

Linux Kernel Development

Greg Kroah-Hartman

gregkh@linuxfoundation.org

github.com/gregkh/kernel-development

61,000 files
25,380,000 lines

4,461 developers
≈530 companies

Kernel releases 4.12.0 – 4.17.0
July 2017 – June 2018

9,900 lines added

4,300 lines removed

2,200 lines modified

Kernel releases 4.12.0 – 4.17.0
July 2017 – June 2018

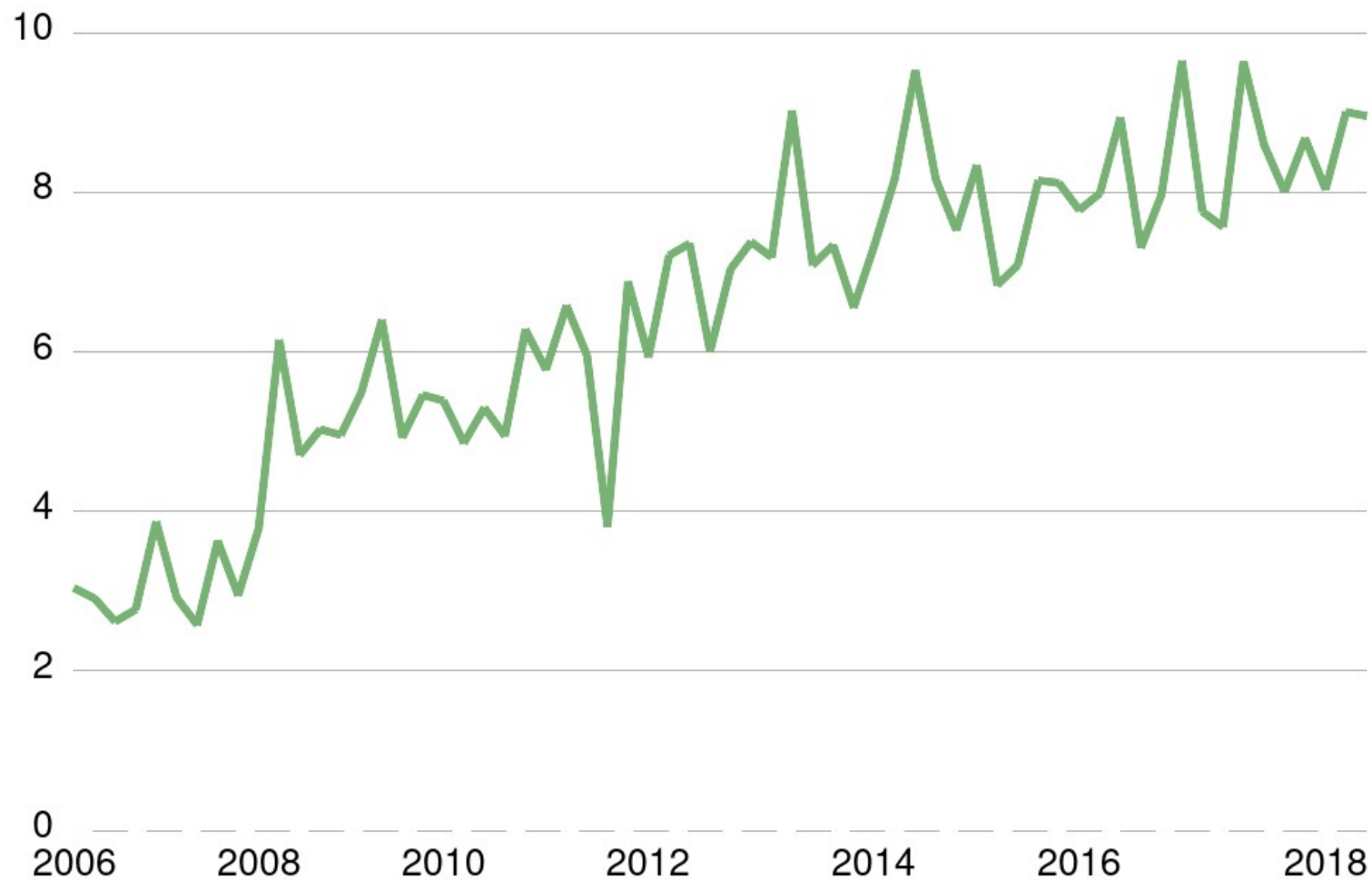
9,900 lines added
4,300 lines removed
2,200 lines modified
Every day

Kernel releases 4.12.0 – 4.17.0
July 2017 – June 2018

8.7 changes per hour

Kernel releases 4.12.0 – 4.17.0
July 2017 – June 2018

Patches merged per hour



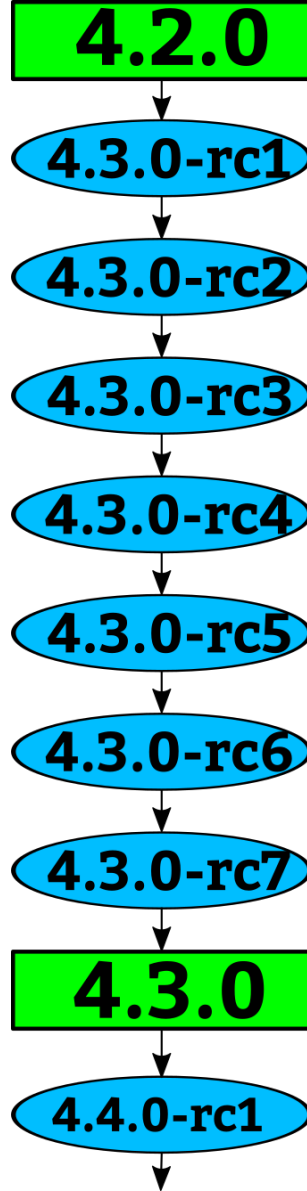
How we stay sane

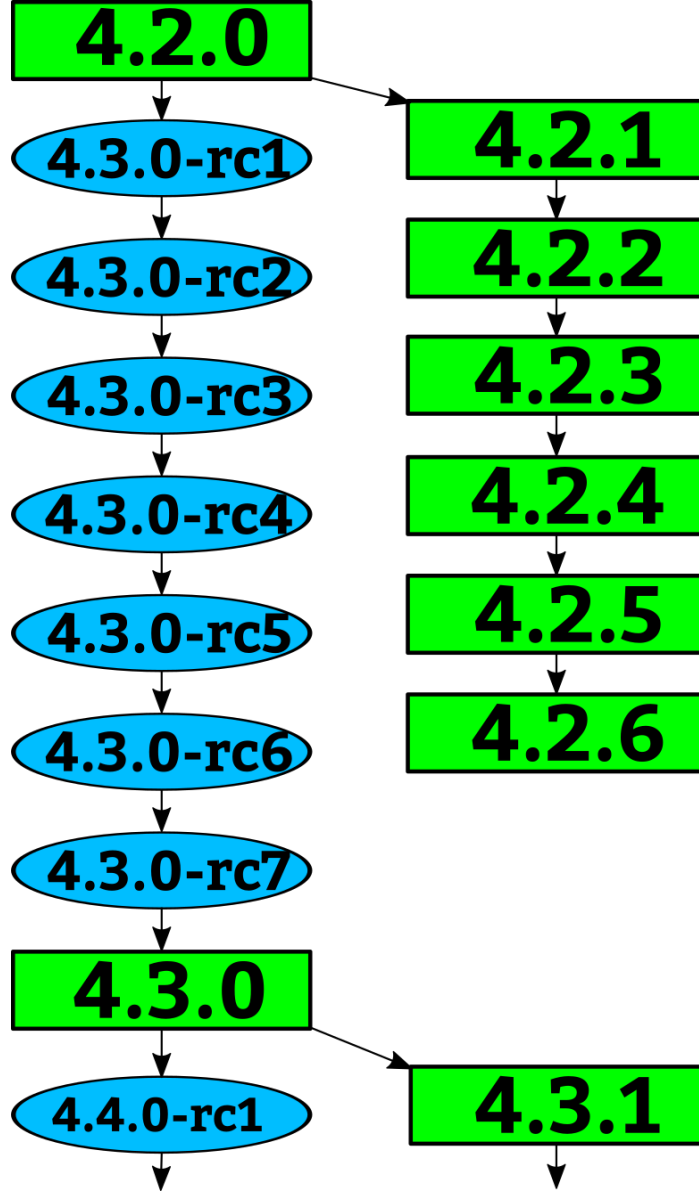
Time based releases

Incremental changes



**New release every
2½ months**





“Longterm kernels”

One picked per year

Maintained for two years

4.4

4.9

4.14

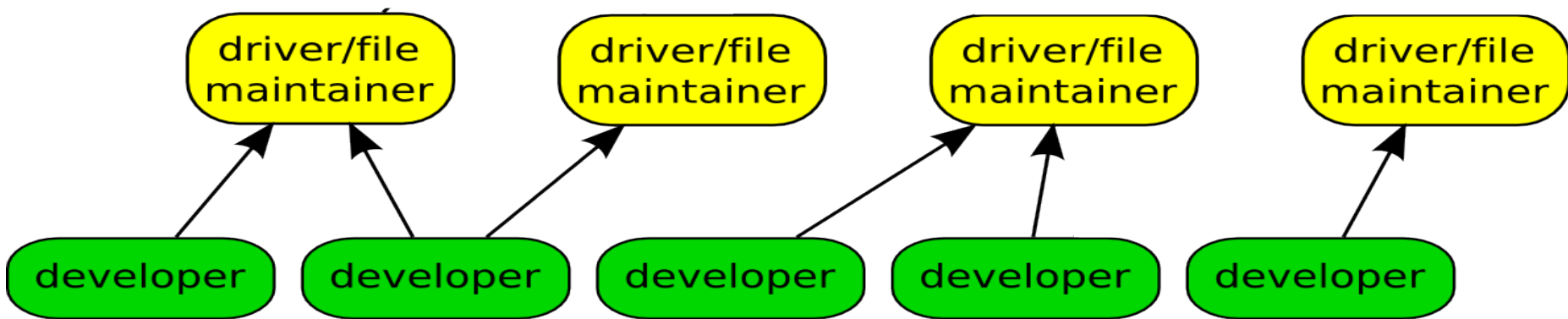
developer

developer

developer

developer

developer



```
commit ecf85e481a716cfe07406439fdc7ba9526bbfaeb
Author:      Robert Jarzmik <robert.jarzmik@free.fr>
AuthorDate:  Tue Apr 21 20:33:10 2009 -0700
Commit:      Greg Kroah-Hartman <gregkh@suse.de>
CommitDate:  Thu Apr 23 14:15:31 2009 -0700
```

USB: otg: Fix bug on remove path without transceiver

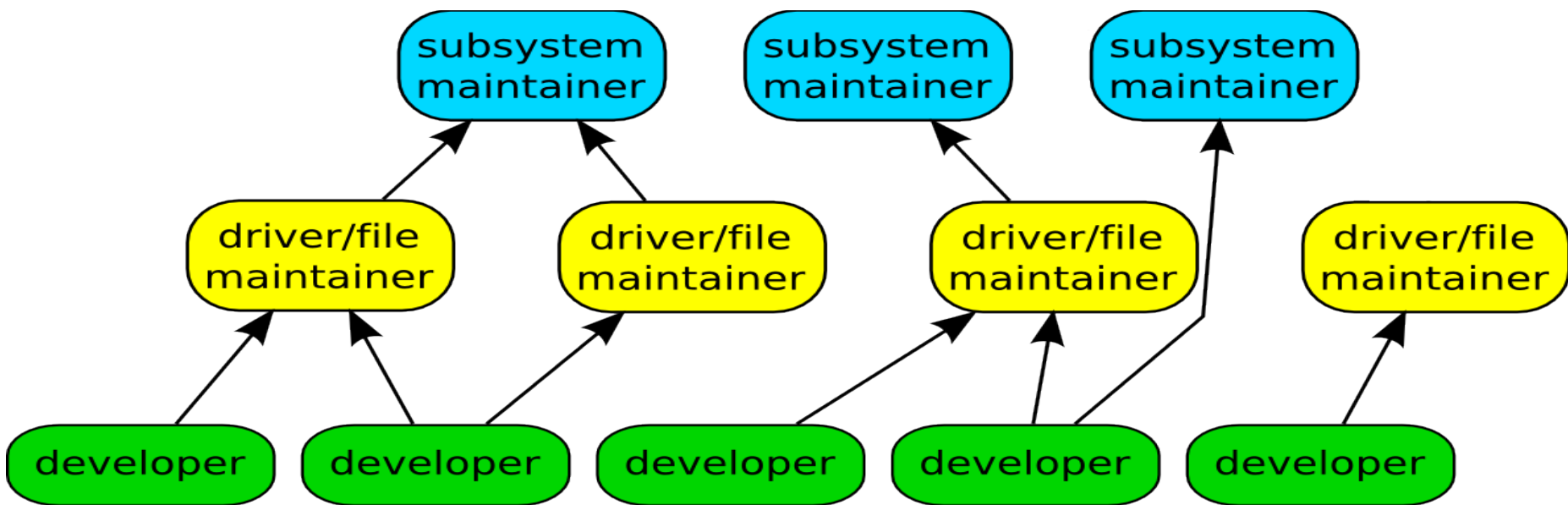
In the case where a gadget driver is removed while no transceiver was found at probe time, a bug in `otg_put_transceiver()` will trigger.

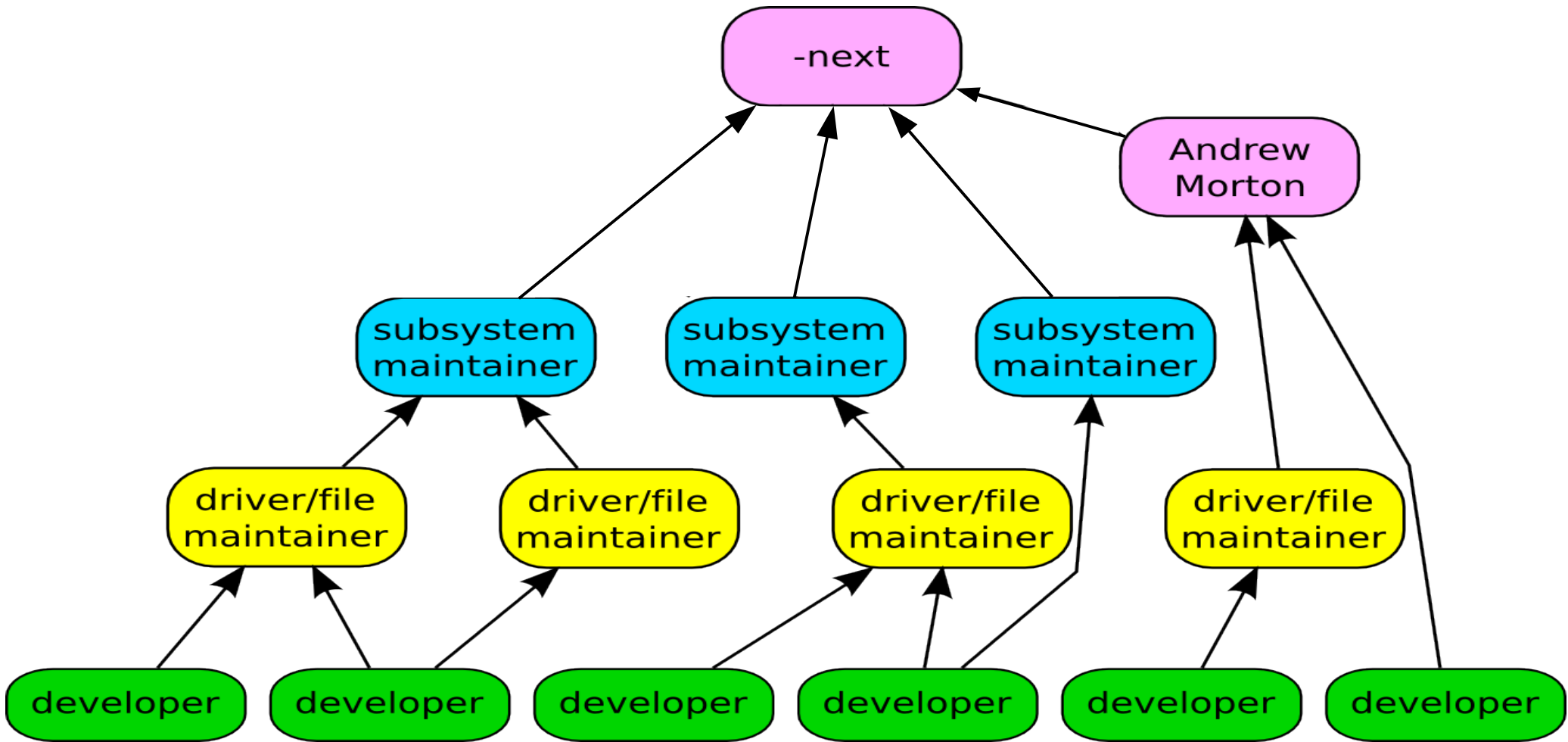
Signed-off-by: Robert Jarzmik <robert.jarzmik@free.fr>
Acked-by: David Brownell <dbrownell@users.sourceforge.net>
Signed-off-by: Greg Kroah-Hartman <gregkh@suse.de>

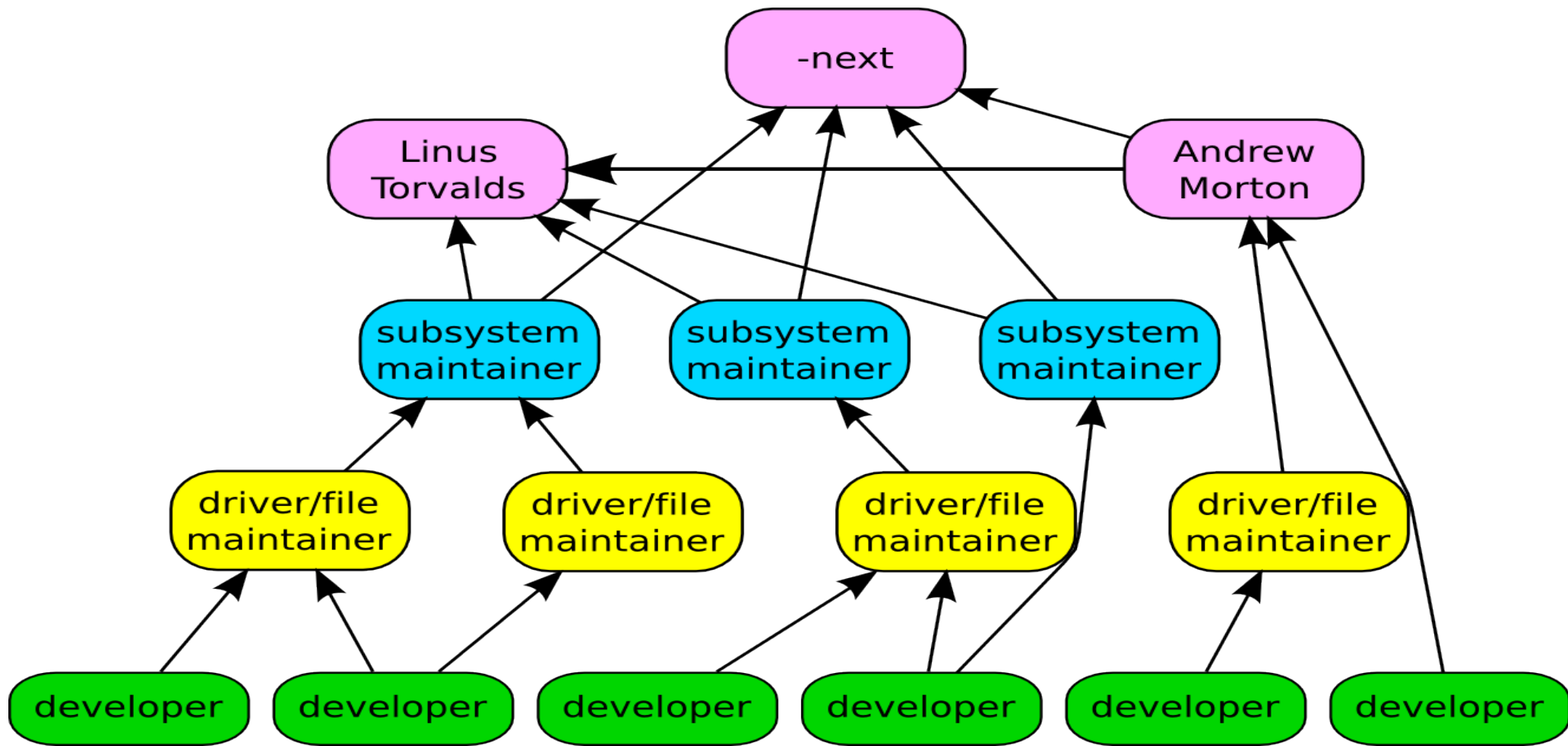
```
--- a/drivers/usb/otg/otg.c
+++ b/drivers/usb/otg/otg.c
@@ -43,7 +43,8 @@ EXPORT_SYMBOL(otg_get_transceiver);
 void otg_put_transceiver(struct otg_transceiver *x)
 {
-    put_device(x->dev);
+    if (x)
+        put_device(x->dev);
 }
```

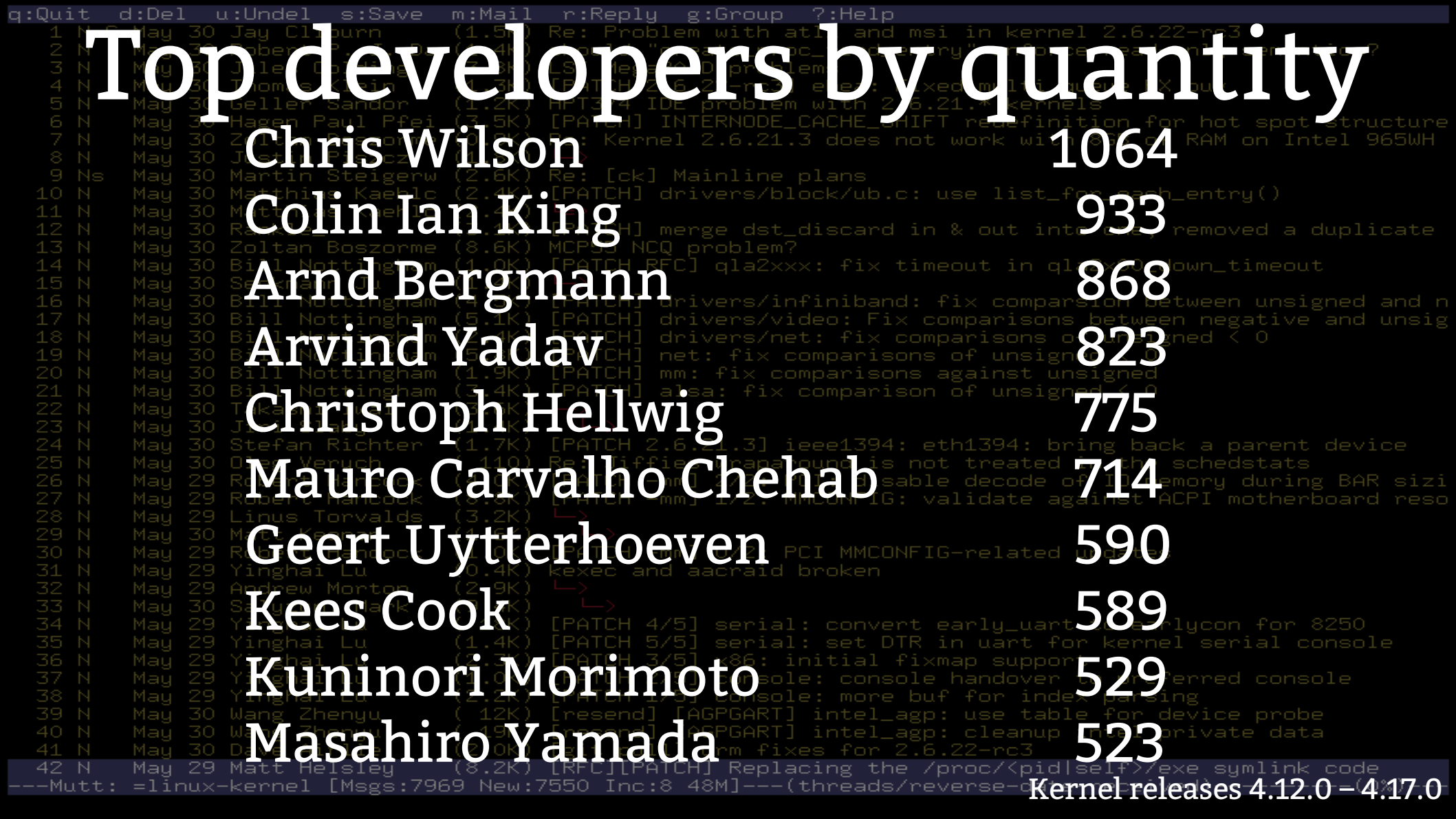
Developer's Certificate of Origin

- (a) I created this change; or
- (b) Based this on a previous work with a compatible license; or
- (c) Provided to me by (a), (b), or (c) and not modified
- (d) This contribution is public.









Top developers by quantity

Chris Wilson 1064

Colin Ian King 933

Arnd Bergmann 868

Arvind Yadav 823

Christoph Hellwig 775

Mauro Carvalho Chehab 714

Geert Uytterhoeven 590

Kees Cook 589

Kuninori Morimoto 529

Masahiro Yamada 523

q:Quit	d:Del	u:Undel	s:Save	m:Mail	r:Reply	g:Group	?:Help
1	N	C	May 30	Jay Cliburn	(1.5K)	Re: Problem with atl1 and m... kernel 2.6.22-rc3	
2	N		May 30	Robert L. Th...	(1.4K)	Should "create_proc_read_entry" enforce read-only semantics?	
3	N		May 30	Jules Corbin	(3.1K)	IS: Regression Problems	
4	N		May 30	Thomas K...	(1.3K)	[PATCH 2-rc3] enet: Fixed multi queue RX bug	
5	N		May 30	Geller, Sandor	(1.1K)	Fixed problem with 2.6.21.* kernels	
6	N		May 30	Hagen Paul Pa...	(3.5K)	[PATCH] INTERNODE_CACHE_SHIFT redefinition for hot spot structure	
7	N		May 30	Zoltan Boszorm...	(2.1K)	Re: Kernel 2.6.21.3 does not work with \$256MB RAM on Intel 965WH	
8	N		May 30	David S. Miller	(3.8K)		9831
9	N	s	May 30	Martin Steigerw...	(2.4K)	[ck] Mainline plans	
10	N		May 30	Matthias Kaehle	(2.4K)	[PATCH] drivers/block/ub.c: use list_for_each_entry()	
11	N		May 30	Matthias Kaehle	(2.4K)		6030
12	N		May 30	Matthias Kaehle	(2.4K)	[PATCH] Re: [PATCH] drivers/block/ub.c: use list_for_each_entry()	
13	N		May 30	Zoltan Boszorm...	(8.6K)	MCF55 NCU problem?	
14	N		May 30	Bill Nottingham	(1.6K)	[PATCH RFC] qla2xxx: fix timeout in qla2x00_down_timeout	
15	N		May 30	Alex Deucher	(3.4K)		4105
16	N		May 30	Bill Nottingham	(5.1K)	[PATCH] drivers/infiniband: fix comparisons between unsigned and n	
17	N		May 30	Bill Nottingham	(2.4K)	[PATCH] drivers/video: Fix comparisons between negative and unsig	
18	N		May 30	Bill Nottingham	(2.4K)	[PATCH] drivers/net: fix comparisons of unsigned < 0	
19	N		May 30	Bill Nottingham	(2.4K)	[PATCH] drivers/net: fix comparisons of unsigned < 0	
20	N		May 30	Bill Nottingham	(2.4K)	[PATCH] drivers/net: fix comparisons of unsigned < 0	
21	N		May 30	Bill Nottingham	(3.4K)	[PATCH] alsa: fix comparison of unsigned < 0	
22	N		May 30	Mark Brown	(3.6K)		2375
23	N		May 30	Stefan Richter	(1.7K)	[PATCH 2.6.21.3] ieee1394: eth1394: bring back a parent device	
24	N		May 30	Oleg Verych	(110)	Re: Jiffies wraparound is not treated in the schedstats	
25	N		May 30	Robert L. Th...	(1.4K)	[PATCH -mm] 2/2: PCI: disable decode of memory during BAR siz	
26	N		May 29	Robert L. Th...	(1.4K)	[PATCH -mm] 1/2: MMCONFIG: validate against motherboard reso	
27	N		May 29	Linus Torvalds	(3.2K)		2116
28	N		May 29	Linus Torvalds	(3.2K)		2088
29	N		May 30	Matt Keenan	(1.4K)		1643
30	N		May 29	Robert L. Th...	(1.4K)	[PATCH -mm] 0/2: PCI MMCONFIG-related updates	
31	N		May 29	Yinghai Lu	(2.3K)	serial: convert early_uart to early_console for 8250	
32	N		May 29	Yinghai Lu	(1.4K)	[PATCH 3/5] serial: set DTR in uart for kernel serial console	
33	N		May 29	Yinghai Lu	(2.3K)	[PATCH 3/5] x86: initial fixmap support	
34	N		May 29	Yinghai Lu	(2.3K)	[PATCH 2/5] console: console handover to registered console	
35	N		May 29	Yinghai Lu	(2.3K)	[PATCH 1/5] console: more buf for index	
36	N		May 29	Wang Zhenyu	(12K)	[resend] [AGPGART] intel_agp: use table for device probe	
37	N		May 30	Wang Zhenyu	(12K)	[resend] [AGPGART] intel_agp: cleanup intel private data	
38	N		May 30	Michael Ellerman	(1.4K)	drm fixes for 2.6.22-rc3	1515
39	N		May 29	Michael Ellerman	(1.4K)	[PATCH] Replacing the /proc/<pid>/<fd>/symlink code	
40	N		May 29	Michael Ellerman	(1.4K)		
41	N		May 29	Michael Ellerman	(1.4K)		
42	N		May 29	Michael Ellerman	(1.4K)		
---Mutt: =linux-kernel [Msgs:7969 New:7550 Inc:8 48M]---(threads/reverse-c							Kernel releases 4.12.0 - 4.17.0

Who is funding this work?

1. Intel	11.5%
2. “Amateurs”	8.0%
3. Red Hat	6.9%
4. AMD	5.1%
5. IBM	4.3%
6. Google	3.7%
7. Linaro	3.7%
8. SUSE	2.9%
9. Renesas Electronics	2.6%
10. Mellanox	2.6%

Who is funding this work?

11. Consultants	2.1%
12. Oracle	2.1%
13. Samsung	2.0%
14. ARM	1.9%
15. Huawei Technologies	1.6%
16. Broadcom	1.5%
17. Bootlin	1.5%
18. Linux Foundation	1.4%
19. Canonical	1.4%
20. Texas Instruments	1.1%

“Working upstream saves time and money”

Dan Frye – VP Open Systems, IBM

Dirk Hohndel – Chief Technologist, Intel

How to change

How to change

Submit code early and often

How to change

Send small pieces

How to change

Ask community for feedback

How to change

Act on it

How to change

Remove legal hurdles

How to change

Force them to work in public

How to change

Allow them to be the community

Kernel Security

Kernel Security

Almost all bugs can be a “security” issue.

Kernel Security

Almost all bugs can be a “security” issue.

Fix them as soon as possible.

Kernel Security

Averaging 21 fixes per day

“If you are not using a stable /
longterm kernel, your machine
is insecure”

– me

“The kernel needs airbags” – Konstantin Ryabitsev

[`slides.com/mricon/giant-bags-of-mostly-water#`](https://slides.com/mricon/giant-bags-of-mostly-water#/)

**“We will always have bugs,
we must stop their exploitation”
– Kees Cook**

outflux.net/slides/2015/ks/security.pdf

Kernel Hardening

kernsec.org/wiki/index.php/Kernel_Self_Protection_Project

Core Infrastructure Initiative

**“Ceaseless change is the only
constant thing in Nature.”**

– John Candee Dean



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