

La produzione del software



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Obiettivi di questa lezione

- Fare software
- La nozione di **prodotto** software
- Varietà di tipi di prodotti software
- L'industria del software
- Lo sviluppo del software

Discussione

- Cos'è il software?
- Cos'è un prodotto sw? Cos'è un servizio sw?
- Esistono tipi diversi di software?
- Se sì, in cosa sono diversi?



Alan Turing

sugli ingegneri del software



Roughly speaking those who work in connection with the Automatic Computing Engine will be divided into its masters and its servants. Its masters will plan out instruction tables for it, thinking up deeper and deeper ways of using it. Its servants will feed it with cards as it calls for them. They will put right any parts that go wrong...As time goes on the calculator itself will take over the functions both of masters and of servants...

The masters are liable to get replaced because as soon as any technique becomes at all stereotyped it becomes possible to devise a system of instruction tables which will enable the electronic computer to do it for itself.

It may happen however that the masters will refuse to do this. They may be unwilling to let their jobs be stolen from them in this way. In that case they would surround the whole of their work with mystery...

La produzione del software (da una sua conferenza del 1947)

Steve Jobs sul software

"The problem is, in hardware you can't build a computer that's twice as good as anyone else's anymore. Too many people know how to do it. You're lucky if you can do one that's one and a third times better or one and a half times better. And then it's only six months before everybody else catches up. But you can do it in software." (1994)



Radio Shack

AMERICA'S TECHNOLOGY STORE™

PRESIDENTS' BIRTHDAY SALE!

DON'T DELAY! 3-DAY SPECIALS ABOVE GOOD SATURDAY THRU MONDAY ONLY!

 All-Wheather Stereo Cut 34% \$1188 <small>Reg. \$1799</small> <i>Realistic STEREO MASTER XMI FM personal stereo storage off GARS, water proof bag, headphones.</i>	 AM/FM Clock Radio 30% OFF \$1388 <small>Reg. \$1999</small> <i>Clockradio™ 281 clock radio's compact size fills nightstand clutter and has</i>	 In-Ear Stereo Phones HALF PRICE! 788 <small>Reg. \$1599</small> <i>Realistic® in-ear phones weigh just 6 & sound like early years. \$10 each.</i>	 Micro-Thin® Calculator 39% OFF \$488 <small>Reg. \$799</small> <i>Realistic EC-412 is almost the size of a credit card. Color powered, was on</i>
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0% INTEREST!

NO PAYMENTS UNTIL MAY! NO DOWN PAYMENT!

HURRY! OFFER ENDS TUESDAY FEBRUARY 19

*See store for details. Offer good through Feb. 19, 1992. Payment due by May 1, 1992. No cash back. Finance charges apply. See store for details. Offer good through Feb. 19, 1992. Payment due by May 1, 1992. No cash back. Finance charges apply. See store for details.

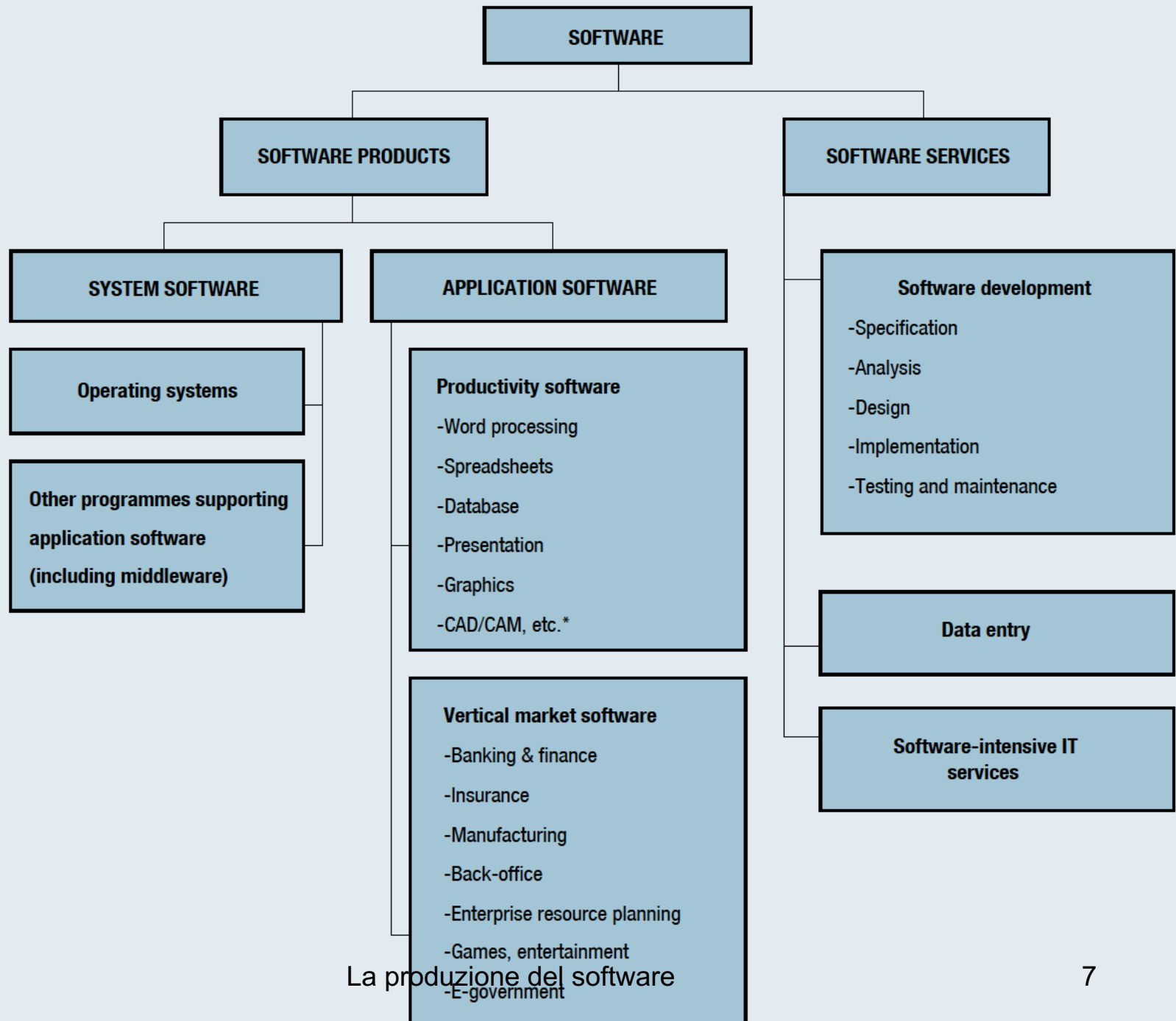
COME IN AND TAKE ADVANTAGE OF THESE OTHER FANTASTIC VALUES!

<h4>INTRODUCTORY SPECIAL!</h4> TANDY® 1000 TL/B Computer System Save \$670 \$1599 <small>Low As \$449 Reg. \$2269</small> <ul style="list-style-type: none"> • 286-Based PC Compatible • Color Monitor • 20MB SmartDrive™ Hard Drive • Easy-to-Use 10-in-1 DiskMate® Software BONUS PACKAGE <ul style="list-style-type: none"> • Lotus Spreadsheet Plus Desktop • DeskMate GSA Write • Quicken • 2-Button Mouse 	 Mobile Cellular Telephone Save \$100 \$199 <small>Low As \$99 Reg. \$299</small> <i>Realistic mobile phone lets you talk hands-free while driving. Features include call waiting, call forwarding, call transfer, call hold, call park, call pick up, call redial, call timer, call timer, call timer, call timer.</i>	 Deluxe Portable CD Player Save \$40 \$159.95 <small>Low As \$119.95 Reg. \$199.95</small> <i>Realistic CD-100 has 10 disc selection memory. 1 hour.</i>
 Tiny Dual-Superhet Radar Detector Save \$60 \$79.95 <small>Low As \$19.95 Reg. \$139.95</small> <i>Radar Patrol 88™ detector lets you drive with confidence. Detects K and K-band radar. \$19.95.</i>	 Compact 10-Channel Desktop Scanner Save \$30 \$99.95 <small>Low As \$69.95 Reg. \$129.95</small> <i>Realistic PRO-57 lets you catch the news as it happens! Free police, fire, rail, military. And more...and more.</i>	 Our Easiest-To-Use Phone Answerer Cut 17% \$49.95 <small>Reg. \$59.95</small> <i>Realistic PRO-241 answerer is ready to use—just plug it in. Has built-in announcement. \$49.95.</i>
 VHS Camcorder Save \$100 \$799 <small>Low As \$699 Reg. \$899</small> <i>Realistic Model 162 includes video light for indoor shooting. 3-hour battery life. \$699.</i>	 Mobile CB With Channel Controls on Mike HALF PRICE! 49.95 <small>Reg. \$99.95</small> <i>Realistic TRC-432 lets you get highway info or help—anytime. Never have to break "phone" again! \$49.95.</i>	 Handheld Voice-Activated Cassette Tape Recorder 40% OFF \$29.95 <small>Low As \$19.95 Reg. \$49.95</small> <i>Realistic CTR-85 makes it so easy to record. Perfect for students, secretaries or anyone who needs to record.</i>
 3-Way Speaker With Massive 15" Woofer Save \$110 \$149.95 <small>Low As \$139.95 Reg. \$249.95</small> <i>Realistic SPS-150 has 15" woofer, 4" tweeter, 1" midrange. \$139.95.</i>	 20-Memory Speed-Dial Phone Cut 33% \$29.95 <small>Low As \$19.95 Reg. \$44.95</small> <i>Realistic SDN-170 has 20 speed-dial numbers. \$29.95.</i>	 Handheld Voice-Activated Cassette Tape Recorder 40% OFF \$29.95 <small>Low As \$19.95 Reg. \$49.95</small> <i>Realistic CTR-85 makes it so easy to record. Perfect for students, secretaries or anyone who needs to record.</i>

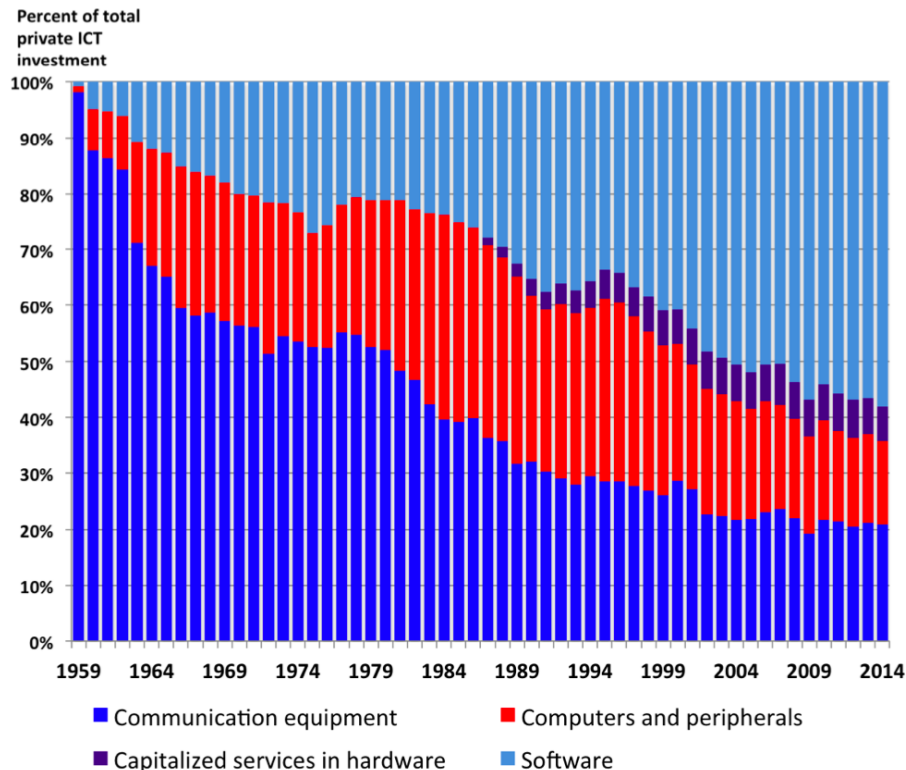
Look for the Radio Shack Store or Dealer nearest You

La produzione del software

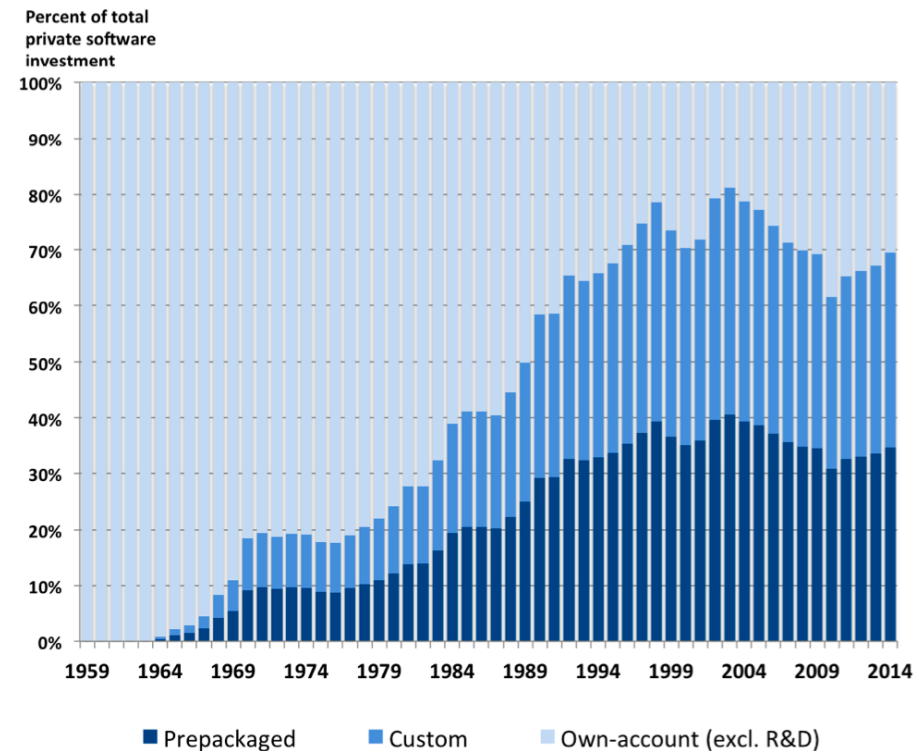
Tipi di software



Il software domina gli investimenti ICT



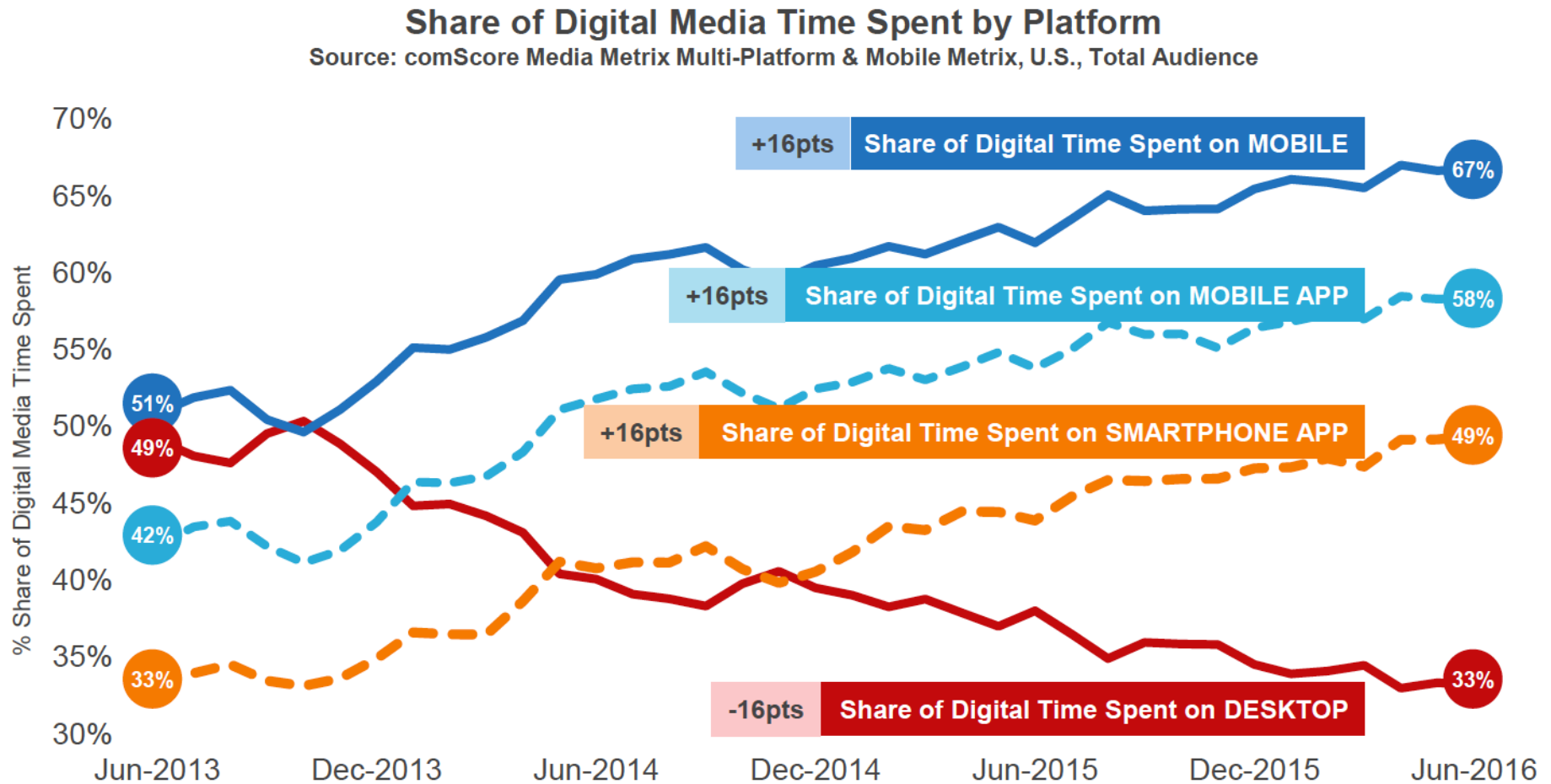
(a) ICT investment component shares



(b) Software investment component shares

Fonte: Byrne & Corrado, ICT Prices and ICT Services: What do they tell us about productivity and technology? 2017

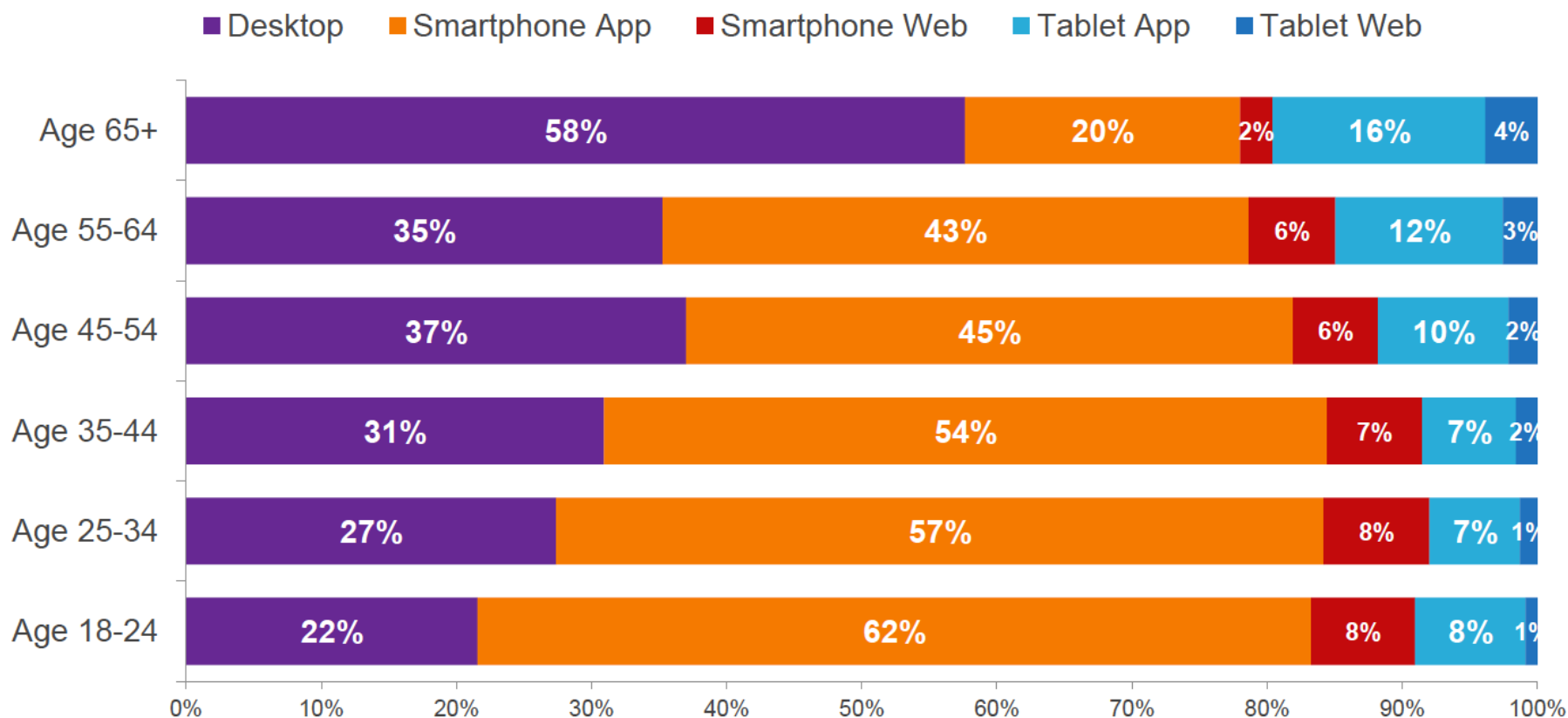
Digital time: desktop vs mobile



Distribuzione del tempo digitale per età

Share of Platform Time Spent by Age

Source: comScore Media Metrix Multi-Platform & Mobile Metrix, U.S., Age 18+, June 2016

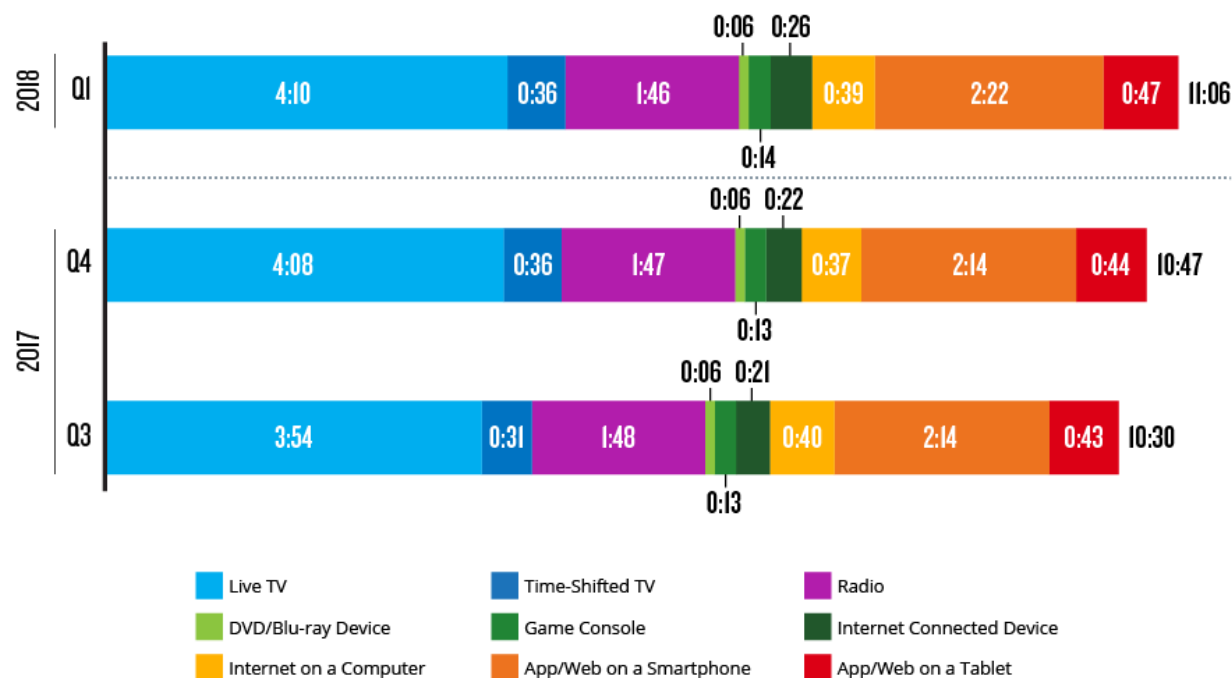


La produzione del software

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AVERAGE TIME SPENT PER ADULT 18+ PER DAY

Based on Total U.S. Population




































Note: Some amount of simultaneous usage may occur across devices.

Source: Q1 2018 Nielsen Total Audience Report

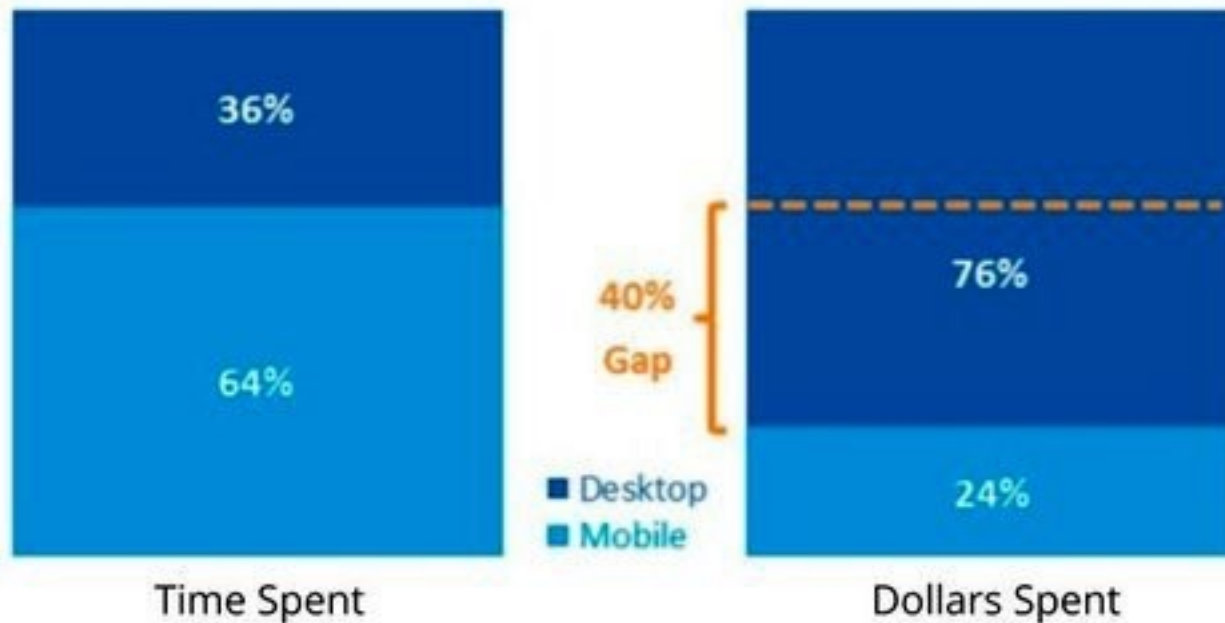
Le app più popolari

<https://www.appannie.com/en/apps/ios/top/>

Free	Paid	Grossing
<div>1</div> <div></div> <div>Stone Miner</div> <div>ZPLAY (HK) TECHNOLOGY CO., LI...</div>	<div>1</div> <div></div> <div>Minecraft</div> <div>Mojang</div>	<div>1</div> <div></div> <div>YouTube: Watch, Listen, St...</div> <div>Google LLC</div>
<div>2</div> <div></div> <div>TikTok</div> <div>TikTok Pte. Ltd.</div>	<div>2</div> <div></div> <div>Bloons TD 6</div> <div>Ninja Kiwi</div>	<div>2</div> <div></div> <div>Disney+</div> <div>Disney</div>
<div>3</div> <div></div> <div>YouTube: Watch, Listen, St...</div> <div>Google LLC</div>	<div>3</div> <div></div> <div>Geometry Dash</div> <div>RobTop Games AB</div>	<div>3</div> <div></div> <div>Tinder - Dating & New Frie...</div> <div>Tinder Inc.</div>
<div>4</div> <div></div> <div>Instagram</div> <div>Instagram, Inc.</div>	<div>4</div> <div></div> <div>True Skate</div> <div>True Axis</div>	<div>4</div> <div></div> <div>Roblox</div> <div>Roblox Corporation</div>
<div>5</div> <div></div> <div>Snapchat</div> <div>Snap, Inc.</div>	<div>5</div> <div></div> <div>HotSchedules</div> <div>HotSchedules</div>	<div>5</div> <div></div> <div>HBO Max: Stream TV & M...</div> <div>WarnerMedia</div>
<div>6</div> <div></div> <div>Facebook</div> <div>Facebook, Inc.</div>	<div>6</div> <div></div> <div>Heads Up!</div> <div>Warner Bros.</div>	<div>6</div> <div></div> <div>Candy Crush Saga</div> <div>King</div>
<div>7</div> <div></div> <div>Messenger</div> <div>Facebook, Inc.</div>	<div>7</div> <div></div> <div>Procreate Pocket</div> <div>Savage Interactive Pty Ltd</div>	<div>7</div> <div></div> <div>Bumble - Dating & Meet P...</div> <div>Bumble Holding Limited</div>
<div>8</div> <div></div> <div>Gmail - Email by Google</div> <div>Google LLC</div>	<div>8</div> <div></div> <div>Monopoly</div> <div>Marmalade Game Studio</div>	<div>8</div> <div></div> <div>Hulu: Stream movies & TV ...</div> <div>Hulu, LLC</div>
<div>9</div> <div></div> <div>Amazon Shopping</div> <div>AMZN Mobile LLC</div>	<div>9</div> <div></div> <div>Plague Inc.</div> <div>Ndemc Creations</div>	<div>9</div> <div></div> <div>Pokémon GO</div> <div>Niantic, Inc.</div>
<div>10</div> <div></div> <div>Google Maps</div> <div>Google LLC</div>	<div>10</div> <div></div> <div>75 Hard</div> <div>44SEVEN MEDIA, LLC</div>	<div>10</div> <div></div> <div>Pandora: Music & Podcasts</div> <div>Pandora Media, Inc.</div>
<div>11</div> <div></div> <div>WhatsApp Messenger</div> <div>WhatsApp Inc.</div>	<div>11</div> <div></div> <div>Grand Theft Auto: San An...</div> <div>Rockstar Games</div>	<div>11</div> <div></div> <div>Garena Free Fire - 4nniver...</div> <div>GARENA INTERNATIONAL I PRIVA...</div>

Come si spendono soldi

Share of Retail Time Spent vs. Dollars Spent



Quanto costa produrre un'app?

- <http://howmuchtomakeanapp.com>

Siti per
sviluppatori
freelance
(esempio
www.freelancer.com)

PROJECT DESCRIPTION	BUDGET
Expert Android Application Developer hello, I am looking some expert honest android application for develop a custom android application... Like this here is the demo [login to view URL] You have to watch this demo more then 20 time befor ... See more Skills: Android iPhone Java Mobile App Development PHP	€636 - €1273 EUR Bid now
Custom Adapter Module in SAP PI Custom Adapter Module in SAP PI, Custom Adapter Module in SAP PI Skills: Java SAP	€15 EUR Bid now
software developed for linux I need you to develop some software for me. I would like this software to be developed for Linux using Java. Skills: Java Linux Software Architecture	€212 - €636 EUR Bid now
CREATE P2P CRYPTO EXCHANGE WEBSITE CAN U CREATE P2P CRYPTO EXCHANGE WEBSITE Skills: C Programming Java PHP Software Architecture Website Design	€18 - €146 EUR Bid now
Android Proof of Concept (PoC) detect if u are close a area (Place) or in the place Only GPS/Maps Experts (not genral apps) Ure android phone, should detect when u are 1km of and address (area of a place). Also when u are at 100 meters, and when u are in the place. [login to view URL] ... See more Skills: Android Google Earth GPS Java Kotlin	€8 - €25 EUR Bid now

La produzione del software

Which Country Has the Best Developers?

Ranked by Average Score Across All HackerRank Challenges

Rank	Country	Score Index	Rank	Country	Score Index
1	China	100.0	26	Netherlands	78.9
2	Russia	99.9	27	Chile	78.4
3	Poland	98.0	28	United States	78.0
4	Switzerland	97.9	29	United Kingdom	77.7
5	Hungary	93.9	30	Turkey	77.5
6	Japan	92.1	31	India	76.0
7	Taiwan	91.2	32	Ireland	75.9
8	France	91.2	33	Mexico	75.7
9	Czech Republic	90.7	34	Denmark	75.6
10	Italy	90.2	35	Israel	74.8
11	Ukraine	88.7	36	Norway	74.6
12	Bulgaria	87.2	37	Portugal	74.2
13	Singapore	87.1	38	Brazil	73.4
14	Germany	84.3	39	Argentina	72.1
15	Finland	84.3	40	Indonesia	71.8
16	Belgium	84.1	41	New Zealand	71.6
17	Hong Kong	83.6	42	Egypt	69.3
18	Spain	83.4	43	South Africa	68.3
19	Australia	83.2	44	Bangladesh	67.8
20	Romania	81.9	45	Colombia	66.0
21	Canada	81.7	46	Philippines	63.8
22	South Korea	81.7	47	Malaysia	61.8
23	Vietnam	81.1	48	Nigeria	61.3
24	Greece	80.8	49	Sri Lanka	60.4
25	Sweden	79.9	50	Pakistan	57.4

(nuove?) categorie di software

- Apps e software ecosystems
- Servizi software
- Nuovi strumenti di sviluppo
- Social software
- Scraping/mining big data
- Embedded software, IoT
- ...

Ecosistemi software



Ecosistemi software

- Gli ecosistemi software sono mercati, in cui si vendono prodotti (es. AppStore o PlayStore) o componenti e servizi (es. Amazon Elastic Computing)
- La caratteristica principale è quella di una collezione di prodotti software, su piattaforma definita da un'azienda, che vengono sviluppati ed evolvono nello stesso ambiente
- Es. Appstore (al 2016): 100 miliardi di download, utili oltre 40miliardi\$; 20 “grandi” sviluppatori incassano il 50% degli utili.

Software as a service

Google: 2 miliardi di linee di codice

25.000 sviluppatori

45.000 commit al giorno

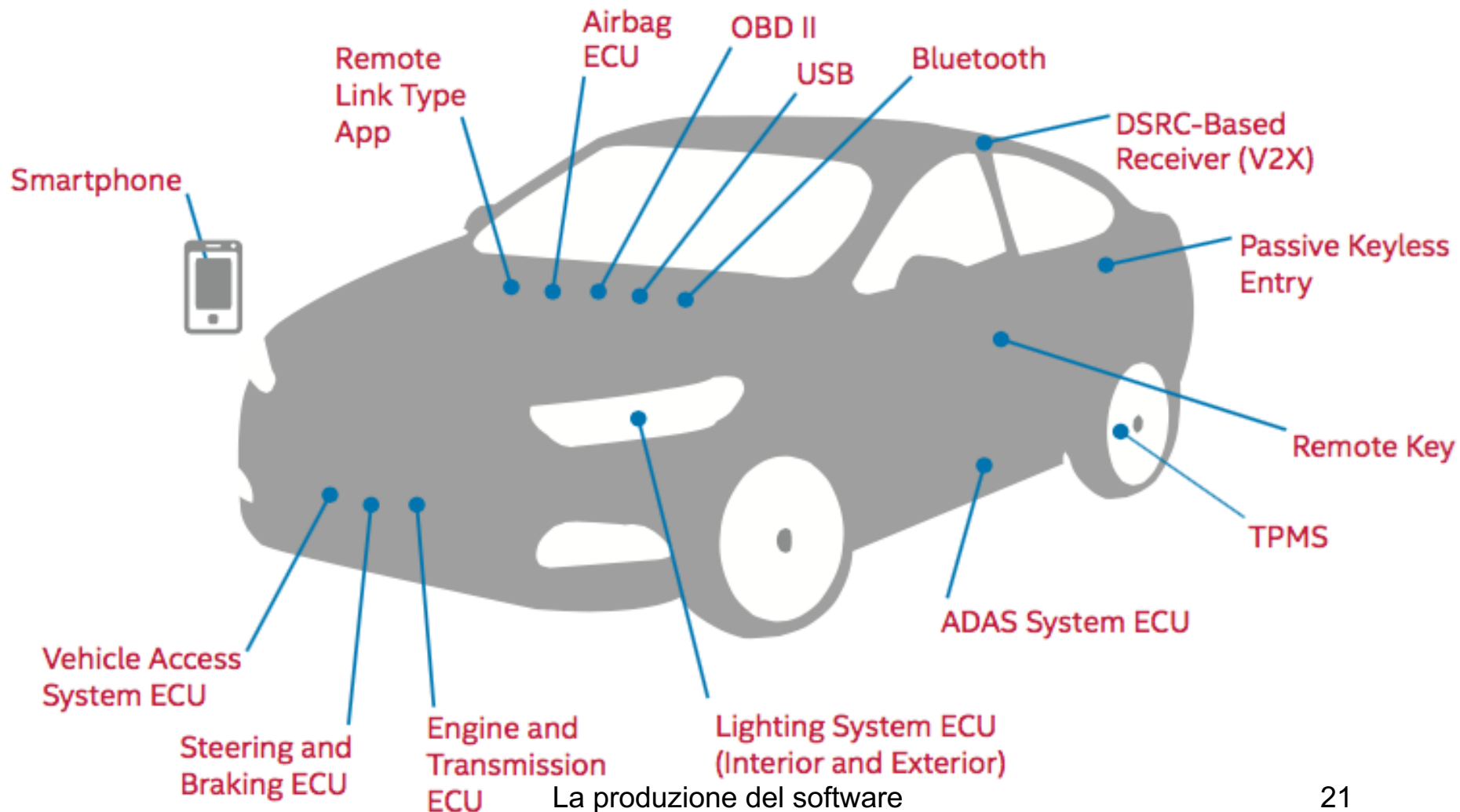
Chrome: 17.4 milioni di linee di codice

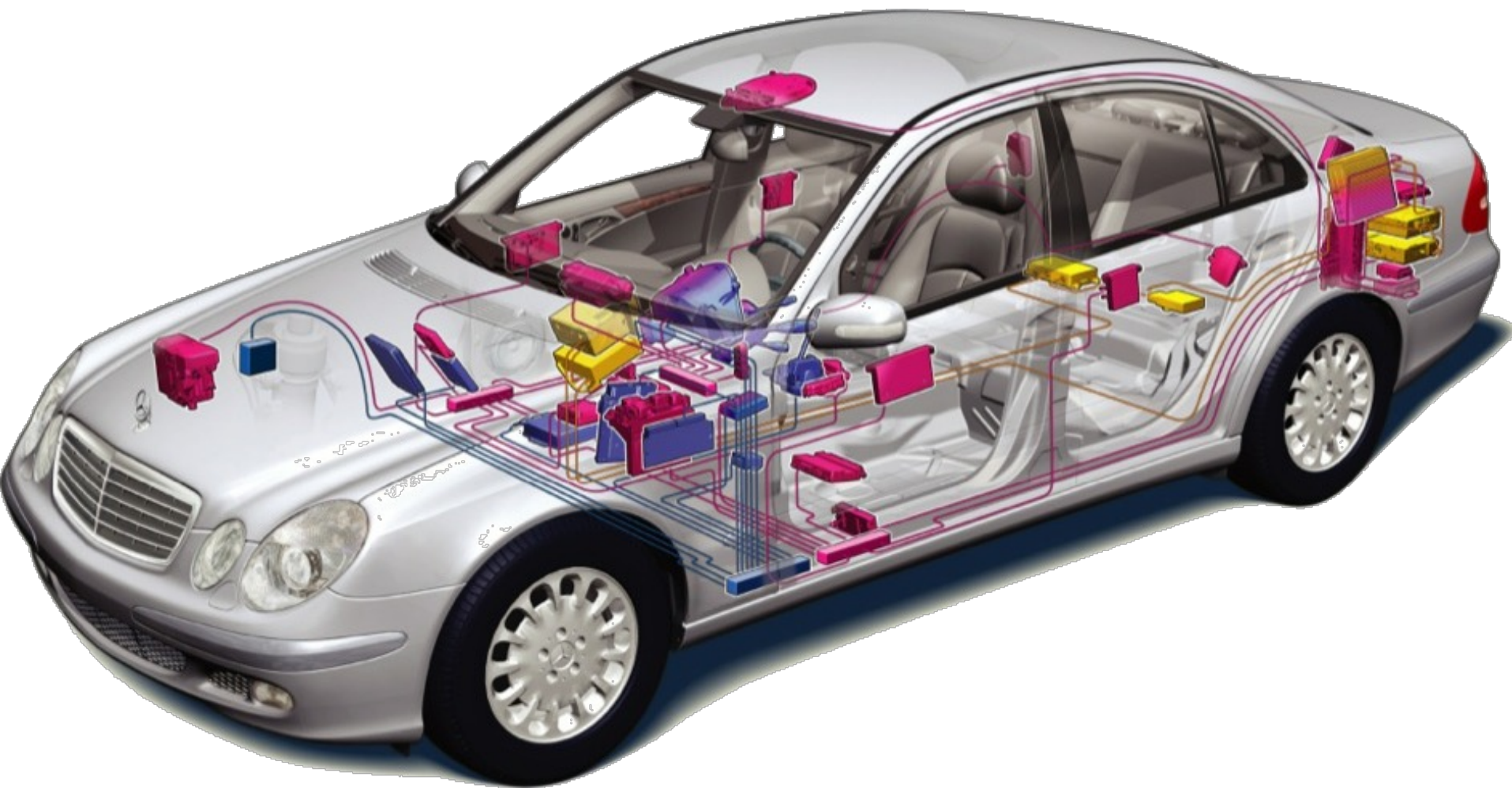
3.700 sviluppatori

380 commit al giorno



Software embedded (“nascosto”)





Social software (Web 2.0)

- Software che supporta la “conversazione” di comunità di utenti. Es. Facebook, Twitter, LinkedIn, Instagram, Pinterest, ecc.
- “*The term **Social software** is normally applied to a range of web-enabled software programs. The programs usually allow users to interact, share, and meet other users*”
- Wiki, chat, forum, blog, ecc

Software libero (non gratis!)

0. A program can be run for any purpose
1. A program can be studied and changed to adapt it to new needs
2. A program can be freely distributed
3. A program can be freely improved and these improvements can be freely distributed

Free Software Foundation

La produzione del software

**FREE AS IN
FREEDOM**
RICHARD STALLMAN'S
CRUSADE FOR FREE SOFTWARE



Richard Stallman
FSF founder

Application Programming Interface (API)

- Amazon API: commercio sw driven
- PhilipsHue API: illuminazione sw driven
- Facebook API: social network sw driven
- GoogleMaps API: maps sw driven
- Stanford API
- CNN API
- Walmart API

Aspetti economici dei prodotti sw

- Ambito d'uso (dimensione in righe)
- Piano di sviluppo (durata)
- Sforzo di sviluppo (costo)
- Produttività del team
- Qualità (difetti)

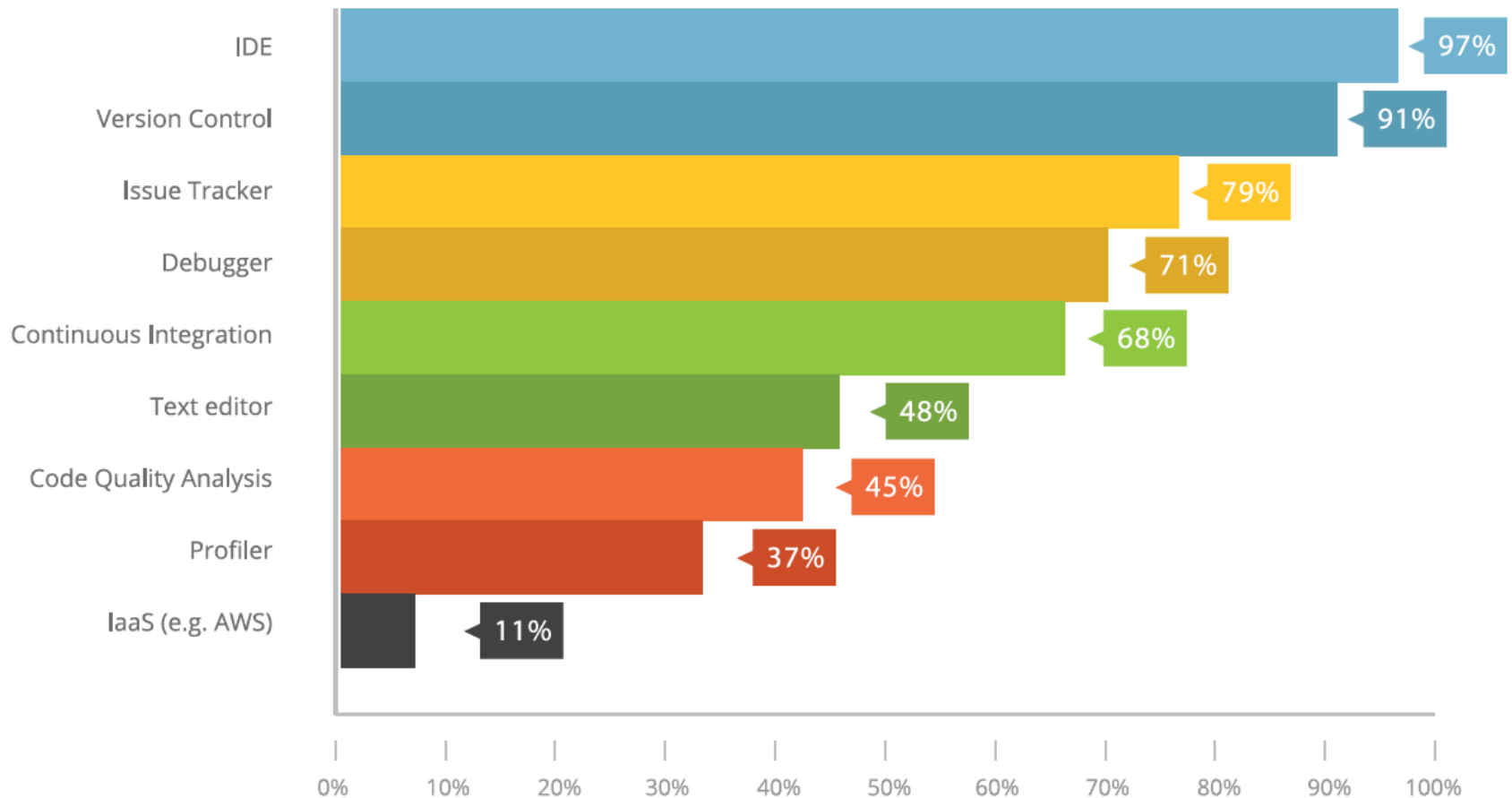
Videogiochi

- Sforzo tipico: $100 \div 500$ anni/persona
- Team: di solito $50 \div 100$ persone
(Assassin Creeds 2009: 450 persone)
- Vendere un milione di copie è ok ma non eccellente

<http://www.informationisbeautiful.net/visualizations/million-lines-of-code/>

Gli strumenti software statistiche d'uso

USERS



I sw sono sempre più grandi e costosi

It would cost over \$1 billion to develop REDHat 7.1 GNU/Linux distribution by conventional proprietary means in the U.S. (in year 2000 U.S. dollars).

Compare this to the \$600 million estimate for Red Hat Linux version 6.2 (which had been released about one year earlier).

Red Hat Linux 7.1 includes over 30 million physical source lines of code (SLOC), compared to well over 17 million SLOC in version 6.2.

Using the COCOMO cost model, this system is estimated to have required about 8,000 person-years of development time (as compared to 4,500 person-years to develop version 6.2).

Red Hat Linux 7.1 represents over a 60% increase in size, effort, and traditional development costs over Red Hat Linux 6.2. This is due to an increased number of mature and maturing open source / free software programs available worldwide (D.Wheeler, 2002)

Alcune cifre

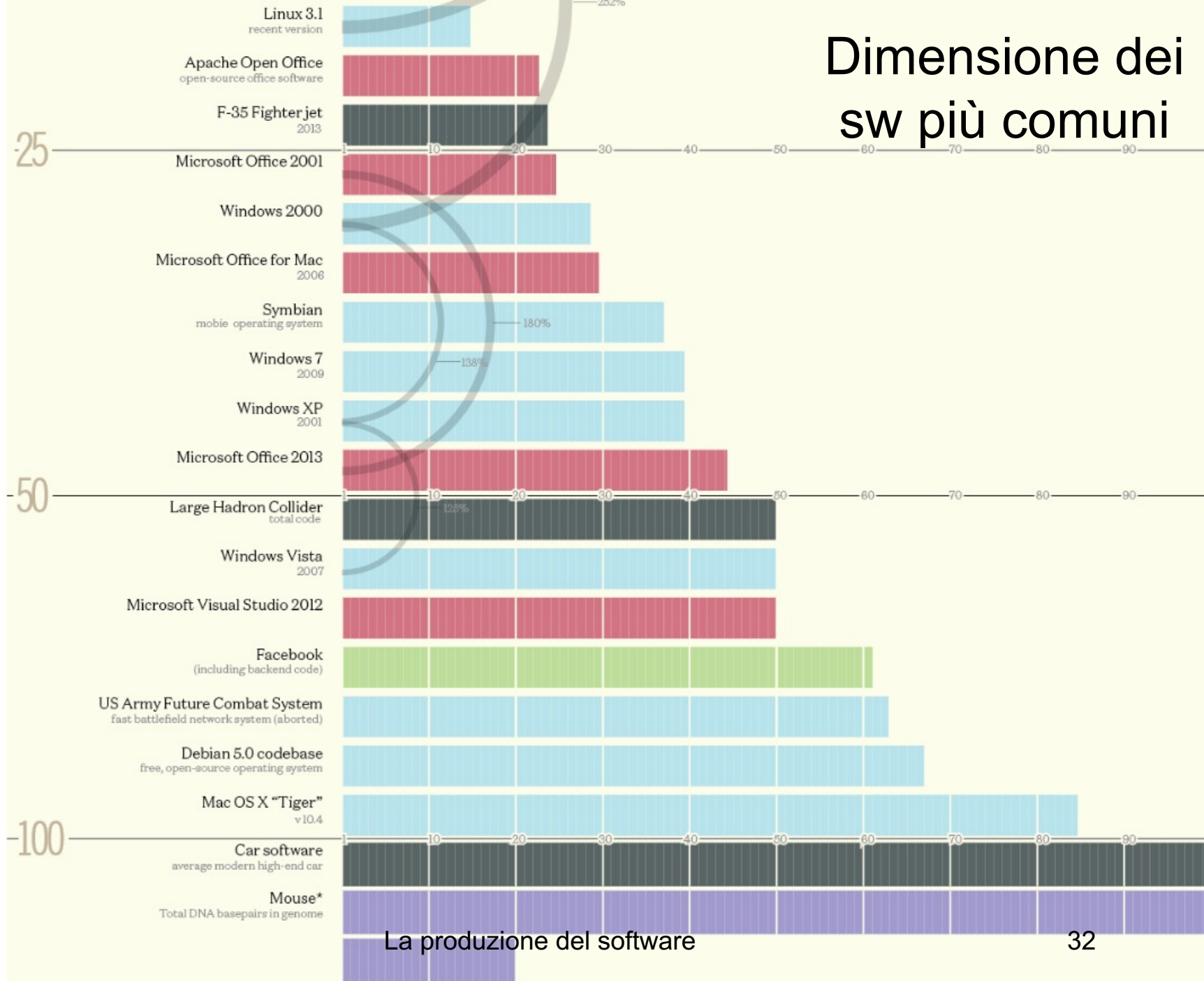
Prodotto	SLOC (righe di codice sorgente)
NASA Space Shuttle Flight Control	430K(shuttle) + 1.4M (ground)
Sun Solaris 1998-2000	7-8M
Microsoft Windows 3.1 (1992)	3M
Microsoft Windows 95	14M
Microsoft Windows 98	18M
Microsoft Windows NT (1992)	4M
Microsoft Windows NT5.0 (1998)	20M
RedHatLinux 6.2 (2000)	17M
MacOS 10.4 (2005)	86M
Linux kernel 4.2 (2016)	20.2M
Debian 7.0 (2012)	419M

Contare le righe

Questa tabella conta quante linee di codice sorgente in Linux RedHat 7.1 sono scritte in vari linguaggi

Linguaggio	SLOC (%)
C	21461450 (71.18%)
C++	4575907 (15.18%)
ShellBourne	793238 (2.63%)
Lisp	722430 (2.40%)
Assembly	565536 (1.88%)
Perl	562900 (1.87%)
Fortran	493297 (1.64%)
Python	285050 (0.95%)
Tcl	213014 (0.71%)
Java	147285 (0.49%)
yacc/bison	122325 (0.41%)
Expect	103701 (0.34%)
lex/flex	41967 (0.14%)
awk/gawk	17431 (0.06%)
Objective-C	14645 (0.05%)
Ada	13200 (0.04%)
C shell	10753 (0.04%)
Pascal	4045 (0.01%)
sed	3940 (0.01%)

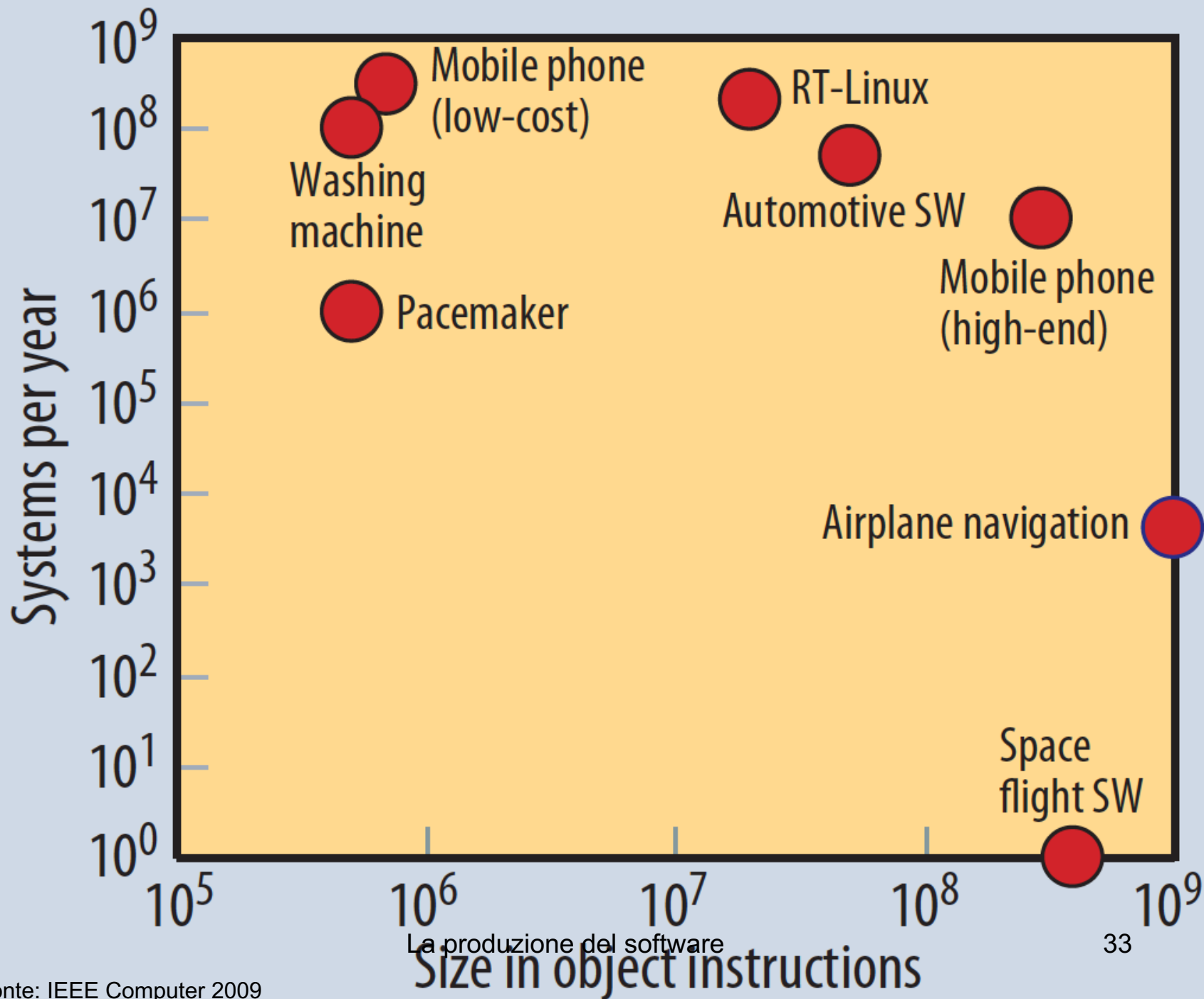
Dimensione dei sw più comuni



La produzione del software

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Software embedded



La produzione del software

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Software

- **Prodotto** invisibile, intangibile, facilmente duplicabile ma costosissimo: opera dell'ingegno protetta dalle leggi
- **Componente** di un sistema di elaborazione: può essere di larga diffusione (*off the shelf*) o *commissionato* da un singolo committente
- **Macchina astratta**; offre funzioni utili per qualche scopo, ha un'*architettura* (fatta di componenti e connettori)
- **Servizio**; ha un'*interfaccia* e si basa su una *infrastruttura*

Il sw è un prodotto industriale

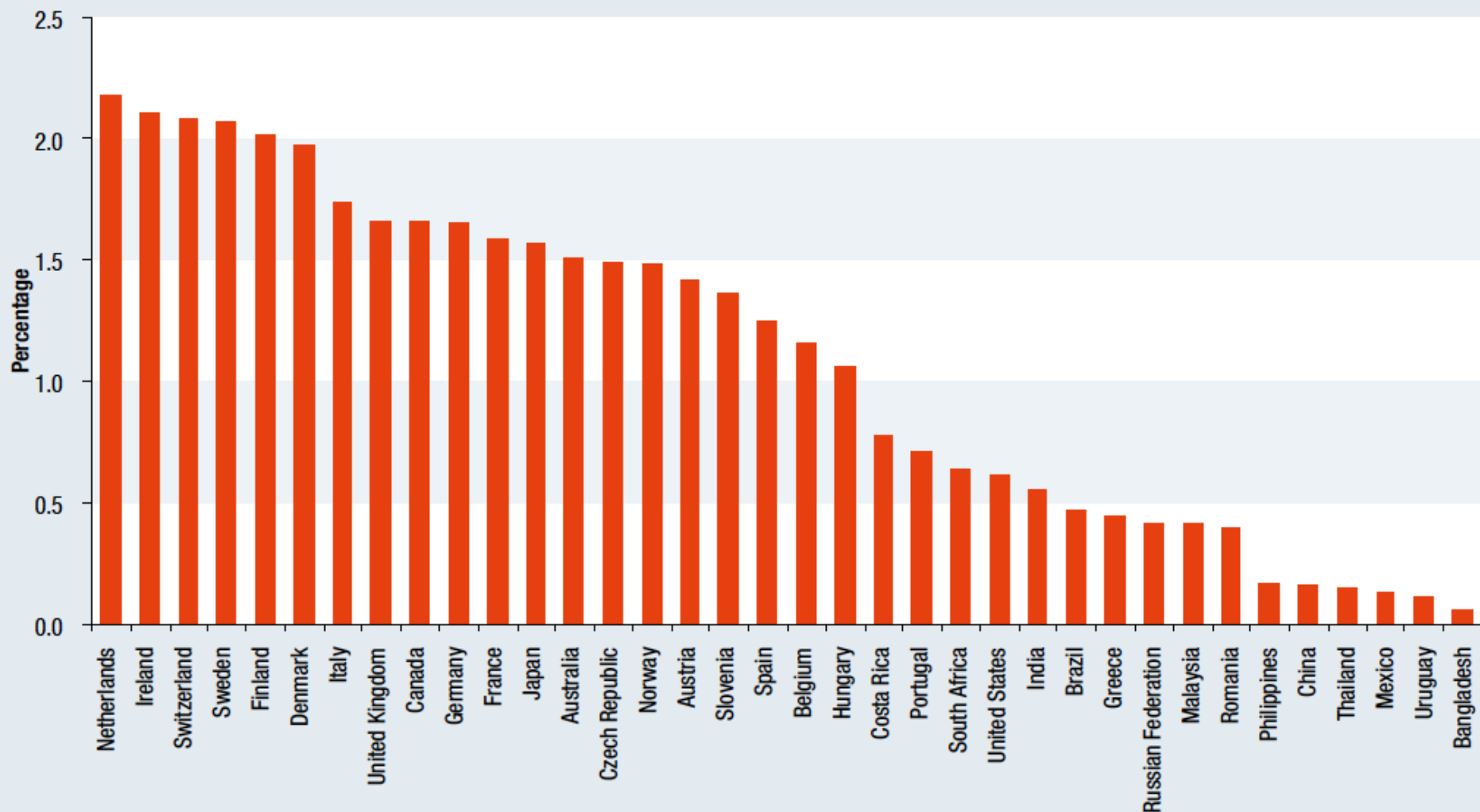
Il software è sempre il *prodotto di un processo di sviluppo*, che inizia con un'idea e termina quando il software viene ritirato

L'industria mondiale del sw cresce a tassi dal 5 al 10% annuo

Il costo di sviluppo di un prodotto software tende a crescere in proporzione al *quadrato* delle sue dimensioni

Quanti producono software

(occupati a produrre sw o servizi, in percentuale sul totale degli occupati)























La produzione del software

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Source: UNCTAD, based on international and national sources. Total employment data sourced from WITSA.

I grandi produttori di software in Europa

(2015, source Truffle Report)

Rank	Company	Country of HQ location	Public	Software +Services 2014 (m€)	Total revenue 2014 (m€)	R&D employees 2014
1	SAP	DE		17 243.9	17 560.0	18908
2	Dassault Systemes	FR		2 078.6	2 346.7	5562
3	Sage	UK		1 539.5	1 620.5	1169
4	Hexagon	SE		1 442.3	2 622.4	3430
5	Wincor Nixdorf	DE		1 367.0	2 471.0	750
6	Asseco Group	PL		1 193.3	1 487.6	3696
7	Software AG	DE		835.6	857.8	968
8	DATEV	DE		790.7	843.5	1355
9	Wolters Kluwer	NL		740.2	3 660.0	2222
10	Misys	UK		639.5	639.5	1100
11	Micro Focus	UK		627.9	627.9	897
12	SWIFT	BE		596.8	628.0	493
13	Unit4	NL		516.0	516.0	1380
14	Visma	NO		464.7	851.7	730
15	Cegedim	FR		460.6	911.5	959
16	Sopra Steria	FR		445.4	3 370.0	800
17	Qlik	SE		418.9	418.9	358
18	Avaloq	CH		411.6	411.6	300
19	Swisslog	CH		411.4	551.3	146
20	Northgate Information Solutions	UK		373.7	826.0	600
21	Fiducia & GAD	DE		369.3	458.4	220
22	Compugroup Holding	DE		368.8	515.1	1426
23	Murex	FR		368.0	368.0	386
24	Temenos	CH		352.6	352.6	441
25	Fidessa	UK		341.0	341.0	437
26	Gemalto	NL		333.9	2 465.0	1105
27	IFS	SE		333.4	333.4	333
28	ESET	SK		328.8	328.8	382
29	Zucchetti	IT		310.3	358.0	900
30	Schneider Electric	FR		304.1	1 713.0	565
31	Reply	IT		287.0	632.2	390

Microsoft Says Its Software 'Ecosystem' Employs 15 Million

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IDC research, paid for by Microsoft, also found that the company's partners earn \$7.79 for every dollar earned by Microsoft.

By [Paul McDougall](#)
[InformationWeek](#)

ottobre 19, 2007 01:38 PM

At a time when its business practices are under close scrutiny in the United States, Europe, and other parts of the world, Microsoft (NSDQ: [MSFT](#)) is touting a new study that says it's responsible for the creation of almost 15 million jobs globally.

IT work involving Microsoft and its [network](#) of partners kept 14.7 million workers employed worldwide, according to the study -- excerpts of which Microsoft made available on Friday.

The jobs range from software programming to system [integration](#) and help desk support.

The study was conducted by market researchers at IDC and paid for by Microsoft. IDC said the IT industry as a whole kept 35.2 million workers employed in 2007. "Software provides a disproportionate contribution to a vibrant IT economy," said John Gantz, chief research officer at IDC, in a statement.

IDC also found that Microsoft's partners earn \$7.79 for every dollar earned by Microsoft, and that the economic activity spurred by the Microsoft ecosystem will produce \$514 billion in tax revenue for governments worldwide in 2007.

I salari d'ingresso dei big players (2016)

Azienda	Stipendio annuo medio in \$ - junior	Bonus medio \$	Totale \$
Amazon	109.000	22.000	131.000
Apple	104.000	16.000	120.000
Google	86.000	20.000	106.000
Cisco	67.000	1.000	68.000
Oracle	67.000	-	67.000
Microsoft	58.000	9.000	67.000
Telefonica	45.000	4.000	49.000
Orange	48.000	-	48.000
IBM	48.000	-	48.000
SAP	44.000	4.000	48.000

Discussione

Come nasce il software?



Prodotti, sistemi, servizi

- Prodotti **generici** (OTS: off the shelf)
 - Prodotti creati da qualche produttore di software e venduti sul mercato a più (tanti) clienti
 - Es.: videogioco
- Sistemi **commissionati** (“customizzati”)
 - Sistemi commissionati da un cliente specifico e sviluppati apposta da un qualche fornitore
 - Es.: portale dell’Università
- Servizi **in perpetuo sviluppo**
 - Sistemi che offrono servizi 24/7 in continuo cambiamento
 - Es. Facebook, Amazon

Requisiti e feature del software

- **Requisito** software: funzione o qualità controllabile (testabile) che deve possedere l'implementazione di un prodotto software. È importante per il **cliente**
- **Feature** software: insieme di funzioni che permettono di usare un prodotto software in un servizio o prodotto. È importante per il **fornitore**

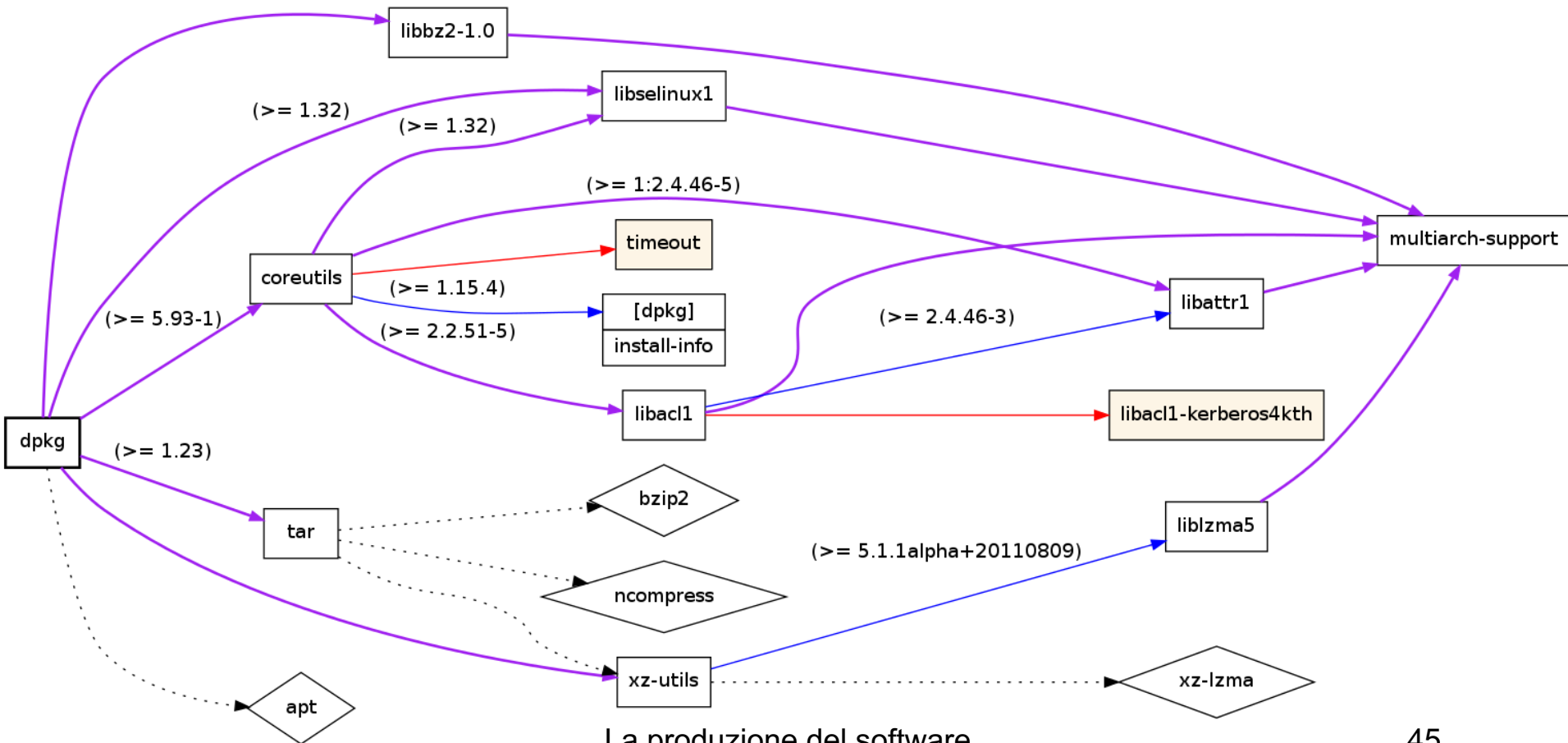
Esempio

- Feature: carrello per negozio elettronico
- Requisiti di un servizio di commercio elettronico: l'utente deve poter registrarsi, aggiungere o togliere elementi al carrello, specificare indirizzi alternativi, pagare

Dipendenze

- Ogni prodotto sw dipende da altri prodotti sw, che a loro volta dipendono da altri sw
- Associamo a ciascun prodotto o sistema software un **grafo di dipendenze**
- I nodi del grafo delle dipendenze sono pacchetti software (es librerie) in diverse versioni

Esempio



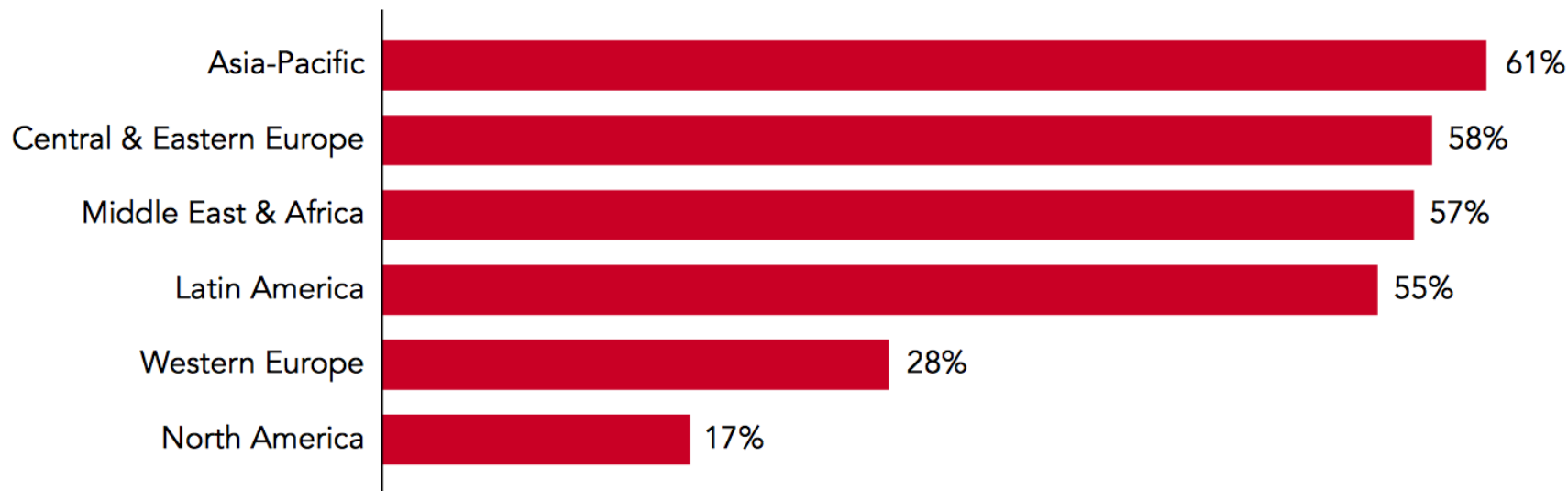
La produzione del software

<http://collab-maint.alioth.debian.org/debtree/>

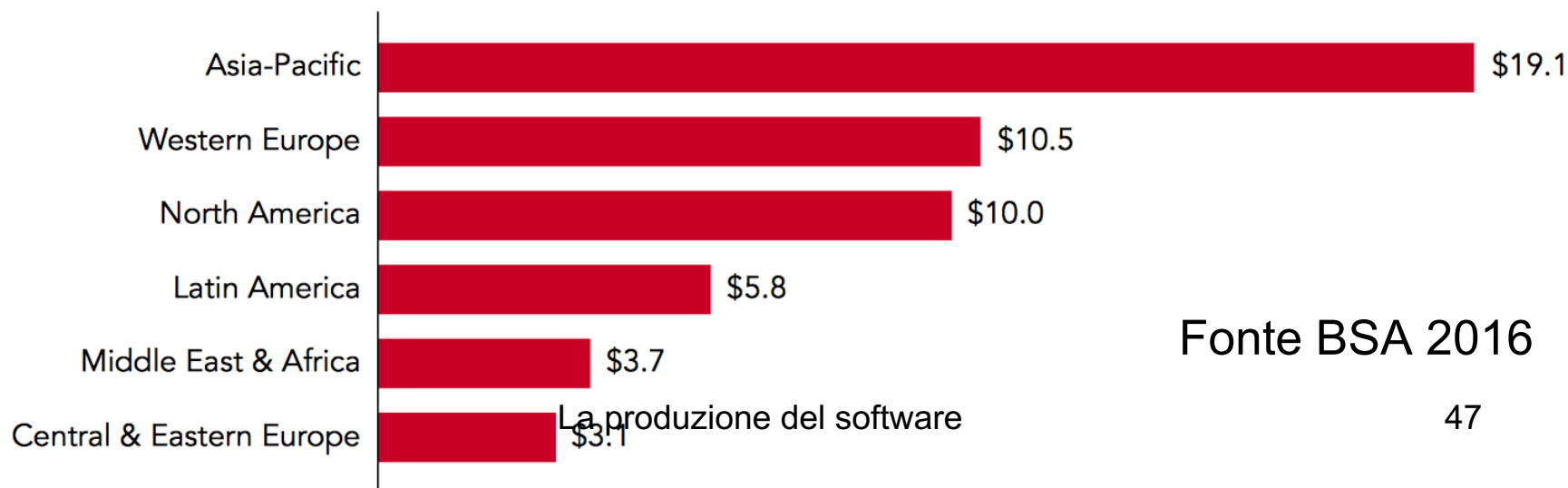
Il software è un prodotto speciale

- È invisibile e intangibile
- Ogni prodotto ha molte dipendenze
- È facilmente duplicabile e distribuibile su rete
- In Europa non è brevettabile (ma protetto)
- Il software di consumo non è garantito
- Viene acquisito su **licenza**
 - Proprietaria (normale, shareware, freeware)
 - Public domain
 - Open source

Average Rate of Unlicensed Software Use



Commercial Value of Unlicensed Software Use (in Billions)



Fonte BSA 2016

Protezione legale del sw

- **Protezione dell'autore:** Il software è un'opera dell'ingegno: chi lo produce è un autore che ha diritto ad un compenso

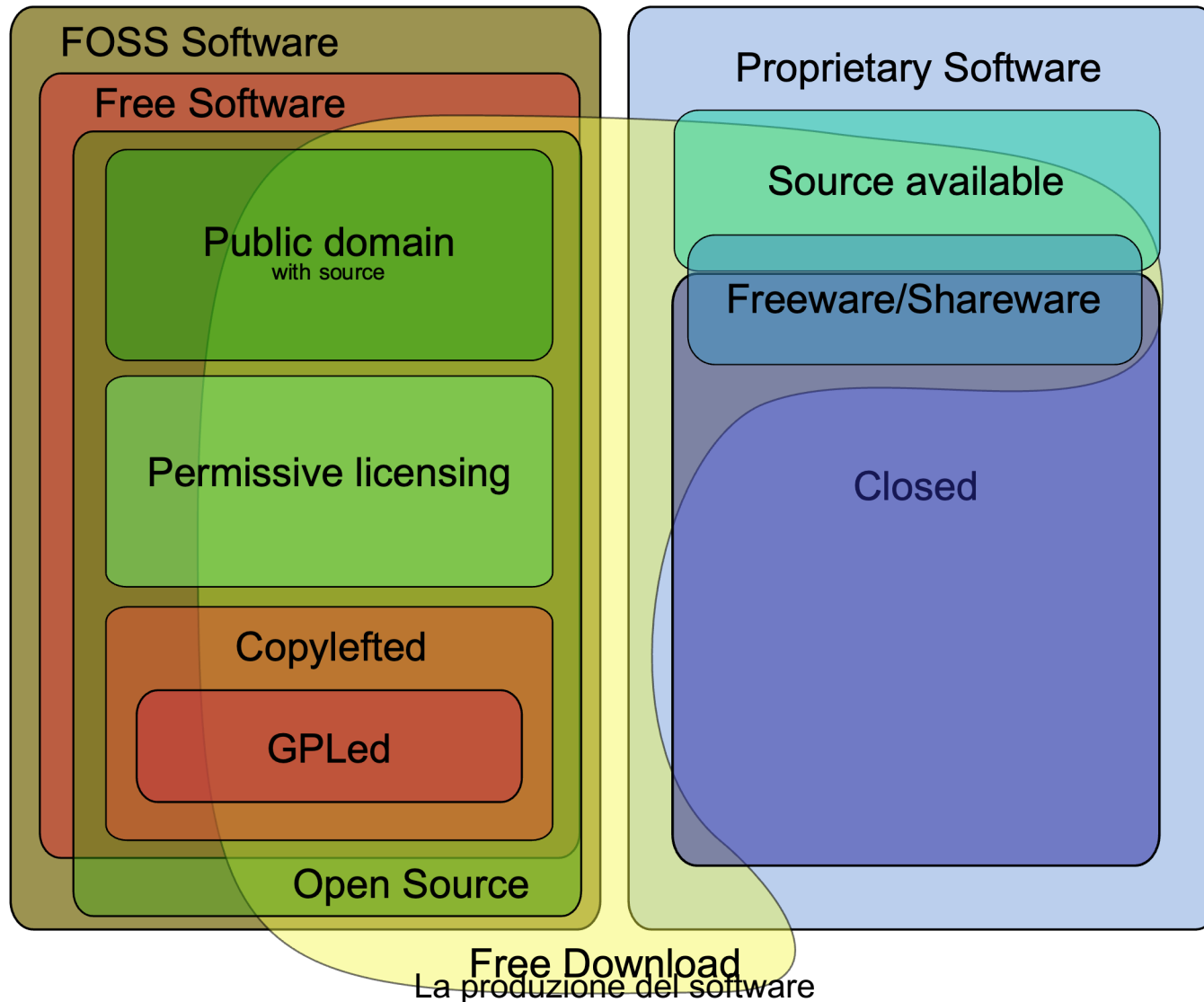
Copiare software abusivamente è **illegale** (anche se non lo si fa per profitto) e in Italia costituisce un reato penale:

La legge italiana 248/2000 punisce col carcere da 6 mesi a 3 anni chi duplica abusivamente software

- Per informazioni sulla brevettabilità del software negli USA:

<http://www.softwarepatent.com>

Le licenze software



SIAE: il pubblico registro sw

- Possono essere registrati i sw che rispettino requisiti di originalità e creatività tali da poter essere identificati come opere dell' ingegno.
- è possibile registrare tutti gli atti che trasferiscono in tutto o in parte diritti di utilizzazione economica relativi a programmi per i quali sia già avvenuta la registrazione
- Per registrare un programma, il richiedente deve trasmettere a SIAE una "dichiarazione" e una "descrizione" oltre, naturalmente, ad un esemplare del programma da depositare registrato su supporto digitale non riscrivibile

Decompilare un sw

- Si può decompilare un software?
- Per esempio, chi l'ha comprato ed ha solo il codice oggetto può decompilarlo per correggere un difetto?

<https://www.lexology.com/library/detail.aspx?g=363a5a27-c2eb-4163-be9d-928784b6a90f>

La garanzia del software

Protezione del compratore:

Quale protezione ha il compratore da difetti del prodotto?

Nel software di consumo in teoria NON c'è alcuna garanzia.

Il software viene venduto “così com'è”, e se ci sono difetti il fabbricante non se ne fa carico:

lo dice il contratto che si visualizza quando si usa per la prima volta un'applicazione

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THE ENTIRE RISK AS TO THE QUALITY OF OR ARISING OUT OF USE OR PERFORMANCE OF THE SOFTWARE PRODUCT AND SUPPORT SERVICES, IF ANY, **REMAINS WITH YOU.**

Garanzie sul software

- La **verifica** garantisce l'aderenza ad una specifica
- La **validazione** garantisce l'accettazione da parte del cliente
- La **certificazione** garantisce l'aderenza a specifiche definite dalla legge

NB: il sw commerciale di solito viene venduto **senza** garanzie (“*as is*”)

I rischi

- Rischi di sviluppo dei sistemi software
- I difetti nel software operativo
- Rischi di esercizio dei sistemi software

Rischi di esercizio

Luglio 2015: **Fiat richiama 1,4 milioni di Jeep**

- Nuova svolta dopo il famoso caso in cui alcuni hacker avevano violato il sistema multimediale UConnetc di una Jeep Cherokee: FCA, dopo aver rilasciato immediatamente un aggiornamento di software ha deciso di richiamare in officina per un controllo gratuito 1,4 milioni di vetture per sistemare definitivamente il sistema informatico di bordo
- “Tutti i settori sono potenziali bersagli di un hacker e l'industria automobilistica non ha fatto eccezione”, ha dichiarato Gualberto Ranieri, capo della comunicazione FCA mercati Nafta spiegando poi che "non c'è stato un solo incidente nel mondo reale in cui è stato coinvolto qualsiasi veicolo FCA a seguito di un'intrusione pirata nei suoi software”.

Alcune qualità del software

- **Robustezza**: sw capace di sopportare errori durante l'esecuzione
- **Sostenibilità**: software duraturo capace di essere modificato economicamente
- **Riproducibilità**: controllo delle versioni

Alcuni dati

Numero di difetti (fault) rilevati durante l'esercizio

- I peggiori sistemi militari: 55 faults/KLoC
- I migliori sistemi militari: 5 faults/KLoC
- Prodotti ottenuti con sviluppo agile (XP): 1.4 faults/KLoC
- Apache web server (open source): 0.5 faults/KLoC
- NASA Space shuttle: 0.1 faults/KLoC

www.easterbrook.ca/steve/?p=1366

Domande di autotest

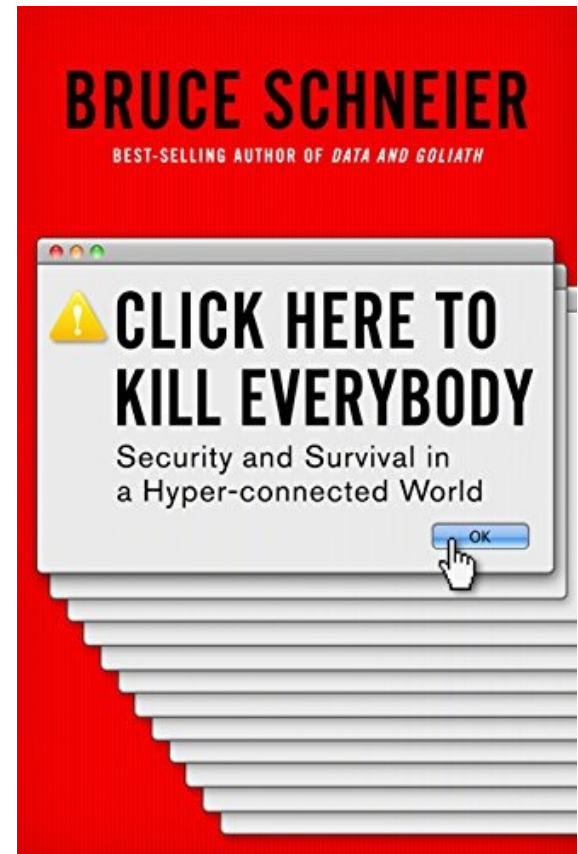
- Cos'è il software? Quanti tipi di sw esistono?
- Perché è costoso produrlo?
- Quali sono i rischi dell'uso del software?
E quelli dello sviluppo?
- Cos'è un difetto software?
- Quanto software può produrre in un anno
 - Una persona? Un'organizzazione? Una nazione?

Libri sul fare software

Oram e Wilson, *Making Software*,
O'Reilly, 2011

Martin, *Clean code. Guida per
diventare bravi artigiani nello sviluppo
agile di software*, 2018

Schneier, *Click here to kill everybody*,
2018



Blog e altro

- `www.joelonsoftware.com`
- `stackoverflow.com`
- `www.freelancer.com`
- `best-practice-software-engineering.blogspot.com`

Gruppi linkedin

- Software developer
- Software testing and quality assurance
- Software as a service

Domande?

