Virtual Grid Execution System: Fault Tolerance Planning and Run-time Rescheduling of Scientific Workflows

VGrADS Team

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Summary

• Demonstrate fault-tolerance atop virtual grids

• Fault-tolerance mechanisms
  o Over-provisioning during workflow planning
  o Rescheduling to respond to failures at runtime

• LEAD workflow - the driving application
Experiment Wizard

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Specify a name, description, and select workflow

My Workflows (0)

Description

WRF Forecasting using NCEP NAM 40km Initial Conditions and Lateral Boundary Data interpolated by ARPS Preprocessing Versions 5.2.8 & Forecast with WRF (ARW Core) Version 2.2. WRF output can be visualized with IDV (3D).
LEAD Execution Scenario

Application

Workflow Planner

Execution Manager

LEAD Portal & Services

Globus

Resources

UCSB

Renci

NCSA

RICE

UI
VGrADS Application Collaboration

LEAD System (Relevant pieces)

LEAD Portal

LEAD BPEL Workflow Engine

Application Service

App. Factory

Event Broker

Workflow Planner

Execution Manager

(VrADS Planner

(Re)-Scheduler

Virtual Grid Execution System

FTR

BQP / VAR

GT4, Personal PBS

Globus

Resources

UCSB

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NCSA

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VGrADS

Virtual Grid Application Development Software Project
VGrADS SC’07 Demo Architecture

Application

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 UCSB  Renci  NCSA  RICE  UH

Performance Model

Globus

Virtual Grid Application Development Software Project
Job States on Resources

- **C** = Completed successfully
- **F** = Failed
- **K** = Killed since another copy finished successfully
- **R** = Running
- **Q** = Queued
LEAD Workflow
Questions?
Here is the workflow and constraints + pointer to performance model. Give me a mapping.

Query the performance model for task’s resource requirements.

Find me two slots (vgFind).

Return slots above threshold.

If reserved submit PBS-glidin at slot start time else submit when BQP suggests.

Return mapping VECTOR.

If not reserved resource, ask - is it time to submit?

Constantly collect data over time.

Planning

Execution

Execution Manager

Workflow Planner

Scheduler

Performance Model

Batch Queue Prediction & Slot Acquisition

GT4 GRAM

(Reserved)

PBS

(Reserved)

Rice

(Reserved)

Virtual Grid Execution System

Slot Globus Gateway

Run Job

Run job

vgStatus

vgLaunch
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Query the performance model for task’s resource requirements

Find me two slots (vgFind)

Return slots above threshold

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Run job

Constantly collect data over time
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