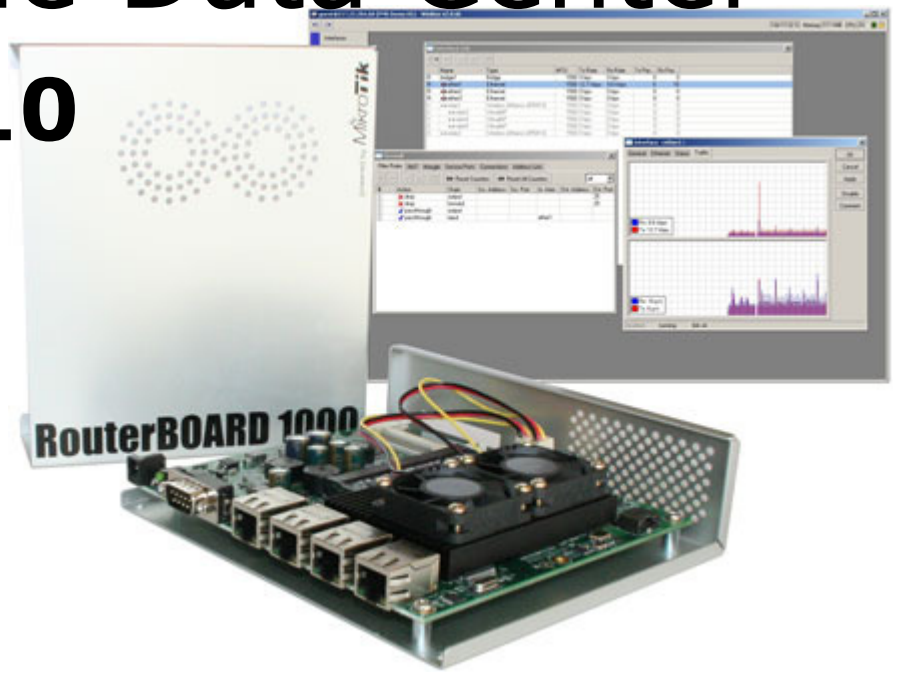
RouterOS in the Data Center

MUM Poland 2010

by Patrik Schaub



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Contents

About FMS

Patrik Schaub, schaub@fmsweb.de

- Founded in 1999
- MikroTik
  - Distribution (www.mikrotik-shop.de)
  - Training (www.mikrotik-training.de)
  - Consulting and service contracts
  - Custom AAA development
- Suppelemtary products
- Own / exclusive product lines

mikroSPOT Addon Software

- Hotspot managemet for windows
- Controlls a RouterOS based hotspot
- Easy to use for untrained staff (hotel, camping…)

mikroSPOT Addon Software

- Resellers welcome
- Test drive at our distributor tabel

mikroCase Classic

- For RouterBOARD, ALIX and ITX
- Two mainboards per U

Classic series:

- Integrated PSU
- Integrated DSL modem possible

mikroCase Budget

- For RouterBOARD, ALIX and ITX
- Two mainboards per U (except RB493)

Budget series:

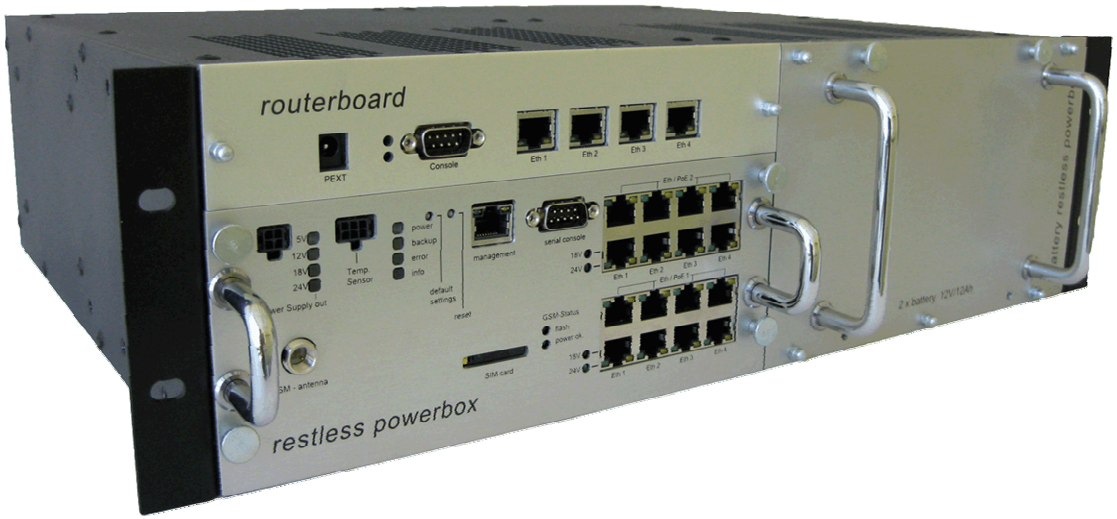
- Low cost
- External PSU

Licenced band microwave equipment

- Licenced band (7-38GHz)
- Up to 800MBit Full Duplex
- Full outdoor and split mount available
- Ideal as backhaul for MikroTik basestations

Restless Powerbox

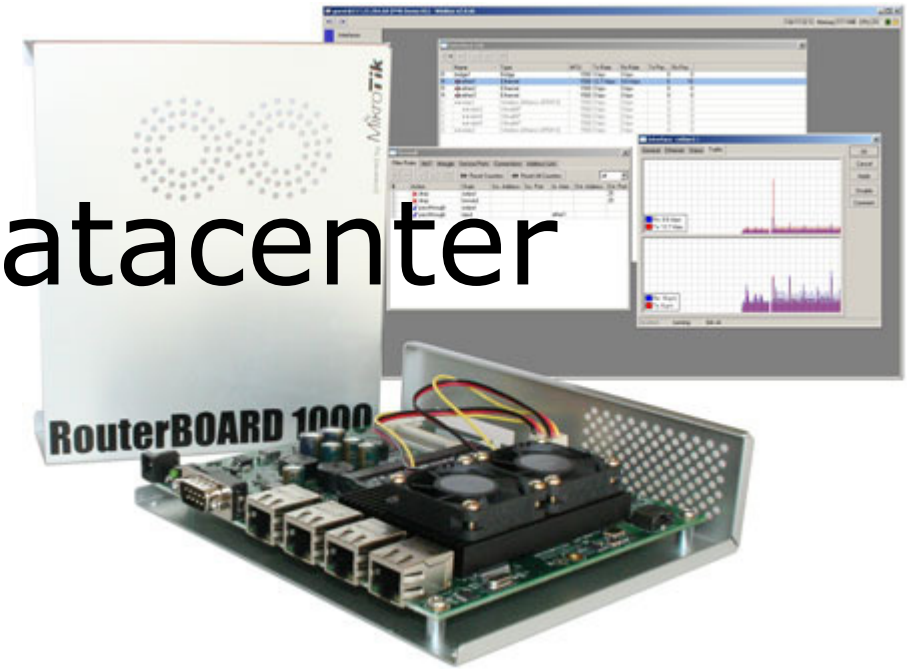
- Remote control passive PoE ports
- Integrated RouterBOARD (optional)
- Integrated UPS
- SMS/Email alarms



Ogma Connect routers

- RouterOS based
- Up to 11 x GBit Eth
- PCI-X addon slot at back
- Different models available

Why to the datacenter



Datacenter

- Technical environment
- Mutiple ISPs available

To get:

- High availability
- High uptime of services
- Good network performance

Data center based applications

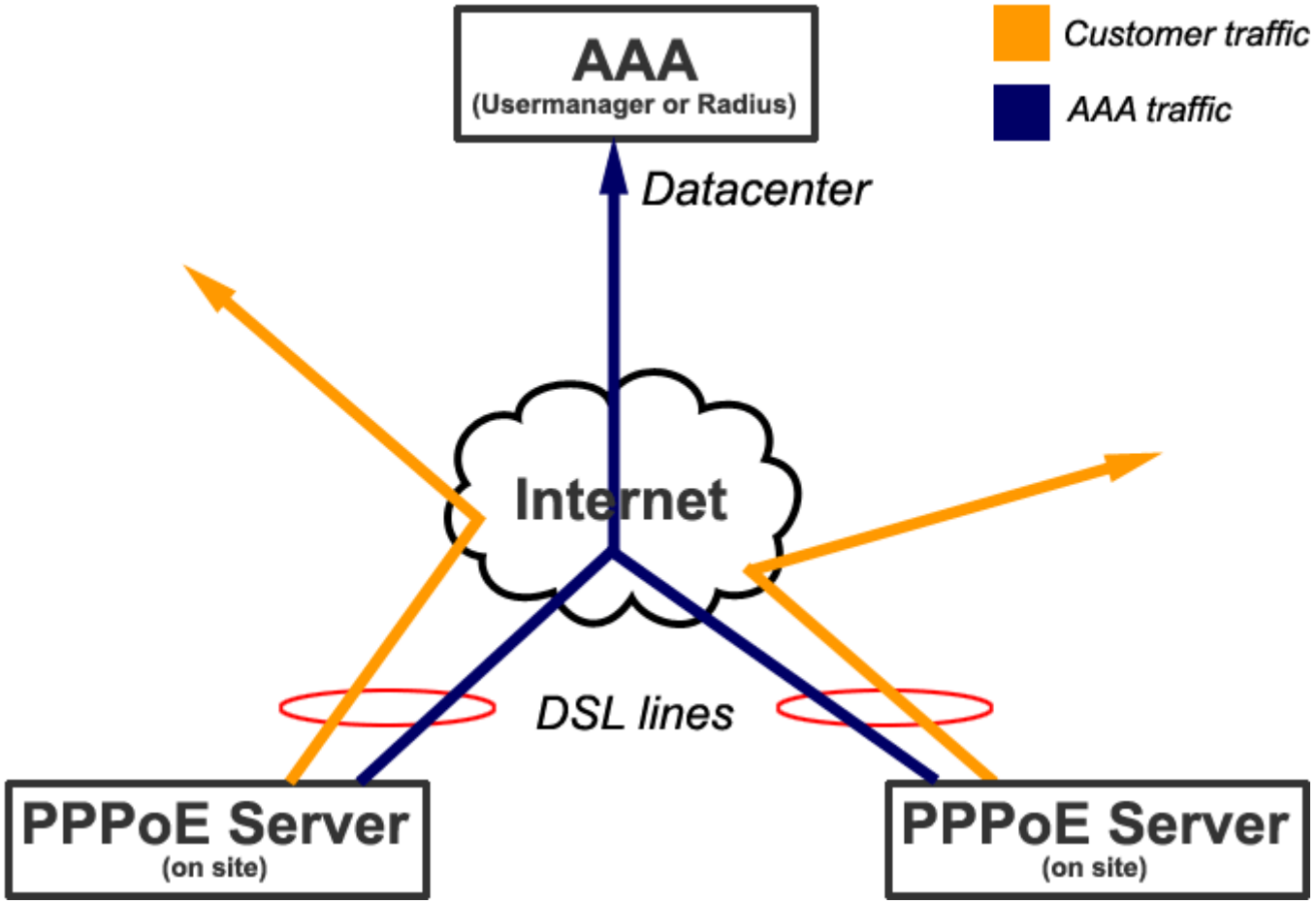
- Web- / Serverhosting
- Running VoIP and IPTV services
- Broadband reselling

- Special case: Wireless ISPs

Common WISP setups

- Decentral with many broadband lines
- Central with leased line and wireless backbone

Example1: Central AAA



Example1: Central AAA

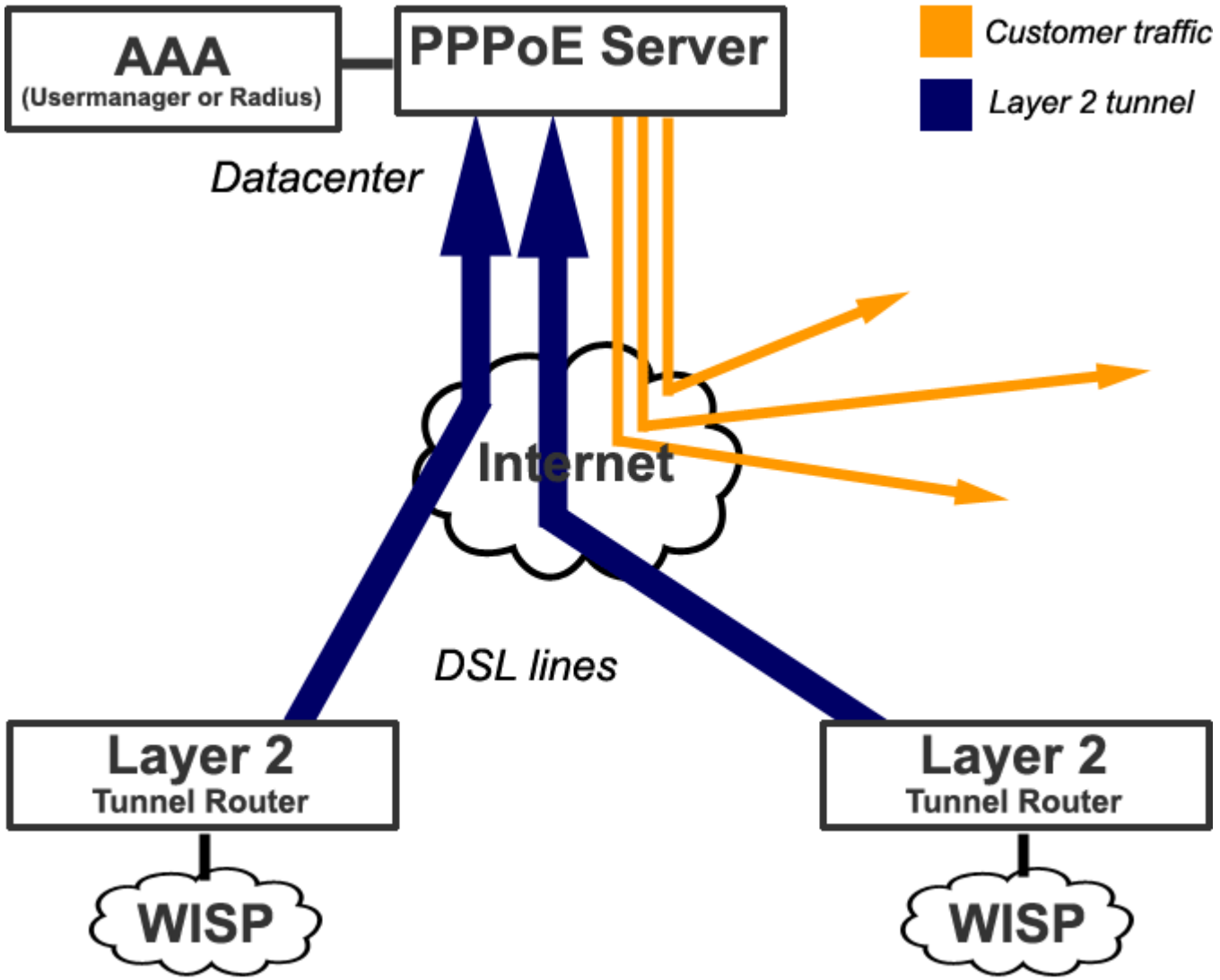
- Cetralising on site AAAs in the datacenter
  - Easier management
  - Customer can use neighboring cells
  - Central AAA with Usermanager or RADIUS possible
  - Hotspot, PPPoE, PPtP

Example2: Datacenter tunneling

- Virtual network by L2 tunneling
- Customer traffic goes through

- Public addresspace for customers
- Central AAA
- Very flexible design
- Free choice of broadband carrier

Example2: Datacenter tunneling

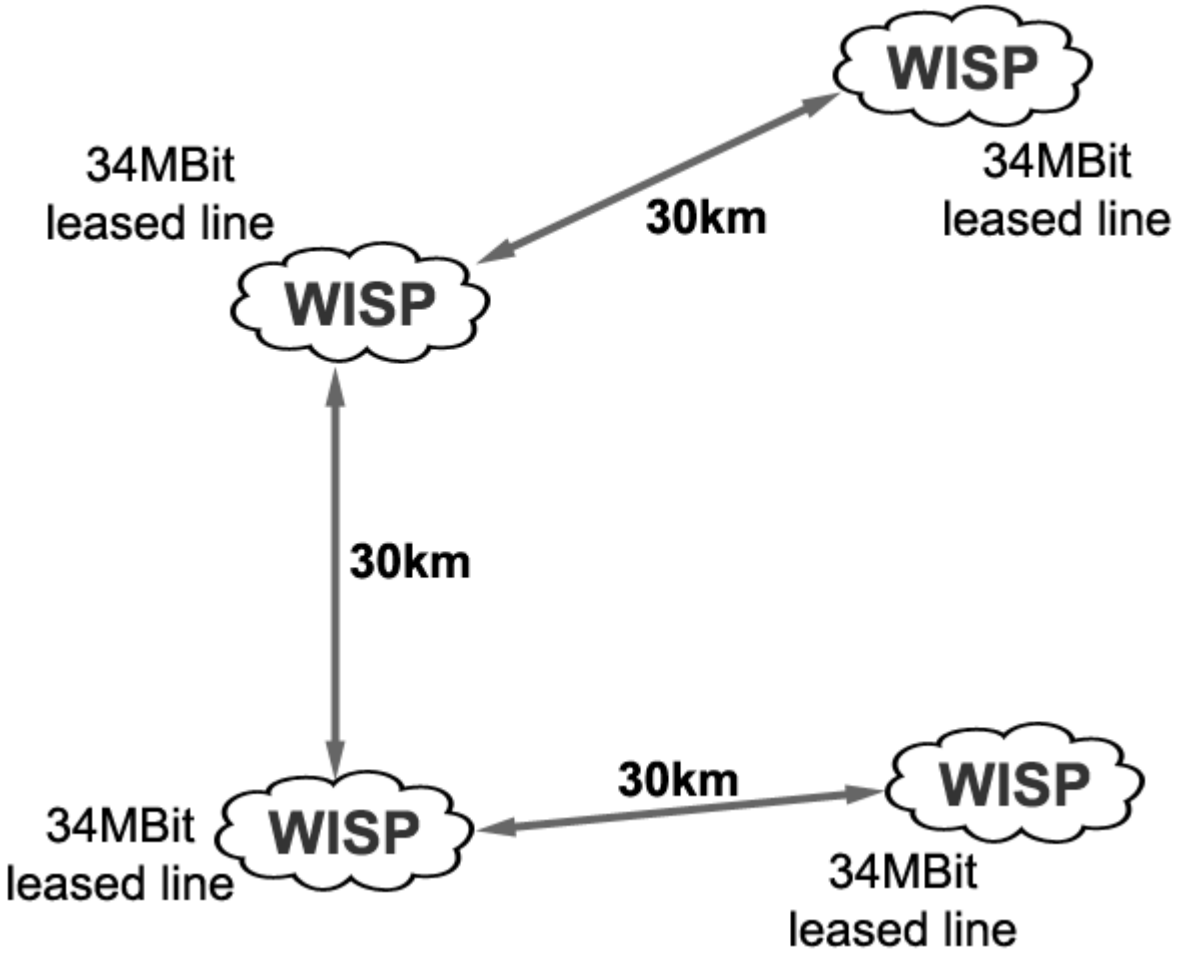


Example3: Wireless Backbone

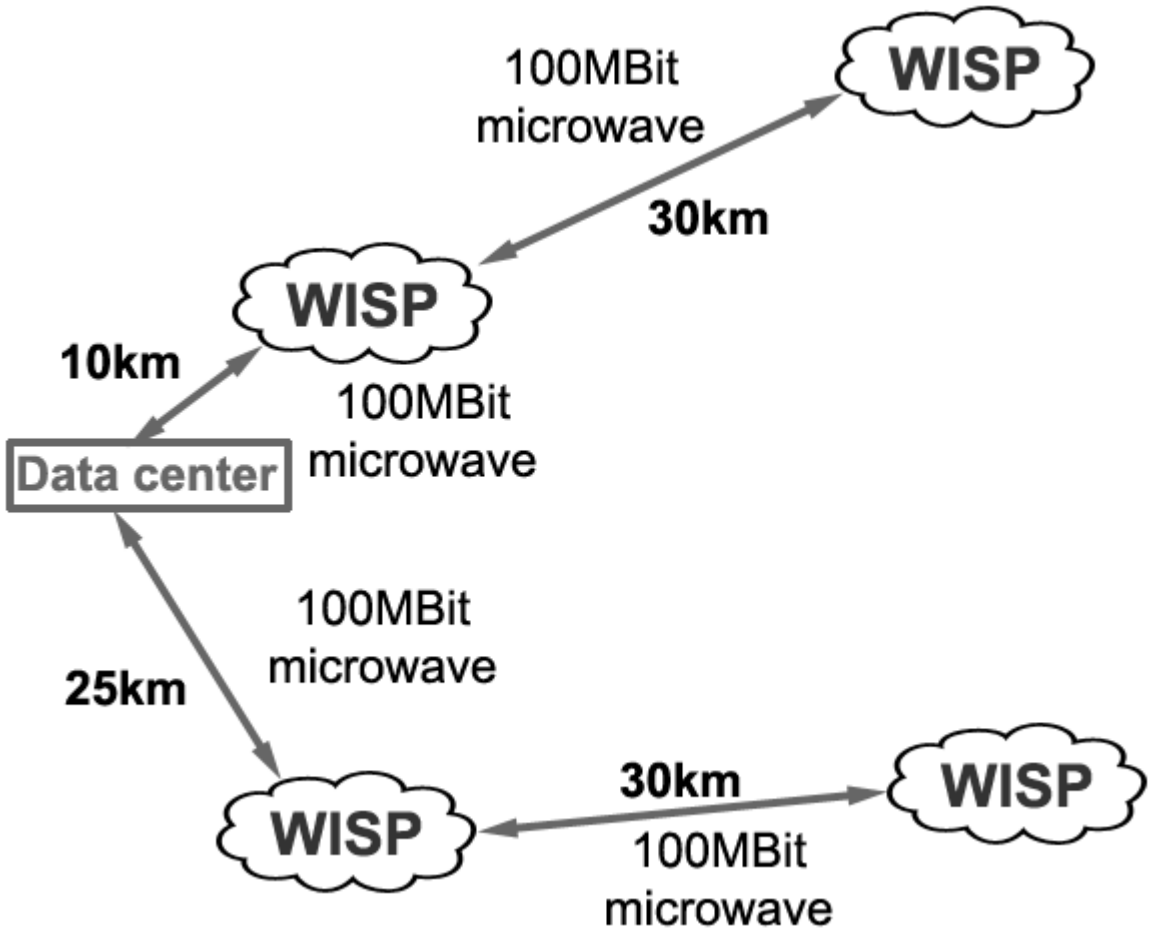
- Central network upstream
- Distributed by a wireless backbone
- Often more cost efficient than leased lines
- Licenced band radio equipment

- FMS provides professional microwave systems from 7 – 38GHz with up to 800MBit and has certified staff for consulting

Example3: Wireless Backbone

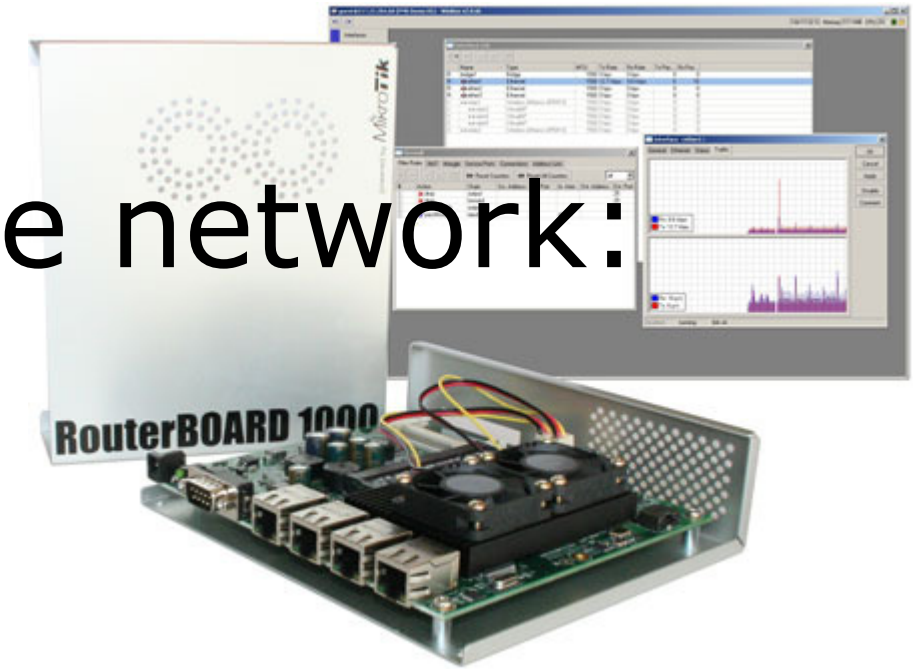


Example3: Wireless Backbone



High available network:

- Bonding -



A single homed core router

- One upstream ISP
- Copper or fibre inhouse cable to core switch
- Corerouter behind core switch
- ISP gateway as default gateway

- The first three single points of failure in our network: Ethernetcable, router port, switch port

- Sollution: Second cable for redundancy

If the link fails: Bonding

- Can achive redundancy and higher bandwidth
- Multiple physical interfaces form one virtual interface
- Different standards and approaches
- MikroTik: Bonding
  Others: Link Aggregation, NIC Teaming, Trunking

RouterOS bonding modes

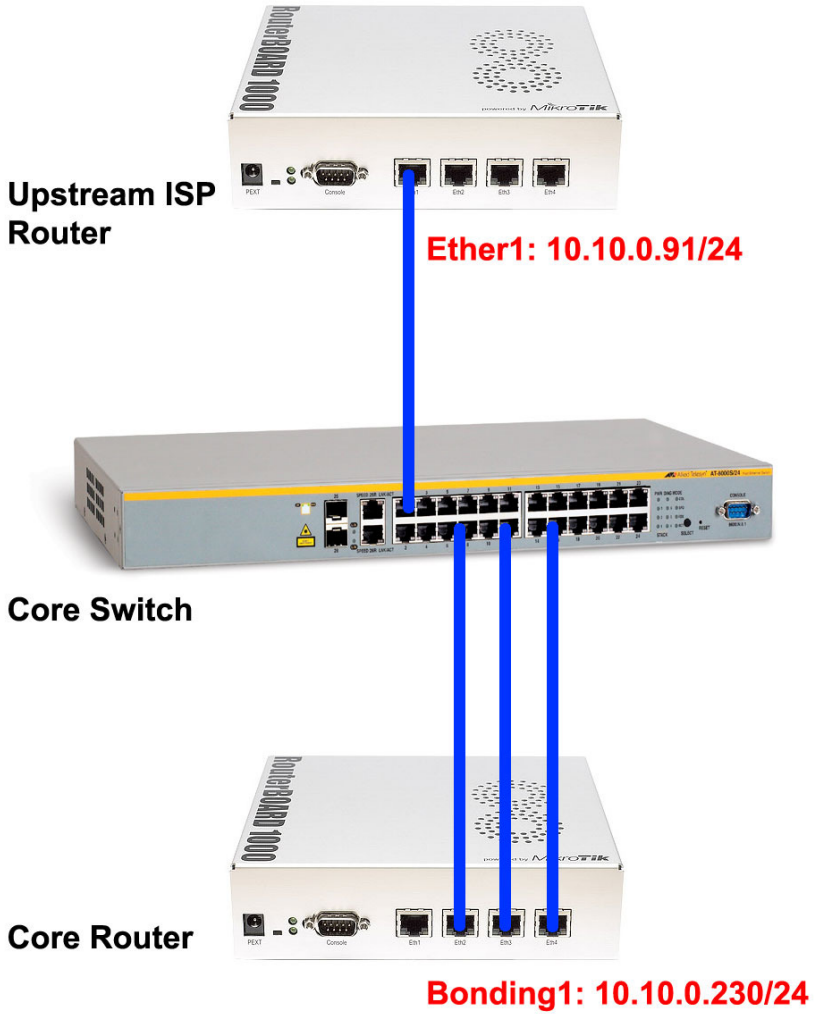
- Goal: redundancy and higher bandwidth
- Problem: reordering of packets for TCP connections
- Different sollutions
- Standard for Aggregation 802.3ad & LACP

RouterOS bonding modes

	Fail-over	Load balancing	Switch config	Link Monitoring
802.3ad	Yes	Yes	Different	MII
active backup	Yes	No	No	Different
broadcast	Yes	No	Yes	ARP, MII
balance rr	Yes	Yes	Yes	ARP, MII
balance xor	Yes	Yes	Yes	ARP, MII
balance tlb	Yes	Yes	No	MII
balance alb	Yes	Yes	No	MII

Fail over for uplink connection

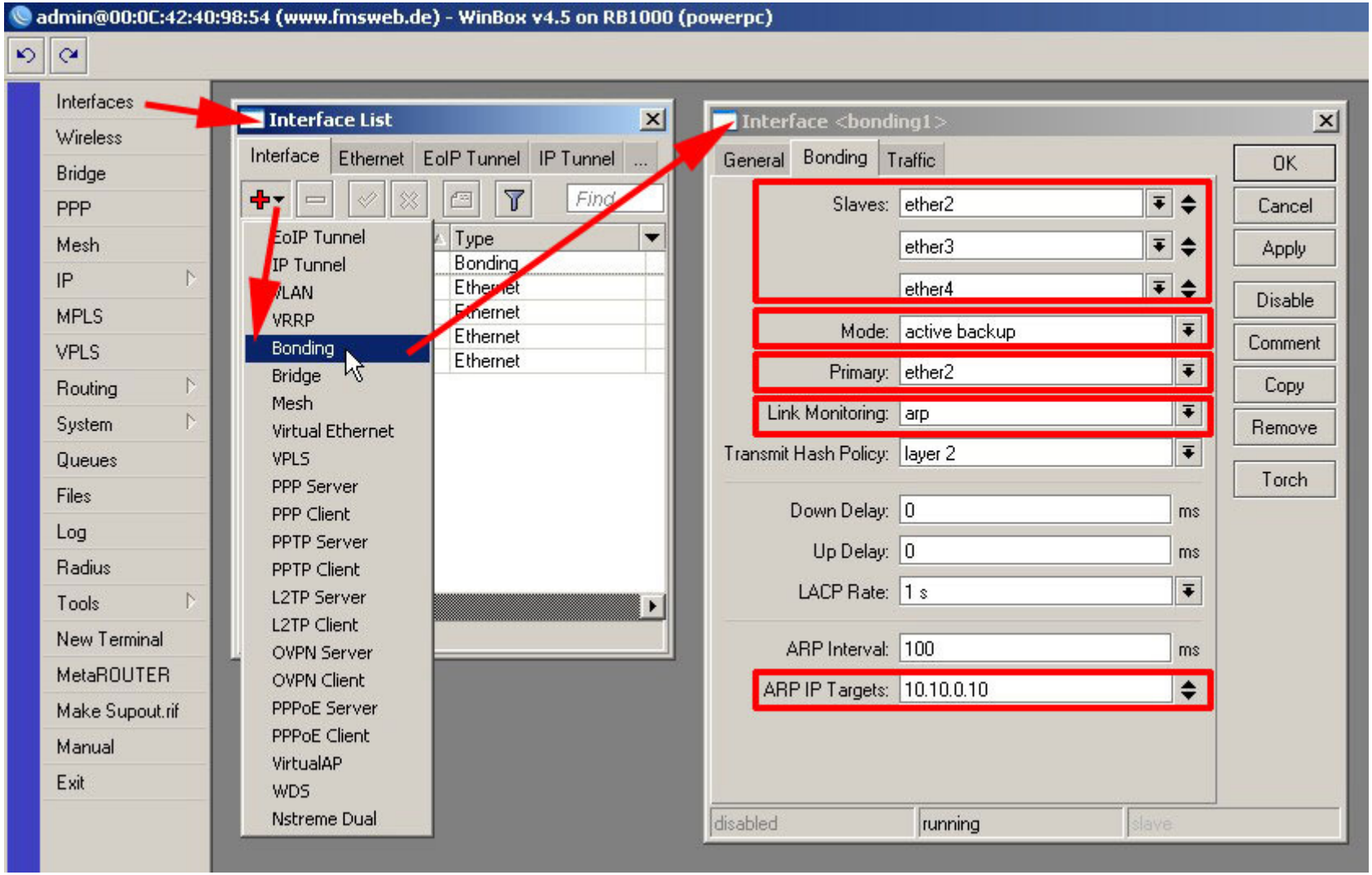
- active-backup
- only fail over
- no switch configuration



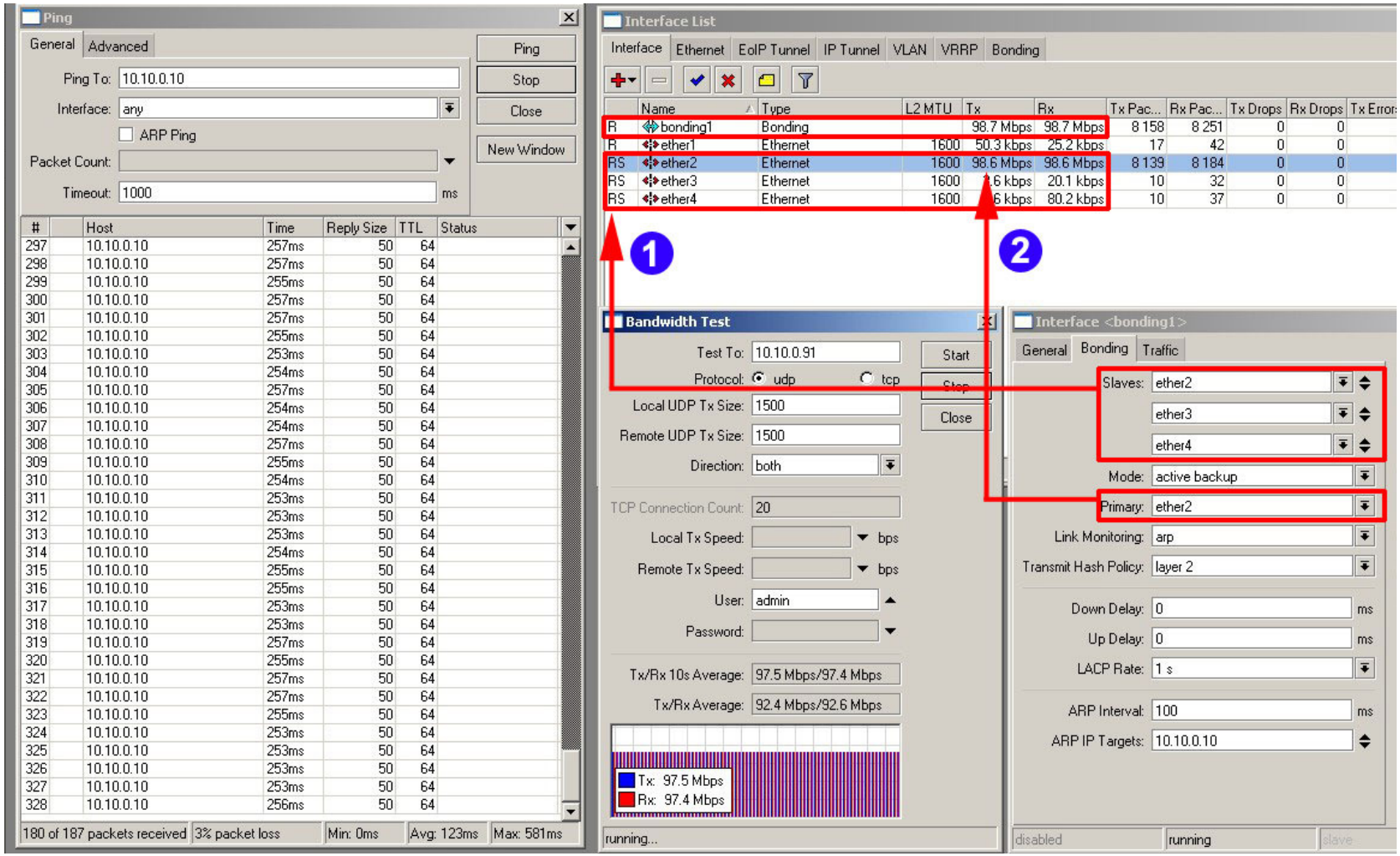
Fail over for uplink connection

- Traffic will flow over primary interface while link is up
- Inactive slave MAC invisible
- More than 2 interfaces possible
- No switch configuration necessary

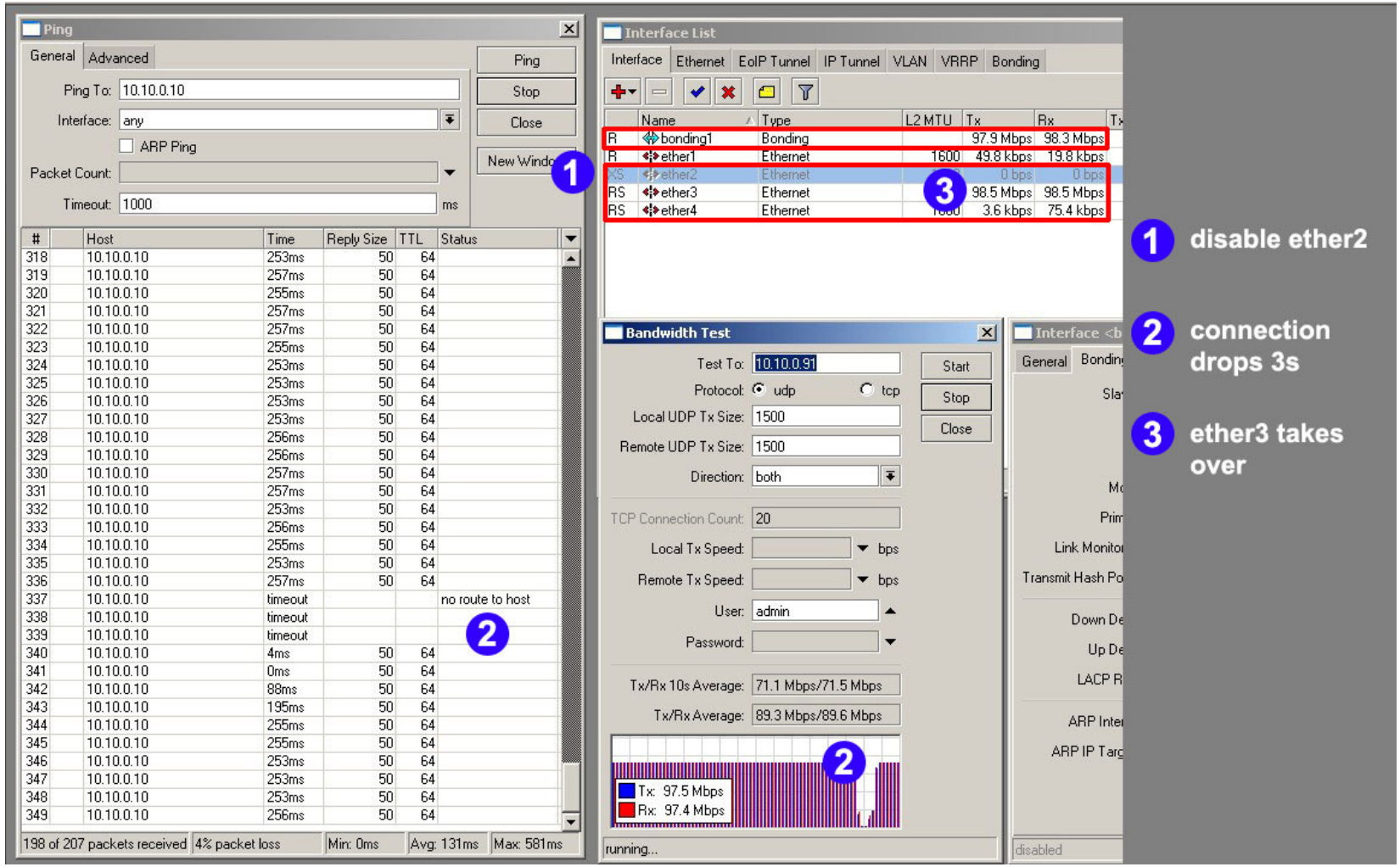
Configuration: active-backup



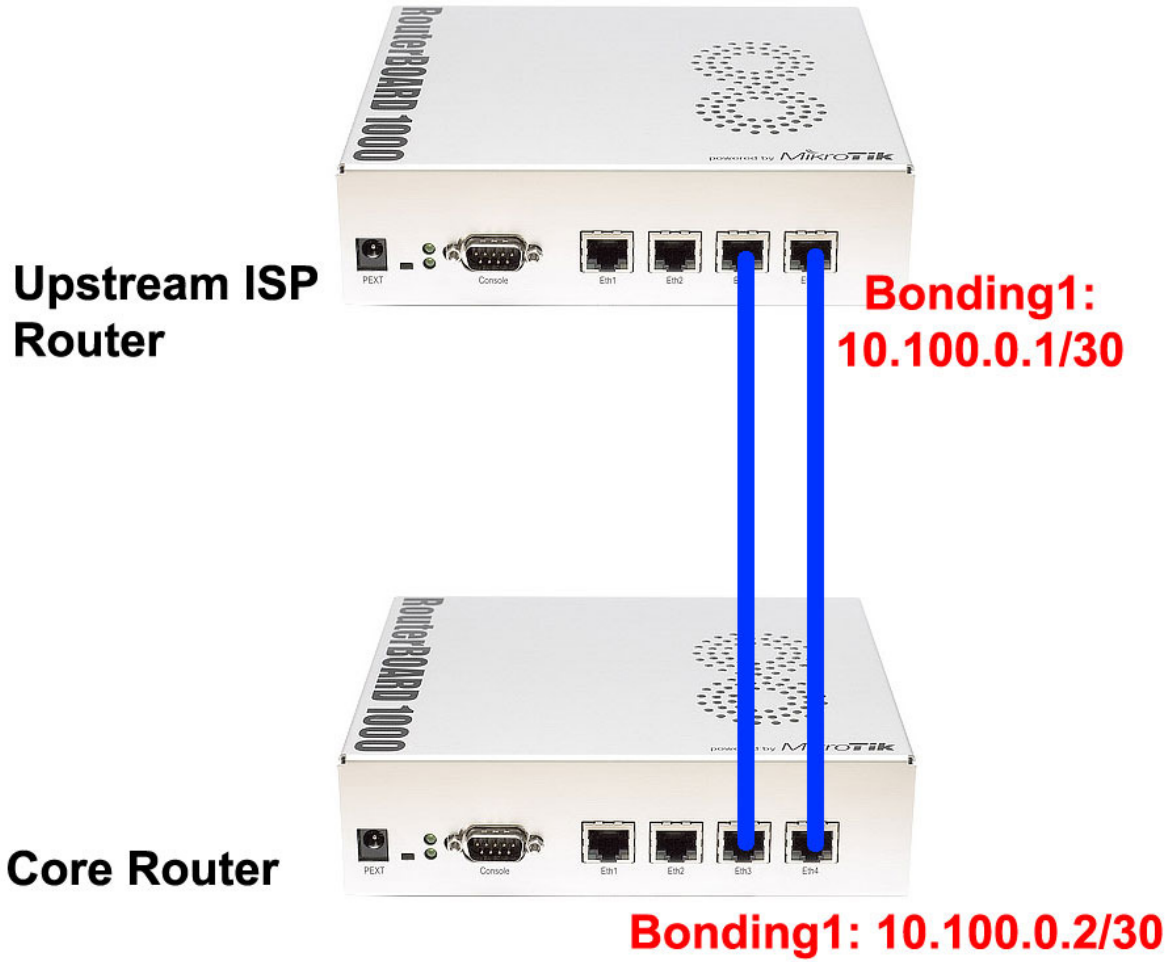
How good does it work?



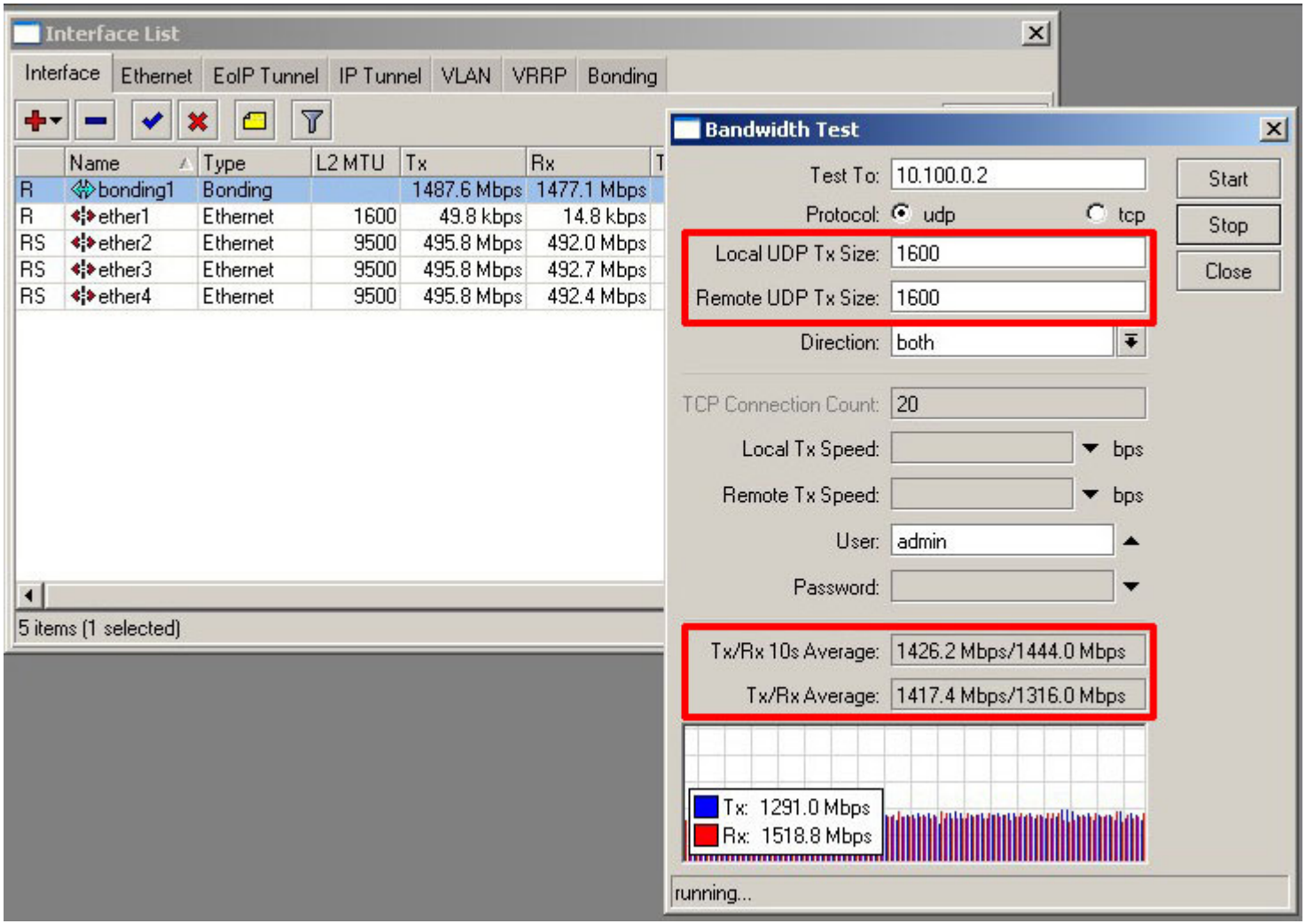
Disable active slave



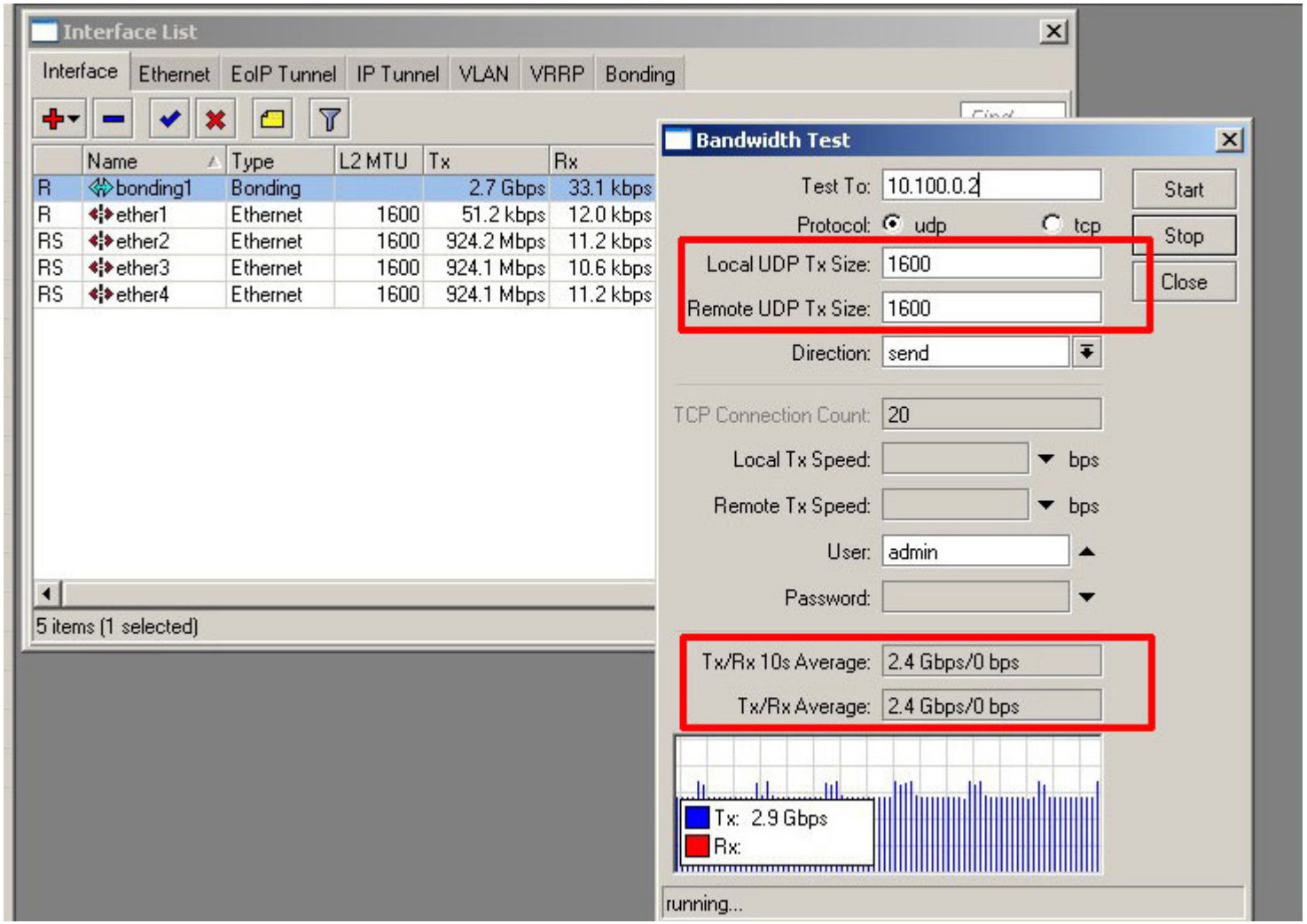
Example: balance-rr



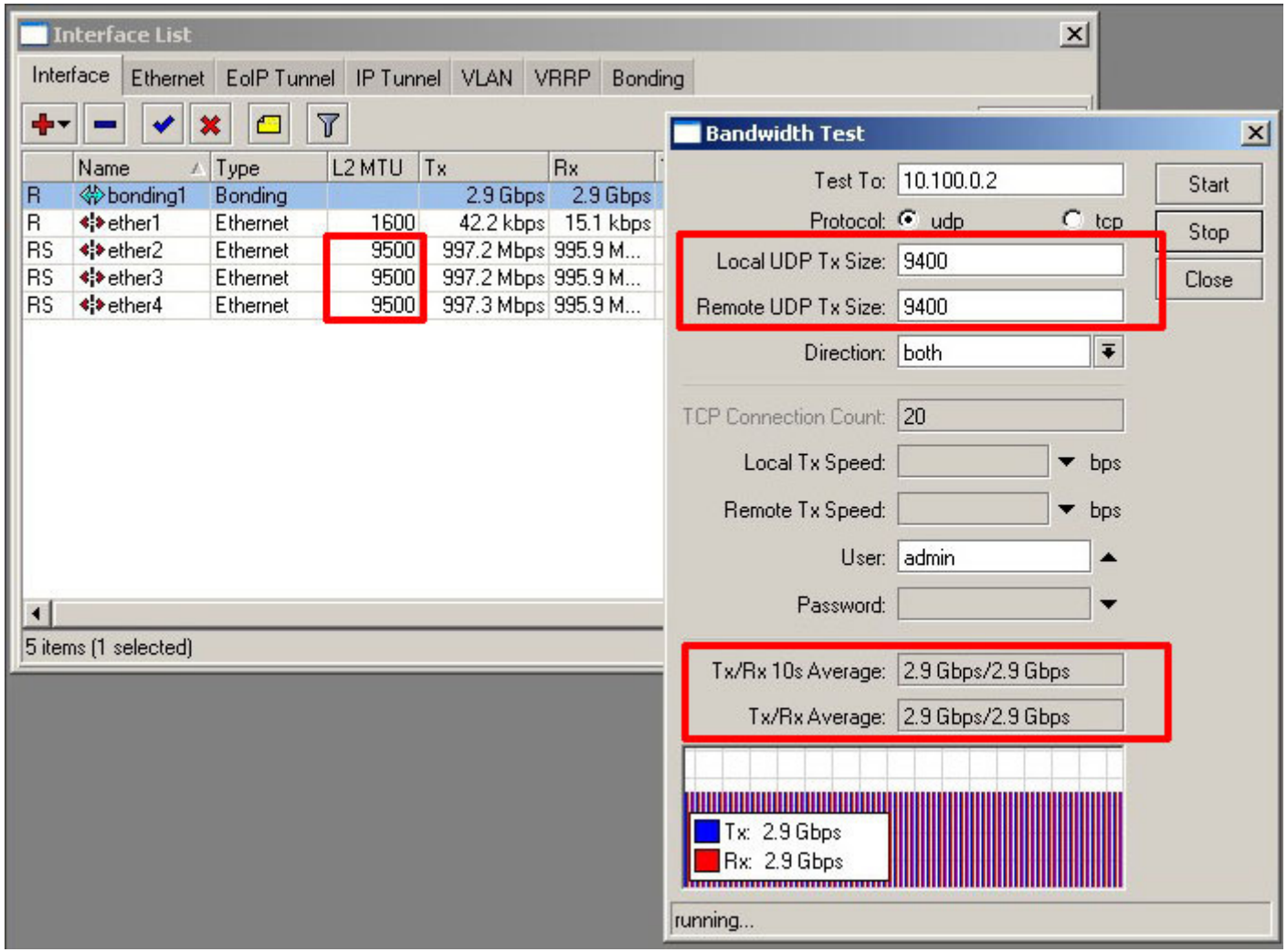
1600 Byte, bidirectional



1600 Byte, unidirectional

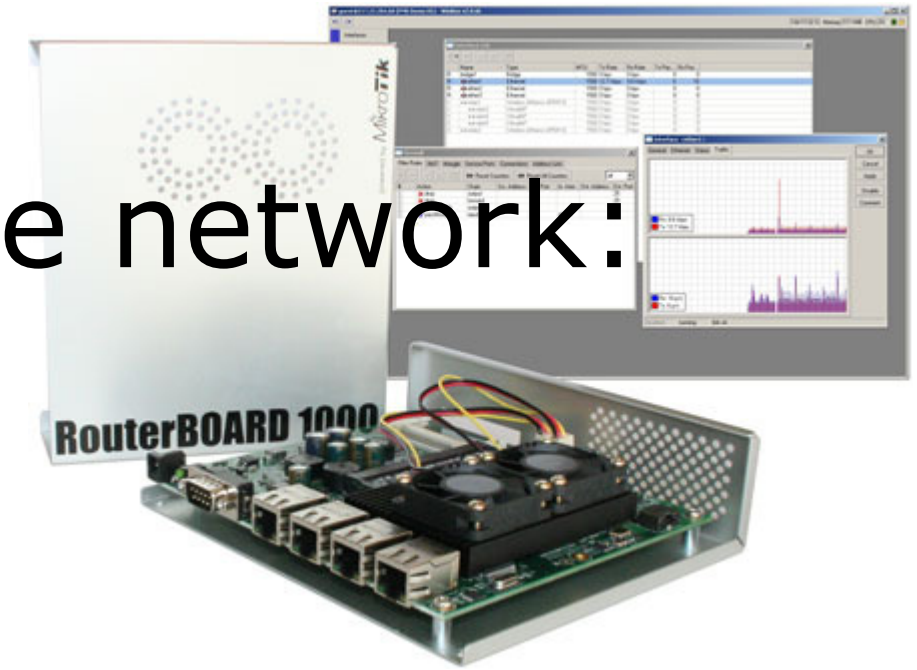


9400 Byte, bidirectional



High available network:

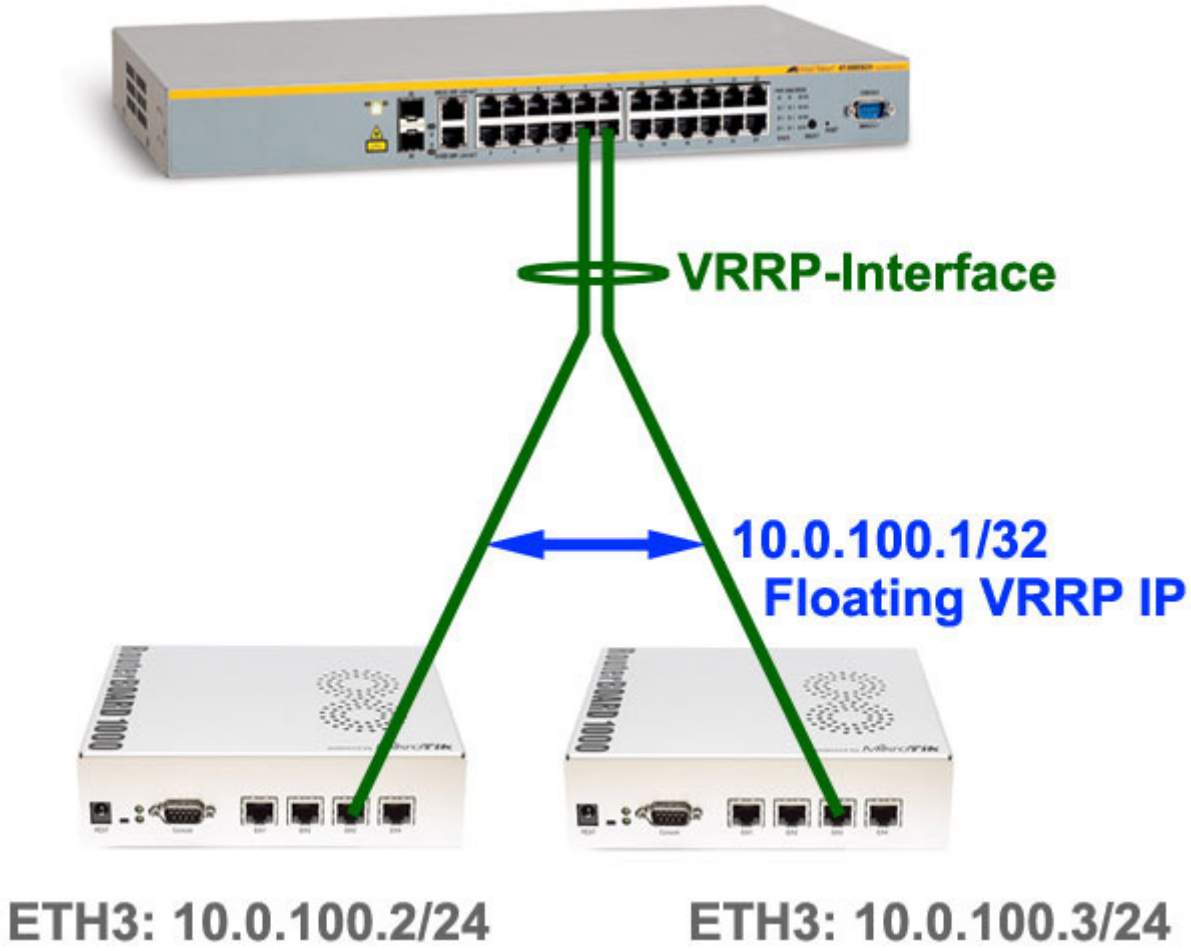
- VRRP -



If the router fails: VRRP

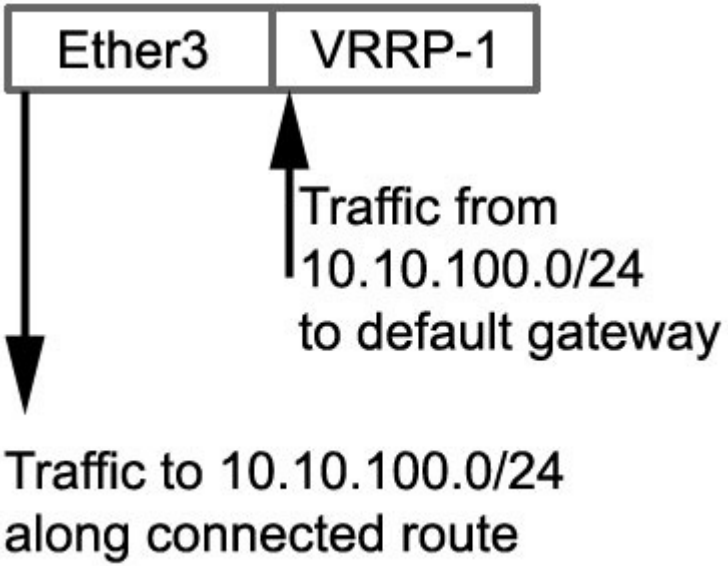
- VRRP (Virtual Router Redundancy Protocol)
- Cluster interfaces of different routers with shared IP adress
- Hot standby of slaves
- Open standard

VRRP Overview

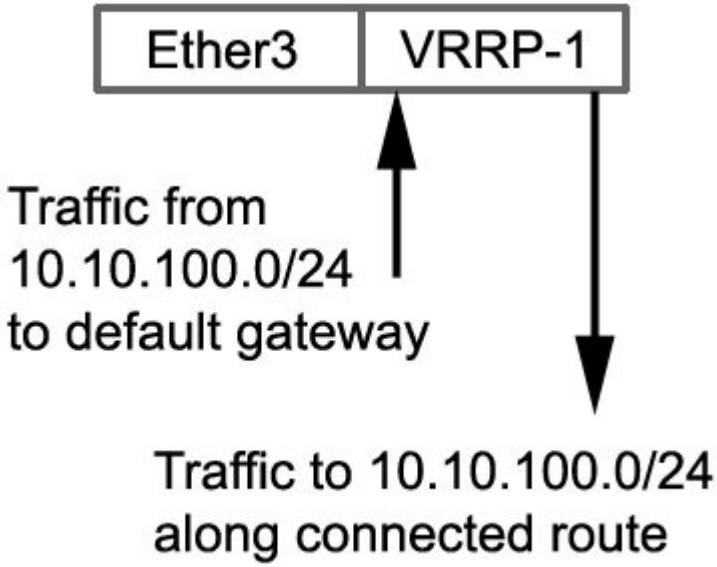


Address decisions

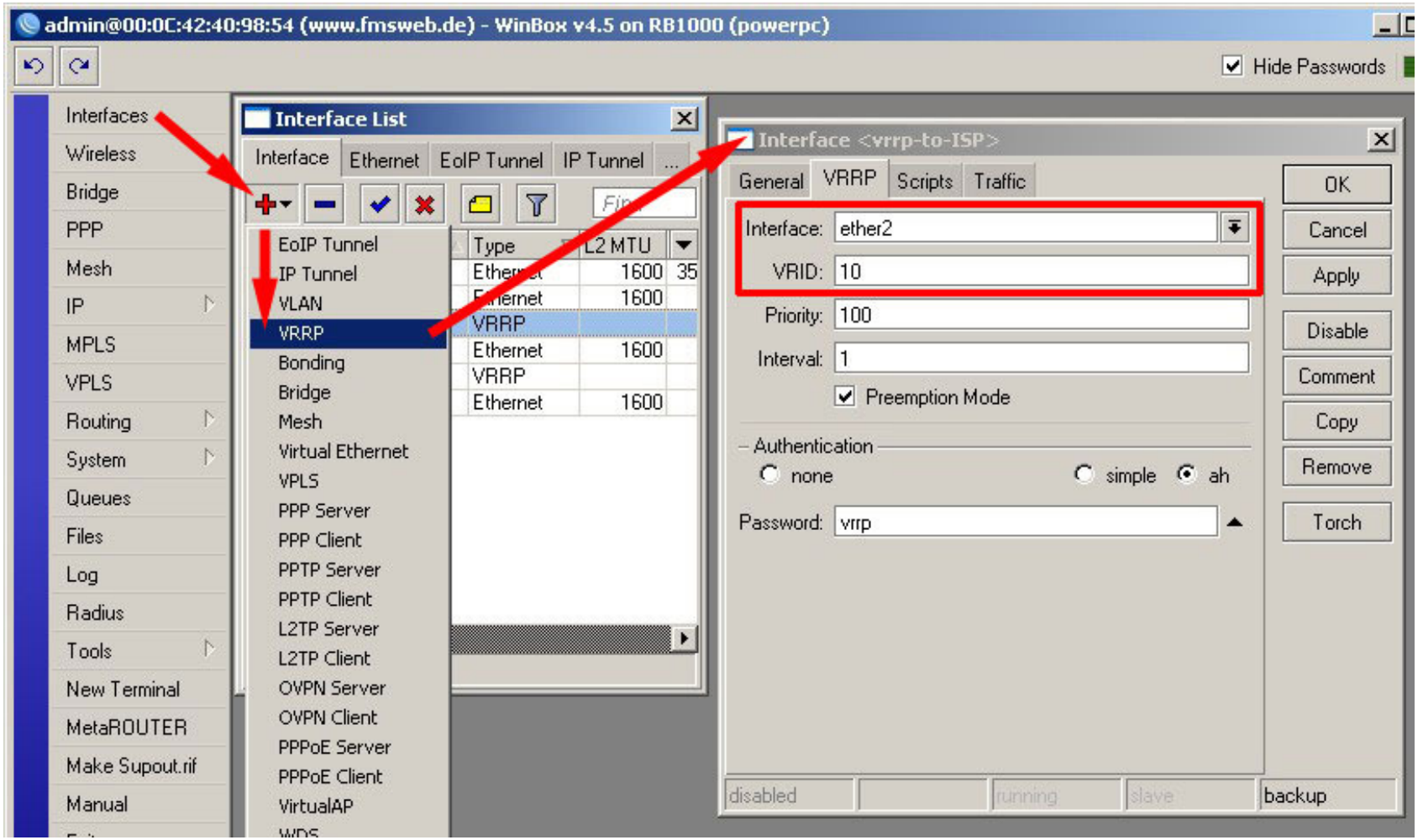
Ether3: 10.10.100.2 /24
VRRP-1: 10.10.100.1 /32



Ether3: 10.10.90.1 /24
VRRP-1: 10.10.100.1 /24



VRRP Configuration

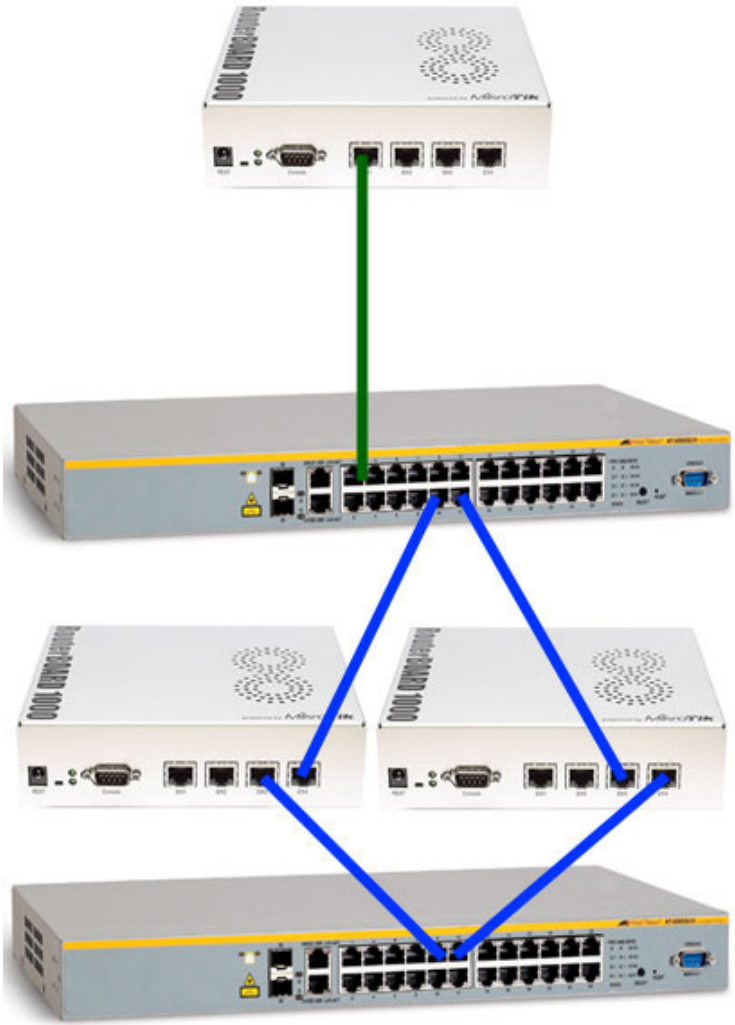


Single homed redundant core router

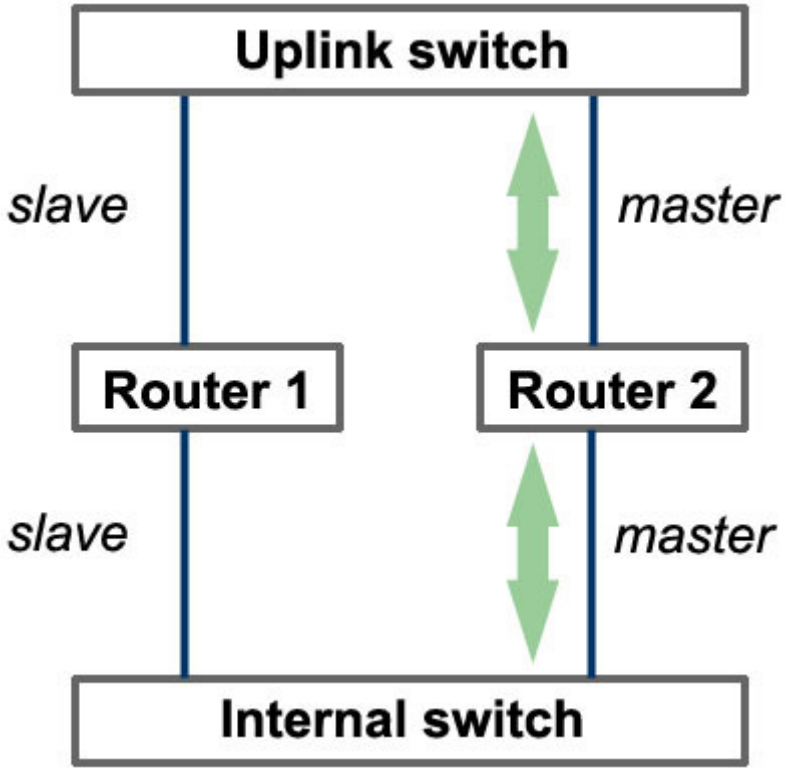
- Two routers connected to uplink switch and client switch
- Interfaces configured for VRRP
- Seperate IP Adresses

- Failover for Dead router

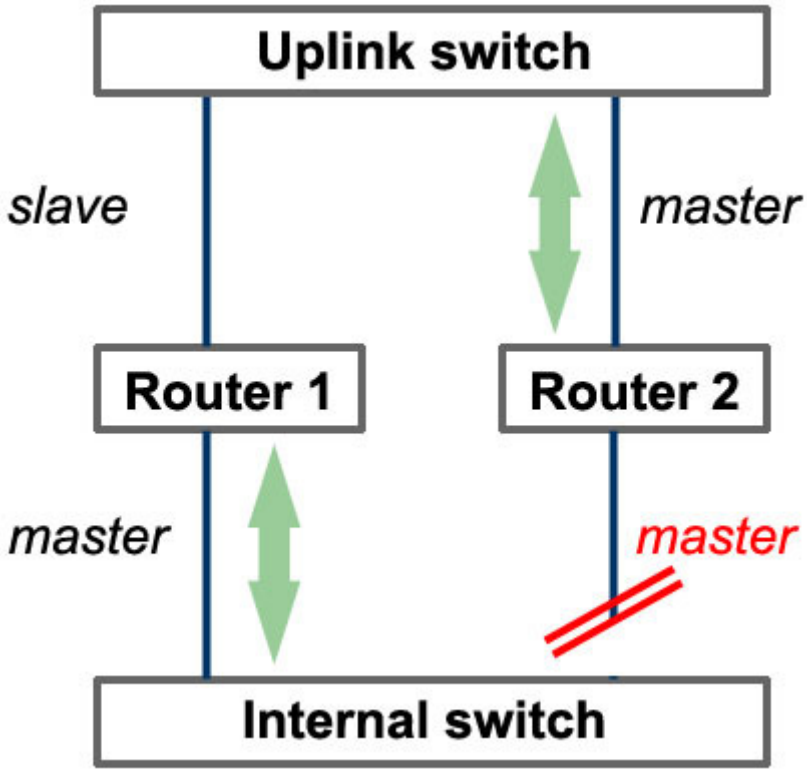
Single homed redundant core router



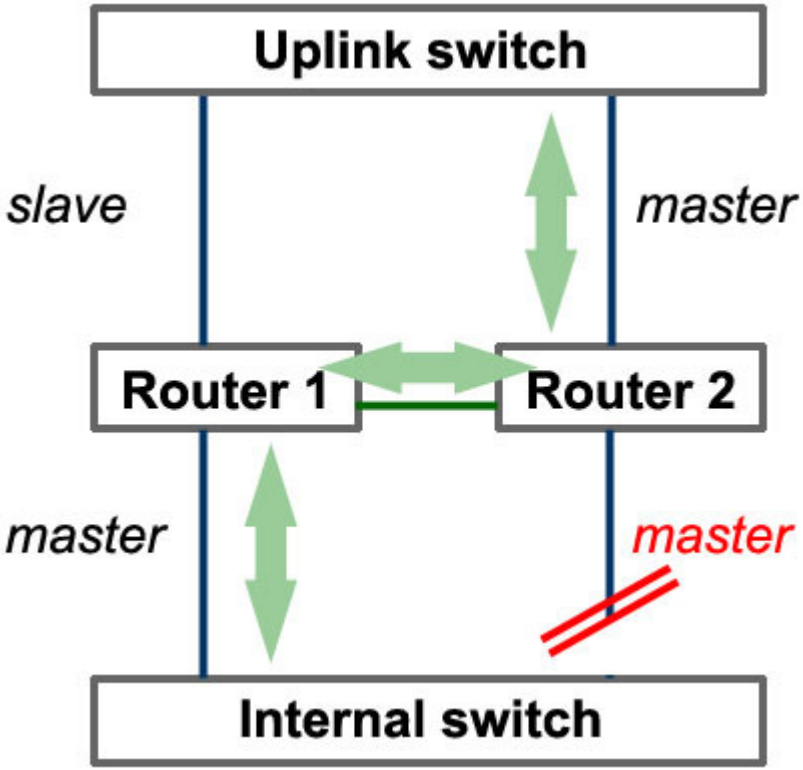
VRRP optimisation



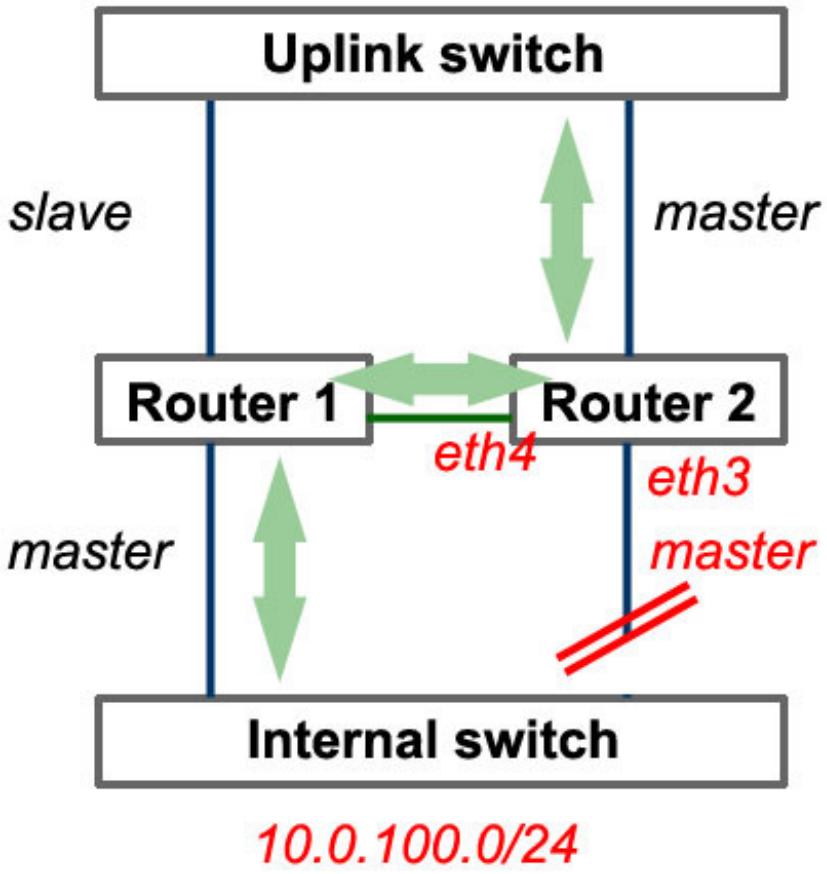
VRRP optimisation



VRRP optimisation



Router 2 – policy based routing



Interface | Ethernet | EoIP Tunnel | IP Tunnel | VLAN | VRRP | Bonding

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...
R	ether1	Ethernet	1600	36.2 kbps	14.9 kbps	7	1
R	ether2	Ethernet	1600	650 bps	0 bps	1	
RM	vrrp-to-ISP	VRRP		650 bps	0 bps	1	
	ether3	Ethernet	1600	0 bps	0 bps	0	
M	vrrp-to-LAN	VRRP		459 bps	0 bps	1	
R	ether4	Ethernet	1600	0 bps	0 bps	0	

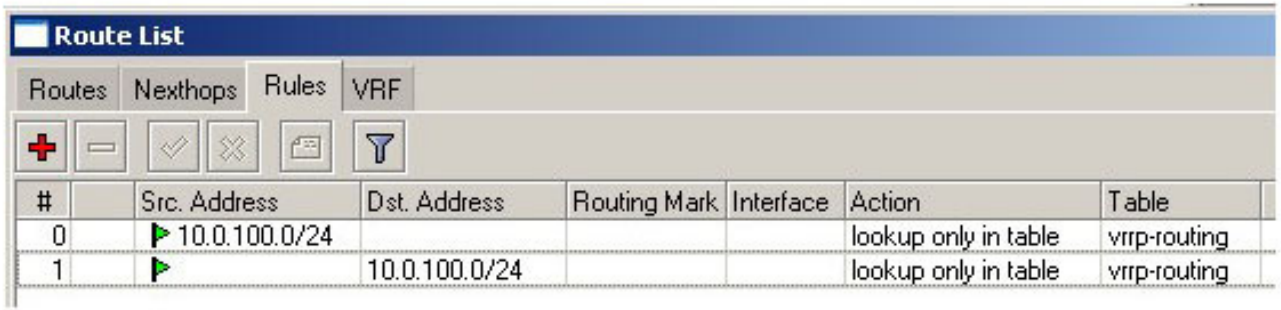
Route List

Routes | Nexthops | Rules | VRF

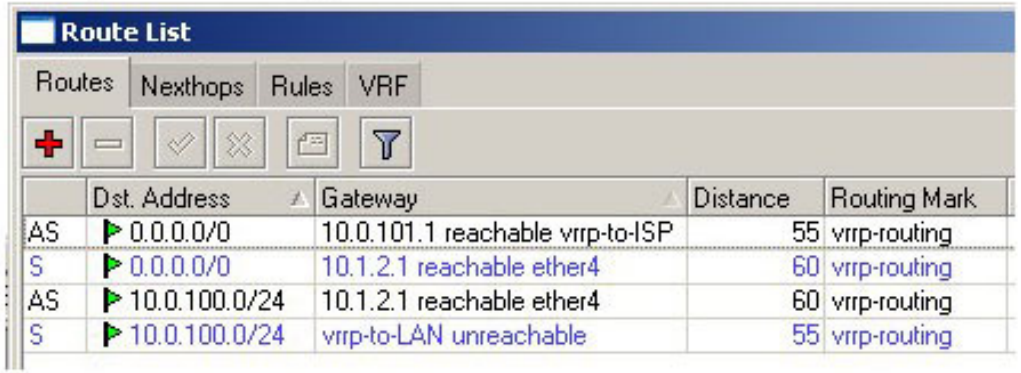
	Dst. Address	Gateway	Distance	Routing Mark
AS	0.0.0.0/0	10.0.101.1 reachable vrrp-to-ISP	55	vrrp-routing
S	0.0.0.0/0	10.1.2.1 reachable ether4	60	vrrp-routing
AS	10.0.100.0/24	10.1.2.1 reachable ether4	60	vrrp-routing
S	10.0.100.0/24	vrrp-to-LAN unreachable	55	vrrp-routing
DAC	10.0.100.0/24	vrrp-to-LAN unreachable	0	
DAC	10.0.101.0/24	vrrp-to-ISP reachable	0	
DAC	10.1.0.0/24	ether2 reachable	0	
DAC	10.1.1.0/24	ether3 unreachable	0	
DAC	10.1.2.0/24	ether4 reachable	0	

Router 2:

routing policys for internal network



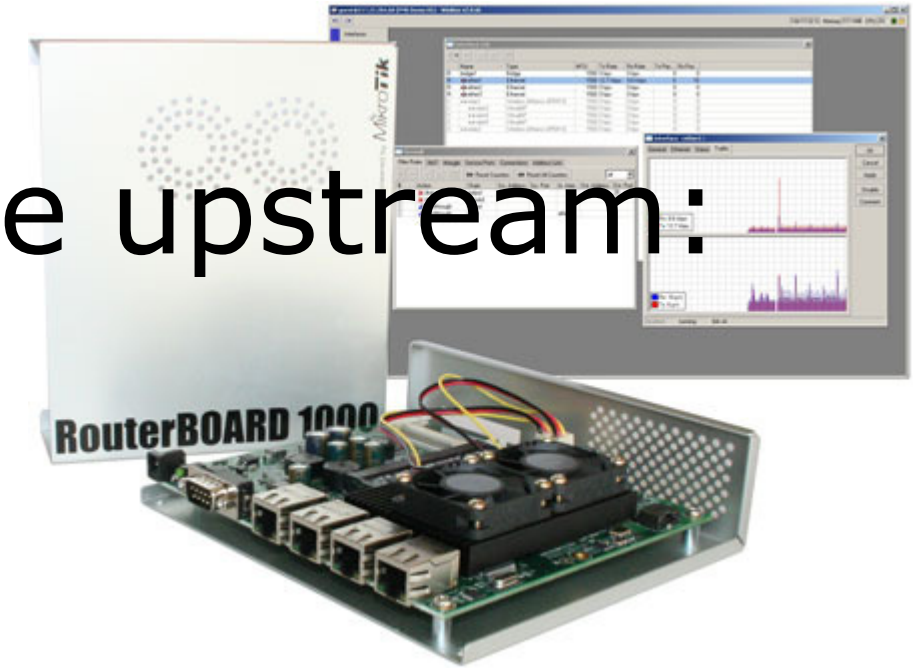
vrrp- routing table



10.0.100.0/24: internal network
10.0.101.1: default Gateway, upstream ISP
10.1.2.1: router 1, direkt link on eth4

High available upstream:

- BGP4-



Redundant upstream

- ISP as the single point of failure
- Connection to multiple ISP

- Problem: Each ISP provides different IP space
- No fail over possibility

IP adresses

- PA (provider aggregatable)
- PI (provider independent)
- AS

- PA assignment from ISP
- PI and AS through sponsoring LIR
- LIR membership and own PA and AS

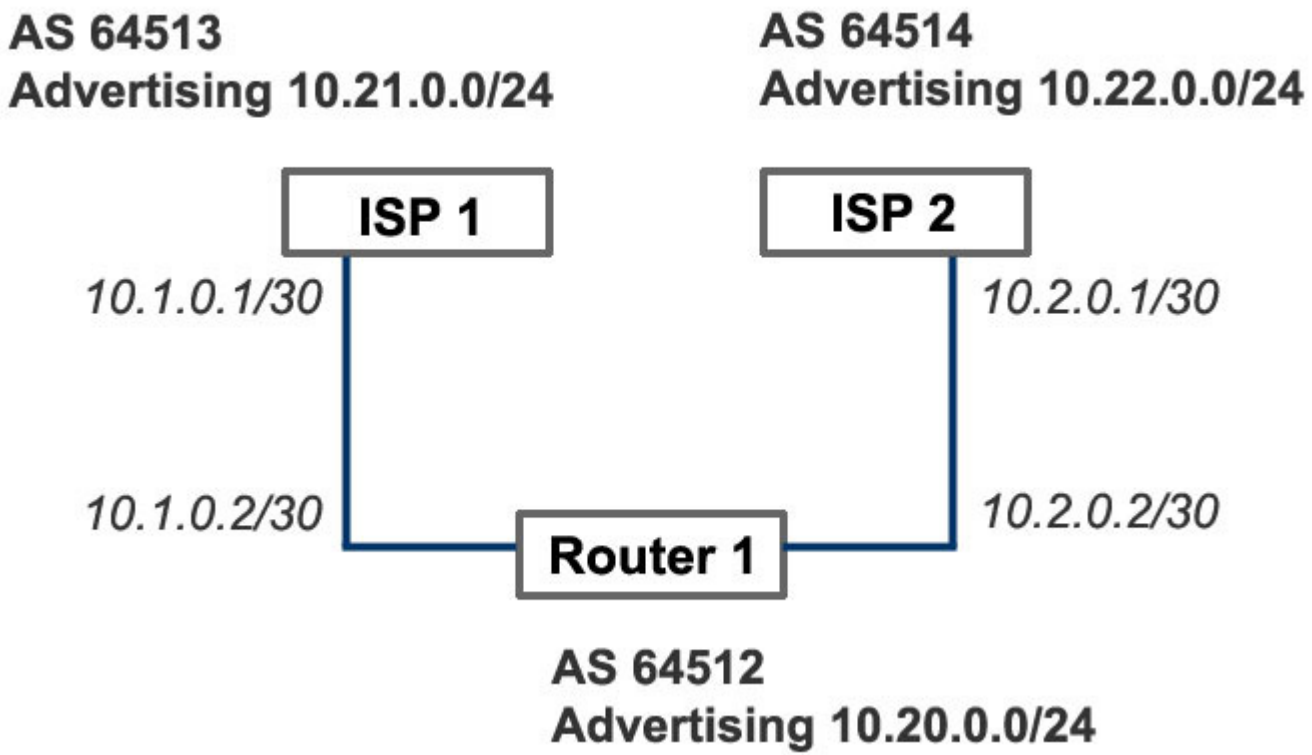
Multihoming

BGP4, inter domain routing:

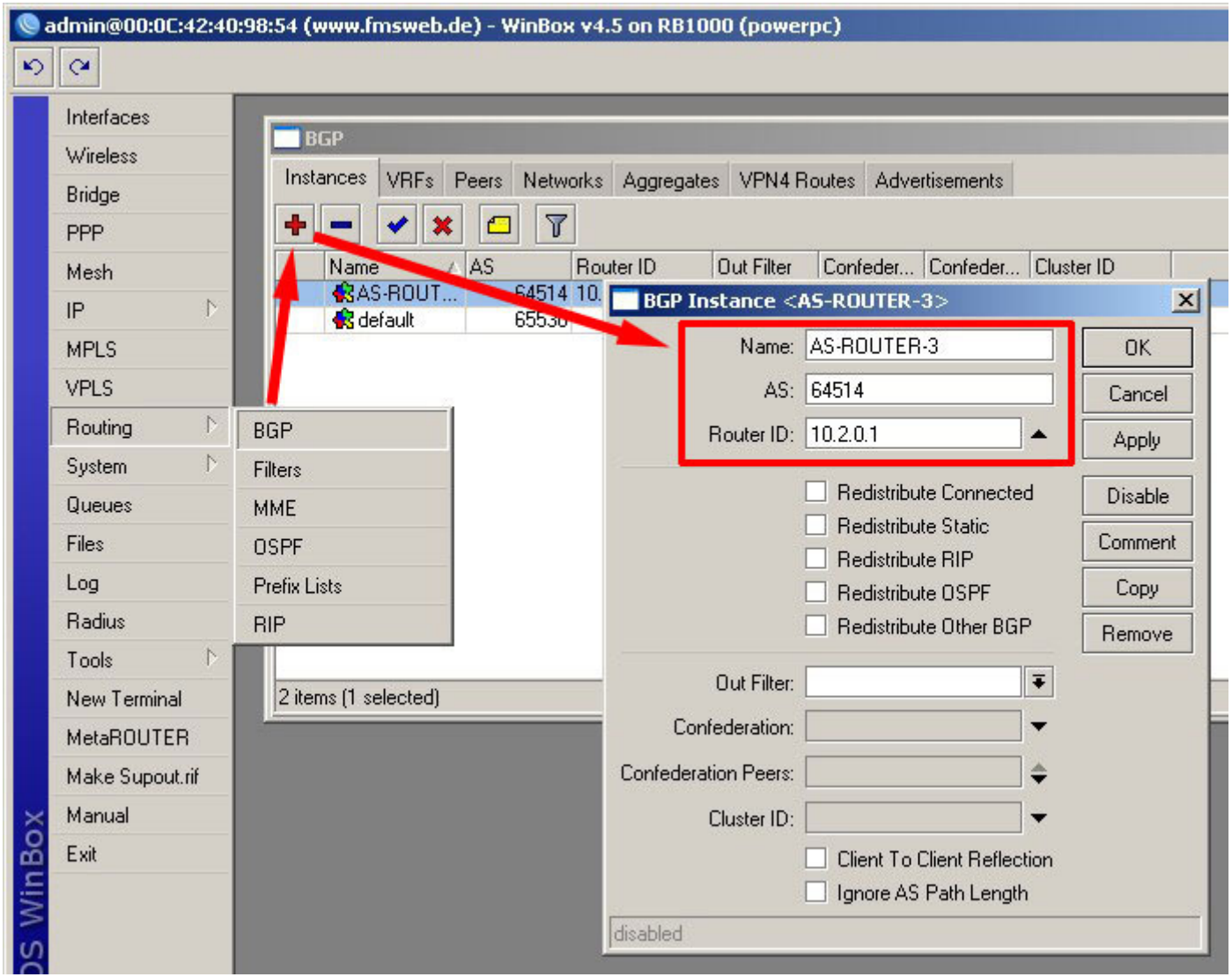
- Announcement of prefixes to ISPs
- Receiving prefixes from ISPs (full feed about 300.000 routes)

- Select best route (usually shortest path) for internal routing table

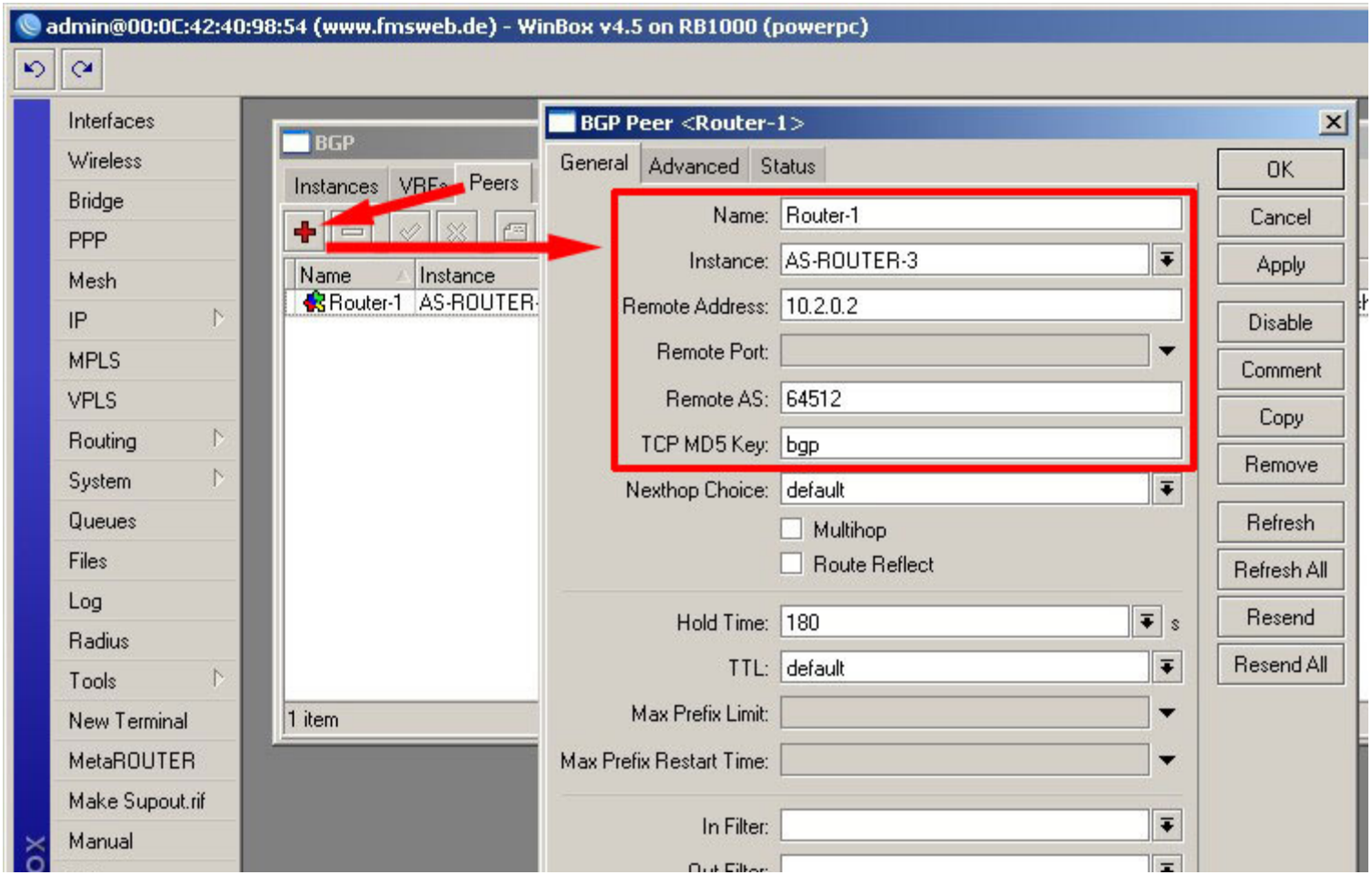
BGP4 test setup



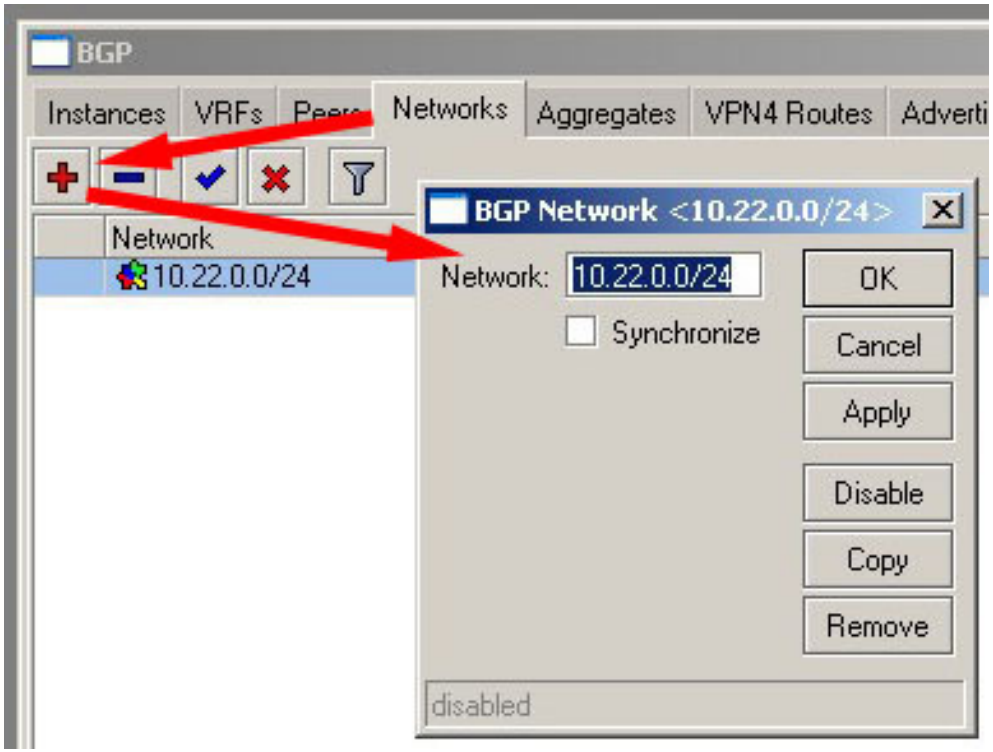
ISP2: New instance



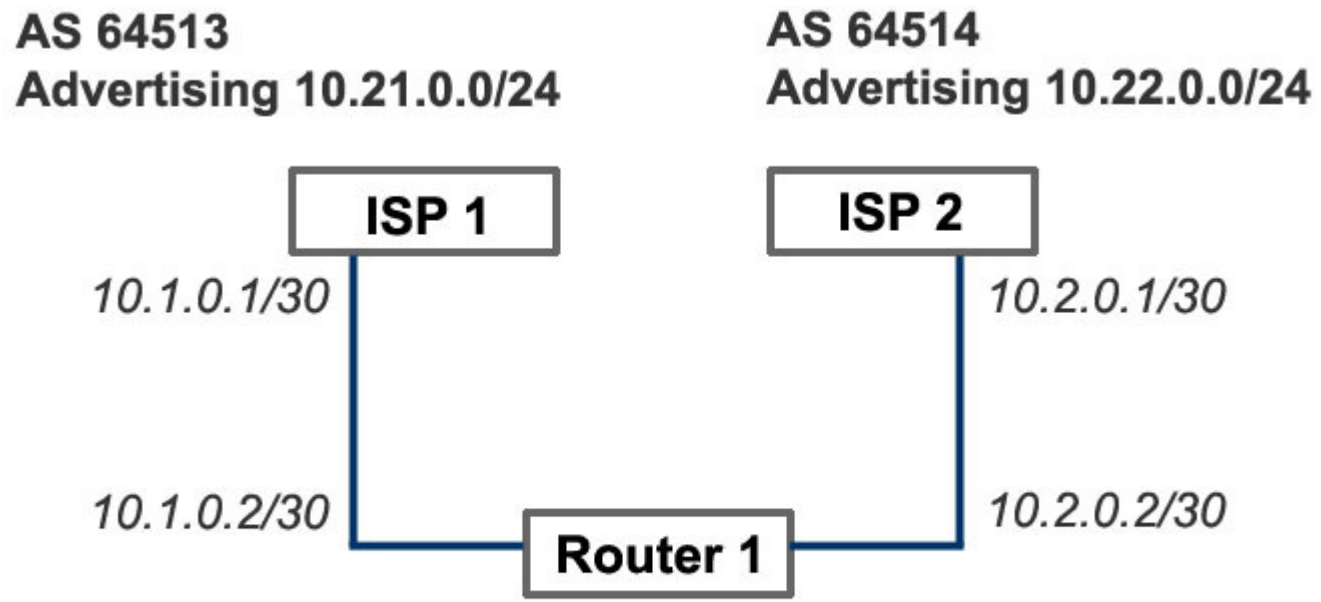
ISP2: New Peer



ISP2: New Network



Unwanted transit on router 1

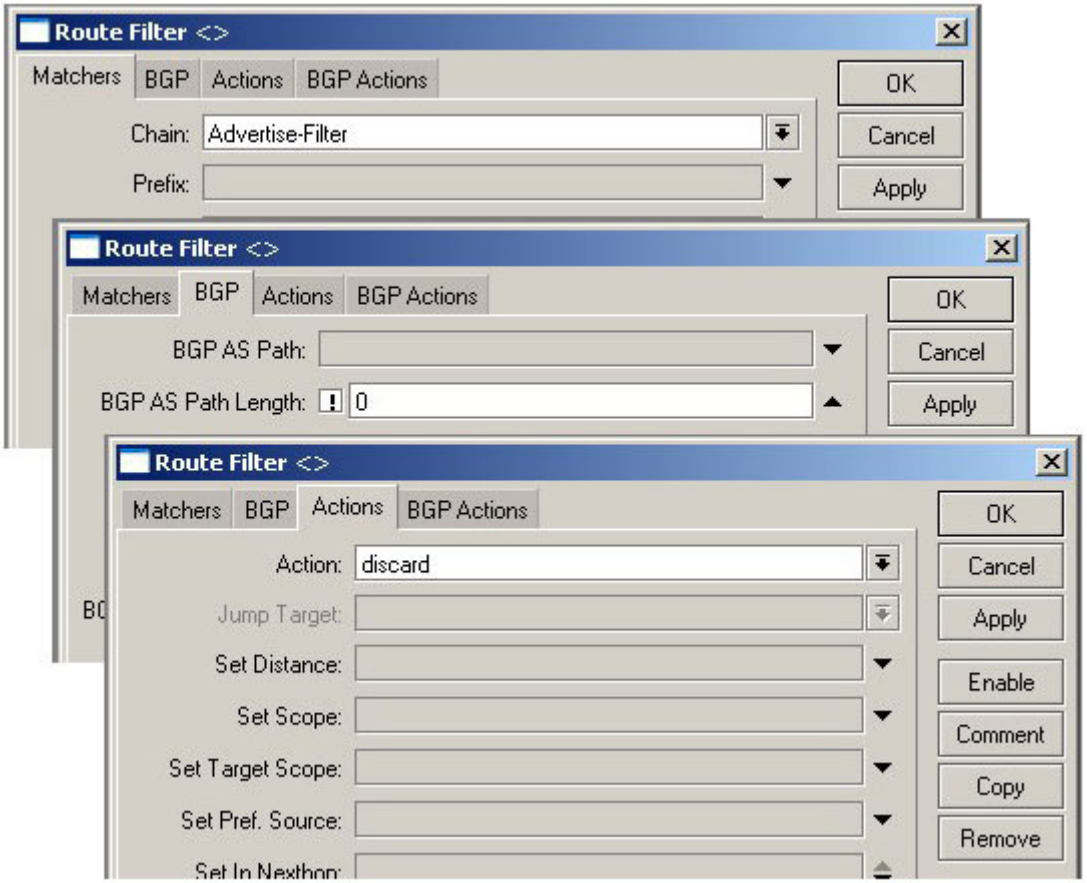


BGP

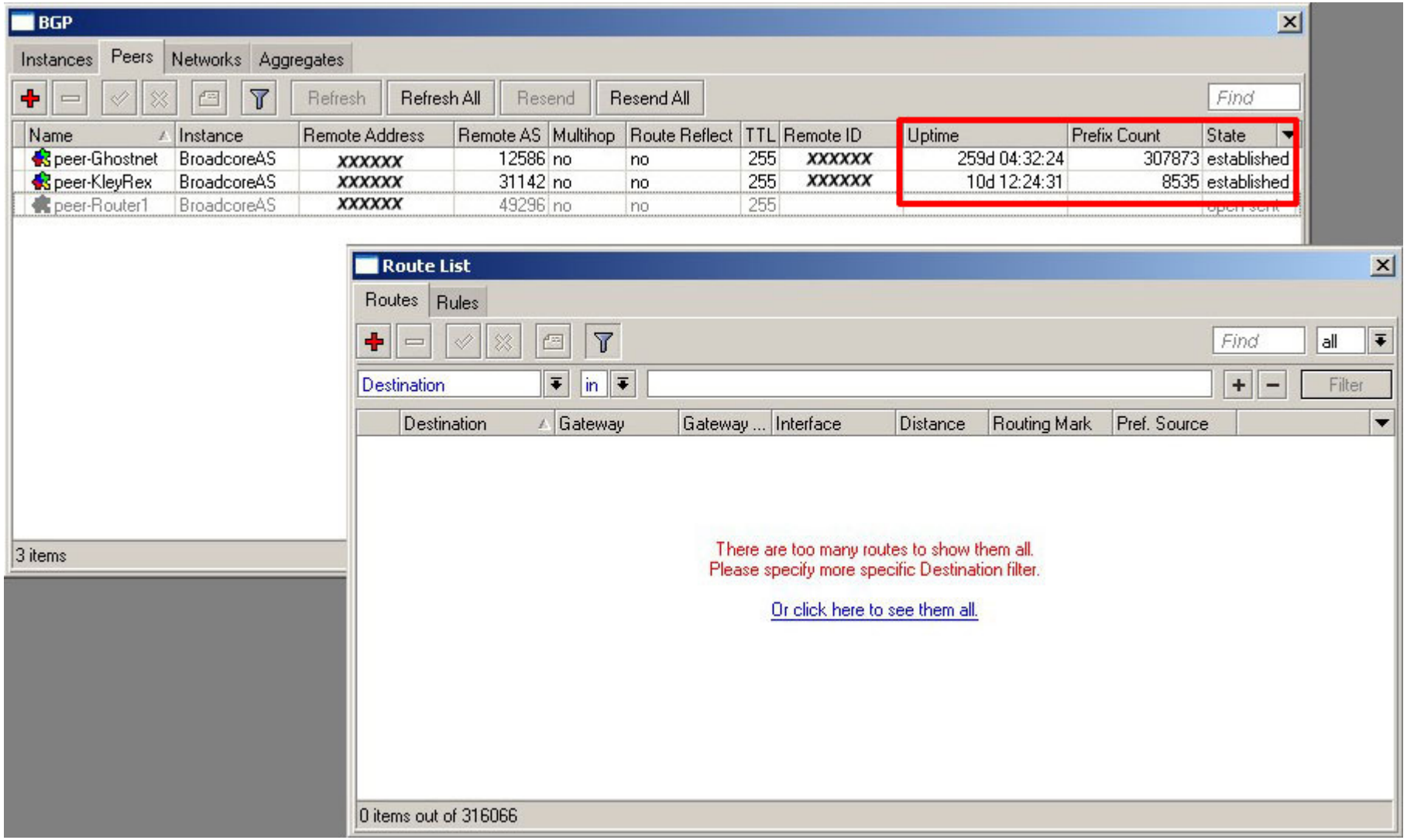
Instances | VRFs | Peers | Networks | Aggregates | VPN4 Routes | Advertisements

Peer	Prefix	Nexthop	AS Path	Origin	Local Pref.
Router-2	10.20.0.0/24	10.1.0.2		igp	0
Router-3	10.20.0.0/24	10.2.0.2		igp	0
Router-3	10.21.0.0/24	10.2.0.2	64513	igp	0
Router-2	10.22.0.0/24	10.1.0.2	64514	igp	0

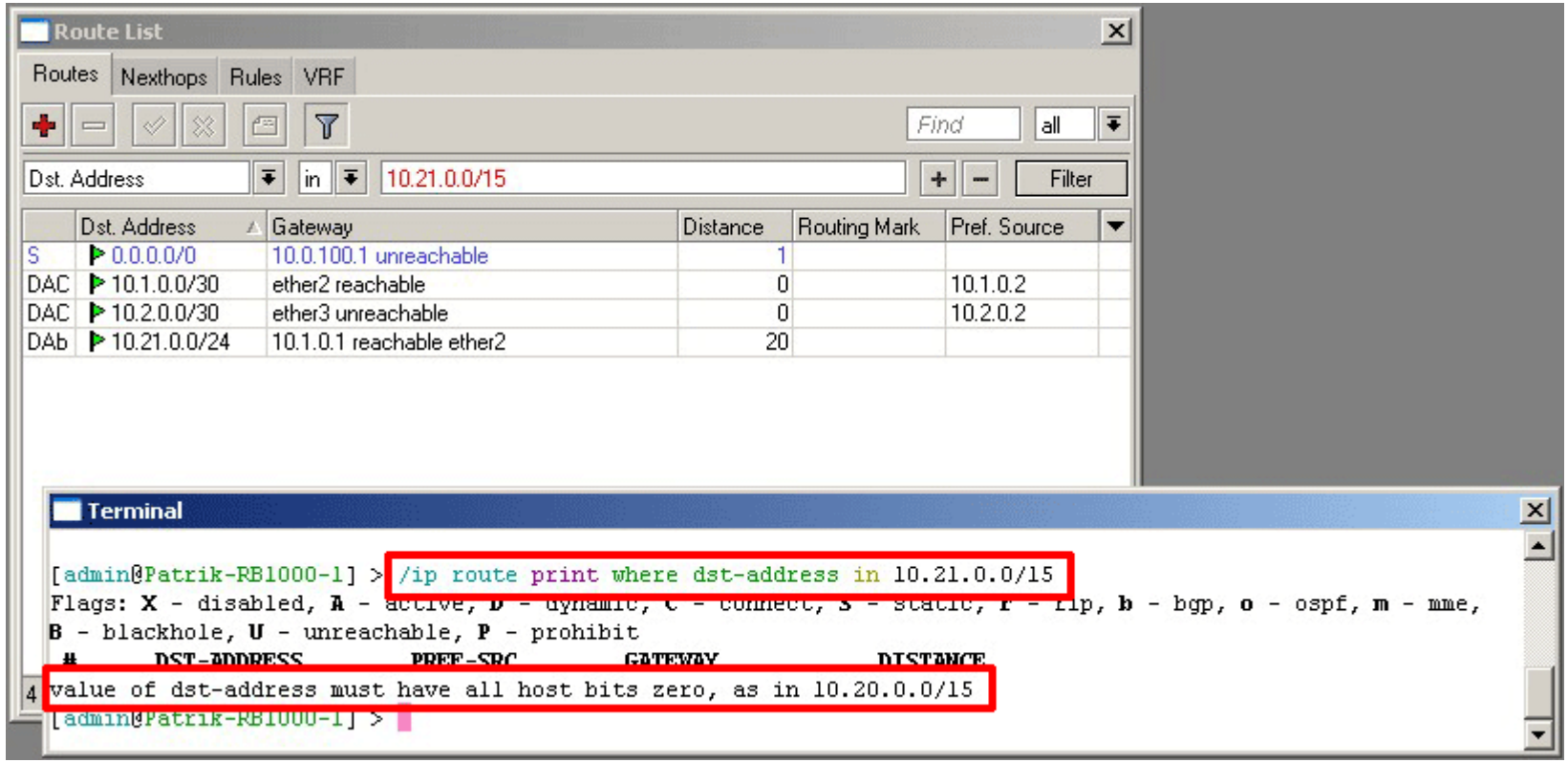
Out-Filter for peers



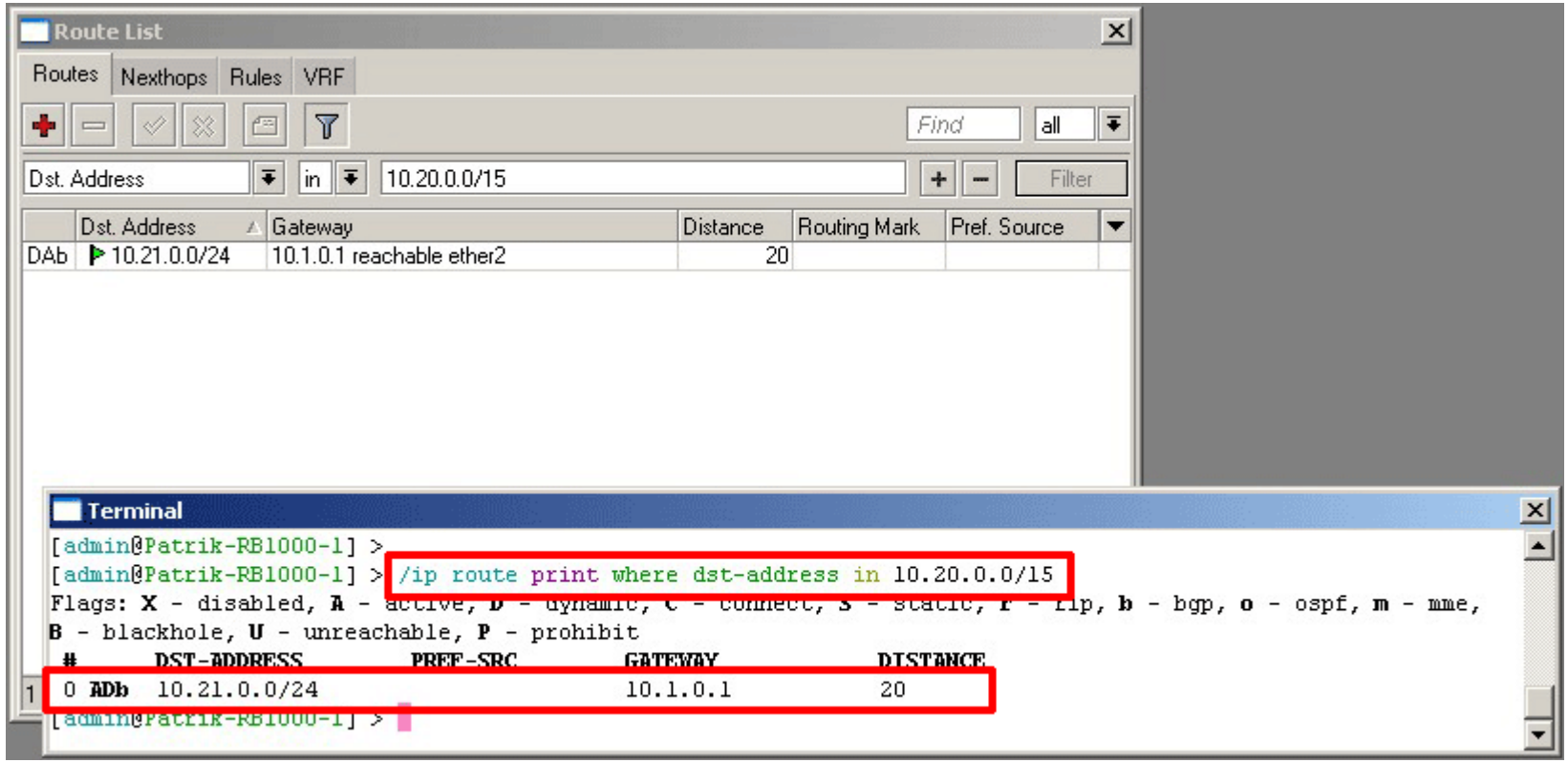
Full feed


BGP
Instances
Peers
Networks
Aggregates
Refresh
Refresh All
Resend
Resend All
Find
Name
Instance
Remote Address
Remote AS
Multihop
Route Reflect
TTL
Remote ID
Uptime
Prefix Count
State
peer-Ghostnet
BroadcoreAS
xxxxxx
12586
no
no
255
xxxxxx
259d 04:32:24
307873
established
peer-KleyRex
BroadcoreAS
xxxxxx
31142
no
no
255
xxxxxx
10d 12:24:31
8535
established
peer-Router1
BroadcoreAS
xxxxxx
49296
no
no
255
3 items
Route List
Routes
Rules
Find
all
Destination
in
Filter
Destination
Gateway
Gateway ...
Interface
Distance
Routing Mark
Pref. Source
There are too many routes to show them all.
Please specify more specific Destination filter.
Or click here to see them all.
0 items out of 316066

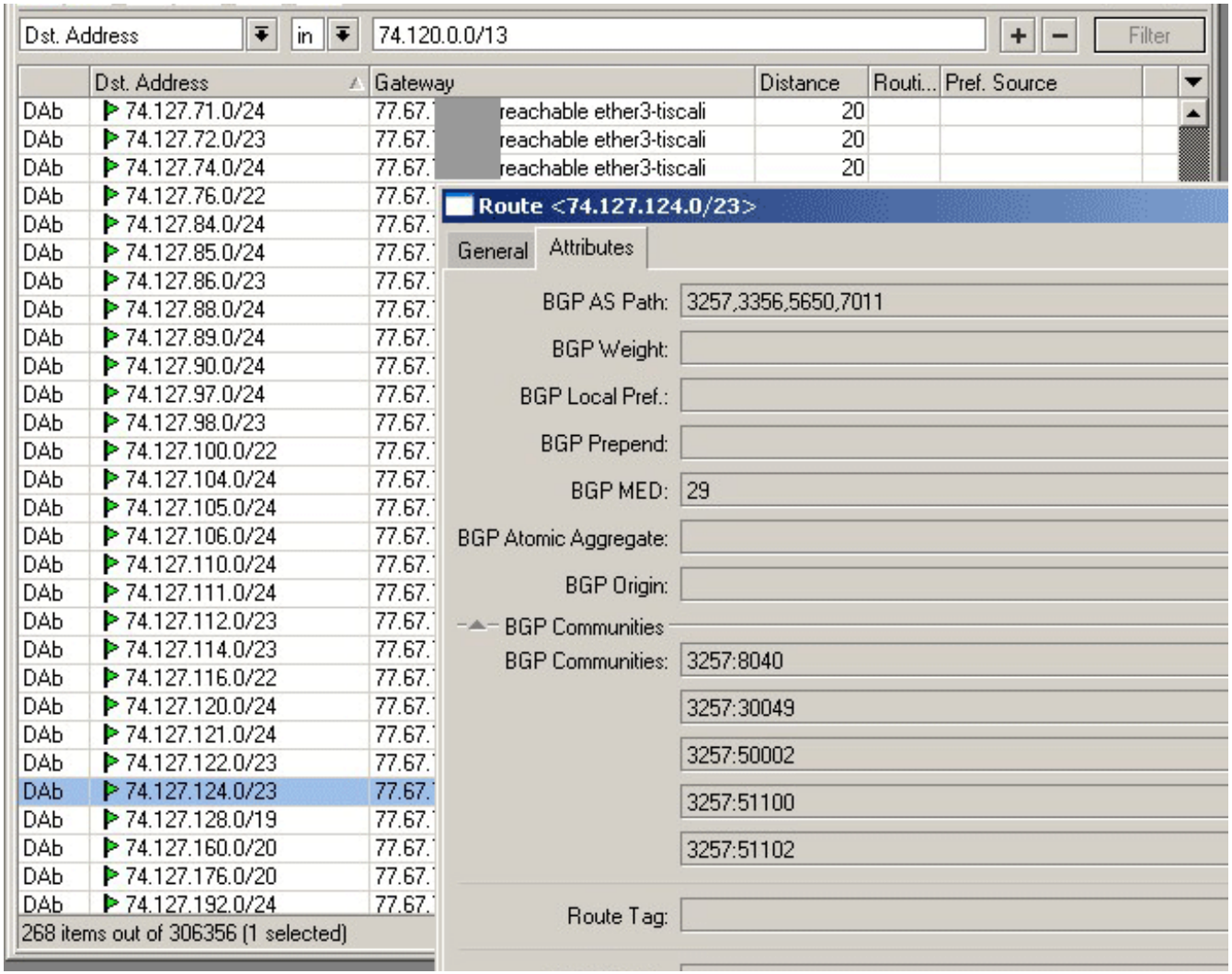
Winbox / CLI Filter



Winbox / CLI Filter

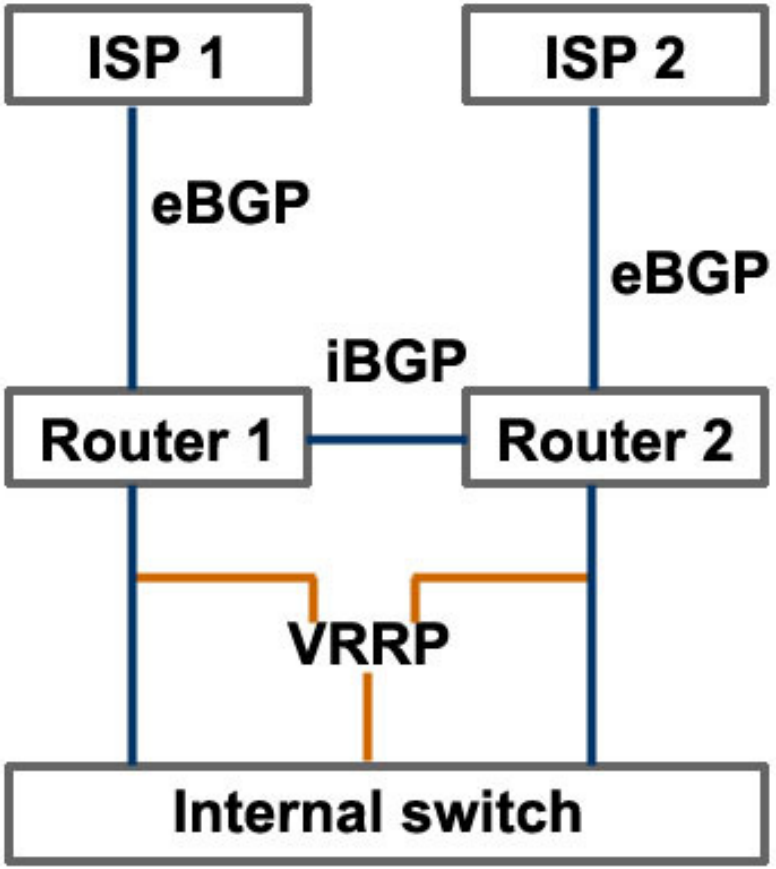


Example with Full Feed

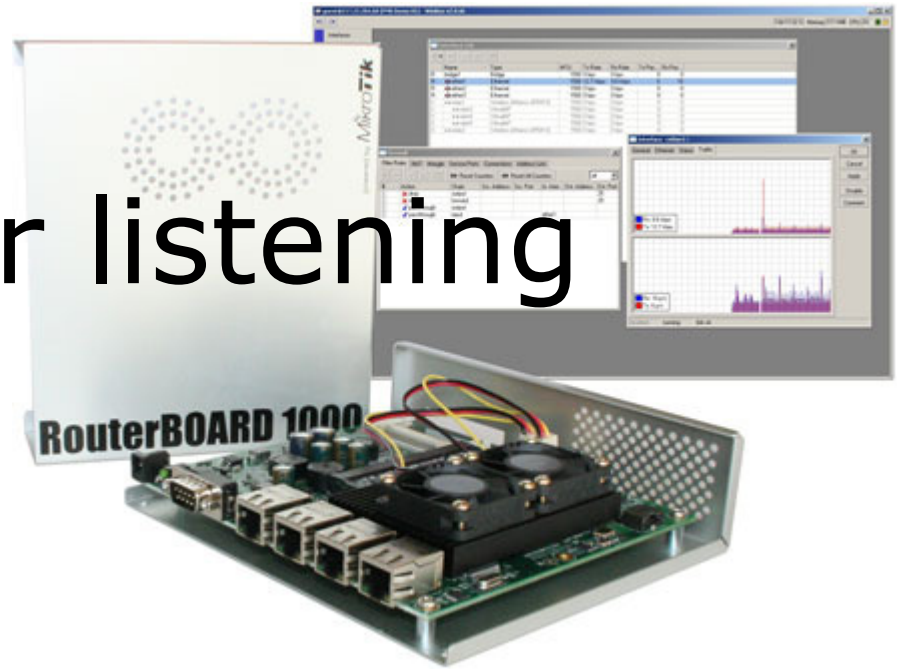


Example Setup

- Next-hop for iBGP
- Policy based route to internal network over iBGP peer
- Policy based route to prevent loops



Thank you for listening



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