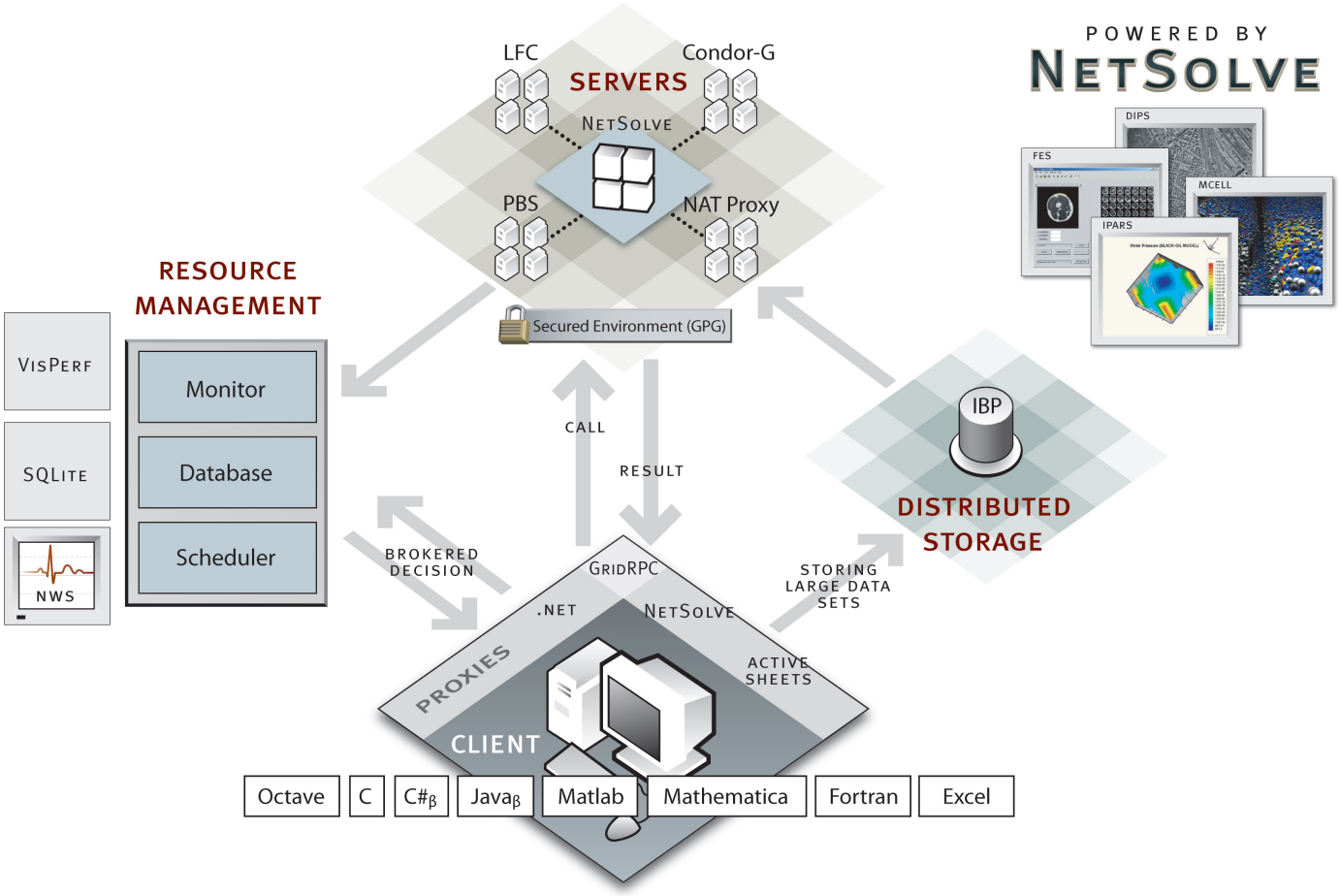
# NetSolve

http://icl.cs.utk.edu/netsolve/

NetSolve investigates the use of distributed computational resources connected by computer networks to solve complex scientific problems. It is a remote procedure call (RPC)-based client/agent/server system that allows users to discover, access, and utilize remote software modules and hardware resources. NetSolve facilitates heterogeneous computing, or the ability to combine different machine architectures and/or operating systems to solve a problem.




## GridSolve & GridRPC

GridSolve is a system for Grid-enabling general purpose Problem Solving Environments (PSEs) and is part of the NSF MiddlewareInitiative (NMI). Gridsolve is a joint project between UTK (ICL, LoCI) and UCSD and will build upon work done previously on NetSolve and GridRPC.

In cooperation with the Global Grid Forum, GridRPC is an effort toward standardizing and implementing a Remote Procedure Call (RPC) mechanism for Grid computing. GridRPC unifies client access to existing Grid computing systems such as Ninf and NetSolve via a common API.

## NetSolve-E

The next generation of NetSolve, dubbed NetSolve-E, will improve three general areas: ease of use, interoperability, and scalability. To improve the ease of use, we have streamlined the process of integrating user code into a NetSolve server. Interoperability encompasses several facets, including better handling of different network topologies, better support for parallel libraries and parallel architectures, and better interaction with other Grid computing systems such as Globus and Ninf. Scalability in the context used here means ensuring that system performance does not degrade as a result of adding components to the NetSolve system.


R&D 100 1999 WINNER

SUPPORT FROM Microsoft

ICL UT Innovative Computing Laboratory

The University of Tennessee Computer Science Department

CITR Center for Information Technology Research

SPONSORED BY

# NetSolve

http://icl.cs.utk.edu/netsolve/

NetSolve/GridSolve is a project that investigates the usage of distributed computational resources connected by computer networks to solve complex scientific problems efficiently. It is a remote procedure call (RPC)-based client/agent/server system that allows users to discover, access, and utilize remotely housed software modules, as well as the computational hardware needed to run these modules. The resources to be leveraged can be distributed by geographic location and/or ownership, and heterogeneous operating environments are supported.

The motivation for NetSolve is to create a grid-based software computing environment used routinely by a large user base to enhance scientific computing capabilities. Fundamental characteristics include

- Ease-of-use for both the user and administrator
- Efficient utilization of resources
- Ease-of-integration of new software modules
- High levels of quality assurance (in the accuracy and performance of both the NetSolve system and the underlying software services)

Although other research groups and organizations are investigating distributed and grid computing concepts, NetSolve's niche is providing access to complex collections of high-performance software that run on clusters of commodity components or supercomputers. Such access reduces the effort scientists normally exert to use these software resources.

There are many advantages to using NetSolve. NetSolve can provide access to otherwise unavailable software and, in cases where the software is readily available, it can make the power of supercomputers accessible from low-end machines such as laptop computers. NetSolve is also designed to increase the accessibility of larger software systems like simulators and modeling software. NetSolve can also be used to extend the capabilities of problem solving environments (PSE), such as Matlab, by increasing the number and types of implemented algorithms available. The system also provides these environments with the ability to distribute NetSolve's computational tasks among multiple processors - a feat, for example, that is not possible with Matlab alone.

Based on our experience developing NetSolve, we have identified several requirements that are not adequately addressed in the current NetSolve system. These new requirements, coupled with the requirements for the original NetSolve system, will form the basis for the next generation of NetSolve.

The overall goal is to address three general problems: ease of use, interoperability, and scalability. To improve the ease of use, we have streamlined the process of integrating user code into a NetSolve server. Interoperability encompasses several facets, including better handling of different network topologies including NATs and firewalls, better support for parallel libraries and parallel architectures, and better interaction with other Grid computing systems such as Globus and Ninf. Scalability in the context used here means ensuring that system performance does not degrade as a result of adding components to the NetSolve system.

NetSolve has been employed by users in a variety of scientific domains ranging from image processing to nuclear engineering, microbiology, and sub-surface fluid modeling. The NetSolve project has also been part of larger collaborations with research groups from universities, government laboratories, and private research organizations.