QoS guaranteed digital media delivery on demand over advanced network

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Background

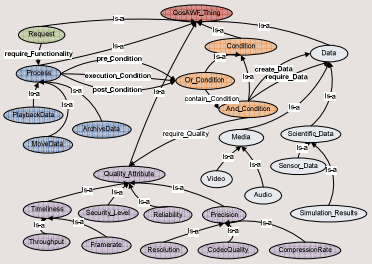
The research is conducted in the context of CineGrid. An important mission of the CineGrid project is to provide a dedicated network environment to connect distributed parties from different domains to share large quantities of very-high-quality digital media, such as the high definition video material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

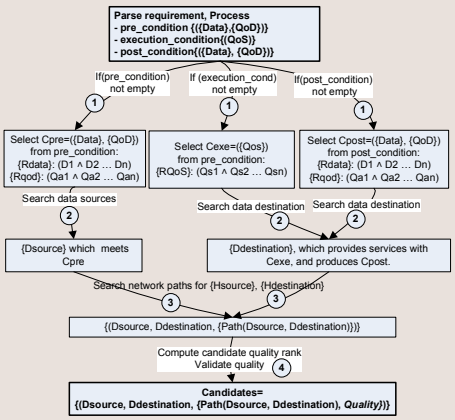
Based on the experience of early work, we propose an ontology for describing abstract workflows process ***qosawf.owl***. It defines the basic concepts of workflow processes, pre/post/execution conditions of the process, media data, and quality attributes. high level workflow

QoSAbstract workflow schema



Query:-
An abstract workflow

3. Resource discovery and ranking



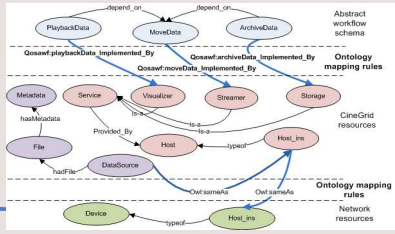
The resource discovery engine 1) parses the input description, 2) searches suitable grid resources which meet the requirements for being the data sources and destination, 3) looks for optimal network paths between them, and 4) computes the quality of resource candidates and proposes solutions.

2. Resource description

CineGrid resources
Cdl:testbed

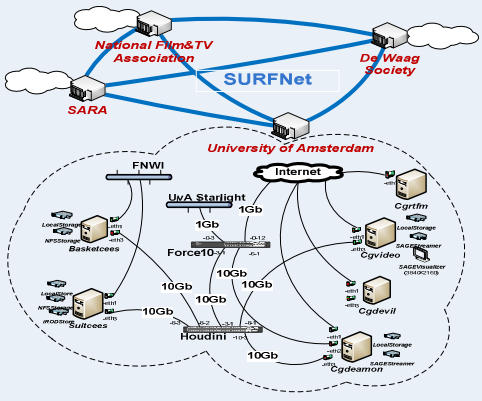
Underlying Network
Ndl:testbed

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***.

Test bed

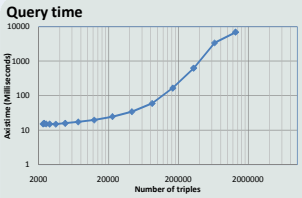


Four locations in Amsterdam host CineGrid resources and are connected via dedicated and configurable circuits provided by SURFnet.

In the current prototype, the communication between portal interface and the search engine (resource discovery agent) is via XML RPC. The semantic description of the CineGrid resources, Network infrastructure, and the query are loaded using the semantic web library of SWIProlog. The SWIProlog also solves constraints defined in the query.

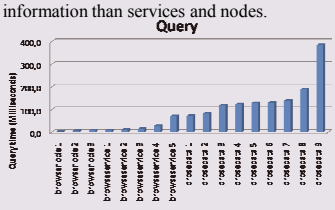
Demonstration and performance

Via the portal, a user can browse and search data, services and hosts in the environment. A user can compose a query using the GUI or load an existing one.



The above figure shows the time costs for a query while the number of triples loaded in the search engine increases. It is measured while all previous queries are not cleaned. The result implies the cost while concurrent queries are made. In the actual situation, the server cleans the history of a query after it expired. A query usually contains 20 triples.

The figure below shows the time costs for some typical queries. We can see the query for searching nodes and services are faster than searching data content. The cost of a query depends on the number of constraints, and the quantity of available meta information of the resource. Currently, data content has much more meta information than services and nodes.



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References.
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