

Towards a Framework for Monitoring and Analyzing QoS Metrics of Grid Services

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QoS Monitoring, Management, and Analysis for Grid Service

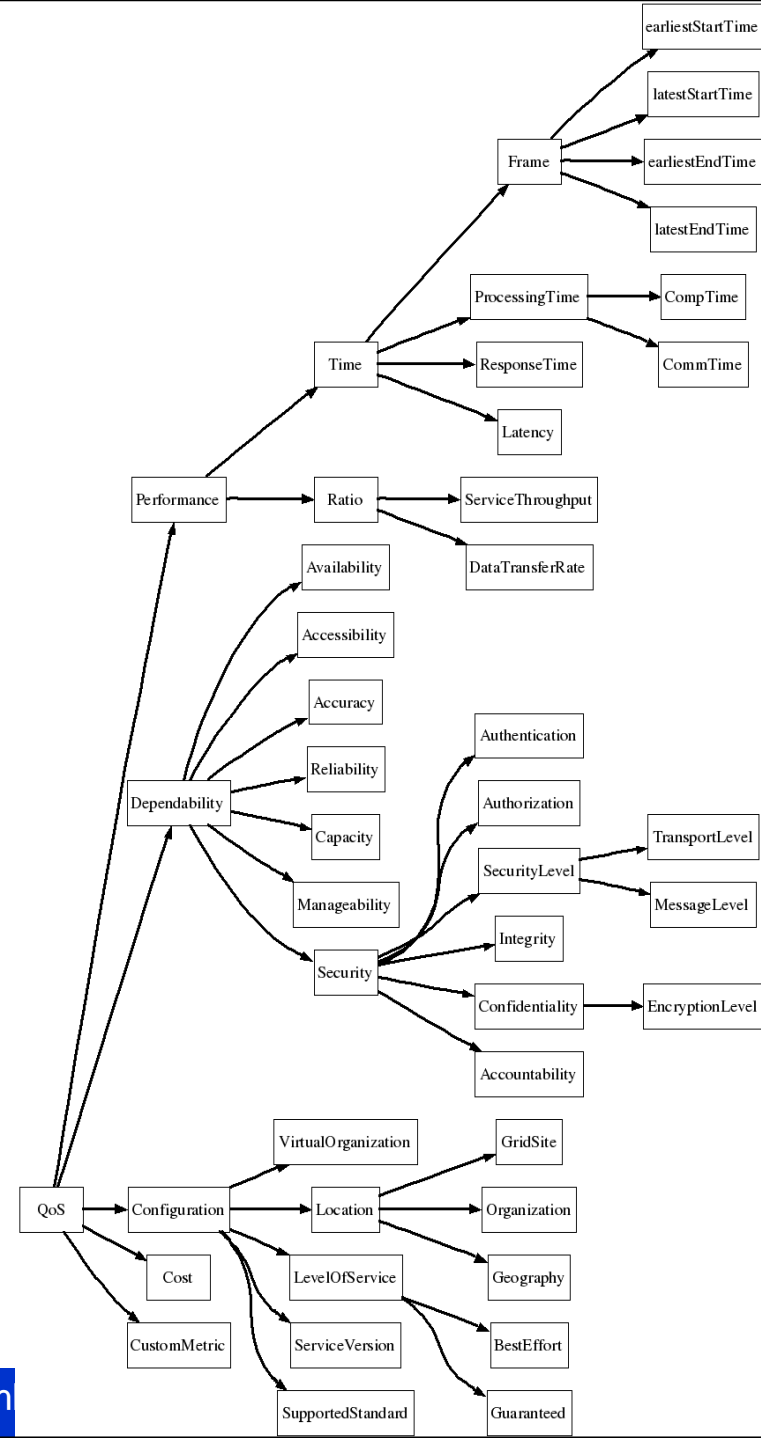
- ❖ Many works discussed about how to utilize QoS metrics in the Grid
 - Yet how to monitor and provide QoS metrics is a challenging task
 - Lack of generic/integrated QoS monitoring frameworks
 - Lack of analysis for interdependent Grid services
- ❖ Our objective:
 - Develop a scalable, generic framework that is able to monitor, provide and manage QoS metrics of Grid services

Our Approach

- ❖ Select and classify measurable QoS metrics of Grid services
 - ❖ Develop sensors for monitoring and providing data that can be used to determine QoS metrics
 - ❖ Provide and manage QoS metrics of various types of monitored resources
 - ❖ Online modelling, monitoring, and analyzing interdependent Grid services
- All implemented in an integrated framework

Measurable QoS Metrics

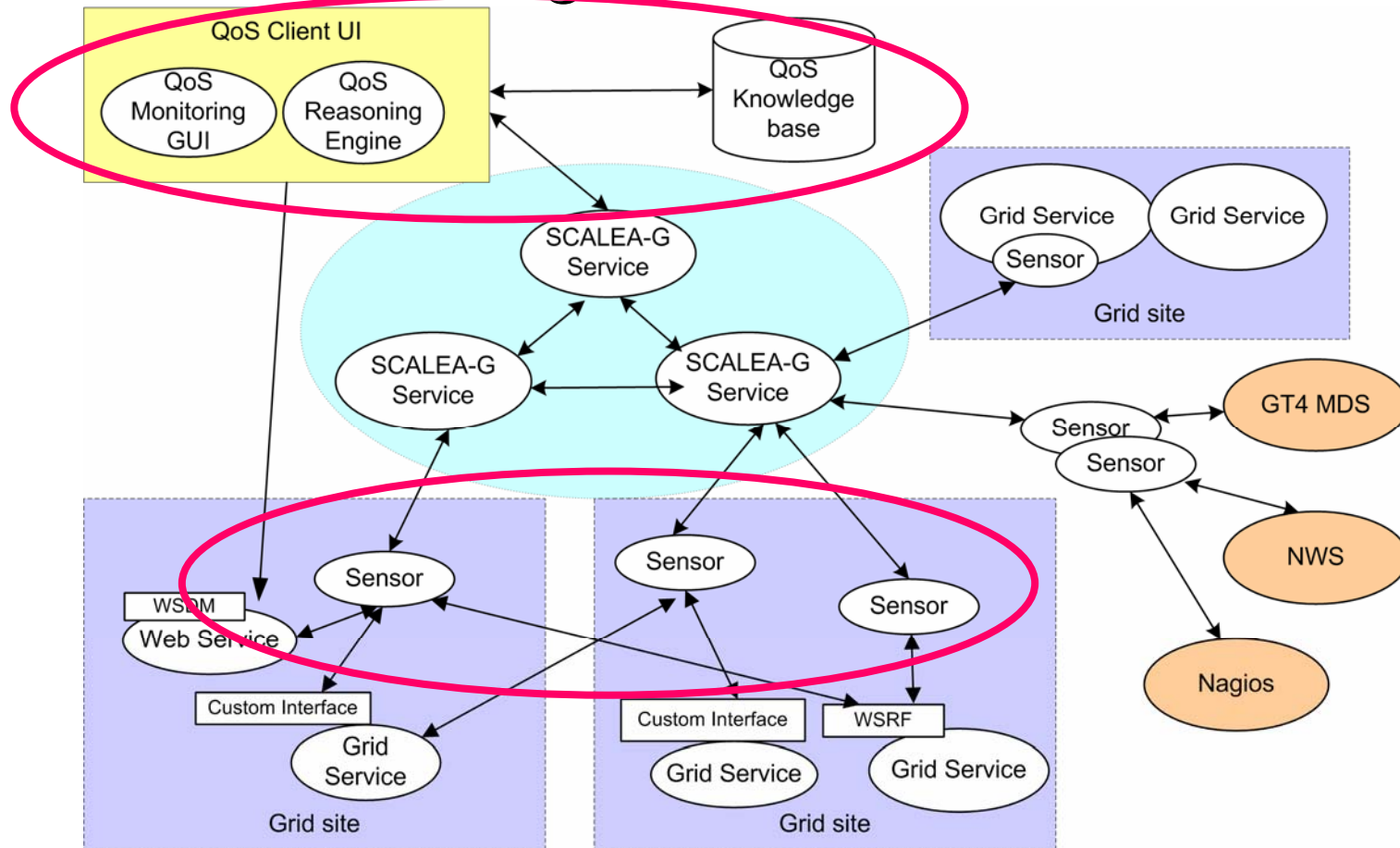
- ❖ Select and classify measurable QoS metrics of Grid services
 - Based on various existing QoS metrics, performance metrics, and QoS, dependability and security taxonomies
- ❖ Develop sensors for monitoring and providing relevant data that can be used to determine these QoS metrics



Collecting monitoring data for determining QoS metrics

- ❖ **Diverse monitored resources:**
 - Include machines (computational services), network paths, Grid middleware and applications
 - Focusing on Web services and WSRF, utilizing WSDM (Web Services Distributed Management)
- ❖ **No single measurement technique**
 - Different methods for different types of monitored resources
 - Direct measurement, accessing data from existing monitoring data providers (Ganglia, Nagios, etc.), parsing log and configuration files
 - Focusing on remote monitoring of services in a non-intrusive way, using publicly accessible interfaces.
- ❖ **Trade-offs:** accuracy versus perturbation, generic versus specific

P2P-based Framework for Monitoring and Providing QoS related data



- ❖ Data is published in P2P-based Grid services
- ❖ WSRF-based service providing QoS metrics

Online Modelling and Analyzing Non-functional Metrics of Interdependent Grid services



Online Modelling and Analyzing Non-functional Metrics of Interdependent Grid services

QoS Tree View

File View Help font++ font--

- QoS
 - Performance
 - Time
 - Latency
 - <PATH.DELAY.ROUNDTRIP>
 - Ratio
 - Dependability
 - Accessibility
 - Availability
 - <MONITORING LOCATIONS>
 - petzeck.dps.uibk.ac.at
 - machine
 - network path
 - icmp:petzeck.dps.uibk.ac.at->pc6163-c703.uibk.ac.at
 - tcp:petzeck.dps.uibk.ac.at->altix1.uibk.ac.at
 - icmp:petzeck.dps.uibk.ac.at->clown.first.fraunhofer.de
 - tcp:petzeck.dps.uibk.ac.at->zeus72.cyf-kr.edu.pl
 - icmp:petzeck.dps.uibk.ac.at->goedis.dps.uibk.ac.at
 - tcp:petzeck.dps.uibk.ac.at->pleisen.dps.uibk.ac.at
 - tcp:petzeck.dps.uibk.ac.at->portal.ui.sav.sk
 - middleware
 - application

Status	
UP	Mon Oct 02 18
UP	Mon Oct 02 18
UP	Mon Oct 02 18
UP	Mon Oct 02 18
UP	Mon Oct 02 18

Metric based QoS Tree View

- pc6163-c703.uibk.ac.at
 - Performance
 - Dependability
 - Accessibility
 - Availability
 - machine
 - network path
 - tcp://altix1.uibk.ac.at
 - tcp://agrid.uibk.ac.at
 - tcp://hydra.gup.uni-linz.ac.at
 - monitored from: pc6163-c703.uibk.ac.at
 - solaris-ping:pc6163-c703.uibk.ac.at->hephygr.oew.ac.at
 - tcp://astro-grid3.uibk.ac.at
 - tcp://astro-grid1.uibk.ac.at
 - tcp://hc-ma.uibk.ac.at
 - icmp://altix1.jku.austriangrid.at
 - tcp://schafberg.coma.sbg.ac.at
 - tcp://karwendel.dps.uibk.ac.at
 - tcp://grid.uibk.ac.at
 - tcp://grid.labs.fhv.at
 - icmp://pc6163-c703.uibk.ac.at
 - middleware
 - application
 - http://pc6163-c703.uibk.ac.at:40350/gwes/services/GWES?wsdl
 - http://pc6163-c703.uibk.ac.at:40350/gwes/services/GWES?method=getWorkflowIDs
 - monitored from: petzeck.dps.uibk.ac.at
 - Availability: 100.0 %
 - Details
 - start of monitoring period: Fri Dec 01 14:18:29 MET 2006
 - end of monitoring period: Fri Dec 01 16:30:38 MET 2006
 - monitoring period covered by metrics: 100.0 %
 - total number of metric values: 35
 - number of UP values: 35
 - first UP value: Fri Dec 01 14:18:29 MET 2006
 - last UP value: Fri Dec 01 16:30:38 MET 2006
 - number of DOWN values: 0
 - average monitoring interval: 233.226 sec.
- http://pc6163-c703.uibk.ac.at:40065/wsrif/services/kwfggrid/DIPASFactory?wsdl
- http://pc6163-c703.uibk.ac.at:40065/wsrif/services/monitorif/service/MonitoringService?wsdl

Conclusions and Future Work

❖ Current implementation

- Based on Globus Toolkit 4.0

❖ At this time not all metrics in the tree supported

- Mostly availability, reliability, performance
- Machines and network paths (IP/ICMP, TCP, HTTP)
- Grid applications and middleware:
 - WSDM-based, Web Services, WSRF, GridFTP, GRAM, etc.

❖ Support modeling, online monitoring and analysis of non-functional parameters of Grid services in a single tool

- Functional and/or operational, local view or global view

❖ Future works

- Working on obtaining data from log files, storing QoS metrics
- Self-management based on QoS metrics and WSDM

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