



Linux kernel selection guide for production use

Tsugikazu SHIBATA, NEC

2nd June 2015

Automotive Linux Summit@ Chinzan-sou

Who am I



Tsugikazu Shibata, NEC

Project lead of LTSI

Member of CEWG

Member of the board of the Linux Foundation

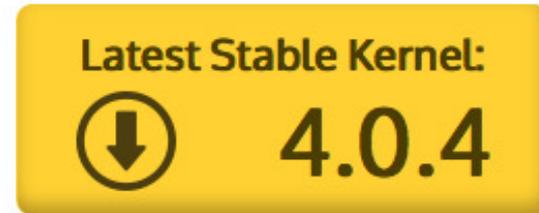
Contents

- Linux Development process and status
- LTS and other choice of kernel
- Introduction of LTSI Project

Status of Latest Linux Kernel



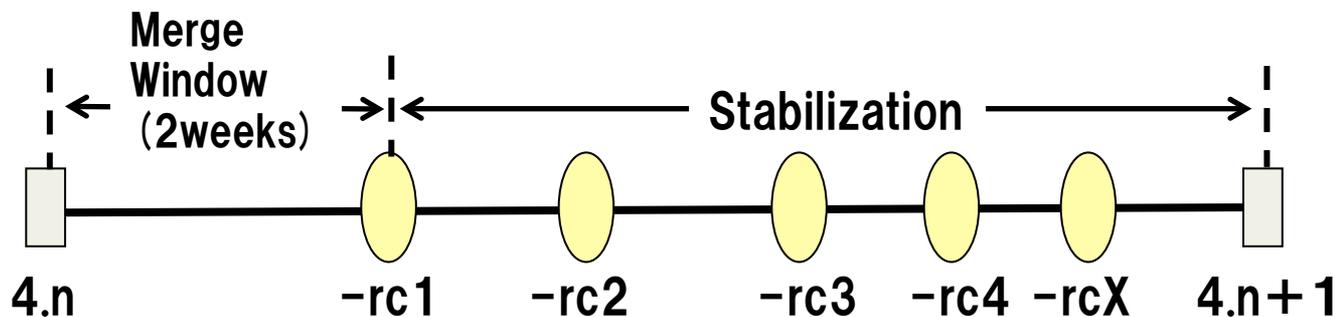
- Latest released Kernel : 4.0
 - Released in April 12th
 - Lines of code : 19,312,477
 - Files : 48,945
- Latest Stable Kernel: 4.0.4
- Current development kernel: 4.1-rc6



Kernel version is being 4.0

Linux Development process

- Just after the release of 4.n, two weeks of merge window will be opened for proposal of new features
- After 2 weeks of merge window, -rc1 will be released and the stabilization will be started
- 4.n+1 will be released when it becomes reasonably stable by some of -rcX released



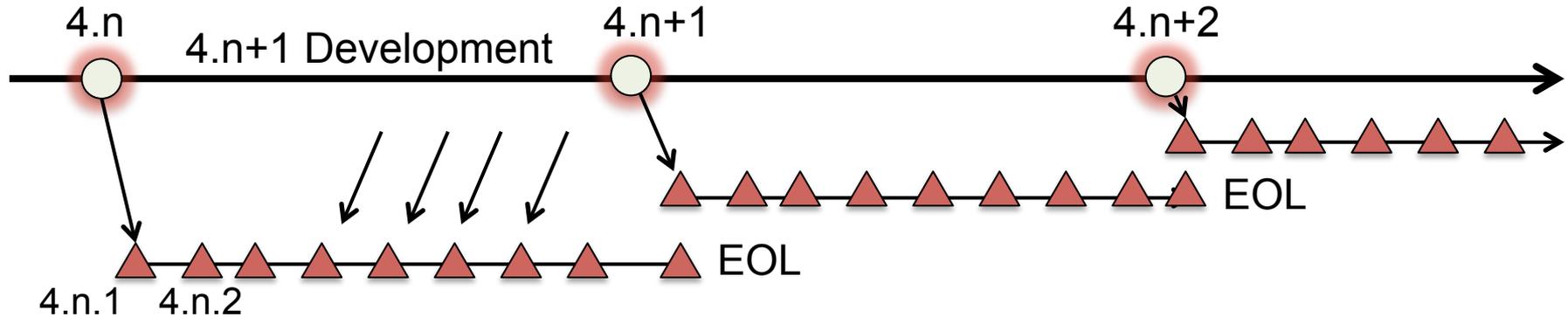
Kernel release cycle

- Release cycle of Linux kernel is about 65days

Version	Release	Duration
3.0	2011-7-21	
3.1	2011-10-24	95
3.2	2012-1-4	72
3.3	2012-3-18	74
3.4	2012-5-20	63
3.5	2012-7-21	62
3.6	2012-9-30	71
3.5	2012-12-10	71
3.8	2013-2-18	70
3.9	2013-4-28	69
3.10	2013-6-30	63

Version	Release	Duration
3.11	2013-9-2	64
3.12	2013-11-15	74
3.13	2014-1-21	67
3.14	2014-3-30	68
3.15	2014-6-8	70
3.16	2014-8-3	56
3.17	2014-10-5	63
3.18	2014-12-7	63
3.19	2015-2-9	64
4.0	2015-4-12	62

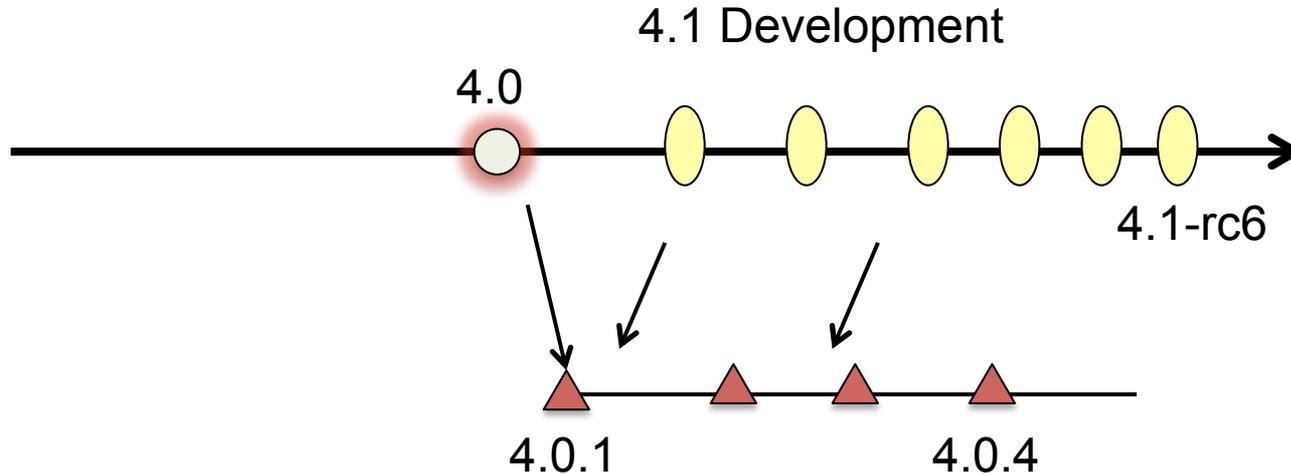
Stable kernel release



- Recommended branch for users who want the most recent stable kernel
- 3 part version like 4.n.m
- Back port small and critical fixes and security problems discovered in a latest development version
- Becomes End Of Line when next stable kernel will be released

Status of Latest Linux Kernel Again

- Latest released Kernel : 4.0
- Latest Stable Kernel: 4.0.4
- Current development kernel: 4.1-rc6



Stable_kernel_rules.txt

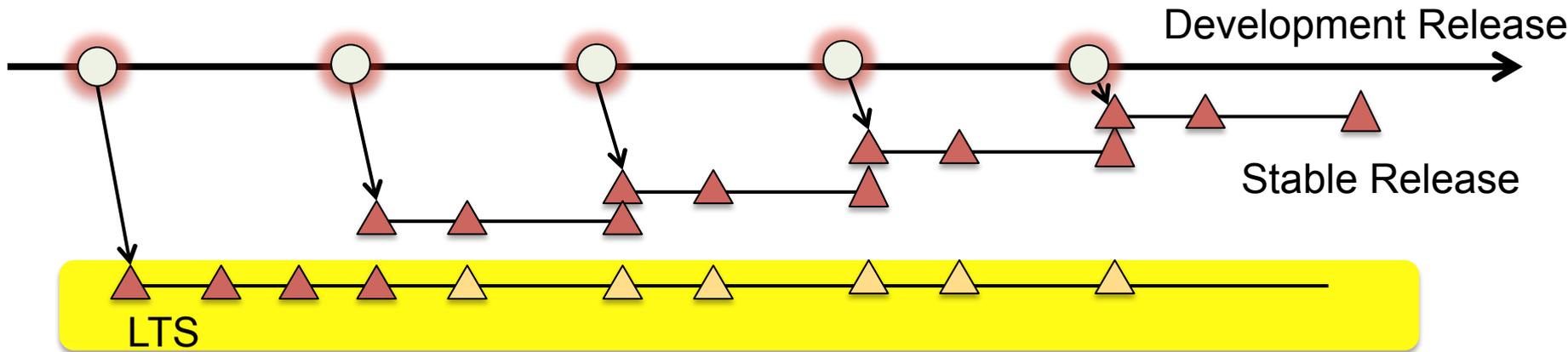
- Published in 2006. Strict rule to back port from latest version

See Documentation/stable_kernel_rules.txt

- It must be obviously correct and tested.
- It cannot be bigger than 100 lines, with context.
- It must fix only one thing.
- It must fix a real bug that bothers people.
- It must fix a problem that causes a build error, an oops, a hang, data corruption, a real security issue, In short, something critical.
- Serious issues as reported by a user may also be considered.
- New device IDs and quirks are also accepted.
- No "theoretical race condition" issues, unless an explanation of how the race can be exploited is also provided.
- It cannot contain any "trivial" fixes in it .
- It or an equivalent fix must already exist in Linus' tree (upstream).

LTS: Long Term Stable Kernel

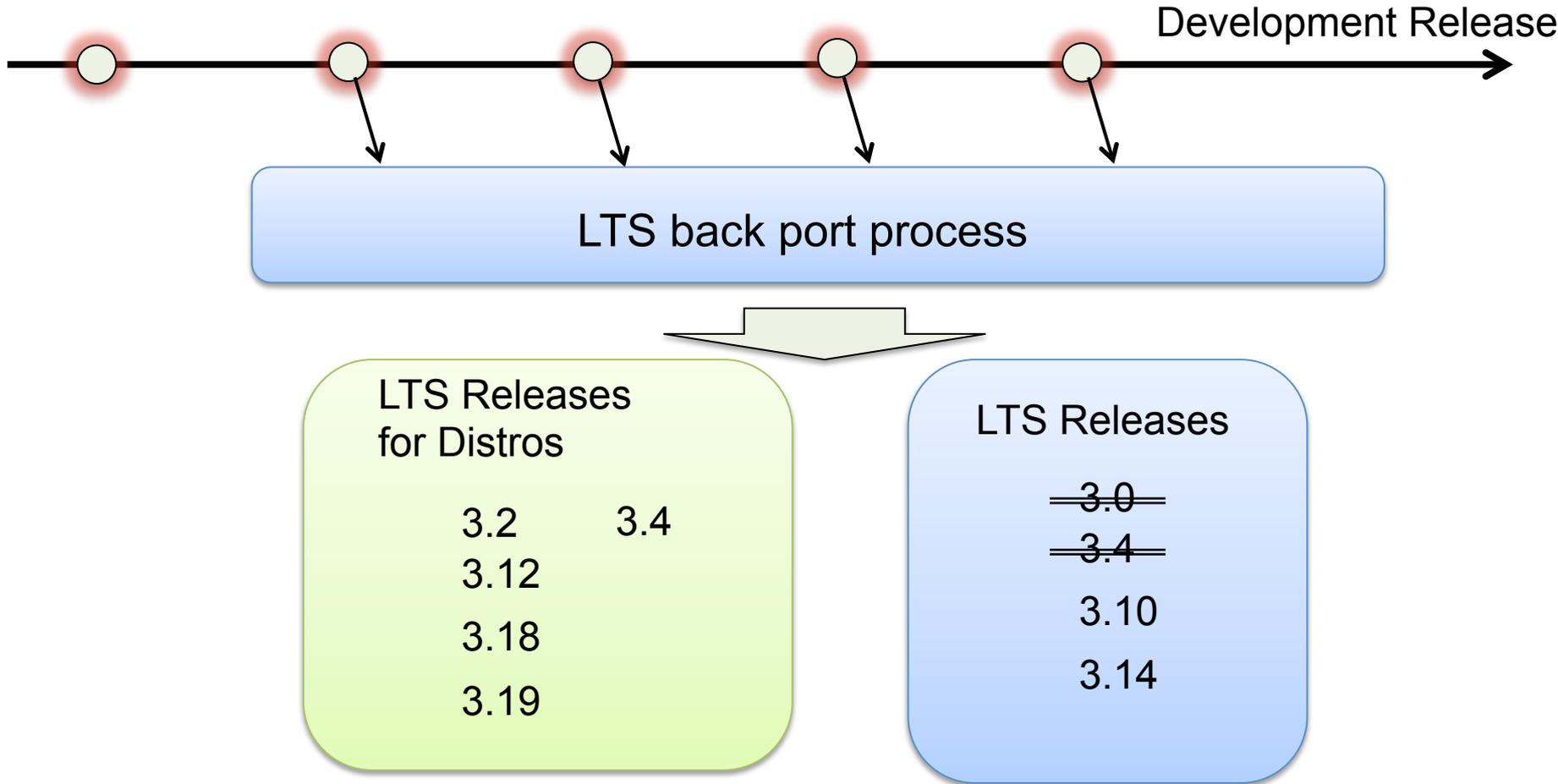
- Extended maintenance period for stable kernel
- Pick one version per year and maintain 2 years
- Bug and security fixes found in latest version are continued to back ported into LTS



Current LTS versions

Version	Maintainer	Released	Projected EOL
3.19	Kamal Mostafa	announced	July, 2016
3.18	Sasha Levin	2014-12-07	Jan, 2017
3.14	Greg Kroah-Hartman	2014-3-30	Aug, 2016
3.12	Jiri Slaby	2013-11-3	2016
3.10	Greg Kroah-Hartman	2013-6-30	Sep, 2015
3.4	Li Zefan	2012-5-20 (2014-9-4)	Sep, 2016
3.2	Ben Hutchings	2012-1-4	2016
2.6.32	Willy Tarreau	2009-12-3	Mid-2015

LTS back port process



LTS includes large number of fixes

- 600 – 700 fixes included in a Stable release
- LTS include fixes multi number of stable releases

As of 2015/5/26

Version		# of commits
From	To	
3.0	3.0.101	3953 (EOL)
3.1	3.1.10	695 (EOL)
3.2	3.2.69	6049
3.3	3.3.8	698 (EOL)
3.4	3.4.107	5210
3.5	3.5.7	816 (EOL)
3.6	3.6.11	757 (EOL)
3.7	3.7.10	718 (EOL)
3.8	3.8.13	996 (EOL)
3.9	3.9.11	746 (EOL)

Version		# of commits
From	To	
3.10	3.10.79	4564
3.11	3.11.10	677 (EOL)
3.12	3.12.43	4885
3.13	3.13.11	903 (EOL)
3.14	3.14.43	3354
3.15	3.15.10	703 (EOL)
3.16	3.16.7	871 (EOL)
3.17	3.17.8	884 (EOL)
3.18	3.18.14	1444
3.19	3.19.8	873

Number of yearly commits on LTS



LTS Version	2012	2013	2014	2015	Total
3.4	1636	1769	1233	359	5210
3.10		1724	2060	588	4564
3.14			2401	876	3354

As of 2015/5/26

1700 ~ 2000 of commits were back ported from latest upstream version into LTS.

Comparison of kernel releases

Upstream	Stable release	LTS
Latest version	Most recent version	1 release/year
Update ~65 days	Become EOL, next version released (~65days)	2 years lifetime
Bug/security fix	Bug/security fix are back ported	Bug/security fix are continue to back ported

What about new features



- New features or new drivers are merging into latest upstream
- LTSI kernel is providing a chance to merge new features on top of LTS
 - Enhanced drivers
 - Important features for industry use
 - New tools related to kernel: Ktap

Note: Patches would be in upstream or at least maintainer accepted

Value of LTSI

- Add vendor required patch to LTS (LTSI kernel)
 - LTSI have own dev. process and git repos
 - Releasing yearly pace
 - LTSI kernel 3.10, 3.14 is available (3.0, 3.4 is EOL)
- Huge testing and Auto test framework
- Share information among companies and help developers for upstream

LTSI 3.14 Kernel history

Items	Date
kernel 3.14 merge window open kernel	2014.1.20
3.14 merge window close	2014.2.2
kernel 3.14 release	2014.3.30
3.14 becomes LTS	2014.8.3
Announce of 2014 LTSI kernel version	2014.8.4
LTSI-3.14 merge window open	2014.8.28
patch collection period	78 days
LTSI-3.14-rc1 (=merge window close)	2014.11.14
validation period	56 days
LTSI-3.14 release	2015.1.9

Achievements for LTSI 3.14



- Common:
 - ktap 0.4, a lightweight script-based dynamic tracing tool
- x86:
 - Intel Low Power Sub-system (LPSS) PWM, found in Intel Baytrail & Braswell SoC.
 - I2C/SMBus i801, added PCI Device ID for Intel Baytrail, Braswell & Intel Wildcat Point (PCH).
 - supports PCI enumeration for Intel Braswell SoC and Intel 9 Series PCH
 - iTCO v3 support for Intel Avoton SoC.
 - GPIO support for Intel Avoton SoC, Panther Point PCH and NM10 chipset
- ARM:
 - Renesas R-CarH2 Lager Board and R-CarM2 Koelsch board

Testing kernel

- LTSI patch set is tested by contributors and result will be shared in the mailing list
- Automated test frame work
 - Fully automated execution using Jenkins
 - Web based GUI to see what's happend
 - 28 bench marks and 33 major test packages included
 - Now implementation of CI is on going

LTSI Auto Test Framework



The screenshot shows the Bitbucket repository page for 'cogentembedded/jta-public'. The interface includes a navigation sidebar on the left with options like 'Overview', 'Source', 'Commits', 'Branches', 'Pull requests', 'Issues', 'Wiki', and 'Downloads'. The main content area is titled 'Overview' and displays repository statistics: Last updated (2014-07-31), Language (—), Access level (Read), 9 Branches, 0 Tags, 0 Forks, and 1 Watcher. Below this, there is a code block for 'Jenkins-based Test Automation' with sections for '0. Software requirements' (Debian Wheezy 64-bit) and '1. Installing' (instructions for running a script and installing toolchains). On the right, there is a 'Recent activity' section showing three commits with their commit hashes and descriptions.

Atlassian Bitbucket Features Pricing owner/repository ? English Sign up Log in

cogentembedded
jta-public

ACTIONS

- Clone
- Compare
- Fork

NAVIGATION

- Overview
- Source
- Commits
- Branches
- Pull requests
- Issues
- Wiki
- Downloads

Overview

Last updated	2014-07-31	9	0
Language	—	Branches	Tags
Access level	Read	0	1
		Forks	Watcher

```
Jenkins-based Test Automation
-----
0. Software requirements
-----
Debian Wheezy 64-bit.

1. Installing
-----
run ./debian_install.sh under root, asnwer simple questions.

It will install all the needed packages.

Install toolchains for needed platforms to /home/jenkins/tools and add them to tools.

See jta-guide.pdf for details.

2. Usage
```

HTTPS https://bitbucket.org/cogentembedd

Unlimited private and public hosted repositories. Free for small teams!

Sign up for free

Recent activity

- 2 commits
Pushed to cogentembedded/jta-public
7cfe53 jobs: FE: add renesas jobs for te...
38e2fef tests: add renesas tests (backend)
4da · 2014-08-01
- 1 commit
Pushed to cogentembedded/jta-public
828393b tests: exit 1 -> build error for buil...
4da · 2014-07-26
- 1 commit
Pushed to cogentembedded/jta-public
1074c60 scripts: add build_failed function ...

<https://bitbucket.org/cogentembedded/jta-public/>

Share

- LTSI have mailing list, wiki, web and twitter for the communication
- F2F meeting at Linux Foundation event
- Help developers to upstream their code

LTSI and LTS

LTSI

LTS

- ❑ Release 1 version / year,
Maintain 2 years
- ❑ Back port bug /security fixes
frequently
- ❑ Add vendor required patches
- ❑ Huge testing and Auto test frame work
- ❑ Share information and Help developers
for upstream

Conclusion

- Several choice of kernel:
 - Latest upstream
 - Stable release
 - LTS
- For industry use of kernel, longer lifetime and security fix are mandatory requirements
- LTSI providing additional value
 - Additional patches, testing, share information

You can participate LTSI



- Follow on Twitter account:

@LinuxLTSI



LinuxLTSI

@LinuxLTSI

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

- 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>

THANK YOU

