

ETSI ISG CIM

LF



World Class Standards

<https://portal.etsi.org/CIM>

Cross-Cutting

**CONTEXT INFORMATION MANAGEMENT
AXIOMS, INFORMATION MODEL,
ARCHITECTURES, QUERYING ...**

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- [ETSI ISG CIM Mission & Organisation](#)
- [Axioms, Assumptions, Architectures](#)
- [Information Model](#)
- [Queries](#)
- [Cross-domain Use Case Examples](#)
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**... to make it easier
for END-USERS
and CITY DATABASES
and IoT internet-of-things
and 3rd-party APPS
to exchange INFO**

User
Apps

Open
Data

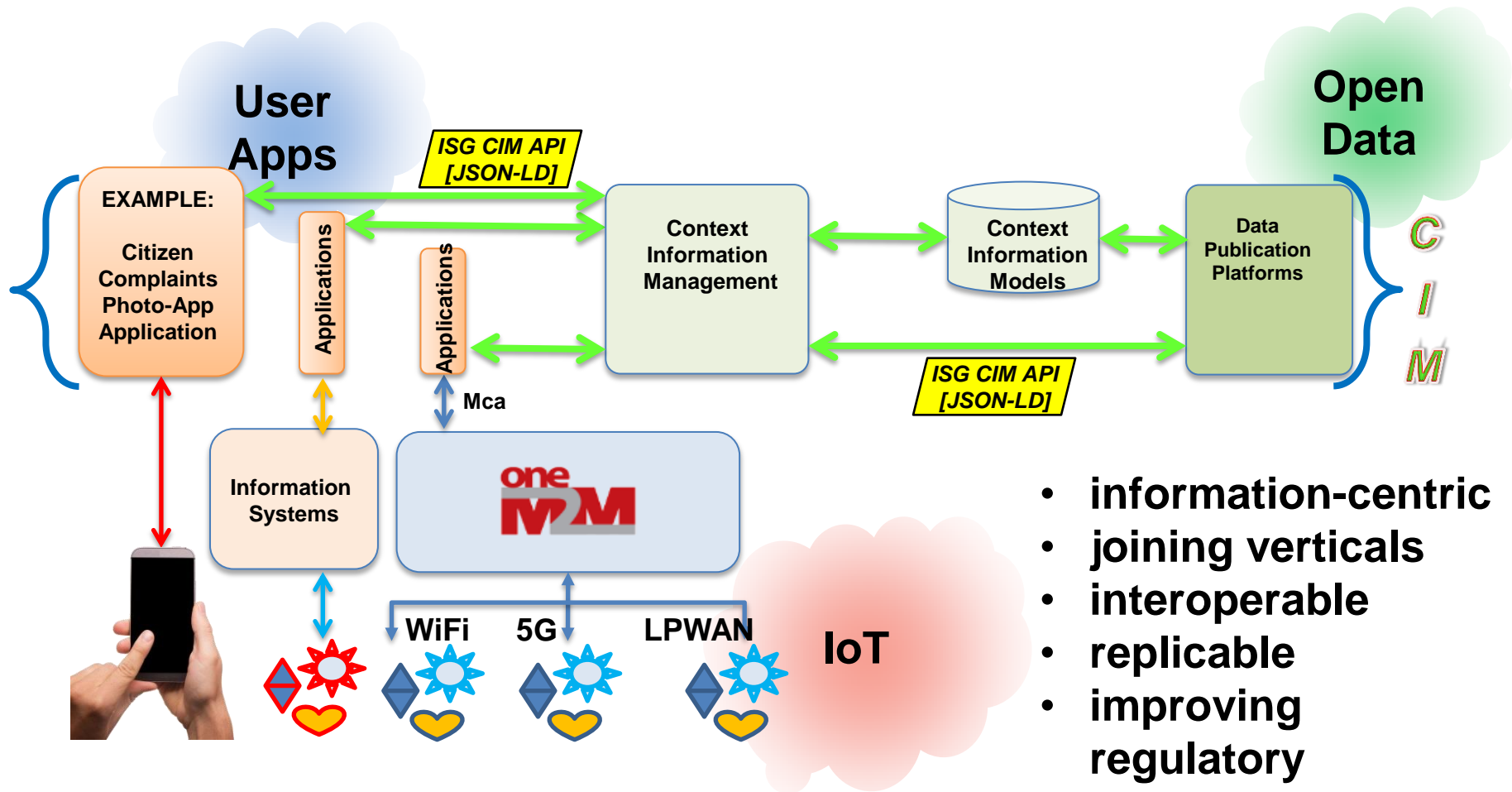
IoT

Applications

**ISG CIM API
[JSON-LD]**



Context Information Management Layer - exchanging information between domains -



- information-centric
- joining verticals
- interoperable
- replicable
- improving regulatory compliance for GDPR

- **Flexible exchange of information between domains**
 - Graph-based
 - Core concepts include Entities and Relationships
 - Entities can have Properties and Relationships
 - *Relationships/Properties can also have Properties and Relationships*
- **Aim to be developer-friendly**
 - Using familiar technologies (e.g. HTTP, JSON-LD)
 - Simple query interface
 - Based on entity type or identifier
 - Scoping of query (e.g. by time/geography)
 - Filtering of results
- **Taking account of "Data on the Web Best Practices" (W3C)**
 - All terms unambiguously reference defined/hierarchical vocabularies
 - enables Licensing, Provenance, Quality information, etc.
 - Federation of (independent) information sources

ETSI ISG CIM is NOT specifying ...



- NOT yet another IoT/M2M standard
- NOT for low-layer protocol or network-centric connectivity
- NOT just a semantic annotation vocabulary

- NOT specific to one particular environment
- NOT restricted to one type of information source
- NOT dedicated to one particular type of application

Architectures

- API is agnostic to the deployed architecture (centralized, distributed, federated)
- Migration between architectures, without changing Applications
- Portability of Applications, across architectures/deployments
- Applications need only know the URL where the API is exposed
- Actual choice of architecture depends on (changeable) trade-offs
 - Centralised Architecture is simplest
 - Distributed architecture may be chosen to improve scalability
 - Federated architecture enables different organizational units to transparently integrate their information sources

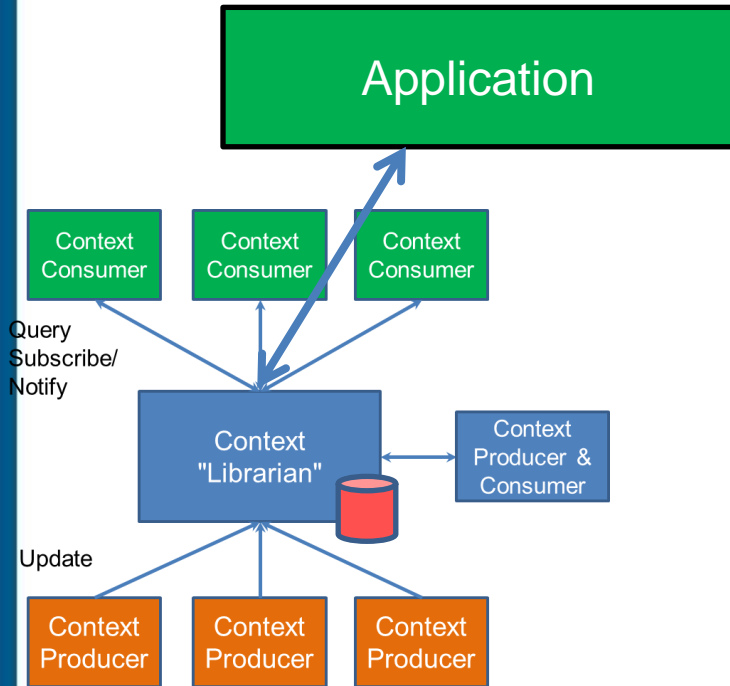
ISG CIM Entities **(... can be mapped to concept of oneM2M "Thing")**

- ETSI ISG CIM **entities** are represented by URIs
- Entities are "first class citizens" in the Information Model and API
- All entities must reference some ontology (to define their type)

Various Architectures possible using ISG CIM



ETSI ISG CIM API



Centralised

Simplicity

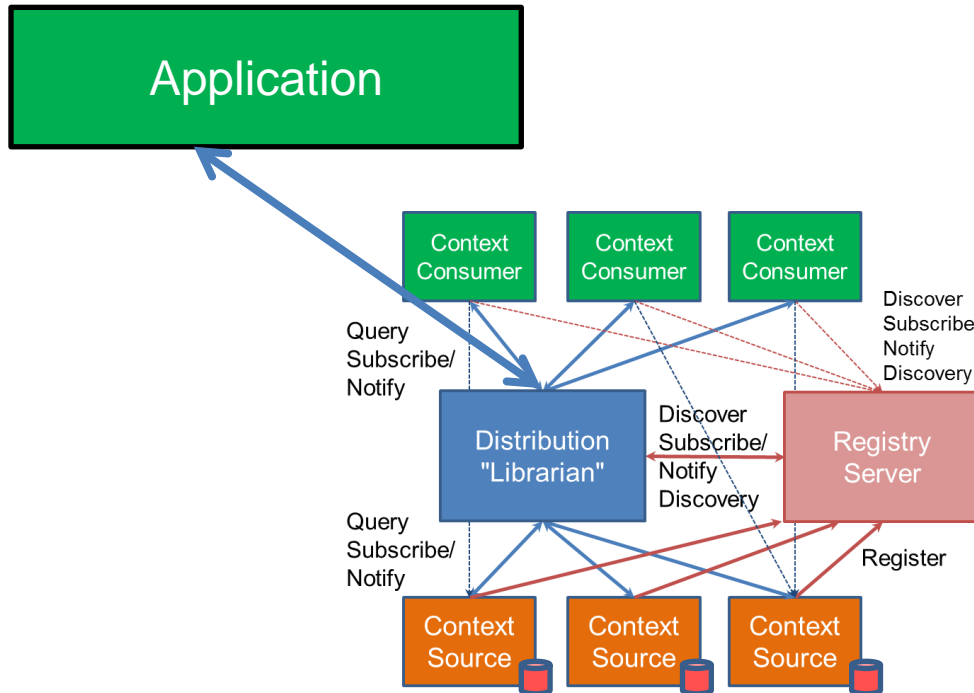
Distributed

Federated

Various Architectures possible using ISG CIM



ETSI ISG CIM API



Centralised

Distributed

Federated

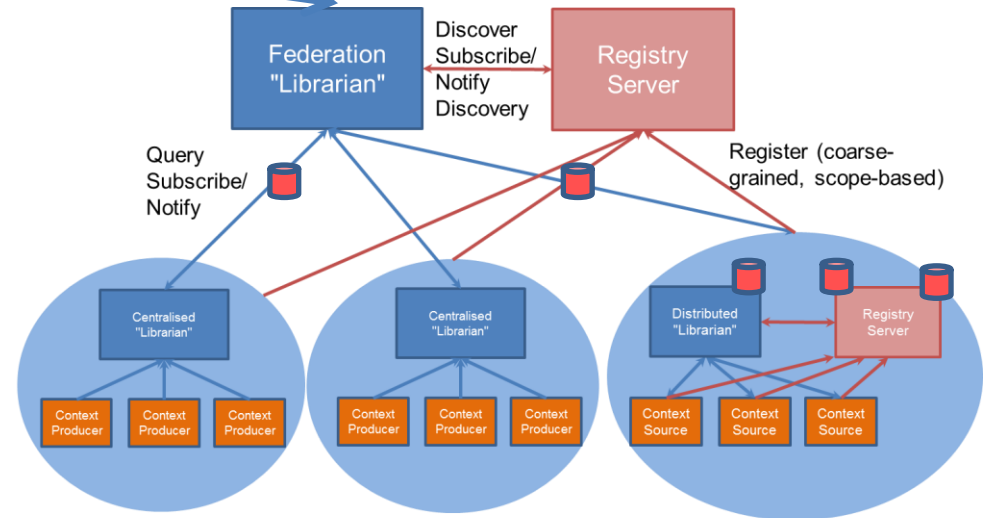
More flexibility

Various Architectures possible using ISG CIM



Application

ETSI ISG CIM API



Centralised

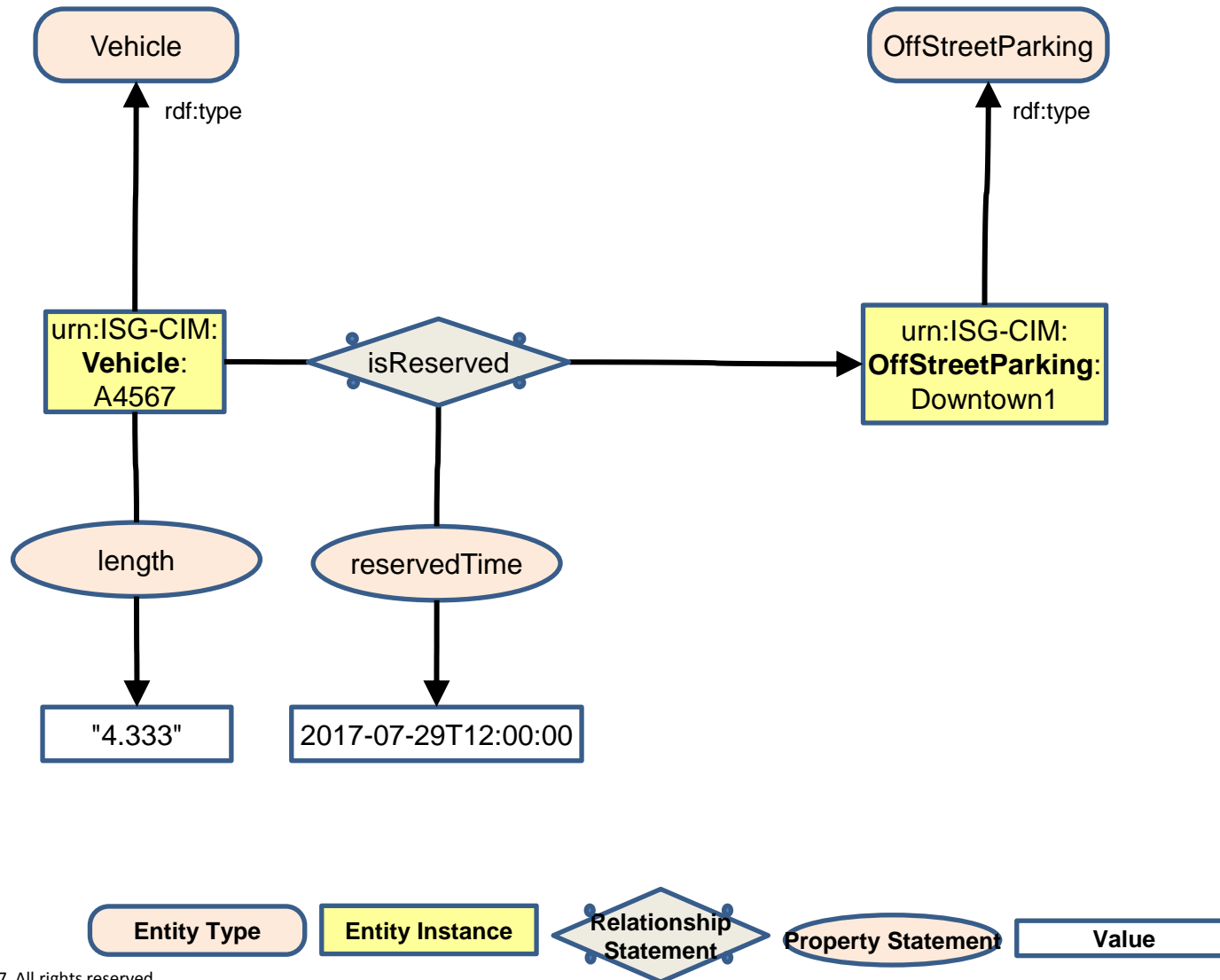
Distributed

Federated

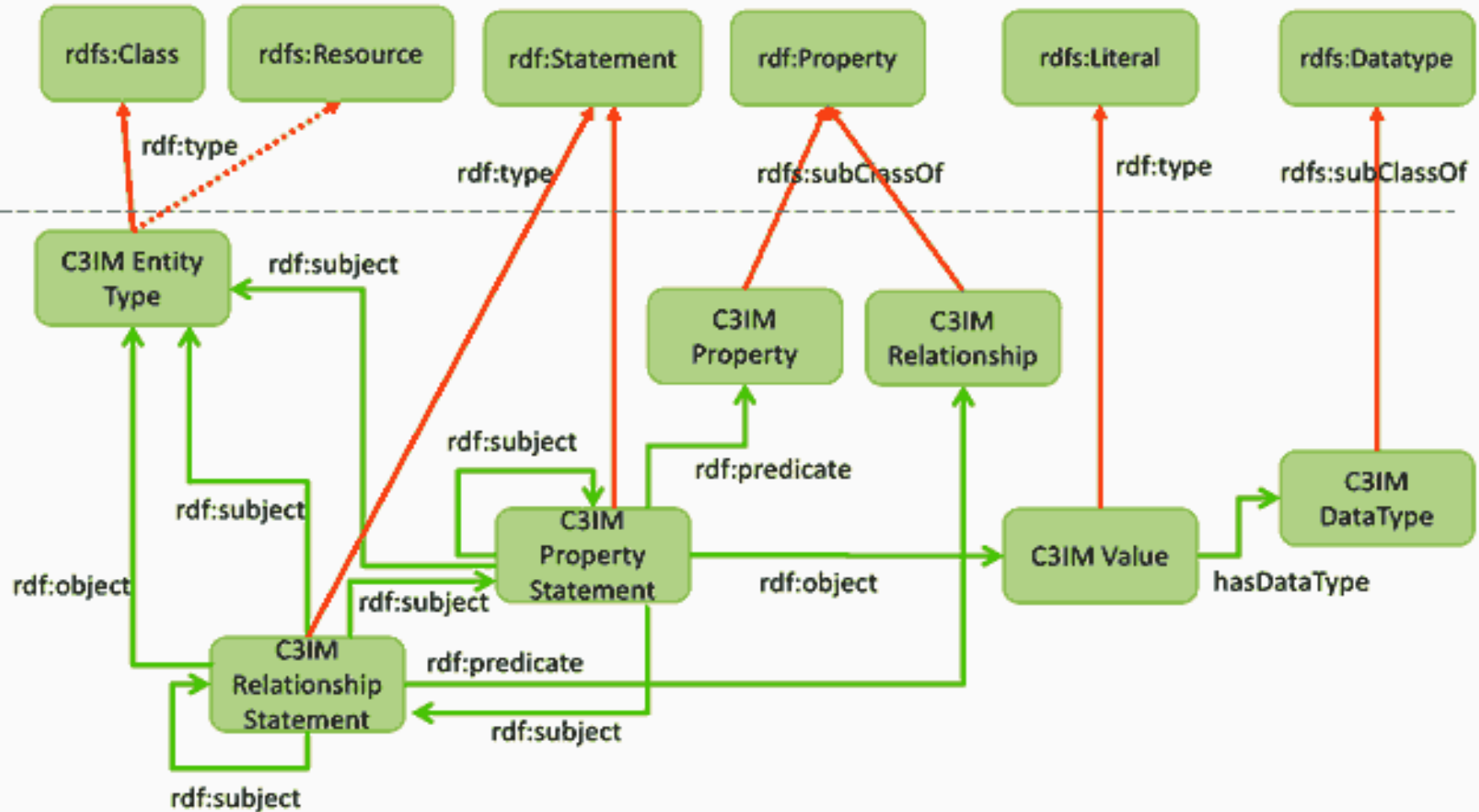
Integration of multiple Systems

Information Model

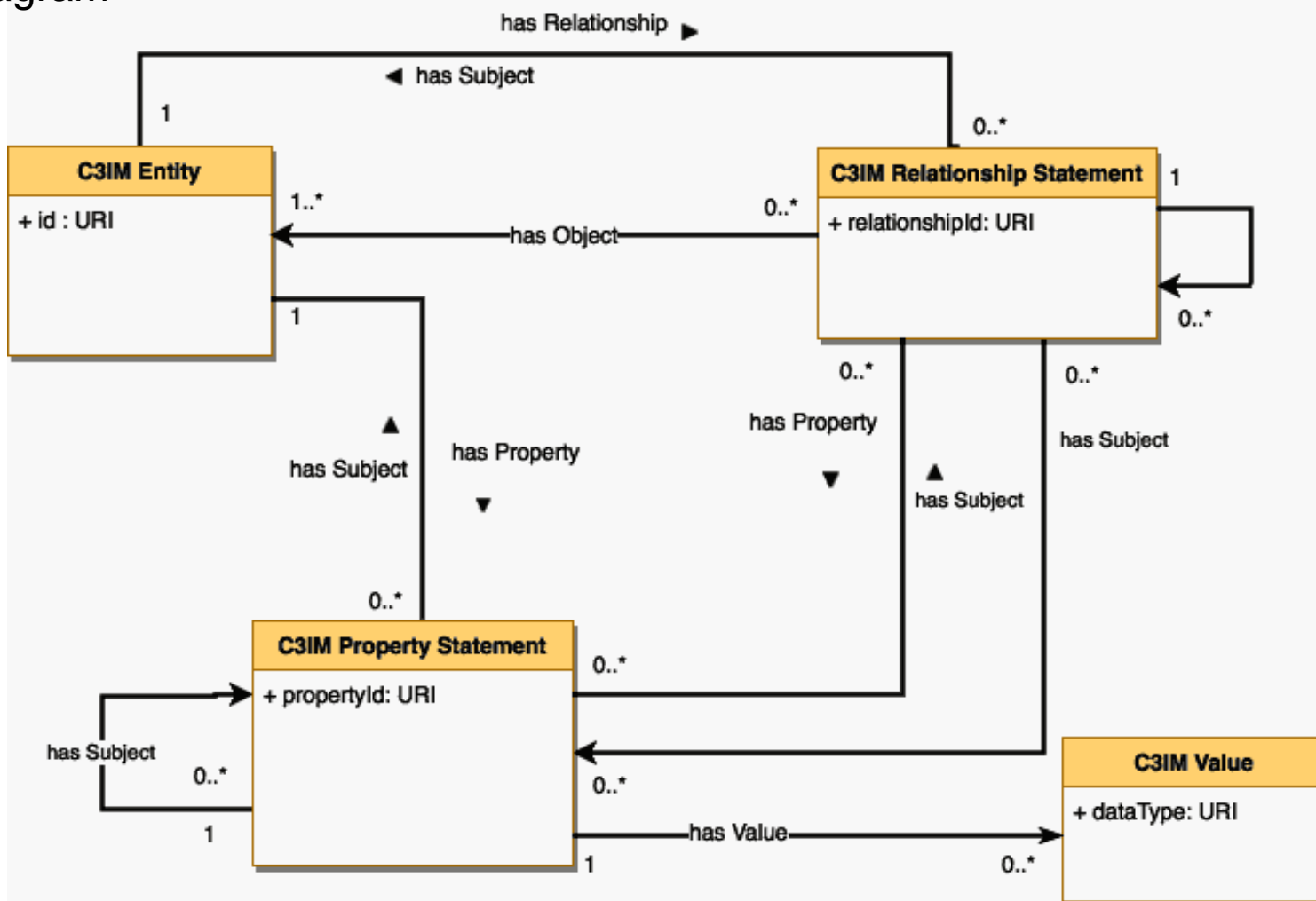
Preview as example



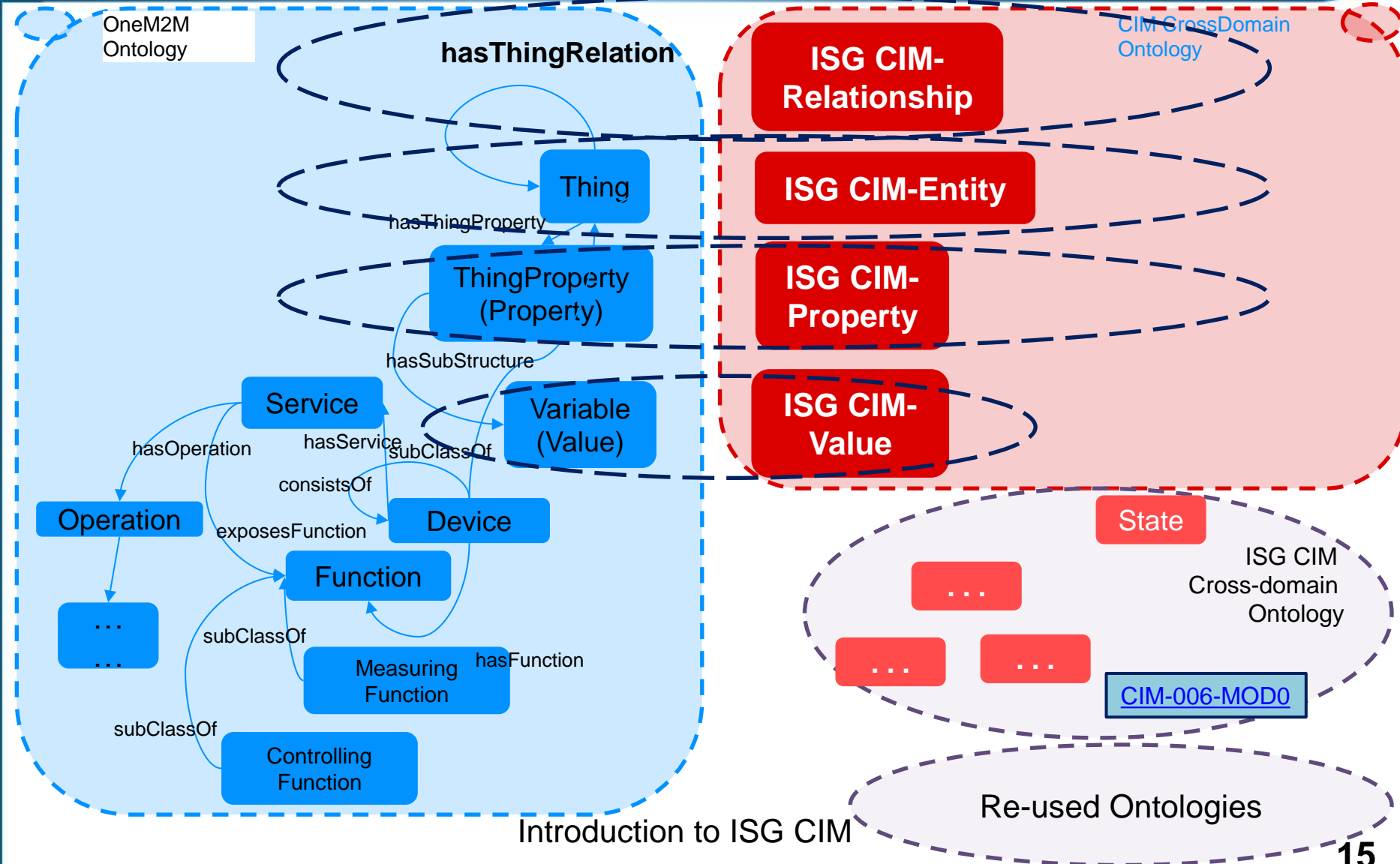
RDF/RDFS Grounding



UML Diagram



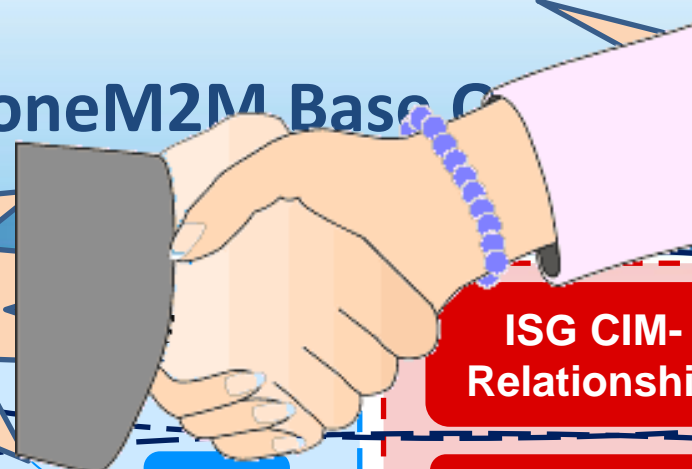
ISG CIM maps to oneM2M Base Ontology



ISG CIM maps to oneM2M Base Ontology

Resource-centric

Entity/Relationship-centric



ISG CIM-Relationship

ISG CIM-Entity

ISG CIM-Property

ISG CIM-Value

Thing

ThingProperty (Property)

Variable (Value)

Service

Operation

Device

Function

Measuring Function

Controlling Function

hasOperation

hasService

exposesFunction

subClassOf

subClassOf

hasSubStructure

subClassOf

hasFunction

NOT focus ISG CIM

State

ISG CIM Cross-domain Ontology

[CIM-006-MOD0](#)

Re-used Ontologies

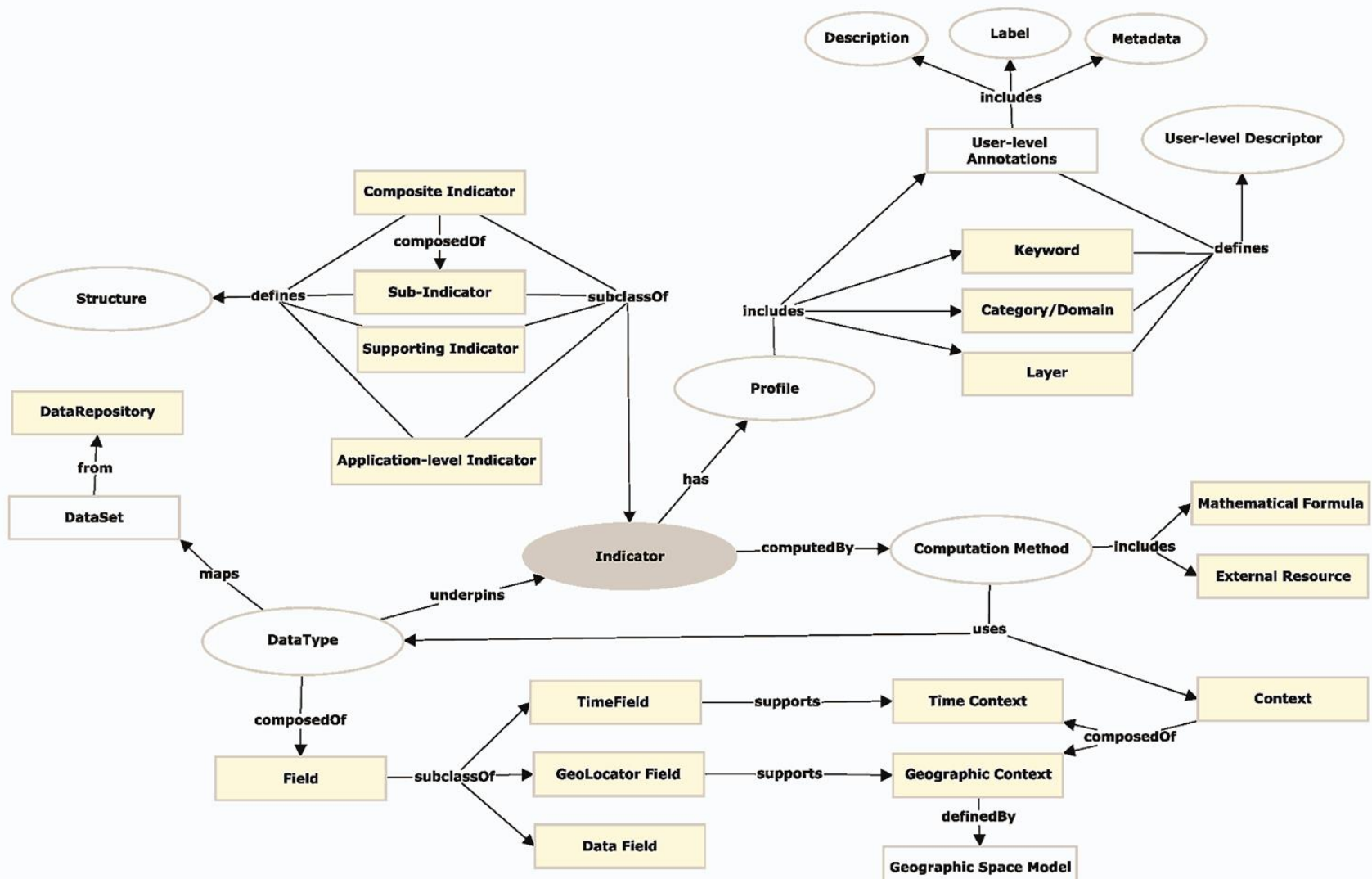
Introduction to ISG CIM

Examples of Ontologies to utilize

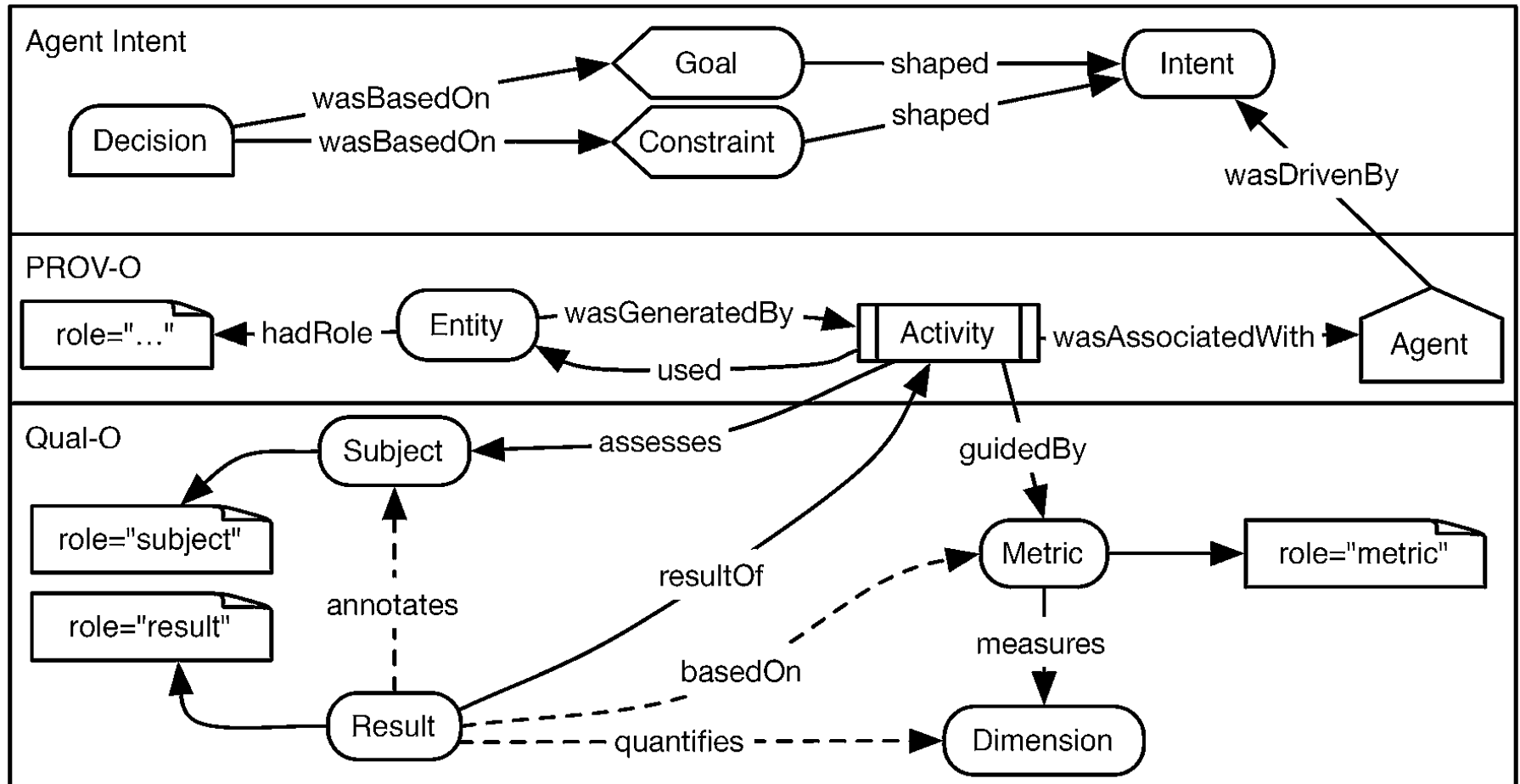
- 🌐 SAREF Buildings
- 🌐 KPIs
- 🌐 Provenance



An extensible system to model KPIs, including key properties like accuracy [527]



A provenance-aware quality ontology [567]



Queries

- Query by id
 - GET /entities?**id**=urn:cim:OffStreetParking:AB23E
 - GET /entities/urn:cim:OffStreetParking:ABCDE
- Query by type
 - GET /entities?**type**=OffStreetParking
- Query by list of ids
 - GET
/entities?**id**=urn:cim:OffStreetParking:AB23E,urn:cim:OffStreetParking:FF11AA
- Query by list of types
 - GET /entities?**type**=OffStreetParking,OnStreetParking
- Query by idPattern
 - GET /entities?**idPattern**=.*FF\$

- Query entities that match certain restrictions
 - GET /entities?q=<Expression>
- Restrictions
 - Equal. brandName==Mercedes
 - Equal with multiple alternatives. brandName==Mercedes,Audi
 - Unequal. brandName!=Mercedes
 - Greater than. temperature>20. temperature>=20
 - Less than. temperature<10. temperature<=10
 - Match pattern. brandName~=cedes\$
 - Match range (closed interval). temperature==10..20
- Restrictions on different data types (Text, Number, DateTime...)
- Restrictions combine (through logical “and”), using ‘;’ separator
 - q=temperature>22;capacity>20

- Queries over Structured Values
 - GET /entities?**type**=Building&**q**=address[street]==Franklinstrasse
- Specific JSON attributes can be requested
 - GET
/entities?**type**=Room&**q**=temperature>20&**attrs**=temperature,capacity
- Or all attributes of the JSON object that represents an entity
 - GET /entities/urn:cim:OffStreetParking:ABCDE/**attrs**

- List entities located at a certain threshold distance to a reference geometry.
 - `/entities?georel=near;maxDistance:2000&geometry=point&coords=40.78,-2.35`
- List entities that exist entirely within a reference geometry.
 - `/entities?georel=coveredBy&geometry=polygon&coords=25.774,-80.190;18.466,-66.118;32.321,-64.757;25.774,-80.190`
- **georel** → (near, coveredBy, intersects, equals, disjoint)
- **geometry** → (point, bbox, polygon, line)
- **coords** → pairs of coordinates (lat,long) separated by ‘;’

Cross-domain Use Case Examples

What kinds of cross-domain use cases do we expect?



🌐 Linking Traffic Management and Parking Entities

- City traffic flow is coordinated with privately-run Parking Centres, to redirect vehicle exits and improve efficient driving

🌐 Smart Parking and HealthCare

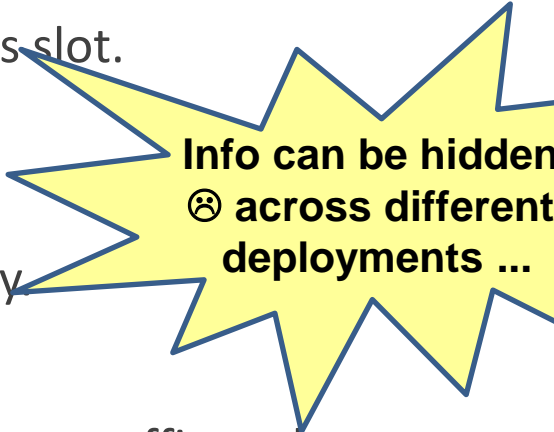
- Health Care System sets appointment. Parking spaces are reserved at client. Health professionals car is admitted and gets slot.

🌐 Smart Lighting and Smart Parking

- Car Parking is booked. Car entry is measured or scheduled. Facility Lighting goes ON. Save energy

🌐 SmartMobility and air-quality information

- Sensors give AirQ info. Traffic system (or App!) routes traffic paths (cars, trucks, bicycles...) for best KPI (lower peaks, avoid schools, ...)



**Info can be hidden
⊗ across different
deployments ...**

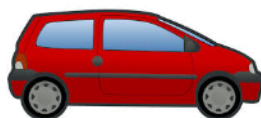
HealthCentre



reserves parking



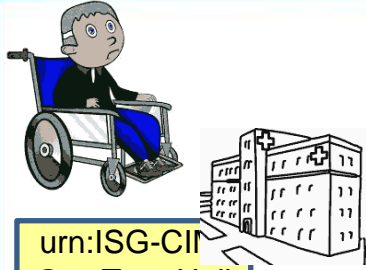
for Mobile Carer



near Patient



Example: E-Health and Smart Parking (HealthCentre reserves parking near Patient)

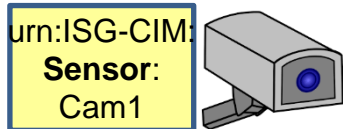


Mr. Smith gets a weekly health checkup from a **HealthCentre** professional (administration: Townhall). Nearby parking is needed.

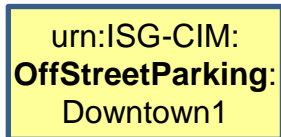
HealthCentre checks maps and finds **Downtown1** is suitable. HealthCentre checks available ParkingSlots at Downtown 1.



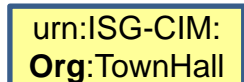
Downtown1 uses Camera Cam1 to check occupancy



Camera Cam1 reports 122 slots available, accuracy 5%



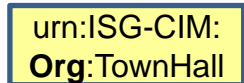
Downtown1 signals to HealthCentre 122 slots (5% accuracy)



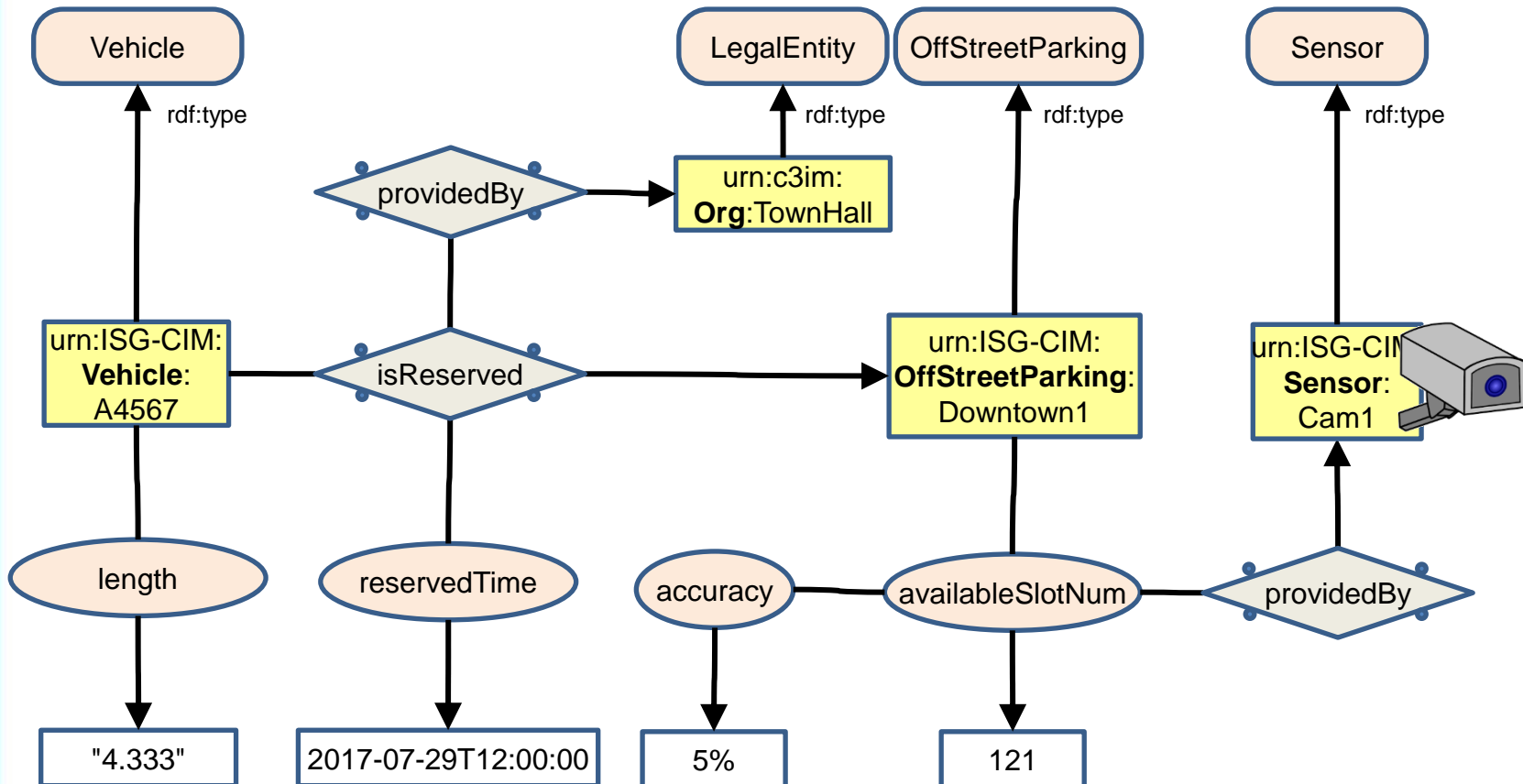
HealthCentre reserves at Downtown1 a Slot for 12:00 midday for **Vehicle A4567**



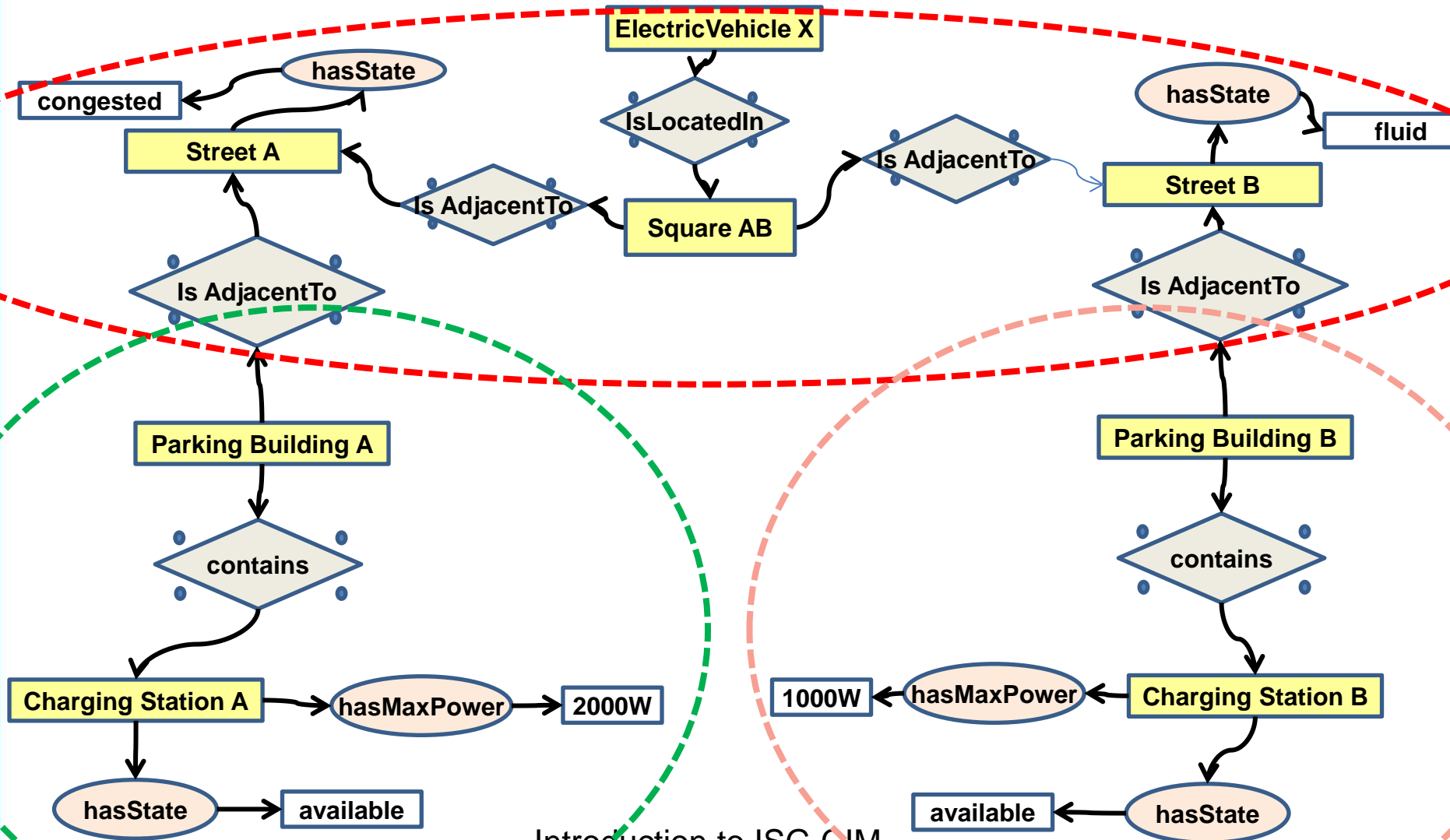
HealthCentre schedules MobileCare A4567 to handle the visit HealthCentre confirms visit and time to Mr. Smith



ISG CIM Data Model instantiation example: - what information do we need to express?

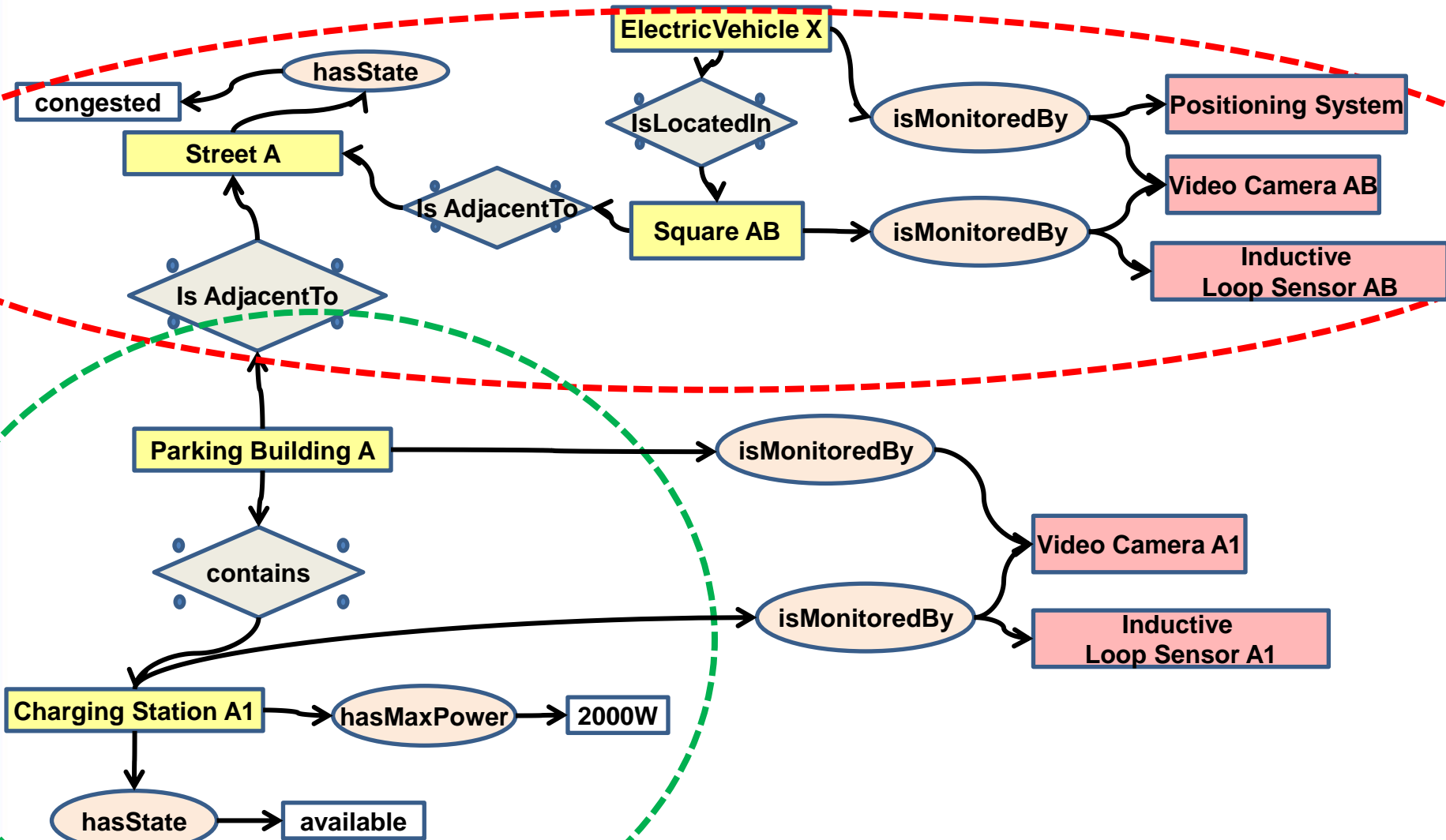


Example cross-silo entity instance graph : Linking Traffic Management and Parking Entities

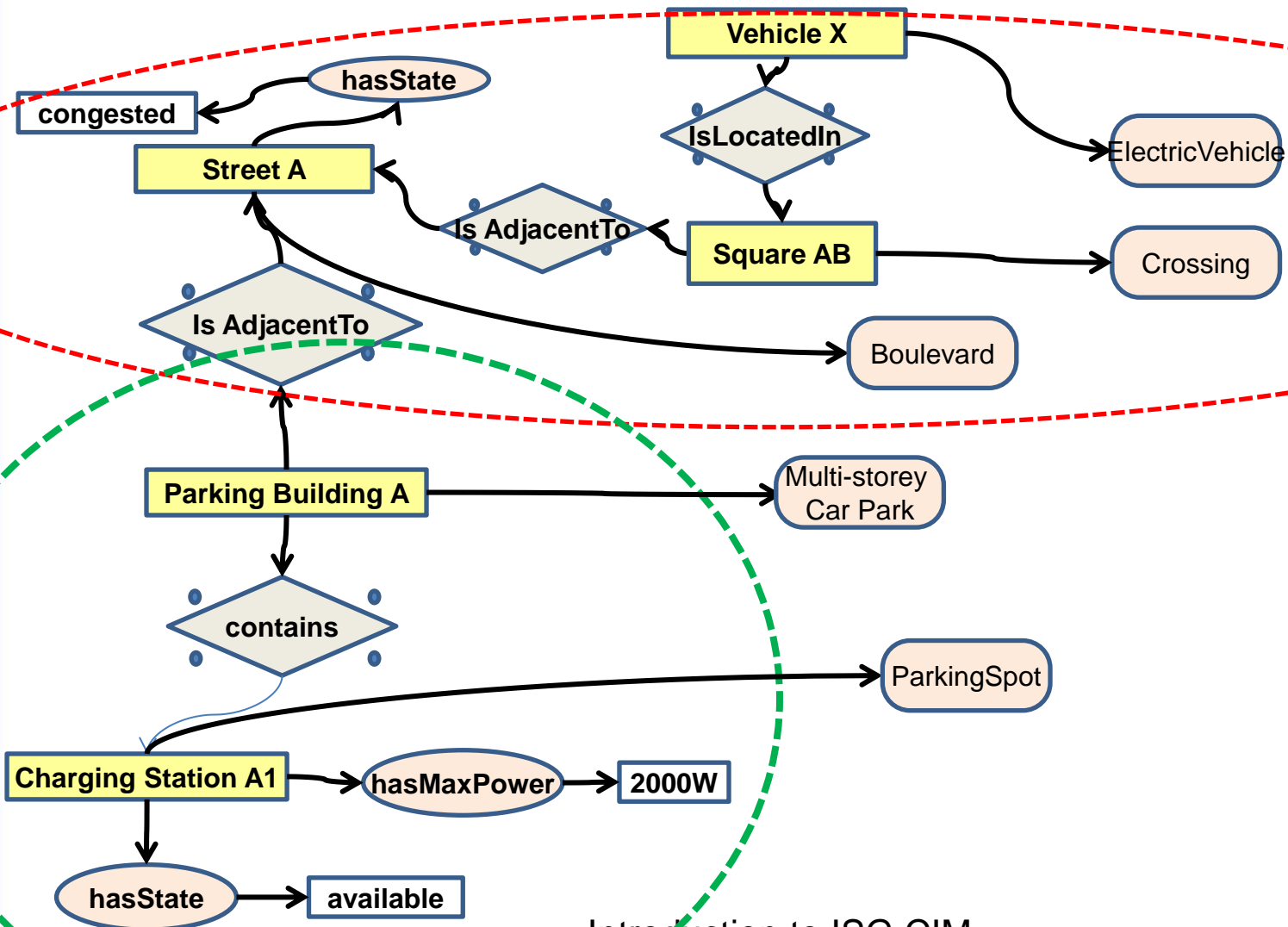


Introduction to ISG CIM

Entity instance graph with associated connected devices



Entity instance graph with associated ontological mappings



Conclusions ...

- ISG CIM is focusing on entity/relationship-centric modelling
- The focus is on an API which aims to be (nearly) agnostic to
 - architecture
 - ontology
 - domain-specific information models
(we hope/plan that the ISG CIM model will enable all/most models)
- Easy usage/interworking with linked-data, open data, and general 3rd-Party apps is being established
- Interworking with oneM2M is hoped/planned asap

Thank you ...



- ... so please join the effort to converge Context Information Management.
- Contact for further information:
ISGSupport@etsi.org
- Open pages for consensus material:
<https://docbox.etsi.org/ISG/CIM/Open>
- + visit at: <https://portal.etsi.org/CIM>

