Product Overview

Whether in the data center or the campus, today’s network managers are learning to overcome many new challenges. Data center network and cloud administrators face the rapid adoption of virtualization, dynamic and on-demand cloud services, and virtual network deployments. In the campus, wireless devices are increasing at a rapid rate, attacks and threats are evolving, and wireless networks demand mission-critical uptime.

Junos Space Network Director is a next-generation network management solution that allows users to visualize, analyze, and control the entire enterprise network—data center and campus, physical and virtual infrastructure, virtual overlay networks, and wired and wireless—through a single pane of glass.

Product Description

Juniper Networks® Junos® Space Network Director provides a smart, comprehensive, and automated network management solution that enables network and cloud administrators to visualize, analyze, and control their entire enterprise network—data center and campus, physical and virtual infrastructure, virtual overlay networks, and wired and wireless—through a single pane of glass. In the data center, Network Director helps administrators manage, visualize, and troubleshoot physical and virtual environments by providing correlated visibility between overlay and physical networks, as well as flow analysis, visualization, and synchronization of network policies as virtual machines (VMs) move from server to server. In the campus, Network Director automates routine management tasks such as network provisioning and troubleshooting, dramatically improving operational efficiency and reliability.

Network Director incorporates key functions that address the challenges posed by the rapid adoption of virtualized, dynamic, and on-demand cloud services across data center and cloud deployments. In addition, Network Director offers sophisticated end-to-end network visibility and flow path analysis in conjunction with the Juniper Networks Cloud Analytics Engine, providing flow-aware performance analysis to improve application performance and availability by associating flows/applications across the physical and virtual infrastructure, improving the ability to quickly roll out new applications and troubleshoot problems.

These smart network management capabilities are delivered through the following key features.

Automate

- **Fabric automation** fully automates the provisioning, configuration, and deployment of complex fabric topologies, providing comprehensive pre- and post-deployment support and management for Layer 2 and Layer 3 fabrics.

- **Zero touch provisioning** (ZTP) simplifies the deployment of networks without requiring user intervention, providing policy-driven plug-and-play provisioning and network bring-up operations for both fabrics and individual devices.

- **Bulk provisioning** enables faster service rollout and activation while protecting against configuration errors with profile-based and pre-validated configurations. Bulk operations can be performed at logical (access, aggregation, core) or location (site, building, floor, rack) levels.
Analyze

- **Performance Analyzer** provides real-time and trended monitoring of hosts, VMs, fabrics, and ports, as well as high-frequency monitoring that gathers valuable performance data for tracking queue depth and heat-map visualization. Network Director analyzes the entire network, using heat-maps to identify over- and under-utilized ports, latency, and top VMs, users, devices, and ports.

- **Network Traffic Analyzer** proactively monitors network usage to find the sources of network traffic spikes. Incorporating an automated policy-driven sFlow collector and flow analysis, Network Traffic Analyzer quickly identifies and isolates users, applications and protocols consuming the most bandwidth.

- **Flow Path Analyzer** provides operational and diagnostic capabilities that trace connectivity between applications and flows by correlating network telemetry data with the application. Flow Path Analyzer visualizes network paths between leaf and spine switches for a given flow/application, correlating congested ports with high-latency events and identifying impacted or unhealthy VMs, applications, and hosts.

- **Overlay and Underlay Analyzer** provides full visibility, performance management, and troubleshooting capabilities for physical and virtualized overlay networks in VMware Virtual Extensible LAN (VXLAN) environments. It provides a consolidated and correlated view of VMs, hosts, fabrics, and overlay and underlay networks with full end-to-end network and flow visibility and analysis.

- **VM Analyzer** provides real-time physical and virtual topology views, tracks vMotion activity including virtual machine creation, deletion, and moves, and maintains complete virtual network inventory.

- **Fabric Analyzer** monitors and analyzes the health of the entire network fabric, including IP Fabric, Virtual Chassis Fabric configurations, and Juniper Networks QFabric® System, increasing service availability.

**Features and Benefits**

**End-to-End Network Visibility and Flow Path Analysis**

Working in conjunction with the Cloud Analytics Engine, Network Director provides network data analysis to improve application performance and availability by associating flows with specific applications across the physical and virtual infrastructure, improving the ability to quickly roll out new applications and troubleshoot problems (see Figure 1).

Network Director analyzes and visualizes application flows running on VMs and bare-metal servers in the data center, reporting the specific path a flow takes through the network, the latency encountered at each hop, and traffic statistics for every network device in the path. Users can start flow analysis on selected active flows on a specific VM or a non-virtualized host on demand and view the results. When users place a critical VM or non-virtualized host on a watch list, Network Director will automatically initiate analysis on all flows running on that device.

**Figure 1: Flow path analysis**

**Network Traffic Analyzer**

The Network Director Network Traffic Analyzer gathers detailed information about network bandwidth usage patterns on each switch port, allowing network administrators to make informed policy and planning decisions about specific applications and ports. Using an automated, policy-driven sFlow collector and flow analysis, Network Traffic Analyzer identifies which users, applications and protocols are consuming the most bandwidth, helping network administrators identify the source of network spikes and bursts to proactively monitor, control and manage network usage (Figure 2).

**Figure 2: Network Traffic Analyzer**

**Integration with Virtualized and Cloud Infrastructure**

Network Director integrates with virtualized and cloud infrastructure tools, providing network and cloud administrators with a comprehensive view of the complete data center infrastructure.

Network Director Management Pack for vRealize Operations provides comprehensive visibility into Juniper infrastructure and VMware virtual networking services deployed in a vSphere environment, including virtual machines (VMs), hosts, and network elements such as switches and switch fabrics. Virtual administrators and network operations managers will be able
to determine at a glance the health, capacity and performance of these objects, helping them quickly remediate problems that impact virtual machine connectivity and performance (Figure 3).

Network Director also provides holistic and correlated visibility into enterprise and private cloud data centers comprised of physical switch fabrics and virtual networks (overlay) (see Figure 4), as well as virtualized and non-virtualized hosts encompassing the following deployments:

- **VMware vCenter**—Network Director unifies physical and virtual networks, providing a comprehensive view of the complete end-to-end virtual-to-physical network infrastructure. It integrates with VMware vCenter, delivering a combined solution that benefits from both vendors’ innovation and from Juniper’s orchestration solutions to discover, visualize connectivity between virtual and physical networks, orchestrate, and monitor VMware vSphere environments.

- **VMware NSX and OpenStack**—Network Director integrates with cloud infrastructure controlled by VMware NSX SDN Controller environments and OpenStack. Through this integration, Network Director provides complete and correlated visibility between virtualized overlay and physical networks as well as virtual machines, VXLAN, virtual tunnel endpoints, and OpenStack networks with full end-to-end network and flow visibility and analysis (Figure 4).

In addition to virtualized and cloud infrastructure deployments mentioned above, Network Director also includes support for non-virtualized servers (also called bare-metal servers).

**Fabric Automation and Management**

Network Director provides comprehensive pre- and post-deployment fabric automation and management for Layer 2 and Layer 3 fabric topologies. It fully automates the provisioning, configuration, and deployment of complex fabric topologies comprised of multistage spine-and-leaf switches, eliminating errors associated with manual deployment (see Figure 5). As part of the pre-deployment automation process for Layer 3 fabrics, Network Director provides simple-to-use workflows to set up fabric switches, assign protocol settings, perform BGP IP address configuration and cabling, and set up ZTP servers.

**Multipoint Navigation and Views**

Network Director improves operational efficiency by allowing users to manage the network from different views, groupings, and perspectives. It includes a customizable dashboard that provides a visual indication of overall network usage and network consumers, including VMs, hosts, top virtual networks, flow analysis, utilization, latency, top talkers, and alarms—all presented as part of a color-coded heat map representing devices and ports. Each device is color coded to convey the level of port utilization and latency; “cooler” colors indicate lower port utilization and latency while “hotter” colors indicate higher port utilization and latency (see Figure 6).
In addition, Network Director Topology view shows all discovered devices in the network on a map where the devices are located across sites, buildings, floors, closets, and racks, along with their physical connections to other devices in the network. Topology view also shows the physical and logical connectivity between various discovered interconnected devices. Topology view allows users to zoom in or out of a site, see how a device is connected to its immediate neighbors, including VMware hosts connected to the switch, or view alarm details, bandwidth of links, and real-time link data and state of the devices. Network Director also enables devices to be rearranged across buildings on the map.

### Aruba Airwave Integration

Network Director integrates with the Aruba Airwave management platform to provide simplified network management. Juniper’s wired technologies such as switching collaborate with the wireless LAN technologies of Aruba Networks to enable you to monitor and configure wireless networks. The integration of these two management platforms enables you to:

- View the Aruba wireless device inventory in Build, Monitor, Report, and Fault modes of Network Director to view all of the Aruba wireless devices connected to Juniper switches and proactively identify impacted wireless devices for fault conditions
- Launch the context-sensitive feature on Aruba Airwave application pages (for all Aruba wireless devices or individual wireless devices connected to Juniper Networks switches) from within Network Director to manage Aruba wireless devices

### Specifications

**Navigation Model**

- Use task-based navigation based on the network management life cycle

**Network View and Device Selection**

- View devices organized by logical relationships, locations, device type, custom group view, data center view, or topology view
- Select logical, location, device-type, custom group, virtual, or topology view groupings to perform tasks on multiple devices simultaneously
- Search for devices in the network
- Define filters to selectively view specific logical, location, device-type, custom group, virtual, or topology groupings

**User Preferences**

- Set user preferences, such as whether time is shown in the client time zone or server time zone

### Table 1. Supported Platforms

<table>
<thead>
<tr>
<th>Supported Platforms</th>
<th>Operating System</th>
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</thead>
<tbody>
<tr>
<td>QFX Series Ethernet Switches</td>
<td>Junos OS releases</td>
</tr>
<tr>
<td>QFX10002</td>
<td>15.1X53-D10</td>
</tr>
<tr>
<td>QFX10002 IP Fabric (Spine)</td>
<td>15.1X53-D10</td>
</tr>
<tr>
<td>QFX5100, EX4300 (Leaf)</td>
<td>14.1X53-D27</td>
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<tr>
<td>QFX5100</td>
<td>13.2X51-D25, 14.1X53-D16, 14.1X53-D27</td>
</tr>
<tr>
<td>QFX3500/QFX3600 (non ELS)</td>
<td>12.3X50-D35 and 12.3X50-D40</td>
</tr>
<tr>
<td>QFX3500/QFX3600 ELS and Virtual Chassis</td>
<td>12.3X51-D30</td>
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<tr>
<td>QFX5100-24Q, QFX5100-48S, QFX5100-96S ELS and Virtual Chassis</td>
<td>14.1X53-D15, 14.1X53-D27</td>
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<tr>
<td>QFX5100-48T</td>
<td>14.1X53-D16, 14.1X53-D27</td>
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<tr>
<td>EX Series Ethernet Switches:</td>
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</tr>
<tr>
<td>• EX2200, EX2200-C</td>
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<tr>
<td>• EX3200</td>
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<tr>
<td>• EX3300: Standalone and with Virtual Chassis technology</td>
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<tr>
<td>• EX4200: Standalone and with Virtual Chassis technology</td>
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<tr>
<td>• EX4500: Standalone and with Virtual Chassis technology</td>
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<tr>
<td>• EX4550: Standalone and with Virtual Chassis technology</td>
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<tr>
<td>• Mixed EX4200, EX4500, EX4550</td>
<td>Junos OS releases 11.4, 12.1, 12.2, 12.3, 13.2X50-D10, 13.2X50-D15, 13.2X51-D15, 13.2X51-D20, 14.1X53-D15, 14.1X53-D25, 15.1R1</td>
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<tr>
<td>• EX6200</td>
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<tr>
<td>• EX8200: Standalone and with Virtual Chassis technology</td>
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<td>EX Series Ethernet Switches with ELS:</td>
<td>Junos OS releases 13.2X51-D25, 14.1X53-D27</td>
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<tr>
<td>• EX4300 Standalone and with Virtual Chassis technology</td>
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<tr>
<td>• EX4600 Standalone and with Virtual Chassis technology</td>
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<tr>
<td>EX9200</td>
<td>Junos OS releases 13.2R1, 13.2R2, 13.3R2, 14.1R4, 14.2R2, 15.1R1</td>
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<tr>
<td>MX Series 3D Universal Edge Routers</td>
<td>Junos OS releases 13.2R2.4, 14.1R4, 14.2R2, 15.1R1</td>
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<tr>
<td>MX240, MX480, MX960 (ELS)</td>
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<tr>
<td>MX80, MX104, MX240, MX480, MX960 (non-ELS)</td>
<td>Junos OS release 14.1R4, 15.1R1</td>
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<td>VMware vCenter Server</td>
<td>vCenter 5.0, 5.1, 5.5, 6.0</td>
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<td>VMware vRealize Operations</td>
<td>6.0</td>
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<tr>
<td>VMware ESXi</td>
<td>VMware ESXi versions 5.0, 5.1, 5.5 and 6.0</td>
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<tr>
<td>OpenStack</td>
<td>Supported release—Icehouse and Juno</td>
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<tr>
<td>VMware NSX –V</td>
<td>Version 6.1</td>
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<tr>
<td>NSX-MH</td>
<td>Version 4.1</td>
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<tr>
<td>WLC Series Wireless LAN Controllers:</td>
<td>MSS releases 7.7 and 8.0 for WLC2, MSS releases 7.7, 8.0, 9.0 and 9.1 for other controllers</td>
</tr>
<tr>
<td>• WLC2</td>
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<td>• WLC8</td>
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<td>• WLC100</td>
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<td>• WLC200</td>
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<td>• WLC800</td>
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<td>• WLC880</td>
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<td>• WLC2800</td>
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Supported Platforms

<table>
<thead>
<tr>
<th>WLA Series Wireless LAN Access Points:</th>
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<tbody>
<tr>
<td>• WLA321, WLA322</td>
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<tr>
<td>• WLA422, WLA432</td>
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<tr>
<td>• WLA522, WLA522E</td>
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<tr>
<td>• WLA532, WLA532E</td>
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<tr>
<td>• WLA620, WLA622</td>
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<td>• WLA632</td>
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<tr>
<th>Aruba Airwave</th>
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<tbody>
<tr>
<td>Aruba Airwave version 8.0.7</td>
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</tbody>
</table>

Operating System

MSS releases 7.7, 8.0, 9.0, and 9.1

Data Center Management

- Set up and view data center networks and topologies
- Discover virtual networks
- Automatically orchestrate physical switches based on vMotion
- View hosts, virtual switches, virtual machines, overlay networks, and virtual tunnel end points (VTEPs)
- View connectivity between VMs, virtual switches, physical switches, and overlay networks
- View vMotion history, VM and host bandwidth utilization
- Compatible with VMware vCenter versions 4.1, 5.0, 5.1, and 5.5
- Compatible with VMware vSphere versions 4.0, 4.1, 5.0, 5.1, and 5.5
- Compatible with VMware NSX6.1
- Compatible with OpenStack Icehouse

VMware vRealize Operations Management Pack

- Management Pack provides:
  - Health dashboard for networking and compute to cloud administrators
  - Correlated view of virtual and physical network components to cloud administrators
  - Physical network capacity management and planning
- Main dashboard widgets—Data Center Overview, Top Alerts, and Object Relationship—display all data centers, underlying fabrics, host devices, and virtual machines that are part of the data center network
- Fabric and fabric members (spine/leaf) dashboards monitor Juniper Fabric topologies such as Virtual Chassis, QFabric Systems, Layer 3 fabrics, and Virtual Chassis Fabrics that are part of the data center. Dashboard widgets display data center fabrics, CPU and memory utilization history, and forecast widgets.
- Top Fabrics and Fabric Members dashboard enables cloud administrators to view and identify potential performance issues in the data center, identifying top fabrics by CPU and memory utilization, top noisiest fabrics based on Alerts widget, and top volatile fabrics based on Metrics widget. Clicking on a row provides more details about that fabric and possible causes, if any, for the vulnerability of the fabric.

Build Mode Features

- Discover and manage devices
- Automate and manage fabrics
- Discover devices to be managed by Network Director
- View inventory of devices for selected logical, location, or device-type groupings
- Launch command-line interface (CLI SSH session), Junos Web interface (switches), or Web View interface (wireless LAN controllers)
- Assign switches to core, aggregation, or access roles for logical view
- View a device's current configuration
- View profiles assigned to a device
- Validate pending configuration on a device
- Set up QFabric System and Virtual Chassis Fabric
- Setup MC-LAG and VRRP

Configuration Profiles

- Create, edit, or delete the following profiles:
  - Access profile (EX Series Ethernet Switches, MX Series 3D Universal Edge Routers [LAN], and WLC Series Wireless LAN Controllers)
  - Authentication profile (EX Series and WLC Series)
  - Authorization profile (WLC Series)
  - Class-of-service (CoS) profile (EX Series, QFX Series, QFabric System, MX Series [LAN], and WLC Series)
  - Device basic settings profile (EX Series, QFX Series, QFabric System, MX Series [LAN], and WLC Series)
  - Filter profile (EX Series, QFX Series, QFabric System, MX Series [LAN], and WLC Series)
  - Port profile (EX Series, QFX Series, MX Series [LAN], and QFabric System)
  - Radio profile (WLC Series)
  - VLAN profile (EX Series, QFX Series, QFabric System, MX Series [LAN] and WLC Series)
  - WLAN service profile (WLC Series)
  - Assign authorization, device basic settings, port, radio, and VLAN profiles to network objects
  - Import existing configuration into system created profiles during device discovery and have profiles automatically assigned to devices

Wireless Network Domains

- Create mobility domain, network domain, and enable Smart Mobile Virtual Controller clustering
- Import existing mobility domain and cluster configurations during device discovery
- Manage for location
- Create sites, buildings, floors, closets, aisles, racks, and outdoor areas for organizing "location" view
- Assign devices to locations
- Leverage Aruba Airwave wireless management integration
Deploy Mode Features

- Configuration changes
  - View pending configuration changes and validate changes before deploying configuration on devices
  - Automatically deploy changes on selected devices immediately or at a scheduled time
  - Manual Approval mode requires device configuration changes to be explicitly approved
  - View deployment results and manage configuration deployment jobs
- Software images
  - Maintain a repository of software images for switches and wireless LAN controllers
  - Deploy selected images on selected devices immediately or at a scheduled time
  - View deployment results and manage image deployment jobs
- Resynchronize configuration
  - Resynchronize the saved device configuration with the configuration on the device
- Configuration file management
  - Back up and restore device configuration files
- Configuration and image baselining
  - Audit configuration changes and image files and send notification in the event of unauthorized changes

Monitor Mode Features

- Data capture
  - Set polling periods for collecting different kinds of data
- Traffic monitoring (view the following for traffic on switches and wireless LAN controllers):
  - Current mix of unicast, multicast, and broadcast packets, and trends over time
  - Packet error trend
  - Port traffic trend
  - Current port utilization and trend
  - VLAN traffic trend on switches
  - Virtual Chassis Control Protocol (VCCP) statistics
  - Fabric Analyzer for Virtual Chassis Fabric and QFabric System
  - Top VMs by bandwidth utilization
  - Host network interface card (NIC) bandwidth utilization
- Virtual switch summary by version
- VM bandwidth utilization trend
- Distribution of mobile devices
- Fabric and fabric members (spine and leaf) utilization
- Network Traffic Analyzer
- Mobile Analyzer: Client session monitoring
  - Search for client session and view session history
  - View the following for wireless and wired clients:
    - Top bandwidth clients by MAC address (wireless clients only)
    - Current session count and session trend

Fault Mode Features

- Alarm monitoring
  - Correlate low-level faults into easy-to-understand alarms
  - View current counts of critical, major, and minor alarms (always visible in user interface)
  - View alarms for selected scope by category, severity, and state
  - View individual alarm details
  - Search for an alarm
- Alarm management
  - Select which alarms are enabled and select the severity level for alarms
  - Configure the length of time that alarms are kept on the server
  - Acknowledge, assign, annotate, and clear alarms
  - Receive and respond to alarm notifications

Report Mode Features

- Report content (available report types):
  - Fabric analyzer
  - IP Fabric
  - Client details
  - Network usage
  - Security alarms
  - Alarm summary
  - Alarm history
  - Network Director audit trail
  - Device inventory
  - Top 10 bandwidth users
  - Active user sessions
  - Network device traffic
- Network neighborhood for access point radios
- VM inventory
- VM vMotion history
- RF interference detail
- Select time frame and scope covered by report (report options):
  - Run reports immediately, or at a specified time, or on a recurring schedule
  - Select report format (PDF, HTML, or CSV)
  - Send reports in e-mail or send them to an SCP server for archiving
- Report management
  - View, delete, download generated reports

System Mode Features
- Audit trail and job management
  - View audit trail of Network Director user and system activity
  - View and manage all jobs
- Troubleshooting support
  - Generate a compressed file of logs and other data to send to Juniper Networks for analysis

Juniper Networks Services and Support
Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services/.

Ordering Information
Network Director uses a very simple perpetual licensing model and is licensed by the number of devices that it manages, including EX Series Ethernet Switches and WLA Series Wireless LAN Access Points. Whether the device is a wireless LAN access point or an Ethernet switch, it is counted as a device. Wireless LAN controllers are not counted towards the device count. Select any quantities and any combination of the following SKUs for the number of devices you plan to manage.

Table 2. Junos Space Network Director Ordering Information

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>JS-NETDIR-10</td>
<td>Junos Space Network Director for 10 devices</td>
</tr>
<tr>
<td>JS-NETDIR-25</td>
<td>Junos Space Network Director for 25 devices</td>
</tr>
<tr>
<td>JS-NETDIR-100</td>
<td>Junos Space Network Director for 100 devices</td>
</tr>
</tbody>
</table>

Network Director is part of Junos Space and requires Junos Space Network Management Platform (JS-PLATFORM) to be installed.

About Juniper Networks
Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.