Broadsens TCP/IP Guide

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Contents

1. Introduction

This document is for TCP/IP reference design only. It defines TCP/IP operations for Broadsens gateways, SVT-V series vibration & temperature sensors and SVT200-T temperature sensor. SVT-A series and wireless IMU sensor support will be added in the future.

BroadVibra version 2.8.4 TCP/IP or above is required. Broadsens gateways function as TCP/IP server. Remote devices function as TCP/IP clients, and connect to the gateway default TCP/IP port 10790. Then sensor live data will be sent to remote devices.

Multiple TCP/IP clients can connect to one gateway at the same time.

2. TCP/IP data type description

Broadsens TCP/IP data types are defined by the first byte (byte 0) and data length. The details are as follows (Table 1):

Table 1 Data type description

Byte 0 value	Data length	Description
0x00	36	SVT200-T temperature sensor data
0x01	64	SVT200-V vibration sensor data
0x02	64	SVT300-V vibration sensor data
0x03	64	SVT400-V vibration sensor data
0xFF	64	Gateway information

When there are multiple bytes defined data, then Big Endian standard should be used (The most significant byte is stored first, or the first byte (at the lowest memory address) is the largest).

3. Sensor data description

Each sensor type data is explained in detail in this chapter.

3.1 SVT-T temperature sensor data.

The length of temperature sensor SVT-200T is 36 bytes. They are defined by the following table (Table 2).

Table 2 SVT-T sensor data

Bytes	**Description**
0	Fixed value: 00
1-2	Time stamp: Year
3	Time stamp: month
4	Time stamp: date
5	Hour

6	Minute
7	Second
8-9	Millisecond (reserved)
10-15	Sensor ID. Only bytes 14 and 15 are used. Bytes 10-13 are reserved
16	Sensor group
17-22	MAC address
23	RSSI in dBm
24-25	Battery level
26	Firmware version
27-28	Temperature value
29-35	Reserved

When there are multiple bytes for a number, then big Endian format is used. For example, the year can be calculated as: byte 1*256+byte 2. Byte 1 value of 0x07, and byte 2 value of 0xe8 (decimal value =232) gives:

7x256+232=2024

The RSSI value is a negative number and can be obtained by subtracting value by 256. The unit is dBm. For example, value of 0xc0 (decimal value of 192) corresponds to -64 dBm (192-256).

The battery level can be obtained by dividing the number by 100. The unit is volt. For example, value of 364 corresponds to 3.64V (364/100).

The firmware version can be obtained by diving the value by 10. For example, number of 28 stands for version 2.8 (28/10).

Temperature value should be scaled by 0.0078125 to obtain the correct reading. If the number is less than 32768, then user can multiply the value directly by 0.0078125 to obtain the temperature. If the number is larger than or equal to 32768, then it is negative temperature, user should minus 65535, then scale the result with 0.0078125. For example, the byte 27 value of 0x0c (decimal value of 12), and byte 28 value of 0xd5 (decimal value of 213) corresponds to temperature of (12*x256+213) *0.0078125=25.664 ^{0}C.

3.2 SVT-V vibration sensor data

SVT-V sensor data are described in the following table (Table 3).

Table 3 SVT-V sensor data

Bytes	**Description**
0	01: SVT200-V data 02: SVT300-V data

	03: SVT400-V data
1-2	Time stamp: Year
3	Time stamp: month
4	Time stamp: date
5	Hour
6	Minute
7	Second
8-9	Millisecond
10-15	Sensor ID Only bytes 14 and 15 are used. Bytes 10-13 are reserved
16	Sensor group
17-22	MAC address
23	RSSI in dBm
24-25	Battery level
26	Firmware version
27-28	Vibration velocity RMS in x axis
29-30	Vibration velocity RMS in y axis
31-32	Vibration velocity RMS in z axis
33-34	Acceleration RMS in x axis
35-36	Acceleration RMS in y axis
37-38	Acceleration RMS in z axis
39-40	Temperature
41-63	Reserved

When there are multiple bytes for a number, then big Endian format is used. Please refer to section 3.1 on how to interpret the data.

The vibration velocity RMS can be obtained by dividing the value by 500. The unit is either in mm/s (Metric) or inch/s (Imperial) based on the unit selection from the gateway setup page. For example, assume that user selects Metric unit at the gateway, and byte 27 value 0x01, and byte 28 value of 0x0d (decimal vale of 13) means that:

Velocity RMS in x axis is: (1*256+13) /500=0.538 mm/s

The vibration acceleration can be obtained by dividing the value by 1000. The unit is g (9.81m/s^2). For example, byte 33 value 0x03, and byte 34 value of 0x05 means that:

Acceleration RMS in x axis is: (3*256+5)/1000=0.773 g

4. Gateway date information

Gateway information includes gateway serial ID, gateway type, CPU usage (in percentage), memory size & usage, temperature, location (latitude and longitude). The gateway information is compatible with MQTT protocol, but with limitation on the length of gateway name. Gateway information are

written into holding registers. Use function code 3 to read the register values. The definition is as the following (*Table 4*):

Table 4 Gateway information registers

Bytes	Description
0	Fixed value, 0xFF
1-2	Time stamp: Year
3	Time stamp: month
4	Time stamp: date
5	Hour
6	Minute
7	Second
8-9	Millisecond
10-23	Gateway name
24-27	Gateway ID (reserved)
28	Gateway chipset
29-30	Gateway software version
31-32	Gateway firmware version
33	CPU usage (%)
34	Memory size
35	Memory usage (%)
36-37	Drive total space (GB)
38	Drive usage (%)
39-40	Location latitude
41-42	Location longitude
43-44	Gateway CPU temperature
45-63	Reserved

Gateway time zone should be adjusted if it is different from local current time. Please refer to Appendix 2.4 of the gateway manual on how to change its time zone.

Gateway name is in ASCII format. ASCII conversion is shown in Figure 1. For example, gateway name of “ABC1” will have bytes value: 0x41 0x42 0x43 0x31. Up to 14 letters are used for gateway name. Gateway name longer than 14 letters will be truncated.

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ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

Figure 1 ASCII table

Gateway chipset is listed in the following table (Table 5).

Table 5 Gateway chipset list

Value	Description
0x04	GU200S_833E
0x10	GU200S-840X
0x20	GU300_840X
0x21	GU300_840E

Latitude can be obtained by dividing the value by 100, and subtract 90. Longitude can be obtained by dividing the value by 100, and subtract 180. Their units are degree.

Gateway CPU temperature can be obtained by dividing the value by 100. For example, byte 43 value of 0x12 (decimal value of 18), byte 44 value of 0x11 (decimal value of 17), will give CPU temperature:

(18x256+11)/100=46.25 degree Celsius.

5. Adjust TCP IP port

The default port of TCP/IP is 10790. User can adjust the TCP/IP port from the control panel. Please refer to Appendix 4 of the gateway's manual on how to access the control panel:

https://www.broadsens.com/download/manuals/Wireless_gateway_operation_manual.pdf

After logging in the control panel, the TCP/IP flow is in the front page. Double click the TCP out node to edit the TCP port (Figure 2). Click on the “Done” button, and then click on “Deploy” button on the right top corner of the control panel to apply the changes.

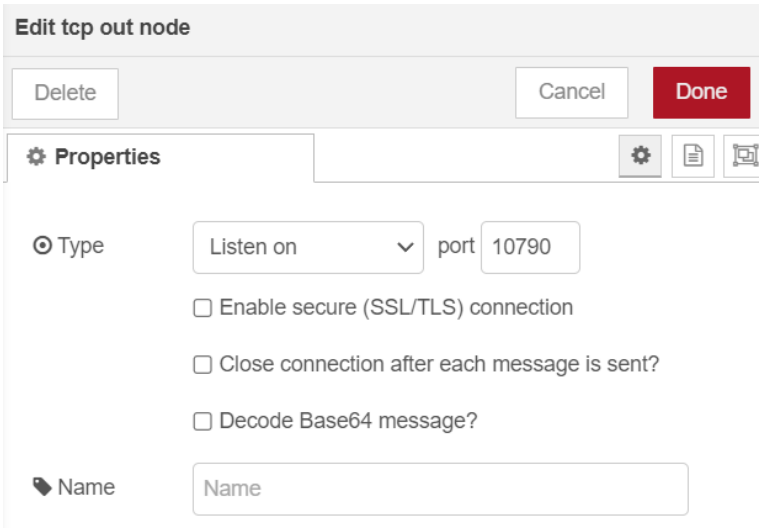

Figure 2 TCP port adjustment

TCP/IP port number larger than 1,000 is recommended for security purpose.

6. Testing with TCP/IP clients

Gateway’s TCP/IP function can be tested quickly with the following Node-RED flows on another gateway (Figure 3). Make sure that the gateways are in the same subnetwork for testing purpose. If the gateways are on different network, then please make sure that the firewall opens TCP/IP port of the gateway as the server.

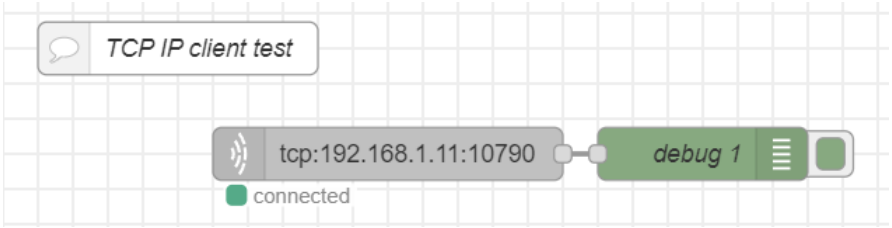

Figure 3 TCP/IP client test

The “TCP In” nodes setting is shown in Figure 4. The port number should match the TCP/IP server’s TCP/IP port, and the host IP should be the TCP/IP server’s IP address. Please delete or disable the debug node after testing is done to save system resources.

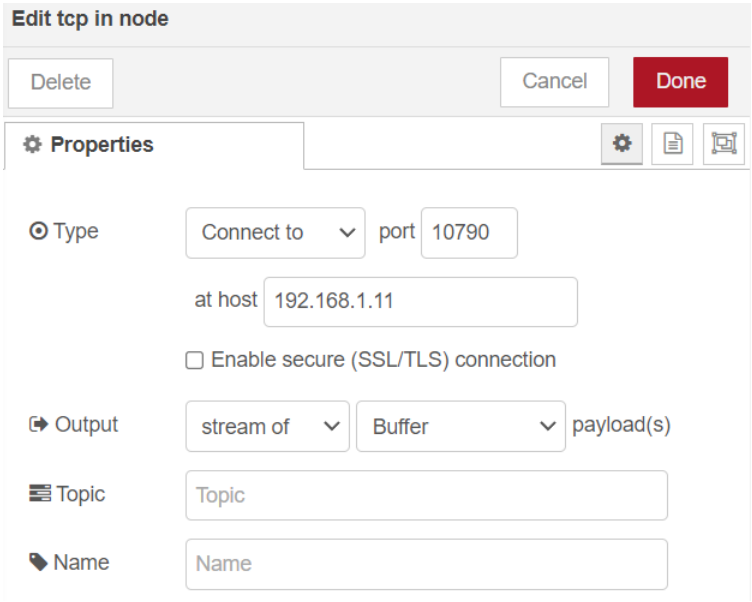

Figure 4 TCP In node setting

If configured properly, then user can see “connected” indication under the “TCP in” node. The debug node will show the binary data sent from the gateway as the TCP/IP server.

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Revision History

- V1.0. Initial release
- V1.1. Revised sensor data format. Added milli second resolution