Static Routing Exercise

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What will the exercise involve?

- Unix network interface configuration
- Cisco network interface configuration
- Static routes
- Default route
- Testing

Routing

- Routing is done based on destination IP address
- Without routing, interface can only reach destinations via ARP
- Cannot reach a destination on another separate network without going through an intermediate device
- A device with at least 2 interfaces can route

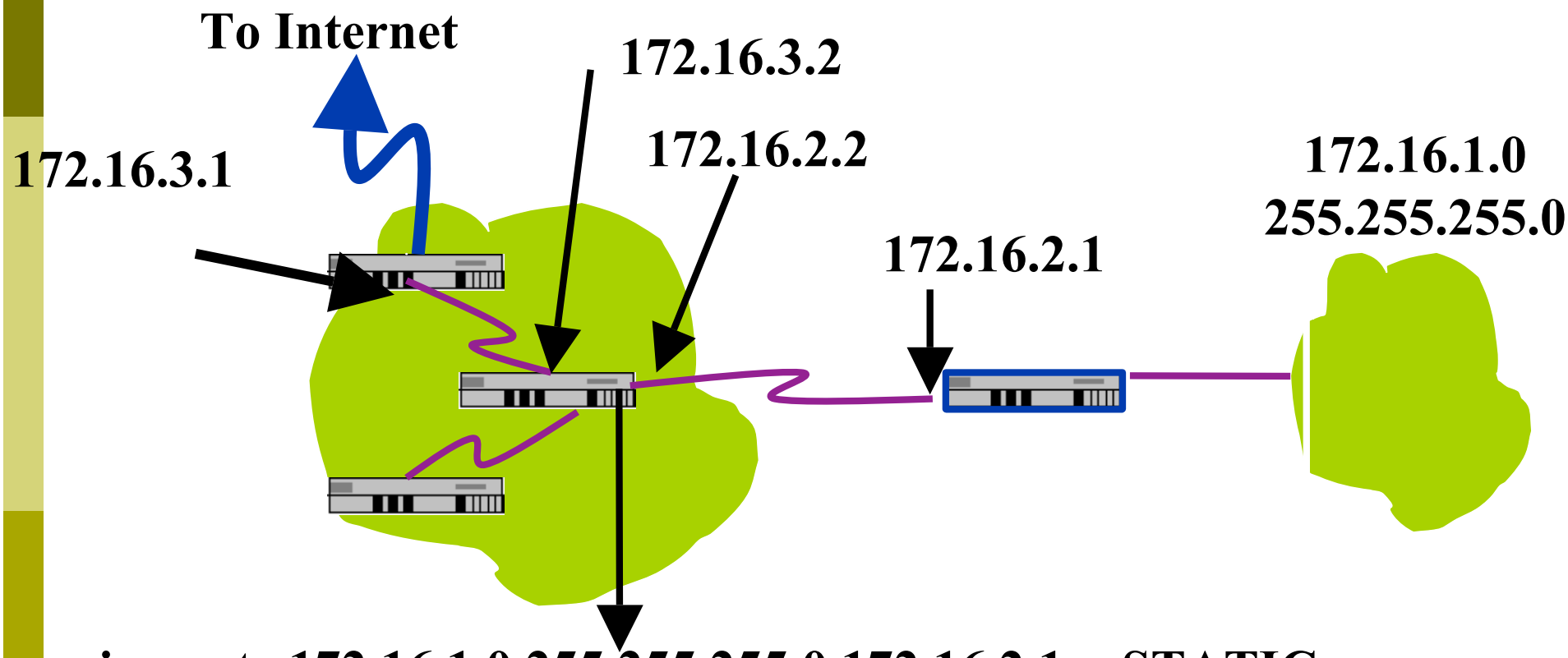
Routing

- Static routes
  - specifically instructs router on which route to take to a particular destination network
- dynamic routes
  - learnt via routing protocols implemented on routers
- default routes
  - route that instructs a machine where to send packets for destinations that are not in the routing table

Static Routing

- Advantages
  - Simple to configure and maintain
  - Secure as only defined routes can be accessed
  - Bandwidth is not used for sending routing updates
- Disadvantages
  - Manual update of routes after changes
  - Explicit addition of routes for all networks
  - Potential for configuration mistakes.

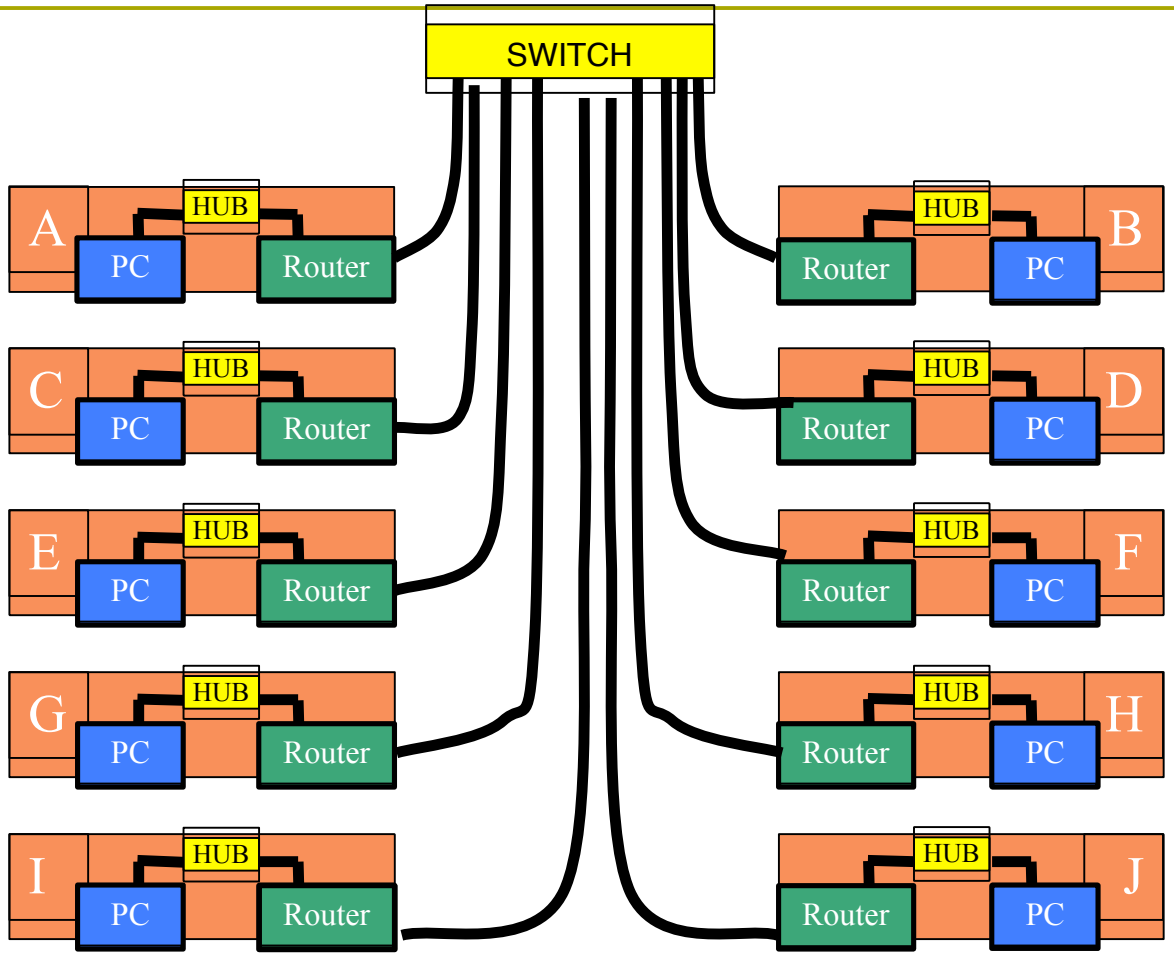
IP Routing Configuration
Static/default route example



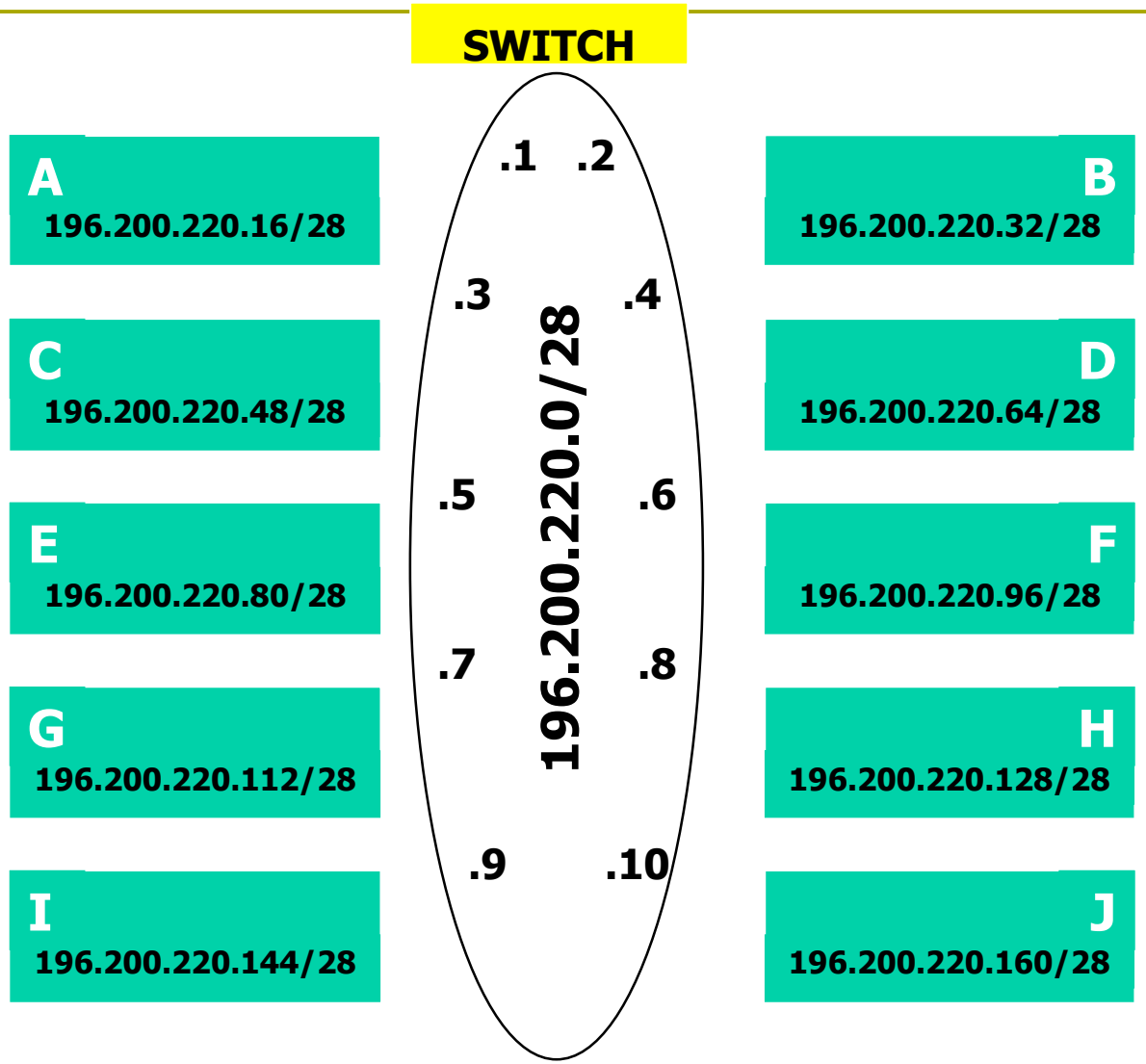
ip route 172.16.1.0 255.255.255.0 172.16.2.1 - STATIC

ip route 0.0.0.0 0.0.0.0 172.16.3.1 - DEFAULT

Classroom Network Layout



Address Assignments



Address Assignment

- You already have an IP address for your router's backbone link (A=.1, B=.2, …)
- You have a /28 for your local network (PC and router connected to hub)
- Assign your own host addresses from your local /28 network

FreeBSD Network Interface Configuration

- configure interface on Unix host
  - **ifconfig** vr0 **inet** *n.n.n.n* **netmask** *m.m.m.m*
  - vr0 is interface name
  - n.n.n.n is IP address
  - m.m.m.m is netmask

Connect PC to router console port

- Connect cable to console port on router, serial port on FreeBSD box
- Use the **tip** command to connect your keyboard and screen to the serial port
  - e.g. **bash$ tip com1**
- You may have to edit **/etc/remote**
- See man pages for **tip(1)** and **remote(5)**
  - **HINT: to exit tip, type ~.**

Cisco Router Network Interface Configuration

- configure backbone interface on cisco router

  conf t

  interface ethernet0/0

  ip address *n.n.n.n m.m.m.m*

  - ethernet0/0 is interface name
  - n.n.n.n is IP address
  - m.m.m.m is netmask
- configure local interface on cisco router
  - ethernet0/1

Cisco Router Network Interface Configuration

- Cisco **global** config should always include:
  - **ip classless**
  - **ip subnet-zero**
  - **no ip domain-lookup**
  - **ip cef**
- Cisco **interface** config should usually include:
  - **no shutdown**
  - **no ip proxy-arp**
  - **no ip redirects**
  - **no ip directed-broadcast**

Test Connectivity

- PC can ping local interface of router
- Router can ping PC
- PC cannot ping backbone interface of router
- Router can ping other routers
- PC cannot ping other routers or other PCs

Configure a default route

- Add route on PC

  route add default *g.g.g.g*

  - g.g.g.g is IP address of gateway (which is on Cisco router)
- Display forwarding table

  netstat -rn

Test connectivity

- All PCs can now reach backbone IP address of own row
- Still can’t reach other rows
  - why?
  - Run a “traceroute” to troubleshoot

Configure static routes for the remaining classroom desks

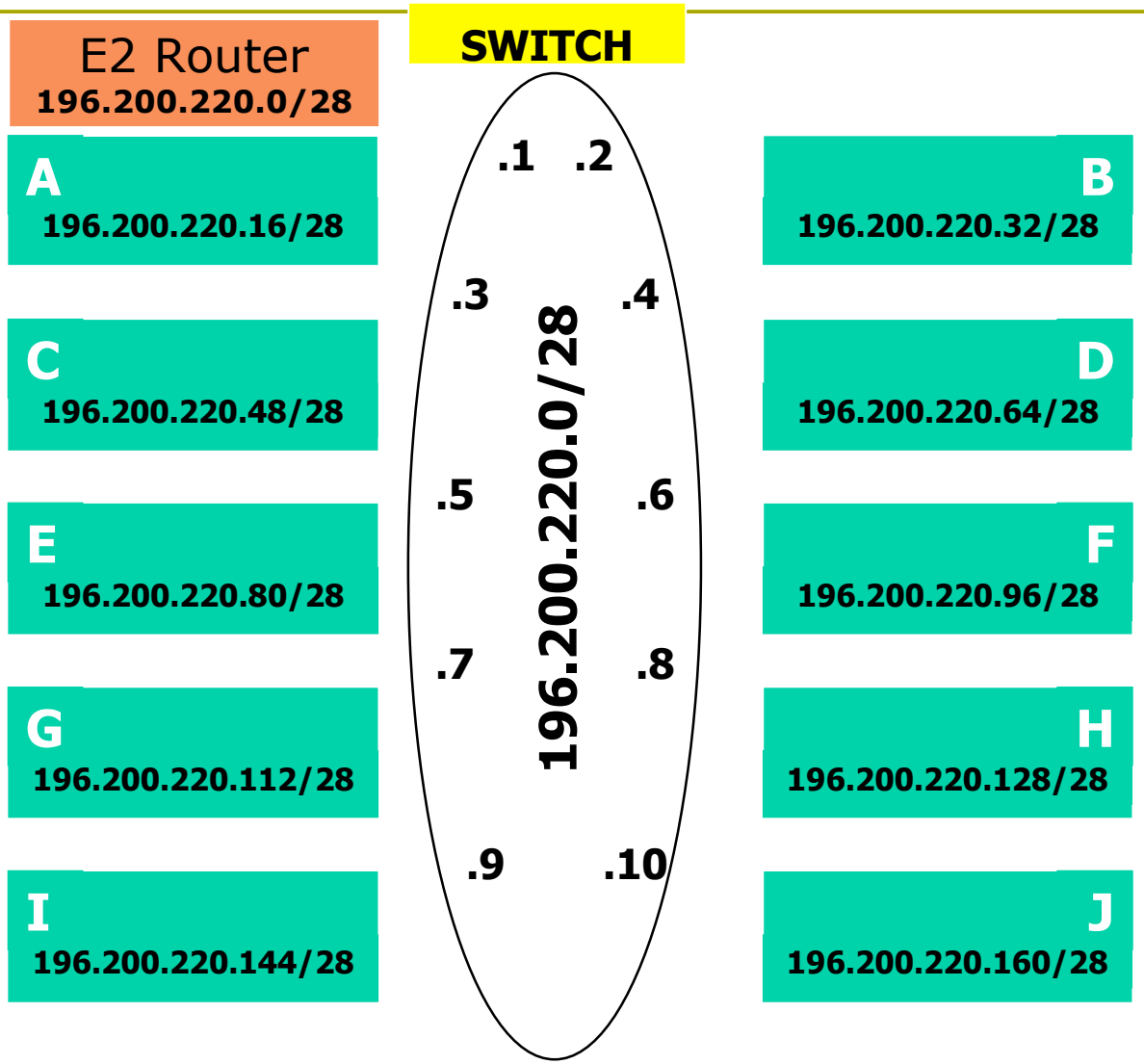
- On router, add static routes to other rows
  - next hop is backbone interface of other row's router

    ip route *n.n.n.n m.m.m.m g.g.g.g*
- Repeat several times until complete

Test Connectivity

- All routers can reach all PCs
- All PCs can reach all backbone IP addresses
- All PCs can reach PCs in other rows
- Test with traceroute

Address Assignments



Configure static routes to classroom router

- On router, remove all static routes

  no **ip route** *n.n.n.n m.m.m.m g.g.g.g*

- Repeat until complete
- Add default route to classroom router
  - next hop is backbone router

    ip route *0.0.0.0 0.0.0.0 g.g.g.g*

Test Connectivity

- All routers can reach all PCs
- All PCs can reach all backbone IP addresses
- All PCs can reach PCs in other rows
- Test with traceroute
- All static routes have now been added on classroom router
- Global:

```
enable secret e2@fnog
```

- Interface:

```
interface ethernet 0/0
 ip address n.n.n.n m.m.m.m
```

- Router:

```
router ospf 1
 network n.n.n.n w.w.w.w area 0
```

- Line:

```
line vty 0 4
```

Edit FreeBSD the '/etc/rc.conf' file

- **On production machines, add lines to /etc/rc.conf to configure network on reboot**
- hostname="porcupine.tomato.example"
- ifconfig_vr0="inet X.X.X.X netmask Y.Y.Y.Y"
- defaultrouter="G.G.G.G"
- **See /etc/default/rc.conf for more information**

Static Routing Exercise

The End