CoAP an introduction

Bifrost workshop
2012-11-28
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CoAP/overview

- Internet-Of-Things (IoT)
- CoAP (Constraint Application Protocol)
- IETF standard (Draft)

CoAP/overview

- Machine-to-Machine (M2M)
- Small footprint, RAM, ROM
- URI (Uniform Resource Identifier)

  mapping considered

CoAP/overview

- RESTful client server compare http:
- Resource Discovery
- UDP
  - Reliable unicast
  - Best effort multicast
- Proxy and Caching is simple

CoAP/message type

- Comfirmable message
- Non-comfirmable message
- Ack message
- Reset message
  - Piggy-backed
  - Seprate

CoAP/transport

- Default UDP but required

  DTLS (Datagram TLS)
- TCP
- SCTP

CoAP/protocol

- 4 byte header
- Options
- Payload
  - uint (unsigned integer)
  - string
  - opague
- Endpoint
  - IP addr, UDP port

CoAP/protocol header

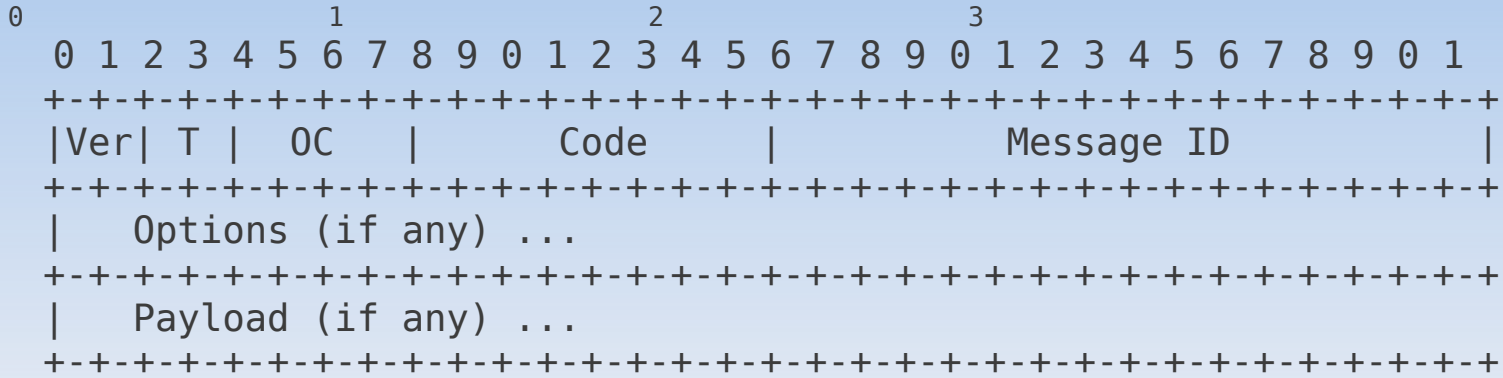


Figure 7: Message Format

3.1. Header Format

The fields in the header are defined as follows:

Version (Ver): 2-bit unsigned integer. Indicates the CoAP version number. Implementations of this specification MUST set this field to 1. Other values are reserved for future versions.

Type (T): 2-bit unsigned integer. Indicates if this message is of type Confirmable (0), Non-Confirmable (1), Acknowledgement (2) or Reset (3). See Section 4 for the semantics of these message types.

Option Count (OC): 4-bit unsigned integer. Indicates the number of options after the header (0-14). If set to 0, there are no options and the payload (if any) immediately follows the header. If set to 15, then an end-of-options marker is used to indicate the end of options and the start of the payload. The format of options is defined below.

CoAP/pkt-size

- Message size
  - Must fit in a single IP datagram
    - Default MTU 1280 bytes
    - 6LOWPAN 127 bytes
    - WSN based on IEEE 802.15.4 127 bytes

CoAP/RESTful

- CoAP Request/Response semantics
  - GET, POST, PUT, DELETE

    Easy to map to HTTP
- Cache and Proxy possible
- Token to match. Request/Respose pairs

CoAP/URI

coap URI

coap://example.se:5683/~sensors./temp1.xml

coaps URI

coaps://example.se:XXXX/~sensors./temp1.xml

CoAP/Resouce Discovery

Endpoint resource discovery (IP addr is known)

(Knowing or learning URI namspace)

- ct (content type) web linking RFC5988
- Multicast: ALL-COAP-NODES
  - Some tricks to read.

CoAP/Secure

- DTLS (Datagram TLS)
- IPSEC alternative
  - Key sharing problems
  - Resource problems
  - Cerificate problems

CoAP/HTTP mapping

- Request/Response model is mapped HTTP
  - Not messages, non-confirmable
- Proxy CoAP → HTTP
- Proxy HTTP → CoAP

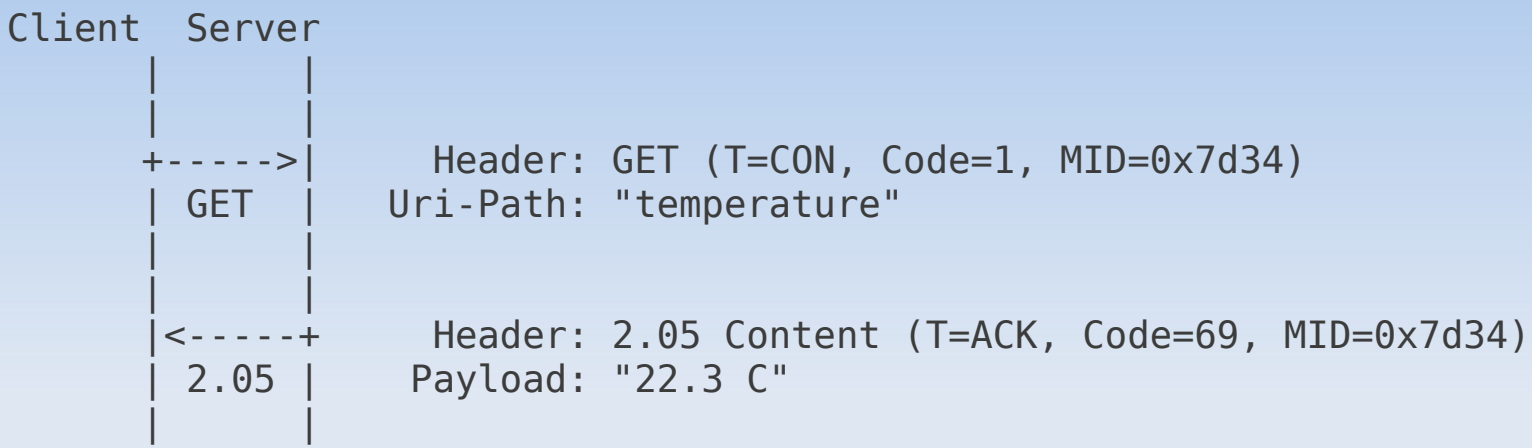
- Proxy is man-in-the middle
  - Security issues
  - Key sharing problems

Caching. Consider.

CoAP/implementations

- Contiki-2.6
  - ETH Zurich
    - 8.5 kB ROM
    - 1.5 kB RAM
- Linux → libcoap
- TinyOs (libcoap)
- Firefox CoAP plugin

CoAP/example



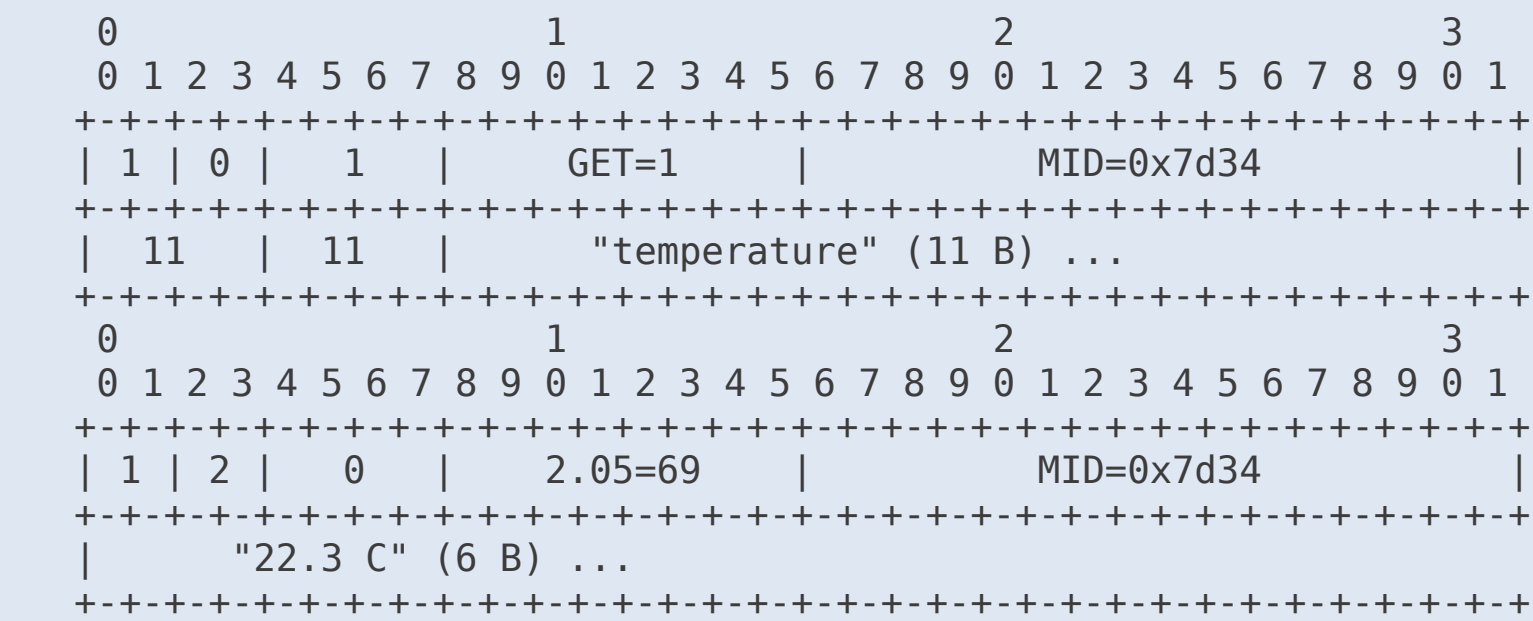


Figure 16: Confirmable request; piggy-backed response

CoAP/additional standards

- Blockwise transfers in CoAP (16-1024 bytes)

  draft-ietf-core-block-10

- CoRE Link Format (GET /.well known/core)

  draft-shelby-core-link-format-14

- Observing Resources in CoAP (Observe option)

  draft-ietf-core-observe-07

References

- The Contiki OS. http://www.contiki-os.org/

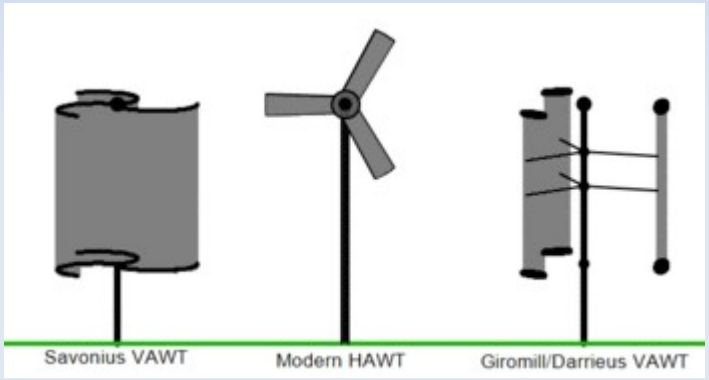
- draft-ietf-core-coap-12 https://datatracker.ietf.org/doc/draft-ietf-core-coap/
- draft-ietf-core-block-10 https://datatracker.ietf.org/doc/draft-ietf-core-block/
- draft-ietf-core-observe-07 https://datatracker.ietf.org/doc/draft-ietf-core-observe/
- draft-ietf-core-link-format-14 https://datatracker.ietf.org/doc/draft-ietf-core-link-format/

- M. Kovatsch, S. Duquennoy, and A. Dunkels, A Low-Power CoAP for Contikiâ in Mobile Adhoc and Sensor Systems (MASS), 2011 IEEE 8th International Conference on, 2011, pp. 855-860, DOI:10.1109/MASS.2011.100.

- IANA: RFCUniform Resource Identifier (URI) Schemes. [RFC4395]

- R. Olsson and J. Laas, Sensd. http://github.com/herjulf/sensd.

Questions



- CoAP/HTTP
- Questions