

Week One Documentation

Cisco Packet Tracer - Network Security & IoT Configuration

1. Project Overview

This documentation covers the configuration of a wireless network infrastructure to provide wireless access to an IoT Server through an IDPS (Intrusion Detection and Prevention System) Router. The project involved configuring routing, switching, wireless connectivity, and security settings in Cisco Packet Tracer.

2. Objectives

- Add a wireless router to the network infrastructure
- Enable wireless devices to access the IoT Server (192.168.5.100)
- Configure proper routing between network segments
- Ensure network security while maintaining connectivity

3. Implementation Steps

3.1 Network Topology Setup

- Added a Layer 2 Switch (2960-24TT) to connect IDPS Router to the Wireless Router
- Added a WRT300N Wireless Router to provide WiFi connectivity
- Connected IDPS Router GigabitEthernet0/2/0 to Switch1 FastEthernet0/1
- Connected Switch1 FastEthernet0/2 to Wireless Router's Internet port

3.2 VLAN Configuration on IDPS Router

- Created VLAN 1 interface with IP address 192.168.10.1/24
- Configured GigabitEthernet0/2/0 as a switchport in VLAN 1
- Enabled the interface with 'no shutdown' command

3.3 Wireless Router Configuration

- Internet Connection Type: Static IP
- Internet IP Address: 192.168.10.2
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.10.1
- LAN IP Address: 192.168.0.1
- DHCP: Enabled for wireless clients
- SSID: kay (Network Name)
- Security: WEP with key 1234567890

3.4 Static Routing

Added a static route on the IDPS Router to enable return traffic to wireless clients:

```
ip route 192.168.0.0 255.255.255.0 192.168.10.2
```

3.5 IPS Configuration

Disabled IPS filtering on GigabitEthernet0/0/1 to allow traffic from the wireless network to reach the IoT Server:

```
no ip ips iosips out
```

4. Network Configuration Summary

Device	Interface	IP Address	Purpose
IDPS Router	Gig0/0/0	192.168.7.1	WAN Connection
IDPS Router	Gig0/0/1	192.168.5.1	IoT Server Network
IDPS Router	VLAN 1	192.168.10.1	Wireless Router Network
IDPS Router	Gig0/2/0	Switchport	Connection to Switch1
Wireless Router	Internet	192.168.10.2	WAN Connection to IDPS
Wireless Router	LAN	192.168.0.1	Wireless Client Network
IoT Server	Ethernet	192.168.5.100	IoT Services

5. Challenges Encountered

5.1 Layer 2 vs Layer 3 Interface Issue

The GigabitEthernet0/2/x interfaces on the ISR4331 router were switchports (Layer 2) and did not allow direct IP address assignment. The 'no switchport' command was not supported in Packet Tracer for this router model.

Solution: Created a VLAN interface (SVI) to assign an IP address and used the switchport for Layer 2 connectivity.

5.2 Incorrect Cable Connection

Initially connected the cable to a LAN port (Ethernet 0) on the wireless router instead of the Internet/WAN port, causing the wireless router to be unreachable.

Solution: Reconnected the cable to the 'Internet' port on the wireless router.

5.3 IPS Blocking Traffic

The IDPS Router's Intrusion Prevention System (signature 2004) was blocking traffic from the wireless network (192.168.10.2) to the IoT Server (192.168.5.100).

Solution: Disabled the IPS rule on the interface using 'no ip ips iosips out' command.

5.4 Wireless Device Compatibility

Smartphones and some laptops with 11 Mbps wireless adapters could not connect to the WRT300N router. Only devices with WPC300N adapters (300 Mbps) successfully connected.

Solution: Used laptops equipped with WPC300N wireless modules for reliable connectivity.

5.5 SSID Mismatch

Some devices were configured with the wrong SSID ('IoT_WiFi') when the router was actually broadcasting 'kay', preventing connection.

Solution: Verified the actual SSID on the router and updated device configurations accordingly.

6. Key Learnings

- **Layer 2 vs Layer 3 Interfaces:** Understanding the difference between switchports and routed ports, and when to use VLAN interfaces (SVIs) for routing.
- **Inter-VLAN Routing:** How to configure routing between different network segments using VLAN interfaces and static routes.

- **Wireless Router Architecture:** The distinction between WAN (Internet) and LAN ports, and how home routers perform NAT and routing.
- **IPS/IDS Impact:** Security systems can block legitimate traffic; understanding how to identify and resolve IPS signature alerts.
- **Troubleshooting Methodology:** Using ping tests systematically to isolate connectivity issues at different network layers.
- **ARP and Layer 2 Connectivity:** Even if ARP entries exist, Layer 3 connectivity may still fail due to security policies.
- **Wireless Adapter Compatibility:** Different wireless adapters have varying compatibility with access points; matching specifications is important.
- **Static Routing Requirements:** When using private networks behind a router, static routes are needed for return traffic.

7. Recommendations for Improvement

- **Network Planning:** Create a detailed network diagram with IP addressing scheme before implementation.
- **Documentation:** Document configurations as they are made, not after troubleshooting.
- **Security Policy Review:** Review IPS/firewall rules before adding new network segments to anticipate blocking issues.
- **Testing Strategy:** Test connectivity at each step rather than configuring everything first.
- **Use WPA2 Security:** Replace WEP with WPA2-PSK for better wireless security.
- **Standardize Equipment:** Use compatible wireless adapters across all devices to avoid connectivity issues.
- **Backup Configurations:** Save router configurations regularly using 'copy running-config startup-config'.
- **Network Segmentation:** Consider implementing proper VLANs for IoT devices for enhanced security.

8. Conclusion

This project successfully established wireless connectivity to an IoT Server through an IDPS Router. The implementation required understanding of Layer 2/3 networking concepts, VLAN configuration, static routing, and security policy management. Key challenges included interface type limitations, cable connection errors, IPS blocking, and wireless compatibility issues. All issues were resolved through systematic troubleshooting and proper configuration adjustments.

9. Final Working Configuration

The following commands were essential for the successful implementation:

```
! IDPS Router Configuration
interface vlan 1
ip address 192.168.10.1 255.255.255.0
no shutdown

interface GigabitEthernet0/2/0
switchport mode access
switchport access vlan 1
no shutdown

ip route 192.168.0.0 255.255.255.0 192.168.10.2

interface GigabitEthernet0/0/1
no ip ips iosips out
```