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Leibniz Institute for the Social Sciences

Historization and Versioning of DDI-Lifecycle Metadata Objects

Findings in the STARDAT Project

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Outline

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Objectives

- Integrated management system for metadata
- Replacement for production systems DBK, DSDM, CBE
- Multi-language documentation on study and variable level
- Controlled vocabularies (Thesauri)
- Related publications, scales, trends and add. metadata
- Interfaces to portals like ZACAT, Cessda, Data Portal, Sowiport and da|ra
- Support of and high interoperability with standards like DDI-C and DDI-L
- Longterm-preservation with DDI

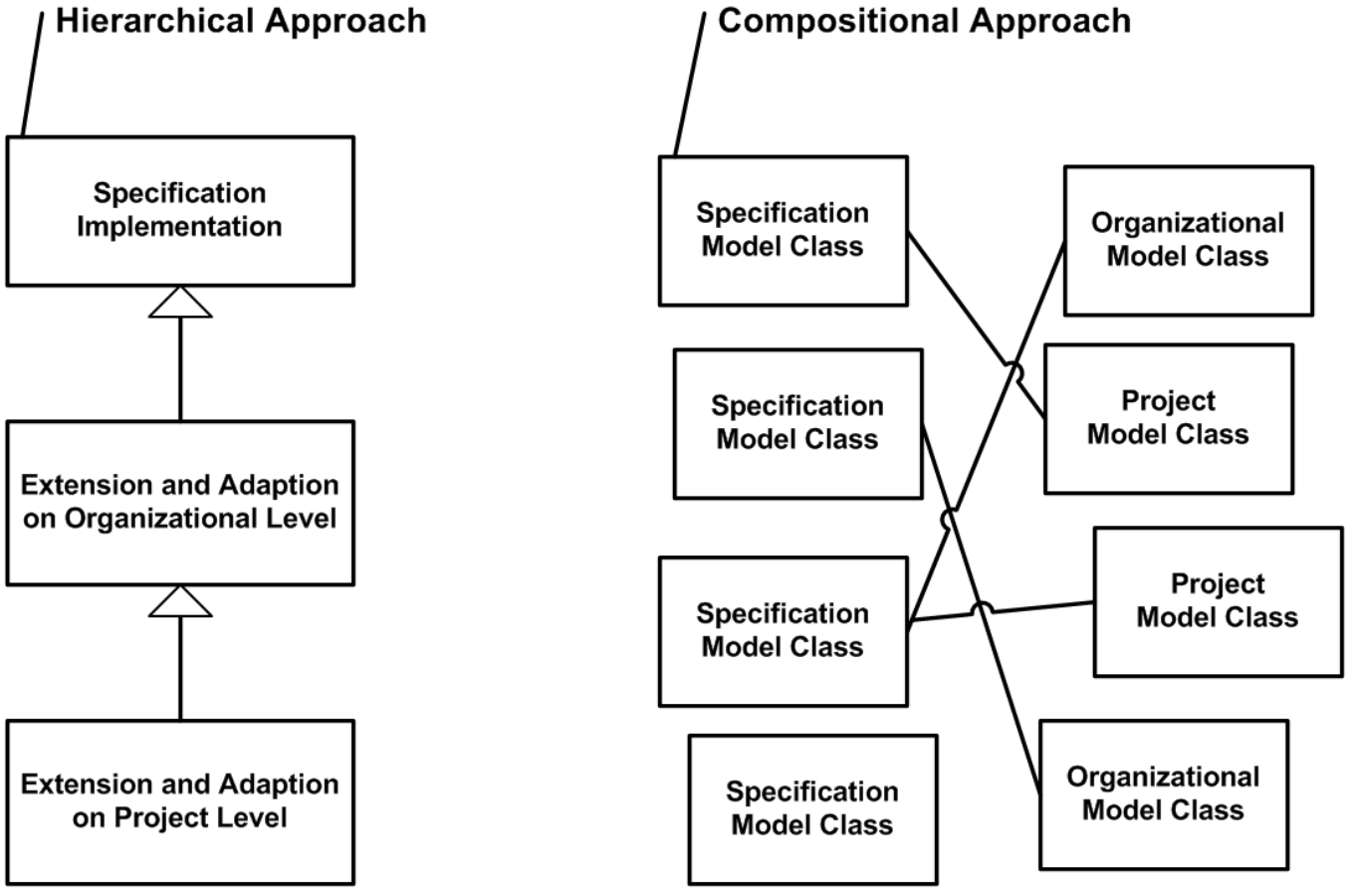
Outline

Principles for Analysis, Design and Coding

My Guidelines for Daily Work

- Strict separation of *modeling* and *mapping*
  - avoids specific, not reusable implementations
  - allows use case specific, possibly different mappings
  - makes incompatibilties explicit
- Strict separation of *model* and *representation*
  - leads to true abstraction in memory
  - is the very necessary base for true interchangeability

Towards a GESIS DDI Architecture



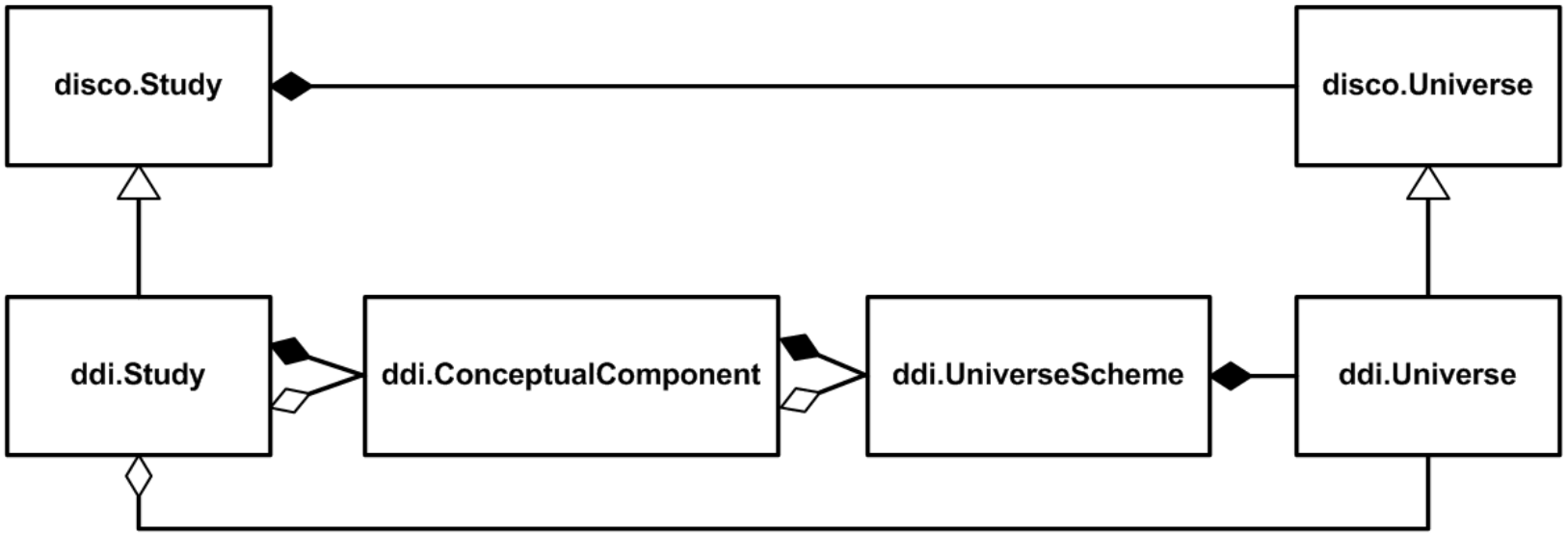
Towards a GESIS DDI Architecture

Comparison of the Two Approaches

- Hierarchy (Inheritance)
  - Technical infrastructure on organizational level (+)
  - Support of services out of the box (+)
  - Lower-level components must be true extensions (-)
  - Explicit definition of requirements for extensibility (-)
- Composite (Mapping)
  - Independence and flexibility in modeling (+)
  - Making incompatibilities explicit (+)
  - Re-implementation of components (-)

Towards a GESIS DDI Architecture

Implementation Challenge: Loss of Maintainables



Coping with DDI Schema Change

My Guidelines for Daily Work

- **Accept it!!!**
- Extract it!
- Restrict it!
- Anticipate it!
- **Contribute to abstract it!**

Coping with DDI Schema Change

Example: Label – Extract and Restrict It!

- DDI 3.1: Object may have **one** multi-lingual label
- DDI 3.2: Object may have **many** multi-lingual labels

$\Rightarrow$ Is it a critical requirement?

Coping with DDI Schema Change

Example: Note – Anticipate It!

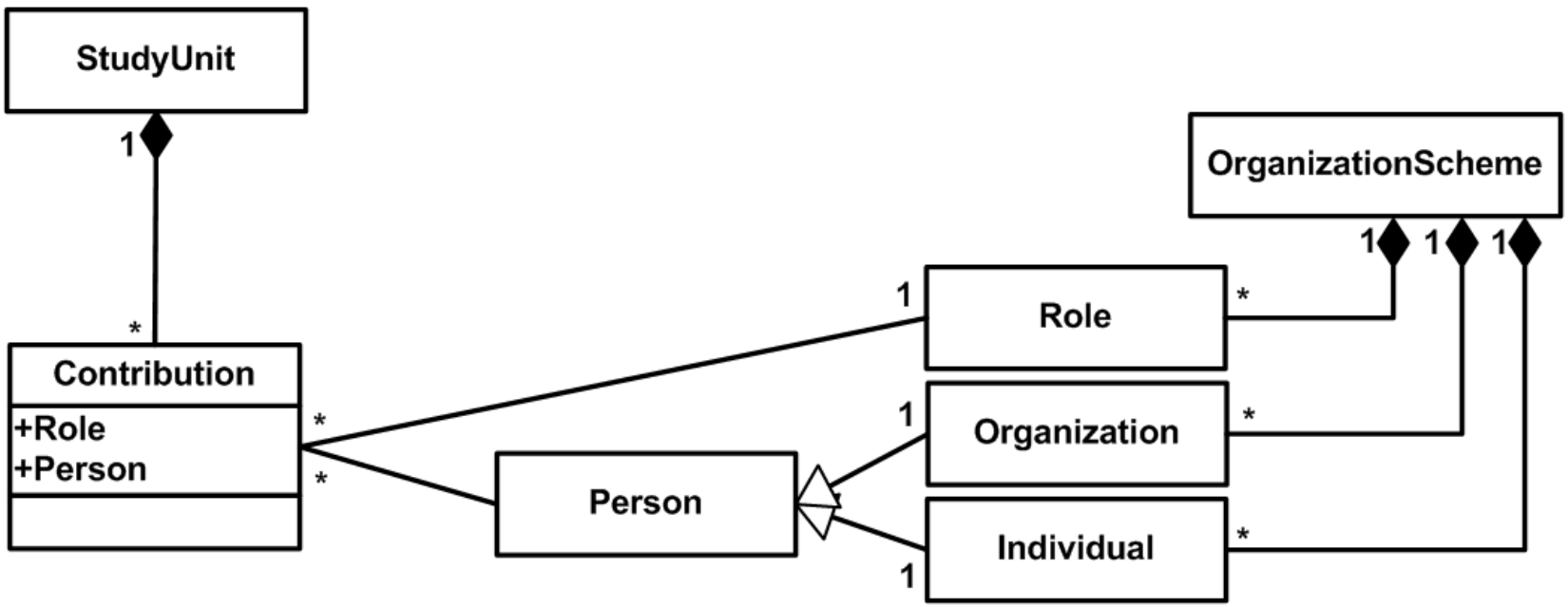
- DDI 3.1: Note is an Identifiable
- DDI 3.2: Note is not an Identifiable any more

$\Rightarrow$ Resolve DDI-L inheritance hierarchy on technical level!

- Only distinction between Identifiable and Non-Identifiable
- All types with domain responsibility are Identifiable

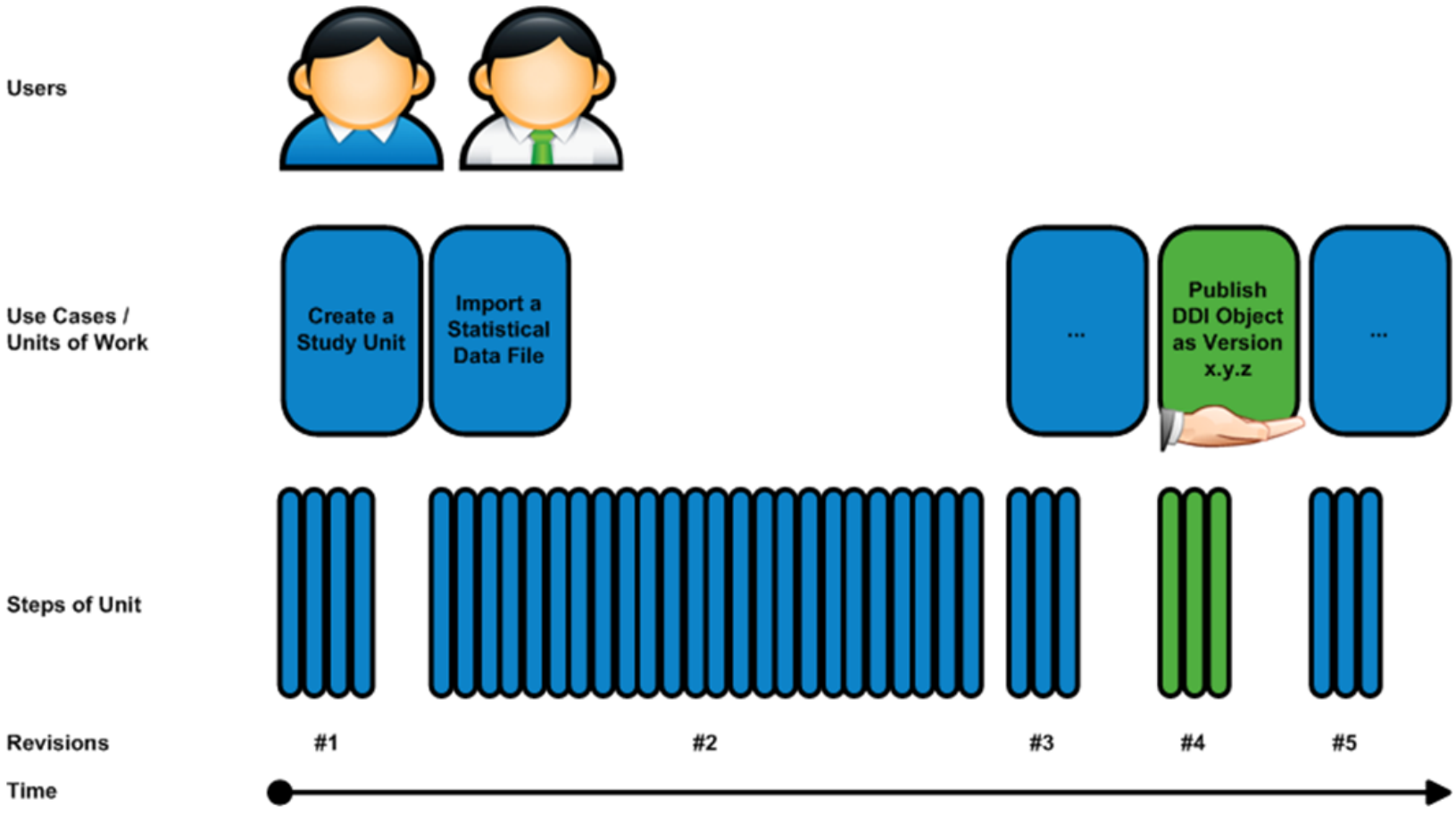
Coping with DDI Schema Change

Example: Citation – Abstract It!



Outline

Use Case: Historization and Versioning



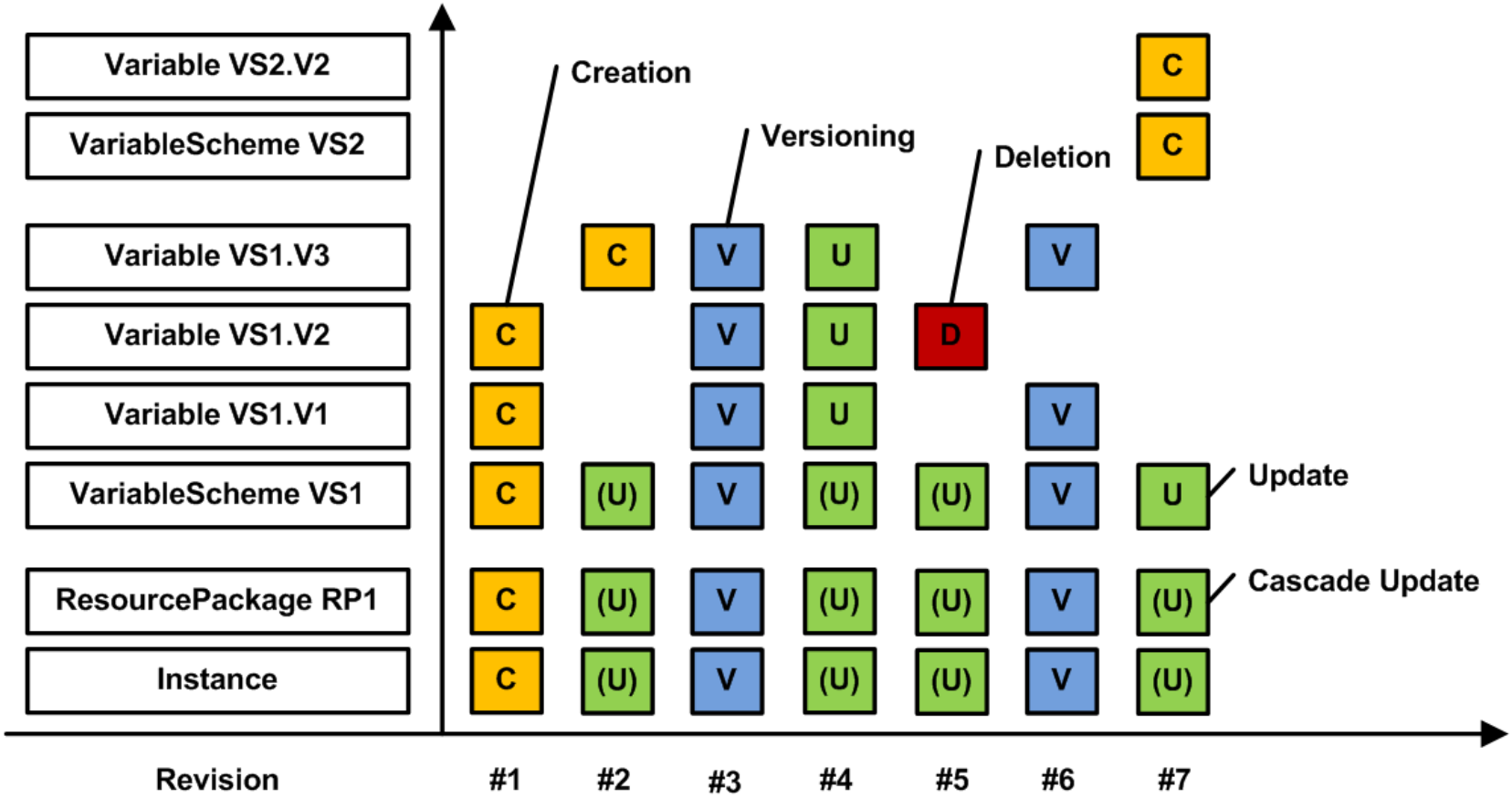
Definition: *Historization*

- is the technical process
- to keep track of change
  - which metadata objects changed
  - when
  - why
  - by whom
- within a transaction
- on attribute and relationship level;
- builds the foundation of *Versioning*.

Definition: *Versioning*

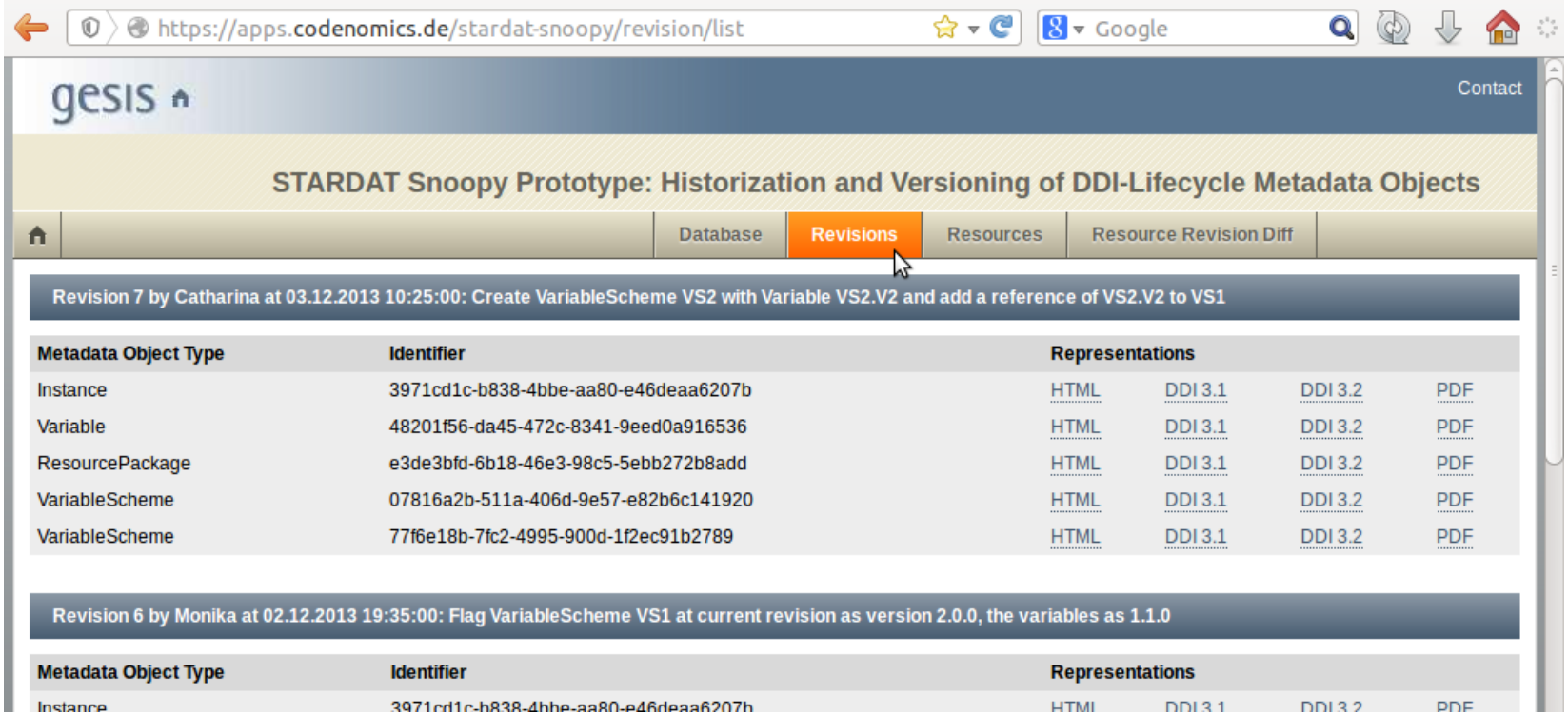
- is the business process
- to flag a given metadata object
- at a given revision with a version number
- according to the agency's versioning policy
- if possible with recommendation or automatically.

Use Case: Historization and Versioning



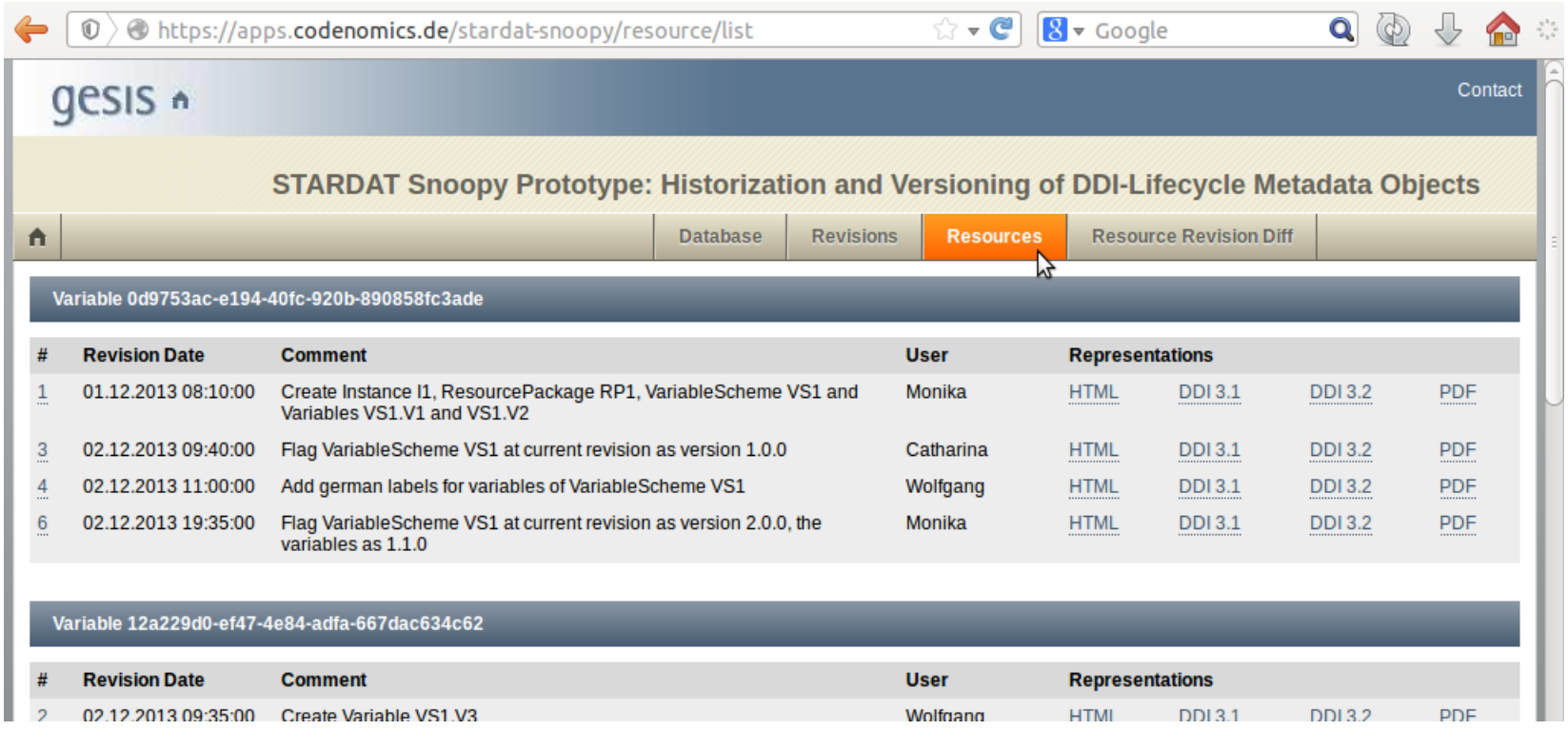
H&V Use Case: Revision View

- Show given revision, range of revisions or all revisions with included metadata objects



H&V Use Case: Resource View

- Show given resource in current state and older revisions



H&V Use Case: Resource Diff View

- Compare given resource between two selected revisions

H&V Use Case: DDI 3.1 Representation


```
−<ddi:DDIInstance agency="de.gesis" id="3971cd1c-b838-4bbe-aa80-e46deaa6207b" version="7" isPublished="false">
   <r:UserID type="11179-IRDI">de.gesis:3971cd1c-b838-4bbe-aa80-e46deaa6207b:7</r:UserID>
  −<g:ResourcePackage agency="de.gesis" id="e3de3bfd-6b18-46e3-98c5-5ebb272b8add" version="7"
   isPublished="false">
     <r:UserID type="11179-IRDI">de.gesis:e3de3bfd-6b18-46e3-98c5-5ebb272b8add:7</r:UserID>
    −<l:VariableScheme id="77f6e18b-7fc2-4995-900d-1f2ec91b2789" agency="de.gesis" version="7"
     isPublished="false">
       <r:UserID type="11179-IRDI">de.gesis:77f6e18b-7fc2-4995-900d-1f2ec91b2789:7</r:UserID>
      −<l:Variable id="0d9753ac-e194-40fc-920b-890858fc3ade" version="1.1.0">
         <r:UserID type="11179-IRDI">de.gesis:0d9753ac-e194-40fc-920b-890858fc3ade:6</r:UserID>
         <l:VariableName>VS1.V1</l:VariableName>
         <r:Label xml:lang="en">Confidence in parliament</r:Label>
         <r:Label xml:lang="de">Vertrauen in Parlament</r:Label>
       </l:Variable>
      −<l:VariableReference>
         <r:ID>48201f56-da45-472c-8341-9eed0a916536</r:ID>
         <r:IdentifyingAgency>de.gesis</r:IdentifyingAgency>
         <r:Version>7</r:Version>
       </l:VariableReference>
      −<l:Variable id="12a229d0-ef47-4e84-adfa-667dac634c62" version="1.1.0">
         <r:UserID type="11179-IRDI">de.gesis:12a229d0-ef47-4e84-adfa-667dac634c62:6</r:UserID>
         <l:VariableName>VS1.V3</l:VariableName>
         <r:Label xml:lang="en">Confidence in schools and educational system</r:Label>
         <r:Label xml:lang="de">Vertrauen in Schulen und Bildungssystem</r:Label>
       </l:Variable>
     </l:VariableScheme>
    −<l:VariableScheme id="07816a2b-511a-406d-9e57-e82b6c141920" agency="de.gesis" version="7"
     isPublished="false">
       <r:UserID type="11179-IRDI">de.gesis:07816a2b-511a-406d-9e57-e82b6c141920:7</r:UserID>
      −<l:Variable id="48201f56-da45-472c-8341-9eed0a916536" version="7">
```

H&V Use Case: Implementation Details

- Not an implementation image of the specification but close as possible to read and write DDI-L
- Java objects bundled as Maven Module
- Java Persistence API and Hibernate Envers annotations as persistence abstraction
- Hibernate as persistence provider

Note!

- Revision number is a global identifier of repository state.
- Version number is not a property of a metadata class.

Object Identification

- {agency}:{identifier}:({revision}), e.g. de.gesis:3971cd1c-b838-4bbe-aa80-e46deaa6207b:7
- {agency}:{identifier}:{version}, e.g. de.gesis:3971cd1c-b838-4bbe-aa80-e46deaa6207b:2.0.0

- Identifier unique within the maintaining agency
- Revision as an ascending Integer
- Version as composition of ascending Integers separated by dots
- Separation of contents/concepts and identification

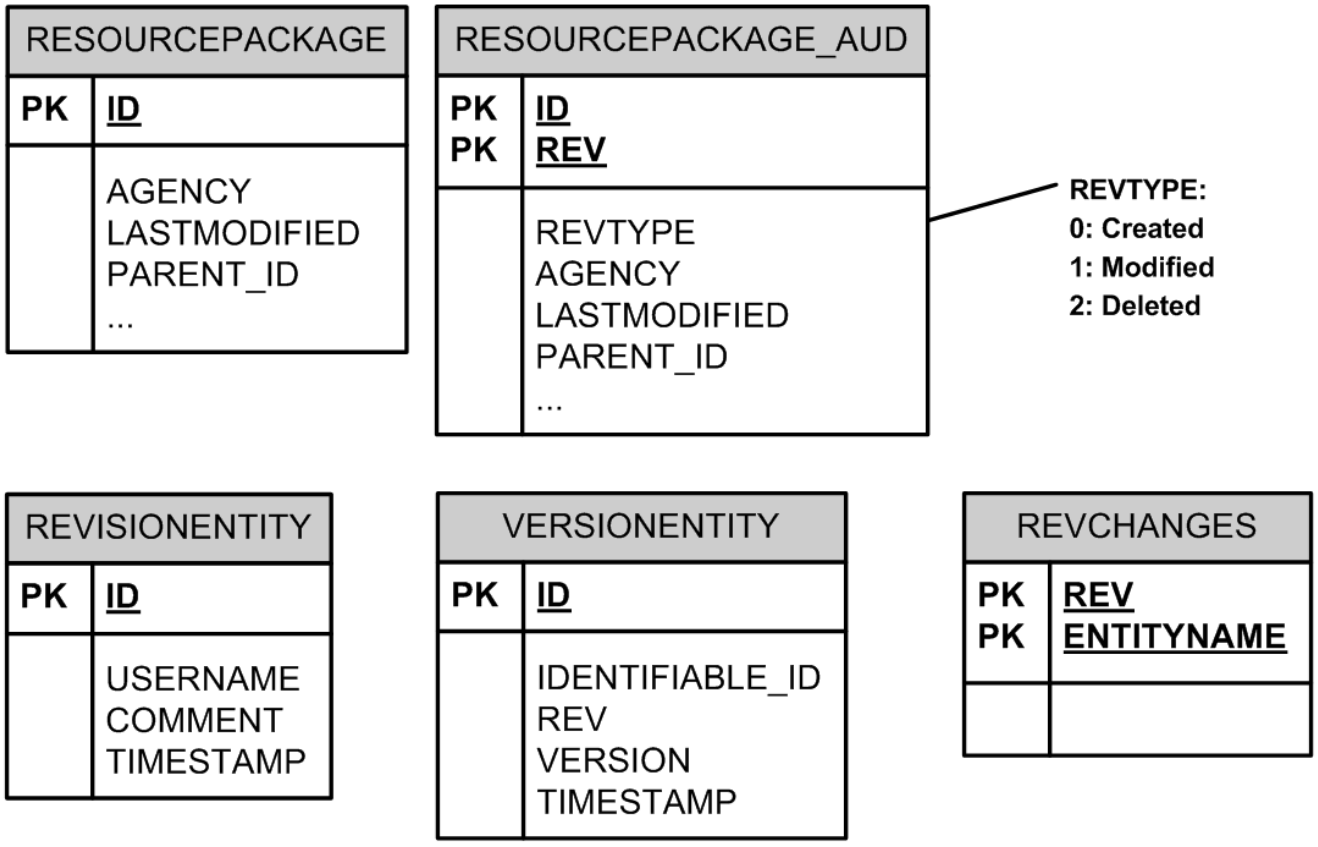
H&V Use Case: Base Class Identifiable

With Hibernate Envers Annotations

```
@Entity
@Audited
@Inheritance(strategy = InheritanceType.TABLE_PER_CLASS)
public class Identifiable
{
  @Id
  private String id;

  @Column
  private String agency;

  @Column
  private long lastModified;

  @ManyToOne
  private Identifiable parent;

  // ...

  @PrePersist
  protected void cascadeLastModified()
  {
    lastModified = RevisionContext.getInstance().getTimestamp();
    if (this.parent != null)
      this.parent.cascadeLastModified();
  }
}
```

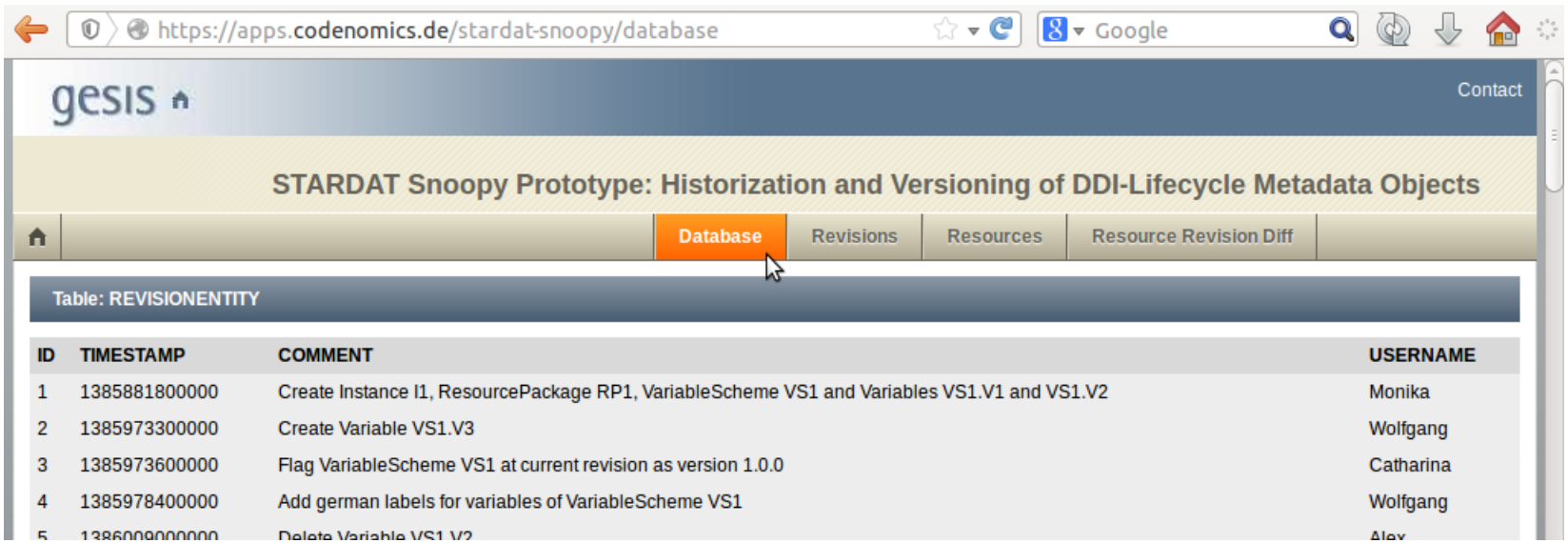
H&V Use Case: Entity Relationship Diagram

Generated by Hibernate Envers



H&V Use Case: Prototype

- Read-only mode for inspecting the small demo use case
- See database tables and contents
- https://apps.codenomics.de/stardat-snoopy



Outline

Use Case: Import a Statistical Data File

Present Workflow and Implementation

- Statistical data file as content reference
- Only support of SPSS
- Import and iterative update of variable information
- Entities: Study, Variable, VariableValue
- All assoziations are compositions (no reuse)

Use Case: Import a Statistical Data File

Possible Future Workflow and Implementation

- Present workflow must be supported
- Also Documentation as content reference
- Entities: StudyUnit|ResourcePackage, Variable, Code, Category, LogicalRecord, PhysicalStructure, RecordLayout, DataItem and necessary schemes
- Some assoziations are compositions, some are aggregations (reuse by reference)

Use Case: Import a Statistical Data File

Comparison

- More complex domain model (-/+)
- More comprehensively complying requirements (+)
- Different thinking about imports and iterative update required by reuse possibilities
- Very intuitive user interface needed to not get lost

Use Case: Import a Statistical Data File

Staged Reuse of Imported Variable Description

- Import all information without any (!) reuse (stage 1)
- Propose use of / Allow search for reusable items
  - within the dataset,
    e.g. code and category schemes (stage 2)
  - within project scope,
    e.g. variables (stage 3)
  - within agency scope,
    e.g. resource packages (stage 4)
  - beyond agency scope (stage 5)

Summary and Conclusion

- Object-relational modeling of DDI-Lifecycle is possible and may help to find suitable abstractions for future DDI versions.
- Hibernate Envers with JPA offers a nice solution to implement historization and versioning of DDI-Lifecycle metadata objects.
- Not only software tools, but (even simple) workflows and processes change fundamentally with the usage of DDI-Lifecycle.

Thank you!
Any questions?

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