

**Participants:** Mehmet Aktas, Harun Altay, Mehmet Necati Aysan, Galip Aydin, Ozgur Balsoy, Geoffrey Fox, Cevat Ikbas, Ali Kaplan, Junghee Kim, Marlon Pierce, Ahmet Topcu, and Beytulah Yildiz

## PET Online Knowledge Center

**Project Overview**  
Information access and management are important tools for researchers and program managers in scientific and engineering fields. The Online Knowledge Center (OKC), funded by the Department of Defense's High Performance Computing Modernization Program (HPCMP), is designed to act as a clearinghouse for wide-ranging information. The HPCMP, through its Programming Environment and Training (PET) component, oversees research in a diverse range of computational areas, from chemistry and materials science, to computational electronics and electromagnetism, to environmental and weather modeling, to structural and fluid mechanics. The OKC is funded to organize the vast amounts of public information generated by programs such as the HPCMP, including research area overviews, contact information, publicly available codes, technical papers, and training and outreach opportunities. The OKC also is developing tools to help scientists communicate and organize their personal information.

Integrating both third party and locally developed technologies, the OKC consists of the following major components: a portlet-based portal interface, a WebDAV-based content management system, and an XML-based communication infrastructure. The central concept of our system is that all data in a distributed framework should be treated in the same way: All data are named with a URI and described by XML metadata, which may be stored in a variety of systems, including both relational and native XML databases.

**Research**  
OKC research focuses on the following areas:

- Developing portlet components and containers
- XML-based, peer-to-peer messaging middleware.
- Metadata information services, including URI naming, discovery, and hybrid search services.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Marlon Pierce: [marpierce@indiana.edu](mailto:marpierce@indiana.edu)

**Web Sites**

- Project web site: <http://ptportal.communitygrids.iu.edu/index.jsp>
- OKC web site: <https://okc.wes.army.mil/index.jsp>
- GXOS Web Site: <http://ww2.cs.fsu.edu/~balsoy/gxos/>

**Participants:** Geoffrey Fox, Shrideep Pallickara, and Xi Rao

## Narada Brokering

**Project Overview**  
NaradaBrokering is an event brokering system designed to run on a large network of cooperating broker nodes. NaradaBrokering supports heterogeneous client configurations that can scale to arbitrary size and incorporates efficient routing algorithms to optimize disseminations to clients. Communication within NaradaBrokering is asynchronous and can be used to support different interactions by encapsulation within specialized events. The system is designed to support a hybrid peer-to-peer (P2P) grid, comprising resources such as relatively static clients, high-end resources, and a dynamic collection of multiple P2P subsystems.

NaradaBrokering interpolates between centralized systems like JMS (Java Message Service) and P2P environments such as JXTA from Sun Microsystems, and can seamlessly replace single server JMS systems with a distributed broker network. It also provides dynamic real time load balancing by incorporating algorithms that determine the best available broker to which a client could connect.

NaradaBrokering incorporates an adaptive transport framework that deploys the best available transport protocol for communication between two end points. It offers support for TCP, UDP, Multicast, RTP, SSL and, HTTP (in progress), as well as a solution to tunnel through firewalls (such as Microsoft's ISA) that allow HTTPS or SSL access to the outside world via proxy or direct connection. This solution also works with authenticating proxies and firewalls with schemes such as Basic, Digest and NTLM for authentications. Every broker also incorporates a performance monitor, which enables the broker administrator to monitor the performance of individual links hosted by the broker. Factors measured depend on the transport protocol used for communication between the end points. The monitoring service also adapts to changing network conditions.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Shrideep Pallickara: [spallick@indiana.edu](mailto:spallick@indiana.edu)

**Web Site**  
<http://www.naradabrokering.org/>

**Participants:** Hasan Bulut, Geoffrey Fox, Ahmet Uyar, and Wenjun Wu

## Audio/Video Collaboration Web Service

**Project Overview**  
Presently, there are various videoconferencing architectures, such as H.323, SIP, Internet Audio, and Access Grid, which, in general, cannot directly interact with one another. Web Services has been proposed as a new way to service oriented distributed computing. The goal of our project is to build a new audio/video collaboration system based on the Web Services framework, which can support H.323, SIP, and Access Grid in the same audio and video meeting. In this system, varied videoconferencing terminals, using different technologies, can collaborate and share the audio and video services provided by different technical providers.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Wenjun Wu: [wewu@indiana.edu](mailto:wewu@indiana.edu)

**Web Site**  
<http://elkbari.ucs.indiana.edu:8080/avweb>

**Participants:** Bryan Carpenter, Geoffrey Fox, Han-Ku Lee, and Sang Boem Lim

## HPJava

**Project Overview**  
The HPJava project is developing an environment for scientific and parallel programming based around Java. It incorporates a preprocessor for an extended dialect of Java, together with various support libraries for communication and other functionality for parallel programming.

The extended version of Java adds "scientific" multidimensional arrays and distributed arrays (a la Fortran 90 and High Performance Fortran) to the basic Java language. It does this in a way that maintains complete compatibility with all standard Java class libraries and Java Virtual Machines. The parallel features of HPJava support a programming model called the "HPspmd model", integrating high-level, data-parallel features from languages, such as HPE, with established, library-centered approaches to programming distributed memory parallel computers (MPI, etc). Target architectures include purpose-built supercomputers and networks of workstations.

An initial version of the HPJava translation system will be released as open source software in the near future. It will support the full HPJava parallel programming language and will incorporate syntax proposals for multi-array extensions to the Java language (consistent with those of the Java Grande Numerics Working Group.) Our multidimensional arrays can have any rank, and the elements of multi-arrays can have any standard Java type, including Java class types and standard Java array types. Regular sections of multi-arrays are fully supported.

The release will also incorporate a new Java version of the "Adlib" collective communication library for data parallel computing, as well as our established "mpiJava" library for parallel computing with Java.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Bryan Carpenter: [dbc@csit.fsu.edu](mailto:dbc@csit.fsu.edu)

**Web Site**  
<http://hpjava.org/>

**HPJava Architecture**

# Community Grids Top Projects

**Bringing data together in one location where electronic communities of users can easily access and share resources**

**Allowing scientists, researchers, and educators to collaborate and share information**

pervasivetechologylabs  
AT INDIANA UNIVERSITY  
[www.pervasivetechologylabs.iu.edu](http://www.pervasivetechologylabs.iu.edu)

**Participants:** Geoffrey Fox, Sung-Hoon Ko, Kangseok Kim, Sangmi Lee, and Sangyoon Oh

## Universal CAROUSEL Access

**Project Overview**  
The primary goal of CAROUSEL (CollAboration fRamework for Universal accEssibiLity) is to develop an open source framework for collaborative computing with universal devices.

Universal accessibility in collaborative system refers to the capability of multiple users to link together using disparate access modes and devices. With CAROUSEL, users of hand-held devices, mobile phones, and conventional desktop machines can join in one collaboration session to accomplish their respective tasks. This system is designed to support both centralized and peer-to-peer collaboration models via a uniform event bus defined in XML and implemented with a pure Java solution. Garnet Message Service Micro Edition (GMSME) is provided for integrating mobile devices to Garnet, a collaborative system developed by the Community Grids Lab. GMSME consists of a Personal Server for mobile devices, a Hand Held Message Service (HHMS) protocol, and APIs for application processors.

We are also investigating the framework based on the Web Service architecture supporting universal accessibility.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Sung-Hoon Ko: [suko@indiana.edu](mailto:suko@indiana.edu)

**Web Site**  
<http://grids.us.indiana.edu/ptliupages/projects/carousel>

**Participants:** Geoffrey Fox, Ying Jin, Mehmet Nacar, Marlon Pierce, Ahmet Sayar, Yan Yan, and Choonhan Youn

## Gateway Computational Web Portal

**Project Overview**  
The Gateway Computational Web Portal project provides secure access to high performance computing (HPC) resources through a Web browser interface. Since 1999, Gateway has played an active role in developing and evaluating a number of user interface and middleware technologies for HPC Web portals, including JavaServer Pages, CORBA, distributed JavaBeans, XML-based Web Services, and portlets.

Gateway provides a number of basic service components, including user services such as batch script generation, job submission, job monitoring, file transfer, and job archiving. Administrative services are also provided through application Web services, which provide a universal interface allowing developers to deploy their code in the portal. Gateway builds specific portals on top of these basic services. Gateway portals support Web-based access to HPC resources, as well as fluid and structural mechanics codes for the Department of Defense's High Performance Computing Modernization Program. Gateway is deployed at the Army Research Lab and the Aeronautical Systems Center.

Gateway's basic services also form the basis of the Solid Earth Research Virtual Observatory Grid project ([www.servogrid.org](http://www.servogrid.org)), funded by NASA to support access and interoperability for earthquake simulation techniques. Portal collaborators include researchers at the Jet Propulsion Laboratory, the University of California-Davis, and Brown University.

Gateway developers are active participants in the Grid Computing Environments Research Group of the Global Grid Forum.

**Research**  
Current Gateway research focuses on two areas:

- Developing adaptable and secure Web Services to support computational Web portals
- Developing client-side portlet components and container environments to organize user interfaces and simplify access to services on the computational grid.

**Contact**  
Geoffrey Fox: [gcf@indiana.edu](mailto:gcf@indiana.edu)  
Marlon Pierce: [marpierce@indiana.edu](mailto:marpierce@indiana.edu)

**Web Sites**

- Gateway Research: [www.gatewayportal.org](http://www.gatewayportal.org)