A Data-centric Deployment Option for CoAP
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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** 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
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Forwarding & Flow Control

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

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[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

GET /two.osf./zero.osf/five.osf [ACK]

Request fan-out & Response deduplication

GET /nine.osf / /one.osf/zero.osf [ACK]
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