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NMRG virtual meeting

Metadata-based Aggregation of Telemetry Flows

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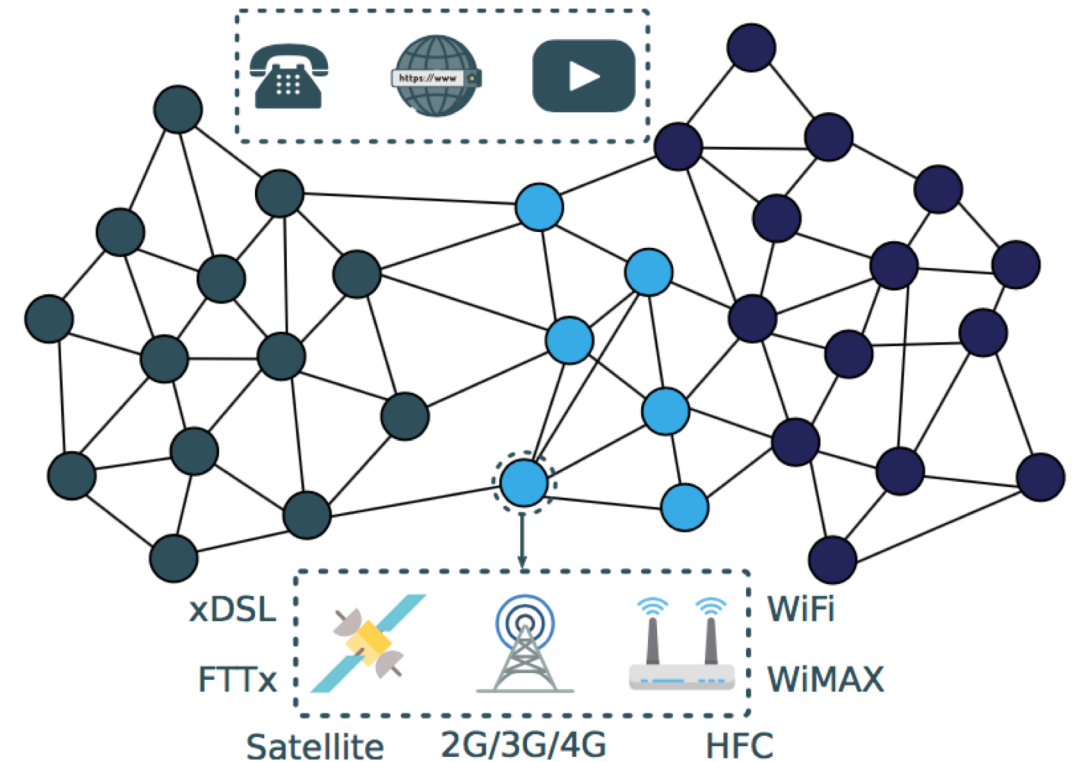
1. Introduction
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Introduction

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

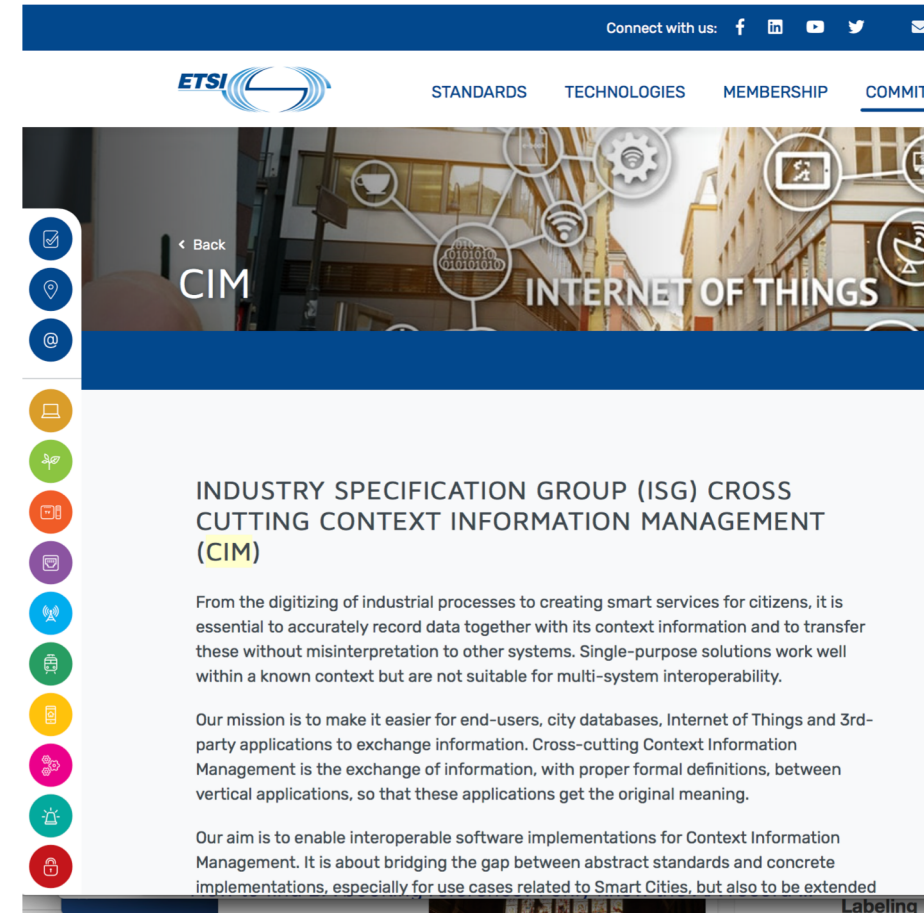
- Use the model to describe data flows
 - Sources
 - Consumers
 - Elements in the flow
- And including
 - The identification of the relationships to the flow data model
 - Provenance metadata
 - Security
- Note we are not talking about modeling the whole systems
 - Only the data they provide and/or consume
 - 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



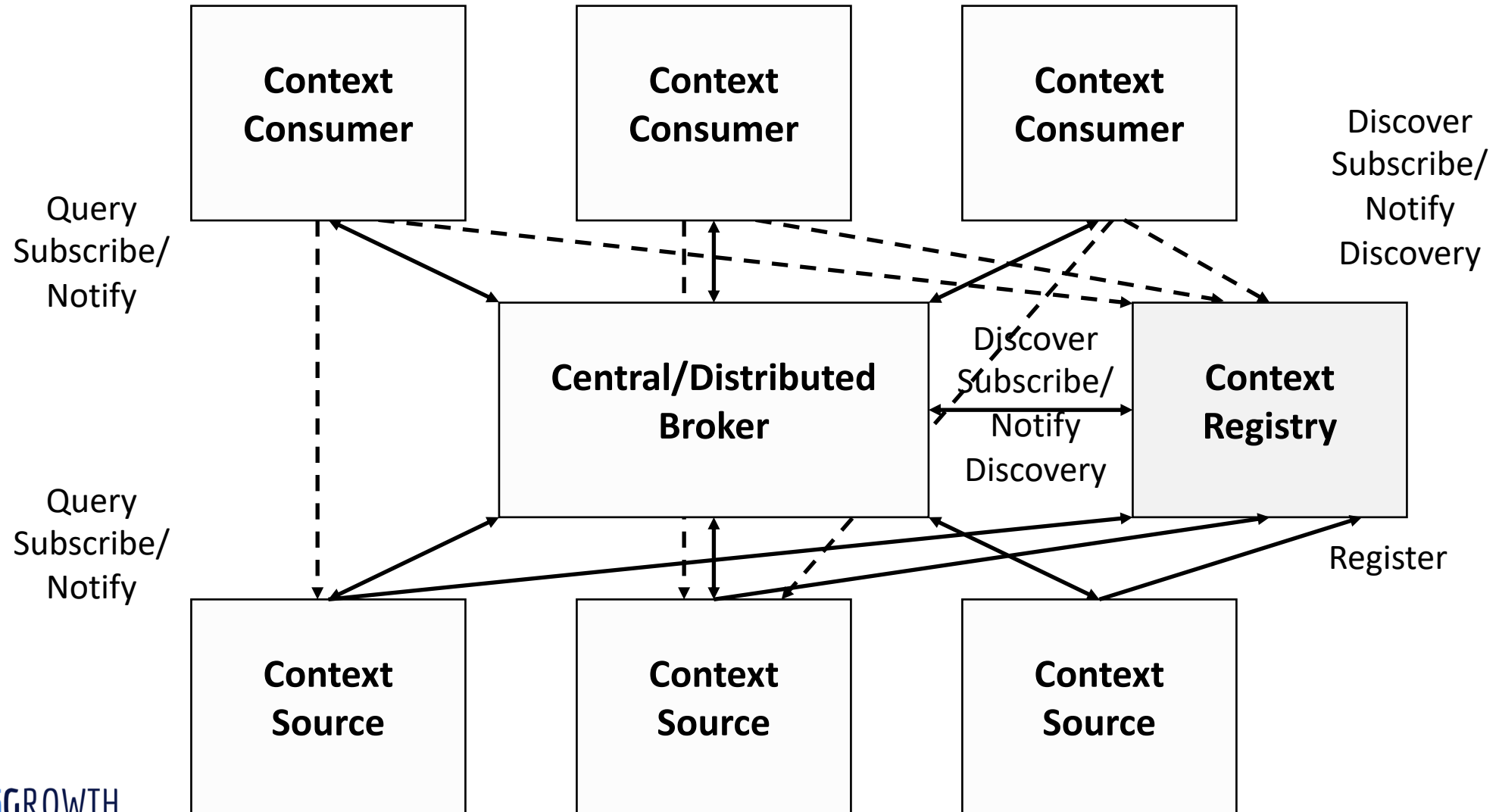
The screenshot shows the ETSI website page for CIM. The header includes the ETSI logo and navigation links for STANDARDS, TECHNOLOGIES, MEMBERSHIP, and COMMIT. The main content area features a large image with the text 'CIM' and 'INTERNET OF THINGS'. Below the image, the title 'INDUSTRY SPECIFICATION GROUP (ISG) CROSS CUTTING CONTEXT INFORMATION MANAGEMENT (CIM)' is displayed. The introductory text reads: 'From the digitizing of industrial processes to creating smart services for citizens, it is essential to accurately record data together with its context information and to transfer these without misinterpretation to other systems. Single-purpose solutions work well within a known context but are not suitable for multi-system interoperability.' The mission statement follows: 'Our mission is to make it easier for end-users, city databases, Internet of Things and 3rd-party applications to exchange information. Cross-cutting Context Information Management is the exchange of information, with proper formal definitions, between vertical applications, so that these applications get the original meaning.' The final paragraph states: 'Our aim is to enable interoperable software implementations for Context Information Management. It is about bridging the gap between abstract standards and concrete implementations, especially for use cases related to Smart Cities, but also to be extended'. A 'Labeling' link is visible at the bottom right of the page.



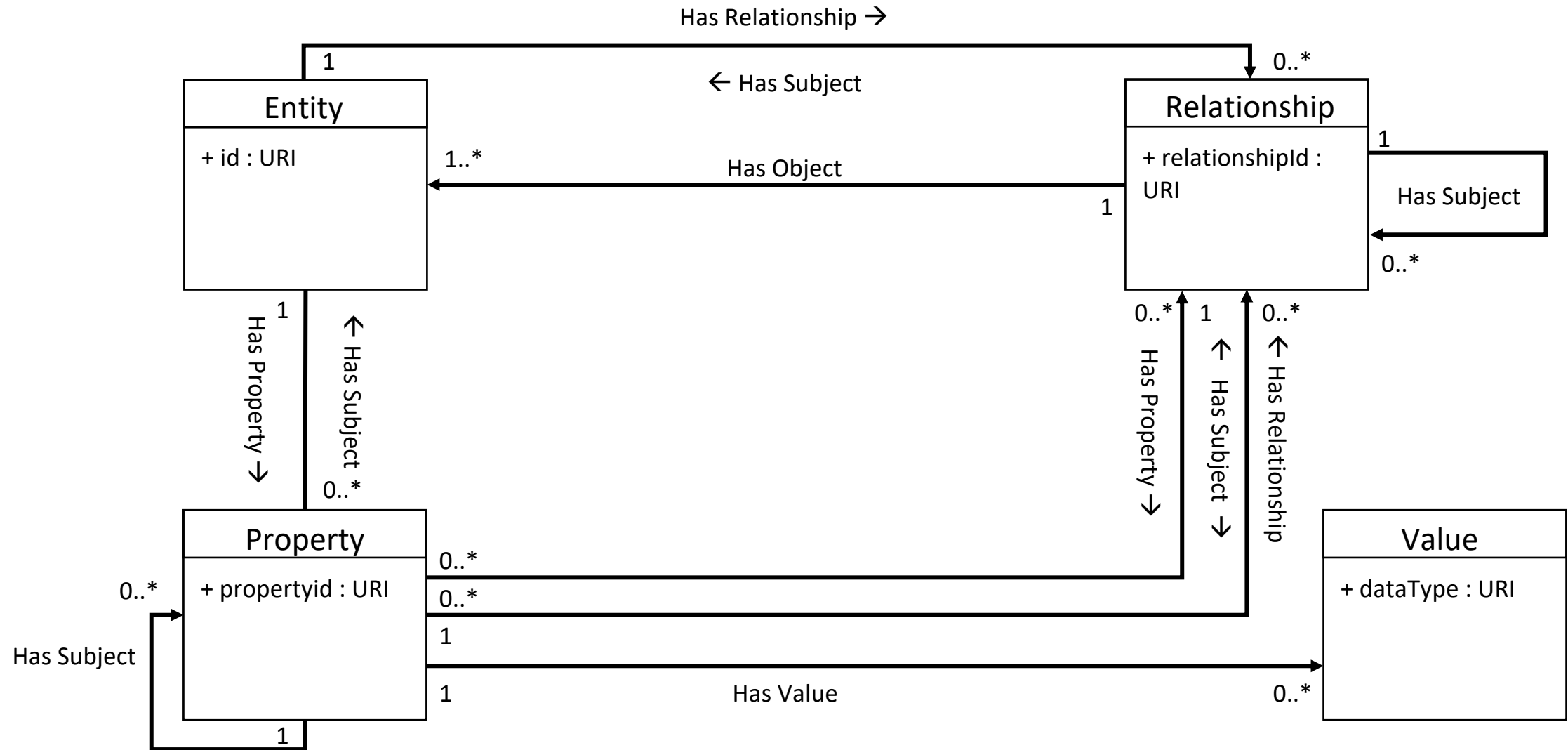
CIM Architecture

- 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





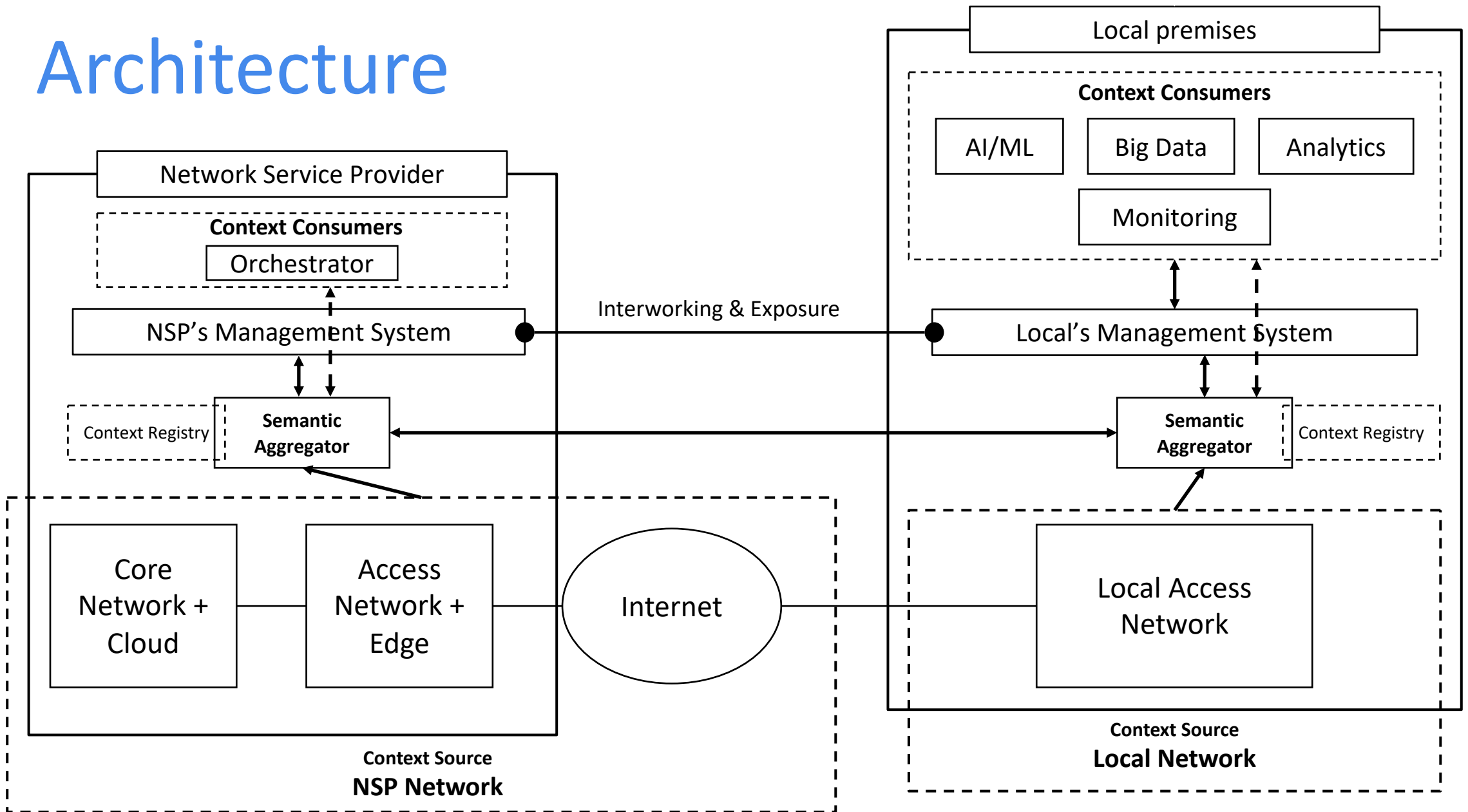
Telemetry Metadata



Telemetry Metadata

- 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



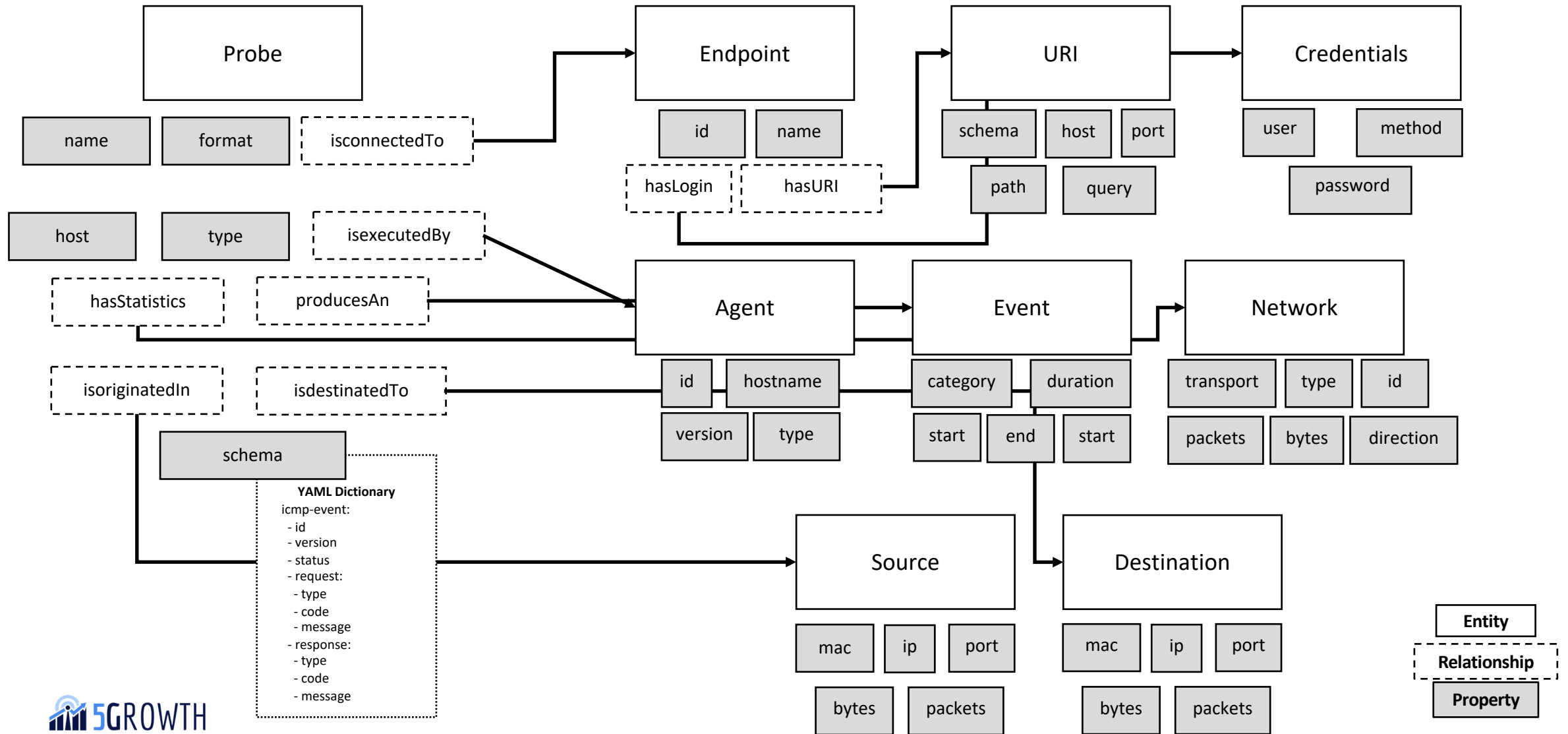


Architecture

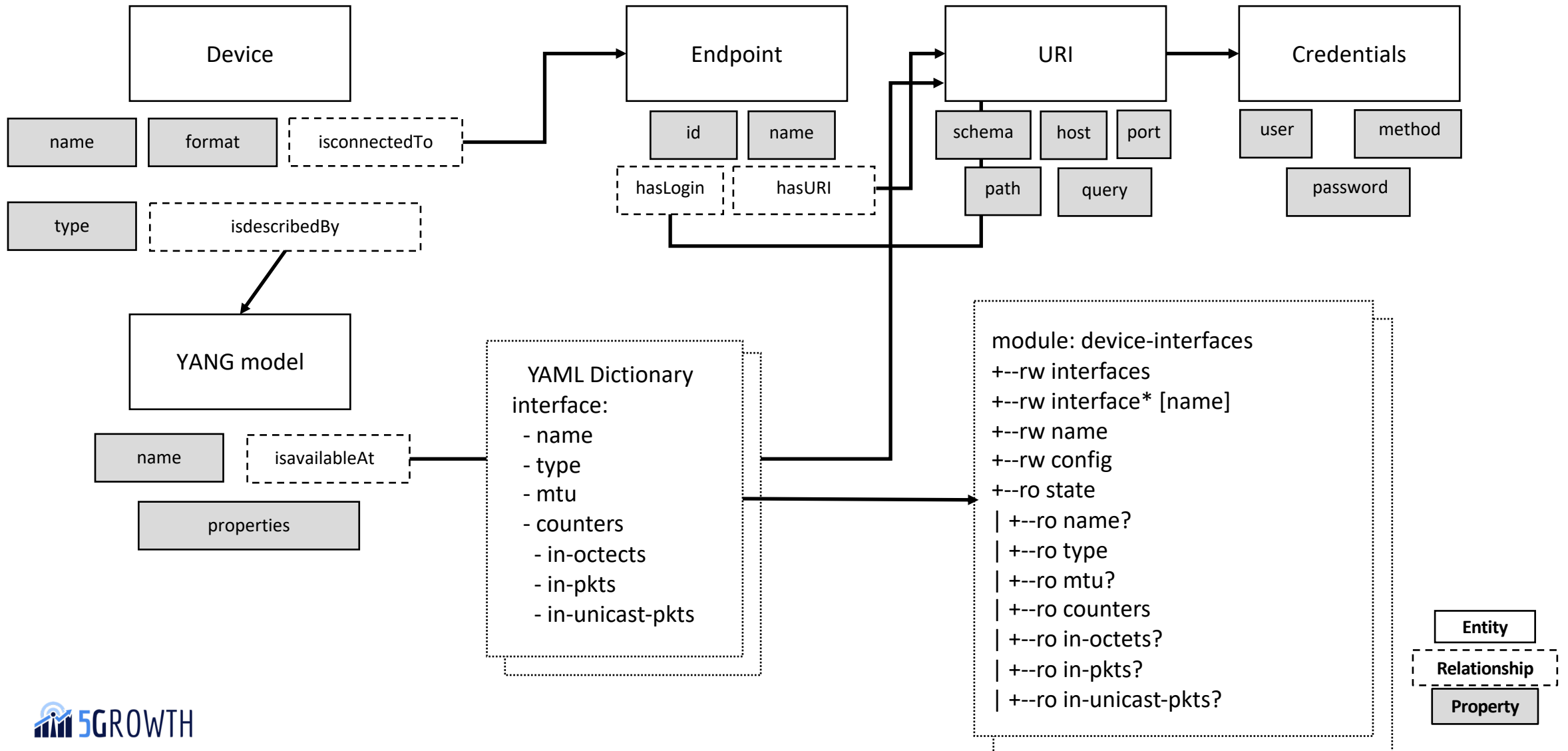
Context Sources (Data Sources):

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

Information Model: Network-based probes



YANG-based devices Information Model





Conclusions



Conclusions

- 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 this in an I-D
 - And look for its further consolidation