

Introduction to Linux Kernel



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Some History

- Created by Linus Torvalds in 1991
 - 21 year old
 - University of Helsinki, Finland
 - Task switcher & terminal driver
- Contribution from MINIX community
- GNU Project
 - Lots of utilities
 - No kernel (GNU Hurd not finished)
- BSD – still in legal battle

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Some Release Statistics

On 14 March 1994, Linux 1.0.0 was released, with 176,250 lines of code. In March 1995, Linux 1.2.0 was released (310,950 lines of code).

Version 2 of Linux, released on 9 June 1996, was followed by additional major versions under the version 2 header:

- 25 January 1999 - Linux 2.2.0 was released (1,800,847 lines of code).
- 18 December 1999 - IBM mainframe patches for 2.2.13 were published, allowing Linux to be used on enterprise-class machines.
- 4 January 2001 - Linux 2.4.0 was released (3,377,902 lines of code).
- 17 December 2003 - Linux 2.6.0 was released (5,929,913 lines of code).
- 9 September 2009 - Linux 2.6.31 was released (12,046,317 lines of code).^[15]

Estimated cost to redevelop

The cost to redevelop the Linux kernel version 2.6.0 in a traditional proprietary development setting has been estimated to be \$612 million USD (£467 million euro) in 2004 prices using the COCOMO man-month estimation model.^[41] In 2006, a study funded by the European Union put the redevelopment cost of kernel version 2.6.8 higher, at €882 million euro (\$1.14 billion USD).^[42]

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Kernel

Original author(s)	Linus Torvalds
Developer(s)	Linus Torvalds and thousands of collaborators
Initial release	1991
Stable release	Kernel 2.6.31.6 (http://en.wikipedia.org/w/index.php?title=Template:Latest_stable_software_release/Linux&action=edit) (2009-11-10) ^[1] [+/- (http://en.wikipedia.org/w/index.php?title=Template:Latest_stable_software_release/Linux&action=edit&preload=Template:LSR/syntax)]
Preview release	Kernel 2.6.32-re8 (http://en.wikipedia.org/w/index.php?title=Template:Latest_preview_software_release/Linux&action=edit) (2009-11-19) ^[2] [+/- (http://en.wikipedia.org/w/index.php?title=Template:Latest_preview_software_release/Linux&action=edit&preload=Template:LSR/syntax)]
Written in	C
Operating system	Unix-like
Available in	English
Type	Kernel
License	GNU General Public License version 2 (only) ^{[3][4]} plus proprietary BLOBs
Website	www.kernel.org (http://www.kernel.org/)

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Latest Stable Kernel

The Linux Kernel Archives

Welcome to the Linux Kernel Archives. This is the primary site for the Linux kernel source, but it has much more than just Linux kernels.
[Frequently Asked Questions](#)

Protocol	Location
HTTP	http://www.kernel.org/pub/
FTP	http://ftp.kernel.org/pub/
RSYNC	rsync://rsync.kernel.org/pub/

Latest Stable Kernel: [!\[\]\(43e165fd0a30e03a39afb86038cd3ee5_img.jpg\) 2.6.32](#)

linus-next: next-20091204	2009-12-04	[Patch] [View Patch]	[Gitweb]
snapshot: 2.6.32-gt1	2009-12-06	[Patch] [View Patch]	[Gitweb]
mainline: 2.6.32	2009-12-03	[Full Source] [Patch] [View Patch]	[Gitweb] [Changelog]
stable: 2.6.32	2009-12-03	[Full Source] [Patch] [View Patch]	[Gitweb] [Changelog]
stable: 2.6.31.6	2009-11-10	[Full Source] [Patch] [View Patch] [View Inc.] [Gitweb] [Changelog]	[Gitweb] [Changelog]
stable: 2.6.30.10	2009-12-04	[Full Source] [Patch] [View Patch] [View Inc.] [Gitweb] [Changelog]	[Gitweb] [Changelog]
stable: 2.6.29.6	2009-07-02	[Full Source] [Patch] [View Patch] [View Inc.] [Gitweb] [Changelog]	[Gitweb] [Changelog]
stable: 2.6.27.39	2009-11-10	[Full Source] [Patch] [View Patch] [View Inc.] [Gitweb] [Changelog]	[Gitweb] [Changelog]
stable: 2.4.37.7	2009-11-07	[Full Source] [Patch] [View Patch]	[Gitweb] [Changelog]

Changelogs are provided by the kernel authors directly. Please don't write the webmaster about them.
[Customize the patch viewer](#)

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My ubuntu (as of 521207)

Monitor Edit View Help
System Processes Resources File Systems

Yunyong-X40

Ubuntu
Release 9.10 (karmic)
Kernel Linux 2.6.31-16-generic
GNOME 2.28.1

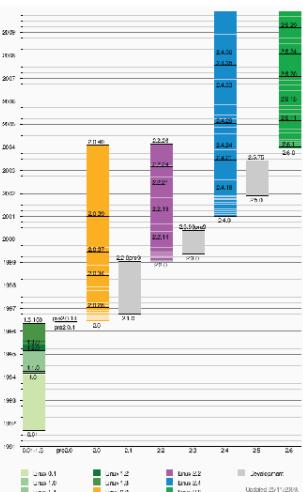
Hardware
Memory: 1.2 GiB
Processor: Intel(R) Pentium(R) M processor 1000MHz

System Status
Available disk space: 51.2 GiB

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Linux Kernel Development Timeline

Linux Kernel Development Model

- Linus Torvalds released “vanilla” versions ~every 3 months
- Main branch vs. stable branch
- 2.4 stable vs. 2.5 unstable → “backport”
- Stable branch – lags on recent h/w & features
- 2.5 → stable → 2.6 + “-next”

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Maintaining Older Versions

Kernel series	Current version	Maintainer
2.0	2.0.40 ^[59]	David Weinehall
2.2	2.2.27-rc2 ^[60]	Marc-Christian Petersen (former maintainer Alan Cox)
2.4	2.4.37.4 ^[61]	Willy Tarreau (former maintainer Marcelo Tosatti)
2.6.16	2.6.16.62 ^[62]	Adrian Bunk
2.6.27	2.6.27.34 ^[63]	Greg Kroah-Hartman ^[55]
2.6.x (current only)	(releases every three months) (http://git.kernel.org/ ?p=linux/kernel/git/torvalds/linux-2.6.git;a=summary)	Linus Torvalds
2.6.x- linux-next	latest development version	

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Core Principles (UNIX/Linux)

- Small single purpose commands
- Simple output
- Accept varied input
- EVERYTHING is a file (consistent interface)
- Configuration in ASCII
- Source in C

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3-Layer Architecture

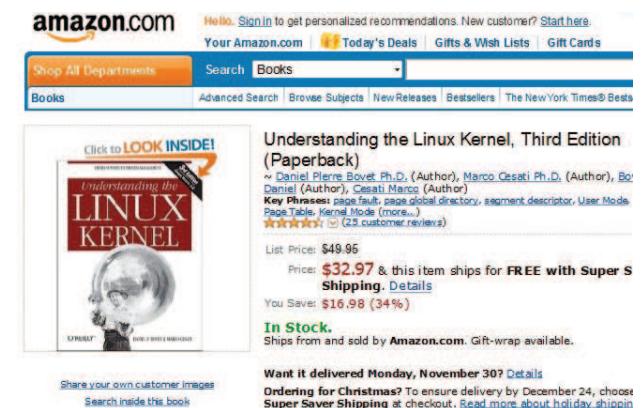
- Hardware
- Kernel-space
 - Consistence interface to all h/w platform
 - Process / security / etc.
- User-space
 - Shells / programs / GUI
 - GNU-Utilities

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Knowledge on Linux Kernel



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File Edit View History Bookmarks ScrapBook Tools Help
Getting Started Google News Knowledge Base Classes Unix Misc Temp Pink's PC 510814 do IST
Linux Tutorials 20 Linux Sys... Top 5 Email... Top 20 Open... Nomadic R... The Linux... Linux Dev...
Table of Contents
The Linux Kernel

This book is for Linux enthusiasts who want to know how the Linux kernel works. It is not an internals manual. Rather it describes the principles and mechanisms that Linux uses; how and why the Linux kernel works the way that it does.
Linux is a moving target; this book is based upon the current, stable, 2.0.33 sources as those are what most individuals and companies are now using.
This book is freely redistributable, you may copy and redistribute it under certain conditions. Please refer to the [copyright and distribution statement](#).
Version 0.8-3
David A Rusling
david.rusling@arm.com
Table of Contents, Show Frames, No Frames
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3 Foxglove Close,
Wokingham,
Berkshire RG41 3NF,
United Kingdom
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The Linux Kernel - Mozilla Firefox
File Edit View History Bookmarks ScrapBook Tools Help
Getting Started Latest Headlines Util News Misc Temp LinuxKernel
Most Visited Gmail - Inbox (68) - yunyon... Linux Online - KernelAnalys...
LinuxOnline! http://www.linux.org
Atmail 6: email, calendaring and groupware done right.
www.atmail.com/atmail
Register Login
Applications Documentation Distributions Download General Info Book Store
MobileZone Brilliant User Interface
An interface to Windows OS www.mobilezone.com
KernelAnalysis-HOWTO
Roberto Arcomano berto@bertolinux.com
v0.7, March 26, 2003
This document tries to explain some things about the [Linux Kernel](#), such as the most important components, how they work, and so on. This HOWTO should help prevent the reader from needing to browse all the kernel source files [searching](#) for the "right" function, "declaration, and definition, and then linking each to the other. You can find the latest version of this document at <http://www.bertolinux.com> If you have suggestions to help make this document better, please submit your ideas to me at the following address: berto@bertolinux.com

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Linux kernel

From Wikipedia, the free encyclopedia

The **Linux kernel** is an operating system kernel used by the Linux family of Unix-like operating systems.^[5] It is one of the most prominent examples of free and open source software.^[6]

The Linux kernel is released under the GNU General Public License version 2 (GPLv2)^[4] plus proprietary licenses for some controversial BLOBs and is developed by contributors worldwide. Day-to-day

Linux



Linux kernel 2.6.25.17 booting

Original author(s) Linus Torvalds

Developer(s) Linus Torvalds and thousands of collaborators

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Knowledge on Linux Kernel

To quote the "official" O'Reilly site for the book:
Written by a leading developer and maintainer of the Linux kernel, Linux Kernel in a Nutshell is a comprehensive guide to kernel configuration and building, a critical task for Linux users and administrators.
No distribution can provide a Linux kernel that meets all users' needs. Computers big and small have special requirements that require recompiling and re-linking the kernel. Whether you're trying to get sound, wireless support, and power management working on a laptop or incorporating enterprise features into a large, volatile memory system or a large server, you can benefit from the insights in this book.
Linux Kernel in a Nutshell covers the entire range of kernel tasks, starting with downloading the source and making sure that the kernel is in sync with the versions of modules you need. In addition to configuration and building the kernel, this book offers reference material and discussions of related topics such as control of kernel options at runtime.
A key benefit of the book is a chapter on determining exactly what drivers are needed for your hardware. Also included are recipes that list what you need to do to accomplish a wide range of popular tasks.

To quote me, the author of the book:
If you want to know how to build, configure, and install a custom Linux kernel on your machine, buy this book. It is written by someone who spends every day building, configuring, and installing custom kernels as part of the development process of this fun, collaborative project called Linux.
I'm especially proud of the chapter on how to figure out what to do to build a kernel based on the hardware running on your machine. This is an essential task for anyone wanting to wring out the best possible speed and control of your hardware.

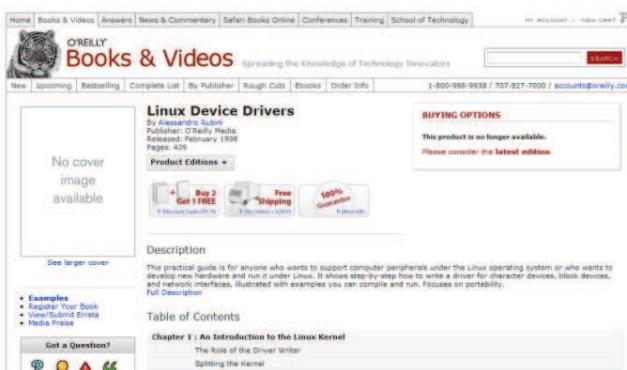
LINUX KERNEL IN A NUTSHELL
A Desktop Quick Reference
O'REILLY®
Greg Kroah-Hartman

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Linux Kernel 2.4 Internals by Tigran Aivazian (82 pages)

Linux Kernel 2.4 Internals

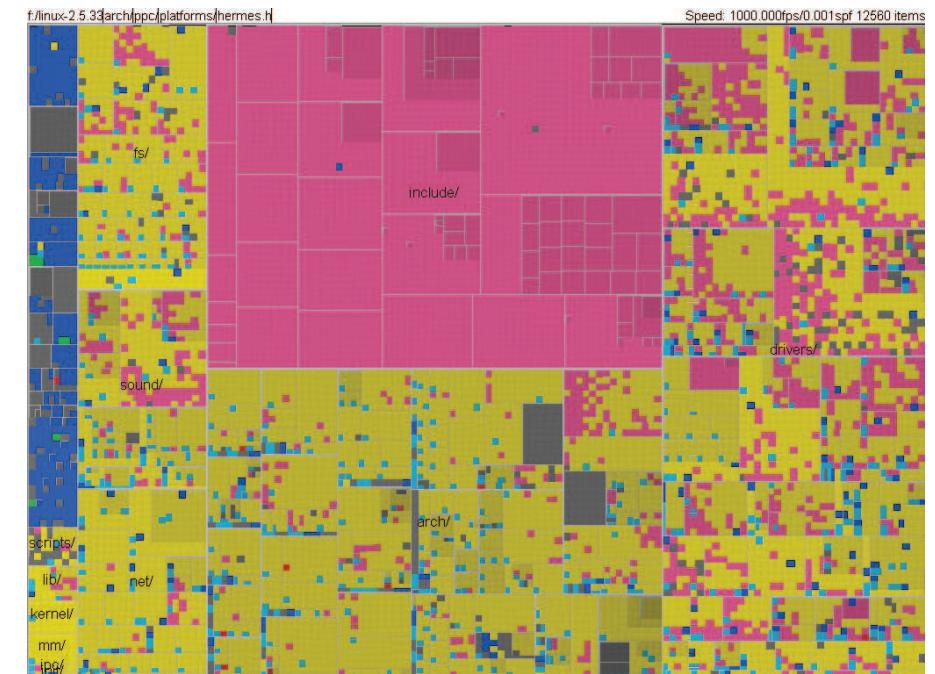
Tigran Aivazian tigran@veritas.com

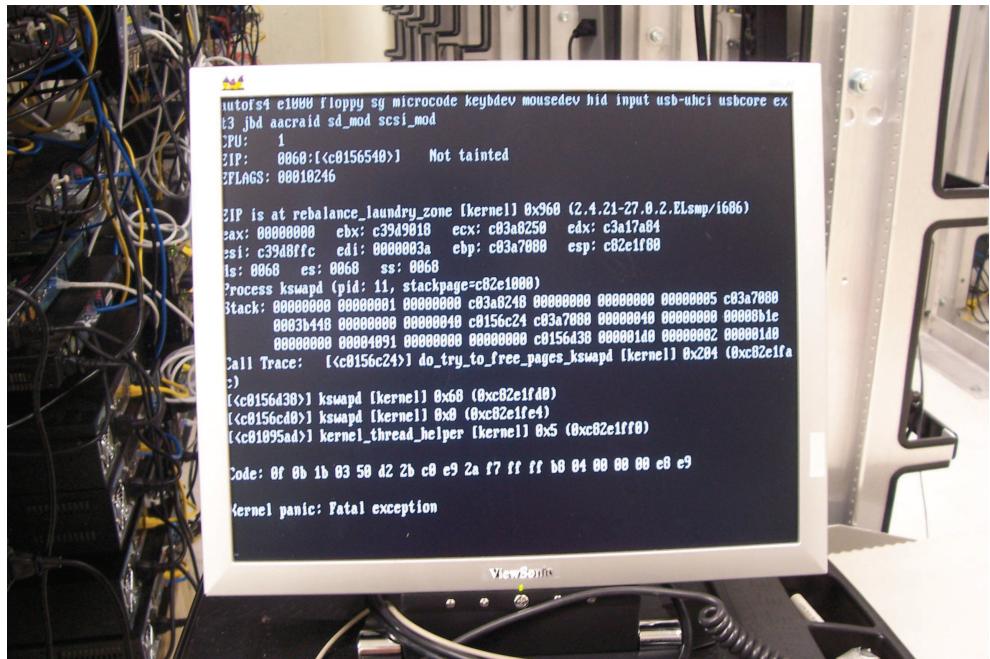
7 August 2002 (29 Av 6001)

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```

ufs1 c1000 floppy sg microcode keybdev mousedev hid input usb-uhci usbc core ex
l3 jbd aacraid sd_mod scsi_mod
CPU: 1
ZIP: 0060:[<c0156540>] Not tainted
FLAGS: 00010246

ZIP is at rebalance_laundry_zone [kernel] 0x960 (2.4.21-27.0.2.ELsmp/i686)
eax: 00000000 ebx: c3949818 ecx: c83a0258 edx: c3a17a04
esi: c3948f1c edi: 0000003a ebp: c83a7800 esp: c82e1ff0
ds: 0068 es: 0068 ss: 0068

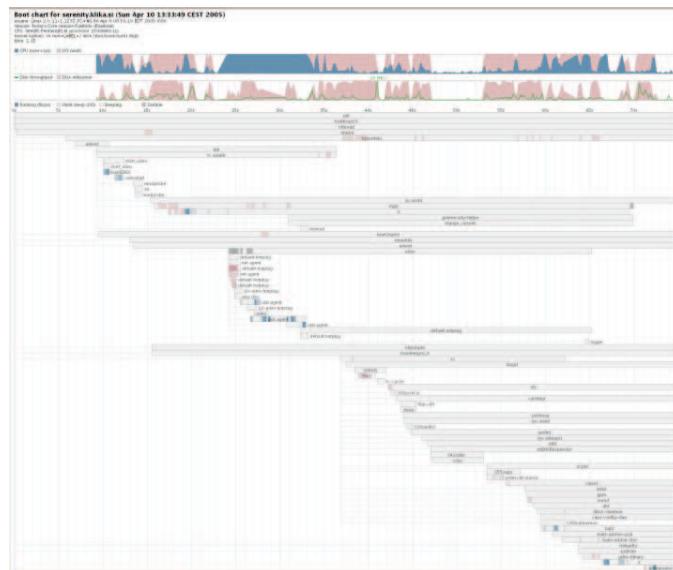
Process kswapd (pid: 11, stackpage=c82e1ff0)
Stack: 00000000 00000001 c83a8248 00000000 00000000 00000005 c83a7880
0003b448 00000000 00000048 c8156c24 c83a7800 00000048 00000000 0000001c
00000000 00004991 00000000 00000000 c8156d38 00000002 0000001d0
Call Trace: [<c0156c24>] do_try_to_free_pages_kswapd [kernel] 0x204 (0xc82e1fa)
[<c0156d38>] kswapd [kernel] 0x68 (0xc82e1fd0)
[<c0156d40>] kswapd [kernel] 0x8 (0xc82e1fe4)
[<c01895ad>] kernel_thread_helper [kernel] 0x5 (0xc82e1ff0)

Code: 0f 0b 1b 03 50 a2 2b c8 e9 2a f7 ff ff b8 04 00 00 00 00 c8 e9

Kernel panic: Fatal exception

```

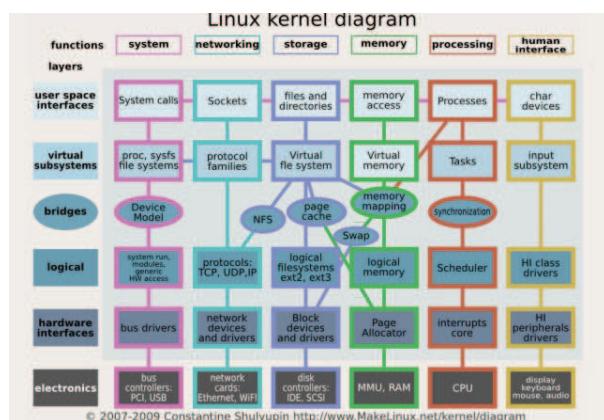
Boot Chart



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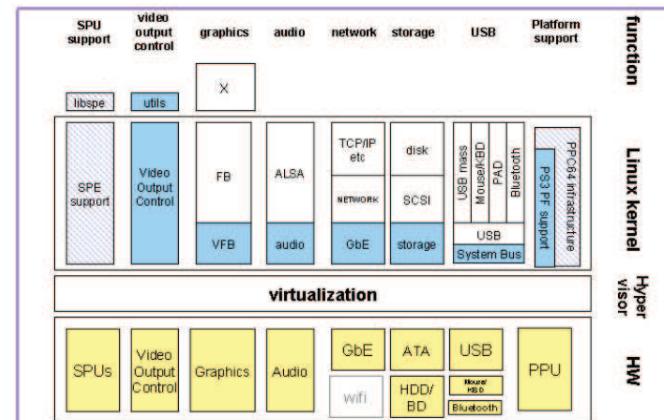


© 2007-2009 Constantine Shulyupin <http://www.MakeLinux.net/kernel/diagram>

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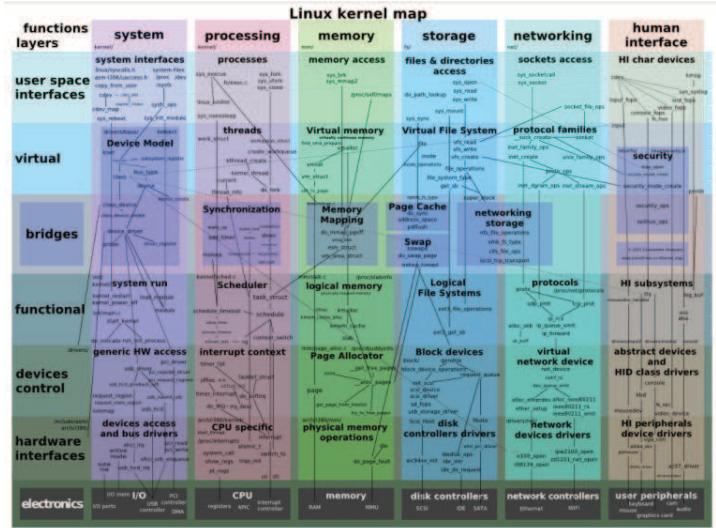
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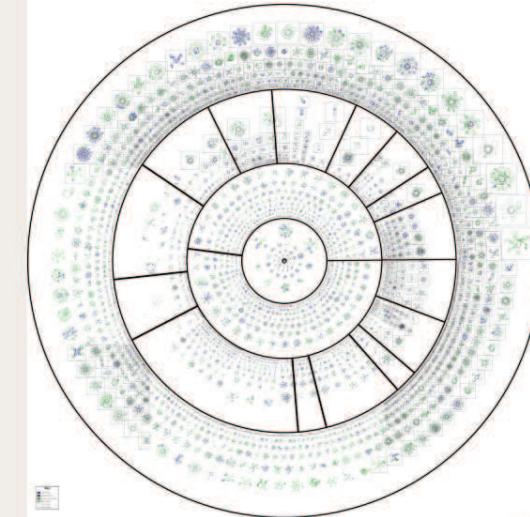


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Linux Kernel v2.4.9



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