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S T U D E N T C O M P U T I N G L A B S

launchd (and other fun stuff)

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What is launchd



- Jordan Hubbard's solution
- /sbin/launchd
 - One ring.., er, process to launch them all...
- Replacement for
 - /sbin/init
 - There is no init in 10.4
 - launchd has PID 1 and is the parent of every process
 - Most /etc/rc's (/etc/rc still exists for now)
 - SystemStarter (still exists for now)
 - mach_init.d (still exists for now)

What can you do with launchd

- Launch Daemons (run as root)
 - ssh, ftp, xinetd, etc...
- Launch Agents (run as user)
 - Kinda like “Login Items” (“User Startup Items” in 10.3)
 - Great example is ssh-agent
- Tune the kernel & environment
 - Set limits
 - Globally redirect stdout & stderr
 - Much much more...

Why launchd?

Other solutions

- init required editing rc files
 - If launch order was wrong, problems...
 - Not the easiest thing for a newbie to configure
- SystemStartup was nice in theory, but...
 - Developers guessed too often
 - Too much requirements
 - Too few requirements
- mach_init.d (bootstrap daemons)
 - Like a horse that never got past the gate
 - Apple used it, but few others

Why launchd?

● launchd

● “Easier to manage”

- One location to turn stuff on and off (not really, but...)
- Up to now, daemons handled daemonization internally
 - Settings were thus internal to the service
 - Launchd can set:
 - UID, GID, PWD, chroot, stdio, resource limits, priority

● Improves performance

- Watchdog
- Provides “on-demand” launches
 - Requirements tied to sockets and file descriptors

Dependencies

- SystemStarter had it...
 - StartupParameters.plist & “Requires” & “Provides”
- Launchd has it, but very different
 - Use IPC (inter-process communication)
 - Either request a socket from the required service
 - Or request a file descriptor
 - If the service isn't running, launchd will launch it
 - Launchd gives your request to the service once it starts
 - Or you can watch files or paths for changes

What is “on demand”?

- Process only loads when it is needed
 - Process startups only when requested
 - Process shuts down when request is finished
 - Frees up memory & resources
 - Example: sshd
 - It is only needed when port 22 is contacted
 - So sshd only runs when something contacts port 22
 - Example: crond
 - It is only needed when there is a crontab
 - So crond only runs when there is a crontab
 - Example: ssh-agent
 - Only needed when opening an ssh connection

Startup in 10.4

- BootROM activate
- /System/Library/CoreServices/BootX
 - Kernel loaded
 - “Booting” image drawn
 - Required kexts loaded
- launchd
 - /etc/rc
 - /System/Library/LaunchDaemons
 - /Library/LaunchDaemons
 - loginwindow

Launchd at startup

- Sockets and file descriptors are registered
 - Services should not “fork” and “daemonize”
 - Launchd will do this for the service
 - This is so that launchd can monitor shutdowns & more
- “Always on” services are started
- If a socket, file descriptor, or file/path is accessed
 - The service that registered is launched
- If service notices no requests, it can shut down
 - Launchd will be aware of the shutdown
 - crond is launched this way

“The Placebo Mini-Pattern”

- `/usr/libexec/WaitingForLoginWindow`
 - Run it anytime!
 - Reads `/var/db/loginwindow.boottime`
 - Image is PART OF BINARY
 - Search MacOSXHints for `WaitingForLoginWindow` for script to replace pdf



Running stuff before loginwindow

- In 10.3 and earlier
 - Modify loginwindow's StartupParameters.plist
- In 10.4
 - Create /etc/rc.local
 - If exists, this is executed by /etc/rc
 - GUI *should* work
 - Still testing, I'm getting strange behavior

Login/logout hooks

- Same as before, except
 - Do not edit /etc/ttys (unless you are using 10.2)
 - In 10.3, you edited
 - /Library/Preferences/com.apple.loginwindow.plist
 - In 10.4, you edit
 - /var/root/Library/Preferences/com.apple.loginwindow.plist
 - BPSystemStarter says these are deprecated (pg 27)
 - File a bug please!!!!
 - Tech Note 301446 says how to do it
- sudo defaults write com.apple.loginwindow LoginHook /path/to/script

Shutdown Items

- SystemStarter scripts had a “Shutdown” function
 - It never worked
 - Until 10.4... (I’ve read, not actually tested)
 - But that is part of SystemStarter, which is going away...
- Launchd will call a service’s SIGTERM
 - This is how to correctly shutdown
 - In other words, it is up to the service

Making LaunchDaemons/Agents

- Assuming you have a service that behaves right
- Edit plist files
 - Required: Label and Program Arguments
 - Should have OnDemand on
 - Many many optional parameters, see:
 - /System/Library/LaunchDaemons for examples
 - “man launchd.plist”
 - BPSystemStartup.pdf (from developer.apple.com)
- Launchd Editor
 - <http://www.codepoetry.net/products/launchdeditor>
 - So much easier, but can't do everything

DEMO

ssh.plist

General Startup Configuration Resource Limits Sockets

Label:

Description:

Program:

Arguments:

ssh.plist

General Startup Configuration Resource Limits Sockets

Listeners

File Socket:
Path:

Network Socket:
Service name:
Family:
Protocol:
Type:
Node name:

Register with Bonjour
Service keys (opt):

Passive

Configuring launchd w/ launchctl

● Modify the run environment

● Run as sudo to change global environment

● This was an impossible task in 10.3

● Limits

● “launchctl limit maxfiles 512”

● “limit descriptors 512”

● “ulimit -n 512”

● Logging

● launchctl log only error critical alert emergency

● This affects launchd (not sure about inheritance)

Configuring launchd w/ launchctl

- Modify the run environment (cont)

- STDOUT, STDERR

- lsof -Pp1

- launchctl stdout /var/log/launchd.out

- Launchd saves it's stdout there

- Environment Variables

- launchctl setenv bla bla2

- Umask

- launchd umask 077

- More, see “launchctl help” or “man launchctl”

Configuring launchd w/ launchctl

- Save launchctl commands
 - /etc/launchd.conf (system settings)
 - \$HOME/.launchd.conf (user settings)
 - Remove “launchctl” from command
 - Example:
umask 077
stdout /var/log/launchd.out
stderr /var/log/launchd.err
- See “man launchd.conf”

I was going to show ssh-agent...

- Anyway who has tried to use it on OS X knows it is a pain
- The ssh-agent binary needs a patch
 - Couldn't get OpenSSL 3.8.1p1 from Apple to compile
 - There are “instructions” at www.opendarwin.org/~landonf/misc/launchd-sshagent
 - It assumes you can compile OpenSSL
 - It assumes you are using OpenSSL 4.0p1
 - 10.4.1 comes with OpenSSL 3.8.1p1
 - I have a 3.8.1 patch file, if you can get OpenSSL to compile...

Resources

- “man” is your friend
 - man launchd
 - man launchd.plist
 - man launchctl
 - man launchd.conf
- BPSystemStartup.pdf from developer.apple.com
- SampleD from developer.apple.com (source code)

Questions