ACET’s e-Research Activities

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1. ACET Centre
   Computing Resources

2. e-Research Projects
   g-Eclipse
   Scientific Visualization and VR
   eMinerals
   iRODS
   VRE
   Other Related Projects
ACET Centre

“Scientific discovery and advancement of science through advanced computing”

Main Research Areas

- Computational Science
- Middleware Technologies for Distributed Systems
- Collaborative Computing
- Scientific Visualization and VR

- Director – Prof. Vassil N. Alexandrov
- 30+ Researchers
- Leading in the area of Computational Science at the University
IBM BladeCenter Cluster - ThamesBlue

- One of the 100 fastest supercomputers in the world
- 884 nodes
- 3168 ppc970 CPU cores
- Myrinet 2 GBit high-speed, low-latency interconnect
- 6 TByte distributed main memory
- 60 TByte IBM GPFS high performance parallel filesystem
- IBM XL C and Fortran compilers
- IBM ESSL/PESSSL scientific libraries
Computing Resources

- IBM pSeries cluster, 4 p655 nodes with 32 POWER4 CPU cores, 64 GByte main memory
- SGI Prism visualization system, 8-way Itanium II node, used for computation and drives the ReaCTor immersive CAVE-like system
- Two powerwalls, fixed and portable 3D visualization systems
- Head Mounted Displays
- Two PC clusters
e-Research Projects

e-Research: “…technologies that support all the processes involved in research including creating and sustaining research collaborations and discovering, analysing, processing, publishing, storing and sharing research data and information.” (JISC, http://www.jisc.ac.uk/whatwedo/themes/ereasearch.aspx)

- g-Eclipse
- Scientific Visualization and VR
- eMinerals
- iRODS
- Sakai VRE Demonstrator
- VERA
- Other Related Projects
g-Eclipse

- An integrated workbench framework to access the power of existing Grid infrastructures
- Grid application users benefit from the desktop-like access to Grid resources
- Grid operators and resource providers are able to reduce the time-to-service by using the Grid management and Grid site configuration tools
- Grid application developers are able to reduce the time-to-market for new Grid applications by accelerating the development and deployment cycle
• EC-funded FP6 project comprising 8 partners
• An official Eclipse Technology project supported by the Eclipse Foundation
• Develop an extensible middleware-independent core architecture upon which support for grid middleware and tools can be built
• Plugins for the gLite middleware were developed, currently implementing support for the GRIA middleware and AWS
• Building a community of developers who will be able to build upon the core framework of g-Eclipse to support even more grid middlewares
Users, Developers and Operators interact with Grid infrastructures via different Eclipse perspectives

- create VO-specific authentication tokens
- describe jobs in JSDL using a wizard & editor
- copy files to and from storage elements
- design simple workflows
- submit jobs and workflows to gLite
- monitor running jobs’ and workflows’ progress
- visualize the results of the computations
- compile, run & debug applications remotely on the Grid
- deploy applications to computing elements
- monitor the status of and interact with the PBS job queues on local computing resources
- login via ssh or glogin to a remote resource
• Ashish Thandavan and David Johnson
• http://www.geclipse.eu
http://www.eclipse.org/geclipse
Scientific Visualization and VR

- Scientific Visualization
- Immersive Virtual Reality
- Collaborative networked environments
- Haptics

- Adrian Haffegee, Ronan Jamieson, Priscilla Ramsamy & Teeroumanee Nadan
- http://acet.rdg.ac.uk/research/virtual_reality/
Virtual interactive environment Generator (VieGen)

- Modular framework of tools and utilities enabling application development even by non-programmers
- Also extensive APIs for programmers
- Available across a wide range of VR hardware
- Developed applications can be used across systems
- Builds on existing 3rd party libraries: OpenSG, VTK, Xerces, OpenAL
- Existing deployments across academia, industry and the arts
Some application areas:

- **Scientific Visualization**: Molecular Docking, Meteorological Models
- **Market Research**: virtual supermarket to measure consumer behaviour
  - Haptic shopping trolley, in-scene eye-tracking
- **Interactive Art**: Virtual memorial, RIBA SMS message wall
- **Collaborative Learning and Education**
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ACET's e-Research Activities

Outline
ACET Centre
e-Research Projects

g-Eclipse
Scientific Visualization and VR
eMinerals
iRODS
VRE
Other Related Projects
MAST

- Multicast Application Sharing Tool (MAST)
- Provides real-time application sharing over multicast networks
- Originally platform-dependent written 100% in C
- New JMast is 90% Java and 10% native platform-dependent C using JNI
- Java approach allows easier porting of application
- Supports standard JPEG streaming or proprietary optimized image-based data transfer
- AccessGrid support
- Ismail Bhana
J Mast in Action

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ACET's e-Research Activities
eMinerals - MiniGrid

- Created an enabling grid-based infrastructure appropriate for scientific research
- IBM pSeries machine provided for computation
- Storage Resource Broker (SRB) used for data storage
- ACET provided SRB vault

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iRODS

- New Data Grid middleware being developed at the San Diego Supercomputer Center (SDSC)
- Building on features of SRB
- Express management policies as rules

Aims

- System which is more flexible than SRB
  - Additional post processing on ingestion
  - Use workflows for server-side data management
  - Provide queued and batch processing
- Rule-based architecture to provide flexibility
- Replaces SRB containers and enables archiving within iRODS
  - Small files - inefficient use of mass storage capabilities
  - Overcome performance problems within SRB container concept
- Containers
  - Not very efficient
  - No decrease in size
  - Tied to SRB
  - No container handling outside SRB

- Develop independent provenance capturing system
- Andrea Weise
**Sakai VRE Demonstrator**

- A Research and development testbed to access open source & standards based portal technologies and to develop Web/Grid services for the UK e-Research community
- Develop a single point of access to a comprehensive set of Grid and collaboration services in a VRE

- The NaradaBrokering Chat and Video System
- The Semantic Web Portlet
- Inter-Portlet Communication
- InfoPortal Portlet
- Condor Portlet
- Portal Bridges
- OGSA-DAI Portlet
- WSN Portlet

- Prof. Mark Baker, Matthew Grove & Rahim Lakhoo
- [http://acet.rdg.ac.uk/projects/vre/](http://acet.rdg.ac.uk/projects/vre/)
VERA Project

- Virtual Environments for Research in Archaeology
- Fully-fledged virtual research environment for the archaeological community
- Enhancing the means of efficiently documenting archaeological excavation and its associated finds
- Create a suitable Web portal that provides enhanced tools for the user community
- Develop utilities that help encapsulate the working practices of current research archaeologists unfamiliar with virtual research environments
• Recycle Bridge – a portlet bridge which allows the reuse of existing software within a portal environment

• School of Systems Engineering, and the Department of Archaeology, University of Reading School of Library, Archive and Information Studies, University College London

• Funded by JISC

• Prof. Mark Baker and Matthew Grove

• http://vera.rdg.ac.uk/
Other Related Projects

- GridRM - A resource monitoring information system for the Grid, Garry Smith
- Long-Term Digital Metadata Curation, Arif Shaon
- SORMA - Development of methods and tools for establishing an Open Grid Market for Grid Resources, Prof. Mark Baker, Garry Smith
- Tycho - An extensible wide-area messaging framework, Prof. Mark Baker, Mat Grove
- CoCo - A generic framework and API of supporting spontaneous multi-user collaborative sessions, Ismail Bhana, David Johnson
- MPJ Express - An implementation of the Java bindings for the MPI standard, Prof. Mark Baker
Thanks!

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- People and Projects website: http://acet.rdg.ac.uk/
- Computing Resources website: http://hpc.acet.rdg.ac.uk/