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CONFIGURAÇÃO DO DHCP

Para configurar o DHCP, primeiro é necessário instalar o pacote isc-dhcp-server. Para isso, utilizando um terminal no linux, basta executar os seguintes comandos comandos com permissão de super usuário:

apt-get update

apt-get install isc-dhcp-server

Depois de instalado o pacote, execute o comando *ifconfig* para listar as interfaces de rede, após isso deve-se identificar a interface de rede Ethernet. No nosso caso, é a interface *enp2s0*;

```
luis@luis-500R4K-500R5H-5400RK-501R5H-5500RH-500R5S:~$ ifconfig
enp2s0    Link encap:Ethernet  HWaddr 24:f5:aa:f4:60:85
          inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::26f5:aaff:fef4:6085/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:409 errors:0 dropped:0 overruns:0 frame:0
          TX packets:432 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:73214 (73.2 KB)  TX bytes:68756 (68.7 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:713 errors:0 dropped:0 overruns:0 frame:0
          TX packets:713 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:60910 (60.9 KB)  TX bytes:60910 (60.9 KB)

wlp1s0    Link encap:Ethernet  HWaddr 70:2c:1f:06:ac:b4
          inet addr:192.168.0.116  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::c8d1:42ff:1e0c:9216/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:55910 errors:0 dropped:0 overruns:0 frame:0
          TX packets:35102 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:63675226 (63.6 MB)  TX bytes:4667390 (4.6 MB)
```

Agora deverá ser configurado o arquivo interfaces localizado em */etc/network/*. Com um editor de texto abra o arquivo. Esse arquivo é utilizado para configurar as interfaces de rede. A interface que faz conexão a cabo fornecerá os endereços IP's a outros dispositivos e a interface wireless fornecerá acesso à Internet.

É necessário configurar o endereço fixo, a máscara de rede, o network e o broadcast. Assim, o arquivo deverá da seguinte forma (lembrando de substituir enp2s0 de acordo com a sua interface de rede):

```
  GNU nano 2.5.3                                File: /etc/network/interfaces

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
iface lo inet loopback

auto enp2s0
iface enp2s0 inet static
      address 172.16.0.1
      netmask 255.255.0.0
      network 172.16.0.0
      broadcast 172.16.255.255
      gateway 192.168.133.1
```

Para que o seu computador reaja às mudanças, execute o comando *ifdown enp2s0 && ifup enp2s0 && ifconfig*. Após, você deve observar a mudança do ip da interface:

```
luis@luis-500R4K-500R5H-5400RK-501R5H-5500RH-500R5S:~$ ifconfig
enp2s0    Link encap:Ethernet  HWaddr 24:f5:aa:f4:60:85
          inet addr:172.16.0.1  Bcast:172.16.255.255  Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:1566 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1533 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:137892 (137.8 KB)  TX bytes:137479 (137.4 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:5962 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5962 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:505921 (505.9 KB)  TX bytes:505921 (505.9 KB)

wlp1s0    Link encap:Ethernet  HWaddr 70:2c:1f:06:ac:b4
          inet addr:192.168.0.107  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::c8d1:42ff:1e0c:9216/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:12510 errors:0 dropped:0 overruns:0 frame:0
          TX packets:9100 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:8813641 (8.8 MB)  TX bytes:1544045 (1.5 MB)

luis@luis-500R4K-500R5H-5400RK-501R5H-5500RH-500R5S:~$
```

Agora deverá ser configurado o servidor DHCP propriamente dito, para isso deve-se configurar o arquivo */etc/dhcp/dhcpd.conf*, da seguinte forma:

1. Descomentar a linha: *#ddns-update-style none;*
2. Atribuir o domínio na linha: *option domain-name “example.org”;*
3. Atribuir o endereço dos servidores DNS na linha: *option domain-name-servers ns1.example.org, ns2.example.org;*
4. Descomentar a linha: *#authoritative;*
5. Definir a sub rede.

   Dessa forma, o arquivo ficará assim:

```
  GNU nano 2.5.3                                File: /etc/dhcp/dhcpd.conf

ddns-update-style none;

option domain-name "fga-frc.org";
option domain-name-servers 8.8.8.8, 8.8.4.4, 192.168.133.1;

default-lease-time 600;
max-lease-time 7200;

authoritative;

log-facility local7;

subnet 172.16.0.0 netmask 255.255.0.0{
  range 172.16.0.2 172.16.254.254;
  option subnet-mask 255.255.0.0;
  option routers 172.16.0.1;
  option broadcast-address 192.168.133.255;
}
```

Para verificar se houve algum erro na sintaxe no arquivo anterior, rodar o comando, no terminal, *dhcpd -t*.

Após isso, deve-se especificar as interfaces a serem usadas. Abra o arquivo */etc/default/isc-dhcp-server*, identifique a linha *INTERFACES=""*(se não houver, pode adicionar) e atribua as interfaces, dessa forma o arquivo ficará assim:

```
  GNU nano 2.5.3                          File: /etc/default/isc-dhcp-server

# Defaults for isc-dhcp-server initscript
# sourced by /etc/init.d/isc-dhcp-server
# installed at /etc/default/isc-dhcp-server by the maintainer scripts

#
# This is a POSIX shell fragment
#

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPD_CONF=/etc/dhcp/dhcpd.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPD_PID=/var/run/dhcpd.pid

# Additional options to start dhcpd with.
#       Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""

# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
#       Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACES="enp2s0"
```

Feito isso, deve-se reiniciar o servidor DHCP executando o comando *service isc-dhcp-server restart*.(Outros comandos que podem ser úteis são: *service isc-dhcp-server start* - para iniciar o servidor –, *service isc-dhcp-server stop* – para parar o servidor –,

service isc-dhcp-server status – para chegar o status do servidor – e *grep dhcp /var/log/syslog* – para verificar logs).

TESTES DO SERVIDOR DHCP CONFIGURADO

Os testes a seguir foram feitos conectando um cabo ethernet no servidor dhcp e no respectivo computador.

1. Teste computador 1(“ubuntu”):

Após alguns segundos que o cabo é no conectado aparece conexão com rede. Após isso foi digitado o comando *ifconfig*, que gerou o seguinte resultado:

```
ubuntu@ubuntu:~$ ifconfig
enp2s0    Link encap:Ethernet  HWaddr d8:50:e6:ec:36:53
          inet addr:192.168.133.2  Bcast:192.168.133.255  Mask:255.255.255.0
          inet6 addr: fe80::db27:97e3:2f06:fe99/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:451 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1241 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:60297 (60.2 KB)  TX bytes:142403 (142.4 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:52756 errors:0 dropped:0 overruns:0 frame:0
          TX packets:52756 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:3301478 (3.3 MB)  TX bytes:3301478 (3.3 MB)

wlp3s0    Link encap:Ethernet  HWaddr 54:27:1e:8c:22:5f
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

2. Teste computador 2(“lucas-pc”):

Após alguns segundos que o cabo é no conectado aparece conexão com rede. Após isso foi digitado o comando *ifconfig*, que gerou o seguinte resultado:

```
lucas@lucas-pc:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 6c:3b:e5:81:ab:f9
          inet addr:192.168.133.3  Bcast:192.168.133.255  Mask:255.255.255.0
          inet6 addr: fe80::f602:decf:c370:7471/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:72 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2893 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:9682 (9.6 KB)  TX bytes:480972 (480.9 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:12001 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12001 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:1774440 (1.7 MB)  TX bytes:1774440 (1.7 MB)

wlan0     Link encap:Ethernet  HWaddr a4:17:31:2e:0f:78
          inet addr:192.168.0.108  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a617:31ff:fe2e:f78/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:233448 errors:0 dropped:0 overruns:0 frame:0
          TX packets:122904 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:306723868 (306.7 MB)  TX bytes:16241373 (16.2 MB)
```

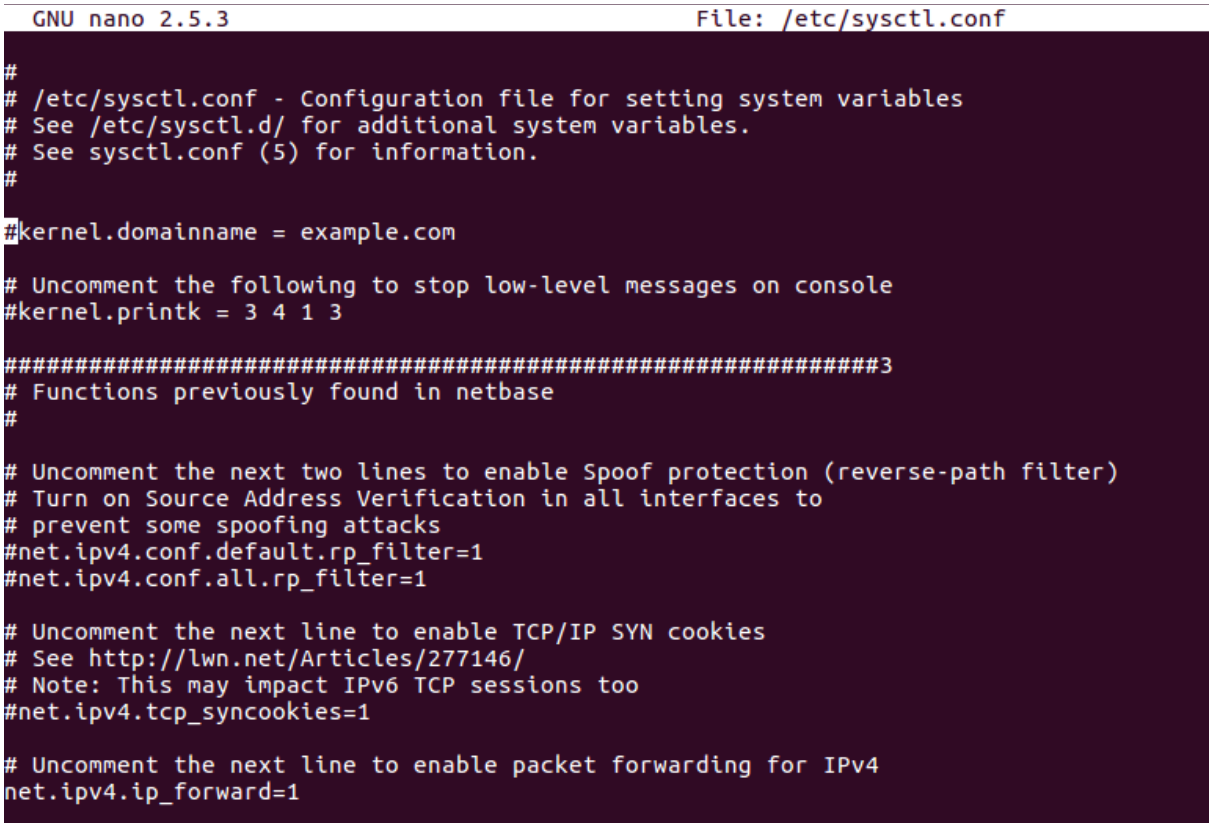
Para verificar as concessões ativas, rodar o seguinte comando no terminal: `cat /var/lib/dhcp/dhcpd.leases | less`, que gerou o seguinte resultado:

```
# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.3.3

lease 192.168.133.2 {
  starts 0 2017/10/08 19:40:31;
  ends 0 2017/10/08 19:50:31;
  cltt 0 2017/10/08 19:40:31;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet d8:50:e6:ec:36:53;
  client-hostname "ubuntu";
}
lease 192.168.133.3 {
  starts 0 2017/10/08 19:50:05;
  ends 0 2017/10/08 20:00:05;
  cltt 0 2017/10/08 19:50:05;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 6c:3b:e5:81:ab:f9;
  client-hostname "lucas-pc";
}
lease 192.168.133.2 {
  starts 0 2017/10/08 19:40:31;
  ends 0 2017/10/08 19:50:31;
  tstp 0 2017/10/08 19:50:31;
  cltt 0 2017/10/08 19:40:31;
  binding state free;
  hardware ethernet d8:50:e6:ec:36:53;
}
(END)
```

CONFIGURANDO O NAT

Abra o arquivo */etc/sysctl.conf* com o editor de texto de sua preferência e identifique a linha *#net.ipv4.ip_forward=1*.



Descomente a linha (apague o '#') para que o roteamento seja ativado, salve o arquivo e execute o comando *sysctl -w net.ipv4.ip_forward=1* para validar as mudanças.

Agora crie um arquivo chamado iniciaNat na pasta */etc/init.d*, para configurar o compartilhamento de internet. No final, seu arquivo deve ficar assim:

Adicione a permissão de execução para o arquivo criado executando o comando *chmod +x /etc/init.d/iniciaNat*.

Agora é possível executar o script com o comando *sudo /etc/init.d/iniciaNat.*

```
luis@luis-500R4K-500R5H-5400RK-501R5H-5500RH-500R5S:~$ sudo /etc/init.d/iniciaNat
Chain INPUT (policy ACCEPT)
target     prot opt source               destination
ACCEPT     all  --  anywhere             anywhere             state RELATED,ESTABLISHED

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination
ACCEPT     all  --  anywhere             anywhere             state RELATED,ESTABLISHED

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
luis@luis-500R4K-500R5H-5400RK-501R5H-5500RH-500R5S:~$
```

Casos de Testes para o NAT

1. Enviando ping para o IP 172.16.0.1

```
ubuntu@ubuntu:~$ ping 172.16.0.1
PING 172.16.0.1 (172.16.0.1) 56(84) bytes of data.
64 bytes from 172.16.0.1: icmp_seq=1 ttl=64 time=0.195 ms
64 bytes from 172.16.0.1: icmp_seq=2 ttl=64 time=0.275 ms
64 bytes from 172.16.0.1: icmp_seq=3 ttl=64 time=0.234 ms
64 bytes from 172.16.0.1: icmp_seq=4 ttl=64 time=0.287 ms
64 bytes from 172.16.0.1: icmp_seq=5 ttl=64 time=0.262 ms
64 bytes from 172.16.0.1: icmp_seq=6 ttl=64 time=0.304 ms
64 bytes from 172.16.0.1: icmp_seq=7 ttl=64 time=0.190 ms
64 bytes from 172.16.0.1: icmp_seq=8 ttl=64 time=0.267 ms
64 bytes from 172.16.0.1: icmp_seq=9 ttl=64 time=0.339 ms
64 bytes from 172.16.0.1: icmp_seq=10 ttl=64 time=0.319 ms
^C
--- 172.16.0.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 8997ms
rtt min/avg/max/mdev = 0.190/0.267/0.339/0.047 ms
ubuntu@ubuntu:~$
```

2. Enviando ping para o servidor DNS da google

```
ubuntu@ubuntu:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
From 192.168.0.112 icmp_seq=1 Destination Host Unreachable
From 192.168.0.112 icmp_seq=2 Destination Host Unreachable
From 192.168.0.112 icmp_seq=3 Destination Host Unreachable
From 192.168.0.112 icmp_seq=4 Destination Host Unreachable
From 192.168.0.112 icmp_seq=5 Destination Host Unreachable
From 192.168.0.112 icmp_seq=6 Destination Host Unreachable
From 192.168.0.112 icmp_seq=7 Destination Host Unreachable
From 192.168.0.112 icmp_seq=8 Destination Host Unreachable
From 192.168.0.112 icmp_seq=9 Destination Host Unreachable
From 192.168.0.112 icmp_seq=10 Destination Host Unreachable
From 192.168.0.112 icmp_seq=11 Destination Host Unreachable
From 192.168.0.112 icmp_seq=12 Destination Host Unreachable
From 192.168.0.112 icmp_seq=13 Destination Host Unreachable
From 192.168.0.112 icmp_seq=14 Destination Host Unreachable
From 192.168.0.112 icmp_seq=15 Destination Host Unreachable
From 192.168.0.112 icmp_seq=16 Destination Host Unreachable
From 192.168.0.112 icmp_seq=17 Destination Host Unreachable
From 192.168.0.112 icmp_seq=18 Destination Host Unreachable
From 192.168.0.112 icmp_seq=19 Destination Host Unreachable
From 192.168.0.112 icmp_seq=20 Destination Host Unreachable
From 192.168.0.112 icmp_seq=21 Destination Host Unreachable
From 192.168.0.112 icmp_seq=22 Destination Host Unreachable
From 192.168.0.112 icmp_seq=23 Destination Host Unreachable
From 192.168.0.112 icmp_seq=24 Destination Host Unreachable
From 192.168.0.112 icmp_seq=25 Destination Host Unreachable
From 192.168.0.112 icmp_seq=26 Destination Host Unreachable
From 192.168.0.112 icmp_seq=27 Destination Host Unreachable
From 192.168.0.112 icmp_seq=28 Destination Host Unreachable
From 192.168.0.112 icmp_seq=29 Destination Host Unreachable
From 192.168.0.112 icmp_seq=30 Destination Host Unreachable
From 192.168.0.112 icmp_seq=31 Destination Host Unreachable
From 192.168.0.112 icmp_seq=32 Destination Host Unreachable
From 192.168.0.112 icmp_seq=33 Destination Host Unreachable
From 192.168.0.112 icmp_seq=34 Destination Host Unreachable
From 192.168.0.112 icmp_seq=35 Destination Host Unreachable
From 192.168.0.112 icmp_seq=36 Destination Host Unreachable
^C
--- 8.8.8.8 ping statistics ---
38 packets transmitted, 0 received, +36 errors, 100% packet loss, time 37145ms
pipe 3
ubuntu@ubuntu:~$
```

REFERÊNCIAS

https://www.youtube.com/watch?v=hqS_EuQA6pQ

https://www.youtube.com/watch?v=0hfJEnYk_6A

https://www.youtube.com/watch?v=1LseRQvGppk