Enforcing reuse and customization in the development of learning objects: a product line approach

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Goal

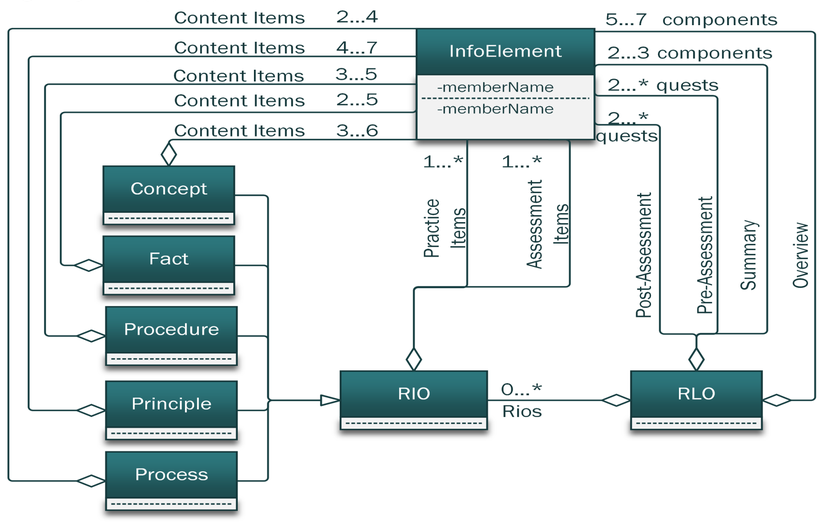
The growing demand for content reuse and customization have motivated the development of tools supporting the Creation and Management of the so-called **Reusable Learning Objects**. Most current Learning Object authoring processes are not driven by Pedagogical criteria; as a consequence, the associated tools use unstructured Content-Models.

➡ Our **goal** is the development of tools for creating reusable, granular, durable, and interoperable learning objects according to different pedagogical templates, and to compose such objects into meaningful courseware pieces. We explore a new way to reuse and customization following Product Line Engineering principles and tools.

Requirements for Building Learning Objects

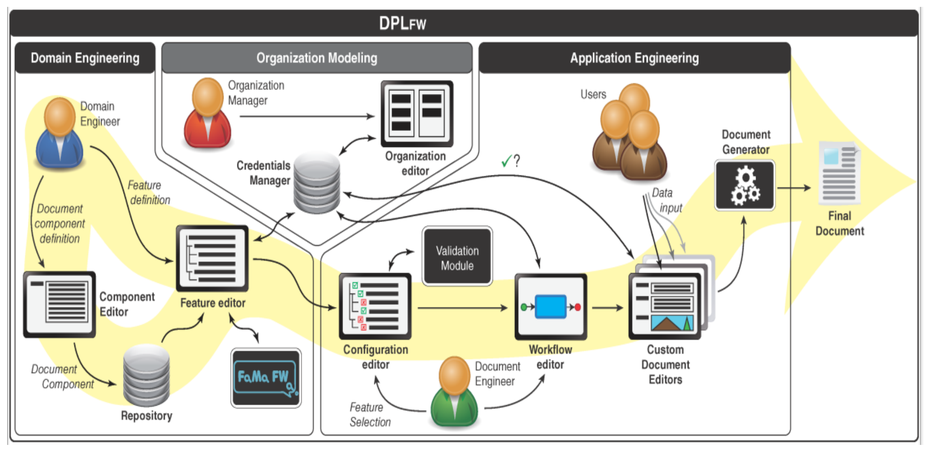
Learning Object Content Model

- Instructors create learning materials in their disciplines following the Cisco's Reusable Information Object strategy.
- A Reusable Information Object (RIO) is a granular, interoperable, reusable piece of information which contains a metadata level.
- RIOs can be combined together to form larger structures called ***Reusable Learning Objects*** (**RLOs**).



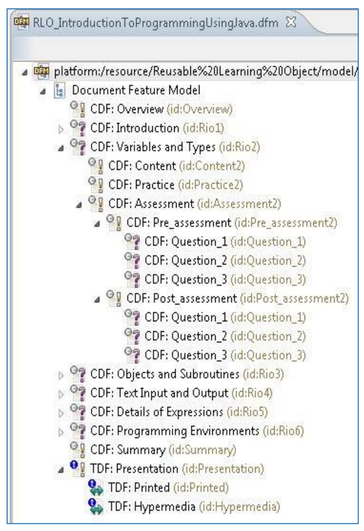
Generation Technology (DPL)

- **Document Product Lines (DPL)** is a methodology to generate documents in domains with high content variability and reuse.
- Documents are the result of assembling document components or *InfoElements* stored in the product line *Repository.*
- DPL applies product line engineering principles and their process is composed of two main activities: *Domain Engineering* and *Application Engineering*.



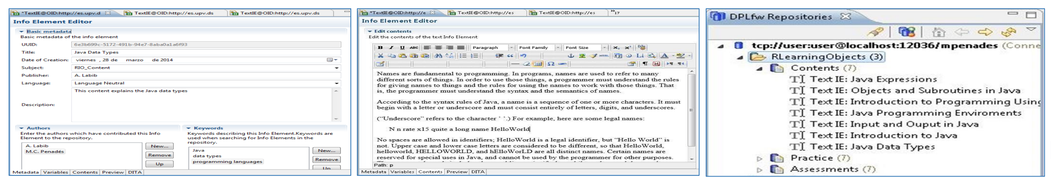
Using DPL to Engineer RLOs

1 RLO Document Feature Model



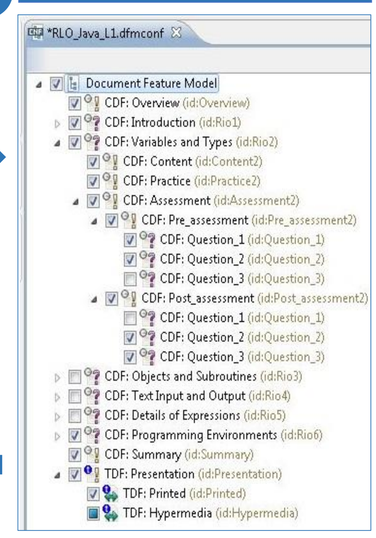
A family of RLOs is defined in DPL: *"Introduction to Programming using Java"*

2 Creating – Storing RIO Comp.



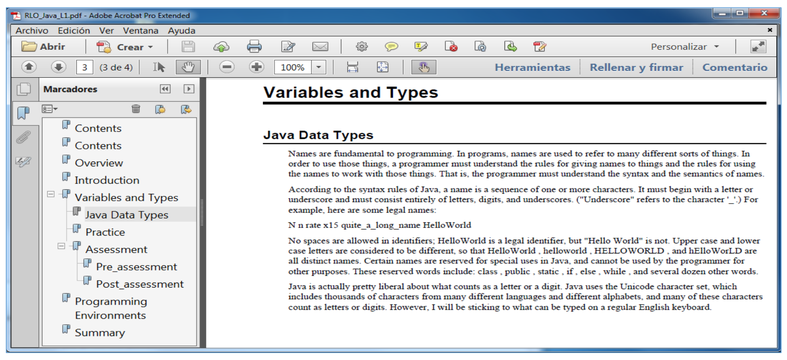
Reusable content assets are stored in the Repository along with their metadata.

3 RLO Configuration



The Configuration guides the characterization of a RLO: a particular *"Introduction to Programming using Java"* is defined.

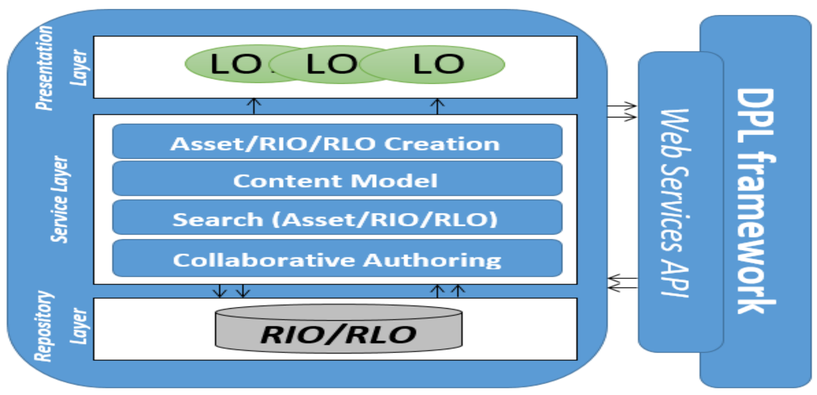
4 RLO Generation



An automatic process generates the RLO in the format selected.

A Learning Object Authoring Tool (LOAT)

- LOAT enforces reuse and customization to increase the efficacy of Learning Object authoring processes.
- Three basic principles have been considered in the design and implementation of LOAT:
  1. The cognitive level
  2. Learning object classification
  3. Content-model architecture.
- The LOAT architecture is divided into three layers:
  1. the Repository Layer
  2. the Services Layer
  3. the Presentation Layer



Conclusion

- LOAT is a tool for creating reusable, granular, durable, and interoperable learning objects.
- A new approach to RIO/RLO development based on product line engineering principles.
- The DPLFW have been used to define families of RIOs and RLOs whose components may be selected dynamically from a set of small pieces.
- This is our first effort towards the design and implementation of LOAT.