QoS Guaranteed Digital Media Delivery and Distributed Processing Over Advanced Networks
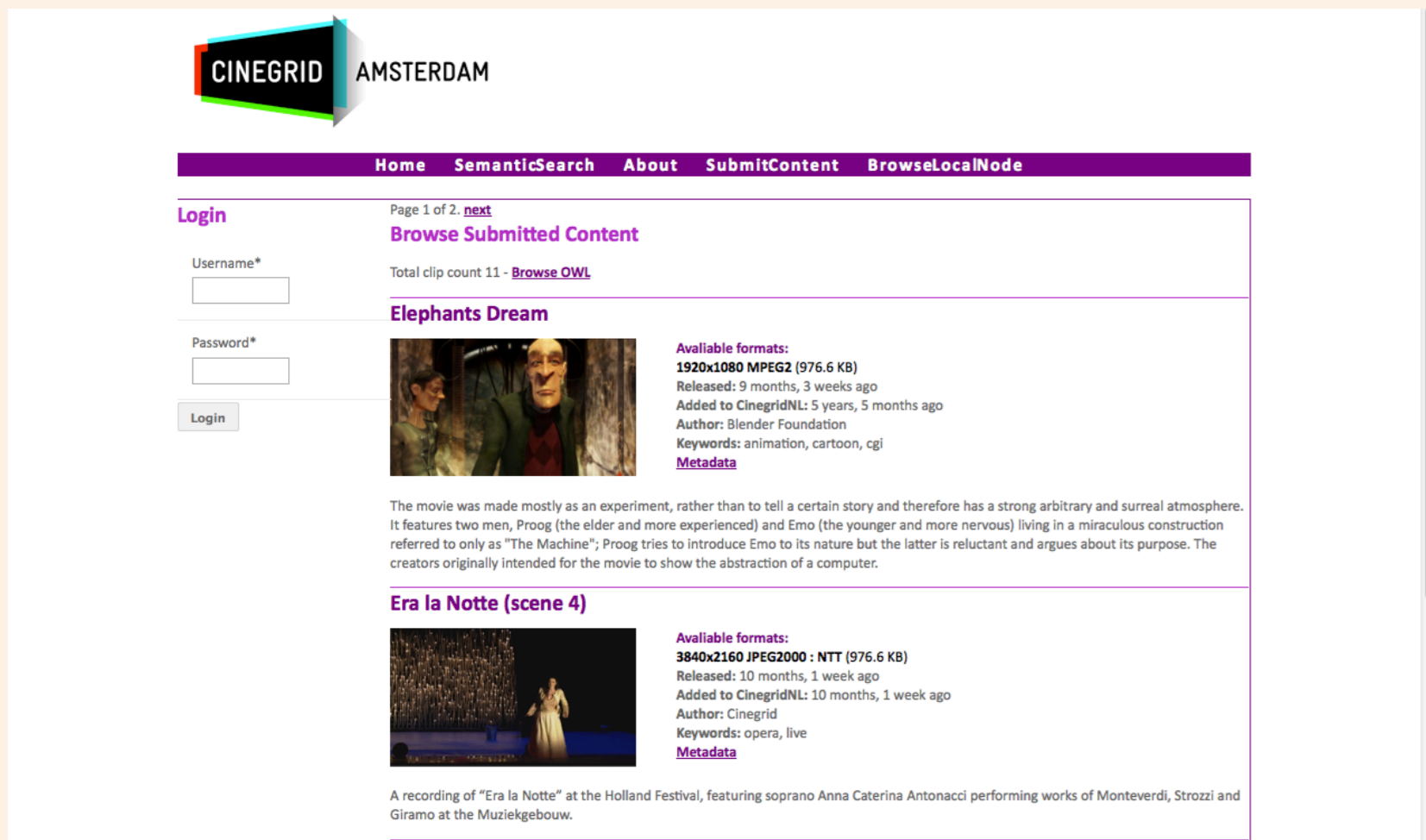
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Background

The research is conducted in the context of CineGrid. An important mission of the CineGrid project is to provide a dedicated network environment to connect distributed parties from different domains to share large quantities of very-high-quality digital media, such as the high definition video material used in the movie industry.

The *digital media delivery and processing on demand* portal allows users to retrieve media material from the infrastructure, and request quality guaranteed connections to deliver the data to qualified nodes for further processing, such as image transformation, playback or visualization. Novel network infrastructures open up new possibilities in network tuning at the application level. The portal includes the network resources in the loop of digital media selection and delivery.

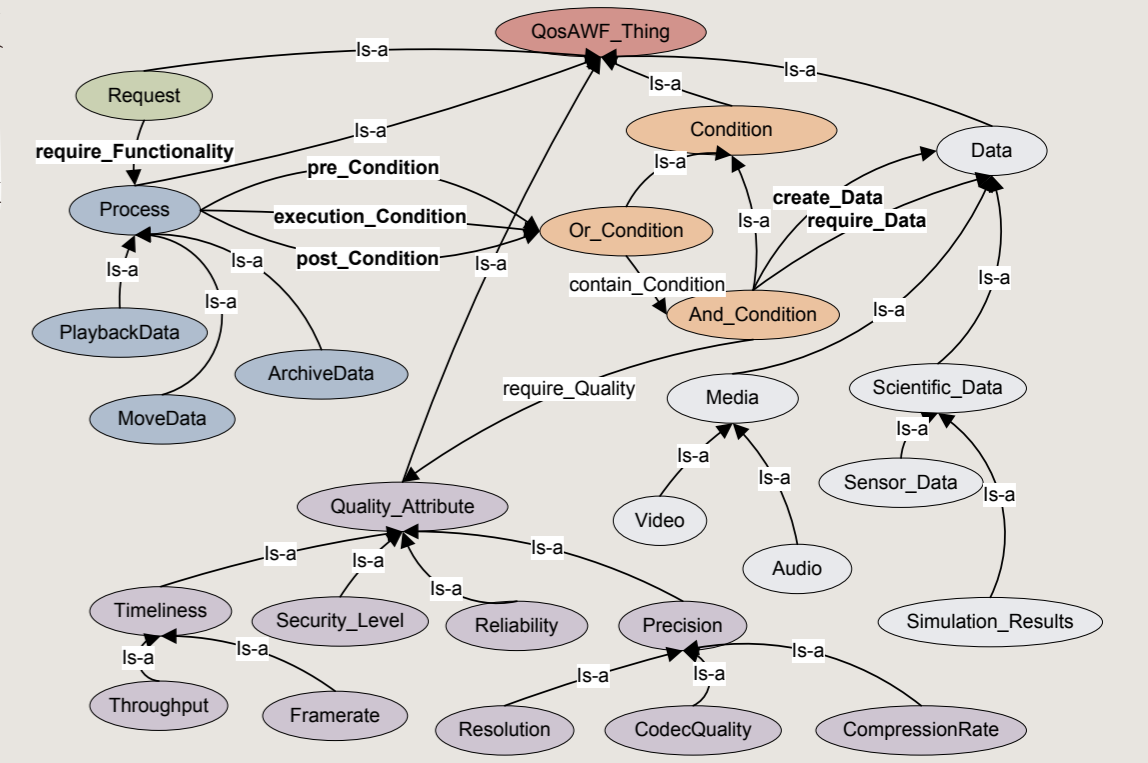## The digital media delivery portal

1. QoS requirements

Based on the experience of early work, we propose an ontology for describing abstract workflows process *qosawf.owl*. It defines the basic concepts of workflow processes, pre/post/execution conditions of the process, media data, and quality attributes. high level workflow
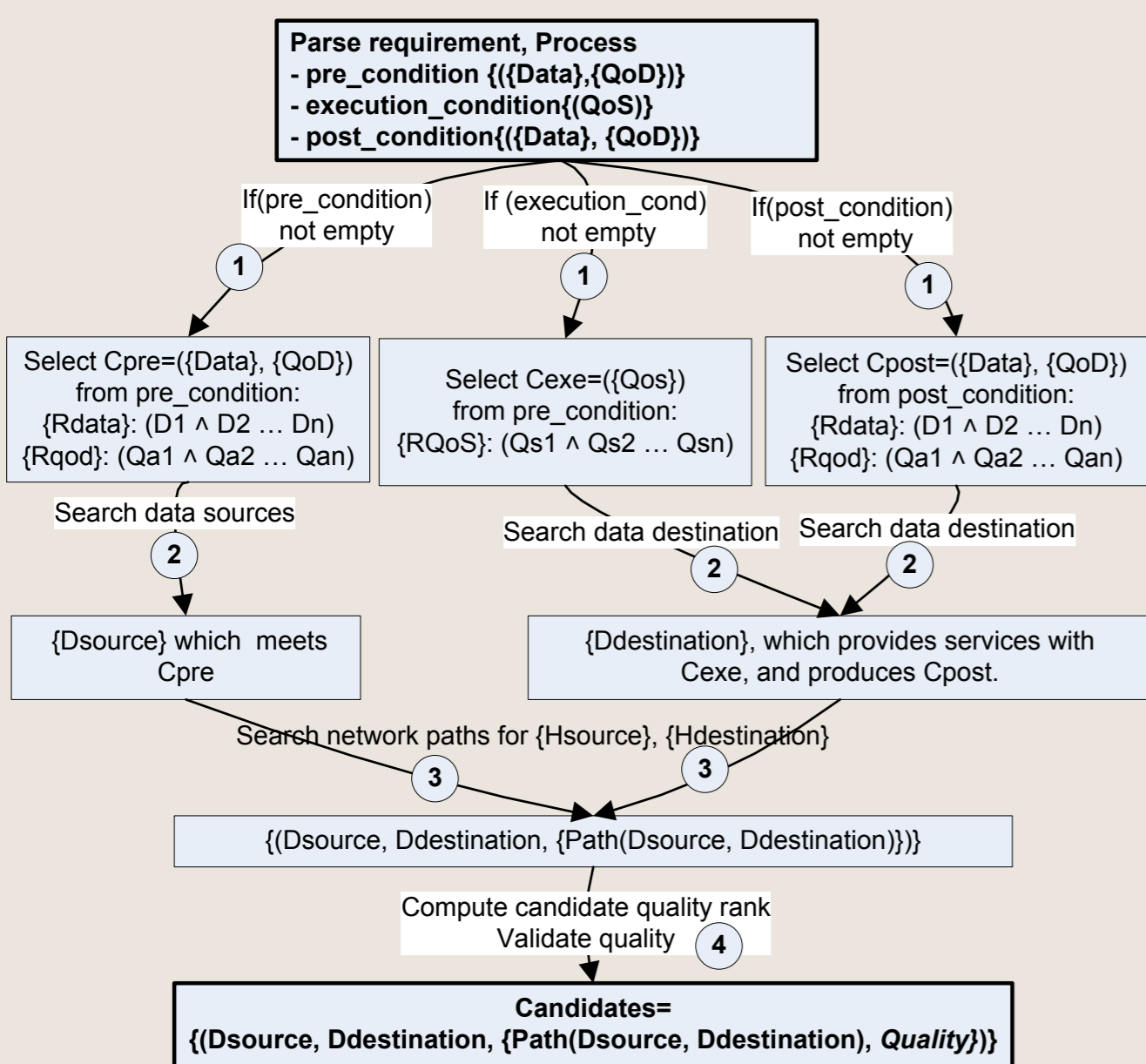
QoSAbstract workflow schema

Query:-
An abstract workflow
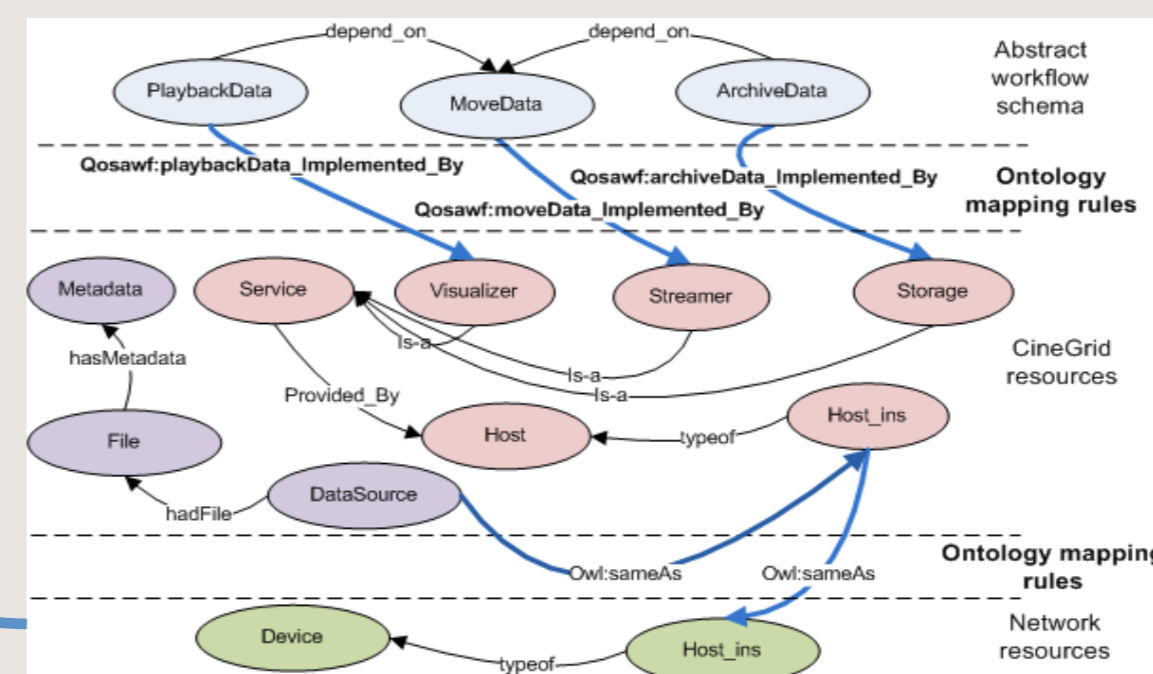
3. Resource discovery and ranking

The resource discovery engine 1) parses the input description, 2) searches suitable grid resources which meet the requirements for being the data sources and destination, 3) looks for optimal network paths between them, and 4) computes the quality of resource candidates and proposes solutions.

2. Resource description
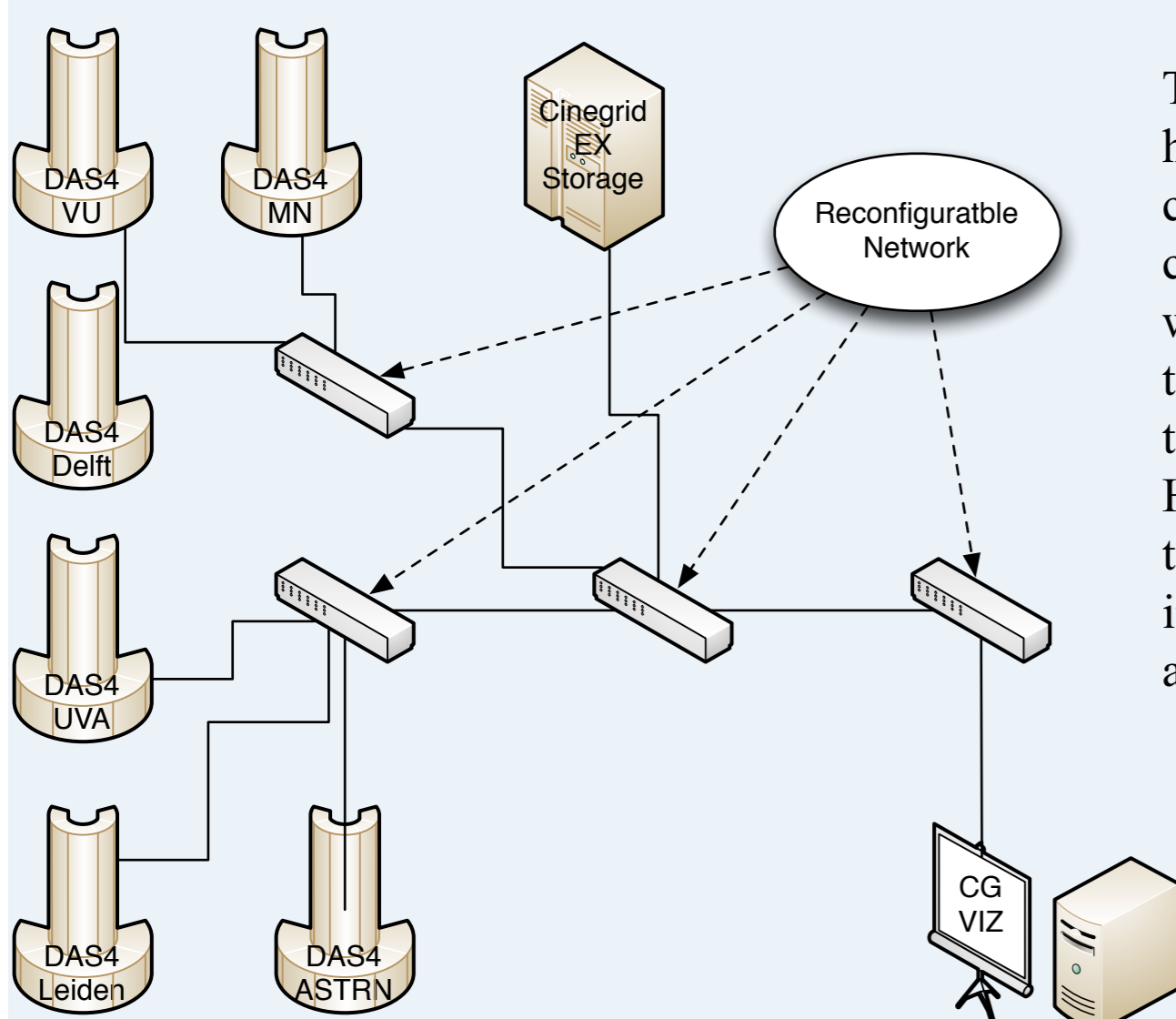
CineGrid resources
Cdl:testbed

Underlying Network
Ndl:testbed

The CineGrid community uses semantic web technologies to describe the services, devices and the network topology. The UvA team in the project have developed two ontologies. The Network Description Language (NDL) models the different levels of a network infrastructure: physical, domain, capability, layer and topology. The CineGrid Description Language (CDL) describes the services and resources on top of the network infrastructure.
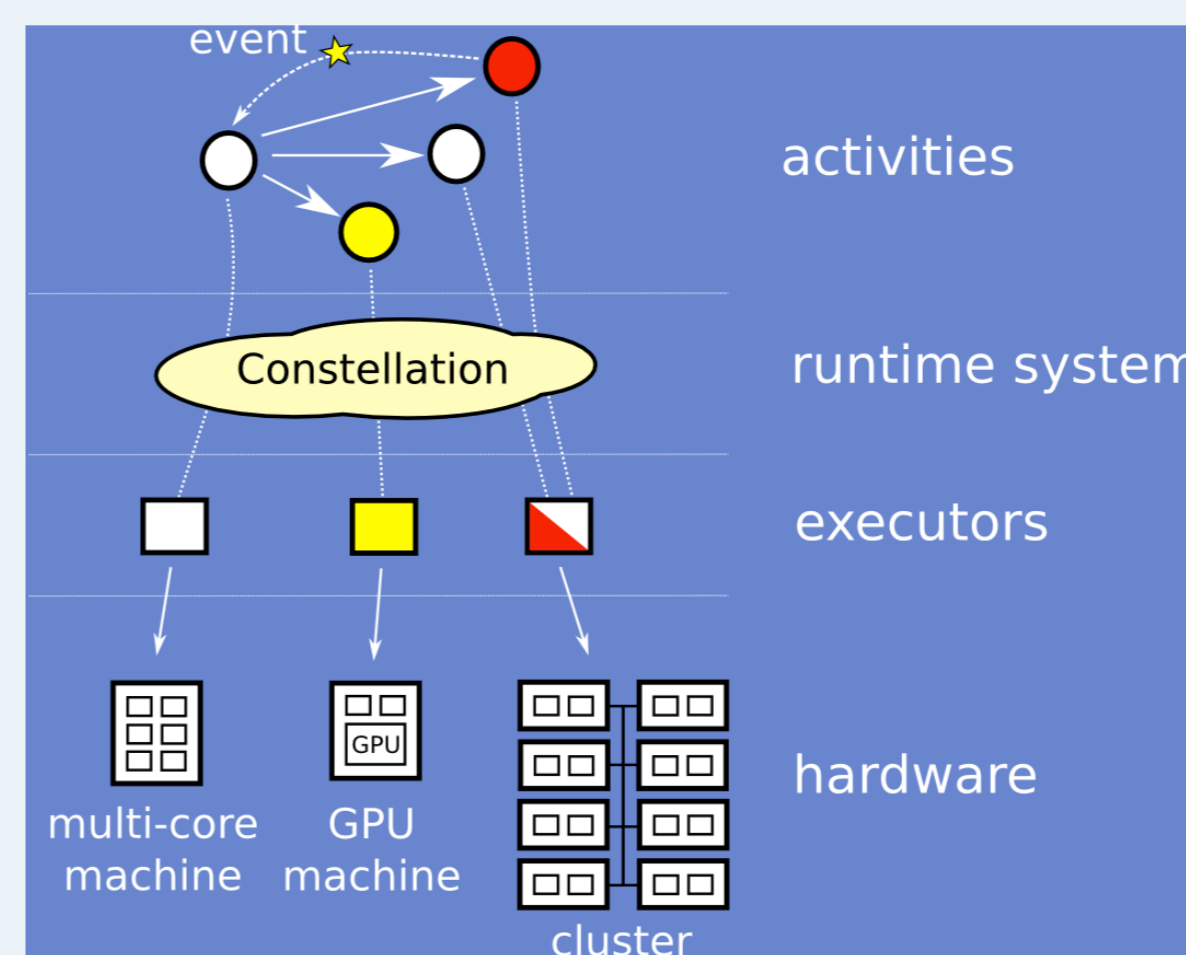

The Owl provides three build-in properties to map ontologies: *owl:sameAs* between instances, *owl:equivalentClass* between classes, and *owl:equivalentProperty* between properties. The CineGrid resources are integrated with the network level resources via property *owl:sameAs*.

Testbed – DAS4 - Cinegrid

The DAS4 is a distributed heterogeneous computing facility. The cluster sites have different hardware configurations (eg. manycore, GPU) which make them suitable for specific tasks. It is connected to the Cinegrid testbed using a reconfigurable network. Having control over the network allows the workflow execution engine to impose certain QoS parameters across all links.

Distributed execution with Consteallation

A bag of tasks / workflow is generated and submitted to the controller which allocates the selected resources and executes the tasks using the *Ibis Constellation Framework.* Constellation provides task scheduling with match-making, thereby ensuring that each job is send to a machine that can actually execute it. This allows applications to be run on dynamic and heterogeneous resources.

References.
[1] Z.Zhao et al., *An agent based planner for including network QoS in scientific workflows*, ABC:MI Oct. 18~20, 2010, Wisla, Poland.
[2] http://cinegrid.uvalight.nl/portal/
[3] http://cinegrid.uvalight.nl/owl/qosawf.owl