




Software Freedom Day 2004 Philippines

# Integrating **FOSS** into the **CS** Curricula: the **Ateneo de Manila** Experience

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## ■ Introduction to FOSS in Education

- ◆ State of FOSS (really short)
- ◆ Educational Environment
- ◆ Benefits in Education
- ◆ Areas of Application

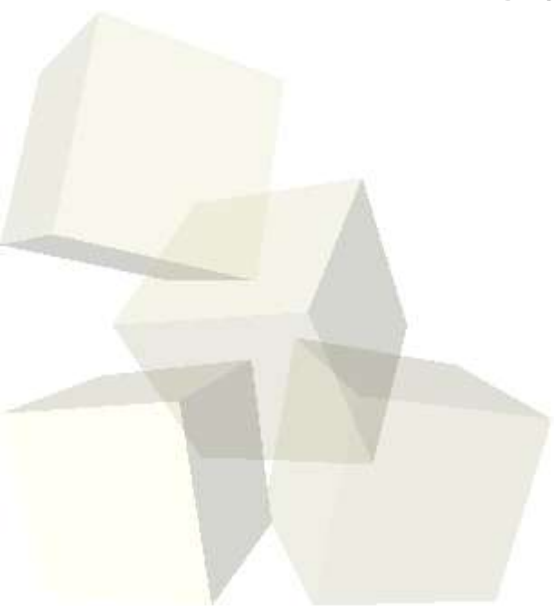
## Integration into CS Curricula

- ◆ Programming Courses
- ◆ Software Engineering
- ◆ Computer Architecture
- ◆ Operating Systems
- ◆ Multimedia, Networks, Electives

## References



# Introduction to **FOSS** in Education





- Already strong in the **edge-of-network** and **network services** industries
  - ◆ Most ISPs in the country (around the world) use **FOSS**
  - ◆ **Apache** – world's most popular Web server
  - ◆ **Squid** – world's most popular HTTP caching server
  - ◆ **BIND** – world's most popular DNS server
- Gaining ground in the enterprise application markets
  - ◆ Big names in enterprise computing backing **FOSS** – **IBM, Oracle, Sun, SAP**
- Creeping into desktop and workplaces
  - ◆ Emergence of easy to use distributions – **Lindows, Lycoris and Knoppix**



# Educational Environment

## ■ K12 Institutions

- ♦ More reluctant to use **FOSS**
- ♦ Stick to De Facto technologies (due to lack of funds)

## ■ Higher Education Institutions

- ♦ Strong **FOSS** following
- ♦ A major source of **FOSS** contributors
- ♦ Willing to try out **FOSS** technology
- ♦ Not always true in the **Philippines**

## ■ The **Philippine** Setting

- ♦ Undergraduate and Graduate course have stronger **FOSS** utilization
- ♦ Use of **FOSS** is principally dictated by the instructor or professor
- ♦ Adoption **limited** mainly to **electives**



# Benefits in Education

- Reduces barrier to ICT entry
- Lower Cost
  - ◆ FOSS by nature has low procurement costs
- Open Philosophy
  - ◆ Allows contribution to various programs and projects
  - ◆ Availability of source code
  - ◆ Open nature of open source community
- Encourages Innovation
  - ◆ Provides a base for developing future innovations
- Possibility of Localization
  - ◆ Encourages localization of software for instances where localization efforts are not commercially viable for software development companies
- And many many more ...



# Areas of Application

## ■ General Office Productivity

- ◆ Office Productivity w/ Openoffice <<http://openoffice.org>>
- ◆ Web Browsing and Email w/ Mozilla <<http://mozilla.org>>

## ■ Support Applications

- ◆ Library Cataloging System w/ Koha <<http://koha.org>>

## ■ Computer Laboratory Maintenance

- ◆ Lab Maintenance and Roll-out w/ LTSP <<http://ltsp.org>>
- ◆ System Imaging w/ Partimage <<http://partimage.org>>

## ■ Course Delivery

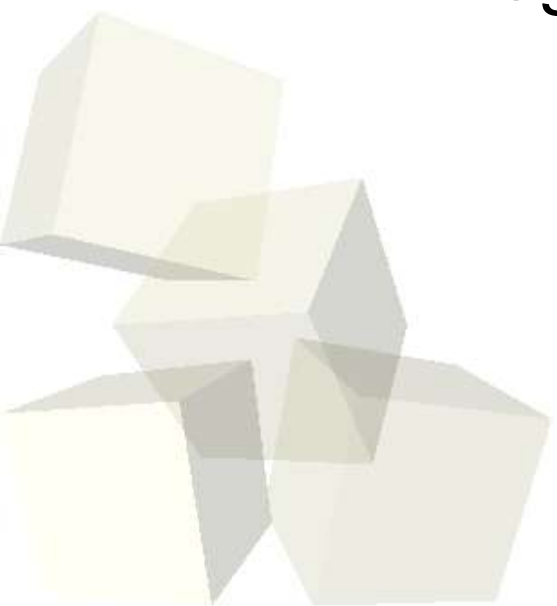
- ◆ Content Delivery w/ Moodle <<http://moodle.org>>
- ◆ Content Delivery w/ Stellar <<http://stellar.mit.edu>>

## ■ Integration in Curricula

- ◆ K12 Education
- ◆ Higher Education



# Integration into the CS Curricula



- **Ateneo DISCS** has taken a number of steps to increase the use of **FOSS** into the CS Curricula (**BS Computer Science, BS Management of Information Systems and MS Computer Science**)
  - ♦ **Direct integration** into core courses
  - ♦ Large number of electives **using** or **dedicated to FOSS**
  - ♦ Still have a long way to go!
- **Goals**
  - ♦ Increase **awareness**, Provide **alternatives**
  - ♦ Encourage students to **use FOSS**
  - ♦ Encourage students to **contribute to FOSS projects**
  - ♦ **Prevent** students from resorting to **software piracy**
  - ♦ Promote a **culture of openness and innovation**



# Programming Courses

- There are numerous **FOSS** packages for programming
  - ♦ ASM, C/C++, Java, C#, Pascal, Perl , Python, PHP, Eiffel, LISP, Erlang, Haskell, Ruby, COBOL (yes, COBOL) and many more ...
  - ♦ Can use **FOSS** to teach nearly every known language
- Learning experience **enhancement** tools
  - ♦ Robocode <<http://robocode.org>> - fun programming
  - ♦ PyGame <<http://pygame.org>>
- **Ateneo** Introductory Programming Courses
  - ♦ Students are encouraged (not forced) to use the **FOSS**
  - ♦ **CS 21 A** <<http://aegis.ateneo.net/cs21a>>
  - ♦ **CS 21 B** <<http://aegis.ateneo.net/cs21b>>



# Software Engineering

- Numerous build tools, bug tracking, testing and source code management systems are also available
  - ◆ GNU Make, Autoconf and Automake <<http://gnu.org>>
  - ◆ Jakarta ANT Build System <<http://jakarta.apache.org>>
  - ◆ Bugzilla <<http://bugzilla.mozilla.org>>
  - ◆ Mantis <<http://mantis.org>>
  - ◆ Junit <<http://junit.org>> - Unit Testing Framework
  - ◆ CVS and/or Subversion
- Presence of Uber-IDEs (Even the kitchen sink)
  - ◆ Eclipse <<http://eclipse.org>>
  - ◆ Netbeans <<http://netbeans.org>>
  - ◆ Emacs <<http://gnu.org>>
- Currently, integrated into **numerous** courses



# Computer Architecture

- The use of **FOSS** has allowed **DISCS** to provide novel ways of teach computer architecture without having to purchase any expensive hardware **microprocessor kits**
- The MIT-developed **JSim** tool is primarily used
  - It is a series of laboratory exercises that allow a student to build a RISC-based microprocessor called the **Beta**
  - Gives the students **hands-on experience** in processor construction
- Other tools
  - **NASM** assembler <<http://nasm.sourceforge.net>>
  - Icarus **Verilog** HDL <<http://icarus.com/eda/verilog>> can be used in place of the **Jsim**
- **CS 152** <<http://aegis.ateneo.net/cs152>>



# Systems Programming

- This course is the **laboratory component** of DISCS' **Operating Systems (OS)** class (**CS 162A**)
- Allows the students to **implement concepts** learned during the OS class
  - ♦ File systems, **Process Management**, **Threading**, Pipes, Semaphores, Shared Memory, other forms of **IPC**, Network **Sockets**
  - ♦ Additionally **lexical analysis**, grammar and Linux **GUI programming** is also covered
- Course mainly uses
  - ♦ **GNU C compiler** (GCC), Flex, Bison, GNU **Make**
  - ♦ GNU Debugger (GDB), System Libraries
- **CS 162B** <<http://cng.ateneo.net/cng/wyu/classes/cs1593>>

- Currently, most **multimedia** classes still use commercial software
- Still working on **tighter integration**
- **FOSS** tools already activity used
  - Image Editing Tool - **GNU Image Manipulation Program (GIMP)** <<http://gimp.org>>
  - Modeling and Rendering Tool – **Blender Modelling and Rendering Tool** <<http://www.blender.org>>
  - Graphics programming - **SDL** <<http://sdl.org>>
  - Ray Tracing – **POV-Ray** <<http://www.povray.org>>

- Uses FOSS software for building network devices such as routers and gateways (mainly Linux)
- Uses FOSS network analysis and security tools
  - Protocol Analyzer – iptraf <<http://iptraf.org>>
  - Protocol Analyzer – Ethereal <<http://ethereal.org>>
  - Vulnerability assessment - NMAP <<http://nmap.org>>
  - Vulnerability assessment - Nessus <<http://nessus.org>>
  - Intrusion Detect System – Snort <<http://snort.org>>
  - And many others ...
- Some network-related courses
  - CS 154 <<http://cng.ateneo.net/cng/wyu/classes/cs154>>
  - CS 139.2 <<http://cng.ateneo.net/cng/wyu/classes/cs139.2>>
  - Networks II, Introduction to Telecommunication Systems

- Numerous **electives** can be offered that would either utilize or discuss **FOSS**
- Here are some possible **electives**:
  - ◆ **Linux Systems and Network Administration**
    - Linux, Apache, Squid, Bind, Sendmail, ...
  - ◆ **Database Design and Administration**
    - MySQL, PostgreSQL, ...
  - ◆ **Enterprise Software Development w/ J2EE**
    - J2EE, Eclipse, Jboss, Jakarta Tomcat, Objectweb Jonas, ...
  - ◆ **Web Programming**
    - Apache+PHP, PEAR, phpLib, Perl, Python, Zope, MonoASP
  - ◆ **Mobile Application Development w/ J2ME**
    - J2ME, Eclipse
  - ◆ **Game Programming**
    - GCC, SDL, PyGame, Blender Game Engine

- SEUL EDU: Free and Open Source Software for Education Archive <<http://richtech.ca/seul/>>
- [Ateneo de Manila](http://discs.ateneo.net) University Department of Information Systems and Computer Science <<http://discs.ateneo.net>>



# Question and Answer Portion

