Q1 **Why Is It Built This Way?** Ch. 3 slides 119–120; Ch. 4 slides 6–7, 22, 59–61; Ch. 5 slide 51

Names: _____

Each row of the grid is one design choice, compared with something the designers could have done instead. Read a finished row as a sentence: "They chose ____ over ____, which lets ____, at the cost of ____."

1. Fill in what each choice buys and what it costs, compared with its alternative. The first row is done for you.

The choice	The alternative	What it buys	What it costs
Forwarding and routing are separate jobs: a router looks up each datagram in a table that routing filled in earlier.	*Work out the route for each datagram when it arrives.*	*Forwarding can run in hardware, in nanoseconds per datagram. Routing can take seconds, in software.*	*When a link changes, the table is out of date until routing catches up.*
TCP senders infer congestion from loss and delay.	Routers tell each sender how fast to send.		
Addresses are given out in hierarchical blocks, and routers match on prefixes.	Any host can have any address, and routers hold one entry per address.		
Link state: every router learns the whole map and computes its own routes.	Distance vector: each router tells only its neighbors its costs to each destination.		

2. Each statement is false. Rewrite it so that it is true.

False statement	True version
Longest prefix match finds the shortest path to the destination.	
An IP address identifies a computer.	
Distance vector is better than link state because it needs less computation.	

Discussion

Pick a row of the grid from part 1. Describe a network where the alternative would be the better choice. What about that network changes the trade-off?

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Q2 **What If…?** Ch. 4 slides 22, 59–61, 95–96; Ch. 5 slide 51

Parts 1–3 each change one thing about the network. Say what follows, and why.

1. Suppose every router keeps a copy of each datagram until the next router acknowledges it, so no link ever loses a datagram. Could TCP now drop its ACKs and retransmissions? What new work do the routers take on?

2. In Week 9, Organization 1 kept its addresses when it moved to a new ISP, so that ISP advertised 200.23.18.0/23 separately. Suppose every organization on the Internet did this. What happens to core routers' forwarding tables? Organization 1 gets the benefit: who pays the cost?

3. A compromised router lies in its routing messages to pull in traffic. How far can the lie reach under link state? Under distance vector? Why do they differ?

4. A laptop fetches a page from a web server, across many routers. Mark ✓ for each device that needs this fact to handle the laptop's first request. A row can have any number of marks, including none.

Fact	Laptop	First-hop router	Core router	Web server
The laptop's IP address				
The server's IP address				
The laptop's TCP congestion window				
Which outgoing link the core router uses for this destination				
Whether a given datagram reached the server				
The complete list of routers on the path				

Discussion

A router needs only the destination address to forward a datagram, yet the source address rides along past every router on the path. Why not leave it out? If you did not want the web server to learn your address, what could you do instead?