

Leveraging Semantics to Improve Reproducibility in Scientific Workflows

Idafen Santana-Perez¹, Rafael Ferreira da Silva², Mats Rynge²
Ewa Deelman², María S. Pérez-Hernández¹, Oscar Corcho¹

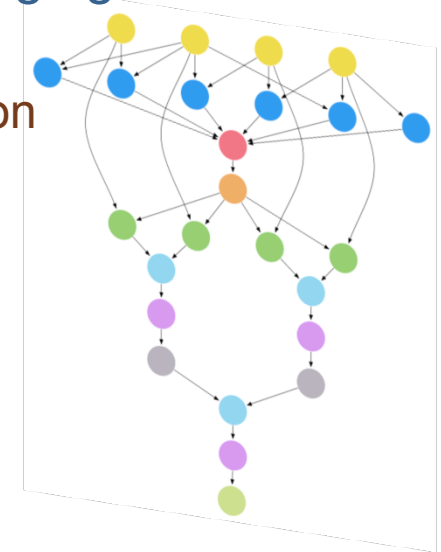
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¹Ontology Engineering Group, Universidad Politécnica de Madrid, Madrid, Spain

²University of Southern California, Information Sciences Institute, Marina Del Rey, CA, USA

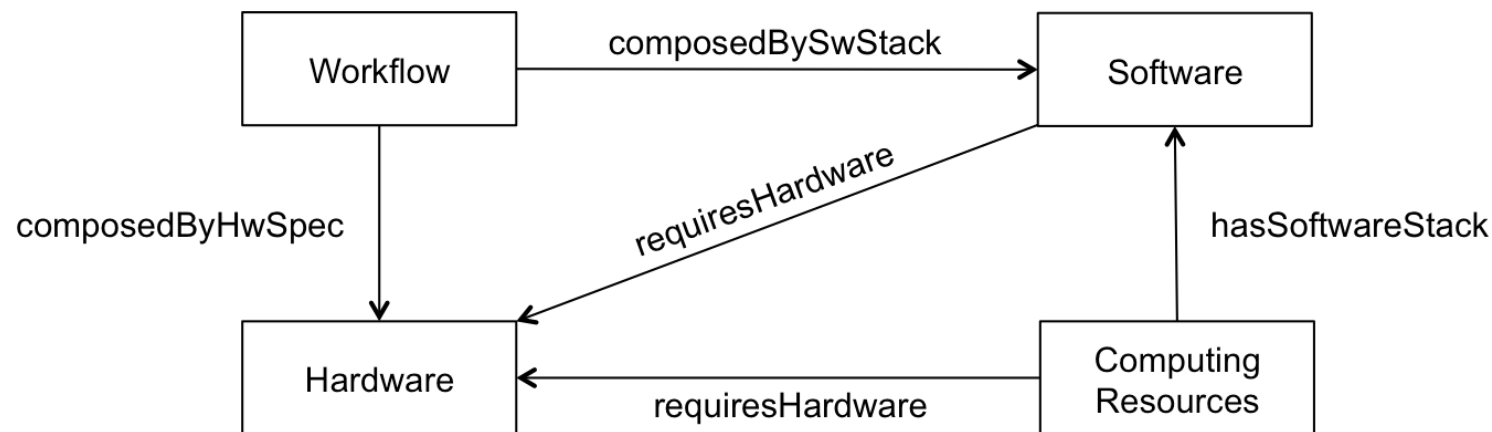
Introduction

- Scientific workflows are a useful representation for managing the execution of large-scale computations
 - Facilitates the creation and management of the computation
 - Provenance is captured at runtime
- Are *data*, *code*, and the *workflow description* enough to achieve reproducibility?
 - What about the underlying infrastructure?
- Two approaches for conserving the environment of an experiment
 - Physical conservation: the real object is conserved
 - Logical conservation: the object description is conserved (**Semantics**)



Semantic Modeling

- We propose a logical-oriented approach to conserve computational environments
 - The capabilities of the resources are semantically described
- We propose semantic models for describing the main domains of a computational infrastructure and how it is related to the workflow:

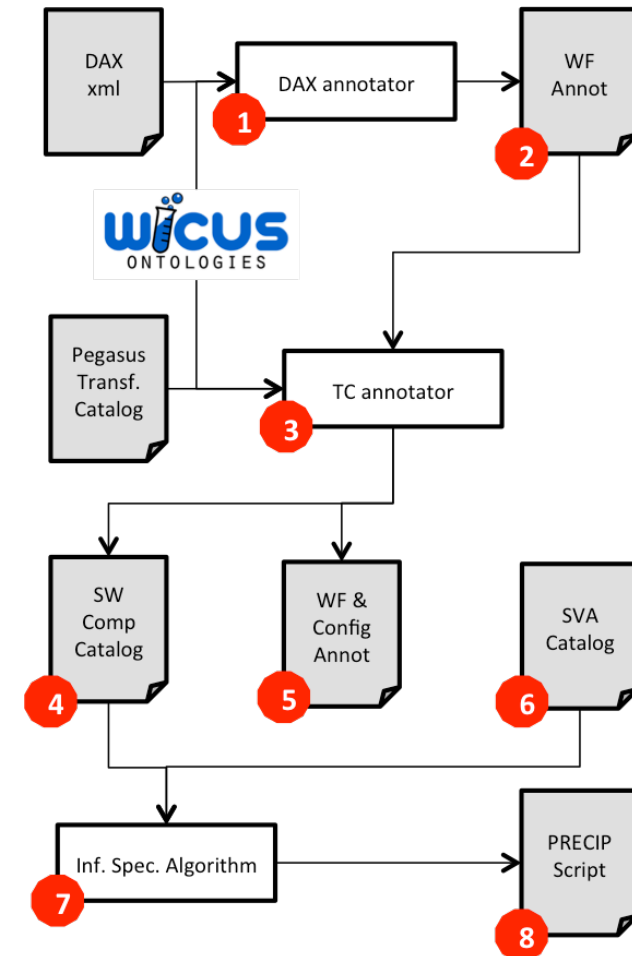


Overview of the Ontology Network



Reproducibility Process

- Experiment Setup
 - **Montage Workflow** (Astronomy)
 - **Pegasus Workflow Management System**
 - Workflow execution on **FutureGrid**
- Semantic Analysis
 - Annotations generated using **WICUS**
 - Infrastructure specification translated as a **PRECIP** script



Overview of the reproducibility process for scientific workflows





Leveraging Semantics to Improve Reproducibility in Scientific Workflows

Thank you

rafsilva@isi.edu

“Semantic annotations combined with scripting functionality is a strong approach for attaining reproducibility of computational environments.”

Research Object	http://pegasus.isi.edu/publications/xsede-reproducibility
PRECIP	http://pegasus.isi.edu/precip
WICUS	http://purl.org/net/wicus
Pegasus WMS	http://pegasus.isi.edu