Developing New Operating Systems

(from a COMPUTERWORLD article by Gary H. Anthes)

Research and development work on operating systems, broadly defined, is going on in many quarters. Here are some projects:

The Legion Project:

Researchers at the University of Virginia are developing Legion, a highly flexible, wide-area operating system designed to build a virtual computer from millions of distributed hosts and trillions of objects while presenting to the user the image of a single computer. Legion applies many of the object-based interoperability principles in the Common Object Request Broker Architecture. It finds and schedules resources and handles security issues among disparate operating systems and objects written in different languages, freeing users from the need to negotiate with outside systems and administrators.

The Globus Project:

This is a university/government research and development project focused on applying grid concepts to scientific and engineering computing. The grid refers to an infrastructure that enables the integrated, collaborative use of high-end computers, networks, databases and scientific instruments owned and managed by multiple organizations. Grid applications often involve large amounts of data and/or computing and often require secure resource sharing across organizational boundaries.

Globus research areas include resource management, data management and access, application development environments, information services and security. The project has developed the Globus Toolkit, a set of services and software libraries to support Grids and Grid applications. The Globus Toolkit includes software for security, information infrastructure, resource management, data management, communication, fault detection and portability.

The Endeavour project:

Researchers involved in the Endeavour project at the University of California, Berkeley, envision an "information utility" that adapts on the fly to the supply and demand for computing resources anywhere in the world. "Fluid software" will choose where to execute and where to access storage. It will requisition resources as needed and negotiate interoperation agreements, ensuring always-available processing. Endeavour is a collection of projects. One, called OceanStore, will provide "nomadic data access – serverless, homeless and freely flowing through the network" – that will make the storage available to a user essentially infinite, according to researchers.

The WebOS project:

The goal of this research effort at Duke University in Durham, N.C., is to provide a common set of operating system services to wide-area applications, including mechanisms for resource discovery, a global name space, remote process execution, resource management, authentication and security. WebOS provides basic operating system services needed to build applications that are geographically distributed, highly available, incrementally scalable and dynamically reconfiguring.

The Globe Project:

Researchers involved in The Globe Project at Vrije University in Amsterdam are working on construction of large-scale wide-area distributed systems enabled by distributed shared objects. In the Globe model, the universe consists of a vast number of shared objects, each with some associated methods. Users of an object may invoke an object's methods. A method can return the contents of a Web page, but it can also accept an e-mail or news message, look up a name in a worldwide distributed database, access a file and perform other actions. Objects are distributed, with active copies on multiple machines at the same time, and they use peer-to-peer communication.

MIT Project Oxygen:

Sponsored by the U.S. Department of Defense, this project at MIT is intended to bring computation and communication to users through natural spoken and visual interfaces, in order to make it easy for users to collaborate, access knowledge and automate repetitive tasks. The Oxygen system rests on an infrastructure of mobile and stationary devices connected by a self-configuring network. Researchers say the Oxygen system must be:

- Pervasive: It must be everywhere, with every portal reaching into the same information base.

- Embedded: It must live in its users' world, sensing and affecting it.

- Nomadic: Its users and computations must be free to move around according to their needs.

- Eternal: It must never shut down or reboot; components may come and go in response to demand, errors and upgrades, but Oxygen as a whole must be nonstop.