# C++ Generic Programming, GNOME/GTK+ and Tools

# Generic Programming

- Generic programming in C++ supports both function and class templates
- Originally conceived to replace C macros
- In C++ the templates are expanded at compile time
- Very difficult to debug due to the verbose compiler error messages

# Use of Generic Programming

- Standard Template Library exists as a direct result of generic programming
- Boost project has been able to extend the language naturally with additional libraries
- Many companies stay away from using custom templates due to engineers not understanding their use
- Templates are thought of taboo due to older versions of compilers having poor support

# GNOME/GTK+

- GTK+ is a cross platform windowing toolkit that has support on Solaris, Mac OS X, Windows, and Linux
- GNOME is a desktop environment which relies upon GTK+ and the X Window System
- GNOME/GTK standard amongst most Linux and UNIX distributions: Ubuntu, Fedora, RHEL, Open Solaris
- Supports several language bindings: C, C++, Ruby, Python, Java, C#, PHP, ...

# Use of GTK+

- The Google Chrome web browser uses GTK+ for support on Linux
- Python GUI applications often use the PyGTK language binding
- Often criticized by KDE camp who uses the Qt windowing toolkit

# Debugging C++

- GNU includes two utilities to aide programmers in their debugging efforts, GDB and GPROF
- GDB is one of the standard debuggers used by C/C++ programmers on Linux
- GDB is a very powerful and complex animal, but does not contain a GUI
- GPROF is a utility which is used to profile your application

# More Debugging

- Valgrind is a tool suite which includes utilities for run-time memory, thread, and heap debugging
- Application is run through Valgrind which replaces library calls with specialized versions for detection
- Very useful in large applications that have several external library dependencies
- Generally runs your program 5-10X slower depending on which utility is activated

# Commercial Tools

- There are several commercial tools available for run-time code analysis (debugging and profiling)
- Microsoft ships Visual Studio with a powerful set of debugging tools
- Open source is limited to what other people need

# Source Code Management

- Also known as version control software
- Allows for an audit trail of commits, changes, and merges of code between multiple developers
- Used by nearly all commercial environments in some fashion or form
- Similar to Word document revision history

# SCM Flavors

- Subversion was developed to be a successor to the CVS; currently most popular open source SCM
- Git was developed by Linus Torvalds for use with Linux kernel development; decentralized and fast
- Many others exist both commercial and non-commercial, centralized and decentralized; usually designed to tackle a specific problem

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