

Understanding BACnet/SC for Easy IT Integration



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BACnet/SC introduces important aspects to implement cybersecurity standards and to easily integrate Building Automation networks into existing IT infrastructure. With BACnet/IP, the BMS installer only needed to request IP addresses from the IT department for the BACnet/IP devices at the installation site. BACnet/SC implements the robust concepts used for secure communications over the Internet by using Transport Layer Security (TLS). The BMS installer must be familiar with TLS communication concepts and be able explain their requirements to the IT folks for successful installation of the job site. This article will attempt to familiarize the building automation installers with these concepts.

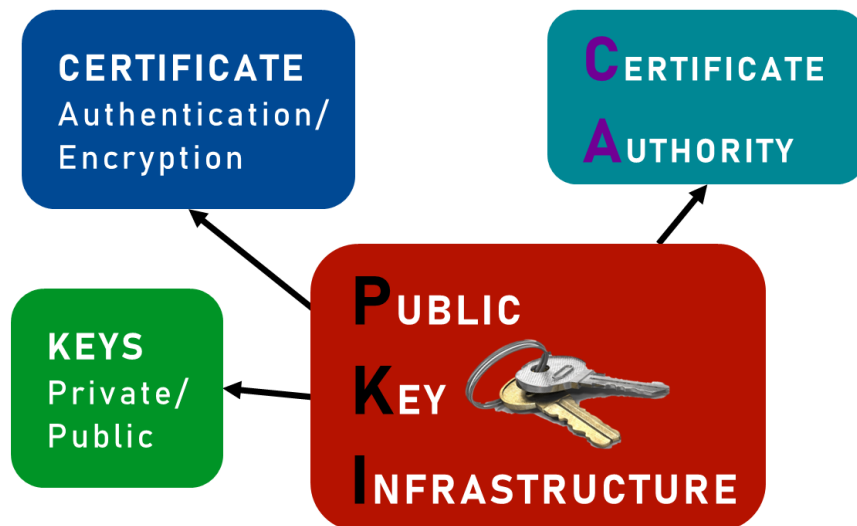


Basics of TLS (Certificates, Keys, and Certificate Authority)

TLS relies on the use of certificates and keys for data encryption, device authentication, and data integrity (i.e., no tampering). Keys occur in pairs (public/private key) and are used for encryption/decryption. A session key for communication may be generated after the initial key exchange for added security.

Certificates are used for authentication and encryption. The public key is part of the certificate, while the private key is secret to the device. The certificates are issued and managed by a central authority, commonly known as a Certificate Authority (CA). All devices must have certificates issued by the same CA to communicate. The device can get the certificate directly from the CA or send a Certificate Signing Request (CSR) to the CA to get the corresponding certificate.

Getting an SSL certificate (SSL is an older version of TLS) installed for a website might be a familiar concept to some people. The CA in this case is a well-known company like Verisign, Comodo, GoDaddy, Let's Encrypt, etc., that is trusted by all devices and browsers to provide access to the website seamlessly over the public internet.



Public Key Infrastructure to generate Keys and Certificates

For a building automation system, getting a certificate from a public CA is not necessary and can be expensive for a large number of devices. The IT department can implement their own infrastructure to generate these keys and certificates. The term PKI (Public Key Infrastructure) is used to define this setup. The building automation product

vendors may also have specific products to implement the PKI, but the certificates and keys for all devices at a site, irrespective of their brand, must be generated from the same tool to ensure interoperability. The certificates on devices also expire and need to be renewed. The validity period must be noted to ensure that the devices continue to communicate seamlessly as part of the BACnet/SC network.

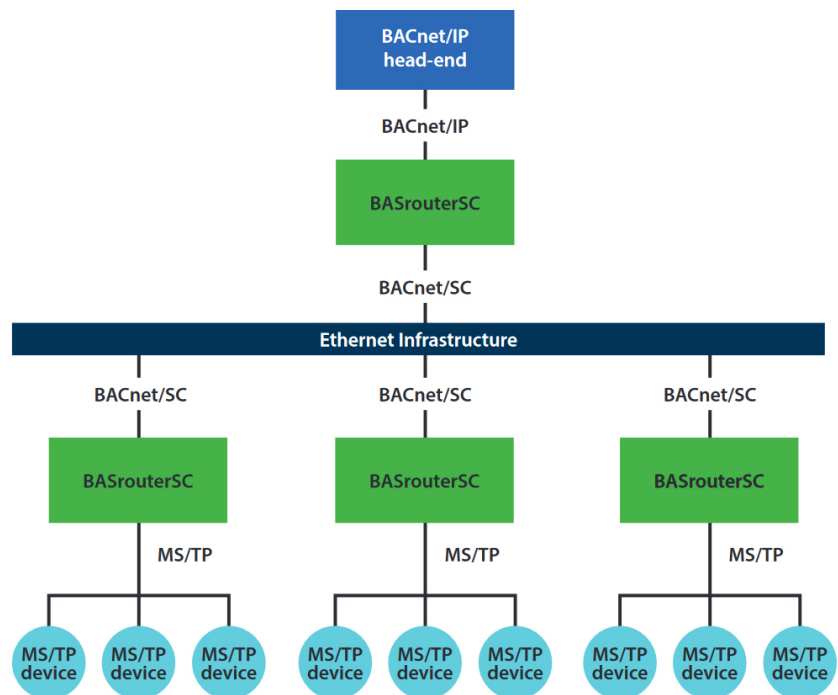


BACnet/IP vs BACnet/SC

BACnet/IP and BACnet/SC both operate over the IP layer. BACnet/IP uses unencrypted communication over the UDP port, while BACnet/SC is connection-based using TCP ports for encrypted communication. BACnet/IP uses broadcast messages for the discovery process and allows any BACnet/IP device to participate in the network.

BACnet/SC with TCP connections introduces the concept of “hub” and “node” devices. Nodes (or end devices) primarily communicate with each other via the hub using directed messages, and there are no broadcast messages. Direct node-to-node communication is supported as well. To provide redundancy, a primary hub and failover hub are used in the BACnet/SC network and must be configured on the the BACnet/SC devices. The number of connections supported by the hub is another consideration to allow for future expansion of the BACnet/SC network.

There may be a requirement to integrate existing BACnet/IP and BACnet MS/TP devices in the building with newer BACnet/SC devices. This can be achieved with the use of a BACnet router supporting these datalink layers, but it is recommended to keep the BACnet/SC and BACnet/IP networks separate.



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