Metadata-based Aggregation of Telemetry Flows

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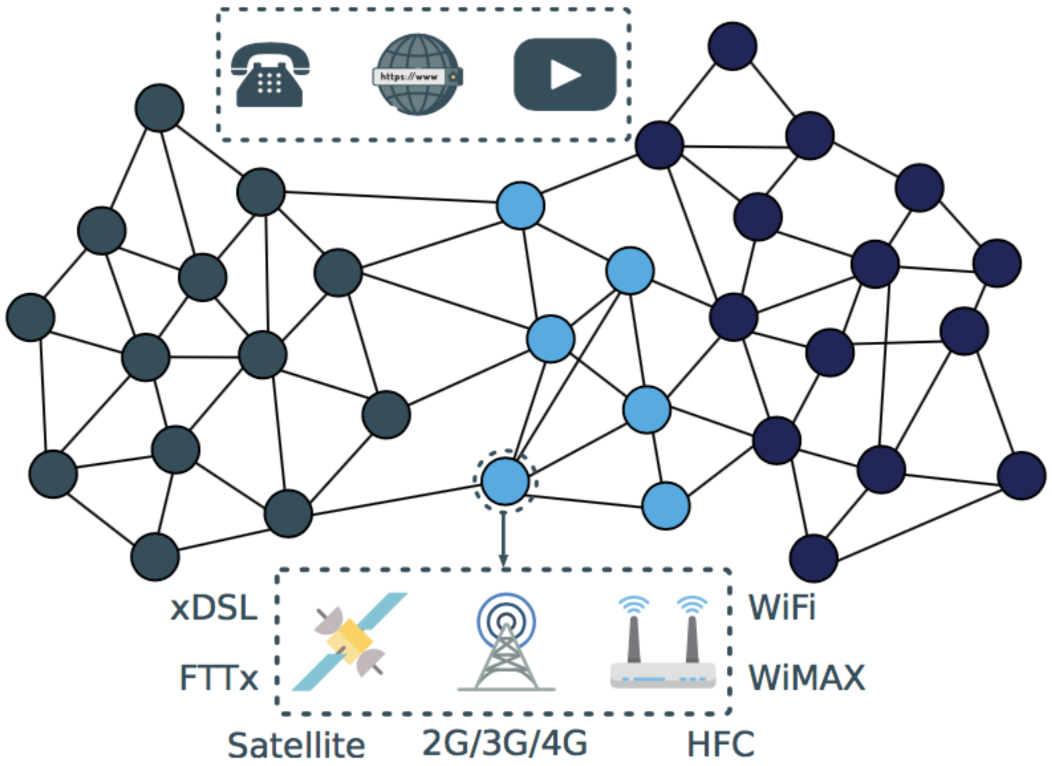
Introduction

The Scenario

- Data is the essential intake for any closed-loop system
  - Avoid poisoning: correct metadata
  - Avoid starvation: sufficient streaming
- Deal with heterogeneity
  - Multi-technology
  - Multi-domain
  - Multi-vendor
  - Multi-…
- And the lessons learned can be applied to action flows in the future, leveraging SDN
  - Intent interfaces
  - Capability models



The goal

- Support the integration of different data flows
  - Open
  - Automated
  - Secure
  - Scalable
- Deal with heterogeneity at all levels
  - Data sources
  - Data models
  - Deployment styles
  - Supporting infrastructures
- A semantic metadata framework for telemetry data
  - Founded on the current results in data model space

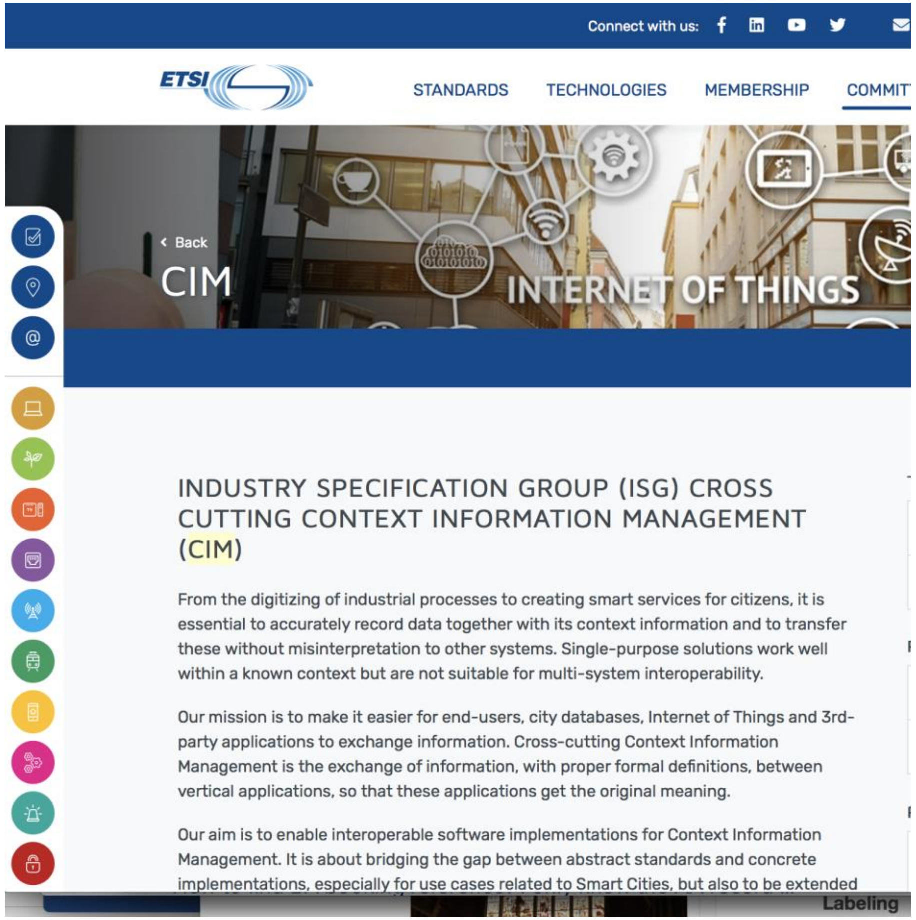
Applying a Semantic Model to Telemetry

- Use the model to describe data flows
  - Sources
  - Consumers
  - Elements in the flow
- And including
  - The identification of the relationships to the flow data model
  - Provenance metadata
  - Security
- Note we are not talking about modeling the whole systems
  - Only the data they provide and/or consume
  - Usable to analyze and normalize flows
  - Without the need of explicit standard alignment
- Extend descriptors
  - Include a protocol for registration, announcements, etc.

Context Information Management

Introducing ISG CIM

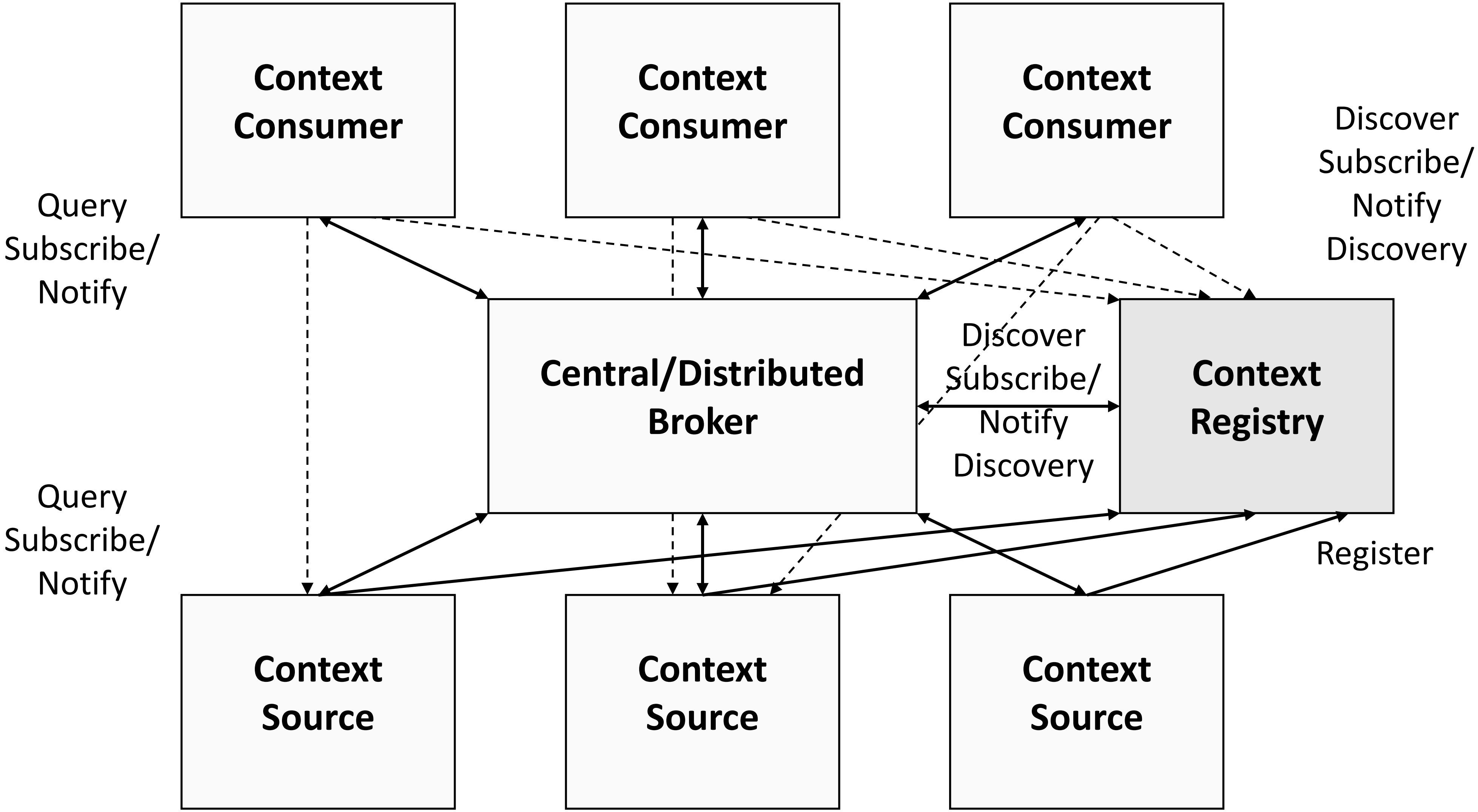
- Focused on mechanisms to deal with context information from many different sources
  - Sharing that information through interoperable data publication platforms.
  - Agnostic to the architecture of the applications sharing information
  - Based on an information model describing entities and relationships
- Currently focused on IoT scenarios
  - Suitable for adaptation to other ones, already documented by the ISG



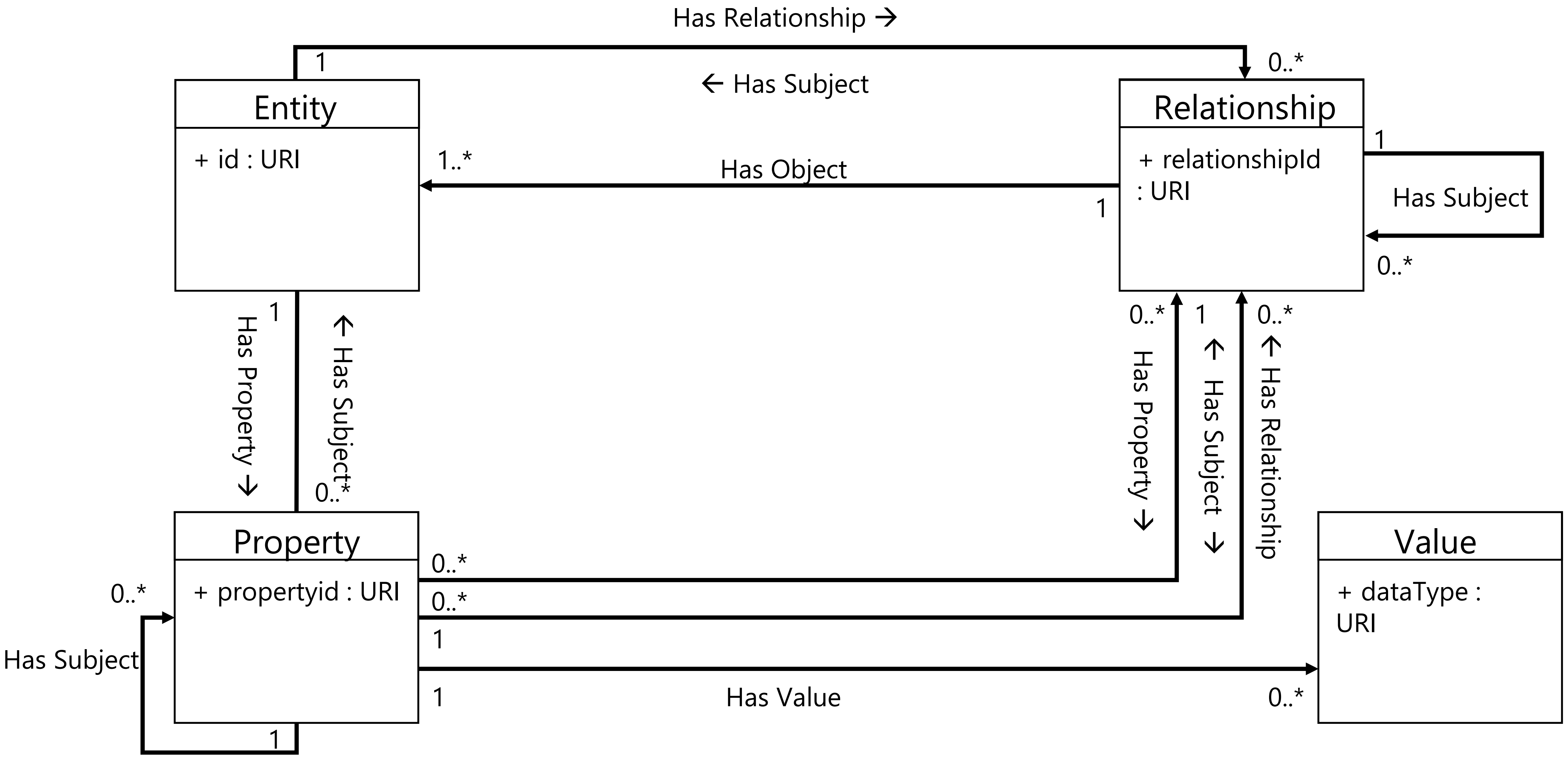
CIM Architecture

- CIM specification does not define a specific architecture
- Three prototypical architectures are presented: Centralized, Distributed and Federated
- Main components:
  - Context Consumer → Request context information from the Broker (e.g. Application)
  - Context Producer/Source → Produce context information (e.g. Router)
  - Central/Distributed/Federated Broker → Response queries / Stores context information
  - Context Registry → Stores the (context) source's context information

CIM Architecture



CIM Information Model



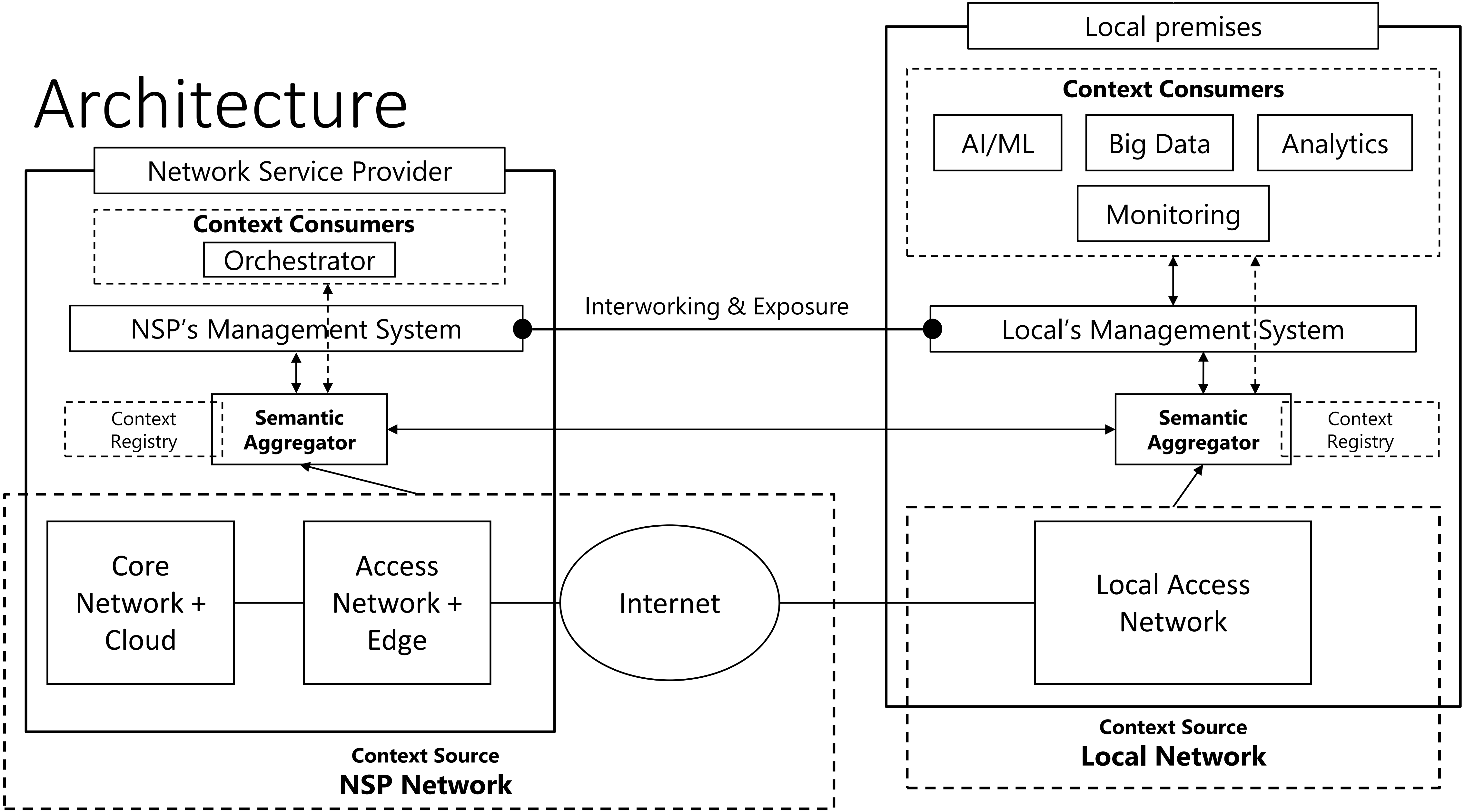
Telemetry Metadata

Telemetry Metadata

Status

- Build general patterns for metadata definition
  - Collect multiple context sources (data sources)
  - Initial definition of some information models
- Use CIM standard as a reference
  - Apply the architectural recommendations in a general architecture
- Build a Semantic Aggregator that make use of new preprocessing/ messaging tools (e.g. Kafka)

Architecture

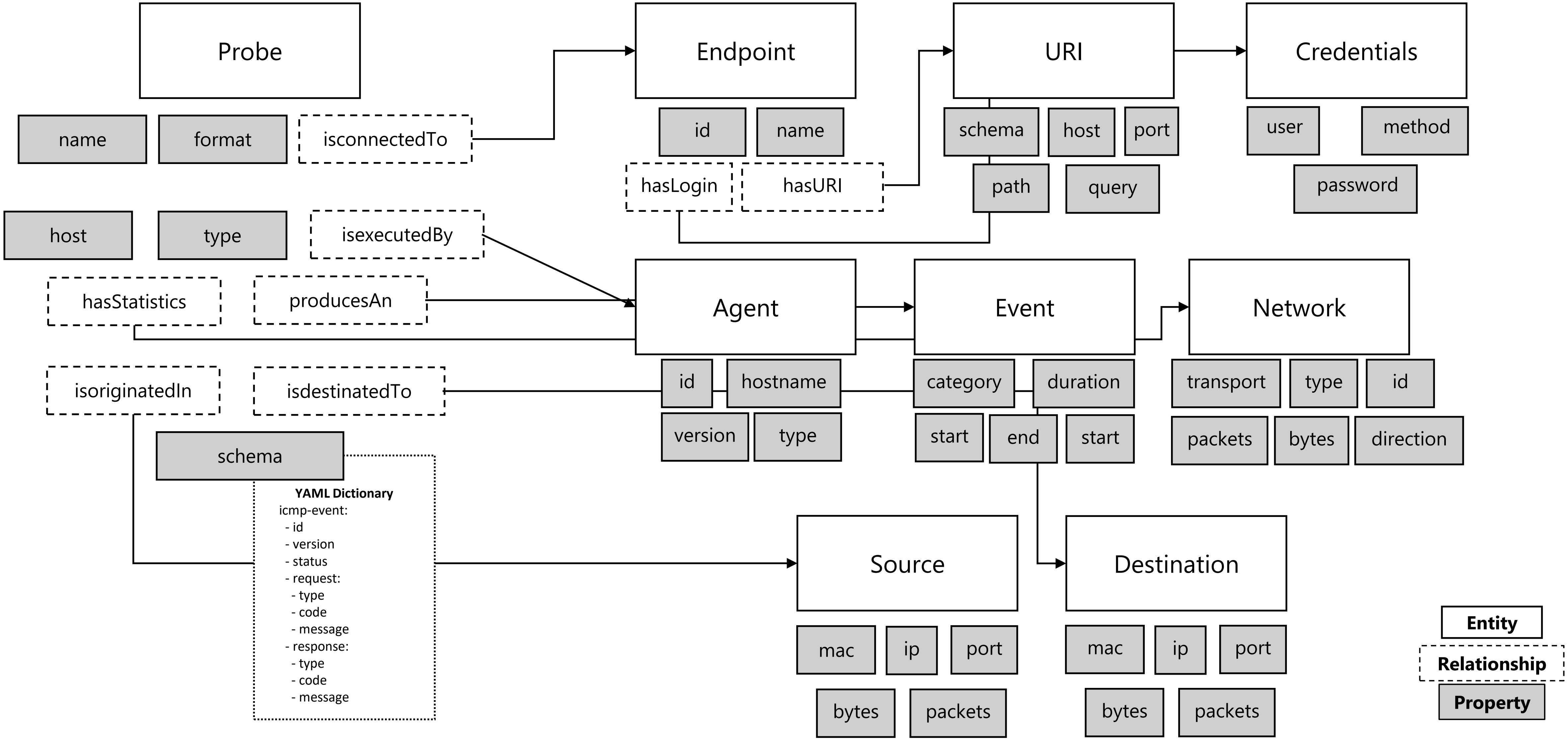


Architecture

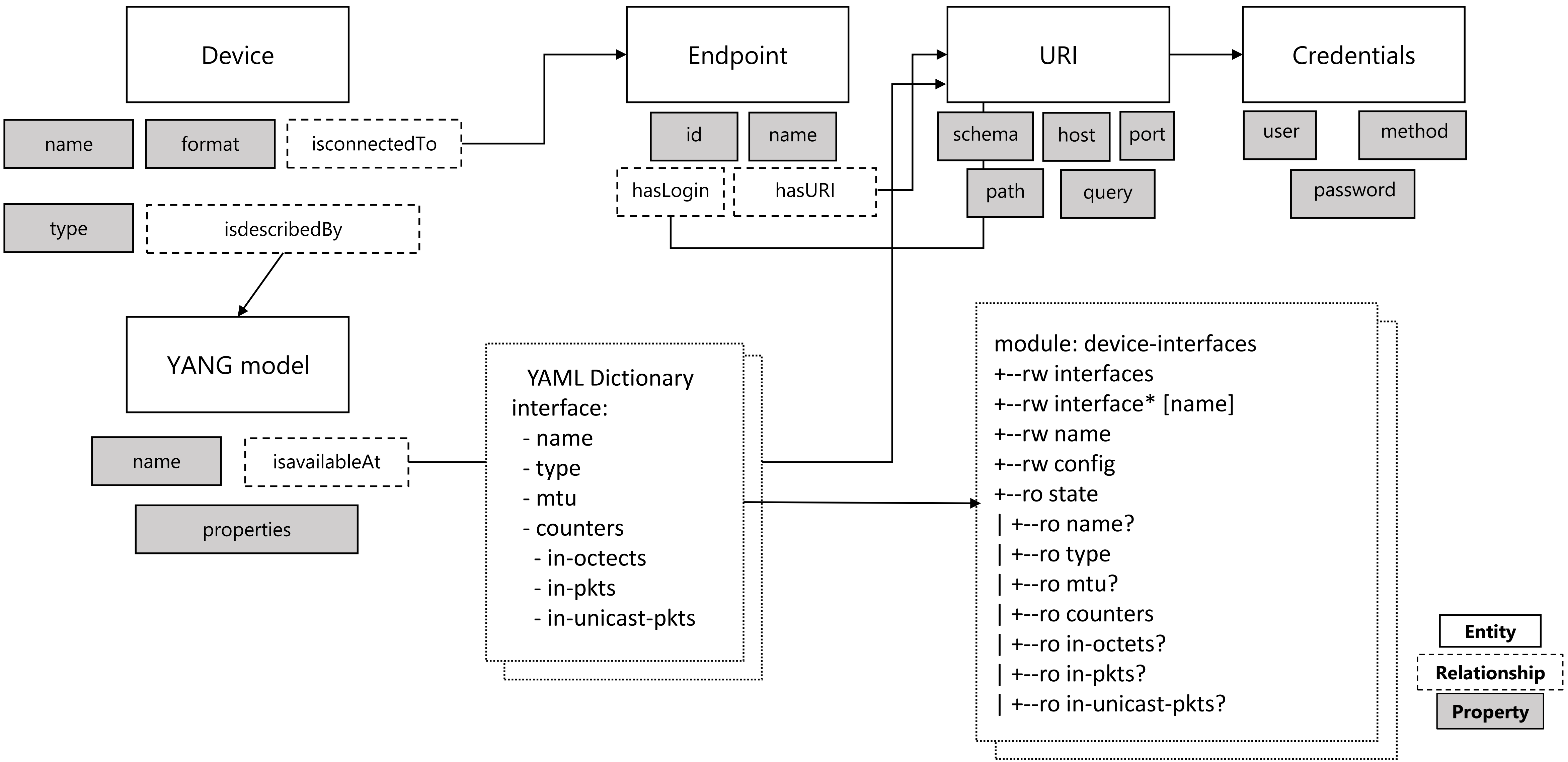
Context Sources (Data Sources):

- Network-based probes:
  - ICMP, HTTP, IPFIX, DNS, etc…
- YANG-based network devices
- In-band Telemety (by means of P4, etc)
- Telemetry for Cloud infrastructures
- Optical devices
- TSDB

Information Model: Network-based probes



Information Model: YANG-based devices



Conclusions

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- Data-driven network management requires the aggregation of heterogeneous sources of data
- A semantic, metadata-based model exists for IoT context data aggregation
- We are exploring the extension of this model to network management
  - Relying on YANG and telemetry frameworks
  - On various application scenarios
- If the RG is interested, we´d be happy to document these in an I-D
  - And look for its further consolidation