

# RZ/N2L Group

BACnet Controller Sample Software

# Introduction

This document describes sample software for executing BACnet Controller profile (B-BC) of BACnet communication protocol for building automation (BA) on RZ/N2L.

# **Target Device**

RZ/N2L Group

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# List of Abbreviations and Acronyms

In this document, the terms below are defined as follows:

Terms	Description
FSP	Flexible Software Package
RSK	Renesas Starter Kit
BA	Building Automation
BACnet	Building Automation and Control Networking
B-SS	BACnet Smart Sensor
B-BC	BACnet Building Controller
B-RTR	BACnet Router
B-OWS	BACnet Operator Workstation
Pmod	Peripheral module interface defined by Digilent Inc.
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ANSI	American National Standards Institute
BIBB	BACnet Interoperability Building Blocks
API	Application Program Interface
APDU	Application Layer Protocol Data Unit
SNTP	Simple Network Time Protocol
BTL	BACnet Testing Laboratories
MS/TP	Master Slave / Token Passing
BIP	BACnet/IP
BVLCI	BACnet virtual link control information
NPCI	network protocol control information

# **Related documents**

Document Type	Document Title	Document No.
Data Sheet	RZ/N2L Group Datasheet	R01DS0397EJ****
User's Manual	RZ/N2L Group User's Manual: Hardware	R01UH0955EJ****
User's Manual	Renesas Starter Kit+ for RZ/N2L User's Manual	R20UT4984EG****
Application Note	RZ/N2L Group TCP/IP IwIP Sample Program Package	R01AN6588EJ****
Application Note	RZ/N2L Group BACnet Sample Software	R01AN6789EJ****



# 1. Overview

## 1.1 Abstract

BACnet is the major communication protocol for building automation (BA). This document describes the configuration and usage of the sample software of BACnet controller (B-BC) with BACnet router function (B-RTR) that enables interoperation between BIP (BACnet/IP) device and MS/TP device in RZ/N2L, RZ processor for industrial network.



Fig. 1-1 RSK+ for RZ/N2L

Note that some figures in this document are reused from other BACnet application notes as long as it is not inconvenient for the reader to refer to them.



Since the sample software described in this document is BACnet Router, which is an interface connecting BACnet devices, the verification in this document uses an application on a PC as a BACnet Client and RZ/N2L BACnet Sample Software (R01AN6789xJ\*\*\*\*) as an MS/TP slave at the other end, as shown in Fig. 1-2.

For the convenience of explanation, the BACnet Router described in this document is referred to as B-BC and the corresponding BACnet Slave is referred to as B-SS.



Fig. 1-2 Subject of this document and test setup



# **1.2 Operating Environment**

# 1.2.1 Software Environment

The operating environment of this sample software is shown in Table 1-1

Category	Name	Version	Link	備考
RZ/N2L BACnet sample software	Sample Package			
IDE	e2studio	23.7.0	https://github.com/renesas/rzn- fsp/releases/download/v1.3.0/setup_rz	Included with e2studio installer
Flexible Software Package	FSP	1.3.0	<u>nfsp v1 3 0 e2s v2023-07.exe</u> .	Included with e2studio installer
GNU Arm Embedded Toolchain	GCC Toolchain	V9.3.1.202004 08 <sup>(*1)</sup>		Included with e2studio installer
BACnet/IP Client Tool	VTS	3.6.7.0	Visual Test Shell for BACnet download SourceForge.net	
BACnet/MSTP Master Tool	Yabe	1.3.0.0	Yet Another Bacnet Explorer download	
Packet analyzer	Wireshark	4.0.3	Wireshark · Download	
MS/TP Capture tool	mstpcap.exe		Capturing MS/TP packets – Optigo Networks (zendesk.com)	Integration with Wireshark.
Terminal Software	TeraTerm	4.108	Releases · TeraTermProject/teraterm (github.com)	

(\*1). The recommended version of GCC Toolchain for FSP v1.3.0 is v12.2.1.arm-12-24, but this sample software is tested with v9.3.1.20200408.

# 1.2.2 Hardware Environment

This sample software is tested under the hardware environment of Table 1-2.

#### Table 1-2 Hardware Environment

Name	Type Name	Maker	Link	Note
Renesas Starter Kit+ for RZ/N2L	RTK9RZN2L0S00 000BE	Renesas Electronics	www.renesas.com/rskrzn2l	RSK Board
Air Velocity Sensor Pmod™ Board	US082- FS3000EVZ	Renesas Electronics	<u>US082-FS3000EVZ - Air</u> <u>Velocity Sensor Pmod™ Board</u> <u>(Renesas Quick-Connect IoT)  </u> <u>Renesas</u>	Renesas Quick Connect IoT
USB/RS485 Convertor	BOB-09822	SparkFun	SparkFun USB to RS-485 Converter - BOB-09822 - SparkFun Electronics	2pcs (one for Yabe and one for Wireshark)



# 2. Hardware configuration

This section describes the hardware configuration of executing the sample software.

# 2.1 RSK Board Settings

When executing the sample software, configure the RSK board settings in Fig. 2-1

- The boot mode is xSPI0 boot mode.
- RS-485 half-duplex mode for BACnet MS/TP



Fig. 2-1 Board Configuration



### Table 2-1 DIPSW Settings

DIPSW		Setting	Default	Description
SW11	1	ON	ON	Enable LED_RED2 signal
	2	OFF	OFF	
	3	OFF	OFF	
	4	OFF	OFF	Enable RS485_RX signal
	5	ON	OFF	
	6	OFF	OFF	Disable P21_5、M2_VP、CAN_RX、ADTRG、P01_7
	7	OFF	OFF	
	8	OFF	OFF	
	9	OFF	OFF	
	10	OFF	OFF	
SW4	1	ON	ON	xSPI0 boot mode (x1 boot Serial flash)
	2	ON	ON	
	3	ON	ON	
	4	ON	ON	JTAG Authentication by Hash is disabled
	5	OFF	OFF	-
	6	OFF	OFF	Enables signals other the trace. (Motor, RS485, etc.) (TRACE_OPTION_SEL=H)
	7	ON	ON	Enables signals other than the external bus. (CAN, Emulator, I2C, etc.) (BSC_OPTION_SW=L)
	8	OFF	OFF	Enable SW3 (general purpose DIPSW)
SW8	1	OFF	OFF	Enable LED_GREEN
	2	ON	ON	
	3	OFF	OFF	
	4	ON	ON	Enable LED5
	5	OFF	OFF	
	6	OFF	OFF	Enable RS485_DE
	7	ON	OFF	
	8	OFF	ON	Disable P02_2, IRQ4, CAN_TX
	9	OFF	OFF	
	10	OFF	OFF	

### **Table 2-2 Jumper Settings**

Jumper	Setting	Default	Description
<b>J</b> 9	open	open	When using the J-Link <sup>®</sup> OB
	short		When using the external emulator or not using the emulator
CN31	2-3short	1-2short	RS485 Half Duplex
CN32	2-3short	1-2short	RS485 Half Duplex
CN20	1-2short	1-2short	When using 3 ports in the same PHY mode
CN21	1-2short	1-2short	When using 3 ports in the same PHY mode
CN22	1-2short	1-2short	When using 3 ports in the same PHY mode
CN24	2-3short	2-3short	Connect 1.8V Power rail to VCC1833_3. (Using XSPI0)
CN8	2-3short	2-3short	Select QSPI Serial Flash (QSPI_CS)
CN29	1-2short	1-2short	USB Serial (UART_USB_RX)



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CN27	1-2short	1-2short	HyperRAM (IC41)
CN25	1-2short	1-2short	Other than the SHOST interface(Trace, SPI, external bus)
CN17	2-3short	2-3short	Select 1.8V for VCC1833_2



# 3. Sample Software

This chapter describes the structure and usage of the sample software.

Please note that FSP v1.1.0 in the following figures should be read as v1.3.0.

# 3.1 Folder structure

The folder structure of the sample software is shown below. The bolded text aim for indicating folders containing files that users will customize with this sample software.

	5_41.0.0
ACNETOSS	BACnet Open Source Software
—bacnet	BACnet Protocol Stack
n	RZ
—arm	ARM
└──CMSIS_5	CMSIS
—aws	AWS
└──amazon-freertos	FreeRTOS
—board	Board
└──rzn2l_rsk	RZ/N2L Renesas Starter Kit
—fsp	Flexible Software Package
n_cfg	Configuration
-aws	AWS
-driver	r_xspi_qspi_cfg.h
_fsp_cfg	FSP
└──bsp	Board Support Package
n_gen	Generated files
cript	Linker Script
rc	User Thread Entry
ser	User files
-OSS	Other OSS
├──amazon-freertos	AWS_OSS
└──-lwip	IwIP_OSS
-renesas	Renesas common files
application	User IwIP application, RTC module, Flash access for configurable dat
├──module	User module
└──oss deps	IwIP OSS dependencies

Fig.3-1 Folder Structure



# 3.2 Boot Sequence

Describes the boot procedure and memory allocation.

The boot mode of the sample software is xSPI0 x1 boot. The figure below shows the BSP tag in the Smart Configurator.

🛛 🖲 • 🗞 • 🏪 🖉 🕸 •	💁 🕶 🔟 п			Q 🔡 🖬	C/C++	the Debug
Project Explorer ×	startup.c	C main.c		- C	18	», 🗖 🗖
E 😵 🍞 🖇 SRZN2L_BACnet_BSS_V1.1.0	Board Supp	oort Packa	ge Configuration	Generate Project Content	Th	ere is no
> S Binaries > D Includes > BACNETOSS	🐯 Restore Defau			Restore Defaults	<ul> <li>active editor that provides an outline.</li> </ul>	
> 😥 common	Device Select	ion				
> 🥵 rzn	FSP version:	1.3.0	~	Board Details		
> 😂 rzn_crg/aws > 🥵 rzn_gen	Board:	RSK+RZN2L	xSPI0 x1 boot mode) V	Renesas Starter Kit+ for RZ/N2L CPU Board (xSPI0 x1 boot mode)		
> 🥴 user/user_config	Device:	R9A07G084M	04GBG			
> 😂 user/user_fs3000_rz	Core:	CR52_0				
> 🔁 rzn_cfg	RTOS:	FreeRTOS				
> 🧀 script	Cumming PCD	Clashe Dies h	terrente Frankliche Starke Commonweite		-	
configuration.xml	Summary BSP	CIOCKS   PINS   I	terrupts event Links stacks Components			
JLinkLog.log	Problems	Console ×	Properties ARAN ARAN ARAN ARAN ARAN ARAN ARAN ARA	Disassembly 🚺 Memory 🛛 🔤 🔤 🖬	9 - 6	9 - ° C
RZN2L BACnet BSS V1.1.0 [	RE/IN FSP					
rzn2l_xspi0_x1_boot.cfg						
>	<					>

Fig.3-2 Boot mode

After downloading the program to the flash memory, the board operates independently by pressing the RESET button on the RSK board or turning the power ON without a debugger connection. You can still connect the debugger for evaluation. However, if jumper 9 (J9) of the RSK board is shorted, the debugger (J-Link OB) cannot be connected.



Fig.3-3 J9



This is the Smart Configurator screen showing the terminal settings (Pins tag) of the serial flash memory device. No changes are required because they have already been configured.



Fig.3-4 XSPI0 Pin Configuration

The order of memory writing in the boot sequence is shown in column "writing order" in the memory layout table below, and the memory is written in the order from (1) to (4). However, (5) is a storage area for data to be retained after the device is rebooted, regardless of the boot sequence. Therefore, they are written during running the system. See Chapter 5.3 for details.

Address	Memory	Content	Leng	th	writing order	remarks	
0x0000000		intvec(64B)				Internal	
0x0000040	ATCM	Unused	0x00020000	128KB	(3)	tightly coupled memory	
0x00000100	] [	hal_entry,ROMdata				lightly coupled memory	
0x00020000	Reserved area	-	-				
0x00100000		Unused				Internal	
0x00102000	BTCM	Loader program(24KB)	0x00020000	128KB	(2)	tightly coupled memory	
0x00108000		stack(60KB)				lightly coupled memory	
0x00120000	Reserved area	-	-				
0x10000000	SYSTEM_RAM	Unused	0x00180000	1.5MB			
0x10180000	Reserved area	-	-	-			
0x30000000	SYSTEM_RAM_MIRROR	Body of program and data	0x00180000	1.5MB	(4)	Non-cached system RAN	
0x30180000	Reserved area	-	-				
0x4000000	xSPI0_CS0_SPACE_MIRROR	Unused	0x04000000	64MB			
0x44000000	xSPI0_CS1_SPACE_MIRROR	Unused	0x04000000	64MB			
0x48000000	xSPI1_CS0_SPACE_MIRROR	Unused	0x04000000	64MB			
0x4C000000	xSPI1_CS1_SPACE_MIRROR	Unused	0x04000000	64MB			
0x50000000	CS0_SPACE_MIRROR	Unused	0x04000000	64MB			
0x54000000	CS2_SPACE_MIRROR	Unused	0x04000000	64MB			
0x58000000	CS3_SPACE_MIRROR	Unused	0x04000000	64MB			
0x5C000000	CS5_SPACE_MIRROR	Unused	0x04000000	64MB			
0x6000000		Parameters for the loader(76B)					
0x6000004C		Loader program(24KB)			(1)		
0x6000604C		Body of program and data					
0x60FFFE00	xSPI0_CS0_SPACE	Reserved area	0x04000000	64MB		512M bits Serial Flash	
0x63FF8000		Unused					
0x63FFC000		Configurable properties			(5)		
0x63FFC092		Unused					
0x64000000	xSPI0_CS1_SPACE	Unused	0x04000000	64MB			
0x68000000	xSPI1_CS0_SPACE	Unused	0x04000000	64MB			
0x6C000000	xSPI1_CS1_SPACE	Unused	0x04000000	64MB			
0x70000000	CS0_SPACE	Unused	0x04000000	64MB			
0x74000000	CS2_SPACE	Unused	0x04000000	64MB			
0x78000000	CS3_SPACE	Unused	0x04000000	64MB			
0x7C000000	CS5 SPACE	Unused	0x04000000	64MB			

Fig.3-5 Memory layout



#### (1) Writing to a Serial Flash Memory Device

e2studio writes the download data to a serial flash ROM with an extended serial peripheral interface (xSPI) assigned to xSPI0\_CS0\_SPACE memory. The download data includes the loader parameters, the loader program and its data, the user program itself and its data.

The memory allocations are specified in the linker script file (fsp\_xspi0\_boot.ld), which is in the script folder.

RZN2L\_BACnet\_BBC\_V\*\*\*\script\fsp\_xspi0\_boot.Id

#### (2) Deploy the loader program to BTCM

The CPU automatically extracts the loader program included in the download data to the BTCM. After extraction, break in system\_init() at the beginning of the initialization on the loader program.

#### (3) Deploy to ATCM

The initial setup of the loader program deploys the user program allocated in ATCM from flash memory to ATCM memory.

#### (4) Deploy to SYSTEM\_RAM\_MIRROR

The initial setup of the loader program deploys the user program allocated in the SYSTEM\_RAM\_MIRROR from the flash memory to the SYSTEM\_RAM\_MIRROR memory.



# 3.3 BACnet Stack

BACnet (Building Automation and Control Network) is the major communication protocol for Building Automation (BA) standardized in ASHRAE/ANSI Standard 135. Air conditioning, lighting, disaster prevention, access control, etc. can be integrated to control and monitor buildings.

BACnet devices are classified into different profiles according to their function and application, such as operator or controller. Major profiles include the central monitoring profile B-OWS (BACnet Operator Workstation), the controller profile B-BC (BACnet Building Controller), and the profile for various sensors B-SS (BACnet Smart Sensor).

The BACnet standard also defines standardized functional blocks (BIBBs) that should be supported for each profile, but it is permissible to support BIBBs that are not included there.

In this document, the sample software (RZN2L\_BACnet\_BBC\_V1.0.0) is called B-BC, but it supports both B-RTR and B-BC profiles.

The function of B-RTR profile is to allow BACnet clients connected to BACnet/IP networks to access B-SS connected to MS/TP networks via B-BC (B-RTR profile). In this case, B-BC (B-RTR profile) works as a MS/TP master for B-SS.

B-BC Profile allows BACnet clients to instruct B-BC (B-BC Profile) to log sensor input values from B-SS or schedule B-SS LEDs to turn on or off at any given day and time. B-BC (B-BC Profile) also functions as a BACnet server for BACnet clients in the upper network layer such as B-OWS.

# 3.3.1 BACnet Protocol Stack

BACnet Protocol Stack (bacnet-stack) is an open-source stack for the BACnet communication protocol. This sample software is a port of BACnet Protocol Stack to RZ/N2L.

#### Base Version : bacnet-stack-1.3.1

Tags · bacnet-stack/bacnet-stack · GitHub

### 3.3.2 License

The license terms for the BACnet Protocol Stack are GPL with exception license. The original text is transcribed below for reference. Please refer <u>BACnet Protocol Stack download | SourceForge.net</u> for more information and comply with the license terms and conditions.

This BACnet protocol stack implementation is specifically designed for the embedded BACnet appliance, using a GPL with exception license (like eCos), which means that any changes to the core code that are distributed are shared, but the BACnet library can be linked to proprietary code without the proprietary code becoming GPL. Note that some of the source files are designed as skeleton or example or template files, and are not copyrighted as GPL.

The text of the GPL exception included in each source file is as follows:

"As a special exception, if other files instantiate templates or use macros or inline functions from this file, or you compile this file and link it with other works to produce a work based on this file, this file does not by itself cause the resulting work to be covered by the GNU General Public License. However the source code for this file must still be made available in accordance with section (3) of the GNU General Public License."



# 3.3.3 Specifications

### 3.3.3.1 BACnet Revision

The protocol version and revision of the BACnet stack used in this sample software are as follows

- BACnet standard Protocol Version : 1
- BACnet standard Protocol Revision : 23

# 3.3.3.2 Service

The sequence of BACnet stack implemented in the sample software is service driven. Interoperability of BACnet devices is provided by the connection between users and providers via services (Whols, I-Am, ReadProperty, etc.).

There are two types of services: Unconfirmed and Confirmed. In the unconfirmed type, the provider does not return an Ack for the service requested by the user. On the other hand, confirmed type will return an Ack.

• **Users** of the sample software mean the following.

In the case of BACnet devices that interconnect over BACnet/IP, it corresponds to the client. For BACnet MS/TP, it corresponds to the master.

• **Providers** mean the following.

In the case of BACnet devices that interconnect over BACnet/IP, it corresponds to the server. For BACnet MS/TP, it corresponds to the slave.

The B-BC in this sample software is a server (provider) for BACnet client and a master (user) for B-SS slave. **Table 3-1** shows the services implemented in the sample software.(  $\checkmark$  : Applicable, blank : Not applicable)

BACnet service	Initiate <sup>1</sup>	Execute <sup>2</sup>
Who-Is	✓ (Request)	1
I-Am	✓ (Notification)	1
Who-Has		1
I-Have	✓ (Notification)	
ReadProperty	✓ (Request) <sup>3</sup>	1
WriteProperty	✓ (Request) <sup>3</sup>	1
DeviceCommunicationControl		1
ReinitializeDevice		1
AtomicReadFile		1
AtomicWriteFile		1
TimeSynchronization		1
UTCTimeSynchronization		1
SubscribeCOV		1

### **Table 3-1 Implemented Services**



BACnet service	Initiate <sup>1</sup>	Execute <sup>2</sup>
ConfirmedCOVNotification	✓ (Notification)	
UnconfirmedCOVNotification	✓ (Notification)	
ReadPropertyMultiple	✓ (Request) <sup>3</sup>	1
ReadPropertyConditional		
ReadRange		1
WritePropertyMultiple	✓ (Request) <sup>3</sup>	1
GetAlarmSummary		1
GetEventInformation		1
GetEnrollmentSummary		
AcknowledgeAlarm		1
ConfirmedEventNotification	✓ (Notification)	
UnconfirmedEventNotification	✓ (Notification)	
UnconfirmedTextMessage		
ConfirmedTextMessage		
AddListElement		
RemoveListElement		
CreateObject		
DeleteObject		
UnconfirmedPrivateTransfer		
ConfirmedPrivateTransfer		
VTOpen		
VTData		
VTClose		

 $\checkmark$  is applicable, blank is not applicable

1. Sends a BACnet service request or notification.

2. Execute the BACnet service and send a response (if a confirmed service is requested).

3. Service request to B-SS, but ReadPropertyMultiple and WritePropertyMultiple are unused.



The following is an overview of the implemented services

Table 3-2 Implemented	service overview
-----------------------	------------------

BACnet service	Description
Who-Is	Who-Is service is used by BACnet users to know which other BACnet devices are sharing the network. Who-Is service is a broadcasted, unconfirmed (does not require an Ack) service.
I-Am	I-Am service is intended to respond to Who-Is service requests. However, I-Am service requests are broadcast transmissions that can be sent anytime. Receipt of Who-Is service request need not be preceded.
Who-Has	Who-Has service is used by BACnet users to identify BACnet devices with specific objects. Who-Has service is a broadcasted, unconfirmed type of service.
I-Have	I-Have service is available to respond to Who-Has service requests. However, I-Have service requests can be issued at any time. Receipt of Who-Has service requests need not be preceded; I-Have service is sent broadcast and is an unconfirmed type of service.
ReadProperty	ReadProperty service is used by BACnet users to request the value of one property of one BACnet object; the BACnet provider responds with Ack and returns the result.
WriteProperty	WriteProperty service is used by BACnet users to change the value of a specified property of one of the BACnet objects. BACnet provider responds with an Ack. If you want to restrict the write access to a specified property, an error with "Error Class" PROPERTY and "Error Code" WRITE_ACCESS_DENIED is returned.
WritePropertyMultiple	The WritePropertyMultiple service is used by BACnet users to set the value of one or more specified properties of one or more BACnet objects. BACnet provider responds with Ack. BACnet users can write any number of properties of any number of objects.
DeviceCommunicationControl	DeviceCommunicationControl service is used by BACnet users to instruct other BACnet devices to stop starting the BACnet service for a specified period of time. The period can be set to "indefinite". BACnet provider responds Ack. If the period is set to "indefinite", the communication must be activated again by DeviceCommunicationControl or ReinitializeDevice service.
ReinitializeDevice	ReinitializeDevice service is used by BACnet users to instruct other BACnet devices to reboot; the BACnet provider responds with Ack.
TimeSynchronization	TimeSynchronization service is used by BACnet users to broadcast or unicast the current time to other BACnet devices so that the devices' clocks can be synchronized with each other. The BACnet provider will not respond with Ack because this service is unconfirmed.
UTCTimeSynchronization	UTCTimeSynchronization service is used by BACnet users to broadcast or unicast the UTC current time relative to the meridian to other BACnet devices so that they can synchronize their clocks with each other. This service is unconfirmed, so the BACnet provider does not respond Ack. The BACnet provider receiving this service subtracts the UTC_Offset property value from the received UTC time to obtain the local time.
SubscribeCOV	SubscribeCOV service is used by BACnet users to receive notification of changes in property values for a particular object; the BACnet provider responds with Ack. ConfirmedCOVNotification and UnconfirmedCOVNotification services are used by BACnet providers to transmit change notifications. The choice of confirmed or unconfirmed type is specified by SubscribeCOV service from the BACnet user. If BACnet providers that receive SubscribeCOV service issue COV notifications, they always send unicast to the BACnet user.
ConfirmedCOVNotification	ConfirmedCOVNotification service is used by BACnet providers to notify subscribers (BACnet users) of changes in the property values of a particular object; the BACnet user responds with Ack.
UnconfirmedCOVNotification	UnconfirmedCOVNotification service is used by BACnet providers to unicast notifications to subscribers of changes in certain object property values or to broadcast notifications of certain object properties (such as outdoor temperature) to many devices.



BACnet service	Description
ReadPropertyMultiple	ReadPropertyMultiple service is used by BACnet users to request the value of one or more specified properties of one or more BACnet objects. BACnet users can read any number of properties of any number of objects. In particular, the property identifier ALL can be used to retrieve all the properties of the object and its values at once.
ReadRange	ReadRange service is used by BACnet users; the BACnet provider reads a specific range of data items in the LogBuffer property of the TrendLog object and responds with Ack.
GetAlarmSummary	GetAlarmsummary service is used by BACnet users to obtain a summary of "active alarms". The BACnet provider responds Ack with an EventState property whose object value does not equal NORMAL and a NotifyType property whose value is ALARM.
GetEventInformation	GetEventInformation service is used by BACnet users to get an overview of all "active event states". BACnet providers will respond Ack with information about the object that notified them of the event.
AcknowledgeAlarm	AcknowledgeAlarm service is used by the BACnet user to tell the BACnet provider that the BACnet user has acknowledged the confirmedEventNotification service or UnconfirmedEventNotification service notified by the BACnet provider. The BACnet provider responds with Ack.
AtomicReadFile	AtomicReadFile service is used by BACnet users to read the BACnet provider's configuration data file to keep a backup of the file. The BACnet provider responds Ack.
AtomicWriteFile	The AtomicWriteFile service is used by BACnet users. The backup file of the configuration data is transferred to the BACnet provider, who restores the configuration data; the BACnet provider responds with Ack.



### 3.3.3.3 Restrictions

The released version V1.0.0 of this sample software has the following restrictions.

- ✓ This sample software does not implement all the functions required for a B-BC device, and BTL testing has not been carried out.
- ✓ This sample software is intended to connect to upper devices of B-BC with BACnet/IP protocol and lower devices with BACnet MS/TP protocol (Fig.3-6). As shown in Table 3-3, the B-BC in this sample software does not work as a BACnet/IP client device and cannot connect to subordinate devices of BACnet server. It also cannot be a MS/TP slave device.



Fig.3-6 BACnet devices that can be connected to B-BC

#### Table 3-3 Connectable device configuration

The Sample Software Connect to			BACnet/IP		BACnet MS/TP		
			Client	Server	Master	Slave	
	VTS				1		
Upper layer device	Yabe	BAChet/IP Client	Client		1		
		BACnet MS/TP	Master			<b>√</b> (*1)	
Lower layer device		BACnet/IP	Server				
	B-SS BACnet MS/	BACnet MS/TP	Slave			~	

✓ is applicable, blank is not applicable

(\*1) B-BC can transfer TOKEN between other MS/TP master devices, but does not support the execution of services such as ReadProperty and WriteProperty.



# 3.3.3.4 BIBBs

BIBBs (BACnet Interoperability Building Blocks) defines a set of services that apply to interoperating BACnet devices. "A" and "B" devices are defined, with the "A" device representing the BACnet user and the "B" device representing the BACnet provider.

BACnet standard (Annex L) defines various device profiles that describe the characteristics of each device, such as B-OWS (BACnet Operator WorkStation) and B-SS (BACnet Smart Sensor).

B-BC (BACnet Building Controller) in this sample software have both "A" and "B" characteristics.

The implemented BIBBs of the sample software is as follows. ( ✓ : Applicable, blank : Not applicable)

BIBB Class	BIBB	BACnet Service	Initiate <sup>1</sup>	Execute <sup>2</sup>	B-BC Standardized <sup>3</sup>
DataSharing	DS-RP-A,B	ReadProperty	1	1	1
	DS-WP-A,B	WriteProperty	1	1	1
	DS-RPM-A,B	ReadPropertyMultiple	✓ 4	1	1
	DS-WPM-A,B	WritePropertyMultiple	✓ 4	1	1
	DS-COV-B	SubscribeCOV		1	
		ConfirmedCOVNotification	1		
		UnconfirmedCOVNotification	1		
Device &	DM-DDB-A,B	Who-Is	1	1	1
Network Management		I-Am	1	1	1
	DM-DOB-B	Who-Has		1	1
		I-Have	1		1
	DM-DCC-B	DeviceCommunicationControl		1	1
	DM-TS-B	TimeSynchronization / UTCTimeSynchronization		1	1
	DM-RD-B	ReinitializeDevice		1	1
	DM-BR-B	AtomicReadFile		1	1
		AtomicWriteFile		1	1
		ReinitializeDevice		1	1
Alarm & Event	AE-N-I-B	ConfirmedEventNotification	1		1
Management		UnconfirmedEventNotification	1		1
	AE-ACK-B	AcknowledgeAlarm		1	1
	AE-INFO-B	GetEventInformation		1	1
Scheduling	SCHED-I-B	ReadProperty		1	1
		WriteProperty		1	1
		TimeSynchronization / UTCTimeSynchronization		1	1
	SCHED-E-B	ReadProperty		1	1
		WriteProperty	1	1	1
		TimeSynchronization / UTCTimeSynchronization		1	1

Table 3-4 Implemented BIBBs (B-BC Profile)



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# BACnet Controller Sample Software

Trending	T-VMT-I-B	ReadRange		1	1
	T-ATR-B⁵	ConfirmedEventNotification	1		~
		UnconfirmedEventNotification	✓		~
		ReadRange		1	1

✓ is applicable, blank is not applicable

1. Sends a BACnet service request or notification.

2. Execute the BACnet service and send a response (if a confirmed service is requested).

3. BIBBs which is defined as normalized for B-BC in ANNEX L.4 of BACnet standards.

4. It is used to request service to B-SS, but ReadPropertyMultiple and WritePropertyMultiple are not used.

5. BACnet service used by T-ATR-B is implemented but BUFFER\_READY event algorithm is not yet supported.

BIBB Class	BIBB	BACnet Service	Initiate <sup>1</sup>	Execute <sup>2</sup>	B-RTR Standardized <sup>3</sup>
DataSharing	DS-RP-B	ReadProperty		1	1
	DS-WP- B	WriteProperty		1	1
Device & Network	DM-DDB- B	Who-Is		1	1
Management		I-Am	1		1
	DM-DOB-B	Who-Has		1	1
		I-Have	1		1
BIBB Class	BIBB	BACnet Network Layer Message	Initiate <sup>1</sup>	Execute <sup>2</sup>	B-RTR Standardized <sup>3</sup>
Device & Network	NM-RC-B	Who-Is-Router-To-Network	1	1	1
Management		I-Am-Router-To-Network	1	1	1
		Reject-Message-To-Network	1	1	1
		Router-Busy-To-Network	1	1	1
		Router-Available-To-Network	1	1	1
		Network-Number-Is	1	1	1

#### Table 3-5 Implemented BIBBs (B-RTR Profile)

✓ is applicable, blank is not applicable

1. Sends a BACnet service request or notification.

2. Execute BACnet service and respond (if confirmed type service is requested) or accept messages.

3. which is defined as normalized for B-RTR in ANNEX L.7 of BACnet standards.

Outlines of the implemented BIBBs in the B-SS sample software is as follows.

#### Table 3-6 Outlines of the implemented BIBB

BIBBs	Description
DS-RP-A	Device A is one property user from device B.
DS-RP-B	Device B returns one property value to device A.
DS-WP-A	Device A sets one property of Device B.
DS-WP-B	Device B writes value from device A to one property.
DS-RPM-A	Device A is a data user from Device B and requests multiple properties at once.



BIBBs	Description
DS-RPM-B	Device B returns multiple property values at once to device A.
DS-WPM-A	Device A sets multiple properties on Device B at once.
DS-WPM-B	Device B writes multiple values from device A to multiple properties at once.
DS-COV-B	Device B accepts COV notification subscription from Device A and sends COV notification to Device A.
DM-DDB-A	Device A makes an identification request to another device and interprets the device's announcement.
DM-DDB-B	Device B responds to the identification request from Device A.
DM-DOB-B	Device B responds to an identification request from Device A with the specified object.
DM-DCC-B	Device B responds to a request from Device A to stop communication.
DM-TS-B	Device B accepts time synchronization from Device A.
DM-RD-B	Device B responds to the reinitialization request from Device A.
DM-BR-B	Device B provides the setting file to Device A, which in turn writes the file to Device B so that its settings can be recovered in case of a failure of Device B.
AE-N-I-B	Device B generates notifications of alarms and other events.
AE-ACK-B	Device B responds to an acknowledgement from Device A for an alarm/event notification that has been sent.
AE-INFO-B	Device B provides event information to Device A.
SCHED-I-B	B devices provide a date and time schedule of the value of specified properties of certain objects in the device.
SCHED-E-B	Device B provides a date and time schedule of the values of specified properties of certain objects on other devices.
T-VMT-I-B	Device B collects trend log data records in the internal buffer.
T-ATR-B	Device B uses the BUFFER_READY event algorithm in the trend log object to notify Device A that the trend log buffer has acquired a given number of data samples.
NM-RC-B	B devices need to respond to router management commands and meet the BACnet router requirements in the Standards.



#### 3.3.3.5 Implemented service as A-Device

The B-BC in this sample software has device A functions as defined in BIBBs. This sample software supports the following BIBBs, service request destinations, and Ack senders as B-BC A devices.

Refer to the links in the "Reference" column for details.

Table 3-7 Support services for B-BC as "A" device

BIBBs	Service	Send to	Receive from	Reference	
	ReadProperty	MS/TP slave			
DS-RP-A	Complex-Ack		MS/TP slave	4.6.2.1 Trending & ReadRange	
	WriteProperty	MS/TP slave		4.6.2.2.Sahaduling	
DS-WP-A	Simple-Ack		MS/TP slave	4.6.2.2 Scheduling	
DS-RPM-A	ReadPropertyMultiple	MS/TP slave			
	Complex-Ack		MS/TP slave		
	WritePropertyMultiple	MS/TP slave		Unused(1)	
DS-WPM-A	Simple-Ack		MS/TP slave		
DM-DDB-A	Who-Is	BIP client		4.6.3 EventNotification / GetEventInformation / AcknowledgeAlarm	
	I-AM		All		

(\*1) ReadPropertyMultiple and WritePropertyMultiple are not used when making service requests to B-SS.

#### 3.3.3.6 Object

A BACnet device consists of a set of objects. An object is represented by an object type and an instance number from 0 to 4194303, which is called an object ID. However, the number 4194303 means invalid and is not used.

The device itself is also an object and is defined in Device object; the object ID of the device is called the device ID. Each BACnet device is required to have a Device object.

Furthermore, objects consist of a set of properties of various data types, and the B-SS accesses hardware to read and write these properties.

The implemented Objects of the sample software is as follows. ( ✓ : Applicable, blank : Not applicable)

#### Table 3-8 Implemented Objects in the B-SS sample software

BACnet Object Type	Object ID	Implementation
Accumulator		
Analog Input	Analog Input, 0	1
	Analog Input, 1	1
Analog Value	Analog Value, 0	1
	Analog Value, 1	1
Averaging		
Binary Output	Binary Output, 0	1



BACnet Object Type	Object ID	Implementation
	Binary Output, 1	1
Binary Value	Binary Value, 0	1
	Binary Value, 1	1
Calendar		
Command		
Device	Device, 10	1
Event Enrollment		
File	File,0	1
Group		
Life Safety Point		
Life Safety Zone		
Loop		
Multi state Input		
Multi state Output		
Multi state Value	Multi state Value, 0	1
	Multi state Value, 1	1
Notification Class	Notification Class,0	1
Program		
Pulse Converter		
Schedule	Schedule,0	1
Trend Log	Trend Log,0	1
Access Door		
Event Log		
Load Control		
Structured View		
Trend Log Multiple		
Access Point		
Access Zone		
Access User		
Access Rights		
Access Credential		
Credential Data Input		
CharacterString Value		
DateTime Value		
Large Analog Value		
BitString Value		



BACnet Object Type	Object ID	Implementation
OctetString Value		
Time Value		
Integer Value		
Positive Integer Value	Positive Integer Value, 0	1
	Positive Integer Value, 1	1
Date Value		
DateTime Pattern Value		
Time Pattern Value		
Date Pattern Value		
Network Security		
Global Group		
Notification Forwarder		
Alert Enrollment		
Channel		
Lighting Output		
Network Port	Network Port, 1	1
	Network Port, 2	1
Binary Lighting Output		

 $\checkmark$  is applicable, blank is not applicable

#### Outlines of the implemented object types are as follows.

# Table 3-9 Outlines of the implemented object types

BACnet Object Type	Description
Analog Input	Analog Input object has properties that represent analog inputs from hardware.
Analog Output	Analog Output object has properties that represent analog output to hardware.
Analog Value	Analog Value object has properties representing analog values that reside in the memory of the BACnet device.
Binary Input	Binary Input object is input from hardware and has property representing two states: ACTIVE or INACTIVE.
Binary Output	Binary Output object is the output to the hardware and has properties representing two states: ACTIVE or INACTIVE.
Binary Value	Binary Value object has properties that represent two states, ACTIVE or INACTIVE, resident in the memory of the BACnet device.
Device	BACnet device must have one Device object for sure: it has Object_Identifier property that is unique to the BACnet device. This is also unique to the entire network.
Multi state Value	Multi state Value object has properties that represent one or more states resident in the memory of the BACnet device.
Positive Integer Value	Positive Integer Value object has properties that allow the BACnet device to access any kind of unsigned data value.
Network Port	Network Port object has properties that represent the network configuration of the BACnet device and must contain at least one network port object.
File	File object has properties of a data file that can be accessed using the file service.



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BACnet Object Type	Description
Notification Class	Notification Class objects have properties necessary for event notification within the BACnet system.
Schedule	Schedule objects have properties to link the writing of specified values to specified properties of a particular object with a recurring schedule that repeats within a specified date range, at any given time on any given date.
Trend Log	The Trend Log object monitors the properties of the referenced object and saves the property value and timestamp to an internal buffer represented in the LogBuffer property when the defined conditions are met. Reading the LogBuffer property requires the ReadRange service.



### 3.3.3.7 Property

BACnet objects have various data elements called "Property," and each property is accessed through services. Properties defined as Required (R) in the Conformance Code are properties that must be supported when an object is supported. Supporting of optional properties (O) is arbitrary, but depending on the conditions, several properties have to be supported (or unsupported).

**Table 3-10** to **Table 3-22** show the supporting objects and its properties included in this sample software. The legends in the tables are shown below.

#### 1. CC : Conformance Code

R: Required, O: Optional, W: Writable

#### 2. Configurable

x(\*1) Configurable by both Initial Configuration Command and WriteProperty Service

Once Configurable property values are written to Flash memory by using Initial Configuration Command in section 5.3, they will be reflected as initial values in the properties when the board is reset. When WriteProperty or WritePropertyMultiple services are executed, the values are also written to Flash memory.

#### x(\*2) Configurable by Initial Configuration Command

Once Configurable property values are written to Flash memory by using Initial Configuration Command in section 5.3, they will be reflected as initial values in the properties when the board is reset.

#### x(\*3) Configurable by WriteProperty Service

When WriteProperty or WritePropertyMultiple services are executed, the property values are also written to Flash memory. They will be reflected as initial values in the properties when the board is reset.

#### 3. Access

R: Readable using ReadProperty or ReadPropertyMultiple services

W: Writeable using WriteProperty or WritePropertyMultiple services

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Present_Value	R		R/W
Description	0		R
Status_Flags	R		R
Event_State	R		R
Reliability	0		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Units	R		R/W
COV_Increment	0		R/W
Time_Delay	0		R/W
Notification_Class	0		R/W
High_Limit	0		R/W
Low_Limit	0		R/W
Deadband	0		R/W
Limit_Enable	0		R/W
Event_Enable	0		R/W
Acked_Transitions	0		R
Notify_Type	0		R/W
Event_Time_Stamps	0		R
Property_List	R		R

#### Table 3-10 Analog Input Object Type



Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Present_Value	R		R/W
Description	0		R
Status_Flags	R		R
Event_State	R		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Units	R		R/W
COV_Increment	0		R/W
Time_Delay	0		R/W
Notification_Class	0		R/W
High_Limit	0		R/W
Low_Limit	0		R/W
Deadband	0		R/W
Limit_Enable	0		R/W
Event_Enable	0		R/W
Acked_Transitions	0		R
Notify_Type	0		R/W
Event_Time_Stamps	0		R
Property_List	R		R

# Table 3-11 Analog Value Object Type

#### Table 3-12 Binary Output Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Present_Value	W		R/W
Description	0		R
Status_Flags	R		R
Event_State	R		R
Reliability	0		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Polarity	R		R/W
Inactive_Text	0		R
Active_Text	0		R
Priority_Array	R		R
Relinquish_Default	R		R
Current_Command_Priority	R		R
Property_List	R		R

#### Table 3-13 Binary Value Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W



Object_Type	R		R
Present_Value	R		R/W
Description	0		R
Status_Flags	R		R
Event_State	R		R
Reliability	0		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Priority_Array	0		R
Relinquish_Default	0		R
Current_Command_Priority	0		R
Property_List	R		R

#### Table 3-14 File Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
File_Type	R		R
File_Size	R		R/W
Modification_Date	R		R
Archive	W		R/W
Read_Only	R		R
File_Access_Method	R		R
Description	0		R
Status_Flags	R		R

### Table 3-15 Notification Class Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Notification_Class	R		R
Priority	R		R/W
Ack_Required	R		R/W
Recipient_List	R		R/W
Description	0		R

### Table 3-16 Schedule Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Present_Value	R		R/W
Effective_Period	R		R/W
Schedule_Default	R		R/W
List_Of_Object_Property_References	R		R/W
Priority_For_Writing	R		R



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Status_Flags	R		R
Reliability	R		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Weekly_Schedule	R		R/W
Description	0		R

### Table 3-17 Multi-state Value Object Type

Property Identifier	CC <sup>1</sup>	Configurable	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Present_Value	R		R/W
Description	0		R
Status_Flags	R		R
Event_State	R		R
Out_Of_Service	R	<b>√</b> (*1)	R/W
Number_Of_States	R		R
State_Text	0		R
Property_List	R		R

#### Table 3-18 Trend Log Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Enable	W		R/W
Start_Time	0		R/W
Stop_Time	0		R/W
Log_DeviceObjectProperty	0		R/W
Log_Interval	0		R/W
Stop_When_Full	R		R/W
Buffer_Size	R		R
Log_Buffer	R		R
Record_Count	W		R/W
Total_Record_Count	R		R
Logging_Type	R		R/W
Align_Intervals	0		R/W
Interval_Offset	0		R/W
Trigger	0		R/W
Status_Flags	R		R
Event_State	R		R
Description	0		R
Property_List	R		R

### Table 3-19 Positive Integer Value Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R



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Object_Name	R		R/W
Object_Type	R		R
Present_Value	R		R/W
Status_Flags	R		R
Out_Of_Service	0	<b>√</b> (*1)	R/W
Units	R		R
Event_State	0		R
Description	0		R
Property_List	R		R

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Status_Flags	R		R
Reliability	R		R
Out_Of_Service	R		R
Network_Type	R		R
Protocol_Level	R		R
Changes_Pending	R		R
Description	0		R
MAC_Address	0	<b>√</b> (*2)	R
BACnet_IP_Mode	0	<b>√</b> (*3)	R/W
IP_Address	0	<b>√</b> (*2)	R
BACnet_IP_UDP_Port	0	<b>√</b> (*2)	R
IP_Subnet_Mask	0		R
IP_Default_Gateway	0	<b>√</b> (*2)	R
IP_DNS_Server	0		R
FD_BBMD_Address	0	<b>√</b> (*3)	R/W
FD_Subscription_Lifetime	0	<b>√</b> (*3)	R/W
Property_List	R		R

# Table 3-20 Network Port Object Type(for BIP)

### Table 3-21 Network Port Object Type(for MSTP)

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R		R
Object_Name	R		R/W
Object_Type	R		R
Status_Flags	R		R
Reliability	R		R
Out_Of_Service	R		R
Network_Type	R		R
Protocol_Level	R		R
Network_Number	0	<b>√</b> (*3)	R/W
Network_Number_Quality	0		R
Changes_Pending	R		R
Apdu_Length	0		R



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Link_Speed	R		R
Description	0		R
MAC_Address	0	<b>√</b> (*2)	R
Max_Master	0		R/W
Max_Info_Frames	0		R/W
Property_List	R		R

#### Table 3-22 Device Object Type

Property Identifier	CC <sup>1</sup>	Configurable <sup>2</sup>	Access <sup>3</sup>
Object_Identifier	R	<b>√</b> (*2)	R
Object_Name	R	<b>√</b> (*1)	R/W
Object_Type	R		R
System_Status	R		R
Vendor_Name	R		R
Vendor_Identifier	R		R
Model_Name	R		R
Firmware_Revision	R		R
Application_Software_Version	R		R
Location	0		R/W
Description	0		R/W
Protocol_Version	R		R
Protocol_Revision	R		R
Protocol_Services_Supported	R		R
Protocol_Object_Types_Supported	R		R
Object_List	R		R
Max_APDU_Length_Accepted	R		R
Segmentation_Supported	R		R
Local_Time	0		R
Local_Date	0		R
UTC_Offset	0	<b>√</b> (*2)	R/W
Daylight_Savings_Status	0		R
APDU_Timeout	R		R/W
Number_Of_APDU_Retries	R		R/W
Device_Address_Binding	R		R
Database_Revision	R		R
Active_COV_Subscriptions	0		R
Max_Master	0		R/W
Max_Info_Frames	0		R/W
Property_List	R		R



# 3.4 Installation of Development Environment

## 3.4.1 e2studio

### 3.4.1.1 Install

Download the version listed in Table 1-1 and install it on your PC. The latest version has a downloadable installer that includes FSP, e2studio, and the GCC toolchain as a single package.

• Double-click the downloaded "setup\_rznfsp\_v1\_3\_0\_e2s\_v2023-07.exe".

26% Extracting	×	]
	Cancel	

Fig.3-7 e2studio Install (1)

Select Users

Renesas Installer		
Ţ	Select which users to install for	
	→ All Users Install for all users on this computer Requires Administrator permissions	
	Current user     Install for X0000000 only     Parts may require Administrator permissions	
	$\rightarrow$ Cancel installation	

Fig.3-8 e2studio Install (2)



· Select "Install"



Fig.3-9 e2studio Install (3)

· Select Install Type

🔜 Renesas RZ/N Flexibl	Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 Se	tup	– 🗆 X
Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 20	22-10 Setup	RENESAS
インストール・タイプ			
	Select Install Type:		
	Quick Install Default installation of e <sup>2</sup> studio, FSP & GCC.	ARM Embedded	
	Custom Install Custom installation of e <sup>2</sup> studio, FSP & GCC	ARM Embedded	
v202212160219	User: All Users < Back	Next > インストー	ル Cancel

Fig.3-10 e2studio Install (4)


#### · Select Install folder

🗟 Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 Setup	— 🗆	$\times$
Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 with $e^2$ studio 2022-10 Setup	RENESAS	
🗩 ४३८२	インストール・ディレクトリの準備ができました。		^
ライセンス	インストール場所: C:¥Renesas¥rzn¥e2studio_v2022-10_fsp_v1.1.0 [変更]		
ショートカット インストール中	必須なソフトウェアは、すでにインストールされています。		
結果	インターネット接続が利用可能 <u>プロキシ設定を変更</u>		
	インストールの準備 インストールするソフトウェア:		
	Renesas e2 studio v22.10.0.R20221013-1357     Java Runtime v11.0.0     Renesas FSP Smart Configurator Core v8.10.0.v20220926-0845     GCC for Renesas RZ Build Support v22.10.0.v20220916-0746     Renesar RZ Common v22.10.0.v20220915-1147		Ŷ
<u>v202212160219</u>	User: All Users < Back Next > インストール	Cancel	

Fig.3-11 e2studio Install (5)

· Check and Click "Next"



Fig.3-12 e2studio Install (6)



#### Click "Install"

🗟 Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 v	vith e <sup>2</sup> studio 2022-10 S	etup	—	
Renesas RZ/N Flexible	Software Package (FSP) v1.	1.0 with e <sup>2</sup> studio 2	022-10 Setup	ſ	RZ
ようこそ ライセンス ショートカット インストール中 結果	重要なプログラムおよびファイル/ ☑ スタート・メニュー・グループ:	へのショートカットは、次の <sup>1</sup> Renesas RZ¥N v1.1.0	局所に作成されます )	: टि र्ग	フォルトを復元(R)
<u>v202212160219</u>	User: All Users	< Back	Next >	インストール	Cancel

Fig.3-13 e2studio Install (7)

Renesas RZ/N Flexible S	Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 Setup – C × Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 Setup
ようこそ ライセンス ショートカット ・ ・ ・ ・ ・ ホール中… 結果	Renesas RZ/N Flexible Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10がインストールされ むまでお待ち ください。 Installing IUs Installing org.eclipse.xtext.xbase
v202212160219	User: All Users < Back Next > インストール Cancel

Fig.3-14 e2studio Install (8)



# RZ/N2L Group

# · Click "OK"

🔜 Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 with e² studio 2022-10 Setup	$ \Box$ $\times$
Renesas RZ/N Flexible	Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 Setup	RENESAS
ようごそ ライセンス ショートカット インストール中	Renesas RZ/N Flexible Software Package (FSP) v1.1.0 with e <sup>2</sup> studio 2022-10 OKをクリックして閉じてください。 □ Launch e2 studio? ☑ View Release Notes? ☑ View What's New? ☑ View Renesas FSP User Manual? <b>役立つリンク:</b> Renesas FSP: C:¥Renesas¥rzn¥e2studio v2022-10 fsp v1.1.0 Renesas FSP User Manual: C:¥Renesas¥rzn¥e2studio v2022-10 fsp v1.1.0 Kenesas FSP User Manual: C:¥Renesas¥rzn¥e2studio v2022-10 fsp v1.1.0 GCC ARM Embedded: C:¥Renesas¥rzn¥e2studio v2022-10 fsp v1.1.0 Kenesas FSP User Manual: C:¥Renesas¥rz	Dのインストールが完了しました。
v202212160210	GCC ARM Embedded: C:#Kenesas#rzn#e2studio v2022-10 tsp v1.1.0#tr 9 2020q2	polchains¥gcc arm¥

Fig.3-15 e2studio Install (9)



#### 3.4.1.2 Project start-up

#### (1) Unzip package

First, unzip the archived package of this sample software (RZN2L\_BACnet\_BBC\_V\*\*\*.zip) and store it in arbitrary folder. Because e2studio cannot recognize project properly if file path is too long in the folder hierarchy, place it in shorter path. Also, do not use multi-byte character, such as Japanese, in the folder path.

#### (2) Execute e2studio

Execute "e2studio.exe" to start e2studio in the following folder (default case) installed:

```
\Renesas\rzn\e2studio_v2023-07_fsp_v1.3.0\eclipse¥e2studio.exe
```



Fig.3-16 Launch project (1)

#### (3) Import Project

Enter any workspace directory and click "Launch".

圆 e² studio Launcher	-		×
Select a directory as workspace			
e <sup>2</sup> studio uses the workspace directory to store its preferences and development artif	acts.		
Workspace: C:¥Users¥xxxxxx¥e2_studio¥ws_FSP13_BA131_QSPI_configurable_RTR	V100 ~	Brows	se
Use this as the default and do not ask again			
Recent Workspaces			
Lau	nch	Cance	el

Fig.3-17 Launch project (2)



#### · Select "Import existing projects"



Fig.3-18 Launch project (3)



Click "Browse" at "Select root directory" and enter the project folder to be imported.

Check the "Copy projects into workspace" checkbox to copy the import project.

Import − □ X Import Projects
Import Projects
Select a directory to search for existing Eclipse projects.
Select root directory Cill lears XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Select root directory. Croseistananan rez_studiotworkspace_13 V Browse
Select archive file:
Projects:
RZN2L_FreeRTOS_IwIP (C:¥Users¥XXXXXXX ¥e2_studio¥workspace_F Select All
Deselect All
Refresh
Options
Copy projects into workspace
Close newly imported projects upon completion
Hide projects that already exist in the workspace
Working sets
Add project to working sets New
Working sets: V Select
? Finish Cancel

Fig.3-19 Launch project (4)

Click "Finish" in Fig.3-19 to display the following and click "Yes To All".

Question	×
Overwrite '.settings' in folder 'RZN2L_FreeRTOS_IwIP'?	
Yes Ves To All No No To All	Cancel

### Fig.3-20 Launch project (5)



📴 Import —	
Import Projects	
Select a directory to search for existing Eclipse projects.	
Select root directory: C#Users#XXXXXXXXE2_studio#workspace_F5	Browse
○ Select archive file:	Browse
Projects:	
	Select All
C	Deselect All
	Refresh
< >>	
Options	
Copy projects into workspace	
Close newly imported projects upon completion	
Hide projects that already exist in the workspace	
Working sets	
Add project to working sets	New
Working sets: V Set	Select
C:¥Users¥71768836¥e2_studio¥workspace_FSP110_sample_B-SS¥RZN2L_FreeRTOS	S_lwIP¥Debug
	0
(?) Finish	

Fig.3-21 Launch project (6)

• When the project import is complete, the following will be displayed. The subsequent sections will be explained in chapter 4.

workspace_FSP110_sample_B-SS_airspee	ed - e' studio						
File Edit Source Refactor Navigate	Search Project Renesas View	s Run Window Help					
🔦 🔅 🔳 🎋 Debug	✓ RZN2L_FreeRTOS_Lv	IP Debug_Flat 🗸 🌼 📋	<b>} -</b> 🔛 🐚   I	S 🕶 🔦 🕶 📷	🥖 💼 🕶 🕶 🔻	🖻 🔻 🞯 🕶 🙋	• 🔗 •
I 📴 п I 🏪 I 🗙 I 🏟 I 🗞   🎋 🕶 🤇	💁 📲 🗞 🗶 🐀 🗰 🕶 🛍 🕌	· 劉 志 [ ② ] 劉 • 羽	• *5 =3 +5	• => •   🖻 -		Q 🗄 😭 🛛	EC C/C++
Project Explorer 🔀 🗖	3				5	Outline $ imes$	
🖻 🕏 🏹 🤅	8				The	re is no active edit	tor that
> S RZN2L_FreeRTOS_IwIP					pro	vides an outline.	
	🛐 Problems 🗙 📮 Conso	le 🔲 Properties 🛞 スマー	ト・ブラウザー 🕠	スマート・マニュアル		7	8 🗖 🗖
	0 errors, 3 warnings, 0 others						
	Description		Resource	Path	Location	lype	
					スマート・マニュアルを	(ンストール中	×
					新しいスマート・マニュ	Pルがインストールされ	ています。
					スマート・マニュアルの	変更 インストール時代	

Fig.3-22 Launch project (7)



### 3.4.2 VTS

Visual Test Shell (VTS) is an application for testing BACnet functionality in systems that use the BACnet/IP protocol. Download the relevant version listed in Table 1-1 from the website and install it on your PC.

For the installation procedure, unzip the downloaded file, open QuickStart.html in the \Docs folder, and refer to the Quick Start Guide.

🊸 SOURC	EFORGE							Help	Creat	te	Join	Login	
Open Source Soft	ware Busir	ness Software	Resources					Sync your G to Sour	tHub Project ceForge	earch for so	oftware or so	olutions Q	J
Home / Browse / Com	unications (Visual	Test Shell for BACnel	,										
Home / Browse / Comr	nunications/Visual	Test Shell for BACnel		l fan D				OPEN SOURCE					
Home / Browse / Comr	Visual	Test Shell for BACnel	t Shel	l for B <i>i</i>	4Cne <sup>-</sup>	t	X						
Home/Browse/Comm	unications / Visual Visual BACnet Tester Brought to you	Test Shell for BACnet al Tes by: duffy399, j	t Shel	I for B/		t	3	OFFN BOURCE EXCELLINCE					
Home / Browse / Comr	Visual Visua BACnet Tester Brought to you 5 Reviews	Test Shell for BACnet al Tes by: duffy399, j	t Shel jimbutlerma, johni Dowi	I for BA	<b>ACne</b> nd 2 others Week	t	t Update: 2	CO18-08-13					
Home / Browse / Comm	Nunications / Visual Visual BACnet Tester Brought to you 5 Reviews	Test Shell for BACnel	t Shel inbutlerma, john Dow	I for B/ hartman, Itribble, ar nloads: 63 This	ACne <sup>r</sup> nd 2 others Week	t Las	t Update: 2	CO18-08-13					
Home / Browse / Come	Numications / Visual Visual BACnet Tester Brought to you 5 Reviews nload	Test Shell for BACnet al Tes 1 1 by: duffy399, j	t St Shel Imbutterma, John Dow Get Updates	l for B/ hartman, Itribble, a nloads: 63 This Share This	ACne <sup>r</sup> nd 2 others Week	t Las	) t Update: 2	CO18-08-13					
Home / Browse / Control	BACnet Tester Brought to you 5 Reviews	Test Shell for BACnet al Tess here duffy 399, j	t t Shel jimbutlerma, John Dow Get Updates	<b>I for B</b> / hartman, Itribble, <b>a</b> nloads: 63 This Share This	ACne <sup>®</sup> nd 2 others Week	t La:	t Update: 2	Construction of a construction					

Fig.3-23 VTS

## 3.4.3 Yabe

Yet Another Bacnet Explorer (YABE) is a graphical window program for exploring and navigating BACnet devices. It does not have a single service output interface like VTS, but it can test systems running on the BACnet MS/TP and BACnet/IP protocols with ease.

Download the relevant version listed in Table 1-1 from the website and install it on your PC.

	GE				Help
Open Source Software	Business Software	Resources			Sync your to So
Home / Browse / Scientific/Engineeri	ing/SCADA/Yet Another B	Bacnet Explorer			<u>₽</u>
Home / Browse / Scientific/Engineeric Yett Graphical Brought to	explorer for BACnet o you by: fchaxel, illis	er Bacne - Free BACnet library in thar	et Explor	er	
Home / Browse / Scientific/Engineer	explorer for BACnet o you by: (chaxel, Illis	er Bacnet Free BACnet library in thar Download	et Explor .c# Is: 1,047 This Week	er	Last Update: 1 day ago
Home / Browse / Scientific / Engineer	explorer for BACnet p you by: fchaxel, Illis views	ter Bacnet er Bacnet ter BACnet library in that Download Get Updates Sha	et Explor .c# 5: 1,047 This Week re This	er	<b>Pretorent</b> ● sautoner Last Update: 1 day ago
Home / Browse / Scientific/Engineer Yet Graphical Brought for 15 Rev Download Linux Windows Android	ing / SCADA / Yet Another B Anoth explorer for BACnet o you by: fchaxel, IIIs riews	er Bacnet - Free BACnet library in that Download Get Updates Sha	et Explor .c# Is: 1,047 This Week re This	er	Last Update: 1 day ago

Fig.3-24 Yabe



# 3.4.4 Wireshark

Wireshark is a free network protocol analyzer. Download and install Wireshark from the link in Table 1-1.



Fig.3-25 download Wireshark

#### 3.4.5 Terminal software

Download and install free terminal software such as TeraTerm.

The terminal software is used to execute initial configuration commands to store configurable property values (configurable properties) in Flash memory. See chapter 5.3 for details.



# 4. Operation Verification

### 4.1 Connection

Fig.4-1 shows a connection diagram for this sample software. Connect the Ethernet cable, J-Link OB debugger, 5V DC cables to the RZ/N2L RSK board. When connecting the board for B-SS, connect the air velocity sensor to the J26 on it. In the board settings in chapter 2.1, it is possible to connect an Ethernet cable to any of the Ethernet connectors of ETH0, ETH1, and ETH2. When using the on-board debugger J-Link OB on the RSK board, leave J9 open and connect the USB Micro cable to J10.

RS-485 is a 2-wire half-duplex communication, connecting the positive line of CN12-6 pin (RS485\_A) and the negative line of CN12-3 pin (RS485\_B) between the B-BC and B-SS boards. Sends service requests from the PC tool to the B-SS via the B-BC as the master device and sends B-SS responses to the PC tool.

To monitor packets of BACnet MS/TP communication with Wireshark, it is necessary to separate the USB port of the PC from that for MS/TP communication, so prepare an RS485/USB converter and connect it by splitting RS485\_A /B signals. (Fig.4-1 1 dotted line)



Fig.4-1 BACnet/IP-MS/TP Hardware Diagram



# 4.2 IP Address Setting for BACnet Client

Configure the Ethernet IP address settings for the PC.

Click on settings in Windows Start ... Configure the IP address as follows.

Settings > Network and Internet > Change adapter options > Ethernet

>Properties > Internet Protocol Version 4 (TCP/IPv4) > Properties

Setwork Connections				- (		×
$\leftarrow \rightarrow - \uparrow $		۹ ق ۲	Search Network Connections	s		
Organize 🔻 Disable this network device	Diagnose this connection Renam	e this connection	>			0
Ethernet 10 Network cable unplugged Realtek USB GbE Family Controlle	Ethernet 2 Network cable unplugged Fortinet SSL VPN Virtual Ether	net X	e <b>rnet 3</b> work cable unplugged inet Virtual Ethernet Adapter (	-		
Ethernet 4 Network cable unplugged ASIX AX88179 USB 3.0 to Gigabit E	fortissl Disconnected PPPoP WAN Adapter	adw Inte	ii in.renesas.com (R) Wi-Fi 6 AX201 160MHz			
					0	
6 items 1 item selected					855	-

Fig.4-2 network connection

Internet Protocol Version 4 (TCP/IPv4) Properties	×
General	
You can get IP settings assigned automatically if yo this capability. Otherwise, you need to ask your nee for the appropriate IP settings.	ur network supports twork administrator
O Obtain an IP address automatically	
Use the following IP address:	
IP address: 192.168	. 10 . 20
Subnet mask: 255 . 255	. 255 . 0
Default gateway:	· ·
Obtain DNS server address automatically	
Use the following DNS server addresses:	
Preferred DNS server:	
Alternate DNS server:	• •
Vajidate settings upon exit	Advanced
	OK Cancel

Fig.4-3 TCP/IPv4 properties

The IP address of the RSK board set in the B-BC sample software is 192.168.10.10. The IP address of the PC needs to be set to 192.168.10.XXX. In this document, 192.168.10.20 is used.



# 4.3 Setup Wireshark

It is possible to capture BACnet/IP communication packets between a PC and B-BC with Wireshark.

Also, to capture the MS/TP protocol packet with Wireshark, download mstpcap.exe from the link in Table 1-1.

https://optigo.zendesk.com/hc/en-us/articles/115001062771-Capturing-MS-TP-packets	
Optigo Networks > Visual BACnet > Knowledge Base	
Capturing MS/TP packets	
Coptigo Networks	
You will need:	
1. A USB to RS-485 converter.	
2. The mstpcap.exe download from there from Steve Karg's BACnet tools version 0.8.6) See this page for an integration with Wireshark.	

Fig.4-4 Download mstpcap.exe

Paste mstpcap.exe under /Program Files/Wireshark/extcap folder.

		1至大兒	<b>71</b> X
📙 audio 🧧 etwdun	p.exe 2022/05/05 10:-	41 アプリケーション	330 KB
bearer mstpca	p.exe 2022/09/02 12:	08 アプリケーション	124 KB
diameter USBPca	pCMD.exe 2020/05/22 18:	01 アプリケーション	56 KB
dtds			
extcap			

Fig.4-5 Paste mstpcap.exe into extcap folder

Launch Wireshark and click COM Port Settings

Select Baud Rate 115200 in the pop-up dialog and Save. Click Start Packet Capture.



🚄 The Wireshark Network Analyzer		_	
File Edit View Go Capture Analyze Statistics Telephony Wire	eless Tools Help		
	Q, Q, III		
Apply a display filter ···· <otrl-></otrl->			
Welcom			
Open Wireshark - Interface Options: BACnet MS/TP on COM	10	×	
C:¥Users	*		^
C:¥Users	~ C		
C:¥Users Save parameter on capture start			~
Captu Restore Defaults	Save Close	Help	
using t			n <del>*</del>
RAC-++ ME/TR ++ COM40			
BAChet MS/1P on COM 10			
Learn			*
Learn	Liete SharkFeet Wireehark	Discord Don:	ate
You are running Wireshark 4.0.4 (v4.0.4-0-gea14d468d9ca). You receive	e automatic updates.	Discola Dom	110
Ready to load or capture	No Packets	Prof	ile: Default

Fig.4-6 Baud rate selection

MS/TP capture screen of Wireshark appears.



Fig.4-7 MS/TP protocol packet capture screen



# 4.4 Start Project

First, import the project as described in section 3.4.1.2.

#### 4.4.1 Build Configuration Notes

Various Symbol definitions are referenced for building. See chapters 5.2.45.1.4 and 5.2.6 for details.

### 4.4.1.1 Change Prohibited Symbols

Changing values of some symbols will result in building errors.

Select the project name in the Project Explorer window, then open Properties in the Project menu.



Fig.4-8 Open project properties



Select GNU C in Languages from the #Symbols tag in C/C++General > Paths and Symbols.

Do not change #BACDL\_ALL, #BACDL\_BIP, or #BACDL\_MSTP in Symbol. If changed, B-BC sample software will not be able to be built.

pe filter text	Paths and Symbols			← → → →
Resource				
Builders		7 A 3		
C/C++ Build	Configuration: Debug	[ Active ]	✓ Manag	je Configurations
<ul> <li>C/C++ General</li> </ul>				
> Code Analysis			1	
Documentation	🕒 Includes 🇰 Symbol	Dibrary Paths 😕 Source Location 🖹 Refe	rences	
File Types	Lanaurana	Cartal	N/ Los	A
Formatter	Languages	Symbol	value	Add
Language Mappings	Assembly	# _RZN_CORE	CR52_0	Edit
MISRA-CTディタ・チェッカ	GNUC	# BACAPP_PRINT_ENABLE	$\wedge$	
Paths and Symbols		# BACDL_ALL		Delete
Preprocessor Include Pat		# BACDL_BIP	1	Export
MCU		# BACDL_MSTP	$\mathbf{U}$	
Project Natures			2	
Project References			2	
Renesas QE			1	
Run/Debug Settings			0×PAC0	
Task Tags			10	
Validation			1	
		# IPADR1	192	
		# IPADR2	168	
		# IPADR3	10	
		# IPADR4	10	
		# LWIP TCP	1	
		# LWIP UDP	1	
		# MAX ANALOG INPUTS	2	
		# MAX ANALOG VALUES	2	
		# MAX_BINARY_OUTPUTS	2	
		# MAX_BINARY_VALUES	2	
		# MAX_COV_SUBSCRIPTIONS	5	
		# MAX_FILES	1	
		# MAX_MULTISTATE_VALUES	2	
		# MAX_NOTIFICATION_CLASSES	1	
		# MAX_POSITIVEINTEGER_VALUES	2	
		# MAX_SCHEDULES	1	
		# MAX_TREND_LOGS	1	
		# MAX_TSM_TRANSACTIONS	10	
		# MSTP_MAC_ADDRESS	5	
		# MULTISTATE_NUMBER_OF_STATES	3	
		# NETWORK_PORT_IPV4_INSTANCE	1	
		# NETWORK_PORT_MSTP_INSTANCE	2	
		# PRINT_ENABLED	1	
		# USK_DEBUG_PRINT	1	
	<ol> <li>Preprocessor Inclu</li> <li>Show built-in values</li> <li>Import Settings</li> </ol>	de Paths, Macros etc." property page may define a	dditional entries	
			Restore Defau	lts Apply
>				

Fig.4-9 Change BACDL\_MSTP to 0 and BACDL\_BIP to 1



#### 4.4.1.2 Settings for NTP Server

NTP client functionality is implemented in the B-BC sample software to get the current time automatically from NTP (Network Time Protocol) server with "SNTP" (Simple Network Time Protocol) from an open-source IwIP.

However, it is assumed that the connecting PC is the NTP server, and B-BC identifies the NTP server by the IP address; identification by the NTP server name is not supported. If the connecting PC does not have NTP server function, the B-BC can get the current time from VTS (or Yabe), see chapter 4.5.3 and 4.6.1 for Time Synchronization Service.

Change the following code if the PC connecting to B-BC via BACnet/IP has NTP server. This IP address must be the same as the one configured in chapter 4.2. 192.168.10.20 is the default value.

user\renesas\application\lwip\_port\_main.c



Fig.4-10 Setting NTP server address

The following Wireshark capture shows NTP protocol packets (filtered by "ntp"). The time request cycle from B-BC to the NTP server is one hour.

Eilo	1-947F11	n Analuza Statist	ics Talanhany Wi	alors Tools	Halo		_		^
Elle		e Analyze Statist	T & 📃 📃 🗨		Teib				
	acnet or bylc or ntp	•••	• •	• •			X		- +
No	Time	Source	Destination	Protocol	Lengt	h Info			
INO.	15 08:41:12 032500	102 168 10 10	102 168 10 255	BACnet-NPDU	Lengt	60 T-Am-Pouter-To-Network			
	16 08:41:12.934001	192.168.10.10	192.168.10.255	BACnet-APDU		67 Unconfirmed-REO i-Am d	evice.10		
	18 08:41:14.878207	192.168.10.10	192.168.10.255	BACnet-APDU		71 Unconfirmed-REO i-Am d	evice.100		
	40 08:41:42.702473	192.168.10.10	192.168.10.20	NTP		90 NTP Version 4, client	,		
4	41 08:41:42.702748	192.168.10.20	192.168.10.10	NTP		90 NTP Version 3, server			
	2017 09:41:42.955496	192.168.10.10	192.168.10.20	NTP		90 NTP Version 4, client			
	2018 09:41:42.955798	192.168.10.20	192.168.10.10	NTP		90 NTP Version 3, server			
	3994 10:41:43.210153	192.168.10.10	192.168.10.20	NTP		90 NTP Version 4, client			
	3995 10:41:43.210561	192.168.10.20	192.168.10.10	NTP		90 NTP Version 3, server			
	5972 11:41:43.465863	192.168.10.10	192.168.10.20	NTP		90 NTP Version 4, client			
	5973 11:41:43.466380	192.168.10.20	192.168.10.10	NTP		90 NTP Version 3, server			
	7955 12:41:43.721921	192.168.10.10	192.168.10.20	NTP		90 NIP Version 4, client			
<	/550 12:41:45:/22040	192.108.10.20	192.100.10.10	NIF		50 NTP VERSION 5, Server			,
		(700 - 1)		(700	0000	74 00 50 10 50 14 71 12	-6 1- 0- 6- 00	00.47	- 00
21	rame 41: 90 bytes on w	ire (720 bits),	90 bytes captured	1 (/20 D1t)	0000	74 90 50 10 T9 ed 7c c2	CO IC 98 TE 00	14 69	3 a8
2	cthernet II, Src: IPL10	<pre>K_IC:98:+e (/C:C on 4 Sec: 102 1</pre>	2:cb:lc:ya:te), L	DST: Kenesi	0020	0a 0a 00 7b f7 fa 00 38	95 b8 1c 06 00	e9 00	00 6
51	iser Datagram Protocol	Sec Port: 123	Det Port: 63482	2.108.10.	0030	0a 98 00 07 d9 6b 9e d6	22 25 e9 61 61	b6 10	00 6
5	letwork Time Protocol i	NTP Version 3 s	erver)		0040	2d 4c 00 00 00 00 00 00	00 00 e9 61 64	b6 b3	3 d6
	> Flags: 0x1c, Leap Ir	dicator: no warn	ing, Version numb	er: NTP Ve	0050	db 43 e9 61 64 b6 b3 d7	5c 72		
	[Request In: 40]								
	[Delta Time: 0.00027	5000 seconds]							
	Peer Clock Stratum:	secondary refere	nce (6)						
	Peer Polling Interva	1: 0 (1 seconds)							
	Peer Clock Precision	: -23 (0.0000001	19 seconds)						
	Root Delay: 0.041382	seconds							
	Root Dispersion: 7.8	49289 seconds							
	Reference ID: 158.21	4.34.37							
	Reference Timestamp:	Jan 28, 2024 23	:28:54.062502699						
	Origin Timestamp: NU	LL an 28 - 2024 2314	1.42 702407100 11	~					
	Transmit Timestamp: 3	dn 20, 2024 20:4 Jan 28, 2024 23:4	1:42.702497199 01						
	fransmite finescamp.	5811 20, 2024 25.	41.42.702504855 0						
<				> <	2				>
0	We contract of Hotel a	DDD 4LLD manner				Designation 2000, Disarlay and 120		- D. C	1.1

Fig.4-11 Capture image of NTP protocol packet



#### 4.4.2 Build

Select the project name in the Project Explorer window and click Clean... in the Project menu.

Image: International Source Relactor Navigate S         Image:	Search Pr S S S S S S S S S S S S S	Open Project Close Project Open FSP Configuration Build All Build Configurations Build Project Build Working Set	Window Help Ctrl+Alt+B Ctrl+B >	LSI Starts executing mere.	Q : EP E C/C++ & Debug E Outli X Doc E E I & Wetors(void) : void H IRQ_Handler(void) : void H Default_Handler(void) : void WEAK REF ATTRIBUTE
	36 36 36 36 36 36 36 36 36 36 31 31 31 31	Clean Build Automatically Build Targets C/C++ Index すべての依存関係を更新 Change Device Change Toolchain Version C/C++ Project Settings	> Alt+D Ctrl+Alt+P	Hox10/T Hox2fa : #1 r1 ware_loop p hactlr bit 1] \r >	#     WEAK_REF_ATTRIBUTE       +     WEAK_REF_ATTRIBUTE       +     Reset_Handler(void) : void       +     Undefined_Handler(void)       +     SVC_Handler(void) : void       +     Prefetch_Handler(void) : void       +     Abort_Handler(void) : void       +     Reserved_Handler(void) : void       +     FIQ_Handler(void) : void       +     FIQ_Handler(void) : void       •     \$ g_fiq_stack : uint8_t[]
	0 items Descrip	Properties		759 😳 スマート・マニュ 🚺 Memor	y 🏷 Debug 🕸 Expressions 📮 E

Fig.4-12 Open project Clean...

Enable the following in the pop-up dialog and click Clean to start all builds.

🕲 Clean — 🗆 X
Clean discards all build results and states. The next time a build occurs the selected projects will be rebuilt from scratch.
Start a build immediately Build the entire workspace
O Build only the selected projects Clean Cancel

Fig.4-13 clean and rebuild



#### 4.4.3 Debug Configurations

After confirming that the build result is 0 errors, select the project name in the Project Explorer window and click Debug Configurations... in the Run menu. Ignore the warning message generated for OSS code.



Fig.4-14 Open Debug Configurations...

#### Operations when starting the debugger for the first time after importing a project

Only when importing a project and launching the debugger for the first time, the following operations should be performed.

- a. Create RZN2L\_BACnet\_BBC\_V\*\*\* Debug[local]
- b. Select Target Device
- c. Debut Tool Settings
- d. Macro Registration

See the following explanation of the above.



### a. Create RZN2L\_BACnet\_BBC\_V\*\*\* Debug[local]

Double click on Renesas GDB Hardware Debugging to generate RZN2L\_BACnet\_BBC\_V\*\*\* Debug[local]



Fig.4-15 Debug Configurations(1)

#### b. Select Target Device

Click on the Debugger tag in the displayed dialog and select Target Device.

Debug Configurations	— 🗆 X
Create, manage, and run configurations	The second se
🗅 🖪 🕫 🗎 🗶 🖨 🔬 🗸	Name: RZN2L BACnet_BSS_V1.0.0 Debug
type filter text	🖹 Ma 🐞 Debugger 🕑 Startup 🗔 Common 🤤 Source
C C/C++ Application C C/C++ Remote Application FASE Script	Debug hardware: J-Link ARM ~ Target Device R9A07c004M04
GDB Hardware Debugging	GDB Settings Connection Settings Debug Tool Settings
GDB OpenOCD Debugging	GDB Connection Settings
<ul> <li>GDB Simulator Debugging (RH850)</li> <li>Java Applet</li> </ul>	Autostart local GDB server     Host name or IP address: localhost
Java Application	Connect to remote GDB server GDB port number: 61234
Launch Group Remote lava Application	Connection timeout (s): 30 ~
<ul> <li>Renesas GDB Hardware Debugging</li> </ul>	GDB
* RZN2L_BACnet_BSS_V1.0.0 Debug [local]	GDB Command: arm-none-eabi-gdb
Renesas Simulator Debugging (RX, RL/8)	Step Mode
Filter matched 13 of 16 items	Re <u>v</u> ert Apply
-	
(?)	Debug Close

#### Fig.4-16 Debug Configurations(2)



Select **R9A07G084M04** and click OK.

Fig.4-17 Debug Configurations(3)

c. Debug Tool Settings

\_

Click the Debut Tool Settings tag and write 400 at Operating Frequency [MHz]

				ŝ
Create, manage, and run configurations			3	Ó
1 🖻 🕫 🖼 🗮 🖻 🍸 🗸	Name: RZN2L_BACnet_BSS_V1.0.0 Debug			
type filter text	📄 Main 😚 Debugger 🕨 Startup 🔲 Common 🤤 Soi	urce		
<ul> <li>C/C++ Application</li> <li>C/C++ Remote Application</li> <li>EASE Script</li> </ul>	Debug hardware: J-Link ARM 🗡 Target Device: 🖪	9A07G084M04		
GDB Hardware Debugging	GDB Settings Connection Settings Debug Tool Set	tings		
GDB OpenOCD Debugging	✓ Semihosting			^
GDB Simulator Debugging (RH850)	Semihosting breakpoint address			
Java Applet	V RTOS	Mar.		
Java Application	RTOS Integration in Debug View	res	¥	
Remote lave Application	Sustem	NO	v	
Renesas GDB Hardware Debugging	Allow caching of flash contents	Yes	~	
RENESS OF Philadelic Debugging	✓ Time Measurement			
Renesas Simulator Debugging (RX, RL78)	Run Break Time Measurement	Yes	~	
	Count Every Core Cycle	Vec	~	
	Operating Frequency (MHz)	400.000		~
			Revert Apply	
Filter matched 13 of 16 items			WeTerr White	

Fig.4-18 Debug Configurations(4)



#### d. Macro Registration

Click on the Startup tag, input *"source rzn2l\_xspi0\_x1\_boot.cfg"* in Run Commands, and click Apply. Click on "Debug" to start downloading. Continue with the procedure in Fig.4-21

Debug Configurations		- 🗆 X
Create, manage, and run configurations		TO-
C 🖻 🕫 🗎 🗶 🖻 🏹 🗸	Name: RZN2L_BACnet_BSS_V1.0.0 Debug	
type filter text	🖹 Main 🅸 Debugger 🕨 Startup 🗋 Common 🦻 Source	
<ul> <li>C/C++ Application</li> <li>C/C++ Remote Application</li> <li>EASE Script</li> <li>GDB Hardware Debugging</li> <li>GDB OpenOCD Debugging</li> <li>GDB Simulator Debugging (RH850)</li> <li>Java Applet</li> <li>Java Applet</li> <li>Java Application</li> <li>Launch Group</li> <li>Renesas GDB Hardware Debugging</li> <li>* RZN2L_BACnet_BSS_V1.0.0 Debug [local]</li> <li>Renesas Simulator Debugging (RX, RL78)</li> </ul>	Runtime Options         Set program counter at (hex):         Set breakpoint at:         Resume         Run Commande         Fource rzn2Lxspi0_x1_boot.cfg	Remove Move up Move down
Filter matched 13 of 16 items	[	Revert Apply
?		Debug Close

Fig.4-19 Debug Configurations(5)

### 4.4.4 Debug

The download procedure after completing the build is shown below.

At the second and subsequent debugger launches, click the Run menu with the project name selected in the C/C++ view.



Fig.4-20 Run menu Debug As



Downloading the program to serial flash ROM.

workspace_FSP110_sample_B-SS_airspeed -	RZN2L_FreeRTOS_lwIP/rzn/Tsp/src/bsp/cmsis/Device/RENESAS/Source/startup.c - e <sup>2</sup> studio – C ×	
File Edit Source Refactor Navigate Se	rrcn Project kenesas views kun Window Help	
🐔 🎋 🔳 🎋 Debug	✓ C RZN2L_FreeRTOS_LwiP Debug_Flat ✓ 🔅 C T	1
💸   🗱 🕶 💁 🕶 🗠 🛪 🦝 🗰 🖛 🕼	💱 🕹 🕸 💋 📸 ד 🗳 ד 🗳 ד 🚱 ד 🥙 ד 🎘 🖋 ד 🗟 🗉 🍿 🖉 ד 🖉 ד 🖓 ד 🤃 🖄	
	Q IE BC/C++ & Debug	
🎦 Project Explorer 🗙 🕞 🐄 🏹 🖇 📟	🗅 🗟 lwip port main. 🕼 startup.c X 🕼 r sci uart.c 🗟 lwip port insta 🔭 😐 🕒 😕 Outline X	
V S RZN2L_FreeRTOS_IwIP [Debug]		
> 🐝 Binaries	Progress Information - X ++ Reserved Handler(void) : void	
> 🔊 Includes	↔ FIQ_Handler(void) : void	
> 🥵 BACNETOSS	Preparing launch delegate P i g_flq_stack : uint8_t[]	
V 🚰 common		
> 📴 055		
> 😥 renesas		
v 👺 rzn	a g_sys_stack: uint8_t[]	
s 🛃 ann	• g_svc_stack : uint8_t[]	
> (2 board	g_eap unto ti	
> Cas fsp	Seguer J-Link V7.000 - Flash download (192 KB)	
> 🖓 rzn cfg/aws	System_Inityoog : void     System_Inityoog : void	
> 🖉 rzn gen	304 compare 1000 User User User User User User User User	
> 🚰 src	305 Ersse 1006 0763s http://www.communication.com	
> 🐸 user/user_config	Program & Verify 108 07228 Default Handler/void : void	/
> 😂 user/user_fs3000_rz	🕐 Problems Programming range Dx600055000 – 0x60005FFF (4 KB) 1 5835 5 Debug	
> 👝 Debug		
> print crg	RZN21 FreeRTOS I w/P Debug Flat (Renesas SDB Hardware Debugging) [nid: 27]	
script	4020-https://	
E isp_spo_boosid		
and a second		<b>´</b>
東行山		-
KZN2L_FreeKTOS_IwIP	コンテキスト・ヘルフをボーリンク中:(55%) 📰 👘 🖓 🔟 📂 🌽 🥲	

Fig.4-21 Download

Click Switch to change to debug view.

E

Confirm Perspective Switch	×
This kind of launch is configured to open the Debug perspe This Debug perspective supports application debugging by displaying the debug stack, variables and breakpoints. Switch to this perspective?	tive when it suspends. providing views for
Remember my decision Swite	h No

Fig.4-22 Perspective Switch

The CPU automatically extracts the loader program included in the download data to the BTCM. After extraction, it breaks in system\_init() at the beginning of the initialization on the loader program.

• In case of operating the RSK board alone without using the debugger, turn off the board power supply, disconnect the debugger cable, and then turn on the board power supply again.



When using the debugger, **click the "reset"** icon and then "resume" **b** after switching to the Debug screen.

File Eult Source Relactor Mygate Sea	rch <u>P</u> roject Kenesas <u>v</u> iews <u>R</u> un <u>w</u> indow <u>H</u> eip	(								
🔚   🛞 = 🍕 = 🏪   🔍 🕪 💷 🔳 🌫	👁 🕼 🖬 💸 🗱 🕈 🕶 💁 🕶 🛰 🌾 🍽	- 💷 📽 🗞 🌽	Q	🔛 🔤 C/C++ 📑	🌾 Debug					
🔯 Debug 🗙 🛛 📄 🦌 it 🖓 🖓 🗖	[RZN2L_BACnet_BBC_V1.0.0] FSP Configur	🖟 startup.c 🗙 ն main.c 🛛 🖻 tasks	s.c 🗖 🗖	(x)= V × <sup>≫</sup> <sub>6</sub>	- 0					
V E RZN2L_BACnet_BBC_V1.0.0 Debug (1)	291		^	20 - NG I	3 🖻 8					
✓ ⑦ RZN2L_BACnet_BBC_V1.0.0.elf [1] [cc	293 • After boot proc	essing, LSI starts executing here.	•	Name Type	^					
✓ IP Thread #1 1 (single core) [core: 0]	296 {	system_init (void)		indine iype						
system_init() at startup.c:299 0	297									
📕 arm-none-eabi-gdb (12.1)	298	loops are only needed when debuggi	ing */							
📕 Renesas GDB server (Host)	299 00102000asm volatile	(								
	300	v r0, #0	\n"							
	301	<pre>vw r1, #0x+07+</pre>	\n"							
	302 III0	vi ri, #0x2ta	\n \n"							
	304 " ad	ds r0 #1	\n"							
	305 " cm	p r0, r1	\n"							
	306 "hn	e software loon	∖n" ×		- ×					
	<		>	< .	> < >					
	☐ Console × IIII Registers	🖹 Problems 🛛 🙀 Debugger Console 🁒 Sm	art Browser 📋	Memory	- 0					
			ا 🔬 🗟 🖌	😼 🗩 🗶 🚽 E	) 🗕 📑 🗕					
	RZN2L BACnet BBC V1.0.0 Debug (1) [Renesas G	DB Hardware Debugging] [pid: 9]								
	Starting target connection				^					
	Finished target connection									
	GDB: 65462									
	Target connection status - OK				~					
< >	<				>					

Fig.4-23 Break at system\_init()

After completing initialization, the loader program jumps and stops at the beginning of main(), Then, click "resume" to return to the running state.

e2s - RZN2L_BACnet_BBC_V1.0.0/rzn_gen/n	ain.ce² studio	-	
Eile Edit Source Refactor Navigate Sear	:h <u>P</u> roject Renesas <u>V</u> iews <u>R</u> un <u>W</u> indow <u>H</u> elp		
🔚 😸 <del>- 🗞 - 1 🏪 1 × 🕪 🗉 🔳 🌫</del>	🤋 . 요   1+   後   祢 - 🍋 - ! 🔍 - 祐 🕪 - 💷 😭 🖏 🌝 🇾	م 😰 🗟 در	'C++ 🐐 Debug
🔯 Debug 🛛 📄 🖳 📄 🖓 👘 🗖	🌼 [RZN2L_BACnet_BBC_V1.0.0] FSP Configur 🔓 startup.c 🛛 🔓 main.c 🗙 🖻 tasks.c 🗧	= 🗆 🛛 🗆 🛛 🕬	» <sub>6</sub> □ □
<ul> <li>         RZN2L_BACnet_BBC_V1.0.0 Debug (1) [I     </li> <li>         RZN2L_BACnet_BBC_V1.0.0.elf [1] [cc     </li> </ul>	79 80	A Mame	E 2 € 8 Type ^
<ul> <li>✓ <sup>™</sup> Thread #1 1 (single core) [core: 0</li> <li>➡ main() at mainc:81 0x30012c2</li> <li>➡ arm-none-eabi-gdb (12.1)</li> <li>➡ Renesas GDB server (Host)</li> </ul>	<pre>82 30012c26 82 30012c26 83 30012c32 84 85 86 30012c32 87 87 88 89 90 90 90 90 90 90 90 90 90 90 90 90 90</pre>	· · · · · · · · · · · · · · · · · · ·	> ~
	📮 Console 🗙 🚟 Registers 🗓 Debug Shell 😰 Problems 🙀 Debugger Console 👒 Smart Browse	ser 🚺 Memory	- 0
	RZN2L BACnet BBC V1.0.0 Debug (1) [Renesas GDB Hardware Debugging] [nid: 9]	k 🚮 🖗 🧲 🚝	🛃 📮 🕶 🔽
	Starting target connection Finished target connection 60B: 65462 Target connection status - 0K		^ ~
< >>			>
Suspended → 0x30012c24	🧭 712199.38 us 👔 PMU 🚓 284879755		
	Writable Smart Insert 81:1:3478		

Fig.4-24 Break at main()



# 4.5 BACnet Communication with VTS

The following description assumes that Wireshark(Ethernet) is running before starting VTS.

B-BC broadcasts I-Am-Router-To-Network and I-Am service frames to the BACnet/IP network to which it belongs after initial configuration. The following shows these packets captured with Wireshark.

192.168.10.10 in Source is the B-BC server address.

192.168.10.255 in Destination means a broadcast address.

BACnet/IP uses UDP packets for communication and the default port is 47808 (0xBAC0). You can filter "bacnet" with Wireshark.(Filtered by "bacnet or bvlc or ntp" below)



Fig.4-25 Capture I-Am service packet multicast from B-BC



## RZ/N2L Group

#### Launch VTS

Double-click VTS.exe in the folder where VTS was installed.



Fig.4-26 Launch VTS

The following descriptions are the settings used in the evaluation of the B-SS sample software. Please modify them according to your operating environment.

Click on Devices... in the Edit menu.

1	VTS - [	vts3.cfg]	
File	e Edit	View Send EPICS Tools	Help
1 C	נ	Delete All Packets Ctrl+I	
: E	1	Refresh	٢
No	o.	Devices	
	_	Ports	
		Names	
		Change Logfile	
		Capture Filter	
		Display Filter	
		Preferences	

Fig.4-27 Edit menu Devices(1)



 Device Options Name: Instance: Segment Size: Max Segments: Window Size: Next Invoke ID: Vendor ID: Max APDU Size: APDU Timeout:	VTS           0           1024           0           1           0           260           1024           5000	Segmentation C Both C Transmit C Receive C None Router I-Am
APDU Seg Timeout: APDU Retries:	3	

Fig.4-28 Edit menu Devices(2)

Click Ports... in the Edit menu.

V 🔂	/тs - [	vts3.cfg]		
File	Edit	View Send EPICS	Tools H	lelp
D		Delete All Packets	Ctrl+D	
Ē		Refresh		١
No.		Devices		
		Ports		
		Names		-
		Change Logfile		
		Capture Filter		Ŀ
		Display Filter		
		Preferences		
	-			-

Fig.4-29 Edit menu Ports(1)

Port Configuration	×
Name         Type         Config         Status           BACnetpoit         IP         0xBAC0ASIXA         B/IP star	New Delete
Nurse DACentrat	OK Cancel
Name:     DACREDUIT     P Endue       Network:     1     VTS     Image: VTS       Null     IP     Ethernet     ARCNET     MSTP     PTP	Арріу
Interface ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapte UDP Port: 0xBAC0 Usually 0xBAC0 (47808) 0 = dynamically assigned	r #8 (192.168.10.2
C BTR (Annex-H) BTR Peers C BBMD (Annex-J) BBMD Peers C B/IP (Annex-J)	
C Foreign Device (Annex-J) Host: Time-to-live:	_

Fig.4-30 Edit menu Ports(2)



# RZ/N2L Group

Click Names... in the Edit menu.

File       Edit       View       Send       EPICS       Tools       Help         D       Delete All Packets       Ctrl+D       E         No.       Devices       Devices       Devices         Ports       Ontrol Capture Filter       Devices       Devices         Display Filter       Display Filter       Devices       Devices		VTS -	- [vts3.cfg	9]			
Delete All Packets       Ctrl+D         Refresh       Image: Change Logfile         Orts       Change Logfile         Display Filter       Display Filter         Preferences       Image: Change Logfile	File	Edit	it View	Send	EPICS	Tools	Help
No.     Refresh       No.     Devices       Ports       Orts       Change Logfile       Capture Filter       Display Filter       Preferences	D		Delete	All Pack	ets	Ctrl+D	
No.     Devices       Ports       Onage Logfile       Capture Filter       Display Filter       Preferences	Ē		Refresh	h			٢
Ports Names Change Logfile Capture Filter Display Filter Preferences	No.		Device	·s			
Names       Change Logfile       Capture Filter       Display Filter       Preferences			Ports				
Change Logfile Capture Filter Display Filter Preferences			Names	5			
Capture Filter Display Filter Preferences			Change	e Logfile	e		
Display Filter Preferences			Captur	re Filter			
Preferences			Display	y Filter			
			Prefere	ences			



Names           Name         Port           CLIENT_VTS         BACnetp           Global Broadcast         BACnetp           Local Broadcast         BACnetp           TD         BACnetp	Network         Address            192 168 10.20:47808            3            192.168.10.20:47808	New Delete
Address Type C Null C Local Broadcast C Local Station C Remote Broadcast C Remote Station C Global Broadcast	Name         CLIENT_VTS           Port         BACnetport           Network	Export

Fig.4-32 Edit menu Names(2)

# 4.5.1 Who-Is / I-Am

(1) Discover Devices

Click Discover Devices... in the Tools menu of the VTS.

🙀 VTS - [vts3.cfg]		
File Edit View Send EPIC	Tools Help	
) 🗅 🚅 🗑 🎒 🗙 o 🔶	Backup/Restore	
1 🗄 💵 👥 🔛 🖽 🖽 🖬	Inconsistent Parameters	
No. TimeStamp Source	Discover Devices	DAE
	Generate EPICS from Device	

Fig.4-33 Tools menu Discover Devices(1)



Select Device: as Global Broadcast in the displayed dialog then click OK.



Fig.4-34 Tools menu Discover Devices(2)

The following Wireshark capture shows that the B-BC server returned I-Am device,10 and I-Am-Router-To-Network responses to the Who-Is service request and Who-Is-Router-To-Network network layer messages from the VTS client. The first Who-Is from the VTS is sent to all device IDs (0-4194303), and three devices respond I-Am. I-Am device,0 indicates the VTS itself, and I-Am device,100 is the B-SS connected to the MS/TP network; the source IP address of I-Am device,100 was routed through the IP address of the B-BC.

The VTS client is requesting four different property values to B-BC and B-SS with ReadProperty service; B-BC and B-SS respond with a Complex-Ack containing the results.

<u>F</u> ile <u>E</u>	dit <u>V</u> iew <u>G</u> o <u>C</u> aptu	re <u>A</u> nalyze <u>S</u> tatis	tics Telephon <u>y W</u> i	reless <u>T</u> ools	<u>H</u> elp						
		। ९ 🗢 🔿 🕾	Ŧ 🌡 🧮 🔳 🔍	Q Q 💷							
bacr	et or bylc or ntp									$\times \rightarrow$	-+
No	Time	Source	Destination	Protocol	Length Info						-
5	03 11:45:32.640991	192,168,10,20	255.255.255.255	BACnet-APDU	60 Unconf	rmed-RE	0 who-Is 0 4194303				
5	04 11:45:32.641229	192.168.10.20	192.168.10.255	BACnet-APDU	67 Unconf	rmed-RE	0 i-Am device,0				
5	05 11:45:32.646837	192.168.10.10	192.168.10.255	BACnet-APDU	67 Unconf:	Irmed-RE	Q i-Am device,10				
5	07 11:45:32.861875	192.168.10.10	192.168.10.255	BACnet-APDU	71 Unconf:	Irmed-RE	Q i-Am device,100				
5	09 11:45:36.036916	192.168.10.20	255.255.255.255	BACnet-APDU	58 Unconf:	Irmed-RE	Q who-Is 1 9				
5	12 11:45:39.111333	192.168.10.20	255.255.255.255	BACnet-APDU	58 Unconf:	irmed-RE	Q who-Is 11 99				
L 5	14 11:45:42.254935	192.168.10.20	255.255.255.255	BACnet-APDU	60 Unconf:	irmed-RE(	Q who-Is 101 419430	93			
5	20 11:45:45.415968	192.168.10.20	192.168.10.10	BACnet-APDU	59 Confir	ned-REQ	readProperty[ 5]	] device,10 o	bject-name		
5	23 11:45:45.441231	192.168.10.10	192.168.10.20	BACnet-APDU	93 Comple:	K-ACK	readProperty[ 5]	] device,10 d	bject-name		
5	24 11:45:45.446398	192.168.10.20	192.168.10.10	BACnet-APDU	59 Confirm	ned-REQ	readProperty[ 6]	] device,10 m	odel-name		
5	26 11:45:45.490821	192.168.10.10	192.168.10.20	BACnet-APDU	77 Comple:	<-ACK	readProperty[ 6]	] device,10 m	odel-name		
5	27 11:45:45.498381	192.168.10.20	192.168.10.10	BACnet-APDU	59 Confirm	ned-REQ	readProperty[ 7]	device,10 a	pplication-softwa	are-version	
5	28 11:45:45.540827	192.168.10.10	192.168.10.20	BACnet-APDU	68 Comple:	K-ACK	readProperty[ 7]	] device,10 a	pplication-softwa	are-version	
5	29 11:45:45.548664	192.168.10.20	192.168.10.10	BACnet-APDU	59 Confirm	ned-REQ	readProperty[ 8]	j device,10 p	rotocol-revision		
5	30 11:45:45.590622	192.168.10.10	192.168.10.20	BACnet-APDU	62 Complex	C-ACK	readProperty[ 8]	j device,10 p	rotocol-revision		
5	22 11:42:45.601864	192.106.10.20	192.106.10.255	BACnet NPDU	51 Who-15	wton To	Notwork				
	22 11:45:45.040019	192.100.10.10	192.100.10.200	BAChet-NPDU	64 Confin	nod DEO	-Network	L doutico 100	object name		
	24 11:45:45.042455	102.108.10.20	102.108.10.10	RACnot-APDU	04 Complex	- ACK	neadProperty[ 9]	device,100	object-name		
	35 11:45:45 922861	192.168.10.10	192.168.10.20	BACnet-APDU	64 Confire	ned-REO	readProperty[ 10]	device 100	model_name		
	36 11:45:46.125586	192.168.10.10	192.168.10.20	BACnet-APDU	77 Comple	C-ACK	readProperty[ 10]	device.100	model-name		
5	37 11:45:46.130357	192,168,10,20	192.168.10.10	BACnet-APDU	64 Confir	ned-REO	readProperty[ 11]	device.100	application-softw	ware-version	
5	38 11:45:46.340744	192,168,10,10	192.168.10.20	BACnet-APDU	72 Comple:	K-ACK	readProperty[ 11]	device.100	application-softw	ware-version	
5	39 11:45:46.350042	192.168.10.20	192.168.10.10	BACnet-APDU	64 Confir	ned-REQ	readProperty[ 12]	device,100	protocol-revision	1	
5	40 11:45:46.555736	192.168.10.10	192.168.10.20	BACnet-APDU	66 Comple:	K-ACK	readProperty[ 12]	device,100	protocol-revision	n	
<											>
> Fra	me 503: 60 bytes on	wire (480 bits).	. 60 bytes captur	ed (480 bits)	) on interface	0000	ff ff ff ff ff ff	7c c2 c6 10	: 9a fe 08 00 45 (	00	
> Eth	ernet II, Src: TPLin	nk 1c:9a:fe (7c:0	2:c6:1c:9a:fe),	Ost: Broadcas	st (ff:ff:ff:ff	0010	00 2e 2a 81 00 00	80 11 00 00	0 c0 a8 0a 14 ff f	ff • *••••	
> Int	ernet Protocol Versi	lon 4, Src: 192.1	168.10.20, Dst: 2	55.255.255.25	55	0020	ff ff ba c0 ba c0	00 1a 07 fg	81 0b 00 12 01 1	20	
> Use	r Datagram Protocol,	Src Port: 47808	8, Dst Port: 4780	В		0030	TT TT 00 TT 10 08	09 00 10 31	* ** **		1211
> BAC	net Virtual Link Cor	ntrol									
> Bui	lding Automation and	d Control Network	< NPDU								
✓ Bui	lding Automation and	d Control Network	< APDU								
	9001 = APDU Typ	e: Unconfirmed-F	REQ (1)								
	Inconfirmed Service	Choice: who-is (	(8)								
2	Device Instance Rang	e LOW Limit: 0	04202								
	Jevice instance kang	e nign timit: 41	194505								
_											

Fig.4-35 Tools menu Discover Devices(2)



VTS displays transmitted and received frames as follows. The contents of the display are not much different from those of Wireshark.

	- [ute2.cfg]					
Eile Er	- (VISSICITY) lit View Cor	ad EDICS Tools Holp				
	III / III / III / III					
					▼	
E 💵	🐹   🕮 💷	目 職 (4, 6) (4) (4) (4)				
No.	TimeStamp	Source	Destination	DADDR	Service Type	∧ Detail View
→ 67	11:45:45.413	CLIENT_VTS	192.168.10.10:47808		ReadProperty, ID=5 device_10, object-name	Timestamp : 11:45:46.554
<del>(</del> 68	11:45:45.439	192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=5, device_10, object-name, "RZN2L_BACnet_Solution_BBC_BRTR"	Source/Destination = 192.168.10.10:0xBAC0
→ 69	11:45:45.444	CLIENT_VTS	192.168.10.10:47808		ReadProperty, ID=6 device_10, model-name	BACnet Virtual Link Layer Detail
<b>+</b> 70	11:45:45.489	192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=6, device_10, model-name, "RZN2L_BBC_BRTR"	BACnet Network Layer Detail
→ 71	11:45:45.496	CLIENT_VTS	192.168.10.10:47808		ReadProperty, ID=7 device_10, application-software-version	BACnet Application Layer Detail
<b>←</b> 72	11:45:45.539	192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=7, device_10, application-software-version, "1.0.0"	
→ 73	11:45:45.546	CLIENT_VTS	192.168.10.10:47808		ReadProperty, ID=8 device_10, protocol-revision	Invoke ID = 12
<b>+</b> 74	11:45:45.589	192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=8, device_10, protocol-revision, 23	Read Property ACK = 12
75	11:45:45.599	VTS Message			Device 100 at 129.0.0.0:0 on network 2. Vendor: Reserved-9999. maxAPDU:480. no-segmentation	[III- [0] Object Identifier: device, 100
→ 76	11:45:45.599	CLIENT_VTS	192.168.10.255:47808		Who-Is-Router-To-Network	FI-[1] Property Identifier: protocol-revision (139)
<b>+</b> 77	11:45:45.599	CLIENT_VTS	Local Broadcast		Who-Is-Router-To-Network	E [3] PropertyValue: Paired tag
<b>+</b> 78	11:45:45.638	192.168.10.10:47808	Local Broadcast	broadcast	I-Am-Router-To-Network	Opening Context Tag = X'3E'
<b>→</b> 79	11:45:45.639	CLIENT_VTS	192.168.10.10:47808	81	ReadProperty, ID=9 device_100, object-name	Ellipsigned: 23
68 🕂	11:45:45.908	(2, 81) via 192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=9, device_100, object-name, "RZN2L_BACnet_Solution"	Closing Context Tag = Y'3E'
→ 81	11:45:45.921	CLIENT_VTS	192.168.10.10:47808	81	ReadProperty, ID=10 device_100, model-name	E closing context rag = x or
82	11:45:46.123	(2, 81) via 192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=10, device_100, model-name, "RZN2L_BASC"	
→ 83	11:45:46.128	CLIENT_VTS	192.168.10.10:47808	81	ReadProperty, ID=11 device_100, application-software-version	
<b>4</b> 84	11:45:46.338	(2, 81) via 192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=11, device_100, application-software-version, "1.1.0"	
+ 85	11:45:46.347	CLIENT_VTS	192.168.10.10:47808	81	ReadProperty, ID=12 device_100, protocol-revision	
<del>(</del> 86	11:45:46.554	(2, 81) via 192.168.10.10:47808	CLIENT_VTS		ReadProperty-ACK, ID=12, device_100, protocol-revision, 23	
87	11:45:46.571	VTS Message			Operation completed successfully	
						¥
<					2	· · · · · · · · · · · · · · · · · · ·
* 0000	C0 A8 0A (	DA BA CO 81 DA DO 18 D1 D8	00 02 01 81			
0010	30 OC OC (	OC 02 00 00 64 19 8B 3E 21	17 3F 0	.d>!.?		
É I						
Ready						

Fig.4-36 VTS log screen

#### (2) Remote Device Management

Who-Is can also be sent from the Send menu in addition to sending it from the Tools menu. Normal service requests can be sent from the Send menu. Click Remote Device Management > Who-Is.

V 💦	TS - [vts3.cfg]						
File	Edit View	end EPICS Tools Help					
0	je 🛛 🗧	New Packet		1			
	• 🕺 🔛	Send Again		ľ			
No.	TimeStamp	BACnetport (IP)		ion	DADDR	Service Type	
<del>(</del> 1	21:39:17.30			oadcast	broadcast	Who-ls, 0-419	4303
⇒2	21:39:17.30	IP	>	10.255:47808	broadcast	I-Am, device_	D
<del>(</del> 3	21:39:17.31	BVLL	>	oadcast	broadcast	I-Am, device_	12
<del>+</del> 4	21:39:17.31	Network	>	oadcast	broadcast	I-Am, device_	D
⇒5	21:39:20.64	Alama and Essent		255.255:47808	broadcast	Who-ls, 1-11	
<b>+</b> 6	21:39:20.64	Alarm and Event	,	oadcast	broadcast	Who-ls, 1-11	
⇒7	21:39:23.69	File Access	>	255.255:47808	broadcast	Who-ls, 13-41	94303
+ 8	21:39:23.69	Object Access	>	oadcast	broadcast	Who-ls, 13-41	94303
9	21:39:26.74	Remote Device Management	$\sum$	DeviceCor	mmunication	Control	168.10.20:47
→ 10	21:39:26.74	Victoral Terminal		Continues	IT		P=1 device_
+ 11	21:39:26.74	virtual terminal		Commed	riextiviessagi	=	D=1 device_0
+ 12	21:39:26.75	Simple/Segment ACK	>	I-Am			CK, ID=1, de
← 13	21:39:26.75	Errors	>	I-Have			CK, ID=1, de
- 14	21:39:26.75	CLIENT VTC	CLIENT	Reinitializ	eDevice		2=2 device_
- 10	21:39:20.755	CLIENT_VIS	CLIENT	Unconfirm	and Towt Mass		CK ID=2 de
4 17	21:39:20:755	CLIENT_VTS	CLIENT	Uncommi	neurextiviess	age	CK ID=2 de
- 1/	21:39:20:755	CLIENT_VTS	CLIENT	TimeSyncl	hronization		D=3 device (
4 10	21:30:26 778	CLIENT VTS	CLIENT	Who-Has			-3 device
⇒ 20	21:39:26 778	CLIENT VTS	CLIEN	Who-Is			C ID-3 de
<b>4</b> 21	21:39:26 779	CLIENT VTS	CLIENT	LITCT			CK ID-3 de
→ 22	21:39:26.793	CLIENT VTS	CLIENT	UTCTIMES	ynchronizati	on	
4 23	21:30:26 703	CLIENT VTS	CLIENT	VTS		ReadProperty	ID=4 device (

Fig.4-37 Send menu Who-Is



Click on the IP tag in the Who-Is dialog and select Global Broadcast or Local Broadcast then the address is automatically filled in.

Global Broadcast:255.255.255.255:47808

Local Broadcast:192.168.10.255:47808

You can also enter the address directly.



Fig.4-38 Who-Is parameters(1)

Click on the BVLCI tag in the Who-Is dialog and make sure that either Original Uncast or Original Broadcast is selected.

Who-Is	– 🗆 X
IP BVLCI NPCI Who-Is	BACnetport
C No BVLCI (Annex H) C Distribute-Broadcast-To-Network Original Unicast	
<ul> <li>Original Broadcast</li> </ul>	ConfirmedTextMessage
C Forwarded-NPDU	
Originating Device Address	
FFFFFFF BAC0810B 000C0100 10080900 1964	Close Send & Close

Fig.4-39 Who-Is parameters(2)



Click on the NPCI tag in the Who-Is dialog and make sure "DNET/DLEN/DADR Present" is selected.



Fig.4-40 Who-Is parameters(3)

Click on the Who-Is tag in the Who-Is dialog and enter the ID range of the device to be searched. If blank, the range will be 0 to 4194303, which is the full range. Lastly, click on Send.

Fig.4-41 Who-Is parameters(4)



The following is a capture of I-Am responses from B-BC and B-SS to a Who-Is service request.

<u>a</u> *1	ーサネッ	가 11																				_			>	<
File	Edit	View	Go (	Capture	Analyze	Statisti	cs Tel	ephony	Wirele	SS	Tools	Help														
		0	010		ء 🗢	⇒ 🗟 7	<u>4</u> 1		⊕ ∈																	
bac	net or	ntp																					$\times$		- -	ŀ
No.		Time			Source	;		Destina	ation			Protoc	ol		Leng	th	Info									^
	924	10:4	3:11.8	391093	192.1	168.10	.20	255.2	255.25	5.2	55	BACne	et-A	PDU		54	Unc	onf	irme	d-RE(	Q wh	o-I	s 0	100		
	925	10:4	3:11.8	391523	192.1	168.10	.100	192.1	.68.10	.25	5	BACne	et-A	PDU		67	Unc	onf	irme	d-RE(	Qi-	Am	dev	ice,	12	
	926	10:4	3:11.9	906250	192.1	168.10	.20	192.1	.68.10	.25	5	BACne	et-A	PDU		67	Unc	onf	irme	d-RE(	Qi-	Am	dev	ice,	0	~
<																									>	
> Fr	ame 9	924:	54 by	tes on	wire (	(432 bi	its),	54 by	tes ca	apti	000	0 ff	ff	ff	ff	ff	ff	7c (	c2 (	-6 1o	: 9a	fe	<b>0</b> 8	00	45	00
> Et	herne	et II	, Src	: TP-Li	.nk_1c:	9a:fe	(7c:o	2:c6:	1c:9a:	fe	001	0 00	28	d0	b7	00	00	80 1	11 (	00 00	0 c0	a8	0a	14	ff	ff
> In	terne	et Pr	otoco	l Versi	on 4,	Src: 1	192.16	58.10.	20, Ds	st:	002	0 ++	++	ba	CØ	ba 10	CØ (	00 1	14 (	0b 05	o 81	0b	00	0c	01 (	00
> Us	er Da	atagr	am Pr	otocol,	Src F	ort: 4	17808,	, Dst	Port:	47	003	0 10	08	69	00	19	64									
> BA	Cnet	Virt	ual L	ink Con	trol																					
> Bu	ildir	ng Au	tomat	ion and	Contr	ol Net	twork	NPDU																		
∽ Bu	ildir	ng Au	tomat:	ion and	l Contr	ol Net	twork	APDU																		
	0001		. = AP	DU Type	e: Unc	onfirm	ed-RE	Q (1)																		
	Unco	ntirr	ned Se	ervice (	Choice	: who-	1s (8	)																		
	Devi	ce Ir	istanc	e Kange	e Low	Limit:	0																			
~	Devi	ce II	istanc	e Kange	e Hign	Limit	: 100																			
<										>	<															>
0	🚺 wir	eshark.	イーサネ	୬ト 11N3M	801pcapr	ng								Pa	ckets	: 948	i · Dis	playe	ed: 46	(4.9%)			Prof	ile: De	efault	

Fig.4-42 Capture Who-Is and I-Am

### 4.5.2 ReadProperty

Click Send menu > Object Access > ReadProperty.

VTS - [vts3.cfg]					
File Edit View S	end EPICS Tools Help				
D 🚅 🔛 🎒	New Packet				
	Send Again		P		
			L	1	
No. TimeStamp	<ul> <li>BACnetport (IP)</li> </ul>		ion	DADDR	Service Type
<ul> <li>93 10:17:55.06</li> </ul>	10		oadcast		Who-ls, 0-100
→ 94 10:17:55.06	9	>	10.255:47808	broadcast	I-Am, device_0
<ul> <li>95 10:17:55.06</li> </ul>	BVLL	>	oadcast	broadcast	I-Am, device_0
<ul> <li>96 10:17:55.08</li> </ul>	Network	>	oadcast	broadcast	I-Am, device_12
➡ 97 10:18:27.41	Alarm and Event	、 、	10.255:47808		Who-ls, 0-100
<ul> <li>98 10:18:27.41</li> </ul>	Alam and Event		oadcast		Who-ls, 0-100
→ 99 10:18:27.41	File Access	>	10.255:47808	broadcast	I-Am, device_0
+ 1 10:18:27.43	Object Access	>	AddListEl	ement	12
← 1 10:18:27.44	Remote Device Management	>	Changel is	st-Error	P
→ 1 10:18:35.88			C I OL		
← 1 10:18:35.88	virtual lerminal	,	CreateObj	ect	
→ 1 10:18:35.88	Simple/Segment ACK	>	CreateObj	ect-ACK	P
← 1 10:18:35.89	Errors	>	CreateOb	ect-Error	12
← 1 10:18:35.90			 DeleteΩbi	ect	P
→ 1 10:20:20.369	CLIENT_VIS	255.255	Deleteob	cct	
← 1 10:20:20.370	CLIENT_VTS	CLIENT	ReadProp	erty	
→ 1 10:20:20.370	CLIENT_VIS	192.168	ReadProp	erty-ACK	P
← 1 10:20:20.385	192.168.10.100:47808	Local E	ReadProp	ertyMultiple	12
← 1 10:20:20.385	CLIENT_VTS	Local E	Development	and the design of the	A CK
→ 1 10:20:39.601	CLIENT_VIS	255.255	кеасигор	ertywutipie-	
← 1 10:20:39.601	CLIENT_VTS	Local E	ReadRang	le	
→ 1 10:20:39.601	CLIENT_VIS	192.168	RemoveLi	stElement	P
← 1 10:20:39.615	192.168.10.100:47808	Local E	WriteBron	warthy.	12
← 1 10:20:39.628	CLIENT_VIS	Local E	witteriop	erty	Ρ.
→ 1 10:40:40.753	CLIENT_VTS	255.255	WriteProp	ertyMultiple	vic
← 1 10:40:40.753	CLIENT_VIS	Local E	WriteProp	ertyMultiple-	Error
→ 1 10:40:40.753	CLIENT_VTS	192.168			D

Fig.4-43 Send menu ReadProperty



Click on the IP tag in the ReadProperty dialog and fill in the B-BC server address directly.

### 192.168.10.10:47808

### Fig.4-44 IP tag parameters

Click on the NPCI tag in the ReadProperty dialog and select B-BC or B-SS in this dialog.

#### The case of selecting B-BC is shown in Fig.4-45.

Verify that Data Expecting Reply is marked  $\checkmark$ .

IP     BVLCI     NPCI     Confirmed-Request     ReadProperty       Version     IP       Version     BVLL       DNET/DLEN/DADR Present     BVLL       DNET     Hex       DADR     Image: AddListElement       Hop Count     CreateObject Access       SNET/SLEN/SADR Present     CreateObject-Error       SNET     Hex       SNET     Hex
Version       IP         DNET/DLEN/DADR Present       BVLL         DNET       Hex         DADR       Image: CreateObject ACK         Hop Count       CreateObject ACK         SNET/SLEN/SADR Present       CreateObject Fror         SNET       Hex         SNET       Hex         SNET       Hex         SNET       Hex         SADR       Image: CreateObject         Image: CreateObject
Image: Data Expecting Reply       Image: ReadPropertyMultiple-ACK         Image: Priority       Image: ReadPropertyMultiple         Priority       Image: Priority         Image: Priority       Image:

Fig.4-45 NPCI tag parameters to B-BC



#### The case of selecting B-BC is shown in Fig.4-46

Enter 2 of the Network\_Number property value for B-SS in DNET. Enter (81) as Hex of 129 of the B-SS's MAC address in DADR. Enter 255 for Hop Count.

The settings in the NPCI dialog are the same when requesting each service other than ReadProperty to B-SS.



Fig.4-46 NPCI tag parameters to B-SS

Click on the Confirmed-Request tag in the ReadProperty dialog and select **480** for Max APDU length accepted.

Fig.4-47 Confirmed Request tag parameters



Click on the ReadProperty tag in the ReadProperty dialog, select ID... > Object Type and enter that Instance.

In the example below, device,100 is input for B-SS, but if B-BC is selected, device,10 should be input.

IP BVLCI NPCI Confirmed-Request ReadProperty MyPort
Network     Alarm and Event     File Access
Object ID       device, 100       D         Property       property-list       Atomic WriteFile         Array Index       Object ID       Additistlement         An object identifier is made of two components: an object type and an instance number.       Additistlement         Object Type       CenterObject       CreateObject         Object Type       Reserved types range 0127       CreateObject -Error         DeleteObject       DeleteObject       ReadProperty         Vendor Type       Vendor Types range 1281023       ReadPropertyMultiple         Here is how the value can be entered directly:       OK       WritePropertyMultiple         WritePropertyMultiple       WritePropertyMultiple       WritePropertyMultiple

Fig.4-48 ReadProperty parameters

Then select Property. In the example, property-list is selected. Lastly, click Send.

Fig.4-49 ReadProperty parameters(2)



B-SS responds with Complex-Ack for the property-list property of the devive,100 object.

Capturing from 7-HAWA 11		- n x
<u>File Edit View Go</u> Capture <u>Analyze Statistics</u> Telephon <u>y</u> <u>Wireless</u> <u>T</u> ools <u>H</u> elp		
		(m
bacnet or bvlc or ntp		
No. Time Source Destination Protocol Length Info	)	· · · · · · · · · · · · · · · · · · ·
3628 13:19:06.277040 192.168.10.20 192.168.10.10 BACnet-APDU 65 Con	firm	med-REQ readProperty[ 77] device,100 property-list
3631 13:19:06.572567 192.168.10.10 192.168.10.20 BACnet-APDU 113 Com	plex	c-ACK readProperty[ 77] device,100 property-list
<		>
S Errer 2621, 112 buter on wine (004 bits) 112 buter contured (004 bits) on inte		000 7c c2 c5 1c 0p fp 74 00 50 10 f0 pd 00 00 45 00
Sthenpet II. Spc: ReperseElect 10:60:ed (74:00:50:10:60:ed). Dot: TBlick 10:00	00	010 00 63 00 18 00 00 ff 11 26 03 c0 a8 0a 0a c0 a8
Thernet Protocol Version 4. Spc: 192.168 10.10. Dst: 192.168 10.20	00	020 0a 14 ba c0 ba c0 00 4f c5 fb 81 0a 00 47 01 08
> User Datagram Protocol, Src Port: 47808. Dst Port: 47808	00	030 00 02 01 81 30 4d 0c 0c 02 00 00 64 1a 01 73 3e
> BACnet Virtual Link Control	00	040 91 70 91 79 91 78 91 46 91 2c 91 0c 91 62 91 8b
> Building Automation and Control Network NPDU	00	91 91 91 91 90 91 40 91 56 91 60 91 60 91 49 91 16 960 91 9b 91 1c 91 39 91 77 91 38 91 18 91 3a 91 98
<ul> <li>Building Automation and Control Network APDU</li> </ul>	00	070 3f
0011 = APDU Type: Complex-ACK (3)		
> 0000 = PDU Flags: 0x0		
Invoke ID: 77		
Service Choice: readProperty (12)		
> ObjectIdentifier: device, 100		
> Property Identifier: property-list (371)		
> {[3]		
> property-list: system-status (112)		
<pre>&gt; property-list: Vendor-name (121) &gt; property-list: vendor-identifien (120)</pre>		
<pre>&gt; property-list: vendor-identifier (120) &gt; property-list: model-name (70)</pre>		
<pre>&gt; property-list: firmware-revision (44)</pre>		
<pre>&gt; property-list: application-software-version (12)</pre>		
<pre>&gt; property-list: protocol-version (98)</pre>		
<pre>&gt; property-list: protocol-revision (139)</pre>		
<pre>&gt; property-list: protocol-services-supported (97)</pre>		
> property-list: protocol-object-types-supported (96)		
<pre>&gt; property-list: object-list (76)</pre>		
> property-list: max-apdu-length-accepted (62)		
<pre>&gt; property-list: segmentation-supported (107)</pre>		
<pre>&gt; property-list: apdu-timeout (11)</pre>		
<pre>&gt; property-list: number-of-APDU-retries (73)</pre>		
> property-list: device-address-binding (30)		
> property-list: database-revision (155)		
> property-list: description (28)		
<pre>&gt; property-list: utc-offset (119)</pre>		
> property-list: local-date (56)		
<pre>&gt; property-list: daylights-savings-status (24)</pre>		
> property-list: location (58)		
<pre>&gt; property-list: active-cov-subscriptions (152)</pre>		
> }[3]		
< >	<	
○ 2 イーサネット 11: <live capture="" in="" progress=""></live>		Packets: 4024 · Displayed: 56 (1,4%) Profile: Default

Fig.4-50 Capture ReadProperty device,100 property-list


# 4.5.3 TimeSynchronization / UTCTimeSynchronization

Double-click Remote Device Management from the service tree displayed in the previously used dialog.

ReadProperty	- 🗆 ×
IP BVLCI NPCI Confirmed-Request ReadProperty	BACnetport -
Object ID device, 12 ID Property property-list	CreateObject-ACK CreateObject-ACK CreateObject-Error CreateObject-Error CreateObject CreateObjec
C0A80A64 BAC0810A 00120104 0005510C 0C020000 0C1A0173	✓ Send

Fig.4-51 TimeSynchronization parameters(1)

Click on TimeSynchronization or UTCTimeSynchronization in the expanded Remote Device Management. Mark  $\checkmark$  at Synchronize with VTS in the TimeSynchronization tag and click Send. If you want to enter a time other than the current time, remove the  $\checkmark$  from Synchronize with VTS and enter the Date and Time directly.

For the destination IP address, the previous value is applied. To change the destination IP address, enter the IP address from the IP tag. The same applies hereafter.

limeSynchronization	- L X
IP BVLCI NPCI TimeSynchronization	BACnetport -
Date     Monday, 13-March-2023       Time     14:08:56.00	ReadProperty ReadProperty-ACK ReadProperty-Multiple ReadProperty/Multiple ReadRange ReadRange WriteProperty WriteProperty/Multiple-Eror Remote Device Management DeviceCommunicationContro ConfirmedTextMessage I-Am Have ReinitializeDevice UnconfirmedTextMessage TimeSynchronization Who-has Who-has Who-has UtrCTimeSynchronization Virtual Terminal Simple/Segment ACK Errors
CDA80A64 BAC0810A 00120104 1006A47B 030D01B4 0E083800	Class Sand & Class

Fig.4-52 TimeSynchronization parameters(2)



TimeSynchronization is an unconfirmed service. However, the destination IP address can be unicast. The following captured screen shows a unicast from a VTS client to a B-BC server.



Fig.4-53 Capture TimeSynchronization

The same applies for sending the UTCTimeSynchronization service instead of the TimeSynchronization service.



# 4.5.4 Who-Has / I-Have

Click Remote Device Management > Who-Has in the Service Tree displayed in the previously used dialog. Enter the Low Limit and High Limit for the search ID ranges. Select the object type from the Object ID pulldown menu, enter the instance number, then click OK.

In the example, the analog-input,0 object is selected; either Object ID or Object Name can be selected.

IP       BVLCI       NPCI       Who-Has       MyPort <ul> <li>GreateObject-Error</li> <li>DeleteObject</li> <li>ReadPropertyAltiple</li> <li>ReadPropertyMultiple</li> <li>An object iD</li> <li>Object ID</li> <li>Object ID</li> <li>Object Type</li> <li>Onanalog-input</li> <li>Reserved Type</li> <li>Reserved types range 0.127</li> <li>Remote Device Management</li> <li>WritePropertyMultiple</li> <li>Wr</li></ul>	IP       BVLCI       NPCI       Who-Has         Image: Standing of the sta	1103		
Vendor Type Vendor Type stange 1281023 DeviceCommunicationContro Instance I Instance range 04194303 Instance range 04194303 Here is how the value can be entered directly. Instance I Instance I	Who-Is	Who-Has	as Object ID An object identifier is made of two components: an object type and an instance number. Object Type analog input Reserved Type Reserved types range 0127 Vendor Type Vendor Types range 1281023 Instance Instance Instance Instance range 04194303 Here is how the value can be entered directly. analog-input. 0 OK	- × MyPort CreateObject-Error DeleteObject ReadPropertyAultiple ReadPropertyMultiple ReadPropertyMultiple WritePr

Fig.4-54 Who-Has parameters(1)

The following is an example of entering an Object Name.

IP       BVLCI       NPCI       Who-Has         Low Limit       0       CreateObject:Error         High Limit       100       ReadProperty         Object ID       D       ReadProperty/Multiple-ACK         Object Name       ANALOG INPUT 0       ReadProperty/Multiple-Error         Object Name       ANALOG INPUT 0       Device CommunicationContro         ConfirmedTextMessage       I-Am       I-Am         I Haw       I-Haw       I-Haw         I Haw       I-Haw       I-Haw	Who-Has	- L X
Low Limit  CreateObject:Error  ReadProperty-ACK  ReadProperty-ACK  ReadPropertyMultiple  ReadPropertyMultiple-ACK  ReadPropertyMultiple-ACK  ReadPropertyMultiple-Cror  ReadPropertyMultiple-Cror  ReadPropertyMultiple-Cror  Remote Device Management  PointePropertyMultiple-Error  Remote Device Management  PointePropertyMultiple-Error  Remote Device Management  PointePropertyMultiple-Error  Remote Device Management  PointePropertyMultiple  Remote Device Management  PointePropertyMultiple  Remote Device Management	IP BVLCI NPCI Who-Has	MyPort
TimeSynchronization     Who-Has     Who-Has     Who-Has     UTCTImeSynchronization     Virtual Terminal     ✓	Low Limit 0 High Limit 100 Object ID ID Object Name ANALOG INPUT 0	CreateObject-Error DeleteObject ReadProperty-ACK ReadProperty/Multiple ReadProperty/Multiple-ACK ReadProperty/Multiple-ACK ReadProperty/Multiple-ACK ReadBange WriteProperty/Multiple-Error Remote Device Management DeviceOnnounicationContro ConfirmedTextMessage DeviceOnnounication Ham DeleteCompute States UnconfirmedTextMessage UnconfirmedText

Fig.4-55 Who-Has parameters(2)



г

Next click on the IP tag and select Global Broadcast or Local Broadcast, then click Send.

WIIO-Has	
IP BVLCI NPCI Who-Has	BACnetport -
Destination Clubral Broadcore CLUENT_VTS Global Broadcast Local Broadcast TD	ReadProperty ReadProperty-ACK ReadPropertyMultiple ReadPropertyMultiple ReadPropertyMultiple ReadPropertyMultiple ReadPropertyMultiple WriteProperty WritePropertyMultiple WritePropertyMultiple DeviceCommunicationContro ConfirmedTextMessage I-Han L-Have I-Have I-Have I-Have I-Have I-Have Who-Has Who-Is Who-Is I UTCTimeSynchronization Virtual Terminal Simple/Segment ACK Errors
FFFFFFF BAC0810A 00110104 10070900 19142C00	Send

Fig.4-56 Who-Has parameters(3)

In the following example, the B-BC server locally broadcasts an I-Have response to a device search broadcast with an analog-input,0 object by a Who-Has service request.

6	Capturing from	イーサネット 11													_		×
File	Edit <u>V</u> iew	Go <u>C</u> aptur	e <u>A</u> nalyze <u>S</u> tatist	iics Telephony <u>W</u> ir 👔 🛃 🗮 🍭	eless <u>T</u> ools Q Q 🏨	<u>H</u> elp											
ba	acnet or bvlc or	ntp													×		- +
lo.	Time 5306 14:09:0 5307 14:09:0	04.271818 04.311807	Source 192.168.10.20 192.168.10.10	Destination 255,255,255,255 192,168,10,255	Protocol BACnet-APDU BACnet-APDU	Length 59 81	Info Unco Unco	nfirme nfirme	d-REQ d-REQ	who-Ha i-Have	s anal devic	.og-ir :e,10	analog	g-inpu	t,0	8 00	>
> Et > Ir > Us > BA > BL > BL > C	<pre>Aunce 5367. et al. http://www.second.com/ second/second/ ACnet Virtua ACnet Virtua (0001 Unconfirme ObjectIden ObjectIden ObjectIden Object Nam Object &gt; Applica String</pre>	Src: Renes cocol Versi Protocol, Protocol, al Link Con mation and = APDU Typ d Service tifier: de tifier: de Name: ANAL tion Tag: 0 Character S	Mile (040 DI) asElect_10:f9:ec on 4, Src: 192.1 Src Port: 4780E trol Control Network e: Unconfirmed-R Choice: i-Have ( vice, 10 alog-input, 0 DG INPUT 0 Character String Set: ANSI X3.4 /	, U Length/Value/Ty UTF-8 (since 201	ed), Dst: Br p2.168.10.255	oadcast	(ff	0010 0020 0030 0040 0050	00 43 0a ff ff ff 75 01 30	3 00 10 F ba c0 F 00 <del>f</del> F 00 4:	1 00 0 9 ba c 7 10 0 1 4e 4	0 ff 0 00 1 1 c4 0 1 4c	11 25 2f 1c 02 00 4f 47	33 c0 d6 81 00 0a 20 49	a8 0 0b 0 c4 0 4e 5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	c0 ai 00 20 00 0 54 2
۲.							>	<									
0	🏹 イーサネット	11: clive can	turo in programs					11 .		5247 F	e	1. 00 (4	29/1		D.	01 D.	Con the

Fig.4-57 Capture Who-Has and I-Have



### RZ/N2L Group

# 4.5.5 ReadPropertyMultiple

Click Object Access > ReadPropertyMultiple from the service tree displayed in the previously used dialog.

ReadPropertyMultiple		– 🗆 ×
IP BVLCI NPCI Confirmed-Request ReadPropertyMultiple		BACnetport -
Object ID	Add	File Access
	Pamaua	AddListElement
	Kemove	ChangeList-Error
	/¥	CreateObject
	×/	CreateObject-Ack
1	- <del>f</del> /	DeleteObject
Object ID ID		ReadProperty
		ReadProperty-ACK
Property Index	Add	ReadPropertyMultiple
		ReadRange
	Kemove	RemoveListElement
	/¥	
		WritePropertyMultiple
	¥/	Remote Device Management
		ConfirmedTextMessage
Property		I-Am
Index		ReinitializeDevice
		<pre> * *</pre>
C0A80AFF BAC0810A 000A0104 0005510E		- Send
		Close Soud & Close

Fig.4-58 ReadPropertyMultiple parameters(1)

Click Add at the upper part of the ReadPropertyMultiple dialog displayed. Click ID..., select an Object ID, and then click OK. In the example, the device,10 object is selected.

IP BVLCI NPCI Confirmed-Request ReadPro	opertyMultiple	MyPort	-
Object ID analog-input, 0	Add	AtomicWritel	File-ACK ^
	Object ID An object identifier is made of two component an instance number.	: an object type and	ACK Error
Object ID analog-input, 0 ID	Object Type device Reserved Type 8 Reserved type	es range 0127	ACK Aultiple Aultiple-ACK
	Vendor Type Vendor Types	range 1281023 ce range 04194303	ment
	Here is how the value can be entered directly. device, 10	ОК	Multiple-Error inagement nicationContro
Property V		I-Am I-Have ReinitializeDe	Message evice
C0A80A0A BAC0810A 00110104 00034E0E 0 001E1F	000000	Close	Send Send & Close

Fig.4-59 ReadPropertyMultiple parameters(2)



## RZ/N2L Group

Click Add in the center of the dialog; select a property from the Property pull-down menu. In the example "all" property is selected; then click on Send.



Fig.4-60 ReadPropertyMultiple parameters(3)

The following example shows a "all" property request of a device,10 object by the ReadPropertyMultiple service from a VTS client and a Complex-Ack response with results from the B-BC server.

File Ec	dit View Go Captu	re Analvze Statis	tics Telephony	Wireless Tools	Help						
		1.665	Ψ 👱 🚍 🔲	444#						_	
bacn	et or bvlc or ntp									× -	<u></u> + <u></u> +
No.	Time	Source	Destination	Protocol	Length Info						
573	36 14:22:03.712459	192.168.10.20	192.168.10.10	BACnet-APD	61 Con	firmed-P	REQ readPropertyM	ultiple[	78]		
L 573	39 14:22:03.716233	192.168.10.10	192.168.10.20	BACnet-APD	506 Com	plex-ACH	<pre></pre> <pre>&lt;</pre>	ultiple[	78]		
<											>
× 1	istOfResults				^	0000	7c c2 c6 1c 9a fe	74 90 5	0 10 f9	ed 08 0	0 45 00
	> {[1]					0010	01 ec 00 1e 00 00	ff 11 2	4 74 c0	a8 0a 0	a c0 a8
	> Property Identifi	er: object-ident	ifier (75)			0020	0a 14 ba c0 ba c0	01 d8 a	7 ed 81	0a 01 d	0 01 00
	> {[4]	-				0030	30 4e 0e 0c 02 00	00 0a 1	e 29 4b	4e c4 0	2 00 00
	> ObjectIdentifier:	device, 10				0040	0a 4† 29 4d 4e /5	1+00 5	2 5a 4e	32 4C 5	+ 42 41 - 42 43
3	> }[4]					0050	43 5f 42 52 54 52	4F 29 4	5 /4 09	08 4F 2	T 42 42 9 70 4e
)	Property Identifi	er: object-name	(77)			0070	91 00 4f 29 79 4e	75 20 0	0 52 65	6e 65 7	3 61 73
)	> {[4]					0080	20 45 6c 65 63 74	72 6f 6	ie 69 63	73 20 4	3 6f 72
· ·	<ul> <li>Object Name</li> </ul>					0090	70 6f 72 61 74 69	6f 6e 4	f 29 78	4e 22 2	7 0f 4f
	Object Name: R	ZN2L_BACnet_Solu	tion_BBC_BRTR			00a0	29 46 4e 75 0f 00	52 5a 4	e 32 4c	5f 42 4	2 43 5f
	> Application Ta	g: Character Str	ing, Length/Val	ue/Type: 31		0000	42 52 54 52 4+ 29	2c 4e /	5 06 00	31 2e 3	02e30
	String Charact	er Set: ANSI X3.	4 / UTF-8 (sinc	e 2010) (0)		0000	21 01 4f 29 8h 4e	21 17 4	E 30 2E	4e 85 0	8 07 97
)	> }[4]					00e0	0b c8 20 f9 00 00	4f 29 6	0 4e 85	09 01 a	c a1 58
)	> Property Identifi	er: object-type	(79)			00f0	00 00 00 80 80 4f	29 4c 4	e c4 02	00 00 0	a c4 0e
)	> {[4]					0100	00 00 01 c4 0e 00	00 02 c	4 00 00	00 00 c	4 00 00
)	> object-type: dev	ice (8)				0110	00 01 c4 00 80 00	00 c4 0	0 80 00	01 c4 0	1 00 00
)	> }[4]					0120	00 C4 01 00 00 01	C4 01 4	0 00 00	C4 01 4	0 00 01
)	> Property Identifi	er: system-statu	is (112)			0140	05 00 00 00 00 04 02	80 00 0	0 c4 0c	04 00 0	0 01 C4 0 c4 0c
)	> {[4]					0150	00 00 01 c4 04 40	00 00 4	f 29 3e	4e 22 0	1 e0 4f
)	> system-status: o	perational (0)				0160	29 6b 4e 91 03 4f	29 Øb 4	e 22 Øb	b8 4f 2	9 49 4e
)	> }[4]					0170	21 03 4f 29 1e 4e	c4 02 0	00 00 00	21 00 6	5 06 c0
)	> Property Identifi	er: vendor-name	(121)			0180	a8 0a 14 ba c0 c4	02 00 0	0 64 21	00 61 8	1 4f 29
)	> {[4]					0190	90 4e 21 03 4t 29	40 48 2	1 /T 4T	29 37 4	e 21 01 3 20 52
)	> vendor-name: UTF-	8 'Renesas Elect	ronícs Corporat	ion'		01b0	5a 4e 32 4c 5f 42	41 43 6	ie 65 74	5f 53 6	f 6c 75
)	> }[4]					01c0	74 69 6f 6e 4f 29	39 4e b	4 Øe 16	01 00 4	f 29 77
)	> Property Identifi	er: vendor-ident	1fier (120)			01d0	4e 32 fd e4 4f 29	38 4e a	4 7c 01	16 01 4	f 29 18
	> {[4]		-			01e0	4e 10 4f 29 3a 4e	75 0c 0	00 54 6f	6b 79 6	f 2c 4a
;	vendor-identifier	: (Unsigned) 999	9		~	01f0	61 70 61 6e 4f 29	98 4e 4	+ 1f		
<					>	<					

Fig.4-61 Capture ReadPropertyMultiple device,10 all



# 4.5.6 WriteProperty

Click Object Access > WriteProperty from the service tree displayed in the previously used dialog. Select the Object ID then click OK. In the example, the multi-state-value,0 object is selected.

IP       BVLCI       NPCI       Confirmed-Request       WriteProperty       BACnetport <ul> <li>IP</li> <li>BVLL</li> <li>Network</li> <li>Alarm and Event</li> <li>File Access</li> <li>Object ID</li> <li>Array Index</li> <li>An object identifier is made of two components: an object type and an instance number.</li> <li>Object Type</li> <li>Priority</li> <li>Reserved Type</li> <li>IP</li> <li>BVLL</li> <li>Network</li> <li>Alarm and Event</li> <li>ChangeList-Error</li> <li>CreateObject - ACK</li> <li>CreateObject - ACK</li> <li>CreateObject - ACK</li> <li>CreateObject - ACK</li> <li>Reserved Type</li> <li>Instance 0</li> <li>Instance range 0.127</li> <li>ReadProperty-ACK</li> <li>ReadProperty-Multiple</li> <li>ReadProperty-Multiple</li> <li>ReadProperty-Multiple</li> <li>ReadProperty-Multiple</li> <li>ReadProperty-Multiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> <li>ReadPropertyMultiple</li> </ul>
Object ID       ID         Object ID       ID         Property       Object ID         Array Index       An object identifier is made of two components: an object type and an instance number.         Value       A Object Type motilisate value         Priority       ID         Priority       Reserved Type         Priority       IS         Reserved Type       Vendor Types range 128.1023         Instance O       Instance range 0.4194303
Here is how the value can be entered directly: multi-state-value, 0 DK BK BK BK BK BK BK BK

Fig.4-62 WriteProperty parameters(1)

Next, select present-value from Property pull-down list.

writeProperty	
IP BVLCI NPCI Confirmed-Request WriteProperty	BACnetport -
Object ID multi-state-value, 0 D., Property present-value notify-type Array Index number-of-states object-identifier object-type out-of-service Priority Present-value profile-name property-list reliability-evaluation-inhibit reliability-evalua	IP         BVLL         Network         Alarn and Event         File Access         Object Access         AddlistElement         CreateObject-Error         CreateObject-ACK         ReadProperty-ACK         ReadPropertyAultiple         ReadPropertyMultiple         ReadPropertyMultiple         WritePropertyMultiple         WritePropertyMultiple
COA80A64 BAC0810A 00130104 0005630F 0C04C000 0019553E 3F	Send

Fig.4-63 WriteProperty parameters(2)



Next click Any....By clicking Add in the pop-up dialog, Null is displayed. With this Null selected, choose the data type from the Type pull-down menu. In the example, Unsigned, which is a multi-state-value data type, is selected.



Fig.4-64 WriteProperty parameters(3)

Input the Value of the popup dialog. For this sample software, the setting range of multi-state-value is 1 to 3. Also, multi-state-value must be greater than 0 at all times. Furthermore, the data type of each property is strictly defined one by one in the standard, so the data type displayed in the Type pull-down menu must be appropriately selected according to the standard. Refer to [12 MODELING CONTROL DEVICES AS A COLLECTION OF OBJECTS] in the standard.

Type     Context     Data       Unsigned     2102     Add       Remove        >       Type     Unsigned       Context	ABSTRACT-SYNTAX.&Type	×	
Image: State of the state o	Type Context Data Unsigned 2102	Add Remove	
Context	< >> Type Unsigned	•	
Value Set	Value Z	Set	

Fig.4-65 WriteProperty parameters(4)



### Then click Send.

Fig.4-66 WriteProperty parameters(5)

The following example shows a request from a VTS client to change the present-value property of a multistate-value,0 object by the WriteProperty service and the Simple-Ack response from the B-SS server.

Capturing from 1-サオット 11       - □ ×         File Edit View Go Capture Analyze Statistics Telephony Wireless Iools Help         Image: Capture Analyze Statistics Telephony Wireless Iools Help         Internet II, Src: TPLinL_1cips:fe (7c:c2:c6:1c:9a:fe), Dst: Renessallect_10:f9:ed (7t         Internet Protocol Version 4, Src: 192:168.10.20 Bst: 192:168.10.10         Isternet Protocol Version 4, Src: 192:168.10.20 Bst: 192:168.10.10         Isternet Analyze Automation and Control Network NPOU         Building Automation and Control Network APOU         00000 eMon Response Segments accepted: Unspecified (0)         eMon Pup Flags: 6x8         e							
Elle Edit View Go Capture Analyze Statistics Telephony Wireless Iools Help         Image: Comparison of Compariso	🧟 Capturing from イーサネット 11					- 🗆	×
▲ ●       ▲ ●       ● <td><u>File Edit View Go Capture Analyze Statist</u></td> <td>tics Telephon<u>y W</u>ireless <u>T</u>ools</td> <td><u>H</u>elp</td> <td></td> <td></td> <td></td> <td></td>	<u>File Edit View Go Capture Analyze Statist</u>	tics Telephon <u>y W</u> ireless <u>T</u> ools	<u>H</u> elp				
Image: Source         Destination         Protocol         Length         Info           66322 14:30:55.912744         192.168.10.20         192.168.10.10         BACnet-APDU         63 Confirmed-REQ         writeProperty[ 79]         multi-state-value, 0         present-value         v           6632 14:30:55.912744         192.168.10.20         BACnet-APDU         60 Sinple-ACK         writeProperty[ 79]         multi-state-value, 0         present-value           6632 14:30:55.912744         192.168.10.20         BACnet-APDU         60 Sinple-ACK         writeProperty[ 79]         multi-state-value, 0         present-value           6632 14:30:55.912744         192.168.10.20         BACnet APDU         600 Sinple-ACK         writeProperty[ 79]         multi-state-value, 0         present-value           6632 14:30:55.912744         192.168.10.20         BACnet Value         000 0         000 0         84 Act 0         95 9d 81 0 9 0 0 7 2 2 c6 1 5 9 d 80 80 4 5 0 0 4 5 0 0 4 7         90 00 0 80 1 8 0 5 7 0 0 0 80 81 1 40 0 0 0 c0 88 84 4 c0 88 64 1         90 0 0 0 0 1 0 5 5 3 2 21 0 2 3 f         90 0 0 0 0 1 0 5 5 3 2 21 0 2 3 f         90 0 0 0 0 1 0 5 5 3 8 21 0 2 3 f         90 0 0 0 0 1 9 5 5 3 8 21 0 2 3 f<		🗿 👲 🚍 📃 🍳 ସ୍ 🖳					
No.     Time     Source     Destination     Protocol     Length     Info       6032     14130:55.912244     192.168.10.20     192.168.10.10     BACnet-APDU     63 Confirmed-REQ     writeProperty[79]     multi-state-value,0 present-value       6032     14130:55.912244     192.168.10.20     BACnet-APDU     60 Simple-ACK     writeProperty[79]     multi-state-value,0 present-value       6052     14130:55.912244     192.168.10.20     BACnet-APDU     60 Simple-ACK     writeProperty[79]     witeProperty[79]       c     >       c     >       c     >       c     >       c     >       c     >	bacnet or bvlc or ntp					$\times \rightarrow$	• +
6832 14:38:55.912744       192.168.18.0       192.168.18.0       8ACnet-APDU       63 Confirmed-REQ       writeProperty[79]       writeProperty[79]          6035 14:38:55.9128961       192.168.10.10       192.168.10.20       BACnet-APDU       60 Simple-ACK       writeProperty[79]       >         >       Frame 6032: 63 bytes on wire (504 bits), 63 bytes captured (504 bits) on interface \D       00       74 90 50 10 f9 ed 7c c2       c6 1c 9a fe 08 00 45 00       t-7         >       Thermet Protocol Version 4, Src: 192.168.10.20, Dst: RenesasElect_10:f9:ed (74       0010       00 31 c6 b7 00 00 80 11 09 00 c0 a0 a0 14 c0 a0       1.         >       User Datagram Protocol, Src Port: 47808, Dst Port: 47808       0000       74 90 50 10 f9 ed 7c c2       c6 1c 9a fe 08 00 45 00       t-7         >       User Datagram Protocol, Src Port: 47808, Dst Port: 192.168.10.10       0000       0010 e0 31 c6 b7 00 00 80 11 95 03 81 00 e0 to 16 09       0010 00 19 55 3e 21 02 3f      0         >       Building Automation and Control Network NPDU       0000       000 00 a1 c5 b7 00 e0 60 10 95 50 82 11 02 3f      0         >       0000 = APDU Flags: 6x0	No. Time Source	Destination Protocol	Length Info				^
C       0035 14130:55.928961 192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       192.168.10.10       1       1         >       Frame 6032: 63 bytes on wire (504 bits), 63 bytes captured (504 bits) on interface \D       0000       74 90 50 10 f9 ed 7c c2       c6 1c 9a fe 08 00 45 00       t.P         >       Ethernet II, Src: TPLink_1c:9a:r6 (7c:c2:c6:1c:9a:r6e), Dst: RenesasElect_10:f9:ed (74       0000       000 as ba c0 ba c0 00 10 95 9d 81 0a 00 c0 a8 0a 14 c0 a8       1.4          >       User Datagram Protocol, Src: Port: 47808, Dst Port: 47808       0000       60 as ac 0 ba c0 9d 10 95 9d 81 0a 00 c0 a8 0a 14 c0 a8           >       Building Automation and Control Network NPDU       0000        0000 ep DU Flags: 0x0           0000 ep DU Flags: 0x0           0000 ep DU Flags: 0x0 <t< td=""><td>6032 14:30:55.912744 192.168.10.20</td><td>192.168.10.10 BACnet-APDL</td><td>J 63 Confirmed-RE</td><td>EQ writeProperty[</td><td>79] multi-state-value</td><td>e,0 present-va</td><td>lue</td></t<>	6032 14:30:55.912744 192.168.10.20	192.168.10.10 BACnet-APDL	J 63 Confirmed-RE	EQ writeProperty[	79] multi-state-value	e,0 present-va	lue
Frame 6032: 63 bytes on wire (504 bits), 63 bytes captured (504 bits) on interface \D Ethernet II, Src: TPLink_1c:9a:fe (7c:c2:c6:1c:9a:fe), Dst: RenesasElect_10:f9:ed (74) Ethernet II, Src: TPLink_1c:9a:fe (7c:c2:c6:1c:9a:fe), Dst: 192.168.10.10 Juser Datagram Protocol, Src Port: 47808, Dst Port: 47808 BACnet Virtual Link Control Building Automation and Control Network NPDU Building Automation and Control Network NPDU 00000 = APDU Type: Confirmed-REQ (0) 0011 = Size of Maximum ADPU accepted: Un to 480 octets (fits in an ARCNET fram Invoke Di: 79 Service Choice: writeProperty (15) > ObjectIdentifier: multi-state-value, 0 > Property Identifier: present-value (85) > [[3]         Prohert Value (uint): 2 > ][3]         Profile: Default  Profile: Default  Profile: Default  Profile: Default </td <td>6035 14:30:55.928961 192.168.10.10</td> <td>192.168.10.20 BACnet-APDU</td> <td>J 60 Simple-ACK</td> <td>writeProperty[</td> <td>79]</td> <td></td> <td>Ň</td>	6035 14:30:55.928961 192.168.10.10	192.168.10.20 BACnet-APDU	J 60 Simple-ACK	writeProperty[	79]		Ň
Profile: 03: 05 test on white (03: 05 test of test) on this / on this / on the rate (0)     Ethernet II, Sort: TPLink [1:93:fe (72::26:16:19:afe), DSI: RenesasElec_10:f9:ed (74     Internet Protocol Version 4, Src: 192.168.10.20, DSI: 192.168.10.10     User Datagram Protocol, Src Port: 47808, DSI Port: 47808     BACnet Virtual Link Control     Building Automation and Control Network NPDU     @000 = APDU Type: Confirmed-REQ (0)     0000 = PDU Flags: 0x0     0000 = PDU Flags: 0x0     0001 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET frat     Invoke ID: 79     Service Choice: writeProperty (15)     ObjectIdentifier: multi-state-value, 0     Property Identifier: present-value (85)     ([3]     Present Value (uint): 2     )[3]      《	Ename 6022: 62 butes on wine (504 bits)	) 62 bytes captured (504 bit	s) on intenface \D	0000 74 90 50 10 f	9 ed 7c c2 c6 1c 9a	fe 08 00 45 00	+.P
<ul> <li>&gt; Internet Protocol Version 4, Src: 192.168.10.20, Dst: 192.168.10.10</li> <li>&gt; User Datagram Protocol, Src Port: 47808, Dst Port: 47808</li> <li>&gt; BACnet Virtual Link Control</li> <li>&gt; Building Automation and Control Network NPDU</li> <li>&gt; Building Automation and Control Network APDU</li> <li>&gt; 0000 = APDU Type: Confirmed-REQ (0)</li> <li>&gt; 0010 = Size of Maximum ADPU accepted: Unspecified (0)</li> <li> 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET frat Invoke ID: 79</li> <li>Service Choice: writeProperty (15)</li> <li>&gt; ObjectIdentifier: multi-state-value, 0</li> <li>&gt; Prosent Value (uint): 2</li> <li>&gt; [[3]</li> <li></li> <li></li></ul>	> Ethernet II, Src: TPLink 1c:9a:fe (7c:0	c2:c6:1c:9a:fe), Dst: Renesas	Elect 10:f9:ed (74	0010 00 31 e8 b7 0	0 00 80 11 00 00 c0	a8 0a 14 c0 a8	- (1)
<ul> <li>&gt; User Datagram Protocol, Src Port: 47808, Dst Port: 47808</li> <li>&gt; BACnet Virtual Link Control</li> <li>&gt; Building Automation and Control Network NPDU</li> <li>&gt; Building Automation and Control Network APDU</li> <li>&gt; 0000 = APDU Type: Confirmed-REQ (0)</li> <li>&gt; 0000 = PDU Flags: 0x0</li> <li> 0001 = Size of Maximum ADPU accepted: Unspecified (0)</li> <li> 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET fram Invoke ID: 79</li> <li>Service Choice: writeProperty (15)</li> <li>&gt; ObjectIdentifier: multi-state-value, 0</li> <li>&gt; Property Identifier: present-value (85)</li> <li>&gt; [[3]</li> <li>&gt; Present Value (uint): 2</li> <li>&gt; ][3]</li> <li></li> <li></li></ul>	> Internet Protocol Version 4, Src: 192.1	168.10.20, Dst: 192.168.10.10		0020 0a 0a ba c0 b	a c0 00 1d 95 9d 81	0a 00 15 01 04	
BaCnet Virtual Link Control Building Automation and Control Network NPDU Building Automation and Control Network APDU 0000 = APDU Type: Confirmed-REQ (0) 0000 = Max Response Segments accepted: Unspecified (0) 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET frantinvoke ID: 79 Service Choice: writeProperty (15) > ObjectIdentifier: multi-state-value, 0 > Property Identifier: present-value (85) > [[3]  <	> User Datagram Protocol, Src Port: 47808	8, Dst Port: 47808		0030 00 03 47 07 0	00 04 00 00 19 55	5e 21 02 5T	0
> Building Automation and Control Network APDU Building Automation and Control Network APDU 0000 = APDU Type: Confirmed-REQ (0) > 0000 = PDU Flags: 0x0 .000 = Max Response Segments accepted: Unspecified (0) 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET fram Invoke ID: 79 Service Choice: writeProperty (15) > ObjectIdentifier: multi-state-value, 0 > Property Identifier: present-value (85) > {[3] > Present Value (uint): 2 > }[3]	> BACnet Virtual Link Control						
<ul> <li>Outputing induction Network APDO</li> <li>Output Type: Confirmed-REQ (0)</li> <li> 0000 = PDU Flags: 0x0</li> <li>.000 = Max Response Segments accepted: Unspecified (0)</li> <li> 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET fran Invoke ID: 79</li> <li>Service Choice: writeProperty (15)</li> <li>ObjectIdentifier: multi-state-value, 0</li> <li>Property Identifier: present-value (85)</li> <li>([3]</li> <li>Present Value (uint): 2</li> <li>&gt; [3]</li> <li></li> <li></li></ul>	Building Automation and Control Network Building Automation and Control Network						
<ul> <li>&gt; 0000 = PDU Flags: 0x0</li> <li> 0011 = Size of Maximum ADPU accepted: Unspecified (0)</li> <li> 0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET fram Invoke ID: 79</li> <li>Service Choice: writeProperty (15)</li> <li>&gt; ObjectIdentifier: multi-state-value, 0</li> <li>&gt; Property Identifier: present-value (85)</li> <li>&gt; {[3]</li> <li>&gt; Present Value (uint): 2</li> <li>&gt; }[3]</li> <li></li> <li><!--</td--><td>0000 = APDU Type: Confirmed-REC</td><td>(0)</td><td></td><td></td><td></td><td></td><td></td></li></ul>	0000 = APDU Type: Confirmed-REC	(0)					
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0011 = Size of Maximum ADPU accepted: Up to 480 octets (fits in an ARCNET fram Invoke ID: 79 Service Choice: writeProperty (15) ) ObjectIdentifier: multi-state-value, 0 > Property Identifier: present-value (85) ) {[3] > Present Value (uint): 2 ) }[3]	.000 = Max Response Segments ac	ccepted: Unspecified (0)					
Invoke ID: 79 Service Choice: writeProperty (15) ) ObjectIdentifier: multi-state-value, 0 ) Property Identifier: present-value (85) ) {[3] ) Present Value (uint): 2 ) }[3] 〇 ② イーサネット 11:	0011 = Size of Maximum ADPU acc	cepted: Up to 480 octets (fit	s in an ARCNET fram				
Service Choice: writeProperty (15) > ObjectIdentifier: multi-state-value, 0 > Property Identifier: present-value (85) > {[3] > Present Value (uint): 2 > }[3]	Invoke ID: 79						
<ul> <li>&gt; ObjectiveIntFile: militi-state-value, の     </li> <li>&gt; Property Identifier: present-value (85)     </li> <li>&gt; {[3]     </li> <li>&gt; Present Value (uint): 2     </li> <li>&gt; }[3]     </li> <li></li>     &lt;</ul>	Service Choice: writeProperty (15)						
(13)     Present Value (uint): 2     ) [3]       (1)     · · · · · · · · · · · · · · · · ·	> Property Identifier: present-value (	(85)					
> Present Value (uint): 2 > }[3] <	> {[3]	(0))					
→ }[3] <  、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、	> Present Value (uint): 2						
く 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、 、	> }[3]						
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● ヹ イーサネット 11: <live capture="" in="" progress=""></live>	<		>	<			>
	○ ズ イーサネット 11: <live capture="" in="" progress=""></live>			Packets: 6077 · Dis	splayed: 74 (1.2%)	Profile: Def	ault

Fig.4-67 Capture WriteProperty multi-state-value,0 present-value



# 4.5.7 WritePropertyMultiple

Click Object Access > WritePropertyMultiple from the service tree displayed in the previously used dialog. Select an object by clicking Add, ID... in Object ID, and then click OK.

In the example, the procedure for verifying the operation of ConfirmedEventNotification from B-BC to VTS clients by using the WritePropertyMultiple service is provided. The notification-class,0 object is selected in Fig.4-68.



Fig.4-68 WritePropertyMultiple parameters(1)

Click Add on Property and select ack-required. Clicking on "Any..." will display a dialog box for selecting the data type. Click Add and select a data type from Type. Click "Set..." to display the corresponding dialog and select a value. Click OK to close the respective dialog.

In the example, the data type EventTransitionBits is selected, and all three event notification conditions are selected.

Fig.4-69 WritePropertyMultiple parameters(2)



# **RZ/N2L** Group

IP   BVLCI   NPCI   Confirmed-Request	WritePropertyMultiple MyPOIT	
Object ID	ABSTRACT-SYNTAX.&Type	× lement ^
Notification-class, 0       Object ID     notification-class, 0       Property     Index       Value     ack-required       8205E0	Type     Context     Data       Event TransitionB     8205E0     Add       Remove     Add       Value     Set       BACnet EventTransitionBits     OK	pject pject pject-ACK pject-Error pject perty-ACK pertyMultiple pertyMultiple-ACK ge istElement pertyMultiple-Error ize Management X cationContro essage
Property ack-required	Index Vic-fault	Cancel e
	Defenite to-normal	tMessage

Fig.4-70 WritePropertyMultiple parameters(3)

As well, click on Add in Property and select recipient-list.

In the example, the data type Destination is selected, the event recipient is VTS(device,0), Ack from VTS is available, all three event notification conditions are selected, and the start and end of the validity period are set.

Object ID       Add       Add       Add         Inotification-class, 0       Remove       ChangeList-Error         Image: CreateObject - ACK       CreateObject - ACK         ABSTRACT-SYNTAX.&Type       X         Type       Context       Data         Destination       8201FEB40E2       Add         Add       Property       Index       Value         Property       Index       Value       Property         Value       Set       Error       ent         Controp       Remove       Set       ent         Value       OK       Cancel       age	IP BVLCI NPCI Confirmed-Request WriteP	ropertyMultiple	MyPort	•
ABSTRACT-SYNTAX.&Type × ABSTRACT-SYNTAX.&Type × Type Context Data Destination 8201FEB40E2 Add Remove ACK Remove ACK Remove ent Context Value Set Property recipient-list Index Value Any Priority Priority OK Cancel age	Object ID notification-class, 0	Add	AddListElement ChangeList-Error CreateObject CreateObject-ACK	^
Property recipient-list Index Value OK Cancel age	Object ID notification-class, 0 ID Property Index Value Prior ack-required 8205E0 recipient-list	ABSTRACT-SYNTAX.&Type	E2 Add Remove	ACK -Error ent Contro e
	I Property recipient-list Index Value Any Priori	Value	Cancel	age 🗸

Fig.4-71 WritePropertyMultiple parameters(4)



Fig.4-72 WritePropertyMultiple parameters(5)

Furthermore, click on Add in Property and select priority. Finally, click Send.

In the example, the data type PriorityArray is selected and the priorities (255: lowest) corresponding to the three notification conditions are set.

VritePropertyMultiple	- X
IP BVLCI NPCI Confirmed-Request WritePropertyMultiple	MyPort
Object ID       notification-class, 0       Object ID       notification-class, 0       ID       Property     Index       Value     Prior       ack-required     8205E0       recipient-list     8201FEB40E2D1000B410       priority     21FF21FF21FF	Add       AddListElement       AddListElement         Remove       CreateObject-Error         /¥       CreateObject-Error         @ CreateObject-Error       @ CreateObject-Error         @ CreateObject-Error       @ DeleteObject         Add       ReadProperty-ACK         @ ReadPropertyMultiple       @ ReadPropertyMultiple         @ ReadPropertyMultiple       @ ReadPropertyMultiple         /¥       @ WritePropertyMultiple         /¥       @ DeviceCommunicationContro         @ DeviceCommunicationContro       @ DeviceCommunicationContro
Propert priority Index	I-Have     I-Have     I-ReinitializeDevice     InconfirmedTextMessage
Value Any Priority	TimeSynchronization
C0A80A0A BAC0810A 003E0104 00035210 0C03C000	History:0 - Send

Fig.4-73 WritePropertyMultiple parameters(6)



ABSTRACT-SYNTAX.&Type	×	
Type Context Data PriorityArray 21FF21FF21FF Add Remove		_
	BACnet PriorityArray X	
Value	PriorityValue 0 PriorityValue 1 PriorityValue 2 BACnet PriorityValue X C null C real C binary C integer 255 C constructedValue ANY OK Cancel	

Fig.4-74 WritePropertyMultiple parameters(7)

Next, select the old value (notification-class,0) once set for the Object ID and click Remove to delete the old setting. Select the object by clicking on the new Object ID Add, ID..., in that order, and click OK. In the example, the analog-input,0 object is selected (Fig.4-82). Click Add in Property and set out-of-service=true and present-value=-0.1 (Fig.4-76) With this setting, you can confirm that the event notification occurs just below the LowLimit property value (0.0) of the OutOfRange event algorithm. Incidentally, an event notification will also occur if the HighLimit property value (100.0) is exceeded. Finally, click Send.

BVLCI NPCI Confirmed-Request WritePropertyMultiple MyPort	•
biject ID Add   nalog-input, 0 CreateObject   iject ID analog-input, 0   ivecologitation ReadProperty   ivecologitation ReadProperty   ivecologitation WritePropert   ivecologitation WritePropert   ivecologitation WritePropert   ivecologitation WritePropert   ivecologitation I-Have   ivecologitation WritePropert   ivecologitation WritePropert   ivecologitatio<	e-ACK e-Error ncontro je end & Close

Fig.4-75 WritePropertyMultiple parameters(8)



# RZ/N2L Group

ABSTRACT-SYNTAX.&Type X	ABSTRACT-SYNTAX.&Type X
Type Context Data Boolean 11 Add Remove	Type Context Data Real 448DCCCCCD Add Remove
< > Type Boolean	< >> Type Real
Context Value true Set	Value -0.100000Set
0K Cancel	OK Cancel

Fig.4-76 WritePropertyMultiple parameters(9)

Below is the packet capture for this. The notification-class,0 object and analog-input,0 object are set by the WritePropertyMultiple service from the VTS client. Then, ConfirmedEventNotification service is requested from the B-BC server and the VTS client returns an Ack.

		] ♥ ⇔ ⇒ ≌	1 🕹 📃 🔳 🖲	Q Q 🎹		
D	acnet or bvlc or ntp					×
No.	Time	Source	Destination	Protocol	Length Info	^
1	3876 18:16:37.417531	192.168.10.20	192.168.10.10	BACnet-APDU	67 Confirmed-REQ	writeProperty[ 4] notification-class,0 priority
1	3877 18:16:37.456525	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	writeProperty[ 4]
1	3878 18:16:37.459917	192.168.10.20	192.168.10.10	BACnet-APDU	85 Confirmed-REQ	writeProperty[ 5] notification-class,0 recipient-list device,0
1	3879 18:16:37.506583	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	writeProperty[ 5]
	3880 18:16:37.510881	192.168.10.20	192.168.10.10	BAChet-APDU	63 Contirmed-REQ	readPropertyMultiple[ 6]
1	3884 18.16.41 810347	192.168.10.10	192.168.10.20	BAChet-APDU BAChet-APDU	61 Confirmed-REO	readPropertyMultiple[ 7]
1	3885 18:16:41.842195	192.168.10.10	192.168.10.20	BACnet-APDU	269 Complex-ACK	readPropertyMultiple[ 7]
1	3897 18:17:03.632625	192.168.10.20	192.168.10.10	BACnet-APDU	68 Confirmed-REQ	writeProperty[ 8] analog-input,0 present-value
1	3898 18:17:03.673395	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	writeProperty[ 8]
1	3899 18:17:03.680801	192.168.10.20	192.168.10.10	BACnet-APDU	61 Confirmed-REQ	readPropertyMultiple[ 9]
1	3900 18:17:03.723645	192.168.10.10	192.168.10.20	BACnet-APDU	269 Complex-ACK	readPropertyMultiple[ 9]
1	3901 18:17:04.053937	192.168.10.10	192.168.10.255	BACnet-APDU	60 Unconfirmed-REQ	2 who-Is 0 0
1	3902 18:17:04.054682	192.168.10.20	192.168.10.255	BACnet-APDU	67 Unconfirmed-REQ	2 1-Am device,0
1	2004 19:17:04 115247	192.168.10.10	192.168.10.20	BAChet-APDU	El Simple ACK	confirmedEventNotification[ 1] device,10 analog-input,0
- 1		192.100.10.20	192.100.10.10	DACHEC-APDO	51 SIMPLE-ACK	contrined.ventedociricación[ 1]
>	ObjectIdentifier: ar	alog-input, 0				
	<pre>([3] ([2] date time: )[2] )[3] Notiffication Class: Priority: (Unsigned) Event Type: out-of-r message Text: UTF-8 Notify Type: alarm ( ack Required: TRUE From State: normal ( To State: low-limit ([12] &gt; ontification paramet &gt; ([5] &gt; exceeding-value:</pre>	(Unsigned) 0 255 ange (5) 'Goes to low lin 0) (4) ers (5) out-of-r -0.100000 (Real)	nit' 'ange			

Fig.4-77 Capture WritePropertyMultiple and ConfirmedEventNotification



## 4.5.8 SubscribeCOV

Click Alarm and Event > SubscribeCOV from the service tree displayed in the previously used dialog.

- The Subscribe Process ID is used to identify the COV client, i.e., the process in the VTS. This ID is used by the B-SS server to identify which COV client it is when the COV notification is made or when the subscribe is canceled. The value 0 is reserved and is used for the COV notification to be made when there is no subscriber. The COV server uses it to broadcast the outdoor air temperature etc.
- The Monitored Object ID is used to specify the object that holds the property to detect changes in value.
- Issue Confirmed Notifications are specified as True/False. If True, the COV client specify a ConfirmedCOVNotification to the COV server. When the COV client receives a COV notification, it returns Ack response to the COV server. The COV server does not send the next COV notification before receiving the Ack. If False, UnconfirmedCOVNotification is specified.
- Lifetime is the subscribe period and the unit is minutes. The COV server will not notify the COV client corresponding to the Subscribe Process ID after the Lifetime has elapsed. If this parameter is left blank, it indicates an indefinite period of time. If the COV client cancels the subscribe, both Issue Confirmed Notifications and Lifetime should be left blank.

Click Send to send a SubscribeCOV service request. then click Send.

In the example, an analog-input,0 object is selected that is assigned the input value of the air velocity sensor, and an unconfirmed COV notification is specified for an indefinite period of time. Fig.4-78 selects B-SS as the destination for the SubscribeCOV service request, the same as in Fig.4-46.

SubscribeCOV	– 🗆 X
IP BVLCI NPCI Confirmed-Request SubscribeCOV	MyPort 🗨
Version	Network Alarm and Event AcknowledgeAlarm ConfirmedCOVNotification
DNET/DLEN/DADR Present       DNET     2       Hex       DADR       Hop Count	InconfirmedCOVNotification     GetAlarmSummary     GetAlarmSummary-ACK     GetAlarmSummary-ACK     GetEnrolImentSummary     GetEnrolImentSummary
	GetEvnolImentSummary-ACK GetEventInformation-ACK GetEv
COA80A0A BAC0810A 00180124 00020181 FF00035C 0509011C 0000000 2900	AddListElement ChangeList-Error

Fig.4-78 Select SubscribeCOV destination (B-SS)





Fig.4-79 SubscribeCOV parameters

The following shows a request from a VTS client to detect changes in the property value of an analoginput,0 object by the SubscribeCOV service and a Simple-Ack response from the B-SS slave. The presentvalue and status-flags property values are notified by the UnconfirmedCOVNotification service from the B-SS slave that detected the air speed change. Time remaining indicates the remaining time of the subscribe period, but it returns 0.00.00 because an indefinite period is requested.

▲ Capturing from イーザネット 11	-		×
Eile Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help			
🗶 🔳 🔬 🐵 🗋 🔍 🚓 🚓 🕾 🚡 📃 🔍 🔍 🗮			
bacnet or bvlc or ntp		$\times \rightarrow$	- +
No. Time Source Destination Protocol Length Info			^
14819 18:43:24.286366 192.168.18.20 192.168.18.10 BACnet-APDU 66 Confirmed REQ subscribeCOV[ 91] analog-input,0			
14821 18:43:24.470281 192.168:10.10 192.168.10.20 BAChet-ADDU 66 Simple-ACK subscribeCOV[91] 14821 18:43:24 A90287 192.168:10.18 19.18 19.18 19.20 BAChet-ADDU 66 Simple-ACK subscribeCOV[91]	value c	tatus-fl	205
14841 18:43:48.892086 192:168.10.10 192:168.10.10 192:168.10.20 BAChet-APDU 86 Unconfirmed-REQ unconfirmedCOVNotification device.100 analog input, 0 present-	value s	tatus-fl	ags
14843 18:43:50.872153 192.168.10.10 192.168.10.20 BACnet-APDU 86 Unconfirmed-REQ unconfirmedCOVNotification device,100 analog-input,0 present-v	value s	tatus-fl;	ags
14845 18:43:52.852435 192.168.10.10 192.168.10.20 BACnet-APDU 86 Unconfirmed-REQ unconfirmedCOVNotification device,100 analog-input,0 present-	value s	tatus-fla	ags
14847 18:43:54.832460 192.168.10.10 192.168.10.20 BACnet-APDU 86 Unconfirmed-REQ unconfirmedCVNotification device,100 analog-input,0 present	value s	tatus-fla	ags
- 14459 10.43.50.012000 132.100.10.10 132.100.10.20 DACHEL-APOD do DICUM 11 med-ALQ UNCUM 11 med-Callot device, 140 analy input, 9 present-	varue s	cacus-110	1 <u>6</u> 2
	5.00	1 +	
> Frame 14849: 80 bytes on wire (osk bits), 80 bytes captured (osk bits) on interface UPVice(WHP_1(bs) 0000 /c.c. co ic 9a te /4 90 50 id 79 ed 00 00 dt - Sthemat II Soci Dengasefiaet 10:001 (/1:00:50:10:00:40) het: TDIinterface (UPVice(WHP_1(bs)) 0010 00 48 00 2 d0 00 ft 11 26 09 cd 88 00 40 c	0 a8	-H	8
> Internet Protocol Version 4, Src: 192.168.10.10, Dst: 192.168.10.20	1 08	4	qU···
> User Datagram Protocol, Src Port: 47808, Dst Port: 47808	0 00 9 6f		D>108
> BACnet Virtual Link Control 0050 2e 82 04 00 2f 4f	5 01	/0	07.80
> Building Automation and Control Network NPDU			
BOILING AUCOMALION AND CONTROL NELWORK APDO     9001			
Unconfirmed Service Choice: unconfirmedCOVNotification (2)			
> ProcessIdentifier: 1			
> DeviceIdentifier: device, 100			
> ObjectIdentifier: analog-input, 0			
> Time remaining: (hh.mm.ss): 0.00.00 (indefinite)			
V list of Values:			
> Property Identifier: present-value (85)			
> {[2]			
<ul> <li>Present Value (real): 0.317193746566772</li> </ul>			
> Application Tag: Real (ANSI/IEE-754 floating point), Length/Value/Type: 4			
> H2]			
Property Identifier: status-flags (11)			
> {[2]			
> status-riags: (bit string) (rrrr)			
> 3(4)			
			>
● 2 イーサネット 11: <live capture="" in="" progress=""> Packets: 15393 · Displayed: 456 (3.0%)</live>		Profile: Def	ault 🔡

Fig.4-80 Capture SubscribeCOV and UnconfirmedCOVNotification



# RZ/N2L Group

The following shows a SubscribeCOV service request from a VTS client with Issue Confirmed Notifications set to True and a Simple-Ack response from the B-SS slave. ConfirmedCOVNortification service notification is sent from the B-SS slave that detected the air velocity change, and the COV client responds with a Simple-Ack.

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acnet or bvlc or ntp								$\times$	+
No. Time Source	Destination	Protocol Lengt	n Info						^
15558 19:05:40.359952 192.168	8.10.20 192.168.10.10	BACnet-APDU	56 Confirmed-REQ	subscribeCO\	V[ 92] ana	alog-input,0			
15562 19:05:40.565384 192.168	8.10.10 192.168.10.20	BACnet-APDU	50 Simple-ACK	subscribeCO\	V[ 92]				
15563 19:05:40.730181 192.168	8.10.10 192.168.10.20	BACnet-APDU	38 Confirmed-REQ	confirmedCO\	VNotificat	tion[ 1] device,10	0 analog-input,0 present-va	alue status-f	lags
15564 19:05:40.731267 192.168	5.10.20 192.168.10.255	BACnet-APDU	Simple-ACK	confirmedCOV	VNotificat	tion[ ]] tion[ ]] dowico 10	A applog input & procept w	alua status 4	1200
15576 19:05:48 866748 192 168	8 10 20 192 168 10 255	BACnet-APDU	56 Simple-ACK	confirmedCO	/Notificat	tion[ 2] device,10	o anatog-input,o present-vi	arue status-r	Tago
15578 19:05:50.785714 192.168	3.10.10 192.168.10.20	BACnet-APDU	38 Confirmed-REO	confirmedCO	VNotificat	tion[ 3] device.10	0 analog-input.0 present-va	alue status-f	lags
15579 19:05:50.786540 192.168	8.10.20 192.168.10.255	BACnet-APDU	56 Simple-ACK	confirmedCO\	VNotificat	tion[ 3]			
15581 19:05:52.761053 192.168	8.10.10 192.168.10.20	BACnet-APDU	38 Confirmed-REQ	confirmedCO\	VNotificat	tion[ 4] device,10	0 analog-input,0 present-va	alue status-f	lags
15582 19:05:52.761524 192.168	8.10.20 192.168.10.255	BACnet-APDU	56 Simple-ACK	confirmedCO\	VNotificat	tion[ 4]			×
<									>
> Frame 15581: 88 bytes on wire (	(704 bits), 88 bytes capt	ured (704 bits) on	interface \Device	NPF_{1B57B4	0000 70	c c2 c6 1c 9a fe 74	90 50 10 f9 ed 08 00 45	00  t.	· P · · · ·
> Ethernet II, Src: RenesasElect_	_10:f9:ed (74:90:50:10:f9	:ed), Dst: TPLink_	lc:9a:fe (7c:c2:c6	5:1c:9a:fe)	0010 00	0 4a 00 32 00 00 ff	11 26 02 c0 a8 0a 0a c0	a8 -J-2	&
> Internet Protocol Version 4, Sr	rc: 192.168.10.10, Dst: 1	92.168.10.20			0020 00	14 Da CO Da CO 00 10 02 01 81 00 03 04	0 36 20 7+ 81 0a 00 2e 01 1 01 09 01 1c 02 00 00 64	20	,
> User Datagram Protocol, Src Por	rt: 47808, Dst Port: 4780	8			0040 00	0 00 00 00 39 00 4e	09 55 2e 44 3d 47 36 f0	2f9.N.	U.D=G6
> BACnet Virtual Link Control	Network NDDU				0050 09	19 6f 2e 82 04 00 2f	4f	·o.··/(	)
Suilding Automation and Control	1 Network APDU								
0000 = APDU Type: Confi	irmed-REO (0)								
> 0000 = PDU Flags: 0x0									
.000 = Max Response Seg	gments accepted: Unspecif	ied (0)							
0011 = Size of Maximum	ADPU accepted: Up to 480	octets (fits in a	n ARCNET frame) (3	)					
Invoke ID: 4									
Service Choice: confirmedCOV	/Notification (1)								
> ProcessIdentifier: 1									
> DeviceIdentifier: device, le	90 2011 0								
> Time remaining: (bb mm ss):	. 0 00 00 (indefinite)								
✓ list of Values:	(inderinitee)								
> {[4]									
> Property Identifier: pres	sent-value (85)								
> {[2]									
✓ Present Value (real): 0.0	0486363768577576								
> Application Tag: Real	(ANSI/IEE-754 floating po	oint), Length/Value	/Type: 4						
> }[2]	tus flags (111)								
> Property Identifier: Stat	us-flags (III)								
> status-flags: (Bit String	z) (FFFF)								
> }[2]									
> }[4]									
<				>	<				>
○ ズ イーサネット 11: ≤live capture in pro	noress					Packets: 15680 , Display	ved: 468 (3.0%)	Profile: D	)efault
						,	,,	i i i i i i i i i i i i i i i i i i i	

Fig.4-81 Capture SubscribeCOV and ConfirmedCOVNortification



#### 4.5.9 ReinitializeDevice

Note) The ReinitializeDevice service resets the target device. When the debugger is connected, push the S3 RESET switch (red) on the RSK board to disconnect the debugger connection. If this service is executed while the debugger is still connected, Ethernet communication will not be established after the B-SS reboots.

Restrictions) The following State parameters of ReinitializeDevice are not yet supported by the B-BC sample software.

STARTBACKUP

- ENDBACKUP
- STARTRESTORE
- ENDRESTORE
- ABORTRESTORE

Click Remote Device Management > ReinitializeDevice from the service tree displayed in the previously used dialog. Select Cold Start or Warm Start for State. Other options are selectable, but with the exception of Activate Changes, the BACnet stack is not yet supported. (However, Activate Changes cannot be selected from the VTS.)

Enter "filister" in Password and click Send.



Fig.4-82 ReinitializeDevice parameters



The following shows a VTS client requesting the ReinitializeDevice service and a Simple-Ack response from the B-BC or B-SS. The B-BC or B-SS locally broadcasts I-Am services when it reboots.





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	<b>I</b>			। ९ 🗢 🔿 🖻	2 T 🕹 📃 🔍	Q Q 🏢																	
	bacnet	or bylc or ntp	)																		X		<b>*</b> +
No.		Time		Source	Destination	Protocol	Length	Info															^
	16218	19:24:36.0	017357	192,168,10,20	192,168,10,10	BACnet-APDU	70	Confirmed-REO	rei	nitial	lizeD	evice	ef 94	1									
L	16219	19:24:36.1	182315	192.168.10.10	192.168.10.20	BACnet-APDU	60	Simple-ACK	rei	nitial	lizeD	evice	er 94	1									
	16221	19:24:37.9	942649	192.168.10.10	192.168.10.255	BACnet-APDU	71	Unconfirmed-REQ	2 i-A	m devi	ice,1	00		1									~
<																							>
	Enama	16218 70	bytes o	n wire (560 bi	its) 70 bytes cantu	red (560 bi	ts) on i	ntenface \Devic		0000	74 0	0 50	10	f9 ed	170 0	-2 0	5.1c	9a f	e 08	99.4	5 00	+.	P
5	ther	et II Sco	·· TPL in	k 1c·9a·fe (7c	r:c2:c6:1c:9a:fe) D	st: Renesasi	Elect 10	+9.ed (74.90.5	0.10	0010	00	38 e9	46	00 00	80 1	11 0	00 6	c0 a	8 Øa	14 c	0 a8	- 8	3.F
Ś	Intern	et Protoco	ol Versi	on 4. Sec: 192	2.168.10.20. Dst: 19	2.168.10.10				0020	0a 0	)a ba	c0	ba c0	0 00 2	24 9	5 a4	81 0	a 00	1c 0	1 24		• • • • • \$
Ś	Jser D	atagram Pr	otocol.	Src Port: 478	808. Dst Port: 47808					0030	00 0	92 01	81	ff 00	035	5e 14	1 09 1	00 1	d 09	00 6	6 69		
>	BACnet	: Virtual L	ink Con	trol						0040	6C 6	9 /3	/4	65 72	2							11	ster
>	Buildi	ng Automat	ion and	Control Netwo	ork NPDU																		
$\sim$	Buildi	ng Automat	ion and	Control Netwo	ork APDU																		
	000	0 = A	PDU Typ	e: Confirmed-R	REQ (0)																		
	>	. 0000 = P	DU Flag	s: 0x0																			
	.00	0 = M	lax Resp	onse Segments	accepted: Unspecifi	ed (0)																	
		. 0011 = S	ize of	Maximum ADPU a	accepted: Up to 480	octets (fits	s in an	ARCNET frame) (3	3)														
	Inv	oke ID: 94	ł																				
	Ser	vice Choic	e: rein	itializeDevice	e (20)																		
	> rei	nitialized	State	Of Device: co	oldstart (0)																		
	> Pas	sword: UTF	-8 'fil	ister'																			
1																							
	7	/_#\$wk 11	clive cap	ture in program >							Dag	kote	16221	Dicol	lawadu.	470 (2)	09(1)	_			Drof	ilor De	foult .
	1	1 24070-116	-silve cap	ture in progress>							r dC	KCLS:	10021	- Dispi	ayeu: 4	113 (22	//0]				FIO	ne. De	rount

Fig.4-84 Capturing ReinitializeDevice (to B-SS)



### 4.5.10 DeviceCommunicationControl

Click Remote Device Management > DeviceCommunicationControl from the service tree displayed in the previously used dialog.

- · In Time duration, enter the communication halt period in minutes.
- Note: If Disable is selected, it requests to stop communication, but does not accept BACnet Protocol Revision 20 or later. The server ignores the Disable request and sends an error PDU with ErrorClass = SERVICES and ErrorCode = SERVICE\_REQUEST\_DENIED.
- · Selecting Enable requests the release of communication halt. Time duration is ignored.
- Selecting Disable Initiation will stop notifications from the server, except for I-Am service. Ack responses for service requests from clients are not stopped.

Enter "filister" in Password and click Send. In the example, Disable Initiation for an infinite period is selected.



Fig. 4-85 DeviceCommunicationControl parameters(Disable Initiation)



The following shows a request from a VTS client for the DeviceCommunicationControl service and notification service from B-SS slave is stopped

(No.565) notify the UnconfirmedCOVNotification service.

(No.566) request Disable initiation.

(No.574) After Simple-Ack response, UnconfirmedCOVNotification service notification has stopped.

(No.623) request Who-Has service but not returned any I-Have service response.

(No.650) request Who-Is service

(No.653) returned I-Am service response.

(No.683) request Enable

(No.685) resume UnconfirmedCOVNotification service notification.

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	bac	cnet or bvlc or ntp														$\times$	<b>•</b> +
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		561 08:49:28.5938	27 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags
		563 08:49:30.5740	29 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags
		565 08:49:32.5543	00 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags
		566 08:49:33.2257	48 192.168.10.20	192.168.10.10	BACnet-APDL	70	0 Confirmed-REQ	deviceComm	unicati	onControl	[101]						
		568 08:49:34.5293	67 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags
		570 08:49:36.5097	28 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value s	status-f	lags
		574 08:49:38.5447	52 192.168.10.10	192.168.10.20	BACnet-APDL	66	0 Simple-ACK	deviceComm	unicati	onControl	[101]						
		623 08:51:04.4656	79 192.168.10.20	192.168.10.10	BACnet-APDL	66	0 Unconfirmed-REQ	who-Has an	alog-in	put,0							
		650 08:51:52.9138	95 192.168.10.20	192.168.10.255	BACnet-APDL	54	4 Unconfirmed-REQ	who-Is									
		651 08:51:52.9359	69 192.168.10.20	192.168.10.255	BACnet-APDL	67	7 Unconfirmed-REQ	i-Am devic	e,0								
		652 08:51:52.9644	72 192.168.10.10	192.168.10.255	BACnet-APDL	67	7 Unconfirmed-REQ	i-Am devic	e,10								
		653 08:51:53.1791	90 192.168.10.10	192.168.10.255	BACnet-APDL	71	1 Unconfirmed-REQ	i-Am devic	e,100								
		683 08:52:42.410	38 192.168.10.20	192.168.10.10	BACnet-APDL	70	<pre>0 Confirmed-REQ</pre>	deviceComm	unicati	onControl	[102]						
		684 08:52:42.6229	20 192.168.10.10	192.168.10.20	BACnet-APDL	66	0 Simple-ACK	deviceComm	unicati	onControl	[102]						
		685 08:52:42.8427	86 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags
		687 08:52:44.8229	54 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value s	status-f	lags
		689 08:52:46.8031	22 192.168.10.10	192.168.10.20	BACnet-APDL	86	5 Unconfirmed-REQ	unconfirme	dCOVNot	ification	device,100	analog-	input,0	present	-value :	status-f	lags 🗡
4																	>
1	Fri	ame 566: 70 bytes	on wire (560 bits	), 70 bytes captur	ed (560 bits	) on int	terface \Device\N	PF_{185784	0000	74 90 50	10 f9 ed 7	c c2 c6	1c 9a f	e 08 00	45 00	t · P · · ·	
1	Eti	hernet II, Src: T	PLink_1c:9a:fe (7c	:c2:c6:1c:9a:fe),	Dst: Renesas	Elect_10	0:f9:ed (74:90:50	:10:f9:ed)	0010	00 38 e9	57 00 00 8	0 11 00	00 c0 a	8 0a 14	c0 a8	·8-W···	
1	In	ternet Protocol V	ersion 4, Src: 192	.168.10.20, Dst: 1	92.168.10.10				0020	0a 0a ba	c0 ba c0 0	0 24 95	a4 81 0	a 00 1c	01 24		\$
1	Us	er Datagram Proto	col, Src Port: 4780	08, Dst Port: 4780	8				0050	66 69 73	74 65 72	11 60 61	19 02 2	00 60 0	00 09	lister	e
1	BA	Cnet Virtual Link	Control						0040	00 00 70	14 05 72					11500	
1	Bu	ilding Automation	and Control Netwo	rk NPDU													
1	<ul> <li>Bu:</li> </ul>	ilding Automation	and Control Networ	rk APDU													
		0000 = APDU	Type: Confirmed-RE	EQ (0)													
	>	0000 = PDU	Flags: 0x0														
		.000 = Max	Response Segments a	accepted: Unspecif	ied (0)												
		0011 = Size	of Maximum ADPU ad	ccepted: Up to 480	octets (fit:	; in an	ARCNET frame) (3)	)									
		Invoke ID: 101															
		Service Choice:	deviceCommunicatior	nControl (17)													
	>	enable-disable:	disable-initiation	n (2)													
	>	Password: UTF-8	'filister'														
								>	<								>
	0 7	▼ wireshark イーサネ	ット 11NOJJH2.pcapng							Packets:	768 · Displaye	ed: 88 (11.5%	6)			Profile: D	efault
-	-												,				

Fig.4-86 Capture DeviceCommunicationControl



### 4.5.11 AtomicReadFile

Many BACnet devices contain configuration data set by vendor-specific configuration tools.

The AtomicReadFile service reads configuration data inside B-BC. The client saves the read data as a backup file. Also, the saved backup file is transferred to B-BC by the AtomicWriteFile service, and B-BC restores the received file data as internal configuration data. File contents and format are vendor-specific.

In the B-BC sample software, the configuration data (variable name: FlashData) is defined by the following structure (FLASH\_DATA\_STRUCT) aligned with 4 bytes.



Fig.4-87 FLASH\_DATA\_STRUCT FlashData

FlashData is allocated on the System RAM but is updated during operation and stored in the QSPI flash memory by the xSPI0 driver. Upon reset, the configuration data is read from the QSPI flash memory and extracted into FlashData on the system RAM; see below for details on FlashData.

Fig.3-5 Memory layout 5.3 Initial Configuration Command user\renesas\application\configurable\_property.c

user\renesas\application\configurable\_property.h

From the service tree in VTS, click File Access > AtomicReadFile.

• File ID is the File object type and instance number.

Stream Access

- Start Position is the number of octets to start reading from the beginning of the file. 0 means the beginning of the file.
- Octet Count is the number of octets to be read from the file, starting from Start Position. As shown in the example below, if a larger value is set, the actual file size is read.

Record Access

• Record-oriented file access is not supported.



AtomicReadFile	– 🗆 X
IP BVLCI NPCI Confirmed-Request AtomicReadFile	MyPort
File ID file, 0 ID	ConfirmedEventNotification UnconfirmedEventNotification GetEnrollmentSummary-ACK GetEventInformation-ACK GetEventInformation-ACK SubscribeCOVProperty File Access AtomicReadFile AtomicWriteFile AtomicWriteFile AtomicWriteFile AtomicWriteFile AtomicWriteFile AtomicWriteFile AtomicOverss Remote Device Management DeviceCommunicationContro ConfirmedTextMessage I-Am H-Have ReinitializeDevice UnconfirmedTextMessage TimeSynchronization Who-Has
COA80A0A BAC0810A 00160104 00036B06 C4028000 000E3100 2201C60F	Close Send & Close

Fig.4-88 AtomicReadFile parameters

The following capture shows a VTS client requesting AtomicReadFile service from B-BC and B-BC responding with an Ack containing file data.

Length: 148 octets, End Of File: TRUE is indicated.



Fig.4-89 Capturing AtomicReadFile



### 4.5.12 AtomicWriteFile

The AtomicWriteFile service overwrites configuration data stored in B-BC. The client transfers the previously read backup file to B-BC by AtomicWriteFile service, and B-BC restores the received file data by overwriting it with the internal configuration data. File contents and format are vendor-specific. Refer to section 4.5.11

From the service tree in VTS, click File Access > AtomicWriteFile.

• File ID is the File object type and instance number.

Stream Access

- Start Position is the number of octets to start reading from the beginning of the file. 0 means the beginning of the file.
  - If Start Position is set to -1, it indicates an operation to be added from the end of the current file.
- Data consists of OCTET STRINGs that are written to a file. Set up a Hex data stream such as 14340000cd74....

Record Access

• Record-oriented file access is not supported.

The following shows how to make Data for the parameters above.

Select the Complex-ACK line from B-BC for the AtomicReadFile service (No. 7902 below) in Wireshark. In the lower left window, place the cursor on > File Data: and right-click, then click Copy>...as a Hex Stream in the menu that appears. Paste to "Data" in the AtomicWriteFile parameter dialog of VTS and click Send.

	Expand Subtrees		L	
bacnet or bvlc or ntp	Collapse Subtrees			+ 🗸 🗆 🖌
Source Destinati	Expand All			^
1328 192.168.10.20 192.168	Collapse All		rver	
9067 192.168.10.10 192.168	condpict vin		ient	
9655 192.168.10.20 192.168	Apply as Column	Ctrl+Shift+I	rver	
8364 192.168.10.20 192.168	A 1 511		tomicReadFile[107] file,0	
/902 192.168.10.10 192.168	Apply as Filter	۲	tomickeadFile[10/]	
3486         192.168.10.10         192.168	Prepare as Filter	•	tomicWriteFile[108]	
7252 192.168.10.10 192.168	Conversation Filter	•	ient	_
7984 192.168.10.20 192.168	Colorize with Filter	+	rver	Y
<	Follow	•		>
> Frame 6451: 206 bytes on w:			7c c2 c6 1c 9a fe 74 90 50 1	0 f9 ed 08 00 45 00
> Ethernet II, Src: RenesasE	Сору	•	All Visible Items	81 0a 00 a4 01 00
> User Datagram Protocol, Sr	Show Dasket Rutes	Chilly Shifty O	All Visible Selected Tree Items	34 00 00 cd 74 90
> BACnet Virtual Link Control	Show Packet Bytes	Cur+shint+O	Description	ff ba c0 cd ff 1e
> Building Automation and Co	Export Packet Bytes	Ctrl+Shift+X	Field Name	42 41 43 6e 65 74
<ul> <li>Building Automation and Con</li> </ul>	Wiki Protocol Page		Value	42 42 43 5f 42 52
0011 = APDU Type: (	Filter Field Reference		value	00 00 00 00 00 00 00
7 0000 = PD0 FIAgS: 0 Invoke ID: 107			As Filter	00 00 00 cd ff e4
Service Choice: atomicRe	Protocol Preferences	,		- 00 cd 00 cd 00 cd
> End Of File: TRUE	Decode As	Ctrl+Shift+U	Copy Bytes as Hex + ASCII Dump	OU TT TT OT
✓ stream access	Go to Linked Packet		as Hex Dump	
> {[0]	Show Linked Packet in New Window		as a Hex Stream	
File Data: 14340000cd	74905010f9edffcdc0a80a14ffbac0	dffle00	as a Base64 String	
> }[0]			as MIME Data	
			uas C String	

Fig.4-90 AtomicWriteFile parameters



AtomicWriteFile	– 🗆 X
IP BVLCI NPCI Confirmed-Request AtomicWriteFile	MyPort
File ID file, 0 ID Stream Access Start Position 0 Data 14340000cd74905010f9edffcdc0a80a14ffbac0cd Record Access Start Record Record Data Record Data	Add         Remove         Add         Remove         Add         Who-have         MonofirmedEventNotification         Add         Remove         Image: Imag
	Send

Fig.4-91 AtomicWriteFile parameters

The following capture shows a VTS client requesting AtomicWriteFile service from B-BC and receiving an Ack from B-BC.

<b>▲</b> *イーサネット 11	- 🗆 X
<u>File Edit View Go Capture Analyze Statistics Telephony Wireless Iools</u>	<u>H</u> elp
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bacnet or bvlc or ntp	×
Source Destination Protocol Length Info	
417 192.168.10.20 192.168.10.10 BACnet-APDU 211 Confirmed-R	EQ atomicWriteFile[108] file,0
486 192.168.10.10 192.168.10.20 BACnet-APDU 60 Complex-ACK	atomicWriteFile[108]
(	>
<pre>&gt; Ethernet II, Src: TPLink_1c:9a:fe (7c:c2:c6:1c:9a:fe), Dst: Renes; &gt; Internet Protocol Version 4, Src: 192.168.10.20, Dst: 192.168.10.: &gt; User Datagram Protocol, Src Port: 47808, Dst Port: 47808 &gt; BACnet Virtual Link Control &gt; Building Automation and Control Network NPDU &gt; Building Automation and Control Network APDU 0000 = APDU Type: Confirmed-REQ (0) &gt; 0000 = PDU Flags: 0x0 .000 = Max Response Segments accepted: Unspecified (0)  0011 = Size of Maximum ADPU accepted: Up to 480 octets (f: Invoke ID: 108 Service Choice: atomicWriteFile (7) &gt; ObjectIdentifier: file, 0 &gt; stream access &gt; {[0] &gt; File Start Position: (Signed) 0 </pre> File Data: 14340000cd74905010f9edffcdc0a80a14ffbac0cdffle00 > Application Tag: Octet String, Length/Value/Type: 148 > }[0]	0010         00 c5 e9 67 00 00 80 11         00 00 c0 a8 0a 14 c0 a8           0020         0a ab a c0 ba c0 00 b1         96 31 81 0a 00 a9 01 04           0030         00 03 6c 07 c4 02 80 00         00 e3 11 81 0a 06 a9 01 04           0040         00 06 cd 74 90 50 10 f9         ed ff cd c0 a8 0a 14 ff           0050         00 cd 05 ff cd ff 02 00         cd 06 c0 a8 0a 0a ba c0           0060         cd 05 ff cd ff 02 00         cd 06 c0 a8 0a 0a ba c0           0060         ed 57 44 5f 53 6f         fc 75 74 69 6f 6e 5f 42           0080         00 00 00 00 00 00 00 00         00 00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00         00 00 00 00 00           0090         00 00 00 00 00 00         00 00 00 00 00           0040         00 00 00 00 00 00         00 00 00 00 00           0040         00 00 00 00 00 00         00
<>	<
● 図 wireshark イーサネット 11NOUH2 pcappg	Packets: 10601 . Displayed: 143 (1.3%) Profile: Default

Fig.4-92 Capturing AtomicWriteFile



# 4.6 BACnet Communication with Yabe

The following operation can be verified from VTS, but will be explained using Yabe, which is easier to operate. Open Windows Start and click on Yabe to launch Yabe.



Fig.4-93 Launch Yabe

This section describes BACnet/IP communication with Yabe. After starting up Yabe, add devices.

Periodic     Subscriptions, Periodic Polling, Events/Alarms     Properties       Image: Send Whols     F2     ow     Dev     Obj     Name     Value     Image: Name     Image: Nam     Image: Nam     Image: Name
Add device     ow     Dev_     Obj.     Name     Value     Time       Send Whols     F2       Export device DB       Time synchronize       Ctrl+T       Device control       Ctrl+Q       Address       Device control       Ctrl+Q       Case Object       Ctrl+Q       Create Object       Ctrl+Q       - or here to subscribe and plot

Fig.4-94 Yabe Add device(1)

Enter BAC0 (47808) for Port in the dialog displayed and select the IP address of the PC client. Click Start to initiate communication.



🔍 BACnet Communication Channel		×
General Retries 3 🔄 Timeout 3000 🜩 Whole	limit low high	
BACnet/IP V4 & V6.000 U4 Port BAC0 Start Local endpoint 92.168.10.20 V BACnet/Secure Connect over Websocket Configuration parameters File : Start BACnetSCConfig config Select Edit	BACnet/MSTP over serial Port Start Baud 115200 Source Address 1 Max Master 127 Max Frames 1	
BACnet/Ethernet Interface Start	BACnet/PTP over serial Port v Baud 115200 ÷ Password	t

Fig.4-95 Yabe Add device(2)

Device 10 in the Devices window is B-BC, Device 100 is B-SS, and Device 2 is Yabe. Here, the YabeDeviceID is set to 2 from Yabe's Options > Settings window. (see chapter 4.6.1)

Click on Device 10.

✓       Yet Another Bacnet Explorer - Yabe         File       Functions       Options         Help       ✓       ✓         Devices       ✓       ✓         ✓       Devices       ✓         ✓       Devices       ✓         ✓       Device 2 - 192.168.10.20:60599       ✓         ✓       Device 10 - 192.168.10.10:47808       ✓         ✓       Device 100 - 129       ✓	Yet Another Bacnet Explorer - Yabe         File       Functions         Options       Help         Devices         Devices         Devices         Device 10 - 192.168.10.20:60599         Device 10 - 129         Address Space
File       Functions       Options       Help         Image: Constraint of the state of th	File       Functions       Options       Help         Image: Constraint of the state of th
Oevices         Image: Devices         Image: Devices         Image: Device 2 - 192.168.10.20:60599         Image: Device 10 - 192.168.10.10:47808         Image: Device 100 - 129	Oevices         Devices         Devices         Device 2 - 192.168.10.20:60599         Device 10 - 192.168.10.10:47808         Device 100 - 129         Address Space
Devices Devices Device Device 2 - 192.168.10.20:60599 Device 10 - 192.168.10.10:47808 Device 100 - 129	Devices Devices Device 2 - 192.168.10.20:60599 Device 10 - 192.168.10.10:47808 Device 100 - 129 Address Space
	Address Space

Fig.4-96 Yabe Add device(3)

Object list for Device 10 appears in the Address Space window.



Fig.4-97 Yabe Add device(4)



Click on Device 100 in the Devices window. The Address Space window switches to a display of the object list for Device 100.



Fig.4-98 Yabe Add device(5)



# 4.6.1 TimeSynchronization / UTCTimeSynchronization

This section describes the procedure for setting up TimeSynchronization / UTCTimeSynchronization from Yabe, as described in section 4.5.3 from VTS.

For time synchronization service, select TimeSynchronization or UTCTimeSynchronization through Options.



Fig.4-99 Selecting a time synchronization service(1)

Setting TimeSynchronize\_UTC to False in the Settings screen below selects TimeSynchronization, while setting it to True selects UTCTimeSynchronization.

Settings	×
GUI_SubscriptionColumns	0;39;1;60;2;60;3;55;4;96;5;60;6;60;7;60;{ 🔨
IPv6_Support	False
MSTP_DisplayFreeAddresses	False
MSTP LogStateMachine	False
Plugins	CheckReliability, CheckStatusFlags,
Segments Max	65
Segments ProposedWindowSize	20
SettingsUpgradeRequired	False
ShowDescriptionWhenUsefull	False
Subscriptions_IssueConfirmedNotifies	False
Subscriptions_Lifetime	120
Subscriptions_ReplacementPollingPerio	100
TimeSynchronize_UTC	False
Udp_DontFragment	True
Udp_ExclusiveUseOfSocket	False
Udp_MaxPayload	480
UsePollingByDefault	False
Vertical_Object_Splitter_Orientation	False
YabeDeviceId	2
	~
Address Space Structured View	
Some settings may require a restart of the pr	rogram .

Fig.4-100 Selecting a time synchronization service(2)



Select B-BC in the Devices window and right-click to select Time\_synchronize from the list that appears.

Click OK on the pop-up window.



Fig.4-101 Selecting a time synchronization service(2)

Similarly, Time\_synchronize should be performed for B-SS.



### 4.6.2 Controlling B-SS from B-BC

B-BC devices support DS-RP-A and DS-WP-A profiles and can Initiate the ReadProperty and WriteProperty services on their own. This chapter describes controlling an external B-SS device from B-BC with DS-RP-A and DS-WP-A.

The TrendLog and Schedule objects handled in this chapter use timestamps. Please execute TimeSynchronization or UTCTimeSynchronization service request to B-BC and B-SS in advance.(Chapter 4.6.1)

# 4.6.2.1 Trending & ReadRange

B-BC requests ReadProperty service (DS-RP-A) to B-SS to collect the PresentValue property of the AnalogInput,0 object of B-SS input from the sensor as a log record in the LogBuffer property of the TrendLog,0 object of B-BC.

Click RZN2L\_BACnet\_Solution\_BBC\_BRTR [10] in the Devices window.

Click TREND LOG 0 (Trendlog:0) in the Address Space window.

Change the following properties in the Properties window

- Set today's date in "Start Time".
- Set tomorrow's date in "Stop Time".
- Change the Instance under DeviceID to (100), which is the instance number of the B-SS device.

If the instance number is 10, the PresentValue of B-BC's own AnalogInput,0 object is the logging target. Note that it is necessary to set OutOfService=True for the AnalogInput,0 object before changing the PresentValue of the B-BC's own AnalogInput,0 object.

• Log Interval is displayed in units of 10[ms], but the actual setting unit is in seconds.

If 1~99 is input, it will be rounded to 100 (100 x 10[ms]=1000[ms]).

When setting 1 second, set 100 (100 x 10[ms]=1000[ms]=1[s]).

The default is 90000 (90000 x 10[ms] = 900000[ms] = 900[s] = 15[min]).

File Functions Options Help			
O X			
Devices	Columnia	Properties	
Devices	Subscrip		
	Show		
Device 2 - 192 168 10 20 51031	011044	✓ BacnetProperty	
R7N2L RACest Solution RRC RRTR [10]		<ul> <li>Object Identifier</li> </ul>	OBJECT_TRENDLOG:0
PZN9L PACent Solution [100]		Туре	OBJECT_TRENDLOG
		Instance	0
Address Space : 19 objects		Object Name	TREND LOG 0
BZN2L BACnet Solution BBC BBTB (Device:10)		Object Type	20 : Object Trendlog
		Enable	True
		Stop When Full	False
		Buffer Size	1000
ANALOG VALUE1		Log Buffer	ERROR_CLASS_PROPERTY: ERROR_CODE_READ_ACCESS_DENIEL
		Record Count	1
		Total Record Count	3
BINARY_OUTPUT:1		Event State	0 : Normal
BINARY_VALUE:0		Logging Type	0
BINARY_VALUE:1	E.c.	Status Flags	0000
FILE 0 (File:0)	Expo	Description	TREND LOG U
	[····]	Start lime	2024/01/29
		Stop Lime	2024/01/30
MULTI_STATE_VALUE:0	1111	<ul> <li>Log Device Object Property</li> </ul>	Reference to OBJECT_ANALOG_INPUT:0
MULTI_STATE_VALUE:1		V Ubjectid	UBJEGT_ANALOG_INPUT:0
TREND LOG 0 (Trendlog:0)		Type	OBJECT_ANALOG_INPUT
POSITIVE_INTEGER_VALUE:0		Instance	
		ArrayIndex	
	10000		
NETWORK PORT:2		Type	
		Instance	DOD DESENT VALUE
		Align Interval	True
		Intervals	0
		anterval Offset	

Fig.4-102 Trend Log object(1)



To refresh TREND LOG 0 (Trendlog:0) in the Address Space window, click on another object and then click on TREND LOG 0 (Trendlog:0) again. Confirm that the "Record Count" property value has increased enough.



Fig.4-103 Trend Log object(2)

Right click on TREND LOG 0 (Trendlog:0) and select "Show TrendLog". Then Yabe makes a ReadRange service request to B-BC.

MULTI_STATE_VALUE:1 TREND LOG 0 (Tree) ③ Subscribe POSITIVEINTEGER POSITIVE_INTEGER NETWORK_PORT:1 NETWORK_PORT:2 Search
--

Fig.4-104 Trend Log object(3)

Logs with time stamps and graphs of B-SS sensor input values are displayed. Make sure that the sensor detects wind while logging is in progress.



Fig.4-105 Show TrendLog



To stop logging, set the "Enable" property value to False.



Fig.4-106 Trend Log object(4)

The following MS/TP network capture shows a ReadProperty service request (DS-RP-A) from B-BC to B-SS and its response being executed in one second cycles. The MAC address 0x05 displayed in Source and Destination indicates a B-BC master, and 0x81 indicates a B-SS slave.



Fig.4-107 ReadProperty service request to B-SS (DS-RP-A) capture



The following capture of the BIP network shows a ReadRange service request from Yabe to B-BC and its response.

	t <u>V</u> iew <u>G</u> o <u>C</u> aptur	e <u>A</u> nalyze <u>S</u> tatist	ics Telephon <u>y W</u> i	reless <u>T</u> ools	<u>H</u> elp						
<u>í</u> 🔳 í	10 🛛 🖬 🗙 C	९ 🗢 🔿 🗟	🗿 🕹 📃 📕 🗨	Q Q 🏨							
bacnet	t or bvlc or ntp									$\times \rightarrow$	• +
No.	Time	Source	Destination	Protocol	Length	Info					^
16926	5 17:06:08.221282	192.168.10.10	192.168.10.20	BACnet-APDU	527	Complex-ACK	readRange[	69] tren	d-log,0	log-buff	en
16927	7 17:06:08.233876	192.168.10.20	192.168.10.10	BACnet-APDU	66	Confirmed-REQ	readRange[	70] tren	d-log,0	log-buff	er
16928	8 17:06:08.272280	192.168.10.10	192.168.10.20	BACnet-APDU	527	Complex-ACK	readRange[	70] tren	d-log,0	log-buff	en
16929	9 17:06:08.285532	192.168.10.20	192.168.10.10	BACnet-APDU	66	Confirmed-REQ	readRange[	71] tren	d-log,0	log-buff	er
16930	0 17:06:08.323408	192.168.10.10	192.168.10.20	BACnet-APDU	527	Complex-ACK	readRange[	71] tren	d-log,0	log-buff	Fer
16933	1 17:06:08.336926	192.168.10.20	192.168.10.10	BACnet-APDU	66	Confirmed-REQ	readRange[	72] tren	d-log,0	log-buff	er
16932	2 17:06:08.374385	192.168.10.10	192.168.10.20	BACnet-APDU	527	Complex-ACK	readRange[	72] tren	d-log,0	log-buff	er
16933	3 17:06:08.387527	192.168.10.20	192.168.10.10	BACnet-APDU	66	Confirmed-REQ	readRange[	73] tren	d-log,0	log-buff	er
16934	4 17:06:08.425495	192.168.10.10	192.168.10.20	BACnet-APDU	527	Complex-ACK	readRange[	73] tren	d-log,0	log-buff	er
16935	5 17:06:08.441992	192.168.10.20	192.168.10.10	BACnet-APDU	66	Confirmed-REQ	readRange[	74] tren	d-log,0	log-buff	er u
1007	C 17.0C.00 477740	100 100 10 10	100 100 10 00	DAC-++ ADDU	507	C1 ACV		747 4	0	1	·
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	Carl: January 29, Time: 5:04:07.0 P }[0] {[1] real value: 0.4842 }[1] Status Flags: (Bit {[0] Date: January 29, Time: 5:04:08.0 P }[0] {[1] real value: 0.905( }[1] Status Flags: (Bit Status Flags: (Bit	2024, (Day of W M. = 17:04:07.0 249 (Real) t String) (FFFT) 2024, (Day of W M. = 17:04:08.0 059 (Real) t String) (FFFT)	eek = Monday) eek = Monday)		003 004 005 006 007 008 009 00a 00b 00c 00d 00c 00d 00c 00d 00c 00d 00c 00d 00c	30         4b 1a 7c           60         50         47 c 7c           61         67 c 7c         1f 2a           62         60         67 f 1c         2c           63         1d 01         1b 41         11           64         10         0e 44         0e         40           60         06         06         06         0e           64         10         0e         44         0e         0e           67         c 11 d 01         1e         2c         0e         0e           61         12 c 2c         00         0e         1e         2c         0e           61         1e         2c         0e         0e         1e         2c         0e           61         0e         2d         1f 2a         0e         0e <th>05         00         00         01           1d         01         b4         11           04         10         0e         a4           3f         67         b1         f8           04         09         00         0f           7c         01         1d         01           1f         2a         04         00           b4         11         04         0c           06         04         7.0         00           06         04         7.0         00           06         06         14         2c           07         06         16         2c           08         07         16         12           104         10         0e         a4           10         07         12         08           08         07         16         01           09         07         18         07           01         01         04         11         00           04         11         00         07         12         20         04</th> <th>19 83 3: 04 07 00 7: 01 11 04 16 2c 34 b4 11 04 06 a4 7. 00 00 14 00 06 14 10 01 b4 04 10 06 16 3d dc da 04 06 06 7c 01 1c 1f 2a 04 1e 2c 36 b4 11 04 c 2c 36 c 2c 36</th> <th>a 05 20 0 0f 1e 1 01 b4 4 10 0e F 89 f3 4 0a 00 c 01 1d f 2a 04 e 2c 3f 4 11 04 e a4 7cc e 48 1f 0 0f 1e 0 0f 1e 0 0f 1e 0 0f 1e 0 0f 2a 04 4 10 0e e 2c 3f 4 10 0e e 2c 65 4 12 00 e 2c 16 5 0 0f 1e 0 0f 1e 0</th> <th>49 15 5e 2c 3e f7 11 04 08 a4 7c 01 7b 1f 2a 0f 1e 2c 00 1b 41 11 00 e a4 80 4c 6b 0d 00 0f 0d 1b 41 11 2a 04 10 2c 3f 73 11 04 10 38 1f 2a 0f 1e 2c 0f 1e 2c 0f 1e 41 38 1f 2a</th> <th>0</th>	05         00         00         01           1d         01         b4         11           04         10         0e         a4           3f         67         b1         f8           04         09         00         0f           7c         01         1d         01           1f         2a         04         00           b4         11         04         0c           06         04         7.0         00           06         04         7.0         00           06         06         14         2c           07         06         16         2c           08         07         16         12           104         10         0e         a4           10         07         12         08           08         07         16         01           09         07         18         07           01         01         04         11         00           04         11         00         07         12         20         04	19 83 3: 04 07 00 7: 01 11 04 16 2c 34 b4 11 04 06 a4 7. 00 00 14 00 06 14 10 01 b4 04 10 06 16 3d dc da 04 06 06 7c 01 1c 1f 2a 04 1e 2c 36 b4 11 04 c 2c 36 c 2c 36	a 05 20 0 0f 1e 1 01 b4 4 10 0e F 89 f3 4 0a 00 c 01 1d f 2a 04 e 2c 3f 4 11 04 e a4 7cc e 48 1f 0 0f 1e 0 0f 1e 0 0f 1e 0 0f 1e 0 0f 2a 04 4 10 0e e 2c 3f 4 10 0e e 2c 65 4 12 00 e 2c 16 5 0 0f 1e 0 0f 1e 0	49 15 5e 2c 3e f7 11 04 08 a4 7c 01 7b 1f 2a 0f 1e 2c 00 1b 41 11 00 e a4 80 4c 6b 0d 00 0f 0d 1b 41 11 2a 04 10 2c 3f 73 11 04 10 38 1f 2a 0f 1e 2c 0f 1e 2c 0f 1e 41 38 1f 2a	0
>	{[0]	2024. (Day of W	eek = Monday)		014	0 3t 36 t9 68 0 04 13 00 0f	1+ 2a 04 10 1e 2c 3e e3	5d 4c 1	F 2a 04	01 D4 11 10 0e a4 0f 74 cf	
>	Date: January 29.						UT II UT 14		- 6L JT	VI /4 CO	

Fig.4-108 ReadRange service request capture to B-BC



# 4.6.2.2 Scheduling

The B-BC requests the WriteProperty service to the B-SS (DS-WP-A) for changing the PresentValue property of the BinaryOutput,0~3 objects of the B-SS assigned to the LEDs to be turned on and off according to the weekly schedule set in the Schedule,0 object of the B-BC.

Click on RZN2L\_BACnet\_Solution\_BBC\_BRTR [10] that appears in the "Devices" window of Yabe.

Right-click "SCHEDULE 0 (Schedule:0)" in the "Address Space" window and select "Show Schedule". The "List Of Object Property References" property in the center of the "Properties" window is assigned to Device,100 BinaryOutput,0 PresentValue as the Schedule target, so there is no need to change it.

If the device instance number of the B-SS is changed to other than 100, for example, the List Of Object Property References property should be changed. Not only BinaryOutput objects, but also other output objects can be changed to Schedule target.

The following output objects of B-SS have been verified as schedule targets.

AnalogOutput, AnalogValue, BinaryOutput, BinaryValue, MultiStateValue, PositiveIntegerValue

In addition, if the device instance number is changed to 10, B-BC's own Output object can be scheduled.

The following output objects of B-BC have been verified as schedule targets.

AnalogValue, BinaryOutput, BinaryValue, MultiStateValue, PositiveIntegerValue



Fig.4-109 Schedule object

Select "Show Schedule" to open the "Simple Schedule Editor" and change the properties.

- Set today's date in "Validity Start Date".
- Set tomorrow's date to "Validity End Date".

Set the general-purpose LED0 on the B-SS board to turn on and then off.



## RZ/N2L Group

- Right-click on today's day in "Weekly Schedules", select "Modify" and set hh:mm:ss = 1.
- Right-click on today's day in "Weekly Schedules" and select "Add" and set hh:mm:ss = 0.

Finally, click Update & Read back to close the Simple Schedule Editor.

Simple Schedule Editor	- 0	×	Simple Schedule Editor	- 🗆 ×
Validity Start Date 2024/01/23 Schedule Default value 0	Validity End Date 2024/01/24 Data Type Enumerated v		Validity Start Date 2024/01/23 Schedule Default value 0	Validity End Date 2024/01/24 Data Type Enumerated ~
Weekly Schedules	iify te y e		Weekly Schedules	
Objects properties references	ALUE on DEVICE:100		Objects properties references	T_VALUE on DEVICE:100
Ontional Exception Schedule not implement	Update & Read bac	k		Update & Read back

Fig.4-110 Simple Schedule Editor

The following MS/TP network capture screen shot shows a WriteProperty service request (DS-WP-A) to B-SS and its response at 18:59:15 and 19:00:45 of the Schedule time. At the same time, LED0 on the B-SS board turns on and off.

SAC	.net MS/TP on COM10								-		×
<u>F</u> ile <u>E</u> d	lit <u>V</u> iew <u>G</u> o <u>C</u> aptu	ire <u>A</u> nalyze	Statistics Telephony	<u>W</u> ireless <u>T</u> ools <u>H</u> el	р						
🛋 🔳 🖌	🧶 🛞 🔚 🔚 🗙 🕻	🖥 🍳 🗢 🔿	😤 🗿 🛓 📃 📃	Q. Q. Q. 🎹							
d mstp	o.src == 0x05) or (mstp.s	rc == 0x81 and	(mstp.dst == 0xFF or mst	p.dst == 0x05)) or (mst	p.src == 0x05 an	d mstp.	.dst == 0xFF) or (mstp.s	rc == 0x02 and mstp.o	dst == 0xFF) 🔀		) +
No.	Time	Source	Destination	Protocol Le	ngth Info						
9440	3 18:59:15.834204	0x05	0x81	BACnet-APDU	29 Confirm	ed-RE(	Q writeProperty[	109] binary-outpu	it,0 present-	value	
9440	4 18:59:15.849821	0×81	0x05	BACnet-APDU	15 Simple-	АСК	writeProperty[	109]			
9555	8 19:00:45.896764	0×05	0x81	BACnet-APDU	29 Confirm	ed-RE(	Q writeProperty[	[110] binary-outpu	it,0 present-	value	
9555	9 19:00:45.913160	0x81	0×05	BACnet-APDU	15 Simple-	ACK	writeProperty[	110]			
c											>
<pre>&gt; Build</pre>	<pre>ding Automation an 300 = APDU Typ  0000 = PDU Flag 300 = Max Resp  0011 = Size of nvoke ID: 109 ervice Choice: writ operty Identifier: b roperty Identifier [3] resent Value (enum Application Tag: [3] riority: (Unsigned)</pre>	<pre>d Control Ne pe: Confirmer ss: 0x0 ponse Segment Maximum ADPI teProperty (: inary-output : present-va: index): 1 Enumerated, ) 16</pre>	twork APDU d-REQ (0) ts accepted: Unspec J accepted: Up to 4 L5) , 0 Lue (85) Length/Value/Type:	ified (0) 80 octets (fits in 1	n an ARCNET f	r					
/						<					
<b>`</b>											

Fig.4-111 WriteProperty service request to B-SS (DS-WP-A) capture


### 4.6.3 EventNotification / GetEventInformation / AcknowledgeAlarm

B-BC's AnalogInput object supports the Out Of Range event algorithm. If the PresentValue property value deviates from the range specified for the Low\_Limit and High\_Limit properties, the ConfirmedEventNotification service or the UnconfirmedEventNotification service will be notified to the BIP client.

The BIP client requests the GetEventInformation service to retrieve all "active event states".

The BIP client also requests an AcknowledgeAlarm service request to confirm that the BIP client has acknowledged the event notification from the B-BC and returned an Ack.

Right-click "NOTIFICATION CLASS 0 (Notification\_Class:0)" in the "Address Space" window and select "Show Notification".



Fig.4-112 Notification Class object



Select Show Notification to open the Notification Editor and change the properties.

- Ack Required selects whether ConfirmedEventNotification is notified to the recipient (BIP client) (with ✓) or UnconfirmedEventNotification is notified (without ✓).
- Process Id is a process handle in the recipient that receives event notifications.

#### EventType

- To\_OffNormal notifies an event when a transition occurs to a state of neither normal nor fault.
- To Fault notifies an event when a transition occurs to the fault state.
- To\_Normal notifies an event when a transition occurs to the normal state.

Validity

• The days of the week and times when Event notifications are activated.

## Receiver

- Set either the instance number or IP address of the device that receives Event notifications.
- However, IP address cannot be selected because this B-BC sample software does not support it. Priority
  - Priority of each Event Notification. The range is 0 to 255.

The above properties are already initialized, so at least only the "Receiver" needs to be changed. The number set in the following example is the device instance number of Yabe. It is configurable from the Options menu bar in Yabe.

Finally, click "Write & Read back" to close the Notification Editor.

🔍 Notifica	tion Editor	-		×
1	Recipient List : NOTIFICATION_CLASS:0			
	Ack Required Process Id	0		
	EventType 🗹 To_OffNormal 🔽 To_Fault 📿 T	o_Normal		
	Validity Monday Tuesday Wedesnday Friday Saturday Sunday from Time 0:00:00 to Time 23:	Thursday 59:59 🖨		
	Receiver : deviceId or IP:Port (like 4000 or 192.168.0.1	:47808)		
Prior To	ty OffNormal 255 To_Fault 255 To	o_Normal	255	
	Write & Read back			

Fig.4-113 Notification Editor



Next click on ANALOG INPUT 0 (Analog\_Input:0) from the Address Space tree and select True for Out Of Service in the Properties window. Setting Out Of Service to True allows the Present Value to be changed.

Then, set the Present Value to 100.1 so that it exceeds the High Limit (100).

S Yet Another Bachet Explorer - Yabe					
File Functions Options Help					
0 ×					
Devices		Subserie	Prop	erties	
🖮 😓 Udp:47808	~	Subscrip		AL	
Device 0 - 192.168.10.20:47808		Show			
— 💭 Device 2 - 192.168.10.20:56884		L 10	~	BacnetProperty	
🗄 💭 RZN2L BACnet Solution BBC BRTR [10]			>	Object Identifier	OBJECT_ANALOG_INPUT:0
				Object Name	
	×			Object Type	U: Object Analog Input
Address Space : 19 objects				Present value	100.1
RZN2L BACnet Solution BBC BRTR (Device:1	0)			Dialus Fidgs Event State	0001
- 🖄 ANALOG INPUT 0 (Analog_Input:0)				Out Of Service	True
				Unite	95 : No Units
				Description	
				Beliahility	0 : No Fault Detected
BINARY_OUTPUT:0				Cov Increment	1
BINARY_OUTPUT: 1				Time Delay	0
BINARY_VALUE:0		$\langle \rangle$		Notification Class	0
BINARY_VALUE:1				High Limit	100
FILE:0		Expo		Low Limit	0
	:0)	<b></b>		Deadband	0
- TRI SCHEDULE:0				Limit Enable	11
				Event Enable	111
				Acked Transitions	010
TRENDLOG:0				Notify Type	0 : Alarm
POSITIVE INTEGER VALUE:0			>	Event Time Stamps	Object[] Array
POSITIVE INTEGER VALUE:1		1 : : : :			
NETWORK PORT:1		• • • • • •			
		1			

Fig.4-114 AnalogInput,0 object(1)

Next, set the Present Value to 99.9, which is less than the High Limit (100), to transit to the normal state.

File Functions Options Help			
• ×			
Devices	Subserir	, Properties	
	Show	● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	OBJECT_ANALOG_INPUT:0
Device 100 - 129		Object Name	ANALOG INPUT U
- *		Brocent Value	
Address Space : 19 objects		Statue Flage	1001
RZN2L_BACnet_Solution_BBC_BRTR (Device:10)		Event State	3 : High Limit
		Out Of Service	True
ANALOG INPUT 1 (Analog_Input:1)		Units	95 : No Units
- 🖄 ANALOG_VALUE:0		Description	ANALOG INPUT 0
ANALOG_VALUE:1		Reliability	0 : No Fault Detected
BINARY_OUTPUT:0		Cov Increment	1
BINARY_OUTPUT:1		Time Delay	0
BINARY_VALUE:0	$\langle \rangle$	Notification Class	0
BINARY_VALUE:1		High Limit	100
	Expo	Low Limit	0
		Deadband	0
SCHEDULE:0		Limit Enable	11
MULTI STATE VALUE:0		Event Enable	111
MULTI STATE VALUE:1		Acked Transitions	010
		Notify Type	0 : Alarm
		Event Time Stamps	Object[] Array
NETWORK_PORT:1     NETWORK_PORT:2			

Fig.4-115 AnalogInput,0 object(2)



Then, right-click B-BC in the Devices window and select Alarm Summary.



Fig.4-116 Select Alarm Summary(1)

The dialog box on the left side of Fig.4-117 is displayed so that you can confirm that the time stamps of the Event occurrence and return correspond to the Event Time Stamps of the AnalogInput,0 object on the right side.

Click "Ack selected alarm(s)" to close the dialog.

🔍 Active Alarms on Device ld 10	X Vet Another Bacnet Explorer - Yabe			
Key F4 to refresh	File Functions Options Help			
Ack selected alarm(s)		0) 0) Subscrip Show □ 10 □ 0 □ 0 □ 0 □ 0 □ 0 □ 0 □ 0 □	Properties 2 24 2 Bacnet/Property 3 Object Mentifier Object Type Present Value Status Flags Event State Out Of Service Units Description Reliability Cov Increment Time Delay Notification Class High Limit Low Limit Deadband Limit Enable Acked Transitions Notify Type Vernal To Off Normal To Fault To Normal	OBJECT_ANALOG_INPUT0           ANALOG INPUT0           0: Object Analog Input           98.9           0001           0: Normal           True           95: No Units           ANALOG INPUT0           0: Normal           True           95: No Units           ANALOG INPUT0           0: No Fault Detected           1           0           0           0           10           0           11           111           111           111           111           0           04/01/26 154141           0007/01/16 0000           2022/01/26 154284

Fig.4-117 Select Alarm Summary(2)



The following Wireshark capture shows the service request and Ack when the described sequence of steps is performed.

- No.14074 : B-BC requests Who-Is service to obtain the IP address of the Recipient configured in the Notification Editor. (DM-DDB-A)
- No.14075 : Recipient (Yabe) responds I-Am. B-BC binds the IP address of the Recipient of device instance number (2) from the I-Am. (DM-DDB-A)
- No.14076 : ConfirmedEventNotification from B-BC when transitioning to OffNormal.
- No.14077 : Ack from Recipient.
- No.14096 : ConfirmedEventNotification from B-BC when transitioning to Normal.
- No.14114 : GetEventInformation service request from Recipient. This service request is triggered when the Alarm Summary described in the procedure is selected.
- No.14145 : Result response Ack from B-BC.
- No.14140 and 14142 : AcknowledgeAlarm service request from Recipient. This is a service request that is triggered when clicking on the "Ack selected alarm(s)" in the dialog described in the procedure. This is an AcknowledgeAlarm service request for two Event notifications of Offnormal and Normal transitions notified by the B-BC.
- No.14144 : ConfirmedEventNotification to notify that the timestamp of the latest event passed in the AcknowledgeAlarm service request matches that of the B-BC end.

🖸 *イーサネット 11					- 🗆 ×
ile <u>E</u> dit <u>V</u> iew <u>G</u> o <u>C</u> aptu	ure <u>A</u> nalyze <u>S</u> tatist	ics Telephon <u>y W</u> i	reless <u>T</u> ools <u>H</u>	<u>H</u> elp	
	5   <b>Q</b> ⊕ ⊕ ⊕ ⊡	₩ 🗐 🗐 🛛			
bacnet or bylc or ntp					
lo Time	Source	Destination	Protocol	Length Info	
14040 15:41:01 070354	102 168 10 20	192 168 10 10	BACnet-APDU	67 Confirmed-PE	writeProperty[ 51 potification_class 0 priority
14040 15:41:01.075554	192.168.10.20	192.168.10.20	BACnet-APDU BACnet-APDU	60 Simple-ACK	writeProperty[ 5]
14042 15:41:01 124945	192.168.10.20	192 168 10 10	BACnet-APDU	85 Confirmed-RE	writeProperty[ 6] notification-class 0 recipient-list device 2
14043 15:41:01 172281	192.168.10.10	192 168 10 20	BACnet-APDU	60 Simple-ACK	writeProperty[ 6]
14044 15:41:01.175894	192.168.10.20	192.168.10.10	BACnet-APDU	63 Confirmed-RE	readPropertyMultiple[ 7]
14045 15:41:01.222272	192.168.10.10	192.168.10.20	BACnet-APDU	96 Complex-ACK	readPropertyMultiple[ 7]
14055 15:41:14.785041	192.168.10.20	192.168.10.10	BACnet-APDU	61 Confirmed-RE	readPropertyMultiple[ 8]
14056 15:41:14.803406	192.168.10.10	192.168.10.20	BACnet-APDU	269 Complex-ACK	readPropertyMultiple[ 8]
14070 15:41:41.418082	192,168,10,20	192,168,10,10	BACnet-APDU	68 Confirmed-RE	writeProperty[ 9] analog-input.0 present-value
14071 15:41:41.420395	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	writeProperty[ 9]
14072 15:41:41.427883	192,168,10,20	192.168.10.10	BACnet-APDU	61 Confirmed-RE	readPropertyMultiple[ 10]
14073 15:41:41.470370	192.168.10.10	192.168.10.20	BACnet-APDU	269 Complex-ACK	readPropertyMultiple[ 10]
14074 15:41:41.965644	192.168.10.10	192.168.10.255	BACnet-APDU	60 Unconfirmed-I	EO who-Is 2 2
14075 15:41:41.967143	192.168.10.20	192.168.10.255	BACnet-APDU	67 Unconfirmed-I	EQ i-Am device,2
14076 15:41:41.975244	192.168.10.10	192.168.10.20	BACnet-APDU	135 Confirmed-RE	confirmedEventNotification[ 1] device.10 analog-input.0
14077 15:41:42,005927	192.168.10.20	192.168.10.10	BACnet-APDU	51 Simple-ACK	confirmedEventNotification[ 1]
14092 15:42:04.893371	192.168.10.20	192.168.10.10	BACnet-APDU	68 Confirmed-RE	writeProperty[ 11] analog-input.0 present-value
14093 15:42:04.896816	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	writeProperty[ 11]
14094 15:42:04.908054	192.168.10.20	192.168.10.10	BACnet-APDU	61 Confirmed-RE	readPropertyMultiple[ 12]
14095 15:42:04.946959	192.168.10.10	192.168.10.20	BACnet-APDU	269 Complex-ACK	readPropertyMultiple[ 12]
14096 15:42:04.956818	192.168.10.10	192.168.10.20	BACnet-APDU	153 Confirmed-RE	confirmedEventNotification[ 2] device,10 analog-input,0
14097 15:42:04.988255	192.168.10.20	192.168.10.10	BACnet-APDU	51 Simple-ACK	confirmedEventNotification[ 2]
14114 15:42:29.115625	192.168.10.20	192.168.10.10	BACnet-APDU	52 Confirmed-RE	getEventInformation[ 13]
14115 15:42:29.148581	192.168.10.10	192.168.10.20	BACnet-APDU	116 Complex-ACK	getEventInformation[ 13] analog-input,0
14140 15:43:13.254837	192.168.10.20	192.168.10.10	BACnet-APDU	103 Confirmed-RE	acknowledgeAlarm[ 14] analog-input,0
14141 15:43:13.256672	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	acknowledgeAlarm[ 14]
14142 15:43:13.257696	192.168.10.20	192.168.10.10	BACnet-APDU	103 Confirmed-RE	acknowledgeAlarm[ 15] analog-input,0
14143 15:43:13.306732	192.168.10.10	192.168.10.20	BACnet-APDU	60 Simple-ACK	acknowledgeAlarm[ 15]
14144 15:43:13.976788	192.168.10.10	192.168.10.20	BACnet-APDU	106 Confirmed-RE	confirmedEventNotification[ 3] device,10 analog-input,0
14145 15:43:13.981100	192.168.10.20	192.168.10.10	BACnet-APDU	51 Simple-ACK	confirmedEventNotification[ 3]
					2
Internet Protocol Vers	ion 4, Src: 192.1	68.10.20, Dst: 1	92.168.10.10	•	0000 74 90 50 10 f9 ed 7c c2 c6 1c 9a fe 08 00 45 00 t.P
User Datagram Protocol	, Src Port: 56884	, Dst Port: 4780	8		0010 00 25 eb 32 40 00 80 11 00 00 c0 a8 0a 14 c0 a8 ·%·2@··· ···
BACnet Virtual Link Co	ntrol				0020 0a 0a de 34 ba c0 00 11 95 91 81 0a 00 09 01 004
Building Automation an	d Control Network	NPDU			20 03 02
Building Automation an	d Control Network	APDU			
0010 = APDU Ty	pe: Simple-ACK (2	)			
Invoke ID: 3					
Service Choice: con	firmedEventNotifi	cation (2)			
				×	
				>	
🗎 🍸 wiroshark 🗸 🕂 🛪 whit	I OLITCIA management				

Fig.4-118 EventNotification capture image



### 4.6.4 AtomicReadFile

See also chapter 4.5.11, which describes the AtomicReadFile service from VTS. This chapter describes the procedure from Yabe. Yabe allows you to save files read from B-BC on your PC.

Open the "Settings" screen from Yabe's Options and set UdpMaxPayload to 480.

If changed, restart Yabe and start from Add Device.

Settings       Image: Control of the program of the prog			
QUI_SubscriptionColumns       0.39,1;60,2;60,3;147,4;60;5;60,6;60,7;36         MSTP_DisplayFreeAddresses       True         MSTP_LogStateMachine       False         Plugins       Check Reliability. Check Status Flags.         Segments_Max       65         Subscriptions_Lifetime       120         Subscriptions_Lifetime       120         Subscriptions_LeauentPollingPerio       1000         TimeSynchronize_UTC       False         Udp_ExclusiveUseOfSocket       False         Udp_MaxPayload       430         Some settings may require a restart of the program       X	Settings	×	×
GUL_SubscriptionColumns       0:39:1:50:2:60:3:147:4:60:5:60:7:36         IPv6_Support       False         MSTP_LogStateMachine       False         Plugins       CheckReliability. CheckStatusFlags.         Segments_ProposedWindowSize       20         SettingsUpgradeRequired       False         Subscriptions_InsueConfirmedNotifies       False         Subscriptions_Lifetime       120         Subscriptions_Lifetime       120         Subscriptions_PolycementPollingPerio       1000         TimeSynchronize_UTO       False         Udp_MaxPayload       480         Udp_DeleyDefault       True         Vertical_Object_Splitter_Orientation       False         VabeDeviceId       2         VabeDeviceId       2			
IPv6 Support       False         MSTP_DisplayFreeAddresses       True         MSTP_DisplayFreeAddresses       True         MSTP_LogStateMachine       False         Plugins       CheckReliability. CheckStatusFlags.         Seements_Max       65         Seements_proposedWindowSize       20         SettingsUpgradeRequired       False         ShowDescriptionWhenUseful       False         Subscriptions_IssueConfirmedNotifies       False         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_DontFragment       False         Udp_DontFragment       False         Udp_StubsiveUseOfSocket       False         Udp_MaxPayload       480         VabeDeviceId       2	GUI SubscriptionColumns	0:39:1:60:2:60:3:147:4:60:5:60:6:60:7:36	1
MSTP_DisplayFreeAddresses       True         MSTP_LogStateMachine       False         Pugins       CheckReliability. CheckStatusFlags.         Segments_Max       65         Segments_ProposedWindowSize       20         SettingsUperadeRequired       False         Subscriptions_IssueConfirmedNotifies       False         Subscriptions_ReplacementPollingPerio       1000         Time       120         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_MaxPayload       430         UseFollingEyDefault       True         Vertical_Object_Splitter_Orientation       False         Udp_MaxPayload       2         Some settings may require a restart of the program       5alse	IPv6 Support	False	
MSTP_LogStateMachine       False         Phigrins       CheckReliability, CheckStatusFlags,         Segments_Max       65         Segments_ProposedWindowSize       20         SettingsUppradeRequired       False         ShowDescriptions_IssueConfirmedNotifies       False         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_MaxPayload       430         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Vaberoyload       2	MSTP DisplayFreeAddresses	True	
Plugins       Check Reliability. Check Status Flags.         Segments_Max       65         Segments_ProposedWindowSize       20         Settings Upgrade Required       False         ShowDescriptions_Lifetime       Talse         Subscriptions_lesueConfirmedNotifies       False         Subscriptions_Lifetime       120         Subscriptions_Lifetime       Talse         Subscriptions_Lifetime       120         Subscriptions_Lifetime       Talse         Subscriptions_Lifetime       Talse         Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp MaxPayload       480         UseFollingByDefault       True         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2       V	MSTP LogStateMachine	False	
Segments_Max       65         Segments_ProposedWindowSize       20         Settings_UpgradeRequired       False         ShowDescriptionWhenUsefull       False         Subscriptions_IssueConfirmedNotifies       False         Subscriptions_Ifetime       120         Subscriptions_ReplacementPollinePerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_MaxPayload       4301         UsePolineByDefault       True         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Some settings may require a restart of the program       a	Plugins	CheckReliability, CheckStatusFlags,	
Segments_ProposedWindowSize       20         Settings/UpgradeRequired       False         Show/Descriptions_Infertime       False         Subscriptions_Infertime       False         Subscriptions_ReplacementPollingPerio       120         Subscriptions_Provide       120         Subscriptions_Provide       120         Subscriptions_Provide       120         Subscriptions_Provide       120         Udp_DontFrament       False         Udp_ExclusiveUseOfSocket       False         Udp_Nar/Payload       480         UserviceId       7         Vertical_Object_Splitter_Orientation       False         VabeDeviceId       2       V	Segments Max	65	
SettingsUpgradeRequired       False         Subscriptions_IssueConfirmedNotfiles       False         Subscriptions_IssueConfirmedNotfiles       120         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronics_UTO       False         Udp_DontFragment       False         Udp_ExclusiveUseOtSocket       False         Udp_MaxPayload       Xall         UsePollingByDefault       True         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Some settings may require a restart of the program	Segments_ProposedWindowSize	20	
ShowDescription/WhenUsefull       False         Subscriptions_IssueConfirmedNotifies       False         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp_ExclusiveUseOfSocket       False         Udp_EvolusiveUseOfSocket       False         Udp_Object_Splitter_Orientation       False         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Some settings may require a restart of the program	SettingsUpgradeRequired /	False	
Subscriptions_IssueConfirmedNotifies       False         Subscriptions_Lifetime       120         Subscriptions_ReplacementPolingPeriol       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp_ExclusiveUseOfSocket       False         Udp_DontFragment       False         Udp_DototFragment       False         Udp_DototSplitter_Orientation       False         Vertical_Object_Splitter_Orientation       False         VabeDeviceId       2         VabeDeviceId       2	ShowDescriptionWhenUsefull	False	
Subscriptions_Lifetime       120         Subscriptions_ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_MarReyload       420         UsePollingByDetault       True         Vertical_Object_Splitter_Orientation       False         Vdp_MarReyload       2         Vertical_Object_Splitter_Orientation       False         VabeDeviceId       2	Subscriptions_IssueConfirmedNotifies	False	
Subscriptions ReplacementPollingPerio       1000         TimeSynchronize_UTC       False         Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp_MaxPayload       480         UsePollingPyDefault       True         Vertical_Object_Splitter_Orientation       False         VabDeviceId       2         VabDeviceId       2	Subscriptions_Lifetime	120	
TimeSynchronize_UTO       False         Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp_MaxPayload       480         UsePolline_BPofeault       True         Vertical_Object_Splitter_Orientation       False         VabeDeviceId       2         VabeDeviceId       2         Some settings may require a restart of the program	Subscriptions_ReplacementPollingPerio	1000	
Udp_DontFragment       False         Udp_ExclusiveUseOfSocket       False         Udp_MaxPayload       480         UsePollingByDefault       True         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Vdp_MaxPayload       2         Some settings may require a restart of the program	TimeSynchronize_UTC	False	
Udp_ExclusiveUseOfSocket       False         Udp_MaxPayload       480         UsePollingByDetault       True         Vertical_Object_Splitter_Orientation       False         YabeDeviceId       2         Udp_MaxPayload       Some settings may require a restart of the program	Udp_DontFragment	False	
Udp_MaxPayload     180       UsePolline_DPoleault     True       Vertical_Object_Splitter_Orientation     False       YabeDeviceId     2	Udp_ExclusiveUseOfSocket	False	
UsePollingByDefault Vertical_Object_Splitter_Orientation YabeDeviceId Udp_MaxPayload Some settings may require a restart of the program	Udp_MaxPayload	480	
Vertical_Object_Splitter_Orientation     False       YabeDeviceId     2       Udp_MaxPayload       Some settings may require a restart of the program	UsePollingByDefault	True	
YabeDeviceId     2       Udp_MaxPayload     v       Some settings may require a restart of the program	Vertical_Object_Splitter_Orientation	False	
Udp_MaxPayload Some settings may require a restart of the program	YabeDeviceId	2	
Udp_MaxPayload Some settings may require a restart of the program		*	
Some settings may require a restart of the program	Udp_MaxPayload		
	Some settings may require a restart of the pr	rogram	

Fig.4-119 Udp\_MaxPayload setting of Yabe

Select "FILE 0 (File:0)" in the "Address Space" window and right-click to select "Download File".

🔍 Yet Another Bacnet Explorer - Yabe	
File Functions Options Help	
i 💿 🗙	
Devices	
	1
الم	
Device 2 - 192,168,10,20:51031	
⊨ — — ■ RZN2L BAChet Solution BBC BRTR [10]	
Device 100 - 129	
Address Space : 19 objects	
RZN2L_BACnet_Solution_BBC_BRTR (Device:10)	1
ANALOG_INPUT:0	
ANALOG_INPUT:1	
ANALOG_VALUE:1	
BINARY_OUTPUT:0	
BINARY_OUTPUT:1	
BINARY_VALUE:0	
BINARY VALUE:1	
FILE 0 (File:0)	
NOTIFICATION 💿 Subscribe	
MULTISTATE V	
MULTISTATEN 🔤 Upload File	
TRENDLOG:0 🔏 DeleteObject	
POSITIVE INTER Search	
NETWORK PORT:1	
NETWORK PORT:2	

Fig.4-120 Select Download File



In the next dialog, name and save the file; click OK on the Done pop-up screen.

🔍 名前を付けて保存		×	
← → · · ↑ 📴 C:¥Users¥71768836¥BACnet¥20240129¥F ∨ ♂	Filesの検索	Q	
整理 ▼ 新しいフォルダー	:== ▼	?	
▲ <u>A</u> A前	更新日時	種類	
■ デスクトップ オ	2024/01/29 14:40	BIN 🕽	
🖊 ダウンロード 🖈		Γ	Dana
		>	Done A
ファイル名(N): FlashData.bin		~	Done
ファイルの種類(T):		~	Done
▲ フォルダーの非表示	保存(S) キャンセ	!JV	ОК

Fig.4-121 Save file with file name



### 4.6.5 AtomicWriteFile

See also chapter 4.5.12, which describes the AtomicWriteFile service from VTS. This chapter describes the procedure from Yabe.

By using Yabe, you can select files from your PC without any awareness of the Hex data stream (content) as with VTS. The selecting file is the file saved with AtomicReadFile service.

Select "FILE 0 (File:0)" in the "Address Space" window and right-click to select "Upload File".

Yet Another Bacnet Explorer - Yabe         File       Functions       Options       Help         Devices       Devices         Devices       Devices         Devices       Device 2 - 192.168.10.20:51031         Device 100 - 129       Device 100 - 129         Address Space : 19 objects         ANALOG JNPUT:1         ANALOG JNPUT:1         ANALOG JNPUT:1
File       Functions       Options       Help         Image: Sevices       Image: Sevices       Image: Sevices       Image: Sevices         Image: Sevice 100       Image: Sevices       Image: Sevices       Image: Sevices         Image: Sevice 119       Image: Sevices       Image: Sevices       Image: Sevices         Image: Sevice 119       Image: Sevices       Image: Sevices       Image: Sevices       Image: Sevices         Image: Sevice 119       Image: Sevices       Image: Sevices       Image: Sevices       Image: Sevices       Image: Sevices         Image: Sevice 119       Image: Sevices       I
Devices         Devices         Devices         Devices         Device 2 - 192.168.10.20:51031         Device 100 - 129         Address Space 19 objects         RZN2L_BACnet_Solution_BBC_BRTR (Device:10)         ANALOG_INPUT:1         ANALOG_VALUE:0
Devices Devices Devices Devices Device 2 - 192.168.10.20:51031 Device 100 - 129 Address Space : 19 objects RZN2L_BACnet_Solution_BBC_BRTR (Device:10) ANALOG_INPUT:1 ANALOG_VALUE:0
Devices     Devices     Device 2 - 192.168.10.20:51031     Device 100 - 129  Address Space : 19 objects     RZN2L_BACnet_Solution_BBC_BRTR (Device:10)     AnALOG_INPUT:1     ANALOG_INPUT:1     ANALOG_VALUE:0
Hudge: 47808     Device 2 - 192.168.10.20:51031     Device 2 - 192.168.00.20:51031     Device 100 - 129  Address Space : 19 objects  Address Space : 19 objects  Address Space : 19 objects  AnALOG_INPUT: 0  ANALOG_INPUT: 1  ANALOG_VALUE:0
Device 2 - 192.168.10.20.51031     ZN2L_BACnet_Solution_BBC_BRTR [10]     Device 100 - 129  Address_Space : 19 objects     RZN2L_BACnet_Solution_BBC_BRTR (Device:10)     ANALOG_INPUT:1     ANALOG_VALUE:0
Address Space : 19 objects Address Space : 19 objects RZN2L_BACnet_Solution_BBC_BRTR (Device:10) ANALOG_INPUT:0 ANALOG_INPUT:1 ANALOG_VALUE:0
Address Space : 19 objects Address Space : 19 objects ANALOG_INPUT: 0 ANALOG_INPUT: 1 ANALOG_VALUE: 0
Address Space : 19 objects RZN2L_BACnet_Solution_BBC_BRTR (Device:10) ANALOG_INPUT:0 ANALOG_INPUT:1 ANALOG_VALUE:0
Address Space : 19 objects RZN2L_BACnet_Solution_BBC_BRTR (Device:10) ANALOG_INPUT:1 ANALOG_INPUT:1 ANALOG_VALUE:0
RZN2L_BACnet_Solution_BBC_BRTR (Device:10)
ANALOG_INPUT:0     ANALOG_INPUT:1     ANALOG_VALUE:0
ANALOG_INPUT:1
ANALOG_VALUE:0
ANALOG VALUE:1
BINARY OUTPUT: 1
BINABY VALUE:0
BINARY VALUE 1
NOTECATION Subscribe
SCHEDULEI - Deveload File
MILITISTATE Upload File
TRENDLOGI A DeleteObject
POSITIVE INTE A Second
POSITIVE INTE
NETWORK PORT1
NETWORK PORT?
Image NETWORK_PORT:2

Fig.4-122 Select Upload File

Select and open the file in the following dialog; click OK on the Done pop-up screen.

의, 開く	×	
$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\blacksquare$ « BACnet » 20240129 » Files $\checkmark$ $\circlearrowright$	Filesの検索	
整理 ▼ 新しいフォルダー	III 🔹 💶 (	
▲ 名前 ^	更新日時 種	
デスクトップ デ	2024/01/29 15:09 BIN	
↓ ダウンロード ★		
		Done X
	>	Done
ファイル名(N): FlashData.bin	~	
	開く(0) キャンセル	ОК

Fig.4-123 Open file



#### 4.6.6 ReinitializeDevice

Note) The ReinitializeDevice service resets the target device. When the debugger is connected, push S3 RESET button (red) on the RSK board to disconnect the debugger connection. If this service is executed while the debugger is connecting, Ethernet communication will not be established after rebooting the B-BC.

ReinitializeDevice from VTS was explained in Chapter 4.5.9, and this section describes the procedure of it from Yabe.

Restrictions) The following State parameter of ReinitializeDevice is not yet supported by the B-BC sample software.

STARTBACKUP, ENDBACKUP, STARTRESTORE, ENDRESTORE, ABORTRESTORE

Yabe allows selection of the service parameter ACTIVATE\_CHANGES, which could not be selected from VTS. Enter "filister" in Password and click OK.



Fig.4-124 Select Device control

Device Communication Control ×
Action Reinitialize Communication
Reinitialize
State COLOSTARI V COLOSTART -Communication WARNSTART Disable ENDBACKUP
Duration (minutes) ENDRESTORE ABORTRESTORE
Optional Password Oct
Cancel OK OK

Fig.4-125 Select ACTIVATE\_CHANGES



## 5. Initial Settings

This chapter describes each parameter setting in this sample software, including initial property values for each object.

## 5.1 Initial Values

Initial values of property for each object or parameters in this sample software are shown below. Please refer to the links shown in the Reference column of the table for how to change the initial values of each property.

## 5.1.1 Ethernet MAC address(IP)

In principle, Ethernet MAC address is uniquely assigned to all network devices, therefore, please set it individually for each RSK board with reference to chapter 5.2.1.

Especially when multiple RSK boards are connected on the same BACnet/IP network, be sure to change it.

#### Table 5-1 Ethernet MAC address

No.	Ethernet MAC address(IP)	Initial value	Reference
1	MAC address printed on CN14 of RSK board	uint8_t g_ether0_mac_address[6] = { 0x00, 0x11, 0x22, 0x33, 0x44, 0x55 };	5.2.1 Ethernet MAC address(IP)



# 5.1.2 Device

Initial values of device object properties are shown.

Table \$	5-2 Dev	vice,10	object	properties
----------	---------	---------	--------	------------

No.	Object	Property	Initial value	Reference
1		object-identifier	device, 10	5.2.2 Device instance
2		object-name	RZN2L_BACnet_Solution_BBC_BRTR	5.2.3 Device name
3		object-type	device (8)	
4		system-status	operational (0)	
5		vendor-name	UTF-8 'Renesas Electronics Corporation'	
6		vendor-identifier	(Unsigned) 9999	
7		model-name	UTF-8 'RZN2L_BBC_BRTR'	
8		firmware-revision	UTF-8 '1.0.0'	
٩		application-software-		
3		version	011-0 1.0.0	
10		protocol-version	(Unsigned) 1	
11		protocol-revision	(Unsigned) 23	
12		protocol-service-supported	acknowledgeAlarm = TRUE getAlarmSummary = TRUE subscribeCOV = TRUE atomicReadFile = TRUE atomicWriteFile = TRUE readProperty = TRUE writeProperty = TRUE writePropertyMultiple = TRUE deviceCommunicationControl = TRUE reinitializeDevice = TRUE i-Am = TRUE timeSynchronization = TRUE who-Has = TRUE who-Is = TRUE readRange = TRUE utcTimeSynchronization = TRUE getEventInformation = TRUE	
13	device,10	protocol-object-type- supported	analog-input = TRUE analog-value = TRUE binary-output = TRUE device = TRUE file = TRUE notification-class = TRUE schedule = TRUE multi-state-value = TRUE trend-log = TRUE positive-integer-value = TRUE network-port = TRUE	
14		object-list	device, 10 network-port, 1 network-port, 2 analog-input, 0 analog-input, 1 analog-value, 0 analog-value, 1 binary-output, 1 binary-output, 1 binary-value, 0 binary-value, 1 notification-class, 0 multi-state-value, 0 multi-state-value, 1 trend-log, 0 file, 0 positive-integer-value, 1 schedule, 0	5.2.4 Number of objects
15	4	max-apdu-length-accepted	(Unsigned) 480	
16	4	segmentation-supported	no-segmentation (3)	
17	4	apdu-timeout	(Unsigned) 3000	
18	4	number-of-apdu-retries	(Unsigned) 3	
19		device-address-binding	DeviceIdentifier:-	empty



# RZ/N2L Group

No.	Object	Property	Initial value	Reference
			network-number:-	
			MAC-address:Port:-	
20		database-revision	(Unsigned) 3	
21		max-master	(Unsigned) 127	
22		max-info-frames	(Unsigned) 1	
23		description	UTF-8 'Renesas RZN2L_BACnet_Solution'	
24		local-time	0:01:34.0 A.M. = 00:01:34.0	
25		utc-offset	(Signed) -540	5.2.5 UTC_Offset
26		local-date	January 1, 2000, (Day of Week = Saturday)	
27		daylights-savings-status	FALSE	
28		location	UTF-8 'Tokyo,Japan'	
29		active-cov-subscriptions	Subscription 1 Recipient>Recipient Process>Recipient network-number:- MAC-address:- Port:- ProcessIdentifier:- Monitored Property Reference ObjectIdentifier:- Property Identifier:- Issue Confirmed Notifications:- Time Remaining:-	empty
30		property-list	system-status (112) vendor-name (121) vendor-identifier (120) model-name (70) firmware-revision (44) application-software-version (12) protocol-version (98) protocol-services-supported (97) protocol-object-types-supported (96) object-list (76) max-apdu-length-accepted (62) segmentation-supported (107) apdu-timeout (11) number-of-APDU-retries (73) device-address-binding (30) database-revision (155) max-master (64) max-info-frames (63) description (28) local-time (57) utc-offset (119) local-date (56) daylights-savings-status (24) location (58) active-cov-subscriptions (152))	



# 5.1.3 Analog Input

Table 5-3 AnalogInput,0 object properties

No.	Object	Property	Initial value		Reference
1		object-identifier	analog-input, 0		
2		object-name	ANALOG INPUT 0		
3		object-type	analog-input (0)		
4		present-value	0.0		
5		status-flags	(Bit String) (FFFF)	in-alarm = FALSE fault = FALSE overridden = FALSE out-of-service = FALSE	
6	1	event-state	normal (0)	1	
7	1	out-of-service	FALSE		5.2.16 OutOfService
8	1	units	No Units (95)		
9	1	description	UTF-8 'ANALOG INPL	JT 0'	
10	1	reliability	no-fault-detected (0)		
11	1	cov-increment	1.000000 (Real)		
12	1	time-delay	(Unsigned) 0		
13	1	notification-class	(Unsigned) 0		
14	1	high-limit	100.000000 (Real)		
15	1	low-limit	0.000000 (Real)		
16	1	deadband	0.000000 (Real)		
	1			low-limit = TRUF	
17	-	limit-enable	(Bit String) (TT)	high-limit = TRUE	
18		event-enable	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
19	analog-input,0	acked-transition	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
20	1	Notify Type	alarm (0)		
			TO-OFFNORMAL	Date: any Time: any	
21		eventTimeStamps	TO-FAULT	Date: any Time: any	
			TO-NORMAL	Date: any Time: any	
22		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) units (117) description (28) reliability (103) cov-increment (22) time-delay (113) notification-class (17) high-limit (45) low-limit (59) deadband (25) limit-enable (35) acked-transition (0) notify-type (72) event-time-stamp (130)	))	

### Table 5-4 AnalogInput,1 object properties

No.	Object	Property	Initial value		Reference
1		object-identifier	analog-input, 1		
2		object-name	ANALOG INPUT 1		
3		object-type	analog-input (0)		
4		present-value	0.0		
5	analog-input,1	status-flags	(Bit String) (FFFF)	in-alarm = FALSE fault = FALSE overridden = FALSE out-of-service = FALSE	
6		event-state	normal (0)		



# RZ/N2L Group

No.	Object	Property	Ini	tial value	Reference
7	-	out-of-service	FALSE		5.2.16 OutOfService
8		units	No Units (95)		
9		description	UTF-8 'ANALOG INPL	JT 1'	
10		reliability	no-fault-detected (0)		
11		cov-increment	1.000000 (Real)		
12		time-delay	(Unsigned) 0		
13		notification-class	(Unsigned) 0		
14		high-limit	100.000000 (Real)		
15		low-limit	0.000000 (Real)		
16		deadband	0.000000 (Real)		
17		limit-enable	(Bit String) (TT)	low-limit = TRUE high-limit = TRUE	
18		event-enable	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
19		acked-transition	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
20	1	Notify Type	alarm (0)		
			TO-OFFNORMAL	Date: any Time: any	
21		eventTimeStamps	TO-FAULT	Date: any Time: any	
			TO-NORMAL	Date: any Time: any	
22		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) units (117) description (28) reliability (103) cov-increment (22) time-delay (113) notification-class (17) high-limit (45) low-limit (59) deadband (25) limit-enable (52) event-enable (35) acked-transition (0) notify-type (72) event-time-stamp (130)	))	



## 5.1.4 Analog Value

Table 5-5 AnalogValue,0 object properties

No.	Object	Property	Initial value		Reference
1		object-identifier	analog-value, 0		
2		object-name	ANALOG VALUE 0		
3		object-type	analog-value (2)		
4		present-value	(real) 0		
				in-alarm = FALSE	
_		status flama		fault = FALSE	
5		status-nags	(Bit String) (FFFF)	overridden = FALSE	
				out-of-service = FALSE	
6		event-state	normal (0)		
7		out-of-service	FALSE		5.2.16 OutOfService
8		units	No Units (95)		
9		description	UTF-8 'ANALOG VAL	.UE 0'	
10		cov-increment	1.000000 (Real)		
11		time-delay	(Unsigned) 0		
12		notification-class	(Unsigned) 4194303		
13		high-limit	0.000000 (Real)		
14		low-limit	0.000000 (Real)		
15		deadband	0.000000 (Real)		
16		limit-enable	(Bit String) (TT)	low-limit = FALSE high-limit = FALSE	
17	analog-value,0	event-enable	(Bit String) (TTT)	to-offnormal = FALSE to-fault = FALSE to-normal = FALSE	
18		acked-transition	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
19		Notify Type	alarm (0)		
			TO-OFFNORMAL	Date: any Time: any	
20		eventTimeStamps	TO-FAULT	Date: any Time: any	
			TO-NORMAL	Date: any Time: any	
21		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) units (117) description (28) cov-increment (22) time-delay (113) notification-class (17) high-limit (45) low-limit (59) deadband (25) limit-enable (52) event-enable (35) acked-transition (0) notify-type (72) event-time-stamp (13)	) 30)	

### Table 5-6 AnalogValue,1 object properties

No.	Object	Property	Initial value	Reference
1		object-identifier	analog-value, 1	
2		object-name	ANALOG VALUE 1	
3	analog-value,1	object-type	analog-value (2)	
4		present-value	(real) 0	
5		status-flags	(Bit String) (FFFF) in-alarm = FALSE	



# RZ/N2L Group

No.	Object	Property	Ini	tial value	Reference
				fault = FALSE	
				overridden = FALSE	
				out-of-service = FALSE	
6		event-state	normal (0)		
7		out-of-service	FALSE		5.2.16 OutOfService
8		units	No Units (95)		
9		description	UTF-8 'ANALOG VAL	.UE 1'	
10		cov-increment	1.000000 (Real)		
11		time-delay	(Unsigned) 0		
12		notification-class	(Unsigned) 4194303		
13		high-limit	0.000000 (Real)		
14		low-limit	0.000000 (Real)		
15		deadband	0.000000 (Real)		
16		limit-enable	(Bit String) (TT)	low-limit = FALSE high-limit = FALSE	
17		event-enable	(Bit String) (TTT)	to-offnormal = FALSE to-fault = FALSE to-normal = FALSE	
18		acked-transition	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
19		Notify Type	alarm (0)		
			TO-OFFNORMAL	Date: any Time: any	
20		eventTimeStamps	TO-FAULT	Date: any Time: any	
			TO-NORMAL	Date: any Time: any	
21		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) units (117) description (28) cov-increment (22) time-delay (113) notification-class (17' high-limit (45) low-limit (59) deadband (25) limit-enable (52) event-enable (35) acked-transition (0) notify-type (72) event-time-stamp (13)	) 30)	



# 5.1.5 Binary Output

Table 5-7 BinaryOutput,0 object properties

No.	Object	Property	Initial value		Reference
1		object-identifier	binary-output, 0		
2		object-name	BINARY OUTPUT 0		
3		object-type	binary-output (4)		
4		present-value	(enum index) 0		
5				in-alarm = FALSE	
6		status flags	(Bit String) (EEEE)	fault = FALSE	
7		status-nays	(Bit Stillig) (FFFF)	overridden = FALSE	
8				out-of-service = FALSE	
9		event-state	normal (0)		
10		out-of-service	FALSE		5.2.16 OutOfService
11		polarity	0		
12		priority-array[1]	NULL		
13		priority-array[2]	NULL		
14		priority-array[3]	NULL		
15		priority-array[4]	NULL		
16		priority-array[5]	NULL		
17		priority-array[6]	NULL		
18		priority-array[7]	NULL		
19		priority-array[8]	NULL		
20		priority-array[9]	NULL		
21		priority-array[10]	NULL		
22	binary-output,0	priority-array[11]	NULL		
23		priority-array[12]	NULL		
24		priority-array[13]	NULL		
25		priority-array[14]	NULL		
26		priority-array[15]	NULL		
27		priority-array[16]	NULL		
28		relinquish-default	0		
29		Current-command-priority	NULL		
30		Reliability	no-fault-detected (0)		
31		description	UTF-8 'BINARY OUT	PUT 0'	
32		active-text	UTF-8 'Active'		
33		inactive-text	UTF-8 'Inactive'		
34		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) polarity (84) priority-array (87) relinquish-default (10 current-command-pri reliability (103) description (28) active-text (4) inactive-text (46)	94) iority (431)	

#### Table 5-8 BinaryOutput,1 object properties

No.	Object	Property	Initial value	Reference
1		object-identifier	binary-output, 1	
2	hinory output 1	object-name	BINARY OUTPUT 1	
3	binary-output, i	object-type	binary-output (4)	
4		present-value	(enum index) 0	



No.	Object	Property	Initial value		Reference
5				in-alarm = FALSE	
6		status-flans	(Bit String) (FEFE)	fault = FALSE	
7		Status-nags	(Bit Otilig) (ITTT)	overridden = FALSE	
8				out-of-service = FALSE	
9		event-state	normal (0)		
10		out-of-service	FALSE		5.2.16 OutOfService
11		polarity	0		
12		priority-array[1]	NULL		
13		priority-array[2]	NULL		
14		priority-array[3]	NULL		
15		priority-array[4]	NULL		
16		priority-array[5]	NULL		
17		priority-array[6]	NULL		
18		priority-array[7]	NULL		
19		priority-array[8]	NULL		
20		priority-array[9]	NULL		
21		priority-array[10]	NULL		
22		priority-array[11]	NULL		
23		priority-array[12]	NULL		
24		priority-array[13]	NULL		
25		priority-array[14]	NULL		
26		priority-array[15]	NULL		
27		priority-array[16]	NULL		
28		relinquish-default	0		
29		Current-command-priority	NULL		
30		Reliability	no-fault-detected (0)		
31		description	UTF-8 'BINARY OUT	PUT 0'	
32		active-text	UTF-8 'Active'		
33		inactive-text	UTF-8 'Inactive'		
34		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) polarity (84) priority-array (87) relinquish-default (10 current-command-pr reliability (103) description (28) active-text (4) inactive-text (46)	)4) iority (431)	

# 5.1.6 Binary Value

Table 5-9	Binar	yValue,0	object	properties
			_	

No.	Object	Property	In	itial value	Reference
1		object-identifier	binary-value, 0		
2		object-name	BINARY VALUE 0		
3		object-type	binary-value (5)		
4		present-value	(enum index) 0		
5				in-alarm = FALSE	
6	binary-value,0	status flags	(Bit String) (EEEE)	fault = FALSE	
7		status-nags	(bit Stillig) (FFFF)	overridden = FALSE	
8				out-of-service = FALSE	
9		event-state	normal (0)		
10	]	out-of-service	FALSE		5.2.16 OutOfService
11		description	UTF-8 'BINARY VALU	JTF-8 'BINARY VALUE 0'	



# RZ/N2L Group

No.	Object	Property	Initial value	Reference
12		reliability	no-fault-detected (0)	
13		priority-array[1]	NULL	
14		priority-array[2]	NULL	
15		priority-array[3]	NULL	
16		priority-array[4]	NULL	
17		priority-array[5]	NULL	
18		priority-array[6]	NULL	
19		priority-array[7]	NULL	
20		priority-array[8]	NULL	
21		priority-array[9]	NULL	
22		priority-array[10]	NULL	
23		priority-array[11]	NULL	
24		priority-array[12]	NULL	
25		priority-array[13]	NULL	
26		priority-array[14]	NULL	
27		priority-array[15]	NULL	
28		priority-array[16]	NULL	
29		relinquish-default	0	
30		current-command-priority	NULL	
31		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) description (28) reliability (103) priority-array (87) relinquish-default (104) current-command-priority (431)	

# Table 5-10 BinaryValue,1 object properties

No.	Object	Property	Initial value		Reference
1		object-identifier	binary-value, 1		
2		object-name	BINARY VALUE 1		
3		object-type	binary-value (5)		
4		present-value	(enum index) 0		
5				in-alarm = FALSE	
6		status flama		fault = FALSE	_
7		status-flags	(Bit String) (FFFF)	overridden = FALSE	_
8				out-of-service = FALSE	
9		event-state	normal (0)		
10		out-of-service	FALSE		5.2.16 OutOfService
11		description	UTF-8 'BINARY VALU	E 1'	
12		reliability	no-fault-detected (0)		
13		priority-array[1]	NULL		
14		priority-array[2]	NULL		
15		priority-array[3]	NULL		
16	binary-value 1	priority-array[4]	NULL		
17	smary value, i	priority-array[5]	NULL		
18		priority-array[6]	NULL		
19		priority-array[7]	NULL		
20		priority-array[8]	NULL		
21		priority-array[9]	NULL		
22		priority-array[10]	NULL		
23		priority-array[11]	NULL		
24		priority-array[12]	NULL		
25		priority-array[13]	NULL		
26		priority-array[14]	NULL		
27		priority-array[15]	NULL		
28		priority-array[16]	NULL		
29		relinquish-default	0		
30		current-command-priority	NULL		
31		property-list	present-value (85) status-flags (111)		



No.	Object	Property	Initial value	Reference
			event-state (36)	
			out-of-service (81)	
			description (28)	
			reliability (103)	
			priority-array (87)	
			relinquish-default (104)	
			current-command-priority (431)	

# 5.1.7 File

	Table	5-11	File.0	obiect	properties
--	-------	------	--------	--------	------------

No.	Object	Property	Initial value	Reference
1		object-identifier	file, 0	
2		object-name	FILE 0	
3		object-type	file (10)	
4		file-type	UTF-8 'application/octet-stream'	
5		file-size	(Unsigned) 148	
6		modification-date	Date: April 1, 2006, (Day of Week = Saturday) Time: 7:00:03.1 A.M. = 07:00:03.1	
7		archive	FALSE	
8	file,0	read-only	FALSE	
9		file-access-method	stream-access (1)	
10		description	UTF-8 'FlashData.bin'	
11		property-list	file-type (43) file-size (42) modification-date (71) archive (13) read-only (99) file-access-method (41) description (28)	



## 5.1.8 Notification Class

# Table 5-12 Notification Class,0 object properties

No.	Object	Pi	operty	Initial value		Reference
1		object-identifie	er	notification-class, 0		
2		object-name		NOTIFICCATION CLAS	S 0	
3		object-type		notification-class (15)		
4		notification-cla	ISS	(Unsigned) 0		
			To Off ormal	(Unsigned) 255		
5		priority	To Fault	(Unsigned) 255		
			To Normal	(Unsigned) 255		
6		ack-required		(Bit String) (TTT)	To_OffNormal = TRUE To_Fault = TRUE To_Normal = TRUE	
	Notification-class,0		valid Days	(Bit String) (TTTTTTT)	Monday = TRUE Tuesday = TRUE Wednesday = TRUE Thursday = TRUE Friday = TRUE Saturday = TRUE Sunday = TRUE	
_			from time	00:00:00.0		
1		recipient-list	to time	23:59:59.0		
			DeviceIdentifier	device, 4194303		
			ProcessIdentifier	0		
			issue confirmed notifications	TRUE		
			transitions	(Bit String) (TTT)	to-offnormal = TRUE to-fault = TRUE to-normal = TRUE	
8		description UTF-8 'NOTIFICATION CLASS 0'				
9		property-list		notification-class (17) priority (86) ack-required (1) recipient-list (102) description (28)		



## 5.1.9 Schedule

Table 5-13	Schedule,0	object	properties
------------	------------	--------	------------

No.	Object	Property Initial value				Reference		
1		object-identifier			schedule, 0			
2		object-name			SCHEDULE 0			
3		object-type			schedule (17)			
4		Present Value			(enum index) 1			
5		effective-period			January 1, any year, (Day of Week = any d	ay of week)		
Ũ					December 31, any yea (Day of Week = any da	ar, ay of week)		
6		schedule-default	<u> </u>		0			
		list-of-object-	ObjectIdentifie	er	binary-output, 0			
7		property-	Property Ident	ifier	present-value (85)			
		references	DeviceIdentifie	er	device, 100			
8		priority-for-writing	g		(Unsigned) 16	1		
9		status-flags			(Bit String) (FFFF)	in-alarm = FALSE fault = FALSE overridden = FALSE out-of-service = FALSE		
10		reliability			no-fault-detected (0)			
11		out-of-service			FALSE			
12		description			UTF-8 'SCHEDULE 0'			
		Monday		Time	00:00:00.0			
	schedule,0			Value	0			
			Tuesday Time Value		00:00:00.0			
					0			
			Wednesday	Time	00:00:00.0			
13		weekly-	a shi		0			
			Thursday	Time	00:00:00.0			
		schedule			Value	0		
			Friday	Time	00:00:00.0			
			Saturday	Timo				
				Value	0.00.00.0			
				Time	00:00:00.0			
			Sunday	Value	0			
14	t property-list			present-value (85) effective-period (32) schedule-default (174) list-of-object-property- priority-for-writing (88) status-flags (111) reliability (103) out-of-service (81) description (28) weekly-schedule (123)	) references (54) )			



## 5.1.10 Multi State Value

No.	Object	Property	Initial value		Reference
1		object-identifier	multi-state-value, 0	multi-state-value, 0	
2		object-name	MULTISTATE VALU	JE 0	
3		object-type	multi-state-value (19	9)	
4		present-value	(uint) 1		
				in-alarm = FALSE	
E		atatua flaga	(Dit String) (EEE)	fault = FALSE	
5		status-nags	(bit String) (FFFF)	overridden = FALSE	
				out-of-service = FALSE	
6		event-state	normal (0)		
7	multi stata uslus O	out-of-service FALSE		5.2.16 OutOfService	
8	muiti-state-value,0	number-of-states	(Unsigned) 3		5.2.6 Number of states
9		description	UTF-8 'MULTISTAT	E VALUE 0'	
10		state-text[0][3][64]	UTF-8 'State 1' UTF-8 'State 2' UTF-8 'State 3'		5.2.7 State text
11		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) number-of-states (7 description (28) state-text (110)	4)	

# Table 5-15 MultiStateValue,1 object properties

No.	Object	Property	Ini	tial value	Reference
1		object-identifier	multi-state-value, 1		
2		object-name	MULTISTATE VALU	IE 1	
3		object-type	multi-state-value (19	)	
4		present-value	(uint) 1		
				in-alarm = FALSE	
5		atatua flaga	(Rit String) (EEEE)	fault = FALSE	
5		status-nags	(Dir Sunny) (FFFF)	overridden = FALSE	
				out-of-service = FALSE	
6		event-state	normal (0)		
7	multi atata valua 1	out-of-service	FALSE		5.2.16 OutOfService
8	muili-state-value, i	number-of-states	(Unsigned) 3		5.2.6 Number of states
9		description	UTF-8 'MULTISTAT	E VALUE 1'	
10		state-text[1][3][64]	UTF-8 'State 1' UTF-8 'State 2' UTF-8 'State 3'		5.2.7 State text
11		property-list	present-value (85) status-flags (111) event-state (36) out-of-service (81) number-of-states (7- description (28) state-text (110)	4)	



# 5.1.11 Trend Log

Table 5-16	Trend I o	a 0 object	nronerties
Table J-10	ITENU LO	y,u objeci	properties

No.	Object Property			Initial value	Reference	
1		object-identifier		trend-	log, 0	
2		object-name		TREN	D LOG 0	
3		object-type		trend-	log (20)	
4		enable		TRUE		
5		stop-when-full		FALS	E	
6		buffer-size		(Unsię	gned) 1000	
7		log-buffer				
8		record-count		(Unsię	gned) 0	
9		total-record-cou	nt	(Unsię	gned) 0	
10		event-state		norma	al (0)	
11		logging-type		polled	(0)	
					in-alarm = FALSE	
10		status flags		(Bit	fault = FALSE	
12		status-hags		(FFFF)	overridden = FALSE	
	trendlog,0			(,	out-of-service = FALSE	
13		description		UTF-8	'TREND LOG 0'	
			Date	Janua	ry 1, 2009,	
14		start-time	Time	(Day o	of Week = Thursday)	
			Time	Decer	nber 22, 2020	
15		stop-time	Date	(Day o	of Week = Tuesday)	
		-	Time	23:59	59.99	
		log-device-	ObjectIdentifier:	analo	g-input, 0	
16		object-property	Property Identifier	prese	nt-value (85)	
			DeviceIdentifier	device	e, 10	
17		log-interval		(Unsię	gned) 90000	
18		align-intervals		TRUE		
19		interval-offset		(Unsię	gned) 0	
20		trigger		FALS	E	
				enable stop-v buffer log-bu	e (133) √hen-full (144) -size (126) íffer (131)	
				record total-r event loggin	I-count (141) ecord-count (145) state (36) g-type (197)	
21		property-list		status descri start-t stop-t log-de log-ini	-flags (111) ption (28) ime (142) ime (143) evice-object-property (132) erval (134) ntervals (193)	
				intervatingge	al-offset (195) r (205)	



## 5.1.12 Positive Integer Value

No.	Object	Property	Ini	tial value	Reference
1		object-identifier	positive-integer-valu	e, 0	
2		object-name	POSITIVEINTEGER	VALUE 0	
3		object-type	positive-integer-valu	e (48)	
4		present-value	(uint) 0		
5				in-alarm = FALSE	
6		status flama		fault = FALSE	
7		status-nags	(Bit String) (FFFF)	overridden = FALSE	
8				out-of-service = FALSE	
9	positive-integer-value,0	units	No Units (95)		
10		description	UTF-8 'POSITIVEIN	TEGER VALUE 0'	
11		event-state	normal (0)		
12		out-of-service	FALSE		5.2.16 OutOfService
13		property-list	present-value (85) status-flags (111) units (117) description (28) event-state (36) out-of-service (81)		

# Table 5-18 PositiveIntegerValue,1 object properties

No.	Object	Property	Ini	tial value	Reference
1		object-identifier	positive-integer-valu	e, 1	
2		object-name	POSITIVEINTEGER	VALUE 1	
3		object-type	positive-integer-valu	e (48)	
4		present-value	(uint) 0		
5				in-alarm = FALSE	
6		status flama		fault = FALSE	
7		status-nags	(Bit String) (FFFF)	overridden = FALSE	
8				out-of-service = FALSE	
9	positive-integer-value,0	units	No Units (95)		
10		description	UTF-8 'POSITIVEIN	TEGER VALUE 1'	
11		event-state	normal (0)		
12		out-of-service	FALSE		5.2.16 OutOfService
13		property-list	present-value (85) status-flags (111) units (117) description (28) event-state (36) out-of-service (81)		



# 5.1.13 Network Port

Initial values of NetworkPort object properties are shown.

Table 5-19	NetworkPort.1	obiect	prop	erties(	for E	3IP)
			F · • F			,

No.	Object	Pro	perty	Ini	tial value	Reference
1		object-identi	fier	network-port, 1		
2		object-name	1	BACnet/IP Port		
3		object-type		network-port (56)		
					in-alarm = FALSE	
4		status flags		(Pit String) (EEEE)	fault = FALSE	
4	notwork port 1	status-nays		(Bit Stillig) (FFFF)	overridden = FALSE	
	network-port, i				out-of-service = FALSE	
5		reliability		no-fault-detected (0)		
6		out-of-servic	e	FALSE		
7		network-type	e	ipv4 (5)		
9		protocol-leve	el	bacnet-application (2	2)	
10		changes-per	nding	FALSE		
11		description		UTF-8 'NETWORK F	PORT 1'	
12		mac-address	S	c0a80a0abac0 (hex)	)	5.2.11 BACnet IP address
13		bacnet-ip-me	ode	normal (0)		
14		ip-address		c0a80a0a (hex)		5.2.11 BACnet IP address
15		bacnet-ip-ud	lp-port	(Unsigned) 47808		5.2.11 BACnet IP address
16		ip-subnet-ma	ask	fffff00 (hex)		
17		ip-default-ga	iteway	c0a80a01 (hex)		
18		ip-dns-serve	r	00000000 (hex)		
19		fd-bbmd-	ip-address	0000000		5.2.13 FD_BBMD_Address
20		address	port	(Unsigned) 47808		5.2.13 FD_BBMD_Address
21		fd-subscripti	on-lifetime	(Unsigned) 60000		5.2.14 FD_Subscription_Lifetime
22		property-list		status-flags (111) reliability (103) out-of-service (81) network-type (427) protocol-level (482) changes-pending (4 description (28) mac-address (423) bacnet-ip-address (4 bacnet-ip-address (4 bacnet-ip-udp-port ( bacnet-ip-default-ga bacnet-ip-default-ga bacnet-ip-dns-serve fd-bbmd-address (4 fd-subscription-lifetin	16) 8) 400) 412) ask (411) teway (401) r (406) 18) me (419)	

# Table 5-20 NetworkPort,2 object properties(for MS/TP)

No.	Object	Property	Ini	tial value	Reference
1		object-identifier	network-port, 2		
2		object-name	MS/TP Port		
3		object-type	network-port (56)		
				in-alarm = FALSE	
4		atatua flago		fault = FALSE	
4	network-port,100	status-nags	(Bit String) (FFFF)	overridden = FALSE	
				out-of-service = FALSE	
5		reliability	no-fault-detected (0)	)	
6		out-of-service	FALSE		
7		network-type	mstp (2)		



8	protocol-level	bacnet-application (2)	
9	network-number	(Unsigned) 2	5.2.8 Network number
10	network-number-quality	configured (3)	
11	changes-pending	FALSE	
12	apdu-length	(Unsigned) 480	
13	link-speed	115200.000000 (Real)	5.2.9 Link speed
14	description	UTF-8 'NETWORK PORT 2'	
15	mac-address	05	5.2.10 MAC address
16	max-master	(Unsigned) 127	
17	max-info-frames	(Unsigned) 1	
18	property-list	status-flags (111) reliability (103) out-of-service (81) network-type (427) protocol-level (482) network-number (425) network-number-quality (426) changes-pending (416) apdu-length (399) link-speed (420) description (28) mac-address (423) max-master (64) max-info-frames (63)	

## 5.1.14 Password

When B-BC receives ReinitializeDevice service or DeviceCommunicationControl service, it checks the password sent by the BACnet user and executes the service only when it matches.

The password implemented in the BACnet stack is used as the default value, refer to Section 5.2.15 to change it.

#### Table 5-21 Password

Service	Initial value	Reference
ReinitializeDevice	filister	
DeviceCommunicationControl	filister	5.2.15 Password



## 5.2 Change Initial Values

This section explains how to change each property initial value and supplementary information for this sample software.

To change the initial values, the source code and macro settings in the sample project need to be changed, rebuilt and rerun, but some data can also be changed through terminal software using the initial configuration commands described in Chapter 5.3. If the value is changed by the initial configuration command, the value becomes effective after the board reset.

The following data can be changed by the initial configuration commands.

- 5.2.1 Ethernet MAC address(IP)
- 5.2.2 Device instance
- 5.2.3 Device name
- 5.2.5 UTC\_Offset
- 5.2.10 MAC address
- 5.2.11 BACnet IP address
- 5.2.16 OutOfService

## 5.2.1 Ethernet MAC address(IP)

Set the MAC address pasted on CN14 shown in Fig. 5-1.



Fig. 5-1 MAC address pasted on CN14

## (1) Setting by Rebuilding

Open Smart Configurator by double-clicking on configuration.xml from the tree shown in Fig. 5-2.

File Edit Source Refactor Navigate Search	Project Renesas Views Run Window Help					
🐔 🐞 🔳 🎄 Debug 🗸 🖟	RZN2L_BACnet_BSS_V1.0.1 Debug 🗸 🄅	•	- 🔨 - 🗟 🏪	≷ I⊳ II ■	N B G R	表 武 慶
× • • • • • • • • • • • • • • • • • • •	8 1 00 1 00 1 00 + 101 + 101 + 101 + 101 + 101	Ø <b>-</b> : Ra 🗐 m :	81 <b>-</b> 81 <b>-</b> *5 c	* 👝 🗸 🖒 🗐	ाली -	
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						JC++ A DEDI
Project Explorer 🗙 📄 🖏 🍸 🖇 🗖					🗄 Outline 🗙	No Contraction of the second s
V 😂 RZN2L_BACnet_BSS_V1.0.1 [Debug]					There is no activ	e editor that
> 🗱 Binaries					provides an out	line.
> 🔊 Includes						
> 🐸 BACNETOSS						
> 🔁 common						
> 🚰 rzn						
> 🛃 rzn_cfg/aws						
> 🐸 rzn_gen						
> 📇 src						
> 🛃 user/user_config						
> 🛃 user/user_ts3000_rz						
> 🗁 Debug						
> is regist						
> Script						
a configuration xml	船 Problems 🗙 📮 Console  スマート・ブラウザ	- 👎 スマート・マニュア	'ル 🐐 Debug  😭	Expressions		78 -
B9A07G084M08GBG.pincfg	) items					
rzn cfa.txt	Description	Resource	Path	Location	Туре	
RZN2L BACnet BSS V1.0.0 Debug.ilink						
RZN2L BACnet BSS V1.0.1 Debug.ilink						
RZN2L FreeRTOS LwIP Debug Flat.jlink						
RZN2L_FreeRTOS_LwIP Debug_Flat.launch						
rzn2l_xspi0_x1_boot.cfg						

Fig. 5-2 Double click configuration.xml



Open the Stacks tab and click on g\_ether0 Ethernet Driver on r\_ether to select it.

File Edit Source Refactor Navigate Search	Project Renesas Views Run Window Help						
🍕 🔯 🔳 🔯 Debug 🗸	💽 RZN2L_BACnet_BSS_V1.0.1 Debug 🗸 🄅 📑	- 8 6 8	- 🔨 - 🔜 🐂	`≈   ।⊳	N 3. 9. R	<b>R R</b>	103
<u>≫</u>	🕹 📎 🖉 📸 + 🚳 + 🗟 + 🎯 + 🍅 🔗	- B B	1 例 - 初 - 15	⇒ ⇒ → +	E4		
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> b) includes > @ BACNETOSS > @ common	Threads New Thread Remove	g_ether0 Eth r_ether Stack	ernet Driver on ks	Remove	≗ Extend Stack >	acti that prov	ve edito vides an line.
> 22 cm_cfg/aws > 28 rzn_gen > 29 src	g_ether0 Ethernet Driver on r_ether     g_uarto UART Driver on r_sci_uart     <	🕁 g_eth	er0 Ethernet Driver o	on r_ether		^	
> 🔑 user/user_coming > 🔑 user/user_fs3000_rz > 🍋 Debug	Objects 🕢 New Object > 🔊 Remove	<	•		<u> </u>	~	
> 🗁 script	Summary BSP Clocks Pins Interrupts Event Link	Stacks Compon	ents				
configuration.xml	Problems × ⊑ Console ♀ スマート・ブラウザー	בבאיא-אג 🕼	アル 🎋 Debug 🏘	C Expressions		78	- 0
<ul> <li>R9A07G084M08GBG.pincfg</li> <li>rzn_cfg.txt</li> <li>RZN2L_BACnet_BSS_V1.0.0 Debug.jlink</li> </ul>	Description  i Infos (59 items)	Resource	Path	Location	Туре		
<ul> <li>RZN2L_BACnet_BSS_V1.0.1 Debug.jlink</li> <li>RZN2L_FreeRTOS_LwIP Debug_Flat.jlink</li> <li>RZN2L_FreeRTOS_LwIP Debug_Flat.jlunch</li> </ul>							
rzn2l_xspi0_x1_boot.cfg							
		<b>~</b> :			:		20

Fig. 5-3 Click Navigate

Then open the Navigate menu and click Show In>Properties.

File Edit Source Refactor	Navi	gate Search Project Renesas Views	Run Window	H	elp	
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- yper   17 💻		Open Declaration		1.		
		Open Type Hierarchy				
陷 Project Explorer 🗙 📄 🔮		Open Call Hierarchy		gura	tion $ imes$	
VI.0.		Open Include Browser				
> 🐝 Binaries		Open from Clink and	Chill Chiffee M			
>  includes		Open from Clipboard	Ctri+Snift+V			
> BACNETOSS	ڪ	Open Element		mov	/e 😑 🤉	g_ether0 Ethern
> 🗁 common		Open Type in Hierarchy			× .	_ether Stacks
> 🖂 rzn cfg/aws		Open Element in Call Hierarchy		ethe	r	
> 冯 rzn gen		Open Resource	Ctrl+Shift+R	ıart	~	g_ether0
> 🔑 src	<b>A</b>				>	
> 冯 user/user_config		open biscovered type				(i)
> 😕 user/user_fs3000_rz	88	Open Setup	>	D Re	emove	<u> </u>
> 🔁 Debug		Open Setup Log				<
> 🍃 rzn_cfg		Open Model Element	Ctrl+Shift+E3		Links Cond	C
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RZN2L_BACnet_BSS_V	T.el	THE TOUS	curr,	æ	Problem De	etails
RZN2L_BACnet_BSS_V <sup>-</sup>	*5	Previous Edit Location	Ctrl+Q	4	System Exp	lorer
RZN2L_FreeRTOS_LwIF	۲.	Next Edit Location	Ctrl+Alt+Right		Properties	
RZN2L_FreeRTOS_LwIF	6	Back	Alt+Left >	1	Toperaes	
rzn2l_xspi0_x1_boot.cf	~	DOCK	AUTLEIL /			

Fig. 5-4 Click Properties



## RZ/N2L Group

Open the Properties tab and enter General>MAC address (e.g. 74:90:50:10:05:B0). Click Generate Project Content after entering the information. Finally, rebuild the project. See chapter 4.4.2 for build procedure.

File Edit Source Refactor Navigate Search	Project R	enesas Views Run Window Help				
🍕 🐞 🔳 🏇 Debug 🗸 🗸	RZN2L_E	BACnet_BSS_V1.0.1 Debug 🗸 🄅 📑 🕶	🔚 🕞   🏵 🕶 🗞 🕶 🔜 🖣		- -	-
		1 · · · · · · · · · · · · · · · · · · ·				
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> 😕 common			r ether Stacks	Remove	provide	es an
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> 📴 rzn_cfg/aws	₩ ₩	g_ethero Ethernet Driver on r_ether	🕀 a ether0 Ethernet Drive	r on r ether		
> 👺 rzn_gen	¥.	g_date of it biver of 1_sci_date	g_calero calence bive	- Children		
> 🚰 src		/				
> 🔛 user/user_config	Objects	New Object > Remove	í			
> 🗁 User/user_ts3000_rz	objects			. · · · · · · · · · · · · · · · · · · ·		
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> 🦻 user						
🔅 configuration.xml	Probler	ns 🗐 Console Properties 🗙 🦓 🕅	(-ト・ノラワサー 味る スマート・マニュア)	ル 🎋 Debug 👷 Expressions	8	. 🗆
R9A07G084M08GBG.pincfg	g_ether0	Ethernet Driver on r_ether				
IZN_CTG.txt RZN2L_BACnet_BSS_V1.0.0 Debug.ilink	Settings	Property	Value			^
RZN2L BACnet BSS V1.0.1 Debug.jlink		✓ General				
RZN2L_FreeRTOS_LwIP Debug_Flat.jlink		Name	g_ether0			
RZN2L_FreeRTOS_LwIP Debug_Flat.launch		Channel	0			
rzn2l_xspi0_x1_boot.cfg		MAC address	74:90:50:10:05:80			
		Zero-copy Mode	Disable			
		Flow control functionality	Disable			
		s Eiltear	1			

Fig. 5-5 Enter MAC address

#### (2) Setting by command

Refer to Chapter 5.3. The setting value by the initial configuration commands takes precedence over the setting value by building.



### 5.2.2 Device instance

The instance number, like other objects, is combined with the object type to form the Object Identifier property.

Only the instance number of the Device object type must be unique over the entire BACnet internetwork. The setting range of Device instance is 0~4194303. However, 4194303 means invalid and is not used. Refer to Chapter 5.3.

#### 5.2.3 Device name

Refer to Chapter 5.3.

### 5.2.4 Number of objects

The following Symbol represents the initial value of the number of objects. This chapter describes how to change this Value.

Here, do not change the number of objects in #BACNET\_NETWORK\_PORTS\_MAX from 2.

#MAX\_ANALOG\_INPUTS #MAX\_ANALOG\_VALUES #MAX\_BINARY\_OUTPUTS #MAX\_BINARY\_VALUES #MAX\_FILES #MAX\_MULTISTATE\_VALUES #MAX\_NOTIFICATION\_CLASSES #MAX\_POSITIVEINTEGER\_VALUES #MAX\_SCHEDULES #MAX\_TREND\_LOGS

The change procedure is as follows.

Select the project name in the Project Explorer window, then open Properties in the Project menu. Click "Edit..." to make changes.

After making changes, click Apply and Close to apply the settings. Click Yes on the pop-up dialog. Finally, rebuild. See Chapter 4.4.2 for build procedures.

Image: Source State       Image: Source State         Image: Source State       Image: Source State
---

Fig. 5-6 Open Properties



type filter text	Paths and Symbols			← → ⇒ < 8
> Resource				
Builders		- T A		0.0.0
> C/C++ Build	Configuration: Debu	g [Active]	✓ Manage	e Configurations
✓ C/C++ General				
> Code Analysis Documentation	Includes # Symb	ols 🕒 Library Paths 🖓 Source Location 🕞 Refere	nces	
File Types	- mendee # Symb	Clorary Paths 2 Source Excation N Refere	lices	
Formatter	Languages	Symbol	Value	^ Add
Indexer	And the second s	# BACNET_NETWORK_PORTS_MAX	2	
Language Mappings	( GNU C )	# BBMD_ENABLED	1	Eart
MISRA-CT=-49-FIND	$\sim$	# BIP_DNS_MAX	1	Delete
Paths and Symbols		# BIP_PORT	0xBAC0	Europe
MCU     MCU		# DEVICE_INSTANCE	10	export
Project Natures		# INTRINSIC_REPORTING	1	
Project References		# IPADR1	192	
Renesas QE		# IPADR2	168	
Run/Debug Settings		# IPADR3	10	
Task Tags		# IPADR4	10	
> Validation		# LWIP_TCP	1	
			1	
		# MAX_ANALOG_INPUTS	2	
		# MAX_RINARY_OUTDUTS	2	
		# MAX_BINARY VALUES	2	
		# MAX COV SUBSCRIPTIONS	5	
		# MAX FILES	1	
		# MAX_MULTISTATE_VALUES	2	
		# MAX_NOTIFICATION_CLASSES	1	
		# MAX_POSITIVEINTEGER_VALUES	2	
		# MAX_SCHEDULES	1	
		# MAX_TREND_LOGS	1	
		# MAX_TSM_TRANSACTIONS	10	
		# MSTP_MAC_ADDRESS	5	
		# MULTISTATE_NUMBER_OF_STATES	3	
		# NETWORK_PORT_IPV4_INSTANCE	1	
		# NETWORK_PORT_MSTP_INSTANCE	2	_
		# PRINT_ENABLED	1	~
		# USK DEBUG PRINT		
	<ol> <li>Preprocessor Inc.</li> </ol>	lude Paths, Macros etc." property page may define ad	ditional entries	
	Show built-in value	es		
	Import Settings	. 🛞 Export Settings		
			Restore Default	s Apply

Fig. 5-7 Change Number of objects

Paths and Symbols	×
Changes made will not be reflected in the index until it is rebuilt. Do you wish to rebuild it now?	
Remember my decision	
Yes No	

Fig. 5-8 Click Yes

# 5.2.5 UTC\_Offset

Refer to Chapter 5.3.



### 5.2.6 Number of states

The Number of states property indicates the number of states represented by the present value of the Multi State Value object and can be changed in the range of 1 to 254. When changing it, the number of State text also needs to be increased or decreased at the same time. See chapter 5.2.7 to change the State text property

Table 5-22 shows the relation between Number of states, Present value, and State text.

Number of states	Present value	State text(string)
	1	State 1
3	2	State 2
	3	State 3

Change the Value of the following Symbol to modify the Number of states. The change procedure is the same as in section 5.2.4.



Fig. 5-9 Change Number of states

## 5.2.7 State text

The State text property is a string that represents the state, such as large, medium, small, etc., which the present value represents. The description string is 64 bytes or less. The default value of "Number of states" is 3, so it is assumed to be 3 here as well. If the value of "Number of states" is changed, the description of State text needs to be modified.

Search for "state\_name[MULTISTATE\_NUMBER\_OF\_STATES][64]" in the source code and change the setting.

#### 5.2.8 Network number

Network number is an MS/TP-specific property that represents the BACnet network number associated with the network. The range of this property is 0~65534, where 0 means unknown.



When WriteProperty or WritePropertyMultiple services are executed for this property, the set value is written to Flash memory. See chapter 5.3.

### 5.2.9 Link speed

Link speed is expressed as bits per second. A value of 0 means that the communication speed is unknown.

It is valid for MS/TP connections and represents the baud rate of the UART. To change the baud rate, select from Table 5-23.

#### Table 5-23 Baud rate

Baud rate	Requirement
9600	Required
19200	Optional
38400	Required
57600	Optional
76800	Optional
115200	Optional

Link speed is changed by the following procedure.

Open the Properties tab with g\_uart5 UART Driver on r\_sci\_uart selected in the Smart Configurator and enter Baud>Baud Rate. After input, click "Generate Project Content". See chapter 5.2.1 for activating the smart configurator.



#### Fig. 5-10 Enter Baud Rate

In addition, modify the corresponding part in the source code. BACNETOSS\sample.h



## Fig. 5-11 Change UART\_BAUDRATE

Finally, rebuild. See chapter 4.4.2 for build procedure.



## 5.2.10 MAC address

Refer to Chapter 5.3.

## 5.2.11 BACnet IP address

Refer to Chapter 5.3.

### 5.2.12 BACnet\_IP\_Mode

The BACnet\_IP\_Mode property of the Network Port object is for BIP only. The B-BC supports NORMAL and FOREIGN, does not support BBMD

**NORMAL**: The device is operating as neither a foreign device nor a BBMD over this network port.

FOREIGN: The device is operating as a foreign device over this network port.

BBMD: The device is operating as a BBMD over this network port.

This property is modified by the WriteProperty or WritePropertyMultiple services. Executing the WriteProperty and WritePropertyMultiple services write the setting value to Flash memory and set the Changes\_Pending property to TRUE. The value becomes valid on reboot or when ReinitializeDevice service request is received with ACTIVATE\_CHANGES or WARMSTART

There is no initial configuration command for this property. Refer to chapter 5.3 for details.

## 5.2.13 FD\_BBMD\_Address

FD\_BBMD\_Address property of the Network Port object is a BIP-specific property, and it consists of the IP address and UDP port number of the BBMD device. When BACnet\_IP\_Mode is FOREIGN, B-BC sends a Register-Foreign-Device BVLL message to the BBMD device to register itself as a foreign device.

This property is modified by the WriteProperty and WritePropertyMultiple services. Executing the WriteProperty and WritePropertyMultiple services write the setting value to Flash memory and set the Changes\_Pending property to TRUE. The value becomes valid on reboot or when ReinitializeDevice service request is received with ACTIVATE\_CHANGES or WARMSTART

Refer to (1) for the procedure to change the property.

There is no initial configuration command for this property. Refer to chapter 5.3 for details.

## (1) FD\_BBMD\_Address setting with VTS

The following is the procedure for setting the FD\_BBMD\_Address property with VTS. Click ID... in the WriteProperty dialog. Configure the followings in the Object ID dialog.

Select Reserved for Object Type.

Set Reserved Type to 56 (OBJECT\_NETWORK\_PORT). (): Defined value in bacenum.h

Set Instance to 1. Click OK.



IP       BVLCI       NPCI       Confirmed-Request       WriteProperty         IP       BVLCI       NPCI       IP         IP       BVLL       IP         IN       BVLL       IN         Object ID       Reserved-56, 1       ID         Property       acked-transitions       An object identifier is made of two components: an object type and error         Array Index       An object identifier is made of two components: an object type and error       Front         Value       Any       Reserved Type       Reserved types range 0.127       Y         Vendor Type       Vendor Type       Vendor Type       Y-ACK       Y-ACK         Vendor Type       Vendor Type       Instance range 0.4194303       Y-ACK         Here is how the value can be entered directly:       Type       Y-Multiple-Kock         Multiple-Error       Management       Y-Multiple-Error	IP       BVLCI       NPCI       Confirmed-Request       WriteProperty         Object ID       Reserved-56, 1       ID       Reserved-56, 1       ID         Property       acked-transitions       Object ID       Reserved-56, 1       ID         Array Index       Object ID       Object ID       Reserved-56, 1       ID         Property       acked-transitions       Object ID       Priority       ent         Value       Any       Object ID       Reserved Type       Festored       t         Priority       Vendor Type       Vendor Types range 128.1023       y-ACK       y-Multiple         Instance       Instance       Instance range 0.4194303       yMultiple-ACK         Here is how the value can be entered directly:       Instance       Imagement         Wultiple       Wultiple       YMultiple       YMultiple         Winturg       Winturg       Winturg       YMultiple         Vertual Terminal       Imagement       Imagement         Winturg       Vertual Terminal       Imagement         Winturg       Vertual Terminal       Imagement
Minimum I Terrainal	Virtual Terminal     Simple/Segment ACK

Fig. 5-12 WriteProperty dialog(1)

Select "< Enter numeric value >" from Property in the WriteProperty dialog.

WriteProperty           IP         BVLCI         NPCI         Confirmed-Request         WriteProperty	- X
Object ID Reserved-56, 1 D., Property acked-transitions Property acked-transitions Array Index vendor-name vendor-na	P       *         BVLL       Network         Alarm and Event       File Access         Object Access       Object Access         CreateObject       CreateObject-Error         CreateObject-Error       DeleteObject-Fror         ReadProperty-ACK       ReadPropertyAutiple         ReadPropertyMutiple       ReadPropertyMutiple-Error         WritePropertyMutiple-Error       ReadPropertyMutiple-Error         ReadDropertyMutiple-Error       ReadDropertyMutiple-Error         RemoveListElement       WritePropertyMutiple-Error         Remote Device Management       WritePropertyMutiple
CDA80A0A BAC0810A 00130104 0003770F 0C0E0000 0119003E 3F	Send Close Send & Close

Fig. 5-13 WriteProperty dialog(2)


Set 418 (PROP\_FD\_BBMD\_ADDRESS) in the Propertyldentifier dialog and click OK.

Object ID Reserved -56, 1 ID Property Center numeric value Array Index Value Any Priority Priority Center BACnelPropertyIdentifier as a number Stordard 0, 366 ASHRAF Reserved 387 - 511 Proprietay: 512 - 4194303 DK Cancel	IP BVLCI NPCI	Confirmed-Request WriteProperty	MyPort 💌
	Object ID Property Array Index Value Priority	Reserved-56, 1  C Enter numeric value  Property/dentifier  Any  Property/dentifier  Enter BACnetProperty/dentifier as Standard 0-386 ASHRAE Reserved 387 - 511 Proprietay: 512 - 4134303  fill  OK Cancel	

Fig. 5-14 WriteProperty dialog(2)

Set 418 (PROP\_FD\_BBMD\_ADDRESS) in the Propertyldentifier dialog, click OK, and then click "Any..." under Value.

WriteProperty IP BVLCI NPCI Object ID Property Array Index Value	Confirmed-Request WriteProperty          Reserved-56, 1       ID         Center numeric value >          Propertyldentifier       ×         Enter BACnetPropetyldentifier as a number Standard 0: 386	— X  MyPort      P      SULL      Network      Alarm and Event      File Access      Object Access      ChangeList-Error      CreateObject-ACK      CreateObject-Error
Value Priority COABOADA BACOB10 0119003E 3F	Any Standard 0. 386 AFIRAE Reserved: 387 - 511 Proprietary: 512 - 4194303 U III OK Cancel III Cancel	CreateObject-Error DeleteObject ReadProperty ReadPropertyMultiple ReadPropertyMultiple ReadRange RemoveListElement WritePropertyMultiple WritePropertyMultiple WritePropertyMultiple WritePropertyMultiple WritePropertyMultiple Simple/Segment ACK Send Close Send & Close

Fig. 5-15 WriteProperty dialog(2)



Click Add in the ABSTRACT-SYNTAX.&Type dialog, select Opening Tag for Type, and set Context to 0. Do not click OK yet.

ABSTRACT-SYNTAX.&Type	
Type         Context         Data           Opening Tag         0         0E         Add           Remove         Image: Context (Context)         Remove         Image: Context (Context)	
<	
Type Opening Tag	
OK Cancel	

Fig. 5-16 ABSTRACT-SYNTAX.&Type dialog(1)

Click Add in the ABSTRACT-SYNTAX.&Type dialog again, select Octet String for Type, and set Context to 1. Set the IP address (in the example, enter C0A80A14 in Hex for 192.168.10.20 of the connecting PC) in Value. Do not click OK yet.

Type     Context     Data       Opering Tag     0     0E       Dotet String     1     1CC0A80A14         Remove         Type     Dotet String       Context     1         Value     Context         Set	[	ABSTRACT-SYNTAX.&Type	×
Image: Set		Type         Context         Data           Dpening Tag         0         0E           Dotet String         1         1CC0A80A14	
Context 1 Value C0480414 Set		Type Dctet String	
		Context	

Fig. 5-17 ABSTRACT-SYNTAX.&Type dialog(2)

Click Add in the ABSTRACT-SYNTAX.&Type dialog again, select Closing Tag for Type, and set Context to 0. Do not click OK yet.

ABSTRACT-SYNTAX.&Type	]
Type         Context         Data           Opening Tag         0         0E           Octet String         1         1CC0480A14           Closing Tag         0         0F	
< > > Type Closing Tag -	
Context	
OK Cancel	

Fig. 5-18 ABSTRACT-SYNTAX.&Type dialog(3)



#### RZ/N2L Group

Click Add in the ABSTRACT-SYNTAX.&Type dialog again, select Unsigned for Type, set Context to 1, set Value to the UDP port number (decimal value of 47808 in the example), and click OK.

ABS	STRACT-SYNTAX.&Type	×	
	Type Context Data Dpening Tag 0 0E Dctet String 1 1CC0A80A14 Closing Tag 0 0F Jnsigned 1 1ABAC0	Add Remove	
< Ту	vpe	-	
Cc Va	alue (47808)	Set	

Fig. 5-19 ABSTRACT-SYNTAX.&Type dialog(4)

Finally, click Send on the WriteProperty dialog.

#### 5.2.14 FD\_Subscription\_Lifetime

FD\_Subscription\_Lifetime property of the Network Port object is a BIP-specific property. It indicates the Time-To-Live value in seconds used in the Register-Foreign-Device BVLL message. Once this Time-To-Live value reaches 0, the B-BC resends the Register-Foreign-Device BVLL message.

This property is modified by the WriteProperty and WritePropertyMultiple services. Executing the WriteProperty and WritePropertyMultiple services write the setting value to Flash memory and set the Changes\_Pending property to TRUE. The value becomes valid on reboot or when ReinitializeDevice service request is received with ACTIVATE\_CHANGES or WARMSTART

There is no initial configuration command for this property. Refer to chapter 5.3 for details.

#### 5.2.15 Password

For changing the Password, search the "Search word" shown in **Table 5-24** and change it in the source code.

#### Table 5-24 Password changes

Service	File to be changed	Search word
ReinitializeDevice	BACNETOSS\bacnet\basic\object\device.c	*Reinit_Password
DeviceCommunicationControl	BACNETOSS\bacnet\basic\service\h_dcc.c	My_Password[32]

#### 5.2.16 OutOfService

When WriteProperty or WritePropertyMultiple services are executed for OutOfService property, the value is also written to Flash memory. Refer to chapter 5.3 for details.



# 5.3 Initial Configuration Command

# 5.3.1 Configurable Properties

There are some Properties in BACnet that are required to maintain their changed values even if device reboot occurs due to power failure etc. In this sample software, the Configurable Property shown in **Table 5-25** to **Table 5-27** is stored in Flash memory (QSPI0 Flash ROM) and the values are maintained after the B-BC device is rebooted.

These Configurable Properties can be set by executing the initial configuration commands via the serial interface. Connect the CN16 terminal where SCI0 peripheral modules are assigned to the PC with a USB cable, and execute the initial configuration commands from the terminal software.

# (1) Configurable Properties

Configurable properties common to BIP and MSTP are listed in Table 5-25.

No.	Configurable Property	Object type	Command	Num of arrays	Min value	Max value	Example value
1	DeviceName		Name_of_device_obj =	64			RZN2L_BACnet_Solution
2	DeviceInstance	Device	Instance_of_dev =		1	4194303	100
3	UTC_Offset		UTC_Offset =		-1440	1440	-540 (means TOKYO/JAPAN)
4	OutOfService	AnalogInput	OOS_AI_0( or 1) =				
5		AnalogValue	OOS_AV_0( or 1) =		false tri		
6		BinaryOutput	OOS_BO_0( or 1) =				
7		BinaryValue	OOS_BV_0( or 1) =			false true	
8		Schedule	OOS_SC_0 =				
9		Multi-stateVale	OOS_MSV_0( or 1) =				
10		PositiveIntegerValue	OOS_PIV_0( or 1) =				

#### Table 5-25 Configurable Properties

# (2) BIP-specific Configurable Properties

In addition to the above, BIP-specific Configurable Properties are shown in Table 5-26.

No. 1 Ethernet\_MAC is the MAC address of the Ethernet PHY; it is not a specified property in the BACnet standard, but can be changed with the initial configuration command without rebuilding.

No.2 The MAC\_Address of BIP consists of the IP address and UDP port number. It can be changed with the initial configuration command without rebuilding.

No. 3 IP\_Address and No. 4 BACnet\_IP\_UDP\_Port are reflected from No. 2 MAC\_Address setting value when rebooting, so there is no dedicated command.

The values of No.5 BACnet\_IP\_Mode, No.6 FD\_BBMD\_Address and No.7 FD\_Subscription\_Lifetime are written to the Flash ROM when the WriteProperty or WritePropertyMultiple services are executed for these properties. Therefore, there is no dedicated command, and each property is reflected at reboot and when the ReinitializeDevice service request is received as ACTIVATE\_CHANGES or WARMSTART.

Table 5-26	<b>BIP-specific</b>	configurable	properties
------------	---------------------	--------------	------------

No.	Configurable Property	Object type	Note	Command	Example value
1			Other than BACnet	Ethernet_mac_address =	74:90:50:10:05:B0
2	MAC_Address	NetworkPort		Bac_IP_mac_address =	192.168.10.10:47808



# RZ/N2L Group

3	IP_Address	"N	MAC_Address" setting		
4	BACnet_IP_UDP_Port	Va	alue is reflected.		
5	BACnet_IP_Mode	F	lash writing when	no command	
6	FD_BBMD_Address	e:	executing WriteProperty		
7	FD_Subscription_Lifetime	a	and WritePropertyMultiple.		

#### (3) MSTP-specific Configurable Properties

**Table 5-27** shows the MSTP-specific Configurable Property.

No.1 MAC\_Address of MS/TP can be changed by initial configuration command without rebuilding.

No.2 Network\_Number is written to Flash memory when the WriteProperty or WritePropertyMultiple services are executed for the property. Therefore, there is no dedicated command, and the property is reflected on reboot or when a ReinitializeDevice service request is received with ACTIVATE\_CHANGES or WARMSTART.

#### Table 5-27 MSTP-specific configurable properties

No.	Configurable Property	Object type	Note	Command	Min value	Max value	Example value
1	MAC_Address			MSTP_mac_address =	128	254	129
2	Network_Number	NetworkPort	Flash writing when executing WriteProperty and WritePropertyMultiple.	no command	0	65534	



# 5.3.2 Setup

Connect CN16 on the RSK board to the PC with a USB cable.



Fig. 5-20 Connect CN16 of the RSK to PC

Start the terminal software on your PC. Any terminal software will be suitable, but here TeraTerm is used as an example. It is available at the following link.

Releases · TeraTermProject/teraterm (github.com)

The serial port setup is as follows

Speed : 115200, Data : 8bit, Parity : none, Stop bits : 1bit, Flow control : none

The terminal setup is as follows

Append LF the transmitted data and Disable Local Echo.

lera lerm: lerminal setup	×	lera lerm: Serial port	setup and connection	×
Terminal size New-line	ОК	Port:	COM4 ~	New setting
83 X 54 Receive: LF	×	Speed:	115200 ~	-
Term size = win size	Cancel	Data:	8 bit $\sim$	Cancel
Auto window resize	Help	Parity:	none 🗸	
Terminal ID: VT100 V		Stop bits:	1 bit 🗸	Help
Answerback: Auto switch (VT	<->TEK)	Flow control:	none 🗸	
		Device Friendly N Device Instance II Device Instance II Device Manufact Provider Name. N Driver Date: 6-21 Driver Version: 10	msec/char 0 msec/char 0 lame: USB シリアルデパイプ D: USB¥VID_0458&PID_8 uren: Microsoft dicrosoft -2006 4.0.19041.3636	msec/line (COM4) 111¥000000000001

Fig. 5-21 Terminal software setup



#### 5.3.3 Command Execution

When the RSK board is reset, it displays a memory dump of the end area of QSPI0 Flash ROM, where the configurable data (Configurable Property) is stored. Fig. 5-22 shows the case of BIP.



Fig. 5-22 Memory dump of data storage area

Upper part: 0x63FFC000 to 0x63FFC093: Data storage area of xSPI0\_CS0\_SPACE Lower part: 0x43FFC000 to 0x43FFC093: Data storage area for xSPI0\_CS0\_SPACE\_MIRROR



Continue typing any key, such as Enter, and the command format will appear.



Fig. 5-23 Command format

#### \*\* CONFIGURATION WRITE COMMAND FORMAT(Setting Example) \*\*

Displays write command format. Setting values are shown as examples. (Chapter 5.3.3.1)

#### \*\*\*\*\*\*\*\*\*\* CONFIGURATION READ COMMAND FORMAT \*\*\*\*\*\*\*\*\*\*

Displays read command format. (Chapter 0)



# 5.3.3.1 Write Command

An example of write command is shown below. Commands must be entered in correct case, capitalization included. The written value becomes effective after the board is rebooted.

#### (1) BIP and MSTP Common Commands

Name\_of\_device\_obj = RZN2L\_BACnet\_Solution\_BBC\_BRTR

This sets the object name (i.e., device name) of the device object.

#### Instance\_of\_dev = 100

This sets the instance number of the device object.

#### UTC\_Offset = -540

This sets UTC\_Offset. This UTC offset (-540) indicates TOKYO/JAPAN (-9hour x 60min), with a minus value east of the meridian and a plus value west of the meridian. It is not necessary to enter a plus sign.

For example, for VANCOUVER/CANADA, UTC\_Offset = 480.

#### OOS\_AI\_0 = true(or false)

This sets the OutOfService property value of the AnalogInput,0 object.

... Omitted

#### OOS\_SC\_0 = true(or false)

This sets the OutOfService property value of the Schedule,0 object.

... Omitted hereafter, see No. 4...10 in **Table 5-25**.

Delete\_saved\_data

This command clears (erases) the stored value to 0xFF.

#### (2) BIP-Specific Commands

Ethernet\_mac\_address = 74:90:50:10:05:B0

This sets the MAC address of the Ethernet PHY on the RSK board.

Bac\_IP\_mac\_address = 192.168.10.10:47808

This sets the IP address and UDP port number of the B-BC.

# (3) MSTP-Specific Commands

MSTP\_mac\_address = 5

This sets the MAC address for MS/TP master of the B-BC.



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After the write commands are executed, reset the board. the settings data are saved as shown in Fig. 5-24. the data saved in Flash ROM are used as the initial values of each property.

33FF0030       :       54       24       14       36       65       74       55       36       66       C75       74       69       64       64         63FF0040       :       57       42       22       54       52       04       52       54       52       00 <th></th> <th></th>		
43FFBFF0       : FF		ŀ
43FFC080 : CD 00 CD 00 43FFC090 : CD 00 FF		





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# 5.3.3.2 Read Command

Fig. 5-25 shows an example of executing each Read command. Execute a read command like ">Ethernet\_mac\_address" then the written value (74:90:50:10:05:B0) will be displayed.

"help\_config" is help command to redisplay the command format.

Image: Collect of the set of the s			_	
File Edit Setup Control Window Help >Ethernet_mac_address 74:90:50:10:F9:ED >Bac_IP_mac_address 5 Ntame_of_device_obj RZV2L_B4Onet_Solution_BBC_BRTR >Instance_of_dev 10 >UTC_Offset -540 >UOS_AL_0 false >OOS_AL_0 false >OOS_AL_0 false >OOS_AL_1 false >OOS_BO_0 false >OOS_BO_0 false >OOS_BO_0 false >OOS_EV_1 false >OOS_EV_1 false >OOS_SC_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_SC_0 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_0 false >OOS_PIV_1 false >OS_PIV_1 false >OS_PIV_1 false >OS_PIV_1 false >OS_PIV_1 false >OS_PIV_1 PIN PIN PIN PIN PIN PIN PIN PIN	COM4 - Tera Term VT	-		×
<pre>&gt;</pre>	File Edit Setup Control Window Help			
>Bac_PP_mac_address 192.168.10.10:47808 >MSTP_mac_address 5 >Mame_of_device_obj RZNZL_B&Onet_Solution_BBC_BRTR >Instance_of_dev 10 >UTC_Offset -540 >00S_AI_O false >00S_AI_O false >00S_AV_O false >00S_AV_1 false >00S_BO_1 false >00S_BO_1 false >00S_BO_1 false >00S_BV_0 false >00S_SC_0 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_0 false >00S_MSV_0 false >00S_MSV_0 false >00S_MSV_0 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1 5 >00S_PIV_1 >0	≥Ethernet_mac_address 74·90:50:10:E9:ED			^
194_51P_mac_address 5 Name_of_device_obj R2VUL_BACnet_Solution_BBC_BRTR 2 Instance_of_dev 10 2 UTC_Offset -540 2 00S_AL_0 false 2 00S_AL_1 false 2 00S_AV_0 false 2 00S_AV_1 false 2 00S_BO_0 false 2 00S_BO_1 false 2 00S_BO_1 false 2 00S_SC_0 false 2 00S_SC_0 false 2 00S_MSV_0 false 2 00S_SC_0 false 2 00S_MSV_0 false 2 00S_MSV_0 false 2 00S_SC_0 false 2 00S_MSV_0 false 2 00S_MSV_0 false 2 00S_MSV_0 false 2 00S_MSV_0 false 2 00S_PIV_0 false 2 00S_PIV_0 false 2 00S_PIV_1 false 2 00S_PIV_1 false 2 00S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 false 2 0S_PIV_10 fa	>Bac_IP_mac_address			
MSTP_mac_address 5 Name_of_device_obj R2N2L_BACret_Solution_BBC_BRTR >Instance_of_dev 10 >UTC_Offset -540 >OOS_AI_O false >OOS_AI_O false >OOS_AV_0 false >OOS_AV_0 false >OOS_BO_0 false >OOS_BO_0 false >OOS_BO_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PI	192.168.10.10:47808			
<pre>&gt; Name_of_device_obj RZM2L_BACnet_Solution_BBC_BRTR &gt;Instance_of_dev 10 &gt;UTC_Offset -540 &gt;OOS_AI_0 false &gt;OOS_AV_0 false &gt;OOS_AV_0 false &gt;OOS_BO_0 false &gt;OOS_BO_0 false &gt;OOS_BO_1 false &gt;OOS_BO_1 false &gt;OOS_SU_0 false</pre>	>MSTP_mac_address			
RANCL_BAChet_Solution_BBC_BRTR >Instance_of_dev 10 >UTC_Offset -540 >OOS_AI_0 false >OOS_AI_1 false >OOS_AV_0 false >OOS_BO_0 false >OOS_BO_0 false >OOS_BO_0 false >OOS_BV_0 false >OOS_BV_0 false >OOS_SC_0 false >OOS_SC_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_PIV_0	o Mame of device obj			
>Instance_of_dev 10 >UTC_Offset -540 >OOS_AI_O false >OOS_AV_O false >OOS_AV_O false >OOS_BO_O false >OOS_BO_O false >OOS_BO_O false >OOS_BV_O false >OOS_SC_O false >OOS_SC_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_MSV_O false >OOS_PIV_O False >OOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O False SOS_PIV_O	RZN2L_BACnet_Solution_BBC_BRTR			
10 >UTC_Offset -540 >00S_A1_0 false >00S_AV_0 false >00S_AV_1 false >00S_B0_0 false >00S_B0_1 false >00S_B0_1 false >00S_BV_1 false >00S_SC_0 false >00S_SC_0 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_1 false >00S_PIV_1	>Instance_of_dev			
>005_01_Set >005_AI_0 false >005_AV_0 false >005_AV_0 false >005_BO_0 false >005_BO_0 false >005_BO_1 false >005_BV_0 false >005_BV_0 false >005_SC_0 false >005_SC_0 false >005_MSV_1 false >005_MSV_1 false >005_PIV_0 false >005_PIV_0	10 NUTC Officet			
<pre>&gt;005_A1_0 false &gt;005_A1_1 false &gt;005_AV_0 false &gt;005_AV_0 false &gt;005_B0_0 false &gt;005_B0_0 false &gt;005_B0_1 false &gt;005_B0_1 false &gt;005_BV_0 false &gt;005_BV_0 false &gt;005_SC_0 false &gt;005_SC_0</pre>	-540			
false >OOS_AV_0 false >OOS_AV_0 false >OOS_AV_1 false >OOS_BO_0 false >OOS_BO_1 false >OOS_BO_1 false >OOS_BV_0 false >OOS_BV_1 false >OOS_SC_0 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_MSV_0 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_1 false >OS_PIV_1 false PIV	>00S_AI_0			
<pre>&gt;00S_A1_i false &gt;00S_AV_0 false &gt;00S_AV_1 false &gt;00S_BV_1 false &gt;00S_B0_1 false &gt;00S_BV_0 false &gt;00S_BV_0 false &gt;00S_BV_1 false &gt;00S_SC_0 false &gt;00S_MSV_0 false &gt;00S_PIV_0 false &gt;00S_PIV_0 false &gt;00S_PIV_1 false &gt;00S_PIV_1 false &gt;00S_PIV_1</pre>	false			
<pre>&gt;00S_AV_0 false &gt;00S_AV_1 false &gt;00S_B0_0 false &gt;00S_B0_1 false &gt;00S_BV_0 false &gt;00S_BV_0 false &gt;00S_BV_1 false &gt;00S_SC_0 false &gt;00S_MSV_0 false &gt;00S_MSV_1 false &gt;00S_MSV_1 false &gt;00S_MSV_1 false &gt;00S_MSV_1 false &gt;00S_PIV_0 false &gt;00S_PIV_0 false &gt;00S_PIV_1 false &gt;00S_PIV_1</pre>	false			
false >OOS_AV_1 false >OOS_BO_0 false >OOS_BO_1 false >OOS_BV_0 false >OOS_BV_1 false >OOS_SC_0 false >OOS_MSV_0 false >OOS_MSV_1 false >OOS_MSV_1 false >OOS_PIV_0 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PIV_1	>00S_AV_0			
>00S_AV_1 false >00S_B0_0 false >00S_BV_0 false >00S_BV_1 false >00S_SC_0 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_1 false >00S_PIV_1	false			
>005_B0_0 false >00S_B0_1 false >00S_BV_0 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_1	2005_AV_1 false			
false >00S_B0_1 false >00S_BV_0 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_0 false >00S_PIV_1 false >00S_PIV_1 false >00S_PIV_1	>00S_B0_0			
2005_BU_0 false 2005_BV_0 false 2005_SC_0 false 2005_MSV_0 false 2005_MSV_1 false 2005_PIV_0 false 2005_PIV_0 false 2005_PIV_1 false 2005_PIV_1	false			
>005_BV_0 false >00S_BV_1 false >00S_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_1 false >00S_PIV_1	2005_B0_1 false			
false >OOS_BV_1 false >OOS_MSV_0 false >OOS_MSV_1 false >OOS_PIV_0 false >OOS_PIV_1 false >OOS_PIV_1 false >OOS_PIV_1	>00S_BV_0			
2003_BV_1 false 200S_SC_0 false 200S_MSV_0 false 200S_PIV_1 false 200S_PIV_0 false 200S_PIV_1 false 200S_PIV_1	false			
>005_SC_0 false >00S_MSV_0 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_1 false >	false			
false >00S_MSV_0 false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_1 false >	>00S_SC_0			
false >00S_MSV_1 false >00S_PIV_0 false >00S_PIV_1 false >	false Noos wey o			
>00\$_MSV_1 false >00\$_PIV_0 false >00\$_PIV_1 false >	false			
false >00S_PIV_0 false >00S_PIV_1 false >	>00\$_M\$V_1			
false >00S_PIV_1 false >	talse NOR PIV O			
>00S_PIV_1 false >	false			
false >	>00\$_PIV_1			
	talse			
✓				$\checkmark$

Fig. 5-25 Read command result



# **Revision History**

		Description	
Rev.	Date	Page	Summary
1.00	Mar/25/2024	-	First Edition

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# General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

#### 1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power is supplied until the power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a systemevaluation test for the given product.

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TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan www.renesas.com

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