An Analysis of Selected IPv6 Network Attacks

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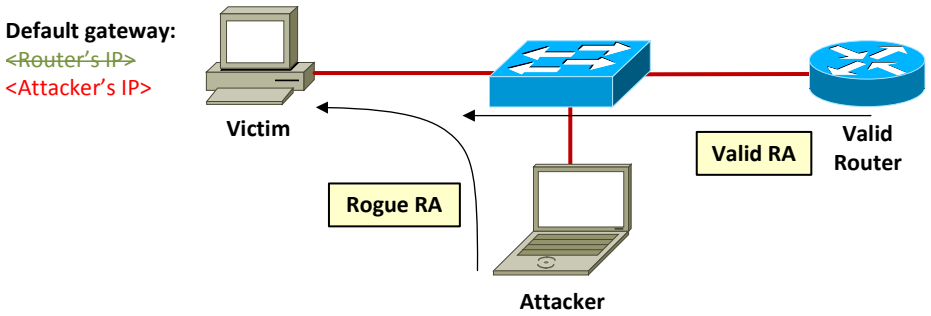
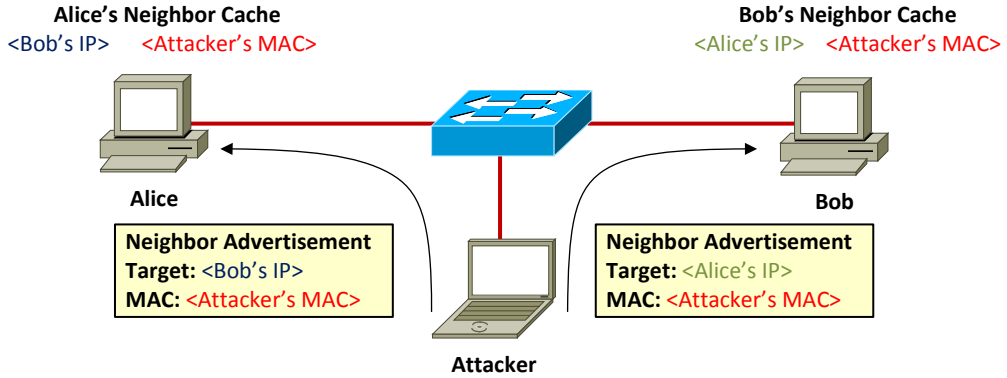
Attacks

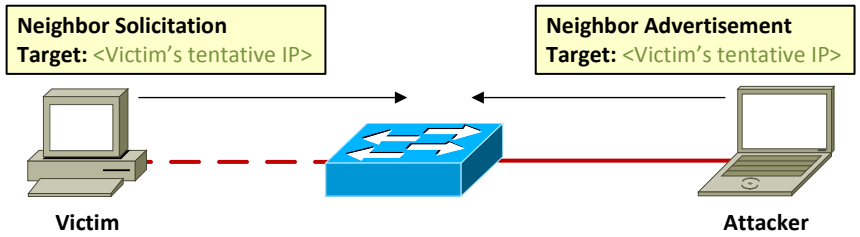
Rogue Router Advertisement MitM



Neighbor Cache Poisoning MitM



Duplicate Address Detection DoS



Defense

Neighbor Discovery Protocol Inspection

- Configured on a switch
- Only trusted ports are allowed to forward Router Advertisements
- Forwarding of Neighbor Advertisements based on a binding table containing valid IPv6-to-MAC mappings.

Bypassing NDP Inspection

Packet fragmentation

1. Fragment

IPv6 HEADER	FRAGMENT HEADER	DESTINATION OPTIONS HEADER

2. Fragment

IPv6 HEADER	FRAGMENT HEADER	DESTINATION OPTIONS HEADER	ROUTER ADVERTISEMENT

Extension Headers

IPv6 HEADER	DESTINATION OPTIONS HEADER	DESTINATION OPTIONS HEADER	...	ROUTER ADVERTISEMENT

An attacker is able to bypass NDP inspection by splitting an original RA message into more IPv6 fragments. A switch processes them individually, but is unable to determine the first octet of RA in the last fragment. Since NDP inspection is usually implemented in hardware, an attacker can use many extension headers in order to exhaust all the allocated resources, thus preventing the switch from recognizing malicious NDP message.

Summary

- Tested on Cisco and H3C devices
- Created tool to attack presented vulnerabilities of Neighbor Discovery Protocol
- All of the tested devices are vulnerable – it is possible for an attacker to easily cause a DoS in a local network
- Administrators are currently unable to prevent from these attacks

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