UNICORE deployment in Polish NGI
Lesson learned

Piotr Bała\textsuperscript{1,2}, Krzysztof Benedyczak\textsuperscript{1}, Rafał Kluszczyński\textsuperscript{1}

\textsuperscript{1} ICM, University of Warsaw

\textsuperscript{2} Faculty of Mathematics and Computer Science, UMK, Toruń
PL-Grid

- National Grid Initiative
- Partners:
  - Polish supercomputer centers
  - CYFRONET, ICM, PCSS, WCSS, TASK

- Project goals were:
  - Build and operate Polish National Grid
  - Provide training and user's support
  - Provide support for application deployment on the Grid

- ICM in PL-Grid
  - Training
  - Application support
  - UNICORE Operating Center
PL-Grid resources

- PL-Grid resources
  - Number of cores: 23,616
  - CPU: 230,16 TFlops
  - Disk: 3,6 PB
  - Memory: 51,33 TB

- Additional resources can be committed by partners

- UNICORE installed in all 5 centers
  - Services have to be maintained till 2017

- UNICORE central services run by ICM
  - Backup copy of Registry and UVOS run by WCSS
UNICORE Production Infrastructure

UNICORE Clients
- UNICORE Commandline Client
- UNICORE Rich Client

Target System
- UNICORE Gateway
- UNICORE/X
- UNICORE TSI
- Torque / PBS Pro

Central Services
- UNICORE Gateway
- UNICORE Registry
- Workflow Service
- Service Orchestrator

UNICORE Summit 2012
Dresden, Germany, 31st May
R. Kluszczyński
Integration with PL-Grid Portal

PL-Grid Portal

Certyfikaty SimpleCA

Portal PL-Grid umożliwia uzyskanie on-line osobistego certyfikatu X.509 o krajowym zasięgu działania (więcej informacji).

System wykrył, że aktualnie posiada Pan/Pani wygenerowany certyfikat. Możliwość generowania certyfikatu została zablokowana aż do momentu, gdy posiadany certyfikat utraci ważność.

Czy odwołać swój certyfikat SimpleCA?

Zarządzanie certyfikatami

Portal pozwala na zarządzanie certyfikatów wystawionych przez Polish Grid CA i Simple CA.

W Portalu zostały zarejestrowane następujące certyfikaty:

Autologin | DN | Serial
---|---|---
CN=plgrid.pl, CN=Plndc

Usługi

Usługi globalne

<table>
<thead>
<tr>
<th>Nazwa</th>
<th>Status</th>
<th>Strona z informacjami</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globalny dostęp gLite</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
<tr>
<td>Globalny dostęp UNICORE</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
<tr>
<td>Dostęp do UNICORE - Cyfronet</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
<tr>
<td>Dostęp do UNICORE - ICM</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
<tr>
<td>Dostęp do UNICORE - WCSS</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
<tr>
<td>Globalny dostęp GosCosGrid (Dostęp testowy)</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
</tbody>
</table>

Usługi dostępowe

<table>
<thead>
<tr>
<th>Nazwa</th>
<th>Zasięg</th>
<th>Status</th>
<th>Strona z informacjami</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dostęp do klastra ZEUS</td>
<td>ACK</td>
<td>Aktywna</td>
<td>Informacje</td>
</tr>
</tbody>
</table>
What User Needs to Know

- PL-Grid portal is central service responsible for users managements
  - Users registration
  - Integrated service of certificates issuing (PL-Grid Simple CA)
  - Certificate registration
  - Activation of UNICORE access
  - UNICORE e-learning materials
  - Scientific groups management

- [http://helpdesk.plgrid.pl](http://helpdesk.plgrid.pl)
  - When there are problems

- Grid Resource Bazaar
  - Groups' grants application
  - Only for groups' coordinators
Number of PL-Grid Users
Getting Access to PL-Grid by Users

Slavek

PL-Grid Simple CA Certificates

W Portalu PL-Grid można uzyskać online osobistego certyfikatu X.509 o krajoznawczych cechach w formacie PEM.

Certyfikaty SimpleCA

Usługi globalne

Zarządzanie certyfikatami

Ekspor t certyfikatu do LDAP

Otwieranie pliku

Typ pliku: p12 File (4,5 KB)
Adres: https://portal.plgrid.pl

Po zakończeniu pobierania:
- Otwórz za pomocą: Erzeglica...
- Zapisz plik
- Zapamiętaj te decyzję dla wszystkich plików tego typu

OK
Anuluj
UVOS as UNICORE Attribute Source

- PL-Grid uses UVOS (UNICORE VO System) as users attribute source
  - Each site has its own branch
  - Site administrator may change roles and Xlogins of his branch

- UNICORE components in PL-Grid use “pull mode” of authorization

- For other tools UVOS server web authentication extensions is used
  - UNICORE accounting portal

- Second UVOS is run by WCSS for fail-over scenario
Behind the Scenes (LDAP & UVOS)

Central LDAP Account Creation

Adding User’s Attribute with DN to LDAP:
plgridX509CertificateDN: CN=Slavek,O=ICM,O=GRID,C=PL

Setting Users Access Attributes (ICM branch example)

Creating UVOS Identity:
CN=Slavek,O=ICM,O=GRID,C=PL

Adding Identity to site’s group:
/vo.plgrid.pl/main/ICM

Setting Users Xlogin and role:

LDAP attribute allows user access to the cluster machines (via ldap.conf)

Register in PL-Grid Portal

Obtain a PL-Grid Certificate

Register Certificate via PL-Grid Portal

Activate UNICORE Access via PL-Grid Portal
Reliability of Services

- In order to maintain reliability of services we need to:
  - Configure HA of services
  - Perform tests of release candidates

- Main central services redundancy run by another site WCSS (fail-over scenario)

- Target system services redundancy run by ICM (fail-over scenario of UNICORE/X and TSI services)

- Testing Infrastructure
  - Very important (!)
  - Allows to develop new tools and test new configurations and updates
  - Two dedicated virtual target systems:
    - ICM, University of Warsaw
    - NCU, Department of Mathematics and Computer Science in Toruń
  - Integrated with the production UVOS but with dedicated branch
Reliability of Target Systems

Access

Gateway
UNICORE/X
Database
TSI
Master
Synchronization
Gateway
UNICORE/X
Database
TSI
Backup
Synchronization
Queueing system
Queueing system
CPU
Target system
UNICORE Monitoring Infrastructure

- Based on Nagios probes
- Integrated with EGI
  - UNICORE GOCDB Types
  - Alarms escalation to Dashboard EGI
  - Included working probes in SAM 17 (announced as internal release):
    - emi.unicore.Gateway
    - emi.unicore.Registry
    - emi.unicore.TargetSystemFactory
    - emi.unicore.GlobalStorage
    - emi.unicore.UVOS
    - emi.unicore.ServiceOrchestarter
    - emi.unicore.WorkflowService
  - PL-Grid participate in Stage Rollout procedure of SAM
- Additional probes used in PL-Grid:
  - LogWatcher for UNICORE

GOCDB Types:
- uncore6.Gateway
- uncore6.Registry
- uncore6.ServiceOrchestrator
- uncore6.StorageFactory
- uncore6.StorageManagement
- uncore6.TargetSystemFactory
- uncore6.UVOSAssertionQueryService
- uncore6.WorkflowFactory
UNICORE Services Status in Nagios

### Service Status Details For Host Group

<table>
<thead>
<tr>
<th>Host</th>
<th>Service</th>
<th>Status</th>
<th>Last Check</th>
<th>Duration</th>
<th>Attempt</th>
<th>Status Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>emunicore Application-AutoDock</td>
<td>OK</td>
<td>05-27-2012 18:47:28</td>
<td>14d 1h 37m 45s</td>
<td>1/2</td>
<td>OK: Autodock suite - autodock test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Application-AutoGrid</td>
<td>OK</td>
<td>05-27-2012 18:56:48</td>
<td>14d 1h 34m 45s</td>
<td>1/2</td>
<td>OK: Autodock suite - autogrid 4.2.3 test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Application-Gromacs</td>
<td>OK</td>
<td>05-27-2012 18:53:23</td>
<td>14d 1h 32m 20s</td>
<td>1/2</td>
<td>OK: Gromacs - mdrun 4.5.3-s test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Application-NAMD</td>
<td>OK</td>
<td>05-27-2012 18:50:28</td>
<td>14d 1h 35m 14s</td>
<td>1/2</td>
<td>OK: NAMD test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Application-POVRay</td>
<td>OK</td>
<td>05-27-2012 18:50:07</td>
<td>14d 1h 35m 35s</td>
<td>1/2</td>
<td>OK: POVRay 3.5 test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Application: UNICORE</td>
<td>OK</td>
<td>05-27-2012 23:50:38</td>
<td>12d 5h 49m 36s</td>
<td>1/2</td>
<td>OK: Test job succeeded</td>
</tr>
<tr>
<td></td>
<td>emunicore Gateway</td>
<td>OK</td>
<td>05-13-2012 16:17:48</td>
<td>31d 19h 6m 23s</td>
<td>1/2</td>
<td>OK: Gateway works properly. 1 service found</td>
</tr>
<tr>
<td></td>
<td>emunicore GlobusStorage</td>
<td>OK</td>
<td>05-25-2012 08:45:21</td>
<td>14d 1h 33m 23s</td>
<td>1/2</td>
<td>OK: SMS at <a href="https://unicore-grid.cyfronet.pl/8080/CYFRONET-ZEUS/services/Storages/management/free-default_storage">https://unicore-grid.cyfronet.pl/8080/CYFRONET-ZEUS/services/Storages/management/free-default_storage</a> works with U 865.41 kByte, D 3023.85 kByte</td>
</tr>
<tr>
<td></td>
<td>emunicore TargetSystemFactory</td>
<td>OK</td>
<td>05-13-2012 18:37:14</td>
<td>14d 1h 48m 28s</td>
<td>1/2</td>
<td>OK: Found 1 TBS instance</td>
</tr>
</tbody>
</table>

**R.Kluszczyński**
Nagios Availability Report

Service Availability Report
Last Updated: Mon May 28 09:46:01 CEST 2012
Nagios® Core™ 3.2.3 - www.nagios.org
Logged in as:CE-PLUG-GRID-ICMONT-Rafal Kluszczyński

Service 'emi.unicore.Application-UNICORE_Job' On Host 'ICM::hyx.plgrid.icm.edu.pl'

01.01.2012 00:00:00 to 05.28.2012 09:40:01
Duration: 1454h 8m 40s 16s

[Aptivity report completed in 0 min 3 sec]

Service State Breakdowns:

<table>
<thead>
<tr>
<th>State</th>
<th>Type / Reason</th>
<th>Time</th>
<th>% Total Time</th>
<th>% Known Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>Unscheduled</td>
<td>143d 13h 51m 31s</td>
<td>96.778%</td>
<td>96.778%</td>
</tr>
<tr>
<td></td>
<td>Scheduled</td>
<td>143d 13h 51m 31s</td>
<td>96.778%</td>
<td>96.778%</td>
</tr>
<tr>
<td>WARNING</td>
<td>Unscheduled</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td></td>
<td>Scheduled</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>Unscheduled</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td></td>
<td>Scheduled</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td>CRITICAL</td>
<td>Unscheduled</td>
<td>3d 6h 22m 33s</td>
<td>2.291%</td>
<td>2.291%</td>
</tr>
<tr>
<td></td>
<td>Scheduled</td>
<td>1d 12h 19m 57s</td>
<td>1.020%</td>
<td>1.020%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4d 18h 42m 30s</td>
<td>3.222%</td>
<td>3.222%</td>
</tr>
<tr>
<td>Undetermined</td>
<td>Nagios Not Running</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td></td>
<td>Insufficient Data</td>
<td>0d 0h 0m 0s</td>
<td>0.000%</td>
<td>0.000%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>148d 8h 40m 1s</td>
<td>100.000%</td>
<td>100.000%</td>
</tr>
</tbody>
</table>

Service Log Entries:
[View full log entries]
UNICORE Accounting

- Integrated with the PL-Grid Infrastructure

- Central Accounting Services:
  - RUS Service – processes accounting data
  - RUS BAT Exporter – publishing accounting data to national PL-Grid database
  - RUS Site – accounting portal allowing to access data and statistics
  - ActiveMQ – broker for storing messages

- Target System Services:
  - RUS Job Processor – sends grid level accounting information about jobs
    - Included in UNICORE/X 6.5.0+
  - RUS BSSAdapter – processing BSS accounting data based on log files

- RUS UCC Plugin – allows to access data from command line and also to reprocess defined accounting data for exporters

- RUS APEL Exporter – almost ready to publish accounting data to EGI database
UNICORE Accounting Infrastructure

Target System Services

- UNICORE Gateway
- UNICORE/X
- UNICORE TSI
- RUS Job Processor Plugin (included in 6.5.0+)

Accounting Central Services

- UCC (RUS UCC Plugin)
- ActiveMQ
- RUS Site via Tomcat
- RUS Service
- RUS BAT Exporter
- RUS APEL Exporter

Batch System (Torque, SGE)

- BSS Scheduler
- BSS Server
- RUS BSS Adapter
- Accounting Data

Users

BATS

APEL
### UNICORE Accounting Portal

#### Search Criteria:
- **User:** Any User
  - Any User
  - Any BBS host
  - Any BSS host
  - Any VO
  - Any VO
  - Any queue

#### Table
<table>
<thead>
<tr>
<th>Job id</th>
<th>User DN</th>
<th>Status</th>
<th>Queue</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1221988</td>
<td>2701819</td>
<td>nova</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221987</td>
<td>2701817</td>
<td>nova</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221986</td>
<td>2701816</td>
<td>nova</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221985</td>
<td>21127017</td>
<td>batch</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221984</td>
<td>64473</td>
<td>-</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221983</td>
<td>21127004</td>
<td>-</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221982</td>
<td>2701815</td>
<td>nova</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221980</td>
<td>2701814</td>
<td>nova</td>
<td>Pawel Wolniwicz, O=PSNC, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221979</td>
<td>64472</td>
<td>-</td>
<td>Pawel Wolniwicz, O=PSNC, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221977</td>
<td>578087</td>
<td>qa4</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221976</td>
<td>6488379</td>
<td>-</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221974</td>
<td>21126890</td>
<td>-</td>
<td>Pawel Wolniwicz, O=PSNC, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221973</td>
<td>2701813</td>
<td>nova</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221972</td>
<td>2701812</td>
<td>nova</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221971</td>
<td>2701811</td>
<td>nova</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221970</td>
<td>64471</td>
<td>-</td>
<td>Tadeusz Szymocha - SAM, O=Cyfronet, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221969</td>
<td>6488340</td>
<td>ce</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221968</td>
<td>578085</td>
<td>qa4</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221967</td>
<td>21126867</td>
<td>-</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221966</td>
<td>578082</td>
<td>qa4</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
<tr>
<td>1221963</td>
<td>21126582</td>
<td>-</td>
<td>Rafal Kluszczynski, O=ICN, O=GRID, C=PL</td>
<td>completed</td>
<td></td>
</tr>
</tbody>
</table>
Usage Graph In Accounting Portal
UNICORE Trainings

◆ PL-Grid portal support also organization of user trainings
  ♦ Users register accounts available only for training
  ♦ Organizer determines which services should users have
    (like “UNICORE Access”)

◆ On-line course management
  ♦ PL-Grid portal allows to apply for a course
  ♦ Courses are integrated with BlackBoard
  ♦ Many UNICORE tutorials like:
    • Getting UNICORE access in PL-Grid
    • UNICORE clients configuration
    • Running jobs and workflows with UNICORE
    • Accessing storage in UNICORE

◆ PL-Grid Users Manual available in PL-Grid Portal
Users' First UNICORE Access

http://portal.plgrid.pl

1. Access UNICORE Tutorials via PL-Grid Portal
2. Choose UNICORE Client
   - Set PKCS12 path in UCC Preferences File
   - Import PKCS12 file into URC keystore
3. Use Client Configuration Module to set Registries & Trusted CA Certificates
4. Access Polish Grid Infrastructure via UNICORE

PL-Grid Users Manual

Online Course Management

Sign Up for On-line Training Course about UNICORE

Get Accepted

BlackBoard LMS

Access BlackBoard Courses

- How to get UNICORE Access
- UNICORE Clients Configuration
- How to run a Job
- How to run a Workflow
- How to access Storages
Client Configuration Manager (CCM)

- CCM allows to set quickly users' Grid environment by XML profile file:
  - Adds registries
  - Adds trusted CA certificates
  - Adds UNICORE clients extensions
Scientific Groups Support

- Scientific experiments often need collaboration
- PL-Grid offers support for scientific groups
  - Separate documents folder, forum and wiki portlets in PL-Grid portal
  - Storage accessible by all group members (via Target System Storage)
- Users can form a scientific groups:
  - Every group has a coordinator
  - Coordinator may apply for a grant
  - Grants are assigned to scientific groups (max. walltime, storage size)
- Every user has his personal grant at start to be able to use the Grid

Group's Grant Application

PL-Grid Portal
- Access PL-Grid Portal
  - Add new Group or join existing one
  - Create Grant Proposal
  - Group's Grant is Active and Ready to Use
- Use Grant ID as a Project Resource in UNICORE Clients
- Store and Access Data in Group's Storage via Target System Storage

Grid Resource Bazaar
- Define Grant's SLA (sites, walltime, storage)
- Evaluate Resources by Sites Administrators and propose an Offer
- Suggest modifications to Grant's SLAs
  - OK? Yes
  - OK? No
- Group's Object Update in LDAP by adding Grant ID attribute
- Selected LDAP Branches' Updates
Groups and Grants in URC
PL-Grid Usage (walltime hours)
Example – Processing of Genetic Data

- Department of Molecular and Forensic Genetics, Institute of Forensic Medicine, Ludwik Rydygier Collegium Medicum, Nicolaus Copernicus University

- The Postgraduate School of Molecular Medicine, Medical University of Warsaw

- Analysis of patients' mtDNA having colorectal cancer (mutation identification)

- GS FLX Instrument (Roche Diagnostics) and its software

- Thanks for UNICORE File Transfer Daemon and UFTP clients support!
Experiment's Workflow

![Diagram of Experiment's Workflow](image)

- **Start** leads to **GSPProcessor**
- **GSPProcessor** leads to **GSReporter** and **GSMapper**
- **GSMapper** leads to **GSAsssembler**
- **GSAsssembler** leads to **May29-94h07m-BLASTjo**
PL-Grid Plus

- 3 Year Project
- Focus on applications
- ICM coordinates 3 domain Grids:
  - Bioinformatics
  - Health and medicine
  - Material sciences
- Science gateways:
  - Still open issue
  - Hosted in Liferay portal
PL-Grid Plus

◆ Hopefully, it will also end with a success...

http://www.tofurious.com/marketing-tips/what-success-really-looks-like/
Many THANKS!

◆ What do we appreciate?
  ◆ UNICORE itself ;)
  ◆ UNICORE Clients (URC, UCC)
  ◆ UNICORE File Transfer Daemon !
  ◆ RPM packages !
    (it really boosted deployment and is helping in maintaining services)

◆ Who do we thanks?
  ◆ All UNICORE Team for a great support
  ◆ B.Schuler and B.Demuth for suggestions and taking into account our requests
  ◆ M.Strzelecki for great UNICORE monitoring support
  ◆ M.Lewandowski for UNICORE Accounting framework
  ◆ UNICORE administrators of other PL-Grid sites:
    • L.Flis (CYFRONET)
    • F.Klajn (WCSS)
    • M.Samson (TASK)
    • Z.Filutowska (PCSS)
  ◆ ICM Hydra cluster administrators
Thank You for Your Attention