Remote Access Configuration for Multiple Buildings

To enable remote access to a BACnet system across a multi-building network, the building automation system (BAS) must be integrated with a secure and scalable networking infrastructure. This application note explains how to configure Contemporary Controls' BASrouters (BASRTSX-B) and Skorpion IP routers (EIGR-E) to enable seamless BACnet/IP communication across subnetted networks, providing secure remote access for multiple buildings. A BASview3 (BASV-3) graphical supervisor monitors and manages controllers in all buildings from a single location.

Introduction

BACnet/IP is widely used in building automation systems, but its reliance on broadcast messaging poses challenges in subnetted IP networks. While IP routers connect subnetted IP networks, they typically block broadcast traffic—an essential component of BACnet device discovery and communication. To overcome this, BBMDs are used to encapsulate and forward broadcast messages across subnets

BBMDs allow BACnet/IP devices on different subnets to communicate by converting broadcast messages into directed messages that can traverse IP routers. Each subnet typically requires a BBMD to decode and rebroadcast messages locally. Alternatively, if all BACnet/IP devices support Foreign Device Registration (FDR), only one BBMD is needed. Devices register with this BBMD, simplifying deployment and reducing hardware requirements.

The EIGR-E routers (with the firewall enabled) are connected to the Internet via their WAN ports and provide connectivity to local BACnet/IP devices through their LAN ports. The BASRTSX-B routers interconnect the BACnet/IP networks to the BACnet MS/TP networks. With BBMD enabled, the BASRTSX-B acts as a BBMD server to pass broadcast messages along the BACnet/IP network.

BACnet/IP Communication Using BBMD

The BASRTSX-B routers include a Broadcast Distribution Table (BDT) capable of storing the IP addresses and subnet masks of up to 50 BBMD peers. This functionality enables BACnet/IP broadcast traffic to be shared across multiple IP subnets and geographically separated buildings.

Application Overview

In this example, the system consists of three buildings: Building A, Building B, and Building C. Building A contains a BASV-3 graphical supervisor responsible for monitoring and managing controllers located in Building A as well as in Buildings B and C. A BASRTSX-B in Building A is configured as the primary BBMD for its local subnet.

To enable inter-building communication, the BASRTSX-B in Building A includes in its BDT the public IP addresses of the BBMD partners located in Buildings B and C. This configuration allows BACnet broadcast messages to be properly distributed between all participating subnets. The topology can be expanded to include additional remote sites by simply adding their corresponding BBMD entries to the BDT.

Network Architecture

Each building includes:

- An EIGR-E router with a public IP address on the WAN interface

- A local LAN containing:

  ◦ One BASRTSX-B configured as the BBMD server for that building

  ◦ Twelve BACnet controllers (BASC-22SR) controllers connected to the MS/TP serial port of the BASRTSX-B (in Buildings A and C)

  ◦ Twelve BACnet controllers (BASC-22DR) controllers located on the same BACnet/IP subnet as the BASRTSX-B in Building B.

Within each building, the BASRTSX-B routes traffic between the BACnet MS/TP and BACnet/IP networks while also performing BBMD functions to forward broadcast messages to remote buildings.
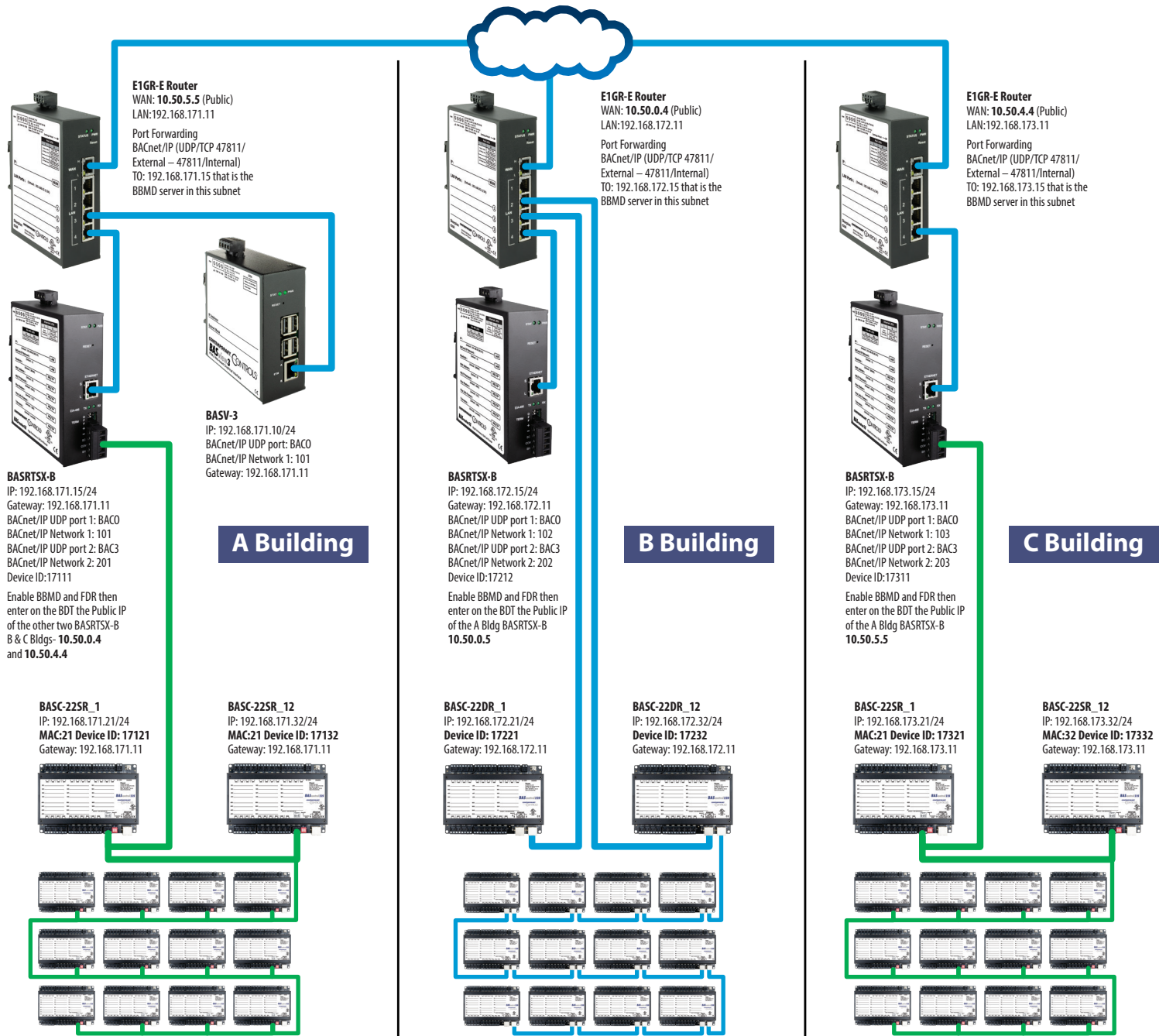
System Operation

With proper BBMD configuration and BDT entries:

- BACnet broadcast messages are forwarded as direct messages across subnets.

- Devices in Buildings B and C become discoverable from Building A.

- The BASV-3 supervisor in Building A can discover, monitor, and manage all controllers across the three buildings

This configuration provides a scalable and efficient method for connecting multiple remote buildings over BACnet/IP using BBMD, while maintaining proper broadcast distribution and device discovery across routed IP networks.

The detailed configuration settings and network topology diagram are provided below.

E1GR-E Router
WAN: **10.50.5.5** (Public)
LAN:192.168.171.11

Port Forwarding
BACnet/IP (UDP/TCP 47811/
External – 47811/Internal)
TO: 192.168.171.15 that is the
BBMD server in this subnet

BASV-3
IP: 192.168.171.10/24
BACnet/IP UDP port: BAC0
BACnet/IP Network 1: 101
Gateway: 192.168.171.11

BASRTSX-B
IP: 192.168.171.15/24
Gateway: 192.168.171.11
BACnet/IP UDP port 1: BAC0
BACnet/IP Network 1: 101
BACnet/IP UDP port 2: BAC3
BACnet/IP Network 2: 201
Device ID:17111

Enable BBMD and FDR then
enter on the BDT the Public IP
of the other two BASRTSX-B
B & C Bldgs- **10.50.0.4**
and **10.50.4.4**

A Building

BASC-22SR_1
IP: 192.168.171.21/24
MAC:21 Device ID: 17121
Gateway: 192.168.171.11

BASC-22SR_12
IP: 192.168.171.32/24
MAC:21 Device ID: 17132
Gateway: 192.168.171.11

E1GR-E Router
WAN: **10.50.0.4** (Public)
LAN:192.168.172.11

Port Forwarding
BACnet/IP (UDP/TCP 47811/
External – 47811/Internal)
TO: 192.168.172.15 that is the
BBMD server in this subnet

BASRTSX-B
IP: 192.168.172.15/24
Gateway: 192.168.172.11
BACnet/IP UDP port 1: BAC0
BACnet/IP Network 1: 102
BACnet/IP UDP port 2: BAC3
BACnet/IP Network 2: 202
Device ID:17212

Enable BBMD and FDR then
enter on the BDT the Public IP
of the A Bldg BASRTSX-B
10.50.5.5

B Building

BASC-22DR_1
IP: 192.168.172.21/24
Device ID: 17221
Gateway: 192.168.172.11

BASC-22DR_12
IP: 192.168.172.32/24
Device ID: 17232
Gateway: 192.168.172.11

E1GR-E Router
WAN: **10.50.4.4** (Public)
LAN:192.168.173.11

Port Forwarding
BACnet/IP (UDP/TCP 47811/
External – 47811/Internal)
TO: 192.168.173.15 that is the
BBMD server in this subnet

BASRTSX-B
IP: 192.168.173.15/24
Gateway: 192.168.173.11
BACnet/IP UDP port 1: BAC0
BACnet/IP Network 1: 103
BACnet/IP UDP port 2: BAC3
BACnet/IP Network 2: 203
Device ID:17311

Enable BBMD and FDR then
enter on the BDT the Public IP
of the A Bldg BASRTSX-B
10.50.5.5

C Building

BASC-22SR_1
IP: 192.168.173.21/24
MAC:21 Device ID: 17321
Gateway: 192.168.173.11

BASC-22SR_12
IP: 192.168.173.32/24
MAC:32 Device ID: 17332
Gateway: 192.168.173.11

Building A Equipment settings:
EIGR-E Router WAN: **10.50.5.5** (Public) LAN:192.168.171.11
Port Forwarding BACnet/IP UDP/TCP: 47811/External; 47811/Internal TO: 192.168.171.15 (the BBMD server in this subnet)
BASRTSX-B IP: 192.168.171.15/24 Gateway:192.168.171.11 BACnet/IP UDP port 1: BAC0 BACnet/IP Network 1: 101 BACnet/IP UDP port 2: BAC3 BACnet/IP Network 2: 201 Device ID:17111 Enable BBMD and FDR, then enter on the BDT the Public IPs of the other two BASRTSX-B devices (**B & C Bldgs-10.50.0.4** and **10.50.4.4**)
BASV-3 IP: 192.168.171.10/24 BACnet/IP UDP port: BAC0 BACnet/IP Network 1: 101 Gateway: 192.168.171.11
BASC-22SR_1 IP: 192.168.171.21/24 **MAC:21 Device ID: 17121** Gateway: 192.168.171.11
BASC-22SR_12 IP: 192.168.171.32/24 **MAC:32 Device ID: 17132** Gateway: 192.168.171.11
Building B Equipment settings:
EIGR-E Router WAN: **10.50.0.4** (Public) LAN:192.168.172.11
Port Forwarding BACnet/IP UDP/TCP: 47811/External; 47811/Internal TO: 192.168.172.15 (the BBMD server in this subnet)

BASRTSX-B
IP: 192.168.172.15/24
Gateway:192.168.172.11
BACnet/IP UDP port 1: BAC0
BACnet/IP Network 1: 102
BACnet/IP UDP port 2: BAC3
BACnet/IP Network 2: 202
Device ID:17212
Enable BBMD and FDR, then enter on the BDT the Public IP of the **A Bldg BASRTSX-B** (**10.50.5.5**)

BASC-22DR_1
IP: 192.168.172.21/24
Device ID: 17221
Gateway: 192.168.172.11

BASC-22DR_12
IP: 192.168.172.32/24
Device ID: 17232
Gateway: 192.168.172.11

Building C Equipment settings:

EIGR-E Router
WAN: **10.50.4.4** (Public)
LAN:192.168.173.11

Port Forwarding
BACnet/IP UDP/TCP: 47811/External; 47811/Internal
TO: 192.168.173.15 (the BBMD server in this subnet)

BASRTSX-B
IP: 192.168.173.15/24
Gateway:192.168.173.11
BACnet/IP UDP port 1: BAC0
BACnet/IP Network 1: 103
BACnet/IP UDP port 2: BAC3
BACnet/IP Network 2: 203
Device ID:17311
Enable BBMD and FDR, then enter on the BDT the Public IP of the **A Bldg** BASRTSX-B (**10.50.5.5**)

BASC-22SR_1
IP: 192.168.173.21/24
MAC:21 Device ID: 17321
Gateway: 192.168.173.11

BASC-22SR_12
IP: 192.168.171.32/24
MAC:32 Device ID: 17332
Gateway: 192.168.173.11

Conclusion

Configuring BASrouters and IP routers for multi-building BACnet/IP integration enables scalable, secure, and efficient communication across complex networks and remote networks. By leveraging BBMD and FDR functionality, building automation systems can achieve reliable performance and simplified management in a multi-building network.

Refer to our BASrouter Application Guide for detailed BACnet routing configuration examples that explain how our BASrouters can be used to solve a particular need.

Contemporary Controls provides three models of BACnet routers — the BASrouter, Portable BASrouter and the BASrouterSX. Contemporary Controls IP Routers are industrial grade routers with built-in switches with advanced features such as a Stateful Firewall, Port Forwarding and NAT. Visit the BASrouter and the IP Routers webpages to learn more.