

DHCP Client and Server

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General Information

Summary

The DHCP (Dynamic Host Configuration Protocol) is needed for easy distribution of IP addresses in a network. The MikroTik RouterOS implementation includes both - server and client parts and is compliant with RFC2131.

General usage of DHCP:

- IP assignment in LAN, cable-modem, and wireless systems
- Obtaining IP settings on cable-modem systems

IP addresses can be bound to MAC addresses using static lease feature.

DHCP server can be used with MikroTik RouterOS HotSpot feature to authenticate and account DHCP clients. See the [HotSpot Manual](#) for more information.

Quick Setup Guide

This example will show you how to setup DHCP-Server and DHCP-Client on MikroTik RouterOS.

- Setup of a DHCP-Server.

1. Create an IP address pool

```
/ip pool add name=dhcp-pool1 ranges=172.16.0.10-172.16.0.20
```

2. Add a DHCP network which will concern to the network **172.16.0.0/12** and will distribute a gateway with IP address **172.16.0.1** to DHCP clients:

```
/ip dhcp-server network add address=172.16.0.0/12 gateway=172.16.0.1
```

3. Finally, add a DHCP server:

```
/ip dhcp-server add interface=wlan1 address-pool=dhcp-pool
```

- Setup of the DHCP-Client (which will get a lease from the DHCP server, configured above).

1. Add the DHCP client:

```
/ip dhcp-client set interface=wlan1 enabled=yes
```

2. Check whether you have obtained a lease:

```
[admin@DHCP-Client] ip dhcp-client lease> print
status: bound
address: 172.16.0.20/12
gateway: 172.16.0.1
dhcp-server: 192.168.0.1
primary-dns: 159.148.147.194
expires: jun/24/2004 19:11:12
[admin@DHCP-Client] ip dhcp-client lease>
```

Specifications

Packages required: *dhcp*

License required: *level1*

Home menu level: */ip dhcp-client, /ip dhcp-server, /ip dhcp-relay*
Standards and Technologies: [DHCP](#)

Description

The DHCP protocol gives and allocates IP addresses to IP clients. DHCP is basically insecure and should only be used in trusted networks. DHCP server always listens on UDP 67 port, DHCP client - on UDP 68 port. The initial negotiation involves communication between broadcast addresses (on some phases sender will use source address of **0.0.0.0** and/or destination address of **255.255.255.255**). You should be aware of this when building firewall.

Additional Documents

- [ISC Dynamic Host Configuration Protocol \(DHCP\)](#)
- [DHCP mini-HOWTO](#)
- [ISC DHCP FAQ](#)

DHCP Client Setup

Home menu level: */ip dhcp-client*

Description

The MikroTik RouterOS DHCP client may be enabled on one 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 the DHCP client obtains one, the route obtained by the DHCP client would be shown as invalid.

Property Description

add-default-route (yes | no; default: **yes**) - whether to add the default route to the gateway specified by the DHCP server

client-id (*text*) - corresponds to the settings suggested by the network administrator or ISP. Commonly it is set to the client's MAC address, but it may as well be any test string

enabled (yes | no; default: **no**) - whether the DHCP client is enabled

host-name (*text*) - the host name of the client

interface (*name*; default: **(unknown)**) - any Ethernet-like interface (this includes wireless and EoIP tunnels)

use-peer-dns (yes | no; default: **yes**) - whether to accept the DNS settings advertized by DHCP server (they will appear in */ip dns* submenu)

Command Description

renew - 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)

Notes

If **host-name** property is not specified, client's system identity will be sent in the respective field of DHCP request.

If **client-id** property is not specified, client's MAC address will be sent in the respective field of DHCP request.

If **use-peer-dns** property is enabled, the DHCP client will unconditionally rewrite the settings in **/ip dns** submenu. In case two or more DNS servers were received, first two of them are set as primary and secondary servers respectively. In case one DNS server was received, it is put as primary server, and the secondary server is left intact.

Example

To enable DHCP client on **ether1** interface:

```
[admin@MikroTik] ip dhcp-client> set enabled=yes interface=ether1
[admin@MikroTik] ip dhcp-client> print
    enabled: yes
    interface: ether1
    host-name: ""
    client-id: ""
    add-default-route: yes
    use-peer-dns: yes
[admin@MikroTik] ip dhcp-client>
```

DHCP Client Lease

Home menu level: */ip dhcp-client lease*

Description

This submenu shows the actual IP address lease received by the client

Property Description

address (*read-only: IP address/mask*) - the address received

dhcp-server (*read-only: IP address*) - IP address of the DHCP server that have given out the current lease

expires (*read-only: text*) - expiration time of the lease

gateway (*read-only: IP address*) - the gateway address received

primary-dns (*read-only: IP address*) - the address of the primary DNS server received

secondary-dns (*read-only: IP address*) - the address of the secondary DNS server received

status (*read-only: "" | searching... | requesting... | bound | renewing... | rebinding...*) - the current state of DHCP client:

- "" - DHCP client is not enabled

- **searching...** - the DHCP client is searching for DHCP server, but has not yet received an offer
- **requesting...** - the DHCP client has received an offer from a DHCP server, and requesting an IP address now
- **bound** - the DHCP client has received an IP address (status bound should also appear on the DHCP server)
- **renewing...** - the DHCP client is trying to renew the lease
- **rebinding...** - the renew operation has failed, and lease time is over, so the DHCP client is trying to request an IP address once again

Example

To check the obtained lease:

```
[admin@MikroTik] ip dhcp-client lease> print
  status: bounded
  address: 80.232.241.15/21
  dhcp-server: 10.1.0.172
  expires: oct/20/2002 09:43:50
  gateway: 80.232.240.1
  primary-dns: 195.13.160.52
  secondary-dns: 195.122.1.59
[admin@MikroTik] ip dhcp-client lease>
```

DHCP Server Setup

Home menu level: */ip dhcp-server*

Description

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 DHCP server to work, you must set up also IP pools (do not include the DHCP server's IP address into the pool range) and DHCP networks.

Property Description

add-arp (yes | no; default: **no**) - whether to add dynamic ARP entry:

- **no** - either ARP mode should be enabled on that interface or static ARP entries should be administratively defined in */ip arp* submenu

address-pool (*name* | *static-only*; default: **static-only**) - IP pool, from which to take IP addresses for clients

- **static-only** - allow only the clients that have a static lease (i.e. no dynamic addresses will be given to clients, only the ones added in lease submenu)

authoritative (yes | no; default: **no**) - whether the DHCP server is the only one DHCP server for that network

interface (*name*) - Ethernet-like interface name

lease-time (*time*; default: **72h**) - the time that a client may use an address. The client will try to renew this address after a half of this time and will request a new address after time limit expires

name (*name*) - reference name

relay (*IP address*; 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 really 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 address*; default: **0.0.0.0**) - the address which the DHCP client must send requests to 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

Notes

If using both - Universal Client and DHCP Server on the same interface, client will only receive a DHCP lease in case it is directly reachable by its MAC address through that interface (some wireless bridges may change client's MAC address).

If **authoritative** property is set to **yes**, the DHCP server is sending rejects for the leases it cannot bind or renew. It also may (although not always) help to prevent the users of the network to run illicitly their own DHCP servers disturbing the proper way this network should be functioning.

If **relay** property of a DHCP server is not set to **0.0.0.0** the DHCP server will not respond to the direct requests from clients.

Example

To add a DHCP server to the **ether1** interface, lending IP addresses from **dhcp-clients** IP pool for 2 hours:

```
[admin@MikroTik] ip dhcp-server> add name=dhcp-office disabled=no \  
\... address-pool=dhcp-clients interface=ether1 lease-time=2h  
[admin@MikroTik] ip dhcp-server> print  
Flags: X - disabled, I - invalid  
#   NAME           INTERFACE  RELAY           ADDRESS-POOL LEASE-TIME  ADD-ARP  
0   dhcp-office     ether1       
dhcp-clients  2h          no  
  
[admin@MikroTik] ip dhcp-server>
```

DHCP Networks

Home menu level: */ip dhcp-server network*

Property Description

address (*IP address/mask*) - the network DHCP server(s) will lend addresses from

boot-file-name (*text*) - Boot file name

dns-server (*text*) - the DHCP client will use these as the default DNS servers. Two comma-separated DNS servers can be specified to be used by DHCP client as primary and secondary DNS servers

domain (*text*) - the DHCP client will use this as the 'DNS domain' setting for the network adapter

gateway (*IP address*; default: **0.0.0.0**) - the default gateway to be used by DHCP clients

netmask (*integer*: 0..32; default: **0**) - the actual network mask to be used by DHCP client

- **0** - netmask from network address is to be used

next-server (*IP address*) - IP address of next server to use in bootstrap

wins-server (*text*) - the Windows DHCP client will use these as the default WINS servers. Two comma-separated WINS servers can be specified to be used by DHCP client as primary and secondary WINS servers

Notes

The **address** field uses netmask to specify the range of addresses the given entry is valid for. The actual netmask clients will be using is specified in **netmask** property.

DHCP Leases

Home menu level: */ip dhcp-server lease*

Description

DHCP server lease submenu is used to monitor and manage server's leases. The issued leases is showed here as dynamic entries. You can also add static leases to issue the definite client (determined by MAC address) the specified IP address.

Generally, the DHCP lease it allocated as follows:

1. an unused lease is in **waiting** state
2. if a client asks for an IP address, the server chooses one
3. if the client will receive statically assigned address, the lease becomes **offered**, and then **bound** with the respective lease time
4. if the client will receive a dynamic address (taken from an IP address pool), the router sends a ping packet and waits for answer for 0.5 seconds. During this time, the lease is marked **testing**
5. in case, the address does not respond, the lease becomes **offered**, and then **bound** with the respective lease time
6. in other case, 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)

Then a client may free the leased address. Then the dynamic lease is removed, and the allocated address is returned to the address pool. But the static lease becomes **busy** until the client will reacquire the address.

Note that the IP addresses assigned statically are not probed.

Property Description

address (*IP address*; default: **0.0.0.0**) - lended IP address for the client

expires-after (*read-only: time*) - time until lease expires

lease-time (*time*; default: **0s**) - time that the client may use an address

- **0s** - lease will never expire

mac-address (*MAC address*; default: **00:00:00:00:00:00**) - MAC address of the client. It is the base for static lease assignment

rx-rate (*integer*; default: **0**) - maximal receive bitrate to the client (for users it is upload bitrate))

- **0** - no limitation

server (*read-only: name*) - server name which serves this client

status (*read-only: waiting | testing | busy | offered | bound*) - lease status:

- **waiting** - not used static lease
- **testing** - testing whether this address is used or not (only for dynamic leases) by pinging it with timeout of 0.5s
- **busy** - this address is assigned statically to a client or already exists in the network, so it can not be leased
- **offered** - server has offered this lease to a client, but did not receive confirmation from the client
- **bound** - server has received client's confirmation that it accepts offered address, it is using it now and will free the address not later, than the lease time will be over

tx-rate (*integer*; default: **0**) - maximal transmit bitrate to the client (for users it is download bitrate))

- **0** - no limitation

Command Description

check-status - Check status of a given busy dynamic lease, and free it in case of no response

Notes

Even though client address may be changed (with adding a new item) in **lease print** list, it will not change for the client. It is true for any changes in the DHCP server configuration because of the nature of the DHCP protocol. Client tries to renew assigned IP address only when half a lease time is past (it tries to renew several times). Only when full lease time is past and IP address was not renewed, new lease is asked (rebind operation).

the deault **mac-address** value will never work! You should specify a correct MAC address there.

Example

To assign 10.5.2.100 static IP address for the existing DHCP client (shown in the lease table as item #0):


```
[admin@MikroTik] ip dhcp-server lease> print
Flags: X - disabled, H - hotspot, D - dynamic
# ADDRESS MAC-ADDRESS EXPIRES-AFTER SERVER STATUS
0 D 10.5.2.90 00:04:EA:C6:0E:40 1h48m59s switch bound
1 D 10.5.2.91 00:04:EA:99:63:C0 1h42m51s switch bound
[admin@MikroTik] ip dhcp-server lease> add copy-from=0 address=10.5.2.100
[admin@MikroTik] ip dhcp-server lease> print
Flags: X - disabled, H - hotspot, D - dynamic
# ADDRESS MAC-ADDRESS EXPIRES-AFTER SERVER STATUS
1 D 10.5.2.91 00:04:EA:99:63:C0 1h42m18s switch bound
2 10.5.2.100 00:04:EA:C6:0E:40 1h48m26s switch bound
[admin@MikroTik] ip dhcp-server lease>
```

DHCP Relay

Home menu level: */ip dhcp-relay*

Description

DHCP Relay is just a proxy that is able to receive a DHCP request and resend it to the real DHCP server

Property Description

dhcp-server (*text*) - list of DHCP servers' IP addresses which should be the DHCP requests forwarded to

interface (*name*) - interface name the DHCP relay will be working on

local-address (*IP address*; default: **0.0.0.0**) - the unique IP address of this DHCP relay needed for DHCP server to distinguish relays:

- **0.0.0.0** - the IP address will be chosen automatically

name (*name*) - descriptive name for relay

Notes

DHCP relay does not choose the particular DHCP server in the dhcp-server list, it just sent to all the listed servers.

Example

To add a DHCP relay named **relay** on **ether1** interface resending all received requests to the **10.0.0.1** DHCP server:

```
[admin@MikroTik] ip dhcp-relay> add name=relay interface=ether1 \
\... dhcp-server=10.0.0.1 disabled=no
[admin@MikroTik] ip dhcp-relay> print
Flags: X - disabled, I - invalid
# NAME INTERFACE DHCP-SERVER LOCAL-ADDRESS
0 relay ether1 10.0.0.1 0.0.0.0
[admin@MikroTik] ip dhcp-relay>
```

Question&Answer-Based Setup

Command name: */ip dhcp-server setup*

Questions

dhcp server interface (*name*) - interface to run DHCP server on

dhcp address space (*IP address/mask*; default: **192.168.0.0/24**) - network the DHCP server will lease to the clients

gateway (*IP address*; default: **0.0.0.0**) - the default gateway of the leased network

dhcp relay (*IP address*; default: **0.0.0.0**) - the IP address of the DHCP relay between the DHCP server and the DHCP clients

addresses to give out (*text*) - the pool of IP addresses DHCP server should lease to the clients

dns servers (*IP address*) - IP address of the appropriate DNS server to be propagated to the DHCP clients

lease time (*time*; default: **3d**) - the time the lease will be valid

Notes

Depending on current settings and answers to the previous questions, default values of following questions may be different. Some questions may disappear if they become redundant (for example, there is no use of asking for 'relay' when the server will lend the directly connected network)

Example

To configure DHCP server on **ether1** interface to lend addresses from 10.0.0.2 to 10.0.0.254 which belong to the **10.0.0.0/24** network with **10.0.0.1** gateway and **159.148.60.2** DNS server for the time of 3 days:

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

dhcp server interface: ether1
Select network for DHCP addresses

dhcp address space: 10.0.0.0/24
Select gateway for given network

gateway for dhcp network: 10.0.0.1
Select pool of ip addresses given out by DHCP server

addresses to give out: 10.0.0.2-10.0.0.254
Select DNS servers

dns servers: 159.148.60.2
Select lease time

lease time: 3d
[admin@MikroTik] ip dhcp-server>
```

The wizard has made the following configuration based on the answers above:

```
[admin@MikroTik] ip dhcp-server> print
Flags: X - disabled, I - invalid
#   NAME           INTERFACE RELAY           ADDRESS-POOL LEASE-TIME  ADD-ARP
0   dhcp1          ether1     0.0.0.0           dhcp_pool1   3d         no

[admin@MikroTik] ip dhcp-server> network print
```

```
# ADDRESS          GATEWAY          DNS-SERVER        WINS-SERVER        DOMAIN
0 10.0.0.0/24      10.0.0.1         159.148.60.2
[admin@MikroTik] ip dhcp-server> /ip pool print
# NAME              RANGES
0 dhcp_pool1        10.0.0.2-10.0.0.254
[admin@MikroTik] ip dhcp-server>
```