

IQRF-UDP

UDP implementation in IQRF devices

Technical Guide



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Throughout this document, GW stands for a general device (typically the IQRF GW Daemon).

Application protocol for UDP channel

The communication is realized with the application protocol described below. It uses the transport protocol UDP according to the OSI reference model. For establishing a connection it is necessary to know the UDP port where the GW is listening and its IP address or the NetBIOS name (Host Name).

GW responses to commands to any asking device. Asynchronous messages are sent to broadcast address until the communication is established. After communication establishing the messages are sent to address of the last communicating host. Thus, more hosts (e.g. servicing programs on more PCs) can communicate with the GW.

If the IP address or NetBIOS of the GW and the port number are known it is just possible to establish the connection. Otherwise the request for a GW identification can be sent to broadcast address (in a single LAN segment only – routers filter packets with broadcast addresses.) All GWs receiving this request will answer which allows to get actual IP address of given GW.

Packet description

The packet structure is the same for both communication directions:

HEADER (H = 9 B)	DATA (D = 0 – 497 B)	CRC (2 B)
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For receiving, the GW checks:

- GW_ADR validity – see the packet header
- Packet length must not be lower than HEADER + CRC
- Packet length must not be higher than HEADER + DATA MAX + CRC
- CRC

Header

Packet header has a fixed length:

0	1	2	3	4	5	6	7	8
GW_ADR	CMD	SUBCMD	RES	RES	PACID_H	PACID_L	DLEN_H	DLEN_L

GW_ADR	Identification address of the equipment: 0x22 IQRF device (e.g.IQD-GW-01, GW-WIFI-01 or GW-ETH-02A) 0x20 3rd party or user specific device, e.g. based on the IQRF GW Daemon
CMD	Command of the packet (values: 0x01 ... 0x7F) Answer to given command: CMD = CMD 0x80 (bit 7 of given CMD set)
SUBCMD	Auxiliary information of the command (values: see description below)
RES	Reserved
PACID_H	Packet identification – upper byte (values: 0x00 ... 0xFF)
PACID_L	Packet identification – lower byte (values: 0x00 ... 0xFF)
DLEN_H	Data length – upper byte (values: 0x00, 0x01)
DLEN_L	Data length – lower byte (values: 0x00 ... 0xFF)

The packet identification (PACID) can be any number 0x0000 – 0xFFFF according to the host specification. The GW always copies this number to the answer to given packet. It means that the host can use any 2B value for PACID_x and the GW returns it without any change. So, the usage is up to the host application. The host can use it e.g. for an identification of received response to given request. IQRF IDE as a host uses it exactly in this way: IDE increments PACID_x with every packet sent to the GW and expects the same PACID_x value in the response from GW.

CRC

The check part has a fixed length:

H+D	H+D+1
CRC_H	CRC_L

CRC type CRC-16-CCITT
 Polynomial 0x1021 ($x^{16} + x^{12} + x^5 + 1$)
 Initial value 0x0000

CRC is calculated from the HEADER and DATA parts.

Communication initiated by the host

Get GW identification

Getting a GW identification. It is intended to identification of the GW which the connection is established with.

Host → GW direction

CMD 0x01 Returns the GW identification
 SUBCMD 0x00 No information
 DLEN 0x0000 No data

GW → Host direction

CMD 0x81 Answer to the 0x01 command
 SUBCMD 0x00 No information
 0x10 Bootloader
 DATA Text with GW identification. See Data identification.

Get GW status

The GW returns the information about its state.

Host → GW direction

CMD 0x02 Returns the GW status
 SUBCMD 0x00 No information
 DLEN 0x0000 No data

GW → Host direction

CMD 0x82 Answer to the 0x02 command
 SUBCMD 0x00 No information
 DATA See Status data

Write data to TR module

Data according the IQRF SPI protocol is written to the TR module. The answer is an acknowledge of writing to the module. If the answer is requested from the module it is sent with the actual command – see Communication initiated by the GW. According to GW configuration either just actual data or the whole packet is written.

Host → GW direction

CMD	0x03	Write data to the TR module
SUBCMD	0x00	No information
DATA		Data for the TR module

GW → Host direction

CMD	0x83	Answer to the 0x03 command
SUBCMD	0x50	Write OK
	0x60	Write Error (number of data = 0 or more than TR buffer COM length)
	0x61	Write Error (SPI bus busy)
	0x62	Write Error (IQRF - CRCM Error)
	0x63	Write Error (GW is not in service mode)
DLEN	0x0000	No data

Write to RTCC in GW

Writing of time and date to the RTCC in GW

Host → GW direction

CMD	0x08	Write to RTCC
SUBCMD	0x00	No information
DB1		GW time – seconds (values see Time and data coding)
DB2		GW time – minutes
DB3		GW time – hours
DB4		GW data – day of week
DB5		GW data – day
DB6		GW data – month
DB7		GW data – year

GW → Host direction

CMD	0x88	Answer to the 0x08 command
SUBCMD	0x50	Write OK
	0x60	Write Error (invalid values)
DLEN	0x0000	No data

Change autentization

Changing of username and password for access to GW via www.

Host → GW direction

CMD	0x09	Change autentization
SUBCMD	0x00	No information
DB1		Username: text
to		(max. 15 characters, not used ones replace with zeroes)
DB15		
DB16		Old password: text
to		(max. 15 characters, not used ones replace with zeroes)
DB30		
DB31		New password: text
to		(max. 15 characters, not used ones replace with zeroes)
DB45		

GW → Host direction

CMD	0x89	Answer to the 0x09 command
SUBCMD	0x50	Write OK
	0x60	Write Error (invalid old password)
DLEN	0x0000	No data

Read TR Module Info in GW

Getting information about the module in the GW

Host → GW direction

CMD	0x11	Read the TR Module Info from the GW
SUBCMD	0x00	No information
DLEN	0x0000	No data

GW → Host direction

CMD	0x91	Answer to the 0x11 command
SUBCMD	0x00	No information
DATA		See Module Info

Reset GW (GW as well as the bootloader)

Remote GW reset (initialization).

Host → GW direction

CMD	0x12	GW reset
SUBCMD	0x00	No information
DLEN	0x0000	No data

GW → Host direction

See Communication initiated by the GW – Sending the GW status message.

TR module reset

Remote reset of the TR module.

Host → GW direction

CMD	0x13	TR module reset
SUBCMD	0x00	No information
DLEN	0x0000	No data

GW → Host direction

CMD	0x93	Answer to the 0x13 command
SUBCMD	0x50	OK command
	0x60	Error command
DLEN	0x0000	No data

Sending a command not implemented in GW

Host → GW direction

CMD	?	Unknown command
SUBCMD	?	Arbitrary information
DATA		Arbitrary data

GW → Host direction

CMD	? 0x80	Answer to an unknown command
SUBCMD	0x60	Packet error
DLEN	0x0000	No data

Communication initiated by the GW (asynchronous message)

Send data from TR module

Sends data from the TR module according to the IQRF SPI protocol. According to the settings either just actual data or the whole packet is send.

GW → Host direction

CMD	0x04	Send data from TR module
SUBCMD	0x00	No information
DATA		Data from TR module

Send GW status message

It is a message from the GW about its state. The information is indicated by the SUBCMD byte.

GW → Host direction

CMD	0x05	GW status message
SUBCMD	0x01	GW reset, sent after switching on
	0x02	Change its own IP address (only if the DHCP is active)
DATA		Text with GW identification. See Identification data.

Identification data

Identification data consists of several texts separated by 0x0D 0x0A.

1. GW type e.g.: „IQRF-GW-Daemon“ or „GW-ETH-02A“
 2. FW version e.g.: „2.50“
 3. MAC address e.g.: „00 11 22 33 44 55“
 4. TCP/IP Stack version e.g.: „5.42“
 5. IP address of GW e.g.: „192.168.2.100“
 6. Net BIOS Name e.g.: „iqrif_xxxx “ 15 characters
 7. IQRF module OS version e.g.: „3.06D“
 8. Public IP address e.g.: „213.214.215.120“
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Status data

GW status data for the *Get GW status* command.

DB1		TR module status (see the IQRF SPI protocol)
DB2		Not used
DB3	0x01	Supplied from external source
DB4		GW time – seconds (see Time and date coding)
DB5		GW time – minutes
DB6		GW time – hours
DB7		GW date – day of the week
DB8		GW date – day
DB9		GW date – month
DB10		GW date – year
DB11		Not used
DB12		Not used

Time zone coding

0x00	(GMT-12:00)	0x0B	(GMT-02:00)	0x16	(GMT+05:45)
0x01	(GMT-11:00)	0x0C	(GMT-01:00)	0x17	(GMT+06:00)
0x02	(GMT-10:00)	0x0D	(GMT)	0x18	(GMT+06:30)
0x03	(GMT-09:00)	0x0E	(GMT+01:00)	0x19	(GMT+07:00)
0x04	(GMT-08:00)	0x0F	(GMT+02:00)	0x1A	(GMT+08:00)
0x05	(GMT-07:00)	0x10	(GMT+03:00)	0x1B	(GMT+09:00)
0x06	(GMT-06:00)	0x11	(GMT+03:30)	0x1C	(GMT+09:30)
0x07	(GMT-05:00)	0x12	(GMT+04:00)	0x1D	(GMT+10:00)
0x08	(GMT-04:00)	0x13	(GMT+04:30)	0x1E	(GMT+11:00)
0x09	(GMT-03:30)	0x14	(GMT+05:00)	0x1F	(GMT+12:00)
0x0A	(GMT-03:00)	0x15	(GMT+05:30)	0x20	(GMT+13:00)

Time and date coding

For individual values the BCD code is used. The upper nibble (UN) means tens and the lower nibble (LN) means units.

Example (seconds):

DB = 0x53 means 53 s

Legal ranges:

Seconds	UN = 0 – 5	LN = 0 – 9	min. 0	max. 59
Minutes	UN = 0 – 5	LN = 0 – 9	min. 0	max. 59
Hours	UN = 0 – 2	LN = 0 – 9	min. 0	max. 23
Day	UN = 0 – 3	LN = 0 – 9	min. 1	max. 31
Month	UN = 0 – 1	LN = 0 – 9	min. 1	max. 12
Year	UN = 0 – 9	LN = 0 – 9	min. 8	max. 99 (2008 - 2099)
Day of week	UN = 0	LN = 0 – 6	min. 0	max. 6 (0 – Sunday, 1 – Monday, ...)

These ranges are checked during writing to the GW. If out of range the packet with SUBCMD = *write Error* is returned.

Module Info data

Information about the TR module in the GW. See IQRF OS Reference guide, function moduleInfo() for description.

DB1	bufferInfo[3]
DB2	bufferInfo[2]
DB3	bufferInfo[1]
DB4	bufferInfo[0]
DB5	bufferInfo[4]
DB6	bufferInfo[5]
DB7	bufferInfo[6]
DB8	bufferInfo[7]

Product information

Document history

190425	GW_ADR parameters in packet header slightly updated.
180511	First release as a separate document. Write Error 0x63 added to <i>Write data to TR module</i> .
Till May 2018	UDP protocol description was included in User's guides of respective IQRF gateways (GW-ETH-0xx and GW-WIFI-01).

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