

Conceitos sobre S.O.

Todos Sistemas Operacionais têm conceitos básicos, como processos, memória e arquivos.

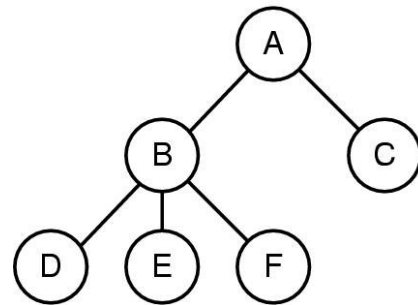
Processos

- Basicamente um programa em execução;
- p/ cada processo em execução existe um espaço de endereçamento;
- neste espaço estão, o programa, os dados, sua pilha e todos as demais informações necessárias para sua execução;
- nos sistemas de tempo compartilhado os processos têm um tempo de CPU;

Processos

- quando o tempo de CPU de um processo acaba ele deve ficar em "stand by" e todas as suas informações devem ficar guardadas para quando a CPU retornar ao processo;
- processos podem criar sub-processos chamados processos filhos;
- cada processo tem um usuário que o iniciou UID (user id).

Processos



Processos

Gerenciador de tarefas do Windows

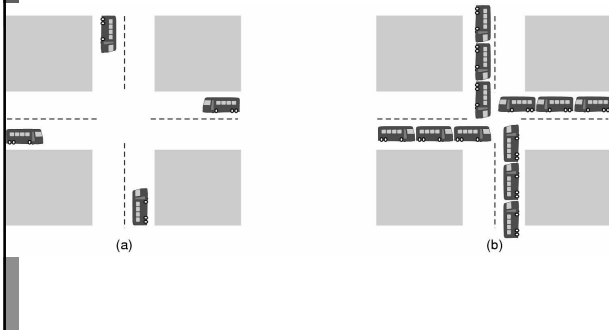
Nome da Imagem	Nome de usuário	CPU	Uso de ...
lsass.exe	SYSTEM	0%	16.828 K
lsass.exe	SYSTEM	0%	6.884 K
lsass.exe	SYSTEM	0%	7.496 K
lsass.exe	SYSTEM	0%	2.128 K
lsass.exe	SYSTEM	0%	6.884 K
lsass.exe	SYSTEM	0%	14.488 K
lsass.exe	SYSTEM	0%	2.724 K
lsass.exe	SYSTEM	0%	2.220 K
lsass.exe	SYSTEM	0%	5.416 K
lsass.exe	SYSTEM	0%	576 K
lsass.exe	SYSTEM	0%	2.850 K
lsass.exe	SYSTEM	0%	2.168 K
lsass.exe	SYSTEM	0%	1.812 K
lsass.exe	SYSTEM	0%	2.188 K
lsass.exe	SYSTEM	0%	1.488 K
lsass.exe	SYSTEM	0%	2.156 K
lsass.exe	SYSTEM	0%	1.192 K
lsass.exe	SYSTEM	0%	4.500 K
lsass.exe	SYSTEM	0%	2.460 K

```

top - 22:44:42 up 11:36, 10 users, load average: 2.31, 2.14, 2.04
task: 116 total, 1 running, 115 sleeping, 1 stopped, 0 zombie
cpu(s): 98.02 us, 2.05 ni, 0.02 id, 0.02 wa, 0.02 hi, 0.02 si, 0.02 st
Mem: 516116 total, 509208 used, 6196 free, 116208 buffers
swap: 1004020 total, 788 used, 1003232 free, 182920 cached

PID   PPID   UID   GID   SIGTSP  TTY   TIME   CPU   COMMAND
1      0      0     0     0      0    0:00   0.0%  init
2      1      0     0     0      0    0:00   0.0%  kthreadd/0
3      1      0     0     0      0    0:00   0.0%  ksoftirqd/0
4      1      0     0     0      0    0:00   0.0%  kworker/0:0
5      1      0     0     0      0    0:00   0.0%  kworker/0:1
6      1      0     0     0      0    0:00   0.0%  kworker/0:2
7      1      0     0     0      0    0:00   0.0%  kworker/0:3
8      1      0     0     0      0    0:00   0.0%  kworker/0:4
9      1      0     0     0      0    0:00   0.0%  kworker/0:5
10     1      0     0     0      0    0:00   0.0%  kworker/0:6
11     1      0     0     0      0    0:00   0.0%  kworker/0:7
12     1      0     0     0      0    0:00   0.0%  kworker/0:8
13     1      0     0     0      0    0:00   0.0%  kworker/0:9
14     1      0     0     0      0    0:00   0.0%  kworker/0:10
15     1      0     0     0      0    0:00   0.0%  kworker/0:11
16     1      0     0     0      0    0:00   0.0%  kworker/0:12
17     1      0     0     0      0    0:00   0.0%  kworker/0:13
18     1      0     0     0      0    0:00   0.0%  kworker/0:14
19     1      0     0     0      0    0:00   0.0%  kworker/0:15
20     1      0     0     0      0    0:00   0.0%  kworker/0:16
21     1      0     0     0      0    0:00   0.0%  kworker/0:17
22     1      0     0     0      0    0:00   0.0%  kworker/0:18
23     1      0     0     0      0    0:00   0.0%  kworker/0:19
24     1      0     0     0      0    0:00   0.0%  kworker/0:20
25     1      0     0     0      0    0:00   0.0%  kworker/0:21
26     1      0     0     0      0    0:00   0.0%  kworker/0:22
27     1      0     0     0      0    0:00   0.0%  kworker/0:23
28     1      0     0     0      0    0:00   0.0%  kworker/0:24
29     1      0     0     0      0    0:00   0.0%  kworker/0:25
30     1      0     0     0      0    0:00   0.0%  kworker/0:26
31     1      0     0     0      0    0:00   0.0%  kworker/0:27
32     1      0     0     0      0    0:00   0.0%  kworker/0:28
33     1      0     0     0      0    0:00   0.0%  kworker/0:29
34     1      0     0     0      0    0:00   0.0%  kworker/0:30
35     1      0     0     0      0    0:00   0.0%  kworker/0:31
36     1      0     0     0      0    0:00   0.0%  kworker/0:32
37     1      0     0     0      0    0:00   0.0%  kworker/0:33
38     1      0     0     0      0    0:00   0.0%  kworker/0:34
39     1      0     0     0      0    0:00   0.0%  kworker/0:35
40     1      0     0     0      0    0:00   0.0%  kworker/0:36
41     1      0     0     0      0    0:00   0.0%  kworker/0:37
42     1      0     0     0      0    0:00   0.0%  kworker/0:38
43     1      0     0     0      0    0:00   0.0%  kworker/0:39
44     1      0     0     0      0    0:00   0.0%  kworker/0:40
45     1      0     0     0      0    0:00   0.0%  kworker/0:41
46     1      0     0     0      0    0:00   0.0%  kworker/0:42
47     1      0     0     0      0    0:00   0.0%  kworker/0:43
48     1      0     0     0      0    0:00   0.0%  kworker/0:44
49     1      0     0     0      0    0:00   0.0%  kworker/0:45
50     1      0     0     0      0    0:00   0.0%  kworker/0:46
51     1      0     0     0      0    0:00   0.0%  kworker/0:47
52     1      0     0     0      0    0:00   0.0%  kworker/0:48
53     1      0     0     0      0    0:00   0.0%  kworker/0:49
54     1      0     0     0      0    0:00   0.0%  kworker/0:50
55     1      0     0     0      0    0:00   0.0%  kworker/0:51
56     1      0     0     0      0    0:00   0.0%  kworker/0:52
57     1      0     0     0      0    0:00   0.0%  kworker/0:53
58     1      0     0     0      0    0:00   0.0%  kworker/0:54
59     1      0     0     0      0    0:00   0.0%  kworker/0:55
60     1      0     0     0      0    0:00   0.0%  kworker/0:56
61     1      0     0     0      0    0:00   0.0%  kworker/0:57
62     1      0     0     0      0    0:00   0.0%  kworker/0:58
63     1      0     0     0      0    0:00   0.0%  kworker/0:59
64     1      0     0     0      0    0:00   0.0%  kworker/0:60
65     1      0     0     0      0    0:00   0.0%  kworker/0:61
66     1      0     0     0      0    0:00   0.0%  kworker/0:62
67     1      0     0     0      0    0:00   0.0%  kworker/0:63
68     1      0     0     0      0    0:00   0.0%  kworker/0:64
69     1      0     0     0      0    0:00   0.0%  kworker/0:65
70     1      0     0     0      0    0:00   0.0%  kworker/0:66
71     1      0     0     0      0    0:00   0.0%  kworker/0:67
72     1      0     0     0      0    0:00   0.0%  kworker/0:68
73     1      0     0     0      0    0:00   0.0%  kworker/0:69
74     1      0     0     0      0    0:00   0.0%  kworker/0:70
75     1      0     0     0      0    0:00   0.0%  kworker/0:71
76     1      0     0     0      0    0:00   0.0%  kworker/0:72
77     1      0     0     0      0    0:00   0.0%  kworker/0:73
78     1      0     0     0      0    0:00   0.0%  kworker/0:74
79     1      0     0     0      0    0:00   0.0%  kworker/0:75
80     1      0     0     0      0    0:00   0.0%  kworker/0:76
81     1      0     0     0      0    0:00   0.0%  kworker/0:77
82     1      0     0     0      0    0:00   0.0%  kworker/0:78
83     1      0     0     0      0    0:00   0.0%  kworker/0:79
84     1      0     0     0      0    0:00   0.0%  kworker/0:80
85     1      0     0     0      0    0:00   0.0%  kworker/0:81
86     1      0     0     0      0    0:00   0.0%  kworker/0:82
87     1      0     0     0      0    0:00   0.0%  kworker/0:83
88     1      0     0     0      0    0:00   0.0%  kworker/0:84
89     1      0     0     0      0    0:00   0.0%  kworker/0:85
90     1      0     0     0      0    0:00   0.0%  kworker/0:86
91     1      0     0     0      0    0:00   0.0%  kworker/0:87
92     1      0     0     0      0    0:00   0.0%  kworker/0:88
93     1      0     0     0      0    0:00   0.0%  kworker/0:89
94     1      0     0     0      0    0:00   0.0%  kworker/0:90
95     1      0     0     0      0    0:00   0.0%  kworker/0:91
96     1      0     0     0      0    0:00   0.0%  kworker/0:92
97     1      0     0     0      0    0:00   0.0%  kworker/0:93
98     1      0     0     0      0    0:00   0.0%  kworker/0:94
99     1      0     0     0      0    0:00   0.0%  kworker/0:95
100    1      0     0     0      0    0:00   0.0%  kworker/0:96
101    1      0     0     0      0    0:00   0.0%  kworker/0:97
102    1      0     0     0      0    0:00   0.0%  kworker/0:98
103    1      0     0     0      0    0:00   0.0%  kworker/0:99
104    1      0     0     0      0    0:00   0.0%  kworker/0:100
105    1      0     0     0      0    0:00   0.0%  kworker/0:101
106    1      0     0     0      0    0:00   0.0%  kworker/0:102
107    1      0     0     0      0    0:00   0.0%  kworker/0:103
108    1      0     0     0      0    0:00   0.0%  kworker/0:104
109    1      0     0     0      0    0:00   0.0%  kworker/0:105
110    1      0     0     0      0    0:00   0.0%  kworker/0:106
111    1      0     0     0      0    0:00   0.0%  kworker/0:107
112    1      0     0     0      0    0:00   0.0%  kworker/0:108
113    1      0     0     0      0    0:00   0.0%  kworker/0:109
114    1      0     0     0      0    0:00   0.0%  kworker/0:110
115    1      0     0     0      0    0:00   0.0%  kworker/0:111
116    1      0     0     0      0    0:00   0.0%  kworker/0:112
117    1      0     0     0      0    0:00   0.0%  kworker/0:113
118    1      0     0     0      0    0:00   0.0%  kworker/0:114
119    1      0     0     0      0    0:00   0.0%  kworker/0:115
120    1      0     0     0      0    0:00   0.0%  kworker/0:116
121    1      0     0     0      0    0:00   0.0%  kworker/0:117
122    1      0     0     0      0    0:00   0.0%  kworker/0:118
123    1      0     0     0      0    0:00   0.0%  kworker/0:119
124    1      0     0     0      0    0:00   0.0%  kworker/0:120
125    1      0     0     0      0    0:00   0.0%  kworker/0:121
126    1      0     0     0      0    0:00   0.0%  kworker/0:122
127    1      0     0     0      0    0:00   0.0%  kworker/0:123
128    1      0     0     0      0    0:00   0.0%  kworker/0:124
129    1      0     0     0      0    0:00   0.0%  kworker/0:125
130    1      0     0     0      0    0:00   0.0%  kworker/0:126
131    1      0     0     0      0    0:00   0.0%  kworker/0:127
132    1      0     0     0      0    0:00   0.0%  kworker/0:128
133    1      0     0     0      0    0:00   0.0%  kworker/0:129
134    1      0     0     0      0    0:00   0.0%  kworker/0:130
135    1      0     0     0      0    0:00   0.0%  kworker/0:131
136    1      0     0     0      0    0:00   0.0%  kworker/0:132
137    1      0     0     0      0    0:00   0.0%  kworker/0:133
138    1      0     0     0      0    0:00   0.0%  kworker/0:134
139    1      0     0     0      0    0:00   0.0%  kworker/0:135
140    1      0     0     0      0    0:00   0.0%  kworker/0:136
141    1      0     0     0      0    0:00   0.0%  kworker/0:137
142    1      0     0     0      0    0:00   0.0%  kworker/0:138
143    1      0     0     0      0    0:00   0.0%  kworker/0:139
144    1      0     0     0      0    0:00   0.0%  kworker/0:140
145    1      0     0     0      0    0:00   0.0%  kworker/0:141
146    1      0     0     0      0    0:00   0.0%  kworker/0:142
147    1      0     0     0      0    0:00   0.0%  kworker/0:143
148    1      0     0     0      0    0:00   0.0%  kworker/0:144
149    1      0     0     0      0    0:00   0.0%  kworker/0:145
150    1      0     0     0      0    0:00   0.0%  kworker/0:146
151    1      0     0     0      0    0:00   0.0%  kworker/0:147
152    1      0     0     0      0    0:00   0.0%  kworker/0:148
153    1      0     0     0      0    0:00   0.0%  kworker/0:149
154    1      0     0     0      0    0:00   0.0%  kworker/0:150
155    1      0     0     0      0    0:00   0.0%  kworker/0:151
156    1      0     0     0      0    0:00   0.0%  kworker/0:152
157    1      0     0     0      0    0:00   0.0%  kworker/0:153
158    1      0     0     0      0    0:00   0.0%  kworker/0:154
159    1      0     0     0      0    0:00   0.0%  kworker/0:155
160    1      0     0     0      0    0:00   0.0%  kworker/0:156
161    1      0     0     0      0    0:00   0.0%  kworker/0:157
162    1      0     0     0      0    0:00   0.0%  kworker/0:158
163    1      0     0     0      0    0:00   0.0%  kworker/0:159
164    1      0     0     0      0    0:00   0.0%  kworker/0:160
165    1      0     0     0      0    0:00   0.0%  kworker/0:161
166    1      0     0     0      0    0:00   0.0%  kworker/0:162
167    1      0     0     0      0    0:00   0.0%  kworker/0:163
168    1      0     0     0      0    0:00   0.0%  kworker/0:164
169    1      0     0     0      0    0:00   0.0%  kworker/0:165
170    1      0     0     0      0    0:00   0.0%  kworker/0:166
171    1      0     0     0      0    0:00   0.0%  kworker/0:167
172    1      0     0     0      0    0:00   0.0%  kworker/0:168
173    1      0     0     0      0    0:00   0.0%  kworker/0:169
174    1      0     0     0      0    0:00   0.0%  kworker/0:170
175    1      0     0     0      0    0:00   0.0%  kworker/0:171
176    1      0     0     0      0    0:00   0.0%  kworker/0:172
177    1      0     0     0      0    0:00   0.0%  kworker/0:173
178    1      0     0     0      0    0:00   0.0%  kworker/0:174
179    1      0     0     0      0    0:00   0.0%  kworker/0:175
180    1      0     0     0      0    0:00   0.0%  kworker/0:176
181    1      0     0     0      0    0:00   0.0%  kworker/0:177
182    1      0     0     0      0    0:00   0.0%  kworker/0:178
183    1      0     0     0      0    0:00   0.0%  kworker/0:179
184    1      0     0     0      0    0:00   0.0%  kworker/0:180
185    1      0     0     0      0    0:00   0.0%  kworker/0:181
186    1      0     0     0      0    0:00   0.0%  kworker/0:182
187    1      0     0     0      0    0:00   0.0%  kworker/0:183
188    1      0     0     0      0    0:00   0.0%  kworker/0:184
189    1      0     0     0      0    0:00   0.0%  kworker/0:185
190    1      0     0     0      0    0:00   0.0%  kworker/0:186
191    1      0     0     0      0    0:00   0.0%  kworker/0:187
192    1      0     0     0      0    0:00   0.0%  kworker/0:188
193    1      0     0     0      0    0:00   0.0%  kworker/0:189
194    1      0     0     0      0    0:00   0.0%  kworker/0:190
195    1      0     0     0      0    0:00   0.0%  kworker/0:191
196    1      0     0     0      0    0:00   0.0%  kworker/0:192
197    1      0     0     0      0    0:00   0.0%  kworker/0:193
198    1      0     0     0      0    0:00   0.0%  kworker/0:194
199    1      0     0     0      0    0:00   0.0%  kworker/0:195
200    1      0     0     0      0    0:00   0.0%  kworker/0:196
201    1      0     0     0      0    0:00   0.0%  kworker/0:197
202    1      0     0     0      0    0:00   0.0%  kworker/0:198
203    1      0     0     0      0    0:00   0.0%  kworker/0:199
204    1      0     0     0      0    0:00   0.0%  kworker/0:200
205    1      0     0     0      0    0:00   0.0%  kworker/0:201
206    1      0     0     0      0    0:00   0.0%  kworker/0:202
207    1      0     0     0      0    0:00   0.0%  kworker/0:203
208    1      0     0     0      0    0:00   0.0%  kworker/0:204
209    1      0     0     0      0    0:00   0.0%  kworker/0:205
210    1      0     0     0      0    0:00   0.0%  kworker/0:206
211    1      0     0     0      0    0:00   0.0%  kworker/0:207
212    1      0     0     0      0    0:00   0.0%  kworker/0:208
213    1      0     0     0      0    0:00   0.0%  kworker/0:209
214    1      0     0     0      0    0:00   0.0%  kworker/0:210
215    1      0     0     0      0    0:00   0.0%  kworker/0:211
216    1      0     0     0      0    0:00   0.0%  kworker/0:212
217    1      0     0     0      0    0:00   0.0%  kworker/0:213
218    1      0     0     0      0    0:00   0.0%  kworker/0:214
219    1      0     0     0      0    0:00   0.0%  kworker/0:215
220    1      0     0     0      0    0:00   0.0%  kworker/0:216
221    1      0     0     0      0    0:00   0.0%  kworker/0:217
222    1      0     0     0      0    0:00   0.0%  kworker/0:218
223    1      0     0     0      0    0:00   0.0%  kworker/0:219
224    1      0     0     0      0    0:00   0.0%  kworker/0:220
225    1      0     0     0      0    0:00   0.0%  kworker/0:221
226    1      0     0     0      0    0:00   0.0%  kworker/0:222
227    1      0     0     0      0    0:00   0.0%  kworker/0:223
228    1      0     0     0      0    0:00   0.0%  kworker/0:224
229    1      0     0     0      0    0:00   0.0%  kworker/0:225
230    1      0     0     0      0    0:00   0.0%  kworker/0:226
231    1      0     0     0      0    0:00   0.0%  kworker/0:227
232    1      0     0     0      0    0:00   0.0%  kworker/0:228
233    1      0     0     0      0    0:00   0.0%  kworker/0:229
234    1      0     0     0      0    0:00   0.0%  kworker/0:230
235    1      0     0     0      0    0:00   0.0%  kworker/0:231
236    1      0     0     0      0    0:00   0.0%  kworker/0:232
237    1      0     0     0      0    0:00   0.0%  kworker/0:233
238    1      0     0     0      0    0:00   0.0%  kworker/0:234
239    1      0     0     0      0    0:00   0.0%  kworker/0:235
240    1      0     0     0      0    0:00   0.0%  kworker/0:236
241    1      0     0     0      0    0:00   0.0%  kworker/0:237
242    1      0     0     0      0    0:00   0.0%  kworker/0:238
243    1      0     0     0      0    0:00   0.0%  kworker/0:239
244    1      0     0     0      0    0:00   0.0%  kworker/0:240
245    1      0     0     0      0    0:00   0.0%  kworker/0:241
246    1      0     0     0      0    0:00   0.0%  kworker/0:242
247    1      0     0     0      0    0:00   0.0%  kworker/0:243
248    1      0     0     0      0    0:00   0.0%  kworker/0:244
249    1      0     0     0      0    0:00   0.0%  kworker/0:245
250    1      0     0     0      0    0:00   0.0%  kworker/0:246
251    1      0     0     0      0    0:00   0.0%  kworker/0:247
252    1      0     0     0      0    0:00   0.0%  kworker/0:248
253    1      0     0     0      0    0:00   0.0%  kworker/0:249
254    1      0     0     0      0    0:00   0.0%  kworker/0:250
255    1      0     0     0      0    0:00   0.0%  kworker/0:251
256    1      0     0     0      0    0:00   0.0%  kworker/0:252
257    1      0     0     0      0    0:00   0.0%  kworker/0:253
258    1      0     0     0      0    0:00   0.0%  kworker/0:254
259    1      0     0     0      0    0:00   0.0%  kworker/0:255
260    1      0     0     0      0    0:00   0.0%  kworker/0:256
261    1      0     0     0      0    0:00   0.0%  kworker/0:257
262    1      0     0     0      0    0:00   0.0%  kworker/0:258
263    1      0     0     0      0    0:00   0.0%  kworker/0:259
264    1      0     0     0      0    0:00   0.0%  kworker/0:260
265    1      0     0     0      0    0:00   0.0%  kworker/0:261
266    1      0     0     0      0    0:00   0.0%  kworker/0:262
267    1      0     0     0      0    0:00   0.0%  kworker/0:263
268    1      0     0     0      0    0:00   0.0%  kworker/0:264
269    1      0     0     0      0    0:00   0.0%  kworker/0:265
270    1      0     0     0      0    0:00   0.0%  kworker/0:266
271    1      0     0     0      0    0:00   0.0%  kworker/0:267
272    1      0     0     0      0    0:00   0.0%  kworker/0:268
273    1      0     0     0      0    0:00   0.0%  kworker/0:269
274    1      0     0     
```

Deadlocks



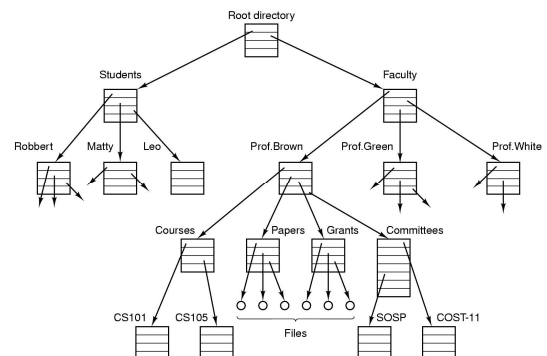
Gerenciamento de memória

- Todo computador tem uma memória principal usada para guardar os **programas em execução**;
- Nos sistemas operacionais antigos era possível apenas um processo de cada vez;
- Nos atuais é possível que mais de um processo fique na memória por vez -> Sendo assim é necessário um esquema de proteção da memória para que um processo não interfira em outro (isso é controlado pelo SO);
- Outro problema enfrentado pelo gerenciamento de memória é quando o tamanho do processo é maior que o tamanho da memória -> Memória Virtual (swap);

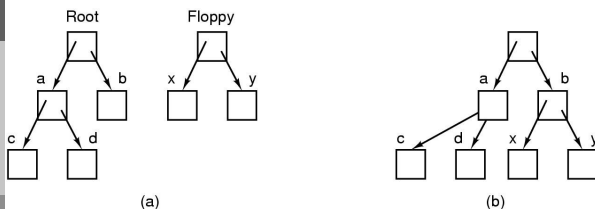
Arquivos

- Todos os sistemas operacionais tratam os dados em arquivos;
- Os arquivos são organizados no S.O. sob a forma de diretórios;
- Existem caminhos relativos e absolutos;
- Diretório-raiz: C:\ (windows) ou / (linux);
- Propriedade e proteção de arquivos;
- Montar os drives.

Arquivos



Arquivos



Segurança

- Computadores contêm muitas informações que muitas vezes os usuários querem manter confidenciais;
- Exemplo de controle de uso de arquivos: Unix, Linux.

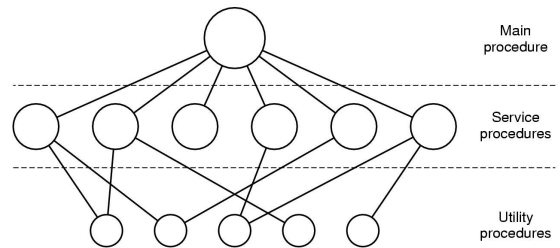


Estrutura de um S.O.

- **Sistemas Monolíticos:**
 - Estrutura mais comum;
 - S.O. é escrito como uma coleção de procedimentos que podem chamar uns aos outros;
 - Para cada chamada ao sistema que uma aplicação necessite há um procedimento relacionado;
 - Assim não existe informação ou procedimentos ocultos e todos podem acessar todos;

Estrutura de um S.O.

- **Sistemas Monolíticos:**



Estrutura de um S.O.

- **Sistemas de Camadas:**
 - Uma outra abordagem de construção de S.O.'s é a organização em hierarquia de camadas;
 - Cada camada é construída usando os serviços da camada imediatamente inferior;

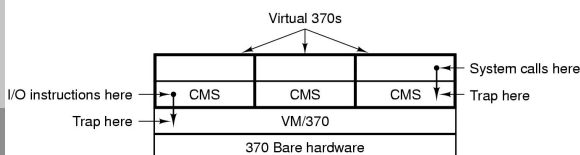
Layer	Function
5	The operator
4	User programs
3	Input/output management
2	Operator-process communication
1	Memory and drum management
0	Processor allocation and multiprogramming

Estrutura de um S.O.

- **Máquinas Virtuais:**
 - Surgiu na construção do SO VM/370 da IBM através do conceito de que um SO de tempo compartilhado oferece:
 - -Multiprogramação;
 - -Máquina estendida com interface mais simples para o hardware;
 - A essência desse sistema é a separação completa dessas duas funções;
 - A máquina virtual é executada diretamente sobre o hardware e implementa a multiprogramação. Sendo assim pode oferecer várias máquinas virtuais ao sistema;

Estrutura de um S.O.

- **Máquinas Virtuais:**
 - Essa máquina virtual é a cópia exata do hardware sobre a qual ela esta rodando;

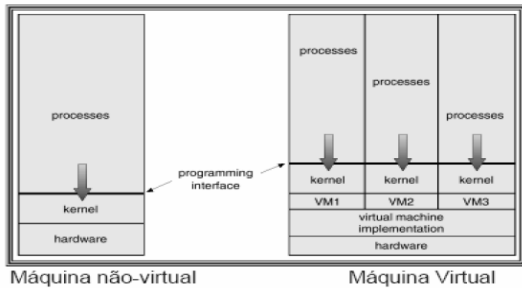


Estrutura de um S.O.

- **Máquinas Virtuais:**
 - A idéia de Máquina Virtual foi utilizada pelo JAVA;
 - JVM -Java Virtual Machine;
 - Compilador JAVA produz código para JVM que é executado por um programa interpretador da JVM;
 - A JVM, por sua vez, pode estar implementada para qualquer máquina ou sistema.

Estrutura de um S.O.

□ Máquinas Virtuais:



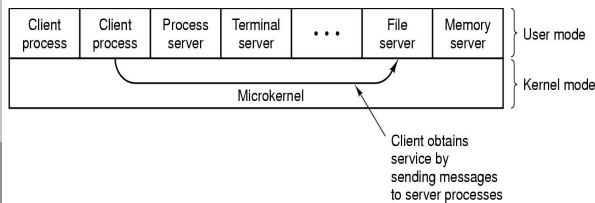
Estrutura de um S.O.

□ Modelo Cliente/Servidor:

- A tendência dos SO's modernos é transferir a maior parte do código para ser executado em modo usuário e deixando o mínimo possível para modo núcleo;
- Neste modelo, para se ler um bloco de arquivo, um processo usuário (cliente) deve enviar uma requisição ao processo servidor, que executa o trabalho em modo núcleo e o envia de volta;
- Dessa forma o SO é dividido em várias partes: servidor de arquivos, servidor de processos, servidor de terminais, servidor de memória e etc;
- Assim cada parte do SO se torna independente, pequena e gerenciável

Estrutura de um S.O.

□ Modelo Cliente/Servidor:



Estrutura de um S.O.

□ Exemplos:

- Monolíticos: Windows, OS/2, Linuz, FreeBSD
- Camadas: Multics
- Máquinas Virtuais: VM/370, VMWare, Xen
- Cliente/Servidor: GNU Hurd, Mach