

MetaROUTER and OpenWrt

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About Me

- **Jesse Liu, Convergingstream**
 - Over 8 years experience using RouterOS
 - Specialization in Wireless, VPN, Load Balancing and Virtualization
 - MikroTik Certified Consultant
 - MikroTik MTCNA, MTCWE Certifications
 - Cisco CCNP, CCDP Certifications

RouterOS Virtualization

RouterOS has two different Virtualization implementations:

- MetaROUTER
- KVM

MetaROUTER

- MetaROUTER is created by MikroTik and currently is supported on **mips-be** and **powerpc** architecture.
- Currently MetaROUTER can create **RouterOS** and **OpenWrt** virtual machines.

KVM

- Kernel-based Virtual Machine (KVM) is a virtualization infrastructure for the Linux kernel. Requires your hardware to support virtualization (Intel VT or AMD-V).
- KVM is available only on RouterOS x86 architecture.
- KVM can create virtual machines of different Operating Systems.

OpenWrt

- OpenWrt is described as a Linux distribution for embedded devices.
- All components have been optimized for size, to be small enough to fit the limited storage and memory.
- There are about 2000 optional software packages available for install via the **opkg** package management system.

Requirements

- Currently MetaROUTER can be used on
 - RB400, RB700 and RB2011 series.
 - RB1000, RB1100, RB1100AH and RB800.
- Can't be used on RB1200, RB1100AHx2 and CCR1036.
- Each virtual machine instance requires at least 16MB RAM (32MB RAM recommended).

Limitations

- One host you can create up to 7 virtual machines.
- External storage devices (CF, microSD or USB) can't be used in the virtual machines.

RB800

WinBox v5.19 on RB800 (powerpc)

MetaROUTERs

MetaROUTERs Interfaces

+ - ✓ ✕ ⚙ Import Image Find

Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
mr1	16		248	running
mr2	16		248	running
mr3	16		248	running
mr4	16		248	running
mr5	16		248	running
mr6	16		248	running
mr7	16		248	running

7 items

New MetaROUTER

Name: mr8 OK

Memory Size: 16 MiB Cancel

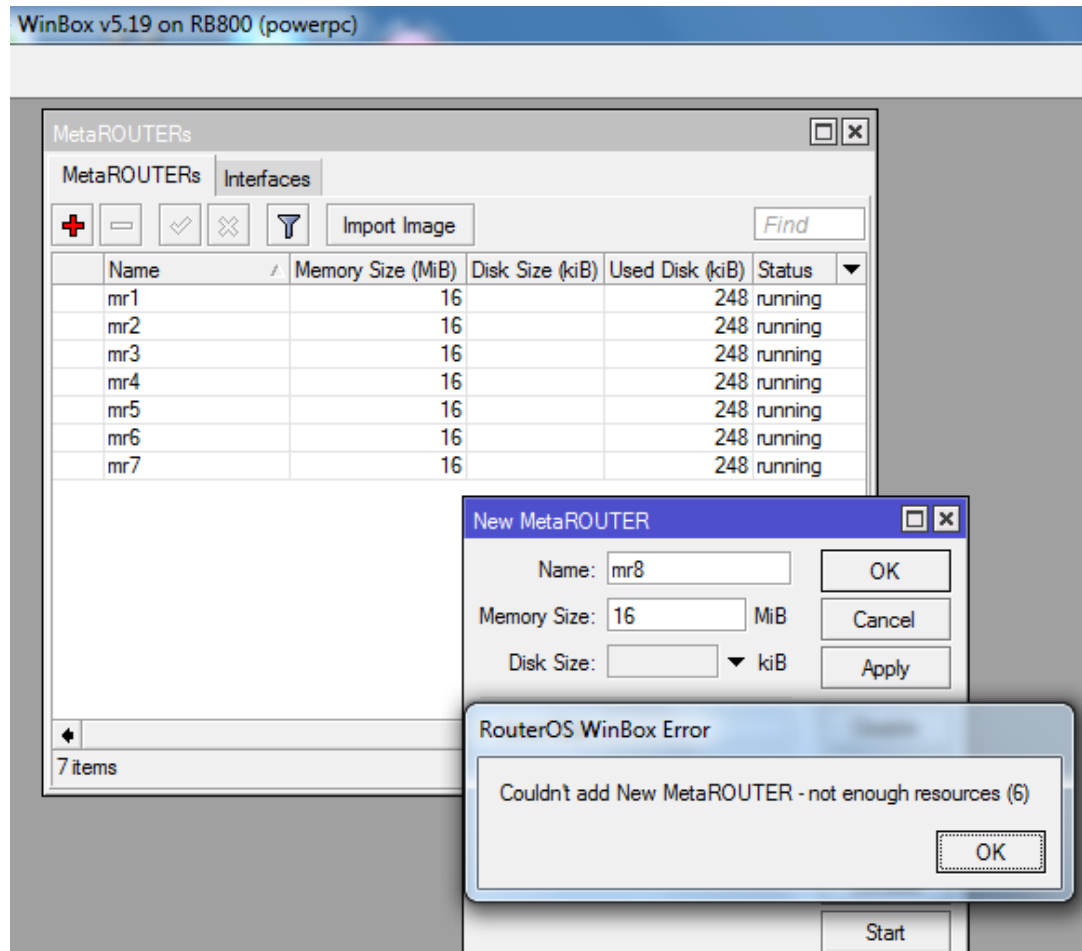
Disk Size: kiB Apply

RouterOS WinBox Error

Couldn't add New MetaROUTER - not enough resources (6)

OK

Start



RB1100AH

WinBox v5.20 on RB1100AH (powerpc)

MetaROUTERs

MetaROUTERs Interfaces

+ - ✓ ✕ ⌵ Import Image Find

Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
mr1	16		221	running
mr2	16		221	running
mr3	16		221	running
mr4	16		221	running
mr5	16		221	running
mr6	16		221	running
mr7	16		221	running

7 items

New MetaROUTER

Name: mr8 OK

Memory Size: 16 MiB Cancel

Disk Size: kiB Apply

RouterOS WinBox Error

Couldn't add New MetaROUTER - not enough resources (6)

OK

Start

Shut down

Reboot

enabled Status: disabled

Known Issues

- Random freezing (mips-be)
 - RB450G, RB435G, RB493G
- Not enough resources (powerpc)
 - RB1100AH (Solved in RouterOS 5.12 or later)

New MetaROUTER

The screenshot displays a network management interface with a sidebar on the left and a main window titled 'MetaROUTERs'. The sidebar contains a list of menu items: Quick Set, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, **MetaROUTER** (circled in red), Make Supout.rif, Manual, and Exit. The main window has two tabs: 'MetaROUTERs' and 'Interfaces'. The 'MetaROUTERs' tab is active, showing a table with one entry: 'mr1' with a Memory Size of 32 MIB, Disk Size of 16043 kiB, and Status of 'running'. A 'New MetaROUTER' dialog box is open in the foreground, allowing the user to create a new MetaROUTER. The dialog box has the following fields and buttons:

- Name: mr2
- Memory Size: 16 MIB
- Disk Size: [] kiB
- Used Disk: []
- Disk Reads: []
- Disk Writes: []
- Buttons: OK, Cancel, Apply, Disable, Copy, Remove, Console, Start, Shut down, Reboot
- enabled [] Status: disabled

Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
mr1	32	16043		running

Import OpenWrt

The screenshot displays the MetaROUTERS interface. At the top, there are tabs for 'MetaROUTERS' and 'Interfaces'. Below the tabs is a toolbar with several icons: a red plus sign, a minus sign, a checkmark, a cross, a funnel, and a button labeled 'Import Image' which is circled in red. To the right of the toolbar is a 'Find' search box. Below the toolbar is a table with the following data:

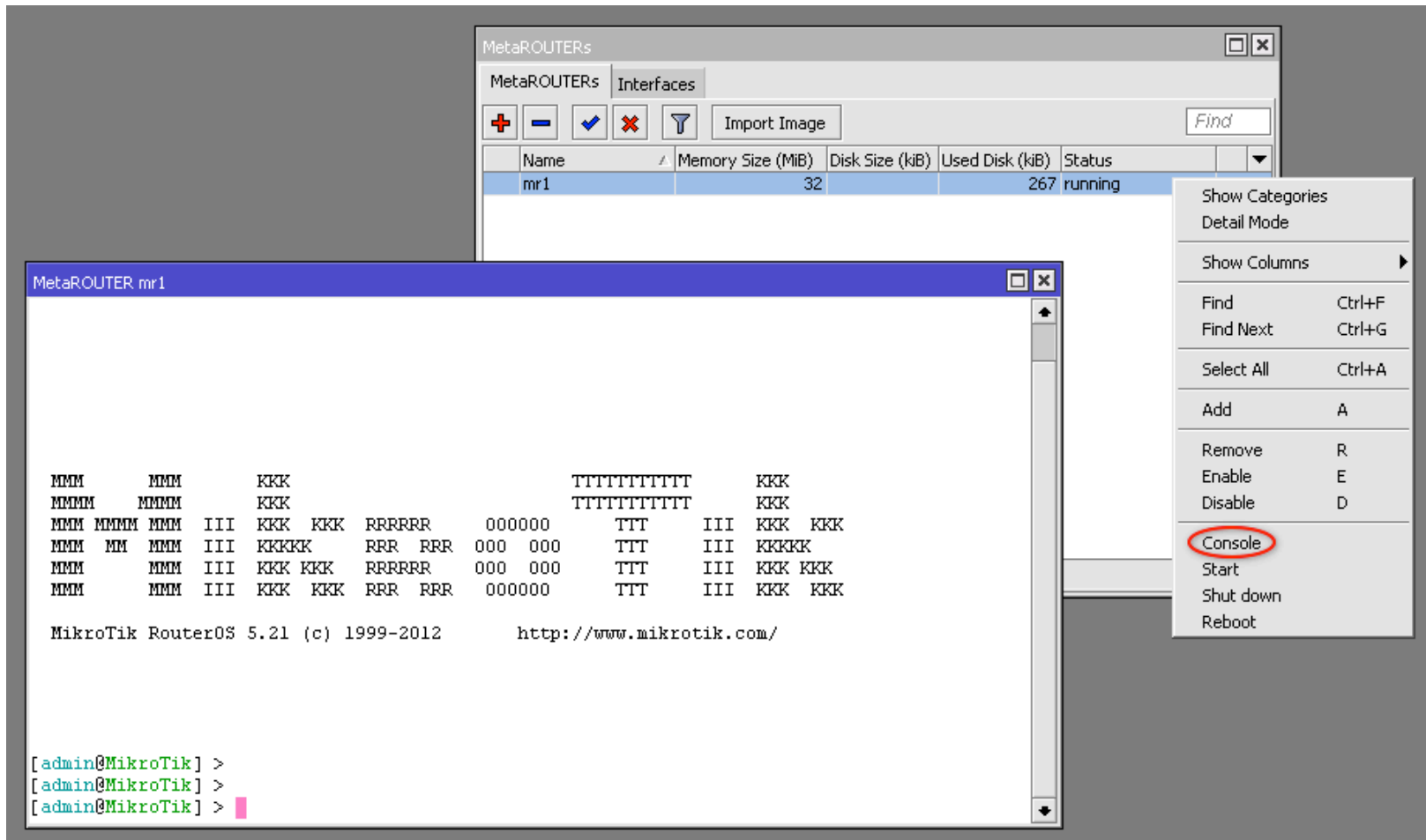
Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
mr1	32		16043	running

An 'Import Image' dialog box is open in the foreground. It has a blue title bar and contains the following fields and controls:

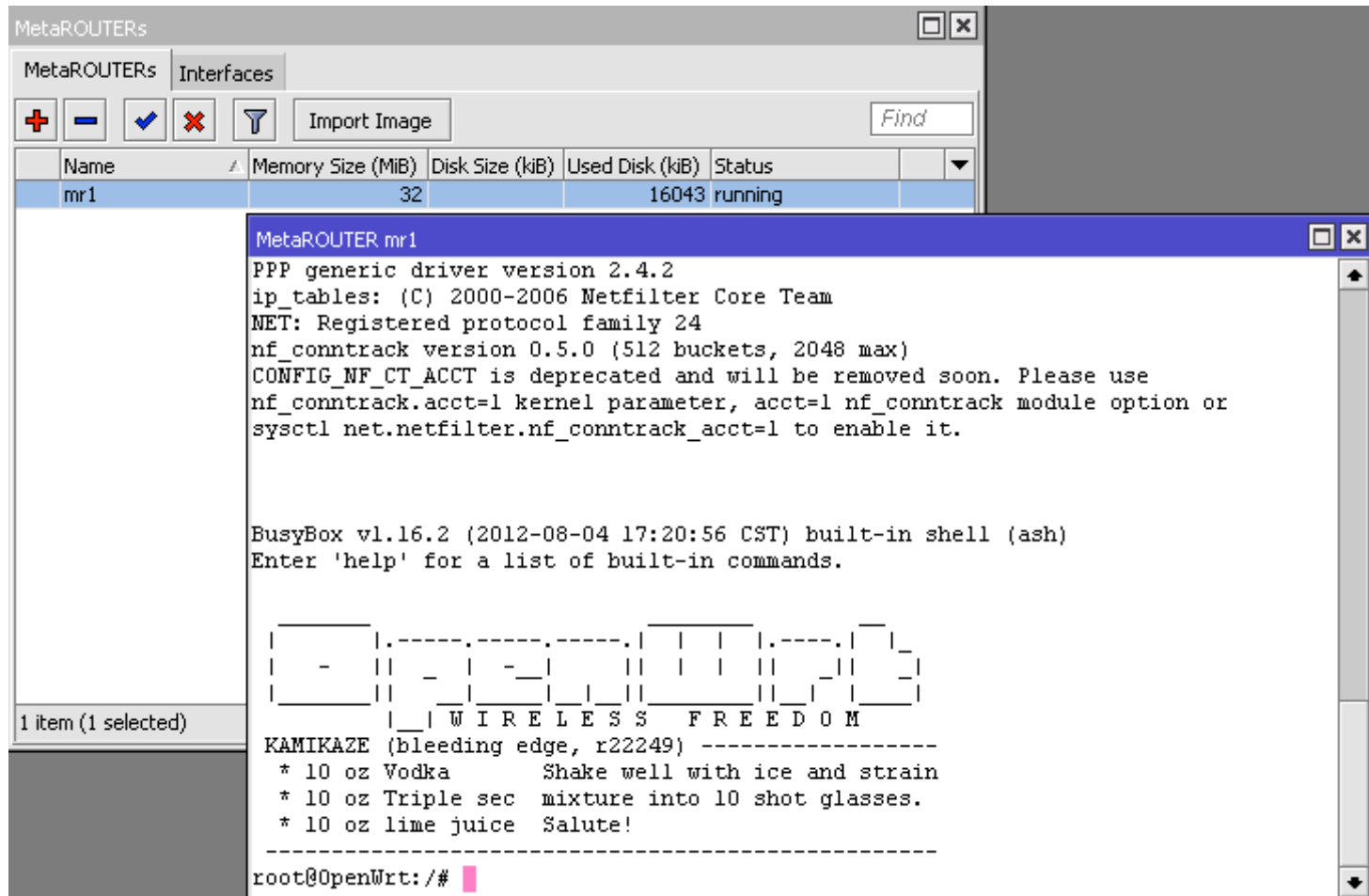
- File Name:** openwrt-mr-mips-rootfs.tar.gz (with a dropdown arrow)
- Memory Size:** 32 (with a text input field) MiB
- Enabled**
- Start** button
- Stop** button
- Imported:** (with an empty text input field)

At the bottom left of the main window, it says '1 item'.

Console access through winbox



Console access through winbox



Virtual Interfaces

- Two different types of virtual interfaces
 - Dynamic interfaces used to connect to a bridge.
 - Static interfaces are used to directly connect to physical port.

Dynamic Interface

The screenshot shows the MetaROUTERS application window with the 'Interfaces' tab selected. A table lists the current interface configuration:

Virtual Machine	Type	Static Interface	VM MAC Address
mr1	dynamic		02:07:22:85:B1:56

A 'New VM Interface' dialog box is open, showing the following configuration:

- Virtual Machine: mr1
- Type: dynamic static
- Dynamic MAC Address: 02:15:A7:C5:E3:D8
- Dynamic Bridge: bridge1
- VM MAC Address: 02:2D:35:59:C7:C0

Buttons on the right side of the dialog include OK, Cancel, Apply, Disable, Copy, and Remove. The status 'enabled' is shown at the bottom of the dialog. The main window also shows a 'Find' search box and a '1 item' status indicator.

VIF interface

MetaROUTERS

MetaROUTERS Interfaces

Virtual Machine	Type	Static Interface	VM MAC Address
mr1	dynamic		02:07:22:85:B1:56

Bridge

Bridge Ports Filters NAT Hosts

Interface	Bridge	Priority (hex)	Path Cost	Horizon	Role	Root Path Cost
I ether2	bridge1	80	10		disabled port	
D vif2	bridge1	80	10		designated port	
wlan1	bridge1	80	10		designated port	

Static Interface

The screenshot shows the MetaROUTERS GUI with the 'Interfaces' tab selected. A table lists the current interfaces:

Virtual Machine	Type	Static Interface	VM MAC Address
mr1	dynamic		02:07:22:85:B1:56

The 'New VM Interface' dialog box is open, showing the following configuration:

- Virtual Machine: mr1
- Type: static (selected)
- Static Interface: ether1
- VM MAC Address: 02:2D:35:59:C7:C0
- Status: enabled

Buttons in the dialog include OK, Cancel, Apply, Disable, Copy, and Remove.

Building your own OpenWrt

- Setting up build environment in Debian 6.0 Squeeze.
- Update the package index files using the following command.
 - ***apt-get update***
- Install the following packages to get the system ready.
 - ***apt-get install subversion build-essential***
 - ***apt-get install libncurses5-dev zlib1g-dev gawk flex libssl-dev unzip python***

Building your own OpenWrt

- Do everything as *non-root* user!
- Download the OpenWrt sources with svn.
 - *mkdir ~/openwrt*
 - *cd ~/openwrt*
 - *svn co svn://svn.openwrt.org/openwrt/trunk/@22249*
 - *cd trunk*
- feeds.conf.default add "@22249" at the end of the line.

Building your own OpenWrt

- Download and install feeds using feeds script.
 - *./scripts/feeds update -a*
 - *./scripts/feeds install -a*
- Download and patch OpenWrt sources.
 - *wget http://www.mikrotik.com/download/metarouter/openwrt-metarouter-1.2.patch*
 - *patch -p0 <openwrt-metarouter-1.2.patch*

Building your own OpenWrt

- Use following commands to check for missing packages.
 - *make defconfig*
 - *make prereq*

Building your own OpenWrt

- Start OpenWrt configuration interface:
 - *make menuconfig*

```
Target System
Use the arrow keys to navigate this window or press the hotkey of
the item you wish to select followed by the <SPACE BAR>. Press
<?> for additional information about this option.
+(-)
  ( ) Marvell/Intel PXA2xx
  (X) Mikrotik MetaROUTER MIPS
  ( ) Mikrotik MetaROUTER PowerPC
  ( ) Mikrotik RouterBoard 532
  ( ) NetusG20
  ( ) PowerXCell Accelerator Board
+ (+) _
<Select> < Help >
```

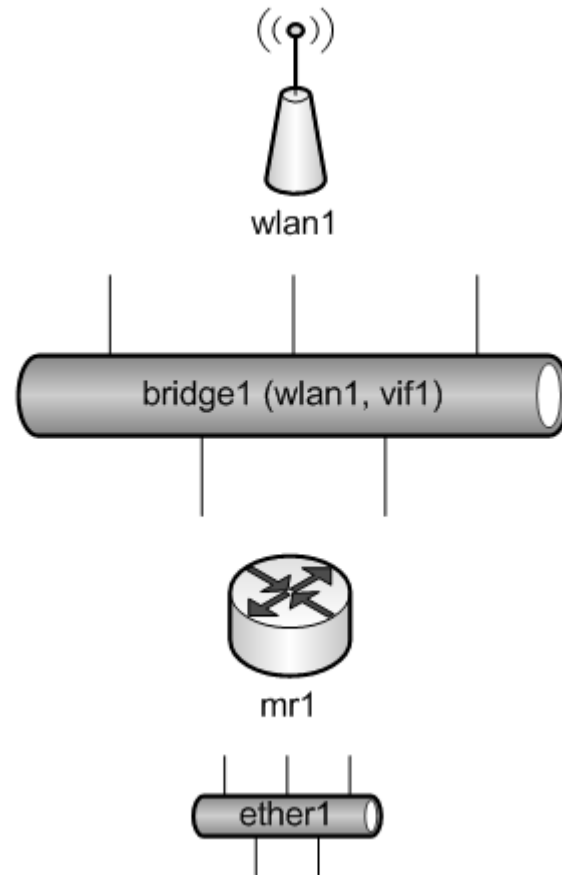

Building your own OpenWrt

- Everything is now ready for building the image(s), which is done with one single command:
 - *make*
- After a successful build, the freshly built image(s) can be found in the newly created <buildroot dir>/bin directory.

Wireless CPE

- Customer can access his own virtual router, without need for other hardware.
- Wireless control only for the WISP, while the Ethernet side is fully under the customer control.

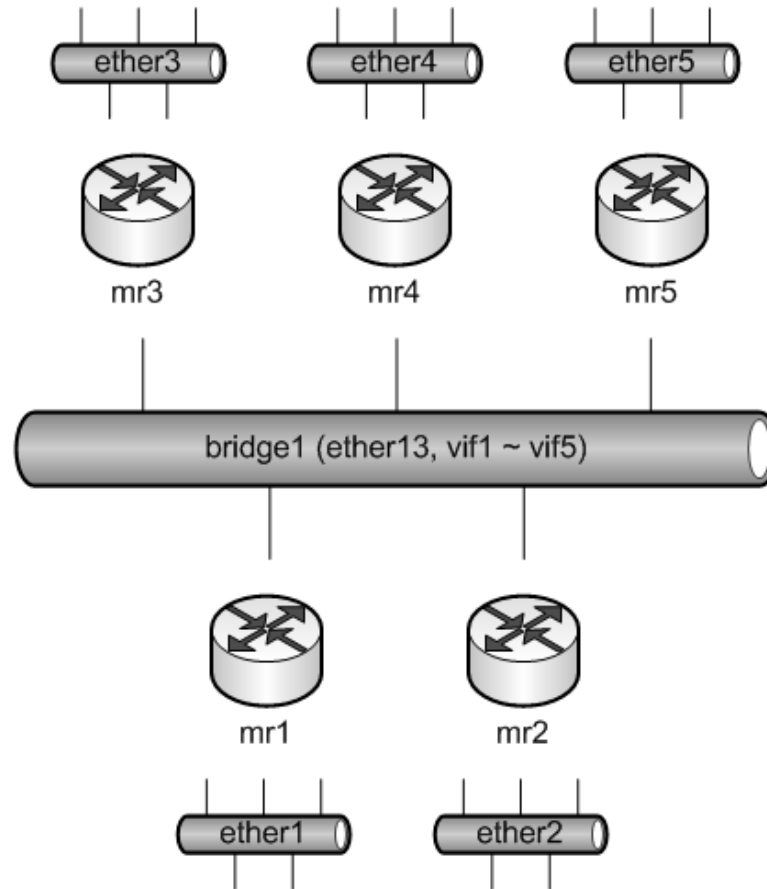
Wireless CPE



Multi-Tenant Applications

- Consolidate a number of routers on one hardware platform, to give the customers their own isolated virtual router.

Multi-Tenant Applications



Server running as guest

- Running specific simple task without need of dedicated server (web server, DNS server, VoIP gateway).
- Install and configure lighttpd, php, bind and asterisk on OpenWrt virtual machine.

Custom applications

- Develop your own custom Linux programs that can be installed on RouterBOARD platforms.

More information at:
<http://wiki.mikrotik.com/wiki/Events>

Thank you for participating