

BGP Multihoming & Failover using VRRP

Hani Rahrouh

hr@wirelessnetware.ca

First Canadian MUM

October 19th, 2015

Montreal, Canada

About me

- Hani Rahrouh
- MikroTik Certified since 2008
- MikroTik Consultant
- MikroTik Certified Trainer Since 2011 @ www.wirelessnetware.ca

<http://www.mikrotik.com/training/partners/northamerica/canada>

- MikroTik Distributor @ www.netwire.ca

Come to our free MikroTik workshops and Events

Come join us for free workshop.

We know MikroTik RouterBOARDS and RouterOS, so we can answer all your questions and help you learn more about the things you're interested in.

www.wirelessnetware.ca

Overview

Fully redundant fault tolerant internet connectivity

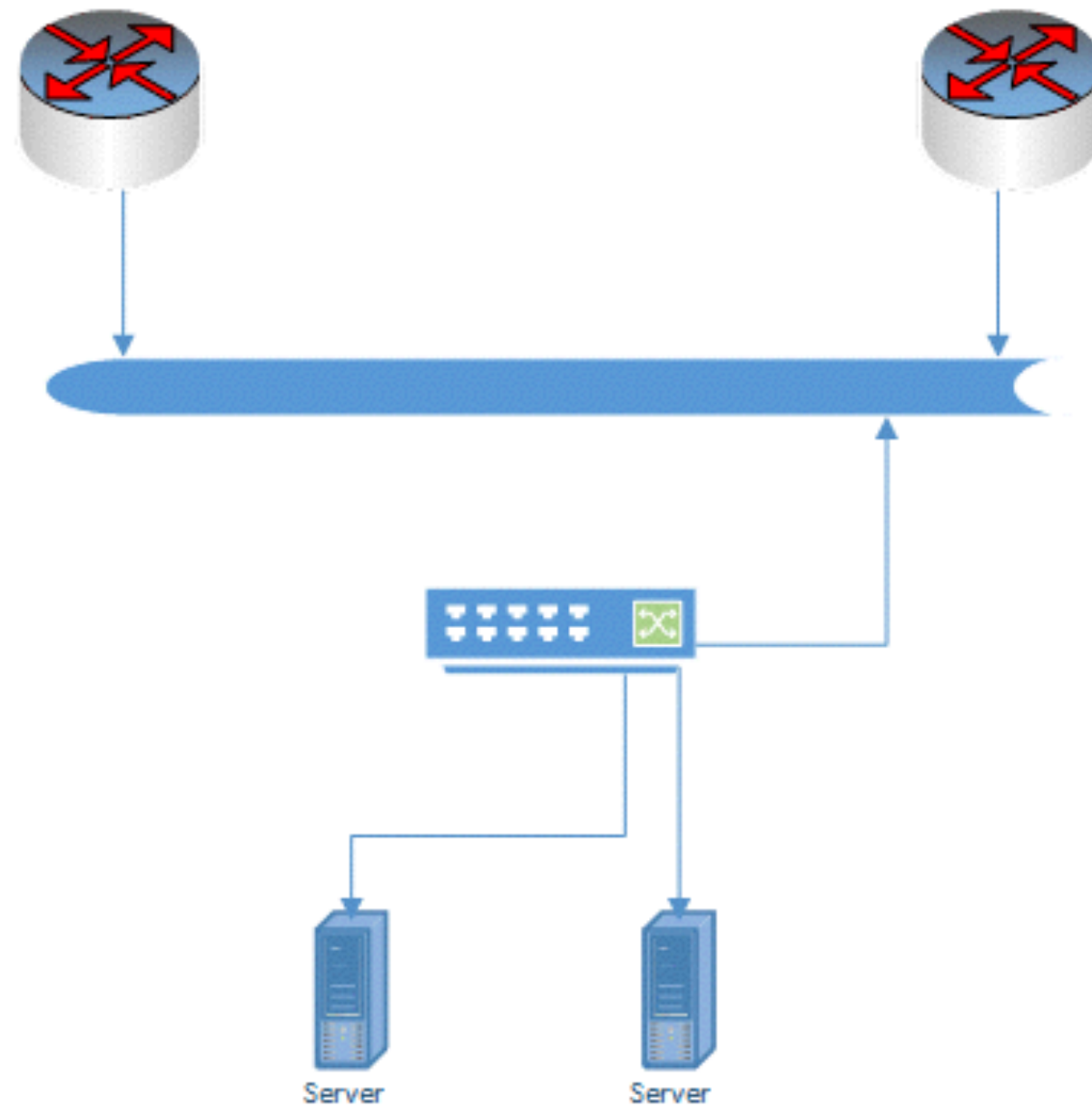
- BGP Multi-homing
 - Why Multi-home?
 - How to Multi-home?
- Dynamic Failover using VRRP
- Manual Failover
- Monitoring

Everything about reliability and redundancy



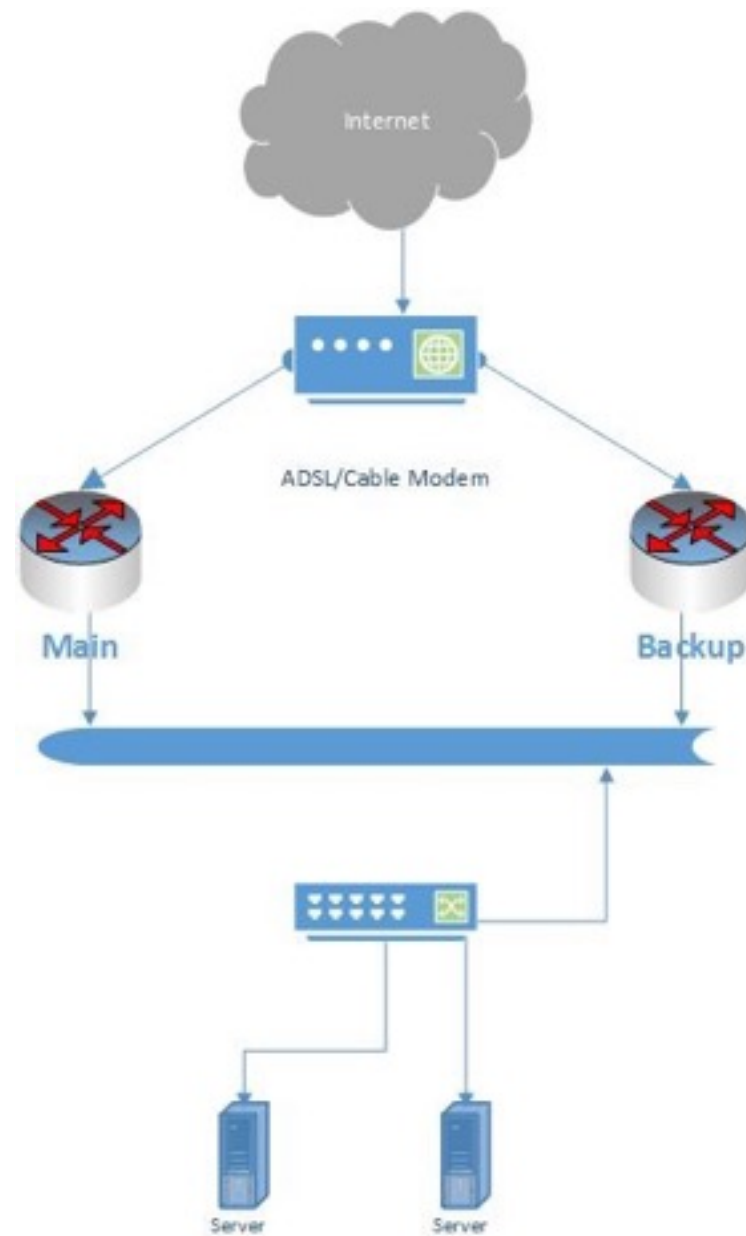
Two of everything

VRRP



Redundant Router(GW)

Virtual Router Redundancy Protocol (VRRP)



Gateway Failed

Redundant gateway!

Is **VRRP** a good idea when
we have connection-tracking
enable on the routers!

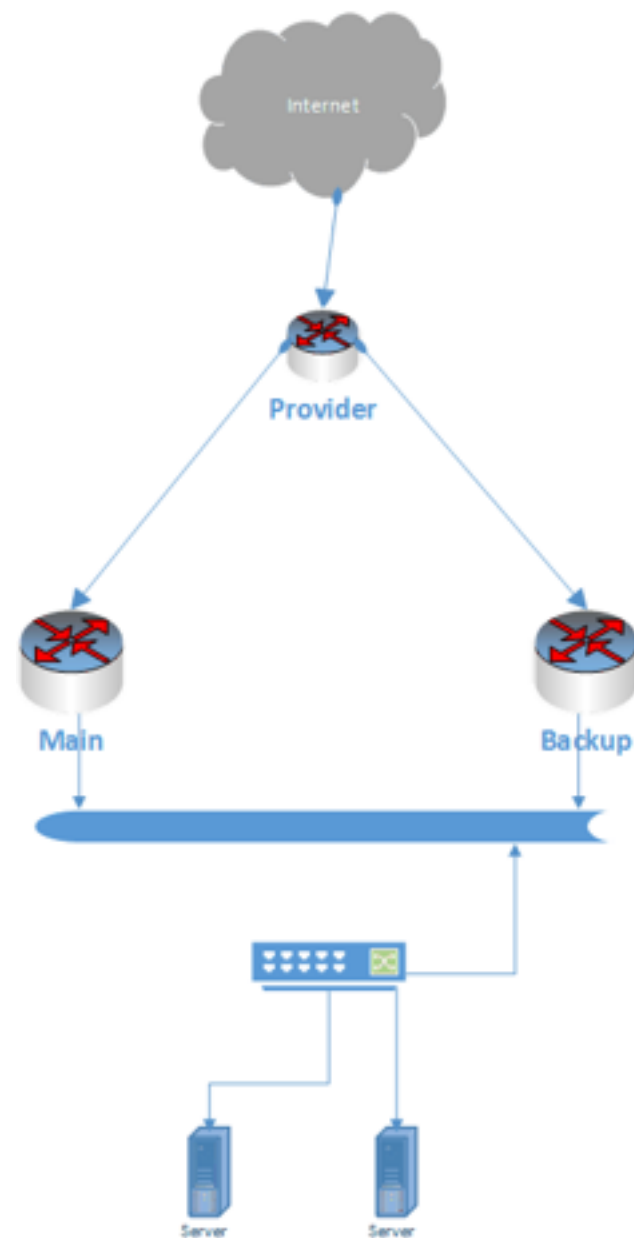
Problems

- ARP

Traffic originated by a VRRP cluster uses a Virtual MAC address of the form 00-00-5e-00-01-<VRID>.

- Connection-Tracking

- Gateway failed



Redundant Gateway

BGP Multi-Homing

Why Multi-home and Why would I want it?

It's all about:

- Redundancy "Fail-over"
- Diversity
- Reliability

Why Multi-home?

■ Redundancy "Fail-over"

One connection to internet means the network is depend on:

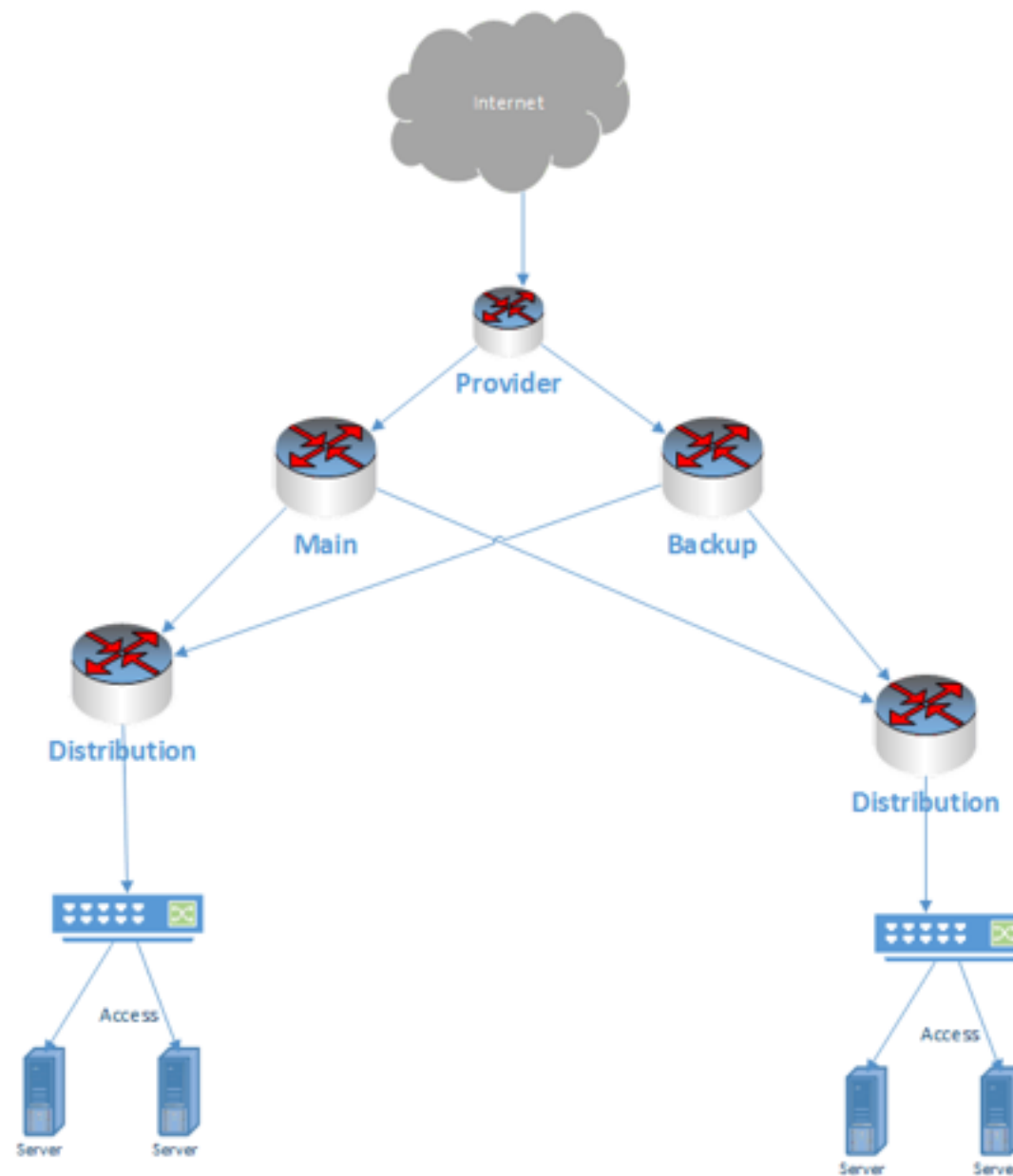
- Local Router (Configuration, RouterOS and RouterBOARD)
- WAN Media (physical failure, carrier failure)

Why Multi-home?

- Reliability
 - Business critical applications demand continuously availability
 - Lack of redundancy implies lack of reliability
implies loss of revenue

Problems

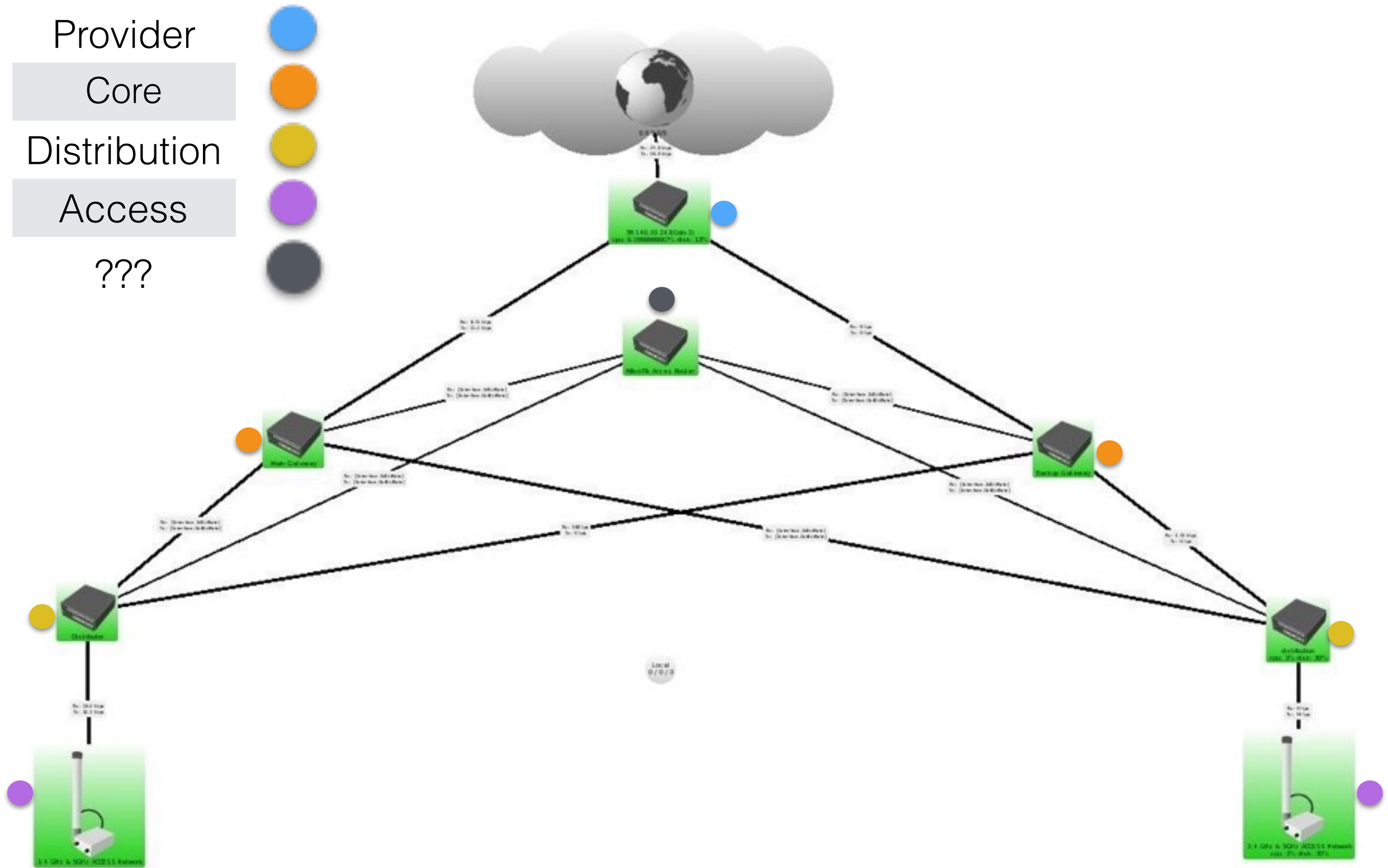
- Connection tracking is unable to keep valid track of connections with multi-homed BGP
- ARP Table Refresh periods
- Client gateway failure
- Downtime
- Hardware failure



Fully redundant fault tolerant internet connectivity



●

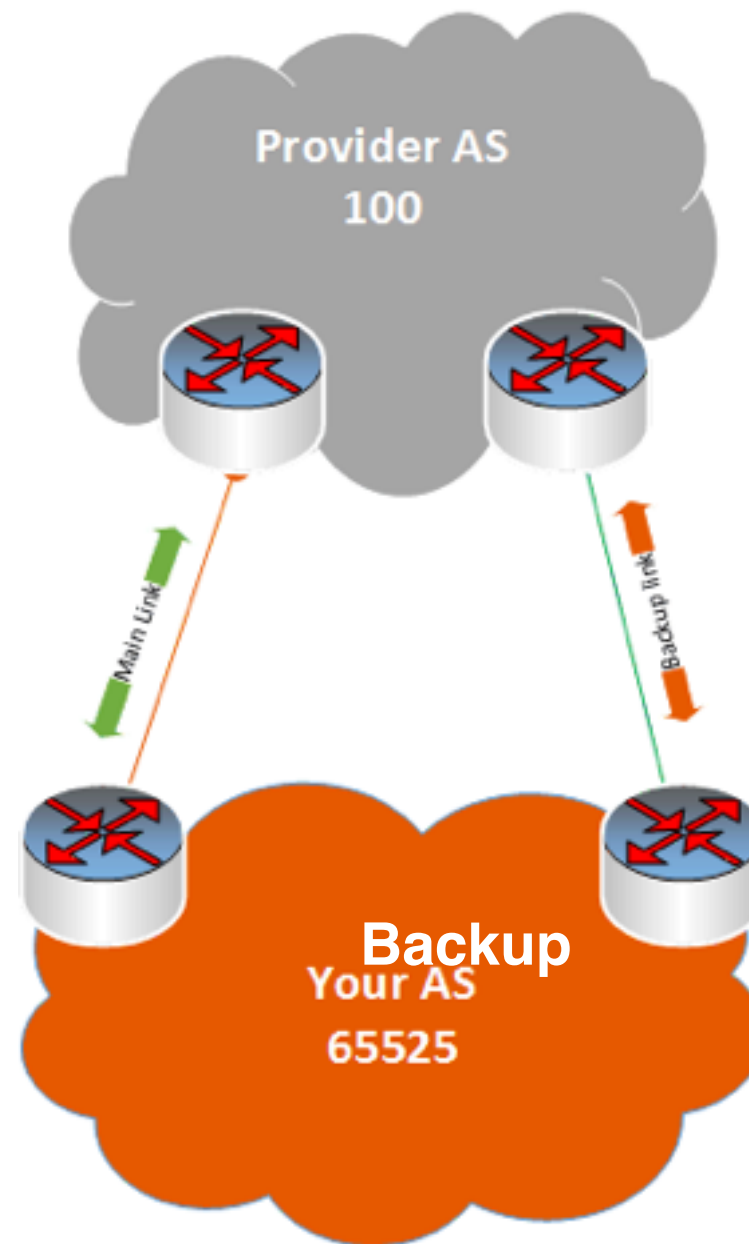


Multi-homing Definition

- Multi-link “ External” to local network
 - **Two or more link to the same ISP**
 - Multiple Interfaces, Single IP address per interface
 - Two or more link to different ISPs

Best path selection

- Lowest MED (default 0)
- Prefer the route with lowest router ID or ORIGINATOR_ID

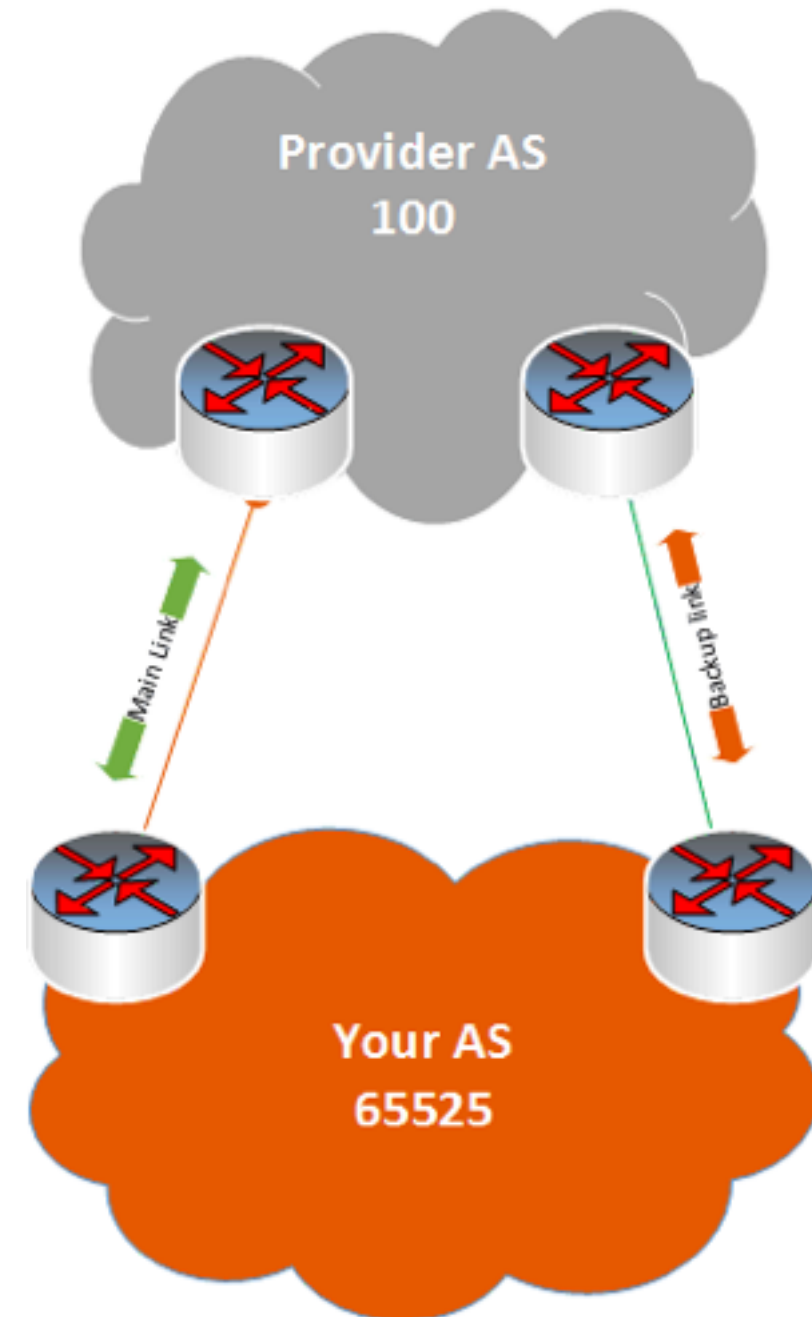


Two or more link to the same ISP

- **Multiple Links, Single IP address (space)**
- Multiple Links, Multiple IP address (spaces)

How to Multi-home

- **Basic Multihoming**
 - Multi-home with the same ISP



Basic Multihoming

Multi-homing to the same ISP

(One as backup only)

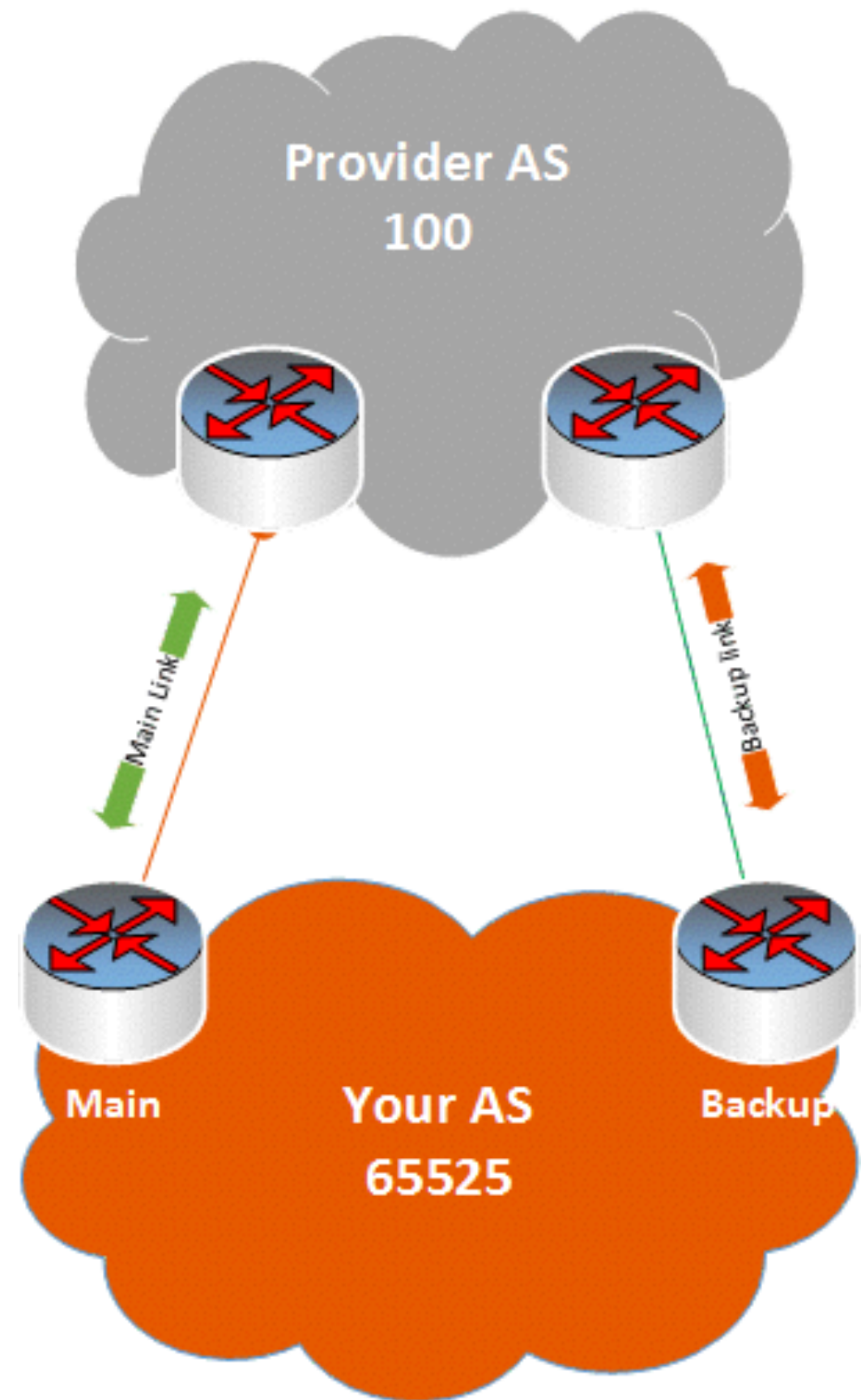
- Use private AS (AS>64511)
- There is no need for public ASN
- AS100 “the provider AS” removes private AS and any customer sub-prefixes from internet announcement

Two link to the same ISP

- Announce /24 aggregate on each link
 - Main link network: announce /24
 - Backup link network: announce /24 with increased metric
- When one link fails, the announcement of /24 aggregate via the backup link ensure continued connectivity.

Two link to the same ISP

Main Router Configuration



Two link to the same ISP

The image shows a network configuration interface with three numbered steps:

- Step 1:** The 'Routing' menu is selected in the top navigation bar.
- Step 2:** The 'BGP Instance <bgp-main>' configuration window is open. The 'Name' field is set to 'bgp-main', the 'AS' field is set to '65521', and the 'Router ID' field is set to '1.1.1.1'. The 'Redistribute Connected' checkbox is checked.
- Step 3:** The 'BGP Peer <peer-main>' configuration window is open. The 'Name' field is set to 'peer-main', the 'Instance' is set to 'bgp-main', and the 'Remote Address' field is set to '<Provider router-ip-address>'. The 'Remote AS' field is set to '<provider-ASN>'. The 'TCP MD5 Key' field is empty, and the 'Nexthop Choice' is set to 'default'. The 'Hold Time' is set to '180' seconds.

Two link to the same ISP

The image displays three screenshots from the Mikrotik WinBox interface, illustrating the configuration of a BGP route filter. Red circles with numbers 1 through 4 highlight specific configuration steps.

Screenshot 1 (Top Left): Shows the main menu with 'Routing' selected. The 'BGP' option is highlighted with a red circle labeled '1'.

Screenshot 2 (Bottom Left): Shows the 'Route Filters' window. The 'Chain' field is set to 'MED' and is highlighted with a red circle labeled '2'. The 'Prefix' is '38.132.32.0' and 'Prefix Length' is '24-32'. The 'Action' is 'passthrough'.

Screenshot 3 (Bottom Right): Shows the 'Route Filter <38.132.32.0>' window. The 'Set BGP Weight' field is highlighted with a red circle labeled '4'. The 'Set BGP MED' field is set to '50'.

Screenshot 4 (Bottom Left): Shows the 'Route Filter <38.132.32.0>' window. The 'Action' field is set to 'passthrough' and is highlighted with a red circle labeled '3'.

- Lower metric is preferred
- Exchanged between AS and used to make decision inside that AS, not passed to third AS.
- Ignored if received from different ASs

Two link to the same ISP

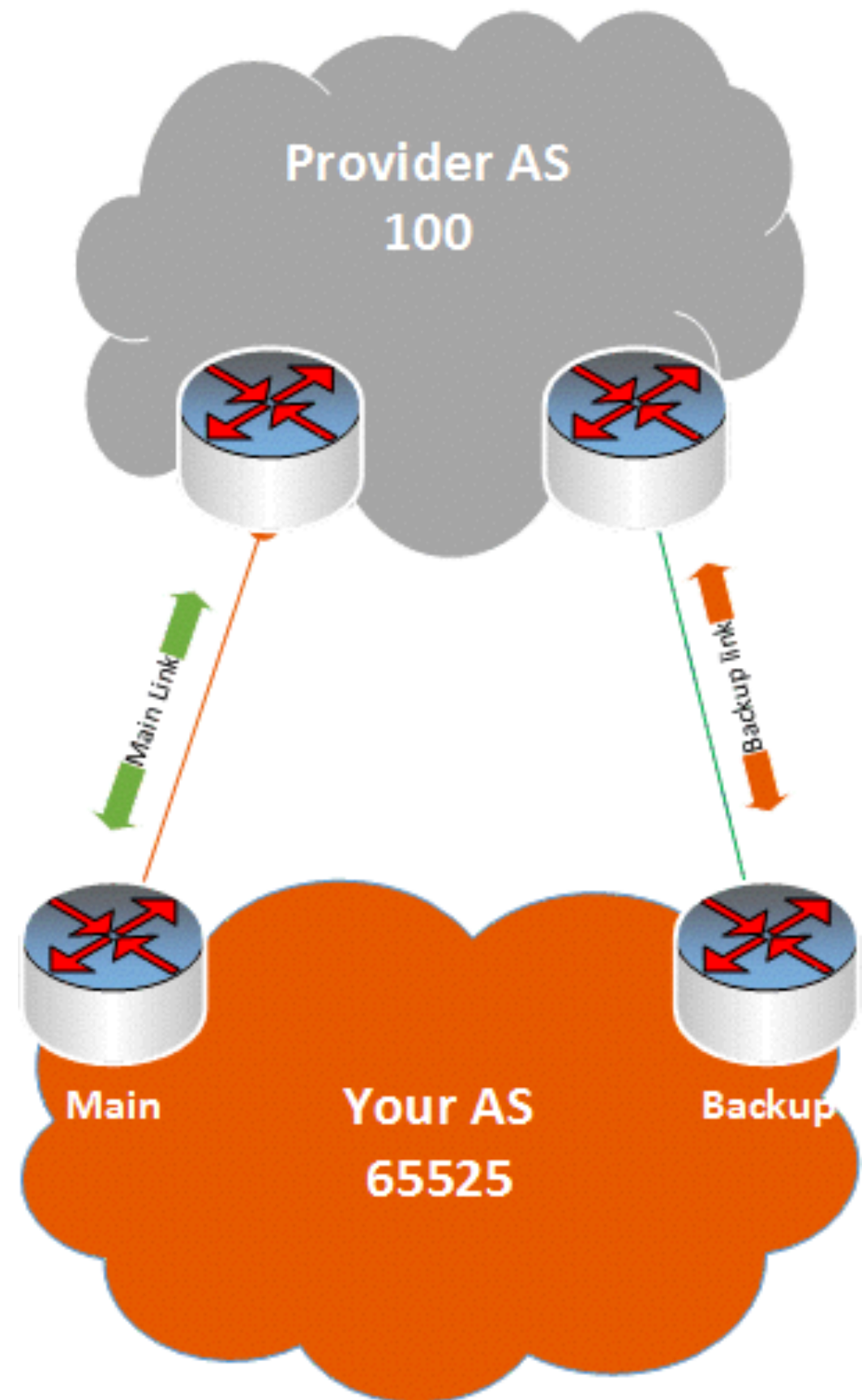
The image shows a network configuration interface with three main panels:

- Left Panel:** A sidebar with 'Routing' and 'System' sections. 'Routing' is selected, and 'BGP' is highlighted under it. A red circle with the number '1' is around the 'BGP' link.
- Middle Panel:** A 'BGP' configuration window with tabs for 'Instances', 'VRFs', 'Peers', and 'Network'. The 'Peers' tab is active, showing a table with columns 'Name' and 'Instance'. A red circle with the number '2' is around the 'peer-main' entry in the 'Name' column.
- Right Panel:** A 'BGP Peer <peer-main>' configuration window with tabs for 'General', 'Advanced', and 'Status'. The 'General' tab is active, showing fields for 'Name', 'Instance', 'Remote Address', 'Remote Port', 'Remote AS', 'TCP MD5 Key', 'Nexthop Choice', 'Hold Time', 'Keepalive Time', 'TTL', 'Max Prefix Limit', 'Max Prefix Restart Time', 'In Filter', 'Out Filter', 'AllowAS In', 'Default Originate', and checkboxes for 'Multihop', 'Route Reflect', 'Remove Private AS', 'AS Override', 'Passive', and 'Use BFD'. A red circle with the number '3' is around the 'MED' value in the 'Out Filter' field. A red arrow points from the text 'Used to hint an external neighbour about path preference into an AS' to this field.

Used to hint an external neighbour about path preference into an AS

Two link to the same ISP

Backup Router Configuration



Two link to the same ISP

The image displays two screenshots of a network configuration interface, likely from a Huawei or H3C device, illustrating the setup for two links to the same ISP.

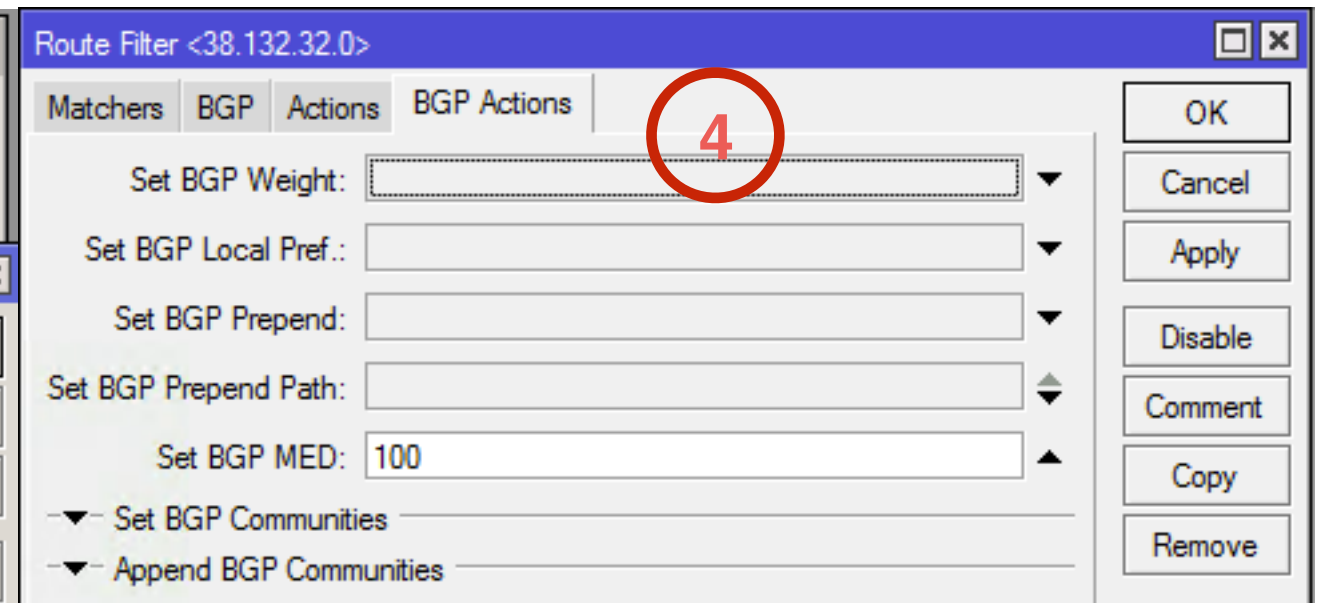
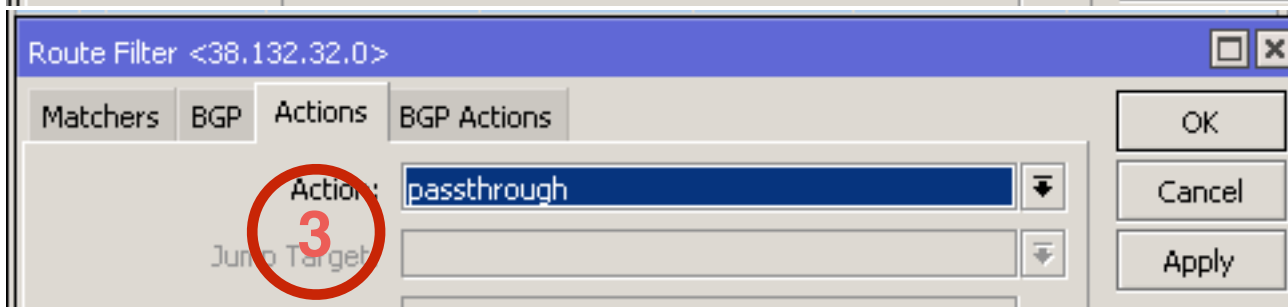
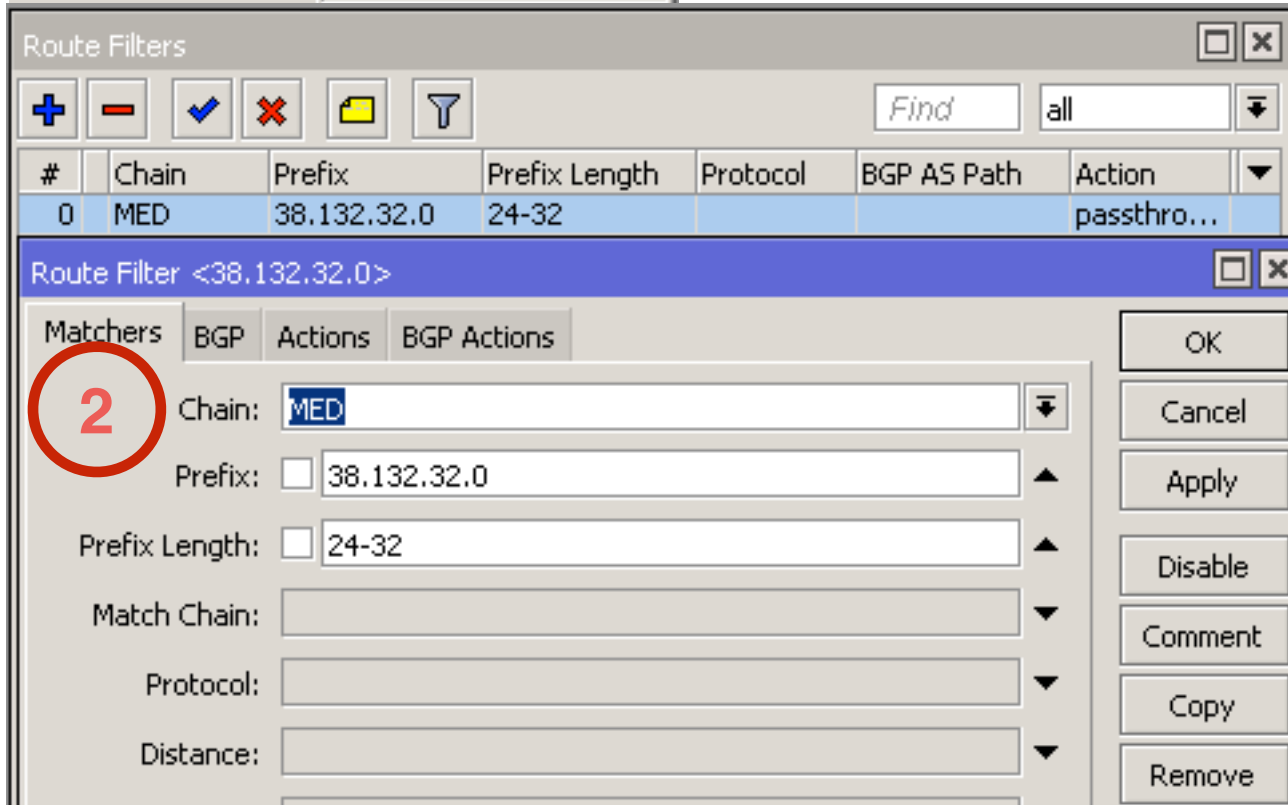
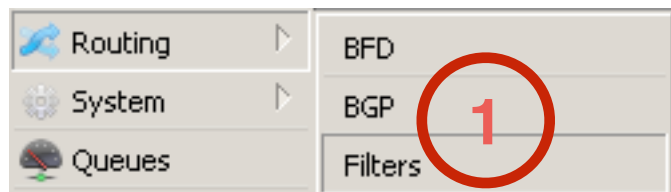
Left Screenshot: Shows the BGP configuration window. The top navigation bar has "Routing" and "System" tabs. The "Routing" tab is selected, and the "BGP" sub-tab is active. Below the navigation bar, there is a table listing BGP instances. The instance "bgp-backup" is selected, showing its AS (65521) and Router ID (1.1.1.1). Below the table, the "BGP Instance <bgp-backup>" configuration window is open. It shows the Name (bgp-backup), AS (65521), and Router ID (1.1.1.1). There are checkboxes for "Redistribute Connected", "Redistribute Static", "Redistribute RIP", and "Redistribute OSPF".

Right Screenshot: Shows the BGP Peer configuration window. The top navigation bar is the same. The "Peers" sub-tab is active. Below the navigation bar, there is a table listing BGP peers. The peer "peer-colo" is selected. Below the table, the "BGP Peer <peer-colo>" configuration window is open. It shows the Name (peer-colo), Instance (bgp-backup), Remote Address (<Provider Remote-IP Address>), Remote Port, Remote AS (<Provider ASN>), and TCP MD5 Key. There are buttons for "OK", "Cancel", "Apply", "Disable", "Comment", and "Copy".

Red circles with numbers 1, 2, and 3 highlight specific elements:

- 1: The "Routing" tab in the top navigation bar.
- 2: The "BGP Instance <bgp-backup>" configuration window.
- 3: The "BGP Peer <peer-colo>" configuration window.

Two link to the same ISP



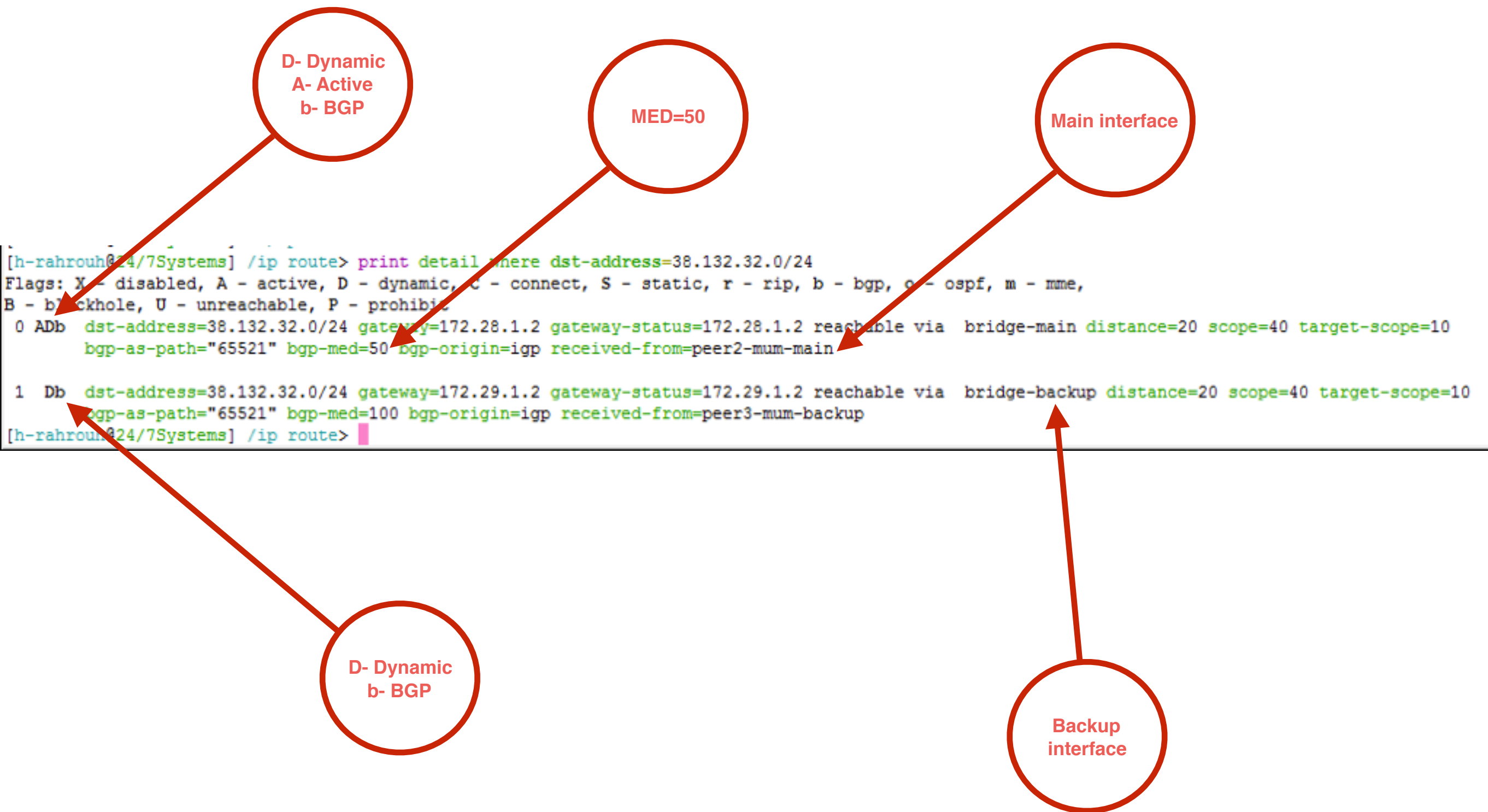
- Lower metric is preferred
- Exchanged between AS and used to make decision inside that AS, not passed to third AS.
- Ignored if received from different ASs

Two link to the same ISP

The image shows a network configuration interface with three main panels:

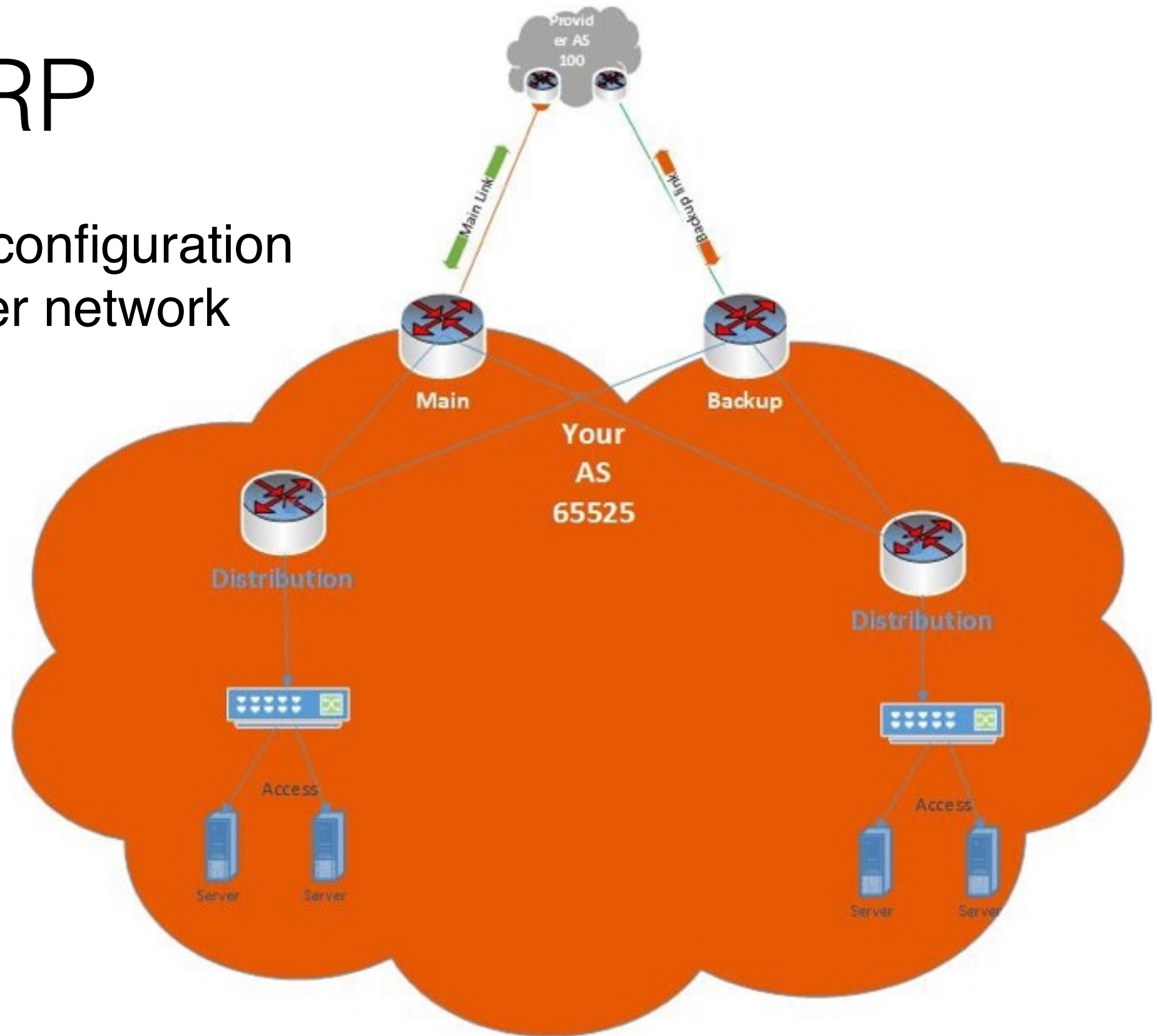
- Left Panel:** A sidebar with 'Routing' and 'System' sections. 'Routing' is selected, and 'BGP' is highlighted under it. A red circle with the number '1' is around the 'BGP' link.
- Middle Panel:** A 'BGP' configuration window with tabs for 'Instances', 'VRFs', 'Peers', and 'Networks'. The 'Peers' tab is active, showing a table with columns 'Name' and 'Instance'. Two entries are listed: 'peer-colo' and 'bgp-backup'. A red circle with the number '2' is around the 'Peers' tab.
- Right Panel:** A 'BGP Peer <peer-main>' configuration window. It has tabs for 'General', 'Advanced', and 'Status'. The 'General' tab is active, showing fields for 'Name', 'Instance', 'Remote Address', 'Remote Port', 'Remote AS', 'TCP MD5 Key', 'Nexthop Choice', 'Hold Time', 'Keepalive Time', 'TTL', 'Max Prefix Limit', 'Max Prefix Restart Time', 'In Filter', 'Out Filter', 'AllowAS In', 'Default Originate', and checkboxes for 'Multihop', 'Route Reflect', 'Remove Private AS', 'AS Override', 'Passive', and 'Use BFD'. The 'Out Filter' field is set to 'MED' and is circled with a red circle containing the number '3'. A red arrow points from the text 'Used to hint an external neighbour about path preference into an AS' to this field.

Used to hint an external neighbour about path preference into an AS



VRRP

Enable VRRP configuration
on Core layer network



VRRP Setup on main Router

The image displays two screenshots from a network configuration interface, illustrating the steps to set up VRRP on a main router. Red circles with numbers 1 through 5 highlight specific actions.

Screenshot 1 (Left): Shows the 'Interface List' window. A new VRRP instance named 'vrrp-main' is being added to the 'bridge-dist' interface. The 'Name' field is highlighted with a red circle labeled '2'. The 'Type' is set to 'VRRP'. The 'MTU' is 1500 and 'L2 MTU' is 1600. The 'Interface <vrrp-main>' configuration window is open, showing the 'General' tab. The 'Interface' is 'bridge-dist', 'VRID' is 50, 'Priority' is 254, and 'Interval' is 1.00. The 'Preemption Mode' is checked. The 'Authentication' is set to 'none'. The 'Version' is 3 and 'V3 Protocol' is IPv4. The status bar at the bottom shows 'enabled', 'running', 'slave', and 'master'.

Screenshot 2 (Right): Shows the 'Address List' window. A new address is being added to the 'vrrp-main' interface. The 'Address' field is highlighted with a red circle labeled '3'. The 'Address' is '192.168.168.254/24', 'Network' is '192.168.168.0', and 'Interface' is 'vrrp-main'. The status bar at the bottom shows 'enabled'.

Screenshot 3 (Bottom Right): Shows the 'Address <192.168.168.254>' configuration window. The 'Address' is '192.168.168.254', 'Network' is '192.168.168.254', and 'Interface' is 'vrrp-main'. The status bar at the bottom shows 'enabled'.

VRRP Setup on backup Router

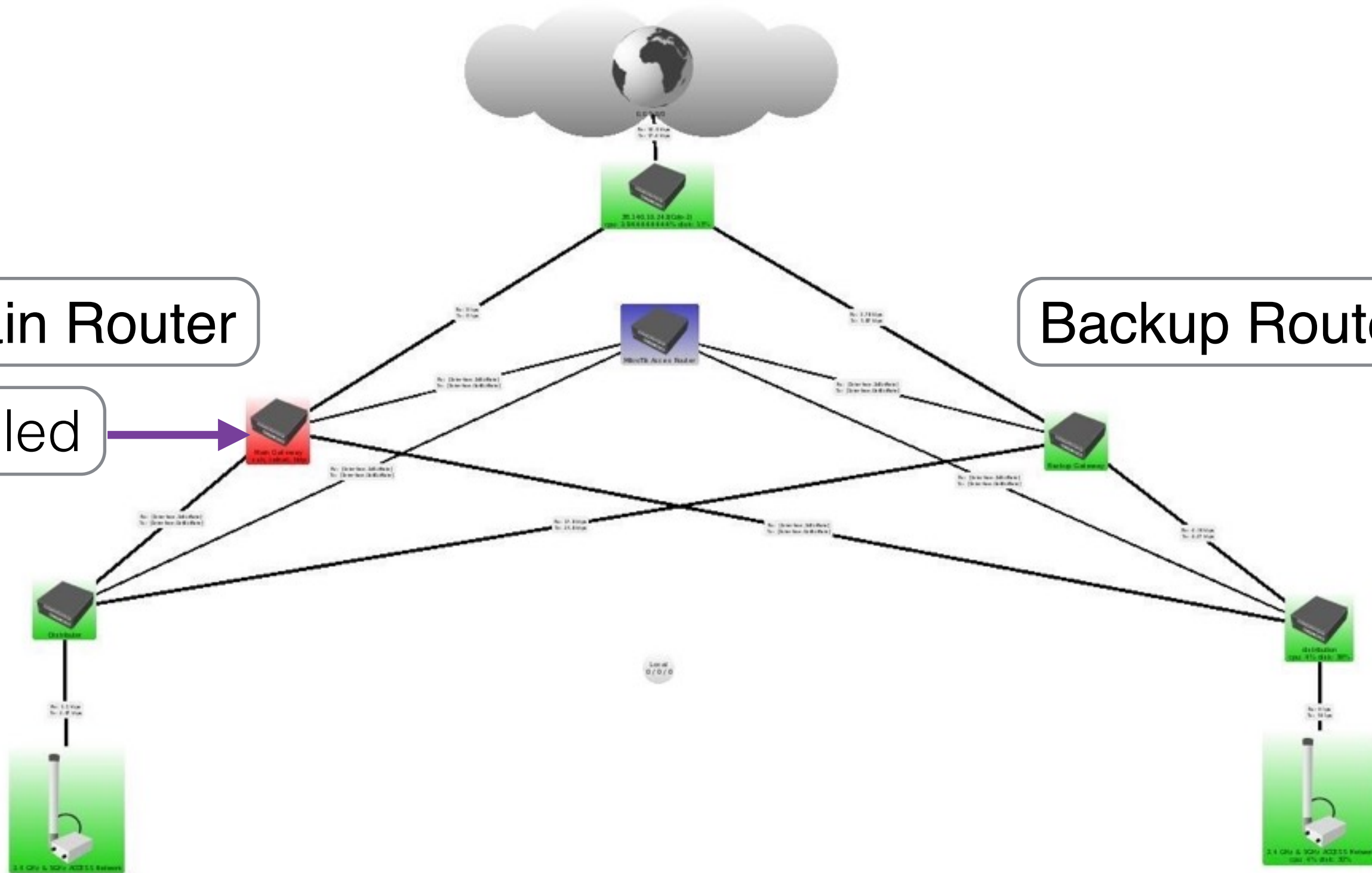
The image shows the Mikrotik WinBox interface for configuring VRRP on a backup router. The steps are numbered 1 through 4:

- Step 1:** In the **Interface List** window, click the **+** button to add a new interface. The new interface is named **vmp-backup** and is of type **VRRP**.
- Step 2:** In the **Interface <vmp-backup>** configuration window, the **VRRP** tab is selected. The configuration is as follows:
 - Interface: **bridge-dist**
 - VRID: **50**
 - Priority: **250**
 - Interval: **1.00** s
 - ☒ **Preemption Mode**
 - Authentication: **none** (selected), **simple**, **ah**
 - Password: (empty)
 - Version: **3**
 - V3 Protocol: **IPv4**
- Step 3:** In the **Address List** window, click the **+** button to add a new address. The new address is **192.168.168.254** with network **192.168.168.254** and interface **vmp-backup**.
- Step 4:** In the **Address <192.168.168.254>** configuration window, the configuration is as follows:
 - Address: **192.168.168.254**
 - Network: **192.168.168.0**
 - Interface: **bridge-dist**

Main Router

Failed

Backup Router



Problems

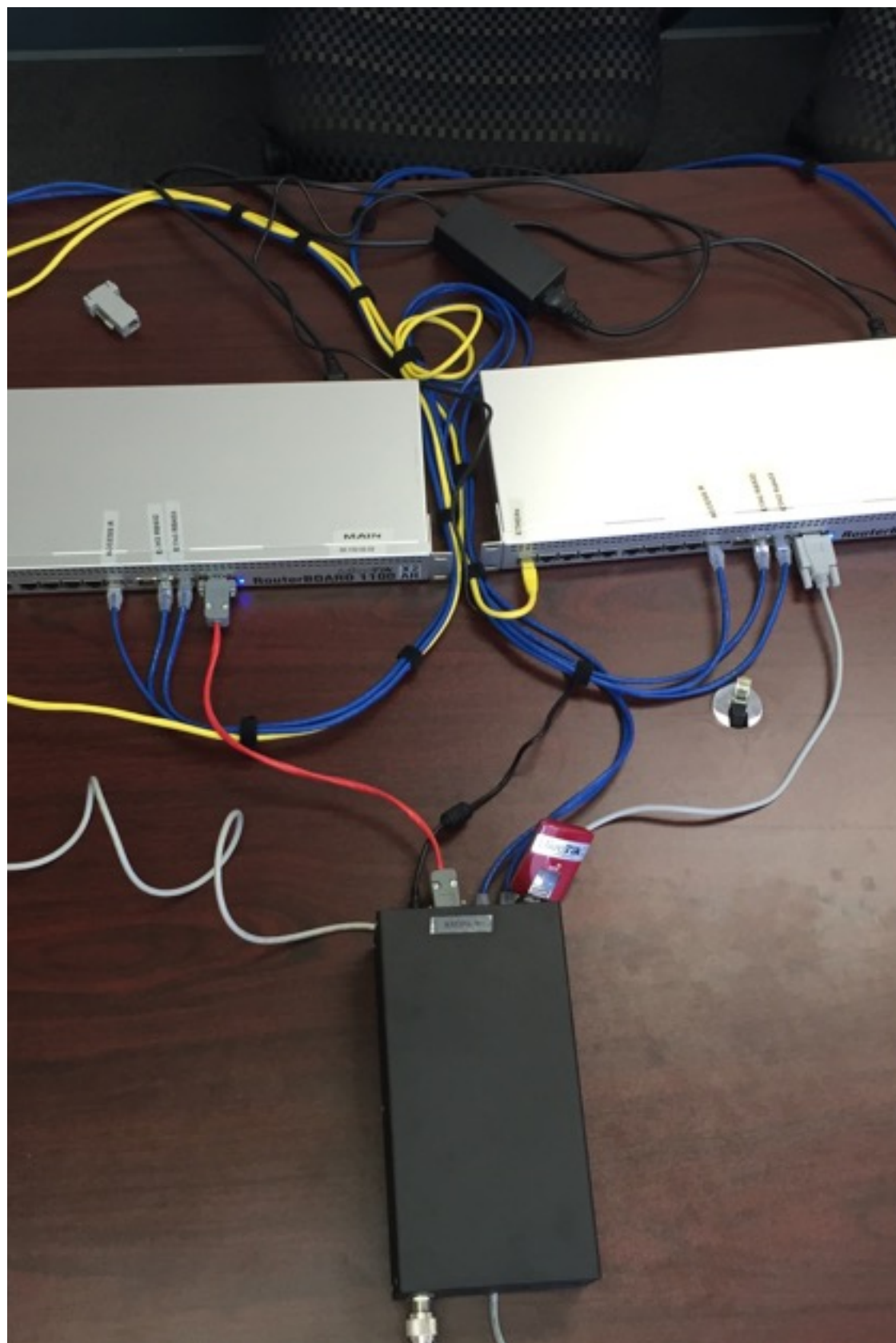
- Router crash!
- Interface failure

Solutions

Monitoring

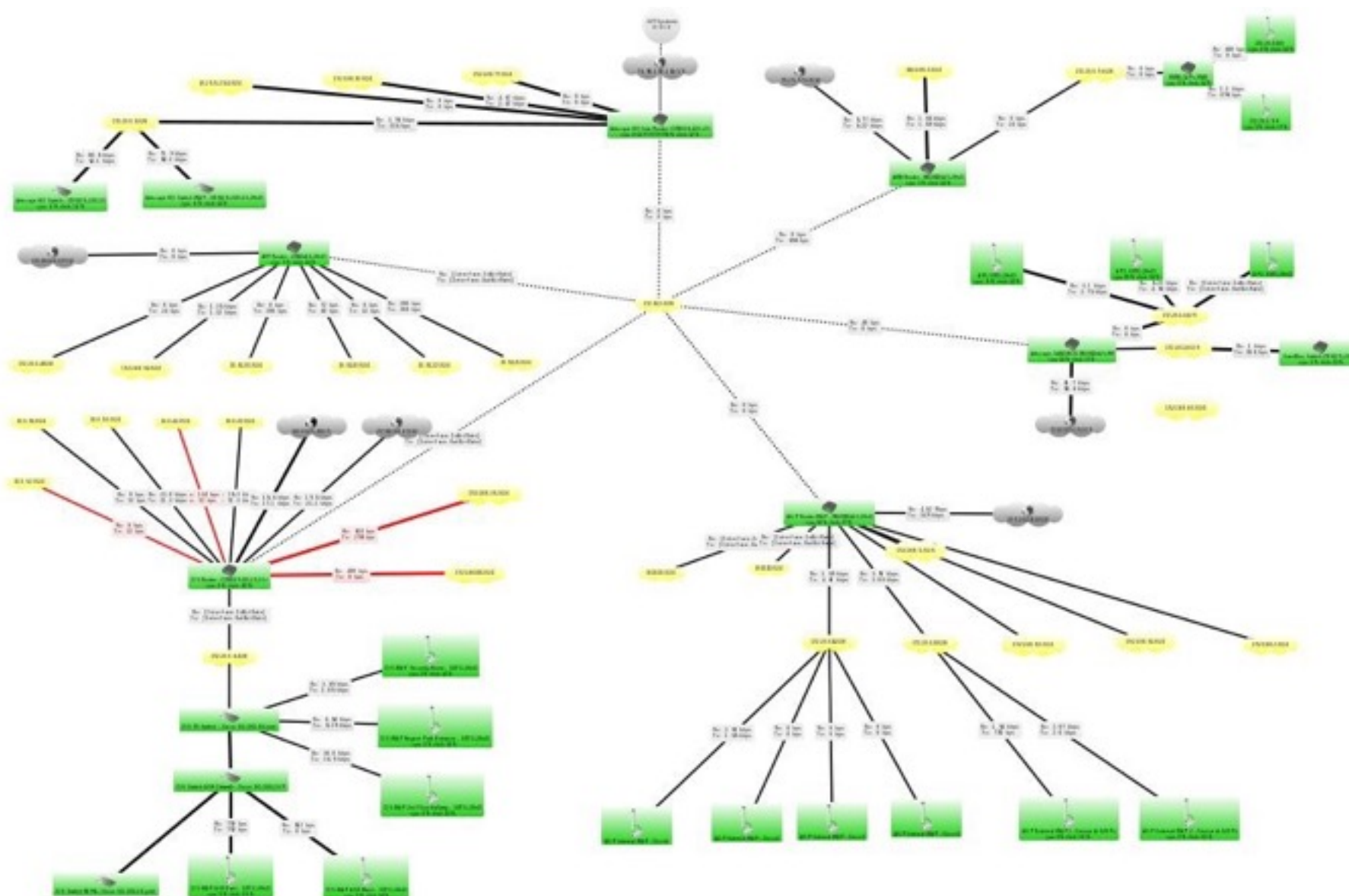
- E-mail notification
- SMS

Access Router



Access Router





The-Dude

The Dude is **free of charge!**

Question?

Enjoy!