



# Applications for a Semantic CineGrid Exchange.

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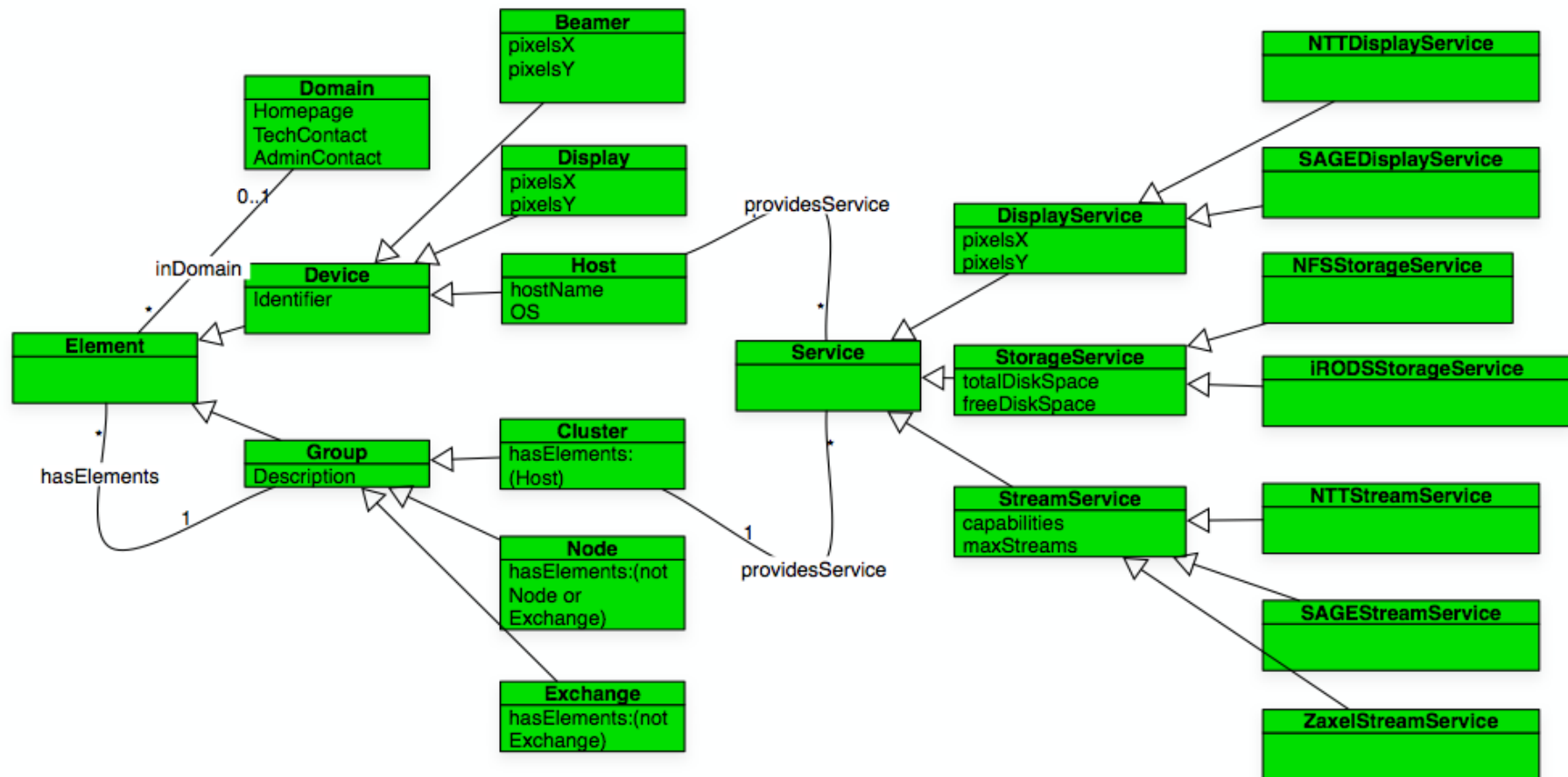


# CineGrid Description Language

- Uses RDF and OWL
  - Resource Description Framework, Web Ontology Language
  - Distributed, each node has its own description.
  - Reusable.
- Allows us to describe elements in the exchange and the services they provide.
  - Node, Exchange, Device
- Link with NDL to describe the underlying network infrastructure.
  - Using owl:sameAs property.

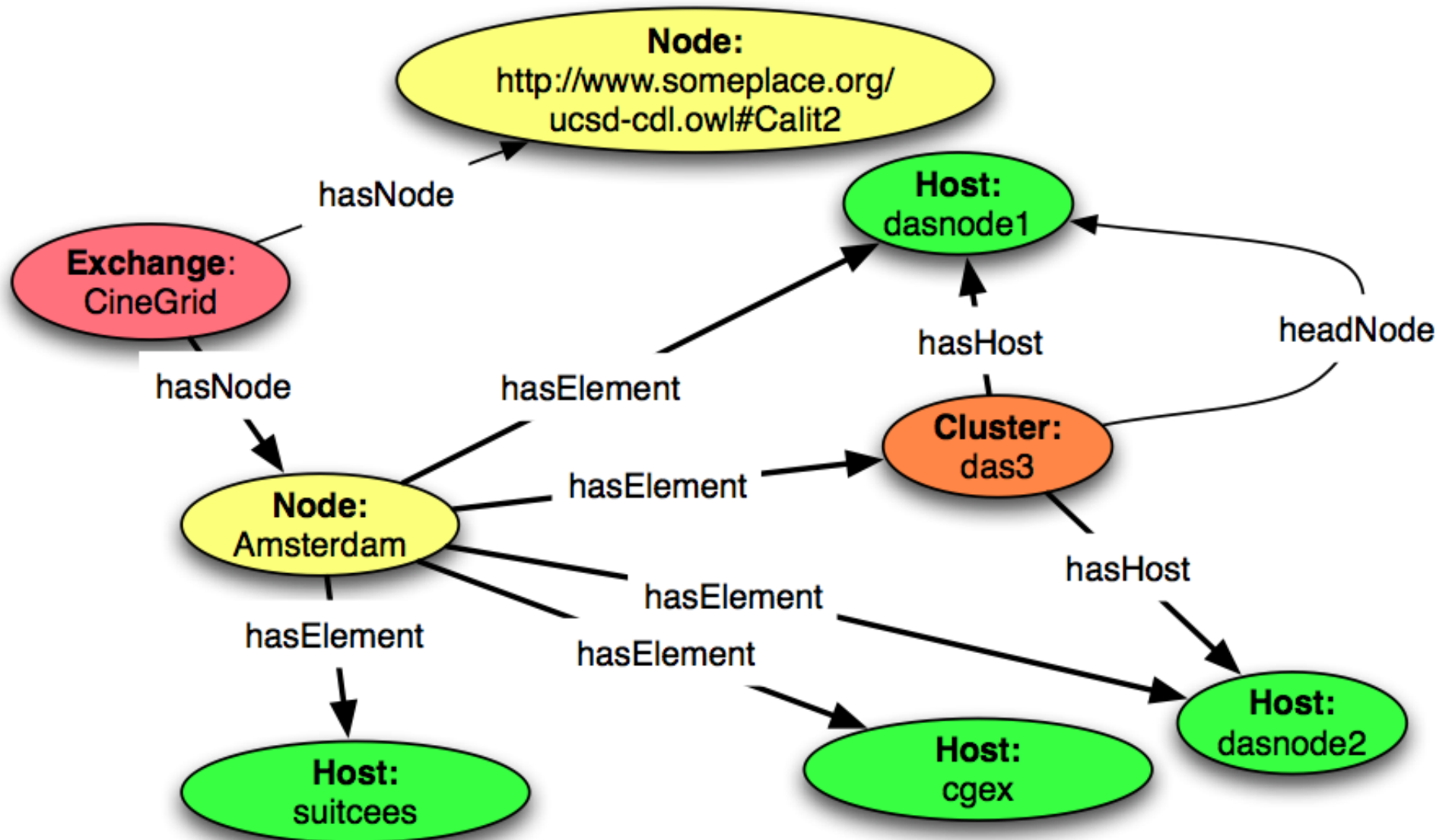


# UML representation of CDL





# CDL Example





# Description example

```
<cdl:hasElements>
  <cdl:Host rdf:ID="cgvideo">
    <cdl:hasDomain rdf:resource="#UvA-SNE"/>
    <owl:sameAs rdf:resource="http://cinagrid.uvalight.nl/owl/ndl-amsterdam.owl#cgvideo"/>
    <cdl:providesService>
      <cdl:SAGEDisplayService rdf:ID="SAGEDisplayService_cgvideo">
        <cdl:pixelsX rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
          >3840</cdl:pixelsX>
        <cdl:providedBy rdf:resource="#cgvideo"/>
        <cdl:pixelsY rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
          >2160</cdl:pixelsY>
      </cdl:SAGEDisplayService>
    </cdl:providesService>
    <cdl:providesService>
      <cdl:LocalStorageService rdf:ID="LocalStorageService_cgvideo">
        <cdl:providedBy rdf:resource="#cgvideo"/>
      </cdl:LocalStorageService>
    </cdl:providesService>
    <cdl:providesService>
      <cdl:SAGEStreamingService rdf:ID="SAGEStreamingService_cgvideo">
        <cdl:providedBy rdf:resource="#cgvideo"/>
      </cdl:SAGEStreamingService>
    </cdl:providesService>
  </cdl:Host>
</cdl:hasElements>
```

**CDL**

**NDL**

```
<ndl-domain:inAdminDomain>
  <ndl-domain:AdministrativeDomain rdf:ID="UvA-SNE"/>
</ndl-domain:inAdminDomain>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Development machine.</rdfs:comment>
</ndl-topo:Device>
<ndl-topo:Device rdf:ID="cgvideo">
  <ndl-topo:hasInterface rdf:resource="#cgvideo-eth3"/>
  <ndl-topo:hasInterface>
    <ndl-topo:StaticInterface rdf:ID="cgvideo-eth1">
      <ndl-topo:connectedTo>
        <ndl-topo:ConnectionPoint rdf:ID="Internet8"/>
      </ndl-topo:connectedTo>
    </ndl-topo:StaticInterface>
  </ndl-topo:hasInterface>
  <ndl-domain:inAdminDomain rdf:resource="#UvA-SNE"/>
</ndl-topo:Device>
<ndl-topo:Device rdf:ID="cgdaemon">
  <ndl-domain:inAdminDomain rdf:resource="#UvA-SNE"/>
  <ndl-topo:hasInterface>
    <ndl-topo:StaticInterface rdf:ID="cgdaemon-eth1">
      <ndl-topo:connectedTo>
        <ndl-topo:ConnectionPoint rdf:ID="Internet5"/>
      </ndl-topo:connectedTo>
    </ndl-topo:StaticInterface>
```



# Progress since CineGrid 09

- Extending CDL
  - Renaming of objects
  - FGCS: “Using ontologies for resource description in the CineGrid Exchange”
- Movie Metadata
  - Not aware of the probably ongoing discussion within CineGrid
  - We use a very limited ontology just to make it work.
- We need to make applications aware of CDL the content requirements
  - NeWQoSPlanner
  - NDL/CDL ontology Editor

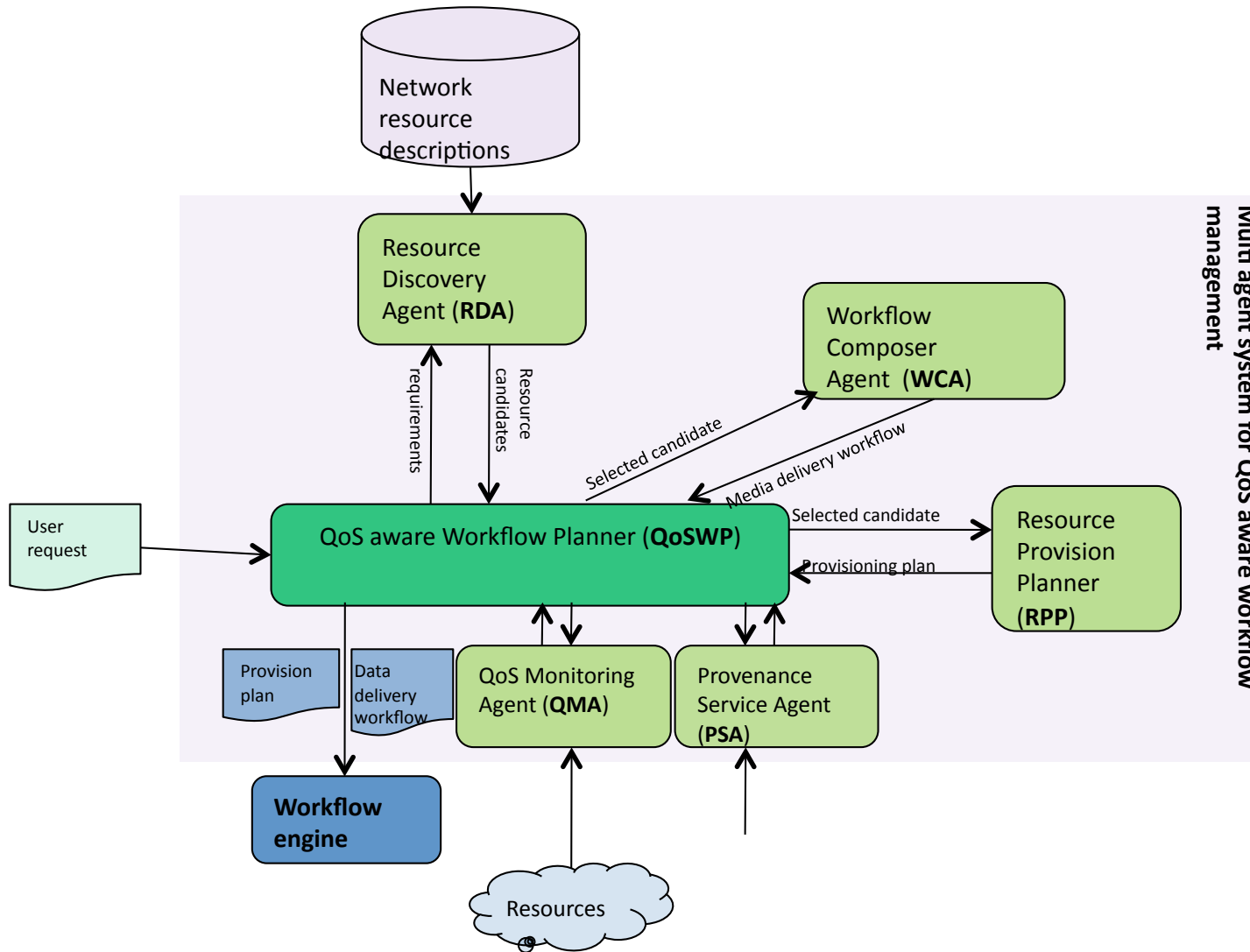


# CineGrid specific workflows

- Show Content
  - Read data from storage
  - Stream data on network
  - Visualize recieved data
- Store Content
  - Get data from user
  - Put data on storage
- Process Content
  - Get file from storage
  - Do some processing
  - Put result on storage



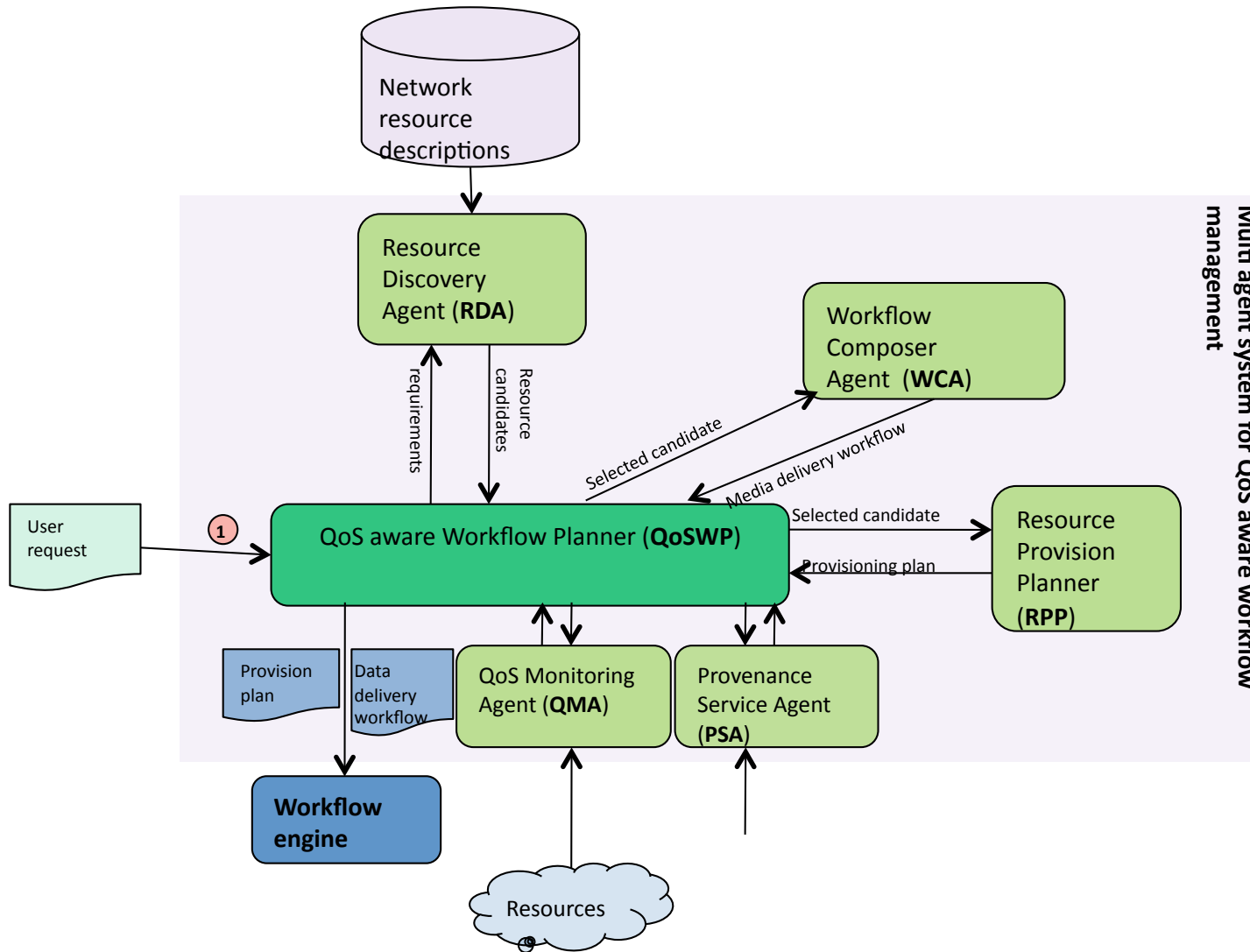
# Network aware Workflow QoS Planner (NEWQoSPlanner)







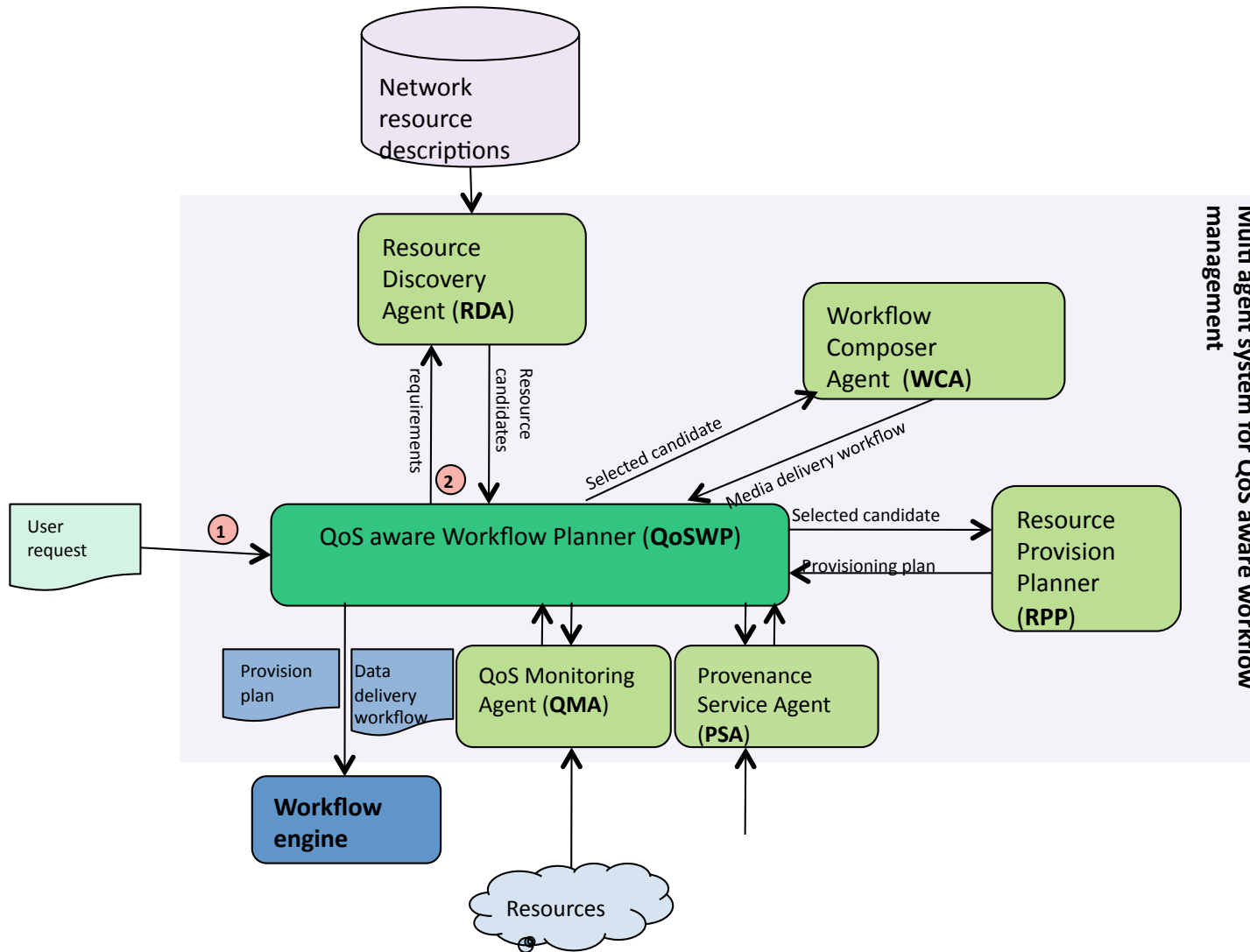
# Network aware Workflow QoS Planner (NEWQoSPlanner)



The QoSWP receives the request for data process services and the service requirements from the user



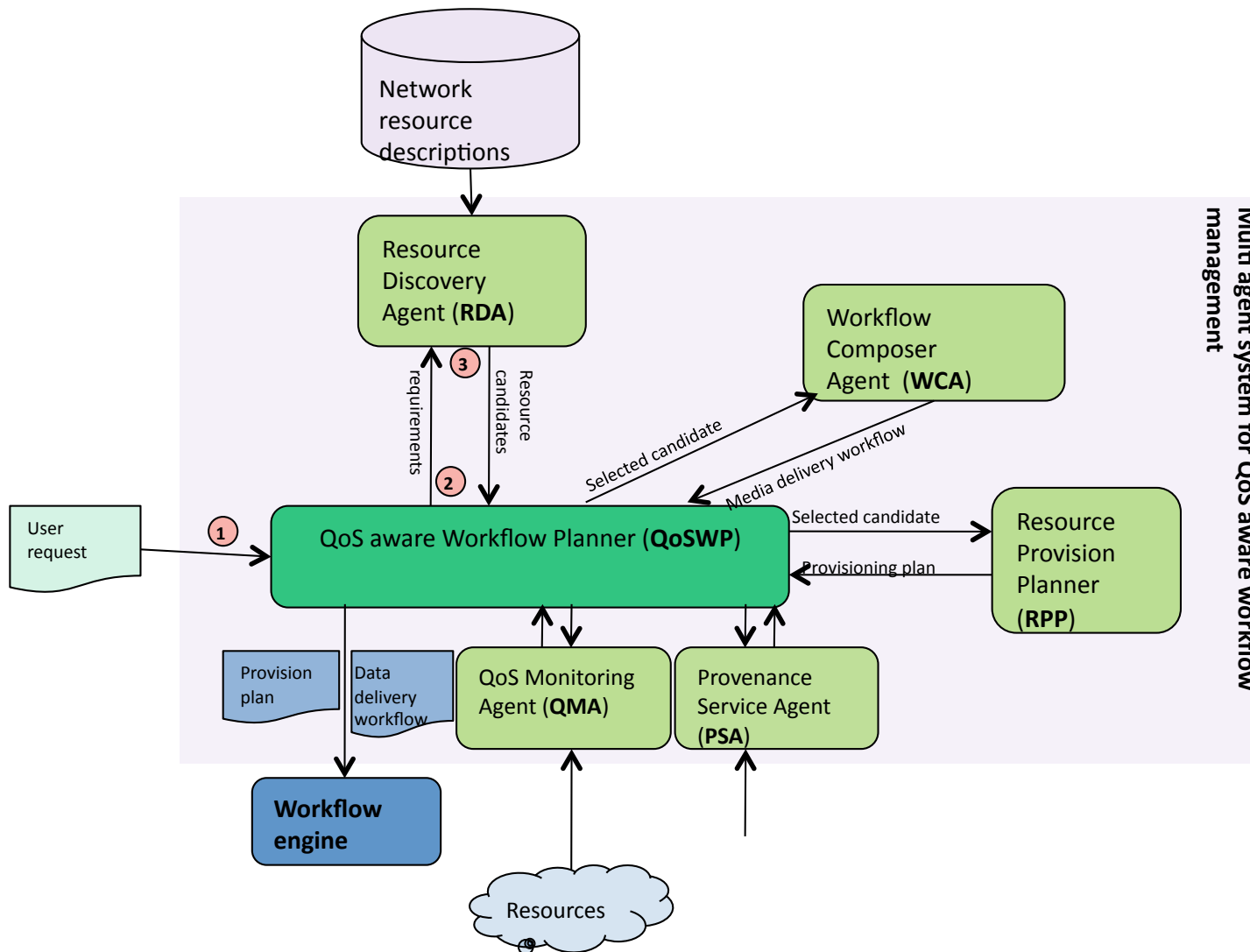
# Network aware Workflow QoS Planner (NEWQoSPlanner)



The RDA reads the description of the resources and the network topologies from the registry, and searches suitable data sources and destinations, and network paths between them.



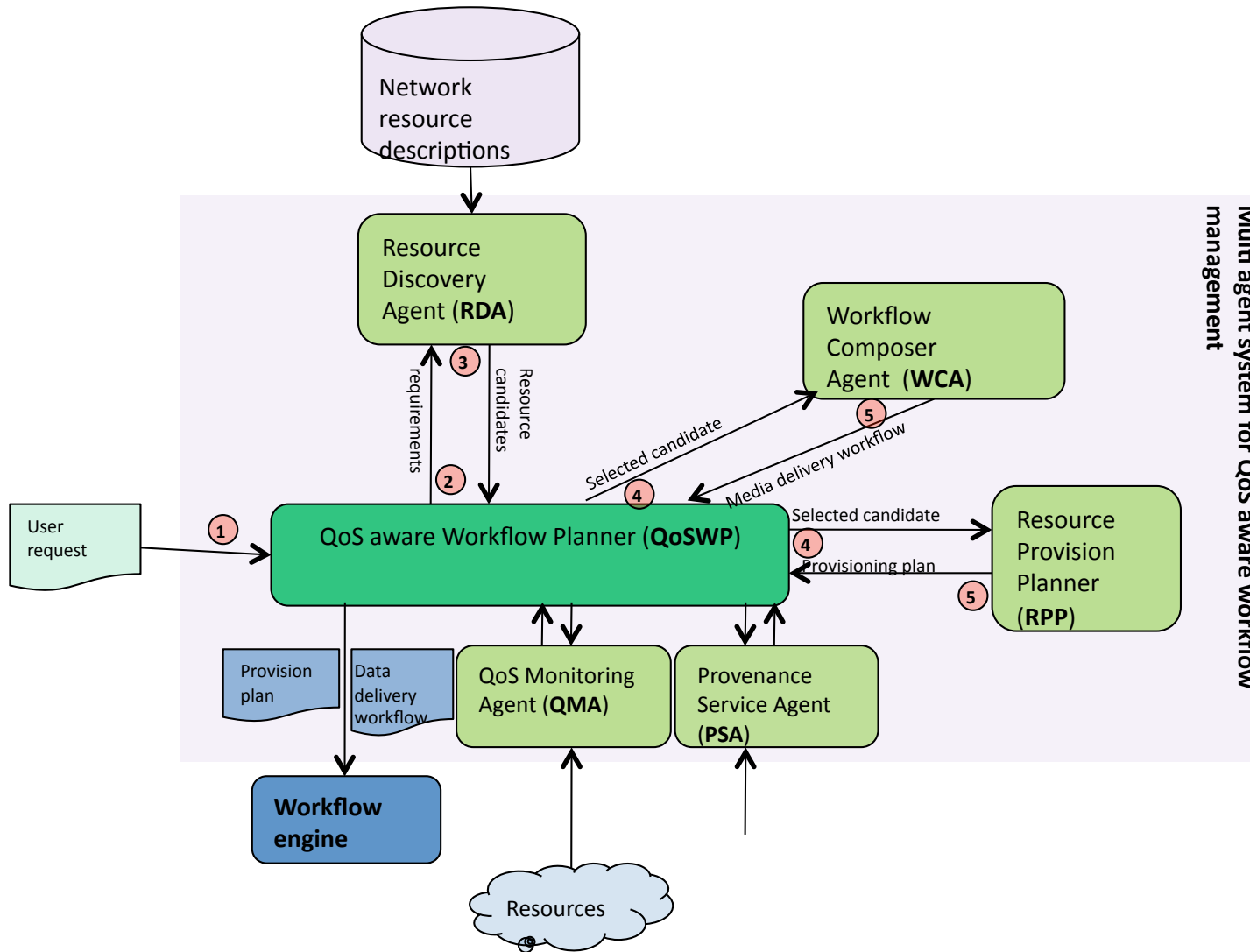
# NEtwork awareWorkflow QoS Planner (NEWQoSPlanner)



The RDA returns a list of qualified candidates, and sorts them based on the quality metrics of each candidate.



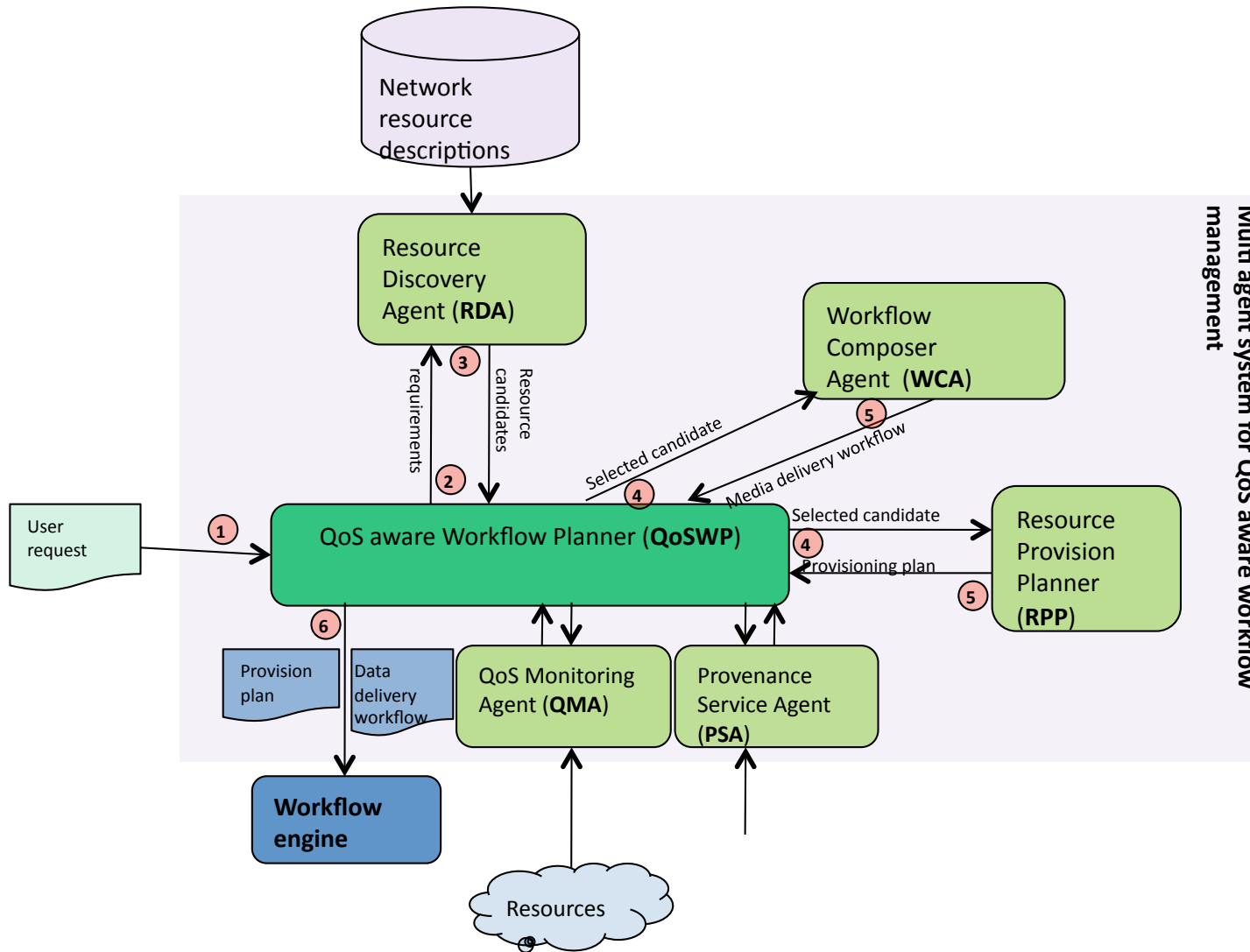
# Network aware Workflow QoS Planner (NEWQoSPlanner)



From the candidates, the QoSWP selects the best one, and request WCA and RPP to generate a resource provisioning plan and a data transfer workflow.



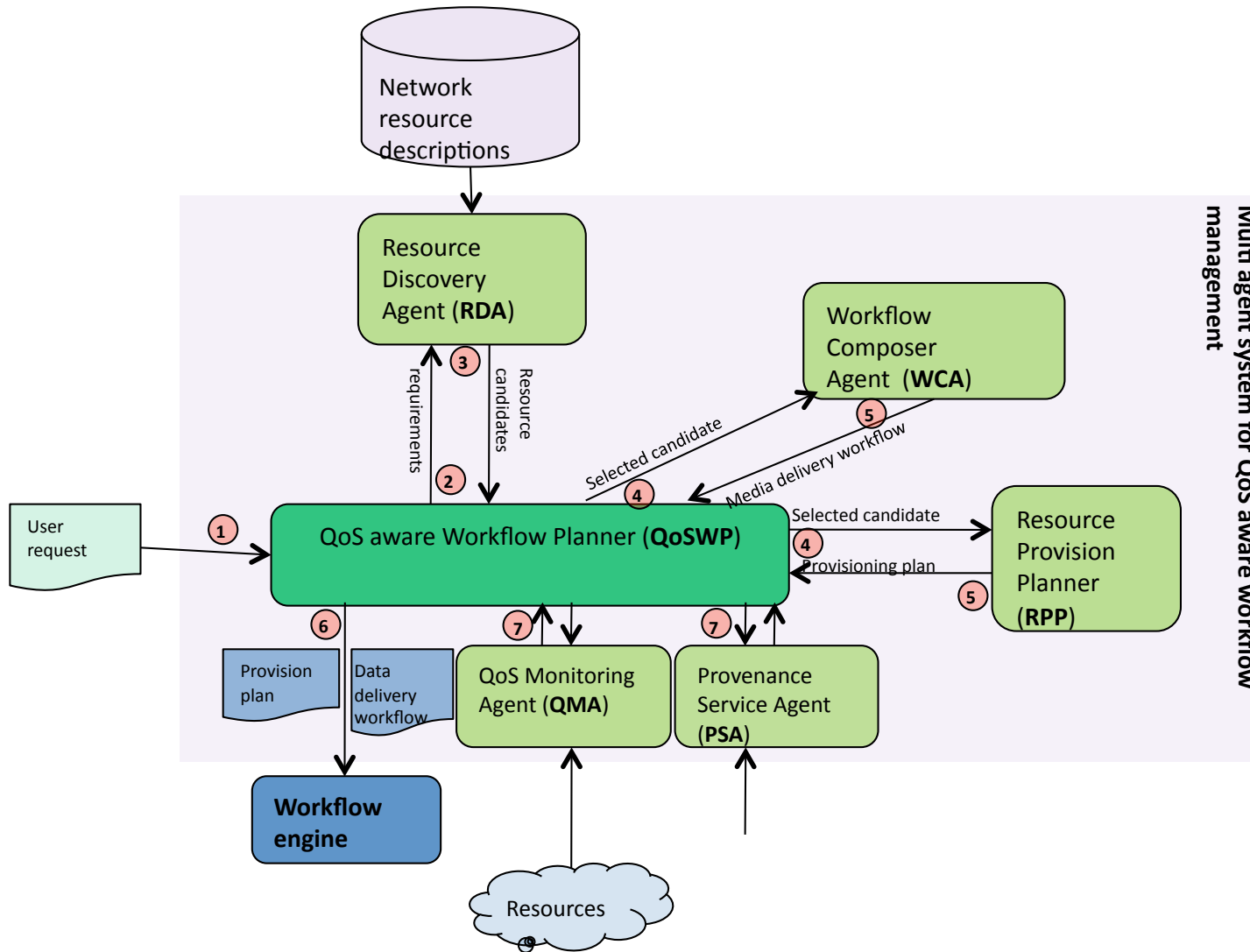
# NEtwork awareWorkflow QoS Planner (NEWQoSPlanner)



The resource provisioning plan and a data transfer will be executed by the workflow engine.



# Network aware Workflow QoS Planner (NEWQoSPlanner)



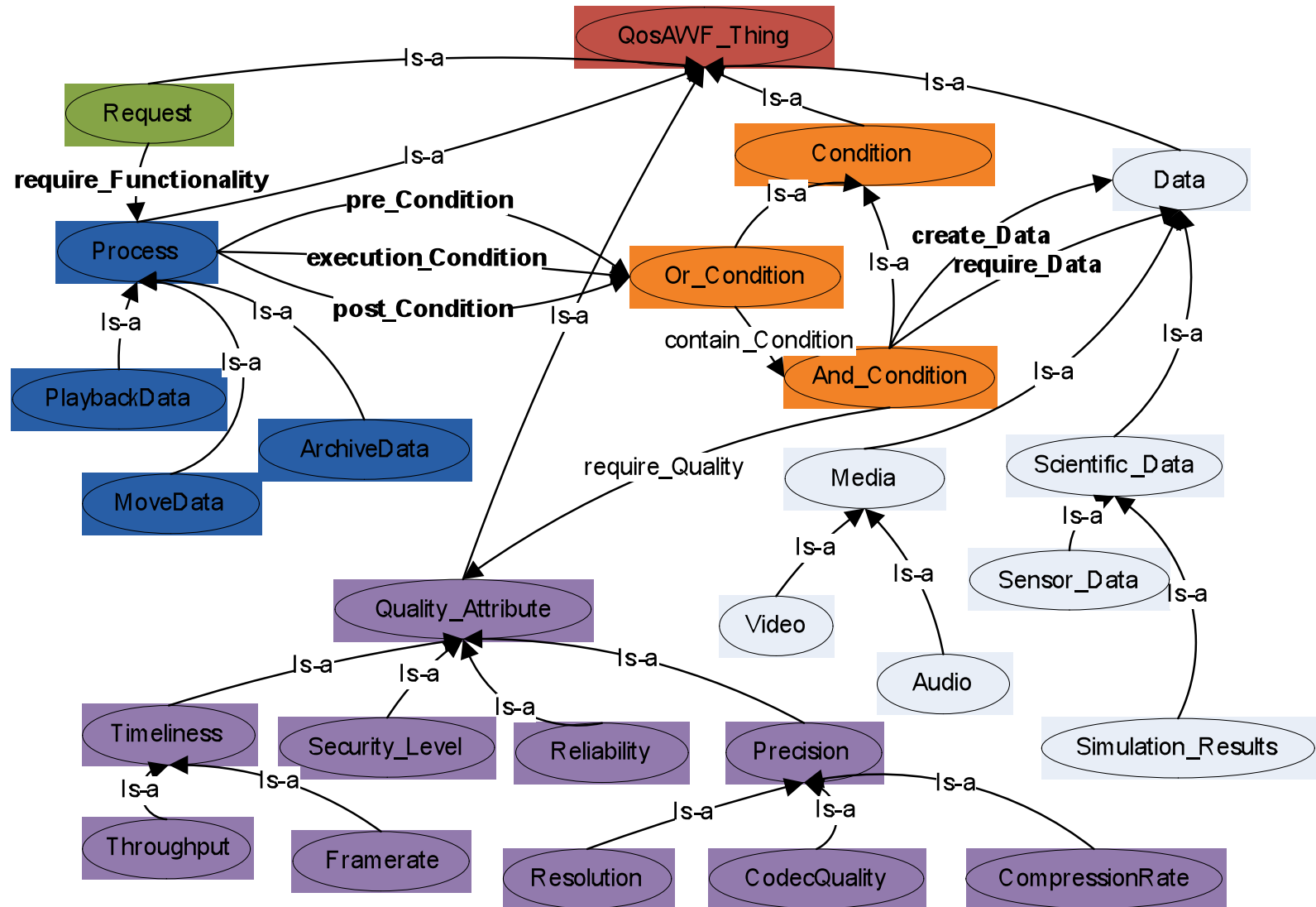
The QMA monitors the state of the resources and checks whether the required quality is satisfied.

Based on the state updates by QMA, the QoSWP may adapt the resources.

The provenance service records events in the resources provisioning.

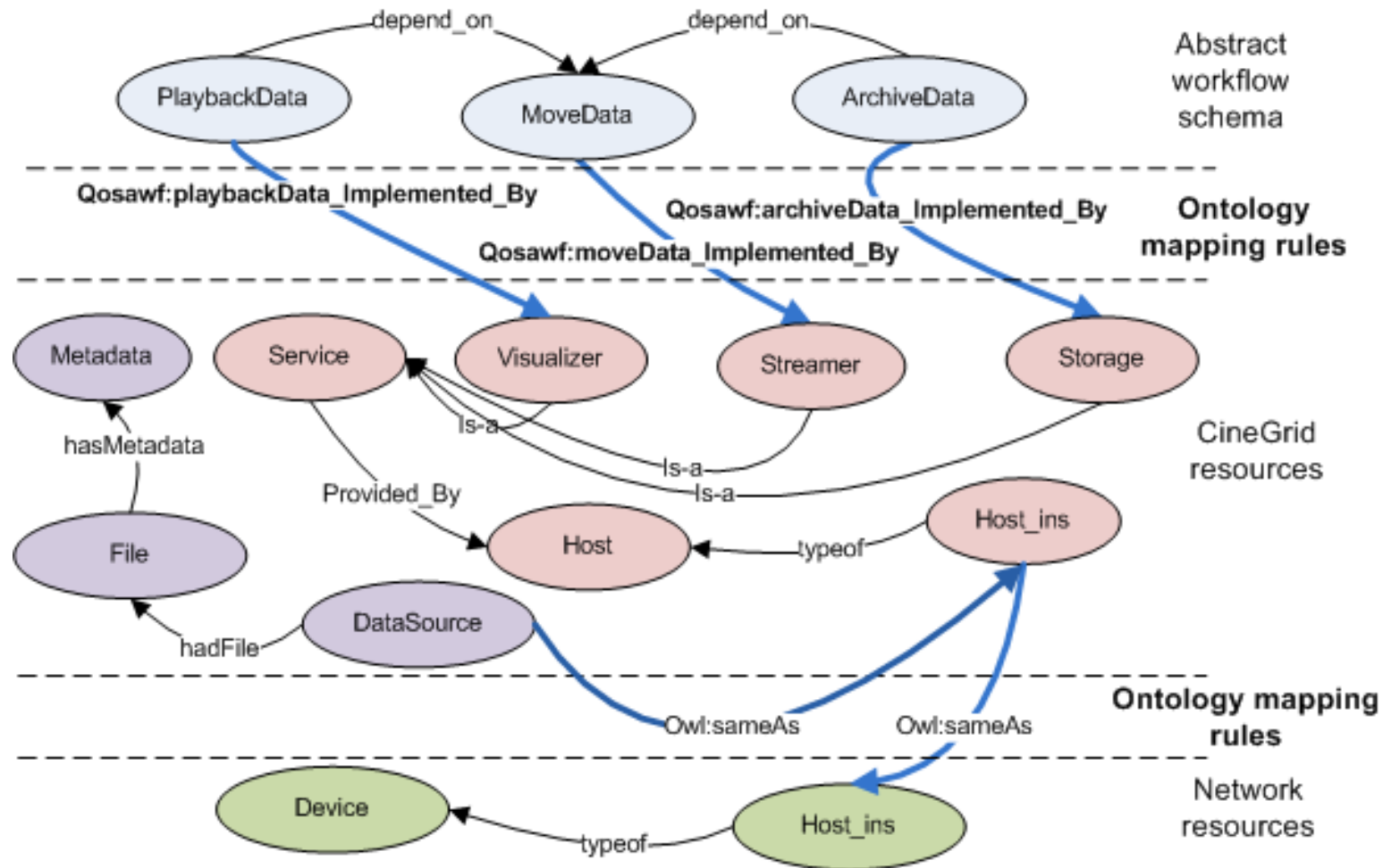


# QoS abstract workflow process description schema





# Ontology mapping







# Retrieving Information

## De Waag



**Author:** Cinegrid.

**Duration:** 54

**OWL class:** <http://cinegrid.uvalight.nl/owl/media.owl#video-de-waag-24>

**Description:**

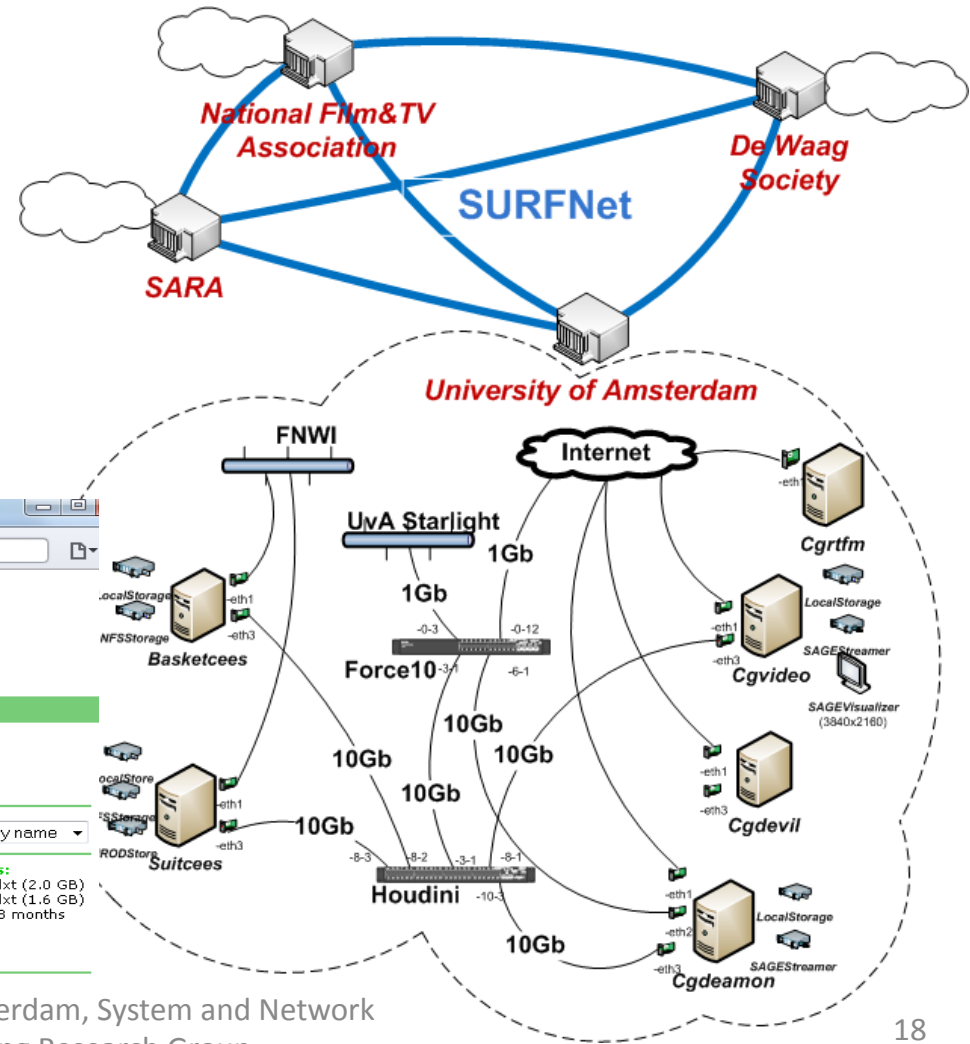
A shot of De Waag on the Nieuwmarkt in Amsterdam.

Codec Format	Location	Size
dxt	1920x1080 <a href="http://cinegrid.uvalight.nl/owl/media.owl#videofile-de-waag-39">http://cinegrid.uvalight.nl/owl/media.owl#videofile-de-waag-39</a>	1.59GiB
	<b>rank bandwidth path</b>	
	1 10000.0 <b>BasketCees</b> (basketcees-eth3,10000.0) --> <b>Houdini</b> (Houdini-8-2,10000.0) --> <b>Houdini</b> (Houdini-10-3,10000.0) --> <b>cgvideo</b> (cgvideo-eth3,10000.0)	
dxt	4096x2160 <a href="http://cinegrid.uvalight.nl/owl/media.owl#videofile-de-waag-36">http://cinegrid.uvalight.nl/owl/media.owl#videofile-de-waag-36</a>	2GiB
	<b>rank bandwidth path</b>	
	1 10000.0 <b>BasketCees</b> (basketcees-eth3,10000.0) --> <b>Houdini</b> (Houdini-8-2,10000.0) --> <b>Houdini</b> (Houdini-10-3,10000.0) --> <b>cgvideo</b> (cgvideo-eth3,10000.0)	



# Use case: QoS guaranteed media delivery on demand

- Media delivery on demand
  - Search movie
  - Propose network path
  - Playback the movie
- Portal + search engine



The screenshot shows a web browser window with the URL <http://cinegrid.uvalight.nl/portal/contentbrowser/>. The page title is "CineGrid distribution center Amsterdam". Below the header, there is a search bar containing the text "C:\Users\zhiming\Projects\NewQoSPlanner-0.1\ontology\dewaag.rc". The search results show "1 matching items for: De Waag". The item details include a thumbnail image of a building, the title "De Waag", and a description: "A shot of De Waag on the Nieuwmarkt in Amsterdam." The available formats are listed as "4096x2160 dxt (2.0 GB)" and "1920x1080 dxt (1.6 GB)". Other metadata includes "Created: 2 years, 8 months ago", "Author: Cinegrid.", and "Categories:".



# NEWQoSPlanner References

- Z.Zhao et al. ,An agent based planner for including network QoS in scientific workflows, ABC:MI Oct.18~20, 2010, Wisla, Poland.
  - <http://ext.delaat.net/posters/2010-10-14-QoSPlanner.pdf>
- Z.Zhao et al. ,Network resource selection for data transfer processes in scientific workflow, WORKS, Super Computing 2010, USA.
  - <http://ext.delaat.net/posters/2010-11-12-SC-QOS.pdf>
- <http://cinegrid.uvalight.nl/owl/qosawf.owl>
- <http://cinegrid.uvalight.nl/owlportal>



# SNE CDL Editor

- Why do we need an editor?
  - Writing CDL/NDL files by hand requires ‘some’ programming background.
  - Software like ‘Protege’ makes the Job easier but still requires a technical background.
  - Automated tools help but in most cases manual editing is still required.

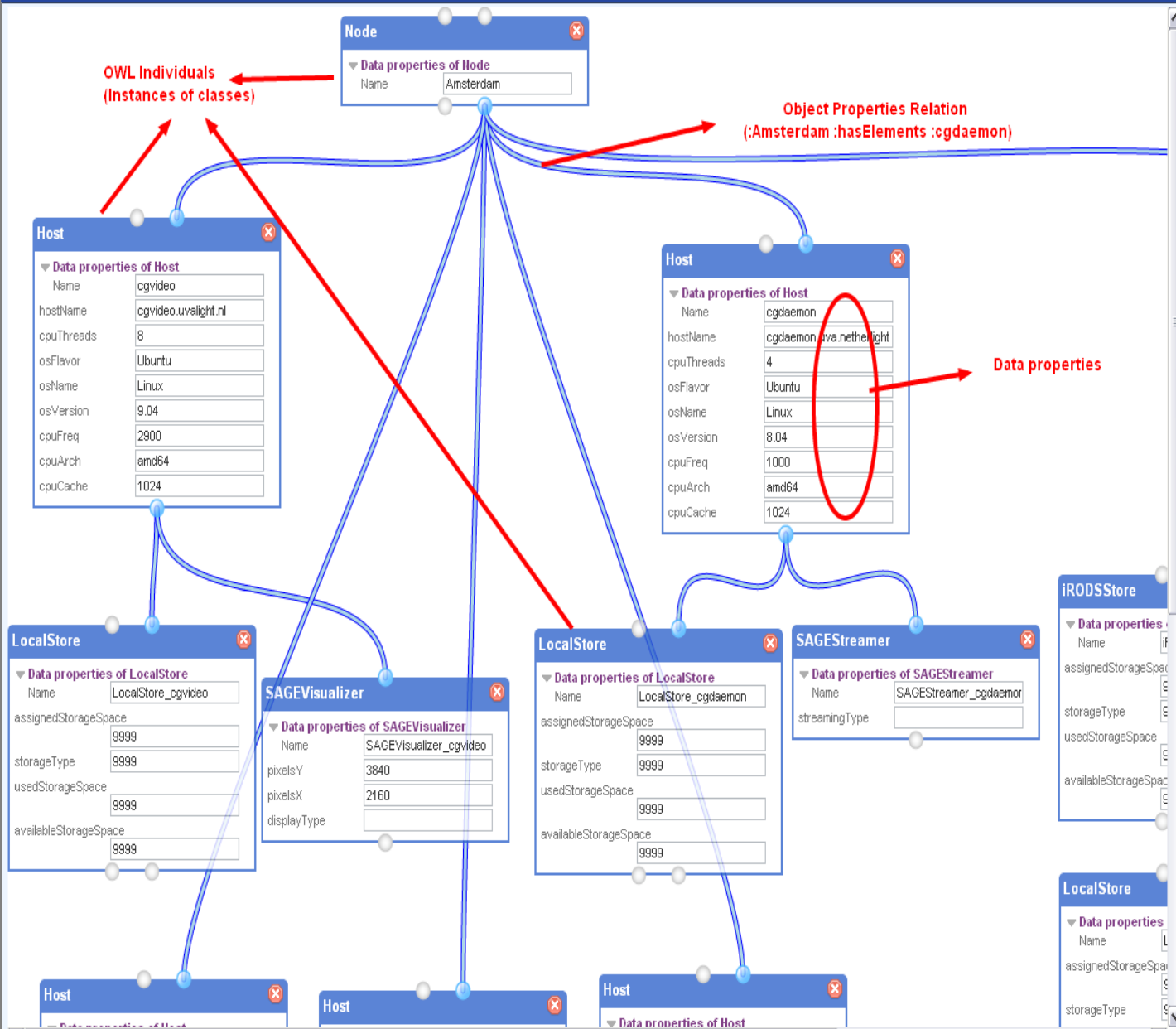


# CDL Editor (Goals)

- Allows instantiation of concepts defined in CDL and NDL
  - User can create instances of classes
  - User can describe data properties of instances
  - User can describe object properties relations
  - User can not modify classes definition (use Protege)
- Assumes no prior knowledge about OWL/RDF
- Provides graphs visualization of what they had created.
- Extensible, can be used for other ontologies

- Ontologies**
- Cinegrid OWL
  - NDL Domain
  - NDL Topology
  - QoS AWF
- Composed**
- CDL\_Amsterdam
  - NDL\_Amsterdam
  - test

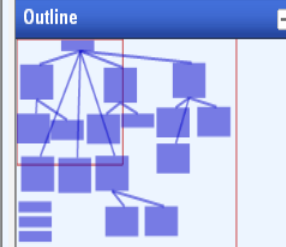
Graph View OWL View Modules View Wires View



**Properties**

Title: CDL\_Amsterdam

Description: Attempting to build http://cinegrid.uvalight.nl/owml/cdl-amsterdam-2.0.owl within this editor



**Info**

SNE Cinegrid editor is designed to allow user to easily create network topology based on Network Description Language and Cinegrid Ontology. Extensions to other ontologies will be possible in the future.

New Load Save Delete Help

Ontologies

Cinegrid OWL

- Content
  - Item
    - AudioClip
    - VideoClip
  - List
- Document
- Element
  - Device
    - Host
    - Projector
    - Screen
  - Group
    - Cluster
    - Exchange
    - Node
- Service
  - Authenticator
  - Indexer
    - XrplIndexer
  - Storage
    - iRODSStore
    - LocalStore
    - NFSSStore
  - Streamer
    - NTTStreamer
    - SAGESStreamer
    - ZaxelStreamer
  - Transcoder
  - Visualizer
    - NTTVisualizer
    - SAGEVisualizer

NDL Domain +

NDL Topology +

QoS AWF +

Composed +

Graph View OWL View Modules View Wires View

```

<!-- http://cinegrid.uvalight.nl/owl/cdl/2.0#cggrtfm -->

<owl:NamedIndividual rdf:about="http://cinegrid.uvalight.nl/owl/cdl/2.0#cggrtfm">
  <rdf:type rdf:resource="http://cinegrid.uvalight.nl/owl/cdl/2.0#Host"/>
  <cpuThreads rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">1</cpuThreads>
  <cpuCache rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">1024</cpuCache>
  <cpuFreq rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">2222</cpuFreq>
  <osVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string">8.04</osVersion>
  <osName rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Linux</osName>
  <osFlavor rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Ubuntu</osFlavor>
  <hostName rdf:datatype="http://www.w3.org/2001/XMLSchema#string">cggrtfm.vlan400.uvalight.net</hostName>
  <cpuArch rdf:datatype="http://www.w3.org/2001/XMLSchema#string">xen-amd64</cpuArch>
</owl:NamedIndividual>

<!-- http://cinegrid.uvalight.nl/owl/cdl/2.0#cgvideo -->

<owl:NamedIndividual rdf:about="http://cinegrid.uvalight.nl/owl/cdl/2.0#cgvideo">
  <rdf:type rdf:resource="http://cinegrid.uvalight.nl/owl/cdl/2.0#Host"/>
  <cpuCache rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">1024</cpuCache>
  <cpuFreq rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">2900</cpuFreq>
  <cpuThreads rdf:datatype="http://www.w3.org/2001/XMLSchema#integer">8</cpuThreads>
  <osVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string">9.04</osVersion>
  <osName rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Linux</osName>
  <osFlavor rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Ubuntu</osFlavor>
  <cpuArch rdf:datatype="http://www.w3.org/2001/XMLSchema#string">amd64</cpuArch>
  <hostName rdf:datatype="http://www.w3.org/2001/XMLSchema#string">cgvideo.uvalight.nl</hostName>
  <providesService rdf:resource="http://cinegrid.uvalight.nl/owl/cdl/2.0#LocalStore_cgvideo"/>
  <providesService rdf:resource="http://cinegrid.uvalight.nl/owl/cdl/2.0#SAGEVisualizer_cgvideo"/>
</owl:NamedIndividual>

<!-- http://cinegrid.uvalight.nl/owl/cdl/2.0#iRODSStore_suitcees -->

<owl:NamedIndividual rdf:about="http://cinegrid.uvalight.nl/owl/cdl/2.0#iRODSStore_suitcees">
  <rdf:type rdf:resource="http://cinegrid.uvalight.nl/owl/cdl/2.0#iRODSStore"/>
  <storageType rdf:datatype="http://www.w3.org/2001/XMLSchema#string">9999</storageType>
  <availableStorageSpace rdf:datatype="http://www.w3.org/2001/XMLSchema#float">9999.0</availableStorageSpace>
  <assignedStorageSpace rdf:datatype="http://www.w3.org/2001/XMLSchema#float">9999.0</assignedStorageSpace>
  <usedStorageSpace rdf:datatype="http://www.w3.org/2001/XMLSchema#float">9999.0</usedStorageSpace>
</owl:NamedIndividual>

<!-- http://cinegrid.uvalight.nl/owl/cdl/2.0#suitcees -->

```

OWL RDF automatically generated based on graph

Properties

Title	CDL_Amsterdam
Description	Attempting to build http://cinegrid.uvalight.nl/ /owl/cdl-amsterdam- 2.0.owl within this editor

Outline



Info

SNE Cinegrid editor is designed to allow user to easily create network topology based on Network Description Language and Cinegrid Ontology. Extensions to other ontologies will be possible in the future.



# Future work

- Further improve CDL
  - Specify network interfaces for services.
- Support for other workflows
  - Adding new content
  - Process content
- Create a easy to use query language to search content/nodes/resources.





# Thank you!

- Portal
  - <http://cinegrid.uvalight.nl/portal>
  - <http://cinegrid.uvalight.nl/owlportal/>
- CDL Editor demo
  - <http://sneteditor.appspot.com>
- Contact Info
  - [R.Koning@uva.nl](mailto:R.Koning@uva.nl)
  - <http://staff.science.uva.nl/~ralph>