

Routing Table Terms

- A dynamically built routing table provides a great deal of information, as shown in the figure. Therefore, it is crucial to understand the output generated by the routing table. Special terms are applied when discussing the contents of a routing table.
- The Cisco IP routing table is not a flat database. The routing table is actually a hierarchical structure that is used to speed up the lookup process when locating routes and forwarding packets. Within this structure, the hierarchy includes several levels.
- Routes are discussed in terms of:
 - Ultimate route
 - Level 1 route
 - Level 1 parent route
 - Level 2 child routes

Routing Table Terms

- Ultimate Route
 - An ultimate route is a routing table entry that contains either a next-hop IPv4 address or an exit interface. Directly connected, dynamically learned, and local routes are ultimate routes.
 - In the figure, the highlighted areas are examples of ultimate routes. Notice that all of these routes specify either a next-hop IPv4 address or an exit interface.

Routing Table Terms

- Ultimate Route

```
R1# show ip route | begin Gateway
Gateway of last resort is 209.165.200.234 to network 0.0.0.0

S* 0.0.0.0/0 [1/0] via 209.165.200.234, Serial0/0/1
    is directly connected, Serial0/0/1
    172.16.0.0/16 is variably subnetted, 5 subnets, 3 masks
C   172.16.1.0/24 is directly connected, GigabitEthernet0/0
L   172.16.1.1/32 is directly connected, GigabitEthernet0/0
R   172.16.2.0/24 [120/1] via 209.165.200.226, 00:00:12, Serial0/0/0
R   172.16.3.0/24 [120/2] via 209.165.200.226, 00:00:12, Serial0/0/0
R   172.16.4.0/28 [120/2] via 209.165.200.226, 00:00:12, Serial0/0/0
R   192.168.0.0/16 [120/2] via 209.165.200.226, 00:00:03, Serial0/0/0
    209.165.200.0/24 is variably subnetted, 5 subnets, 2 masks
C   209.165.200.224/30 is directly connected, Serial0/0/0
L   209.165.200.225/32 is directly connected, Serial0/0/0
R   209.165.200.228/30 [120/1] via 209.165.200.226, 00:00:12, Serial0/0/0
C   209.165.200.232/30 is directly connected, Serial0/0/1
L   209.165.200.233/32 is directly connected, Serial0/0/1

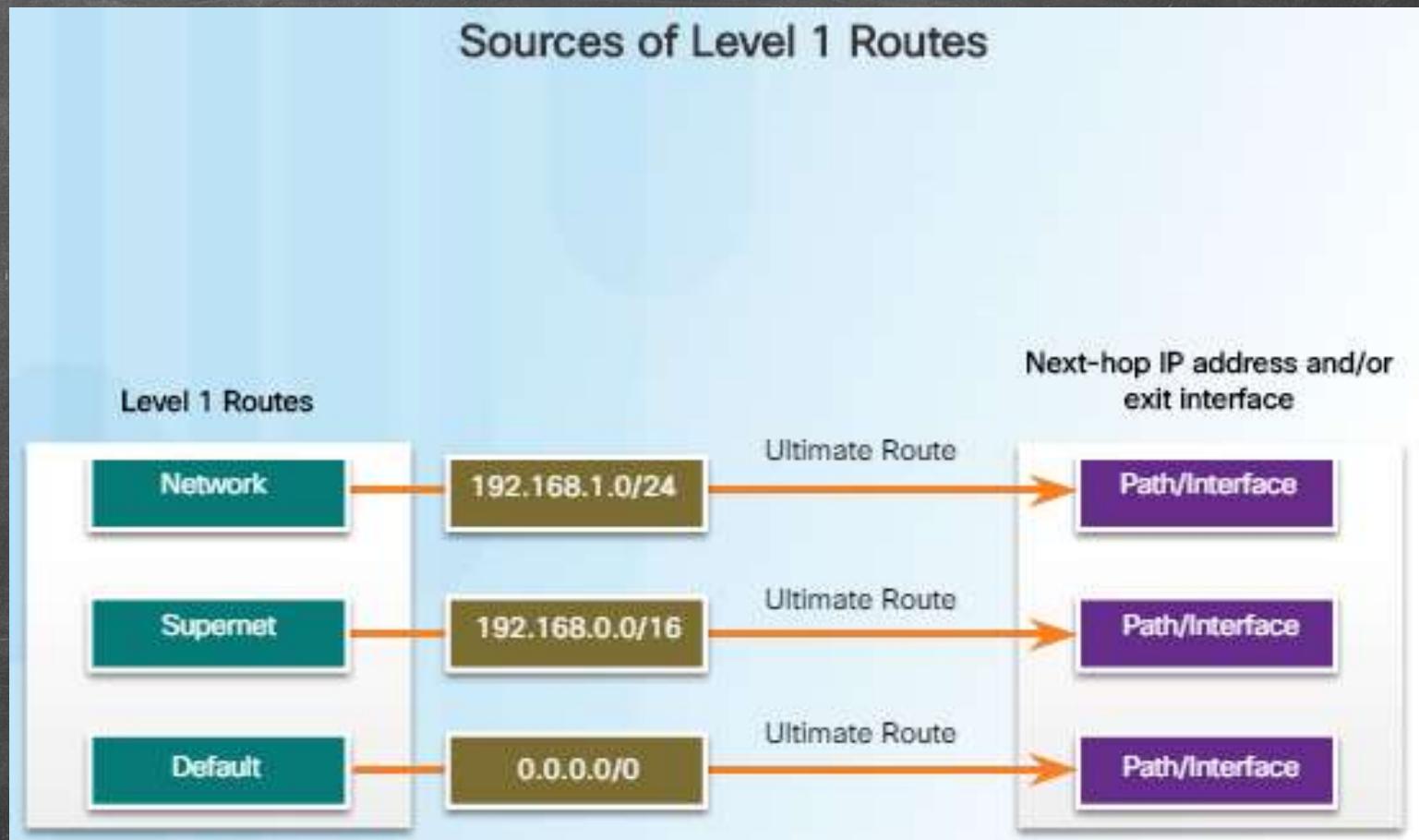
R1#
```

Routing Table Terms

- Level 1 Route
 - A level 1 route is a route with a subnet mask equal to or less than the classful mask of the network address.
Therefore, a level 1 route can be a:
 - Network route - A network route that has a subnet mask equal to that of the classful mask.
 - Supernet route - A supernet route is a network address with a mask less than the classful mask, for example, a summary address.
 - Default route - A default route is a static route with the address 0.0.0.0/0.
 - The source of the level 1 route can be a directly connected network, static route, or a dynamic routing protocol.

Routing Table Terms

- Level 1 Route
 - Figure 1 highlights how level 1 routes are also ultimate routes.



Routing Table Terms

- Level 1 Route
 - Figure 2 highlights level 1 routes.

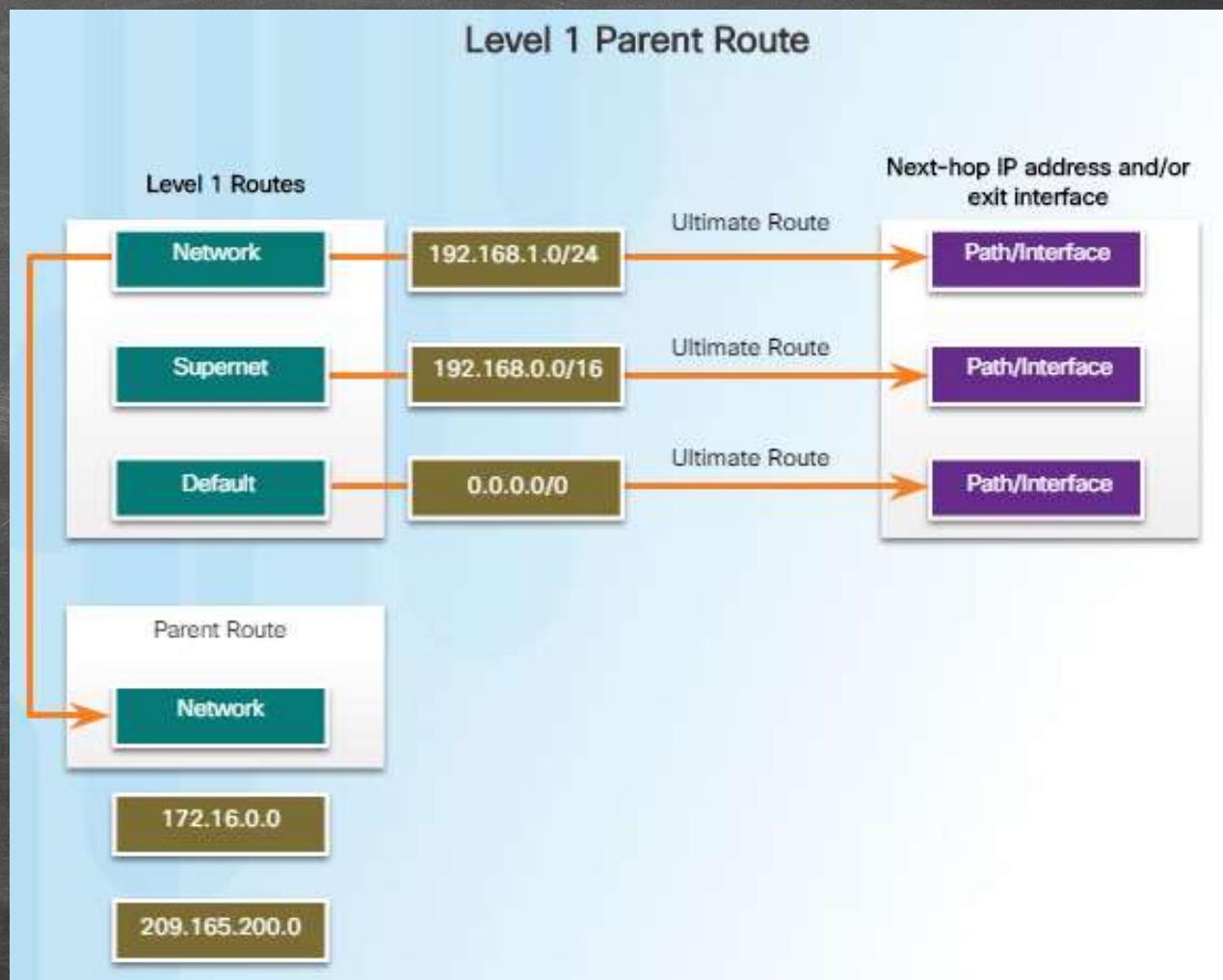
```
R1# show ip route | begin Gateway
Gateway of last resort is 209.165.200.234 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 209.165.200.234
      172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
      C     172.16.1.0/24 is directly connected, GigabitEthernet0/0
      L     172.16.1.1/32 is directly connected, GigabitEthernet0/0
      R     172.16.2.0/24 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
      R     172.16.3.0/24 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
      R     172.16.4.0/28 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
      R     192.168.0.0/16 [120/2] via 209.165.200.226, 00:00:16, Serial0/0/0
      209.165.200.0/24 is variably subnetted, 5 subnets, 2 masks
      C     209.165.200.224/30 is directly connected, Serial0/0/0
      L     209.165.200.225/32 is directly connected, Serial0/0/0
      R     209.165.200.228/30 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
      C     209.165.200.232/30 is directly connected, Serial0/0/1
      L     209.165.200.233/32 is directly connected, Serial0/0/1

R1#
```

Routing Table Terms

- Level 1 Parent Route
 - As illustrated in Figure 1, the 172.16.0.0 and 209.165.200.0 routes are level 1 parent routes. A parent route is a level 1 network route that is subnetted. A parent route can never be an ultimate route.



Routing Table Terms

- Level 1 Parent Route
 - Figure 2 highlights the level 1 parent routes in the routing table of R1. In the routing table, it basically provides a heading for the specific subnets it contains. Each entry displays the classful network address, the number of subnets and the number of different subnet masks into which the classful address has been subdivided.

```
R1# show ip route | begin Gateway
Gateway of last resort is 209.165.200.234 to network 0.0.0.0

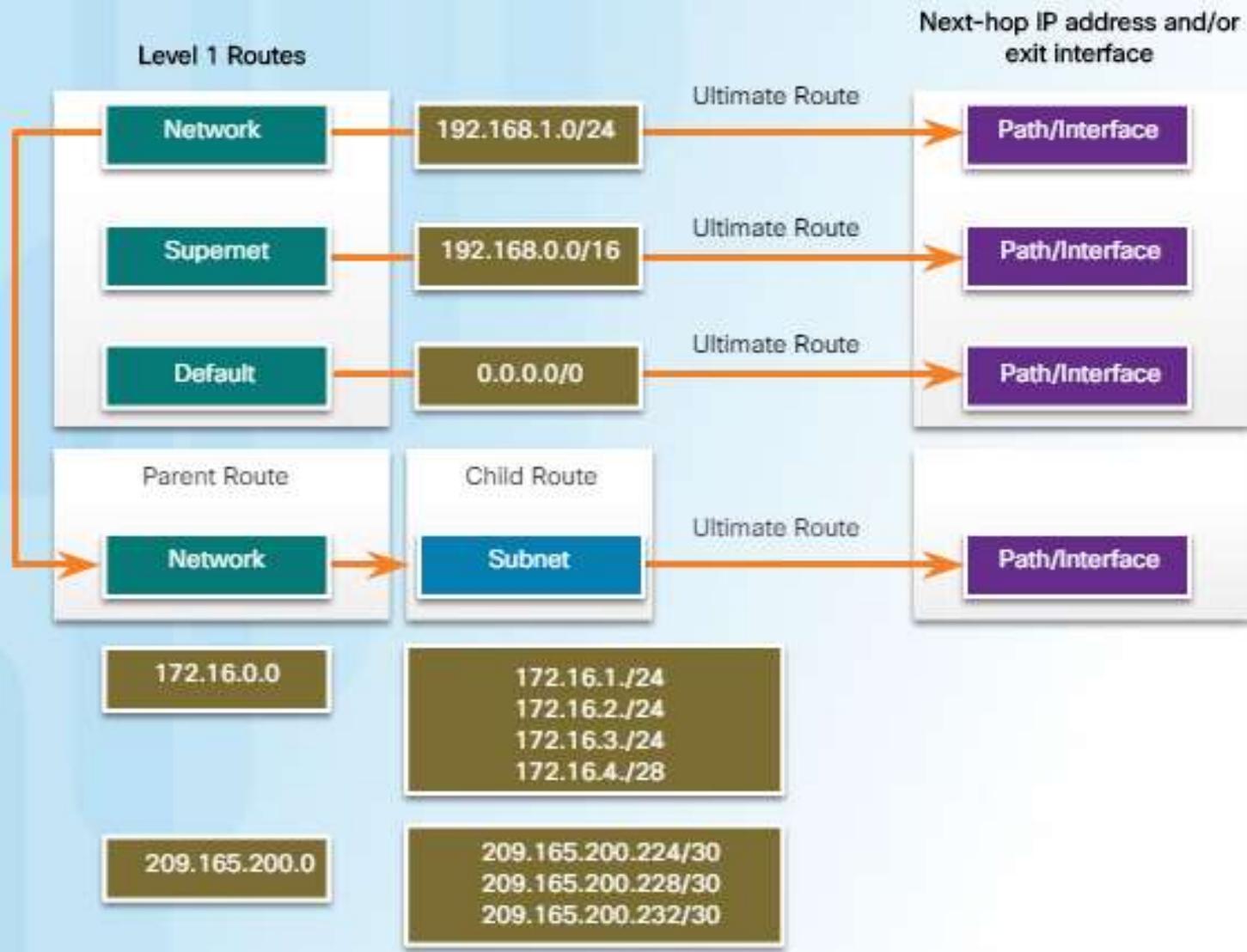
S*  0.0.0.0/0 [1/0] via 209.165.200.234
    172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
C      172.16.1.0/24 is directly connected, GigabitEthernet0/0
L      172.16.1.1/32 is directly connected, GigabitEthernet0/0
R      172.16.2.0/24 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
R      172.16.3.0/24 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
R      172.16.4.0/28 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
R      192.168.0.0/16 [120/2] via 209.165.200.226, 00:00:16, Serial0/0/0
    209.165.200.0/24 is variably subnetted, 5 subnets, 2 masks
C      209.165.200.224/30 is directly connected, Serial0/0/0
L      209.165.200.225/32 is directly connected, Serial0/0/0
R      209.165.200.228/30 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
C      209.165.200.232/30 is directly connected, Serial0/0/1
L      209.165.200.233/32 is directly connected, Serial0/0/1
R1#
```

Routing Table Terms

- Level 2 Child Route
 - A level 2 child route is a route that is a subnet of a classful network address. As illustrated in Figure 1, a level 1 parent route is a level 1 network route that is subnetted. Level 1 parent routes contain level 2 child routes, as shown in Figure 2.
 - Like a level 1 route, the source of a level 2 route can be a directly connected network, a static route, or a dynamically learned route. Level 2 child routes are also ultimate routes.
 - Note: The routing table hierarchy in Cisco IOS has a classful routing scheme. A level 1 parent route is the classful network address of the subnet route. This is the case even if a classless routing protocol is the source of the subnet route.
 - Figure 3 highlights the child routes in the routing table of R1.

Routing Table Terms

Child Routes are Ultimate Routes



Routing Table Terms

- Level 2 Child Route

```
R1# show ip route | begin Gateway
```

```
Gateway of last resort is 209.165.200.234 to network 0.0.0.0
```

```
S* 0.0.0.0/0 [1/0] via 209.165.200.234
```

```
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
```

```
C 172.16.1.0/24 is directly connected, GigabitEthernet0/0
```

```
L 172.16.1.1/32 is directly connected, GigabitEthernet0/0
```

```
R 172.16.2.0/24 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
```

```
R 172.16.3.0/24 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
```

```
R 172.16.4.0/28 [120/2] via 209.165.200.226, 00:00:21, Serial0/0/0
```

```
R 192.168.0.0/16 [120/2] via 209.165.200.226, 00:00:16, Serial0/0/0
```

```
209.165.200.0/24 is variably subnetted, 5 subnets, 2 masks
```

```
C 209.165.200.224/30 is directly connected, Serial0/0/0
```

```
L 209.165.200.225/32 is directly connected, Serial0/0/0
```

```
R 209.165.200.228/30 [120/1] via 209.165.200.226, 00:00:21, Serial0/0/0
```

```
C 209.165.200.232/30 is directly connected, Serial0/0/1
```

```
L 209.165.200.233/32 is directly connected, Serial0/0/1
```

```
R1#
```

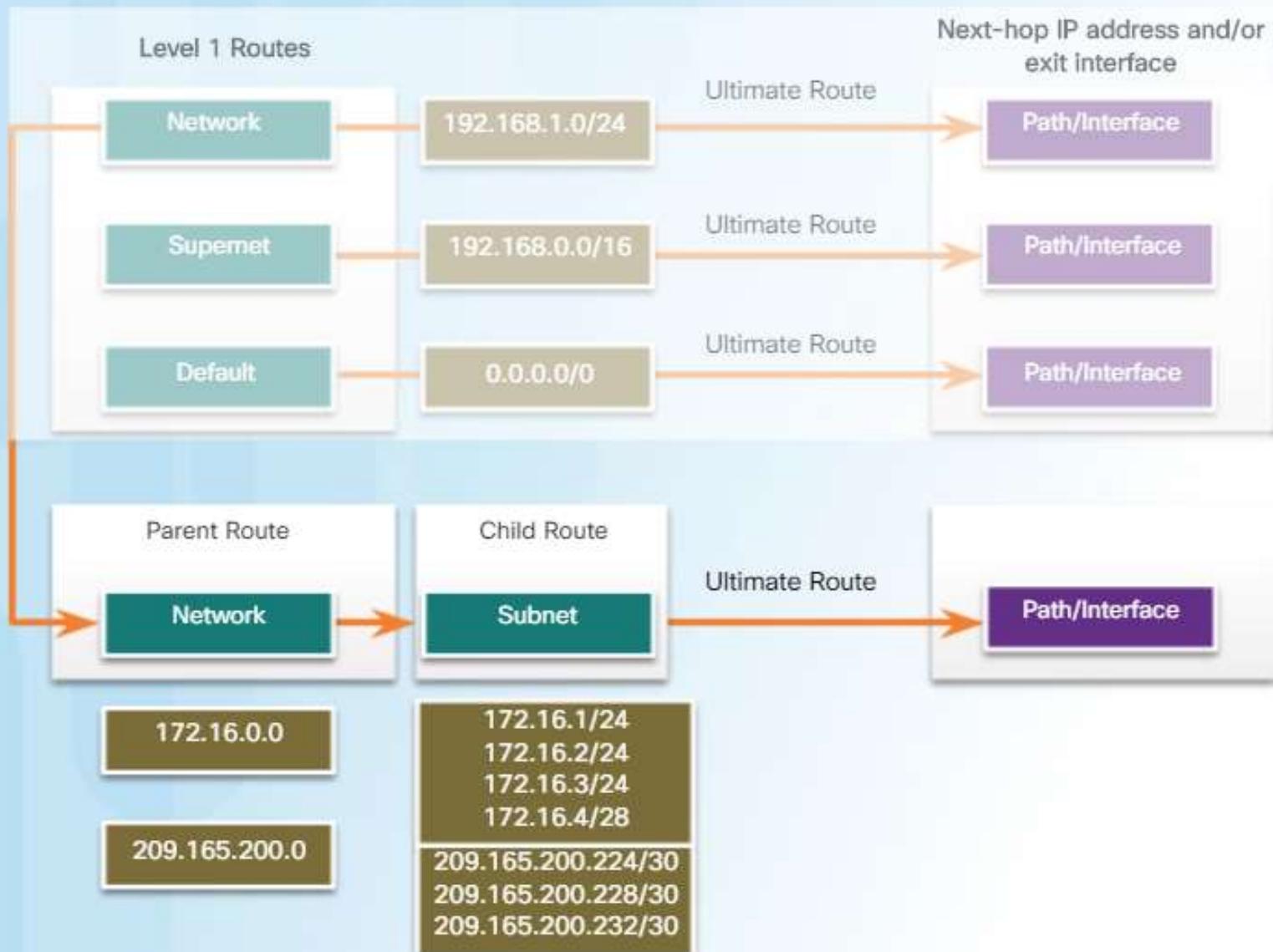
Route Lookup Process

Match Level 1 Routes



Route Lookup Process

Match Level 2 Child Routes



Route Lookup Process

Match Supernet and Then Default Route

