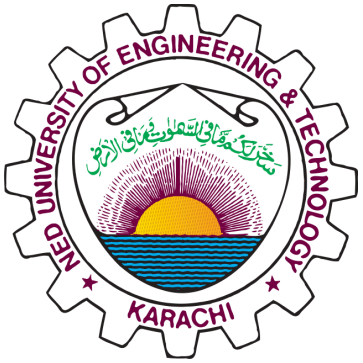

Complex Computing Problem Report

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Course Code: CT-376
Course Title: Computer Communication Networks

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1. Introduction & Enterprise Context

This report details the design and implementation of a robust enterprise network using Huawei eNSP. The simulated environment represents a mid-sized organization with six distinct departments—each requiring secure, segmented access—and a centralized data centre providing critical application and storage services. The architecture reflects real-world best practices by ensuring high availability, security, and scalable management.

Departments:

1. HUMAN RESOURCE
2. FINANCE
3. INFORMATION TECHNOLOGY
4. RESEARCH & DEVELOPMENT
5. SUPPLY CHAIN
6. INVENTORY MANAGEMENT
7. DATA CENTRE

Routers:

- AR1->**HR-Router**
- AR2->**Finance Router**
- AR3->**IT Router**
- AR4->**R&D Router**
- AR5->**Supply Chain Router**
- AR6-> **Inventory Management Router**
- AR7->**Router A(connects HR and Finance Router)**
- AR8->**Router B(connects IT & R&D Router)**
- AR9-> **Router C (Connects Supply Chain and Inventory Management Router)**
- AR10->**Main Router(Connects Router A, Router B, Router C)**
- AR11->**Data Centre Router**

Total Routers used: 11

Switches:

Each department contains 1 switch while Data Centre has 2 switches.
Total Switches used: 8

Key Business Requirements:

- **Segmentation:** Independent LAN segments for HR, Finance, IT, R&D, Supply Chain, and Inventory, protecting departmental data and containing broadcast domains.
- **Centralized Resources:** Each department has their own resources, isolated yet accessible via Main Router in Headquarters..
- **Resilience:** Redundant Layer 2 links using LACP and loop-avoidance with STP to guarantee uninterrupted connectivity.
- **Flexible Routing:** Static routes for sensitive data-centre paths, complemented by RIP v2 for dynamic departmental route exchange.

- **Operational Efficiency:** Automated host provisioning (DHCP) and centralized configuration management (FTP, Telnet) secured via AAA frameworks.

---

2. Three-Tier Topology Design

2.1 Layered Architecture

The network follows a three-tier model to separate functions and optimize performance:

1. **Access Layer:** Departmental edge routers (AR1–AR6) and S5700 switches deliver end-user connectivity and VLAN enforcement.
2. **Distribution Layer:** Aggregation routers (AR7, AR8, AR9) consolidate access links, enforce policies, and summarize routes.
3. **Core Layer:** The Main Router (AR10) acts as the backbone switch, routing inter-distribution traffic and connecting to the Data Centre (AR11).

2.2 Physical & Logical Connectivity

- **Access ↔ Distribution:** Point-to-point Gigabit Ethernet links using /30 subnets minimize wasted IPs and simplify routing.
- **Distribution ↔ Core:** Three /30 uplinks ensure dedicated bandwidth and clear logical separation between business groupings.
- **Data Centre:** Dual-homed to SW9 & SW10 via LACP for aggregated bandwidth; static-routed to AR4 to maintain isolation from RIP advertisements.

2.3 Design Justification

- **Fault Isolation:** Localizing failures to a single department prevents cascading outages.
- **Policy Enforcement:** Distribution routers serve as centralized enforcement points for security and QoS policies.
- **Scalability:** Adding departments or data-centre links involves minimal changes, preserving growth flexibility.

---

3. IP Addressing & Subnetting Strategy

3.1 Address Block & VLSM

The 10.0.0.0/16 private block is segmented using Variable Length Subnet Masking (VLSM) to align subnet sizes with actual requirements:

PC Addresses

PC Name	Department	VLAN	IP Address	Subnet Mask	Default Gateway
HR_PC1	HR	10	dhcp	255.255.255.240 (/28)	10.1.10.1
HR_PC2	HR	20	dhcp	255.255.255.240 (/28)	10.1.20.1
Finance_PC1	Finance	10	10.2.10.2	255.255.255.0 (/24)	10.2.10.1
Finance_PC2	Finance	20	10.2.20.2	255.255.255.0 (/24)	10.2.20.1
IT_PC1	IT	10	10.3.10.2	255.255.255.0 (/24)	10.3.10.1
IT_PC2	IT	20	10.3.20.2	255.255.255.0 (/24)	10.3.20.1
R&D_PC1	R&D	10	10.4.10.2	255.255.255.0 (/24)	10.4.10.1
R&D_PC2	R&D	20	10.4.20.2	255.255.255.0 (/24)	10.4.20.1
SupplyChain_PC1	Supply Chain	10	10.5.10.2	255.255.255.0 (/24)	10.5.10.1

SupplyChain_PC2	Supply Chain	20	10.5.20.2	255.255.255.0 (/24)	10.5.20.1
Inventory_PC1	Inventory	10	10.6.10.2	255.255.255.0 (/24)	10.6.10.1
Inventory_PC2	Inventory	20	10.6.20.2	255.255.255.0 (/24)	10.6.20.1
DC_PC1	Data Centre	30	10.30.30.2	255.255.255.0 (/24)	10.30.30.1
DC_PC2	Data Centre	40	10.40.40.2	255.255.255.0 (/24)	10.40.40.1

Segment	Subnet	Mask	Usable Hosts	Rationale
Access ↔ Dist (Per Dept)	10.100.X.0	/30	2	Efficient P2P links; conserve address space.
Dist ↔ Core (Group Uplinks)	10.200.X.0	/30	2	Dedicated aggregation paths; summarizable.
HR User VLANs	10.1.10.0, 10.1.20.0	/28	14 each	Supports growth while conserving address space.
Finance–Inventory VLANs	10.X.10.0, 10.X.20.0	/24	254 each	Departments with higher device counts.
Data Centre (App/Storage)	10.30.30.0, 10.40.40.0	/24	254 each	Server farms require more IPs; isolation.

3.2 Hierarchical Summarization

- **Third Octet Mapping:** 10.1.x.x for HR, 10.2.x.x for Finance, etc. simplifies route summarization in distribution/core.

- **Consistent Gateways:** First usable (.1) per subnet eases scripting and documentation.

3.3 Justification

Precise VLSM reduces wasted space, supports departmental growth, and streamlines routing tables—key for enterprise efficiency.

---

4. VLAN Architecture & Inter-VLAN Routing

4.1 VLAN Segmentation

- **User VLANs:** Two per department (10 for primary, 20 for secondary functions).
- **Management VLAN:** VLAN 99 reserved for out-of-band management on Data Centre Switch..
- **Data Centre VLANs:** VLAN 30 for application servers, VLAN 40 for storage/backups.

4.2 Switch Configuration Template

```
system-view
vlan batch 10 20 30 40 99
interface GigabitEthernet0/0/1
  port link-type access
  port default vlan 10
interface GigabitEthernet0/0/2
  port link-type access
  port default vlan 20
interface GigabitEthernet0/0/24
  port link-type trunk
  port trunk allow-pass vlan 10 20 30 40 99
save
```

- **Explanation:** Trunk ports carry multiple VLANs, conserving switch uplinks while ensuring proper tag propagation.

4.3 Router-on-a-Stick for Inter-VLAN Routing

```
interface G0/0/0.10
 dot1q termination vid 10
 ip address 10.1.10.1 255.255.255.240
interface G0/0/0.20
 dot1q termination vid 20
 ip address 10.1.20.1 255.255.255.240
Save
```

Router Interface Addresses:

Router (Alias)	Interface	Connected To	IP Address	Subnet Mask
AR1 (HR-Router)	G0/0/0.10 (VLAN10)	HR_SW (VLAN 10)	10.1.10.1	255.255.255.240 (/28)
	G0/0/0.20 (VLAN20)	HR_SW (VLAN 20)	10.1.20.1	255.255.255.240 (/28)
	G0/0/1	AR7 (Router-A)	10.100.1.1	255.255.255.252 (/30)
AR2 (Finance-Router)	G0/0/0.10 (VLAN10)	Finance_SW (VLAN 10)	10.2.10.1	255.255.255.0 (/24)
	G0/0/0.20 (VLAN20)	Finance_SW (VLAN 20)	10.2.20.1	255.255.255.0 (/24)
	G0/0/1	AR7 (Router-A)	10.100.2.1	255.255.255.252 (/30)
AR3 (IT-Router)	G0/0/0.10 (VLAN10)	IT_SW (VLAN 10)	10.3.10.1	255.255.255.0 (/24)
	G0/0/0.20 (VLAN20)	IT_SW (VLAN 20)	10.3.20.1	255.255.255.0 (/24)
	G0/0/1	AR8 (Router-B)	10.100.3.1	255.255.255.252 (/30)
AR4 (R&D-Router)	G0/0/0.10 (VLAN10)	R&D_SW (VLAN 10)	10.4.10.1	255.255.255.0 (/24)
	G0/0/0.20 (VLAN20)	R&D_SW (VLAN 20)	10.4.20.1	255.255.255.0 (/24)
	G0/0/1	AR8 (Router-B)	10.100.4.1	255.255.255.252 (/30)
AR5 (SupplyChain-Router)	G0/0/0.10 (VLAN10)	SupplyChain_SW (VLAN 10)	10.5.10.1	255.255.255.0 (/24)
	G0/0/0.20 (VLAN20)	SupplyChain_SW (VLAN 20)	10.5.20.1	255.255.255.0 (/24)
	G0/0/1	AR9 (Router-C)	10.100.5.1	255.255.255.252 (/30)

AR6 (Inventory-Router)	G0/0/0.10 (VLAN10)	Inventory_SW (VLAN 10)	10.6.10.1	255.255.255.0 (/24)
	G0/0/0.20 (VLAN20)	Inventory_SW (VLAN 20)	10.6.20.1	255.255.255.0 (/24)
	G0/0/1	AR9 (Router-C)	10.100.6.1	255.255.255.252 (/30)
AR7 (Router-A)	G0/0/0	AR1 (HR-Router)	10.100.1.2	255.255.255.252 (/30)
	G0/0/1	AR2 (Finance-Router)	10.100.2.2	255.255.255.252 (/30)
	G0/0/2	AR10 (Main-Router)	10.200.0.2	255.255.255.252 (/30)
AR8 (Router-B)	G0/0/0	AR3 (IT-Router)	10.100.3.2	255.255.255.252 (/30)
	G0/0/1	AR4 (R&D-Router)	10.100.4.2	255.255.255.252 (/30)
	G0/0/2	AR10 (Main-Router)	10.200.1.2	255.255.255.252 (/30)
AR9 (Router-C)	G0/0/0	AR5 (SupplyChain-Router)	10.100.5.2	255.255.255.252 (/30)
	G0/0/1	AR6 (Inventory-Router)	10.100.6.2	255.255.255.252 (/30)
	G0/0/2	AR10 (Main-Router)	10.200.2.2	255.255.255.252 (/30)
AR10 (Main-Router)	G0/0/0	AR7 (Router-A)	10.200.0.1	255.255.255.252 (/30)
	G0/0/1	AR8 (Router-B)	10.200.1.1	255.255.255.252 (/30)
	G0/0/2	AR9 (Router-C)	10.200.2.1	255.255.255.252 (/30)
AR11 (DataCentre-Router)	G0/0/0.30	VLAN 30	10.30.30.1	255.255.255.0 (/24)

	G0/0/0.40	VLAN 40	10.40.40.1	255.255.255.0 (/24)
	G0/0/1.99	AR4 (R&D-Router)	10.200.4.2	255.255.255.252 (/30)

- **Explanation:** Sub-interfaces allow a single physical interface to route traffic between VLANs, reducing hardware costs.

4.4 Benefits & Justification

- **Broadcast Containment:** Limits storms to VLAN boundaries.
- **Security Control:** ACLs can be applied to sub-interfaces for fine-grained access.
- **Operational Efficiency:** Simplified cabling and switch port utilization.

---

5. DHCP Deployment for Host Provisioning

5.1 DHCP Configuration on HR Router (AR1)

```
# VLAN 10 Pool
dhcp enable
ip pool HR_VLAN10
 network 10.1.10.0 mask 255.255.255.240
 gateway-list 10.1.10.1
 excluded-ip-address 10.1.10.1
 lease day 3
 dns-list 8.8.8.8
# VLAN 20 Pool
ip pool HR_VLAN20
 network 10.1.20.0 mask 255.255.255.240
 gateway-list 10.1.20.1
 excluded-ip-address 10.1.20.1
 lease day 3
 save
```

- **Explanation:** Pools automate IP assignment, ensuring consistent network parameters and rapid endpoint onboarding.

5.2 Advantages

- **Time Savings:** Eliminates manual host configuration.
- **Error Reduction:** Minimizes IP conflicts and misconfigured gateways.
- **Scalability:** Easily extendable to other departments by replicating pool definitions.

---

6. Static Routing for Data Centre Integration

6.1 Configuration Summary

Router	Destination	Mask	Next Hop	Purpose
AR11	0.0.0.0	0.0.0.0	10.200.4.1	Default route to R&D Router
AR4	10.30.30.0	255.255.255.0	10.200.4.2	Reach VLAN30 via Data Centre
AR4	10.40.40.0	255.255.255.0	10.200.4.2	Reach VLAN40 via Data Centre
AR8	10.30.30.0, 10.40.40.0	255.255.255.0	10.100.4.1	Route through R&D aggregation
AR10	10.30.30.0, 10.40.40.0	255.255.255.0	10.200.1.2	Core-to-Data Centre path via AR8

6.2 Explanation & Justification

- **Predictable Paths:** Explicit next hops guarantee that sensitive Data Centre subnets travel only on known links.
- **Security Boundary:** Server VLANs are not injected into RIP, reducing exposure to route leaks.
- **Low Overhead:** Static routes consume no CPU for periodic updates—suitable for stable, low-change segments.

---

7. Dynamic Routing with RIP v2

7.1 Configuration Template

```
rip 1
 version 2
 network 10.0.0.0
save
```

- **Explanation:** Enables RIP on all interfaces within the 10.0.0.0/8 block, allowing automatic exchange of departmental routes.

7.2 Benefits & Justification

- **Automatic Discovery:** Simplifies adding new VLANs or departments—no manual route entry required.
- **VLSM Compatibility:** Supports varied subnet sizes (/28 and /24) without issues.
- **Simplicity:** Well-suited for small to medium networks with limited hop counts.

---

8. Link Aggregation (LACP) Implementation

8.1 Configuration (SW9 & SW10)

```
system-view
interface Eth-Trunk1
 mode lacp-static
 trunkport G0/0/1 to 0/0/2
 port link-type trunk
 port trunk allow-pass vlan 30 40 99
save
```

- **Explanation:** Static LACP bundles two physical links into one logical interface, ensuring both linking switches remain synchronized.

8.2 Verification

```
display eth-trunk 1
display lacp statistics
```

8.3 Benefits & Justification

- **Bandwidth Aggregation:** Doubles throughput capacity for Data Centre traffic.
- **Link Resilience:** Automatic failover protects against single-link failures.
- **Simplified Management:** Treats multiple ports as a single interface in routing and STP.

---

9. Spanning Tree Protocol (STP) Configuration

9.1 Global STP Setup

```
system-view
stp enable
```

9.2 Root Bridge Designation

```
# SW9 (Primary)
stp root primary
# SW10 (Secondary)
stp root secondary
```

save

- **Explanation:** Fixing the root bridges provides deterministic path selection and avoids unpredictable elections.

9.3 Port Cost Adjustment

```
interface G0/0/5
 stp cost 2000
quit
```

9.4 Verification

```
display stp brief
display stp interface Eth-Trunk1
```

9.5 Benefits & Justification

- **Loop Prevention:** Ensures a single active path, eliminating broadcast storms.
- **Controlled Topology:** Pre-defined root priorities stabilize the network structure.
- **Rapid Convergence:** Auto-adjusts roles on link failures to maintain connectivity.

---

10. Network Services: FTP & Telnet

10.1 FTP Configuration on Main Router (AR10)

```
ftp server enable
local-user user1 password irreversible-cipher Pass123
local-user user1 privilege level 15
local-user user1 service-type ftp
save
```

Workflow:

```
ftp 10.200.0.1  # connect
Username: user1
Password: Pass123
> dir
> put startup.cfg
> get huawei-s7200.bin
> quit
```

- **Justification:** Centralized file transfer interface allows secure backup and distribution of configurations and OS images.

10.2 Telnet Access via AAA

```
aaa
 local-user admin    password irreversible-cipher Pass123   # AR10
 local-user admin-1  password irreversible-cipher Secure123 # AR7
 local-user admin-2  password irreversible-cipher Secure123 # AR8
quit
line vty 0 4
 authentication-mode aaa
 protocol inbound telnet
 user privilege level 15
 idle-timeout 10 0
Save
```

Main-Router:
Username: **admin** Password:**Pass123**
Router-A:
Username: **admin-1** Password:**Secure123**
Router-B:
Username: **admin-2** Password:**Secure123**

Usage:

```
telnet 10.200.0.1  # admin
telnet 10.200.0.2  # admin-1
telnet 10.200.1.2  # admin-2
```

- **Justification:** AAA-backed Telnet sessions enforce secure credentials and support audit trails for remote management.

---

11. Cloud Service Implementation

To demonstrate cloud integration, two PCs are connected via a simulated cloud environment to facilitate secure, scalable communication.

Objectives:

- Extend on-premises VLAN segments into a cloud-based overlay network.
- Ensure bi-directional communication between PC22 and PC23 through the cloud.

Implementation Steps:

1. **Cloud Setup:**
    - Create 2 PC with two subnets: 192.168.1.1/24 and 192.168.1.2/24.
    - Create 2 UDP based Ethernet internal links.
2. **Cloud Mapping:**
    - Map the created links to each other (two-way) to establish connection.

Verification:

- From PC22:
  ping 192.168.1.1 # Should reach via cloud
- From PC23:
  ping 192.168.1.2 # Should reach via cloud

Justification:

- **Scalability:** The cloud VPC overlay decouples on-prem IP schemes from cloud subnets.
- **Security:** Encrypted IPsec tunnel ensures confidentiality and integrity.
- **Flexibility:** Additional departments can be connected by extending the VPN ACLs and route entries.

---

12. Design Assumptions & Constraints

1. All Ethernet links operate at Gigabit speed with no mismatches.
2. No external firewall; intra-network segmentation and ACLs provide necessary security.
3. IPv6 deployment scheduled for Phase II.
4. VLAN 99 available on all switches for management and OOB access.
5. NTP and Syslog services hosted externally (out-of-scope for this report).

---

13. Future Expansion & Scalability Roadmap

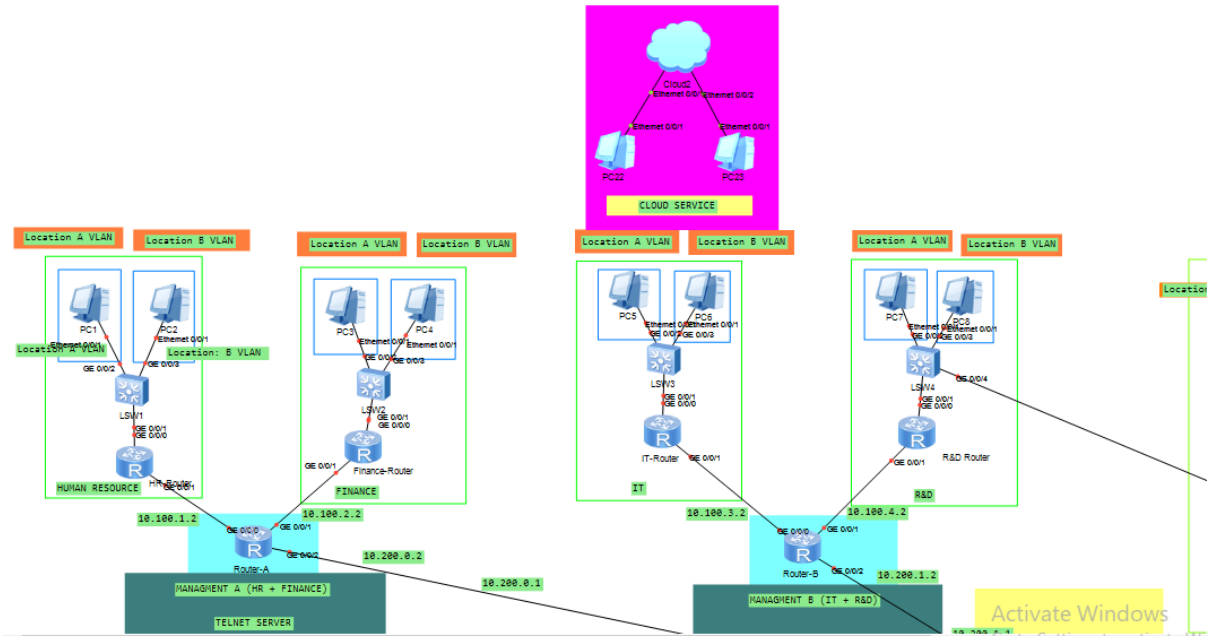
1. **Migration to OSPF/EIGRP:** For enhanced convergence times and traffic engineering.
2. **Dual-Stack IPv6:** To accommodate growing address requirements and future-proofing.
3. **Software-Defined Networking (SDN):** Centralized control plane for dynamic provisioning.
4. **Network Automation:** Leverage Ansible or Python scripts for consistent configuration management.
5. **High-Availability Core:** Implement VRRP/HSRP and redundant core routers to eliminate single points of failure.
6. **Data Centre Segmentation:** Deploy VXLAN/BGP EVPN for multi-tenant isolation and scalability.

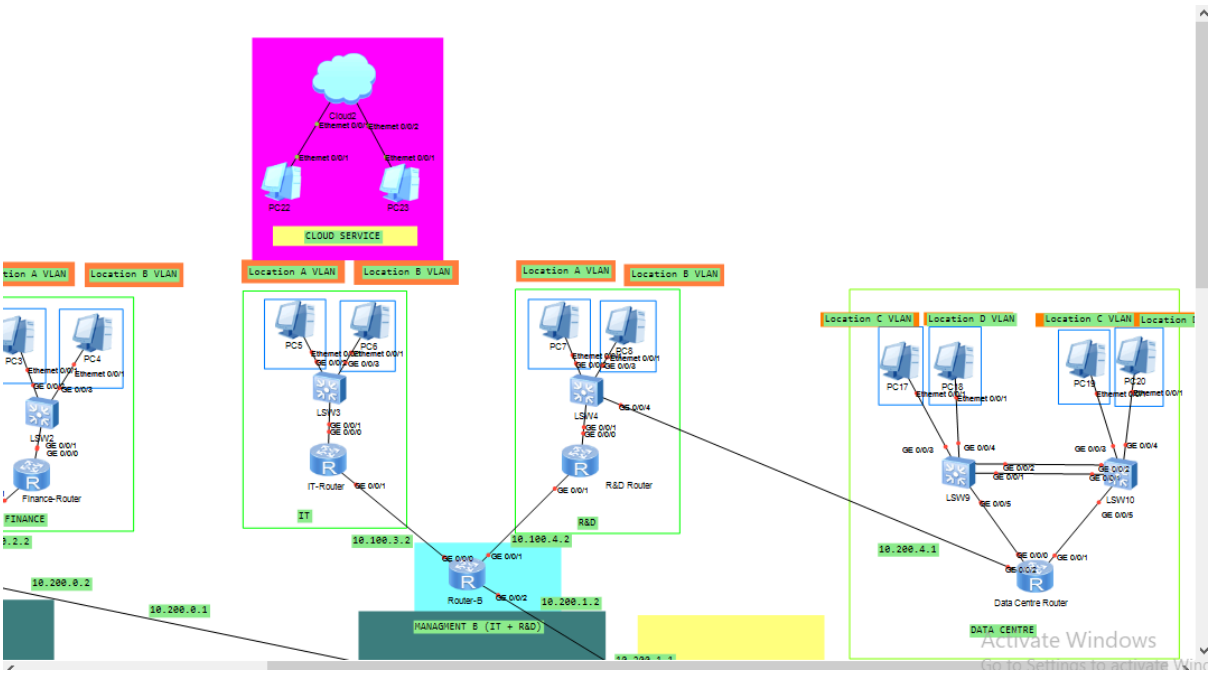
14. Conclusion

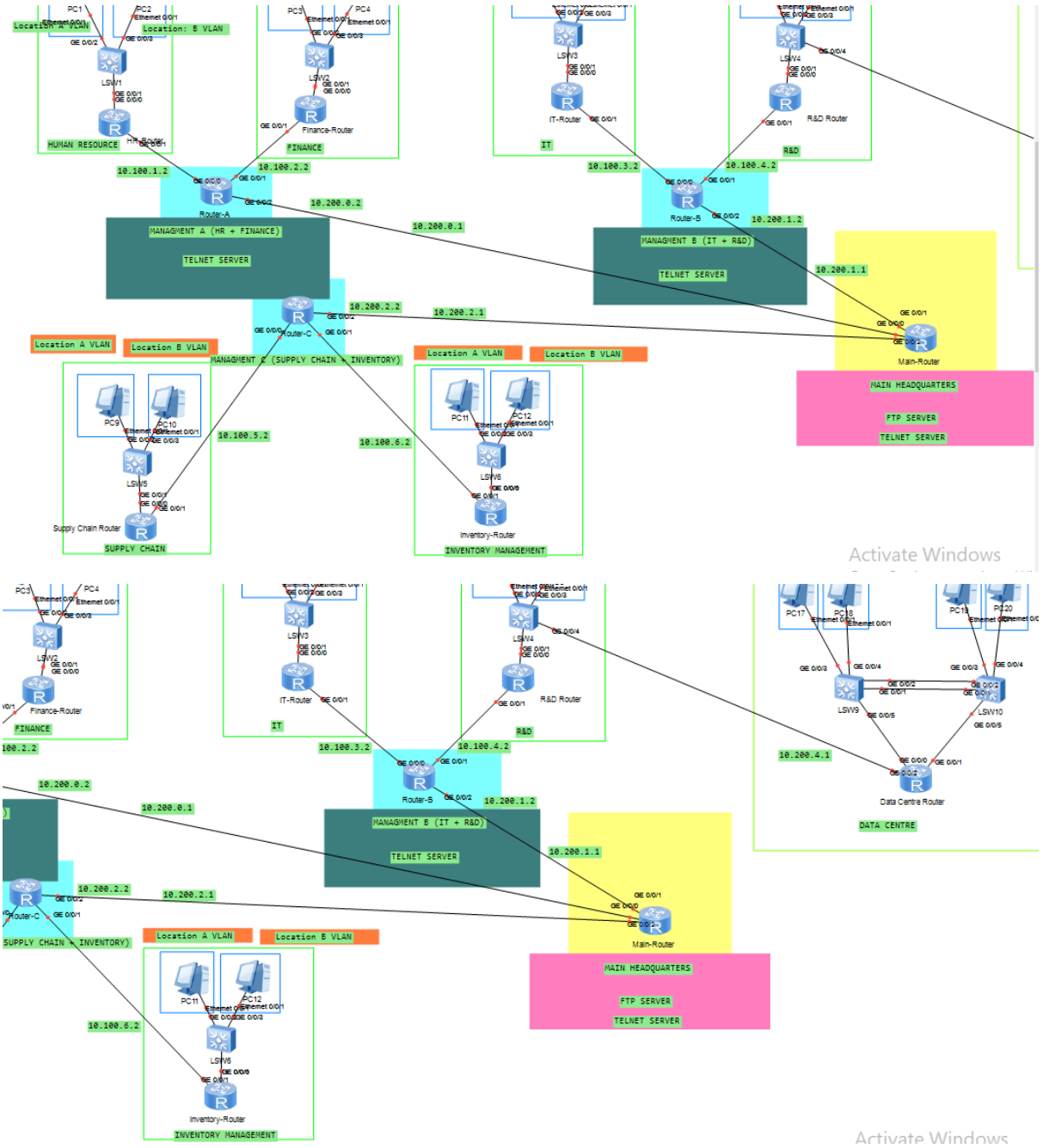
This comprehensive design delivers an enterprise-grade network that balances segmentation, redundancy, and operational efficiency. The hybrid routing model—static for mission-critical data centre subnets and RIP v2 for departmental networks—ensures both control and flexibility. Layer 2 resiliency via LACP and STP, complemented by AAA-secured management services (FTP, Telnet), creates a sturdy framework ready for future growth and advanced services.

15. Appendix: Configuration Snippets & Verification

15.1 Topology:

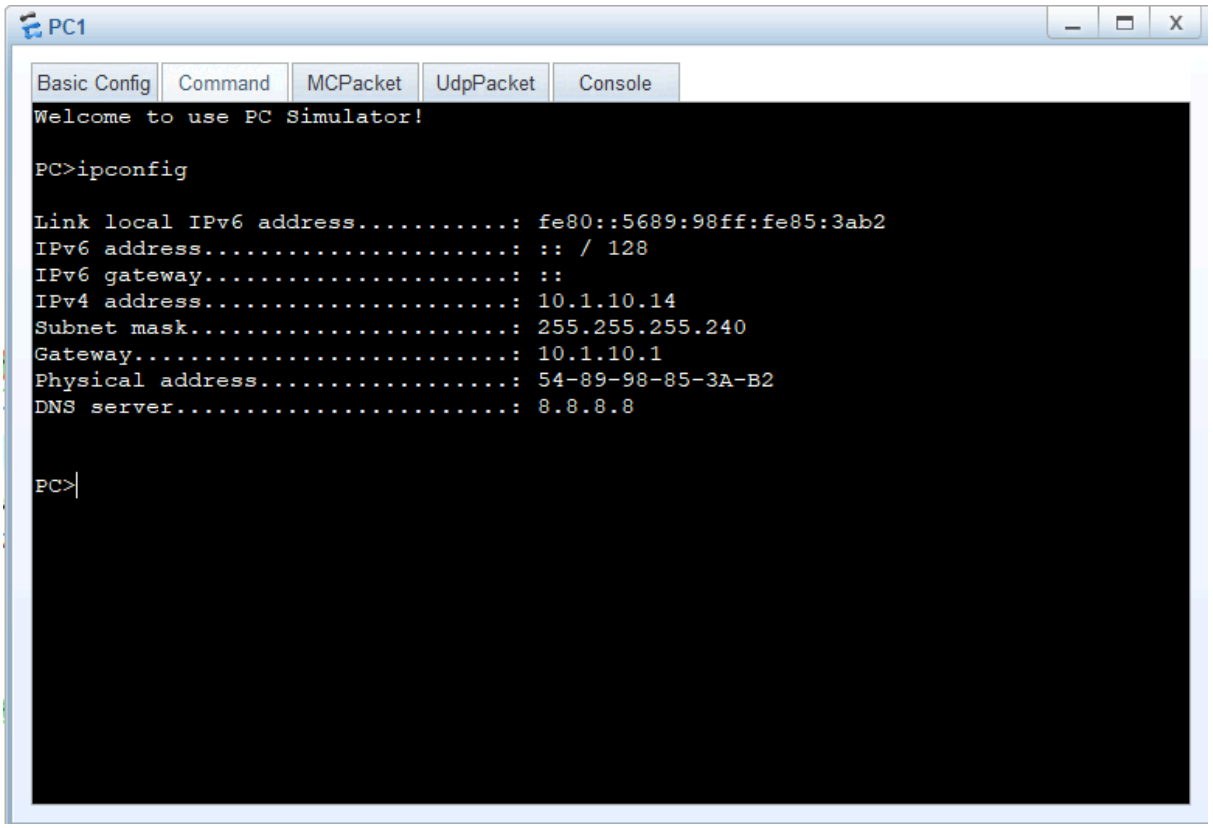




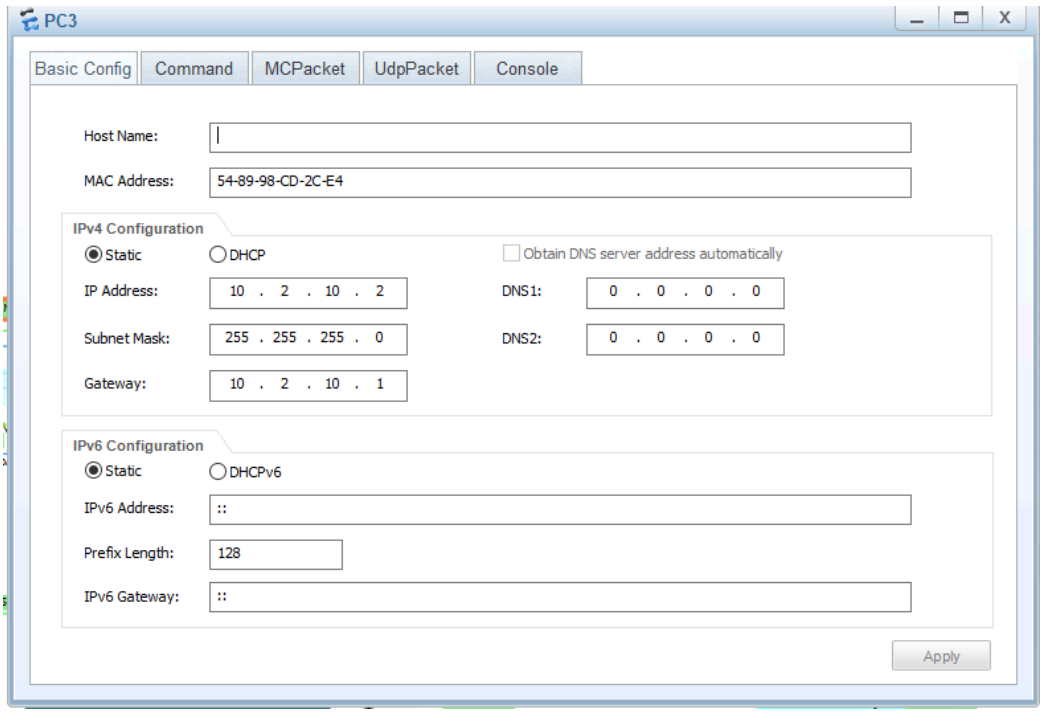

HUMAN RESOURCE
FINANCE
IT
R&D
MANAGMENT A (HR + FINANCE)
TELNET SERVER
MANAGMENT B (IT + R&D)
TELNET SERVER
MANAGMENT C (SUPPLY CHAIN + INVENTORY)
Location A VLAN
Location B VLAN
SUPPLY CHAIN
INVENTORY MANAGEMENT
MAIN HEADQUARTERS
FTP SERVER
TELNET SERVER
DATA CENTRE
Router-A
Router-B
Router-C
Main-Router
Data Centre Router
Activate Windows

15.2 IP Addressing:

Dhcp IP Assignment on HR PCs:



Manual IP assignment on Finance PC:



15.3 VLAN & Inter-VLAN via Router-on-a-stick Configuration:

VLAN at DataCentre:

LSW9

```
May 13 2025 12:23:45-08:00 Data-Centre_SW1 %%01PHY/1/PHY(l)[0]:    GigabitEthern
et0/0/1: change status to up
May 13 2025 12:23:45-08:00 Data-Centre_SW1 %%01PHY/1/PHY(l)[1]:    GigabitEthern
et0/0/2: change status to up
May 13 2025 12:23:45-08:00 Data-Centre_SW1 %%01IFNET/4/IF_STATE(l)[2]:Interface
Vlanif1 has turned into UP state.
May 13 2025 12:23:45-08:00 Data-Centre_SW1 %%01IFNET/4/IF_STATE(l)[3]:Interface
Eth-Trunk1 has turned into UP state.
<Data-Centre_SW1>display vlan
The total number of vlans is : 4
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/5(D)      GE0/0/6(D)      GE0/0/7(D)      GE0/0/8(D)
                GE0/0/9(D)      GE0/0/10(D)     GE0/0/11(D)     GE0/0/12(D)
                GE0/0/13(D)     GE0/0/14(D)     GE0/0/15(D)     GE0/0/16(D)
                GE0/0/17(D)     GE0/0/18(D)     GE0/0/19(D)     GE0/0/20(D)
                GE0/0/21(D)     GE0/0/22(D)     GE0/0/23(D)     GE0/0/24(D)
                Eth-Trunk1(U)

30   common  UT:GE0/0/3(U)

             TG:GE0/0/5(D)      Eth-Trunk1(U)

40   common  UT:GE0/0/4(U)

             TG:GE0/0/5(D)      Eth-Trunk1(U)

99   common  TG:GE0/0/5(D)      Eth-Trunk1(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
30   enable  default       enable  disable    VLAN 0030
40   enable  default       enable  disable    VLAN 0040
99   enable  default       enable  disable    VLAN 0099
<Data-Centre_SW1>
```

VLAN at HR:

LSW1

```
The device is running!

<HR-SW>display vlan
The total number of vlans is : 3
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/1(D)      GE0/0/4(D)      GE0/0/5(D)      GE0/0/6(D)
                GE0/0/7(D)      GE0/0/8(D)      GE0/0/9(D)      GE0/0/10(D)
                GE0/0/11(D)     GE0/0/12(D)     GE0/0/13(D)     GE0/0/14(D)
                GE0/0/15(D)     GE0/0/16(D)     GE0/0/17(D)     GE0/0/18(D)
                GE0/0/19(D)     GE0/0/20(D)     GE0/0/21(D)     GE0/0/22(D)
                GE0/0/23(D)     GE0/0/24(D)

10   common  UT:GE0/0/2(U)
             TG:GE0/0/1(D)

20   common  UT:GE0/0/3(U)
             TG:GE0/0/1(D)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------
1    enable  default       enable  disable    VLAN 0001
10   enable  default       enable  disable    VLAN 0010
20   enable  default       enable  disable    VLAN 0020
<HR-SW>
May 13 2025 12:22:00-08:00 HR-SW %%01PHY/1/PHY(l)[0]:    GigabitEthernet0/0/1: c
hange status to up
May 13 2025 12:22:00-08:00 HR-SW %%01IFNET/4/IF_STATE(l)[1]:Interface Vlanifl ha
s turned into UP state.
```

Inter-vlan at HR:

HR-Router

```
#
interface Ethernet0/0/6
#
interface Ethernet0/0/7
#
interface GigabitEthernet0/0/0
#
interface GigabitEthernet0/0/0.10
 dot1q termination vid 10
 ip address 10.1.10.1 255.255.255.240
 arp broadcast enable
 dhcp select global
#
interface GigabitEthernet0/0/0.20
 dot1q termination vid 20
 ip address 10.1.20.1 255.255.255.240
 arp broadcast enable
 dhcp select global
#
interface GigabitEthernet0/0/1
 ip address 10.100.1.1 255.255.255.252
#
interface NULL0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
<HR-Router>
```

Inter-vlan at Finance:

Finance-Router

```
interface Ethernet0/0/1
#
interface Ethernet0/0/2
#
interface Ethernet0/0/3
#
interface Ethernet0/0/4
#
interface Ethernet0/0/5
#
interface Ethernet0/0/6
#
interface Ethernet0/0/7
#
interface GigabitEthernet0/0/0
#
interface GigabitEthernet0/0/0.10
 dot1q termination vid 10
 ip address 10.2.10.1 255.255.255.0
 arp broadcast enable
#
interface GigabitEthernet0/0/0.20
 dot1q termination vid 20
 ip address 10.2.20.1 255.255.255.0
 arp broadcast enable
#
interface GigabitEthernet0/0/1
 ip address 10.100.2.1 255.255.255.252
#
interface NULL0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
<Finance-Router>
```

15.4 DHCP Implementation:

Commands:

HR-Router

```
 sysname HR-Router
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load flash:/portalpage.zip
#
 drop illegal-mac alarm
#
 wlan ac-global carrier id other ac id 0
#
 set cpu-usage threshold 80 restore 75
#
dhcp enable
#
ip pool vlan10
 gateway-list 10.1.10.1
 network 10.1.10.0 mask 255.255.255.240
 dns-list 8.8.8.8
#
ip pool vlan20
 gateway-list 10.1.20.1
 network 10.1.20.0 mask 255.255.255.240
 dns-list 8.8.8.8
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface Ethernet0/0/0
#
interface Ethernet0/0/1
#
interface Ethernet0/0/2
```

DHCP Statistics:

```
#
return
<HR-Router>display dhcp server statistics
 DHCP Server Statistics:

 Client Request           : 2
  Dhcp Discover           : 1
  Dhcp Request            : 1
  Dhcp Decline            : 0
  Dhcp Release            : 0
  Dhcp Inform             : 0
 Server Reply             : 2
  Dhcp Offer              : 1
  Dhcp Ack                : 1
  Dhcp Nak                : 0
 Bad Messages             : 0

<HR-Router>
```

15.5 Static Routing:

Data Centre Router:

AR11

```
<Data-Centre-Router>

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Data-Centre-Router>display ip routing-table protocol static
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Public routing table : Static
         Destinations : 1        Routes : 1        Configured Routes : 1

Static routing table status : <Active>
         Destinations : 1        Routes : 1

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        0.0.0.0/0   Static  60   0           RD   10.200.4.1      GigabitEthernet
0/0/1.99

Static routing table status : <Inactive>
         Destinations : 0        Routes : 0

<Data-Centre-Router>
```

Ping Commands:

From Main Router to Data Centre:

```
  Configuration console time out, please press any key to log on

<Main-Router>ping 10.200.4.1
  PING 10.200.4.1: 56  data bytes, press CTRL_C to break
    Request time out
    Reply from 10.200.4.1: bytes=56 Sequence=2 ttl=254 time=50 ms
    Reply from 10.200.4.1: bytes=56 Sequence=3 ttl=254 time=20 ms
    Reply from 10.200.4.1: bytes=56 Sequence=4 ttl=254 time=30 ms
    Reply from 10.200.4.1: bytes=56 Sequence=5 ttl=254 time=40 ms

  --- 10.200.4.1 ping statistics ---
    5 packet(s) transmitted
    4 packet(s) received
    20.00% packet loss
    round-trip min/avg/max = 20/35/50 ms

<Main-Router>
```

From R&D to Data Centre:

```
<R&D-Router>ping 10.200.4.1
  PING 10.200.4.1: 56  data bytes, press CTRL_C to break
    Reply from 10.200.4.1: bytes=56 Sequence=1 ttl=255 time=1 ms
    Reply from 10.200.4.1: bytes=56 Sequence=2 ttl=255 time=1 ms
    Reply from 10.200.4.1: bytes=56 Sequence=3 ttl=255 time=1 ms
    Reply from 10.200.4.1: bytes=56 Sequence=4 ttl=255 time=1 ms
    Reply from 10.200.4.1: bytes=56 Sequence=5 ttl=255 time=1 ms

  --- 10.200.4.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 1/1/1 ms

<R&D-Router>
```

15.6 Dynamic Routing (RIP):

HR Router:

HR-Router

```
The device is running!

<HR-Router>system-view
Enter system view, return user view with Ctrl+Z.
[HR-Router]interface GigabitEthernet 0/0/1
[HR-Router-GigabitEthernet0/0/1]ip address 10.100.1.1 255.255.255.252
May  4 2025 23:30:11-08:00 HR-Router %%01IFNET/4/LINK_STATE(l)[0]:The line proto
col IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[HR-Router-GigabitEthernet0/0/1]
[HR-Router-GigabitEthernet0/0/1]
[HR-Router-GigabitEthernet0/0/1]quit
[HR-Router]quit
<HR-Router>system-view
Enter system view, return user view with Ctrl+Z.
[HR-Router]rip 1
[HR-Router-rip-1]version 2
[HR-Router-rip-1]network 10.0.0.0
[HR-Router-rip-1]quit
[HR-Router]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<HR-Router>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait.........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<HR-Router>
<HR-Router>save
```

Finance Router:

Finance-Router

```
The device is running!

<Finance-Router>system-view
Enter system view, return user view with Ctrl+Z.
[Finance-Router]interface GigabitEthernet 0/0/1
[Finance-Router-GigabitEthernet0/0/1]ip address 10.100.2.1 255.255.255.252
[Finance-Router-GigabitEthernet0/0/1]
May  4 2025 23:45:23-08:00 Finance-Router %%01IFNET/4/LINK_STATE(l)[0]:The line
protocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[Finance-Router-GigabitEthernet0/0/1]
[Finance-Router-GigabitEthernet0/0/1]
[Finance-Router-GigabitEthernet0/0/1]rip 1
[Finance-Router-rip-1]version 2
[Finance-Router-rip-1]network 10.0.0.0
[Finance-Router-rip-1]quit
[Finance-Router]quit
<Finance-Router>

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Finance-Router>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait..........
```

IT Router:

IT-Router

```
The device is running!
##################################################
<IT-Router>
May  5 2025 00:24:38-08:00 IT-Router %%01IFPDT/4/IF_STATE(l)[0]:Interface Gigabi
tEthernet0/0/0 has turned into UP state.
<IT-Router>
May  5 2025 00:24:38-08:00 IT-Router %%01IFNET/4/LINK_STATE(l)[1]:The line proto
col IP on the interface GigabitEthernet0/0/0.10 has entered the UP state.
<IT-Router>
May  5 2025 00:24:38-08:00 IT-Router %%01IFNET/4/LINK_STATE(l)[2]:The line proto
col IP on the interface GigabitEthernet0/0/0.20 has entered the UP state.
<IT-Router>
May  5 2025 00:24:52-08:00 IT-Router %%01IFPDT/4/IF_STATE(l)[3]:Interface Gigabi
tEthernet0/0/1 has turned into UP state.
<IT-Router>system-view
Enter system view, return user view with Ctrl+Z.
[IT-Router]interface GigabitEthernet 0/0/1
[IT-Router-GigabitEthernet0/0/1]ip address 10.100.3.1 255.255.255.252
May  5 2025 00:26:04-08:00 IT-Router %%01IFNET/4/LINK_STATE(l)[4]:The line proto
col IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[IT-Router-GigabitEthernet0/0/1]quit
[IT-Router]rip 1
[IT-Router-rip-1]version 2
[IT-Router-rip-1]network 10.0.0.0
[IT-Router-rip-1]quit
[IT-Router]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<IT-Router>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait.........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<IT-Router>
```

R&D Router:

RD Router

```
The device is running!

<R&D-Router>system-view
Enter system view, return user view with Ctrl+Z.
[R&D-Router]interface GigabitEthernet 0/0/1
[R&D-Router-GigabitEthernet0/0/1]ip address 10.100.4.1 255.255.255.252
May  5 2025 00:27:54-08:00 R&D-Router %%01IFNET/4/LINK_STATE(l)[0]:The line prot
ocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[R&D-Router-GigabitEthernet0/0/1]quit
[R&D-Router]rip 1
[R&D-Router-rip-1]version 2
[R&D-Router-rip-1]network 10.0.0.0
[R&D-Router-rip-1]quit
[R&D-Router]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<R&D-Router>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<R&D-Router>
```

Inventory Router:

Inventory-Router

```
The device is running!

<INV-Router>system-view
Enter system view, return user view with Ctrl+Z.
[INV-Router]interface GigabitEthernet 0/0/1
[INV-Router-GigabitEthernet0/0/1]ip address 10.100.6.1 255.255.255.252
May  5 2025 01:25:21-08:00 INV-Router %%01IFNET/4/LINK_STATE(l)[0]:The line prot
ocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[INV-Router-GigabitEthernet0/0/1]quit
[INV-Router]rip 1
[INV-Router-rip-1]version 2
[INV-Router-rip-1]network 10.0.0.0
[INV-Router-rip-1]quit
[INV-Router]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<INV-Router>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<INV-Router>
<INV-Router>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 31       Routes : 31

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      10.1.10.0/28  RIP     100  4           D   10.100.6.2      GigabitEthernet
0/0/1
      10.1.20.0/28  RIP     100  4           D   10.100.6.2      GigabitEthernet
0/0/1
      10.2.10.0/24  RIP     100  4           D   10.100.6.2      GigabitEthernet
0/0/1
      10.2.20.0/24  RIP     100  4           D   10.100.6.2      GigabitEthernet
0/0/1
      10.3.10.0/24  RIP     100  4           D   10.100.6.2      GigabitEthernet
0/0/1
```

Supply Chain Router:

Supply Chain Router

```
The device is running!

<Supply-Chain-Router>system-view
Enter system view, return user view with Ctrl+Z.
[Supply-Chain-Router]interface GigabitEthernet 0/0/1
[Supply-Chain-Router-GigabitEthernet0/0/1]ip address 10.100.5.1 255.255.255.252
May  5 2025 01:23:20-08:00 Supply-Chain-Router %%01IFNET/4/LINK_STATE(l)[0]:The
line protocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[Supply-Chain-Router-GigabitEthernet0/0/1]quit
[Supply-Chain-Router]rip 1
[Supply-Chain-Router-rip-1]version 2
[Supply-Chain-Router-rip-1]network 10.0.0.0
[Supply-Chain-Router-rip-1]quit
[Supply-Chain-Router]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Supply-Chain-Router>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 31        Routes : 31

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      10.1.10.0/28  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.1.20.0/28  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.2.10.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.2.20.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.3.10.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.3.20.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.4.10.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
0/0/1
      10.4.20.0/24  RIP     100  4           D   10.100.5.2      GigabitEthernet
```

Router A:

Router-A

```
The device is running!

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname Router-A
[Router-A]interface GigabitEthernet0/0/0
[Router-A-GigabitEthernet0/0/0]ip address 10.100.1.2 255.255.255.252
May  4 2025 23:32:40-08:00 Router-A %%01IFNET/4/LINK_STATE(l)[0]:The line protoc
ol IP on the interface GigabitEthernet0/0/0 has entered the UP state.
[Router-A-GigabitEthernet0/0/0]quit
[Router-A]interface GigabitEthernet 0/0/1
May  4 2025 23:34:08-08:00 Router-A %%01IFPDT/4/IF_STATE(l)[1]:Interface Gigabit
Ethernet0/0/1 has turned into UP state.
[Router-A]interface GigabitEthernet 0/0/1
[Router-A-GigabitEthernet0/0/1]
May  4 2025 23:34:12-08:00 Router-A %%01IFPDT/4/IF_STATE(l)[2]:Interface Gigabit
Ethernet0/0/2 has turned into UP state.
[Router-A-GigabitEthernet0/0/1]ip address 10.100.2.2 255.255.255.252
May  4 2025 23:34:21-08:00 Router-A %%01IFNET/4/LINK_STATE(l)[3]:The line protoc
ol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[Router-A-GigabitEthernet0/0/1]
[Router-A-GigabitEthernet0/0/1]quit
[Router-A]interface GigabitEthernet 0/0/2
[Router-A-GigabitEthernet0/0/2]ip address 10.200.0.2 255.255.255.252
May  4 2025 23:34:51-08:00 Router-A %%01IFNET/4/LINK_STATE(l)[4]:The line protoc
ol IP on the interface GigabitEthernet0/0/2 has entered the UP state.
[Router-A-GigabitEthernet0/0/2]quit
[Router-A]rip 1
[Router-A-rip-1]version 2
[Router-A-rip-1]network 10.0.0.0
[Router-A-rip-1]quit
[Router-A]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Router-A>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<Router-A>
```

Router B:

Router-B

```
The device is running!

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname Router-B
[Router-B]interface GigabitEthernet 0/0/0
[Router-B-GigabitEthernet0/0/0]ip address 10.100.3.2 255.255.255.252
May  5 2025 00:33:29-08:00 Router-B %%01IFNET/4/LINK_STATE(l)[0]:The line protoc
ol IP on the interface GigabitEthernet0/0/0 has entered the UP state.
[Router-B-GigabitEthernet0/0/0]quit
[Router-B]interface GigabitEthernet 0/0/1
[Router-B-GigabitEthernet0/0/1]ip address 10.100.4.2 255.255.255.252
May  5 2025 00:34:27-08:00 Router-B %%01IFNET/4/LINK_STATE(l)[1]:The line protoc
ol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[Router-B-GigabitEthernet0/0/1]quit
[Router-B]interface GigabitEthernet 0/0/2
[Router-B-GigabitEthernet0/0/2]ip address 10.200.1.2 255.255.255.252
May  5 2025 00:35:07-08:00 Router-B %%01IFNET/4/LINK_STATE(l)[2]:The line protoc
ol IP on the interface GigabitEthernet0/0/2 has entered the UP state.
[Router-B-GigabitEthernet0/0/2]quit
[Router-B]rip 1
[Router-B-rip-1]version 2
[Router-B-rip-1]network 10.0.0.0
[Router-B-rip-1]quit
[Router-B]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Router-B>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<Router-B>
<Router-B>
```

Router C:

Router-C

```
[Router-C]interface GigabitEthernet 0/0/0
[Router-C-GigabitEthernet0/0/0]ip address 10.100.5.2 255.255.255.252
May  5 2025 01:27:57-08:00 Router-C %%01IFNET/4/LINK_STATE(l)[0]:The line protoc
ol IP on the interface GigabitEthernet0/0/0 has entered the UP state.
[Router-C-GigabitEthernet0/0/0]quit
[Router-C]interface GigabitEthernet 0/0/1
[Router-C-GigabitEthernet0/0/1]ip address 10.100.6.2 255.255.255.252
May  5 2025 01:28:36-08:00 Router-C %%01IFNET/4/LINK_STATE(l)[1]:The line protoc
ol IP on the interface GigabitEthernet0/0/1 has entered the UP state.
[Router-C-GigabitEthernet0/0/1]quit
[Router-C]interface GigabitEthernet 0/0/2
[Router-C-GigabitEthernet0/0/2] ip address 10.200.2.2 255.255.255.252
May  5 2025 01:29:31-08:00 Router-C %%01IFNET/4/LINK_STATE(l)[2]:The line protoc
ol IP on the interface GigabitEthernet0/0/2 has entered the UP state.
[Router-C-GigabitEthernet0/0/2]quit
[Router-C]rip 1
[Router-C-rip-1]version 2
[Router-C-rip-1]network 10.0.0.0
[Router-C-rip-1]quit
[Router-C]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Router-C>save
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<Router-C>
<Router-C>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 31        Routes : 31

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      10.1.10.0/28  RIP     100  3           D   10.200.2.1      GigabitEthernet
0/0/2
      10.1.20.0/28  RIP     100  3           D   10.200.2.1      GigabitEthernet
0/0/2
```

15.7 Link Aggregation (LACP):

Switches:

SW1_DataCentre:

LSW10

```
The device is running!

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname Data-Centre_SW2
[Data-Centre_SW2]
May 12 2025 19:13:51-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
.1.2011.5.25.191.3.1 configurations have been changed. The current change number
 is 4, the change loop count is 0, and the maximum number of records is 4095.
[Data-Centre_SW2]
[Data-Centre_SW2]vlan batch 30 40
Info: This operation may take a few seconds. Please wait for a moment...done.
[Data-Centre_SW2]
May 12 2025 19:14:11-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
.1.2011.5.25.191.3.1 configurations have been changed. The current change number
 is 5, the change loop count is 0, and the maximum number of records is 4095.
[Data-Centre_SW2]
[Data-Centre_SW2]interface Eth-Trunk 1
[Data-Centre_SW2-Eth-Trunk1]mode lacp-static
[Data-Centre_SW2-Eth-Trunk1]
May 12 2025 19:14:31-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
.1.2011.5.25.191.3.1 configurations have been changed. The current change number
 is 6, the change loop count is 0, and the maximum number of records is 4095.
[Data-Centre_SW2-Eth-Trunk1]
[Data-Centre_SW2-Eth-Trunk1]trunkport GigabitEthernet 0/0/1 to 0/0/2
Info: This operation may take a few seconds. Please wait for a moment...done.
[Data-Centre_SW2-Eth-Trunk1]
May 12 2025 19:14:39-08:00 Data-Centre_SW2 %%01IFNET/4/IF_STATE(l)[0]:Interface
Eth-Trunk1 has turned into UP state.
May 12 2025 19:14:41-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
.1.2011.5.25.191.3.1 configurations have been changed. The current change number
 is 7, the change loop count is 0, and the maximum number of records is 4095.
[Data-Centre_SW2-Eth-Trunk1]
[Data-Centre_SW2-Eth-Trunk1]
[Data-Centre_SW2-Eth-Trunk1]port link-type trunk
[Data-Centre_SW2-Eth-Trunk1]
May 12 2025 19:15:01-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
.1.2011.5.25.191.3.1 configurations have been changed. The current change number
 is 8, the change loop count is 0, and the maximum number of records is 4095.
[Data-Centre_SW2-Eth-Trunk1]
[Data-Centre_SW2-Eth-Trunk1]port trunk allow-pass vlan 30 40
[Data-Centre_SW2-Eth-Trunk1]quit
[Data-Centre_SW2]
May 12 2025 19:15:11-08:00 Data-Centre_SW2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4
```

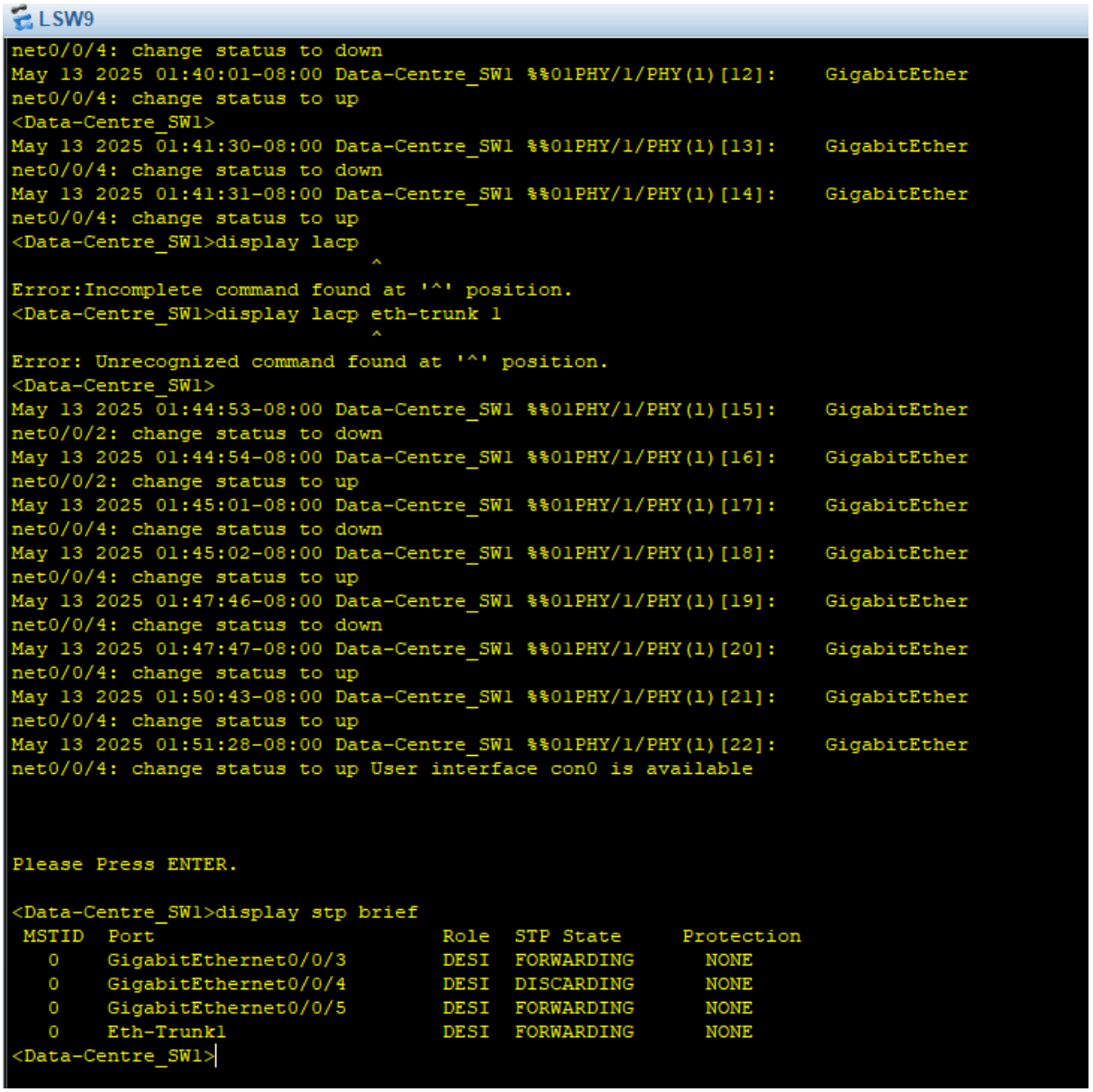
SW2_DataCentre:

LSW10

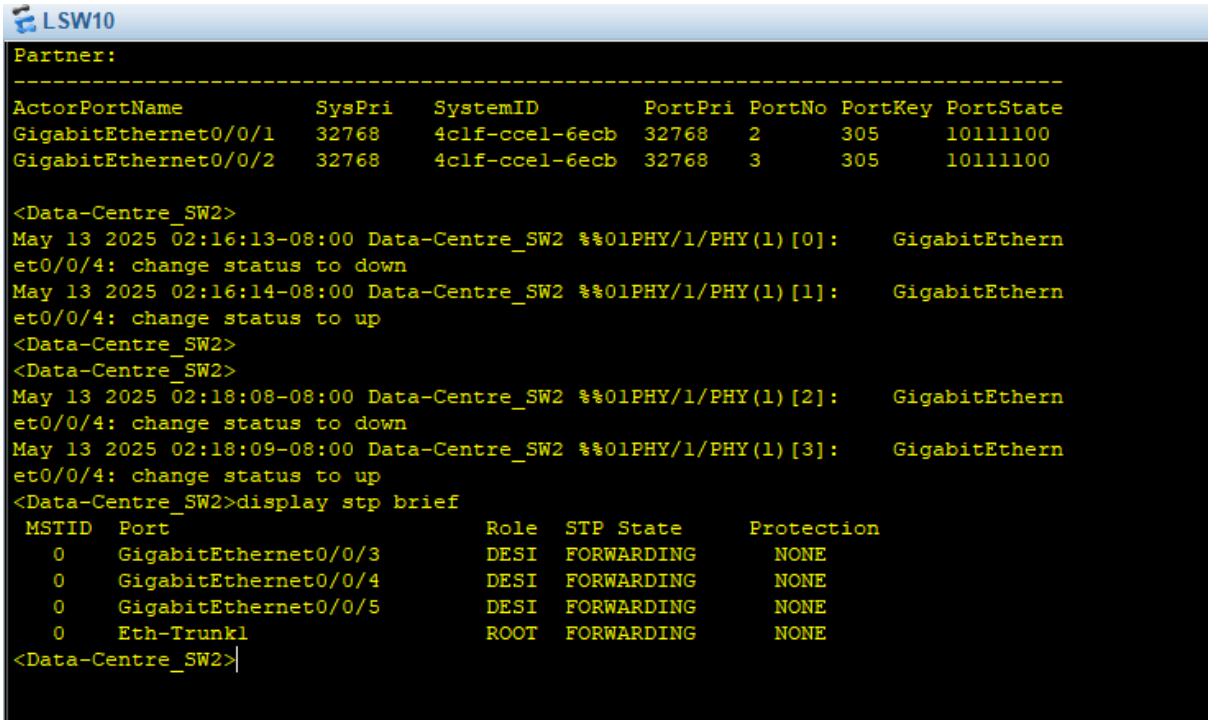
```
<Data-Centre_SW2>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]Y
Info: Please input the file name ( *.cfg, *.zip ) [vrpcfg.zip]:
May 13 2025 01:40:00-08:00 Data-Centre_SW2 %%01CFM/4/SAVE(l)[0]:The user chose Y
 when deciding whether to save the configuration to the device.
<Data-Centre_SW2>
May 13 2025 01:47:44-08:00 Data-Centre_SW2 %%01PHY/1/PHY(l)[1]:    GigabitEthern
et0/0/4: change status to down
May 13 2025 01:47:45-08:00 Data-Centre_SW2 %%01PHY/1/PHY(l)[2]:    GigabitEthern
et0/0/4: change status to up
May 13 2025 01:49:52-08:00 Data-Centre_SW2 %%01PHY/1/PHY(l)[3]:    GigabitEthern
et0/0/4: change status to down
May 13 2025 01:49:53-08:00 Data-Centre_SW2 %%01PHY/1/PHY(l)[4]:    GigabitEthern
et0/0/4: change status to up User interface con0 is available



Please Press ENTER.

<Data-Centre_SW2>display eth-trunk [Trunk-ID]   # e.g., display eth-trunk 1
                                ^
Error: Wrong parameter found at '^' position.
<Data-Centre_SW2>display eth-trunk 1
Eth-Trunkl's state information is:
Local:
LAG ID: 1                   WorkingMode: STATIC
Preempt Delay: Disabled     Hash arithmetic: According to SIP-XOR-DIP
System Priority: 32768      System ID: 4clf-ccd6-59d7
Least Active-linknumber: 1  Max Active-linknumber: 8
Operate status: up          Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
ActorPortName          Status   PortType PortPri PortNo PortKey PortState Weight
GigabitEthernet0/0/1   Selected 1GE      32768   2      305     10111100  1
GigabitEthernet0/0/2   Selected 1GE      32768   3      305     10111100  1

Partner:
--------------------------------------------------------------------------------
ActorPortName          SysPri   SystemID        PortPri PortNo PortKey PortState
GigabitEthernet0/0/1   32768    4clf-cce1-6ecb  32768   2      305     10111100
GigabitEthernet0/0/2   32768    4clf-cce1-6ecb  32768   3      305     10111100

<Data-Centre_SW2>
```

15.8 Spanning Tree Protocol (STP):

Data-Centre_SW1:



Data-Centre_SW2:

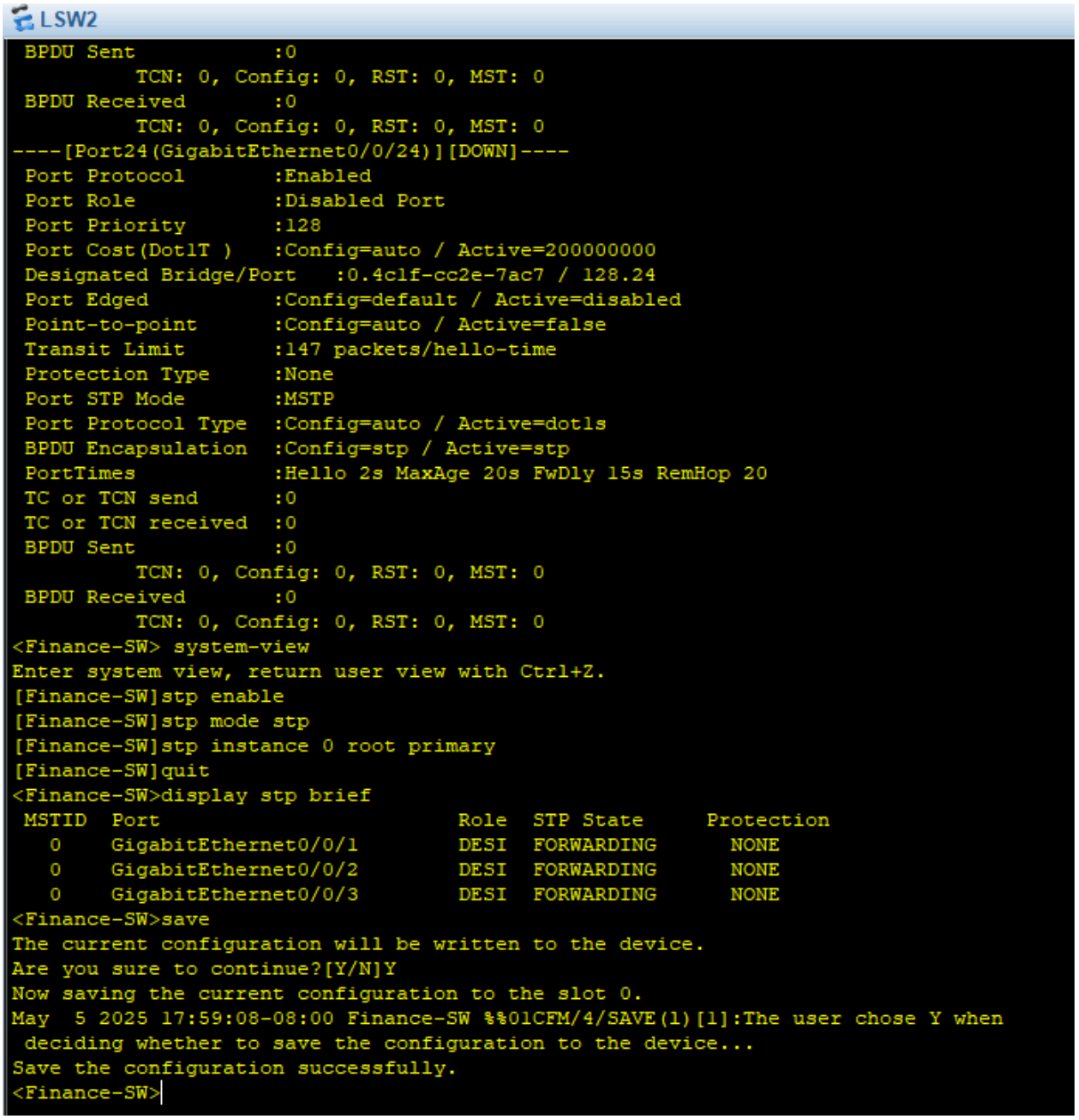


HR_SW:

LSW1

```
The device is running!

<HR-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/2        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/3        DESI  FORWARDING      NONE
<HR-SW>system-view
Enter system view, return user view with Ctrl+Z.
[HR-SW]stp enable
[HR-SW]
May  5 2025 17:53:15-08:00 HR-SW %%01PHY/1/PHY(l)[0]:    GigabitEthernet0/0/3: c
hange status to downst
May  5 2025 17:53:16-08:00 HR-SW %%01PHY/1/PHY(l)[1]:    GigabitEthernet0/0/3: c
hange status to upp mode stp
[HR-SW]stp instance 0 root primary
[HR-SW]
May  5 2025 17:53:35-08:00 HR-SW DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.
25.191.3.1 configurations have been changed. The current change number is 1, the
 change loop count is 0, and the maximum number of records is 4095.
May  5 2025 17:53:40-08:00 HR-SW %%01PHY/1/PHY(l)[2]:    GigabitEthernet0/0/2: c
hange status to upquit
<HR-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/2        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/3        DESI  FORWARDING      NONE
<HR-SW>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]Y
May  5 2025 17:54:08-08:00 HR-SW %%01CFM/4/SAVE(l)[3]:The user chose Y when deci
ding whether to save the configuration to the device.
Now saving the current configuration to the slot 0...
Save the configuration successfully.
<HR-SW>
May  5 2025 17:54:25-08:00 HR-SW %%01PHY/1/PHY(l)[4]:    GigabitEthernet0/0/3: c
hange status to down
May  5 2025 17:54:26-08:00 HR-SW %%01PHY/1/PHY(l)[5]:    GigabitEthernet0/0/3: c
hange status to up
```

FIN_SW:


LSW2
BPDU Sent :0
TCN: 0, Config: 0, RST: 0, MST: 0
BPDU Received :0
TCN: 0, Config: 0, RST: 0, MST: 0
----[Port24(GigabitEthernet0/0/24)][DOWN]----
Port Protocol :Enabled
Port Role :Disabled Port
Port Priority :128
Port Cost(Dot1T) :Config=auto / Active=200000000
Designated Bridge/Port :0.4c1f-cc2e-7ac7 / 128.24
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=false
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :MSTP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send :0
TC or TCN received :0
BPDU Sent :0
TCN: 0, Config: 0, RST: 0, MST: 0
BPDU Received :0
TCN: 0, Config: 0, RST: 0, MST: 0
<Finance-SW> system-view
Enter system view, return user view with Ctrl+Z.
[Finance-SW]stp enable
[Finance-SW]stp mode stp
[Finance-SW]stp instance 0 root primary
[Finance-SW]quit
<Finance-SW>display stp brief
MSTID Port Role STP State Protection
0 GigabitEthernet0/0/1 DESI FORWARDING NONE
0 GigabitEthernet0/0/2 DESI FORWARDING NONE
0 GigabitEthernet0/0/3 DESI FORWARDING NONE
<Finance-SW>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]Y
Now saving the current configuration to the slot 0.
May 5 2025 17:59:08-08:00 Finance-SW %%01CFM/4/SAVE(l)[1]:The user chose Y when deciding whether to save the configuration to the device...
Save the configuration successfully.
<Finance-SW>

IT_SW:

LSW3

```
 Port Cost(Dot1T )    :Config=auto / Active=200000000
 Designated Bridge/Port    :0.4c1f-ccd9-67dc / 128.24
 Port Edged           :Config=default / Active=disabled
 Point-to-point       :Config=auto / Active=false
 Transit Limit        :147 packets/hello-time
 Protection Type      :None
 Port STP Mode        :MSTP
 Port Protocol Type   :Config=auto / Active=dot1s
 BPDU Encapsulation   :Config=stp / Active=stp
 PortTimes            :Hello 2s MaxAge 20s FwDly 15s RemHop 20
 TC or TCN send       :0
 TC or TCN received   :0
 BPDU Sent            :0
          TCN: 0, Config: 0, RST: 0, MST: 0
 BPDU Received        :0
          TCN: 0, Config: 0, RST: 0, MST: 0
<IT-SW>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]Y
Now saving the current configuration to the slot 0.
May  5 2025 18:01:57-08:00 IT-SW %%01CFM/4/SAVE(l)[0]:The user chose Y when deci
ding whether to save the configuration to the device..
Save the configuration successfully.
<IT-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/2        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/3        DESI  FORWARDING      NONE
<IT-SW>
May  5 2025 18:03:08-08:00 IT-SW %%01PHY/1/PHY(l)[1]:    GigabitEthernet0/0/2: c
hange status to up
<IT-SW>system-view
Enter system view, return user view with Ctrl+Z.
[IT-SW]stp enable
[IT-SW]stp mode stp
[IT-SW]stp instance 0 root primary
[IT-SW]quit
<IT-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/2        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/3        DESI  FORWARDING      NONE
<IT-SW>
```

R&D_SW:

LSW4

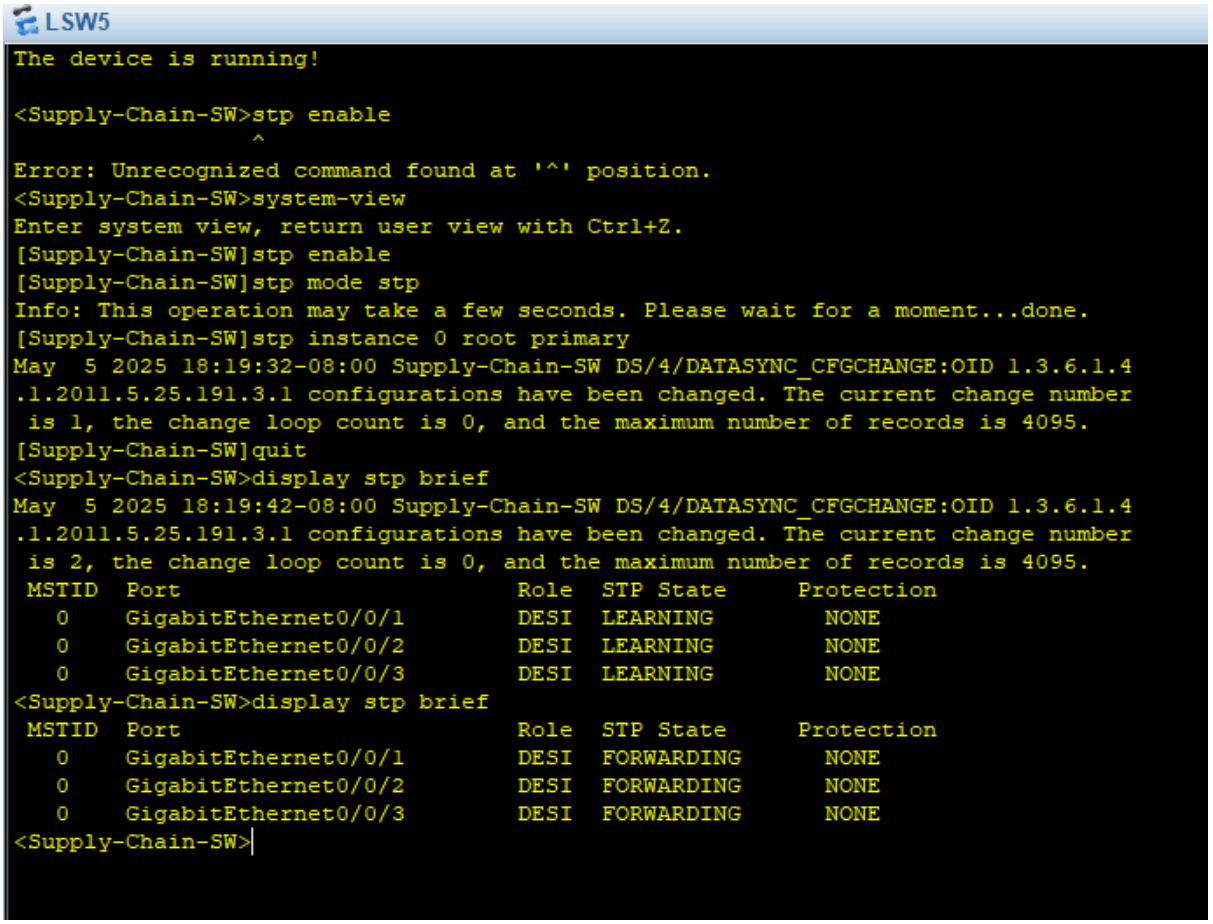
```
The device is running!

<R&D-SW>system-view
Enter system view, return user view with Ctrl+Z.
[R&D-SW]stp enable
[R&D-SW]\
        ^
Error: Unrecognized command found at '^' position.
[R&D-SW]
[R&D-SW]
[R&D-SW]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[R&D-SW]
May  5 2025 18:17:23-08:00 R&D-SW DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5
.25.191.3.1 configurations have been changed. The current change number is 1, th
e change loop count is 0, and the maximum number of records is 4095.
[R&D-SW]stp instance 0 root primary
[R&D-SW]quit
<R&D-SW>display stp b
May  5 2025 18:17:43-08:00 R&D-SW DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5
.25.191.3.1 configurations have been changed. The current change number is 2, th
e change loop count is 0, and the maximum number of records is 4095.rief
 MSTID  Port                      Role  STP State     Protection
   0    GigabitEthernet0/0/1      DESI  LEARNING        NONE
   0    GigabitEthernet0/0/2      DESI  LEARNING        NONE
   0    GigabitEthernet0/0/3      DESI  LEARNING        NONE
<R&D-SW>display stp brief
 MSTID  Port                      Role  STP State     Protection
   0    GigabitEthernet0/0/1      DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/2      DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/3      DESI  FORWARDING      NONE
<R&D-SW>
```

INV_SW:

LSW6

```
The device is running!

<INV-SW>system-view
Enter system view, return user view with Ctrl+Z.
[INV-SW]stp enable
[INV-SW]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[INV-SW]
May  5 2025 18:21:22-08:00 INV-SW DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5
.25.191.3.1 configurations have been changed. The current change number is 1, th
e change loop count is 0, and the maximum number of records is 4095.
[INV-SW]
[INV-SW]stp instance 0 root primary
[INV-SW]
May  5 2025 18:21:32-08:00 INV-SW DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5
.25.191.3.1 configurations have been changed. The current change number is 2, th
e change loop count is 0, and the maximum number of records is 4095.
[INV-SW]quit
<INV-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  DISCARDING      NONE
   0    GigabitEthernet0/0/2        DESI  DISCARDING      NONE
   0    GigabitEthernet0/0/3        DESI  DISCARDING      NONE
<INV-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/2        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/3        DESI  LEARNING        NONE
<INV-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/2        DESI  LEARNING        NONE
   0    GigabitEthernet0/0/3        DESI  LEARNING        NONE
<INV-SW>display stp brief
 MSTID  Port                        Role  STP State     Protection
   0    GigabitEthernet0/0/1        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/2        DESI  FORWARDING      NONE
   0    GigabitEthernet0/0/3        DESI  FORWARDING      NONE
<INV-SW>
```

Supply_Chain_SW:



15.9 Networking Services:

15.9.1 File Transfer Protocol (FTP):

Commands:

Router-A

```
st.

<Router-A>ftp 10.200.0.1
Trying 10.200.0.1 ...

Press CTRL+K to abort
Connected to 10.200.0.1.
220 FTP service ready.
User(10.200.0.1:(none)):user1
331 Password required for user1.
Enter password:
230 User logged in.

[Router-A-ftp]dir
200 Port command okay.
150 Opening ASCII mode data connection for *.
-rwxrwxrwx   1 noone    nogroup      1204 May 10 17:15 test.cfg
drwxrwxrwx   1 noone    nogroup         0 May 10 17:02 dhcp
-rwxrwxrwx   1 noone    nogroup    121802 May 26  2014 portalpage.zip
-rwxrwxrwx   1 noone    nogroup      2263 May 10 17:01 statemach.efs
-rwxrwxrwx   1 noone    nogroup    828482 May 26  2014 sslvpn.zip
-rwxrwxrwx   1 noone    nogroup       249 May 10 17:15 private-data.txt
drwxrwxrwx   1 noone    nogroup         0 May 10 17:15 .
-rwxrwxrwx   1 noone    nogroup       589 May 10 17:01 vrpcfg.zip
226 Transfer complete.
FTP: 532 byte(s) received in 0.160 second(s) 3.32Kbyte(s)/sec.

[Router-A-ftp]mkdir CCP
257 "CCP" new directory created.

[Router-A-ftp]pwd
257 "/" is current directory.

[Router-A-ftp]cd CCP
250 CWD command successful.

[Router-A-ftp]pwd
257 "/CCP" is current directory.

[Router-A-ftp]quit
221 Server closing.

<Router-A>
```

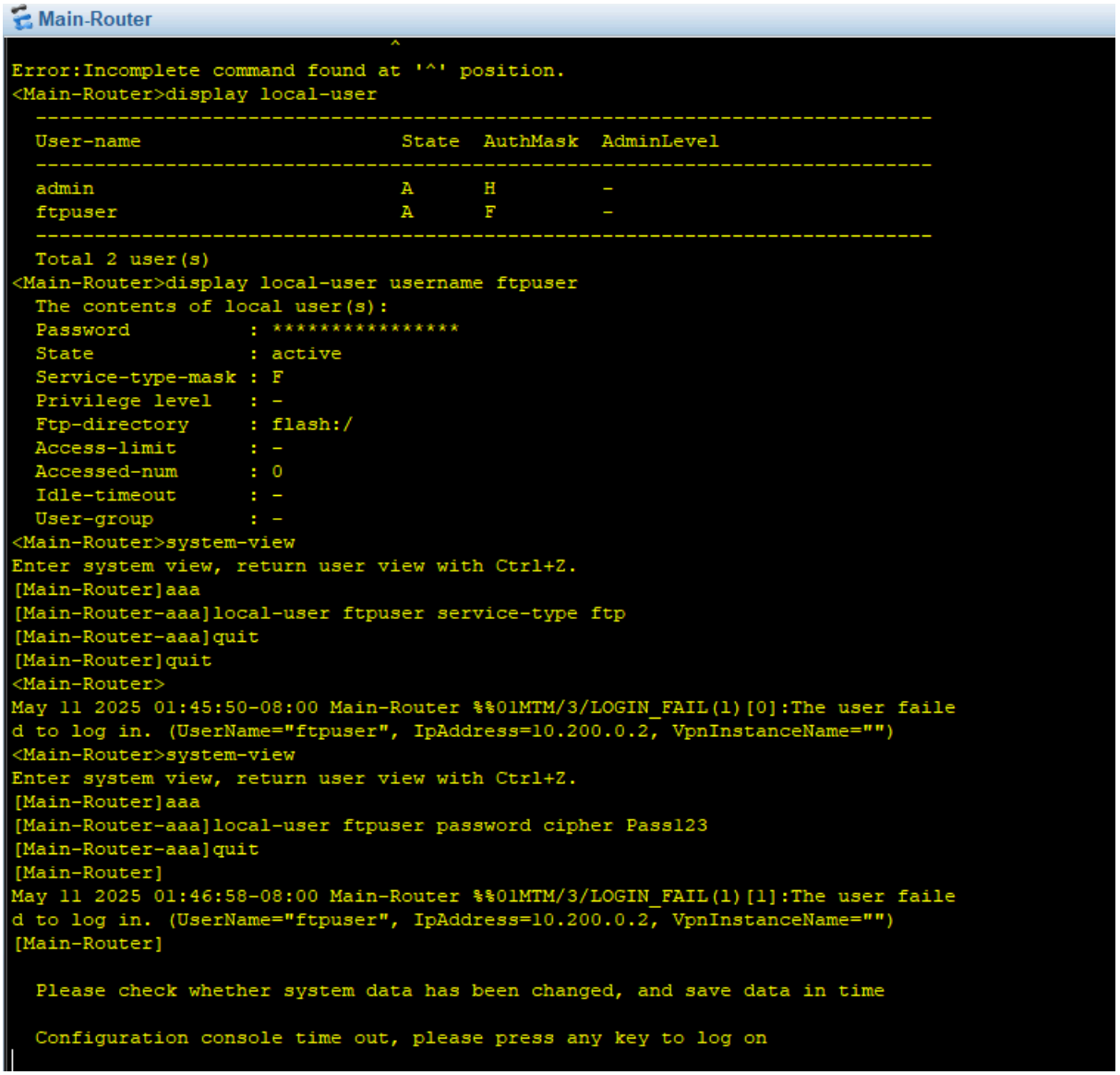
LOGIN:

```
<Router-A>ftp 10.200.0.1
Trying 10.200.0.1 ...

Press CTRL+K to abort
Connected to 10.200.0.1.
220 FTP service ready.
User(10.200.0.1:(none)):user1
331 Password required for user1.
Enter password:
230 User logged in.

[Router-A-ftp]
```

FTP on Main Router:

Main-Router

```
  Configuration console time out, please press any key to log on

<Main-Router>system-view
Enter system view, return user view with Ctrl+Z.
[Main-Router]ftp server enable
Info: Succeeded in starting the FTP server
[Main-Router]aaa
[Main-Router-aaa]local-user ftpuser password cipher Huawei@123
Info: Add a new user.
[Main-Router-aaa]local-user ftpuser service-type ftp
[Main-Router-aaa]local-user ftpuser ftp-directory flash:/
[Main-Router-aaa]quit
[Main-Router]quit
<Main-Router>save test.txt
 Invalid file name or Invalid extension ( *.cfg, *.zip )!
<Main-Router>save test.cfg
 Are you sure to save the configuration to test.cfg? (y/n)[n]:y
  It will take several minutes to save configuration file, please wait........
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<Main-Router>ipconfig
             ^
Error: Unrecognized command found at '^' position.
<Main-Router>display ftp-server
   FTP server is running
   Max user number                5
   User count                     0
   Timeout value(in minute)       30
   Listening port                 21
   Acl number                     0
   FTP server's source address    0.0.0.0

<Main-Router>display local-user
  ------------------------------------------------------------------------------
  User-name                      State  AuthMask  AdminLevel
  ------------------------------------------------------------------------------
  admin                          A      H         -
  ftpuser                        A      F         -
  ------------------------------------------------------------------------------
  Total 2 user(s)
<Main-Router>display ip interface brief
*down: administratively down
```


Main-Router
^
Error:Incomplete command found at '^' position.
<Main-Router>display local-user
User-name State AuthMask AdminLevel
admin A H -
ftpuser A F -
Total 2 user(s)
<Main-Router>display local-user username ftpuser
The contents of local user(s):
Password : **********
State : active
Service-type-mask : F
Privilege level : -
Ftp-directory : flash:/
Access-limit : -
Accessed-num : 0
Idle-timeout : -
User-group : -
<Main-Router>system-view
Enter system view, return user view with Ctrl+Z.
[Main-Router]aaa
[Main-Router-aaa]local-user ftpuser service-type ftp
[Main-Router-aaa]quit
[Main-Router]quit
<Main-Router>
May 11 2025 01:45:50-08:00 Main-Router %%01MTM/3/LOGIN_FAIL(l)[0]:The user faile
d to log in. (UserName="ftpuser", IpAddress=10.200.0.2, VpnInstanceName="")
<Main-Router>system-view
Enter system view, return user view with Ctrl+Z.
[Main-Router]aaa
[Main-Router-aaa]local-user ftpuser password cipher Pass123
[Main-Router-aaa]quit
[Main-Router]
May 11 2025 01:46:58-08:00 Main-Router %%01MTM/3/LOGIN_FAIL(l)[1]:The user faile
d to log in. (UserName="ftpuser", IpAddress=10.200.0.2, VpnInstanceName="")
[Main-Router]
Please check whether system data has been changed, and save data in time
Configuration console time out, please press any key to log on

15.9.2 Telnet:

Authentication:

HR-Router

```
    Reply from 10.200.0.2: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.200.0.2: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.200.0.2: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 10.200.0.2: bytes=56 Sequence=5 ttl=255 time=30 ms

  --- 10.200.0.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/44/120 ms

<HR-Router>ping 10.200.0.1
  PING 10.200.0.1: 56  data bytes, press CTRL_C to break
    Request time out
    Reply from 10.200.0.1: bytes=56 Sequence=2 ttl=254 time=50 ms
    Reply from 10.200.0.1: bytes=56 Sequence=3 ttl=254 time=30 ms
    Reply from 10.200.0.1: bytes=56 Sequence=4 ttl=254 time=30 ms
    Reply from 10.200.0.1: bytes=56 Sequence=5 ttl=254 time=20 ms

  --- 10.200.0.1 ping statistics ---
    5 packet(s) transmitted
    4 packet(s) received
    20.00% packet loss
    round-trip min/avg/max = 20/32/50 ms

<HR-Router>telnet 10.200.0.1
  Press CTRL_] to quit telnet mode
  Trying 10.200.0.1 ...
  Connected to 10.200.0.1 ...

Login authentication


Username:admin-A
Password:
Error: Failed to send authen-req.

  Logged Fail!

Username:admin-A
Password:
Error: Failed to send authen-req.

  Logged Fail!
```

Commands:

Telnet from IT-Router:

IT-Router

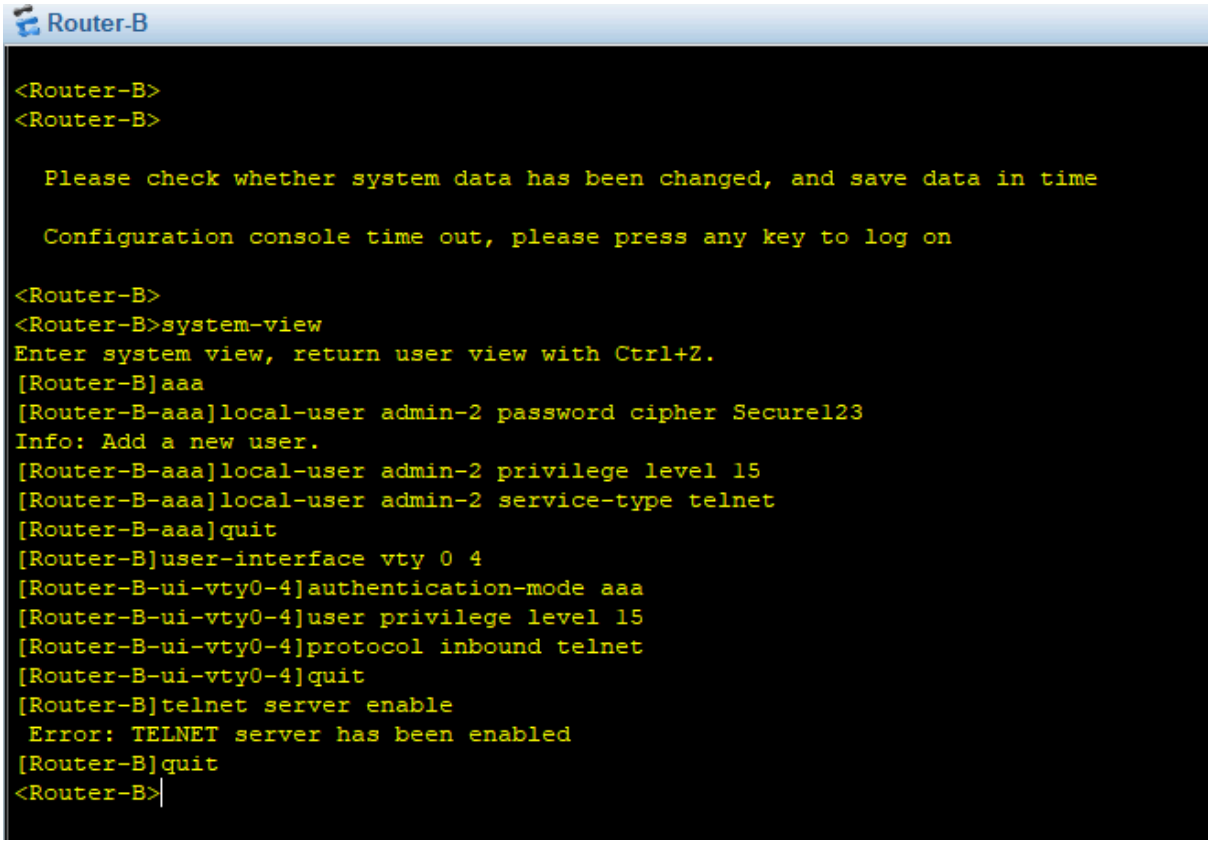
```
 TELNET server port                      :23
<IT-Router>system-view
Enter system view, return user view with Ctrl+Z.
[IT-Router]user-interface vty 0 4
[IT-Router-ui-vty0-4]undo authentication-mode password
                                            ^
Error:Too many parameters found at '^' position.
[IT-Router-ui-vty0-4]undo authentication-mode
[IT-Router-ui-vty0-4]undo set authentication password
                          ^
Error: Unrecognized command found at '^' position.
[IT-Router-ui-vty0-4]display this
[V200R003C00]
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
 user privilege level 15
user-interface vty 16 20
#
return
[IT-Router-ui-vty0-4]

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<IT-Router>
<IT-Router>
<IT-Router>system-view
Enter system view, return user view with Ctrl+Z.
[IT-Router]quit
<IT-Router>telnet 10.200.0.1
  Press CTRL_] to quit telnet mode
  Trying 10.200.0.1 ...
  Connected to 10.200.0.1 ...

Login authentication


Username:admin
Password:
<Main-Router>
```

Telnet on Router-A:

Router-A

```
Info: Add a new user.
[Router-A-aaa]local-user admin-A privilege level 15
[Router-A-aaa]local-user admin-A service-type telnet
[Router-A-aaa]quit
[Router-A]user-interface vty 0 4
[Router-A-ui-vty0-4]authentication-mode aaa
[Router-A-ui-vty0-4]user privilege level 15
[Router-A-ui-vty0-4]protocol inbound telnet
[Router-A-ui-vty0-4]quit
[Router-A]telnet server enable
 Error: TELNET server has been enabled
[Router-A]quit
<Router-A>display telnet
                        ^
Error:Incomplete command found at '^' position.
<Router-A>

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on

<Router-A>system-view
Enter system view, return user view with Ctrl+Z.
[Router-A]aaa
[Router-A-aaa]local-user admin-1 password cipher Secure123
Info: Add a new user.
[Router-A-aaa]local-user admin-1 privilege level 15
[Router-A-aaa]local-user admin-1 service-type telnet
[Router-A-aaa]quit
[Router-A]user-interface vty 0 4
[Router-A-ui-vty0-4]authentication-mode aaa
[Router-A-ui-vty0-4]user privilege level 15
[Router-A-ui-vty0-4]protocol inbound telnet
[Router-A-ui-vty0-4]quit
[Router-A]telnet server enable
 Error: TELNET server has been enabled
[Router-A]quit
<Router-A>

  Please check whether system data has been changed, and save data in time

  Configuration console time out, please press any key to log on
```

Telnet on Router-B:



15.9.3 Ping Verification:

Main-Router

```
The device is running!

<Main-Router>ping 10.100.3.2
  PING 10.100.3.2: 56  data bytes, press CTRL_C to break
    Reply from 10.100.3.2: bytes=56 Sequence=1 ttl=255 time=80 ms
    Reply from 10.100.3.2: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.100.3.2: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.100.3.2: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 10.100.3.2: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.100.3.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/34/80 ms

<Main-Router>ping 10.100
May 14 2025 00:23:03-08:00 Main-Router %%01IFPDT/4/IF_STATE(l)[0]:Interface Giga
bitEthernet0/0/0 has turned into UP state..
<Main-Router>ping 10.100
May 14 2025 00:23:03-08:00 Main-Router %%01IFNET/4/LINK_STATE(l)[1]:The line pro
tocol IP on the interface GigabitEthernet0/0/0 has entered the UP state.
<Main-Router>ping 10.100.4.2
  PING 10.100.4.2: 56  data bytes, press CTRL_C to break
    Reply from 10.100.4.2: bytes=56 Sequence=1 ttl=255 time=20 ms
    Reply from 10.100.4.2: bytes=56 Sequence=2 ttl=255 time=10 ms
    Reply from 10.100.4.2: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.100.4.2: bytes=56 Sequence=4 ttl=255 time=10 ms
    Reply from 10.100.4.2: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.100.4.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/16/20 ms

<Main-Router>
May 14 2025 00:23:09-08:00 Main-Router %%01IFPDT/4/IF_STATE(l)[2]:Interface Giga
bitEthernet0/0/2 has turned into UP state.
<Main-Router>
May 14 2025 00:23:09-08:00 Main-Router %%01IFNET/4/LINK_STATE(l)[3]:The line pro
tocol IP on the interface GigabitEthernet0/0/2 has entered the UP state.
<Main-Router>ping 10.200.1.2
  PING 10.200.1.2: 56  data bytes, press CTRL_C to break
```