EIGRP Metric Calculation

- As EIGRP is a Distance Vector routing protocol, it will receive routes from its neighbours with their metric to the destination networks
- It will then add its metric to reach the neighbour to get the total metric to the destination network
- If multiple routes are available, the route (or equal cost routes) with the best metric will make it into the routing table

EIGRP Metric

EIGRP can consider various link characteristics to calculate its metric:

- Bandwidth
- Delay
- Reliability
- Load

EIGRP Metric Calculation

- EIGRP Metric = 256*((K1*Bandwidth) + (K2*Bandwidth)/(256-Load) + K3*Delay)*(K5/(Reliability + K4)))
- By default, the values of K1 and K3 are set to 1, and K2, K4 and K5 are set to 0
- The formula can be shortened to 256*(bandwidth + delay)

EIGRP Metric Calculation – show ip route

```
R5#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 12 subnets, 3 masks
D        10.0.0.0/16 is a summary, 00:09:59, Null0
D        10.0.0.0/24 [90/30720] via 10.0.3.1, 00:11:28, FastEthernet3/0
D        10.0.1.0/24 [90/30720] via 10.0.3.1, 00:11:28, FastEthernet3/0
D        10.0.2.0/24 [90/30720] via 10.0.3.1, 00:11:28, FastEthernet3/0
C        10.0.3.0/24 is directly connected, FastEthernet3/0
L        10.0.3.2/32 is directly connected, FastEthernet3/0
D        10.1.0.0/16 is a summary, 00:09:59, Null0
D        10.1.0.0/24 [90/33280] via 10.1.3.1, 00:10:12, FastEthernet2/0
D        10.1.1.0/24 [90/30720] via 10.1.3.1, 00:11:28, FastEthernet2/0
D        10.1.2.0/24 [90/30720] via 10.1.3.1, 00:11:28, FastEthernet2/0
C        10.1.3.0/24 is directly connected, FastEthernet2/0
L        10.1.3.2/32 is directly connected, FastEthernet2/0
```

EIGRP Metric

- Only bandwidth and delay are considered by default
- It is not recommended to turn on using reliability or load in the calculation
- Interfaces have a default bandwidth (eg 100 Mbps on FastEthernet interfaces, 1.544 Mbps on a serial interface)
- The default bandwidth can be overridden by an administrator with the ‘bandwidth’ command

EIGRP Metric - Bandwidth

```
R1#show interface serial1/0
Serial1/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
!
R1(config)#interface serial1/0
R1(config-if)#bandwidth 768
!
R1#show interface serial1/0
Serial1/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 768 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
```

EIGRP Metric - Delay

- A default delay is assigned based on the type of interface
- (The router does not actively measure the actual delay on a link)

Manipulating the EIGRP Metric

- EIGRP takes the bandwidth and delay of an interface into account when calculating the metric, so paths along higher bandwidth links will be preferred
- The most desirable path will typically be automatically selected
- If you want to use a different path, you can manipulate this by manually changing the bandwidth or delay on interfaces
- It is recommended to use delay because the bandwidth setting can affect many features other than EIGRP (such as QoS)

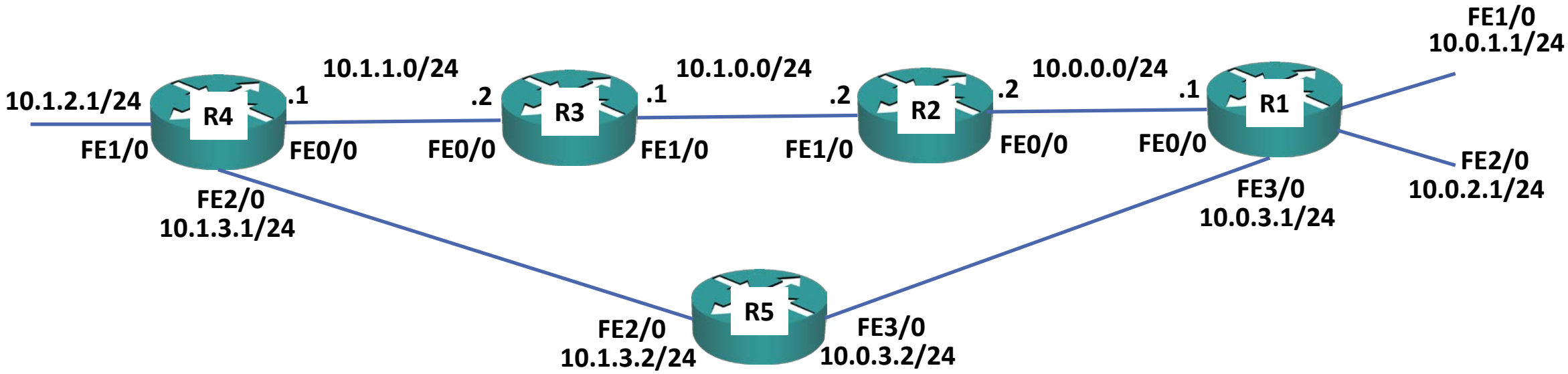
Manipulating the EIGRP Metric

```
R1#show interface serial1/0
Serial1/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
!
R1(config)#interface serial1/0
R1(config-if)#delay 1000 (tens of microseconds)
!
R1#show interface serial1/0
Serial1/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 768 Kbit/sec, DLY 10000 usec, (microseconds)
     reliability 255/255, txload 1/255, rxload 1/255
```

Bandwidth and Delay

- Altering the bandwidth or delay in the configuration does not change the physical properties of an interface
- If a serial interface has a clock rate of 768 kbps, and you set the bandwidth statement as 256 kbps, the interface still physically sends 768,000 bits onto the wire every second
- Changing the bandwidth or delay only affects software policies such as the EIGRP metric

Lab


10.1.2.1/24
R4
FE1/0
.1
FE0/0
10.1.1.0/24
FE2/0
10.1.3.1/24
.2
R3
FE0/0
.1
FE1/0
10.1.0.0/24
.2
R2
FE1/0
.2
FE0/0
10.0.0.0/24
.1
R1
FE0/0
FE1/0
10.0.1.1/24
FE2/0
10.0.2.1/24
FE3/0
10.0.3.1/24
R5
FE2/0
10.1.3.2/24
FE3/0
10.0.3.2/24