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K-12 Open Minds

Teaching Linux in a Windows Lab

No Budget, No Support, No Problem

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Today's Topics

- The Problem
  - Selected Open Standards
  - Trends: Software and Architecture
- Free and Open Source Software (FOSS)
  - GNU's Four Freedoms
- Linux and Linux Distributions
- Observed FOSS Freedoms
- Observed FOSS Empowerments
  - Open Source Licenses
- Live CDs: Quickest way to FOSS
  - LiveCD Advantages
- A Sample Blogging Assignment
- Conclusions

The Problem *Part One*

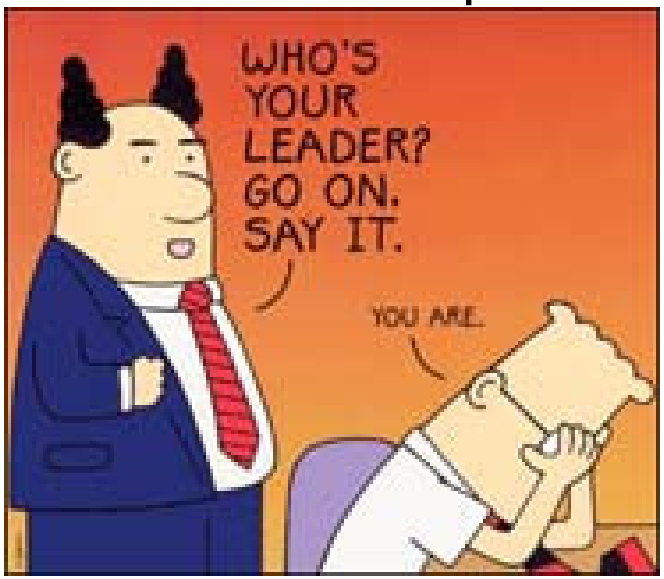
- Many organizations utilize Windows or Mac Computer Laboratories exclusively.
  - Meeting academic goals requires laboratory availability.
  - Availability often requires constrained Windows configurations.
    - i.e. limited rights, privileges, application software, or utilities.

The Problem *Part Two*

- Constraints may become a source of tension.
  - Teachers may perceive restricted proprietary software offerings as restricting scope of academic goals.
  - Students may perceive lack of open lab time to be a learning constraint.
  - As lab classes grow, or are offered more frequently, available open laboratory time decreases.
    - Inverse correlation between need and availability.
- Fortunately, there are alternatives.
  - Linux and Live Linux CDs

Other Proprietary Software Problems

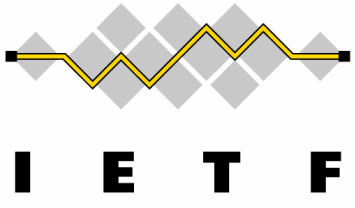
- Proprietary software posses several other potentially constraining attributes.
- Specifically:
  - Cost
  - Availability
  - Commitments required
    - Time (budget cycle)
    - Resources (support)

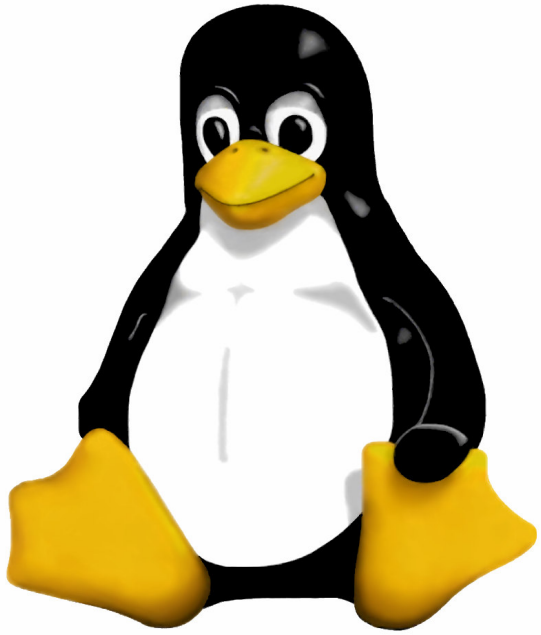


- In addition, proprietary file formats and interfaces can create vendor lock in…
- While, the reality is that each of us utilize open computer standards every day.

Selected Open Standards

- Networking Hardware
  - Ethernet (Developed ’82, first IEEE standard ’92
- Networking and O/S Software
  - TCP/IP (IETF RFC 1180, ’91)
  - Apache Web Server (Apache License, ‘9
  - HTML (IETF RFC 1866, ’95)
  - CSS (W3C, ’96)
- GNU (FSF, began ’83)
- SQL (ANSI, began ’86)
- Linux (GNU GPL, ’91)
- XML (W3C, ’98)

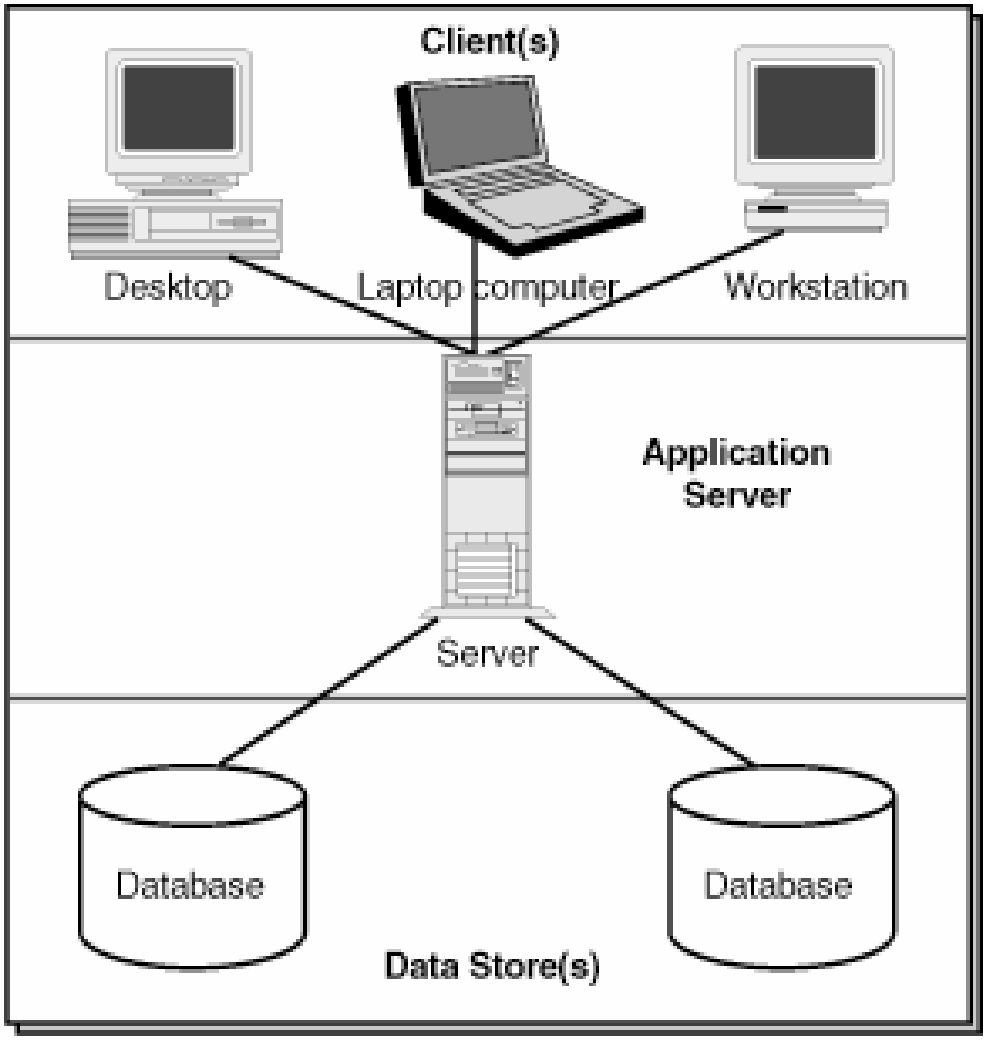




Trends: Software and Architecture

- Increasing Modularization and Standardization
  - Client/Server architecture frees the client from hardware and software dependencies
- Increased Independence (layers)
  - Computer System (Hardware)
  - Network
  - Operating System
  - Applications, Web Servers, Data Bases, Etc.
  - Open File Formats
- Internet Centric Applications
  - For example, using Google's Online Services to build an online portfolio that is independent of:
    - Hardware
    - Operating system
    - Client software

Trend: Internet Application Architecture



Complete client side hardware and O/S independence!

Note that "web browser" is client.

Hardware could be a computer, a phone, or something else.

Complete server side hardware and O/S independence!

Note that server side also uses open standards to communicate between layers.

HTTP, XML, SQL

FOSS: One Solution Aspect

- Free and Open Source Software (FOSS) based educational activities
  - Available for Linux and Windows.
- Activities can utilize a variety FOSS desktop, networking, and O/S software tools.
  - For example, Open Office, Ethereal (WireShark), net cat, and Apache.
- Linux can use a graphical interface analogous to that used by Microsoft Windows and Mac OSX.
  - The graphical interfaces are so similar that our students required virtually no transition.
- What does Free Software mean?

FREE SOFTWARE FOUNDATION

GNU's Four Freedoms

Free software a matter of liberty, not price.

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and adapt it to your needs (freedom 1).
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to improve the program, and release your improvements to the public, so that the whole community benefits (freedom 3).

What is Linux?

- A Unix-like operating system kernel
  - Originally created by Linus Torvalds et al (1991).
- Each distribution packages related GNU utilities and applications with the Linux Kernel.
  - Many Linux utilities and applications were developed under the GNU project and general public license (GPL).
  - Most Linux software is compatible across all major distributions.

Observed FOSS Freedoms

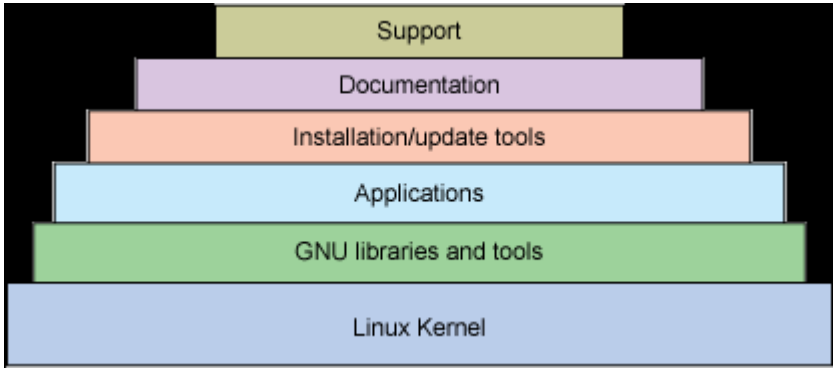
- Frees students
  - To continue their work at home, at work, or at other places.
  - From needing to use the school's computer laboratories.
- Frees instructors from:
  - Their school's budget and purchasing cycles.
- Frees schools from
  - The need to provide open lab time
  - The need to track software licenses
- Frees data from proprietary formats
  - Frees students and instructors to utilize whatever software best meets their educational goals.

Observed FOSS Empowerments

- Empowers students to
  - Gain experience as computer administrators without the possibility of impacting other students or classes.
  - Legally distribute laboratory software with their friends or coworkers.
- Empowers instructors to choose optimum software without regard to budget or purchasing constraints.
- Empowers schools to use laboratory hardware for multiple purposes rather than for a single dedicated purpose (or class).

Lets look closer at Linux and Linux distributions.

What Makes a Linux Distribution?



- Linux distributions consist of:
  - Linux kernel
  - GNU tools and libraries
  - Additional application and utility software
    - Windows manager and desktop environment
    - Applications and utilities
  - Documentation

`http://www.ibm.com/developerworks/linux/library/l-linux-distros/`

What Differentiates Linux Distributions?

- Linux distributions offer different utility and application software packages that provide different functionality to different audiences.
  - Some distros may offer fully-featured desktops whereas some may be server focused and still others may be rescue focused…
- All distributions are “the same, but different”...
  - Share a common kernel
  - Combine different tools, windows managers, and software
  - Offer different levels of functionality and sophistication

Linux Distributions and Licenses

- Distributions may be released under a variety of Open Source Licenses.
- GNU's General Public License is one popular license
  - Knoppix LiveCD uses GPL V2
- Some distributions also contain free but not open source software.
  - Within a particular distribution, different licenses may apply to separate software packages.
    - Philosophical differences can impact specific distributions.
  - Flash player is an example of a free but not open source software.

Selected Popular Open Source Licenses

- Apache License, 2.0
- New and Simplified BSD licenses
- GNU General Public License (GPL)
- GNU Library or "Lesser" General Public License (LGPL)
- MIT license
- Mozilla Public License 1.1 (MPL)
- Common Development and Distribution License
- Common Public License 1.0
- Eclipse Public License

`http://www.opensource.org/licenses/category`

LiveCDs: Quickest Path to Linux

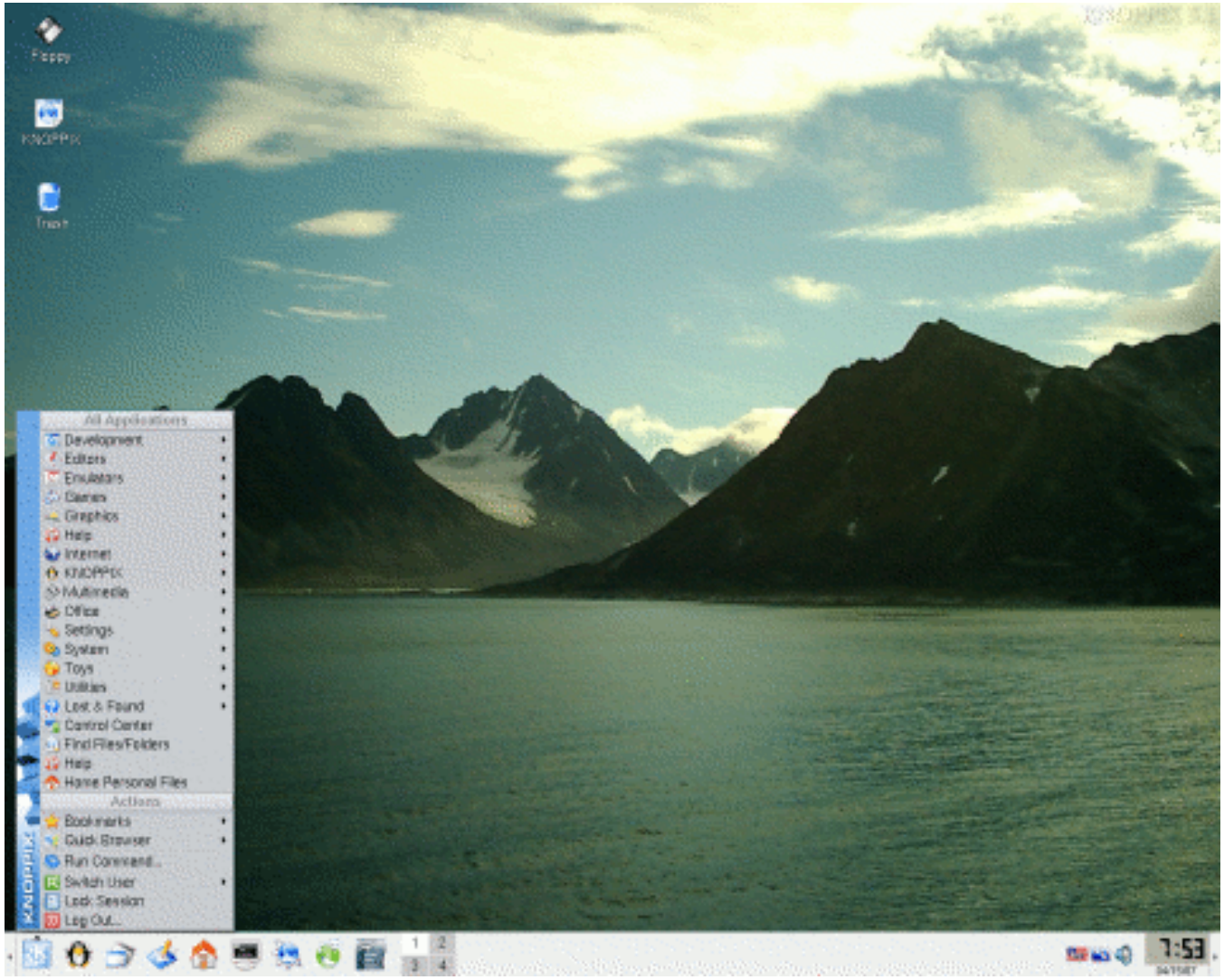
- Live Linux CD are distributions that distinguish themselves by being complete and able to run from a CD or similar media.
  - CD
  - USB
  - DVD
  - Typically, can also be installed on a HD
  - Or can be run under a virtual machine on Windows

LiveCd Advantages

- Lab set up is passing out Live CDs.
  - Our first effort took seven minutes from CD distribution to having everyone booted up…
- Contain many applications. For example, Knoppix contains:
  - Open Office
  - Multimedia, MP3 Players, Graphics (Gimp), screen capture
  - Many programming languages, development tools and developer libraries.
  - CD burner
  - Over 1,000 software packages.
- No need for license tracking.
- Trouble shooting is “turn the computer off, turn the computer on”.
  - Immune from virus, worm, and spyware infection.
  - Immune from operator errors that impact other students.

What do LiveCDs Look Like?

What do LiveCDs Look Like?



Knoppix 5.11

LiveCD Distributions

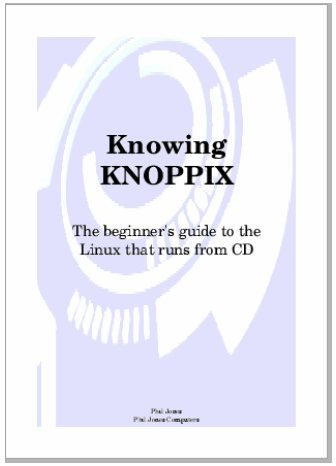
ubuntu

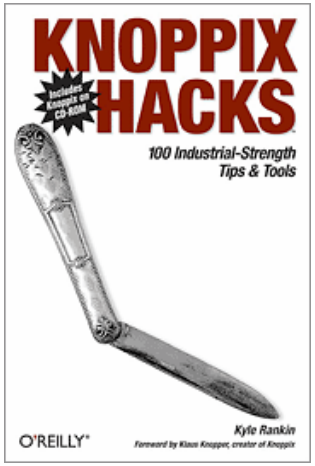
There are a variety of Live CD distributions.

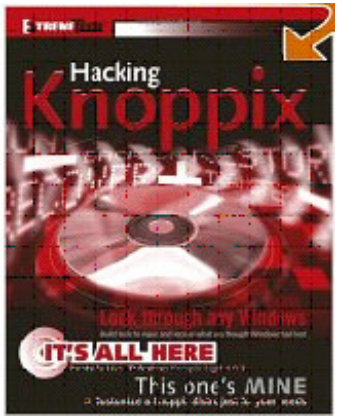
Choose the one that offers the optimum potential for your situation.

For us that distribution was Knoppix.

Knoppix Documentation







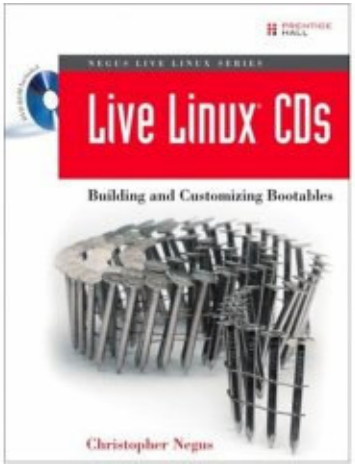
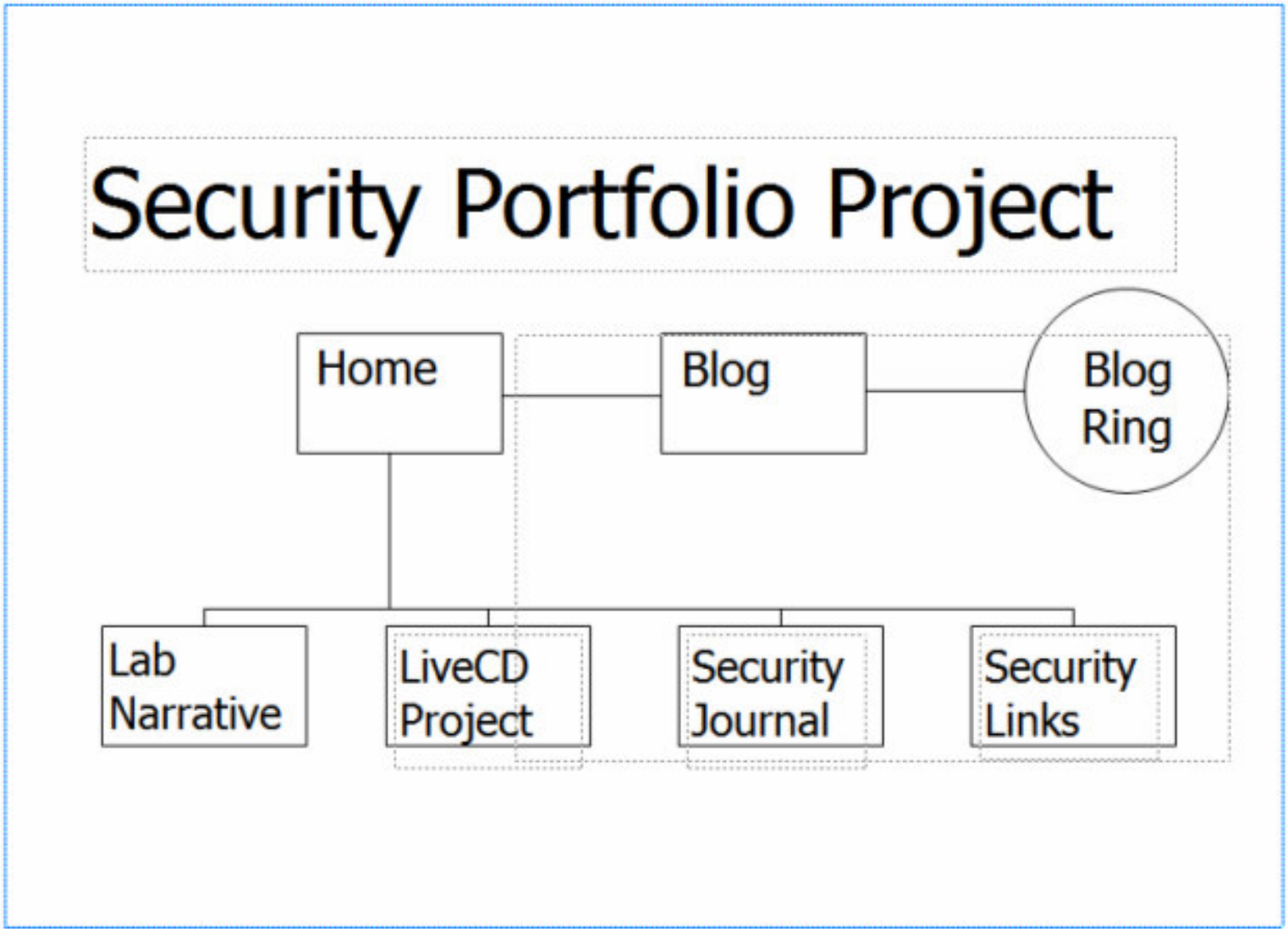


Figure 1-1 Portfolio Project



Blog

Each student will create an online blog. It is strongly recommend that you use Google's Blooger. This blog will hold your journal articles. These articles will be driven by in class assignments. This blog/journal will allow you to connect conceptual class activities with current news events.

While you don't necessarily have to use your name to identify the blog, you must let me know how to identify your blog. For example, rather than your name you may, by prearrangement, list a hash of your name.

Historically, the class has used blogs from Xanga.com. This enables all student blogs to be linked into a class blog ring. You may join the blog ring at:
http://www.xanga.com/home.aspx?user=croweye

Each student is also required to have an online web site. For a free web site, most students choose Geocities.com. Here, each student posts online copies of their work. Each site's home page will link to both the student's online blog and the class blog ring. Likewise, the blog should link to the online portfolio.

Online Journal

When assigned, you will find, and link to, a relevant security article concerning a specific topic. Your article must relate to the assigned security topic

Once you have selected an appropriate article, you should write a brief expository essay pertaining to the article. Brief here means from one to five paragraphs. The essay should

Conclusions

- Antidotal student response has been enthusiastic.
- Because the labs are open source and LiveCD based, students can repeat and/or verify their labs at home or at work.
- Students can freely distribute lab software.
- Software is free consequently budget discussions are irrelevant.
- I can burn the software myself – not subject to purchasing inertia.

Questions?

- Thanks for attending!

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First they ignore you,
then they laugh at you,
then they fight you,
then you win.

--Mahatma Gandhi