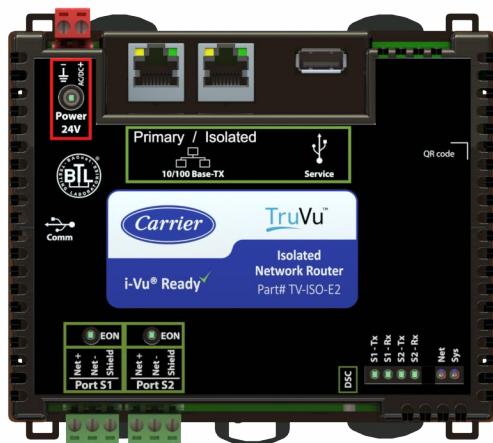


# Dynamic Bindings and DHCP for the TV-ISO-E2





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Important changes are listed in **Document revision history** at the end of this document.

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## Subject

What to expect when using dynamic bindings and the DHCP server of the ISO product family (TV-ISO-E2).

## Introduction and New Capabilities

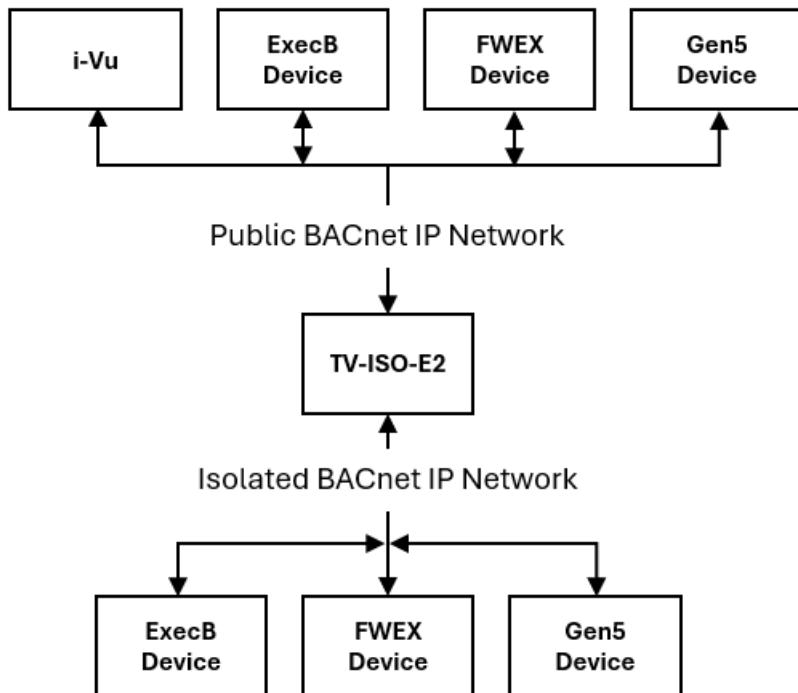
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The ISO product family introduces a DHCP server on an isolated, private network with BACnet routing , eliminating the need to install BACnet IP based devices on the building LAN. However, the use of the DHCP Server requires the use of dynamic BACnet bindings—a method of addressing that uses the device instance—as opposed to static bindings, which use the IP address and UDP port. Under certain circumstances, a device configured for DHCP may be assigned a new IP address. The DHCP server within the TV-ISO-E2 has been configured to minimize the likelihood of readdressing (see *Circumstance under which a device may be assigned a different IP address via DHCP* at the end of this document) but, should this occur, controllers using dynamic bindings will perform a re-bind to reestablish communications.

Typically, the re-bind occurs automatically because a device, when assigned a different IP address by the DHCP server, broadcasts an I-Am that can be used by other devices to update their respective binding tables. However, if this broadcast is not received by a device (for example, due to network congestion or intermediate hardware failures), the "listening" device must broadcast a Who-Is and wait for an I-Am to update bindings and re-establish communications.

The following diagram shows an example network topography containing different types of software and firmware device platforms (i-Vu®, ExecB, FWEX, and Gen5) that use dynamic bindings and devices that use DHCP.

**Devices using dynamic bindings to communicate with devices on isolated BACnet IP network**

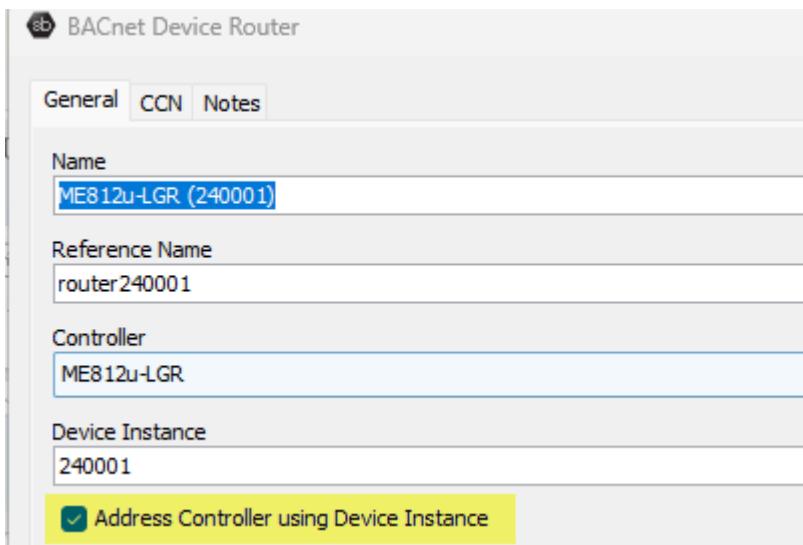


**Devices getting their IP address from the DHCP Server**

The following sections describe how asynchronous binding changes are handled by Carrier®'s products.

## i-Vu®-To-Device Communications

Starting in i-Vu® 9.0, devices can be configured for dynamic bindings by checking **Address Controller Using Device Instance** in SiteBuilder under device **Properties** and in i-Vu® using **Configure** in the **Network** tree.



When this setting is enabled, i-Vu® broadcasts a Who-Is and pauses for an expected I-Am when attempting to communicate with the device for the first time. Testing has confirmed i-Vu® correctly binds to a device addressed using DHCP if "Address Controller using Device Instance" is enabled and re-establishes communications if the address changes whether the initial I-Am from the changed device is received or not.

## Device-To-Device Communications

Devices are also able to communicate with other devices using dynamic bindings. This is typically performed using network points (inputs and output) in control programs where the URL address is specified as a device instance. For example, the following network point reads Analog Value 18 hosted on the device with an instance of 144895:

Name	Type	Value	Locked	Default Value	Com Enabled	COV Enable	Refresh Time (mm:ss)	Test	Address	Search / Replace
AN11	(ANI)	3.00	<input type="checkbox"/> 0	0	<input checked="" type="checkbox"/> All	<input checked="" type="checkbox"/>	0 : 30	<input type="checkbox"/>	bacnet://144895/av:18	<input type="button" value="Search / Replace"/>

Testing was performed to verify the three firmware platforms (ExecB, FWEX, and Gen5) were able to successfully rebind when performing device-to-device communications and bindings were changed asynchronously. The test has confirmed the three product platforms will correctly bind to a device addressed using DHCP and will re-establish communications if the address changes whether the initial I-Am from the changed device is received or not as long as the devices are using the most up-to-date firmware, see *Recommendations* below.

The amount of time required to rebind a network point after an asynchronous address change is dependent on several factors, including:

- Was the initial I-Am broadcast received?
- Network Point Refresh Time – in testing, this was set to 30 seconds
- APDU Retries – in testing this was set to 3
- APDU Timeout – in testing this was set to 3000 ms (3 seconds)
- Backoff Period – this is defined in each device as 60 seconds

The following table shows the maximum time between two successful network point reads or writes if an asynchronous binding change occurs:

Firmware Platform	Initial I-Am Received?	Recovery Time Calculation Using Test Conditions	Maximum Recovery Time Using Test Conditions
FWEX and ExecB	No	Refresh Time+ (ADPU Retries + 1) * APDU Timeout + Backoff Period + (ADPU Retries + 1) * APDU Timeout + Backoff Period	30 + 12 + 60 + 12 + 60 <hr/> 174 seconds
	Yes	Refresh Time + (ADPU Retries + 1) * APDU Timeout + Backoff Period	30 + 12 + 60 <hr/> 102 seconds
Gen5	No	Refresh Time + (ADPU Retries + 1) * APDU Timeout + Refresh Time + Rebind Time	30 + 12 + 30 + 5 <hr/> 77 seconds
	Yes	Refresh time	30 seconds

## Other Considerations

A FWEX device restarts when assigned a new IP address via DHCP. This causes an I-Am to be broadcast and the Control Program (CP) engine to be restarted. A CP engine restart means control is suspended for a period of time and can be problematic for CPs directly controlling I/O for critical or sensitive equipment.

We suggest you consider static IP addresses for particularly critical equipment. To configure a device on the Isolated Port of an TV-ISO-E2 for a static IP address, the device can be configured to use a static IP address that is outside of the range of the "Start Address" and "End Address" of the DHCP server but within the isolated network IP subnet range. For example, a FWEX device could be statically assigned the IP address of 10.254.254.201 when the address lease range of the DHCP server in the ISO products is configured as 10.254.254.2 to 10.254.254.199, but its subnet mask is 255.255.255.0 (yielding a total addressable range of 10.254.254.2 to 10.254.254.254).

## Recommendations

When using DHCP and dynamic bindings operators should use

- WebCTRL/i-Vu 9.0 or later
- ExecB version 6.06:102 later
- FWEX version 107.10.2020 or later
- Gen5 version 108.06.20206 or later

Using an earlier version of i-Vu® or firmware may result in communications failures due to devices not rebinding correctly if address changes occur. These failures would be observed as a "Cannot communicate with controller" message in i-Vu® or a "Device offline" error for network points.

## Circumstances under which a device may be assigned a different IP address via DHCP

- Power is removed from the TV-ISO-E2 for longer than the DHCP lease time. When power is reapplied to the TV-ISO-E2 there is no guarantee it will assign the same IP addresses to the devices on the network.
- Power is removed from a device for longer than the DHCP lease time. When power is reapplied to the device there is no guarantee it will be assigned the same IP address by the DHCP server.
- There are more devices on the network requesting DHCP addresses than there are DHCP addresses available. For instance, if the DHCP Start Address is 10.254.254.10 while the DHCP End Address is 10.254.254.20 (a pool of 11 leases) and 12 or more devices on the network are requesting DHCP addresses, there is no guarantee they will be assigned the same IP address on the next request.
- If the DHCP address range (i.e., the DHCP Start Address and/or DHCP End Address) is changed.
- The TV-ISO-E2 is replaced/swapped.
- A device is replaced/swapped.



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