INTRODUCTION OF LINUX

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PART I

- Brief Introduction
- Basic Conceptions & Environment
- Install & Configure a Virtual Machine
- Basic Commands

PART II

- Shell Script
- Compile & Debug (for C)
- Text Editor (Vim, Sublime text, Atom)

PART I

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HISTORY

- 1969 - UNIX
- 1984 - GNU
- 1987 - MINIX
- 1995 - POSIX
- Internet

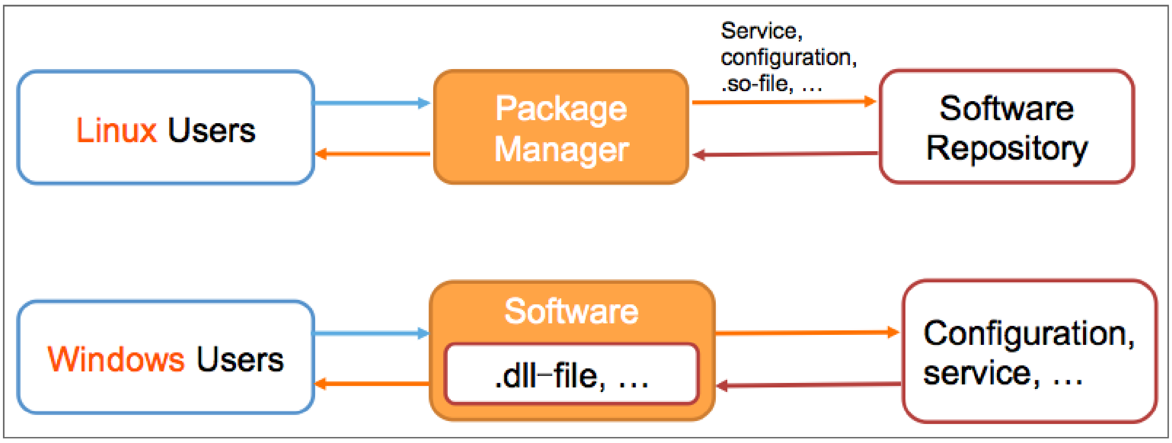
DISTRIBUTION

- Ubuntu
- Debian
- CentOS
- Arch Linux
- Fedora
- ...

FEATURES

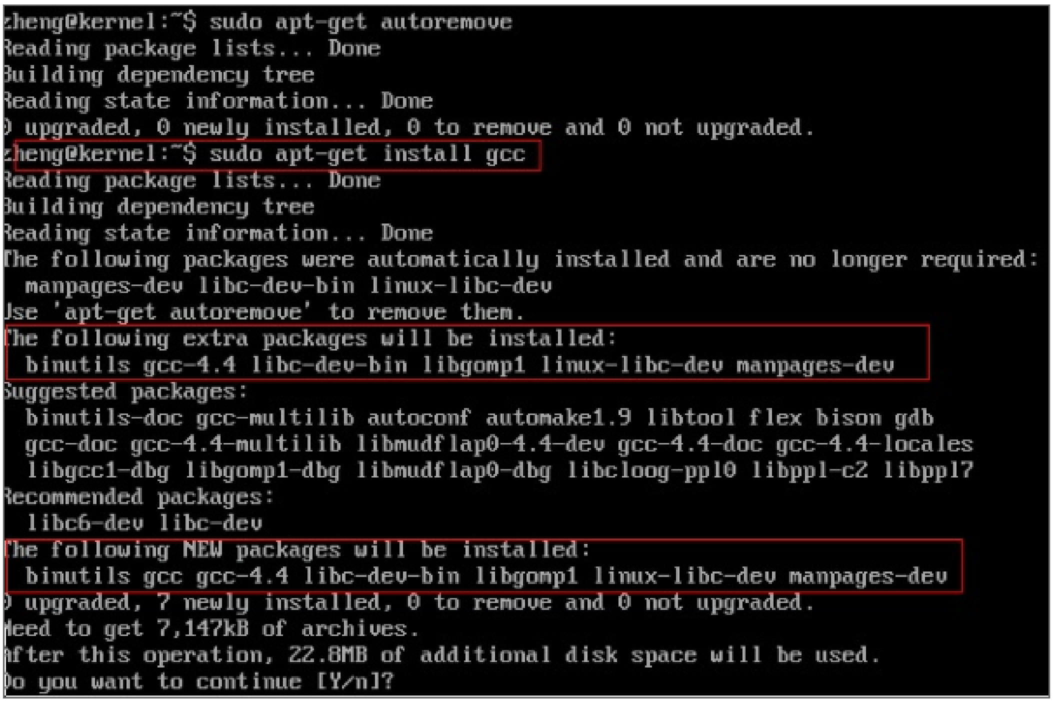
- Protable
- Open source
- Security
- Shell
- ...

LINUX VS WINDOWS SOFTWARE



LINUX INSTALL SOFTWARE

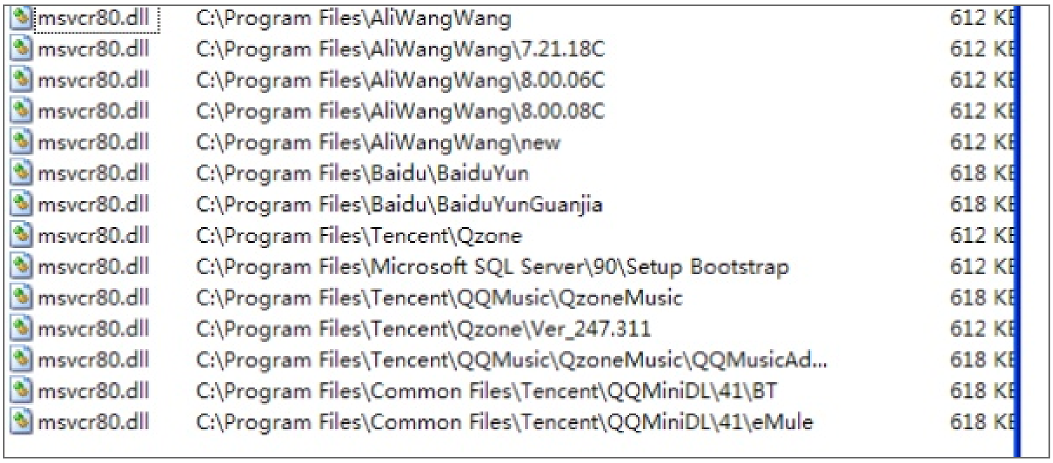
Package Manager：`apt-get` (Advanced Package Tool)



```
zheng@kernel:~$ sudo apt-get autoremove
Reading package lists... Done
Building dependency tree
Reading state information... Done
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
zheng@kernel:~$ sudo apt-get install gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  manpages-dev libc-dev-bin linux-libc-dev
Use 'apt-get autoremove' to remove them.
The following extra packages will be installed:
  binutils gcc-4.4 libc-dev-bin libgomp1 linux-libc-dev manpages-dev
Suggested packages:
  binutils-doc gcc-multilib autoconf automake1.9 libtool flex bison gdb
  gcc-doc gcc-4.4-multilib libmudflap0-4.4-dev gcc-4.4-doc gcc-4.4-locales
  libgcc1-dbg libgomp1-dbg libmudflap0-dbg libcloog-ppl0 libppl-c2 libppl7
Recommended packages:
  libc6-dev libc-dev
The following NEW packages will be installed:
  binutils gcc gcc-4.4 libc-dev-bin libgomp1 linux-libc-dev manpages-dev
0 upgraded, 7 newly installed, 0 to remove and 0 not upgraded.
Need to get 7,147kB of archives.
After this operation, 22.8MB of additional disk space will be used.
Do you want to continue [Y/n]?
```

WINDOWS INSTALL SOFTWARE

msvcr80.dll



msvcr80.dll	C:\Program Files\AliWangWang	612 KB
msvcr80.dll	C:\Program Files\AliWangWang\7.21.18C	612 KB
msvcr80.dll	C:\Program Files\AliWangWang\8.00.06C	612 KB
msvcr80.dll	C:\Program Files\AliWangWang\8.00.08C	612 KB
msvcr80.dll	C:\Program Files\AliWangWang\new	612 KB
msvcr80.dll	C:\Program Files\Baidu\BaiduYun	618 KB
msvcr80.dll	C:\Program Files\Baidu\BaiduYunGuanjia	618 KB
msvcr80.dll	C:\Program Files\Tencent\Qzone	612 KB
msvcr80.dll	C:\Program Files\Microsoft SQL Server\90\Setup Bootstrap	612 KB
msvcr80.dll	C:\Program Files\Tencent\QQMusic\QzoneMusic	618 KB
msvcr80.dll	C:\Program Files\Tencent\Qzone\Ver_247.311	612 KB
msvcr80.dll	C:\Program Files\Tencent\QQMusic\QzoneMusic\QQMusicAd...	618 KB
msvcr80.dll	C:\Program Files\Common Files\Tencent\QQMiniDL\41\BT	618 KB
msvcr80.dll	C:\Program Files\Common Files\Tencent\QQMiniDL\41\eMule	618 KB

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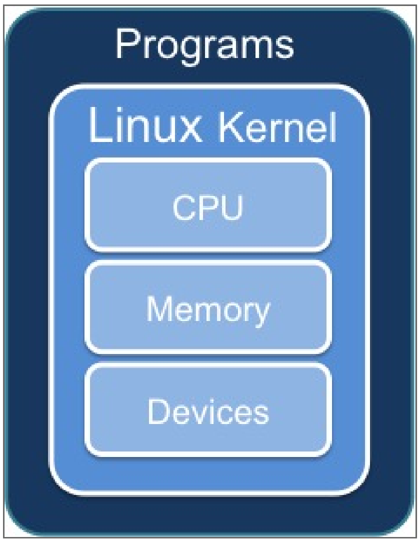
LINUX KERNEL

<>

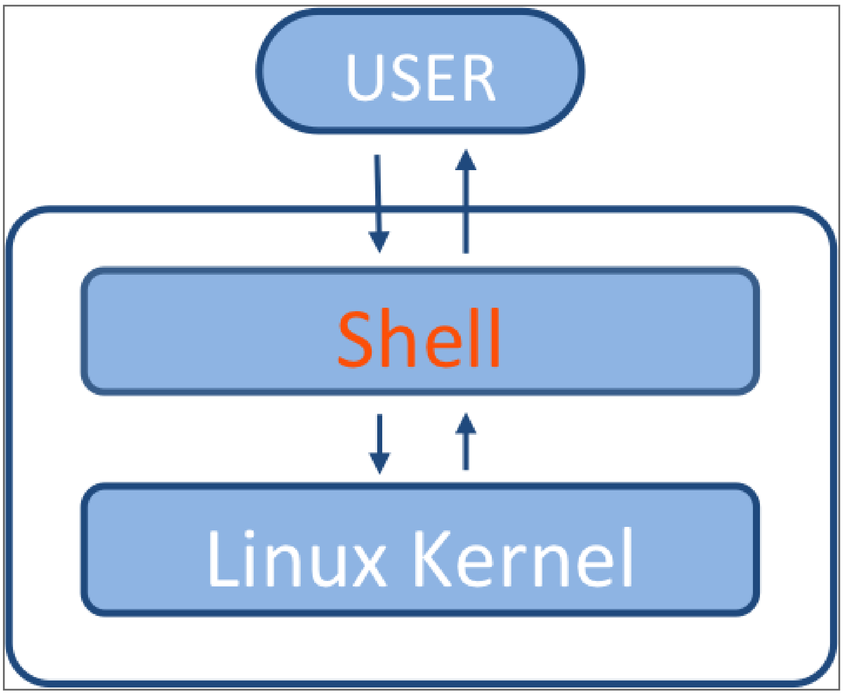
The most important component of Linux OS, containing all the operating system's core functions and the device drivers.

- memory management
- process scheduling
- file system
- ...



SHELL (CLI SHELL)

Command Line Interface A program which accepts commands as text input and converts commands to appropriate operating system functions.

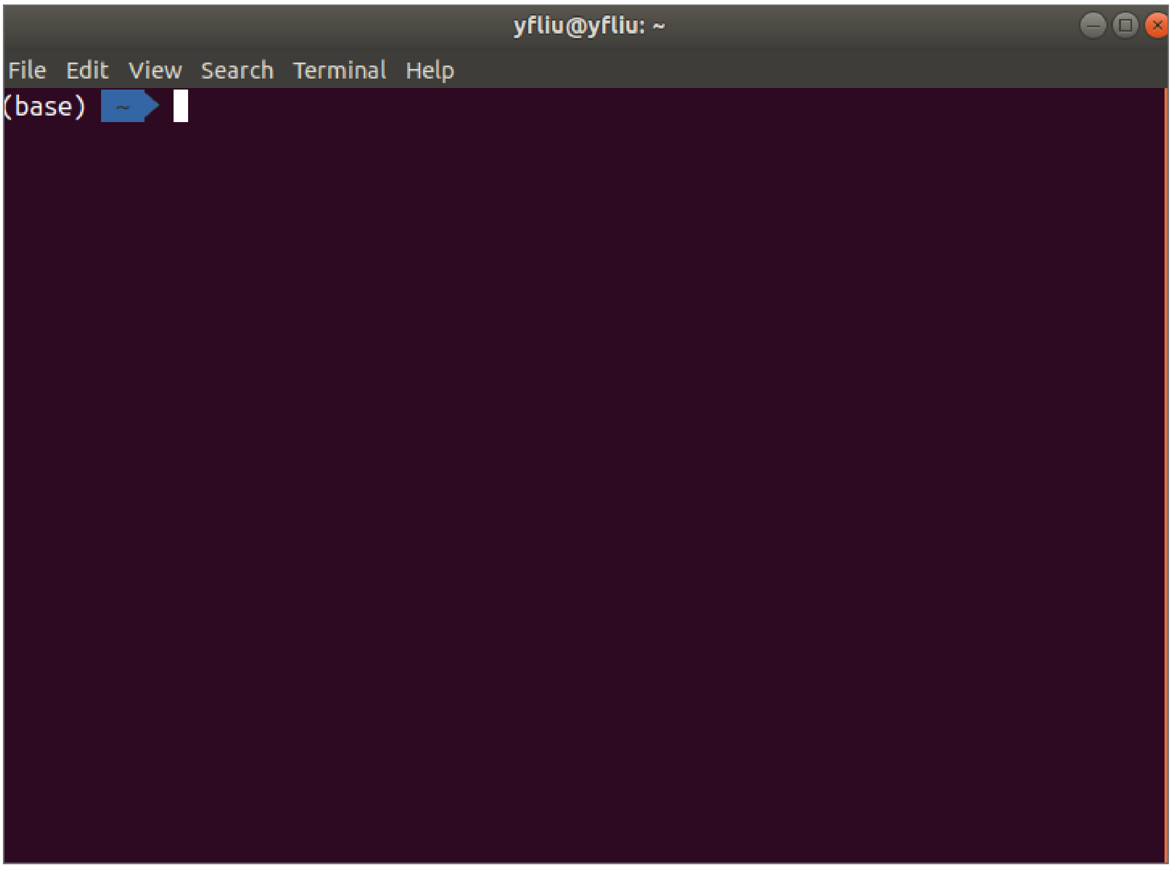


TERMINAL↔SHELL

The terminal send information to the shell, receive and display the information from the shell.

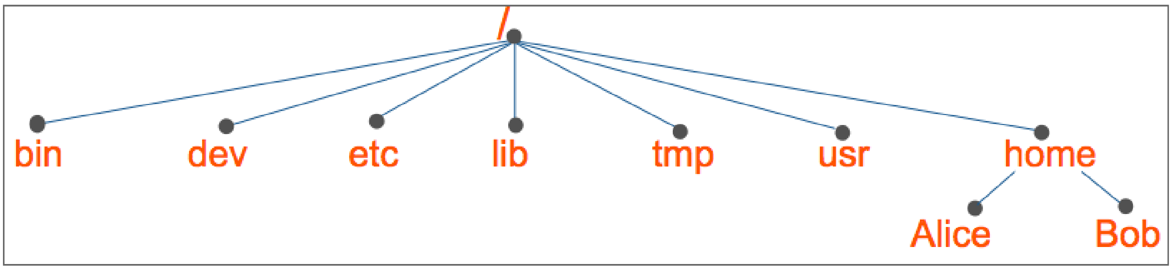
OPEN TERMINAL

keyboard accelerators: CTRL+ALT+T



```
(base) ~
```

FILE SYSTEM



Tree structure, with the root directory “ / ”

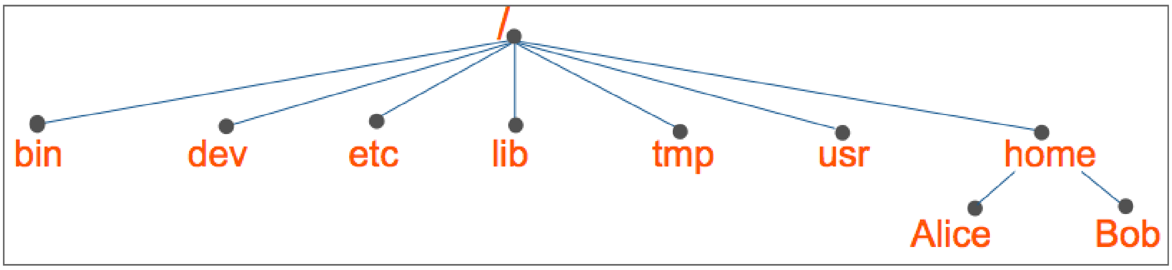
`/home/oslab/...`

`~` = `/home/oslab`

`.`

`..`

FILE SYSTEM

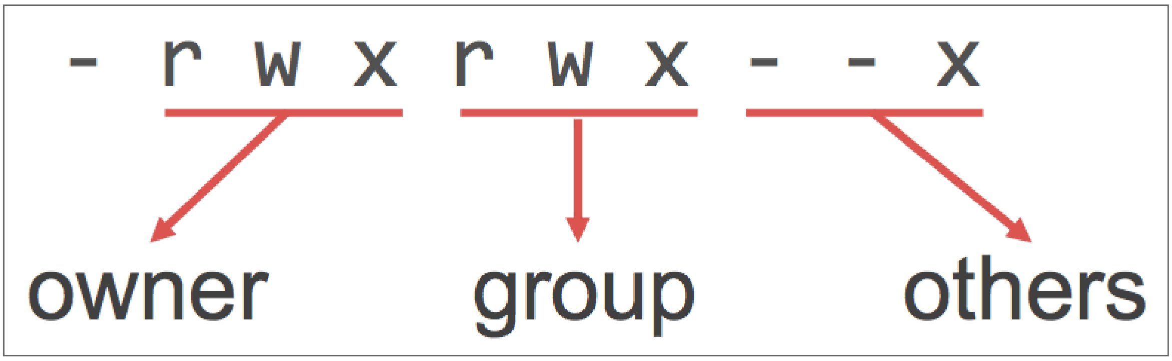


/bin : essential tools and other programs
/dev : files representing the system’s hardware devices
/etc : system configuration files
/home : the home directory for all system’s users
/lib : essential system library files
/proc : files that give information about current system
/usr : files related to user tools and applications

USER & GROUP

The system determines whether or not a user or group can access a file or directory.
There is a special user called Super User or the root which has permission to access any file and directory. Three Permissions:

- `r` = read
- `w` = write
- `x` = execute



ENVIRONMENT VARIABLES

Environment variables are a set of values that can affect the way running processes will behave on a computer.

- PATH -- Contains a colon-separated list of directories that the shell searches for commands that do not contain a slash in their name.
- HOME -- Contains the location of the user's home directory.
- ...

Set The Environment Variables:

```
export VARIABLE = value    # temporary
/etc/profile               # permanent, all users

~/.profile                 # permanent, one user
~/.bashrc
```

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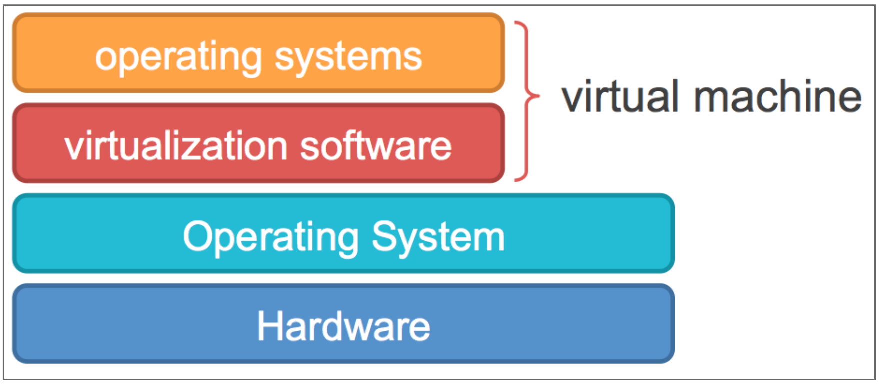
VIRTUAL MACHINE

A virtual machine is an emulation of a particular computer system.



Virtualization Software provide (hardware) resources virtually to the new OS.

- VMware
- Virtual Box
- Virtual PC

INSTALL THE VIRTUAL MACHINE

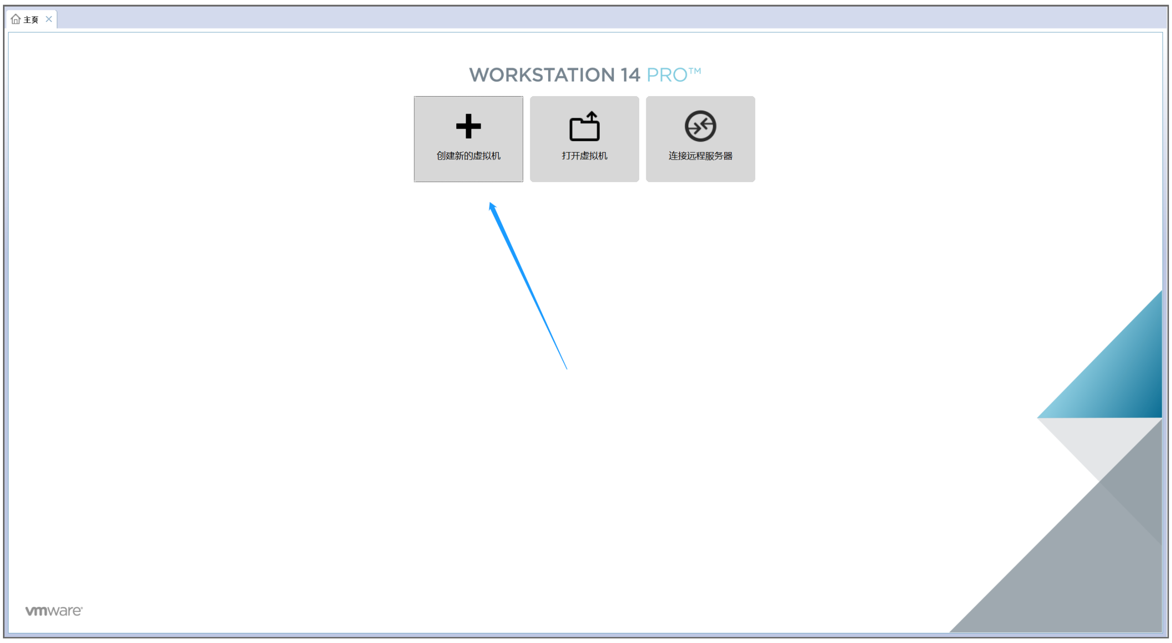
VMware Workstation 14.0 + Ubuntu 20.04 LTS

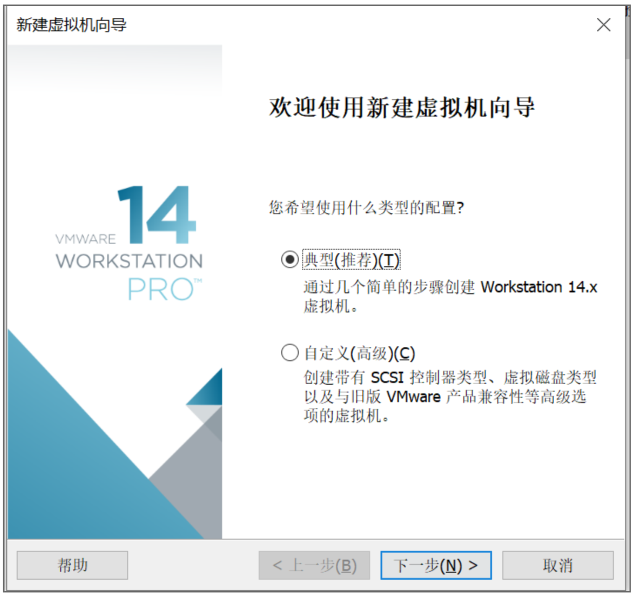
vmware

ubuntu

1. Download the Setup File of Vmware14.0 **http://download3.vmware.com/software/wkst/file/VMware-workstation-full-14.0.0-6661328.exe**
2. Download the Ubuntu Ubuntu 20.04 LTS from the official website **www.ubuntu.com/download/desktop**
3. Install VMware 14.0
4. Create a Virtual Machine in the VMware

CREATE A VIRTUAL MACHINE





欢迎使用新建虚拟机向导

您希望使用什么类型的配置?

● 典型(推荐)(T)

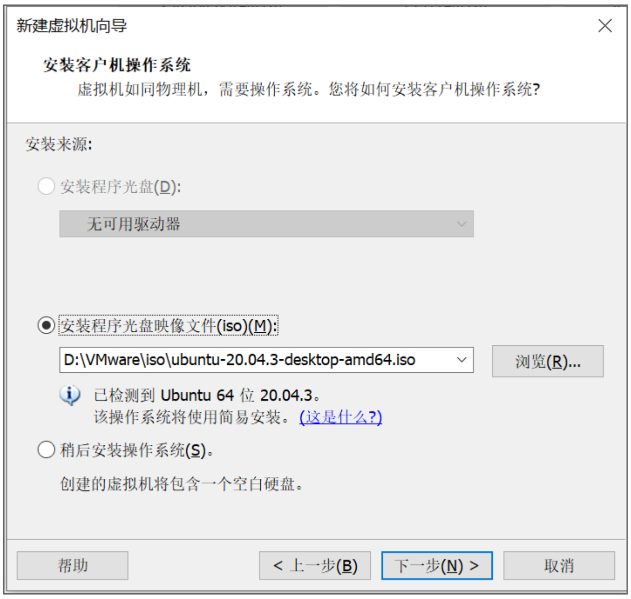
通过几个简单的步骤创建 Workstation 14.x 虚拟机。

○ 自定义(高级)(C)

创建带有 SCSI 控制器类型、虚拟磁盘类型以及与旧版 VMware 产品兼容性等高级选项的虚拟机。

CREATE A VIRTUAL MACHINE

In the computers in our computer room, our .iso-file lies on path E:/ of the system.



新建虚拟机向导

安装客户机操作系统

虚拟机如同物理机，需要操作系统。您将如何安装客户机操作系统?

安装来源:

○ 安装程序光盘(D):

无可用驱动器

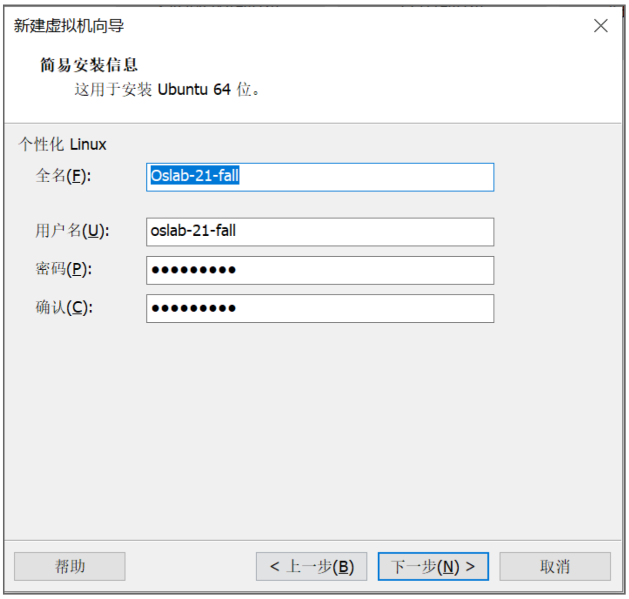
● 安装程序光盘映像文件(iso)(M):

D:\VMware\iso\ubuntu-20.04.3-desktop-amd64.iso

已检测到 Ubuntu 64 位 20.04.3。
该操作系统将使用简易安装。(这是什么?)

○ 稍后安装操作系统(S)。

创建的虚拟机将包含一个空白硬盘。



新建虚拟机向导

简易安装信息

这用于安装 Ubuntu 64 位。

个性化 Linux

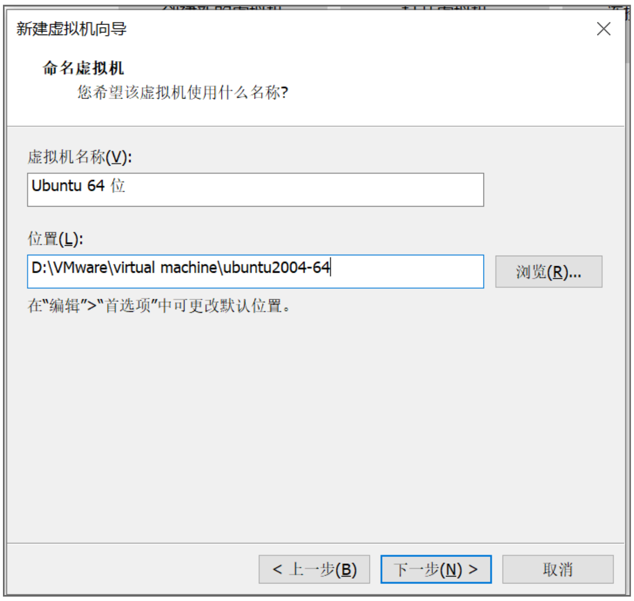
全名(F): Oslab-21-fall

用户名(U): oslab-21-fall

密码(P): •••••••••

确认(C): •••••••••

CREATE A VIRTUAL MACHINE



新建虚拟机向导

命名虚拟机

您希望该虚拟机使用什么名称?

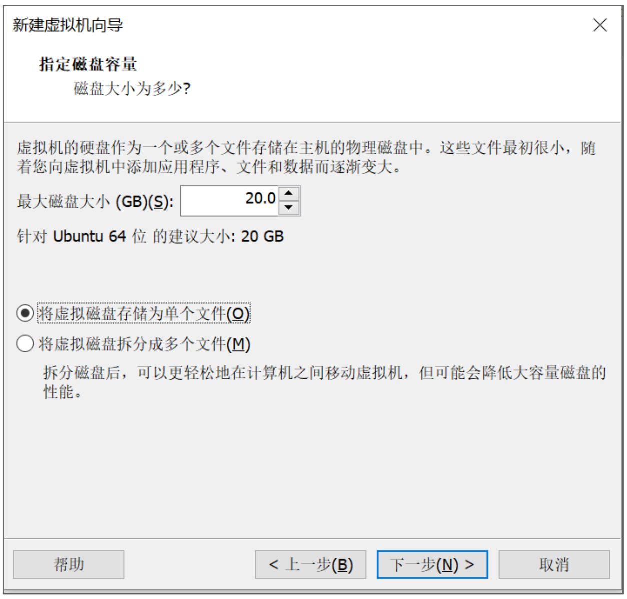
虚拟机名称(V):

Ubuntu 64 位

位置(L):

D:\VMware\virtual machine\ubuntu2004-64

在"编辑">"首选项"中可更改默认位置。



新建虚拟机向导

指定磁盘容量

磁盘大小为多少?

虚拟机的硬盘作为一个或多个文件存储在主机的物理磁盘中。这些文件最初很小，随着您向虚拟机中添加应用程序、文件和数据而逐渐变大。

最大磁盘大小 (GB)(S): 20.0

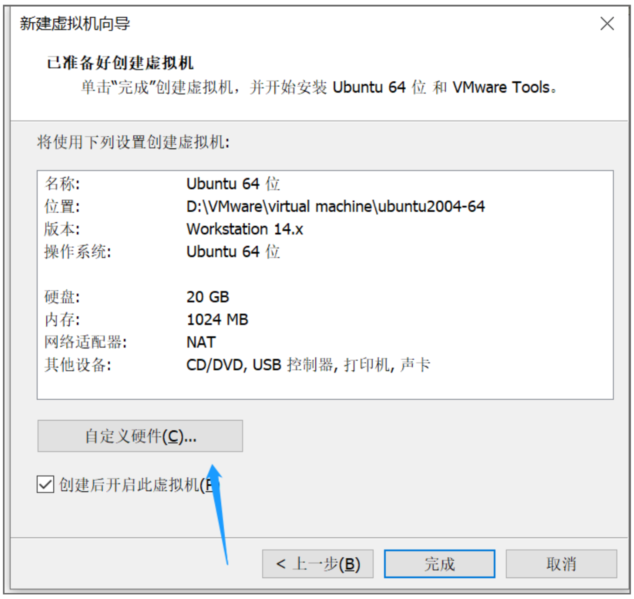
针对 Ubuntu 64 位 的建议大小: 20 GB

● 将虚拟磁盘存储为单个文件(O)

○ 将虚拟磁盘拆分成多个文件(M)

拆分磁盘后，可以更轻松地在计算机之间移动虚拟机，但可能会降低大容量磁盘的性能。

CREATE A VIRTUAL MACHINE



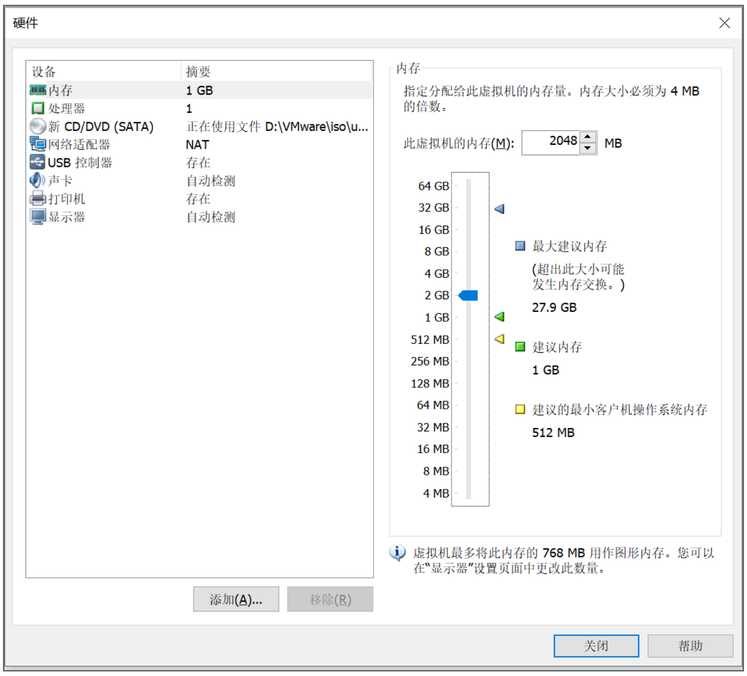
新建虚拟机向导

已准备好创建虚拟机

单击"完成"创建虚拟机，并开始安装 Ubuntu 64 位 和 VMware Tools。

将使用下列设置创建虚拟机:

名称:	Ubuntu 64 位
位置:	D:\VMware\virtual machine\ubuntu2004-64
版本:	Workstation 14.x
操作系统:	Ubuntu 64 位
硬盘:	20 GB
内存:	1024 MB
网络适配器:	NAT
其他设备:	CD/DVD, USB 控制器, 打印机, 声卡



硬件

设备	摘要
内存	1 GB
处理器	1
新 CD/DVD (SATA)	正在使用文件 D:\VMware\iso\u...
网络适配器	NAT
USB 控制器	存在
声卡	自动检测
打印机	存在
显示器	自动检测

内存

指定分配给此虚拟机的内存量。内存大小必须为 4 MB 的倍数。

此虚拟机的内存(M): 2048 MB

🟦 最大建议内存
(超出此大小可能发生内存交换。)
27.9 GB

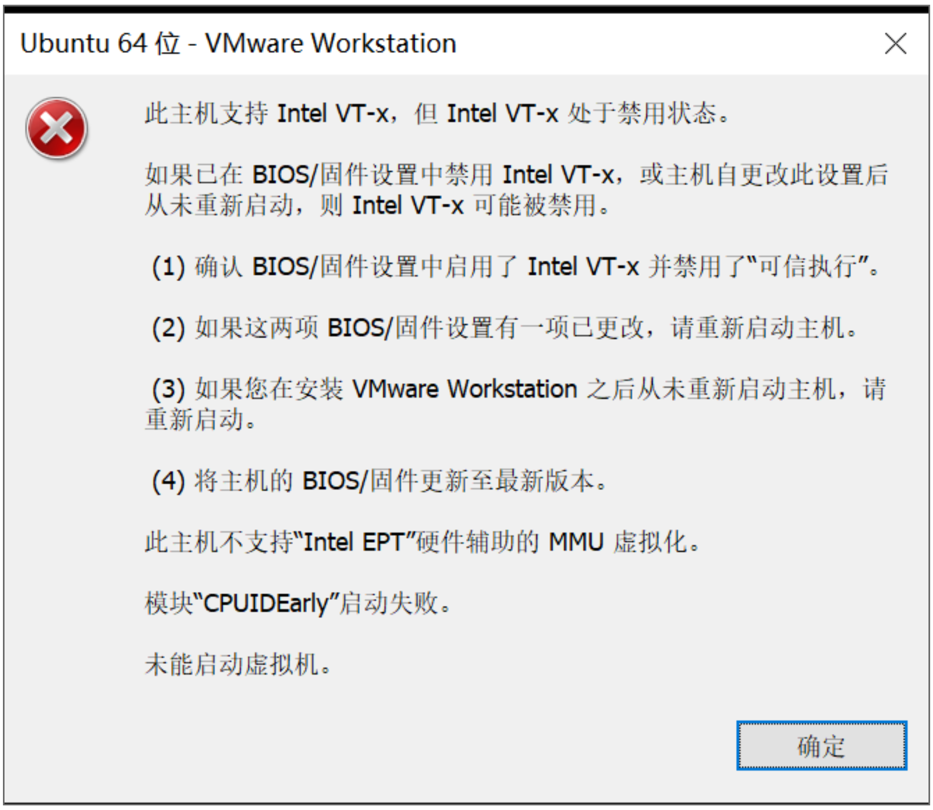
🟩 建议内存
1 GB

🟨 建议的最小客户机操作系统内存
512 MB

虚拟机最多将此内存的 768 MB 用作图形内存。您可以在"显示器"设置页面中更改此数量。

所分配的内存过少会导致虚拟机运行时卡顿。

CREATE A VIRTUAL MACHINE



Ubuntu 64 位 - VMware Workstation

此主机支持 Intel VT-x，但 Intel VT-x 处于禁用状态。

如果已在 BIOS/固件设置中禁用 Intel VT-x，或主机自更改此设置后从未重新启动，则 Intel VT-x 可能被禁用。

(1) 确认 BIOS/固件设置中启用了 Intel VT-x 并禁用了“可信执行”。

(2) 如果这两项 BIOS/固件设置有一项已更改，请重新启动主机。

(3) 如果您在安装 VMware Workstation 之后从未重新启动主机，请重新启动。

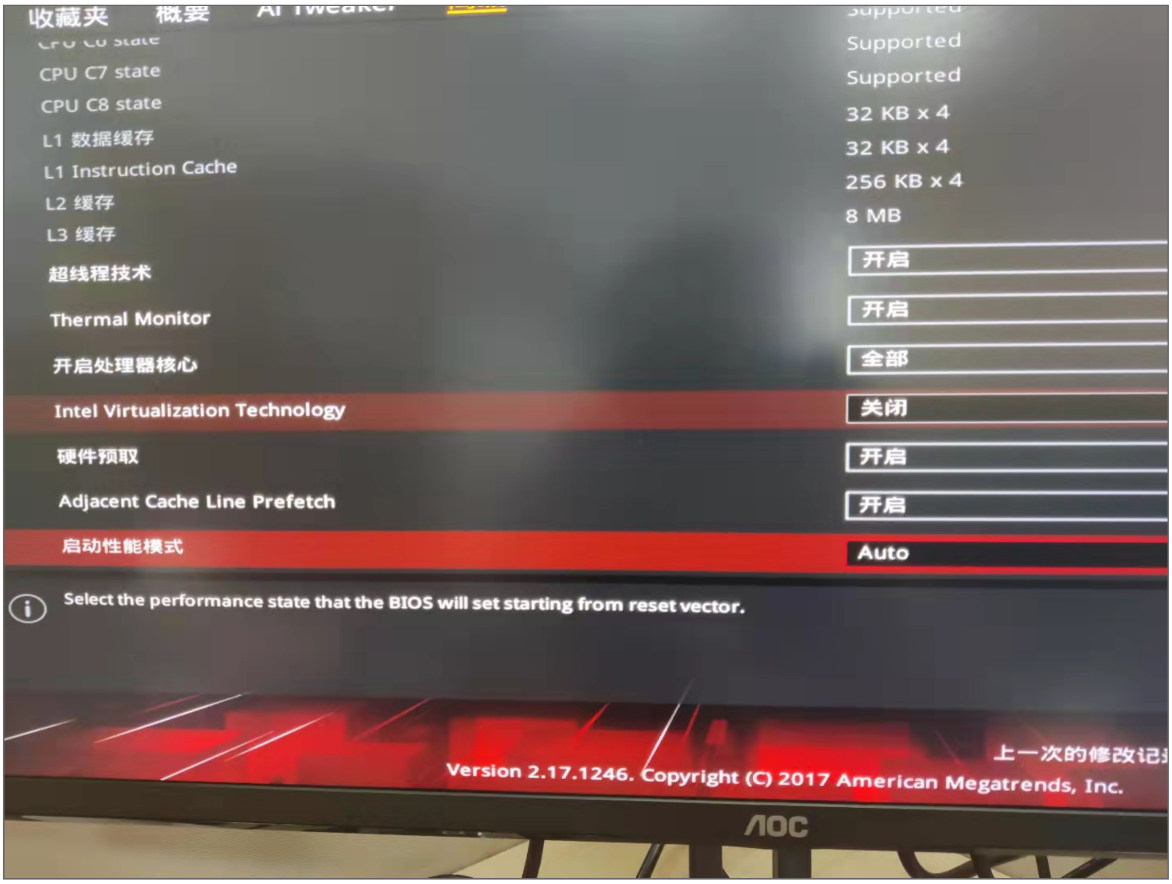
(4) 将主机的 BIOS/固件更新至最新版本。

此主机不支持“Intel EPT”硬件辅助的 MMU 虚拟化。

模块“CPUIDEarly”启动失败。

未能启动虚拟机。

需要在BIOS界面打开虚拟环境的设置



CPU C6 state	Supported
CPU C7 state	Supported
CPU C8 state	Supported
L1 数据缓存	32 KB x 4
L1 Instruction Cache	32 KB x 4
L2 缓存	256 KB x 4
L3 缓存	8 MB
超线程技术	开启
Thermal Monitor	开启
开启处理器核心	全部
Intel Virtualization Technology	关闭
硬件预取	开启
Adjacent Cache Line Prefetch	开启
启动性能模式	Auto

Select the performance state that the BIOS will set starting from reset vector.

上一次的修改记

Version 2.17.1246. Copyright (C) 2017 American Megatrends, Inc.

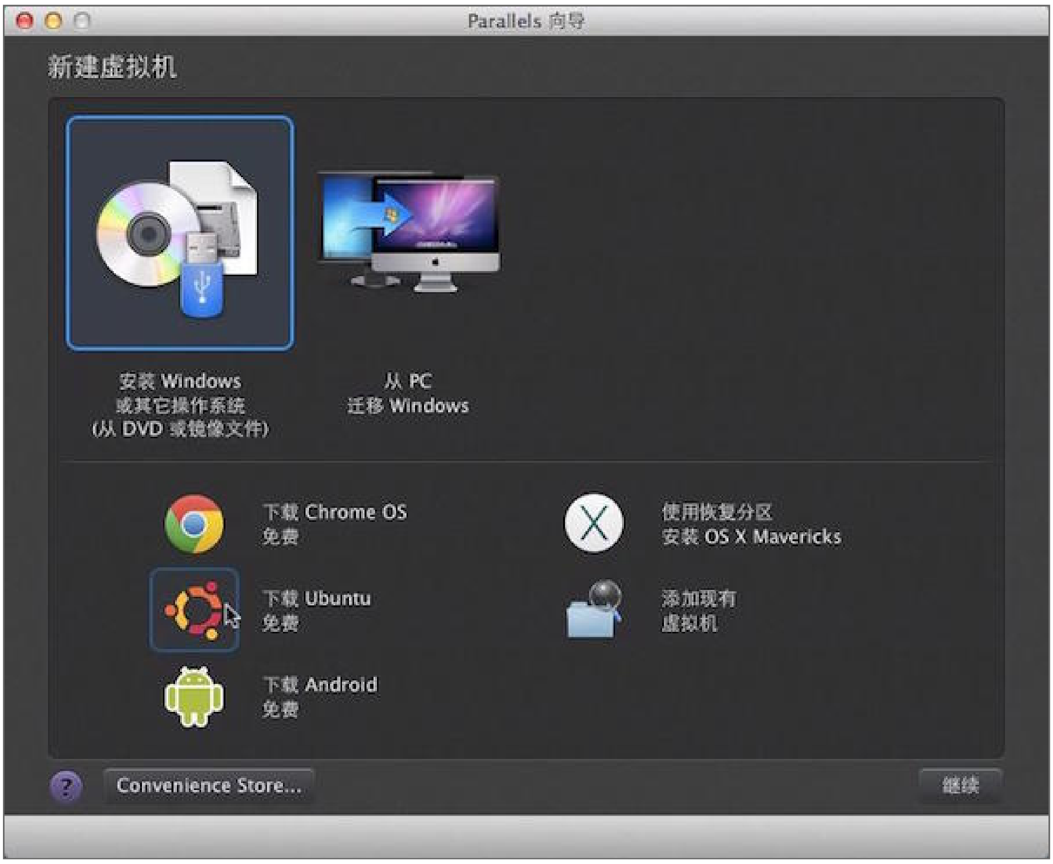
CREATE A VIRTUAL MACHINE (MAC)

Mac Virtual Machine -- Parallels desktop

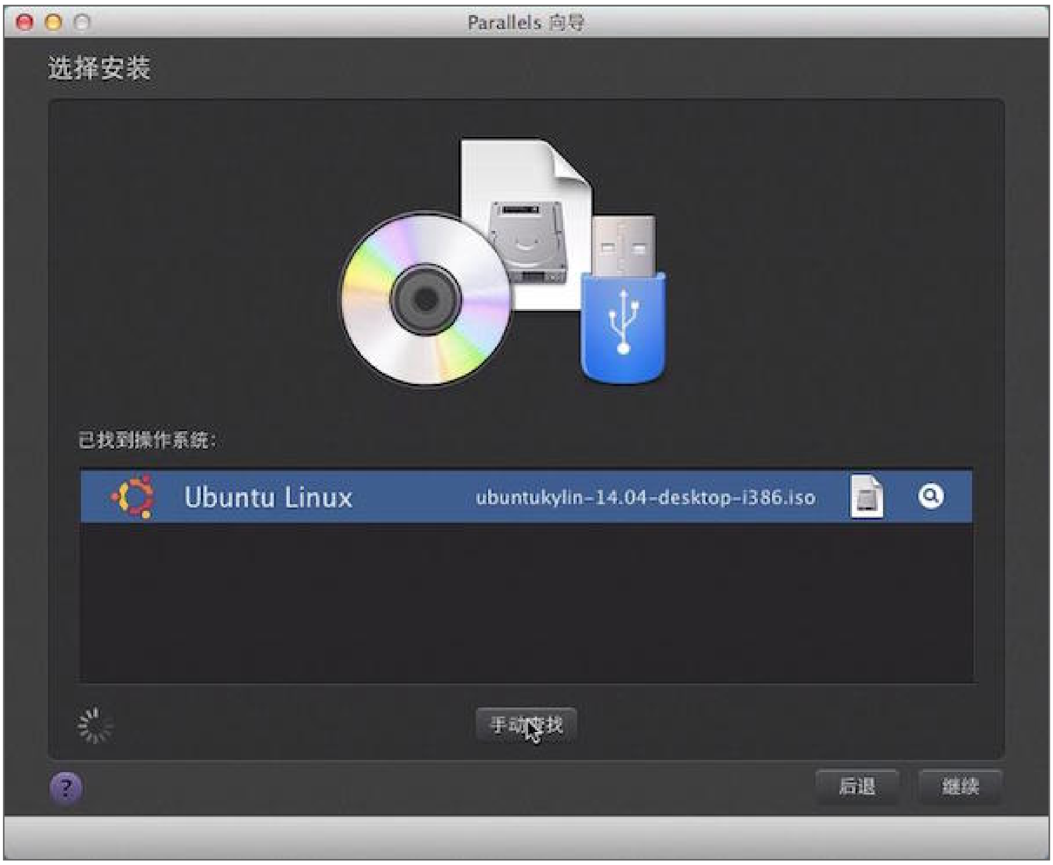
Ubuntu14.iso->magnet:?xt=urn:btih:5EE7E1DC3E01F362B0E53BFEE9E4D6DCDEDAD61B

Parallels desktop->http://xclient.info/s/parallels-desktop.html?t=2c5f238779ee02ff6e1b5cda873deeacaeabc304

CREATE A VIRTUAL MACHINE (MAC)



CREATE A VIRTUAL MACHINE (MAC)

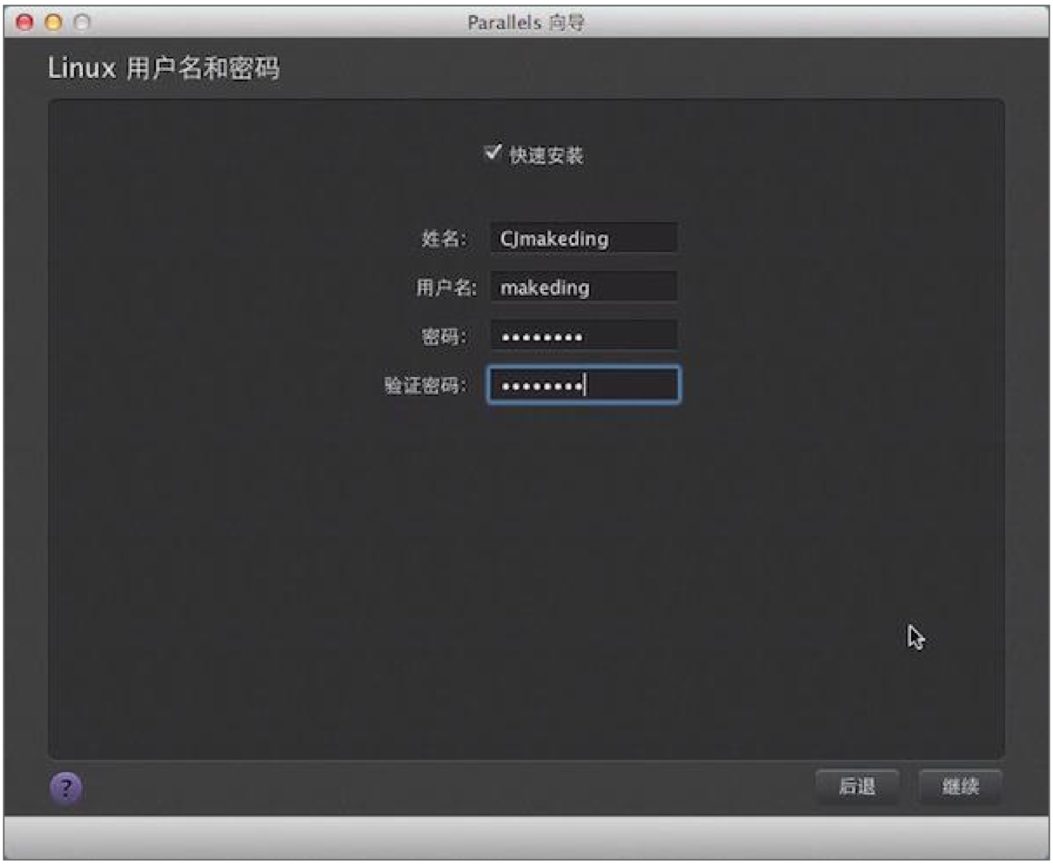


选择安装

已找到操作系统：

Ubuntu Linux ubuntukylin-14.04-desktop-i386.iso

CREATE A VIRTUAL MACHINE (MAC)



Parallels 向导

Linux 用户名和密码

☑ 快速安装

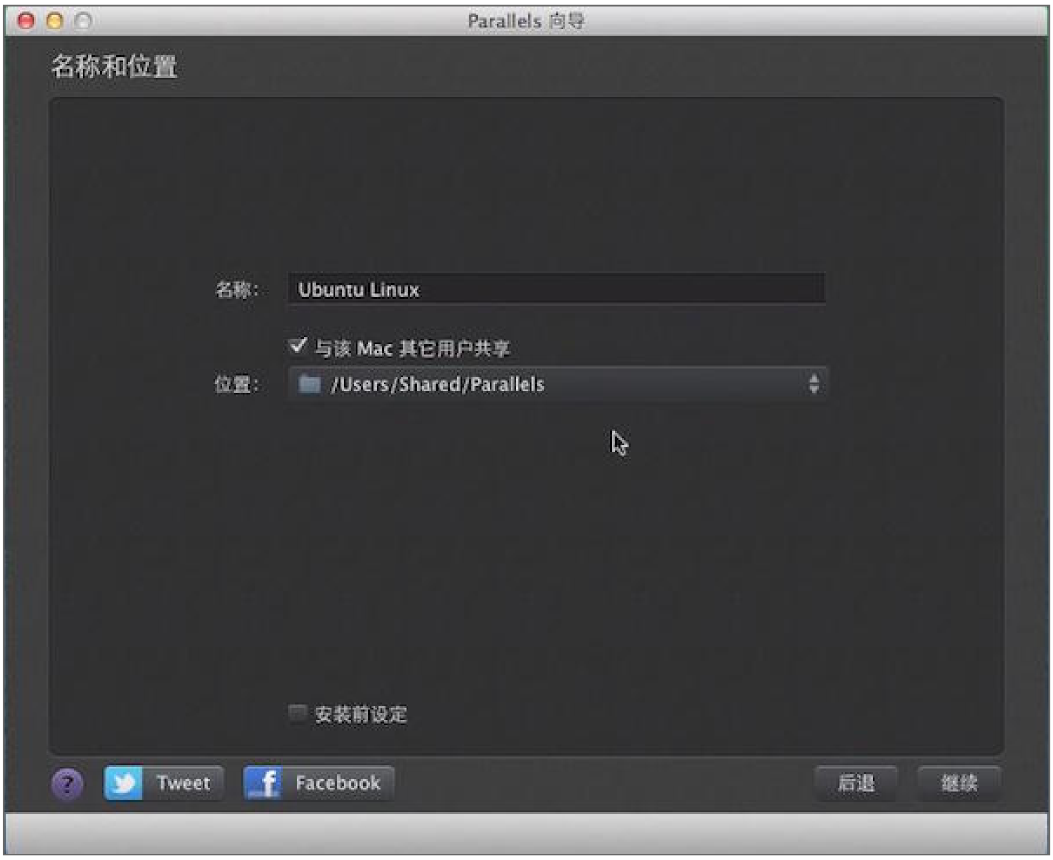
姓名: CJmakeding

用户名: makeding

密码: •••••••••

验证密码: •••••••••

CREATE A VIRTUAL MACHINE (MAC)



Parallels 向导

名称和位置

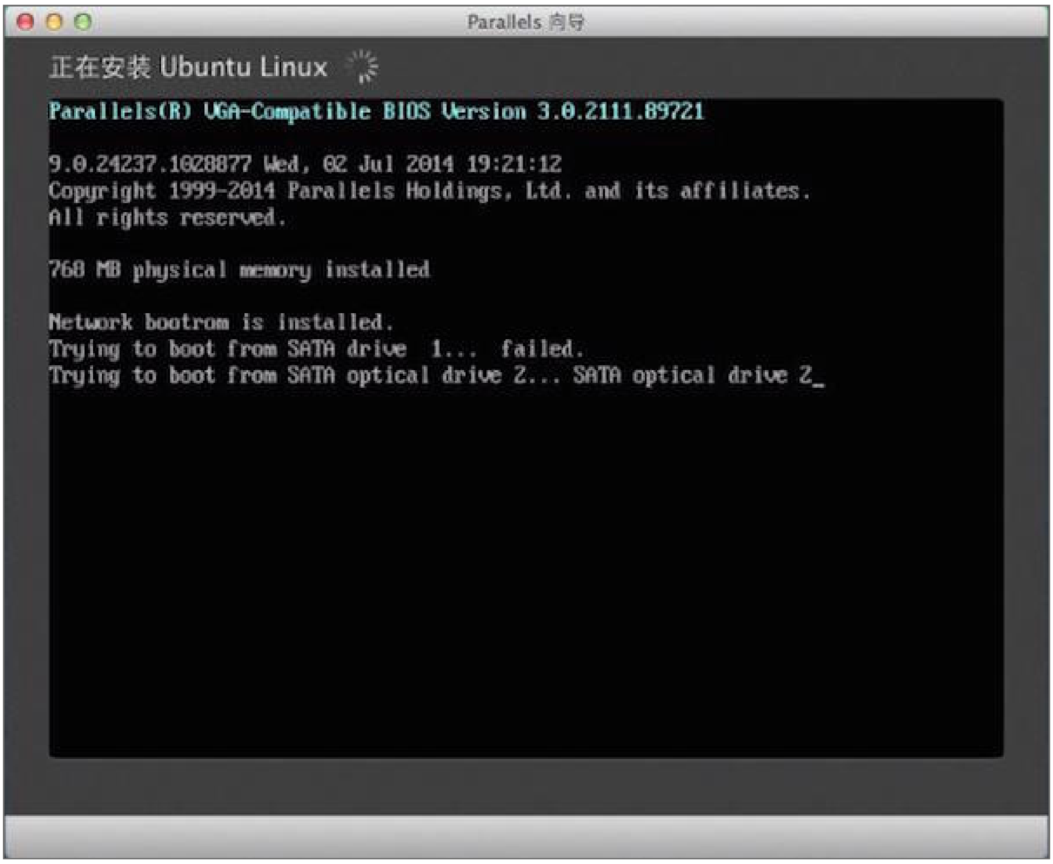
名称：Ubuntu Linux

☑ 与该 Mac 其它用户共享

位置：/Users/Shared/Parallels

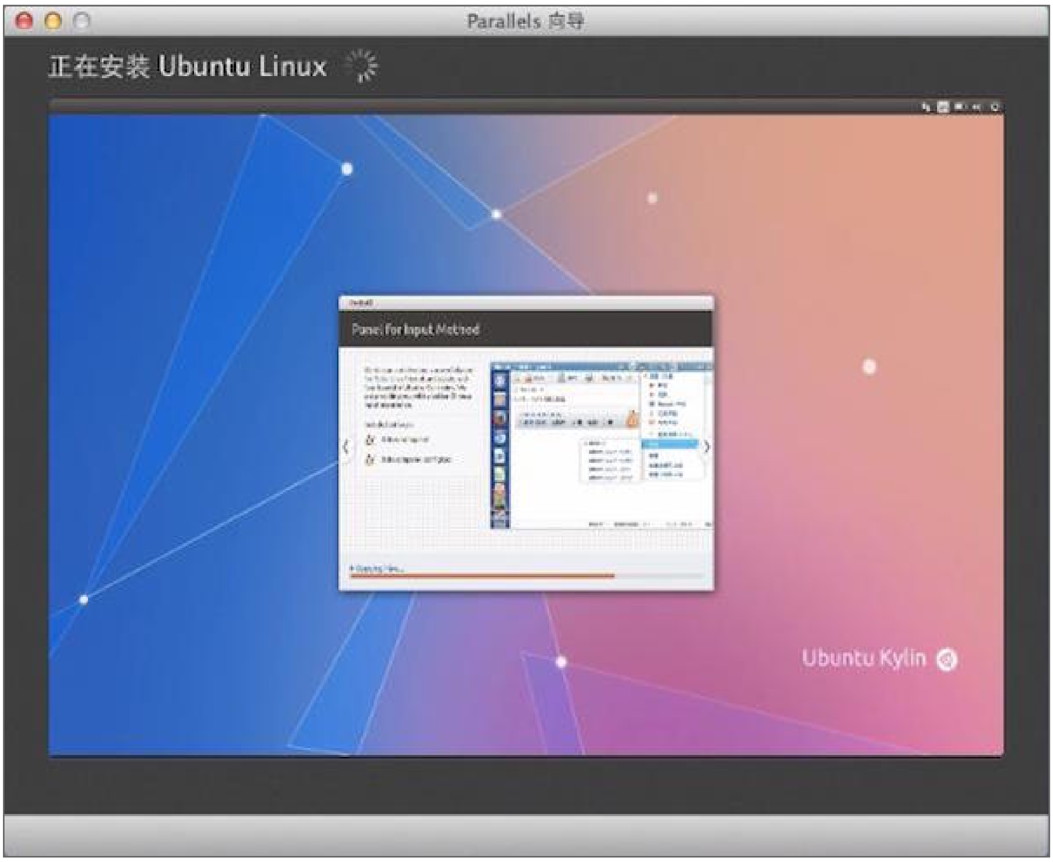
□ 安装前设定

CREATE A VIRTUAL MACHINE (MAC)

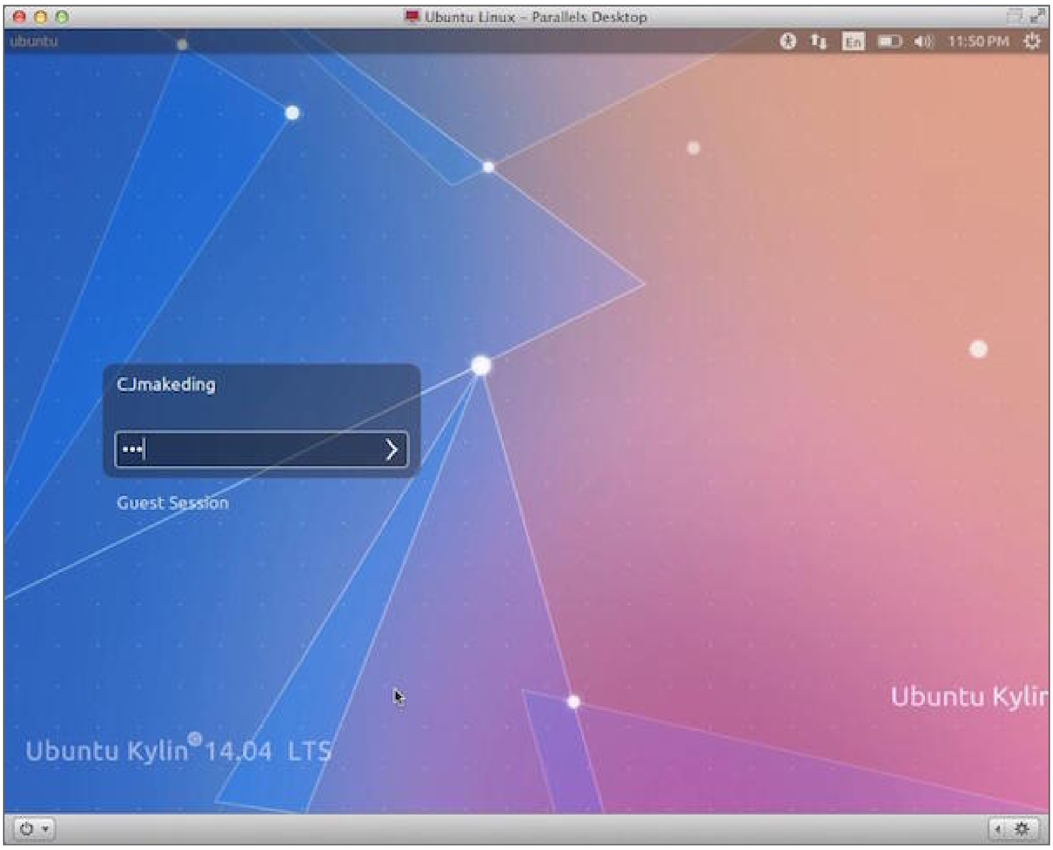


```
Parallels(R) VGA-Compatible BIOS Version 3.0.2111.89721

9.0.24237.1028877 Wed, 02 Jul 2014 19:21:12
Copyright 1999-2014 Parallels Holdings, Ltd. and its affiliates.
All rights reserved.

768 MB physical memory installed

Network bootrom is installed.
Trying to boot from SATA drive  1...  failed.
Trying to boot from SATA optical drive 2... SATA optical drive 2_
```

CREATE A VIRTUAL MACHINE (MAC)



CREATE A VIRTUAL MACHINE (MAC)



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BASIC COMMANDS

command [-options] [arguments]

- cd pwd ls
- su chmod cat
- touch rename mv cp
- mkdir rmdir rm
- find grep
- > >> | xargs
- awk
- man help --help

cd (CHANGE DIRECTORY)

```
cd
cd ~
cd -
cd ..
```

pwd (PRINT WORKING DIRECTORY)

```
pwd
```

`man` (MANUAL)

```
man ls
```

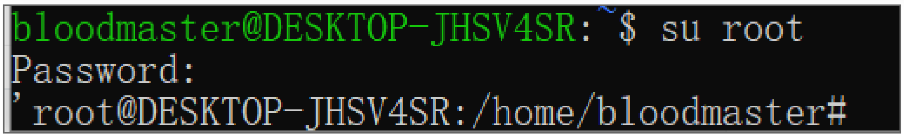
`ls` **(LIST SEGMENT)**

-l long - Displaying long format
-a all - Lists all files in the given directory
-R recursive - Recursively lists subdirectories
-d directory - Shows information about a directory

```bash ls ls -l ls -a ls -R ls -d ls -la ls -ld ... ```

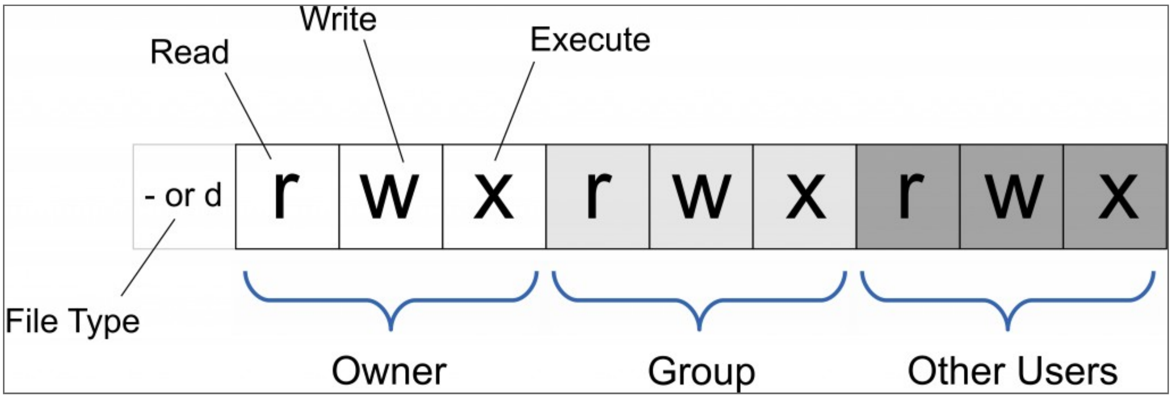
su (SWITCH USER)

```
su xiaoming
```



```
bloodmaster@DESKTOP-JHSV4SR:~$ su root
Password:
root@DESKTOP-JHSV4SR:/home/bloodmaster#
```

chmod (CHANGE MODE)



ls (LIST)

```
ls -la
output:
---------- 1 bloodmaster bloodmaster    0 Sep  2 21:

chmod 660 class1.txt
ls -la
output:
-rw-rw---- 1 bloodmaster bloodmaster    0 Sep  2 21:

chmod u-r test1.txt
ls -la
output:
--w-rw---- 1 bloodmaster bloodmaster    0 Sep  2 21:
```

`cat` (CONCATENATE)

```
cat test1.txt
```

touch

```
touch test1.txt
```

rename

```
rename 's/test1/test11/'  test1.txt
```

mv **(MOVE)**

```
mv test.txt test1.txt
mv test01.txt test02.txt /home/bloodmaster/tes
```

cp **(COPY)**

```
cp test.txt /home/bloodmaster/test
```

---

mkdir **(MAKE DIRECTORY)**

```
mkdir Lesson1/rename
```

rmdir **(REMOVE EMPTY DIRECTORY)**

```
rmdir empty_directory
```

`rm` (REMOVE)

`-r`	recursive
`-i`	interactive
`-f`	force
`-rf`	

```
rm -rf ~/Lesson1/*
rm -i oslab04.txt
```

find

```
find ~ -name "*.txt"
find . -type f
find . -type d
```

grep

> *globally search a regular expression and print*

```
grep match_pattern file_name
grep apple oslab05.txt
grep -i apple oslab05.txt
```

> & >> (REDIRECTION)

```
覆盖
cat oslab06.txt oslab07.txt > oslab08.txt
追加
cat oslab06.txt oslab07.txt >> oslab08.txt
```

| (PIPELINE)

- input1 output1 | output2 | output3

```
command1 | command2
cat test3.txt | grep test | grep te
```

xargs

```
 test1.txt:test2.txt test3.txt
 test2.txt:test2
 test3.txt:test3
 cat test1.txt | xargs cat -n
```

awk **(AHO, WEINBERG & KERNIGHAN)**

AWK is a programming language designed for text processing and typically used as a data extraction and reporting tool.

pattern { action }
BEGIN、regular expression、END
{ function calls, variable assignments, calculations }

```
log.txt
2 this is a test
3 Are you like awk
This's a test
10 There are orange,apple,mongo
```

```
awk '{[pattern] action}' {filenames}
awk '{print $1,$4}' log.txt
awk -F[,] '{print $1,$4}' log.txt
awk 'BEGIN { print "Hello, world!" }'
awk 'BEGIN { for (i = 1; i <= 5; ++i) print i
```

help

```
help cd
```

--help

```
ls --help
```

WIKIPEDIA

https://en.wikipedia.org/wiki/AWK