

FINAL PROJECT IN NET 313 -
ADVANCE NETWORKING

**PROJECT TITLE:
ADVANCED NETWORK
ARCHITECTURE
WITH DHCP AND EIGRP
OPTIMIZATION**

GROUP 11





OBJECTIVE: ✨

Design, implement, and optimize a network infrastructure for a technology hub facility using Cisco Packet Tracer. The network must meet the scalability, redundancy, and security demands of a tech-driven environment. Network performance will be evaluated, and enhancements proposed based on real-world business needs. ✨



Part 1: Company and Network Requirements



1. Define Your Company

Company Type: Technology Hub Facility ✨

The tech hub facility provides a collaborative space for startups, IT professionals, and developers. It includes shared work spaces, conference rooms, and a dedicated data center. The network accommodates multiple clients, ensuring secure high-speed internet, dependable connectivity, and strong security measures.



Unique Networking Requirements:

High bandwidth to handle concurrent operations and extensive data transfers.

Segmented networks for tenant isolation and administrator access

Scalable infrastructure to accommodate up to 500 users simultaneously

Goals:

Performance:

- Ensure stable, low-latency connections.

Scalability:

- Expand seamlessly as the user base increases.

Security:

- Protect client data and comply with industry standards.



2. Analyze Business Needs

IP Addressing:

- Static IPs: Reserved for critical devices such as routers, servers, and printers.
- Dynamic IP Allocation: Provided via DHCP for client devices in each subnet.



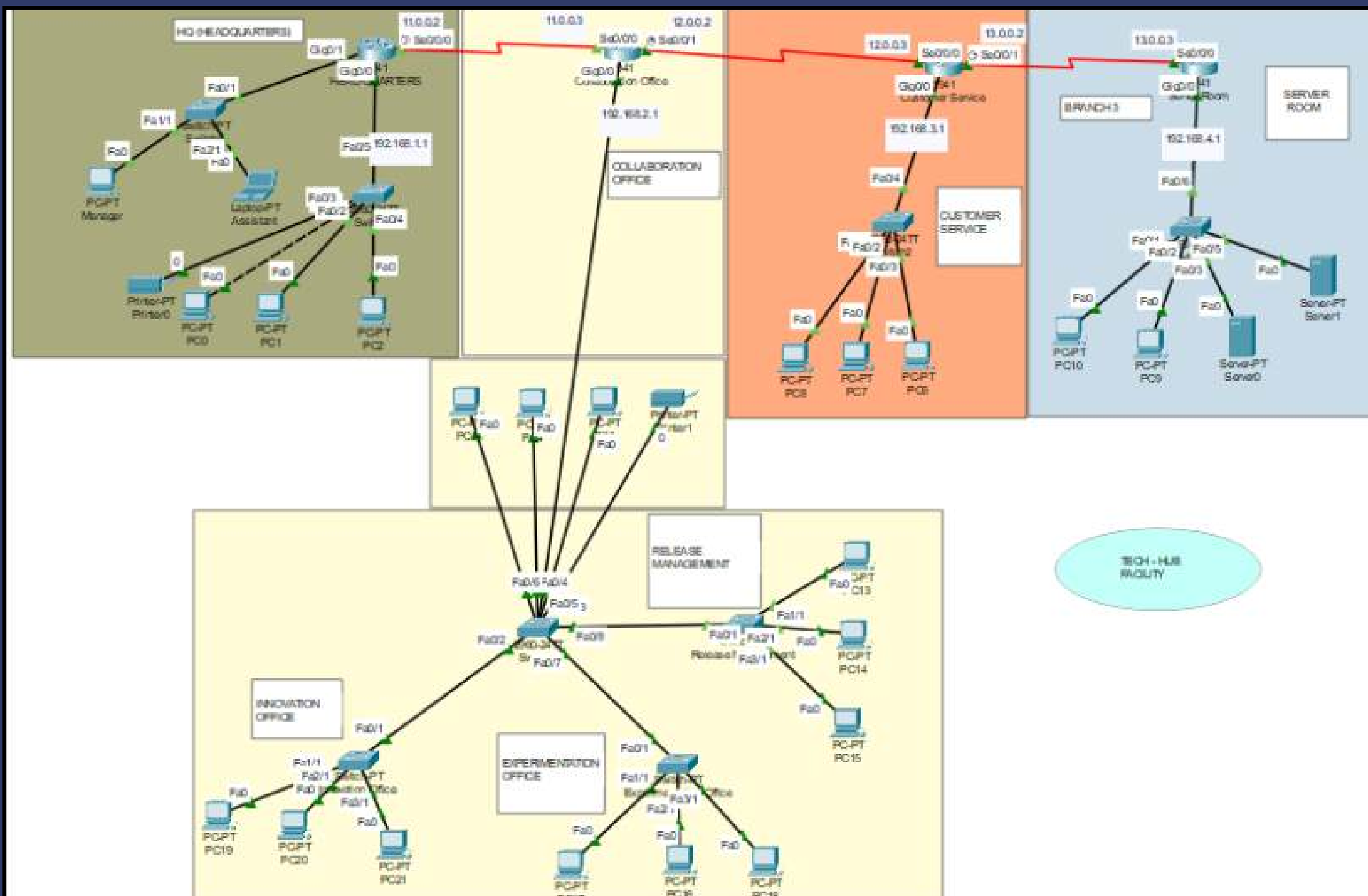
Security Requirements:

- VLAN segmentation to isolate tenant traffic from administrative operations.
- Strong device authentication (e.g., WPA3) and encryption protocols (SSL/TLS).
- Firewalls, intrusion detection/prevention systems (IDS/IPS), and access control lists (ACLs).





Part 2: Network Design and Planning





1. Network Topology

Topology Type: Hybrid Topology (Star + Point-to-Point WAN)

The network design uses a Hybrid Topology, which combines Star Topology for LAN configurations within each location and Point-to-Point WAN links for inter-site connectivity.

Why This Topology is Suitable for the Project:

1. Scalability
2. Reliability and Redundancy
3. Centralized Management
4. Optimized Bandwidth Usage
5. Cost-Effectiveness

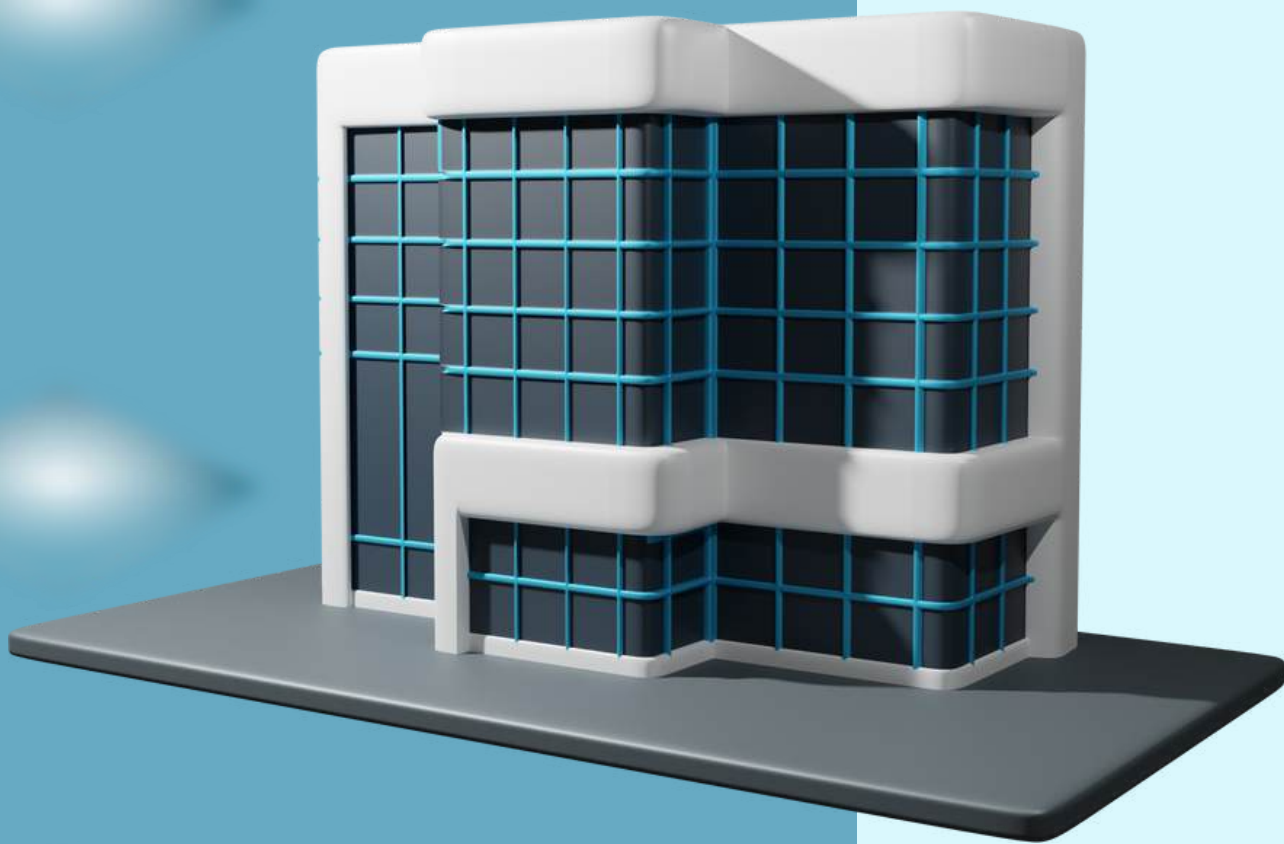




Network Overview:

- **Headquarters (HQ):** Subnet 192.168.1.0/24
- **Branch 1:** Subnet 192.168.2.0/24
- **Branch 2:** Subnet 192.168.3.0/24
- **Branch 3:** Subnet 192.168.4.0/24
- **WAN Links:** Using the range 10.0.0.0/30 for point-to-point inter-site connections.





Headquarters (HQ):

- **Subnet:** 192.168.1.0/24
- **Core Devices:**
 1. Router R1 with GigabitEthernet and Serial interfaces.
 2. PCs (PC0-5), Printer0, and a centralized DHCP server.

Branch 1:

- **Subnet:** 192.168.2.0/24
- **Core Devices:**
 1. Router R2 connected to HQ via a Serial link.
 2. PCs (PC6-8), IP Phone6, and Printer1.





Branch 2:

- **Subnet:** 192.168.3.0/24
- **Core Devices:**

1. Router R3 connected to HQ via Serial link.
2. PCs (PC9-11), IP Phone3, and a server cluster.

Branch 3:

Subnet: 192.168.4.0/24

Core Devices:

1. Router R4 connected to HQ via a Serial link.
2. Devices include PCs (PC12-15) and IoT devices (e.g., sensors, smart boards) used for collaborative techlabs.





WAN Network:

IP Range: 10.0.0.0/30 for Serial links between routers (HQ to Branch 1, 2, and 3).



2. Design Explanation

DHCP Configuration:

Centralized DHCP Server: Located at HQ, serving the local subnet (192.168.1.0/24). DHCP Relay Agents: Configured on R2, R3, and R4 for Branch 1, Branch 2, and Branch 3 to enable dynamicIPallocation.

Static Assignments:

Static IPs are assigned to critical devices for reliability:



HQ Router R1: 192.168.1.1

Branch 1 Router R2: 192.168.2.1

Branch 2 Router R3: 192.168.3.1

Branch 3 Router R4: 192.168.4.1

Security Features:



VLANs: Configured to segment tenant traffic and administrative traffic.

Encryption: Use of secure protocols such as WPA3 for wireless and SSL/TLS for management interfaces.

Firewalls and ACLs: Deployed to filter traffic and prevent unauthorized access.

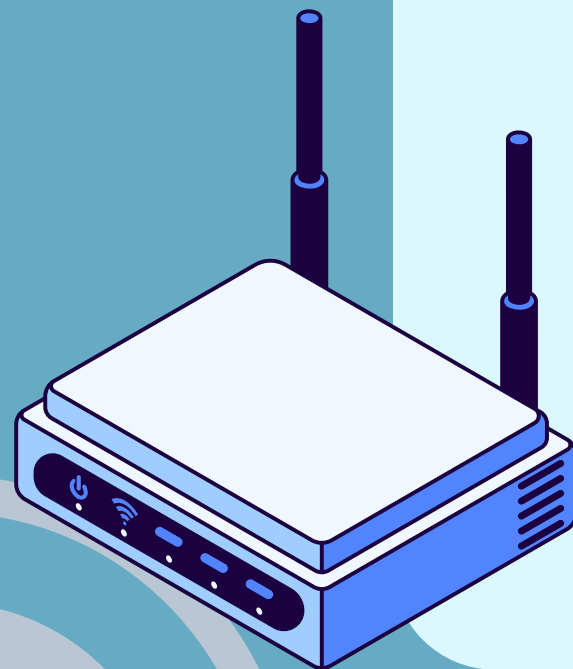
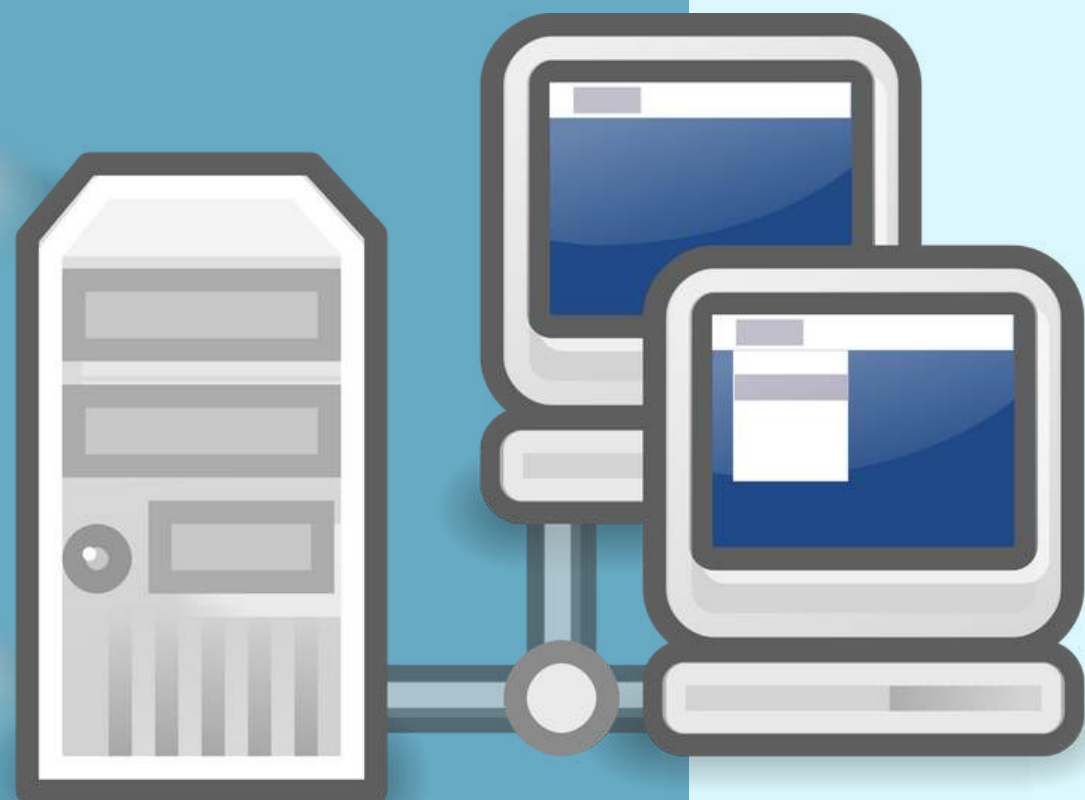


Part 3: Configuration and Implementation ✨

1. Router and Switch Configuration

- Hostnames, encrypted passwords, and basic security applied to all devices.
 - **DHCP Setup:**
 1. Centralized DHCP server with relay agents at each branch.
 2. Static bindings for servers and printers to ensure consistent addressing.
- VLAN Configuration:





Part 3: Configuration and Implementation ✨

- **VLAN Configuration:** - VLANs for tenant and admin traffic, with inter-VLAN routing for management.

2. Security Configuration

- ACLs applied to control traffic flows.
- Encrypted passwords and management access.
- IDS/IPS for monitoring and firewall for traffic filtering.





Part 4: Advanced Testing and Analysis

1. Simulations and Tests

Scenarios:

- **Redundancy:** Simulate device and link failures to validate EIGRP failover mechanisms and redundancy.
- **DHCP Testing:** Validate dynamic IP allocation at HQ, Branch 1, Branch 2, and Branch 3, ensuring proper relay agent functionality.
- **EIGRP Performance:** Validate convergence times and routing table accuracy

Testing Tools: Cisco Packet Tracer for simulation and analysis.




2. Document and Evaluate Testing Results:

- Successful DHCP Allocation: Confirmed for all subnets.
- EIGRP Failover: Verified seamless route failover and reconvergence.
- Connectivity: Full end-to-end communication validated across all devices and locations.

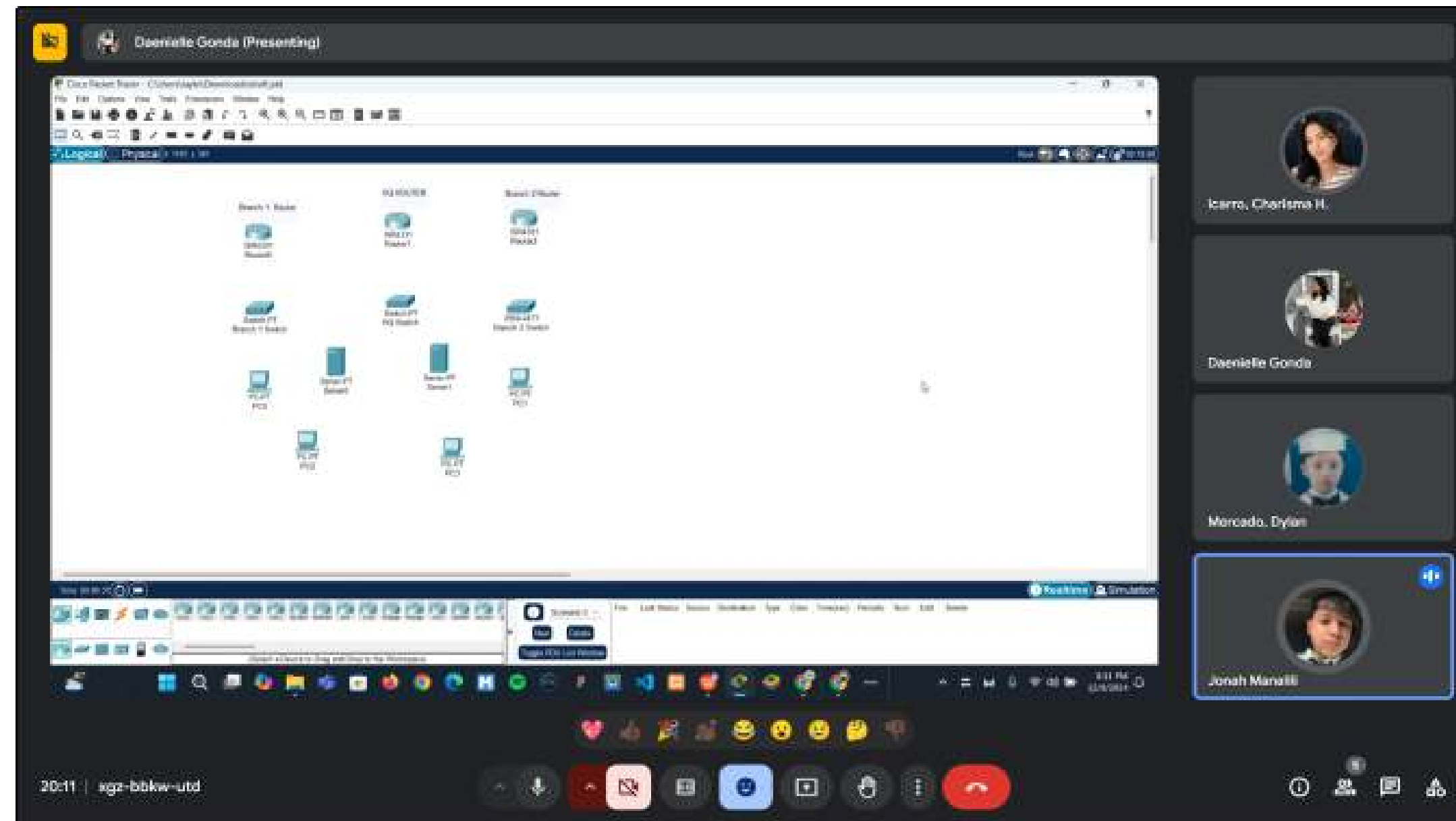


Conclusion

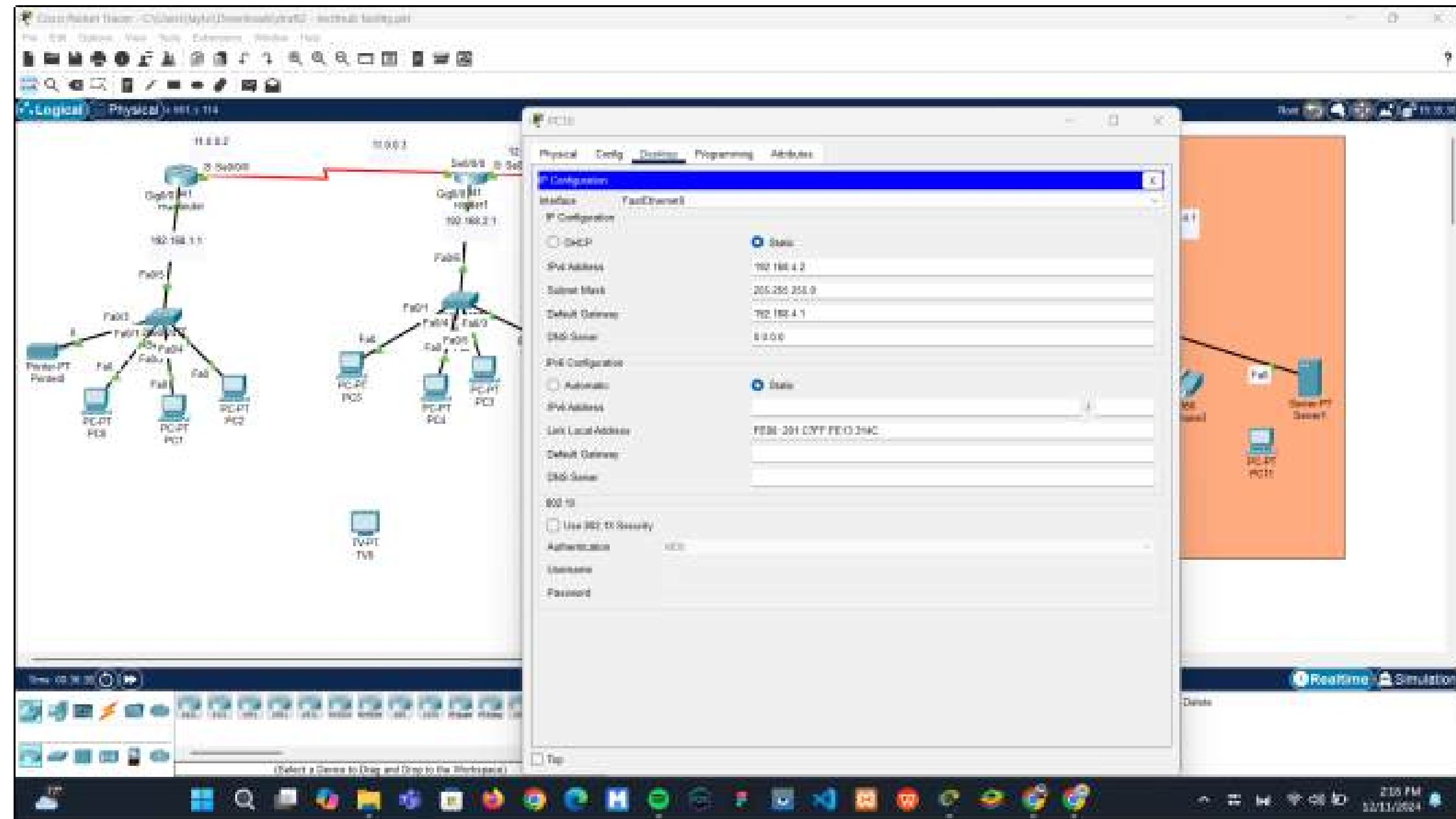
The Hybrid Topology combining Star Topology for LANs and Point-to-Point WAN links for branch connections is ideal for the tech hub facility. This topology meets the project goals of scalability, reliability, and security while enabling centralized management and efficient resource utilization.



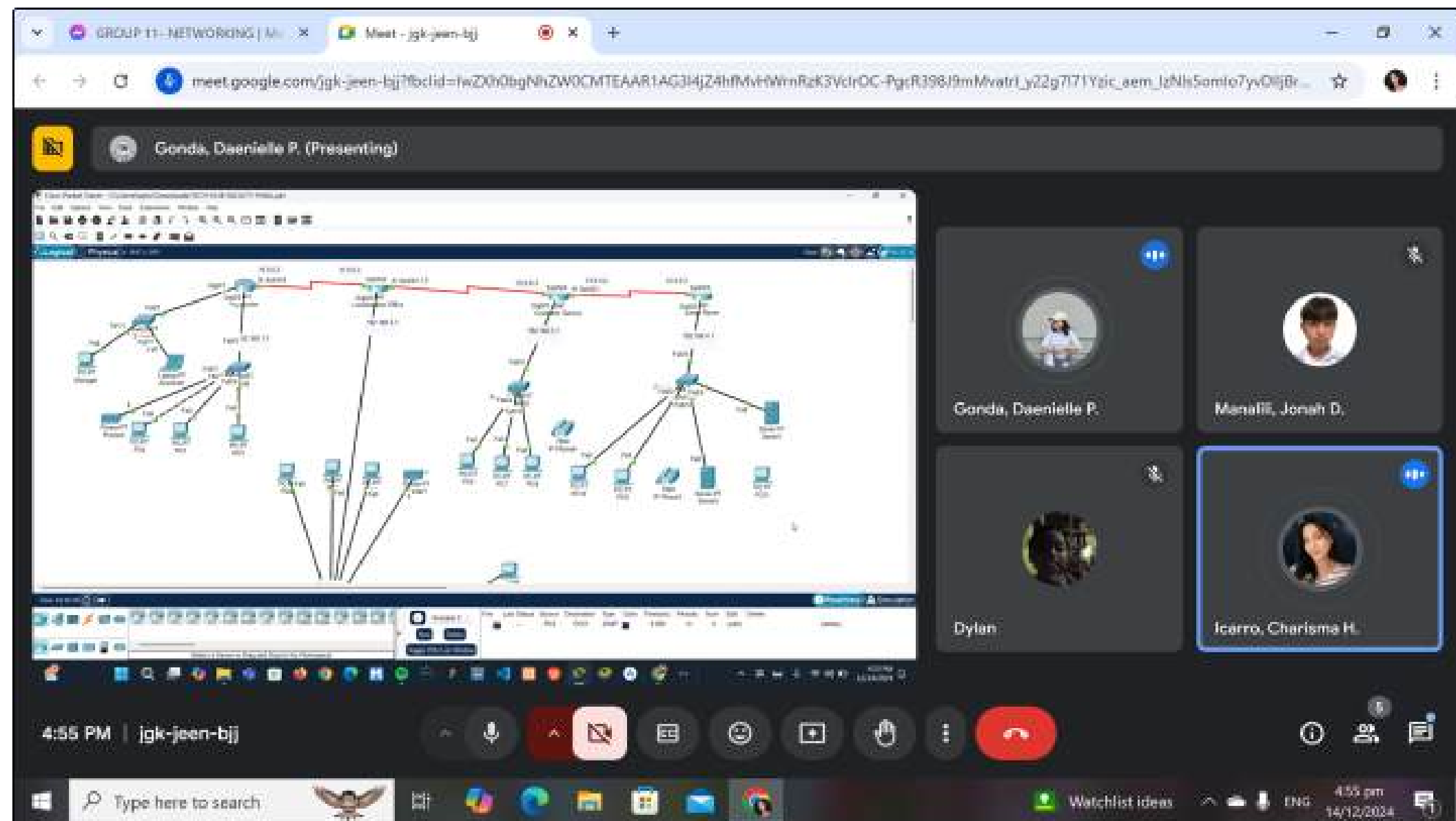
DOCUMENTATION:



DOCUMENTATION:



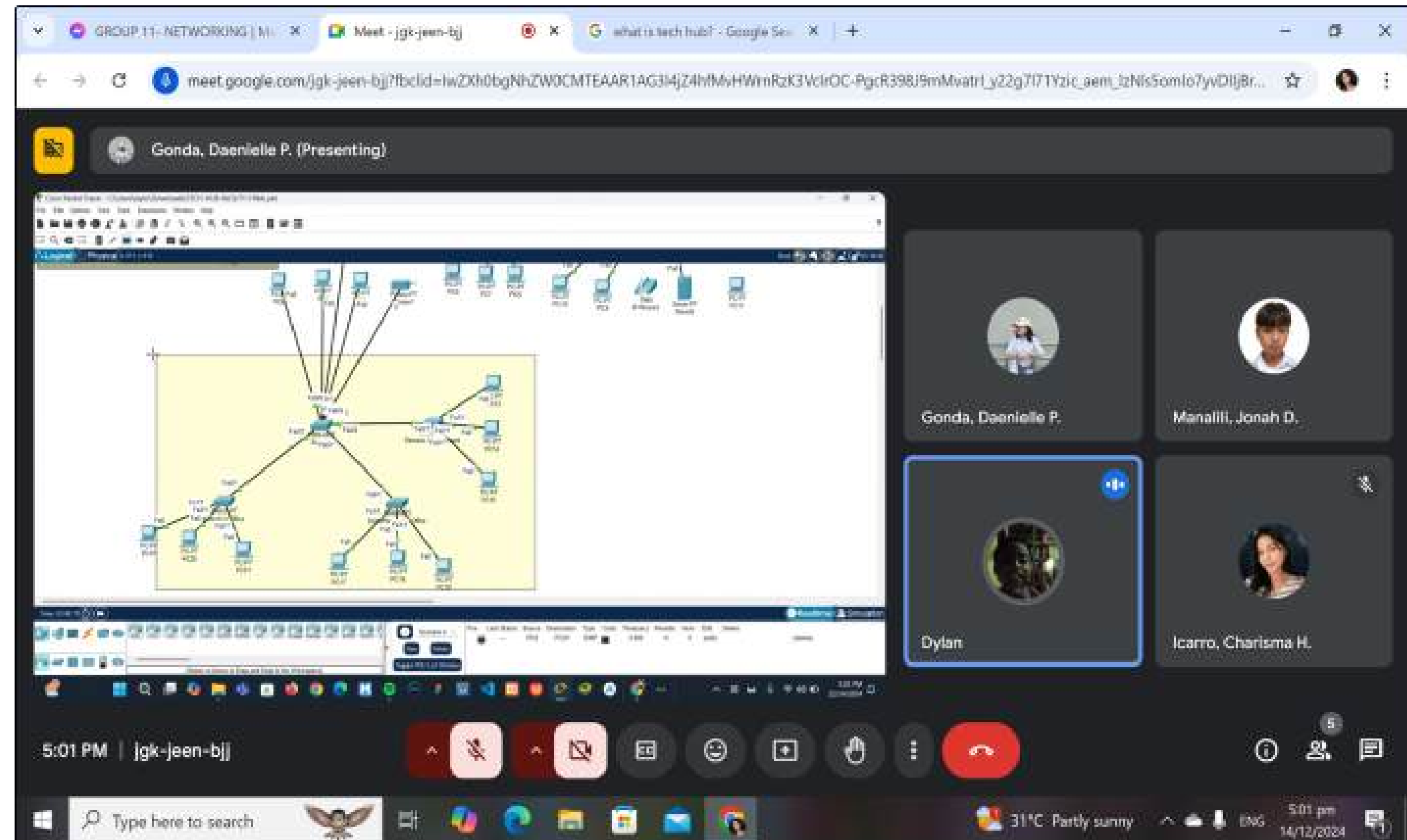
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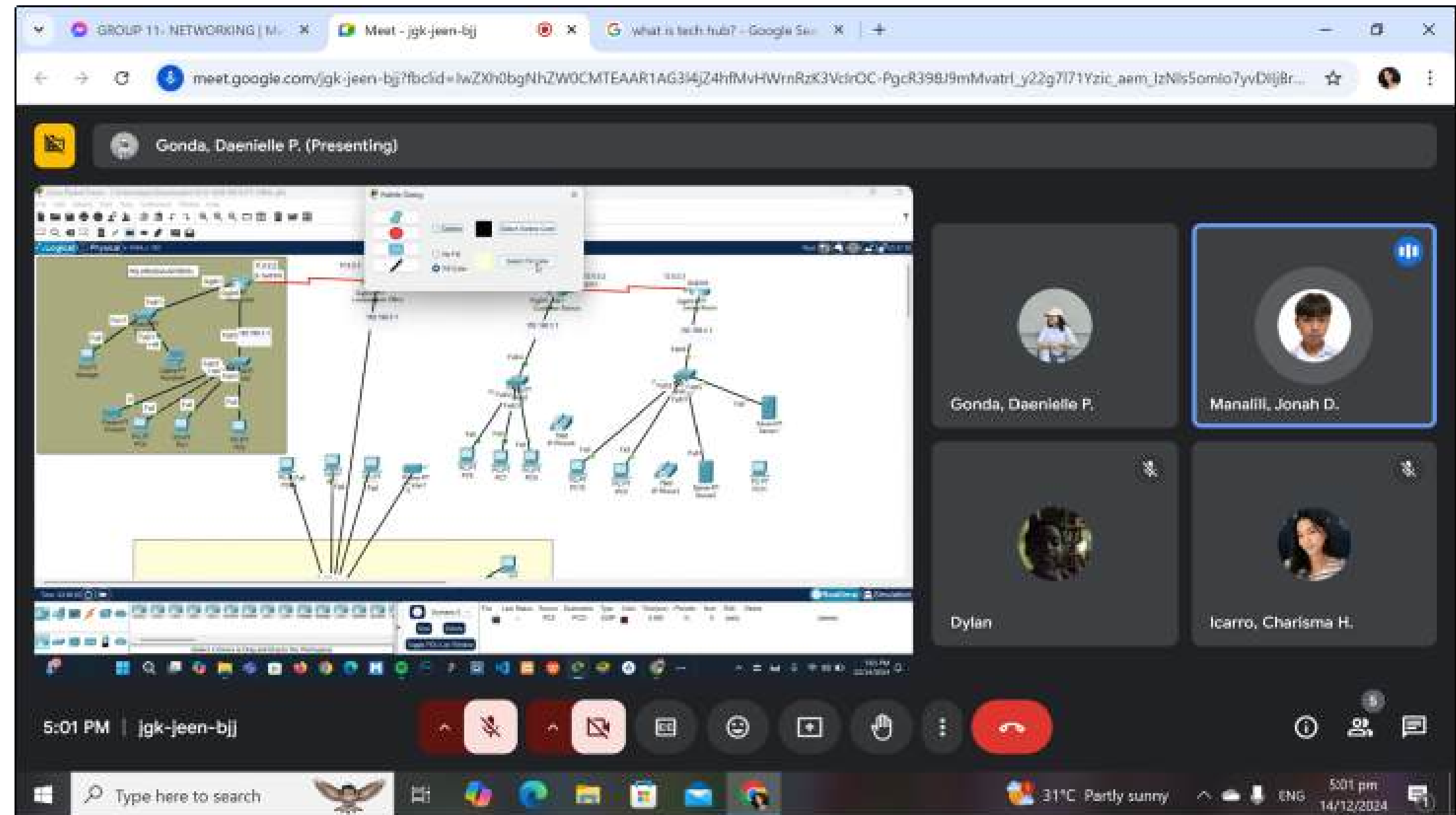
DOCUMENTATION:

The screenshot displays a Google Meet interface. The main window shows a presentation of a network diagram with multiple nodes and connecting lines. The interface includes a top navigation bar with the text "GROUP 11 - NETWORKING | M..." and "Meet - jgk-jeen-bj". The bottom status bar shows the time "4:55 PM" and the meeting ID "jgk-jeen-bj". On the right side, there is a list of participants: Gonda, Daeniele P. (Presenting), Manelli, Jonah D., Dylan, and Icarro, Charisma H. (highlighted with a blue border). The bottom of the screen shows a Windows taskbar with various application icons and a search bar.

DOCUMENTATION:



DOCUMENTATION:



DOCUMENTATION:

The screenshot displays a Google Meet interface. The main window shows a presentation of a network diagram with three distinct sections: a green area on the left, a yellow area in the center, and a brown area on the right. Each section contains a hierarchical tree structure of nodes and connecting lines. The presenter's name, 'Gonda, Daenelle P. (Presenting)', is visible at the top of the meeting window. On the right side, a grid of participant avatars is shown, including 'Manalili, Jonah D.', 'Gonda, Daenelle P.', 'Dylan', and 'Icarro, Charisma H.'. The bottom of the screen shows the Windows taskbar with the time '5:05 PM', the meeting ID '| jgk-jeen-bj |', and system information including '31°C Partly sunny' and '14/12/2024'.

DOCUMENTATION:

The screenshot displays a Google Meet interface during a presentation. The main window shows a network diagram with various nodes and connections. Overlaid on this is a command prompt window with the following text:

```
Technical Support: http://www.cisco.com/techsupport  
Copyright (c) 2010 by Cisco Systems, Inc.  
Total memory size = 512 MB - On-board = 512 MB, 00000000  
= 0 MB  
C1900/441/00 platform with 126200 bytes of main  
memory  
Main memory is configured to 64/-/On-board/DIMM0  
bit mode with ECC disabled  
Booting ROMMON initialized  
program load complete, entry point: 0x00000000, size:  
0x10340  
program load complete, entry point: 0x00000000, size:  
0x10340  
IOS Image Load Test  
Digitally Signed Release Software  
program load complete, entry point: 0x00000000, size:  
0x2b0c50  
Well decompressing the image :  
#####
```

On the right side of the Meet window, there are three participant tiles: Manalili, Jonah D., Gonda, Daeniele P., and Icarro, Charisma H. The bottom of the screen shows the Windows taskbar with the time 5:30 PM and the date 14/12/2024.

DOCUMENTATION:

The screenshot shows a Google Meet window with the following details:

- Browser Tabs:** "GROUP 11-NETWORKING | M...", "Meet - jgk-jeen-bj", and "meet.google.com/jgk-jeen-bj?fbclid=IwZXh0bgNhZWQCMTEAR0ZKPf2Ra8s6D92mg39w3peLr8TfWGHYtAXdpx_TCABrTkAl-qjRC3Pnqp4_aem_E9VvknCmfmdh..."
- Meeting Header:** "Gonda, Daenelle P. (Presenting)"
- Participants:** Three participants are visible in a grid: "Manalili, Jonah D.", "Gonda, Daenelle P." (highlighted with a blue border), and "Icarro, Charisma H.".
- Shared Document:** A document titled "FINAL PROJECT" is being presented. It includes the logo of "SANTA FE DE BOGOTÁ VENTURA STATE UNIVERSITY" and the "COLLEGE OF COMPUTING SCIENCES". The document content includes:
 - Project Title:** Advanced Network Architecture with SD-WAN and SD-WAN Optimization
 - Objective:** Students will design, implement, and optimize a network that integrates SD-WAN and SD-WAN optimization to enhance network performance, reliability, and security. They will also evaluate the network's effectiveness based on predefined business needs.
 - Student Responsibility:**
 - 1. Define the network architecture, goals, and requirements.
 - 2. Identify the roles of various network components and their interactions.
 - Security Check Your Company:** Students will have to use the final network design for a company. They will be given the type of company they will be working for. Students will have to use the final network design for a company. They will be given the type of company they will be working for.
- Table:** A table with 4 columns: "Name", "Task & Section", "Date", and "Score /100".
- Taskbar:** The Windows taskbar at the bottom shows the time as "5:31 PM | jgk-jeen-bj" and the date as "14/12/2024".



”

THANK YOU!

BSIT-3M

Gonda, Daenielle P.

Icarro, Charisma H.

Manalili, Jonah D.

Mercado, Dylan M.