

nic.br

Núcleo de Informação
e Coordenação do
Ponto BR

cgi.br

Comitê Gestor da
Internet no Brasil



registro.br cert.br cetic.br ceptro.br ptt.br

The background of the slide is a dark gray circuit board pattern with white lines representing traces and components. The top and bottom sections of the slide feature this pattern, while the middle section is a solid light gray gradient.

IPv6 na última milha com PPPoE

ceptro.br nic.br egi.br

Agenda

- Motivação
- PPPoE
- SLAAC
- DHCPv6-PD
- Experimento

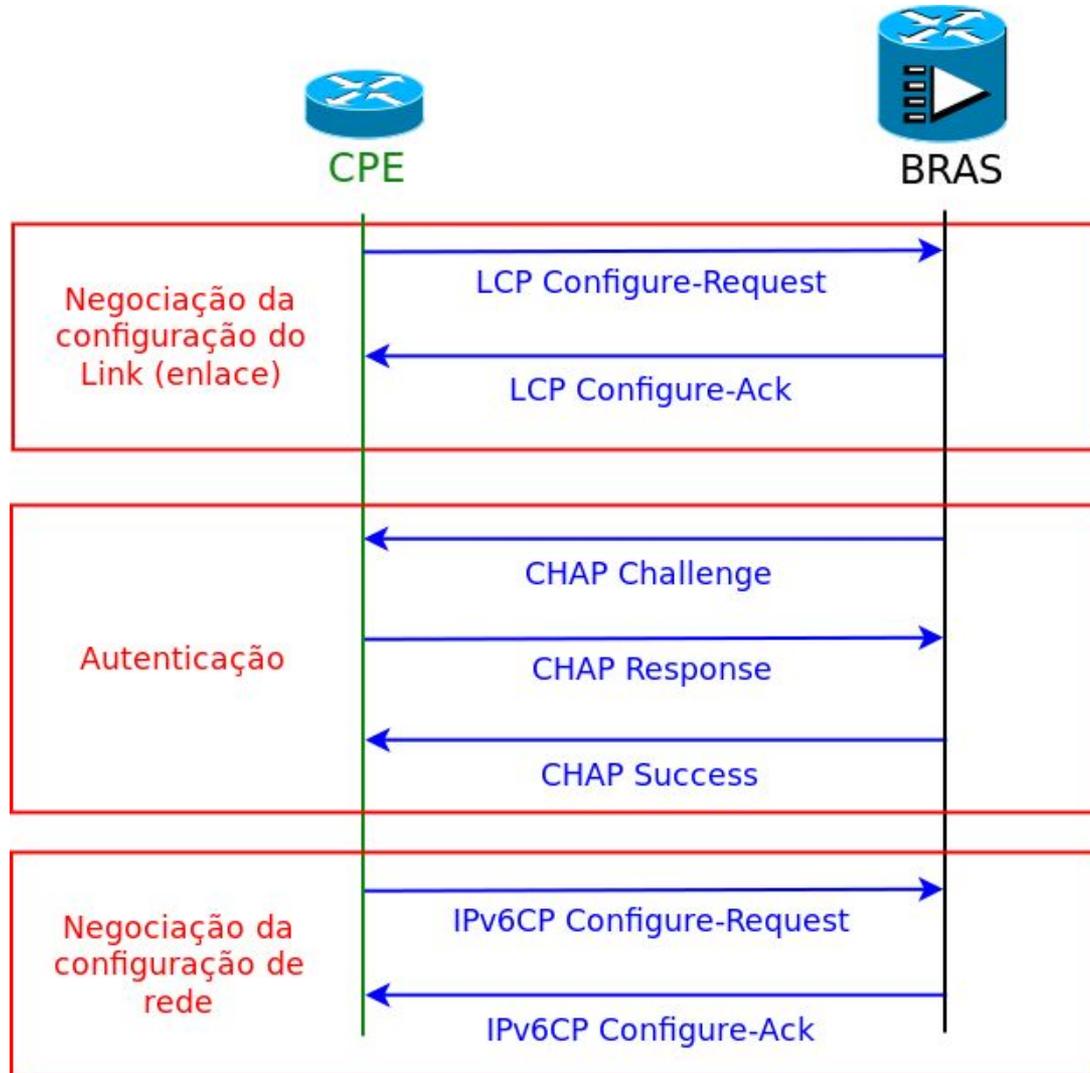
Motivação

- Esgotamento dos endereços IPv4
- Incentivar a implantação de IPv6
- Assunto muito procurado pelos alunos do curso IPv6
- Aprender mais sobre o estado da arte da implementação das soluções em IPv6

PPPoE

- *Point-to-Point Protocol over Ethernet*
- Etapas para conectividade
 - Estabelecimento de link
 - *Link Control Protocol (LCP)*
 - Autenticação
 - *Challenge Authentication Protocol (CHAP)*
 - *Password Authentication Protocol (PAP)*
 - Configuração da camada de rede
 - *Network Control Protocol (NCP) - IPCP e IPv6CP*

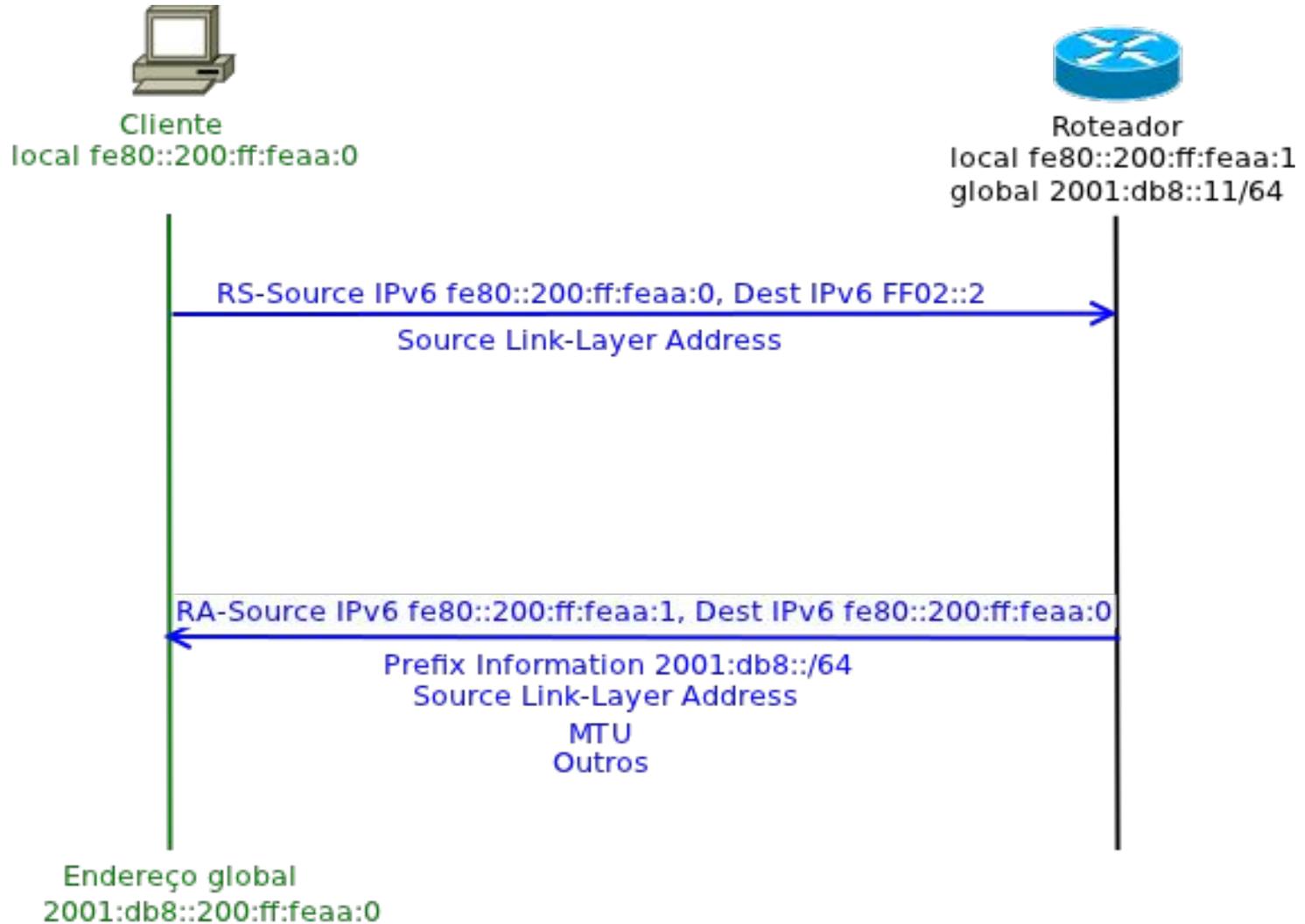
PPPoE



SLAAC

- *StateLess Address AutoConfiguration*
- Utiliza mensagens ICMPv6
- Neighbor Discovery Protocol (NDP)
 - Router Solicitation (RS)
 - Router Advertisement (RA)
 - Flags
 - Prefix Information

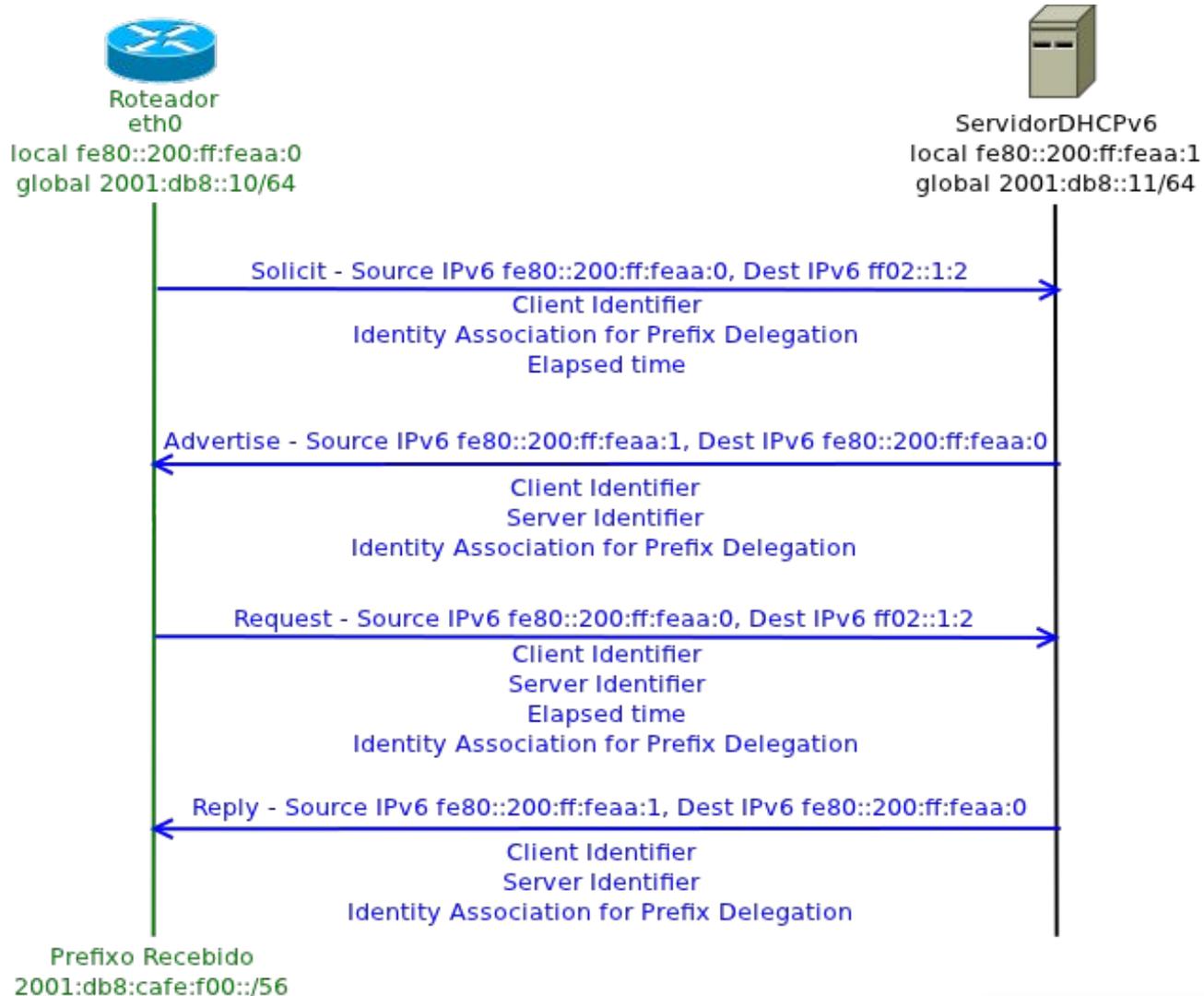
SLAAC



DHCPv6-PD

- *Dynamic Host Configuration Protocol - prefix delegation*
- Stateful
- Mesmas mensagens do DHCPv6
 - 4 mensagens básicas
 - Solicit
 - Advertise
 - Request
 - Reply
 - Adicionado “Identity Association for Prefix Delegation”

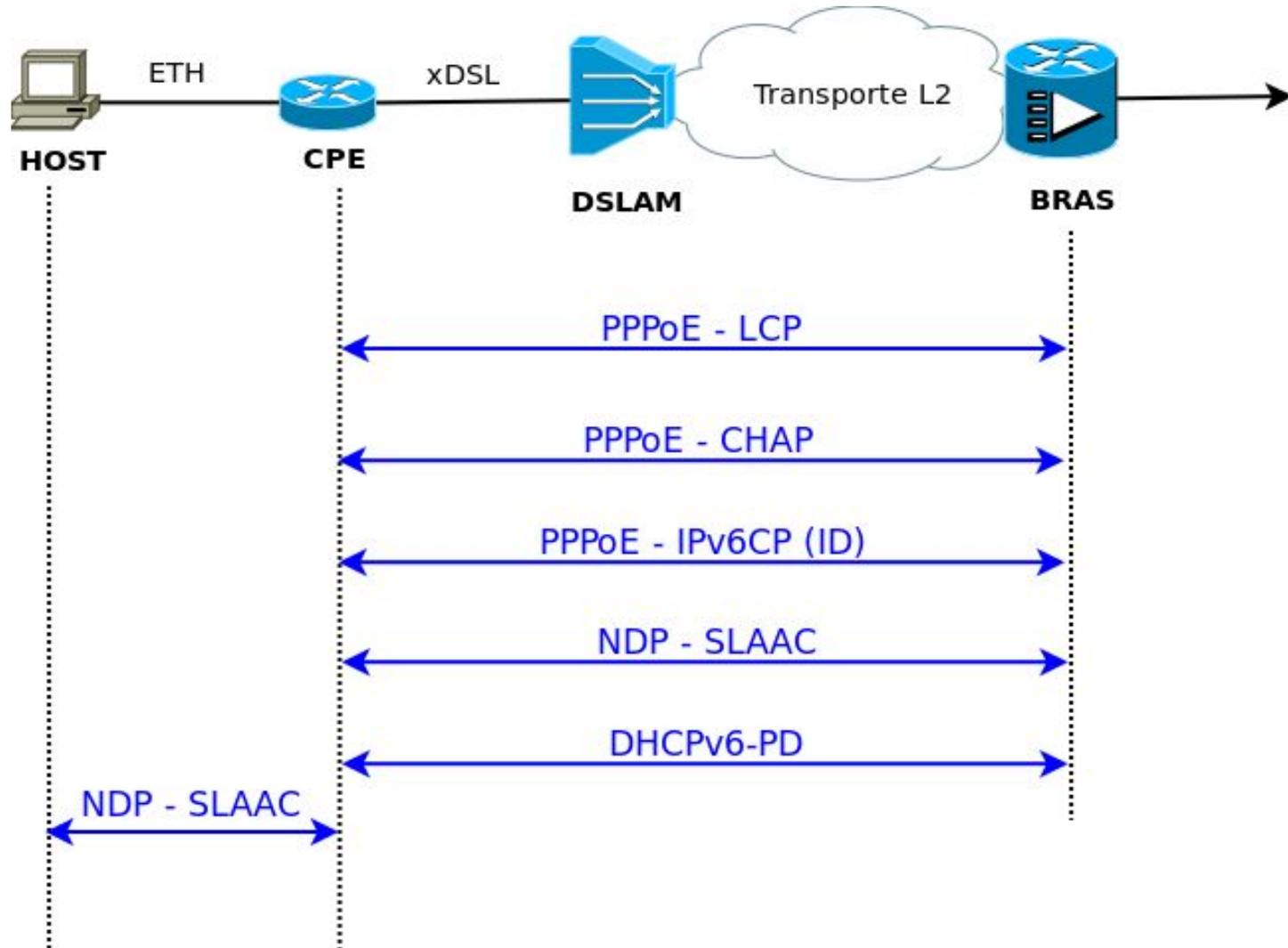
DHCPv6-PD



Experimento

- Tipos de implementação
 - SLAAC (**WAN**) + DHCPv6-PD (**LAN**)
 - DHCPv6 Stateful (**WAN**) + DHCPv6-PD (**LAN**)
- Recomendação
 - Utilizar endereços globais
 - WAN side: /64 para cada cliente
 - LAN side: /56 para cada cliente (DHCP-PD)
 - 1 /44 has 4.096 /56
 - 1 /40 has 65.536 /56
 - 1 /36 has 1.048.576 /56

Experimento



Experimento

- Equipamentos
 - **BRAS** - Mikrotik RB433 - v6.38.7
 - **CPE** - TP-Link TL-WR1043ND - Chaos Calmer 15.05.1
 - **Host** - Notebook Linux - Ubuntu 14.04

Experimento

- Topologia



BRAS

RouterOS WinBox

IPv6 Pool

Pools Used Prefixes

Name	Prefix	Prefix Length	Expire Time
poolV6LAN	2001:db8:c01a::/48		56
poolV6WAN	2001:db8:c0ca::/48		64

2 items

BRAS

The screenshot shows the RouterOS WinBox interface. On the left is a sidebar with various configuration categories, with 'PPP' highlighted in a red box. The main window displays the 'PPP' configuration page, with the 'Profiles' tab selected. A table lists three profiles: 'default', 'default-encr.', and 'pppoe_v6'. The 'pppoe_v6' profile is selected and highlighted in blue. To the right, a 'PPP Profile <pppoe_v6>' dialog box is open, showing configuration options. The 'General' tab is active, and 'Remote IPv6 Prefix Pool' and 'DHCPv6 PD Pool' are highlighted in red. The 'Remote IPv6 Prefix Pool' is set to 'poolV6WAN' and the 'DHCPv6 PD Pool' is set to 'poolV6LAN'. Other fields include Name (pppoe_v6), Local Address (10.0.0.1), Remote Address (poolv4), Bridge, Bridge Port Priority, Bridge Path Cos, Incoming Filter, Outgoing Filter, Address List, DNS Server (0.0.0.0), and WINS Server. At the bottom of the dialog, there are radio buttons for 'Change TCP MSS' (no, yes, default) and 'Use UPnP' (no, yes, default). The status bar at the bottom indicates '3 items (1 selected)'.

Name	Local Address	Remote Address	Bridge	Rate Limit	Only One
default					default
default-encr.					default
pppoe_v6	10.0.0.1	poolv4			default

PPP Profile <pppoe_v6>

General Protocols Limits Queue Scripts

Name: pppoe_v6

Local Address: 10.0.0.1

Remote Address: poolv4

Remote IPv6 Prefix Pool: poolV6WAN

DHCPv6 PD Pool: poolV6LAN

Bridge: []

Bridge Port Priority: []

Bridge Path Cos: []

Incoming Filter: []

Outgoing Filter: []

Address List: []

DNS Server: 0.0.0.0

WINS Server: []

- Change TCP MSS
 no yes default

- Use UPnP
 no yes default

3 items (1 selected)

BRAS

RouterOS WinBox

PPP

Interface PPPoE Servers Secrets Profiles Active Connections L2TP Secrets

Name	Local Address	Remote Address	Bridge	Rate Limit	Only One
default					default
default-encr.					default
pppoe_v6	10.0.0.1	poolv4			default

PPP Profile <pppoe_v6>

General Protocols Limits Queue Scripts

- Use IPv6
 no yes required default

- Use MPLS
 no yes required default

- Use Compression
 no yes default

- Use Encryption
 no yes required default

3 items (1 selected)

BRAS

RouterOS WinBox

PPP

Interface PPPoE Servers **Secrets** Profiles Active Connections L2TP Secrets

PPP Authentication&Accounting

Name	Password	Service	Caller ID	Profile	Local Address	Remote Address	Last Logged Out
ipv6Seg...	*****	pppoe		pppoe_v6			Jan/01/2002 05:00:07

PPP Secret <ipv6Segredo>

Name: ipv6Segredo
Password: *****
Service: pppoe
Caller ID:
Profile: pppoe_v6

Local Address:
Remote Address:
Remote IPv6 Prefix:
Routes:
Limit Bytes Ir:
Limit Bytes Out:
Last Logged Ou: Jan/01/2002 05:00:07

enabled

1 item (1 selected)

BRAS

RouterOS WinBox

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- IPv6
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- MetaROUTER
- Partition
- 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 Pro...	Authentication
service1	ether2	1480	1480		pppoe_v6	chap pap

PPPoE Service <service1>

Service Name: service1

Interface: ether2

Max MTU: 1480

Max MRU: 1480

MRRU:

Keepalive Timeout: 10

Default Profile: pppoe_v6

One Session Per Host

Max Sessions:

PADO Delay: ms

Authentication: mschap2 mschap1 chap pap

enabled

Buttons: OK, Cancel, Apply, Disable, Copy, Remove

1 item (1 selected)

Common Configuration

General Setup

Advanced Settings

Physical Settings

Firewall Settings

Status



pppoe-wan6

Uptime: 0h 17m 12s

RX: 60.85 KB (652 Pkts.)

TX: 61.26 KB (936 Pkts.)

IPv4: 10.0.0.255/32

IPv6: 2001:db8:c0ca:0:814f:7b24:4aed:8aac/64

CPE

Protocol

PPPoE ▾

PAP/CHAP username

ipv6Segredo

PAP/CHAP password

....



Access Concentrator

auto

Leave empty to autodetect

Service Name

auto

Leave empty to autodetect

DHCP Server

[General Setup](#)[Advanced Settings](#)[IPv6 Settings](#)

Router Advertisement-Service	server mode ▾
DHCPv6-Service	server mode ▾
NDP-Proxy	disabled ▾
DHCPv6-Mode	stateless + stateful ▾

Always announce default router

 Announce as default router even if no public prefix is available.

Announced DNS servers

Announced DNS domains

CPE

Interfaces

Interface Overview

CPE

Network	Status	Actions
LAN  br-lan	Uptime: 0h 19m 49s MAC-Address: 30:B5:C2:4C:15:28 RX: 508.92 KB (5507 Pkts.) TX: 903.70 KB (5127 Pkts.) IPv4: 192.168.1.1/24 IPv6: 2001:db8:c01a::1/64	 Connect  Stop  Edit  Delete
WAN  pppoe-wan	RX: 0.00 B (0 Pkts.) TX: 0.00 B (0 Pkts.)	 Connect  Stop  Edit  Delete
WAN6  pppoe-wan6	Uptime: 0h 19m 41s RX: 66.13 KB (708 Pkts.) TX: 64.96 KB (992 Pkts.) IPv4: 10.0.0.255/32 IPv6: 2001:db8:c0ca:0:814f:7b24:4aed:8aac/64	 Connect  Stop  Edit  Delete

 Add new interface...

Linux

```
6: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether c4:e9:84:dd:6f:a9 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.119/24 brd 192.168.1.255 scope global eth2
        valid_lft forever preferred_lft forever
    inet6 2001:db8:c01a:0:a907:185b:5869:fbac/64 scope global temporary dynamic
        valid_lft 257910sec preferred_lft 85799sec
    inet6 2001:db8:c01a:0:c6e9:84ff:fedd:6fa9/64 scope global tentative dynamic
        valid_lft 257910sec preferred_lft 231990sec
    inet6 fe80::c6e9:84ff:fedd:6fa9/64 scope link
        valid_lft forever preferred_lft forever
```

Conclusão

- IPv6 pode ser implantado utilizando um servidor PPPoE no Mikrotik
- Informar features faltando e bugs para a equipe de desenvolvimento do equipamento
- Acompanhar os changelogs

Dúvidas?

