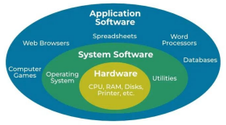
Resources and Models

Physical Resources

Person, Organization

Building, Device



Processing HW/SW

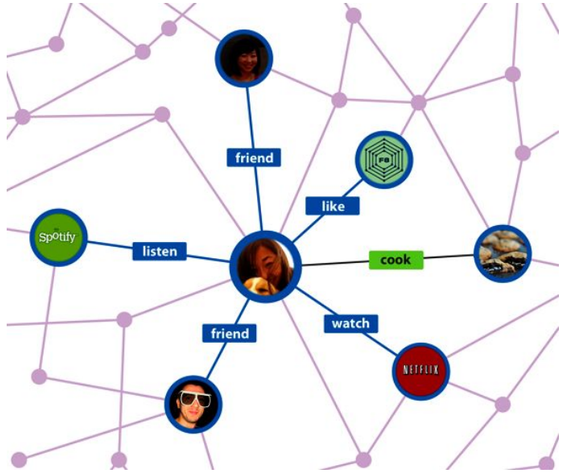
Event

Ontology / Knowledge Graph

RDF nodes *describe* physical and data resources. Resources exist independently of any graph.

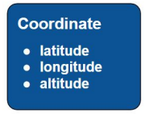
"The node is not the territory"

Edges define relationships among nodes, enriching knowledge about them.



Data Resources

DataType = Model (a blank form)
Value = Data (fills in a form)

Form	Value
Identity	 Document
Blueprint	
Bill of materials	 Message, Packet
Sensor reading	
Playbook	 Structure, PDU
Report, Log	 Image, Media

Information Model

Data Types *define* the *essential* content of data resources independently of data format, abstracting away insignificant detail.

Value = instance of an abstract DataType
Logical Value = essential content / meaning
Literal Value = sequence of bytes / characters

Data Model

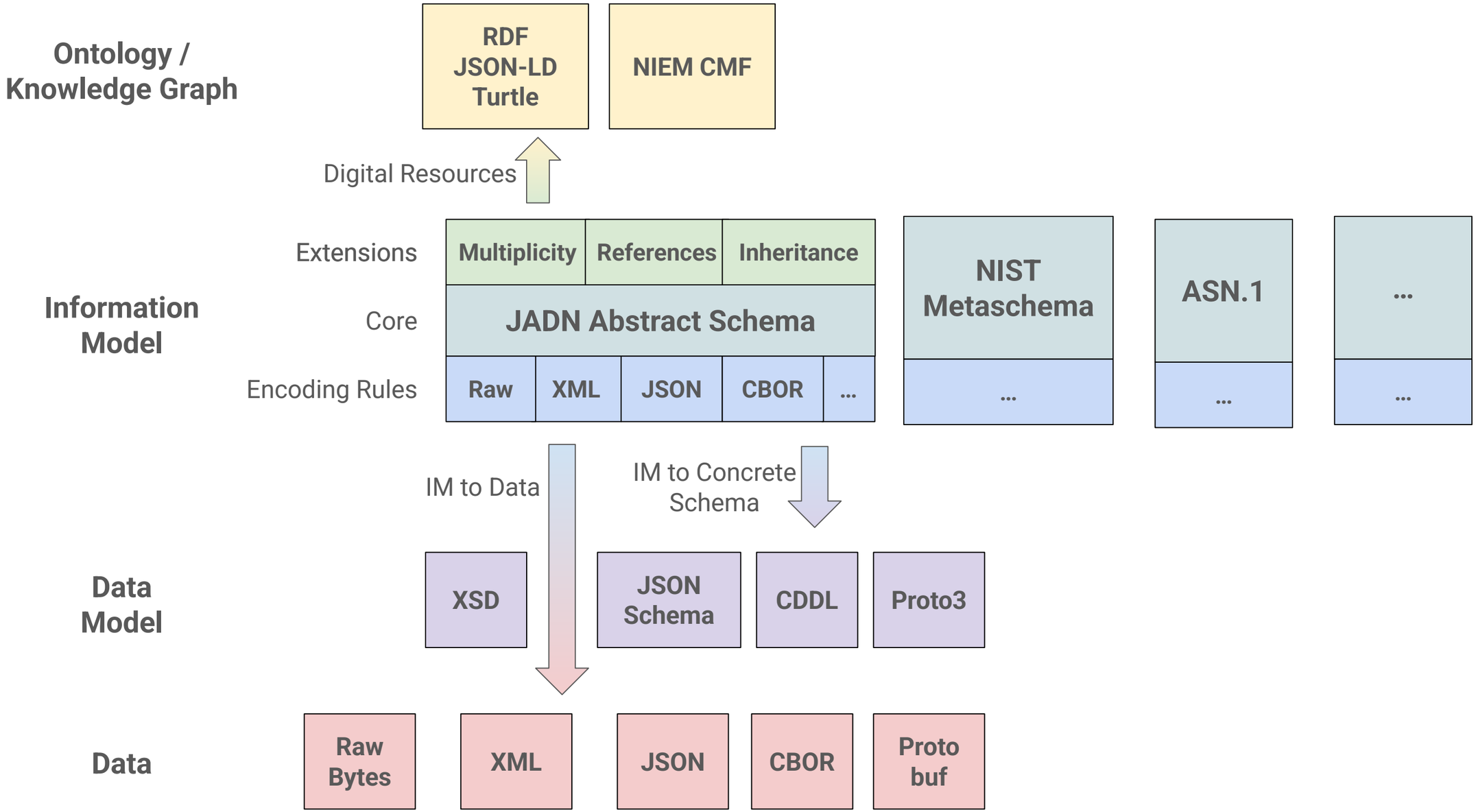
DataTypes *define* the content of data resources in a fixed data format.

Value = instance of a concrete DataType
Value = sequence of bytes / characters

Object Model

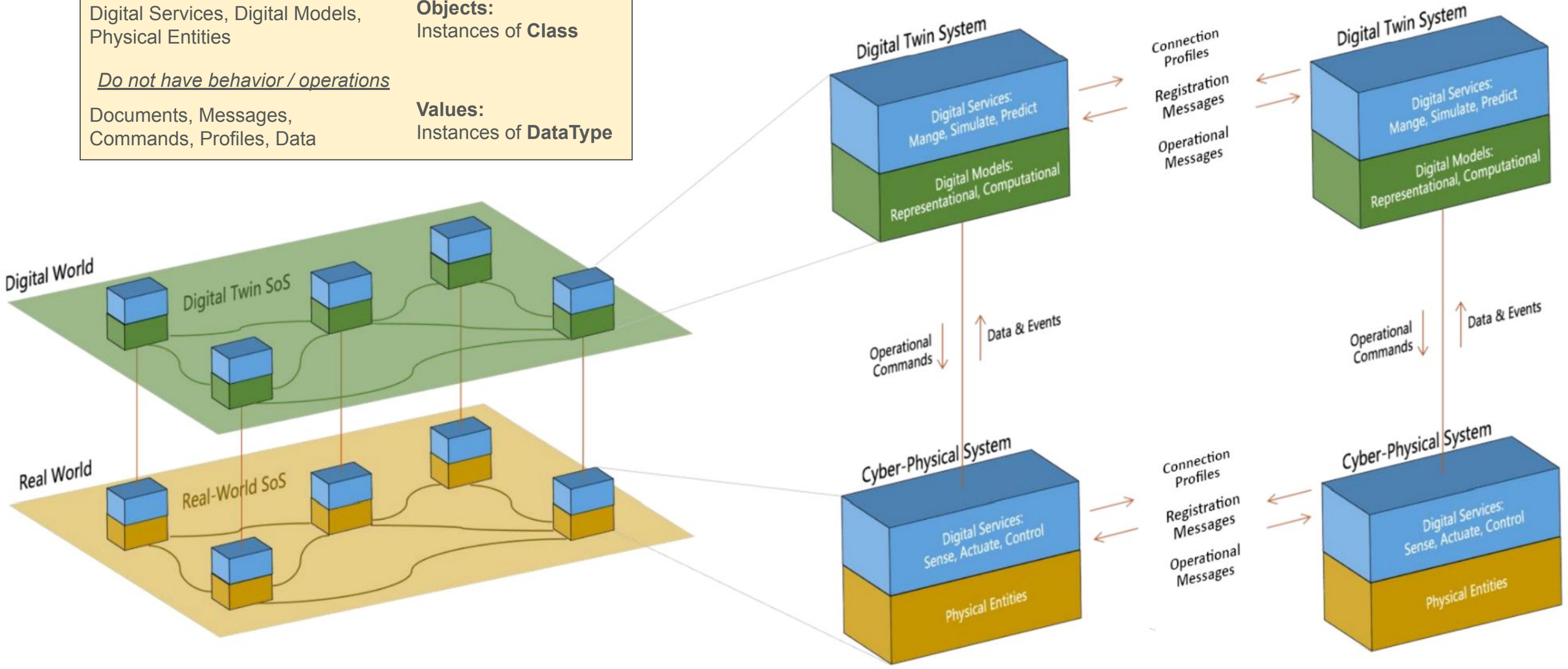
Objects are instances of Class. Objects model processes / operations and are not Values that can be hashed or compared.

Values are instances of DataType. Information models are composed of DataTypes, not Classes.


Ontology / Knowledge Graph
RDF JSON-LD Turtle
NIEM CMF
Digital Resources
Information Model
Extensions
Multiplicity
References
Inheritance
Core
JADN Abstract Schema
Encoding Rules
Raw
XML
JSON
CBOR
...
NIST Metaschema
...
ASN.1
...
...
...
IM to Data
IM to Concrete Schema
Data Model
XSD
JSON Schema
CDDL
Proto3
Data
Raw Bytes
XML
JSON
CBOR
Proto buf

Digital Twins: Resources and Models

Resources	Models
Have behavior / operations Digital Services, Digital Models, Physical Entities	**Objects:** Instances of **Class**
Do not have behavior / operations Documents, Messages, Commands, Profiles, Data	**Values:** Instances of **DataType**



Information Model DataTypes

JADN Schema

- Package (module) with a namespace

Minimal set of core DataTypes:

- 5 Primitive
- 5 Compound
- 2 Union

UML DataType Diagrams:

Figure 10.3 DataType Notation