

NETWORK MANAGEMENT SYSTEM

ASSIGNMENT-2: MOBILE NETWORK FUNDAMENTALS

ACTIVITY: RESEARCH AND PRESENT AN OVERVIEW OF MOBILE NETWORKS

NAME: PAVITHRAA E S

CLASS AND SECTION: CSE-B

REG. NO: 211721104099

ROLL NO: 202101100

COLLEGE NAME: RAJALAKSHMI INSTITUTE OF TECHNOLOGY

TRAINER: Mr. Kripal Tripathi

Overview of Mobile Network Fundamentals

Introduction to Mobile Networks

Mobile networks are wireless communication networks that enable connectivity and data transmission across vast distances. These networks support voice calls, messaging, and internet services for mobile devices.

Network Generations

- **2G:** Introduced basic digital voice services.
- **3G:** Enabled higher data speeds for multimedia applications.
- **4G (LTE):** Provided high-speed internet and seamless mobile broadband.
- **5G:** Introduced ultra-fast connectivity, low latency, and IoT integration.

Basic Components

- **Base Transceiver Station (BTS):** Facilitates communication between user equipment and the network.
- **Mobile Switching Center (MSC):** Manages call setup and routing.
- **Packet Core Network:** Handles data traffic and internet connectivity.
- **HLR/VLR:** Manages user authentication and location tracking.

Communication Protocols

- **GSM:** The standard for global communication.
- **CDMA:** An alternative technology allowing multiple users on the same frequency.
- **LTE:** The foundation of 4G networks.
- **5G NR:** The new radio technology enhancing data throughput and efficiency.

Network Operations

- **Call Setup and Handover:** Seamlessly transitioning calls between BTS as a user moves.
- **Data Session Establishment:** Initiating and maintaining data sessions for internet access.
- **Mobility Management:** Tracking and managing user location and network availability.

GNS3 Setup and Installation

Introduction to GNS3

GNS3 (Graphical Network Simulator-3) is an open-source network simulator that allows the configuration and testing of complex networks without physical hardware.

Installation Steps

1. **Download GNS3:** Visit <https://www.gns3.com/> and download the installer for your operating system.
2. **Install Virtualization Software:** Use VirtualBox or VMware for hosting virtual devices.
3. **Configure GNS3 VM:** Integrate the GNS3 VM with the main application for improved performance.

Importing Network Images

1. **Add Cisco IOS Images:** Go to “File” > “Preferences” > “IOS Routers” and upload Cisco router images.
2. **Set Up Virtual Switches:** Import compatible images for Cisco switches.

Creating a Basic Network Topology

Designing the Topology

Create a simple topology involving:

- **Routers:** To direct traffic and manage routing.
- **Switches:** For interconnecting virtual hosts and managing VLANs.
- **Hosts:** Simulate endpoints for connectivity tests.

Initial Configurations

- Set up hostnames for routers and switches.
- Assign IP addresses to interfaces.
- Enable basic routing protocols like static routing or RIP.

Basic Router and Switch Operations

Router Configuration

Setting Up Hostnames:

```
connection.send_command('hostname Router1')
```

Configuring Interfaces:

```
connection.send_command('interface GigabitEthernet0/1')  
connection.send_command('ip address 192.168.1.1 255.255.255.0')  
connection.send_command('no shutdown')
```

Switch Configuration

Creating VLANs:

```
connection.send_command('vlan 10')  
connection.send_command('name SALES')
```

Assigning Ports to VLANs:

```
connection.send_command('interface FastEthernet0/1')  
connection.send_command('switchport mode access')  
connection.send_command('switchport access vlan 10')
```

Network Testing and Verification

Ping and Connectivity Tests

Use the ping command to verify connectivity between hosts:

```
output = connection.send_command('ping 192.168.1.2')  
print(output)
```

Route Verification

Check the routing table:

```
output = connection.send_command('show ip route')
print(output)
```

Python Script for Network Configuration

Purpose of the Script

The script automates basic router and switch configurations using Python and the Netmiko library.

Python Code:

```
from netmiko import ConnectHandler

# Define the device
cisco_router = {
    'device_type': 'cisco_ios',
    'host': '192.168.1.1',
    'username': 'admin',
    'password': 'admin',
    'port': 22,
}

# Connect and send commands
connection = ConnectHandler(**cisco_router)
connection.send_command('hostname Router1')
connection.send_command('interface GigabitEthernet0/1')

connection.send_command('ip address 192.168.1.1 255.255.255.0')
connection.send_command('no shutdown')
output = connection.send_command('show ip interface brief')
print(output)
connection.disconnect()
```

Conclusion and Key Takeaways

Summary of Accomplishments

- Successfully researched mobile network fundamentals and set up a network using GNS3.
- Configured routers and switches with Python scripting for automation.

Challenges Faced

- Initial setup and integration of images into GNS3.
- Understanding the Netmiko library for scripting.

Applications and Future Work

- Applying network automation for larger-scale projects.
- Integrating more complex routing protocols and network scenarios.

References

- **Books and Articles:** Mobile Networking Textbooks, Cisco Networking Guides.
- **Websites:** GNS3 Documentation, [Cisco Config Guides](#).
- **Libraries Used:** Netmiko documentation and tutorials.