

A Data-centric Deployment Option for CoAP

draft-gundogan-core-icncoap-00

CoRE WG @ IETF 110

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Information-Centric Networking (ICN)

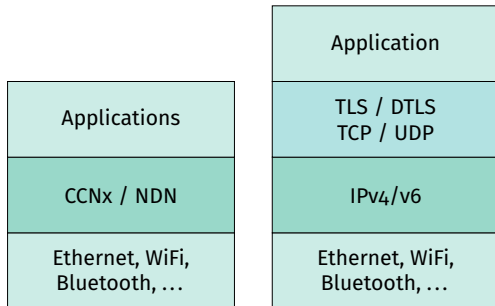
- ▶ Alternative networking paradigm
- ▶ Specialization on content delivery
- ▶ Loose coupling of data and host endpoints

Prominent architectures

- ▶ Named-Data Networking (NDN)
- ▶ Content-Centric Networking (CCNx)

Protocol features

- ▶ Name-based, stateful forwarding
- ▶ In-network content caching
- ▶ Content object security



Research indicates: promising candidate for IoT deployments

Benefits of Information-centric Properties for the IoT

**Stateful
Forwarding**

Caching

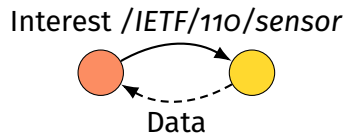
**Content
Object Security**

- ▶ **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

Technical Aspects of NDN / CCNx

Communication Model

- ▶ Request–response paradigm
- ▶ Layer 3 primitives: Interest & Data



Technical Aspects of NDN / CCNx

Communication Model

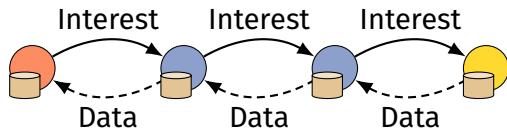
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- ▶ Layer 3 primitives: Interest & Data

Interest /IETF/110/sensor



Forwarding & Flow Control

- ▶ Request state on each hop
- ▶ Hop-wise caching & retransmissions



Technical Aspects of NDN / CCNx

Communication Model

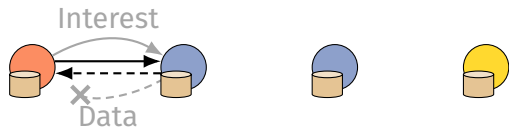
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Forwarding & Flow Control

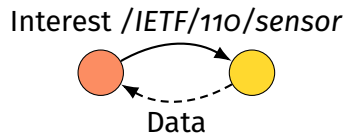
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Technical Aspects of NDN / CCNx

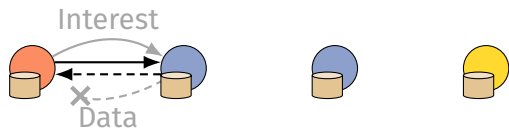
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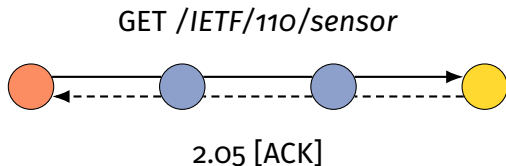
Content Object Security

- ▶ Autonomously verifiable data packets using HMAC or digital signatures
- ▶ End-to-end protection beyond untrusted gateways

Constructing a Data-centric CoAP Deployment

Standard deployment

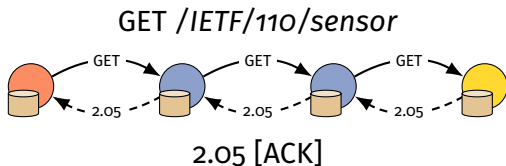
CoAP client / server + IPv6 forwarders
End-to-end retransmissions



Data-centric deployment

CoAP client / server + **CoAP proxies**
Hop-by-hop request state
Hop-wise caching & retransmissions
Forwarding decision on names

bonus: link-local IPv6 addresses
for better 6LoWPAN compressibility

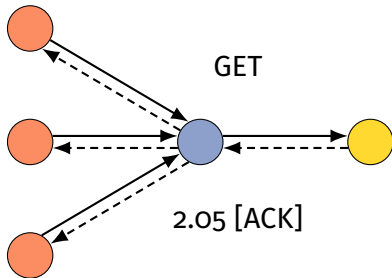


[ACM ICN'20] Toward a RESTful Information-Centric Web of Things [...]

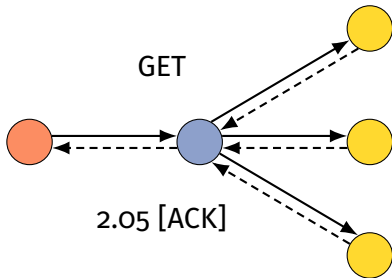
Multi-party Communication

- ▶ CCNx / NDN have integral support for multi-party communication
- ▶ Data-centric CoAP deployments inherit the same feature set

Request aggregation & Response fan-out



Request fan-out & Response deduplication



Conclusion & Outlook

Takeaways

- ▶ Improved network resiliency & reduced latency
- ▶ Location independence of content & mobility support
- ▶ Efficient multi-party communication
- ▶ New perspective for CoAP deployments

Future Work

- ▶ Dynamic proxy discovery