StarJourney
TRAINING & CONSULTING

Linux User Mode Programming Outline

GNU Compiler

- History of gcc
- Four stages of compilation
- Using gcc
- Preprocessor features
- Warnings & Errors
- Optimizations
- Linking

Using make

- How make works
- Makefile rules
- Implicit rules
- Variables in makefiles
- Targets

Working with Libraries

- Benefits of code in libraries
- Shared vs. static libraries
- Creating static libraries
- Creating shared libraries
- Using libraries
- Library locations
- lLdconfig

Process Management

- Linux vs. Windows process
- Process relationships
- Waiting on a child
- Process priority
- Real time priority

Memory Management

- Allocating user-space memory
- Memory alignment
- Locked memory
- Memory initialization
- Memory copy
- Memory comparison
- Memory search

General Debug Principles

- Symbols
- Link maps
- Optimized builds
- User mode debugging
- Exceptions
- Traps
- Strategies to isolate bugs

Debugging with gdb

- Source level debugging
- Getting started with gdb
- Examining & modifying memory
- Debuginfo libraries
- Attaching gdb to a running process
- Debugging utilities
- Electric fence
- Magic SysRq usage

User Mode Crashes

- Hangs vs. Crashes
- Types of Hangs
- Types of Crashes
- Using gdb on a crash file

Synchronization

- Need for synchronization
- Critical sections race conditions
- Mutexes
- Semaphores
- Atomic Bit operations
- Atomic Integers
- Deadlocks

Network Programming

- Linux networking overview
- Working with sockets
- Client functions
- Host vs network byte order
- Using getaddrinfo
- Server functions
- Datagram Communication with UDP

Profiling Code

- What is code profiling?
- Sampling vs. Instrumented profiling
- Performance profiling
- Coverage profiling
- Profiling tools
- valgrind
- VTune (Intel)

Interprocess Communication

- Introduction to IPC's in Linux
- Shared memory
- Semaphores
- Message queues
- POSIX vs. System V options
- Pipes
- popen & pclose
- Using pipe()
- Named pipes

Linux User-space Drivers

- Why consider user-space for drivers?
- mmap (for memory mapped registers)
- PCI configuration space
- Handling interrupts for user-space?
- DMA for user-space?
- USB drivers in user-space

Signals

- What are signals
- Working with signals
- Blocking signals
- Working with sigaction
- Sending signals
- Real-Time signals

Threads in Linux

- Multi-threading programming
- When threading works
- Working with threads
- Thread identity
- join()
- Controlling threads
- Conditional variables