

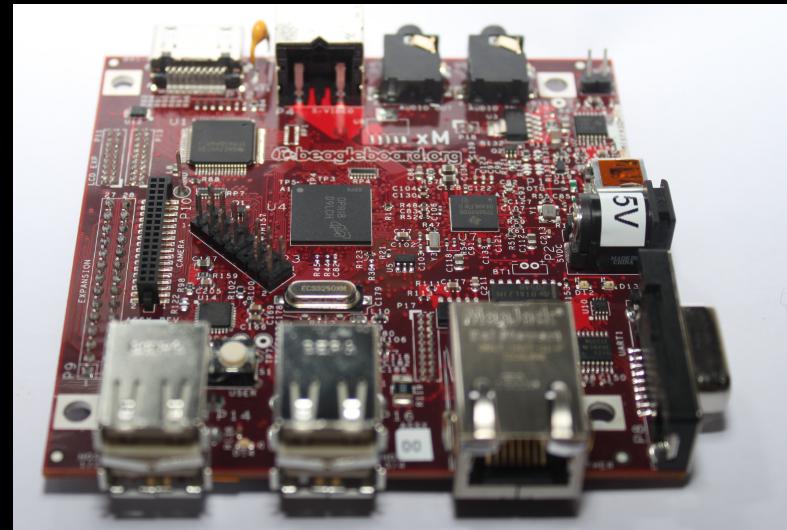
De 0.01 à 3.0

20 ans de Linux

# Thomas Petazzoni

# Thomas Petazzoni

# Linux embarqué



# Thomas Petazzoni

# Linux embarqué

# Free Electrons



# Thomas Petazzoni

# Linux embarqué

# Free Electrons

# Buildroot

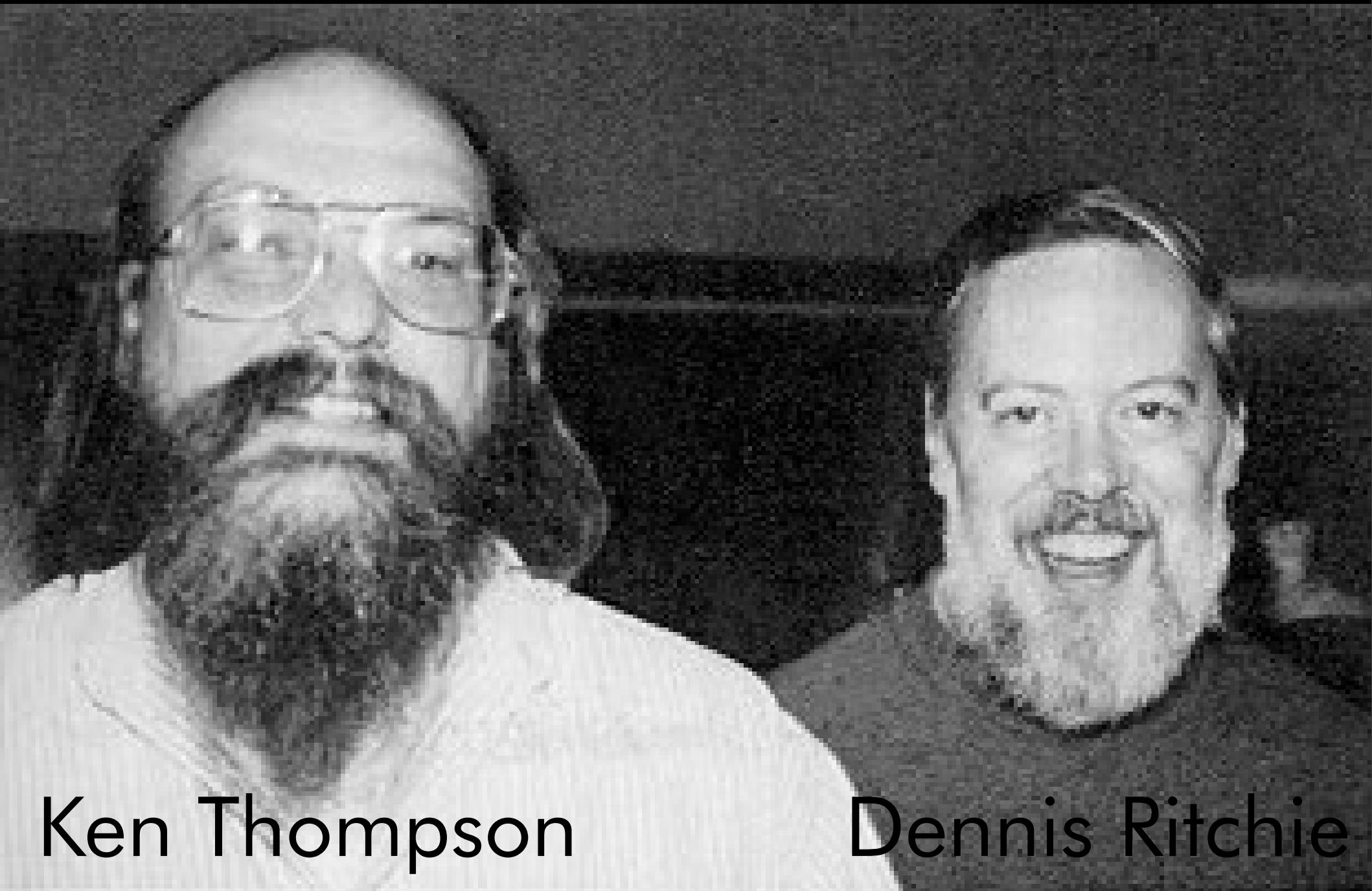


Thomas Petazzoni  
Linux embarqué  
Free Electrons  
Buildroot  
Toulibre



Linux a 20 ans...

Linux a 20 ans...  
...mais avant ?



Ken Thompson

Dennis Ritchie

~ 1972

~ 1972  
language C

~ 1972  
language C  
Unix



PDP-7

# GNU

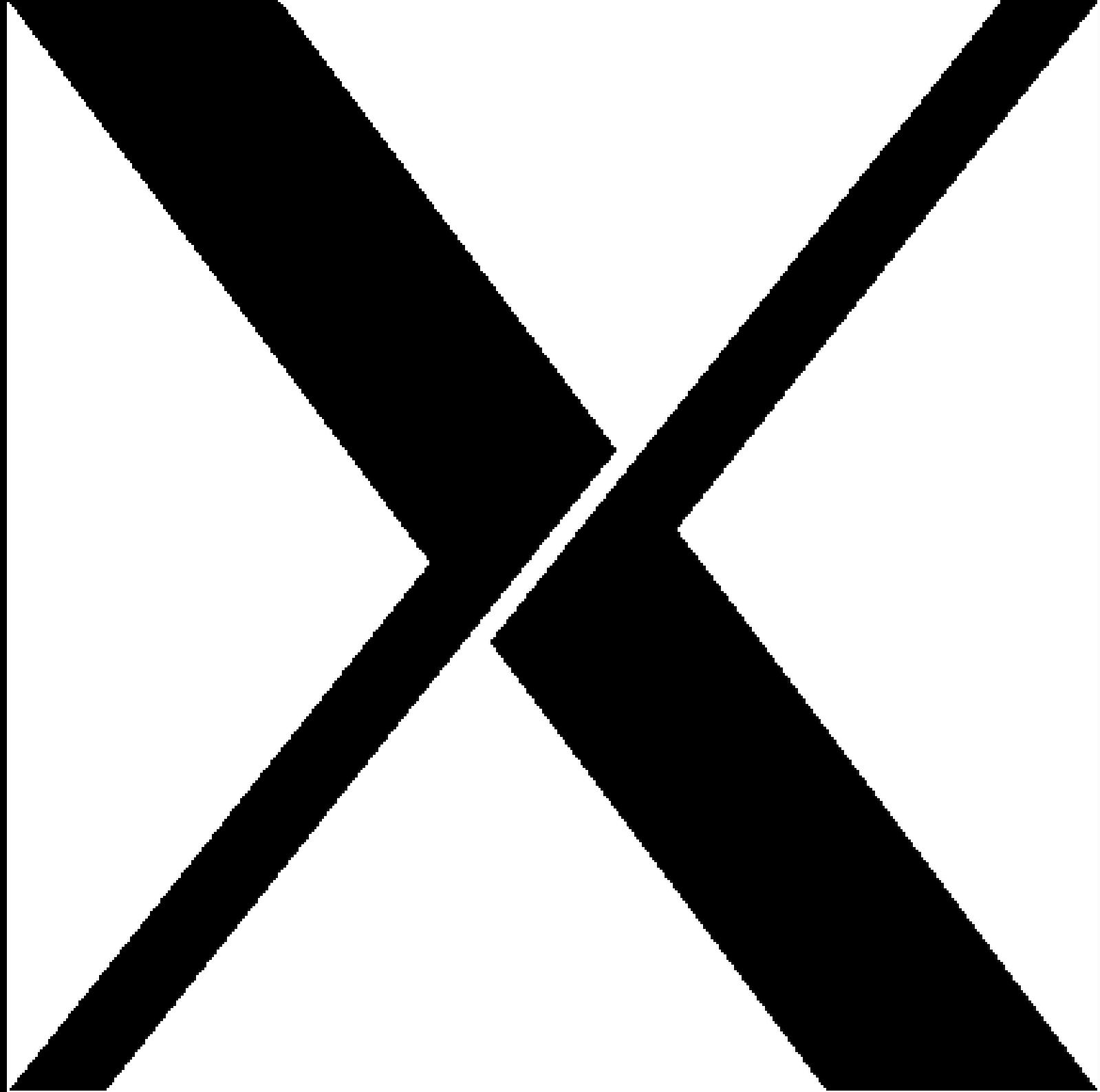
A new fragrance by RMS



1985  
GNU Manifesto

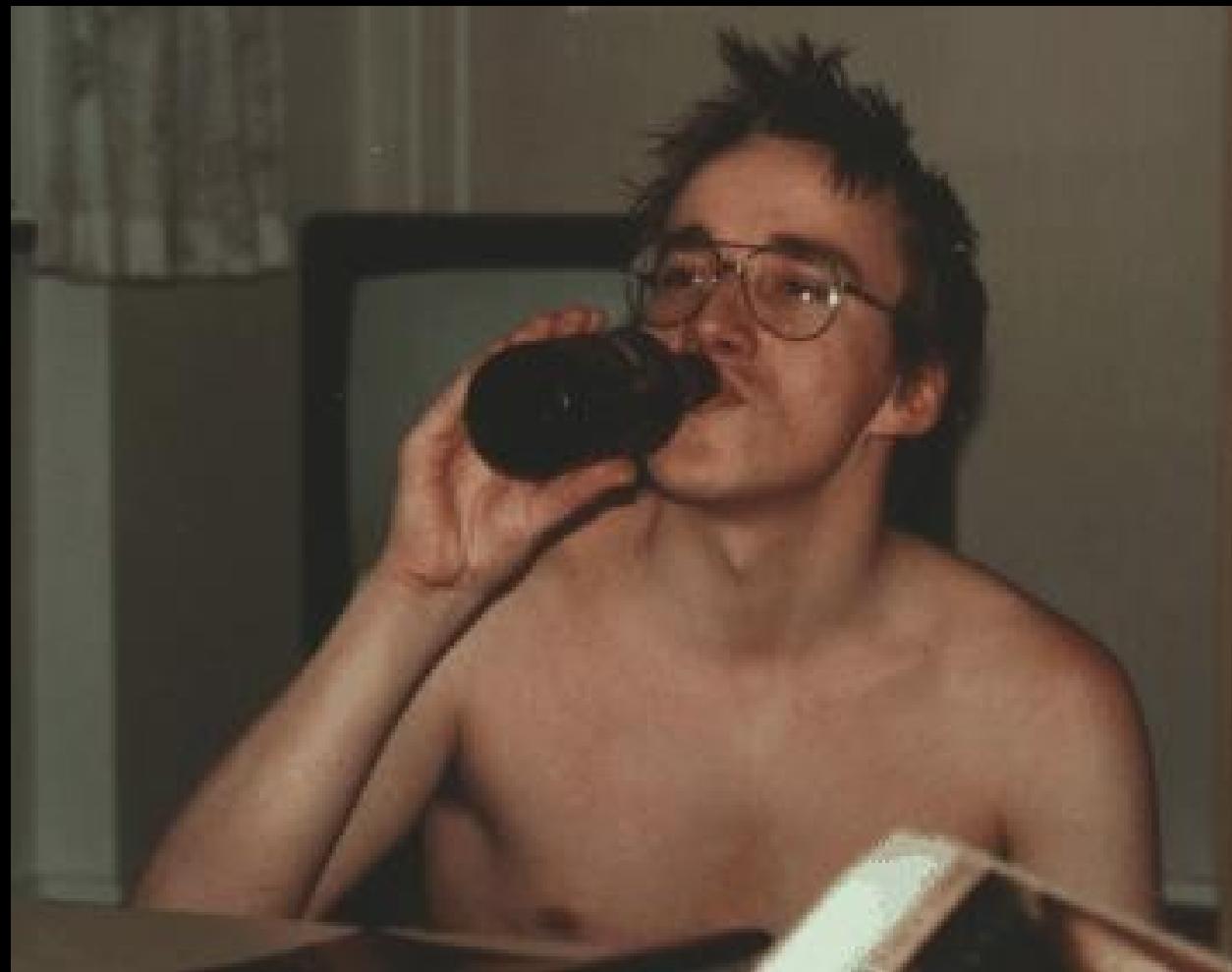
“So that I can continue to use computers without dishonor, I have decided to put together a sufficient body of free software so that I will be able to get along without any software that is not free.”

– *Richard Stallman*



1988  
X Consortium





1991  
Helsinki  
21 ans

Noël 1990 est venu et est reparti, et le 5 janvier, Linus a acheté un nouvel ordinateur. Il utilisait un **Sinclair QL** à la maison, mais voulait un **PC avec un processeur Intel 386**. Il prit son prêt étudiant et en acheta un. Il voulait en savoir plus sur le multitâche en apprenant comment le 386 le faisait. **Malheureusement, il a également obtenu une copie de Prince of Persia (si je me souviens bien), un jeu pour ordinateur.**

Lars Wizenius - « Linux at 20, some personal memories »

# Émulateur de terminal

# comp.os.minix – 3 juillet 1991

Hello netlanders,

Due to a project I'm working on (in minix),  
I'm interested in the posix standard definition.

Could somebody please point me to a  
(preferably) machine-readable format of the  
latest posix rules? Ftp-sites would be  
nice.

[...]

Linus Torvalds

# comp.os.minix – 25 août 1991

Hello everybody out there using minix -

I'm doing a (free) operating system (**just a hobby, won't be big and professional like gnu**) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)

Linus

PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT protable (uses 386 task switching etc), and **it probably never will support anything other than AT-harddisks**, as that's all I have :-(.

Plus tard, il a décidé de rendre le code disponible, et a obtenu de l'un des admins de ftp.funet.fi de l'y mettre. Pour cela, le projet avait besoin d'un nom.

Linus a voulu l'appeler **Freax**, mais Ari Lemmke, l'admin de ftp.funet.fi, décida de l'appeler **Linux** à la place.

Lars Wizenius - « Linux at 20, some personal memories »

Linux 0.01

17 septembre 1991

10.239 lignes

Démonstration ! :-)

Linux 0.02  
5 octobre 1991

Linux 0.11

19 décembre 1991

Capable de se compiler

lui-même !

13.839 lignes

Linux 0.12

5 janvier 1992

Passage à la GPLv2 !

19.645 lignes

LINUX 0.12 BOOT DISK /dev/hd4

LINUX 0.12 ROOT DISK

Root

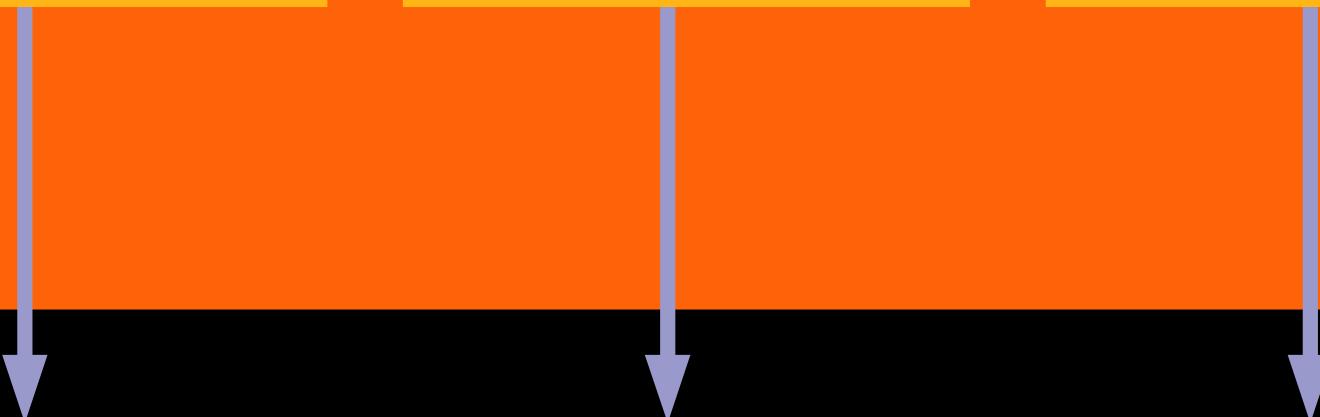
29 janvier 1992  
« LINUX is obsolete »  
Andrew Tanenbaum

# Espace utilisateur

Application 1

Application 2

Application 3



IPC

Drivers

Noyau

Gestion mémoire

Gestion processus et  
ordonnancement

Systèmes de fichiers

Pile réseau

# Espace utilisateur

Application 1

Application 2

Application 3

Couche réseau

Driver

Système de fichiers

Gestion processus et  
ordonnancement

Noyau

IPC

1992

Premières distributions

*MCC Interim Linux*

*SLS*

*Yggdrasil*

Linux 0.95  
Support X Window System  
la 1.0 est proche !  
20.882 lignes

Linux 0.96a

Linux 0.96b

Linux 0.96c

Linux 0.97

etc...

Linux 1.0

mars 1994

support réseau

176.250 lignes

80 contributeurs

x.y.z

y pair, stable  
y impair, développement

Linux 1.2

mars 1995

Alpha, MIPS, SPARC

310.950 lignes

128 contributeurs

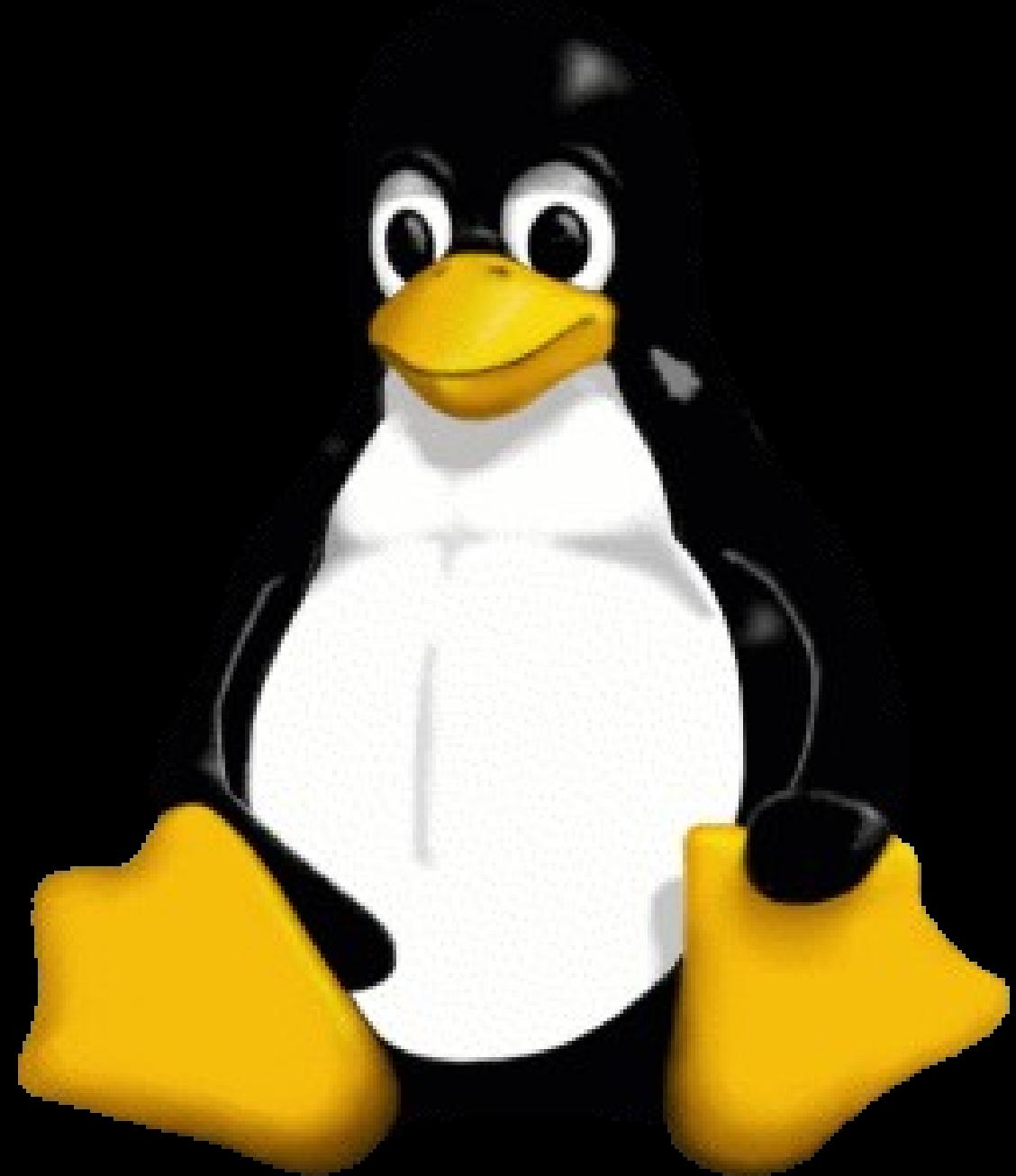
Linux 2.0

1996

support SMP

777.956 lignes

190 contributeurs



1996  
Lerry Ewing  
Avec GIMP 0.54

« Penguinitis makes you stay awake at nights just  
thinking about penguins and feeling great love  
towards them »

Torvalds

1996

« Making Linux GPL'd was  
definitely the best thing I  
ever did. »

Torvalds

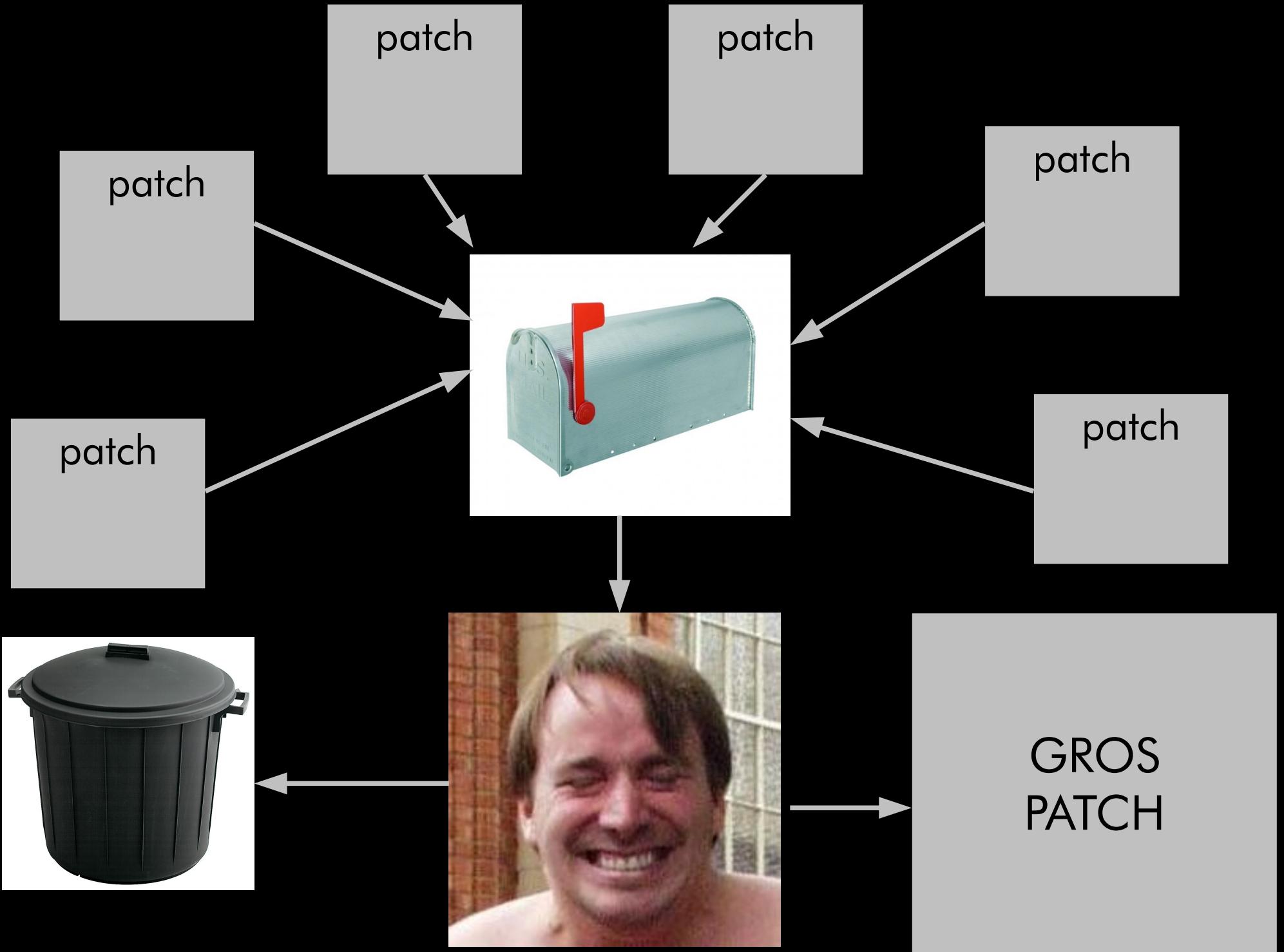
# Fin 1998

“Quite frankly, this particular discussion (and others before it) has just made me irritable, and is ADDING pressure. Instead, I'd suggest that if you have a complaint about how I handle patches, you think about what I end up having to deal with for five minutes.

Go away, people. Or at least don't Cc me any more. I'm not interested, I'm taking a vacation, and I don't want to hear about it any more. In short, get the hell out of my mailbox.”

– Linus Torvalds

Workflow sans  
gestion de version



```
$ cat kernel/sys.c
[...]
SYSCALL_DEFINE4(reboot, int, magic1, int, magic2, unsigned int, cmd,
               void __user *, arg)
{
    char buffer[256];
    int ret = 0;

    [ ... ]

    /* For safety, we require "magic" arguments. */
    if (magic1 != LINUX_REBOOT_MAGIC1 ||
        (magic2 != LINUX_REBOOT_MAGIC2 &&
         magic2 != LINUX_REBOOT_MAGIC2A &&
         magic2 != LINUX_REBOOT_MAGIC2B &&
         magic2 != LINUX_REBOOT_MAGIC2C))
        return -EINVAL;

    [ ... ]
}
```

#define LINUX_REBOOT_MAGIC1	0xfeeddead
#define LINUX_REBOOT_MAGIC2	672274793
#define LINUX_REBOOT_MAGIC2A	85072278
#define LINUX_REBOOT_MAGIC2B	369367448
#define LINUX_REBOOT_MAGIC2C	537993216

hex( 672274793 ) → 0x28121969  
hex( 85072278 ) → 0x05121996  
hex( 369367448 ) → 0x16041998  
hex( 537993216 ) → 0x20112000

Linux 2.2  
Janvier 1999  
support hardware, ~IPv6  
1.800.847 lignes

1998

« "Regression testing"?  
What's that? If it compiles,  
it is good; if it boots up, it  
is perfect. »  
Torvalds

Linux 2.4  
Janvier 2001  
encore plus de choses...  
3.377.902 lignes

2002

Bitkeeper  
gestion de version  
décentralisé  
propriétaire

Amélioration importante  
de la scalabilité  
de Linus

Linux 2.6  
Décembre 2003  
toujours plus de choses...

Avril 2005  
Plus de Bitkeeper gratuit

3 avril 2005  
Début du développement  
de Git  
par Torvalds

2007

« I'm an egotistical  
bastard, and I name all my  
projects after myself. First  
Linux, now git. »

Torvalds

16 juin 2005

2.6.12 sort, grâce à Git

# Changement de processus de développement

2 semaines

Merge  
window

6 à 10 semaines

Correction de bugs

X-1

X-rc1

X-rc2

X-rc3

X-rc4

X

Fin 2005  
*stable tree*

Début 2008  
*linux-next*

22 juillet 2011

Linux 3.0

pas de changements  
importants

14.647.033 lignes

Torvalds



Mainteneurs de sous-systèmes  
ou d'architectures



Mainteneurs de « drivers » ou  
d'ensembles de drivers



Contributeurs

Développement avec  
mailing list

Git

2000

« Talk is cheap. Show me  
the code. »

Torvalds

- ✉ ▾ [PATCH 0/5] GIC OF bindings Rob Herring
- ✉ [PATCH 1/5] irq: add declaration of irq\_domain\_simple\_ops to irqdomain Rob Herring
- ✉ ▾ [PATCH 2/5] irq: fix existing domain check in irq\_domain\_add Rob Herring
- ✉ ▾ Re: [PATCH 2/5] irq: fix existing domain check in irq\_domain\_add Thomas Gleixner
- ✉ Re: [PATCH 2/5] irq: fix existing domain check in irq\_domain\_add Grant Likely
- ✉ ▾ [PATCH 3/5] of/irq: introduce of\_irq\_init Rob Herring
- ✉ Re: [PATCH 3/5] of/irq: introduce of\_irq\_init Arnd Bergmann
- ✉ ▾ Re: [PATCH 3/5] of/irq: introduce of\_irq\_init Grant Likely
- ✉ ▾ Re: [PATCH 3/5] of/irq: introduce of\_irq\_init Rob Herring
- ✉ Re: [PATCH 3/5] of/irq: introduce of\_irq\_init Grant Likely
- ✉ ▾ [PATCH 4/5] ARM: gic: allow irq\_start to be 0 Rob Herring
- ✉ Re: [PATCH 4/5] ARM: gic: allow irq\_start to be 0 Grant Likely
- ✉ Re: [PATCH 4/5] ARM: gic: allow irq\_start to be 0 Russell King - ARM Linux
- ✉ ▾ [PATCH 5/5] ARM: gic: add OF based initialization Rob Herring
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Marc Zyngier
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Rob Herring
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Marc Zyngier
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Rob Herring
- ✉ Re: [PATCH 5/5] ARM: gic: add OF based initialization Grant Likely
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Thomas Abraham
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Cousson, Benoit
- ✉ ▾ Re: [PATCH 5/5] ARM: gic: add OF based initialization Russell King - ARM Linux

**From:** Arnd Bergmann <[arnd@arndb.de](mailto:arnd@arndb.de)>  
**To:** Rob Herring <[robherring2@gmail.com](mailto:robherring2@gmail.com)>  
**Cc:** [b-cousson@ti.com](mailto:b-cousson@ti.com), [marc.zyngier@arm.com](mailto:marc.zyngier@arm.com), [devicetree-discuss@lists.openembedded.org](mailto:devicetree-discuss@lists.openembedded.org), Rob Herring <[rob.herring@calxeda.com](mailto:rob.herring@calxeda.com)>, [grant.likely@secretlab.ca](mailto:grant.likely@secretlab.ca), [thomas.jamie@jamieiles.com](mailto:thomas.jamie@jamieiles.com), [shawn.guo@linaro.org](mailto:shawn.guo@linaro.org), [linux-arm-kernel@lists.infradead.org](mailto:linux-arm-kernel@lists.infradead.org)  
**Subject:** Re: [PATCH 3/5] of/irq: introduce of\_irq\_init  
**Date:** Thu, 15 Sep 2011 12:41:32 +0200  
**Sender:** [linux-arm-kernel-bounces@lists.infradead.org](mailto:linux-arm-kernel-bounces@lists.infradead.org)  
**User-Agent:** KMail/1.12.2 (Linux/2.6.35-22-generic; KDE/4.3.2; x86\_64; ; )

On Wednesday 14 September 2011, Rob Herring wrote:

```
> From: Rob Herring <rob.herring@calxeda.com>
>
> of_irq_init will scan the devicetree for matching interrupt controller
> nodes. Then it calls an initialization function for each found controller
> in the proper order with parent nodes initialized before child nodes.
>
> Based on initial pseudo code from Grant Likely.
>
> Signed-off-by: Rob Herring <rob.herring@calxeda.com>
> Cc: Grant Likely <grant.likely@secretlab.ca>
```

Looks good to me,

Acked-by: Arnd Bergmann <[arnd@arndb.de](mailto:arnd@arndb.de)>

On Thu, Nov 24, 2011 at 12:49:54PM +0100, Peter Rusko wrote:

```
> +struct platform_device * __init mx28_add_lradc(  
> +                           const struct mxs_lradc_plat_data *pdata)  
> +{  
> +     struct resource res[] = {  
> +         {  
> +             .start = MX28_LRADC_BASE_ADDR,  
> +             .end = MX28_LRADC_BASE_ADDR + SZ_16K - 1,  
> +             .flags = IORESOURCE_MEM,  
> +         },  
> +     };
```

I've pointed this out to people before, and I'll do it again. I wish people would take a moment to think about the code they write...

How the compiler can implement the above is as this equivalent C code:

```
static struct res_initializer[] = {  
    {  
        .start = MX28_LRADC_BASE_ADDR,  
        .end = MX28_LRADC_BASE_ADDR + SZ_16K - 1,  
        .flags = IORESOURCE_MEM,  
    },  
};
```

**From:** Tony Lindgren <[tony@atomide.com](mailto:tony@atomide.com)>  
**To:** Arnd Bergmann <[arnd@arndb.de](mailto:arnd@arndb.de)>  
**Cc:** [linux-omap@vger.kernel.org](mailto:linux-omap@vger.kernel.org), [linux-arm-kernel@lists.infradead.org](mailto:linux-arm-kernel@lists.infradead.org)  
**Subject:** [GIT PULL] omap fixes for v3.2-rc2, take 2  
**Date:** Wed, 23 Nov 2011 15:55:29 -0800  
**Sender:** [linux-arm-kernel-bounces@lists.infradead.org](mailto:linux-arm-kernel-bounces@lists.infradead.org)  
**User-Agent:** Mutt/1.5.20 (2009-06-14)

Hi Arnd,

This one has the DSS patches left out, some patches sent to stable, and based on -rc2.

Regards,

Tony

The following changes since commit [cfcfc9eca2bcbd26a8e206baeb005b055dbf8e37](#):  
Linus Torvalds (1):  
    Linux 3.2-rc2

are available in the git repository at:

<git://git.kernel.org/pub/scm/linux/kernel/git/tmlind/linux-omap fixes>

3.0 → 3.1

22 juillet → 24 octobre

94 jours

8.465 patches

90 patches/jour

1.136 développeurs

180 sociétés

125.000 lignes ajoutées

un cycle mou

(None)	13.1%
RedHat	10.4%
(Unknown)	8.8%
Intel	7.3%
Broadcom	5.1%
Novell	4.5%
IBM	3.6%
Texas Instruments	3.3%
(Consultant)	2.6%
Freescale	2.2%
Linaro	2.0%
Samsung	1.9%
Google	1.8%
Wolfson	1.7%
Fujitsu	1.5%
Renesas	1.2%
Oracle	1.0%
MiTAC	0.9%
Nokia	0.9%
(Academia)	0.9%

# Sur un an

octobre 2010 → octobre 2011

5 releases (.37, .38, .39, 3.0, 3.1)

49.000 patches

2.800 développeurs

1.400.000 lignes ajoutées

**Linux aujourd'hui**

- > 91% du top 500
- > 500.000 activations par jour de téléphones Android
- utilisation massive sur les serveurs et dans l'embarqué

After all, we've had forty years of Unix, and that whole "monolithic kernel in C" hasn't become invalid in those forty years. Sure, the details have changed, the language has evolved, and we have way more complex interfaces, but the basic design is still quite recognizable. And I don't think another 20 years will necessarily change that at all.

-- Linus Torvalds

# Questions ?

Remerciements à Jonathan Corbet pour son excellente présentation « 20 years of Linux » à ELCE, Prague, octobre 2011