BUILD GUIDES · NETWORK ENGINEERING

3 Network Engineer Resume Projects

No network engineering experience? Build these three, write each one up, and you have three real lines for the Projects section of your resume. No home lab needed: everything here runs on a laptop.

01 **VLAN Office Network**
Packet Tracer · VLANs · DHCP

02 **Two-Site OSPF Network**
GNS3 · OSPF · ACLs · NAT

03 **Packet Capture Triage**
Wireshark · DNS · TCP

HOW TO USE THIS GUIDE

01 Build it. Follow the steps and type every command yourself.

02 Prove it. Run the checks and screenshot the output.

03 Document it. One page: diagram, what you configured, proof it works.

04 Add the resume line. Each project ends with one you can copy.

START TODAY, 5 MINUTES

Make a free Cisco Networking Academy account and download Packet Tracer. That is all you need for Project 01.

netacad.com/resources/lab-downloads

VLAN Office Network

01

STACK Packet Tracer · VLANs · DHCP

One switch, one router, three departments that must stay separate but still reach each other through the router. This is the first network most junior engineers are asked to touch.

WHAT YOU NEED

- Cisco Packet Tracer. Free with a NetAcad account.
- In Packet Tracer: one 2911 router, one 2960 switch, three PCs.

THE PLAN

VLAN	NAME	SUBNET	GATEWAY
10	STAFF	192.168.10.0/24	192.168.10.1
20	GUEST	192.168.20.0/24	192.168.20.1
30	SERVERS	192.168.30.0/24	192.168.30.1

Cable PC1 to Fa0/1, PC2 to Fa0/2, PC3 to Fa0/3, and switch Gi0/1 to router Gi0/0.

STEP 1 · CREATE 3 VLANS ON ONE SWITCH

SWITCH

```
enable
configure terminal
vlan 10
 name STAFF
vlan 20
 name GUEST
vlan 30
 name SERVERS
interface fa0/1
 switchport mode access
 switchport access vlan 10
interface fa0/2
 switchport mode access
 switchport access vlan 20
interface fa0/3
 switchport mode access
 switchport access vlan 30
```

STEP 2 · TRUNK TO A ROUTER-ON-A-STICK

The trunk carries all three VLANs up one cable. The router gets one sub-interface per VLAN and becomes each VLAN's gateway.

SWITCH

```
interface g0/1
 switchport mode trunk
```

ROUTER

```
enable
configure terminal
interface g0/0
 no shutdown
interface g0/0.10
 encapsulation dot1Q 10
 ip address 192.168.10.1 255.255.255.0
interface g0/0.20
 encapsulation dot1Q 20
 ip address 192.168.20.1 255.255.255.0
interface g0/0.30
 encapsulation dot1Q 30
 ip address 192.168.30.1 255.255.255.0
```

STEP 3 · ONE DHCP POOL PER VLAN

ROUTER

```
ip dhcp excluded-address 192.168.10.1 192.168.10.10
ip dhcp excluded-address 192.168.20.1 192.168.20.10
ip dhcp excluded-address 192.168.30.1 192.168.30.10
ip dhcp pool STAFF
 network 192.168.10.0 255.255.255.0
 default-router 192.168.10.1
ip dhcp pool GUEST
 network 192.168.20.0 255.255.255.0
 default-router 192.168.20.1
ip dhcp pool SERVERS
 network 192.168.30.0 255.255.255.0
 default-router 192.168.30.1
```

On each PC: Desktop > IP Configuration > DHCP. Each should pull an address from its own VLAN's subnet.

STEP 4 · PING ACROSS VLANS TO PROVE IT

PROOF

```
! on the switch
show vlan brief
show interfaces trunk
! on the router
show ip dhcp binding
! on PC1 (command prompt): ping PC2's address
ping 192.168.20.11
```

The first ping or two can time out while ARP resolves. Run it twice and screenshot the clean one.

DOCUMENT IT

- Screenshot of the topology with VLANs labelled.
- The addressing table from this page.
- show running-config from the switch and the router.
- The four proof outputs above.
- Three sentences: what the business needed, what you built, how you proved it.

RESUME · PROJECTS COPY THIS LINE

Designed a 3-VLAN office network with inter-VLAN routing and DHCP in Cisco Packet Tracer

Two-Site OSPF Network

02

STACK GNS3 · OSPF · ACLs · NAT

Two offices joined through a core router. Routes are learned with OSPF, guests are blocked from the server network, and everyone shares one public address to reach the internet.

READ THIS FIRST: WHERE TO RUN IT FOR $0

GNS3 is free, but it does not come with router software. Cisco's images are licensed, so do not download them from random sites. Three honest ways to build this lab: (1) Packet Tracer, where every command in this guide works as written. (2) Cisco Modeling Labs Free, which gives you real Cisco images for up to 5 running nodes with a free Cisco account. (3) GNS3 with an image you are licensed to use. On your resume, name the tool you actually used.

gns3.com

developer.cisco.com/docs/modeling-labs/cml-free

THE PLAN

LINK	SUBNET	ADDRESSES
Guest LAN (Site A)	10.1.20.0/24	SITE-A .1, PC .10
Server LAN (Site B)	10.2.30.0/24	SITE-B .1, server .10
SITE-A to CORE	10.0.12.0/30	SITE-A .1, CORE .2
CORE to SITE-B	10.0.23.0/30	CORE .1, SITE-B .2
CORE to internet	203.0.113.0/30	CORE .2, ISP .1

The "internet" is one more router or server set to 203.0.113.1/30 with no routes back to your 10.x networks. Interface names differ between platforms. Match them to yours.

STEP 1 · BUILD 2 SITES WITH 3 ROUTERS

SITE-A

```
hostname SITE-A
interface g0/0
 description Guest LAN
 ip address 10.1.20.1 255.255.255.0
 no shutdown
interface g0/1
 description to CORE
 ip address 10.0.12.1 255.255.255.252
 no shutdown
```

CORE

```
hostname CORE
interface g0/0
 description to SITE-A
 ip address 10.0.12.2 255.255.255.252
 no shutdown
interface g0/1
 description to SITE-B
 ip address 10.0.23.1 255.255.255.252
 no shutdown
interface g0/2
 description to internet
 ip address 203.0.113.2 255.255.255.252
 no shutdown
```

SITE-B

```
hostname SITE-B
interface g0/0
 description Server LAN
 ip address 10.2.30.1 255.255.255.0
 no shutdown
interface g0/1
 description to CORE
 ip address 10.0.23.2 255.255.255.252
 no shutdown
```

Guest PC: 10.1.20.10/24, gateway 10.1.20.1. Server: 10.2.30.10/24, gateway 10.2.30.1.

STEP 2 · BRING UP OSPF IN AREA 0

ALL THREE ROUTERS

```
! SITE-A
router ospf 1
 router-id 1.1.1.1
 network 10.1.20.0 0.0.0.255 area 0
 network 10.0.12.0 0.0.0.3 area 0
 passive-interface g0/0

! CORE
ip route 0.0.0.0 0.0.0.0 203.0.113.1
router ospf 1
 router-id 2.2.2.2
 network 10.0.12.0 0.0.0.3 area 0
 network 10.0.23.0 0.0.0.3 area 0
 default-information originate

! SITE-B
router ospf 1
 router-id 3.3.3.3
 network 10.2.30.0 0.0.0.255 area 0
 network 10.0.23.0 0.0.0.3 area 0
 passive-interface g0/0
```

PROOF

```
show ip ospf neighbor
! you want state FULL on both CORE neighbors
show ip route ospf
! from the guest PC, before any ACL exists:
ping 10.2.30.10
```

STEP 3 · ACL: BLOCK GUESTS FROM SERVERS

Filter as close to the source as you can: inbound on the guest LAN interface. Everything else is still allowed.

SITE-A

```
ip access-list extended GUEST-IN
 deny ip 10.1.20.0 0.0.0.255 10.2.30.0 0.0.0.255
 permit ip any any
interface g0/0
 ip access-group GUEST-IN in
```

PROOF

```
! from the guest PC: this must now fail
ping 10.2.30.10
! on SITE-A: the deny line shows matches
show access-lists
```

STEP 4 · NAT OVERLOAD OUT TO THE INTERNET

CORE

```
access-list 1 permit 10.0.0.0 0.255.255.255
ip nat inside source list 1 interface g0/2 overload
interface g0/0
 ip nat inside
interface g0/1
 ip nat inside
interface g0/2
 ip nat outside
```

PROOF

```
! from the guest PC: reach the internet side
ping 203.0.113.1
! on CORE: 10.1.20.10 translated to 203.0.113.2
show ip nat translations
```

The ISP device has no route to 10.x. If the ping works, NAT is the reason.

On Cisco Modeling Labs Free, stay inside 5 nodes: skip the server and ping 10.2.30.1 instead.

DOCUMENT IT

- Topology diagram with every subnet labelled.
- The addressing table and the three router configs.
- Ping to the server before the ACL (works) and after (blocked).
- show ip ospf neighbor, show access-lists, show ip nat translations.
- Three sentences: the requirement, your design, your proof.

RESUME · PROJECTS — COPY THIS LINE

Built a two-site routed network with OSPF, ACLs and NAT in GNS3

Built it in Packet Tracer or Cisco Modeling Labs instead? Swap the last word.

Packet Capture Triage

03

STACK Wireshark · DNS · TCP

"The site won't load" is the most common ticket in networking. In this project you capture real traffic, find a DNS failure and a TCP failure, and write up the root cause the way an engineer would.

WHAT YOU NEED

- Wireshark. Free and open source.

  wireshark.org

GROUND RULE

Capture only on a network you own or have permission to test. Your own laptop on your home network is perfect.

STEP 1 · CAPTURE YOUR OWN TRAFFIC

01 Open Wireshark and double-click the interface with a moving graph (Wi-Fi or Ethernet).

02 A healthy request: open a site you have not visited today.

03 A DNS failure: in a terminal, run the first command below.

04 A TCP failure: in the browser, open the address below and let it time out.

05 Press the red square to stop the capture. Save it.

MAKE IT FAIL ON PURPOSE

```
nslookup this-name-does-not-exist-4821.com
http://10.255.255.1
```

If your own network uses 10.255.255.x, pick another private address nothing answers on.

STEP 2 · FILTER: DNS, THEN TCP.FLAGS.SYN==1

DISPLAY FILTERS, ONE AT A TIME

```
dns
dns.flags.rcode != 0
tcp.flags.syn == 1 && tcp.flags.ack == 0
tcp.analysis.retransmission
ip.addr == 10.255.255.1
```

- dns shows every lookup. A healthy one is a query followed by a response with an address.
- dns.flags.rcode != 0 shows only failed lookups. Your fake name comes back "No such name".

- The SYN filter shows every new connection your laptop tried to open.

STEP 3 · FIND THE HANDSHAKE THAT FAILS

A healthy TCP connection opens with three packets: SYN, then SYN-ACK, then ACK. Right-click any packet and choose Follow > TCP Stream to see one conversation on its own.

WHAT YOU SEE	WHAT IT MEANS
SYN, SYN-ACK, ACK	Healthy. Connection opened.
SYN, SYN, SYN, no reply [TCP Retransmission]	Nothing answered. Host down, wrong address, or a firewall drop.
SYN, then RST	Host is up. That port is closed.

Your 10.255.255.1 attempt should show the second pattern: the same SYN sent again and again, flagged as a retransmission, with no SYN-ACK.

STEP 4 · WRITE A ONE-PAGE FINDINGS REPORT

REPORT TEMPLATE, ONE PER FAULT

```
SYMPTOM     What the user would have reported.
EVIDENCE    Filter used, packet numbers, screenshot.
ROOT CAUSE  One sentence. DNS returned no such name,
            or SYN to 10.255.255.1 was never answered.
NEXT STEP   What you would check or fix next.
```

Share screenshots of the relevant packets, not the capture file. The file contains everything your laptop did while it was recording.

RESUME · PROJECTS — COPY THIS LINE

Diagnosed DNS and TCP faults from packet captures in Wireshark and documented root cause

Your 3 resume projects

Add a Projects section under your skills. One line per project, strongest first.

PROJECTS

- **Designed a 3-VLAN office network with inter-VLAN routing and DHCP in Cisco Packet Tracer**
- **Built a two-site routed network with OSPF, ACLs and NAT in GNS3**
- **Diagnosed DNS and TCP faults from packet captures in Wireshark and documented root cause**

WHAT TO DO NEXT

01 Put the three write-ups somewhere you can link: a public GitHub repo or a single PDF. Add the link to your resume.

02 Be ready to explain each one out loud. Why a trunk? What does FULL mean in OSPF? How did you know nothing answered the SYN?

03 Change one thing in each lab and document it: a fourth VLAN, a second OSPF area, a different fault to find.

04 Back the projects with a cert. VLANs, routing, ACLs, NAT and troubleshooting come up again on Network+ and CCNA.

STEP 4, THE NETWORKING CERT PATH

Network+ then CCNA, in order. Try 15 free Network+ practice questions first, no sign-up needed.

getuprep.com/paths/networking

If this helped, follow @getuacademy on Instagram for more free tech resources.