



# RouterOS + SwOS

100% mikrotik based networks

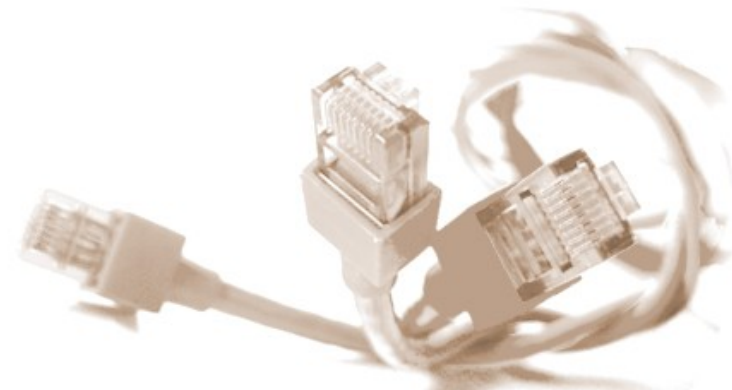
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## Antonio Nivaldo F. Leite Junior

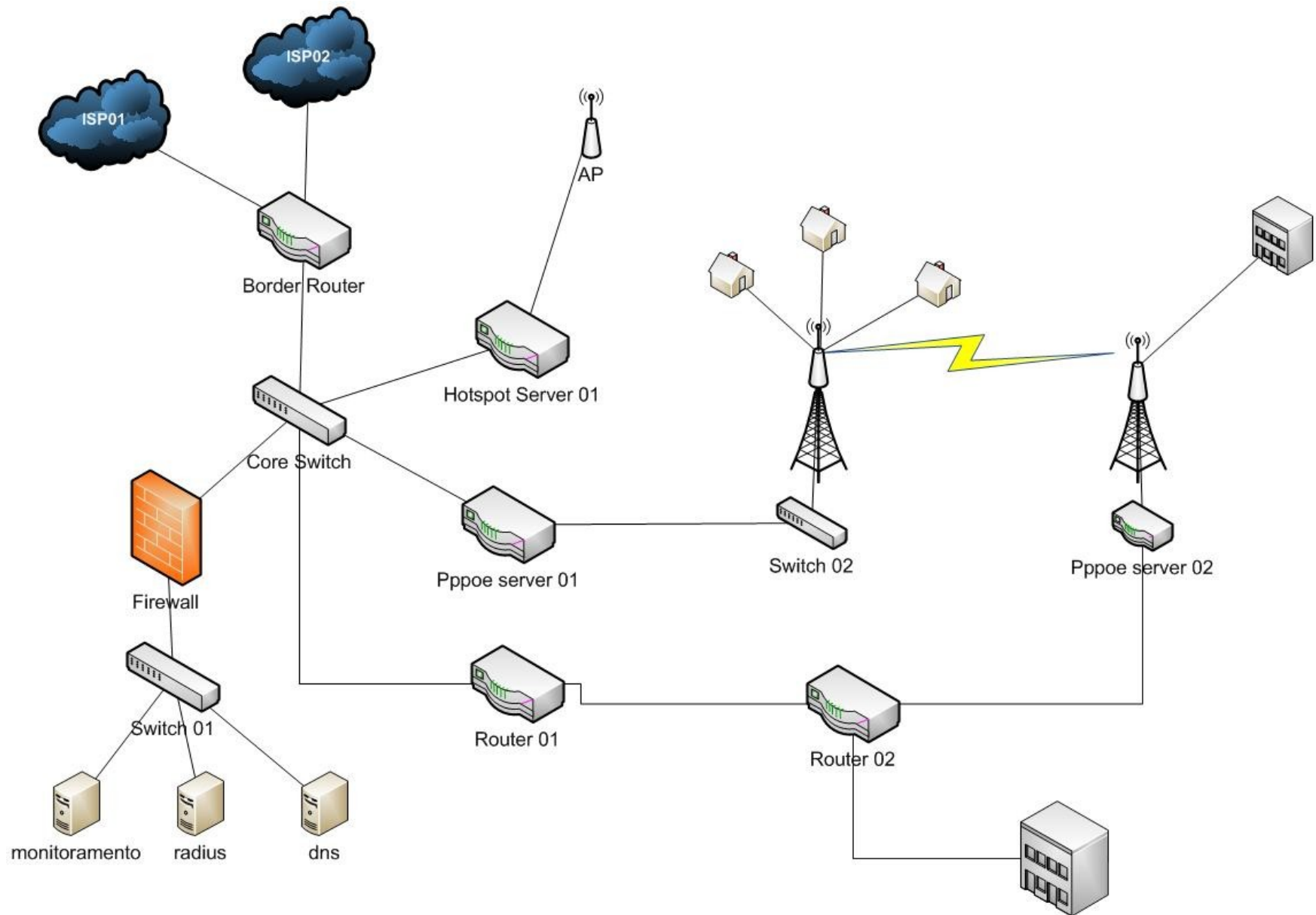
- Bacharel em Ciências da Computação;
- Bacharel em Comunicação Social c/ ênfase em Pub. e Propaganda;
- Pós-Graduando em segurança da informação em redes de computadores;
- Mikrotik Certified Consultant: (MTCNA, MTCTCE, MTCUME, MTCRE, MTCINE);
- Professor dos cursos de redes e telecomunicações do SENAI;
- Diretor de TI – G3 Telecom;
- Consultor técnico – Macbras (Grupo MGSat) – Mikrotik Official Distributors;
- Consultor técnico – Bradel Distribuição - Mikrotik Official Distributors.



**Como implementar e gerenciar uma rede totalmente baseada em soluções Mikrotik?**

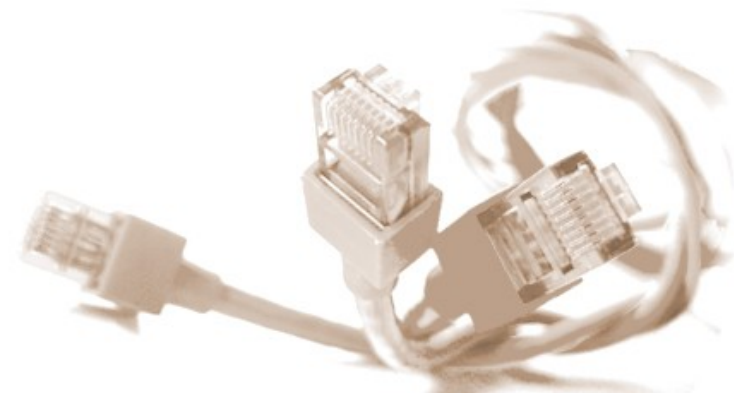


# Topologia de um ISP



## Switch x Bridge x Hub

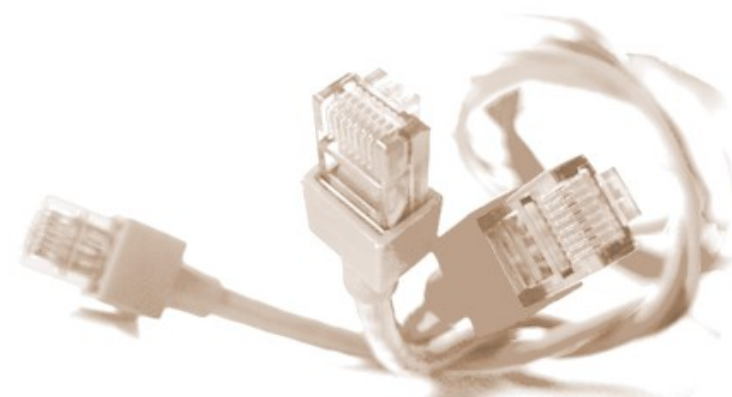
- Performance
- Escalabilidade
- Segurança
- Recursos



Foi uma função implementada no RouterOS a partir da versão 4 para ter acesso as funções do switch chip, o qual esta presente em algumas Routerboards.

| Feature        | Atheros8316  | Atheros7240 | ICPlus175D | Other |
|----------------|--------------|-------------|------------|-------|
| Port Switching | yes          | yes         | yes        | yes   |
| Port Mirroring | yes          | yes         | yes        | no    |
| Host table     | 2k entries   | 2k entries  | no         | no    |
| Vlan table     | 4096 entries | 16 entries  | no         | no    |
| Rule table     | 32 rules     | no          | no         | no    |

- Atheros8316: RB450G, RB750G e RB1100.
- Atheros7240: RB750.
- ICPlus175D: RB450 e RB433 (novas versões).
- ICPlus175C: RB450 e RB433 (versões antigas).
- ICPlus178C: RB493 e RB816.



# Switch

RouterOS WinBox

Interfaces

Bridge

PPP

Switch

Mesh

IP

MPLS

VPLS

Routing

System

Queues

Files

Log

Radius

Tools

New Terminal

MetaROUTER

Make Supout.rif

Manual

Exit

5 it

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel VLAN VRRP Bonding

Find

|    | Name                | Type     | L2 MTU | Tx        | Rx        | Tx Pac... | Rx Pac... | Tx Drops | Rx Drops | Tx Errors | Rx Errors |
|----|---------------------|----------|--------|-----------|-----------|-----------|-----------|----------|----------|-----------|-----------|
| R  | ether1-gateway      | Ethernet | 1524   | 47.8 kbps | 13.6 kbps | 5         | 13        | 0        | 0        | 0         | 0         |
| R  | ether2-local-master | Ethernet | 1524   | 0 bps     | 0 bps     | 0         | 0         | 0        | 0        | 0         | 0         |
| RS | ether3-local-slave  | Ethernet | 1524   | 0 bps     | 0 bps     | 0         | 0         | 0        | 0        | 0         | 0         |
|    | ether4-local-slave  | Ethernet | 1524   | 0 bps     | 0 bps     | 0         | 0         | 0        | 0        | 0         | 0         |
|    | ether5-local-slave  | Ethernet | 1524   | 0 bps     | 0 bps     | 0         | 0         | 0        | 0        | 0         | 0         |

Interface <ether2-local-master>

General Ethernet Status Traffic

Name: ether2-local-master

Type: Ethernet

MTU: 1500

L2 MTU: 1524

MAC Address: 00:0C:42:5F:C3:3B

ARP: enabled

Master Port: none

Bandwidth (Rx/Tx): unlimited / unlimited

Switch: 0

OK Cancel Apply Disable Comment Torch

Interface <ether3-local-slave>

General Ethernet Status Traffic

Name: ether3-local-slave

Type: Ethernet

MTU: 1500

L2 MTU: 1524

MAC Address: 00:0C:42:5F:C3:3C

ARP: enabled

Master Port: ether2-local-master

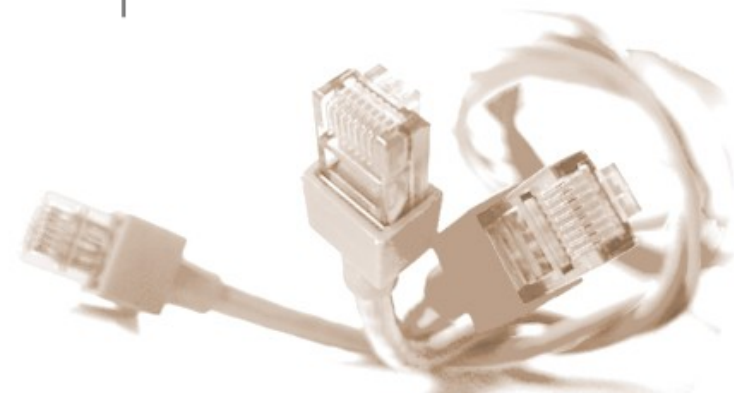
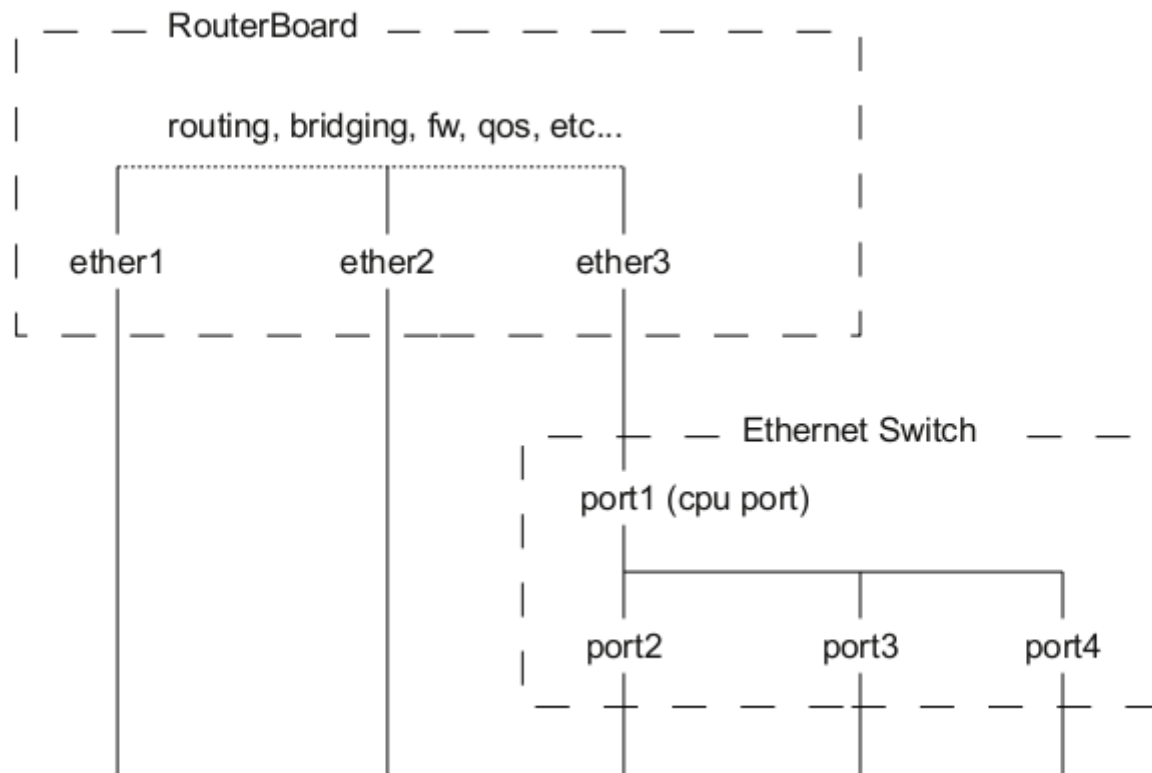
Bandwidth (Rx/Tx): unlimited / unlimited

Switch: 0

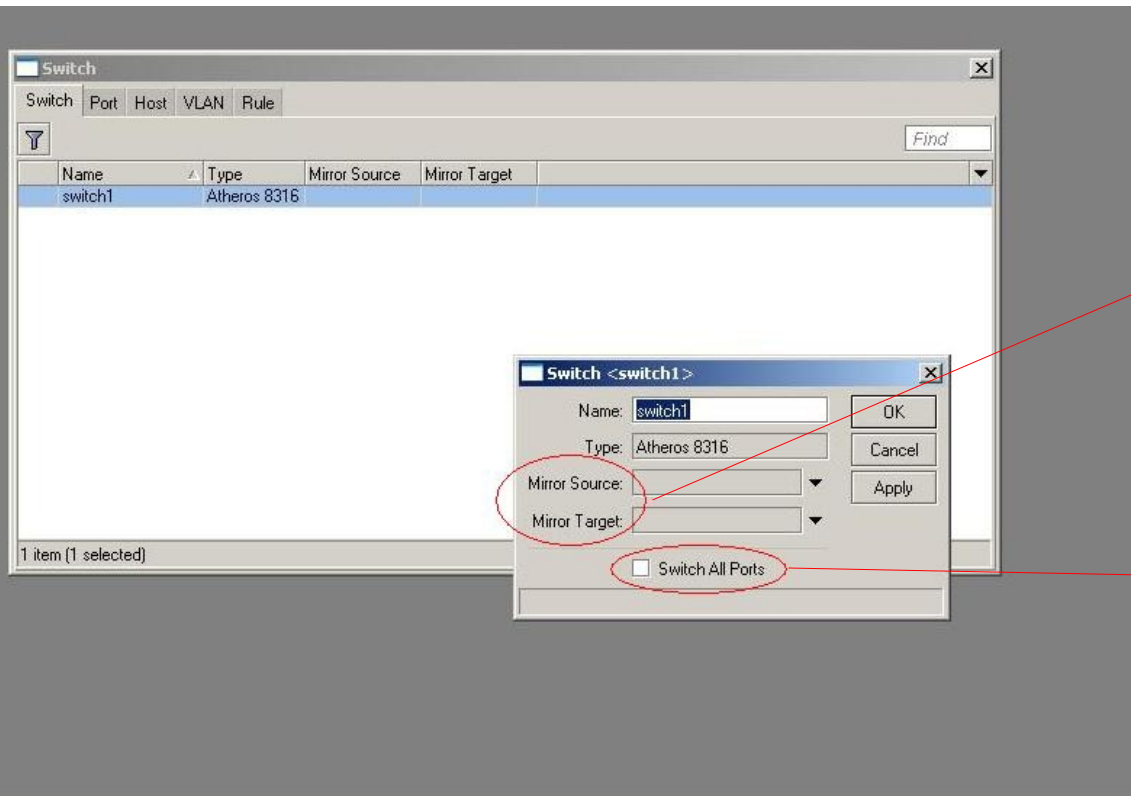
OK Cancel Apply Disable Comment Torch

disabled running slave link ok

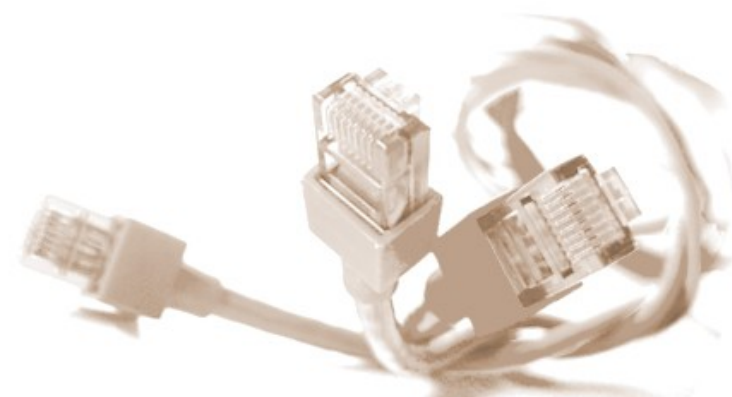
# Switch



# Switch

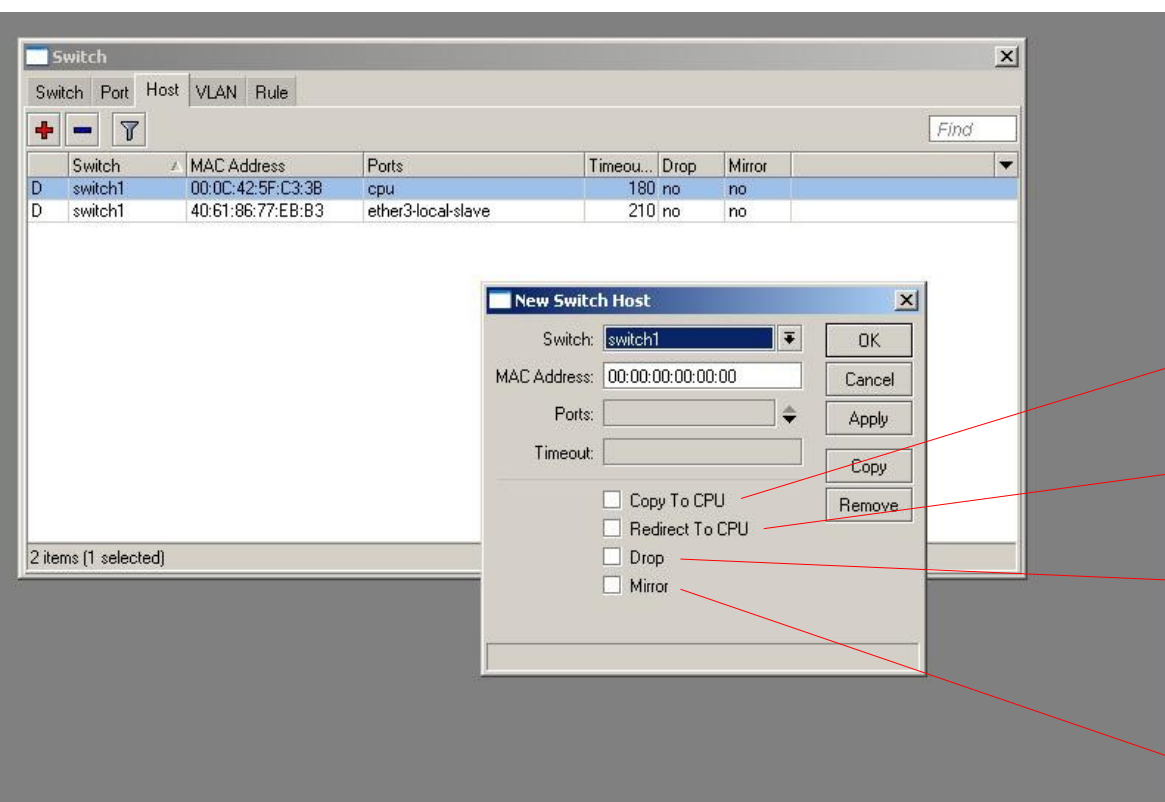


- Port Mirroring: faz a cópia de todo tráfego de uma porta e espelha para outra.
- Enable: significa que a porta 1 fara parte do switch.



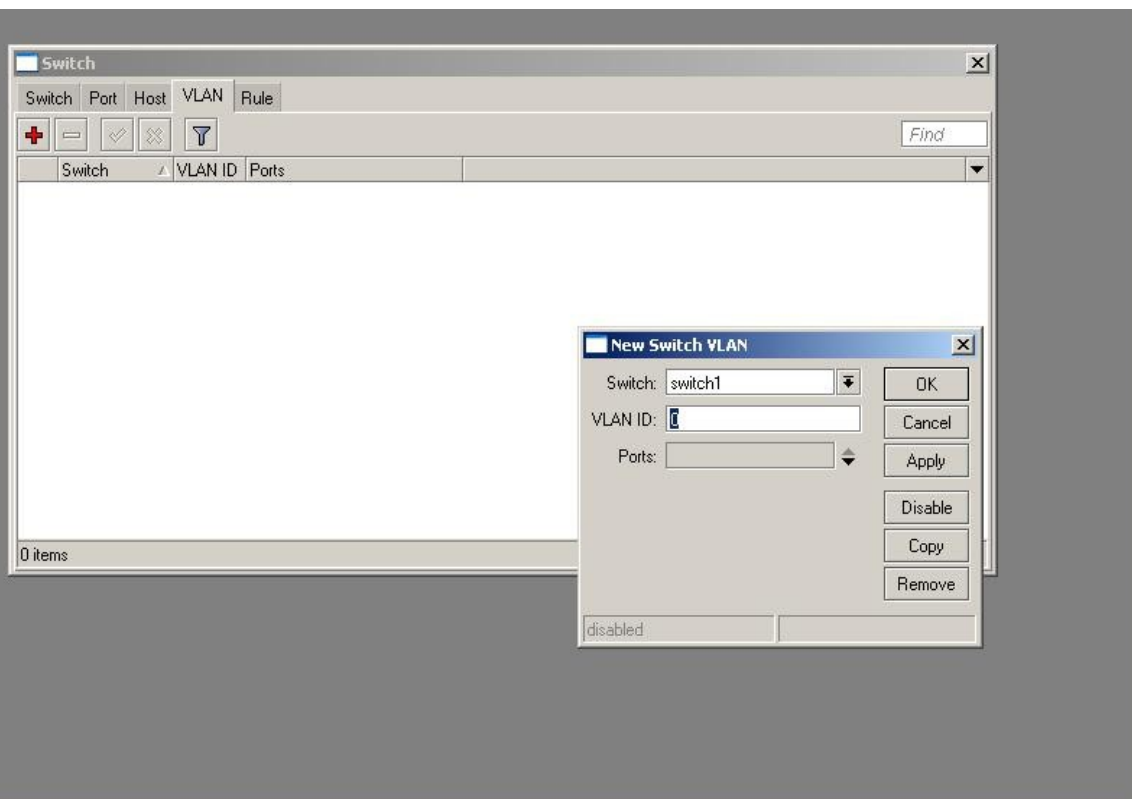
## Tabela de hosts

Permite entradas dinâmicas e estáticas



- O pacote é clonado e enviado para a CPU
- O pacote é redirecionado para CPU
- O pacote é descartado, com base no mac address de **origem**
- O pacote é clonado e enviado para a porta configurada no mirror target



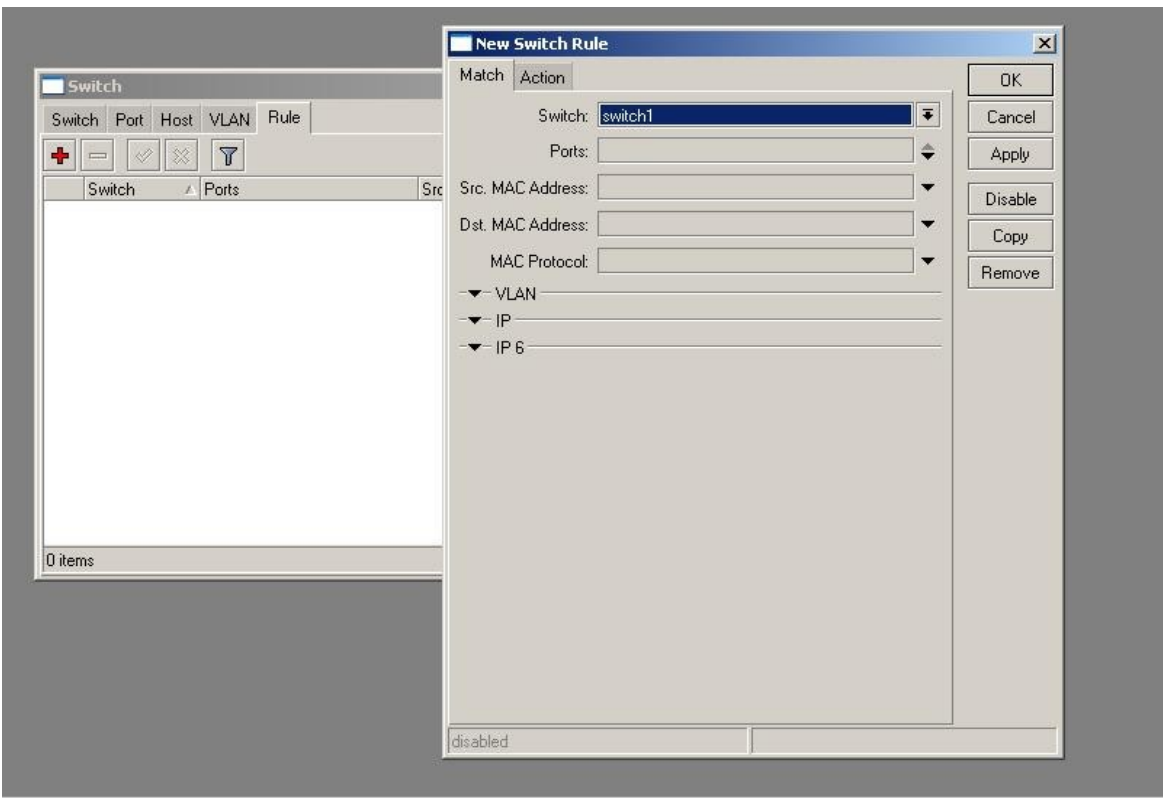


## Tabela de Vlans

Regras de encaminhamento baseadas no protocolo 802.1q

- **Disable** – ignora a tabela vlan, o pacote com tag vlan é tratado como se não tivesse a tag
- **Fallback** - modo padrão - tratar os pacotes com a tag vlan que não está presente na tabela vlan apenas como pacotes sem tag vlan.
- **Check** - descartar pacotes com tag VLAN que não está presente na tabela vlan.
- **Secure** - descartar pacotes com tag VLAN que não está presente na tabela vlan e numa porta específica.

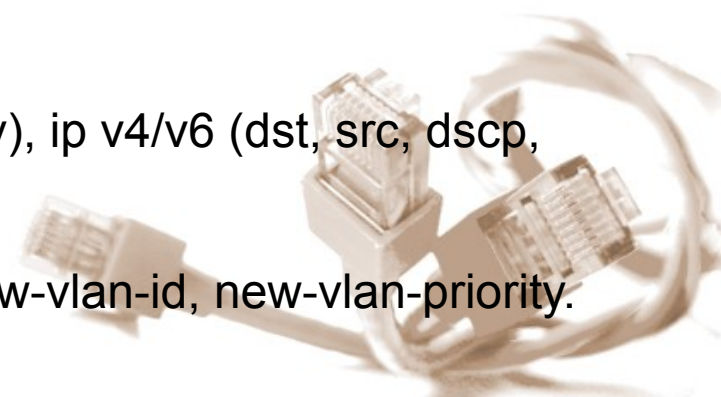




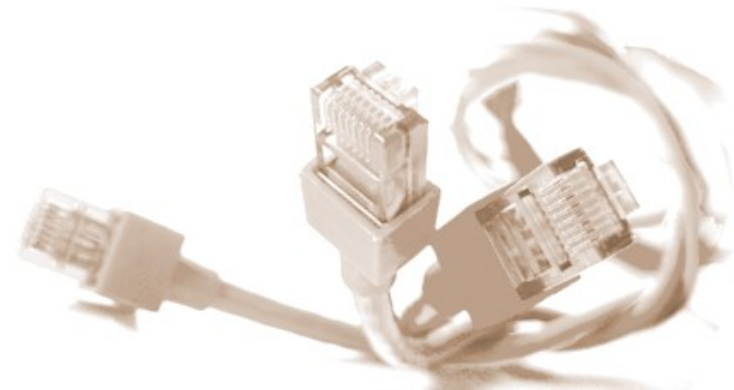
## Tabela de Regras

Ferramenta que possibilita a filtragem, encaminhamento e marcação Vlan de pacotes baseados em protocolos de camada 2, 3 e 4.

- **parametros** – mac (src, dst, protocol), vlan (header, id, priority), ip v4/v6 (dst, src, dscp, protocol...), L4 (src port, dst port).
- **ações** – copy-to-cpy, redirect-to-cpu, mirror, new-dst-ports, new-vlan-id, new-vlan-priority.

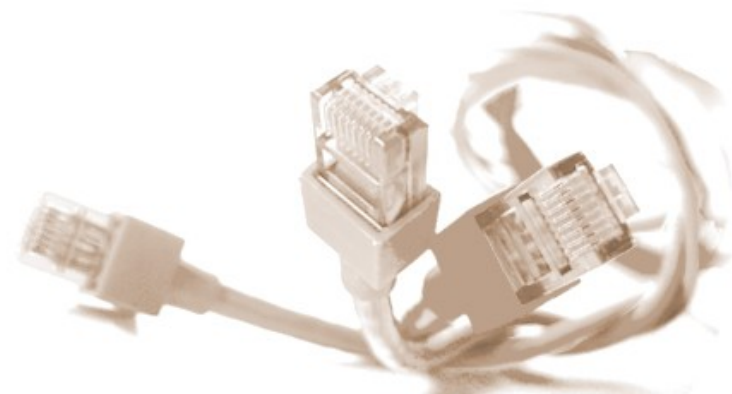


Sistema operacional desenvolvido especificamente para gerenciamento de Switchs Mikrotik, através de interface web.



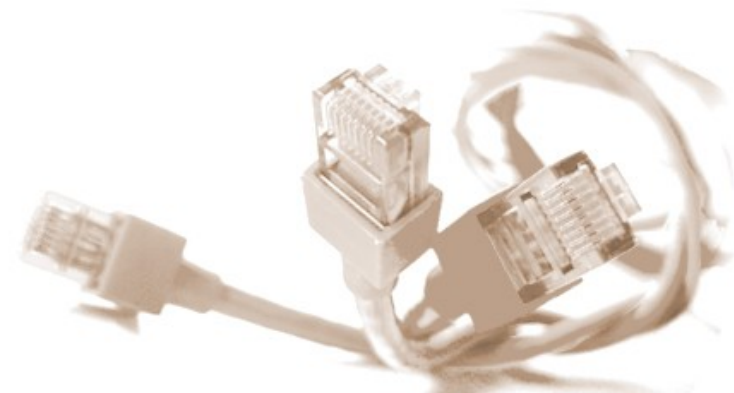
## Dispositivos suportados

- Rb250GS



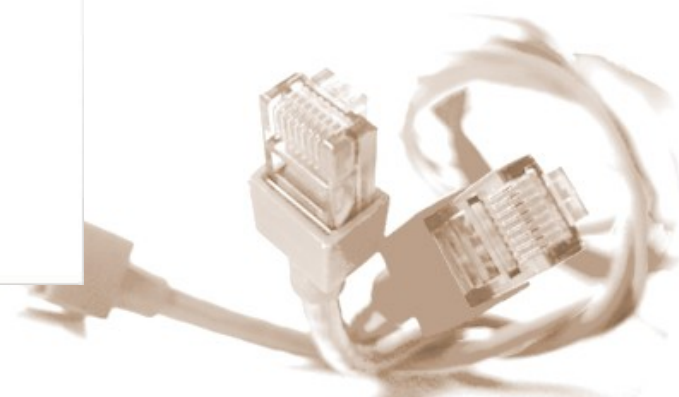
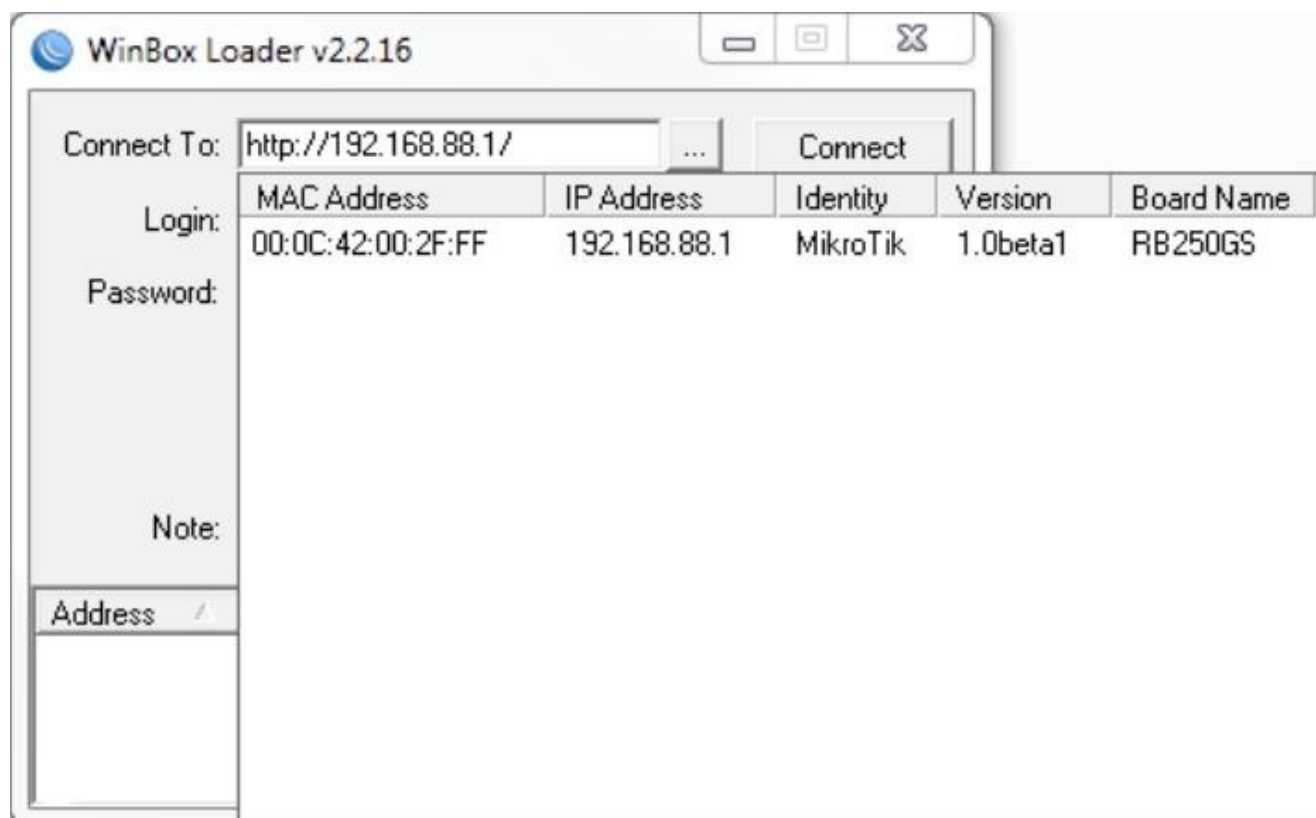
## Características Básicas

- Permite o acesso a todas os recursos do switch-chip;
- Gerenciavel via interface gráfica web;
- Baixa latência;
- Alta velocidade;
- Wire speed throughput;



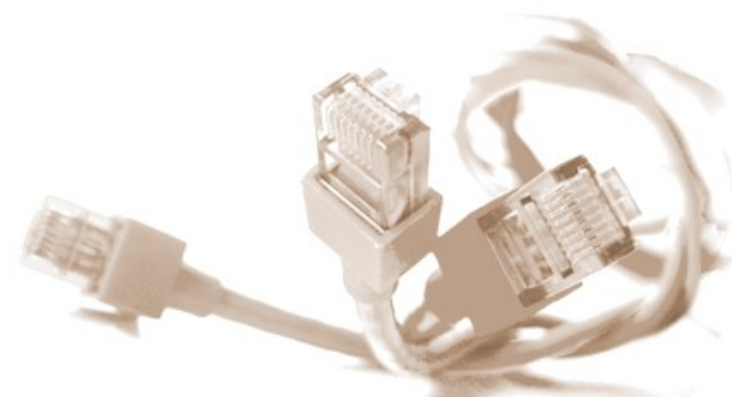
## Características Básicas

- Suporte ao protocolo NDP



## Principais Funções

- **Port Forwarding table:** permite ou restringe o fluxo de tráfego entre duas portas específicas;
- **Port Lock:** Filtro baseado em MAC Address, aceita apenas a comunicação de hosts com endereço MAC cadastrado na tabela “Static Hosts”;
- **Port Mirroring:** permite espelhar qualquer tráfego para uma porta específica;
- **Bandwidth Limit:** limitação de banda em nível de hardware;
- **Broadcast Storm Control, VLANs, ACLs, SNMP, RSTP, Watchdog...**



## ScreenShots

# Forwarding

MikroTik SwOS

Link

Forwarding

Statistics

VLAN

VLANs

Static Hosts

Hosts

SNMP

ACL

System

Logout

Port1

Port2

Port3

Port4

Port5

Forwarding

From Port 1

From Port 2

From Port 3

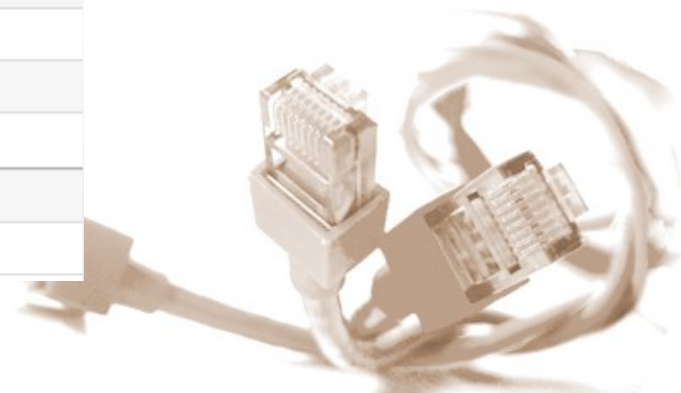
From Port 4

From Port 5

Port Lock

Port Lock

Lock On First



## ScreenShots

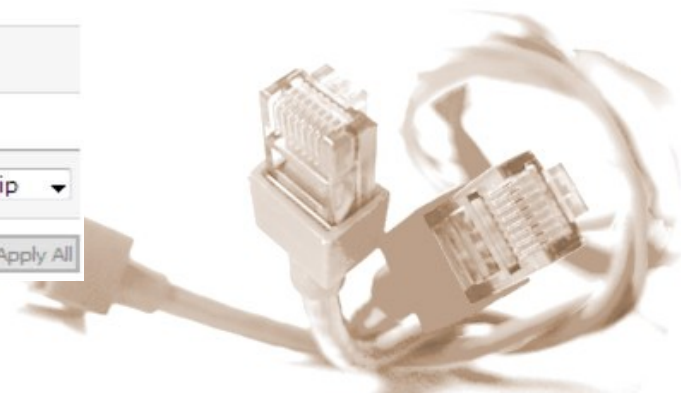
# VLAN

MikroTik SwOS

Link Forwarding Statistics **VLAN** VLANs Static Hosts Hosts SNMP ACL System Logout

|                 | Port1                    | Port2                    | Port3                    | Port4                    | Port5                    |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>Ingress</b>  |                          |                          |                          |                          |                          |
| VLAN Mode       | disabled ▾               | enabled ▾                | strict ▾                 | strict ▾                 | strict ▾                 |
| Default VLAN ID | 1                        | 1                        | 11                       | 12                       | 13                       |
| Force VLAN ID   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>Egress</b>   |                          |                          |                          |                          |                          |
| VLAN Header     | leave as is ▾            | add if missing ▾         | always strip ▾           | always strip ▾           | always strip ▾           |

Discard Changes Apply All



## ScreenShots

# Access-List Rules

MikroTik SwOS

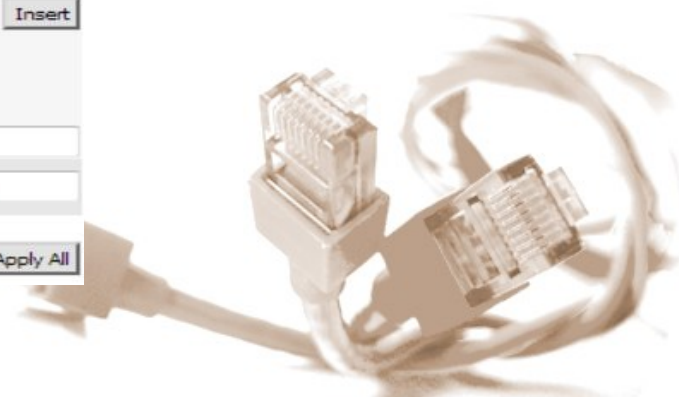
Link Forwarding Statistics VLAN VLANs Static Hosts Hosts SNMP **ACL** System Logout

Pending changes

|                                                                                                                                                                                                     |                                 |                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------|
| From: <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 | Clear Cut Insert                |                                                                  |
| MAC Src: <input type="text"/>                                                                                                                                                                       | MAC Dst: <input type="text"/>   | Ethertype: <input type="text"/> hex                              |
| VLAN: any                                                                                                                                                                                           | VLAN ID: <input type="text"/>   | Priority: <input type="text"/>                                   |
| IP Src: <input type="text"/>                                                                                                                                                                        | IP Dst: <input type="text"/>    | Protocol: <input type="text"/> DSCP: <input type="text"/>        |
| <input type="checkbox"/> Redirect To <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5                         | <input type="checkbox"/> Mirror | Set VLAN ID: <input type="text"/> Priority: <input type="text"/> |

|                                                                                                                                                                                                     |                                 |                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------|
| From: <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 | Clear Cut Insert                |                                                                  |
| MAC Src: <input type="text"/>                                                                                                                                                                       | MAC Dst: <input type="text"/>   | Ethertype: <input type="text"/> hex                              |
| VLAN: any                                                                                                                                                                                           | VLAN ID: <input type="text"/>   | Priority: <input type="text"/>                                   |
| IP Src: <input type="text"/>                                                                                                                                                                        | IP Dst: <input type="text"/>    | Protocol: <input type="text"/> DSCP: <input type="text"/>        |
| <input type="checkbox"/> Redirect To <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5                         | <input type="checkbox"/> Mirror | Set VLAN ID: <input type="text"/> Priority: <input type="text"/> |

Append Discard Changes Apply All





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