Linux OS Fundamentals for the SQL Admin

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Overview

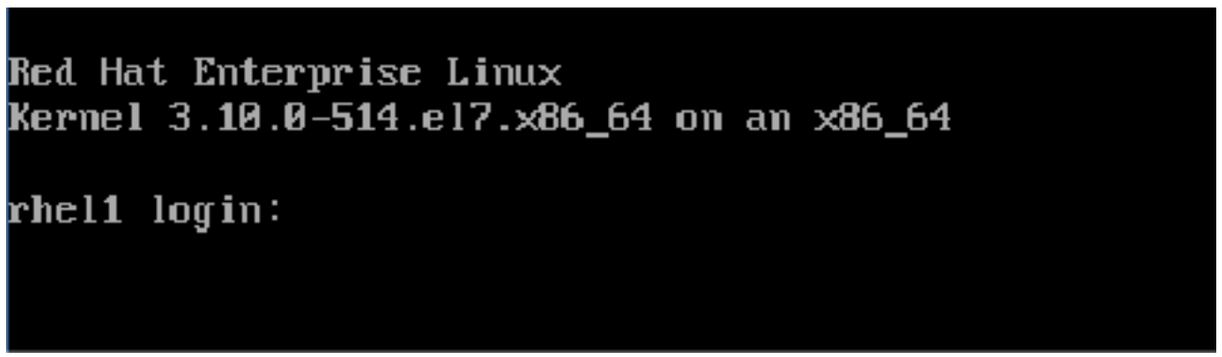
- Linux Architecture
- Interacting With Your Linux System
- I/O Redirection and Pipelines
- File System Basics
- Working With PowerShell on Linux
- Working With Packages
- Managing Services with systemd
- System Resource Management
- Getting Help

Linux Architecture

User Space	Users	Interact with the Shell	Cause Problems :)
	Shell	Executes Your Commands… Your Interface to the Kernel	Commands, Editors…any User Program
Kernel Space	Kernel	Resource Management and Access	Process, Pages and File Systems
	Hardware	Physical Resources	CPU, Memory and Disk

Interacting With Your Linux System

- Text
  - Console
  - SSH - Secure Shell
    - Terminal (Linux/Mac)
    - PuTTY (Windows)
    - WSL (Bash on Windows)
    - Win32 OpenSSH
- Graphically
  - Desktop Manager
  - VNC



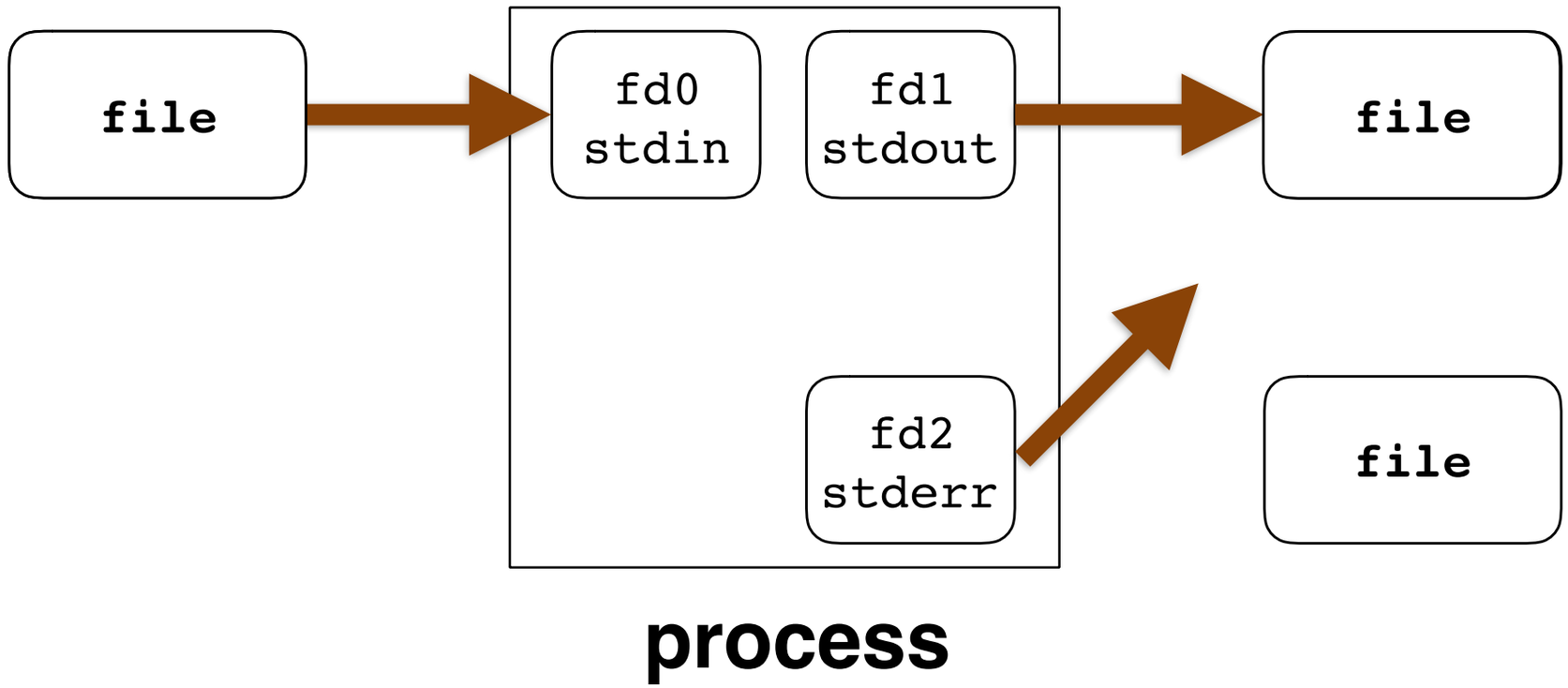
Access and Privileged Access

- Linux security is based on user ids
  - root - UID 0
    - # at the command prompt `[root@rhel1 ~]#`
    - Try to avoid using root
  - Regular named users
    - $ at the command prompt `[demo@rhel1 ~]$`
- Switching users
  - `su` - switch user, uses that user's password
  - `sudo` - Allows for users to execute an individual command with escalated privileges. Your password.

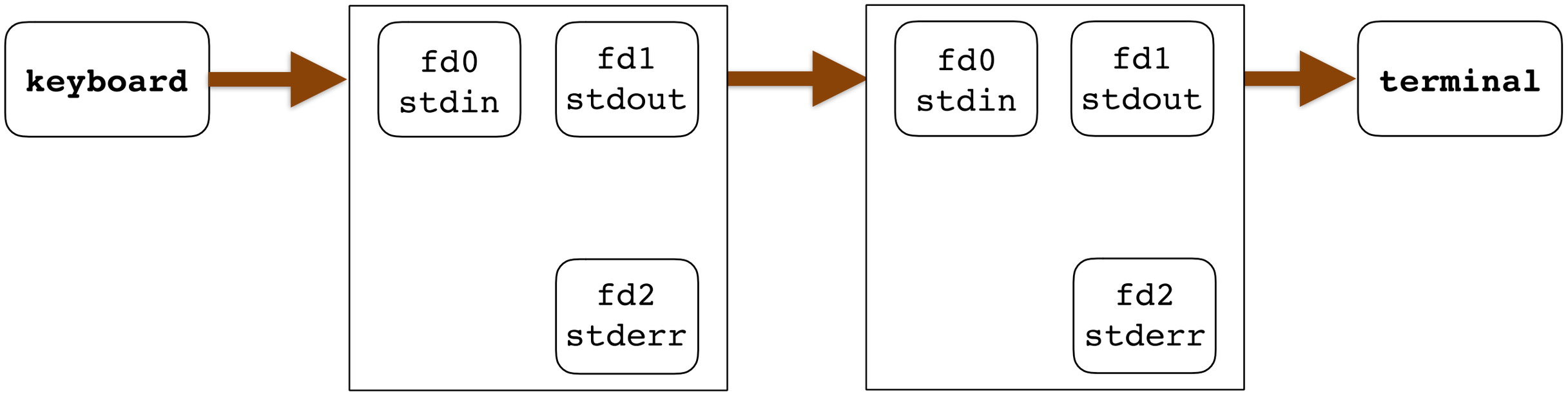
Many UNIX programs do quite trivial things in isolation, but, combined with other programs, become general and useful tools

Kernighan and Pike

IO Redirection



Text Based Pipelines



ls | more

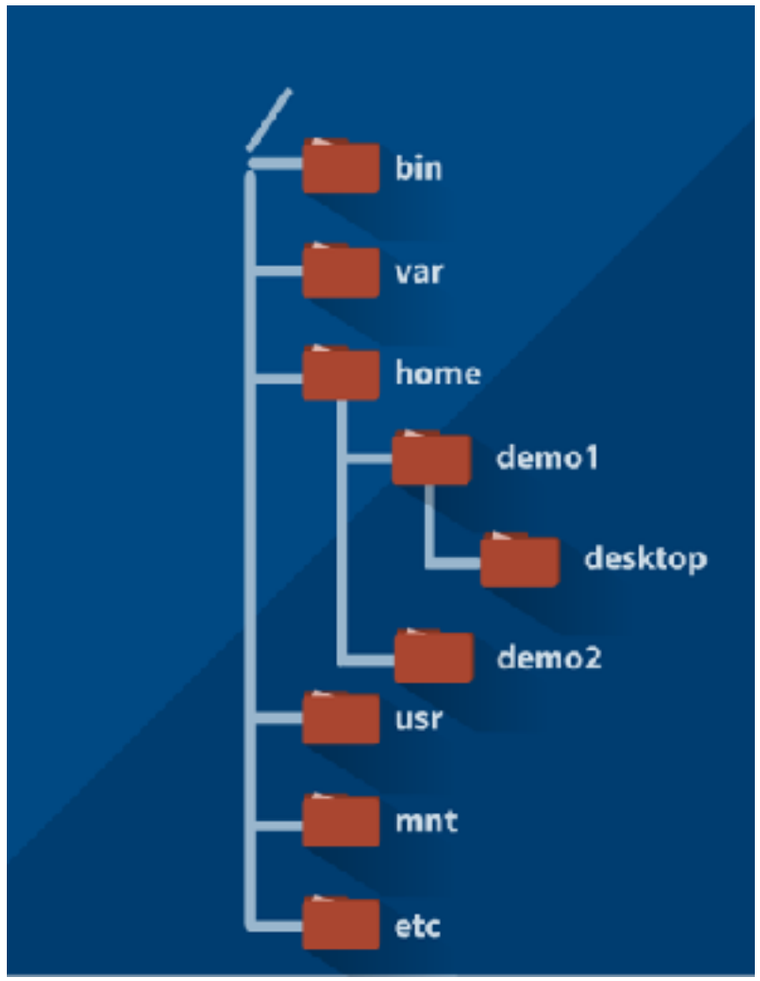
process group

I/O Redirection and Pipes

- Redirect standard output - `stdout ( > and >> )`
  - Normally directed to the terminal
  - Useful for redirecting the output of a command to file or another process
- Redirect standard input - `stdin ( < and << )`
  - Normally input via keyboard
  - Useful for directing input into a program from a file
- Redirect standard error - `stderr ( 2> )`
  - Normally output to terminal
  - Useful for separating error output from standard output and redirect to another location
- Using a pipe - `( | )`
  - Interprocess communication
  - Process groups
  - Internal buffers

The LINUX File System

- Everything is a file - No really, EVERYTHING!
- File system tree
  - The most common analogy
- Filesystem Hierarchy Standard (FHS)
  - The standard UNIX filesystem layout



Working with PowerShell on Linux

- Available now! (about monthly releases)
- Majority of the cmdlets are available to you
- PowerShell can be used as your default Linux shell - http://bit.ly/2iFOKuN
- Remoting
  - Currently relies on SSH
  - WSMan/WinRM remoting exists but…

Demo Linux and PowerShell

- Connecting to a system via SSH
- Process management
  - `ps`
  - `Get-Process`
- Building command pipelines

RPM Package Manager (RPM)

- Package Management System
  - A package is a collection of programs, scripts and meta data
- Suite of management tools
- Used to install/upgrade/remove packages
- Does not provide dependency management
- apt

yum

- Package manager
- Dependency management
- Software is stored in repositories
  - Software publishers {RedHat, CentOS}
  - Third Party {EPEL, RPMForge, Microsoft}
  - Your own
- System wide updates
- apt

Demo

- Package management with yum
- Install SQL Server on Linux from Microsoft's yum repository

Managing Services with systemd

- Service Control - `systemctl`
- Verifying Services are Running
- Units and Unit Files
- Dependencies before/after
- Viewing Logs - `journalctl`

Demo

- `systemctl`
  - `enable`
  - `disable`
  - `status`
  - `stop`
  - `start`

System Resource Management

- CPU
  - Load average and run queues
- Disk
  - Space and latency, IO waits
- Memory
  - Memory pressure and swapping
- Network
  - Throughput, latency and reliability
- SQL Server DMVs

System Resource Management

- `top/htop`
- `vmstat`
- `free -m`
- `du -chs ./dir`
- `df -h`
- `dstat` (Monitoring Swiss Army Knife)
- `sar` (system activity reporter)

Performance Monitoring

System	Windows	Linux Tool	Linux
CPU	%Processor Time	`top`	CPU usage, load average
Memory	%Committed bytes in use	`free -m`	Total, used, free, cache
Disk - Space	%Free Space	`df -h`	Total, used, available, mount
Disk - IOs	Disk Transfers/sec	`iostat -dx`	tps, r/s, w/s
Disk - Latency	Avg. Disk Sec/ Transfer	`iostat -dx`	await, svctm***
Disk - IO Size	Avg. Disk Bytes/ Transfer	`iostat -dx`	avgrq-sz
Interface	Bytes/Sec	`ifstat/bwm-ng/nload`	Packets/sec, bits/sec

Check out `dstat` it will do most of these

Getting Help

- man pages
- `Get-Help`
- Local documentation
  - `/usr/share/doc`
    - Documentation about all of the install packages on your system
    - Help files
    - Example and default configuration files

Key Takeaways

- It's just an operating system, once you get over the syntax and environmental changes
  - A lot of the concepts are the same
  - Architecture
  - I/O redirection and text based pipelines
  - File system basics
  - PowerShell on Linux
  - Packages
  - systemd
  - System resource management

Additional Resources

- **Pluralsight**
  - **Understanding and Using Essential Tools for Enterprise Linux 7**
    - Installation, command execution, managing files, permissions
    - Using VI, Advanced Shell Topics and Pipelining
  - **LFCE - Advanced Network and System Administration**
    - Managing services, performance monitoring, package management, NFS and Samba
- **Play by Play: Microsoft Open Source PowerShell and Linux and Mac**
  - Where PowerShell fits in a heterogenous data center
  - Remoting, Linux management tasks, PowerShell functions and DSC

Need more data or help?

http://www.centinosystems.com/blog/talks/

Links to resources
Demos
Presentation

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Questions?

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Thank You!

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