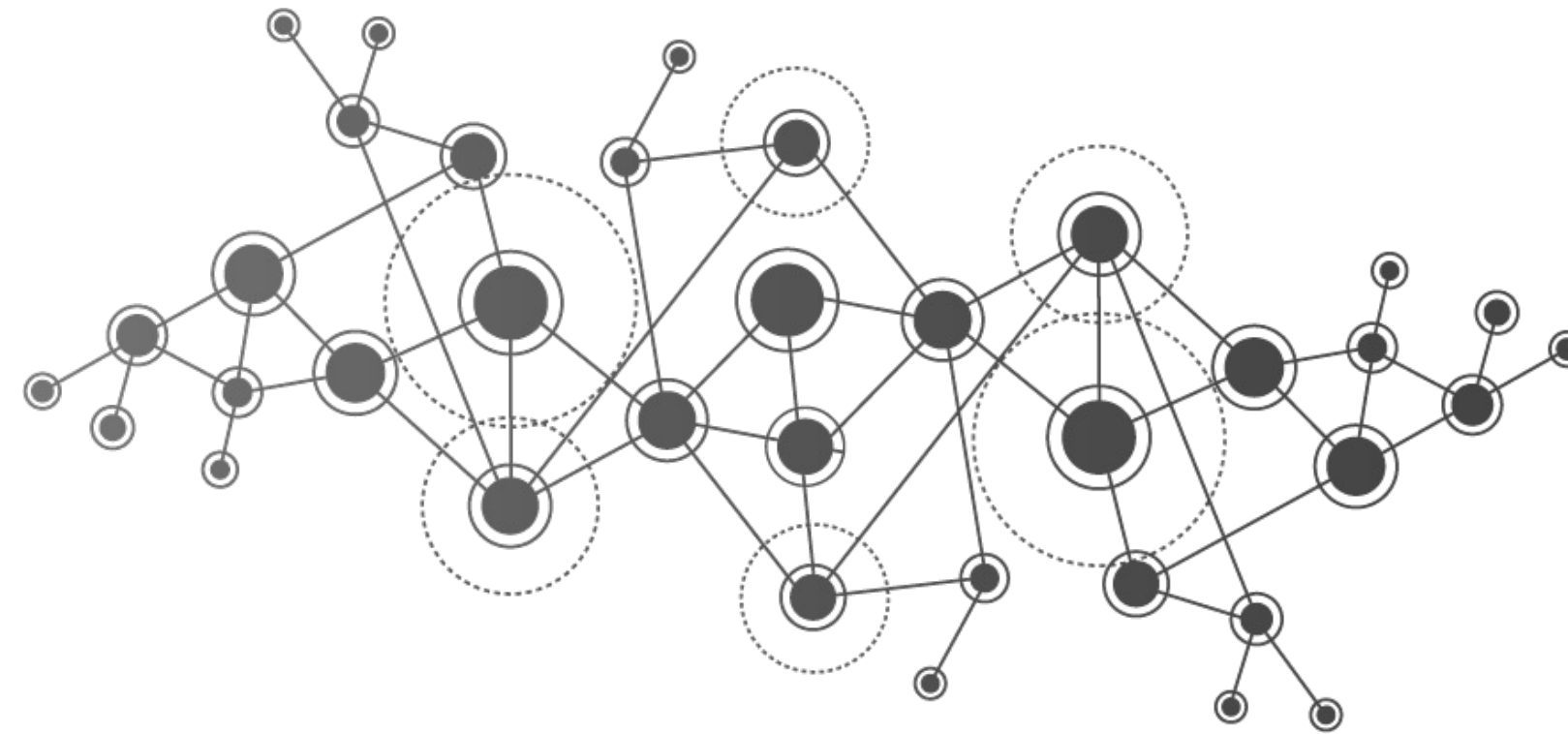




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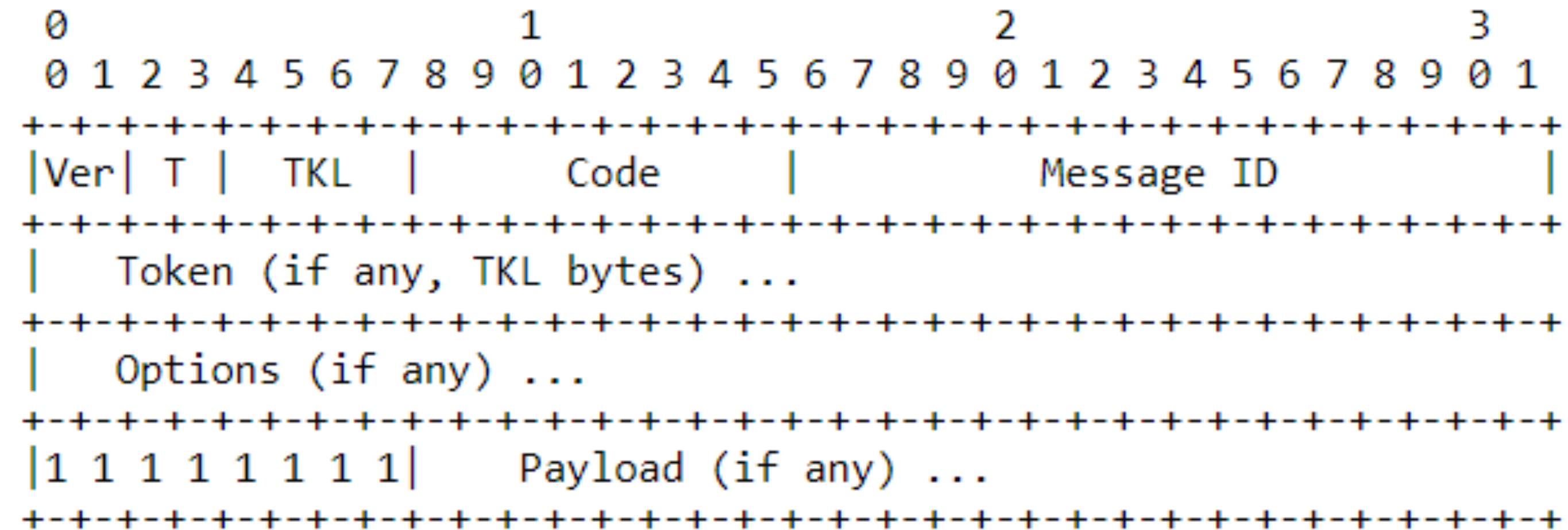
Intelligent Internet of Things

CoAP Packet Structure Exercise

Prof. Marco Picone

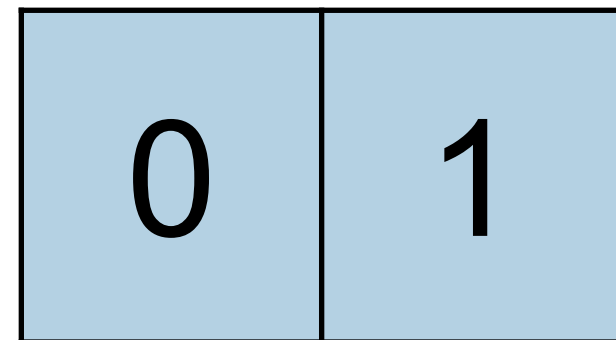
A.A 2023/2024

CoAP Packet - Exercise 1



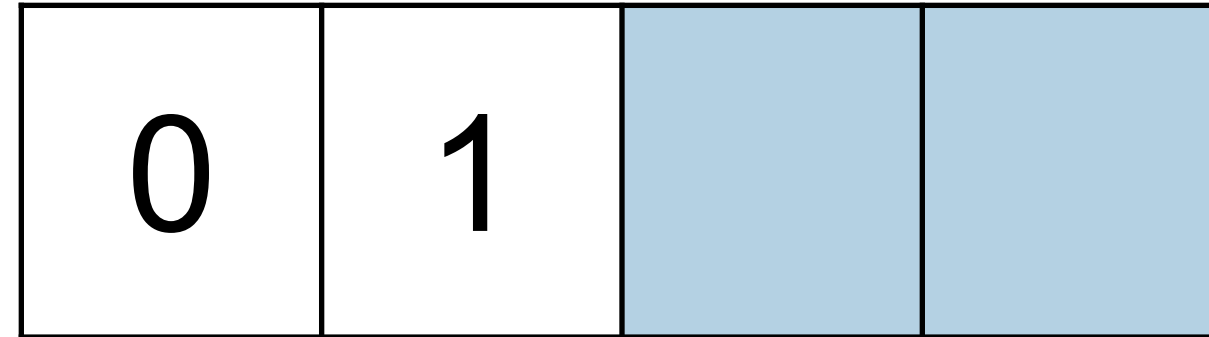
- Build a CoAP with the following characteristics
 - NON confirmable
 - GET Method
 - URI: coap://example.com:5683/sensors/temp/1
 - Message-ID: 1036
 - Token: 160

CoAP Packet - Exercise 1




Version

CoAP Packet - Exercise 1



T (2 bit): Type (0 = CON, 1 = NON, 2 = ACK, 3 = RST)

CoAP Packet - Exercise 1

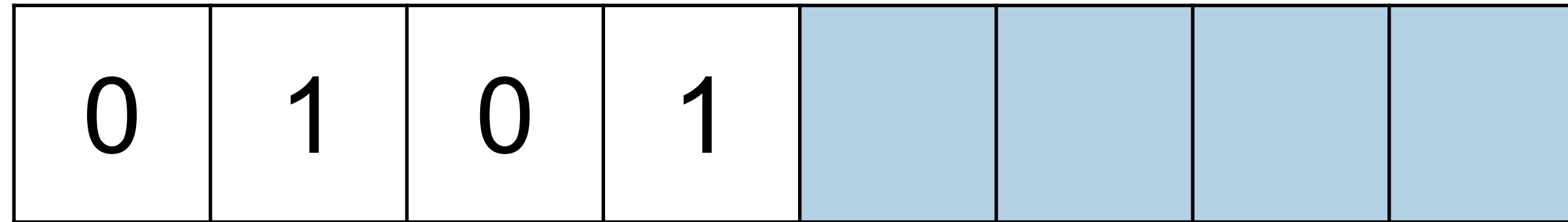


0	1	0	1
---	---	---	---

T (2 bit): Type (0 = CON, 1 = NON, 2 = ACK, 3 = RST)

According to the specifications we use the
NON Confirmable Message Type


CoAP Packet - Exercise 1



TKL (4 bit): Token length (0-8); lengths 9-15 are reserved

In our case
Token: 160 = 0xa0 fits in 1 byte

CoAP Packet - Exercise 1



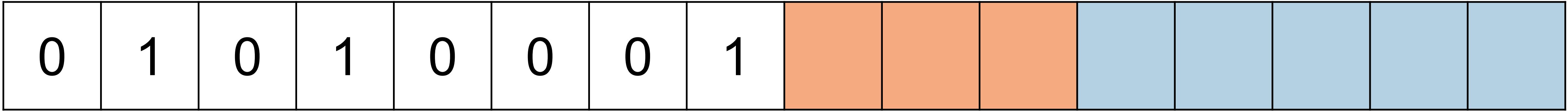
0	1	0	1	0	0	0	1
---	---	---	---	---	---	---	---

TKL (4 bit): Token length (0-8); lengths 9-15 are reserved



Token Length = 1

CoAP Packet - Exercise 1



Code (8 bit): 3 bits class + 5 bit detail

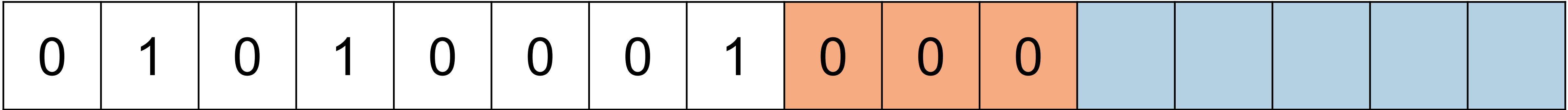
Class

Detail

Class	Bits	Meaning
0	000	Request
2	010	Success
4	100	Client error
5	101	Server error

} Response

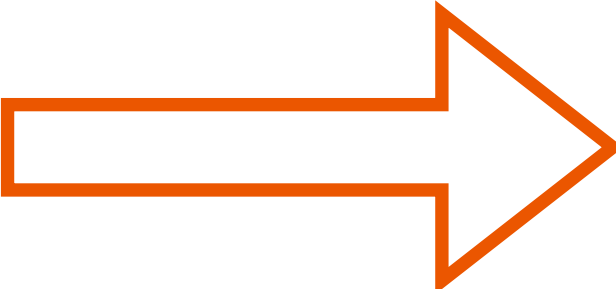
CoAP Packet - Exercise 1



Code (8 bit): 3 bits class + 5 bit detail

Class

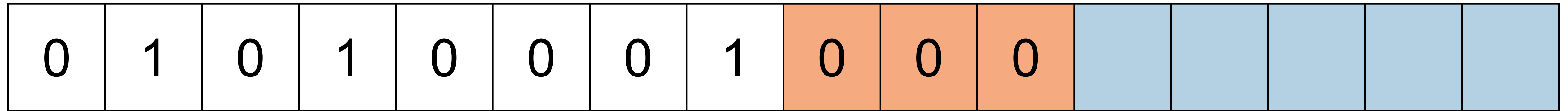
Detail



Class	Bits	Meaning
0	000	Request
2	010	Success
4	100	Client error
5	101	Server error

} Response

CoAP Packet - Exercise 1



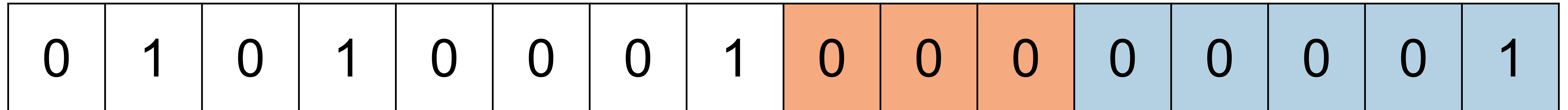
Code (8 bit): 3 bits class + 5 bit detail

Class

Detail

- Detail:
 - 1 (GET)
 - 2 (POST)
 - 3 (PUT)
 - 4 (DELETE)

CoAP Packet - Exercise 1



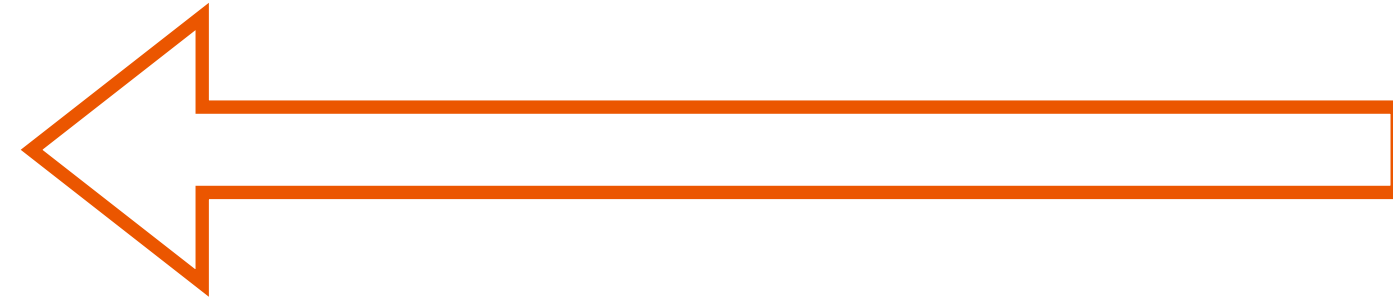
Code (8 bit): 3 bits class + 5 bit detail

Class

Detail

- Detail:

- 1 (GET)



- 2 (POST)

- 3 (PUT)

- 4 (DELETE)

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1

Message-ID: 1036 = 0x40c = 10000001100

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0

Message-ID: 1036 = 0x40c = 10000001100

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0

Token: 160

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0

Token: 160

Token Length = 1

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0

Token: 160

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0

Token: 160 = 0xa0 = 10100000

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Token: 160 = 0xa0 = 10100000

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Options

Option number	Option name	Format	Length (byte)
3	Uri-Host	string	1-255
7	Uri-Port	uint	0-2
11	Uri-Path	string	0-255
15	Uri-Query	string	0-255

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

URI: coap://example.com:5683/sensors/temp/1

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

URI: coap://example.com:5683/sensors/temp/1

Host: example.com

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

URI: coap://example.com:5683/sensors/temp/1

Port: 5683

CoAP Packet - Exercise 1



0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

URI: coap://example.com:5683/sensors/temp/1

Path: /sensors/temp/1

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Options

Host: example.com

Port: 5683

Path: sensors

Path: temp

Path: 1

Option Number: 3

Option Number: 7

Option Number: 11

Option Number: 11

Option Number: 11

Option Delta: 3

Option Delta: 4

Option Delta: 4

Option Delta: 0

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Host

--	--	--	--	--	--	--	--

Option Delta

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Host

0	0	1	1				
---	---	---	---	--	--	--	--

Option Delta (3)

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Host

0	0	1	1				
---	---	---	---	--	--	--	--

Option Length

Uri-Host: **example.com** 11 bytes

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Host

0	0	1	1	1	0	1	1
---	---	---	---	---	---	---	---

Option Length

Uri-Host: **example.com** 11 bytes (1011)

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Port

0	1	0	0				
---	---	---	---	--	--	--	--

Option Delta (4)

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0								

Uri-Port

0	1	0	0	0	0	1	0
---	---	---	---	---	---	---	---

Option Length

Uri-Port: 5683 - > 2 bytes

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Port: 5683 = 0001011000110011

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

0	1	0	0				
---	---	---	---	--	--	--	--

Path: sensors

Option Number: 11

Option Delta: 4

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

Option Length (7)							
0	1	0	0	0	1	1	1

Path: sensors

Option Number: 11

Option Delta: 4

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

0	1	0	0	0	1	1	1	sensors
---	---	---	---	---	---	---	---	---------

Option Length (7)

Path: sensors

Option Number: 11

Option Delta: 4

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

0	0	0	0				
---	---	---	---	--	--	--	--

Path: temp

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

				Option Length (4)			
0	0	0	0	0	1	0	0

Path: temp

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

								Option Length (4)							
0	0	0	0	0	1	0	0	temp							

Path: temp

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

0	0	0	0				
---	---	---	---	--	--	--	--

Path: 1

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

Option Length (1)							
0	0	0	0	0	0	0	1

Path: 1

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															

Uri-Path

								Option Length (1)							
0	0	0	0	0	0	0	1	1							

Path: 1

Option Number: 11

Option Delta: 0

CoAP Packet - Exercise 1

0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															
0	1	0	0	0	1	1	1	sensors							
0	0	0	0	0	1	0	0	temp							
0	0	0	0	0	0	0	1	1							

CoAP Packet - Exercise 1

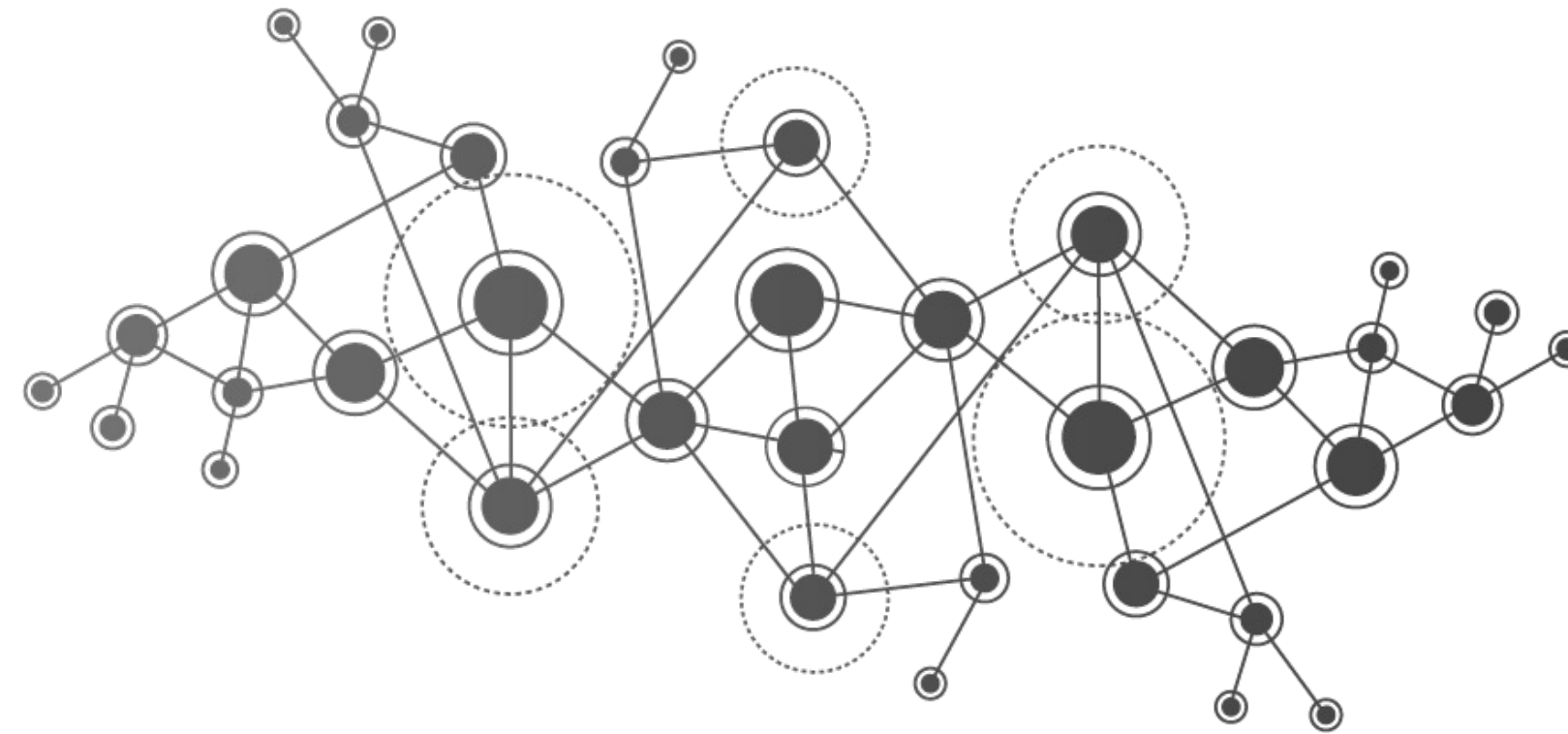
0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
11 bytes (example.com)															
0	1	0	0	0	0	1	0	00010110							
00110011															
0	1	0	0	0	1	1	1	sensors							
0	0	0	0	0	1	0	0	temp							
0	0	0	0	0	0	0	1	1							

No marker (no payload)



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Intelligent Internet of Things

CoAP Packet Structure Exercise

Prof. Marco Picone

A.A 2023/2024
