Xen on ARM

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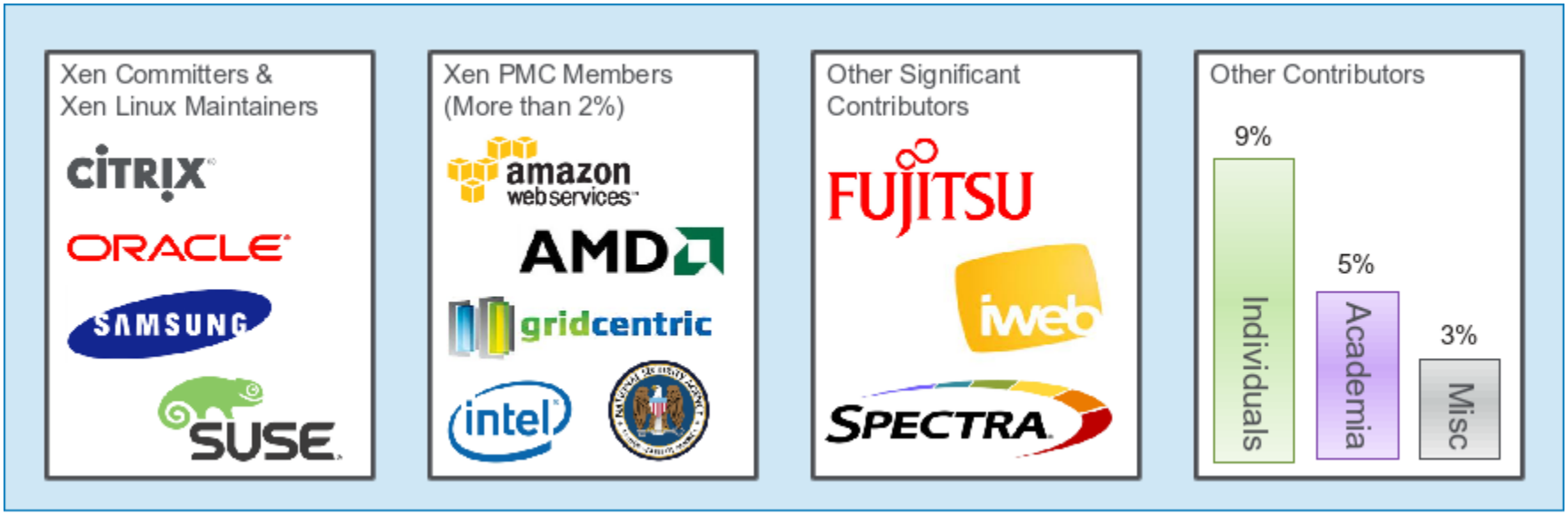
What is Xen?

- a type-1 hypervisor
- small footprint (less than 90K LOC)

Xen: Open Source

GPLv2 with DCO (like Linux)

Diverse contributor community

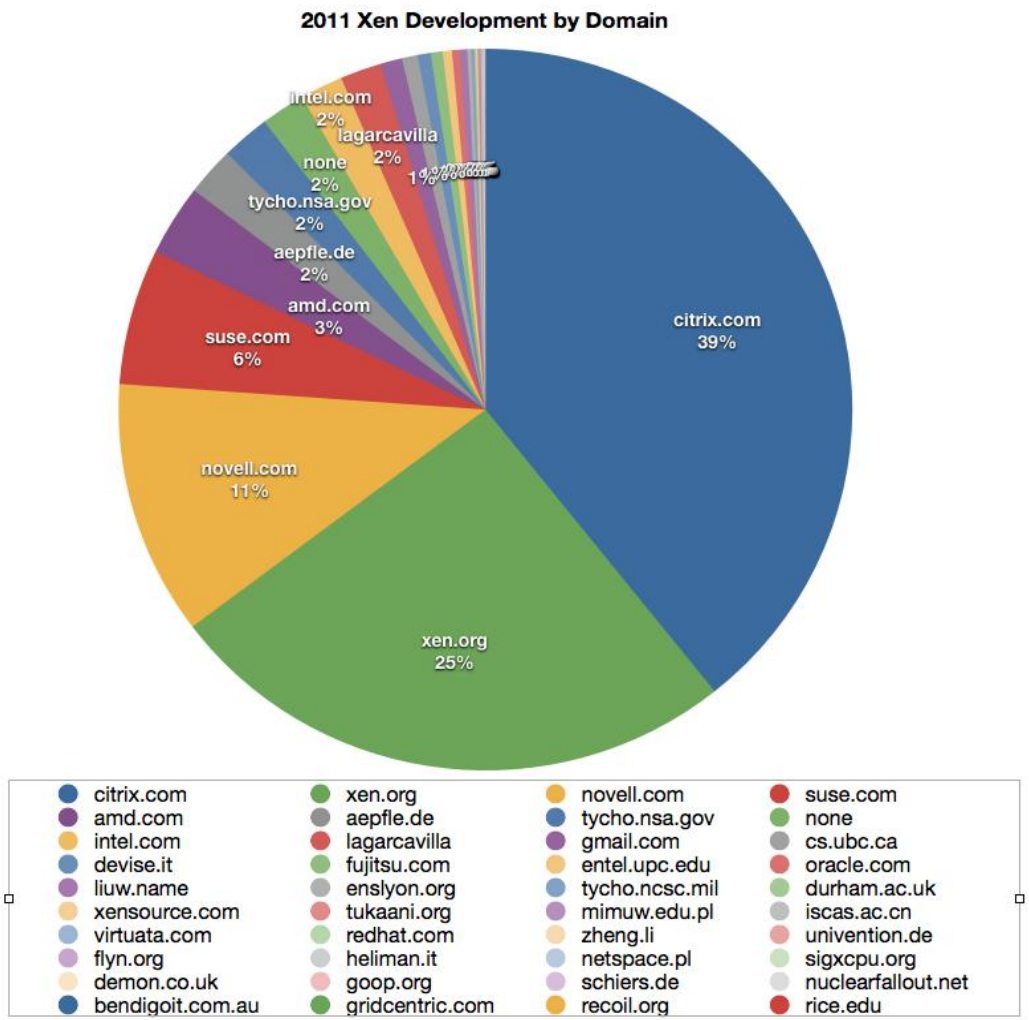


Xen: Open Source

source:

Mike Day

http://code.ncultra.org



Xen: the gears of the cloud

- large user base

  more than 10 million individuals users

- power the largest clouds in production

- not just for servers

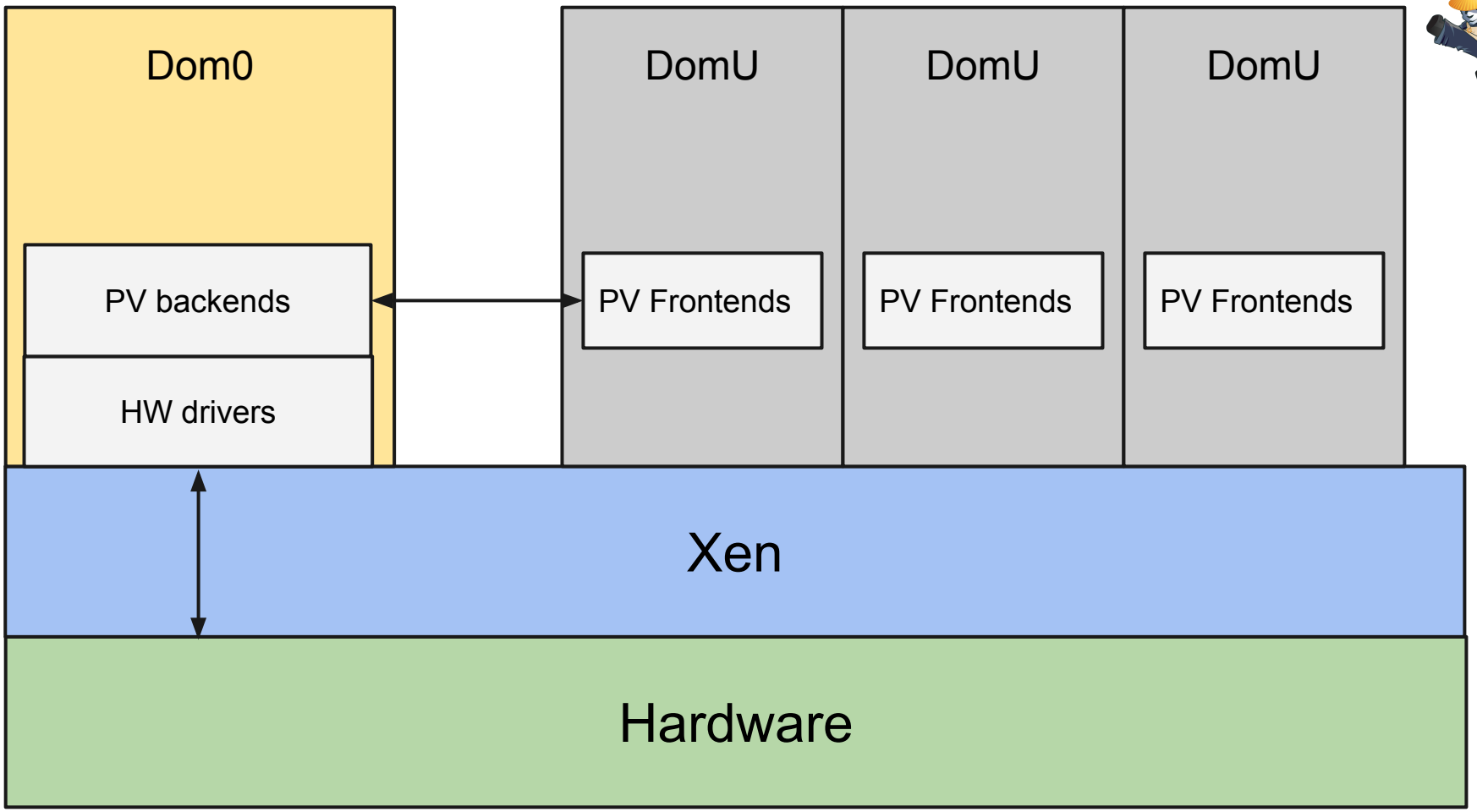
rackspace
the open cloud company

amazon
web services™

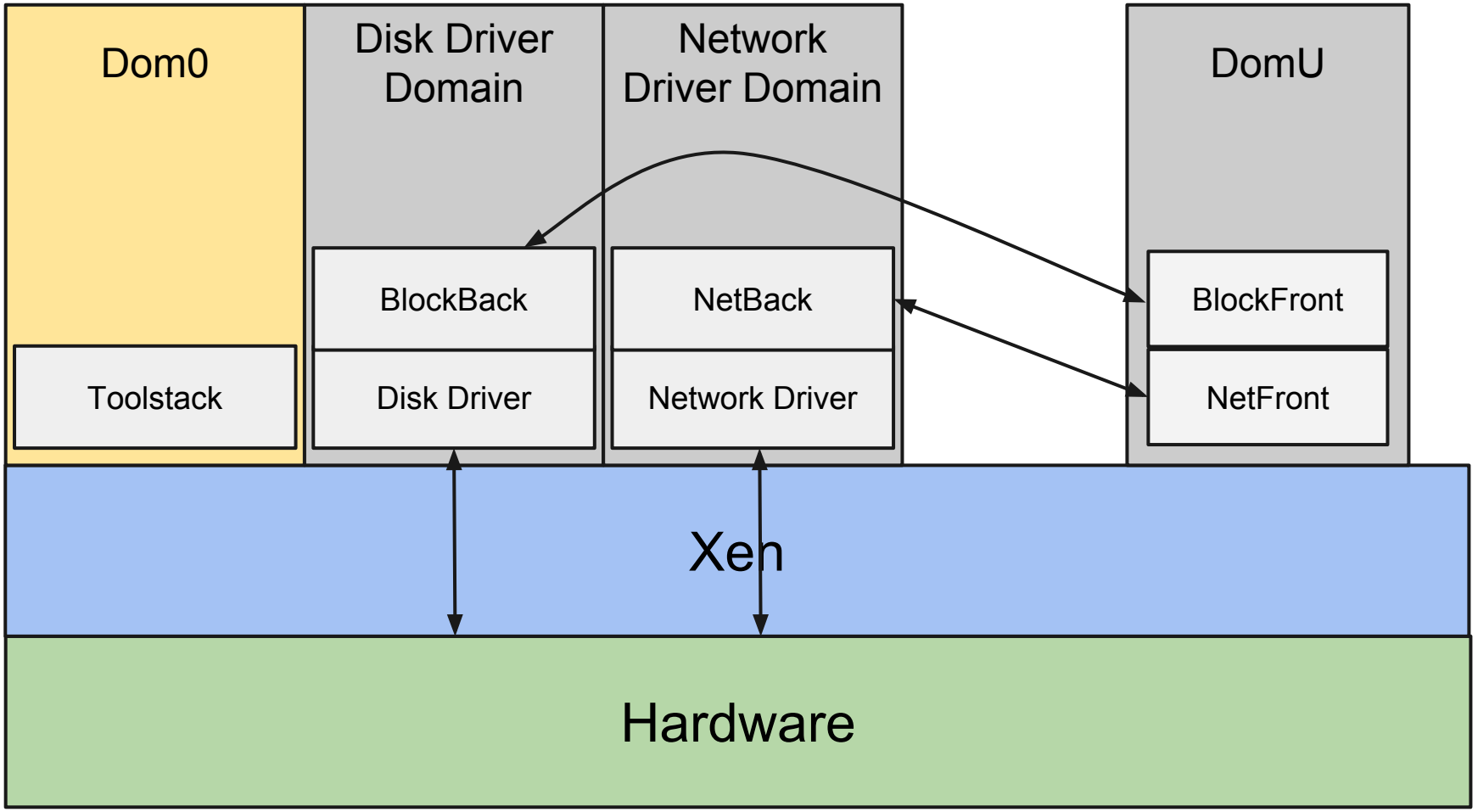
linode.com

QUBESOS

Xen Architecture



Xen Architecture: driver domains



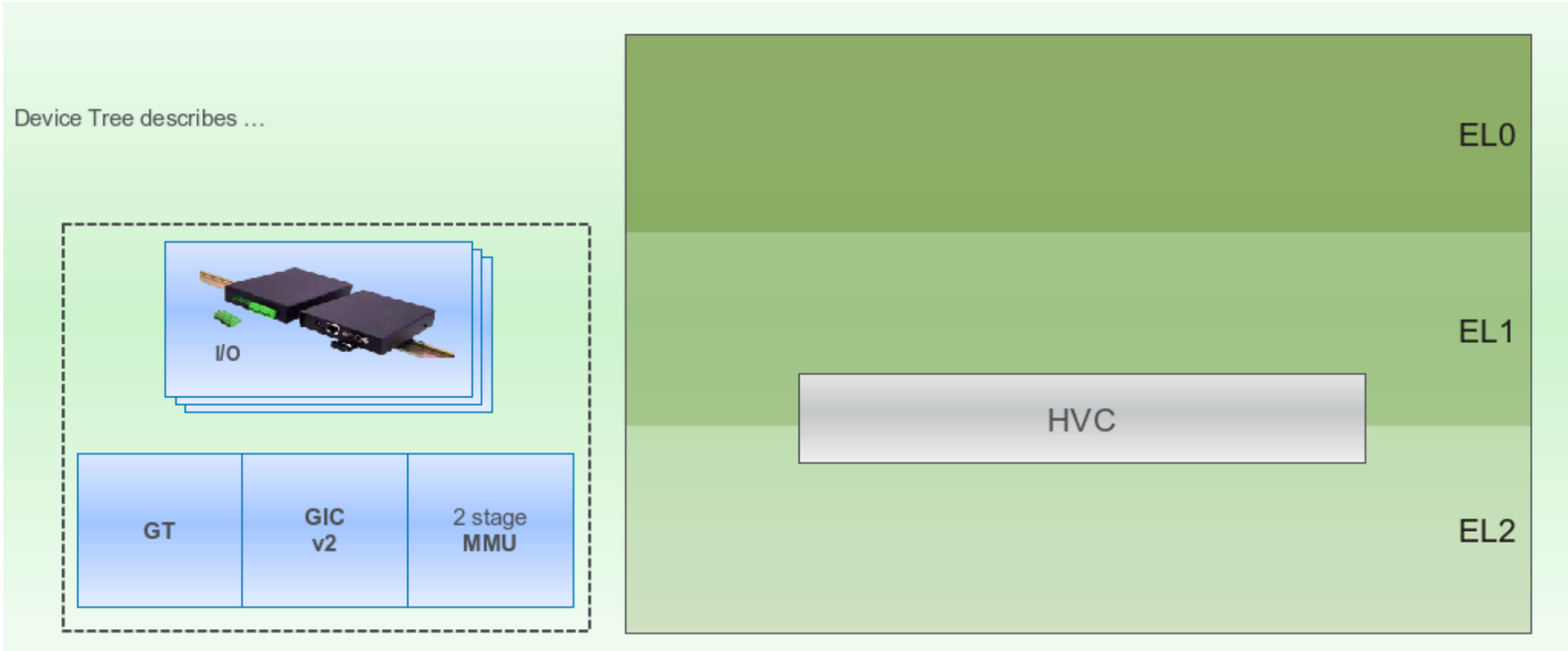
Xen Architecture: driver domains

- disaggregation and componentization
- security and isolation
- resilience
- hardware vendors can run their drivers in separate VMs
  - could run in a RTOS environment
  - hidden from the user
    - media codecs, crypto keys, etc.

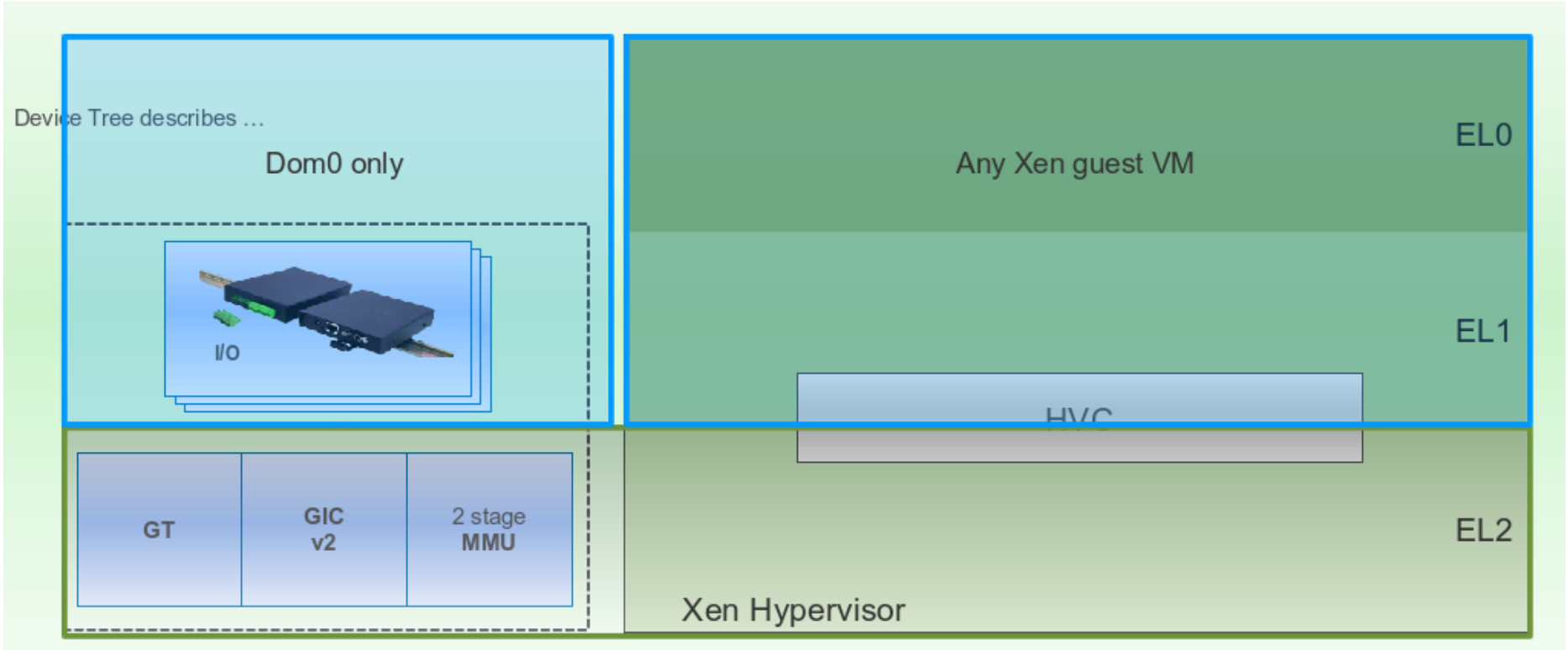
Xen on ARM: not just a port

- a lean and simple architecture
  - removed cruft accumulated during the years
  - no emulation, no QEMU
  - use PV drivers for IO as early as possible
  - one type of guest
  - exploit the hardware as much as possible
- a very good match for the hardware
- clean architecture = small code base

Xen on ARM architecture



Xen on ARM architecture

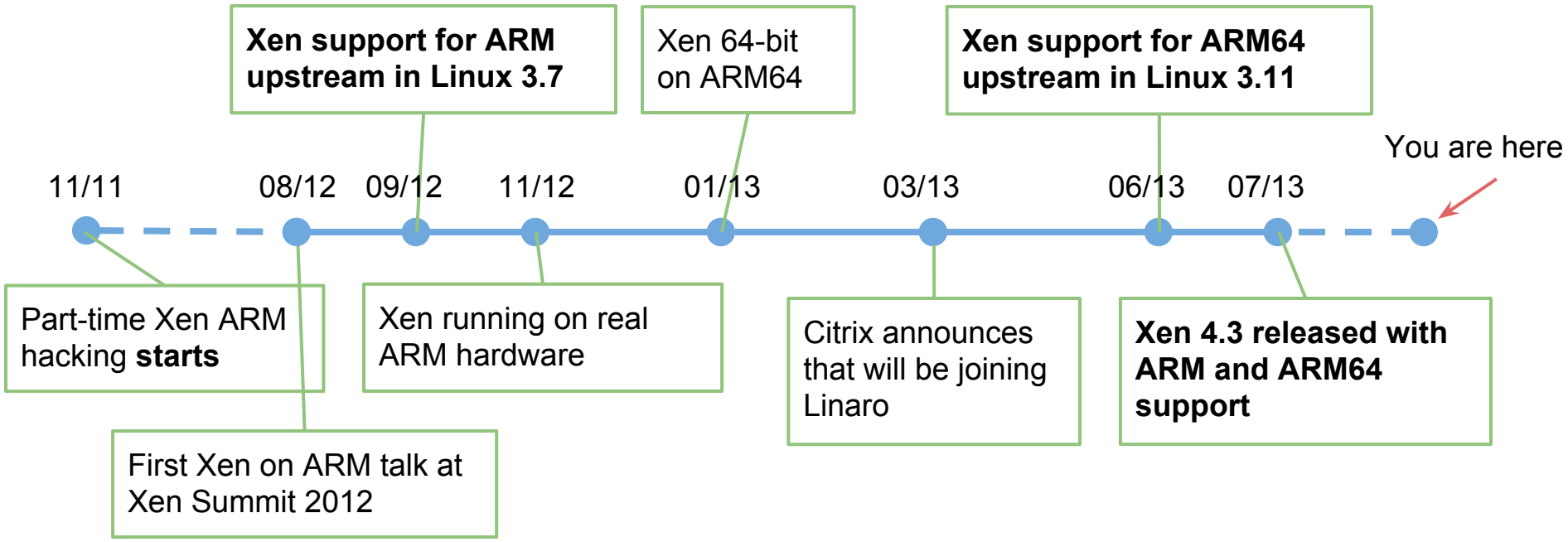


Code size
sometimes smaller is better

	Common	ARMv7	ARMv8	Total
xen/arch/arm	5,122	1,969	821	7,912
C	5,023	406	344	5,773
ASM	99	1,563	477	2,139
xen/include/asm-arm	2,315	563	666	3,544
TOTAL	**7,437**	**2,532**	**1,487**	**11,456**

- X86_64-bit: ~120,000LOC (~4,000 ASM)
- ARM code ~= **1/10** x86_64 code

Achievements of one year



A growing community

Xen-devel ARM traffic from August 2012:

- 4685 emails: 360 emails per month!
- 39% of which are **not** from Citrix

Hardware support

Upstream:

- Versatile Express Cortex A15
- Arndale board
- ARMv8 FVP

In progress:

- Cubieboard2
- Calxeda “Midway”
- Applied Micro “Mustang”
- Broadcom Brahma-B15
- OMAP5

Porting Xen to a new board

- Xen only relies on GIC and GT
- platform specific code in Xen is reduced to:
  - secondary cpus bring up
  - UART drivers
  - any platform specific bootup quirks (ideally none)

Upstream features

Xen v4.3:

- basic lifecycle operations
- memory ballooning
- scheduler configurations and vcpu pinning

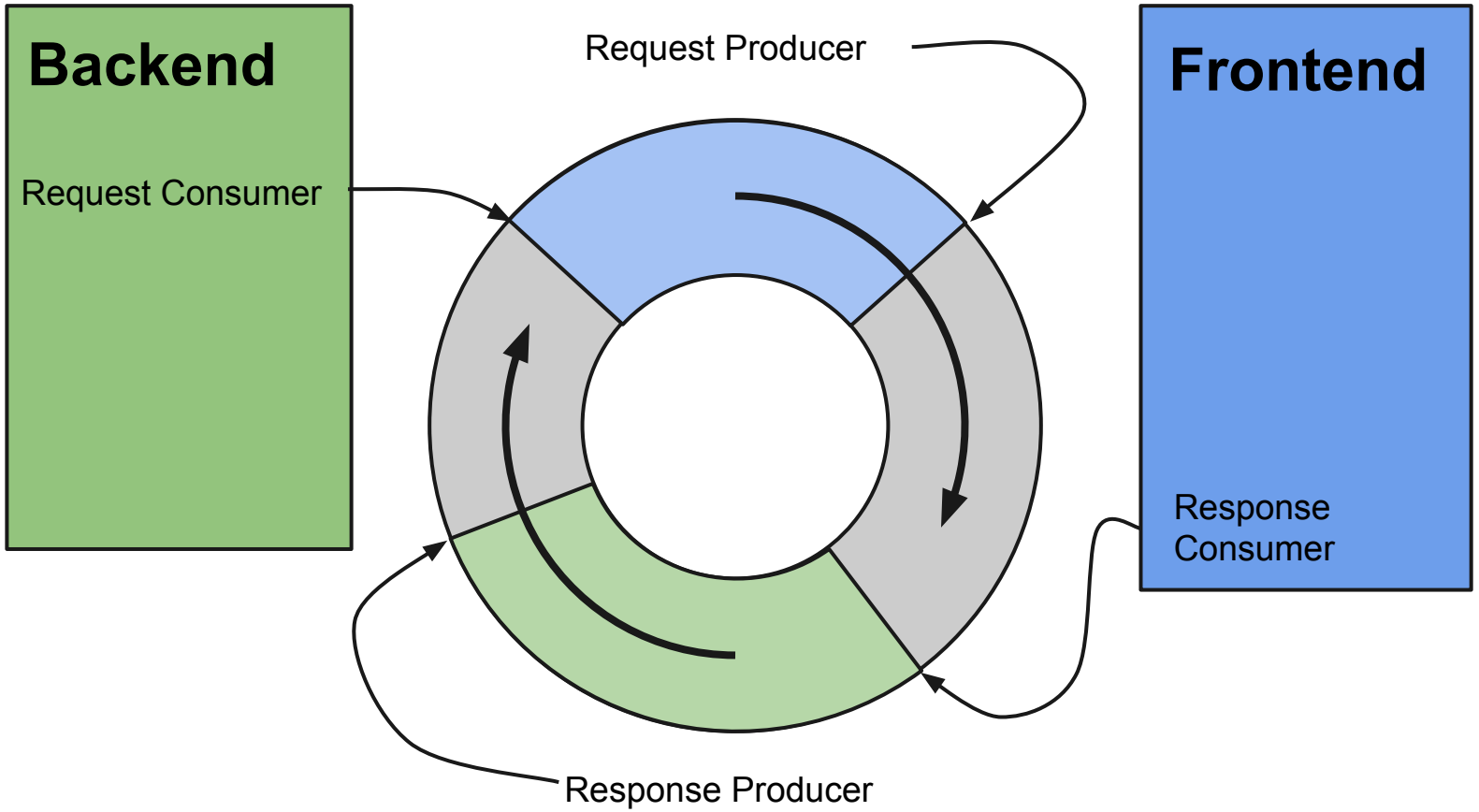
Linux v3.11:

- dom0 and domU support
- 32-bit and 64-bit support
- SMP support
- PV disk, network and console

Android on Xen on ARM

- Android is based on the Linux kernel
  - Jelly Bean uses Linux 3.4, when it updates to 3.7 will get Xen on ARM support out of the box
- Additional work needed to support client devices (compass, GPS, etc.) on multiple VMs
  - easy to export 1 device to 1 VM
  - otherwise each type of device needs a PV drivers pair

PV Protocols



PV Protocols

- shared ring protocol
- software interrupts AKA event channels
- consensual memory sharing: grant table
- easy to write
- plenty of examples
  - network, block, console, PCI, keyboard, mouse, framebuffer, sound, SCSI, USB, …

Porting other OSes to Xen on ARM

- No invasive modifications needed
- only some new drivers:
  - grant table, xenbus and event channels
  - PV drivers for network, block, console, etc.
- BSD drivers already exist in NetBSD and FreeBSD, can they be reused?
- FreeBSD port to Xen on ARM in progress

Coming in Xen 4.4

- 64-bit guest support
- live-migration
- SWIOTLB

A look into the future

- IOMMU support in Xen
- device assignment
- UEFI booting
- ACPI support

Xen for automotive: why?

- type-1
- small footprint
  - small codebase
  - no QEMU, no emulation
- driver domains / service VMs
  - componentization
  - security
  - support for legacy drivers
- supports Linux out of the box
- easy to port other OSes to Xen on ARM

More Information

- http://www.xenproject.org
- Xen on ARM @wiki.xenproject.org goo.gl/FKNXe
- http://lists.xen.org/mailman/listinfo/xen-devel

Questions?


Fin.