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CSEN 602: Operating Systems – Spring '18

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Mini-Project I – Report

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## 1. Part I – System Calls

### 1.1 System Call #1:

- System call command: `ps -A`
- Output screenshot:

```
Khadijas-MacBook-Air:Sprint0 khadijahammoud$ ps -A
  PID TTY          TIME CMD
    1 ??        2:41.07 /sbin/launchd
   36 ??        0:08.80 /usr/sbin/syslogd
   37 ??        0:21.73 /usr/libexec/UserEventAgent (System)
   39 ??        0:04.49 /System/Library/PrivateFrameworks/Uninstall.framework/
   40 ??        0:26.75 /usr/libexec/kextd
   41 ??        0:43.01 /System/Library/Frameworks/CoreServices.framework/Vers
   43 ??        0:03.51 /System/Library/PrivateFrameworks/MediaRemote.framework
   46 ??        0:01.18 /System/Library/CoreServices/appleeventsd --server
   47 ??        0:27.10 /usr/libexec/configd
   48 ??        0:11.98 /System/Library/CoreServices/powerd.bundle/powerd
   49 ??        0:03.53 /usr/libexec/mobileassetd
   54 ??        0:31.50 /usr/libexec/logd
   58 ??        2:40.02 /usr/libexec/airportd
   60 ??        0:00.71 /usr/libexec/warmd
   61 ??        1:39.15 /System/Library/Frameworks/CoreServices.framework/Fram
   66 ??        0:00.05 /System/Library/CoreServices/iconservicesagent
   67 ??        0:00.09 /System/Library/CoreServices/iconservicesd
   69 ??        0:00.81 /usr/libexec/diskarbitrationd
   71 ??        0:32.57 /usr/libexec/coreduetd
   72 ??        0:00.04 /usr/libexec/wdhelper
   77 ??        1:13.99 /usr/libexec/opaiddirectord
   78 ??        0:10.56 /usr/sbin/wirelessproxd
   80 ??        0:21.74 /System/Library/PrivateFrameworks/ApplePushService.fra
   81 ??        0:00.01 /Library/PrivilegedHelperTools/com.docker.vmmnetd
   82 ??        0:00.08 /System/Library/PrivateFrameworks/Noticeboard.framework
   83 ??        0:19.02 /System/Library/CoreServices/launchservicesd
   84 ??        0:03.40 /System/Library/PrivateFrameworks/MobileDevice.framewo
   85 ??        0:10.88 /usr/sbin/securityd -i
   87 ??        0:28.01 /usr/libexec/locationd
   89 ??        0:18.83 /usr/libexec/DuetHeuristic-BM
   90 ??        0:00.24 /usr/libexec/displaypolicyd -k 1
   91 ??        0:52.93 /usr/sbin/blued
   92 ??        0:00.04 autofsd
   95 ??        0:00.28 /System/Library/PrivateFrameworks/Heimdal.framework/He
   97 ??        0:03.11 /System/Library/PrivateFrameworks/GenerationalStorage.
   98 ??        0:44.93 /System/Library/CoreServices/loginwindow.app/Contents/
   99 ??        0:00.27 /System/Library/CoreServices/loginind
  100 ??        0:00.02 /usr/sbin/KernelEventAgent
  102 ??       12:29.78 /usr/libexec/hidd
  103 ??        0:00.94 /usr/libexec/corebrightnessd --launchd
  104 ??        0:01.28 /usr/libexec/AirPlayXPCHelper
  105 ??        0:19.54 /usr/sbin/notifyd
  106 ??        0:17.32 /usr/sbin/distnoted daemon
  107 ??        0:01.43 /usr/libexec/amfid
  108 ??        0:10.13 /usr/sbin/cfprefsd daemon
  110 ??        0:02.32 /System/Library/CoreServices/coreservicesd
  111 ??        0:01.11 /System/Library/Frameworks/Security.framework/Versions
  115 ??        0:00.37 aslmanager
  120 ??        0:00.06 /System/Library/Frameworks/PCSC.framework/Versions/A/X
  121 ??        0:18.09 /usr/libexec/trustd
  126 ??        0:00.06 /System/Library/Frameworks/CryptoTokenKit.framework/ct
  134 ??       62:58.26 /System/Library/PrivateFrameworks/SkyLight.framework/R
```

- Brief description of the output: *“ps” is used to provide information about the currently running processes, including their PIDs. “ps -A” is a system call that lists the processes of all users of the system rather than just those of the current user.*

## 1.2 System Call #2:

- System call command:
  - ps aux*
  - top*
- Output screenshot:

- ps aux*

```

Khadijas-MacBook-Air:Sprint0 khadijahammoud$ ps aux
USER                PID  %CPU %MEM    VSZ   RSS Tt  STAT  STARTED      TIME COMMAND
khadijahammoud     3645   2.8   2.8  3912972 237064 ??  Ss   2:59PM   0:10.89 /System/Library/
khadijahammoud     488    1.5   0.4  2682076 35640  ??  S    Fri03PM   1:33.18 /Applications/On
khadijahammoud    2726    1.3   4.7  6902020 396008  ??  S    Wed12AM  11:05.81 /Users/khaledham
khadijahammoud     531    1.0   0.2  7135336 13652  ??  S    Fri03PM  18:09.68 com.docker.hyper
_windowserver      134    0.8   1.9  4152664 161404  ??  Ss   Fri03PM  61:23.89 /System/Library/
khadijahammoud    1786    0.7   0.3  2650964 21232  ??  S    Mon01AM   0:46.46 /Applications/Ut
khadijahammoud    3639    0.1   0.4  2504352 33148  ??  S    2:56PM   0:01.31 /System/Library/
khadijahammoud    3586    0.0   0.3  2490168 29328  ??  S    2:21PM   0:00.35 /System/Library/
khadijahammoud    3585    0.0   0.3  2489144 29072  ??  S    2:19PM   0:00.40 /System/Library/
khadijahammoud    3580    0.0   0.5  2566120 44692  ??  Ss   2:19PM   0:01.01 /System/Library/
khadijahammoud    3575    0.0   2.3  2840952 196084  ??  S    2:19PM   0:20.41 /Applications/Pa
_spotlight         3498    0.0   0.2  2501364 15204  ??  S    12:08PM   0:00.09 /System/Library/
khadijahammoud    3390    0.0   0.2  2474764 13304  ??  Ss   12:07PM   0:00.08 /Library/Frameworko
khadijahammoud    3356    0.0   0.3  2575396 21412  ??  Ss   12:07PM   0:00.28 /System/Library/
root               3316    0.0   0.0  2445360 2116  ??  SNs   12:07PM   0:00.01 /usr/libexec/per
root               3315    0.0   0.0  2453552 2128  ??  SNs   12:07PM   0:00.01 /usr/libexec/per
khadijahammoud    3259    0.0   0.1  2500984 7196  ??  Ss    1:56AM   0:00.11 /System/Library/
khadijahammoud    3258    0.0   0.1  2525300 11488  ??  S    1:56AM   0:00.58 /System/Library/
khadijahammoud    3257    0.0   0.1  2558244 10756  ??  S    1:56AM   0:00.75 /System/Library/
khadijahammoud    3251    0.0   0.1  2508068 11516  ??  S    1:47AM   0:00.44 /System/Library/
khadijahammoud    3245    0.0   0.1  2516588 11640  ??  S    1:47AM   0:00.48 /System/Library/
khadijahammoud    3200    0.0   0.0  2469896 2704  ??  Ss   12:51AM   0:00.02 /System/Library/
khadijahammoud    3197    0.0   2.9  3574476 240920  ??  S    12:51AM   1:33.37 /Applications/Wh
khadijahammoud    3196    0.0   0.4  2734364 32680  ??  S    12:51AM   0:13.20 /Applications/Wh
khadijahammoud    3195    0.0   1.0  3707416 83672  ??  S    12:51AM   1:02.61 /Applications/Wh
khadijahammoud    3186    0.0   0.2  3705156 20388  ??  Ss   12:38AM   0:00.98 /System/Library/
khadijahammoud    3144    0.0   0.3  2527752 25060  ??  S    11:30PM   0:00.73 /System/Library/
khadijahammoud    3112    0.0   0.6  3802796 54260  ??  Ss   10:24PM   0:04.48 /System/Library/
khadijahammoud    3086    0.0   0.3  2497392 22920  ??  Ss   10:08PM   0:00.44 /System/Library/
khadijahammoud    3085    0.0   0.0  2495740 3636  ??  S    10:08PM   0:00.04 /System/Library/
khadijahammoud    3084    0.0   0.7  3887212 57724  ??  S    10:08PM   0:07.06 /Applications/Me
khadijahammoud    2962    0.0   0.2  2541684 18440  ??  S    4:28PM   0:01.16 /System/Library/
khadijahammoud    2886    0.0   0.1  6026752 5804  ??  S    Wed10AM   0:22.99 /Library/Java/Ja
khadijahammoud    2762    0.0   0.3  4009768 23020  ??  Ss   Wed12AM   0:13.65 /System/Library/
khadijahammoud    2683    0.0   0.0  2496296 1804  ??  S    Wed12AM   0:00.12 /System/Library/
khadijahammoud    2643    0.0   0.0  2500640 748  ??  S    Wed12AM   0:00.48 /System/Library/
khadijahammoud    2625    0.0   0.4  2594332 31892  ??  Ss   Tue11PM   0:03.10 /System/Library/
_assetcache       2623    0.0   0.0  2497204 2032  ??  Ss   Tue11PM   0:00.34 /System/Library/
khadijahammoud    2618    0.0   1.1  3054272 88508  ??  S    Tue11PM   0:35.42 /Applications/Ke
khadijahammoud    2613    0.0   0.7  3757728 57912  ??  Ss   Tue11PM   0:16.26 /System/Library/
_datadetectors    2526    0.0   0.0  2470344 12  ??  Ss   Tue12PM   0:00.03 /usr/libexec/Dat
khadijahammoud    2427    0.0   0.0  2496332 988  ??  Ss   Mon01PM   0:00.09 /System/Library/
khadijahammoud    2426    0.0   0.0  2461704 732  ??  Ss   Mon01PM   0:00.04 /System/Library/
khadijahammoud    2423    0.0   0.3  3998844 29324  ??  Ss   Mon01PM   0:57.34 /System/Library/
khadijahammoud    2411    0.0   0.2  3847216 16784  ??  Ss   Mon01PM   0:05.10 /System/Library/
khadijahammoud    2311    0.0   0.0  2470044 988  ??  S    Mon10AM   0:00.06 /System/Library/
khadijahammoud    2040    0.0   0.0  2473660 1720  ??  Ss   Mon04AM   0:00.11 /System/Library/
root              2037    0.0   0.0  2469648 1468  ??  Ss   Mon04AM   0:00.07 /System/Library/
khadijahammoud    2005    0.0   0.0  2470188 1820  ??  Ss   Mon03AM   0:00.24 /System/Library/
khadijahammoud    1968    0.0   0.0  2499696 3412  ??  S    Mon02AM   0:00.38 /System/Library/
_spotlight        1842    0.0   0.0  2497044 548  ??  S    Mon01AM   0:00.87 /System/Library/
khadijahammoud    1788    0.0   0.0  2461044 1116 s001 S    Mon01AM   0:00.35 -bash
root              1787    0.0   0.0  2469468 8 s001 Ss   Mon01AM   0:00.04 login -pf khadij
khadijahammoud    1745    0.0   0.1  3572028 6236  ??  Ss   Mon01AM   0:04.74 /System/Library/
khadijahammoud    1736    0.0   0.0  2497172 856  ??  S    Mon01AM   0:00.14 /System/Library/
khadijahammoud    1734    0.0   0.0  2514476 2212  ??  Ss   Mon01AM   0:00.73 /System/Library/
khadijahammoud    1733    0.0   0.0  2497456 2020  ??  S    Mon01AM   0:00.25 /System/Library/
khadijahammoud    1614    0.0   0.0  2513540 764  ??  Ss   Mon12AM   0:00.10 /System/Library/
khadijahammoud    1613    0.0   0.1  2589964 7164  ??  Ss   Mon12AM   0:15.29 /System/Library/
khadijahammoud    1611    0.0   0.0  2470256 2364  ??  S    Mon12AM   0:00.09 /System/Library/

```

## o *top*

11:46:00

Processes: 310 total, 2 running, 308 sleeping, 1356 threads  
 Load Avg: 1.96, 1.69, 1.58 CPU usage: 1.92% user, 3.36% sys, 94.71% idle SharedLibs: 207M resident, 47M data, 25M linkedit. MemRegions: 52198 total, 2270M resident, 95M private, 790M shared.  
 PhysMem: 6359M used (1695M wired), 1831M unused. VM: 1985G vszize, 627M framework vszize, 199957064(0) swapins, 201240063(0) swapouts. Networks: packets: 2650088/1145M in, 927978/153M out.  
 Disks: 4884296/7856 read, 6164408/8076 written.

A442	COMMAND	%CPU	TIME	#TH	#WQ	#PORT	MEM	PURG	CMPRS	PGRP	PPID	STATE	BOOSTS	%CPU_ME	%CPU_OTHRS	UID	FAULTS	COW	MSGSENT	MSGRECV	SYSBSD	SYSMACH	CSW
8442	screencaptur	0.0	00:00.26	4	3	57	2376K	20K	0B	290	290	sleeping	#0[1]	0.00000	0.79976	501	15215+	248	2757+	579+	1625+	5661+	1591+
8441	top	3.0	00:00.77	1/1	0	21	3788K	0B	0B	8441	8362	running	#0[1]	0.00000	0.00000	0	6783+	110	236418+	118165+	19030+	152689+	1166+
8432	netbiosd	0.0	00:00.05	2	2	30	2448K	0B	0B	8432	1	sleeping	#0[1]	0.00000	0.00000	222	4218	162	145	36	1181	280	1493
8425	mdworker	0.0	00:00.06	3	1	55	3836K	0B	0B	8425	1	sleeping	#0[1]	0.00000	0.00000	501	6217	207	593	249	4509	699	184
8421	QuickLookSat	0.0	00:00.46	2	1	45	13M	640K	0B	8421	1	sleeping	#0[8]	0.00000	0.00000	501	36774	1014	721	234	10497	1178	2905
8420	mdworker	0.0	00:00.00	3	1	55	8720K	0B	0B	8420	1	sleeping	#0[1]	0.00000	0.00000	501	9470	377	1133	459	129137	1280	10467
8416	quicklookd	0.0	00:00.70	4	1	110	9968K	92K	0B	8416	1	sleeping	#0[17]	0.00000	0.00000	501	19386	1083	1699	639	32051	3149	3884
8414	com.apple.We	0.0	00:45.17	6	1	221	89M	18M	0B	8414	1	sleeping	#0[25799]	0.00000	0.00000	501	70514	3441	214060	102738	467051	795079	350660
8409	MTLCompilerS	0.0	00:00.15	2	2	32	9984K	0B	0B	8409	1	sleeping	#0[2]	0.00000	0.00000	501	7835	435	164	57	690	364	933
8405	mdworker	0.0	00:00.18	3	1	55	7448K	0B	0B	8405	1	sleeping	#0[1]	0.00000	0.00000	501	8906	376	618	265	14241	713	1853
8388	mdworker	0.0	00:00.51	4	1	47	14M	0B	0B	8388	1	sleeping	#0[1]	0.00000	0.00000	501	14886	189	1963	766	5854	2163	2104
8387	mdworker	0.0	00:00.35	4	1	47	13M	0B	0B	8387	1	sleeping	#0[1]	0.00000	0.00000	501	12112	187	1156	437	4305	1400	1752
8383	VTDecoderXPC	0.0	00:00.03	2	1	34	2500K	0B	0B	8383	1	sleeping	#0[4]	0.00000	0.00000	501	4424	157	159	52	708	359	171
8382	AlertNotific	0.0	00:00.02	2	2	26	976K	0B	0B	8382	1	sleeping	#0[1]	0.00000	0.00000	501	3817	146	133	43	553	253	195
8381	Google Chrom	0.0	00:00.00	10	1	109	24M	0B	0B	8377	8377	sleeping	#0[1]	0.00000	0.00000	501	28282	1652	9181	3752	9445	19102	7943
8379	crashpad_han	0.0	00:00.01	4	1	27	944K	0B	0B	8378	1	sleeping	#0[1]	0.00000	0.00000	501	3337	137	59	21	438	130	140
8377	Google Chrom	0.0	00:05.57	33	1	432	50M	296K	0B	8377	1	sleeping	#0[110]	0.00000	0.00000	501	51491	1915	37631	13146	68359	112608	51638
8372	com.apple.sp	0.0	00:00.07	2	1	53	2500K	0B	0B	8372	1	sleeping	#0[0]	0.00000	0.00000	501	4573	160	330	127	10642	587	539
8370	mdworker	0.0	00:00.39	4	1	47	12M	0B	0B	8370	1	sleeping	#0[1]	0.00000	0.00000	501	13092	189	1260	473	4076	1550	1477
8368	mdworker	0.0	00:00.47	4	1	47	12M	0B	0B	8368	1	sleeping	#0[1]	0.00000	0.00000	501	13862	189	2067	799	6213	2328	1997
8362	bash	0.0	00:00.02	1	0	16	788K	0B	0B	8362	8361	sleeping	#0[1]	0.00000	0.00000	501	1655	430	74	31	2080	122	158
8361	login	0.0	00:00.02	2	1	28	1012K	0B	0B	8361	271	sleeping	#0[9]	0.00000	0.00000	0	2979	106	156	47	1576	251	359
8349	IMDPersisten	0.0	00:00.06	2	1	61	2084K	44K	0B	8349	1	sleeping	#0[5]	0.00000	0.00000	501	6580	175	326	142	2532	777	873
8347	systemstat	0.0	00:00.71	2	2	27	6436K	0B	0B	8347	1	sleeping	#0[1]	0.00000	0.00000	0	7551	195	123	46	171058	257	1061
8341	captivesagent	0.0	00:00.05	4	1	47	2244K	0B	0B	8341	1	sleeping	#*[1]	0.00000	0.00000	258	3794	149	148	115	3032	472	713
8339	syncdefaults	0.2	00:07.30	4	2	140	14M	0B	0B	8339	1	sleeping	#0[21]	0.00000	0.00000	501	15579	265	29238+	25402+	26917	157043+	42361+
8338	com.apple.au	0.0	00:00.03	2	2	21	920K	0B	0B	8338	1	sleeping	#0[0]	0.00000	0.00000	501	3665	143	110	36	503	225	136
8335	com.apple.iT	0.0	00:00.06	2	2	48	5116K	0B	0B	8335	1	sleeping	#0[2]	0.00000	0.00000	501	6774	179	204	142	2220	501	933
8333	cdpd	0.0	00:00.04	2	1	35	1120K	0B	0B	8333	1	sleeping	#0[6]	0.00000	0.00000	501	4098	169	124	40	1657	256	423
8331	assistantd	0.0	00:00.03	2	1	111	13M	408K	0B	8331	1	sleeping	#0[17]	0.00000	0.00000	501	25422	550	1354	529	40596	2997	6924
8329	ProtectedClo	0.0	00:00.12	2	1	60	2004K	120K	0B	8329	1	sleeping	#0[4]	0.00000	0.00000	501	5553	171	568	164	10249	1093	1436
8328	applessdstat	0.0	00:00.01	2	1	32	644K	0B	0B	8328	1	sleeping	#0[1]	0.00000	0.00000	0	2138	124	91	39	763	193	469
8320	reversetempl	0.0	00:00.44	3	1	44	10M	0B	0B	8320	1	sleeping	#0[0]	0.00000	0.00000	501	11659	203	393	154	5644	966	1585
8276	com.apple.iC	0.0	00:03.35	8	5	91	4000K	4096B	636K	8276	1	sleeping	#0[21]	0.00000	0.00000	501	14991	230	7281	2201	45207	10672	18516
8275	MTLCompilerS	0.0	00:00.04	2	2	31	384K	0B	5100K	8275	1	sleeping	#0[1]	0.00000	0.00000	501	6601	435	155	67	776	344	289
8274	com.apple.We	0.0	00:29.91	9	1	106	108M	0B	39M	8274	1	sleeping	#0[6479]	0.00000	0.00000	501	209578	2168	109832	96926	105279	666325	156953
8251	MTLCompilerS	0.0	00:00.21	2	2	31	400K	0B	5200K	8251	1	sleeping	#0[3]	0.00000	0.00000	501	8052	435	170	71	937	379	677
8184	XprotectServ	0.0	00:04.20	2	2	51	2036K	0B	6200K	8184	1	sleeping	#0[5]	0.00000	0.00000	501	79597	172	337	134	54336	632	5356
8180	CoreServices	0.0	00:01.10	3	1	200	4140K	0B	8476K	8180	1	sleeping	#0[1]	0.00000	0.00000	501	19963	312	8007	1294	17502	21456	14938
8175	VTDecoderXPC	0.0	00:03.79	2	1	44	4400K	0B	6716K	8175	1	sleeping	#0[1000]	0.00000	0.00000	501	59732	246	89482	39985	25818	73364	23032
8174	com.apple.au	0.0	00:00.02	2	2	20	8192B	0B	908K	8174	1	sleeping	#0[2]	0.00000	0.00000	501	3665	142	112	36	513	222	143
8173	com.apple.We	0.0	06:57.58	11	1	263	560M	476K	192M	8173	1	sleeping	#0[42703]	0.00000	0.00000	501	788460	38443	1186871	664566	2205907	3776071	1779562
8165	Code Helper	0.0	00:01.49	3	1	48	1308K	0B	46M	8095	8146	sleeping	#0[1]	0.00000	0.00000	501	20808	1134	150	71	12440+	498	10527+
8164	Code Helper	0.0	00:00.37	12	1	110	1484K	0B	22M	8095	8095	sleeping	#0[1]	0.00000	0.00000	501	19400	1155	692	336	5179	4521	3479
8147	Code Helper	0.0	00:00.39	7	1	52	572K	0B	20M	8095	8145	sleeping	#0[1]	0.00000	0.00000	501	13300	1143	135	64	3919	295	2455
8146	Code Helper	0.0	00:06.53	7	1	53	12M	0B	44M	8095	8145	sleeping	#0[1]	0.00000	0.00000	501	49239	1324	104	83	175453+	797	84692+
8145	Code Helper	0.0	00:11.09	17	1	150	20M	0B	99M	8095	8095	sleeping	#0[6]	0.00000	0.00000	501	109171	1361	21028	4139	114309	105393	69532
8106	crashpad_han	0.0	00:00.03	4	1	20	308K	0B	604K	8105	1	sleeping	#0[1]	0.00000	0.00000	501	3569	122	59	21	530	134	76
8099	Code Helper	0.0	00:02.98	17	1	124	14M	0B	35M	8095	8095	sleeping	#0[1]	0.00000	0.00000	501	50794	1136	1867	1292	78674	40411	31849
8097	Code Helper	0.0	00:07.36	5	1	116	1216K	0B	35M	8095	8095	sleeping	#0[1]	0.00000	0.00000	501	94599	1577	64740	24408	84643	211806	51489
8096	gamecontroll	0.0	00:00.42	4	3	58	820K	0B	468K	8096	1	sleeping	#0[35]	0.00000	0.00000	247	5812	152	1428	155	14274	4810	9700
8095	Electron	0.0	00:23.39	43	1	510	32M	244K	25M	8095	1	sleeping	#0[197]	0.00000	0.00000	501	104826	1944	132700	44163	409294	551619+	198203+
8066	diskimages-h	0.0	00:18.03	3	1	84	468K	0B	11M	8066	1	sleeping	#0[1]	0.00000	0.00000	501	7623	134	194584	97190			



## o Before (Google Chrome PID: 8384)

Processes: 322 total, 2 running, 320 sleeping, 1406 threads  
Load Avg: 1.01, 1.67, 1.74 CPU usage: 8.67% user, 10.36% sys, 80.96% idle SharedLibs: 189M resident, 45M data, 23M linkedit. MemRegions: 56208 total, 1918M resident, 91M private, 691M shared.  
PhysMem: 5759M used (1644M wired), 2430M unused. VM: 1936G vszize, 627M framework vszize, 19911620(0) swapins, 201240063(0) swapouts. Networks: packets: 2623766/1134M in, 910417/149M out.  
Disks: 4792675/785G read, 6146100/807G written.

11:15:22

PID	COMMAND	%CPU	TIME	#TH	#WQ	#PORT	MEM	PURG	CMPRS	PPRP	PPID	STATE	BOOSTS	%CPU_ME	%CPU_OTHR	UID	FAULTS	COW	MSGSENT	MSGRECV	SYSBSD	SYSMACH	CSW2
8395	screencaptur	9.6	00:00.53	2	1	53	2440K	20K	0B	290	290	sleeping	*0[1]	0.00000	9.15672	501	27734+	268+	5549+	1171+	2759+	11685+	3262+
8392	top	3.0	00:03.71	1/1	0	21	4432K	0B	0B	8392	8362	running	*0[1]	0.00000	0.00000	0	27561+	106	753209+	376343+	105338+	562999+	3666+
8388	mdworker	0.0	00:00.17	4	1	48	12M	0B	0B	8388	1	sleeping	*0[1]	0.00000	0.00000	501	8463	187	827	321	3152	984	969
8387	mdworker	0.0	00:00.15	4	1	48	11M	0B	0B	8387	1	sleeping	*0[1]	0.00000	0.00000	501	10165	187	657	266	2582	750	1180
8384	Google Chrom	0.0	00:01.31	16	1	143	33M	0B	0B	8377	8377	sleeping	*0[1]	0.00000	0.00000	501	27103	1595	2574	667	14249	14238	9137
8383	VTDecoderXPC	0.0	00:00.03	2	1	35	2500K	0B	0B	8383	1	sleeping	0[4]	0.00000	0.00000	501	4414	157	153	46	672	328	141
8382	AlertNotific	0.0	00:00.02	2	2	26	976K	0B	0B	8382	1	sleeping	0[1]	0.00000	0.00000	501	3817	146	133	43	553	253	195
8381	Google Chrom	0.0	00:00.56	10	1	127	24M	9696K	0B	8377	8377	sleeping	*0[1]	0.00000	0.00000	501	27859	1651	7531	3071	5650	9520	4201
8379	crashpad_han	0.0	00:00.01	4	1	27	900K	0B	0B	8378	1	sleeping	*0[1]	0.00000	0.00000	501	3324	137	59	21	382	127	137
8377	Google Chrom	0.7	00:02.05	36	2	457+	50M+	332K	0B	8377	1	sleeping	*0[31]	0.00611	0.00000	501	45463+	1908	17520+	6528+	43310+	50477+	23628+
8375	QuickLookSat	0.0	00:00.03	2	1	45	2804K	0B	0B	8375	1	sleeping	0[1]	0.00000	0.00000	501	5499	186	173	51	748	364	320
8373	quicklookd	0.0	00:00.10	4	1	92	4352K	32K	0B	8373	1	sleeping	0[1]	0.00000	0.00000	501	0079	255	410	107	5175	834	567
8372	com.apple.sp	0.0	00:00.05	2	1	48	2364K	0B	0B	8372	1	sleeping	0[0]	0.00000	0.00000	501	4134	155	178	59	7923	389	349
8371	mdworker	0.0	00:00.05	3	1	49	3008K	0B	0B	8371	1	sleeping	*0[1]	0.00000	0.00000	501	6217	190	522	221	2590	569	149
8370	mdworker	0.0	00:00.12	4	1	48	10M	0B	0B	8370	1	sleeping	*0[1]	0.00000	0.00000	501	7977	187	699	281	2690	798	707
8368	mdworker	0.0	00:00.24	4	1	48	11M	0B	0B	8368	1	sleeping	*0[1]	0.00000	0.00000	501	8313	187	1107	411	4120	1378	1319
8362	bash	0.0	00:00.02	1	0	16	784K	0B	0B	8362	8361	sleeping	*0[1]	0.00000	0.00000	501	1516	351	70	29	1322	120	125
8361	login	0.0	00:00.02	2	1	28	1012K	0B	0B	8361	271	sleeping	*0[9]	0.00000	0.00000	0	2979	186	156	47	1576	251	359
8357	mdworker	0.0	00:00.07	3	1	52	3256K	0B	0B	8357	1	sleeping	*0[1]	0.00000	0.00000	501	0691	223	553	233	7869	621	430
8356	mdworker	0.0	00:00.07	3	1	52	3312K	0B	0B	8356	1	sleeping	*0[1]	0.00000	0.00000	501	0715	224	557	235	7838	620	1224
8355	mdworker	0.0	00:00.09	3	1	52	3312K	0B	0B	8355	1	sleeping	*0[1]	0.00000	0.00000	501	0733	224	552	270	9155	752	315
8354	mdworker	0.0	00:00.09	3	1	52	3308K	0B	0B	8354	1	sleeping	*0[1]	0.00000	0.00000	501	0750	224	628	260	9035	729	308
8349	IMDPersisten	0.0	00:00.05	2	1	64	2080K	44K	0B	8349	1	sleeping	0[4]	0.00000	0.00000	501	4533	175	302	100	1984	674	608
8347	systemstats	0.0	00:00.02	2	2	20	976K	0B	0B	8347	1	sleeping	*0[1]	0.00000	0.00000	0	3109	184	00	30	986	155	117
8342	netbiosd	0.0	00:00.05	2	2	30	2496K	0B	0B	8342	1	sleeping	*0[1]	0.00000	0.00000	222	4227	162	145	36	1119	200	629
8341	captiveagent	0.0	00:00.04	4	1	47	2244K	0B	0B	8341	1	sleeping	*1[1]	0.00000	0.00000	250	3766	149	142	78	1621	411	430
8340	mdworker	0.0	00:00.05	3	1	49	2964K	0B	0B	8340	1	sleeping	*0[1]	0.00000	0.00000	501	6257	191	544	230	2938	611	450
8339	syncdefaults	0.3	00:01.06	4	2	134+	14M+	0B	0B	8339	1	sleeping	*0[17]	0.73382	0.00000	501	14791+	265	5945+	4230+	16577+	27551+	13014+
8338	com.apple.au	0.0	00:00.03	2	2	21	920K	0B	0B	8338	1	sleeping	0[0]	0.00000	0.00000	501	3665	143	110	36	503	225	136
8337	ocspd	0.0	00:00.04	2	1	35	1704K	0B	0B	8337	1	sleeping	*0[1]	0.00000	0.00000	0	3701	166	286	32	769	725	181
8335	com.apple.iT	0.0	00:00.06	3	3	49	5116K	0B	0B	8335	1	sleeping	0[2]	0.00000	0.00000	501	6737	179	204	105	1694	464	715
8333	cdpd	0.0	00:00.04	2	1	35	1128K	0B	0B	8333	1	sleeping	0[6]	0.00000	0.00000	501	4098	169	124	40	1657	256	423
8331	assistantd	0.0	00:00.01	2	1	111	13M	488K	0B	8331	1	sleeping	0[13]	0.00000	0.00000	501	25366	550	1167	444	47962	2527	6544
8329	ProtectedClo	0.0	00:00.12	2	1	61	2004K	120K	0B	8329	1	sleeping	0[2]	0.00000	0.00000	501	5529	171	526	145	10125	1013	1362
8328	appplessdstat	0.0	00:00.01	2	1	32	644K	0B	0B	8328	1	sleeping	*0[1]	0.00000	0.00000	0	2138	124	91	39	763	193	469
8320	reversetempl	0.0	00:00.43	3	1	43	10M	0B	0B	8320	1	sleeping	0[0]	0.00000	0.00000	501	11507	203	361	140	4446	904	1516
8276	com.apple.iC	0.5	00:00.00	4	3	63+	2564K+	0B	916K	8276	1	sleeping	0[1]	0.00000	0.40478	501	10037+	206	1018+	594+	12747+	2791+	4960+
8275	MTLCompilerS	0.0	00:00.04	2	2	31	332K	0B	5152K	8275	1	sleeping	0[1]	0.00000	0.00000	501	6576	435	155	61	722	338	263
8274	com.apple.We	0.0	00:29.39	6	1	183	107M	25M	39M	8274	1	sleeping	*0[6257]	0.00000	0.00000	501	200216	2168	180438	96293	174817	659451	151157
8272	mdworker	0.0	00:00.07	3	1	55	336K	0B	2768K	8272	1	sleeping	*0[1]	0.00000	0.00000	501	6397	207	598	255	4576	725	512
8267	mdworker	0.0	00:00.06	3	1	48	1172K	0B	1872K	8267	1	sleeping	*0[1]	0.00000	0.00000	501	0080	198	573	246	4453	685	304
8251	MTLCompilerS	0.0	00:00.21	2	2	31	352K	0B	5248K	8251	1	sleeping	0[3]	0.00000	0.00000	501	0027	435	170	65	883	373	650
8184	XprotectServ	0.0	00:04.20	2	2	52	2024K	0B	6220K	8184	1	sleeping	0[5]	0.00000	0.00000	501	79581	172	336	127	54265	622	5317
8180	CoreServices	0.0	00:00.98	3	1	200	4008K	0B	8528K	8180	1	sleeping	*0[1]	0.00000	0.00000	501	19775	312	7205+	1210	15300+	10411+	11774+
8175	VTDecoderXPC	0.0	00:03.33	2	1	44	4644K	0B	6876K	8175	1	sleeping	0[900]	0.00000	0.00000	501	57993	246	77607	34615	22882	63982	20267
8174	com.apple.au	0.0	00:00.02	2	2	20	8192B	0B	908K	8174	1	sleeping	0[2]	0.00000	0.00000	501	3665	142	112	36	513	222	143
8173	com.apple.We	5.5	06:45.30	17	4	275	405M+	20M+	341M+	8173	1	sleeping	*0[40082+]	0.00000	0.00000	501	724807+	38443	1140660+	639263+	2119841+	3639999+	1726951+
8171	MTLCompilerS	0.0	00:00.06	2	2	31	328K	0B	7440K	8171	1	sleeping	0[2]	0.00000	0.00000	501	7178	435	167	65	747	361	283
8170	com.apple.We	0.0	00:14.39	6	1	217	5708K	0B	165M	8170	1	sleeping	*0[5754]	0.00000	0.00000	501	95525	1859	61506	30510	130421	193522	93551
8166	Code Helper	0.0	00:01.32	3	1	40	1000K	0B	40M	0095	0146	sleeping	*0[1]	0.00000	0.00000	501	20006	1134	150	65	9316+	492	7410+
8164	Code Helper	0.0	00:00.35	12	1	110	1444K	0B	22M	0095	0095	sleeping	*0[1]	0.00000	0.00000	501	19462	1155	623	269	5012	3409	3227
8147	Code Helper	0.0	00:00.36	7	1	52	568K	0B	20M	0095	0145	sleeping	*0[1]	0.00000	0.00000	501	13294	1143	135	58	3149	209	1960
8146	Code Helper	0.0	00:06.38	7	1	53	876K	0B	58M	0095	0145	sleeping	*0[1]	0.00000	0.00000	501	44486	1324	178	74	174315	768	83955
8145	Code Helper	0.0	00:11.77	17	1	150	8580K	0B															

## o After

Processes: 317 total, 2 running, 315 sleeping, 1336 threads  
 Load Avg: 1.68, 1.55, 1.56 CPU usage: 2.98% user, 4.60% sys, 92.49% idle SharedLibs: 207M resident, 47M data, 24M linkedit, MemRegions: 52618 total, 2234M resident, 98M private, 831M shared.  
 PhysMem: 6341M used (1679M wired), 1850M unused. VM: 1922G vszie, 627M framework vszie, 199953844(0) swapins, 201240063(0) swapouts. Networks: packets: 2640488/1143M in, 922048/151M out.  
 Disks: 4002595/7856 read, 6155471/8076 written.

11:31:24

	COMMAND	%CPU	TIME	#TH	#WQ	#PORT	MEM	PURG	CMPRS	PGRP	PPID	STATE	BOOSTS	%CPU_ME	%CPU_OTHRS	UID	FAULTS	COW	MSGSENT	MSGRECV	SYSBSD	SYSMACH	CSW
8424	screencaptur	3.1	00:00.39	2	1	53	2396K	20K	0B	290	290	sleeping	*0[1]	0.00000	2.98875	501	19921+	280	5272+	915+	2033+	9408+	3700+
8423	top	3.4	00:01.19	1/1	0	21	4012K	0B	0B	8423	8362	running	*0[1]	0.00000	0.00000	0	10185+	189	317482+	158662+	32367+	216621+	1453+
8421	QuickLookSat	0.0	00:00.10	2	1	46	13M	256K	0B	8421	1	sleeping	0[1]	0.00000	0.00000	501	15126	1012	258	72	3529	502	433
8420	mdworker	0.0	00:00.21	3	1	55	7704K	0B	0B	8420	1	sleeping	*0[1]	0.00000	0.00000	501	8991	377	660	279	28428	737	1465
8416	quicklookd	0.0	00:00.20	4	1	110	9732K	80K	0B	8416	1	sleeping	0[1]	0.00000	0.00000	501	13708	1082	520	161	5834	1036	1011
8414	com.apple.We	0.0	00:25.24	7	2	222	87M	17M	0B	8414	1	sleeping	*0[18494]	0.00000	0.00000	501	66942	3440	129481	55708	268761	443167	190025
8409	MTLCompilerS	0.0	00:00.15	2	2	32	9984K	0B	0B	8409	1	sleeping	0[2]	0.00000	0.00000	501	7824	435	164	51	636	358	904
8405	mdworker	0.0	00:00.18	3	1	55	7448K	0B	0B	8405	1	sleeping	*0[1]	0.00000	0.00000	501	8902	376	612	259	14199	683	1826
8396	mdworker	0.0	00:00.06	3	1	55	3188K	0B	0B	8396	1	sleeping	*0[1]	0.00000	0.00000	501	6253	206	585	244	4473	663	218
8388	mdworker	0.0	00:00.36	4	1	48	14M	0B	0B	8388	1	sleeping	*0[1]	0.00000	0.00000	501	11287	189	1229	454	4720	1510	1434
8387	mdworker	0.0	00:00.29	4	1	48	12M	0B	0B	8387	1	sleeping	*0[1]	0.00000	0.00000	501	11835	187	916	354	3432	1075	1431
8383	VTDecoderXPC	0.0	00:00.03	2	1	35	2500K	0B	0B	8383	1	sleeping	0[4]	0.00000	0.00000	501	4414	157	153	46	672	328	141
8382	AlertNotific	0.0	00:00.02	2	2	26	976K	0B	0B	8382	1	sleeping	0[1]	0.00000	0.00000	501	3817	146	133	43	553	253	195
8381	Google Chrom	0.0	00:00.70	10	1	110	24M	9700K	0B	8377	8377	sleeping	*0[1]	0.00000	0.00000	501	28274	1652	8596	3522	7730	15167	6296
8379	crashpad_han	0.0	00:00.01	4	1	27	944K	0B	0B	8378	1	sleeping	*0[1]	0.00000	0.00000	501	3337	137	59	21	424	129	139
8377	Google Chrom	0.0	00:04.17	37	2	444	49M	332K	0B	8377	1	sleeping	*0[67]	0.00000	0.00000	501	49647	1914	25686	9681	56114	80704+	36029+
8372	com.apple.sp	0.0	00:00.05	2	1	48	2368K	0B	0B	8372	1	sleeping	0[0]	0.00000	0.00000	501	4156	155	211	74	8316	417	401
8371	mdworker	0.0	00:00.05	3	1	49	3008K	0B	0B	8371	1	sleeping	*0[1]	0.00000	0.00000	501	6217	190	522	221	2590	569	149
8370	mdworker	0.0	00:00.37	4	1	48	12M	0B	0B	8370	1	sleeping	*0[1]	0.00000	0.00000	501	13066	189	1172	439	4554	1420	1374
8368	mdworker	0.0	00:00.44	4	1	48	12M	0B	0B	8368	1	sleeping	*0[1]	0.00000	0.00000	501	12798	189	1953	757	5814	2160	1830
8362	bash	0.0	00:00.02	1	0	16	780K	0B	0B	8362	8361	sleeping	*0[1]	0.00000	0.00000	501	1591	392	72	30	1833	121	148
8361	login	0.0	00:00.02	2	1	28	1012K	0B	0B	8361	271	sleeping	*0[9]	0.00000	0.00000	0	2979	186	156	47	1576	251	359
8357	mdworker	0.0	00:00.07	3	1	52	3256K	0B	0B	8357	1	sleeping	*0[1]	0.00000	0.00000	501	8691	223	553	233	7869	621	430
8356	mdworker	0.0	00:00.07	3	1	52	3312K	0B	0B	8356	1	sleeping	*0[1]	0.00000	0.00000	501	8715	224	557	235	7838	620	1224
8355	mdworker	0.0	00:00.09	3	1	52	3312K	0B	0B	8355	1	sleeping	*0[1]	0.00000	0.00000	501	8733	224	652	270	9155	752	315
8354	mdworker	0.0	00:00.09	3	1	52	3388K	0B	0B	8354	1	sleeping	*0[1]	0.00000	0.00000	501	8750	224	628	260	9035	729	308
8349	IMDPersisten	0.0	00:00.05	2	1	62	2000K	44K	0B	8349	1	sleeping	0[5]	0.00000	0.00000	501	6544	175	320	105	2028	715	634
8347	systemstats	0.0	00:00.71	2	2	27	6436K	0B	0B	8347	1	sleeping	0[1]	0.00000	0.00000	0	7551	195	123	46	171058	257	1061
8342	netbiosd	0.0	00:00.05	2	2	30	2500K	0B	0B	8342	1	sleeping	*0[1]	0.00000	0.00000	222	4240	162	145	36	1192	280	669
8341	captiveagent	0.0	00:00.04	4	1	47	2244K	0B	0B	8341	1	sleeping	*0[1]	0.00000	0.00000	258	3766	149	142	78	1621	411	430
8340	mdworker	0.0	00:00.05	3	1	49	2964K	0B	0B	8340	1	sleeping	*0[1]	0.00000	0.00000	501	6257	191	544	230	2938	611	450
8339	syncdefaults	0.2	00:04.75	4	2	134	14M	0B	0B	8339	1	sleeping	0[17]	0.00000	0.00000	501	14875	265	18264+	15509+	20298	96757+	28845+
8338	com.apple.au	0.0	00:00.03	2	2	21	920K	0B	0B	8338	1	sleeping	0[0]	0.00000	0.00000	501	3665	143	110	36	503	225	136
8335	com.apple.iT	0.0	00:00.06	3	3	49	5116K	0B	0B	8335	1	sleeping	0[2]	0.00000	0.00000	501	6737	179	204	105	1694	464	715
8333	cdpd	0.0	00:00.04	2	1	35	1128K	0B	0B	8333	1	sleeping	0[6]	0.00000	0.00000	501	4098	169	124	40	1657	256	423
8331	assistantd	0.0	00:00.82	2	1	111	13M	400K	0B	8331	1	sleeping	0[13]	0.00000	0.00000	501	25370	550	1199	445	47977	2656	6591
8329	ProtectedClo	0.0	00:00.12	2	1	61	2004K	120K	0B	8329	1	sleeping	0[2]	0.00000	0.00000	501	5529	171	526	145	10125	1013	1362
8328	applessdstat	0.0	00:00.01	2	1	32	644K	0B	0B	8328	1	sleeping	*0[1]	0.00000	0.00000	0	2138	124	91	39	763	193	469
8320	reversetempl	0.0	00:00.43	3	1	43	10M	0B	0B	8320	1	sleeping	0[0]	0.00000	0.00000	501	11587	203	361	140	4446	904	1516
8276	com.apple.iC	0.0	00:02.09	5	4	66	2636K	0B	880K	8276	1	sleeping	0[1]	0.00000	0.00000	501	11559	206	4442	1352	27980	6543	11463
8275	MTLCompilerS	0.0	00:00.04	2	2	31	332K	0B	5152K	8275	1	sleeping	0[1]	0.00000	0.00000	501	6576	435	155	61	722	338	263
8274	com.apple.We	0.0	00:29.01	6	1	183	180M	0B	39M	8274	1	sleeping	*0[6372]	0.00000	0.00000	501	208794	2168	189059	96573	179479	662586	153520
8267	mdworker	0.0	00:00.06	3	1	48	1172K	0B	1072K	8267	1	sleeping	*0[1]	0.00000	0.00000	501	8080	198	573	246	4453	685	304
8251	MTLCompilerS	0.0	00:00.21	2	2	31	352K	0B	5240K	8251	1	sleeping	0[3]	0.00000	0.00000	501	8027	435	170	65	883	373	650
8184	XProtectServ	0.0	00:04.20	2	2	51	2024K	0B	6220K	8184	1	sleeping	0[5]	0.00000	0.00000	501	79586	172	337	128	54281	626	5327
8180	CoreServices	0.0	00:01.03	3	1	208	4108K	0B	8516K	8180	1	sleeping	*0[1]	0.00000	0.00000	501	19848	312	7548	1226	16345	19685	13279
8175	VTDecoderXPC	0.0	00:03.79	2	1	45	4400K	0B	6716K	8175	1	sleeping	*0[1000]	0.00000	0.00000	501	59728	246	89476	39979	25781	73333	23002
8174	com.apple.au	0.0	00:00.02	2	2	20	8192B	0B	908K	8174	1	sleeping	0[2]	0.00000	0.00000	501	3665	142	112	36	513	222	143
8173	com.apple.We	0.0	00:56.05	11	1	263	556M	30M	193M	8173	1	sleeping	*0[42527]	0.00000	0.00000	501	782851	38443	1185649	663752	2187816	3765056	1773632
8165	Code Helper	0.0	00:01.41	3	1	48	1156K	0B	46M	8095	8146	sleeping	*0[1]	0.00000	0.00000	501	28043	1134	150	65	10932+	492	9045+
8164	Code Helper	0.0	00:00.36	12	1	110	1450K	0B	22M	8095	8095	sleeping	*0[1]	0.00000	0.00000	501	19466	1155	655	301	5076	4001	3338
8147	Code Helper	0.0	00:00.37	7	1	52	568K	0B	20M	8095	8145	sleeping	*0[1]	0.00000	0.00000	501	13294	1143	135	58	3533	289	2220
8146	Code Helper	0.0	00:06.51	7	1	53	12M	0B	44M	8095	8145	sleeping	*0[1]	0.00000	0.00000	501	49235	1324	184	77	175062	791	84441
8145	Code Helper	0.0	00:11.88	18	1	152	20																

## 2. Part II - Directory Duplication Process in C

```
#include<stdio.h>

void main() {
printf("Enter directory name: ");
char directoryName[20];
scanf("%s", directoryName);
char temp [50];
strcpy(temp,directoryName);
int dir = mkdir(directoryName,0700);
if(-1 == dir){
    int i = 1;
    int flag = 4;
    while( 4 == flag){
        char buffer[50];
        sprintf( buffer, "%d", i );
        strcpy(temp,directoryName);
        strcat(temp,buffer);
        int dir1 = mkdir(temp,0700);
        if(0 == dir1){
            flag = 5;
        }
        i++;
    }
}
else{
    printf("successful");
}
}
```