Motivation :

There are various problems faced while running multiple operating systems. The problems are isolating concurrent operating systems from each other, accommodating all types of applications being supported by these operating systems and performance overhead incurred from by virtualization. Paper introduces Xen, which is a x86 virtual machine monitor. It allows the use of same commodity operating systems to share and run on traditional hardware without sacrificing both performance and functionality. The design of Xen is aimed to run 100 virtual machines at maximum concurrently on a server.

Key idea :

Paravirtualization is the main contribution of this paper on which the design of Xen is based. In Xen, there is no operating system that controls the physical hardware. Xen introduces the idea of a new piece of software called hypervisor which is less-featured and supposed to be as small as possible. The guest OSes run on top of this hypervisor. The Xen uses privilege levels as same as x86 architecture, having four levels call the rings. The hypervisor runs on ring 0, guest OS run on ring 1 and applications run on guest OS with least privilege that is ring 3.

Strengths :

* Application binary interfaces(ABI) are compatible with paravirtualized operating system. There is no need to make changes in the ABIs for running on any of the guest OS.
* Hypervisor’s IO interface is a lot simpler. Xen has shared memory and asynchronous buffer descriptor rings through which IO data is transmitted. This buffer implementation results in higher throughput, along with allowing validation checks to be done by Xen.
* System calls from applications can be directly called into a guest OS, using a fast handler. With help of the fast handler, there is no need for system calls to go through the Xen every time.

Weakness :

I think making changes in traditional OS such as windows or MacOs for running it as a guest OS on Xen will be difficult. A lot of efforts need to be made for making it compatible for Xen. Also, even after making guest OS compatible, various applications need different implementations for different OS and hence the paravirtualization will still be not used fully. Privileged instructions are checked by Xen evert time, which adds to the overhead Xen has, decreasing its performance.

Thoughts on paper :

The authors claimed that x86 architecture is uncooperative machine architecture and that providing full virtualization on such architecture is challenging. This paper brainstormed the idea of virtualization and operating systems, coming up with the approach of hypervisor and term paravirtualization. The idea was able to make applications run without requiring any changes to the application binaries. The results show that Xen performs better than some of the other virtualization tools such as VMware workstation 3.2. The features and performance of Xen is very significant, and this makes it used in various tools such as in Amazon EC2.