

# Free software and open resources: Opportunities for reducing the Digital Divide

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21st December 2002

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# Definition

## What is it?

**Free software | libre software:** An ethical view:  
Freedom to copy, use, read, modify, give.

**Open source software:** A pragmatism view:  
Better software, better marketing, easier acceptance by industry.

## What it is not?

**Gratis software:** A gift (often related to monopolistic practices).

**Shareware:** A cheap distribution method.

## Licences

- Software is mainly *protected* by copyright law.
- By default you can do almost nothing.
- Licences give you some rights (and restrictions):
  - Public domain: author renounce to all rights.
  - BSD type licence: you must give credit to authors:
    - Better to spread standards.
  - GPL type licence (copyleft): you must grant the same rights you received (if you redistribute derived work):
    - Better to produce more free software (viral licence?).

# Advantages of free software

## For any user

- Easy evaluation and acquisition.
- Customizability & easier integration.
- Easier inspection for code quality and security,
- Real competitive support.
- Independence of provider policies or survival.
- A learning tool.
- Good support in the net.
- A method to establish standards.
- **Cost?**

## The cost of free software use

Must account the *total cost of ownership*.

- Cost of adquisition:
  - In some places *piracy* is cheaper.
- Cost of use:
  - Training.
  - Peer support.
  - Installation and administration.
  - Hardware & additional software needed.
  - Quality and fitness.

## Example low cost system

- Many refurbished PC:
  - $\geq i386$ .
  - $\geq 8Mb$ .
  - Diskless.
  - With terminal software (LTSP, netstation, VNC).
- One GNU/Linux box:
  - Relatively recent ( $\geq$  Pentium II).
  - Enough memory (may be  $40Mb$  per client for Openoffice).
  - Application server.
  - File server.
  - On demand dialup router.
  - The only administrable point.
  - The only point which needs hardware upgrades.
- Examples: Schoolnet Namibia (<http://www.schoolnet.na>), BorgouNet (<http://www.borgou.net>).

## Advantages for any administration

- **Cost!** Even if some software is produced (can be shared).
- National security:
  - Recoverability of citizen data (open formats).
  - Safety of confidential information (no backdoors).
- Universal access to administration services (standards based, vendor neutral).



## Advantages for third world countries

- Cost again.
- Customizability (local languages, customs, laws, ...).
- Development of local software industry.
- Better education in information technologies.
- High potential for less hardware costs.
- Technological independence.

## But

- A lot of illegal copy: no need perceived for *gratis* software.
- Poisoned gifts.
- Free software is unknown or considered second class.
- No technical expertise.
- The proprietary formats barrier.

# Political initiatives

## UNDP Recommendations

UNDP Human development report 2001<sup>a</sup>

*Making new technologies work for human development*

- Providing regional and global institutional support:
  - Protecting common resources:
    - \* Biodiversity.
    - \* Open source software.

*Open source software could  
speed the information and communications technology revolution  
if its use takes off on a sufficiently wide scale.*

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<sup>a</sup><http://hdr.undp.org/reports/global/2001/en/pdf/completenew.pdf>

## Legislative initiatives

**Perú:** LP 2485 (april 2002):

Ley de Uso de Software Libre en la Administración Pública.

- Exclusive of free software in all state institutions.
- Exceptions:
  - Unavailabilty.
  - Research.

**Argentina:** LP 904-D-02 (march 2002):

Política de utilización de software libre por el Estado Nacional.

## Practical government initiatives

**China:** All Beijing government computers with Red Flag Linux.

**Corea:** 120.000 copies of HancommLinux/HancomOffice for administration computers.

**Thailand:** Linux Thai Extension and School internet server.

**Philippines:** Announced a Linux based distribution for de administration.

**Spain:** Extremadura's Linex distribution (<http://www.linex.org>) for administration and schools (¿Andalucía also?).

France, Germany, European Commission, ...

# The production of free software

## Who produces free software?

- First world countries: Europe, US, Japan, New Zealand, Australia, Israel, South Africa, Brazil, Argentina.
- Young educated people (average 27 years old, most 21–24), the majority unpaid.
- 80% produced by 20% of developers,

## Why free software is produced?

- Learning, sharing, cooperation, fun (no money or reputation).
- Outcome of government funded research projects (mainly US, decreasing).
- Government funded deployment projects (few, increasing).
- As the only way to compete with *de-facto* monopolies (IBM, HP, Compaq, Sun, SGI, ..., mainly support, freeng code, and funding).
- Solution of need plus a **better development model**.
- As a **better business model**

## Better development model?

- A way to attract codevelopers and bug trackers without cost.
- Parallel development, natural selection.
- Software reuse.
- Several cooperation models:
  - Bazaar (better for modular, standard software).
  - Cathedral (better for innovative, risky software).
- Distributed cooperation tools: CVS, bugzilla, sourceforge, ...

## Better business model?

- Because a better development model.
- No distribution and packaging costs.
- ¿But where is the money?
  - Installation, configuration and support.
  - Education.
  - Customization and integration.
  - Paid new developments.
  - Selling other products (hardware. internet access, portals, ...).
- Marketing:
  - A good free product.
  - A good web site.
  - Presence in relevant mailing lists and meetings.
  - Attracting user and developer base.



## Are losing something developing countries?

- Cheap labour (sometimes educated: India, Eastern Europe, Cuba, Costa Rica, Brazil, Chile, Argentina, ...).
- Cheap infrastructure: ubiquitous PC + internet.
- May they compete in packaged proprietary software?
  - Very difficult to enter.
  - Huge marketing costs.
  - Better to build good software factories (indian model).



## Other free resources

with the exception of *free art*  
they **do not work immediatly**  
High cost off **effective replication.**

## Free documentation, recopilations, courseware

- Essential for knowledge dissemination.
- GFDL licence:
  - Preserve author reputation and merit (modification history, invariant parts).
  - Universal access (transparent formats, like DocBook).
- Legal texts are free invariant documents.
- May use specialized development methods (wikis, etc).

## Examples

- Free software documentation projects: <http://www.tldp.org> ...
- Collaborative encyclopaedias:  
<http://www.wikipedia.com>,  
<http://mathworld.wolfram.com> ...
- Peer reviewed journals: <http://www.fisrtmonday.org>.
- Community created URL directories: <http://dmoz.org>.
- Open courseware: <http://web.mit.edu/ocw/>.

## Free standards

- Essential for interoperability (and free software).
- Traditional in the internet world (IETF RFC, WWW Consortium).
- Free copying and implementation.
- Free of patents.
- Lack of free standards for office work.
- Open Standards Definition <sup>a</sup>

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<sup>a</sup><http://perens.com/OpenStandards/Definition.html>

## Free hardware

- Protected by patents and special copyrights for circuit layouts.
- Virtual machine specifications: needed for drivers, compilers, etc.
- Implementations:
  - Machine readable descriptions: VHDL, PCB layouts, ...
  - Test programs.
  - Human processable documentation and schematics.
  - Examples:
    - \* Open cores:  
[www.opencores.org](http://www.opencores.org), ESA Leon-32, picoJAVA, ...
    - \* Universal access initiatives:
      - Brazil's People's PC.
      - Indian Simputer.

# The Simputer

Community Digital Assistant<sup>a</sup>



<sup>a</sup>[www.simputer.org](http://www.simputer.org)

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## The Simputer

- Designed by Indian Institute of Science and Encore (Bangalore).
- Now in production (Encore and Pico Peta Simputers).
- Low cost community owned (\$190).
- Personalized by a Smartcard.
- No storage.
- Linux based GPL'ed software for the illiterate.
- Open hardware based on the Simputer GPL.
- Trademarks *Simputer* and *Simputerized*.
- One time fee for commercialization and trademark use.



## Free software and ISF/UPM ITC projects

- Free software used when the better solution.
- Proprietary solutions when free solutions not available or accepted  
→ multiplied development & maintenance costs.
- Free software development techniques barely used:  
→ lack of experience.  
→ lack of resources.
- Few contributions yet.

## GNU/Linux

- Currently in standard and embedded servers (Debian).



- Planned in clients (maybe a metadistro).
- Planned in thin clients (embedded Linux).
- Planned in Wifi solar powered routers (embedded Linux).

## VHF client/server networks

- Up to 50 Km.
- Standard voice FM radios.
- Intermiently used with data.
- Windows clients & Debian/GNU/Linux server.
- Soft soundmodem.
- Amateur semiduplex AX.25 transport, but
  - Linux code uses standard CS/CA access control:
    - taller masts
    - more power.
  - Implemented a round robin demand based access control, transparent to the clients.
  - Alternative: a standard DAMA facility.

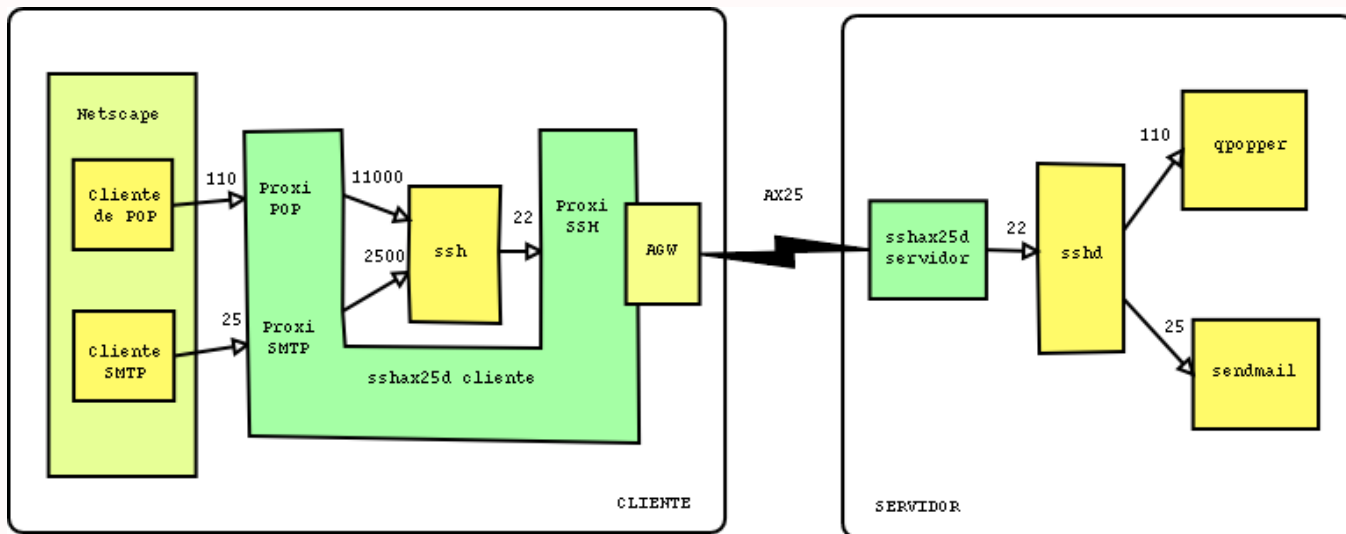
## Micronet protocols

- UUCP between health centers and the mail hub:
  - Interruptible.
  - Can be compressed and batched with BSMTP.
  - Can use long distance calls if needed.
  - IP transport (i protocol).
- Windows makes necessary to support POP and SMTP.

## IP over AX.25

- ¿Need to support TCP?
  - TCP/IP over half duplex AX.25: very inefficient.
  - Avoid it.
- Use of SSH:
  - POP and SMTP proxys.
  - Mutiplexing, compression and encryption  $\rightarrow \approx 20.000$  bps.

## SSH-AX25 piping



## HF networks

- Long distance.
- Expensive or slow modems (100 - 300 bps).
- Narrow band (3 KHz SSB).
- Fading.
- Heavy modifications to NEWQPSK sound modem (convolutional turbocodes) giving about 2000 bps.
- Round robin AX.25 with big windows.
- Home made selective reject.
- UUCP/BSMTP over AX.25 (y protocol).
- Only Linux.
  - Workstation and server.
  - Embedded HF mail gateway.

## LEO Microsatellites

- Amateurs, commercial, cooperation (Healthsat).
- Short passes few times a day.
- PACSAT protocols over AX.25 (broadcast and file transfer).
- Developed a transport for *sendmail*.
- Developed a gateway ground micronetwork  $\Leftrightarrow$  satellite.
- Doppler correction.
- Special antenna (replacement for motorised antenna).



## Applications

- XML based tools for teleeducation:
  - Currently built as HTML lessons and sent by e-mail.
  - DTD for abstract definition of courses.
  - An editor for abstract courses.
  - Automatic transformations for:
    - \* Splitting in lessons and them sending by e-mail.
    - \* Web site and CD-ROM publishing.
    - \* Printable version.
- Epidemiological reporting, drugs handling, ...