Data transfer protocol

The communication protocol is build on top of TCP/IP. Data are transferred in a form of binary-encoded messages that consist of Header, Data and Checksum. Structure of the message is described in tables below.
Measuring device is a client that connects to a host. The device can be connected to multiple hosts. Messages with readouts are send one after another until the connection is teminated.

Message structure

Byte size	Name	Description
80	**Header**	Information about the transferred readouts.
N x 24	**Data**	N is number of readouts in the packet. N <= 1024.
4	Packet checksum	Checksum is appended right after the last readout. [1]

Header structure

Byte size	Name	Description
3	Sync	Must be 0x55 0x00 0x55.
1	Packet type	0x00 for single value readouts.
32	Device ID	String identification of source device. Unique name of the device. [2]
32	Sensor ID	String identification of sensor. User-editable sensor name. [2]
2	Packet counter	Sequence number to identify lost messages.
2	Packet readout count	Number of readouts in one message. User-editable.
4	Packet byte size	Total message size in bytes. [3]
4	Header checksum	[1]

Data structure

Byte size	Name	Description
24	**Readout** #1	The first readout.
24	Readout #2	The second readout.
	...	
24	Readout #N	The last readout.

Readout structure

Byte size	Name	Description
8	Timestamp seconds	Unsigned integer [4]
8	Timestamp microseconds	Unsigned integer [4]
8	Value	Double

[1]
For checksum computation the message is interpreted as an array of unsigned 32 bit integers. The checksum is sum of values in the array. The Packet checksum is computed from the whole message (Header+Data) and the Header checksum is computed only from the Header.
Implementation (C++) of a method that computes checksums is following:

```
void compute_checksum() {
	uint32_t *p = (uint32_t *)this; // 'this' points at the beginning of the message
	uint32_t count = ( this->header.packet_byte_size )/4 - 1;
	uint32_t sum = 0;
	while(count >0) {
		sum += *p++;
		count--;
	}
	*((uint32_t *)p) = sum;
}
```

[2]
The string in Device ID and Sensor ID is null-terminated.

[3]
The value of Packet byte size is calculated by the following formula:

$$\text{Size of Header} + \text{Packet readout count} * \text{Size of Readout} + 4$$
$$80 + N * 24 + 4$$

[4]
The timestamp in Readout structure is standard Unix timestamp (seconds since epoch beginning).