DHCP

DHCP Client

Summary

Sub-menu: `/ip dhcp-client`

The DHCP (Dynamic Host Configuration Protocol) is used for the easy distribution of IP addresses in a network. The MikroTik RouterOS implementation includes both server and client parts and is compliant with RFC 2131.

The MikroTik RouterOS DHCP client may be enabled on any Ethernet-like interface at a time. The client will accept an address, netmask, default gateway, and two DNS server addresses. The received IP address will be added to the interface with the respective netmask. The default gateway will be added to the routing table as a dynamic entry. Should the DHCP client be disabled or not renew an address, the dynamic default route will be removed. If there is already a default route installed prior to the DHCP client obtaining one, the route obtained by the DHCP client would be shown as invalid.

RouterOS DHCP client asks for the following options:

- option 1 - SUBNET_MASK,
- option 3 - GATEWAY_LIST,
- option 6 - TAG_DNS_LIST,
- option 33 - STATIC_ROUTE,
- option 42 - NTP_LIST,
- option 121 - CLASSLESS_ROUTE,

DHCP Options

DHCP client has the possibility to set up options that are sent to the DHCP server. For example, hostname and MAC address. The syntax is the same as for DHCP server options.

Currently, there are three variables that can be used in options:

- HOSTNAME;
- CLIENT_MAC - client interface MAC address;
- CLIENT_DUID - client DIUD of the router, same as used for the DHCPv6 client. In conformance with RFC4361

DHCP client default options include these default Options:

Name	code	value
clientid_duid	61	0xff$(CLIENT_DUID)
clientid	61	0x01$(CLIENT_MAC)
hostname	12	$(HOSTNAME)

Properties

Property	Description
add-default-route (*yes* | *no* | *special-classless*; Default: **yes**)	Whether to install default route in routing table received from dhcp server. By default RouterOS client complies to RFC and ignores option 3 if classless option 121 is received. To force client not to ignore option 3 set *special-classless*. This parameter is available in v6rc12+ - **yes** - adds classless route if received, if not then add default route (old behavior) - **special-classless** - adds both classless route if received and default route (MS style)
client-id (*string*; Default:)	Corresponds to the settings suggested by the network administrator or ISP. If not specified, client's MAC address will be sent
comment (*string*; Default:)	Short description of the client
default-route-distance (*integer:0..255*; Default:)	Distance of default route. Applicable if `add-default-route` is set to `yes`.
disabled (*yes* | *no*; Default: **yes**)	
host-name (*string*; Default:)	Host name of the client sent to a DHCP server. If not specified, client's system identity will be used.
interface (*string*; Default:)	Interface on which DHCP client will be running.

script (*script*; Default:)	Execute script on status change. This parameter is available in v6.39rc33+ These are available variables that are accessible for the event script: • bound - 1 - lease is added/changed; 0 - lease is removed • server-address - server address • lease-address - lease address provided by server • interface - name of interface on which client is configured • gateway-address - gateway address provided by server • vendor-specific - stores value of option 43 received from DHCP server • lease-options - array of received options `Example >>`
use-peer-dns (*yes* | *no*; Default: **yes**)	Whether to accept the DNS settings advertised by DHCP Server. (Will override the settings put in the `/ip dns` submenu.
use-peer-ntp (*yes* | *no*; Default: **yes**)	Whether to accept the NTP settings advertised by DHCP Server. (Will override the settings put in the `/system ntp client` submenu)

Read-only properties

Property	Description
address (*IP/Netmask*)	IP address and netmask, which is assigned to DHCP Client from the Server
dhcp-server (*IP*)	IP address of the DHCP server.
expires-after (*time*)	Time when the lease expires (specified by the DHCP server).
gateway (*IP*)	IP address of the gateway which is assigned by DHCP server
invalid (*yes* | *no*)	Shows whether configuration is invalid.
netmask (*IP*)	
primary-dns (*IP*)	IP address of the first DNS resolver, that was assigned by the DHCP server
primary-ntp (*IP*)	IP address of the primary NTP server, assigned by the DHCP server
secondary-dns (*IP*)	IP address of the second DNS resolver, assigned by the DHCP server
secondary-ntp (*IP*)	IP address of the secondary NTP server, assigned by the DHCP server
status (*bound* | *error* | *rebinding...* | *requesting...* | *searching...* | *stopped*)	Shows the status of DHCP Client

Menu specific commands

Property	Description
release (*numbers*)	Release current binding and restart DHCP client
renew (*numbers*)	Renew current leases. If the renew operation was not successful, client tries to reinitialize lease (i.e. it starts lease request procedure (rebind) as if it had not received an IP address yet)

Configuration Examples

Simple DHCP client

Add a DHCP client on ether1 interface:

```
/ip dhcp-client add interface=ether1 disabled=no
```

After the interface is added, you can use the "print" or "print detail" command to see what parameters the DHCP client acquired:

```
[admin@MikroTik] ip dhcp-client> print detail
Flags: X - disabled, I - invalid
 0   interface=ether1 add-default-route=yes use-peer-dns=yes use-peer-ntp=yes
     status=bound address=192.168.0.65/24 gateway=192.168.0.1
     dhcp-server=192.168.0.1 primary-dns=192.168.0.1 primary-ntp=192.168.0.1
     expires-after=9m44s
[admin@MikroTik] ip dhcp-client>
```


If the interface used by the DHCP client is part of the VRF configuration, then the default route and other received routes from the DHCP server will be added to the VRF routing table.

DHCP client status can be checked with:

```
/ip dhcp-client print detail
```

Lease script example

It is possible to execute a script when a DHCP client obtains a new lease or loses an existing one. This is an example script that automatically adds a default route with routing-mark=WAN1 and removes it when the lease expires or is removed.

```
/ip dhcp-client
add add-default-route=no dhcp-options=hostname,clientid disabled=no interface=ether2 script="{\r\
    \n    :local rmark \"WAN1\"\r\
    \n    :local count [/ip route print count-only where comment=\"WAN1\"]\r\
    \n    :if (\$bound=1) do={\r\
    \n        :if (\$count = 0) do={\r\
    \n            /ip route add gateway=\$\"gateway-address\" comment=\"WAN1\" routing-mark=\$rmark\r\
    \n        } else={\r\
    \n            :if (\$count = 1) do={\r\
    \n                :local test [/ip route find where comment=\"WAN1\"]\r\
    \n                :if ([/ip route get \$test gateway] != \$\"gateway-address\") do={\r\
    \n                    /ip route set \$test gateway=\$\"gateway-address\"\r\
    \n                }\r\
    \n            } else={\r\
    \n                :error \"Multiple routes found\"\r\
    \n            }\r\
    \n        }\r\
    \n    } else={\r\
    \n        /ip route remove [find comment=\"WAN1\"]\r\
    \n    }\r\
    \n}\r\
    \n"
```

Resolve default gateway when 'router' (option3) is from a different subnet

In some cases, administrators tend to set the 'router' option which cannot be resolved with offered IP's subnet. For example, the DHCP server offers 192.168.88.100/24 to the client, and option 3 is set to 172.16.1.1. This will result in an unresolved default route:

```
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0  DS  0.0.0.0/0                          172.16.1.1              1
 1 ADC  192.168.88.0/24    192.168.88.100  ether1
```

To fix this we need to add /32 route to resolve the gateway over ether1, which can be done by the running script below each time the DHCP client gets an address

```
/system script add name="dhcpL" source={ /ip address add address=($"lease-address" . "/32") network=$"gateway-
address" interface=$interface }
```

Now we can further extend the script, to check if the address already exist, and remove the old one if changes are needed

```
/system script add name="dhcpL" source={
  /ip address {
    :local ipId [find where comment="dhcpL address"]
    :if ($ipId != "") do={
      :if (!([get $ipId address] = ($"lease-address" . "/32") && [get $ipId network]=$"gateway-address" )) do={
        remove $ipId;
        add address=($"lease-address" . "/32") network=$"gateway-address" \
          interface=$interface comment="dhcpL address"
      }
    } else={
      add address=($"lease-address" . "/32") network=$"gateway-address" \
        interface=$interface comment="dhcpL address"
    }
  }
}
```

DHCPv6 Client

Summary

Sub-menu: `/ipv6 dhcp-client`

DHCP-client in RouterOS is capable of being a DHCPv6-client and DHCP-PD client. So it is able to get a prefix from DHCP-PD server as well as DHCPv6 stateful address from DHCPv6 server.

Properties

Property	Description
add-default-route (*yes* | *no*; Default: **no**)	Whether to add default IPv6 route after client connects.
comment (*string*; Default:)	Short description of the client
disabled (*yes* | *no*; Default: **no**)	
interface (*string*; Default:)	Interface on which DHCPv6 client will be running.
pool-name (*string*; Default:)	Name of the IPv6 pool in which received IPv6 prefix will be added
pool-prefix-length (*string*; Default:)	Prefix length parameter that will be set for IPv6 pool in which received IPv6 prefix is added. Prefix length must be greater than the length of received prefix, otherwise prefix-length will be set to received prefix length + 8 bits.
prefix-hint (*string*; Default:)	Include a preferred prefix length.
request (*prefix, address*; Default:)	to choose if the DHCPv6 request will ask for the address or the IPv6 prefix, or both.
script (*string*; Default:)	Run this script on the dhcp-client status change. Available variables: • pd-valid - if the prefix is acquired by the client; • pd-prefix - the prefix acquired by the client if any; • na-valid - if the address is acquired by the client; • na-address - the address acquired by the client if any. • options - array of received options (only ROSv7)

use-peer-dns (*yes* | *no*; Default: **yes**)	Whether to accept the DNS settings advertised by the IPv6 DHCP Server.

Read-only properties

Property	Description
duid (*string*)	Auto generated DUID that is sent to the server. DUID is generated using one of the MAC addresses available on the router.
request (*list*)	specifies what was requested - prefix, address or both.
dynamic (*yes* | *no*)	
expires-after (*time*)	Time when the IPv6 prefix expires (specified by the DHCPv6 server).
invalid (*yes* | *no*)	Shows whether configuration is invalid.
prefix (*IPv6 prefix*)	Shows received IPv6 prefix from DHCPv6-PD server
status (*stopped* | *searching* | *requesting...* | *bound* | *renewing* | *rebinding* | *error* | *stopping*)	Shows the status of DHCPv6 Client: • **stopped** - dhcpv6 client is stopped • **searching** - sending "solicit" and trying to get "advertise" • **requesting** - sent "request" waiting for "reply" • **bound** - received "reply". Prefix assigned. • **renewing** - sent "renew", waiting for "reply" • **rebinding** - sent "rebind", waiting for "reply" • **error** - reply was not received in time or some other error ocurred. • **stopping** - sent "release"

Menu specific commands

Property	Description
release (*numbers*)	Release current binding and restart DHCPv6 client
renew (*numbers*)	Renew current leases. If the renew operation was not successful, client tries to reinitialize lease (i.e. it starts lease request procedure (rebind) as if it had not received an IP address yet)

Script

It is possible to add a script that will be executed when a prefix or an address is acquired and applied or expires and is removed using DHCP client. There are separated sets of variables that will have the value set by the client depending on prefix or address status change as the client can acquire both and each of them can have a different effect on the router configuration.

Available variables for dhcp-client

- pd-valid - value - 1 or 0 - if prefix is acquired and it is applied or not
- pd-prefix - value ipv6/num (ipv6 prefix with mask) - the prefix inself
- na-valid - value - 1 or 0 - if address is acquired and it is applied or not
- na-address - value - ipv6 address - the address

IAID

To determine what IAID will be used, convert internal ID of an interface on which DHCP client is running from hex to decimal.

For example, DHCP client is running on interface pppoe-out1. To get internal ID use following command

```
[admin@t36] /interface> :put [find name="pppoe-out1"]
*15
```

Now convert hex value 15 to decimal and you get IAID=21

Configuration Examples

Simple DHCPv6 client

This simple example demonstrates how to enable dhcp client to receive IPv6 prefix and add it to the pool.

```
/ipv6 dhcp-client add request=prefix pool-name=test-ipv6 pool-prefix-length=64 interface=ether13
```

Detailed print should show status of the client and we can verify if prefix is received

```
[admin@x86-test] /ipv6 dhcp-client> print detail
Flags: D - dynamic, X - disabled, I - invalid
 0 interface=bypass pool-name="test-ipv6" pool-prefix-length=64 status=bound
prefix=2001:db8:7501:ff04::/62 expires-after=2d23h11m53s request=prefix
```

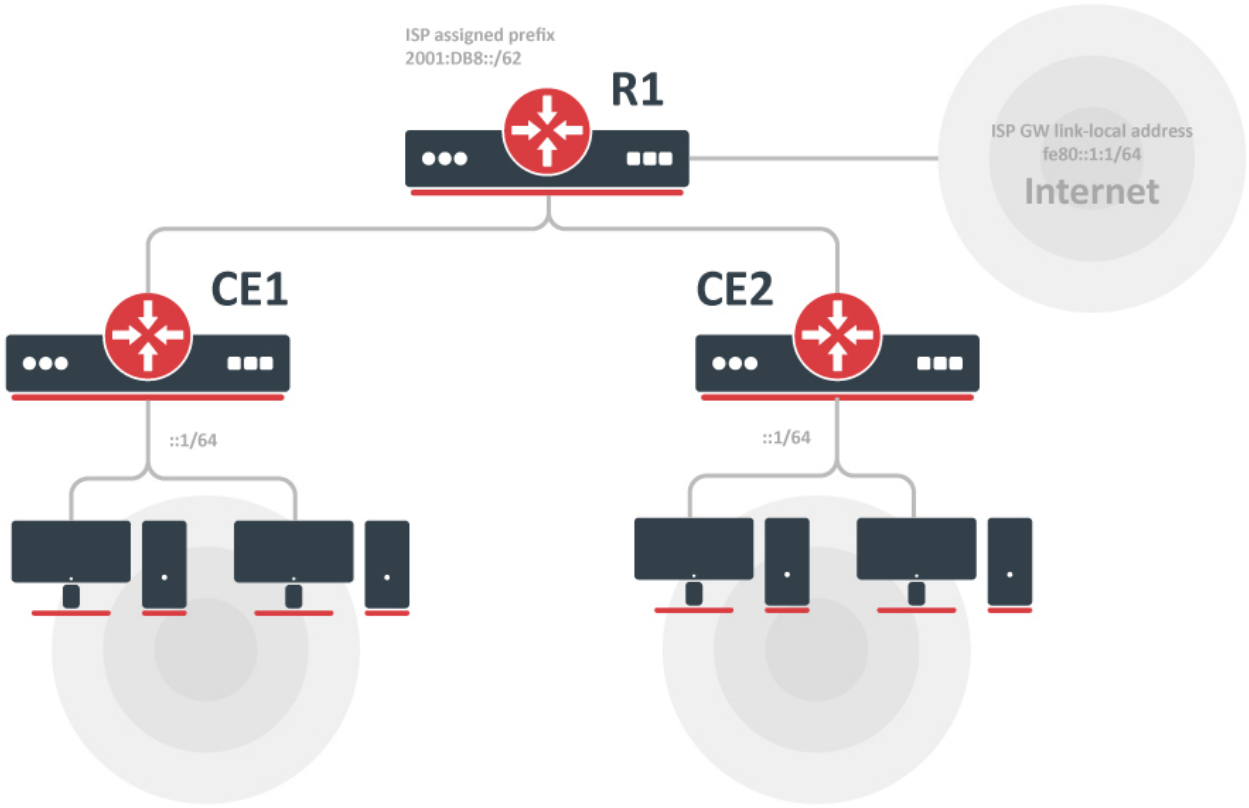
Notice that server gave us prefix 2a02:610:7501:ff04::/62 . And it should be also added to ipv6 pools

```
[admin@MikroTik] /ipv6 pool> print
Flags: D - dynamic
# NAME PREFIX REQUEST PREFIX-LENGTH
0 D test-ipv6 2001:db8:7501:ff04::/62 prefix 64
```

It works! Now you can use this pool, for example, for pppoe clients.

Use received prefix for local RA

Consider following setup:



- ISP is routing prefix 2001:DB8::/62 to the router R1
- Router R1 runs DHCPv6 server to delegate /64 prefixes to the customer routers CE1 CE2
- DHCP client on routers CE1 and CE2 receives delegated /64 prefix from the DHCP server (R1).
- Client routers uses received prefix to set up RA on the local interface

Configuration

R1

```
/ipv6 route
add gateway=fe80::1:1%to-ISP

/ipv6 pool
add name=myPool prefix=2001:db8::/62 prefix-length=64

/ipv6 dhcp-server
 add address-pool=myPool disabled=no interface=to-CE-routers lease-time=3m name=server1
```

CE1

```
/ipv6 dhcp-client
add interface=to-R1 request=prefix pool-name=my-ipv6

/ipv6 address
add address=::1/64 from-pool=my-ipv6 interface=to-clients advertise=yes
```

CE2

```
/ipv6 dhcp-client
 add interface=to-R1 request=prefix pool-name=my-ipv6
/ipv6 address add address=::1/64 from-pool=my-ipv6 interface=to-clients advertise=yes
```

Check the status

After configuration is complete we can verify that each CE router received its own prefix

On server:

```
[admin@R1] /ipv6 dhcp-server binding> print
 Flags: X - disabled, D - dynamic
# ADDRESS DUID IAID SERVER STATUS
 1 D 2001:db8:1::/64 0019d1393536 566 server1 bound
2 D 2001:db8:2::/64 0019d1393535 565 server1 bound
```

On client:

```
[admin@CE1] /ipv6 dhcp-client> print
Flags: D - dynamic, X - disabled, I - invalid
# INTERFACE STATUS REQUEST PREFIX
0 to-R1 bound prefix 2001:db8:1::/64

[admin@CE1] /ipv6 dhcp-client> /ipv6 pool print
Flags: D - dynamic
# NAME PREFIX PREFIX-LENGTH
0 D my-ipv6 2001:db8:1::/64 64
```

We can also see that IPv6 address was automatically added from the prefix pool:

```
[admin@CE1] /ipv6 address> print
Flags: X - disabled, I - invalid, D - dynamic, G - global, L - link-local
# ADDRESS FROM-POOL INTERFACE ADVERTISE 0 G 2001:db8:1::1/64 to-clients yes
..
```

And pool usage shows that 'Address' is allocating the pool

```
[admin@CE1] /ipv6 pool used> print
 POOL PREFIX OWNER INFO
my-ipv6 2001:db8:1::/64 Address to-clients
```

DHCP Server

Summary

The DHCP (Dynamic Host Configuration Protocol) is used for the easy distribution of IP addresses in a network. The MikroTik RouterOS implementation includes both server and client parts and is compliant with RFC 2131.

The router supports an individual server for each Ethernet-like interface. The MikroTik RouterOS DHCP server supports the basic functions of giving each requesting client an IP address/netmask lease, default gateway, domain name, DNS-server(s) and WINS-server(s) (for Windows clients) information (set up in the DHCP networks submenu)

In order for the DHCP server to work, IP pools must also be configured (do not include the DHCP server's own IP address into the pool range) and the DHCP networks.

It is also possible to hand out leases for DHCP clients using the RADIUS server; the supported parameters for a RADIUS server are as follows:

Access-Request:

- NAS-Identifier - router identity
- NAS-IP-Address - IP address of the router itself
- NAS-Port - unique session ID
- NAS-Port-Type - Ethernet
- Calling-Station-Id - client identifier (active-client-id)
- Framed-IP-Address - IP address of the client (active-address)
- Called-Station-Id - the name of DHCP server
- User-Name - MAC address of the client (active-mac-address)
- Password - " "

Access-Accept:

- Framed-IP-Address - IP address that will be assigned to a client
- Framed-Pool - IP pool from which to assign an IP address to a client
- Rate-Limit - Datarate limitation for DHCP clients. Format is: rx-rate[/tx-rate] [rx-burst-rate[/tx-burst-rate] [rx-burst-threshold[/tx-burst-threshold] [rx-burst-time[/tx-burst-time][priority] [rx-rate-min[/tx-rate-min]]]]. All rates should be numbers with optional 'k' (1,000s) or 'M' (1,000,000s). If tx-rate is not specified, rx-rate is as tx-rate too. Same goes for tx-burst-rate and tx-burst-threshold and tx-burst-time. If both rx-burst-threshold and tx-burst-threshold are not specified (but burst-rate is specified), rx-rate and tx-rate are used as burst thresholds. If both rx-burst-time and tx-burst-time are not specified, 1s is used as default. Priority takes values 1..8, where 1 implies the highest priority, but 8 - the lowest. If rx-rate-min and tx-rate-min are not specified rx-rate and tx-rate values are used. The rx-rate-min and tx-rate-min values can not exceed rx-rate and tx-rate values.
- Ascend-Data-Rate - TX/RX data rate limitation if multiple attributes are provided, first limits tx data rate, second - RX data rate. If used together with Ascend-Xmit-Rate, specifies RX rate. 0 if unlimited
- Ascend-Xmit-Rate - tx data rate limitation. It may be used to specify the TX limit only instead of sending two sequential Ascend-Data-Rate attributes (in that case Ascend-Data-Rate will specify the receive rate). 0 if unlimited
- Session-Timeout - max lease time (lease-time)

> ⚠ DHCP server requires a real interface to receive raw ethernet packets. If the interface is a Bridge interface, then the Bridge must have a real interface attached as a port to that bridge which will receive the raw ethernet packets. It cannot function correctly on a dummy (empty bridge) interface.

Leases

Sub-menu: `/ip dhcp-server lease`

DHCP server lease submenu is used to monitor and manage server leases. The issued leases are shown here as dynamic entries. You can also add static leases to issue a specific IP address to a particular client (identified by MAC address).

Generally, the DHCP lease is allocated as follows:

- an unused lease is in the "waiting" state
- if a client asks for an IP address, the server chooses one
- if the client receives a statically assigned address, the lease becomes offered, and then bound with the respective lease time

- if the client receives a dynamic address (taken from an IP address pool), the router sends a ping packet and waits for an answer for 0.5 seconds. During this time, the lease is marked testing
- in the case where the address does not respond, the lease becomes offered and then bound with the respective lease time
- in other cases, the lease becomes busy for the lease time (there is a command to retest all busy addresses), and the client's request remains unanswered (the client will try again shortly)

A client may free the leased address. The dynamic lease is removed, and the allocated address is returned to the address pool. But the static lease becomes busy until the client reacquires the address.

IP addresses assigned statically are not probed!

Properties

Property	Description
add-arp (*yes* | *no*; Default: **no**)	Whether to add dynamic ARP entry. If set to **no** either ARP mode should be enabled on that interface or static ARP entries should be administratively defined in */ip arp* submenu.
address-pool (*string* | *static-only*; Default: **static-only**)	IP pool, from which to take IP addresses for the clients. If set to **static-only**, then only the clients that have a static lease (added in lease submenu) will be allowed.
allow-dual-stack-queue (*yes* | *no*; Default: **yes**)	Creates a single simple queue entry for both IPv4 and IPv6 addresses, uses the MAC address and DUID for identification. Requires IPv6 DHCP Server to have this option enabled as well to work properly.
always-broadcast (*yes* | *no*; Default: **no**)	Always send replies as broadcasts even if the destination IP is known. Will add additional load on L2 network.
authoritative (*after-10sec-delay* | *after-2sec-delay* | *yes* | *no*; Default: **yes**)	Option changes the way how a server responds to DHCP requests: • yes - replies to clients request for an address that is not available from this server, DHCP server will send a negative acknowledgment (DHCPNAK); • no - DHCP server ignores clients requests for addresses that are not available from this server; • after-10sec-delay - requests with "secs < 10" will be processed as in "no" setting case and requests with "secs >= 10" will be processed as in "yes" case; • after-2sec-delay - requests with "secs < 2" will be processed as in "no" setting case and requests with "secs >= 2" will be processed as in "yes" case; If all requests with "secs < x" should be ignored, then **delay-threshold=x** setting should be used.
bootp-lease-time (*forever* | *lease-time* | *time*; Default:)	Accepts two predefined options or time value: • forever - lease never expires • lease-time - use time from lease-time parameter
bootp-support (*none* | *static* | *dynamic*; Default: **static**)	Support for BOOTP clients: • none - do not respond to BOOTP requests • static - offer only static leases to BOOTP clients • dynamic - offer static and dynamic leases for BOOTP clients
client-mac-limit (*integer* | *unlimited*; Default: **unlimited**)	Specifies whether to limit a specific number of clients per single MAC address or leave unlimited. Note that this setting should not be used in relay setups.
conflict-detection (*yes* | *no*; Default:)	Allows disabling/enable conflict detection. If the option is enabled, then whenever the server tries to assign a lease it will send ICMP and ARP messages to detect whether such address in the network already exists. If any of the above get reply address is considered already used. Conflict detection must be disabled when any kind of DHCP client limitation per port or per mac is used.
delay-threshold (*time*	If the sec's field in the DHCP packet is smaller than the delay threshold, then this packet is ignored. If set to **none** - there is

/ *none*; Default: **none**)	no threshold (all DHCP packets are processed)
dhcp-option-set (*name* / *none*; Default:)	Use a custom set of DHCP options defined in the option sets menu.
insert-queue-before (*bottom* / *first* / *name*; Default:)	Specify where to place dynamic simple queue entries for static DCHP leases with a rate-limit parameter set.
interface (*string*; Default:)	The interface on which server will be running.
lease-script (*string*; Default: **""**)	A script that will be executed after a lease is assigned or de-assigned. Internal "global" variables that can be used in the script: • leaseBound - set to "1" if bound, otherwise set to "0" • leaseServerName - DHCP server name • leaseActMAC - active mac address • leaseActIP - active IP address • lease-hostname - client hostname • lease-options - an array of received options
lease-time (*time*; Default: **10m**)	The time that a client may use the assigned address. The client will try to renew this address after half of this time and will request a new address after the time limit expires.
name (*string*; Default:)	Reference name
parent-queue (*string* / *none*; Default: **none**)	
relay (*IP*; Default: **0.0.0.0**)	The IP address of the relay this DHCP server should process requests from: • 0.0.0.0 - the DHCP server will be used only for direct requests from clients (no DHCP relay allowed) • 255.255.255.255 - the DHCP server should be used for any incoming request from a DHCP relay except for those, which are processed by another DHCP server that exists in the `/ip dhcp-server` submenu.
src-address (*IP*; Default: **0.0.0.0**)	The address to which the DHCP client must send requests in order to renew an IP address lease. If there is only one static address on the DHCP server interface and the source address is left as 0.0.0.0, then the static address will be used. If there are multiple addresses on the interface, an address in the same subnet as the range of given addresses should be used.
use-framed-as-classless (*yes* / *no*; Default: **yes**)	Forward RADIUS Framed-Route as a DHCP Classless-Static-Route to DHCP-client. Whenever both Framed-Route and Classless-Static-Route are received Classless-Static-Route is preferred.
use-radius (*yes* / *no* / *accounting*; Default: **no**)	Whether to use RADIUS server: • no - do not use RADIUS; • yes - use RADIUS for accounting and lease; • accounting - use RADIUS for accounting only.

Store Configuration

Sub-menu: `/ip dhcp-server config`

This sub-menu allows the configuration of how often the DHCP leases will be stored on disk. If they would be saved on a disk on every lease change, a lot of disk writes would happen which is very bad for Compact Flash (especially, if lease times are very short). To minimize writes on disk, all changes are saved on disk every store-leases-disk seconds. Additionally, leases are always stored on disk on graceful shutdown and reboot.

Manual changes to leases - addition/removal of a static lease, removal of a dynamic lease will cause changes to be pushed for this lease to storage.

Rate limiting

It is possible to set the bandwidth to a specific IPv4 address by using DHCPv4 leases. This can be done by setting a rate limit on the DHCPv4 lease itself, by doing this a dynamic simple queue rule will be added for the IPv4 address that corresponds to the DHCPv4 lease. By using the *rate-limit* parameter you can conveniently limit a user's bandwidth.

> ⚠ For any queues to work properly, the traffic must not be FastTracked, make sure your Firewall does not FastTrack traffic that you want to limit.

First, make the DHCPv4 lease static, otherwise, it will not be possible to set a rate limit to a DHCPv4 lease:

```
[admin@MikroTik] > /ip dhcp-server lease print
Flags: X - disabled, R - radius, D - dynamic, B - blocked
 #   ADDRESS               MAC-ADDRESS       HOST-NAME              SERVER              RATE-
LIMIT              STATUS
 0 D 192.168.88.254        6C:3B:6B:7C:41:3E MikroTik
DHCPv4_Server                                bound

[admin@MikroTik] > /ip dhcp-server lease make-static 0

[admin@MikroTik] > /ip dhcp-server lease print
Flags: X - disabled, R - radius, D - dynamic, B - blocked
 #   ADDRESS               MAC-ADDRESS       HOST-NAME              SERVER              RATE-
LIMIT              STATUS
 0   192.168.88.254        6C:3B:6B:7C:41:3E MikroTik
DHCPv4_Server                                bound
```

Then you can set a rate to a DHCPv4 lease that will create a new dynamic simple queue entry:

```
[admin@MikroTik] > /ip dhcp-server lease set 0 rate-limit=10M/10M

[admin@MikroTik] > /queue simple print
Flags: X - disabled, I - invalid, D - dynamic
 0  D name="dhcp-ds<6C:3B:6B:7C:41:3E>" target=192.168.88.254/32 parent=none packet-marks="" priority=8/8
queue=default-small/default-small limit-at=10M/10M max-limit=10M/10M burst-limit=0/0 burst-threshold=0/0 burst-
time=0s/0s
      bucket-size=0.1/0.1
```

> ⚠ By default allow-dual-stack-queue is enabled, this will add a single dynamic simple queue entry for both DCHPv6 binding and DHCPv4 lease, without this option enabled separate dynamic simple queue entries will be added for IPv6 and IPv4.

If *allow-dual-stack-queue* is enabled, then a single dynamic simple queue entry will be created containing both IPv4 and IPv6 addresses:

```
[admin@MikroTik] > /queue simple print
Flags: X - disabled, I - invalid, D - dynamic
 0  D name="dhcp-ds<6C:3B:6B:7C:41:3E>" target=192.168.88.254/32,fdb4:4de7:a3f8:418c::/66 parent=none packet-
marks="" priority=8/8 queue=default-small/default-small limit-at=10M/10M max-limit=10M/10M burst-limit=0/0
burst-threshold=0/0
      burst-time=0s/0s bucket-size=0.1/0.1
```

Network

Sub-menu: `/ip dhcp-server network`

Properties

Property	Description

address (*IP /netmask*; Default:)	the network DHCP server(s) will lease addresses from
boot-file-name (*string*; Default:)	Boot filename
caps-manager (*string*; Default:)	A comma-separated list of IP addresses for one or more CAPsMAN system managers. DHCP Option 138 (capwap) will be used.
dhcp-option (*string*; Default:)	Add additional DHCP options from the option list.
dhcp-option-set (*string*; Default:)	Add an additional set of DHCP options.
dns-none (*yes | no*; Default: **no**)	If set, then DHCP Server will not pass dynamic DNS servers configured on the router to the DHCP clients if no DNS Server in DNS-server is set. By default, if there are no DNS servers configured, then the dynamic DNS Servers will be passed to DHCP clients.
dns-server (*string*; Default:)	the DHCP client will use these as the default DNS servers. Two comma-separated DNS servers can be specified to be used by the DHCP client as primary and secondary DNS servers
domain (*string*; Default:)	The DHCP client will use this as the 'DNS domain' setting for the network adapter.
gateway (*IP*; Default: **0.0.0.0**)	The default gateway to be used by DHCP Client.
netmask (*integer: 0..32*; Default: **0**)	The actual network mask is to be used by the DHCP client. If set to '0' - netmask from network address will be used.
next-server (*IP*; Default:)	The IP address of the next server to use in bootstrap.
ntp-server (*IP*; Default:)	the DHCP client will use these as the default NTP servers. Two comma-separated NTP servers can be specified to be used by the DHCP client as primary and secondary NTP servers
wins-server (*IP*; Default:)	The Windows DHCP client will use these as the default WINS servers. Two comma-separated WINS servers can be specified to be used by the DHCP client as primary and secondary WINS servers

RADIUS Support

Since RouterOS v6.43 it is possible to use RADIUS to assign a rate limit per lease, to do so you need to pass the Mikrotik-Rate-Limit attribute from your RADIUS Server for your lease. To achieve this you first need to set your DHCPv4 Server to use RADIUS for assigning leases. Below is an example of how to set it up:

```
/radius
add address=10.0.0.1 secret=VERYsecret123 service=dhcp
/ip dhcp-server
set dhcp1 use-radius=yes
```

After that, you need to tell your RADIUS Server to pass the Mikrotik-Rate-Limit attribute. In case you are using FreeRADIUS with MySQL, then you need to add appropriate entries into **radcheck** and **radreply** tables for a MAC address, that is being used for your DHCPv4 Client. Below is an example for table entries:

Error rendering macro 'code': Invalid value specified for parameter 'com.atlassian.confluence.ext.code.render.InvalidValueException'

```
INSERT INTO `radcheck` (`username`, `attribute`, `op`, `value`) VALUES
('00:0C:42:00:D4:64', 'Auth-Type', ':=', 'Accept'),

INSERT INTO `radreply` (`username`, `attribute`, `op`, `value`) VALUES
('00:0C:42:00:D4:64', 'Framed-IP-Address', '=', '192.168.88.254'),
('00:0C:42:00:D4:64', 'Mikrotik-Rate-Limit', '=', '10M'),
```

Alerts

To find any rogue DHCP servers as soon as they appear in your network, the DHCP Alert tool can be used. It will monitor the ethernet interface for all DHCP replies and check if this reply comes from a valid DHCP server. If a reply from an unknown DHCP server is detected, an alert gets triggered:

```
[admin@MikroTik] ip dhcp-server alert>/log print
00:34:23 dhcp,critical,error,warning,info,debug dhcp alert on Public:
    discovered unknown dhcp server, mac 00:02:29:60:36:E7, ip 10.5.8.236
[admin@MikroTik] ip dhcp-server alert>
```

When the system alerts about a rogue DHCP server, it can execute a custom script.

As DHCP replies can be unicast, the 'rogue DHCP detector' may not receive any offer to other DHCP clients at all. To deal with this, the rogue DHCP detector acts as a DHCP client as well - it sends out DHCP discover requests once a minute.

DHCP Options

Sub-menu: `/ip dhcp-server option`

With the help of the DHCP Option list, it is possible to define additional custom options for DHCP Server to advertise. Option precedence is as follows:

- radius,
- lease,
- server,
- network.

This is the order in which the client option request will be filled in.

According to the DHCP protocol, a parameter is returned to the DHCP client only if it requests this parameter, specifying the respective code in the DHCP request Parameter-List (code 55) attribute. If the code is not included in the Parameter-List attribute, the DHCP server will not send it to the DHCP client, but **since RouterOS v7.1rc5 it is possible to force the DHCP option** from the server-side even if the DHCP-client does not request such parameter:

```
ip/dhcp-server/option/set force=yes
```

Properties

Property	Description
code (*integer:1..254*; Default:)	dhcp option code. All codes are available at http://www.iana.org/assignments/bootp-dhcp-parameters
name (*string*; Default:)	Descriptive name of the option
value (*string*; Default:)	Parameter's value. Available data types for options are: ○ 'test' -> ASCII to Hex 0x74657374 ○ '10.10.10.10' -> Unicode IP to Hex 0x0a0a0a0a ○ s'10.10.10.10' -> ASCII to hex 0x31302e31302e31302e3130 ○ s'160' -> ASCII to hex 0x313630 ○ '10' -> Decimal to Hex 0x0a ○ 0x0a0a -> No conversion ○ $(VARIABLE) -> hardcoded values RouterOS has predefined variables that can be used: • HOSTNAME - client hostname • RADIUS_MT_STR1 - from radius MT attr nr. 24 • RADIUS_MT_STR2 - from radius MT attr nr. 25 • REMOTE_ID - agent remote-id • NETWORK_GATEWAY - the first gateway from '*/ip dhcp-server network*', note that this option won't work if used from lease Now it is also possible to combine data types into one, for example: "0x01'vards'$(HOSTNAME)"

	For example if HOSTNAME is 'kvm', then raw value will be 0x0176617264736b766d.
raw-value (*HEX string*)	Read-only field which shows raw DHCP option value (the format actually sent out)

DHCP Option Sets

Sub-menu: `/ip dhcp-server option sets`

This menu allows combining multiple options in option sets, which later can be used to override the default DHCP server option set.

Example

Classless Route

A classless route adds a specified route in the clients routing table. In our example, it will add

- dst-address=160.0.0.0/24 gateway=10.1.101.1
- dst-address=0.0.0.0/0 gateway=10.1.101.1

According to RFC 3442: The first part is the netmask ("18" = netmask /24). Second part is significant part of destination network ("A00000" = 160.0.0). Third part is IP address of gateway ("0A016501" = 10.1.101.1). Then There are parts of the default route, destination netmask (0x00 = 0.0.0.0/0) followed by default route (0x0A016501 = 10.1.101.1)

```
/ip dhcp-server option
add code=121 name=classless value=0x18A000000A016501000A016501
/ip dhcp-server network
set 0 dhcp-option=classless
```

Result:

```
[admin@MikroTik] /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        GATEWAY            DISTANCE
 0 ADS  0.0.0.0/0                          10.1.101.1         0
 1 ADS  160.0.0.0/24                       10.1.101.1         0
```

A much more robust way would be to use built-in variables, the previous example can be rewritten as:

```
/ip dhcp-server option
add name=classless code=121 value="0x18A00000\$(NETWORK_GATEWAY)0x00\$(NETWORK_GATEWAY)"
```

Auto proxy config

```
/ip dhcp-server option
  add code=252 name=auto-proxy-config value="'https://autoconfig.something.lv/wpad.dat'"
```

Vendor Classes

Since 6.45beta6 version RouterOS support vendor class ID matcher. The vendor class is used by DHCP clients to optionally identify the vendor and configuration.

Example

In the following configuration example, we will give an IP address from a particular pool for an Android-based mobile phone. We will use the RouterBOARD with a default configuration

```
/ip pool
add name=default-dhcp ranges=192.168.88.10-192.168.88.254
add name=pool-for-VID ranges=172.16.16.10-172.16.16.120
```

Configure `vendor-class-id` matcher. DHCP servers configuration remains the default

```
/ip dhcp-server
add address-pool=default-dhcp disabled=no interface=bridge name=defconf
/ip dhcp-server network
add address=192.168.88.0/24 comment=defconf gateway=192.168.88.1
/ip dhcp-server vendor-class-id
add address-pool=pool-for-VID name=samsung server=defconf vid=android-dhcp-9
```

Connect your mobile phone to the device to receive an IP address from the 172.16.16.0 network

```
[admin@mikrotik] > /ip dhcp-server lease print detail
Flags: X - disabled, R - radius, D - dynamic, B - blocked
 0 D address=172.16.16.120 mac-address=30:07:4D:F5:07:49 client-id="1:30:7:4d:f5:7:49" address-lists="" 
server=defconf dhcp-option="" 
     status=bound expires-after=8m55s last-seen=1m5s active-address=172.16.16.120 active-mac-address=30:07:4D:
F5:07:49 
     active-client-id="1:30:7:4d:f5:7:49" active-server=defconf host-name="Galaxy-S8"
```

If you do not know your devices Vendor Class ID, you can turn on DHCP debug logs with `/system logging add topics=dhcp`. Then in the logging entries, you will see **Class-ID**

```
10:30:31 dhcp,debug,packet defconf received request with id 4238230732 from 0.0.0.0
10:30:31 dhcp,debug,packet     secs = 3
10:30:31 dhcp,debug,packet     ciaddr = 0.0.0.0
10:30:31 dhcp,debug,packet     chaddr = 30:07:4D:F5:07:49
10:30:31 dhcp,debug,packet     Msg-Type = request
10:30:31 dhcp,debug,packet     Client-Id = 01-30-07-4D-F5-07-49
10:30:31 dhcp,debug,packet     Address-Request = 172.16.16.120
10:30:31 dhcp,debug,packet     Server-Id = 192.168.88.1
10:30:31 dhcp,debug,packet     Max-DHCP-Message-Size = 1500
10:30:31 dhcp,debug,packet     Class-Id = "android-dhcp-9"
10:30:31 dhcp,debug,packet     Host-Name = "Galaxy-S8"
10:30:31 dhcp,debug,packet     Parameter-List = Subnet-Mask,Router,Domain-Server,Domain-Name,Interface-MTU,
Broadcast-Address,Address-Time,Ren
ewal-Time,Rebinding-Time,Vendor-Specific
10:30:31 dhcp,info defconf assigned 172.16.16.120 to 30:07:4D:F5:07:49
10:30:31 dhcp,debug,packet defconf sending ack with id 4238230732 to 172.16.16.120
10:30:31 dhcp,debug,packet     ciaddr = 0.0.0.0
10:30:31 dhcp,debug,packet     yiaddr = 172.16.16.120
10:30:31 dhcp,debug,packet     siaddr = 192.168.88.1
10:30:31 dhcp,debug,packet     chaddr = 30:07:4D:F5:07:49
10:30:31 dhcp,debug,packet     Msg-Type = ack
10:30:31 dhcp,debug,packet     Server-Id = 192.168.88.1
10:30:31 dhcp,debug,packet     Address-Time = 600
10:30:31 dhcp,debug,packet     Domain-Server = 192.168.88.1,10.155.0.1,10.155.0.126
```

Configuration Examples

Setup

To simply configure DHCP server you can use a `setup` command.

First, you configure an IP address on the interface:

```
[admin@MikroTik] > /ip address add address=192.168.88.1/24 interface=ether3 disabled=no
```

Then you use `setup` a command which will automatically ask necessary parameters:

```
[admin@MikroTik] > /ip dhcp-server setup
Select interface to run DHCP server on

dhcp server interface: ether3
Select network for DHCP addresses

dhcp address space: 192.168.88.0/24
Select gateway for given network

gateway for dhcp network: 192.168.88.1
Select pool of ip addresses given out by DHCP server

addresses to give out: 192.168.88.2-192.168.88.254
Select DNS servers

dns servers: 10.155.126.1,10.155.0.1,
Select lease time

lease time: 10m
```

That is all. You have configured an active DHCP server.

Manual configuration

To configure the DHCP server manually to respond to local requests you have to configure the following:

- An **IP pool** for addresses to be given out, make sure that your gateway/DHCP server address is not part of the pool.

```
/ip pool add name=dhcp_pool0 ranges=192.168.88.2-192.168.88.254
```

- A **network** indicating subnets that DHCP-server will lease addresses from, among other information, like a gateway, DNS-server, NTP-server, DHCP options, etc.

```
/ip dhcp-server network add address=192.168.88.0/24 dns-server=192.168.88.1 gateway=192.168.88.1
```

- In our case, the device itself is serving as the gateway, so we'll add the **address** to the bridge interface:

```
/ip address add address=192.168.88.1/24 interface=bridge1 network=192.168.88.0
```

- And finally, add **DHCP Server**, here we will add previously created address **pool**, and specify on which **interface** the DHCP server should work on

```
/ip dhcp-server add address-pool=dhcp_pool0 disabled=no interface=bridge1 name=dhcp1
```

DHCPv6 Server

Summary

Standards: `RFC 3315, RFC 3633`

Single DUID is used for client and server identification, only IAID will vary between clients corresponding to their assigned interface.

Client binding creates a dynamic pool with timeout set to binding's expiration time (note that now dynamic pools can have a timeout), which will be updated every time binding gets renewed.

When a client is bound to a prefix, the DHCP server adds routing information to know how to reach the assigned prefix.

Client bindings in the server do not show MAC address anymore (as it was in v5.8), DUID (hex) and IAID are used instead. After upgrade, MAC addresses will be converted to DUIDs automatically, but due to unknown DUID type and unknown IAID, they should be further updated by the user;

⚠ RouterOS DHCPv6 server can only delegate IPv6 prefixes, not addresses.

General

Sub-menu: `/ipv6 dhcp-server`

This sub-menu lists and allows to configure DHCP-PD servers.

Property	Description
address-pool (*enum* / *static-only*; Default: **static-only**)	IPv6 pool, from which to take IPv6 prefix for the clients.
authoritative (*after-10sec-delay* / *after-2sec-delay* / *yes* / *no*; Default: **after-2sec-delay**)	Whether the DHCP server is the only DHCP server for the network: • after-10sec-delay - to clients request for an address, DHCP server will wait 10 seconds and if there is another request from the client after this period of time, then DHCP server will offer the address to the client or will send DHCPNAK if the requested address is not available from this server • after-2sec-delay - to clients request for an address, DHCP server will wait 2 seconds and if there is another request from the client after this period of time, then DHCP server will offer the address to the client or will send DHCPNAK if the requested address is not available from this server • yes - to clients request for an address that is not available from this server, the DHCP server will send a negative acknowledgment (DHCPNAK) • no - DHCP server ignores clients requests for addresses that are not available from this server
binding-script (*string*; Default:)	A script that will be executed after binding is assigned or de-assigned. Internal "global" variables that can be used in the script: • bindingBound - set to "1" if bound, otherwise set to "0" • bindingServerName - dhcp server name • bindingDUID - DUID • bindingAddress - active address • bindingPrefix - active prefix
delay-threshold (*time* / *none*; Default: **none**)	If the secs field in the DHCP packet is smaller than the delay-threshold, then this packet is ignored. If set to **none** - there is no threshold (all DHCP packets are processed)
disabled (*yes* / *no*; Default: **no**)	Whether DHCP-PD server participates in the prefix assignment process.
interface (*string*; Default:)	The interface on which server will be running.
lease-time (*time*; Default: **3d**)	The time that a client may use the assigned address. The client will try to renew this address after half of this time and will request a new address after the time limit expires.
name (*string*; Default:)	Reference name

Read-only Properties

Property	Description

dynamic (*yes* | *no*)	
invalid (*yes* | *no*)	

Bindings

Sub-menu: `/ipv6 dhcp-server binding`

DUID is used only for dynamic bindings, so if it changes then the client will receive a different prefix than previously.

Property	Description
address (*IPv6 prefix*; Default:)	IPv6 prefix that will be assigned to the client
allow-dual-stack-queue (*yes* | *no*; Default: **yes**)	Creates a single simple queue entry for both IPv4 and IPv6 addresses, uses the MAC address and DUID for identification. Requires IPv4 DHCP Server to have this option enabled as well to work properly.
comment (*string*; Default:)	Short description of an item.
disabled (*yes* | *no*; Default: **no**)	Whether an item is disabled
dhcp-option (*string*; Default:)	Add additional DHCP options from the option list.
dhcp-option-set (*string*; Default:)	Add an additional set of DHCP options.
life-time (*time*; Default: **3d**)	The time period after which binding expires.
duid (*hex string*; Default:)	DUID value. Should be specified only in hexadecimal format.
iaid (*integer [0..4294967295]*; Default:)	Identity Association Identifier, part of the Client ID.
prefix-pool (*string*; Default:)	Prefix pool that is being advertised to the DHCPv6 Client.
rate-limit (*integer [/integer] [integer [/integer] [integer [/integer] [integer [/integer]]]]*; Default:)	Adds a dynamic simple queue to limit IP's bandwidth to a specified rate. Requires the lease to be static. Format is: rx-rate[/tx-rate] [rx-burst-rate[/tx-burst-rate] [rx-burst-threshold[/tx-burst-threshold] [rx-burst-time[/tx-burst-time]]]]. All rates should be numbers with optional 'k' (1,000s) or 'M' (1,000,000s). If tx-rate is not specified, rx-rate is as tx-rate too. Same goes for tx-burst-rate and tx-burst-threshold and tx-burst-time. If both rx-burst-threshold and tx-burst-threshold are not specified (but burst-rate is specified), rx-rate and tx-rate is used as burst thresholds. If both rx-burst-time and tx-burst-time are not specified, 1s is used as default.
server (*string* | *all*; Default: **all**)	Name of the server. If set to **all**, then binding applies to all created DHCP-PD servers.

Read-only properties

Property	Description
dynamic (*yes* | *no*)	Whether an item is dynamically created.
expires-after (*time*)	The time period after which binding expires.
last-seen (*time*)	Time period since the client was last seen.
status (*waiting*	Three status values are possible:

| offered | bound)	• **waiting** - Shown for static bindings if it is not used. For dynamic bindings this status is shown if it was used previously, the server will wait 10 minutes to allow an old client to get this binding, otherwise binding will be cleared and prefix will be offered to other clients. • **offered** - if **solicit** message was received, and the server responded with **advertise** a message, but the **request** was not received. During this state client have 2 minutes to get this binding, otherwise, it is freed or changed status to **waiting** for static bindings. • **bound** - currently bound.

For example, dynamically assigned /62 prefix

```
[admin@RB493G] /ipv6 dhcp-server binding> print detail
 Flags: X - disabled, D - dynamic
0 D address=2a02:610:7501:ff00::/62 duid="1605fcb400241d1781f7" iaid=0
 server=local-dhcp life-time=3d status=bound expires-after=2d23h40m10s
last-seen=19m50s
1 D address=2a02:610:7501:ff04::/62 duid="0019d1393535" iaid=2
server=local-dhcp life-time=3d status=bound expires-after=2d23h43m47s
last-seen=16m13s
```

Menu specific commands

Property	Description
make-static ()	Set dynamic binding as static.

Rate limiting

It is possible to set the bandwidth to a specific IPv6 address by using DHCPv6 bindings. This can be done by setting a rate limit on the DHCPv6 binding itself, by doing this a dynamic simple queue rule will be added for the IPv6 address that corresponds to the DHCPv6 binding. By using the `rate-limit` the parameter you can conveniently limit a user's bandwidth.

For any queues to work properly, the traffic must not be FastTracked, make sure your Firewall does not FastTrack traffic that you want to limit.

First, make the DHCPv6 binding static, otherwise, it will not be possible to set a rate limit to a DHCPv6 binding:

```
[admin@MikroTik] > /ipv6 dhcp-server binding print
Flags: X - disabled, D - dynamic
# ADDRESS DUID SERVER STATUS
0 D fdb4:4de7:a3f8:418c::/66 0x6c3b6b7c413e DHCPv6_Server bound

[admin@MikroTik] > /ipv6 dhcp-server binding make-static 0

[admin@MikroTik] > /ipv6 dhcp-server binding print
Flags: X - disabled, D - dynamic
# ADDRESS DUID SERVER STATUS
0 fdb4:4de7:a3f8:418c::/66 0x6c3b6b7c413e DHCPv6_Server bound
```

Then you need can set a rate to a DHCPv6 binding that will create a new dynamic simple queue entry:

```
[admin@MikroTik] > /ipv6 dhcp-server binding set 0 rate-limit=10M/10
[admin@MikroTik] > /queue simple print
Flags: X - disabled, I - invalid, D - dynamic
0 D name="dhcp<6c3b6b7c413e fdb4:4de7:a3f8:418c::/66>" target=fdb4:4de7:a3f8:418c::/66 parent=none packet-
marks="" priority=8/8 queue=default
-small/default-small limit-at=10M/10M max-limit=10M/10M burst-limit=0/0
burst-threshold=0/0 burst-time=0s/0s bucket-size=0.1/0.1
```


By default `allow-dual-stack-queue` is enabled, this will add a single dynamic simple queue entry for both DCHPv6 binding and DHCPv4 lease, without this option enabled separate dynamic simple queue entries will be added for IPv6 and IPv4.

If `allow-dual-stack-queue` is enabled, then a single dynamic simple queue entry will be created containing both IPv4 and IPv6 addresses:

```
[admin@MikroTik] > /queue simple print
Flags: X - disabled, I - invalid, D - dynamic
 0 D name="dhcp-ds<6C:3B:6B:7C:41:3E>" target=192.168.1.200/32,fdb4:4de7:a3f8:418c::/66 parent=none packet-
marks="" priority=8/8 queue=default
-small/default-small limit-at=10M/10M max-limit=10M/10M
burst-limit=0/0 burst-threshold=0/0 burst-time=0s/0s bucket-size=0.1/0.1
```

RADIUS Support

Since RouterOS v6.43 it is possible to use RADIUS to assign a rate-limit per DHCPv6 binding, to do so you need to pass the Mikrotik-Rate-Limit attribute from your RADIUS Server for your DHCPv6 binding. To achieve this you first need to set your DHCPv6 Server to use RADIUS for assigning bindings. Below is an example of how to set it up:

```
/radius
add address=10.0.0.1 secret=VERYsecret123 service=dhcp
/ipv6 dhcp-server
set dhcp1 use-radius=yes
```

After that, you need to tell your RADIUS Server to pass the Mikrotik-Rate-Limit attribute. In case you are using FreeRADIUS with MySQL, then you need to add appropriate entries into **radcheck** and **radreply** tables for a MAC address, that is being used for your DHCPv6 Client. Below is an example for table entries:

```
INSERT INTO `radcheck` (`username`, `attribute`, `op`, `value`) VALUES
('000c4200d464', 'Auth-Type', ':=', 'Accept'),
 INSERT INTO `radreply` (`username`, `attribute`, `op`, `value`) VALUES
('000c4200d464', 'Delegated-IPv6-Prefix', '=', 'fdb4:4de7:a3f8:418c::/66'),
('000c4200d464', 'Mikrotik-Rate-Limit', '=', '10M');
```

> ⚠ By default allow-dual-stack-queue is enabled and will add a single dynamic queue entry if the MAC address from the IPv4 lease (or DUID, if the DHCPv4 Client supports `Node-specific Client Identifiers` from RFC4361), but DUID from DHCPv6 Client is not always based on the MAC address from the interface on which the DHCPv6 client is running on, DUID is generated on a per-device basis. For this reason, a single dynamic queue entry might not be created, separate dynamic queue entries might be created instead.

Configuration Example

Enabling IPv6 Prefix delegation

Let's consider that we already have a running DHCP server.

To enable IPv6 prefix delegation, first, we need to create an address pool:

```
/ipv6 pool add name=myPool prefix=2001:db8:7501::/60 prefix-length=62
```

Notice that prefix-length is 62 bits, which means that clients will receive /62 prefixes from the /60 pool.

The next step is to enable DHCP-PD:

```
/ipv6 dhcp-server add name=myServer address-pool=myPool interface=local
```

To test our server we will set up wide-dhcpv6 on an ubuntu machine:

- install wide-dhcpv6-client
- edit "/etc/wide-dhcpv6/dhcp6c.conf" as above

You can use also RouterOS as a DHCP-PD client.

```
interface eth2{
send ia-pd 0;
};

id-assoc pd {
prefix-interface eth3{
sla-id 1;
sla-len 2;
};
};
```

- Run DHCP-PD client:

```
sudo dhcp6c -d -D -f eth2
```

- Verify that prefix was added to the:

```
mrz@bumba:/media/aaa$ ip -6 addr
 ..
2: eth3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qlen 1000
 inet6 2001:db8:7501:1:200:ff:fe00:0/64 scope global
 valid_lft forever preferred_lft forever
 inet6 fe80::224:1dff:fe17:81f7/64 scope link
 valid_lft forever preferred_lft forever
```

- You can make binding to specific client static so that it always receives the same prefix:

```
[admin@RB493G] /ipv6 dhcp-server binding> print
Flags: X - disabled, D - dynamic
# ADDRESS DU IAID SER.. STATUS 0 D 2001:db8:7501:1::/62 16 0 loc.. bound
[admin@RB493G] /ipv6 dhcp-server binding> make-static 0
```

- DHCP-PD also installs a route to assigned prefix into IPv6 routing table:

```
[admin@RB493G] /ipv6 route> print
 Flags: X - disabled, A - active, D - dynamic, C - connect, S - static, r - rip, o - ospf, b - bgp, U -
unreachable
 # DST-ADDRESS GATEWAY DISTANCE
...
2 ADS 2001:db8:7501:1::/62 fe80::224:1dff:fe17:8... 1
```

DHCP Relay

Summary

Sub-menu: `/ip dhcp-relay`

The purpose of the DHCP relay is to act as a proxy between DHCP clients and the DHCP server. It is useful in networks where the DHCP server is not on the same broadcast domain as the DHCP client.

DHCP relay does not choose the particular DHCP server in the DHCP-server list, it just sends the incoming request to all the listed servers.

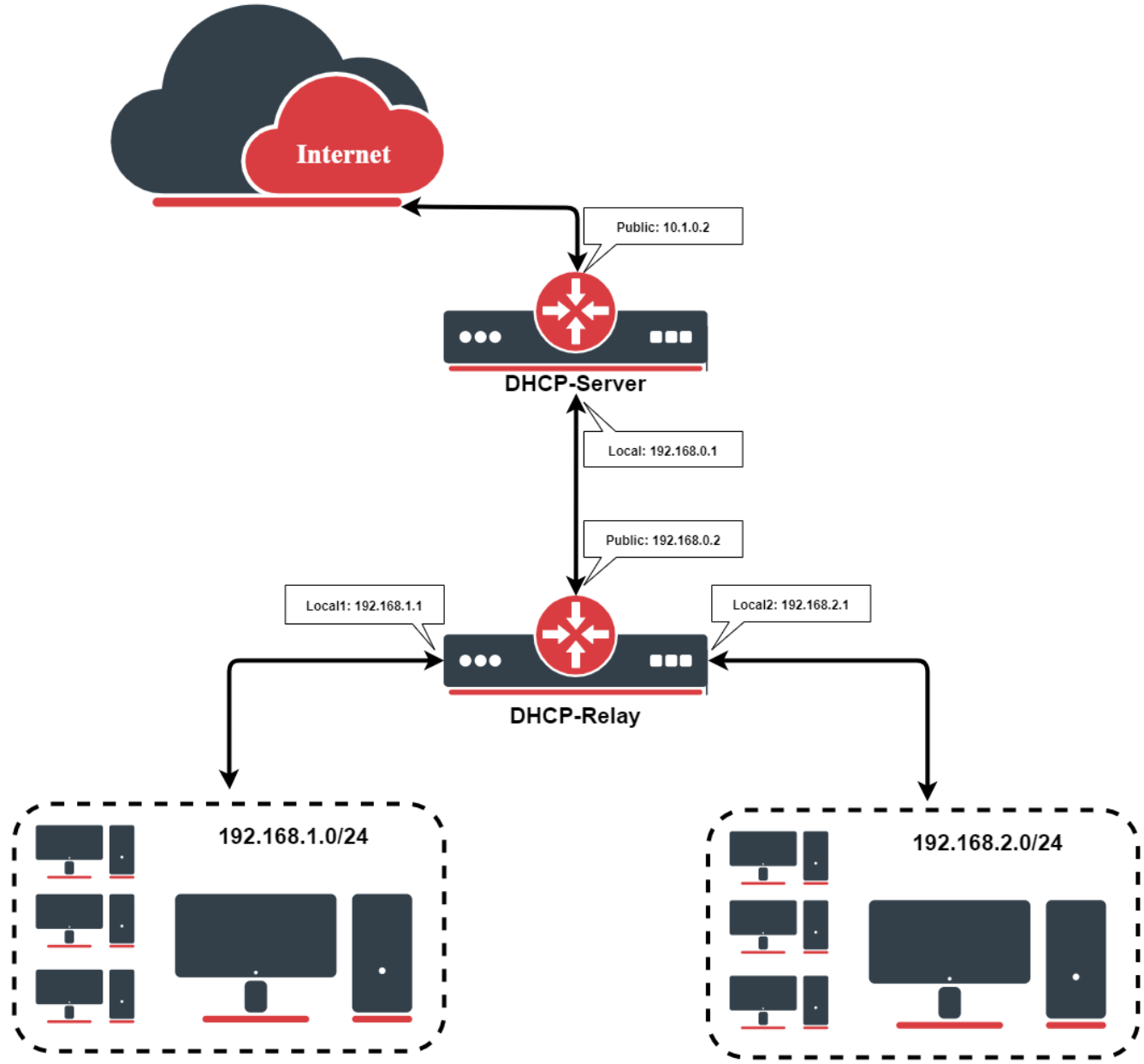
Properties

Property	Description
add-relay-info (*yes* | *no*; Default: **no**)	Adds DHCP relay agent information if enabled according to RFC 3046. Agent Circuit ID Sub-option contains mac address of an interface, Agent Remote ID Sub-option contains MAC address of the client from which request was received.
delay-threshold (*time* | *none*; Default: **none**)	If secs field in DHCP packet is smaller than delay-threshold, then this packet is ignored
dhcp-server (*string*; Default:)	List of DHCP servers' IP addresses which should the DHCP requests be forwarded to
interface (*string*; Default:)	Interface name the DHCP relay will be working on.
local-address (*IP*; Default: **0.0.0.0**)	The unique IP address of this DHCP relay needed for DHCP server to distinguish relays. If set to **0.0.0.0** - the IP address will be chosen automatically
relay-info-remote-id (*string*; Default:)	specified string will be used to construct Option 82 instead of client's MAC address. Option 82 consist of: interface from which packets was received + client mac address or **relay-info-remote-id**
name (*string*; Default:)	Descriptive name for the relay

Configuration Example

Let us consider that you have several IP networks 'behind' other routers, but you want to keep all DHCP servers on a single router. To do this, you need a DHCP relay on your network which will relay DHCP requests from clients to the DHCP server.

This example will show you how to configure a DHCP server and a DHCP relay that serves 2 IP networks - 192.168.1.0/24 and 192.168.2.0/24 that are behind a router DHCP-Relay.



IP Address Configuration

IP addresses of DHCP-Server:

```
[admin@DHCP-Server] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
 #   ADDRESS            NETWORK         BROADCAST       INTERFACE
 0   192.168.0.1/24     192.168.0.0     192.168.0.255   To-DHCP-Relay
 1   10.1.0.2/24        10.1.0.0        10.1.0.255        Public
[admin@DHCP-Server] ip address>
```

IP addresses of DHCP-Relay:

```
[admin@DHCP-Relay] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
 #   ADDRESS            NETWORK         BROADCAST       INTERFACE
 0   192.168.0.2/24     192.168.0.0     192.168.0.255   To-DHCP-Server
```

```
 1   192.168.1.1/24     192.168.1.0     192.168.1.255   Local1
 2   192.168.2.1/24     192.168.2.0     192.168.2.255   Local2
[admin@DHCP-Relay] ip address>
```

DHCP Server Setup

To setup 2 DHCP Servers on the DHCP-Server router add 2 pools. For networks 192.168.1.0/24 and 192.168.2.0:

```
/ip pool add name=Local1-Pool ranges=192.168.1.11-192.168.1.100
/ip pool add name=Local1-Pool ranges=192.168.2.11-192.168.2.100
[admin@DHCP-Server] ip pool> print
 # NAME                                      RANGES
 0 Local1-Pool                               192.168.1.11-192.168.1.100
 1 Local2-Pool                               192.168.2.11-192.168.2.100
[admin@DHCP-Server] ip pool>
```

Create DHCP Servers:

```
/ip dhcp-server add interface=To-DHCP-Relay relay=192.168.1.1 \
   address-pool=Local1-Pool name=DHCP-1 disabled=no
/ip dhcp-server add interface=To-DHCP-Relay relay=192.168.2.1 \
   address-pool=Local2-Pool name=DHCP-2 disabled=no
[admin@DHCP-Server] ip dhcp-server> print
Flags: X - disabled, I - invalid
 #   NAME         INTERFACE     RELAY           ADDRESS-POOL LEASE-TIME ADD-ARP
 0   DHCP-1       To-DHCP-Relay 192.168.1.1     Local1-Pool  3d00:00:00
 1   DHCP-2       To-DHCP-Relay 192.168.2.1     Local2-Pool  3d00:00:00
[admin@DHCP-Server] ip dhcp-server>
```

Configure respective networks:

```
/ip dhcp-server network add address=192.168.1.0/24 gateway=192.168.1.1 \
   dns-server=159.148.60.20
/ip dhcp-server network add address=192.168.2.0/24 gateway=192.168.2.1 \
   dns-server 159.148.60.20
[admin@DHCP-Server] ip dhcp-server network> print
 # ADDRESS            GATEWAY         DNS-SERVER      WINS-SERVER     DOMAIN
 0 192.168.1.0/24     192.168.1.1     159.148.60.20
 1 192.168.2.0/24     192.168.2.1     159.148.60.20
[admin@DHCP-Server] ip dhcp-server network>
```

DHCP Relay Config

Configuration of DHCP-Server is done. Now let's configure DHCP-Relay:

```
/ip dhcp-relay add name=Local1-Relay interface=Local1 \
   dhcp-server=192.168.0.1 local-address=192.168.1.1 disabled=no
/ip dhcp-relay add name=Local2-Relay interface=Local2 \
   dhcp-server=192.168.0.1 local-address=192.168.2.1 disabled=no
[admin@DHCP-Relay] ip dhcp-relay> print
Flags: X - disabled, I - invalid
 #   NAME                        INTERFACE      DHCP-SERVER     LOCAL-ADDRESS
 0   Local1-Relay                Local1         192.168.0.1     192.168.1.1
 1   Local2-Relay                Local2         192.168.0.1     192.168.2.1
[admin@DHCP-Relay] ip dhcp-relay>
```