

14. Wrong default route propagation in OSPF enabled network

Default route introduce ultimate outgoing interface for L3 PDU from our network. Most common use is in stub-networks where is only one interface pointing to outside network (in this case is no need for load balancing between two or among ISPs interfaces). Instead of routers having to store routes for all of the networks in the internet, they can share a single default route to represent any network that is not in the routing table.

In small office networks is static routing and manual default route settings in use but in large network or in much more flexible network scenarios are dynamic routing protocol introduced.

Static default route can be propagated from router where command ***ip route 0.0.0.0 0.0.0.0 interface/IP_of_next_hop*** to all other routers in network.

How to enable default route distribution to network with most common IPv4 routing protocols?

1) *Configure static default route on router that act as network boundary to ISP network with command:*

ip route 0.0.0.0 0.0.0.0 interface/IP_of_next_hop

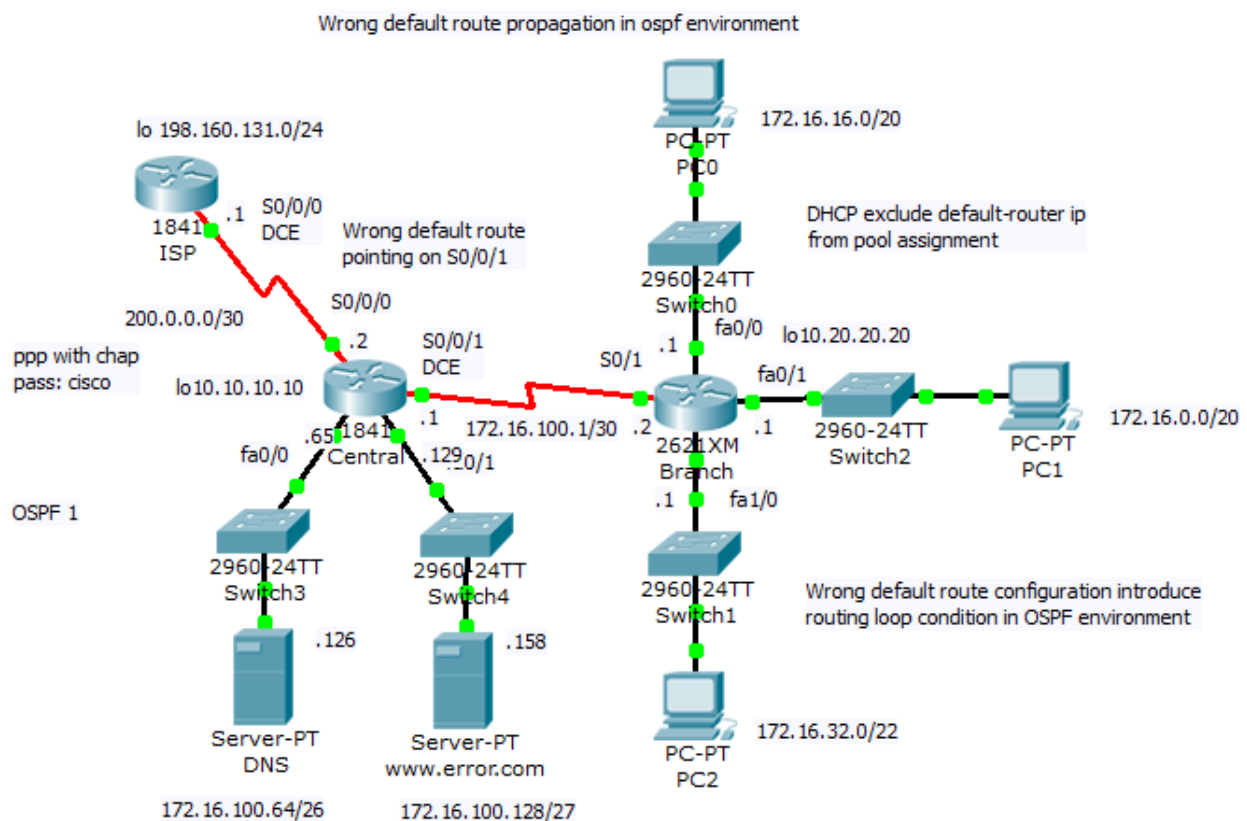
2) *Default static route needs to be advertised to all others routers that use dynamic routing protocols*

- for RIP1/2 use router command: default-information originate
- for EIGRP use router command: redistribute static
- for OSPF use router command: default-information

originate

But what is happen when wrong default route is introduced in network topology? How troubleshoot problem with wrong default static route? We going to explore how this condition affect our production network and how to fix it.

Preconfigured scenario in cisco packet tracer 5.2 or above can be obtained from here. Small office network in this scenario look like this

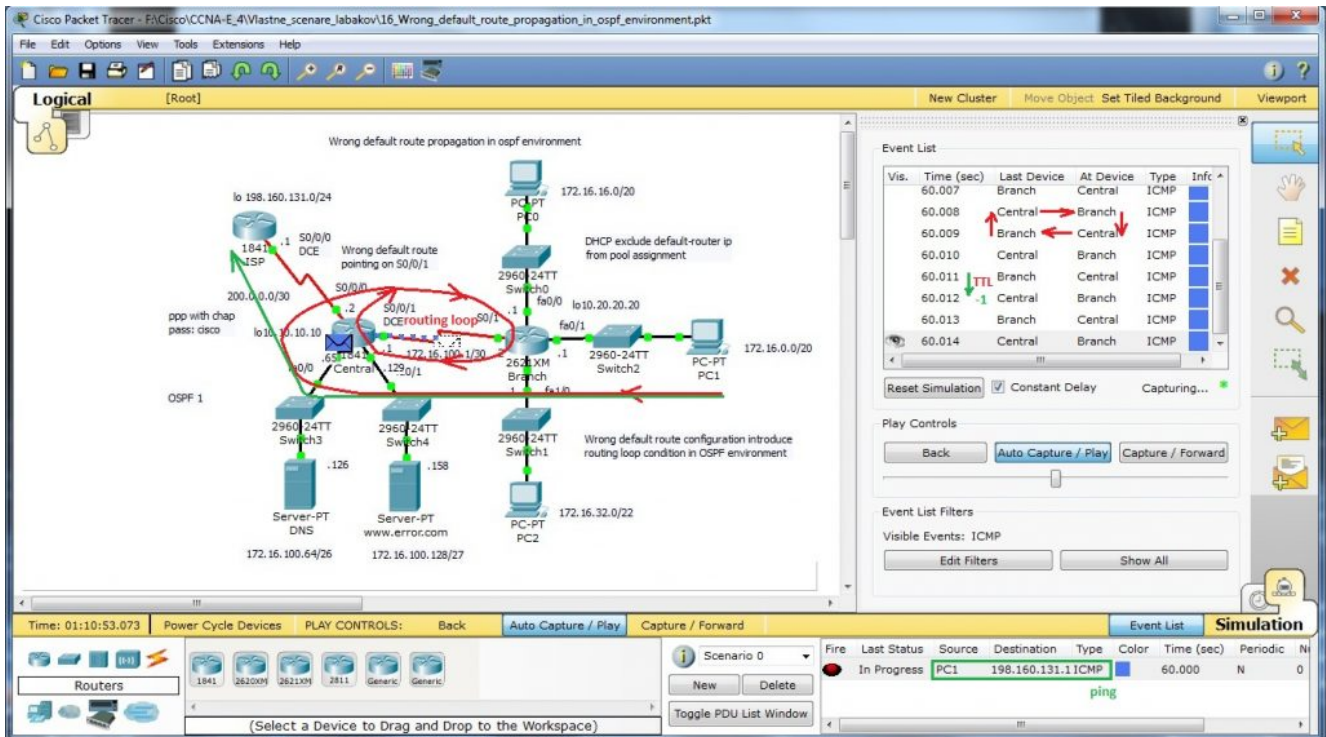


Network topology consist of central router (act as boundary between office network and WAN) and one branch router (for simplicity is there only one branch router). All end devices are on separate networks and private address space is in use in internal network. Wrong default route

ip route 0.0.0.0 0.0.0.0 serial0/0/1 (correct it is serial0/0/0) introduce in network routing loop that we will examine.

Our lab include option for sending ping and follow what is

happen. Toggle to simulation mode and Auto capture/play.



Wrong default route lead PDU to its origin and Branch router loop back to central router with default route. L3 PDU contain mechanism how to break endless looping of PDU – TTL in data packet header is decreased after L3 routing to appropriate interface as you can see on next picture (PDU examination in cisco packet tracer – simulation mode).

PDU Information at Device: Branch

OSI Model Inbound PDU Details **Outbound PDU Details**

PDU Formats

HDLC

0	8	16	32	32+x	48+x	56+x	Bi
FLG:	ADR:	CONTROL:	DATA: (VARIABLE LENGTH)	FCS:	FLG:		
0111 1110	0x8f	0x0		0x0	0111 1110		

IP

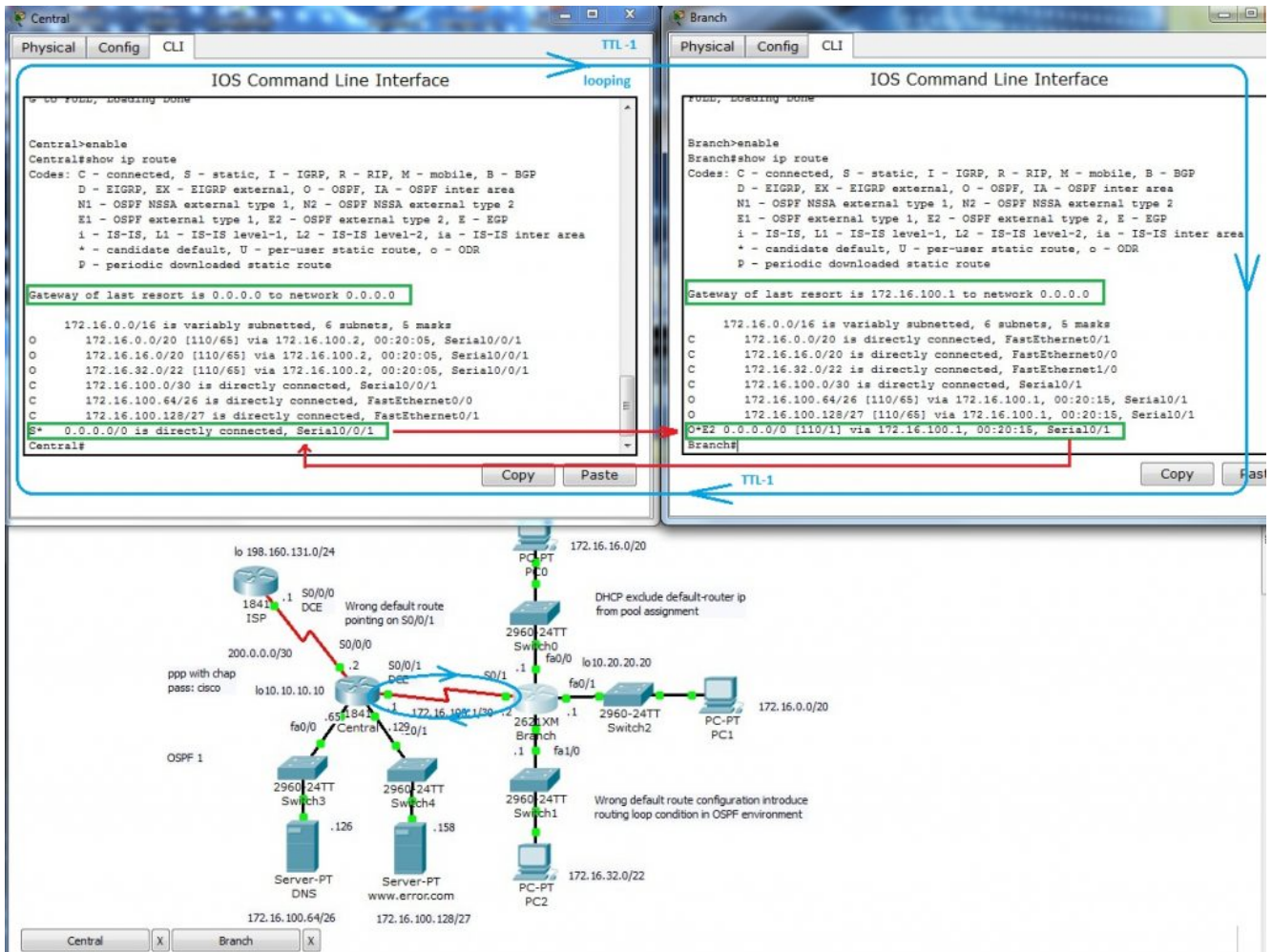
0	4	8	16	19	31	Bits
4	HL	DSCP: 0x0	TL: 28			
ID: 0x4		0x0	0x0			
TTL: 2		PRO: 0x1	CHKSUM			
SRC IP: 172.16.0.2						
DST IP: 198.160.131.1						
OPT: 0x0					0x0	
DATA (VARIABLE LENGTH)						

ICMP

0	8	16	31	Bits
TYPE: 0x8		CODE: 0x0	CHECKSUM	
ID: 0x2		SEQ NUMBER: 1		

TTL=1 decreased after routing to outgoing if -1 when 0 reached PDU will be drop

Output from most common troubleshooting command show ip route that output from routers routing table issued on both routers is:



Now is time correct our mistake. What we need to do? At first you must remove wrong default route. There is no way how to change existing static route. First remove wrong route with command

```
no ip route 0.0.0.0 0.0.0.0 serial0/0/1
```

that point not to ISP router but back to internal Branch router and cause routing loop. Next step is introduce appropriate (correct) default route this way:

```
ip route 0.0.0.0 0.0.0.0 serial0/0/0
```

and now we going to examine output from show ip route. But you will obtain problem that is cause of my mistake. In routing table is not default route introduced. Keep in mind that static route (but all routes) is in output only when appropriate outgoing interface is on. Then we will examine up state of s0/0/0 interface. As you can see physical layer is Up

The screenshot displays a network simulation environment with several components:

- Central Router CLI:** Shows the configuration of static routes for the 172.16.0.0/16 network. The output lists various subnets and their connections to the ISP network and other parts of the office network.
- Branch Router CLI:** Shows the configuration of static routes for the 172.16.0.0/16 network, including connections to the Central router and other office subnets.
- Network Diagram:** A detailed diagram showing the network topology. It includes an ISP (198.160.131.0/24), a Central router (2960-24TT Switch0), and a Branch router (2960-24TT Switch1). The diagram also shows various servers (Server-PT DNS, Server-PT www.error.com) and PCs (PC1, PC2) connected to the network. Annotations highlight configuration errors, such as "Wrong default route pointing on S0/0/1" and "Wrong default route configuration introduce routing loop condition in OSPF environment".
- Event Log:** A table showing network events, including ICMP traffic between devices. The table has columns for "Vis.", "Time (sec)", "Last Device", "At Device", "Type", and "Info".

For ISP (internet access – now without security configuration) connection in network with many clients I decided for NAT (network address translation) with PAT (port address translation) on interface s0/0/0.

At first we must create standard access list (i use named but also can be used numbered)

ip access-list standard NAT

permit 172.16.0.0 0.0.15.255

permit 172.16.16.0 0.0.15.255

permit 172.16.32.0 0.0.15.255

permit 172.16.100.0 0.0.0.3

and then enable nat translation with command

ip nat inside source list NAT interface s0/0/0 overload

most common beginners (also me) mistake is forget mark appropriate interface as ip nat inside and outside. in our case it is:

interface s0/0/0

ip nat outside

interface s0/0/1

ip nat inside.

Now we can place simple PDU between appropriate ends.

The image displays a network simulation environment with three main components:

- CLI Screenshots:** Two windows showing the IOS Command Line Interface. The left window shows the ISP router's routing table. The right window shows the Central router's configuration, including NAT rules and interface markings. Annotations in red and blue highlight specific configuration lines and explain their purpose, such as "for servers static NAT we need unique public address, not PAT enabled interface" and "and please remember mark inside and outside NAT interfaces".
- Network Diagram:** A topology diagram showing the physical and logical connections between devices. It includes an ISP, several routers (Central, Branch, Switches), and servers (DNS, www.error.com). Annotations describe NAT with PAT on the ISP's s0/0/0 interface and OSPF configurations for inter-area connectivity.
- Packet Tracer Event List:** A table showing the sequence of events in the simulation, including ICMP traffic between various devices.

Vis.	Time (sec)	Last Device	At Device	Type	Info
60.001		PC1	Switch2	ICMP	
60.002		Branch	Central	ICMP	
60.003		Branch	Central	ICMP	
60.004		Central	ISP	ICMP	
60.005		Central	Branch	ICMP	
60.007		Branch	Switch2	ICMP	
60.008		Switch2	PC1	ICMP	

As „how to?“ training you can establish connection for inside servers and enable reach them from ISP side. There must be used static nat and address range for inside global must increase from 200.0.0.0/30 to minimal 200.0.0.0/29 as it state previews picture.

Final and fixed packet tracer lab is on next picture and for

your training can be obtained from here (PKT 5.2 or above).

The screenshot displays a network simulation environment with the following components:

- Topology Diagram:** A network diagram titled "Wrong default route propagation in ospf environment". It features an ISP (1841) connected to a Central router (1841) via S0/0/0. The Central router is connected to two branch routers (2960-24TT Switch3 and 2960-24TT Switch4) via S0/0/1. The Central router also connects to another branch router (2960-24TT Switch2) via S0/1. Various PCs and servers are connected to these switches. Annotations include: "NAT with PAT on interface s0/0/0", "Wrong default route pointing on S0/0/1", "DHCP exclude default-router ip from pool assignment", "Wrong default route configuration introduce routing loop condition in OSPF environment", and "need public address for remote reachability and DNS records How to do it is for your personal training."
- Event List:** A table showing simulation events:

Vis.	Time (sec)	Last Device	At Device	Type	Infc
	60.001	PC1	Switch2	ICMP	
	60.002	Switch2	Branch	ICMP	
	60.003	Branch	Central	ICMP	
	60.004	Central	ISP	ICMP	
	60.005	ISP	Central	ICMP	
	60.006	Central	Branch	ICMP	
	60.007	Branch	Switch2	ICMP	
	60.008	Switch2	PC1	ICMP	
- Simulation Controls:** Includes "Reset Simulation", "Constant Delay" (checked), "Captured to: 158.126 s", "Play Controls" (Back, Auto Capture / Play, Capture / Forward), and "Event List Filters" (Visible Events: ICMP, Edit Filters, Show All).
- Bottom Panel:** Shows "Time: 01:41:26.556", "Power Cycle Devices", "PLAY CONTROLS", "Scenario 0", and a table of simulation results:

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	N
	Successful	PC1	198.160.131.1	ICMP		60.000	N	0