Finding Long-Term usable Linux Kernel for Embedded Products

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NEC
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Chinzan-so @Tokyo
Agenda

• LTSI patch status
• LTSI release process
• What’s next
Key activities of LTSI

✓ Provide industry managed kernel and maintain two years
✓ Provide a common place for embedded industry to share information
✓ Support upstream activity
LTSI: Industry managed kernel

• LTSI defines a common kernel every year and maintains for 2 years
• LTSI adopts community Long term stable kernel as a base. Bug/security fixes from upstream are applied to LTSI.
• LTSI kernel = long term + additional patches
• After 2 years term finished, possible to take over maintenance for longer term
Stable kernel release

- After release of a kernel, stable release branch will start to maintain until n+2 version released
- Stable release will be included bug/security fixes found in latest version and back ported
Maintaining Long term stable kernel

- Take over maintenance of “stable release” and continue back porting to specific log term kernel version
- Maintainer of “Long Term Stable” kernel should have trusted relationship among kernel development community

Diagram:

- Nodes represent versions 3.n, 3.n+1, 3.n+2, 3.n+3, and mainline
- Edges illustrate porting and relationship with versions 3.n.1, 3.n.2, 3.n.m
- 70 days timeline
Community’s long term kernels and Its consumers

- 2.6.27: SUSE11
- 2.6.32: SUSE11 SP1/RHEL 6/Ubuntu10.04 LTS
- 2.6.34: Wind River Linux
- 2.6.35: Embedded usage, Android (Ginger Bread)
- 3.0: LTSI, Android (Ice Cream Sandwich), SUSE11 SP2
- 3.2: Debian7, Ubuntu 12.04 LTS
- 3.4: LTSI, Android (Jelly bean)

Note: Maintenance of most of 2.6 long term kernels had been stopped
Patches included in LTSI

- LTSI have two types of patches
  - Community’s Long Term Stable (LTS) patches
  - Patches posted in LTSI mailing list

<table>
<thead>
<tr>
<th></th>
<th>LTS</th>
<th>LTSI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>2238</td>
<td>875</td>
<td>3113</td>
</tr>
<tr>
<td>3.4</td>
<td>2750</td>
<td>721</td>
<td>3471</td>
</tr>
</tbody>
</table>
Cost estimation of LTSI patches

• If a company do all the back port by themselves, how much cost does they spend?

• Condition:
  – 3000 patches back ported into a kernel
  – 15K$/Month/Kernel Engineer

• EST A) 1 hour for back port a patch
  – 3000 x 1MH = 375MDay = 18.75MMonth
  – 18.75MM x 15K$ = 281.25K$ = 2812.5 万円

• EST B) Half day(4 Hour) for a back port
  – 1.125M$ = 1.125億円

LTSI is providing 3.0 and 3.4. Value of LTSI is over 2M$
Linux Kernel release cycle

Dates

Kernel version

<table>
<thead>
<tr>
<th>Version</th>
<th>Dates</th>
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<tbody>
<tr>
<td>3.1</td>
<td>100</td>
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<tr>
<td>3.2</td>
<td>70</td>
</tr>
<tr>
<td>3.3</td>
<td>70</td>
</tr>
<tr>
<td>3.4</td>
<td>60</td>
</tr>
<tr>
<td>3.5</td>
<td>50</td>
</tr>
<tr>
<td>3.6</td>
<td>80</td>
</tr>
<tr>
<td>3.7</td>
<td>70</td>
</tr>
<tr>
<td>3.8</td>
<td>70</td>
</tr>
<tr>
<td>3.9</td>
<td>70</td>
</tr>
</tbody>
</table>
LTSI 3.4 release process

- LTSI merge window will be opened when LTS released. It will be after two release of kernel version.
- LTSI will be released after reasonable validation period.
LTSI development phase

① Preparation for Merge window
② Merge window to propose patches to LTSI
③ Validation period
④ After the release
Patchwork is now ready

- Patchwork is a tool to cherry pick a patch available on LTSI mailing list.
- By using Patchwork, we can share patches even after the release of LTSI.

https://patchwork.kernel.org/project/ltsi-dev/list/

# Patchwork LTSI Project development

**Project:** lsdi-dev

**Patches**
- [12/12] ARM: shmobile: armadillo800eva: set clock rates before timer init
- [11/12] ARM: shmobile: use FSI driver's audio clock on armadillo800eva
- [10/12] ASoC: fsi: tidyup sh_fsi_platform_info pointer

**Submitter:**
- Do Quang Thang

**State:** New
**LTSI can be selected in Yocto**

- Yocto is project to build your own distribution
- From 1.4 release of Yocto, you can choose LTSI3.4 as kernel for Yocto
- Release cycle of LTSI is one release per year and Yocto is every six month, we will continue to sync with Yocto
What about next release?

- Next LTS version is not yet decided
- We can expect next release if Linux kernel release will be continue same pace
Summary

• LTSI released two of kernel version 3.0, 3.4
• If your company do the back port like LTSI, the cost become over 2M$
• LTSI now provide patchwork and integrated with Yocto project
• Using LTSI is really cost effective approach for your embedded products
How you can participate LTSI

• Follow on Twitter account: @LinuxLTSI
• Web: http://ltsi.linuxfoundation.org
• Mailing list: https://lists.linuxfoundation.org/mailman/listinfo/ltsi-dev
• Git tree: http://git.linuxfoundation.org/?p=ltsi-ernel.git;a=summary

LTSI stands for Long-Term Support Initiative. A group of CE Working Group of the Linux Foundation to provide Long-Term and stable Linux for Industry.
Open Workshop

• Date/Time: May 30, 2013 4:00pm - 5:00pm
• Place: Orchid 1&2, 4\textsuperscript{th} floor
• Agenda
  – Technical detailed update
  – Industry based discussion
  – Demonstration of Use Case Program
  – Others

We will do another Use Case Program soon, Stay tuned!
THANK YOU
## Linux kernel: release date, # of files and lines

| Version | Release date | # of Files | # of Lines          | Change  
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>3.9</td>
<td>2013-4-30</td>
<td>42,423</td>
<td>16,686,972 (+1.6%)</td>
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<tr>
<td>3.8</td>
<td>2013-2-19</td>
<td>41,520</td>
<td>16,416,967 (+1.4%)</td>
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<td>3.7</td>
<td>2012-12-11</td>
<td>40,905</td>
<td>16,191,784 (+1.4%)</td>
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<tr>
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<td>39,733</td>
<td>15,868,122 (+1.7%)</td>
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<tr>
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<td>15,596,464 (+1.4%)</td>
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<tr>
<td>3.4</td>
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<td>38,566</td>
<td>15,383,946 (+1.4%)</td>
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<tr>
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<td>38,082</td>
<td>15,166,160 (+1.1%)</td>
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<tr>
<td>3.2</td>
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<td>37,617</td>
<td>14,998,737 (+1.5%)</td>
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<tr>
<td>3.1</td>
<td>2011-10-28</td>
<td>37,085</td>
<td>14,770,555</td>
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Released 60-70 days

500 Files, 200K Lines of code added for a version