OMII-UK/OMII-Europe and OMII-China

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OMII-UK: Supporting e-Research

OMII-UK provides software and services to help the UK research community adopt e-Research practices and technology

- Funding from EPSRC from 2004 to 2010
- Software, e.g.
  - Workflow design and execution – Taverna
  - Access and integrate data – OGSA-DAI
  - Manage computational resources – Campus Grid Toolkit
- Services: support, evaluation, consultancy, expertise
- Build active, sustainable communities around developed open source products using accepted/emerging open standards
  - Fund appropriate projects through Commissioned Software Programme

OMII-Europe: Interoperable Grid Middleware

Established to source key software components that can interoperate across several heterogeneous Grid middleware platforms

- EU-funded project from May 2006 to April 2008; 16 partners
- Re-engineering of Grid middleware components to support interoperability through appropriate open standards
- Middleware components sourced across six areas
  - Virtual Organisation Management: OGSA-AuthZ, SAML
  - Accounting: OGSA-RUS and OGSA-UR
  - Data Access: WS-DAIR, WS-DAIX
  - Job Submission, **Component Exchange**: OGSA-BES, JSDL
  - Portals: much of the above
- Focus on Globus, gLite and UNICORE
- Components available from OMII-Europe repository
  - http://omii-europe.org/

OMII-Europe Component Exchange: Re-engineering the CROWN Meta Scheduler to support OGSA-BES and JSDL

OMII-Europe Component Exchange

- Facilitated a two-way exchange of components between OMII-Europe and our project partners in China
- Chinese partners (unfunded effort) – OMII-China:
  - Beihang and Tsinghua Universities
  - ICT, CNIC – Chinese Academy of Sciences
- Process:
  - Mutual evaluation of Europe/Chinese infrastructures to identify candidate components for porting
    - CROWN Meta Scheduler - Beihang
    - Dynamic Deploy Service (DDS) - ICT
  - Agreed development work for porting to respective infrastructures
  - Delivery of developed components to OMII-Europe repository

Motivations

- Many Grid infrastructures have been developed, but, traditionally, with little interoperability:
  - Policies / security governing access/use of distributed resources
  - Lack of adherence to common standards
- Interoperability offers huge benefits for categories of users within user community:
  - e-Infrastructure providers: easier deployment/management of software distributions
  - e-Science users:
    - Freedom to choose services deployed in different Grids; based on functionality, not deployed on a particular Grid
    - Potential to utilise a far greater amount of resources
  - e-Science application developers: portability of apps across multiple Grids to increase uptake

Standards: the key to Interoperability

- Adoption of common standards strongly supported and implemented by OMII-Europe and GIN (Grid Interoperability Now) for:
  - Job Submission, Accounting, Virtual Organisation Management…
  - Standards from: OGF, OASIS, W3C, DMTF…
  - Across platforms: EGEE, Globus, UNICORE & others
- Focus on Job Submission (OGSA-BES, JSDL) standards for Component Exchange

Emerging Job Submission Standards

- Two key standards for two key elements:
  - The Basic Execution Service interface (OGSA-BES)
    - Simplified version of OGSA-EMS (Execution Management Service)
    - Handles basic job lifecycle management
    - Defines simple (but extendable) job state model
      - Pending, running, cancelled, failed or finished
  - The Job Submission Description Language (JSDL)
    - Specify job executable, data staging and resource requirements

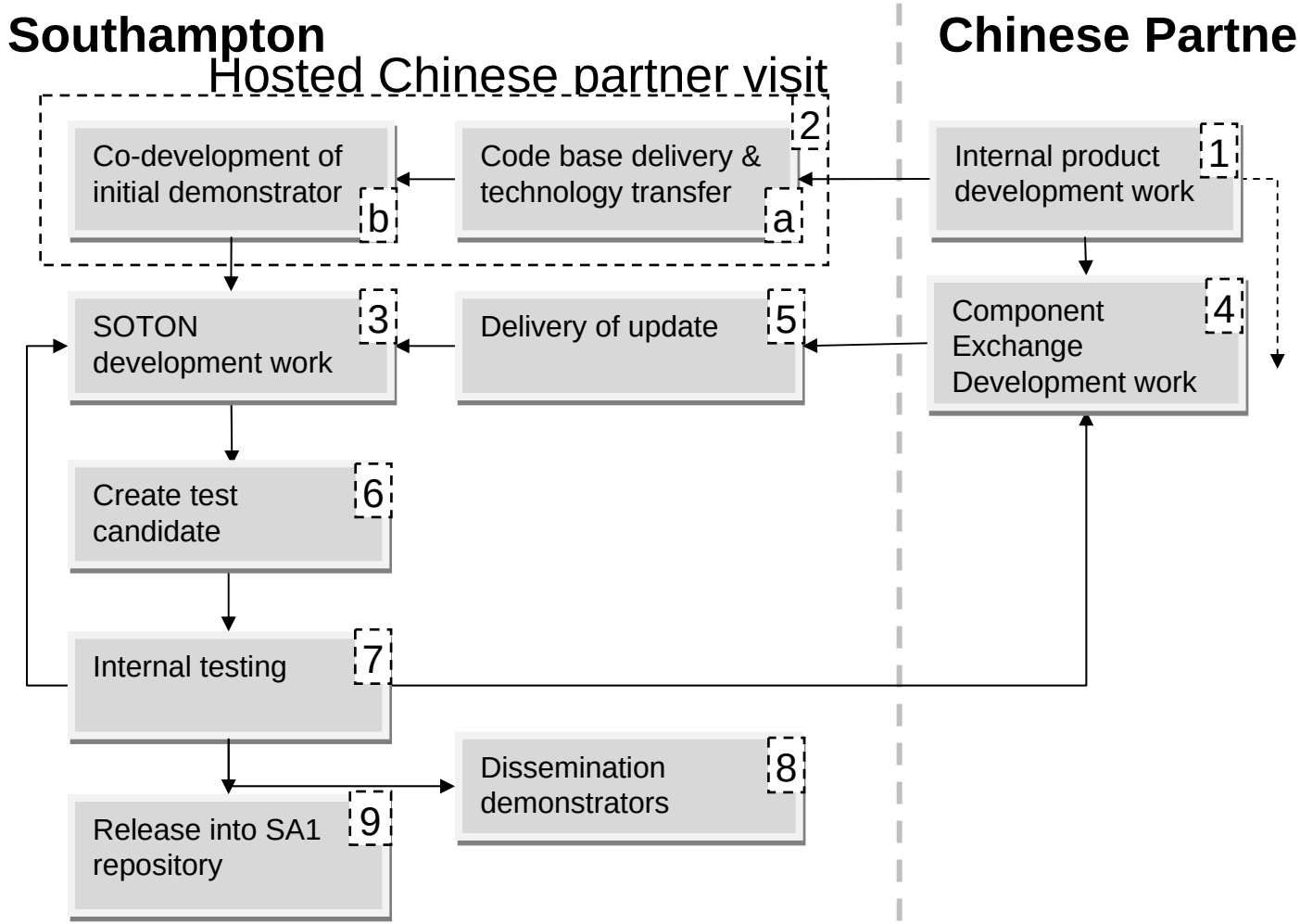
Interface/Interaction Standards not Enough

- BES & JSDL alone not enough for real interoperability
  - JSDL is extensible
  - Differing security models across Grid infrastructures
- HPC-Profile proposes Grid interoperability through:
  - Restricted OGF Job Submission Description Language (JSDL)
  - OGF OGSA Basic Execution Service (BES)
  - WS-I Basic Profile
- In addition, an agreed security framework between participants
  - e.g. initially via HTTPS transport (server offers certificate) & username/password (client) for user authentication
- OMII-UK has implemented the HPC-Profile within:
  - GridSAM – funded by OMII-UK, first to adopt BES
  - CROWN – with OMII-Europe, in collaboration with Beihang University, China

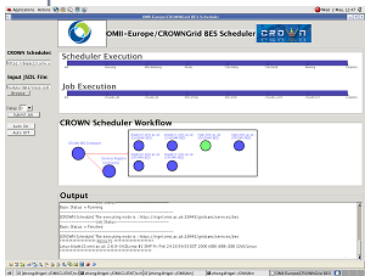
Job Brokering using the CROWN Scheduler

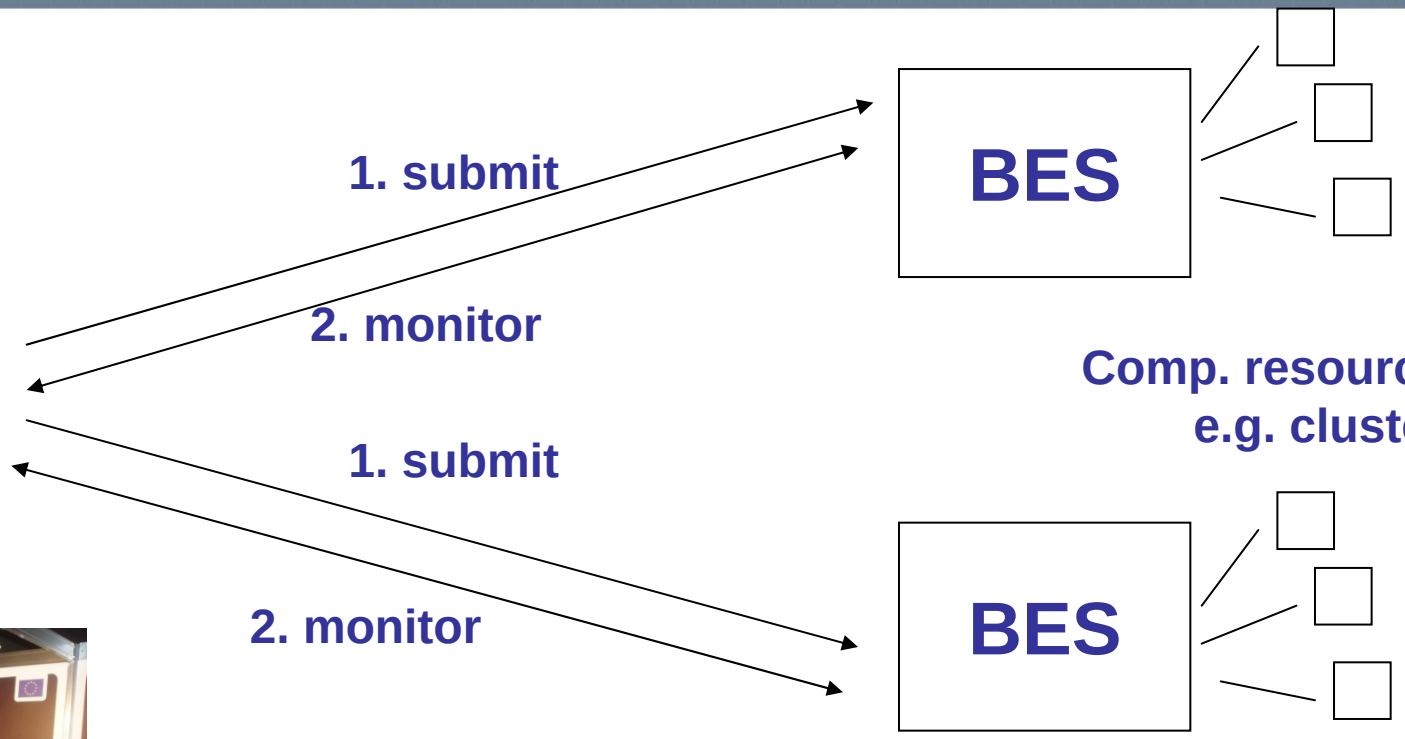
- CROWN Grid developed by Beihang University
- With OMII-Europe as part of Component Exchange activity with OMII China:
  - Identified CROWN Meta Scheduler
  - Deployable within OMII 3.4.x
  - Coordinated implementation of BES interface to the Scheduler

Collaborative Development Process



CROWN BES Scheduler





- 2 jobs, different requirements
- Identify 2 appropriate BES instances
- Submit to both

Current Status of BES Meta Scheduler

- Platforms: GT4.0.5, OMII 3.4.x, CROWN 2.4.3
- Tested interoperability with: UNICORE-BES 6.x, CREAM-BES 1.0 (EGEE), GridSAM 2.0.1, CROWN 2.4.3
  - Utilises separate security policy for each
- User-implemented scheduling policies
  - Extensible policy framework
  - Essentially a 'matchmaker' between resources and resource requirements specified in JSDL
- From http://www.omii-europe.com/:
  - Complete report D:JRA1.14 available
  - v1.0.0 BES Scheduler download

OMII-UK:
Developing GridSAM and a Responsive Development Community around it

What is GridSAM?

- Enables jobs to be *submitted* to *computational resources* and *monitored*
  - Computational resources: single machine, or cluster (Condor, Sun GridEngine, Globus, PBS & LSF in dev.)
  - Client submission/monitoring: command line, API
- Utilises accepted, emerging OGF standards
  - OGSA-BES (Basic Execution Service)
  - JSDL (Job Submission Description Language)
- Used by e.g. UCL: Theoretical Chemistry group & Centre for Computational Science
- Developed separately within ICT, Beijing as part of VEGA-GOS
- Installed on the UK NGS (National Grid Service)
- Current release v2.0.2, v2.1.0 release end of this month

Motivations

- Issues from various sources, inc. UK Campus Grid SIG
- University College London:
  - Number of research domains with own applications, in neurological modelling, Markov models/genetics, chemistry, nanoscale electronics, gene search
  - Legion cluster: PBS/Torque, Lustre shared filesystem
  - With Applications Hosting Environment (AHE), use GridSAM to access resources
- Challenges in supporting platforms, accounting, security, job management

Addressing the Issues I

- Community
  - Hosted on SourceForge in Subversion code repository http://sourceforge.net/projects/gridsam
  - Mailing lists – gridsam-discuss, gridsam-developer
  - Development is an open process
    - Project plan published on SourceForge and updated
    - Anyone can become involved

Addressing the Issues II

- Collaboration
  - Managed: OMII-UK Southampton
  - Actively developed:
    - OMII-UK Southampton
    - Institute of Computing Technology (ICT), Beijing – 'ICTGridSAM' project
    - London e-Science Centre – 'GridSAM3' project
  - University College London
- 'Release-often' policy
  - Currently version 2.0.2 – released last week
  - Version 2.1.0 planned for end of September

CGT – The Campus Grid Toolkit

- Client/server solution that contains
  - Apache Tomcat/Axis/WSS4j (WS-Security)
  - GridSAM
  - Application Hosting Environment (AHE)
- Easy installation for quick deployment via autoconfiguration
  - Initial security setup for testing
  - Hooks into existing computational resources
- End-to-end examples
- Documentation
- Version 1.1.1 (with GridSAM 2.0.2) out now
  - Available from http://www.omii.ac.uk
  - Later version end of September to support GridSAM 2.1.0

Bringing the Technology Together…