

DHCP Server and Client for FieldServer

Introduction

The FieldServer's IP address for each Ethernet network interface can be allocated with the use of DHCP (Dynamic Host Configuration Protocol). To use this functionality, a DHCP Server must be present on the network to allocate IP addresses to the FieldServer. A DHCP Client running on the FieldServer is responsible for obtaining an IP address from the DHCP Server.

The FieldServer DHCP Server can be used to give an IP address lease to a computer connected to the FieldServer via an Ethernet connection. This ensures that a connecting computer will be on the same network subnet as the FieldServer allowing support and diagnostic utilities like RuiNet and RuiDebug to work correctly.

DHCP Client

The DHCP Client requests (or leases) an IP Address from the DHCP Server. When the FieldServer boots, the DHCP Client automatically attempts to contact a DHCP Server on the network to get a new IP address lease or renew an existing IP Address lease.

<u>New IP address lease</u>	A new lease is defined as the very first lease issued to a DHCP Client and remains persistent until reset. The lease is stored in the dhcp.ini file on the FieldServer and thus can be reset by deleting this file using RuiNet.
<u>Existing IP address lease</u>	The DHCP Client will attempt to renew the IP address lease most recently received using the information in the dhcp.ini file. Failing this it will attempt to get an IP address by sending a DHCP message to discover other DHCP Servers on the LAN. If still unsuccessful, it will use the last IP address set in the FS_IP.INI file.

Disabling - The DHCP Client for each adapter can be enabled or disabled from the RuiNet "1" screen.

NB. This will update the FS_IP.INI file, so that if the FieldServer reboots without another form of IP Address allocation, this new IP address will become the default.

How it works

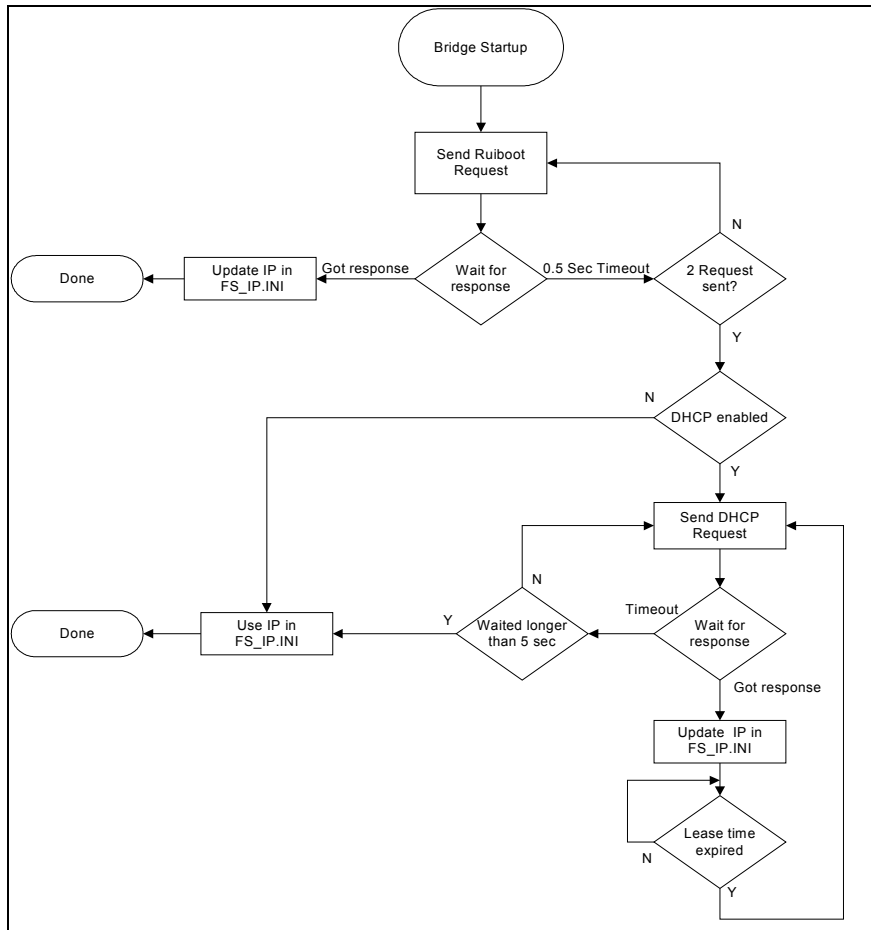
On startup the FieldServer will transmit a "DHCP Discovery" message on the network for the interface for which the DHCP Client is enabled. DHCP Server(s) on the network will each respond with a "DHCP offer" message. The offer will contain among other parameters, an IP address, a netmask, a gateway address and a lease time. The FieldServer will inspect the first offer it receives, discarding all others, and if acceptable, will send a "DHCP Request" message to the offering Server. If the request is acceptable to the Server, it will respond by transmitting a "DHCP Ack" message to the FieldServer. This effectively constitutes an IP address lease for the FieldServer which is valid for the "lease time" that was indicated in the offer. The FieldServer now records the IP address it received in a file called DHCP.INI.

During normal operation the FieldServer will try and renew its lease after about ½ of the lease time has expired. This will involve the transmission of a “DHCP Request” message to the DHCP Server, which should respond with a “DHCP Ack” message to renew the lease. If the FieldServer cannot reach the DHCP Server or the DHCP Server does not renew the lease for some reason, the FieldServer will try and obtain a new lease from any DHCP Server on the network. If this also fails, it will continue using the current lease without trying to renew it. This situation will be reset on restarting the FieldServer where it will again try to renew the lease it had before. The lease it had before is indicated by the existence of an IP address in the DHCP.INI file. If it can't be renewed again, it will try and get a new lease which may have a different IP address. If this also fails, it will revert to using the IP address that was previously used for that network interface, which in this case will be the previously leased IP address.

Under normal circumstances where the DHCP Server will always be available, the FieldServer will continue renewing its lease during normal operation. When the FieldServer has been restarted, it will always try to renew the lease it had by using the IP address in the DHCP.INI file in the “DHCP Request” message it transmits on the network. When this fails, it will revert to discovering DHCP Servers to get a new lease. Should a new lease be granted, the IP address in the DHCP.INI file will be updated. The FieldServer also updates the FS_TCP.INI file with the IP address, netmask and gateway address received from DHCP. It also stores the DHCP Client's operational state (Enabled or Disabled) in the FS_TCP.INI file.

The DHCP.INI file also contains the transmit retries setting (default = 1) and the receive timeout time (default = 2 seconds). This file has to be manually uploaded and edited, then downloaded again to change these settings in the event that a DHCP Server is too slow to respond. See the FAQ for information on the file format.

DHCP Client State Diagram



Frequently Asked Questions

1) Do I have to use DHCP to obtain IP addresses for a FieldServer?

No, you may disable DHCP and assign static IP addresses from the 'I' menu on Ruinet.

2) When do I need to use DHCP?

- Where network devices need to be automatically configured.
- Moving a FieldServer from one network to another without the operator requiring any knowledge of the new network's configuration or parameters.
- Where it is helpful to re-use IP addresses dynamically (when IP addresses are scarce through the use of static assignments)

3) Will my FieldServer's IP address remain the same when I'm using DHCP?

It may or may not depending on the DHCP Server's settings and whether multiple DHCP Servers are used on a network. Some DHCP Servers may be set to not renew a Client's lease at startup and assign a new IP address. This setting is not recommended. When multiple DHCP Servers are used independently (i.e. not in a backup supporting mode) and a FieldServer cannot renew a lease because the original DHCP Server is not available anymore, it may obtain a new lease from another DHCP Server.

4) What are recommended lease times for setting up a DHCP Server?

This depends on the network administrator's priorities. Lower lease times could be useful on networks with a limited number of IP addresses available to have them ready for re-assignment

when Clients cease to exist on a network. Lease times of a few days or weeks are normally sufficient.

5) *My DHCP Server is located on a different subnet. Will DHCP still work?*

The FieldServer DHCP Client is set to use broadcasting by default to solve this issue. As long as bridges, routers or gateways connecting networks support broadcasting, DHCP should still work.

6) *Can I assign a specific IP address to a FieldServer via DHCP?*

Yes, most DHCP Servers should support this. You can setup your DHCP Server to do a static assignment and normally you only need to supply the intended device's MAC address for the DHCP Server to identify it. Obtain your FieldServer's MAC address and setup your DHCP Server to assign it a specific IP address.

7) *Can I assign a permanent lease to a FieldServer?*

Yes, most DHCP Servers should support an infinite lease option. When receiving an infinite lease, the FieldServer will not try to renew the lease under normal operation, but will try and renew it when restarted.

8) *The FieldServer is not successful in getting a lease from my DHCP Server; how can I increase the transmit retries and receive timeout to possibly remedy the situation ?*

The DHCP.INI file has the following format:

```
N1_DHCP_IP = 192.168.0.242
N2_DHCP_IP = 192.168.0.243
TX_RETRIES = 1
RX_TIMEOUT = 2000
```

Upload the file with Ruinet, edit it and then download it to the FieldServer. Restart your FieldServer. The timeout value is in milliseconds (1000 ms = 1 second). Note that increasing the retries and timeout values will make your FieldServer take longer to start up in the event that the DHCP Client cannot find a DHCP Server. It will take longer before you will be able to connect to it using Ruinet or Ruiping.

9) *Where can I find more information about DHCP in general ?*

http://www.dhcp-handbook.com/dhcp_faq.html

(Please note that information from this source does not necessarily apply directly to the FieldServer's DHCP Client).

DHCP Server

- The FieldServer DHCP Server is enabled by default on both Ethernet adapters* and will be active after restarting the FieldServer.
- The DHCP Server has the same IP address as the adapter it is operating on.
- The FieldServer probes the Ethernet network for other DHCP Servers every 3 minutes and will disable the FieldServer's own DHCP Server until a restart should one or more external DHCP Servers be found. This is done to prevent interference on the network. The probe is done on each Ethernet adapter and will disable only the DHCP Server for the adapter on which one or more external DHCP Servers were found. Should the DHCP server already have granted leases to clients, those clients will eventually get to a state to discover the new DHCP server(s) and will be given new leases. The leases would likely not have the same IP Addresses as the clients had from the FieldServer's DHCP Server.
- The FieldServer DHCP Server gives out 5 minute IP address leases to allow DHCP clients to be quickly reconfigured without restarting them should the FieldServer containing the DHCP server be removed from a LAN and another DHCP server installed
- A maximum of 20 concurrent IP address leases are supported. When all leases are used up, DHCP messages from all other clients will be ignored, except if a leased or bound DHCP client issues a DHCP Release message to give up its lease. The very first DHCP client trying to get a lease following a lease release will get the newly available lease.
- The FieldServer DHCP Server can be disabled from the Ruinet I screen.
- **DHCP server bindings history** – the DHCP server will keep a lease reserved for a client even if that client is temporarily not connected to the network way past its lease time. It does not, however, keep a record of the leases it granted between DHCP server FieldServer restarts. Thus the Server's bindings can be deleted by restarting the FieldServer. If the restart is needed for some other reason, the DHCP server will still grant the existing clients their leases, but only after their lease times have passed and the DHCP clients re-discovers DHCP servers.
- **Verifying leases** – The DHCP server verifies whether an IP address is unused on the network before giving it to a DHCP client in a lease offer message. It does this by checking for ARP replies to ARP requests on IP addresses. It also detects whether the DHCP client is replying to an ARP request to prevent not recognizing that the IP address is unused.
- **Co-existence with FieldServer DHCP clients** – The DHCP server does not respond to DHCP messages from local DHCP clients (this statement simply means that a FieldServer that has both a DHCP Server and Client running on an adapter will not get into a local loopback situation). This is detected by matching the Ethernet addresses of the Ethernet adapters against the client hardware addresses used in the DHCP messages. It does however, respond to DHCP messages from remote FieldServer DHCP clients.
- **DHCP Clients on different subnets** – When a DHCP client is on a different subnet than the FieldServer acting as a DHCP server, the DHCP server offers the client an IP address on the same subnet as the FieldServer.

* Only on the first adapter N1 for the FS-B35

