Principles and properties		Structures	
✓	Versatility	✓	Module
	Conceptual integrity	✓	Dependency
✓	Independently changeable		Process
	Automatic propagation		Data access
	Buildability		
✓	Growth accommodation		
	Entropy resistance		

Xen and the Beauty of Virtualization

Derek Murray
Keir Fraser

Introduction

XEN IS A VIRTUALIZATION PLATFORM THAT HAS GROWN FROM AN ACADEMIC research effort to become a major open source project. It enables its users to run several operating systems on a single physical machine, with particular emphasis on performance, isolation, and security.

The Xen project has had great impact in a variety of fields: from software to hardware, academic research to commercial development. A large part of its success is due to it being released as open source, under the GNU General Public License (GPL). However, the developers did not simply sit down one day and decide to write an open source hypervisor. It began as part of a larger—and even more ambitious—research project called *Xenoservers*. This project provided the motivation for developing Xen, so we'll use it here to explain the need for virtualization.

Making Xen open source not only made it available to a vast range of users, but also allowed it to enjoy a symbiotic relationship with other open source projects. The unique thing about Xen is that, when it was first released, it employed *paravirtualization* to run commodity operating systems such as Linux. Paravirtualization involves making changes to the operating systems that run on top of Xen, which both improves performance and simplifies Xen itself. However, paravirtualization only goes so far, and it is only with hardware support from