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16. Administrative Distance and route source preference

In environment with 2 or more enabled routing protocols must be present mechanism for selection of routing sources that are learned. **What routing protocol obtained routes for remote network will be introduced to routers routing table?** That is a big question.

Administrative Distance in short AD is considered parameter that will break the tie and say about trustworthiness of routing source.

	Routing source	AD (administrative distance)
connected	0	
static	1	
EIGRP summary route	5	
External BGP	20	
Internal EIGRP	90	
IGRP	100	
OSPF	110	

Routing source	AD (administrative distance)
IS-IS	115
RIP	120
External EIGRP	170
Internal BGP	200

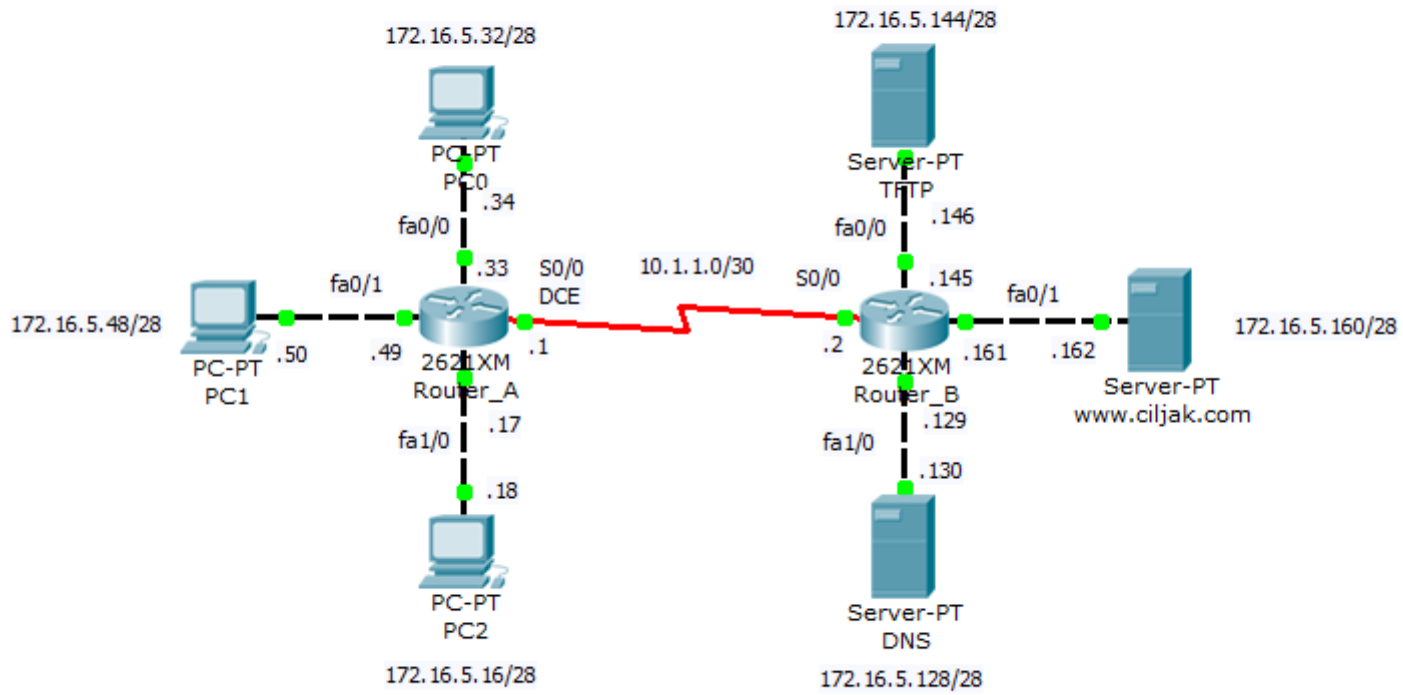
Say in other words - AD is number from interval <0, 255>. And lower is better that mean static route (AD=1) is preferred over OSPF learned route (AD=110).

Training scenario focus on introduction routing sources (learned route) from RIP, EIGRP and OSPF routing protocols.

Fully configured lab. scenario for Cisco Packet Tracer 5.2 or above can be [obtained from here](#) [1]. Topology diagram show next picture.

Which routing protocol would be used to route packets to 172.16.5.48/28?

Configured: RIPv2
EIGRP 100 with auto-summary
OSPF 100



[2]

Routing protocols configuration is

Router_A	Router_B
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<pre> router eigrp 100 passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 172.16.5.0 0.0.0.63 network 10.1.1.0 0.0.0.3 auto-summary ! router ospf 100 log-adjacency-changes passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 172.16.5.0 0.0.0.63 area 0 network 10.1.1.0 0.0.0.3 area 0 ! router rip version 2 passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 10.0.0.0 network 172.16.0.0 ! ip classless </pre>	<pre> router eigrp 100 passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 172.16.5.128 0.0.0.63 network 10.1.1.0 0.0.0.3 auto-summary ! router ospf 100 log-adjacency-changes passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 172.16.5.128 0.0.0.63 area 0 network 10.1.1.0 0.0.0.3 area 0 ! router rip version 2 passive-interface FastEthernet0/0 passive-interface FastEthernet0/1 passive-interface FastEthernet1/0 network 10.0.0.0 network 172.16.0.0 ! ip classless </pre>
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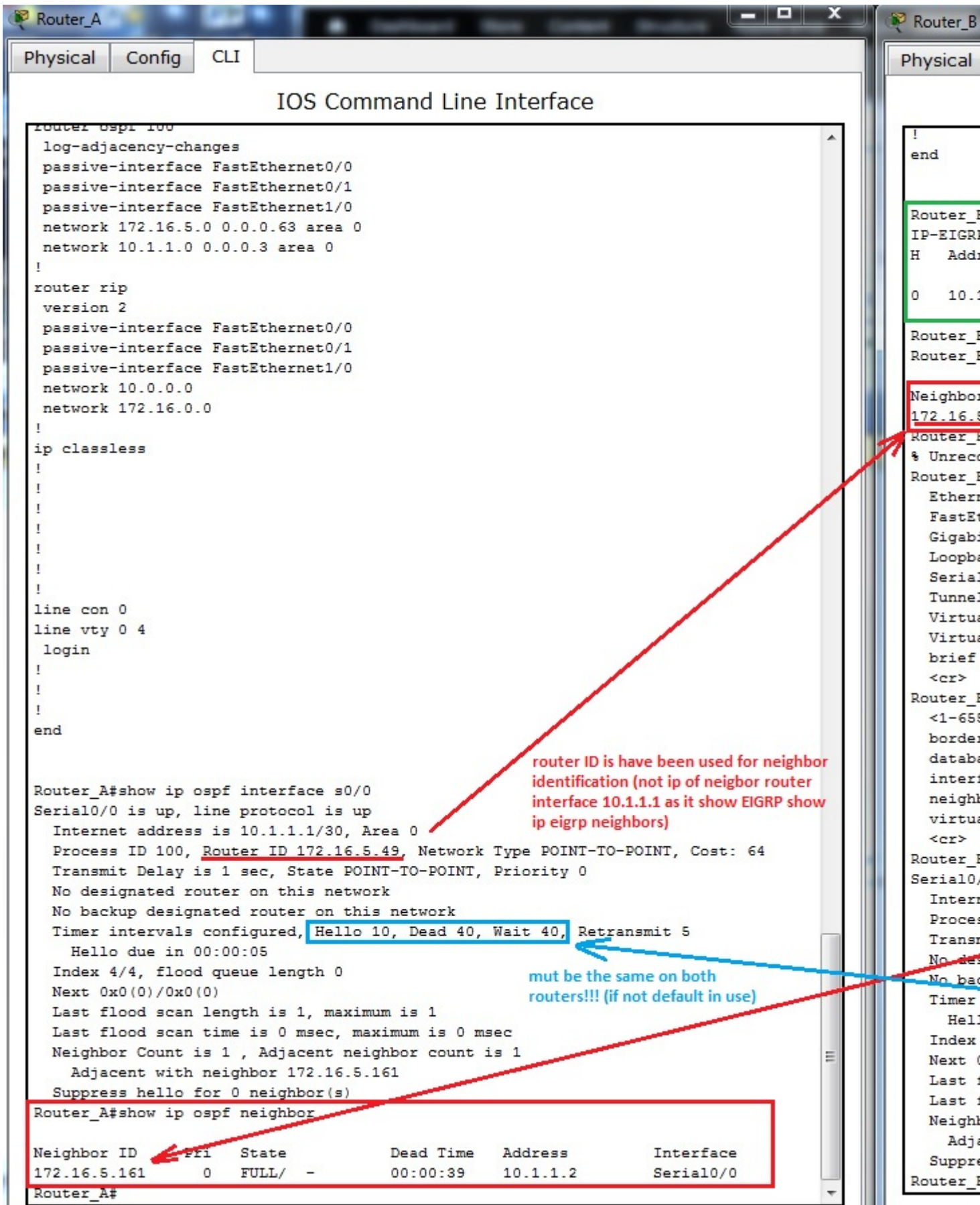
EIGRP and OSPF routing protocols will create neighborhood relation between facing interfaces. This mechanism is important for generate triggers after breaking relationship after topology change in network and cause generating and spreading routing protocols PDU, algorithm recalculation and rearrangement in routing table.

If routing table is missing expected route please take a look at creation of neighbor relation and verify appropriate timers that trigger sending hello packet or define time for detaching route from table after their potential error.

Important commands for troubleshooting at CCNA level are:

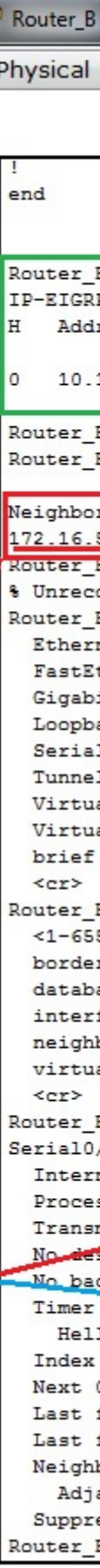
- show ip eigrp neighbors
- show ip ospf neighbor
- show ip ospf interface INTERFACE
- show ip route
- show ip protocols

Output from neighborhood verification commands are



router ID is have been used for neighbor identification (not ip of neighbor router interface 10.1.1.1 as it show EIGRP show ip eigrp neighbors)

mut be the same on both routers!!! (if not default in use)



Now we can look at routing table both router A and B. What we can expect? Which routing protocol introduce their route to routing table? Lower AD is preferred and lowest AD has EIGRP!

But what is wrong, routing table show only classfull D (Dual EIGRP route) that point nowhere (Null0)? can you mentally answer why it is so? What is wrong in our config? Classless VLSM route (network mask is longer as appropriate classfull mask) are introduced by OSPF because OSPF is inherently classless routing protocol.

Please remember that null0 classfull route introduced to routing table by EIGRP protocol (leading D for that route) is because auto-summary was not suppressed and is in use. For correcting this behavior on our network we must type no auto-summary on router-config command prompt of router eigrp 100.

All that was we describe is recorded from output of CLI Router_A and Router_B on next picture.

Router_A
Router_B

Physical
Config
CLI

IOS Command Line Interface

```

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D    10.0.0.0/8 is a summary, 00:33:05, Null0
C    10.1.1.0/30 is directly connected, Serial0/0
      172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks
D    172.16.0.0/16 is a summary, 00:33:05, Null0
C    172.16.5.16/28 is directly connected, FastEthernet1/0
C    172.16.5.32/28 is directly connected, FastEthernet0/0
C    172.16.5.48/28 is directly connected, FastEthernet0/1
O    172.16.5.128/28 [110/65] via 10.1.1.2, 00:32:50, Serial0/0
O    172.16.5.144/28 [110/65] via 10.1.1.2, 00:32:50, Serial0/0
O    172.16.5.160/28 [110/65] via 10.1.1.2, 00:32:50, Serial0/0
Router_A#router eigrp 10
      ^
% Invalid input detected at '^' marker.

Router_A#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router_A(config)#router eigrp 100
Router_A(config-router)#no auto-summary
Router_A(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 100: Neighbor 10.1.1.2 (Serial0/0) is up: new adjacency
%DUAL-5-NBRCHANGE: IP-EIGRP 100: Neighbor 10.1.1.2 (Serial0/0) is down: Interface
e Goodbye received
%DUAL-5-NBRCHANGE: IP-EIGRP 100: Neighbor 10.1.1.2 (Serial0/0) is up: new adjacency

Router_A(config-router)#do show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

      10.0.0.0/30 is subnetted, 1 subnets
C    10.1.1.0 is directly connected, Serial0/0
      172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks
R    172.16.0.0/16 [120/1] via 10.1.1.2, 00:00:00, Serial0/0
C    172.16.5.16/28 is directly connected, FastEthernet1/0
C    172.16.5.32/28 is directly connected, FastEthernet0/0
C    172.16.5.48/28 is directly connected, FastEthernet0/1
D    172.16.5.128/28 [90/2172416] via 10.1.1.2, 00:01:16, Serial0/0
D    172.16.5.144/28 [90/2172416] via 10.1.1.2, 00:01:16, Serial0/0
D    172.16.5.160/28 [90/2172416] via 10.1.1.2, 00:01:16, Serial0/0
Router_A(config-router)#

```

auto-summary for eigrp in effect

because auto-summary for preferred eigrp (lower ad 90) is in use, appropriate VLSM subnet are introduced from protocol that is classes - OSPF

no auto-summary for eigrp

way to convergence of eigrp routing protocol after neighborhood recreation

[4]
Router_B

One of many processes that run on our router is mapping L3 address to L2 mac address on Ethernet interfaces. Info about learned relationship between L3 and L2 address offer ARP table of router. Their output can be visible after typing show arp on privileged exec of CLI (output depend on previews communication, arp cache is dynamic table that is aged after appropriate time non use of connection. That mean, if you will have all mac in table you must make ping sweep).

```
Router_A#show arp
Protocol  Address                Age (min)  Hardware Addr  Type   Interface
Internet  172.16.5.17            -          0060.7038.CD01  ARPA   FastEthernet1/0
Internet  172.16.5.18            2          0090.2193.645C  ARPA   FastEthernet1/0
Internet  172.16.5.33            -          000C.85D9.5D01  ARPA   FastEthernet0/0
Internet  172.16.5.34            3          00D0.BAE7.3634  ARPA   FastEthernet0/0
Internet  172.16.5.49            -          000C.85D9.5D02  ARPA   FastEthernet0/1
Internet  172.16.5.50            2          0090.0C1B.3E57  ARPA   FastEthernet0/1 [5]
```

Records with character - in Age column is local interface of device. These records are excluded from aging mechanism! (- mean local interface on device, other are learned through ARP protocol)

[Tweet](#) [6]

Source URL: <http://cdesigner.eu/content/16-administrative-distance-and-route-source-preference>

Links:

- [1] http://cdesigner.eu/obsah/ccna/17_Routing_source_election_proces_in_multi_routing_protocol_environment.pkt
- [2] http://cdesigner.eu/obsah/ccna/17_Routing_source_election_proces_in_multi_routing_protocol_environment.png
- [3] http://cdesigner.eu/obsah/ccna/17_1.jpg
- [4] http://cdesigner.eu/obsah/ccna/17_2.jpg
- [5] http://cdesigner.eu/obsah/ccna/17_arp_cache_of_router_A.png
- [6] <http://twitter.com/share>