HAW HAMBURG

A Data-centric View on the Web of Things

ICNRG Interim

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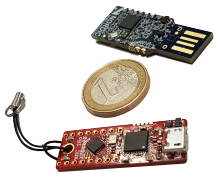
Common Web of Things Deployments

- Constrained IoT devices, gateway, cloud services



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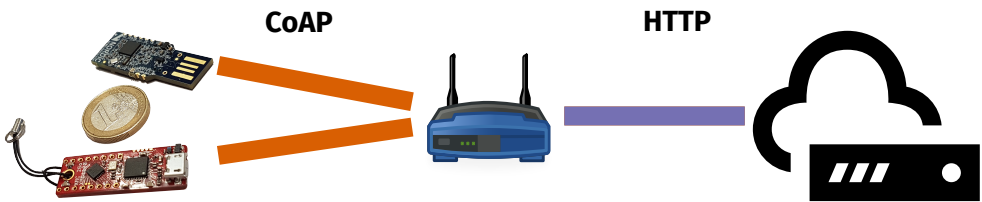
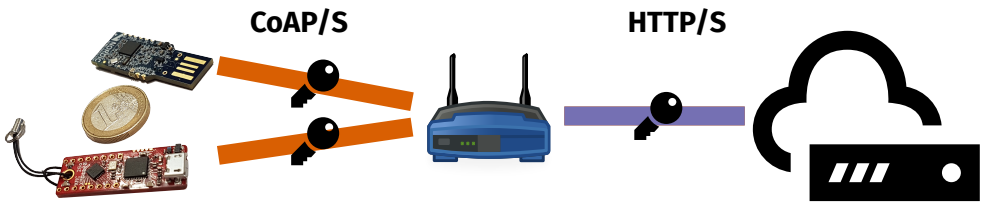
- RESTful deployment using CoAP and HTTP



Common Web of Things Deployments

- Constrained IoT devices, gateway, cloud services
- RESTful deployment using CoAP and HTTP
- Transport layer security (DTLS, TLS) between endpoints



Challenges

Network Resilience

- Packet loss due to radio interference and exhausted buffer resources

→ End-to-end retransmissions with repeated link traversals

End-to-End Security

- Security termination due to mobility and protocol conversion

→ Costly session establishments and complex trust infrastructure

Benefits of Information-centric Properties for the IoT

- **Stateful forwarding** and **caching** shorten request paths and reduce link traversals on retransmissions
- **Content object security** enables end-to-end security and reduces session management complexity

Constructing an Information-centric Web of Things

[ICN'20] Toward a RESTful Information-Centric Web of Things [...]

Communication Model & Flow Control

- CoAP GET method provides request-response paradigm
- Acknowledgments for requests and optionally for responses

Stateful Forwarding & Caching

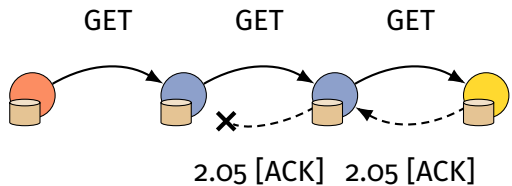
- CoAP proxies [RFC7252] forward requests and relay back responses
- Proxies perform caching, namespace or protocol translation

Content Object Security

- OSCORE [RFC8613] provides Authenticated Encryption with Associated Data
- Confidentiality, Integrity, Request–Response binding, Non-replayability

Deploying an Information-centric Web of Things

- Proxy on each forwarding node
- Hop-wise retransmissions & caching
- OSCORE protected messages



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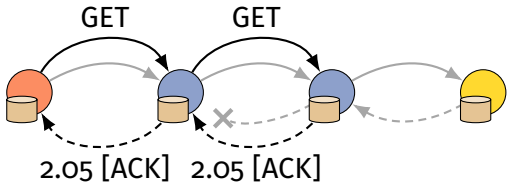

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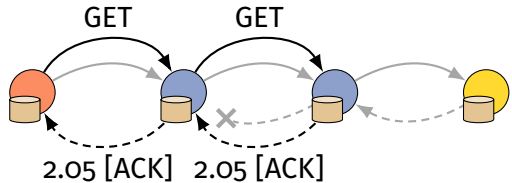
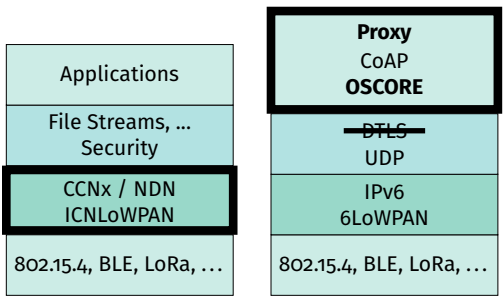




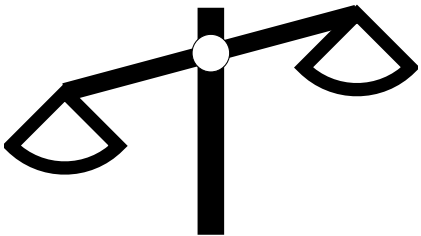
- Reflects ICN properties on app layer
- Forwards on service names
- Beware of request idempotency!

bonus: link-local IPv6 addresses benefit 6LoWPAN compression

Benefits on a Scale

CoAP

- Improved resilience
- Reduced latency
- Location independence of data



CCNx / NDN

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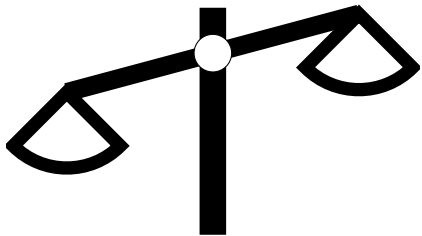

CCNx / NDN

- Early deployment chance?
- Response acknowledgments?
- Efficient cache revalidation (ETag)?

Ongoing Efforts

- Integrate the inherent multicast support of CCNx / NDN into information-centric CoAP deployments
- Assess request aggregation and response deduplication in CoAP for idempotent requests and static content (and dynamic content?)
- Evaluate secured group communication (*e.g.*, Group OSCORE) and effects on cachability of protected messages

Thank You!