

Subnet Boundaries: Local vs. Remote

Recommended time: 45-60 minutes | Focus: IPv4 subnetting, prefix boundaries, local-vs.-remote forwarding

Learning Objectives

1. Determine the network address, broadcast address, and usable host range from an IPv4 address and prefix.
2. Decide whether a destination is local or remote from the source host.
3. Explain why a host uses its default gateway for a remote destination.
4. Use subnet evidence in a defensible troubleshooting explanation.

Teacher design rule: Require a prediction before configuration and an explanation after verification. A working fix without supported reasoning is still useful formative-assessment evidence.

Warm-Up - 5 Minutes

A host is configured as 192.168.10.70/27. Ask students to identify the /27 block before using a calculator.

Expected reasoning: /27 creates blocks of 32 addresses. The blocks begin at .0, .32, .64, .96, .128, .160, .192, and .224. Therefore .70 belongs to the .64-.95 block.

Teacher Model - 10 Minutes

Work through the full boundary: network 192.168.10.64, broadcast 192.168.10.95, usable hosts .65-.94.

Then ask whether 192.168.10.20 is local. It is outside the /27 boundary, so the host treats it as remote and sends toward its default gateway.

Student Practice - 15 Minutes

Classify each destination as local or remote: 10.20.4.25/24 to 10.20.4.90; 10.20.4.25/24 to 10.20.5.90; 172.16.8.142/26 to 172.16.8.150; 172.16.8.142/26 to 172.16.8.70; 192.168.50.206/28 to 192.168.50.210.

Expected classifications: local, remote, local, remote, local. Require students to show the boundary, not only the answer.

Evidence Artifact

Client: 10.30.12.70/27 | Gateway: 10.30.12.65 | Destination: 10.30.12.100.

The source is in 10.30.12.64-95. The destination is outside that subnet. The host therefore sends the frame toward the gateway rather than resolving the remote destination directly on the local link.

Misconception to Expose

Incorrect claim: "If the first three octets match, the devices are local."

Correction: the prefix length defines the network boundary. Visual similarity between addresses is not enough.

Exit Ticket

For 192.168.40.126/26, identify the network, broadcast, usable range, classify 192.168.40.70 as local or remote, and explain the forwarding consequence.

Answer: network .64; broadcast .127; usable .65-.126; .70 is local; the host attempts local-link delivery rather than using the default gateway.

Changed-Fact Extension

Change only the prefix from /26 to /25. Students must explain exactly which boundary changes and whether the forwarding decision changes.

Quick Assessment Rubric

Criterion	Strong Evidence
Prediction	States the expected network behavior or artifact before the change.
Interpretation	Explains what the evidence proves and what remains unresolved.
Decision	Changes only what the evidence supports.
Verification	Repeats the original test and includes a control or negative test when appropriate.

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