

Mykonos Web Security 4.5.1

User Guide

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This guide provides an overview of the Mykonos Web Security system, explains its functions, and includes directions for deploying and configuring the appliance for use in a network. It also outlines how to properly use the software included.

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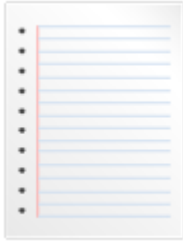
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Other Documentation Formats

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Table 1. Available User Guide Formats

PDF (.pdf)	eBook (.epub)	Text (.txt)
 1	 2	 3

Introduction

1.1. Overview

1.1.1. Summary

Mykonos Web Security (MWS) secures websites against hackers, fraud and theft. Its web intrusion prevention system uses deception to detect, track, profile and block hackers in real-time. Unlike signature-based approaches, Mykonos Web Security is the first technology that pro-actively inserts detection points to identify attackers *before* they do damage - and without any false positives. Mykonos goes beyond the IP address to track the individual attacker, profile their behavior and deploy counter measures. With Mykonos Web Security software, administrators are liberated from writing rules, analyzing massive log files or monitoring another console. Mykonos neutralizes threats as they occur, preventing the loss of data and saving companies millions of dollars from fraud or lost revenue.

1.1.2. Why is it Unique as a Security Product?

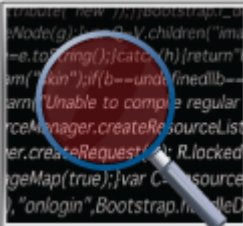
The software uses deception-based techniques that make attacking a website protected by Mykonos Web Security more time consuming, tedious, and costly. The software inserts detection points into your web server's output to browsers. The detection points do not affect your web server (it never sees them), nor do they appear on user screens. The detection points are monitored and stripped from the requests coming back from the user's browser. Any change to a detection point is an indicator of hacking attempts; this triggers the deception response. Would-be hackers are deceived into wasting time attempting penetration using 'dummy' information, and so do not continue exploring elsewhere for security holes.




Mykonos sits between your web servers and the outside world. It adds detection points to outbound web traffic and removes them from inbound web traffic; thus, it works with any web-hosting system. There is no need to alter a single line of code on the website or web application. Annoying false positives are eliminated; MWS only looks at points it has inserted. Legitimate users never see these and have no reason to modify them; thus when a detection point is triggered, there is no chance it is a false positive; someone is probing.

1.1.3. What Does the Software Do?

There are four main phases within Mykonos Web Security.

Table 1.1. The phases of Mykonos Web Security

<p>Step 1: Detect</p> 	<p>Mykonos uses tar traps to detect threats without false positives to detect attackers before they materialize into attacks. These detection points detect when attackers are doing reconnaissance on your site, looking for vulnerabilities to exploit.</p>
<p>Step 2: Track</p>	<p>Mykonos user's persistent tokens and fingerprinting to track not only IPs but browsers, software and scripts.</p>

	
<p>Step 3: Profile</p> 	<p>Mykonos creates a smart profile of the threats, helping you understand the threat and determine the best way to respond.</p>
<p>Step 4: Respond</p> 	<p>After detecting, tracking and profiling the threat, Mykonos provides you with many block, warn or deceive options.</p>

1.1.4. What traffic does it inspect?

Mykonos Web Security software inspects only HTTP and HTTPS traffic. It functions as a reverse proxy.

1.1.5. How is it managed?

The system logs incidents to a database of attacker profiles, and exposes them to the security administrators through a web-based Monitoring Console. System administrators can apply automated abuse-prevention policies, or respond manually.

1.2. Major Components

Major system components include:

- The **HTTP/HTTPS Gateway Proxy** for accepting and translating raw traffic and interacting with the defensive security layer. This is core to having the system serve as an in-line proxy. This layer is also responsible for SSL encryption, decryption, and compression.
- The **Security Engine** and **Profile Database**, core components for managing all aspects of run-time security.
- The **Response Rules Engine** for automating responses to in-violation behavior in real time.
- A **Web Monitoring Console** that provides real-time monitoring, system configuration, reporting and charting.
- **Processors** - objects that contain specific security instructions for the Security Engine as well as logic to detect and interpret malicious behavior.

1.3. Features

Abuse Detection Processors

A library of HTTP processors that implement specific abuse detection points in application code. Detection points identify abusive users who are trying to establish attack vectors such as SQL injection, cross-site scripting, and cross-site request forgery.

HTTP Capture

Captures, logs, and displays HTTP traffic for security incidents.

Abuse Responses

Enables administrators to respond to application abuse with session-specific warnings, blocks, and additional checks.

Abuse Profiles

Maintains a historical profile of known application abusers and all of their malicious activity against the application, for analysis and sharing.

Tagging and Re-identification

Enables application administrators to re-identify abusive users and apply persistent responses, over time and across sessions.

Policy Expressions

Simple expression syntax for writing automated, application-wide countermeasures for the system policy engine.

Email Alerts

Sends alert emails when specific incidents or incident patterns occur.

Monitoring Console

Web-based monitoring and analysis interface allows administrators to drill into application sessions, security incidents, and abuse profiles. As well as, manage and monitor manual and automated responses.

Web-based Configuration

Browser-based configuration interface for all system configuration and deployment options.

Software and Hardware Delivery Support

Distributed as VM image, or drop-shipped as a pre-built hardware appliance on HP hardware.

SSL Inspection

Passive decryption or termination.

Multi-application Protection

Single system processes and secures traffic for multiple application domains.

1.4. Support

For any issues or questions contact Juniper Support:

- 1-888-314-5822 (toll free, US & Canada)
- [Juniper Support Contact Information](#)¹

For those outside the US and Canada, there are regional numbers available through the above URL.

Deployment Overview

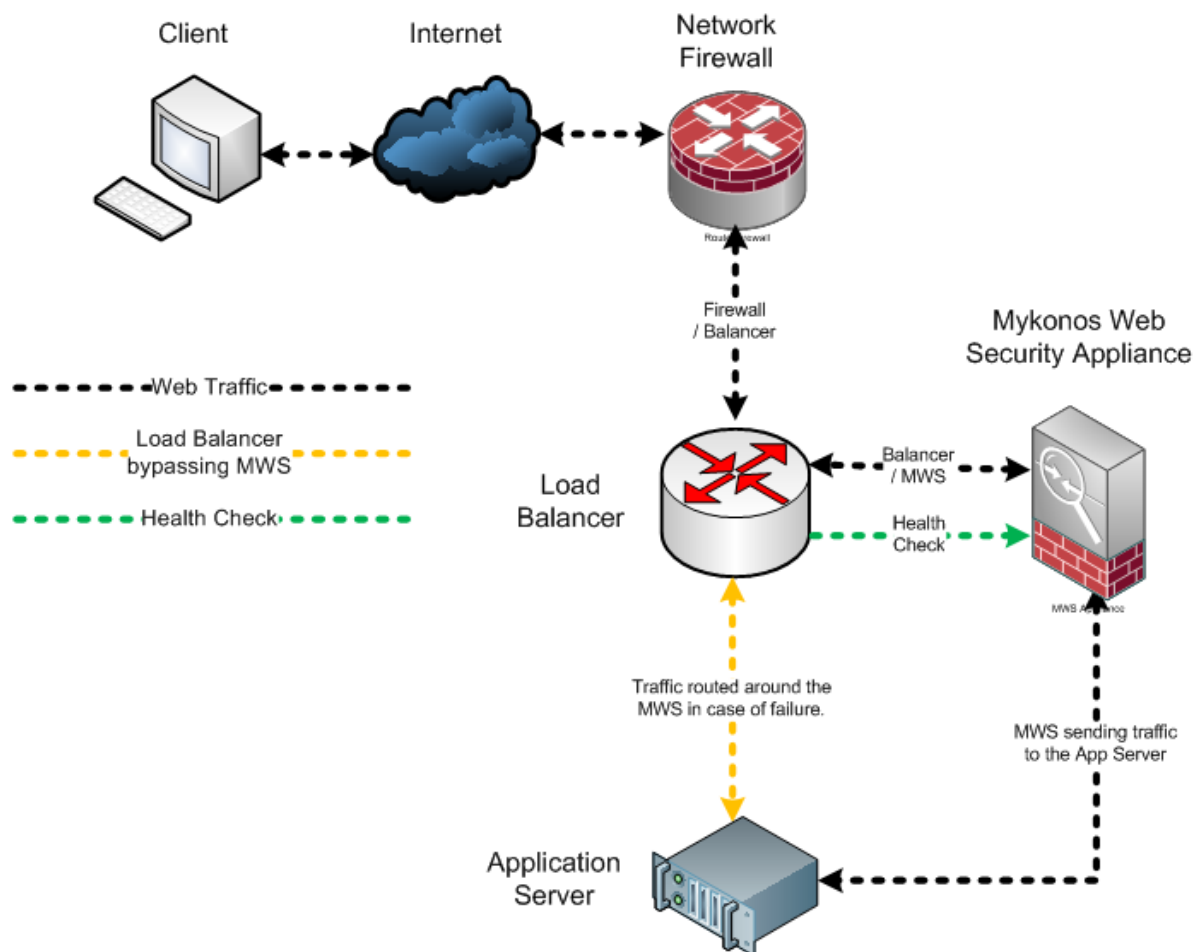
The Mykonos Web Security (MWS) appliance processes all inbound web requests and outbound web responses. Outbound responses are modified in ways that are invisible to the average user; inbound requests are checked to see if the modified responses have been touched in any way. Such touching is suspicious, and indicates a possible hacker. Due to its focus on web applications, MWS only accepts HTTP/HTTPS traffic and is normally placed between a load balancer and your web applications. Topologically, the best way to look at the MWS Appliance is as a Web Reverse Proxy Server. Using this technique makes the design resistant to failure of the MWS hardware.

2.1. Appliance Network Placement

2.1.1. Between Firewall and Web Servers

MWS acts as a reverse proxy and actively manipulates traffic between the protected web application and the Internet. It is deployed between the protected web server and the last system which can alter user-facing traffic. This location gives MWS full visibility into the HTTP traffic destined for the web servers (including any errors that may have been caused by authentication failures), and lets it inject and strip out any code it uses in protecting the application.

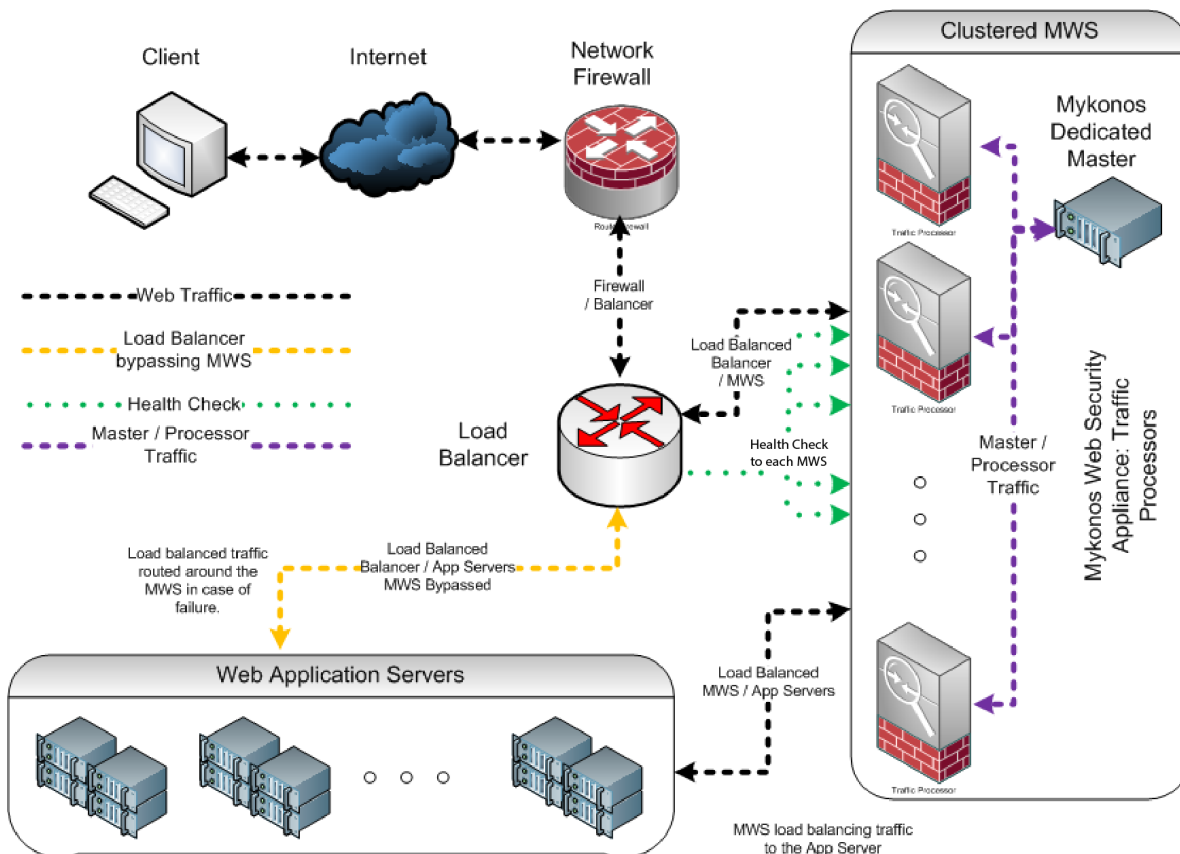
This topology has the added benefit of minimum impact on internal network bandwidth.



The network placement requirements also include:

- MWS only processes HTTP and HTTPS traffic, therefore it must live behind a device that can separate Application Layer (Layer 7) traffic.
- In order to prevent an MWS problem from impacting a protected application, the upstream device (i.e., the router or load balancer) must perform Health Check monitoring on MWS over HTTP. If the Health Check fails, the load balancer or Layer 7 router should pass traffic directly to the protected application servers, rather than to the MWS.

The actual implementation depends on the user's specific network topology. The first figure shows the MWS deployed in its most simple form as a reverse proxy connected to a load balancer. The following figure shows a more complex environment with clustered web servers and clustered Mykonos appliances.



2.2. Options for Load-Balanced Environments

MWS can serve as a load balancer for HTTP and HTTPS web traffic, however it is recommended that a dedicated hardware solution be used in that capacity. Dedicated load balancers are optimized for that role and should provide higher overall performance.

2.3. SSL Traffic Consideration

MWS includes SSL decryption capabilities to give it visibility into all of the protected application's traffic. MWS supports two modes: Passive Decryption and SSL Termination.

In Passive Decryption mode, the MWS decrypts requests for processing, then re-encrypts them before sending them on to the application server. HTTPS responses to the user follow the same process, where they are decrypted, processed, and re-encrypted before returning to the user.

In SSL Termination mode, the appliance serves as an SSL termination point. It decrypts incoming HTTPS traffic, processes them, then proxies the decrypted requests on to the application. Responses to the user are received unencrypted from the application server, processed, encrypted, then passed to the user.

Details of SSL configuration are covered fully in the Setup and Configuration sections of this document.



Note

You will need a copy of the certificate on the MWS in order to process SSL traffic.

2.4. Limitations

- MWS only accepts HTTP and HTTPS 1.0 and 1.1 traffic.
- It is not a network firewall and should not be an edge device.
- MWS does not currently support redundancy for network traffic, including link aggregation, or fail open hardware devices.
- MWS does not support hardware fail open capability itself and should not be physically in line with protected application servers.
- MWS doesn't support link aggregation or trunking, which means it cannot be connected to 2 network devices that can assume each other's IP addresses in the Active/Passive redundant network configuration.

2.5. Hardware Requirements for Mykonos

MWS records suspicious activity to disk by default and requires fast and reliable disk access. The volume of disk access can increase dramatically when extended logging is turned on. MWS can be installed directly on a suitable server, or as a virtual machine under VMware. When deploying in a virtual environment, be sure the selected disk is logically close enough to the virtual machine that it can maintain the required throughput even when backups or other disk-intensive operations are underway.

Table 2.1. Hardware Requirements

	Virtual		Physical	
	Minimum	Recommended	Minimum	Recommended
CPU	2 vcores, >2 GHz	4 vcores, >2.4 GHz	2 cores, >2 GHz	4 cores, >2.4 GHz
RAM	8 GB per VM	16 GB per VM	8 GB	16 GB
Disk Size	30 GB	60 GB	30 GB	60 GB
Disk I/O	Tier 2 or better	Tier 2 or better	Directly-attached, 5400 RPM drives	Directly-attached, 7200 RPM drives or better

These are **minimum** specifications and should provide sufficient performance for most applications. However, application traffic and server load can vary widely. Your site may require higher performance hardware, or virtual hardware, to adequately handle the load.

A Mykonos deployment configured for high-availability **requires** 10GB Ethernet connections on each platform.

Appliance Installation

MWS is a software appliance (operating system, utilities, and application software) that can be installed directly on customer provided hardware from the supplied ISO image, or as a Virtual Machine. It can also be installed in a Cloud environment. For hardware installation, please see the documentation that came with your hardware before burning the ISO to a CD or DVD media. For a Virtual Machine installation, please follow VMware's procedures to install the Mykonos .ova file through the vSphere application. For a Cloud installation, please see your vendor's documentation.

3.1. Mykonos Terminology

Appliance

The Mykonos software/hardware system.

Application

The web server program, whether it is Apache, JBOSS, Microsoft, or other web serving software.

GUI

Graphical User Interface.

HA

High Availability, a configuration that aims to reduce the chance the entire system fails.

MWS

Mykonos Web Security, the name of the product.

TUI

Text User Interface, usually invoked on the command line via "sudo setup".

3.2. Initial Setup

Initial configuration is done through the console in a limited shell. Once the MWS has been initialized for the first time, the administrator can log into a Web console to finish the initial setup. Once the setup is complete, the MWS will be protecting your applications. You must use the direct console interface to configure the appliance IP address. Once the system has an IP address, you can use SSH to connect via port 2022.

Use the SSH command:

```
SSH <machine_IP_address> -p 2022 -l mykonos
```

Default login credentials for the console are:

- User: mykonos
- Password: mykonosadmin



Important

You should change the default login and password immediately after installation.

3.2.1. Changing the Password

The system password can only be changed from the underlying Linux command line. To do this, connect via the console or SSH. You will see the setup utility screen; navigate to 'Quit' and you will exit to the shell. Type 'passwd' and follow the prompts.

3.3. First Time Configuration

Basic configuration of the MWS is straightforward. The following steps are executed via the console and the Text User Interface (TUI):

- Set the host name
- Set up networking
- Restart networking
- Initialize the appliance

At this point, the web interface should be active. From it, you will:

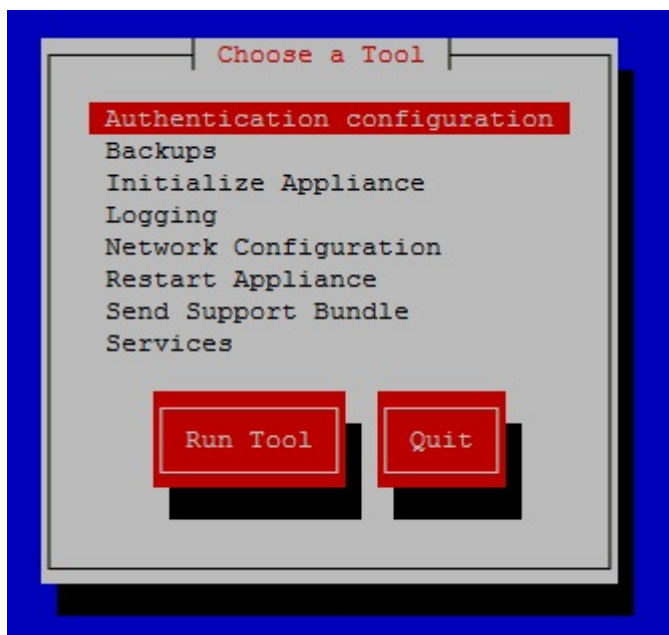
- License the appliance
- Perform a basic appliance test
- Run the installation wizard

3.4. TUI Steps

The following steps are performed through the Text User Interface. This is initially done via the console, however the TUI is available through SSH once the Appliance is operating.

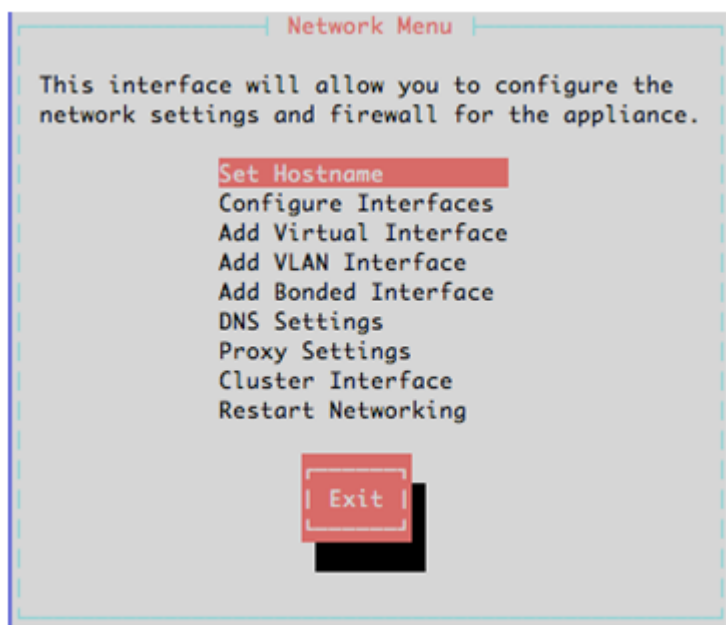
3.4.1. Network Configuration

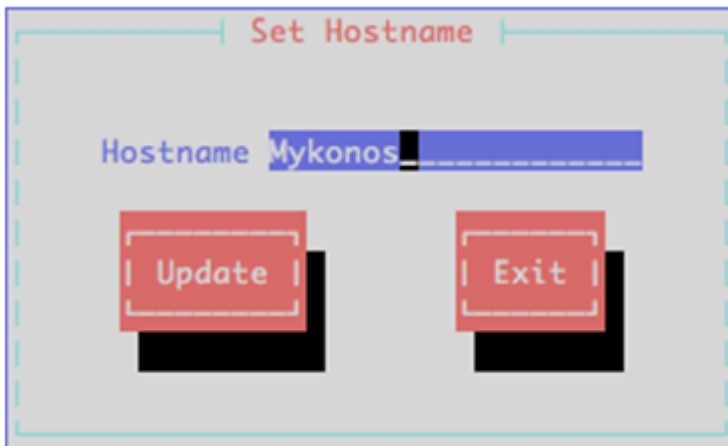
The minimum requirements for the appliance's network setup are to set a hostname and configure a network interface.



3.4.1.1. Setting the Hostname

To configure the network interface, first enter the TUI and select "Network Configuration" from the menu. From here, enter the "Set Hostname" menu and enter the name by which you want the appliance to be known.

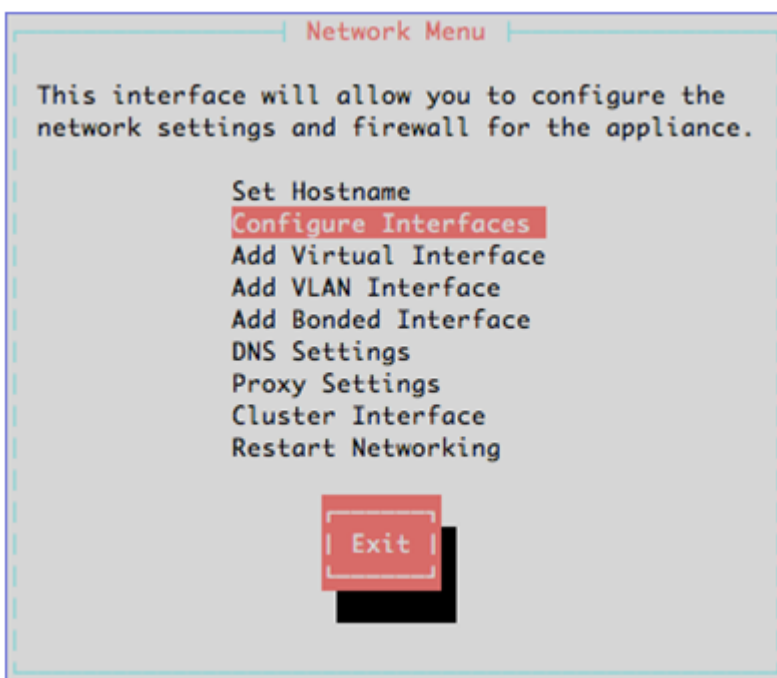


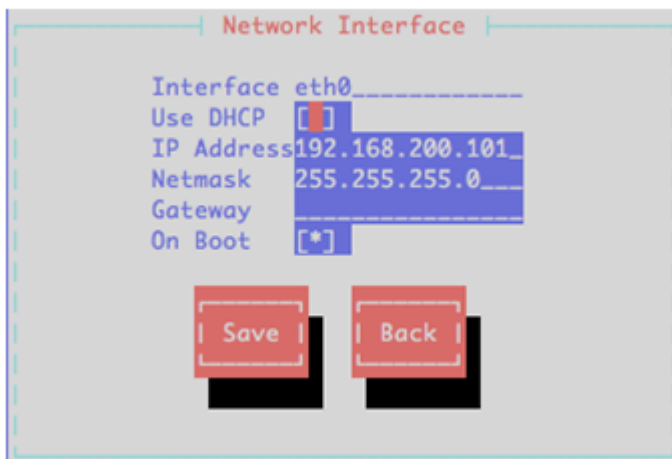
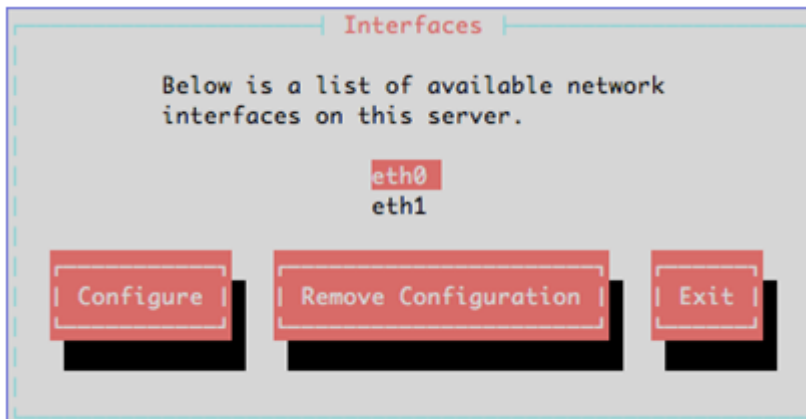


3.4.1.2. Interface Configuration

Once the Hostname is set, open the "Configure Interfaces" menu and enter the network settings for the appliance's network interface.

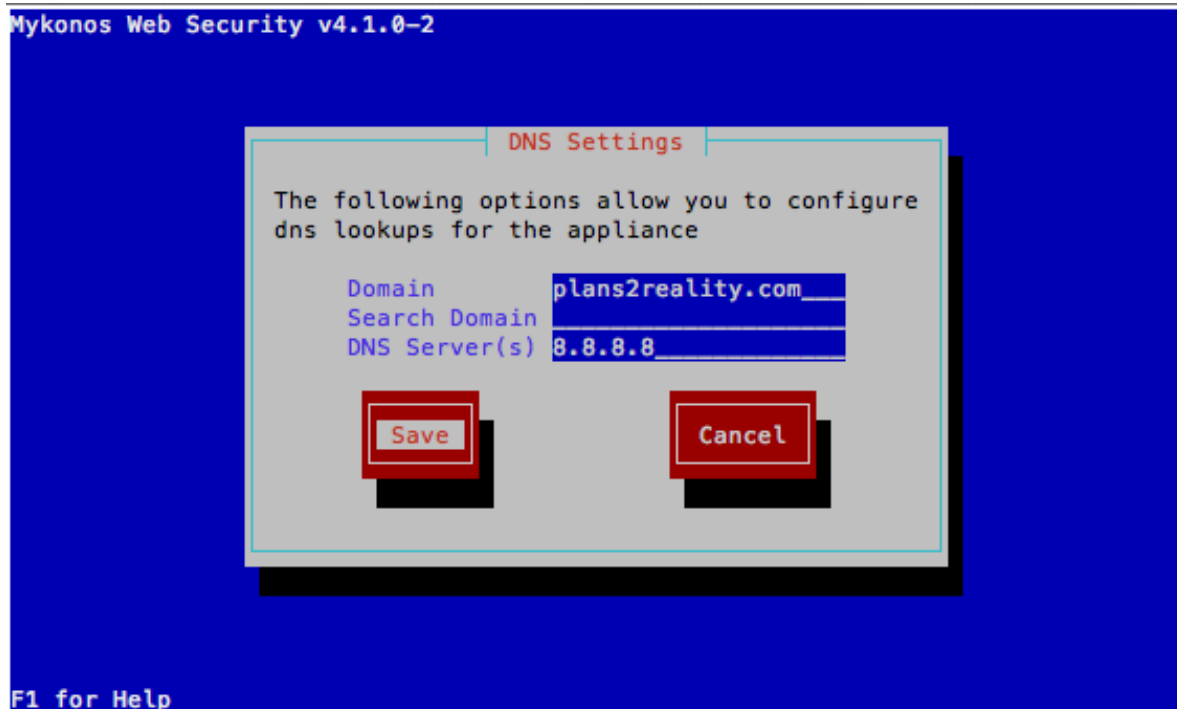
- Interface - Select network interface
- Use DHCP - Check to use DHCP; uncheck for fixed IP address
- IP Address - Specify a fixed IP address (if DHCP is unchecked)
- Netmask - Specify the netmask
- Gateway - Specify network gateway IP address
- On Boot - Select to start the interface at boot time





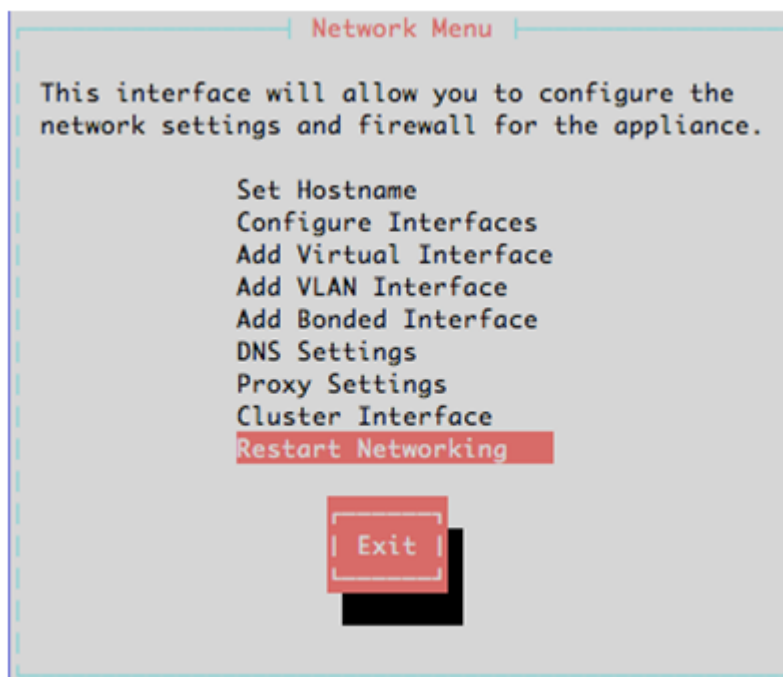
3.4.1.3. Set DNS

If you set a static IP address, you will need to specify a DNS server. Select DNS settings from the network menu, and enter appropriate values.



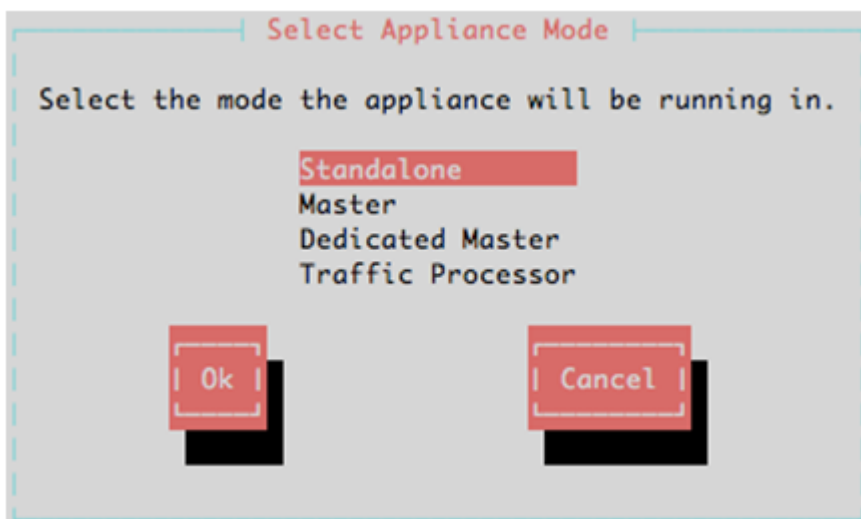
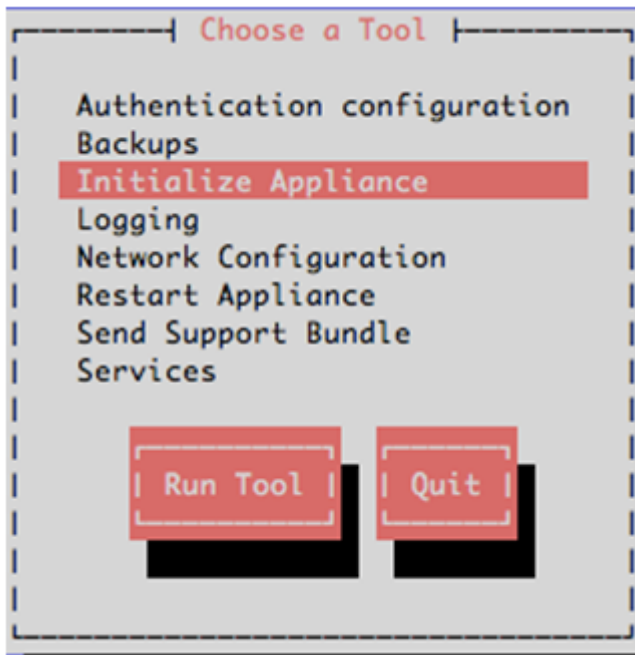
3.4.1.4. Restart the network

After the Hostname and network interface information has been set, you must restart networking to have the changes take effect.



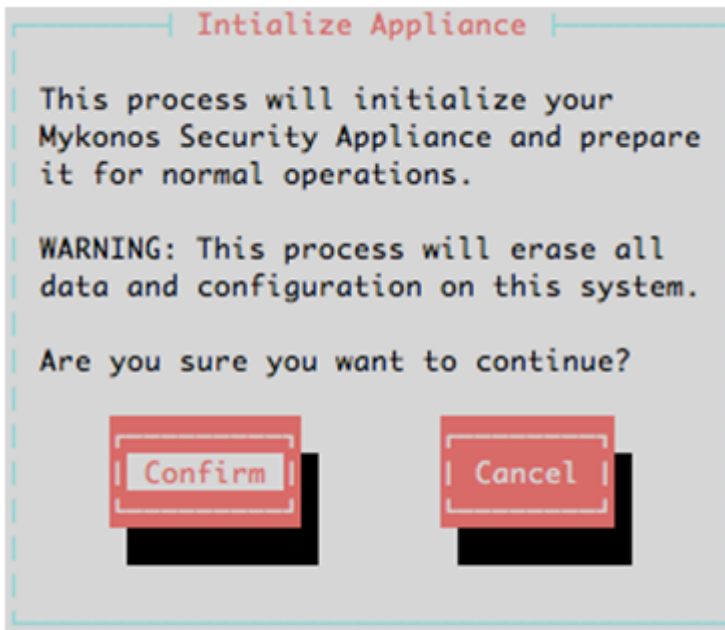
3.4.1.5. Initialize the Appliance

Now you are ready to initialize the appliance's services. Open the TUI menu and select the "Initialize Appliance" from the menu. You will be presented with four choices:



- Standalone: A single MWS is being used.
- Master: An MWS that both processes traffic and controls other MWS appliances.
- Dedicated Master: This MWS only directs other MWS appliances; it requires at least one appliance in "Traffic Processor" mode to protect a site.
- Traffic Processor: This MWS is a slave; it only processes traffic and requires at least one Master or Dedicated Master to protect a site.

After you make your selection, the appliance typically takes three to five minutes to initialize, depending on available resources. Once initialization is complete, you will have access to the web interface to finish the initial configuration.



The Appliance typically takes 3 to 5 minutes to initialize, depending on available resources. Once initialization is complete, the administrator will have access to the Web interface where they can finish the initial configuration.



Note

Initialization sets the system to a "default" state and will overwrite any existing configurations. If this is the first time you're configuring the Appliance it will not be an issue. However, if you are rerunning the initialization on an existing system, be aware this will reset it to defaults, deleting any existing data on the Appliance. For existing systems, see the section, 'Configuration Import / Export'.

3.4.1.6. Verify Connectivity

After all initialization steps have been performed, verify that all network settings are correct, and that the appliance can be reached from the network. Navigate to the ip or hostname assigned to the appliance (on SSL), and specify port 5000.

For example:

- `https://10.10.10.104:5000`
- `https://my-mws-hostname:5000`

If you see the following dialog, network settings are correctly configured.



3.5. Licensing

In order to complete MWS configuration, you will need to install the license for your product. Use a web browser to connect to your appliance on port 5000 and log in using the Admin's credentials.



Note

The configuration url is: `https://<IP address or hostname>:5000`

Examples:

- `https://10.11.12.13:5000`
- `https://mws.mydomain.com:5000`

Go to the Licensing section and follow the prompts.

Enter the license key supplied by your Sales Engineer in the Add a New License field.

Click Add.

Review the Terms of Service.

Click Yes on "I agree to the terms of service."

If the license validation step fails, check the network settings, particularly proxy settings for the network. Your MWS has to reach the outside world to contact the licensing server.



Welcome to Mykonos Web Security!

It looks like you haven't configured your backend servers yet.
We recommend that you use the [Configuration Wizard](#) to get things set up.

The interface shows the Mykonos logo and a navigation bar with buttons for Configuration, Autoresponses, Reports, System Status, Licensing, and Updates. A green status bar indicates the user is logged in. A yellow message bar states: "Please add a license to continue using Mykonos Web Security." The main section is titled "Licensing" and contains the text: "Your product must have a valid license installed before you can use it." and "You do not appear to have installed any licenses." Below this is a large "Add a New License" heading, a text input field, and an "Add" button.

The screen displays the "Mykonos Software License Terms" with a list of definitions for various terms. At the bottom, there are two radio button options: "NO" (selected) and "YES". The "NO" option is labeled "I agree to the terms of service". The "YES" option is labeled "Send hardware details to Mykonos customer support?". A "Save License" button is located at the bottom right.

Mykonos Software License Terms

1.4 "Enhancement" means any technology that enhances, improves, or otherwise modifies any Licensed Software.

1.5 "Error" means an error in any Licensed Software which significantly degrades the Licensed Software as compared to Mykonos's published performance specifications and/or Documentation.

1.6 "EULA" means a binding license agreement entered into between Licensee and an End User for any Licensed Software.

1.7 "Executable Code" means the fully compiled binary version of a software program that can be executed by a computer without further compilation.

1.8 "Fees" means the License Fees, Support Fees, and Training Fees identified on Licensee's Order Form(s).

1.9 "Including", "Include", and their variants means Including without limitation unless the context clearly provides otherwise.

1.10 "Intellectual Property Rights" or "IPRs" means any and all rights in patents, copyrights, trademarks, service marks, trade secrets and know-how, and applications, registrations, and derivative works of any of the foregoing.

1.11 "Licensed Software" means all software Mykonos provides to Licensee in connection with this Agreement, including Licensed Software and Mykonos Technology.

1.12 "Login Credentials" means the unique set of credentials provided by Mykonos to Licensee which identifies Licensee and enables Licensee to access to a downloadable version of the applicable Licensed Software.

1.13 "Mykonos Technology" means Mykonos's tools and technology known as Mykonos Web Security that comprise its deception-based security software, virtual machine, and cloud-based versions including any Executable Code, software packages, images, ISO's, virtual images, related data files, Source Code, Enhancements, Bug Fixes, and any Updates / Upgrades.

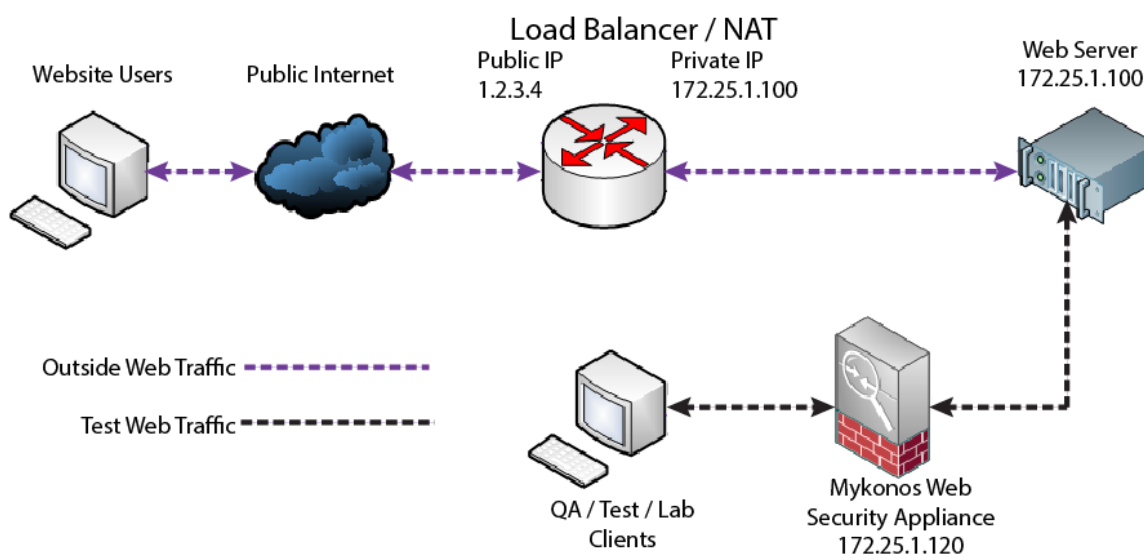
☐ NO
I agree to the terms of service

☐ YES
Send hardware details to Mykonos customer support?

[Save License](#)

3.6. Creating a Test Configuration

MWS acts as a reverse proxy and is deployed between the protected web server and the load balancer. This location gives MWS full visibility into the HTTP traffic destined for the web servers (including any errors that may have been caused by authentication failures), and lets it inject and strip out any code it uses in protecting the application.



With this topology, the web server remains in production, at its normal (private) IP address. You are creating a small 'island' of system(s) which access the web server through MWS; all production traffic continues to flow in the normal manner. Your MWS appliance is set up as it will be for production; this makes it easy to go live when you are ready.

3.6.1. Initial Configuration and Testing

One (or more) test systems must be configured so that they see the web server at the IP address of the MWS appliance, 172.25.1.120. This can be done with either a local split-DNS or the local Hosts file.

3.6.2. Larger-Scale Testing

When you are ready to scale up testing, your split DNS can be configured so that outside users 'see' the web server directly, but all inside users (i.e. employees) receive the MWS IP address when accessing the web server. This lets you thoroughly test and evaluate before going live.

Configuring Mykonos Web Security

The Web interface is used for system configuration, as well as monitoring and reporting. The initial installation required you to access this interface to license MWS and bring your appliance on-line. You will use this interface for nearly all configuration options.

The configuration URL is: **https://<IP address or hostname>:5000**

Examples:

- https://10.11.12.13:5000
- https://mws.mydomain.com:5000



Note

Log into the Web interface using the "mykonos" account. If you have not changed the password, the default is "mykonosadmin" and we strongly recommend you change it.

4.1. Configuration Wizard

The Configuration Wizard gives you a simple way to configure the most commonly used basic features on the MWS Appliance, including defining one or more web applications to protect, alerting, and backups. During the initial configuration, the Appliance received network connectivity, its license, and was initialized. However, it needs to have one or more Backend Servers (web applications) defined in order to protect live traffic.



Welcome to Mykonos Web Security!

It looks like you haven't configured your backend servers yet.
We recommend that you use the [Configuration Wizard](#) to get things set up.

The Wizard walks you through setting up Backend Servers, SMTP Settings, Alerts, and Backups. When you've completed the Wizard, it will give show you a confirmation page and some additional steps, such as pointing your Load Balancer to the Appliance, you may wish to perform.



Warning

Upon completion of the Wizard, PLEASE make a note of your backup encryption key. If you lose this key, NOBODY, not even Mykonos Support, can retrieve the information contained in your backups!



Note

When using the system's default mail server, users should set a valid hostname and ensure that the mail configuration observes all best practices for setting up a mail server.

The Wizard has a minimum of 6 steps. The actual number of steps may increase depending on your choices, such as defining multiple applications to protect.

4.1.1. Wizard: Backend Servers

Mykonos Web Security functions as a reverse proxy, sitting in front of your web application. MWS can protect an arbitrary number of application servers. In order for us to process traffic, you must specify at least one backend server to which we will proxy traffic. The default is 1 and should suffice in most applications. If the MWS will serve as a software load balancer, rather than using a dedicated hardware solution, multiple servers can be configured at this time.

STEP 1 OF 6: BACKEND SERVERS

Mykonos Web Security functions as a reverse proxy, sitting in front of your web application. In order for us to process traffic, you must specify at least one backend server to which we will proxy traffic.

Number of Backend Servers:

Mykonos Web Security can be configured as a simple software load balancer. If you're not planning on doing that, just leave this '1' here.

next→

4.1.2. Wizard: Backend Server Configuration

Each Backend Server you configure here requires the following information:

- **Server Name:** A unique name that MWS uses to identify this server. The name can include any alphanumeric character, "-", and "_", with no whitespace. Do not use the server's Fully Qualified Domain Name (FQDN) or a URL. If you are using VMware, you may wish to use the same name here as you assigned in VMware, to avoid confusion. This is not necessary, however.
- **Server Address:** Specify the server's IP. MWS does not support IPv6 addressing at this time.
- **HTTP Port:** Usually port 80.
- **HTTPS Port:** Usually port 443.
- **Weight:** Defaults to 1. This value is used when the MWS is serving as a software load balancer and represents the relative "weight" the server has for balancing purposes.
- **Backup:** Defaults to NO. This only applies if you are using the MWS as a software load balancer and designates this server as a backup.

STEP 2 OF 5: BACKEND SERVERS

For each backend server, specify a server name (just for your reference), and IP address and port information. If you'd like to use Mykonos Web Security as a simple software load balancer, you will also need to specify a weight other than 1, and whether or not each server is a backup server.

Server Name:	<input type="text" value="Backend1"/> <small>A simple logical and unique name of the server using only letters, numbers, and the dash character with no whitespace (do NOT use a url or a fully qualified domain name for this)</small>
Server Address:	<input type="text" value="10.10.10.101"/> <small>Specify a hostname or IPv4 address.</small>
HTTP Port:	<input type="text" value="80"/> <small>The TCP port to use for unencrypted (HTTP) communication with the server.</small>
HTTPS Port:	<input type="text" value="443"/> <small>The TCP port to use for encrypted (HTTPS) communication with the server.</small>
Weight:	<input type="text" value="1"/> <small>If using Mykonos Web Security as a software load balancer, this is the load balancing weight (higher = more requests).</small>
Backup?	<input type="checkbox"/> NO <small>If using Mykonos Web Security as a software load balancer, whether or not this server is a backup server.</small>

4.1.3. Wizard: SMTP Servers

MWS can email alerts to your administration team. While the appliance can serve as its own mail server, we recommend that you use a valid mail server for your network.

SMTP Configuration supports the following fields:

- **SMTP Default Sender:** This will be the "From:" address in email alerts. The address should be valid for your network so alert mails won't be mis-categorized as spam.
- **SMTP Server Address:** Defaults to localhost. Set it to the IP address or FQDN of your mail server if you are using an off-board mail server as recommended.
- **SMTP Server Port Number:** Defaults to 25. Set it to the port your mail server is listening on.
- **SMTP Username:** Defaults to blank, and may remain blank if you are using the onboard server. Set it to a user with valid access to the mail server.
- **SMTP Password:** Defaults to blank, and may remain blank if you are using the onboard server. Set it to password for the SMTP username supplied above.

STEP 3 OF 5: SMTP SETTINGS

Various components of Mykonos Web Security send email. If you'd like to use the built-in SMTP server, you can just click 'Next', but if you have an MTA on your network already, please specify the details below.

SMTP Default Sender:	<input type="text" value="support@mykonossoftware.com"/> <small>Will be used as the default 'from' address for email sent by the server. Address should be a valid sender for your domain to avoid being miscategorized as spam.</small>
SMTP Server Address:	<input type="text" value="localhost"/> <small>Enter the IP address or FQDN of your SMTP server.</small>
SMTP Server Port:	<input type="text" value="25"/> <small>If your SMTP server is on a non-standard port, enter it here.</small>
SMTP Username:	<input type="text"/> <small>If your SMTP Server requires authentication, enter the username here.</small>
SMTP Password:	<input type="password"/> <small>If your SMTP Server requires authentication, enter the password here.</small>

4.1.4. Wizard: Alert Service

The MWS can send alerts to an SNMP server or via email to appropriate personnel. The alert service is optional, and defaults to "No." If you choose not to activate alerts, the Wizard will skip to the next section.

STEP 4 OF 5: ALERT SERVICE

Mykonos Web Security can be configured to send email alerts or SNMP traps to administrators when an incident of a specified severity is detected. For instance, we could send out an email notification to a specific admin who is on-call if an incident level of 'critical' is detected, allowing the admin to respond quickly to the threat.

Send Alerts?	<input type="checkbox"/> NO <small>The alert service can send SNMP traps or email system administrators when certain activity is detected. If you leave Alerts turned off, these will be logged *only*.</small>
---------------------	---

4.1.5. Wizard: Backup Service

Mykonos Web Security can perform regular, scheduled backups of all of its data. We strongly recommend that you turn backups on. You can select backup via FTP or SSH.

The Backup Service lets you specify the following fields:

- **Frequency:** How often backups are sent off-board
- **Retention:** Number of days to keep off-board backups
- **FTP Service:** Whether to use FTP. If set to YES, the server, username, and password fields are required.
- **SSH Service:** Whether to use SSH. If set to YES, the server, username, and password fields are required.

STEP 7 OF 7: BACKUP SERVICE

Please specify how you would like backups to be conducted.

Frequency:	Weekly <input type="button" value="v"/> <small>How often would you like backups to be performed?</small>
Retention:	<input type="text" value="30"/> <small>Number of days that backups will be kept before being deleted.</small>
FTP:	<input type="checkbox"/> NO <small>Would you like to push backups to an FTP Server?</small>
FTP Server:	<input type="text"/>
Username:	<input type="text"/>
Password:	<input type="text"/>
SSH:	<input type="checkbox"/> NO <small>Would you like to push backups to an SSH Server (via SCP)?</small>
SSH Server:	<input type="text"/>
Username:	<input type="text"/>
Password:	<input type="text"/>

4.1.6. Wizard: Alerts via SNMP

If you choose to activate alerts, it will give you the option of setting up the number of SNMP servers to alert and the number of email addresses to which messages will be sent. The defaults to both are 0.

STEP 6 OF 8: ALERT SERVICE SNMP SETTINGS

For each SNMP server, please enter an IP address or FQDN, and a port, if other than the default.

Server Address:	<input type="text"/> <small>Specify a hostname or IPv4 address.</small>
Port:	<input type="text" value="162"/>

4.1.6.1. SNMP Settings

If you have chosen to activate Simple Network Management Protocol (SNMP) alerts, the Wizard will walk you through setting up each of the addresses to send SNMP alerts to. You will need to provide an IP address or FQDN, and port number, for each server.

Server Address:	<input type="text" value="172.20.8.8"/> <small>Specify a hostname or IPv4 address.</small>
Port:	<input type="text" value="162"/>

4.1.7. Wizard: Alerts via email

If you have chosen to activate email alerts, the Wizard will walk you through setting up each email address to which the Appliance will send alerts to.

Email alerts require the following fields:

- **Name:** A common name for referencing this email address
- **Email Address:** Email address
- **Minimum Severity:** Minimum severity level to trigger an email alert to this address
- **Shift Start:** Start time for this address in 24 hour format.
- **Shift End:** End time for this address in 24 hour format.

You are also given the option of having it send alerts on the weekend. Note that you can build complex schedules by creating multiple entries for the same person. For example, admin@yourcompany.com could have an entry named admin-weekday that specified 8 AM to 5 PM, M-F, and a second entry named admin-weekend that specified 6 AM to 6 PM.

STEP 7 OF 8: ALERT SERVICE EMAIL CONTACTS
Please specify the details for each Alert Contact, including their approximate on-call schedule. This information can be changed at any time, after the wizard is completed.

Name:	<input type="text"/>
Email Address:	<input type="text"/>
Minimum Severity:	<input type="text" value="High"/> <small>The minimum severity that the contact will receive alerts for.</small>
Shift Start:	<input type="text"/> <small>Earliest time that alerts will be sent to this contact (use 24-hour time).</small>
Shift End:	<input type="text"/> <small>Latest time that alerts will be sent to this contact (use 24-hour time).</small>
Sunday:	<input checked="" type="checkbox"/> YES <small>Whether or not alerts will be sent to this contact on Sundays.</small>



Note

Configuration of advanced features, such as encryption keys, are not available in the Wizard.

4.1.8. Wizard: Confirmation Page

Once you have completed the Wizard's main steps, you will see the confirmation page, where you will see the URL you can use to confirm the appliance is performing correctly. You will also see the secret key the appliance generated for your backups. Whether MWS is storing backups locally or off-site, you **MUST** have this key. Note that the key is actually a link. You must click on it and confirm acceptance of the key.



Important

Record the secret key and keep it someplace safe. If you run through System Initialization again (See section 3) it will create a new key and you will lose access to your backups if you haven't recorded the old key. If you lose this key, Technical Support will not be able to recover it or your backups.

The screenshot shows the Mykonos web interface. At the top, the Mykonos logo is on the left, and 'You are logged in as mykonos.' with 'Help' and 'Logout' links is on the right. Below the logo is a navigation bar with buttons for Configuration, Autoresponses, Reports, System Status, Licensing, and Updates. On the left side, there is a sidebar menu with options: Basic Mode, Global Configuration, Services, Processors, Applications, Configuration Wizard (highlighted), Expert Mode, and Import / Export. The main content area has a breadcrumb trail 'Configuration > Wizard > Done'. The title 'Configuration Wizard Complete' is in large orange letters. Below it, a message says 'Congratulations! You have successfully completed the initial configuration of Mykonos Web Security, and your system should be passing traffic now.' followed by 'You can confirm this by visiting the URL: <http://steve-vm.mykonossoftware.net/>'. A section titled 'Important! - Backup Secret Key' in teal text shows 'Your backup secret key is: **iLk11WCwofD67rgS**'. A warning follows: 'Please take a moment to store this value someplace safe. If you reinitialize Mykonos Web Security, and do not know your backup secret key, nobody — not even Mykonos Support — will be able to recover your backups!'. Below this is a 'What's Next?' section with a 'DNS' heading, starting with 'Once you're satisfied that everything's set up the way you'd like, you'll want to point your web application's DNS entries to Mykonos Web Security. Before you do that, though, you'.

4.2. Verify the Installation

In order to verify that your MWS appliance is processing traffic, use the following URL to access the appliance honeypot and confirm that it replies with a fake .htaccess.

`http://<IP or Hostname>/.htaccess`

The appliance should reply with something similar to the following. Note that the actual fake .htaccess file may not look exactly like this example.

```
<files "server_logs.txt">
    AuthUserFile
/www/root/.htpasswd
    AuthType Basic
    AuthName "Error logs"
    Require valid-user
</files>
```

Congratulations! Your initial MWS configuration is complete and the appliance is ready to start protecting your applications.

4.3. Health Check URL

The Health Check URL lets an external system (typically a load balancer) confirm that the MWS system is operating properly. Your MWS system will generate a file name consisting of an arbitrary string of characters; make a note of it. If an HTTP request is sent to MWS for this file name, MWS will return 200 OK, with a code in the body of the message. The responses are below.

Table 4.1. Health Check responses and corresponding meanings.

Response	Meaning
No response	MWS is offline
200 OK, plus OK	MWS is fully functional and is protecting your web sites
200 OK, plus DISABLED	MWS is running, but has been disabled or the license has expired
200 OK, plus STAND BY [...]	MWS is waiting on an external resource. The contents of [...] will provide additional information

The format of the HTTP request should be:

`http://MWS_fullyqualifieddomainname_or_IPaddress/filenamegeneratedbyMWS`

4.4. What's Next?

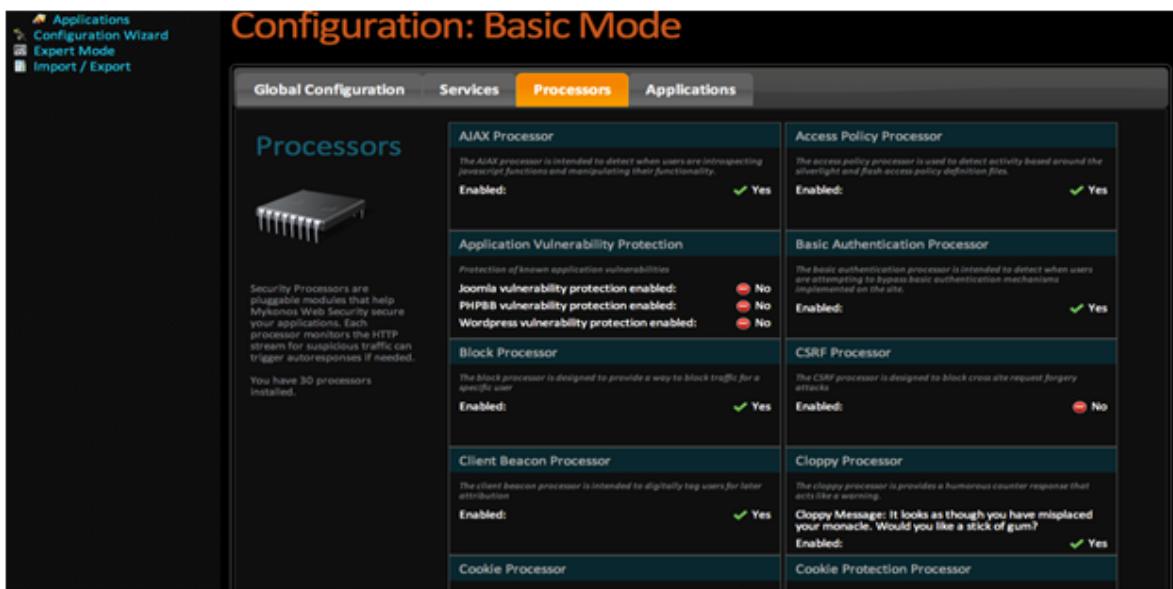
Mykonos Web Security is now configured to secure one web server application. If you have multiple web server applications, or would like to configure the system differently on a per-page basis, please refer to Chapter 6 Additional Configuration Options to add or edit applications.

Your system is now installed and has its basic configuration parameters set. In the next section, you will learn how to protect multiple web sites and modify your protection settings.

4.5. Basic vs. Expert Configuration

Mykonos Web Security is widely configurable with numerous settings to optimize it for your environment. Once you've completed the Wizard, the Appliance will route traffic through a default application profile to the designated backend servers. This default profile is simple, but adequate for many applications. However, there are still hundreds of options available to further customize the Appliance to meet your specific requirements.

MWS has two configuration modes accessible from the Configuration button on the Web interface. Basic Mode gives you access to all of the Appliance's features with a wide range of customizations through a user friendly interface and is recommended for most situations. Expert mode, on the other hand, gives you access to the deepest levels of the Appliance's configuration presented in a key:value pair format. Expert mode is just that: best used by experts who are comfortable making multiple changes at once. The only functional difference between these two modes is presentation and the ability to perform multiple changes at once in Expert mode. Basic mode is recommended for most users and most applications.



Important

When using Expert Mode, be sure to click the "Save" button when you are done making changes. Unlike Basic Mode, Expert Mode does NOT save the configuration to the engine after each parameter is modified; it lets you make multiple changes at once and then write the entire configuration image as one transaction.



Important

Using Expert Mode with Internet Explorer (even recent versions) might cause unexpected behavior, so it is recommended to use other browsers like Chrome, Safari, Opera or Firefox!

**Note**

The Configuration UI, by default, will only display the simplest of configuration options. Select the "Advanced" filter to display all of the options.

4.5.1. Global Configuration

The global configuration defines the system's default actions, bindings, and preferences. It has the following sub-sections:

Application - Identification (Advanced)

How the root-level application exposes itself. Control the name of the server software that is running, the web root, and webmaster email.

Application - Traffic

Parameters related to the root-level application's traffic, such as timeouts, backend servers and health checks, and whether or not to use SSL.

Default Responses (Advanced)

Allows administrators to upload a custom page that will be returned to the client on a successful request instead of the standard http response page.

Error Handling (Advanced)

Any response codes that will be considered to be unsuccessful requests by the system.

General

Configuration related to low-level operations of the Security Engine.

Incident Monitoring (Advanced)

Administrators can set how the system monitors the security of session tokens.

Logging (Advanced)

Configures how the system logs user data. Administrators can configure whether to log request and response data before or after processing, as well as the default logging level.

SMTP Configuration

Mykonos Web Security uses email for several pieces of key functionality, including alerting and reporting. The Configuration Wizard walks you through setting up SMTP servers, but, if you need to, you can change these settings through this menu.

Security

Configure various security-related parameters, such as the health-check URL, and whether or not to log various pieces of the HTTP Request / Response.

Security Monitor

Configure session timeouts for the Security Monitor application.

Server Ports

Specify which ports to use for the Configuration UI (default: 5000), Security Monitor (default: 8080), and system HTTP port (default: 80).

Session Management (Advanced)

Administrators can configure the session cookie used to track users, as well as the profile name list.

4.5.2. Services

Services run in the background, performing tasks such as sending alerts, generating reports, or performing maintenance tasks. The following Services are configurable through the "Services" tab in the Configuration UI.

Alert Service

The system can be configured to send email alerts to administrators when an incident of a specified severity is detected. For instance, the system could send out an email notification to a specific admin who is on call if an incident level of critical is detected, allowing the admin to respond quickly to the threat.

Mykonos Web Security can send Alerts to email addresses on a defined schedule, and / or send SNMP traps to one or more SNMP servers. The initial configuration of the Alert Service can be performed with the Configuration Wizard, but if you need to change these settings, they are available through the "Services" tab of Configuration.

Auto Response Service

Allows administrators to turn the Auto Response service on or off.

Backup Service

This menu configures the backup service. Administrators can configure the frequency, type, and destination for system backups. These settings can also be configured through the Configuration Wizard.

Database Cleanup Service (Advanced)

Administrators can configure how often the database cleanup service runs for sessions, profiles, and incidents through this option.

Security Engine Service (Advanced)

Configures the memory, database, and fingerprinting used by the security engine.

Session Consolidation Service (Advanced)

Administrators can configure how and when the system consolidates user sessions.

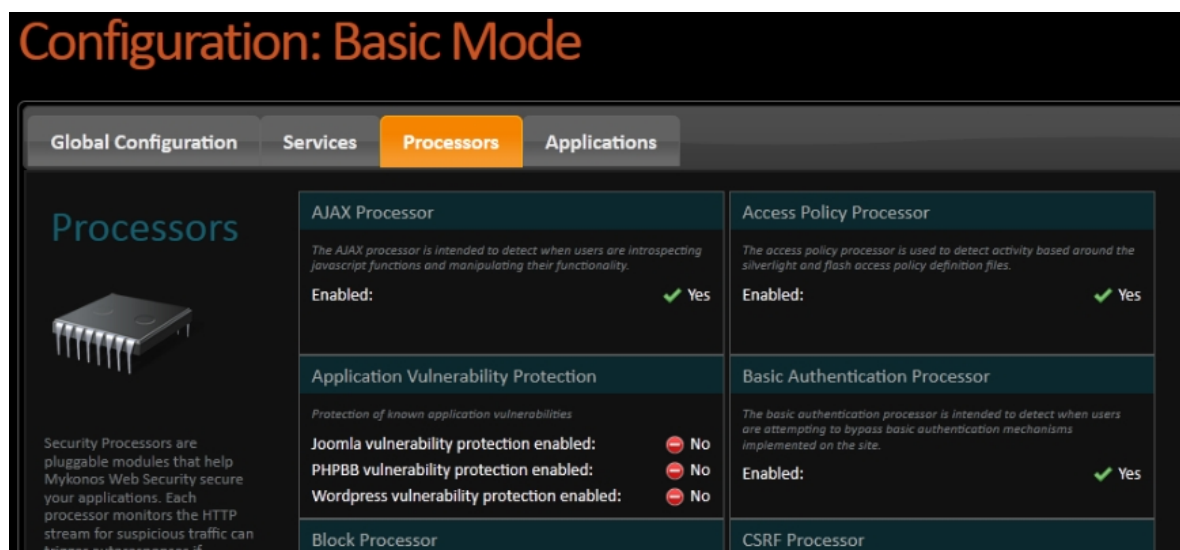
Statistic Service (Advanced)

Configures how the system logs statistical data.

4.5.3. Processor Configuration

Each processor has its own set of configuration options that may be applicable to your application. For each processor, the Administrators can leave the default configuration in place, modify it to suit their situation, or disable the individual processor. In most cases, the default is appropriate.

To configure a processor, browse it on the menu and click on it to expand the options. To turn it on or off, select True or False in the "Processor Enabled" field. Many processors have additional options you can select, some very detailed, allowing you to optimize the processor for your specific application.



4.5.4. Application Profiles

A single installation of Mykonos Web Security can leverage application profiles to protect multiple applications on your site. The "Default Catch-All Application" is configured to catch all traffic before routing it to the Backend Server. MWS processes applications in order, and the Catch All would be last as a failsafe for processing traffic. It is also safe to delete this profile once you have added one or more specific to your environment.

Select "Applications" in the Configuration UI To configure application profiles. All applications inherit the Global Application parameters. To override what will be handled by the new profile, you will wish to define the following fields:

- A URL pattern that the system can use to route traffic to the correct URL.
- If there are multiple Backend Servers, which ones MWS will be proxy for.

When you add an application, the final step will be to set the URL pattern. You can change each application you've added later through the Application / Traffic . Url patterns follow standard Perl Regular Expression (PCRE) syntax.

For example:

- **Any traffic:** `^.*$`
- **Any subdomain:** `^.*\domain\.com$`
- **Multiple, or no, subdomains:** `^((www|shop)\.)?domain\.com$`



Important

URL patterns and profiles are observed in the order they are created/arranged, ensure that all new application profiles are added above the default catch-all to avoid conflicts. The order of Application Profiles can be changed by clicking the "Move Up/Down" options to avoid conflicts in URL patterns and routing.

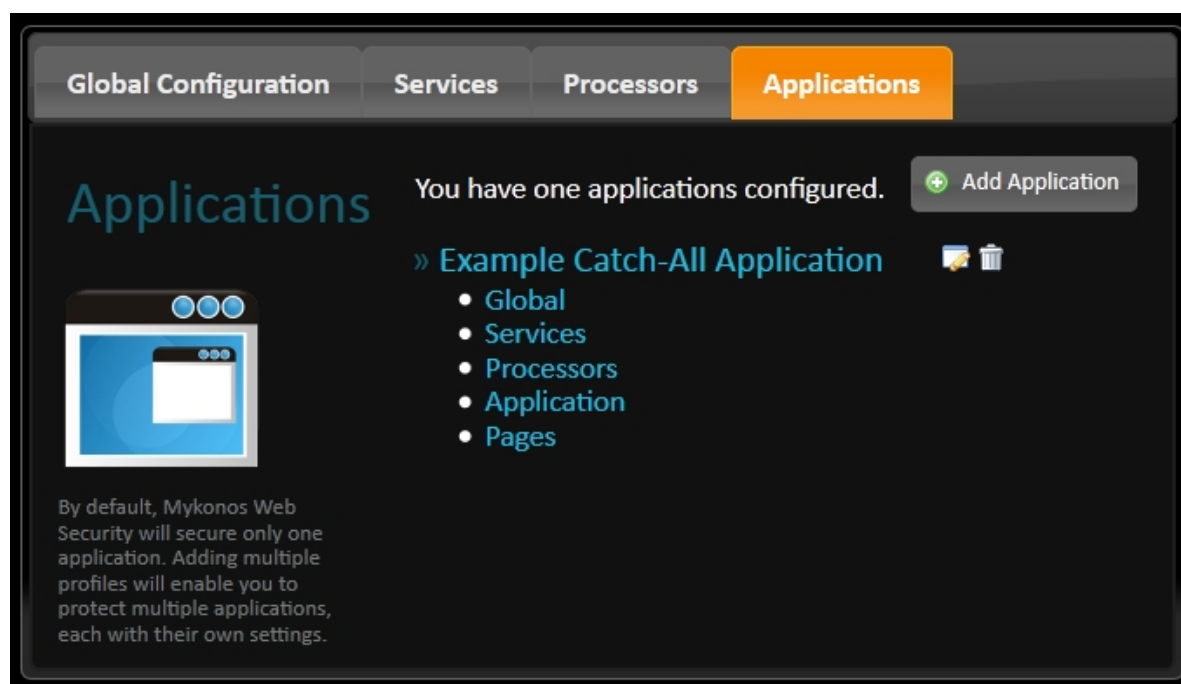
**Note**

If SSL is required for this application, you will also need to enable SSL and ensure that all the required certificates are uploaded and configured as described in the "Configuring SSL" section of this guide.

**Note**

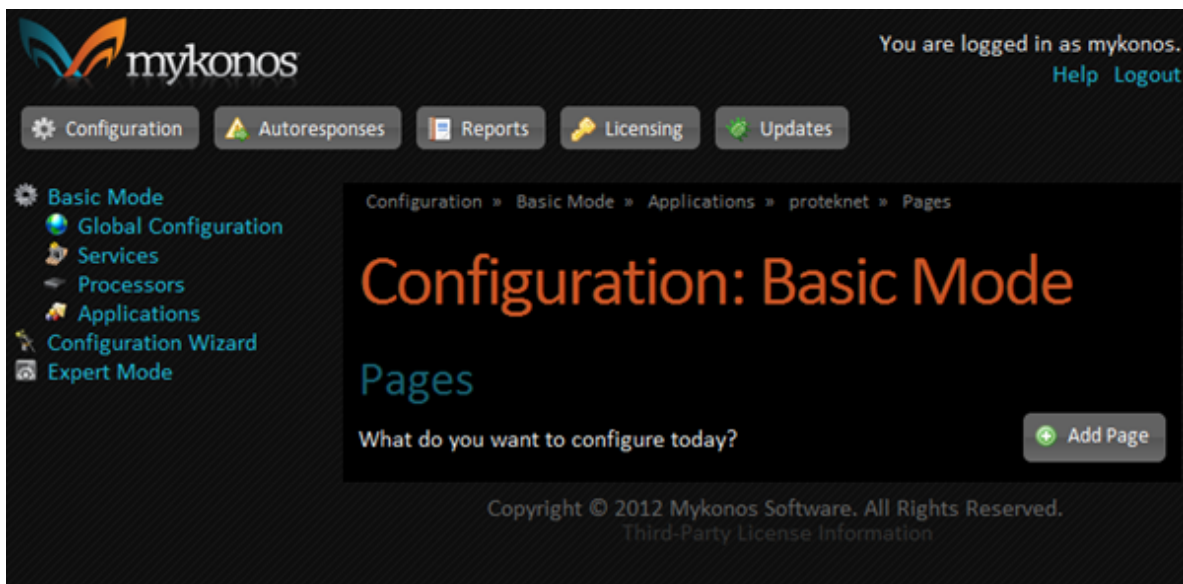
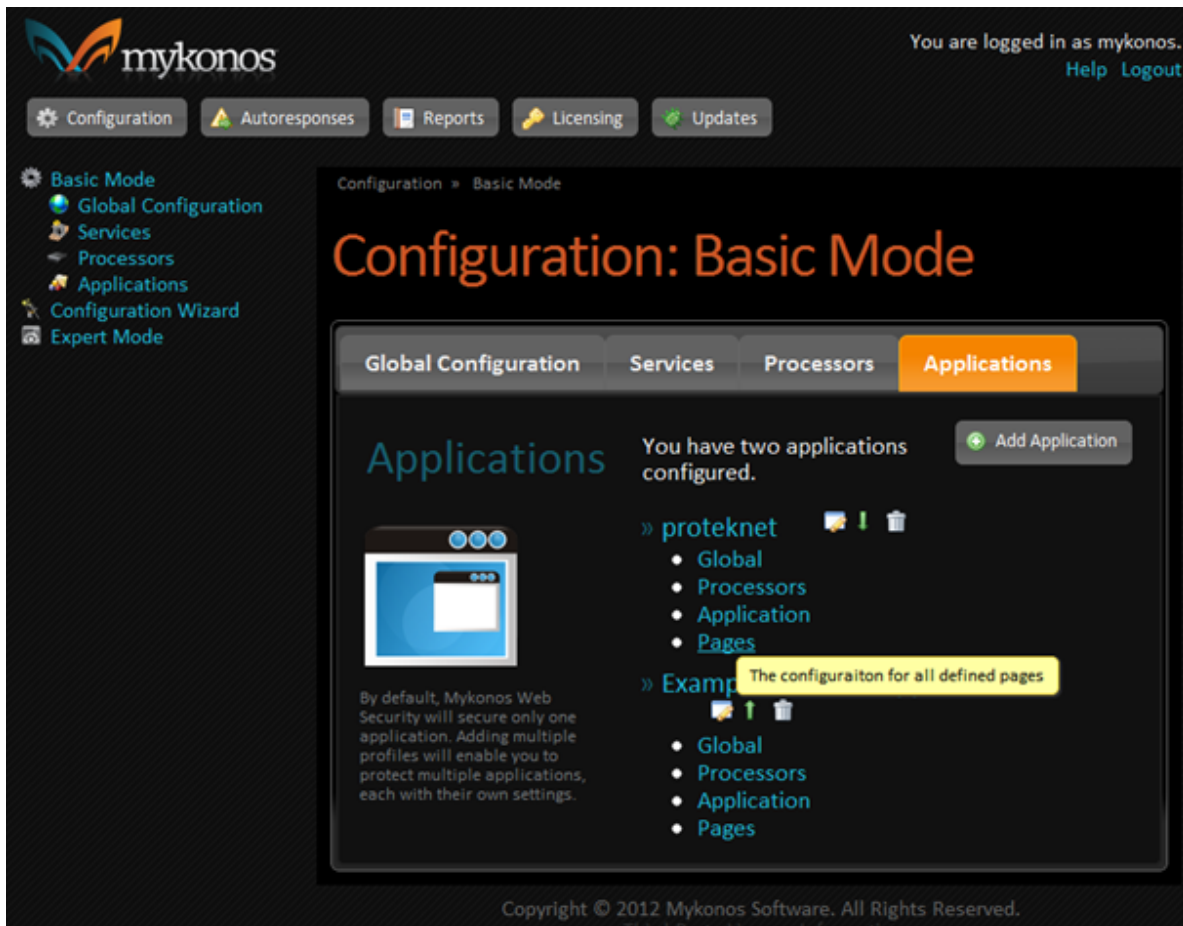
Most, but not all, parameters can be overridden at the context of an application or page. If you have overridden a parameter, and wish to instead use the value defined at a higher level, you may wish to click the "clear" button to re-establish the override.

When you add an application, the final step will be to set the URL pattern. If you need to change it at a later date, this parameter is accessible through the Application / Traffic submenu for each application you have added.



4.5.4.1. Adding Pages

MWS supports different configurations for different pages within a protected application. You can define page specific configurations under the "Applications" menu option. To add an individual page within an application, find the application profile that contains the page, and click "Pages" in the list of options below. From there, select "Add Page". Configuration is similar to adding applications, requiring you to supply a URL pattern for each page.



4.6. Configuration Import / Export

Mykonos Web Security lets you export a configuration "Image" containing every parameter you've specified. These images can be imported by the system, letting you make a backup of your system configuration before making major changes, or to aid in some types of deployment. The exported configuration is a standard XML

document which you can hand edit. However hand editing is not recommended since it introduces the risk of corrupting your configuration.

To access the Configuration Import / Export feature, click the "Configuration" button on the top of the UI, and then click "Configuration Import / Export".

**Note**

If you execute a System Initialization from the TUI, you can use an imported configuration to bring your system back to its previous running configuration. However, historical traffic information will still be lost.

4.7. Configuring SSL

4.7.1. Enabling SSL to the Client

To enable SSL between Mykonos Web Security and the client, first navigate to the application for which you want to enable SSL. Then, select "Server Ports" under "Application". Upload your SSL certificate and Key file, then select a listening interface IP address, and finally, a port. The combination of port/IP must be unique for the system. If the system is clustered, an IP must be selected for each node.

**Note**

Certificates should be in PEM (Privacy Enhanced Mail) format.

4.7.2. Enabling SSL to the backend

To enable SSL for the traffic between Mykonos Web Security and the backend servers, simply login to the Configuration UI and under "Global / Application / Traffic", enable the option for SSL to the backend. This can also be done on a per-application basis.

4.8. Clustering

Individual MWS appliances have the ability to work together as one system, in a cluster. Clustering allows traffic to be divided among multiple appliances, effectively reducing per-system load. In a clustered network configuration, the "master" node holds the database that will be populated by one or more "traffic processors". In order to successfully utilize a Mykonos cluster, a load-balancer must properly segregate traffic to each of the defined traffic processing nodes. Each of these traffic nodes must maintain connectivity with the master in order to operate.

**Important**

Clustering should not be confused with High Availability! Clustering would be used to increase throughput (by utilizing multiple processing nodes), and can reduce the chance that the whole system will fail. Clustering does not protect the master node from failure as in a High Availability setup; only HA configurations are set up to include failsafe procedures to designate a new master when the first one is unavailable.

4.8.1. Node Types

In a traditional MWS deployment (one system), the appliance is responsible for holding its own database as well as processing the traffic. In a clustered deployment, you have the ability to segregate the database from those systems which will process incoming requests. During cluster configuration, you will have the ability to designate a node type for each system. At a minimum, the cluster must have a way to process traffic, and a way to store the relevant information.

- **Master**

A Master node is similar to a single-system deployment in that it holds the database, and also processes incoming traffic. This satisfies both requirements for a cluster (database and traffic processor), so it is possible to set up a cluster with only one Master node (no additional processing nodes). Additional traffic processing nodes can be added at a later point in time if desired.

- **Dedicated Master**

A Dedicated Master node holds the database similar to a Master node, but does not have the ability to process traffic. Using a Dedicated Master in a clustered configuration requires the addition of at least one Traffic node.

- **Traffic Processor**

A Traffic node is only responsible for processing incoming requests. It does not contain a database, so a Master or Dedicated Master node must accompany a Traffic node. The number of Traffic nodes you can add to a cluster is dependent on (1.) the hardware specifications of the Master, (2.) the amount of incoming traffic on protected web application, and (3.) the number of additional Traffic nodes in the cluster. For optimal stability, be sure to monitor the cluster's performance as you add each Traffic node.

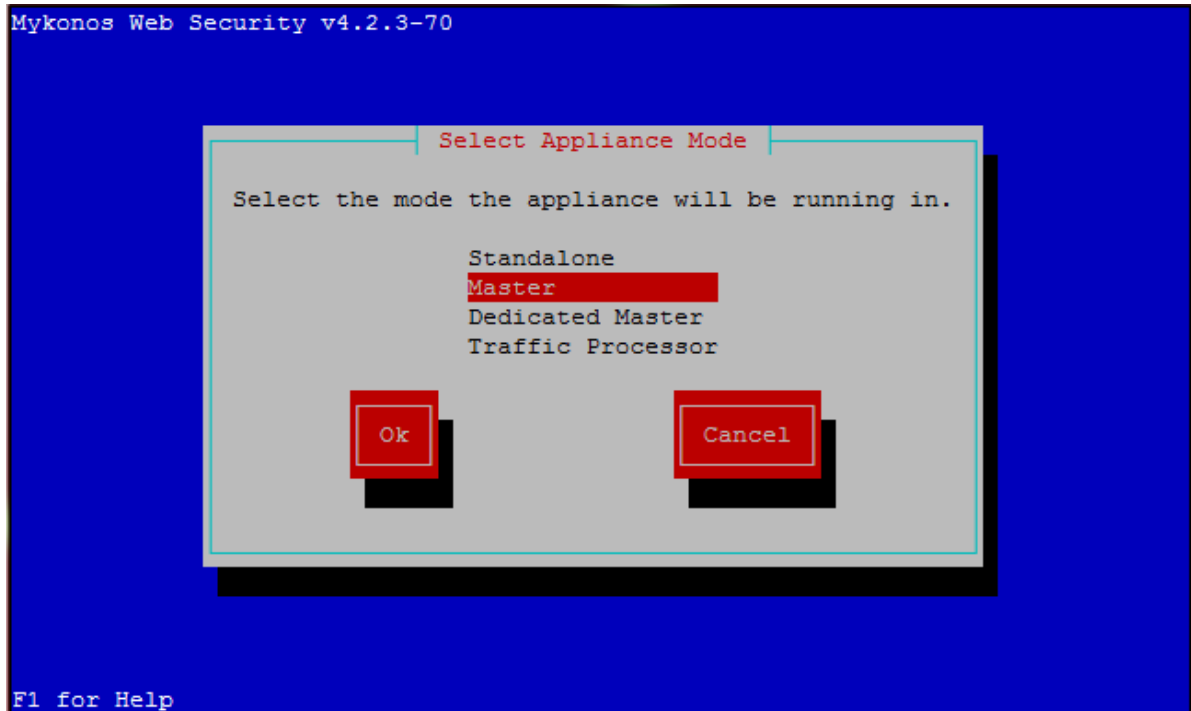
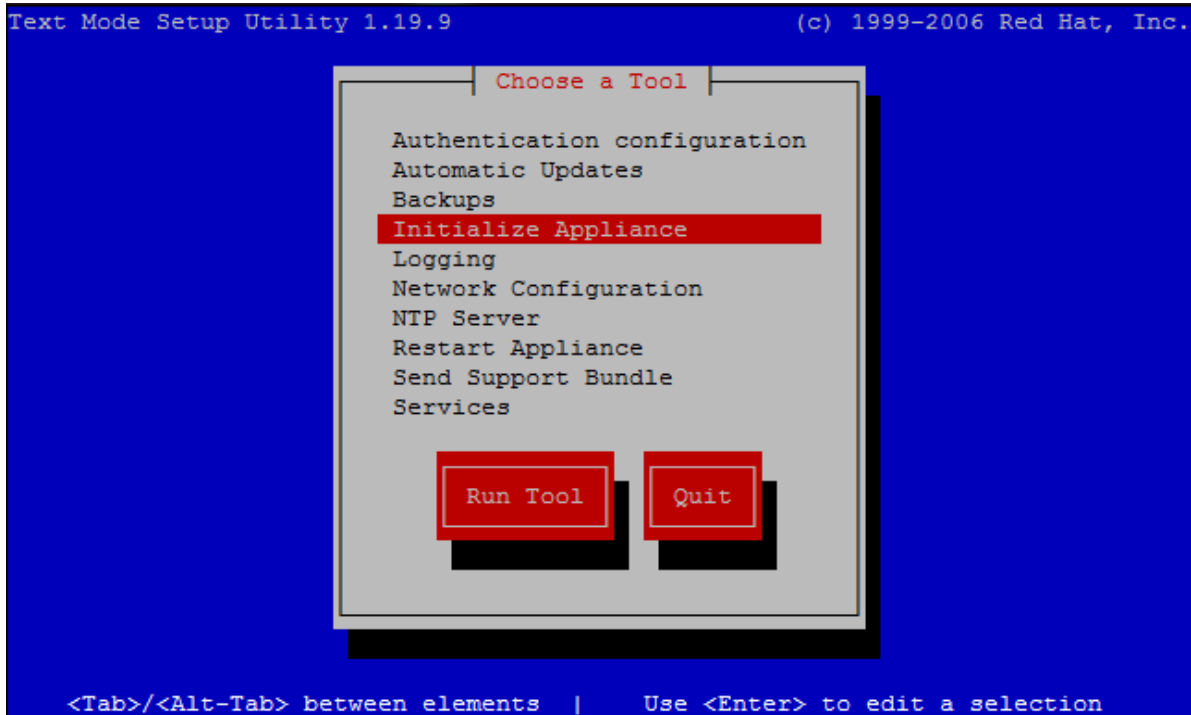
4.8.2. Setting up Clustering



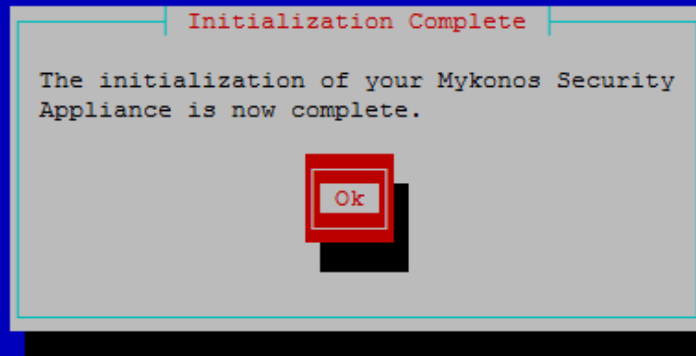
Important

Unlike a traditional cluster, a MWS cluster does not automatically balance traffic between each of the nodes. For this reason, a load balancer is required to be configured to send traffic to each traffic processing node.

Setting up a cluster is as easy as configuring multiple stand-alone boxes. The first step is to set up the master. You must set up the master first because you will need to supply the master's IP when initializing the traffic nodes. To initialize a master, simply choose "Master" or "Dedicated Master" from the TUI setup menu ('sudo setup').



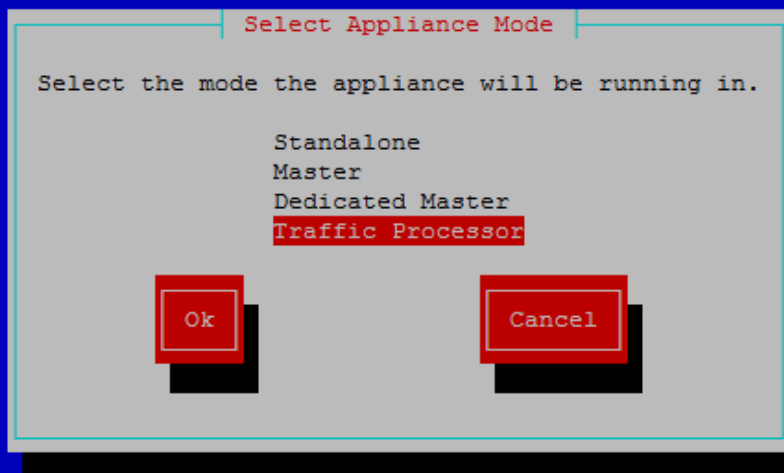
Mykonos Web Security v4.2.3-70



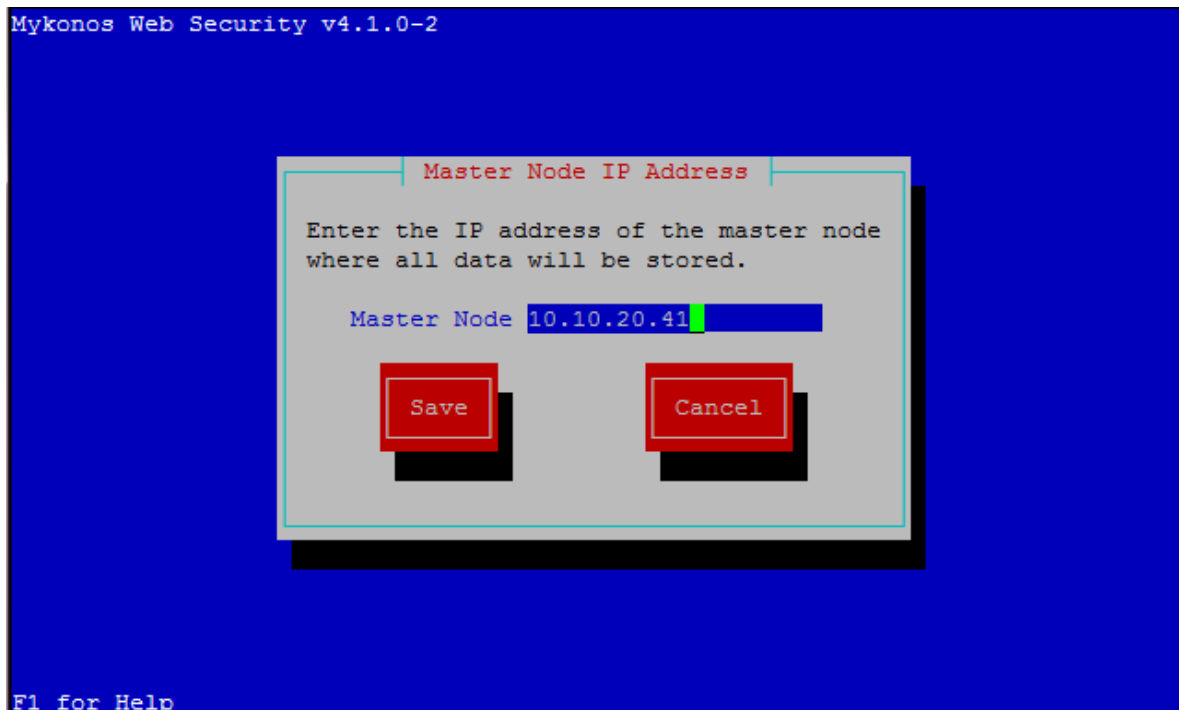
F1 for Help

Setup will initialize the master, and once complete you should be able to navigate to the management interface at <https://HOSTNAME:5000>. Once the master is initialized, you can initialize the other appliances as traffic processing nodes. The steps are similar to the master setup, however you will be prompted to enter the IP of the master node.

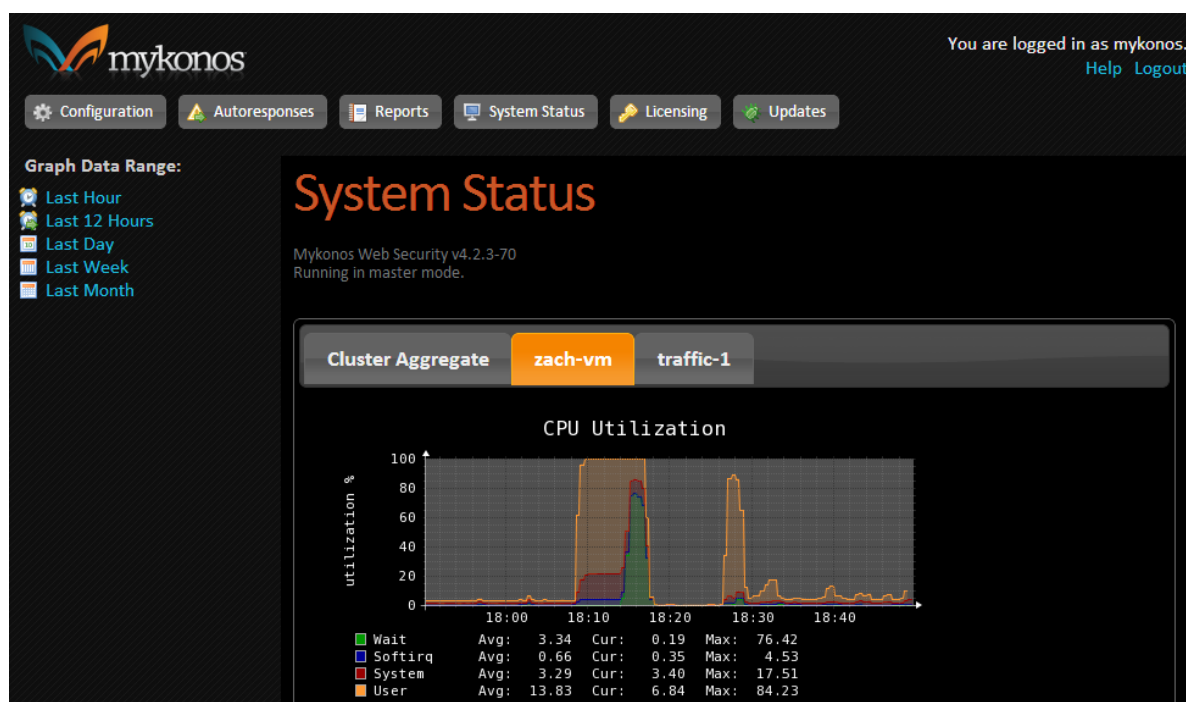
Mykonos Web Security v4.1.0-2



F1 for Help



Once the traffic node is initialized, you can verify the cluster by navigating to the management interface (<https://HOSTNAME:5000>) and clicking on "System Stats". There should be a separate tab for each node in the cluster, and an additional tab for the aggregate cluster data.

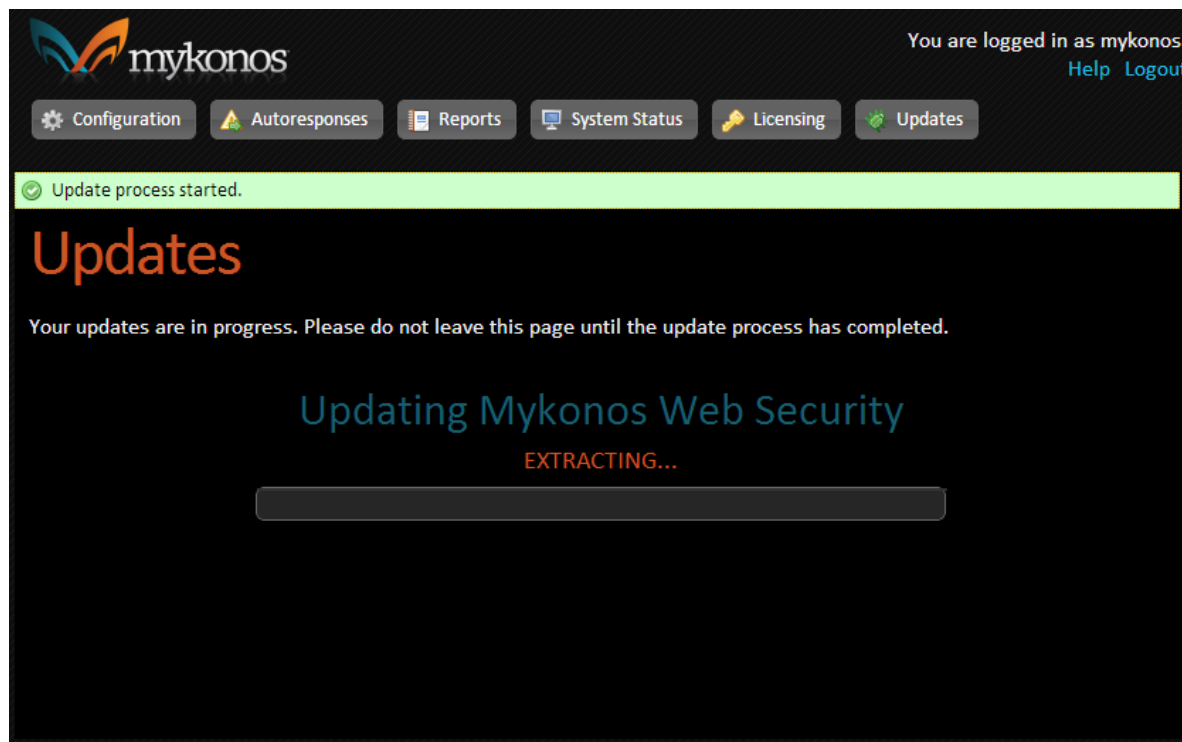


Note

Remember: you must use an external load balancing solution to point to each traffic processing node, as the MWS cluster will not do this for you!

4.8.3. Updating the Cluster

Updating a cluster is similar to updating a stand-alone box. Navigate to "Updates" in the management interface on the master node (the traffic nodes have no management interface) and apply the updates as you would on an individual appliance (see Chapter entitled, "System Updates"). The master node will automatically apply the same update to each of its traffic processing nodes in the cluster; there is no need to individually update each appliance.



Note

The process for updating a cluster will take longer than updating a single appliance, as the same update has to be applied to each node.

4.9. High Availability

To minimize the risk of downtime, MWS deployments have the ability to be placed in a Highly Available (HA) configuration. In this setup, an additional appliance is on stand-by in the event that the currently-active appliance goes offline. If this happens, the passive appliance is able to become the new active appliance automatically - without needing to restart the system. An HA configuration is similar to MWS Clustering, with the major exception being that the passive system has a copy of the services needed to take over when the Master fails. MWS uses a Virtual IP (VIP) to float between the currently active system and the current passive system.



Note

An HA configuration is only available on the MWS dedicated hardware systems -- it is not available in a software installation.

4.9.1. Configuring HA

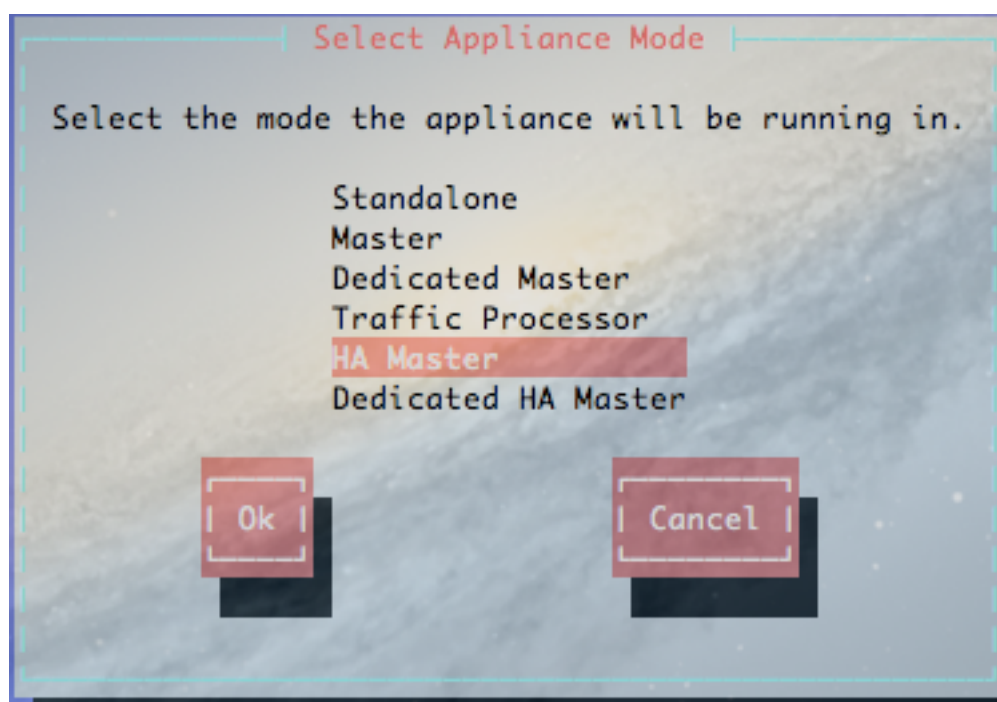
If your appliance is HA-ready, you will see two additional modes available on the "Select Appliance Mode" screen during appliance Initialization. On the **active** appliance (the one that will be the primary appliance), enter TUI setup by typing "sudo setup". Select "Initialize Appliance" and select either "HA Master" or "HA Dedicated Master" for the mode. A distinction on these modes are available below:

- **HA Master**

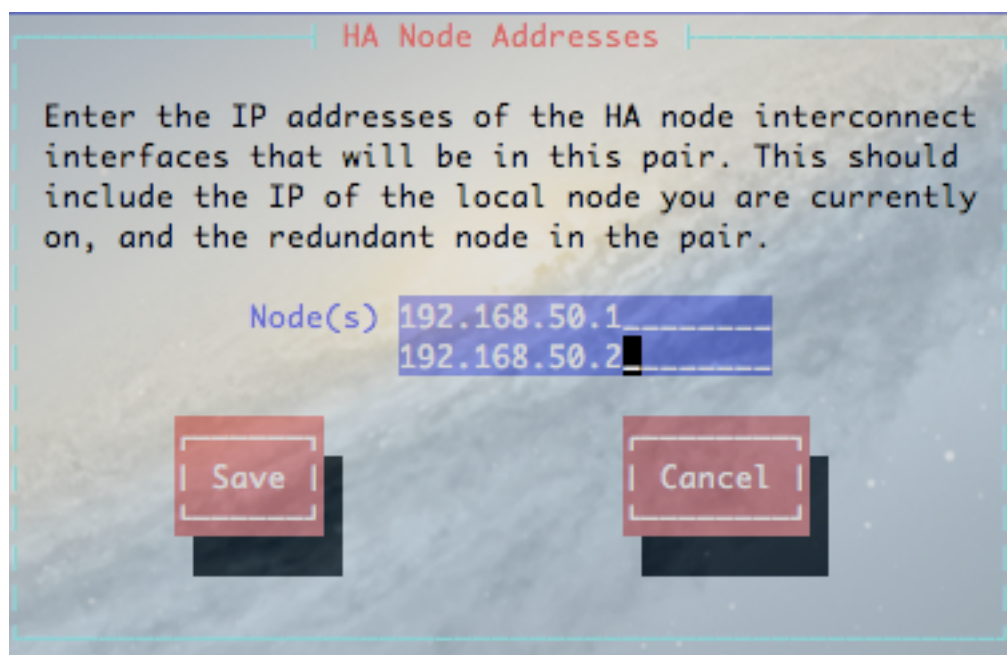
If the appliance is in HA Master mode, it will act as a stand-alone system. The system's database will be stored on this node, and will be replicated/mirrored to the passive appliance (configured later). The appliance will also be able to process traffic like a standard installation.

- **HA Dedicated Master**

Just like in MWS Clustering, the Dedicated Master has no way to process traffic by itself. It only contains the database and essential services to talk to the other appliances. If you would like an MWS Cluster configured for HA, you can select this mode to prevent the master from processing any traffic. Keep in mind you will need to utilize Clustering to configure at least one Traffic Processing node. A copy of the master will still exist on the passive system.



After choosing the HA master mode, you will be prompted to enter the IPs belonging to the HA pair. This will include the IP of the current master (the active appliance) as well as the IP of the appliance to fail-over to (the passive appliance).



HA Node Addresses

Enter the IP addresses of the HA node interconnect interfaces that will be in this pair. This should include the IP of the local node you are currently on, and the redundant node in the pair.

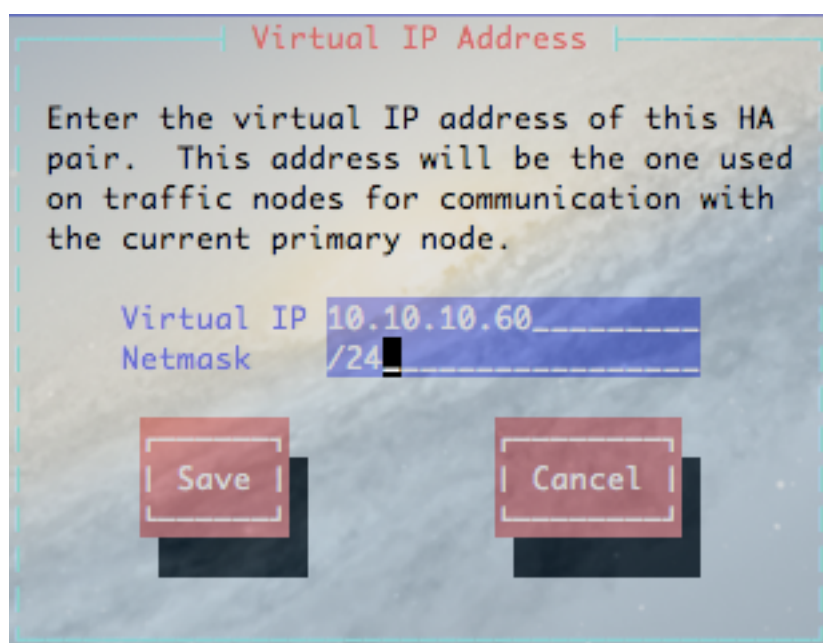
Node(s) 192.168.50.1
192.168.50.2

Save Cancel

**Note**

Be sure that each of the appliances are on the same MWS version (invoke "mykonos-get-version" from the appliance's command line). Appliances not on the same version as the master will need to be manually updated to the HA master's version before continuing on.

Next, you will be prompted to enter the Virtual IP (VIP) that the system will use as the IP of the currently-active system. You may enter either the standard or CIDR bitmask (for example, 255.255.255.0 or /24) for the netmask.



Virtual IP Address

Enter the virtual IP address of this HA pair. This address will be the one used on traffic nodes for communication with the current primary node.

Virtual IP 10.10.10.60
Netmask /24

Save Cancel

After allowing the Initialization process to complete, you can verify proper HA setup by navigating to the management interface ("https://VIP:5000 where VIP is the Virtual IP").

High Availability

NODE INFORMATION

	verhlucky (localhost)	nizlucky
Online?	Yes	Yes
Role	Primary	Secondary
Device State	Connected	Connected
Disk State	UpToDate	UpToDate

PERFORMANCE INDICATORS

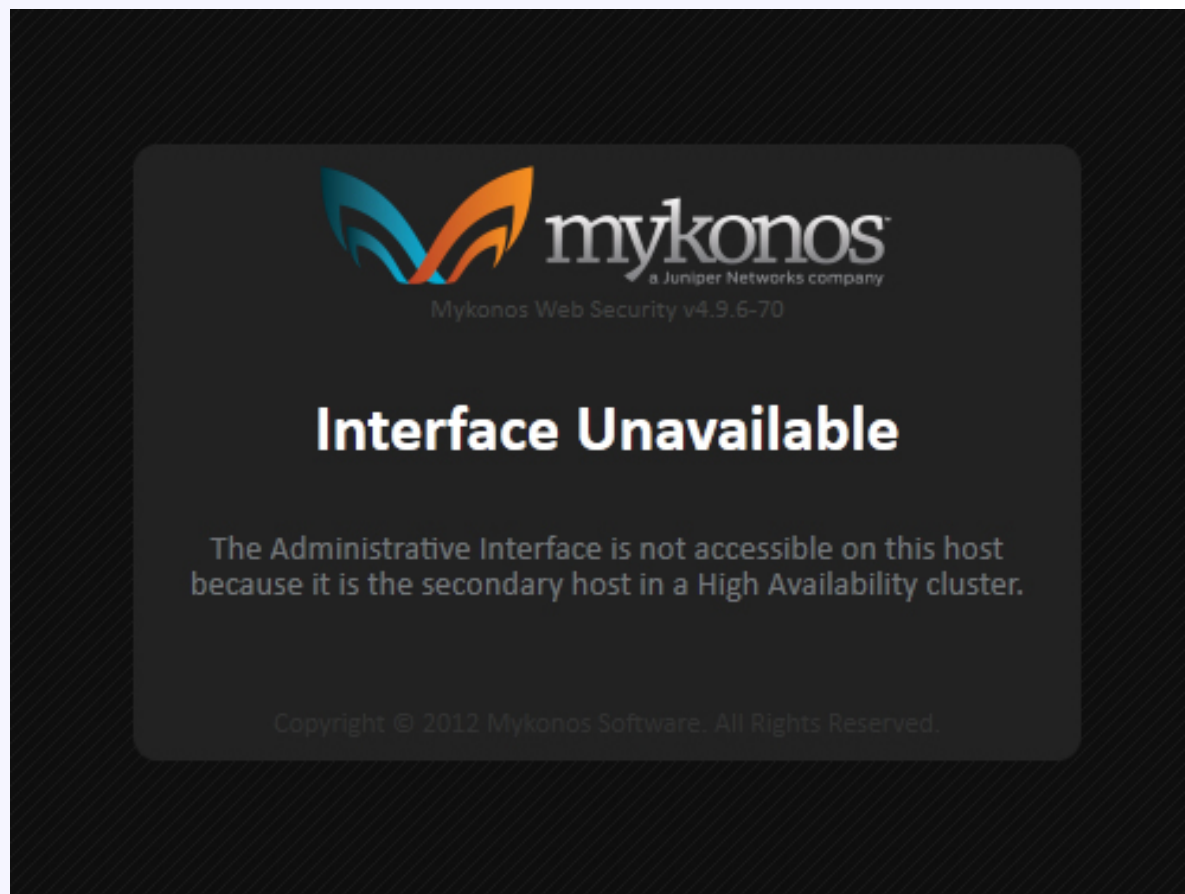
Network Send (NS) (?)	151.0 KB
Network Receive (NR) (?)	0 bytes
Disk Write (DW) (?)	2.9 KB
Disk Read (DR) (?)	150.8 KB
Activity Log (AL) (?)	57
Bitmap (BM) (?)	9606
Local Count (LO) (?)	0
Pending (PE) (?)	0
Unacknowledged (UA) (?)	0
Application Pending (AP) (?)	0
Out of Sync (OOS) (?)	0 bytes

MANUAL FAILOVER

 **Initiate Manual Failover**

**Note**

You must use the VIP to access the configuration interface. If you attempt to use the management interface on the passive appliance, you will see:

**Important**

Since the various HA appliances in a configuration need to interface with the database, port 5432 will be open! Be sure to restrict access to this port with your firewall to prevent unwanted incoming connections. Mykonos Web Security is NOT intended to be used as an edge device.

4.9.2. Updating with HA

To update an HA system, navigate to the management interface (<https://VIP:5000> where VIP is the Virtual IP) and update as described in the "System Updates" chapter. The update will be applied to both systems in the HA pair.

**Note**

While both the active and passive machines must be on the same MWS version to be initially configured in HA mode, appliances already in HA mode will successfully update together.

Managing the Appliance

5.1. Restart/Shutdown

Shutting down or restarting the Appliance is done from the TUI, accessed either from the system console, vSphere, or via SSH to your Appliance on port 2022. Normal console login will take the administrator directly to the Text User Interface. If you are at a shell prompt, you can start the TUI with the command:

sudo setup

To safely shutdown or reboot the appliance administrators choose the "Reboot appliance" option from the menu.

5.2. System Updates

Provided the MWS has internet access, either direct or through a configured proxy, it will automatically check for software updates every night and download them when new ones are available. However, the appliance will not automatically apply updates. For security and stability, they will need to be manually applied by an administrator.

While MWS only checks for updates every night, you can force the appliance to check for updates at any time by clicking the "check for updates" link under "Online Updates". MWS will fetch any available online updates at this time.



Note

Updates will not automatically populate in the Updates pane until you refresh the page. You are not required to stay on the Updates page while MWS is fetching an online update.


MWS also has the ability to upload updates manually, without an internet connection. After uploading the package to the appliance, it will become available to the updates system, and you will be able to apply the update as described below.

**Important**

While MWS is uploading offline updates, you should refrain from navigating off the Updates pane until the upload is complete.

Updates

ONLINE UPDATES

 [check for updates](#)

There are no updates ready for installation at this time.

OFFLINE UPDATES

If you would like to apply an update manually, you may use this form to upload the file you have received.

File *


Browse...



Upload File

Updates

ONLINE UPDATES

 [check for updates](#)

There are no updates ready for installation at this time.

OFFLINE UPDATES


If you would like to apply an update manually, you may use this form to upload the file you have received.



Uploading... Please Wait.

If an update is available (either an uploaded offline update or an automatically downloaded one), you can view the available update package along with any information about it, including the package name, version, whether or not a reboot is required after installing the update, a description, and list of changes. After reviewing the changes you can choose to apply the update by sliding the 'Update?' switch to the 'Yes' position (it should be on 'Yes' by default) and clicking the 'Update Selected' button at the bottom of the package table.

ONLINE UPDATES

 check for updates

You have 1 update available.

Update?	Name	Version	Reboot (?)
<input checked="" type="checkbox"/>	Mykonos Web Security Core	4.2.2-96	No

DESCRIPTION

Upscaling the resurgent networking exchange solutions, achieving a breakaway systemic electronic data interchange system synchronization, thereby exploiting technical environments for mission critical broad based capacity constrained systems. Fundamentally transforming well designed actionable information whose semantic content is virtually null. Empowerment in information design literacy demands the immediate and complete disregard of the entire contents of this cyberspace communication.

CHANGELOG

9/26/2012
User Guide updated with section explaining offline vs. online updates.

9/23/2012
Administrator can now configure the maximum login attempts on a page before forcing a captcha response.

9/19/2012
Reports system overhauled. Reports can now be exported from many pages in the security monitor.



Note

At this time, it is not possible to roll back to earlier versions of the Appliance software.

5.3. System Statistics

The MWS software allows for standard SNMP system monitoring. All statistics available on a typical Linux system would be available to MWS customers through standard system SNMP mibs.

In addition, the MWS currently offers six types of systems statistics in a form of graphs in Configuration interface. They include CPU Utilization, CPU Load Average, Memory Utilization, Network Traffic, Proxy Connection and Proxy Requests. They can be access via System Status button in the top menu of the Configuration management interface.

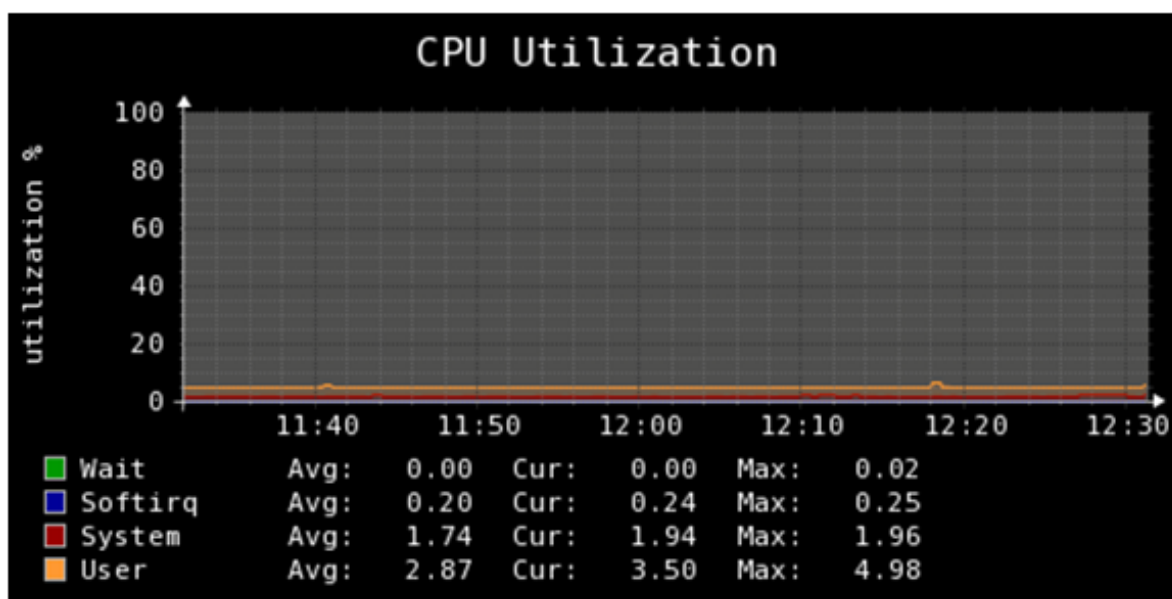


Depending on the desired level of details, the statistics can be viewed for the Last Hour, Last 12 Hours, Last Day, Last Week and, finally, Last Month (always last 30 days).

Below are the details of the statistics that are available for each type:

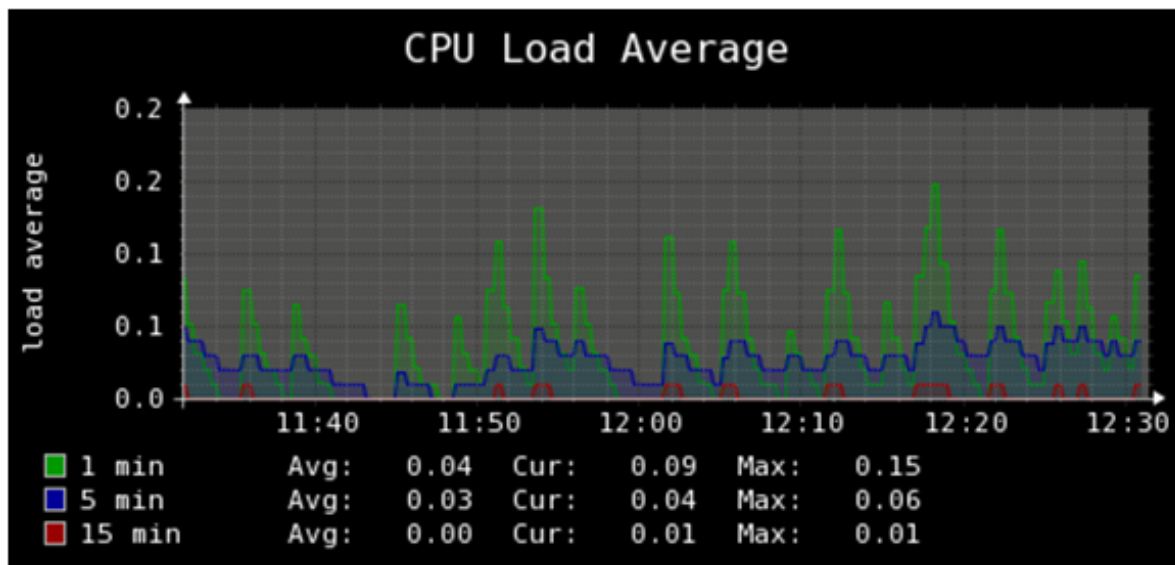
CPU Utilization

- Wait - Percentage of CPU time spent in wait (on disk)
- Softirq - Percentage of CPU time spent handling software interrupts
- System - Percentage of CPU time spent in kernel space
- User - Percentage of CPU time spent in user space



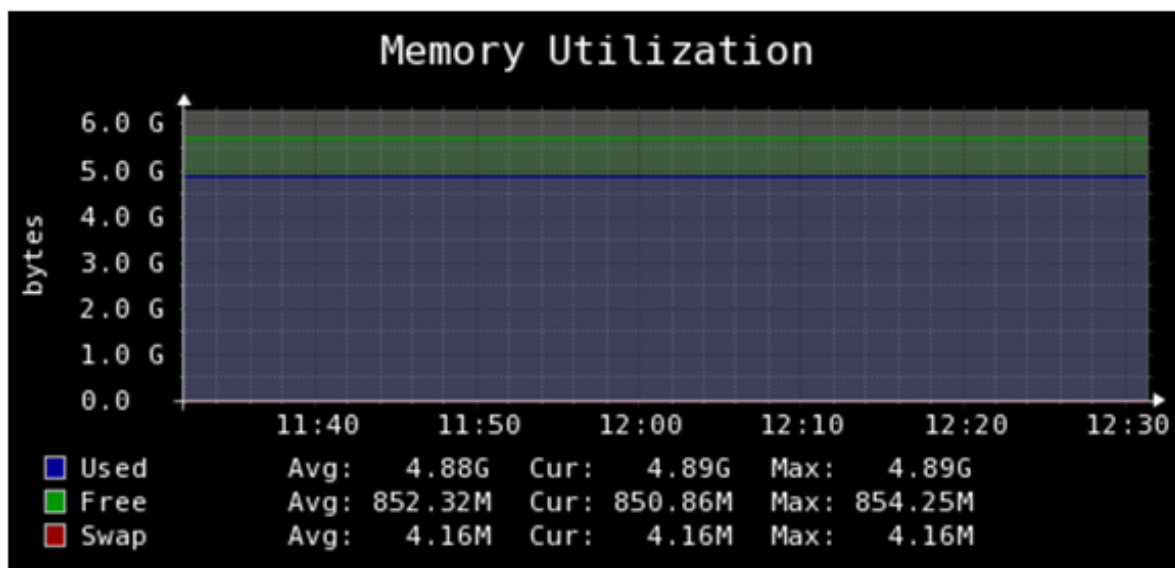
CPU Load Average

- 1 min - CPU Load for the last minute
- 10 min - CPU Load for the last 10 minutes
- 15 min - CPU Load for the last 15 minutes



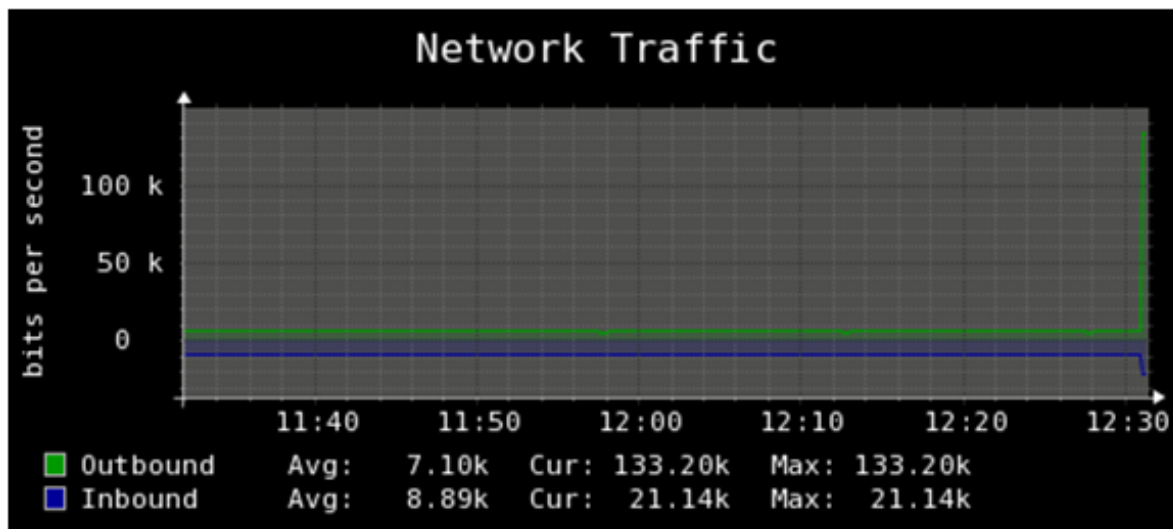
Memory Utilization

- Used - Amount of memory used
- Free - Amount of memory free
- Swap - Amount of swap used



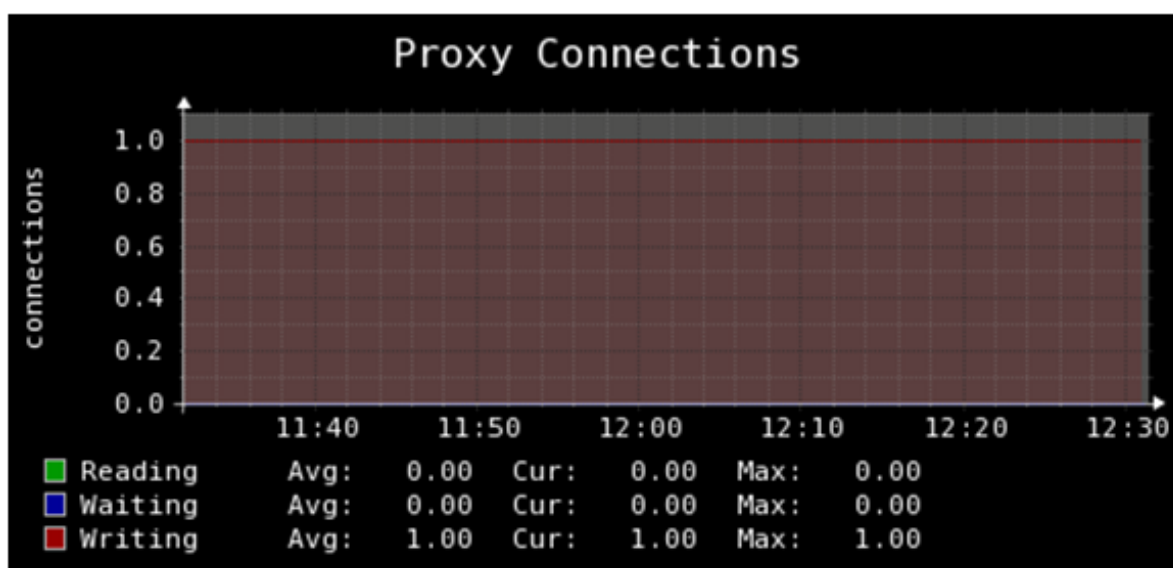
Network Traffic

- Outbound - Amount of traffic leaving the box
- Inbound - Amount of traffic entering the box



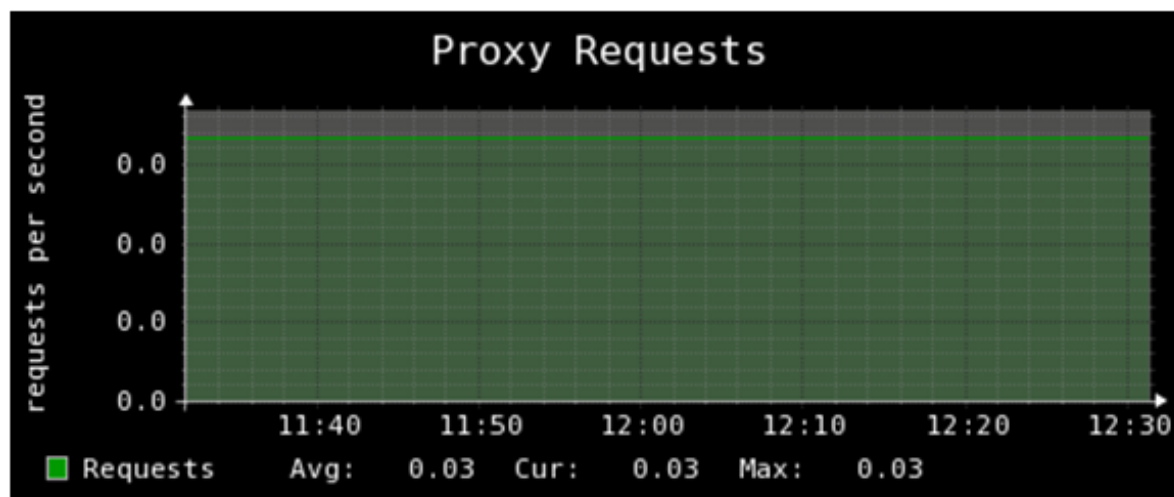
Proxy Connections

- Reading - Number of TCP connections reading data
- Waiting - Number of TCP connections waiting
- Writing - Number of TCP connection writing



Proxy Requests

- Requests - Current number of HTTP/HTTPS requests being processed



5.3.1. Master-Slave Mode

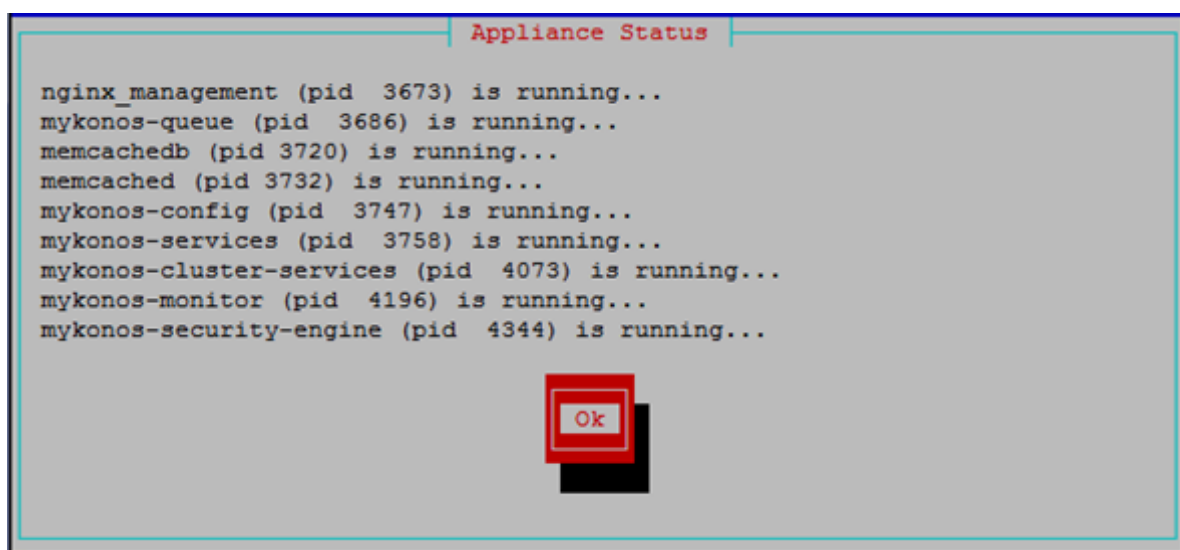
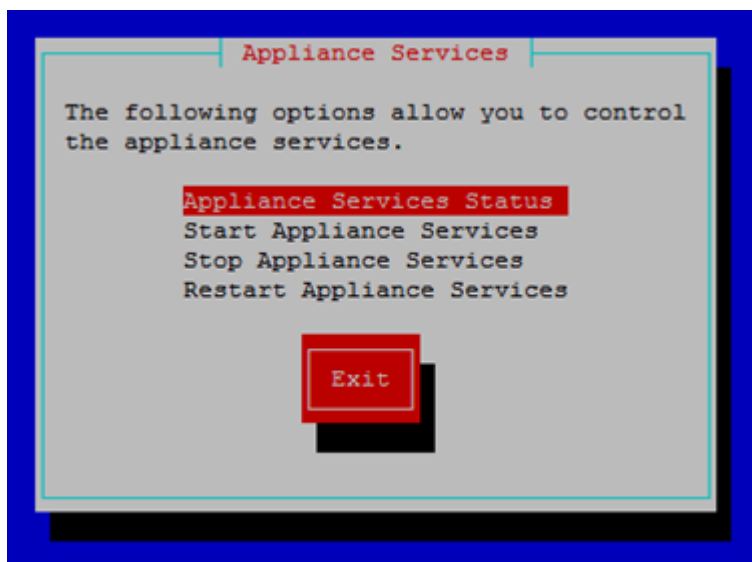
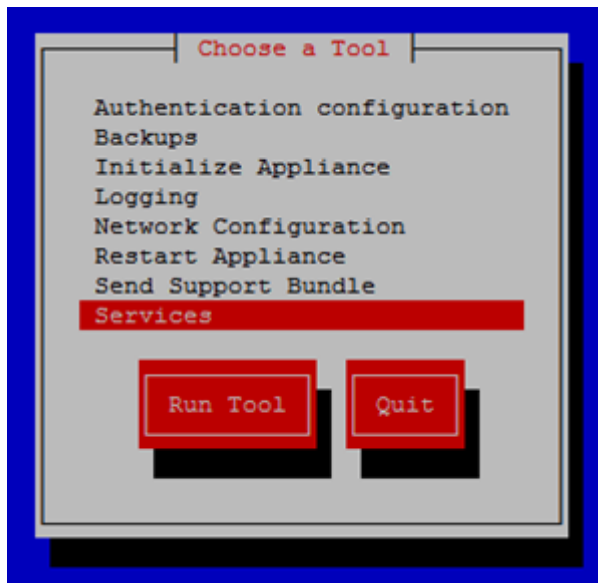
In the case of the appliance running in multi-server mode, the systems statistics will show details for each node in the cluster as well as the key cumulative data across the entire cluster. Each system will be presented as a tab in the Configuration UI's system status page with Aggregate tab being first. The Aggregate tab always shows CPU Utilization, Network traffic, Proxy connections and Proxy requests collected from the entire active MWS cluster.

5.4. Troubleshooting and Maintenance

5.4.1. Managing Services

The MWS runs on top of an optimized, hardened, Linux installation and is very stable in normal operation. The core of MWS are several programs that run as services, "daemons" in Linux parlance, that work in concert to defend your web applications.

The Services menu in the TUI lets you check the status of MWS services, or start, stop, or restart, them, if necessary. It is also possible to perform these actions from the command line as well. Note that these are all console functions, and not accessed through the Web interface.



5.4.2. Viewing Logs

MWS keeps its log files in the /var/logs/mws directory. The log files often prove useful for troubleshooting if there is ever a problem with the Appliance. MWS uses the following logs:

- audit.log
- mws.log
- mws-access.log

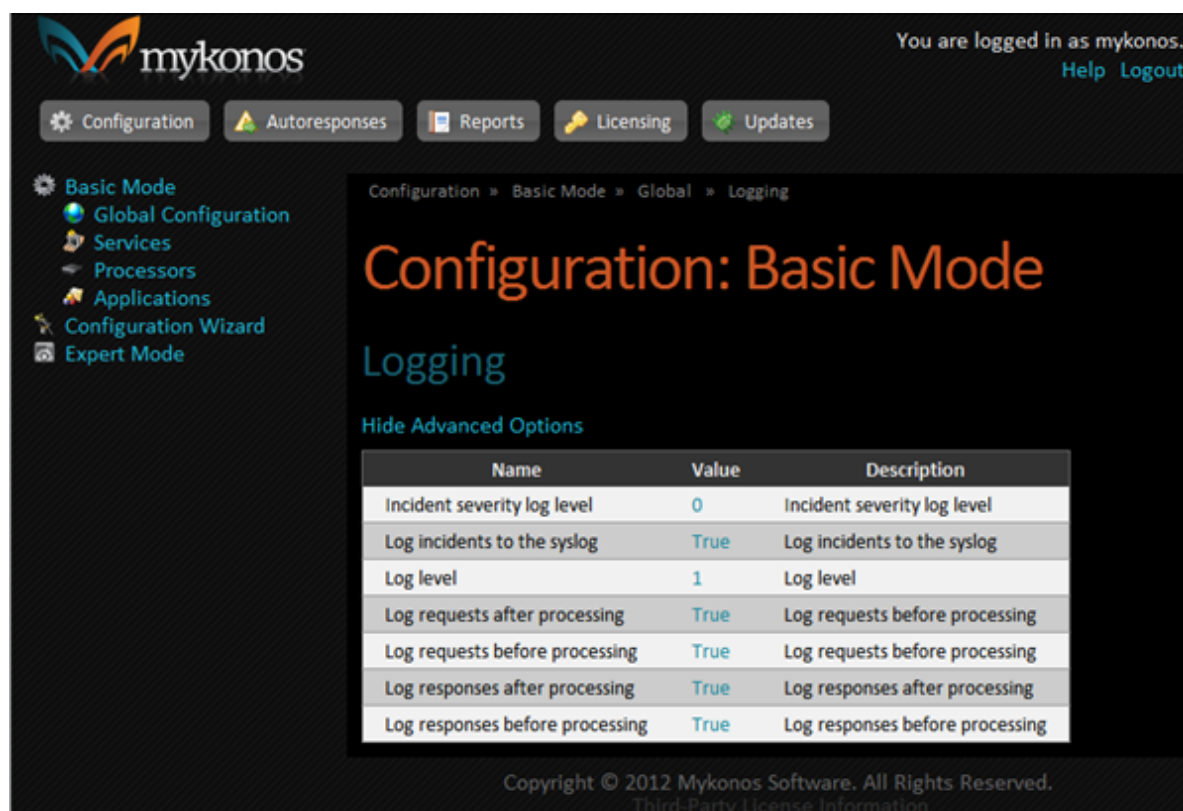
The audit.log file contains the systems auditing information on who has logged into the system and what actions they've performed.

The mws.log file includes all of the systems operational logs. These entries each include a header that states which service created the log entry.

The mws-access.log file includes details of HTTP transactions that are passing between the outside user, the MWS, and the protected Application Server.

The administrator can adjust logging levels for HTTP access that are logged to mws-access.log, using the "Global/Logging" section of the Web interface. By default, MWS doesn't log the details of URL requests. However, it can be set to one of three levels.

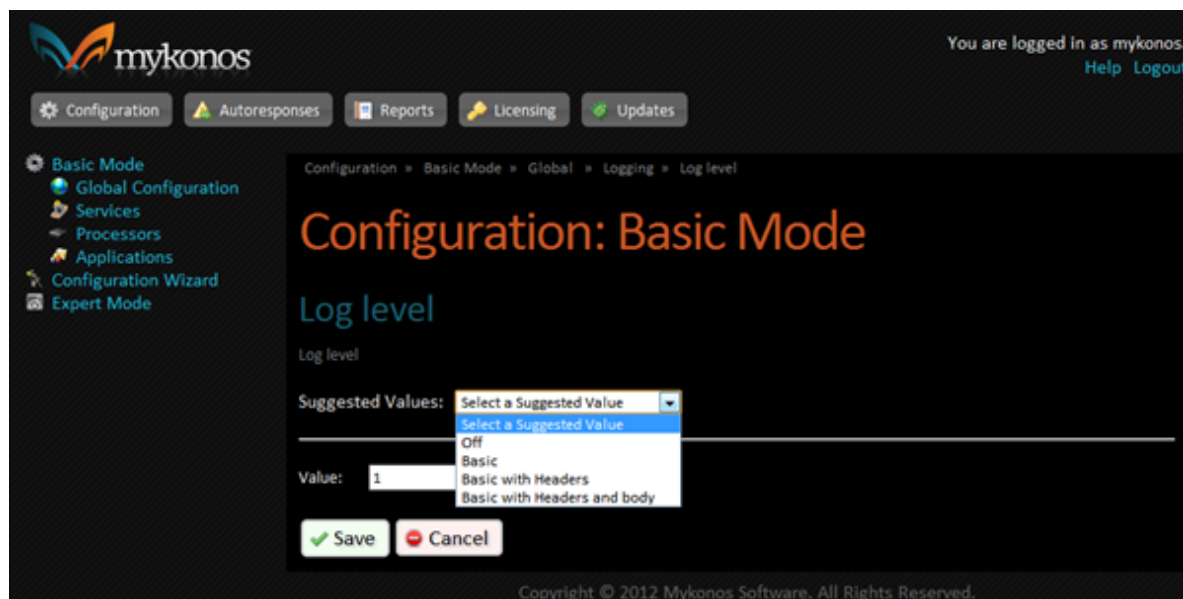
- URL Only
- URL and Headers
- Full HTTP Packets



The screenshot shows the Mykonos web interface. At the top, the Mykonos logo is on the left, and the text "You are logged in as mykonos." with "Help" and "Logout" links is on the right. Below the header is a navigation bar with buttons for Configuration, Autoreponses, Reports, Licensing, and Updates. On the left side, there is a sidebar menu with options: Basic Mode, Global Configuration, Services, Processors, Applications, Configuration Wizard, and Expert Mode. The main content area is titled "Configuration: Basic Mode" and "Logging". Below this, there is a link to "Hide Advanced Options". A table displays the logging configuration settings.

Name	Value	Description
Incident severity log level	0	Incident severity log level
Log incidents to the syslog	True	Log incidents to the syslog
Log level	1	Log level
Log requests after processing	True	Log requests before processing
Log requests before processing	True	Log requests before processing
Log responses after processing	True	Log responses after processing
Log responses before processing	True	Log responses before processing

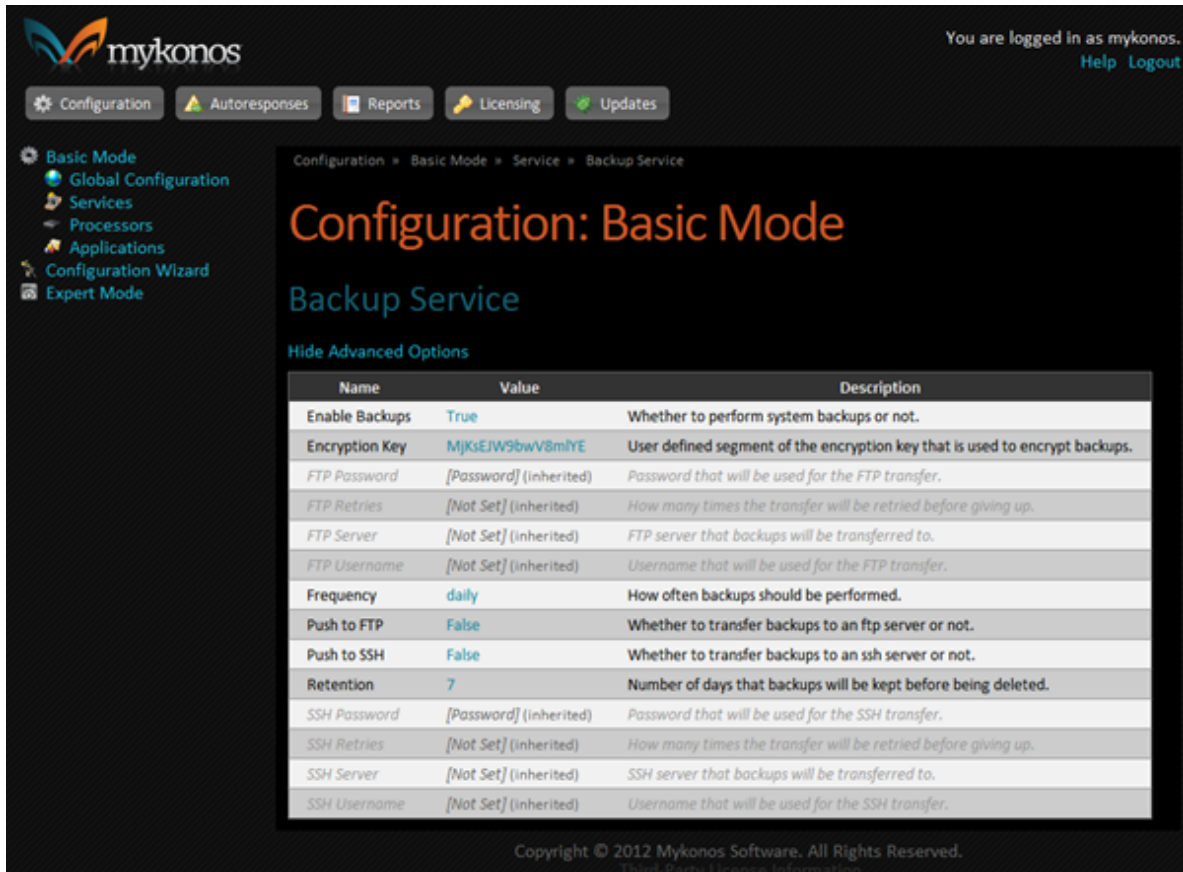
At the bottom of the interface, the copyright notice reads: "Copyright © 2012 Mykonos Software. All Rights Reserved. Third-Party License Information".



The information logged here is usually used for troubleshooting, allowing an administrator to see exactly what the requests look like before and after processing by the MWS.

5.5. Backup and Recovery

By default, the Appliance runs backups every day and the administrator can adjust the backup interval on the configuration UI. MWS stores its Backups in the `/home/mykonos/backups` directory. You can restore configuration backups from the TUI or command line, while backups of the incident database are only done from the command line.



mykonos

You are logged in as mykonos. [Help](#) [Logout](#)

Configuration Autoresponses Reports Licensing Updates

Basic Mode Global Configuration Services Processors Applications Configuration Wizard Expert Mode

Configuration » Basic Mode » Service » Backup Service

Configuration: Basic Mode

Backup Service

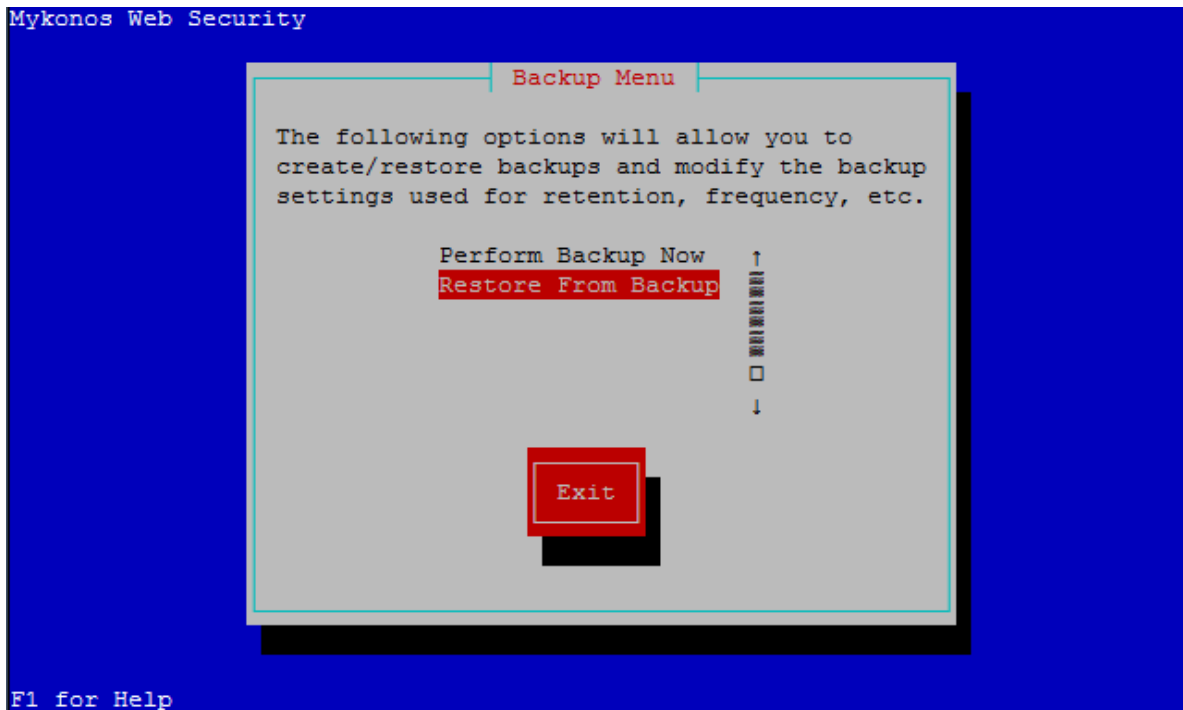
Hide Advanced Options

Name	Value	Description
Enable Backups	True	Whether to perform system backups or not.
Encryption Key	MjKsEjW9bwV8mlyE	User defined segment of the encryption key that is used to encrypt backups.
FTP Password	[Password] (inherited)	Password that will be used for the FTP transfer.
FTP Retries	[Not Set] (inherited)	How many times the transfer will be retried before giving up.
FTP Server	[Not Set] (inherited)	FTP server that backups will be transferred to.
FTP Username	[Not Set] (inherited)	Username that will be used for the FTP transfer.
Frequency	daily	How often backups should be performed.
Push to FTP	False	Whether to transfer backups to an ftp server or not.
Push to SSH	False	Whether to transfer backups to an ssh server or not.
Retention	7	Number of days that backups will be kept before being deleted.
SSH Password	[Password] (inherited)	Password that will be used for the SSH transfer.
SSH Retries	[Not Set] (inherited)	How many times the transfer will be retried before giving up.
SSH Server	[Not Set] (inherited)	SSH server that backups will be transferred to.
SSH Username	[Not Set] (inherited)	Username that will be used for the SSH transfer.

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5.5.1. Restoring System Configuration from Backup

While rarely required, the administrator can restore the Appliance configuration from backup using the TUI on the Backups submenu.



This menu is pre-populated with a list of current system backups, and the following options:

- Restore Latest Backup - This will restore the database using the last saved backup file.
- Reset to Clean State - This option will clear all of the data from the database and set it to a pristine state.

5.5.2. Backing up and Restoring Console Data

To restore the data that is displayed in the Monitoring Console from a back up, users must use the command line utility.



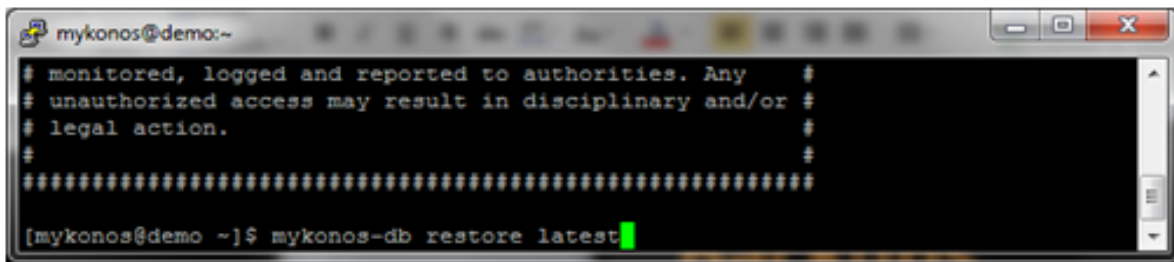
Note

If the data is being restored to the Console, a database backup will need to be specified from `/usr/share/msa/database` or use the "latest" option to restore from the last valid backup.

This is run with the following command: **sudo /usr/sbin/mykonos-db <option>**

The options to this command are:

- backup
- restore (filename)
- restore latest
- clean



```
mykonos@demo:~  
# monitored, logged and reported to authorities. Any #  
# unauthorized access may result in disciplinary and/or #  
# legal action. #  
# #  
#####  
[mykonos@demo ~]$ mykonos-db restore latest
```

Processor Reference

Mykonos Web Security uses a modular approach to securing your application. Each module is responsible for monitoring, detecting and securing a particular aspect of the application and/or individual HTTP request/response. These logical entities are referred to as Security Processors.

Processors are the configurable operators that implement an additional layer of security between the application/web servers and the end user. They are responsible for analyzing the request and response data sent to and from the server and monitor anything from the state of injected honey pots to contents of the headers and body of the HTTP/HTTPS requests and responses. Processors can be managed through the system configuration user interface. While some of the operations may be as simple as incrementing a counter, others are far more sophisticated and may alter the request and response data so it is important that administrators configure processors correctly to ensure web application's security and functionality.

Each processor is monitoring the HTTP stream for particular alterations from what is considered typical traffic. These alterations are called "triggers". Each security processor may have several triggers they are responsible for detecting. If matched, the processor responsible for handling it will generate a security incident. Incident varies by its complexity, which is explained in the section below.

6.1. Complexity Definitions

Complexity is a rating of the skill, effort, and experience necessary to trigger a specific incident. The following is a description of the rating system:

Informational (0.0)

Informational incidents represent information about the client that may or may not indicate malicious activity, but are not common. Informational incidents are used to identify more complex abuse patterns that cannot be identified from a single request. An example of an informational incident is when the user has disabled the Referer header.

Suspicious (1.0)

Suspicious incidents represent activity that is abnormal but not guaranteed to be malicious. This is similar to an informational incident, except that the event is borderline malicious, not just unusual. Just like informational incidents, suspicious incidents are used to identify more complex abuse patterns that cannot be confirmed as malicious from just one request. An example of a suspicious incident is when the user requests a file that does not exist (404 error).

Low (2.0)

Low complexity incidents represent malicious activity that does not require any special tools, does not require a deep understanding of application architecture, and generally can be executed by an unsophisticated threat. An example of a low complexity incident is when the user modifies a query string parameter in the URL.

Medium (3.0)

Medium complexity incidents represent malicious activity that would require special tools, advanced browser configuration, scripting, or a understanding of how web applications are designed and implemented. These types of attacks are generally not executed by unsophisticated attackers, and are more likely to be targeted at the protected site, rather than at an arbitrary IP range. An example of a medium complexity incident is when the user requests the robots.txt spider configuration file from a browser or a script spoofing its identity as a browser.

High (4.0)

High complexity incidents represent malicious activity that is highly advanced and requires a deep understanding of web application architecture, implementation, security features, and multi request workflows. High complexity incidents are generally far too advanced for an average attacker and usually have a specific target. An example of a high complexity incident is when a user is able to break the encryption used on basic authentication password files.

6.2. Security Processors

The Security Processors are separated into four groups:

- Honeypot Processors
- Activity Processors
- Tracking Processors
- Response Processors

Honeypot processors contain the logic of injecting the fake vulnerabilities and points of interest to the hackers with the goal of exposing the attacker prior to them finding an actual vulnerability on the site. Activity processors are the processors that monitor for and report any other malicious behavior. These operators watch for malicious activity based on non-injected points of interest. These typically involve monitoring headers, errors, input fields, URL sequences, etc, with the goal of identifying malicious behavior within the valid application stream.

Tracking processors, allow for more advanced tracking of the attackers. These processors attempt to collect additional data based on behavioral characteristics and unique attacker's environment information. These "fingerprints" become a basis for the "hacker database" used in detecting attackers from the first request they make.

Finally, Response processors are the processors that are used for generating response to the end user. If turned on, these can be used to either manually or automatically (depending on the configuration) respond to a hacker as soon as their activity is detected. In case of an automated response, these can be tuned to match more or less any condition including but not limited to frequency of occurrence, complexity, types of incidents triggered.

6.3. Honeypot Processors

6.3.1. Access Policy Processor

This processor injects fake permission data into the `clientaccesspolicy.xml` file of the web application's domain. The fake access policy references a fake service and grants a random domain access to call it. If the service is ever called, or any files are ever requested in the directory the service is supposedly contained in, an incident can be created. Under normal conditions, no user will ever see the `clientaccesspolicy.xml` file, and therefore be unaware of the URL to the fake service or the directory it resides in. In the cases where a Silverlight object is legitimately requesting `clientaccesspolicy.xml` from the protected domain in order to access a known service, it will not create an incident, because the service being called is defined with real access directives.

6.3.1.1. Configuration

Table 6.1. Access Policy Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether or not to enable this process for https traffic.
Advanced			
Fake Service	String	Random	The fake service the user requested.
Incident: Malicious Service Call	Boolean	True	The user manually entered the URL into the browser and accessed the service that way. They did not call the function.
Incident: Service Directory Indexing	Boolean	True	The user asked for a file index on the directory that contains the fake service.
Incident: Service Directory Spider	Boolean	True	The user is issuing requests for resources inside the directory that contains the fake service. Since the directory does not exist, all of these types of requests are unintended and malicious.

6.3.1.2. Incidents

6.3.1.2.1. Malicious Service Call

Complexity: Medium (3.0)

Default Response: 1x = 5 day Strip Inputs

Cause: MWS adds a fake cookie to the websites it protects. The cookie is intended to look as though it is part of the applications overall functionality, and is often selected to appear vulnerable (such as naming the cookie 'debug' or 'admin' and giving it a numerical or Boolean value). The "Cookie Parameter Manipulation" incident is triggered whenever the fake cookie value changes its value.

Behavior: Modifying the inputs of a page is the foundation of a large variety of attack vectors. Basically, if you want to get the backend server to do something different, you need to supply different input values (either by cookie, query string, url, or form parameters). Depending on what value the user chose for the input, the attack could fall under large number of vectors, including "Buffer Overflow", "XSS", "Denial of Service", "Fingerprinting", "Format String", "HTTP Response Splitting", "Integer Overflow", and "SQL injection" among many others. A common practice is to first spider the website, then test every single input on the site for a specific set of vulnerabilities. For example, the user might first index the site, then visit each page on the site, then test every exposed input (cookie, query string, and form inputs) with a list of SQL injection tests. These tests are designed to break the resulting page if the input is vulnerable. As such, the entire process (which can involve thousands of requests) can be automated and return a clean report on which inputs should be targeted. Because MWS cookie looks just like a normal application cookie, a spider that tests all inputs will eventually test the fake cookie as well. This means that if there is a large volume of this incident, it is likely due to such an automated process. It should be assumed that the values tested against the fake cookie, have also been tested against the rest of the cookies on the site.

6.3.1.2.2. Service Directory Indexing

Complexity: Medium (3.0)

Default Response: 1x = 5 day Block

Cause: Originally, embedded HTML technologies such as Flash and Java, were not able to communicate with 3rd party domains. This was a security constraint to prevent a malicious Java or Flash object from performing unwanted actions against a site other than the one hosting the object (for example, a Java applet that brute forces a Gmail login in the background). This limitation was eventually decreased in order to facilitate more complex mash-ups of information from a variety of sources. However to prevent any untrusted websites from abusing this new capability, a resource called the "clientaccesspolicy.xml" was introduced. Now, when a plugin object wants to communicate with a different domain, it will first request "clientaccesspolicy.xml" from that domain. If the file specifies that the requesting domain is allowed to access the specified resource, then the plugin object will be given permission to communicate directly with the 3rd party. The clientaccesspolicy.xml therefore provides a convenient reference for hackers when trying to scope the attack surface of the website. For example, there may be a vulnerable service listed in clientaccesspolicy.xml, but that service may not be referenced anywhere else on the site. So unless the hacker looks at clientaccesspolicy.xml, they would never even know the service existed. MWS will inject a fake service definition into the clientaccesspolicy.xml file in order to identify which users are manually probing the file for information. The "Service Directory Indexing" incident will be triggered if the user attempts to get a file listing from the directory the fake service is supposedly located in.

Behavior: Attempting to get a file listing from the directory where the potentially vulnerable service is located is likely in an effort to identify other unreferenced vulnerable services, or possibly even data or source files used by the service. Such a request represents a "[Directory Indexing](#)¹" attack, and is generally performed while attempting to establish a full understanding of a websites attack surface.

6.3.1.2.3. Service Directory Spider

Complexity: Medium (3.0)

Default Response: 1x = 5 day Block

Cause: Originally, embedded HTML technologies such as Flash and Java, were not able to communicate with 3rd party domains. This was a security constraint to prevent a malicious Java or Flash object from performing unwanted actions against a site other than the one hosting the object (for example, a Java applet that brute forces a Gmail login in the background). This limitation was eventually decreased in order to facilitate more complex mash-ups of information from a variety of sources. However to prevent any untrusted websites from abusing this new capability, a resource called the "clientaccesspolicy.xml" was introduced. Now, when a plugin object wants to communicate with a different domain, it will first request "clientaccesspolicy.xml" from that domain. If the file specifies that the requesting domain is allowed to access the specified resource, then the plugin object will be given permission to communicate directly with the 3rd party. The clientaccesspolicy.xml therefore provides a convenient reference for hackers when trying to scope the attack surface of the website. For example, there may be a vulnerable service listed in clientaccesspolicy.xml, but that service may not be referenced anywhere else on the site. So unless the hacker looks at clientaccesspolicy.xml, they would never even know the service existed. MWS will inject a fake service definition into the clientaccesspolicy.xml file in order to identify which users are manually probing the file for information. The "Service Directory Spidering" incident will be triggered if the user attempts to request a random file inside the directory the fake service is supposedly located in.

Behavior: Requesting a random file from the directory where the potentially vulnerable service is supposedly located is likely in an effort to identify other unreferenced resources. This could include configuration files,

¹ <http://projects.webappsec.org/w/page/13246922/Directory-Indexing>

other services, data files, etc... Usually an attacker will first attempt to get a full directory index (which only takes one request), but if that fails, the only other technique is to guess the filenames (which could take thousands of requests). Because guessing the file names can take so many requests, there are several publicly available tools that can enumerate over a large list of common file and directory names in a matter of minutes. This type of behavior is an attempt to exploit a server for "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"² vulnerabilities, and is generally done while the attack is trying to scope the web applications attack surface.

6.3.2. Ajax Processor

A mistake commonly made by web developers is to consolidate every JavaScript file used by their website into a single file. They then reference that one file from every page on the site, regardless of whether it needs all of the code defined in the file. This is an optimization trick that works, but exposes potential vulnerabilities. The goal is to get the browser to cache all of the external JavaScript, so that you don't need to keep downloading additional code as you navigate the site. Consider the case where one of the pages on the site contains an administrative console written with AJAX technology. In the administrative page, there is a JavaScript file that contains code for managing users of the site (creating user, deleting users, getting user details, etc...). Normally only administrators would visit this page, and they would be the only ones who can see this code. Once all JavaScript on the site is consolidated however, these types of sensitive functions tend to get mixed into the rest of the safer functions. Hackers look for these types of functions in order to find both the administrative page that uses them, as well as exploit the function itself. The goal of this trap is to emulate this common mistake and entice hackers into attempting to exploit the "sensitive looking" function.

6.3.2.1. Configuration

Table 6.2. Ajax Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Inject Script Enabled	Boolean	True	Whether to inject the fake Javascript code into HTML responses.
Service	Configurable	AJAX Service	The fake service to expose.
Incident: Malicious Script Execution	Boolean	True	The user executed the fake JavaScript function
Incident: Malicious Service Call	Boolean	True	The user manually entered the URL into the browser and accessed the service that way. They did not call the function.

6.3.2.2. Incidents

6.3.2.2.1. Malicious Script Execution

Complexity: Medium (3.0)

² <http://projects.webappsec.org/Predictable-Resource-Location>

Default Response: 1x = Slow Connection 2-6 seconds and permanent Strip Inputs in 10 minutes.

Cause: MWS injects a fake JavaScript file into the websites it protects. This fake JavaScript file is designed to look as though it is intended for administrative use only, but has been mistakenly linked in with non administrative pages. The JavaScript file exposes an AJAX function that communicates with a potentially vulnerable fake service. If the user attempts to invoke this function using a tool like Firebug, this incident will be triggered.

Behavior: It is common practice to create a few single JavaScript files that contain the majority of the code your site needs, and then importing that code into all of the pages. This increases the performance of the site, because the user can download and cache all the JavaScript at once, rather than having to re-download all or some of it again on every page change. However in some cases, developers mistakenly include sensitive administrative functions in with common functions needed by unauthenticated users. For example, a developer might include an "addUser" function into a file that also contains a "changeImageOnHover" function. The "addUser" function may only be called from an administrative UI (behind a login), while the hover image effect would be called on a lot of different pages. Hackers often look through all of the various Javascript files being included on the pages of a website in order to find references to other services that might be vulnerable.

Once a function has been identified, the hacker will attempt to find a way to exploit the service the function uses. Because the attacker is actually executing the function instead of attempting to directly communicate with the potentially vulnerable service, this is likely a less sophisticated attack. They are more then likely just trying to determine if the service actually exists, and if they can call it without being authenticated, however depending on the values they supplied as arguments to the function, this could be a number of different attack types, including "[Abuse of Functionality](#)³", "[Buffer Overflow](#)⁴", "[Denial of Service](#)⁵", "[Format String](#)⁶", "[Integer Overflows](#)⁷", "[OS Commanding](#)⁸", and "[SQL Injection](#)⁹".

6.3.2.2.2. Malicious Script Introspection

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds and Captcha. 2x = Slow Connection 4-14 seconds and permanent Block in 10 minutes.

Cause: MWS injects a fake JavaScript file into the websites it protects. This fake JavaScript file is designed to look as though it is intended for administrative use only, but has been mistakenly linked in with non administrative pages. The JavaScript file exposes an AJAX function that communicates with a potentially vulnerable fake service. If the user manually inspects the code of the function and attempts to exploit the service it uses directly (without calling the function itself), this incident will be triggered.

Behavior: It is common practice to create a few single JavaScript files that contain the majority of the code your site needs, and then importing that code into all of the pages. This increases the performance of the site, because the user can download and cache all the JavaScript at once, rather than having to re-download all or some of it again on every page change. However in some cases, developers mistakenly include sensitive administrative functions in with common functions needed by unauthenticated users. For example, a developer might include an "addUser" function into a file that also contains a "changeImageOnHover" function. The "addUser" function may only be called from an administrative UI (behind a login), while the hover image effect would be called on a lot of different pages. Hackers often look through all of the various Javascript files

³ <http://projects.webappsec.org/Abuse-of-Functionality>

⁴ <http://projects.webappsec.org/Buffer-Overflow>

⁵ <http://projects.webappsec.org/Denial-of-Service>

⁶ <http://projects.webappsec.org/Format-String>

⁷ <http://projects.webappsec.org/Integer-Overflows>

⁸ <http://projects.webappsec.org/OS-Commanding>

⁹ <http://projects.webappsec.org/SQL-Injection>

being included on the pages of a website in order to find references to other services that might be vulnerable.

Once a function has been identified, the hacker will attempt to find a way to exploit the service the function uses. Unlike the malicious script execution incident, here the attacker has actually dissected the fake AJAX function and attempted to directly exploit the service it uses. This is a more sophisticated attack than actually calling the Javascript function, because it requires that the user understand Javascript logic. Depending on what values they are sending to the service, this could be in an effort to perform any number of exploits, including [Abuse of Functionality](#)¹⁰, [Buffer Overflow](#)¹¹, [Denial of Service](#)¹², [Format String](#)¹³, [Integer Overflows](#)¹⁴, [OS Commanding](#)¹⁵, and [SQL Injection](#)¹⁶.

6.3.3. Basic Authentication Processor

The basic authentication processor is responsible for emulating a vulnerable authentication mechanism in the web application. This is done by publicly exposing fake server configuration files (.htaccess and .htpasswd) that appear to be protecting a resource with basic authentication (a part of the HTTP protocol). To the attacker, the site will appear to be exposing a sensitive administrative script on the site, with weak password protection. As the malicious user identifies the availability of such publicly exposed files, they are walked through a series of steps that emulate exposing an additional piece of information. As the final step, if they end up breaking the weakly authenticated password, they will be considered a high threat.



Note

Note: This processor should only be used when the site is using Apache as front end web servers due to particular files involved (.htaccess and .htpasswd) being specific to Apache web server.)



Note

Browsers often ignore the body content of HTTP responses if the status code is anything except 200. For best compatibility with different browser versions, you may wish to use a 200 status code when uploading responses such as images or executable code.

6.3.3.1. Configuration

Table 6.3. Basic Authentication Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Authorized Users	Collection	Collection	A list of authorized user accounts.

¹⁰ <http://projects.webappsec.org/Abuse-of-Functionality>

¹¹ <http://projects.webappsec.org/Buffer-Overflow>

¹² <http://projects.webappsec.org/Denial-of-Service>

¹³ <http://projects.webappsec.org/Format-String>

¹⁴ <http://projects.webappsec.org/Integer-Overflows>

¹⁵ <http://projects.webappsec.org/OS-Commanding>

¹⁶ <http://projects.webappsec.org/SQL-Injection>

Parameter	Type	Default Value	Description
Protected Resource	Collection	Protected Resource	The fake protected resource.
Randomization Salt	String	Random	A random set of characters used to salt the generation of code. Any value is fine here.
Incident: Cracked Authentication	Boolean	True	The user has successfully accessed a fake protected resource using a cracked username and password.
Incident: Directory Configuration Requested	Boolean	True	The user has requested the apache directory configuration file .htaccess.
Incident: Directory Passwords Requested	Boolean	True	The user has requested the apache password file .htpasswd
Incident: Invalid Resource Login	Boolean	True	The user has attempted to login to access the fake file protected by basic authentication, but failed.
Incident: Protected Resource Requested	Boolean	True	The user has requested a fake file which is protected by basic authentication

6.3.3.2. Incidents

6.3.3.2.1. Apache Configuration Requested

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running apache. One such vulnerability involves the use of an [.htaccess](http://httpd.apache.org/docs/current/howto/htaccess.html)¹⁷ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the .htaccess file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests .htaccess or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured.

Behavior: Hackers will often attempt to get the .htaccess file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"¹⁸ weakness that might expose a "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)"¹⁹, "[OS Commanding](http://projects.webappsec.org/OS-Commanding)"²⁰, "[Path Traversal](http://projects.webappsec.org/Path-Traversal)"²¹, or "[URL Redirector Abuse](http://projects.webappsec.org/URL-Redirector-Abuse)"²² vulnerability among others. The fact that an .htaccess file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is related to .htaccess. They are requesting a user database file for a password

¹⁷ <http://httpd.apache.org/docs/current/howto/htaccess.html>

¹⁸ <http://projects.webappsec.org/Server-Misconfiguration>

¹⁹ <http://projects.webappsec.org/Credential-and-Session-Prediction>

²⁰ <http://projects.webappsec.org/OS-Commanding>

²¹ <http://projects.webappsec.org/Path-Traversal>

²² <http://projects.webappsec.org/URL-Redirector-Abuse>

protected resource defined in .htaccess. This file is generally named ".htpasswd". The user either opened the .htaccess file and found the reference to .htpasswd, or they simply tried .htpasswd to see if anything came back (with or without asking for .htaccess). Either way, this behavior is involved in the establishment of a "Credential/Session Prediction" vulnerability. The request for .htpasswd is usually performed while attempting to establish the scope of the websites attack surface, although sometimes is not performed until trying to identify a valid attack vector.

6.3.3.2.2. Apache Password File Requested

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running apache. One such vulnerability involves the use of an [.htaccess](http://httpd.apache.org/docs/current/howto/htaccess.html)²³ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the .htaccess file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests .htaccess or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured. MWS will automatically block any requests for the .htaccess resource, and return a fake version of the file. The fake version of the file will contain the directives necessary to password protect a fake resource. These directives allude to the existence of a user database file that contains usernames and encrypted passwords. The "Apache Password File Requested" incident will trigger in the event that the user requests the fake user database file (generally named .htpasswd).

Behavior: Hackers will often attempt to get the .htaccess file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"²⁴ weakness that might expose a "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)"²⁵, "[OS Commanding](http://projects.webappsec.org/OS-Commanding)"²⁶, "[Path Traversal](http://projects.webappsec.org/Path-Traversal)"²⁷, or "[URL Redirector Abuse](http://projects.webappsec.org/URL-Redirector-Abuse)"²⁸ vulnerability among others. The fact that an .htaccess file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is related to .htaccess. They are requesting a user database file for a password protected resource defined in .htaccess. This file is generally named ".htpasswd". The user either opened the .htaccess file and found the reference to .htpasswd, or they simply tried .htpasswd to see if anything came back (with or without asking for .htaccess). Either way, this behavior is involved in the establishment of a "Credential/Session Prediction" vulnerability. The request for .htpasswd is usually performed while attempting to establish the scope of the websites attack surface, although sometimes is not performed until trying to identify a valid attack vector.

6.3.3.2.3. Invalid Credentials

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds. 15x = Brute Force Invalid Credentials Incident.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running

²³ <http://httpd.apache.org/docs/current/howto/htaccess.html>

²⁴ <http://projects.webappsec.org/Server-Misconfiguration>

²⁵ <http://projects.webappsec.org/Credential-and-Session-Prediction>

²⁶ <http://projects.webappsec.org/OS-Commanding>

²⁷ <http://projects.webappsec.org/Path-Traversal>

²⁸ <http://projects.webappsec.org/URL-Redirector-Abuse>

apache. One such vulnerability involves the use of an [.htaccess](http://httpd.apache.org/docs/current/howto/htaccess.html)²⁹ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the .htaccess file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests .htaccess or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured. MWS will automatically block any requests for the .htaccess resource, and return a fake version of the file. The fake version of the file will contain the directives necessary to password protect a fake resource. Should the user request the password protected resource, MWS will simulate the correct authentication method defined in .htaccess, and simulate the existence of the fake resource. The "Invalid Credentials" incident will trigger in the event that the user requests the fake password protected file and supplies an invalid username and password (as would be the case if they requested the file in a browser and guessed a username and password at the login prompt).

Behavior: Hackers will often attempt to get the .htaccess file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"³⁰, "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)"³¹, "[OS Commanding](http://projects.webappsec.org/OS-Commanding)"³², "[Path Traversal](http://projects.webappsec.org/Path-Traversal)"³³, or "[URL Redirector Abuse](http://projects.webappsec.org/URL-Redirector-Abuse)"³⁴ vulnerability among others. The fact that an .htaccess file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is referenced only from .htaccess. The fake resource is password protected, and the user has attempted to authenticate with bad credentials. This is most likely in an effort to guess a valid username and password combination, such as "admin:admin", or "guest:guest". It may also be part of a larger brute force attempt, where the attacker tries a long list of possible combinations. This is a poor method for locating valid usernames and passwords, especially since the user database file .htpasswd is actually exposed (albeit fake). So a brute force attack (represented by a large quantity of this incident type) generally means the attacker is less sophisticated.

6.3.3.2.4. Protected Resource Requested

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running apache. One such vulnerability involves the use of an [.htaccess](http://httpd.apache.org/docs/current/howto/htaccess.html)³⁵ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the .htaccess file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests .htaccess or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured. MWS will automatically block any requests for the .htaccess resource, and return a fake version of the file. The fake version of the file will contain the directives necessary to password protect a fake resource. Should the user request the password protected resource, MWS will simulate the correct authentication method defined in .htaccess, and simulate the existence of the fake resource. The "Protected Resource Requested" incident will trigger in the event that the user requests the

²⁹ <http://httpd.apache.org/docs/current/howto/htaccess.html>

³⁰ <http://projects.webappsec.org/Server-Misconfiguration>

³¹ <http://projects.webappsec.org/Credential-and-Session-Prediction>

³² <http://projects.webappsec.org/OS-Commanding>

³³ <http://projects.webappsec.org/Path-Traversal>

³⁴ <http://projects.webappsec.org/URL-Redirector-Abuse>

³⁵ <http://httpd.apache.org/docs/current/howto/htaccess.html>

fake password protected file and does not supply a username and password (as would be the case if they requested the file in a browser and canceled the login prompt).

Behavior: Hackers will often attempt to get the .htaccess file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"³⁶ weakness that might expose a "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)"³⁷, "[OS Commanding](http://projects.webappsec.org/OS-Commanding)"³⁸, "[Path Traversal](http://projects.webappsec.org/Path-Traversal)"³⁹, or "[URL Redirector Abuse](http://projects.webappsec.org/URL-Redirector-Abuse)"⁴⁰ vulnerability among others. The fact that an .htaccess file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is referenced only from .htaccess. The resource is password protected, but the user has not yet tried to supply credentials. This is most likely in an attempt to see if the password protected file actually exists.

6.3.3.2.5. Brute Force Invalid Credentials

Complexity: Medium (3.0)

Default Response: 1x = Captcha. 2x = permanent Block.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running apache. One such vulnerability involves the use of an .htaccess⁴¹ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the .htaccess file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests .htaccess or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured. MWS will automatically block any requests for the .htaccess resource, and return a fake version of the file. The fake version of the file will contain the directives necessary to password protect a fake resource. Should the user request the password protected resource, MWS will simulate the correct authentication method defined in .htaccess, and simulate the existence of the fake resource. The "Brute Force Invalid Credentials" incident will trigger in the event that the user requests the fake password protected file and repeatedly supplies an invalid username and password (as would be the case if the user was guessing various username and password combinations).

Behavior: Hackers will often attempt to get the .htaccess file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"⁴² weakness that might expose a "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)"⁴³, "[OS Commanding](http://projects.webappsec.org/OS-Commanding)"⁴⁴, "[Path Traversal](http://projects.webappsec.org/Path-Traversal)"⁴⁵, or "[URL Redirector Abuse](http://projects.webappsec.org/URL-Redirector-Abuse)"⁴⁶ vulnerability among others. The fact that an .htaccess file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is referenced only from .htaccess. The fake resource is password protected, and the user has attempted to authenticate with a large number of bad credentials. This is most likely in an effort to guess a valid username and password combination, such as "admin:admin", or "guest:guest". This is a

³⁶ <http://projects.webappsec.org/Server-Misconfiguration>

³⁷ <http://projects.webappsec.org/Credential-and-Session-Prediction>

³⁸ <http://projects.webappsec.org/OS-Commanding>

³⁹ <http://projects.webappsec.org/Path-Traversal>

⁴⁰ <http://projects.webappsec.org/URL-Redirector-Abuse>

⁴¹ <http://httpd.apache.org/docs/current/howto/htaccess.html>

⁴² <http://projects.webappsec.org/Server-Misconfiguration>

⁴³ <http://projects.webappsec.org/Credential-and-Session-Prediction>

⁴⁴ <http://projects.webappsec.org/OS-Commanding>

⁴⁵ <http://projects.webappsec.org/Path-Traversal>

⁴⁶ <http://projects.webappsec.org/URL-Redirector-Abuse>

poor method for locating valid usernames and passwords, especially since the user database file `.htpasswd` is actually exposed (albeit fake). So a brute force attack generally means the attacker is less sophisticated.

6.3.3.2.6. Password Cracked

Complexity: High (4.0)

Default Response: 1x = permanent Block.

Cause: Apache is a web server used by many websites on the internet. As a result, hackers will often look for vulnerabilities specific to apache, since there is a good chance any given website is probably running apache. One such vulnerability involves the use of an `.htaccess`⁴⁷ file to provide directory level configuration (such as default 404 messages, password protected resources, directory indexing options, etc...), while not sufficiently protecting the `.htaccess` file itself. By convention, any resource that provides directory level configuration should not be exposed to the public. This means that if a user requests `.htaccess` or a related resource, they should get either a 404 or a 403 error. Unfortunately, not all web servers are configured correctly to block requests for these resources. In such a scenario, a hacker could gain valuable intelligence on the way the server is configured. MWS will automatically block any requests for the `.htaccess` resource, and return a fake version of the file. The fake version of the file will contain the directives necessary to password protect a fake resource. The directives will also allude to the existence of a password database file. If the attacker requests the password database file, and then uses a tool such *John The Ripper*⁴⁸ to crack one of the encrypted passwords, they will be able to authenticate against the fake protected resource successfully. Should the user request the password protected resource, and supply a valid username and password combination (as defined in the password database), the "Password Cracked" incident will be triggered.

Behavior: Hackers will often attempt to get the `.htaccess` file from various directories on a website in an effort to find valuable information about how the server is configured. This is usually done to find a "*Server Misconfiguration*"⁴⁹ weakness that might expose a "*Credential/Session Prediction*"⁵⁰, "*OS Commanding*"⁵¹, "*Path Traversal*"⁵², or "*URL Redirector Abuse*"⁵³ vulnerability among others. The fact that an `.htaccess` file is even exposed is a "Server Misconfiguration" vulnerability in itself. In this specific case, the attacker is asking for a different resource that is referenced only from `.htaccess`. The fake resource is password protected, and the user has supplied valid authentication credentials. The only way to obtain valid credentials is to either brute force the login (which would be the case if there were excessive numbers of "Invalid Credential" incidents), or to access the fake password database file (usually `.htpasswd`) and crack one of the encrypted passwords using an encryption cracking tool. This represents the final and most complicated step in a successful "Credential/Session Prediction" exploit, and is usually performed long after the attack surface of the site has been fully scoped. Unless there are excessive numbers of "Invalid Credential" incidents, which would be the case in a brute force attack, the user must have also requested `.htpasswd`, and therefore should also have an "Apache Password File Requested" incident. If this incident is missing, then the hacker has likely established two independent profiles in MWS.

6.3.4. Cookie Processor

Cookies are used by web applications to maintain state for a given user. They consist of key/value pairs that are passed around in headers and also stored client side. Each key/value pair has various attributes including

⁴⁷ <http://httpd.apache.org/docs/current/howto/htaccess.html>

⁴⁸ <http://www.openwall.com/john/>

⁴⁹ <http://projects.webappsec.org/Server-Misconfiguration>

⁵⁰ <http://projects.webappsec.org/Credential-and-Session-Prediction>

⁵¹ <http://projects.webappsec.org/OS-Commanding>

⁵² <http://projects.webappsec.org/Path-Traversal>

⁵³ <http://projects.webappsec.org/URL-Redirector-Abuse>

which domains it is valid for, what paths within those domains, as well as security restrictions and expiration information. Because this is the primary way for a web application to maintain a session, hackers will often try to manipulate cookie values manually in an effort to escalate access or hijack someone else's session. All of the attacks applicable to modifying form parameters are also applicable to modifying cookie parameters. It may even be possible, although unlikely, to find an SQL injection flaw in a cookie parameter.

6.3.4.1. Configuration

Table 6.4. Cookie Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether or not to enable this process for http traffic.
Advanced			
Cookie	String	Cookie	The fake cookie to use.
Incident: Cookie Parameter Manipulation	Boolean	True	The user modified the value of a cookie which should never be modified.

6.3.4.2. Incidents

6.3.4.2.1. Cookie Parameter Manipulation

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds and permanent Strip Inputs in 10 minutes.

Cause: MWS adds a fake cookie to the websites it protects. The cookie is intended to look as though it is part of the applications overall functionality, and is often selected to appear vulnerable (such as naming the cookie 'debug' or 'admin' and giving it a numerical or Boolean value). The "Cookie Parameter Manipulation" incident is triggered whenever the fake cookie value changes its value.

Behavior: Modifying the inputs of a page is the foundation of a large variety of attack vectors. Basically, if you want to get the backend server to do something different, you need to supply different input values (either by cookie, query string, url, or form parameters). Depending on what value the user chose for the input, the attack could fall under large number of vectors, including "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)"⁵⁴, "[XSS](http://projects.webappsec.org/Cross-Site+Scripting)"⁵⁵, "[Denial of Service](http://projects.webappsec.org/Denial-of-Service)"⁵⁶, "[Fingerprinting](http://projects.webappsec.org/Fingerprinting)"⁵⁷, "[Format String](http://projects.webappsec.org/Format-String)"⁵⁸, "[HTTP Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)"⁵⁹, "[Integer Overflow](http://projects.webappsec.org/Integer-Overflows)"⁶⁰, and "[SQL injection](http://projects.webappsec.org/SQL-Injection)"⁶¹, among many others. A common practice is to first spider the website, then test every single input on the site for a specific set of vulnerabilities. For example, the user might first index the site, then visit each page on the site, then test every exposed input (cookie, query string, and form inputs) with a list of SQL injection tests.

These tests are designed to break the resulting page if the input is vulnerable. As such, the entire process

⁵⁴ <http://projects.webappsec.org/Buffer-Overflow>

⁵⁵ <http://projects.webappsec.org/Cross-Site+Scripting>

⁵⁶ <http://projects.webappsec.org/Denial-of-Service>

⁵⁷ <http://projects.webappsec.org/Fingerprinting>

⁵⁸ <http://projects.webappsec.org/Format-String>

⁵⁹ <http://projects.webappsec.org/HTTP-Response-Splitting>

⁶⁰ <http://projects.webappsec.org/Integer-Overflows>

⁶¹ <http://projects.webappsec.org/SQL-Injection>

(which can involve thousands of requests) can be automated and return a clean report on which inputs should be targeted. Because MWS cookie looks just like a normal application cookie, a spider that tests all inputs will eventually test the fake cookie as well. This means that if there is a large volume of this incident, it is likely due to such an automated process. It should be assumed that the values tested against the fake cookie, have also been tested against the rest of the cookies on the site.

6.3.5. File Processor

When developing websites, administrators will often rename files in order to make room for a newer version of the file. They may also archive older files. A common vulnerability is the case where these older files are left in the web accessible directories, and they contain non static resources. For example, consider the case where a developer renames `shopping_cart.php` to `shopping_cart.php.bak`. If an attacker looks for php files and tries to access all of them with a `.bak` extension, they may stumble across the backup file. Because the server is not configured to parse `.bak` files as php files, it will serve the unexecuted script source code to the client. This technique can yield database credentials, system credentials, as well as expose more serious vulnerabilities in the code itself. The goal of this processor is to detect when a user is attempting to find unreferenced files.

6.3.5.1. Configuration

Table 6.5. File Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Block Response	Configurable	HTTP Response	The response to return when a request is blocked due to a matching suspicious token rule with blocking enabled.
Suspicious Tokens	Collection	Collection	The configured suspicious extensions.
Incident: Suspicious File Exposed	Boolean	True	A file which has a suspicious filename is publicly available.
Incident: Suspicious Filename	Boolean	True	A file with a filename that contains a suspicious token was requested.

6.3.5.2. Incidents

6.3.5.2.1. Suspicious Filename

Complexity: Suspicious (1.0)

Default Response: 10x = Suspicious File Enumeration Incident.

Cause: MWS has a list of file tokens which represent potentially sensitive files. For example, developers will often rename source files with a `".bck"` extension during debugging, and sometimes they forget to delete the backup after they are done. Hackers often look for these left over source files. MWS is configured to look for any request to a file with a `".bck"` extension (as well as any other configured extensions), and trigger this incident if the file does not exist. An incident will not be triggered if the file does in fact exist, and the extension is not configured to block the response. This is to avoid legitimate files being flagged as suspicious filenames.

Behavior: There are specific files that many websites host, that contain valuable information for a hacker. These files generally include data such as passwords, SQL schema's, source code, etc... When hackers try to breach a site, they will often check to see if they can locate some of these special files in order to make their jobs easier. For example, if a hacker sees that the home page is called "index.php", they may try and request "index.php.bak", because if it exists, it will be returned as raw source code. This is usually an effort to exploit a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"⁶² vulnerability. Automated scanners will generally test all of these types of extensions (.bck, .bak, .zip, .tar, .gz, etc...) against every legitimate file that is located through simple spidering. Because this incident is only created if the file being requested does not actually exist, it does not represent a successful exploit.

6.3.5.2.2. Suspicious File Exposed

Complexity: Suspicious (1.0)

Default Response: 10x = Suspicious File Enumeration Incident.

Cause: MWS has a list of file tokens which represent potentially sensitive files. For example, developers will often rename source files with a ".bck" extension during debugging, and sometimes they forget to delete the backup after they are done. Hackers often look for these left over source files. MWS is configured to look for any request to a file with a ".bck" extension (as well as any other configured extensions), and trigger this incident if the extension is configured as illegal. This incident will only be triggered if the file actually exists, and it is configured to be blocked by default. For example, the user might request "database.sql". If the .sql extension is configured to block, and the file actually exists on the server, this incident will be generated. If "database.sql" does not exist, then only a "Suspicious Filename" incident will be created.

Behavior: There are specific files that many websites host, that contain valuable information for a hacker. These files generally include data such as passwords, SQL schema's, source code, etc... When hackers try to breach a site, they will often check to see if they can locate some of these special files in order to make their jobs easier. For example, if a hacker sees that the home page is called "index.php", they may try and request "index.php.bak", because if it exists, it will be returned as raw source code. This is usually an effort to exploit a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"⁶³ vulnerability. Automated scanners will generally test all of these types of extensions (.bck, .bak, .zip, .tar, .gz, etc...) against every legitimate file that is located through simple spidering. This incident is only triggered when the user requested a file that would otherwise have been successfully returned, if it were not blocked by MWS. For example, the user might request "database.sql" and actually get a 200 response from the server indicating that the file exists and is accessible to everyone. However if the Mykonos system is configured to mark the ".sql" extension as illegal, then MWS will block the request and trigger this incident. This prevents the sensitive file from potentially being exposed to an actual malicious user. If this incident occurs, the server administrator should immediately remove the sensitive file or change its permissions so it is no longer publicly accessible.

6.3.5.2.3. Suspicious Resource Enumeration

Complexity: Low (2.0)

Default Response: 1x = 5 day Block.

Cause: MWS has a list of file tokens which represent potentially sensitive files. For example, developers will often rename source files with a ".bck" extension during debugging, and sometimes they forget to delete the backup after they are done. Hackers often look for these left over source files. MWS is configured to look for any request to a file with a ".bck" extension (as well as any other configured extensions), and trigger a

⁶² <http://projects.webappsec.org/Predictable-Resource-Location>

⁶³ <http://projects.webappsec.org/Predictable-Resource-Location>

Suspicious Filename incident if the file does not exist. Should the suspicious filename incident be triggered several times, this incident will then be triggered.

Behavior: There are specific files that many websites host, that contain valuable information for a hacker. These files generally include data such as passwords, SQL schema's, source code, etc... When hackers try to breach a site, they will often check to see if they can locate some of these special files in order to make their jobs easier. For example, if a hacker sees that the home page is called "index.php", they may try and request "index.php.bak", because if it exists, it will be returned as raw source code. This is usually an effort to exploit a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"⁶⁴ vulnerability. Automated scanners will generally test all of these types of extensions (.bck, .bak, .zip, .tar, .gz, etc...) against every legitimate file that is located through simple spidering. The first few times a user requests a filename containing a suspicious token, they will only get "Suspicious Filename" incidents. However if they request a large volume of filenames with suspicious tokens, then the "Suspicious Resource Enumeration" incident is generated. This incident represents a user who is actively scanning the site with very aggressive tactics to find unlinked and sensitive data.

6.3.6. Hidden Input Form Processor

Many webmasters create forms which post to a common form handling service; using hidden fields to indicate how the service should handle the data. A common hacking technique is to look for these hidden parameters and see if there is any way to change the behavior of the service by manipulating its input parameters. This processor is responsible for injecting a fake hidden input into forms in HTML responses and ensuring that when those values are posted back to the server, they have not been modified.

6.3.6.1. Configuration

Table 6.6. Hidden Input Form Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Hidden Input Parameter	Collection	Collection	The possible hidden inputs on a page.
Inject Input Enabled	Boolean	True	Whether to inject hidden inputs into HTML forms.
Maximum Injections	Integer	3	The maximum number of fake hidden parameters that will be added to any given URL.
Strip Fake Input	Boolean	True	Whether to remove the fake input value from the posted form results before proxying the request to the backend servers. This should only be turned off if there is some additional security implemented on the form, where its contents are signed on the client and validated on the server.

⁶⁴ <http://projects.webappsec.org/Predictable-Resource-Location>

Parameter	Type	Default Value	Description
Incident: Hidden Parameter Manipulation	Boolean	True	The user submitted the form and the value of the injected parameter is not what was expected.
Incident: Hidden Input Type Manipulation	Boolean	True	The user submitted the form and the value of the injected parameter is not what was expected. It was also modified to post a file.

6.3.6.2. Incidents

6.3.6.2.1. Parameter Type Manipulation

Complexity: High (4.0)

Default Response: 1x = Permanent Strip Inputs.

Cause: MWS inspects outgoing traffic for HTML forms with a "POST" method type. Forms that post to a local URL (within the same domain), will be modified to include a fake hidden input with a defined value. The input is intended to look as though it was always part of the form, and is often selected to appear vulnerable (such as naming the input 'debug' or 'loglevel' and giving it a numerical or Boolean value). The input will however, always be assigned a value that can be represented as a string of characters (in other words, not binary data).

The "Parameter Type Manipulation" incident is triggered whenever the fake hidden input is modified from its originally assigned value in order to submit a multipart file.

Behavior: Modifying the inputs of a page is the foundation of a large variety of attack vectors. Basically, if you want to get the backend server to do something different, you need to supply different input values (either by cookie, query string, url, or form parameters). Depending on what value the user chose for the input, the attack could fall under large number of vectors, including "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)"⁶⁵, "[XSS](http://projects.webappsec.org/Cross-Site+Scripting)"⁶⁶, "[Denial of Service](http://projects.webappsec.org/Denial-of-Service)"⁶⁷, "[Fingerprinting](http://projects.webappsec.org/Fingerprinting)"⁶⁸, "[Format String](http://projects.webappsec.org/Format-String)"⁶⁹, "[HTTP Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)"⁷⁰, "[Integer Overflow](http://projects.webappsec.org/Integer-Overflows)"⁷¹, and "[SQL injection](http://projects.webappsec.org/SQL-Injection)"⁷², among many others. Unlike a normal "Hidden Parameter Manipulation" incident, this version is triggered when the user changes the encoding of the form and submits the hidden input as a file post. This is likely in an attempt to either achieve a "Buffer Overflow", or to exploit a filter evasion weakness, that might have otherwise blocked the value being submitted. A common practice is to first spider the website, then test every single input on the site for a specific set of vulnerabilities. For example, the user might first index the site, then visit each page on the site, then test every exposed input (cookie, query string, and form inputs) with a list of SQL injection tests. These tests are designed to break the resulting page if the input is vulnerable. As such, the entire process (which can involve thousands of requests) can be automated and return a clean report on which inputs should be targeted. Because MWS injects several fake inputs, a spider that tests all inputs will eventually test the fake input as well. This means that if there is a large volume of this incident, it is likely due to such an automated process. It should be assumed that the values tested against the fake input, have also been tested against the rest of the inputs on the site.

⁶⁵ <http://projects.webappsec.org/Buffer-Overflow>

⁶⁶ <http://projects.webappsec.org/Cross-Site+Scripting>

⁶⁷ <http://projects.webappsec.org/Denial-of-Service>

⁶⁸ <http://projects.webappsec.org/Fingerprinting>

⁶⁹ <http://projects.webappsec.org/Format-String>

⁷⁰ <http://projects.webappsec.org/HTTP-Response-Splitting>

⁷¹ <http://projects.webappsec.org/Integer-Overflows>

⁷² <http://projects.webappsec.org/SQL-Injection>

6.3.6.2.2. Hidden Parameter Manipulation

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds. 2x = Logout User. 3x = Strip Inputs.

Cause: MWS inspects outgoing traffic for HTML forms with a "POST" method type. Forms that post to a local URL (within the same domain), will be modified to include a fake hidden input with a defined value. The input is intended to look as though it was always part of the form, and is often selected to appear vulnerable (such as naming the input 'debug' or 'loglevel' and giving it a numerical or Boolean value). The "Hidden Parameter Manipulation" incident is triggered whenever the fake hidden input is modified from its originally assigned value.

Behavior: Modifying the inputs of a page is the foundation of a large variety of attack vectors. Basically, if you want to get the backend server to do something different, you need to supply different input values (either by cookie, query string, url, or form parameters). Depending on what value the user chose for the input, the attack could fall under large number of vectors, including "[Buffer Overflow](#)⁷³", "[XSS](#)⁷⁴", "[Denial of Service](#)⁷⁵", "[Fingerprinting](#)⁷⁶", "[Format String](#)⁷⁷", "[HTTP Response Splitting](#)⁷⁸", "[Integer Overflow](#)⁷⁹", and "[SQL injection](#)⁸⁰" among many others. A common practice is to first spider the website, then test every single input on the site for a specific set of vulnerabilities. For example, the user might first index the site, then visit each page on the site, then test every exposed input (cookie, query string, and form inputs) with a list of SQL injection tests. These tests are designed to break the resulting page if the input is vulnerable. As such, the entire process (which can involve thousands of requests) can be automated and return a clean report on which inputs should be targeted. Because MWS injects several fake inputs, a spider that tests all inputs will eventually test the fake input as well. This means that if there is a large volume of this incident, it is likely due to such an automated process. It should be assumed that the values tested against the fake input, have also been tested against the rest of the inputs on the site.

6.3.7. Hidden Link Processor

When trying to exploit a site, hackers will often scan the contents of the site in search of directories and files that are of interest. Because this activity is done at the source level, the hacker finds every file referenced, whereas when a user views a website, they can only see the links that are visible according to the HTML. This processor injects a fake link into documents that references a file that looks interesting. The link is injected in such a way that prevents it from being rendered when the browser loads the page. This means that no normal user would ever find/click on the link, but that a scanner or hacker who is looking at the source code likely will.

6.3.7.1. Configuration

Table 6.7. Hidden Link Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.

⁷³ <http://projects.webappsec.org/Buffer-Overflow>

⁷⁴ <http://projects.webappsec.org/Cross-Site+Scripting>

⁷⁵ <http://projects.webappsec.org/Denial-of-Service>

⁷⁶ <http://projects.webappsec.org/Fingerprinting>

⁷⁷ <http://projects.webappsec.org/Format-String>

⁷⁸ <http://projects.webappsec.org/HTTP-Response-Splitting>

⁷⁹ <http://projects.webappsec.org/Integer-Overflows>

⁸⁰ <http://projects.webappsec.org/SQL-Injection>

Parameter	Type	Default Value	Description
Advanced			
Hidden Links	Configurable	Hidden Links	The set of hidden links that can be injected into the site.
Inject Link Enabled	Boolean	True	Whether to inject the link into HTTP responses.
Incident: Link Directory Indexing	Boolean	True	The user requested a directory index on one of the fake parent directories of the linked file.
Incident: Link Directory Spidering	Boolean	True	The user requested a resource inside the fake directory of the linked file.
Incident: Malicious Resource Requested	Boolean	True	The user requested the fake linked resource.

6.3.7.2. Incidents

6.3.7.2.1. Link Directory Indexing

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and 1 day Block.

Cause: MWS injects a hidden link into pages on the protected web application. This link is not exposed visually to users of the website. In order to find the link, a user would need to manually inspect the source code of the page. If a user finds the hidden link code in the HTML, and attempts to get a directory file listing from the directory the link points to, this incident will be triggered.

Behavior: A common technique for hackers when scoping the attack surface of a website is to spider the site and collect the locations of all of its pages. This is generally done using a simple script that looks for URL's in the returned HTML of the home page, then requests those pages and checks for URL's in their source, and so forth. Legitimate search engine spiders will do this as well. But the difference between a legitimate spider and a malicious user, is how aggressively they will use the newly discovered URL to derive other URLs. This incident triggers when the user goes beyond just checking the linked URL, but instead also attempts to get a file listing from the directory the URL points to. A legitimate spider would not do this, because it is considered fairly invasive. This activity is generally looking for a "[Directory Indexing](http://projects.webappsec.org/Directory-Indexing)"⁸¹ weakness on the server, in an effort to locate unlinked and possibly sensitive resources.

6.3.7.2.2. Link Directory Spidering

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and 5 day Block in 6 minutes.

Cause: MWS injects a hidden link into pages on the protected web application. This link is not exposed visually to users of the website. In order to find the link, a user would need to manually inspect the source code of the page. If a user finds the hidden link code in the HTML, and attempts to request some other arbitrary file in the same fake directory as the link, this incident will be triggered.

Behavior: A common technique for hackers when scoping the attack surface of a website is to spider the site and collect the locations of all of its pages. This is generally done using a simple script that looks for URL's

⁸¹ <http://projects.webappsec.org/Directory-Indexing>

in the returned HTML of the home page, then requests those pages and checks for URL's in their source, and so forth. Legitimate search engine spiders will do this as well. But the difference between a legitimate spider and a malicious user, is how aggressively they will use the newly discovered URL to derive other URLs. This incident triggers when the user goes beyond just checking the linked URL, but instead also attempts to request one or more arbitrary files inside the same directory as the file referenced by the hidden link. A legitimate spider would not do this, because it is considered fairly invasive. This activity is generally looking for a "[Directory Indexing](http://projects.webappsec.org/Directory-Indexing)"⁸² weakness on the server, or a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"⁸³ vulnerability, in an effort to locate unlinked and possibly sensitive resources.

6.3.8. Query String Processor

Hackers tend to manipulate the values of query string parameters in order to get the application to behave differently. The goal of this processor is to add fake query string parameters to some of the links and forms in the page, and verify that they do not get modified when accessed by the user.

6.3.8.1. Configuration

Table 6.8. Query String Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Fake Parameters	Collection	Collection	The collection of fake parameters to add to the links which already have parameters.
Inject Parameter Enabled	Boolean	True	Whether to inject query string parameters on urls in HTTP responses.
Maximum Injections	Integer	3	Whether to inject query string parameters on urls in HTTP responses.
Strip Fake Input	Boolean	True	Whether to remove the fake input value from the query string before proxying the request to the backend servers. This should only be turned off if there is some additional security implemented on the site, where links are signed on the client and validated on the server.
Incident: Query Parameter Manipulation	Boolean	True	The user manually modified the value of a query string parameter.

⁸² <http://projects.webappsec.org/Directory-Indexing>

⁸³ <http://projects.webappsec.org/Predictable-Resource-Location>

6.3.8.2. Incidents

6.3.8.2.1. Query Parameter Manipulation

Complexity: Low (2.0)

Default Response: 3x = Slow Connection 2-6 seconds. 5x = 1 day Strip Inputs.

Cause: MWS injects a fake query parameter into some of the links of the protected web site. This query parameter has a known value, and should never change, because it is not part of the actual web application. If a user modifies the query parameter value, this incident will be triggered.

Behavior: Query parameters represent the most visible form of user input a web application exposes. They are clearly visible in the address bar, and can be easily changed by even an inexperienced user. However most users do not attempt to change values directly in the query string, unless they are trying to perform some action the website does not normally expose through its interface, or does not make sufficiently easy. Because it is so easy for a normal user to accidentally change a query parameter, this incident alone is not considered strictly malicious. However depending on the value that is submitted, this could be part of a number of different exploit attempts, including "[Buffer Overflow](#)"⁸⁴, "[XSS](#)"⁸⁵, "[Denial of Service](#)"⁸⁶, "[Fingerprinting](#)"⁸⁷, "[Format String](#)"⁸⁸, "[HTTP Response Splitting](#)"⁸⁹, "[Integer Overflow](#)"⁹⁰, and "[SQL injection](#)"⁹¹.

6.3.9. Robots Processor

The Robots.txt proxy processor is responsible for catching malicious spiders that do not behave in accordance with established standards for spidering. Hackers often utilize the extra information sites expose to spiders, and then use that information to access resources normally not linked from the public site. Because this activity is effectively breaking established standards for spidering, this processor will also identify hackers who are using the information maliciously.

6.3.9.1. Configuration

Table 6.9. Robots Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Fake Disallowed Directories	String	Random	The path to a fake directory to add to the disallow rules in the robots.txt file. This path should be completely fake and not overlap with actual directories

⁸⁴ <http://projects.webappsec.org/Buffer-Overflow>

⁸⁵ <http://projects.webappsec.org/Cross-Site+Scripting>

⁸⁶ <http://projects.webappsec.org/Denial-of-Service>

⁸⁷ <http://projects.webappsec.org/Fingerprinting>

⁸⁸ <http://projects.webappsec.org/Format-String>

⁸⁹ <http://projects.webappsec.org/HTTP-Response-Splitting>

⁹⁰ <http://projects.webappsec.org/Integer-Overflows>

⁹¹ <http://projects.webappsec.org/SQL-Injection>

Parameter	Type	Default Value	Description
Incident: Spider Configuration Requested	Boolean	True	The user requested the spider rules file robots.txt. This may not be a problem, as good spiders will do this too, but users should never do it.
Incident: Malicious Spider Activity	Boolean	True	The user requested a resource which was restricted in the spider rules file, indicating this user is not a good spider, but is spidering the site anyway.

6.3.9.2. Incidents

6.3.9.2.1. Spider Configuration Requested

Complexity: Informational (0.0)

Default Response: None.

Cause: One of the standard resources commonly exposed by websites is called robots.txt, which is used to instruct search engines on how to spider the website. Two of the more important directives are "allow" and "disallow" — used to identify which directories a spider should index, and which directories it should stay away from.

Despite the best-practice being to actually lock down any resource that should not be exposed, some webmasters simply add a "disallow" statement so that those resources do not get indexed and therefore are never found by users. This technique does not work, because attackers will often access robots.txt and intentionally traverse the "disallow" directories in search of vulnerabilities. So, in effect, the listing of such directories effectively points hackers in the direction of the most sensitive resources on the site.

Mykonos Web Security will intercept requests for robots.txt and either generate a completely fake robots.txt file (if one does not exist), or modify the existing version by injecting a fake directory as a disallow directive. The "Spider Configuration Requested" incident (which is considered informational only) is triggered whenever a user requests robots.txt (including legitimate spiders).

Behavior: Requesting robots.txt occurs in two different scenarios. The first is where a legitimate spider, such as Googlebot, attempts to index the website. In this case, the robots.txt file will be requested, and no requests from that client will be issued to the disallow directories. In the second scenario, a malicious user requests robots.txt and then indexes some or all of the disallow directories. The fact that this incident was triggered does not necessarily mean the user is malicious (which is why it is informational), but it does exclude the user from the general population of average users, because the user is attempting to gain information not intended for a normal user.

This type of behavior is generally observed while the client is attempting to establish the overall attack surface of the website (or, in the case of a legitimate spider, they are attempting to establish the desired index limitations).

6.3.9.2.2. Malicious Spider Activity

Complexity: Low (2.0)

Default Response: 1x = Captcha and Slow Connection 2-6 seconds. 6x = 1 day Block.

Cause: One of the standard resources that just about every website should expose is called robots.txt. This resource is used by search engines to instruct them on how to spider the website. Two of the more important directives are "allow" and "disallow". These directives are used to identify which directories a spider should index, and which directories it should stay away from. Good practice for any website is to lock down any resource that should not be exposed. However some web masters simply add a "disallow" statement so that those resources do not get indexed and therefore are never found by users. This technique does not work, because attackers will often access robots.txt and intentionally traverse the "disallow" directories in search of vulnerabilities. So in effect, the listing of such directories is basically pointing hackers in the direction of the most sensitive resources on the site. MWS will intercept requests for robots.txt and either generate a completely fake robots.txt file (if one does not exist), or modify the existing version by injecting a fake directory as a disallow directive. The "Malicious Spider Activity" incident is triggered whenever a user attempts to request a resource in the fake disallow directory, or attempts to perform a directory index on the disallow directory.

Behavior: Requesting robots.txt occurs in two different scenarios. The first is where a legitimate spider, such as Google, attempts to index the website. In this case, the robots.txt file will be requested, and no requests from that client will be issued to the disallow directories. In the second scenario, a malicious user requests robots.txt and then indexes some or all of the disallow directories. In this specific case, the user has requested robots.txt to obtain the list of disallow directories, and then started searching for resources in those directories.

This activity is performed to find a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"⁹² vulnerability. Because spidering a directory tends to be a noisy process (lots of requests), there are likely to be many of these incidents if there are any. The sum of occurrences of this incident represent the type of activity the user is performing to index a directory. The set of URL's for which this incident is triggered, represent the filenames the malicious user is testing for. For example, if they were searching for PDF files that contain stock information, there would be an incident for each filename with a PDF extension they tried to request. There is a very strong chance that if the filename was requested in the disallow directory, it was probably requested in every other directory on the site as well. This type of behavior is generally observed while the client is attempting to establish the overall attack surface of the website (or in the case of a legitimate spider, they are attempting to establish the desired index limitations).

6.4. Activity Processors

6.4.1. Custom Authentication Processor

The custom authentication processor is designed to add strong and secure authentication to any page in the protected application. The authentication processor also logs malicious activity like invalid logins and modifying cookies or query parameters.

6.4.1.1. Configuration

Table 6.10. Custom Authentication Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.

⁹² <http://projects.webappsec.org/Predictable-Resource-Location>

Parameter	Type	Default Value	Description
User Accounts	Collection	Collection	A collection of user accounts to use for this processor.
Advanced			
Auth Cookie Name	String	Random	The name of the authentication cookie.
Login Page Timeout	Integer	10 Minutes	The number of seconds a login page can be used before it times out. This is intended to prevent attacks based on watching network traffic. It should be as short as is tolerable.
MD5 Script Name	String	Random	The name of the Javascript resource that contains the MD5 code.
Session Timeout	Integer	1 Hour	The number of seconds a session can be idle before it times out.
User Accounts	Collection	Null	Configure user account login credentials for this processor.
Incident: Auth Cookie Tampering	Boolean	True	The user has modified the cookie used to manage custom authentication, probably in an attempt to expose sensitive information or bypass access restrictions.
Incident: Auth Input Parameter Tampering	Boolean	True	The user has modified the parameters used to manage custom authentication, probably in an attempt to expose sensitive information or bypass the authentication mechanism.
Incident: Auth Invalid Login	Boolean	True	The user has attempted to login but supplied invalid credentials, this could be perfectly normal, but large numbers of this type of incident would indicate a brute force attack.
Incident: Auth Query Parameter Tampering	Boolean	True	The user has modified the query parameters that were submitted when the user was asked to originally login. This is likely in an attempt to probe the authentication mechanism for exploits.

6.4.1.2. Incidents

6.4.1.2.1. Auth Input Parameter Tampering

Complexity: Medium (3.0)

Default Response: 3x = Warn User, 5x = Captcha. 9x = 1 day Strip Inputs.

Cause: MWS provides the capability of password protecting any URL on the protected site. This means that if a user attempts to access that URL, they will be prompted to enter a username and password before the original request is allowed to be completed. This incident is triggered when a user attempts to manipulate the hidden form parameters used to handle authentication.

Behavior: Manipulating hidden input fields in a form, for whatever reason is generally considered malicious. In this case, since the form is being used to password protect a resource, it is likely that the attacker is trying

to bypass the authentication by finding a vulnerability in the authentication mechanism. Depending on the modified value they submit, they could be attempting to launch a "[Buffer Overflow](#)⁹³", "[XSS](#)⁹⁴", "[Denial of Service](#)⁹⁵", "[Fingerprinting](#)⁹⁶", "[Format String](#)⁹⁷", "[HTTP Response Splitting](#)⁹⁸", "[Integer Overflow](#)⁹⁹", or "[SQL injection](#)¹⁰⁰" attack among many others.

6.4.1.2.2. Auth Query Parameter Tampering

Complexity: Low (2.0)

Default Response: 1x = Warn User. 2x = 1 day Strip Inputs.

Cause: MWS provides the capability of password protecting any URL on the protected site. This means that if a user attempts to access that URL, they will be prompted to enter a username and password before the original request is allowed to be completed. This incident is triggered when a user attempts to manipulate the query parameters that were submitted with the original unauthenticated request, after authentication has been completed.

Behavior: Manipulating query parameters after authenticating is not very easy to do without a 3rd party tool, and has no legitimate purpose. As such, this type of behavior is most likely related to a user who is trying to smuggle a malicious payload through a network or web firewall. Depending on the value the user submits for the modified query string, they could be attempting a "[Buffer Overflow](#)¹⁰¹", "[XSS](#)¹⁰²", "[Denial of Service](#)¹⁰³", "[Fingerprinting](#)¹⁰⁴", "[Format String](#)¹⁰⁵", "[HTTP Response Splitting](#)¹⁰⁶", "[Integer Overflow](#)¹⁰⁷", or "[SQL injection](#)¹⁰⁸" attack among many others. One interesting note is that the user has actually authenticated in order to cause this incident. As such, it is also likely that the account for which the user authenticated has been compromised and should be updated (with a new password). Although it is possible that the true owner of the account has executed the malicious action, and should therefore potentially be banned.

6.4.1.2.3. Auth Cookie Tampering

Complexity: Medium (3.0)

Default Response: 1x = Warn User, 2x = Captcha. 3x = 1 day Strip Inputs.

Cause: MWS provides the capability of password protecting any URL on the protected site. This means that if a user attempts to access that URL, they will be prompted to enter a username and password before the original request is allowed to be completed. This incident is triggered when a user attempts to manipulate the cookie used to maintain the authenticated session once the user logs in.

Behavior: Manipulating cookies is not easy to do without a 3rd party tool, and has no legitimate purpose. As such, this type of behavior is most likely related to a user who is trying to perform a "[Credential/Session](#)

⁹³ <http://projects.webappsec.org/Buffer-Overflow>

⁹⁴ <http://projects.webappsec.org/Cross-Site+Scripting>

⁹⁵ <http://projects.webappsec.org/Denial-of-Service>

⁹⁶ <http://projects.webappsec.org/Fingerprinting>

⁹⁷ <http://projects.webappsec.org/Format-String>

⁹⁸ <http://projects.webappsec.org/HTTP-Response-Splitting>

⁹⁹ <http://projects.webappsec.org/Integer-Overflows>

¹⁰⁰ <http://projects.webappsec.org/SQL-Injection>

¹⁰¹ <http://projects.webappsec.org/Buffer-Overflow>

¹⁰² <http://projects.webappsec.org/Cross-Site+Scripting>

¹⁰³ <http://projects.webappsec.org/Denial-of-Service>

¹⁰⁴ <http://projects.webappsec.org/Fingerprinting>

¹⁰⁵ <http://projects.webappsec.org/Format-String>

¹⁰⁶ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹⁰⁷ <http://projects.webappsec.org/Integer-Overflows>

¹⁰⁸ <http://projects.webappsec.org/SQL-Injection>

*Prediction*¹⁰⁹ attack, or execute an input based attack such as a "*Buffer Overflow*¹¹⁰", "*XSS*¹¹¹", "*Denial of Service*¹¹²", "*Fingerprinting*¹¹³", "*Format String*¹¹⁴", "*HTTP Response Splitting*¹¹⁵", "*Integer Overflow*¹¹⁶", or "*SQL injection*¹¹⁷" attack among many others. One interesting note is that the user has actually authenticated in order to cause this incident. As such, it is also likely that the account for which the user authenticated has been compromised and should be updated (with a new password). Although it is possible that the true owner of the account has executed the malicious action, and should therefore potentially be banned.

6.4.1.2.4. Authentication Brute Force

Complexity: Medium (3.0)

Default Response: 1x = Captcha. 2x = 1 day Block.

Cause: MWS provides the capability of password protecting any URL on the protected site. This means that if a user attempts to access that URL, they will be prompted to enter a username and password before the original request is allowed to be completed. This incident is triggered when a user submits a large volume of invalid username and password combinations.

Behavior: Submitting a single invalid username or password is likely a user typo, and is not necessarily malicious. However it does represent a security event, and a large number of these events may represent a more serious threat such as "*Brute Force*¹¹⁸". It is possible however, that the invalid username or password might also be an attack vector targeted at the authentication mechanism such as a "*Buffer Overflow*¹¹⁹", "*XSS*¹²⁰", "*Denial of Service*¹²¹", "*Fingerprinting*¹²²", "*Format String*¹²³", "*HTTP Response Splitting*¹²⁴", "*Integer Overflow*¹²⁵", or "*SQL injection*¹²⁶" attack among many others. This incident is a higher level incident that gets tripped when dozens of "Auth Invalid Login" incidents are created. As such, it does not contain much information about the actual accounts being targeted. If more detail is desired, the underlying "Auth Invalid Login" incidents should be reviewed. These incidents are only suspicious (not considered malicious on their own), so the filtering option will need to be set to show non malicious incidents.

6.4.1.2.5. Auth Invalid Login

Complexity: Suspicious (1.0)

Default Response: 20x = Auth Brute Force Incident.

Cause: MWS provides the capability of password protecting any URL on the protected site. This means that if a user attempts to access that URL, they will be prompted to enter a username and password before

¹⁰⁹ <http://projects.webappsec.org/Credential-and-Session-Prediction>

¹¹⁰ <http://projects.webappsec.org/Buffer-Overflow>

¹¹¹ <http://projects.webappsec.org/Cross-Site+Scripting>

¹¹² <http://projects.webappsec.org/Denial-of-Service>

¹¹³ <http://projects.webappsec.org/Fingerprinting>

¹¹⁴ <http://projects.webappsec.org/Format-String>

¹¹⁵ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹¹⁶ <http://projects.webappsec.org/Integer-Overflows>

¹¹⁷ <http://projects.webappsec.org/SQL-Injection>

¹¹⁸ <http://projects.webappsec.org/Brute-Force>

¹¹⁹ <http://projects.webappsec.org/Buffer-Overflow>

¹²⁰ <http://projects.webappsec.org/Cross-Site+Scripting>

¹²¹ <http://projects.webappsec.org/Denial-of-Service>

¹²² <http://projects.webappsec.org/Fingerprinting>

¹²³ <http://projects.webappsec.org/Format-String>

¹²⁴ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹²⁵ <http://projects.webappsec.org/Integer-Overflows>

¹²⁶ <http://projects.webappsec.org/SQL-Injection>

the original request is allowed to be completed. This incident is triggered when a user submits an invalid username or password. This incident alone is not necessarily malicious, as it is possible for a legitimate user to accidentally type their username or password incorrectly.

Behavior: Submitting a single invalid username or password is likely a user typo, and is not necessarily malicious. However it does represent a security event, and a large number of these events may represent a more serious threat such as "[Brute Force](#)¹²⁷". It is possible however, that the invalid username or password might also be an attack vector targeted at the authentication mechanism such as a "[Buffer Overflow](#)¹²⁸", "[XSS](#)¹²⁹", "[Denial of Service](#)¹³⁰", "[Fingerprinting](#)¹³¹", "[Format String](#)¹³²", "[HTTP Response Splitting](#)¹³³", "[Integer Overflow](#)¹³⁴", or "[SQL injection](#)¹³⁵" attack among many others. So if the value specified for the username and password does not look like a legitimate username and password (they are too long, or contain unusual characters), then this incident may be more serious. However, even in this case, the user is more likely to submit dozens of invalid credentials (not just one), and there is a different incident for that scenario.

6.4.2. Cookie Protection Processor

This processor is responsible for protecting a set of application cookies from modification or assignment by the user.

6.4.2.1. Configuration

Table 6.11. Cookie Protection Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Protected Cookies	Collection	Collection	The name of the protected cookie.
Advanced			
Protected Cookie Signature Suffix	String	Random	The suffix to add to the protected cookie names when generating a signature cookie. For example, if the protected cookie is PHPSESSID and the suffix is _MX, then the signature for PHPSESSID would be in a cookie named PHPSESSID_MX.
Incident: Application Cookie Manipulation	Boolean	True	The user either attempted to modify one of the protected cookies, or attempted to assign a new value.

¹²⁷ <http://projects.webappsec.org/Brute-Force>

¹²⁸ <http://projects.webappsec.org/Buffer-Overflow>

¹²⁹ <http://projects.webappsec.org/Cross-Site+Scripting>

¹³⁰ <http://projects.webappsec.org/Denial-of-Service>

¹³¹ <http://projects.webappsec.org/Fingerprinting>

¹³² <http://projects.webappsec.org/Format-String>

¹³³ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹³⁴ <http://projects.webappsec.org/Integer-Overflows>

¹³⁵ <http://projects.webappsec.org/SQL-Injection>

6.4.2.2. Incidents

6.4.2.2.1. Application Cookie Manipulation

Complexity: Low (2.0)

Default Response: 1x = Warn User and Logout User. 2x = 5 day Strip Inputs.

Cause: MWS is designed to provide additional protection to cookies used by the web application for tracking user sessions. This is done by issuing a signature cookie any time the web application issues a "protected cookie"(which cookies to protect is defined in configuration). The signature cookie ties the application cookie (such as PHPSESSID) to the Mykonos session cookie. If any of the 3 cookies are modified (Mykonos session cookie, signature cookie, or the actual application cookie), then this incident will be triggered, and the application cookie will be terminated (effectively terminating the users session). This prevents any users from manually creating a session cookie, hijacking another users cookie, or manipulating an existing cookie.

Behavior: Manipulation of cookies is generally performed in order to hijack another user's session. However because cookies represent another type of application input, modifications could also be performed to attempt other exploits. If the modified value resembles a legitimate value for the application cookie, then this is likely a session hijacking attempt. If the cookie contains other values that are clearly not valid, then it is more then likely an attack on generic application inputs such as a "[Buffer Overflow](#)¹³⁶", "[XSS](#)¹³⁷", "[Denial of Service](#)¹³⁸", "[Fingerprinting](#)¹³⁹", "[Format String](#)¹⁴⁰", "[HTTP Response Splitting](#)¹⁴¹", "[Integer Overflow](#)¹⁴²", and "[SQL injection](#)¹⁴³" attack among many others.

6.4.3. Error Processor

Errors and their contents play a big part in hacking a website. When a hacker obtains an error message, it provides useful information, the very least of which is that the attacker found a way to do something unintended in the web application and the server executed code to handle it. As such, when a user attempts to hack a website, they frequently induce and receive error messages. Often these error messages are very unusual and are not common when a normal user visits the site. For example, the error code 400 (Bad Request) is returned when the raw data in a request does not follow the HTTP standards. While it is possible to get a 400 error by typing invalid characters into the URL, the majority of these errors are caused by 3rd party software (usually not a browser), improperly communicating with the server. A hacker might for example, manually construct a malicious request and forget to include the "Host" header. The goal of this processor is to record unusual and unexpected errors as incidents.

This processor will also monitor all 404 errors and attempt to identify Common Directory Enumeration and User Directory Enumeration.

¹³⁶ <http://projects.webappsec.org/Buffer-Overflow>

¹³⁷ <http://projects.webappsec.org/Cross-Site+Scripting>

¹³⁸ <http://projects.webappsec.org/Denial-of-Service>

¹³⁹ <http://projects.webappsec.org/Fingerprinting>

¹⁴⁰ <http://projects.webappsec.org/Format-String>

¹⁴¹ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹⁴² <http://projects.webappsec.org/Integer-Overflows>

¹⁴³ <http://projects.webappsec.org/SQL-Injection>

6.4.3.1. Configuration

Table 6.12. Error Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Legitimate Error Detection Enabled	Boolean	True	Whether to attempt to identify errors in the protected web applications so that they can be ignored.
Advanced			
Error Cache Expiration	Integer	43200 (12 hours)	The number of seconds to cache an error condition so that subsequent matching error conditions from other users can be identified. The less traffic the site sees on a regular basis, the higher this value must be. The recommended default is for sites that see several thousand users a day or more.
Error Cache Size	Integer	50	The number of error conditions to cache for each level of specificity. If too many error conditions are encountered in a short period of time, this will prevent the tracking code from consuming too much memory. Errors at the full URL with query string specificity will cache this many conditions, at the URL only level it will cache twice this many, and at the filename level, it will cache 3 times as many as this value.
Filename Only Expiration	Integer	259200 (3 days)	The number of seconds that an error must not be encountered on a filename regardless of its location before an ignored error starts being recorded again.
Filename Only Threshold	Integer	70	The maximum number of unique users who can hit a specific filename, regardless of location, and get the same error before it stops being recorded as suspicious (zero = do not track based on filename).
URL With Query Expiration	Integer	259200 (3 days)	The number of seconds that an error must not be encountered on the full URL with query string before an ignored error starts being recorded again.
URL With Query Threshold	Integer	30	The maximum number of unique users who can hit a full URL including query string and get the same error before it stops being recorded as suspicious (zero = do not track based on full url).

Parameter	Type	Default Value	Description
URL Without Query Expiration	Integer	259200 (3 days)	The number of seconds that an error must not be encountered on the URL excluding query string before an ignored error starts being recorded again.
URL Without Query Threshold	Integer	50	The maximum number of unique users who can hit a URL excluding query string and get the same error before it stops being recorded as suspicious (zero = do not track based on url).
100 Continue	Configurable	Error Status	Continue.
101 Switching Protocols	Configurable	Error Status	Switching Protocols.
102 Processing	Configurable	Error Status	Processing.
300 Multiple Choices	Configurable	Error Status	Multiple Choices.
301 Moved Permanently	Configurable	Error Status	Moved Permanently.
302 Found	Configurable	Error Status	Found.
303 See Other	Configurable	Error Status	See Other.
304 Not Modified	Configurable	Error Status	Not Modified.
305 Use Proxy	Configurable	Error Status	Use Proxy.
306 Switch Proxy	Configurable	Error Status	Switch Proxy.
307 Temporary Redirect	Configurable	Error Status	Switch Proxy.
400 Bad Request	Configurable	Error Status	Bad Request.
401 Unauthorized	Configurable	Error Status	Unauthorized.
402 Payment Required	Configurable	Error Status	Payment Required.
403 Forbidden	Configurable	Error Status	Forbidden.
404 Not Found	Configurable	Error Status	Not Found.
405 Method Not Allowed	Configurable	Error Status	Not allowed.
406 Not Acceptable	Configurable	Error Status	Not acceptable.
407 Proxy Authentication Required	Configurable	Error Status	Proxy Authentication Required.
408 Request Timeout	Configurable	Error Status	Request Timeout.
409 Conflict	Configurable	Error Status	Conflict.
410 Gone	Configurable	Error Status	Gone.
411 Length Required	Configurable	Error Status	Length Required.
412 Precondition Failed	Configurable	Error Status	Precondition Failed.

Parameter	Type	Default Value	Description
413 Request Entity Too Large	Configurable	Error Status	Request Entity Too Large.
414 Request-URI Too Long	Configurable	Error Status	Request-URI Too Long.
415 Unsupported Media Type	Configurable	Error Status	Unsupported Media Type.
416 Requested Range Not Satisfiable	Configurable	Error Status	Requested Range Not Satisfiable.
417 Expectation Failed	Configurable	Error Status	Expectation Failed.
418 I'm a teapot	Configurable	Error Status	418 I'm a teapot.
422 Unprocessable Entity	Configurable	Error Status	Unprocessable Entity.
423 Locked	Configurable	Error Status	Locked.
424 Failed Dependency	Configurable	Error Status	Failed Dependency.
425 Unordered Collection	Configurable	Error Status	Unordered Collection.
426 Upgrade Required	Configurable	Error Status	Upgrade Required.
449 Retry With	Configurable	Error Status	Retry With.
450 Blocked by Windows Parental Controls	Configurable	Error Status	Blocked by Windows Parental Controls.
500 Internal Server Error	Configurable	Error Status	Internal Server Error.
501 Not Implemented	Configurable	Error Status	Not Implemented.
502 Bad Gateway	Configurable	Error Status	Bad Gateway.
503 Service Unavailable	Configurable	Error Status	Service Unavailable.
504 Gateway Timeout	Configurable	Error Status	Gateway Timeout.
505 HTTP Version Not Supported	Configurable	Error Status	HTTP Version Not Supported.
506 Variant Also Negotiates	Configurable	Error Status	Variant Also Negotiates.
507 Insufficient Storage	Configurable	Error Status	Insufficient Storage.
509 Bandwidth Limit Exceeded	Configurable	Error Status	Bandwidth Limit Exceeded.
510 Not Extended	Configurable	Error Status	Not Extended.

Parameter	Type	Default Value	Description
Incident: Illegal Response Status	Boolean	True	The user issued a request that resulted in an error status code that is considered suspicious and possibly malicious.
Incident: Suspicious Response Status	Boolean	True	The user issued a request that resulted in a known error status code generally involved in malicious behavior. On its own this is not enough to classify abuse, but patterns of this indicator may lead to higher level malicious incidents.
Incident: Unexpected Response Status	Boolean	True	The user issued a request that resulted in an unknown error status code and could represent a successful exploit.
Incident: Unknown Common Directory Requested	Boolean	True	The user has requested a directory that does not exist. The directory is in a list of common directory names, so it is likely that this request is in an attempt to find a directory that is not linked from the site.
Incident: Unknown User Directory Requested	Boolean	True	The user has requested a directory for a specific system user that does not exist. The username is in a list of common usernames, so it is likely that this request is in an attempt to identify a user account that is not linked from the site.

6.4.3.2. Incidents

6.4.3.2.1. Illegal Response Status

Complexity: Suspicious (1.0)

Default Response: None.

Cause: MWS monitors the various status codes returned by the protected website and compares them to a configurable list of known and acceptable status codes. Some status codes are expected during normal usage of the site (such as 200 - OK, or 403 - Not Modified), but some status codes are much less common for a normal user (such as 500 - Server Error, or 404 - File Not Found). When a user issues a request that results in a status code that is configured as illegal, then this incident will be triggered.

Behavior: In the process of attempting to find vulnerabilities on a web server, hackers will often encounter errors. Just a single error or two is likely not a problem, because even legitimate users accidentally type a URL incorrectly on occasion. However when excessive numbers of unexpected status codes are returned, the behavior of the user can be narrowed down and classified as malicious. The actual vulnerability an attacker is looking for, can be identified through the status codes they are being returned. For example, if the user is getting a lot of 404 errors, they are likely searching for unlinked files ("[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)¹⁴⁴"). If the user is getting a lot of 500 errors, they may be trying to establish a successful "[SQL Injection](#)¹⁴⁵" or "[XSS](#)¹⁴⁶" vulnerability.

¹⁴⁴ <http://projects.webappsec.org/Predictable-Resource-Location>

6.4.3.2.2. Suspicious Response Status

Complexity: Suspicious (1.0)

Default Response: 10x 404 = Resource Enumeration Incident.

Cause: MWS monitors the various status codes returned by the protected website and compares them to a configurable list of known and acceptable status codes. Some status codes are expected during normal usage of the site (such as 200 - OK, or 403 - Not Modified), but some status codes are much less common for a normal user (such as 500 - Server Error, or 404 - File Not Found). When a user issues a request which results in a status code that is not known and does not have any associated configuration, this incident will be triggered.

Behavior: In the process of attempting to find vulnerabilities on a web server, hackers will often encounter errors. Just a single error or two is likely not a problem, because even legitimate users accidentally type a URL incorrectly on occasion. However when excessive numbers of unexpected status codes are returned, the behavior of the user can be narrowed down and classified as malicious. The actual vulnerability the attacker is looking for can be identified through the status codes they are being returned. For example, if the user is getting a lot of 404 errors, they are likely searching for unlinked files ("[Predictable Resource Location](#)"¹⁴⁷). If the user is getting a lot of 500 errors, they may be trying to establish a successful "[SQL Injection](#)"¹⁴⁸ or "[XSS](#)"¹⁴⁹ vulnerability. In the case of this incident, the user is getting an unexpected status code. This is likely because of a bug in the web application which the user has found and is attempting to exploit. The URL this incident is created for, should be reviewed to determine why it would be responding with a non standard status code. If the status code is intentionally non-standard, but is acceptable behavior, then the custom status code should be added to the list of known and accepted status codes in config.

6.4.3.2.3. Unexpected Response Status

Complexity: Suspicious (1.0)

Default Response: None.

Cause: Mykonos Web Security monitors the various status codes returned by the protected website and compares them to a configurable list of known and acceptable status codes. Some status codes are expected during normal usage of the site (such as "200 OK" or "304 Not Modified"), but some status codes are much less common for a normal user (such as "500 Internal Server Error" or "404 Not Found"). When a user issues a request which results in a status code that is not known and does not have any associated configuration, this incident will be triggered.

Behavior: In the process of attempting to find vulnerabilities on a web server, hackers will often encounter errors. Just a single error or two is likely not a problem, because even legitimate users accidentally type a URL incorrectly on occasion. However when excessive numbers of unexpected status codes are returned, the behavior of the user can be narrowed down and classified as malicious. The actual vulnerability the attacker is looking for can be identified through the status codes they are being returned. For example, if the user is getting a lot of 404 errors, they are likely searching for unlinked files ("[Predictable Resource Location](#)"¹⁵⁰). If the user is getting a lot of 500 errors, they may be trying to establish a successful "[SQL Injection](#)"¹⁵¹ or "[XSS](#)"¹⁵² vulnerability. In the case of this incident, the user is getting an unexpected status

¹⁴⁵ <http://projects.webappsec.org/SQL-Injection>

¹⁴⁶ <http://projects.webappsec.org/Cross-Site+Scripting>

¹⁴⁷ <http://projects.webappsec.org/Predictable-Resource-Location>

¹⁴⁸ <http://projects.webappsec.org/SQL-Injection>

¹⁴⁹ <http://projects.webappsec.org/Cross-Site+Scripting>

¹⁵⁰ <http://projects.webappsec.org/Predictable-Resource-Location>

¹⁵¹ <http://projects.webappsec.org/SQL-Injection>

code. This is likely because of a bug in the web application which the user has found and is attempting to exploit. The URL this incident is created for, should be reviewed to determine why it would be responding with a non standard status code. If the status code is intentionally non-standard, but is acceptable behavior, then the custom status code should be added to the list of known and accepted status codes in config.

In the case of this incident, the user is getting an unexpected status code. This is likely because of a bug in the web application which the user has found and is attempting to exploit. The URL this incident is created for should be reviewed to determine why it would be responding with an unexpected status code. If the status code is intentionally non-standard, but is acceptable behavior, then the custom status code should be added to the list of known and accepted status codes in config.

6.4.3.2.4. Unknown Common Directory Requested

Complexity: Suspicious (1.0)

Default Response: 5x = Common Directory Enumeration Incident

Cause: This incident is triggered when a user requests a directory on the server that does not exist, and that directory name is in a list of commonly used directory names (for example: <http://www.example.com/public/> where "public" is not a real directory).

Behavior: Often times, administrators will upload sensitive content onto a web server in an obscure location and not link to that content anywhere on the site. The assumption is that the content is private because no one will find it. However humans are somewhat predictable, so it's actually quite common for two administrators to pick the same "obscure" location to place sensitive content. As such, hackers have compiled a list of the most commonly chosen directory names where sensitive content is often stored, and they will basically test every name in the list to see if a site has a directory by that name. If it does, the attacker is able to locate and obtain that sensitive content. An example of a tool that allows attackers to quickly identify hidden directories is called "DirBuster" (https://www.owasp.org/index.php/Category:OWASP_DirBuster_Project).

6.4.3.2.5. Unknown User Directory Requested

Complexity: Suspicious (1.0)

Default Response: 5x = User Directory Enumeration Incident

Cause: Many web servers allow the users on the system to maintain publicly accessible web directories. These directories are generally accessible from the root directory of the website followed by a tilde and the username. For example, if the web server had a user named 'george', that user could serve content from <http://www.example.com/~george/>. This incident is triggered when an attacker requests a user directory on the server that does not exist, and that user directory name is in a list of commonly used usernames (for example: <http://www.example.com/~root/> where "root" is not a real user directory).

Behavior: Often times, administrators will upload sensitive content onto a web server in an obscure location and not link to that content anywhere on the site. The assumption is that the content is private because no one will find it. However humans are somewhat predictable, so it's actually quite common for two administrators to pick the same "obscure" location to place sensitive content. As such, hackers have compiled a list of the most commonly chosen directory names where sensitive content is often stored, and they will basically test every name in the list to see if a site has a directory by that name. If it does, the attacker is able to locate and obtain that sensitive content. In this specific case, the attacker is testing for default user directories for users with predictable names (such as 'root', 'guest', 'nobody', etc...). An example of a tool that allows attackers to quickly identify hidden user directories is called "DirBuster" (https://www.owasp.org/index.php/Category:OWASP_DirBuster_Project).

¹⁵² <http://projects.webappsec.org/Cross-Site+Scripting>

6.4.3.2.6. Common Directory Enumeration

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds & Captcha, 2x = Slow Connection 2-6 seconds & 1 day Block

Cause: This incident is triggered when a user requests a directory on the server that does not exist, and that directory name is in a list of commonly used directory names (for example: <http://www.example.com/public/> where "public" is not a real directory). Specifically, this incident is triggered when the user requests many different commonly named directories, as would be the case if they were testing for a large list of possible directory names.

Behavior: Often times, administrators will upload sensitive content onto a web server in an obscure location and not link to that content anywhere on the site. The assumption is that the content is private because no one will find it. However humans are somewhat predictable, so it's actually quite common for two administrators to pick the same "obscure" location to place sensitive content. As such, hackers have compiled a list of the most commonly chosen directory names where sensitive content is often stored, and they will basically test every name in the list to see if a site has a directory by that name. If it does, the attacker is able to locate and obtain that sensitive content. An example of a tool that allows attackers to quickly identify hidden directories is called "DirBuster" (https://www.owasp.org/index.php/Category:OWASP_DirBuster_Project).

6.4.3.2.7. User Directory Enumeration

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds & Captcha, 2x = Slow Connection 2-6 seconds & 1 day Block

Cause: Many web servers allow the users on the system to maintain publically accessible web directories. These directories are generally accessible from the root directory of the website followed by a tilde and the username. For example, if the web server had a user named 'george', that user could serve content from <http://www.example.com/~george/>. This incident is triggered when an attacker requests a user directory on the server that does not exist, and that user directory name is in a list of commonly used usernames (for example: <http://www.example.com/~root/> where "root" is not a real user directory). Specifically, this incident is triggered when an attacker requests many different username directories, as would be the case if they were testing for a large list of possible usernames.

Behavior: Often times, administrators will upload sensitive content onto a web server in an obscure location and not link to that content anywhere on the site. The assumption is that the content is private because no one will find it. However humans are somewhat predictable, so it's actually quite common for two administrators to pick the same "obscure" location to place sensitive content. As such, hackers have compiled a list of the most commonly chosen directory names where sensitive content is often stored, and they will basically test every name in the list to see if a site has a directory by that name. If it does, the attacker is able to locate and obtain that sensitive content. In this specific case, the attacker is testing for default user directories for users with predictable names (such as 'root', 'guest', 'nobody', etc...). An example of a tool that allows attackers to quickly identify hidden user directories is called "DirBuster" (https://www.owasp.org/index.php/Category:OWASP_DirBuster_Project).

6.4.4. Header Processor

A useful technique when attacking a site is to determine what software the site is using. This is known as fingerprinting the server. There are many methods used, but the basic idea is to look for signatures that identify various products. For example, it might be a known signature that Apache always lists the "Date"

response header before the "Last-Modified" response header. If very few other servers follow this same pattern, then checking to see which header comes first could be used as a means of identifying if Apache is being used or not. Other key methods include looking for "Server" or "X-Powered-By" headers that actually specify the software being used. The goal of this processor is to eliminate headers as a means of fingerprinting a server.



Important

While the goal of this processor is mainly to prevent fingerprinting, it may also catch some malicious behavior and erroneous behavior in the protected applications (potentially as a result of an exploit). As such, the following incidents are recognized by the processor.

6.4.4.1. Configuration

Table 6.13. Header Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Header Mixing Enabled	Boolean	True	Whether this processor should shuffle the order of response headers to avoid exposing identifiable information.
Maximum Header Length	Integer	8192	The maximum allowed length of a header in bytes. If header stripping is enabled, then any headers that exceed this length will be removed from the request before proxying.
Request Header Stripping Enabled	Boolean	True	Whether this processor should strip unnecessary headers in request packets to avoid sending malicious data to the server
Response Header Stripping Enabled	Boolean	True	Whether this processor should strip unnecessary response headers to avoid giving away identifiable information
Known Request Headers	Collection	Collection	A list of known request headers.
Known Response Headers	Collection	Collection	A list of known Response headers
Incident: Duplicate Request Header	Boolean	True	The application returned multiple instances of the same header, which it is never expected to do.
Incident: Duplicate Response Header	Boolean	False	The user provided multiple instances of the same header, and the header does not usually allow multiples.
Incident: Illegal Request Header	Boolean	True	The user provided a request header which is known to be involved in malicious activity.

Parameter	Type	Default Value	Description
Incident: Illegal Response Header	Boolean	True	The application returned a response header which it is never supposed to return.
Incident: Missing All Headers	Boolean	True	The user issued a request which is missing both the User Agent and Host headers.
Incident: Missing Host Header	Boolean	True	The application returned a response which is missing a required header.
Incident: Missing Request Header	Boolean	True	The user issued a request which is missing a required header.
Incident: Missing Response Header	Boolean	True	The application returned a response which is missing a required header.
Incident: Missing User Agent Header	Boolean	True	The user issued a request which is missing a required header.
Incident: Request Header Overflow	Boolean	True	The user issued a request which contained a header that was longer then the allowed maximum.
Incident: Unexpected Request Header	Boolean	False	The user issued a request which contains an unexpected and unknown header.
Incident: Compound Request Header Overflow	Boolean	True	The user issued multiple requests which contained a header that was longer then the allowed maximum.

6.4.4.2. Incidents

6.4.4.2.1. Duplicate Request Header

Complexity: Informational (0.0)

Default Response: None.

Cause: MWS monitors all of the request headers sent from the client to the web application. According to the HTTP RFC, no client should ever provide more the one copy of a specific header. For example, clients should not send multiple "Host" headers. However there are a few exceptions, such as the "Cookie" header, which can be configured to allow multiples. If the user sends multiple headers that are not configured explicitly to allow duplicates, then this incident will be triggered.

Behavior: Sending duplicate headers of the same type can be caused by several different things. It is either an attempt to profile the web server and see how it reacts, an attempt to smuggle malicious data into the headers (because a firewall might not look at subsequent copies of the same header), or possibly just be a poorly programmed web client. In either case, it represents unusual activity that sets the user aside from everyone else. It signifies that the user is suspicious and is doing something average users do not do.

6.4.4.2.2. Duplicate Response Header

Complexity: Informational (0.0)

Default Response: None

Cause: MWS monitors all of the response headers sent from the server to the client. According to the HTTP RFC, no server should ever provide more the one copy of a specific header. For example, servers should

not send multiple "Content-Length" headers. However there are a few exceptions, such as the "Set-Cookie" header, which can be configured to allow multiples. If the server attempts to return multiple headers of the same type, which are not configured explicitly to allow duplicates, then this incident will be triggered.

Behavior: The RFC does not allow for servers to return multiple headers of the same type, with a few exceptions, such as "Set-Cookie". If the server does return duplicates for a header that normally does not support duplicates, then there is either a bug in the web application, or the user has successfully executed a "[Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)¹⁵³" attack. In either case, the service located at the URL this incident is triggered for should probably be reviewed for response splitting vulnerabilities or bugs that would cause duplicate response headers to be returned.

6.4.4.2.3. Illegal Request Header

Complexity: Suspicious (1.0)

Default Response: None.

Cause: MWS monitors all of the request headers included by clients. It has a list of known request headers that should never be accepted. This list is configurable, and by default, includes any headers known to be exclusively involved in malicious activity. Should a user include one of the illegal headers, this incident will be triggered. Because the list of illegal headers is configurable, it cannot be guaranteed that the request that contained the header is strictly malicious, but it does signify that the client is doing something highly unusual.

Behavior: Some HTTP headers can be used in order to get the server to do something it isn't designed to do. For example, the "max-forwards" header can be used to specify how many hops within the internal network the request should make before it is dropped. An attacker could use this header to identify how many network devices are between themselves and the target web server. Because the list of illegal headers is customizable, the type of behavior the header relates to can vary. However this type of behavior is generally performed when scoping the attack surface of the website.

6.4.4.2.4. Illegal Response Header

Complexity: Informational (0.0)

Default Response: None.

Cause: MWS monitors all of the response headers sent to the client from the web application. It has a list of known response headers that should never be returned. This list is configurable, and by default, includes any headers known to compromise the server's identity or security. Should the server return one of the illegal headers, this incident will be triggered. Because the list of illegal headers is configurable, it cannot be guaranteed that the request that contained the header is strictly malicious, but it does signify that something unusual has taken place. This may even represent a hackers successful attempt to exploit a backend service.

Behavior: There is a strict set of HTTP response headers that browsers understand and can actually use. Any headers returned by the server outside of the standard set could potentially expose information about the server or its software. Some headers can even be used to execute more complex attacks. In order to protect the server in the event of a serious issue (such as a "[Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)¹⁵⁴" attack), some headers can be configured as illegal. Because the set is configurable, it is not straight forward as to what the actual header means or what vulnerability it might be targeted at.

¹⁵³ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹⁵⁴ <http://projects.webappsec.org/HTTP-Response-Splitting>

6.4.4.2.5. Missing All Headers

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and Captcha.

Cause: Most legitimate web browsers and tools submit at least a few headers with each HTTP request. Headers are used to provide valuable information to the server when trying to construct a response, such as what type of browser the user is using, or what domain name they are trying to access. If a user submits a request that does not contain any headers at all, this incident will be triggered.

Behavior: Not providing any headers at all, is generally an activity performed when probing an IP to see if it is running a web server. The user will submit a minimal request containing 1 line of text, and see if the response given back from the server is an HTTP response. If so, the attacker has confirmed that the IP is hosting a web server on the given port. In many cases, the attacker will also be able to identify which web server is running, and if that web server has any known vulnerabilities. Such information can then be used to attack the web server directly.

6.4.4.2.6. Missing Host Header

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and Captcha.

Cause: All legitimate web browsers submit a Host header with each HTTP request. The host header contains the value entered into the address bar as the server. This could be either the server IP address or the domain name. In either case, it will always be provided. If a user submits a request that does not contain a Host header, this incident will be triggered.

Behavior: Not providing a host header is generally an activity performed when trying to scope the attack surface of the website. Some web servers are configured to host different websites from the same IP address, based on which domain name is supplied. Hackers will often attempt to send a request without a host header to see if the server will serve back a default website. If the default website is not the main website, this may provide additional pages the attacker can attempt to exploit. This could be considered a "[Server Misconfiguration](http://projects.webappsec.org/Server-Misconfiguration)"¹⁵⁵ weakness, but may also be a legitimate design choice for the web server and its applications. It does not necessarily expose a vulnerability as long as the default web application is secure. Because all major browsers submit host headers on every request, the user would need to take advantage of a more complex tool, such as a raw data client, or HTTP debugging proxy to manually construct a request that does not have a host header. As such, this activity is almost always malicious. In a few cases, some legitimate monitoring tools may omit this header, but those tools should be added to the trusted IP list in configuration.

6.4.4.2.7. Missing Request Header

Complexity: Low (2.0)

Default Response: None.

Cause: MWS monitors all of the request headers sent from the client to the server. It also maintains a list of headers which are required for all HTTP requests (such as Host and User-Agent). If one of the required headers is not included in a request, this incident will be triggered.

Behavior: Every legitimate client will always supply specific headers such as "Host" and "User-Agent". If a client does not provide these headers, then the client is likely not a legitimate user. There are several different

¹⁵⁵ <http://projects.webappsec.org/Server-Misconfiguration>

cases of not legitimate clients, such as hacking tools, manually crafted HTTP requests using something like Putty, or a network diagnostic tool such as nagios. Because there are a few cases that are not necessarily malicious (such as nagios), the incident itself is not necessarily malicious. It does however exclude the user from being a legitimate web browser doing the intended actions allowed by the web application.

6.4.4.2.8. Missing Response Header

Complexity: Informational (0.0)

Default Response: None.

Cause: MWS monitors all of the response headers sent from the server to the client. It also maintains a list of headers which are required for all HTTP responses (such as Content-Type). If one of the required headers is not included in a response, this incident will be triggered.

Behavior: If the server is acting correctly, it should always return all of the required response headers. If it is missing a response header, this is likely due to a bug in the web application, or a successfully executed "[Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)¹⁵⁶" attack. In either case, the service located at the URL this incident is triggered for, should probably be reviewed for either response splitting vulnerabilities, or bugs that would cause abnormal HTTP responses (such as dropping the connection immediately after sending the status code).

6.4.4.2.9. Missing User Agent Header

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and Captcha.

Cause: Most legitimate web browsers and tools submit a User-Agent header with each HTTP request. The user agent header contains information that identifies which software the user is using to access the website, whether that software it is Googlebot, Firefox, Safari, or another piece of software... If a user submits a request that does not contain a User-Agent header, this incident will be triggered.

Behavior: Not providing a user-agent header is generally an activity performed trying to evade detection. The user agent header provides identifying information that could be used by the web server to track requests made by the same user. It may also provide information about the user's personal computer. Sometimes, hackers will replace the user agent string with another user agent string that is perfectly legitimate, but for a different environment than the one they are actually using. Some legitimate users also take this measure as a general security practice; therefore, as long as at least some value is submitted for the user-agent, it cannot be guaranteed to be a malicious act.

However, in the case of the header being absent, a user would have had to take advantage of a tool or debugging proxy in order to filter the traffic. This is almost always performed during the course of a malicious action. Some tools such as network health monitors may also trigger this incident, because they are doing something normal users should not do, but they are considered trusted. In this case, the IP addresses of those tools should be added to the configuration trusted IP whitelist.

6.4.4.2.10. Request Header Overflow

Complexity: Suspicious (1.0)

Default Response: 3x = Compound Request Header Overflow Incident.

¹⁵⁶ <http://projects.webappsec.org/HTTP-Response-Splitting>

Cause: MWS monitors all of the request headers sent from the client to the server. It has a configured limit that defines how long any individual header is allowed to be. After 3 or more headers are submitted that exceed the limit, this incident will be triggered.

Behavior: While not as common as form inputs or query parameter inputs, some web applications actually use the values submitted in headers within their code base. If these values are treated incorrectly, such as not being validated before being used in an SQL statement, they potentially expose the same set of vulnerabilities a form input might. As such a hacker who is attempting to execute a "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)¹⁵⁷" attack might do so by attempting to provide an excessively long value in a header. They may also use an excessively long header value to craft a complex "[SQL Injection](http://projects.webappsec.org/SQL-Injection)¹⁵⁸" attack. Because the user submitted multiple headers which exceeded the defined limit, the intentions of the user are more likely to be malicious. It is less likely that a poorly crafted browser plug-in would overflow multiple headers, despite the possibility that it might overflow a single one.

Because there is a possibility that a legitimate user with a poorly-written browser plugin may cause a header of unusual length to be submitted, this incident cannot be guaranteed to be malicious from just a single case.

6.4.4.2.11. Compound Request Header Overflow

Complexity: Medium (3.0)

Default Response: 1x = Captcha, 2x = 1 Day Strip Inputs.

Cause: Mykonos Web Security monitors all of the request headers sent from the client to the server, which are then compared with a configured limit that defines how long any individual header is allowed to be. After 3 or more headers are submitted that exceed the limit, this incident will be triggered.

Behavior: While not as common as form inputs or query parameter inputs, some web applications actually use the values submitted in headers within their codebase. If these values are treated incorrectly, such as not being validated before being used in an SQL statement, they potentially expose the same set of vulnerabilities as a form input. A hacker who is attempting a "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)¹⁵⁹" attack might do so by attempting to provide an excessively long value in a header. They may also use an excessively long header value to craft a complex "[SQL Injection](http://projects.webappsec.org/SQL-Injection)¹⁶⁰" attack.

Because the user submitted multiple headers which exceeded the defined limit, the intentions of the user are more likely to be malicious. It is less likely that a poorly-crafted browser plugin would overflow multiple headers, despite the possibility that it might overflow a single one.

6.4.4.2.12. Unexpected Request Header

Complexity: Informational (0.0)

Default Response: None

Cause: MWS monitors all of the request headers included by clients. It has a list of known request headers that should be accepted. This list includes all of the headers defined in the HTTP RFC document, which means that if any additional headers are passed, it is part of some non standard HTTP extension. Should a user include a non standard header, this incident will be triggered. It is not necessarily a malicious action on its own, but it does signify that the client is unusual in some way (and potentially malicious) and therefore warrants additional monitoring.

¹⁵⁷ <http://projects.webappsec.org/Buffer-Overflow>

¹⁵⁸ <http://projects.webappsec.org/SQL-Injection>

¹⁵⁹ <http://projects.webappsec.org/Buffer-Overflow>

¹⁶⁰ <http://projects.webappsec.org/SQL-Injection>

Behavior: When attackers are trying to exploit a server, one of the techniques is to attempt to profile what software the server is running. This can be partially accomplished by observing how the server reacts to various types of headers. For example, if the attacker knows that a specific 3rd party web application has a feature where it behaves differently if you send a header "X-No-Auth", then a hacker might send "X-No-Auth" to the site just to see what happens. While this could represent a higher level attack on a specific application; sending non standard headers is more likely part of the hacker's effort to scope the attack surface of the website. This incident alone cannot be deemed malicious because some users have browser plug-ins installed that automatically include non standard headers with requests to some sites. Additionally, some AJAX sites also pass around custom headers as part of their expected protocol.

This incident alone cannot be deemed malicious because some users have browser plug-ins installed that automatically include non-standard headers with requests to some sites. Additionally, some AJAX sites utilize custom headers as part of their expected protocol.

6.4.5. Method Processor

GET and POST are two very well known HTTP request methods. A request method is a keyword that tells the server what type of request the user is making. In the case of a GET, the user is requesting a resource. In the case of a POST, the user is submitting data to a resource. There are however, several other supported request methods which include HEAD, PUT, DELETE, TRACE, and OPTIONS. These methods are intended to divide the types of requests into more granular operation. In almost all web application implementations, the PUT, DELETE, TRACE and OPTIONS methods are all left unimplemented. Unfortunately, some systems provide default implementations for things such as TRACE and OPTIONS. As a result, some administrators accidentally expose unprotected services. Hackers often try these different request methods to identify servers which support them, and therefore may be vulnerable.

6.4.5.1. Configuration

Table 6.14. Method Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Block Unknown Methods	Boolean	True	Whether to block requests that contain unknown HTTP methods.
Known Methods	Collection	Collection	The list of known HTTP methods. Also allows you to customize the action to take for each occurrence of the known HTTP method.
Incident: Illegal Method Requested	Boolean	True	The user issued a request using an HTTP method which is considered illegal.
Incident: Unexpected Method Requested	Boolean	True	The user issued a request using a request method other than GET, POST, and HEAD, which resulted in a server error.

6.4.5.2. Incidents

6.4.5.2.1. Illegal Method Requested

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and 1 Day Strip Inputs in 10 minutes

Cause: HTTP supports several different "methods" of submitting data to a web server. These methods generally include "GET", "POST", and "HEAD", and less commonly "PUT", "DELETE", "TRACE", and "OPTIONS". MWS monitors all of the methods used by a user when issuing HTTP requests, and compares them to a configured list of known and allowed HTTP methods. If the user submits a request that uses a method which is not in the list of known methods, this incident will be triggered.

Behavior: HTTP methods allow the web server to handle user provided data in different ways. However some of the supported methods are somewhat insecure and should not be supported unless absolutely necessary. In a few cases, methods which are not standard to HTTP are used by 3rd party web applications.

When an attacker is looking for a known vulnerability, they may issue requests using some of these custom defined HTTP methods to see if the server accepts or rejects the request. If the server accepts the request, then the software is likely installed. This type of activity is generally performed when scoping the attack surface of the web application. It is possible that if a third-party web application is legitimately installed and is using custom HTTP methods, that those methods will need to be added to the list of configured HTTP methods so as not to flag users who are using those applications. In either case, because it is possible for this incident to happen without malicious intent, it is considered only suspicious.

6.4.5.2.2. Unexpected Method Requested

Complexity: Suspicious (1.0)

Default Response: None.

Cause: HTTP supports several different "methods" of submitting data to a web server. These methods generally include "GET", "POST", and "HEAD", and less commonly "PUT", "DELETE", "TRACE", and "OPTIONS". MWS monitors all of the methods used by a user when issuing HTTP requests, and compares them to a configured list of known and allowed HTTP methods. If the user submits a request that uses a method which is not in the list of known methods, this incident will be triggered.

Behavior: HTTP methods allow the web server to handle user provided data in different ways. However some of the supported methods are somewhat insecure and should not be supported unless absolutely necessary. In a few cases, methods which are not standard to HTTP are used by 3rd party web applications.

When an attacker is looking for a known vulnerability, they may issue requests using some of these custom defined HTTP methods to see if the server accepts or rejects the request. If the server accepts the request, then the software is likely installed. This type of activity is generally performed when scoping the attack surface of the web application. It is possible that if a 3rd party web application is legitimately installed and is using custom HTTP methods, that those methods will need to be added to the list of configured HTTP methods so as not to flag users who are using those applications. In either case, because it is possible for this incident to happen without malicious intent, it is considered only suspicious.

6.5. Tracking Processors

6.5.1. Etag Beacon Processor

This processor is not intended to identify hacking activity, but instead is intended to help resolve a potential vulnerability in the proxy. Because session tracking in the proxy is done using cookies, it is possible for an attacker to clear their cookies in order to be recognized by the proxy as a new user. This means that if we identify that someone is a hacker, they can shed that classification simply by clearing their cookies. To help resolve this vulnerability, this processor attempts to store identifying information in the browsers JavaScript persistence mechanism. It then uses this information to attempt to identify new sessions as being created by the same user as a previous session. If successful, a hacker who clears their cookies and obtains a new session will be re-associated with the previous session shortly afterwards.

6.5.1.1. Configuration

Table 6.15. Etag Beacon Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Beacon Resource	Configurable	Random	The resource to use for tracking.
Inject Beacon Enabled	Boolean	True	Whether a reference to the beacon resource should be automatically injected into HTML responses.
Revalidation Frequency	Integer	180 (3 Minutes)	How often in seconds to re-validate the old stored etag and re-associate that session with the current one. This value should not be left too short, because it will cause the browser to constantly re-request the fake resource and make the tracking technique more visible.
Incident: Session Etag Spoofing	Boolean	True	The user has provided a fake ETag value which is not a valid session.

6.5.1.2. Incidents

6.5.1.2.1. Session Etag Spoofing

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection 2-6 seconds, 3x = Slow Connection 4-15 seconds.

Cause: The HTTP protocol supports many different types of client side resource caching in order to increase performance. One of these caching mechanisms uses a special header called "E-Tag" to identify when the client already has a valid copy of a resource. When a user requests a resource for the first time, the server has the option of returning an E-Tag header. This header contains a key that represents the version of the file that was returned (ex. an MD5 hash of the file contents). On subsequent requests for the same resource, the

client will provide the last E-Tag it was given for that resource. If the server identifies that both the provided E-Tag, and the actual E-Tag of the file are the same, then it will respond with a 403 status code (Not Modified), and the client will display the last copy it successfully downloaded. This prevents the client from downloading the same version of a resource over and over again. In the event that the E-Tag value does not match, the server will return a new copy of the resource and a new E-Tag value. MWS takes advantage of this caching mechanism to store a tracking token on the client. It does this by injecting a fake embedded resource reference (such as an image or a JavaScript file) into some of the pages on the protected site. When the browser loads these pages, it will automatically request the embedded resources in the background. The fake resource that was injected by MWS, will supply a special E-Tag value that contains a tracking token. As the user continues to navigate around the site, each time they load a page that contains a reference to the fake resource, the browser will automatically transmit the previously received E-Tag to the server. This allows MWS to correlate the requests, even if other tracking mechanisms such as cookies are not successful. The E-Tag value returned by the fake resource, which contains the tracking token, is also digitally signed and encrypted, much like MWS session cookie. This prevents a user from successfully guessing a valid E-Tag token, or attempting to provide an arbitrary value without being detected. If an invalid E-Tag is supplied for the fake resource, a "Session E-Tag Spoofing" incident is triggered.

Behavior: There are very few cases where the E-Tag caching mechanism is part of an attack vector, so this incident would almost exclusively represent a user who is attempting to evade tracking or exploit the tracking method to their advantage. For example, if a user identifies the E-Tag tracking mechanism, they may provide alternate values in order to generate errors in the tracking logic and potentially disconnect otherwise correlated traffic. They may also attempt to guess other valid values in order to correlate otherwise non-related traffic (such as a hacker attempting to group other legitimate users into their traffic). While this is a highly unlikely attack vector, it could loosely be classified as a "[Credential and Session Prediction](http://projects.webappsec.org/w/page/13246918/Credential-and-Session-Prediction)¹⁶¹" attack. It is also possible, though unlikely, that once an attacker identifies the dynamic nature of the E-Tag header for the fake resource, they may also launch a series of other attacks based on input manipulation. This could include testing for [SQL injection](http://projects.webappsec.org/SQL-Injection)¹⁶², [XSS](http://projects.webappsec.org/Cross-Site+Scripting)¹⁶³, [Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)¹⁶⁴, [Integer Overflow](http://projects.webappsec.org/Integer-Overflows)¹⁶⁵, and [HTTP Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)¹⁶⁶ among others. However these would be attacks directly against MWS, and not against the protected web application.

6.5.2. Client Beacon Processor

The client beacon processor is intended to digitally tag users for later identification by for embedding a tracking token into the client. There are configurable parameters that administrators can use to configure each type of storage mechanisms that are used track malicious users.

6.5.2.1. Configuration

Table 6.16. Client Beacon Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.

¹⁶¹ <http://projects.webappsec.org/w/page/13246918/Credential-and-Session-Prediction>

¹⁶² <http://projects.webappsec.org/SQL-Injection>

¹⁶³ <http://projects.webappsec.org/Cross-Site+Scripting>

¹⁶⁴ <http://projects.webappsec.org/Buffer-Overflow>

¹⁶⁵ <http://projects.webappsec.org/Integer-Overflows>

¹⁶⁶ <http://projects.webappsec.org/HTTP-Response-Splitting>

Parameter	Type	Default Value	Description
Advanced			
Flash Storage Enabled	Boolean	True	Whether to use the flash shared data API to track the user.
IE UserData Storage Enabled	Boolean	True	Whether to use internet explorers userData storage API to track the user
Local Storage Enabled	Boolean	True	Whether to use Javascript local storage to track the user.
Private Storage Enabled	Boolean	True	Whether to track users between private browsing mode and normal browsing mode in Firefox. A collection of names to use for the Application session cookie.
Silverlight Storage Enabled	Boolean	True	Whether to use the Silverlight storage api to track the user. The Silverlight storage API is unique in that it is exposed across all browsers. If this beacon is enabled and the user has Silverlight installed, this beacon can track the user even if they switch browsers.
Window Name Storage Enabled	Boolean	True	Whether to use the window.name property of the browser window to track the user.
Resource Extensions	Collection	Collection	A collection of resource extensions to use for the processor.
Script Refresh Delay	Integer	3600 (1 Hour)	The amount of time in seconds to cache the randomly generated set of beacon scripts. After this amount of time, the beacon scripts will change.
Script Variations	Integer	30	The number of random variations of the beacon script to cache, and then to select from on each request.
Incident: Beacon Parameter Tampering	Boolean	True	The user has issued a request to the session tracking service which appears to be manually crafted. This is likely in an attempt to spoof another users session, or to exploit the applications session management. This would never happen under normal usage.
Incident: Beacon Session Tampering	Boolean	True	The user has altered the data stored on the client in an effort to prevent tracking. They have altered the data in such a way as to remain consistent with the same data format. This would never happen under normal usage.

6.5.2.2. Incidents

6.5.2.2.1. Beacon Parameter Tampering

Complexity: Medium (3.0)

Default Response: 1x = 5 day Strip Inputs in 10 minutes

Cause: MWS uses a special persistent token that inserts itself in multiple locations throughout the client.

When a user returns to the site later on, these tokens are transmitted back to the server. This allows the server to correlate the traffic issued by the same user, even if the requests are weeks apart. This incident is triggered when the user manipulates the token data being transmitted to the server on a subsequent visit. They manipulated the data in such a way as to break the expected formatting for the token.

Behavior: Attempts to manipulate and spoof the tracking tokens are generally performed when the attacker is trying to figure out what the token is used for and potentially evade tracking. Because the format of the token is completely wrong, this is likely a generic input attack, where the user is attempting to find a vulnerability in the code that handles the token. This could include a "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)¹⁶⁷", "[XSS](http://projects.webappsec.org/Cross-Site+Scripting)¹⁶⁸", "[Denial of Service](http://projects.webappsec.org/Denial-of-Service)¹⁶⁹", "[Fingerprinting](http://projects.webappsec.org/Fingerprinting)¹⁷⁰", "[Format String](http://projects.webappsec.org/Format-String)¹⁷¹", "[HTTP Response Splitting](http://projects.webappsec.org/HTTP-Response-Splitting)¹⁷²", "[Integer Overflow](http://projects.webappsec.org/Integer-Overflows)¹⁷³", or "[SQL injection](http://projects.webappsec.org/SQL-Injection)¹⁷⁴" attack among many others. The content of the manipulated token should be reviewed to better understand what type of attack the user was attempting, however because the tokens are heavily encrypted and validated, this incident does not represent a threat to the security of the system tracking mechanism.

6.5.2.2.2. Beacon Session Tampering

Complexity: Medium (3.0)

Default Response: 1x = 5 day Strip Inputs in 10 minutes.

Cause: MWS uses a special persistent token that inserts itself in multiple locations throughout the client.

When a user returns to the site later on, these tokens are transmitted back to the server. This allows the server to correlate the traffic issued by the same user, even if the requests are weeks apart. This incident is triggered when the user manipulates the token data being transmitted to the server on a subsequent visit. They manipulated the data in such a way as to remain consistent with the correct formatting for the token, but the token itself is not valid and was never issued by the server.

Behavior: Attempts to manipulate and spoof the tracking tokens are generally performed when the attacker is trying to figure out what the token is used for and potentially evade tracking. If they are assuming it's used for session management, this might also be a part of a "[Credential/Session Prediction](http://projects.webappsec.org/Credential-and-Session-Prediction)¹⁷⁵" attack. Because the format of the submitted modified token is still consistent with the format expected, this is not likely a generic input attack. It also does not represent any threat to the system, as the modified token is simply ignored.

¹⁶⁷ <http://projects.webappsec.org/Buffer-Overflow>

¹⁶⁸ <http://projects.webappsec.org/Cross-Site+Scripting>

¹⁶⁹ <http://projects.webappsec.org/Denial-of-Service>

¹⁷⁰ <http://projects.webappsec.org/Fingerprinting>

¹⁷¹ <http://projects.webappsec.org/Format-String>

¹⁷² <http://projects.webappsec.org/HTTP-Response-Splitting>

¹⁷³ <http://projects.webappsec.org/Integer-Overflows>

¹⁷⁴ <http://projects.webappsec.org/SQL-Injection>

¹⁷⁵ <http://projects.webappsec.org/Credential-and-Session-Prediction>

6.6. Response Processors

6.6.1. About Responses

The processors in this section are responsible for issuing the various counter responses to malicious users on a server protected by Mykonos Web Security. A **response** is activated when MWS believes intervention is required between the profiled user and the webserver. This response can manifest into any of the types fully explained below.

6.6.1.1. Response Methodology

When Mykonos Web Security believes a response is required, the type of response issued depends on the type of behavior the malicious user exhibited to receive the response. For example, users that MWS think are automated tools will likely get issued a CAPTCHA response, whereas it is obvious that a real malicious user (not a bot) will be able to solve a CAPTCHA. In the second case, adding a 2 to 6 second slow might be more effective at wasting the hacker's time.

Another factor that comes into play when issuing counter responses is risk level. If Mykonos Web Security believes a user is of no immediate risk to the system, it might only activate those responses which still allow the user to browse the site somehow, such as the Warning response or Slow Connection response. This way, MWS can monitor that user and gather additional information to properly assess their risk level. If MWS believes the user is a danger to the system, it will issue a more severe response, such as stripping out all inputs on every request or outright blocking the profile.

Some responses might not get issued right away. For example, an incident may produce "a permanent block in 20 minutes". The reason for this delay in the counter response is MWS uses this buffer time to gather some last-minute information on the profile before issuing the final response. MWS will respond instantly if it perceives immediate threat to the integrity of the system, but instances where this is not the case allow MWS to profile the attacker for a bit longer. The end result will be a more complete look at the attacker and his/her habits.

6.6.1.2. Types of Responses

Certain response processors are self-explanatory, such as the Block Processor (the user will see that they are blocked). Other responses are "invisible" in that there are no manifestations of the response visible to the user. An example of an invisible response processor is the Strip Inputs Processor. This processor will simply remove all values from all inputs on any form submitted because MWS has determined that the user's input can no longer be trusted. On the user-end, they will see nothing that will indicate to them that this response is active (until they figure out that all inputs are not being recognised).

6.6.1.3. Response Activation

Responses get automatically activated according to rules set forth within MWS. These rules are outlined for each incident a user can trigger, and are described in the documentation for each processor. The default response for each incident is documented in the User Guide, and will look something like, "Default Response: 1x = Warn User. 2x = 1 Day Block". The '1x' or '2x' indicate the number of incidents of that type triggered. For this example, triggering this incident once results in the Warning Processor being activated. If the same incident is triggered again on the same profile, the user then gets a 1 day block via the Block Processor.



Note

You may wish to completely disable automatic counter responses entirely. If this is the case, changing the configuration parameter "Auto Response Activation Enabled" to 'False' will prevent any new automatic activations, but will not hinder your ability to manually activate responses on profiles. (Configuration >> Global Configuration >> Auto Response Service >> "Auto Response Activation Enabled = False")

6.6.1.4. Compounding and Overriding Responses

- **Warning** - There is no need to warn someone when they are already blocked.
- **Captcha** - If the user is ever unblocked (or the block expires), they will be prompted to solve the captcha.
- **Cloppy** - If they are ever unblocked (or the block expires) Cloppy will appear.
- **Google Maps** - If the user is ever unblocked (or the block expires), they will be shown the Google map.

Captcha overrides:

- **Warning** - MWS will warn after they solve the captcha.
- **Cloppy** - Cloppy will appear after they solve the captcha.
- **Google Maps** - The Google map will be shown after they solve the captcha.

Strip Inputs overrides:

- **Break Authentication** - It is redundant, as MWS is already stripping login credentials.

6.6.2. Block Processor

The block processor is actually a form of auto response. When this processor is enabled, it will allow the security system to block a response with "Blocked!" message sent back to the user.



Note

There are no actual triggers for this processor; it is a form of response.

6.6.2.1. Configuration

Table 6.17. Block Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Block Response	Configurable	HTTP Response	The response to return to the user when they are blocked.

6.6.3. Request Captcha Processor

The Captcha processor is designed to protect specific pages in a web application from automation. This is done by using a "Captcha" challenge, where the user is required to transcribe random characters from an obscured image or muffled audio file in order to complete the request. The intent is that a human would be capable of correctly answering the challenge, while an automated script with no human intervention would be unable to do so. This assumes that the image is obscured enough that text recognition software is not effective, and the audio file significantly distorted to defeat speech-to-text software. Requiring such user interaction is somewhat disruptive, so it should be utilized only for pages that are prime automation targets (such as contact forms, registration pages, login pages, etc.).

Furthermore, these captcha challenges can be customized to fit the style of the application it is protecting. For more information on how to customize a captcha, see the Captcha Template documentation in the appendix of the user guide.

6.6.3.1. Configuration

Table 6.18. Request Captcha Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Bad Request Block Response	HTTP Response	400 HTTP Response	The response to return if the user issues a request that either is too large, or uses multi-part and multi-part is disabled.
Blocked Replay Response	String	Random Value	The response to return if the user attempts to submit the validated request multiple times using the same captcha answer, and that behavior is not allowed.
Captcha Binary Directory	String	Random Value	The name of the directory where captcha images and audio files will be served from. This should not conflict with any actual directories on the site.
Captcha Characters	String	Random Value	The characters to use when generating a random captcha value. Avoid using characters that can be easily mixed up. This set of characters is case sensitive.
Captcha State Cookie Name	String	Random Value	The name of the cookie to use to track the active captchas that have not yet been solved. The cookie is only served to the captcha binary directory.
Captcha Validation Input Name	String	Random Value	The name of the form input used to transmit the captcha validation key. This should be obscure so that users who have not been required to enter a captcha cannot supply bad values to this input to profile the system.

Parameter	Type	Default Value	Description
Maximum Active Captchas	Integer	7	The maximum number of captchas any given user can be solving at any given time. This limit can be overcome, but the majority of users will not be able to. This is primarily for performance, as the more active captchas that are allowed, the larger the state cookie becomes.
Support Audio Version	Boolean	True	Whether an audio version of the captcha is provided to the user. This may be a requirement for accessibility, as vision impaired users would otherwise be unable to solve the captcha.
Watermark	String	Random Value	The text to watermark the captcha with. This can be used to prevent the captcha from being used in a phishing attack. For example, an abuser would not be able to simply display the captcha on a different site and ask a user to solve it. The watermark would tip the user off that the captcha was not intended for the site they are visiting. Use %DOMAIN to use the domain name as the watermark.
Cancel URL	String	None	The URL to redirect the user to if they cancel the captcha. This should not be to the same domain, because the domain is being blocked using a captcha, and therefore, canceling would only redirect to a new captcha. An empty value will hide the cancel button.
Captcha Expiration	Integer	2 minutes	The maximum number of seconds the user has to solve the captcha before the request is no longer possible.
Expired Captcha Response	HTTP Response	400 HTTP Response	The response to return if the user submits a validated request after the captcha has expired. This may happen if the user refreshes the results of the captcha long after they have solved it.
Maximum Request Size	Integer	500kb	The maximum number of bytes in a request before it is considered not acceptable for captcha validation, and will be blocked.
Protected Pages	Collection	None	A collection of protected pages.
Incident: Bad Captcha Answer	Boolean	False	The user was asked to solve a captcha and entered the wrong value. This could be a normal user error, or it could be the results of failed abuse.
Incident: Captcha Cookie Manipulation	Boolean	True	The user submitted a request and was asked to solve a captcha. They then modified the state cookie used to track captchas, making

Parameter	Type	Default Value	Description
			it invalid. This is likely in an attempt to find a way to bypass the captcha validation mechanism.
Incident: Captcha Directory Indexing	Boolean	True	The user has requested a directory index in the directory that serves the captcha images and audio files. This is likely in an attempt to get a list of all active captchas or to identify how the captchas are generated.
Incident: Captcha Directory Probing	Boolean	True	The user has requested a random file inside the directory that serves the captcha images and audio files. This is likely in an attempt to find an exploitable service or sensitive file that may help bypass the captcha validation mechanism.
Incident: Captcha Disallowed MultiPart	Boolean	True	The user has submitted a multipart form post to the protected page, which has been configured as a disallowed option. This is likely in an attempt to find an edge case the captcha validation mechanism is not expecting.
Incident: Captcha Image Probing	Boolean	True	The user is probing the directory used to serve captcha images. This is likely in an attempt to find hidden files or a way to invoke errors from the captcha serving logic.
Incident: Captcha Parameter Manipulation	Boolean	True	The user has submitted a request with a valid captcha, but they modified the query string parameters. This could be in an attempt to change the output of executing the request without requiring the user to re-validate with another captcha.
Incident: Captcha Request Replay Attack	Boolean	True	The user has attempted to submit the same request multiple times with the same captcha answer. In other words, they solved the captcha once and issued the resulting request multiple times.
Incident: Captcha Request Size Limit Exceeded	Boolean	True	The user has submitted a request to the protected page which contains more data than is allowed. This may be an attempt to reduce system performance by issuing expensive requests, or it may be an indicator of a more complex attack.
Incident: Captcha Request Tampering	Boolean	True	The user submitted a request and was asked to solve a captcha. They introspected the page containing the captcha and altered the serialized request data (the data from the original request before the captcha prompt). They then submitted a valid captcha using

Parameter	Type	Default Value	Description
			the modified request data. This is likely in an attempt to abuse the captcha system and identify a bypass technique.
Incident: Captcha Signature Spoofing	Boolean	True	The user submitted a request and was asked to solve a captcha. They introspected the page containing the captcha and provided a validation key from a previously solved captcha. This is likely in an attempt to submit multiple requests under the validation of the first.
Incident: Captcha Signature Tampering	Boolean	True	The user submitted a request and was asked to solve a captcha. They introspected the page containing the captcha and provided a fake validation key. This is likely in an attempt to bypass the captcha validation mechanism.
Incident: Expired Captcha Request	Boolean	True	The user submitted a request and was given a set window of time to solve a captcha. The user solved the captcha and submitted the request for final processing after the window of time expired. This is likely an indication of a packet replay attack, where the user attempts to invoke the business logic of the protected page multiple times under the same captcha validation.
Incident: Mismatched Captcha Session	Boolean	True	The user submitted a request and was asked to solve a captcha. They solved the captcha, but upon submitting the request for final processing, they did so under a different session ID. This is likely due to multiple machines participating in the execution of the site workflow and may indicate a serious targeted automation attack.
Incident: No Captcha Answer Provided	Boolean	True	The user attempted to validate a captcha but did not supply an answer to validate. There is no interface that allows the user to do this, so they must be manually executing requests against the captcha validation API in an attempt to evade the mechanism.
Incident: Unsupported Audio Captcha Requested	Boolean	True	The user has requested an audio version of the captcha challenge, but audio is not supported and there should not be an interface to ask for the audio version. The user is likely trying to find a way to more easily bypass the captcha system.

6.6.3.2. Incidents

6.6.3.2.1. Captcha Answer Automation

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and 1 Day Strip Inputs

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*¹⁷⁶" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides an abnormal volume of bad solutions to the captcha image. For example, the image may have said "Hello", but the user attempted 30 different values all of which did not match "Hello". Because the images can be somewhat difficult to read at times (in order to ensure a script cannot break them), it is not uncommon for a legitimate user to enter the wrong value a few times before getting it right, especially if they are unfamiliar with this type of technique, but after dozens of failed attempts, it is more likely a malicious user.

Behavior: Simply providing a bad solution to the captcha image is not necessarily malicious. Legitimate users are not always able to solve the captcha on the first try. However if a large volume of invalid solutions are provided, then it is more likely that a script is attempting to crack the captcha image through educated guessing and "*Brute Force*¹⁷⁷".

6.6.3.2.2. No Captcha Answer Provided

Complexity: Medium (3.0)

Default Response: 1x = Warn User. 2x = 1 Day Block

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*¹⁷⁸" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user forces

¹⁷⁶ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁷⁷ <http://projects.webappsec.org/Brute-Force>

¹⁷⁸ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

the captcha interface to submit the request without a valid captcha solution. There is no way to do this without manipulating the logic that controls captcha protected requests.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. In this specific case, the attacker attempted to submit the captcha protected page without actually solving the captcha. Instead they provided an empty value for the solution parameter. It is not possible to submit an empty solution using the provided captcha interface, so this is almost guaranteed to be a malicious attempt at generating an error and obtaining additional details about the captcha implementation though an "[Information Leakage](#)¹⁷⁹" weakness.

6.6.3.2.3. Multiple Captcha Request Overflow

Complexity: Low (2.0)

Default Response: 1x = 1 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "[Insufficient Anti-Automation](#)¹⁸⁰" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit dozens of captcha protected requests that exceed the configured maximum for protected request sizes.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. In this specific case, the attacker submitted dozens of extremely large requests, probably in an effort to find a "[Buffer Overflow](#)¹⁸¹" vulnerability, which would produce useful error data and potentially open the server up to further exploitation. They may also be attempting to overload the server and execute a "[Denial of Service](#)¹⁸²" attack.

6.6.3.2.4. Unsupported Audio Captcha Requested

Complexity: Medium (3.0)

Default Response: 3x = Slow Connection 2-6 seconds and Warn User. 5x = 1 Day Block.

¹⁷⁹ <http://projects.webappsec.org/Information-Leakage>

¹⁸⁰ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁸¹ <http://projects.webappsec.org/Buffer-Overflow>

¹⁸² <http://projects.webappsec.org/Denial-of-Service>

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"¹⁸³ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to request the audio version of a captcha challenge when support for audio captchas has been explicitly disabled.

Behavior: Solving an image based captcha is exceptionally difficult and requires a great deal of time and research. Solving an audio captcha however is far less difficult. There are already multiple open source libraries available for translating speech to text. As such, it is often necessary to disable the support of "audio" captchas for critical workflows (such as administrative login dialogs), unless absolutely necessary for accessibility reasons. This incident occurs when the audio captcha has been disabled, but a user is attempting to manually request the audio version of the captcha challenge anyway. The captcha interface does not expose a link to the audio version unless it is explicitly enabled in configuration, so this would require that the user knows where to look for the audio version, they understand the filename conventions, and they know how to make the request manually to download the file. In either case, if audio captchas are not enabled (through configuration), then this effort will not be successful.

6.6.3.2.5. Bad Captcha Answer

Complexity: Suspicious (1.0)

Default Response: 10x = Captcha Answer Automation Incident.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"¹⁸⁴ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a bad solution to the captcha image. For example, the image may have said "Hello", but the user typed "hfi0" instead. Because the images can be somewhat difficult to read at times (in order to ensure a script cannot break them), it is not uncommon for a legitimate user to enter the wrong value a few times before getting it right, especially if they are unfamiliar with this type of technique.

¹⁸³ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁸⁴ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

Behavior: Simply providing a bad solution to the captcha image is not necessarily malicious. Legitimate users are not always able to solve the captcha on the first try. However if a large volume of invalid solutions are provided, then it is more likely that a script is attempting to crack the captcha image through educated guessing and "*Brute Force*"¹⁸⁵.

6.6.3.2.6. Mismatched Captcha Session

Complexity: High (4.0)

Default Response: 1x = Warn User, 2x = 5 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"¹⁸⁶ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a solution to a captcha that was issued for a different session than their own, as might be the case in a script that uses minimal human interaction to solve the captcha's, but everything else is automated

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try and harvest successfully solves captchas from other users on the site. This can be done either by infecting those machines with a virus, or by implanting script into some of the sites pages (possibly through XSS). If this technique is used, then the captcha that is being solved may not have originated from the same session as the user who is submitting the solution. This is a dead giveaway that the user is attempting to defeat the captcha system to automate a specific task.

6.6.3.2.7. Expired Captcha Request

Complexity: Suspicious (1.0)

Default Response: None.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

¹⁸⁵ <http://projects.webappsec.org/Brute-Force>

¹⁸⁶ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

Captchas are generally used to resolve "*Insufficient Anti-Automation*¹⁸⁷" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a solution to a captcha after the allotted time for solving the captcha has elapsed.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to run expensive image processing algorithms on the captcha image in order to identify what the represented value might be. Additionally, a user might attempt to send the captcha to a warehouse of human captcha solvers. These warehouses specialize in solving large volumes of captchas at a fairly low price (less than a penny per captcha). In either case, it can take several minutes to get the correct captcha answer, and will likely run out the amount of time the user is allowed for solving the captcha. If using a browser, the input would flat out stop accepting answers, but in a scripted scenario, the script will likely try and submit the value anyway, because it is unaware of the expiration. It is possible that this incident would be triggered by a legitimate user, if they were to refresh the page that was produced after the captcha was solved. This would effectively cause the captcha to be reprocessed after the expiration time had been exceeded. As such, this incident on its own is not considered malicious.

6.6.3.2.8. Captcha Request Tampering

Complexity: High (4.0)

Default Response: 1x = Warn User. 2x = 5 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*¹⁸⁸" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a solution to a captcha which is correct, but they have modified the parameter containing the original request (which is heavily encrypted to prevent tampering).

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. The parameter that was modified contained the original request data (before the captcha was issued), it is likely that the attacker is attempting to smuggle a malicious payload through the system without being detected by any network or web firewalls. Because this parameter uses heavy encryption and validation, this type of activity will not produce any useful information or expose any vulnerabilities. Depending on the value they submitted for the original request data, this may also fall under one of the other attack categories involving manipulating general inputs, such as a "*Buffer Overflow*¹⁸⁹", "*XSS*¹⁹⁰", "*Denial of*

¹⁸⁷ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁸⁸ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁸⁹ <http://projects.webappsec.org/Buffer-Overflow>

¹⁹⁰ <http://projects.webappsec.org/Cross-Site+Scripting>

[Service](#)¹⁹¹, ["Fingerprinting"](#)¹⁹², ["Format String"](#)¹⁹³, ["HTTP Response Splitting"](#)¹⁹⁴, ["Integer Overflow"](#)¹⁹⁵, or ["SQL injection"](#)¹⁹⁶ attack among many others.

6.6.3.2.9. Captcha Signature Tampering

Complexity: High (4.0)

Default Response: 1x = Warn User. 2x = 5 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve ["Insufficient Anti-Automation"](#)¹⁹⁷ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a solution to a captcha which is correct, but they have modified the integrity checking signature passed along with the captcha solution.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. Depending on the value they submitted for the original request data, this may also fall under one of the other attack categories involving manipulating general inputs, such as a ["Buffer Overflow"](#)¹⁹⁸, ["XSS"](#)¹⁹⁹, ["Denial of Service"](#)²⁰⁰, ["Fingerprinting"](#)²⁰¹, ["Format String"](#)²⁰², ["HTTP Response Splitting"](#)²⁰³, ["Integer Overflow"](#)²⁰⁴, or ["SQL injection"](#)²⁰⁵ attack among many others.

6.6.3.2.10. Captcha Signature Spoofing

Complexity: High (4.0)

Default Response: 1x = Warn User. 2x = 5 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image

¹⁹¹ <http://projects.webappsec.org/Denial-of-Service>

¹⁹² <http://projects.webappsec.org/Fingerprinting>

¹⁹³ <http://projects.webappsec.org/Format-String>

¹⁹⁴ <http://projects.webappsec.org/HTTP-Response-Splitting>

¹⁹⁵ <http://projects.webappsec.org/Integer-Overflows>

¹⁹⁶ <http://projects.webappsec.org/SQL-Injection>

¹⁹⁷ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

¹⁹⁸ <http://projects.webappsec.org/Buffer-Overflow>

¹⁹⁹ <http://projects.webappsec.org/Cross-Site+Scripting>

²⁰⁰ <http://projects.webappsec.org/Denial-of-Service>

²⁰¹ <http://projects.webappsec.org/Fingerprinting>

²⁰² <http://projects.webappsec.org/Format-String>

²⁰³ <http://projects.webappsec.org/HTTP-Response-Splitting>

²⁰⁴ <http://projects.webappsec.org/Integer-Overflows>

²⁰⁵ <http://projects.webappsec.org/SQL-Injection>

and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"²⁰⁶ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user provides a solution to a captcha which is correct, but they have replaced the integrity checking signature passed along with the captcha solution to one that was used in a previous captcha solution.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. This specific incident generally reflects the behavior of a user who is trying to submit a request that would normally be protected by a captcha, but they are trying to trick the system into thinking the captcha was solved correctly, even though it was not. This is generally looking for a "*Insufficient Anti-Automation*"²⁰⁷ weakness in the captcha handling mechanism.

6.6.3.2.11. Captcha Cookie Manipulation

Complexity: Medium (3.0)

Default Response: 1x = Warn User. 2x = 5 Day Strip Inputs.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"²⁰⁸ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user alters the cookies used to maintain captcha state.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. In this specific case, the attacker modified a cookie that is used to maintain the state of the captcha. The cookie is heavily encrypted, but the attacker may be attempting to establish a way of either identifying what the value of the captcha is algorithmically (by analyzing the cookie value), or they may be

²⁰⁶ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²⁰⁷ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²⁰⁸ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

attempting to assign a value to the captcha. In either case, this activity generally indicates a user who is trying to find a way to bypass the captcha. Depending on the value they submitted for the original request data, this may also fall under one of the other attack categories involving manipulating general inputs, such as a "[Buffer Overflow](#)²⁰⁹", "[XSS](#)²¹⁰", "[Denial of Service](#)²¹¹", "[Fingerprinting](#)²¹²", "[Format String](#)²¹³", "[HTTP Response Splitting](#)²¹⁴", "[Integer Overflow](#)²¹⁵", or "[SQL injection](#)²¹⁶" attack among many others.

6.6.3.2.12. Captcha Image Probing

Complexity: Low (2.0)

Default Response: 1x = Warn User. 2x = 5 Day Block.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "[Insufficient Anti-Automation](#)²¹⁷" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to request a captcha image file for a request that is not being protected by a captcha.

Behavior: In order to find a way to bypass the captcha mechanism, attackers will often attempt to collect a large number of captcha images for offline analysis. If the attacker can find a pattern in how the captcha images are issued, or how the filename relates to the value in the image, then they can effectively bypass the captcha mechanism at will. In this case, the attacker is guessing arbitrary captcha image filenames, but is attempting to keep the format of the names consistent with known captcha image URL's. Because the filename used and the values in the image have no correlation, this technique will not be successful and will simply waste the attacker's time and resources.

6.6.3.2.13. Captcha Request Size Limit Exceeded

Complexity: Suspicious (1.0)

Default Response: 10x = Multiple Captcha Request Overflow Incident.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the

²⁰⁹ <http://projects.webappsec.org/Buffer-Overflow>

²¹⁰ <http://projects.webappsec.org/Cross-Site+Scripting>

²¹¹ <http://projects.webappsec.org/Denial-of-Service>

²¹² <http://projects.webappsec.org/Fingerprinting>

²¹³ <http://projects.webappsec.org/Format-String>

²¹⁴ <http://projects.webappsec.org/HTTP-Response-Splitting>

²¹⁵ <http://projects.webappsec.org/Integer-Overflows>

²¹⁶ <http://projects.webappsec.org/SQL-Injection>

²¹⁷ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"²¹⁸ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit a captcha protected request that contains a request body larger than the configured maximum.

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated or if an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. In this specific case, the attacker submitted an extremely large request, probably in an effort to find a "*Buffer Overflow*"²¹⁹ vulnerability, which would produce useful error data and potentially open the server up to further exploitation. This incident is not necessarily malicious on its own, as it is possible for a normal user to submit a value that is larger than the configured maximum, especially if the configured maximum is small, or if the form protected by the captcha allows file posts.

6.6.3.2.14. Captcha Disallowed MultiPart

Complexity: Suspicious (1.0)

Default Response: 10x = Multiple Captcha Disallow Multipart Incident.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script). Captchas are generally used to resolve "*Insufficient Anti-Automation*"²²⁰ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit a captcha protected request that contains a binary file, and the captcha is explicitly configured to not allow binary file submission (it has been configured to disallow multi-part form submissions).

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the captcha, they may use various different techniques. One of these techniques is to try changing various values used by the web application in the captcha mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse engineering is generally performed by advanced hackers. In this specific case, the attacker submitted a binary file in the request that is being protected. The captcha in this case has been explicitly configured to not allow Multi-Part form submissions, so this represents unexpected and undesired activity. Using Multi-Part forms, the attacker can

²¹⁸ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²¹⁹ <http://projects.webappsec.org/Buffer-Overflow>

²²⁰ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

more easily accomplish a "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)"²²¹ attack, which would produce useful error data and potentially open the server up to further exploitation. Additionally, some web applications do not handle the encoding used for multi-part forms gracefully, so error information may also be obtained from conflicts arising from the submission type. This is not necessarily a malicious incident on its own, because it is possible that the user is legitimately submitting a multi-part form, and just happened to have the captcha activated during the submission. However this is a very rare case, and still represents a somewhat suspicious client.

6.6.3.2.15. Captcha Directory Indexing

Complexity: Low (2.0)

Default Response: 1x = Slow Connection 2-6 seconds and 1 Day Block.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "[Insufficient Anti-Automation](http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation)"²²² weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to request a directory index from the same fake directory as the captcha images are being served from.

Behavior: When attempting to either bypass the captcha mechanism, or find a vulnerability in the server, attackers will often try finding unlinked resources throughout the web site. The captcha mechanism uses a fake directory in order to serve the images and audio files that contain the captcha challenge. If the attacker is requesting an arbitrary file within the same fake directory, they are likely trying to find a "[Predictable Resource Location](http://projects.webappsec.org/Predictable-Resource-Location)"²²³ vulnerability. In this specific case, the attacker is attempting to get a full file listing of everything inside the captcha directory. This could potentially be used to get a massive list of all active captcha URL's, or to find resources that are used in the creation of captcha challenges. The directory index will not be allowed, so this does not actually provide the attacker with any useful information.

6.6.3.2.16. Captcha Directory Probing

Complexity: Low (2.0)

Default Response: 1x = Warn User. 2x = Slow Connection 2-6 seconds and 5 Day Block.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully.

²²¹ <http://projects.webappsec.org/Buffer-Overflow>

²²² <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²²³ <http://projects.webappsec.org/Predictable-Resource-Location>

Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*²²⁴" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to request an arbitrary file (not a captcha image, but something else) from within the same fake directory as the captcha images are being served from.

Behavior: When attempting to either bypass the captcha mechanism, or find a vulnerability in the server, attackers will often try finding unlinked resources throughout the web site. The captcha mechanism uses a fake directory in order to serve the images and audio files that contain the captcha challenge. If the attacker is requesting an arbitrary file within the same fake directory, they are likely trying to find a "*Predictable Resource Location*²²⁵" vulnerability. For example, the attacker might be trying to find a source file in the captcha serving directory in hopes of actually being able to get the source code behind how captcha images are generated. Because the directory is fake, the attacker will never find any of the resources they are looking for.

6.6.3.2.17. Captcha Parameter Manipulation

Complexity: Suspicious (1.0)

Default Response: 5x = Multiple Captcha Parameter Manipulation Incident.

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*²²⁶" weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit multiple solutions for multiple captchas, but they keep modifying the query parameters that were submitted with the original requests. For example, if the user submitted a "add product to cart" request, and one of the query parameters was the item to add, this incident would be triggered if after solving the captcha, the value of that query parameter was modified to some other value, and this modification happened dozens of times.

Behavior: Because captcha's prevent automation, attackers will sometimes try and find ways to abuse the technique used to request the captcha in order to exploit the site. For example, if the attacker can find a way to submit the same solution over and over again, but have the web application perform a different action each time, they may be able to solve the captcha once and still automate the resulting workflow. In this case, the attacker changed a query parameter that was submitted with the original request. They submitted the original request, solved the captcha, changed the query parameter, and then resubmitted the solved captcha request.

In some cases, this might cause the web application to execute a different operation based on the difference in query parameter values. For example, if the protected workflow is "add product to cart" on a shopping site,

²²⁴ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²²⁵ <http://projects.webappsec.org/Predictable-Resource-Location>

²²⁶ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

then the attacker might attempt to submit the same solved captcha repeatedly, but change the product ID that is being added on each request. This might allow them to automate the addition of products to a shopping cart, after solving only one captcha challenge. The captcha mechanism does not allow the modification of query parameters after the original request has been submitted, so this type of activity will not be successful.

6.6.3.2.18. Captcha Request Replay Attack

Complexity: Suspicious (1.0)

Default Response: 5x = Multiple Captcha Replay Incident

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"²²⁷ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit a captcha solution multiple times and "replay" is explicitly disabled for the captcha being used.

Behavior: Because captcha's prevent automation, attackers will sometimes try and find ways to abuse the technique used to request the captcha in order to exploit the site. For example, if the attacker can find a way to submit the same solution over and over again, they may be able to solve the captcha once and still automate the resulting workflow. This is sometimes considered legitimate behavior (as would be expected if the user refreshed the browser after submitting a successful captcha), however in many cases, such functionality would make the captcha significantly less effective at preventing automation. In this case, the attacker resubmitted a request that had already been successfully validated through a captcha, and "replay" was explicitly disabled for the captcha. This is not necessarily a malicious incident on its own, because the user may have accidentally refreshed the browser, however multiple attempts would definitely represent malicious intent. An example of where a captcha's "replay" could cause a problem is on a gaming site, where the user is adding fake "money" to their account. In order to add the fake money, they must solve the captcha.

This workflow is protected with a captcha, because if a user could automate the process, they would be able to add unlimited funds to their account. If an attacker were able to solve the captcha once, and continuously resubmit the resulting request, they could effectively add funds over and over again without resolving a new captcha. This would then allow for automation. Replay attackers are less of a problem if the web application being protected already has a method of preventing the same request from being submitted accidentally multiple times. Such would be the case if the web application maintained state information for the given session, and recorded the operation after it was successful, then used that state information to prevent a future occurrence of the operation.

6.6.3.2.19. Multiple Captcha Replays

Complexity: Low (2.0)

Default Response: 1x = Warn User, 2x = 1 Day Strip Inputs

²²⁷ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

Cause: A captcha is a special technique used to differentiate between human users, and automated scripts. This is done through a Turing test, where the user is required to visually identify characters in a jumbled image and transcribe them into an input. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed. Additionally, an audio version is optionally available to allow users who have a visual handicap to complete the captcha successfully. Captchas are used in two different ways by the system. They can be explicitly added to any workflow within the protected web application (such as requiring a captcha to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script).

Captchas are generally used to resolve "*Insufficient Anti-Automation*"²²⁸ weaknesses in the protected web application. Regardless of which type of captcha is being used, this incident is generated when the user attempts to submit a captcha solution multiple times and "replay" is explicitly disabled for the captcha being used.

Behavior: Because captcha's prevent automation, attackers will sometimes try and find ways to abuse the technique used to request the captcha in order to exploit the site. For example, if the attacker can find a way to submit the same solution over and over again, they may be able to solve the captcha once and still automate the resulting workflow. This is sometimes considered legitimate behavior (as would be expected if the user refreshed the browser after submitting a successful captcha), however in many cases, such functionality would make the captcha significantly less effective at preventing automation. In this case, the attacker resubmitted a request that had already been successfully validated through a captcha, and "replay" was explicitly disabled for the captcha. This is not necessarily a malicious incident on its own, because the user may have accidentally refreshed the browser, however multiple attempts would definitely represent malicious intent. An example of where a captcha's "replay" could cause a problem is on a gaming site, where the user is adding fake "money" to their account. In order to add the fake money, they must solve the captcha.

This workflow is protected with a captcha, because if a user could automate the process, they would be able to add unlimited funds to their account. If an attacker were able to solve the captcha once, and continuously resubmit the resulting request, they could effectively add funds over and over again without resolving a new captcha. This would then allow for automation. Replay attackers are less of a problem if the web application being protected already has a method of preventing the same request from being submitted accidentally multiple times. Such would be the case if the web application maintained state information for the given session, and recorded the operation after it was successful, then used that state information to prevent a future occurrence of the operation.

6.6.3.2.20. Multiple Captcha Disallow Multipart

Complexity: Low (2.0)

Default Response: 1x = 1 Day Strip Inputs

Cause: A CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) is a special technique used to differentiate between human users, and automated scripts. The user is required to visually identify characters in a jumbled image and transcribe them into a text box. An audio version is also available, for users with a visual handicap. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed.

CAPTCHAs are used in two different ways by the System. They can be explicitly added to any workflow within the protected web application (such as requiring a CAPTCHA to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the

²²⁸ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

user, but with a way for the user to unblock themselves if they can prove they are not an automated script). CAPTCHAs are generally used to resolve "*Insufficient Anti-Automation*"²²⁹ weaknesses in the protected web application.

Regardless of which type of CAPTCHA is being used, this incident is generated when the user attempts to submit dozens of CAPTCHA-protected requests that contain binary files, and the CAPTCHAs are explicitly configured to not allow binary file submission (it has been configured to disallow multi-part form submissions).

Behavior: When a hacker is attempting to establish an automated script that is capable of defeating the CAPTCHA, they may use various techniques. One of these techniques is to try changing various values used by the web application in the CAPTCHA mechanism in an effort to see if an error can be generated, or an unexpected outcome can be achieved. This type of probing and reverse-engineering is generally performed by advanced hackers.

In this specific case, the attacker submitted dozens of binary files in the requests that are being protected. The CAPTCHA in this case has been explicitly configured to not allow Multi-Part form submissions, so this represents unexpected and undesired activity. Using Multi-Part forms, the attacker can more easily accomplish a "*Buffer Overflow*"²³⁰ attack, which would produce potentially sensitive error data and possibly open the server up to further exploitation. Additionally, some web applications do not handle the encoding used for multi-part forms gracefully, so error information may also be obtained from conflicts arising from the submission type. Because this is happening so frequently from the same user, it is also possible that the user is attempting to execute a "*Denial of Service*"²³¹ attack.

6.6.3.2.21. Multiple Captcha Parameter Manipulation

Complexity: Low (2.0)

Default Response: 1x = Warn User, 2x = 1 Day Strip Inputs

Cause: A CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) is a special technique used to differentiate between human users, and automated scripts. The user is required to visually identify characters in a jumbled image and transcribe them into a text box. An audio version is also available, for users with a visual handicap. If the user is unable to complete the challenge in a reasonable amount of time, they are not allowed to proceed with their original request. Because it is nearly-impossible to script the deciphering of the image, automated scripts generally get stuck and cannot proceed.

CAPTCHAs are used in two different ways by the System. They can be explicitly added to any workflow within the protected web application (such as requiring a CAPTCHA to login, or checkout a shopping cart), and they can be used to test a suspicious user before allowing them to continue using the site (similar to blocking the user, but with a way for the user to unblock themselves if they can prove they are not an automated script). CAPTCHAs are generally used to resolve "*Insufficient Anti-Automation*"²³² weaknesses in the protected web application.

Regardless of which type of CAPTCHA is being used, this incident is generated when the user attempts to submit multiple solutions for multiple CAPTCHAs, but they keep modifying the query parameters that were submitted with the original requests. For example, if the user submitted a "add product to cart" request, and one of the query parameters was the item to add, this incident would be triggered if, after solving the CAPTCHA, the value of that query parameter was modified to some other value, and this modification happened dozens of times.

²²⁹ <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

²³⁰ <http://projects.webappsec.org/w/page/13246916/Buffer%20Overflow>

²³¹ <http://projects.webappsec.org/w/page/13246921/Denial%20of%20Service>

²³² <http://projects.webappsec.org/w/page/13246938/Insufficient%20Anti-automation>

Behavior: Because CAPTCHAs prevent automation, attackers will sometimes try to find ways to abuse the technique used to request the CAPTCHA in order to exploit the site. For example, if the attacker can find a way to submit the same solution over and over again, but have the web application perform a different action each time, they may be able to solve the CAPTCHA once, and still automate the resulting workflow.

In this case, the attacker changed many query parameters on many different requests that were protected with a CAPTCHA. They submitted the original request, solved the CAPTCHA, changed the original query parameters, and then resubmitted the solved CAPTCHA request. In some cases, this might cause the web application to execute a different operation based on the difference in query parameter values. For example, if the protected workflow is "add product to cart" on a shopping site, then the attacker might attempt to submit the same solved CAPTCHA repeatedly, but change the product ID that is being added on each request. This might allow them to automate the addition of products to a shopping cart, after solving only one CAPTCHA challenge.

The CAPTCHA mechanism does not allow the modification of query parameters after the original request has been submitted, so this type of activity will not be successful.

This is not considered malicious activity right away, because it is possible that a user may accidentally modify a query parameter; however, when this incident is triggered, it represents a user who has modified dozens of different query parameters on different CAPTCHA-protected pages.

6.6.4. CSRF Processor

The CSRF processor is responsible for ensuring that the protected website does not allow a cross site request forgery attack. CSRF attacks are a type of session hijacking, where a malicious website redirects a user to a sensitive service call on the target website. For example, a user might visit a malicious website that has an image tag pointed to the "deleteAccount" service running on a target website. When a user visits the malicious website, they are unknowingly calling the "deleteAccount" operation. If they had an active session on the target site, their account would be deleted.

This processor works by intercepting any request that could potentially be part of a CSRF attack. This is determined by looking at the referrer header being passed in by the client. The referrer header tells the server where the user came from. If the user is navigating around the actual website legitimately, they will have a referrer header on nearly all requests they make which will match the domain of the site they are navigating. If the user types the URL in manually, or follows a link from another site, they will not have a referrer. If it's a CSRF attack, there will either be no referrer, or a 3rd party domain in the referrer.

In all cases where the referrer does not match the domain of the protected site, a special redirection page will be returned to the client instead of the request they actually asked for. The redirection page will check to make sure the user is not a victim of a CSRF attack, and if they are not, it will automatically redirect the user to the original page they requested.

This processor only protects clients that have "user-agent" headers matching that of a known browser. This is because CSRF attacks are specifically targeted at average web users, and they generally stick to the major browsers. So spiders and scripts will bypass the CSRF processors detection/protection mechanism. This processor also detects the case where a user has turned off referrers (and thus, no requests will contain a referrer), and in that case, will turn off CSRF protection for the client. As such, a user who has disabled referrers will still be susceptible to CSRF, but that should be a very small percentage (if not zero) of the overall user pool.

In the event that a user issues a request that cannot be validated as not a CSRF attack, the user will not be automatically redirected. Instead, they will be presented a "This page has moved" response, and will be asked to click a link to continue to the page they actually wanted. The link to proceed is randomly positioned on the

page to prevent Click Jacking attacks (where a malicious site overlays legitimate content on top of the target site and gets the user to click the legitimate content, while also hijacking the click to transparently activate the content underneath). A special case involves when a 3rd party website opens the target site in a new window or tab. If the 3rd party site retains ownership of the newly opened window or tab, the user will be asked to click the "continue" link so that the original window can be closed and a new window can be opened in its place. This action breaks the ownership and prevents the 3rd party website from performing actions on the window (such as closing or redirecting it).

Because it is sometimes expected that a 3rd party site will be making calls into the target site, it is possible to configure a list of "trusted" 3rd party sites. Any requests issued from a trusted domain will not be protected against CSRF. This allows the trusted site to host the target site in an IFRAME or make service calls unimpeded. Be careful who you add to the trusted domain list, because if the trusted domain is susceptible to XSS or CSRF itself, then it can be used as a proxy to launch a CSRF attack against your protected sites. This trust does not apply if the hosting domain is running over SSL, and the target domain is not running over SSL. If the 3rd party page hosting an IFRAME of the target site is running in SSL, it must load the SSL version of the target site, otherwise the CSRF protection will still be applied. It is however fine if the 3rd party site is not SSL protected and the target site is SSL protected.

6.6.4.1. Configuration

Table 6.19. CSRF Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Block Response	Configurable	HTTP Response	The response to return if the CSRF mechanism cannot complete the request due to errors or tampering.
CSRF Nonce Salt	String	Random	A 256 character random string used to ensure that CSRF nonce tokens are generated differently between different deployments.
CSRF Token Name	String	Random	The name of the query string parameter used to indicate a successfully validated request after it has been determined that it is not a CSRF attack. Select a name that will not conflict with a real query parameter used by the site
Ignore Scripts	Boolean	True	CSRF is largely a browser based attack, so to ensure that scripts such as legitimate spiders are not treated as potential CSRF victims, this option can be enabled to ignore all non browsers for CSRF protection.
Ignored Extensions	Collection	.xap, .xaml	A list of file suffixes (extensions) that will not be protected by CSRF. By default, Silverlight binaries are included, because some browsers will remove the referrer for

Parameter	Type	Default Value	Description
			Silverlight embedded content, which may interfere with CSRF protection and prevent the Silverlight content from loading.
Remote Script Resource	Configurable	CSRF Script Inclusion Resource	The fake resource to request if the page is being loaded as a remote script on a third party domain. This is primarily for detection of the attack and can be any fake resources as long as it does not actually exist on the server.
Trusted Domains	Collection	None	The list of domains that are allowed to display the web application in a frame, reference resources such as images or scripts, or are allowed to make remote API calls using techniques that are similar to a CSRF attack. If the trusted domain starts with a period, then it will match any subdomain before the designated period. For example, .site.com will match www.site.com, my.new.site.com and site.com.
CSRF Extra JavaScript	String	None	Since CSRF protection may cause the referrer to be removed from the request, it may be necessary to add any analytic code to the JavaScript used to detect and stop CSRF attacks. As such, if you use a 3rd party analytics script, you should put that code in this parameter to capture the unmodified original request details. The code will be injected into a script tag, so it must be valid JavaScript or the CSRF protection may stop functioning correctly.
Incident: CSRF Parameter Tampering	Boolean	True	The user tampered with the parameters used by the security engine to prevent CSRF on requests that have an untrusted 3rd party referer. This is likely in an attempt to find a vulnerability in the CSRF protection mechanism.
Incident: CSRF Remote Script Inclusion	Boolean	False	The user has accessed an untrusted 3rd party website which contains an embedded script reference to the protected application. While the user may not be malicious, this represents a CSRF attack from the untrusted website against the protected application. Because the attack was not successful, it is likely being executed by the user who is attempting to construct the attack vector.
Incident: HTTP Referrers Disabled	Boolean	True	The user is using what looks like a browser, but they have HTTP referrers disabled. This is not a malicious incident, but it does indicate an unusual client

6.6.4.2. Incidents

6.6.4.2.1. CSRF Parameter Tampering

Complexity: Suspicious (1.0)

Default Response: 10x = Multiple CSRF Parameter Tampering Incident.

Cause: MWS protects against CSRF attacks by using a special interception technique. When a request comes in to MWS, the referrer is checked. In the event that there is a 3rd party referrer (the user was following a link from another site), the interception mechanism kicks in. This involves returning a special page to the user that validates that the user is intentionally requesting the resource. If the validation is successful, the user is transparently redirected to the original resource they requested. If the validation fails, the user is then instructed to manually confirm their intentions, or return to the page they came from (to prevent the CSRF attack from working). In most cases, a valid CSRF attack would function in such a way as to hide this manual confirmation step, so the user would probably never see it (e.g. if the URL was loaded using an image HTML tag, then the resulting HTML confirmation step would not render, because its HTML, not an image). This incident is triggered when a user submits a request with a 3rd party referrer, and then manipulates the code of the CSRF interception page to alter the original data that was submitted. For example, they submit a request that looks like a CSRF attack (has a 3rd party referrer), and then use a tool like Firebug to edit the query string parameters that would be sent to the server after they manually allowed the request on the CSRF intercept page.

Behavior: CSRF attacks are generally two-phase. The first phase involves the attacker establishing a functional CSRF attack. This could take quite a while and involves the attacker making requests to the protected site, trying all different types of CSRF techniques. The second phase is when the attacker injects the successful CSRF vector into a public website. In the second phase, legitimate users are visiting the public website and unknowingly executing the CSRF attack in the background. It is not useful to flag the victims of the CSRF attack as hackers, because they may not even know what is going on. However it is useful to flag the original attack vector establishment, because it may shed light on who created the "*CSRF*²³³" attack. This incident reflects a user who is manipulating the CSRF prevention mechanism, likely in an attempt to find a way to get around it. As such, if a user has this incident, they are probably trying to establish a CSRF attack, and careful attention should be paid to the values they are changing the parameters to and which URL is being requested (this will help identify what the user is trying to attack).

6.6.4.2.2. Multiple CSRF Parameter Tampering

Complexity: Low (2.0)

Default Response: 1x = Captcha, 2x = 1 Day Strip Inputs

Cause: MWS protects against CSRF attacks by using a special interception technique. When a request comes in to MWS, the referrer is checked. In the event that there is a 3rd party referrer (the user was following a link from another site), the interception mechanism kicks in. This involves returning a special page to the user that validates that the user is intentionally requesting the resource. If the validation is successful, the user is transparently redirected to the original resource they requested. If the validation fails, the user is then instructed to manually confirm their intentions, or return to the page they came from (to prevent the CSRF attack from working). In most cases, a valid CSRF attack would function in such a way as to hide this manual confirmation step, so the user would probably never see it (e.g. if the URL was loaded using an image HTML tag, then the resulting HTML confirmation step would not render, because its HTML, not an image). This incident is triggered when a user submits dozens of requests with a 3rd party referrers, and

²³³ <http://projects.webappsec.org/Cross-Site-Request-Forgery>

then manipulates the code of the CSRF interception page to alter the original data that was submitted. For example, they submit a bunch of requests that look like CSRF attacks (they have 3rd party referrers), and then use a tool like Firebug to edit the query string parameters that would be sent to the server after they manually allowed the requests on the CSRF intercept page.

Behavior: CSRF attacks are generally two-phase. The first phase involves the attacker establishing a functional CSRF attack. This could take quite a while and involves the attacker making requests to the protected site, trying all different types of CSRF techniques. The second phase is when the attacker injects the successful CSRF vector into a public website. In the second phase, legitimate users are visiting the public website and unknowingly executing the CSRF attack in the background. It is not useful to flag the victims of the CSRF attack as hackers, because they may not even know what is going on. However it is useful to flag the original attack vector establishment, because it may shed light on who created the "[CSRF²³⁴](#)" attack. This incident reflects a user who is manipulating the CSRF prevention mechanism, likely in an attempt to find a way to get around it. As such, if a user has this incident, they are probably trying to establish a CSRF attack, and careful attention should be paid to the values they are changing the parameters to and which URL is being requested (this will help identify what the user is trying to attack).

6.6.4.2.3. CSRF Remote Script Inclusion

Complexity: Informational (0.0)

Default Response: None.

Cause: MWS protects against CSRF attacks by using a special interception technique. When a request comes in to MWS, the referrer is checked. In the event that there is a 3rd party referrer (the user was following a link from another site), the interception mechanism kicks in. This involves returning a special page to the user that validates that the user is intentionally requesting the resource. If the validation is successful, the user is transparently redirected to the original resource they requested. If the validation fails, the user is then instructed to manually confirm their intentions, or return to the page they came from (to prevent the CSRF attack from working). In most cases, a valid CSRF attack would function in such a way as to hide this manual confirmation step, so the user would probably never see it (e.g. if the URL was loaded using an image HTML tag, then the resulting HTML confirmation step would not render, because its HTML, not an image). This incident is triggered when a user accesses a page on a 3rd party website which contains a Javascript tag that loads content from the protected site. This would normally represent a victim of a CSRF attack, but because CSRF attacks are blocked, an attacker is unlikely to execute such an attack. Therefore, it is more probable that the attacker is testing a possible vector to see if it will work and encountering this incident.

Behavior: CSRF attacks are generally two-phase. The first phase involves the attacker establishing a functional CSRF attack. This could take quite a while and involves the attacker making requests to the protected site, trying all different types of CSRF techniques. The second phase is when the attacker injects the successful CSRF vector into a public website. In the second phase, legitimate users are visiting the public website and unknowingly executing the CSRF attack in the background. It is not useful to flag the victims of the CSRF attack as hackers, because they may not even know what is going on. However it is useful to flag the original attack vector establishment, because it may shed light on who created the "[CSRF²³⁵](#)" attack. While this incident would potentially be fired for any victims of a CSRF attack, CSRF attacks are blocked by this processor, so it is unlikely that an attacker would ever actually try to use the vector against legitimate users. As such, it is far more likely that the attacker is still in the first phase and trying to uncover a successful CSRF vector. Because of this, careful attention should be paid to the URL that is being requested (this will help identify what the user is trying to exploit).

²³⁴ <http://projects.webappsec.org/Cross-Site-Request-Forgery>

²³⁵ <http://projects.webappsec.org/Cross-Site-Request-Forgery>

6.6.4.2.4. HTTP Referers Disabled

Complexity: Suspicious (1.0)

Default Response: None.

Cause: The HTTP protocol provides support for a special header called the "referer" (misspelled on purpose). This header tells the web server where the user just came from. So if the user visits google and follows a link from google to get to another page, the request for that second page will contain a "referer" of "http://www.google.com". Some browsers provide the option to turn off automatic transmission of the "referer" header. This would make it impossible for websites to identify the page the user came from. This incident is triggered whenever a user accesses the website with referers disabled. This is not necessarily a malicious act, as it could be the result of an excessively paranoid legitimate user, but it is also somewhat unusual and is often a technique employed by malicious users.

Behavior: Hackers will often disable the referer header to make it more difficult to monitor and analyze an attack through the traditional HTTP log files. Many web servers will record the URL the user is accessing, as well as the referer that was submitted. As such, by disabling referers, the hacker is able to eliminate a large percentage of the information collected about the attack.

6.6.5. Header Injection Processor

This processor provides the header injection counter response. It allows extra a custom header to be defined that is injected into a suspected hackers requests to allow custom handling.



Note

There are no actual triggers for this processor; it is a form of response.

6.6.5.1. Configuration

Table 6.20. Header Injection Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Default Header Name	String	Random	The default header name to use if one is not specified in the response configuration.
Default Header Value	String	True	The default header value to use if one is not specified in the response configuration.

6.6.6. Force Logout Processor

This processor provides the force logout counter response. It strips out and invalidates the users session tokens logging them out of the site.

**Note**

There are no actual triggers for this processor - it is a form of response.

6.6.6.1. Configuration

Table 6.21. Force Logout Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Application Session Cookie	Collection	Collection	A collection of names to use for the Application session cookie
Advanced			
Clear Session Cookies	Boolean	False	Whether to clear any terminated session cookies from the malicious users browser. This may help the user identify why they are getting logged off, so unless the application has code on the client that reads the session cookie value, or the cookie is used in traffic not protected by the Mykonos system, this option should be turned off.

6.6.7. Strip Inputs Processor

This processor is used to transparently remove all user input from requests being issued to the server. This response will make the web application, or the client accessing it, to appear broken from the users perspective. The website will also take on a much smaller attack surface should the client be a vulnerability scanner.

**Note**

There are no actual triggers for this processor; it is a form of response.

6.6.7.1. Configuration

Table 6.22. Strip Inputs Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.

6.6.8. Slow Connection Processor

The slow connection processor is designed to introduce large delays in requests issued by malicious traffic without impacting the performance of legitimate users.



Note

There are no actual triggers for this processor; it is a form of response.

6.6.8.1. Configuration

Table 6.23. Slow Connection Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Default Maximum Delay	Integer	5 Seconds	The default maximum number of milliseconds to delay malicious requests.
Default Minimum Delay	Integer	500 MilliSeconds	The default minimum number of milliseconds to delay malicious requests.

6.6.9. Warning Processor

The warning processor is designed to allow a warning message to be presented to a user without completely blocking site access. The warning processor only enables the ability to respond to a user with a "warning", which would allow them to continue browsing the page and the site. The warning would be created and activated for a user by the auto response system, or manually from the console. The existing processor overlays semi-transparent HTML elements on top of the entire webpage, which temporarily disables any mouse or keystrokes on the page and, therefore, creating a "modal dialog" effect. This processor isn't designed to completely stop an attacker from using the website; it is there to warn them. Given the browser debugging tools available today, an attacker may be able to dismiss the warning by means of such tools. Any tampering with the warning's default dismissal behavior (waiting 5 seconds until dismissal button is automatically enabled and clicking on dismiss button) will be considered an incident and will be tracked.

6.6.9.1. Configuration

Table 6.24. Warning Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			

Parameter	Type	Default Value	Description
Default Warning Message	String	"Your connection has been detected performing suspicious activity. Your traffic is now being monitored."	The default message to use in the warning dialog. This can be defined on a session by session basis, but if no explicit value is assigned to the warning, this value will be used.
Default Warning Title	String	Security Warning	The default title to use in the warning dialog. This can be defined on a session by session basis, but if no explicit value is assigned to the warning, this value will be used.
Dismissal Delay	Integer	10 Seconds	The amount of time in seconds that must elapse before the warning can be dismissed. This is a soft limit, as an experienced user may be able to get around enforcement measures.
Dismissal Resource	Configurable	Random	The information needed to define the URL and response used to dismiss a warning.
Warning Directory	String	Random	The name of the directory where the warning Javascript and css code will be served from. For example: warningcode.
Incident: Warning Code Tampering	Boolean	True	The user has attempted to dismiss the warning without waiting the delay and using the provided mechanism. This is probably an attack on the warning system.

6.6.9.2. Incidents

6.6.9.2.1. Warning Code Tampering

Complexity: Medium (3.0)

Default Response: 1x = Logout User, 2x = 5 Day Strip Inputs.

Cause: MWS is capable of issuing non blocking warning messages to potentially malicious users. These warning messages are designed to force the user to wait for a period of time, before they can dismiss the warning and continue using the site. If the user attempts to exploit or bypass this delay mechanism in order to dismiss the warning early, this incident will be triggered.

Behavior: Once a hacker has been warned, they are then aware that a security system is monitoring their activity. This may cause some hackers to investigate what might be protecting the site. This could involve additional scanning, or it could involve attacking the warning mechanism directly. This type of behavior generally indicates a hacker with moderate to advanced skill levels. Depending on what they modify the warning code input to be, this could represent a simple exploratory test, or the user could be trying to launch a more complex attack against the warning code handler itself, such as "[Buffer Overflow](http://projects.webappsec.org/Buffer-Overflow)²³⁶", "[XSS](http://projects.webappsec.org/Cross-Site+Scripting)²³⁷", "[Denial](#)

²³⁶ <http://projects.webappsec.org/Buffer-Overflow>

²³⁷ <http://projects.webappsec.org/Cross-Site+Scripting>

of Service²³⁸, "Fingerprinting"²³⁹, "Format String"²⁴⁰, "HTTP Response Splitting"²⁴¹, "Integer Overflow"²⁴², and "SQL injection"²⁴³ among many others.

6.6.10. Application Vulnerability Processor

The application vulnerability processor is designed to block known attack vectors for select 3rd party applications. By default this processor does nothing. If you host a 3rd party application such as WordPress, you should enable the configuration parameters that represent the 3rd party software you are using. This will enable protection for that software component.

6.6.10.1. Configuration

Table 6.25. Application Vulnerability Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor. Note that even though traffic passes through the processor, it may not actually do anything unless specific 3rd party application protection is enabled.
Joomla Vulnerability Protection Enabled	Boolean	False	Whether traffic should be analyzed for Joomla vulnerabilities
PHPBB Vulnerability Protection Enabled	Boolean	False	Whether traffic should be analyzed for PHPBB vulnerabilities
Wordpress Vulnerability Protection Enabled	Boolean	False	Whether traffic should be analyzed for Wordpress vulnerabilities
Advanced			
Mode of Operation	Integer	1	Whether to block a request on a positive signature, or just create an incident
Block Response	HTTP Response	404 Error	The default message to use in the warning dialog. This can be defined on a session by session basis, but if no explicit value is assigned to the warning, this value will be used.

6.6.10.2. Incidents

6.6.10.2.1. App Vulnerability Detected

Complexity: Low (2.0)

²³⁸ <http://projects.webappsec.org/Denial-of-Service>

²³⁹ <http://projects.webappsec.org/Fingerprinting>

²⁴⁰ <http://projects.webappsec.org/Format-String>

²⁴¹ <http://projects.webappsec.org/HTTP-Response-Splitting>

²⁴² <http://projects.webappsec.org/Integer-Overflows>

²⁴³ <http://projects.webappsec.org/SQL-Injection>

Default Response: 1x = Slow Connection 2-6 seconds, 3x = Slow Connection 2-6 seconds and Strip Inputs for 1 day

Cause: The application vulnerability processor is designed to identify known attack vectors issued to 3rd party applications such as WordPress. This incident indicates that one of those known attack vectors has been issued by the associated user. The exact nature of the vector that was identified should be described in the incident details.

Behavior: One of the easiest ways to compromise a website is to look for 3rd party web applications such as WordPress. If one is found, the attacker can then look up any known vulnerabilities in that software and the version of it that is running on the website. If they find vulnerabilities, they can then launch them and potentially compromise the site with a few minutes with minimal effort.

6.6.11. Support Processor

When a user is blocked or otherwise responded to using one of the counter measures, this processor provides a way to identify which profile is associated with a user, and to then allow those responses to be deactivated at the discretion of the IT administrator. For example, if a user were to get a 404 error when asking for a PDF document linked from the main site, and they then try to find the file by trying a bunch of different file names, they may eventually get blocked for performing a directory enumeration attack. When this happens, the blocked user may contact support for assistance getting access to the site again.

This processor works by exposing a special administrative URL (defined in configuration) which the support team can access. When a support request comes in from a blocked users, the support representative can access this administrative URL which will provide another URL. The support representative should then provide this second URL to the affected user. The affected user can then visit that URL and get a special code. This code can be used to search for the profile and deactivate responses in the Security Monitor (profile list).

If the affected user gets a code of "00000000000000000000" (all zeros), this means that the user is not identified as an attacker and therefore is not being blocked or responded to with a counter response from Mykonos. As such, other causes of the user's inability to access the site should be investigated.

DO NOT GIVE OUT THE ADMINISTRATIVE URL! It is only used to get a fresh URL that is safe to provide to the affected user. If the administrative URL is leaked to the public, it should be changed immediately.

So the overall workflow is as follows:

1. User is blocked or otherwise responded to with a counter measure.
2. User calls support for assistance.
3. Support accesses the administrative URL.
4. Support copies the newly created URL in the response and provides to the affected user.
5. The affected user accesses the newly created URL and provides the resulting code to support.
6. Support or an Admin then logs into the security monitor, clicks on the profile graph to get a list of profiles, and then searches for the code.
7. Support or Admin reviews user's list of incidents to verify the user was responded to in error. If so, the Support or Admin disables the responses.

Note that the "block" response is by default, configured to return the code. So if a user has been blocked, steps 3-5 can be omitted, and the user can simply provide the code specified in the block message to support. For all other responses, the full workflow needs to be followed, because there is no other way to obtain the code.

6.6.11.1. Configuration

Table 6.26. Support Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor.
Advanced			
Private Support URL	String	Random	The URL a support representative would access to get additional details about how to provide support to users who are having issues that may be Mykonos related. If the value is "ABC", then the private URL would be <code>http://www.example.com/ABC</code> . It is absolutely imperative that this URL not be leaked to non-internal users. If it is leaked, it must be changed immediately.
Public Support URL Salt	String	Random	A random value used to ensure that support URLs are not predictable. This can be any random string 30 characters in length.
Public URL Expiration	Integer	3	The number of days a public support URL remains valid for. After this many days, the URL will no longer provide support information. This is to prevent any issues from a public support URL being leaked.

6.6.12. Cloppy Processor

The Cloppy processor is a joke response built for demonstration purposes. It creates an animated paperclip in the lower right corner of the website, which belittles and taunts the attacker. This should never be used on a legitimate threat and is not the default counter response for any type of behavior. It is provided to demonstrate the diversity of counter responses Mykonos is capable of. You should never activate this response unless you have a good relationship with the user you are activating it on, and they have a good sense of humor.

You can configure the message and options cloppy presents both in configuration (the default messages), or in the response specific config (the XML you define when you manually activate a response or when you write a rule that activates a response). The oldest cloppy response will be the one for which the messages are loaded, so if you create multiple cloppy responses, you can create a dialog of several messages. For example, try activating cloppy three times with the following config values (create them in the following order):

1. Activate Cloppy: `<config message="This is the first message"><option label="First op" url="" /><option label="Second op" url="" /></config>`

2. Activate Cloppy: `<config message="This is the second message"><option label="First op" url="" /><option label="Second op" url="" /></config>`
3. Activate Cloppy: `<config message="This is the third message"><option label="First op" url="" /><option label="Second op" url="" /></config>`

Once you activate the above 3 cloppy responses, you should see that cloppy will present the "This is the first message" dialog first. Once you click on an option in that dialog, the next page you load will display "This is the second message", and finally, after clicking on one of those options, you should get "This is the third message".

Once you click an option in cloppys dialog, it will dismiss that specific cloppy response. Thats why you are able to stack the responses and get a dialog going.

6.6.12.1. Configuration

Table 6.27. Cloppy Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor. Note that just because traffic is passing through the processor, does not mean any users will actually have a Cloppy response activated on them. As such, simply enabling this processor will not result in cloppy being activated for any users. You would still need to manually activate the Cloppy response in the Security Monitor (or define an auto response rule that activates it, but that is highly discouraged).
Cloppy Message	String	"It looks like youre an unsophisticated script kiddie attempting to hack this website"	What do you want cloppy to say when offering help?
Cloppy Options	Collection	Collection	The list of ways cloppy can help with associated URLs.
Advanced			
Cloppy Directory	String	cloppybin	The name of the directory where the binary resources needed to load cloppy are served from. For example: cloppyfiles. The name should be selected not to conflict with a real directory at the top level of the website.
Cloppy Dismiss Directory	String	Random	The name of the directory used to dismiss cloppy. This URL should be random and not conflict with existing directory names on the site.

6.6.13. Login Processor

The login processor is designed to add additional protection to the login dialogs throughout the protected site. By default, it will not provide any additional protection, and must be configured to protect specific login forms. Once a login form has been configured, the processor will begin to monitor the login attempts and start checking for abusive patterns.

This processor is capable of detecting a wide variety of abuse patterns on a login dialog, as well as stopping these abusive activities. One key protection mechanism is to require a captcha if a user attempts to login to an account which has experienced more than 3 failed login attempts since the last successful login attempt. This ensures that a malicious user cannot brute force a specific username, because after 3 failed attempts, the brute force tool will be stopped by a captcha. This does not represent a counter response, but instead is built in functionality that applies to all users on the system. So if user "A" submits 5 bad passwords, and then user "B" submits a password for the same username, user "B" will get a captcha, as well as user "A" for any additional login attempts they try. As soon as a user successfully logs into the account, it will take another 3 failed login attempts before the next captcha is required.

In addition to protecting against a single username being attacked with a brute force script, the processor also detects "User sharing", "User pooling", "Username scans", "Multi-User brute force scans". See the incident descriptions for more information on what these incidents represent and what counter responses will be activated as a result.

In order to configure the Login Processor to protect a login form, edit the "Protected Login Pages" configuration parameter. Add a new row and provide the following information. It will be useful to look at the HTML source code of the login form as it will have critical information you will need to configure protection:

- **Name:** The name of the login page (this is just for your reference, it can be anything)
- **URL Pattern:** The Regular Expression used to identify a username/password submission. This pattern should match the "action" attribute of the HTML <FORM> tag wrapping the login dialog.
- **Username Field Type:** The type of inputs used to submit a username. Normally this will be "POST Parameter", however other options are provided for more specialized login mechanisms.
- **Username Field Name Pattern:** A regular expression used to match the name of the input the username is submitted with. Normally this is "username", but could be other variations such as "usr", "user", etc... You can simply enter the name of the input in this field if a regular expression is not required.
- **Username Field Pattern Value:** A regular expression used to extract the username from the input value. Normally this should just be "^.*\$", but if the username is wrapped in JSON for example, you may need to create a more complex expression. The username is considered the first matching parenthesis group in the pattern.
- **Username Field Encoding:** The type of data encoding used on the username. Normally this will be "Ascii", however if any client side encoding is performed, other encoding options are available.
- **Password Field Type:** The type of inputs used to submit a password. Normally this will be "POST Parameter", however other options are provided for more specialized login mechanisms.
- **Password Field Name Pattern:** A regular expression used to match the name of the input the password is submitted with. Normally this is "password", but could be other variations such as "pwd", "pass", etc... You can simply enter the name of the input in this field if a regular expression is not required.
- **Username Field Pattern Value:** A regular expression used to extract the password from the input value. Normally this should just be "^.*\$", but if the password is wrapped in JSON for example, you may need to

create a more complex expression. The password is considered the first matching parenthesis group in the pattern.

- **Password Field Encoding:** The type of data encoding used on the password. Normally this will be "Ascii", however if any client side encoding is performed, other encoding options are available.
- **Failure Pattern Target:** In order to identify a failed login attempt, the processor will search for a specific pattern in the response. This attribute specifies where to search for that pattern. Normally this would be "Body" to search the HTML body of the response.
- **Failure Pattern:** The regular expression to search for to check and see if the login attempt was unsuccessful. Assuming the Failure Pattern Target is "Body", this would be something like "you have provided an invalid username and password". However the exact text will need to be set to whatever the site actually returns. View the source of the response after a failed login and search for the error text, so that you get the most accurate version possible. Simply copying the text from the rendered page may exclude embedded HTML tags which will cause the pattern to never match.
- **Failure Pattern Condition:** Specifies whether finding the failure pattern means the login was unsuccessful, or whether not finding the pattern means the login was unsuccessful.
- **Success Pattern Target:** In order to identify a successful login attempt, the processor will search for a specific pattern in the response. This attribute specifies where to search for that pattern. Normally this would be "Body" to search the HTML body of the response.
- **Success Pattern:** The regular expression to search for to check and see if the login attempt was successful. Assuming the Success Pattern Target is "Body", this would be something like "you have successfully logged in". However the exact text will need to be set to whatever the site actually returns. View the source of the response after a successful login and search for something that only gets displayed on a successful login, so that you get the most accurate version possible. Simply copying the text from the rendered page may exclude embedded HTML tags which will cause the pattern to never match.
- **Success Pattern Condition:** Specifies whether finding the success pattern means the login was successful, or whether not finding the pattern means the login was successful.
- **Require Captcha After:** Specifies how many failed login attempts on the same username before requiring all future login attempts on that username to solve a captcha. Entering "0" will allow infinite attempts.

Keep in mind that some website implementations allow login information to be posted to many different URLs. If that is the case, make sure the URL pattern is defined generically enough to match any URL the user might submit a login request to. Only submissions that match the URL pattern will be protected.

Once a login form has been configured, it can be tested by attempting to login to the same username 6 or more times. You should be presented with a captcha. Next, solve the captcha and log in with the correct password. Then logout and attempt to login to the same username again. If you do not get a captcha, then the login form is configured correctly.

6.6.13.1. Configuration

Table 6.28. Login Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			

Parameter	Type	Default Value	Description
Processor Enabled	Boolean	True	Whether traffic should be passed through this processor. Note that just because this processor is enabled, does not mean that any login forms are being protected. Login forms will not be protected until they are configured in the "Protected Login Pages" parameter.
Protected Login Pages	Collection	None	The list of pages that should be protected from login and account abuse. These pages should reflect the URL's that accept username's and passwords and allow login, not necessarily the pages that contain login forms. For example, if every page on the site had a login form, but they all submitted to login.php, then only login.php needs to be configured in this processor.
Advanced			
Bad Request Block Response	HTTP Response	400 Error	The response to return if the user issues a request that either is too large, or uses multi-part and multi-part is disabled.
Blocked Replay Response	HTTP Response	400 Error	The response to return if the user attempts to submit the validated request multiple times using the same captcha answer, and that behavior is not allowed.
Cancel URL	String	(empty)	The URL to redirect the user to if they cancel the captcha. This should not be to the same domain, because the domain is being blocked using a captcha, and therefore, canceling would only redirect to a new captcha. An empty value will hide the cancel button
Captcha Binary Directory	String	Random	The name of the directory where captcha images and audio files will be served from. This should not conflict with any actual directories on the site.
Captcha Characters	String	abcdefghijklmnopqrstuvwxyz ABCEFGHJKLMNPQRSTUVWXYZ 234678	The characters to use when generating a captcha value. Avoid using characters that can be easily mixed up. This set of characters is case sensitive.
Captcha Expiration	Integer	120	The maximum number of seconds the user has to solve the captcha before the request is no longer possible.
Captcha State Cookie	String	Random	The name of the cookie to use to track the active captchas that have not yet been solved. The cookie is only served to the captcha binary directory.
Captcha Template	File	Default Template	The HTML template used to ask the user to complete a captcha. This template must

Parameter	Type	Default Value	Description
			contain specific key words in order to integrate properly. Please refer to the manual for more information.
Captcha Validation Input Name	String	Random	The name of the form input used to transmit the captcha validation key. This should be obscure so that users who have not been required to enter a captcha cannot supply bad values to this input to profile the system.
Expired Captcha Response	HTTP Response	400 Error	The response to return if the user submits a validated request after the captcha has expired. This may happen if the user refreshes the results of the captcha long after they have solved it.
Maximum Active Captchas	Integer	7	The maximum number of captchas any given user can be solving at any given time. This limit can be overcome, but the majority of users will not be able to. This is primarily for performance, as the more active captchas that are allowed, the larger the state cookie becomes.
Maximum Request Size	Integer	524288 (500KB)	The maximum number of bytes in a request before it is considered not acceptable for captcha validation, and will be blocked.
Support Audio Version	Boolean	True	Whether an audio version of the captcha is provided to the user. This may be a requirement for accessibility, as vision impaired users would otherwise be unable to solve the captcha.
Watermark	String	%DOMAIN	The text to watermark the captcha with. This can be used to prevent the captcha from being used in a phishing attack. For example, an abuser would not be able to simply display the captcha on a different site and ask a user to solve it. The watermark would tip the user off that the captcha was not intended for the site they are visiting. Use %DOMAIN to use the domain name as the watermark.
Incident: Site Invalid Login	Boolean	True	The user has submitted an invalid username or password. This is just an informational incident and is used to identify more complex attacks. It is highly recommended that this incident not be disabled, as it may cause other incidents to no longer register.
Incident: Site Login Multiple IP	Boolean	True	The user has submitted a valid username and password for an account that has recently been used by a different IP. This is just an informational incident and is used to

Parameter	Type	Default Value	Description
			identify more complex attacks. It is highly recommended that this incident not be disabled, as it may cause other incidents to no longer register.
Incident: Site Login Multiple Usernames	Boolean	True	The user has submitted a valid username and password for more than one account recently. This is just an informational incident and is used to identify more complex attacks. It is highly recommended that this incident not be disabled, as it may cause other incidents to no longer register.

6.6.13.2. Incidents

6.6.13.2.1. Site Login Invalid

Complexity: Suspicious (1.0)

Default Response: 15x (3 or more bad passwords per username) = Site Login Brute Force, 15x (less than 3 bad passwords per username) = Site Login Username Scan, 8x (bad passwords for same username) = Site Login User Brute Force

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a user attempts to login with an invalid username and password. This incident alone is not considered malicious, but is used to perform additional analysis and may be promoted to a malicious incident if an abusive pattern is identified (such as many invalid logins representing a brute force attack).

Behavior: This incident simply reflects the case where a user has entered bad login information. By itself, this cannot be considered malicious as it is extremely common for a legitimate user to accidentally type their information incorrectly, or to forget their password. As such, it is only an indication of possible abuse and requires additional analysis and data before it can be confirmed as malicious or acceptable.

6.6.13.2.2. Site Login Multiple IP

Complexity: Informational (0.0)

Default Response: 3x = Site Login User Sharing

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when multiple clients successfully log into the same account. Depending on the nature of the protected site, this may be perfectly acceptable behavior, however on some sites this type of behavior can indicate abuse. This incident alone is not considered malicious, but is used to perform additional analysis and potentially promote the event as a malicious incident if an abusive pattern is identified.

Behavior: Many websites provide a way for users to authenticate so that their experience and data can be customized specifically for them. In the case of this incident, credentials for one of those accounts have been distributed to multiple clients and two or more of those clients are logging into the account. Unless the website expects users to share credentials, this would generally indicate a situation where the credentials for an account have been compromised and the account has been hijacked. Additional follow up may be required

to recover the account (such as changing the password or locking the account until the actual owner contacts the administrators to resolve the issue).

6.6.13.2.3. Site Login Multiple Usernames

Complexity: Suspicious (1.0)

Default Response: 3x = Site Login User Pooling

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a single client successfully authenticates with multiple distinct usernames. This incident alone is not considered malicious, but is used to perform additional analysis and potentially promote the event as a malicious incident if an abusive pattern is identified.

Behavior: There are two possibilities for this incident. Firstly, a single user may have signed up for multiple accounts on the protected site, and they are simply using those accounts. On some sites, this alone would be considered malicious, while on other sites, this is considered perfectly acceptable. For example, an online email provider may allow its users to sign up for multiple email accounts. On the other hand, a billing website for your home utility provider would probably not expect a single household to have multiple accounts. The other possibility is that a single user has hijacked several other accounts. This may be more obvious if there is also a "Site Login User Sharing" incident for the username as well. This would indicate that not only is the malicious user logging into multiple accounts, but other users are also logging into those accounts. Generally, an account should be used by a single user unless the website has specific rules about allowing users to share account details.

6.6.13.2.4. Site Login User Sharing

Complexity: Low (2.0)

Default Response: None.

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when multiple clients successfully log into the same account. Depending on the nature of the protected site, this may be perfectly acceptable behavior, however on some sites this type of behavior can indicate abuse.

Behavior: Many websites provide a way for users to authenticate so that their experience and data can be customized specifically for them. In the case of this incident, credentials for one of those accounts have been distributed to multiple clients and two or more of those clients are logging into the account. Unless the website expects users to share credentials, this would generally indicate a situation where the credentials for an account have been compromised and the account has been hijacked. Additional follow up may be required to recover the account (such as changing the password or locking the account until the actual owner contacts the administrators to resolve the issue).

6.6.13.2.5. Site Login User Pooling

Complexity: Low (2.0)

Default Response: None.

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a single client successfully logs into several different accounts. Depending on the nature of the protected site, this may be perfectly acceptable behavior, however on some sites this type of behavior can be harmful.

Behavior: There are two possibilities for this incident. Firstly, a single user may have signed up for multiple accounts on the protected site, and they are simply using those accounts. On some sites, this alone would be considered malicious, while on other sites, this is considered perfectly acceptable. For example, an online email provider may allow its users to sign up for multiple email accounts. On the other hand, a billing website for your home utility provider would probably not expect a single household to have multiple accounts. The other possibility is that a single user has hijacked several other accounts. This may be more obvious if there is also a "Site Login User Sharing" incident for the username as well. This would indicate that not only is the malicious user logging into multiple accounts, but other users are also logging into those accounts. Generally, an account should be used by a single user unless the website has specific rules about allowing users to share account details.

6.6.13.2.6. Site Login User Brute Force

Complexity: Medium (3.0)

Default Response: 1x = Break Authentication for 1 hour, 2x = Break Authentication for 6 hours, 3x = Strip Inputs for 1 day

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a user attempts to login to the same username many times with invalid passwords.

Behavior: In this case, the user is probably attempting to brute force the account indicated in the incident details. Brute force against authentication works by enumerating over a list of common passwords and testing all of them against the target username. The hope is that the target user selected a weak password and that password is in the "dictionary" list of passwords to try. In some cases, a custom brute force tool may be employed, which enumerates over a list of passwords that were carefully constructed using the targets personal information (birthdays, anniversaries, names, ages, phone numbers, etc...)

6.6.13.2.7. Site Login Brute Force

Complexity: Medium (3.0)

Default Response: 1x = Slow Connection for 6 hours, 3x = Slow Connection & Break Authentication for 6 hours

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a user attempts to login against a large number of different usernames.

Behavior: A common authentication attack is Brute Force. This attack involves submitting a large number of username and password combinations in an effort to identify users who have chosen weak passwords. This type of attack is extremely noisy and requires thousands of requests to execute.

6.6.13.2.8. Site Login Username Scan

Complexity: Medium (3.0)

Default Response: 1x = Captcha for 6 hours, 3x = Strip Inputs & Slow Connection for 1 day

Cause: The login processor is designed to protect the login dialog of the website. It works by monitoring all login attempts and identifying suspicious and malicious events. This specific incident is triggered when a user attempts to login against a large number of different usernames with a small number of passwords for each.

Behavior: One flaw present in a lot of authentication implementations is that the results that are returned when submitting an invalid username and password are different then the results returned when the username is valid but the password is not. By enumerating over a large number of possible usernames and supplying bad passwords, the attacker is able to identify which usernames are actually valid in the system. This is one of the first steps to a large scale brute force attack. Once the user has a list of valid usernames, they can then launch the brute force attack against just those usernames to make the attack quicker and harder to identify. A best practice when developing authentication systems is to ensure that the results that are returned from an invalid username, are the same results returned when providing a valid username and invalid password. For example, the error should read "The username and password you supplied could not be found in our database", instead of "The username you provided does not exist".

6.6.14. Google Map Processor

The Google Map Processor provides a counter response called the "Google Map Response". When this response is activated, the user will be shown an overlay dialog with a google map of their geo location (as resolved from their IP address using MaxMind Geo IP). It will then recommend 4 google search results on a configured term (default is 'Criminal Attorney'). The intention is to scare the individual into believing that we know where they live and plan to attempt prosecution.

The google map response requires several things in order to work. First, you must obtain a google map API key and set it in configuration. Until you do this, you will not be able to enable the processor. Once enabled, if you activate the processor on a user, they will only see the response if Mykonos can resolve their geo location from MaxMind GeoIP. If a geo location cannot be resolved, the map will not be displayed. Additionally, the google map response is not a default response for any activity, so unless you manually activate it, or create a custom auto response rule to activate it, it will never be used.

Keep in mind that by activating this response, you are effectively broadcasting your public google map API key to the attacker. If the attacker decides to exploit this fact, they can easily drain your google map request and search result quotas. As such, it is important to get an API key for a junk google development account, so that your quota's are not shared with legitimate site functions. You should also not sign up for paid quota extensions on that particular account, as that could allow the attacker to run up your bill. Just use the free quotas.

6.6.14.1. Configuration

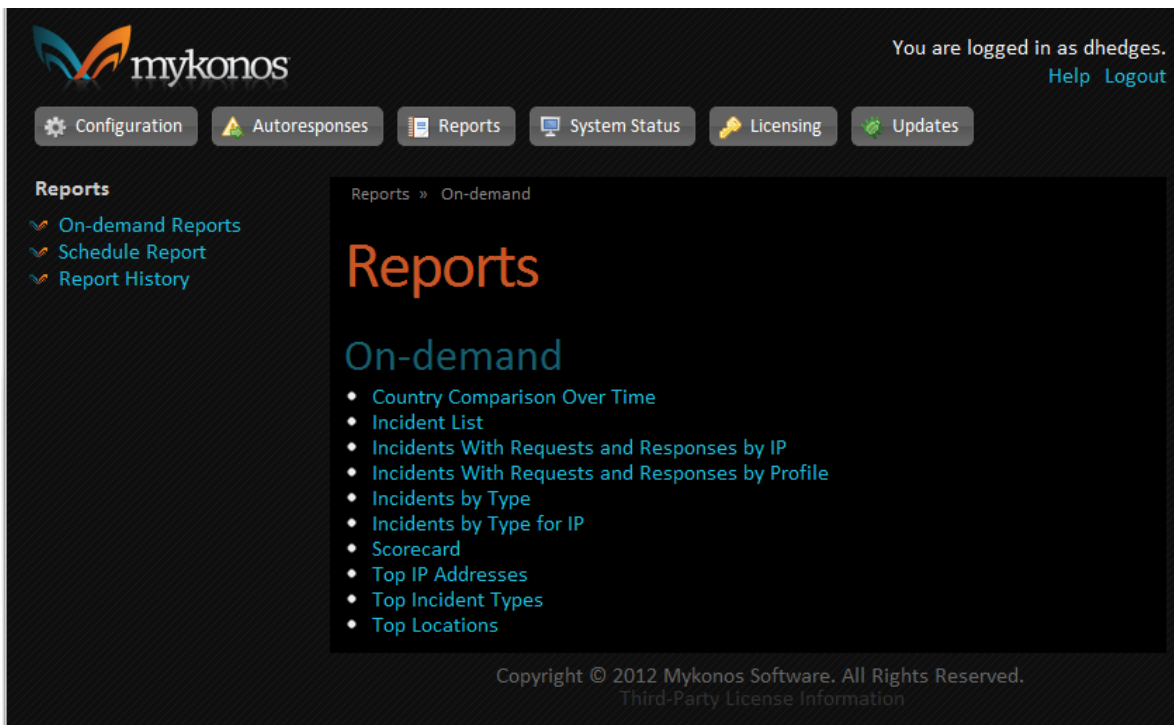
Table 6.29. Google Map Processor Configuration Parameters

Parameter	Type	Default Value	Description
Basic			
Processor Enabled	Boolean	False	Whether traffic should be passed through this processor.
Google API Key	String	[Not Set]	The API key issued by Google to authorize the map API to be used on the domain being protected by Mykonos. This API key should be enabled for both Google Map API v3, and the Custom Search API.
Advanced			
Default Search Term	String	"Criminal Attorney"	The default term to search for localized locations on.

Parameter	Type	Default Value	Description
Dismissal Resource	Map Dismissal Resource	mapdata	The information needed to define the URL and response used to dismiss a map.
Map Directory	String	mapdata	The name of the directory where the map Javascript and css code will be served from. For example: mapdata.

Reporting

The system has a built-in reporting interface that can be accessed through the Configuration Editor, by clicking on the "Reports" button. Administrators can run one of many pre-defined reports or schedule a report or access report history. Most reports can be exported to both PDF and CSV (comma separated value) formats. Reports that are composed of several disparate visual elements (like the Scorecard) are only available in PDF format.



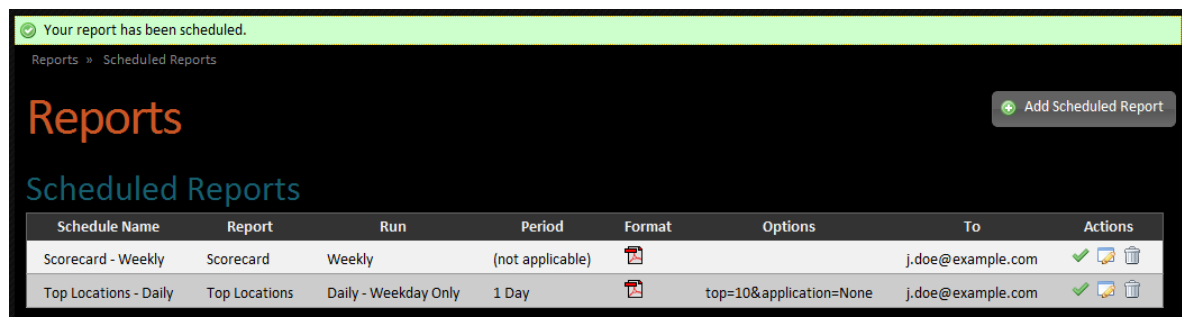
7.1. On-Demand Reporting

This page provides access to reports run on demand. Available reports include:

- Country Comparison Over Time
- Incident List
- Incidents With Requests and Responses by IP
- Incidents with Requests and Responses by Profile
- Incidents by Type
- Incidents by Type for IP
- Scorecard
- Top IP Addresses
- Top Incident Types
- Top Locations

7.2. Report Schedules

Allows administrators to view all of the reports currently scheduled to run on the system, add a new report to the list, edit an existing report schedule, edit an existing report options, or enable/disable an existing report scheduled to run.



7.3. Scheduling a Report

Administrators can configure the reporting interface to generate a report on a custom schedule which will be automatically emailed to any email address specified.

To create a scheduled report select the "Schedule Report" left navigation link and then click the "Add Scheduled Report" button at the top right of the Scheduled Reports page. This will bring up a list of reports to run, choose the report that you want to run on a repeated basis by following its link.

On the subsequent page enter all of the schedule details and report options and then select "Generate Report Schedule" and save the changes.

Most reports share the following options in common:

File type

The file format that will be used to generate the report. Options usually include PDF or CSV. Certain reports are only available in PDF.

Schedule Name

The name of the report schedule that will appear in the reporting interface.

Run

The time schedule in hours, weeks, months, or years that the report should run on.

Period

The period of time that the report should be run on.

Send to

The email address that this report should be sent to.

Enabled

Sets this report schedule to active (YES) or inactive (NO). Inactive reports will not be run on a scheduled basis.

Reports » Schedule Report » Scorecard

Reports

Schedule Report: Scorecard

File type

Schedule name *
Pick a name for the scheduled report.

Run *
How often would you like this report to run?

Send to
Separate email addresses with a comma.

Enabled ☒

Individual reports may have various additional options that are specific to that report. For instance the Country Comparison Over Time report contains a field for the number of countries to show and a list of specific countries to include.

Schedule Report: Country Comparison Over Time

File type

The number of countries to show (top n)

Countries to include **Select options**

Schedule name *

Run *

Period *

Send to

Enabled

Search

✓ Check all ✗ Uncheck all

- ☒ Aland Islands
- ☐ Albania
- ☐ Algeria
- ☐ Angola
- ☐ Anguilla
- ☐ Anonymous Proxy

7.4. Report History

An archive option, which allows administrators to view all of the historical scheduled reports that have been run on the system. Previously run reports can be down-loaded by clicking the icon with the green arrow pointing down. Reports can also be deleted, to save on disk space, by clicking the icon that looks like a trash can.

Report History

Schedule Name	Report	Run	Period	Format	Date	Actions
Scorecard Report	Scorecard	Weekly	1 Week	(52.5 KB)	Thu Apr 26 19:31:05 UTC 2012	
Scorecard Report	Scorecard	Weekly	1 Week	(54.8 KB)	Thu Apr 19 19:30:58 UTC 2012	
Scorecard Report	Scorecard	Weekly	1 Week	(48.8 KB)	Thu Apr 12 19:30:44 UTC 2012	
Scorecard Report	Scorecard	Weekly	1 Week	(48.8 KB)	Mon Apr 09 20:05:42 UTC 2012	

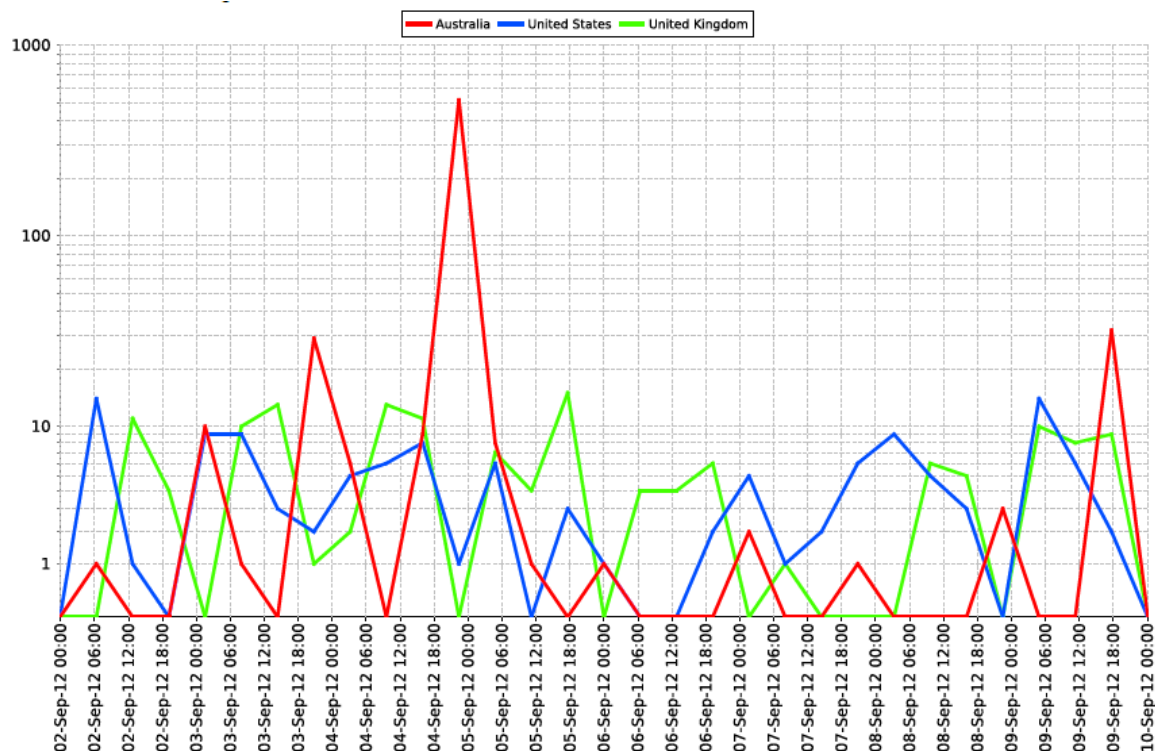
7.5. Report Details

There are ten different reports that are available either immediately, through the On-demand Report page, or on a repeated and scheduled basis, through the Scheduled Report page. Each retrieves different sets of information.

Country Comparison Over Time

This report displays a graph showing the number of incidents per country for the top N number of countries over a specified date range. Administrators can specify the number of countries to include and the specific countries to include as well. Dates are displayed along the horizontal axis. Incident counts are displayed along the vertical axis scaled logarithmically.

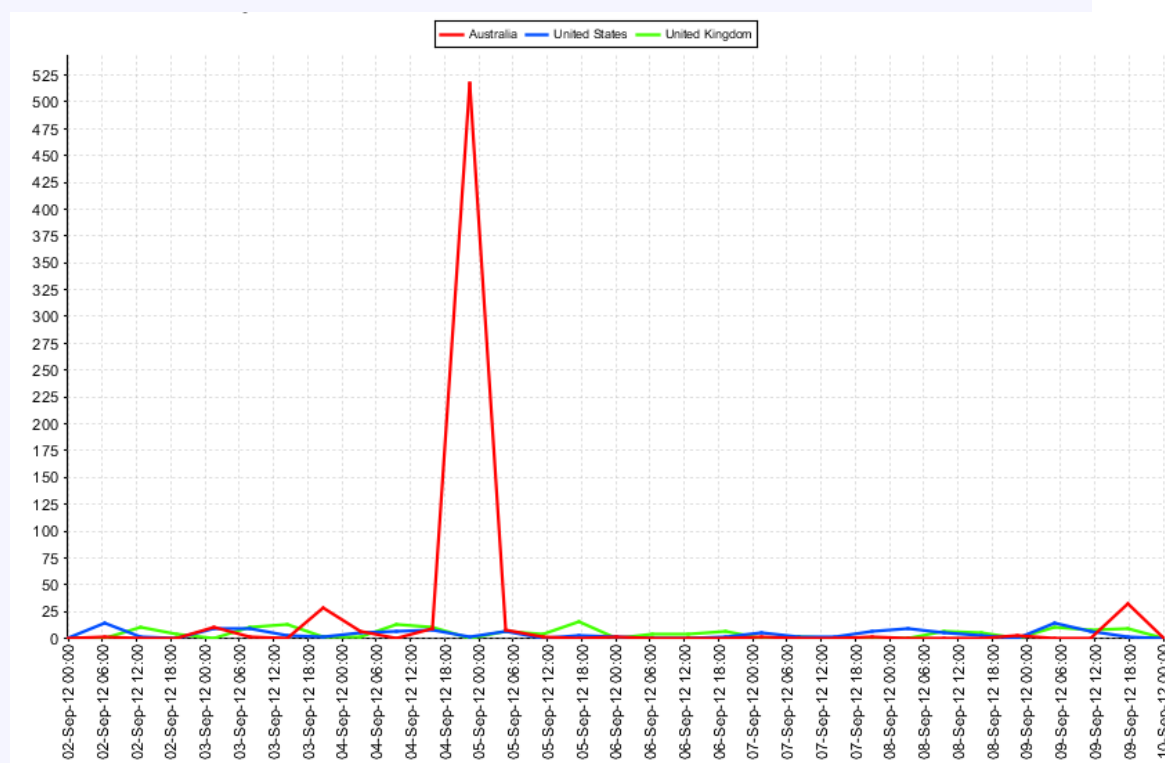
This report is only available in PDF format.





Note

Please note the logarithmic scale on the vertical axis. The distance between hash marks on the graph vary. For instance the hash marks between 1 and 10 increase by 1 each time (1, 2, 3 ...). The hash marks between 10 and 100 increase by 10 (10, 20, 30 ...). The hash marks between 100 and 1000 increase by 100 (100, 200, 300 ...). It is used in the graph above, and in others described below, because the counts may vary widely and displaying them with a logarithmic scale will allow them to be compressed into a more readable format. For instance if the graph above was displayed without a such a scale most of the detail between the 1 and 10 hash marks would be compressed to the point where it would not be readable, as in the graph below.



Incident List

The incident list report displays a list of every incident that occurred between the two given dates. Details for each incident include the type, complexity, count of occurrences, name of the hacker profile associated with the incident, location of the hacker and the first and last date of occurrence of that incident.

The report can be narrowed to include only selected profiles, incident types, countries, a single application, and/or a specified number of incidents by altering the specific options for this report.

Incidents from 05-Aug-12 00:00 to 15-Sep-12 00:00

Mykonos System Report

Application: All

<http://www.mykonossoftware.com/>

Displaying top 100 out of 107 rows

Incident Name	Complexity	Count	Location	Profile	First	Last
Missing User Agent Header	Low	39	Macedonia - Unknown	Inez 8633	23-Aug-12 15:32	23-Aug-12 15:32
Missing User Agent Header	Low	39	China - Shanxi	Beatriz 9780	29-Aug-12 07:35	29-Aug-12 07:36
Missing User Agent Header	Low	7	Canada - Ontario	Mike 6474	29-Aug-12 16:21	29-Aug-12 17:48
Missing User Agent Header	Low	5	United States - Oklahoma	Josie 2020	02-Sep-12 00:00	02-Sep-12 01:55
Missing User Agent Header	Low	5	Canada - Ontario	Rosemarie	30-Aug-12 18:39	30-Aug-12 18:40
Missing User Agent Header	Low	4	United States - California	Joshua 7944	08-Aug-12 13:29	08-Aug-12 13:29
Missing User Agent Header	Low	3	United States - Washington	Darren 1899	20-Aug-12 13:28	20-Aug-12 13:28
Apache Configuration Requested	Low	3	United States - New York	Mercedes 5932	04-Sep-12 11:27	04-Sep-12 11:39
Missing User Agent Header	Low	2	China - Beijing	Lula 5206	30-Aug-12 14:21	30-Aug-12 14:41

Incidents with Requests and Responses by IP

This report lists the incidents for a given IP and date range. Details for each incident include: date of the first occurrence, the user agent string, the request content, the response content, the incident type, and the count of occurrences.

Incidents with Requests and Responses by Profile

This report lists the incidents for a given profile name and date range. Details for each incident include: date of the first occurrence, the user agent string, the request content, the response content, the incident type, and the count of occurrences.

Incidents by Type

This report lists the incidents that have occurred within a given date range. Details displayed include: the type of each incident that has occurred and the count for that particular type.

Incident by Type for IP

This report displays a list of incidents created between the given dates for a given IP Address. Details on the report include: the name of the incident type and the count of the number of incident occurrences of that type.

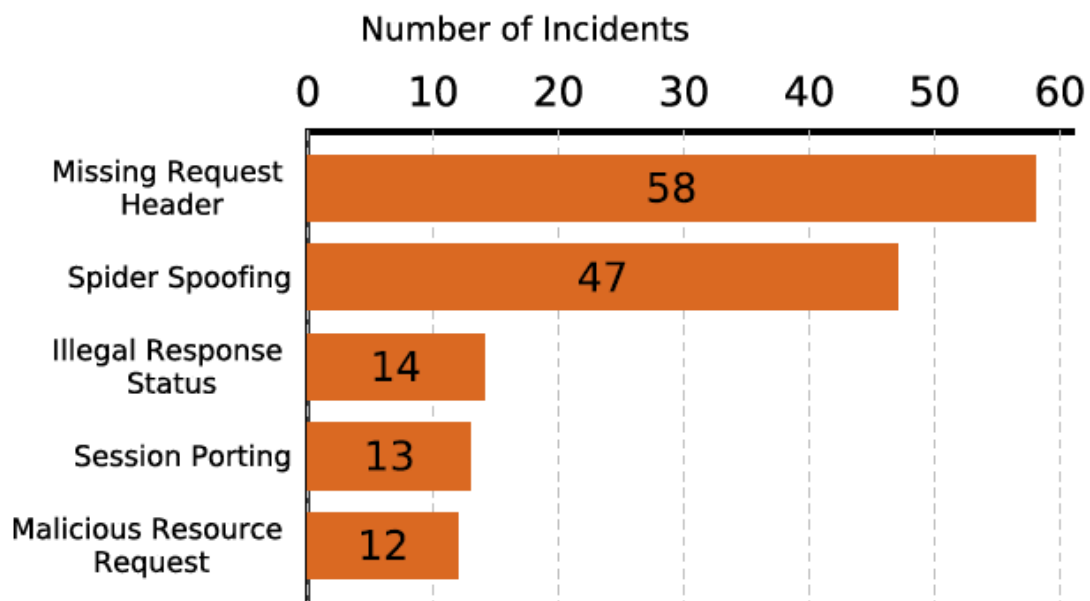
Scorecard

The scorecard report displays a summary of activity on the protected site. The executive summary at the top of the page displays the total number of attackers detected, the number of attackers that have been blocked, and the number of incidents detected for three time periods. These time periods are: from the beginning of the appliance to the the current date, the last month from the first of the month through the last of the month, and the last complete week starting from Sunday through Saturday.

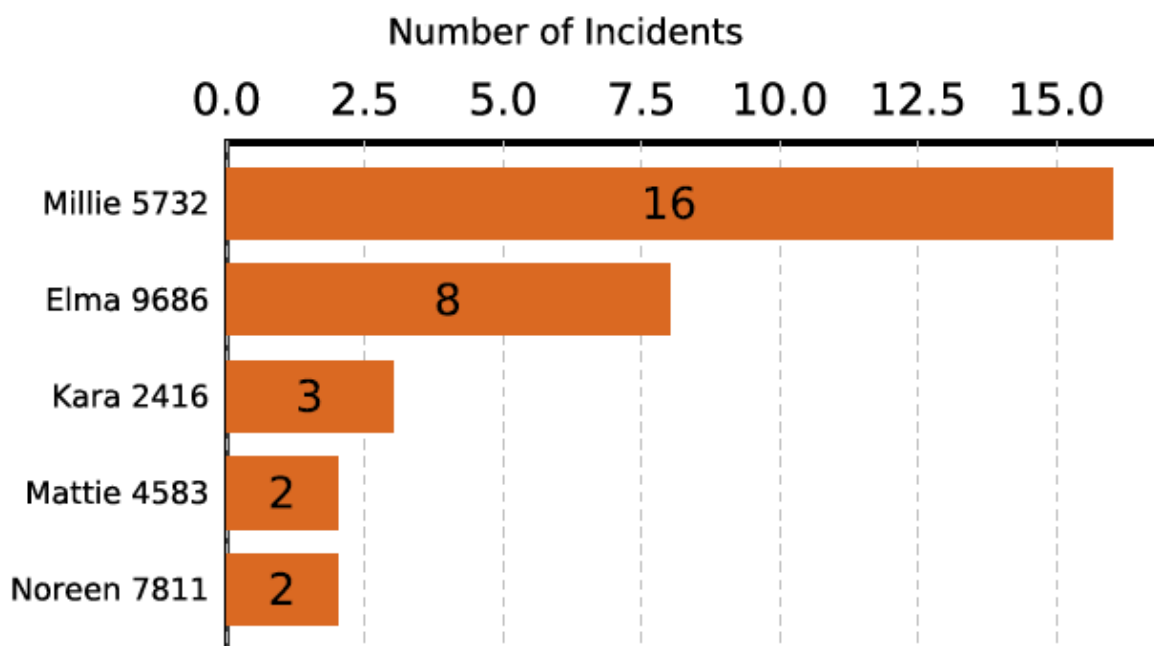
Executive Summary	Attackers Detected	Attackers Blocked	Incidents detected
Since Deployment (15-Nov-11 to 30-Apr-12)	1988	34	9100
Last Month (01-Mar-12 to 31-Mar-12)	444	4	875
Last Week (22-Apr-12 to 28-Apr-12)	39	0	47

Below the executive summary section are four graphs that break out the top five incident types, the top five hackers by volume, the top five countries by volume, and the activity of the previous week broken out by day of the week.

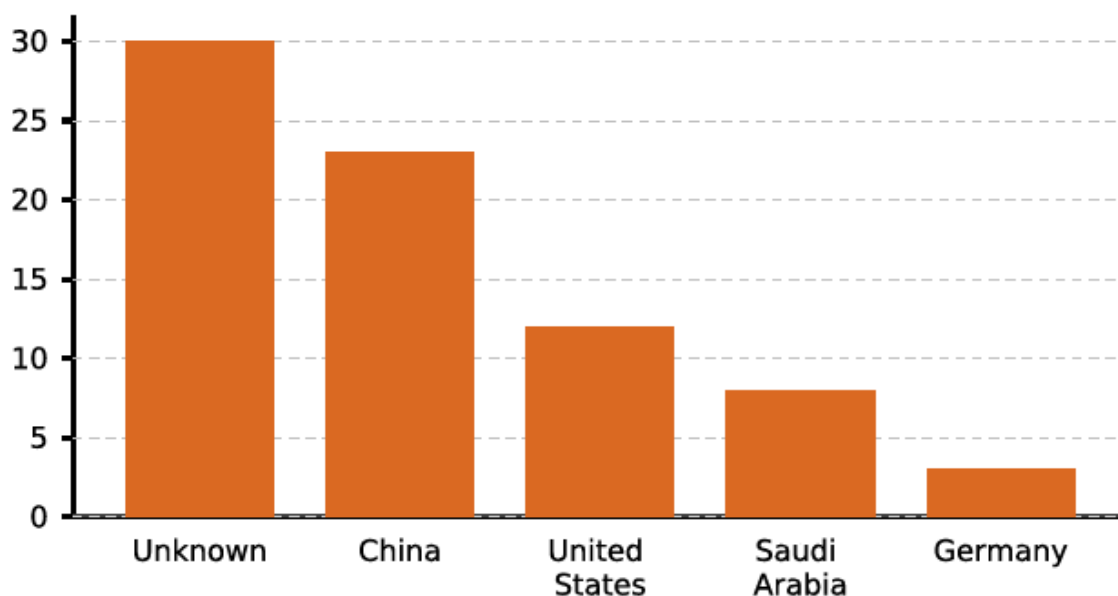
Incident Types (Top 5)



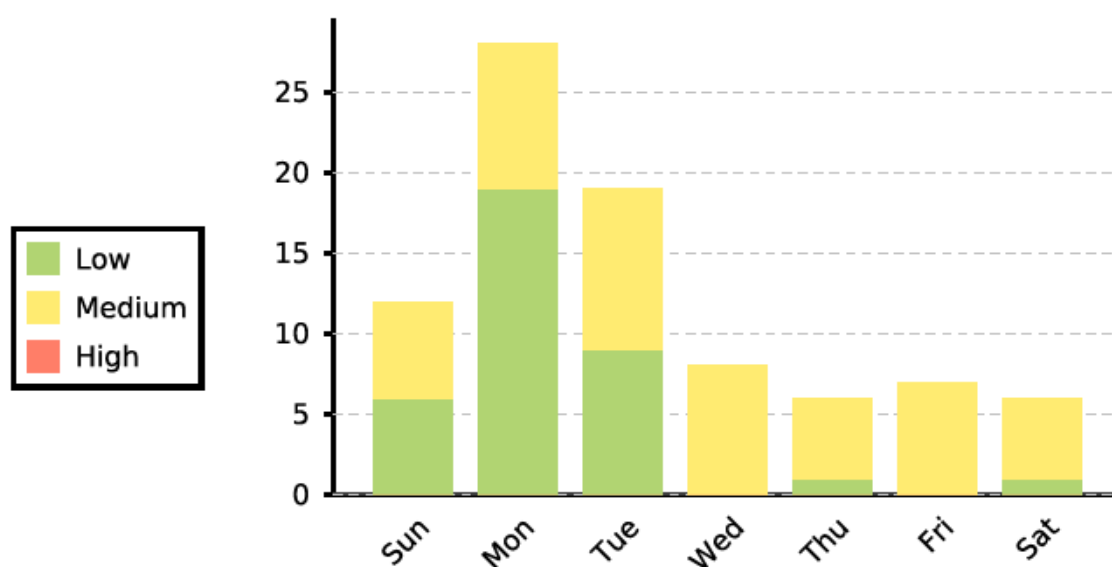
Incident Volume by Hacker (Top 5)



Incident Source Countries (Top 5)



Last week's incident activity



Below the four graphs is the weekly report section, which lists the counts of incidents broken out by threat level and totaled. It also includes counts of the number of hackers who were blocked, the number who were countered with a non blocking response (such as a slowed connection or a warning), the number of hackers that were not responded to (because they were not deemed a high enough threat), and the total number of hackers.

Weekly Report

Threat level of Attackers	Low	Medium	High	Total
Number of Attackers	11	49	0	60

Responses Deployed	Blocking	Non-blocking	None	Total
Number of Attackers	0	15	47	62

This report is only available in PDF format.

Top IP Addresses

The Top IP Addresses report will contain up to five graphs, one for each complexity level, that break down the IP addresses that have caused the most incidents. If there were no incidents of a given complexity then there will not be a graph for that complexity.

This report is only available in PDF format.

Top Incident Types

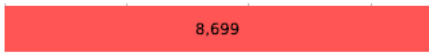
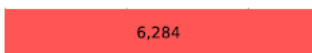



The Top Incident Types report contains a list of the top N incident types over the specified time period, ordered by number of occurrences. Included on the list is supplementary detail such as the number of countries, profiles, and IP addresses related to the type of incident.

Top 13 incident types from 01-Jan-12 00:00 to 15-Sep-12 00:00

Application: All

Mykonos System Report

<http://www.mykonossoftware.com/>

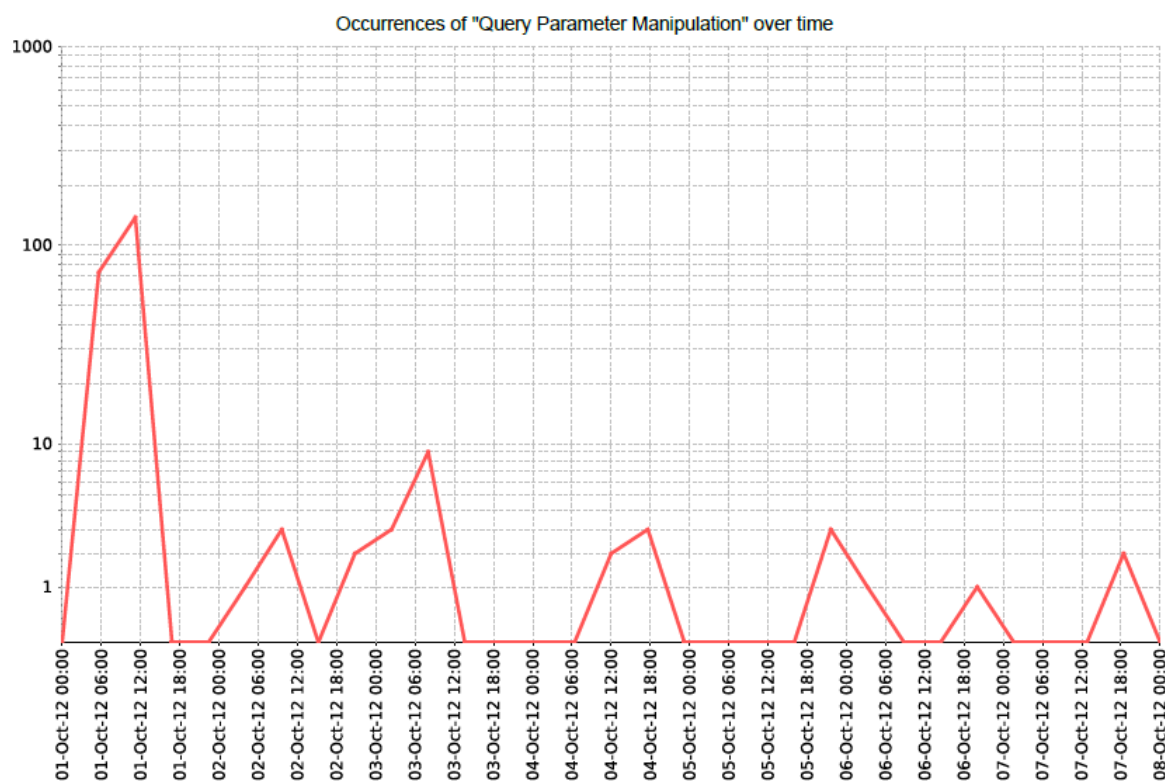
Missing User Agent Header	Occurrence 8699 Profiles: 1231	Countries 45 IP addresses: 599	
Missing Host Header	Occurrence 6284 Profiles: 321	Countries 31 IP addresses: 169	
Malicious Script Introspection	Occurrence 169 Profiles: 169	Countries 16 IP addresses: 114	
Spider Configuration Requested	Occurrence 150 Profiles: 131	Countries 10 IP addresses: 65	
Query Parameter Manipulation	Occurrence 114 Profiles: 11	Countries 8 IP addresses: 11	

Following the list is a set of graphs each on their own page. Each graph is specific to one type of incident on the list and shows the distribution of those incident occurrences over the selected time period. The time period is shown on the horizontal axis. The count of occurrences of each type of incident are shown on the vertical axis scaled logarithmically.



Note

View above note in Country Comparison Over Time report section for explanation of a logarithmic scale.



The report can be narrowed to include a specified number of types of incidents or only a selected set of incidents. It can also be narrowed to only contain data from a specific application.

This report is only available in PDF format.

Top Locations

This report contains a list of the top N locations ordered by the number of incidents that originated from each location during the specified time interval. Included on the list is supplementary information including the number of High, Medium, Low, and Indicator level incidents from each location.

Top 10 locations between 19-Aug-12 00:00 and 19-Sep-12 00:00

<http://www.mykonossoftware.com/>

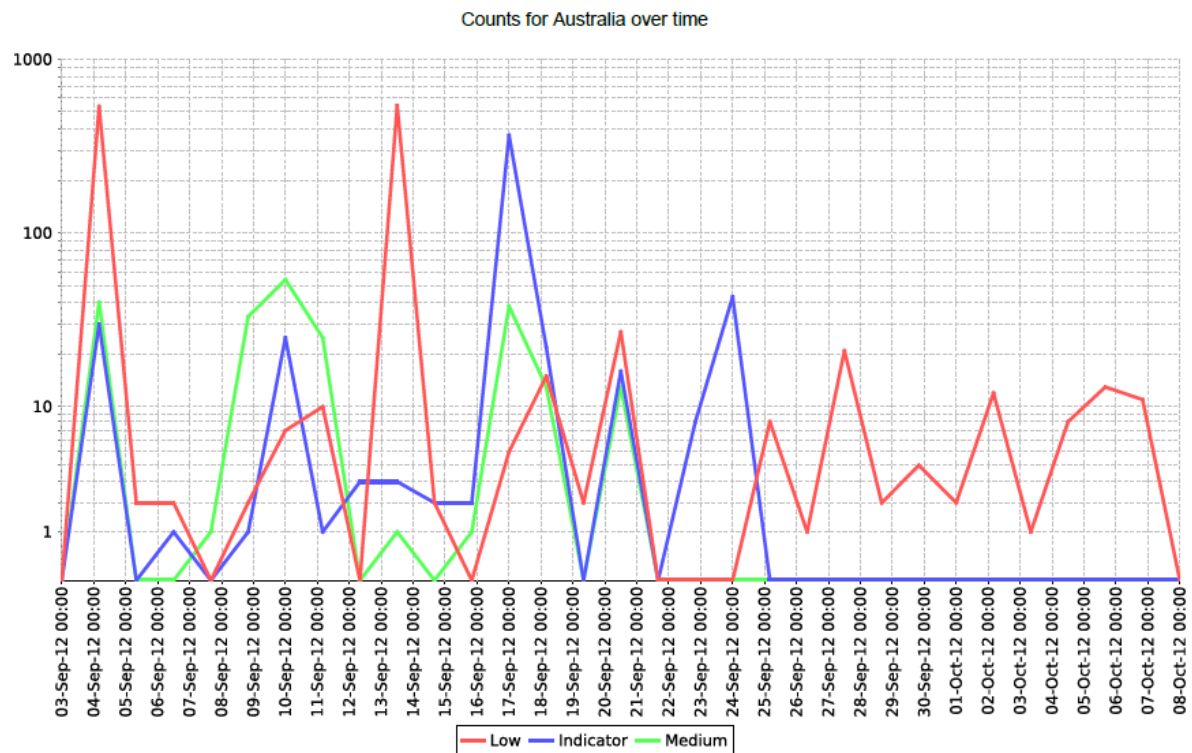
Application: All

Australia	Indicators: 6 Lows: 670	Mediums 906 Highs: 0	1,582
United States	Indicators: 10 Lows: 412	Mediums 1068 Highs: 0	1,490
United Kingdom	Indicators: 0 Lows: 14	Mediums 1044 Highs: 0	1,058
China	Indicators: 0 Lows: 530	Mediums 0 Highs: 0	530

Following the list is a set of graphs each on their own page. Each graph is specific to one country on the list and shows the distribution of each incident level over the selected time period. The horizontal axis shows the time period. The count of occurrences of incidents from a specific country are shown on the vertical axis scaled logarithmically.

**Note**

View above note in Country Comparison Over Time report section for explanation of a logarithmic scale.



This report is only available in PDF format.

Using the Security Monitor

The Mykonos Monitoring Console is the interface used to display the current incidents and sessions being monitored by the system, it can be accessed through a web browser using the [Appliance IP]:8080. The first layer of the console is the dashboard, which contains the navigation menu and the Incidents, sessions and profile graphs. Clicking on any of these graphs or items in the navigation menu will bring up a corresponding widget that the user can use to drill down into the data to get more information.



8.1. Navigation Menu

The Navigation menu, found on the left hand side of the security monitor, displays a clickable list of any of the currently open widgets, allowing users to quickly switch between the different menus and widgets. The number of menus that appear on the dashboard can be configured by clicking on the "Items" dropdown at the top right of the navigation menu, up to four menus can be placed on the dashboard at once.

8.2. Dashboard

The Dashboard provides a quick overview of the current detected and most frequent attacks, active and top hackers, and the counter responses that have been deployed. Clicking the profiles listed under the "Top Hackers" list will bring up the details of that profile.

8.3. Application Specific Views

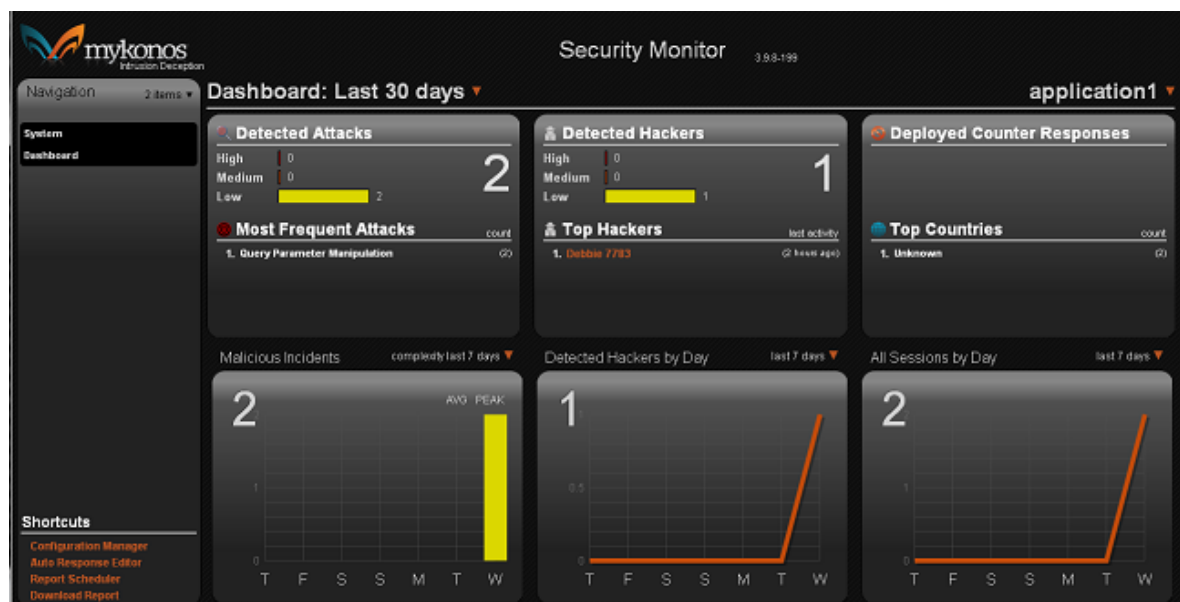
The security monitor now has the ability to narrow its view to a specific application instead of using the original global view of all applications.

The currently active view is displayed in the top right corner of the security monitor. It will only be visible if the "System" navigation option is selected from the navigation menu on the left.

The user may choose to change their current view by clicking the down arrow at the top right of the screen. The list include the "All Applications" option in addition to an option for each configured application. (see green box below).



Selecting one of the applications will change the data displayed on the dashboard and all of the other widget views to include only items that are connected to that application. For instance the Detected Attacks widget will only display attacks targeted at the selected application and the Detected Hackers widget will only display hackers that have made an attack on the selected application and so on.



If a hacker has made attacks on two different applications then their profile will show when either of those application specific views is selected. Similarly if a non malicious session has made requests to more than one application that session will show in the Session List widget when any of those applications are selected.

While the items listed in each widget are specific to that application, please note however, that the "Requests" and "Errors" columns of the Session List, Session, Location and Environment widgets and the "Count" column of the Incident widgets all display the totals across all applications rather than for that specific application. So if

the session list widget shows a session in an application specific view that has 143 requests, then at least one of the requests was made to that application, however there is no guarantee that all of the 143 requests were made to that application, some of the 143 requests may have been made to another application.

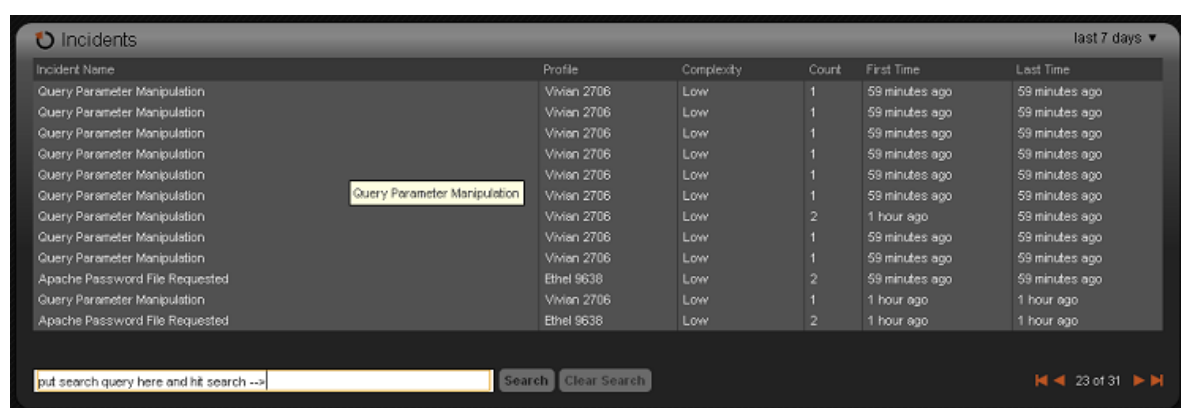
Selecting the "All Applications" option will change the data displayed on the dashboard and all of the other widget views to include all items for all of the applications. This view will include any items that were created prior to the introduction of any particular application and any items that had been caught by an application that was later deleted. Please note that creating a new application will only separate data going forward it will not retroactively separate any data that already appears in the monitor.

8.4. Search

The Security Monitor's Search feature allows the user to filter data collected by Mykonos Web Security, and isolate searched for bits of incident, profile, and session data.

A search can be initiated by entering the desired criteria in the search field found in one of the following widgets:

- Incidents List
- Profiles List
- Sessions

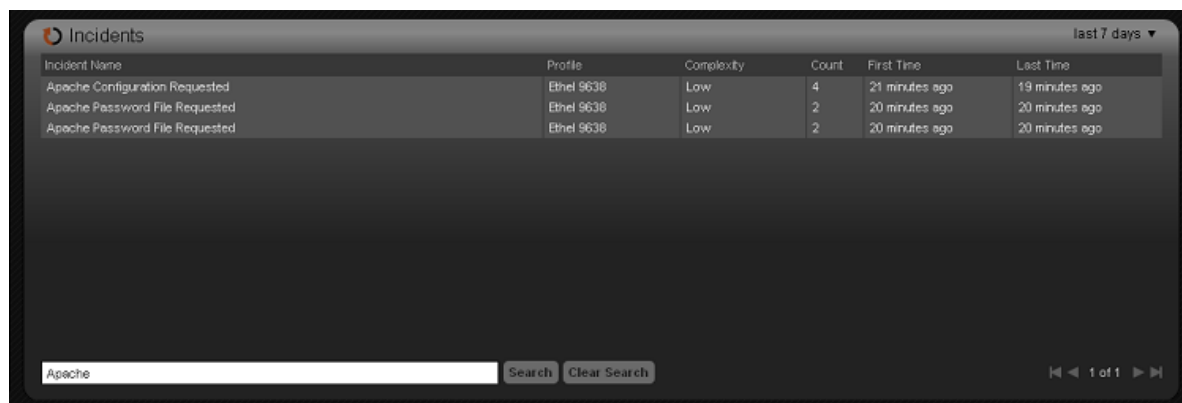


Incident Name	Profile	Complexity	Count	First Time	Last Time
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	2	1 hour ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	59 minutes ago	59 minutes ago
Apache Password File Requested	Ethel 9638	Low	2	59 minutes ago	59 minutes ago
Query Parameter Manipulation	Vivian 2706	Low	1	1 hour ago	1 hour ago
Apache Password File Requested	Ethel 9638	Low	2	1 hour ago	1 hour ago

The Security Monitor's search engine will return matches after comparing the submitted search query text to the following data fields:

- Browser Name
- Browser Version
- Useragent String
- Incident Name
- IP Address
- Host
- Region
- City
- Zip

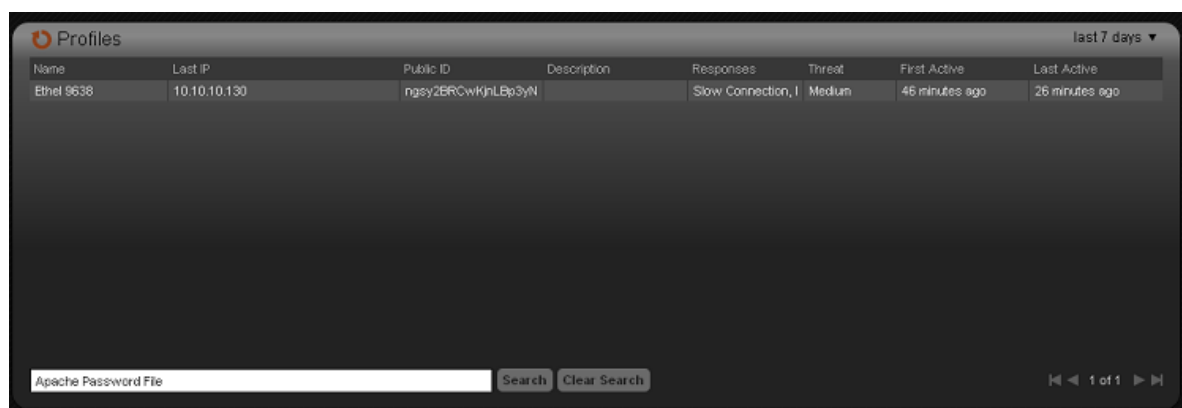
- Country Name
- Profile Name
- Profile Description
- Profile Public ID
- Request Content
- Response Content



The screenshot shows the 'Incidents' widget with a table of incident data. The table has columns for Incident Name, Profile, Complexity, Count, First Time, and Last Time. The data is filtered for the 'last 7 days'. At the bottom, there is a search bar containing the text 'Apache' and buttons for 'Search' and 'Clear Search'.

Incident Name	Profile	Complexity	Count	First Time	Last Time
Apache Configuration Requested	Ethel 9638	Low	4	21 minutes ago	19 minutes ago
Apache Password File Requested	Ethel 9638	Low	2	20 minutes ago	20 minutes ago
Apache Password File Requested	Ethel 9638	Low	2	20 minutes ago	20 minutes ago

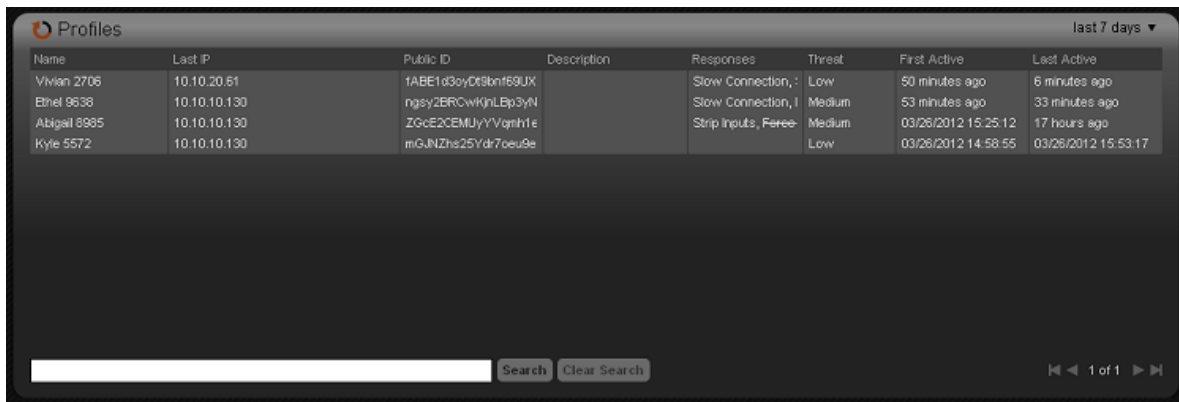
All of the above fields are searched for any of the widgets, even if the particular field does not appear on that widget. For example users can search the Profiles List widget by Incident Name and it will return only Profiles that are associated with that Incident, even though that field is not shown on the Profiles List widget.



The screenshot shows the 'Profiles' widget with a table of profile data. The table has columns for Name, Last IP, Public ID, Description, Responses, Threat, First Active, and Last Active. The data is filtered for the 'last 7 days'. At the bottom, there is a search bar containing the text 'Apache Password File' and buttons for 'Search' and 'Clear Search'.

Name	Last IP	Public ID	Description	Responses	Threat	First Active	Last Active
Ethel 9638	10.10.10.130	ngsy2ERcWkjpLBp3yN		Slow Connection, I	Medium	46 minutes ago	26 minutes ago

The clear search button will clear out the search query text box and reset the widget to its default contents.



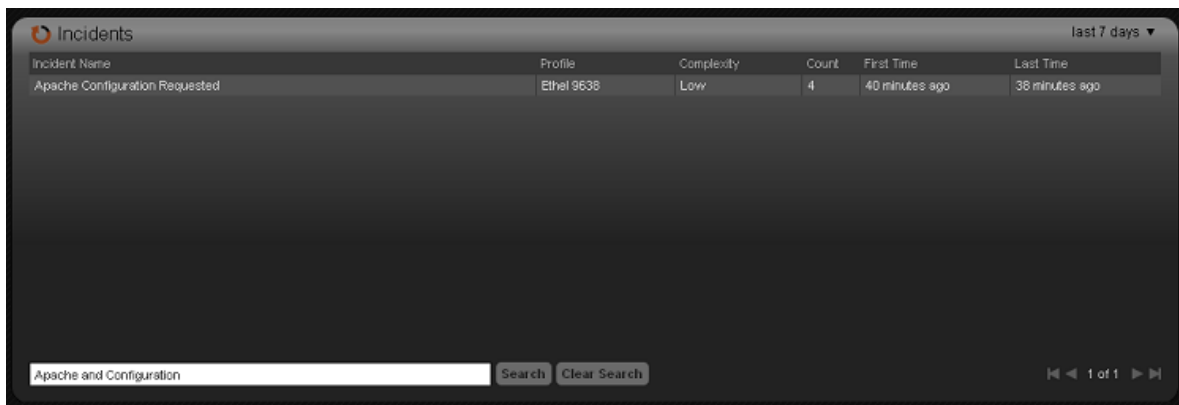
Name	Last IP	Public ID	Description	Responses	Threat	First Active	Last Active
Vivian 2706	10.10.20.61	1ABE1d3oyOt9bnf69Uk		Slow Connection, "	Low	50 minutes ago	6 minutes ago
Ethel 9638	10.10.10.130	ngsy2BRCwkjnlEp3yN		Slow Connection, I	Medium	53 minutes ago	33 minutes ago
Abigail 8985	10.10.10.130	ZGcE2CEMUYyVgmh1e		Strip Inputs, Feeee	Medium	03/26/2012 15:25:12	17 hours ago
Kyle 5572	10.10.10.130	mGUNZhs25Ydr7ceu9e			Low	03/26/2012 14:58:55	03/26/2012 15:53:17

8.4.1. Additional Search Query Options

Query strings can also be modified by using the word "and" or "or" or by the use of parentheses.

The "and" Keyword:

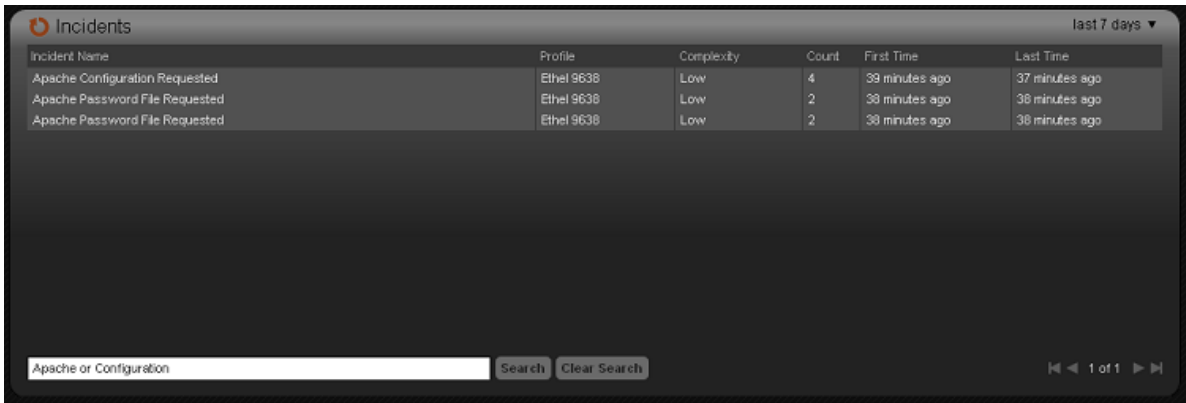
If user includes the word "and" (without quotes) as part of search parameter, for example "Apache and Configuration", we will search for a single record that contains reference to both Apache and Configuration. We will not search for records that contain references to one or the other, ONLY those with references to both. Users can also use the "&" character in place of the word "and".



Incident Name	Profile	Complexity	Count	First Time	Last Time
Apache Configuration Requested	Ethel 9638	Low	4	40 minutes ago	38 minutes ago

The "or" Keyword:

If user includes the word "or" (without quotes) as part of search parameter, for example "Apache or Configuration", we will search for any record that contains reference to either Apache or Configuration OR reference to both. Users can also use the "|" character in place of the word "or".



The screenshot shows a web interface titled "Incidents" with a dropdown menu set to "last 7 days". Below the title is a table with the following data:

Incident Name	Profile	Complexity	Count	First Time	Last Time
Apache Configuration Requested	Ethel 9638	Low	4	39 minutes ago	37 minutes ago
Apache Password File Requested	Ethel 9638	Low	2	38 minutes ago	38 minutes ago
Apache Password File Requested	Ethel 9638	Low	2	38 minutes ago	38 minutes ago

At the bottom of the widget, there is a search bar containing the text "Apache or Configuration", a "Search" button, and a "Clear Search" button. To the right of the search bar, there are navigation controls showing "1 of 1".

Parentheses:

Parentheses can be used to control order of operations when using multiple parameters. If a user searches for "Ethel and (Apache or Manipulation)", results will return that match either Apache or Manipulation in addition to Ethel.

Prefix Search:

If the word a user enters is the beginning of another word it will be matched. So if a user searches for "Config" records matching "Config" and "Configuration" will be returned. Similarly if a user searches for the start of an IP address "120.193." the results will return any IP addresses that start with those numbers.

8.5. Incidents, Sessions, and Profiles Charts

These graphs provide an overview of the number of incidents, sessions, and profiles that the software currently has logged. By default the graphs will display the totals for each section. Hovering the mouse over any point where the graph intercepts a day will show the count for that day. Clicking on any of the graphs will launch the corresponding widget.

this menu also provides shortcut links to the software Configuration Manager, Auto Response Editor, and reporting features.



8.6. Incidents Menu Filter Options

Table 8.1. Incidents Menu Filter Options

Graph	Configuration	Description
Incidents	Severity	Only display results for the last: 12hrs, 24hours, 7 days, 14 days, or 32 days.

Graph	Configuration	Description
	Count	Displays incident count for the last: 12hrs, 24hours, 7 days, 14 days, or 32 days.
	Severity(pie)	Display results in a pie chart for the last: 12hrs, 24hours, 7 days, 14 days, or 32 days.
Sessions	Count	Displays the sessions created for the last: 12hrs, 24hours, 7 days, 14 days, or 32 days.
Profiles	Count	Displays the profiles created for the last: 12hrs, 24hours, 7 days, 14 days, or 32 days.

8.7. Complexity Definitions

Complexity is a rating of the skill, effort, and experience necessary to trigger a specific incident. The following is a description of the rating system:

Table 8.2. Complexity Definitions

Complexity	Description
Low (Suspicious)	The incident can be triggered without any special tools or hacking techniques. It is possible, though unlikely, that a non malicious user may accidentally exhibit the behavior necessary to trigger the incident. For example, altering the contents of the query string could be the results of a sloppy copy/paste of a URL.
Medium (Passively Malicious)	The incident can be triggered only with the use of tools or less commonly used browser features. There is no chance that a legitimate user will accidentally trigger the incident. Incidents of this complexity are primarily triggered by pre-fabricated scripts and scanners, and therefore do not reflect the experience of the hacker. It would be easy for a user with malicious intent to trigger an incident of this complexity without actually understanding anything they are doing. For example, making a request with the OPTIONS http method, which is usually a step performed by most vulnerability scanners.
High (Directly Malicious)	The incident can be triggered only with the use of tools or advanced browser features. There is no chance that a legitimate user will accidentally trigger the incident. Incidents of this complexity generally require a deeper understanding of web vulnerabilities in combination with independent specialized tools. It would be fairly difficult for a malicious user to trigger incidents of this complexity without truly understanding the nature of the potential vulnerability. For example, calling a JavaScript AJAX method manually from firebug.
Extreme (Targeted)	The incident can be triggered only with the use of tools and advanced browser features. There is no chance that a legitimate user will accidentally trigger the incident. Incidents of this complexity require a very deep understanding of web vulnerabilities, security tools, and applied hacking techniques. These incidents are extremely difficult for an inexperienced user to trigger. For example, using a tool such as John-The-Ripper to crack the encryption used on an .htpasswd file.

8.8. Incidents List Widget

The Incidents list provides a list of all the Incidents currently being tracked on the system. Selecting any incident from the Incidents list will launch the incidents widget, which provides a detailed view of the incident. The Incidents list provides the following information:

Incident Name	Profile	Complexity	Count	First Time	Last Time
Apache Password File Requested	Wendy 5526	Low	1	55 minutes ago	55 minutes ago
Apache Configuration Requested	Wendy 5526	Low	1	55 minutes ago	55 minutes ago
Malicious Service Call	Rafael 7898	Medium	1	1 hour ago	1 hour ago
Malicious Service Call	Jasmine 8255	Medium	1	1 hour ago	1 hour ago
Malicious Service Call	Rafael 7898	Medium	1	1 hour ago	1 hour ago
Malicious Service Call	Jasmine 8255	Medium	1	1 hour ago	1 hour ago
Malicious Service Call	Claudette 8729	Medium	2	2 hours ago	2 hours ago
Malicious Service Call	Claudette 8729	Medium	1	2 hours ago	2 hours ago
Malicious Service Call	Claudette 8729	Medium	1	2 hours ago	2 hours ago
Malicious Service Call	Claudette 8729	Medium	1	2 hours ago	2 hours ago

8.8.1. Incidents List Details

Table 8.3. Incidents List Details

Column	Description
Incident Name	The name of the incident that was triggered.
Profile	The hacker profile associated with this incident.
Severity	The severity level associated with this form of attack.
Complexity	The relative difficulty of this type of attack.
Time	The time at which the incident took place.
Pagination	If there are multiple pages worth of incident data, clicking here will either bring up the next page in the incidents list or the previous page. Users can also click the page number; enter a new value in the text field and hit the enter key, which will skip to the desired page.
Refresh Timer	Sets the refresh time on the incidents list or can be used to manually refresh the list.

8.9. Incident Widget

The Incident widget provides users with a detailed account of each incident that is being tracked. Users can view the content of the request that triggered the incident, the response data, and customize the assigned severity level. The Incident widget provides the following information:

8.9.1. Incidents Widget Details

Table 8.4. Incidents Widget Details

Item	Description
Description Tab	Provides a description of the incident.
Details	Allows users to view the details associated with this incident.
Request	Displays all of the details of the request header for this incident.
Response	Displays the header details of the response for this incident.
View Content Body	This option is available from the Request and Response tabs and allows users to view the content of this request or the content of the response returned to the client.
Name	Name that the system has assigned to the hacker profile.
Threat	The level of threat that this hacker poses. This rank is based on the complexity of the hacking attempts that associated with this profile.
Location	The location that the request came from.
User Agent	The browser and OS that the computer submitting the request is using.



Note

Clicking on any of the orange text in the incident details will launch the appropriate widget and allow the user to drill down into an event for more detailed information. Clicking the orange configuration icon will allow the user to change the complexity level that is assigned to this incident.

8.10. Sessions Widget

The session widget stores the data that is logged during different hacker sessions.

Remote Address	Browser	Operating System	Location	Requests	Errors	Profile Name	First Active	Last Active
10.30.1.240	Firefox 3.6.1	Windows XP		16749	0		42 minutes ago	38 minutes ago
10.30.1.9	Firefox 3.6.17	Windows 7		73	10	Claudette 8729	17 hours ago	51 minutes ago
10.30.1.232	Firefox 3.6.18	Windows 7		13	2	Wendy 5526	4 hours ago	57 minutes ago
10.30.1.240	Chrome 12.0.742.112	Windows 7		93	2	Ray 6942	07/11/2011 09:18:31	1 hour ago
10.30.1.9	Firefox 5.0	Windows 7		2	0	Rafael 7898	2 hours ago	2 hours ago
10.30.1.9	Firefox 5.0	Windows 7		39	2	Jasmine 8255	07/11/2011 13:05:27	2 hours ago
10.30.1.240	Firefox 5.0	Windows 7		61	24	Carole 5709	07/11/2011 16:15:06	2 hours ago
10.30.1.9	Firefox 3.6.17	Windows 7		4	0		16 hours ago	16 hours ago
10.30.1.9	Unknown Unknown	Unknown		20	10		16 hours ago	16 hours ago
10.30.1.239	Firefox 5.0	Windows 7		52	4		07/11/2011 14:29:30	07/11/2011 16:09:05
10.30.1.239	Internet Explorer 9.0	Windows 7		31118	14		07/11/2011 15:41:27	07/11/2011 15:48:54

The information that is logged includes:

- IP Address
- Location
- Profile name

- Time since last activity
- The number of requests
- Errors

Selecting the Incidents, Environments, or Locations tab will load the low level data for the selected session from those widgets.

8.11. Profile List Widget

The Profiles list widget provides a list of all the profiles that have been created and that are currently active in the system. Selecting any profile from the list will launch the profile widget, which provides a detailed view of each user profile. The list provides the following information:

Name	Last IP	Public ID	Description	Responses	Threat	First Active	Last Active
Norman 2588		3n7LvMaYjWcon1M8lgzO	Tried to hack into the development system.	Slow Connection, Force Capt	Low	8 hours ago	8 hours ago
Catherine 3965		VaHWPcd3xs6xgKIADIZn			Low	9 hours ago	9 hours ago
Rita 8199		QLqes9Wb6hj8Sx2MJre			Low	19 hours ago	19 hours ago
Joanne 4605		h7Q6LmY1UEhwhPxxw8hS			Low	04/17/2012 07:13:07	04/17/2012 07:13:07
Camille 6380		5ex4qp4RA5yHrighQO3U			Low	04/17/2012 06:00:50	04/17/2012 06:00:50
Sherrie 2101		QoF9550QzcYVzg2apYeT			Low	04/16/2012 21:01:15	04/16/2012 21:01:15
Lawanda 8947		cavlyYCoXpc8lsc51dpb	Automated tool used to obtain company em	Force Captcha Validation	Low	04/16/2012 07:30:16	04/16/2012 07:33:05
Harriet 2868		x3p9a64AcdJqjQvHK7L			Low	04/16/2012 00:06:45	04/16/2012 00:06:45
Daphne 2734		07tbDcwV7kUzxWxpOkiv			Low	04/13/2012 19:19:11	04/13/2012 19:19:11
Bettie 5233		ZorrPdpMDW8woowYaBa3	Attempted to hack the Gibson.	Block User, Force Captch	Low	04/13/2012 18:16:00	04/13/2012 18:16:00
Myrtle 7817		FHYIsRK2MM7ZrCNCJ5nq			Low	04/13/2012 10:58:24	04/13/2012 10:58:24

8.11.1. Profiles List Details

Table 8.5. Profiles List Details

Column	Description
Name	The name of the profile.
Last IP	The last known non-proxy IP address of the profile.
Public ID	The ID assigned to the profile for use in the Support Processor, when unblocking a profile.
Description	A customizable description of this profile.
Response	A list of the auto responses that have been deployed on this profile.
Threat	The threat level posed by this profile.
First Active	The first time this profile created an incident on the system.
Last Active	The time that this account was last active on the system

8.12. Profile Widget

The Profile widget stores the data that is logged for each profile on the system. Admins can use this widget to see details on the hacker such as locations, sessions, responses, and can create a custom description of a profile with any extra notes and information.

Profile: Camille 6380 1 day ago

Incidents Sessions Locations Environments Responses Description

Name	Complexity	Count	First Time	Last Time
Missing User Agent Header	Low	1	04/17/2012 06:00:53	04/17/2012 06:00:53
Missing Host Header	Low	1	04/17/2012 06:00:53	04/17/2012 06:00:53
Missing Request Header	Suspicious	1	04/17/2012 06:00:50	04/17/2012 06:00:50

Camille 6380

Threat: Low

Last IP: [REDACTED]

Last Active: 04/17/2012 06:00:50
First Active: 04/17/2012 06:00:50

Show only malicious incidents

Users can drill down into a profile through any of the tabs on the profile widget for greater detail. The default information that is logged includes:

Table 8.6. Profile Widget Details

Item	Description
Name	The name associated with this profile.
Threat	The level of threat this hacker poses to the system.
Last Active	The last time the hacker was active on the system.
First Active	The first time this profile was active on the system.
Complexity	The complexity of the attack this profile used.
Count	The number of times this account has been active on the system.
First Time	The first time that the incident took place.
Last Time	The last time that the incident took place.

The profiles widget gives users a view into all of data that the system has gathered on a hacker. The profile widget divides profile information across 6 tabs:

Incidents Tab

The incidents tab gives a quick breakdown of the incidents and their details that are associated with this profile.

Sessions Tab

This tab provides a quick break down of the sessions and their details that are associated with this profile.

Locations Tab

This tab will show the remote address, host name, city region, postal code, country and the number of requests that are associated with this profile.

Environments Tab

Gives a list of the environments details, such as, browser name, version, OS and the number of requests from this profile. Double clicking anything in this list will launch the environments widget.

Responses Tab

Displays a list of the default auto responses that are active for this profile. This menu also provides a means for deactivating or changing an auto response.

Descriptions Tab

Shows a description for this profile, if an administrator has created any.

8.12.1. Editing a Profile

Next to the profile picture you will see a small gear shaped icon. Clicking on the icon brings up the menu and will allow administrators to edit the profile name, description associated with this profile, and the avatar, as well as allow the administrator to delete the entire profile.

8.12.2. Configuring Responses

By clicking on the Responses Tab next in the Profile Widget, users will be given the option to configure how the system responds to a hacker and view the details of any currently active responses.

Table 8.7. Response Configuration Options

Option	Description
Warn User	The suspected hacker will be sent a pop-up with a warning letting them know we are tracking them.
Block User	The suspected hacker's access to the site will be removed and they will be blocked.
Force Captcha Validation	The suspected hacker will be presented with a captcha the must be answered to continue using a site.
Inject Header	The suspected hackers requests will have a custom header injected into them.
Slow Connection	The suspected hackers request will be delayed by a configurable value.
Strip Inputs	The query parameters and form fields will be stripped from requests issued by the suspected hacker.
Logout User	Terminates any current user sessions for this profile on a site.
Break Authentication	Hashes any incoming passwords when attempting to login, effectively thwarting brute-force attacks that have correct credentials. Even with the correct password, the login will be unsuccessful.
Cloppy	Activates an animated paperclip that intimidates the user.



Note

After selecting a response, there will be no "on screen notification" for what option was selected until the console screen refreshes. Even though the notification for selecting a response is not immediately displayed, the response itself is immediately active.

8.13. Location Widget



The locations widget records the IP address, location, the number of requests, and the last time that a hacker profile was active. Locations are displayed on a global map and administrators have the option to zoom in on the location of a hacker's IP address.

- Profile
- Incident
- Session
- Environment

Double clicking on any of the records listed on these tabs will launch the corresponding widget allowing a drill down for more information.

8.14. Environment Details

The environment widget provides details on a hacker's user environment. The security console will gather user information on any hacker that creates an incident and keep a list of them here. The information gathered includes:

- Browser
- Browser version
- Operating system
- Number of requests made
- Time of last request

Auto-Response Configuration

Autoresponses

An autoreponse is composed of a set of rules which define the conditions under which a counter response should be automatically created and activated for a specific session or profile. It is possible to have as many rules as needed to protect the system. However, the more rules, the longer it will take to determine if a new incident matches an event condition. In addition, the more conditions in the rule, the longer the rule will take to evaluate if the event condition matches a new incident.

Showing all autoreponses. [Only show active autoreponses.](#)

Name	Status	Description	Actions
Session Management		This auto response rule provides handling for the core session management incidents generated by the security engine. Session Cookie Spoofing (0001): 1x = Logout User, 2x = 1 Day Clear Inputs, 3x = 5 Day Clear Inputs; Session Cookie Tampering (0004): 1x = Logout User, 2x = 1 Day Clear Inputs, 3x = 5 Day Clear Inputs;	
Processor: User Agent		This auto response rule provides handling for incidents related to the user agent processor. Specifically the case where a user changes their user agent in the middle of navigating the protected website. Session Porting (0002): 6x = Logout User, 8x = Captcha & Logout User, 9x = Warn & Logout User & Slow Connection 2-6 seconds, 10x = Logout User & Slow Connection 4-15 seconds;	
Processor: ETag Beacon		This auto response rule provides handling for incidents generated by the etag beacon processor. These incidents are generally triggered when a user attempts to exploit the tracking mechanism used by the application to reidentify users. This rule is designed to first slow the users connection down, and if the behavior continues, slow it down even further. Session ETag Spoofing (1001): 1x = Slow Connection 2-6 seconds, 3x = Slow Connection 4-15 seconds;	
Processor: Application Vulnerability Processor		This auto response rule provides handling for incidents generated by the application vulnerability processor. These incidents are generally triggered when a user attempts to exploit a known vulnerability in a 3rd party application. This rule is designed to first slow the users connection down, and if the behavior continues, break the application with the clear input response.	

An auto response is composed of a set of rules which define the conditions under which a counter response should be automatically created and activated for a specific session or profile. It is possible to have as many rules as needed to protect the system. However, the more rules, the longer it will take to determine if a new incident matches an event condition. In addition, the more conditions in the rule, the longer the rule will take to evaluate if the event condition matches a new incident.

Table 9.1. Auto Response Descriptions

Default Auto Response	Description
Session Management	This auto response rule triggers if the user attempts to manipulate the mykonos session tracking cookie. A first attempt will result in a forced logout of the application, and subsequent attempts will result in progressively longer blocks.
Application Vulnerability Processor	If your web-application uses supported 3rd party applications (like Joomla, Wordpress, etc.), this processor will analyze and act on malicious traffic that intends to exploit them. For more information on which 3rd party tools are supported, refer to the AutoResponse documentation in Security Monitor.
User Agent Processor	This auto response rule triggers when the user attempts to use the same session information between multiple browsers. After this happens 2 more times, the user will first be required to complete a captcha. Then if they do it again, they will be warned, and their connection will be progressively slowed.

Default Auto Response	Description
Login Processor	This rule triggers on incidents that are generally triggered by abusive and suspicious activity targeted at the websites authentication system.
Access Policy Processor	This auto response rule triggers if the user attempts to exploit the fake service exposed by this processor. The user will be automatically blocked for 5 days.
ETag Beacon Processor	This auto response rule triggers if a user attempts to manipulate the mykonos cached based tracking token. The user's connection will be progressively slowed down.
Basic Authentication Processor	This auto response rule triggers when the user attempts to exploit the fake .htaccess file exposed by this processor. Simple exploration will result in the user's connection being slowed. Brute force attempts will be stopped with a captcha or block, and successful breaches of the fake protected resource will result in a permanent block.
Robots Processor	This auto response triggers when the user or malicious spider uses the information in the robots.txt file for illegitimate purposes. The first incident results in a captcha, and subsequent violations result in a 1 day block.
Hidden Input Form Processor	This auto response rule triggers when the user modifies a hidden form input parameter. The first attempt will result in the users connection being slowed down. The second attempt will result in a forced logout of the web application, and a third attempt will cause all of the users input to be stripped for all future requests to the web application. Attempts to change the content type of the form will result in a permanent block.
Cookie Processor	This auto response rule triggers when the user attempts to manipulate the value of a cookie. The first attempt will result in the connection to the website being slowed down. The second attempt will result in a block.
AJAX Processor	This auto response rule triggers when the user interacts with a fake AJAX function injected into the web application. If the user reverse engineers the code and manually invokes its behavior, such as would happen with an automated script or spider, the first incident will result in a forced captcha and a slower connection, and the second attempt will result in a 10 minute block. If the user actually invokes the Javascript function, the first invocation will result in a slower connection, while a second invocation will result in a 10 minute block.
Header Processor	This auto response rule triggers when the user has unusual headers or header data which a normal browser or well developed spider would not supply. If the user excludes required headers such as Host and UserAgent, their connection will be slowed and they will be required to complete a captcha. If the user manipulates their user agent header, they will first be forced to complete a captcha, on a second offense, they will be warned and have their connection slowed. Attempts to overflow headers beyond RFC standards will cause a 1 day block.
Hidden Link Processor	This auto response rule triggers when a spider or malicious user attempts to identify unreferenced resources in a fake directory. Any attempt to perform a directory index or fish for valid file names will cause the connection to be slowed and the user to be blocked for 1 day.
Query Parameter Processor	This auto response rule triggers when a user manipulates the fake query parameter injected by the system more than 3 times. The users connection will be slowed and they will be automatically blocked for 1 day.
Method Processor	This auto response rule triggers when a user or spider sends a request with a malicious HTTP method such as TRACE. Violations will cause the users connection to be slowed and they will be blocked after 10 minutes for 1 day.

Default Auto Response	Description
Error Processor	This auto response rule triggers when a user attempts to find unreferenced resources by guessing file names. Repeat attempts to find nonexistent resources will result in a 1 day block.
File Processor	This auto response rule triggers when a user attempts to find sensitive files by guessing file names or changing parts of valid file names. After enough attempts, the user will be blocked for 5 days.
Warning Processor	This auto response rule triggers when a user attempts to automate the dismissal of the warning response. Attempts to do so will result in a 5 day block.
Cookie Protection Processor	This auto response rule triggers when a user attempts to modify the web application session cookie. The first attempt will result in a warning and a forced logout of the web application, a second attempt will result in a 5 day block.
Captcha Processor	This auto response rule triggers when a user attempts to find a way to bypass the captcha response without solving the captcha. Most attempts will result in a warning, followed by a block on repeat attempts. More serious attempts, such as attempting a buffer overflow on the captcha code will result in an immediate block. In some cases the users connection will also be slowed.
CSRF Processor	This auto response rule triggers if a user attempts to manipulate the CSRF protection introduced by the system, potentially to find a filter evasion vulnerability. The first attempt will result in a forced captcha, while subsequent attempts will block the user for 1 day.
Custom Authentication Processor	This auto response rule triggers if a user attempts to exploit the authentication mechanism offered by the system. The first attempt will result in a warning, and subsequent attempts will result in either a direct block for 1 day, or a captcha and then a block. Brute force attempts will first result in a captcha, and subsequent violations will result in a 1 day block.
Client Beacon Processor	This auto response rule triggers when the user attempts to tamper with the client side tracking logic. The user will automatically be blocked for 1 day after a delay of 10 minutes.
New and Modified Profiles	This auto response rule sends out an alert any time a new profile is created, or a profile elevates its threat level. The severity of the alert will equal the threat of the new or elevated profile that triggered the alert.
Returning Profile	This auto response rule sends out an alert any time a profile returns on a subsequent day. For example, a new hacker is observed on Monday, if the hacker is only active for 1 hour on Monday, but returns on Tuesday to continue, this rule will issue an alert. The severity of the alert will equal the threat level of the profile.
New Incident	This auto response rule sends out an alert any time a new incident is observed. The severity of the alert will equal the complexity of the incident.
New Response	This auto response rule sends out an alert any time a new counter response is activated. The severity of the alert will always equal 1.

9.1. Using the Editor

To create an auto response, open the configuration UI and select the "ADD New Rule" button. This will launch the editor which can be used to create and edit an auto response:

Edit Autoresponse

Configuration » Autoresponses » Edit Autoresponse

Basic

Code

Events

Log

BASIC INFORMATION

Name *

My Autoresponse

Description

Here is a description of my autoresponse.

Enabled ☒ YES ☐

Safe mode ☐ NO ☒

☒ Save ☐ Cancel

Table 9.2. Auto Response Editor Fields

Field	Description
Name	The name of the auto response.
Description	Description of the auto response and its triggers.
Enabled	Sets an auto response to be active.
Safe Mode	allows the auto response to activate, but does not actually respond. This setting is for testing and debugging auto responses.
Code	The actual code that defines the auto response.
Events	the events that will trigger the auto response.
Log	A table which consists of any log statements printed during autoresponse execution. Use the JavaScript console object to output to an autoresponse's log

Field	Description
API Reference	A link to the Auto response API documentation.

Command Line Interface

Mykonos Web Security contains a Command Line Interface (CLI), which provides users with access to the primary data sources. The CLI allows users to generate complex reports based on the data gathered by the security engine for the purpose of reporting and data analysis. The interface can be run by executing the following command:

sudo mykonos-reports-cli

```
Mykonos Command Line Interface:
The mykonos command line interface provides access to the raw data collected by
the security engine. For a full description of what this command can do and how
it works, reference the man page.

    man mykonos-reports-cli

Syntax:
mykonos-reports-cli
mykonos-reports-cli -l
mykonos-reports-cli -d=DATASOURCE -h
mykonos-reports-cli -d=DATASOURCE [OPTIONS]

Arguments:

    -l
        get the list of all supported data sources and their names

    -d=<data source>
        specify the data source to work with by name

    -h
        get the list of fields and supported arguments for the specified data source

    -i=<index>
        specify the starting index for the result set

    -m=<max>
        specify the maximum number of records to return

    -s=<fields>
        specify the sorting to apply to any data being read from the data source

    -o=<path>
        output the data from the data source to the specified file

    -f=<text|csv|xml|html>
        the format to use when outputting the data from the data source

    -c
        Whether to make string filter arguments case insensitive
```

To generate a report, users need to specify the following:

- A data source.
- An optional format.
- Any parameters necessary to filter the data.
- Any other output arguments.

When fully constructed, a command to generate a report would look similar to this:

sudo mykonos-reports-cli -d=Datasource --format=true/false --parameter

Using the `-h` option in the CLI will bring up a help page with all of the available filters and parameters; a list of parameters is also available at the end of this document.

10.1. Supported arguments

The command line interface provides access to the raw information that the system uses. The following are the main arguments provided for accessing, outputting, and formatting the data returned by the CLI:

-d=<data source name>

Define which data source to get data from (from the list of available data sources).

-h

Get help documentation for the specified data source. This includes the accepted arguments and resulting fields.

-o=<path>

Output data to a specified file (if not specified, then output is to console).

-f=<text|csv|xml|html>

The format to use when outputting the data from the data source, supported formats are: CSV, XML, HTML or text.

-l

Get the list of all supported data sources and their names.

-i=<index>

Specify the starting index for the result set.

-m=<max>

Specify the maximum number of records to return.

-s=<fields>

Specify the sorting to apply to any data being read from the data source.

10.1.1. Data Sources

The CLI provides users with the following data sources In order to access the data generated by the security engine and generate reports. The full list of Data sources can be viewed at any time with the **-l** option and a Data source can be loaded through the **-d=** argument:

Browser

Data source that exposes information about known and detectable browsers.

Country

Data source that exposes information about known countries.

Environment

Data source that exposes information about environments.

Incident

Data source that exposes information about incidents.

IncidentType

Data source that exposes information about known incident types.

IpAddress

Exposes IP Address information.

Location

Data source that exposes information about locations.

OperatingSystem

Data source that exposes information about known and detectable operating systems.

Profile

Data source that exposes information about profiles.

Response

Data source that exposes types of responses (counter attacks).

Session

Data source that exposes information about sessions.

10.1.2. Formatting

All reports are generated with the default columns and sorting. Users may reformat any report or change the sorting for the columns by supplying any optional filtering arguments when the report is generated. To generate a report that has all of the profile and session count data from the session's data source, users would include the following arguments in the command to add those columns:

```
sudo mykonos-reports-cli -d=Session --include-default=true --include-counts=true
```

```
mykonos@gali:~$ sudo /usr/sbin/mykonos-reports-cli -d=Session --include-default=true --include-counts=true
```

session.id	session.requestCount	session.errorCount	session.firstActive	session.lastActive	session.incidentCount	session.environmentCount	session.locationCount
460	1	1	3/25/11 2:24 PM	3/25/11 2:24 PM	mail	1	1
462	8	1	3/25/11 2:24 PM	3/25/11 2:24 PM	2	1	1
463	1	0	3/25/11 2:47 PM	3/25/11 2:47 PM	1	1	1
474	1	0	3/25/11 2:47 PM	3/25/11 2:47 PM	1	1	1

To generate a report that excludes the default columns, but still contains the session counts data, users would simply run this command with the default option set to false:

```
sudo mykonos-reports-cli -d=Session --include-default=false --include-counts=true
```

10.1.3. Example Report

The CLI allows users to combine filtering arguments for data sources to create complex and detailed reports. These arguments follow the format:

--argumentName="Value"

For example, if a user wanted a report that displayed a list of all the sessions created after 09/12/2010, that also were from a client that used Windows XP, the following algorithm would be used:

```
sudo mykonos-reports-cli -d=Session --createdStartDate='09/12/2010 01:01 am' --environmentId=200
```

Appendix A. Incident Methods



Note

Parameters wrapped in [] are optional.

Table A.1. Incident Methods

Name	Description	Parameters
isIncidentType	Check the incident type by either its code or its name.	incident:string
isIncidentDate	Check to see if an incident occurred on the given month, day and year. The month, day and year arguments may be left empty to match any value. Note that Jan = 1, and years are in the format YYYY.	[month:int] [day:int] [year:int]
isIncidentDateRange	Check to see if an incident occurred between two dates. All values must be defined. Note that Jan = 1, and years are in the format YYYY.	start_month:int start_day:int start_year:int end_month:int end_day:int end_year:int
isIncidentTime	Check to see if an incident occurred at a given time. The hour, minute and second arguments may be left empty to match any value.	[hour:int] [minute:int] [second:int]
isIncidentTimeRange	Check to see if an incident occurred between a given time range. All values must be specified.	start_hour:int start_minute:int start_second:int end_hour:int end_minute:int end_second:int
isIncidentCount	Check the number of times an incident has occurred against an integer operation and specified value. Supported operations include (>, <, ==, !=). The results are: (count [operator] value)	operator:string value:int
isIncidentCountRange	Check to see if the number of times an incident has occurred is within a given range.	min:int

Name	Description	Parameters
		max:int
isIncidentContextSubString	Check to see if the context XML associated with the incident contains the provided substring. The search is case sensitive by default, unless the second parameter is "false"	search:string [[caseSensitive]:Boolean]
isIncidentContextPattern	Check to see if the context XML associated with an incident contains a simple pattern. Supported pattern wild cards include +, ? and *. Pattern matches are performed case sensitive unless the second parameter to this method is "false".	pattern:string [[caseSensitive]:Boolean]
isIncidentIP	Check to see if an incident came from a given IP address. Each parameter specifies the required value for the specific block of the address. Any of the parameters can be left empty to match any value.	[a_block:int] [b_block:int] [c_block:int] [d_block:int]
isIncidentIPRange	Check to see if an incident came from a given IP address range. Each parameter specifies a range of accepted values for the specific address block. Ranges are specified in the format: min-max. For example: 10-22, or 0-255	[a_block_range:string] [b_block_range:string] [c_block_range:string] [d_block_range:string]
isIncidentBrowser	Check to see if the incident occurred from a given browser. The parameter expects the canonical name of the browser.	name:string
isIncidentOperatingSystem	Check to see if the incident occurred from a given operation system. The parameter expects the canonical name of the operating system.	name:string
isIncidentBrowserVersion	Check to see if the incident occurred from a specified version of the browser. The check is case sensitive by default, unless the second parameter is "false". The version could contain any character and should be considered as an arbitrary user supplied string value.	version:string [[caseSensitive]:Boolean]
isIncidentBrowserVersionPattern	Check to see if the incident occurred from a browser with a version that matches a given simple pattern. Pattern wild cards include ?, * and +. The match is done case sensitive unless the second parameter is "false". The version could contain any character and should be considered as an arbitrary user supplied string value.	pattern:string [[caseSensitive]:Boolean]
isIncidentBrowserVersionSubstring	Check to see if the incident occurred from a browser with a version that contains the given sub string. The match is done case sensitive unless the second parameter is "false". The version could contain any	Search:string [[caseSensitive]:Boolean]

Name	Description	Parameters
	character and should be considered as an arbitrary user supplied string value.	
isIncidentCountry	Check to see if the incident originated from a given country. The parameter expects a valid 2 character country code, or the canonical name of the country.	country:string
isIncidentLatitude	Check to see if the incident originated from a specified geographical latitude. The parameter is expected to be a decimal number between -90.0 and +90.0	latitude:float
isIncidentLatitudeRange	Check to see if the incident originated between a specified geographical latitude range. The parameters are expected to be decimal numbers between -90.0 and +90.0.	min:float max:float
isIncidentLongitude	Check to see if the incident originated from a specified geographical longitude. The parameter is expected to be a decimal number between -90.0 and +90.0	longitude:float
isIncidentLongitudeRange	Check to see if the incident originated between a specified geographical longitude. The parameters are expected to be decimal numbers between -90.0 and +90.0.	min:float max:float
isIncidentCity	Check to see if the incident originated in a specified city. The parameter is expected to be the city name and is case sensitive unless the second parameter is "false"	city:string [caseSensitive]:Boolean
isIncidentCityPattern	Check to see if the incident originated from a city that matches a specified pattern. The supported wild cards are *, ?, and +. The pattern is case sensitive unless the second parameter is "false".	pattern:string [caseSensitive]:Boolean
isIncidentCitySubString	Check to see if the incident originated from a city that contains a specified sub string. The substring search is done case sensitive unless the second parameter is "false"	search:string [caseSensitive]:Boolean
isIncidentHost	Check to see if the incident originated in a specified host. The parameter is expected to be the host name and is case sensitive unless the second parameter is "false"	host:string [caseSensitive]:Boolean
isIncidentHostPattern	Check to see if the incident originated from a host name that matches a specified pattern. The supported wild cards are *, ?, and +. The pattern is case sensitive unless the second parameter is "false".	pattern:string [caseSensitive]:Boolean
isIncidentHostSubString	Check to see if the incident originated from a host name that contains a specified sub string. The substring search is done case sensitive unless the second parameter is "false"	search:string [caseSensitive]:Boolean

Name	Description	Parameters
isIncidentRegion	Check to see if the incident originated in a specified region. The parameter is expected to be the region name and is case sensitive unless the second parameter is "false"	region:string [caseSensitive]:Boolean
isIncidentRegionPattern	Check to see if the incident originated from a region that matches a specified pattern. The supported wild cards are *, ?, and +. The pattern is case sensitive unless the second parameter is "false".	pattern:string [caseSensitive]:Boolean
isIncidentRegionSubString	Check to see if the incident originated from a region that contains a specified sub string. The substring search is done case sensitive unless the second parameter is "false"	search:string [caseSensitive]:Boolean
isIncidentZip	Check to see if the incident originated in a specified zip code. The parameter is expected to be the zip code and is case sensitive unless the second parameter is "false". While zip codes should generally be numeric, there is the possibility of foreign zip codes containing strange characters.	zip:string [caseSensitive]:Boolean
isIncidentZipPattern	Check to see if the incident originated from a zip code that matches a specified pattern. The supported wild cards are *, ?, and +. The pattern is case sensitive unless the second parameter is "false".	pattern:string [caseSensitive]:Boolean
isIncidentZipSubString	Check to see if the incident originated from a zip code that contains a specified sub string. The substring search is done case sensitive unless the second parameter is "false"	search:string [caseSensitive]:Boolean

Appendix B. Captcha Template

There are several processors that utilize captchas to prevent automation. These processor include:

- **Request Captcha Processor**

This processor allows you to attach a captcha to any page on the web application. It is also responsible for enforcing the "Force Captcha Validation" counter response.

- **Login Processor**

This processor utilizes captchas to prevent brute force attacks on login dialogs. Once there have been more than three (3) failed login attempts on a single username (from any users), any future attempts to login as that user will require a captcha.

When a captcha must be presented, the format in which it is displayed is defined as a Captcha Template. By default, there is a captcha template defined for both processors that will work on all websites. In the event that you would like to customize the way the captcha looks when it is presented (such as wrapping it with the standard template of the website being protected), the captcha template can be modified. This is done by accessing the advanced configuration parameters for the two aforementioned processors and editing the "Captcha Template" parameter.

In order to edit the parameter, it is recommended that you first download a copy of the existing default template. If you have already made modifications to the template, you can get the original by selecting the suggestion "Default Unbranded Template", and then downloading the associated file.

Once you have a copy of the default template, open it in a text editor. You can make any modifications to the HTML as required, but be sure not to modify the existing JavaScript or remove any of the existing HTML. To prevent introducing changes that might prevent the captcha from functioning, it is recommended that modifications be limited to stylistic changes (do not alter the content of the SCRIPT tags, and do not alter the contents of the FORM tag). After your modifications, you can upload the new file into the parameter to update the captcha HTML served by Mykonos. It is recommended that you keep a copy of the modified template to make future modifications easier.

You will also notice that there are a few special HTML tags in the template. These tags are replaced by Mykonos before the template is served to the end-user. These tags reside either in a SCRIPT tag or in a FORM tag, so as long as those elements are not modified, these tags should continue to function correctly. These special tags include:

- **<%captchaDir>**

The directory name that all captcha images and audio files are served from.

- **<%signature>**

The file name for the captcha image or audio resource to load.

- **<%includeAudio> . . . </%includeAudio>**

Displays the content between the open and closing tags only if audio captchas are enabled.

- **<%cancel>**

The URL to redirect the user to if they cancel the captcha operation.

- **<%delay>**

The number of seconds the user has to complete the captcha before it expires.

- **<%multiPart> . . . </%multiPart>**

Displays the content between the opening and closing tag only if the original request that is being protected by a captcha was a multipart form submission (vs. a URL encoded form post [by default, forms are URL encoded]).

- **<%datasignature>**

The signature of the data that was originally posted to the page protected by the captcha. This is used to ensure that the data is not modified after submission, but before the captcha is solved.

- **<%data>**

The encrypted data submitted to the original page that required a captcha. This is used so that once the captcha is solved, the original request can be reconstructed and submitted to the backend servers.

- **<%inputname>**

The name of the input used to identify when a user submits a captcha. The value for this input name is configurable and should not conflict with any existing inputs the site uses. A random string of 5 or more characters should be sufficient (but must be set in configuration so that it can be injected in place of the custom tag when serving a captcha).

After the new template has been uploaded and saved in configuration, you can test your changes by triggering the applicable captcha.

- **Request Captcha Processor**

Access the protected page and request `http://www.domain.com/.htaccess` which will generate a profile for your session. Find the new profile in the security monitor and manually activate the "Force Captcha Validation" response. Then go back to the protected site and make a few more requests until the captcha shows up.

- **Login Processor**

If the login processor is configured to protect a login dialog on the site, then simply provide 4 or more invalid passwords for the same username. On the 5th attempt, you should be presented with the login processor captcha.

Note: Changes to the captcha template are made to the live deployment. So if you break the captcha template during modifications, it may cause the captcha to stop working for some of the users on the site until the template is repaired. Creating a new "Page" in configuration for a fictitious URL and making the changes on that page first would allow you to test the modifications without impacting every use on the site.

Appendix C. Incident Log Format

If MWS is configured to log incidents to the syslog they will be logged with the following format:

<date> <host> [<log level>][mws-security-alert][<thread id>] <message>

where all of the items in angle brackets will be replaced by information relevant to that log entry. The <message> portion of each log entry consists of a series of name value pairs, with the name (unquoted) followed by an equal sign (=) followed by the value (in quotes).

The following names are common for all incidents:

MKS_Category - will always have the value "Security Incident" when logging security incidents

MKS_Type - a textual name for the type of incident

MKS_Severity - an integer between 0 and 4 for the severity of the incident (0 being lowest, 4 being highest)

MKS_ProfileName - the name of the hacker profile who caused the incident (also visible in the security monitor)

MKS_SrcIP - the ip of the hacker who caused the incident

MKS_pubkey - a textual key unique to that hacker profile (also visible in the security monitor)

MKS_useragent - the full useragent string of the browser or other program used by the hacker

MKS_url - the url used on the request that caused the incident

MKS_count - the number of times this hacker has caused this same incident

Following the common names will be any incident specific contextual values which are tracked with the incident. These will vary based on incident type. For example a Query Parameter Manipulation incident would include the parameter that was changed along with actual and expected values.

Here is a sample log entry:

```
Apr 6 20:58:36 vm1 [INFO][mws-security-alert][Thread-49927] MKS_Category="Security Incident"
MKS_Type="Query Parameter Manipulation" MKS_Severity="2" MKS_ProfileName="Luis 9605"
MKS_SrcIP="10.10.10.130" MKS_pubkey="fkrvpvFNhwoWRgaQiUxS" MKS_useragent="Mozilla/5.0
(Windows NT 6.1; WOW64) AppleWebKit/535.19 (KHTML, like Gecko) Chrome/18.0.1025.142 Safari/535.19"
MKS_url="http://www2.testsite.com:80/basket/?action=listing&id=3" MKS_count="1" MKS_actual="2568"
MKS_expected="25304" MKS_param="n_idx"
```

Appendix D. Open Source Software Licenses

D.1. Overview

This section contains a list of open source projects that might be used in Mykonos. The licenses associated with each project only encompass the binary and source files distributed by that project. None of the licenses detailed in this section extend to the code or binaries created by Mykonos Software.

Mykonos Software is not affiliated with any of the listed open source projects.

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- [Section D.2.2, “AJAXUpload”](#)
- [Section D.2.3, “Ant / Ant Contrib”](#)
- [Section D.2.4, “Apache Jakarta Commons”](#)
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- [Section D.2.88, "WebOb"](#)
- [Section D.2.89, "WhalinMemCachedClient"](#)
- [Section D.2.90, "YUI Compressor"](#)
- [Section D.2.91, "YUI"](#)

D.2.1. Ahocorasick Algorithm Library

The following software may be included in this product:

Ahocorasick Algorithm Library

(Version: 1.1)

Use of any of this software is governed by the terms of the license below.

D.2.1.1. Software License Agreement (BSD License)

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D.2.1.2. Sources of Intellectual Property Included in the YUI Library

YUI is issued by Yahoo! under the BSD license above. Below is a list of certain publicly available software that is the source of intellectual property in YUI, along with the licensing terms that pertain to those sources of IP. This list is for informational purposes only and is not intended to represent an exhaustive list of third party contributions to YUI.

- **Douglas Crockford's JSON parsing and stringifying methods:** In the JSON Utility, Douglas Crockford's JSON parsing and stringifying methods are adapted from work published at JSON.org. The adapted work is in the public domain.
- **Robert Penner's animation-easing algorithms:** In the Animation Utility, YUI makes use of Robert Penner's algorithms for easing.
- **Geoff Stearns's SWFObject:** In the Charts Control and the Uploader versions through 2.7.0, YUI makes use of Geoff Stearns's SWFObject v1.5 for Flash Player detection and embedding. More information on SWFObject can be found at <http://blog.deconcept.com/swfobject/>. SWFObject is (c) 2007 Geoff Stearns and is released under the MIT License (<http://www.opensource.org/licenses/mit-license.php>).
- **Diego Perini's IEContentLoaded technique:** The Event Utility employs a technique developed by Diego Perini and licensed under GPL. YUI's use of this technique is included under our BSD license with the author's permission.

D.2.2. AJAXUpload

The following software may be included in this product:

AJAXUpload

Use of any of this software is governed by the terms of the license below.

D.2.2.1. License

Copyright (c) 2010 Andrew Valums

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D.2.3. Ant / Ant Contrib

The following software may be included in this product:

Ant / Ant Contrib

Versions:

- 1.0b3
- 1.7.0

Use of any of this software is governed by the terms of the license below.

D.2.3.1. Apache License, Version 2.0

Apache License

Version 2.0, January 2004

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The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is

covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a. The modified work must itself be a software library.
- b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)
- b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying

library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

- c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- d. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- e. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

- a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.
- b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

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obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

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14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

D.2.6.4. NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

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END OF TERMS AND CONDITIONS

D.2.6.5. How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the library's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>
```

```
This library is free software; you can redistribute it and/or
modify it under the terms of the GNU Lesser General Public
License as published by the Free Software Foundation; either
version 2.1 of the License, or (at your option) any later version.
```

```
This library is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU
Lesser General Public License for more details.
```

```
You should have received a copy of the GNU Lesser General Public
License along with this library; if not, write to the Free Software
Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
```

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the
library `Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice
```

That's all there is to it!

D.2.7. Base64

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Version 2, June 1991

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[This is the first released version of the library GPL. It is numbered 2 because it goes with version 2 of the ordinary GPL.]

D.2.9.2. Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the library.

Also, for each distributor's protection, we want to make certain that everyone understands that there is no warranty for this free library. If the library is modified by someone else and passed on, we want its recipients to know that what they have is not the original version, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

D.2.9.3. TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a. The modified work must itself be a software library.

- b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)
- b. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- c. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- d. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:
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Django Web Framework

(Version:1.4)

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Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the tire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

D.2.31.3. GNU LESSER GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a. The modified work must itself be a software library.
- b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version

than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

- b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
- c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- d. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- e. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

- a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.
- b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

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END OF TERMS AND CONDITIONS

D.2.31.5. How to Apply These Terms to Your New Libraries

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To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the library's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>
```

```
This library is free software; you can redistribute it and/or
modify it under the terms of the GNU Lesser General Public
License as published by the Free Software Foundation; either
version 2.1 of the License, or (at your option) any later version.
```

```
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but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU
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```

```
You should have received a copy of the GNU Lesser General Public
License along with this library; if not, write to the Free Software
Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
```

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the
library `Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice
```

That's all there is to it!

D.2.32. JCapcha FreeTTS extension

The following software may be included in this product:

JCapcha FreeTTS extension

(Version: 1.0)

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D.2.32.1. Lesser General Public License, version 2.1

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D.2.32.2. Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

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from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the tire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

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For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

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The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

D.2.32.3. GNU LESSER GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is

covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a. The modified work must itself be a software library.
- b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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Versions:

- 1.0.12

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(Version: 1.1)

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(Version: Nightly Build - Sat Mar 3 09:04:15 2012)

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jshash - JavaScript MD5 Hash Function

(Version: 2.2)

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(Version: 0.9-p5)

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JPython was created in late 1997 by Jim Hugunin. Jim was also the primary developer while he was at CNRI. In February 1999 Barry Warsaw took over as primary developer and released JPython version 1.1.

In October 2000 Barry helped move the software to SourceForge where it was renamed to Jython. Jython 2.0 and 2.1 were developed under the Jython specific license below.

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(Version: 0.9.21)

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D.2.58. mail.jar

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mail.jar

Versions:

- 1.4.1
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```

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```

```
library `Frob' (a library for tweaking knobs) written by James Random Hacker.
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<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice
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(Version: 0.9.9.4)

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Ty Coon, President of Vice
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That's all there is to it!

D.2.78. Saxon

The following software may be included in this product:

The Saxon XSLT and XQuery Processor from Saxonica Limited (Saxon-HE)

<http://www.saxonica.com/>

(Version: 9.3.0.4j)

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