What Is a Process Tree?

• If you **write your own shell**, that shell process becomes the **parent** of each command it spawns.

• A "**process tree**" is just a hierarchical view showing the **root** of all processes at the top, and each child branching below its parent, etc.

```
[Shell>ps -axj

Inside Child Process with PID: 10602
Executing Command: ps

USER              PID  PPID  PGID   SESS JOBC STAT   TT       TIME COMMAND
root                1     0     1      0    0 Ss     ??  177:15.51 /sbin/launc
root               83     1    83      0    0 Ss     ??  173:35.86 /usr/libexe
root               85     1    85      0    0 Ss     ??    8:03.91 /usr/libexe
root               87     1    87      0    0 Ss     ??    1:16.36 /System/Lib
root               88     1    88      0    0 Ss     ??   55:17.96 /System/Lib
root               92     1    92      0    0 Ss     ??   10:05.23 /usr/sbin/s
root               95     1    95      0    0 Ss     ??   15:52.09 /usr/libexe
root               97     1    97      0    0 Ss     ??   21:43.61 /System/Lib
root               98     1    98      0    0 Ss     ??    0:00.01 /usr/libexe
root              103     1   103      0    0 Ss     ??    0:04.80 /usr/libexe
root              108     1   108      0    0 Ss     ??    1:20.12 /usr/libexe
root              112     1   112      0    0 Ss     ??  108:42.91 /System/Lib
root              114     1   114      0    0 Ss     ??    0:11.43 /usr/libexe
root              115     1   115      0    0 Ss     ??    5:54.78 /usr/libexe
root              119     1   119      0    0 Ss     ??    2:21.04 /usr/sbin/s
root              122     1   122      0    0 Ss     ??    5:19.90 /usr/libexe
root              123     1   123      0    0 Ss     ??  113:12.05 /usr/libexe
root              124     1   124      0    0 Ss     ??    9:13.41 /System/Lib
root              125     1   125      0    0 Ss     ??   54:56.24 /System/Lib
_timed            126     1   126      0    0 Ss     ??    1:29.50 /usr/libexe
_usbmuxd          127     1   127      0    0 Ss     ??    0:14.70 /System/Lib
root              128     1   128      0    0 Ss     ??    1:59.33 /usr/sbin/s
_locationd        130     1   130      0    0 Ss     ??   68:20.46 /usr/libexe
root              132     1   132      0    0 Ss     ??    0:00.18 autofsd
root              133     1   133      0    0 Ss     ??   27:06.80 /usr/libexe
_distnote         135     1   135      0    0 Ss     ??    8:26.24 /usr/sbin/d
root              139     1   139      0    0 Ss     ??    0:20.24 /System/Lib
root              140     1   140      0    0 Ss     ??    0:07.35 /System/Lib
root              141     1   141      0    0 Ss     ??    0:00.12 /usr/sbin/K
root              145     1   145      0    0 Ss     ??   16:11.43 /usr/sbin/n
root              147     1   147      0    0 Ss     ??   82:59.38 /usr/libexe
root              148     1   148      0    0 Ss     ??   12:05.11 /usr/libexe
root              149     1   149      0    0 Ss     ??    0:29.67 /System/Lib
_windowserver     150     1   150      0    0 Ss     ??  5052:42.19 /System/Lib
root              151     1   151      0    0 Ss     ??   18:50.66 /usr/sbin/c
parulahlawat      153     1   153      0    0 Ss     ??   59:35.07 /System/Lib
root              155     1   155      0    0 Ss     ??   83:02.19 /usr/libexe
root              156     1   156      0    0 Ss     ??   10:57.38 /System/Lib
root              159     1   159      0    0 Ss     ??    3:47.73 /usr/libexe
root              161     1   161      0    0 Ss     ??    2:00.14 /System/Lib
```

```
Shell>pstree

Inside Child Process with PID: 16646
Executing Command: pstree

-+= 00001 root /sbin/launchd
 |--= 00083 root /usr/libexec/logd
 |--= 00085 root /usr/libexec/UserEventAgent (System)
 |--= 00087 root /System/Library/PrivateFrameworks/Uninstall.framework/Resources/uninstalld
 |--= 00088 root /System/Library/Frameworks/CoreServices.framework/Versions/A/Frameworks/FSEvents.framework/
 |-+= 00092 root /usr/sbin/systemstats --daemon
 | \--- 00369 root /usr/sbin/systemstats --logger-helper /private/var/db/systemstats
 |--= 00095 root /usr/libexec/configd
 |--= 00097 root /System/Library/CoreServices/powerd.bundle/powerd
 |--= 00098 root /usr/libexec/IOMFB_bics_daemon
 |--= 00103 root /usr/libexec/remoted
 |--= 00108 root /usr/libexec/watchdogd
 |--= 00112 root /System/Library/Frameworks/CoreServices.framework/Frameworks/Metadata.framework/Support/mds
 |--= 00114 root /usr/libexec/kernelmanagerd
 |--= 00115 root /usr/libexec/diskarbitrationd
 |--= 00119 root /usr/sbin/syslogd
 |--= 00122 root /usr/libexec/thermalmonitord
 |--= 00123 root /usr/libexec/opendirectoryd
 |--= 00124 root /System/Library/PrivateFrameworks/ApplePushService.framework/apsd
 |--= 00125 root /System/Library/CoreServices/launchservicesd
 |--= 00126 _timed /usr/libexec/timed
 |--= 00127 _usbmuxd /System/Library/PrivateFrameworks/MobileDevice.framework/Versions/A/Resources/usbmuxd -
 |--= 00128 root /usr/sbin/securityd -i
 |--= 00130 _locationd /usr/libexec/locationd
 |--= 00132 root autofsd
 |--= 00133 root /usr/libexec/dasd
 |--= 00135 _distnote /usr/sbin/distnoted daemon
 |--= 00139 root /System/Library/CoreServices/logind
 |--= 00140 root /System/Library/PrivateFrameworks/GenerationalStorage.framework/Versions/A/Support/revision
 |--= 00141 root /usr/sbin/KernelEventAgent
 |--= 00145 root /usr/sbin/notifyd
 |--= 00147 root /usr/libexec/corebrightnessd --launchd
 |--= 00148 root /usr/libexec/AirPlayXPCHelper
 |--= 00149 root /System/Library/Frameworks/CoreMediaIO.framework/Versions/A/Resources/com.apple.cmio.regist
 |--= 00150 _windowserver /System/Library/PrivateFrameworks/SkyLight.framework/Resources/WindowServer -daemo
 |--= 00151 root /usr/sbin/cfprefsd daemon
 |--= 00153 parulahlawat /System/Library/CoreServices/loginwindow.app/Contents/MacOS/loginwindow console
 |--= 00155 root /usr/libexec/runningboardd
 |--= 00156 root /System/Library/PrivateFrameworks/CoreDuetContext.framework/Resources/contextstored
 |--= 00159 root /usr/libexec/lsd runAsRoot
```

"**visualizing the process tree**" to see that your custom shell has created child processes, they generally mean using a command or tool that displays **which processes are running** and **who spawned whom** (i.e., the parent-child relationships).