

Thiago Santos

Dual Stack / Pilha Dupla



M O G A
Telecom



solintel



VLSM

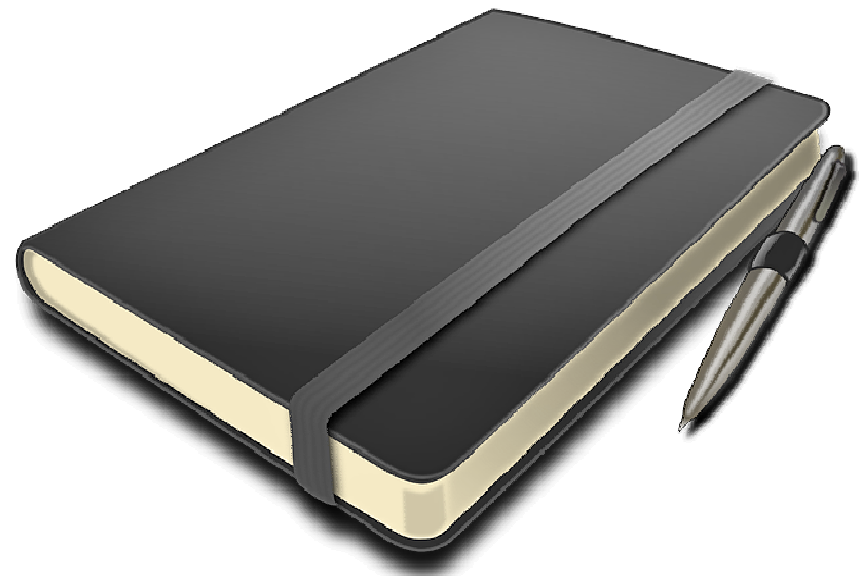
#juntosomosmais

Thiago Santos

- Graduando em Engenharia Elétrica com ênfase em Telecomunicações;
- 5 anos de experiência no mercado de telecomunicações;
- Experiência em redes HFC;
- Serviços de numeração ASN;
- Conhecimento regulatório para provedores.

Agenda

- ☐ Nivelamento IPv6;
- ☐ Protocolos utilizáveis na implementação;
- ☐ Apresentação laboratório prático.



Esgotamento IPv4

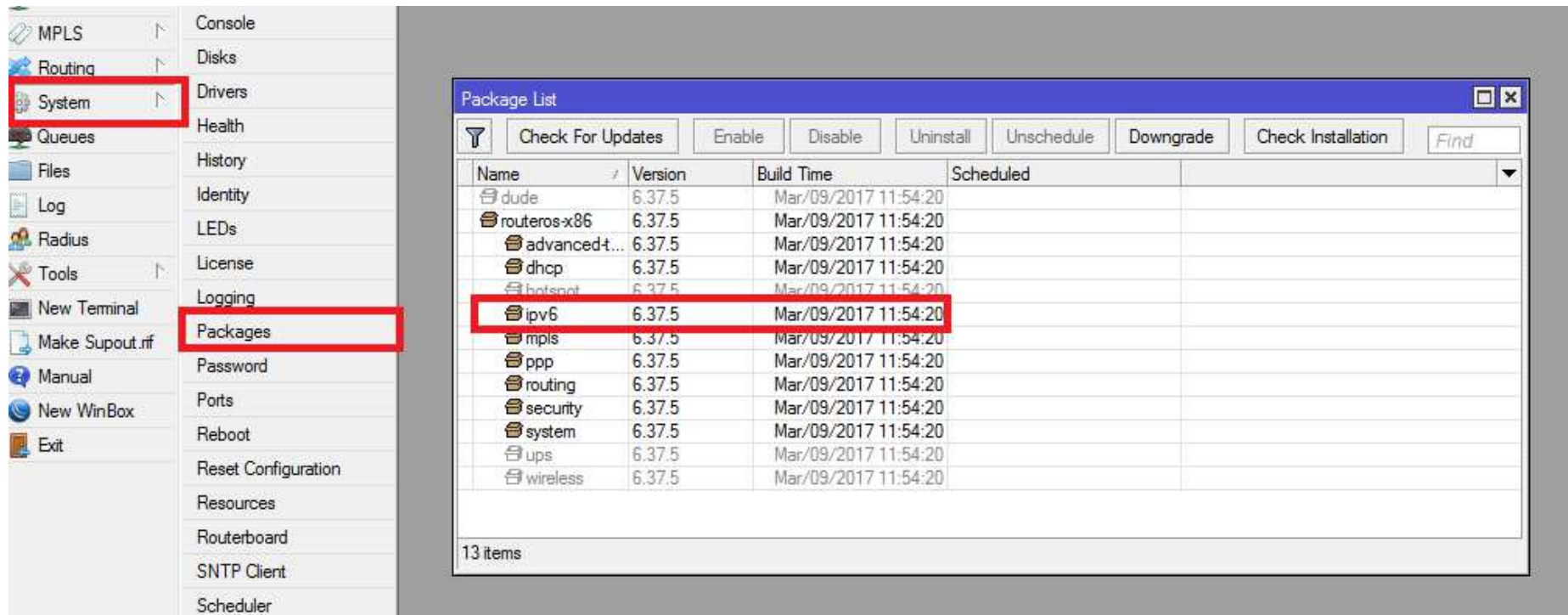


Um pouco sobre IPv6

- O IP versão 6 começou a ser desenvolvido no início da década de 1990, com o objetivo de ser a solução definitiva para o esgotamento de endereços IPs na Internet;
- O IPv6 aumentou o endereçamento IP de 32 para 128 bits.



IPv6 no Mikrotik RouterOS:

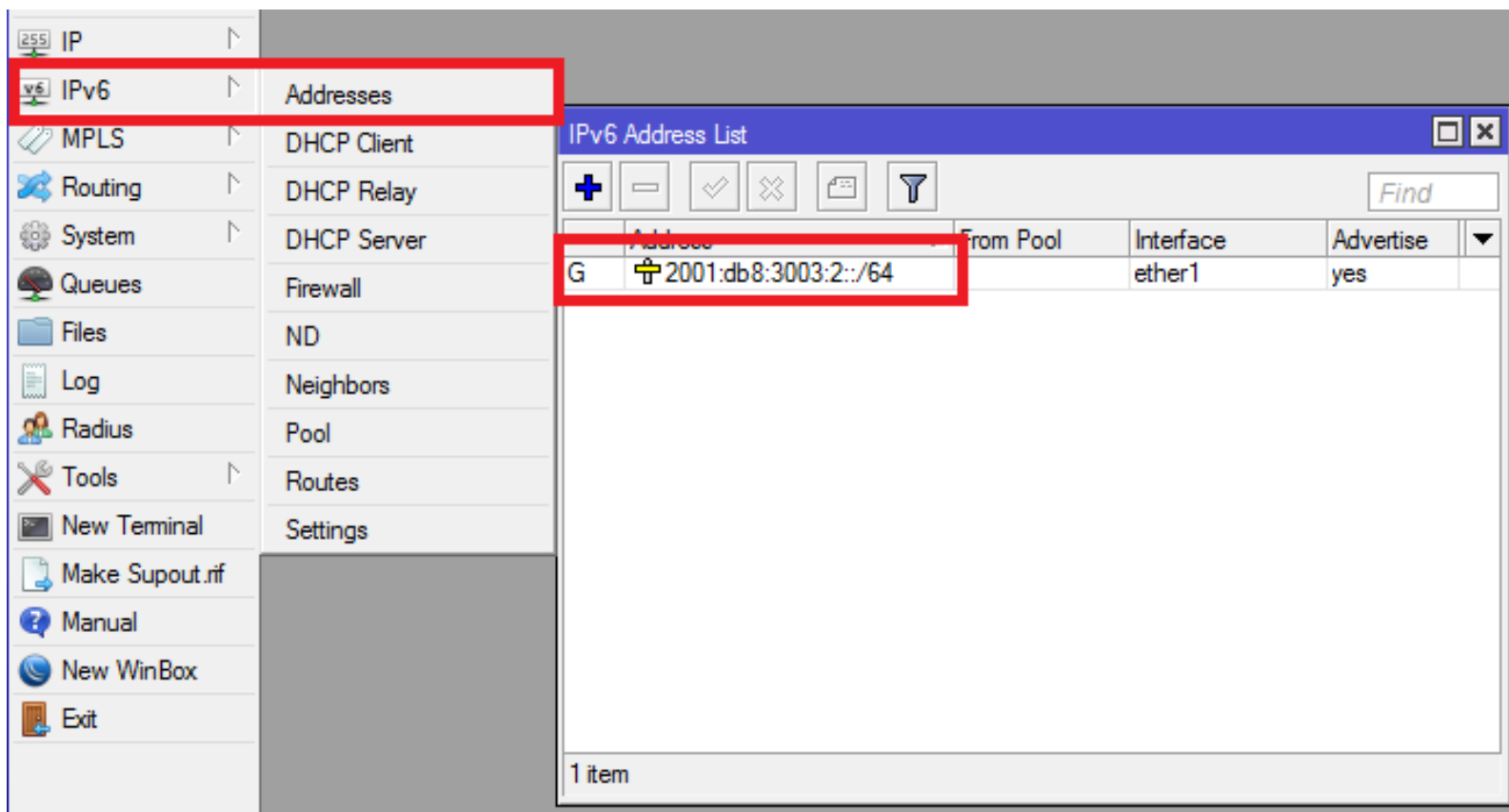


The screenshot shows the Mikrotik WinBox interface. On the left, the 'System' menu item is highlighted with a red box. Below it, the 'Packages' option is also highlighted with a red box. The main window displays the 'Package List' dialog, which contains a table of installed packages. The 'ipv6' package is highlighted with a red box in the table.

Name	Version	Build Time	Scheduled
dude	6.37.5	Mar/09/2017 11:54:20	
routeros-x86	6.37.5	Mar/09/2017 11:54:20	
advancedt...	6.37.5	Mar/09/2017 11:54:20	
dhcp	6.37.5	Mar/09/2017 11:54:20	
hotspot	6.37.5	Mar/09/2017 11:54:20	
ipv6	6.37.5	Mar/09/2017 11:54:20	
mpls	6.37.5	Mar/09/2017 11:54:20	
ppp	6.37.5	Mar/09/2017 11:54:20	
routing	6.37.5	Mar/09/2017 11:54:20	
security	6.37.5	Mar/09/2017 11:54:20	
system	6.37.5	Mar/09/2017 11:54:20	
ups	6.37.5	Mar/09/2017 11:54:20	
wireless	6.37.5	Mar/09/2017 11:54:20	

13 items

IPv6 no Mikrotik RouterOS:

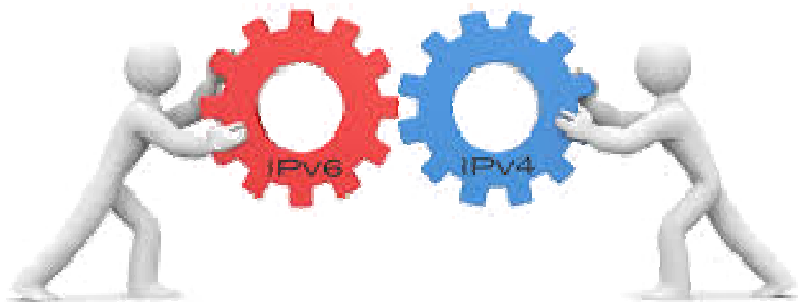
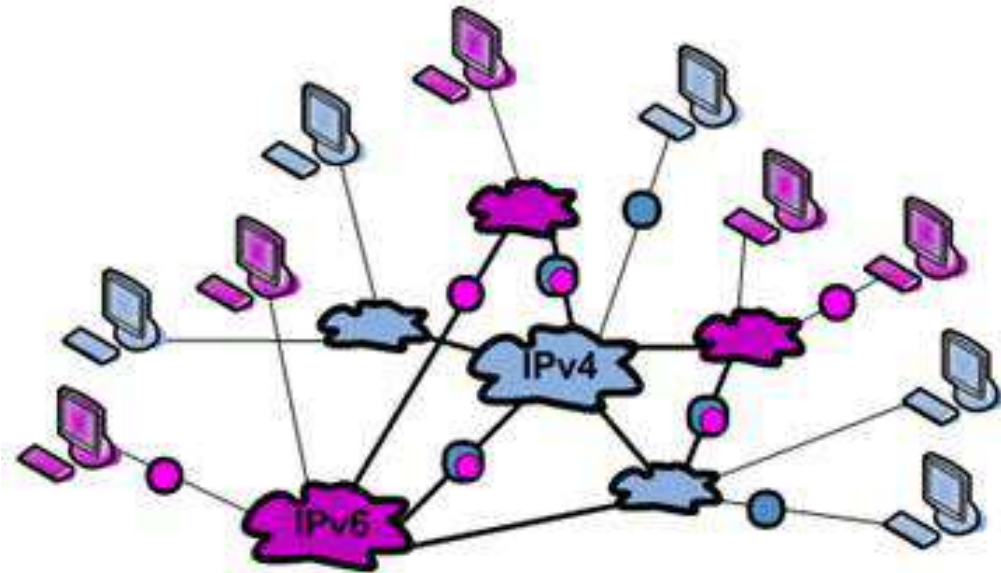


The screenshot shows the Mikrotik WinBox interface. In the left sidebar, the 'IP' category is expanded, and 'IPv6' is selected. The main window displays the 'IPv6 Address List' table. A red box highlights the 'IPv6' menu item in the sidebar, and another red box highlights the first row of the table.

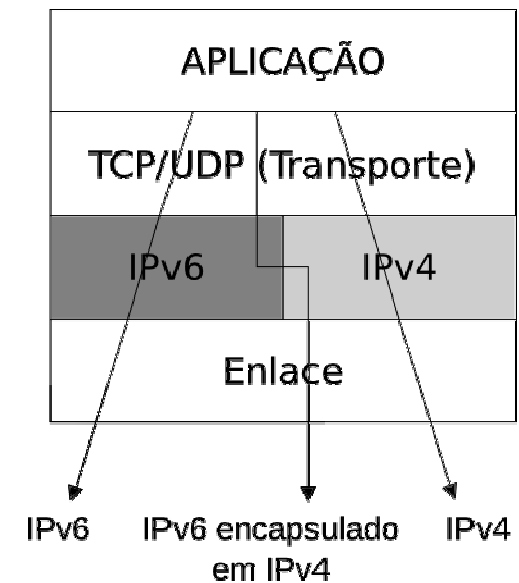
	Address	From Pool	Interface	Advertise
G	2001:db8:3003:2::/64		ether1	yes

1 item

O que é pilha dupla (Dual Stack)?



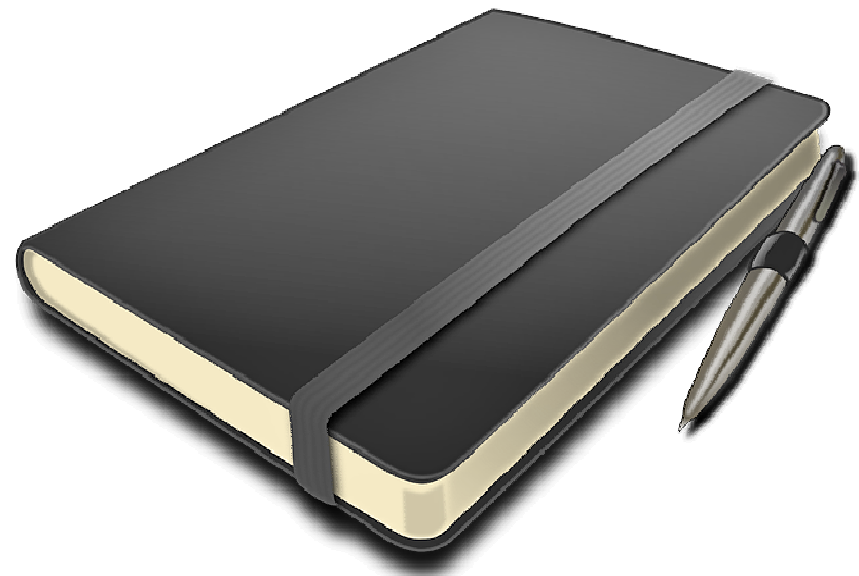
Características da Pilha Dupla:



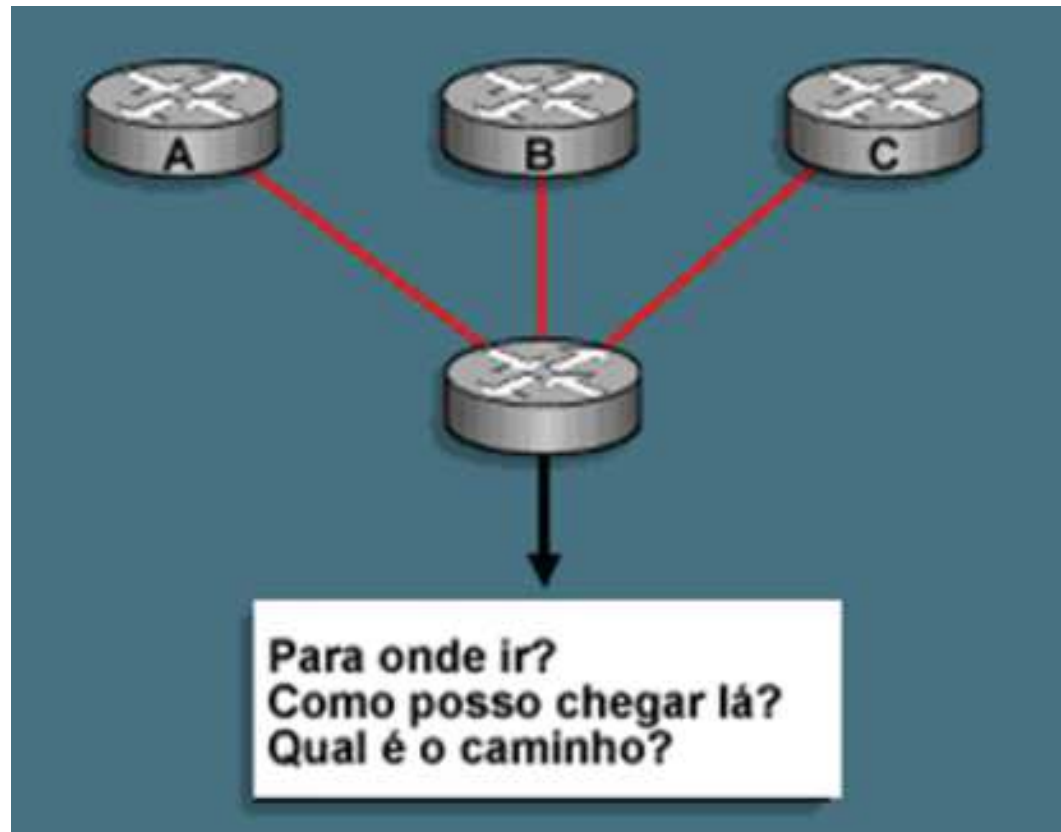
- Deverá ser utilizada sempre que possível!
- Coexistência de IPv4/IPv6
- Elimina a necessidade de mecanismos reais de tradução

Agenda

- ✓ Nivelamento IPv6;
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- ☐ Apresentação laboratório prático.



Protocolos de roteamento IPv6:



Protocolos de Roteamento/autenticação IPv6:

- Rota estática
- OSPFv3
- BGP4
- PPPoE + DHCP-PD



Rota estática IPv6:

- A rota estática define um caminho distinto entre dois roteadores;
- Não atualiza automaticamente;
- Não utiliza nenhum ciclo da CPU para calcular e analisar atualizações de roteamento.

Rota estática IPv6 no MikroTik:

admin@192.168.147.130 (PE1) - WinBox v6.37.5 on CHR (x86_64)

Session Settings Dashboard

Safe Mode Session:

Quick Set
Interfaces
Bridge
PPP
Mesh
IP
IPv6
MPLS
Routing
System
Queues
Files
Log
Radius
Tools
New Terminal
Make Supout.rtf
Manual
New WinBox
Exit

Addresses
DHCP Client
DHCP Relay
DHCP Server
Firewall
ND
Neighbors
Pool
Routes
Settings

IPv6 Route List

	Dst. Address	Gateway	Distance
Db	::/0	fe80::5200:ff:fe09:0%ether1 reachable	20
AS	::/0	2001:db1:2::12 reachable ether1	1

IPv6 Route <::/0>

General Attributes

Dst. Address: ::/0

Gateway: 2001:db1:2::12 reachable ether1

Check Gateway:

Type: unicast

Distance: 1

Scope: 30

Target Scope: 10

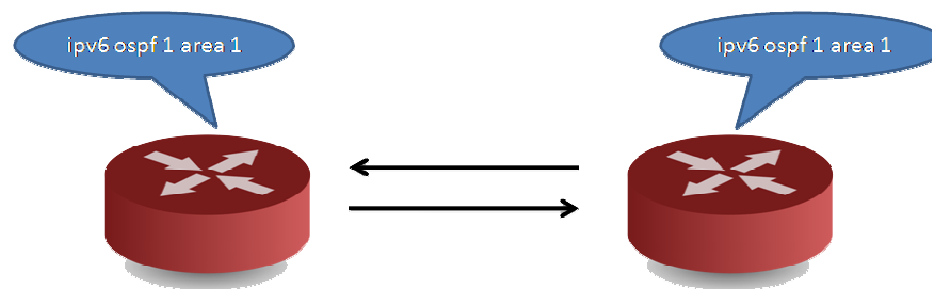
Received From:

enabled active static

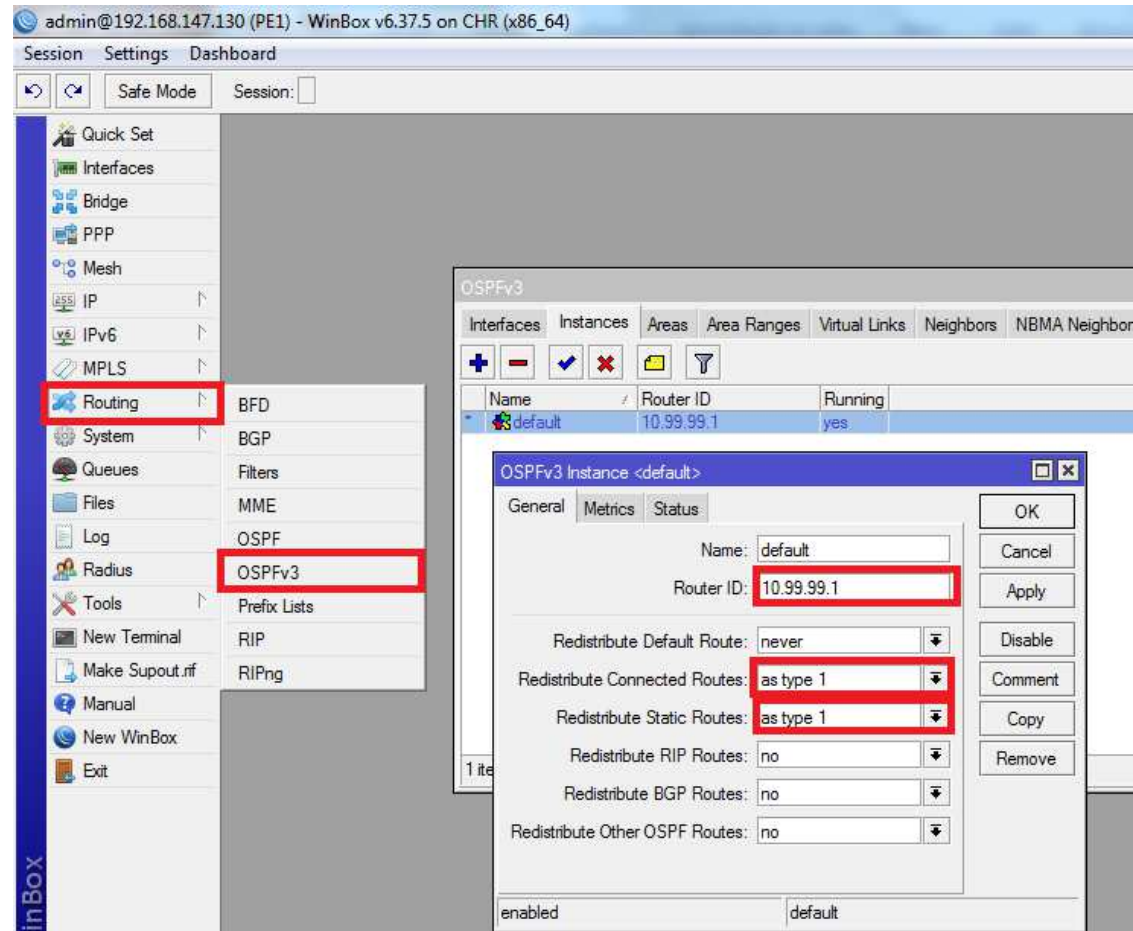
OSPFv3

- Plataforma independente de implantação;
- processamento por enlace ao invés de processamento por nó.

OSPF for IPv6



OSPFv3 no MikroTik:



OSPFv3 no Mikrotik:

admin@192.168.147.130 (PE1) - WinBox v6.37.5 on CHR (x86_64)

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Safe Mode Session:

Quick Set

Interfaces

Bridge

PPP

Mesh

IP

IPv6

MPLS

Routing

System

Queues

Files

Log

Radius

Tools

New Terminal

Make Supout.tif

Manual

New WinBox

BFD

BGP

Filters

MME

OSPF

OSPFv3

Prefix Lists

RIP

RIPng

OSPF

Interfaces Instances Networks Areas Area Ranges Virtual Links Neighbors NBMA Neighbors Sham Links LSA Routes ...

Interface	Cost	Priority	Authentic...	Authenticatio...	Network Type	Instance	Area	Neig...	State
D ether2	10	1	none	*****	broadcast	default	backbone	0	designated ro...

OSPFv3

Interfaces Instances Areas Area Ranges Virtual Links Neighbors NBMA Neighbors LSA Routes AS Border Routers OSPFv3 Routers

Area	Interface	Cost	Priority	Network Type	Instance	Neig...	State
backb...	ether2	10	1	default	default	0	designated ro...
backb...	ether3	10	1	default	default	0	designated ro...

BGP4:

- O BGP, protocolo de roteamento dinâmico, utilizado para comunicação entre sistemas autônomos (AS's);
- O BGP foi projetado para evitar loops de roteamento entre AS's.

BGP4 no MikroTik:

admin@192.168.147.130 (PE1) - WinBox v6.37.5 on CHR (x86_64)

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BFD
BGP
Filters
MME
OSPF
OSPFv3
Prefix Lists
RIP
RIPng

BGP

Instances VRFs Peers Networks Aggregates VPN4 Routes Advertisements

Name	AS	Router ID	Out Filter	Confeder...	Confeder...	Cluster ID
default	65000	10.99.99.1				

BGP Instance <default>

Name: default OK

AS: 65000 Cancel

Router ID: 10.99.99.1 Apply

☐ Redistribute Connected Disable

☐ Redistribute Static Comment

☐ Redistribute RIP Copy

☐ Redistribute OSPF Remove

☐ Redistribute Other BGP

Out Filter:

Confederation:

Confederation Peers:

Cluster ID:

Routing Table:

☒ Client To Client Reflection

☐ Ignore AS Path Length

BGP4 no MikroTik:

admin@192.168.147.130 (PE1) - WinBox v6.37.5 on CHR (x86_64)

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 Mesh
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 IPv6
 MPLS
Routing
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 Log
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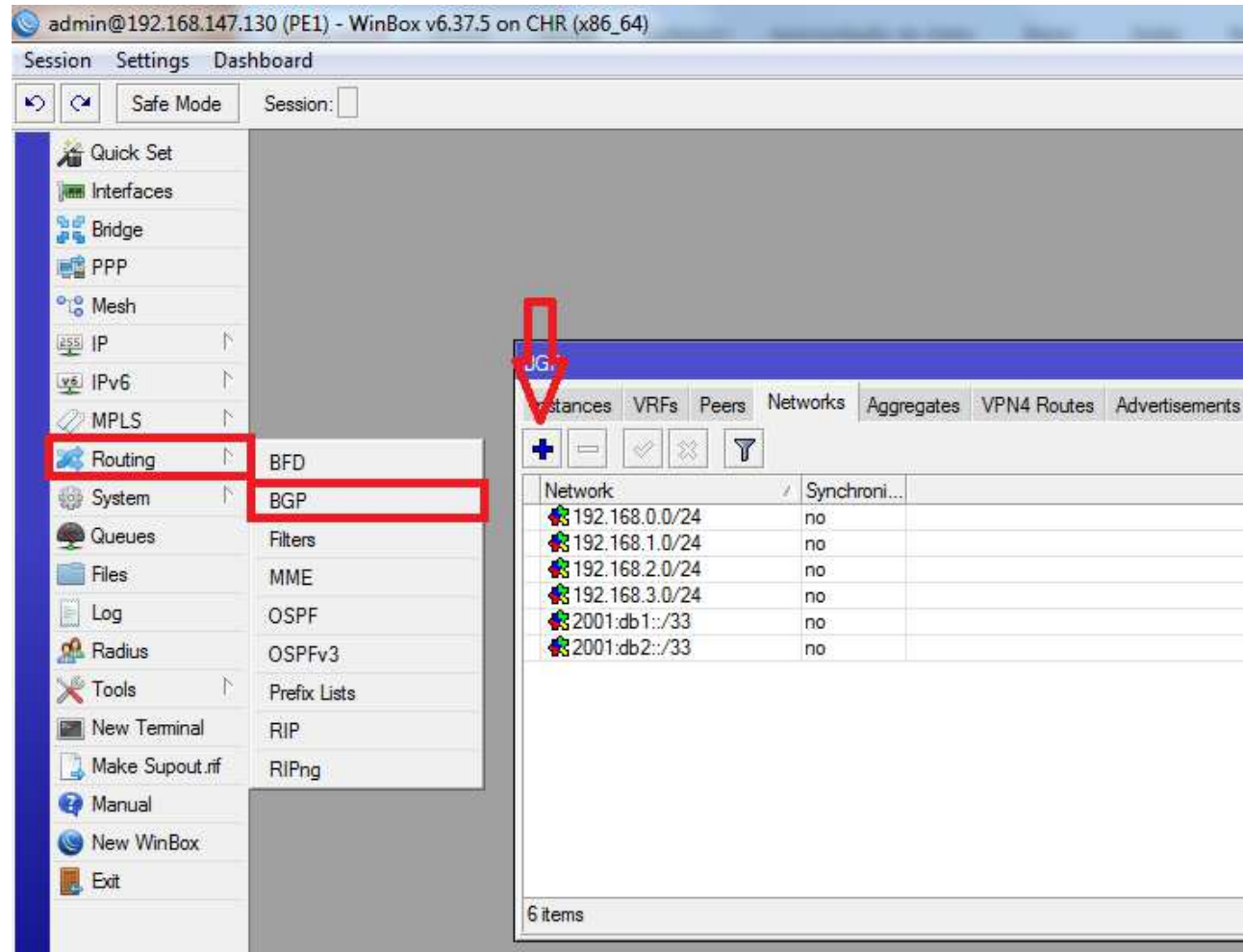
BFD
BGP
 Filters
 MME
 OSPF
 OSPFv3
 Prefix Lists
 RIP
 RIPng

Instances VRFs Peers Networks Aggregates VPN4 Routes Advertisements
 + - ✓ ✗ 📁 🔍 Refresh Refresh All Resend Resend All

Name	Instance	Remote Address	Remote AS	M...	R...	TTL
peer1_oper1v6	default	2001:db1:2::12	65001	no	no	d...
peer_oper1	default	10.1.0.2	65001	yes	no	d...
peer_oper2	default	10.2.0.2	65002	no	no	d...
peer_oper2v6	default	2001:db1:4::12	65002	no	no	d...

4 items (1 selected)

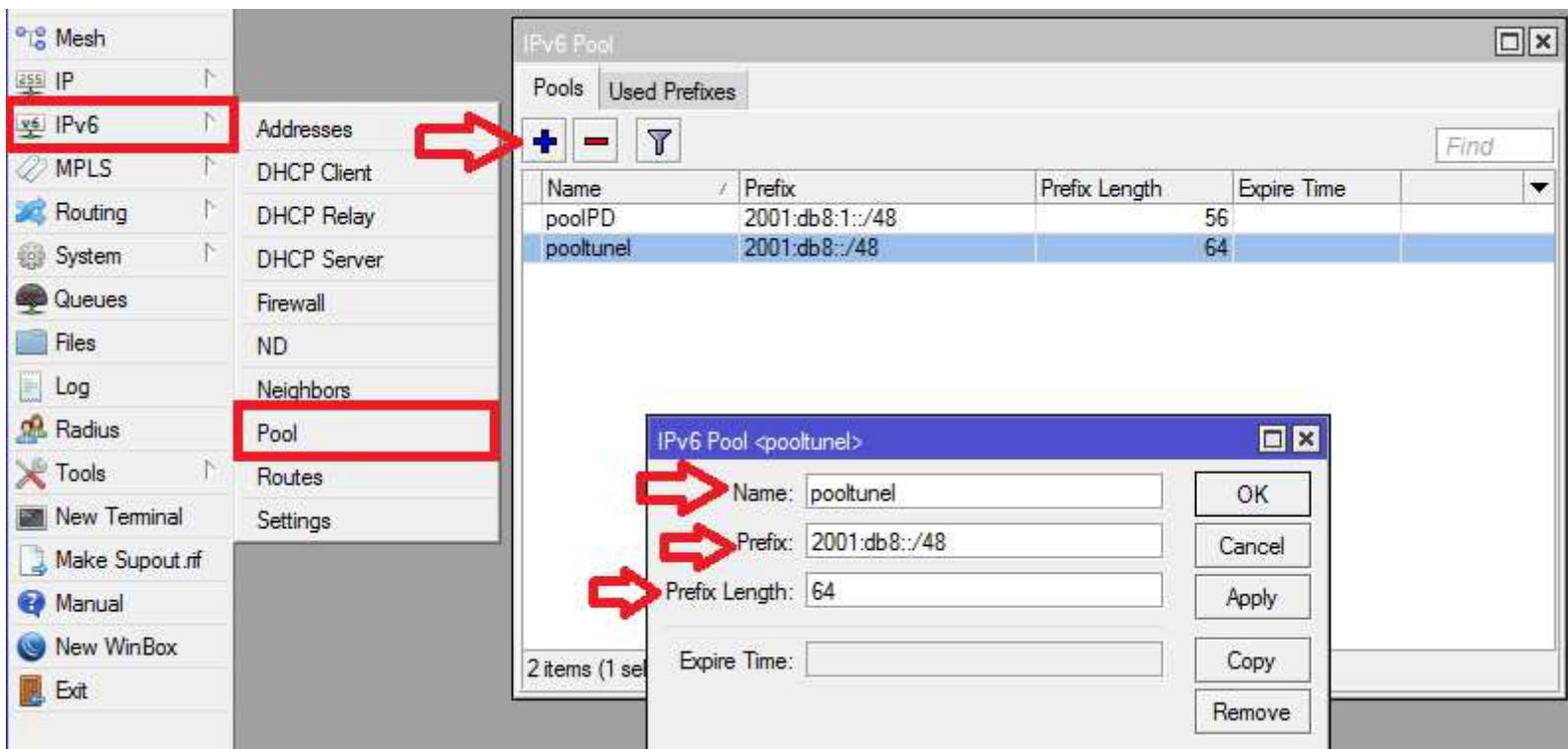
BGP4 no MikroTik:



PPPoE + DHCP-PD:

- O cliente PPPoE obtém o endereço IPv6 da interface WAN através do DHCP - PD. e um prefixo delegado para ser usado para o segmento;
- DHCP - PD.

PPPoE IPv6 no MikroTik:



The screenshot shows the MikroTik WinBox interface. In the left sidebar, the 'IPv6' menu item is highlighted with a red box, and the 'Pool' sub-item is also highlighted with a red box. A red arrow points to the '+' button in the 'IPv6 Pool' window. Another red arrow points to the 'pooltunnel' entry in the table. A third red arrow points to the 'Name' field in the 'IPv6 Pool <pooltunnel>' dialog box.

IPv6 Pool

Pools Used Prefixes

Name	Prefix	Prefix Length	Expire Time
poolPD	2001:db8:1::/48	56	
pooltunnel	2001:db8::/48	64	

2 items (1 selected)

IPv6 Pool <pooltunnel>

Name: pooltunnel

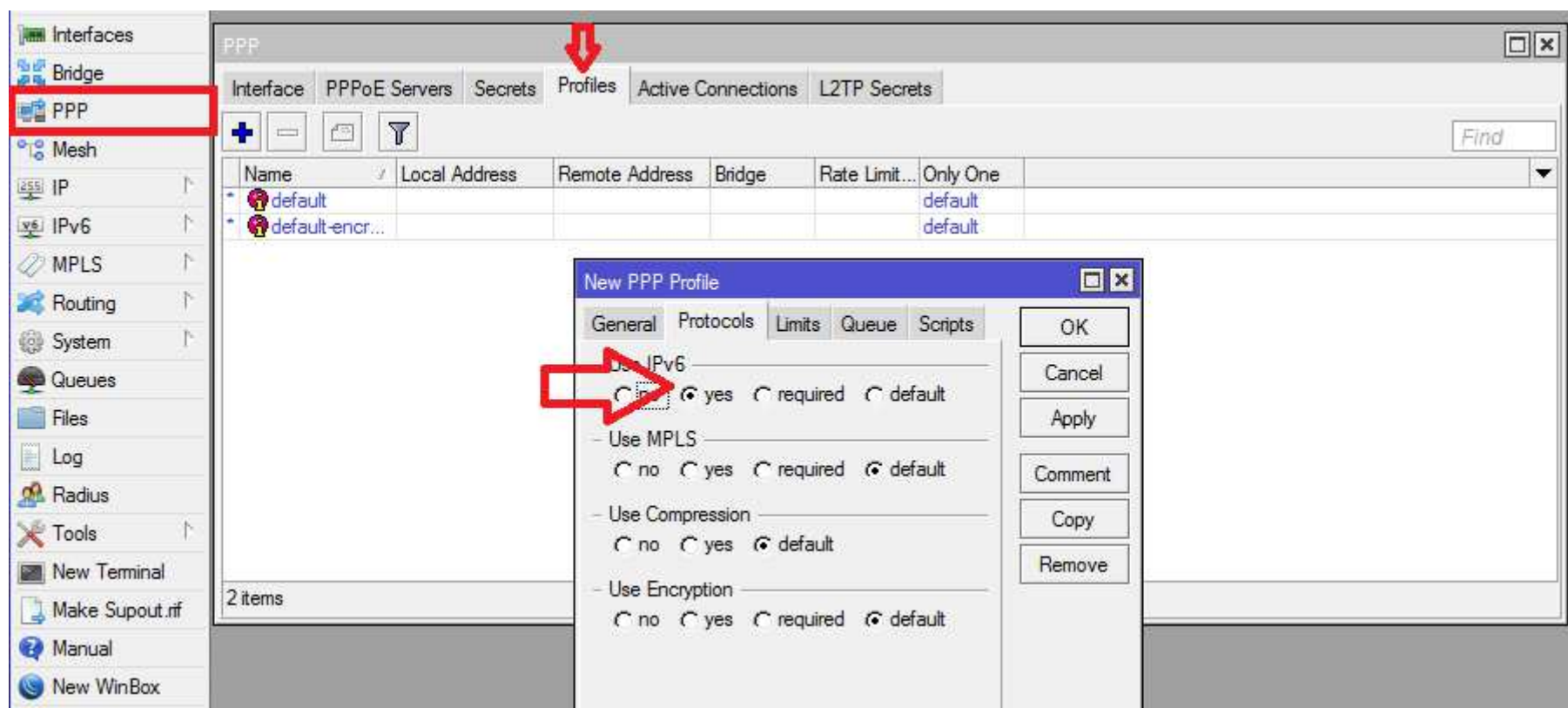
Prefix: 2001:db8::/48

Prefix Length: 64

Expire Time:

OK Cancel Apply Copy Remove

PPPoE IPv6 no MikroTik:



PPPoE IPv6 no MikroTik:

admin@50:00:00:01:00:00 (PPPoE1) via 192.168.147.130 - WinBox v6.37.5 on CHR (x86_64)

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RouterOS WinBox

PPP

Interface PPPoE Servers Secrets Profiles Active Connections L2TP Secrets

Name	Local Address	Remote Address	Bridge	Rate Limit...	Only One
default	10.99.99.7	pool_PPPoE			default
default-encr...					default

PPP Profile <default>

General Protocols Limits Queue Scripts

Name: default

Local Address: 10.99.99.7

Remote Address: pool_PPPoE

Remote IPv6 Prefix Pool: pool_remoto

DHCPv6 PD Pool: pool_local

Bridge:

Bridge Port Priority:

Bridge Path Cost:

Incoming Filter:

Outgoing Filter:

Address List:

DNS Server: 8.8.8.8

WINS Server:

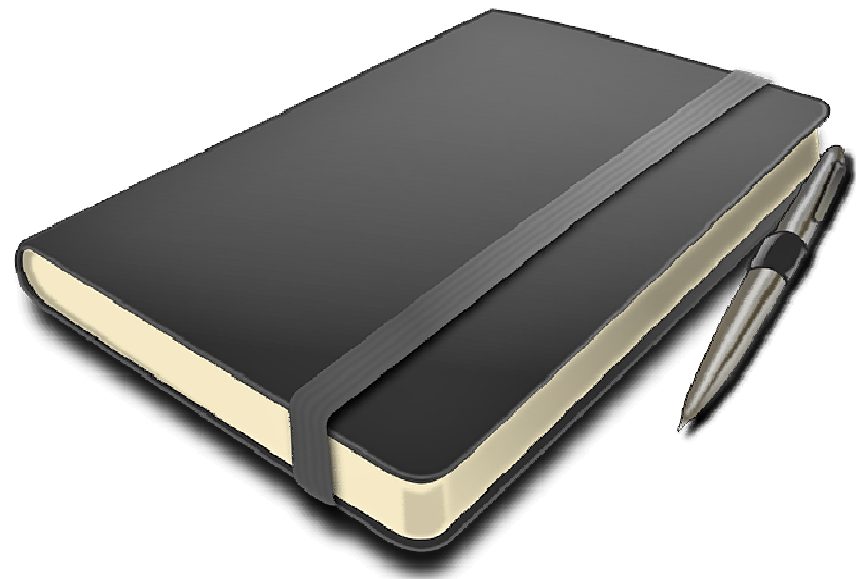
- Change TCP MSS
☐ no ☒ yes ☐ default

- Use UPnP
☐ no ☐ yes ☒ default

OK
Cancel
Apply
Comment
Copy
Remove

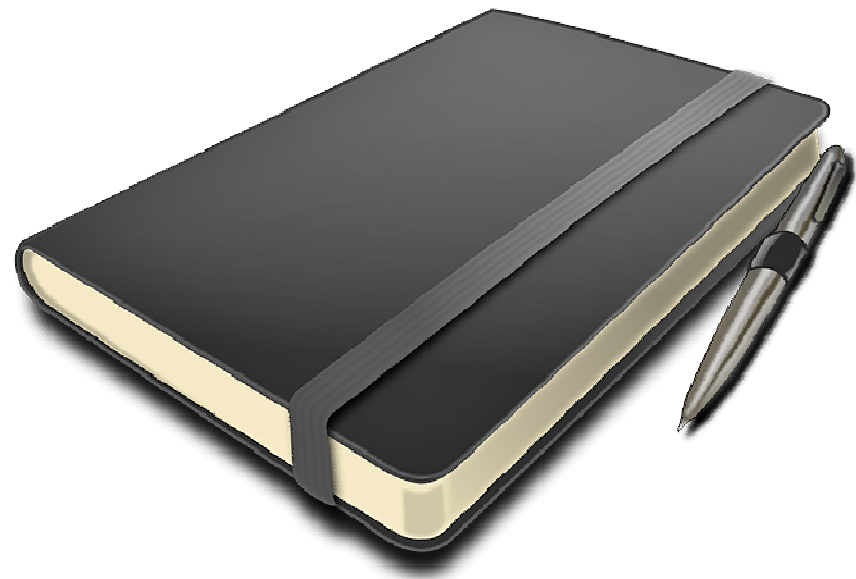
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Perguntas ?



OBRIGADO !!!



Thiago Santos

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