

Scenario Connecting Remote Offices Using PPP

Czech travel agency has two branches in Prague and Brno. The branches are connected via PPP links through Gateway to the Internet. Travel agency uses OSPF for internal routing and a static default route towards ISP. Every serial link among Prague, Brno, and Gateway uses PPP encapsulation with authentication. Configure PAP, resp. CHAP, on these links.

Task 1 Configure Basic Device Settings.

- 1. Prepare your network.**
Step 1: Cable network topology.
Step 2: Clear all existing configurations.
- 2. Perform basic router configuration.**
Connect links between network devices based on the topology.
Configure hostnames. Disable DNS lookup.
Configure enable password and secure vty connection. Use password **cisco**.
Create a message of the day (MOTD) banner warning users that unauthorized access is prohibited.
Gateway is connected to ISP (switch Internet) using Ethernet.
- 3. Configure IP addresses and routing.**
Set IP addresses on all interfaces of the routers. The IP address of Gateway is obtained from ISP via DHCP.
Configure DHCP servers for LANs on Prague and Brno. Default DNS server is 10.10.10.1.
Enable single-area OSPF on routers Prague, Brno, Gateway. Do not advertise internal routes to ISP or LANs.
Configure a default route toward the Internet. Redistribute the route using the OSPF process.
Configure NAT on Gateway towards the Internet. All traffic from local LANs will be permitted.
- 4. Verify serial connection.**
Test connection end to end connection using ping.
Check the contents of routing tables.

Task 2 Configure PPP on Serial Interfaces.

- 1. Using debug command on one of the routers check the effect of PPP initialization.**
router# debug ppp negotiation
- 2. Display the default serial encapsulation**
router# show interface <serial>
- 3. Change default encapsulation from HDLC to PPP.**
router(conf-if)# encapsulation ppp
- 4. Check the PPP phases and protocols used to establish connection.**
What protocols and data are exchanged?
What kind of data is sent/received on interfaces?

Task 3 Break and Restore PPP Encapsulation.

- 1. Return one of the serial interfaces to the default HDLC encapsulation.**
A) router(conf-if)# encapsulation hdlc or B) router(conf-if)# no encapsulation ppp
- 2. Observe the debug PPP and OSPF messages.**
- 3. Verify the current encapsulation.**
router# show interfaces <serial>
- 4. Restore PPP encapsulation.**
- 5. Turn off debugging.**

Task 4 Configure PPP Authentication.

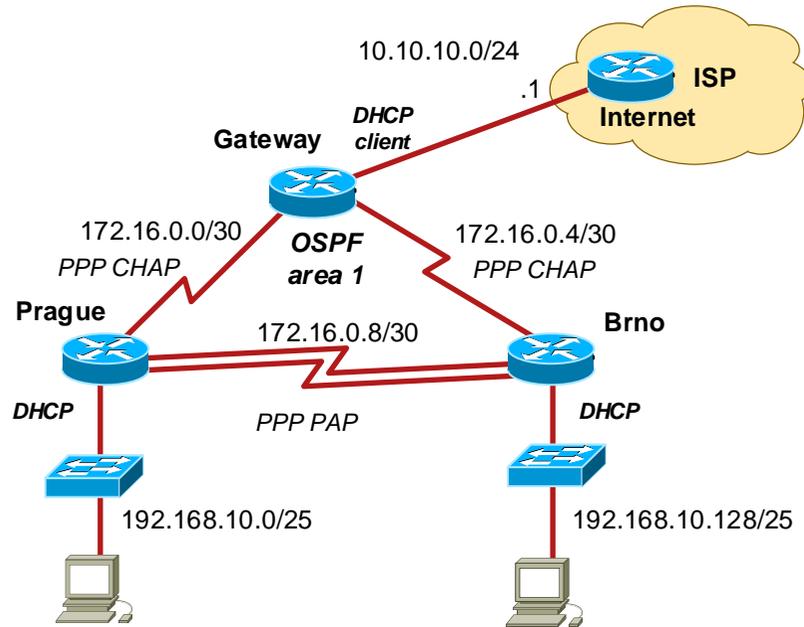
- 1. Configure PAP authentication on the serial link between Prague and Brno. For each host set different user name and password for mutual authentication.**
router(conf)# username <local-username> password <local-passwd>
router(conf)# int <serial>
router(conf-if)# ppp authentication pap
router(conf-if)# ppp pap sent-username <remote-username> password <remote-passwd>
- 2. Configure CHAP authentication between Prague/Brno and Gateway. For each link set a different password.**
router(conf)# username <remote-hostname> password <passwd>
router(conf)# int <serial>
router(conf-if)# ppp authentication chap
- 3. Debug ppp authentication**
router# debug ppp authentication.
router(conf)# int <serial>
- 4. Intentionally break the serial link configured with authentication**
router(conf-if)# shutdown
router(conf-if)# no shutdown

What protocols and data are exchanged? What kind of data is sent/received on interfaces?

- 5. Break up and restore CHAP authentication on the serial link between Prague and Gateway.**
router(conf)# int <serial>
router(conf-if)# ppp authentication pap

What happens when different authentication protocol is set between Prague and Gateway?

- ```
router(conf-if)# ppp authentication chap
router(conf)# username <remote-hostname> password <incorrect-password>
```
- 6. Verify end-to-end connection from a PC to the Internet.**



### Task 5 PPP Multilink

1. Add a parallel serial link between routers Prague and Brno.
2. Reset serial interfaces on the existing link between Prague and Brno  
`router(conf)# default interface <serial-interface>`
3. Set PPP encapsulation and PPP multilink group on both serial interfaces.  
`router(conf-if)# encapsulation ppp`  
`router(conf-if)# ppp multilink`  
`router(conf-if)# ppp multilink group 1`  
`router(conf-if)# clock rate <rate> # for DCE only`  
`router(conf-if)# no shutdown`
4. Create a multilink interface.  
`router(conf)# interface multilink 1`  
`router(conf-if)# ip address <address>`  
`router(conf-if)# ppp multilink`  
`router(conf-if)# ppp multilink group 1`
5. Check multilink configuration.  
`router# show ppp multilink`
6. Configure PAP authentication on PPP multilink.
7. Check multilink configuration  
`router# show int multilink 1`  
`router# show cdp neighbors`  
`router# show ip ospf neighbors`

### Task 6 Save the Config Files on TFTP Server.

1. Run TFTPd32 on PC1.
2. Copy running-config to TFTP server.  
`router# copy running tftp`
3. Restart routers, remove cables, switch off PCs.

### Hints Useful Commands for Verification and Debugging.

- ```
# show ip route ospf
# show ip ospf interface brief
# show ip ospf neighbor
# show ip route ospf

# show ip protocols

# show controllers <if-name>

# show interfaces <if-name>
# show ip interface brief
# show ip interface <if-name>

# show ppp multilink
# show int multilink <no>

# show ip dhcp server statistics
# show ip dhcp pool
# show ip dhcp bindings

# show ip nat translations
# show ip nat translations verbose
# clear ip nat translation *

# clear ip nat statistics
# show ip nat statistics

# show access-lists
```