# Lab 01

# 1 — Enterprise Foundation

# Lab 01 — Enterprise Lab Environment Setup

## Section A — Enterprise Build Scenario

### Lab Type

Enterprise Foundation Build Lab

### Difficulty

Beginner → Professional Foundation

### Estimated Time

90–120 Minutes

### Lab Objective

In this lab, you will build the complete foundational environment required for the entire CCNP ENCOR Enterprise journey using EVE-NG.

You will:

- Prepare the EVE-NG enterprise lab environment
- Deploy Cisco routing and switching nodes
- Configure VPCS hosts
- Build the first enterprise topology
- Validate end-to-end connectivity
- Create a reusable enterprise lab foundation

This lab becomes the baseline for future Enterprise Labs.

# Why This Lab Matters

Most networking courses immediately start with commands.

Real enterprise engineers first:

- prepare infrastructure,
- validate environments,
- standardize naming,
- verify connectivity,
- optimize resources,
- and build repeatable workflows.

This lab teaches the operational workflow used in real enterprise engineering environments.

# Enterprise Scenario

Your company is building a new internal enterprise lab platform for training junior network engineers.

You are assigned to:

- prepare the virtual infrastructure,
- deploy enterprise routers and switches,
- validate host communication,
- and create the baseline topology used by future projects.

# Recommended System Requirements

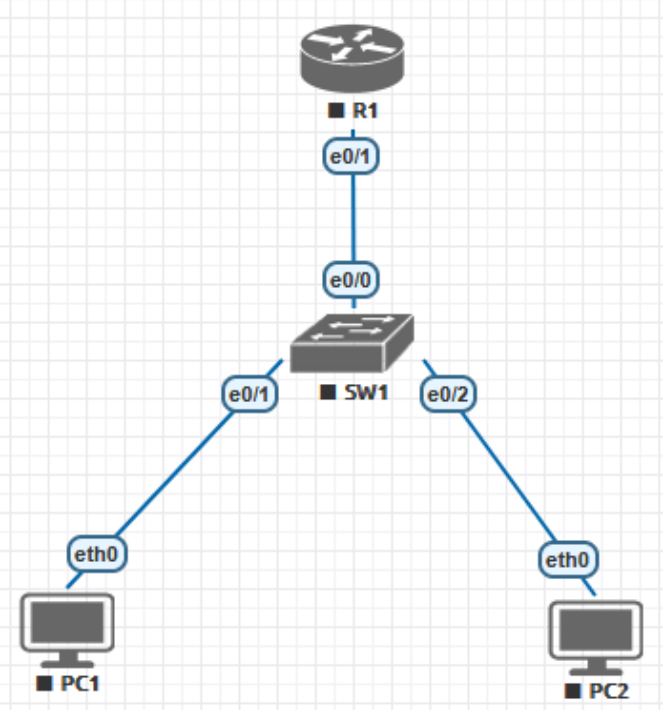
| Component | Recommended |
| --- | --- |
| CPU | Intel i7 / Ryzen 7 |
| RAM | 32 GB |
| Storage | SSD / NVMe |

| | |
|---|---|
| Hypervisor | VMware Workstation Pro |
| EVE-NG Version | Community Edition Latest |
| Host OS | Windows 10/11 |

# Required Images

| Device | Purpose |
|---|---|
| Cisco iol L3 | Enterprise routing |
| Cisco iol L2 | Layer 2 switching |
| VPCS | Lightweight enterprise endpoint testing |

# Enterprise Topology for EVE-NG & GNS3




# Connection Table

| Device | Interface | Connected To | Interface |
|---|---|---|---|

| | | | |
|---|---|---|---|
| R1 | Ethernet0/1 | SW1 | Ethernet0/0 |
| SW1 | Ethernet0/1 | PC1 | eth0 |
| SW1 | Ethernet0/2 | PC2 | eth0 |

# IP Addressing Table

| Device | Interface | IP Address | Gateway |
|---|---|---|---|
| R1 | Ethernet0/1 | 192.168.10.1/24 | N/A |
| PC1 | eth0 | 192.168.10.10/24 | 192.168.10.1 |
| PC2 | eth0 | 192.168.10.20/24 | 192.168.10.1 |

# Enterprise Naming Standards

| Device Type | Naming Convention |
|---|---|
| Router | R1 |
| Switch | SW1 |
| VPCs | PC1 / PC2 |

# Step 1 — Deploy Nodes in EVE-NG

## Goal

Create the initial enterprise topology.

## Add The Following Nodes

| Node | Quantity |
|---|---|
| IOSvL3 Router | 1 |
| IOSvL2 Switch | 1 |
| VPCS Host | 2 |

# Step 2 — Connect The Topology

## Goal

Create all enterprise network connections.

Use the Connection Table above to cable the topology.

# Step 3 — Configure PC1

## Goal

Configure static IP addressing.

## Commands

```
VPCS> ip 192.168.10.10/24 192.168.10.1
Checking for duplicate address...
VPCS : 192.168.10.10 255.255.255.0 gateway 192.168.10.1

VPCS> set pcname PC1

PC1> save
Saving startup configuration to startup.vpc
.  done
```

# Verification

```
PC1> show ip

NAME        : PC1[1]
IP/MASK     : 192.168.10.10/24
GATEWAY     : 192.168.10.1
DNS         :
MAC         : 00:50:79:66:68:07
LPORT       : 20000
RHOST:PORT  : 127.0.0.1:30000
MTU         : 1500
```

# Expected Result

- PC1 should have the correct IP address
- Default gateway should be configured

# Step 4 — Configure PC2

## Commands

```
VPCS> ip 192.168.10.20/24 192.168.10.1
Checking for duplicate address...
VPCS : 192.168.10.20 255.255.255.0 gateway 192.168.10.1

VPCS> set pcname PC2

PC2> save
Saving startup configuration to startup.vpc
.  done
```

# Verification

```
PC2> show ip

NAME        : PC2[1]
IP/MASK     : 192.168.10.20/24
GATEWAY     : 192.168.10.1
DNS         :
MAC         : 00:50:79:66:68:08
LPORT       : 20000
RHOST:PORT  : 127.0.0.1:30000
MTU         : 1500
```

# Expected Result

- PC2 should have correct addressing
- Default gateway should exist

# Step 5 — Configure SW1

## Goal

Prepare the enterprise access switch.

## Commands

```
enable

conf t

hostname SW1

interface Ethernet0/0

no shutdown

interface Ethernet0/1

no shutdown

interface Ethernet0/2

no shutdown

end

write memory
```

# Verification

```
SW1#show interfaces status

Port         Name               Status       Vlan       Duplex  Speed Type
Et0/0                           connected    1            full   auto 10/100/1000BaseTX
Et0/1                           connected    1            full   auto 10/100/1000BaseTX
Et0/2                           connected    1            full   auto 10/100/1000BaseTX
Et0/3                           connected    1            full   auto 10/100/1000BaseTX
```

# Expected Result

All interfaces should be connected/up.

# Step 6 — Configure R1

## Goal

Deploy enterprise Layer 3 gateway.

## initial router configuration

```
% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: n

Would you like to terminate autoinstall? [yes]:


Press RETURN to get started!
```

### Commands

```
enable

conf t

hostname R1

interface Ethernet0/1

ip address 192.168.10.1 255.255.255.0

no shutdown

end

write memory
```

# Verification

```
R1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            unassigned      YES unset  administratively down down
Ethernet0/1            192.168.10.1    YES manual up                    up
Ethernet0/2            unassigned      YES unset  administratively down down
Ethernet0/3            unassigned      YES unset  administratively down down
```

# Expected Result

Ethernet1 should be UP/UP.

# Step 7 — Validate Layer 2 Connectivity

## From PC1

```
PC1> ping 192.168.10.20

84 bytes from 192.168.10.20 icmp_seq=1 ttl=64 time=0.574 ms
84 bytes from 192.168.10.20 icmp_seq=2 ttl=64 time=0.826 ms
84 bytes from 192.168.10.20 icmp_seq=3 ttl=64 time=2.944 ms
```

# Expected Result

Ping should succeed.

# Step 8 — Validate Default Gateway Reachability

## From PC1

```
PC1> ping 192.168.10.1

192.168.10.1 icmp_seq=1 timeout
84 bytes from 192.168.10.1 icmp_seq=2 ttl=255 time=4.577 ms
```

```
84 bytes from 192.168.10.1 icmp_seq=3 ttl=255 time=4.006 ms
84 bytes from 192.168.10.1 icmp_seq=4 ttl=255 time=3.696 ms
```

**Note:** The first ping may time out due to the ARP resolution process. The host must first learn the MAC address of the gateway (192.168.10.1) before sending ICMP packets, so subsequent pings succeed once the ARP entry is created.

# Expected Result

Ping should succeed.

# Step 9 — Validate End-to-End Enterprise Connectivity

## From PC2

```
PC2> ping 192.168.10.10

84 bytes from 192.168.10.10 icmp_seq=1 ttl=64 time=0.750 ms
84 bytes from 192.168.10.10 icmp_seq=2 ttl=64 time=0.800 ms
84 bytes from 192.168.10.10 icmp_seq=3 ttl=64 time=2.954 ms
```

# Expected Result

End-to-end connectivity should work.

# Step 10 — Basic Enterprise Verification

## Router Verification

```
R1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            unassigned      YES unset  administratively down down
Ethernet0/1            192.168.10.1    YES manual up                    up
Ethernet0/2            unassigned      YES unset  administratively down down
```

```
Ethernet0/3            unassigned      YES unset  administratively down down

R1#show running-config
Building configuration...
.
.
.
interface Ethernet0/0
 no ip address
 shutdown
!
interface Ethernet0/1
 ip address 192.168.10.1 255.255.255.0
!
interface Ethernet0/2
 no ip address
 shutdown
!
interface Ethernet0/3
 no ip address
 shutdown
!
ip forward-protocol nd
!
!
ip http server
ip http secure-server
ip ssh bulk-mode 131072

!
!
control-plane
!
!
line con 0
 logging synchronous
line aux 0
line vty 0 4
 login
 transport input ssh
```

# Switch Verification

```
SW1#show interfaces status

Port         Name               Status       Vlan       Duplex  Speed Type
Et0/0                           connected    1            full   auto 10/100/1000BaseTX
```

```
Et0/1                           connected    1            full   auto 10/100/1000BaseTX
Et0/2                           connected    1            full   auto 10/100/1000BaseTX
Et0/3                           connected    1            full   auto 10/100/1000BaseTX

SW1#show mac address-table
          Mac Address Table
------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
   1    0050.7966.6807    DYNAMIC     Et0/1
   1    0050.7966.6808    DYNAMIC     Et0/2
   1    aabb.cc00.5010    DYNAMIC     Et0/0
Total Mac Addresses for this criterion: 3
```

# VPCS Verification

```
PC2> show ip

NAME        : PC2[1]
IP/MASK     : 192.168.10.20/24
GATEWAY     : 192.168.10.1
DNS         :
MAC         : 00:50:79:66:68:08
LPORT       : 20000
RHOST:PORT  : 127.0.0.1:30000
MTU         : 1500

PC2> ping 192.168.10.1

84 bytes from 192.168.10.1 icmp_seq=1 ttl=255 time=0.750 ms
84 bytes from 192.168.10.1 icmp_seq=2 ttl=255 time=1.428 ms
84 bytes from 192.168.10.1 icmp_seq=3 ttl=255 time=4.530 ms
```

# Common Mistakes

| Problem | Cause |
|---|---|
| Ping fails | Interface shutdown |
| VPCS unreachable | Wrong gateway configuration |
| Interfaces down | Wrong EVE cabling |
| Router unreachable | Wrong subnet mask |

# Enterprise Engineering Notes

- Always validate interfaces before troubleshooting routing.
- Enterprise labs should follow consistent naming standards.
- VPCS hosts provide lightweight scalable endpoint testing.
- Full Linux hosts should only be introduced when enterprise services or automation tools are required.
- End-to-end verification must happen after every deployment phase.

# Step 11 — Save Configurations

## Router

write memory

## Switch

write memory

# What You Learned

In this lab you learned:

- Enterprise lab preparation
- EVE-NG topology deployment
- VPCS endpoint networking
- Basic switching
- Basic routing
- End-to-end validation
- Enterprise operational workflow

# Verification Score

| Task | Status |
| --- | --- |
| VPCS configured | ☐ |
| Switch configured | ☐ |
| Router configured | ☐ |
| Connectivity verified | ☐ |
| Configurations saved | ☐ |
| Baseline exported | ☐ |

# Section B — Enterprise Troubleshooting Scenario

# Incident Scenario

After deployment, users report that PC1 cannot reach the default gateway.

Your task:

- investigate the issue,
- identify the root cause,
- restore enterprise connectivity.

# Step 1 — Introduce Failure

## On R1

```
enable

conf t

interface Ethernet0/1

shutdown
```

# Step 2 — Verify Failure Symptoms

## From PC1

```
ping 192.168.10.1
```

# Expected Result

Ping should fail.

# Step 3 — Begin Investigation

## Router Verification

```
show ip interface brief
```

# Expected Result

GigabitEthernet1 should show administratively down.

# Root Cause Analysis

The enterprise gateway interface was shutdown.

Without an active Layer 3 gateway:

- hosts cannot leave the local segment,
- routing services fail,
- enterprise communication breaks.

# Step 4 — Restore Service

### Commands

```
enable

conf t

interface Ethernet0/1

no shutdown

end

write memory
```

## Step 5 — Validate Recovery

### From PC1

```
ping 192.168.10.1
```

## Expected Result

Connectivity should be restored.

## Final Enterprise Validation

### Router

```
show ip interface brief
```

### Switch

```
show interfaces status
```

## VPCS

```
ping 192.168.10.1
```

# Final Engineering Note

Enterprise troubleshooting always follows this workflow:

1. Verify physical connectivity
2. Verify interface status
3. Verify IP addressing
4. Verify Layer 2 operation
5. Verify Layer 3 reachability
6. Restore service
7. Validate recovery end-to-end