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CAS BACnet Stack

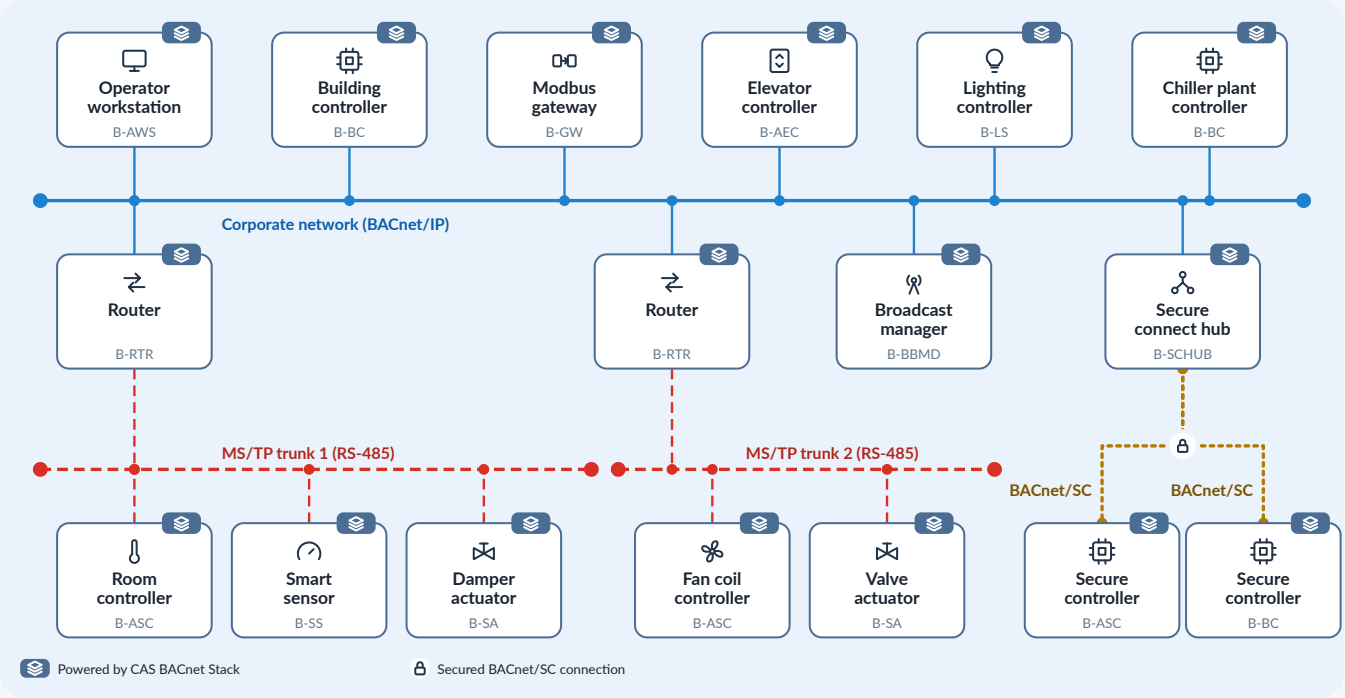
DESCRIPTION

The CAS BACnet Stack is a royalty-free C++ library, delivered with its full source code, that adds BACnet server and client communication to embedded devices and applications. It runs on Windows, Linux and microcontrollers, and implements ANSI/ASHRAE Standard 135-2024 at BACnet protocol revision 30.

Your firmware or application describes its points as BACnet objects. The stack answers requests from the network, asks your code for each value through callbacks, and sends requests of its own when your code acts as a client. The library is independent of your network hardware: it calls your application to send each message and to collect each message your application has received.

One library covers three data links (BACnet/IP, MS/TP over RS-485, and BACnet Secure Connect, BACnet/SC) and the roles a device plays on them: a field device, an operator workstation, a gateway with virtual devices, a BACnet router, a broadcast management device (BBMD) and a BACnet/SC hub.

The stack implements every required BACnet interoperability building block (BIBB) of 39 device profiles, and supports 61 object types in full. It comes with example projects, and with adapters for seven programming languages.



A building's BACnet network. Every device on it can run the CAS BACnet Stack.

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FEATURES

- **Add BACnet without writing a protocol stack.** The stack decodes, checks and answers BACnet messages. Your code describes its points and supplies their values.
- **One library across your product line.** The same stack runs in microcontroller firmware, on embedded Linux and on Windows, over BACnet/IP, MS/TP and BACnet/SC.
- **Ready for secure sites.** BACnet/SC is built in, so your device can join networks that require encrypted, authenticated connections.
- **Fits small devices.** The embedded build compiles only the object types, services and data links you enable.
- **Support from the engineers who maintain it.** Chipkin engineers help you from your first build through troubleshooting.

AT A GLANCE

Standard	ANSI/ASHRAE 135-2024
Protocol revision	30
Device profiles	39
BIBBs	160
Object types	61 in full
Platforms	Windows, Linux, microcontrollers (bare metal, FreeRTOS, Zephyr)
Language	C++17

WHAT YOU RECEIVE

- The full C++ source code, with CMake presets for the platforms listed below.
- Prebuilt libraries for Windows x64 (DLL) and Linux x64 (static and shared), in a release package with BACnet/SC and one without it.
- Adapters for C/C++, C#, Java, Python, Node.js, Go and Rust, and a Zephyr module for microcontroller firmware.
- Example projects for 21 device profiles, each with ready-to-run Windows and Linux binaries. Running one is the way to try the stack.
- The manual and API reference: every function, callback and constant, and a Quick Start that builds a working server.
- The unit test suite, to build and run on your own machine.

REQUIREMENTS AND DEPENDENCIES

Compiler	A C++17 compiler, and CMake 3.25 or later
Libraries	The C++ standard library (STL) and a heap
Does not need	Threads, C++ exceptions or run-time type information (RTTI). Make every call from one thread
Your application supplies	One send and one receive callback for all data links, regular calls to `BACnetStack_Tick()`, and a system time callback
For each data link	BACnet/IP: a UDP socket (port `47808` by convention). MS/TP: an RS-485 serial port and a 1 ms timer. BACnet/SC: a TLS 1.3 WebSocket
Platforms	Windows x64; Linux x64, x86, ARMv7 and ARM64; microcontrollers: bare metal, FreeRTOS, or Zephyr (a Zephyr module is included)

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SPECIFICATIONS

Standard	ANSI/ASHRAE Standard 135-2024, protocol revision 30 (24 minimum)
Data links	BACnet/IP (Annex J) with BBMD and foreign device registration; MS/TP (Clause 9); BACnet/SC (Annex AB), node and hub
MS/TP	Manager (master) nodes, MAC addresses 0 to 127, one port per application. Baud rate set by your application
BBMD tables	Foreign Device Table up to 128 entries; Broadcast Distribution Table up to 512 entries
APDU lengths	50, 128, 206, 480, 1024 and 1476 bytes (480 on MS/TP)
Segmentation	Segmented transmit and receive, as a client and as a server
Character sets	UTF-8, IBM/Microsoft DBCS, JIS X 0208, ISO 10646 UCS-4, UCS-2 and ISO 8859-1
Devices	Hosts one BACnet device, plus virtual devices behind a virtual router (gateway). As a client, it can send requests to any device on the network
Alarms, COV and trends	Intrinsic alarm reporting; COV subscriptions; Trend Log and Trend Log Multiple
Message decoding	BACnet messages to JSON or XML, for logging and web-based tools
Measured response	ReadProperty processed in 9.7 µs (median)

SUPPORTED DEVICE PROFILES

The 39 device profiles of Annex L for which the stack implements every required BIBB. ★ The most commonly used profiles.

Controller
B-SS Smart Sensor
B-SA Smart Actuator ★
B-ASC Application Specific Controller ★
B-AAC Advanced Application Controller
B-BC Building Controller ★

Life Safety Controller
B-ALSC Advanced Life Safety Controller
B-LSC Life Safety Controller

Access Control Controller
B-AACC Advanced Access Control Controller
B-ACC Access Control Controller

Miscellaneous
B-RTR Router
B-GW Gateway ★
B-BBMD Broadcast Management Device
B-ACDC Access Control Door Controller
B-ACCR Access Control Credential Reader
B-SCHUB Secure Connect Hub

Lighting Controller
B-LS Lighting Supervisor
B-LD Lighting Device

Elevator Controller
B-AEC Advanced Elevator Controller
B-EC Elevator Controller
B-EM Elevator Monitor

Authentication & Authorization
B-AS Authorization Server

Operator Interface
B-XAWS Cross-Domain Advanced Workstation
B-AWS Advanced Operator Workstation
B-OWS Operator Workstation
B-OD Operator Display

Life Safety Operator Interface
B-ALSWS Advanced Life Safety Workstation
B-LSWS Life Safety Workstation
B-LSAP Life Safety Annunciator Panel

Access Control Operator Interface
B-AACWS Advanced Access Control Workstation
B-ACWS Access Control Workstation
B-ACSD Access Control Security Display

General
B-GENERAL General

Lighting Operator Interface
B-ALWS Advanced Lighting Workstation
B-LOD Lighting Operator Display

Lighting Control Station
B-ALCS Advanced Lighting Control Station
B-LCS Lighting Control Station

Elevator Operator Interface
B-AEWS Advanced Elevator Workstation
B-EWS Elevator Workstation
B-ED Elevator Display

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SUPPORTED BIBBS

The 160 BIBBs the stack implements, by area of Annex K. An A BIBB is the client side of a service, a B BIBB the server side. Internal: the device works with its own objects; External: with objects in other devices. Deprecated: kept in the standard for historical purposes only.

Data Sharing (52)

DS-RP-A	ReadProperty-A
DS-RP-B	ReadProperty-B
DS-RPM-A	ReadPropertyMultiple-A
DS-RPM-B	ReadPropertyMultiple-B
DS-WP-A	WriteProperty-A
DS-WP-B	WriteProperty-B
DS-WPM-A	WritePropertyMultiple-A
DS-WPM-B	WritePropertyMultiple-B
DS-COV-A	COV-A
DS-COV-B	COV-B
DS-COVP-A	COV Property-A
DS-COVP-B	COV Property-B
DS-COVU-A	COV Unsubscribed-A
DS-COVU-B	COV Unsubscribed-B
DS-V-A	View-A
DS-AV-A	Advanced View-A
DS-M-A	Modify-A
DS-AM-A	Advanced Modify-A
DS-WG-A	WriteGroup-A
DS-WG-I-B	WriteGroup-Internal-B
DS-WG-E-B	WriteGroup-External-B
DS-COVM-A	COV Multiple-A
DS-COVM-B	COV Multiple-B
DS-LSV-A	Life Safety View-A
DS-LSAV-A	Life Safety Advanced View-A
DS-LSM-A	Life Safety Modify-A
DS-LSAM-A	Life Safety Advanced Modify-A
DS-ACV-A	Access Control View-A
DS-ACAV-A	Access Control Advanced View-A
DS-ACM-A	Access Control Modify-A
DS-ACAM-A	Access Control Advanced Modify-A
DS-ACUC-A	Access Control User Config-A
DS-ACUC-B	Access Control User Config-B
DS-ACSC-A	Access Control Site Config-A
DS-ACSC-B	Access Control Site Config-B
DS-ACAD-A	Access Control Access Door-A
DS-ACAD-B	Access Control Access Door-B
DS-ACCDI-A	Access Control Credential Data Input-A
DS-ACCDI-B	Access Control Credential Data Input-B
DS-LO-A	Lighting Output-A
DS-LOS-A	Lighting Output Status-A
DS-ALO-A	Advanced Lighting Output-A
DS-LO-B	Lighting Output-B
DS-BLO-B	Binary Lighting Output-B
DS-LV-A	Lighting View-A
DS-LAV-A	Lighting Advanced View-A
DS-LM-A	Lighting Modify-A
DS-LAM-A	Lighting Advanced Modify-A
DS-EV-A	Elevator View-A
DS-EAV-A	Elevator Advanced View-A
DS-EM-A	Elevator Modify-A
DS-EAM-A	Elevator Advanced Modify-A

Alarm and Event Management (39)

AE-N-A	Notification-A
AE-N-I-B	Notification-Internal-B
AE-N-E-B	Notification-External-B
AE-ACK-A	Acknowledge-A
AE-ACK-B	Acknowledge-B
AE-ASUM-A	Alarm Summary-A (deprecated)
AE-ASUM-B	Alarm Summary-B (deprecated)
AE-ESUM-A	Enrollment Summary-A (deprecated)
AE-ESUM-B	Enrollment Summary-B (deprecated)
AE-INFO-A	Information-A (deprecated)
AE-INFO-B	Information-B
AE-LS-A	LifeSafety-A
AE-LS-B	LifeSafety-B
AE-VN-A	View Notifications-A
AE-AVN-A	Advanced View Notifications-A
AE-VM-A	View and Modify-A
AE-AVM-A	Advanced View and Modify-A
AE-AS-A	Alarm Summary View-A
AE-ELV-A	Event Log View-A
AE-ELVM-A	Event Log View and Modify-A
AE-EL-I-B	Event Log-Internal-B
AE-EL-E-B	Event Log-External-B
AE-NF-B	Notification Forwarder-B
AE-NF-I-B	Notification Forwarder-Internal-B
AE-CRL-B	Configurable Recipient Lists-B
AE-TES-A	Temporary Event Subscription-A
AE-LSVN-A	Life Safety View Notifications-A
AE-LSAVN-A	Life Safety Advanced View Notifications-A
AE-LSVM-A	Life Safety View and Modify-A
AE-LSAVM-A	Life Safety Advanced View and Modify-A
AE-AC-A	Access Control-A
AE-AC-B	Access Control-B
AE-ACAVN-A	Access Control Advanced View Notifications-A
AE-ACVM-A	Access Control View and Modify-A
AE-ACAVM-A	Access Control Advanced View and Modify-A
AE-EVN-A	Elevator View Notifications-A
AE-EAVN-A	Elevator Advanced View Notifications-A
AE-EVM-A	Elevator View and Modify-A
AE-EAVM-A	Elevator Advanced View and Modify-A

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SUPPORTED BIBBS, CONTINUED

Scheduling (10)

SCHED-A	Scheduling-A (deprecated)	SCHED-AVM-A	Advanced View and Modify-A	SCHED-TMR-I-B	Timer-Internal-B
SCHED-I-B	Internal-B	SCHED-VM-A	View and Modify-A	SCHED-TMR-E-B	Timer-External-B
SCHED-E-B	External-B	SCHED-WS-A	Weekly Schedule-A		
SCHED-R-B	Readonly-B	SCHED-WS-I-B	Weekly Schedule-Internal-B		

Trending (13)

T-VMT-A	View and Modify Trends-A (deprecated)	T-VMMV-A	View and Modify Multiple Values-A (deprecated)	T-V-A	View-A
T-VMT-I-B	View and Modify Trends-Internal-B	T-VMMV-I-B	View and Modify Multiple Values-Internal-B	T-AVM-A	Advanced View and Modify-A
T-VMT-E-B	View and Modify Trends-External-B	T-VMMV-E-B	View and Modify Multiple Values-External-B	T-A-A	Archival-A
T-ATR-A	Automated Trend Retrieval-A	T-AMVR-A	Automated Multiple Value Retrieval-A		
T-ATR-B	Automated Trend Retrieval-B	T-AMVR-B	Automated Multiple Value Retrieval-B		

Device Management (31)

DM-DDB-A	Dynamic Device Binding-A	DM-UTC-B	UTCTimeSynchronization-B	DM-ANM-A	Automatic Network Mapping-A
DM-DDB-B	Dynamic Device Binding-B	DM-RD-A	ReinitializeDevice-A	DM-ADM-A	Automatic Device Mapping-A
DM-DOB-A	Dynamic Object Binding-A	DM-RD-B	ReinitializeDevice-B	DM-ATS-A	Automatic Time Synchronization-A
DM-DOB-B	Dynamic Object Binding-B	DM-BR-A	Backup and Restore-A	DM-MTS-A	Manual Time Synchronization-A
DM-DCC-A	DeviceCommunicationControl-A	DM-BR-B	Backup and Restore-B	DM-SP-VM-A	Subordinate Proxy-View and Modify-A
DM-DCC-B	DeviceCommunicationControl-B	DM-R-A	Restart-A	DM-LOM-A	Lighting Output Management-A
DM-TM-A	Text Message-A	DM-R-B	Restart-B	DM-DDA-A	Dynamic Device Assignment-A
DM-TM-B	Text Message-B	DM-LM-A	List Manipulation-A	DM-DDA-B	Dynamic Device Assignment-B
DM-TS-A	TimeSynchronization-A	DM-LM-B	List Manipulation-B	DM-DAP-VM-A	Device Address Proxying-View and Modify-A
DM-TS-B	TimeSynchronization-B	DM-OCD-A	Object Creation and Deletion-A		
DM-UTC-A	UTCTimeSynchronization-A	DM-OCD-B	Object Creation and Deletion-B		

Network Management (7)

NM-RC-B	Router Configuration-B	NM-FDR-A	Foreign Device Registration-A	NM-SCCM-A	Secure Connect Certificate Management-A
NM-BBMDC-A	BBMD Configuration-A	NM-SCH-B	Secure Connect Hub-B		
NM-BBMDC-B	BBMD Configuration-B	NM-CC-A	Communications Configuration-A		

Gateway (2)

GW-VN-B	Virtual Network-B	GW-EO-B	Embedded Objects-B

Audit Reporting (4)

AR-R-B	Reporter-B	AR-V-A	View-A
AR-R-S-B	Reporter-Simple-B	AR-AVM-A	Advanced View and Modify-A

Authentication and Authorization (2)

AA-DAC-A	Dynamic Authorization Client-A	AA-AS-B	Authorization Server-B

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SUPPORTED OBJECT TYPES

★ The most commonly used object types. Supported in part: the object type is available, but not every property or behaviour of it is implemented; ask Chipkin for the details.

Supported in full

Access Credential
Access Door
Access Point
Access Rights
Access User
Access Zone
Accumulator
Alert Enrollment
Analog Input ★
Analog Output ★
Analog Value ★
Averaging
Binary Input ★
Binary Lighting Output
Binary Output ★
Binary Value ★
BitString Value
Calendar
Channel
CharacterString Value
Color
Color Temperature
Command
Credential Data Input
Date Pattern Value
Date Value
DateTime Pattern Value
DateTime Value
Device ★
Elevator Group
Escalator
Event Log
File
Global Group
Group
Integer Value
Large Analog Value
Life Safety Point
Life Safety Zone
Lift
Lighting Output
Load Control
Loop
Multi-state Input ★
Multi-state Output ★
Multi-state Value ★
Network Port ★
Notification Class
Notification Forwarder
OctetString Value
Positive Integer Value
Program
Pulse Converter
Schedule
Staging
Structured View
Time Pattern Value
Time Value
Timer
Trend Log
Trend Log Multiple

Supported in part

Audit Log
Audit Reporter
Event Enrollment

COMPANY HISTORY

Chipkin Automation Systems Inc. was founded in 2000 in Vancouver, B.C. Chipkin builds protocol gateways and BACnet software, and provides integration support and custom development, across more than 220 protocols. Device manufacturers use the CAS BACnet Stack to add BACnet to their products.

1,000,000+ device installations of the CAS BACnet Stack

25+ years of BACnet experience

SALES AND CUSTOMER SERVICE

Chipkin is proud to provide support for our products. For technical support, sales, and customer service, please contact us.

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A C++ library by Chipkin Automation Systems. Implements ANSI/ASHRAE Standard 135-2024, BACnet protocol revision 30.
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