Semantics for integrated services

Network QoS in workflows for e-Science
My presentation in a wordle

http://www.wordle.net
Services and semantics

- It is our belief that:

  *without added semantics (intelligence) you cannot provide integrated services.*

  Integrated services require workflows.

- Our approach:
  - Semantic Web lead us to **NDL** and **CDL**
  - Scientific workflows lead us to the **workflow bus platform** developed in the VL-e project.
Quality tuning in scientific workflow

Abstract processes: Refine application logic

Concrete workflow: select optimal services, components

Storage, computing elements: select high performance resources

Network: network path selection.
Network QoS planner

- User request
- Resource Discovery Agent (RDA)
- QoS aware Workflow Planner (QoSWP)
- Workflow Composer Agent (WCA)
- Resource Provision Planner (RPP)
- Workflow engine
- QoS Monitoring Agent (QMA)
- Provenance Service Agent (PSA)

Network resource descriptions

Selected candidate

Selected candidate

Selected candidate

Provisioning plan

Data delivery workflow

Media delivery workflow

Semantic for integrated services
QoS abstract workflow process description schema

Data related process
Pre/Execution/Post condition
QoS (attributes)

Data
- Data
- Data
- Data
- Data

Process
- Require Functionality
- Pre/Condition
- Execution Condition
- Post/Condition
- Or/Condition
- And/Condition

Request
- Require Functionality
- Process

PlaybackData
- MoveData
- ArchiveData

Quality Attribute
- Timeliness
- Security Level
- Reliability
- Precision
- Throughput
- framerate
- Resolution
- CodecQuality
- CompressionRate

Scientific Data
- Video
- Audio
- Sensor Data
- Simulation Results

Condition
- Create Data
- Require Data

Media
- Video
- Audio

QoS (attributes)
Current prototype

- SWIProlog/Semantic web library
  - RDF triples manipulations
  - Graph finding algorithm -> network path
  - Solving constraints
- JAVA Prolog interface (JPL)
  - Manipulate Prolog functions via Java
- Java Agent development framework
  - Agent communication language (ACL) between agents
  - XMLRPC: between agent and web portal
CineGrid use case

- Media delivery on demand
  - Search movie
  - Propose network path
  - Playback the movie
More?

We have an upcoming demonstration during SuperComputing. And we have published a few papers on this:

- Z. Zhao, P. Grosso, R. Koning, J. v/d Ham, C.de Laat
  *Network resource selection for data transfer processes in scientific workflow*
  In: Workflows in Support of Large-Scale Science (WORKS10) - November 14 2010, New Orleans, LO

- Z. Zhao, P. Grosso, R. Koning, J. v/d Ham, C. de Laat
  *An architecture including network QoS in scientific workflows*
  In: Proceedings of Int'l Conf. on Grid and Cloud Computing (GCC 2010), November 1-5, 2010, Nanjing, China,IEEE Xplore digital library

- Z. Zhao, P. Grosso, R. Koning, J. van der Ham, C. de Laat
  *An agent based planner for including network QoS in scientific workflows*
  In: Int'l workshop on Agent Based Computing: from Model to Implementation VII (ABC:MI'10), October 18-20, 2010, in Wisla, Poland, ISSN 1896-7094, IEEE Xplore digital library