Debian & Xen

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About 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
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

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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
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
• 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 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
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
    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.org/Xen
  • http://wiki.xen.org/Category:Debian
    – Category:{XCP,User,Developers}