

CCN

CCNx 1.0 Internet of Things Architectural Overview

Computer Science Laboratory
Networking & Distributed Systems

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CCN IoT Platform

Accommodate multiple IoT protocols

Improve performance and availability

- CCN Caching, request aggregation, packet security, mobility and untethered operation

Provide security

- CCN packet-level security (encryption, authentication, provenance)

Device and service discovery

CCN discovery protocols

Name all sensor data, operations, storage and computation

CCN IoT Platform

Aggregate, Compute, and Cache

Abstracts multiple IoT protocols to CCN

Provides CCN name semantics unifying

- IoT protocol data, communication and control.
- Named computation on named IoT data
- Store named data for future processing

Perform computation on IoT data

- Store results, fetch from other sources

Store historical, synthesized, and raw data

CCN IoT Aggregator

Multi-protocol termination point for IoT.

- MQTT, DDS, CoAP, XMPP, STOMP, HTTP, and others.
- Use the CCN security model to unify the IoT models.
- CCN Message Queue (CCNmq) buffering inbound and outbound IoT messages.

CCN Named Resources abstract:

- Protocols
Specific IoT Protocol and packet operations
- Values
Protocol and Packet fields
- Control
Control and management of the IoT protocols

CCN IoT Computation

Computation and analysis from the edge to the core

IoT messages are:

- Received. Processed. Stored.
- Triggers hook to additional retrieval and processing.

Interoperates with other CCN IoT edge devices.

- Enables aggregating the aggregators.

Presents IoT computation, algorithms as CCN named data.

- Programming model of CCN named data and functions.

CCN IoT Cache and Data Model

IoT messages are:

- Organized by topic, publisher, etc.
- Stored in memory for subsequent processing and delivery

Policies for cached message lifecycle:

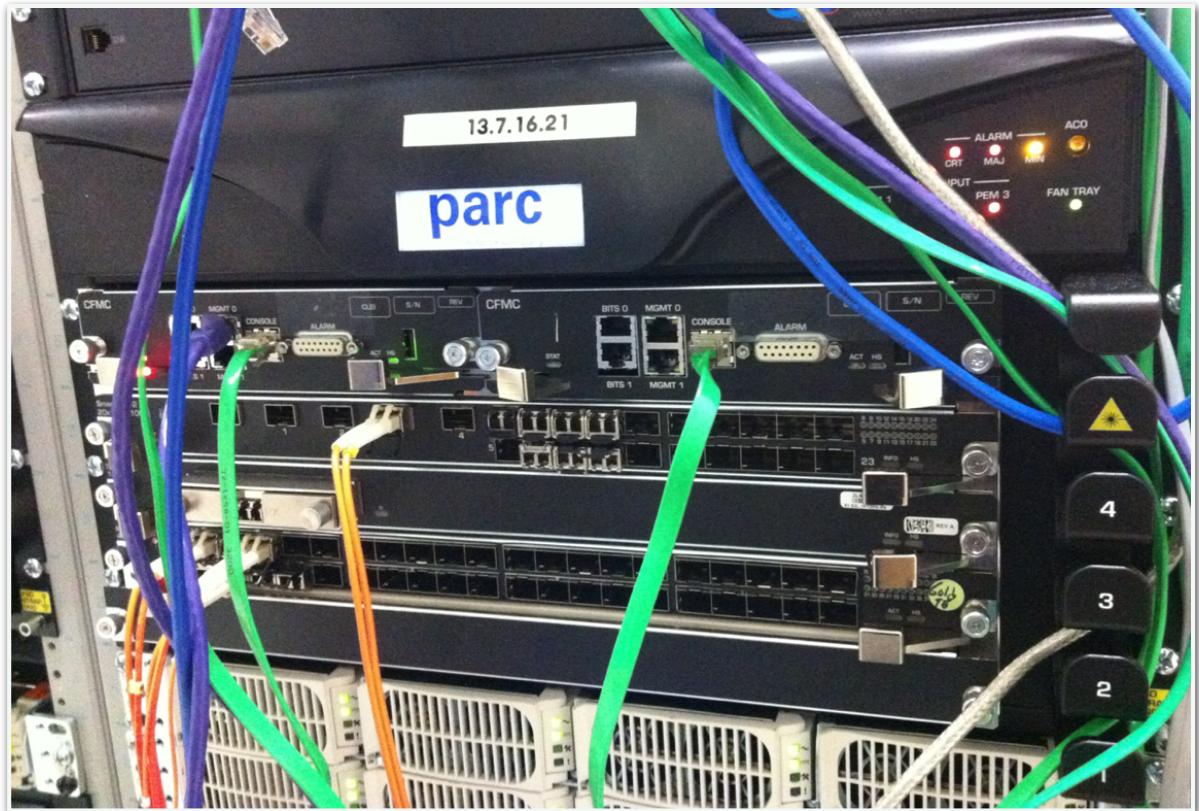
- Duplicate messages
- Time-to-Live
- Access control

Data is named via a organization taxonomy

CCN IoT Edge

“Mini”

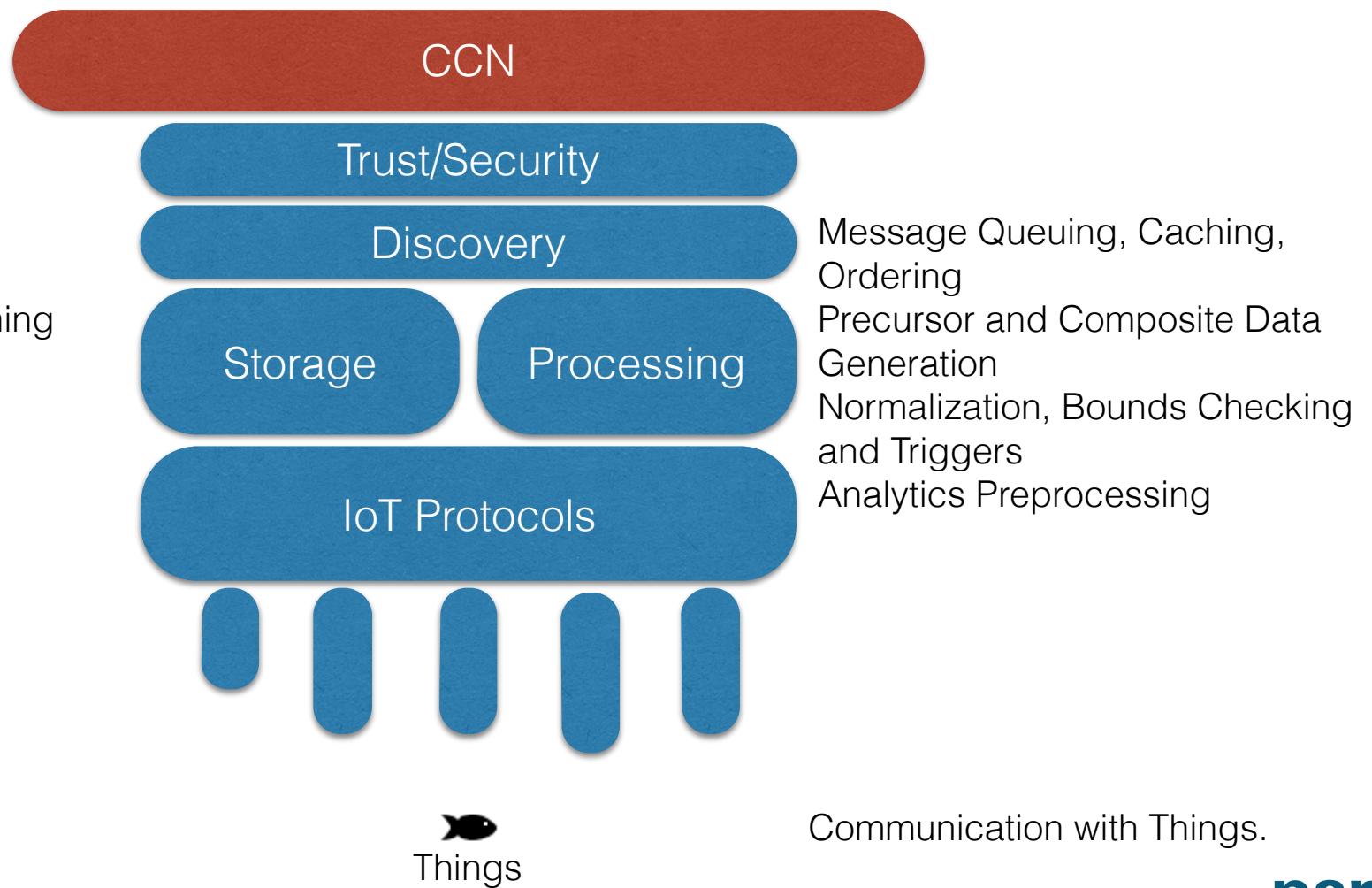
- Q1CY2014 (start)
- High Capacity



Basic Software Architecture

CCN Transport Stack
and communication

Message Queuing, Caching
Data Caching
Intermediate results.



Contemporary Applications

Energy

- Monitoring, orchestration, brokering.
- “CCN for Energy” project

Data Center Management

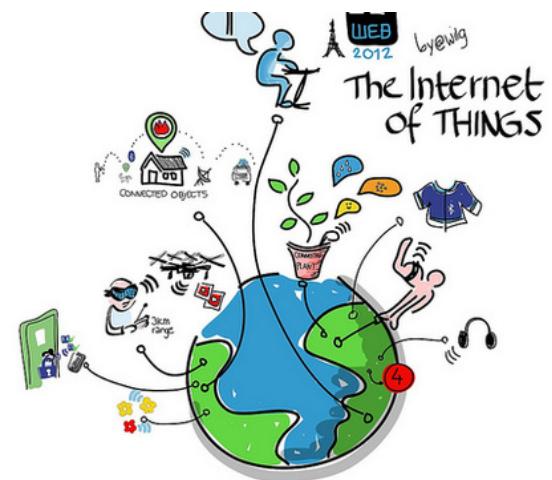
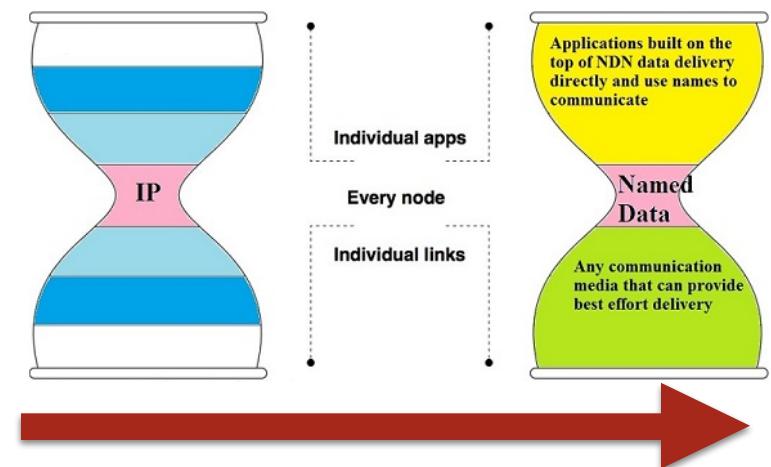
- Network orchestration (network function virtualization)
- Cloud assembly (VM+Storage+Network) management.

Systems and Logistics

- Vehicles, containers, package networking.

CCN For Energy

- CCN is a paradigm shift in networking in which information is accessed by **name** rather than **address**.
- The Internet of Things (IoT) is a rapidly evolving trend in which more devices can be sensed and controlled via the network. Future energy applications will rely heavily on IoT.
- This research aims at positioning CCN as a networking technology ideal for IoT applications, by maturing the CCN architecture with key features like auto-configuration, authentication, privacy, and in-network aggregation.



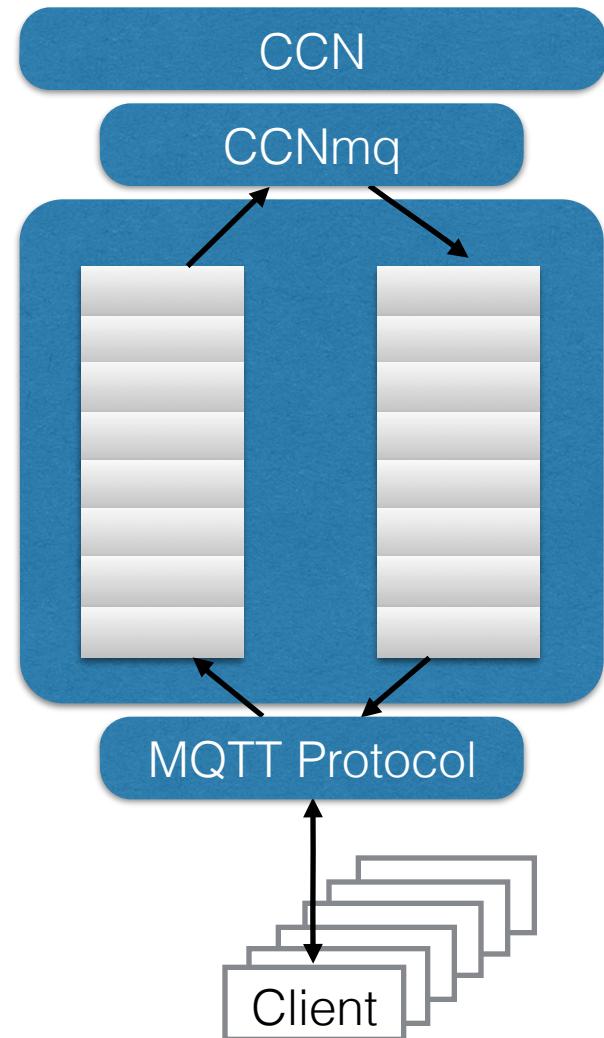
Tiny CCN for MQTT

MQTT Broker offering MQTT messages in CCN.

Maintains queuing and triggers for clients using the CCNmq API.

Enforces/ensures delivery policies for the native message queue protocol(s).

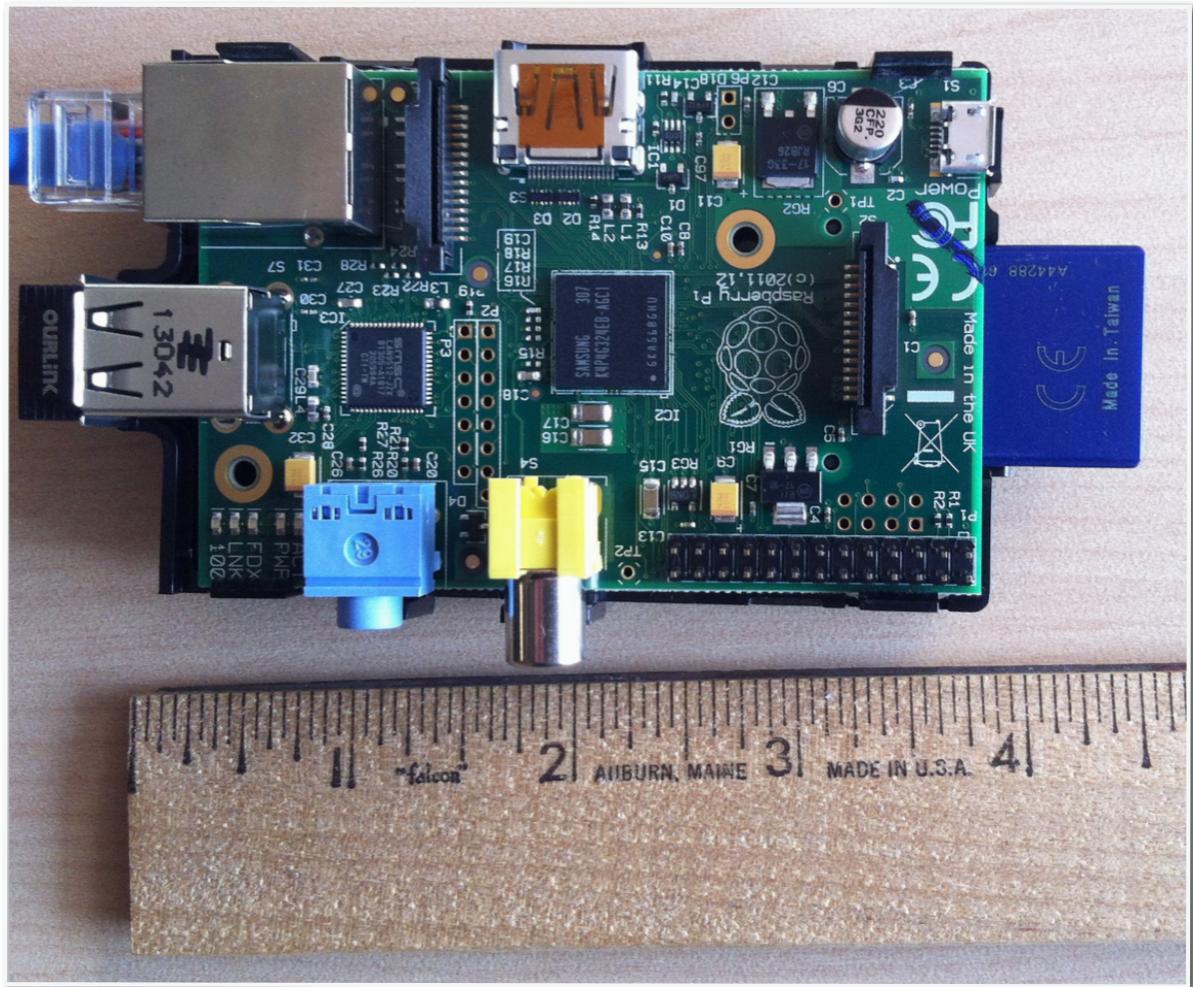
Translates native MQTT to and from CCNmq operations.



CCN IoT Edge

“Micro”

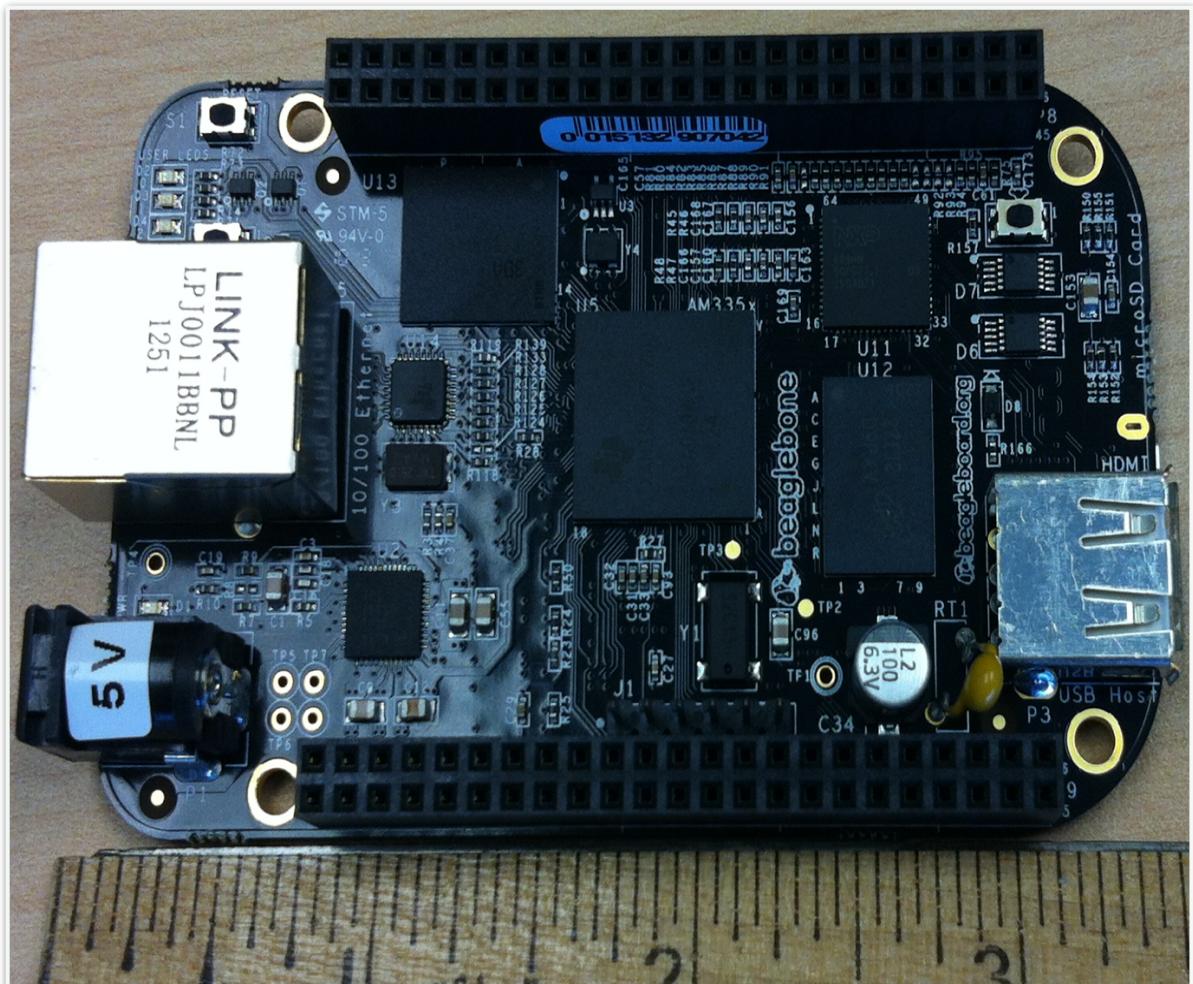
- Q2CY2013
- Raspberry Pi
- 700Mhz ARM 1176JZF
- CCN 0.7.x



CCN IoT Edge

“Micro”

- Q4CY2013
- Beaglebone Black
- 1Ghz TI AM3359
- 512MB DDR3
- .5A @ 5V
- CCNx 0.8 +



CCN IoT for MQTT

