xen.org

Debian & Xen

Ian Campbell
ijc@hellion.org.uk
ijc@xen.org
ian.campbell@citrix.com

About Xen

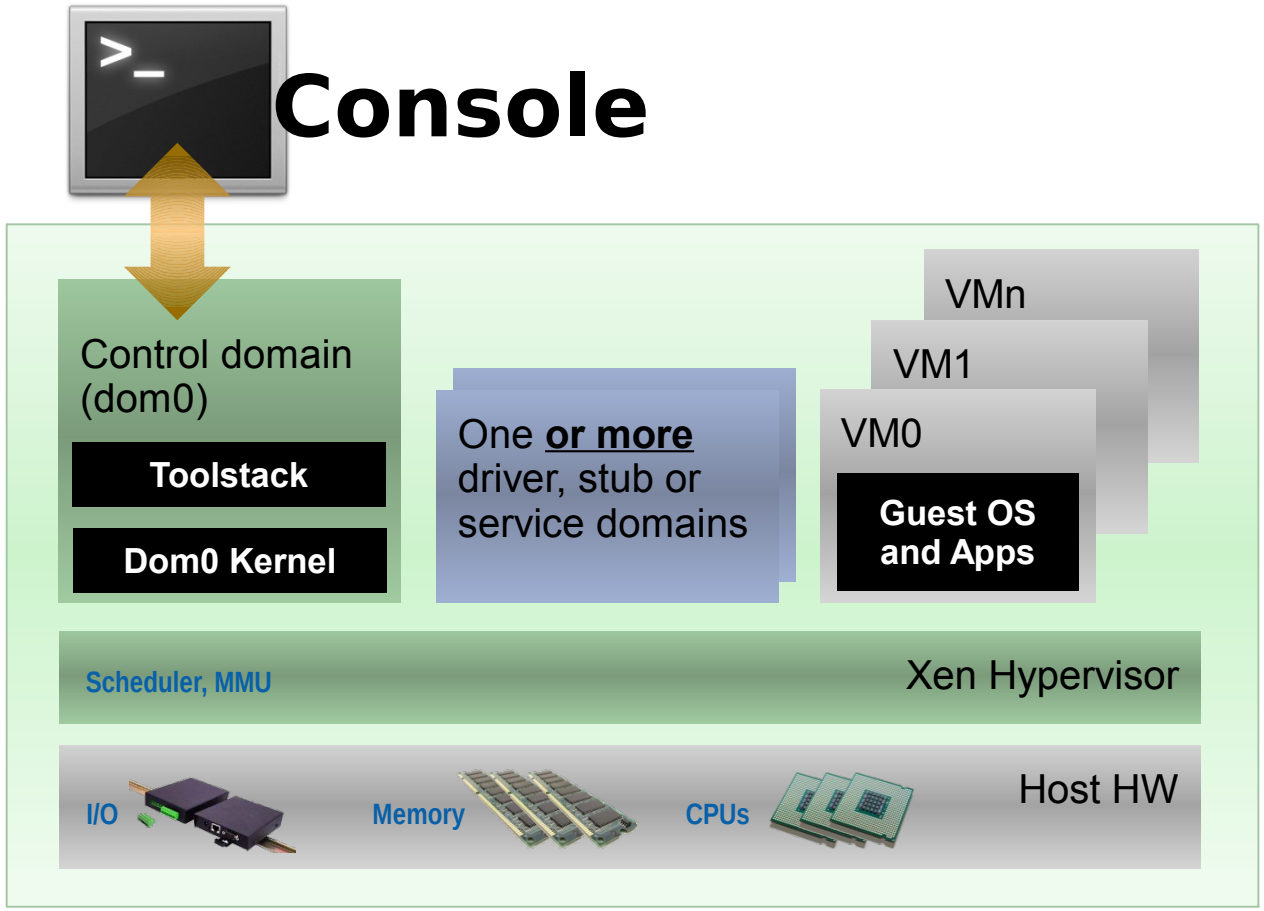
A Brief History Of Xen

- Late 1990s: XenoServers Project (Cambridge)
  - The **XenoServer project** is building a *public infrastructure for wide-area distributed computing*. We envisage a world in which **XenoServer** execution platforms will be scattered across the globe and available for any member of the public to submit code for execution.

A Brief History Of Xen

- Version 1.0 October 2003
- Version 2.0 November 2004
- Version 3.0 December 2005
  - Finally settled on the architecture which is still in use today
- Current release is Xen 4.1
- 4.2 on the horizon

Basic Xen Concepts



Control Domain aka Dom0

- Dom0 kernel with drivers
- Xen Management Toolstack
- Trusted Computing Base

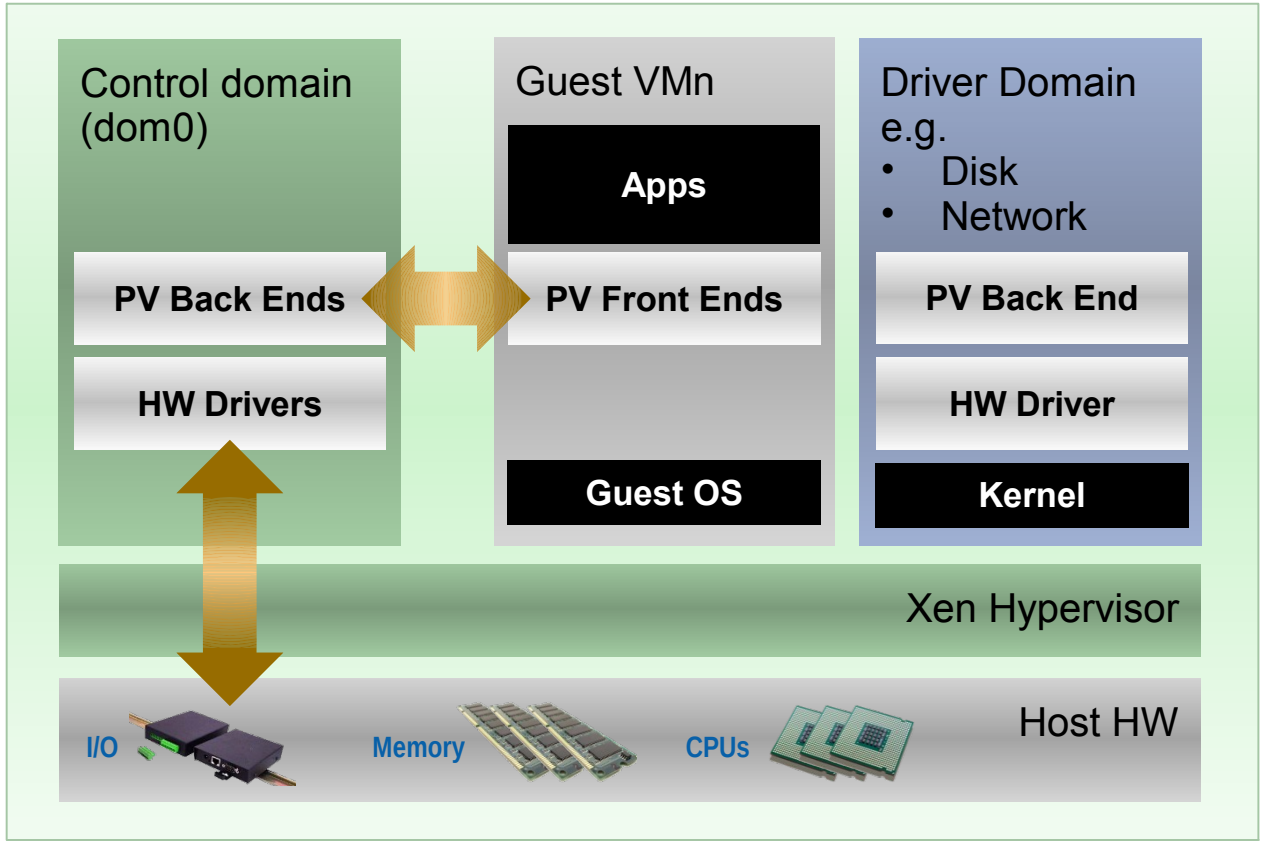
Guest Domains

- Your applications
- Your user's applications

Driver/Stub/Service Domain(s)

- A “driver, device model or control service in a box”
- De-privileged and isolated
- Lifetime: start, stop, kill

PV Domains



Limitations

- limited set of virtual hardware

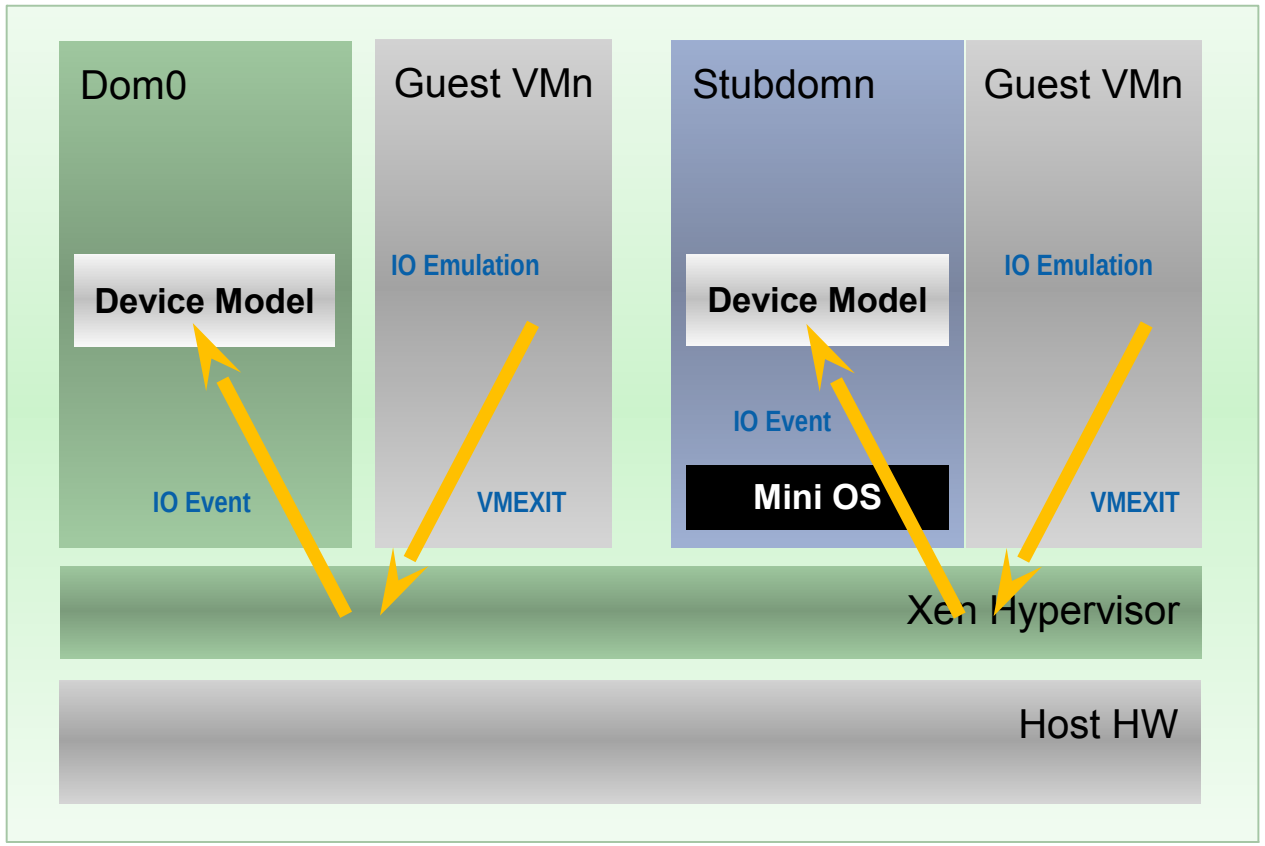
Advantages

- Fast
- Works on any system
- (even without virt extensions)

Driver Domains

- Security
- Isolation
- Reliability and Robustness

HVM Domains



Disadvantages

- Slower than PV due to Emulation (mainly I/O devices)

Advantages

- Install the same way as native Operating System

Stub Domains

- Security
- Isolation
- Reliability and Robustness

PV on HVM

- **A spectrum of PV and HVM**
- **Linux enables as many PV interfaces as possible**
- **Advantages:**
  - install the same way as native
  - PC-like hardware
  - access to fast PV devices
  - exploit nested paging
  - Good performance trade-offs
- **Drivers in Linux 3.x**

	HVM	PV on HVM	PV
Boot Sequence	Emulated	Emulated	PV
Memory	HW	HW	PV
Interrupts, Timers & Spinlocks	Emulated	PV	PV
Disk & Network	Emulated	PV	PV
Privileged Operations	HW	HW	PV

PV Kernels

- **Original “classic” XenoLinux port**
  - Heavily modified
  - Compile time choice
  - Pain for Distros (additional kernel packages etc)
- **Modern “paravirt_ops” Linux port**
  - Boot time selection of Xen PV vs baremetal interfaces
  - DomU support upstream from ~2.6.27, Dom0 from 3.0
- **NetBSD / FreeBSD**

Debian & Xen: The Past

Xen History In Debian

- Earliest versions (1.x and 2.x) packaged by Adam Heath, starting with 1.2 in March 2004
- Version 3.0 added by Julien Danjou in April 2006
  - Etch released with support for both dom0 and domU
- Later maintained by Guido Trotter & Bastian Blank
- Bastian is the maintainer today.

Debian as a Guest

- **Etch**: classic XenoLinux based kernel flavour
  - Install using **debootstrap** or **xen-tools**
- **Lenny**:
  - paravirt_ops for i386 (686-bigmem)
  - Classic XenoLinux flavour for amd64
  - I386 install using d-i netboot images
  - ...debootstrap / xen-tools still available

Debian as a Guest

- **Squeeze**:
  - Paravirt ops for both amd64 and i386
  - Install using d-i netboot + multiarch netinst & DVD images
  - ...debootstrap / xen-tools still available
- **Wheezy**:
  - Added Blu-Ray install option.

Debian as a Host

- **Etch**: XenoLinux based kernel flavour
- **Lenny**: XenoLinux based kernel flavour
- **Squeeze**: paravirt_ops based kernel flavour
- **Wheezy**: No more Xen kernel flavour
  - Upstream 3.2 kernel supports dom0 out of the box!

Debian & Xen: The Present

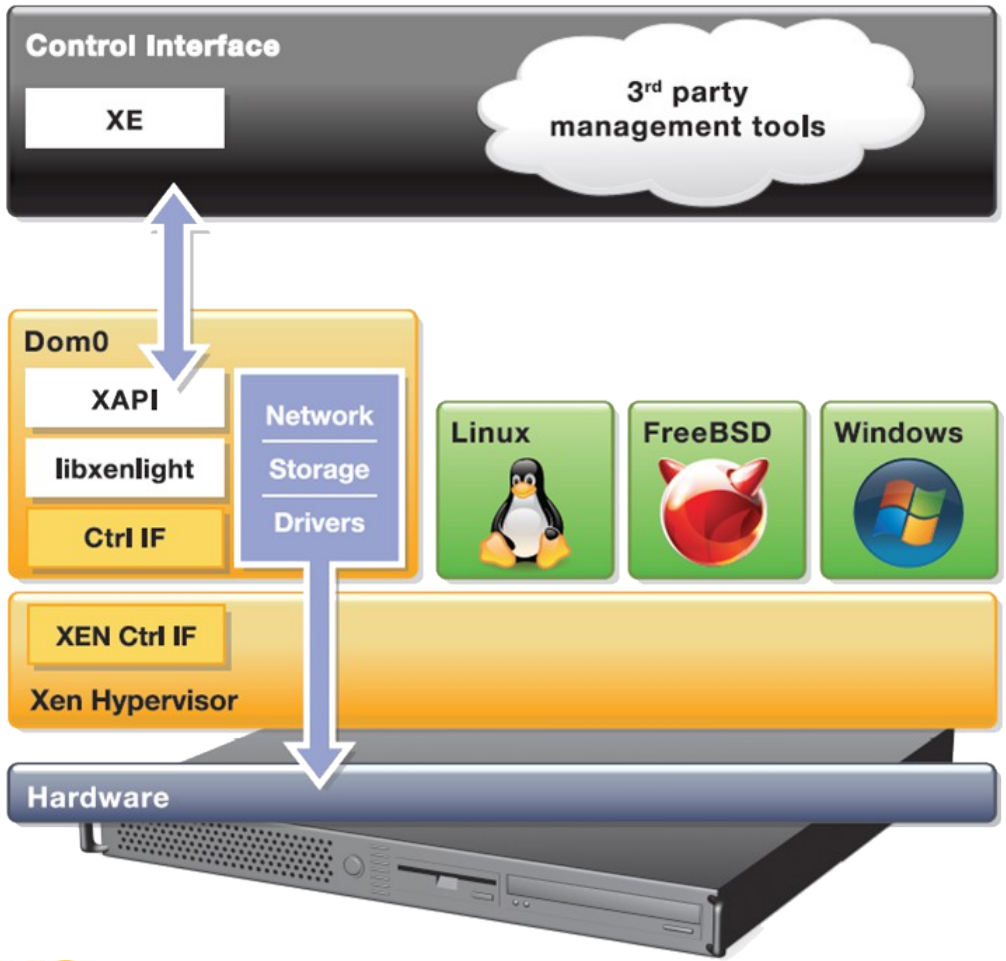
xen.org

Xen

Wheezy

- Shipping Xen 4.1 (current upstream stable release)
- No more Xen flavours
  - Using upstream pvops code in the standard kernel flavour for both dom0 and domU
- Shipping XCP's XAPI toolstack

XCP



- Complete vertical stack for server virtualization
- Distributed as an appliance (ISO) with CentOS 5.5 Dom0, misc DomU's, network & storage support and Xen API
- But CentOS isn't Debian! Unacceptable!

Xapi on Debian

- Project Kronos
  - Make the XAPI toolstack independent of CentOS
  - Deliver Xen, XAPI and everything in between (storage manager, network support, OCaml libs, etc.) on Debian
  - `# apt-get install xcp-xapi`

Xapi and the Cloud

- Xapi supports the XenAPI XML-RPC interface.
- XenAPI was designed to be highly programmable and has bindings for several languages
- XenAPI is the preferred interface for several cloud orchestration layers.
- Supporting XenAPI enables Debian based cloud infrastructure

Debian & Xen: The Future

Hypervisor

- Continue to track upstream releases in Sid
  - Xen 4.3 release planning at XenSummit 27/28 Aug
- Transition from xend to xl toolstack
- Better documentation
  - http://wiki.debian.org/Xen
  - http://wiki.xen.org/wiki/Category:Debian
  - http://wiki.xen.org/wiki/Xen_Document_Days

Kernels

- Upstream kernel support for Xen
  - No more kernel flavours or special handling for Xen!
  - Less work for Debian kernel maintainers
- PV/PVHVM kfreebsd?
- Hurd?

Xapi on Debian

- **Wheezy**:
  - Try it and report bugs:
    - `reportbug xcp-xapi` or pkg-xen-devel on Alioth
    - http://wiki.xen.org/wiki/Reporting_Bugs_against_XCP or xen-api@lists.xen.org
- **Wheezy + 1**:
  - Continue to separate xapi from XCP
  - Further improve xapi integration with Debian

Guest Support

- PVHVM
  - Seamlessly enable for HVM installations
  - Allow user to choose best guest type
- Hybrid
  - “PV with HVM features”
  - Initial prototypes upstream
  - Expected for 4.3

Disaggregation

- Driver Domains
  - `# apt-get install xen-network-backend`
  - Harder for e.g. primary storage controller
  - Specialised initramfs?
- Mini-OS stub DM and service domains
  - Monolithic OS/Application, using newlib
  - Difficult to fit into the usual distro model
  - Perhaps Multi-arch “picoport”?

ARM

- New upstream port
- Targeting ARM v7 w/ virtualisation extensions
  - Currently targeting emulators, eventually Cortex A15
- Initially targeting a “hybrid” style guest
- Device Tree from Day 1
- Currently able to boot dom0 and one domU
- Debian's arm ports and support for Xen a natural fit
- Interested? `xen-devel@lists.xen.org`

Conclusion

- Debian has always been on the leading edge of adoption of new Xen developments
- Has consistently supported Xen across multiple releases
- Opportunity to become a leading cloud infrastructure OS.
- Plenty of other interesting work too.

- **IRC:**
  - #debian-xen @ OFTC
  - ##xen @ Freenode
- **Lists:**
  - pkg-xen-devel@lists.alioth.debian.org
  - xen-{users,devel,api}@lists.xen.org
- **Wiki:**
  - http://wiki.debian.og/Xen
  - http://wiki.xen.org/Category:Debian
    - Category:{XCP,User,Developers}

Questions ...