CU CS 4995-03: Internet Systems Programming

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Introduction

- Internet – Systems – Programming
- Correctness, portability, performance, maintainability.
- goals: build large reliable distributed systems, quickly

Course Mechanics

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Assignments: "style" counts; see coding guidelines

Platform: ANSI C(++); mostly Linux and/or Solaris, some NT.

Exam: final + midterm or group project (?)

Books

- W. Richard Stevens, *Advanced Programming in the Unix Environment*, Addison-Wesley
- Michi Henning and Steve Vinoski, *Advanced CORBA Programming with C++*, Addison Wesley, 1999.
- K. Birman, *Building Secure and Reliable Network Applications*, Manning, 1996.

Coding Guidelines

- Every file and function *must* be documented;
- Consistent indentation, e.g.,:

```
if (x > 0) {
  printf("success!\n");
}
```

- Variables: CamelCase or var_name; CONSTANT.
- Suggested naming: *FileFunction*
- No compiler warnings allowed.
- Suggested style guidelines: see assignment.
- Ideas for BCP?

Class Overview

Foundations of systems programming:

- tools: `gcc`, `make`, `automake`, `gdb`, `CVS`, `prof`
- advanced file system (low-level I/O, ioctl, locking, asynchronous I/O)
- time and date services (including network time synchronization)
- process management (fork, exec, process environments, process groups)
- threads and synchronization (Posix and NT threads)
- signals and local IPC (pipes)

"Classical" distributed programming:

- Unix and Windows sockets
- multicast
- RSVP
- Sun RPC and XDR

Distributed file systems:

- Sun network file system (NFS) v.2 - v.4
- Microsoft SMB
- AFS
- Sun MC

"Modern" distributed programming:

- Corba

- ACE
- DCOM [?]
- active networks [?]

Databases and directories:

- domain name service
- yellow pages
- LDAP (light-weight directory access protocol)
- ODBC (database interface)
- JDBC (Java database interface)

Web programming:

- cgi

- servlets
- JavaScript
- Netscape plug-in and client interface
- XML
- web document object model (DOM)

Network management: SNMP [time permitting]

Security: GSAPI (security API)

What is (Internet) Systems Programming?

$\leftrightarrow$ GUI, kernel, …

- lower level – with interface to OS APIs
- emphasis on latency/throughput, reliability
- scaling

Examples: drivers, server (Samba, web), authentication module (system services); *embedded* systems programming