# What is BBMD and Why Should I Care?

BACnet utilizes broadcast messages for certain functions, such as when you try to discover BACnet devices. If your BACnet devices are interconnected via IP routers then these broadcast messages will, normally, be blocked by the IP router. This may cause issues for your BACnet communications. If your client device/application supports statically entered network settings for all devices then this might not be an issue but most clients will want to send a broadcast message, Who-Is, to discover the devices in the system and to discover the network information necessary to communicate with these devices.
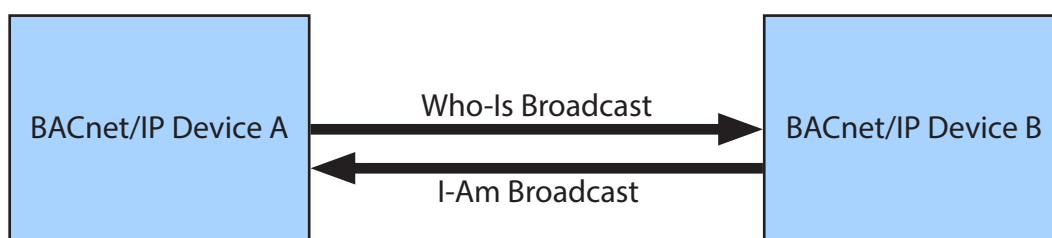
Figure 1

In figure 1, Device A sends a Who-Is broadcast and Device B responds with an I-Am that carries networking information that allows Device A to read/write properties on Device B.
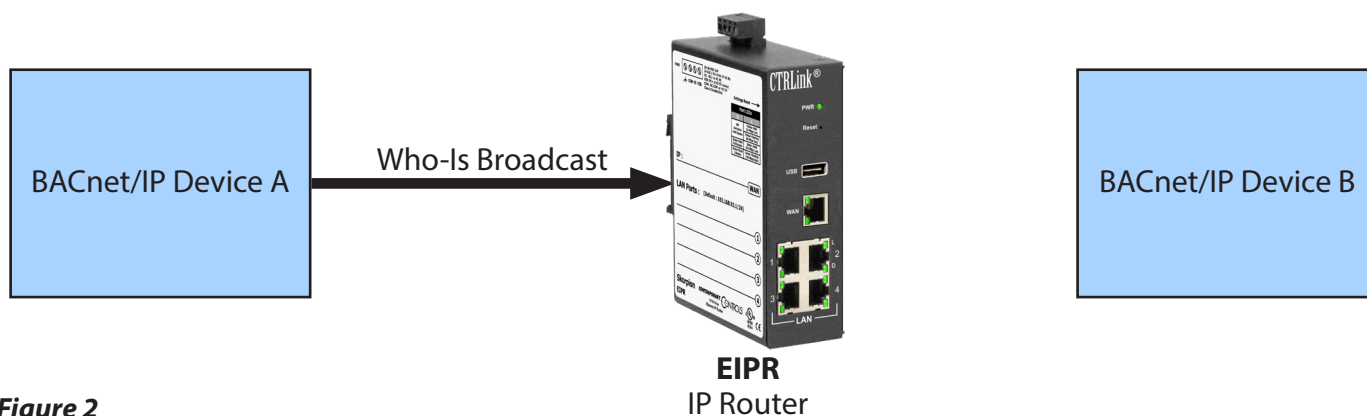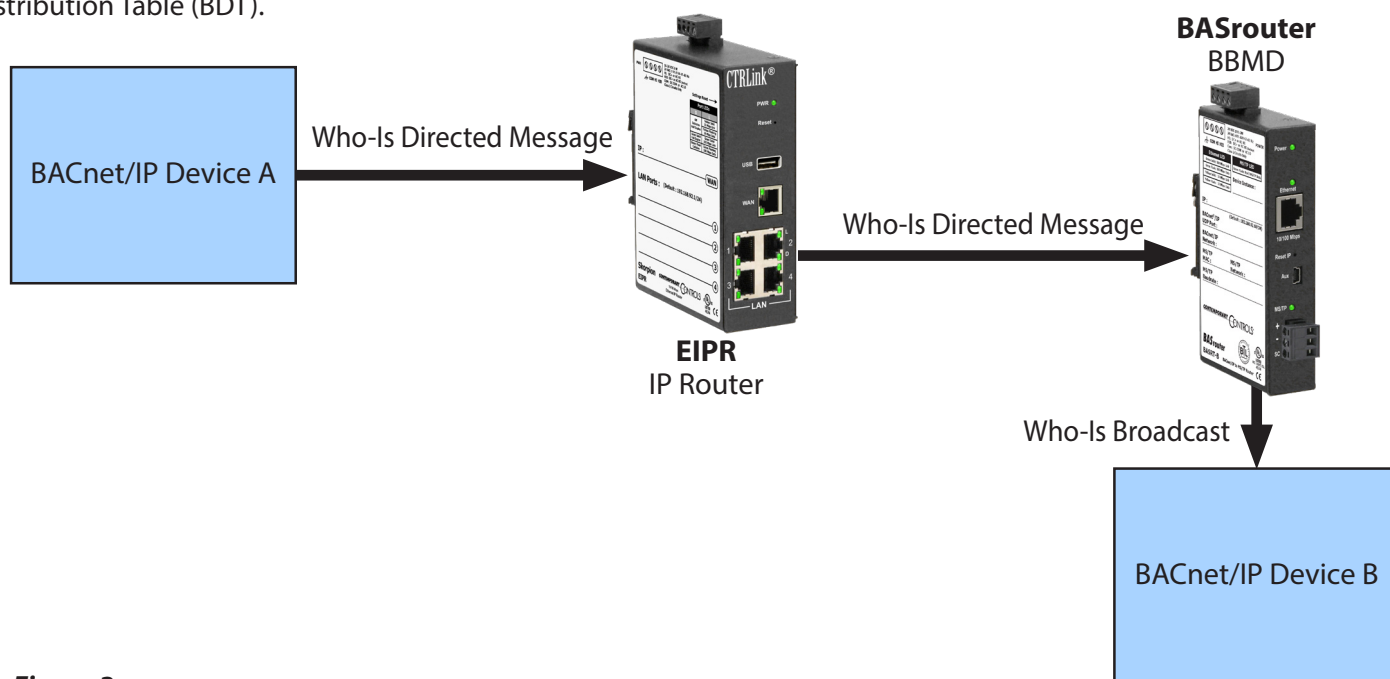

EIPR
IP Router

Figure 2

In figure 2, we add an IP router and the Who-Is is thrown away by the IP router and not delivered to Device B.

BACnet solves the IP router issue by utilizing a BACnet/IP Broadcast Management Device (BBMD). The BBMD will send any received broadcast messages as directed messages through the IP router to its partner BBMD devices. For this to work you must configure each BBMD with the IP addresses of all other BBMDs. Or you can have all BBMDs send their broadcast messages to one centrally located BBMD, however, all client devices must utilize the central BBMD. These entries go into the BBMD's Broadcast Distribution Table (BDT).

Many BACnet/IP devices or applications also support a feature entitled Foreign Device Registration (FDR). FDR allows the BACnet/IP device or application to send its broadcast messages to a BBMD. The BBMD will then forward these broadcast messages to all other BBMDs and all other FDR devices. If a subnet has only FDR supported devices then it does not need a local BBMD. These devices can register with a BBMD on another subnet.

Figure 3

In figure 3, we add the BBMD (Contemporary Control's BASrouter) and Device A uses its FDR to send a directed message through the IP router to the BBMD, which passes the Who-Is onto Device B.
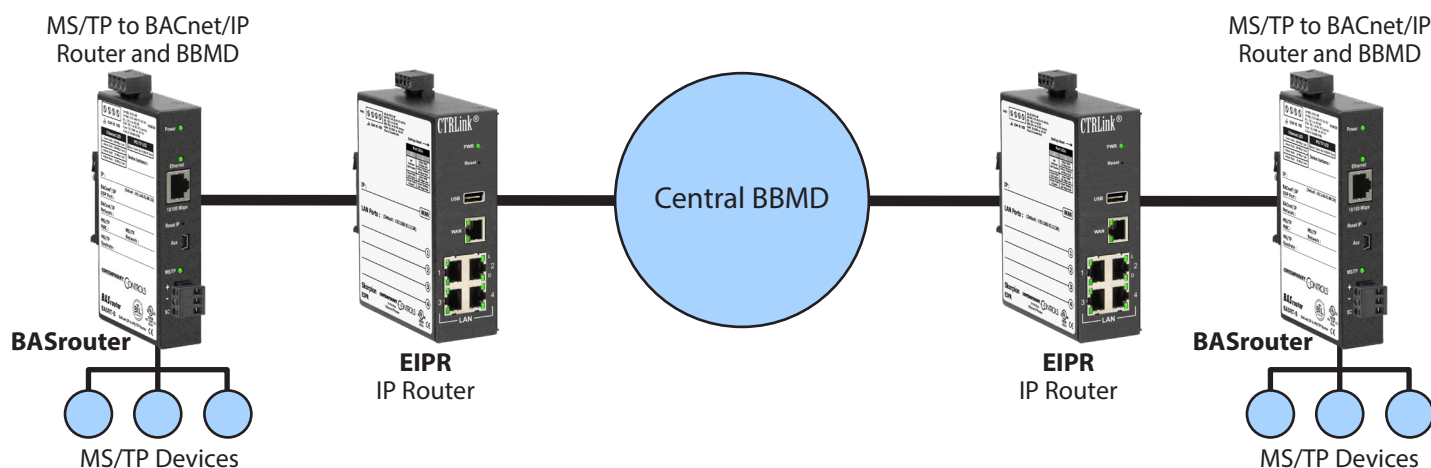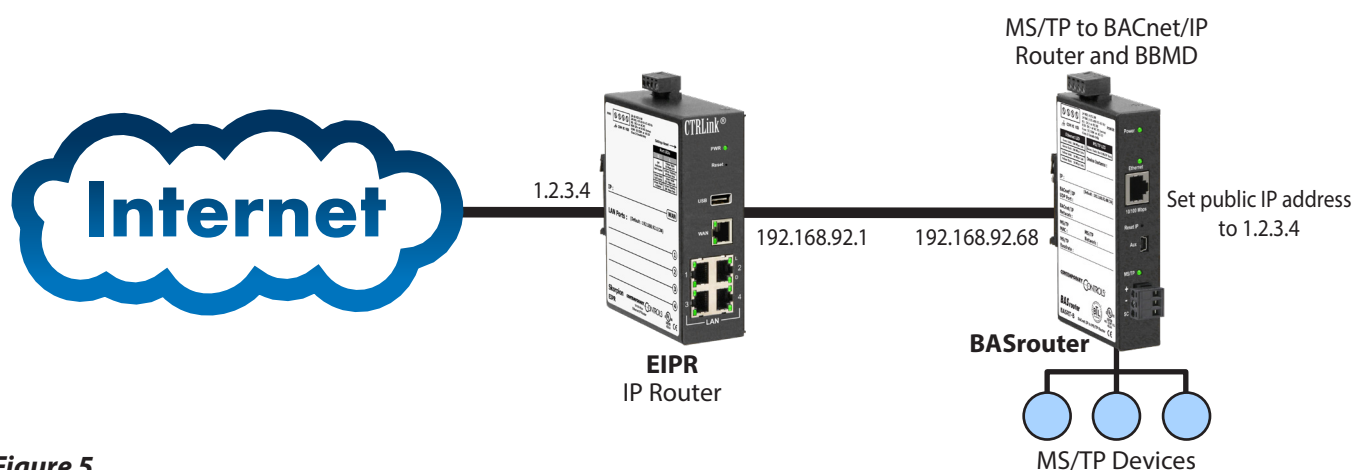

Figure 4

In figure 4, we have multiple BASrouters and one central BBMD. The BASrouters would have one entry in their BDT, the IP address of the Central BBMD.

What if the IP router has a firewall?

A firewall will block messages which originate on the WAN side and will allow messages which originate on the LAN side to pass. The responses to the LAN messages can also pass through the firewall. This is important when connecting an IP router directly to the Internet. In the previous examples the firewall in the IP routers were disabled. While enabling the firewall is important when connecting the IP router to the Internet, it can cause complications for BACnet communications.

When a firewall is enabled in the IP router then it must be configured to port forward a specific port to the local

BBMD for BACnet communications to originate on the WAN side and pass through the IP router. Normally this port is 47808 (BAC0 in hex), however, read the following section "With Great Power Comes Great Responsibility" when connecting your BACnet networks to the Internet. Also, the BBMD communications must appear as if they were using the public IP addresses (Internet addresses) of the IP routers. On the BASrouter from Contemporary Controls you would change the public IP address setting from 0.0.0.0 to the public IP address of IP router which is port forwarding BACnet communications to the BAS router.

Figure 5

In figure 5, we have an example network where the IP router has its port 47808 port forwarded to the BASrouter and the BASrouter has its public IP address set to the IP router's public IP address of 1.2.3.4. Figure 6 shows the public IP address webpage setting.
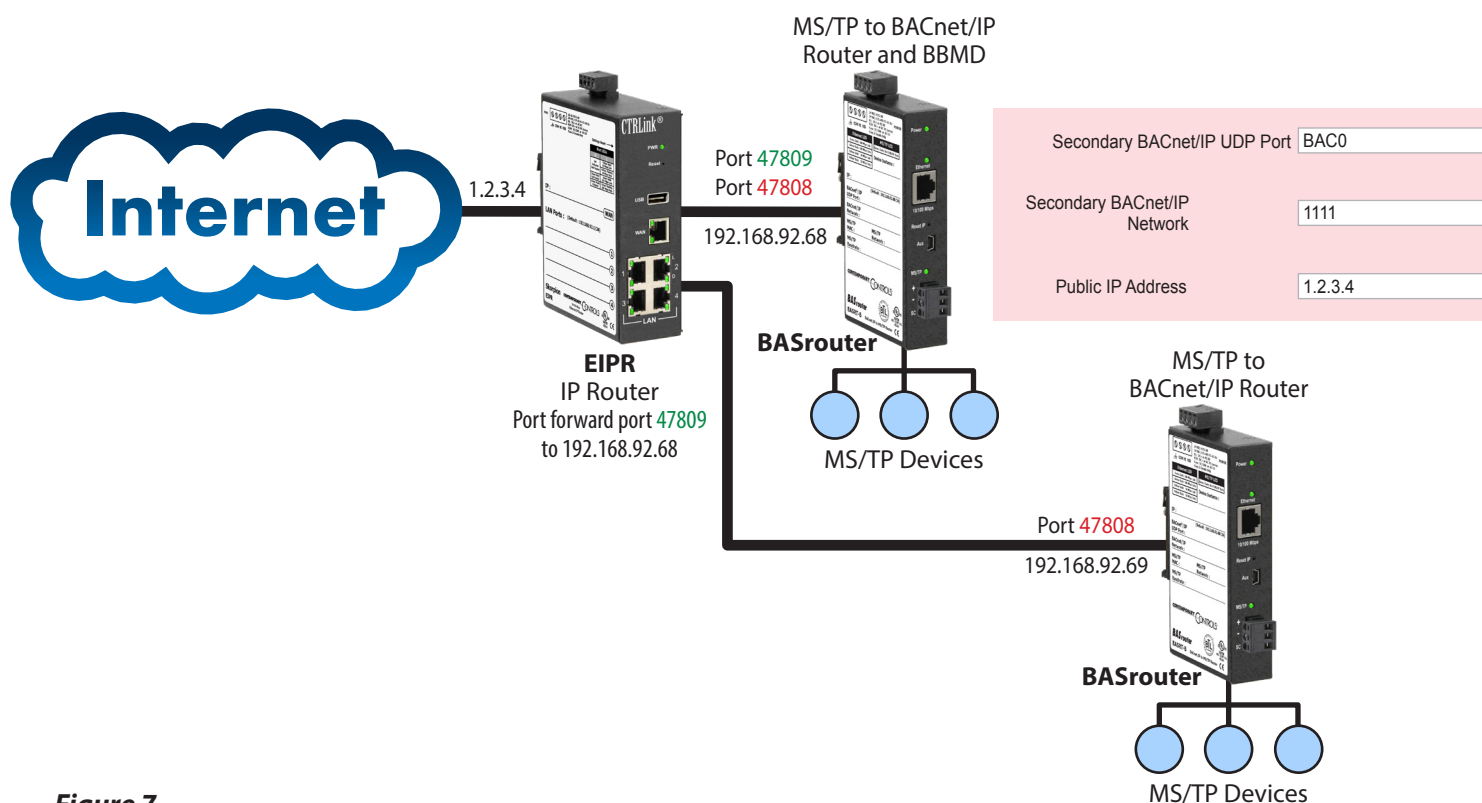

Figure 6

What if I have I two BACnet routers on my subnet?

In the previous example all BACnet/IP messages were forwarded through the IP router to one IP device, the BASrouter. However, if there are multiple BASrouters, or other BACnet/IP devices, then the device receiving all BACnet/IP traffic from the IP router will need to forward this traffic to the rest of the network. The BASrouter can provide this feature.

As discussed in the previous example the BASrouter appeared to the Internet to be 1.2.3.4 using port 47808. If you have multiple BASrouters or other BACnet devices on the same side of the IP router then each of these devices cannot be 1.2.3.4:47808. Luckily BACnet has a solution

for this, see 135-2010 J.7.8 (BBMD with Network Address Translation). The BASrouter supports this feature.
In BACnet/IP all devices must use the same port number to communicate directly. If you have devices communicating with port 47808 and 47809 they cannot communicate together, even if they are connected to the same Ethernet switch. To do so would require a BACnet router. The BASrouter can route messages from one port number, say 47808 and another port number, say 47809. Because of this feature and the BBMD support, the BASrouter can support multiple local BACnet/IP devices when connected to an IP router with firewall enabled (some may call this a NAT router or PAT router).


Figure 7

In figure 7, we have the top BASrouter receiving all BACnet traffic from the Internet as the IP router is port forwarding all BACnet traffic to this BASrouter. The top BASrouter is then forwarding the traffic to the lower BASrouter (and to any other connected BACnet devices). The rest of the local BACnet/IP devices should use port 47808 (BAC0) for their communications. One thing to note is that the Internet BACnet communications now must use port BAC1 or 47809. You can also change this around such that the Internet communications uses 47808 and the local devices use 47809. However, if possible change your Internet communication port numbers to something not related to BACnet. See the following section "With Great Power Comes Great Responsibility" when connecting your BACnet networks to the Internet. In either case the local BACnet communications must use a different port number than the one used on the Internet. This example can also scale to more local BACnet/IP devices.

With Great Power Comes Great Responsibility
Best Security Practices when using BBMD

The BASrouter/BASrouterLX can provide a simple and easy way to get your BACnet MS/TP devices onto the Internet. However, you should give some consideration to how this is used. Remember, with great power comes great responsibility.

EIPR   **BASrouter**
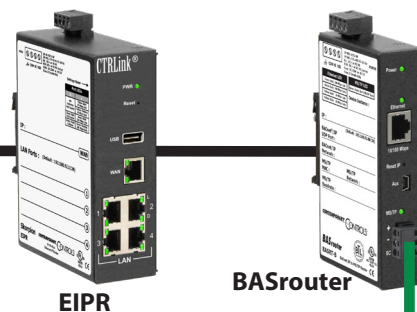
The BBMD and FDR features can allow devices/PCs on the Internet to communicate with your MS/TP devices. However, once these are in place this can also allow anyone else to also communicate with your MS/TP devices. Here are some suggestions on how to best protect yourself.

1. Change the BACnet port number you use on the Internet to something other than 47808. This is a well-known port number for BACnet. There are tools that can discover your BACnet devices using this port. Simply changing this to another value that is not associated with BACnet is a very good idea.

2. The BASrouter has two communication port numbers. Typically, these are 80 for the webpage and 47808 for BACnet communications. When you port forward Internet communications from your Internet connected IP router to the BASrouter you can decide if you want the BASrouter's webpages exposed as well as your BACnet communications. If you feel you need to expose your webpages, change the external port to something other than 80. This is the well-known port number for webpages. There are programs which are searching the Internet for interesting devices to talk to. They will try port 80. Change this to something not normally associated with webpages and they won't find you. Better yet don't expose the BASrouter webpages. This is not required during the normal operation once the device has been configured.

3. If you do expose the webpage to the Internet, make sure you change the user name and password from the defaults. This is good advice for any IP device on the Internet and should be done even if the BASrouter is not directly on the Internet.

4. The BASrouterLX has a "Allowlist" feature. This indicates which IP devices can communicate with your MS/TP devices. If your BASrouterLX is on the Internet, this can control who can communicate through it and only allow your devices or PCs to communicate to your connected MS/TP network.

5. To provide the best security, use a VPN to communicate with the BASrouter or BASrouterLX. You can connect the BASrouter or BASrouterLX to our EIPR-V with the RemoteVPN option. This will provide a secure VPN connection for the BACnet communications with your MS/TP devices over the Internet. Your PC, after loading the OpenVPN client, can communicate, in a secure manner over the Internet, through the EIPR-V to your BASrouter or BASrouterLX and then read/write your MS/TP devices. In the previous examples, you needed to perform a port forward from your Internet connected IP router to the BASrouter/BASrouterLX. With the EIPR-V and RemoteVPN option, this is not needed. The Internet connected IP router can remain unchanged and you will still be able to communicate with your MS/TP devices over the Internet, however, with much more security.