

POORIA TAABBODI

*Microsoft: MCSA, MCSE 2003 Security
MCSE 2012 R2 & 2016 Cloud Platform and Infra
Microsoft Official Trainer*



*MikroTik: MTCNA, MTCWE, MTCRE, MTCTCE
MTCUME, MTCINE, MTCIPv6E, Trainer & Consultant*

Cisco: CCNA, CCNP

PaloSanto(VOIP): ECE, ESM

Supervisor & Technical Manager of Neda Gostar Saba



L3-PPPOE + InterVLAN Routing Implementation Over MikroTik

Powered by: POORIA TAABBODI
Armenia-October - 2017

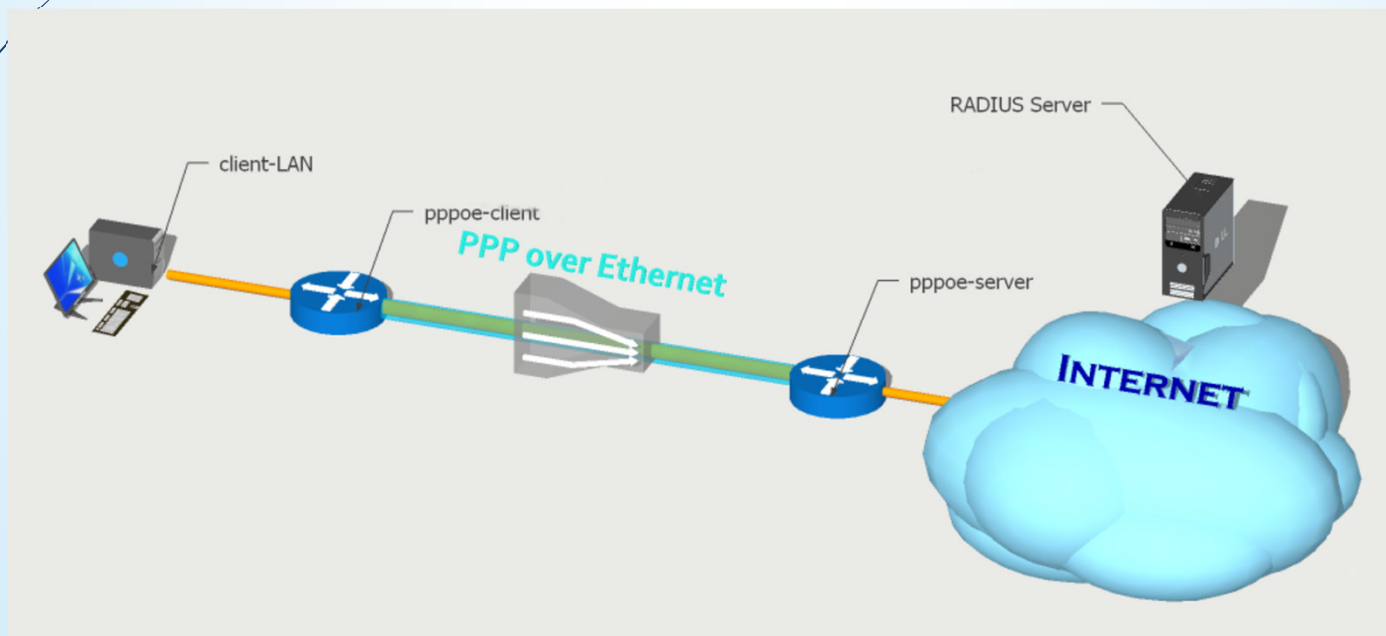
Welcome to this Workshop!

First, some basic concepts

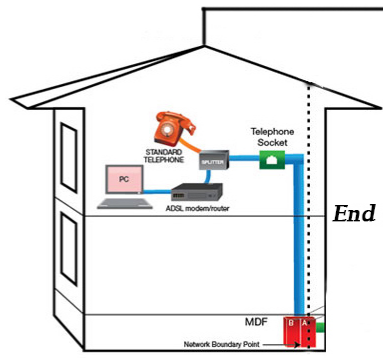
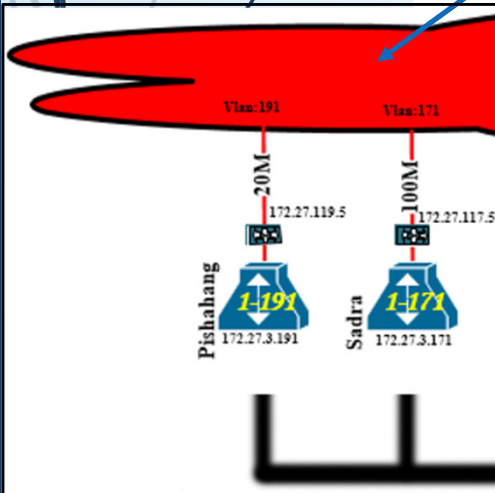
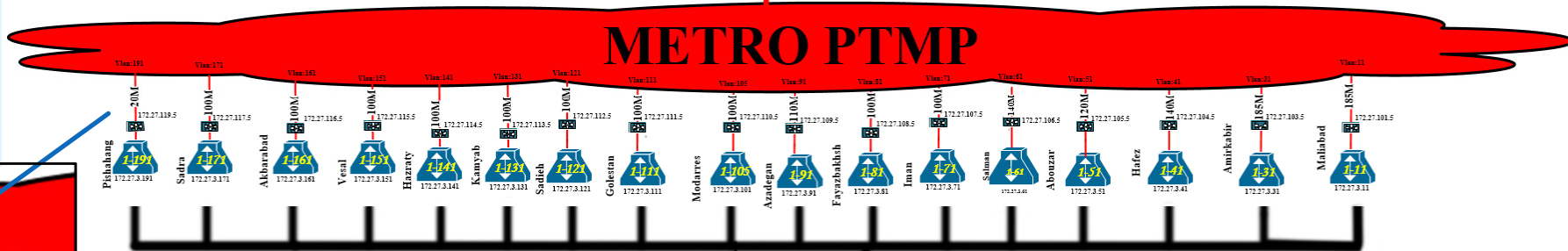
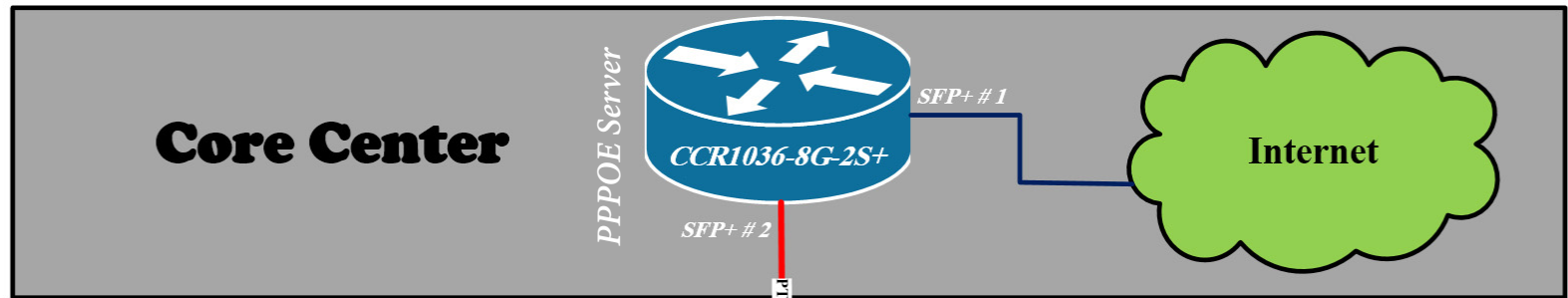


What is PPPOE?

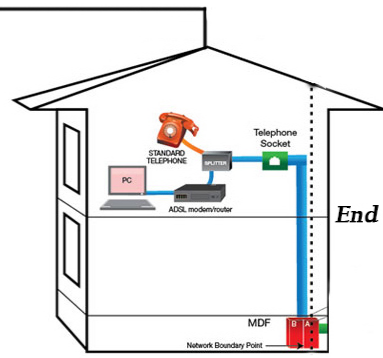
Point-to-Point Protocol over Ethernet or PPPoE, is a Layer II network protocol that used for encapsulating Point-to-Point Protocol (PPP) frames inside Ethernet frames. It is used mainly with DSL services where individual users connect to a DSL modem over Ethernet. As you know Ethernet networks are packet-based and have no capacity for a connection or circuit. They also lack basic security features to protect against IP and MAC conflicts and rogue DHCP servers, so most Internet providers separate their users traffics to several VLANs .



Imagine that our Network Topology is:



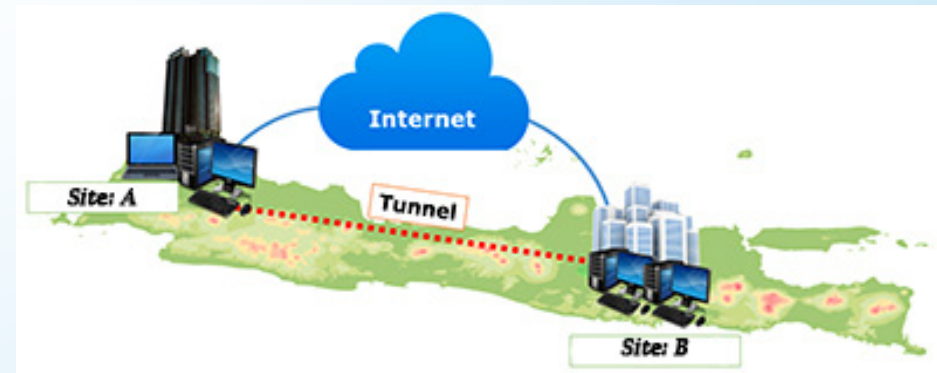
End Users Home or Office



End Users Home or Office

EoIP Tunnel

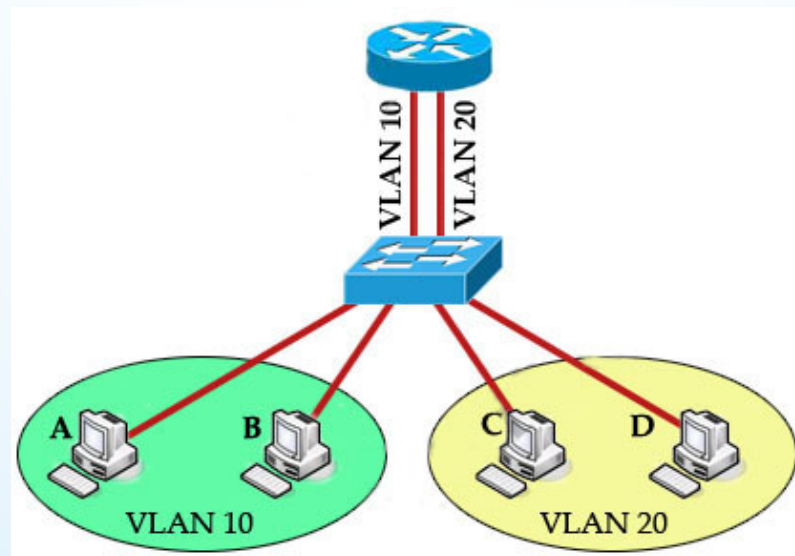
- *Ethernet over IP (EoIP) Tunneling is a MikroTik RouterOS protocol that creates an Ethernet tunnel between two routers on top of an IP connection. The EoIP tunnel may run over IPIP tunnel, PPTP tunnel or any other connections capable of transporting IP.*
- *EoIP tunnels add at least 42 bytes overhead.
(8 bytes GRE + 14 bytes Ethernet + 20 bytes IP)*



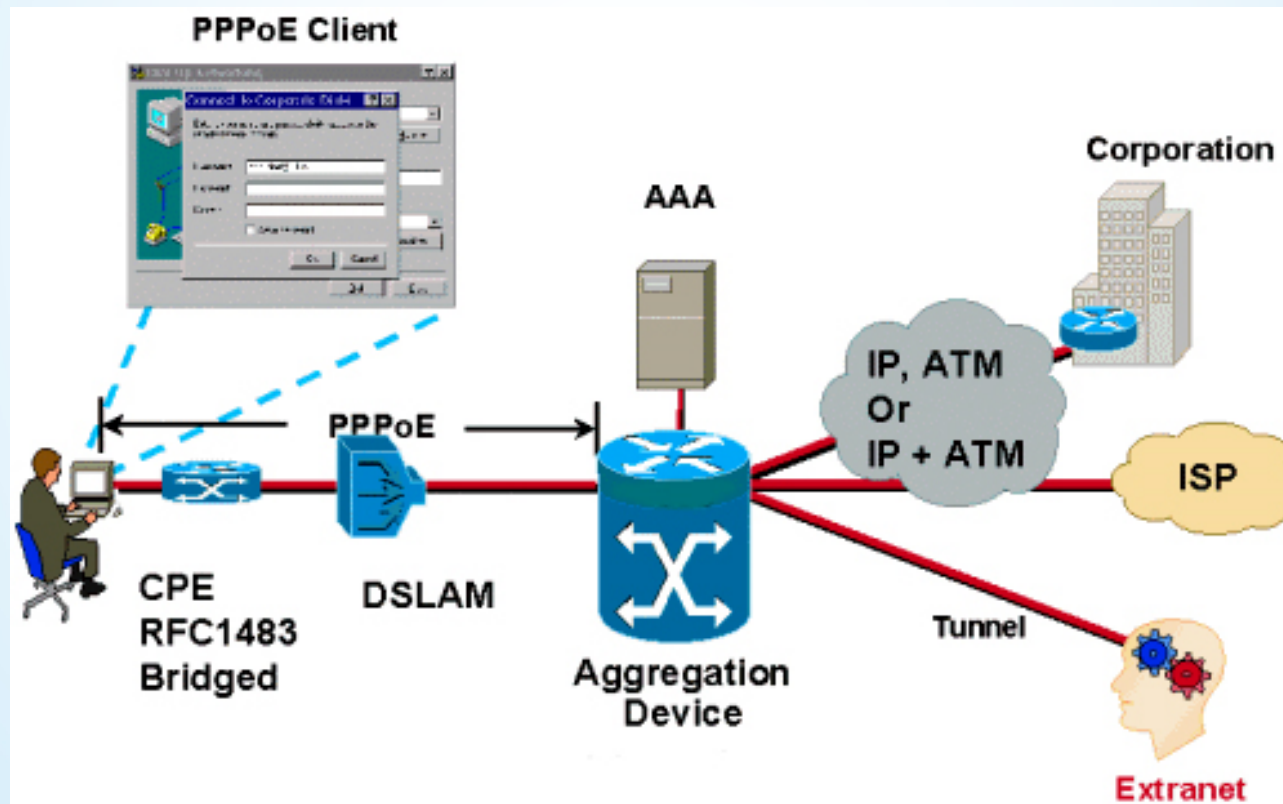
InterVLAN Routing

- Some times in addition to the PPPOE Connection you may need to have Layer III communication between your branches. (for example for managing your devices)

In this case you use InterVLAN Routing...



*Let's go to implementing PPPOE over EoIP Tunnel
And
Branches InterVLAN Routing*



Creating "VLAN Interface" for each branches on Core MikroTik

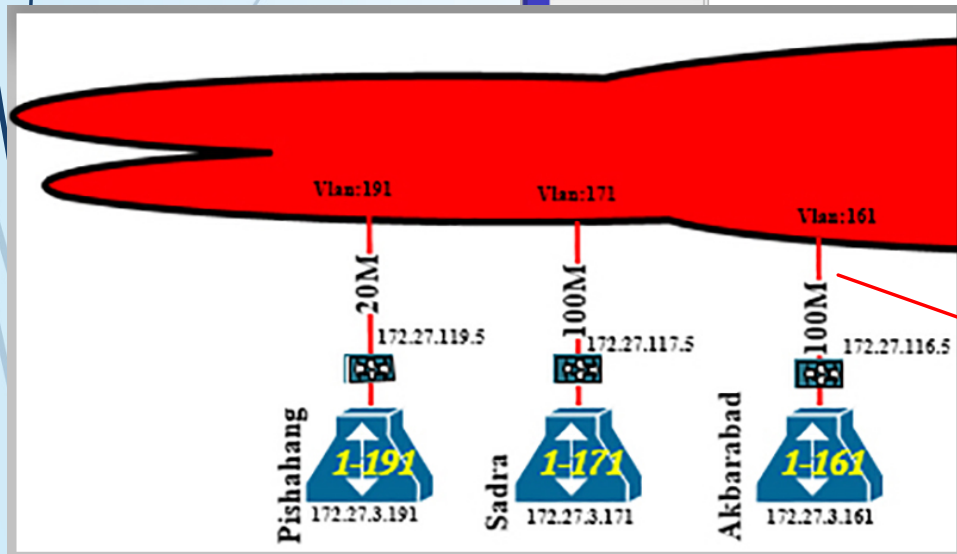
Session Settings Dashboard

Safe Mode Session: 00:0C:29:B4:C9:F3

Core MikroTik

Interface List

Interface	Interface List	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE								
R	vlan161																
R	vlan171																



New Interface

General Loop Protect Status Traffic

Name: vlan191

Type: VLAN

MTU: 1500

Actual MTU:

L2 MTU:

MAC Address:

ARP: enabled

ARP Timeout:

VLAN ID: 191

Interface: sfp-sfpplus2

Use Service Tag

enabled running slave

Configuring IP Address for branches VLANs

Session Settings Dashboard

Safe Mode Session: 00:0C:29:B4:C9:F3

Core MikroTik

Address List

Address	Network	Interface
172.27.116.4/24	172.27.116.0	vlan161
172.27.117.4/24	172.27.117.0	vlan171

New Address

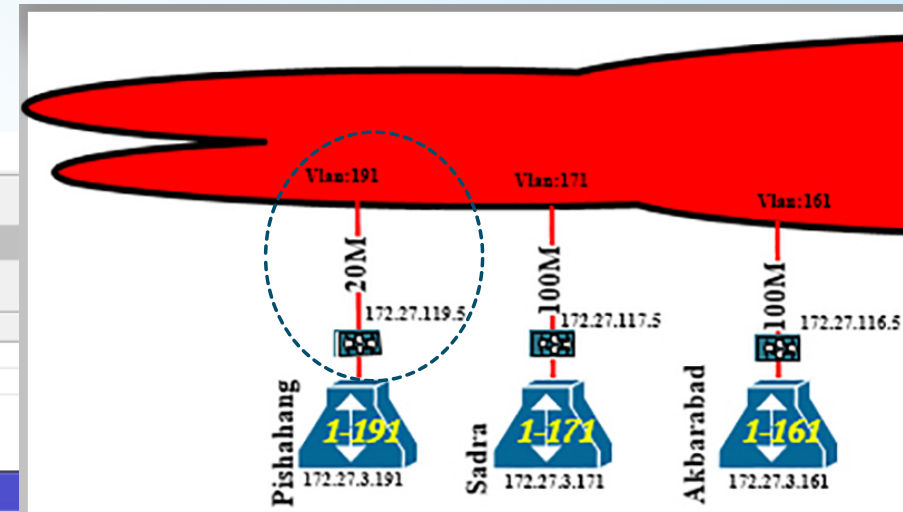
Address: 172.27.119.4/24

Network: 172.27.119.0

Interface: vlan191

OK Cancel Apply Disable Comment Copy Remove

enabled



Branches Basic IP Configurations

RouterOS WinBox

Session Settings Dashboard
Safe Mode Session: 00:0C:29:B4:C9:F3

Branch MikroTik

Address List

Address	Network	Interface
172.27.119.5/24	172.27.119.0	ether5->TC-PTMP

New Address

Address: 172.27.119.5/24
Network: 172.27.119.0
Interface: ether5->TC-PTMP

Route List

Dst. Address	Gateway
--------------	---------

New Route

General Attributes

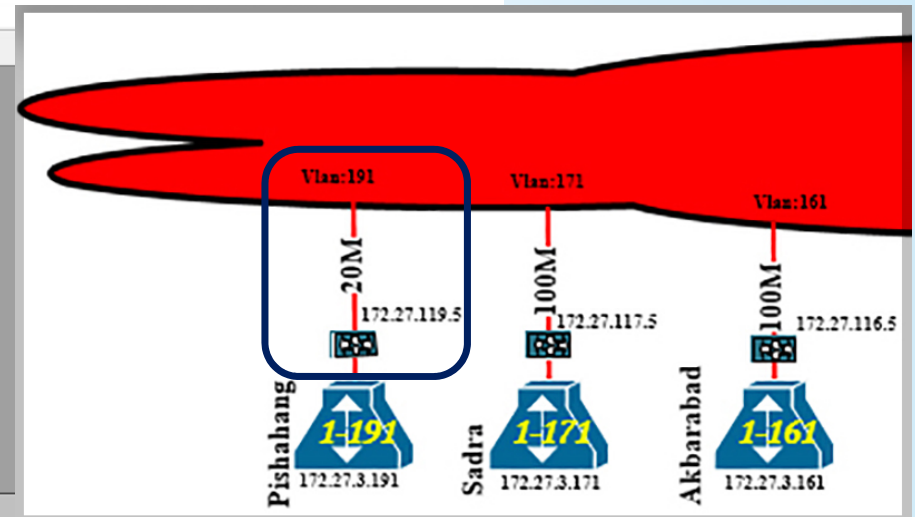
Dst. Address: 0.0.0.0/0
Gateway: 172.27.119.4

Type: unicast

Distance: 30
Scope: 10

Routing Mark:
Pref. Source:

enabled active



Creating & Configuring EoIP Tunnels

Core MikroTik

Branch MikroTik

The screenshot shows the MikroTik WinBox interface for the Core MikroTik. The session ID is 172.27.119.4:8292. The 'Interface List' on the left shows a list of EoIP tunnels. The 'Interface <eoip-tunnel-Pishahang>' configuration window is open, showing the following settings:

- Name: eoip-tunnel-Pishahang
- Type: EoIP Tunnel
- MTU: 1458
- L2 MTU: 65535
- MAC Address: 02:30:A9:8F:3A:B7
- ARP: enabled
- Local Address: [empty]
- Remote Address: 172.27.119.5
- Tunnel ID: 119
- DSCP: inherit
- Dont Fragment: no
- Clamp TCP MSS: checked
- Allow Fast Path: checked

Red circles highlight the 'Remote Address' and 'Tunnel ID' fields. A red arrow points from the 'Remote Address' field in the Core MikroTik window to the 'Remote Address' field in the Branch MikroTik window.

The screenshot shows the MikroTik WinBox interface for the Branch MikroTik. The session ID is 172.27.119.5:8292. The 'Interface List' on the left shows a list of EoIP tunnels. The 'Interface <eoip-tunnel-Pishahang->Valiasr>' configuration window is open, showing the following settings:

- Name: eoip-tunnel-Pishahang->Valiasr
- Type: EoIP Tunnel
- MTU: 1500
- Actual MTU: 1500
- L2 MTU: 65535
- MAC Address: 02:D9:D8:98:97:FF
- ARP: enabled
- Local Address: [empty]
- Remote Address: 172.27.119.4
- Tunnel ID: 119
- DSCP: inherit
- Dont Fragment: no
- Clamp TCP MSS: checked
- Allow Fast Path: checked

Red circles highlight the 'Remote Address' and 'Tunnel ID' fields. A red arrow points from the 'Remote Address' field in the Core MikroTik window to the 'Remote Address' field in the Branch MikroTik window.

Bridging EoIP Tunnel with End-Users Interface

The image shows two overlapping screenshots of the Mikrotik WinBox interface. The top screenshot shows the 'Bridge' configuration page for a bridge named 'bridgePTMP'. The bottom screenshot shows the 'Ports' tab for the same bridge, displaying a table of connected interfaces.

Bridge Configuration (Top Screenshot):

Name	Type
bridgePTMP	Bridge

Bridge Ports Configuration (Bottom Screenshot):

Interface	Bridge	Priority (h...)	Path Cost	Horizon	Role
eoip-tunnel-Pishahang->Valiasr	bridgePTMP	80	10		root port
ether3-> End_User_PPPOE Client	bridgePTMP	80	10		designated port

Branch Mikrotik

Bridging Branches EoIP Tunnels on Core MikroTik

The image displays the MikroTik WinBox interface. The main window shows the 'Bridge' configuration page with a table of bridge ports. A red arrow points from the 'PPPOE_Bridge' entry in the table to the 'New Bridge Port' dialog box.

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx	FP Tx Packet (p/s)	FP Rx Packet (p/s)	MAC Address	Protoco...
PPPOE_Bridge	Bridge	65535	0 bps	0 bps	0	0	0 bps	0 bps	0	0		rstp

Interface	Bridge	Priority (h...	Path Cost	Horizon	Role	Root Pat...
eoip-tunnel-Sa...	PPPOE_Bridge	80	10		designated port	

New Bridge Port dialog box details:

- Interface: eoip-tunnel-Pishahang
- Bridge: PPPOE_Bridge
- Priority: 80 hex
- Path Cost: 10
- Horizon: [dropdown]
- Edge: auto
- Point To Point: auto
- External FDB: auto
- Auto Isolate

Buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove. Status: enabled / inactive

Filtering Branches Layer II Traffics

RouterOS WinBox

Session Settings Dashboard

Safe Mode Session: 172.27.2.4:8292

Core MikroTik

#	Action	Chain	Interfaces...	Interfaces/Out. Interface	Src. MAC Address...	Dst. MAC Address...	MAC Prot...	Bytes	Packets
13	drop	forward		leoiptunnel-Fayazbakhsh			8100 (vlan)	16.3 GiB	143 970 ...
14	drop	forward		leoiptunnel-Fayazbakhsh			8100 (vlan)	1549.8 MiB	25 901 477
15	drop	forward		leoiptunnel-Golestan			8100 (vlan)	13.3 GiB	134 997 ...
16	drop	forward		leoiptunnel-Golestan			8100 (vlan)	2732.5 MiB	38 734 438
17	drop	forward		leoiptunnel-Golestan			8100 (vlan)	987.9 MiB	19 157 444
18	drop	forward		leoiptunnel-Hafez			8100 (vlan)	1086.8 MiB	20 125 618
19	drop	forward		leoiptunnel-Hafez			8100 (vlan)	4.8 GiB	61 160 712
20	drop	forward		leoiptunnel-Hafez			8100 (vlan)	24.0 GiB	213 217 ...
21	drop	forward		leoiptunnel-Hafez			8100 (vlan)	5.5 GiB	59 660 018
22	drop	forward		leoiptunnel-Hafez					
23	drop	forward		leoiptunnel-Hazraty					
24	drop	forward		leoiptunnel-Hazraty					
25	drop	forward		leoiptunnel-Kamyab					
26	drop	forward		leoiptunnel-Kamyab					
27	drop	forward		leoiptunnel-Modarres					
28	drop	forward		leoiptunnel-Modarres					
29	drop	forward		leoiptunnel-Modarres					
30	drop	forward		leoiptunnel-Pishahang					
31	drop	forward		leoiptunnel-Malabad					
32	drop	forward		leoiptunnel-Akbarabad					
33	drop	forward		!Valiasr>SDH>Shahrak Sanati					
34	drop	forward		leoiptunnel-Malabad					
35	drop	forward		leoiptunnel-Malabad					
36	drop	forward		leoiptunnel-Malabad					
37	drop	forward		leoiptunnel-Malabad					
38	drop	forward		leoiptunnel-Malabad					
39	drop	forward		leoiptunnel-Azadegan					
40	drop	forward		leoiptunnel-Azadegan					
41	drop	forward		leoiptunnel-Azadegan					
42	drop	forward		leoiptunnel-Salman					
43	drop	forward		leoiptunnel-Salman					
44	drop	forward		leoiptunnel-Salman					
45	drop	forward		leoiptunnel-Salman					
46	drop	forward		leoiptunnel-Salman					
47	drop	forward		leoiptunnel-Sadieh					
48	drop	forward		leoiptunnel-Sadieh					
49	drop	forward		leoiptunnel-Iman					
50	drop	forward		leoiptunnel-Iman					
51	drop	forward		leoiptunnel-Iman					
52	drop	forward		leoiptunnel-Vesal					
53	drop	forward		leoiptunnel-Kazeroun-Qandi					
54	drop	forward		leoiptunnel-Kazeroun-Qandi					
55	drop	forward		leoiptunnel-Kazeroun-Salman					
56	drop	forward		leoiptunnel-Kazeroun-Salman					
57	drop	forward		leoiptunnel-Marvdasht-Kowsar					

Bridge Filter Rule <>

General Advanced ARP STP Action Statistics

Chain: forward

In. Interface: leoiptunnel-Pishahang

Out. Interface: leoiptunnel-Pishahang

MAC Protocol-Num: 8100 (vlan)

enabled

Bridge Filter Rule <>

General Advanced ARP STP Action Statistics

Action: drop

Log

Log Prefix:

enabled

1

2

3

Providing “IP Pool” for PPPOE Clients

RouterOS WinBox

Session Settings Dashboard

Safe Mode Session: 89.165.56.10 CPU: 0% Memory: 223.9 MB Uptime: 25d 00:12:28

Core MikroTik

The screenshot displays the MikroTik WinBox interface. On the left, a sidebar menu lists various system settings, with 'Pool' highlighted under the 'IP' category. A red arrow points from this menu item to a configuration dialog box titled 'IP Pool <pool1>'. This dialog box has two tabs: 'Pools' and 'Used Addresses'. The 'Pools' tab is active, showing a table with columns for Name, Addresses, and Next Pool. A red arrow also points to the 'Add' (+) button in the top left of the dialog. Below the table, a smaller dialog box is open, showing the configuration for a new pool: Name: PPPOE_POOL, Addresses: 89.165.56.30-89.165.56.250, and Next Pool: none. The status bar at the bottom of the dialog indicates '5 items (1 selected)'.

Creating "PPP Profile" for PPPOE Connections

RouterOS WinBox

Session Settings Dashboard

Safe Mode Session: 89.165.56.10 CPU: 5% Memory: 223.9 MB Uptime: 25d 00:18:07

Core Mikrotik

PPP

Interface PPPoE Servers Secrets Profiles Active Connections L2TP Secrets

Name / Local Address Remote Address Bridge Rate Limit... Only One

New PPP Profile

General Protocols Limits Queue Scripts

Name: PPPOE_Profile

Local Address: 89.165.56.1

Remote Address: PPPOE_POOL

Bridge: []

Bridge Port Priority: []

Bridge Path Cost: []

Incoming Filter: []

Outgoing Filter: []

Address List: []

DNS Server: 89.165.56.20

WINS Server: []

- Change TCP MSS
 no yes default

- Use UPnP
 no yes default

OK Cancel Apply Comment Copy Remove

New PPP Profile

General Protocols Limits Queue Scripts

- Use MPLS
 no yes required default

- Use Compression
 no yes default

- Use Encryption
 no yes required default

OK Cancel Apply Comment Copy Remove

Creating “PPP Secret” for PPPOE Clients

RouterOS WinBox

Session Settings Dashboard

Safe Mode Session: 89.165.56.10 CPU: 2% Memory: 223.9 MB Uptime: 25d 00:39:41

Core MikroTik

PPP

Interface PPPoE Servers Secrets Profiles Active Connections LZTP Secrets

PPP Authentication & Accounting

Name	Password	Service	Caller ID	Profile	Local Address	Remote Address	Last Logged Out
------	----------	---------	-----------	---------	---------------	----------------	-----------------

New PPP Secret

Name: ptaabodi

Password: *****

Service: any

Caller ID:

Profile: PPPOE_Profile

Local Address:

Remote Address:

Routes:

Limit Bytes In:

Limit Bytes Out:

Last Logged Out:

enabled

OK Cancel Apply Disable Comment Copy Remove

Enable & Configuring PPPOE Server

Session Settings Dashboard

Safe Mode Session: 00:0C:29:B4:C9:F3

Core MikroTik

RouterOS WinBox

Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Mesh
IP
MPLS
Routing
System
Queues
Files
Log
Radius
Tools
New Terminal
Make Supout.rif
Manual
New WinBox
Exit

PPP

Interface PPPoE Servers Secrets Profiles Active Connections L2TP Secrets

Service ...	Interface	Max MTU	Max MRU	MRRU	Default Profile	Authentication
0 items						

New PPPoE Service

Service Name: PPPOE_Server

Interface: PPPOE_Bridge

Max MTU:

Max MRU:

MRRU:

Keepalive Timeout: 10

Default Profile: PPPOE_Profile

One Session Per Host

Max Sessions:

PADO Delay: ms

Authentication: mschap2 mschap1
 chap pap

OK
Cancel
Apply
Disable
Copy
Remove

enabled

Conclusion

- *You have L3-Communication on Branches...*
- *Clients have Internet access by a PPPOE Client Connection*

The screenshot displays a Windows desktop environment with several open windows:

- Command Prompt (C:\WINDOWS\system32\cmd.exe):** Two windows showing successful ping tests. The first window shows a ping to 8.8.8.8 with 4 successful replies and a 0% loss rate. The second window shows a ping to 172.27.119.5 with 4 successful replies and a 0% loss rate.
- Ethernet Status:** A window showing the general status of the Ethernet connection, indicating that IPv4 and IPv6 connectivity are not available.
- Network Connection Details:** A window showing the details of the network connection, including the physical address (BC-EE-7B-01-47-6B), IPv4 address (172.27.116.5), and other network parameters.
- Windows Security Sign in:** A dialog box prompting the user to sign in with the username 'ptaabodi'.
- Settings:** The Windows Settings application is open, showing the 'Network & Internet' section.

The desktop background features a blue and white abstract design. The ASUS logo is visible in the bottom right corner of the desktop.

Any Questions?

Thank You!



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ptaabodi@hotmail.com