Network Management

interface configuration

Intro

- configuratie nic:
  - via GUI: is mogelijk,
    kan problemen geven als simultaan in CLI wordt geconfigureerd

  - via CLI: varieert afhankelijk van distributie
    we bekijken Ubuntu in slides

/etc/network/interfaces

```
student@server1:~$ cat /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp
```

2 interfaces gedefinieerd: lo en eth0

auto : auto-start (ifup -a)

inet : tcp/ip (inet6 = ipv6, ddp = apple, ipx = novell, …)

/etc/network/interfaces

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# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp
```

lo = loopback device

    virtueel device (geen hardware)

    loopback: trafic naar dit device wordt gestuurd naar een service op OS

    bvb. webserver localhost ip=127.0.0.1

/etc/network/interfaces

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# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp
```

eth0 = eerste netwerk (ethernet) kaart

optie 1: ip address via DHCP-server

/etc/network/interfaces

```
student@server1:~$ cat /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet static
address 192.168.14.100
network 192.168.14.0
netmask 255.255.255.0
gateway 192.168.14.2
dns-nameservers 192.168.14.2
dns-search pxl.be
```

eth0 = eerste netwerk (ethernet) kaart

optie 2: fixed ip (static)

gateway: alle trafic buiten het network wordt naar de gateway (router) gestuurd

/etc/network/interfaces

Wijziging in `/etc/network/interfaces` blijft behouden na reboot

verder: met ifconfig tijdelijke wijziging

ifdown

take a network interface down

```
sudo ifdown eth0

sudo ifdown -a
```

```
man ifdown
```

-a, --all

    If given to **ifup**, affect all interfaces marked **auto**. Interfaces are brought up in the order in which they are defined in /etc/network/interfaces. Combined with **--allow**, acts on all interfaces of a specified class instead. If given to **ifdown**, affect all defined interfaces. Interfaces are brought down in the order in which they are currently listed in the state file. Only interfaces defined in /etc/network/interfaces will be brought down.

ifup

bring a network interface up

```
sudo ifup eth0

sudo ifup -a


man ifup
```

-a, --all

        If given to **ifup**, affect all interfaces marked **auto**. Interfaces are brought up in the order in which they are defined in /etc/network/interfaces. Combined with **--allow**, acts on all interfaces of a specified class instead. If given to **ifdown**, affect all defined interfaces. Interfaces are brought down in the order in which they are currently listed in the state file. Only interfaces defined in /etc/network/interfaces will be brought down.

ifdown && ifup

Wijziging in `/etc/network/interfaces`

nic opnieuw opstarten

```
ifdown eth0 && ifup eth0
```

rol van && :

    test of 1e commando lukt?

    indien ja voer 2e commando uit

ifconfig

- informatie opvragen en wijzigingen aanbrengen
- informatie opvragen zonder arguments: alle nic's

ifconfig

- informatie opvragen en wijzigingen aanbrengen
- informatie opvragen met arguments: 1 specifieke nic

```
student@server1:~$ ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:0c:29:82:80:50
          inet addr:192.168.14.133  Bcast:192.168.14.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe82:8050/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:57 errors:0 dropped:0 overruns:0 frame:0
          TX packets:39 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:11328 (11.3 KB)  TX bytes:4726 (4.7 KB)
```

ifconfig

- gewone user heeft vermoedelijk `/sbin` niet in `$PATH` staan:

```
normaluser@server1:~$ ifconfig eth0
Command 'ifconfig' is available in '/sbin/ifconfig'
The command could not be located because '/sbin' is not included in the PATH environment variable.
This is most likely caused by the lack of administrative privileges associated with your user account.
ifconfig: command not found
normaluser@server1:~$ /sbin/ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:0c:29:82:80:50
          inet addr:192.168.14.133  Bcast:192.168.14.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe82:8050/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:57 errors:0 dropped:0 overruns:0 frame:0
          TX packets:39 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:11328 (11.3 KB)  TX bytes:4726 (4.7 KB)
```

up and down

opnieuw opstarten nic

```
ifconfig eth0 down && ifconfig eth0 up
```

huidige configuratie eth0 wordt uitgelezen en opnieuw gebruikt

(eventueel aangebrachte wijziging via ifconfig blijft behouden)

alternatief voor

```
ifdown eth0 && ifup eth0
```

configuratie wordt gelezen uit `/etc/network/interfaces`

setting up IP address
setting up MAC address

Tijdelijke wijziging


```
student@server1:~$ ifconfig eth0 | grep 192
          inet addr:192.168.14.100  Bcast:192.168.14.255  Mask:255.255.255.0
student@server1:~$ sudo ifconfig eth0 192.168.14.101 netmask 255.255.0.0
student@server1:~$ ifconfig eth0 | grep 192
          inet addr:192.168.14.101  Bcast:192.168.255.255  Mask:255.255.0.0
student@server1:~$ sudo ifdown eth0 && sudo ifup eth0
RTNETLINK answers: No such process
student@server1:~$ ifconfig eth0 | grep 192
          inet addr:192.168.14.100  Bcast:192.168.14.255  Mask:255.255.255.0
```

```
student@server1:~$ ifconfig eth0 | grep HW
eth0      Link encap:Ethernet  HWaddr 00:0c:29:82:80:50
student@server1:~$ sudo ifconfig eth0 hw ether 00:42:42:42:42:42
student@server1:~$ sudo ifdown eth0 && sudo ifup eth0
student@server1:~$ ifconfig eth0 | grep HW
eth0      Link encap:Ethernet  HWaddr 00:42:42:42:42:42
```
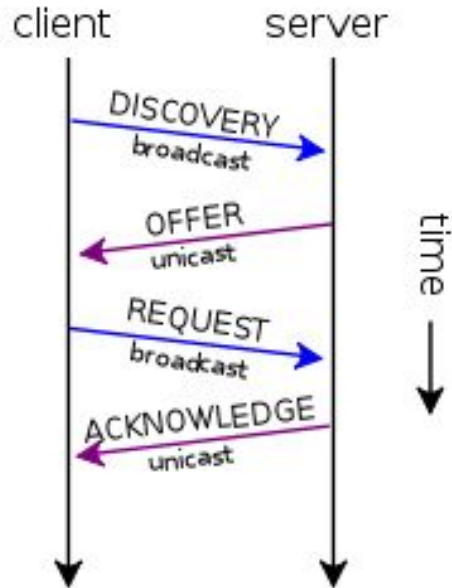
(is ook tijdelijk, maar blijft na `ifdown eth0 && ifup eth0` behouden)

dhclient

dhclient = daemon op huidige OS

server = DHCP server
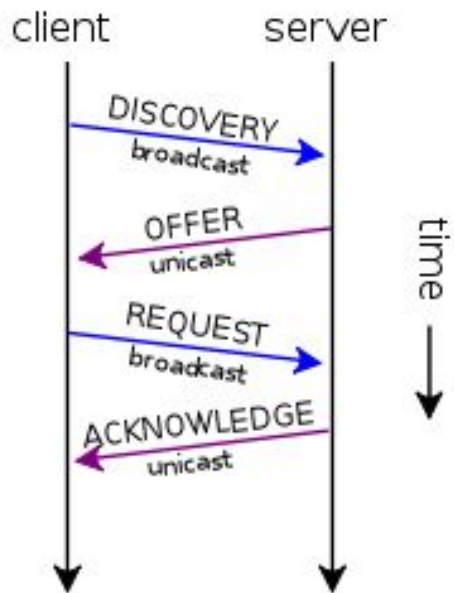

DISCOVERY

client weet niet waar DHCP-server

broadcast naar alle hosts in network

'mijn MAC address = ... gelieve mij een ip address te bezorgen'
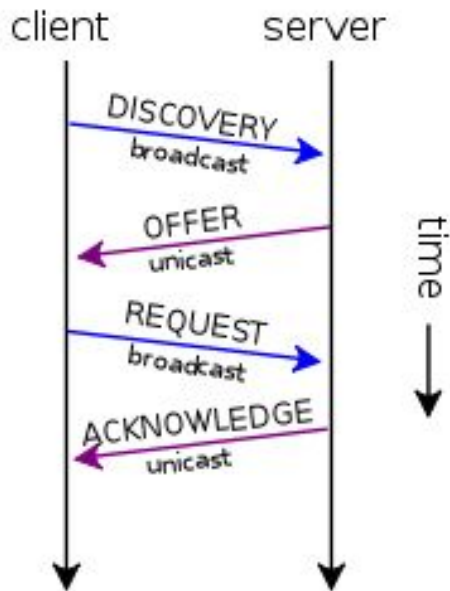
dhclient

OFFER

1 of meerdere DHCP servers sturen naar de client

aanbod (lease):
IP address voor client, subnet mask, lease duration en IP address van DHCP server

dhclient

REQUEST

client kiest voor 1 van de OFFERS

doet een broadcast

'ik kies voor het OFFER van ...'

Gekozen DHCP server geeft
ACKNOWLEDGE
alle andere DHCP servers weten dat
hun OFFER niet meer nodig is

dhclient

Zie man dhclient

Release   `sudo dhclient -r eth0`

Opnieuw lease aanvragen   `sudo dhclient eth0`

(ifup zal de dhclient daemon starten)

hostname

Tijdelijke wijziging

```
student@server1:~$ cat /etc/hostname
server1
student@server1:~$ hostname
server1
student@server1:~$ sudo hostname test
student@server1:~$ hostname
test
student@server1:~$ sysctl kernel.hostname
kernel.hostname = test
student@server1:~$ sudo sysctl kernel.hostname=server
sudo: unable to resolve host test
kernel.hostname = server
```

arp

ARP(8)   Linux Programmer's Manual   ARP(8)

NAME

    arp - manipulate the system ARP cache

DESCRIPTION

    Arp manipulates or displays the kernel's IPv4 network neighbour cache.
    It can add entries to the table, delete one or display the current con-
    tent.

    ARP stands for Address Resolution Protocol, which is used to find the
    media access control address of a network neighbour for a given IPv4
    Address.

arp

Toon alle entries

```
student@server1:~$ arp -a
? (192.168.14.2) at 00:50:56:ff:52:ca [ether] on eth0
? (192.168.14.254) at 00:50:56:f5:76:3e [ether] on eth0
```

```
student@destkop1:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0c:29:1d:cb:aa
          inet addr:192.168.14.134  Bcast:192.168.14.255  Mask:255.255.255.0
```

```
student@server1:~$ ping 192.168.14.134
PING 192.168.14.134 (192.168.14.134) 56(84) bytes of data.
64 bytes from 192.168.14.134: icmp_seq=1 ttl=64 time=0.453 ms
```

```
student@server1:~$ arp -a
? (192.168.14.134) at 00:0c:29:1d:cb:aa [ether] on eth0
? (192.168.14.2) at 00:50:56:ff:52:ca [ether] on eth0
? (192.168.14.254) at 00:50:56:f5:76:3e [ether] on eth0
```

Delete entry

```
student@server1:~$ sudo arp -d 192.168.14.134
student@server1:~$ arp -a
? (192.168.14.134) at <incomplete> on eth0
? (192.168.14.2) at 00:50:56:ff:52:ca [ether] on eth0
? (192.168.14.254) at 00:50:56:f5:76:3e [ether] on eth0
```

(of met hostname)

PXL

route

```
ROUTE(8)                    Linux Programmer's Manual                    ROUTE(8)

NAME
       route - show / manipulate the IP routing table

DESCRIPTION
       Route manipulates the kernel's IP routing tables.  Its primary  use  is
       to  set up static routes to specific hosts or networks via an interface
       after it has been configured with the ifconfig(8) program.

       When the add or del  options  are  used,  route  modifies  the  routing
       tables.   Without these options, route displays the current contents of
       the routing tables.
```

route

```
student@server1:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         192.168.14.2    0.0.0.0         UG    0      0        0 eth0
192.168.14.0    *               255.255.255.0   U     0      0        0 eth0
192.168.14.0    *               255.255.255.0   U     0      0        0 eth1
```

of
```
student@server1:~$ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags MSS Window   irtt Iface
default         192.168.14.2    0.0.0.0         UG    0 0          0 eth0
192.168.14.0    *               255.255.255.0   U     0 0          0 eth0
192.168.14.0    *               255.255.255.0   U     0 0          0 eth1
```

Tijdelijk wijzigingen routering: (vb. default gateway)

```
sudo route add default gw 192.168.14.xx
```

```
(man route)
```

PXL

ping

Met ping wordt vaak de TCP/IP configuratie getest.

(ook traceroute, dig)

```
student@server1:~$ ping 192.168.14.134
PING 192.168.14.134 (192.168.14.134) 56(84) bytes of data.
64 bytes from 192.168.14.134: icmp_seq=1 ttl=64 time=0.873 ms
64 bytes from 192.168.14.134: icmp_seq=2 ttl=64 time=0.190 ms
64 bytes from 192.168.14.134: icmp_seq=3 ttl=64 time=1.95 ms
Ctrl-C ^C

--- 192.168.14.134 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.190/1.005/1.953/0.726 ms
```

VMware: NAT
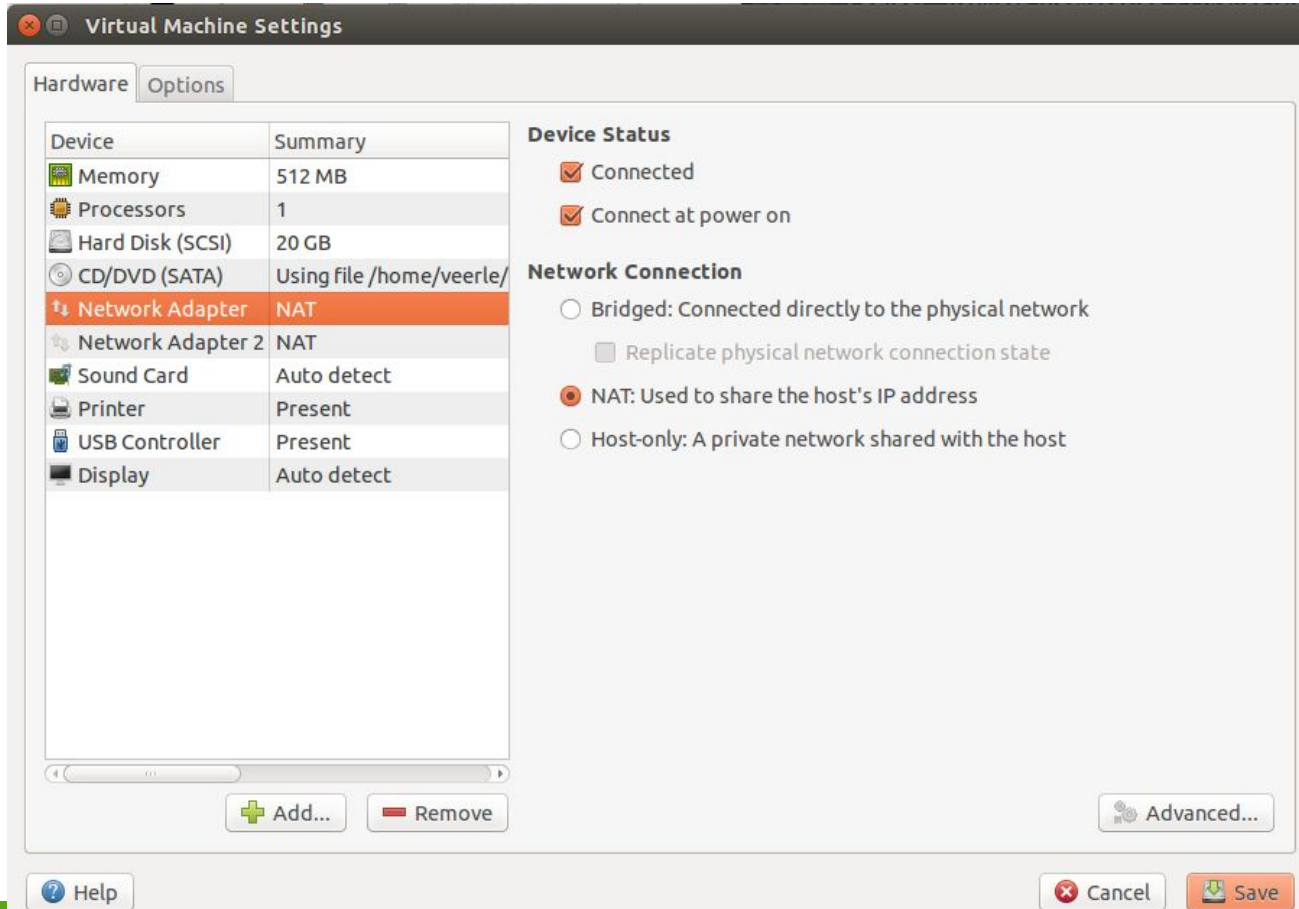
VMware: NAT - host

interface vmnet8


```
                    :~$ ifconfig vmnet8
vmnet8      Link encap:Ethernet  HWaddr 00:50:56:c0:00:08
            inet addr:192.168.14.1  Bcast:192.168.14.255  Mask:255.255.255.0
            inet6 addr: fe80::250:56ff:fec0:8/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
```

NAT router en DNS Server

ip = 192.168.14.**2**

DHCP Server

ip = 192.168.14.**254**

VMware: NAT - VM

VMware: NAT - VM


```
student@server1:~$ dig www.google.be

; <<>> DiG 9.9.5-3-Ubuntu <<>> www.google.be
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 59758
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 4, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; MBZ: 0005 , udp: 4096
;; QUESTION SECTION:
;www.google.be.                 IN      A

;; ANSWER SECTION:
www.google.be.          5       IN      A       64.233.166.94

;; AUTHORITY SECTION:
google.be.              5       IN      NS      ns3.google.com.
google.be.              5       IN      NS      ns4.google.com.
google.be.              5       IN      NS      ns1.google.com.
google.be.              5       IN      NS      ns2.google.com.

;; ADDITIONAL SECTION:
ns1.google.com.         5       IN      A       216.239.32.10
ns2.google.com.         5       IN      A       216.239.34.10
ns3.google.com.         5       IN      A       216.239.36.10
ns4.google.com.         5       IN      A       216.239.38.10

;; Query time: 36 msec
;; SERVER: 192.168.14.2#53(192.168.14.2)
;; WHEN: Mon Oct 12 20:51:52 CEST 2015
;; MSG SIZE  rcvd: 204
```

```
student@server1:~$ route
Kernel IP routing table
Destination     Gateway         Genmask
default         192.168.14.2    0.0.0.0
192.168.14.0    *               255.255.2
192.168.14.0    *               255.255.2
```

DNS - poort 53