

CS144 Week 5: Routing

# How packets find their way across the Internet

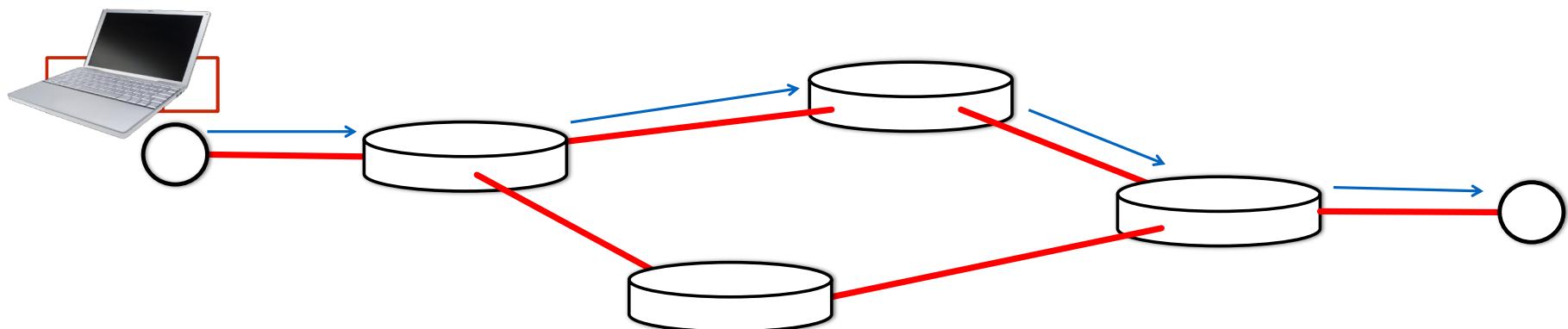


**Nick McKeown**

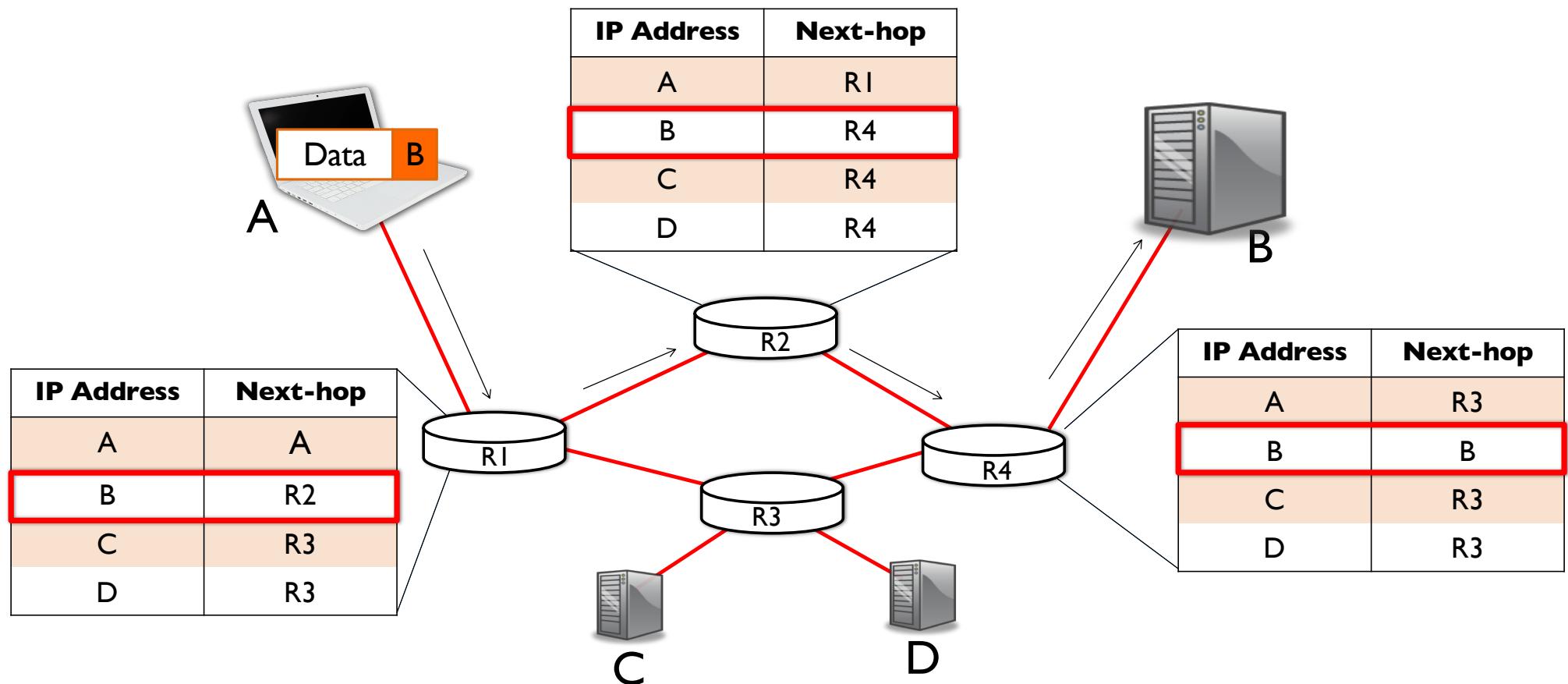
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# Routers forward IP datagrams one at a time

1. Routers uses IP address as a key into a forwarding table, then
2. Sends datagram to a router closer to the destination.



# The Internet forwards datagrams **hop-by-hop**



How do the routers **know**  
what forwarding table to use?

What techniques can you think of?

# Here are three ways

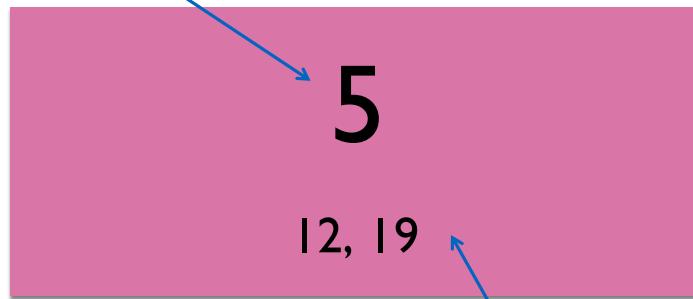
1. **Flooding:** Every router sends arriving packet to every neighbor
2. **Source Routing:** End host lists the routers to visit along the way (in each packet)
3. **Distributed Algorithm:** Routers talk to each other and construct forwarding tables using a clever algorithm

You are going to figure this out on your own!!!

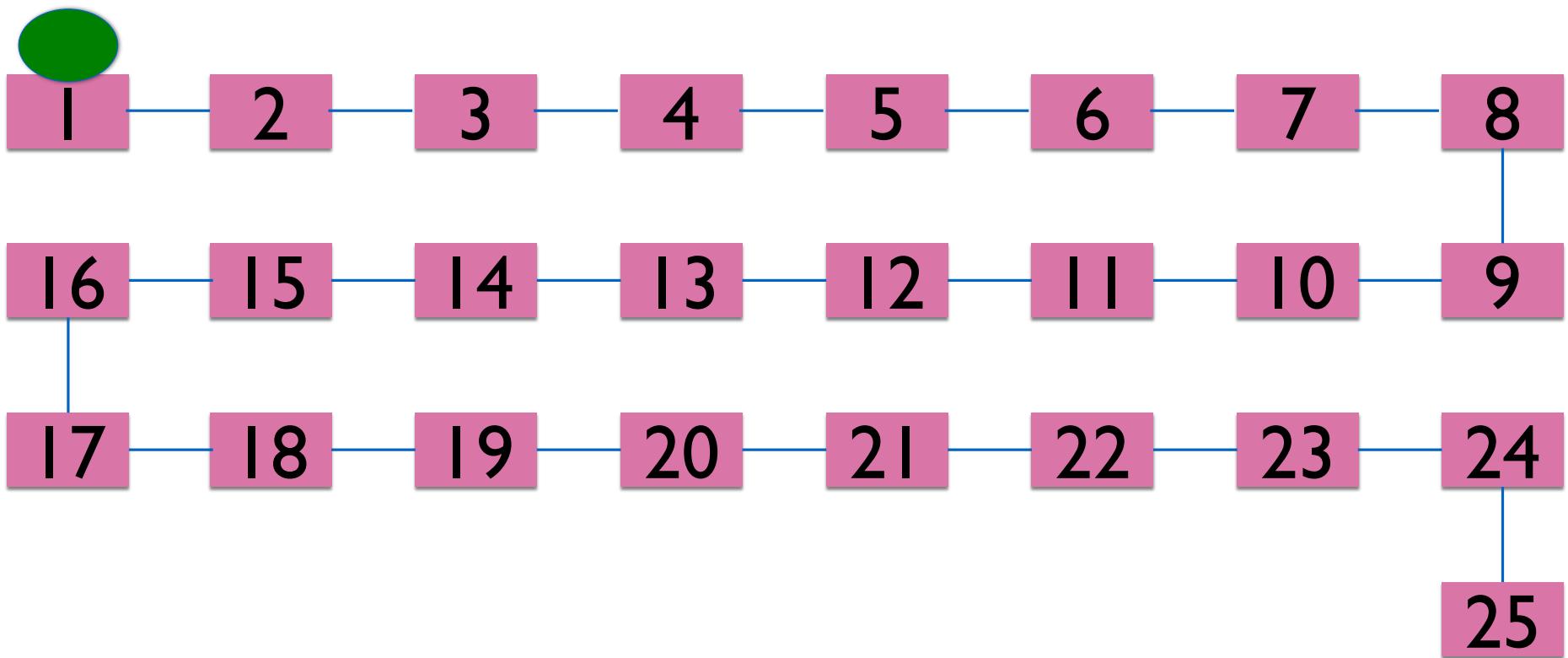
# **Game: Routing Competition**

# Task 1

Your router  
ID

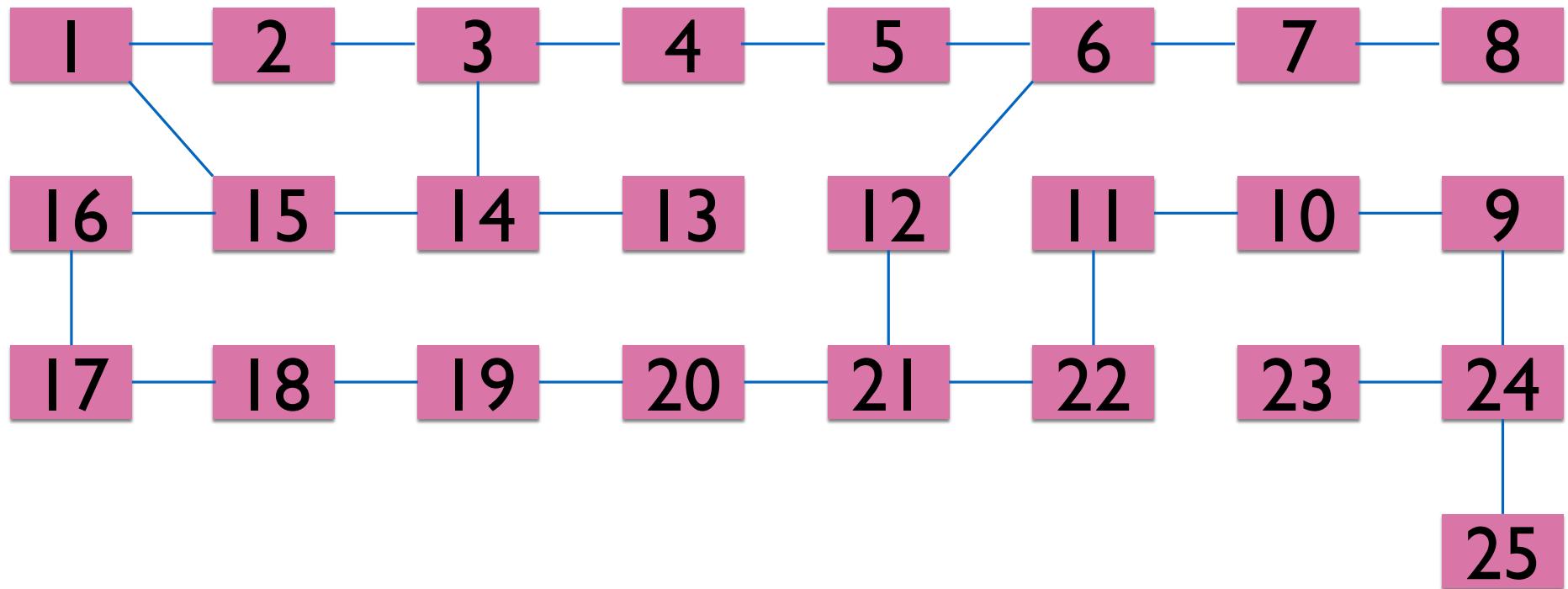


The IDs of your neighbors



# Task 2

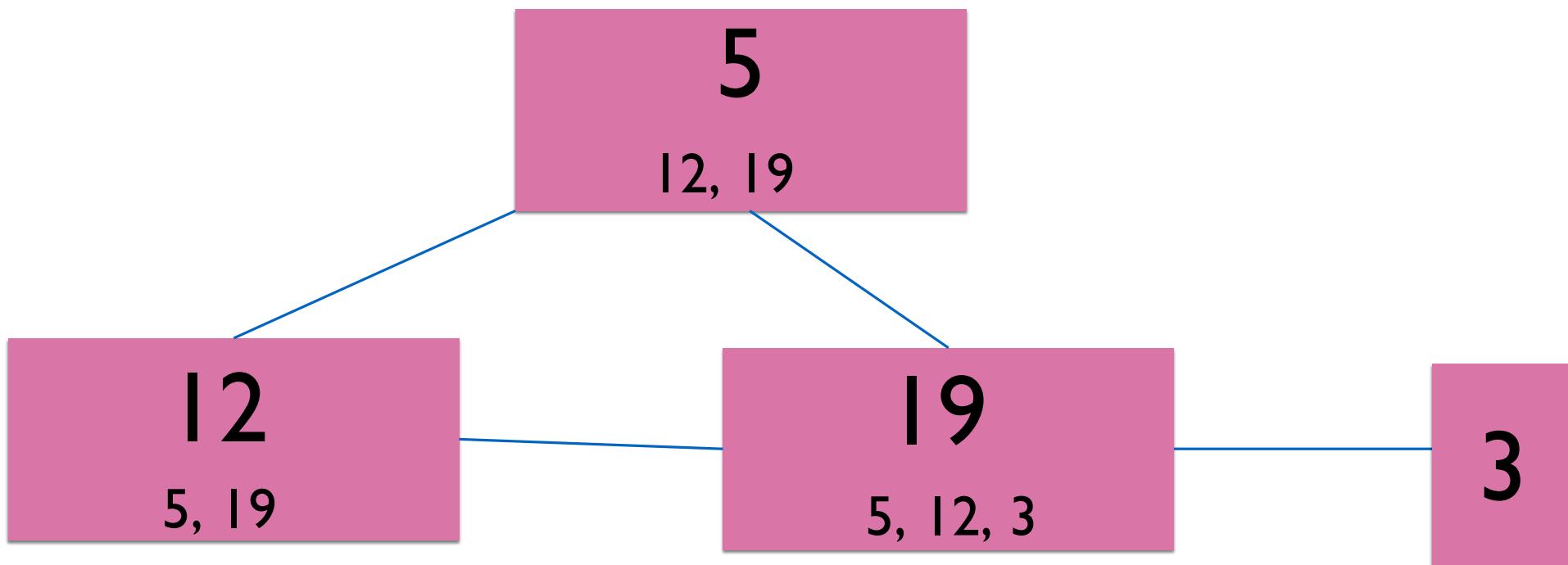
# Find the shortest path



# Task 3

In a real network, the routers don't know what the network looks like.

This time, *I won't show you the network.*



# Rules

## You may not

- ▶ Pass your card to anyone else
- ▶ Leave your seat
- ▶ Write anything down

## You may

- ▶ Ask nearby friends (in your group) for advice
- ▶ Shout to other participants (anything you want!!!)
- ▶ Say bad things about Nick

## You must: *Participate*

# Task 3

Find the shortest path from  
Node 1 to Node 40.

When you are done, you must be able  
to repeat it correctly.

The first group to finish is the champion!!

# Pink Group



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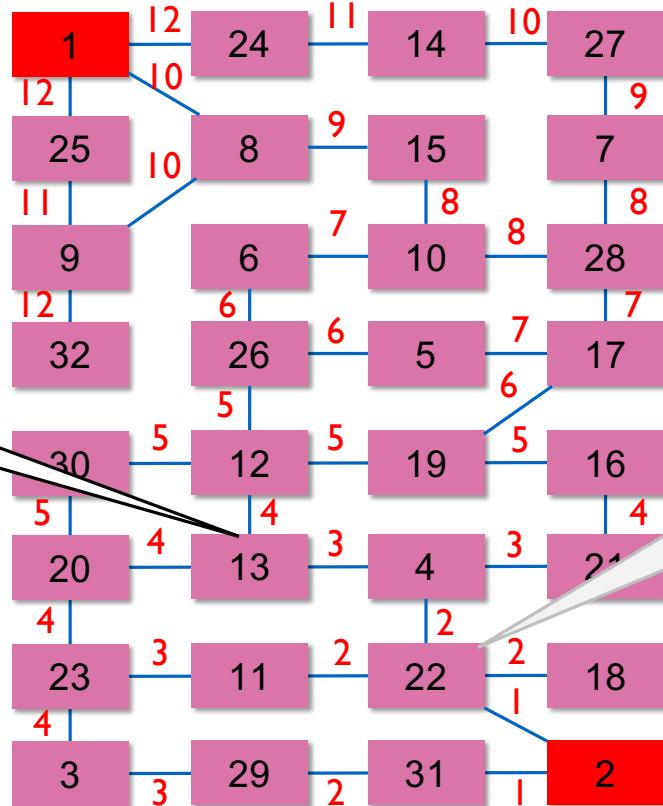
...

40

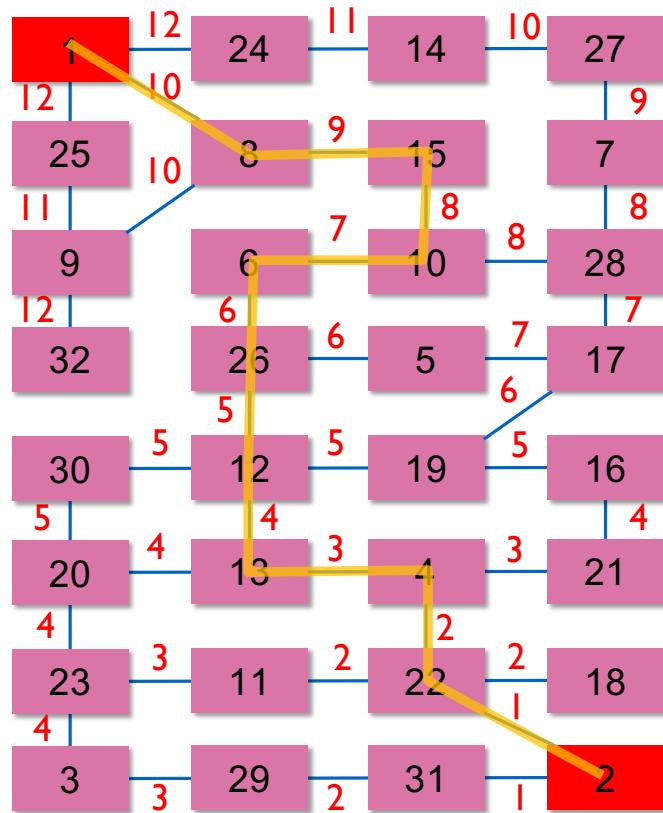
**Go!**

An algorithm to find the shortest path

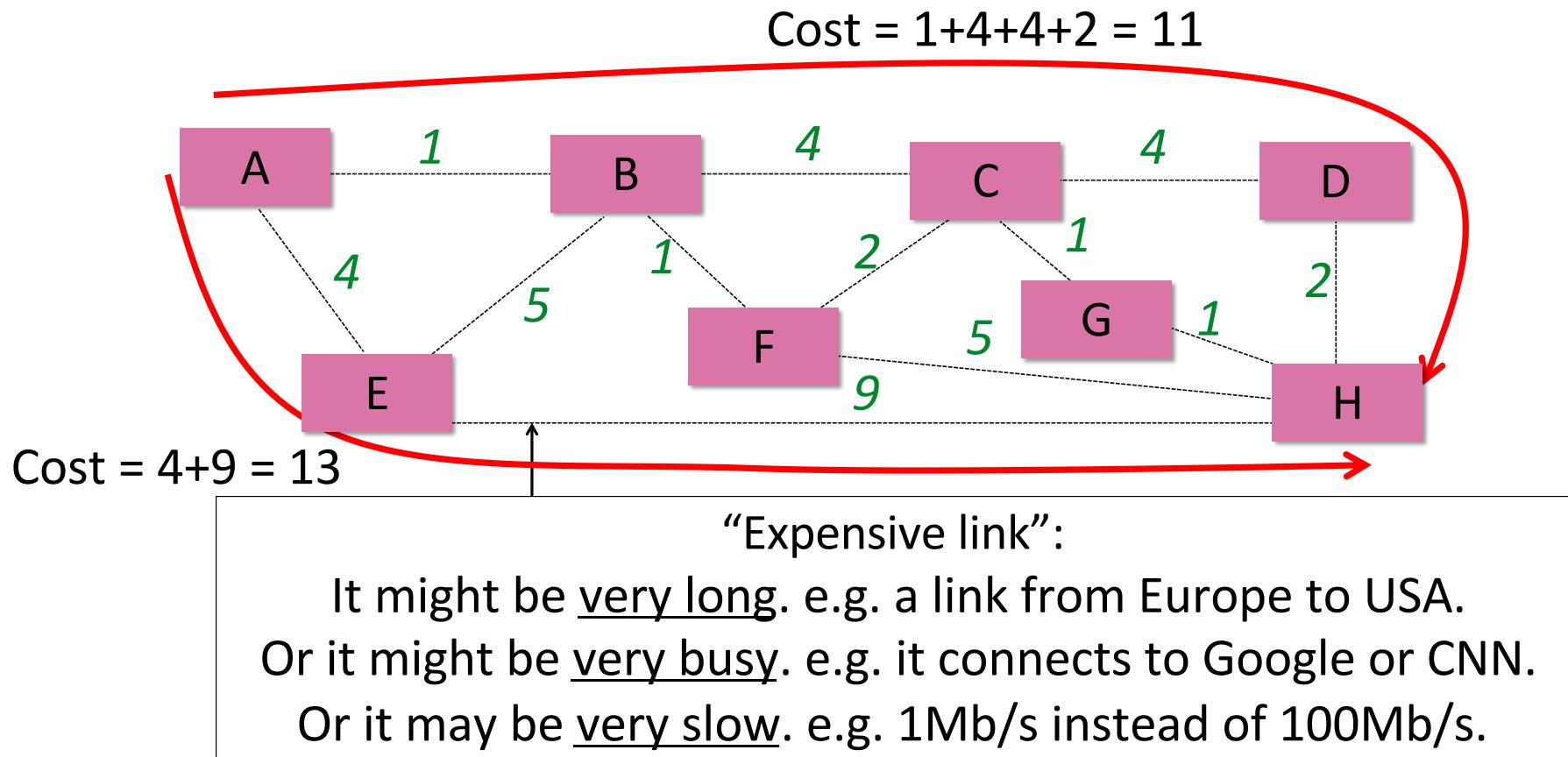
IP Address	Next-hop
Node 2	Node 4



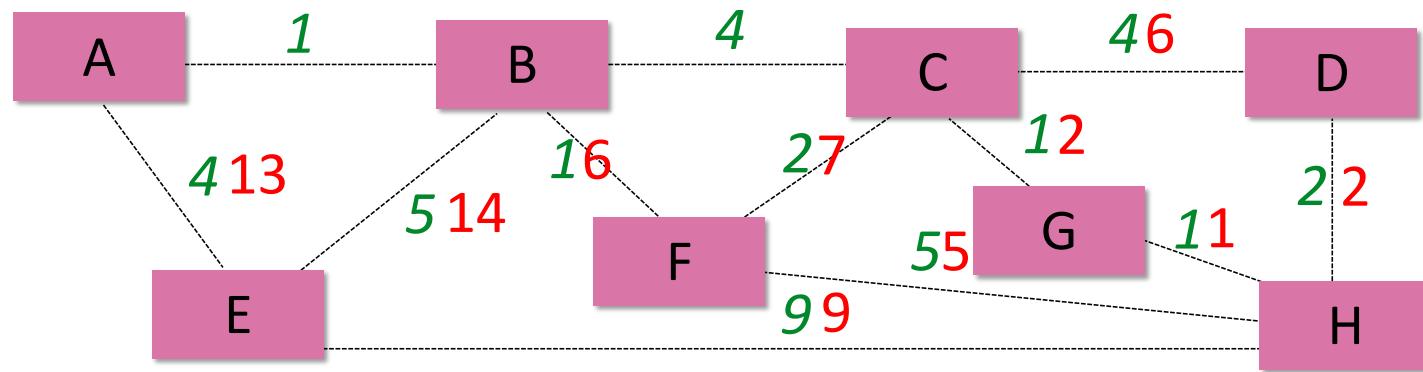
**"You can reach node 2 in  
1 hop from node 22"**



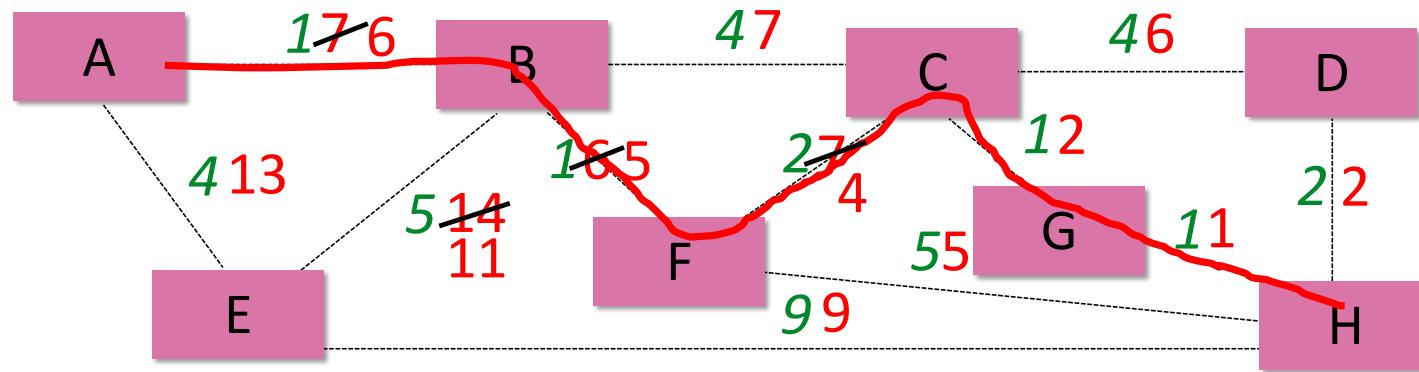
What if each link has a “cost”?



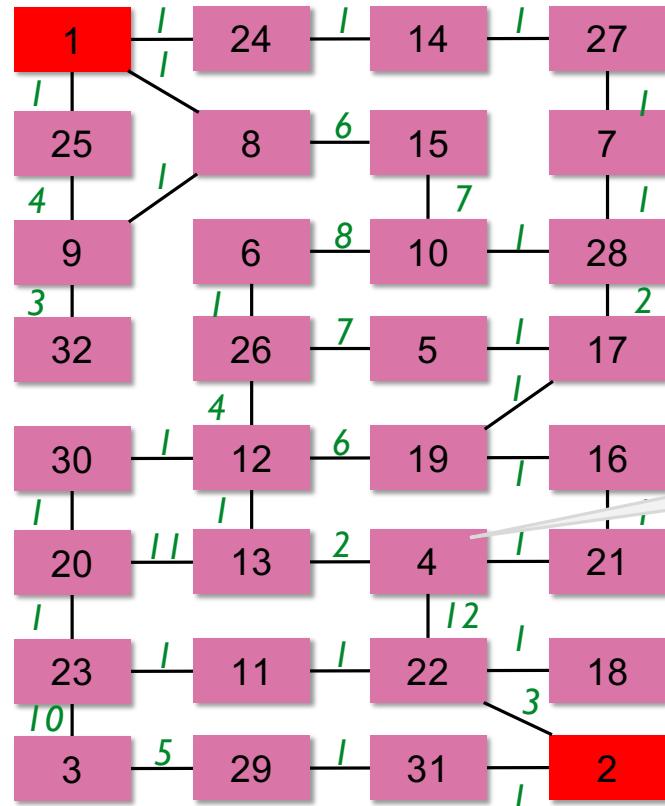
# Find lowest cost path to H



# Find lowest cost path to H



# Find the lowest cost path



Router 4 tells its neighbors:  
*"I can reach 2 with a cost of 15"*

# Solution

