Launchd Cheatsheet

Job Definition Locations

Type	Location	Run on behalf of
User Agents	/Library/LaunchAgents	Current user
Global Agents	/Library/LaunchAgents	Current user
Global Daemons	/Library/LaunchDaemons	Root/specified user
System Agents	/System/Library/LaunchAgents	Current user
System Daemons	/System/Library/LaunchDaemons	Root/specified user

Basic Job Definition Example

```
<?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>com.example.app</string>
      <key>Program</key>
      <string>/Users/aipgadmin/TEST.sh</string>
      <key>RunAtLoad</key>
      <true/>
  </dict>
</plist>
```

Basic Job Definition Keys

Option Name	What is it for?	Required?
Label	Job identifier, must be unique for the launchd instance. Written in reverse domain notation.	Yes
Program	Specifies the complete path to your executable.	Maybe???
ProgramArguments	Used in place of "Program" if your executable requires command line args	No

Environment Modification Keys

Option Name	What is it for?	Required?
EnvironmentVariables	Used to customize the environment the program runs in	No
StandardInPath, StandardOutPath, StandardErrorPath	Used to redirect stdin, stdout, and stderr, when given a path as a key value.	No
Working Directory	Used to set the working directory of the executable.	No.
SoftResourceLimit/ HardResourceLimit	Constrain the resources the executable has access to. More details on the subpoptions in the "Resource Constraint Types" table.	No

Permissions and Security Keys

Option Name	What is it for?	Required?
UserName/GroupName	Specifies the user and group the job should run as. Will be ignored when specified for an agent.	No
InitGroups	Specifies whether launchd should call the function initgroups(3) before starting the job. Will be ignored when specified for an agent.	No
Umask	Specifies a set of default perms a file/folder will have if created by this job	No
RootDirectory	Causes the job to treat the supplied value as the root of the fs. You will need copies of all files needed for this job in the supplied directory.	No

Runtime Option Keys

Option Name	What is it for?	Required?
RunAtLoad	Tells the job to start as soon as it is loaded.	No
Start Interval	Tells the job to execute every "n" seconds.	No
StartIntervalCalendar	Tells job to run at a specific time (i.e. every day at 3am). Can be configured based on Month, Day, Weekday, Hour, or Minute	No
StartOnMount	Tells job to run any time a device is mounted (so when you add a new hard drive or insert a usb)	No
WatchPaths	Tells job to Run when any of the supplied list of files is modified.	No
QueueDirectories	Tells job to run whenever one of the supplied list of directories is *not* empty.	No
KeepAlive	Tells job to stay alive depending on a given condition. These conditions can be found in the "Keepalive Suboptions" table	No
AfterInitialDemand	When applied to jobs with the keys **RunAtLoad**, **StartCalendarInterval**, **WatchPaths**, or **KeepAlive**, it causes the job to ignore these keys until the job has been started manually.	No

Performance Keys

Option Name	What is it for?	Required?
LegacyTimers	Controls the behavior of timers created by the job. If set to true, this will cause timers created by the job to opt into less energy efficient but more precise behavior (will not be batched with other timers)	No
Nice	Run the job with a specified scheduling priority. -20 is selfish, will have highest priority, while 20 is very nice and takes a backseat.	No

Miscellaneous Keys

Option Name	What is it for?	Required?
AbandonProcessGroup	Allows child processes to outlive their parents rather than being reaped by SIGTERM	No
ExitTimeOut	Forcequits if SIGTERM does not kill the processes within the given number of seconds after the job's completion.	No
TimeOut	Suggested idle time before the job should quit.	No
ThrottleInterval	Time in seconds to wait between invocations. Use with KeepAlive to run a job every n seconds while a certain condition applies.	No

Resource constraint types

Resource Type	Description
CPU	Max num of cpu time (in sec) the process can use without being killed)
FileSize	Max size for program-created files.
NumberOfFiles	Max number of files this program can create
Core	Max size core file this process can create
Data	Max size of memory allocated to the process (in bytes)
MemoryLock	Max amount of memory (in bytes) that can be locked into physical memory
NumberOfProcesses	Max number of processes that can be created with the same uid.
ResidentSetSize	Max amount of physical memory in bytes this process should get
Stack	Max stack size for the process.

KeepAlive Suboptions

KeepAlive Suboption Key	Suboption Description
N/A	Restart anytime the process goes down.
SuccessfulExit	If set to "true", the job will be restarted until it fails; if set to "false", the job will be restarted until it succeeds.
Crashed	Used to restart the program if it crashes. If set to "true" the process will be restarted after it crashed; if set to false, the program will be restarted *unless* it crashed.
NetworkState	Setting this to "true" will start the job when any network is or becomes available; setting it to "false" starts the job only when/while all network connections are down.
PathState	Keeps a job alive as long as a given path exists (if set to "true"), or does not exist (if set to "false").
OtherJobEnabled	If set to "false", this option keeps a job alive if the specified job is not loaded, and terminates it when it is, and vice versa.

StartCalendarInterval Date Keys

Key	Description	Regular Values
Month	Month of year	1-12
Day	Day of month	1-31
Weekday	Day of week	0-7, with both 0 and 7 being Sunday
Hour	Hour of day	0-23
Minute	Minute of Hour	0-59

Cron-style Syntax Reminders

Cron Syntax Mechanism	Example Syntax	Cron Syntax Notes
Wildcarding	*	Will execute program for any value in the valid range of the wildcarded field.
Ranges	n-m	Ranges are separated with a hypen. The specified range is inclusive.
Lists	0-5,10-15,28	A comma-separated list of ranges and/or numbers.
Step Values	0-31/2 or */n	Can be used to specify execution every "n" days. Step values can also be included in lists

Umask Values Key

Digit	Granted Permissions
0	read, write, execute/search
1	read, write
2	read, execute/search
3	read only
4	write, execute
5	write only
6	execute/search only
7	none

Defining permissions Based on Umask Values

The values given above are octal, but when we define our umask, we will need a trio of octal digits. As per usual, the first digit defines perms given to the user who owns it, second digit defines perms for the group, and last digit defines perms for everyone else. These digits, however, are represented in octal, so after we compose them, we will need to convert to the decimal format expected by the **Umask** key. We can do so using the following command:

```
\$ echo "obase=10;ibase=8; \textlangle{}3_digit_combo\textrangle{}" | bc
```

Launchd Basic Operational Commands

Command/Action	Wat do?	expected output
$ launchctl list	Returns a list of all currently loaded jobs.	List of all currently loaded jobs
$ launchctl load /path/to/job/definition/file	Loads job manually.	N/A if success
$ launchctl unload /path/to/job/definition/file	Unloads job manually.	N/A if success
$ launchctl start ⟨job_label⟩	Manually starts job. Must be loaded before starting.	N/A if success
$ launchctl stop ⟨job_label⟩	Manually stops job	N/A if success
$ launchctl unload -w /path/to/job/definition/file	Permanently unloads job using the "overrides" database.	N/A if success
$ launchctl load -w /path/to/job/definition/file	Permanently loads job using the "overrides" database.	N/A if success
$ sudo /usr/libexec/Plistbuddy /var/db/launchd.db/com.apple.launchd.peruser.\ ‘echo $UID‘/overrides.plist -c Delete:⟨job_label⟩	Deletes an **agent** job from the overrides database	N/A if success

Removing a job from the Override Database (Post-Yosemite)

1. **Boot into recovery mode**
   (a) Restart your mac
   (b) Hold down cmd-R before OSX starts up until the Apple logo appears. After it finishes restarting, you will see a desktop with an OSX menu bar and an OSX Utilities Window.
   (c) Select "Terminal" from the Utilities menu.
2. **Disable System Integrity Protection (If El Capitan or later)**
   (a) Enter the command "csrutil disable" into the terminal.
   (b) If successful, you will see a message stating that System Integrity Protection has been disabled.
3. **Remove Job from the override database**
   - **For Agents:** $ /usr/libexec/Plistbuddy /var/db/com.apple.xpc.launchd/disabled.‘id -u‘.plist -c Delete:⟨job_label⟩
   - **For Daemons:** $ /usr/libexec/Plistbuddy /var/db/com.apple.xpc.launchd/disabled.plist -c Delete:⟨job_label⟩
4. **Restore System Integrity Protection (If El Capitan or later)**
   (a) Enter the command "csrutil enable" into the terminal.
   (b) If successful, you will see a message stating that System Integrity Protection has been enabled.
5. **Reboot to exit recovery mode**