BACnet: Cyclic Reading of a Property

Hardware

- Raspberry Pi as a BACnet server (provides data points)
- CODESYS Control Win V3 as a BACnet client (cyclic reading of the data points)

Requirements for the server and client

Check that the following entries are present in the file CODESYSControl.cfg.

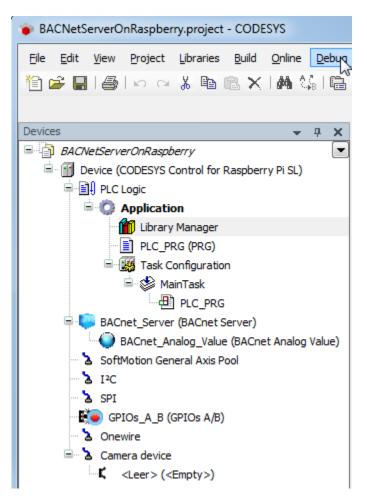
- Including the BACnet component: [ComponentManager] Component.[n+1]=CmpBACnet
- Including the INI file of the BACnet stack (pay attention to the syntax): [CmpBACnet] IniFile=bacstacd.ini

Requirements for the BACnet server

- Create a "Standard project" and select "CODESYS Control Raspberry Pi SL" as the device.
- Define the target system by means of the Network scan.

BACNetServerOnRaspberry.project* - CODESYS	6			
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Devices 👻 🗘 🗙	Device X			
BACNetServerOnRaspberry				
Device (CODESYS Control for Raspberry Pi SL)	Communication Settings	Scan Network Jateway - Device -		
E DLC Logic				
Application	Applications			
- 🏙 Ubrary Manager	Backup and Restore		•	: .
PLC_PRG (PRG)	backup and Restore		20 20 20 20	
🖹 🧱 Task Configuration	Files		IN IN IN IN	\sim
🖹 🍪 MainTask	1.105		Gateway	• (•)
PLC_PRG	Log		Gateway	
BACnet_Server (BACnet Server)	-	Gateway-1	-	[0301.A000.03C6] (active) -
BACnet_Analog_Value (BACnet Analog Value)	PLC Settings	IP-Address:		Device Name:
SoftMotion General Axis Pool		localhost		ThK_raspbeny
& IPC	PLC Shell	Port		Device Address:
- à spi		1217		0301.A000.03C6
- E GPIOs_A_B (GPIOs A/B)	Users and Groups			Target ID:
- a Onewire	Task Deployment			0000 0010
Camera device	Task Deployment			Target Type:
<pre>Leer> (<empty>)</empty></pre>	Status			4102
				Target Vendor:
	Information			35 - Smart Software Solutions GmbH
				Target Version:
				3.5.11.0
II				

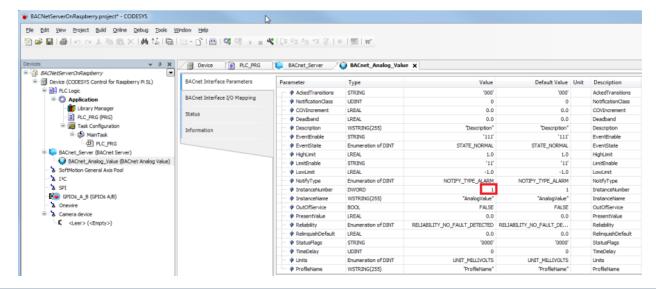
• Insert a "BACnet Server" and a "BACnet Analog Value" object in the device tree:



• Every device in a BACnet network must have a unique ID. Set this in the tab BACnet Interface Parameters of the "BACnet Server" object.

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evices v 9 X	Bevice PLC_PRG	Cont_Server X					
BACNetServerOnRaspberry E Device (CODESYS Control for Raspberry PI S.)	BACnet Interface Parameters	Parameter	Type	Value	e Default Value U		
- D PLC Logic	binchet proetrade Parameters		Frumeration of DINT				
B O Application	BACnet Interface I/O Mapping	UsedBACnetStringType		BACNET_STRING_UTF_8	BACNET_STRING_UTF_8		
1 Library Manager		SupportUnsolicitedCOV	BOOL	FALSE	FALSE		
PLC PRG (PRG)	Status	HideToOutside	BOOL	FALSE	FALSE		
File Processon File Pro		Device Properties					
RainTask	Information	APDUSegmentTimeout	UDINT	2000	2000		
D PLC_PRG		APDUTimeout	UDINT	3000	3000		
B BACnet, Server (BACnet Server)		ApplicationSoftwareVersion	WSTRING(255)	"1.0"	"1.0"		
 BACnet_Server (owCnet Server) BACnet Analog Value (BACnet Analog Value) 		DaylightSavingsStatus	BOOL	TRUE	TRUE		
Saftetotion General Axis Pool		 Description 	WSTRING(255)	"Description"	"Description"		
- A Softwork General Axis Pool		FirmwareRevision	WSTRING(255)	"1.0"	1.0*		
- 2 591		 LocalDate 	DATE	D#1970-1-1	D#1970-1-1		
BPI BPI BPI B (GPI DE A/B)		 LocaTime 	TIME	T#0s	T#0s		
CPIOS_A_B (CPIOS A/B)		 Decation 	WSTRING(255)	"Location"	"Location"		
Conevire Camera device		 MaxAPDULengthAccepted 	UDENT	1476	1476		
		 Ø MaxinfoFrames 	UDINT	1	1		
- C <leer> (<empty>)</empty></leer>		 Ø HaxMaster 	UDINT	127	127		
		- I ModelName	WSTRING(255)	"Model"	"Model"		
		NumberOfAPDURetries	UDINT	5	5		
		InstanceNumber	DWORD	718	1		
		InstanceName	WSTRING(255)	"BACnet_Server"	"BACnetDevice"		
		ProtocolObjectTypesSupported	STRING	111111111101111111100111001110101	1111111111011111111001110101		
		ProtocolServicesSupported	STRING	111111111111101111001000011110011111011	111111111111111011110010000011110011111011		
		ProtocolVersion	UDIINT	1	1		

Within a device, every instance of a BACnet object type (BACnet Analog Value, BACnet Binary Value, etc.) receives a unique ID. This remains unchanged here as the value "1".



Both the instance ID of the device and the instance ID of the object type are reused in the source code of the BACnet client.

• Adapt the "PLC_PRG" as follows:

BACNetServerOnRaspberry.project* - CODESYS <u>File E</u>dit <u>View Project Build Online D</u>ebug <u>T</u>ools <u>W</u>indow Hens 🎦 🚅 🔚 | 🎒 | い つ み 🖁 🛍 🗙 | 桷 🎼 | 🏪 + 🔓 | 🏙 | 🧐 🧐 🕨 📲 🔧 | ほ 💷 🖆 ぷ | や | 栗 | ╤ Devices д × 📄 PLC_PRG 🗙 Device • BACNetServerOnRaspberry 1 PROGRAM PLC_PRG 🚊 🕋 Device (CODESYS Control for Raspberry Pi SL) VAR -: BOOL; 3 xSwitch PLC Logic LREAL := 0.23; 4 lrValue ÷., Application END VAR 5 👘 Library Manager PLC_PRG (PRG) 🖹 🎆 Task Configuration 1 // Numeric simulation 2 IF xSwitch then 🖮 🍪 MainTask -3 lrValue := lrValue + 0.01; PLC_PRG -4 IF lrValue >= 5.0 THEN = 🧓 BA<u>Cnet Server (BACnet Ser</u>ver) 5 xSwitch := False; BACnet_Analog_Value BACnet Analog Value) 6 END IF SoftMotion General Axis Pool ELSE 7 Ъ I²C lrValue := lrValue - 0.01; 8 SPI SPI -9 IF lrValue <= -5.0 THEN 🐞 GPIOs_A_B (GPIOs A/B) 10 xSwitch := True; 11 END IF Onewire 12 END IF 🖹 为 Camera device 13 ____K <Leer > (<Empty>) 14 BACnet_Analog_Value PresentValue := lrValue; must be identical

Declaration

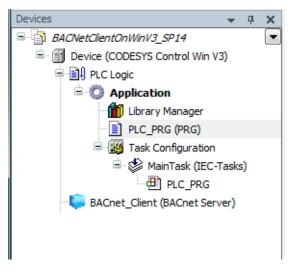
VAR xSwitch : BOOL; lrValue : LREAL := 0.23; END_VAR

Implement

```
ation
// Numeric simulation
IF xSwitch then
    IrValue := lrValue + 0.01;
    IF lrValue >= 5.0 THEN
        xSwitch := False;
    END_IF
ELSE
    IrValue := lrValue - 0.01;
    IF lrValue <= -5.0 THEN
        xSwitch := True;
    END_IF
END_IF
BACnet_Analog_Value.PresentValue := lrValue;
</pre>
```

Requirements for the BACnet client (As of BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and rename it to "BACnet_Client"

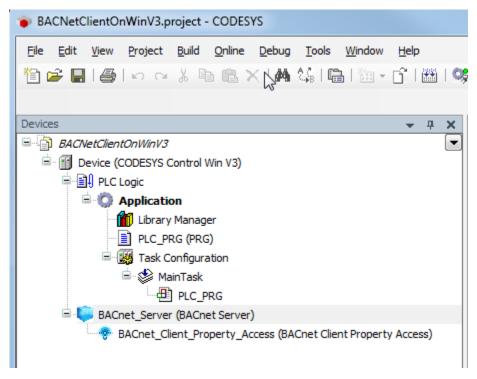


• Adapt the PLC_PRG POU as follows:

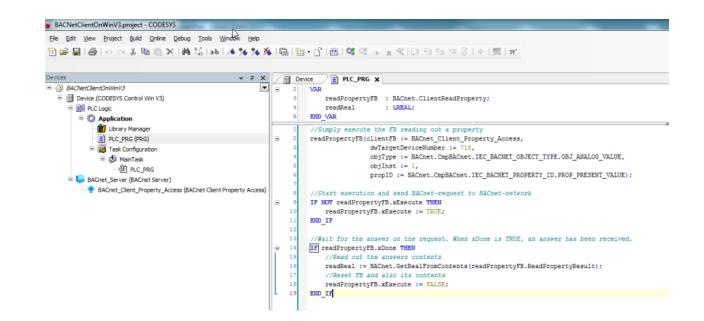
Declaration		
VAR fbReadProperty xReadExecute	: BACnet.BACnetClientReadProperty; : BOOL;	
lrReadValue	: LREAL;	
xInitDone END_VAR	: BOOL := FALSE;	
Implemen		

Requirements for the BACnet client (Up to BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and a "BACnet Client Property Access" object in the device tree.



• Adapt the "PLC_PRG" POU as follows:



Declaration

VAR	
readPropertyFB	: BACnet.ClientReadProperty;
readReal :	LREAL;
END_VAR	

Implement ation

```
//Simply execute the FB reading out a property
readPropertyFB(clientFB := BACnet_Client_Property_Access,
                dwTargetDeviceNumber := 718,
                objType := BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE,
                objInst := 1,
                propID := BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);
//Start execution and send BACnet-request to BACnet-network
IF NOT readPropertyFB.xExecute THEN
   readPropertyFB.xExecute := TRUE;
END_IF
//Wait for the answer on the request. When xDone is TRUE, an answer has been received.
IF readPropertyFB.xDone THEN
   //Read out the answers contents
   readReal := BACnet.GetRealFromContents(readPropertyFB.ReadPropertyResult);
   //Reset FB and also its contents
   readPropertyFB.xExecute := FALSE;
END_IF
```

Downloading and starting the projects

BACnet server

• Download the application to the PLC.

BACNetServerOnRespberry.project* - CDDESYS								
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Devices - 0. X	Device PLC_PRG X							
B 3 B4DietServerünRaspberry	Device Application JTLC_ITEG							
🖹 📀 💮 Device [connected] (CODESIIS Control for Raspberry P								10
RLC Logic	Expression		Value	Prepared value	Address	Comment		3
Application [run]	silvature	BOOL	-8.95088000888					<u> </u>
Ebrary Manager	· PValue	UREAL	-8.95000000000					
- 11 PLC_PRG (PRG)								
Task Configuration W MainTask								
- BI PLC PRS	1 // Americ simulation				A W			
= G BACnet_Server (BACnet Server)	B 2 0 IF aSwitch The							
G BACnet, Analog, Value (BACnet Analog Value)	3 0 lrValue 498 > (= lrValue 498 > + 0.01)							
SoftMotion General Axis Pool	H 4 0 IF lrValue 498 > >= 5.0 THES							
- O & IC	5 0 xSwitch THUE (= False)							
- 🖸 🔓 spt	6 BD_IF							
GPIDe_A_B (GPIDe A/B)	0 0 1rValue 480 > := 1rValue 480 > - 0.01;							
G & Onewire	S 9 0 IF inValue data a cm -5.0 THEN							
🖷 😏 🏅 Camera destos	10 0 zSwitch nut := True;							
C «Leer» («Empty»)	11 HD_IF 12 HD_IF							
	13							
	14 BACnet_Analog_Value.FrementValue_did + := irValu	-0.96 + ;						
	15 O RETURN							
								100 %
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	generate code							
	generate global initializations							
· · · · · ·	generate code initialization							
POUr Structure	generate relocations Size of generated code: 120+08 bytes							
	Size of generated code: 328408 bytes Last build: O 0 • 0 Precome	ole: 🗸 🤹 R	UN	Program loade	4	Program unchanged	Current user: (nobody) INS L	a 13 Col 1 Ch 1

BACnet client

• Download the application to the PLC.

BACNetClientOnWinV3.project - CODESYS	N		_			_	- 0 X					
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		 International and the 1300 tml 										
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= 3 840/et/lent0nillin/3	Device Application PLC_PRG											
Device [connected] (CODESIIS Control Win V3)	Expression	Type Value	Prepared value	Address	Comment		R.					
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Application (run)	readropertyre readReal	84Cret.ClentReadP LREAL L.1100000143051147										
Ebrary Manager	Prezkasi	UKEAL LILOUDUIHUUUUUH										
Inc_mas (mas)	1 //Simply execute the FB readi	ar ait a wanastii	V W									
= 🧱 Task Configuration	B 2 0 readPropertyFB (clientFB 1= BA	Chet Cliest Property Loseas.										
iii · 级 MainTask □————————————————————————————————————		elfanker 718 1= 718,										
= 🖓 🥃 84Cnet_Server (84Cnet Server)		HOG * := BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_AMALOG_VALUE,										
 O SAChet_Clent_Property_Access (BAChet Cle 	5 objInst 1	i= 1,										
- CF T BACHEL_CHENT_Property_Access (pachet CHE	a propid Page 4	<pre>HE > := BACnet.CmpBACnet.IEC_BACHET_FROPERTY_ID.PROP_PRESENT_VALUE);</pre>										
	7 1 //Start execution and send BA	The second second second										
	9 0 17 MUT readPropertyTS.xEsecut											
	10 readFropertyID.xIsscute 10											
	11 110 17											
	12											
		request. When xDone is TRUE, an answer has been received.										
	= 14 0 IF readFropertyTB.xDone											
	15 //Read out the answers co 16 0 readReal 111 + := BAC	stents net.GetRealFromContents(readFropertyTB.ReadFropertyResult);										
	17 //Reset FD and also its c	net.wetwealridmLoncencs(resiropertyrb.wesorropertywesult);										
	10 c readFropertyFB.xEsecute											
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Reading a device property

If for example general properties of the device be read, then you have to pay attention that the ID of the device number agrees with the object instance. Example: Reading the revision number of the firmware: