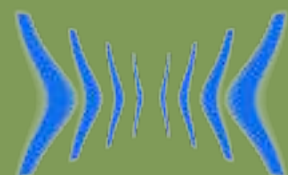


Introduction to Open Source



RadioCommunications
Unit of the ICTP ARPL

Marco Zennaro
mzennaro@ictp.it
Carlo Fonda
cfonda@ictp.it

Agenda

- ▶ Open Source
- ▶ Linux
 - ▶ Linux history
 - ▶ Distributions
- ▶ License Types
- ▶ OS and Development



OS Definition

Why is it called Open Source Software?

- ▶ **Open:** collaboration is open to all
- ▶ **Source:** source code is freely shared

Ideals of Open Source

What are the ideals of Open Source?

- ▶ **Share** the goal: a broad group of contributors recognize the same need and agree on how to meet
- ▶ **Share** the work: projects are broken into smaller tasks, and a review process screens the best contributions
- ▶ **Share** the result: code should be available to all and improvements should be shared to all

Open Source and Science

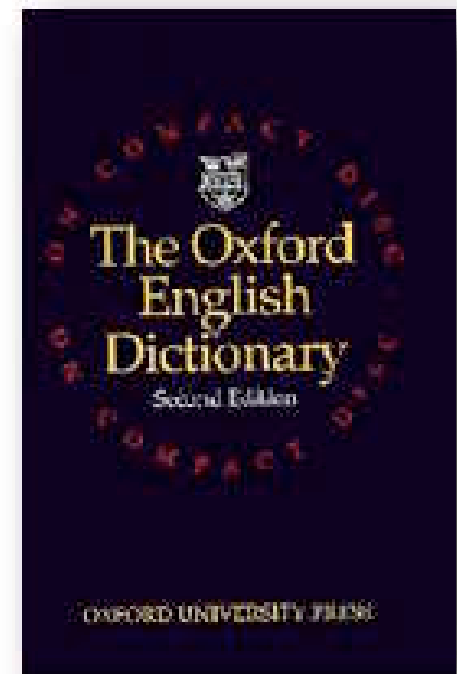
- ▶ The scientific method rests on a process of discovery and a process of **justification**
- ▶ For scientific results to be justified, they must be **replicable**
- ▶ Replication is not possible unless the source is **shared**

Open Source and Science

- ▶ Where scientists talk of discovering, Open Source programmers talk of creating
- ▶ Where scientists talk of replication, Open Source programmers talk of debugging
- ▶ **The Open Source movement is an extension of the scientific method**

Open Source in history

- ▶ The Oxford English *Dictionary*, 1857
- ▶ Human Genome Project, one year before Linux



Open Source and software

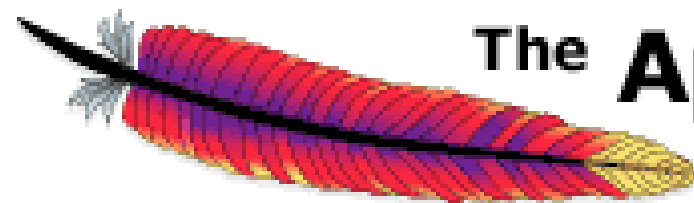
- ▶ **Linux**, 18 million users
- ▶ Google uses Linux (1000 queries per second!)

Video!



Open Source and software

- ▶ **Apache**, OS webserver
- ▶ Used in 69% of webserver, 15 million servers!



The **Apache Software Foundation**

<http://www.apache.org/>

Video!

Open Source and software

- ▶ **Open Office**, a complete office suite of programs, compatible with Microsoft's Office, available in 21 different languages
- ▶ <http://www.openoffice.org>



Open Source and software

- ▶ **<http://www.sourceforge.net>**
- ▶ 95000 collaborative software projects
- ▶ 1000000 registered users!



Open Source and software



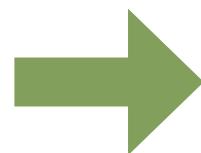
Topic







- 📁 [Communications](#) (10226 projects)
- 📁 [Database](#) (4151 projects)
- 📁 [Desktop Environment](#) (2210 projects)
- 📁 [Education](#) (2106 projects)
- 📁 [Games/Entertainment](#) (9525 projects)
- 📁 [Internet](#) (16303 projects)
- 📁 [Multimedia](#) (8156 projects)
- 📁 [Office/Business](#) (3296 projects)
- 📁 [Other/Nonlisted Topic](#) (1648 projects)
- 📁 [Printing](#) (300 projects)
- 📁 [Religion](#) (181 projects)
- ➡ 📁 [Scientific/Engineering](#) (6186 projects)
- 📁 [Security](#) (1762 projects)
- 📁 [Sociology](#) (225 projects)
- 📁 [Software Development](#) (11116 projects)
- 📁 [System](#) (13344 projects)
- 📁 [Terminals](#) (407 projects)
- 📁 [Text Editors](#) (1834 projects)

Open Source and software

Topic

Scientific/Engineering



-  **Artificial Intelligence** (1097 projects)
-  **Astronomy** (163 projects)
-  **Bio-Informatics** (363 projects)
-  **Chemistry** (91 projects)
-  **Electronic Design Automation (EDA)** (207 projects)
-  **GIS** (133 projects)
-  **Human Machine Interfaces** (330 projects)
-  **Information Analysis** (341 projects)
-  **Interface Engine/Protocol Translator** (97 projects)
-  **Mathematics** (945 projects)
-  **Medical Science Apps.** (241 projects)
-  **Physics** (222 projects)
-  **Visualization** (920 projects)

Open Source and software

2. **Celestia** - Celestia is real-time 3D space simulation which lets you travel through our solar system and to over 100,000 stars in our neighborhood.

- Development Status: 4 - Beta ✓ 🗳 (12660)
- Environment: Cocoa (MacOS X) ✓ 🗳 (1559) , Win32 (MS Windows) ✓ 🗳 (13660) , Gnome ✓ 🗳 (2146) , KDE ✓ 🗳 (1683)
- Intended Audience: Education ✓ 🗳 (3297) , End Users/Desktop ✓ 🗳 (26968) , Science/Research ✓ 🗳 (3073)
- License: GNU General Public License (GPL) ✓ 🗳 (37435)
- Natural Language: English ✓ 🗳 (43705)
- Operating System: MacOS X ✓ 🗳 (2346) , Windows 95/98/2000 ✓ 🗳 (6753) , Linux ✓ 🗳 (20758)
- Programming Language: C++ ✓ 🗳 (13529)
- Topic: Education ✓ 🗳 (1445) , Games/Entertainment ✓ 🗳 (2210) , 3D Rendering ✓ 🗳 (785) , **Astronomy** ✓ 🗳 (163)

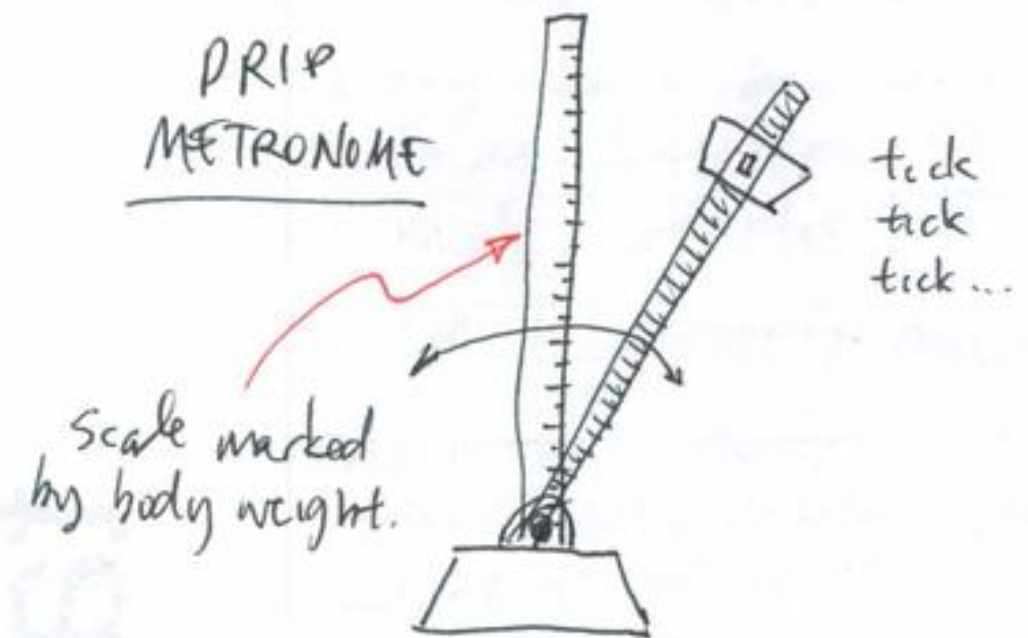
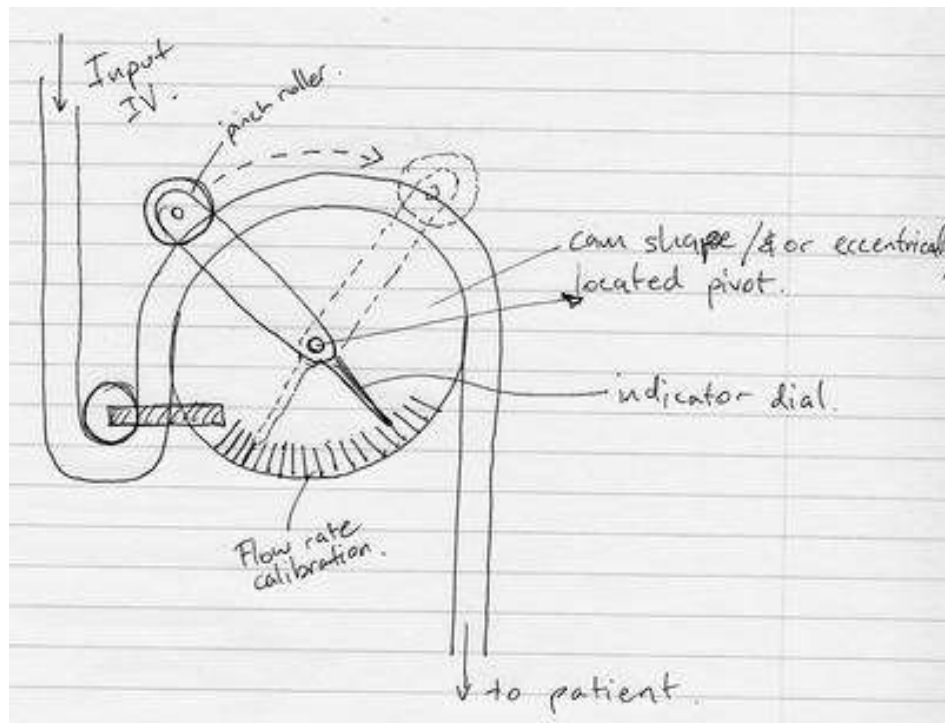
Activity Percentile:
97.03

Activity Ranking:
489

Registration Date:
2001-02-23 16:52

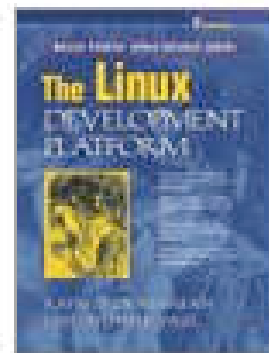
Open Source Projects

► Biology: cholera



Open Source Projects

- ▶ **Publishing: Prentice Hall**
- ▶ <http://www.informit.com/promotion/1041>



Linux Development Platform, The

List Price: \$49.99

Your Price: \$44.99 (Save 10%)

[Add to Cart](#)

The Linux Development Platform shows how to choose the best open source and GNU development tools for your specific needs, and integrate them into a complete development environment that maximizes your effectiveness in any project.

[Download The Linux Development Platform in PDF](#)

[Download the source document](#)

[Download the figures](#)

Open Source Projects

- ▶ **Publishing: Project Gutenberg**
- ▶ <http://www.gutenberg.org>
- ▶ 6000 books for free
- ▶ “Distributed proofreading”

Open Source Projects

- **Publishing: PLOS**
- <http://www.plos.org>
- PLOS Medicine
- PLOS Biology

Get **read.**

Open access means anyone with an internet connection can read your research.

For free. Really.



Launching autumn 2004:

PLOS MEDICINE
Submit your best work now.

Public Library of Science
journals are online at
www.plosmedicine.org
www.plosbiology.org

Open Source Projects

- ▶ **Academia: MIT Open Courseware**

- ▶ <http://ocw.mit.edu>

- ▶ 915 MIT courses

- ▶ translations in Spanish
and Portuguese

Lecture Notes

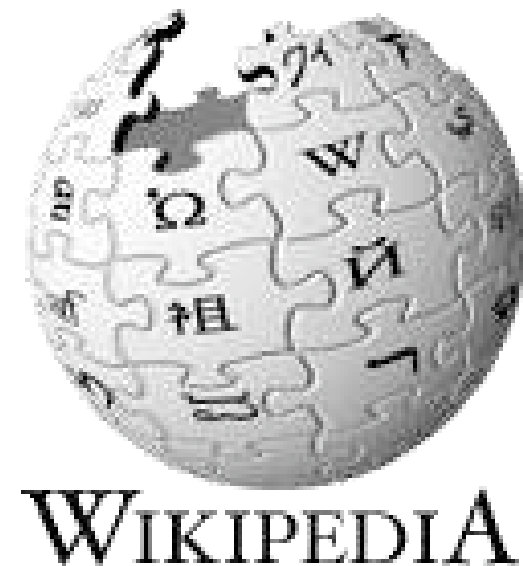
.....

This section provides the lecture notes used in the course. The occasional pres in those slides during lecture.

LEC #	TOPICS
1	Data Networks (PDF)
2	The Data Link Layer: Framing and Error Detection (PDF)
3 & 4	The Data Link Layer: ARQ Protocols (PDF)
5 & 6	Introduction to Queueing Theory (PDF)

Open Source Projects

- ▶ **Publishing: Wikipedia**
- ▶ <http://www.wikipedia.com>
- ▶ 10000 active contributors
- ▶ 1000000 articles in 50 languages
- ▶ 457466 articles in English



Open Source Projects

► Publishing: Wikipedia

Abdus Salam

From Wikipedia, the free encyclopedia.

Prof. Dr. Abdus Salam ([January 29, 1926](#)–[November 21, 1996](#)) received the [Nobel Prize](#) in [Physics](#) in [1979](#) for his work in [electroweak theory](#), which is the mathematical and conceptual synthesis of the electromagnetic and weak interactions—the latest stage reached until now on the path towards the unification of the fundamental forces of nature. Salam, [Sheldon Glashow](#), and [Steven Weinberg](#) arrived at the theory independently and shared the prize. The validity of the theory was ascertained in the following years through experiments carried out at the [Super Proton Synchrotron](#) facility at [CERN](#) in [Geneva](#), particularly the discovery of the [W and Z bosons](#).

Director of the International Centre for Theoretical Physics (ICTP), [Trieste](#), Italy, from 1964 to December 1993, Salam died in [Oxford](#) in 1996, after a long illness. He was buried in [Pakistan](#) where he was born.

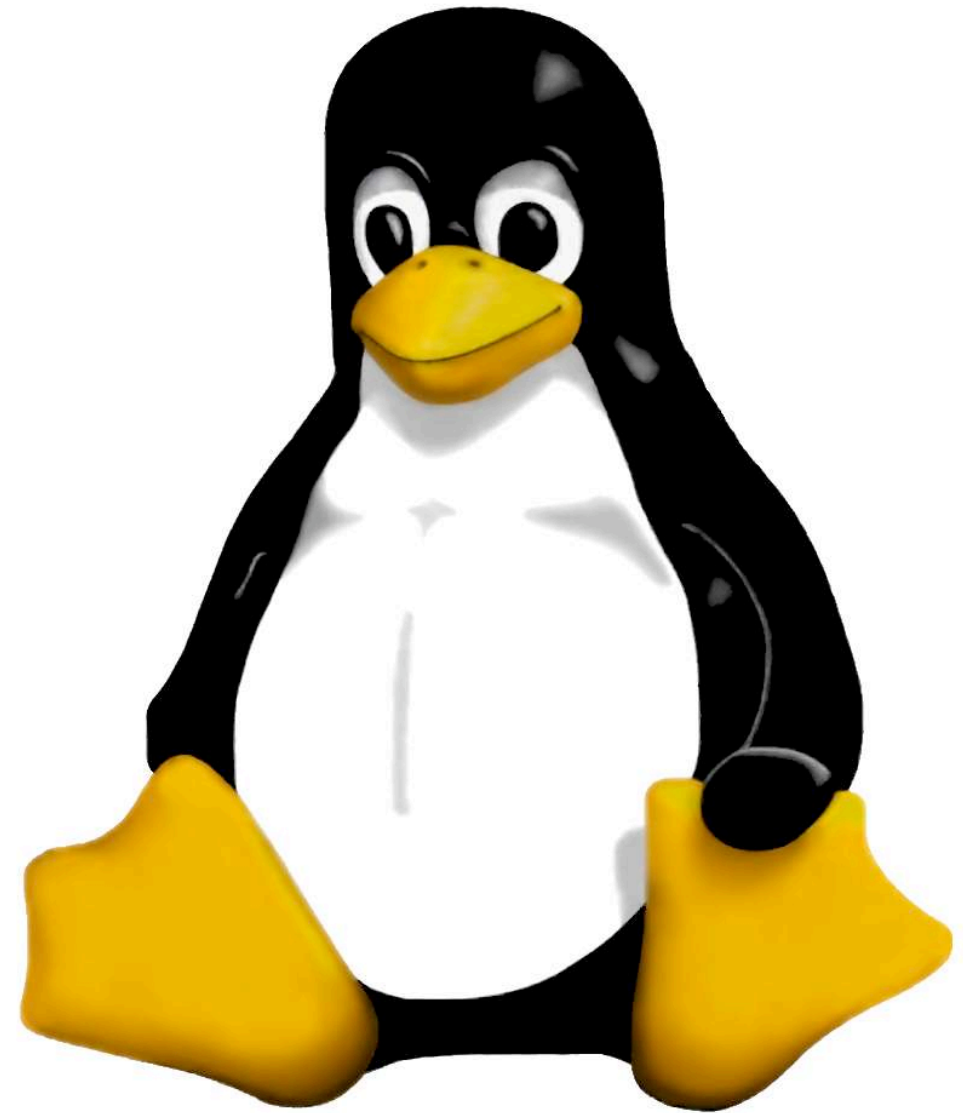
Although he belonged to the [Ahmadiyya](#) Muslim sect—considered heretical by many Muslims—Pakistanis are proud of their country's Nobel Laureate, some religious zealots notwithstanding.

In the early 1970s, Abdus Salam played a role in starting [Pakistan](#)'s Atomic Energy Commission.

Open Source Projects

- ▶ **What have we learned so far?**
 - ▶ Open Source is not new!
 - ▶ Open Source is not just software!
 - ▶ Open Source is based on **sharing**!

Linux



Linux History

- ▶ From the 60s to the 80s, revenues came from selling and supporting hardware. Each computer had its Operating System.
- ▶ In 1969 AT&T laboratories developed Unix, which worked on different hardware platforms.
- ▶ Commercial users had to pay a high license fee, academic ones could use the software with low fees.



Linux History

- ▶ Sharing the source code among software developers became commonplace.
- ▶ In the early 80s, AT&T changed the licensing policy, and Unix became restricted to the ones who paid for the license.
- ▶ IBM, HP and DEC developed proprietary Unix versions.



Linux History

- ▶ In 1984, Richard Stallman from MIT, started to develop a free alternative to Unix.
- ▶ He also established a special license, the GNU license, to ensure that software is free and open to anyone.
- ▶ In 1985 he founded the Free Software Foundation.



"The only way ... to avoid moral corruption would be to have an OS that is free."

Linux History

- ▶ The GNU GPL (General Public License) says that every copy of a program governed by the GPL license, even if modified, must be subject to the GPL again. It has a “viral” effect!
- ▶ In the 90s, GPL+Internet, many new Open Source projects started.

Video!



Linux History

- ▶ The GPL guarantees four basic freedoms for the user:
 - ▶ You have the freedom to run the program, **for any purpose**.
 - ▶ You have the freedom to study how the program works and **modify** it to suit your needs. To make this freedom effective in practice, you must have access to the source code.

Linux History

- ▶ The GPL guarantees four basic freedoms for the user:
 - ▶ You have the freedom to **redistribute copies**, either gratis or for a fee.
 - ▶ You have the freedom to distribute **modified versions** of the program, so that the community can benefit from your improvements.

Linux History

- ▶ In 1991, **Linus Torvalds**, a finnish computer science student, started to develop a Unix OS for the personal computer.
- ▶ The code of the experimental version was put under the **GPL license**.



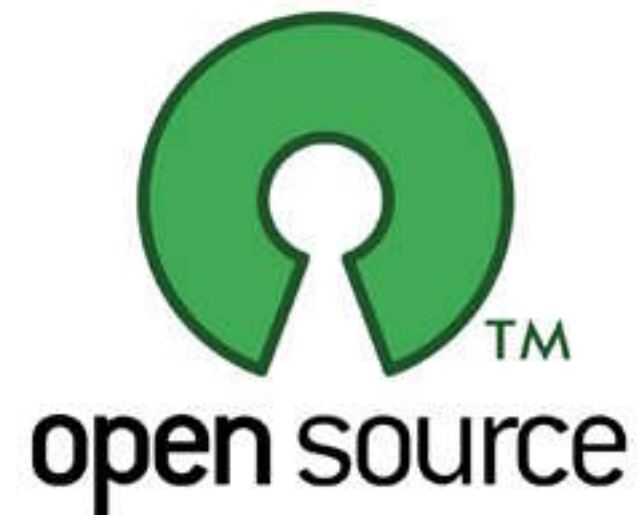
From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Message-ID: <1991Aug25.205708.9541@klaava.Helsinki.FI>
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki

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. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things). I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)
Linus (torvalds@kruuna.helsinki.fi)
PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT portable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-).

Linux History

Linux History

- ▶ In 1997, the **Open Source Initiative** (OSI) was founded, and it developed the Open Source Definition (OSD).
- ▶ The OSD is a guideline for OSS licenses other than the GPL, and the “viral” effect is not a requirement.



Linux

- ▶ A linux distribution has thousands of dollars worth of software for no cost.
- ▶ Linux is a complete OS that is stable and reliable.
- ▶ Linux is extremely powerful, it comes with a complete development environment and excellent networking facilities.

Linux

- ▶ It is an ideal environment to run web servers as Apache.
- ▶ It is easily upgradable.
- ▶ It supports multiple processors as standard.
- ▶ It has a lot of documentation.
- ▶ It runs also on old machines.

Linux

- ▶ Amazon, Yahoo!, CNN, Google run on servers based on Linux.
- ▶ The Human Genome Project was run using Linux clusters.

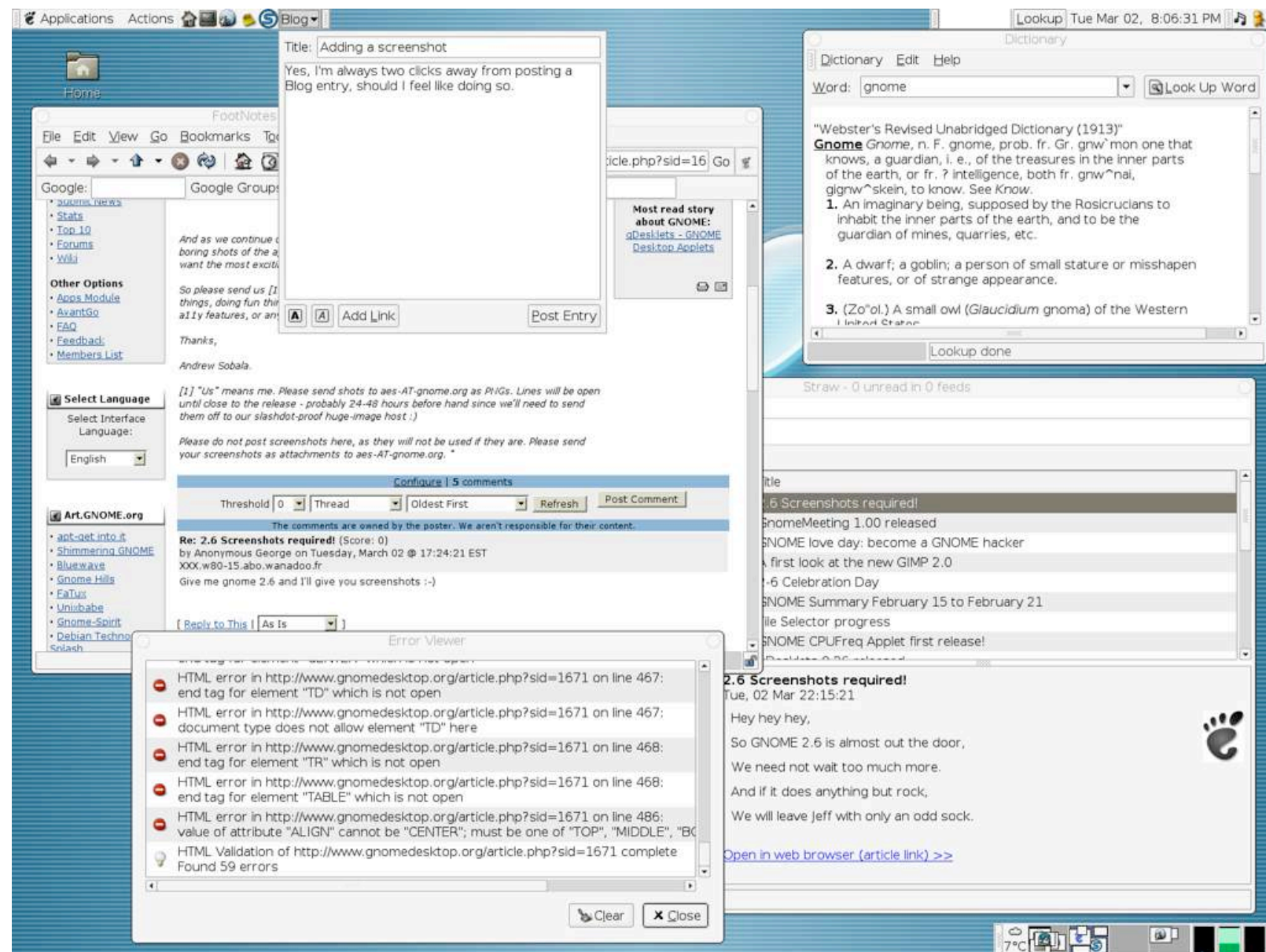
 **amazon.com.**

YAHOO!

CNN.com.

Google™

Linux



Linux Distributions

- ▶ Linux comes in different “flavors”
 - ▶ MandrakeLinux, for desktops and laptops
 - ▶ Slackware, for servers
 - ▶ Debian, for experts



Linux Distributions

- ▶ **Knoppix**: it is a “**live**” Linux distro, which runs directly from the CD-Rom.
 - ▶ Pros: you don't need to install it on your hard disk. It is useful to learn linux, to experiment with it, and to have Linux always with you.
 - ▶ Cons: it is slow, you can't save your documents
- ▶ <http://www.knoppix.org>

Licenses



Licenses

- ▶ From UNESCO's "World Information Report '97/'98":
 - ▶ The creation and ownership of knowledge products are of increasing importance because of the centrality of information and knowledge to post-industrial economies. **Those who control copyright have a significant advantage in the emerging, knowledge-based global economy.**

Licenses

- ▶ The OSI has certified over 40 different open source licensing agreements.
- ▶ The **GPL** is the most widely-used open source software license and is considered the most “purest” by requiring that all software code is free and available and that changes must be shared with the community. Linux is available under the GPL license.

Licenses

- ▶ The **BSD** (Berkeley Software Distribution) License, adopted by Berkeley Unix, requires copyright notification, and permits the source to be used in any manner, as long as notification is provided. FreeBSD, Postgres SQL, and Apple's OS X are based on the BSD licensed technology.
- ▶ The **MPL** (Mozilla Public License) provides for code that can remain proprietary under very specific terms, and is among the most flexible licenses. Mozilla and Firebird browsers are available under this license.

Licenses

- ▶ The **Creative Commons** license is adopted by many writers, musicians, and film-makers.
- ▶ <http://www.creativecommons.org>
- ▶ “Some Rights Reserved”
- ▶ An example is <http://www.magnatune.com>



Licenses



A Spotter's Guide to Shared Content

The "**SOME RIGHTS RESERVED**" logo is the first sign that a work is licensed using Creative Commons. Artists then mix and match from a menu of choices to specify conditions for sharing.



ATTRIBUTION: Any reuse, such as inclusion of a song in a movie, must credit the original artist.



NONCOMMERCIAL USE:

Revenue-producing uses, such as advertising or corporate presentations, require negotiation with the artist.



NO DERIVATIVES: The work may be shared but not modified, adapted, or changed in any way.



SHARE ALIKE: It's OK to share the work, but only under the same licensing terms established by the original artist.



SAMPLING: Others may sample, "mash up," or creatively transform the work, but it can't be used in advertising.



PUBLIC DOMAIN: No rights reserved. Artists relinquish all rights to a work, making it public property.

OS and Development



OS and Development

- ▶ Linus Torvalds stated in an interview:
 - ▶ “I think that if the developing country is serious about not just seeing IT as a cost center, but as a requirement for national development, the real advantage of open source ends up being able to **build up your own knowledge base**. And that is not cheap itself- you’ll likely pay as much for that as you’d pay for a proprietary software solution.”

OS and Development

- ▶ Linus Torvalds stated in an interview:
 - ▶ “The difference being that with the proprietary solution, you’ll never catch up, and you’ll have to pay forever, without ever learning anything yourself.”

OS and Development

- ▶ The TCO (**Total Cost of Ownership**) is often used as a measure of software cost. A paper from the Swedish International Development Cooperation Agency shows that TCO computations defer greatly for developed and developing countries.
- ▶ In developed countries, where labor costs are high, the initial cost (license fee) of software is a small fraction of the TCO.

OS and Development

- In developing countries, where labor costs are low, the license fee is the dominating factor of the TCO (OSS typically has little or no license cost compared to proprietary software). This is demonstrated by comparing license fees with a country's GDP per capita (the average individual income). Even after software price discounts, the price tag is enormous in purchasing power terms.

OS and Development

- ▶ Windows XP + Office XP have a price of US\$560 in the US.
- ▶ This is 2.5 months of GDP/capita in South Africa and 16 months of GDP/capita in Vietnam.
- ▶ This is the equivalent of charging a fee in the US of US\$7541 and US\$48011, which is clearly unaffordable.

OS and Development

- ▶ No discount would significantly reduce this cost, and in any case there will never be a guarantee that any discount offered is intended to be sustained for the long term, rather than a temporary measure used to tempt users.

OS and Development

Regional Aggregates	GDP/capita	PCs ('000s)	WinXP Effective Cost	WinXP GDP months
USA	35277	178326	560	0.19
European Union	20863	116997	947	0.32
The Caribbean	4560	308	4332	1.47
Latin America	4335	18703	4557	1.55

OS and Development

Africa	652	7636	30297	10.31
Middle East	2679	9708	7375	2.51
Asia	2128	102229	9282	3.16
Oceania	13946	11886	1417	0.48

OS and Development

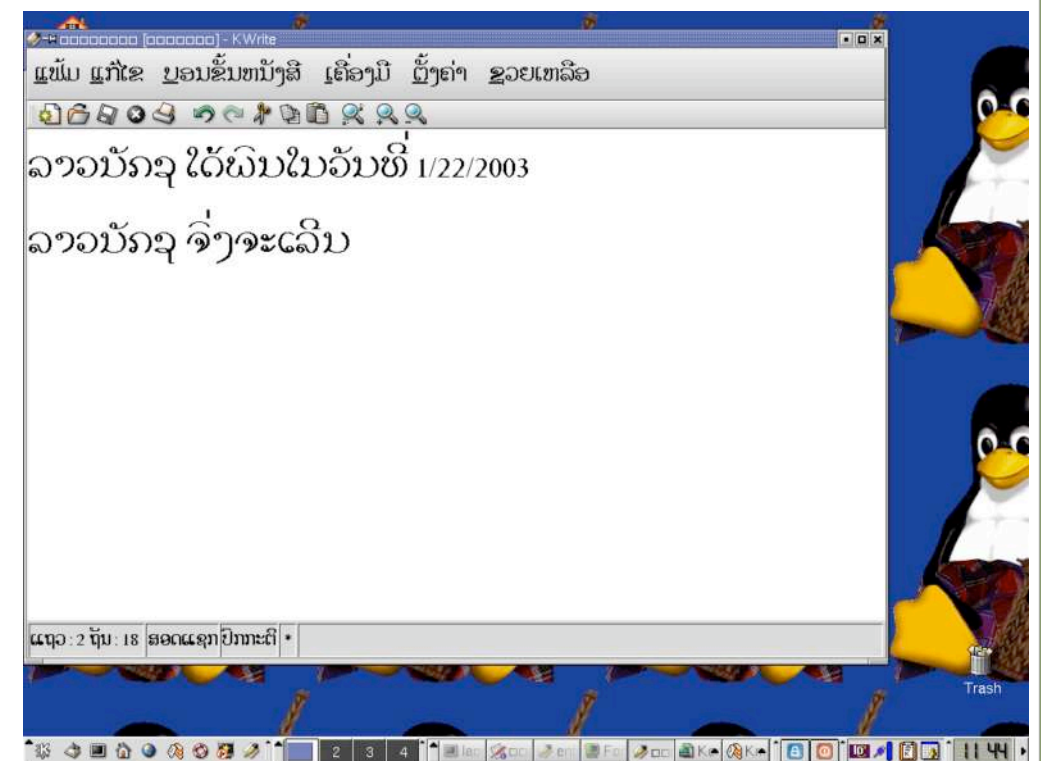
- ▶ What can you do to promote Open Source software in your country?
 - ▶ Establish OSS Advocacy Groups as LUGs (Linux User Groups)
 - ▶ Establish an OSS Portal where users can find available open source solutions for specific needs along with the appropriate rating information

OS and Development

- ▶ What can you do to promote Open Source software in your country?
 - ▶ Establish training programs through professional organizations (doctors, lawyers, etc)
 - ▶ Introduce OSS in University curricula
 - ▶ Introduce OSS in K-12 curricula

OS and Development

- ▶ What can you do to promote Open Source software in your country?
- ▶ Offer localized versions of OSS. This demonstrates the viability of using OSS products for building people-oriented applications, which require national language support.



OS and Development

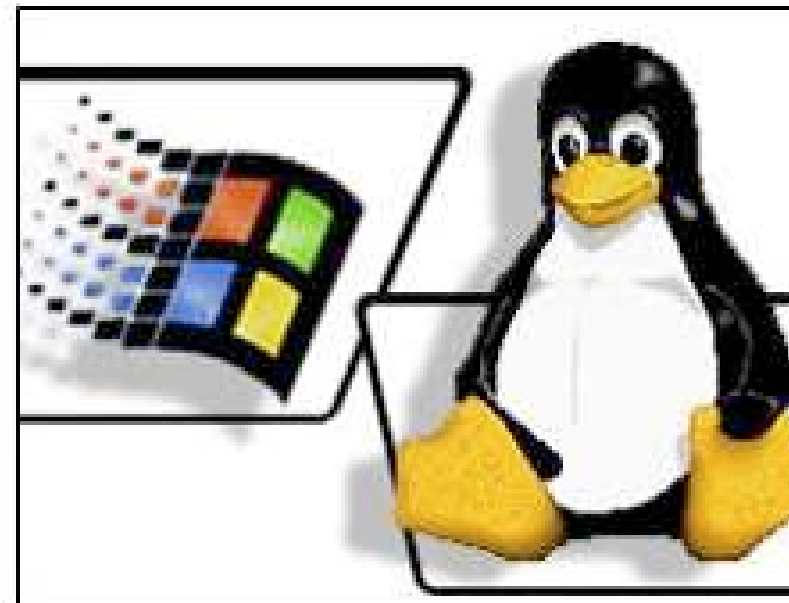
TECHNOLOGY

China to invest in Linux-based software

Wednesday, November 5, 2003 Posted: 1:00 PM EST (1800 GMT)

BEIJING, China (Reuters) -- The Chinese government plans to throw its financial weight behind Linux-based computer systems that could rival Microsoft Corp's Windows in one of the world's fastest-growing technology markets, an official said on Wednesday.

China would build a domestic software industry around Linux -- a cheaper software standard that can be copied and



© 2003 Tech

OS and Development

Government: **Vietnam Embracing Open-Source Products**

Posted Oct 30, 2003 - 01:17 PM

Silicon Valley: "'We are trying step by step to eliminate Microsoft,' said Nguyen Trung Quynh of Vietnam's Ministry of Science and Technology. Quynh and other government tech officials want Vietnam to be on the cutting edge of an international movement to embrace open-source software -- products that can be downloaded from the Internet for free and perform the same tasks as Microsoft Windows or Office.

The initiative is Vietnam's solution to software piracy, a rampant problem that threatens to derail the country's economic aspirations.

OS and Development

- ▶ **FOSSFA**: Free and Open Source Software for Africa
- ▶ <http://www.fossfa.net>



OS and Development

- ▶ **SchoolNetAfrica**
- ▶ <http://www.schoolnetafrica.net>

SchoolNetAfrica.net



Introduction to OS

Thank you for your attention!

► Contact info:

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