



IX FÓRUM REGIONAL

Incentivando o diálogo sobre os
Pontos de Troca de Tráfego Internet

GOIÂNIA

IPV6



PROVEDOR

Cleber Aguiar



Encontro dos Sistemas
Autônomos da
Internet no Brasil

Certifico para os devidos fins que

Cleber Aguiar Costa

participou do **IX(PTT) Fórum Regional - Encontro dos Sistemas Autônomos da Internet no Brasil**, realizado no dia 28 de abril de 2017, com carga horária de 8 horas, sob a organização do Núcleo de Informação e Coordenação do Ponto BR (NIC.br) e do Comitê Gestor da Internet no Brasil (CGI.br).

Brasília, 28 de abril de 2017

A rectangular box containing a handwritten signature in black ink, which appears to read "Antonio Marcos Moreiras".

Antonio Marcos Moreiras
Comissão Organizadora

ix.br nic.br cgi.br

Capacitação

ceptro.br

Boas Práticas Operacionais para
Sistemas Autônomos

CERTIFICAMOS para os devidos fins que

Cleber Aguiar Costa

participou do curso **Boas Práticas Operacionais para Sistemas Autônomos**, realizado de 24 a 27 de abril de 2017, com carga horária de 32 horas, sob a organização do Centro de Estudos e Pesquisas em Tecnologias de Redes e Operações (CEPTRO.br) do Núcleo de Informação e Coordenação do Ponto BR (NIC.br).

São Paulo, 28 de abril de 2017.



Coordenador do Curso

ceptro.br nic.br cgi.br

The MikroTik logo features the word "MikroTik" in a brown, sans-serif font. The "i" in "Mikro" has a small, curved line above it, resembling a stylized bird or a signal. The "T" in "Tik" is bold and has a horizontal bar that is slightly offset to the right.

MikroTik

Cleber Aguiar Costa

having successfully completed the appropriate training and certification requirements, is hereby recognised as a MikroTik certified

MTCIPv6E

1806IPv6E2884

14-06-2018

Valid for three years since issue. Validate the authenticity of this document at <https://www.mikrotik.com/certificates/>
Issued by MikroTiks SIA, Brivibas gatve 214A, Riga, Latvia

Comparativo IPv6 VS IPv4

Decimal, Binário

IPv4 32 bits

| | | | | | | | |
|-----------|-----------|----------|-----------|---|---|---|---|
| 192 | 168 | 0001 | 254 | | | | |
| 1100 0000 | 1010 1000 | 00000001 | 1111 1110 | | | | |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

2^{32} 4.294.967.296 Quantidade de IPV4

(Quatro bilhões,duzentos e novena e quatro milhões,novecentos e sessenta e sete mil,duzentos e noventa e seis)

IPv6

2^{128}

3,4028236692093846346337460743177e+38

340 282 366 920 938 463 463 374 607 431 770 000 000

convertido

Trezentos e quarenta undecillion, duzentos e oitenta e dois decillion, trezentos e sessenta e seis nonillion, novecentos e vinte octillion, novecentos e trinta e oito setecentos, quatrocentos e sessenta e três sextillion, quatrocentos e sessenta e três quintilhão, trezentos e setenta e quatro quatrilhões, seiscentos e sete trilhões, quatrocentos e trinta e um bilhões, setecentos e setenta milhões

<http://tulengua.es/numeros-texto/default.aspx>

Sub-redes 2001: db8 :: / 32 em / 34

$$34 - 32 = 2$$

$2^2 = 4$ Fornece 4 sub-redes /34

- 0000 = 0
- 0001 = 1
- 0010 = 2
- 0011 = 3
- 0100 = 4
- 0101 = 5
- 0110 = 6
- 0111 = 7
- 1000 = 8
- 1001 = 9
- 1010 = A
- 1011 = B
- 1100 = C
- 1101 = D
- 1110 = E
- 1111 = F

2001: 0db8: 0000: 0000: 0000: 0000: 0000:

0000 / 32

0000 0000 0000 0000

0000

0100

1000

1100

2001: db8 :: / 34

2001: db8: 4000 :: / 34

2001: db8: 8000 :: / 34

2001: db8: c000 :: / 34

Sub-redes 2001: db8 :: / 34 em / 37

$$37 - 34 = 3$$

$2^3 = 8$ Fornece 8 sub-redes /37

2001: 0db8: 0000: 0000: 0000: 0000:

0000/34
0000/34

0000000000000000

0000 0000 = 2001: db8 :: / 37

0000 1000 = : d2001b8: 800 :: / 37

0001 0000 = 2001: db8: 1000 :: / 37

0001 1000 = 2001: db8: 1800 :: / 37

0010 0000 = 2001: db8: 2000 :: / 37

0010 1000 = 2001: db8: 2800 :: / 37

0011 0000 = 2001: db8: 3000 :: / 37

0011 1000 = 2001: db8: 3800 :: / 37

0000 = 0

0001 = 1

0010 = 2

0011 = 3

0100 = 4

0101 = 5

0110 = 6

0111 = 7

1000 = 8 000

1001 = 9 001

1010 = A 010

1011 = B 011

1100 = C 100

1101 = D 101

1110 = E 110

1111 = F 111

Sub-redes 2001: db8 :: / 37 em / 40

$$40 - 37 = 3$$

$2^3 = 8$ Fornece 8 sub-redes /40

2001: 0db8: 0000: 0000: 0000: 0000:

0000/34 bits

0000000000000000

- 0000 = 0
- 0001 = 1
- 0010 = 2
- 0011 = 3
- 0100 = 4
- 0101 = 5
- 0110 = 6
- 0111 = 7
- 1000 = 8
- 1001 = 9
- 1010 = A
- 1011 = B
- 1100 = C
- 1101 = D
- 1110 = E
- 1111 = F

- 000
- 100
- 010
- 011
- 100
- 101
- 110
- 111

0000 = 2001: db8 :: / 40

0001 = 2001: db8: 100 :: /

0010 = 2001: db8: 200 :: /

0011 = 2001: db8: 300 :: /

0100 = 2001: db8: 400 :: /

0101 = 2001: db8: 500 :: /

0110 = 2001: db8: 600 :: /

0111 = 2001: db8: 700 :: / 40

Sub-redes 2001: db8 :: / 40 em / 44

$$44 - 40 = 4$$

$$2^4 = 16$$

Fornece 16 sub-redes /44

2001: 0db8: 0000: 0000: 0000: 0000:

0000 / 34 bits

0000000000000000

- 0000 = 0
- 0001 = 1
- 0010 = 2
- 0011 = 3
- 0100 = 4
- 0101 = 5
- 0110 = 6
- 0111 = 7
- 1000 = 8
- 1001 = 9
- 1010 = A
- 1011 = B
- 1100 = C
- 1101 = D
- 1110 = E
- 1111 = F

- 0000 = 2001:db8::/44
- 0001 = 2001:db8:10::/44
- 0010 = 2001:db8:20::/44
- 0011 = 2001:db8:30::/44
- 0100 = 2001:db8:40::/44
- 0101 = 2001:db8:50::/44
- 0110 = 2001:db8:60::/44
- 0111 = 2001:db8:70::/44
- 1000 = 2001:db8:80::/44
- 1001 = 2001:db8:90::/44
- 1010 = 2001:db8:a0::/44
- 1011 = 2001:db8:b0::/44
- 1100 = 2001:db8:c0::/44
- 1110 = 2001:db8:d0::/44
- 1101 = 2001:db8:e0::/44
- 1111 = 2001:db8:f0::/44

Global unicast 2000::/3

IP público

Link local fe80::/10
Multicast ff00::/8
Unique local fc00::/7

Auto assinado 169.254.0.0/16
Grupo multicast 224.0.0.0/4
IP Privado 192.168.0.0/16

::/10

0:0:0:0:0:0:0:0/0

Default gateway

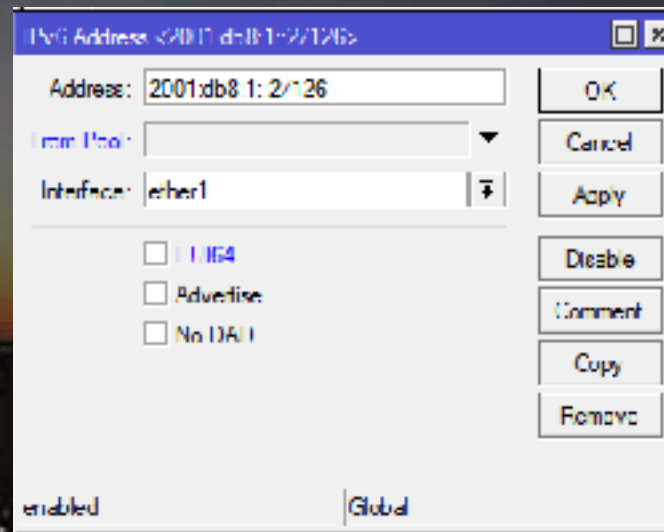
gateway default, DST 2000::/3

Ativar Pacote IPv6

The screenshot shows the Mikrotik WinBox interface. On the left is a sidebar menu with categories like MPLS, Routing, System, Quina, Rina, Log, Radius, Tools, New Terminal, Make Snapshot, Manual, New WinBox, and File. A sub-menu is open under 'System', listing options such as Auto Upgrade, Certificates, Clock, Console, Drivers, History, Identity, IPRA, License, Logging, Packages, and Resources. The 'Packages' option is selected, opening a 'Package List' window. This window has a toolbar with buttons for 'Check For Updates', 'Enable', 'Disable', 'Uninstall', 'Unschedule', 'Downgrade', 'Check Installation', and 'Find'. Below the toolbar is a table with columns for Name, Version, Build Time, and Scheduled. The 'ipv6' package is highlighted in blue.

| Name | Version | Build Time | Scheduled |
|--------------|---------|----------------------|-----------|
| mtk-rom-amp | 6.42.3 | May/24/2018 09:20:22 | |
| advanced-... | 6.42.3 | May/24/2018 09:20:22 | |
| JlUp | 6.42.3 | May/24/2018 09:20:22 | |
| hotspot | 6.42.3 | May/24/2018 09:20:22 | |
| ipv6 | 6.42.3 | May/24/2018 09:20:22 | |
| ip6 | 6.42.3 | May/24/2018 09:20:22 | |
| ppp | 6.42.3 | May/24/2018 09:20:22 | |
| routing | 6.42.3 | May/24/2018 09:20:22 | |
| security | 6.42.3 | May/24/2018 09:20:22 | |
| system | 6.42.3 | May/24/2018 09:20:22 | |
| wireless | 6.42.3 | May/24/2018 09:20:22 | |

/ipv6 address



IPv6 Address <2001:db8:1:2::1/126>

Address: 2001:db8:1:2::1/126

From Pool: [dropdown]

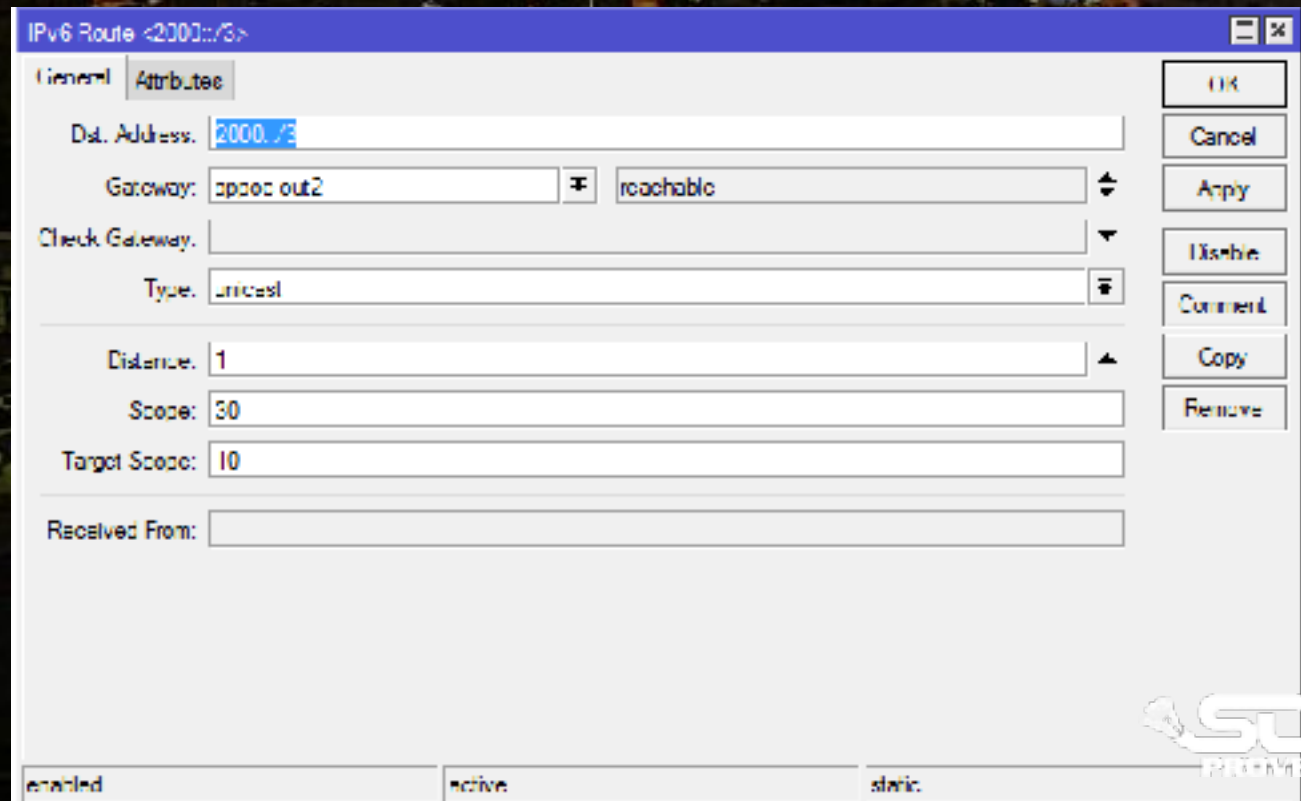
Interface: ether1

IPv6
 Advertise
 No DAAD

enabled Global

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

/ipv6 route



IPv6 Route <2000::/3>

General Attribute

Dest. Address: 2000::/3

Gateway: spono out2 reachable

Check Gateway: [dropdown]

Type: unicast

Distance: 1

Scope: 30

Target Scope: 10

Received From: [text box]

enabled active static

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

gateway

IPv6 Pool < IPv6 Pools >

Name: POOL PX

Prefix: 2001:db8:10::/52

Prefix Length: 64

Expire Time:

IPv6 Pool < IPv6 Pools >

Name: POOL PD

Prefix: 2001:db8::/44

Prefix Length: 66

Expire Time:

New PPP Profile

General Protocols Limits Queue Scripts

- Use IPv6 _____
 no yes required default

- Use MTU _____
 no yes required default

- Use Compression _____
 no yes default

- Use Encryption _____
 no yes required default

New PPP Profile

General Protocols Limits Queue Scripts

Name: profile

Local Address:

Remote Address:

Remote IPv6 Prefix Pool: POOL PX

DHCPv6 PD Pool: POOL PD

Bridge:

Bridge Port Priority:

Bridge Path Cost:

Bridge Horizon:

Incoming Filter:

Outgoing Filter:

Address List:

Interface List:

DNS Server:

WINS Server:

- Change TCP MSS _____
 no yes default

- Use UPnP _____
 no yes default

Client

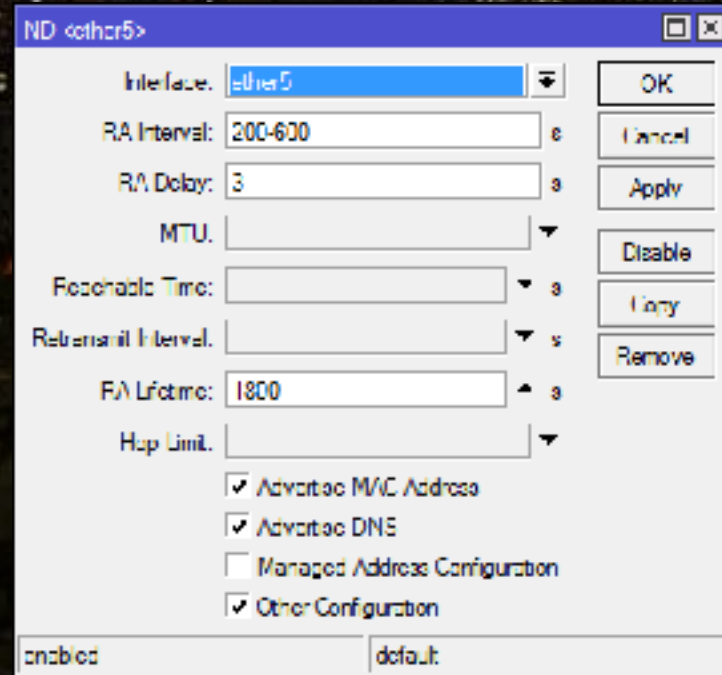
[http://\[2001:12ff:0:4::22\]/](http://[2001:12ff:0:4::22]/)

[http://\[2001:12ff:0:4::22\]:8080](http://[2001:12ff:0:4::22]:8080)

Neighbor Discovery

/ipv6 nd

- Protocolo Neighbor discovery (ND)
- Substitui o ARP do IPv4
- Rastreia e descobre outros hosts IPv6
- Capaz de configurar endereços de forma automática
- Utiliza o protocolo ICMPv6



Nome da POOL
ipv6 dhcp-client

IPv6 Client (pppoe-out1)

DHCP Advanced Status

Interface: pppoe-out1

Request: info address prefix

Pool Name: pool-2ipv6

Pool Prefix Length: 56

Prefix Link:

Use Peer DNS
 Add Default Route

enabled Status bound

OK
Cancel
Apply
Disable
Comment
Copy
Remove
Release
Renew

IPv6 Pool

Pools Used Prefixes

+ = T Find

| Name | Prefix | Prefix Length | Expire Time |
|------------|---|---------------|-------------|
| dhcp | 2001:2000:0000:0000:0000:0000:0000:0000 | 56 | 2d 12:16:45 |
| pool-2ipv6 | 2001:2000:0000:0000:0000:0000:0000:0000 | 56 | 2d 12:18:38 |

SLAAC

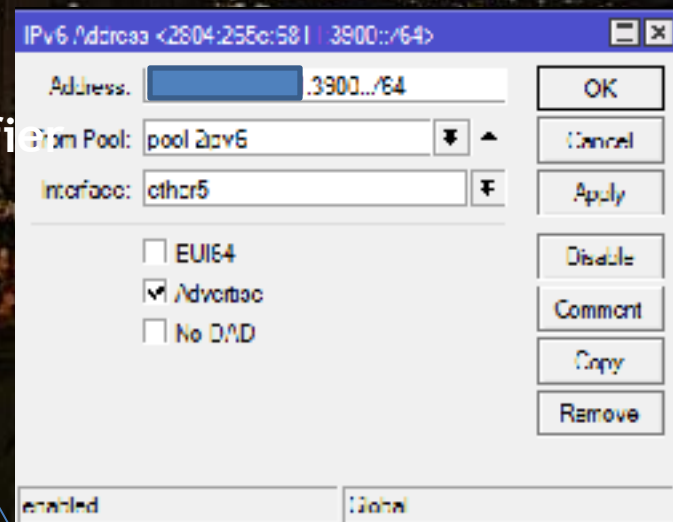
- Stateless Address AutoConfiguration
- Usa mensagens: router solicitation e router advertisement
- Solicita a um roteador
- Recebe o IP do router e configurações de endereçamento IP

64-bit Extended Unique Identifier

Habilite advertise

Marque a interface de saída

Busque a POOL



IPv6 Address <2804:255e:5811:3900::/64>

Address: [2804:255e:5811:3900::/64]

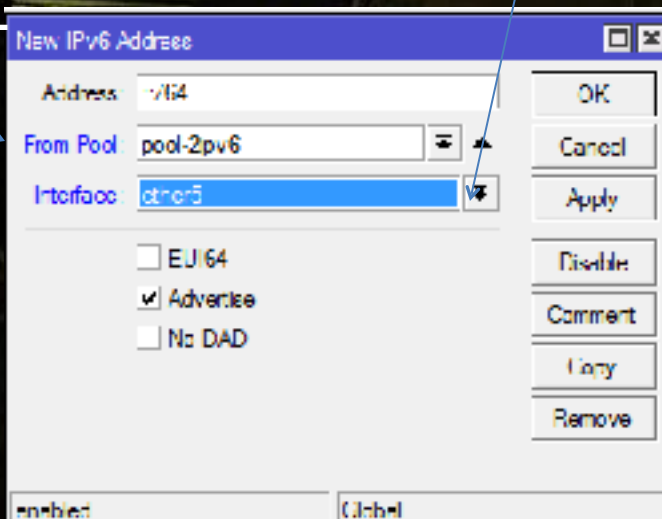
From Pool: pool-2pv6

Interface: ether5

EUI64
 Advertise
 No DAD

enabled [Label]

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



New IPv6 Address

Address: ::/64

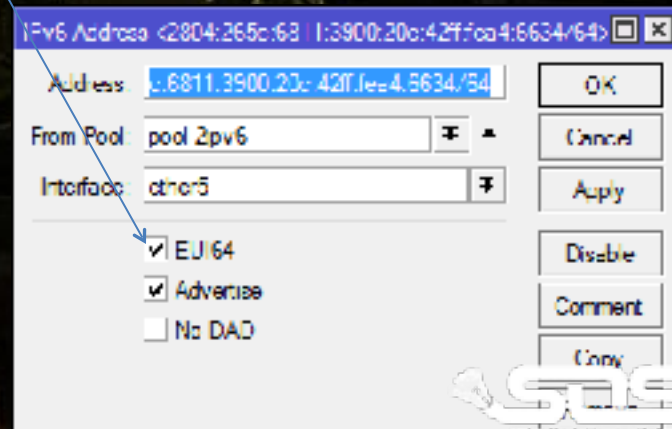
From Pool: pool-2pv6

Interface: ether5

EUI64
 Advertise
 No DAD

enabled [Label]

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



IPv6 Address <2804:265e:6811:3900:20c:42ff:foo4:6634/64>

Address: [2804:265e:6811:3900:20c:42ff:foo4:6634/64]

From Pool: pool-2pv6

Interface: ether5

EUI64
 Advertise
 No DAD

enabled [Label]

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

Detalhes da Conexão de Rede

Detalhes da Conexão de Rede:

| Propriedade | Valor |
|--------------------------|---|
| Máscara da Sub-rede IPv4 | 255.255.255.0 |
| Concessão Obtida | quinta-feira, 11 de julho de 2018 10:14 |
| Vencimento da Concessão | sexta-feira, 10 de agosto de 2018 03:14 |
| Gateway Padrão IPv4 | 10.0.0.1 |
| Servidor DHCP IPv4 | 10.0.0.1 |
| Servidores DNS IPv4 | 8.8.4.4 |
| Servidor WINS IPv4 | |
| NetBIOS sobre Topo H... | Sim |
| Endereço IPv6 | fe80::4475:58b6:815a:3001:4475:58b6:815a:3001 |
| Endereço IPv6 temporário | 3429:ad9b:62a:019 |
| Endereço IPv6 temporário | 300:3429:ad9b:62a |
| Endereço IPv6 link local | fe80::4475:58b6:815a:3001%11 |
| Gateway Padrão IPv6 | fe80::4475:58b6:815a:3001 |
| Servidor DNS IPv6 | |

Fechar



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