Upstreaming Hardware Enablement
December 8th 2011

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Project Manager, Hardware Enablement Team
Agenda

• Introduction to Hardware Enablement Team
• Difficulties of Hardware Enablement on Linux
• How Fixes Flow from OEM Projects to Ubuntu and Upstream Kernel
• How We Ensure Ubuntu has the Best Hardware Support - Certification Process
The Hardware Enablement Team (HWE)
Hardware Enablement Team (HWE) – What we do

• To directly support Canonical's OEM projects by enabling hardware and any resolving hardware related issues
• Track and drive code changes from enablement projects into future Ubuntu releases and upstream
• To ensure the Ubuntu Community as well as the larger Linux community as a whole can benefit from Canonical's work
• Develop tools: fwts, fwts-live, S3/S4 debugging
• Please visit http://odm.ubuntu.com/
Hardware Enablement Team – Who we are

- A global team with about 15 developers (Taiwan, China, US, UK, Sweden, Finland, Australia)
- Expertise in kernel, graphics and audio stacks, BIOS, firmware and other hardware related areas.
Hardware Enablement Team

• Hardware issue we work at include:
  • Graphics
  • Audio
  • Networking: Wi-Fi, Ethernet
  • Bluetooth
  • Card Reader
  • Suspend/Hibernation/Resume
  • Hotkeys
  • BIOS, ACPI, UEFI
  • USB
  • Align Ubuntu, HW driver and OEM schedules, especially new platforms like Intel Ivy Bridge, Cedar Trail, AMD Comal
  • And many others
What’s Wrong?
What’s wrong?

This really is a true story, and she doesn’t know I put it in my comic because her wifi hasn’t worked for weeks.
What’s wrong? – A Real-life Case

As usual, some things which were broken in the previous release are now fixed, but things which were working are now broken.

A friend of mine has two wireless USB devices. One works on 9.04 while the other one doesn’t, which is fair enough.

With 9.10 however, the one which wasn’t working now works, but the one which was working now doesn’t.

It’s not the first time either. Upgrading from 8.10 to 9.04 his TV tuner cards which used to work, then stopped.
Problems of Supporting New Hardware on Linux (1)

1. Hardware driver development is market-driven
   - Linux support lags behind hardware availability

2. Lack of open official specification
   - Rely on reverse engineering, e.g. nouveau, Wifi (old Atheros, Broadcom), some touchpads
     → Incomplete, lack of features compare with proprietary driver
   - Legal issues
   - Make use of firmware
     - e.g. some bluetooth, low-end printer, winmodem
     - needs special tools to activate device
     - Re-distributable?
Problems of Supporting New Hardware on Linux (2)

3. BIOS designed for Windows
   - Non-ACPI-compliant BIOS is very common
   - All sorts of strange issues: brightness, hotkeys, suspend/resume, etc.
   - Lots of kernel options to workaround:
     - `acpi_backlight=vendor`, `acpi=off`, `acpi_sleep=nonvs`, etc
   - WMI is abused, *undocumented*, vendors still implement their own custom interfaces
   - Functions encapsulated in EC
   - We have very good BIOS/UEFI sessions in UHS last and this year
Upstreaming
Upstreaming

Linux Kernel

Ubuntu Community

Codes, Patches

Use
Upstreaming – the Ecosystem

- **IHV** can work directly with upstream

1. **Enable HW**
2. **Codes, Patches**
3. **Fix Cert Blockers**

**Ubuntu**

**Canonical**

**Linux Kernel**

**IHV provides HW and driver**

**Ubuntu Image**

**OEM**

**IHV**

**Certification**

**Hardware Enablement**

**OEM Mainstream Systems**
How Fixes Flow from OEM Projects to Ubuntu (1)

- Scenario 1: Bug initially found in OEM HW without any known fix

1. HWE engineer submit patches to upstream maintainers, upstream accepted the patches
2. Bug found in OEM project, commit to upstream kernel first, then to 12.04 and SRU to 11.04
3. HWE fixed an OEM bug, commit to upstream kernel first, then to 12.04 and SRU to 11.04

Bug found in OEM project, already fixed in 12.04, HWE identify the commits and provide to OEM and backport to 11.04 as SRU
Stable Release Updates

- Once an Ubuntu release has been completed and published, updates for it are only released under certain circumstances, and must follow a special procedure called a "stable release update" or SRU.
- -updates repository for package updates
- -proposed for updates ready for testing
- Workflows of SRU for kernel and other packages are different
- What goes into Stable Release Updates (SRU)?
  - Security Fixes
  - Critical Bug Fixes
  - Hardware Enablement
Kernel Stable Release Updates Workflow

https://bugs.launchpad.net/kernel-sru-workflow
### Kernel Stable Release Updates Workflow

#### linux: 3.0.0-14.23 -proposed tracker

* Reported by Horton R. Krzesinski on 2011-11-22

**This bug affects 1 person. Does this bug affect you?**

<table>
<thead>
<tr>
<th>Affects</th>
<th>Status</th>
<th>Importance</th>
<th>Assigned to</th>
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<tr>
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<td>Canonical Hardware Certification</td>
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<td>Horton R. Krzesinski</td>
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How Fixes Flow from OEM Projects to Ubuntu (2)

• Scenario 2: Bug found in OEM HW but fix already exists in development branch

Open public bug

HWE fixed an OEM bug, commit to upstream kernel first, then to 12.04 and SRU to 11.04

Bug found in OEM project, already fixed in 12.04, HWE identify the commits and provide to OEM and backport to 11.04 as SRU
Certification

- The hardware certification program tests and certifies hardware from partners with Ubuntu to ensure that the combination provides the functionality expected by users
- http://www.ubuntu.com/certification
Certification
Certification Schedule

OEM requests for Ubuntu 10.10 preload

Cert team certify Stock 11.04

Cert team certify Stock 11.10

Cert team certify Stock 12.04

Pre-installed Certification on OEM Image

Certification Issued
How Fixes Flow from Certification to Upstream

OEM Machine Enabled → Certify Pre-installed for 11.10 → 11.10 Cert Issued → 12.04 Released → Certify For 12.04 → 12.04 Cert Issued

Bugs Found

Cert Team Open Public Bugs → HWE Fix Bugs → HWE Works With Upstream

HWE Submit SRU and 12.10
Certified hardware

We work with all the top hardware providers to make sure Ubuntu runs on your favourite devices. The hardware below has all been awarded the status of **Certified** for Ubuntu.

<table>
<thead>
<tr>
<th>Make</th>
<th>Laptops</th>
<th>Desktops</th>
<th>Servers</th>
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<td>VMware</td>
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</tbody>
</table>

**Search certified hardware**

**Recently certified hardware**
- Dell Precision Workstation R5500
- Dell Latitude E5520
- Lenovo ThinkCentre Edge 91
- Dell PowerEdge M910
- Dell Optiplex XE

**Ubuntu certified**
OEMs submit systems to Canonical’s testing facility where certification testing and validation is performed by Canonical engineers.
# Ubuntu on Dell

<table>
<thead>
<tr>
<th>Model</th>
<th>32-bit</th>
<th>64-bit</th>
<th>64-bit</th>
<th>10.04 LTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspiron 570</td>
<td>11.10</td>
<td>10.10</td>
<td>10.10</td>
<td></td>
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<tr>
<td>Inspiron 580</td>
<td>11.10</td>
<td>10.04</td>
<td>10.04</td>
<td>LTS</td>
</tr>
</tbody>
</table>

OEMs submit systems to Canonical’s testing facility where certification testing and validation is performed by Canonical engineers.
Difficulties of Upstreaming

- Blocked by architectural changes, e.g. hybrid graphics
- Regressions like Sandy bridge. We did the bulk of our enablement work on Sandy bridge on Maverick (using 2D only), so when 3D support finally landed in Natty and Certification runs started, a whole new line of bugs were found
- Potential risk of inclusion into stable release
- Blocked by upstream developers
Why You Should Care as a Hardware Vendor – The Trend

• Ubuntu user base is growing fast
  • 20 million users

• We are working with major OEMs
  • 200 Dell Stores in China
  • Nowadays Ubuntu computers are easy to buy online
  • OEM expects full Linux support before product launch
  • Same launch date for Linux and Windows becoming the norm
  • Components with good Linux track record is preferable
Why You Should Care as a Hardware Vendor?
Why You Should Care as a Hardware Vendor – Technically

- Maintain driver for your device easily
  - You do not need to port again and again for each kernel.
- Community will help
  - Bug found and fix, maintenance responsibility, API change, etc.
- Users will be happy, and buy more your devices
  - What laptop will you suggest to buy for Linux? – Thinkpads? Dell?
Thank you

Questions?