

IDSA **LIVE** SESSIONS

INTERNATIONAL DATA
SPACES ASSOCIATION



 **Fraunhofer**
FIT

Tech Talk:

The IDS Information Model

September 3, 11 a.m.



Dr. Christoph Lange
Fraunhofer FIT

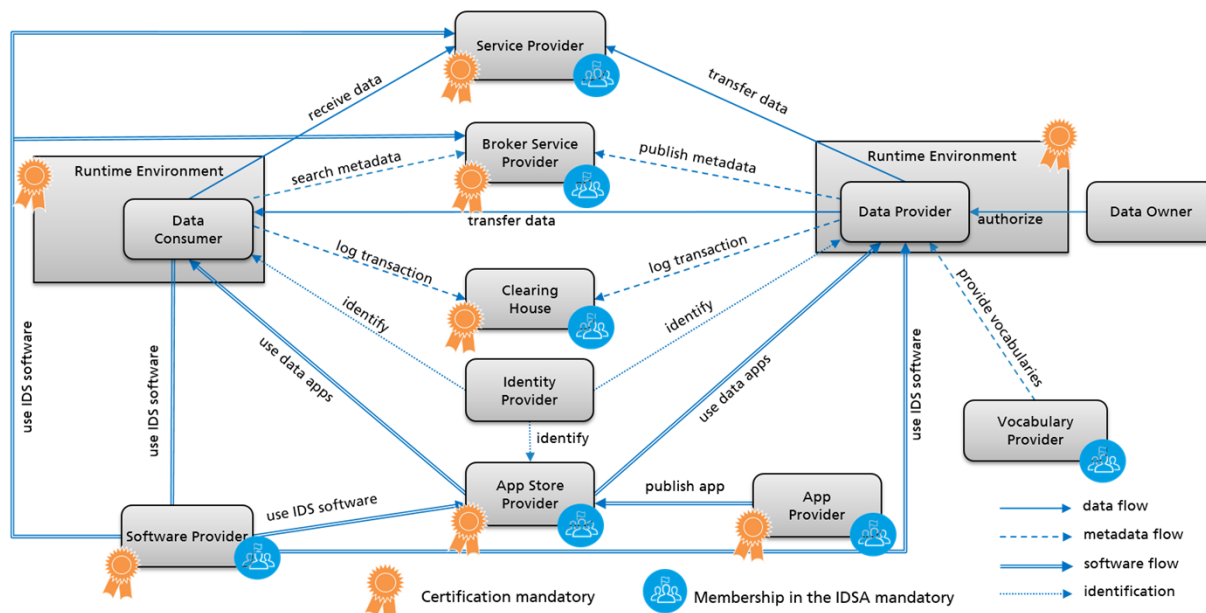


Sebastian Steinbuss
IDSA



IDS ARCHITECTURE

WHERE IS THE INFORMATION MODEL?

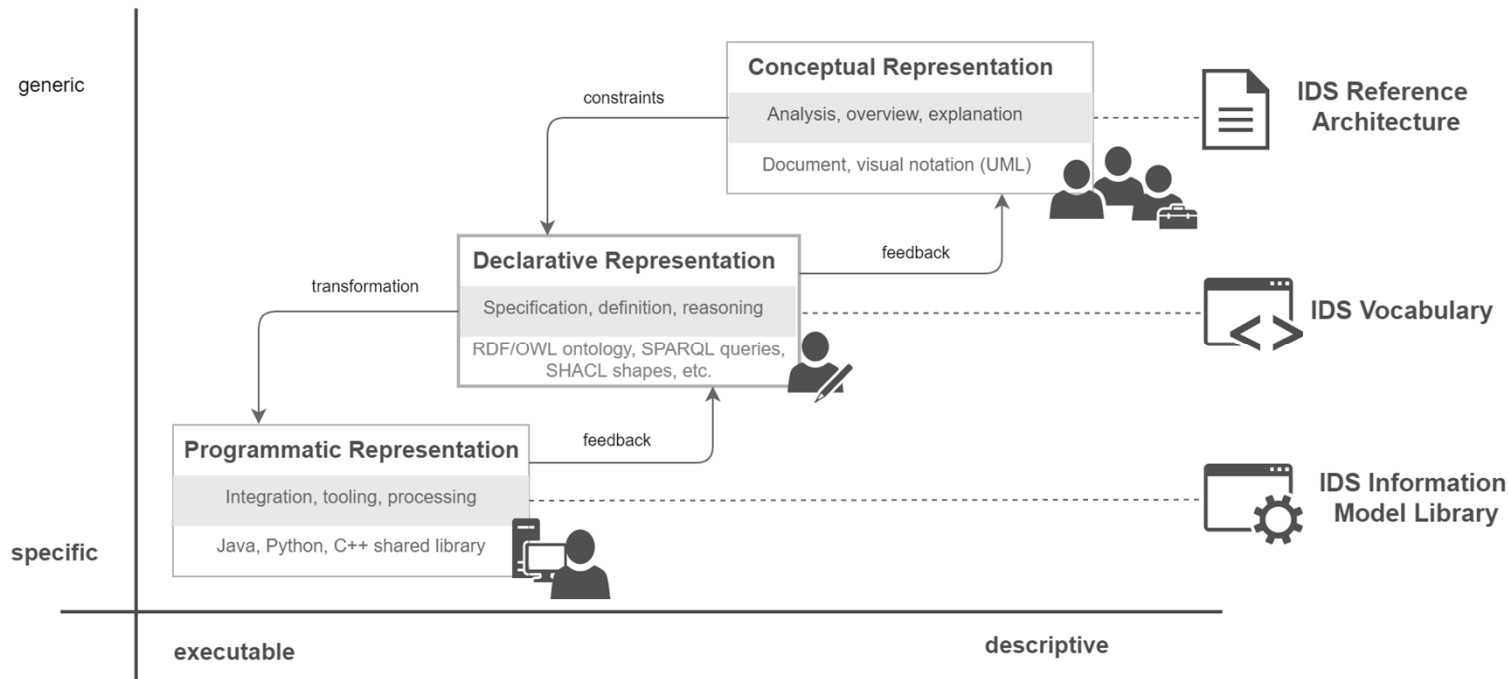


Common language of the IDS, e.g., for

- descriptions of digital resources,
- self-description of components,
- message headers.

IDS REFERENCE ARCHITECTURE MODEL

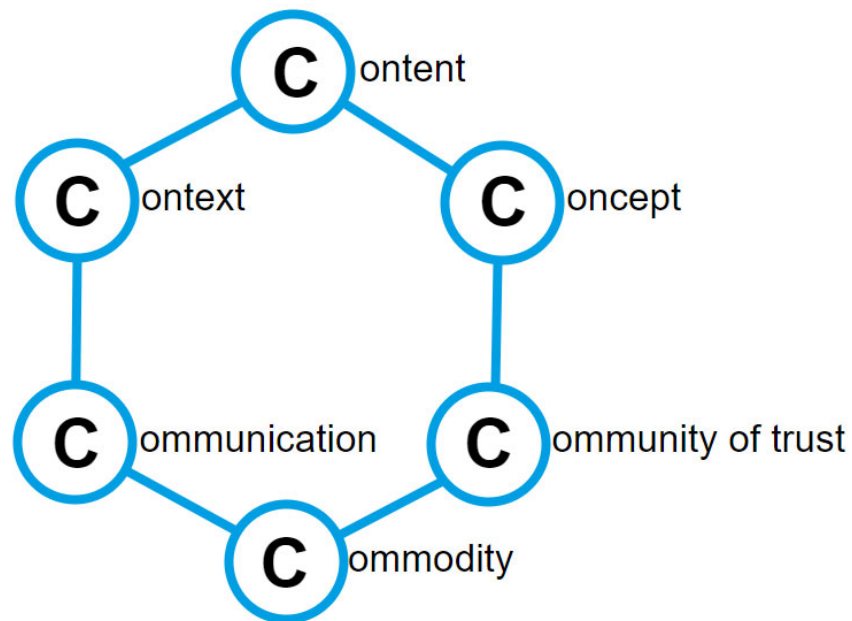
INFORMATION LAYER





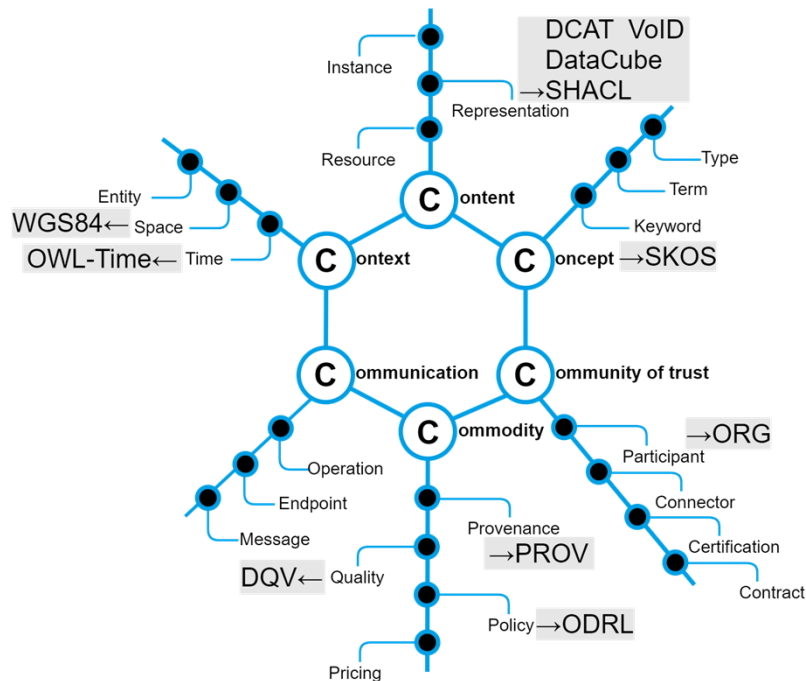
IDS INFORMATION MODEL

CONCERNS IN SHARING DIGITAL RESOURCES



IDS INFORMATION MODEL

BUILDING ON STANDARDS





IDS INFORMATION MODEL

LATEST RELEASE V4.0.0

- Open Source on GitHub
 - <https://github.com/International-Data-Spaces-Association/InformationModel>
- Implementation and technical documentation
 - <https://w3id.org/idsa/core/>
- “Free as in beer” Java library
 - <https://maven.iais.fraunhofer.de/artifactory/eis-ids-public/de/fraunhofer/iais/eis/ids/infomodel/>



IDS INFORMATION MODEL

EARLY HISTORY (→ [CHANGE LOG](#))

- 2017-04: [IDS RAM v1.0](#): initial specification of information layer (16 pages)
- 2018-04: [IDS RAM v2.0](#): expanded specification of information layer (24 p.)
- 2018-09: Information Model v1.0.0: Concern Hexagon, implementation covering all concerns, Java library (→ [Webinar](#))
- 2019-04: [IDS RAM v3.0](#): updated to Information Model v1.0.0 (20 p.)
- 2019–2020 (→ [next slide](#)): usage policies and contracts, identity provider, validation, domain-specific extensions, messages, app configuration model



IDS INFORMATION MODEL

STEPS AFTER RAM V3.0 (→ [CHANGE LOG](#))

- 2019-11: Information Model v2.0.0: identity provider (dynamic attribute token, participant information), more comprehensive validation of schema instances, [message taxonomy](#)
- 2020-03: Information Model v3.0.0: Dynamic Attribute Token updated w.r.t. DAPS specification, description of domain-specific structure and semantics of data resources
- 2020-08: Information Model v4.0.0: redesigned/improved/expanded usage policy language with many templates, configuration model (of apps in Connector), more flexible references to external terminology (e.g., licenses, content types), semi-automatic version upgrade tool support

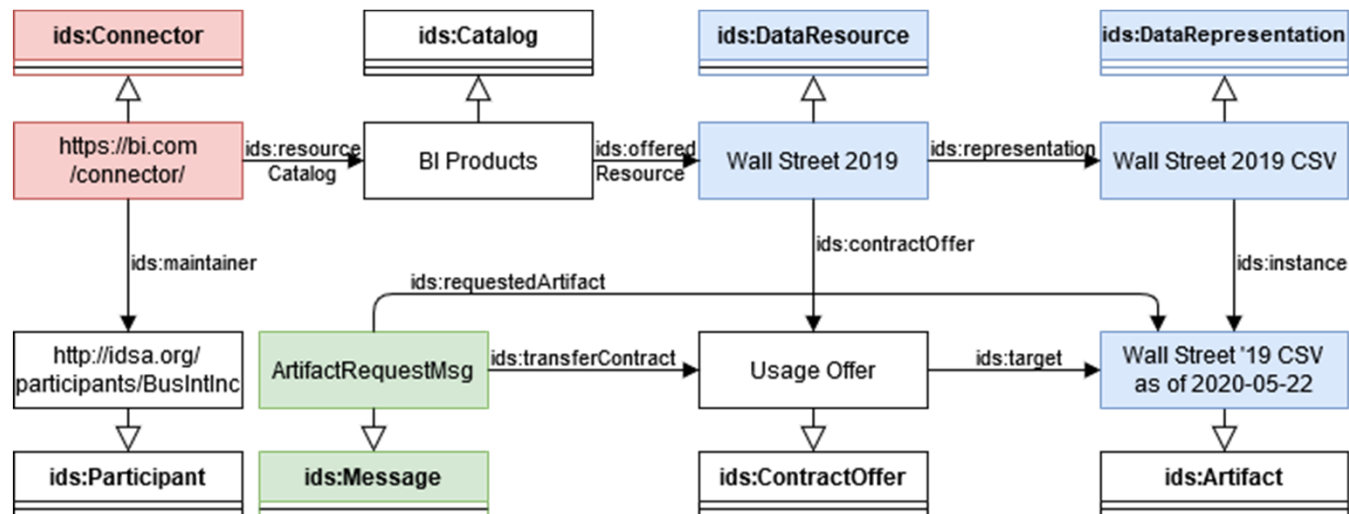


IDS INFORMATION MODEL

EXAMPLE: OVERVIEW

FinTech selling stock exchange price dataset to HFTs:

- Transform data into economic value
- restrict access and subsequent usage (sovereignty!)



IDS INFORMATION MODEL

EXAMPLE: SOURCE CODE (RDF/TURTLE)

```
_:StockData a ids:DataResource ;
  ids:title "Wall Street Stock Prices 2019"@en ;
  ids:description "This dataset contains the complete stock market prices
    of all 2019 Wall Street listed companies by milliseconds."@en ;
  ids:keyword "stock price", "Wall Street", "2019" ;
  ids:publisher <http://idsa.org/participants/BusIntInc>;
  ids:temporalCoverage [ a ids:Interval ;
    ids:begin [ a ids:Instant ;
      ids:dateTime "2019-01-01T00:00:00.000-04:00"^^xsd:dateTimeStamp ];
    ids:end [ a ids:Instant ;
      ids:dateTime "2019-12-31T23:59:59.999-04:00"^^xsd:dateTimeStamp]];
  ids:language idsc:EN ;
  ids:representation [ ids:instance _:StockDataCSV ; ids:mediaType
    <https://www.iana.org/assignments/media-types/text/csv>;];
  ids:resourceEndpoint [ a ids:ConnectorEndpoint ; ids:accessURL
    "https://bi.com/connector/reports/2019_wall_street.csv"^^xsd:anyURI];
  ids:contractOffer _:StockDataOffer .
```



IDS INFORMATION MODEL

EXAMPLE: SOURCE CODE (JAVA)

```
_:StockData a ids:DataResource ;
ids:title "Wall Street Stock Prices 2019"@en ;
ids:description "This dataset contains the complete stock market prices
of all 2019 Wall Street listed companies by milliseconds."@en ;
ids:keyword "stock price", "Wall Street", "2019" ;
ids:publisher <http://idsa.org/participants/BusIntInc>;
ids:temporalCoverage [ a ids:Interval ;
ids:begin [ a ids:Instant ;
ids:dateTime "2019-01-01T00:00:00.000-04:00"^^xsd:dateTimeStamp ] ;
ids:end [ a ids:Instant ;
ids:dateTime "2019-12-31T23:59:59.999-04:00"^^xsd:dateTimeStamp]] ;
ids:language ids:en ;
ids:representation [ ids:instance _:StockDataCSV ; ids:mediaType
<https://www.iana.org/assignments/media-types/text/csv>;
ids:resourceEndpoint [ a ids:ConnectorEndpoint ; ids:accessURL
"https://bi.com/connector/reports/2019_wall_street.csv"^^xsd:anyURI];
ids:contractOffer _:StockDataOffer .
```

```
DataResource metadata = new DataResourceBuilder()
._title_(Util.asList(new TypedLiteral("Wall Street ... 2019", "en")))
._description_(Util.asList(new TypedLiteral("This dataset...", "en")))
._keyword_(Util.asList(new PlainLiteral("stock price"), [...]))
._publisher_(URI.create("http://idsa.org/participants/BusIntInc"))
._temporalCoverage_(Util.asList(new IntervalBuilder().[...].build()))
._language_(Util.asList(Language.EN))
._representation_(Util.asList(new RepresentationBuilder()[...]))
._resourceEndpoint_(Util.asList(new ResourceEndpointBuilder()[...]))
._contractOffer_(<data_restrictions>).build();
```





"COMMUNITY OF TRUST" CONCERN

EXAMPLE: IDENTITY PROOFS AT RUNTIME

```
{ "@context" : "https://w3id.org/idsa/contexts/context.jsonld",  
  "@id" : "http://w3id.org/idsa/DatPayload/A51317560",  
  "@type" : "ids:DatPayload",  
  "referringConnector" : { "@id": "http://bi.com/connector" },  
  "iss": "65:43:5D:E8...:keyid:CB:8C:...AE:2F:31:46",  
  "sub": "65:43:5D:E8...:keyid:CB:8C:...DD:CB:FD:0B",  
  "iat": 1589982066, "nbf": 1590154866, "exp": 1590759666,  
  "aud": { "@id": "idsc:IDS_CONNECTOR_ATTRIBUTES_ALL" },  
  "scope": "ids_connector_attributes",  
  "securityProfile": { "@id": "idsc:BASE_SECURITY_PROFILE" }}
```





IDS INFORMATION MODEL

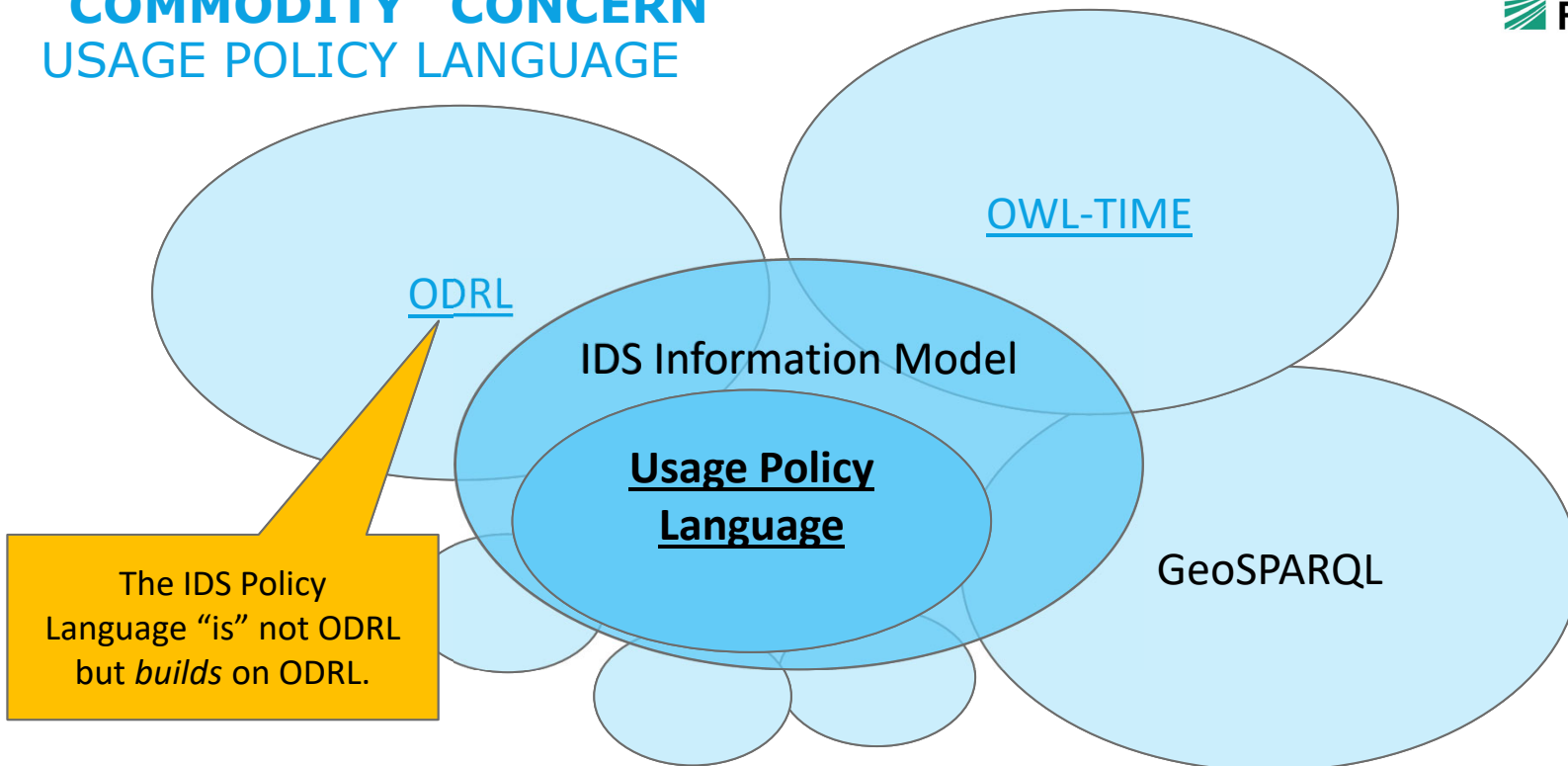
EXAMPLE: USAGE POLICIES

```
_:StockDataOffer a ids:ContractOffer ;
ids:permission [ ids:target _:StockData ;
  ids:action idsc:READ ;
  ids:constraint [ ids:leftOperand idsc:USER;
    ids:operator idsc:MEMBER_OF;
    ids:rightOperandReference <http://whiterock-invest.com/> ];
ids:postDuty [
  ids:action [ ids:includedIn idsc:COMPENSATE ;
    ids:actionRefinement [ ids:leftOperand idsc:PAY_AMOUNT ;
      ids:operator idsc:EQ ;
      ids:rightOperand "5000000"^^xsd:double ] ] [...] ] .
```





"COMMODITY" CONCERN USAGE POLICY LANGUAGE





“CONTENT” CONCERN

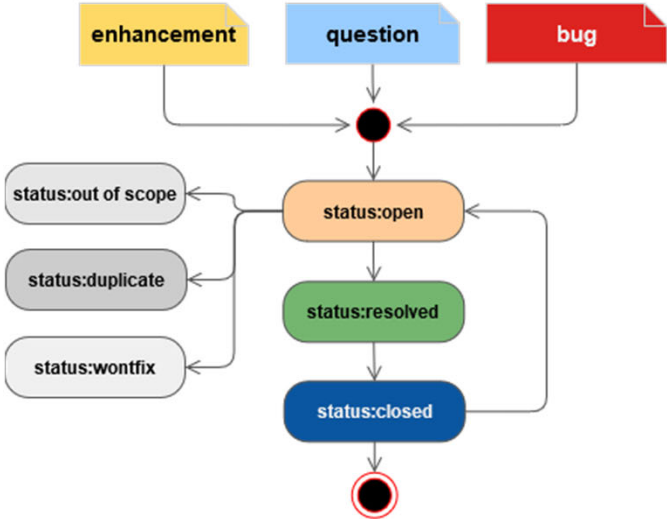
DOMAIN-SPECIFIC STRUCTURE AND SEMANTICS

Type of Information	Standard	Use Case
Use of vocabularies	VoID	“This data resource mainly contains information about average and minimum temperatures.” “This data resource mainly contains instances of the W3C SOSA/SSN sensor data ontology .”
Data structure	Data Cube	“This data resource consists of a three-dimensional matrix with temperature measurements in degrees centigrade in the dimensions 1. time, 2. geo-coordinates, and 3. sensor used.”
Detailed graph structure	SHACL	“This data resource contains measurements of average and minimum temperature in a specific place at a specific time, measured by sensor 6c4a550f-5a6b-4ebf-b17f-40429d39f6da” (similar to above but also works with structures other than matrices/cubes)

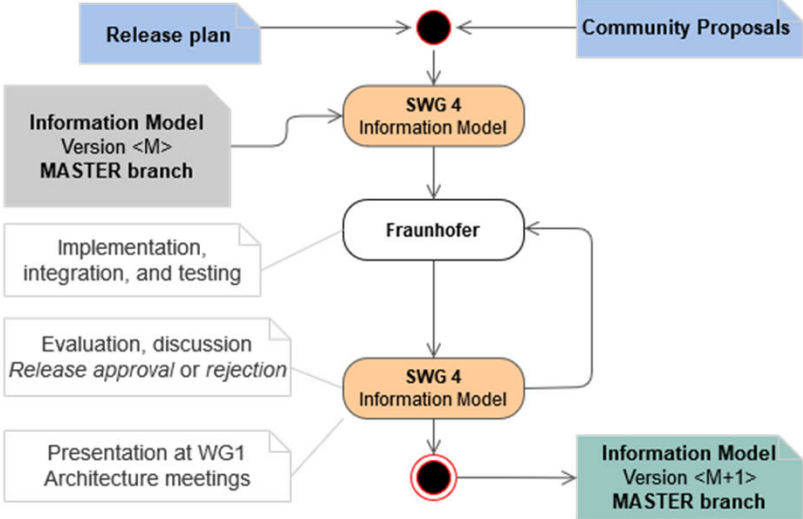


RELEASE CYCLE WHERE AND HOW TO PARTICIPATE

Collaboration and processes



Releases twice a year (March & September)

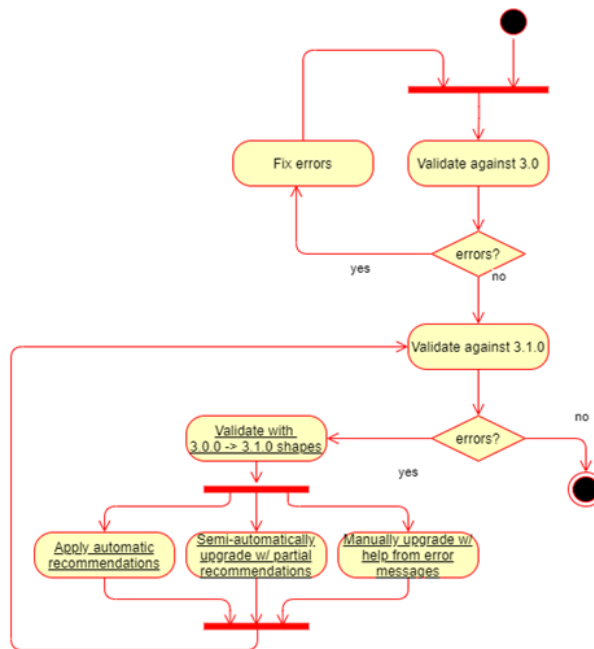




VERSION UPGRADE SUPPORT

COMPANION TOOLS FOR COMPONENT IMPLEMENTERS

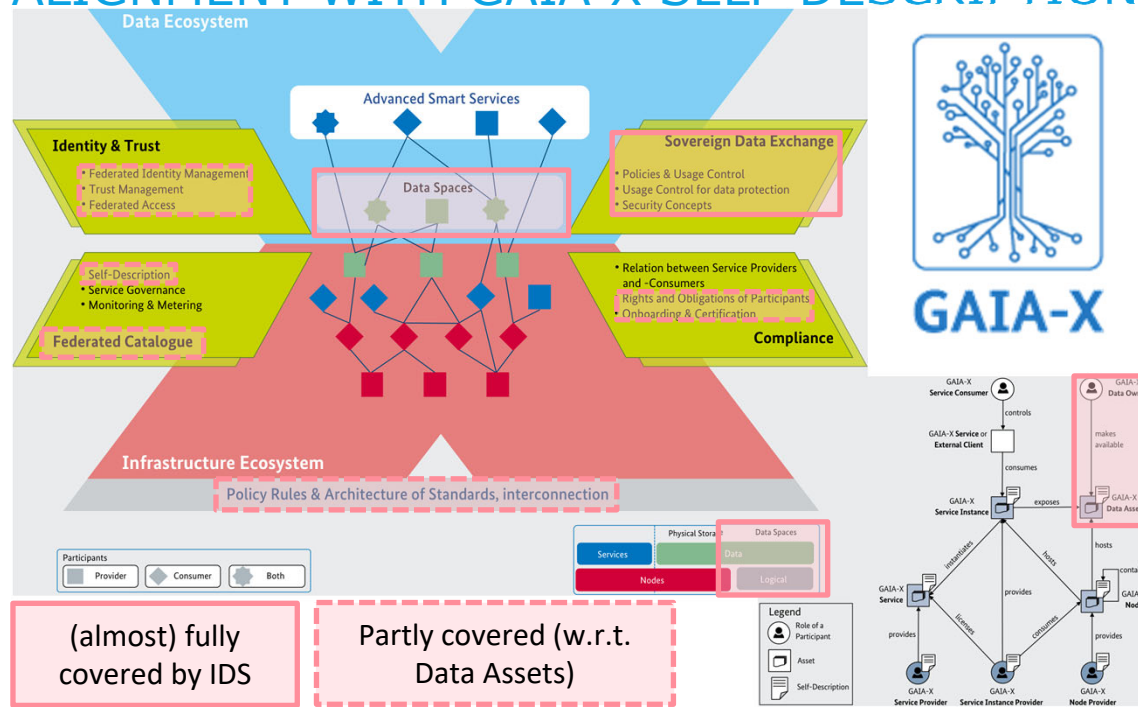
Version 3.0.0 to version 3.1.0



IDS INFORMATION MODEL PLANNED STEPS AFTER V4.0.0

- [usage policy templates](#) evolution based on findings of usage control team
- aligning documentation with [IDS-G](#)
- REST API in addition to message-based interaction
- taking up lessons learned from applications in related projects, e.g.:
 - [DEMETER H2020](#) (agri-food interoperability): metadata layer of an Agricultural Information Model as a *profile* of the IDS Information Model; full W3C [DCAT2/DCAT-AP](#) support
 - [TRUSTS H2020](#) (Trusted Secure Data Space → 29 September Live Session): alignment with [W3C Data Privacy Vocabulary](#)
 - [Mobility Data Space](#) (Germany): filtering data resources by region or time
 - [GAIA-X European federated data and service infrastructure](#) (→ separate slide): self-description

IDS INFORMATION MODEL ALIGNMENT WITH GAIA-X SELF-DESCRIPTIONS



- Based on JSON-LD
- Additional ideas w.r.t. service orchestration
- Extended notion of trust by signatures on parts of self-descriptions



GET INVOLVED! WORKING GROUP AND REGULAR EVENTS

Possibilities for IDSA Members

- Participate in [Sub-Working Group 4 "Information Model"](#)
- Monthly call on 2nd Thursday at 16:00 CE(S)T; next one on 10 September

Invitation to everyone

- file issues on <https://github.com/International-Data-Spaces-Association/InformationModel> (→ release cycle slide)





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