



RapID Platform - EtherNet/IP Network Interface

Application Note for Configuring IP Addressing Modes

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CONVENTIONS

Arial Bold	Designates headings, figure captions, and table captions.
Blue	Designates hyperlinks.
<code>Courier</code>	Designates code text.
<i>Italics</i>	Designates emphasis, warning, or caution related to nearby information. Also used to differentiate terms from other common words (e.g., “If the <i>set</i> parameter is 0, then they will be cleared.”).

1. Introduction

This application note applies to the RapID Platform EtherNet/IP Network Interface as well as the RapID Platform EtherNet/IP Network Interface with DLR. Because any EtherNet/IP device can be configured to obtain its IP parameters (e.g. DHCP enable/disable flag, IP address, subnet mask, etc.) from various sources (e.g. the host processor/secondary application, configuration data, the network's PLC) and because it must strictly conform to the EtherNet/IP specification, it can sometimes be difficult to determine exactly how the device derived its IP address and/or IP parameters. This document addresses some of the questions that arise in these circumstances.

2. System Startup Overview

The IP addressing mode and associated information (referred to as the IP parameters in this document) can originate from multiple places such as the system's configuration data, EEPROM or the host processor depending on how and when the system is configured. The system's IP parameters are stored in non-volatile memory (EEPROM) but are copied to RAM for use at run-time.

When the system is powered up, the system's software will check EEPROM for the IP parameters. If the IP parameters are not present (i.e. the system is brand new or the EEPROM has been wiped), the system will copy the IP parameters from the (previously loaded) configuration data (which is stored in flash) into EEPROM and then use those IP parameters at run-time. (From here, the IP parameters will be available in EEPROM the next time the system powers up.) If the IP parameters are present in EEPROM, the system will simply use those values at run-time.

During configuration at run-time, the host processor has the opportunity to override the IP parameters that the system obtained from EEPROM. If the host overrides the IP parameters, those parameters are used instead. It should be noted that the IP parameters the host supplies are stored in RAM so they will need to be sent each time the system is configured. If the host does not override the IP parameters, the system will finish its IP configuration using the IP parameters retrieved from EEPROM. Additionally, once the system is up and running, the values in EEPROM can be altered through the EtherNet/IP TCP/IP object.

3. Frequently Asked Questions

Q: How does the Configuration Tool control the device's IP address settings?

A: The Configuration Tool is used to define an EtherNet/IP device and to set the following IP parameters (among other data):

- The DHCP Enable Flag
- The Static IP Address
- The Subnet Mask
- The Gateway Address
- The Domain Name Server 1 and 2 (DNS1/DNS2) IP Addresses

The first item to notice is the DHCP enable flag. If DHCP is enabled, the static IP address, subnet mask, gateway address, DNS1 and DNS2 addresses will all be ignored. The network's DHCP server will be expected to provide this information. If DHCP is not enabled (which means you are using a static IP address), these settings will be used to directly set the device's IP parameters. Also, this data is used to define what is referred to as the "out-of-the-box" settings. This is the setting a completely new and uninitialized device is expected to use. Since the actual operating IP parameters are changeable and non-volatile, it is possible for a device to operate using parameters that differ from those in the configuration data but there is a means to command a device to revert back to these known parameters at any time thus returning to the "out-of-the-box" state.

Additionally, since the EtherNet/IP TCP/IP object attributes can be used to modify these parameters and since these modifications are stored in non-volatile EEPROM, the EEPROM data can be made to differ from the configuration data. However, in order to avoid losing an active connection to an operating device, any modified parameters will not be put into use until after the next system reset.

Q: My device is not using the addressing mode I set in my configuration data. Why?

A: There are two possible scenarios under which you might see this behavior. During configuration, the host processor is always presented with an opportunity to override the IP parameters that the system obtained from EEPROM. If the host is overriding the IP parameters from EEPROM, you might observe that the device is not using the IP parameters from your configuration data because the host is overriding those parameters. The other scenario under which you might see this behavior is if you recently changed the configuration data (by reloading your configuration data in flash) without wiping the EEPROM first. In this case, when the system powers up, it will check EEPROM for a valid set of IP parameters. If valid parameters are found, then those parameters will be used without checking the new configuration data. (See the System Startup Overview for more details.) Only after the host sends the "Start" command will the IP parameters actually be applied.

Q: If my configuration data changes, how do I bring the IP parameters in EEPROM back up to date?

A: You must manually wipe the EEPROM and then restart the system. The boot loader has a "wipe" command that can be used for this purpose. See the *Bootloader User Guide* for details.

Q: I see that the host can command the system to use DHCP, to use a static IP address or to use NVM. What's the difference between these?

A: Regardless of what is in the configuration data or EEPROM, the host can use any of the following settings:

- Use DHCP
- Use a Static IP Address
- Use NVM

If the "Use DHCP" or "Use a Static IP Address" options are used, the IP parameters that the system obtained from EEPROM will be overridden with the DHCP or static IP address information supplied by the host. The last setting ("Use NVM") simply tells the system to use the IP parameters that it obtained from EEPROM as-is.

Note: Remember that the non-volatile parameters in EEPROM can still be changed using the EtherNet/IP TCP/IP object.

Q: How do I revert a device back to the "out-of-the-box" settings?

A: This can be done by issuing a "Type 1" reset service to the EtherNet/IP Identity Object.

Q: What are the issues that could affect the conformance test process?

A: In attribute 2 of the EtherNet/IP TCP/IP object, the device will always advertise the capability flags "DHCP client" (bit 2) and "configuration settable" (bit 4). This means that the conformance test will always test the system's support for DHCP and for a static IP regardless of what the IP parameters in the configuration data are and regardless of how the host is setting IP parameters. This means that if the host sets the IP addressing mode to anything other than "Use NVM", the conformance test will fail. This is because the conformance test will expect the changes it makes to be non-volatile. However, since the host can override this and is unaware of what the test is doing, the resulting setting might not always be correct.

Q: So what exactly does the conformance test do when it is testing the TCP/IP object?

A: This answer makes the following assumptions:

- The IP parameters in the configuration data indicate DHCP should be used
- The test starts out with the system in the "out-of-the-box" state
- The host is set to always command the system to "use NVM"
- A DHCP server that will provide a known and consistent IP address is available

While these items may be labeled here as "assumptions", it is not a bad idea to treat them as "recommendations" for best results on the conformance test. The conformance test will do a lot of individual tests of the TCP/IP object but the test steps as they pertain to the DHCP vs. static IP address settings, are shown below.

Note: The TCP/IP object attributes being referred to are the Configuration Control attribute (#3) and the Interface Configuration attribute (#5).

The conformance test software will:

- Ensure the module is present at the expected IP address
- Read attribute 3 and expect it to be 2 (use DHCP)
- Set attribute 3 to 0 (use static)
- Issue an Identity Object Reset Service Type 0
- Wait for the module to reboot
- Verify the module is still present at the same IP address as before
- Read attribute 3 and expect it to be 0 (use static)
- Set attribute 5 to IP address with last octet incremented (e.g. if the existing IP address is 192.168.1.100, the new IP address will be 192.168.1.101)
- Issue an Identity Object Reset Service Type 0
- Wait for the module to reboot
- Verify the module is present at the new IP address
- Read attribute 3 and expect it to be 0 (use static)
- Set attribute 3 to 2 (use DHCP)
- Issue an Identity Object Reset Service Type 0
- Wait for the module to reboot
- Verify the module is present at original IP
- Read attribute 3 and expect it to be 2 (use DHCP)

As you can see, if the host is overriding any of these settings, the conformance tool will not see the results it expects and will see this as an error causing the test to fail.

4. Revision History

The following table shows the sequence of revisions to document IA331131008.

Table 1. Revision History

Date	Revision	Description	Page(s)
October 8, 2013	00	Initial Release	NA

5. For Additional Information

The Innovasic Support Team wants our information to be timely, complete, accurate, useful, and easy to understand. Please feel free to contact our experts at Innovasic at any time with suggestions, comments, or questions.

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