

Open Source at Seneca



Seneca is Canada's largest college, with over 100,000 students from 75 countries. In addition to offering diplomas, post-diploma, and graduate certificates, Seneca also offers bachelors degrees, including the Bachelor of Software Development. Our curriculum integrates and emphasizes open source technologies, tools, and practices. Students and faculty are also actively engaged in applied research. For example, one current research project is developing a modified version of Firefox that demonstrates the capabilities of a next-generation input device being developed by a Canadian company.

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I. Introduction

Open source is an integral part of Seneca, and specifically, the School of Computer Studies. Since 1998, and the introduction of our first course on Linux, we have worked hard to promote and foster open source in our core curriculum, applied research, and through our involvement with the community. This document describes some examples of where open source is involved in what we do. It is hard to document them all. However, I hope this will give you some sense of the place open source has in our personal and professional work.

II. Curriculum

We offer many courses that are directly focused on open source tools and technologies as part of the core curriculum. We also use open source in order to teach other courses which aren't directly focused on open source. In these cases things like example source code, FOSS projects, or tools find their way into what we show the students. Finally, we offer a one year post-diploma graduate program in Linux System Administration (ISA).

It is also important to point out that our core curriculum begins with multiple courses in C and C++. We believe that this is an important skill that students need to learn from the beginning. We also start students on Internet programming, both on the client and server side, from day one. Together, these two skill sets form the basis for later work in project and research courses, where students can begin to explore more complex programming.

Examples of core open source courses include:

- IPC144 Introduction to Programming in C
- ULI101 Introduction to Unix/Linux and the Internet
- BT0120 Operating Systems for Programmers - UNIX/Linux
- BTP200 Object-Oriented Programming using C++ (Part I)
- INT222 Internet I - Internet Fundamentals (XHTML, XML, CSS, JavaScript, DOM)
- BTI220 Internet Architecture and Development
- OPS235 Introduction to Open System Servers (DHCP, ftp, ssh, apache, X, etc.)
- BTP300 Object-Oriented Programming using C++ (Part II)
- OPS335 Open System Application Server
- OPS435 Open System Automation
- BTI320 Web Programming using LAMP
- INT322 Internet II - Web Programming on Unix/Linux using LAMP
- INT420 Web Server Administration (Apache, Perl, and mod_perl)
- GUI546 Graphical User Interface (GUI) Programming (includes X Window programming)
- INT525 Advanced Apache Administration
- SEC520 Internet Security
- UNX510 Unix/Linux Bash Shell Scripting
- UNX511 Unix/Linux System Programming
- INT522 VoiceXML Programming using PHP and VoiceXML
- XPR500 Extreme Programming (foss project developed with foss tools)
- INT620 Applied E-Commerce using Apache
- GAM672 3D Modeling Tools (Blender, Python for scripting)
- PHP701 PHP Development
- UNX705 Linux Operating System

- NGA773 Network Administration for Game Networks

The ISA Linux post-diploma is completely based on open source:

- SYA710 System Administration - Installing Linux
- SPR720 Shell Programming - Scripting with BASH
- LPT730 Linux Power Applications - Installing & Using
- XWN740 X Windows - Configuring & Using
- NAD710 Introduction to Networks - Using Linux
- SYA810 Linux System Administration
- NAD810 Network Administration - Using Linux
- SCR821 Advanced Scripting - with Perl and PHP
- SEC830 Security Issues - On Linux
- SRA840 Server Administration - On Linux

We have also managed to include open source in courses outside of Computer Studies, for example, in the Bioinformatics program:

- BIF704 Bioinformatics Programming using Perl (bioperl)
- BIF801 Proteomics (DeepView, VAST, Cn3D, and Swiss model)
- BIF802 Bioinformatics Programming using Java (biojava)

Examples of how we weave open source into other courses:

- Use of revision control, including CVS and SVN. We have multiple dedicated servers for both, which students use to co-ordinate group projects.
- Automated testing with JUnit, NUnit and related unit testing frameworks.
- Teaching programming through source code reading. For example, in BTP600 (Design Patterns in UML) we read source code from the Mono, Eclipse, and Mozilla projects in order to demonstrate the use and implementation of design patterns we are studying. Students are taught to find, navigate, and begin understanding large source code.
- We use the source code from the Mono project in order to teach various courses in .NET. This helps us demonstrate best practices by examining code written by professional .NET programmers (in this case from Ximian, Novell, and the open source world), while also giving students a more thorough knowledge of the available libraries in .NET.
- Using the open source development toolchain vi, gcc, make, etc.
- Introducing and using development tools such as Eclipse and Ant for our Java development courses
- We are also working on developing a Linux Kernel Programming option for students in their final semester.

Finally, we have recently added a new course in our BSD degree program: DPS909 Topics in Open Source Development. This fall we are focusing on the Mozilla project. Students are working with Mozilla to improve or add features to the browser, Mozilla web tools, etc. You can read more about the course and our work with Mozilla here: <http://zenit.senecac.on.ca/wiki>.

III. Other Open Source Activities

A. Open Source in High Schools

Seneca is actively involved in introducing Linux and other open source technologies to high school students. Our first such project was led by professor John Selmys at Emery Collegiate in Toronto in the summer of 2003. Seneca donated the servers, networking equipment, and client machines to build a thin client lab running the Linux Terminal Server Project (LTSP). Seneca ISA students then configured and setup the lab and trained the teachers and administration on how to use the software. Emery loves it. They now use open source tools in their curriculum. We have since had our students design and install a long-distance wireless link so that we can continue to support the lab remotely.

This past year another of our professors, Murray Saul, went to Parkdale high school to teach an introductory course on computer use. He noticed that their PCs were quite old and suggested that they could also benefit from the thin-client (LTSP) setup that we had already done at Emery. Seneca again donated 33 workstations plus a server, and provided delivery and setup of the new lab. The knowledge we had gained at Emery meant that we could roll this out very quickly and painlessly.

Seneca has continued to support these labs by connecting them to the Internet. The Toronto School Board will not allow any non-Windows machines to be connected to their network. Therefore, we have gone out of our way to find wireless Internet access for these labs, first donated by Seneca, then through a small Toronto startup, which co-ordinates wifi bandwidth sharing across the city.

We are committed to this type of work and continue to work with high schools in Toronto to bring open source into the classroom. We have just finished setting-up a third such lab at George S. Henry Academy with 30 PCs and servers donated by Seneca running LTSP on edubuntu. We hope we can do more.

Internally we also promote open source and are working on a project with the goal of putting a FOSS package in the hands of every Seneca staff member, which will include a handout and an Ubuntu disc set containing: an auto-run program which enables you to install Firefox/OpenOffice/Gimp on Windows; a 'live' Ubuntu disc for test-driving Linux; and an Ubuntu installer.

B. Developing the Open Source Communities

For the past four years Seneca has run the Free and Open Source Symposium, one of Canada's best events for bringing together developers and educators working with open source. The goals of the symposium are to educate people on the technologies that exist today, and to form relationships within a community of people who don't have other opportunities to connect with one another. For example, last year we brought Jim McQuillan, the founder and project leader of the Linux Terminal Server Project, to the symposium. Jim was instrumental in helping us get our LTSP-based labs configured correctly at Emery and Parkdale. It was great to say "thank-you" in person.

This past summer we also hosted the Mozilla Calendar Summit—four days of meetings for developers from around the world working on Mozilla's Sunbird and Lightning applications. The meetings were the first time many of them had met in person.

This fall professors Danny Roy and John Selmys will be hosting a wi-fi camp for high-school teams at Seneca. The event will bring together high school students and teachers from across the province

and have them compete to build their own antennae (cantennas) and then do a scavenger hunt to locate several hidden access points. Students will use open technologies and will be judged on their cantenna performance.

Seneca also runs the Centre for the Development of Open Technology (CDOT), which is an umbrella group helping to start and support various open source initiatives within the college. A number of professors and students use the resources provided by CDOT to host and develop their projects.

Seneca has for many years run a weekly Linux Club, which provides a way for students interested in open source to come and meet, as well as a lab in which to experiment with hardware and software. The club's main activity outside of weekly meetings has been to run Linux Installfests. Two or three times a year, the Linux Club installs and configures Linux on any PC belonging to a Seneca student or faculty. The events are always well attended.

C. Providing Infrastructure Support to Open Source

Seneca has a long history in high-performance computing. Our Academic and Computing Services has been using this knowledge and our network and computing resources to support many open source projects and groups. For example, we provide bandwidth mirroring for projects such as: Mozilla, Gentoo, PuTTY, Elive, etc. We also provide servers and computing resources to Mozilla and others who are working on our joint research and open source initiatives. Much of this work has focused on the use of Virtual Machines. As such, we are beginning a new research project in the winter to explore automated management and provisioning of virtual machines within our clusters. Our goal is to streamline and automate the process of creating build farms, test environments, etc. All of this has been possible because of the close relationship we have with Sun. Seneca is the Sun Centre of Excellence in Enterprise Knowledge Services (<http://www.senecac.on.ca/scoe/index.html>). We hope to leverage this to help increase our capacity to do bigger projects with Mozilla and its partners.

IV. Current Research Activities

Seneca is actively involved in applied research activities involving collaborative work between faculty, students, and outside partners. Some examples of this work include:

- **UI Software Research.** A group of four Seneca students worked to develop drivers, an API, and other related software for a next-generation human interface device being developed by a Canadian company. As a proof of concept, they modified the Firefox browser to accept new types of input and to alter the way it draws the UI. Mozilla was active in supporting the students and their supervisor.
- **Joystick Force-Feedback Metrics.** A group of two Seneca students is working to write software which can help determine "the best" force feedback joystick empirically. The project uses the open source Ogre rendering engine to encapsulate DirectX and OpenGL. A Canadian haptics company is interested in being able to rate their technology against others on the market.
- **Open Source Search Engine.** A small group of students and faculty are slowly working to build a search engine based on open source tools. Currently they have an openMosix cluster and are now researching and testing different MPI parallel libraries.
- **Emery Wireless Project.** A project to study the effects of environment on long-distance

wireless networks using open source software. Begun in the spring of 2005, we are now in the data gathering phase. Data analysis is scheduled for fall 2006.

- **VPN Grid Computing.** Professor Mike Martin is currently doing research into the relationship between the Globus Toolkit for grid programming and OpenVPN, with the goal of developing an API for VPN connection management on the Grid.
- **APNG Impementation.** A third-year BSD student spent the summer working with Mozilla's Vladimir Vukićević to implement the APNG extension of libpng (the Portable Network Graphics library). This work is now finished, and the student is going on to add APNG support to Firefox version 3.0. The work was funded by Google.
- **DISTCC for MSVC.** Two fourth year BSD students are working to add support for the Microsoft C++ compiler to distcc. Distcc is a distributed compiler that allows for a network of PCs to be used when compiling large applications. Mozilla would like to be able to use distcc on Windows, something it does now on Linux.
- **Buildbot Extensions.** A second-year CPA student has been working since the summer to add support for various aspects of the Mozilla build system to the buildbot project. Buildbot is an automated build system that could be used to replace Mozilla's aging Tinderbox system.
- **Source Code Indexing Service Analysis.** Two second-year BSD students are working to find suitable replacements for the Mozilla's aging lxr service (<http://lxr.mozilla.org>). LXR provides developers with web-based access to the millions of lines of code in the Mozilla source tree. However, as Mozilla considers moving from CVS to SVN, they are also interested in examining other alternative indexing services. The students are working to identify, setup, test, and document other systems for use by the Mozilla development community.
- **Open Source Testing.** Seneca has setup a number of labs in order to do testing. For example, Seneca's English Language Institute is working with Mozilla to test international font rendering in Firefox 3. Another example is our Microsoft Vista testing lab, where students and faculty are working to test Firefox compatibility on Vista. In both cases Mozilla has provided us with custom builds.

V. Active Open Source Projects

In addition to our funded research activities, a number of volunteer open source projects are done by Seneca people, including:

- **VNC#** A .NET implementation of the VNC protocol released under the GPL. The project was written as a collaboration between a Seneca professor and two of his students. It has since been used to teach software development at Seneca, and is also integrated into many software projects around the world. For example, Aulofee (<http://www.aulofee.com/>) in France has included it in their network monitoring suite.
- **Pasco** An open source implementation for Linux of the PASCO Science Workshop 500 Interface (SW500i). This closed source device is used in high schools across the province to help science teachers do measurements with various probes (e.g., temperature, distance). Seneca convinced the manufacturer to give us the protocol documents and allow us to write open source software so that high school teachers and students could continue to use these

devices in their work on Linux computers. This project was done by a Seneca student under the supervision of his professor.

- **EDrive** An open source driving simulator/game that can be used to practice advanced driving techniques in a safe and inexpensive way. EDrive was developed as a way to explore the issues of cross-platform game development on the way toward creating our current courses in game programming.
- **ISO Master** An open source ISO CD image editor for Linux using GTK. It is similar to products available on Windows, such as ISO Buster and UltraISO. Users can open an .ISO file, extract any files from the image and add new files. This project started as an academic project and is continuing to be developed as an open source project: <http://littlesvr.ca/isomaster/>
- **OSCAR SUSE Port** An open source high performance computing solution. Seneca's Academic Computing Services recently completed and now maintains the SUSE port of OSCAR. Work is also underway to complete the Fedora Core 4 X86-64 testing and development.

VI. Forthcoming Open Source Publications

The past year has been very busy for professor Chris Tyler, who has two open source books on the go:

Tyler, Chris. Fedora Linux: A Complete Guide to Red Hat's Community Distribution. O'Reilly (July 2006).

Tyler, Chris. X Power Tools. O'Reilly (not yet announced, September 2006).

VII. Expanding Open Source in Teaching

We are also excited at the ways in which open source can transform teaching and open new horizons for our students. In 2003 professor Anthony Austin won the McGraw-Hill Ryerson Award for Innovation in Education for his talk on Seneca's use of Linux and the GPL in the classroom. We can also imagine numerous ways to do more in the classroom, especially using open source in order to help teach difficult concepts.

For example, professor John Samuel would like to have what he calls the “visible browser,” which is reminiscent of the “visible human” models of a transparent body showing the internal structure. The idea would be to have a fully functional browser, with an additional display of all that goes on behind the scenes, including all the details and content of the HTTP request and response messages, the actual packets that are being sent and received, their content, routing information, etc. This would be a very useful tool for teaching web programming, networking, and security. It would also help students to better understand how the HTTP protocol actually works—something they struggle with now.

The Mozilla platform and Firefox browser provide a ready-made foundation on which to build this and other such teaching tools. We see open source as providing a way for us to better teach our students, and to improve the quality of education we deliver.

VIII. Conclusion

Seneca is really excited about open source, and we are trying hard to infect our fellow colleagues, students, and the technology community abroad with the same enthusiasm. While we have already managed to achieve some great things, we are excited about what will happen next. As is the case with most open source endeavors, ours is very much a grass roots effort. Hopefully the momentum we have created will see Seneca rise to become more organized and influential in the open source world.