

Route Selection: Longest Prefix vs. Forwarding Success

Recommended time: 50-70 minutes | Focus: Longest-prefix match, next-hop reachability, return paths

Learning Objectives

1. Identify all routes that match a destination.
2. Select the longest matching prefix.
3. Separate route selection from successful forwarding.
4. Explain why the return path matters to end-to-end communication.

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.

Routing Table

Connected 192.168.10.0/24; 10.0.0.0/8 via 192.168.10.2; 10.20.0.0/16 via 192.168.10.3; 10.20.30.0/24 via 192.168.10.4; default via 192.168.10.1.

Round 1 - Select the Route

10.20.30.55 → /24; 10.20.99.5 → /16; 10.99.1.1 → /8; 203.0.113.8 → default.

Require students to list matching routes before naming the winner.

Round 2 - Break the Next Hop

Keep the /24 route installed but make 192.168.10.4 unreachable.

The /24 still wins the lookup, but successful forwarding through that next hop is not proven. Route selected is not the same as route usable.

Round 3 - Break the Return Path

The forward router reaches 10.20.30.55, but the remote side lacks a route back to 192.168.10.0/24.

End-to-end communication can fail despite a correct forward route.

Misconception to Expose

Incorrect: "If the most specific route fails, the router always tries the broader route."

Correction: behavior depends on route installation and reachability mechanisms. A forwarding failure alone does not guarantee fallback.

Exit Ticket

For a new destination, students must document matching routes, winning prefix, selected next hop, next-hop verification, and return-path verification.

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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