Semantic information management: the approach to semantic assets development lifecycle

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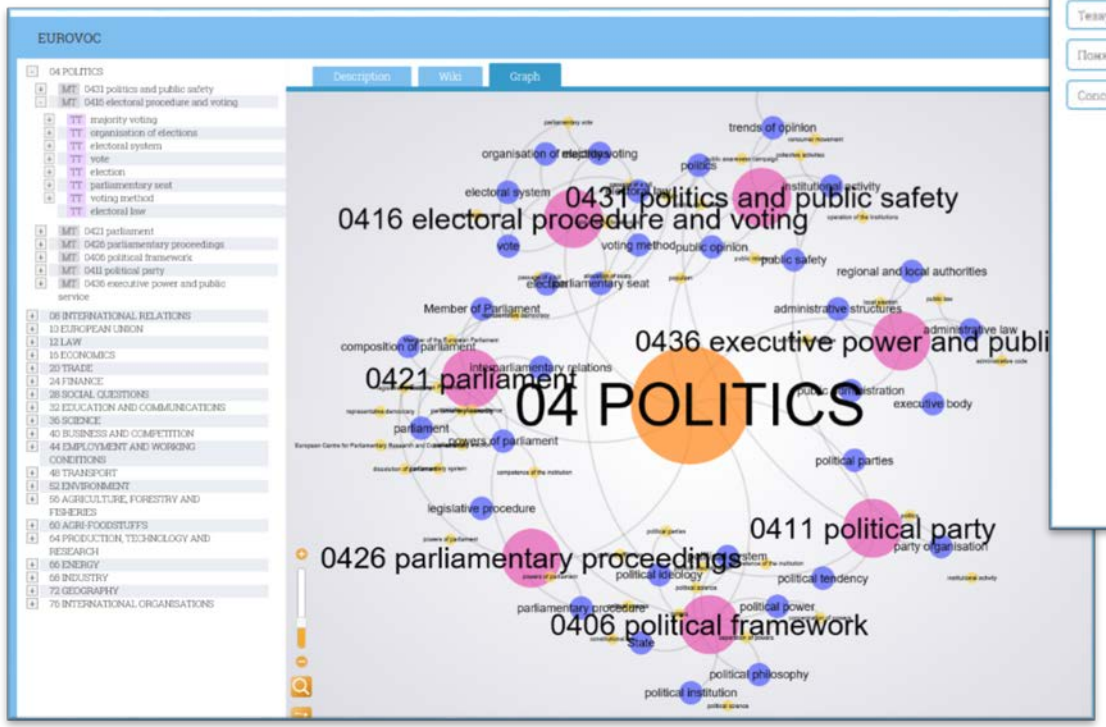
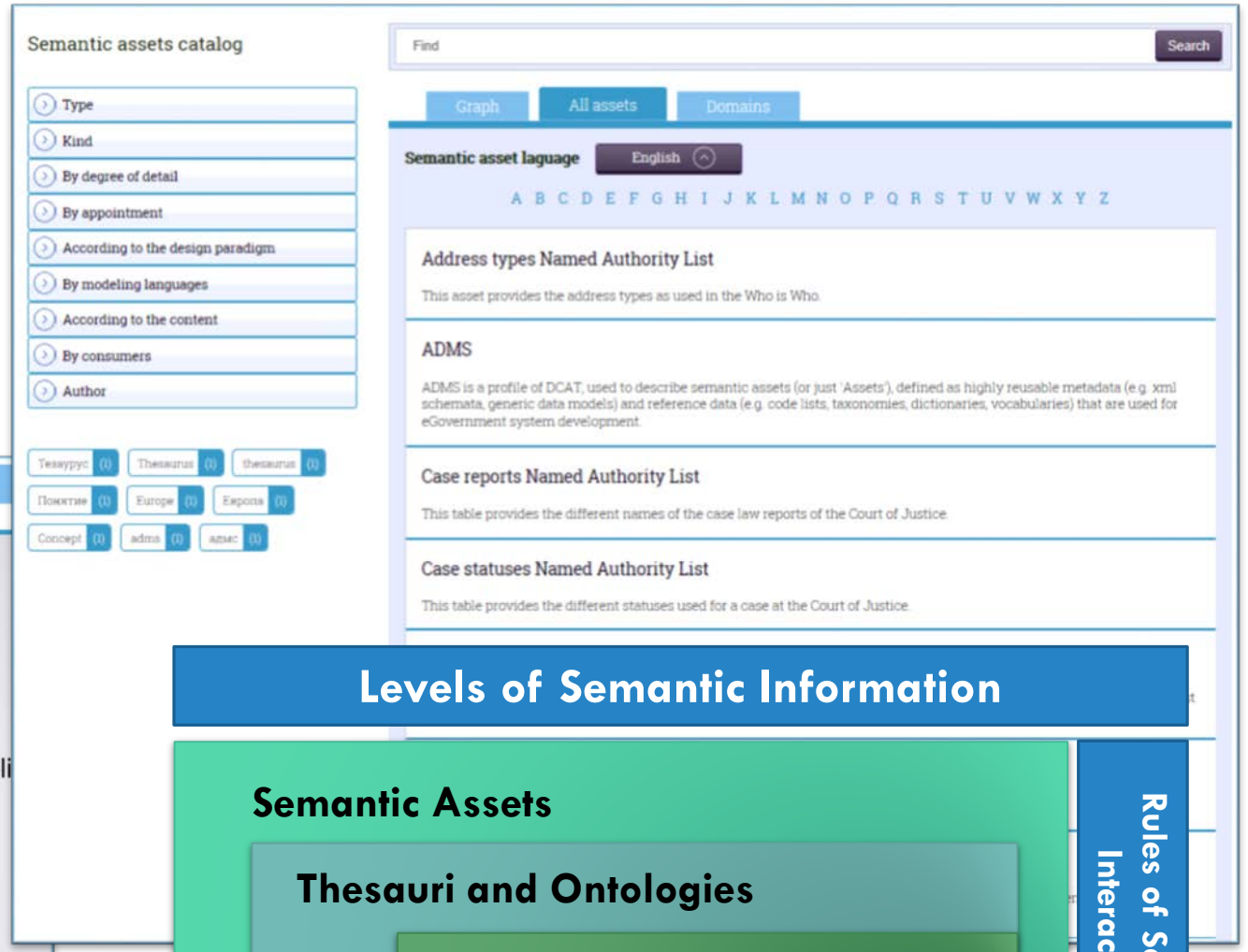
Semantic Interoperability and Semantic Assets

Semantic interoperability

the ability of computer systems to exchange data with unambiguous, shared meaning.

Required to enable machine computable logic, inferencing, knowledge discovery, and data federation between information systems





Levels of Semantic Information

Semantic Assets

Thesauri and Ontologies

Vocabularies and Taxonomies

Glossaries

Rules of Semantic Interaction

Challenges for the Application of Semantic Integration Methods

- The construction of SA is carried out by the expert groups throughout the process of an information system development or modeling of a particular domain. In this case the knowledge of domain experts should be transferred **from paper documents to machine-readable formats (ontologies, thesauri, and glossaries – semantic assets).** Without this step, the dissemination of knowledge outside of a specific information system is insufficient for “understanding” and complicates further (re)use by other distributed systems interacting in a heterogeneous environment.

- Already developed SA are usually insufficient for the modeling of information exchange, therefore, **experts have to solve the task of building a more detailed semantic exchange model**. It is a new model which can be further (re)used as well as the others.

- To provide the ability for information systems to interact on a semantic level, **it is necessary to join the efforts of IT-specialists and various domain experts.** Additionally this collaboration aims at **avoiding the problem of cross disciplinary misunderstanding which results in multiple revisions and unsatisfactory results.**

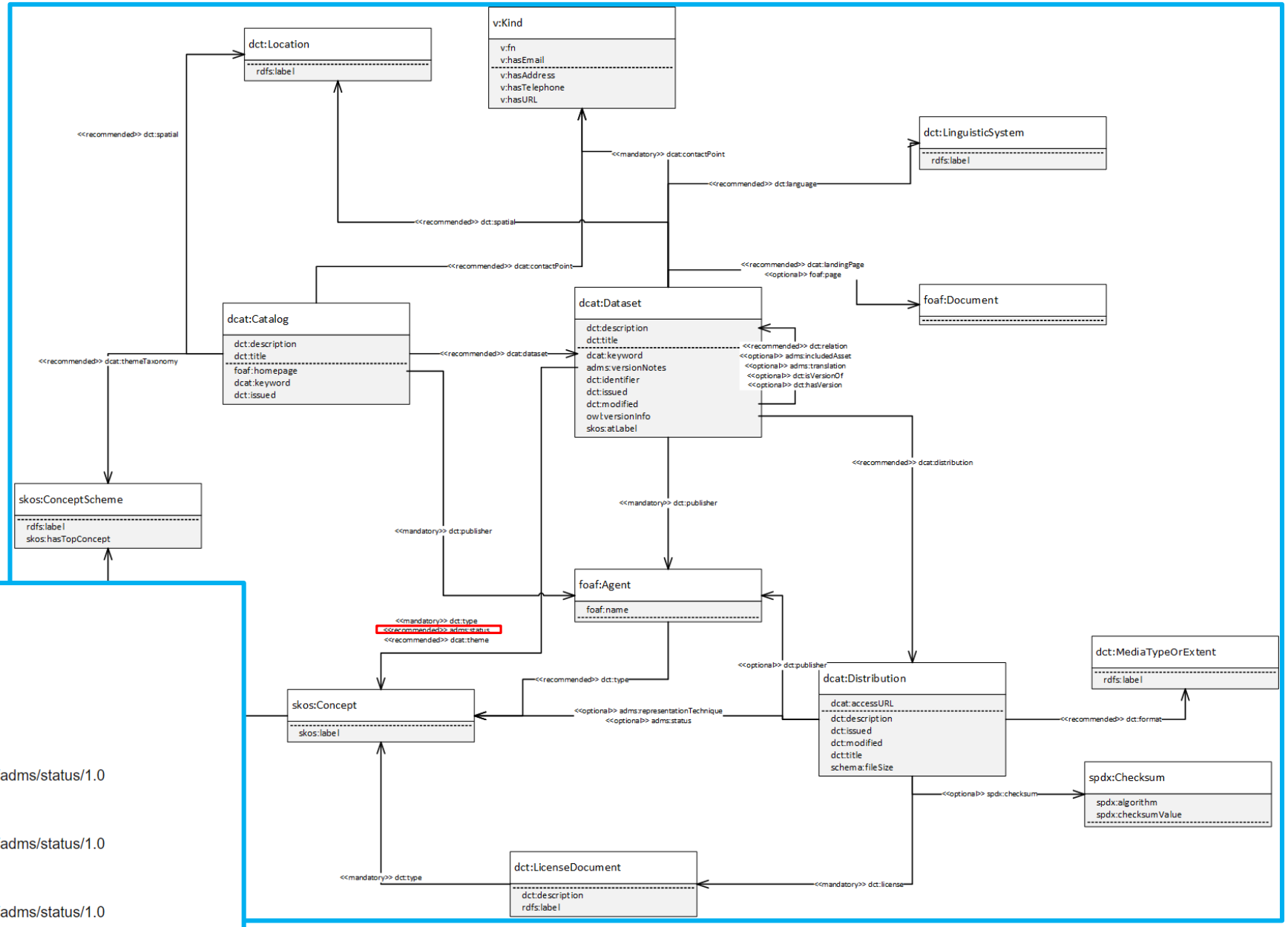
- Existing ontology based approaches for semantic interoperability have not been sufficiently effective because “there is no systematic methodology to follow, no concert methodology for building ontologies and all existing ontology-based not able to reconcile all types of semantic conflicts”. Ontology Summit supports this experts’ concern and emphases that “in practice, however, Semantic Interoperability is difficult to achieve”.

- **Every expert thinks his semantic model is absolutely different and prefers to invent a new one. This brings us to problem of semantic chaos.**

In order to overcome the challenges shown above and to simplify the application of semantic integration methods at the stage of semantic asset development we need to set an expert-oriented, common methodology for SA Management and support it with appropriate tools.

International Experience

ADMS



Status

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+ skos:hasTopConcept

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Current Approaches to Semantic Assets Management

Cataloging

- Completed
- Deprecated
- UnderDevelopment
- WithDrawn

Does not cover collaboration, as well as the evaluation and quality assessment at development stage

Collaboration

- Recommendation W3C (REC)
- Proposed Recommendation (PR)
- Candidate for Recommendation (CR)
- Working draft (WD)

Considers the standard as a whole document and cannot be used for semantic assets because they consist of elements and branches of elements

Meta Data Registers

ISO/IEC 11179
ISO/IEC 11179-6:2015

- Preferred Standard
- Standard
- Qualified
- Recorded
- Candidate
- Incomplete
- Retired

Demands the establishment of registering authority and can be used at the further stages of methodology development

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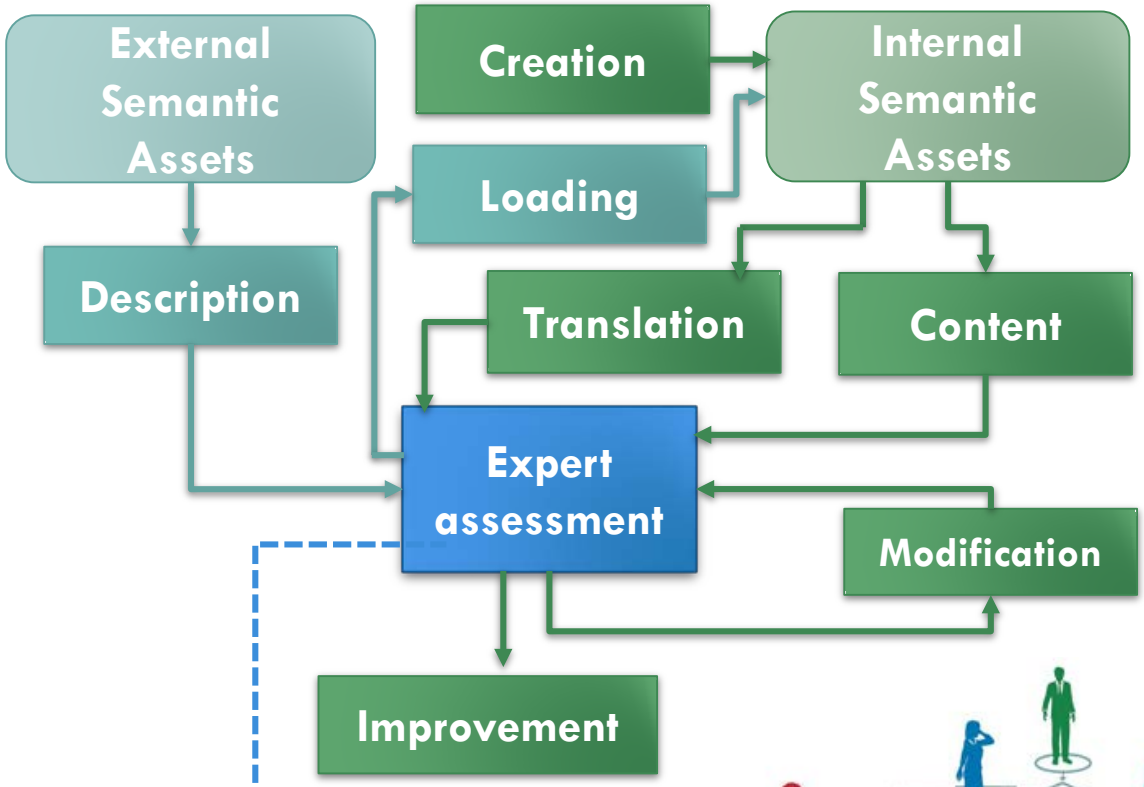
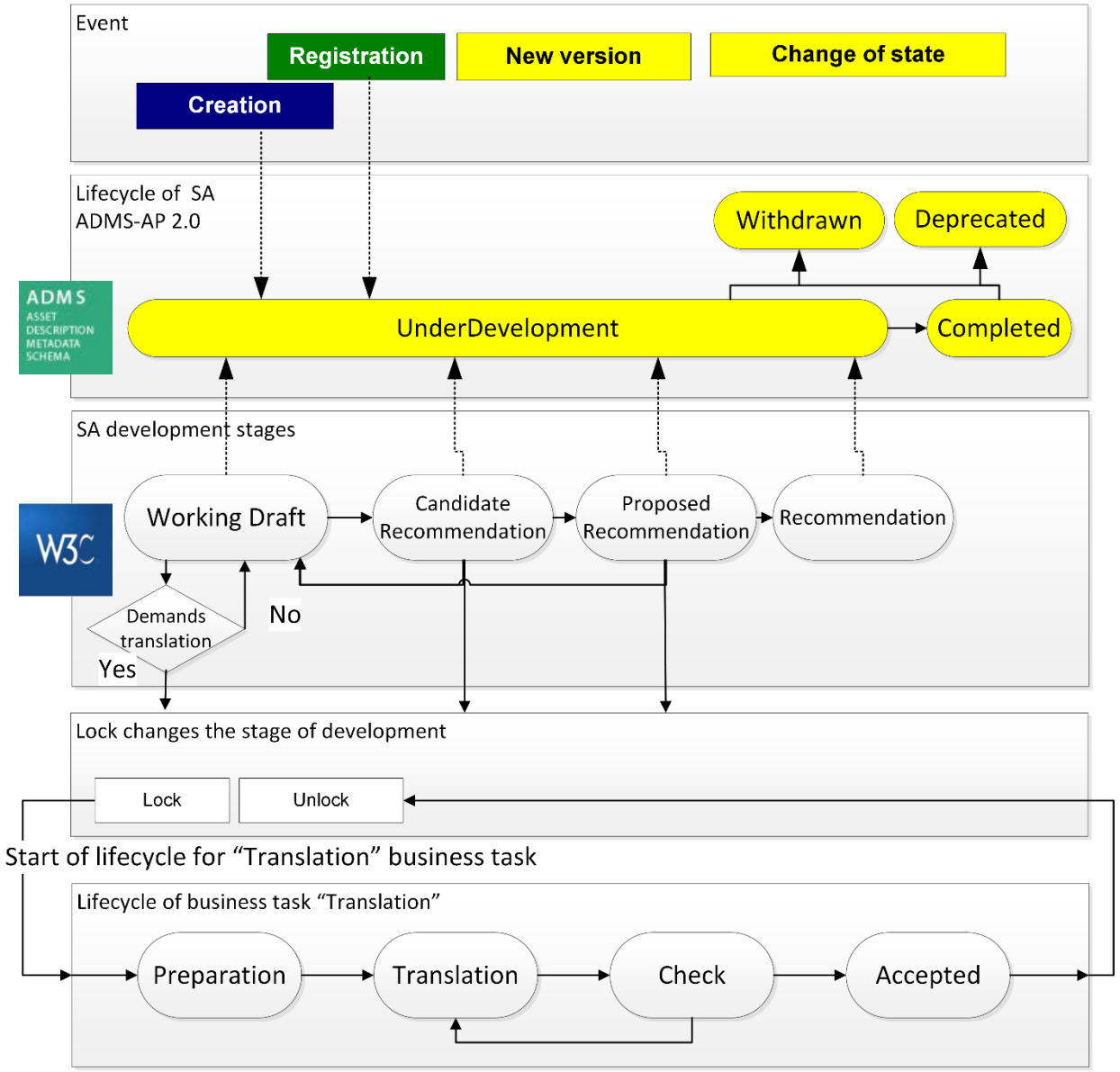
Semantic Assets Management. Scenarios



(1) validation (working group)
(2) public expert assessment (community)
(3) independent review (domain expert)

- **Domain experts** can develop semantic assets in scope and detail necessary for IT specialists during SA implementation in information systems
- **Domain experts** can establish the correspondence between different SA elements to harmonize their content
- **IT specialists** can ensure the consistency of the developed semantic models with the description of the subject area, generally accepted standards and recommendations regarding the composition and contents
- **Domain experts** can review the models developed by IT specialists to assess semantic completeness and consistency.

Semantic Assets Management Lifecycle



SA development stages	Business tasks for SA development stages	Comments
Work Draft (WD)	SA Loading SA Creation SA Translation SA Expert assessment	Filling the content of the asset (loading SA contents, creation of new SA elements, translation, etc.) and refining the description of SA (completion of fields, classification, connection to other assets)
Candidate for recommendation (CR)	SA Modification SA Expert assessment	Main expert evaluation and making "cosmetic" changes, e.g. spelling improvement
Proposed recommendation (PR)	SA Expert assessment	Decision that the SA can be recommended for implementation
Recommendation (REC)		

ADMS-WF 1.0

For compatibility and reuse of semantic assets at the stage of their development by domain experts and IT specialists we developed
ADMS-WF 1.0 profile
ADMS-AP 2.0 extension

- Companies owning semantic assets, experts and IT specialists can use the ADMS-WF 1.0 profile for cataloging, as well as supporting the SA lifecycle during harmonization, developing new or finalizing existing versions of semantic assets.

- Experts can use the ADMS-WF 1.0 to support the lifecycle of SA during the process of semantic assets discussion and assessment.

- IT specialists can use this profile to support the lifecycle of SA when validating the correspondence of data schemas (metadata) to domain models or enriching data schemas with the semantic information needed to support interoperability of heterogeneous information systems.

- to support the development of semantic assets and SA harmonization
- to register existing semantic assets in the catalogue
- to load SA from external resources for further (re)use (e.g. for localization) after expert review and assessment

QUESTIONS?

THANK YOU!

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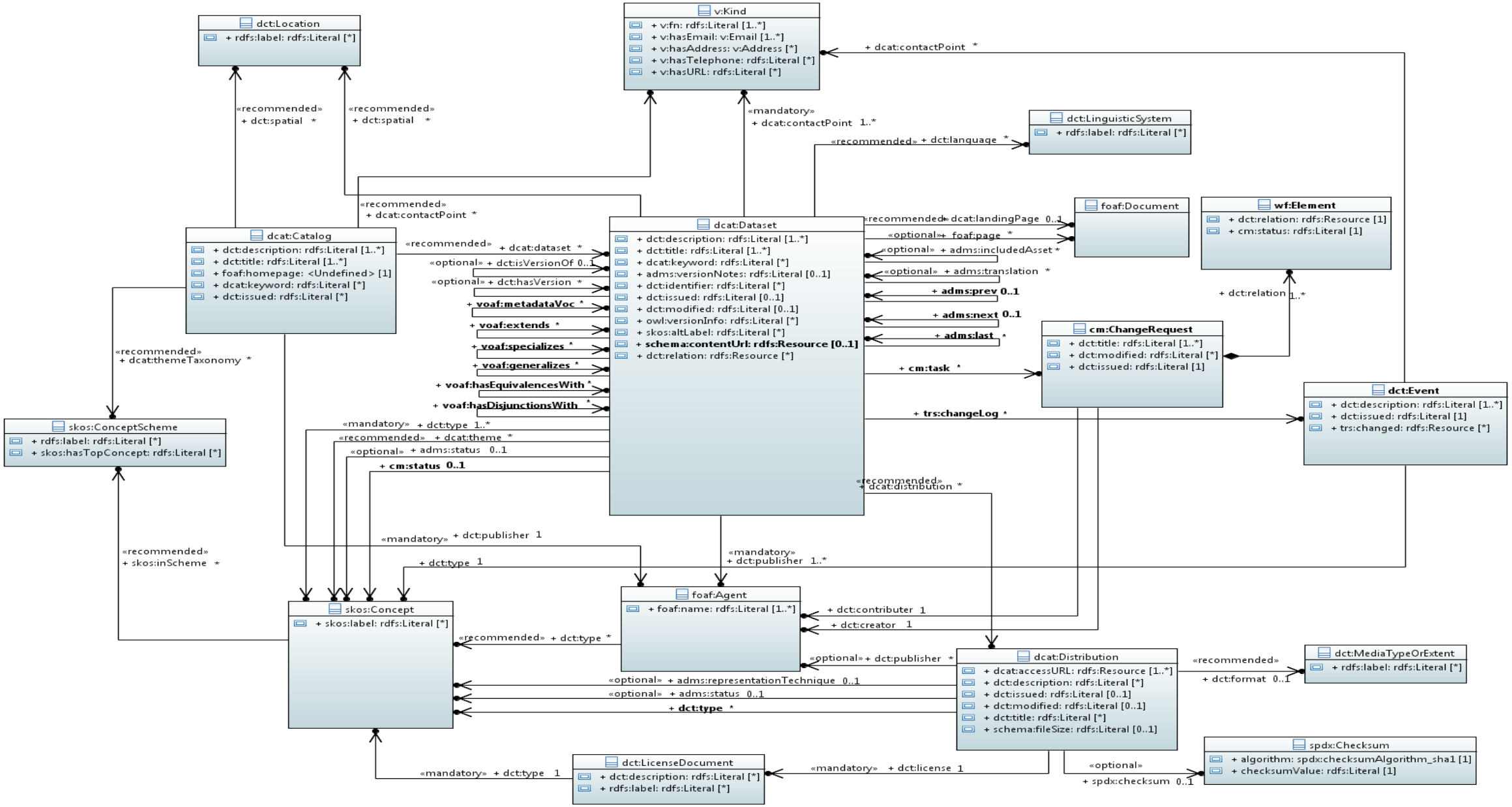
ADMS AP 2.0 Extension – ADMS-WF 1.0

- additional properties to ADMS “Asset”, dcat:Dataset class to conduct SA versioning, access SA contents together as well as to connect business tasks and events
- additional property to ADMS “Asset Distribution”, dcat: Distribution class for the integration with external design tools

- “Event”, dct:Event class for the storage and distribution of events, occurring during SA development
- “Change Request”, cm:ChangeRequest class in order to fix business tasks connected with SA as well as their workflow.

ADMS-WF 1.0 profile

ADMS-WF Extended UML class diagram of ADMS-AP 2.0



Conclusion and Future work

- We offer the methodology of collective work at the stage of the semantic assets development mainly based on the existing methods of semantic asset management and Web standards. The analysis of limitations inherent to the standard SA management has been done and the necessity of SA lifecycle extension has been proven in order to support SA development workflow.

- The objectives of a collaborative semantic integration platform are determined, including the usage scenarios of the suggested ADMS-WF 1.0 profile and their association with the stages of SA development.

- We propose to extend existing lifecycle and combine SA lifecycle, SA development stages and lifecycle of business tasks.

- To implement the proposed approaches, an extension of the cataloguing schema for semantic assets - ADMS-WF 1.0 has been developed, providing backward compatibility of the collaborative semantic integration platform with ADMS-AP 2.0-compliant catalogues together with the provision of information about SA built or modified in the process of experts' collaboration for the semantic integration of heterogeneous information systems.

- Consolidation and (re)use of semantic assets, including the provision of core vocabularies and data models for information exchange.

- Collaboration of domain experts and IT specialists using a community-driven, standards-based approach for modeling information systems and information exchange services, as well as, transforming open data to linked open data.