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西南林业大学
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题 目： 一个简单操作系统的实现 —

RongOS

分院系部： 计算机与信息科学学院

专 业： 计算机科学与技术专业

姓 名： 蒲启元

导师姓名： 王晓林

导师职称： 讲师

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一个简单操作系统的实现 — RongOS

蒲启元

(西南林业大学 计算机与信息科学学院, 云南 昆明 650224)

摘 要：操作系统管理着计算机的硬件和软件资源，它是向上层应用软件提供服务（接口）的核心系统软件，这些服务包括进程管理，内存管理，文件系统，网络通信，安全机制等。操作系统的设计与实现则是软件工业的基础与内核。为此，在国务院提出的《中国制造 2025》中专门强调了操作系统的开发。但长期以来，操作系统核心开发技术都掌握在外国人手中，技术受制，对于我们的软件工业来说很不利。本文拟从零开始设计开发一个简单的操作系统，包括 `boot loader`，中断，内存管理，图形接口，多任务，以及在这个系统上的几个小应用等。尽管这个系统很简单，但它为自主开发操作系统做了一个小小的尝试。

关键词：操作系统，开发，自主

The implement of a simple OS — RongOS

Qiyuan Pu

School of Computer and Information Science
Southwest Forestry University
Kunming 650224, Yunnan, China

Abstract: Operating system manages the sources of hardware and software, it lie in the core of the system software and provide service(interface) to upper application. These service including process management, memory management, file system, network communication, security mechanism etc. The design and implement of operating system is the foundation and core of software industry. Therefore, «Made in China 2025» emphasize the development of operating system that put forward by The State Council. For a long time, however, the kernel development technology grasped in the hand of foreigner, it's bad for our software industry cause of limited technology. So this article will design and develop a simple operating system, including boot loader, interrupt, memory management, graphic interface, multitasking, and some little application depend on this system. In spite of the simple of this system, it's a small trying for autonomous development operating system.

Key words: operating system, development, autonomous

目 录

1 Chapter — Preliminary Works	1
1.1 Development Environment	1
1.2 Tools	1
1.3 Install	1
2 Chapter — Boot Loader	2
2.1 Chose Disk	2
2.2 The Structure of Floppy Disk	2
2.3 The Source Codes and Comments of Boot Loader	2
参考文献	8
指导教师简介	8
致 谢	10

插图目录

2-1 Floppy Disk Structure 1	2
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表格目录

1 Chapter — Preliminary Works

1.1 Development Environment

Operating System: Debian 4.11.0-1-amd64

Debug System: QEMU emulator version 2.8.1(Debian 1:2.8+dfsg-7)

Emacs version: GNU Emacs 25.2.2

1.2 Tools

Some tools used to develop RongOS, see tools.¹.

1.3 Install

Debian System: there is a small tutorial.²

QEMU, for my x86_64 architecture:

```
$ sudo apt-get install qemu-system-x86_64
```

Note that the tools is exe formate, so on Debian system, you need to install wine:

```
$ sudo apt-get update
```

```
$ sudo apt-get install wine
```

Maybe you also need to add i386 architecture cause of AMD64 on your machine to use these tools:

```
$ sudo dpkg --add-architecture i386
```

```
$ sudo apt-get update
```

¹<https://github.com/Puqiyuan/RongOS/tree/master/Tools>

²http://cs2.swfc.edu.cn/~wx672/lecture_notes/linux/install.html

2 Chapter — Boot Loader

2.1 Chose Disk

There are many ways to boot a operating system, from hard disk, USB, floppy disk etc. I chose floppy disk, although it is out of date. For my purpose is that develop a simple operating system, pay my attention on how to development. The structure of floppy disk is simple and for my simple operating system it's enough.

2.2 The Structure of Floppy Disk

This picture show the inside of floppy disk:

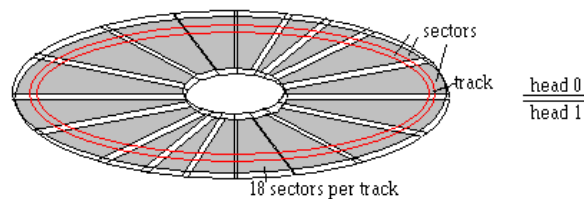


图 2-1 Floppy Disk Structure 1

2.3 The Source Codes and Comments of Boot Loader

```
1          CYLS equ 10
2
3  org 0x7c00 ; load the program to address 0x7c00.
4          jmp entry
5          ; The next codes specify the format of standard FAT12 floppy disk.
6  db 0x90 ;db is the abbreviation of "define byte", it literally places that byte
7          ; right there in the executable.
8  db "RONGBOOT" ;The name of boot sector, must be 8 byte.
```



```
9  dw 512 ; the size of every sector, must be 512 byte.
10 db 1 ; the size of cluster, must be 1.
11 dw 1 ; the start point of FAT, 1 general case.
12 db 2 ; the number of FAT, must be 2.
13 dw 224 ; the size of root directory, 224 in general.
14 dw 2880 ; the size of this floppy disk, must be 2880.
15 db 0xf0 ; the kind of disk.
16 dw 9 ; the length of FAT.
17 dw 18 ; how many sectors in one track, must be 18.
18 dw 2 ; the number of head, must be 2.
19 dd 0 ; no partion, must be 0.
20 dd 2880 ; the size if re-writer one time.
21 db 0,0,0x29 ; just fixed, no meaning.
22 dd 0xffffffff
23 db "RONGBOOTOS " ; the name of disk.
24 db "FAT12  " ; the name of disk formate.
25 resb 18 ; reserved 18 byte.
26     ; end FAT12 formate.
27
28 entry:
29     mov ax, 0 ; init the registers.
30     mov ss, ax
31     mov sp, 0x7c00
32     mov ds, ax
33
34     mov si, msg_init
35     jmp init
36
37
38 init:
39     mov al, [si]
```

```
40         add si, 1 ; increment by 1.
41         cmp al, 0
42         je load
43         mov ah, 0x0e ; show a character.
44         mov bx, 15   ; specify the color of the character.
45         int 0x10 ; call BIOS function, video card is number 10.
46         jmp init
47
48
49 msg_init:
50     db 0x0a
51     db 0x0d
52     db "Copyright: GPL"
53     db 0x0a
54     db 0x0d
55     db "Author: Qiyuan Pu"
56     db 0x0a
57     db 0x0d
58     db "https://github.com/Puqiyuan/RongOS"
59     db 0x0a
60     db 0x0d
61     db "IPL is loading, please waiting..."
62     db 0x0a
63     db 0x0d
64     db "....."
65
66
67 load:
68
69     mov ax, 0
70
```

```
71         mov ax, 0x0820
72         mov es, ax
73         mov ch, 0
74         mov dh, 0
75         mov cl, 2
76
77     readloop:
78         mov si, 0
79
80     retry:
81         mov ah, 0x02
82         mov al, 1
83         mov bx, 0
84         mov dl, 0x00
85         int 0x13
86         jnc next
87         add si, 1
88         cmp si, 5
89         jae error
90         mov ah, 0x00
91         mov dl, 0x00
92         int 0x13
93         jmp retry
94
95     next:
96         mov ax, es
97         add ax, 0x0020
98         mov es, ax
99         add cl, 1
100        cmp cl, 18
101        jbe readloop
```

```
102         mov cl, 1
103         add dh, 1
104         cmp dh, 2
105         jb readloop
106         mov dh, 0
107         add ch, 1
108         cmp ch, CYLS
109         jb readloop
110         jmp correct
111
112
113 fin:
114     hlt
115     jmp fin
116
117
118 error:
119     mov si, msg
120
121
122 correct:
123     mov si, msg_corr
124
125
126 putloop:
127     mov al, [si]
128     add si, 1
129     cmp al, 0
130     mov [0x0ff0], ch
131     je 0xc200
132     mov ah, 0x0e
```

```
133         mov bx, 15
134         int 0x10
135         jmp putloop
136
137
138 msg_corr:
139     db 0x0a
140     db 0x0d
141     db 0x0a
142     db 0x0d
143     db "OK: IPL loaded"
144     db 0x0a
145     db 0x0d
146     db 0
147
148
149 msg:
150     db 0x0a
151     db "IPL load error"
152     db 0x0a
153     db 0
154     resb 0x7dfe-$
155
156
157     db 0x55, 0xaa ; the sector end with 0x55 0xaa, the sector is
158                   ;boot sector.
```

参考文献

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指导教师简介

指导教师简介（约百余字）

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首先我想感谢我的老师，王晓林。大学期间，他给了我很多指导，包括专业方面和上大学的意义等。很多时候，他对学生的要求看起来都是不近情理的，但正是通过这个“痛苦”的过程，我锻炼了坚强的意志，和战胜困难的信心。谢谢你，王老师。我最想感谢的是我的女友，她容忍我在完成这个设计时的很多个夜晚不陪她，给我支持，鼓励我，不抱怨。所以我愿意把这个简单操作系统命名为 **RongOS**, 蓉便是她名字的最后两个字。谢谢你，我最亲爱的。