

CS 50011: Introduction to Systems II

Review

Prof. Jeff Turkstra



Final Exam

- ~75 questions
- Mix of multiple choice, true/false, and short answer
- Closed notes, closed books, no calculators
- Wednesday, 8/2 1pm-3pm LWSN B134



Exam topics

- Storage
 - Types
 - Relative speed
 - Storage hierarchy
 - Basic characteristics
 - Interaction with host
 - Block abstraction
 - SANs
 - Network attached storage



- Data layout
 - Partitioning
 - Volume managers
 - File systems
 - RAID
 - LUKS
- File systems
 - Basic layout
 - inodes
 - Fields
 - Data block referencing



- Basic utilities
- File types
- Permissions
- Extended attributes
- DAC/MAC
- SELinux
- Additional *NIX Utilities
 - I/O Redirection
 - tee
 - grep



- Simple regular expressions
 - head, tail, cut, paste, wc, sort
- Architecture
 - Moore's law
 - Transistors, gates
 - Combinational vs. sequential circuits
 - Harvard vs. Von Neumann
 - Processor types
 - Storing programs



- Instruction sets
 - Opcodes, operands, results
 - Instruction format
 - CISC/RISC
 - Endianness
 - Simple ISA design
- DMA and MMU
- Execution modes or rings
- Trusting trust paper

- Software hierarchy
- Assembly
 - What is it
 - How do we get it
 - If-then-else and subroutine calls

- Intel x86 basics
 - Recognize common instructions
 - Interpret simple programs
 - Intel vs AT&T syntax
 - Registers
 - Flags
 - Addressing modes
- Programs vs. Processes

- Typical memory layout
- Stack
 - What is it?
 - How is it manipulated
 - Stack frame
 - Base pointer/stack pointer
 - Typical layout for x86
- Calling conventions
 - Register preservation
 - System calls

- Security
 - Virtualization overview
 - VirtualBox example
 - VT-x, AMD-V
 - Why? How?
 - Instruction set support
 - Microcode updates
 - NX bit
 - Exec shield
 - Stack canaries
 - ASLR

- Memory management
 - Virtual memory
 - Why? How?
 - Working set
 - Copy-on-write
 - Segmentation
 - Demand-based paging
 - Resident set
 - Page tables
 - Multi-level
 - Translation

- MMU
- TLB
- Virtually addressed caches
 - Aliasing
- Basic page fault handling
- mmap()
- Compilers
 - Executable file formats
 - ELF format
- Utilities and output



- Building a program, steps
- Preprocessor
- Compiler steps
- Libraries
- Lazy binding
- Simple Makefile



- Networking
 - Basic architecture
 - Addressing
 - Routing
 - ARP
 - DNS
 - DHCP
 - UDP/TCP
 - NAT



- Sockets
 - Ports
 - Basic API
 - Usage
 - HTTP server
- Databases
 - SQL
 - Schema
 - Primary, foreign keys
 - JOINS



- Web applications
 - Client/server model
 - CGI
 - 3-tier model
 - Model/view/controller
 - AJAX
 - JSON
 - Sessions
 - Cookies
- Cloud computing



Questions?

