High Availability on MikroTik RouterOS

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About me

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- Introduction
- Resources to provide high avaibility
- Virtual Routing – VRRP
- Some Examples of VRRP
- Resources available on RouterBoards
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Introduction

- High availability is a system ability to shape physical or logic changes in order to maintain the network UP the maximum possible time.

- It is possible to provide high avaibility on MikroTik RouterOS by using several protocols and techniques. We also can find some interesting resources on RouterBoards.

Let's see what we can use to provide high avaibility

- Bonding
- STP
- Static Routing
- Dynamic Routing
- Virtual Routing (VRRP)
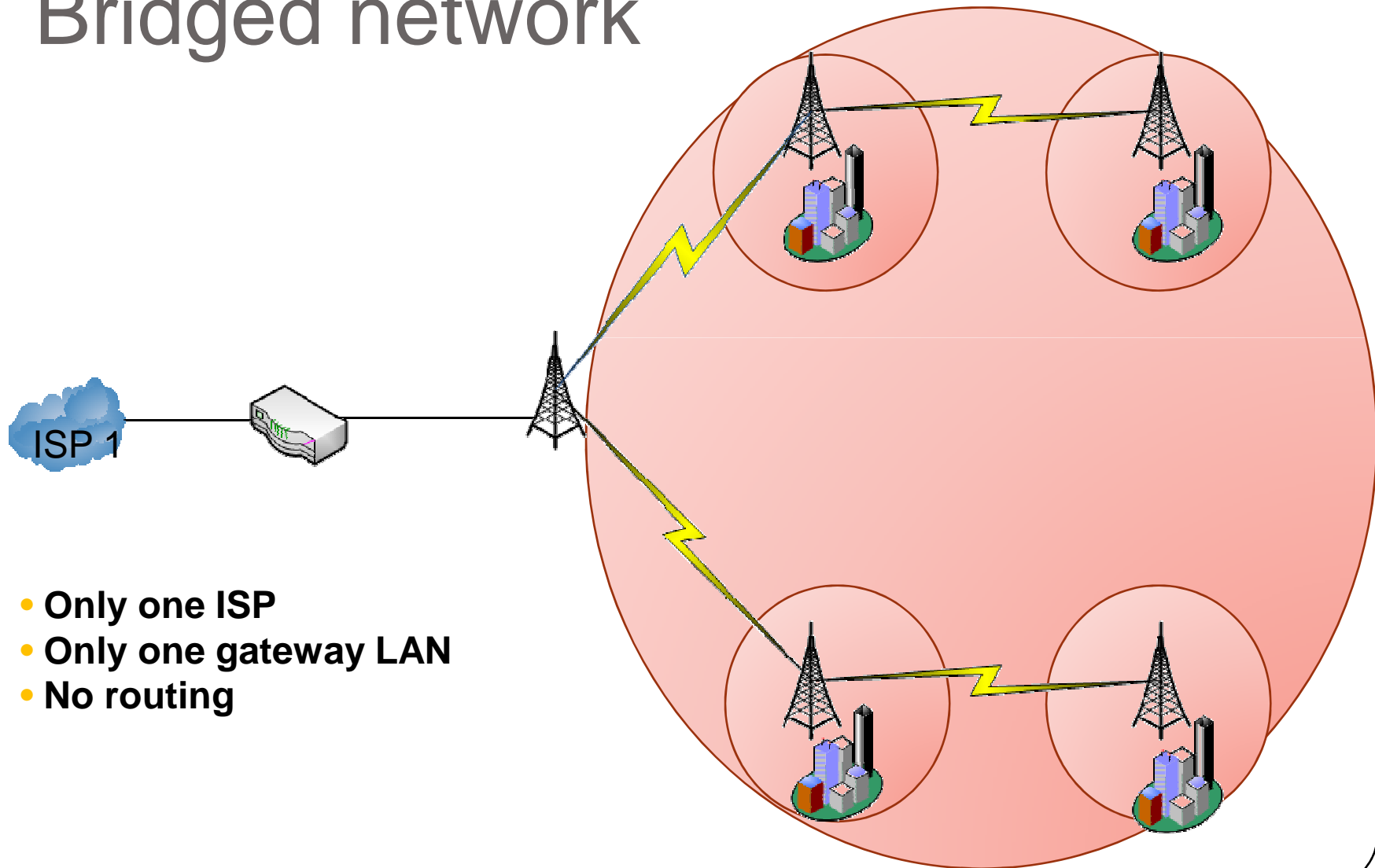- ByPass – On RouterBoards
- Redundant Power – On RouterBoards

Cont…

- All these resources you can use together or maybe you can apply one of them according to the problem you need to solve.

- In most cases you need to use more than one to reach satisfactory results.

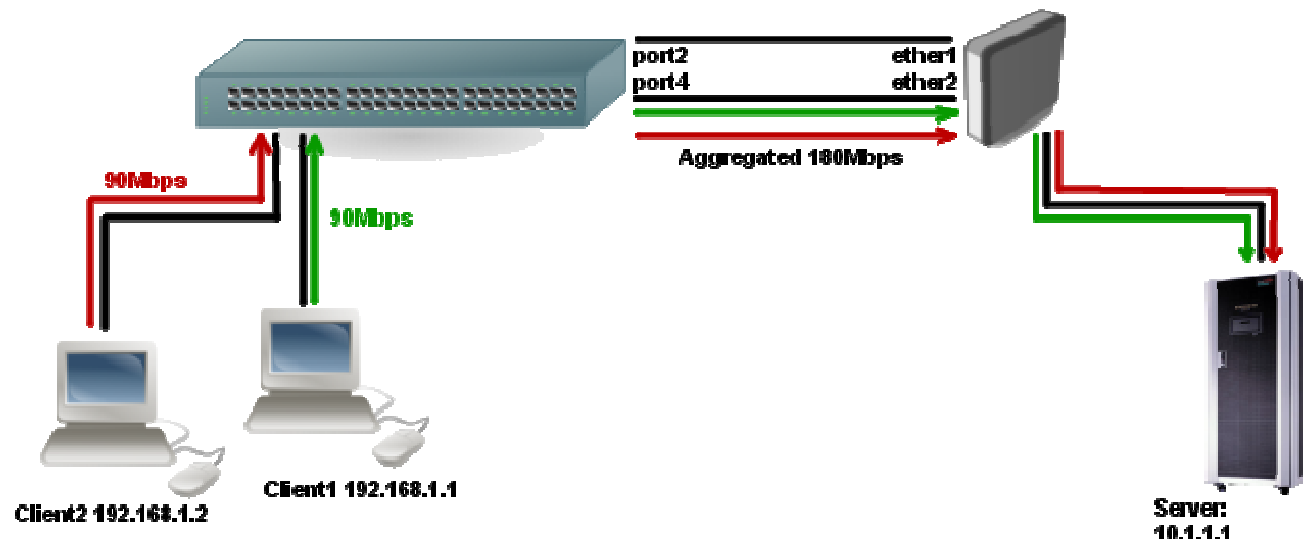- First step is understand the network topology.

Bridged network

ISP 1

- **Only one ISP**
- **Only one gateway LAN**
- **No routing**

Bonding

- Bonding works putting together two or more interfaces in order to aggregate links or provider failover.

- However in some cases the failover system can take more than 20 seconds to work.

Bonding

- **Positives**: Default configuration is very easy, several modes to aggregate and it is possible to use it with EoIP tunnels.

- **Negatives**: Too slow to detect topology changes and some problems with excessive retransmissions in some modes.

(R)STP

- Spanning tree Protocol is used to provide loop free bridge networks. In the first moment the protocol elects a root bridge and than starts to calculate loop free paths. If a loop is detect trough any port the protocol disable this specific port or put it on standby mode.
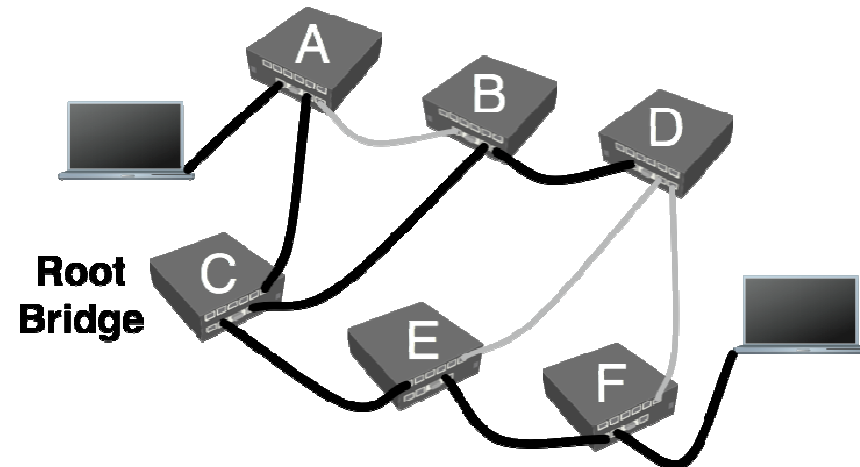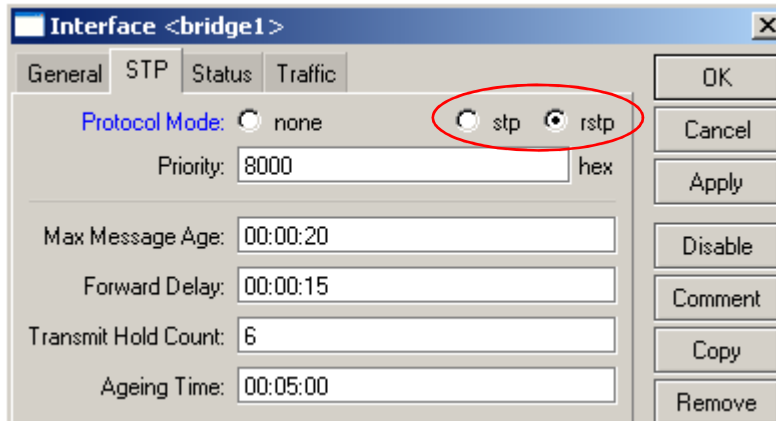
STP

- **Positives**: You do not need to worry about L2 filters or use Split Horizon to avoid loops. The protocol will analyze the topology and do all the hard work to you.

- **Negatives**: If you have a huge network is important to make some adjusts in order to make it work smoothly. Security problems too.

- More information about security problems with STP you can find here: http://mum.mikrotik.com/presentations/BR09/Seguranca_camada2_Maia.pdf
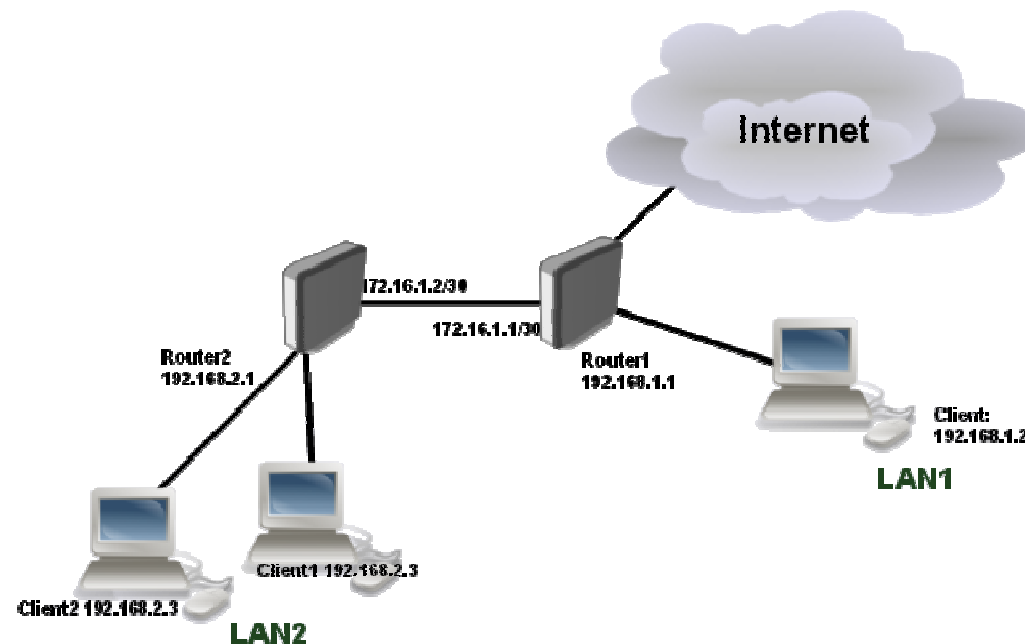
Routed network

BGP

ISP 1

BGP

ISP 2

OSPF

RIP
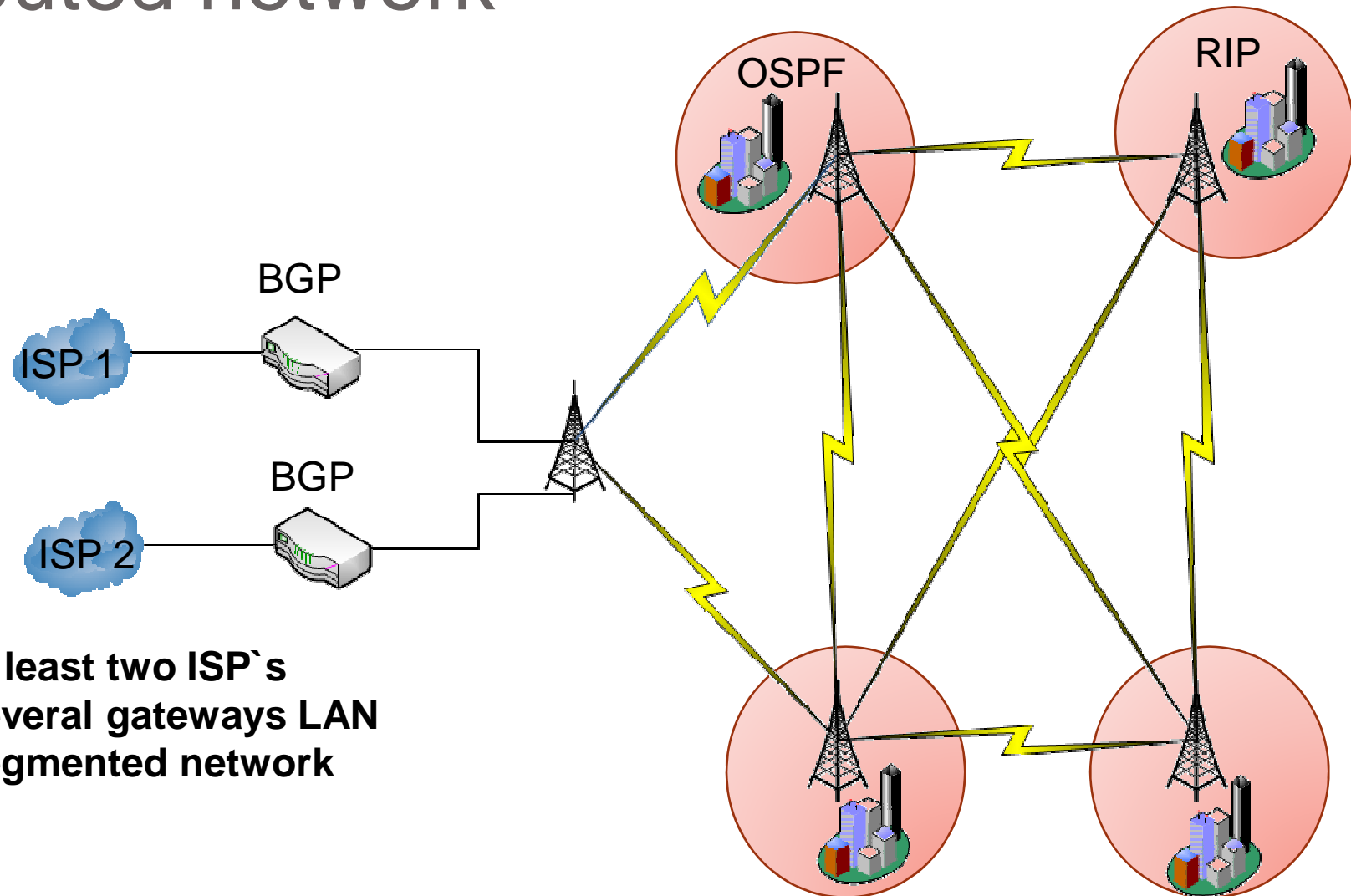
- **At least two ISP`s**
- **Several gateways LAN**
- **Segmented network**

Static Routing

- It is possible to provide high availability using static routing too. However you need to forecast all possible problems that can happen.
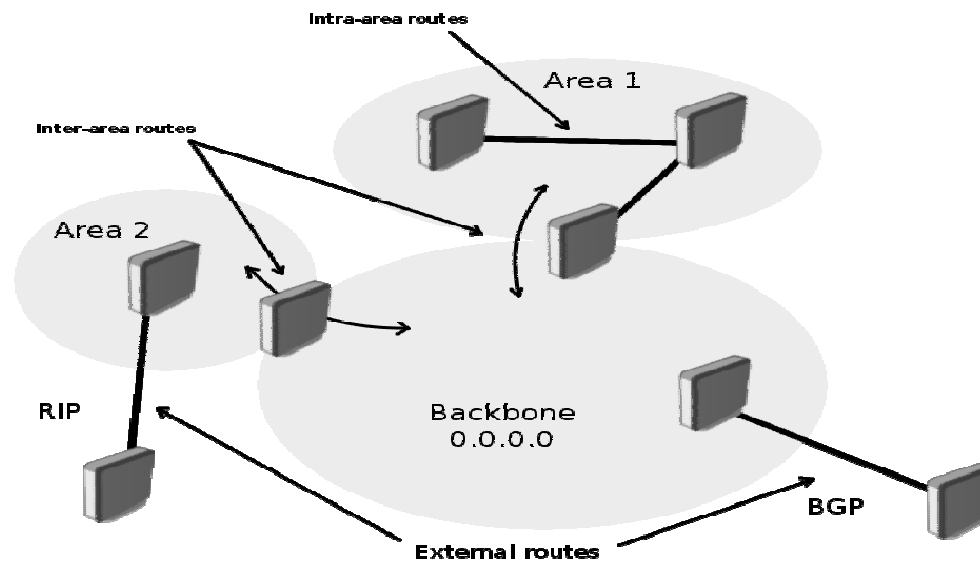
Static Routing

- **Positives**: Can solve some specific problems that could be more complicate to solve by changing your dynamic protocol setup or even not possible to solve because the dynamic routing protocol just fail.

- **Negatives**: Human fail will happen on huge networks. Some failover solutions are very difficult to get in some cases.

Dynamic Routing

- We can solve the static routing hard working by using dynamic routing protocols as: RIP, OSPF, MME, BGP, etc…

- The dynamic routing protocols are able to announce physical or logical changes and according to their algorithms they can make the necessary modifications on the routing table in order to keep traffic flow.

Dynamic Routing

- **Positives**: These protocols can do the "hard work" for you. Easy to create one way flow to UPLOAD and other to DOWNLOAD without lose redundancy.

- **Negatives**: These algorithms needs some cpu usage and make changes to the routing table very often.
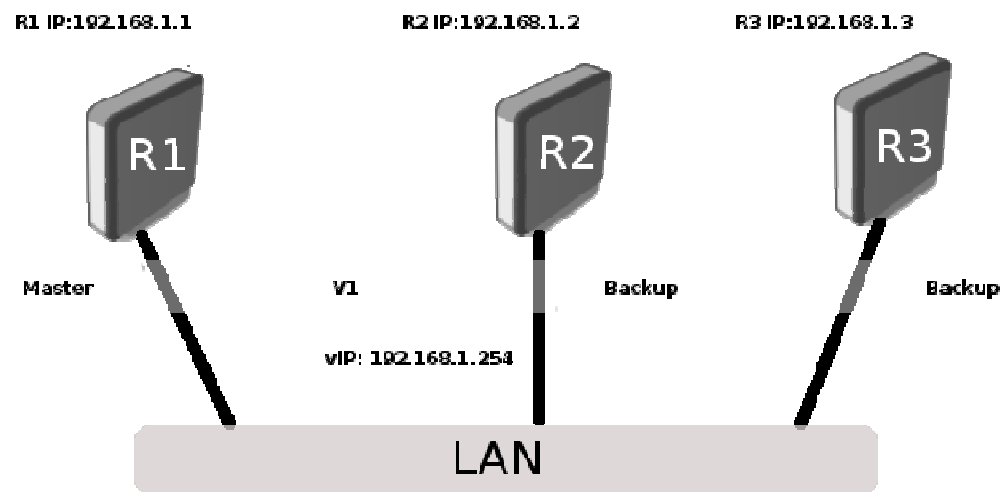
VRRP

- O Virtual Router Redundancy Protocol (VRRP) is a network protocol that provides automatic assignment of routers available to participating hosts. This increases the availability and confiability of routing paths by selecting default gateways automatically.

- The protocol accomplishes this by creating virtual router groups, which are an abstract representation of multiple routers. The default gateway of a host participant is assigned to the virtual router instead of a physical router.
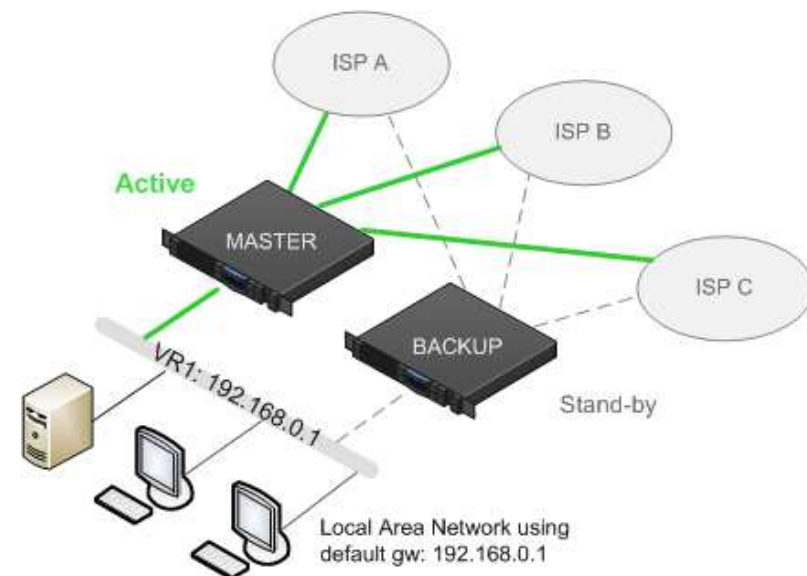
VRRP

- If the physical router that routes packets on behalf of the virtual router fails, another physical router is automatically selected to replace him. The physical router that does the routing of packets in a given time is called the master router.

R1 IP:192.168.1.1   R2 IP:192.168.1.2   R3 IP:192.168.1.3

R1   R2   R3

Master   V1   Backup   Backup
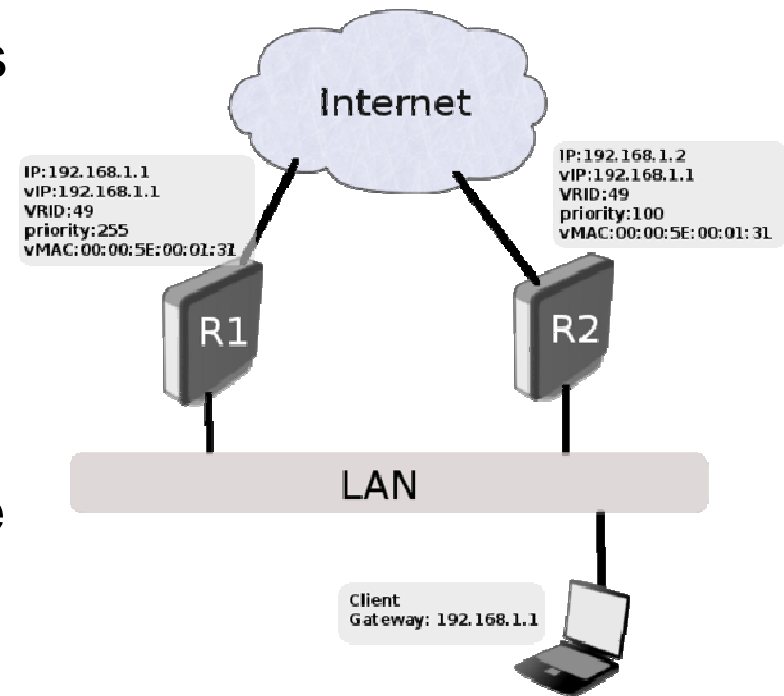
vIP: 192.168.1.254

LAN

VRRP

- Routers have priorities between 1-255 and the router with the highest priority will be the master one. When a planned withdrawal of a master router is about to happen you may change its priority. Which means that the backup router will preempt the master router status instead of having to wait the timeout. This reduces the "black hole" effect.

VRRP

- The default VRRP implementation is very simple.

- Advanced parameters should be adjusted in order to get some desired results like:

- Suppose you want the router R1 to be always the master one. You have to give it a bigger priority than R2 and you must set "Preampetable Mode=yes".

IP:192.168.1.1
vIP:192.168.1.1
VRID:49
priority:255
vMAC:00:00:5E:00:01:31

IP:192.168.1.2
vIP:192.168.1.1
VRID:49
priority:100
vMAC:00:00:5E:00:01:31

R1
R2
LAN
Client
Gateway: 192.168.1.1

- I have one live demonstration that can be found on tiktube page: http://www.tiktube.com/video/DEfH3aLmgGGHIICpIGqtpzpuDlEopEnI=
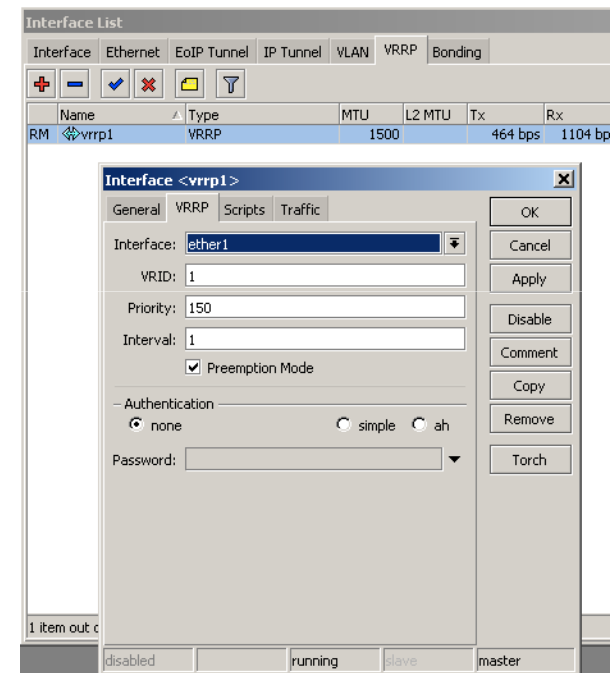
Soft configuration #1

For Router R1:

```
/interface vrrp add interface=ether1 vrid=49 priority=150
/ip address add address=192.168.1.1/24 interface=ether1
/ip address add address=192.168.1.254/32 interface=vrrp1
```
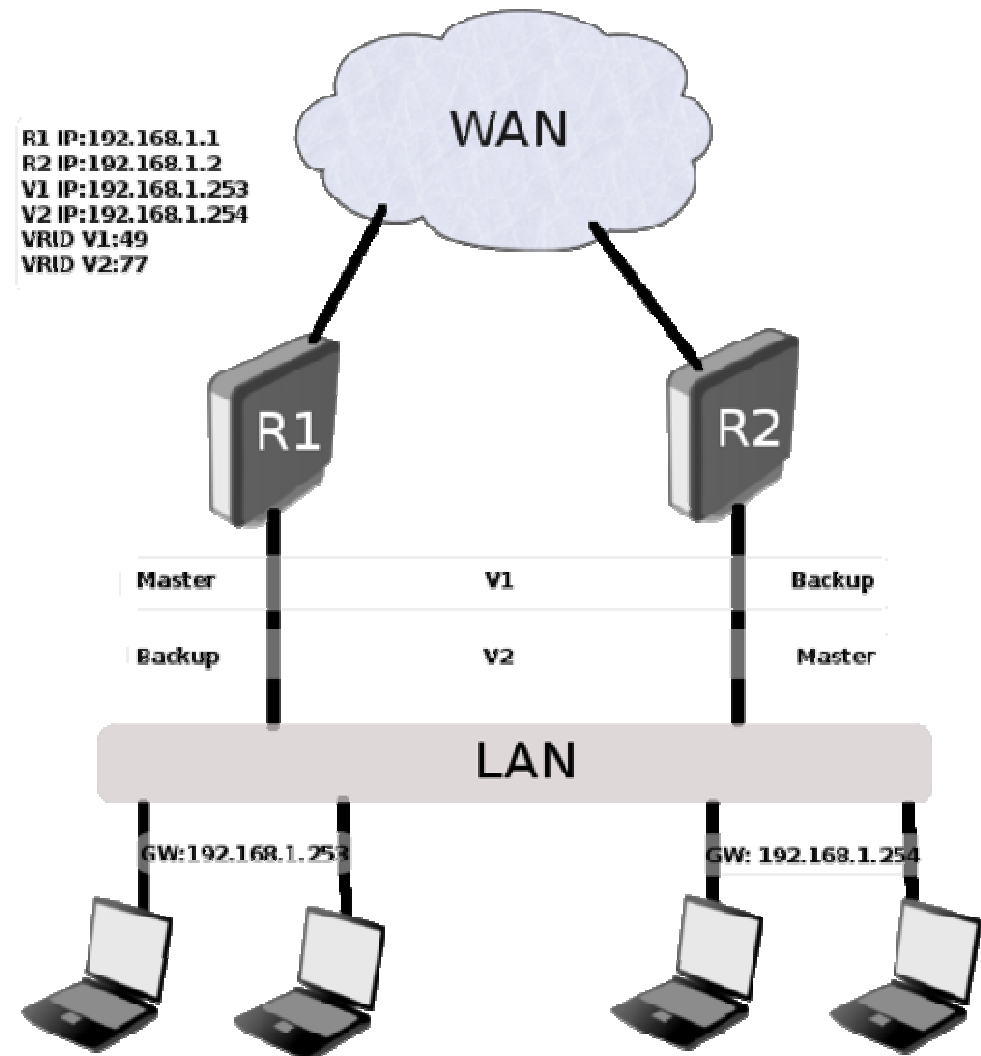
For Router R2:

```
/interface vrrp add interface=ether1 vrid=49 priority=100
/ip address add address=192.168.1.2/24 interface=ether1
/ip address add address=192.168.1.254/32 interface=vrrp1
```

Soft configuration #2

- Its is possible to make load balance using VRRP.

- In this case you need to create two virtual routing groups with different IDs.

R1 IP:192.168.1.1
R2 IP:192.168.1.2
V1 IP:192.168.1.253
V2 IP:192.168.1.254
VRID V1:49
VRID V2:77

WAN

R1   R2

Master   V1   Backup

Backup   V2   Master

LAN

GW:192.168.1.253   GW: 192.168.1.254

Soft configuration #2

For Router R1:

```
/ip address add address=192.168.1.1/24 interface=ether1
/interface vrrp add interface=ether1 vrid=49 priority=150
/interface vrrp add interface=ether1 vrid=77 priority=100
/ip address add address=192.168.1.253/32 interface=vrrp1
/ip address add address=192.168.1.254/32 interface=vrrp2
```

For Router R2:

```
/ip address add address=192.168.1.2/24 interface=ether1
/interface vrrp add interface=ether1 vrid=49 priority=100
/interface vrrp add interface=ether1 vrid=77 priority=150
/ip address add address=192.168.1.253/32 interface=vrrp1
/ip address add address=192.168.1.254/32 interface=vrrp2
```
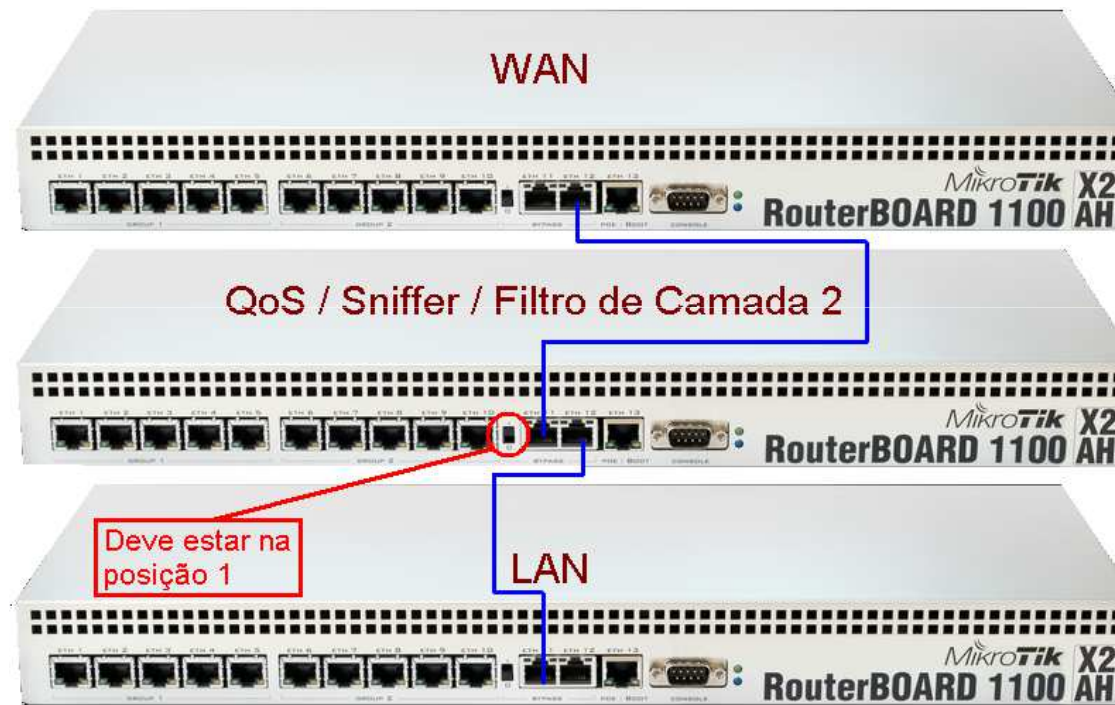
VRRP

- **Positives**: Fast response in case of physical failure, easy way to replace devices without black hole periods and no routing table modification.

- **Negatives**: In Nated networks some connections you will reset.

ByPass

- Here you will find a great solution to redundant access points in your tower:
http://mum.mikrotik.com/presentations/PL12/grifonline.pdf
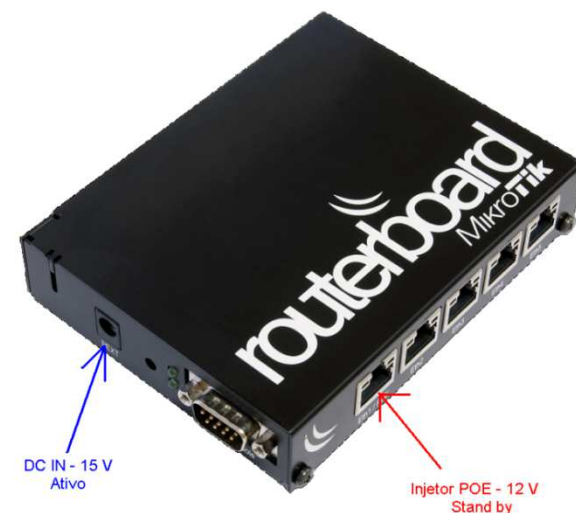
Power Redundancy

- The RouterBoards can be fed simultaneously with DC jack and POE Injector.

- This way you can replace power suply without lose the uptime.

- The higher voltage is chosen.

DC IN - 15 V
Ativo

Injetor POE - 12 V
Stand by

Final considerations

- We conclude that a single redundancy feature may be not enough not perform high availability.

- However the mutual cooperation of all these techniques allows us to provide high availability.

- All these features and techniques used in this presentation are available in MikroTik RouterOS and the RouterBoards.

Questions??

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Thanks!!
Hvala!!