Linux Kernel Development

Greg Kroah-Hartman
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github.com/gregkh/kernel-development

62,800 files
25,560,000 lines

4,466 developers
≈530 companies

9,500 lines added
2,700 lines removed
2,000 lines modified
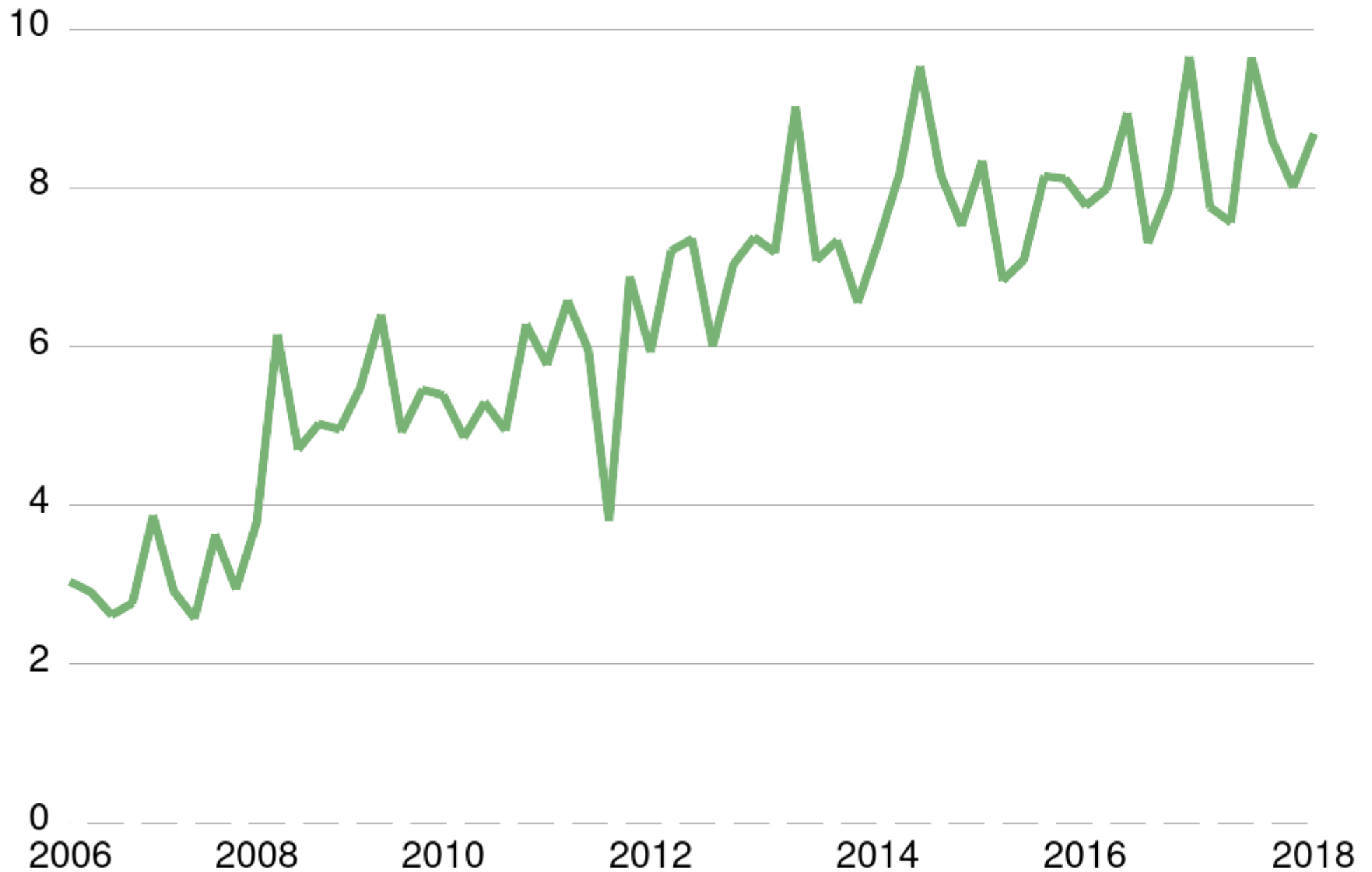
9,500 lines added
2,700 lines removed
2,000 lines modified

Every day

8.5 changes per hour

Kernel releases 4.11.0 – 4.16.0
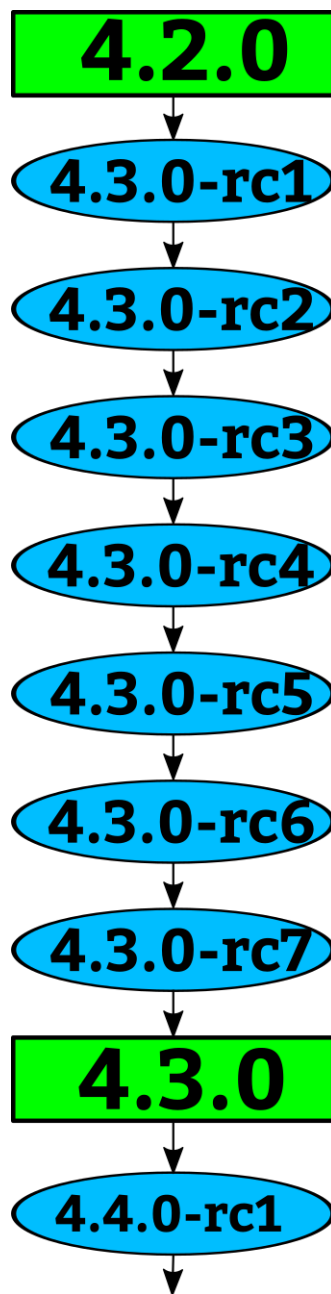April 2016 – April 2017

Patches merged per hour

How we stay sane

Time based releases
Incremental changes

New release every 2½ months

Kernel releases 3.10.0 – 3.14.0

```
4.2.0
  │
  ▼
4.3.0-rc1
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  ▼
4.3.0-rc2
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  ▼
4.3.0-rc3
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  ▼
4.3.0-rc4
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  ▼
4.3.0-rc5
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  ▼
4.3.0-rc6
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  ▼
4.3.0-rc7
  │
  ▼
4.3.0
  │
  ▼
4.4.0-rc1
  │
  ▼
```

```
          4.2.0 ──────────┐
            │             ▼
            ▼           4.2.1
      4.3.0-rc1           │
            │             ▼
            ▼           4.2.2
      4.3.0-rc2           │
            │             ▼
            ▼           4.2.3
      4.3.0-rc3           │
            │             ▼
            ▼           4.2.4
      4.3.0-rc4           │
            │             ▼
            ▼           4.2.5
      4.3.0-rc5           │
            │             ▼
            ▼           4.2.6
      4.3.0-rc6
            │
            ▼
      4.3.0-rc7
            │
            ▼
          4.3.0 ──────────┐
            │             ▼
            ▼           4.3.1
      4.4.0-rc1           │
            │             ▼
            ▼
```
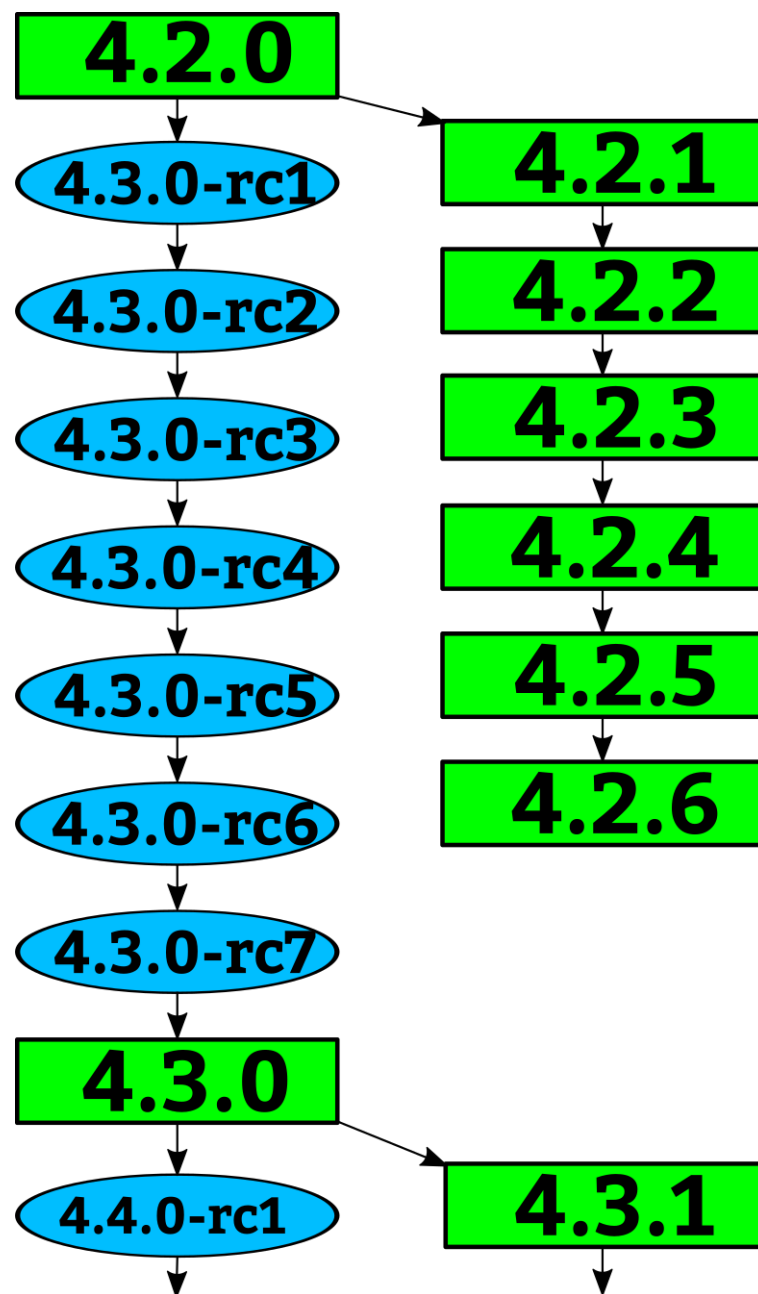
"Longterm kernels"

One picked per year
Maintained for two years
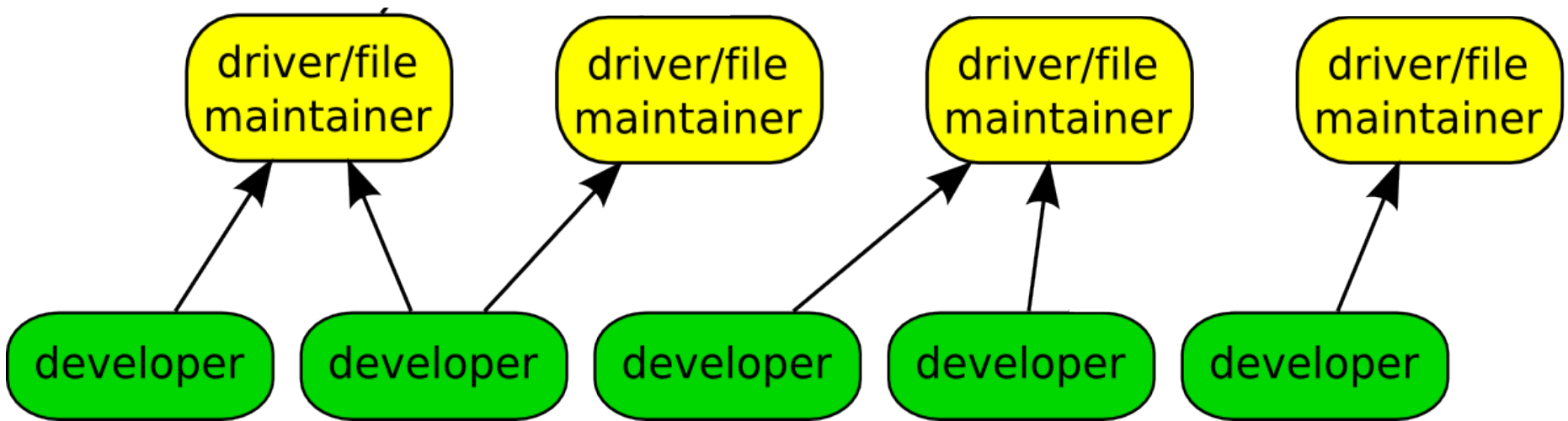
4.4   4.9   4.14

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);
 }
```
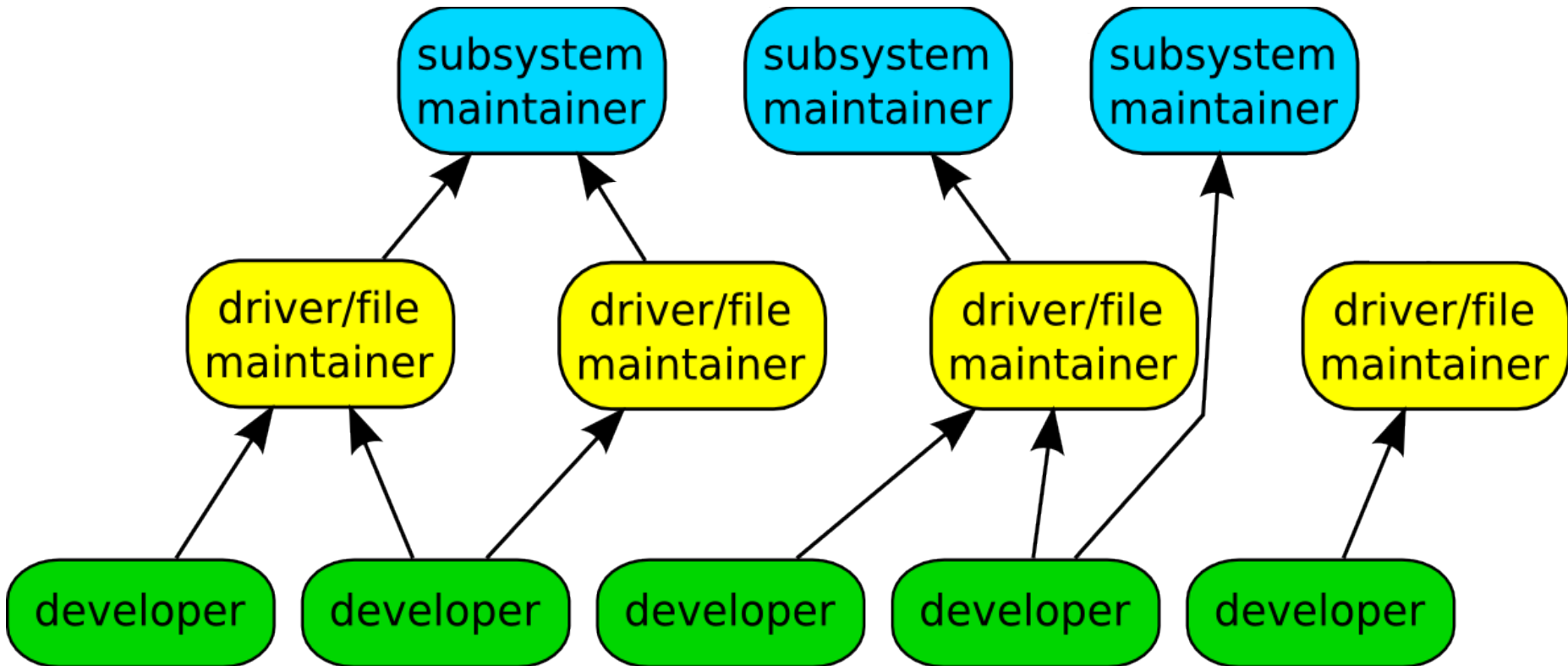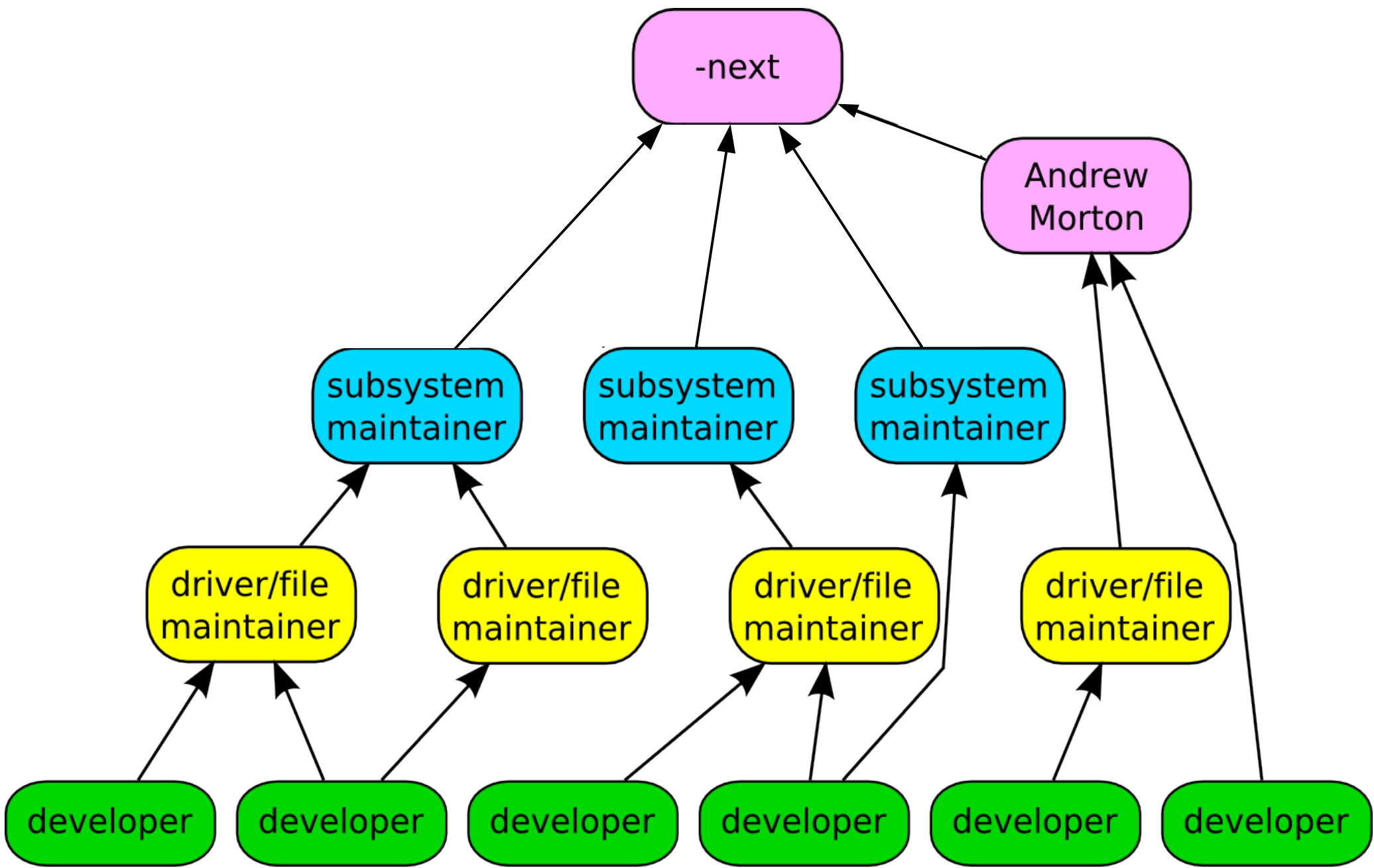
Developer's Certificate of Origin
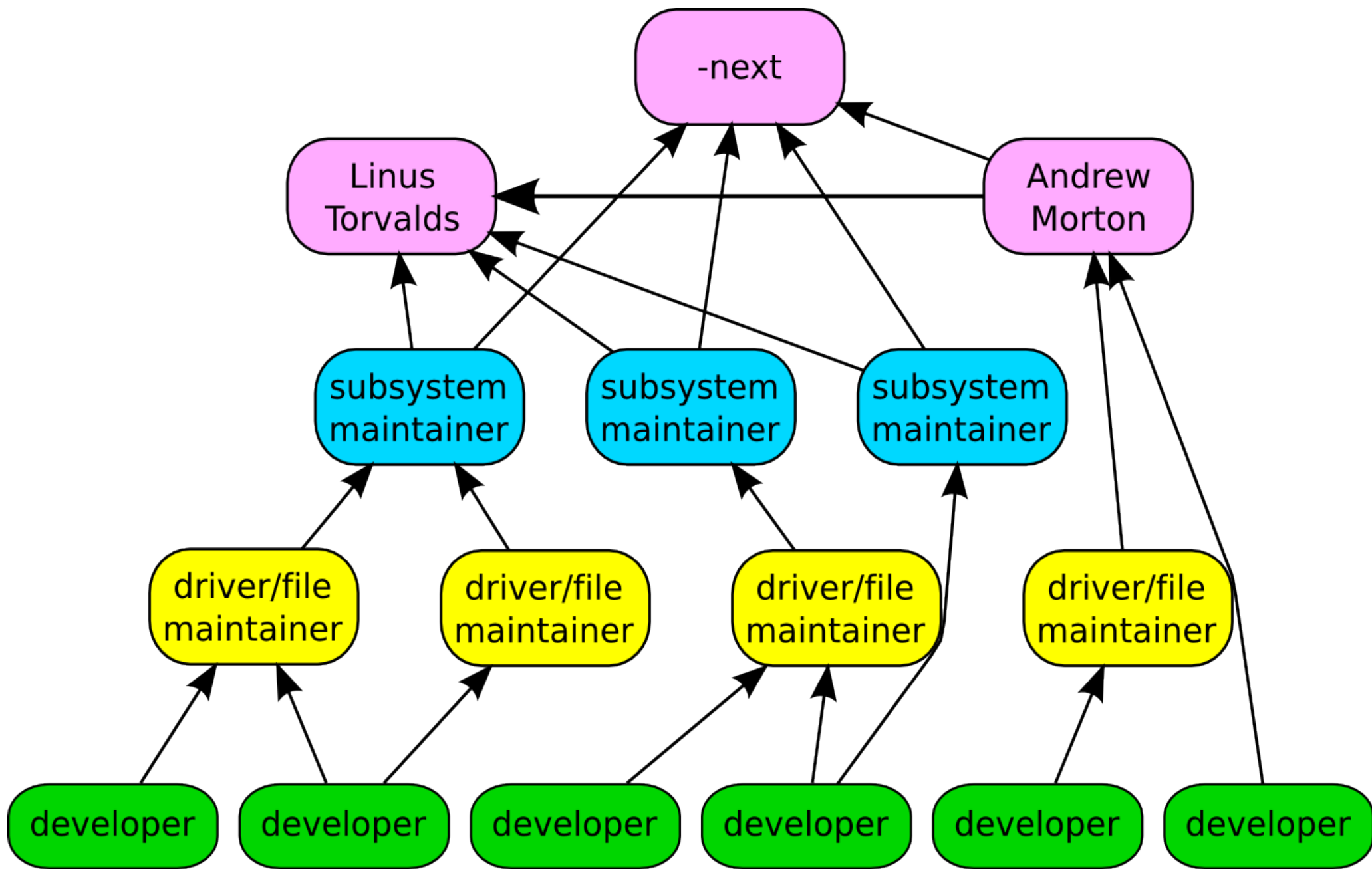
(a) I created this change; or

(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	1356
Johan Hovold	920
Mauro Carvalho Chehab	867
Arnd Bergmann	826
Christoph Hellwig	790
Arvind Yadav	710
Colin Ian King	641
Viresh Kumar	566
Greg Kroah-Hartman	507
Geert Uytterhoeven	492

Kernel releases 4.9.0 – 4.14.0

Top Signed-off-by:

David S. Miller	9430
Greg Kroah-Hartman	9342
Mauro Carvalho Chehab	3039
Mark Brown	2385
Linus Torvalds	2261
Alex Deucher	2095
Andrew Morton	2013
Ingo Molnar	1989
Martin Petersen	1681
Chris Wilson	1520

Kernel releases 4.9.0 – 4.14.0

Who is funding this work?

1.	Intel	12.4%
2.	"Amateurs"	8.5%
3.	Red Hat	6.8%
4.	Linaro	5.4%
5.	IBM	3.9%
6.	Google	3.4%
7.	Consultants	3.3%
8.	SUSE	3.1%
9.	AMD	2.8%
10.	Samsung	2.7%

Kernel releases 4.9.0 – 4.14.0

Who is funding this work?

11.	Mellanox	2.2%
12.	Renesas Electronics	2.1%
13.	Oracle	1.7%
14.	Broadcom	1.5%
15.	ARM	1.5%
16.	Huawei Technologies	1.5%
17.	Texas Instruments	1.2%
18.	Linux Foundation	1.1%
19.	Free Electrons	1.1%
20.	Canonical	1.1%

Kernel releases 4.9.0 – 4.14.0

"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#/

"We will always have bugs,
we must stop their exploitation"
– Kees Cook

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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