



Open Source and the New Technology Economy: The Importance of External Collaborative R&D

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Samsung Research America – Silicon Valley
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Talk Description

With the proliferation of open source software and the fast development model that goes with it, technology companies have been examining how to leverage that speed and quality of development to build their products and services.

In this talk, Dr. Haddad, Head of Open Source Innovation at Samsung, will provide a discussion that focuses on the concept of external collaborative R&D (sometimes also called Open Innovation), the needs for companies to pick up new skills and adapt to new, faster, more agile and more collaborative mode of operation where they collaborate on the 80% and innovate on the 20%.

At Samsung, Haddad's group is responsible of fostering collaboration on various technology areas (system, web, media) and will provide examples of how the team is operating and managing external R&D.

Talk Structure

- **Business and Product Strategies Enabled by Open Source**
- **Future of Open Source – Survey Results**
- **Open Source is External R&D**
- **Academic Research as External R&D**
- **Closing Remarks**



Business & Product Strategies Enabled by Open Source



Smart Companies Have an Open Source Strategy.

What's your Open Source strategy?

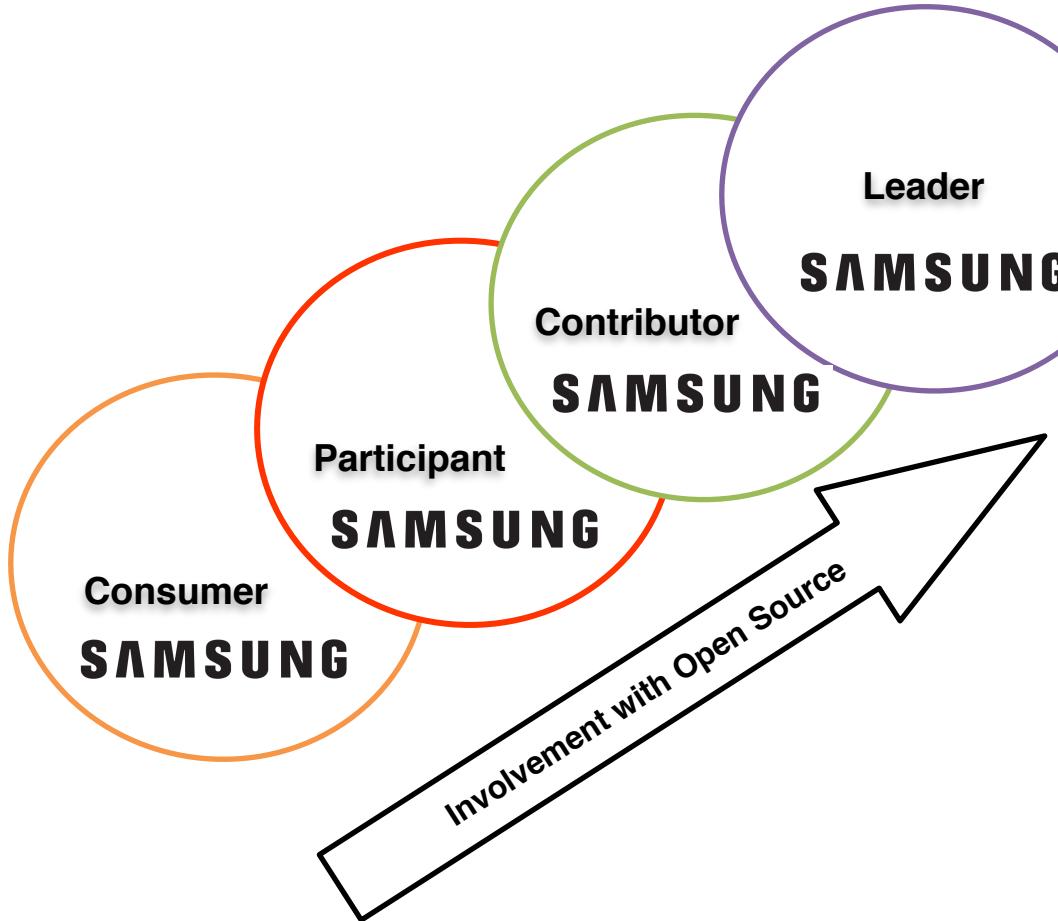


Who is funding this work?

1. "Amateurs"	11.6%
2. Intel	9.3%
3. Red Hat	8.7%
4. Linaro	5.9%
5. Samsung	4.0%
6. Texas Instruments	3.7%
7. Unknown Individuals	3.6%
8. IBM	3.1%
9. SuSE	3.1%
10. Vision Engraving	2.7%

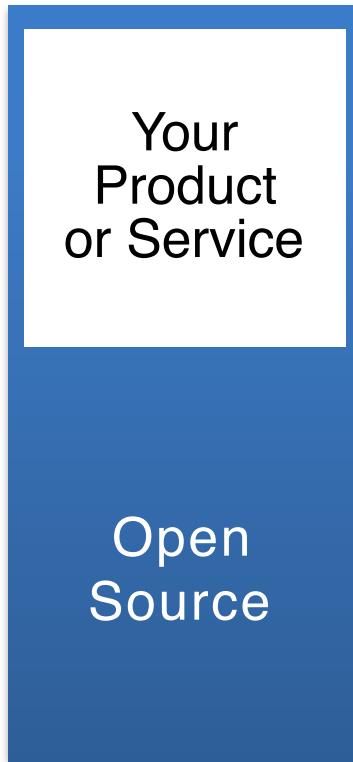
LINUX FOUNDATION

Kernel releases 3.8.0 – 3.12.0

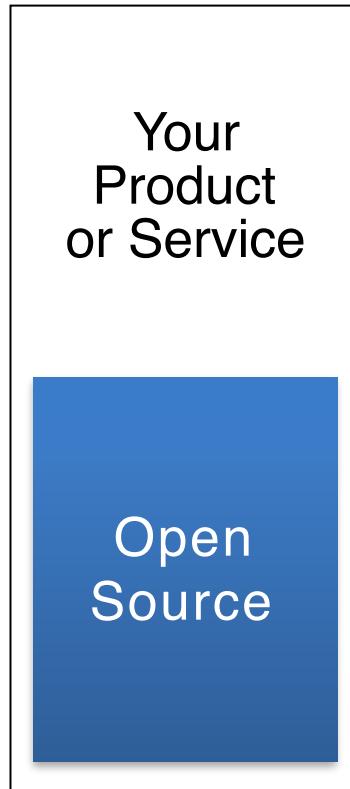


Product Strategies Enabled by Open Source

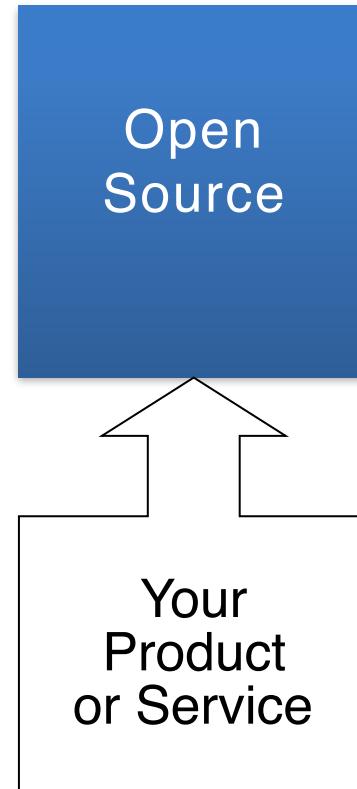
Building OSS



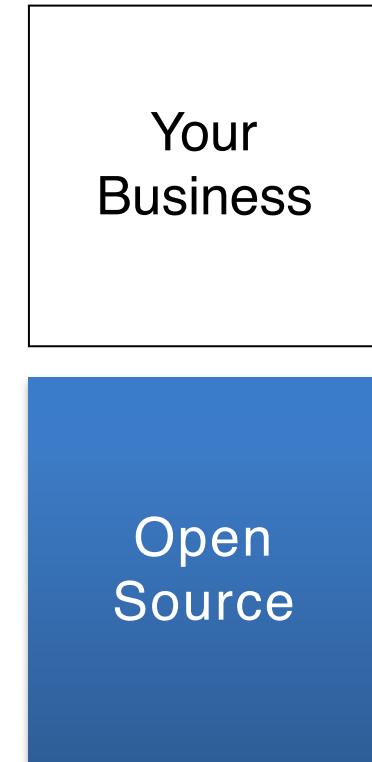
Building with OSS



Building for OSS



Building on OSS



"I believe that open source components have contributed to Samsung's business success very much." he said. So much so that Samsung has expanded its contributions to Linux and open source, becoming one of the top 10 contributors to the Linux kernel in 2012. It now employs more than 20,000 software developers whose work is based in large part on open source components. Suh said.



Sang-bum Suh, Ph.D.

VP of the Software Platform Team in
Software R&D Center, Samsung

Source: Linux.com
Talks by Jaguar Land Rover, Samsung, Adapteva
Underscore Industry Trend Toward Collaboration
By Libby Clark

Inner Sourcing: Internal Open Source Strategy

● Internally adopting open source development processes

- Re-use code across products
- Fast release cycles
- Ongoing QA



● Benefits of inner sourcing:

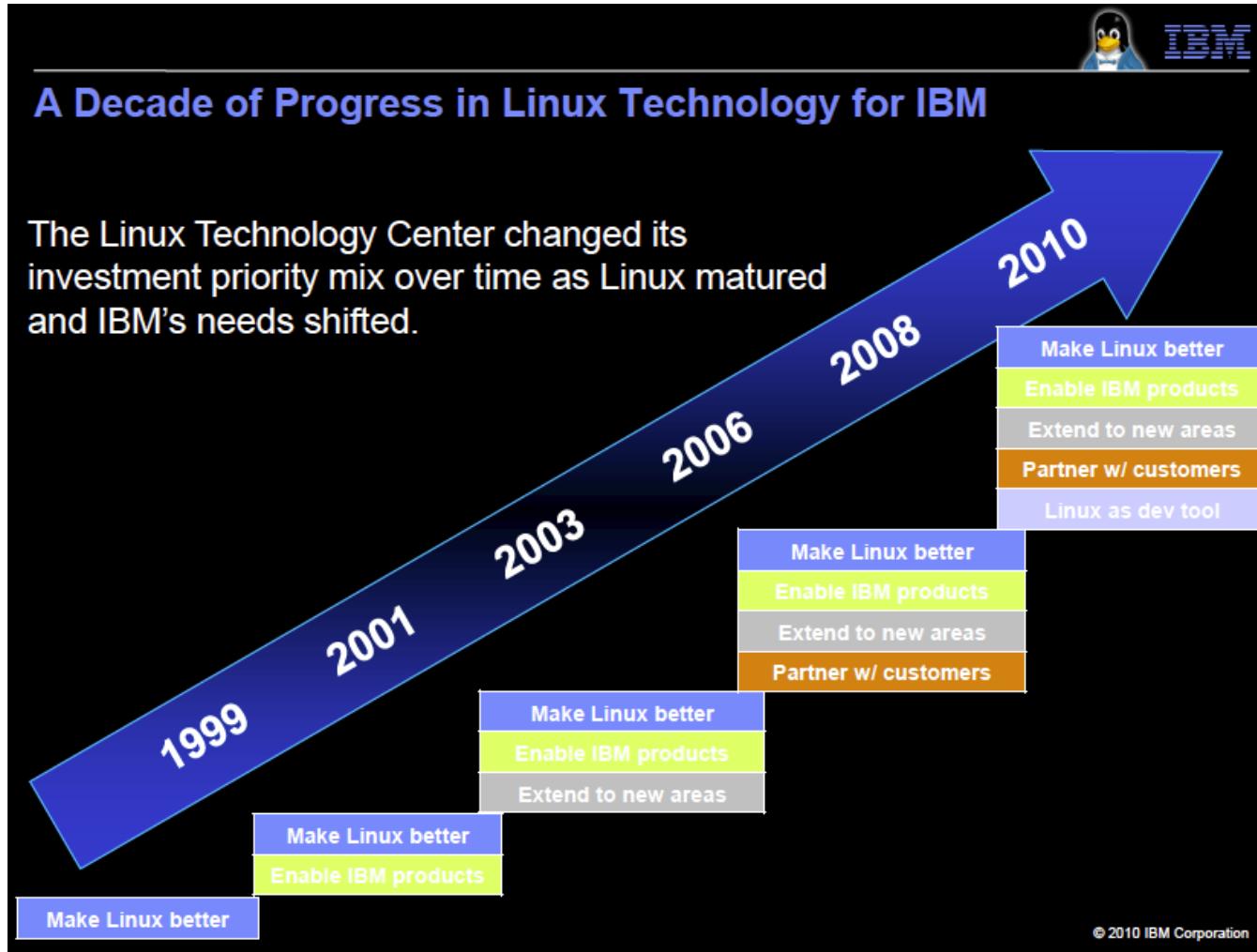
- Soft
 - Cross organizational visibility into code, tools, skillsets, projects
 - Cross organizational collaboration, buy-in
 - Developer engagement and morale, motivation, volunteerism
- Hard
 - Code reuse
 - Better quality
 - Improved innovation

Guy Martin
Samsung Open Source Strategist
Ex-Red Hat, Managing Principle

We're late: The US Experience Started in 1999



10+ Years of Linux and Open Source at IBM
Linux Foundation Collaboration Summit, April 14, 2010



The Japanese Experience Started in ~2003 (via OSDL)

2003

- Japanese ICT leaders (founding members of the Open Source Developments Labs) took a long view on open source
- They realize their industry would depend on Linux and open source software
- They knew they needed to catch up with companies in NA that were dominating the vast majority of open source development
- They had specific goals related to how they wanted to influence which projects and how – Linux was the primary project
- They understood the existence of barriers they needed to overcome (cultural barriers, language barriers, business barriers and knowledge gaps)

2014

- Japan now has a domestic support ecosystem for major country infrastructure which is based on Linux (Japan railway control systems, Tokyo stock exchange, Etc.)
- Japanese firms are able to attract top talent to their firms because they are seen as community leaders
- Japanese firms are very active in open source development activities related to their products
- Major new industry projects such as LTSI are being launched from Japan to address their business needs
- Japanese companies have strong presence in open source organizations (Example: Presence in the Linux Foundation – 25% of Platinum members with BoD seat and 28% of Gold members - not to mention dozens at Silver level)

Korea is Happening Now

- Increased # of Korean companies active with open source foundations
- Increased # of Open Source conferences in Korea (Korea Linux Forum, FOSCON, Samsung Open Source Conference, Kernel Summit, Free & Open Source Software for Geospatial, etc.)
- Significant increase in contributions to key Open Source projects
- Very active local open source communities
- New industries joining (automotive, finance)

What about China?

- In Japan -> **NEC, HITACHI, FUJITSU**
- In Korea -> **Samsung, LG, ETRI**
- In China
that
drive in -> **Huawei is extremely well position to drive
transformation and lead the open source
China.**





The Future of Open Source (2014 Survey Results)

<https://www.blackducksoftware.com/future-of-open-source>



FOR THE LAST 8 YEARS THE #1
BENEFIT FOR PARTICIPATING
IN OPEN SOURCE PROJECTS
HAS BEEN:

**HELP
REDUCE COSTS**



NEARLY **50%**

RETAIN THEIR COMPETITIVE ADVANTAGE
THROUGH OPEN SOURCE

A blue-tinted photograph of two men in business attire running on a track. One man is in the foreground, leaning forward with his arms outstretched. The other man is slightly behind him, also running. In the background, a city skyline is visible under a clear sky.

“Contributing can make us a first market mover and give us a kind of monopoly in time. Although competitors will be able to access and build upon the code, actively contributing gives Sony the advantage that we know it best.”

Sony Mobile

WSJ May 2014



DATA SNAPSHOT

38%

INFLUENCE A
PROJECT'S
DIRECTION

37%

FIND AND RECRUIT
DEVELOPER
TALENT

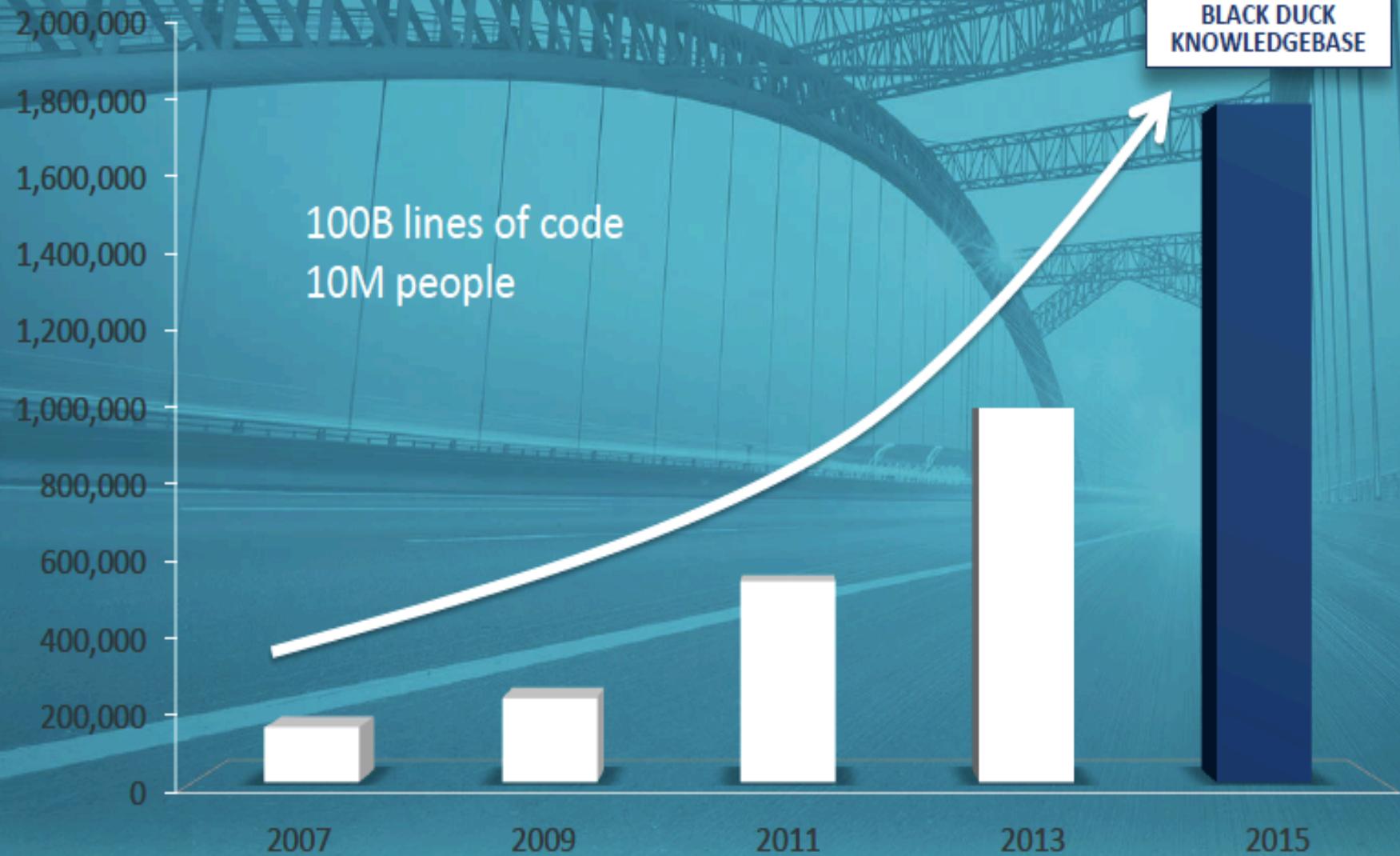
FREES UP TIME & MONEY FOR INNOVATION

OVER
50%



OF COMPANIES ARE TRYING TO CREATE NEW PRODUCTS AND SERVICES

OPEN SOURCE PROJECTS



VENTURE INVESTMENTS IN OPEN SOURCE

NORTH BRIDGE
venture partners

2011



INVESTMENTS
\$398M

AVERAGE DEAL SIZE
\$8M



DEALS
49

2012



INVESTMENTS
\$669M

AVERAGE DEAL SIZE
\$14M



DEALS
49

2013



INVESTMENTS
\$920M

AVERAGE DEAL SIZE
\$18M



DEALS
51



Open Source is External R&D



Companies with Strong External R&D



Google



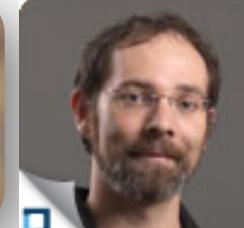
IBM

CITRIX

Microsoft

QUALCOMM®

FUJITSU



ORACLE®



NEC



What's for Dinner?

2011
THE WALL STREET JOURNAL
WSJ



ESSAY

Why Software Is Eating The World

By MARC ANDREESSEN

August 20, 2011

2013

THE
LINUX
FOUNDATION



“If you are going to master software you must master open source”.

Jim Zemlin, Executive Director, The Linux Foundation

Collaboration Summit 2013 Opening Keynote Speech

May 5, 2014, 5:51 PM ET

Open Source ‘Eating’ Software World: Samsung

Article

Comments



By RACHAEL KING

Reporter

THE WALL STREET JOURNAL
WSJ

Samsung Electronics is ramping up its contributions to various open source projects as the company depends more on open source software in its products. The company sees open source software as a faster path to innovation.

2014

“External R&D” is Eating the Software World.



3 Top Results of Increased External R&D

Direct Product Innovation:

Billions of dollars of free software harnessed to create products and services.

Faster TTM:

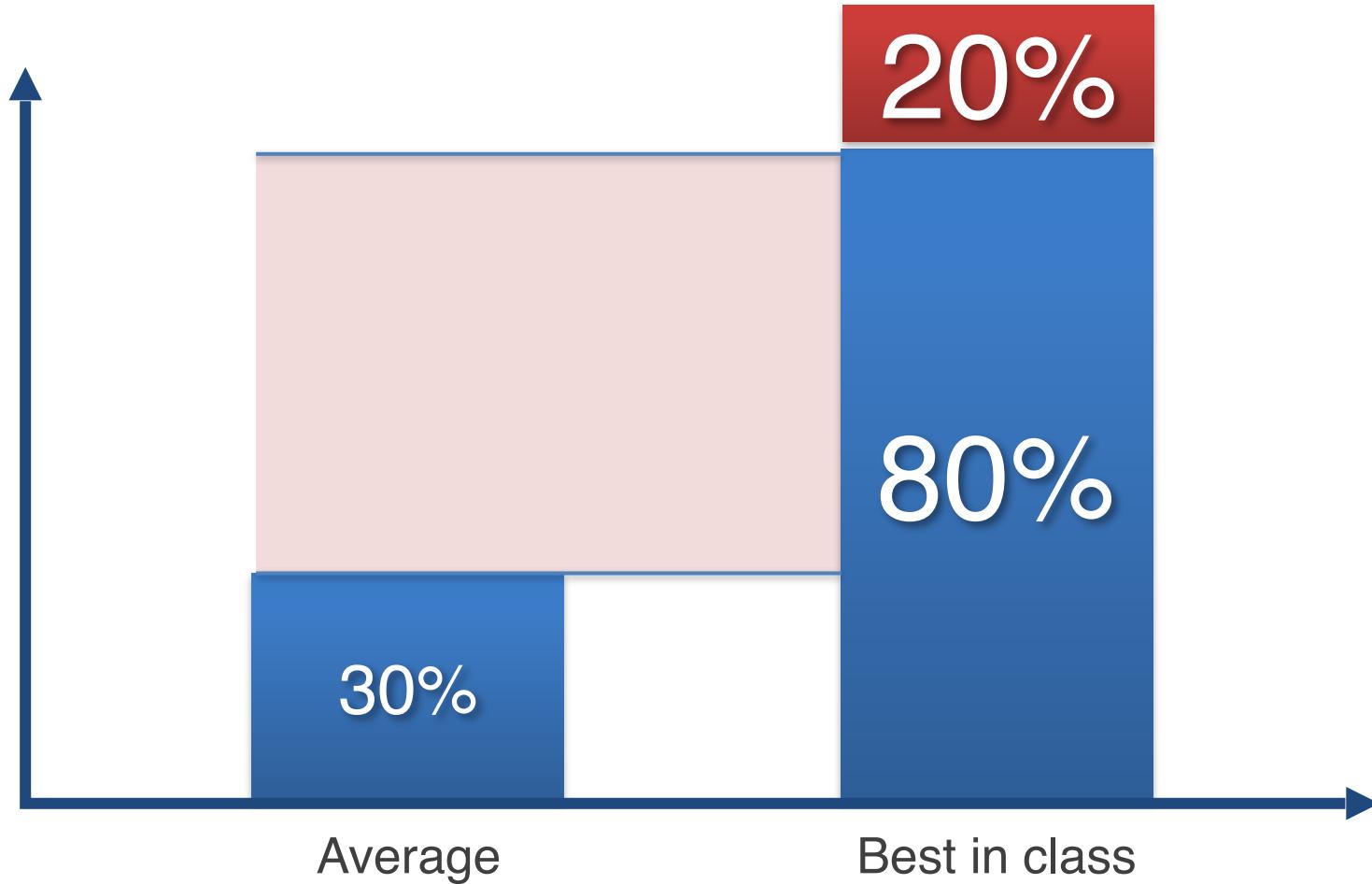
Business aligned with upstream open source projects enables faster time to market. We don't align with upstream projects just because it's fun. We do it because it is a part of our business strategy.

Better Hiring:

Organizations with strong external R&D attract top software talent.

Open Source is a Strategic Asset

Shift from smaller part to majority of code being open source.
Embedded, Supercomputing, Telecom, Banking, Healthcare, Auto, etc.



IDC 2014

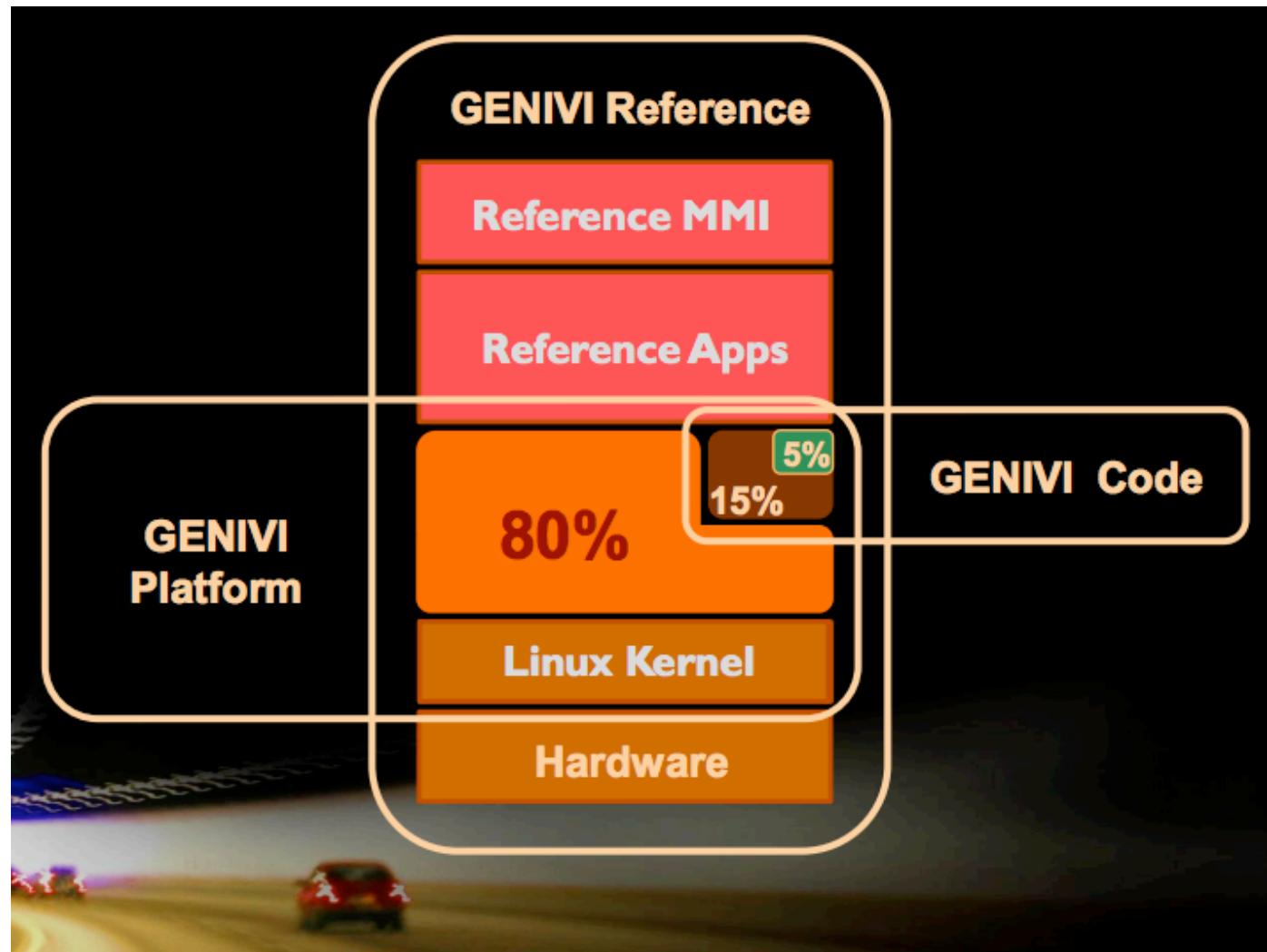
GENIVI Alliance (Automotive Industry, 159 members)

80%
Global Developer
Community
Collaborative R&D

15%
GENIVI Members
Collaborative R&D

5%
Differentiation

More Focus
+
More Innovation



GENIVI Alliance 2014

“About 85% of software at Sony Mobile Communications AB is open source”.

- Carl-Eric Mols, Sony Mobile

WSJ, May 2014

CIO Journal.
FROM THE WALL STREET JOURNAL

WSJ.com CIO Home from Deloitte

May 9, 2014, 5:08 PM ET
BY STEVEN NORTON



Open Source Contributions Spawn Competitive Advantage at Sony Mobile

Carl-Eric Mols, head of open source software operations at Sony Corp.’s mobile division, says contributing directly to the open source community has cut maintenance costs and allowed it to speed up some product releases by two to four weeks, a competitive advantage that can translate to millions of dollars in new revenue.

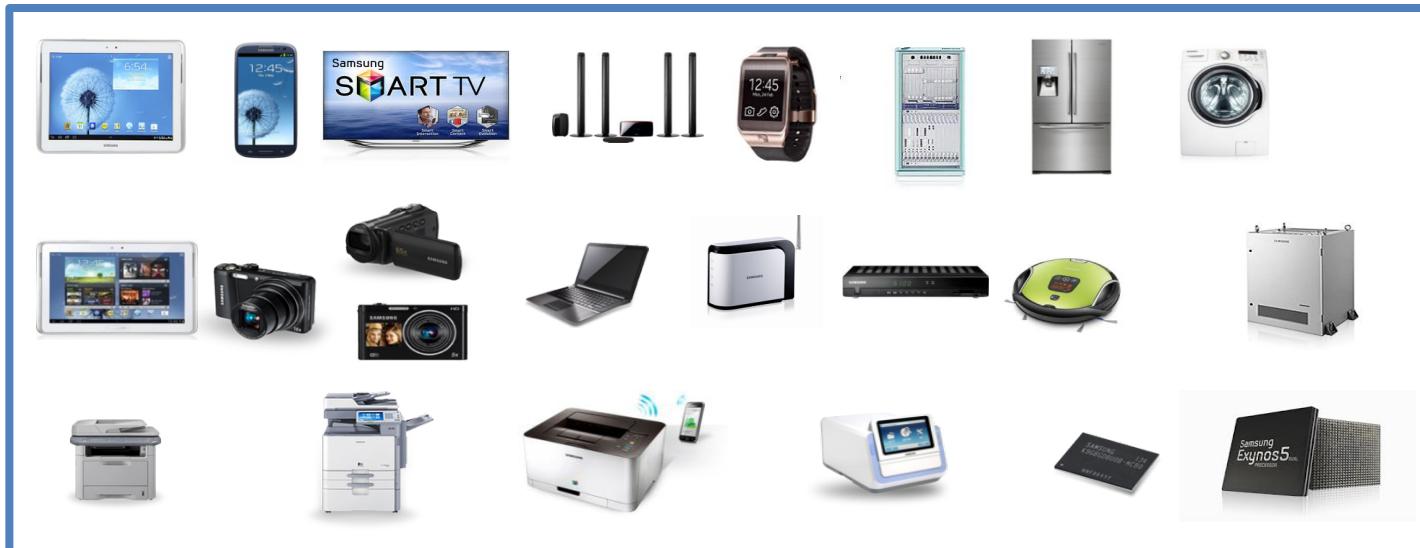
“Contributing can make us a first market mover and give us a kind of monopoly in time,” Mr. Mols told CIO Journal. Although competitors will be able to access and build upon the code, actively contributing gives Sony “the advantage that we know it best,” he said.

Samsung Electronics

“Today you can’t build a product without using open source software.”

- Samsung

WSJ, May 2014





Open Source at Facebook

At Facebook, we have always been strong advocates of open software. From our earliest days - when the site was built on PHP, MySQL and memcached - we've been privileged to stand on the shoulders of open source giants.

Ever since, we've worked hard to contribute our own work back to the community, and help other companies - both small and large - learn from our experience of building web, mobile, big data, and infrastructure stacks at scale.

Most of our projects are on [GitHub](#), and we also actively contribute elsewhere, such as to the [Hadoop](#) projects, [LLVM](#), [GNU grep](#), and [Mercurial](#), amongst many others.

[Our Projects on GitHub](#)

Apple



www.apple.comopensource/

**488 Open Source Components used in Apple Products.
(Oct 23, 2014)**

Store Mac iPhone Watch iPad iPod iTunes Support

Open at the source.

As the first major computer company to make Open Source development a key part of its ongoing software strategy, Apple remains committed to the Open Source development model. Major components of Mac OS X, including the UNIX core, are made available under Apple's Open Source license, allowing developers and students to view source code, learn from it and submit suggestions and modifications. In addition, Apple uses software created by the Open Source community, such as the HTML rendering engine for [Safari](#), and returns its enhancements to the community.

Apple believes that using Open Source methodology makes [Mac OS X](#) a more robust, secure operating system, as its core components have been subjected to the crucible of peer review for decades. Any problems found with this software can be immediately identified and fixed by Apple and the Open Source community.

Learn more about Open Source development at
<http://developer.apple.comopensource/>

Open Source Projects:

Component	Project	Version	Used In
AddressBook-Metakit	Metakit	2.4.9.2	Mac OS X, Xcode Tools
AirPortFamily	wpa_supplicant	0.3.9	Mac OS X
AKCmds	LibTIF	3.8.2	Mac OS X, Xcode Tools
amavisd	amavisd	amavisd-new-2.6.5	Mac OS X, Server
apache	apache	2.2.19	Mac OS X, Xcode Tools
apache_mod_bw	apache_mod_bw	0.8	Server
apache_mod_encoding2	apache_mod_encoding2	20021209	Server
apache_mod_jk	apache_mod_jk	1.2.30	Server
apache_mod_perl	mod_perl	2.0.5	Mac OS X, Xcode Tools

Apple Open Source

Releases

 OS X	 Developer Tools	 iOS	 OS X Server
▼ 10.10 10.10	▼ 5.x 5.1 5.0	▼ 6.1 6.1.3 6.1	▼ 3.x 3.0.2
► 10.9 ► 10.8 ► 10.7 ► 10.6 ► 10.5 ► 10.4 ► 10.3 ► 10.2 ► 10.1 ► 10.0	► 4.x ► 3.x ► 3.0/3.1 ► 2.x ► WWDC2004DP ► WWDC2003DP ► Dec2001	► 6.0 ► 5.x ► 4.x ► 3.x ► 2.x ► SDK ► 1.x	► 2.x

Open Source Reference Library

A collection of useful documents about open source from Apple Developer

	Security	Porting	Frameworks
WebKit	I/O Kit	X11	
Daemons & Services	Kernel	Concurrency	

And Microsoft...



Microsoft “loves Linux” as it makes Azure bigger, better

11 million servers, new giant VMs, and more third-party app support.



WIRED

Microsoft Cracks List of Top Linux Contributors

BY CADE METZ 04.03.12 | 11:56 AM | PERMALINK

[Share](#) 2 [Tweet](#) 0 [G+](#) 68 [in Share](#) [Pin It](#)

Microsoft | Openness

[Twitter](#) 1,400 [Facebook](#) 440 [Search Microsoft.com](#) [bing](#)

Microsoft+Linux

HOME OPEN SOURCE OPEN IN THE CLOUD OPENNESS IN GOVT ABOUT OPENNESS
BLOG

Open Source



back

Case Studies

Resources +
Related Items



More Videos

In demand
23 of 25
23 of the top 25 downloaded OSS projects run on Windows.*

OPENNESS BLOG

see all blog posts

Office 365 Calling All Developers – Android, iOS, Windows

Wednesday, October 29, 2014

Yesterday at TechEd Europe 2014, Microsoft announced new capabilities that make Office 365 more extensible for developers, including: General availability of new Office 365 APIs for mail, files, calendar and contacts New open source mobile SDKs for native app development, ...
[Read more](#)

OPENNESS STORY

CASE STUDIES

NEWS & PERSPECTIVES

PROJECT DIRECTORY

Available Now: SUSE Linux Enterprise Server 12 on Microsoft Azure

Tuesday, October 28, 2014

The newest major release of SUSE Linux Enterprise (SLES 12), is now available on Microsoft Azure. SLES 12 includes the latest technological innovations from upstream to provide enterprise customers with increased uptime, improved operational efficiency and accelerated innovation. SLES 12 ... [Read more](#)

Microsoft and Linux: Love is in the Cloud

Some did not embrace it or were too late ...



Things are developing nicely



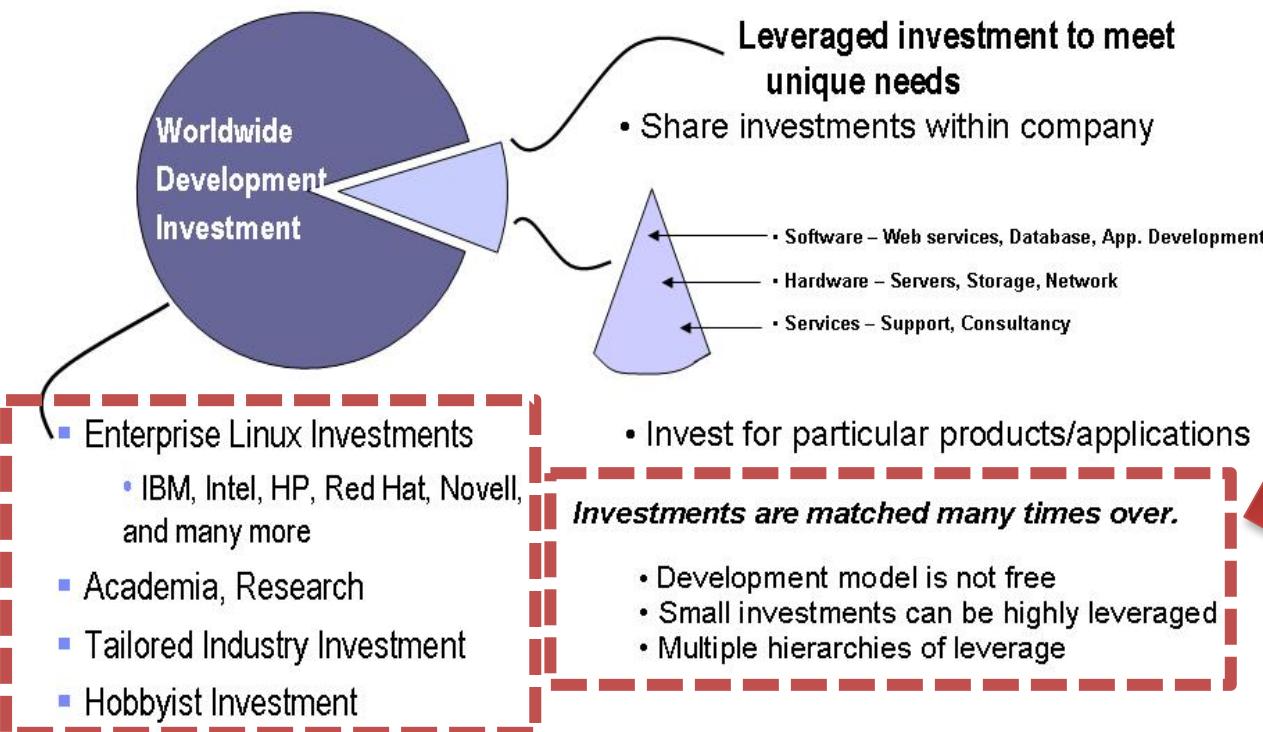
What about ROI on External R&D?

Dan Frye, VP Open Systems Development, IBM - October 2nd, 2007

Invited Keynote at Motorola Inc. during internal Open Source conference.

IBM Open Systems Development

Leveraged Development Expense with Linux



Organizing External R&D: Collaborative Foundations

Formal structures to enable collaboration across companies with competing commercial interests.

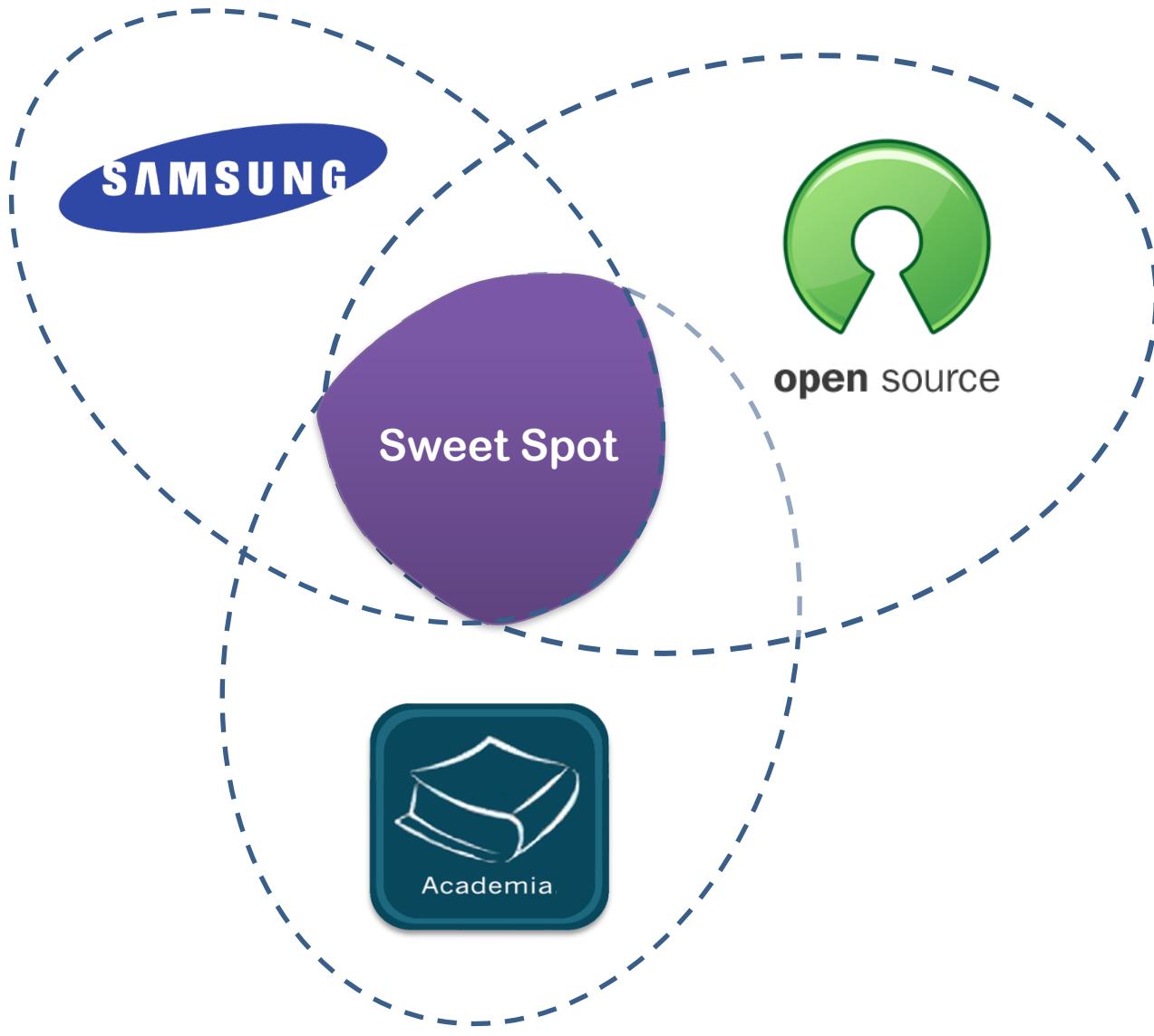




Academic Research is External R&D

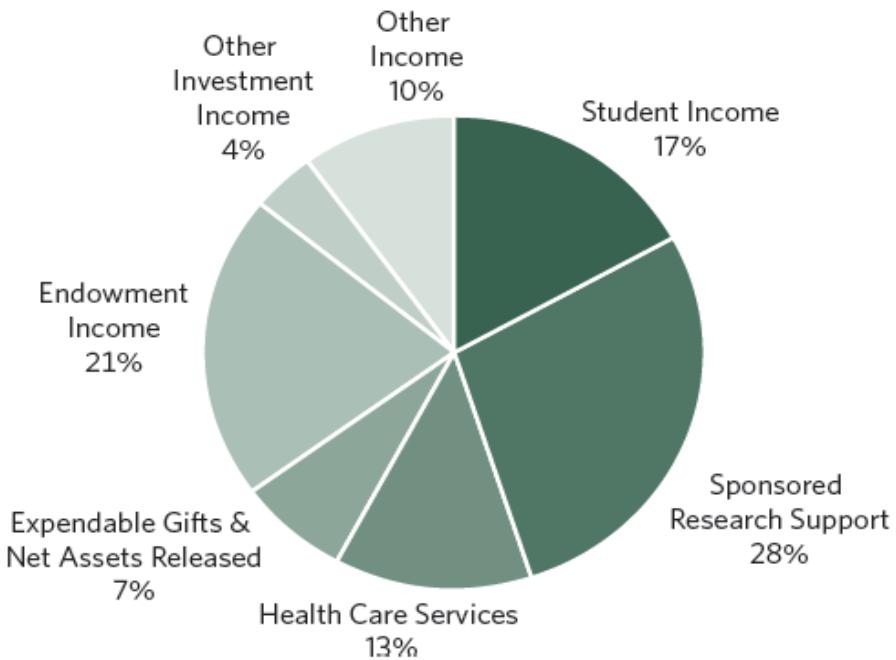


How Open Source allows us to do more External R&D?

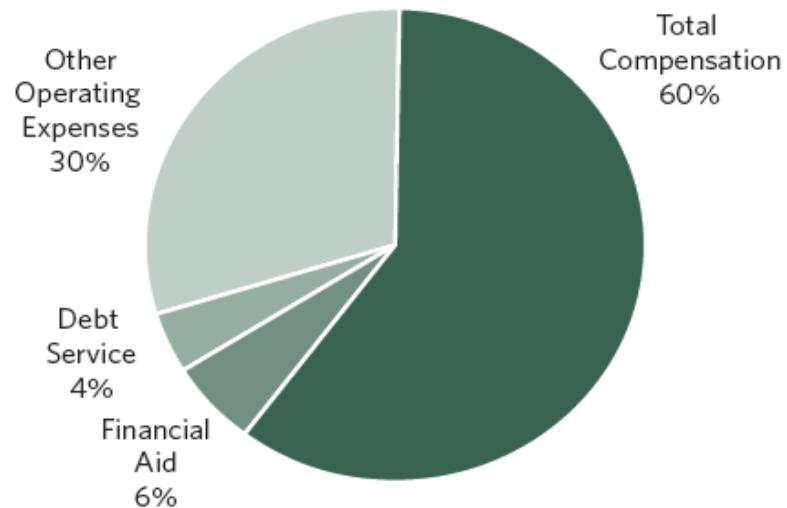


Stanford University Financials* 2012/13

2012/13 CONSOLIDATED REVENUES: \$4,443.4M¹



2012/13 CONSOLIDATED EXPENSES: \$4,096.3M



Endowment: B \$21.4
Budgeted Payout for 2015**: B \$1.065**

* Stanford.edu

** Stanford Daily 09/25/2014

Top 100 Universities Granted Patents in 2012

Generates more patents than:

Rank	Organization	Patents
1	University of California, The Regents of	357
2	Massachusetts Institute of Technology	216
3	Stanford University	182
4	Wisconsin Alumni Research Foundation	155
5	Tsinghua University	149
6	University of Texas	141
7	California Institute of Technology	136
8	National Taiwan University	122
9	University of Michigan	97
10	University of Illinois	85
10	National Chiao Tung University	85
10	University of Utah Research Foundation / University of Utah	85

92	United States of America, Navy	355
93	NTT Docomo, Inc.	348
94	Lockheed Martin Corp.	346
95	Nikon Corp.	340
96	Thomson Licensing S.A.	335
97	EMC Corp.	333
98	Adobe Systems, Inc.	332
99	Motorola-Mobility, Inc.	323
100	Corning Inc.	322
101	Caterpillar Inc.	319
102	Monsanto Technology, LLC	318
103	Novartis AG	317
104	Hyundai Motor Co.	314
105	Exxon Mobil Corp.	308
106	LSI Corp.	307
107	NXP B.V.	306
108	Halliburton Energy Services, Inc.	301
109	Invention Science Fund I, LLC Samsung SDI Co., Ltd.	298
111	TDK Corp.	295
112	Amazon Technologies, Inc.	287
113	Juniper Networks, Inc.	286
114	Merck & Co., Inc.	276
115	International Game Technology (IGT)	275
116	Yahoo, Inc.	270
117	Murata Manufacturing Co., Ltd.	267
	Nvidia Corp.	267
119	Mediatek Inc.	264

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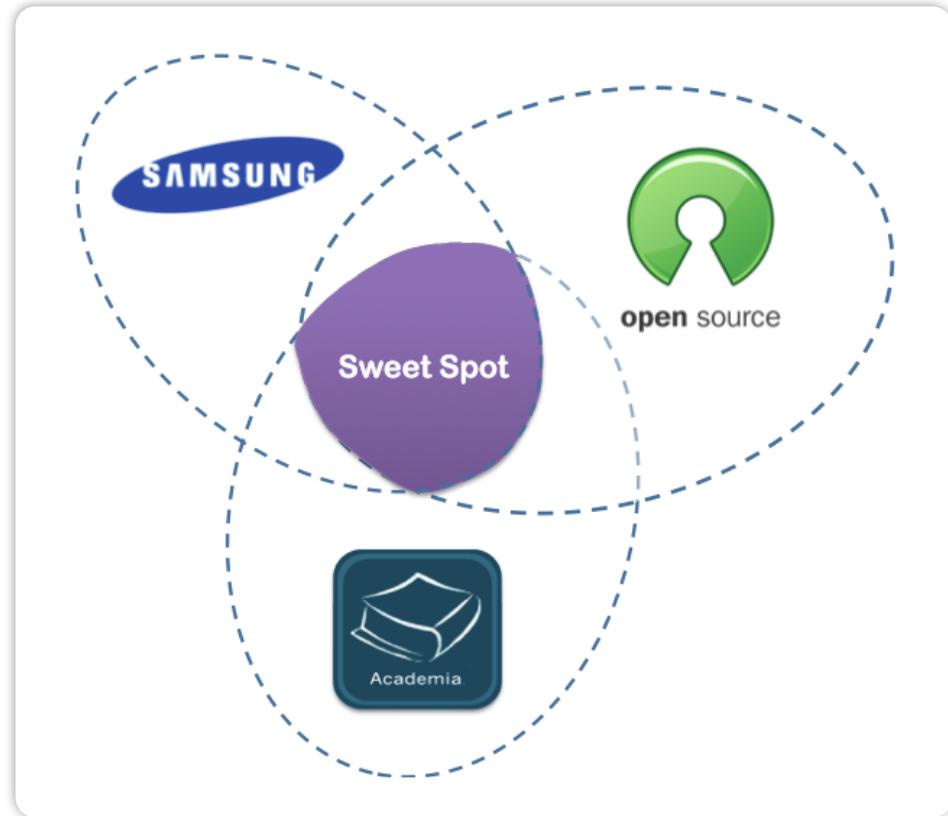
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2	Massachusetts Institute of Technology	216
3	Stanford University	182
4	Wisconsin Alumni Research Foundation	155
5	Tsinghua University	149
6	University of Texas	141
7	California Institute of Technology	136
8	National Taiwan University	122
9	University of Michigan	97
10	University of Illinois	85
10	National Chiao Tung University	85
10	University of Utah Research Foundation / University of Utah	85

157	Stanford University	182
158	Rambus, Inc.	181
159	Yamaha Corp.	179
160	Advanced Micro Devices, Inc.	178
161	Netapp, Inc.	177
162	Sandisk Technologies Inc.	175

Universities are the equivalent of mid- to large- cap companies.

What's Common w/ Open Source or Inner Source?

- Collaborative approach to innovation
- Inceptions of initiatives / ideas
- Licenses of produced code
- Community building
- Conferences
- Publications
- Forums



What are we doing with universities globally?

● 74 Research projects divided over 14 themes: (2013 data)

Big Data and Networks	Computational Science
Next Generation Computing	Data Storage
Display and Vision	Energy
Bio	Metabolic Engineering
Medical Technology	Aging
New Material	Sensor Technology
Smart Device	IC Technology

List of universities is too long to list on a single slide.

What are we doing in the US?

MIT

DUKE

UC BERKELEY

CARNEGIE MELLON

NORTHEASTERN

UNIVERSITY OF WASHINGTON

UNIVERSITY OF TOKYO

UNIVERSITY OF CANTERBURY

WASHINGTON

UNIVERSITY OF NORTH CAROLINA

UNIVERSITY OF SOUTHERN CALIFORNIA

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

HARVARD

STANDORD

PURDUE

NORTHEASTERN

UC RIVERSIDE

TUFTS

UNIVERSITY OF COLORADO

UNIVERSITY OF

UNIVERSIRY OF MINNESOTA

UNIVERSITY OF SAN FRANCISCO

(2014 data)

Closing Remarks



Top 8 Tech Companies Spent >\$61 B on Internal R&D

Volkswagen	R&D Spending: US \$ 10.4 bn Revenue: US \$ 178.6 bn
Samsung	R&D Spending: US \$ 10.1 bn Revenue: US \$ 53.3 bn
Roche	R&D Spending: US \$ 9.8 bn Revenue: US \$ 73.7 bn
Intel	
Microsoft	
Toyota	
Novartis	
Merck	
Pfizer	
Johnson & Johnson	
General Motors	
Google	R&D Spending: US \$ 6.8 bn Revenue: US \$ 50.2 bn
Honda	
Daimler	
Sanofi	R&D Spending: US \$ 6.3 bn Revenue: US \$ 104.5 bn
IBM	R&D Spending: US \$ 6.1 bn Revenue: US \$ 38.8 bn
GlaxoSmithKline	R&D Spending: US \$ 6.1 bn Revenue: US \$ 88.4 bn
Nokia	
Panasonic	
Sony	R&D Spending: US \$ 5.7 bn Revenue: US \$ 82.3 bn

2013

Huawei's Best-Kept Secret: an Army of Engineers

THE WALL STREET JOURNAL
WSJ

ARTICLE VIDEO COMMENTS (12)

ASIA CHINA HUAWEI R&D



By JURO OSAWA [CONNECT](#)

Huawei R&D Spending US \$ 4.78 bn

6 Components to External R&D



UNIVERSITY



ENTREPRENEURSHIP
The Open Innovation Center



SAMSUNG ACCELERATOR



INDUSTRY

5 **SAMSUNG**
Open Source Group

**Open Source
Organizations**

Building our Open Source R&D



Open source goes corporate at Samsung

Posted 01 Oct 2014 by Ben Lloyd Pearson

Rating: ★★★★☆ (7 votes)



How Samsung is Bringing Open Source Culture Inside the Firewall

Thursday, 27 March 2014 14:27 | Libby Clark | Exclusive

Samsung Talks About Its Aggressive Linux Talent Recruitment Strategy

Wednesday, 22 May 2013 06:41 | Jennifer Cloer | Exclusive

May 5, 2014, 5:51 PM ET Open Source 'Eating' Software World: Samsung



Busted for Dodging Linux License, Samsung Makes Nice With Free Code

BY ROBERT MCMILLAN 08.20.13 | 6:30 AM | PERMALINK

RESULTS TO DATE (2014)

- **Contributions**
 - 25 dedicated OSS developers (16 maintainers)
 - Linux Kernel, Multimedia, Graphics, Web, Virtualization
 - > 6300 upstream contributions
 - 2/3 bug fixes, remaining split between enhancements/new features
 - 98% contribution acceptance rate
 - 15% of contributions driven by business units
- **Thought Leadership/Visibility**
 - > 60 conference presentations/papers
 - 13 media mentions (including WSJ, Linux.com, etc.)
 - 35 product developers graduated from OSS Leadership Program

Who is funding this work?

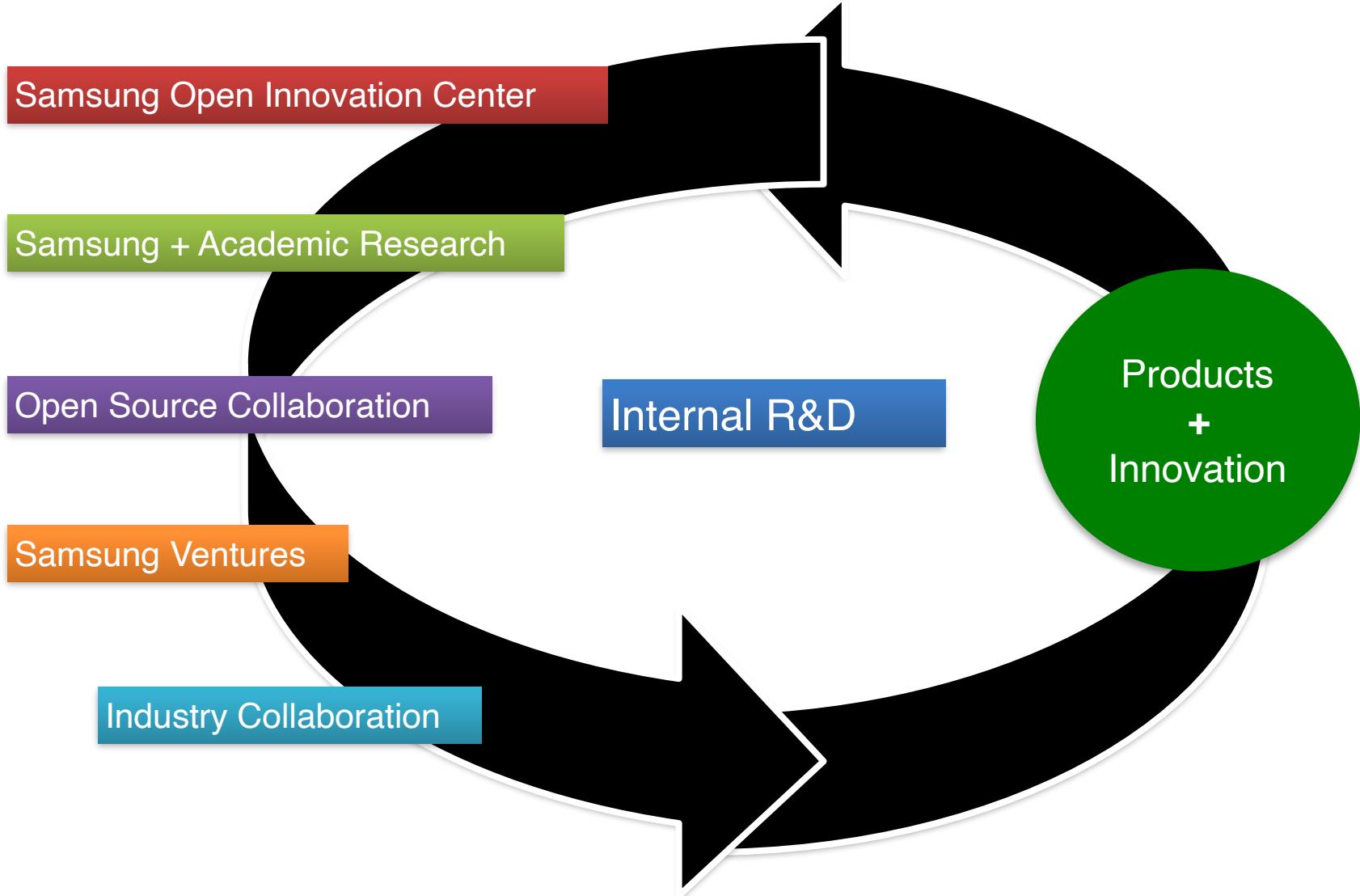
1. "Amateurs"	11.6%
2. Intel	9.3%
3. Red Hat	8.7%
4. Linaro	5.9%
5. Samsung	4.0%
6. Texas Instruments	3.7%
7. Unknown Individuals	3.6%
8. IBM	3.1%
9. SuSE	3.1%
10. Vision Engraving	2.7%

LINUX FOUNDATION



Kernel releases 3.8.0 – 3.12.0

Open Innovation Relies on Collaboration



Open Collaboration Principles

- 1- Not all smart people work for us. We need to find a way to tap into their knowledge.**
- 2- External R&D creates significant value. Internal R&D claims portion of that value.**
- 3- We don't need to originate the research to profit from it.**
- 4- If we make the best use of internal & external ideas, we will win.**

Why Spend on External R&D?

External collaborative R&D is very important to our business.

- + Allows shared development and lowers R&D cost.
- + Helps us accelerate product development and innovation.
- + Enables us to help drive and transform our industry.
- + Gives us strong influence on technologies used in our products.
- + Creates a broad ecosystem with higher level business opportunities for those that can act fast.
- + Gives us ammunition in the ongoing talent war.
- + Commoditizes competitors.

Adapting Corporate Culture to Collaborative R&D



General Recommendations

- Increase involvement with academic R&D.
- Create and implement a corporate open source strategy.
- Adopt inner-sourcing development methodology.
- Increase involvement with open source; Become leaders in key open source technologies used in products.

How important is external R&D?



*Your future depends on
it.*

Thank you.

Ibrahim Haddad, Ph.D.
Head of Open Source Innovation Group
Samsung Research America – Silicon Valley
Ibrahim.H@Samsung.com
Twitter: @IbrahimAtLinux

