ODM2: Developing a Community Information Model and Supporting Software to Extend Interoperability of Sensor and Sample Based Earth Observations

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A Community Information Model

An information model is an abstract representation of concepts, their properties and the relationships, constraints and operations between them.

It implicitly or explicitly forms the conceptual foundation for each component of a data system. However, information models for each are often arbitrarily different, limiting capabilities.

A common information model is critically important to the effectiveness and interoperability of cyberinfrastructure.
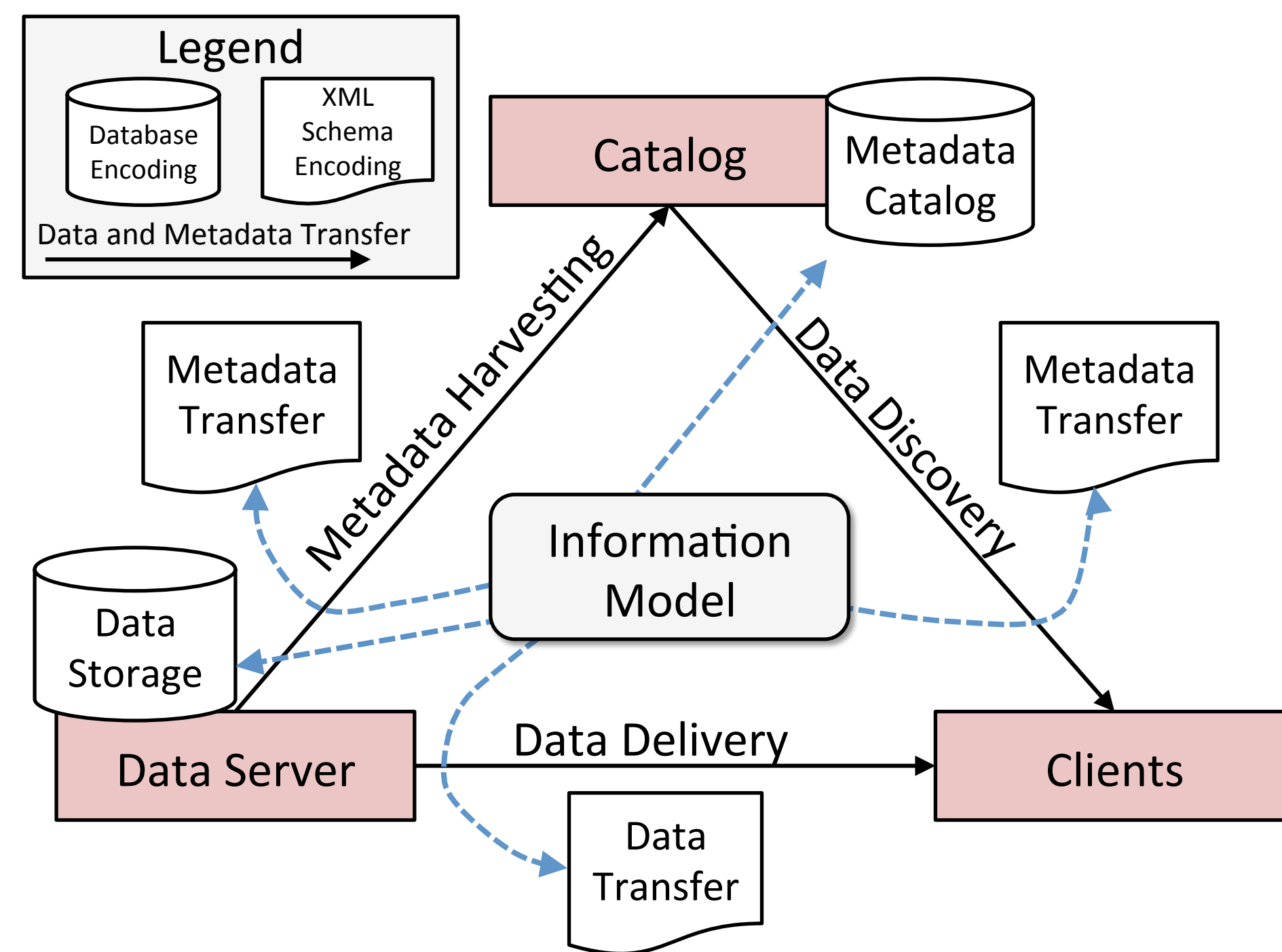
Vision for an Integrative & Extensible Data Model for Earth Observations

Our goal is to co-develop with the broad geoscience community an information model that can serve as the common conceptual foundation for the next generation of cyberinfrastructure. Our aim is for deep interoperability across multiple disciplines and systems to support powerful data discovery, access, publication and visualization capabilities.

Our motivation arose from the challenges we faced developing an integrated data system prototype for the Critical Zone Observatory (CZO) program, which required strong interoperability between systems that were developed around sensor-based data and those around sample-based data. Our scope has since expanded to include a wide array of spatially-discrete, feature-based Earth observations.

Sensor Based Data
- Stream gages
- Continuous water quality sampling
- Weather stations
- Soil moisture
- Groundwater level/quality

Sample Based Data
- Water quality samples
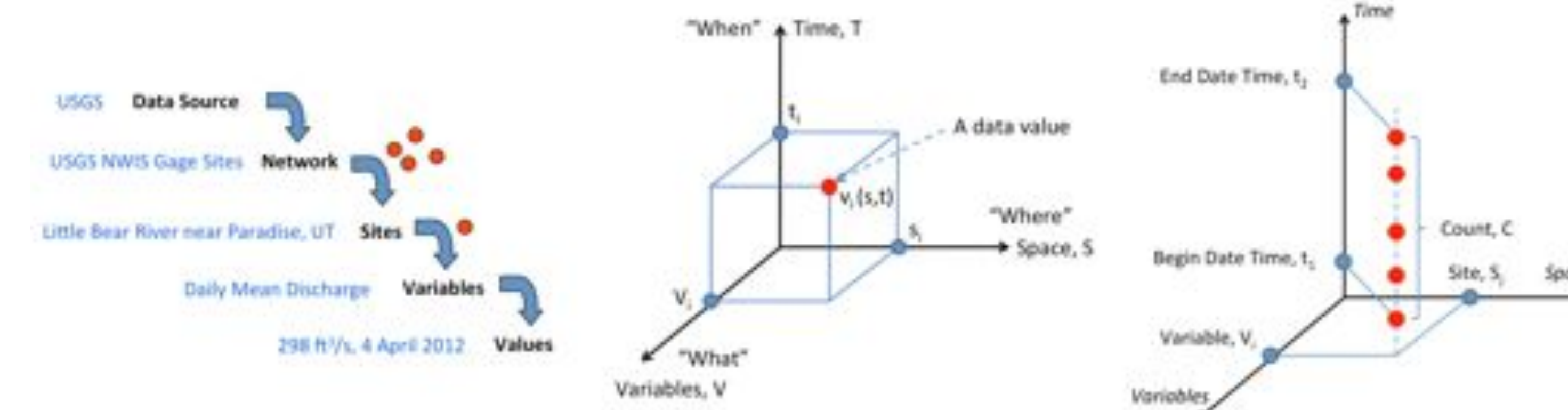- Rock cores
- Sediment samples
- Soil Profile Samples

Contact Us! We invite input from the Geoscience Community to meet specific needs for data management and sharing.
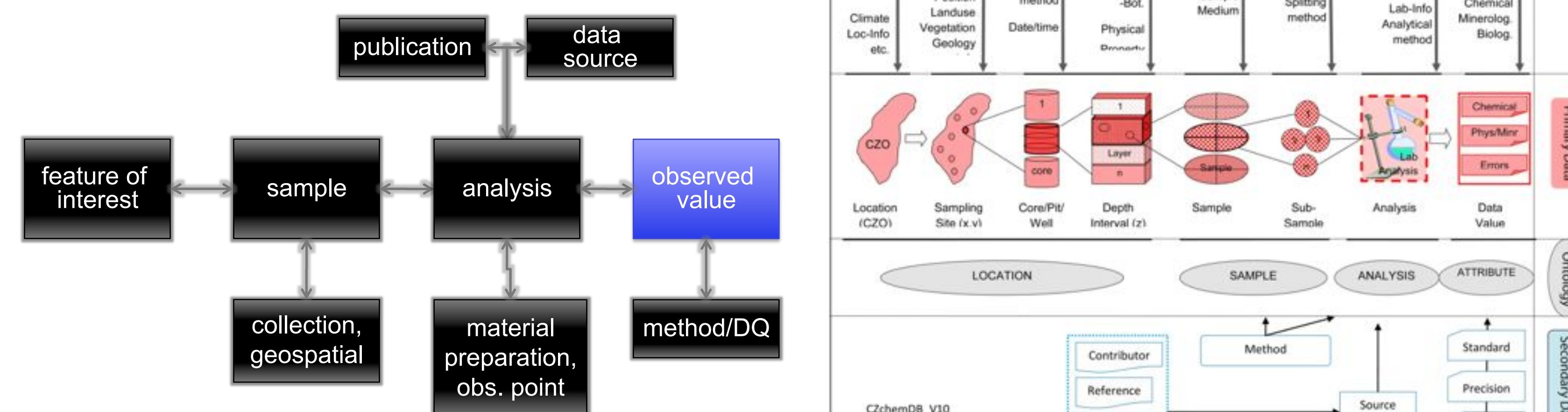
Existing Information Models

Sensor-based data:
CUAHSI HIS Observations Data Model (ODM 1.1)

Sample-based data:
IEDA EarthChem databases

The CZchemDB implementation of EarthChem database schemas.
X.Niu, J.Z. Williams, D.Miller, K.Lehnert, B. Bills, S. L. Brantley, (2013), An Ontology Driven Relational Geochemical Database for the Earth's Critical Zone: CZchemDB, Submitted to *Journal of Environmental Informatics.*

Limitations of Existing Models
- ODM 1.1 supports only point-based observations and doesn't support sample-based data well
- EarthChem databases support only sample based observations
- Not all of the structure of these models is required for each type of data
- Versioning and provenance of data are not well represented
- Existing models do not support each of the functional use cases well (e.g., storage, catalog, transfer, archival)

Observations Data Model 2.0:

Vision and Functional Use Cases
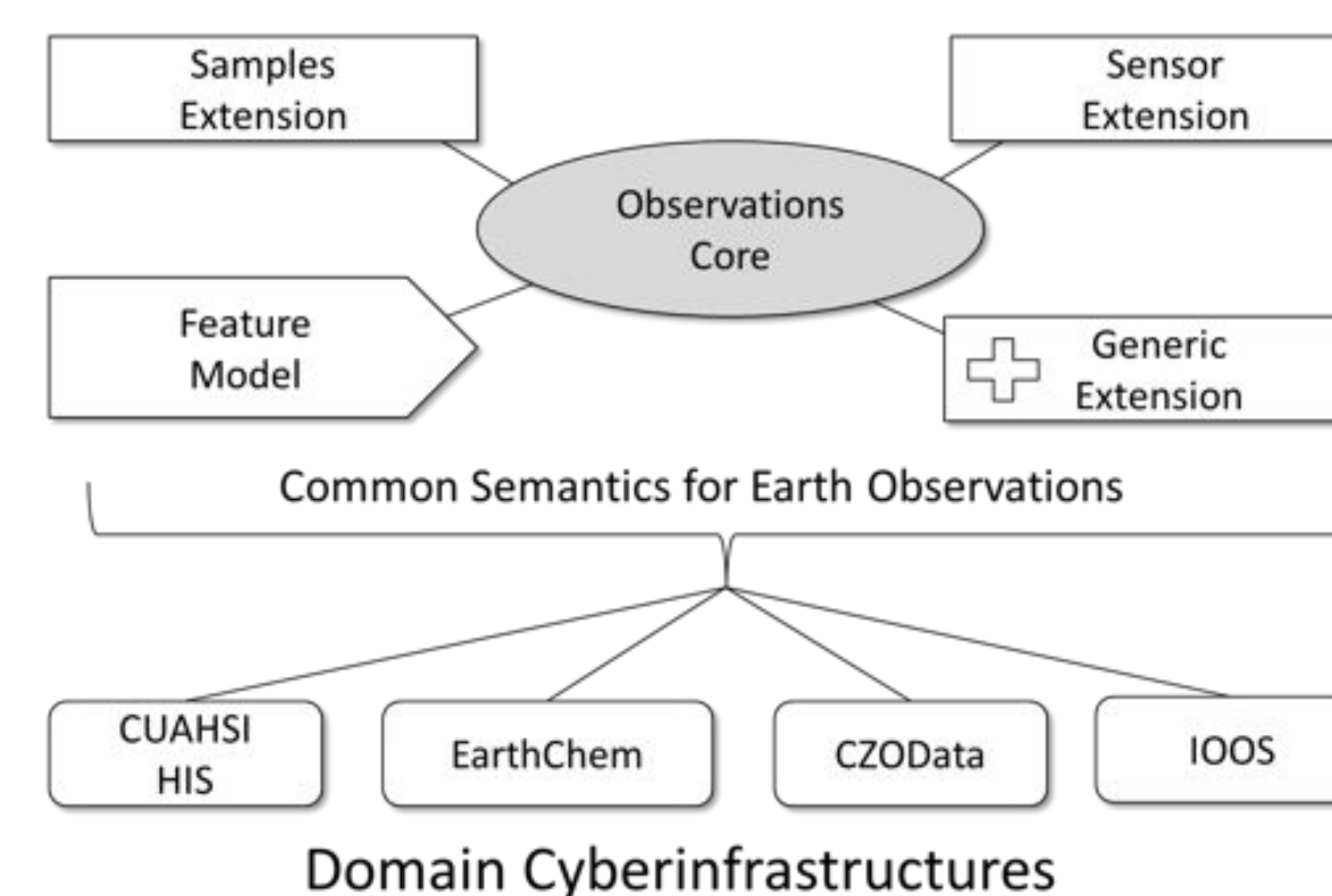
A core observations information model will be coupled with extensions (e.g., samples and sensors) to support multiple domain cyberinfrastructures.
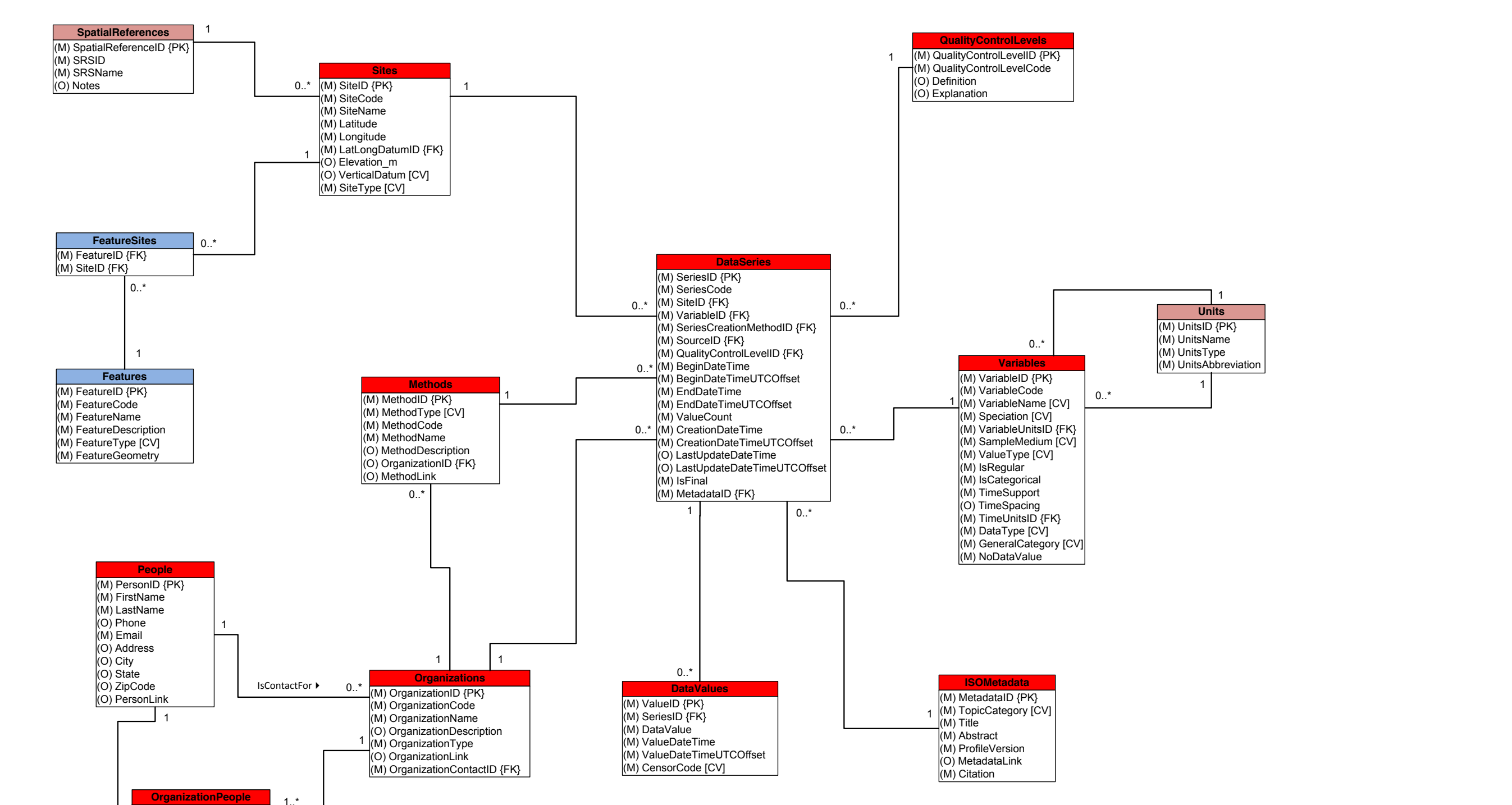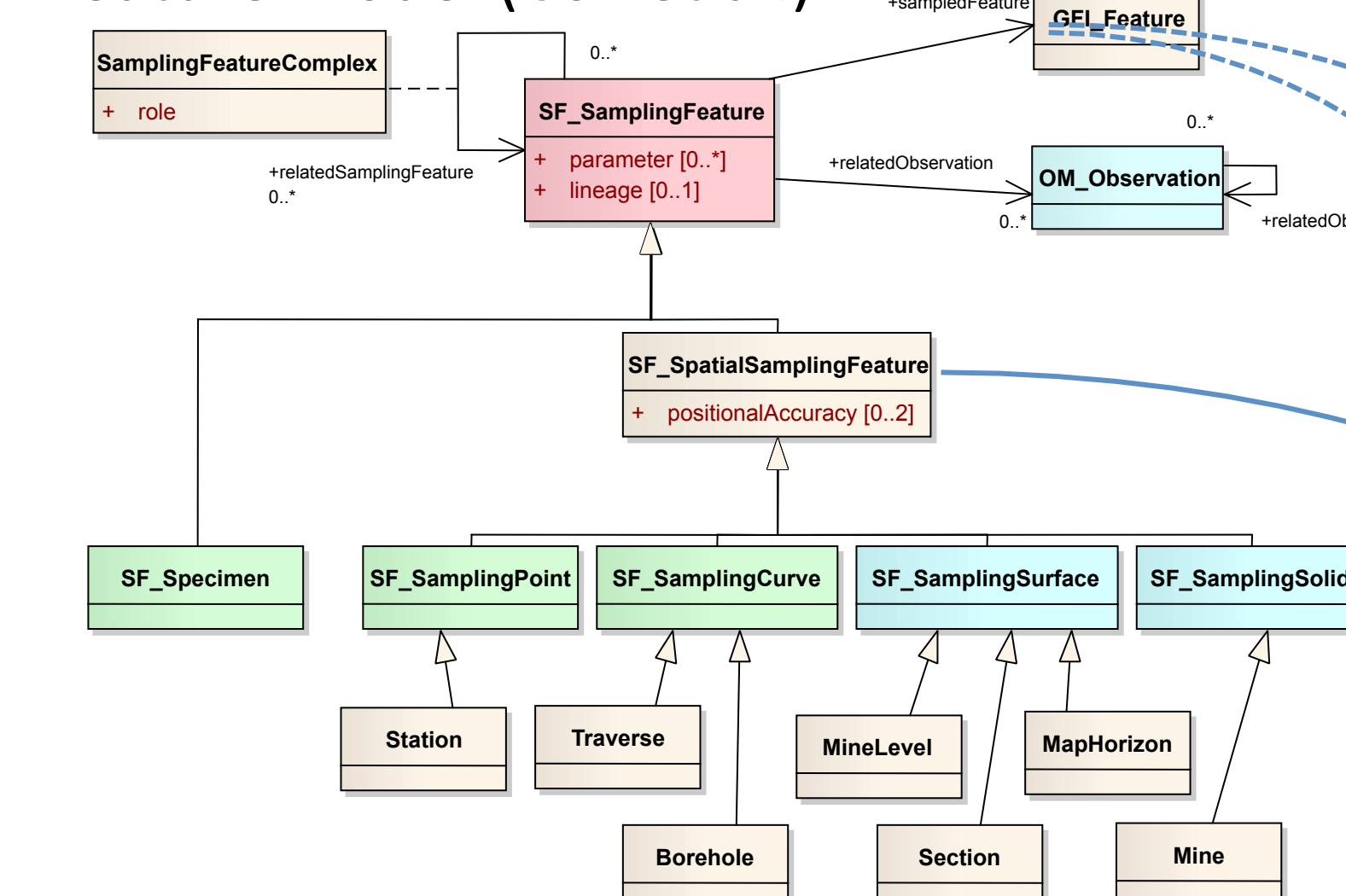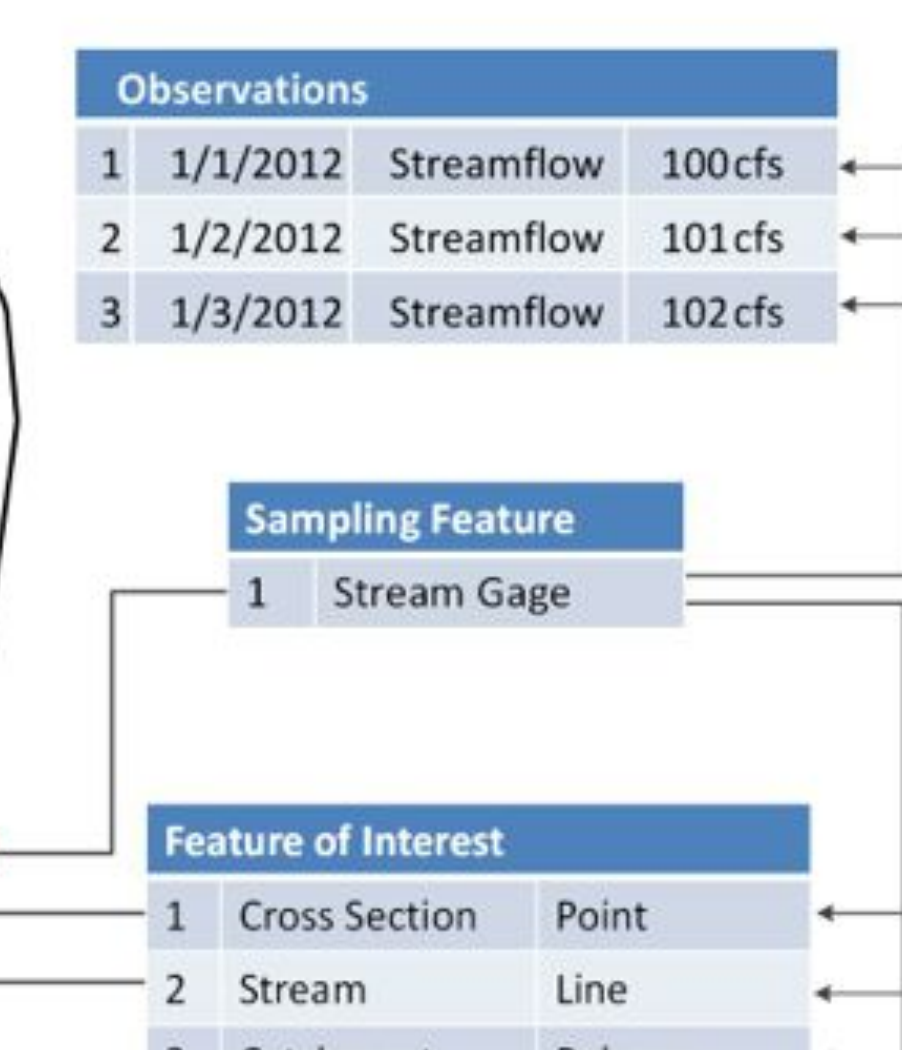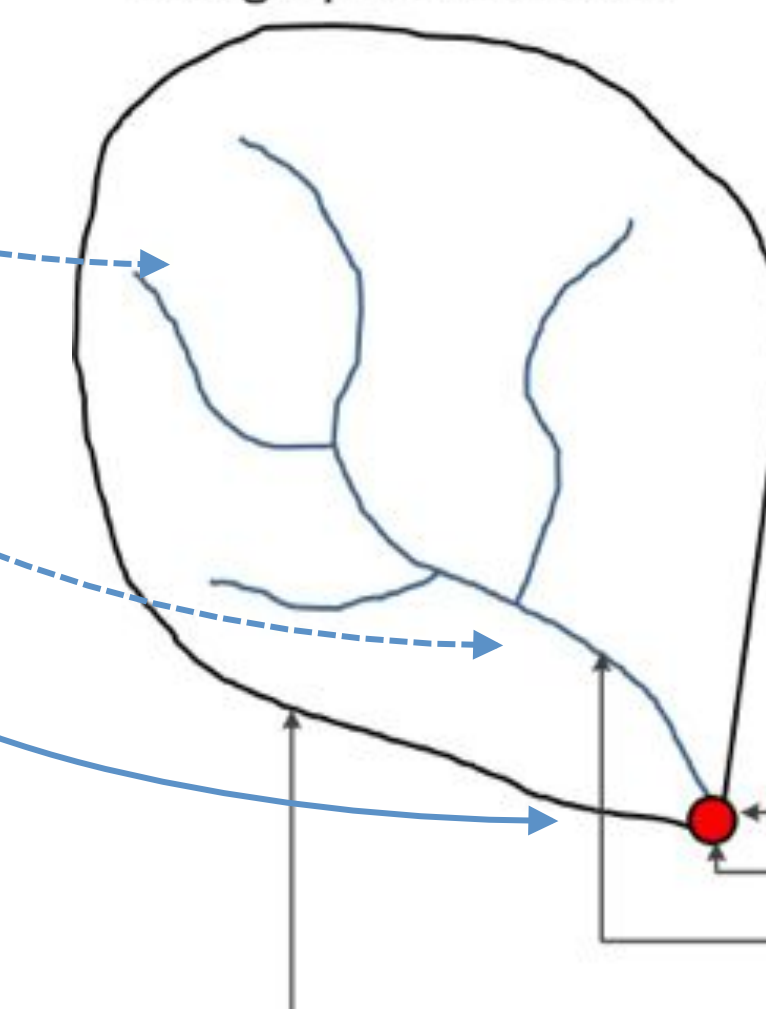
ODM 2.0 - Core

Linking Observations to the Geo-Environment

OGC Observations & Measurements Feature Model (Cox et al.)