LTSI Project update

Long Term Support Initiative

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at Open Source Summit Japan, Ariake Tokyo

Linux = Open Source project

- Linux is one of the most successful Open Source project
- Continue growing in 27 years ; expanding adoption for new area;
  - IT enterprise, Cloud, Network, Smart Phone, Robotics, Embedded, IoT and many others
- Developing and delivering under GPLv2

Developed by the community

- Participating ~1700 developer, ~230 companies every releases

- Growing yearly 1.5Mlines of code, 4000 files increased

- 27 Years of history

- Maintainers have great skill to manage the subsystem and professional knowledge of its area of technologies

Status of Latest Linux Kernel

- Latest released Kernel : 4.17
  - Released: June 3rd , 2018
  - Lines of code : 25,379,564   (-179,241)
  - Files : 61,332   (-1,661)
  - Developed period: 63 days from 4.16
- Current Stable Kernel: 4.17.2
- Current development kernel: 4.18-rc1

Kernel release cycle

- Release cycle: 65 ~ 70 days, 5~6 releases/year

Version	Release	Rel. span
3.19	2015-2-9	64
4.0	2015-4-12	62
4.1	2015-6-22	71
4.2	2015-8-30	69
4.3	2015-11-2	64
4.4	2016-1-10	68
4.5	2016-3-14	64
4.6	2016-5-15	63
4.7	2016-7-24	70
4.8	2016-10-2	70

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Version	Release	Rel. span
4.9	2016-12-11	70
4.10	2017-02-19	60
4.11	2017-04-30	80
4.12	2017-07-02	63
4.13	2017-09-03	63
4.14	2017-11-12	70
4.15	2018-1-28	77
4.16	2018-4-1	63
4.17	2018-6-3	63

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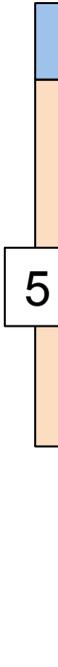
Linux development policy

- Upstream is only the place to accept the patches
  - Reviewed by skilled maintainer
  - Tested with other proposals to confirm no conflicts
 - Well coordinated development process for over thousands of developers

Upstream

New Features

Fixes
(Bug/Security)

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
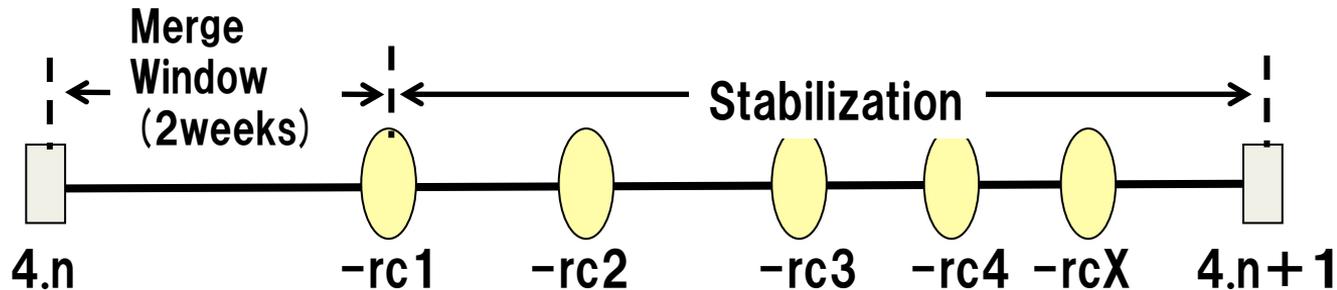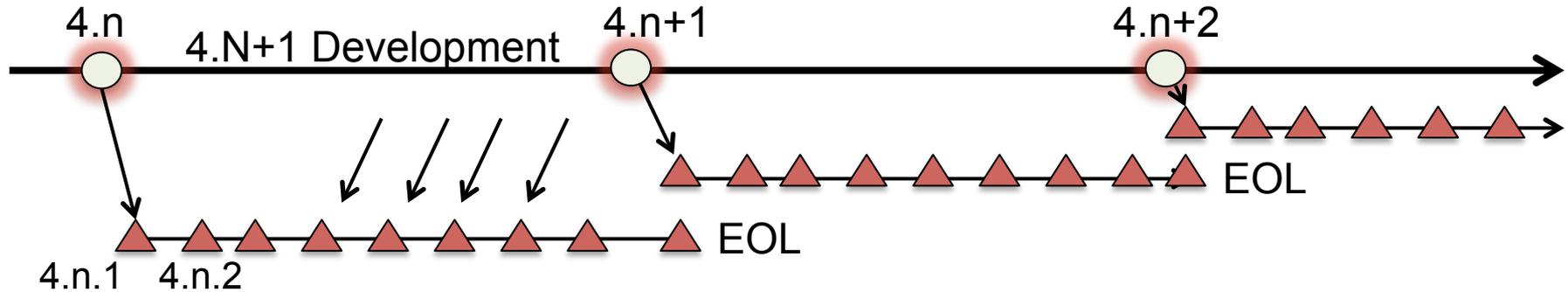
Linux Source Code Growth

- Increasing 0.3ML/Version, 1.5ML/year

Linux source code growth

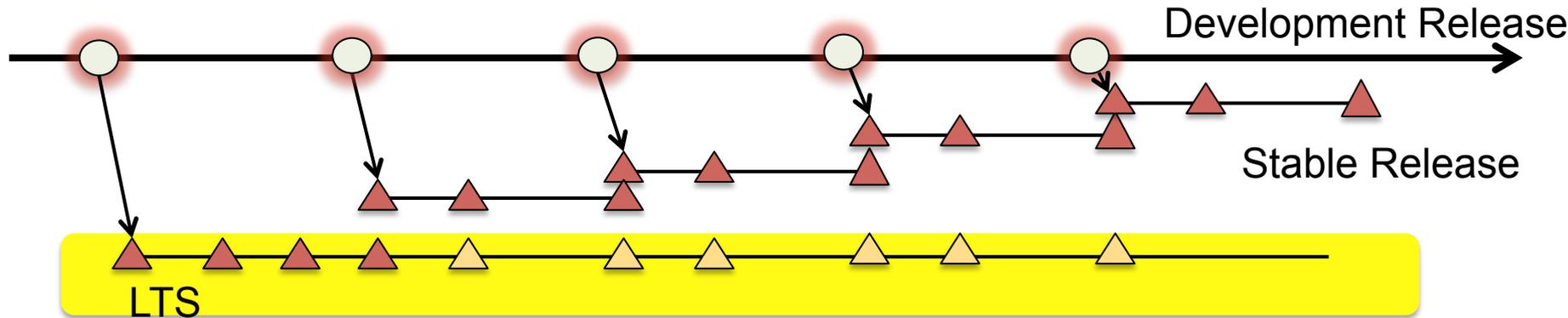# Stable kernel release

4.n 4.N+1 Development 4.n+1 4.n+2

4.n.1 4.n.2 EOL EOL
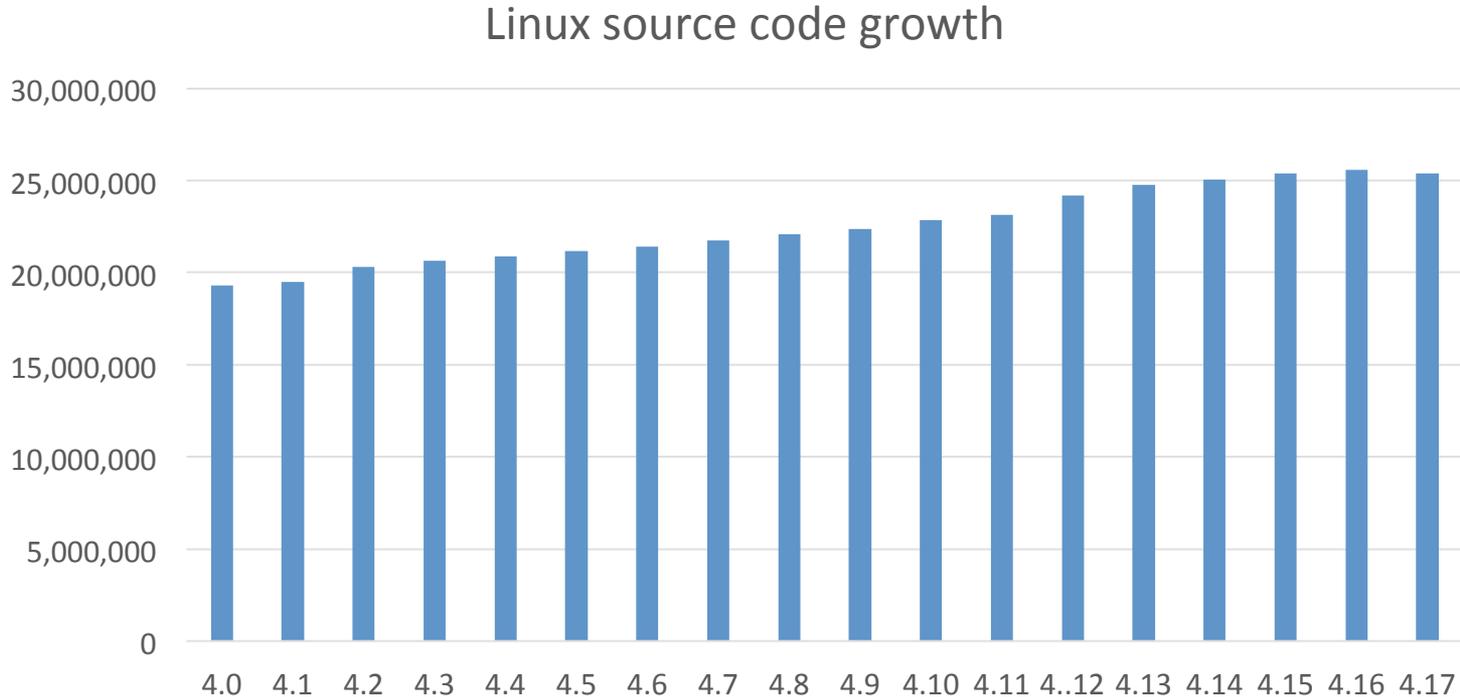
- Recommended branch for users who want the most recent stable kernel

- 3 part version like 4.n.m

- Contain small and critical fixes for security problems or significant regressions discovered in a latest development version

- Becomes "End Of Life" when next stable kernel were released

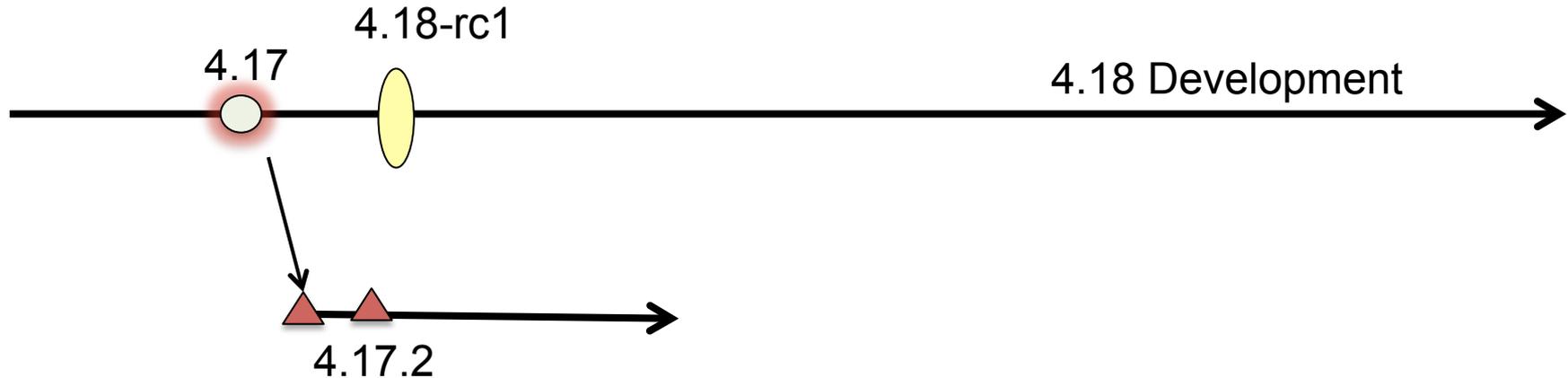# LTS: Long Term Stable Kernel

- Extended maintenance period for stable kernel
- Kernel tree continue to back port bug and Security fixes for more long term
- Pick one version per year and maintain 2 years

Status of Latest Linux Kernel Again

- Latest released Kernel : 4.17

- Current Stable Kernel : 4.17.2

- Current development kernel : 4.18-rc1

4.18-rc1

4.17

4.18 Development

4.17.2

Why LTS?

- Only the tree get fixes from the community

- In the real use case, tested/confirmed kernel is important, less important for new features

- Security/Bug Fixes will be released weekly or more and that should be applied

- LTS will be released around November/December time frame for easier for planning

Current LTS versions

Version	Maintainer	Released	Projected EOL	Years
4.14	Greg Kroah-Hartman	2017-11-12	Jan, 2020	2
4.9	Greg Kroah-Hartman	2016-12-11	Jan, 2019	2
4.4	Greg Kroah-Hartman	2016-01-10	Feb, 2022	6
~~4.1~~	~~Sasha Levin~~	~~2015-06-21~~	~~May, 2018~~	~~3~~
3.16	Ben Hutchings	2014-08-03	Apr, 2020	6
~~3.2~~	~~Ben Hutchings~~	~~2012-01-04~~	~~May, 2018~~	~~6~~

https://www.kernel.org/category/releases.html

Support period of LTS Kernels
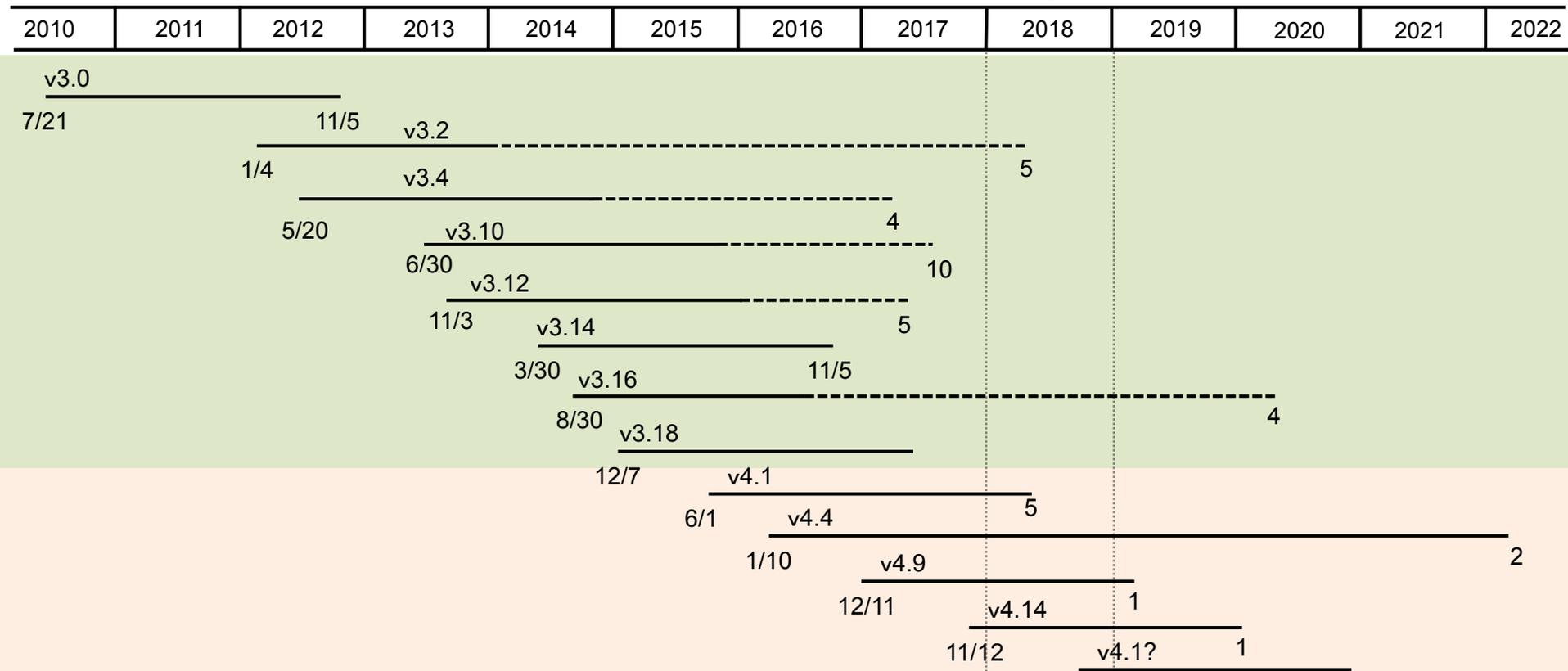
LTS includes large number of fixes

- 600 – 700 fixes included in a Stable release
- LTS include several thousands of fixes

As of 2018/06/07

Version FROM-TO		#Commits
3.2	**3.2.99**	**8531**
3.3	3.3.8	698
3.4	**3.4.113**	**5929**
3.5	3.5.7	816
3.6	3.6.11	757
3.7	3.7.10	718
3.8	3.8.13	996
3.9	3.9.11	746
3.10	**3.10.108**	**6705**
3.11	3.11.10	677

Version FROM-TO		#commits
3.12	**3.12.74**	**7746**
3.13	3.13.11	903
3.14	**3.14.79**	**4977**
3.15	3.15.10	703
3.16	**3.16.56**	**8437**
3.17	3.17.8	884
3.18	**3.18.112**	**6821**
3.19	3.19.8	873
4.0	4.0.9	757
4.1	**4.1.52**	**6695**

Version FROM-TO		#commits
4.2	4.2.8	903
4.3	4.3.6	618
4.4	**4.4.135**	**8516**
4.5	4.5.7	973
4.6	4.6.7	705
4.7	4.7.10	912
4.8	4.8.17	1102
4.9	**4.9.105**	**8212**
4.10	4.10.17	1136
4.11	4.11.12	984

Version FROM-TO		#commits
4.12	4.12.14	837
4.13	4.13.16	883
4.14	**4.14.47**	**4800**
4.15	4.15.18	1616
4.16	4.16.13	1267

LTS (red)
EOLed LTS (bold)
Stable

of Yearly fixes in LTS

- LTS include 1 ~ 3 thousands of fixes every year
- Continue to apply these patches are very important for the security viewpoint

As of 2018/5/7

Version	Maintainer	Released	Years maintained	Total Commits	Fixes/year
4.14	Greg Kroah-Hartman	2017-11-12	0.6	4800	4800
4.9	Greg Kroah-Hartman	2016-12-11	1.5	8212	5474
4.4	Greg Kroah-Hartman	2016-01-10	2.4	8516	3548
3.16	Ben Hutchings	2014-08-03	4.2	8437	2008

Overview of Meltdown and Spectre

Name	CVE	Solution in Linux	Note
Spectre V1 Bounds Check Bypass (Variant1)	CVE-2017-5753	Fixes for X86 and ARM Available. Driver need to do more	Back ported to LTS 4,4, 4.9, 4.14. ARM is different
Spectre V2 Branch Target Injection (Varinat2)	CVE-2017-5715	Fixes for X86 and ARM Available as Retpoline implementation	Back ported to LTS 4.14, 4.9, 4.4 Java script/Brower update may needed for side channel attack
Meltdown Rogue Data Cache Load (Variant3)	CVE-2017-5754	PTI(Page Table Isolation) X86 and ARM Fixes were different	Back ported to LTS 4.14, 4.9, 4.4

Please CHECK by yourself for the latest status, things are changing time by time.

Overview of Meltdown and Spectre

Name	CVE	Solution in Linux	Note
Rogue System Register Read (Variant3a)	CVE-2018-3640	Expects X86 only and need to update CPU Microcode.	Kernel fix for Metldown solve this problem
Speculative Store Bypass (Varinat4)	CVE-2018-3639	SSBD(Speculative Store Bypass Disable) handling ARM fixes not yet	Available for 4.9.102, 4.14.43, 4.16.11 Microcode update required for full protection
Lazy Floating point state restore (Variant5)		Linux kernel fixed in 2016	Details to be published June27

Please CHECK by yourself for the latest status, things are changing time by time.

Regular Kernel Update

- Meltdown/Spectre problem tell us
  - Security problem is #1 priority, need to provide immediate fixes
  - Area of fixes are unexpected so that sync with LTS is very important
  - Cherry picking patches are being difficult to confirm
    - Number of fixes will come later
- Applying ALL the LTS patches is the best way, cherry picking patches possibly have problem

Why all the patches?

- Patches are based on latest LTS kernel that is based on all patched source code

- If you applied cherry picked your preferred patches only, that will become not same as latest LTS and finally, newer important patch may not be applied
  - Because of rack of other patches

- Whole set of patches need to apply if you wanted to use your kernel for long term

Case of LTS 4.14

- 4.14 released in 2017-11-12, Now 4.4.50 is there
- Monthly 6 to 9 release happening for 4.14.x

- Monthly , Bi-monthly or quarterly kernel update may reasonable

# of releases for month

Month	4.4	4.9	4.14
2017/12	5	7	7
2018/1	6	6	6
2	5	6	7
3	7	7	9
4	4	5	6
5	5	8	9
6	3	4	3

As of 2018/06/18

What's the problem?

- Need to test new kernels for every LTS, it takes more cost and time to maintain
  - Use Automated test such as Fuego/KernelCI
  - Use common test suites and share the results
  - Make consensus of common tests and develop it
  - Continue to discuss further

Further discussion at LTSI Workshop

- Discuss about Applying patches of LTS and automated tests
  - Greg KH, Tim Bird, Kevin Hillman
  - AGL/CIP people
- Date: Friday 22nd June 2018
- Time: 10:30-12:00
- Venue: room 2

LTSI Status

What is LTSI

- Open Source community to create and maintain LTSI kernel tree for long term
  - Based on LTS, All the LTS patches are applicable
  - Add another chance to include further patches on top of LTS, That is LTSI tree
    - Self contained changes or future upstream code
    - Drivers for LTS, developed after LTS release
  - Industry party to share best practice and help companies to use Linux for long term
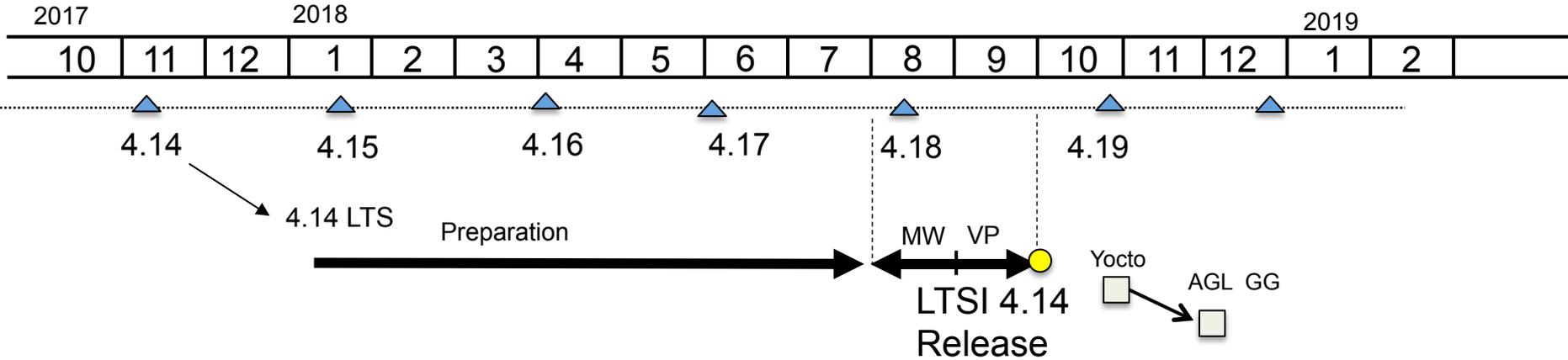
LTSI includes LTS

LTSI

- ☐ Be able to add required features on top of LTS
- ☐ Share status, info, problem among industry people
- ☐ Huge testing by contributors
- ☐ Auto test frame-work
- ☐ Provide help developer for upstream

LTS

- ☐ Release 1 version / year, Maintain 2 years
- ☐ Frequently and large number of bug /security fixes

LTSI 2018 Development plan

You will be able to have chance to add new patches on top of 4.14 in LTSI Merge Window
(Note: The patches should be already in –next or self contained)

Merge Window Open	Merge window Close	Validation Start	Release
August 1st	End of August	Right after Merge window closed	End of September

LTS for this year will be

4.20

Or Maybe 5.0

Note: if everything going fine

Conclusion

- Using LTS/LTSI is important for real use case
- Security fixes are more important and apply ALL the LTS patches may be a solution
  - Continue to discuss for a better shape

- Why don't you join LTSI?
  - By joining LTSI, you will be able to share best practice
  - Be able to get information for stable kernel

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

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

THANK YOU