

★ Grid technologies have evolved rapidly and they are now integral to the everyday functioning of both the academic and commercial sectors. A key player in research from the early days, the UNICORE developer community aims to push them even further, as **Dr Achim Streit** explains

# UNICORE: Getting to the heart of Grid technologies

**Established in 1997** as a project funded by the German Ministry of Education and Research (BMBF), the UNICORE (Uniform Interface to Computing Resources) developer community was one of the key forerunners of European efforts to make distributed computing more widely available. Twelve years later UNICORE is still going strong, and although the technologies involved have moved on in the intervening period, its founding goals remain relevant today. “The original aim of UNICORE was to enable easy-to-use and secure access to supercomputers in Germany,” explains Dr Achim Streit, the UNICORE development community’s spokesman. “Then, over the years, as the Grid paradigm became more public and more popular, we were in a position where our expertise was more highly valued. We were already doing Grid computing at a time when Grid computing was not as rigidly defined as it is today. Today, our major goal remains the provision of easy-to-use, secure access to Grid resources.”

While nobody could have foreseen the pace of development of Grid technologies, and their general impact, UNICORE’s emphasis on an open and extensible design has helped them adapt to the rapidly changing circumstances of recent years. UNICORE’s status as pioneers in their field, which meant they were ideally placed to play a central role in emerging trends, is particularly important in this regard. “The fact that we were there right from the beginning, in parallel to the Globus Toolkit, has brought us significant benefits. We both started independently, but at a similar time. We have had similar experiences, right at the start we were looking at standards for example,” points out Streit. “We had projects in this area at an early

stage when no-one else was looking at it. At that time there was the US Grid Forum, E-Grid – the European Grid Forum, and there was also the Asia-Pacific Grid forum. Later on these three elements joined up to establish a global grid forum, which today is known as the OGF.”

## Ongoing development

Having been in existence now for over a decade, UNICORE can no longer be seen as a fixed-term research project, nor is it a commercially-focused enterprise. While Streit acknowledges that circumstances have changed, and that the consortium has evolved in line with emerging demands, he says UNICORE has nevertheless managed to retain its focus on research and development. “I would describe us as a middleware consortium. We have several partners who are contributing to our work, and we get funding through various EU and German programmes,” he says. “The baseline technologies have evolved significantly. At the beginning everyone just developed their own code and used their own principles to solve problems. Over the years, with the evolution of the Grid standards the emphasis has shifted towards Web and Grid services. This has fundamentally changed the technologies that are used in UNICORE compared to five or eight years ago. For example, UNICORE is still implemented in Java, as it was from the beginning. Some things have changed and some things have stayed the same.”

While there have been constants in UNICORE since 1996, the overall picture is one of an ongoing development. This is being driven, in large part, by the evolving nature of user demands, and with academics eager to gain access to ever-faster, more effective, more efficient technologies, it is

a trend which Streit does not foresee ending any time soon. “We will always want to continue improving our technology,” he predicts. “If you look right now at what’s going on with cloud computing and virtualisation, there are many concepts in these areas that will influence UNICORE. We have a supercomputing background, and so the multi-core revolution will also change Grid computing. A few years ago, you could get more application performance simply by buying a new processor. Things are more complicated today and will change Grid computing. There will no longer be sequential applications requiring just one CPU (Central Processing Unit) – there will be more and more applications requiring multiple CPUs. This is something where we, coming from supercomputing, have some knowledge which we can use to help our users, to help foresee their problems.”

With the UNICORE development being coordinated at the publicly funded Jülich Supercomputing Centre, these tend to be the problems of the academic sector. However, the academic sector encompasses a broad spectrum of users, in terms of both level of expertise and also academic discipline, making user feedback and ongoing modification a crucial element in the consortium’s work. “It is very important for us to talk with our users,” stresses Streit. “We get feedback through our support mailing lists and hold discussions with people interested in using UNICORE. Requirements come up, which then drive the research to check whether an existing technology can be re-used or if we have to develop a new solution from scratch,” he continues. The consortium’s use of open-source software coding brings significant benefits in this regard. “Yes. It is really helpful,” confirms Streit. “As I said, we

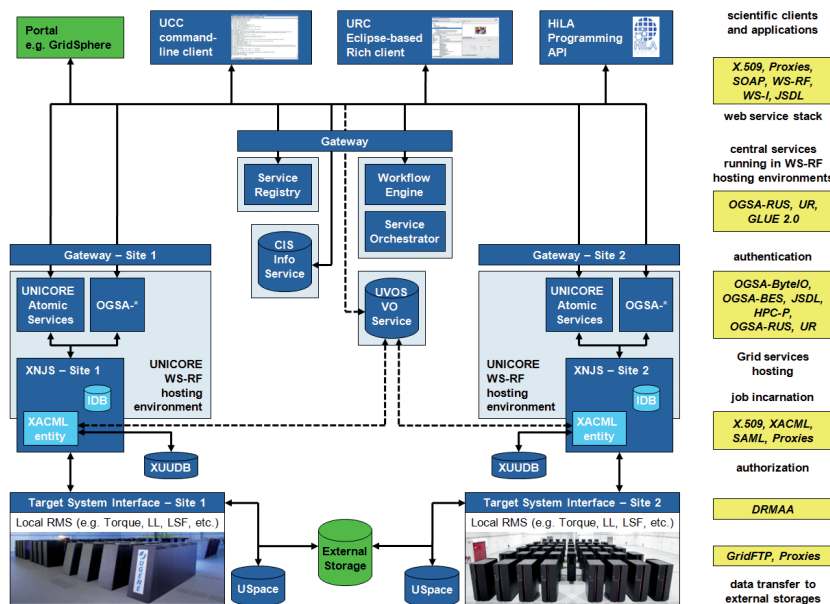


Diagram of the architecture of UNICORE 6 – more detailed information on UNICORE 6 and its components is available at [www.unicore.eu](http://www.unicore.eu)

have a developer community – mostly I would say from Europe – but we see on our support and development mailing lists that people from all over the world are working with the source code.”

**Broad relevance**

Of course, this approach would not be possible if UNICORE was not open-source, and the ability of users to look at the source code and apply adaptations has played an important part in the consortium’s development. However, not all UNICORE users have this kind of level of Grid computing knowledge, and the consortium has to take account of their needs as well if it is to ensure its broad relevance, something of which Streit is well aware. “We also have scientific users who have only a relatively low level of Grid computing knowledge and this is good,” he acknowledges. “They are also able to use UNICORE. This is made possible through our emphasis on being easy-to-use, that’s why we have our graphical UNICORE Rich Client (URC), which is based on the commonly known Eclipse framework. Graphical plug-ins for our Rich Client, so called Application GridBeans, allow for a tight integration of various types of applications in UNICORE. Combined with mechanisms on the service and resource level, scientists – life scientists or biologists for example – can work in their own problem domain and specify the application input parameters in the way they are used to.”

This ability to adapt to user needs would suggest that the potential of the consortium’s work extends far beyond the academic sector. Indeed, T-Systems Sfr already offers UNICORE 6 to their customers (for example the German Weatherservice DWD), and the German company is working closely with the consortium to ensure that these requirements are integrated in the development process. While acknowledging the commercial potential of Grid technologies, Streit says that the needs of academic researchers will remain paramount. “Grid computing will, as it comes from research, always have a big basis in research. However, more and more industrial companies will start looking at these technologies over the coming years as they are already doing,” he says. “Areas like cloud computing – which is being pushed by commercial providers like Google and Amazon – virtualisation of resources and its support in Grid technologies as well as energy-efficiency and Green-IT will continue to grow in importance. We are currently working quite intensively on distributed data management aspects, so that users can not only submit jobs to different eInfrastructures through standardised interfaces, but they can also transfer their data. Looking to the long-term, application support is a key area. Parallel programmes will grow more important to users, and supporting these adequately in UNICORE is one of our major goals for the years to come.” ★

**At a glance**

**Full Project Title**  
UNICORE – Uniform Interface to Computing Resources

**Project Objectives**  
UNICORE offers a ready-to-run Grid system including client and server software. UNICORE makes distributed computing and data resources available in a seamless and secure way in intranets and the internet. UNICORE 6 is the latest Web Services-based, OGSA-compliant version of the UNICORE Grid middleware.

**Project Partners**  
To be found on [www.unicore.eu](http://www.unicore.eu)

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Community Spokesman

Since 2005 Dr Achim Streit has worked at the Jülich Supercomputing Centre (JSC) of the Forschungszentrum Jülich. Since July 2005 he is leading the Distributed Systems and Grid Computing division at JSC. His group is leading the core development of the UNICORE Grid technology in close collaboration with its partners from the UNICORE developer community. He and his group are also active in numerous national and European Grid projects.

