

集群虚拟化技术实践项目任务书

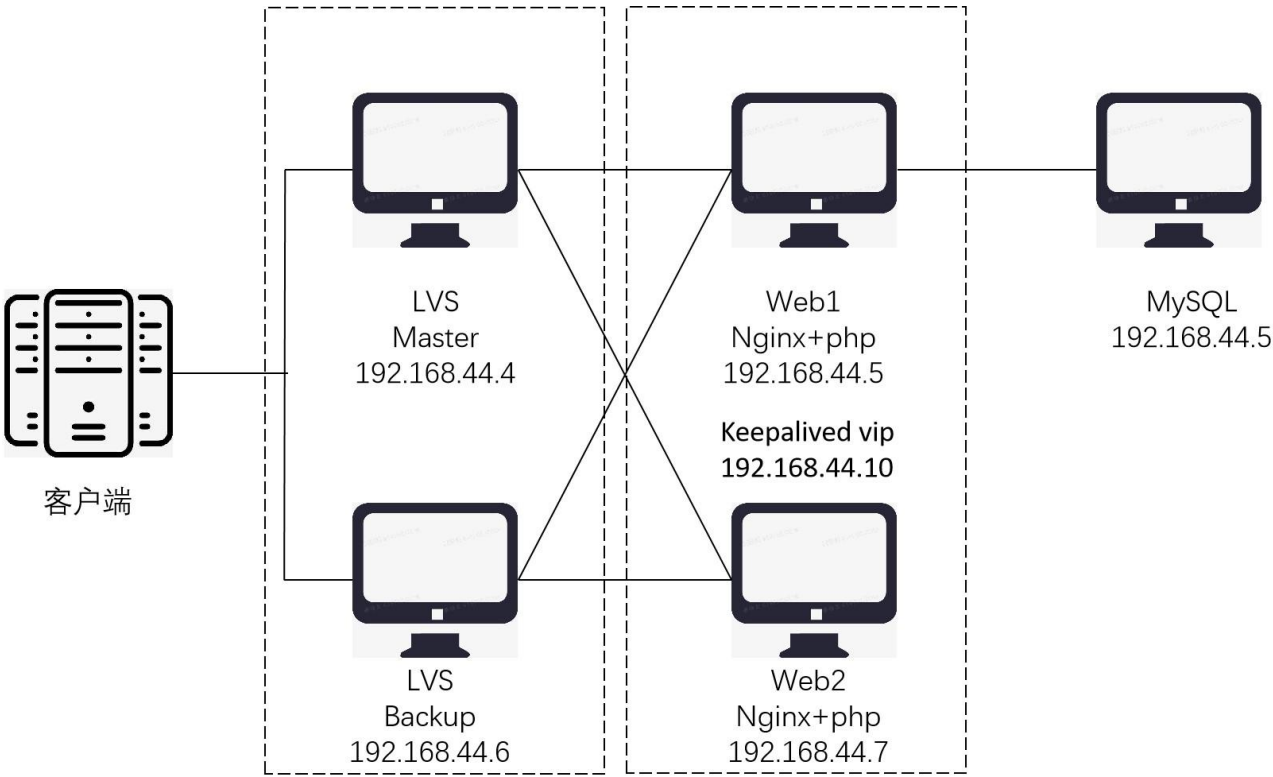
一、实践目标

通过完成典型的集群虚拟化环境部署项目，帮助学生熟悉集群虚拟化环境部署要求，巩固学生集群和虚拟化所需的技能。

二、实践项目背景

xx 网络科技公司为了提高 IT 部门的管理效率，节约运营成本，希望把现在的集群环境迁移到 Docker 虚拟化环境。公司计划在一台主机上部署多个 Docker 容器的方式，完成虚拟化环境迁移。

三、网络拓扑图



四、节点、网卡、IP 规划表

节点名称	网卡	IP 地址及子网掩码
Keepalived master	ens33	192.168.44.4 255.255.255.0
Keepalived bakup	ens37	192.168.44.6 255.255.255.0
Nginx+php 1	Ens33	192.168.44.5 255.255.255.0
Nginx+php 2	Ens33	192.168.44.7 255.255.255.0
mysql	Ens33	192.168.44.5 255.255.255.0
Keepalived VIP	Ens33/Ens37	192.168.44.100

五、Docker 环境部署

```
curl -fsSL https://get.docker.com | bash -s docker --mirror aliyun
```

```
# 配置镜像加速 vim /etc/docker/daemon.json
```

```
{"registry-mirrors":["https://registry.docker-cn.com"]}
```

设置开机启动

```
systemctl enable --now docker
```

六、LVS 主服务器部署

```
yum install keepalived -y
```

```
# 编辑配置文件
```

```
> /etc/keepalived/keepalived.conf
```

```
vim /etc/keepalived/keepalived.conf
```

```
global_defs {
```

```
    router_id LVS_DEVEL
```

```
}
```

```
vrrp_instance VI_1 {
```

```
    state MASTER
```

```
    interface ens33
```

```
    virtual_router_id 51
```

```
    priority 100
```

```
    advert_int 1
```

```
        authentication {
```

```
            auth_type PASS
```

```
            auth_pass 1111
```

```
        }
```

```
    virtual_ipaddress {
```

```
        192.168.44.100
```

```
    }
```

```
}
```

```
virtual_server 192.168.44.100 80 {  
    delay_loop 6  
  
    lb_algo rr  
  
    lb_kind DR  
  
    nat_mask 255.255.255.0  
  
    persistence_timeout 0  
  
    protocol TCP  
  
    real_server 192.168.44.5 80 {  
        weight 3  
  
        # TCP_CHECK {  
  
        #     connect_timeout 10  
  
        #     nb_get_retry 3  
  
        #     delay_before_retry 3  
  
        #     connect_port 80  
  
        # }  
    }  
  
    real_server 192.168.44.7 80 {  
        weight 3  
  
        #TCP_CHECK {  
  
        #     connect_timeout 10  
  
        #     nb_get_retry 3  
  
        #     delay_before_retry 3
```

```

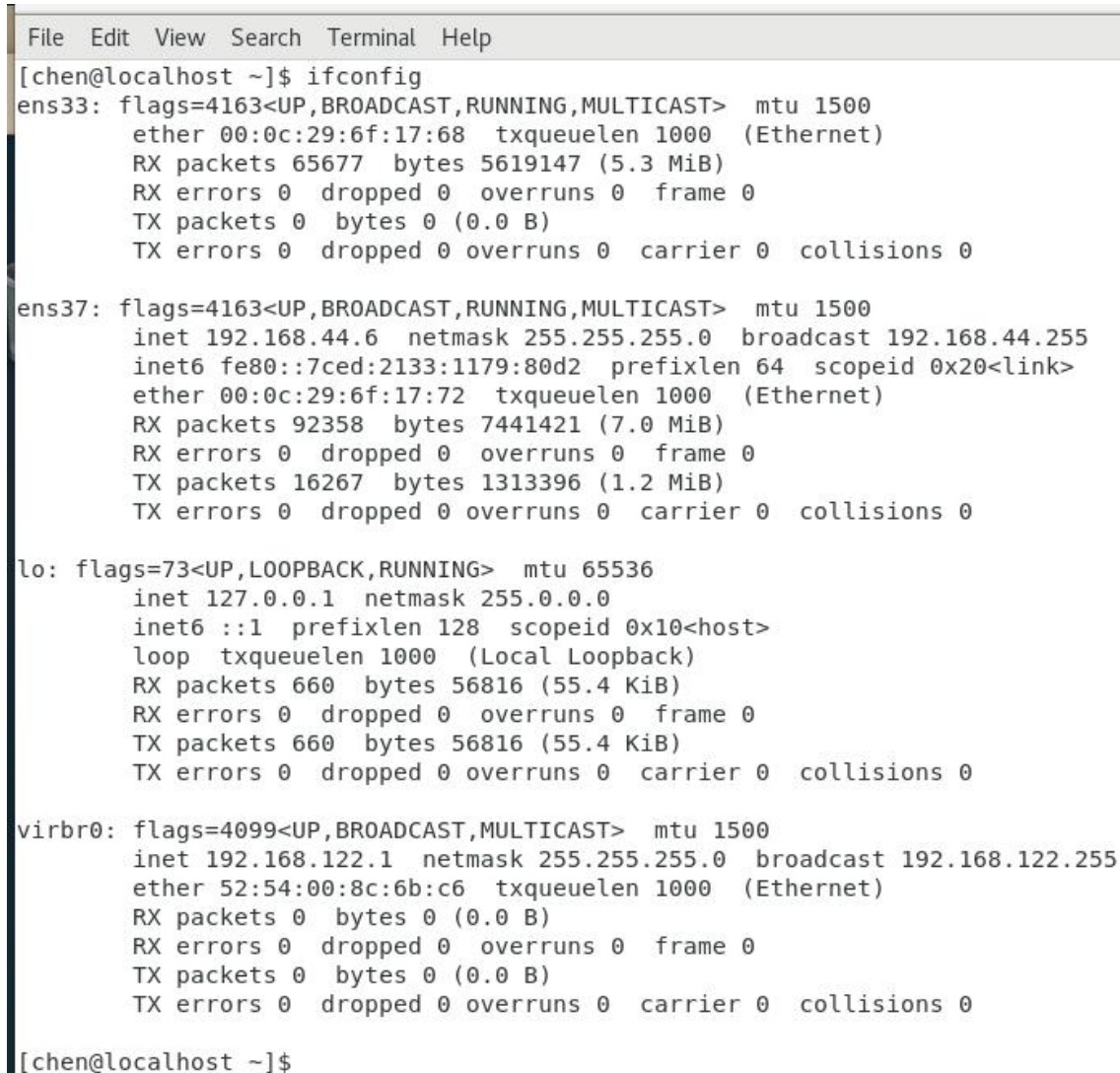
# connect_port 81

#}

}

}

```



```

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[chen@localhost ~]$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    ether 00:0c:29:6f:17:68 txqueuelen 1000 (Ethernet)
    RX packets 65677 bytes 5619147 (5.3 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ens37: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.44.6 netmask 255.255.255.0 broadcast 192.168.44.255
    inet6 fe80::7ced:2133:1179:80d2 prefixlen 64 scopeid 0x20<link>
    ether 00:0c:29:6f:17:72 txqueuelen 1000 (Ethernet)
    RX packets 92358 bytes 7441421 (7.0 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 16267 bytes 1313396 (1.2 MiB)
    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 660 bytes 56816 (55.4 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 660 bytes 56816 (55.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
    ether 52:54:00:8c:6b:c6 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

[chen@localhost ~]$

```

七、LVS 备服务器部署

yum install keepalived -y

编辑配置文件

> /etc/keepalived/keepalived.conf

vim /etc/keepalived/keepalived.conf

```
global_defs {
```

```
    router_id LVS_DEVEL
```

```
}
```

```
vrrp_instance VI_1 {
```

```
    state BACKUP
```

```
    interface ens37
```

```
    virtual_router_id 51
```

```
    priority 50
```

```
    advert_int 1
```

```
        authentication {
```

```
            auth_type PASS
```

```
            auth_pass 1111
```

```
        }
```

```
    virtual_ipaddress {
```

```
        192.168.44.100
```

```
    }
```

```
}
```

```
virtual_server 192.168.44.100 80 {
```

delay_loop 6

lb_algo rr

lb_kind DR

nat_mask 255.255.255.0

persistence_timeout 0

protocol TCP

real_server 192.168.44.5 80 {

weight 3

TCP_CHECK {

connect_timeout 10

nb_get_retry 3

delay_before_retry 3

connect_port 80

}

}

real_server 192.168.44.7 80 {

weight 3

#TCP_CHECK {

connect_timeout 10

nb_get_retry 3

delay_before_retry 3

connect_port 81

```

    #}

}

}

[root@localhost ~]# ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.44.4 netmask 255.255.255.0 broadcast 192.168.44.255
    inet6 fe80::d380:e8cc:dc24:edf0 prefixlen 64 scopeid 0x20<link>
    ether 00:0c:29:7f:95:1b txqueuelen 1000 (Ethernet)
    RX packets 786489 bytes 956035950 (911.7 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 263844 bytes 16684923 (15.9 MiB)
    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 1 (Local Loopback)
    RX packets 1148 bytes 98324 (96.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1148 bytes 98324 (96.0 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
    ether 52:54:00:96:e6:ee txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

[root@localhost ~]# █

```

八、WEB_01 服务器部署

docker pull nginx

docker pull php:7.3-fpm

```

docker run -d -p 9000:9000 --name my-php -v
/home/chen/Desktop/data1:/var/www/html php:7.3-fpm

docker run -d -p 80:80 --name my-nginx -v
/home/chen/Desktop/data1/conf:/etc/nginx/conf.d -v

```



```
/home/chen/Desktop/data1/html:/var/www/html nginx
```

```
cat /home/chen/Desktop/data1/conf/default.conf
```

```
server {
```

```
    listen 80;
```

```
    root /var/www/html;
```

```
    location / {
```

```
        index index.php index.html index.htm;
```

```
    }
```

```
    location ~ \.php$ {
```

```
        include fastcgi_params;
```

```
        fastcgi_param
```

```
SCRIPT_FILENAME
```

```
$document_root$fastcgi_script_name;
```

```
        fastcgi_pass my-php:9000;
```

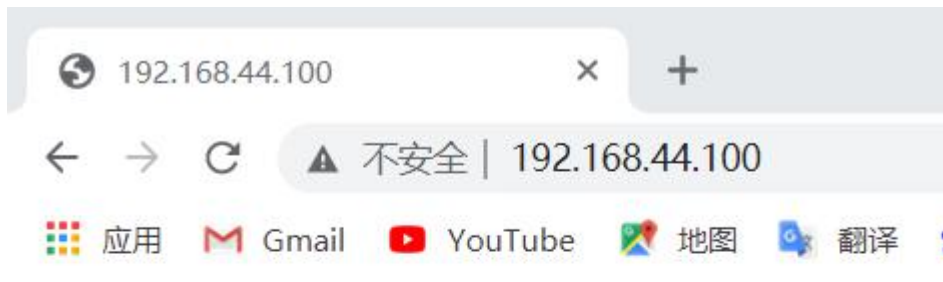
```
        fastcgi_index index.php;
```

```
    }
```

```
}
```

```
cat /home/chen/Desktop/data1/html/index.html
```

```
Hello data1
```



hello data1

```
chen@localhost:~  
File Edit View Search Terminal Help  
[chen@localhost ~]$ ifconfig  
br-5b72d9c80416: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 172.18.0.1 netmask 255.255.0.0 broadcast 172.18.255.255  
    inet6 fe80::42:13ff:fe15:42f8 prefixlen 64 scopeid 0x20<link>  
    ether 02:42:13:15:42:f8 txqueuelen 0 (Ethernet)  
    RX packets 88711 bytes 7078361 (6.7 MiB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 19386 bytes 1859653 (1.7 MiB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
br-73430091ddee: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500  
    inet 172.19.0.1 netmask 255.255.0.0 broadcast 172.19.255.255  
    ether 02:42:7f:d3:8e:e7 txqueuelen 0 (Ethernet)  
    RX packets 0 bytes 0 (0.0 B)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 0 bytes 0 (0.0 B)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
docker0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255  
    inet6 fe80::42:ff:fe68:5f38 prefixlen 64 scopeid 0x20<link>  
    ether 02:42:00:68:5f:38 txqueuelen 0 (Ethernet)  
    RX packets 0 bytes 0 (0.0 B)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 12 bytes 1654 (1.6 KiB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.44.5 netmask 255.255.255.0 broadcast 192.168.44.255  
    inet6 fe80::c394:a191:6d94:8113 prefixlen 64 scopeid 0x20<link>  
    ether 00:0c:29:c8:54:19 txqueuelen 1000 (Ethernet)  
    RX packets 88711 bytes 7078361 (6.7 MiB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 19386 bytes 1859653 (1.7 MiB)  
    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 1 (Local Loopback)  
    RX packets 452 bytes 51092 (49.8 KiB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 452 bytes 51092 (49.8 KiB)
```

```

lo:0: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 192.168.44.100 netmask 255.255.255.255
    loop txqueuelen 1 (Local Loopback)

veth63539c6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::9cb6:52ff:fea2:e761 prefixlen 64 scopeid 0x20<link>
    ether 9e:b6:52:a2:e7:61 txqueuelen 0 (Ethernet)
    RX packets 10524 bytes 754608 (736.9 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 29148 bytes 2008530 (1.9 MiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

veth9d73e71: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b042:2eff:fe77:9383 prefixlen 64 scopeid 0x20<link>
    ether b2:42:2e:77:93:83 txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 20 bytes 2302 (2.2 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

veth9eb9ca1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::48e2:bdf:fe8f:e305 prefixlen 64 scopeid 0x20<link>
    ether 4a:e2:bd:8f:e3:05 txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 22 bytes 2450 (2.3 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
    ether 52:54:00:61:4b:8d txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

九、WEB_02 服务器部署

docker pull nginx

docker pull php:7.3-fpm

```
docker run -d -p 9000:9000 --name my-php -v
```

/home/chen/Desktop/data1:/var/www/html php:7.3-fpm

```
docker run -d -p 80:80 --name my-nginx -v
```

```
/home/chen/Desktop/data1/conf:/etc/nginx/conf.d -v
```

/home/chen/Desktop/data1/html:/var/www/html nginx

```
cat /home/chen/Desktop/data1/conf/default.conf
```

```
server {
```

```
listen 80;
```

```
root /var/www/html;
```

```
location / {
```

```
    index index.php index.html index.htm;
```

```
}
```

```
location ~ \.php$ {
```

```
    include fastcgi_params;
```

```
    fastcgi_param
```

```
SCRIPT_FILENAME
```

```
$document_root$fastcgi_script_name;
```

```
    fastcgi_pass my-php:9000;
```

```
    fastcgi_index index.php;
```

```
}
```

```
}
```

```
cat /home/chen/Desktop/data1/html/index.html
```

```
Hello data3
```

192.168.44.100



不安全 | 192.168.44.100



应用



Gmail



YouTube



地图



翻译



百度



诚毅学院

hello data3

```
[chen@localhost ~]$ ifconfig
br-5b72d9c80416: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.18.0.1 netmask 255.255.0.0 broadcast 172.18.255.255
    inet6 fe80::42:4eff:fe71:1159 prefixlen 64 scopeid 0x20<link>
    ether 02:42:4e:71:11:59 txqueuelen 0 (Ethernet)
    RX packets 57561 bytes 4969959 (4.7 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1937 bytes 424203 (414.2 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

br-73430091ddee: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.19.0.1 netmask 255.255.0.0 broadcast 172.19.255.255
    ether 02:42:93:c0:5f:88 txqueuelen 0 (Ethernet)
    RX packets 135 bytes 10150 (9.9 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 181 bytes 14725 (14.3 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
    ether 02:42:af:03:11:ea txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.44.7 netmask 255.255.255.0 broadcast 192.168.44.255
    inet6 fe80::1b3e:4ce5:72aa:a066 prefixlen 64 scopeid 0x20<link>
    inet6 fe80::c394:a191:6d94:8113 prefixlen 64 scopeid 0x20<link>
    ether 00:0c:29:5a:5f:3a txqueuelen 1000 (Ethernet)
    RX packets 57561 bytes 4969959 (4.7 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1937 bytes 424203 (414.2 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 1 (Local Loopback)
    RX packets 496 bytes 55540 (54.2 KiB)

lo:0: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 192.168.44.100 netmask 255.255.255.255
    loop txqueuelen 1 (Local Loopback)

veth01b1945: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::cceb:70ff:fe7d:4126 prefixlen 64 scopeid 0x20<link>
    ether ce:eb:70:fd:41:26 txqueuelen 0 (Ethernet)
    RX packets 135 bytes 10150 (9.9 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 181 bytes 14725 (14.3 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

vethd888cee: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::3cce:8bff:fe9e:834e prefixlen 64 scopeid 0x20<link>
    ether 3e:ce:8b:9e:83:4e txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 26 bytes 2714 (2.6 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
    ether 52:54:00:61:4b:8d txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```


十、mysql 服务器部署

docker pull mysql:5.7

docker run -d -p 3306:3306 -e MYSQL_ROOT_PASSWORD=123456 --name
mysql57 mysql:5.7

```
[root@localhost ~]# /etc/init.d/realserver start
start LVS of REALServer
[root@localhost ~]# docker run -d -p 3306:3306 -e MYSQL_ROOT_PASSWORD=123456
--name mysql57 mysql:5.7
b68ca4748c4c34d23a0a97095b38738c2b1b20a69c887cf512a7968fd24dd6e2
[root@localhost ~]# docker exec -it mysql57 bash
root@b68ca4748c4c:/# mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.34 MySQL Community Server (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement
.

mysql> exit
Bye
root@b68ca4748c4c:/# exit
```

重点、难点

- 1、使用 **Docker** 完成集群的虚拟化部署。
- 2、**LAMP** 环境部署（**MySQL** 分离），动静分离（**apache**、**php**、**mysql**）。
- 3、掌握 **Docker** 网络的原理与操作。
- 4、集群的高可用使用 **keepalived** 或 **heartbeat** 实现。
- 5、**mysql** 允许远程访问并对应用程序的数据库进行授权。