

ESSENTIALS



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Using the BACnet® Discovery Tool – BDT

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In the first Essentials publication we discussed issues when applying BACnet routers in the field. Our focus was on BACnet/IP to BACnet MS/TP routing — with one side of the router tied to an Ethernet backbone and the other side dedicated to separate MS/TP networks. But is there a quick way to determine if the router is successfully communicating to attached devices? We think there is with the *BACnet Discovery Tool (BDT)*. Although limited to very simple tasks, it is easy to use — and it is FREE!

The BACnet Discovery Tool (*bdt.exe*) is a BACnet/IP application for Windows® that is easy to install and use. It is an excellent means for verifying communication with MS/TP devices that are being accessed through BACnet/IP routers such as those available from Contemporary Controls: the **BASRT-B** DIN-rail mounted BACnet/IP-to-MS/TP router — or its portable counterpart, the **BAS RTP-B**.

The tool is based on an open source BACnet protocol stack developed by Steve Karg. His project is described at: <http://bacnet.sourceforge.net>

At just over 520 kB, *bdt.exe* is small — making it a snap to download. When you download the tool, you can save and run it from anywhere on your computer's hard drive.

We use BDT with our BACnet Interoperability Board. On this board we mount equipment from different BACnet vendors to prove our routers operate with different equipment configurations. In the photo at the end of this article you will notice mostly Alerton devices being tested, but we can change out equipment as needed. Although we have more elaborate BACnet tools, BDT is a vendor-neutral tool that can quickly discover BACnet devices. To give you an idea on how this works, we configured our board with three MS/TP segments each tied to a dedicated BAS Router. Each BAS Router has its BACnet/IP side tied to a common network through one of our Ethernet switches. Attached to the network is a workstation running BDT.

We launch *bdt.exe* by double-clicking its filename or icon. As soon as the application starts, it opens in its own window. It immediately activates its *Who-Is* service and transmits one

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BACnet Discovery Tool v1.1
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Broadcast: FFFFFFFFC0BA
Address: 045CA8C0C0BA

Sending Global Who-Is

Received I-Am Response from 202162 (vendor 245)
Received I-Am Response from 202161 (vendor 245)
Received I-Am Response from 202160 (vendor 245)
Received I-Am Response from 3015 (vendor 18)
Received I-Am Response from 3002 (vendor 18)
Received I-Am Response from 3044 (vendor 18)
Received I-Am Response from 3004 (vendor 18)
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.
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Received I-Am Response from 3041 (vendor 18)
Received I-Am Response from 3042 (vendor 18)
Received I-Am Response from 3043 (vendor 18)

Device      MAC              MaxAPDU Net
202162     COA85C66BACO    1476    0
202161     COA85C665BACO    1476    0
202160     COA85C664BACO    1476    0
3015       COA85C64BACO     128     100
3002       COA85C64BACO     128     100
3044       COA85C65BACO     128     101
3004       COA85C64BACO     128     100
.
.
.
3041       COA85C66BACO     128     102
3042       COA85C66BACO     128     102
3043       COA85C66BACO     128     102

Press any key to exit

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NOTE: For ease of illustration, the screen capture has been altered so that two lists that actually appear *one-after-the-other*, are here displayed *side-by-side*. Also, both lists (the responses on the left and the device information on the right) are *abbreviated*.

Who-Is query. If we do not see any response within a few seconds, we can try *pinging* the IP address of the router to confirm that its IP channel is functional. **NOTE:** Because **bdt.exe** sends a BACnet/IP *Who-Is* (not a BACnet/Ethernet *Who-Is*) it will not discover any devices which only support BACnet/Ethernet.

Each *I-Am* response is reported on screen as soon as received. As shown in the screen capture, each response also identifies the associated *Device Instance* number and *Vendor* identifier. The first three responses are from Contemporary Controls whose vendor number is 245. The remaining devices are identified as manufactured by Alerton whose vendor number is 18.

After all of the *I-Am* responses have been received, **bdt.exe** summarizes the information it has received as illustrated in the right portion of the sample screen. In this example, you see a list of many respondents on the left. The associated summary list on the right reports each *Device Instance*, the device's maximum Application Protocol Data Unit (*MaxAPDU*) value and the number of the network (*Net*) on which it resides. A *Net* value of 0 represents the network to which the BACnet Discovery Tool is attached — and so it must be an IP network. (This identification is reinforced by a *MaxAPDU* value of 1476 — typical of an Ethernet network.) Since the first three responses in the device summary on the right show that devices 202162, 202161 and 202160 have *Net* values of 0, the originators of the first three *I-Am* messages must be BACnet/IP devices — in this case, they are the three BAS routers.

The second column (*MAC*) of the summary report on the right, requires detailed explanation. The *MAC* value is a composite of two pieces of hexadecimal information obtained from the BACnet/IP device involved in each *I-Am* response. The first eight digits represent the IP address of the BACnet/IP equipment that has **delivered** the *I-Am* response. The last four digits report that device's BACnet/IP UDP port number.

NOTE regarding the MAC value: there is a significant difference between the BACnet/IP protocol (used by **bdt.exe**) and the BACnet Ethernet protocol. The **bdt.exe** *MAC* value is **not** the Ethernet *MAC* address as you might expect. This is because BACnet/IP protocol uses the device IP address as the *MAC* value. Only BACnet Ethernet protocol uses the actual Ethernet *MAC* address as the *MAC* value.

The equipment **delivering** the *I-Am* response could itself be simply a BACnet/IP device (as is the case with the first three respondents) — or it could be a router that is acting as an intermediary for devices on the far side of the router (which is the case with the remaining respondents in our example).

If the response *Device Instance* is that of an MS/TP device, then the associated *MAC* information pertains only to the router that **delivered** the response.

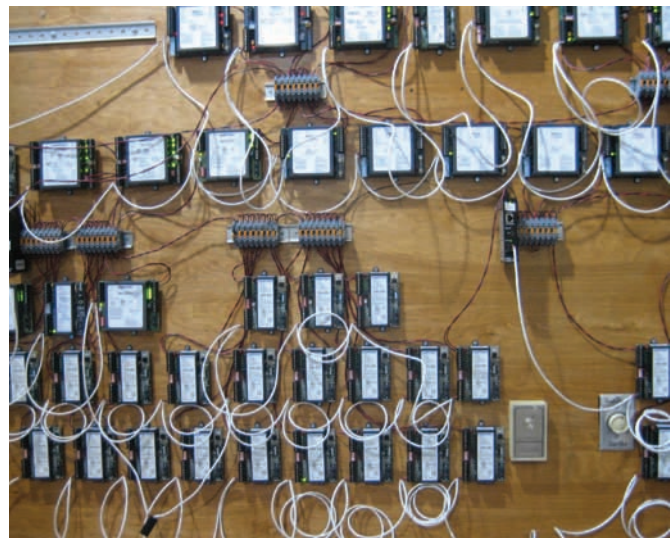
The first response shows device 202162. Its information tells us it is a BACnet/IP device (*Net* value 0) whose *MAC* value reported an IP address of 0A0000D9 and a BACnet standard UDP port number of BAC0.

Responses 4 and 5 are for devices 3015 and 3002, respectively. Because these two lines have identical *MAC* values, their *I-Am* responses must have passed through the *same* BACnet/IP router — a fact also indicated by the matching network numbers of 100. In this case the router's IP address is seen to be C0A85C64 — and the router used UDP port BAC0. **NOTE:** If you wish to convert the foregoing hexadecimal values into their decimal equivalents, the UDP port is simply 47808. The displayed hexadecimal IP address value converts to a dotted decimal IP address by converting two digits at a time to decimal. In this example, segment C0A85C64 into its quad address hex values: C0-A8-5C-64 — then these four hex pairs convert to 192.168.92.100.

Note that response 6 (for device 3044) passed through a different router that is identified by a *MAC* value of C0A85C65BAC0, and operating on network number 101. And also see that the final response (for device 3043) passed through yet another router identified by a *MAC* value of C0A85C66BAC0 and residing on network 102.

Finally, the last line in the sample screen indicates that once you have finished examining its display you can end the application by pressing any key. When you terminate the application, its window closes automatically.

You can download this handy, **free** application by pointing your browser to: <http://www.ccontrols.com/exe/bdt.exe>



BACnet Interoperability Board.