UDP + CoAP + X protokol

	Bits	0 1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21 22 23	24 25 26 27 28 29 31 32
UDP HEADER	0	Source Port		Destination Port	
	32	Length		Checksum	
CoAP HEADER	64	Ver	Type	Token Length	Code	Message ID
	96	Token (optional) -> Up to 8 Bytes -> Token length 4b -> 2^4 = 16B -> 9-15 are reserved, must not be sent			
	128				
	...	Options (Optional)			
	...				
X HEADER	...	Payload Marker	Ver	Type	
	...	UUID - Device Id			
	...				
	...				
	...				
	...	Timestamp			
	...			Metadata (optional)	
X PAYLOAD	...	X-Payload Marker	Sensore type	Data type	Value ...
	...	Sensore type	Data type	Value ...	
	...	...			

Payload size - length

Payoload size of X protocol can be calculated from length field of UDP header, since we know the size of CoAP header + X header. Length field in UDP header is mandatory.

Checksum

We can use checksum from UDP header, since this checksum contains UDP header + UDP data (CoAP + X). Checksum field is optional in UDP header, but in general it is almost always used. We will be using this checksum only for control mechanism. If the checksum is wrong, we just skip the packet. Type of checksum is 16 bits CRC.

Version

2 bit field, so we can have 4 versions of X protocol.

Type

Type field indicates type of message. It is 2 bit field, so we can have up to 4 types of message. 00 - Data message, 01 - Metadata message, 10 - KeepAlive message, 11 - Unassigned

UUID - device id

Device id is 16B field for UUID.

Timestamp

Time when was data measured. The representation of timestamp field is Unix 64-bit timestamp.

CoAP option format = Metadata

X metadata will have the same structure as CoAP options

	0 1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21 22 23	24 25 26 27 28 29 31 31
1	Option delta	Option length	Option value	
2	Option delta	Option length	Option delta extended	Option length extended	Option value
3	Option delta	Option length	Option delta extended	Option
	length extended	Option value		

Metadata delta	Metadata length	Metadata value

Option Format

Bit Positions							
0	1	2	3	4	5	6	7
Option Delta				Option Length			
Option Delta Extended (None, 8 bits, 16 bits)							

Option Length Extended (None, 8 bits, 16 bits)
Option Value

Option Delta:

- 0 to 12: For delta between 0 to 12: Represents the exact delta value between the last option ID and the desired option ID, with no Option Delta Extended value
- 13: For delta from 13 to 268: Option Delta Extended is an 8-bit value that represents the Option Delta value minus 13
- 14: For delta from 269 to 65,804: Option Delta Extended is a 16-bit value that represents the Option Delta value minus 269
- 15: Reserved for Payload Marker, where the Option Delta and Option Length are set together as 0xFF.

Option Length:

- 0 to 12: For Option Length between 0 to 12: Represents the exact length value, with no Option Length Extended value
- 13: For Option Length from 13 to 268: Option Length Extended is an 8-bit value that represents the Option Length value minus 13
- 14: For Option Length from 269 to 65,804: Option Length Extended is a 16-bit value that represents the Option Length value minus 269
- 15: Reserved for future use. It is an error if Option Length field is set to 0xFF.

Option Value:

- Size of Option Value field is defined by Option Length value in bytes.
- Semantic and format this field depends on the respective option.

No.	C	U	N	R	Name	Format	Length	Default
1	x			x	If-Match	opaque	0-8	(none)
3	x	x	-		Uri-Host	string	1-255	(see below)
4				x	ETag	opaque	1-8	(none)
5	x				If-None-Match	empty	0	(none)
7	x	x	-		Uri-Port	uint	0-2	(see below)
8				x	Location-Path	string	0-255	(none)
11	x	x	-	x	Uri-Path	string	0-255	(none)
12					Content-Format	uint	0-2	(none)
14		x	-		Max-Age	uint	0-4	60
15	x	x	-	x	Uri-Query	string	0-255	(none)
17	x				Accept	uint	0-2	(none)
20				x	Location-Query	string	0-255	(none)
35	x	x	-		Proxy-Uri	string	1-1034	(none)
39	x	x	-		Proxy-Scheme	string	1-255	(none)
60			x		Size1	uint	0-4	(none)

Payload marker : *The byte 0xFF has the meaning of a payload marker only where the beginning of another option could occur. Payload marker is option delta and option length with value 15 -> 1111 1111.*

X protokol - payload

Sensore type

Sensorre type is 1B field, so we can support 256 sensors for one device

Data type

Data type is 1B field, so we can support 256 types of data.

Value

Data from sensore. Length of value is defined according to Data type.