IP Addresses and ARP

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Table of Contents

General Information

Summary

The following Manual discusses IP address management and the Address Resolution Protocol settings. IP addresses serve as identification when communicating with other network devices using the TCP/IP version 4 protocol. In turn, communication between devices in one physical network proceeds with the help of Address Resolution Protocol and ARP addresses.

Specifications

Packages required: ***system***
License required: ***level1***
Home menu level: ***/ip address, /ip arp***
Standards and Technologies: ***IPv4, ARP***
Hardware usage: ***Not significant***

IP Addressing

Home menu level: ***/ip address***

Description

IP addresses serve for a general host identification purposes in IP networks. Typical (IPv4) address consists of four octets. For proper addressing the router also needs the network mask value, *id est* which bits of the complete IP address refer to the address of the host, and which - to the address of the network. The network address value is calculated by binary **AND** operation from network mask and IP address values. It's also possible to specify IP address followed by slash "/" and the amount of bits that form the network address.

In most cases, it is enough to specify the address, the netmask, and the interface arguments. The network prefix and the broadcast address are calculated automatically.

It is possible to add multiple IP addresses to an interface or to leave the interface without any addresses assigned to it. In case of bridging or PPPoE connection, the physical interface may bot have any address assigned, yet be perfectly usable. Putting an IP address to a physical interface included in a bridge would mean actually putting it on the bridge interface itself. You can use **/ip address print detail** to see to which interface the address belongs to.

MikroTik RouterOS has following types of addresses:

- **Static** - manually assigned to the interface by a user
- **Dynamic** - automatically assigned to the interface by DHCP or an estabilished PPP connections

Property Description

actual-interface (*read-only: name*) - name of the actual interface the logical one is bound to. For example, if the physical interface you assigned the address to, is included in a bridge, the actual interface will show that bridge.

address (*IP address*) - IP address

broadcast (*IP address*; default: **255.255.255.255**) - broadcasting IP address, calculated by default from an IP address and a network mask

disabled (yes | no; default: **no**) - specifies whether the address is disabled or not

interface (*name*) - interface name the IP address is assigned to

netmask (*IP address*; default: **0.0.0.0**) - delimits network address part of the IP address from the host part

network (*IP address*; default: **0.0.0.0**) - IP address for the network. For point-to-point links it should be the address of the remote end

Notes

You cannot have two different IP addresses from the same network assigned to the router. *Exempli gratia*, the combination of IP address **10.0.0.1/24** on the **ether1** interface and IP address **10.0.0.132/24** on the **ether2** interface is invalid (unless both interfaces are bridged together), because both addresses belong to the same network **10.0.0.0/24**. Use addresses from different networks on different interfaces.

Example

```
[admin@MikroTik] ip address> add address=10.10.10.1/24 interface=ether2
[admin@MikroTik] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
```

```
  #   ADDRESS            NETWORK         BROADCAST       INTERFACE
  0   2.2.2.1/24         2.2.2.0         2.2.2.255       ether2
  1   10.5.7.244/24      10.5.7.0        10.5.7.255      ether1
  2   10.10.10.1/24      10.10.10.0      10.10.10.255    ether2
[admin@MikroTik] ip address>
```

Address Resolution Protocol

Home menu level: ***/ip arp***

Description

Even though IP packets are addressed using IP addresses, hardware addresses must be used to actually transport data from one host to another. Address Resolution Protocol is used to map OSI level 3 IP addreses to OSI level 2 MAC addreses. Router has a table of currently used ARP entries. Normally the table is built dynamically, but to increase network security, it can be partialy or completely built statically by means of adding static entries.

Property Description

address (*IP address*) - IP address to be mapped

interface (*name*) - interface name the IP address is assigned to

mac-address (*MAC address*; default: **00:00:00:00:00:00**) - MAC address to be mapped to

Notes

Maximal number of ARP entries is 8192.

If ARP feature is turned off on the interface, i.e., **arp=disabled** is used, ARP requests from clients are not answered by the router. Therefore, static arp entry should be added to the clients as well. For example, the router's IP and MAC addresses should be added to the Windows workstations using the **arp** command:

```
C:\> arp -s 10.5.8.254  00-aa-00-62-c6-09
```

If **arp** property is set to **reply-only** on the interface, then router only replies to ARP requests. Neighbour MAC addresses will be resolved using **/ip arp** statically, but there will be no need to add the router's MAC address to other hosts' ARP tables.

Example

```
[admin@MikroTik] ip arp> add address=10.10.10.10 interface=ether2 mac-address=06 \
\... :21:00:56:00:12
[admin@MikroTik] ip arp> print
Flags: X - disabled, I - invalid, H - DHCP, D - dynamic
  #   ADDRESS         MAC-ADDRESS       INTERFACE
  0 D 2.2.2.2         00:30:4F:1B:B3:D9 ether2
  1 D 10.5.7.242      00:A0:24:9D:52:A4 ether1
  2   10.10.10.10     06:21:00:56:00:12 ether2
[admin@MikroTik] ip arp>
```

If static arp entries are used for network security on an interface, you should set arp to 'reply-only' on that interface. Do it under the relevant **/interface** menu:

```
[admin@MikroTik] ip arp> /interface ethernet set ether2 arp=reply-only
```

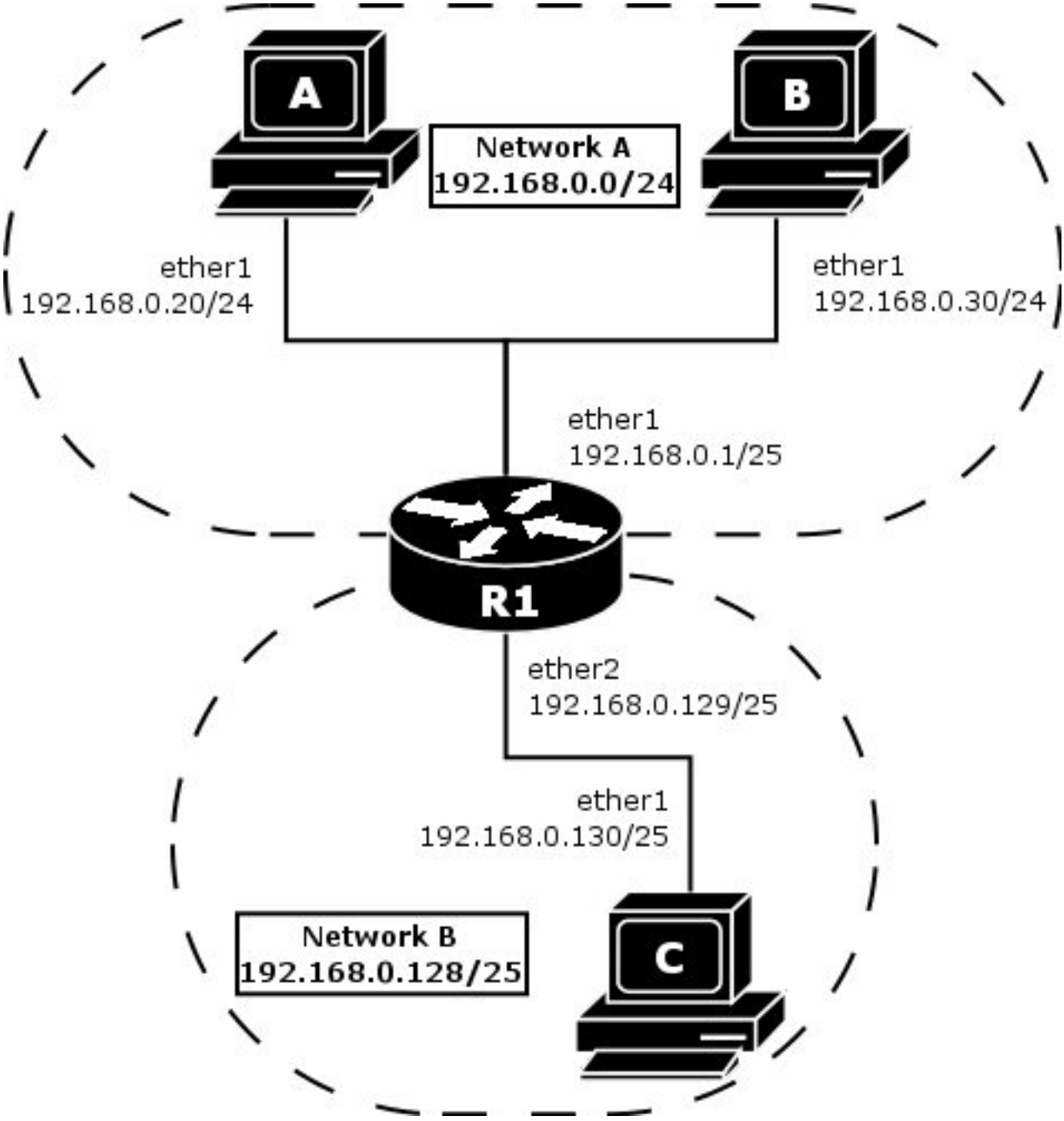
```
[admin@MikroTik] ip arp> print
Flags: X - disabled, I - invalid, H - DHCP, D - dynamic
  #   ADDRESS         MAC-ADDRESS       INTERFACE
  0 D 10.5.7.242      00:A0:24:9D:52:A4 ether1
  1   10.10.10.10     06:21:00:56:00:12 ether2

[admin@MikroTik] ip arp>
```

Proxy-ARP feature

Description

A router with properly configured proxy ARP feature acts like a transparent ARP proxy between directly connected networks. Consider the following network diagram:



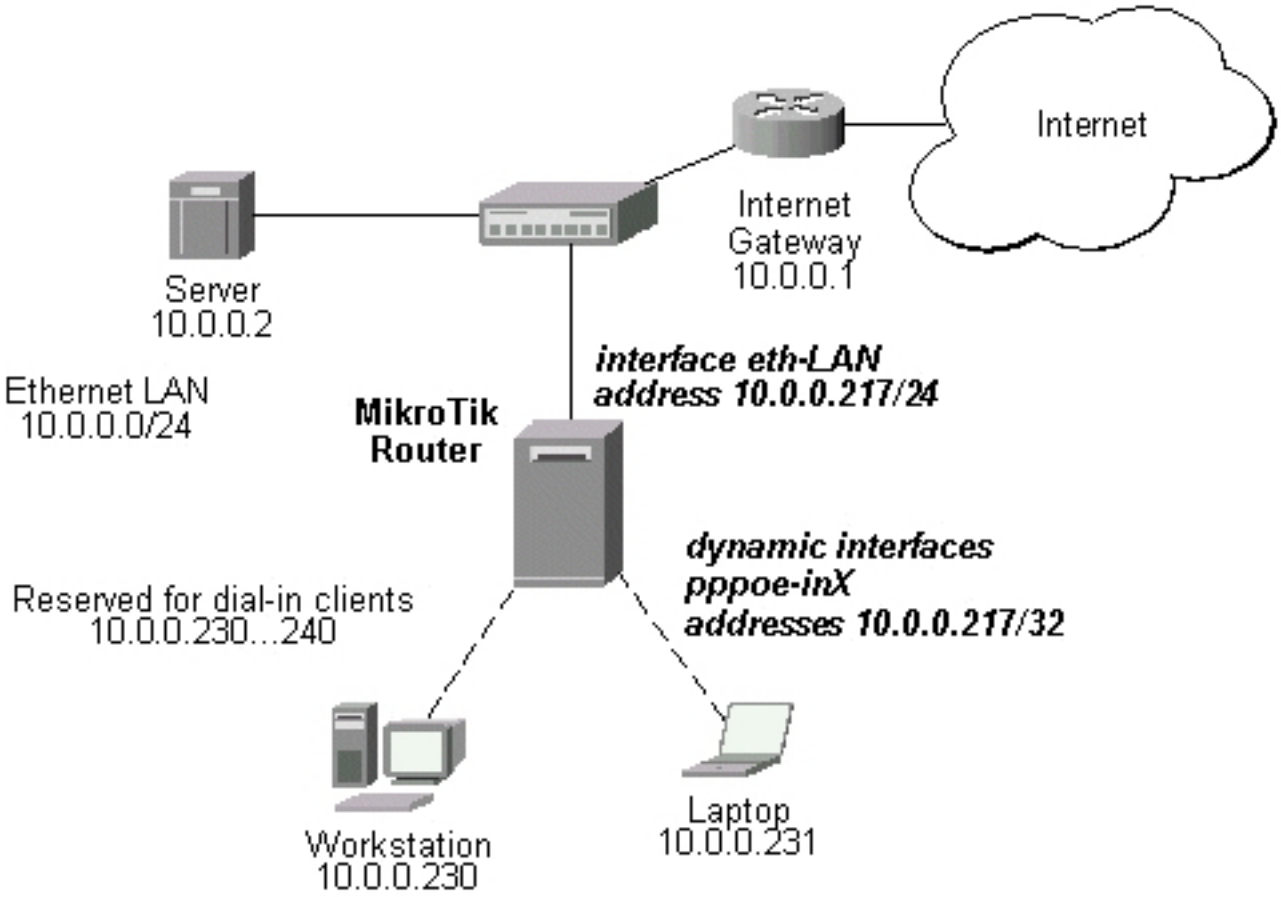
Suppose the host A needs to communicate to host C. To do this, it needs to know host's C MAC address. As shown on the diagram above, host A has /24 network mask. That makes host A to believe that it is directly connected to the whole 192.168.0.0/24 network. When a computer needs to communicate to another one on a directly connected network, it sends a broadcast ARP request. Therefore host A sends a broadcast ARP request for the host C MAC address.

Broadcast ARP requests are sent to the broadcast MAC address FF:FF:FF:FF:FF:FF. Since the ARP request is a broadcast, it will reach all hosts in the network A, including the router R1, but it will not reach host C, because routers do not forward broadcasts by default. A router with enabled proxy ARP knows that the host C is on another subnet and will reply with its own MAC adress. The router with enabled proxy ARP always answer with its own MAC address if it has a route to the destination.

This behaviour can be usefull, for example, if you want to assign dial-in (ppp, pppoe, pptp) clients IP addresses from the same address space as used on the connected LAN.

Example

Consider the following configuration:



The MikroTik Router setup is as follows:

```
admin@MikroTik] ip arp> /interface ethernet print
Flags: X - disabled, R - running
  #    NAME                MTU   MAC-ADDRESS       ARP
  0  R eth-LAN             1500  00:50:08:00:00:F5 proxy-arp
[admin@MikroTik] ip arp> /interface print
Flags: X - disabled, D - dynamic, R - running
  #    NAME                TYPE            MTU
  0    eth-LAN             ether           1500
  1    prism1              prism           1500
  2 D  pppoe-in25          pppoe-in
  3 D  pppoe-in26          pppoe-in
[admin@MikroTik] ip arp> /ip address print
Flags: X - disabled, I - invalid, D - dynamic
  #   ADDRESS            NETWORK         BROADCAST       INTERFACE
  0   10.0.0.217/24      10.0.0.0        10.0.0.255      eth-LAN
  1 D 10.0.0.217/32      10.0.0.230      0.0.0.0         pppoe-in25
  2 D 10.0.0.217/32      10.0.0.231      0.0.0.0         pppoe-in26
[admin@MikroTik] ip arp> /ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        G GATEWAY         DIS INTE...
```

```
 0 A S  0.0.0.0/0                          r 10.0.0.1        1   eth-LAN
 1 ADC  10.0.0.0/24        10.0.0.217                        0   eth-LAN
 2 ADC  10.0.0.230/32      10.0.0.217                        0   pppoe-in25
 3 ADC  10.0.0.231/32      10.0.0.217                        0   pppoe-in26
[admin@MikroTik] ip arp>
```

Troubleshooting

Description

- **Router shows that the IP address is invalid**
  Check whether the interface, the address is assigned to, is present, enabled and running.