Understanding DAI for Port Security on EX-series Switches

Dynamic ARP inspection (DAI) protects EX-series switches against ARP spoofing.

DAI inspects ARP packets on the LAN and uses the information in the DHCP snooping database on the switch to validate ARP packets and to protect against ARP cache poisoning. ARP requests and replies are compared against entries in the DHCP snooping database, and filtering decisions are made based on the results of those comparisons. When an attacker tries to use a forged ARP packet to spoof an address, the switch compares the address to entries in the database. If the MAC address or IP address in an ARP packet does not match a valid entry in the DHCP snooping database, the packet is dropped.

ARP packets are trapped to the Routing Engine and are rate-limited to protect the switch from CPU overload.

Address Resolution Protocol

Sending IP packets on a multiaccess network requires mapping an IP address to an Ethernet media access control (MAC) address.

Ethernet LANs use Address Resolution Protocol (ARP) to map MAC addresses to IP addresses.

The switch maintains this mapping in a cache that it consults when forwarding packets to network devices. If the ARP cache does not contain an entry for the destination device, the host (the DHCP client) broadcasts an ARP request for that device's address and stores the response in the cache.

ARP Spoofing

ARP spoofing (also known as ARP poisoning or ARP cache poisoning) is one way to initiate man-in-the-middle attacks. The attacker sends an ARP packet that spoofs the MAC address of another device on the LAN. Instead of the switch sending traffic to the proper network device, it sends it to the device with the spoofed address that is impersonating the proper device. If the impersonating device is the attacker's machine, the attacker receives all the traffic from the switch that should have gone to another device. The result is that traffic from the switch is misdirected and cannot reach its proper destination.

One type of ARP spoofing is gratuitous ARP, which is when a network device sends an ARP request to resolve its own IP address. In normal LAN operation, gratuitous ARP messages indicate that two devices have the same MAC address. They are also broadcast when a network interface card (NIC) in a device is changed and the device is rebooted, so that other devices on the LAN update their ARP caches. In malicious situations, an attacker can poison the ARP cache of a network device by sending an

ARP response to the device that directs all packets destined for a certain IP address to go to a different MAC address instead.

To prevent MAC spoofing through gratuitous ARP and through other types of spoofing, EX-series switches examine ARP responses through DAI.

DAI on EX-series Switches

DAI examines ARP requests and responses on the LAN and validates ARP packets. The switch intercepts ARP packets from an access port and validates them against the DHCP snooping database. If no IP-MAC entry in the database corresponds to the information in the ARP packet, DAI drops the ARP packet and the local ARP cache is not updated with the information in that packet. DAI also drops ARP packets when the IP address in the packet is invalid.

JUNOS for EX-series software uses DAI for ARP packets received on access ports because these ports are untrusted by default. Trunk ports are trusted by default, so ARP packets bypass DAI on them.

You configure DAI for each VLAN, not for each interface (port). By default, DAI is disabled for all VLANs. You can set an interface to be trusted for ARP packets by setting dhcp-trusted on that port.

For packets directed to the switch to which a network device is connected, ARP queries are broadcast on the VLAN. The ARP responses to those queries are subjected to the DAI check.

For DAI, all ARP packets are trapped to the Routing Engine. To prevent CPU overloading, ARP packets destined for the Routing Engine are rate-limited.

If the DHCP server goes down and the lease time for an IP-MAC entry for a previously valid ARP packet runs out, that packet is blocked.

Related Topics

- Port Security for EX-series Switches Overview
- Understanding DHCP Snooping for Port Security on EX-series Switches
- Example: Configuring Port Security, with DHCP Snooping, DAI, MAC Limiting, and MAC Move Limiting, on an EX-series Switch
- Example: Configuring DHCP Snooping, DAI , and MAC Limiting on an EX-series Switch with Access to a DHCP Server Through a Second Switch
- Example: Configuring DHCP Snooping and DAI to Protect the Switch from ARP Spoofing Attacks
- Enabling Dynamic ARP Inspection (CLI Procedure)
- Enabling Dynamic ARP Inspection (J-Web Procedure)