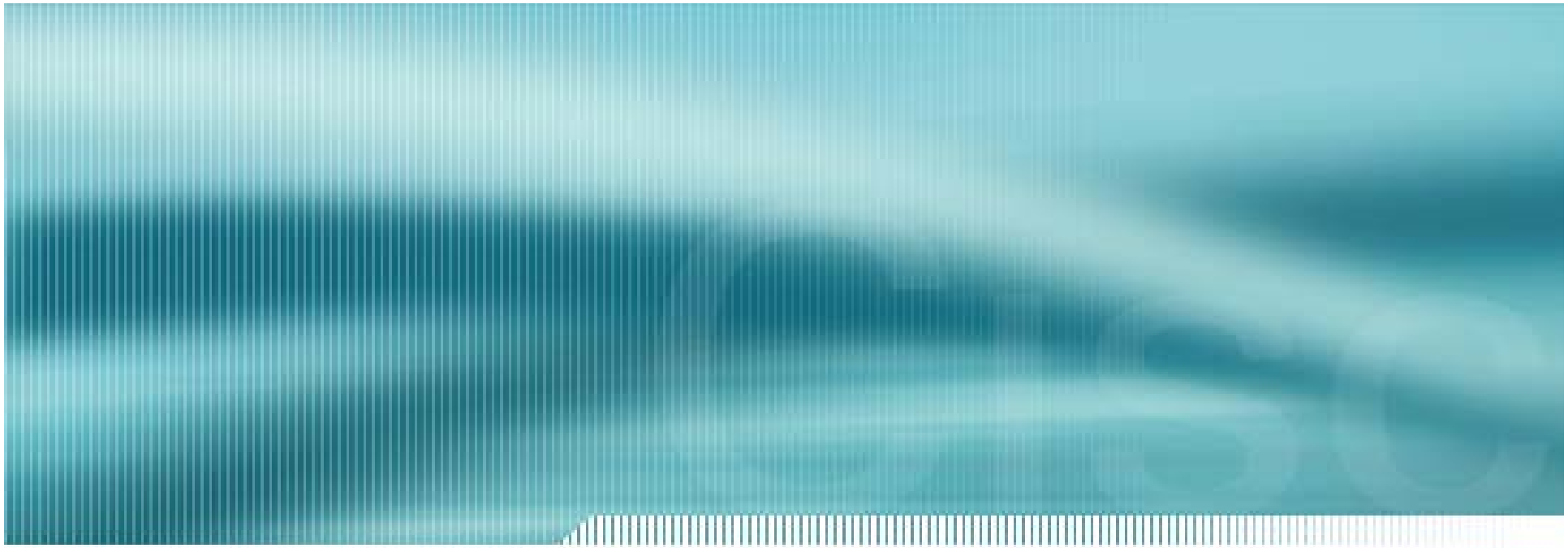

Route Optimization

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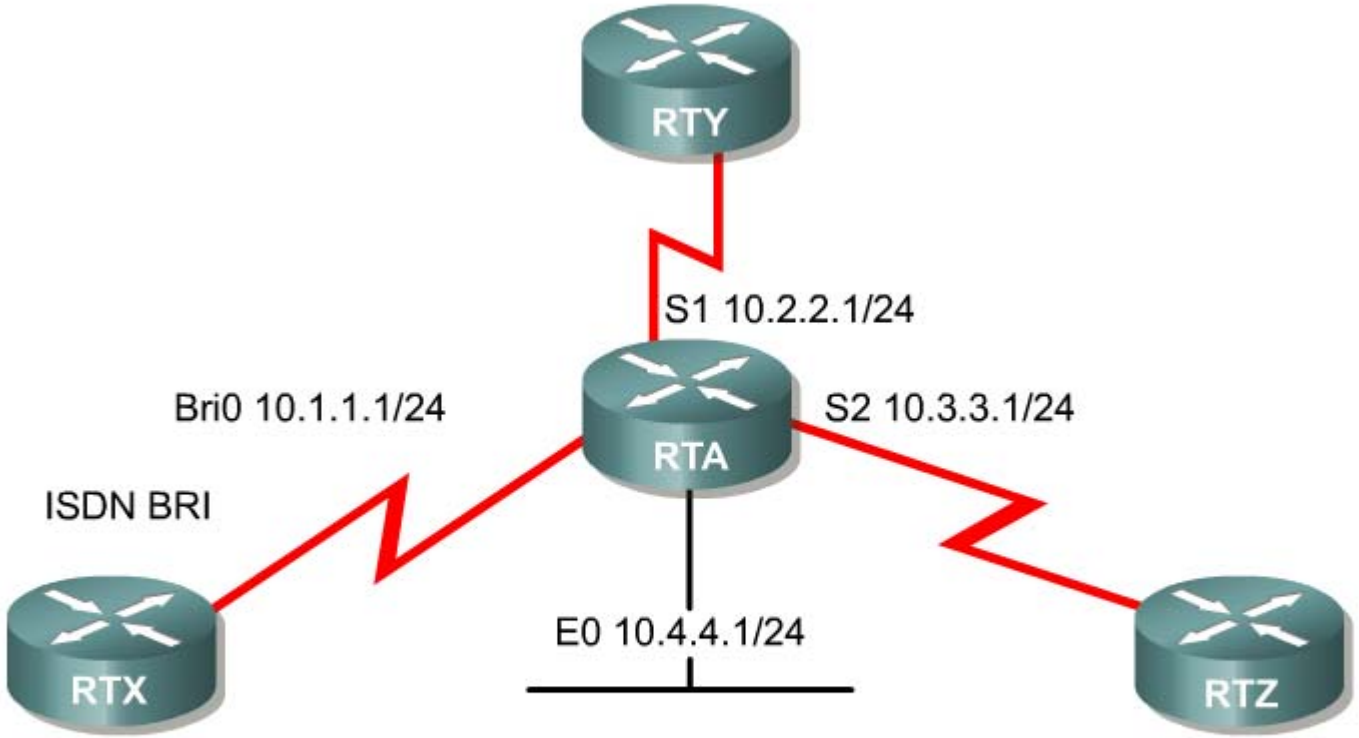
Route Optimization

- Controlling routing updates
- Policy routing
- Route redistribution

Controlling Routing Updates

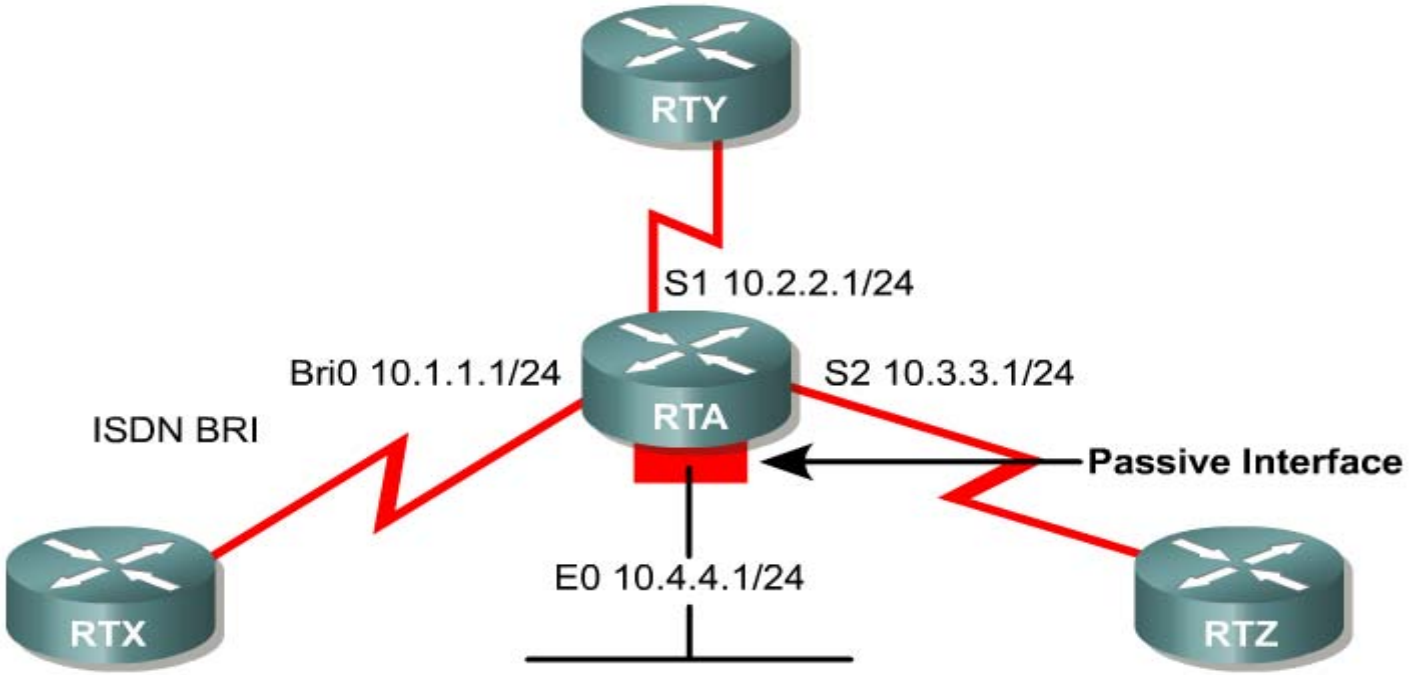
- Routing updates may not be needed or required on all links
  - Ethernet end networks
  - Dial-up link
  - Insecure link
  - External links
  - AS boundaries
- Configure passive interfaces or route filters

Controlling Routing Updates




```
RTA(config)#router rip
RTA(config-router)#network 10.0.0.0
```

Passive Interfaces




```
RTA(config)#router rip
RTA(config-router)#network 10.0.0.0
RTA(config-router)#passive-interface E0
```

All updates suppressed

Passive Interfaces

- **The passive-interface and different routing protocols**
  - **RIP/IGRP: Can receive updates but does not send**
  - **OSPF: Routing information is neither sent nor received via a passive interface**
    - **The network address of the passive interface appears as a stub network in the OSPF domain**
  - **EIGRP: The router stops sending hello packets on passive interfaces**
    - **Can’t form adjacencies, send or receive routing updates**

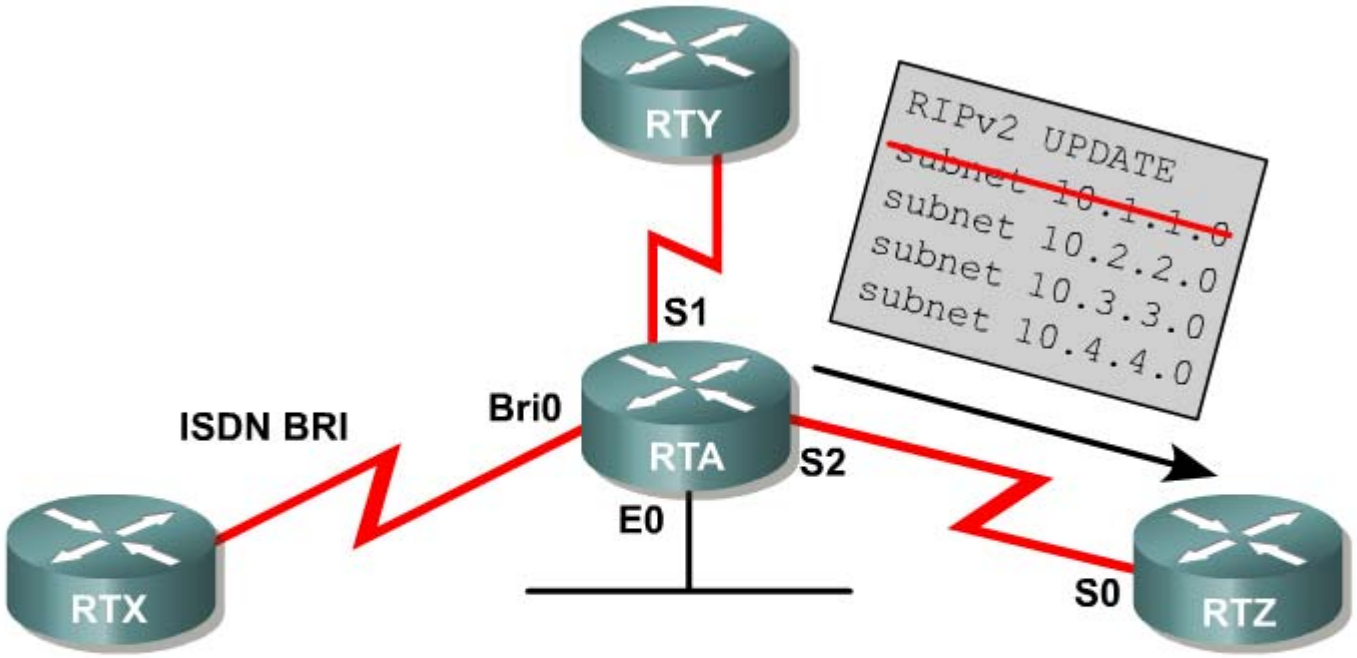
Route Filters

- **Passive interfaces blocks all updates entirely**
  - **May need to suppress only certain router from being advertised or learnt about**
- **Distribute-list command to pick and choose what routes a router will send or receive updates about**
- **The distribute-list references an ACL**
  - **Creates a route filter**
- **Can be global (to all interfaces) or local (to a specific interface)**
- **Can be for inbound or outbound advertisements**

Route Filters (Cont.)

- Route filters may be needed to enforce a routing policy that is based on some external factors such as:
  - Link expense
  - Administrative jurisdiction
  - Security concerns
  - Overhead reduction – prevent access routers from receiving the complete core routing table
- Have no effect on link state protocols
- Can allow EIGRP to form neighbor relationships, then suppress certain routes

Distribute List

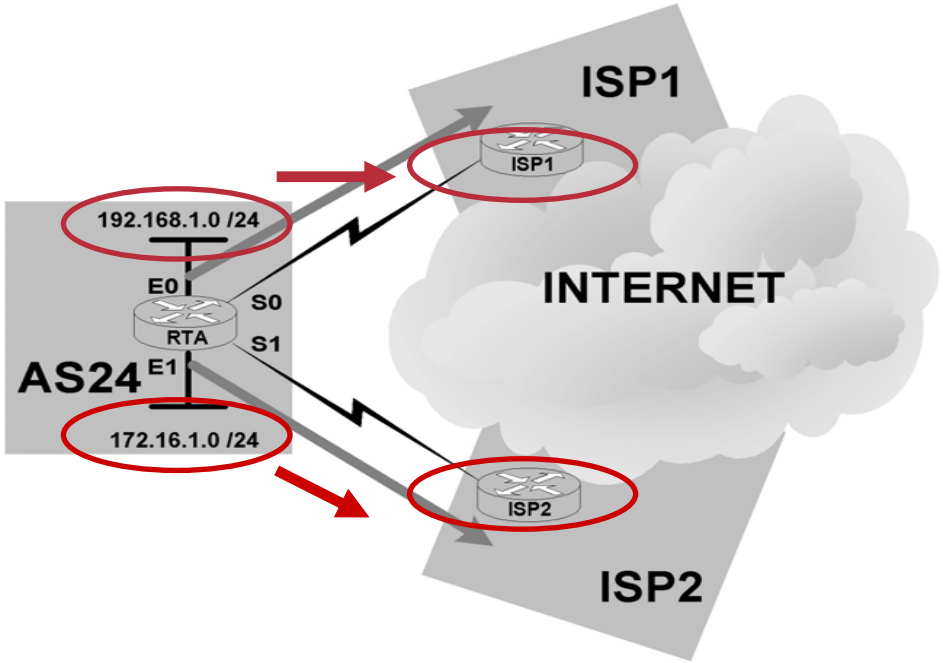



```
RTA(config)#router rip
RTA(config-router)#network 10.0.0.0
RTA(config-router)#distribute-list 24 out
RTA(config-router)#exit
RTA(config)#access-list 24 deny 10.1.1.0 0.0.0.255
RTA(config)#access-list 24 permit any
```

Route Maps – Policy Routing

- **Usually route based on destination address**
- **Route maps allow us to route based on other criteria (Policy routing)**
  - **Use ACL**
  - **Override dynamic routing**
  - **Really an elegant form of static routing**
- **Route maps usually used between AS**

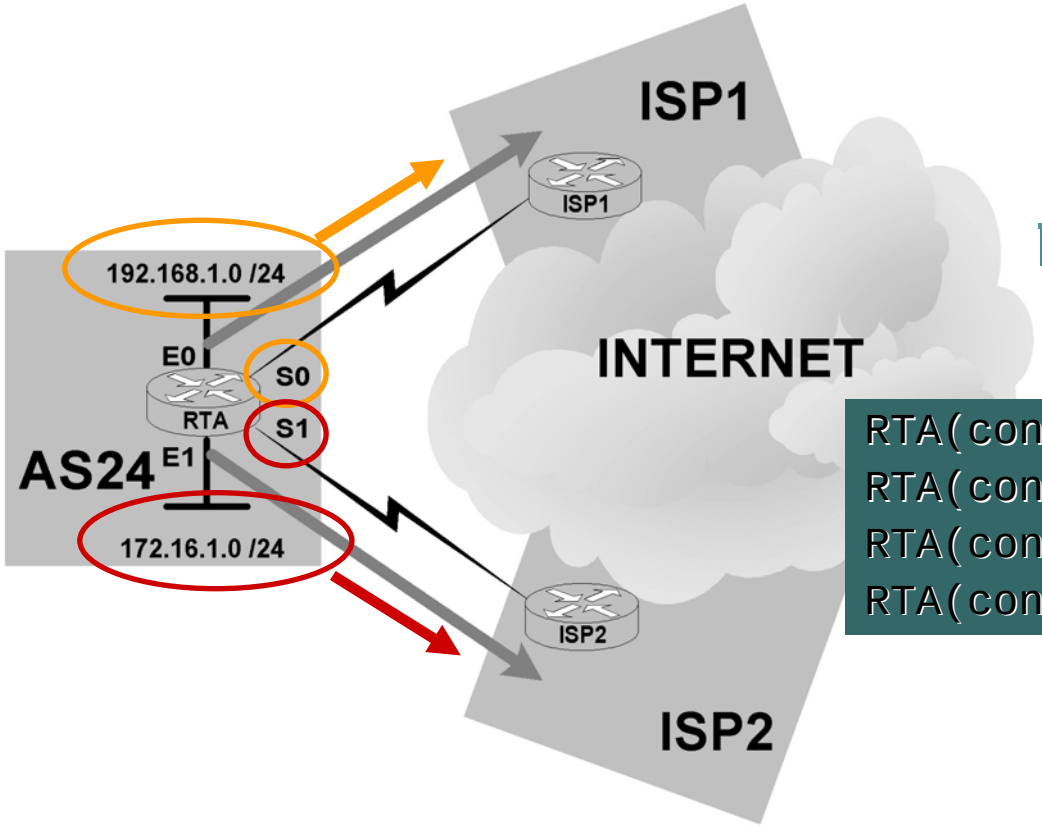
Policy Routing Example



Assume for this example that the policy we want to enforce is this:

- **Internet-bound traffic from 192.168.1.0 /24 is to be routed to ISP1**
- **Internet-bound traffic from 172.16.1.0 /24 is to be routed to ISP2.**

Policy Routing Example




```
RTA(config)#interface e0
RTA(config-if)#ip policy route-map ISP1
RTA(config)#interface e1
RTA(config-if)#ip policy route-map ISP2
```

```
RTA(config)#access-list 1 permit 192.168.1.0 0.0.0.255
RTA(config)#route-map ISP1 permit 10
RTA(config-route-map)#match ip address 1
RTA(config-route-map)#set interface s0
RTA(config)#access-list 2 permit 172.16.1.0 0.0.0.255
RTA(config)#route-map ISP2 permit 10
RTA(config-route-map)#match ip address 2
RTA(config-route-map)#set interface s1
```

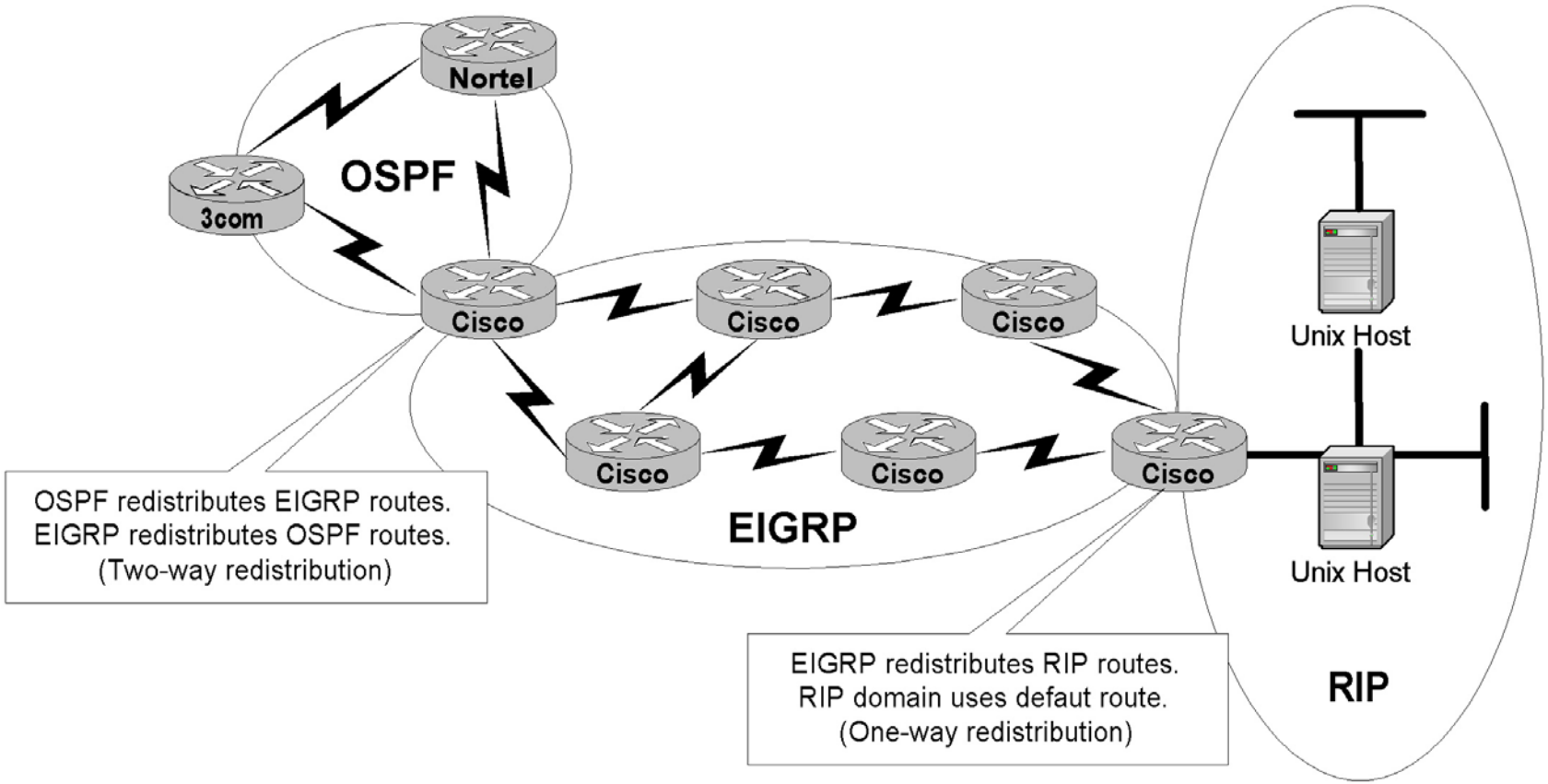
Route Redistribution

- To support multiple routing protocols within the same inter-network efficiently, routing information must be shared among the different routing protocols
  - For example, routes learned from a RIP process may need to be imported into an IGRP process
- The process of exchanging routing information between routing protocols is called route redistribution

Why configure redistribution?

- **You want to run IGRP/EIGRP in one or more areas in a mixed vendor environment**
- **You want to support legacy UNIX systems that supports RIP only, but use a more scalable protocol elsewhere**
- **You need a temporary fix during a prolonged upgrade from older protocols and hardware to newer, more scalable solutions**

Why configure redistribution? (Cont.)



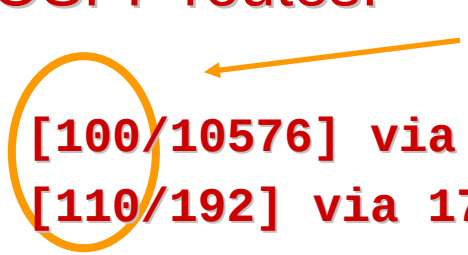
Administrative Distance

Route Source	Default Distance
Connected Interface	0
Static Route	1
Enhanced IGRP Summary Route	5
External BGP	20
Internal Enhanced IGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EGP	140
External Enhanced IGRP	170
Internal BGP	200
Unknown	255

Administrative Distance

- **When using multiple IP routing protocols on a router, the default distances almost always suffice.**
- **However, some circumstances call for changing the administrative distance values on a router.**
- **If, for example, a router is running both IGRP and OSPF, it may receive routes to the same network from both protocols.**

- The default administrative distances **favour IGRP** routes over OSPF routes:




```
I   10.0.0.0   [100/10576] via 192.168.0.1, Serial0
O   10.0.0.0   [110/192] via 172.17.0.1, Serial1
```

Changing Administrative Distance

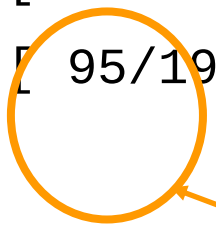
- **But since IGRP doesn’t support CIDR, you may want the router to use the OSPF route instead.**
- **In this case, you can configure the local router to apply a custom administrative distance to all OSPF routes:**

```
RTZ(config)#router ospf 1
RTZ(config-router)#distance 95
```

Changing Administrative Distance

- **With the** distance 95 **command, RTZ compares the IGRP and OSPF routes and comes up with a different result:**

```
I   10.0.0.0   [100/10576] via 192.168.0.1, Serial0
O   10.0.0.0   [  95/192] via 172.17.0.1, Serial1
```



OSPF at 95 now favored

Changing Administrative Distance

- **Distance can also be changed based on**
  - **Source ip address of the route (specific address)**

```
RTZ(config)#router rip
RTZ(config-router)#distance 105 10.4.0.2 255.255.255.0
```

  - **Access list criteria (range of addresses)**

```
RTZ(config)#router rip
RTZ(config-router)#distance 97 10.3.0.1 255.255.255.0 2
RTZ(config-router)#exit

RTZ(config)#access-list 2 permit 192.168.3.0 0.0.0.255
```

Configuring Redistribution

- **The redistribution command is available for all IP routing protocols, so the command is considered to be independent of any one protocol**
  - **This is misleading, because the redistribution command can be used differently depending on the IP routing protocols involved**
- **Redistribution can take on various complexities depending upon the from and to routing protocols, and the options that can be implemented**

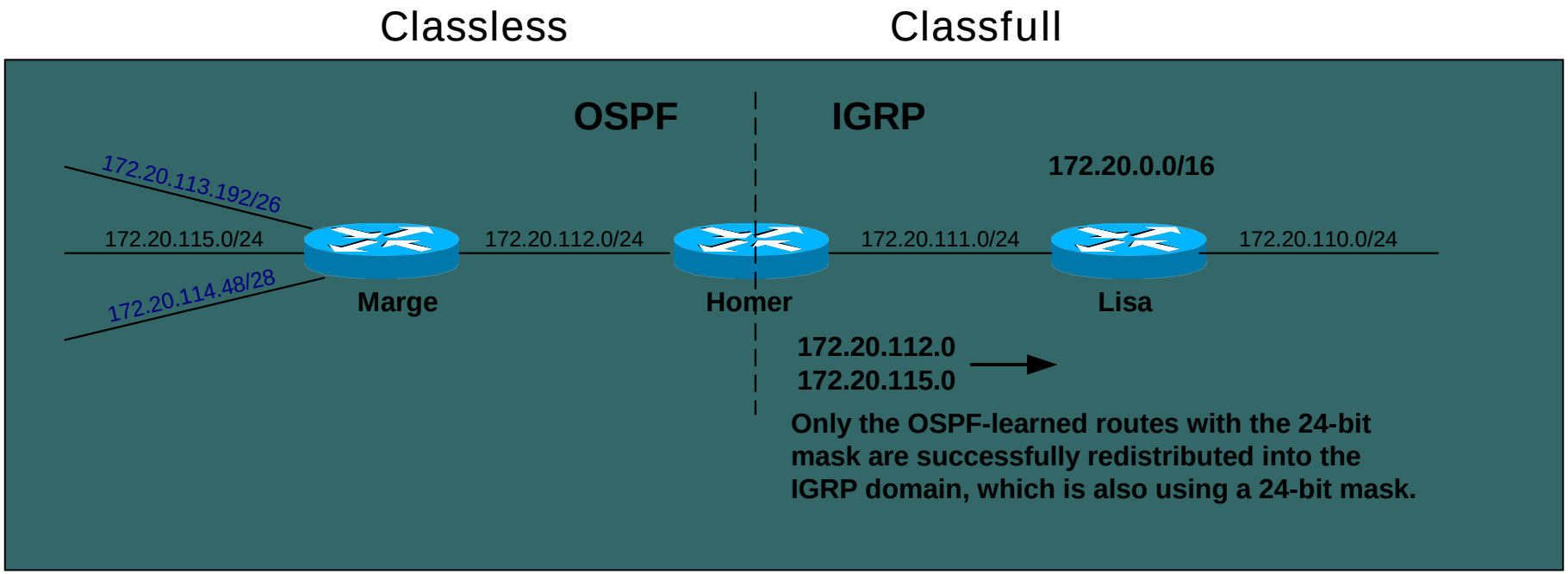
Redistribution from classless to classful protocols

- **Careful consideration must be given when redistributing routes from a classless routing process domain into a classful domain**
- **Remember, a classful routing protocol does not advertise an address mask along with the advertised destination address**
- **For every route a classful router receives, one of two situations will apply:**
  - **The router will have one or more interfaces attached to the same major (classful) network**
  - **The router will have no interfaces attached to the major (classful) network**

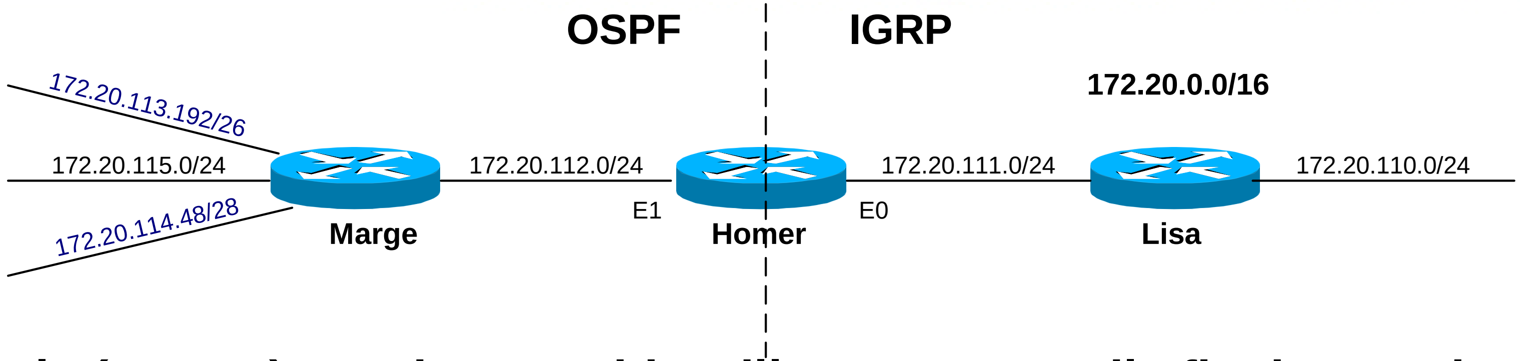
Redistribution from classless to classful protocols

- The router will have one or more interface attached to the same major (classful) network
  - The router must use its own configured mask for that major network to correctly determine the subnet of a packets destination address
- The router will have no interfaces attached to the major (classful) network
  - Only the major network address itself can be included in the advertisment because the router has no way of knowing which subnet mask to use

Redistributing from Classless to Classfull Protocols



Configuring Redistribution

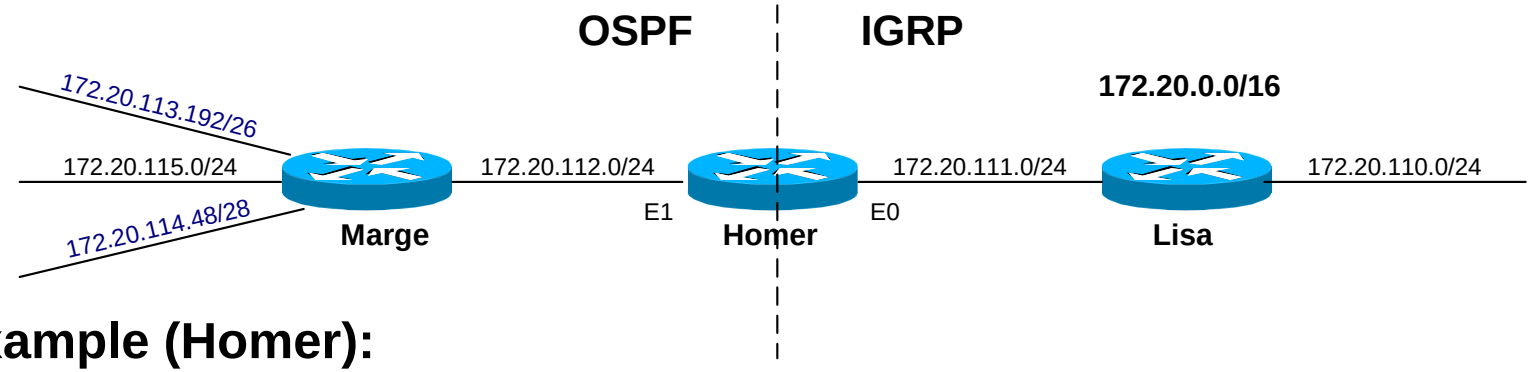


Example (Homer): By the way this will not necessarily fix the previous issue of Lisa not seeing all networks.

```
router igrp 1
  redistribute ospf 1 metric 10000 100 255 1
  passive-interface ethernet 1
  network 172.20.0.0


router ospf 1
 redistribute igrp 1 metric 30 metric-type 1 subnets
 network 172.20.112.2 0.0.0.0 area 0
```

Configuring Redistribution



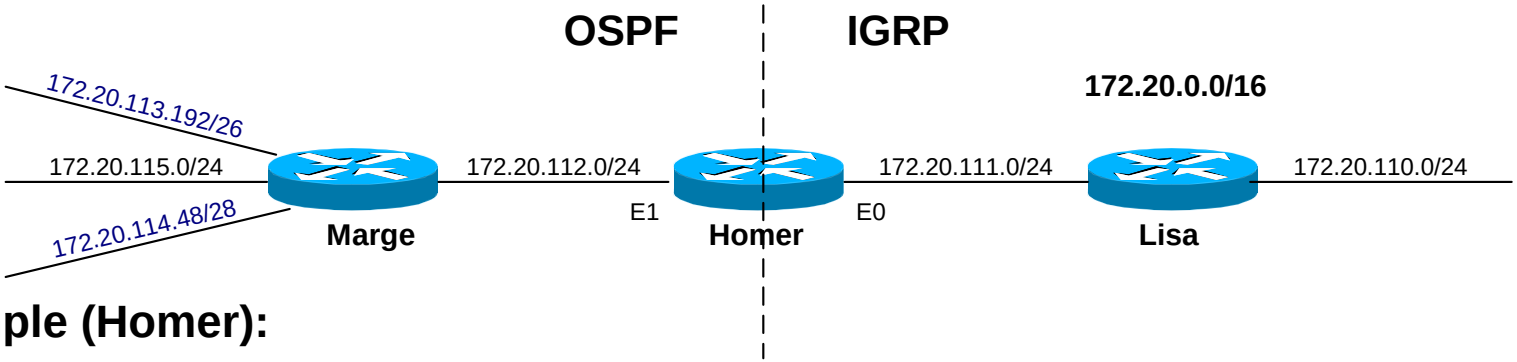
Example (Homer):

```
router igrp 1
  redistribute ospf 1 metric 10000 10 255 1
  passive-interface ethernet 1
  network 172.20.0.0
```

Bandwidth kbps | **Delay 10** mircoseconds | **Reliability** n/255 | **Load** n/255

- **This configuration redistributes routes discovered by OSPF process 1 into IGRP process 1.**
- **The** metric **portion assigns IGRP metrics to these routes.**

Configuring Redistribution



Example (Homer):

```
router ospf 1
 redistribute igrp 1 metric 30 metric-type 1 subnets
 network 172.20.112.2 0.0.0.0 area 0
```

- **This configuration redistributes routes discovered by IGRP process 1 into OSPF process 1.**
- **The** metric **portion assigns an OSPF cost of 30 to each of these routes.**
- **The** metric-type 1 **portion specifies that the these routes will be advertised as E1 routes, and the internal costs will be added.**
- **The** subnets **keyword redistributes subnet details. Without it, only the classful address would be redistributed.**