Data Sheet CODESYS BACnet SL

CODESYS BACnet SL is a product that extends the functionality of a device in order to be able to implement applications in building management systems compliant to ANSI/ASHRAE Standard 135-2020. This function is integrated directly into the CODESYS Development System.

Product description

BACnet

BACnet (**B** uilding **A** utomation and **C** ontrol **Net** work) is a network protocol for building automation. It is developed by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), standardized by ASHRAE 135-2020, ANSI, and ISO 16484-5 and continuously updated. This open standard enables building operators to use BACnet compliant devices from different manufacturers interoperably.

BACnet basics

BACnet defines an **object model** in which a physical device is represented by a group of standardized BACnet objects. Each object type provides a well defined list of **properties**. BACnet devices provide various **services** and **procedures** to other devices, depending on the complexity of the device. So-called **BIBBs** (BACnet Interoperability Building Blocks) define the set of services and procedures which must be supported on the server and client side in order to realize certain requirements of the system. BACnet devices are classified by a **device profile**. Device profiles can range from a simple smart sensor (**B-SS**) to a complex building controller (**B-BC**). The **PICS** (Protocol Implementation Conformance Statement) document associated with a BACnet device lists all supported BIBBs, object types, character sets, and communication options. BACnet devices communicate over network, in most cases via BACnet/IP and to a lesser extent via BACnet MS/TP (BACnet Manager-Subordinate Token-Passing).

CODESYS BACnet

CODESYS BACnet SL enables the implementation of building automation applications in compliance with ANSI/ASHRAE Standard 135-2020. All object types defined in ANSI/ASHRAE Standard 135-2020 and all services required for application development are supported. Integrated libraries, devices and plug-ins enable the configuration and implementation of an application with BACnet support. For example, to provide an analog value (BACnet Analog Value) in the BACnet network, a corresponding BACnet Analog Value device simply has to be inserted in the device tree of the CODESYS application.
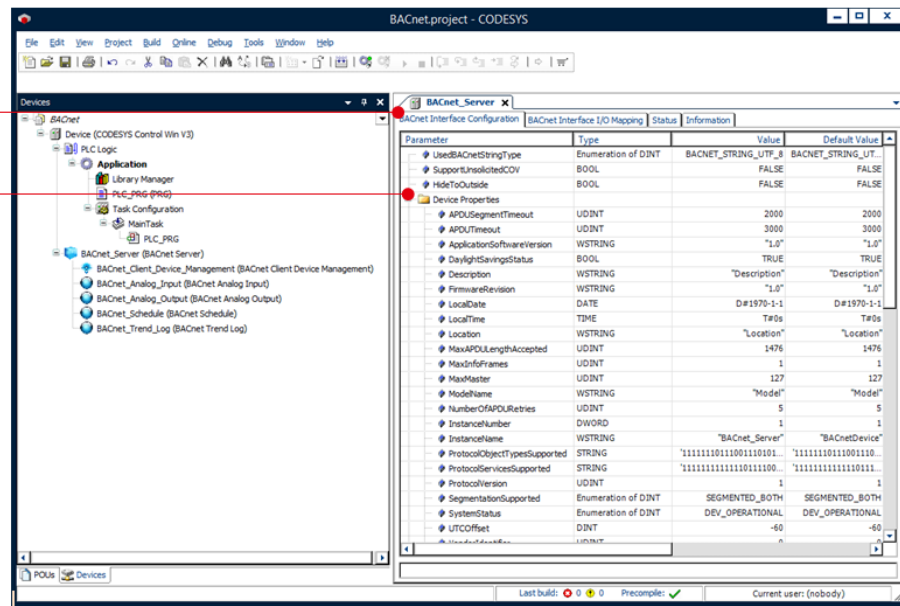
Picture 1: Example of a simple BACnet application in CODESYS

Architecture

CODESYS BACnet SL is based on a runtime component which contains the BACnet stack. This runtime component is accessed by a plug-in that provides libraries and devices for this purpose. There are three libraries: CmpBACnet, BACnet and BACnetDefaultImpl.

The **CmpBACnet** library provides all the BACnet data types, as well as a low level API to access the BACnet stack.

The **BACnet** library is about to significantly simplify the task of BACnet application programming. It provides easy to use function blocks for BACnet objects and client requests, as well as an event mechanism to handle BACnet stack service request callbacks. BACnet object properties can be configured regarding existance, writability and persistance.

The **BACnetDefaultImpl** library serves to further reduce the development effort and the amount of IEC application code the application developer has do create. This applies especially for the aspects for which the BACnet standard ASHRAE 135 doesn't provide definitions. CODESYS implementations for those aspects need to be based on assumptions on both the PLC and the application. That's why such implementations must not be fixed in BACnet library, preventing to realize different use cases or dealing with constraints. The BACnetDefaultImpl library is the place to put those "default implementations". In best case (assumptions fit the requirements/constraints) the "default implementation" of a certain aspect can be used out of the box. If this is not the case, the "default implementation" of a certain aspect can be used as a good example and starting point for a PLC / application specific implementation. BACnetDefaultImpl library contains amongst others "default implementations" covering

- Object/Property persistence
- Backup/Restore
- Trend Log
- Device Communication Control

- TimeSync/UTCTimeSync
- Unconfigured Device Discovery and Address Assignment
- Re-Init-Device

The **BACnet plugin** provides consistency checking of BACnet object IDs and library versions. Furthermore, the BACnet plugin provides functionality to export / import BACnet datapoints to / from an EDE file.

BACnet MS/TP

CODESYS BACnet SL provides communication via BACnet/IP. PLC manufacturers can extend CODESYS BACnet SL with a BACnet MS/TP device driver for their specific hardware.

BACnet objects

CODESYS BACnet SL supports all object types defined in the ANSI/ASHRAE standard 135-2020. The basic functionalities of the BACnet objects are implemented in the runtime component. This means, for example, that a BACnet server can respond to BACnet client read property requests without the user having to carry out any further implementations. Application-specific behavior can be implemented and adapted by the user via "hooks".

The BACnet objects are accessed at runtime via function blocks related to the devices.

For some of the BACnet objects, the behavior is not completely defined in the BACnet standard. For these aspects, either corresponding application code (*) is necessary or a "default implementation" (**) is available.

- Accumulator *
- Audit Log *
- Averaging *
- Event Log *
- Life Safety Point *
- Life Safety Zone *
- Network Port **
- Program *
- Trend Log **
- Trend Log Multiple *

"*" - BACnet objects marked with "*" require application code to complete aspects of the functionality not covered by the BACnet standard, but required in practice.

"**" - Some aspects of the functionality of the BACnet Network Port or Trend Log are not completely defined by the BACnet standard, but covered with a "default implementation" provided with CODESYS BACnet.

BACnet client access

The following BACnet client requests are available:

Acknowledge Alarm   Subscribe COV

	Get Enrollment Summary	
Add List Element	Get Event Info	Subscribe COV Property
Audit Log Query	Life Safety Operation	Subscribe COV Property Multiple
Backup BACnet Device	Read Property	Time Synchronization
Confirmed Private Transfer	Read Property Multiple	UTC Time Synchronization
Confirmed Text Message	Read Stream File	Write Property
Create Object	Read Range	Write Property Multiple
Delete Object	Reinitialize Device	Write Stream File
Device Communication Control	Remove List Element	
Get Alarm Summary	Restore BACnet Device	

BACnet client access is provided by BACnet client function blocks which can be used via CODESYS BACnet client devices or directly without a device.

BACnet Interoperability Building Blocks (BIBBs)

The following BACnet Interoperability Building Blocks can be used with CODESYS BACnet:

DS-RP-A	DS-COVU-B	SCHED-E-B	DM-TS-B**
DS-RP-B	AE-N-I-B	T-VMT-I-B	DM-UTC-A
DS-RPM-A	AE-N-E-B	T-VMT-E-B	DM-UTC-B**
DS-RPM-B	AE-ACK-B	T-ATR-B	DM-RD-B
DS-WP-A	AE-ASUM-B	T-VMMV-I-B*	DM-BR-B**
DS-WP-B	AE-ESUM-B	T-VMMV-E-B*	DM-R-B**
DS-WPM-B	AE-INFO-B	DM-DDB-A	DM-LM-B
DS-COV-A	AE-EL-I-B*	DM-DDB-B	DM-OCD-B**
DS-COV-B	AE-EL-E-B*	DM-DOB-B	DM-ATS-A
DS-COVP-A	AE-CRL-B	DM-DCC-B	DM-MTS-A
DS-COVP-B	SCHED-I-B	DM-TS-A	NM-BBMDC-B

"*" - BIBBs marked with "*" require application code to complete aspects of the functionality not covered by the BACnet standard, but required in practice.

"**" - Some aspects of the functionality of the BIBBs marked with "**" are not completely defined by the BACnet standard, but covered with a "default implementation" provided with CODESYS BACnet.

BACnet conformity and certificate

The conformity of BACnet devices - for example matching BACnet Device Profile B-BC - built with CODESYS BACnet SL can be tested and attested efficiently by an accredited BACnet testing laboratory. Corresponding tests are prepared and are used by CODESYS in the quality assurance process of CODESYS BACnet SL. A successful BACnet conformity test done by an accredited BACnet testing laboratory is the primary prerequisite for a BACnet certificate and

listing at BACnet International. Preparation and attendance of a BACnet conformity test requires detailed knowledge of the BACnet functionality, the testing procedures as well as the required documents. It is highly recommended to arrange appropriate consulting and support (by means of a service contract with CODESYS) prior to a BACnet conformity test.

BACnet protocol revision, changes in the BACnet standard and CODESYS BACnet major version

The enhancements and changes between ASHRAE 135-2012 and ASHRAE 135-2020 are so extensive, that complete compatibility from the point of view of the application - depending on the BACnet functional scope used - is not ensured.

CODESYS BACnet SL version <= 1.7.x.x implements the functionality standardized in BACnet standard ASHRAE 135-2012, supports protocol revision 14/15 and is referred to as CODESYS BACnet(1) (major version 1) for better differentiation.

CODESYS BACnet SL version >= 2.x.x.x implements the functionality standardized in BACnet standard ASHRAE 135-2020, supports protocol revision 25 and is referred to as CODESYS BACnet2 (major version 2) for better differentiation.

CODESYS BACnet SL therefore contains libraries and device descriptions for both protocol revision 25 (version >= 2.x.x.x) and protocol revision 14/15 (version <= 1.7.x.x). The libraries and device descriptions that support protocol revision 25 (CODESYS BACnet2) are named accordingly (CmpBACnet2, BACnet2, BACnet2DefaultImpl).

For new developments, CODESYS BACnet2 - i.e. protocol revision 25 - should be used as a priority. The CODESYS BACnet(1) libraries and device descriptions included are intended for maintaining existing applications without changing to protocol revision 25.

The procedure to migrate an existing application to CODESYS BACnet2 - i.e. protocol revision 25 - is described in the library documentation of the BACnet2 library.

Functional limitations of CODESYS BACnet(1)

CODESYS BACnet(1) has some functional limitations compared to CODESYS BACnet2.

Supported object types:

Accumulator*	Calendar	Integer Value	Notification Class
Analog Input	Command	Large Analog Value	Positive Integer Value
Analog Output	Device	Life Safety Point*	Program*
Analog Value	Event Enrollment	Life Safety Zone*	Pulse Converter
Averaging*	Event Log*	Loop	Schedule
Binary Input	File	Multi-state Input	Structured View
Binary Output	Global Group	Multi-state Output	Trend Log**
Binary Value	Group	Multi-state Value	Trend Log Multiple*

"*" - BIBBs marked with "*" require application code to complete aspects of the functionality not covered by the BACnet standard but required in real world applications.

"**" - Some aspects of BACnet Trend Log are not completely defined by the BACnet standard, but covered with a "default implementation" provided with CODESYS BACnet.

Furthermore, the following BACnet client requests are not supported:

- Audit Log Query
- Subscribe COV Property Multiple

General information

Supplier:

CODESYS GmbH

Memminger Strasse 151

87439 Kempten

Germany

Support:

Technical support is not included with this product. To receive technical support, please purchase a CODESYS Support Ticket.

https://support.codesys.com

Item:

CODESYS BACnet SL

Item number:

2303000005

Sales / Source of supply:

CODESYS Store
https://store.codesys.com

Included in delivery:

- Package for the CODESYS Development System including license agreement and online help
- License key

System requirements and restrictions

Programming System	CODESYS Development System V3.5.17.0 or higher
Runtime System	• CODESYS Control V3.5.19.0 or higher (für protocol revision 25) • CODESYS Control V3.5.15.0 or higher (für protocol revision 15)
Supported Platforms/ Devices	• CODESYS Control for Win (not RTE) • CODESYS Control for Linux • CODESYS Control for Raspberry Pi • CODESYS Control for BeagleBone • CODESYS Control for emPC-A/iMX6 • CODESYS Control for emPC-A/iMX6 • CODESYS Control for PLCnext • CODESYS Control for WAGO Touch Panels 600

Note: Other platforms are supported provided that the device manufacturer also supports CODESYS BACnet.

Additional Requirements	-
Restrictions	-
Licensing	

Single Device License: The license can be used on the target device/PLC on which the CODESYS Runtime System is installed.

Licenses are activated on a software-based license container (soft container), which is permanently connected to the controller. Alternatively the license can be stored on a CODESYS Key (USB-Dongle). By replugging the CODESYS Key, the license can be used on any other controller.

Required Accessories	-

Note: Technical specifications are subject to change. Errors and omissions excepted. The content of the current online version of this document applies.

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