Napredno korištenje operacijskog sustava Linux

3. Protokoli

Dominik Barbarić, Josip Domšić
Nositelj: doc.dr.sc. Stjepan Groš

Sveučilište u Zagrebu
Fakultet elektrotehnike i računarstva

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OSI RM

Open Systems Interconnection Reference Model

- Fizički sloj - Ethernet, USB, ISDN, 802.11, Bluetooth
- Podatkovni sloj - Ethernet, ARP, MAC, CSMA/CA
- Mrežni sloj - ICMP, IPsec, IPv4, IPv6, AppleTalk
- Transportni sloj - UDP, TCP
- Sjednički sloj - SOCKS, SAP, RTP
- Prezentacijski sloj - MIME
- Aplikacijski sloj - DNS, DHCP, FTP, HTTP, SMTP

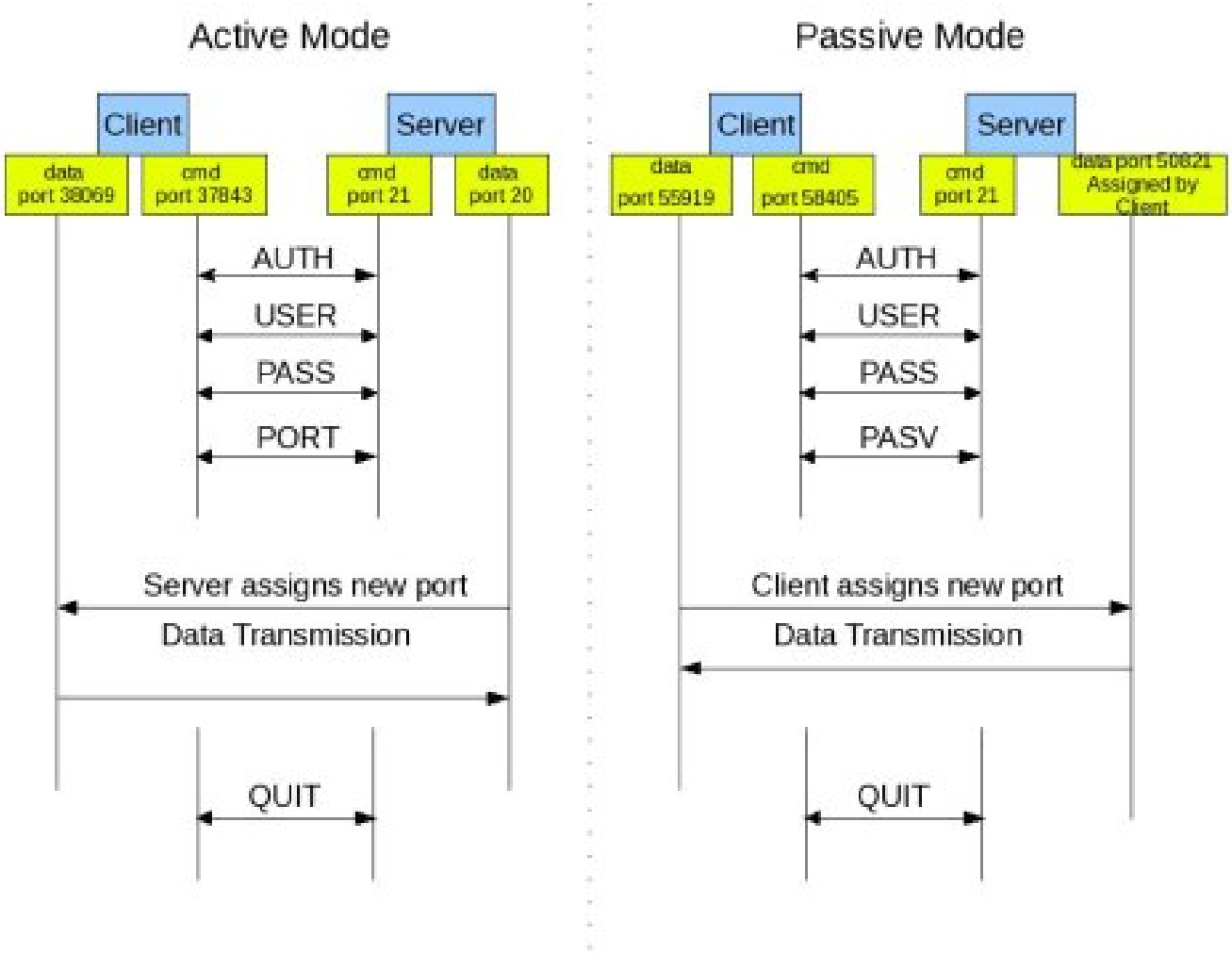
TCP/IP

Transmission Contral Protocol over Internet Protocol

Najrasprostranjenija implementacija

- Podatkovni sloj (Fizički i Podatkovni)
- Mrežni sloj
- Transportni sloj
- Aplikacijski sloj (Sjednički, Prezentacijski, Aplikacijski)

TCP/IP


Active Mode
Client
Server
data port 38069
cmd port 37843
cmd port 21
data port 20
AUTH
USER
PASS
PORT
Server assigns new port
Data Transmission
QUIT
Passive Mode
Client
Server
data port 55919
cmd port 58405
cmd port 21
data port 50821 Assigned by Client
AUTH
USER
PASS
PASV
Client assigns new port
Data Transmission
QUIT

Komunikacija

- IP protokol zaslužan je za adresiranje računala te usmjeravanje podataka u mreži
- TCP uspostavlja i održava vezu između 2 subjekta / računala / hosta, osigurava da svi paketi stignu i u točnom rasporedu
- Jedinstveno definirano: parom IP adresa i port
- Alternativa je socket file
- Definira se i tip komunikacije: Stream, Datagram, RAW, ...

Klijent-Server arhitektura

- Server pruža usluge klijentima preko definiranih mrežnih protokola
- Alternativa je peer-to-peer
  - Serveru se pristupa preko *socket*a
    IP adresa i port
    Prijenosni protokol (TCP, UDP, . . .)
- Serverski programi se pokreću kao *daemon*

Protokoli

- INETD / XINETD
- SSH, SCP
- HTTP, HTTPS
- FTP
- NFS, SMB
- DNS

ssh

TCP port 22
OpenSSH, Dropbear, ...

- Pristup udaljenoj sesiji
- Enkriptirani protokoli
- SFTP i SCP protokoli
- SSH tunnel

  X11 forwarding

ssh

/etc/ssh/sshd_config

```
Port 22
AddressFamily any
ListenAddress 0.0.0.0                   # IP adrese na kojima server slusa
ListenAddress ::                        #      IPv6

Protocol 2                              # SSH-2 protokol

HostKey for protocol version 1
HostKey /etc/ssh/ssh_host_key           # Sigurnosni kljucevi servera
HostKeys for protocol version 2         # Koriste se za enkripciju veze
HostKey /etc/ssh/ssh_host_rsa_key
HostKey /etc/ssh/ssh_host_dsa_key
HostKey /etc/ssh/ssh_host_ecdsa_key
HostKey /etc/ssh/ssh_host_ed25519_key

SyslogFacility AUTH                     # Postavke logova
LogLevel INFO                           # Razina logiranja

PidFile /run/sshd.pid                   # Datoteka s PID-om servera
```

ssh

/etc/ssh/sshd_config

```
LoginGraceTime 600                          # Vrijeme cekanja prije ponovnog logina
PermitRootLogin no                          # Ogranicenja autentifikacije
StrictModes yes
axAuthTries 6
axSessions 10

# Odabir nacina autentifikacije korisnika
RSAAuthentication yes                       # RSA kljucevi
PubkeyAuthentication yes

# Datoteka s popisom kljuceva s dozvoljenim pristupom (za svakog korisnika)
AuthorizedKeysFile      .ssh/authorized_keys

RhostsRSAAuthentication no                  # Autentifikacija klijentskih racunala
HostbasedAuthentication no
```

ssh

/etc/ssh/sshd_config

```
# Onemogucavanje tekstualnih sifri
# Cesto "no" ako se koriste druge metode autentifikacije
PasswordAuthentication no
PermitEmptyPasswords no
ChallengeResponseAuthentication no

# Autentifikacija kroz druge auth protokole
KerberosAuthentication no
GSSAPIAuthentication no
UsePAM yes

# Omogucen X11 forward za X klijente na serveru
X11Forwarding yes
```

telnet

TCP port 23
xinetd

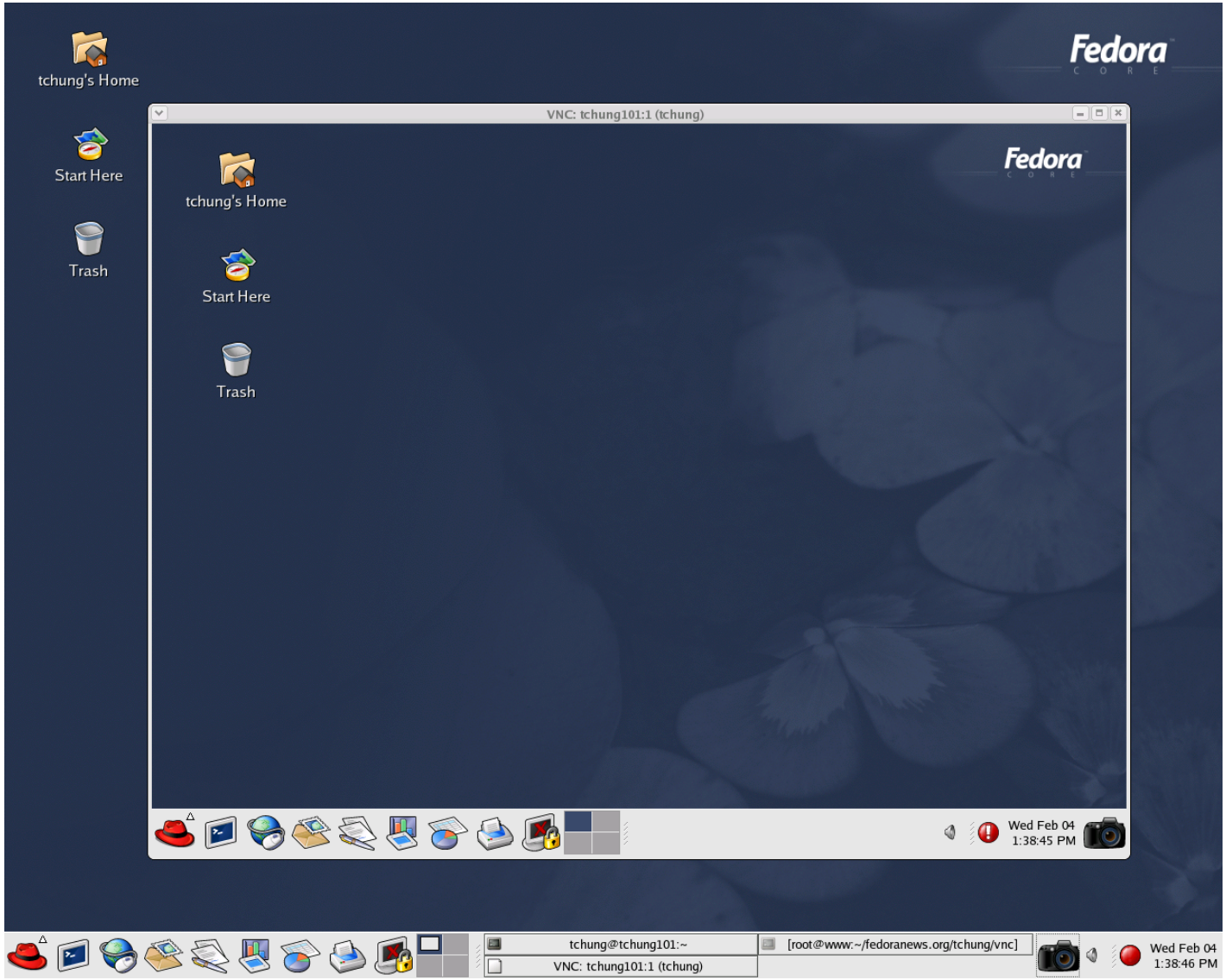
- Udaljeni pristup konzoli
- Nesiguran protokol
- Često korišten na ugradbenoj opremi

vnc

TCP port 5900
tightvnc, tigervnc, realvnc

- Virtual Network Computing
- Udaljeni pristup grafičkom sučelju
- Koristi Remote Framebuffer protokol
  - Rad s bilo kojim windowing sustavom

vnc


tchung's Home
Start Here
Trash
Fedora
CORE
VNC: tchung101:1 (tchung)
tchung's Home
Start Here
Trash
Fedora
CORE
Wed Feb 04
1:38:45 PM
tchung@tchung101:~
[root@www:~/fedoranews.org/tchung/vnc]
VNC: tchung101:1 (tchung)
Wed Feb 04
1:38:46 PM

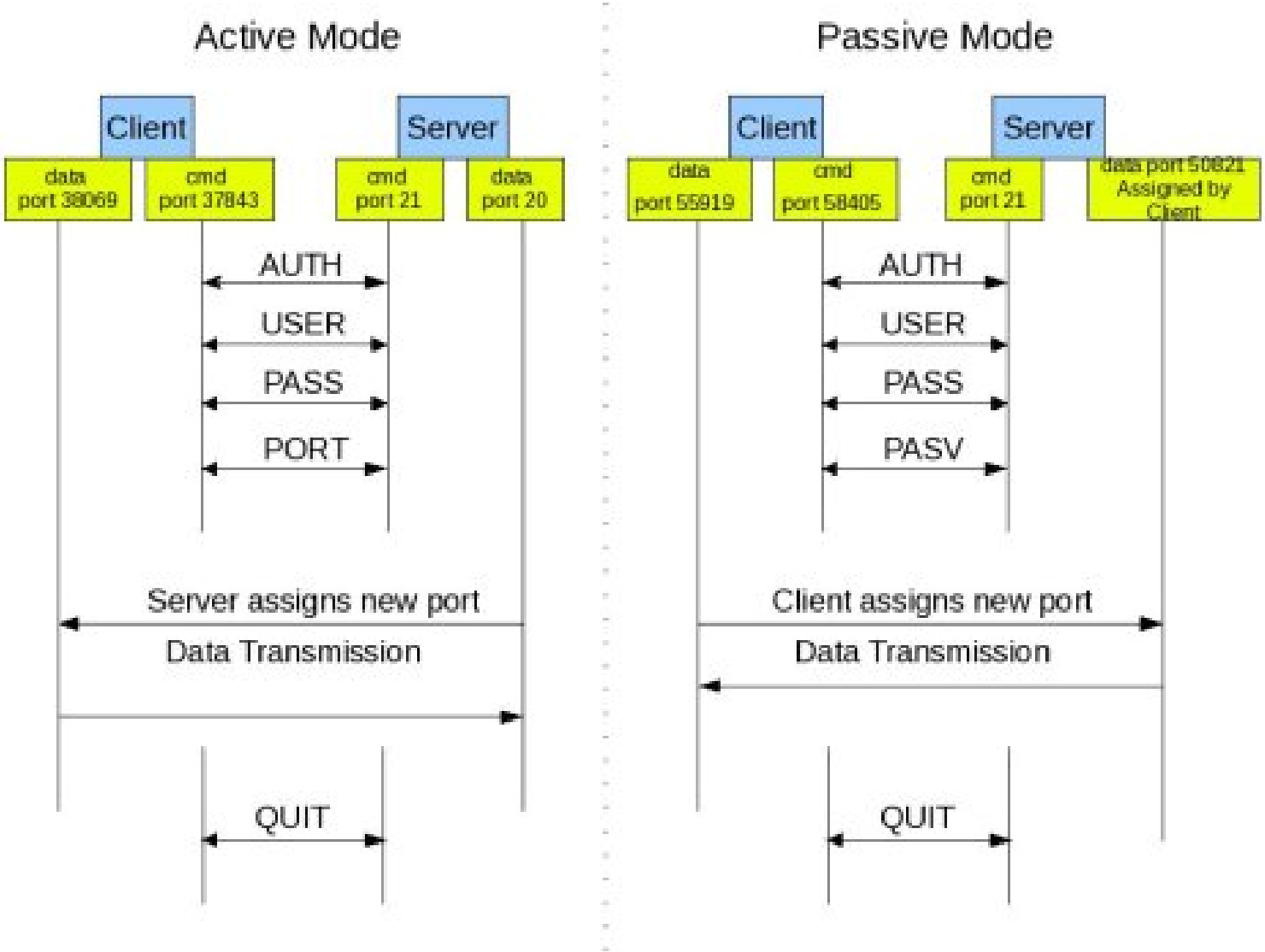
ftp

TCP port 21 (control)
vsftpd, proftpd, bftpd, ...

- File Transfer Protocol
- Varijante: TFTP, SFTP (SSH FTP), FTPS (SSL/TLS FTP)
- Dva načina rada:
  - Aktivni
  - Pasivni

ftp

Način rada



ftp

/etc/vsftpd.conf

```
anonymous_enable=NO                          # Anonimni pristup
local_enable=YES                             # Pristup lokalnim korisnicima

# Per-user configuration
user_config_dir=/etc/vsftpd_conf.d           # Folder u kojem se nalaze konfiguracije
                                             # za svakog korisnika

# Omogucena FTP write naredba (dozvola pisanja na server)
write_enable=YES
# Don't allow recursive listing { prevents excessive I/O usage.
ls_recurse_enable=NO

# Logiranje uploada i downloada u xfer formatu
xferlog_enable=YES
xferlog_std_format=NO
log_ftp_protocol=YES

# ftp data kroz port 20 (active mode)
connect_from_port_20=YES
```

ftp

/etc/vsftpd.conf

```
# Uploaded files are owned by the uploader.
chown_uploads=NO

# You may change the default value for timing out an idle session.
idle_session_timeout=600

# You may change the default value for timing out a data connection.
data_connection_timeout=120

# Location of the RSA certificate to use for SSL encrypted connections.
rsa_cert_file=/etc/ssl/private/vsftpd.pem

# Allow PASV (passive ftp)
pasv_enable=YES
pasv_min_port=12000                     # Dozvoljeni portovi u pasivnom modu
pasv_max_port=12500
pasv_address=123.45.678.901             # Javna adresa servera
pasv_addr_resolve=NO
# Allow active ftp
port_enable=YES
```

http(s)

TCP port 80, 443
Apache, Nginx

HyperText Transfer Protocol

Port 80 - neenkriptirana veza

Port 443 - SSL veza

Apache konfiguracija `/etc/httpd/conf`

Nginx konfiguracija `/etc/nginx/nginx.conf`

Apache

/etc/httpd/conf/httpd.conf

```
Listen 80                                       # Port servera

ServerRoot "/srv/apache"
DocumentRoot "/srv/apache/www"

ServerName localhost:80
ServerAdmin admin@example.com

ErrorLog logs/error.log                         # Postavke logiranja
LogLevel error

LoadModule cgi_module modules/mod_cgi.so
LoadModule dav_module modules/mod_dav.so
LoadModule dav_fs_module modules/mod_dav_fs.so
LoadModule dir_module modules/mod_dir.so
LoadModule mime_module modules/mod_mime.so

DefaultType text/plain                          # Defaultni MIME type
```

Apache

/etc/httpd/conf/httpd.conf

```
<IfModule dir_module>
   DirectoryIndex index.html index.php index.aspx
</IfModule>

IndexIgnore .htaccess                                    # .htaccess datoteka nije index

<FilesMatch "^.ht">                                      # Zabrani pristup .htaccess datotekama
   Order allow,deny
   Deny from all
</FilesMatch>

<Directory />
   Options FollowSymLinks
   AllowOverride all
   Order deny,allow
   Allow from all
   Satisfy all
</Directory>

<Directory "/srv/apache/www/phpMyAdmin">                 # Razlicite postavke za direktorij
   Options None
   AllowOverride None
   order deny,allow
   deny from all
   allow from 127.0.0.1
</Directory>
```

DHCP, DNS

DHCP serveri

- dhcpd, dnsmasq

DNS serveri

- BIND, pdnsd, dnsmasq

Primjer konfiguracije `/etc/dhcpd.conf`

```
# Postavke za sve rangeove koje router dodjeljuje
option domain-name-servers 8.8.8.8, 8.8.4.4;            # Adresa DNS-a koja se predaje klijentima
option subnet-mask 255.255.255.0;
option routers 139.96.30.100;                           # Gateway

# Postavke IP rangea
subnet 139.96.30.0 netmask 255.255.255.0 {
    range 139.96.30.150 139.96.30.250;

    host racunalo1 {                                    # Fiksna IP adresa za određenu MAC adresu
        hardware ethernet 70:56:81:22:33:44;
        fixed-address 139.96.30.199;
    }
}
```

Literatura

https://wiki.archlinux.org/index.php/Server

https://wiki.archlinux.org/index.php/nginx
https://wiki.archlinux.org/index.php/vsftpd
https://www.centos.org/docs/5/html/Deployment_Guide-en-US/s1-ftp-vsftpd-conf.html

http://www.tldp.org/LDP/solrhe/Securing-Optimizing-Linux-RH-Edition-v1.3/chap15sec122.html

https://wiki.archlinux.org/index.php/tightvnc

https://wiki.archlinux.org/index.php/Dhcpd
http://www.linuxhomenetworking.com/wiki/index.php/Quick_HOWTO_:_Ch08_:_Configuring_the_DHCP_Server