

CoAP over Everything

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@chrysn

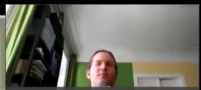
2023-09-10
Frankfurt, RIOT summit

Familiarity with CoAP

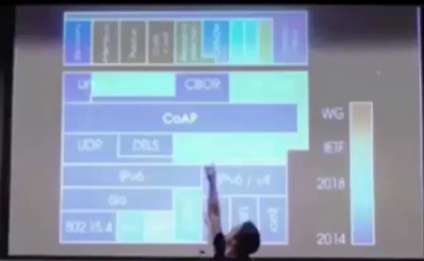
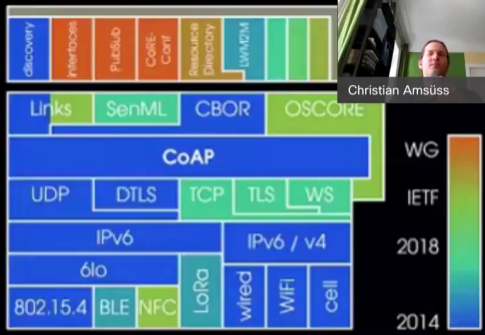
- ▶ Heard of CoAP?
- ▶ Used CoAP?
- ▶ ...on a different transport than UDP or DTLS?

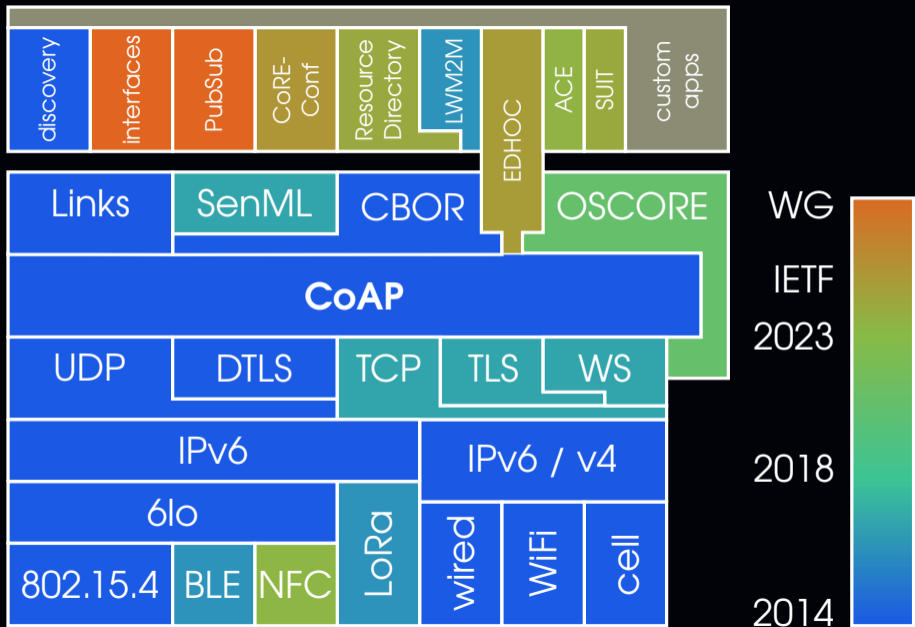
CoAP in 100 words or less

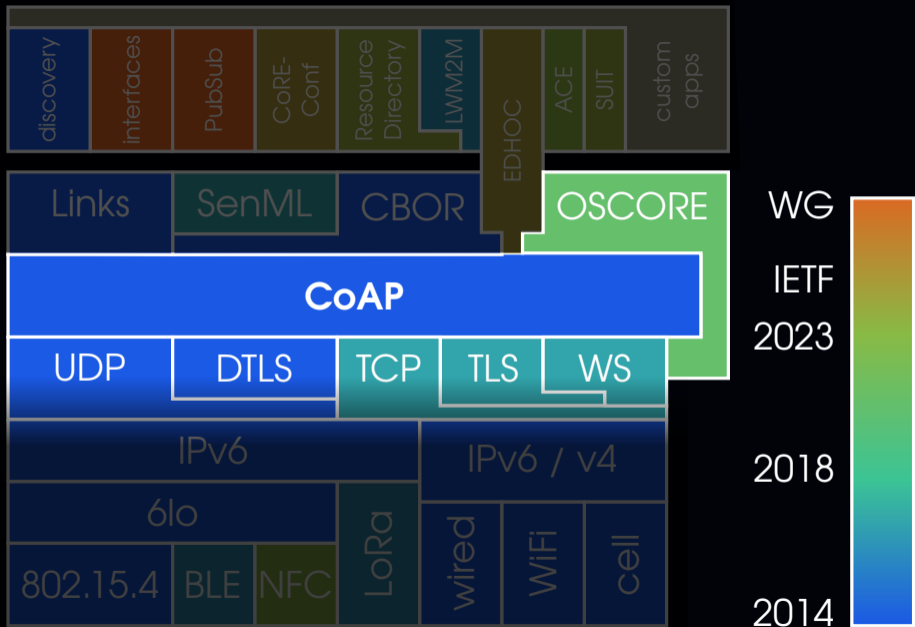
- ▶ Protocol for embedded devices
- ▶ REST Semantics very similar to HTTP
GET, PUT, POST, URLs and paths
- ▶ compact encoding, easy to process
- ▶ UDP based
- ▶ extra features: notifications, FETCH method, powerful proxies

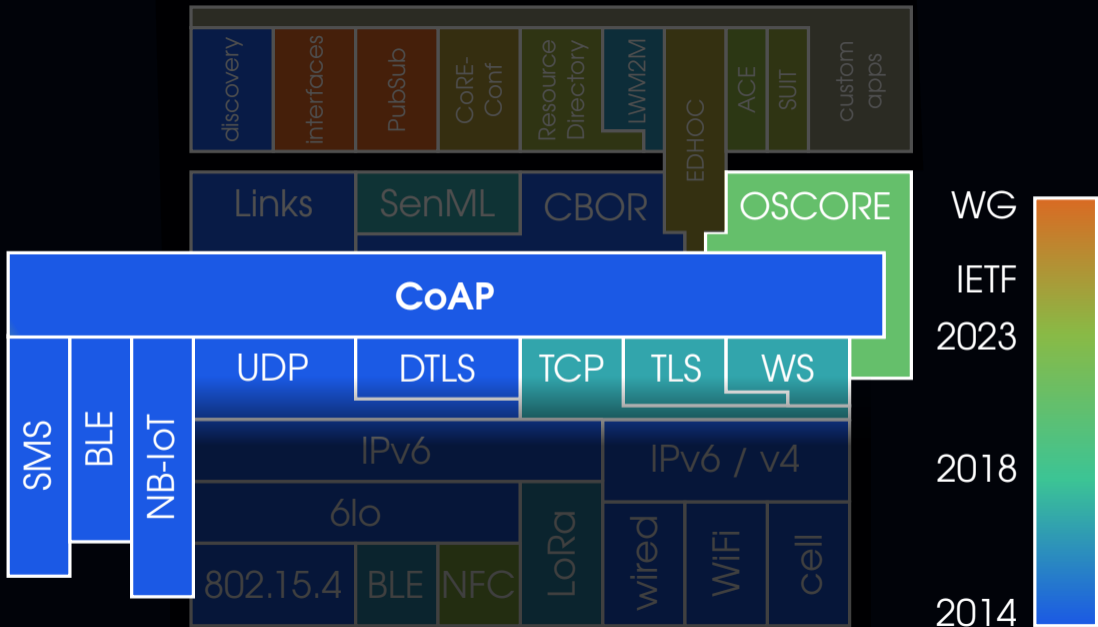


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Different framing / ... Modified details ... Identical options

UDP
DTLS

UNIX sockets

SLIP

NB-IoT

LoRaWAN

SMS

Maturity

Similarity with
CoAP-over-UDP

I²C
SPI
1-wire
CAN bus
Zigbee
(Web)USB
XMPP
SCTP

Bundle

GATT

WebSockets
TCP
TLS
OSCORE

QUIC

Fully specified

.....

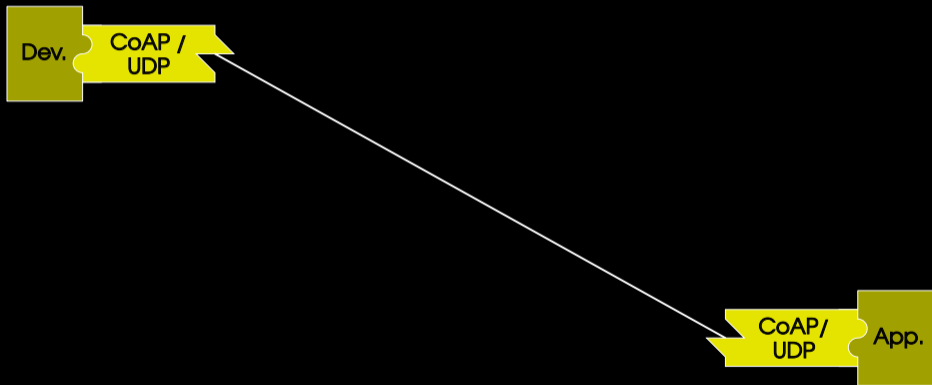
Draft

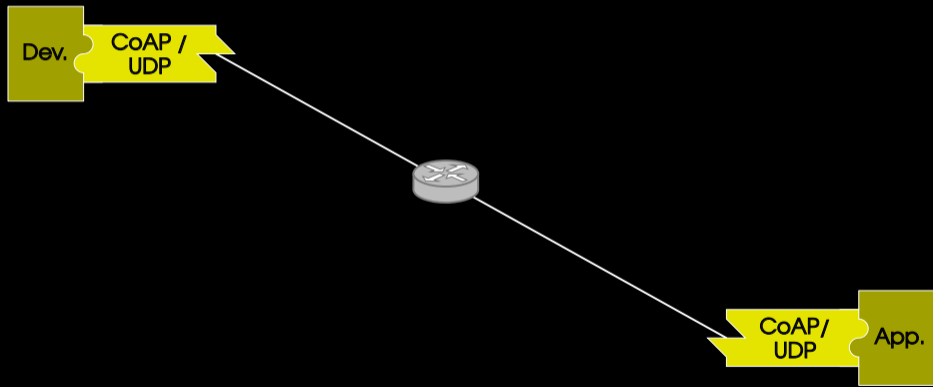
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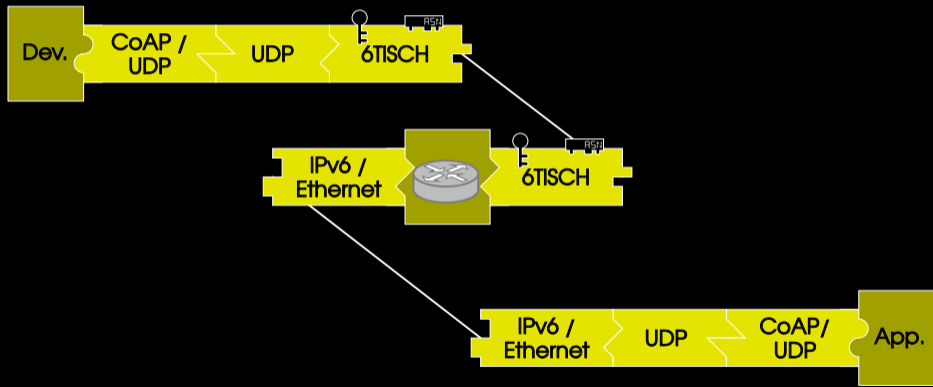
Sketch

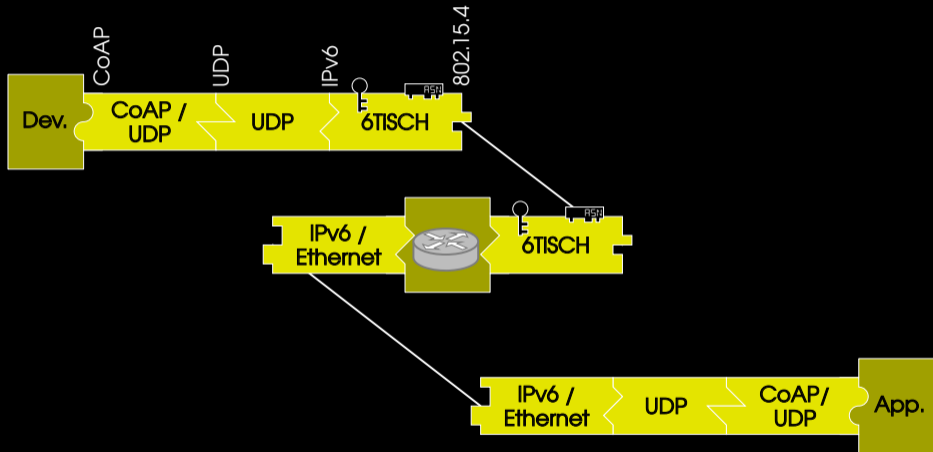


Idea





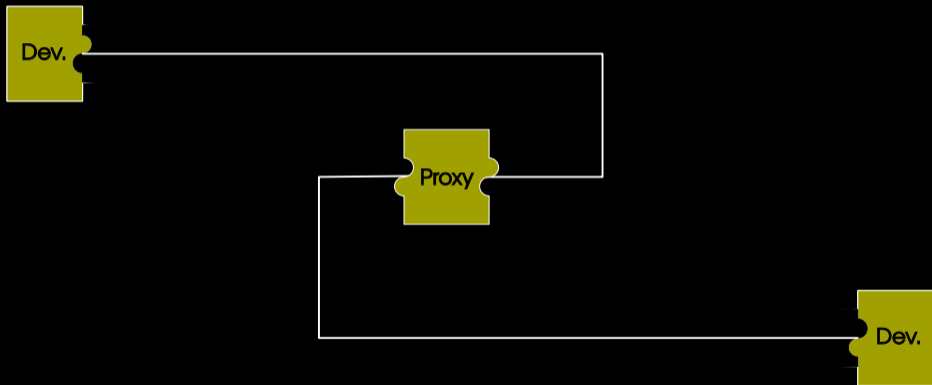


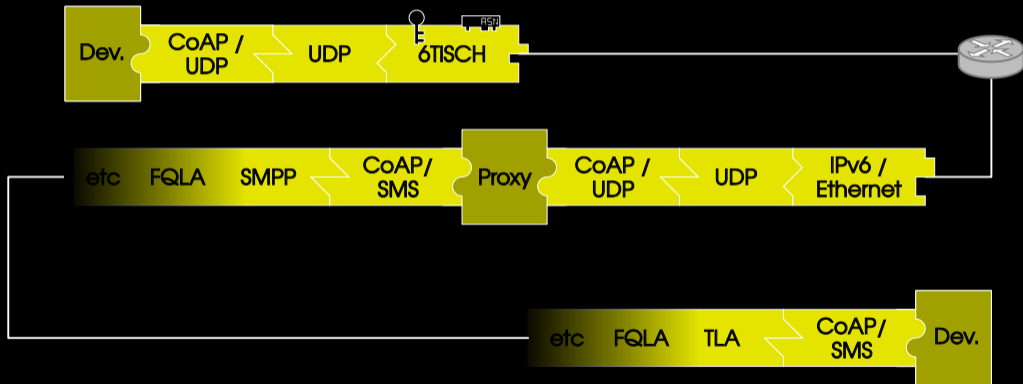


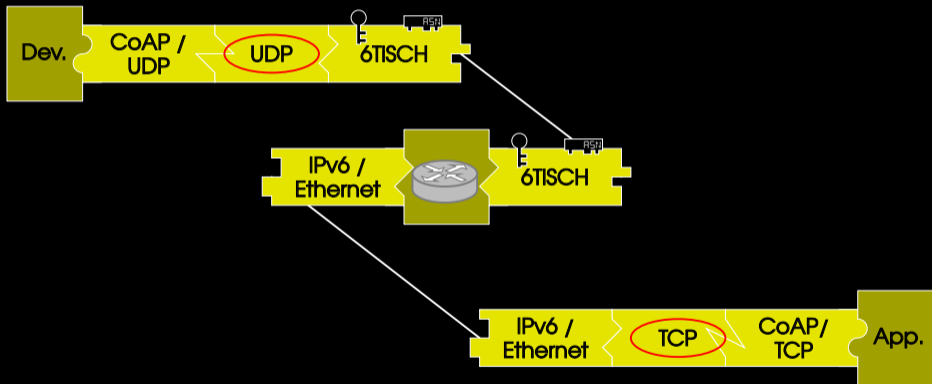


No common path to the wire.



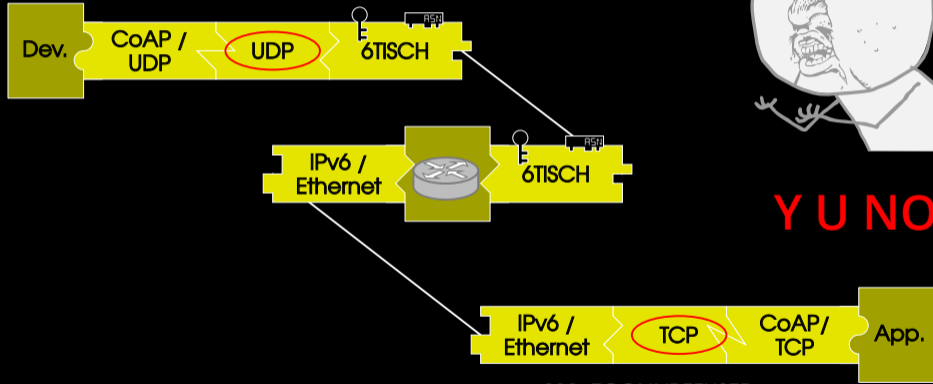
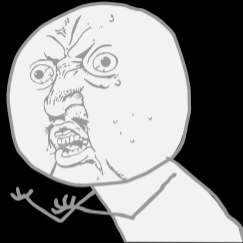






111: ECONNREFUSED

CON

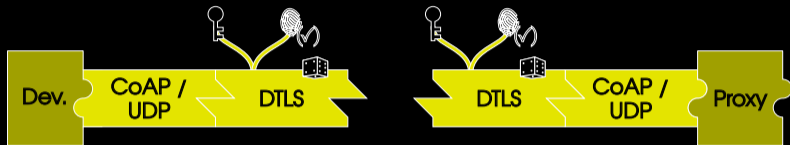


Y U NO ACK?

111: ECONNREFUSED

Issues?

- ▶ Fragmentation
- ▶ Security terminated



Different framing / ... Modified details ... Identical options

Maturity

Legend:
no shared IP
IP available
uses IP

Similarity with CoAP-over-UDP

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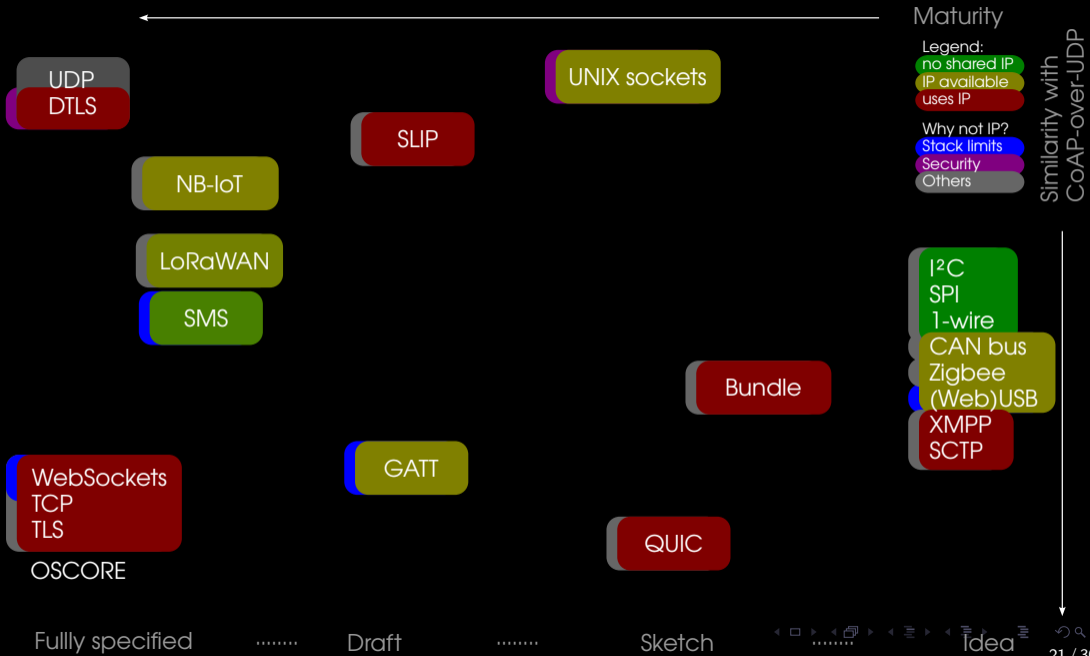
QUIC

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Draft

Sketch

Different framing / ... Modified details ... Identical options



Maturity

Legend:

- no shared IP
- IP available
- uses IP

Why not IP?

- Stack limits
- Security
- Others

Similarity with CoAP-over-UDP

Fully specified

Draft

Sketch

Idea

CoAP on RIOT

- ▶ CoAP-over-UDP and DTLS
- ▶ Others useful?

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Draft

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Sketch



Idea

CoAP over UDP

- ▶ Base transport: UDP
- ▶ Header items: Type (CON/NON/ACK/RST), Code, Message ID, Token
- ▶ Reliability: CoAP does retransmits
- ▶ Ordering: None – Observe option carries numeric value

CoAP over Serial / slipmux

- ▶ Base transport: Serial line running an extended SLIP
- ▶ Header items: Type (CON/NON/ACK/RST), Code, Message ID, Token
- ▶ Reliability: CoAP does retransmits
- ▶ Ordering: Full ordering, but Observe defined as in UDP
- ▶ Extras: 2 Byte check-sum integrated in CoAP side

CoAP over TCP

- ▶ Base transport: TCP
- ▶ Header items: Length, Code, Token
- ▶ Reliability: Provided
- ▶ Ordering: Provided – Observe is empty

CoAP over GATT

- ▶ Base transport: Bluetooth Low Energy's GATT
- ▶ Header items: 1-bit Message ID and confirmation, Code, Token
- ▶ Reliability: Partially provided
- ▶ Ordering: Provided – Observe is underspecified

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Sketch



Idea

CoAP-over-everythin in RIOT: What do we need?

- ▶ Header details hidden from application code
- ▶ Transport type metadata provided to application
Alternatively: Higher level abstractions.
- ▶ Flexible representations of underlying addresses
- ▶ Driver-like model for CoAP transports

Thanks for having me here

Slides and more links on <http://christian.amsuess.com/presentations/2023/summit-coap-over-everything/>

