

LSP中enable了swap functionality.

```
CONFIG_SWAP = y
```

与CONFIG_SWAP相关的file (in mm/)

```
obj-$(CONFIG_SWAP) += page_io.o swap_state.o swapfile.o  
obj-y += swap.o
```

CONFIG_ZSWAP是对swap contents进行压缩的。

与swap functionality相关的system call是 `swapon` and `swapoff` , 在mm/swapfile.c中实现。

所以如果disable swap functionality,这两个system call也应该不能使用。

其实LSP这样的为embedded system设计的系统根本用不上swap functionality,完全可以disable,

这样kernel的footprint也可以缩小。

build swap function disable kernel and startup.

```

1. root@granite2:~# dd if=/dev/zero of=./swapfile bs=1024 count=1024 ①
2. 1024+0 records in
3. 1024+0 records out
4. root@granite2:~# ls -l
5. -rwxr-xr-x    1 root    root        701994 Aug  8 10:48 strace
6. -rw-r--r--    1 root    root        1048576 Aug  8 10:47 swapfile
7. root@granite2:~# mkswap swapfile ②
8. Setting up swapspace version 1, size = 1020 KiB
9. no label, UUID=18ceae8e-7a24-454c-be76-53e2311ef3ba
10. root@granite2:~# swapon swapfile ③
11. swapon: /home/root/swapfile: insecure permissions 0644, 0600 suggested.
12. swapon: swapfile: swapon failed: Function not implemented
13. root@granite2:~# strace swapon swapfile
14. execve("/sbin/swapon", ["swapon", "swapfile"], [/ * 14 vars */]) = 0
15. brk(0) = 0x18000
16. uname({sys="Linux", node="granite2", ...}) = 0
17. mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0xb6f49000
18. access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
19. open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
20. fstat64(3, {st_mode=S_IFREG|0644, st_size=19287, ...}) = 0
21. mmap2(NULL, 19287, PROT_READ, MAP_PRIVATE, 3, 0) = 0xb6f44000
22. close(3) = 0
23. open("/lib/libmount.so.1", O_RDONLY|O_CLOEXEC) = 3
24. read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\0\3\0(\0\1\0\0\0\10t\361F4\0\0\0"...
    , 512) = 512
25. fstat64(3, {st_mode=S_IFREG|0755, st_size=258588, ...}) = 0
26. mmap2(0x46f10000, 237120, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3,
    0) = 0x46f10000
27. mmap2(0x46f48000, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENY
    WRITE, 3, 0x38000) = 0x46f48000
28. mmap2(0x46f49000, 3648, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANON
    YMOUS, -1, 0) = 0x46f49000
29. close(3) = 0
30. open("/lib/libsmartcols.so.1", O_RDONLY|O_CLOEXEC) = 3
31. read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\0\3\0(\0\1\0\0\0\10\274\350F4\0\0\0"...
    .., 512) = 512
32. fstat64(3, {st_mode=S_IFREG|0755, st_size=122240, ...}) = 0
33. mmap2(0x46e88000, 143132, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3,
    0) = 0x46e88000
34. mprotect(0x46ea2000, 28672, PROT_NONE) = 0
35. mmap2(0x46ea9000, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENY
    WRITE, 3, 0x19000) = 0x46ea9000
36. mmap2(0x46eaa000, 3868, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANON
    YMOUS, -1, 0) = 0x46eaa000
37. close(3) = 0
38. open("/lib/tls/v71/neon/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
39. stat64("/lib/tls/v71/neon/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or dir
    ectory)
40. open("/lib/tls/v71/neon/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
    file or directory)

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41. stat64("/lib/tls/v7l/neon", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
42. open("/lib/tls/v7l/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
43. stat64("/lib/tls/v7l/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
44. open("/lib/tls/v7l/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
45. stat64("/lib/tls/v7l", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
46. open("/lib/tls/neon/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
47. stat64("/lib/tls/neon/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
48. open("/lib/tls/neon/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
49. stat64("/lib/tls/neon", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
50. open("/lib/tls/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
51. stat64("/lib/tls/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
52. open("/lib/tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
53. stat64("/lib/tls", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
54. open("/lib/v7l/neon/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
55. stat64("/lib/v7l/neon/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
56. open("/lib/v7l/neon/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
57. stat64("/lib/v7l/neon", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
58. open("/lib/v7l/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
59. stat64("/lib/v7l/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
60. open("/lib/v7l/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
61. stat64("/lib/v7l", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
62. open("/lib/neon/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
63. stat64("/lib/neon/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
64. open("/lib/neon/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
65. stat64("/lib/neon", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
66. open("/lib/vfp/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
67. stat64("/lib/vfp", 0xbe82c4a8) = -1 ENOENT (No such file or directory)
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68. open("/lib/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
69. read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\3\0(\0\1\0\0\0\330\202\326F4\0\0\0"
..., 512) = 512
70. fstat64(3, {st_mode=S_IFREG|0755, st_size=1346356, ...}) = 0
71. mmap2(0x46d50000, 1259864, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3
, 0) = 0x46d50000
72. mprotect(0x46e76000, 32768, PROT_NONE) = 0
73. mmap2(0x46e7e000, 16384, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x126000) = 0x46e7e000
74. mmap2(0x46e82000, 6488, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x46e82000
75. close(3) = 0
76. open("/lib/libblkid.so.1", O_RDONLY|O_CLOEXEC) = 3
77. read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\3\0(\0\1\0\0\0\200M\354F4\0\0\0"...
, 512) = 512
78. fstat64(3, {st_mode=S_IFREG|0755, st_size=227436, ...}) = 0
79. mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb6f43000
80. mmap2(0x46ec0000, 237260, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3,
0) = 0x46ec0000
81. mprotect(0x46eef000, 32768, PROT_NONE) = 0
82. mmap2(0x46ef7000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2f000) = 0x46ef7000
83. mmap2(0x46ef9000, 3788, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x46ef9000
84. close(3) = 0
85. open("/lib/libuuid.so.1", O_RDONLY|O_CLOEXEC) = 3
86. read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\3\0(\0\1\0\0\0\270\16\360F4\0\0\0".
.., 512) = 512
87. fstat64(3, {st_mode=S_IFREG|0755, st_size=16652, ...}) = 0
88. mmap2(0x46f00000, 44928, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3,
0) = 0x46f00000
89. mprotect(0x46f03000, 28672, PROT_NONE) = 0
90. mmap2(0x46f0a000, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x46f0a000
91. close(3) = 0
92. mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb6f42000
93. set_tls(0xb6f424c0, 0xb6f42bf8, 0x46d47050, 0xb6f424c0, 0x46d47050) = 0
94. mprotect(0x46e7e000, 8192, PROT_READ) = 0
95. mprotect(0x46d46000, 4096, PROT_READ) = 0
96. munmap(0xb6f44000, 19287) = 0
97. brk(0) = 0x18000
98. brk(0x39000) = 0x39000
99. getcwd("/home/root", 4096) = 11
100. lstat64("/home/root/swapfile", {st_mode=S_IFREG|0644, st_size=1048576, ...}) = 0
101. stat64("/home/root/swapfile", {st_mode=S_IFREG|0644, st_size=1048576, ...}) = 0
102. write(2, "swapon: ", 8swapon: ) = 8
103. write(2, "/home/root/swapfile: insecure pe"... , 63/home/root/swapfile: insecure permissions 0644, 0600 suggested.) = 63
104. write(2, "\n", 1
105. ) = 1

```

[illegible]

①

create storage for the swap file

②

create swap file. swap file是有一定的format的，mkswap generate the information.

③

enable the swap file

④

`swapon` utility invoke "swapon" system call. 由于CONFIG_SWAP is disabled, "swapon" system call根本没实现, 所以这里返回 `ENOSYS` (Function not implemented)