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
  - *Over-provisioning* during workflow planning
  - *Rescheduling* to respond to failures at runtime

- LEAD workflow - the driving application

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Experiment Builder Portlet

Experiment Wizard

User: Lavanya Ramakrishnan Project: VGrADSTest_Nov6_1

Specify a name, description, and select workflow

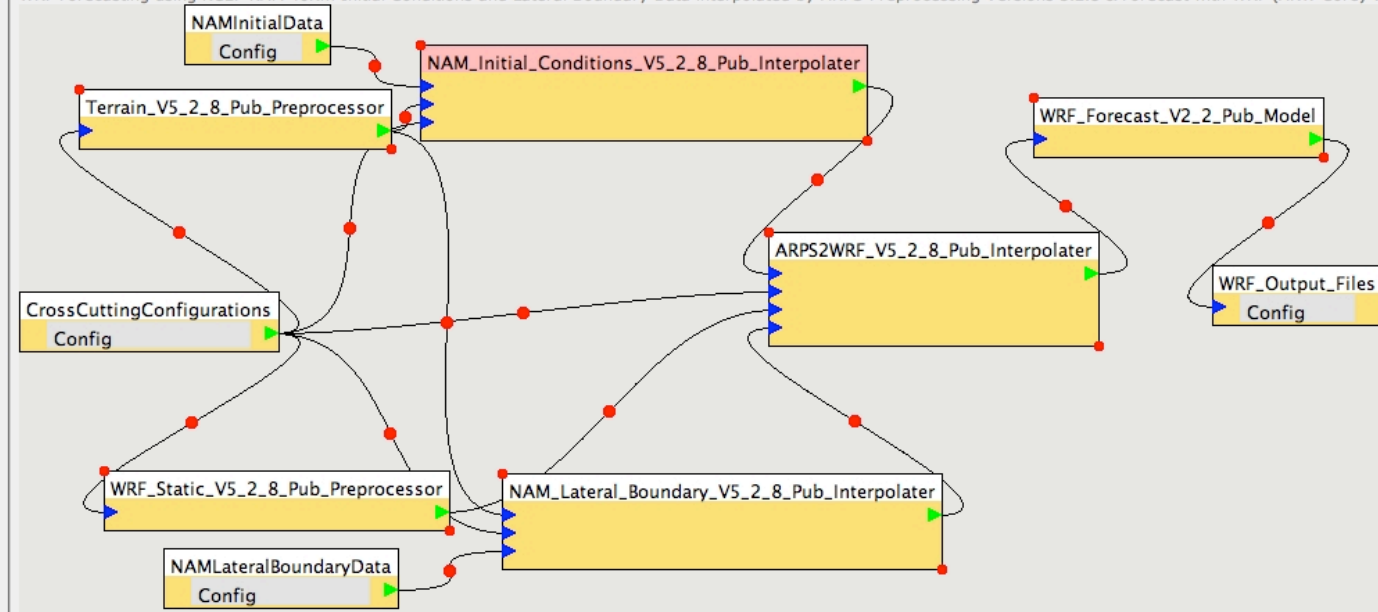Name: dan_test

Description:

Workflow

My Workflows (0)   Sample Workflows (1)

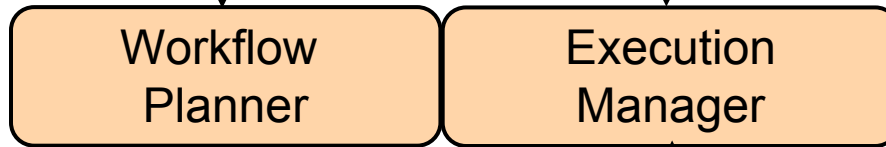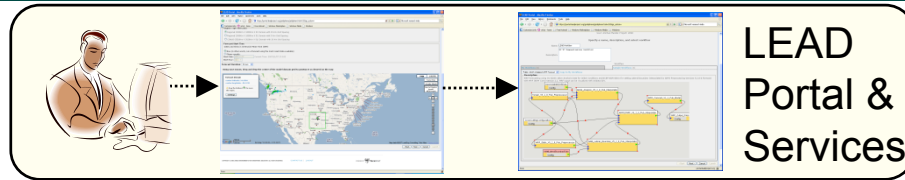VGrADS: NAM Initialized WRF Forecast   Copy to My Workflows

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 ouput can be visualized with IDV (3D).

| NAMInitialData |
| Config |

NAM_Initial_Conditions_V5_2_8_Pub_Interpolater

Terrain_V5_2_8_Pub_Preprocessor

WRF_Forecast_V2_2_Pub_Model

ARPS2WRF_V5_2_8_Pub_Interpolater

WRF_Output_Files
Config

| CrossCuttingConfigurations |
| Config |

WRF_Static_V5_2_8_Pub_Preprocessor

NAM_Lateral_Boundary_V5_2_8_Pub_Interpolater

| NAMLateralBoundaryData |
| Config |

< Back   Next >   Cancel   Launch

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LEAD Execution Scenario

Application   LEAD Portal & Services

Workflow Planner   **Execution Manager**

Globus

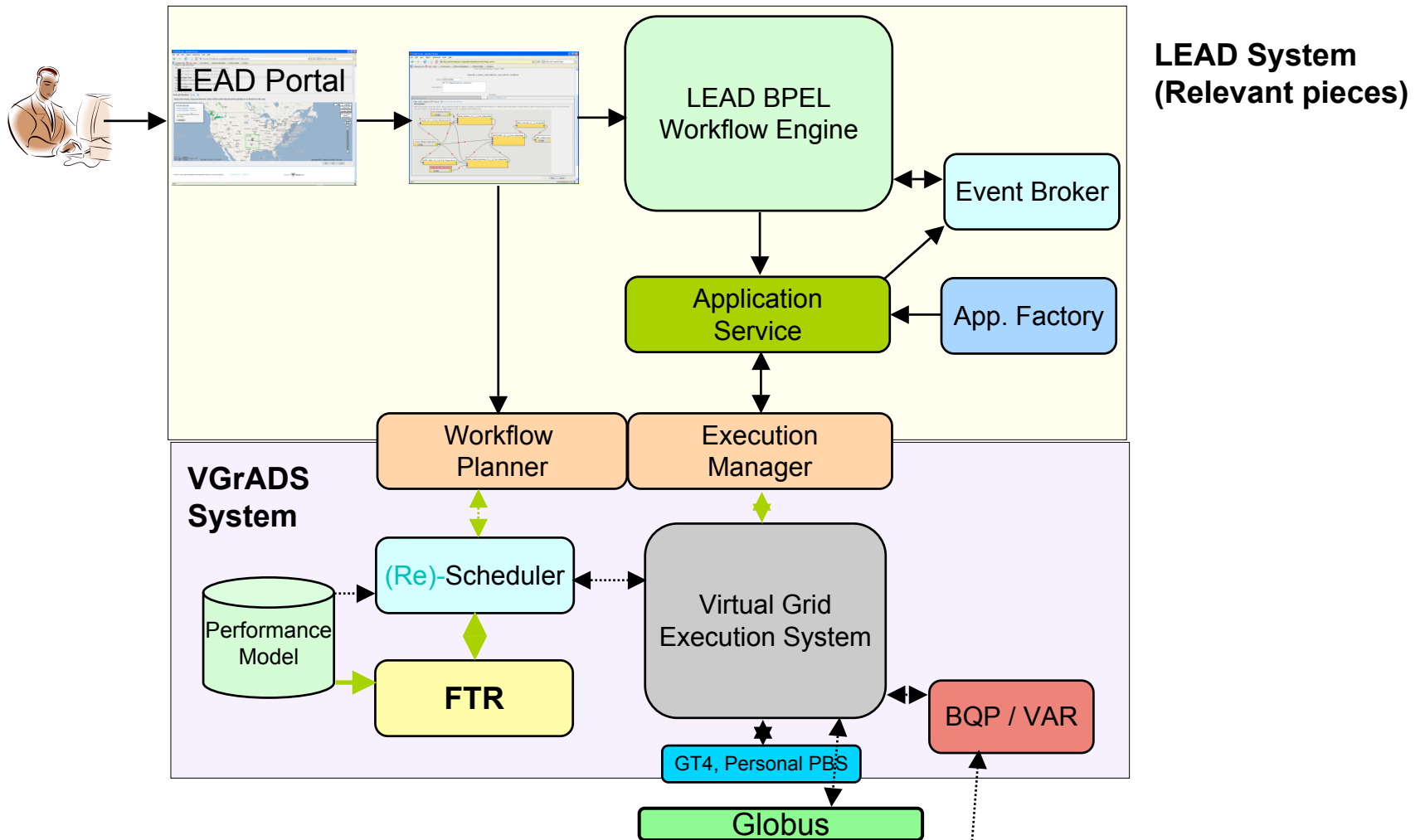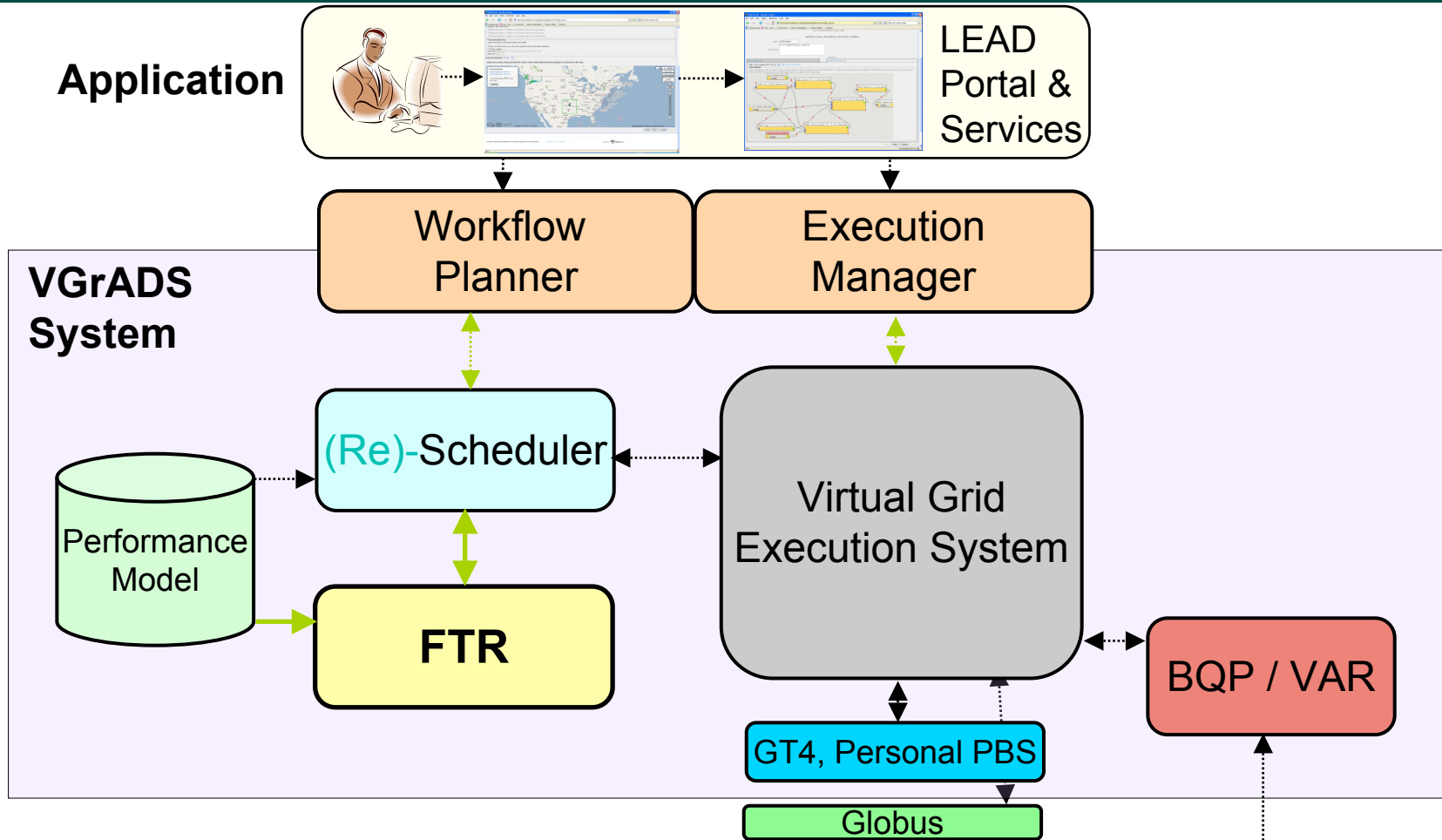**Resources**   UCSB   Renci *Renaissance Computing Institute*   NCSA   RICE   UH

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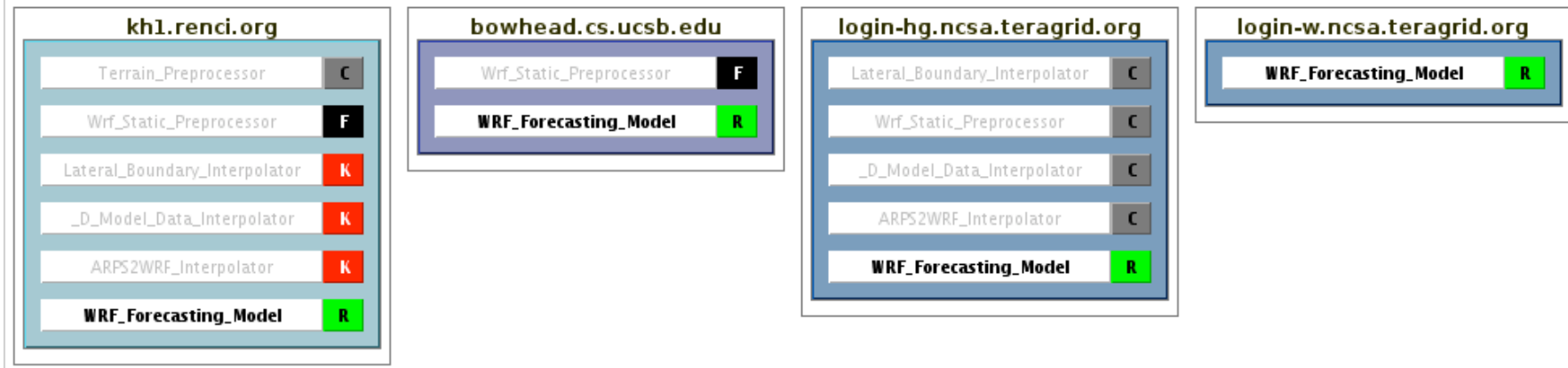# VGrADS Application Collaboration

VGrADS SC'07 Demo Architecture

Job States on Resources

Resource View

kh1.renci.org

Terrain_Preprocessor	C
Wrf_Static_Preprocessor	F
Lateral_Boundary_Interpolator	K
_D_Model_Data_Interpolator	K
ARPS2WRF_Interpolator	K
WRF_Forecasting_Model	R

bowhead.cs.ucsb.edu

Wrf_Static_Preprocessor	F
WRF_Forecasting_Model	R

login-hg.ncsa.teragrid.org

Lateral_Boundary_Interpolator	C
Wrf_Static_Preprocessor	C
_D_Model_Data_Interpolator	C
ARPS2WRF_Interpolator	C
WRF_Forecasting_Model	R

login-w.ncsa.teragrid.org

WRF_Forecasting_Model	R

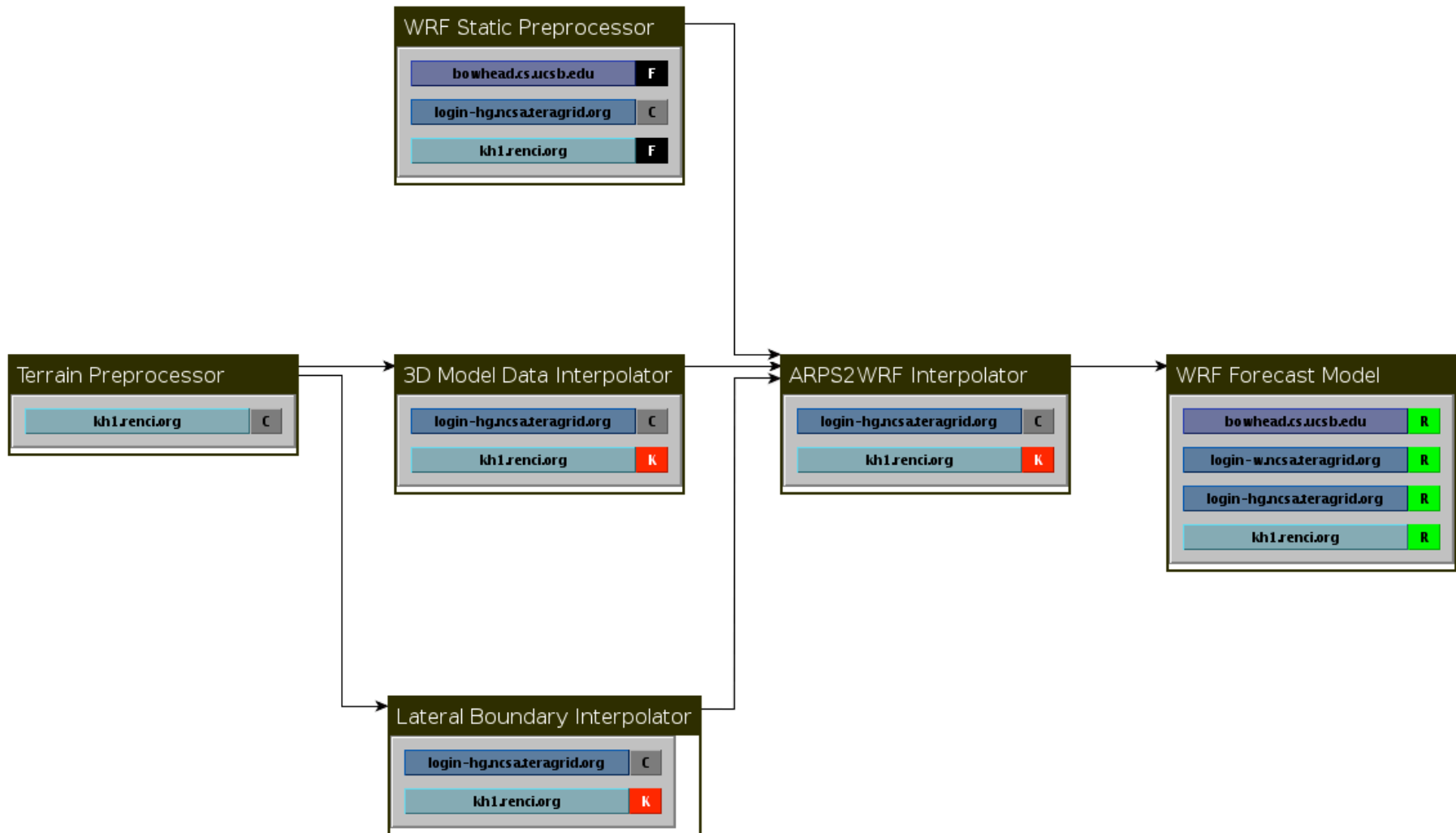**C** = Completed successfully

F = Failed

K = Killed since another copy finished successfully

R = Running

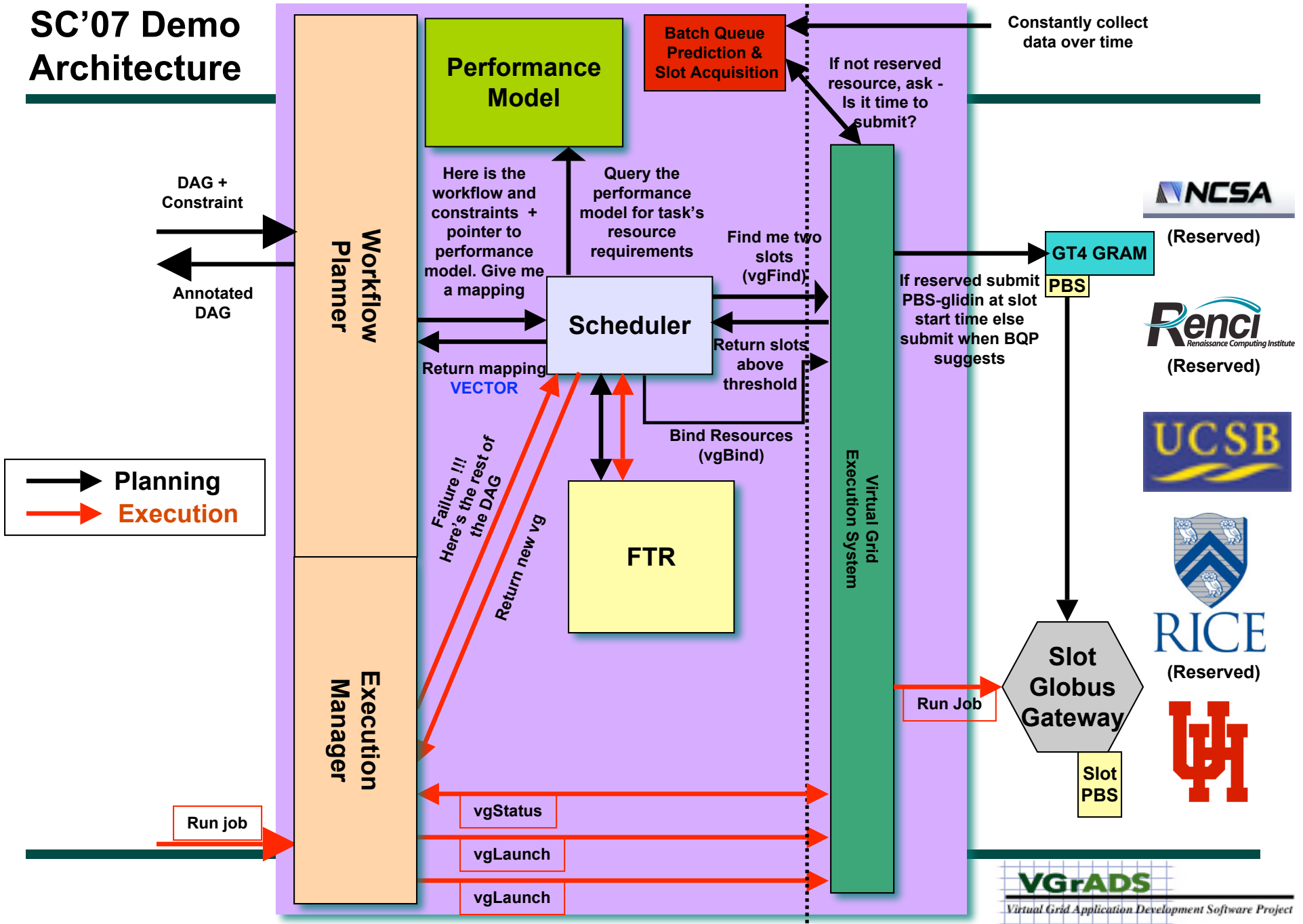**Q** = Queued

LEAD Workflow

Questions?

SC'07 Demo Architecture

SC'07 Demo Architecture

Performance Model

Batch Queue Prediction & Slot Acquisition

Constantly collect data over time

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

DAG + Constraint

Annotated DAG

Workflow Planner

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 mapping VECTOR

Return slots above threshold

Scheduler

Planning

Execution

Failure !!! Here's the rest of the DAG

Return new vg

Bind Resources (vgBind)

FTR

Virtual Grid Execution System

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

GT4 GRAM

PBS

NCSA (Reserved)

Renci Renaissance Computing Institute (Reserved)

UCSB

RICE (Reserved)

Execution Manager

Run job

vgStatus

vgLaunch

vgLaunch

Run Job

Slot Globus Gateway

Slot PBS

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