Linux Kernel for System Programming

Prasad

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Required Parameters

- Compatibility (POSIX Conformance)
- The system should be easy to learn
- Modifications should be possible
  - Function Call Interface
  - Features and Device Drivers

POSIX and Compatibility

- Portable Operating Systems Interface
- By IEEE and accepted by ISO and ANSI
- Source level compatibility across architectures and operating systems
- Covers API, Shells and Tools, etc;
- Linux is certified for POSIX conformance
- GNU tools are POSIX conformant too!
- Windows needs “Services for UNIX”

Easy to Learn

- Linux is Free Software
  - Source code available
  - Add remove features before compiling
- Documentation Available
  - API
  - Cross References
- Example: Linux uses linked lists a lot, it started using hashes a little more from version 2.6... any idea about windows?

Easy to Modify: System Calls

- System Calls
  - Context Switch (to kernel mode)
  - Function(s) execution
  - Context Switch (to user mode)
- System Calls in Linux
  - Software Interrupt (0x80)
  - System call table
  - Function Definitions

Easy to Modify: System Calls

- Sample system call addition
  - The 'useless' system call adds two integers
  - Create an entry in arch/i386/kernel/entry.S
  - Assign a number in include/asm-i386/unistd.h
  - Implement the function
  - Compile the kernel source
- Use it in your program ;)
- Demo: Code walk-through for the 'useless' system call

Easy to Modify: Features

- Many people write device drivers and features to the Linux kernel
- Simple steps to be followed
  - Know what you want to add
  - See if it already exists (www.lkml.org)
  - Learn how to add
    - Take a look at the existing sources
    - Ask people on the LKML
  - Do it and submit the patch!
- There are many beta-testers out there :)

Easy to Modify: Some Tools

- kgdb
  - Serial Debugging
  - Two machines connected over serial line
  - Place breakpoints and step-through the kernel source
- UML
  - User mode linux
  - Runs in usermode (virtualizes resources)
  - No reboots for small changes!!!

Showcase: MigSHM

- DSM Patch for OpenMOSIX
  - DSM: Distributed Shared Memory
  - OpenMOSIX
    - Linux Kernel Patch
    - Provides process migration and transparent clustering
- Done by college students from Pune
  - The MAASK Team
  - Five girls from Commins College of Engineering, University of Pune

Thank You

s.prasad@gmail.com