ProdProc - Product and Production Process Modeling and Configuration

Dario Campagna and Andrea Formisano

Dept. of Mathematics and Computer Science, University of Perugia, Italy

Overview

- Why product and process configuration?
- The ProdProc framework
- Comparison with related work
- Conclusions and future work

Product Configuration

- Product configuration systems support companies deploying mass customization strategies
- Many research studies have been conducted on product configuration
- Different software product configurators have been proposed in the past years

Aldanondo et al.

- Mass customization needs to cover the whole customizable product cycle
- Current product configuration systems do not explicitly cover production process problematics
- Aldanondo et al. proposed to couple product with process modeling and configuration
- Inspired by Aldanondo et al. works we devised a new framework for product/process configuration

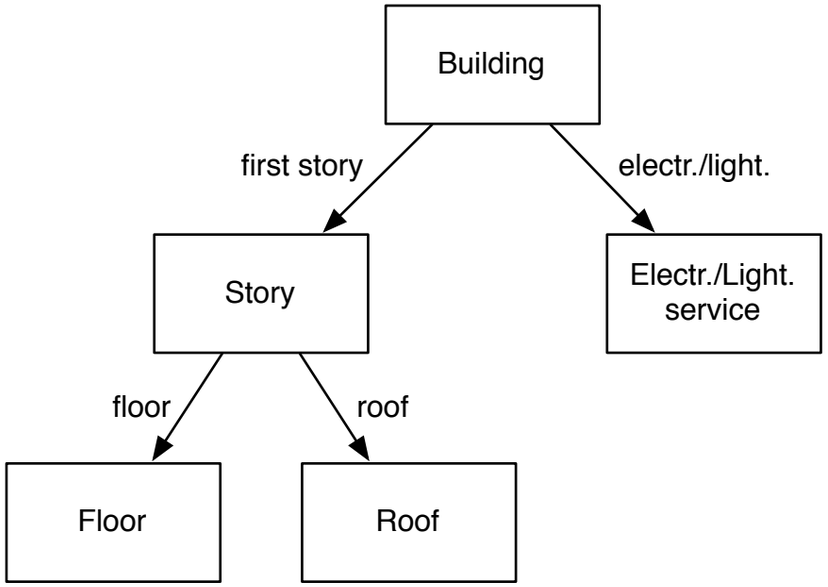
The ProdProc Framework

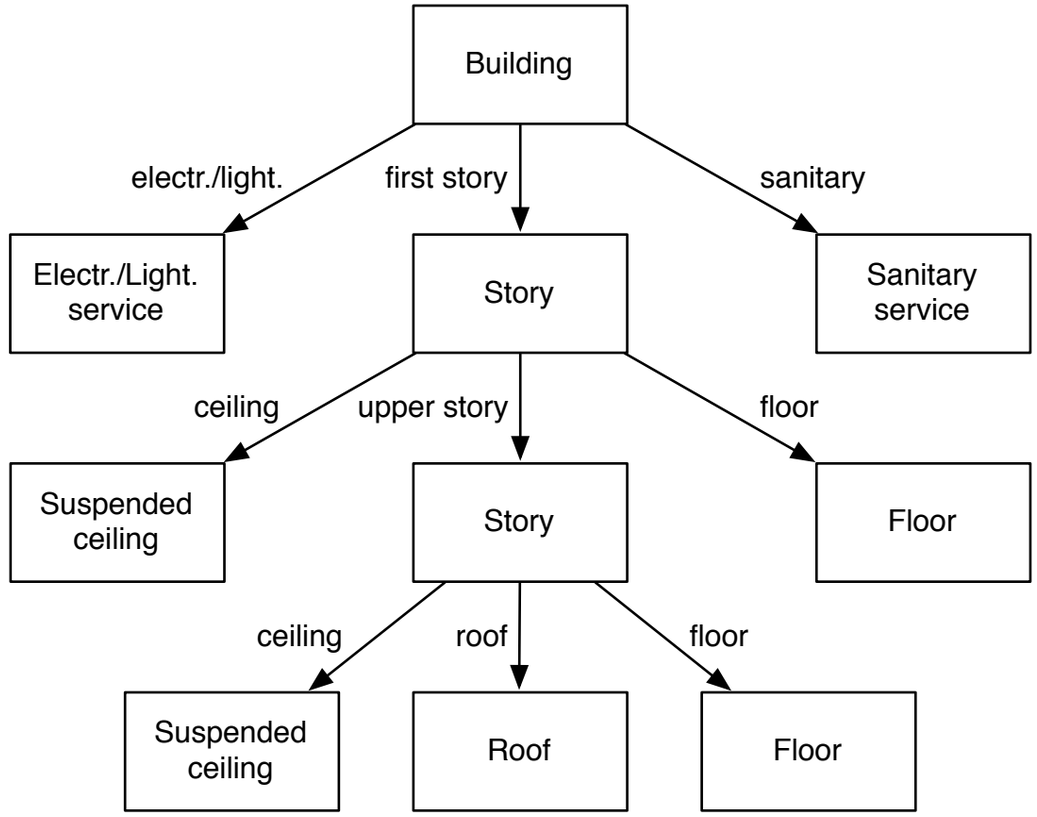
- A graphical framework for modeling configurable products and their production processes
- Extension of MCE and Aldanondo et al. languages
  - It allows one to model a product as a multi-graph and a set of constraints
  - It allows to model a process in terms of activities, temporal constraints, resources, etc.
  - It allows to couple a product with a process through a set of constraints

Process Modeling Tools

- Process modeling tools (e.g. BPMN, YAWL) allows one to deal with (business) process management
- They allow a user to define a process, and guide she/he through the process execution
- Also within the filed of process modeling it is possible to find tools and scientific works
- Existing modeling language are not well suited for been coupled with a product modeling language

Product Variants

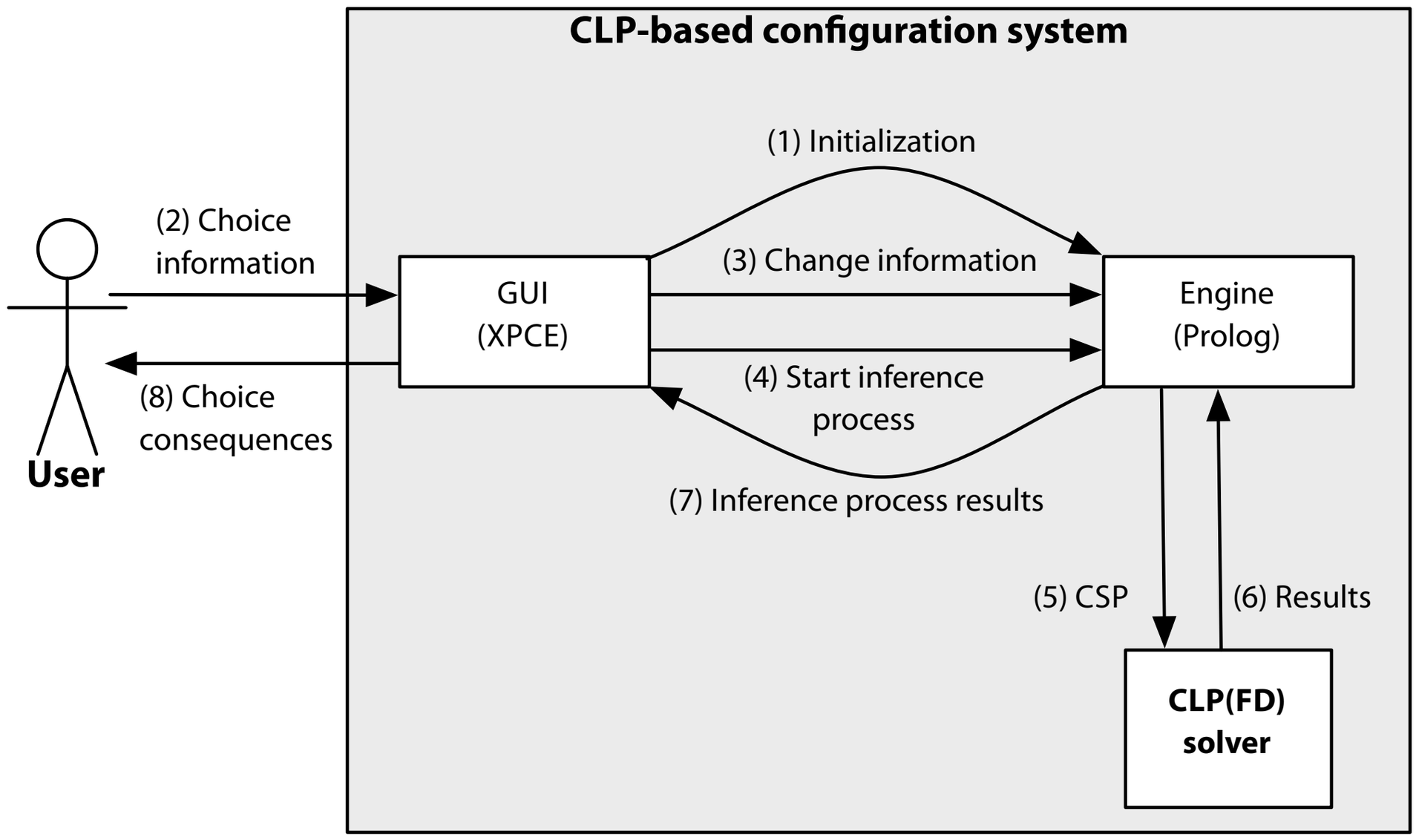




- Tree structure
- Variable representing configurable characteristics
- Assignments of values for variables
- Assignments have to satisfy compatibility relations

Demo

Interactive Configuration



Related Work: products

- ProdProc extends MCE with cardinality variables, product model graph, cardinality (model) constraints, and meta-paths

- ProdProc can be viewed as the source code representation of a system with respect to the MDA abstraction levels [Felfernig]

- ProdProc covers a subset of the ontolgy presented by Soininen et al., but it is not limited to product modeling and defines a rich constraint language

Related Work: processes

- ProdProc combines modeling features of languages like BPMN and YAWL with a declarative approach for control flow definition
- ProdProc natively supports features that are not present in existing process modeling languages (e.g., resources, activity duration constraints, etc.)
- ProdProc models allows one to describe configurable processes

Conclusions

- We considered the problem of product and production process modeling and configuration
- We devised a graphical framework, called ProdProc, covering both physical and production aspects of configurable products
- We are implementing a CLP-based system on top of ProdProc using XPCE/Prolog
- We plan to experiment our configuration system on different real-world application domains, and to compare it with commercial products

References

- [Aldanondo et al.] M. Aldanondo and E. Vareilles. Configuration for mass customization: how to extend product configuration towards requirements and process configuration. J. of Intelligent Manufacturing, 19(5):521–535, 2008.

- [MCE] D. Campagna, C. De Rosa, A. Dovier, A. Montanari, and C. Piazza. Morphos Configuration Engine: the Core of a Commercial Configuration System in CLP(FD). Fundam. Inform., 105(1-2): 105–133, 2010.

- [Felfernig] A. Felfernig. Standardized Configuration Knowledge Representations as Technological Foundation for Mass Customization. IEEE Trans. on Engineering Management, 54(1):41–56, 2007.

- [Soininen et al.] T. Soininen, J. Tiihonen, T. Männistö, and R. Sulonen. Towards a general ontology of configuration. Artif. Intell. Eng. Des. Anal. Manuf., 12:357-372, 2009.

- [BPMN] S. A. White and D. Miers. BPMN modeling and reference guide: understanding and using BPMN. Lighthouse Point, 2008.

- [YAWL] A. H. M. ter Hofstede, W.M.P. van der Aalst, M. Adams, and N. Russell. Modern Business Process Automation - YAWL and its Support Environment. Springer, 2010.