

Open Information Models for an Interoperable Internet Of Things

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The Goal: Web Scale Interoperability

- IoT is connecting software to the physical world
- Application interoperability: linking resource endpoints to application software components
- Application software can run in devices, gateways, and cloud servers
- Like the web:
 - permission-less, making it easy to innovate
 - high value in reuse of components
 - high value in the network effect

Machine Interoperability Problem

- The web of people and documents is based on hyperlinks that are human-understandable
- Relying on visual metaphor and human cognitive processing
- Machines have limited ability to reason
- Machines therefore need hyperlinks with explicit meaning

Machine-Understandable Hyperlinks

- Hyperlinks which contain embedded metadata of the general form:

```
<subject URL> ; relation=value
```

```
<sen/3303/0/5700> ; resourceType=temperature
```

- Basic s,p,o construct maps to XML, JSON, RDF
- Subset of web linking and semantic web
- An Information Model is a collection of such links that describes some resource

Web Objects and REST API

- URL points to structured object containing resource endpoints and metadata
- Resource endpoints and semantic hyperlinks encapsulated in a self-describing Web Object
- REST API enables discovery and linking resources to application software with a minimum of program logic – GET and PUT are easy to use without further instruction

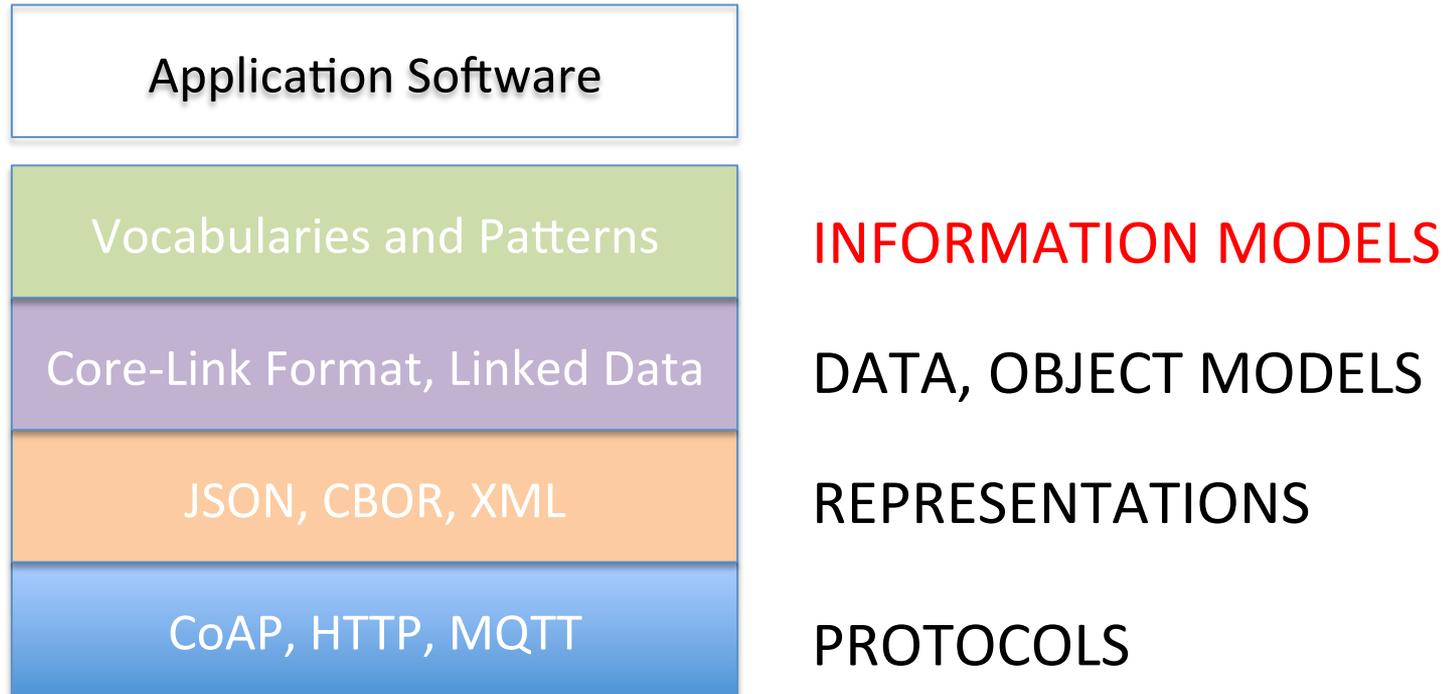
Resource Discovery

- Resource Directories and catalogs: collections of semantic links that describe resources
- Devices register with a RD and upload semantic links
- Applications discover resources by performing relation/attribute queries on the RD server
- CoRE RD and Hypercat are two practical examples

Interoperability Requires Consistency

- At the data model level
 - Representations
 - Formats
- And at the Information Model level
 - Vocabulary
 - Concepts
 - Design patterns, how they are used in the system
- Application level interoperability is driven by common vocabulary and design patterns

Levels Of Interoperability



- Application Interoperability is driven by common Information Models

W3C Potential Involvement

- Information standards and architecture for interoperability
- Like HTML for the web of people & documents, hypermedia for machines
- Standards for metadata construction and design patterns
- Resource Discovery and Linking
- Lightweight and compatible with the Semantic Web