

Status of Linux Kernel Development and Relationship with Industry

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NEC
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\$ who am i

- ✓ Tsugikazu Shibata
- ✓ OSS Promotion Center, NEC
- ✓ Member of the Board of The Linux Foundation
- ✓ Member of CEWG
- ✓ Fostering industry's developer
- ✓ Maintaining a Japanese version of documents in Linux kernel
 - ✓ ie. HOWTO at Documentation/ja_JP

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- Status of latest kernel
- Status of series of kernel development
- Status of Enterprise and Embedded distributions

Status of Latest Kernel

- Latest release: 2.6.39

Released: 19 May. 2011

- Latest mainline kernel version : 3.0-rc1

Released: 30, May. 2011

- Latest stable release:

2.6.38.7

2.6.37.6

Long-term stable release

2.6.27.59, 2.6.32.41, 2.6.33.14,

2.6.34.9, 2.6.35.13

Linux 2.6.39 status

Last release of 2.6 series

Released at: 19 May, 2011

Size of tar.bz2: 76,096,559
(=73MB)

of Lines: 14,533,662
(=13.8ML)

of Files: 36,706

Comparison with other software

- Linux source code tar ball is now bigger than GCC and Firefox!

Software	size of tar.bz2 (source code)
Linux-2.6.39	73MB
Firefox-4.0	63MB
GCC-4.6.0	68MB

of lines and % in 2nd directories

Linux-2.6.39:	Lines	%

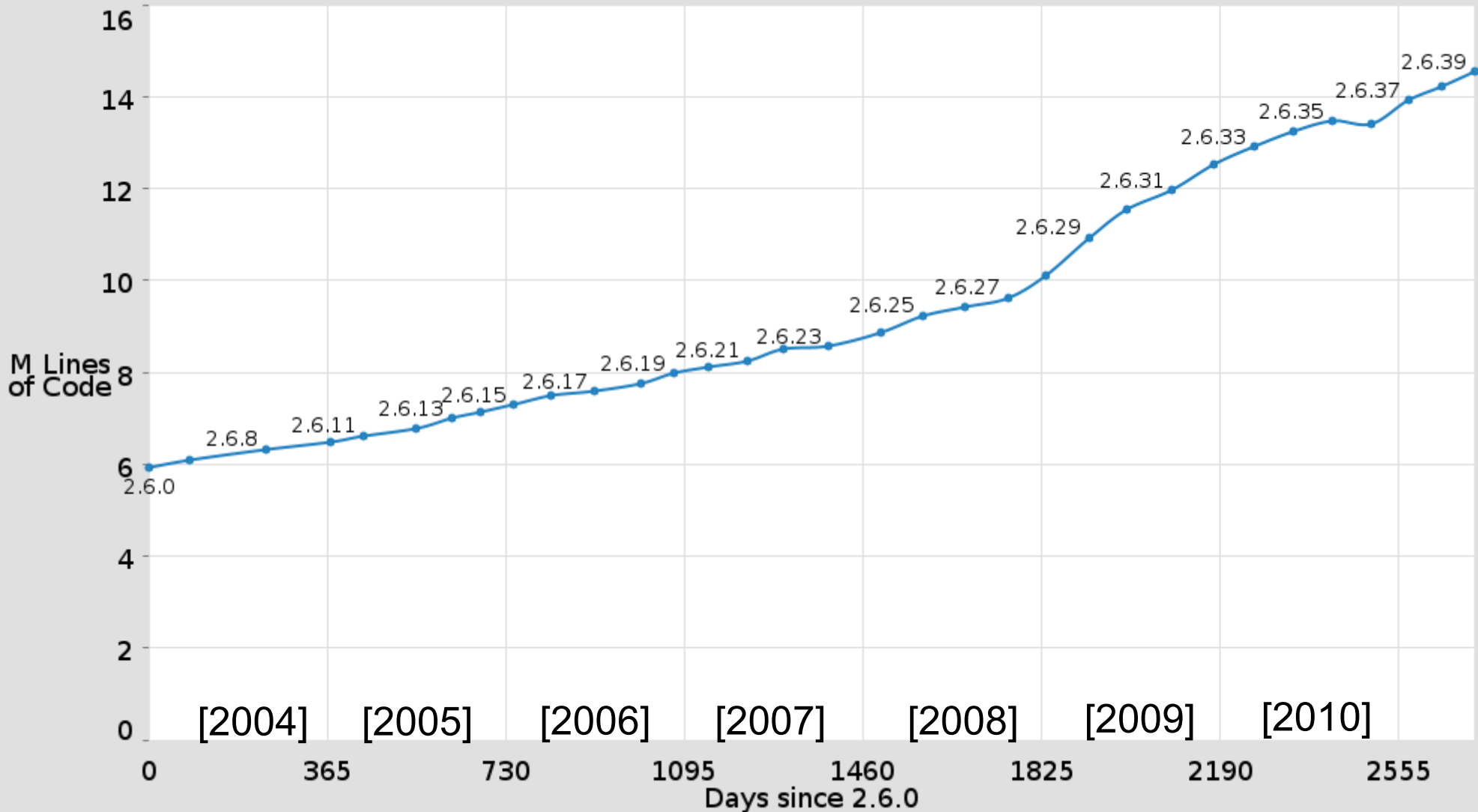
Drivers	7,763,205	53.42%
Arch	2,845,584	19.58%
Fs	984,240	6.77%
Net	680,972	4.69%
Sound	677,020	4.66%
Include	466,159	3.21%
Documentation	374,038	2.57%
Kernel	175,983	1.21%
Firmware	134,916	0.93%
Mm	82,502	0.57%
Scripts	69,695	0.48%
Tools	65,359	0.45%
Security	60,385	0.42%
Crypto	51,466	0.35%
Lib	45,780	0.31%
Block	21,483	0.15%
.	13,633	0.09%
Ipc	7,849	0.05%
Virt	5,974	0.04%
Init	4,512	0.03%
Samples	2,019	0.01%
Usr	888	0.006%
-----	-----	
Total:	14,533,662	100%

Status of series of Kernel development

Source code growth

- 0.8ML/year from 2004-2008, 1.8ML/year since 2009,
- Large code removal happened 2.6.23 and 2.6.36

Linux Kernel source line growth



of lines in each releases

Version	Lines	added	%

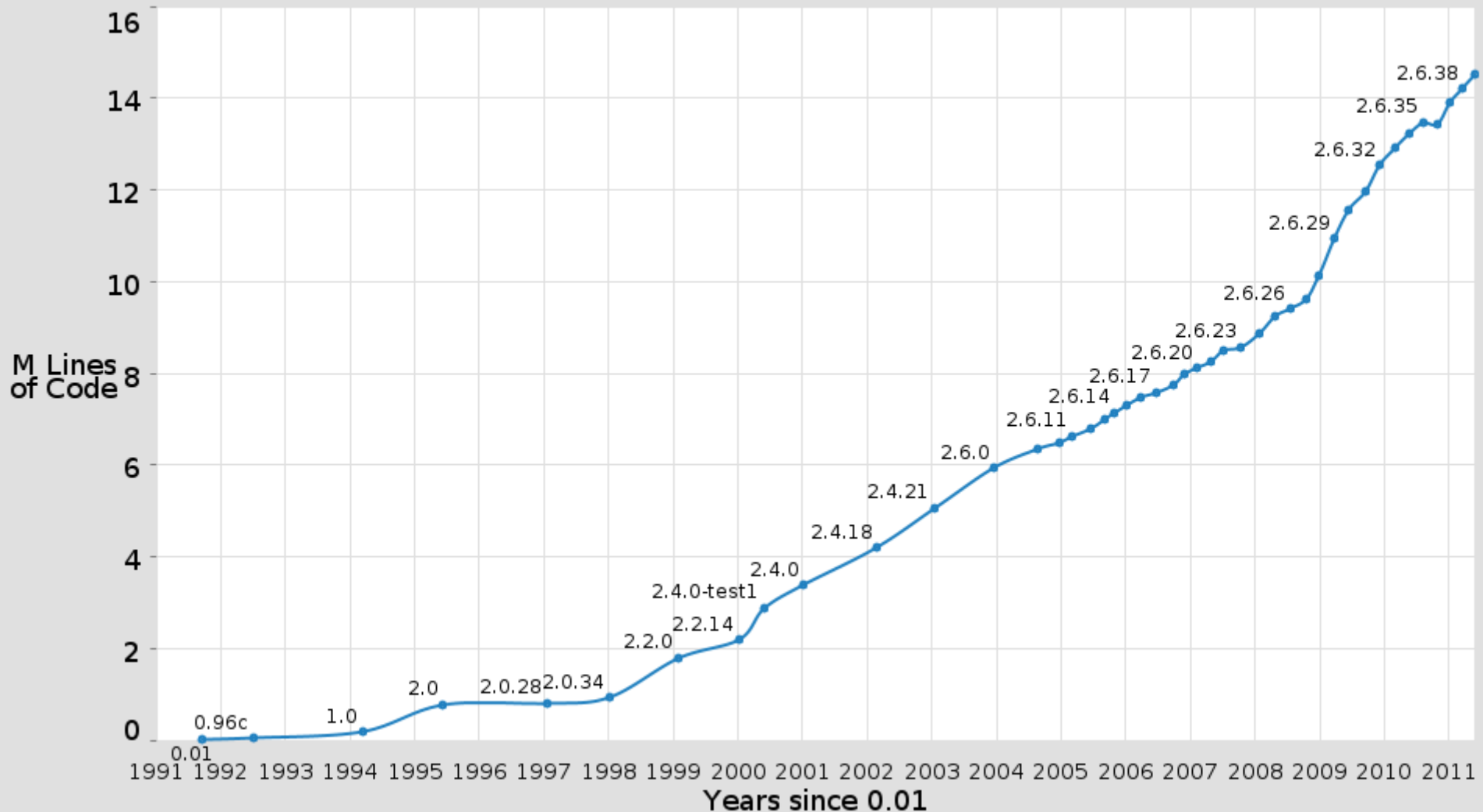
2.6.25	9,232,541	-	4.2%
2.6.26	9,411,790	179,249	1.9%
2.6.27	9,630,023	218,233	2.3%
2.6.28	10,115,662	485,639	5.0%
2.6.29	10,930,802	815,140	8.1%
2.6.30	11,557,329	626,527	5.7%
2.6.31	11,966,482	409,153	3.5%
2.6.32	12,530,196	563,714	4.7%
2.6.33	12,910,203	380,007	3.0%
2.6.34	13,241,101	330,898	2.6%
2.6.35	13,465,772	224,671	1.7%
2.6.36	13,419,556	-46,216	-0.34%
2.6.37	13,916,403	496,847	3.70%
2.6.38	14,208,946	292,543	2.10%
2.6.39	14,533,662	324,716	2.3%

Added : difference with previous release

This year is 20th anniversary of Linux

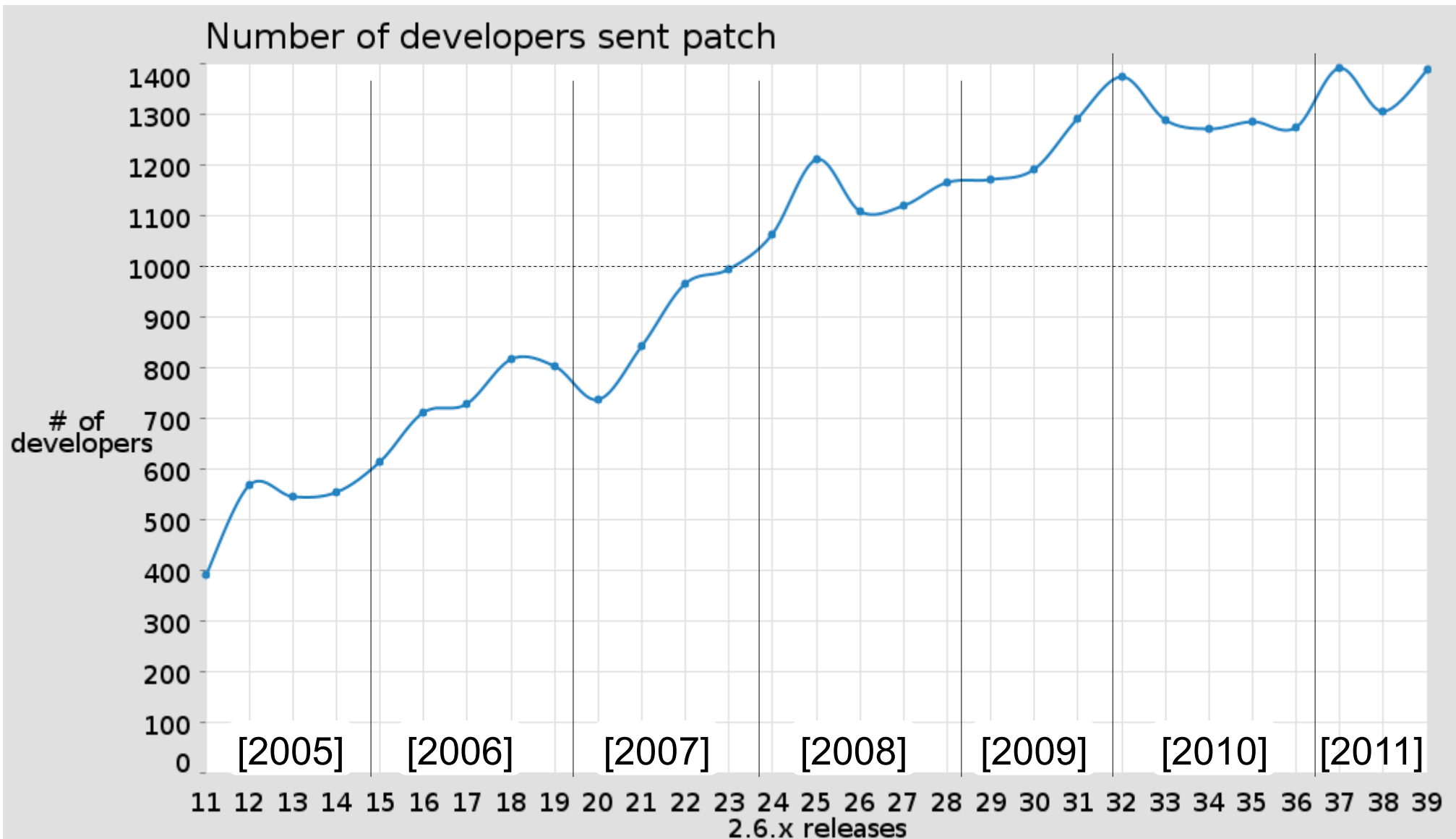
- Linux is growing with rapid pace and further acceleration is on going from 2009

Linux Kernel source line growth



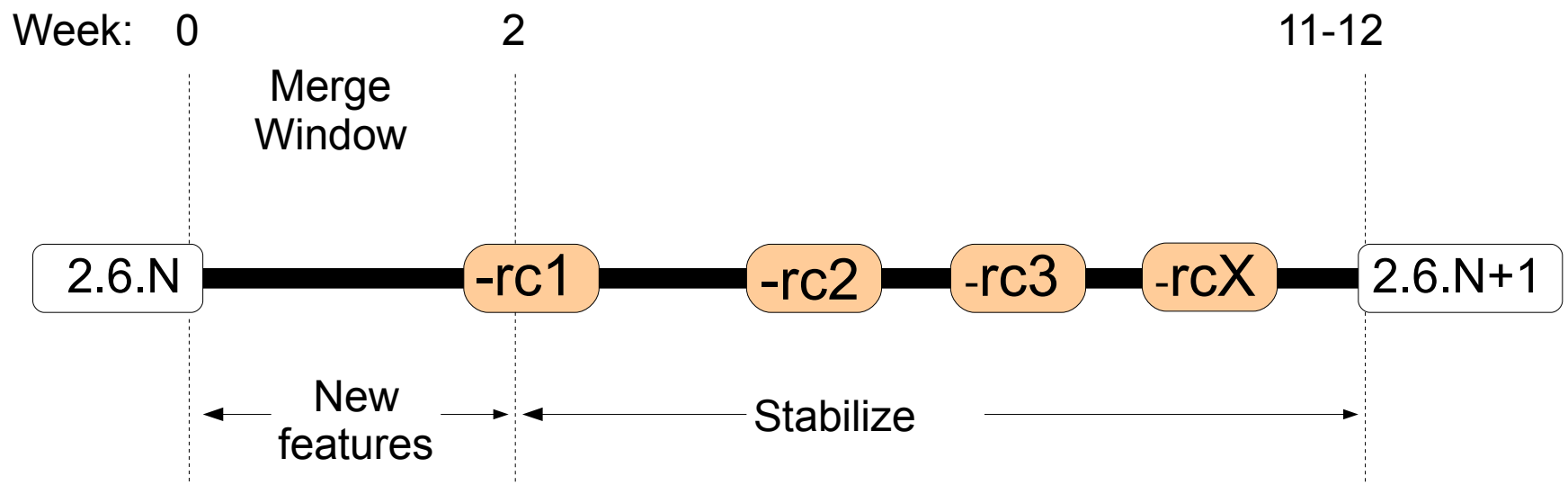
Number of developers sent patches

- More than 1000 of developers since 2.6.23
- Become average 1,300 developers this year



Development Process

- Merge window and Release candidates
 - 2 weeks of merge window just after kernel released
 - Each RC takes a week or 10 days, continue 8-9 times



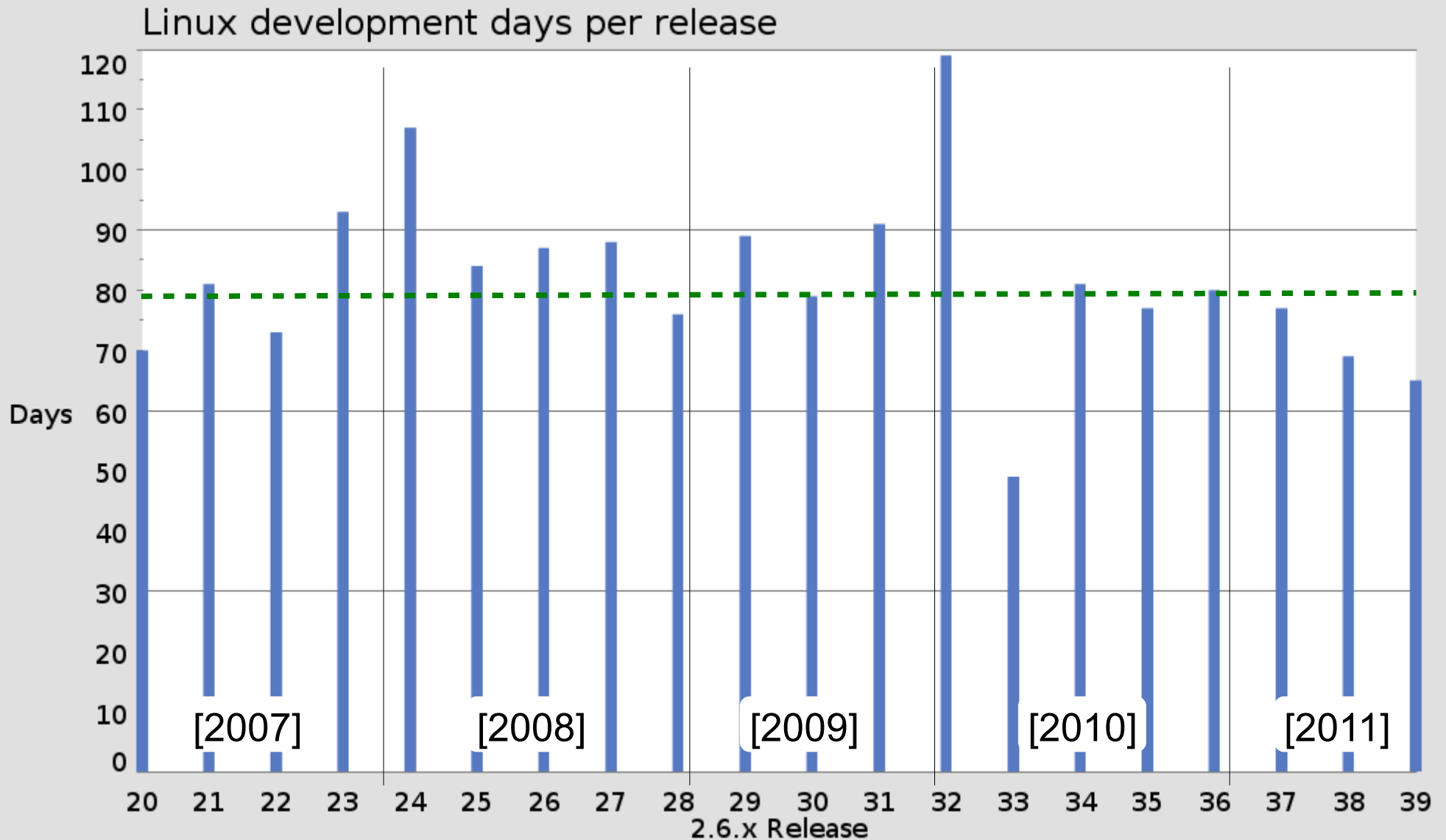
Days spend for each releases w/ RCs

Version	Days	-RC
2.6.26	87	- rc9
2.6.27	88	- rc9
2.6.28	76	- rc9
2.6.29	89	- rc8
2.6.30	79	- rc8
2.6.31	91	- rc9
2.6.32	85	- rc8
2.6.33	83	- rc8
2.6.34	81	- rc7
2.6.35	77	- rc6
2.6.36	80	- rc8
2.6.37	77	- rc8
2.6.38	69	- rc8
2.6.39	65	- rc7



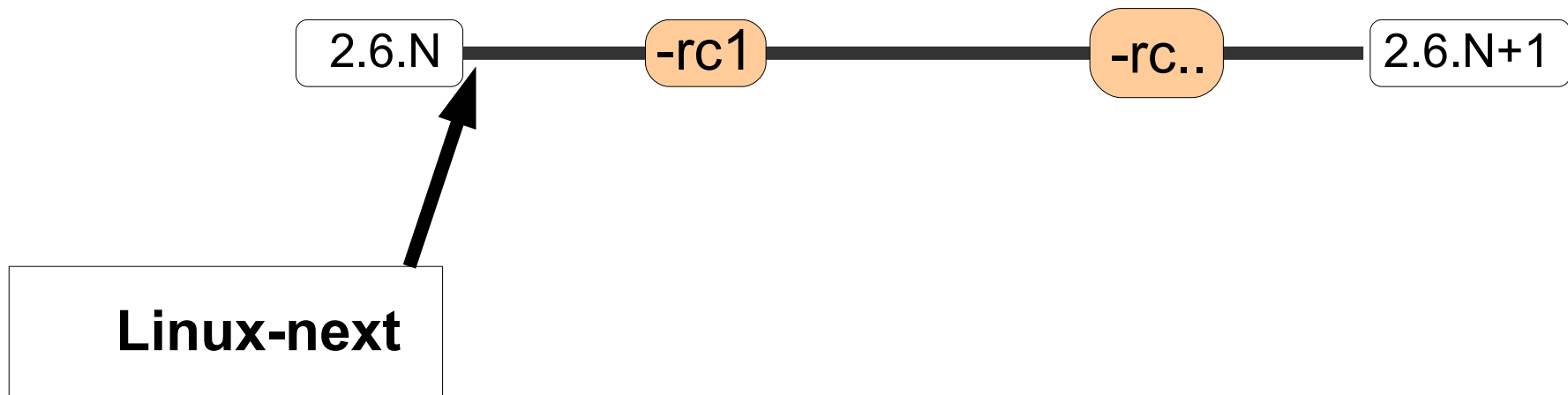
Days to develop each releases

- Average 73 days in last 4 releases
- Average 84 days in last 10 releases



Linux-next for next merge window

- Do automated build test to solve problem for next merge window
- Merging 190 of subsystem trees
- Maintainers get notification about build problems on almost daily basis
- Started from 2008



Mailing lists and subscribers

- VGER.KERNEL.ORG is portal of Linux kernel development community
 - There are 133 of mailing lists regarding to Linux

Subscribers of LKML

Date	Subscriber
2009/10	5,491
2010/9	5,591
2011/5	5,952

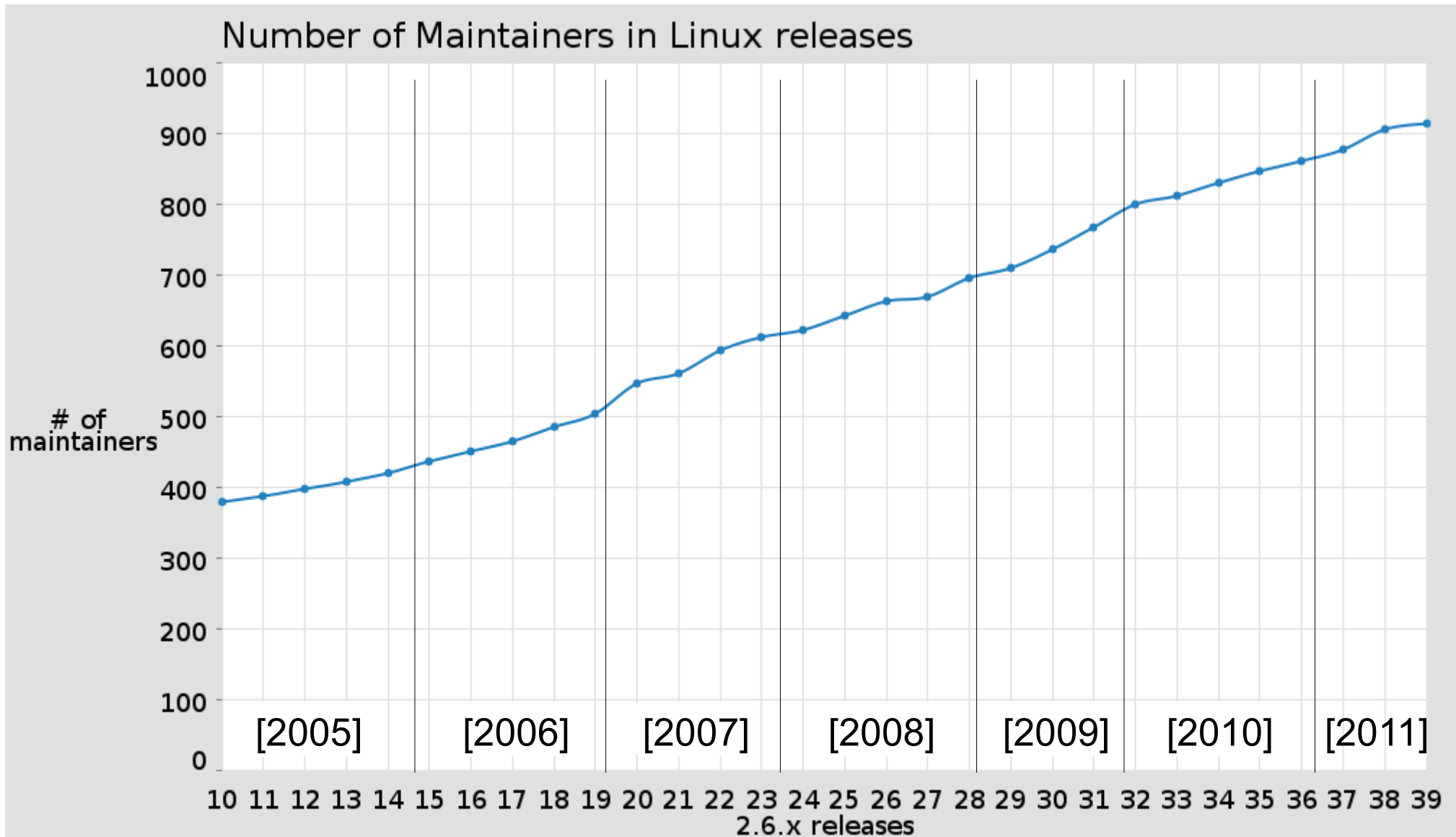
Subscribers of 133 mailing lists

Date	Subscribers
2009/10	31,594
2010/9	35,454
2011/5	37,102



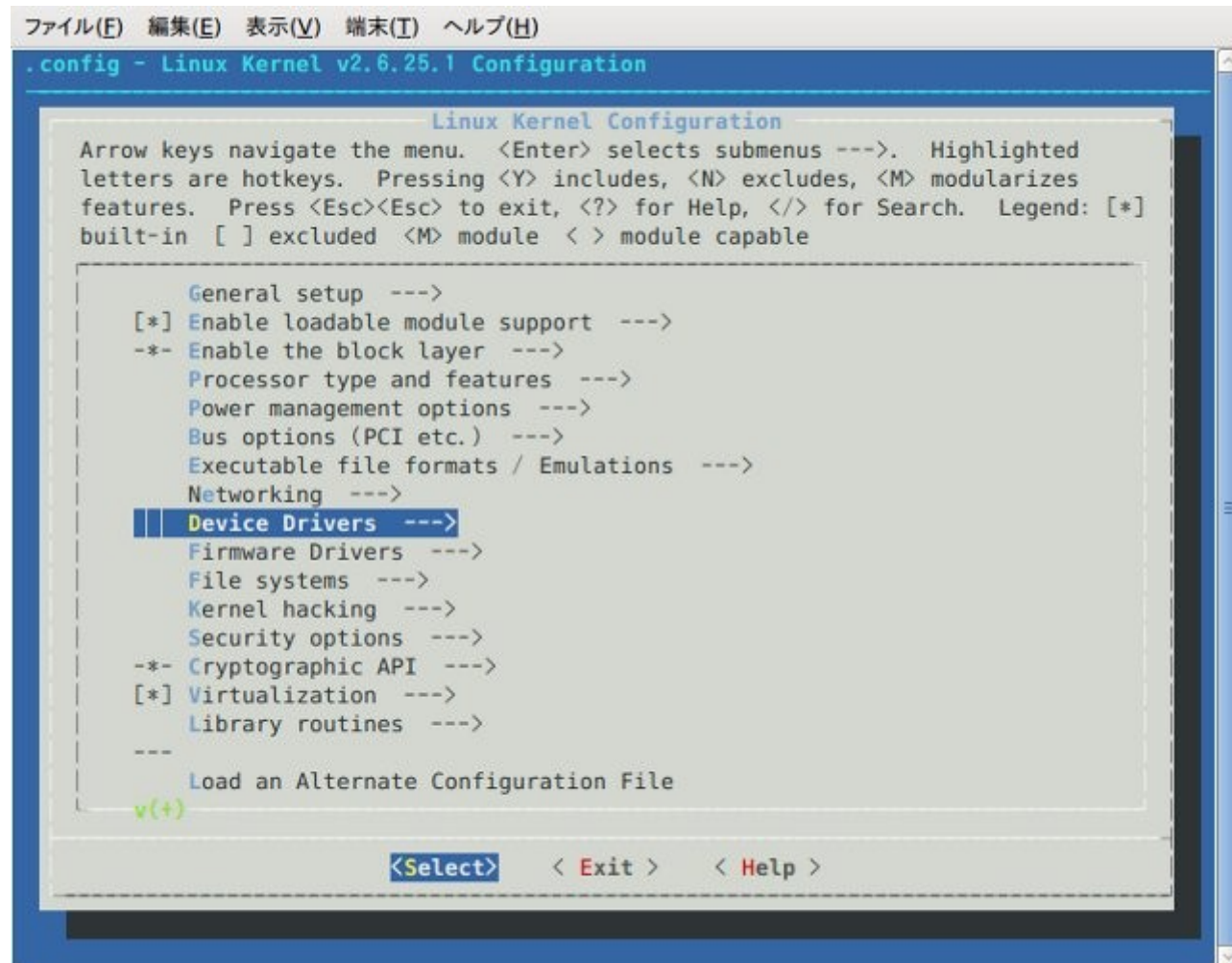
Number of MAINTAINERS

- 913 maintainers in 2.6.39



Choosing feature of Linux

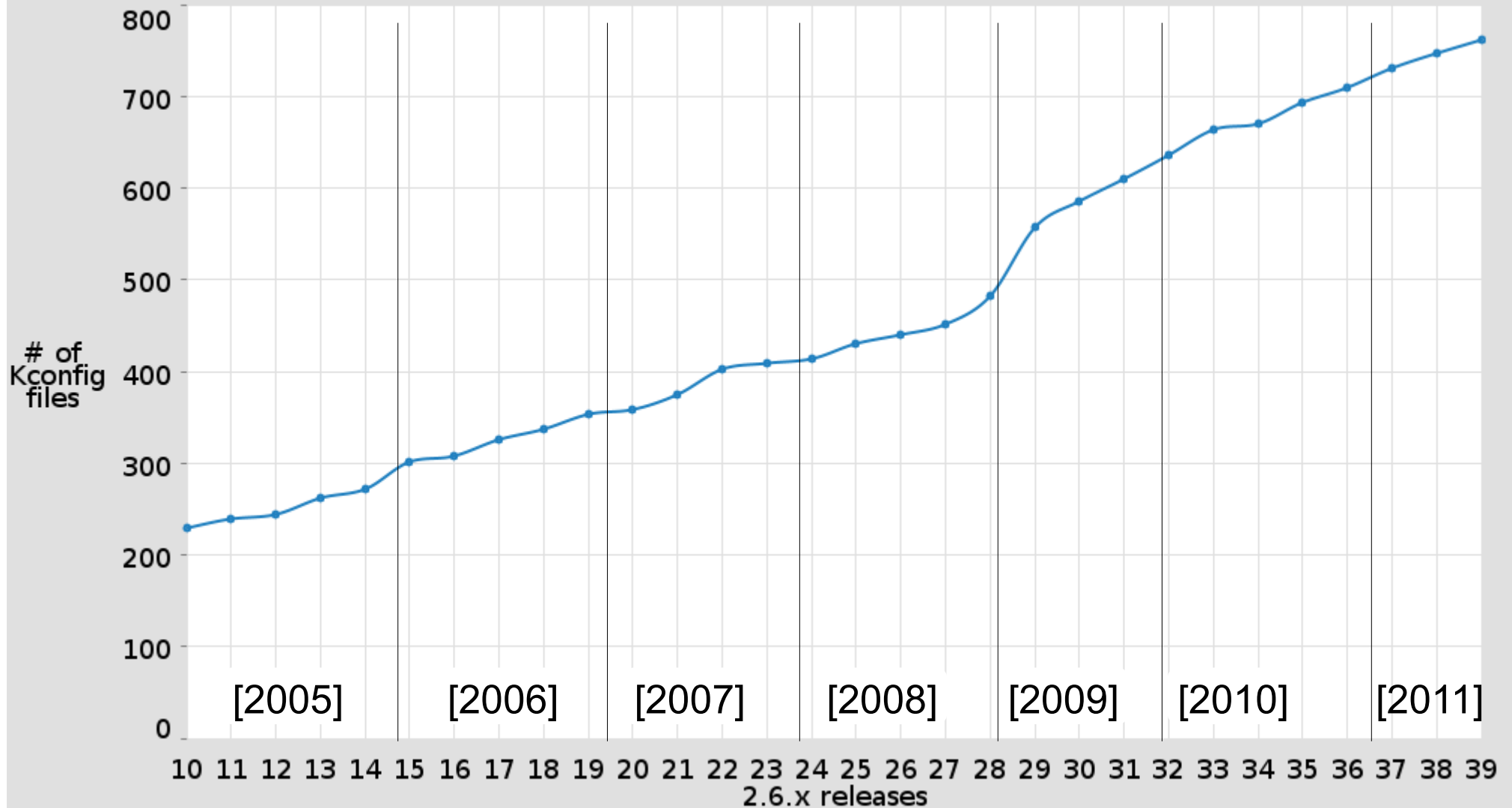
- Possible by using “make menuconfig” (or xconfig)
- There are 761 of Kconfig files in 2.6.39
- 11,447 of configuration items



Growth of configuration files

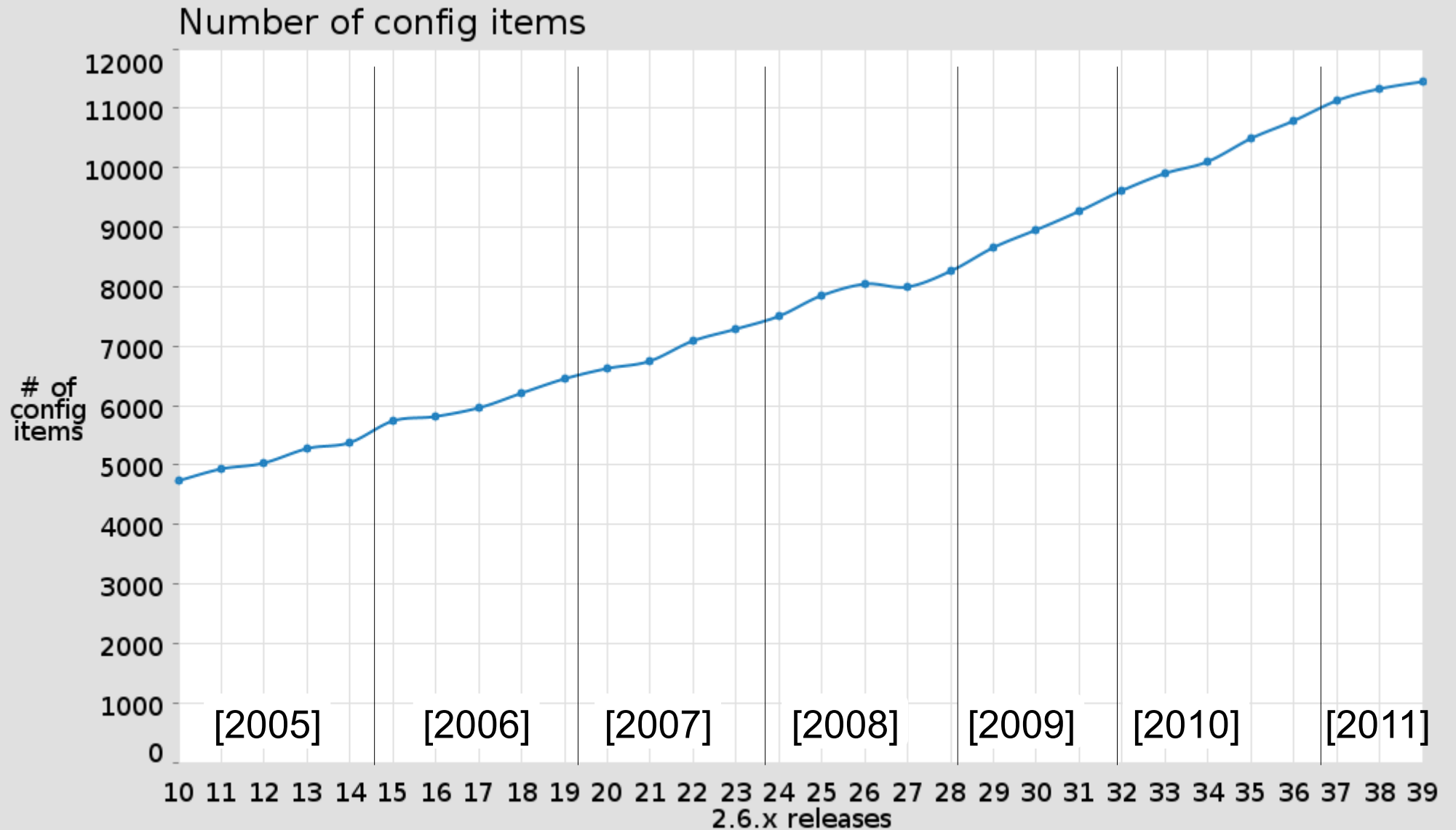
- 747 of configuration files in 2.6.39

Number of config file in each releases



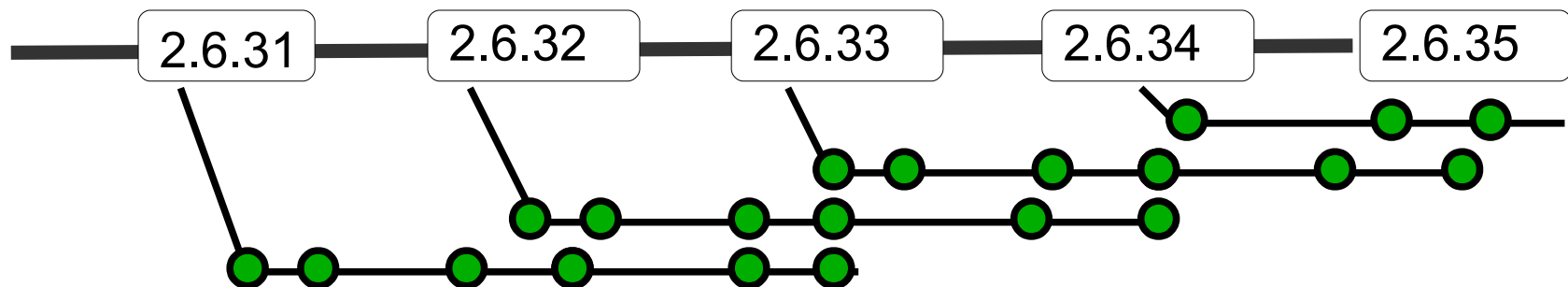
of configuration items

- 11,447 of configuration items in 2.6.39



Stable Release

- Stable kernel release only added security and significant regression fixes
 - Experimental feature will not be included
- 4 parts of version number
 - ie) 2.6.38.2
- Most latest two of stable kernels are maintained by stable team
- Recommended for the usage of most recent “stable” kernel



Long Term Stable Release

- There are some of “Long Term” stable release
- Many parties are using for their own purpose
- This is being a “Connection point” between community and industry

Latest Version	User/Purpose
2.6.27.59	OpenSUSE, Ubuntu, Mandriva
2.6.32.41	RHEL, SLES
2.6.33.13	-RT
2.6.34.9	Windriver Linux and others
2.6.35.13	MeeGo, CE Linux Fourm

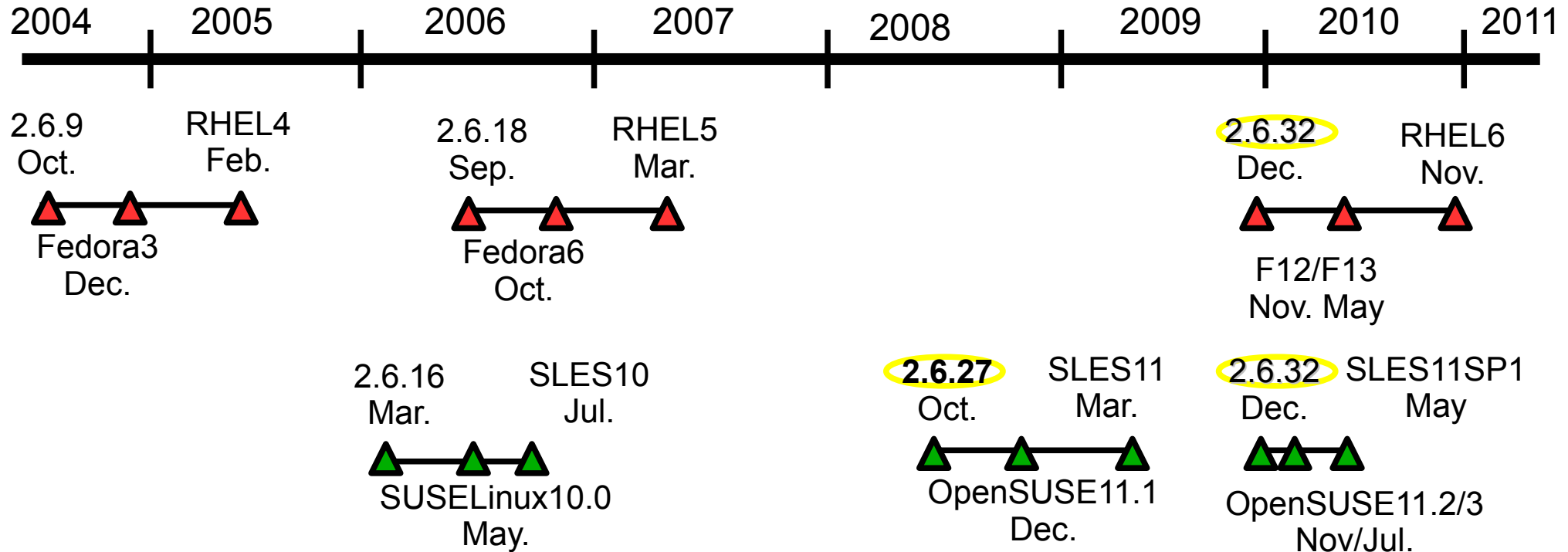
Summary

- 7 years of stable 2.6 kernel development process since 2004
- 1,300 of developers send patches in each releases within about 80 days
- Well coordinated development process; Linux-next, merge window, stable release
- Features can be chosen from its config item
- All those development is on going by large number of community participants and maintainers

Status of Enterprise and Embedded Linux Distributions

Linux upstream kernel and distros

- Enterprise distro take 9-12 months for the integration/ testing to provide commercial quality products from upstream Kernel
- Release period is about 3-4 years
- RHEL6 and SLES11 is using 2.6.32 LTS



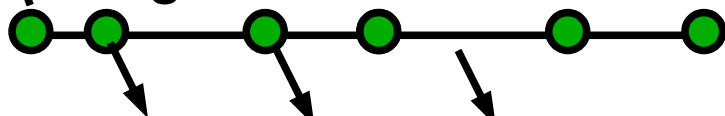
Keeping a kernel usable in 3-4 years

- Long-Term Stable Release is the great foundation for distro to stick same version

Upstream

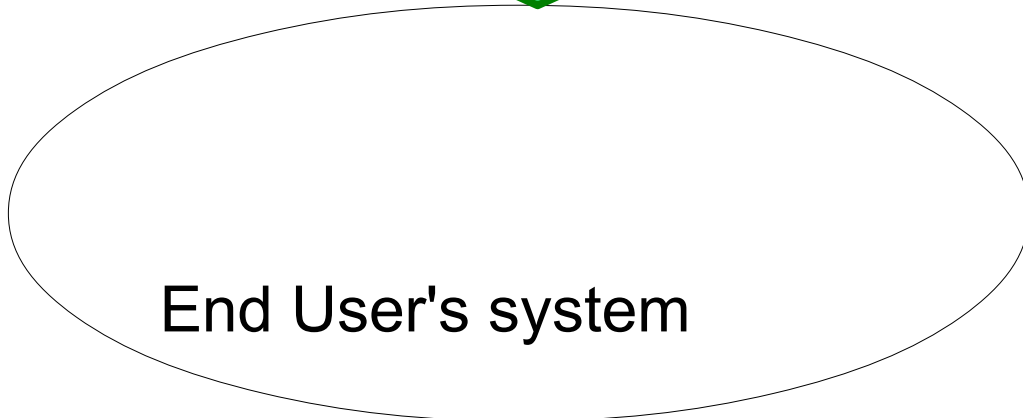


Long Term Stable release



Downstream

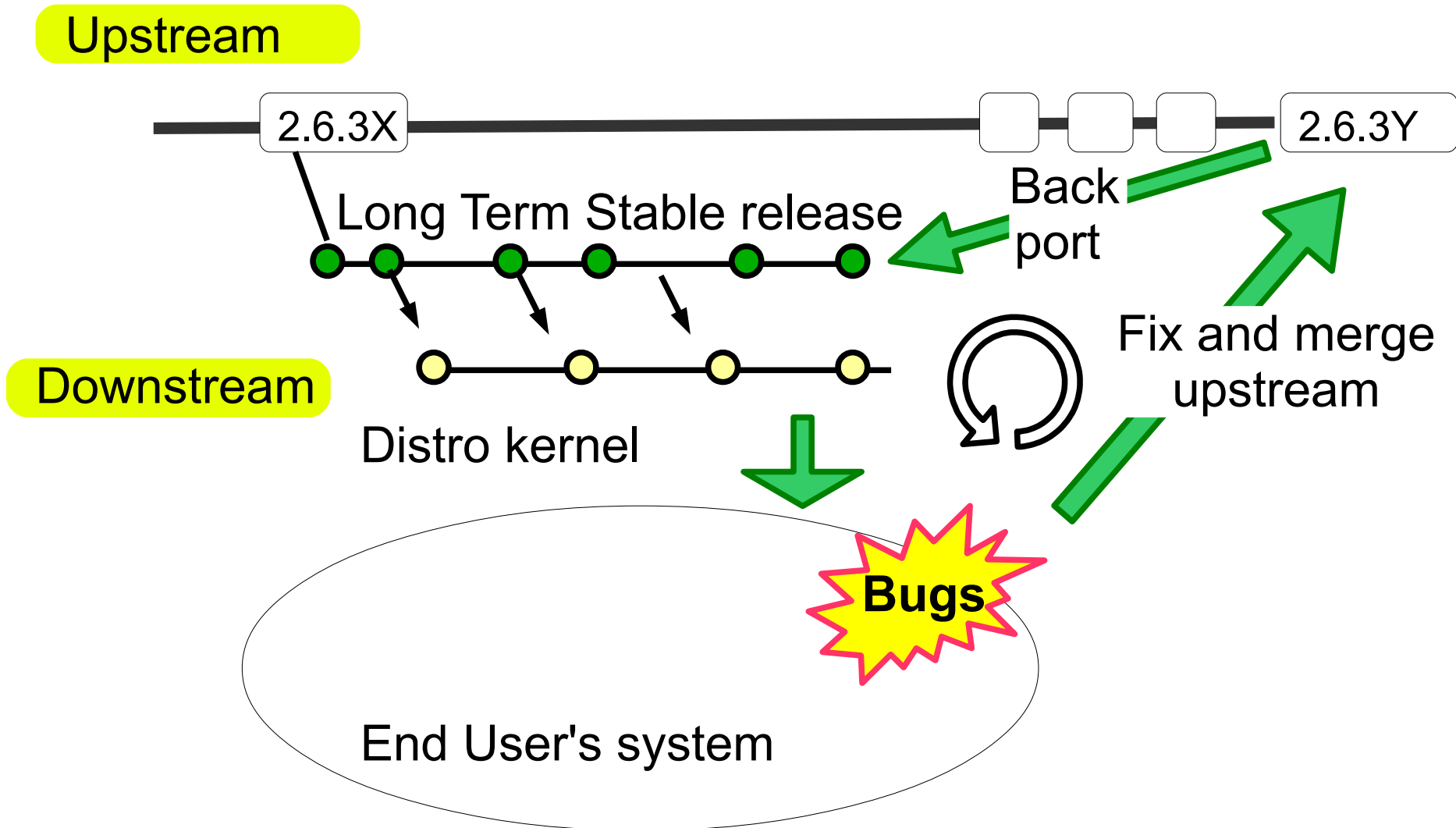
Distro kernel



End User's system

Keeping a kernel usable in 3-4 years

- Bugs fixing cycle with upstream is key to the stable user system



Android and Linux kernel



- Android is using relatively new kernel
- Releasing every 4-6 month for actual products

Android version	Code name	Released date	Kernel version	Kernel release date
1.1		9, Feb. 2009		
1.5	Cupcake	30, Apr. 2009	2.6.27	9. Oct. 2008
1.6	Donut	15, Sep. 2009	2.6.29	23, Mar 2009
2.0, 2.1	Eclair	26, Oct. 2009	2.6.29	23, Mar 2009
2.2	Froyo	20, May 2010	2.6.32	6, Jan 2010
2.3	Ginger Bread	6, Dec 2010	2.6.35	1, Aug 2010
3.0, 3.1	Honey Comb	Feb 2011	2.6.36	20, Oct 2010
?	Ice cream Sandwich	2011, 4Q	2.6.39? 3.0.x ?	

MeeGo and Linux kernel

- MeeGo is also taking latest kernel
- 2-3 month after kernel released
- 6 month release cycle

Version	Released date	Kernel version	Kernel release date
1.0	26, May 2010	2.6.33	24, Feb. 2010
1.01	July 2010	2.6.33.5	
1.1	Oct. 2010	2.6.35	1, Aug 2010
1.2	May, 2011	2.6.37	5, Jan 2011
?	Nov, 2011?	2.6.39? 3.0?	



Comparison between Enterprise and Embedded

- Enterprise Eco system has well established

	Enterprise	Embedded
Distribution	RHEL, SLES, Ubuntu	
Distro Version Up duration	2-3 Years	
Long Term Stable Kernel	2.6.27, 2.6.32	
Upstream bug fix cycle	Available	

Comparison between Enterprise and Embedded

- Enterprise Eco system is well established
- Embedded needs to do more

	Enterprise	Embedded
Distribution	RHEL, SLES, Ubuntu	Android, MeeGo
Distro Version Up duration	2-3 Years	3-6 Month
Long Term Stable Kernel	2.6.27, 2.6.32	2.6.35 Need further LTS version
Upstream bug fix cycle	Available	Should be available

Summary

- In enterprise space, community, industry and users are well connected as the Eco system
 - Stable IT/Enterprise infrastructure comes from:
 - Long Term Stable release by the community
 - Long term support service from industry
- Linux is being the fundamental piece for phones, tablets and any of embedded devices with distributions such as Android and MeeGo
 - Latest kernel will help innovation
 - However, according to the high pace of release span, they need further LTS release
 - Maybe once a year
 - Plus bug fix cycle with upstream
- CEWG discuss this issue with community

Conclusion

- Linux development is:
 - More than 1300 people, average 80 days, large number of developers and maintainers
- In Enterprise space, there are well coordinated Eco system:
 - Upstream bug fix cycle, 3-4 years release span, Long-Term Stable release
- In Embedded space, there need more coordination:
 - 6-9 month release span, Long-Term Stable release according to release span, upstream bug fix cycle

THANK YOU !