

PDP-11 & VAX-11 仿真程序 SIMH

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I. SIMH仿真程序

SimH (History Simulator) is a collection of simulators for historically significant or just plain interesting computer hardware and software from the past. The goal of the project is to create highly portable system simulators and to publish them as open-source software on the Internet, with freely available copies of significant or representative software.

SimH (History Simulator) 是一个仿真器集合，用于仿真过去具有重要历史意义或简单有趣的计算机硬件和软件。该项目的目标是创建高度便携的系统模拟器，并将它们作为开源软件发布在 Internet 上并提供重要或代表性的操作系统及其他软件的副本。

Software Download: <http://simh.trailing-edge.com/sources/simhv312-3.zip>

Documents: http://simh.trailing-edge.com/pdf/all_docs.html

1.1 SIMH V3.x可以仿真下列早年的电脑系统

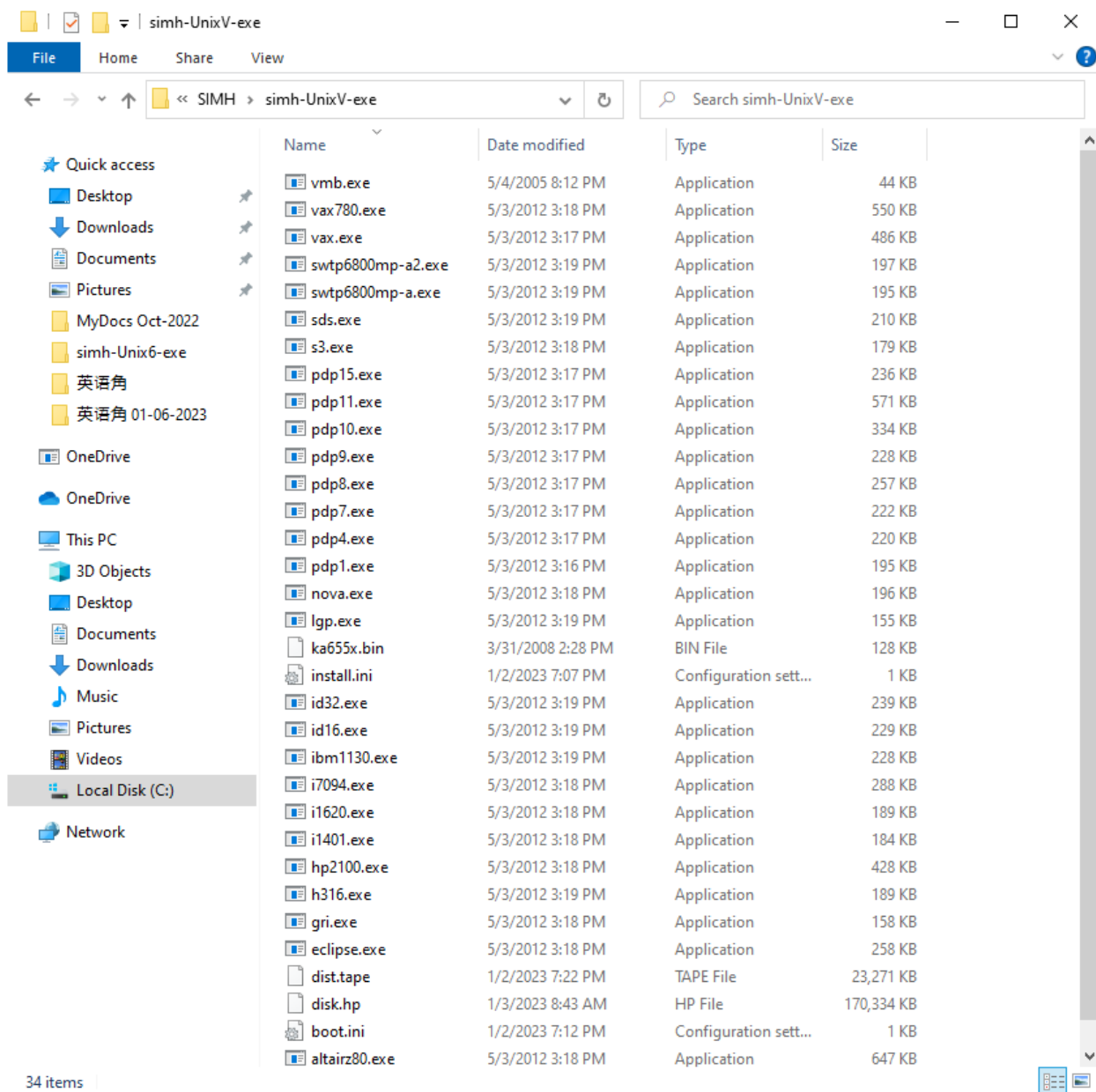
- Data General Nova, Eclipse
- Digital Equipment Corporation PDP-1, PDP-4, PDP-7, PDP-8, PDP-9, PDP-10 (KS10), PDP-11, PDP-15 (and UC15), VAX11/780, VAX3900
- GRI Corporation GRI-909, GRI-99
- IBM 1401, 1620, 7090/7094, System 3
- Interdata (Perkin-Elmer) 16b and 32b systems
- Hewlett-Packard 2114, 2115, 2116, 2100, 21MX, 1000, 3000
- Honeywell H316/H516
- MITS Altair 8800, 8080 only
- Royal-McBee LGP-30, LGP-21
- Scientific Data Systems SDS 940
- Xerox Data Systems Sigma 32b systems

1.2 SIMH V3.x 软件结构

SIMH 软件结构与另外一个仿真程序 QEMU 比较相近。也是在 DOS CMD 下执行的。软件下载 un-compress 以后会发现在 SIMH 目录下面有很多exe文件。这些文件分别有名

称如 pdp11.exe, pdp14.exe, vax.exe, vax780.exe 等等. 见下图. 每个 exe 程序执行的时候可以带一些参数. 这些参数可以放在一个 xxx.ini 文件中. 如:

```
>pdp11 install.ini <CR>
```



II. SIMH仿真 PDP-11/70 运行 UNIX System V

参考: http://squoze.net/UNIX/sysV_pdp11/Installation

UNIX System V Release 1 on PDP-11

You can get various SysV distributions from archive.org. I've put the distribution files [here](#) and a complete distribution tape [here](#).

2.1 下载磁带 `dist.tape`. 操作系统所有内容都在磁带上.

http://squoze.net/UNIX/sysV_pdp11/files/dist.tape

Unfortunately there don't seem to be any documents in the distribution, but the installation is very easy if you've installed SysIII.

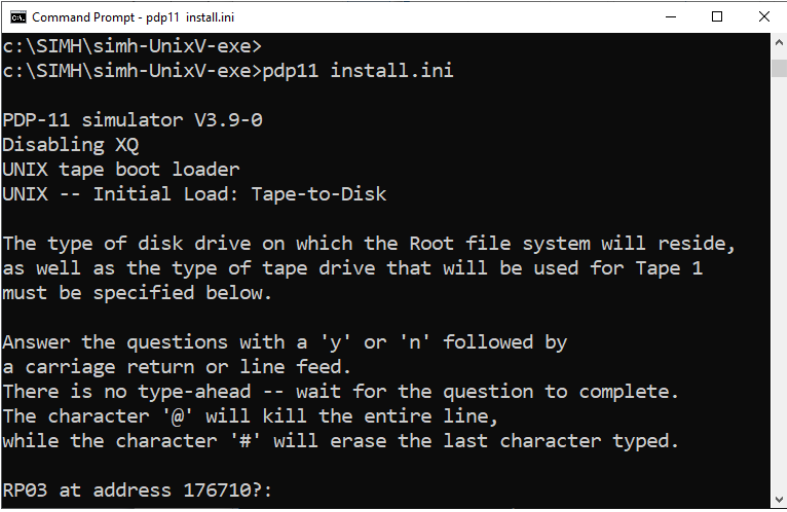
Installing the root file system

2.2 建立启动文件 `install.ini`

Create a file `install.ini`:

```
set cpu 11/70
set cpu idle
set rp0 rp06
att rp0 disk.hp
att tm0 dist.tape
b tm0
```

2.3 运行 `pdp11 install.ini` <CR> 程序. 回答一些问题.



```
Command Prompt - pdp11 install.ini
c:\SIMH\simh-UnixV-exe>
c:\SIMH\simh-UnixV-exe>pdp11 install.ini

PDP-11 simulator V3.9-0
Disabling XQ
UNIX tape boot loader
UNIX -- Initial Load: Tape-to-Disk

The type of disk drive on which the Root file system will reside,
as well as the type of tape drive that will be used for Tape 1
must be specified below.

Answer the questions with a 'y' or 'n' followed by
a carriage return or line feed.
There is no type-ahead -- wait for the question to complete.
The character '@' will kill the entire line,
while the character '#' will erase the last character typed.

RP03 at address 176710?:
```

Run simh and install the root file system:

```
% pdp11 install.ini
```

```
PDP-11 simulator V4.0-0 Beta          git commit id: 8blaf8b8
Disabling XQ
UNIX tape boot loader
UNIX -- Initial Load: Tape-to-Disk
```

The type of disk drive on which the Root file system will reside,
as well as the type of tape drive that will be used for Tape 1
must be specified below.

Answer the questions with a 'y' or 'n' followed by
a carriage return or line feed.
There is no type-ahead -- wait for the question to complete.
The character '@' will kill the entire line,
while the character '#' will erase the last character typed.

```
RP03 at address 176710?: n
RP04/5/6 at address 176700?: y
Drive number (0-7)?: 0
Disk drive 0 selected.
```

```
Mount a formatted pack on drive 0.
Ready?: y
```

```
TU10/TM11 at address 172520?: y
Drive number (0-7)?: 0
Tape drive 0 selected.
```

The tape on drive 0 will be read from the current position
at 800bpi, 5120 characters (10 blocks) per record,
and written onto the pack on drive 0 starting at block 0.

```
Ready?: y
Size of filesystem to be copied is 7000 blocks.
What is the pack volume label? (e.g. p0001):
The pack will be labelled p0001.
The boot block for your type of disk drive will now be installed.
```

The file system copy is now complete.

To boot the basic unix for your disk and tape drives
as indicated above, mount this pack on drive 0
and read in the boot block (block 0) using
whatever means you have available; see romboot(8), 70boot(8).

```
Then boot the program unixgdtm using diskboot(8).
Normally: #0=unixgdtm
```

The system will initially come up single-user; see init(8).
If you have an upper case only console terminal,
you must execute: stty lcase; see stty(1).

After UNIX is up, link the file unixgdtm to unix using ln(1).

```
# ln /unixgdtm /unix

Set the date(1).

Good Luck!

The tape will now be rewound.

HALT instruction, PC: 002422 (BR 2420)
sim>
```

Booting UNIX

2.4 磁带基本程序已经装完, 重新 boot

Just continue from the previous prompt to boot from hard disk:

```
sim> b rp0
#0=unixgdtm

UNIX/sysV: unixgdtm
real mem = 262144 bytes
avail mem = 185280 bytes

INIT: SINGLE USER MODE
#
```

If you want, change erase (default #) and kill (default @) to whatever you like using `stty`, this is what I do:

```
# stty erase <press backspace> kill <press ^U>
```

Installing the rest of the tape

2.5 继续装磁带的其他部分

The installation is very similar to SysIII again:

```
# echo </dev/mt4

# echo </dev/mt4

# echo </dev/mt4

# echo </dev/mt4

# cd /
# mkfs /dev/rrp1 322278 7 418
bytes per logical block = 512
total logical blocks = 322278
```

```
total inodes = 65496
gap (physical blocks) = 7
cylinder size (physical blocks) = 418
```

```
# labelit /dev/rp1 usr p0002
```

```
Current fsname: , Current volname: , Blocks: 322278, Inodes: -40
FS Units: 512b, Date last mounted: Wed Dec 1 14:49:01 1982
NEW fsname = usr, NEW volname = p0002 -- DEL if wrong!!
```

```
# mount /dev/rp1 /usr
# cd /usr
# cpio -idmB </dev/rmt4
28530 blocks
# cpio -idmB </dev/rmt4
750 blocks
# cpio -idmB </dev/rmt4
230 blocks
# mkdir man
# cd man
# cpio -idmB </dev/rmt4
4720 blocks
# cpio -idmB </dev/rmt4
300 blocks
#
```

Configure the system for multiuser:

```
# ed /etc/rc
751
/mount/
      : put mounts here
a
      /etc/mount /dev/rp1 /usr
.
w
777
q
# ln /unixgdtm /unix
```

Now halt:

```
# sync
# sync
# sync
# ^E
Simulation stopped, PC: 001666 (MOV (SP)+,177776)
sim> q
Goodbye
```

Booting the installed system

2.6 建立 boot 文件 boot.init

Create a file **boot.ini**:

```
set cpu 11/70
set cpu idle
set rp0 rp06
att rp0 disk.hp
b rp0
```

2.7 启动单用户 UNIX

And run simh:

```
% pdp11 boot.ini

PDP-11 simulator V4.0-0 Beta          git commit id: 8b1af8b8
Disabling XQ
#0=unix

UNIX/sysV: unixgdtm
real mem = 262144 bytes
avail mem = 185280 bytes

INIT: SINGLE USER MODE
# init 2

INIT: New run level: 2
Is the date Wed Dec  1 14:54:14 EST 1982 correct? (y or n) y
Do you want to check the file systems? (y or n) n
-su: /usr/lib/acct/startup: cannot execute
process accounting started
errdemon started
cron started

Console Login: root (no password)
UNIX System V
#
```

2.8 操作系统安装完毕. 下次如何启动 UNIX System V

- 1) **cd c:\SIMH\simh-UnixV-exe <CR>**
- 2) **>pdp11 boot.ini**

PDP-11 simulator V3.9-0

Disabling XQ

#0=unix

UNIX/sysV: unixgdtm

real mem = 262144 bytes

avail mem = 185280 bytes

INIT: SINGLE USER MODE

init 2

INIT: New run level: 2

Is the date Wed Dec 1 14:55:46 EST 1982 correct? (y or n) y

Do you want to check the file systems? (y or n) n

-su: /usr/lib/acct/startup: cannot execute

process accounting started

errdemon started

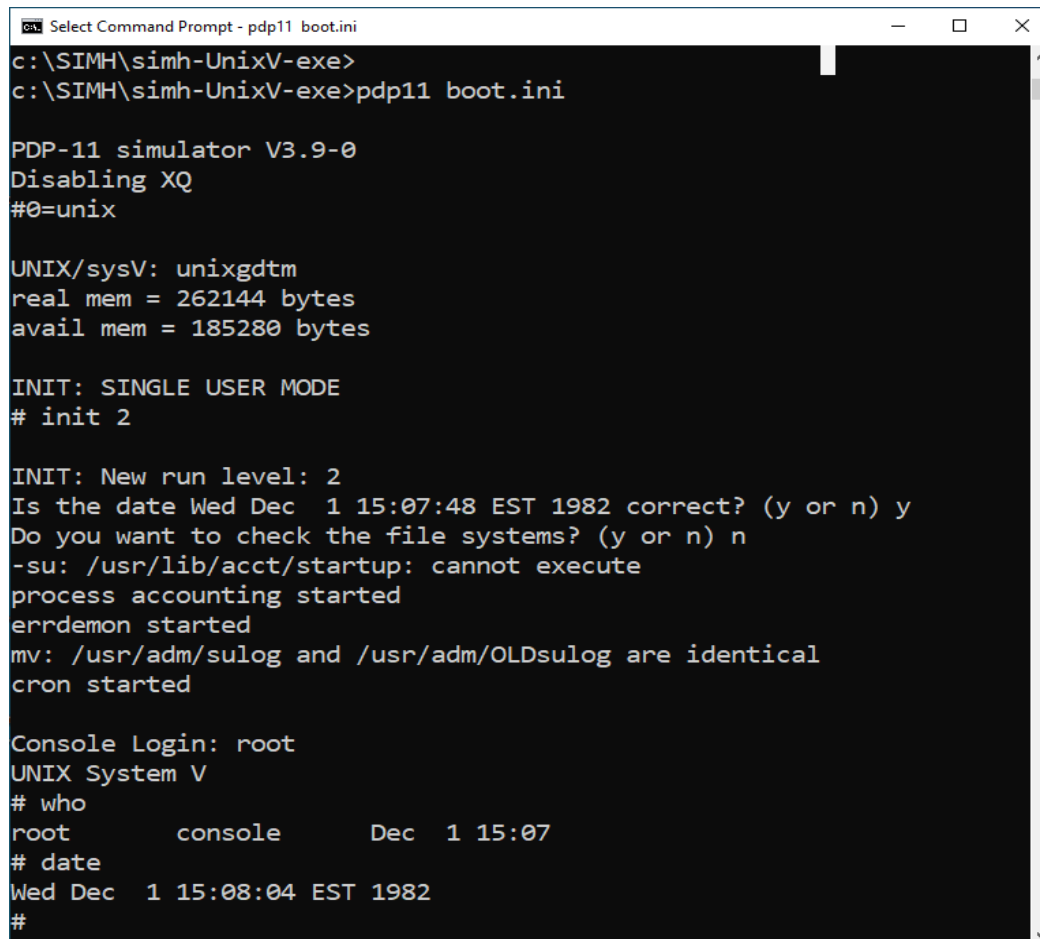
mv: /usr/adm/sulog and /usr/adm/OLDSulog are identical

cron started

Console Login: root (no password)

UNIX System V

2.9 CMD Screen Dump



```
c:\SIMH\simh-UnixV-exe>
c:\SIMH\simh-UnixV-exe>pdp11 boot.ini

PDP-11 simulator V3.9-0
Disabling XQ
#0=unix

UNIX/sysV: unixgdtm
real mem = 262144 bytes
avail mem = 185280 bytes

INIT: SINGLE USER MODE
# init 2

INIT: New run level: 2
Is the date Wed Dec 1 15:07:48 EST 1982 correct? (y or n) y
Do you want to check the file systems? (y or n) n
-su: /usr/lib/acct/startup: cannot execute
process accounting started
errdemon started
mv: /usr/adm/sulog and /usr/adm/OLDSulog are identical
cron started

Console Login: root
UNIX System V
# who
root      console      Dec  1 15:07
# date
Wed Dec  1 15:08:04 EST 1982
#
```