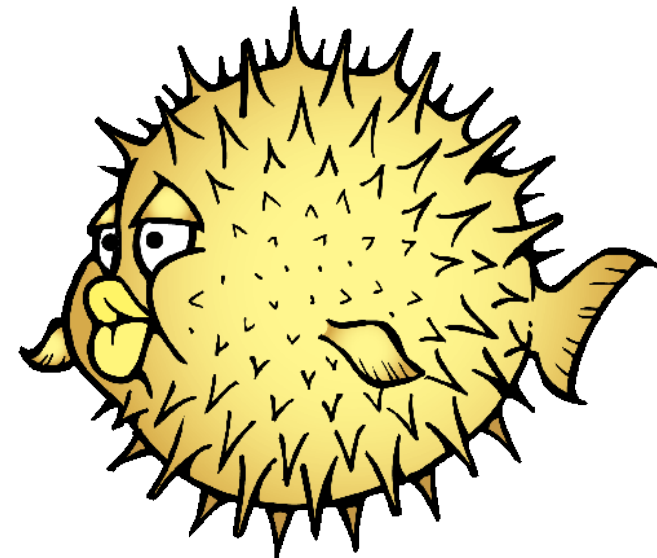# Network booted
OpenBSD Workstations

Jan Klemkow
<jan@openbsd.org>

BSDCan
May 17th 2019

Profession

- Master of Engineering

- Software Developer

OpenBSD

- User since 3.9

- Contributor since 5.0

- Developer since 6.6

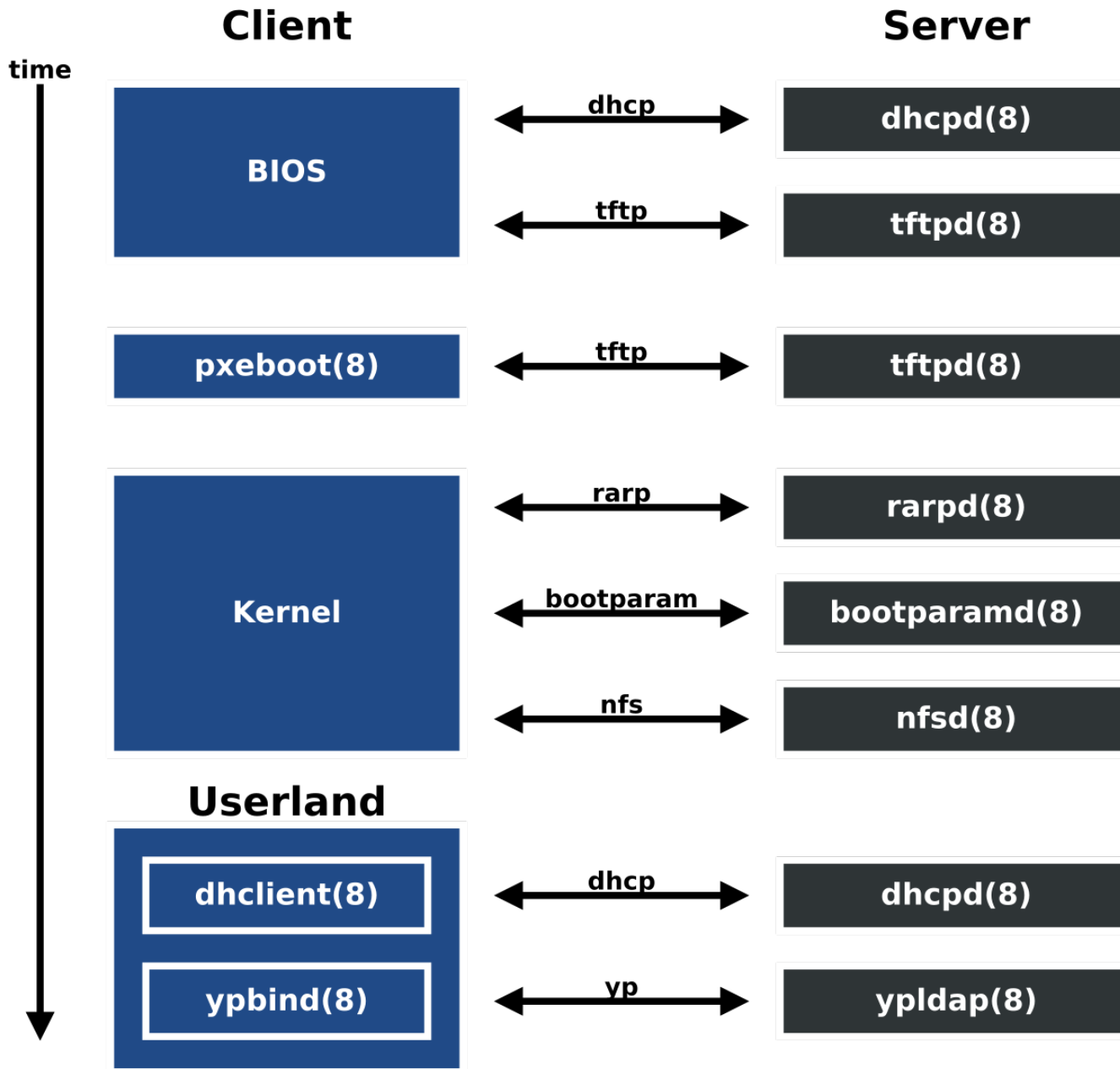# The given Environment.

- Linux Workstations

- /home via NFS

- LDAP Server

- PXE booted GRUB bootloader
  - default disk
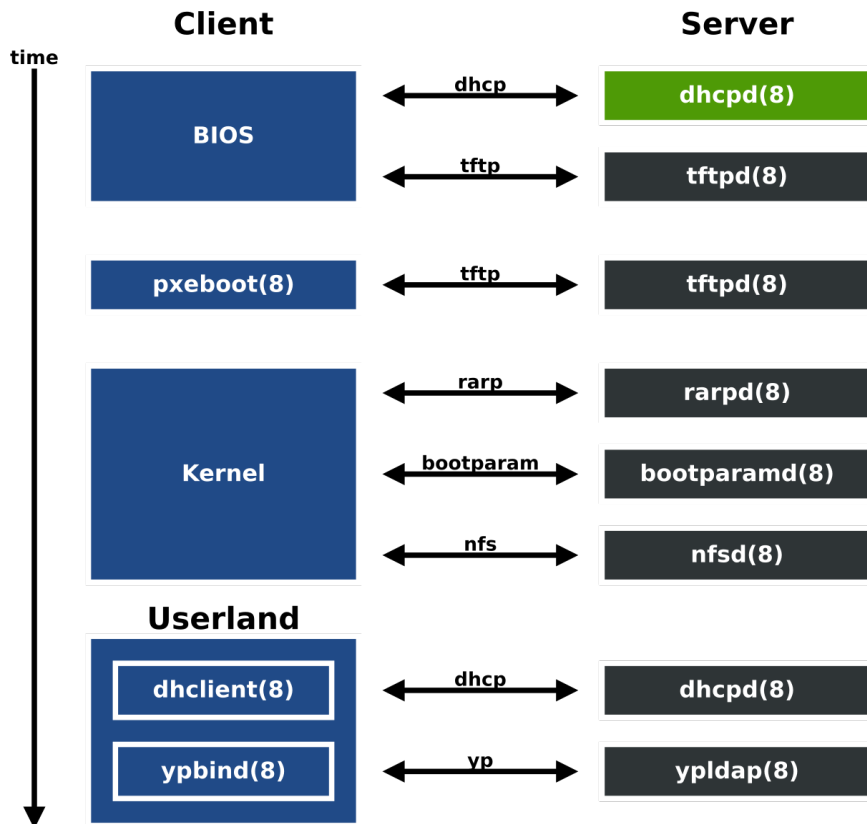 - optional Linux Netinstall

- Linux Workstations

- /home via NFS

- LDAP Server

- PXE booted GRUB bootloader
  - default disk
  - **optional OpenBSD Live Boot**
  - optional Linux Netinstall

Client   **Server**

time

BIOS	←dhcp→	dhcpd(8)
	←tftp→	tftpd(8)

pxeboot(8)	←tftp→	tftpd(8)

Kernel	←rarp→	rarpd(8)
	←bootparam→	bootparamd(8)
	←nfs→	nfsd(8)

Userland

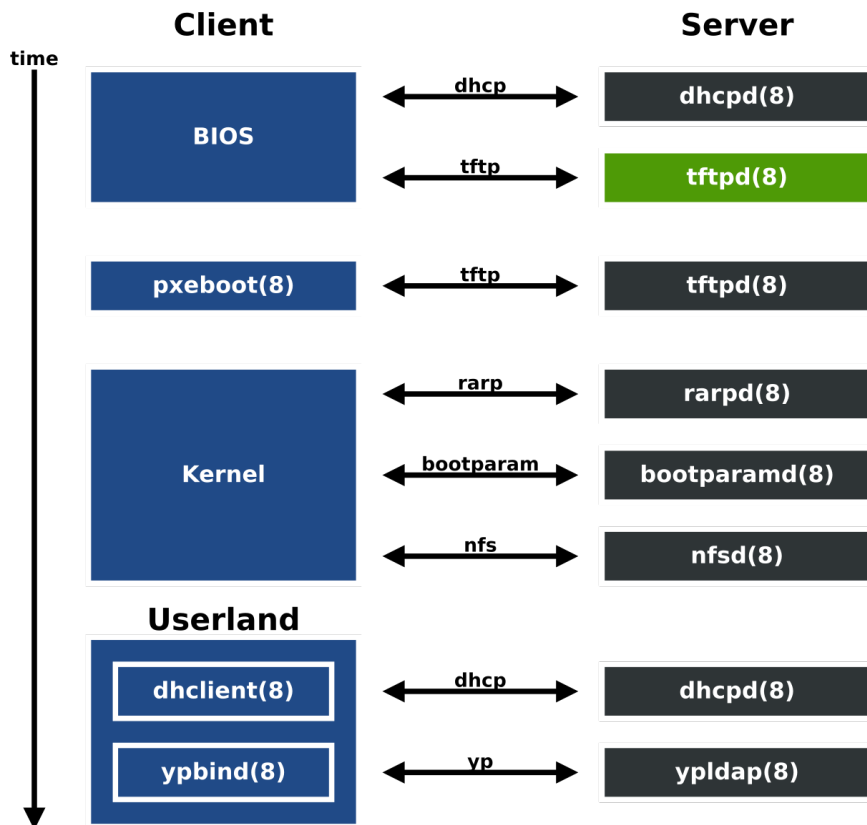| dhclient(8)	←dhcp→	dhcpd(8)
ypbind(8)	←yp→	ypldap(8)

```
# cat /etc/dhcpd.conf
...
host client {
    hardware ethernet xx:xx:xx:xx:xx:xx;
    fixed-address 10.0.0.2;
    next-server 10.0.0.1;
    filename "pxeboot";
}
...

# rcctl enable dhcpd
# rcctl start dhcpd
```

Needed Environment

Client		Server

time

BIOS ←→ dhcp → dhcpd(8)

←→ tftp → tftpd(8)

pxeboot(8) ←→ tftp → tftpd(8)

Kernel ←→ rarp → rarpd(8)

←→ bootparam → bootparamd(8)

←→ nfs → nfsd(8)

Userland

dhclient(8) ←→ dhcp → dhcpd(8)

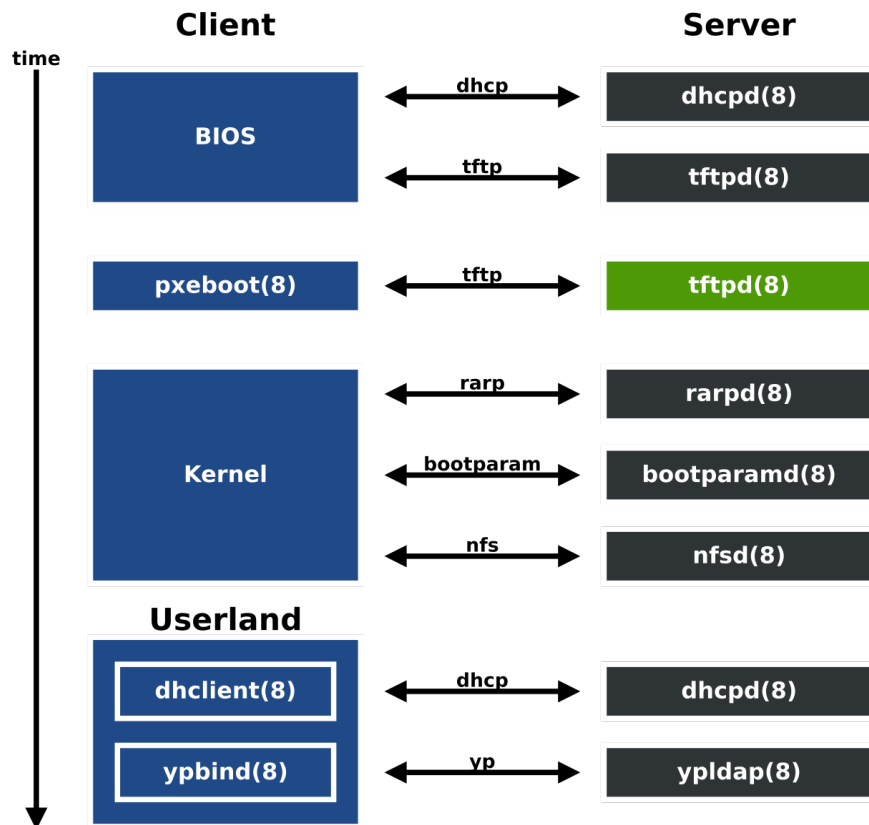**ypbind(8)** ←→ yp → ypldap(8)

```
# mkdir /tftpboot
# cp /usr/mdec/pxeboot /tftpboot

# cat /etc/rc.conf.local
...
tftpd_flags=-l 10.0.0.1 /tftpboot
...

# rcctl start tftpd
```
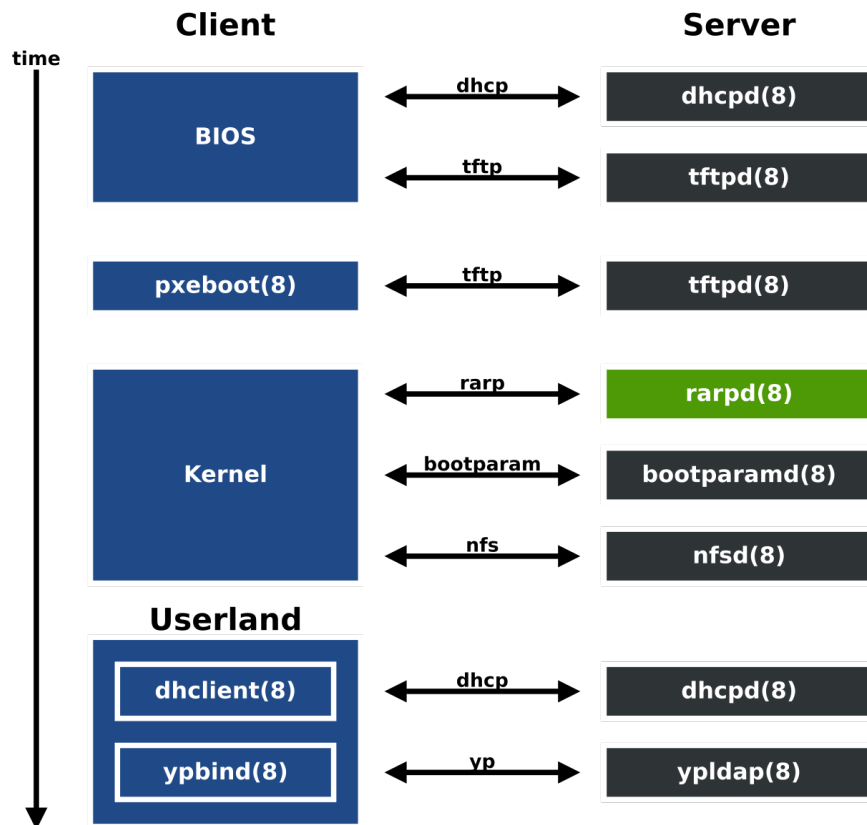
Needed Environment

Client		Server

time

Client

Server

BIOS ←→ dhcp ←→ dhcpd(8)

BIOS ←→ tftp ←→ tftpd(8)

pxeboot(8) ←→ tftp ←→ tftpd(8)

Kernel ←→ rarp ←→ rarpd(8)

Kernel ←→ bootparam ←→ bootparamd(8)

Kernel ←→ nfs ←→ nfsd(8)

Userland

dhclient(8) ←→ dhcp ←→ dhcpd(8)

ypbind(8) ←→ yp ←→ ypldap(8)

```
# cp /bsd /tftpboot
```

Needed Environment

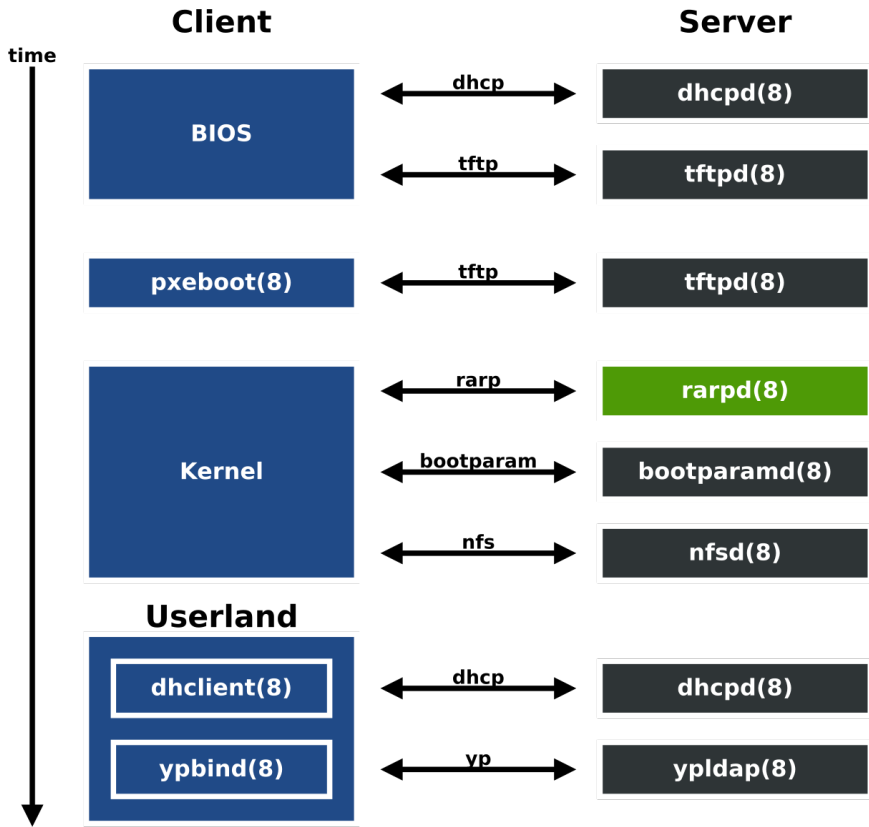| Client		Server
BIOS	←dhcp→	**dhcpd(8)**
	←tftp→	**tftpd(8)**
pxeboot(8)	←tftp→	**tftpd(8)**
Kernel	←rarp→	**rarpd(8)**
	←bootparam→	**bootparamd(8)**
	←nfs→	**nfsd(8)**
Userland		
dhclient(8)	←dhcp→	**dhcpd(8)**
ypbind(8)	←yp→	**ypldap(8)**

time

```
# cat /etc/ethers
...
xx:xx:xx:xx:xx:xx   client
...

# cat /etc/hosts
...
10.0.0.2            client
...

# rcctl enable rarpd
# rcctl start rarpd
```

Needed Environment

Client

Server

time

| BIOS | ←dhcp→ | dhcpd(8) |
| | ←tftp→ | tftpd(8) |

| pxeboot(8) | ←tftp→ | tftpd(8) |

Kernel	←rarp→	**rarpd(8)**
	←bootparam→	bootparamd(8)
	←nfs→	nfsd(8)

Userland

| dhclient(8) | ←dhcp→ | dhcpd(8) |
| ypbind(8) | ←yp→ | ypldap(8) |

```
# cat /etc/ethers
...
xx:xx:xx:xx:xx:xx   client
...

# cat /etc/hosts
...
10.0.0.2            client
...

# rcctl enable rarpd
# rcctl start rarpd
```

Client   **Server**
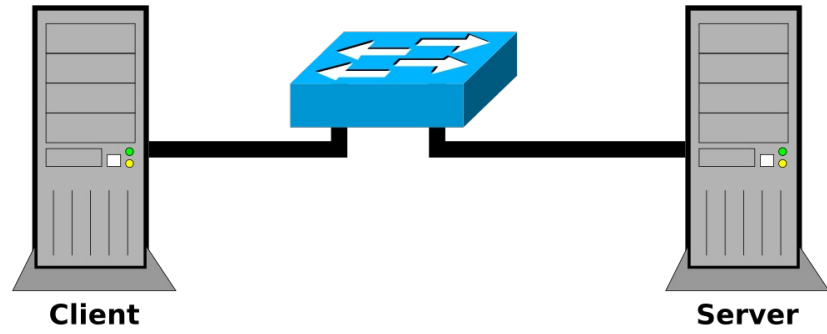
Needed Environment


```
# cat /etc/ethers
...
xx:xx:xx:xx:xx:xx   client
...

# cat /etc/hosts
...
10.0.0.2           client
...

# rcctl enable rarpd
# rcctl start rarpd
```
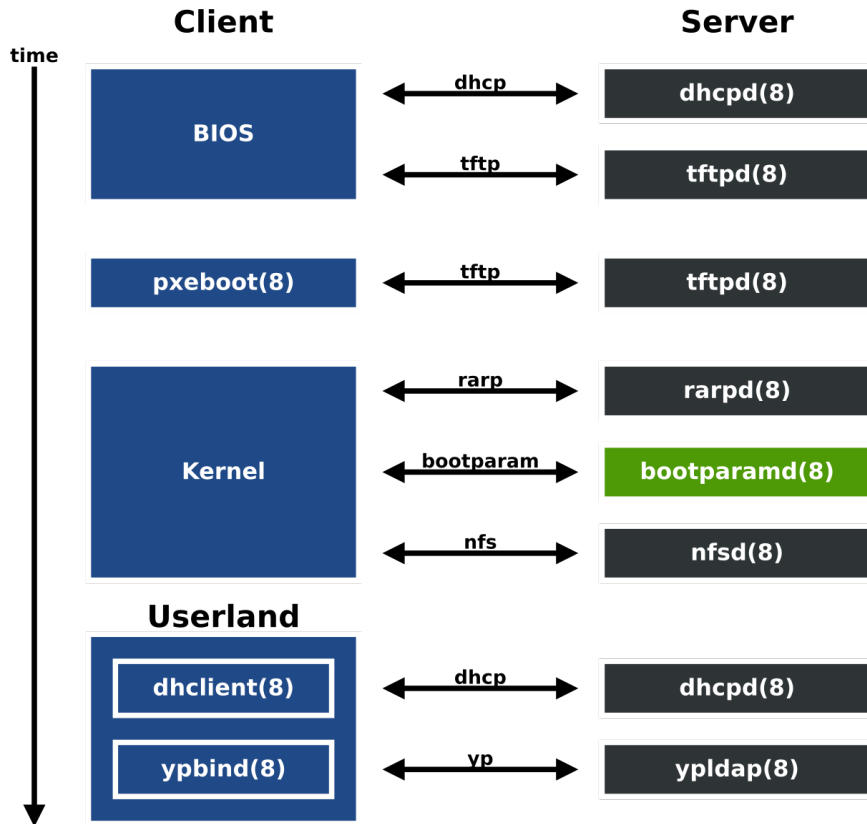
Needed Environment


```
# cat /etc/bootparams
...
client  root=10.0.0.1:/exports/client
...

# rcctl enable bootparamd
# rcctl start bootparamd
```
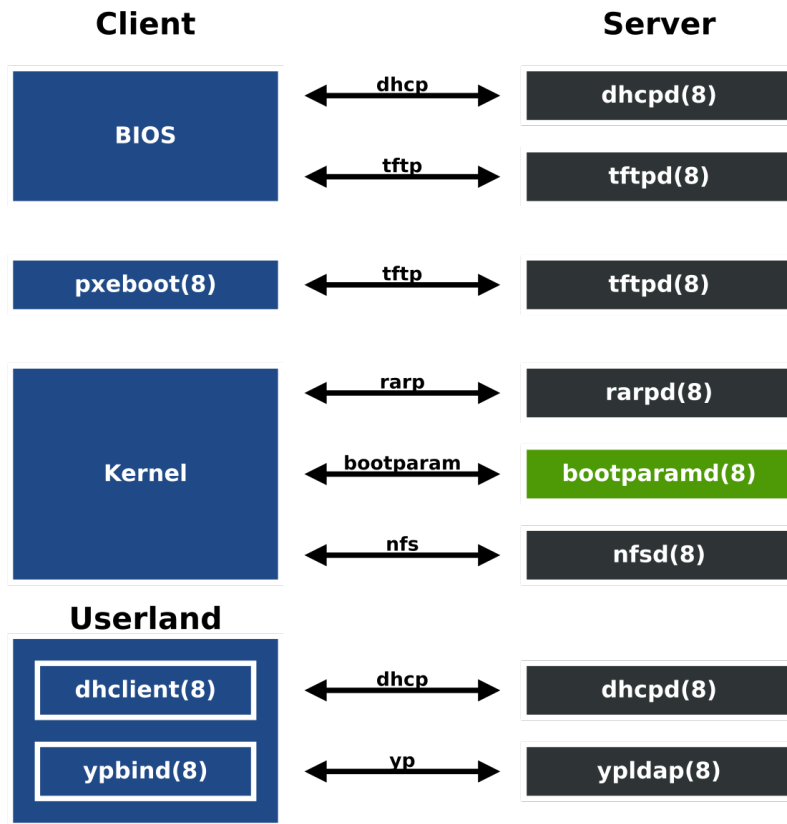
How to create a root filesystem?

Create a root filesystem


```
# mkdir -p /export/client
# tar xzphf *.tgz -C /export/client

# cd /export/client/var/sysmerge/
# tar xzphf etc.tgz -C /export/client/
# tar xzphf xetc.tgz -C /export/client/

# cd /export/client
# (cd dev; ./MAKEDEV all)

# cat > etc/fstab <<-EOF
  10.0.0.1:/export/client /     nfs rw        0 0
  10.0.0.1:/usr            /usr nfs ro        0 0
  swap                     /tmp mfs rw,-s512M 0 0
EOF

# echo "client"          > etc/myname
# echo "dhcp"            > etc/hostname.em0
# echo "portmap_flags=" >> etc/rc.conf.local
# echo "ypbind_flags="  >> etc/rc.conf.local
# echo "xendom_flags="  >> etc/rc.conf.local

# echo "genua.de"        > etc/defaultdomain
# echo '+:*::::::::::' >> etc/master.passwd
# echo '+:*::'          >> etc/group
# pwd_mkdb -d etc -p etc/master.passwd
# cap_mkdb -f etc/login.conf /etc/login.conf
```
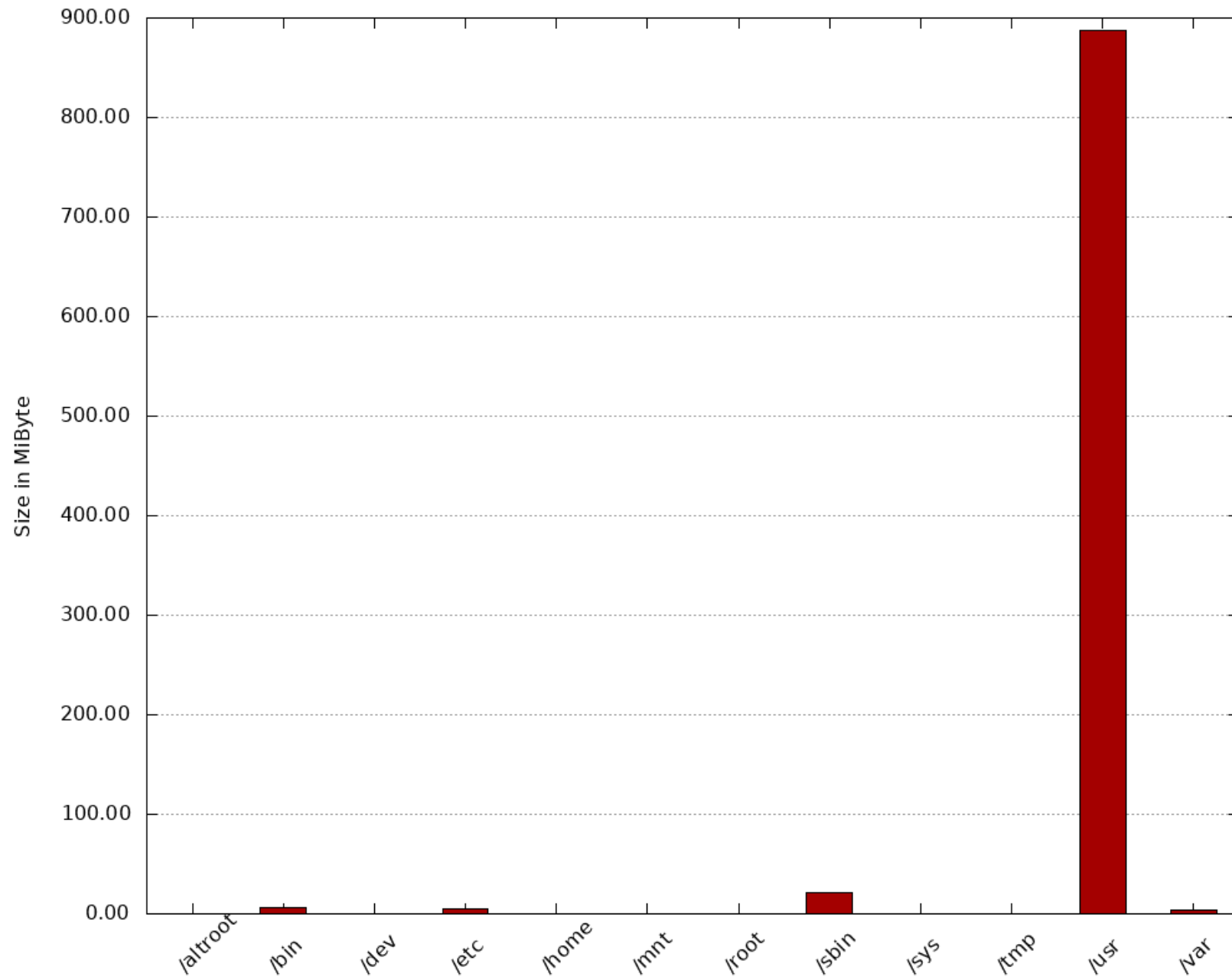
How big is a default root filesystem?

du -sh /export/client
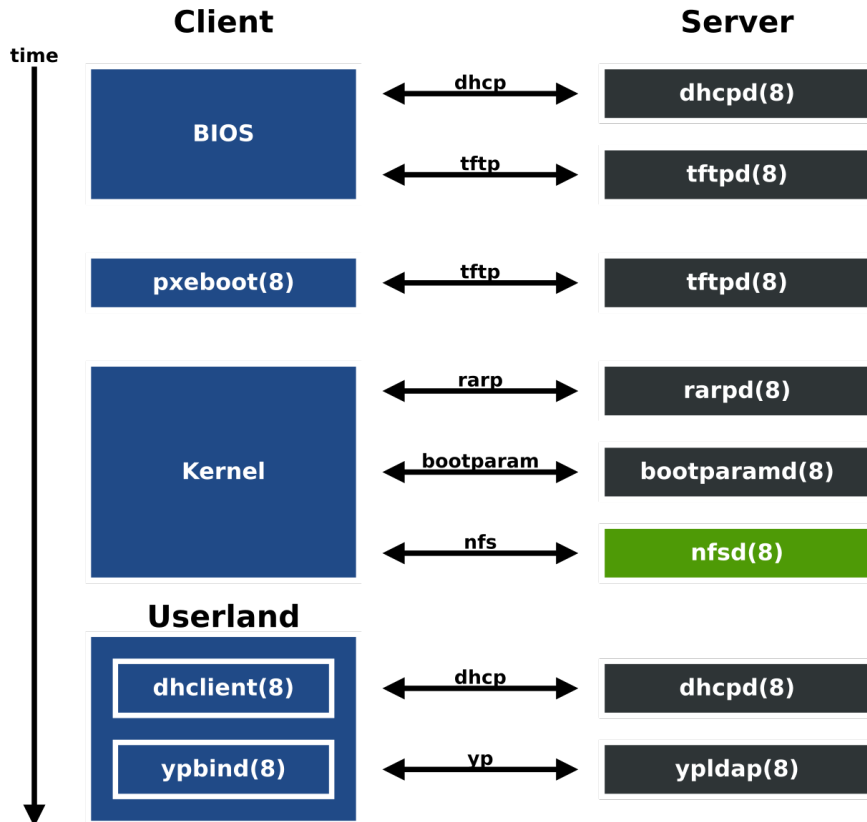922M /export/client

~1 GiByte/WS × 250 WS = **250 GiByte**

rm -r /export/client/usr/*

du -sh /export/client
34M   /export/client

~34 MiByte/WS × 250 WS = **8.5 GiByte**

Needed Environment

Client		Server

time

BIOS	← dhcp →	**dhcpd(8)**
	← tftp →	**tftpd(8)**
pxeboot(8)	← tftp →	**tftpd(8)**
Kernel	← rarp →	**rarpd(8)**
	← bootparam →	**bootparamd(8)**
	← nfs →	**nfsd(8)**

Userland

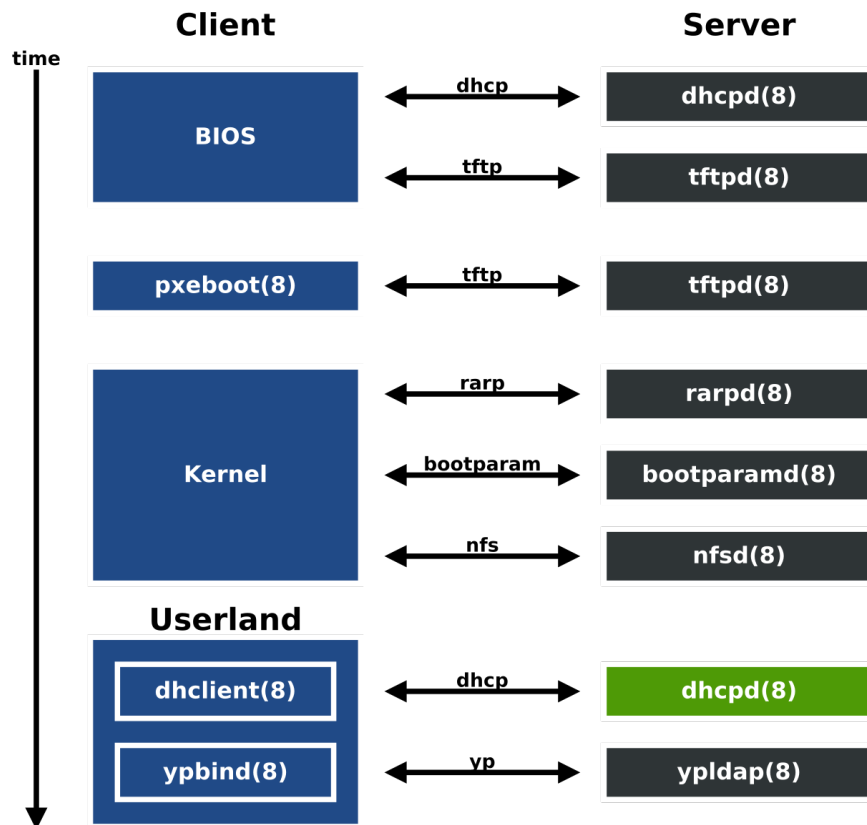|		
dhclient(8)	← dhcp →	**dhcpd(8)**
ypbind(8)	← yp →	**ypldap(8)**

```
# cat /etc/exports
/usr -ro -network=10.0.0.0 -mask=255.255.255.0
/var/db/pkg -ro -network=10.0.0.0 -mask=255...
...
/export/client -maproot=root -alldirs 10.0.0.2
...

# rcctl enable mountd nfsd portmap
# rcctl start mountd nfsd portmap
```

Needed Environment

Client		Server

time

BIOS ←dhcp→ **dhcpd(8)**

←tftp→ **tftpd(8)**

pxeboot(8) ←tftp→ **tftpd(8)**

Kernel ←rarp→ **rarpd(8)**

←bootparam→ **bootparamd(8)**

←nfs→ **nfsd(8)**

Userland

dhclient(8) ←dhcp→ **dhcpd(8)**
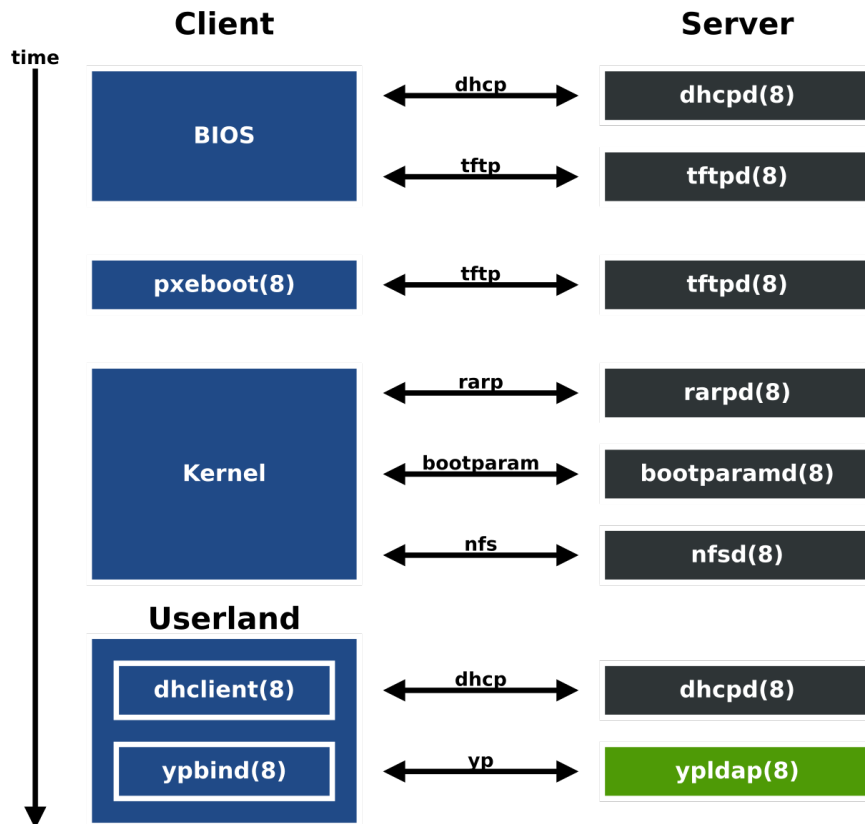
ypbind(8) ←yp→ **ypldap(8)**

```
# cat /etc/ethers
...
xx:xx:xx:xx:xx:xx   client
...

# cat /etc/hosts
...
10.0.0.2            client
...

# rcctl enable rarpd
# rcctl start rarpd
```

Needed Environment


```
# cat /etc/ypldap.conf

domain "genua.de"

provide map "passwd.byname"
provide map "passwd.byid"
provide map "group.byname"
provide map "group.byid"
provide map "netid.byname"

directory "ldap.genua.de" tls {
    ...
    passwd filter "(objectClass=posixAccount)"
    ...
}

# rcctl enable ypldap
# rcctl start ypldap
```

```
# cat /export/client/etc/fstab
...
swap                    /tmp        mfs rw,-s512M
10.0.0.1:/var/db/pkg    /var/db/pkg nfs ro
```

	Workstation	**vServer**
CPU	· Intel Core i5-4590	· Intel Xeon 43xx
RAM	· 8 GiByte	· 4 GiByte
Net	· 100 MBit/s	· 1 GBit/s
Disk		· 128 GiByte
GFX	· Intel integrated GFX	

- system starts a bit slower
- programs starts a bit slower

- no local storage

- Rollout of 250 Workstations in 12min

Problems.

- sharing ~/.* between Linux and OpenBSD

- switching OpenBSD <-> Linux shifts the Clock

- no swap

- non-persistent /tmp

- /etc/sshd/known_hosts

- All rootfs at /export/...
- Offline Maintainance
- Easy Upgrade

Questions?