Il software libero: genesi, stato e prospettive

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Seminario per Sistemi Operativi
Corso di laurea in Informatica
Università di Padova

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I - genesi

tre storie:

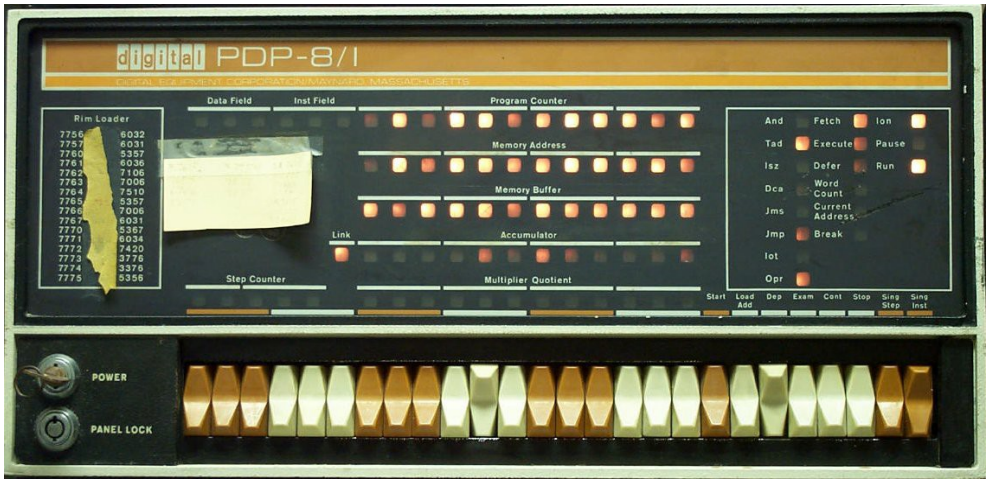
1- GNU & FSF

2- Linux

3- Open Source

Mainframe

IBM 1960 - SAGE AN-FSQ-7
ALU Acc. no. 1983.0012.001,
Musée des sciences et de la technologie du Canada



Sui primi computer:

software distribuito in sorgente,

condiviso tra chi lo scriveva,

in una comunità di utenti/sviluppatori.

Con la diffusione dei minicomputer e dei PC (1981):
software venduto a parte (UNIX, DOS, CP/M,...),
solo in forma eseguibile per evitare concorrenza,
a degli utenti isolati.

Richard Stallman, MIT AI lab, USA,

When the AI Lab bought a new PDP-10 in 1982, its administrators decided to use Digital's nonfree timesharing system instead of ITS.

The modern computers of the era, such as the VAX or the 68020, had their own operating systems, but none of them were free software: you had to sign a nondisclosure agreement even to get an executable copy. http://www.gnu.org/gnu/thegnuproject.html

"ci fu impedito di fare cose utili" = aggressione alla libertà

1983 *GNU project:* come Unix, ma completamente libero:
Tools: editor (Emacs), compilatore (gcc),

1885 Free Software Foundation (FSF)
GNU General Public License (GPL)

1990 *Kernel,* il nucleo: GNU Hurd: è molto avanzato e più difficile del previsto: blocca il progetto

"Make the world a better place"

GNU e Le 4 libertà

0 Libertà di eseguire il programma, per qualsiasi scopo.

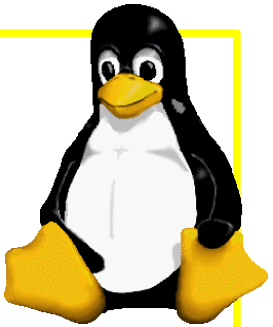
1 Libertà di studiare come funziona il programma, e adattarlo *alle proprie necessità*.

2 Libertà di ridistribuire le copie *in modo da aiutare il prossimo*.

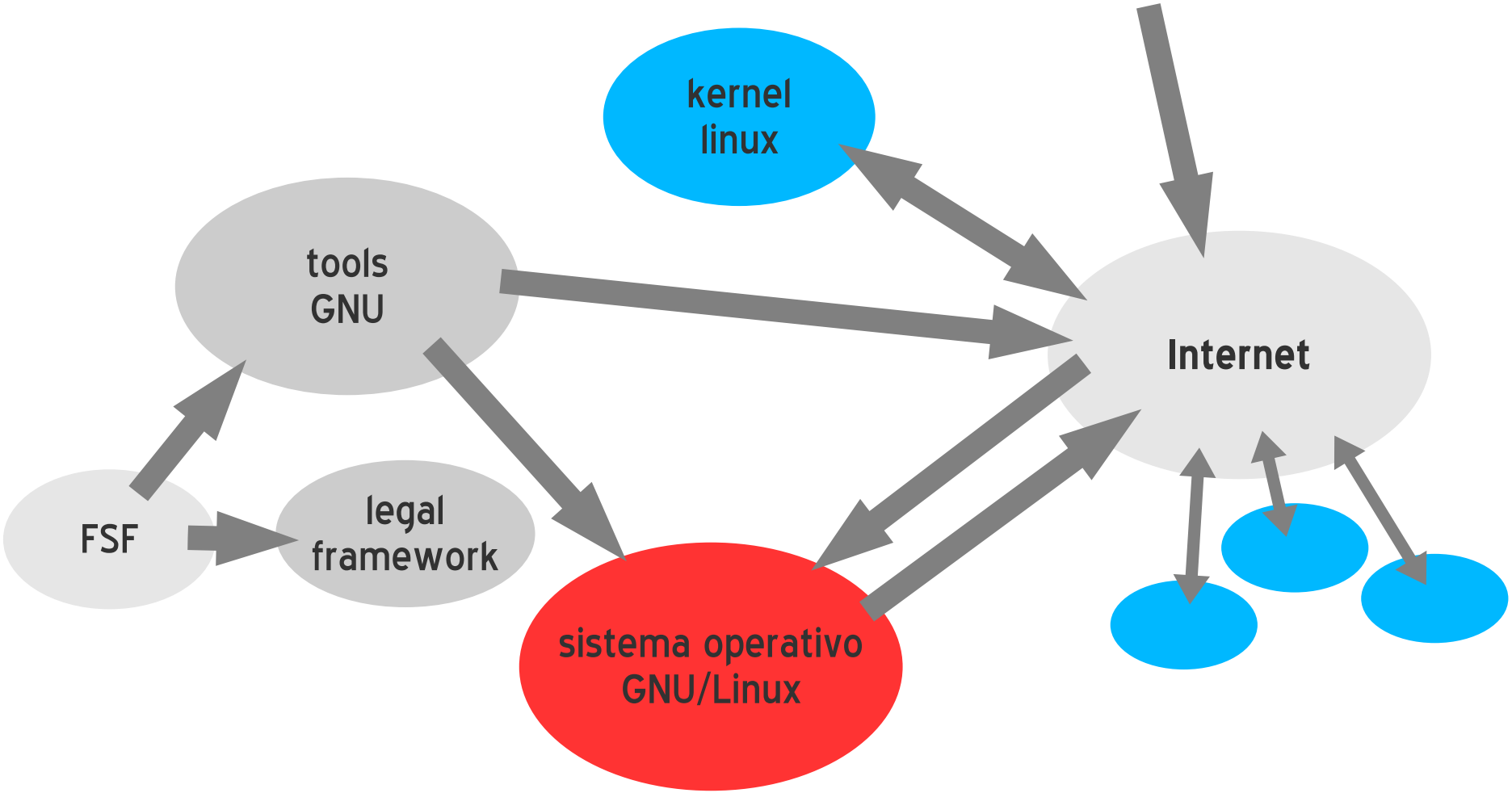
3 Libertà di migliorare il programma, e distribuirne pubblicamente i miglioramenti, *in modo tale che tutta la comunità ne tragga beneficio*.

Richard M.Stallman, Cambridge MA, 1984

Linus Torvalds, Helsinki University, Finlandia, 25 Ago 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..."



Linux kernel map

2.6.35

http://www.makelinux.net

functionalities
layers

human interface | system | processing | memory | storage | networking

user space interfaces

system calls and system files

HI char devices

interfaces core

processes

memory access

files & directories access

sockets access

virtual

security

Device Model

threads

virtual memory

Virtual File System

protocol families

bridges

cross-functional modules

debugging

synchronization

memory mapping

page cache

networking storage

socket splice

logical

functions implementations

HI subsystems

system run

Scheduler

logical memory

logical file systems

protocols

device control

abstract devices and HID class drivers

generic HW access

interrupts core

Page Allocator

block devices

network interface

hardware interfaces

drivers, registers and interrupts

HI peripherals device drivers

device access and bus drivers

CPU specific

physical memory operations

disk controller drivers

network device drivers

electronics

user peripherals

I/O

CPU

memory

disk controllers

network controllers

1989 Cygnus Software, Michael Tyman: prima impresa di assistenza su free software

Il successo di Linux e degli altri programmi liberi attira le imprese.

1993 RedHat

1994 SUSE Linux 1.0

Free suona *gratis* : tabù per il business
→ "*Open Source*" è il *maketing term per "free software".*

1998 Netscape, sotto la pressione della concorrenza Microsoft, decide di rilasciare il sorgente del browser Mozilla. → Open Source Initiative (Raymond, Perens).

2000 Sun rilascia OpenOffice.org

2006 Sun rilascia Java, accordi tra Novell e Microsoft

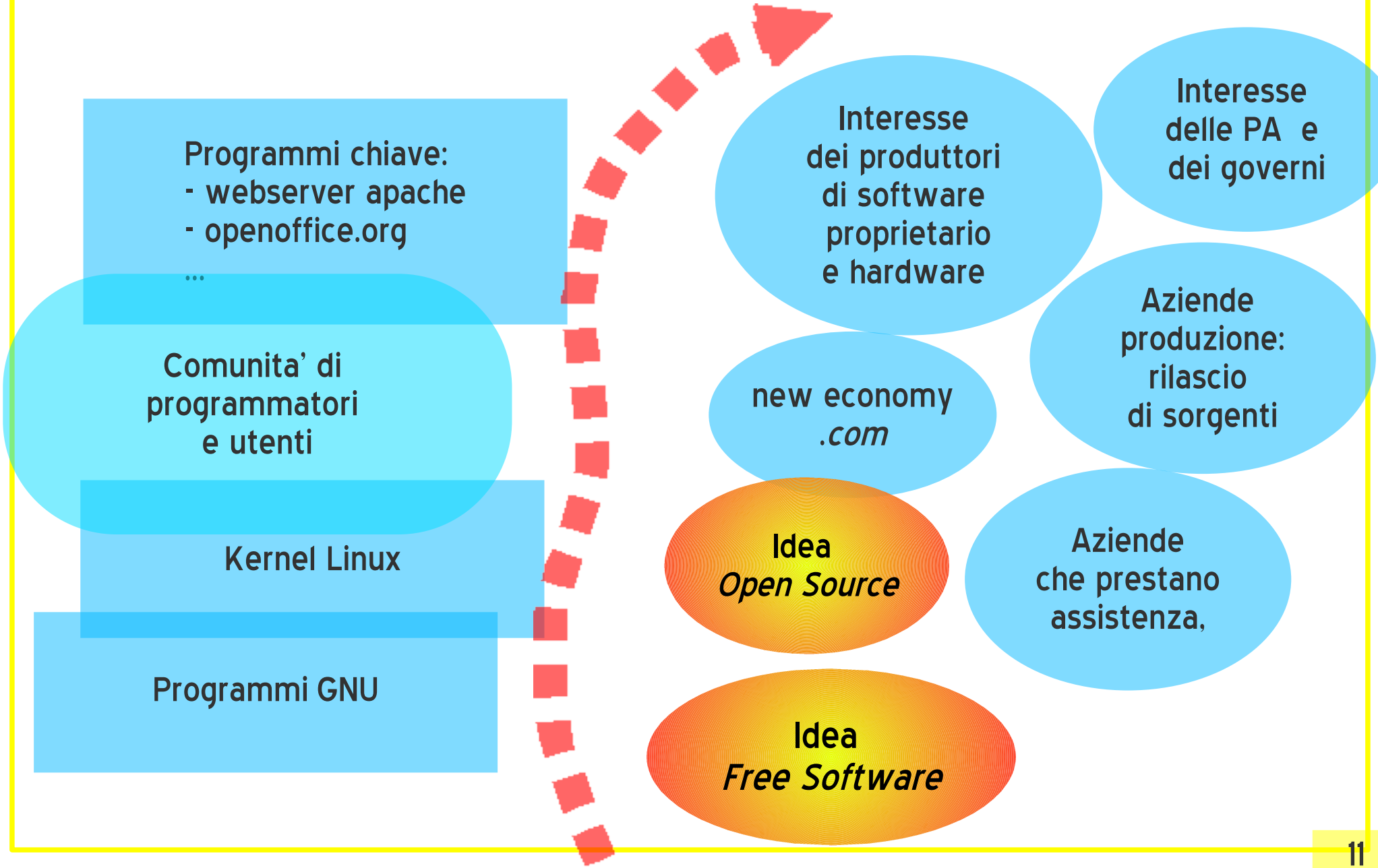
2007 Google rilascia Android,

2010 Sun comprata da Oracle, 2011 fork LibreOffice

open source™

http://geekz.co.uk/lovesraymond

Il successo di GNU/Linux



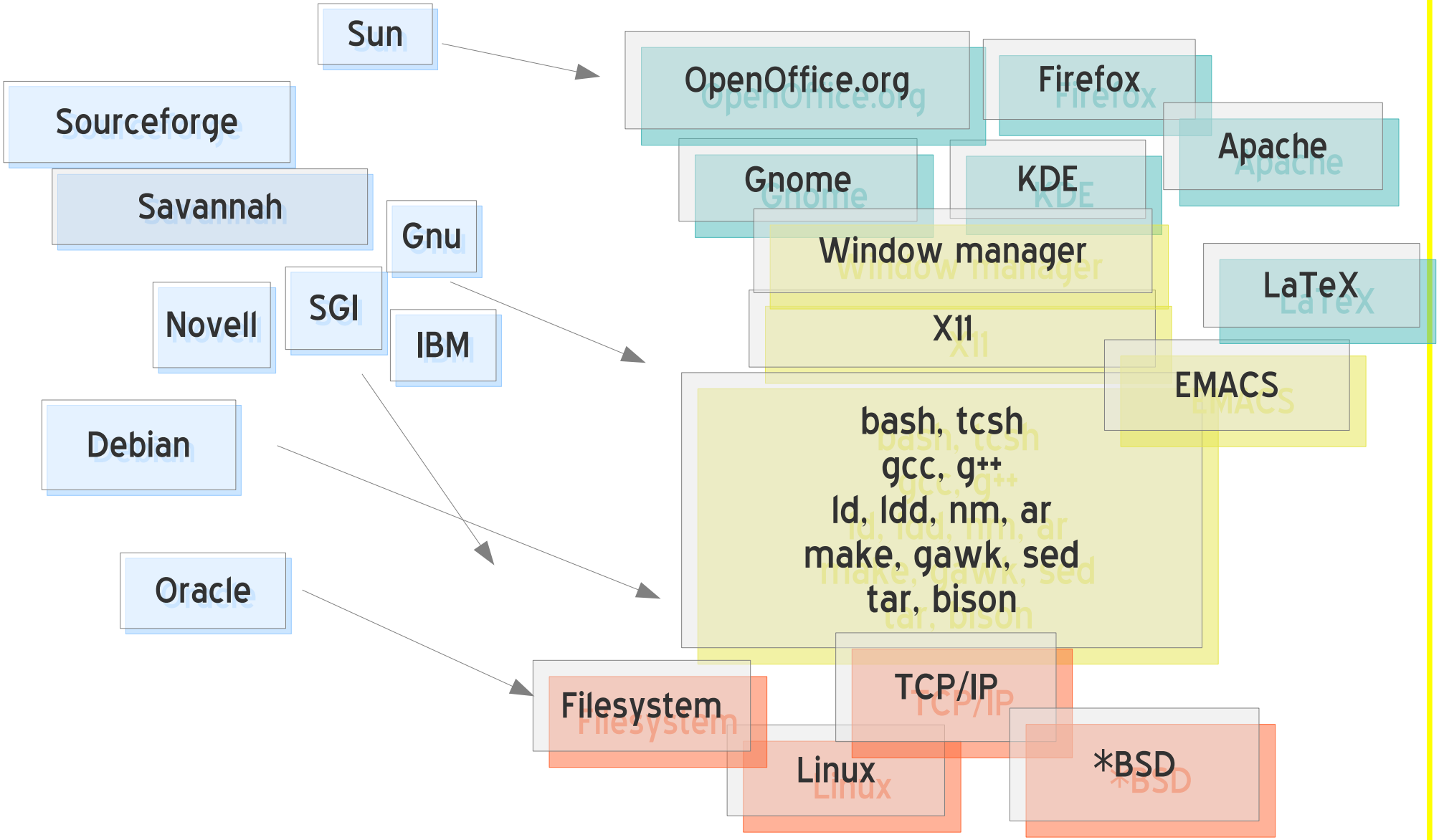
II - stato

1 - composizione di un sistema libero

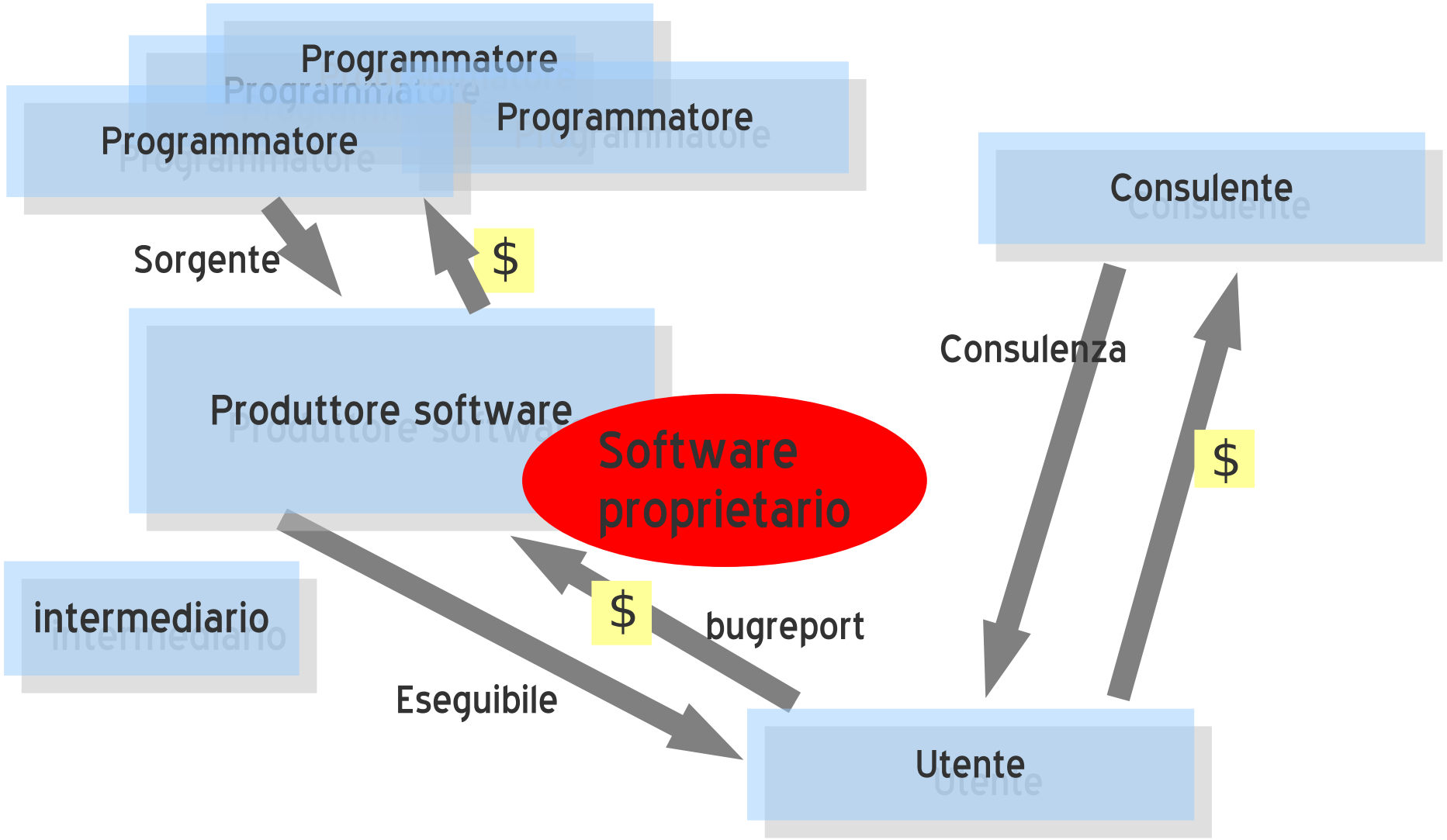
2 - il mercato del software, regolazione

3 - foss come modello di
- licenza
- sviluppo
- distribuzione

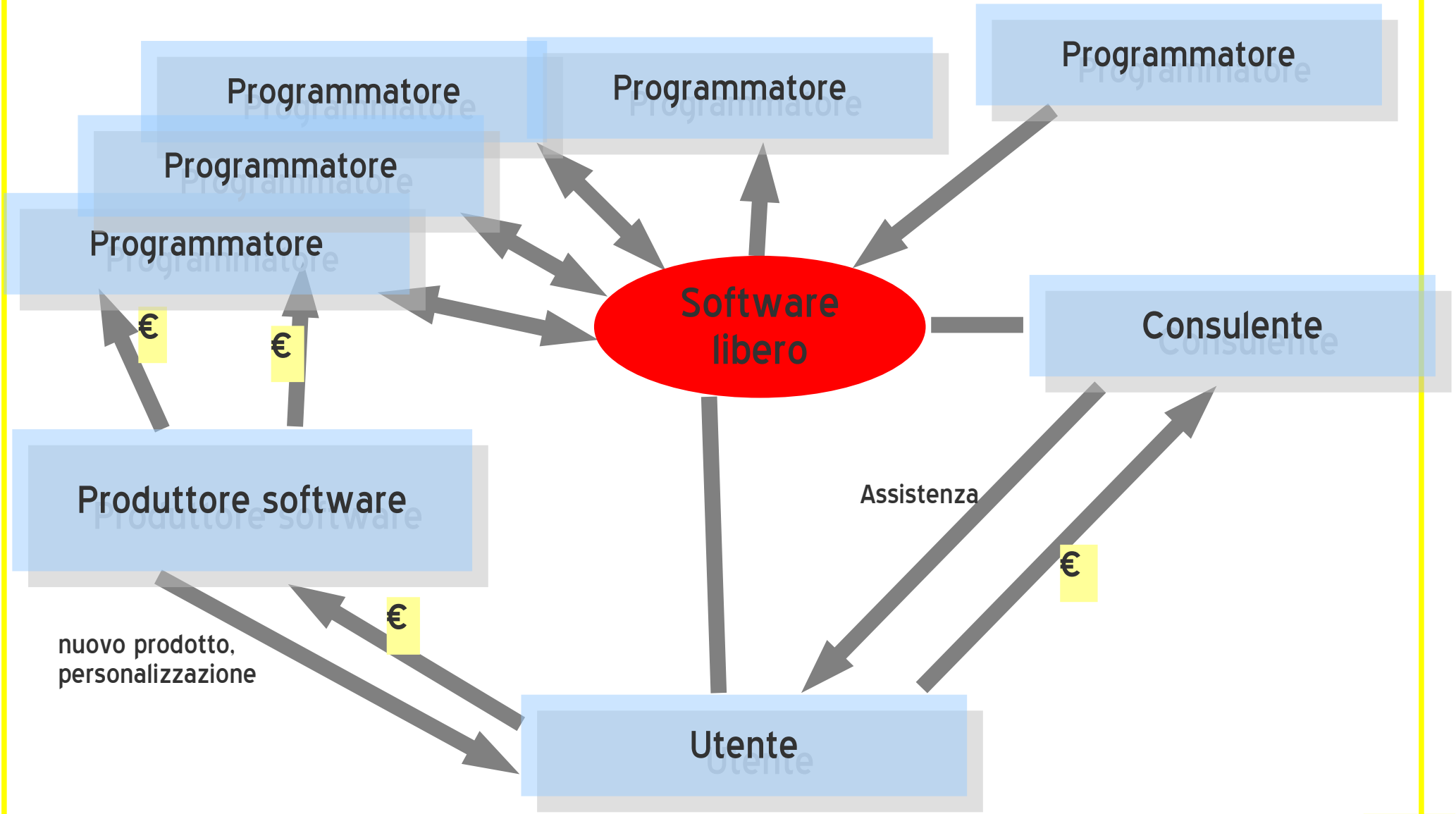
(prezzo)


Sun
Sourceforge
Savannah
Gnu
Novell
SGI
IBM
Debian
Oracle
OpenOffice.org
Firefox
Apache
Gnome
KDE
Window manager
LaTeX
X11
EMACS
bash, tcsh
gcc, g++
ld, ldd, nm, ar
make, gawk, sed
tar, bison
TCP/IP
Filesystem
Linux
*BSD

mercato software proprietario



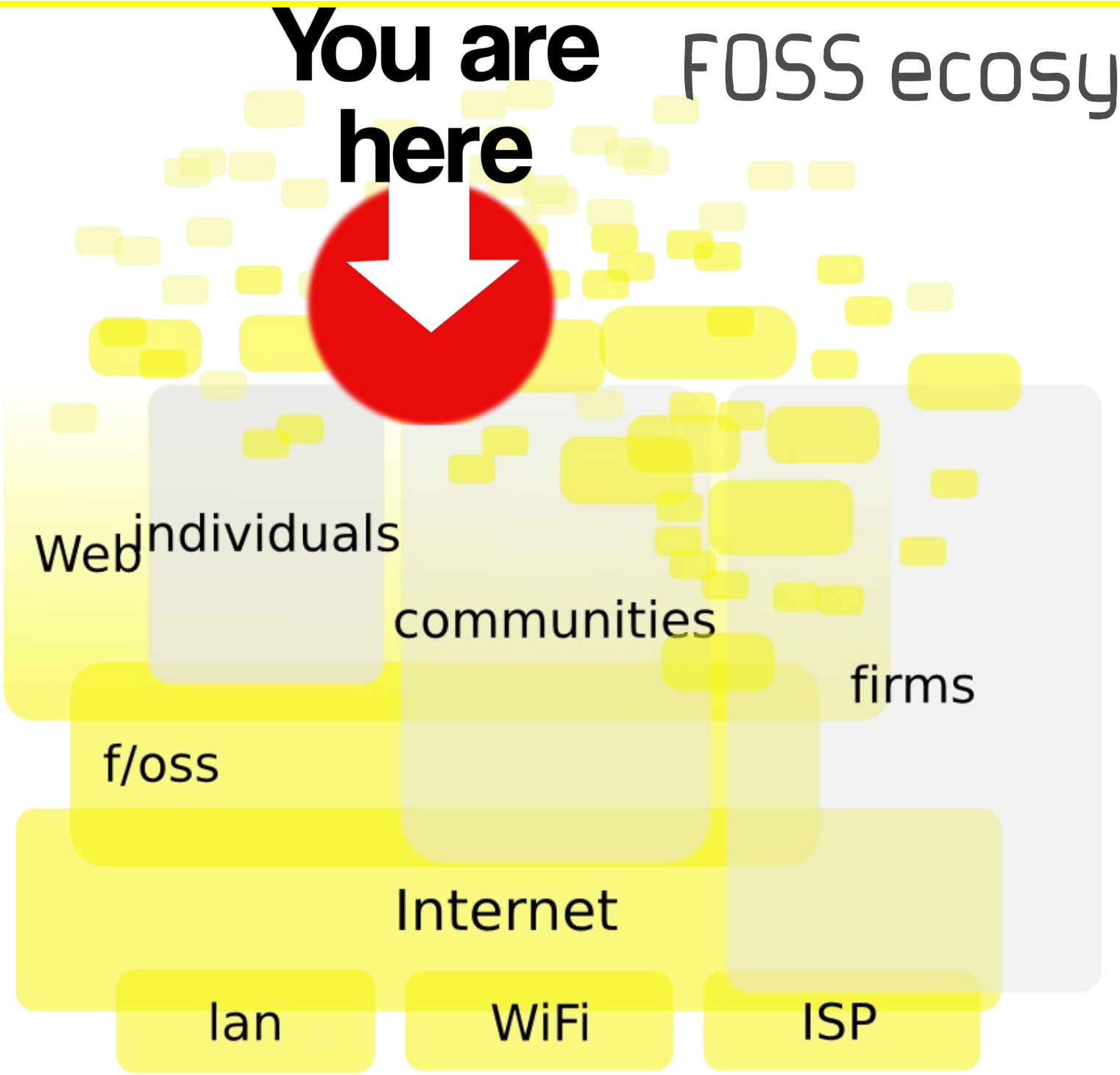
mercato software libero



Strategie delle imprese

- partecipare per influenzare un progetto f/oss
  - definire gli strumenti
  - acquisire la conoscenza necessaria per competere
- ridurre rischi e costi
  - il *backport* é più costoso
  - "in proprietary software, it can be too late to back up when you make a mistake"
- richiede creatività:
    - community exploration/exploitation

FOSS ecosystem



Most active Linux Employers

Most active 2.6.34 employers

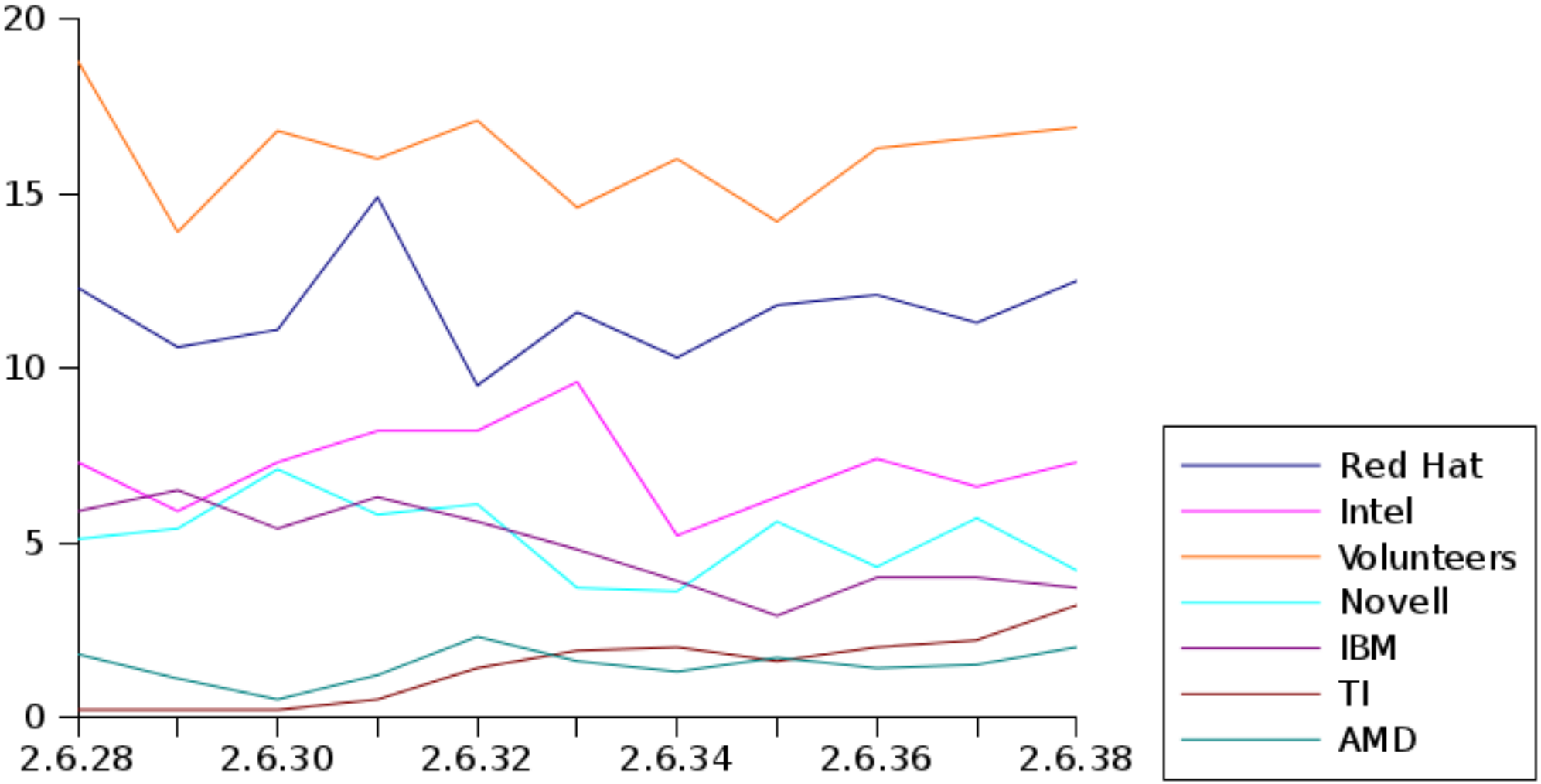
By changesets			By lines changed		
(None)	1455	16.0%	Red Hat	75235	10.3%
(Unknown)	959	10.5%	(None)	75160	10.3%
Red Hat	934	10.3%	(Unknown)	67541	9.2%
Intel	472	5.2%	Broadcom	56595	7.7%
IBM	354	3.9%	Intel	33175	4.5%
Novell	329	3.6%	New Dream Network	31501	4.3%
(Consultant)	274	3.0%	(Consultant)	29140	4.0%
Nokia	248	2.7%	Novell	24217	3.3%
New Dream Network	237	2.6%	Wolfson Microelectronics	20660	2.8%
Renesas Technology	188	2.1%	Renesas Technology	16205	2.2%
Texas Instruments	180	2.0%	Chelsio	13937	1.9%
Pengutronix	154	1.7%	IBM	13618	1.9%
Oracle	144	1.6%	QLogic	13182	1.8%
HP	128	1.4%	MSC Vertriebs GmbH	12545	1.7%
(Academia)	125	1.4%	Samsung	12224	1.7%
Analog Devices	123	1.4%	Marvell	11914	1.6%
AMD	121	1.3%	Texas Instruments	11228	1.5%
Fujitsu	121	1.3%	Analog Devices	11047	1.5%
Marvell	120	1.3%	AMD	10894	1.5%
Wolfson Microelectronics	101	1.1%	Nokia	10217	1.4%

Most active 2.6.38 employers

By changesets			By lines changed		
(None)	1544	16.9%	(None)	133902	18.2%
Red Hat	1145	12.5%	Broadcom	97317	13.2%
Intel	664	7.3%	Red Hat	56561	7.7%
(Unknown)	654	7.1%	Intel	44650	6.1%
Novell	383	4.2%	Analog Devices	41083	5.6%
IBM	334	3.7%	Rising Tide Systems	31869	4.3%
(Consultant)	315	3.4%	(Unknown)	30462	4.1%
Texas Instruments	290	3.2%	Wolfson Micro	25167	3.4%
AMD	184	2.0%	Texas Instruments	24193	3.3%
Broadcom	172	1.9%	IBM	16124	2.2%
Wolfson Micro	170	1.9%	Novell	13939	1.9%
Nokia	169	1.8%	(Consultant)	13789	1.9%
Oracle	136	1.5%	Freescale	11454	1.6%
Samsung	133	1.5%	Nokia	10535	1.4%
Google	133	1.5%	Oracle	10415	1.4%
Atheros	132	1.4%	ST Ericsson	9521	1.3%
Analog Devices	115	1.3%	Renesas Tech.	8534	1.2%
Fujitsu	112	1.2%	Samsung	7988	1.1%
Pengutronix	109	1.2%	AMD	7950	1.1%
Renesas Tech.	107	1.2%	Oki Semiconductor	7087	1.0%

602540 82%
Firms: ~60%

Kernel changeset contributions by employer



By Jonathan Corbet

March 2, 2011

http://lwn.net/Articles/429912/

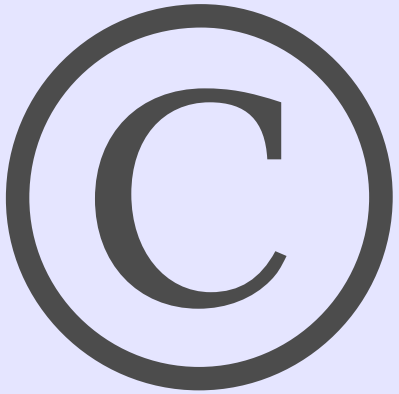
modelli di licenza

impresa

diritti di sfruttamento economico

autore

diritti morali



licenza

utente

Licenze software proprietario

concedono:

facoltà di

- **esecuzione del codice binario**
- **a certe condizioni**

vietano:

- **copia, modifica, diffusione**
- ***reverse engineering***

Licenze software libero

concedono:

facoltà di:

- **esecuzione del codice binario, senza condizioni**
- **modifica, diffusione, del codice sorgente**

vietano:

...dipende...

Modelli di licenze libere

1. **Public Domain** viene ceduto tutto, anche il ©

   → reversibile (può essere reso proprietario)

2. ***tipo* BSD** (Berkeley Standard Distribution):

   deve sempre rimanere il © dell'autore

   → reversibile (può essere reso proprietario)

3. **GNU GPL** (General Public License):

   "copyleft" o permesso d'autore

   prodotti derivati devono usare GPL

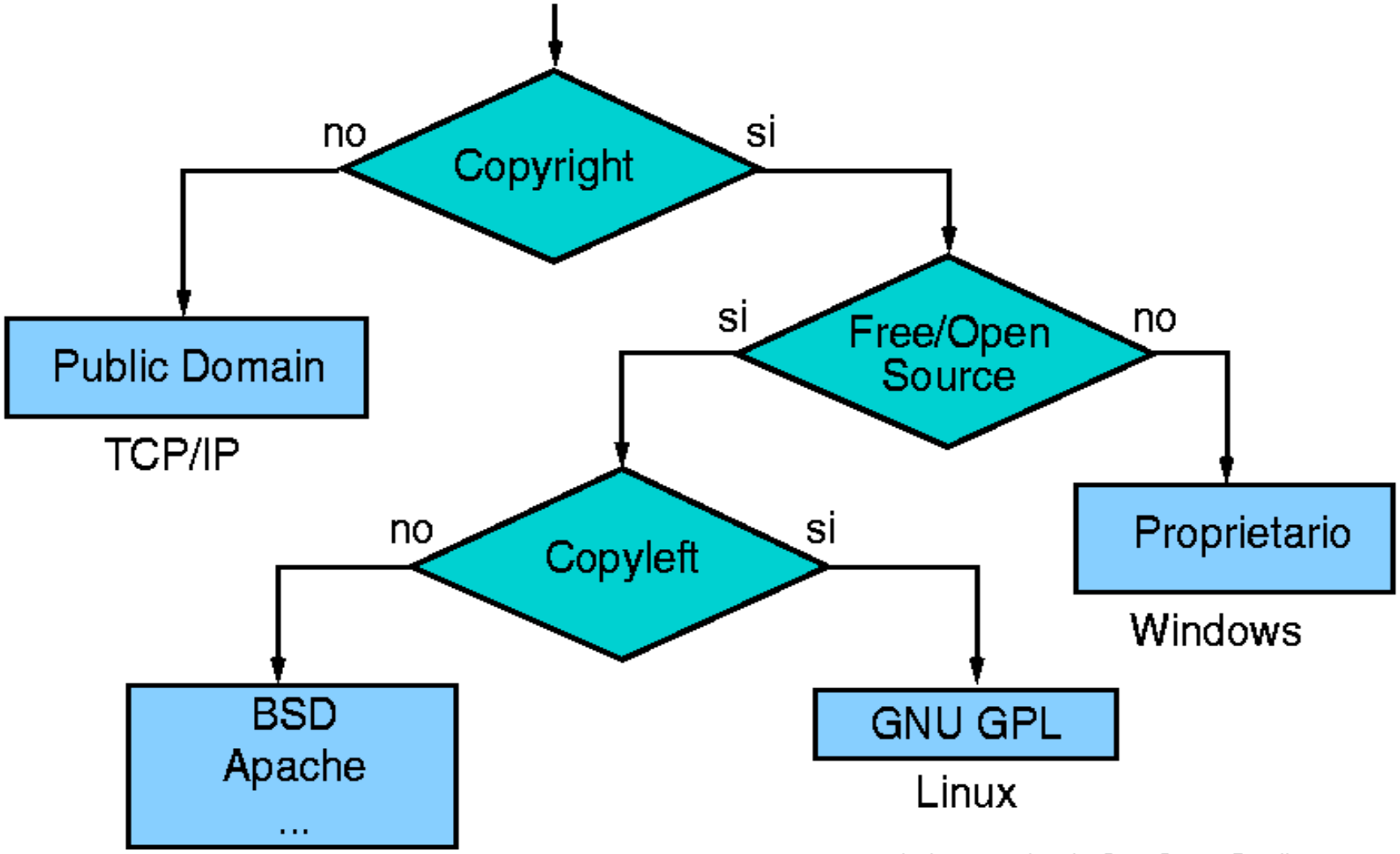
   → irreversibile

gnu general public license

Copyleft :
Chi distribuisce copie di un programma coperto da GPL, sia gratis sia in cambio di un compenso, deve concedere ai destinatari tutti i diritti che ha ricevuto.

Deve anche assicurarsi che i destinatari ricevano o possano ottenere il codice sorgente.

E deve mostrar loro le condizioni di licenza, in modo che essi conoscano i propri diritti.



da: Lawrence Lessig: Open Source Baselines, 2002

Modelli di sviluppo del software

Sequenziale, iterativo, agile, ..., *community based*

Cattedrale/Bazaar (Raymond, 1999)

Single Guru
Master - Disciple o *Benevolent dictator*
Project team

***self-identification* (Benkler, 2006)**

Modelli di distribuzione del software

Tradizionale

supporto fisico +
distributore/rivenditore

Internet based

download, try & buy

f/oss: distribuzione integrata con sviluppo e supporto

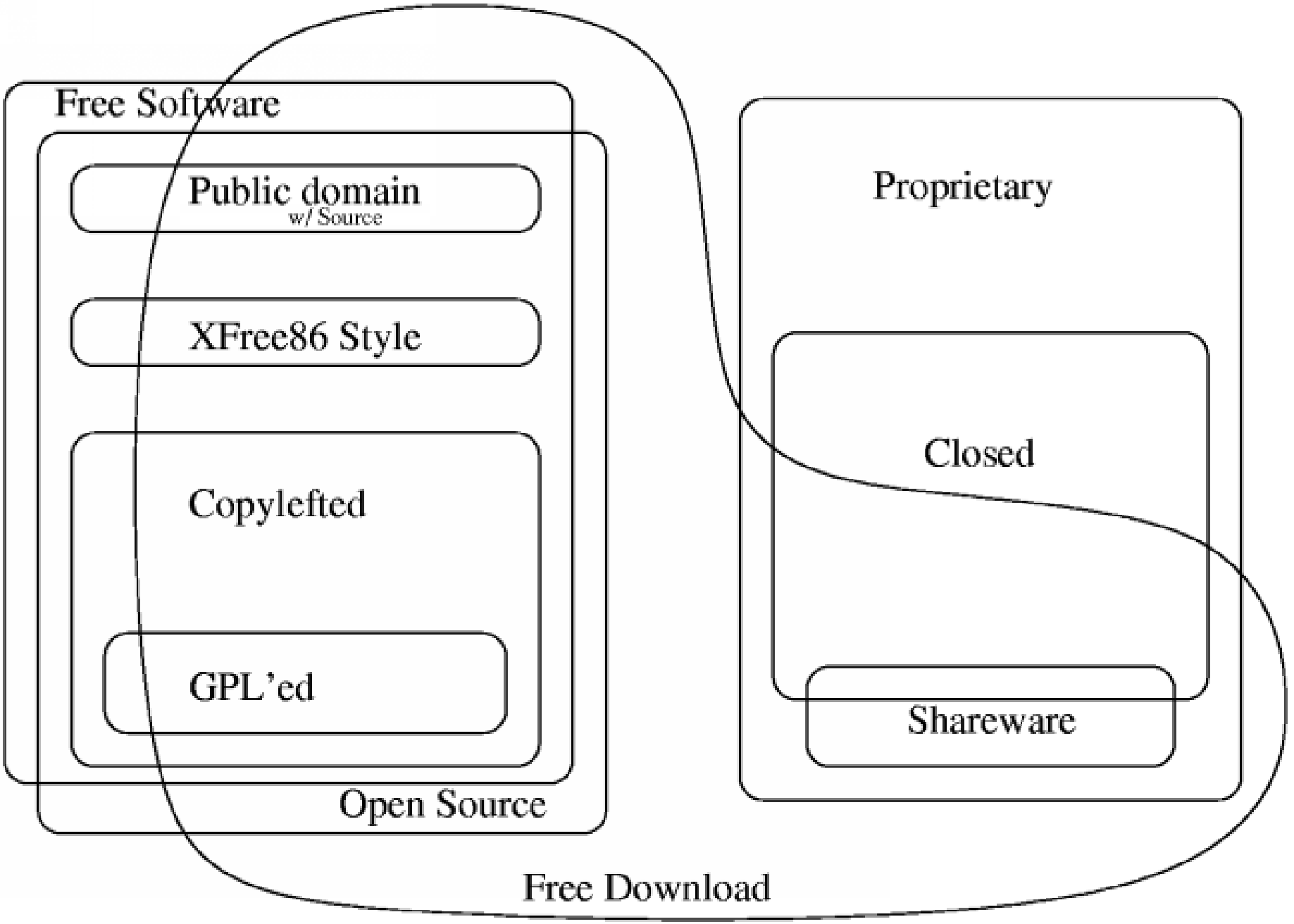
prezzo

Per essere *free* software
deve essere libero,

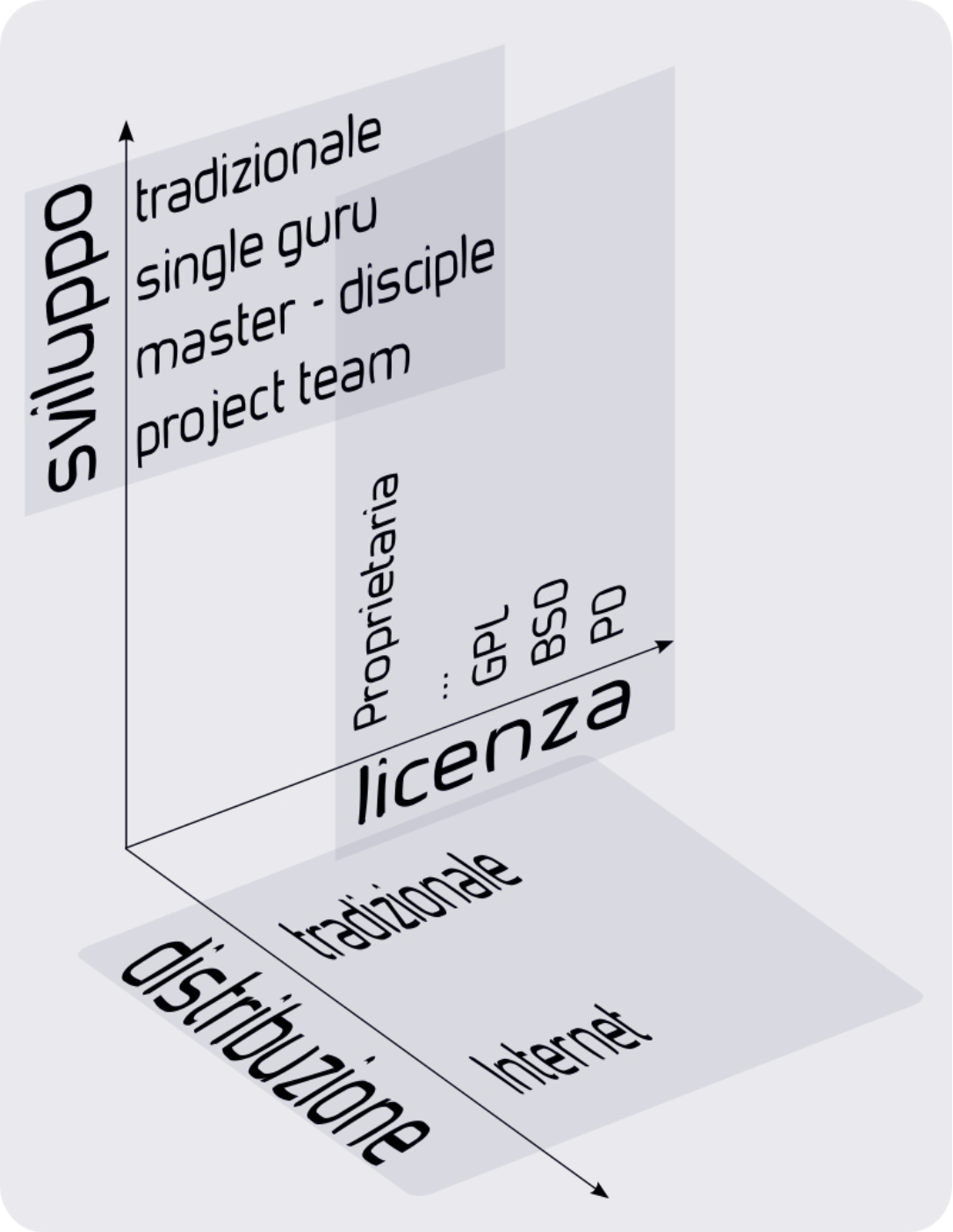
inoltre

può essere gratis
(e spesso lo è)

***freeware* (sw proprietario gratuito) ≠ free software**



http://www.gnu.org/philosophy/categories.html



sviluppo, licenza, distribuzione (e prezzo) sono ortogonali

Il free software è una novità

... dagli anni ’70.

Quale motivo per il nuovo impulso?

Prezzo? Non sempre.

Licenze? Certamente!

Distribuzione? Anche!

codice **sorgente**

\+ licenze libere = *free software*

\+ Internet = *peer-production* e distribuzione

\+ imprese = *Open Source*

---

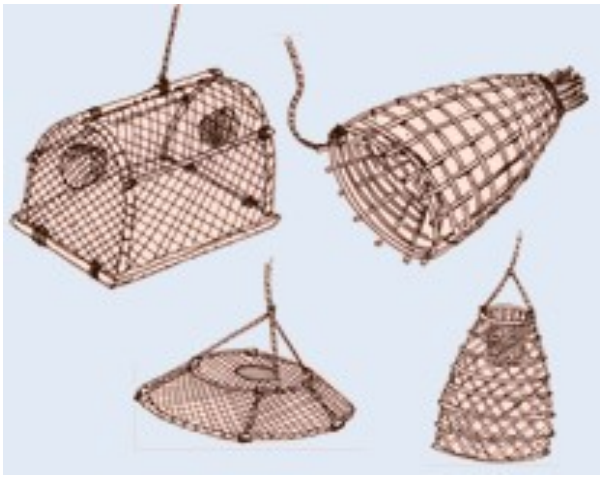
free software prodotto, usato e distribuito
grazie ad Internet da privati e imprese

III - prospettive

* "open source" e "peer production" sono sempre più "mainstream"
* What's hot: data, cloud & mobile
* sfide {
  - formati dati proprietari
  - sw chiusi su kernel aperti
  - brevetti software
* free/open future

Data *lock-in*

- **accesso ai dati:**
  - **nel *tempo***
  - **da *programmi* diversi**
  - **da *architetture* di tipo diverso**



- **formati aperti e interoperabili**
  Open Document Open XML
- **codice per la pubblica amministrazione digitale**

"Data is the new Oil"

Michael Palmer
2006

"Data is just like crude. It's valuable, but if unrefined it cannot really be used. It has to be changed into gas, plastic, chemicals, etc to create a valuable entity that drives profitable activity; so must data be broken down, analyzed for it to have value.

The issue is how do we marketers deal with the massive amounts of data that are available to us? How can we change this crude into a valuable commodity ?"

D: Da dove vengono i dati?

http://ana.blogs.com/maestros/2006/11/data_is_the_new.html

Open Data

* Science : maps, genomes, chemical compounds, formulae, medical data and practice, bioscience and biodiversity [...]
* Government and NGO: demographics, maps, public spending, justice, health, education, ...
* Users: habits, voluntary crowdsourcing, ...

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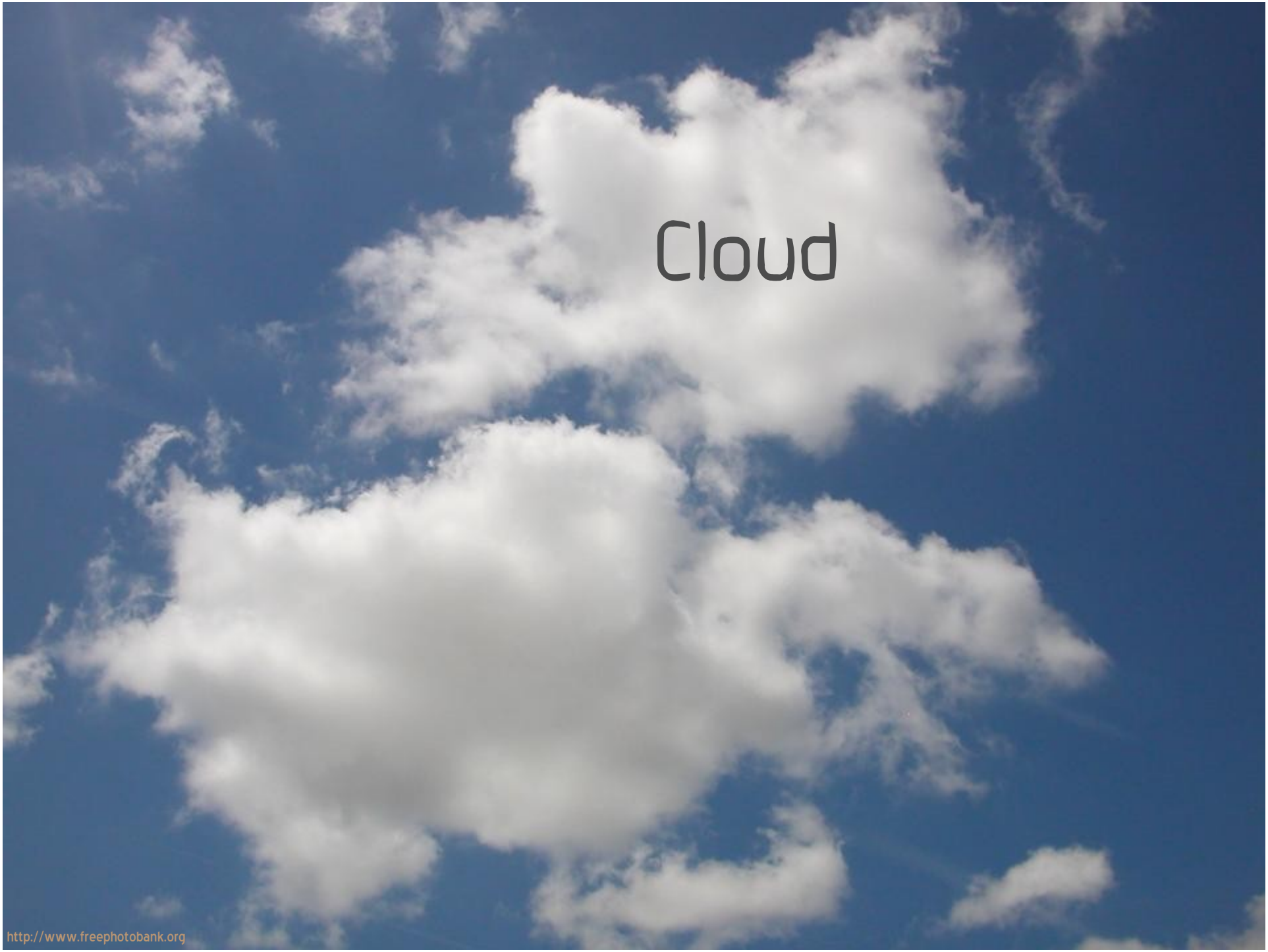
* Provides: access, redistribution, reuse, ...
* Needs: security & privacy, interoperability, open data standards, licenses, statistics, visualization techniques

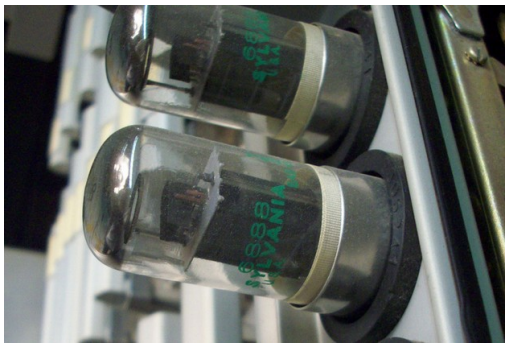
http://www.opendefinition.org

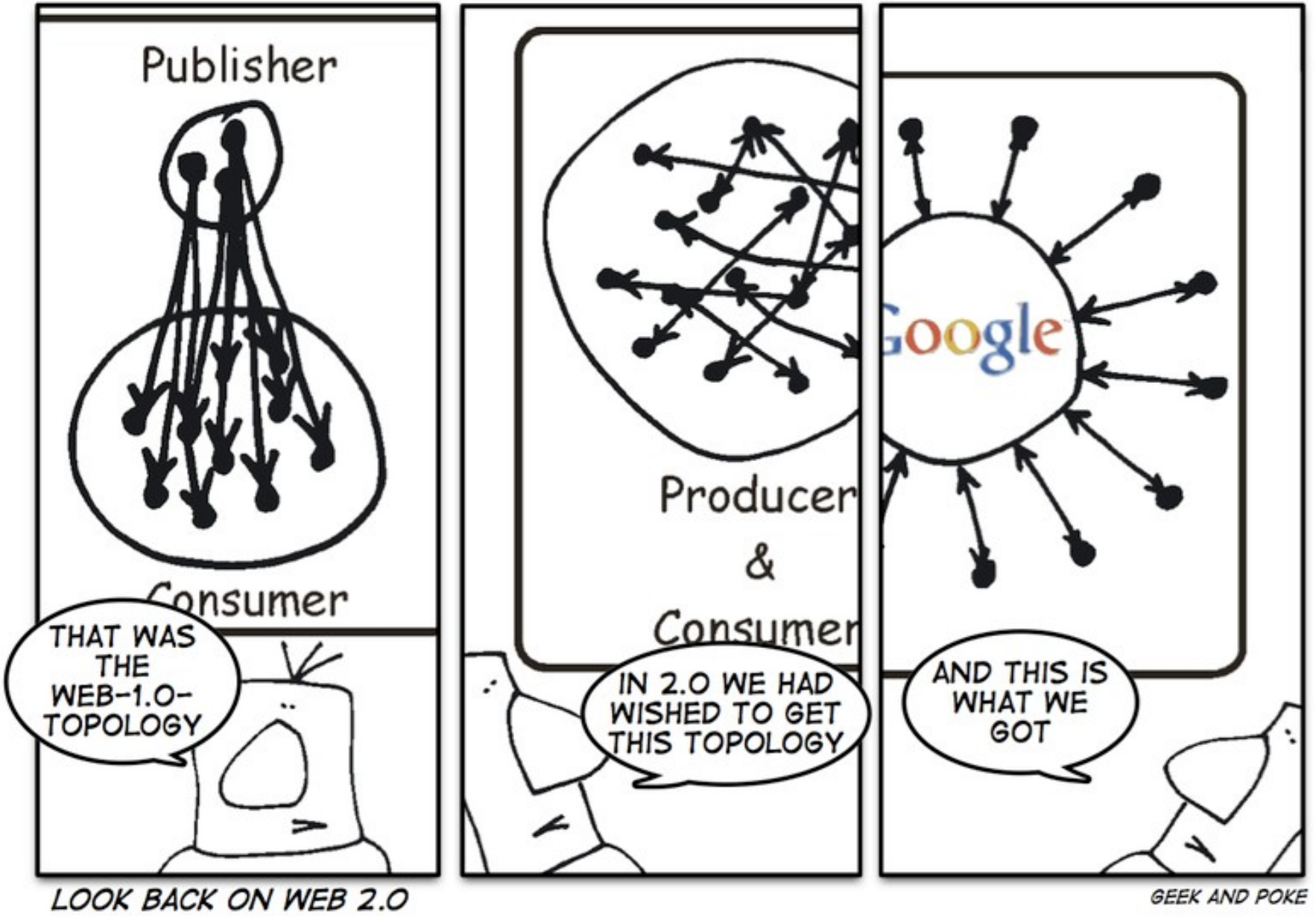


http://www.freephotobank.org

IBM 2009 - NERCS @ Berkeley Magellan Lawrence Nat'l Lab - Roy Kaltschmidt, photographer

Cloud ≟ Mainframe 2.0





http://geekandpoke.typepad.com/geekandpoke/2006/10/look_back_on_we.html October 21, 2006

Cloud key concepts

centrally hosted hardware + storage
functional separation between resources
modulation and pricing of resource use

+ services (backup, fault tolerance, balancing)
+ some software (O.S. → application)

Cloud services

* IaaS Infrastructure (+ virtualized os):
  Amazon EC is mostly Gnu/Linux-based
  you do: os installation → application

* PaaS Platform (+programming env. + APIs):
  Google App Engine: Java/Python
  you do: application development & maintenance

* SaaS Software (+ fixed end user application)
  Google Apps for email and docs; Salesforce.com

* Xaas = X as a Service

FOSS Clouds

* OpenStack.org, OpenNebula, Nimbus
* Eucalyptus: Amazon EC2 and S3 API compliant.
* User test drive: http://open.eucalyptus.com/CommunityCloud

4.2 Creating Keypairs

Keypairs are used in Eucalyptus to authenticate a user's identity. Before running a VM instance, you must first create a keypair as follows:

```
euca-add-keypair mykey | tee mykey.private
```

A pair of keys are created; one public key, stored in Eucalyptus, and one private key stored in the file `mykey.private` and printed to standard output. The `ssh` client requires strict permissions on private keys:

```
chmod 0600 mykey.private
```

4.3 Running a VM Instance

You can now run instances that are accessible with the newly generated private key:

```
euca-run-instances -k mykey -n <number of instances to start> <emi-id>
euca-describe-instances
```

4.4 Authorizing Security Groups and Allocating IPs

If your administrator has configured Eucalyptus to provide security groups and elastic IPs, you may be required to allow logins to your instance, allocate a public IP (if you have not done so before, check 'euca-describe-addresses' as a reminder), and assign it to your running instance:

Allow 'ssh' connections from the Internet:

```
euca-authorize -P tcp -p 22 -s 0.0.0.0/0 default
```

Allocate a public IP if you have not done so already:

```
euca-allocate-address
```

Associate an allocated IP with your running instance:

```
euca-associate-address <IP from allocate> -i <instance ID>
```

Once the instance is shown as 'Running', it will also show two IP addresses assigned to it.

4.5 Logging into a VM Instance

You can now log into it with the SSH key that you created:

```
ssh -i mykey.private root@<accessible-instance-ip>
```

To terminate instances, use:

```
euca-terminate-instances <instance-id1> <instance-id2> ... <instance-idn>
```

Is Android Open?

@Arubin
Andy Rubin

the definition of open: "mkdir android ; cd android ; repo init -u git://android.git.kernel.org/platform/manifest.git ; repo sync ; make"

19 Oct via web

* Google: "While we're excited to offer these new features to Android [3.0] tablets, we have more work to do before we can deliver them to other device types including phones. Until then, we've decided not to release Honeycomb to open source."

http://www.theregister.co.uk/2011/03/24/google_will_not_open_source_android_honeycomb_on_release_of_first_devices/

Mobile wars update

- **According to Gartner:**
  - **Android 38.5 %**
  - **Apple's iOS 19.4 %,**
  - **Symbian at 19.2 %**

  http://news.cnet.com/8301-13506_3-20051610-17.html
- **~~Nokia (maemo) +~~ Linux Foundation (moblin) + Intel = MeeGo**
- **Nokia drops Symbian, allies to Microsoft**

free-open future

Architettura aperta

- **prodotto**

  free software & hardware

  free spectrum

  formati aperti, standard aperti

- **processo**

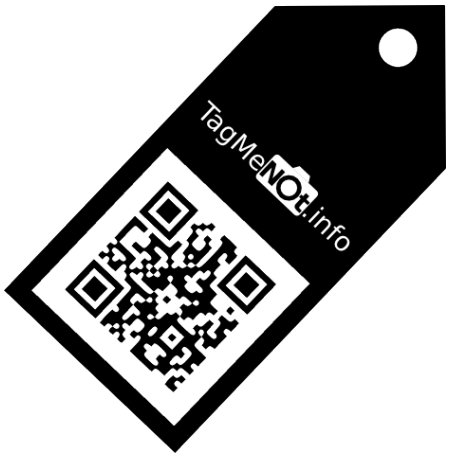
  partecipazione libera, peer-production

- **policy e governance**

  processi decisionali aperti e partecipabili, valori condivisi

Thanks and happy hacking!

my privacy enhancing project: TagMeNot.info



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Chi se ne occupa

- Internazionale:
  - FSF Free Software Foundation : www.fsf.org
  - Open Source Initiative: www.opensource.org
  - GNU : www.gnu.org
  - League for Programming Freedom: lpf.ai.mit.edu
  - Electronic Fronteer Foundation: www.eff.org
  - Foundation for a Free Information Infrastructure: www.ffii.org
- Italia
  - AsSoLi (Associazione Software Libero): www.softwarelibero.it
  - ILS (Italian Linux Society) www.linux.it

Linux 2.6.39
BKL gone for good

lock_kernel();
/* critical region ... */
unlock_kernel();

/pub/scm / linux/kernel/git/torvalds/linux-2.6.git / commitdiff

summary | shortlog | log | commit | commitdiff | tree
raw | patch (parent: ae7eb89)

BKL: That's all, folks

```
author     Arnd Bergmann <arnd@arndb.de>
           Tue, 25 Jan 2011 21:52:22 +0000 (22:52 +0100)
committer  Arnd Bergmann <arnd@arndb.de>
           Sat, 5 Mar 2011 09:56:00 +0000 (10:56 +0100)
```

```
This removes the implementation of the big kernel lock,
at last. A lot of people have worked on this in the
past, I so the credit for this patch should be with
everyone who participated in the hunt.
```

Digital Rights/Restriction Management

A Call For The Home Media Network - Gordon Bell and Jim Gemmell
4 May 2001 (draft v8: 28/4/2004)
Technical Report MSR-TR-2001-52
Microsoft Research - Microsoft Corporation

However, in our model of the future, **all content will be distributed to the home and reside on home servers and be distributed on the home IP network** not as analog audio or video.
[...]
The most fundamental question to be answered about content distribution/storage is how to protect it as intellectual property based on the owner's desires. **Publishers do not want their content to be carried in any form that might be digitally copied**, so they don't want it to pass unencrypted over any interface, and are leery about giving it to any device with a removable store.
[...]
In a few years, we may all look back at this time as the **end of an era** when so much content (TV & radio) could freely and legally be recorded for personal use.

Brevetti

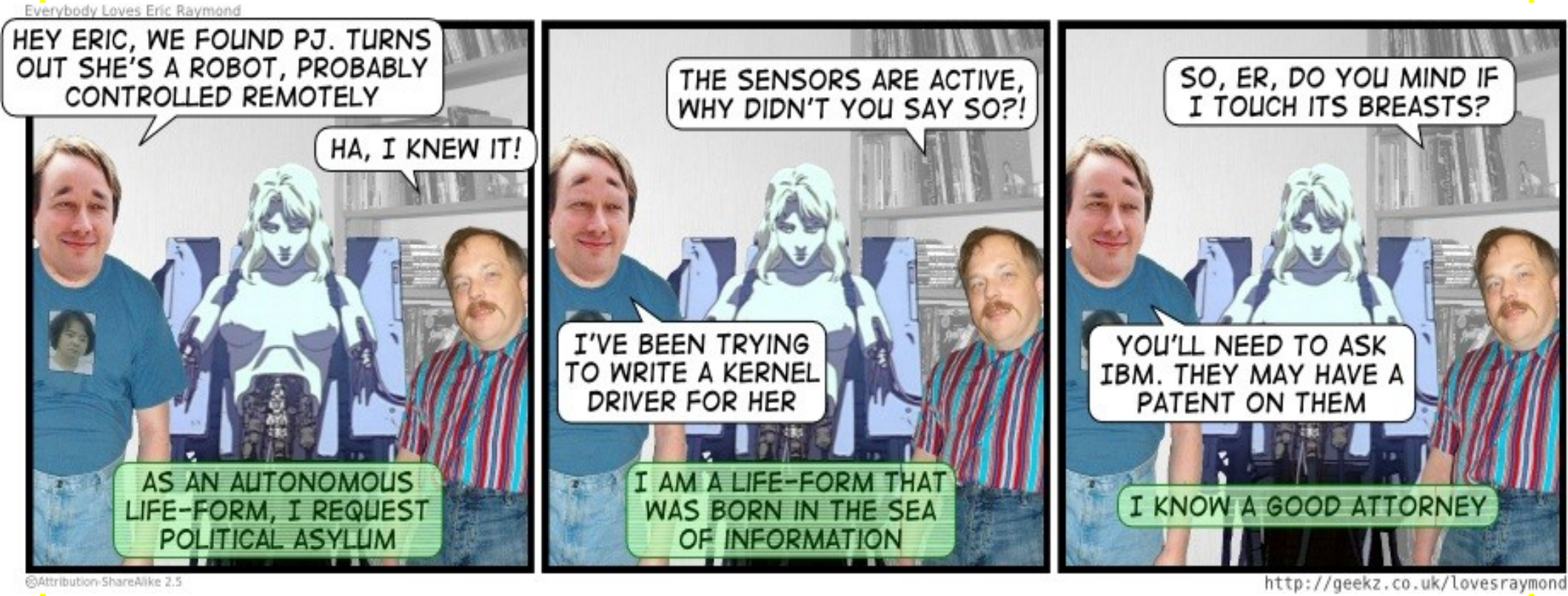
Contrariamente al motivo per cui sono nati i brevetti, quelli software soffocano l'innovazione.

Vengono brevettati anche procedimenti e algoritmi banali o conosciuti descritti in modo da suggerire l'esistenza di complessità inesistenti.

Portano allo stallo:

impossibile innovare senza violare brevetti altrui,
frustrazione del programmatore,
risorse per i brevetti sottratte alla ricerca.

brevetti & liti



- PJ è Pamela Jones di www.groklaw.org
- cfr il burattinaio di *ghost in the shell*
  (film di Mamoru Oshii e manga di Masamune Shirow)