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# CS309 Network Administration and Management

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Project Work

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"ADVANCED NETWORK CONFIGURATION: IMPLEMENTING ACL, DHCP, AND OSPF"

Name: *Name Lastname*

Student Number: *Student ID*

DEADLINE FOR SUBMISSION: JUNE 3RD, 2024

## Packet Tracer - IPv4 ACL Implementation Challenge

### Addressing Table

Device	Interface	IP Address
HQ	G0/0/0	a.b.c.1/26
	G0/0/1	d.e.f.65/29
	S0/1/0	m.n.o.1/30
	S0/1/1	p.q.r.1/30
Branch	G0/0/0	g.h.i.1/27
	G0/0/1	j.k.l.33/28
	S0/1/1	p.q.r.2/30
PC-1	NIC	a.b.c.10/26
PC-2	NIC	a.b.c.20/26
PC-3	NIC	a.b.c.30/26
Admin	NIC	d.e.f.67/29
Enterprise Web Server	NIC	d.e.f.70/29
Branch PC	NIC	g.h.i.17/27
Branch Server	NIC	j.k.l.45/28
Internet User	NIC	s.t.u.218/24
External Web Server	NIC	v.w.x.73/24

### Objectives

- Configure a router with standard named ACLs.
- Configure a router with extended named ACLs.
- Configure a router with extended ACLs to meet specific communication requirements.
- Configure an ACL to control access to network device terminal lines.
- Configure the appropriate router interfaces with ACLs in the appropriate direction.
- Verify the operation of the configured ACLs.
- Configure OSPF routing to ensure all devices can communicate efficiently across multiple subnets.
- Set up DHCP servers and/or DHCP relay agents to manage IP address allocation dynamically. (Note: Ensure ACL configurations do not block DHCP and OSPF traffic.)

### Background / Scenario

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In this activity you will configure DHCP, OSPF, extended, standard named, and extended named ACLs to meet specified communication requirements.

### Instructions

#### Step 1: Verify Connectivity in the New Company Network

First, test connectivity on the network as it is before configuring the ACLs. All hosts should be able to ping all other hosts.

#### Step 2: Configure Standard and Extended ACLs per Requirements.

Configure ACLs to meet the following requirements:

##### Important guidelines:

- Do **not** use explicit deny any statements at the end of your ACLs.
- Use shorthand (**host** and **any**) whenever possible.
- Write your ACL statements to address the requirements in the order that they are specified here.
- Place your ACLs in the most efficient location and direction.

##### ACL 1 Requirements

- Create ACL **101**.
- Explicitly block FTP access to the Enterprise Web Server from the internet.
- No ICMP traffic from the internet should be allowed to any hosts on HQ LAN 1
- Allow all other traffic.

##### ACL 2 Requirements

- Use ACL number **111**
- No hosts on HQ LAN 1 should be able to access the Branch Server.
- All other traffic should be permitted.

##### ACL 3: Requirements

- Create a named standard ACL. Use the name **vtty\_block**. The name of your ACL must match this name exactly.
- Only addresses from the HQ LAN 2 network should be able to access the VTY lines of the HQ router.

##### ACL 4: Requirements

- Create a named extended ACL called **branch\_to\_hq**. The name of your ACL must match this name exactly.
- No hosts on either of the Branch LANs should be allowed to access HQ LAN 1. Use one access list statement for each of the Branch LANs.
- All other traffic should be allowed.

#### Step 3: Verify ACL Operation.

- Perform the following connectivity tests between devices in the topology. Note whether or not they are successful.

**Note:** Use the **show ip access-lists** command to verify ACL operation. Use the **clear access list counters** command to reset the match counters.

Send a ping request from Branch PC to the Enterprise Web Server. Was it successful? Explain.

Which ACL statement permitted or denied the ping between these two devices? List the access list name or number, the router on which it was applied, and the specific line that the traffic matched.

Attempt to ping from PC-1 on the HQ LAN 1 to the Branch Server. Was it successful? Explain.

Which ACL statement permitted or denied the ping between these two devices?

Open a web browser on the External Server and attempt to bring up a web page stored on the Enterprise Web Server. Is it successful? Explain.

Which ACL statement permitted or denied the ping between these two devices?

- b. Test connections to an internal server from the internet.

From the command line on the Internet User PC, attempt to make an FTP connection to the Branch Server. Is the FTP connection successful?

Which access list should be modified to prevent users from the Internet to make FTP connections to the Branch Server?

Which statement(s) should be added to the access list to deny this traffic?

### Step 4: Configure DHCP with a Relay Agent

- a. Configure DHCP scopes on the main server for each subnet that doesn't directly host the DHCP server.
- b. For example, the DHCP server at HQ will have scopes for its own subnet (a.b.c.0/26), and possibly others like the Branch subnet (g.h.i.0/27).
- c. Configure routers at branch locations to act as DHCP relay agents.
- d. On each branch router, enable the DHCP relay and specify the IP address of the DHCP server located at HQ.

### Step 5: Implement OSPF

For simplicity, define a single OSPF area for all devices in the network.

#### Configure OSPF on Routers:

- a. Enable OSPF on each router.
- b. Use network statements to include all interfaces in OSPF.
- c. Ensure that OSPF advertisements include the networks for all subnets involved in the exercise.

#### Adjust OSPF Parameters:

- a. Configure OSPF priorities on routers to control designated router elections.
- b. Set OSPF timers if necessary to optimize convergence times.

### Step 6: Verify DHCP, OSPF, and ACL Operations

#### DHCP Verification

- a. Ensure that devices on different subnets can obtain IP addresses from the DHCP server via the relay agents.
- b. Check the lease assignments on the DHCP server to verify correct scope usage.

#### OSPF Verification

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- a. Use commands like `show ip ospf neighbor` to verify OSPF neighbor relationships.
- b. Check the routing tables using `show ip route` to ensure OSPF routes are present and correct.

### ACL Impact Analysis

- a. Verify that ACLs do not block OSPF routing updates or DHCP relay traffic.

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# IP Address Allocation Guidelines

To ensure the uniqueness of network configurations across all submissions, IP addresses will be allocated sequentially based on each student's identifier. Each student will use a unique starting point for the IP address sequence (please use your number in the attendance sheet). This sequence must be used to replace the placeholder network portions (a.b.c, d.e.f, etc.) provided in the assignment. You can use any class of IPs you prefer, but you should substitute a portion of the placeholder segments in the IP addresses with your assigned network portions. Make sure that all instances of a specific placeholder throughout the assignment are replaced consistently with the same network portion. For example, if you are assigned 10.0.1 for a.b.c, then every occurrence of a.b.c in the assignment should be replaced with 10.0.1. Document the original placeholders and the corresponding actual network portions you used in a table or list within your assignment. This record is crucial for verifying that you have correctly applied your unique IP ranges and adhered to the assignment's requirements.

**Example:** If your number in the attendance sheet is 5, your starting IP address segment will be 10.0.5. The next student start with a.b.c.6, and so on, incrementing each starting segment by one for each student. Therefore, if a.b.c is your placeholder, you will replace it with 10.0.5 throughout your assignment configuration. The

## Compliance

It is critical that you use only the network portions assigned to you. Using different or incorrect network portions can result in the rejection of your submission. I will verify that each submitted assignment uses a unique set of IP addresses as per the sequential allocation system established in the IP Address Allocation Guidelines to ensure fairness and adherence to the assignment requirements.

## Configuration Details:

- List all IP addresses used, including the replacements you made for the placeholders. Explain why specific ranges were chosen for each segment of the network.
- Detail the configurations for each device in your network, including routers, switches, and any other network devices.
- Describe the tests you performed to ensure everything was configured correctly.
- Include screenshots or command outputs from the Packet Tracer software that verify the operation of the network.

## Submission Format

- Upload both your Packet Tracer file and your documentation PDF to Turnitin by the deadline **June 3rd, 2024**.

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- Make sure each file is correctly named and includes all necessary information.
  - Ensure you submit both the documentation and the Packet Tracer file by the date and time specified in the assignment details to avoid any late penalties.

## Documentation Guidelines

- **Work Submission:**
  1. The project should be submitted in either a LaTeX folder along with a PDF file, or a Microsoft Word document. The project should be well-structured and clearly presented, with appropriate use of graphics, tables, and figures as needed to support the content. It is important to note that the first page of the project for each student should be this cover page, and it should be the first page of the submitted file.
  2. The deadline for submitting the project is **June 3rd, 2024 at 17:00 Eastern European Time (EET)**. It is crucial to ensure that the project is uploaded to the designated folder named **"Assignment NAM SP24"** on TURNITIN on or before this date and time to be considered for grading.
  3. Your Packet Tracer file should be named using your first and last name, followed by the assignment name, to ensure it can be easily identified. For example, if your name is Name Lastname, the file name should be **name\_lastname.pkt** and your documentation file should be named as **name\_lastname.pdf**.

## Academic Integrity

- Be aware that any violation of academic integrity policies will be taken seriously and may result in disciplinary action, including a failing grade for the project or course.
- Properly cite all sources of information, including texts and online resources, following the APA (American Psychological Association) citation style.

**Note:** Late submissions may result in a lower grade or may not be accepted.

**GOOD LUCK!**