CrossGrid WP3

Task 3.3

Grid Monitoring

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# Task 3.3 Participants

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Task 3.3 Presentation

TO DO:

1. Subtasks specification and division

2. Time schedule, timing between partners at least for the first milestone

3. Definition of interfaces – too early

4. Referencing, dependency on other WP/task propositions to other tasks & WPs

5. Draft documents following ‘Software Requirements’
Task 3.3: Subtasks Specification and Division

Task 3.3 (CYFRO / TCD / ICM)

Requirements Specification

Task 3.3.1 (CYFRO - ?? MM, ICM – 28MM)

Invasive Monitoring:

‘Autonomous monitoring system for on-line and automatic performance analysis’

Task 3.3.2 (TCD – 32 MM)

Non-invasive Monitoring:

‘SQL-query-based tool support and interfaces to Grid application programming environment’

Task 3.3.3 (CYFRO - ?? MM)

Jiro:

‘Jiro-based services for Grid infrastructure monitoring’
# Task 3.3 Time schedule, timing between partners

## PM 1-3 Definition of requirements

PM3: Deliverable D3.1 [ALL]

## PM 4-6 Designing of architecture, interfaces and security issue

PM6: Deliverable D3.2 (report) [ALL]

## PM 6 First testbed set-up on selected sites

PM6: Deliverable D3.2 [ALL]

## PM 6-12 Implementation of 1st prototype (running on local grid)

PM12: Deliverables D3.3 (prototype and report)

**Timing between partners:** to be decided
Task 3.3 Definition of interfaces

Too early yet
# Task 3.3 Technology Assumptions

## Globus:
- Globus Sockets – mature technology
- MDS - mature technology but obsolete by end-2002

## DataGrid:
- RGMA - released into DataGrid Testbed1
- DataGrid are keen to assist Task 3.3

## Conclusion:
- Use Globus Sockets + RGMA where useful
- Only use MDS for first testbed
Globus Sockets

Supported by Globus toolset
Includes GSI security
Quick high-performance solution
Does not give access to grid information system
Will give trouble with firewalls
RGMA

Philosophy

• Any measurement or fact represented as a tuple
• Add time stamp and it becomes monitoring information
• At most the difference is 1 field - the time stamp

Time is the binding element

Datagrid use R-GMA not only for monitoring but also as the basis of an information system
R-GMA: Data Model

DataGrid have chosen a RELATIONAL data model

Not general distributed RDBMS system, but a way to use relational model in a distributed environment where ACID (Atomicity, Consistency, Isolation and Durability) properties are not considered important

Producers announce: SQL “CREATE TABLE”

publish: SQL “INSERT”

Consumers collect: SQL “SELECT”

Viewed as one huge logical data base, partitioned according to certain criteria (specified by WHERE clause as a predicate)
CrossGrid WP2 Info Flows

CrossGrid Technical Annex
Fig. WP2-1

Applications (WP1) executing on Grid testbed (WP4)

Benchmarks (2.3)

Grid Monitoring (3.3)

Performance measurement

Automatic analysis

Visualization

MPI verification (2.2)

Application Source Code

Performance analysis (2.4)

Analytical model

Not now needed
CrossGrid Task 3.3: External Info Flows

WP3

Grid Resource Management (3.2)

Grid Monitoring (3.3)

Optimisation of Data Access (3.4)

WP2

Performance evaluation tools (2.4)
CrossGrid Task 3.3: Internal Info Flows

WP3

Infrastructure

Non-invasive Monitoring (3.3.2-TCD)

Instruments

Jiro Services (3.3.3-CYFRO)

Performance Information Post-processing (3.3.1-ICM)

Applications

OMIS Application Monitor + Local Monitor (3.3.1-CYFRO)

OMIS Service Manager + Perf Tools (3.3.1-CYFRO)

Jiro info

OMIS info

Trace info

Result info

dB

input

ctrl skt

input

input
CrossGrid Task 3.3: Use Cases

1. Don’t know exactly what info is of interest:
   Constantly monitor - when we know, look at the accumulated info
   R-GMA supports this approach

2. Know what info is of interest, in short term:
   Immediately evaluate only what is actually needed
   OCM is inspired by this approach

3. Know what info is of interest, in long term:
   Constantly monitor & accumulate only what is actually needed
   R-GMA supports by this approach
CrossGrid Task 3.3: Can it use R-GMA?

Infrastructure

WP3

Non-invasive Monitoring (3.3.2-TCD)

MDS (Globus)

Jiro Services (3.3.3-CYFRO)

R-GMA (DataGrid)

Performance Information Post-processing (3.3.1-ICM)

OMIS Service Manager + Perf Tools (3.3.1-CYFRO)

OMIS Application Monitor + Local Monitor (3.3.1-CYFRO)

Applications

Instruments

Static info

Jiro info

MDS info

R-GMA info (includes Jiro, MDS, Trace, OMIS & Result)

OMIS info

CrossGrid Task 3.3
CrossGrid Task 3.3.1: Invasive Monitoring

Task 3.3.1 (CYFRONET, Krakow, Poland, ICM, University of Warsaw, Poland)

Invasive Monitoring:

‘Autonomous monitoring system for on-line and automatic performance analysis’

Derived from OMIS / OCM research

http://wwwbode.in.tum.de/~omis/

For on-line monitoring

And APART research

http://www.fz-juelich.de/apart/

For performance analysis of parallel programs
CrossGrid Task 3.3.1: Invasive Monitoring

Autonomous monitoring system for on-line and automatic performance analysis
CrossGrid Task 3.3.1: Invasive Monitoring

Autonomous monitoring system for on-line and automatic performance analysis

Invasive Monitoring

Synchronous Control/Data via Globus sockets?

Performance Tools

Service Manager

OMIS Interface

Local Monitor

Application Monitor

Application

OMIS Interface

Performance Data Storage

RGMA Producer API

RGMA Consumer API

Producer Servlet

Consumer Servlet

Archiver Servlet

Consumer Servlet(s)

Archiver API

Performance Information Post-processing (3.3.1-ICM)

dB
CrossGrid Task 3.3.1: Post-processing

- Exploitation of time patterns in grid performance:
  - Use of AI methods (agent type simulation and neural/genetic algorithms)
  - Visual analysis of raw data
  - Automated application of statistical analysis

- Analysis of performance and resource usage patterns for typical applications
  - Visual analysis
  - Database of application activity patterns

- Perspective:
  - Optimization of predicted grid usage/performance
CrossGrid Task 3.3.2: Non-invasive Monitoring

Task 3.3.2 (Trinity College Dublin, Ireland)

Non-invasive Monitoring:

'SQL-query-based tool support and interfaces to Grid application programming environment'

High-Speed Data Capture

Relational Trace Database

Bulk Database Import
CrossGrid Task 3.3.2: Non-invasive Monitoring

SQL-query-based tool support and interfaces to Grid application programming environment

Non-invasive Monitoring

OMIS Interface

Non-invasive Monitoring

Canonical Producer

OMIS Interface

Synchronous Control/Data via Globus sockets?

RGMA Producer API

RGMA Consumer API

RGMA/OMIS interface

Performance Tools

Performance Analysis Post-processing (3.3.2-TCD)

Non-invasive Monitoring

Producer Servlet

Consumer Servlet

Archiver Servlet

Asynchronous Information via R-GMA?

Consumer Servlet(s)

Archiver

Log Files

dB

Canonical Producer

OMIS Interface

Performance Tools

Performance Analysis Post-processing (3.3.2-TCD)
CrossGrid Task 3.3.3: Jiro Monitoring

Task 3.3.3 (CYFRONET, Krakow, Poland)

Jiro:

‘Jiro-based services for Grid infrastructure monitoring’

New technology

http://www.jiro.com/

For distributed resource management

Part of ‘Federated Management Architecture’
CrossGrid Task 3.3.3: Jiro Monitoring

Management Policies

Jiro Agent  Jiro Agent  Jiro Agent

Management Facade

Jiro Agent  Jiro Agent  Jiro Agent

Hardware
CrossGrid Task 3.3.3: Jiro Monitoring

Jiro Connections

Jiro Monitoring

RGMA Producer API

RGMA Consumer API

Producer Servlet

Consumer Servlet

Consumer Servlet(s)

Archiver Servlet

Jiro-Based services for Grid infrastructure monitoring'

Jiro Monitoring

Information via R-GMA?
Problems with R-GMA

1. **Sensor data MUST be pushed to Producer servlet**
   e.g. for debugging, queries may focus on small section of logfiles, yet complete multi-GB logfiles must be move to Producer servlet

2. **Each query MUST instantiate new objects & connections**
   e.g. when debugging, have constant interaction with same producer, yet each query requires fresh instantiation of Consumer servlet + http connections
Problem 1:
Problem 2:

Synchronous Control/Data via Globus sockets

OMIS Interface

Application

OMIS Interface

Local Monitor

Performance Data Storage

RGMA Producer API

RGMA Consumer API

Service Manager

Performance Tools

Asynchronous Information via R-GMA?

Producer Servlet

Consumer Servlet

Consumer Servlet(s)

Archiver Servlet

Maybe?

Query RGMA to find Local Monitor

Then set up Control/Data connection

dB

CrassGrid Task 3.3

CrossGrid Task 3.3
Problems with R-GMA

1. Sensor data MUST be pushed to Producer servlet
   DataGrid will fix this
   4-MAR-2002

2. Each query MUST instantiate new objects & connections
   DataGrid will do *halfway-house* solution, then investigate.
   Specifically – data analysis tools situated as information producers/servers and consumers pulling automatically data from higher order producers
   4-MAR-2002
WP3 Task 3.3

THE END