

Getting Started with launchd for Sys Admins

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whoami

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history

- ✦ Released with 10.4 Tiger (2005)
- ✦ Open Source - macosforge.org
- ✦ Replaces init, rc, cron, watchdog SystemStarter and many more
- ✦ launchd runs PID 1
- ✦ 10.7.3
 - ✦ 133 LaunchAgents
 - ✦ 228 LaunchDaemons

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Who can use launchd?

- ✦ Apple (Look, Don't Touch)
- ✦ Developers (Not Covered)
- ✦ Systems Admins (You)

Startup Sequence

Startup Sequence	Event
Power On	Boot-ROM/RAM check is initialized
BootROM-POST	Black screen, power LED on - POST
BootROM-EFI	Boot chime
Boot EFI	Metallic Apple logo - found boot.efi
kernel	Grey screen with Apple and spinning gear
launchd	Blue screen
loginwindow	Login window appears
User Environment Setup	"Logging in...", Desktop and Dock appear

Components

- ✦ launchd
- ✦ **launchd.plist**
- ✦ **launchctl**
- ✦ launchd.conf
- ✦ Check the man pages
 - ✦ Terminal - `man launchd.plist`
 - ✦ Or - developer.apple.com

launchd

- ✦ Responsible for starting the system
 - ✦ Scanning for LaunchDaemons *.plist
- ✦ Start services based on demand
- ✦ Keeps services alive if asked

Agents vs Daemons

LaunchAgents	LaunchDaemons
Runs as logged in user	Runs as root
Loaded at login	Loaded at boot
User interface	No user interface
All Users or Per User	System Level
Multiple Instances / Users	One Instance

man launchd

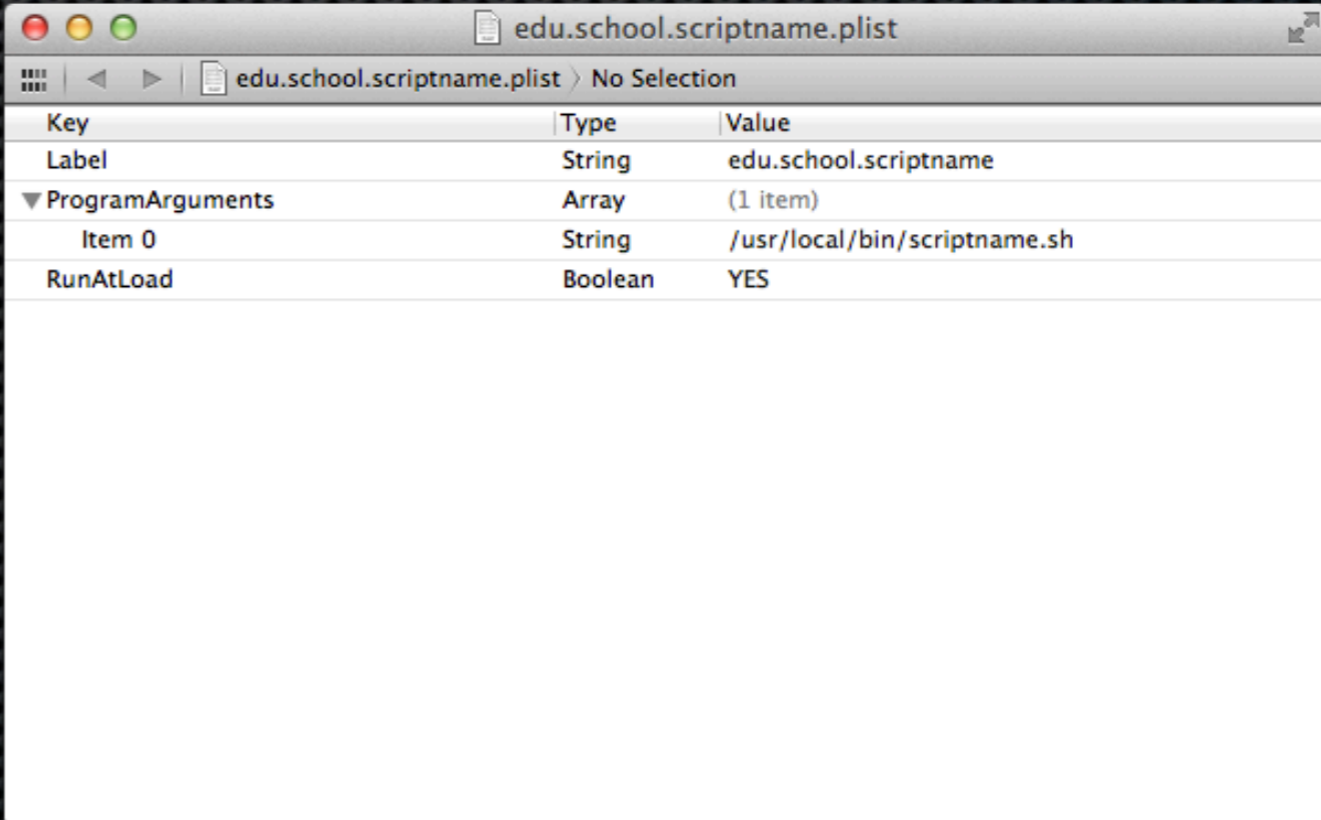
launchd.plist

Location	Purpose
~/Library/LaunchAgents	Per-user agents provided by the user.
/Library/LaunchAgents	Per-user agents provided by the administrator.
/Library/LaunchDaemons	System-wide daemons provided by the administrator.
/System/Library/LaunchAgents	Per-user agents provided by Mac OS X.
/System/Library/LaunchDaemons	System-wide daemons provided by Mac OS X.

man launchd.plist

Basic launchd.plist

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN"
"http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
  <key>Label</key>
  <string>edu.school.scriptname</string>
  <key>ProgramArguments</key>
  <array>
    <string>/usr/local/bin/scriptname.sh</string>
  </array>
  <key>RunAtLoad</key>
  </true>
</dict>
</plist>
```



Key	Type	Value
Label	String	edu.school.scriptname
▼ ProgramArguments	Array	(1 item)
Item 0	String	/usr/local/bin/scriptname.sh
RunAtLoad	Boolean	YES

launchd.plist

- ✦ Required Keys

- ✦ Label - unique identifier (reverse DNS) org.myorg.server.script
- ✦ Program or ProgramArguments /path/to/script.sh
- ✦ Trigger such as RunAtLoad, StartInterval, StartOnMount...

- ✦ Common Keys

- ✦ KeepAlive, WatchPaths, EnvironmentVariables, Disabled, AbandonProcessGroup, StandardOutPath, StartInterval

- ✦ Permissions

- ✦ -rw-r--r-- root wheel (chown root:wheel & chmod 644)

KeepAlive

- ✦ KeepAlive <dict> or <true/>
- ✦ PathState <key> and <true/> or <false/>
 - ✦ Keeps the job running as long as the path does or does not exist
- ✦ SuccessfulExit <boolean>, NetworkState <boolean>
- ✦ Jobs that exit quickly and frequently when configured to be kept alive will be throttled to conserve resources

StartCalendarInterval

- StartCalendarInterval <dict of int or array of dict of integers>
 - Minute <integer> - The minute on which this job will be run.
 - Hour <integer> - The hour on which this job will be run.
 - Day <integer> - The day on which this job will be run.
 - Weekday <integer> - The weekday on which this job will be run (0 and 7 are Sunday).
 - Month <integer> - The month on which this job will be run.

com.apple.periodic-daily

```
<plist version="1.0">
<dict>
  <key>Label</key>
  <string>com.apple.periodic-daily</string>
  <key>ProgramArguments</key>
  <array>
    <string>/usr/sbin/periodic</string>
    <string>daily</string>
  </array>
  <key>LowPriorityIO</key>
  <true/>
  <key>Nice</key>
  <integer>1</integer>
  <key>StartCalendarInterval</key>
  <dict>
    <key>Hour</key>
    <integer>3</integer>
    <key>Minute</key>
    <integer>15</integer>
  </dict>
  <key>AbandonProcessGroup</key>
  <true/>
</dict>
</plist>
```

StartInterval

- ✦ StartInterval <integer>
- ✦ Starts the job every N seconds after job is loaded
- ✦ Based on when loaded (booted) not the system clock
- ✦ Useful for load balancing or randomizing

WatchPaths vs QueueDirectories

- ✦ WatchPaths <array of strings>
 - ✦ Any one of the listed paths are modified
 - ✦ Does not need to exist and creation != modification
- ✦ QueueDirectories <array of strings>
 - ✦ Path is a directory and directory is not empty
 - ✦ Watch out for Finder's .DS_Store files

com.apple.periodic-weekly

```
<key>StartCalendarInterval</key>
<dict>
  <key>Hour</key>
  <integer>3</integer>
  <key>Minute</key>
  <integer>15</integer>
  <key>Weekday</key>
  <integer>6</integer>
</dict>
```

com.apple.periodic-monthly

```
<key>StartCalendarInterval</key>
<dict>
  <key>Hour</key>
  <integer>5</integer>
  <key>Minute</key>
  <integer>30</integer>
  <key>Day</key>
  <integer>1</integer>
</dict>
```

com.apple.backupd-auto

```
<key>StartInterval</key>
<integer>3600</integer>
```

com.apple.backupd-attach

```
<key>StartOnMount</key>
<true/>
```

com.apple.ReportPanic

```
<key>QueueDirectories</key>
<array>
  <string>/var/db/PanicReporter/</string>
</array>
```

com.apple.AppStoreUpdateAgent

```
<key>StartInterval</key>
<integer>14400</integer>
```

com.vix.cron

```
<key>KeepAlive</key>
<dict>
  <key>PathState</key>
  <dict>
    <key>/etc/crontab</key>
    <true/>
  </dict>
</dict>
```

Program vs ProgramArguments

```
<key>Program</key>
```

```
  <string>/usr/local/bin/myScript.sh</string>
```

```
<key>ProgramArguments</key>
```

```
  <array>
```

```
    <string>/usr/local/bin/myScript.sh</string>
```

```
    <string>-selfDestruct</string>
```

```
  </array>
```

AbandonProcessGroup

- Boolean `<true/>` or `<false/>`
- When a job dies, `launchd` kills any remaining processes with the same process group ID as the job. Setting this key to `true` disables that behavior. (man `launchd.plist`)
- Use with quick running scripts that send emails
- Use ``sleep`` as an alternative in your script

Logging

- ✦ `StandardOutPath <string>/path/to/log.log</string>`
 - ✦ All logging done by your script and any commands called by your script
- ✦ `StandardErrorPath <string>`
 - ✦ Logs all errors, can be the same as `StandardOutPath`
- ✦ Logs need to be writable by launchd's User

launchctl

- User specific (Use sudo)
- list [<job label>]
 - `launchctl list edu.school.scriptname`
 - `- 0 edu.school.scriptname`
- load / unload <path to .plist>, [-w] to modify Disabled key or [-F] to ignore
 - `launchctl load /Library/LaunchDaemons/edu.school.scriptname.plist`
- start / stop <job label>
 - `launchctl stop edu.school.scriptname`

launchd.conf

- ✦ /etc/launchd.conf
 - ✦ `setenv DYLD_LIBRARY_PATH /usr/local/oracle/instantclient`
- ✦ \$HOME/.launchd.conf
 - ✦ Your launchd configuration file (currently unsupported).

Variations

- ✦ 10.4
 - ✦ OnDemand (Defaults to true)
 - ✦ 60 Second Run Minimum x 10 attempts before unload
- ✦ 10.5
 - ✦ LimitLoadToSessionType (Aqua)
 - ✦ KeepAlive (Replaces OnDemand)
- ✦ 10.6
 - ✦ Disabled - /private/var/db/launchd.db/
 - ✦ com.apple.launchd/overrides.plist
 - ✦ com.apple.launchd.peruser.\$UID/overrides.plist

Creating your own scripts

- ✦ Location
 - ✦ /Library/Scripts, /usr/local/
- ✦ Dependancies
 - ✦ Network, Volumes, Hardware, Directory Services
- ✦ Environment
 - ✦ #!/bin/bash, \$PATH, exit 0
- ✦ Cleanup first boot scripts (rm .plist, srm \$0)

Demo

Resources

- Tools

Xcode (Property List Editor), Lingon, `defaults` or any plain text editor

- man pages

developer.apple.com/documentation/darwin/reference/manpages

- AFP548 launchd in depth

www.afp548.com/article.php?story=20050620071558293

- Launchd: One Program to Rule them All with Dave Zarzycki

video.google.com/videoplay?docid=9134517895937683240

Questions