



<http://www.unicore.eu>

Synopsis

UNICORE – A European Grid Technology – comes with a history of more than 10 years. Although originally initiated from the Supercomputing domain, today UNICORE is a general-purpose Grid technology. In its recent version, UNICORE 6 follows the latest standards from the Grid and Web Services world and offers a rich set of features to its users.

Due to its supercomputing background, UNICORE follows the principle “Grid driving Supercomputing”. In order to establish this the UNICORE developer community maintains a close feedback loop with major stakeholders in the supercomputing domain in particular end-users, user support teams as well as operation teams.

In consequence UNICORE is the Grid technology for supercomputing in Europe. UNICORE is used in DEISA (<http://www.deisa.org>), the Distributed European Infrastructure or Supercomputing Applications, which couples the most powerful supercomputing systems in Europe and thereby operates and enhances a European supercomputing service on top of these existing national services. In PRACE (<http://www.prace-project.eu>), the Partnership for Advanced Computing in Europe, which prepares the deployment of a future pan-European PetaFlop supercomputing service, UNICORE is a prime candidate to be used to interconnect Europe’s future leadership supercomputers of PetaFlop/s performance.

Although being supercomputing-oriented, UNICORE is a general-to-use Grid technology. It can be used in Grid infrastructures of any nature and without limitations on the type of computing resources ranging from single PCs coupled together for a Campus Grid or cluster-systems similar to the EGEE Grid infrastructure. For example UNICORE is used in D-Grid (<http://www.d-grid.de>), the German national Grid initiative.

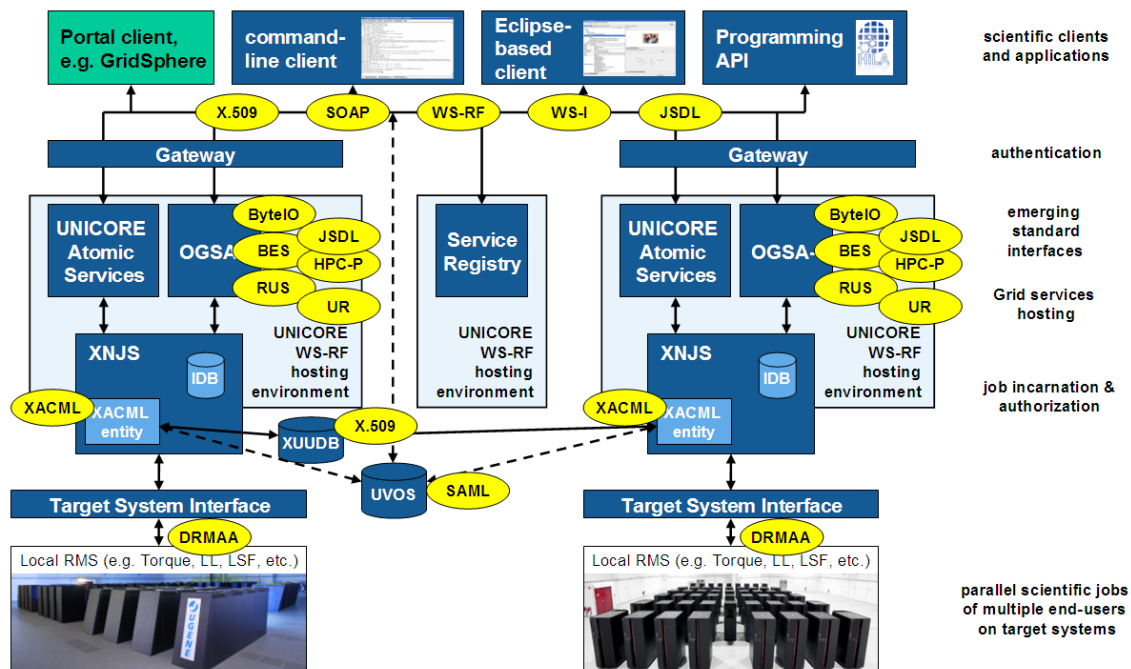
All UNICORE software is available as Open Source under BSD license from the UNICORE Website (<http://www.unicore.eu>), while the software repository is hosted on SourceForge.

Supported by the UNICORE Forum (<http://www.unicore.eu/forum>), the Jülich Supercomputing Centre (JSC) at Forschungszentrum Jülich (FZJ) co-ordinates the UNICORE Open Source activities and provides support for academic users of UNICORE.

Concept

The UNICORE development adapts the following guiding principles and implementation strategies:

- *Open source* under BSD license.
- *Standards-based*, conforming to the latest standards from the Open Grid Forum (OGF), W3C, OASIS, and IETF, in particular the *Open Grid Services Architecture* (OGSA) and the *Web Services Resource Framework* (WS-RF 1.2).
- *Open and extensible* realized with a modern Service-Oriented Architecture (SOA), which allows to easily replace particular components with others.
- *Interoperable* with other Grid technologies to enable a coupling of Grid infrastructures or the users needs
- *Seamless, secure, and intuitive* following a vertical, end-to-end approach and offering components at all levels of a modern Grid architecture from intuitive user interfaces down to the resource level. Like previous versions UNICORE 6 seamlessly integrates in existing environments.
- *Mature security mechanisms* adequate for the use in supercomputing environments and Grid infrastructures. X.509 certificates form the basis for authentication and authorisation, enhanced with a support for proxy certificates and virtual organisations (VO) based access control.
- *Workflow support* tightly integrated into the stack while being extensible in order to use different workflow languages and engines for domain-specific usage.
- *Application integration* mechanisms on the client, services and resource level for a tight integration of various types of applications from the scientific and industrial domain.
- *Different clients* serving the needs of various scientific communities, e.g. graphical clients to define complex workflows, command line tool, web-based access.
- *Quick and simple to install and configure* to address requirements from operational teams and to lower the barrier of adopting Grid technologies. Similar the configuration of the various services and components is easy to handle.
- *Various operating and batch systems* are supported on all layers, i.e. clients, services and systems; Windows, MacOS, Linux, and Unix systems as well as different batch systems are supported such as LoadLeveler, Torque, SLURM, LSF, OpenCCS, etc.
- *Implemented in Java* to achieve platform-independence.



UNICORE 6 Architecture and Standards

Architecture & Standards

The architecture of UNICORE 6 is three-layered: client layer, service layer, and system layer.

On the top *client layer* a variety of clients are available to the users, ranging from a programming API named *HiLA*, graphical clients such as the *Eclipse-based Client*, to a command line interface named *UCC*. For a tight integration of various types of applications, the concept of GridBeans was invented, which offers an API to easily implement graphical client extensions and connect them with UNICORE 6's core functionalities.

The middle *service layer* comprises all services and components of the UNICORE Service-Oriented Architecture (SOA). The *Gateway* component acts as the entry point for a UNICORE site and performs the authentication of all incoming requests and submitted jobs through X.509 certificates. The *XNJS* component is the job management and execution engine of UNICORE 6. The functionality of the XNJS is accessible via two service interfaces:

- UNICORE's proprietary interface UAS (= UNICORE Atomic Services), which offers the full functionality of the XNJS to higher level services, clients, and users.
- a standardised set of interfaces based on various *OGSA*-* standards.

For authorisation of users the *XUADB* user database performs the mapping from X.509 certificates to the actual users' logins. Alternatively a SAML-based VO management service named *UVOS* is available. The UNICORE 6 services in a Grid are configured to register themselves at the *Service Registry*. It is then contacted by the clients in order to "connect to the Grid".

The bottom *system layer* connects the Grid resources with its individual batch systems to the UNICORE 6 Grid. In the *TSI* component the abstracted requests from the Grid are translated to system-specific commands,

e.g. for job submission specific commands such as *lsubmit* or *qsub* are called. These are invoked with the user's UID and environment. Hence, the TSI component is the only component in the UNICORE 6 stack that needs to be executed with root privileges.

Participation

UNICORE is developed within an open developer community using the world's largest Open Source software development web site SourceForge (UNICORE's project page on SourceForge is accessible through <http://www.unicore.eu>). There you find:

- *mailing lists* for communication between users and developers, to receive the latest news, or as discussion fora for UNICORE developers.
- *trackers* for bug reports and feature requests.
- *download page* that links to all released UNICORE software components.
- *source code repository* as the central storage of all UNICORE-related source code.

In case you use UNICORE as the basis for your R&D, develop services for UNICORE, implement UNICORE application GridBeans, or work on UNICORE-related topics you want to share with the community, please let us know. Just send an email to unicore-info@fz-juelich.de and discuss with us an appropriate way to present your work in the community section on the UNICORE web site.

Contact

For downloading the UNICORE software, taking a look at the source code, reading documentation and tutorials, or finding out about developments in the community, please visit the UNICORE web site (<http://www.unicore.eu>).