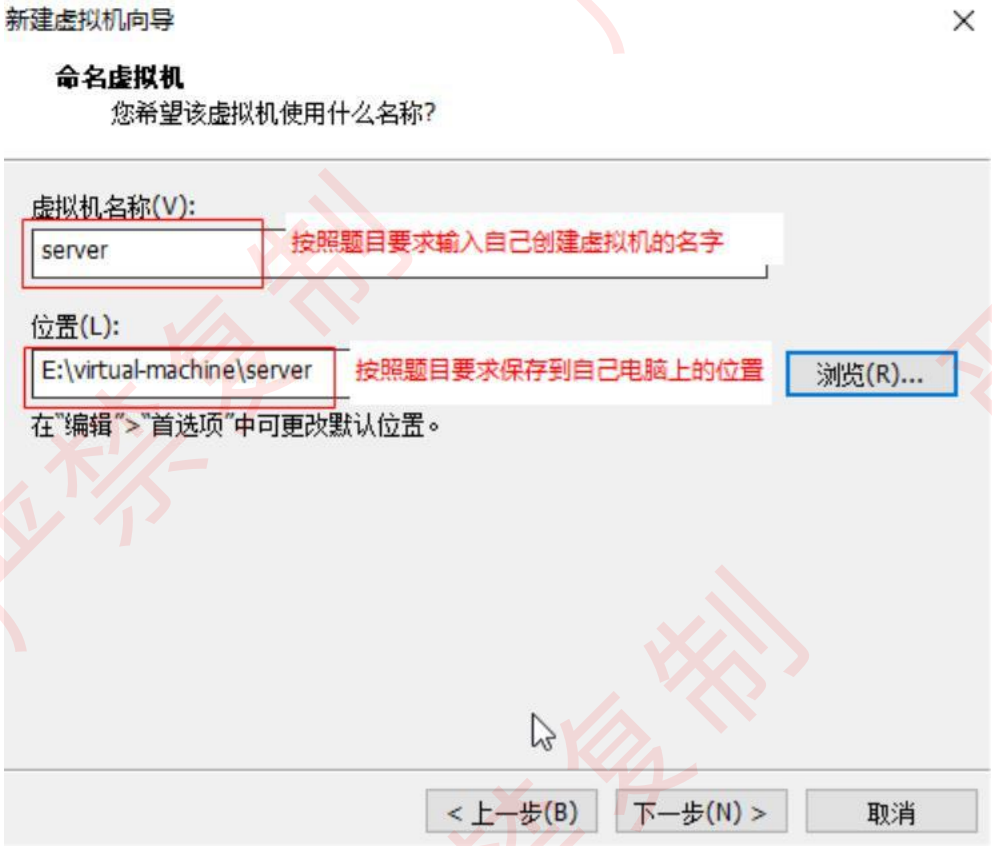
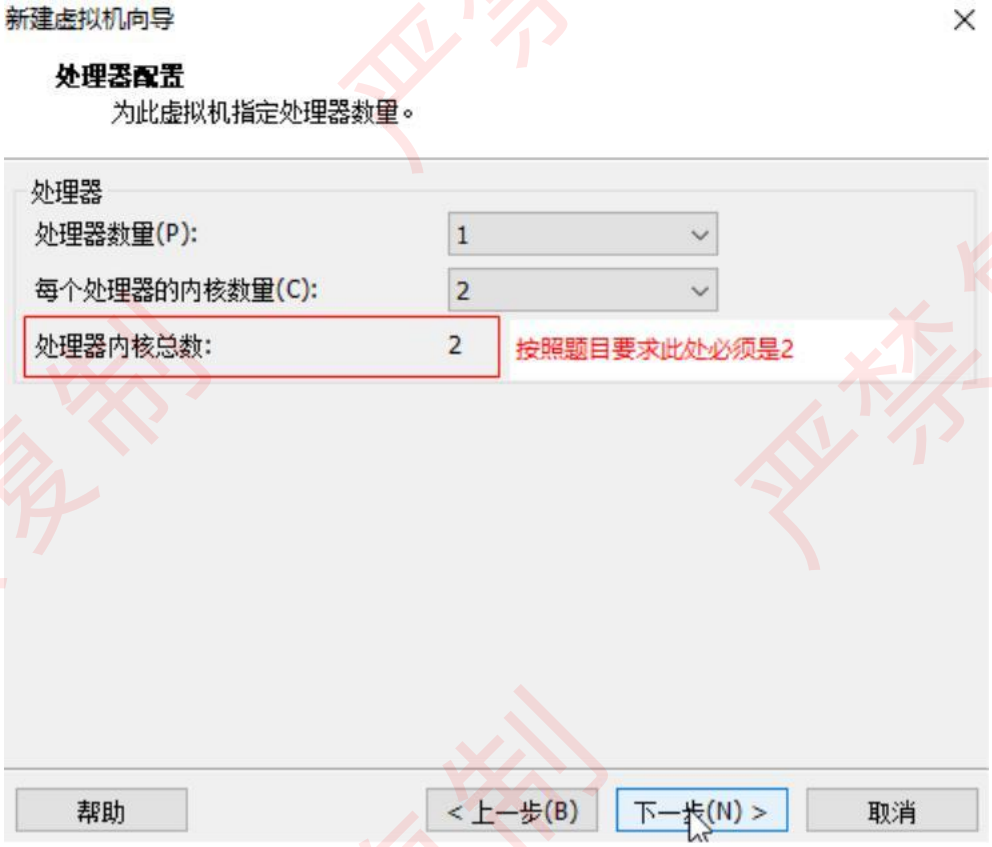
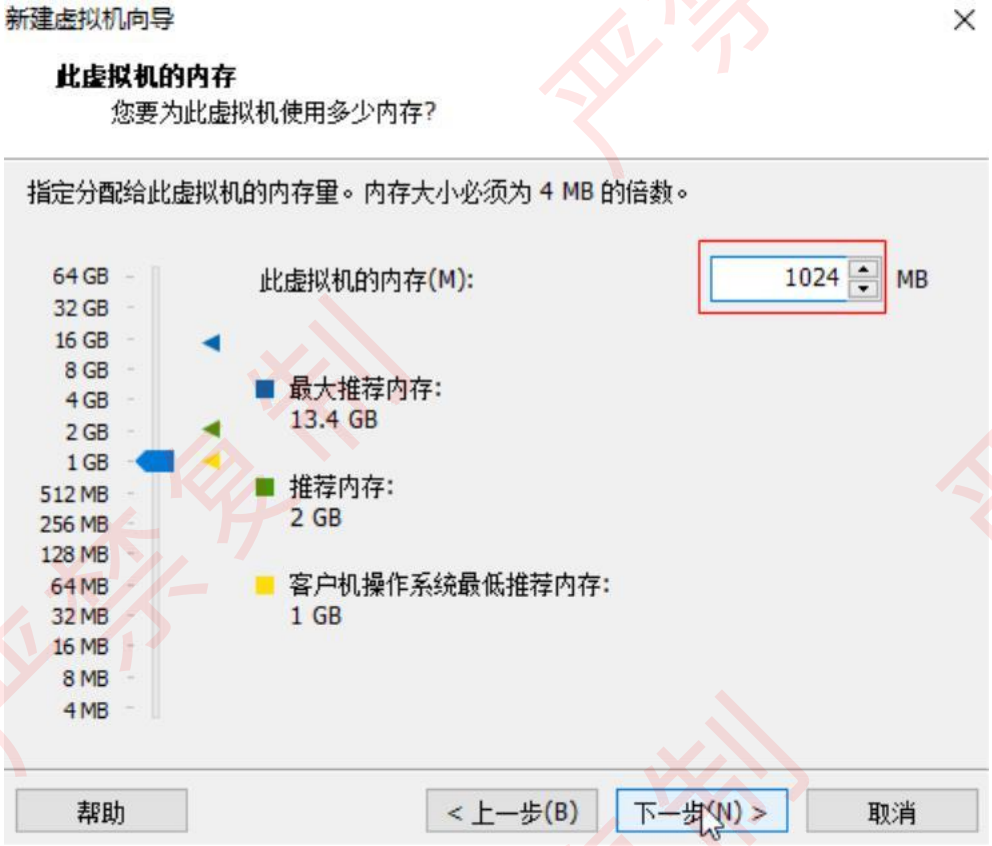
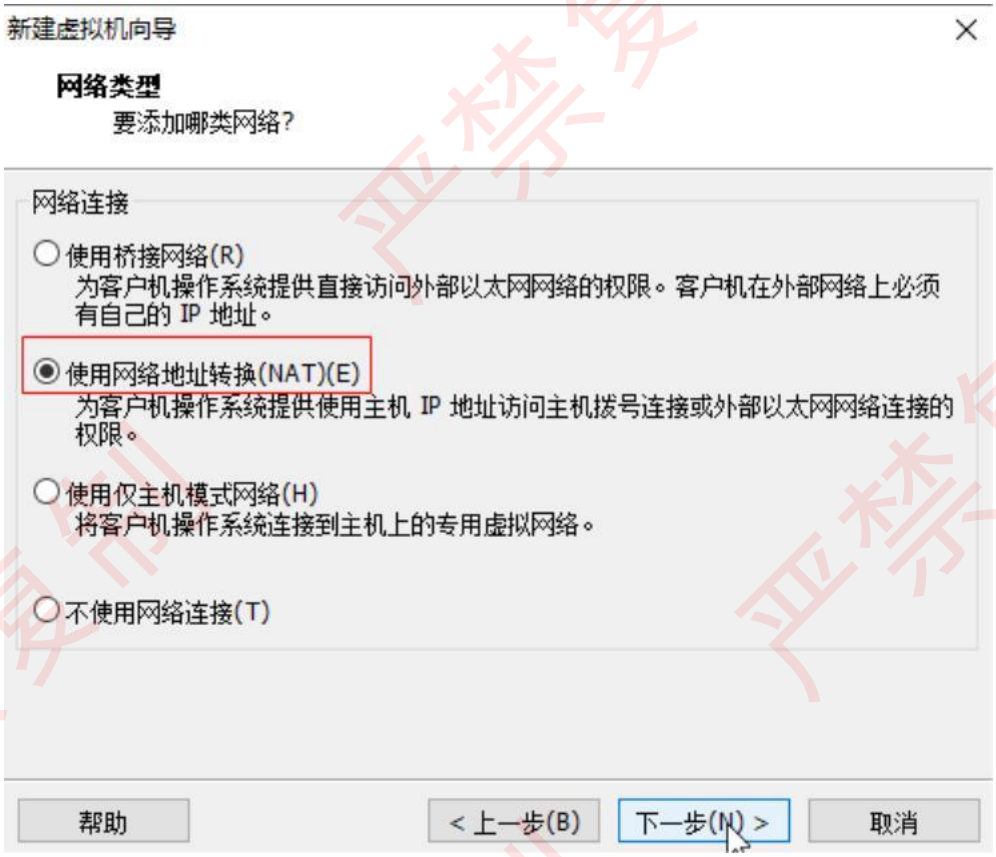
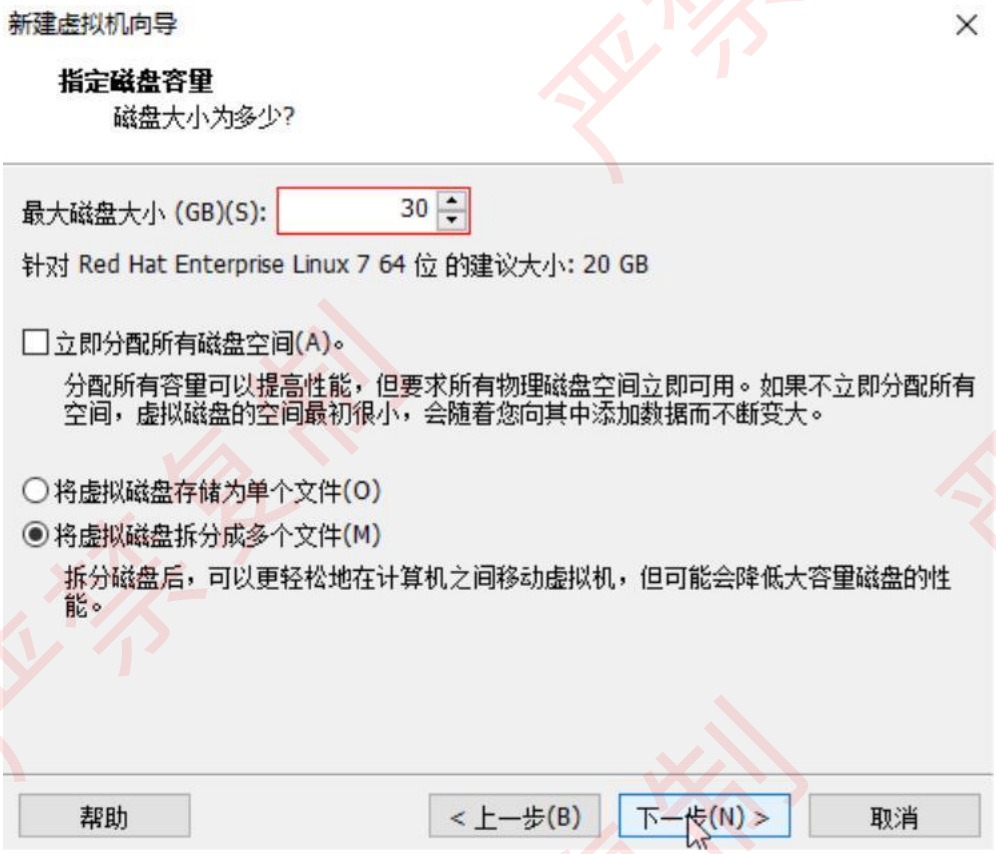
1、在VMWare中创建虚拟机，要求设置内存大小为1G，CPU为2，硬盘大小为30G，网络连接采用NAT模式，其他保持默认即可。

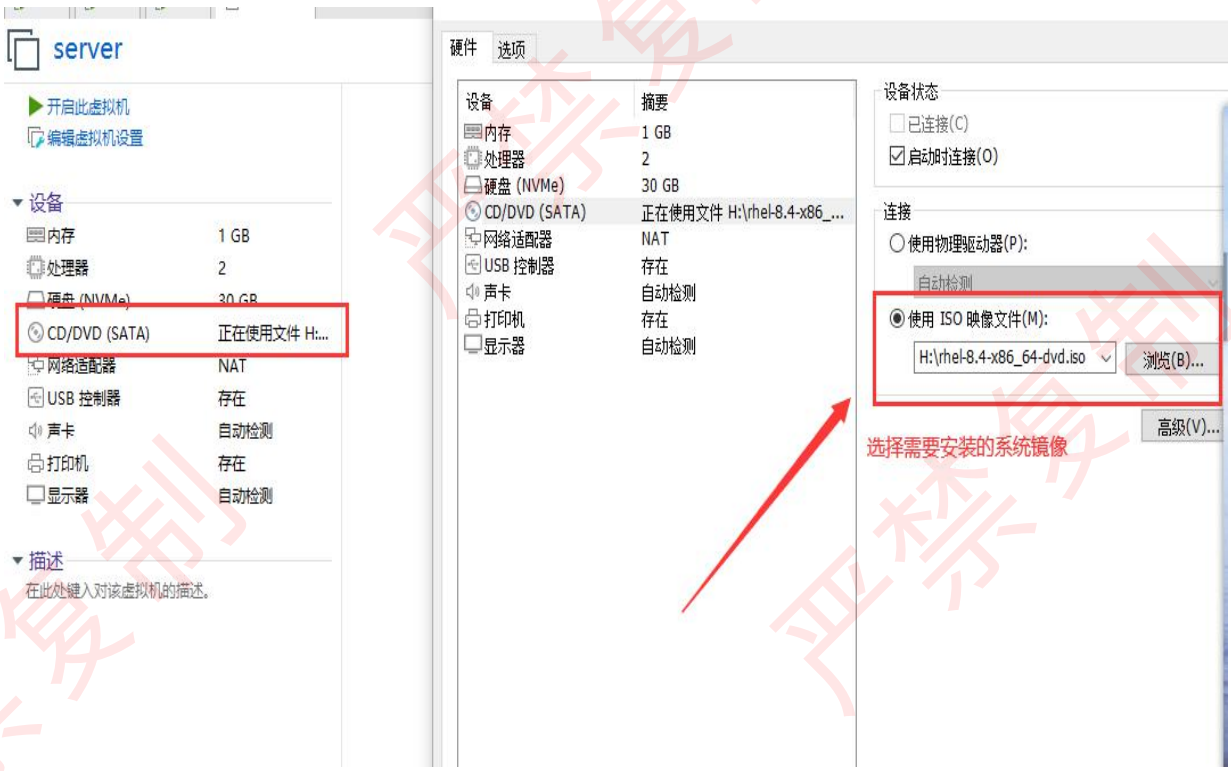




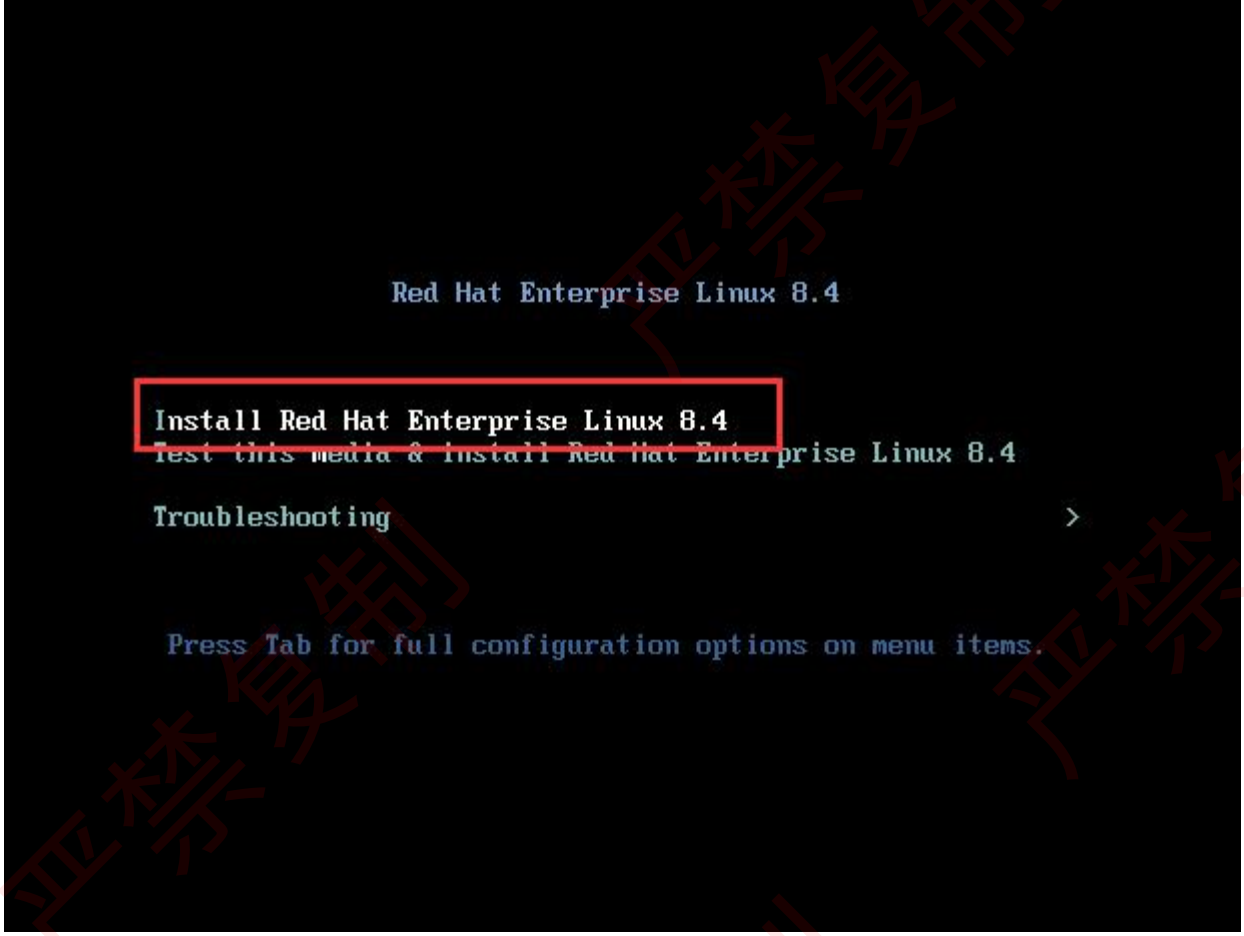

新建虚拟机向导
此虚拟机的内存
您要为此虚拟机使用多少内存?
指定分配给此虚拟机的内存里。内存大小必须为 4 MB 的倍数。
64 GB
32 GB
16 GB
8 GB
4 GB
2 GB
1 GB
512 MB
256 MB
128 MB
64 MB
32 MB
16 MB
8 MB
4 MB
此虚拟机的内存(M):
1024
MB
最大推荐内存:
13.4 GB
推荐内存:
2 GB
客户机操作系统最低推荐内存:
1 GB
帮助
< 上一步(B)
下一步(N) >
取消


新建虚拟机向导
网络类型
要添加哪类网络?
网络连接
使用桥接网络(R)
为客户机操作系统提供直接访问外部以太网网络的权限。客户机在外部网络上必须有自己的 IP 地址。
使用网络地址转换(NAT)(E)
为客户机操作系统提供使用主机 IP 地址访问主机拨号连接或外部以太网网络连接的权限。
使用仅主机模式网络(H)
将客户机操作系统连接到主机上的专用虚拟网络。
不使用网络连接(T)
帮助
< 上一步(B)
下一步(N) >
取消

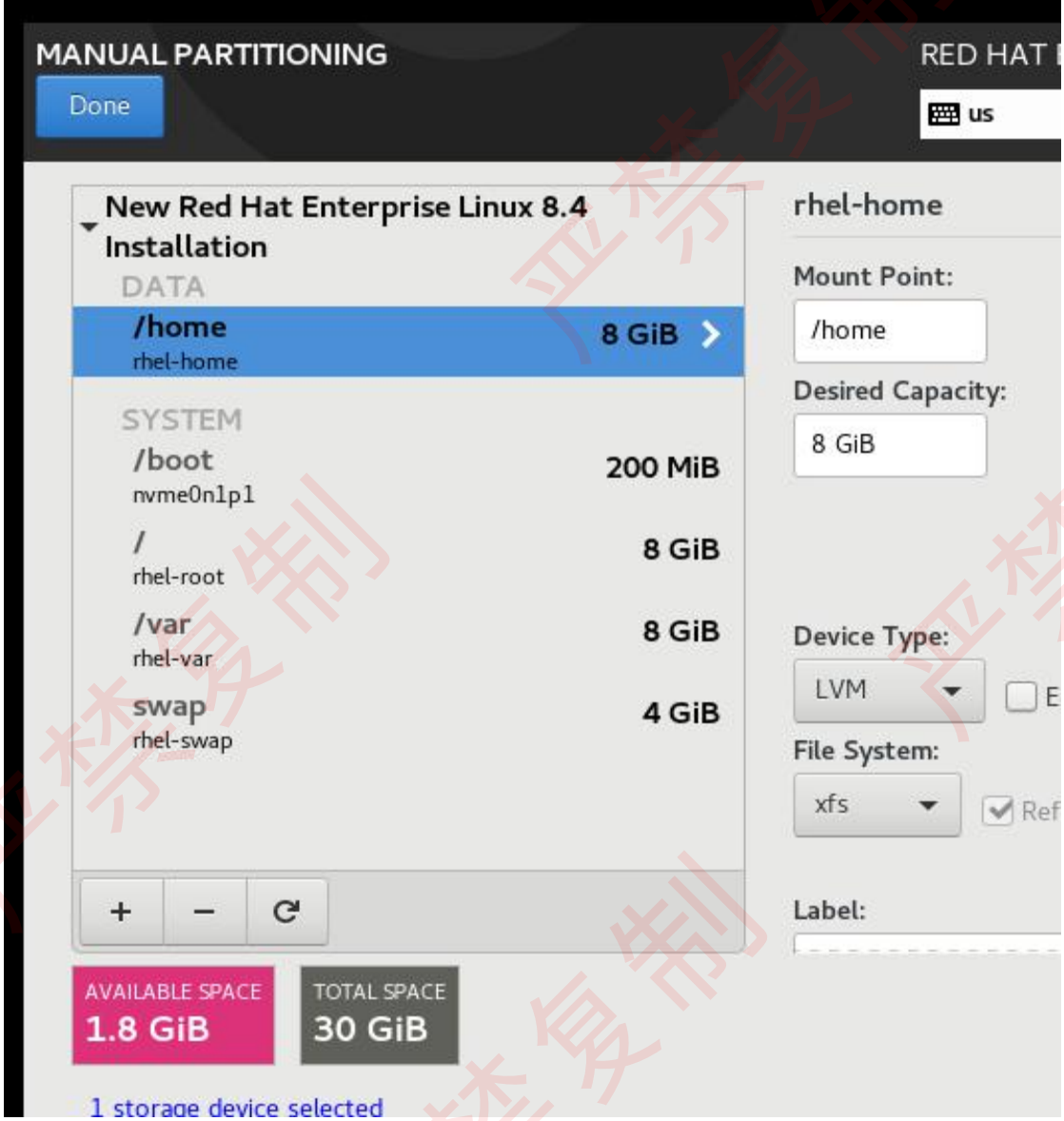


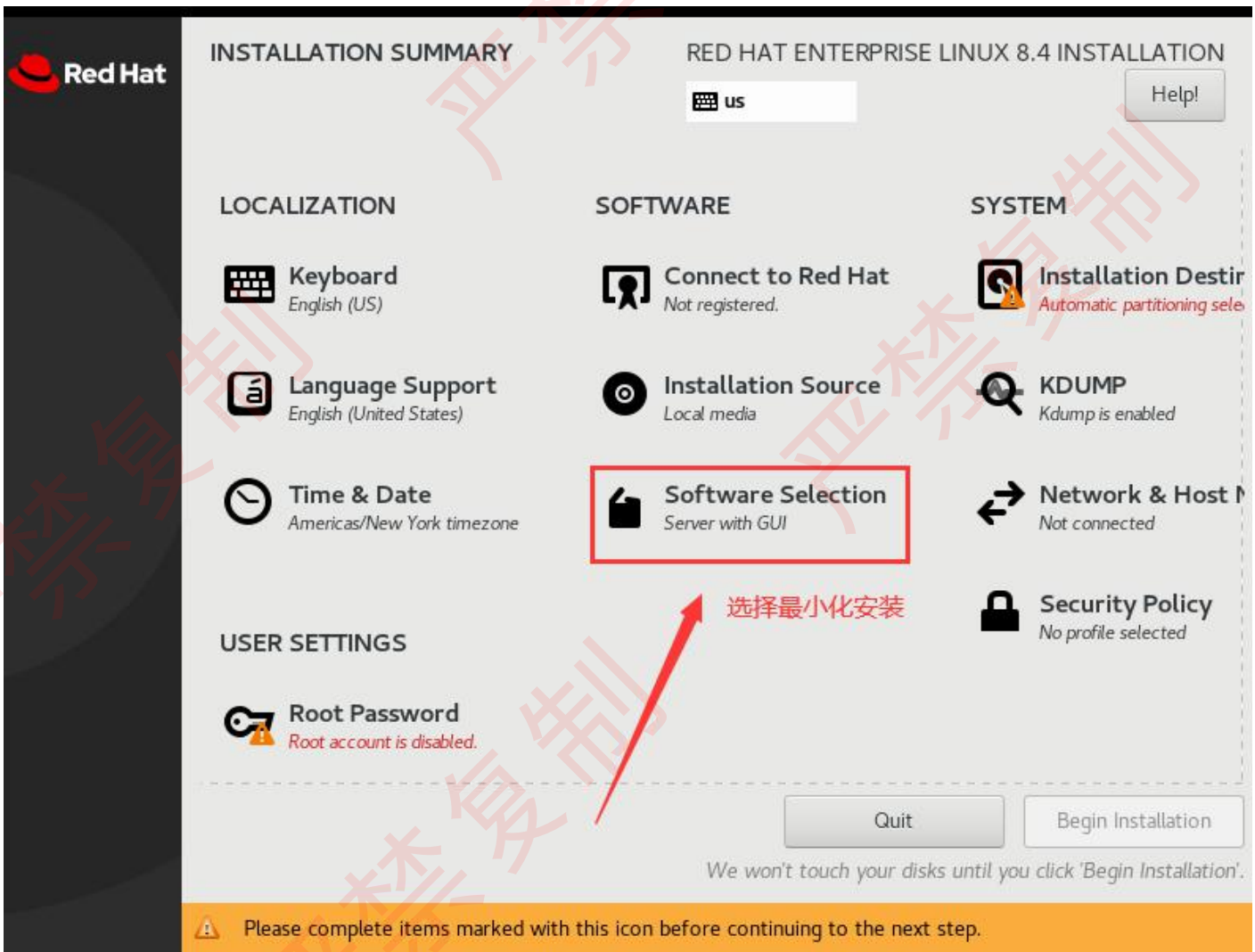


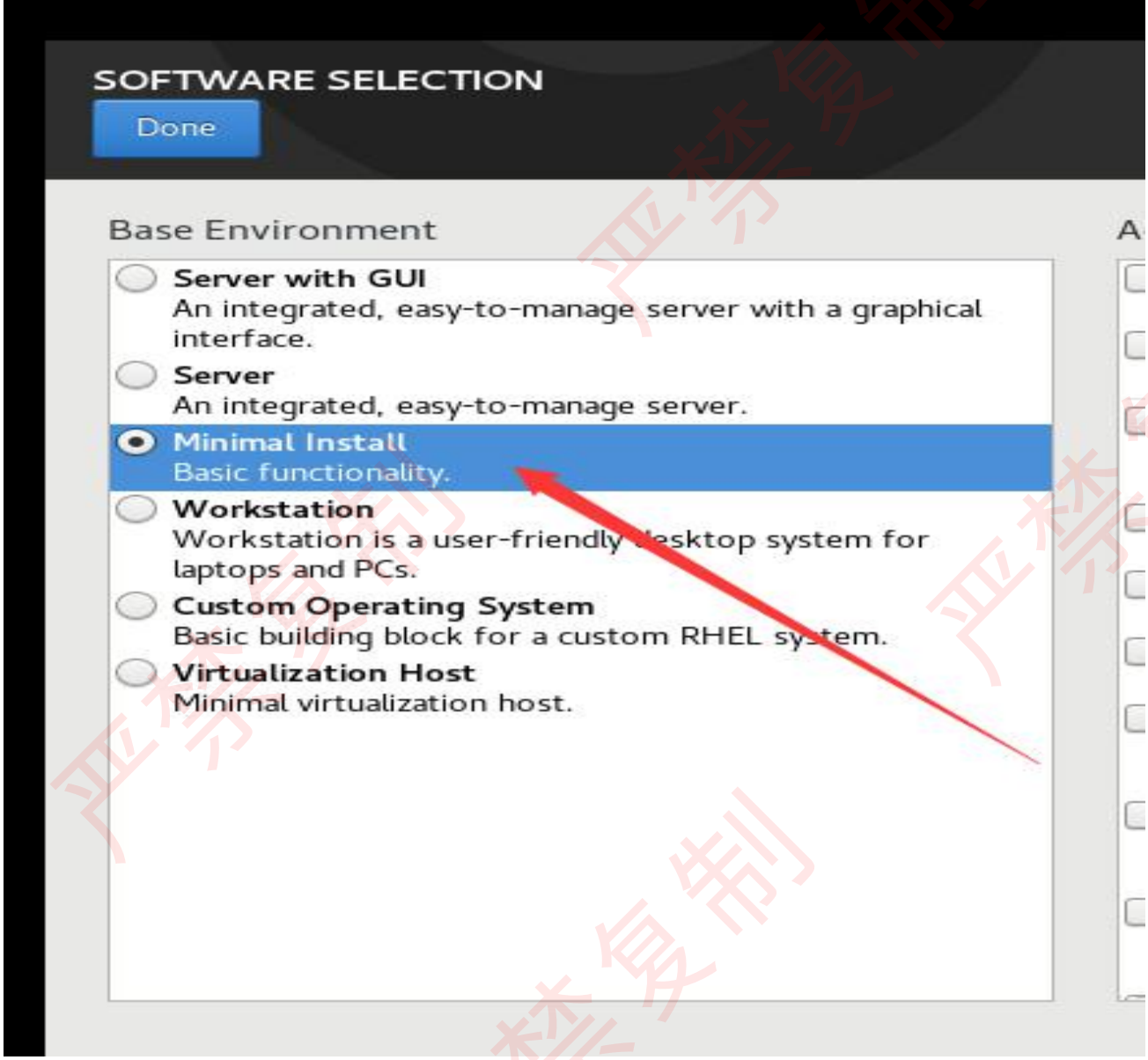
2、安装最小化rhel8.4操作系统，要求分区设定如下：“/boot”分区大小为200MB，“/”分区大小为 8G，“/home”分区大小为 8G，“/var”分区大小为 8G，“swap”交换分区大小为4G。

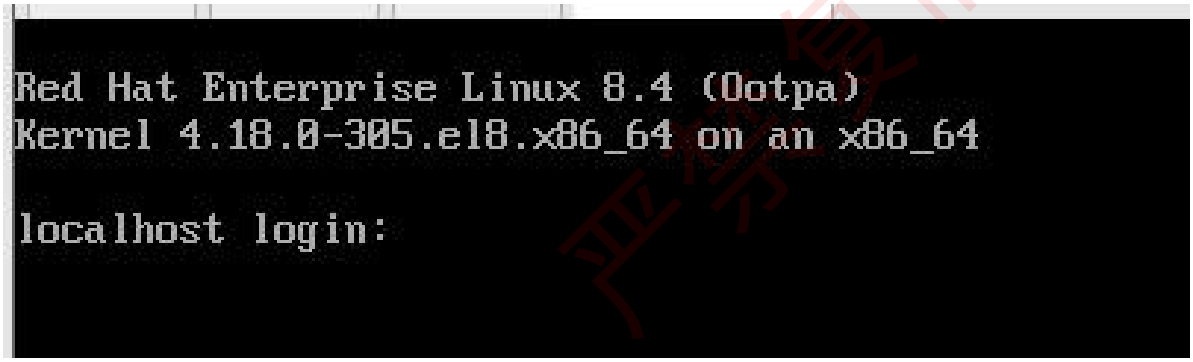

Red Hat Enterprise Linux 8.4
Install Red Hat Enterprise Linux 8.4
Test this media & install Red Hat Enterprise Linux 8.4
Troubleshooting
Press Tab for full configuration options on menu items.


INSTALLATION SUMMARY
RED HAT ENTERPRISE LINUX 8.4 INSTALLATION
us
Help!
LOCALIZATION
SOFTWARE
SYSTEM
Keyboard
English (US)
Connect to Red Hat
Not registered.
Installation Destir
Custom partitioning selecte
分区
Language Support
English (United States)
Installation Source
Local media
KDUMP
Kdump is enabled
Time & Date
Asia/Shanghai timezone
Software Selection
Minimal Install
Network & Host N
Not connected
设置最小化安装
Security Policy
No profile selected
USER SETTINGS
Root Password
Root password is set
设置密码
User Creation
Quit
Begin Installation
We won't touch your disks until you click 'Begin Installation'.

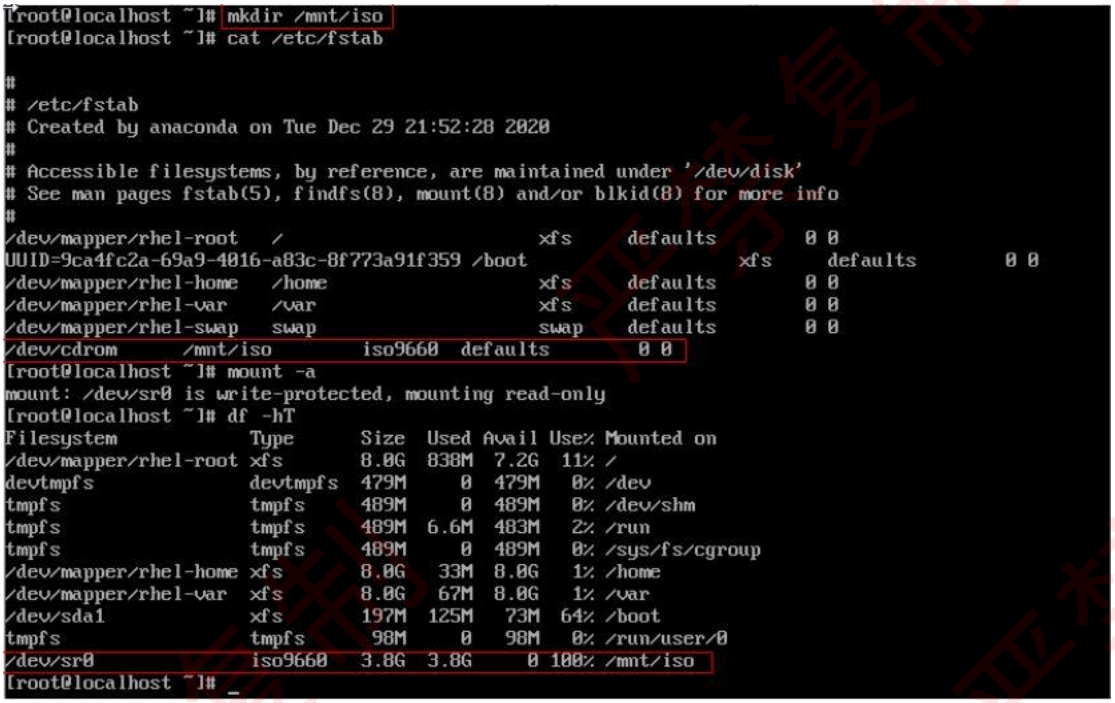

MANUAL PARTITIONING
Done
RED HAT
us
New Red Hat Enterprise Linux 8.4 Installation
DATA
/home
rhel-home
8 GiB
SYSTEM
/boot
nvme0n1p1
200 MiB
/
rhel-root
8 GiB
/var
rhel-var
8 GiB
swap
rhel-swap
4 GiB
rhel-home
Mount Point:
/home
Desired Capacity:
8 GiB
Device Type:
LVM
File System:
xfs
Label:
AVAILABLE SPACE
1.8 GiB
TOTAL SPACE
30 GiB
1 storage device selected

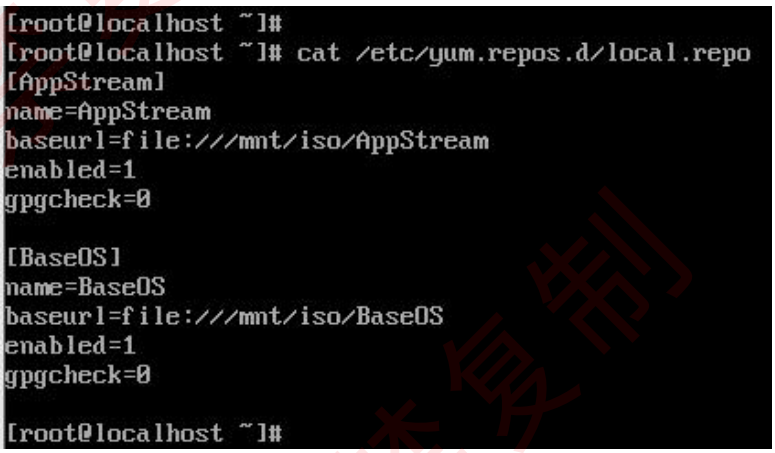

Red Hat
INSTALLATION SUMMARY
RED HAT ENTERPRISE LINUX 8.4 INSTALLATION
us
Help!
LOCALIZATION
Keyboard
English (US)
Language Support
English (United States)
Time & Date
Americas/New York timezone
SOFTWARE
Connect to Red Hat
Not registered.
Installation Source
Local media
Software Selection
Server with GUI
SYSTEM
Installation Destir
Automatic partitioning sele
KDUMP
Kdump is enabled
Network & Host N
Not connected
Security Policy
No profile selected
选择最小化安装
USER SETTINGS
Root Password
Root account is disabled.
Quit
Begin Installation
We won't touch your disks until you click 'Begin Installation'.
Please complete items marked with this icon before continuing to the next step.

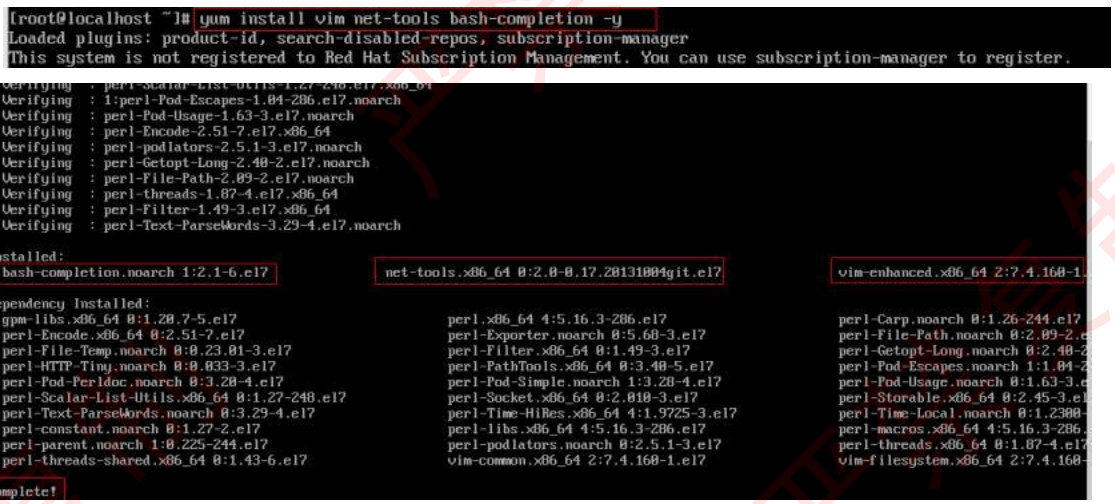

SOFTWARE SELECTION
Done
Base Environment
Server with GUI
An integrated, easy-to-manage server with a graphical interface.
Server
An integrated, easy-to-manage server.
Minimal Install
Basic functionality.
Workstation
Workstation is a user-friendly desktop system for laptops and PCs.
Custom Operating System
Basic building block for a custom RHEL system.
Virtualization Host
Minimal virtualization host.



3、永久挂载rhel8.4的镜像到/mnt/iso目录，并配置一个本地yum源，安装vim、net-tools及bash-completion包。



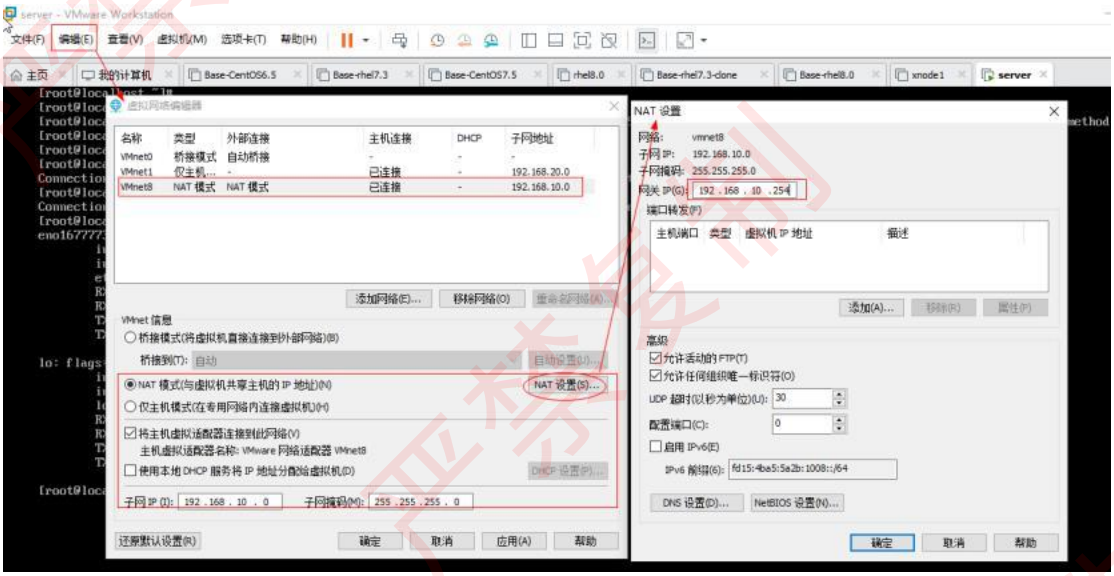


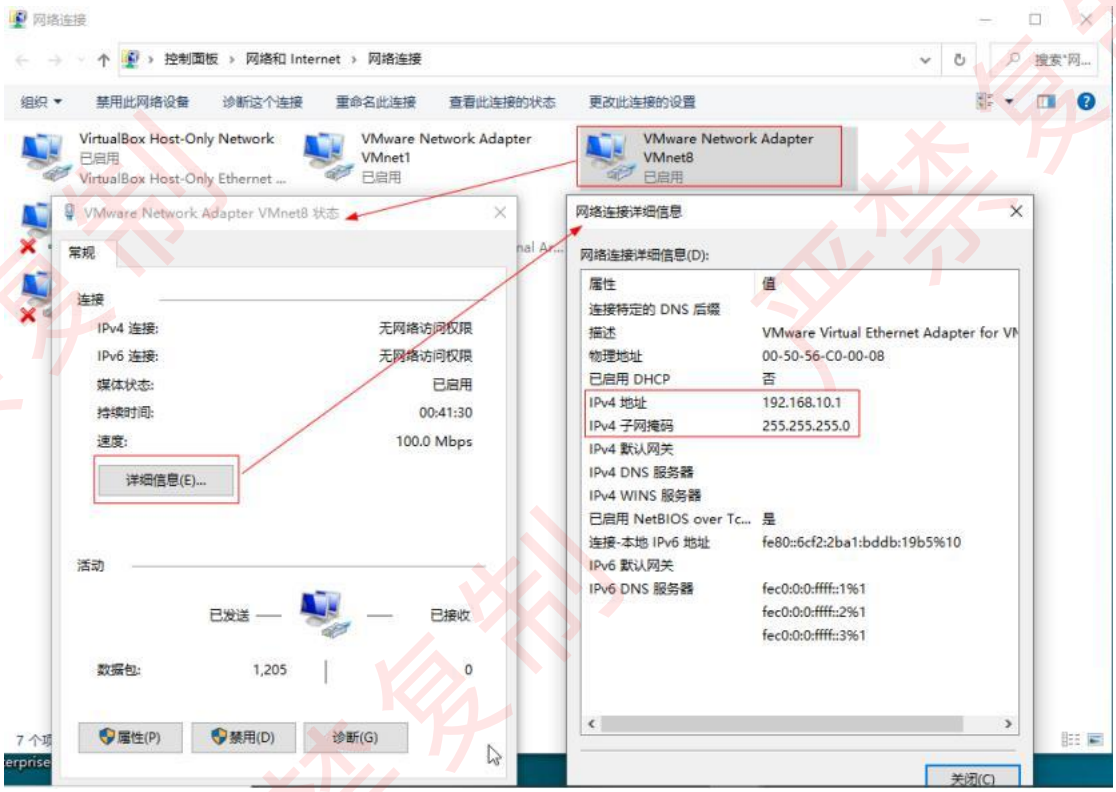


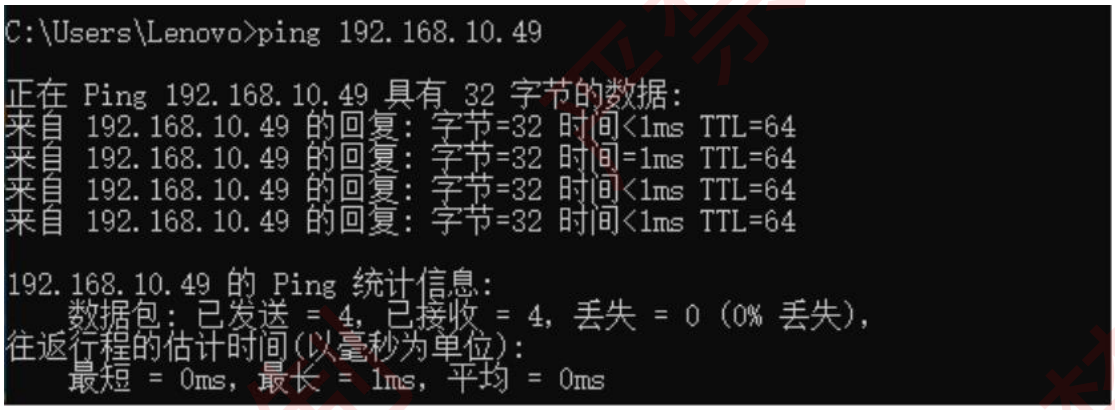
4、使用 nmcli命令配置 rhel8.4系统的网络，要求IP地址为192.168.10.XX/24，网关为192.168.10.254，DNS为202.103.224.68。并且使用ifconfig命令查看网卡的IP地址。使用远程连接工具CRT进行连接。(其中，XX为自己学号的后两位)

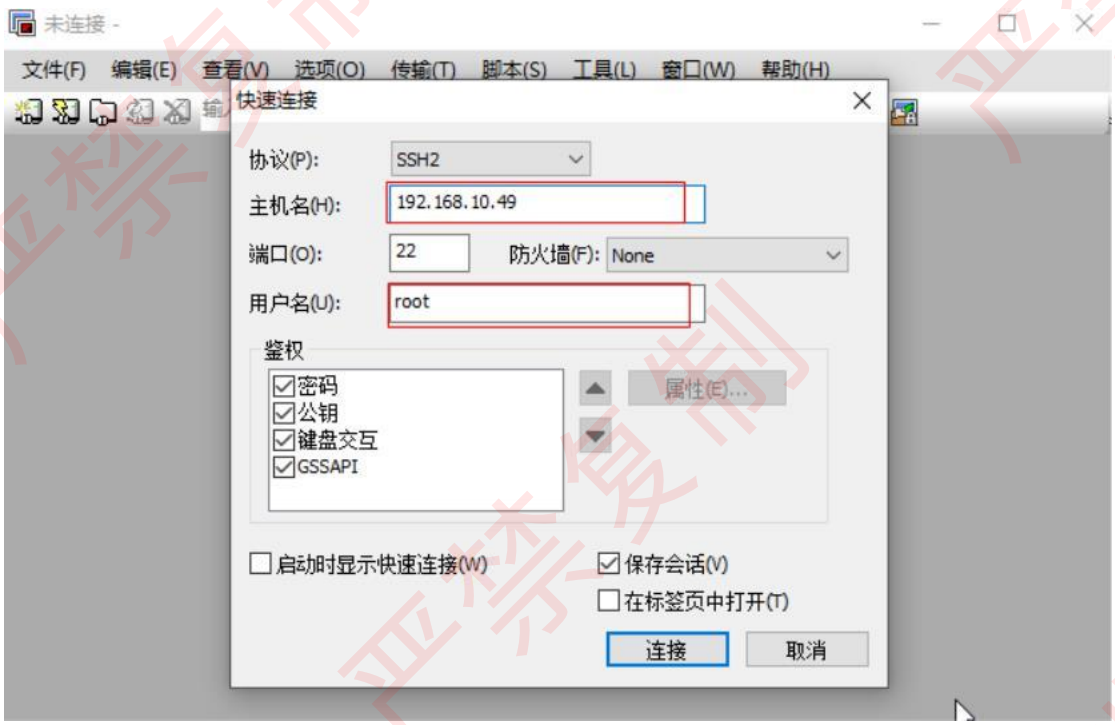
```
[root@localhost ~]#
[root@localhost ~]# nmcli connection mod ens160 ipv4.add 192.168.10.49/24 ipv4.gateway 192.168.10.254 ipv4.dns 202.103.224.68
[root@localhost ~]# nmcli connection down ens160
Connection 'ens160' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)
[root@localhost ~]# nmcli connection up ens160
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/4)
[root@localhost ~]#
```

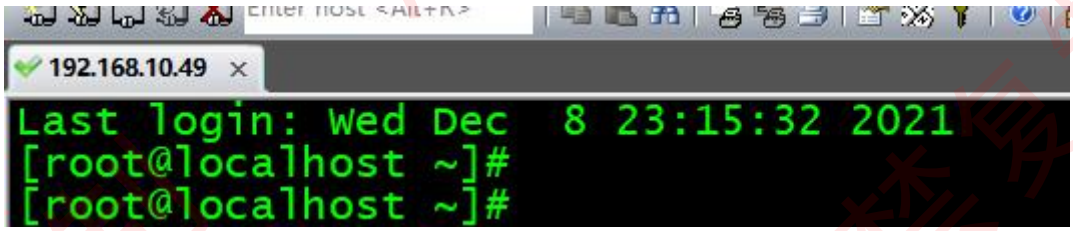
```
[root@localhost ~]# ifconfig
ens160: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.10.49  netmask 255.255.255.0  broadcast 192.168.10.255
        inet6 fe80::20c:29ff:febf:e73d  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:bf:e7:3d  txqueuelen 1000  (Ethernet)
        RX packets 111  bytes 12066 (11.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 75  bytes 5456 (5.3 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 49  bytes 4284 (4.1 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 49  bytes 4284 (4.1 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[root@localhost ~]#
```











5、配置rhel7.2的主机名为: YYY.example.com。使用hostnamectl命令配置并查看配置情况。(其中, YYY为自己姓名首字母)

```
[root@localhost ~]# hostnamectl set-hostname gpg.example.com
[root@localhost ~]# bash
[root@gpg ~]# hostnamectl
   Static hostname: gpg.example.com
         Icon name: computer-vm
           Chassis: vm
        Machine ID: 103e1cf26b7a43e4881a3e15f01de031
           Boot ID: f053a5e127d14837ab19010b476949fc
    Virtualization: vmware
  Operating System: Red Hat Enterprise Linux Server 7.2 (Maipo)
       CPE OS Name: cpe:/o:redhat:enterprise_linux:7.2:GA:server
            Kernel: Linux 3.10.0-327.el7.x86_64
      Architecture: x86-64
```

6、目录和文件操作:

(1)、在/home目录下面创建stu/temp/test目录，然后在/home/stu下面创建文件file1到file5;

```
[root@gpg ~]# cd /home/
[root@gpg home]# mkdir -p stu/temp/test
[root@gpg home]# cd /home/stu/
[root@gpg stu]# touch file{1..5}
[root@gpg stu]# ls
file1  file2  file3  file4  file5  temp
```

(2)、将/home/stu下的 file1到 file5文件移动到/home/stu/temp/test目录下并且重命名为test1到test5;

```
[root@gpg stu]# mv file1 /home/stu/temp/test/test1
[root@gpg stu]# mv file2 /home/stu/temp/test/test2
[root@gpg stu]# mv file3 /home/stu/temp/test/test3
[root@gpg stu]# mv file4 /home/stu/temp/test/test4
[root@gpg stu]# mv file5 /home/stu/temp/test/test5
[root@gpg stu]#
[root@gpg stu]#
[root@gpg stu]# ls /home/stu/temp/test/
test1  test2  test3  test4  test5
```

(3)、将/home/stu下的temp目录拷贝到/tmp目录下;

```
[root@gpg stu]# ls
temp
[root@gpg stu]# cp -r temp/ /tmp/
[root@gpg stu]# ls /tmp/
ks-script-D4y5Xa_  temp  yum.log
```

(4)、删除/home/stu目录下的temp目录及目录里的所有内容。

```
[root@gpg stu]# ls
temp
[root@gpg stu]# rm -rf temp/
[root@gpg stu]#
[root@gpg stu]# ls
[root@gpg stu]#
```

7、请查找系统上拥有者为 student用户的普通文件，并将其拷贝到/root/findfiles目录

中。

```
[root@gpg ~]# mkdir /root/findfiles
[root@gpg ~]#
[root@gpg ~]# find / -user student -type f -exec cp {} /root/findfiles \;
find: '/proc/21220/task/21220/fdinfo/6': No such file or directory
find: '/proc/21220/fdinfo/6': No such file or directory
[root@gpg ~]#
[root@gpg ~]# ls -al /root/findfiles/
total 16
drwxr-xr-x. 2 root root   73 Dec 29 22:38 .
dr-xr-x---. 3 root root 4096 Dec 29 22:38 ..
-rw-r--r--. 1 root root   18 Dec 29 22:38 .bash_logout
-rw-r--r--. 1 root root  193 Dec 29 22:38 .bash_profile
-rw-r--r--. 1 root root  231 Dec 29 22:38 .bashrc
-rw-r-----. 1 root root    0 Dec 29 22:38 student
```

8、设定系统的Selinux的工作模式为disabled，要求系统重启后依然生效。

```
[root@gpg ~]# cat /etc/selinux/config

# This file controls the state of SELinux on the system.
# SELINUX= can take one of these three values:
#     enforcing - SELinux security policy is enforced.
#     permissive - SELinux prints warnings instead of enforcing.
#     disabled - No SELinux policy is loaded.
SELINUX=disabled
# SELINUXTYPE= can take one of three two values:
#     targeted - Targeted processes are protected,
#     minimum - Modification of targeted policy. Only selected processes are pro
tected.
#     mls - Multi Level Security protection.
SELINUXTYPE=targeted


[root@gpg ~]#
[root@gpg ~]# setenforce 0
[root@gpg ~]#
[root@gpg ~]# getenforce
Permissive
```

9、查找字符串。把/etc/selinux/config文件中所有包含忽略大小写 selinux字符串的行找到，并将这些行按照原始文件中的顺序存放到/root/wordlist中，/root/wordlist文件不能包含空行和以#号开头的行。

```
[root@gpg ~]# grep -i selinux /etc/selinux/config | grep -v ^# | grep -v ^$ > /r
oot/wordlist
[root@gpg ~]#
[root@gpg ~]# cat /root/wordlist
SELINUX=disabled
SELINUXTYPE=targeted
```

10、创建一个名为/root/sysconfig.tar.gz的归档文件，其中包含了/etc/sysconfig目录中的内容。tar归档文件必须使用gzip进行压缩。

```
[root@gpg ~]# tar -zcvf /root/sysconfig.tar.gz /etc/sysconfig/
tar: Removing leading `/' from member names
/etc/sysconfig/
/etc/sysconfig/selinux
/etc/sysconfig/ip6tables-config
/etc/sysconfig/iptables-config
/etc/sysconfig/cbq/
/etc/sysconfig/cbq/avpkt
/etc/sysconfig/cbq/cbq-0000.example
/etc/sysconfig/rdisc
/etc/sysconfig/console/
/etc/sysconfig/init
/etc/sysconfig/modules/
/etc/sysconfig/netconsole
/etc/sysconfig/network-scripts/
/etc/sysconfig/network-scripts/ifcfg-lo
/etc/sysconfig/network-scripts/ifdown
/etc/sysconfig/network-scripts/ifdown-bnep
/etc/sysconfig/network-scripts/ifdown-eth
[root@gpg ~]# ls /root/sysconfig.tar.gz
/root/sysconfig.tar.gz
```

11、创建用户和用户组

(1)、新建一个名为adminuser的组，组id为40000;

```
[root@gpg ~]# groupadd -g 40000 adminuser
[root@gpg ~]#
[root@gpg ~]# cat /etc/group | grep adminuser
adminuser:x:40000:
```

(2)、新建一个名为natasha的用户，并将adminuser作为其附属组;

```
[root@gpg ~]# useradd -G adminuser natasha
[root@gpg ~]#
[root@gpg ~]# id natasha
uid=1001(natasha) gid=1001(natasha) groups=1001(natasha),40000(adminuser)
```

(3)、新建一个名为harry的用户，并将adminuser作为其附属组;

```
[root@gpg ~]# useradd -G adminuser harry
[root@gpg ~]#
[root@gpg ~]# id harry
uid=1002(harry) gid=1002(harry) groups=1002(harry),40000(adminuser)
```

(4)、新建一个名为sarah的用户，其不属于adminuser组，其在系统中没有任何可交互的shell;

```
[root@gpg ~]# useradd -s /sbin/nologin sarah
[root@gpg ~]#
[root@gpg ~]# id sarah
uid=1003(sarah) gid=1003(sarah) groups=1003(sarah)
[root@gpg ~]#
[root@gpg ~]# cat /etc/passwd | grep sarah
sarah:x:1003:1003::/home/sarah:/sbin/nologin
```

(5)、natasha、harry和sarah三个用户的密码均设置为redhat;

```
[root@gpg ~]# echo redhat | passwd --stdin natasha
Changing password for user natasha.
passwd: all authentication tokens updated successfully.
[root@gpg ~]#
[root@gpg ~]# echo redhat | passwd --stdin harry
Changing password for user harry.
passwd: all authentication tokens updated successfully.
[root@gpg ~]#
[root@gpg ~]# echo redhat | passwd --stdin sarah
Changing password for user sarah.
passwd: all authentication tokens updated successfully.
```

(6)、创建一个名为jay的用户，用户的id为3456，密码为glegunge;

```
[root@gpg ~]# useradd -u 3456 jay
[root@gpg ~]# id jay
uid=3456(jay) gid=3456(jay) groups=3456(jay)
[root@gpg ~]#
[root@gpg ~]# echo glegunge | passwd --stdin jay
Changing password for user jay.
passwd: all authentication tokens updated successfully.
```

12、配置文件/var/tmp/fstab的权限——复制文件/etc/fstab到/var/tmp目录下，并按照以下要求配置/var/tmp/fstab文件的权限:

```
[root@gpg ~]# cp /etc/fstab /var/tmp/fstab
[root@gpg ~]#
[root@gpg ~]# ls /var/tmp/fstab
/var/tmp/fstab
```

(1)、该文件的所属人为root;

(2)、该文件的所属组为root;

(3)、该文件对任何人均没有执行权限;

```
[root@gpg ~]# chown root:root /var/tmp/fstab
[root@gpg ~]#
[root@gpg ~]# chmod a-x /var/tmp/fstab
[root@gpg ~]#

[root@gpg ~]# ls -l /var/tmp/fstab
-rw-r--r--. 1 root root 660 Dec 29 22:56 /var/tmp/fstab
```

(4)、用户natasha对该文件有读和写的权限;

```
[root@gpg ~]# setfacl -m u:natasha:rw /var/tmp/fstab
[root@gpg ~]# getfacl /var/tmp/fstab
getfacl: Removing leading '/' from absolute path names
# file: var/tmp/fstab
# owner: root
# group: root
user::rw-
user:natasha:rw-
group::r--
mask::rw-
other::r--
```

(5)、用户harry对该文件既不能读也不能写;

```
[root@gpg ~]# setfacl -m u:harry:--- /var/tmp/fstab
[root@gpg ~]# getfacl /var/tmp/fstab
getfacl: Removing leading '/' from absolute path names
# file: var/tmp/fstab
# owner: root
# group: root
user::rw-
user:natasha:rw-
user:harry:---
group::r--
mask::rw-
other::r--
```

(6)、所有其他用户（包括当前已有用户及未来创建的用户）对该文件都有读的权限。

```
[root@gpg ~]# ls -l /var/tmp/fstab
-rw-rw-r--+ 1 root root 660 Dec 29 22:56 /var/tmp/fstab
[root@gpg ~]#
[root@gpg ~]# getfacl /var/tmp/fstab
getfacl: Removing leading '/' from absolute path names
# file: var/tmp/fstab
# owner: root
# group: root
user::rw-
user:natasha:rw-
user:harry:---
group::r--
mask::rw-
other::r--
```

13、在/home目录下创建名为admins的子目录，并按以下要求设置权限:

(1)、/home/admins目录的所属组为adminuser;

```
[root@gpg ~]# mkdir /home/admins
[root@gpg ~]#
[root@gpg ~]# ls -ld /home/admins/
drwxr-xr-x. 2 root root 6 Dec 29 23:02 /home/admins/
[root@gpg ~]#
[root@gpg ~]# chgrp adminuser /home/admins/
[root@gpg ~]# ls -ld /home/admins/
drwxr-xr-x. 2 root adminuser 6 Dec 29 23:02 /home/admins/
```

(2)、该目录对adminuser组的成员可读可执行可写，但对其他用户没有任何权限，但root不受限制;

```
[root@gpg ~]# chmod g=rwx,o=--- /home/admins/
[root@gpg ~]# ls -ld /home/admins/
drwxrwx---. 2 root adminuser 6 Dec 29 23:02 /home/admins/
```

(3)、在/home/admins目录下所创建的文件的所属组自动被设置为adminuser;

```
[root@gpg ~]# chmod g+s /home/admins/
[root@gpg ~]#
[root@gpg ~]# ls -ld /home/admins/
drwxrws---. 2 root adminuser 6 Dec 29 23:02 /home/admins/
```

14、对natasha用户建立计划任务，要求在本地时间的每天14:23执行以下命令: /bin/echo

“rhcsa”。

```
[root@gpg ~]# crontab -e -u natasha
no crontab for natasha - using an empty one
23 14 * * *     /bin/echo "rhcsa"
```

15、配置自己的系统为一个时钟服务器系统，要求系统开机依然生效。

(1)、安装chrony软件包;

```
[root@gpg ~]# yum install chrony -y
Loaded plugins: product-id, search-disabled-repos, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use su
bscription-manager to register.
Resolving Dependencies
--> Running transaction check
---> Package chrony.x86_64 0:2.1.1-1.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package         Arch            Version                 Repository        Size
================================================================================
Installing:
 chrony          x86_64          2.1.1-1.el7             rhel7.2          280 k

Transaction Summary
================================================================================
Install  1 Package

Total download size: 280 k
Installed size: 468 k
Downloading packages:
Running transaction check
```

(2)、配置时钟服务器;

```
[root@gpg ~]# vim /etc/chrony.conf
# Use public servers from the pool.ntp.org project.
# Please consider joining the pool (http://www.pool.ntp.org/join.html).
#server 0.rhel.pool.ntp.org iburst
#server 1.rhel.pool.ntp.org iburst
#server 2.rhel.pool.ntp.org iburst
#server 3.rhel.pool.ntp.org iburst
server 192.168.10.49 iburst

# Ignore stratum in source selection.
stratumweight 0

# Allow NTP client access from local network.
#allow 192.168/16
allow all

# Listen for commands only on localhost.
bindcmdaddress 127.0.0.1
bindcmdaddress ::1

# Serve time even if not synchronized to any NTP server.
local stratum 10
```

(3)、启动时钟服务，并设置开机自动启动;

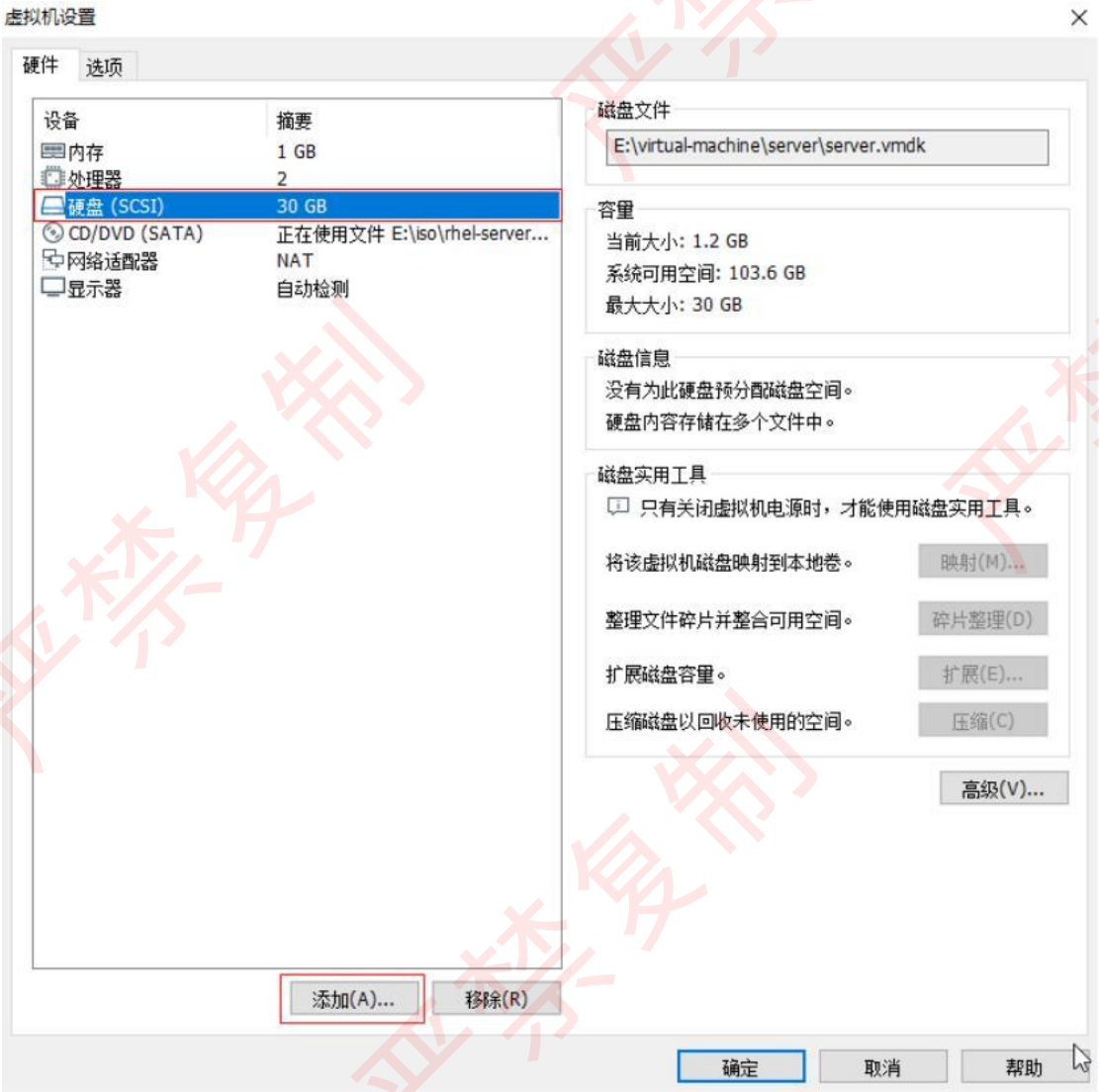
```
[root@gpg ~]# systemctl enable chronyd
[root@gpg ~]# systemctl restart chronyd
[root@gpg ~]# systemctl status chronyd
● chronyd.service - NTP client/server
   Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled; vendor pres
et: enabled)
   Active: active (running) since Tue 2020-12-29 23:17:36 CST; 5s ago
  Process: 21758 ExecStartPost=/usr/libexec/chrony-helper update-daemon (code=ex
ited, status=0/SUCCESS)
  Process: 21755 ExecStart=/usr/sbin/chronyd $OPTIONS (code=exited, status=0/SUC
CESS)
 Main PID: 21757 (chronyd)
   CGroup: /system.slice/chronyd.service
           └─21757 /usr/sbin/chronyd

Dec 29 23:17:36 gpg.example.com systemd[1]: Starting NTP client/server...
Dec 29 23:17:36 gpg.example.com chronyd[21757]: chronyd version 2.1.1 starti...)
Dec 29 23:17:36 gpg.example.com chronyd[21757]: Generated key 1
Dec 29 23:17:36 gpg.example.com systemd[1]: Started NTP client/server.
Hint: Some lines were ellipsized, use -l to show in full.
```

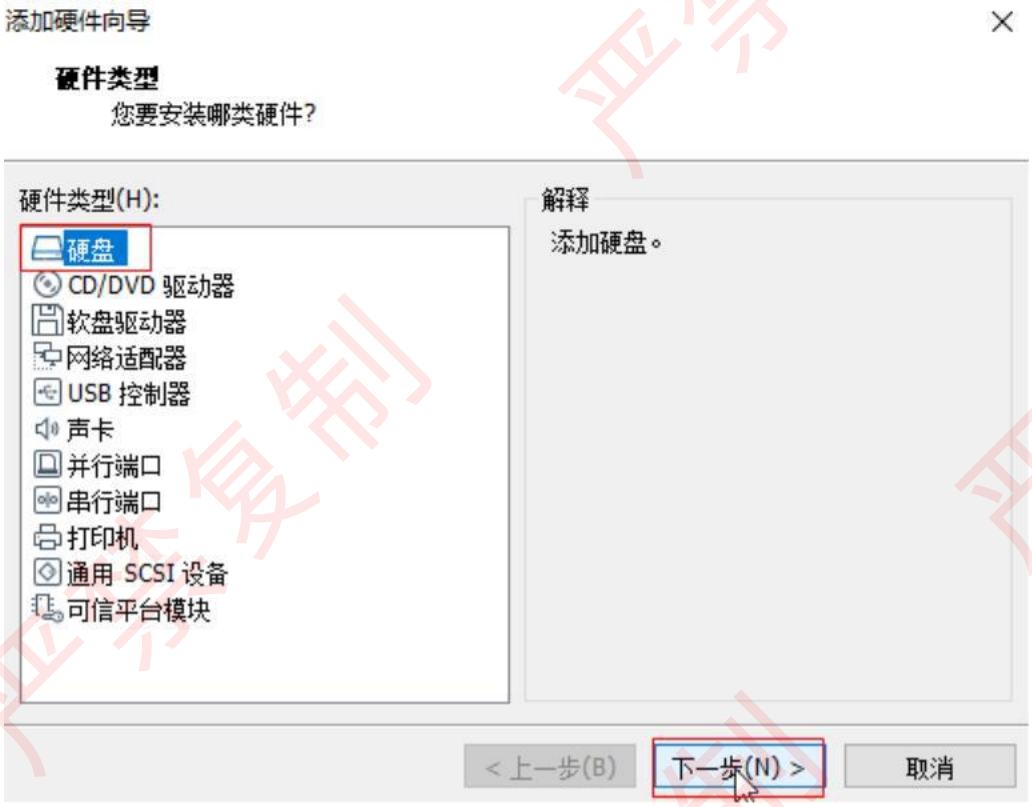
(4)、查看时钟服务器;

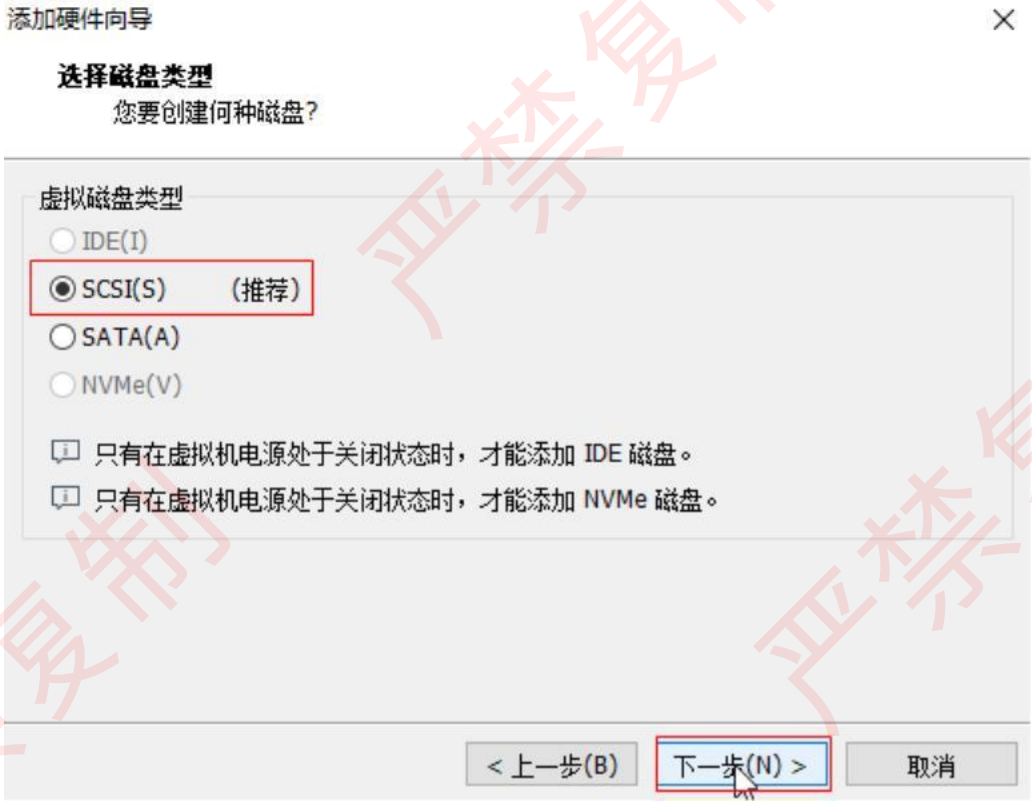
```
[root@gpg ~]# chronyc
chrony version 2.1.1
Copyright (C) 1997-2003, 2007, 2009-2015 Richard P. Curnow and others
chrony comes with ABSOLUTELY NO WARRANTY.  This is free software, and
you are welcome to redistribute it under certain conditions.  See the
GNU General Public License version 2 for details.

chronyc> sources
210 Number of sources = 1
MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^* 192.168.10.49                 10   6   377   175  -2093ns[  -13us] +/-   27us
chronyc> waitsync
try: 1, refid: 192.168.10.49, correction: 0.000000000, skew: 681.168
chronyc> exit
[root@gpg ~]#
```

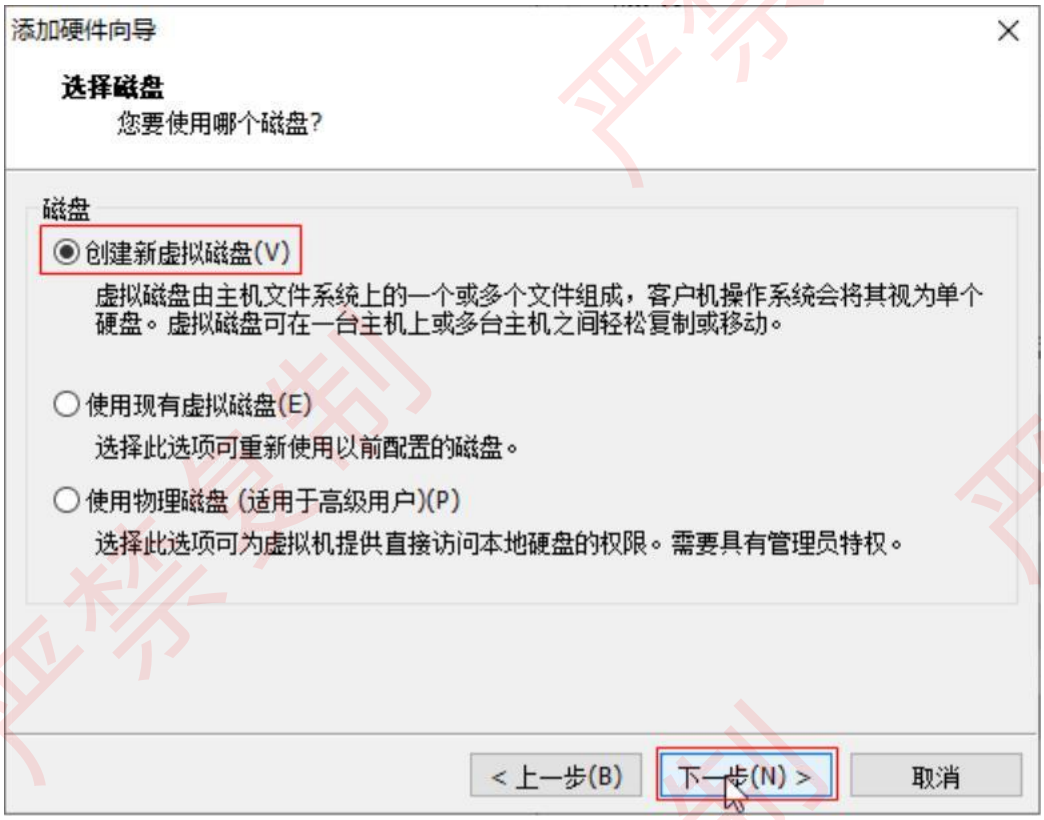
16、给虚拟机添加一块 20G的硬盘。给 linux系统添加一个新的 swap分区，并满足如下要求:

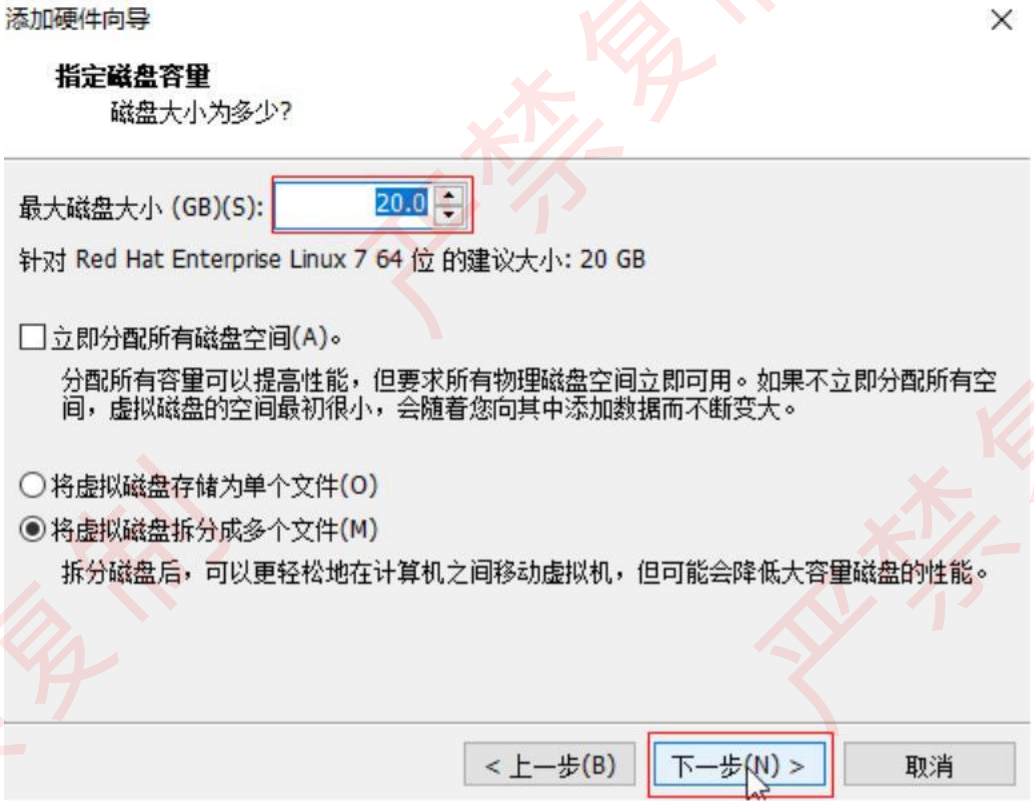
添加20G的硬盘

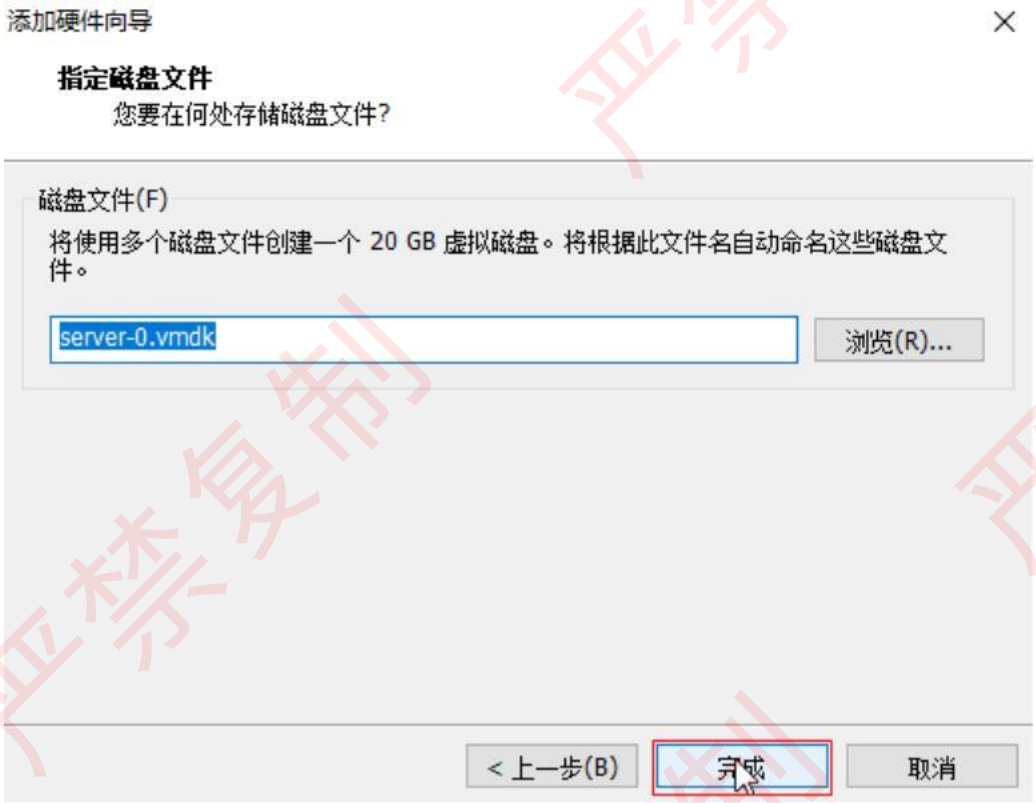

虚拟机设置
硬件
选项
设备
摘要
内存
1 GB
处理器
2
硬盘 (SCSI)
30 GB
CD/DVD (SATA)
正在使用文件 E:\iso\rhel-server...
网络适配器
NAT
显示器
自动检测
磁盘文件
E:\virtual-machine\server\server.vmdk
容量
当前大小: 1.2 GB
系统可用空间: 103.6 GB
最大大小: 30 GB
磁盘信息
没有为此硬盘预分配磁盘空间。
硬盘内容存储在多个文件中。
磁盘实用工具
只有关闭虚拟机电源时，才能使用磁盘实用工具。
将该虚拟机磁盘映射到本地卷。
映射(M)...
整理文件碎片并整合可用空间。
碎片整理(D)
扩展磁盘容量。
扩展(E)...
压缩磁盘以回收未使用的空间。
压缩(C)
高级(V)...
添加(A)...
移除(R)
确定
取消
帮助

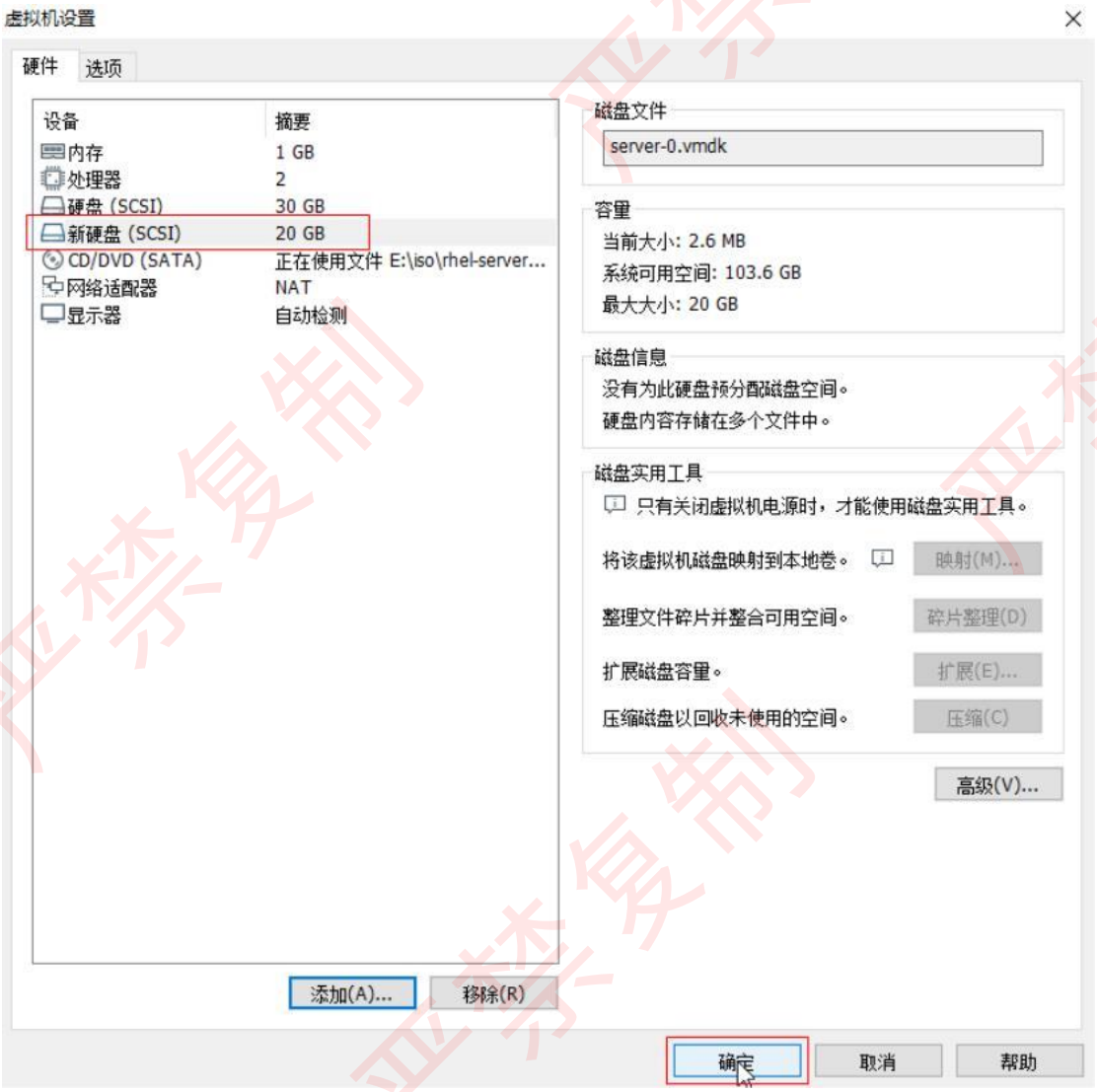

添加硬件向导
硬件类型
您要安装哪类硬件?
硬件类型(H):
硬盘
CD/DVD 驱动器
软盘驱动器
网络适配器
USB 控制器
声卡
并行端口
串行端口
打印机
通用 SCSI 设备
可信平台模块
解释
添加硬盘。
< 上一步(B)
下一步(N) >
取消


添加硬件向导
选择磁盘类型
您要创建何种磁盘?
虚拟磁盘类型
IDE(I)
SCSI(S) (推荐)
SATA(A)
NVMe(V)
只有在虚拟机电源处于关闭状态时，才能添加 IDE 磁盘。
只有在虚拟机电源处于关闭状态时，才能添加 NVMe 磁盘。
< 上一步(B)
下一步(N) >
取消


添加硬件向导
选择磁盘
您要使用哪个磁盘?
磁盘
创建新虚拟磁盘(V)
虚拟磁盘由主机文件系统上的一个或多个文件组成，客户机操作系统会将其视为单个硬盘。虚拟磁盘可在一台主机上或多台主机之间轻松复制或移动。
使用现有虚拟磁盘(E)
选择此选项可重新使用以前配置的磁盘。
使用物理磁盘 (适用于高级用户)(P)
选择此选项可为虚拟机提供直接访问本地硬盘的权限。需要具有管理员特权。
< 上一步(B)
下一步(N) >
取消


添加硬件向导
指定磁盘容量
磁盘大小为多少?
最大磁盘大小 (GB)(S):
20.0
针对 Red Hat Enterprise Linux 7 64 位 的建议大小: 20 GB
立即分配所有磁盘空间(A)。
分配所有容量可以提高性能，但要求所有物理磁盘空间立即可用。如果不立即分配所有空间，虚拟磁盘的空间最初很小，会随着您向其中添加数据而不断变大。
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。
< 上一步(B)
下一步(N) >
取消


添加硬件向导
指定磁盘文件
您要在何处存储磁盘文件?
磁盘文件(F)
将使用多个磁盘文件创建一个 20 GB 虚拟磁盘。将根据此文件名自动命名这些磁盘文件。
server-0.vmdk
浏览(R)...
< 上一步(B)
完成
取消



硬盘添加立即识别不了，必须重启虚拟机才能识别。

```
[root@gpg ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   30G  0 disk
├─sda1            8:1    0  200M  0 part /boot
└─sda2            8:2    0   28G  0 part
  ├─rhel-root   253:0    0    8G  0 lvm  /
  ├─rhel-swap   253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home   253:2    0    8G  0 lvm  /home
  └─rhel-var    253:3    0    8G  0 lvm  /var
sr0              11:0    1  3.8G  0 rom  /mnt/iso
[root@gpg ~]#
[root@gpg ~]# reboot
```

重启完虚拟机查看添加的20G硬盘。

```
[root@gpg ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   30G  0 disk
├─sda1            8:1    0  200M  0 part /boot
└─sda2            8:2    0   28G  0 part
  ├─rhel-root   253:0    0    8G  0 lvm  /
  ├─rhel-swap   253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home   253:2    0    8G  0 lvm  /home
  └─rhel-var    253:3    0    8G  0 lvm  /var
sdb               8:16   0   20G  0 disk
sr0              11:0    1  3.8G  0 rom  /mnt/iso
```

查看系统已有的swap分区

```
[root@gpg ~]# free -m
              total        used        free      shared  buff/cache   available
Mem:            977         122         605           6         249         699
Swap:          4095           0        4095
[root@gpg ~]# swapon -s
Filename                                Type            Size    Used    Priority
/dev/dm-1                               partition       4194300 0       -1
```

(1)、swap分区容量为512MiB;

```
[root@gpg ~]# fdisk /dev/sdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x8a0e03b9.

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p):  直接按Enter键
Using default response p
Partition number (1-4, default 1):  直接按Enter键
First sector (2048-41943039, default 2048):  直接按Enter键
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-41943039, default 41943039): +512M
Partition 1 of type Linux and of size 512 MiB is set

Command (m for help): p

Disk /dev/sdb: 21.5 GB, 21474836480 bytes, 41943040 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x8a0e03b9
```

```
   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048     1050623      524288   83  Linux

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): l

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           27  Hidden NTFS Win 82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      39  Plan 9          83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       3c  PartitionMagic  84  OS/2 hidden C:  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      40  Venix 80286     85  Linux extended  c7  Syrinx
 5  Extended        41  PPC PReP Boot   86  NTFS volume set da  Non-FS data
 6  FAT16           42  SFS             87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS/exFAT 4d  QNX4.x          88  Linux plaintext de  Dell Utility
 8  AIX             4e  QNX4.x 2nd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    4f  QNX4.x 3rd part 93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       51  OnTrack DM6 Aux 9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 52  CP/M            a0  IBM Thinkpad hi eb  BeOS fs
 e  W95 FAT16 (LBA) 53  OnTrack DM6 Aux a5  FreeBSD         ee  GPT
 f  W95 Ext'd (LBA) 54  OnTrackDM6      a6  OpenBSD         ef  EFI (FAT-12/16/
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fd  Linux raid auto

Hex code (type L to list all codes): 82
Changed type of partition 'Linux' to 'Linux swap / Solaris'

Command (m for help): p

Disk /dev/sdb: 21.5 GB, 21474836480 bytes, 41943040 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x99e1f525

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048     1050623      524288   82  Linux swap / Solaris

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

(2)、当系统启动时，swap分区应该可以自动挂载；

查看划分的分区并格式化swap分区。

```
[root@gpg ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   30G  0 disk
├─sda1            8:1    0  200M  0 part /boot
└─sda2            8:2    0   28G  0 part
  ├─rhel-root   253:0    0    8G  0 lvm  /
  ├─rhel-swap   253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home   253:2    0    8G  0 lvm  /home
  └─rhel-var    253:3    0    8G  0 lvm  /var
sdb               8:16   0   20G  0 disk
└─sdb1            8:17   0  512M  0 part
sr0              11:0    1  3.8G  0 rom  /mnt/iso
[root@gpg ~]#
[root@gpg ~]# mkswap /dev/sdb1
Setting up swapspace version 1, size = 524284 KiB
no label, UUID=54c0295c-9957-4263-93bf-586e00fa3462
```

```
[root@gpg ~]# vim /etc/fstab

#
# /etc/fstab
# Created by anaconda on Tue Dec 29 21:52:28 2020
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/rhel-root   /                       xfs     defaults        0 0
UUID=9ca4fc2a-69a9-4016-a83c-8f773a91f359 /boot                   xfs     defaults        0
0
/dev/mapper/rhel-home   /home                   xfs     defaults        0 0
/dev/mapper/rhel-var    /var                    xfs     defaults        0 0
/dev/mapper/rhel-swap   swap                    swap    defaults        0 0
/dev/cdrom      /mnt/iso        iso9660  defaults        0 0
UUID=54c0295c-9957-4263-93bf-586e00fa3462       swap    swap    defaults        0 0
```

(3)、不要移除或修改其他已经存在于系统中的swap分区；

```
[root@gpg ~]# swapon /dev/sdb1
[root@gpg ~]#
[root@gpg ~]# free -m
              total        used        free      shared  buff/cache   available
Mem:            977         122         605           6         250         699
Swap:          4607           0        4607
[root@gpg ~]#
[root@gpg ~]# swapon -s
Filename                                Type            Size    Used    Priority
/dev/dm-1                               partition       4194300 0       -1
/dev/sdb1                               partition       524284  0       -2
```

17、，按如下要求创建逻辑卷。

划分1G大小的分区。

```
[root@gpg ~]# fdisk /dev/sdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p):
Using default response p
Partition number (2-4, default 2):
First sector (1050624-41943039, default 1050624):
Using default value 1050624
Last sector, +sectors or +size{K,M,G} (1050624-41943039, default 41943039): +1G
Partition 2 of type Linux and of size 1 GiB is set

Command (m for help): t
Partition number (1,2, default 2):
Hex code (type L to list all codes): l

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           27  Hidden NTFS Win 82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      39  Plan 9          83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       3c  PartitionMagic  84  OS/2 hidden C:  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      40  Venix 80286     85  Linux extended  c7  Syrinx
 5  Extended        41  PPC PReP Boot   86  NTFS volume set da  Non-FS data
```

```
 6  FAT16           42  SFS             87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS/exFAT 4d  QNX4.x          88  Linux plaintext de  Dell Utility
 8  AIX             4e  QNX4.x 2nd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    4f  QNX4.x 3rd part 93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       51  OnTrack DM6 Aux 9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 52  CP/M            a0  IBM Thinkpad hi eb  BeOS fs
 e  W95 FAT16 (LBA) 53  OnTrack DM6 Aux a5  FreeBSD         ee  GPT
 f  W95 Ext'd (LBA) 54  OnTrackDM6      a6  OpenBSD         ef  EFI (FAT-12/16/
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fd  Linux raid auto
1b  Hidden W95 FAT3 70  DiskSecure Mult bb  Boot Wizard hid fe  LANstep
1c  Hidden W95 FAT3 75  PC/IX           be  Solaris boot    ff  BBT
1e  Hidden W95 FAT1 80  Old Minix
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sdb: 21.5 GB, 21474836480 bytes, 41943040 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x99e1f525

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048     1050623      524288   82  Linux swap / Solaris
/dev/sdb2         1050624     3147775     1048576   8e  Linux LVM

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.

[root@gpg ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   30G  0 disk
├─sda1            8:1    0  200M  0 part /boot
└─sda2            8:2    0   28G  0 part
  ├─rhel-root   253:0    0    8G  0 lvm  /
  ├─rhel-swap   253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home   253:2    0    8G  0 lvm  /home
  └─rhel-var    253:3    0    8G  0 lvm  /var
sdb               8:16   0   20G  0 disk
└─sdb1            8:17   0  512M  0 part [SWAP]
sr0              11:0    1  3.8G  0 rom  /mnt/iso

[root@gpg ~]# partprobe /dev/sdb
[root@gpg ~]#
[root@gpg ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   30G  0 disk
├─sda1            8:1    0  200M  0 part /boot
└─sda2            8:2    0   28G  0 part
  ├─rhel-root   253:0    0    8G  0 lvm  /
  ├─rhel-swap   253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home   253:2    0    8G  0 lvm  /home
  └─rhel-var    253:3    0    8G  0 lvm  /var
sdb               8:16   0   20G  0 disk
├─sdb1            8:17   0  512M  0 part [SWAP]
└─sdb2            8:18   0    1G  0 part
sr0              11:0    1  3.8G  0 rom  /mnt/iso
```

(1)、创建一个名为datastore的卷组，卷组的PE大小为16MiB;

```
[root@gpg ~]# pvcreate /dev/sdb2
  Physical volume "/dev/sdb2" successfully created
[root@gpg ~]#
[root@gpg ~]#
[root@gpg ~]# vgcreate -s 16M datastore /dev/sdb2
  Volume group "datastore" successfully created
[root@gpg ~]#
[root@gpg ~]# vgdisplay datastore
  --- Volume group ---
  VG Name               datastore
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  1
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                0
  Open LV               0
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               1008.00 MiB
  PE Size               16.00 MiB
  Total PE              63
  Alloc PE / Size       0 / 0
  Free  PE / Size       63 / 1008.00 MiB
  VG UUID               T7FlYP-N8Xr-nV7O-V5O0-uV5M-kvaW-KdLPF1
```

(2)、逻辑卷的名字为database，所属卷组为datastore，该逻辑卷由50个PE组成;

```
[root@gpg ~]# lvcreate -n database -l 50 datastore
  Logical volume "database" created.
[root@gpg ~]#
[root@gpg ~]# lvdisplay /dev/datastore/database
  --- Logical volume ---
  LV Path                /dev/datastore/database
  LV Name                database
  VG Name                datastore
  LV UUID                vx2Jvj-rkpM-GJw7-27u1-W5o9-D16I-nk1ORB
  LV Write Access        read/write
  LV Creation host, time gpg.example.com, 2021-01-04 05:54:20 +0800
  LV Status              available
  # open                 0
  LV Size                800.00 MiB
  Current LE             50
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     8192
  Block device           253:4
```

(3)、将新建的逻辑卷模式化为 xfs文件系统，要求系统启动时，该逻辑卷能被自动挂载到/mnt/database目录;

将逻辑卷database格式化为xfs文件系统:

```
[root@gpg ~]# mkfs.xfs /dev/datastore/database
meta-data=/dev/datastore/database isize=256    agcount=4, agsize=51200 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=0        finobt=0
data     =                       bsize=4096   blocks=204800, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=0
log      =internal log           bsize=4096   blocks=853, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

创建挂载目录，将修改/etc/fstab配置文件永久挂载:

```
[root@gpg ~]# mkdir /mnt/database
[root@gpg ~]#
[root@gpg ~]# vim /etc/fstab

#
# /etc/fstab
# Created by anaconda on Tue Dec 29 21:52:28 2020
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/rhel-root   /                       xfs     defaults        0 0
UUID=9ca4fc2a-69a9-4016-a83c-8f773a91f359 /boot                   xfs     defaults        0
0
/dev/mapper/rhel-home   /home                   xfs     defaults        0 0
/dev/mapper/rhel-var    /var                    xfs     defaults        0 0
/dev/mapper/rhel-swap   swap                    swap    defaults        0 0
/dev/cdrom      /mnt/iso        iso9660  defaults         0 0
UUID=54c0295c-9957-4263-93bf-586e00fa3462       swap    swap    defaults        0 0
/dev/datastore/database /mnt/database   xfs     defaults        0 0
```

挂载并查看挂载情况：

```
[root@gpg ~]# mount -a
[root@gpg ~]#
[root@gpg ~]# df -hT
Filesystem                      Type      Size  Used Avail Use% Mounted on
/dev/mapper/rhel-root           xfs       8.0G  910M  7.2G  12% /
devtmpfs                        devtmpfs  479M     0  479M   0% /dev
tmpfs                           tmpfs     489M     0  489M   0% /dev/shm
tmpfs                           tmpfs     489M  6.7M  483M   2% /run
tmpfs                           tmpfs     489M     0  489M   0% /sys/fs/cgroup
/dev/sr0                        iso9660   3.8G  3.8G     0 100% /mnt/iso
/dev/mapper/rhel-var            xfs       8.0G   92M  8.0G   2% /var
/dev/mapper/rhel-home           xfs       8.0G   33M  8.0G   1% /home
/dev/sda1                       xfs       197M  110M   88M  56% /boot
tmpfs                           tmpfs      98M     0   98M   0% /run/user/0
/dev/mapper/datastore-database  xfs       797M   33M  765M   5% /mnt/database
```

18、按如下要求调整本地逻辑卷database的容量：

(1)、调整后的逻辑卷及文件系统大小为1024MiB；

(2)、调整后确保文件系统已存在的内容不能被破坏；

(3)、调整后的容量可能出现误差，合理的误差都是允许的；

(4)、调整后，保证其挂载目录不改变，文件系统完成。

先查看当前的逻辑卷大小：

```
[root@gpg ~]# df -hT
Filesystem                      Type      Size  Used Avail Use% Mounted on
/dev/mapper/rhel-root           xfs       8.0G  910M  7.2G  12% /
devtmpfs                        devtmpfs  479M     0  479M   0% /dev
tmpfs                           tmpfs     489M     0  489M   0% /dev/shm
tmpfs                           tmpfs     489M  6.7M  483M   2% /run
tmpfs                           tmpfs     489M     0  489M   0% /sys/fs/cgroup
/dev/sr0                        iso9660   3.8G  3.8G     0 100% /mnt/iso
/dev/mapper/rhel-var            xfs       8.0G   92M  8.0G   2% /var
/dev/mapper/rhel-home           xfs       8.0G   33M  8.0G   1% /home
/dev/sda1                       xfs       197M  110M   88M  56% /boot
tmpfs                           tmpfs      98M     0   98M   0% /run/user/0
/dev/mapper/datastore-database  xfs       797M   33M  765M   5% /mnt/database
```

查看当前卷组的大小：

```
[root@gpg ~]# vgs
  VG        #PV #LV #SN Attr   VSize    VFree
  datastore   1   1   0 wz--n- 1008.00m 208.00m
  rhel        1   4   0 wz--n-   28.00g    4.00m
```

题目要求把逻辑卷扩展为 1024MiB，当前逻辑卷大小为 800MiB，而逻辑卷所在的卷组剩余只有208MiB，不够扩展。(扩展需要1024MiB-800MiB=224MiB)

因此，要按题目扩展文件系统，就要扩展逻辑卷，要扩展逻辑卷就要扩展逻辑卷所在的卷组，要扩展卷组就必须有物理卷，要物理卷必须有硬盘或分区。

即：先划分分区，创建物理卷。

```
[root@gpg ~]# fdisk /dev/sdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): n
Partition type:
   p   primary (2 primary, 0 extended, 2 free)
   e   extended
Select (default p):
Using default response p
Partition number (3,4, default 3):
First sector (3147776-41943039, default 3147776):
Using default value 3147776
Last sector, +sectors or +size{K,M,G} (3147776-41943039, default 41943039): +1G
Partition 3 of type Linux and of size 1 GiB is set

Command (m for help): p

Disk /dev/sdb: 21.5 GB, 21474836480 bytes, 41943040 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x99e1f525

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048     1050623      524288   82  Linux swap / Solaris

/dev/sdb2         1050624     3147775     1048576   8e  Linux LVM
/dev/sdb3         3147776     5244927     1048576   83  Linux

Command (m for help): t
Partition number (1-3, default 3):
Hex code (type L to list all codes): l

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           27  Hidden NTFS Win 82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      39  Plan 9          83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       3c  PartitionMagic  84  OS/2 hidden C:  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      40  Venix 80286     85  Linux extended  c7  Syrinx
 5  Extended        41  PPC PReP Boot   86  NTFS volume set da  Non-FS data
 6  FAT16           42  SFS             87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS/exFAT 4d  QNX4.x          88  Linux plaintext de  Dell Utility
 8  AIX             4e  QNX4.x 2nd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    4f  QNX4.x 3rd part 93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       51  OnTrack DM6 Aux 9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 52  CP/M            a0  IBM Thinkpad hi eb  BeOS fs
 e  W95 FAT16 (LBA) 53  OnTrack DM6 Aux a5  FreeBSD         ee  GPT
 f  W95 Ext'd (LBA) 54  OnTrackDM6      a6  OpenBSD         ef  EFI (FAT-12/16/
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fd  Linux raid auto
1b  Hidden W95 FAT3 70  DiskSecure Mult bb  Boot Wizard hid fe  LANstep
```

```
1c  Hidden W95 FAT3 75  PC/IX           be  Solaris boot    ff  BBT
1e  Hidden W95 FAT1 80  Old Minix
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sdb: 21.5 GB, 21474836480 bytes, 41943040 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x99e1f525

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048     1050623      524288   82  Linux swap / Solaris
/dev/sdb2         1050624     3147775     1048576   8e  Linux LVM
/dev/sdb3         3147776     5244927     1048576   8e  Linux LVM

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

查看划分的分区，如果看不到请更新分区表：

```
[root@gpg ~]# lsblk
NAME                      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                         8:0    0   30G  0 disk
├─sda1                      8:1    0  200M  0 part /boot
└─sda2                      8:2    0   28G  0 part
  ├─rhel-root             253:0    0    8G  0 lvm  /
  ├─rhel-swap             253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home             253:2    0    8G  0 lvm  /home
  └─rhel-var              253:3    0    8G  0 lvm  /var
sdb                         8:16   0   20G  0 disk
├─sdb1                      8:17   0  512M  0 part [SWAP]
└─sdb2                      8:18   0    1G  0 part
  └─datastore-database    253:4    0  800M  0 lvm  /mnt/database
sr0                        11:0    1  3.8G  0 rom  /mnt/iso
[root@gpg ~]# partprobe /dev/sdb
[root@gpg ~]#
[root@gpg ~]# lsblk
NAME                      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                         8:0    0   30G  0 disk
├─sda1                      8:1    0  200M  0 part /boot
└─sda2                      8:2    0   28G  0 part
  ├─rhel-root             253:0    0    8G  0 lvm  /
  ├─rhel-swap             253:1    0    4G  0 lvm  [SWAP]
  ├─rhel-home             253:2    0    8G  0 lvm  /home
  └─rhel-var              253:3    0    8G  0 lvm  /var
sdb                         8:16   0   20G  0 disk
├─sdb1                      8:17   0  512M  0 part [SWAP]
├─sdb2                      8:18   0    1G  0 part
│ └─datastore-database    253:4    0  800M  0 lvm  /mnt/database
└─sdb3                      8:19   0    1G  0 part
sr0                        11:0    1  3.8G  0 rom  /mnt/iso
```

创建物理卷：

```
[root@gpg ~]# pvs
  PV         VG        Fmt  Attr PSize    PFree
  /dev/sda2  rhel      lvm2 a--    28.00g   4.00m
  /dev/sdb2  datastore lvm2 a--  1008.00m 208.00m
[root@gpg ~]#
[root@gpg ~]# pvcreate /dev/sdb3
  Physical volume "/dev/sdb3" successfully created
[root@gpg ~]#
[root@gpg ~]# pvs
  PV         VG        Fmt  Attr PSize    PFree
  /dev/sda2  rhel      lvm2 a--    28.00g   4.00m
  /dev/sdb2  datastore lvm2 a--  1008.00m 208.00m
  /dev/sdb3            lvm2 ---     1.00g   1.00g
```

扩展卷组:

```
[root@gpg ~]# vgs
  VG        #PV #LV #SN Attr   VSize    VFree
  datastore   1   1   0 wz--n- 1008.00m 208.00m
  rhel        1   4   0 wz--n-   28.00g   4.00m
[root@gpg ~]#
[root@gpg ~]# vgextend datastore /dev/sdb3
  Volume group "datastore" successfully extended
[root@gpg ~]#
[root@gpg ~]# vgs
  VG        #PV #LV #SN Attr   VSize  VFree
  datastore   2   1   0 wz--n-  1.97g 1.19g
  rhel        1   4   0 wz--n- 28.00g 4.00m
```

扩展逻辑卷:

```
[root@gpg ~]# lvs
  LV       VG        Attr       LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  database datastore -wi-ao---- 800.00m
  home     rhel      -wi-ao----   8.00g
  root     rhel      -wi-ao----   8.00g
  swap     rhel      -wi-ao----   4.00g
  var      rhel      -wi-ao----   8.00g
[root@gpg ~]#
[root@gpg ~]# lvextend -L 1024M /dev/datastore/database
  Size of logical volume datastore/database changed from 800.00 MiB (50 extents) to 1.00 GiB
 (64 extents).
  Logical volume database successfully resized.
[root@gpg ~]#
[root@gpg ~]# lvs
  LV       VG        Attr       LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  database datastore -wi-ao---- 1.00g
  home     rhel      -wi-ao---- 8.00g
  root     rhel      -wi-ao---- 8.00g
  swap     rhel      -wi-ao---- 4.00g
  var      rhel      -wi-ao---- 8.00g
```

扩展文件系统:

```
[root@gpg ~]# df -hT
Filesystem                     Type      Size  Used Avail Use% Mounted on
/dev/mapper/rhel-root          xfs       8.0G  910M  7.2G  12% /
devtmpfs                       devtmpfs  479M     0  479M   0% /dev
tmpfs                          tmpfs     489M     0  489M   0% /dev/shm
tmpfs                          tmpfs     489M  6.7M  483M   2% /run
tmpfs                          tmpfs     489M     0  489M   0% /sys/fs/cgroup
/dev/sr0                       iso9660   3.8G  3.8G     0 100% /mnt/iso
/dev/mapper/rhel-var           xfs       8.0G   92M  8.0G   2% /var
/dev/mapper/rhel-home          xfs       8.0G   33M  8.0G   1% /home
/dev/sda1                      xfs       197M  110M   88M  56% /boot
tmpfs                          tmpfs      98M     0   98M   0% /run/user/0
/dev/mapper/datastore-database xfs       797M   33M  765M   5% /mnt/database
```

```
[root@gpg ~]# xfs_growfs /dev/datastore/database
meta-data=/dev/mapper/datastore-database isize=256    agcount=4, agsize=51200 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=0        finobt=0
data     =                       bsize=4096   blocks=204800, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=0
log      =internal               bsize=4096   blocks=853, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 204800 to 262144
[root@gpg ~]#
[root@gpg ~]# df -hT
Filesystem                      Type      Size  Used Avail Use% Mounted on
/dev/mapper/rhel-root           xfs       8.0G  910M  7.2G  12% /
devtmpfs                        devtmpfs  479M     0  479M   0% /dev
tmpfs                           tmpfs     489M     0  489M   0% /dev/shm
tmpfs                           tmpfs     489M  6.7M  483M   2% /run
tmpfs                           tmpfs     489M     0  489M   0% /sys/fs/cgroup
/dev/sr0                        iso9660   3.8G  3.8G     0 100% /mnt/iso
/dev/mapper/rhel-var            xfs       8.0G   92M  8.0G   1% /var
/dev/mapper/rhel-home           xfs       8.0G   33M  8.0G   1% /home
/dev/sda1                       xfs       197M  110M   88M  56% /boot
tmpfs                           tmpfs      98M     0   98M   0% /run/user/0
/dev/mapper/datastore-database xfs       1021M   33M  989M   4% /mnt/database
```

注意：如果逻辑使用 ext3或ext4文件系统格式化，则拉伸文件系统使用 resize2fs命令。