Linux Networking: network services

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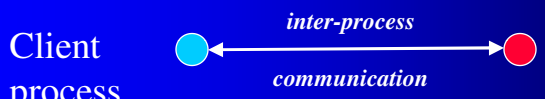
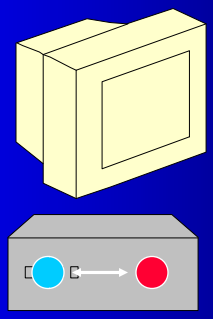
Client and server: matched pairs



OK as long as there's a way to talk



Client process

Server process

OK as long as there's a way to talk

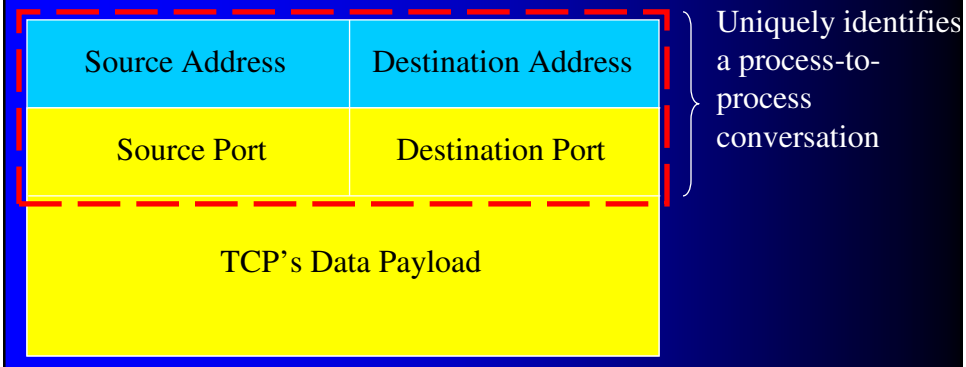
Client process

Server process

Trans-net way to talk: socket programming

- a communications interface/mechanism
- like IPC (inter-process communications)
- but generalized to span machines (inter-*machine*-inter-process)
- coded like file handles
- sockets correspond to service "ports"of TCP and UDP

Ports and conversations



Distinction: machine vs process

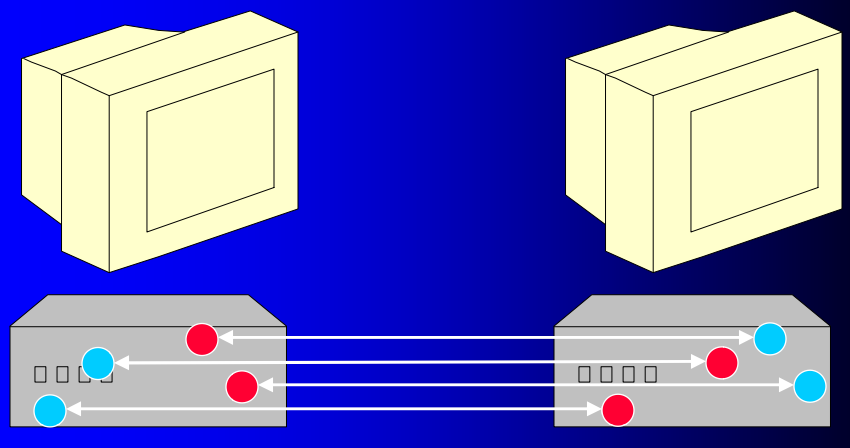
client machine??

server machine??

Client process

Server process

Distinction: machine vs process



ftp server
mail client
web server
telnet client

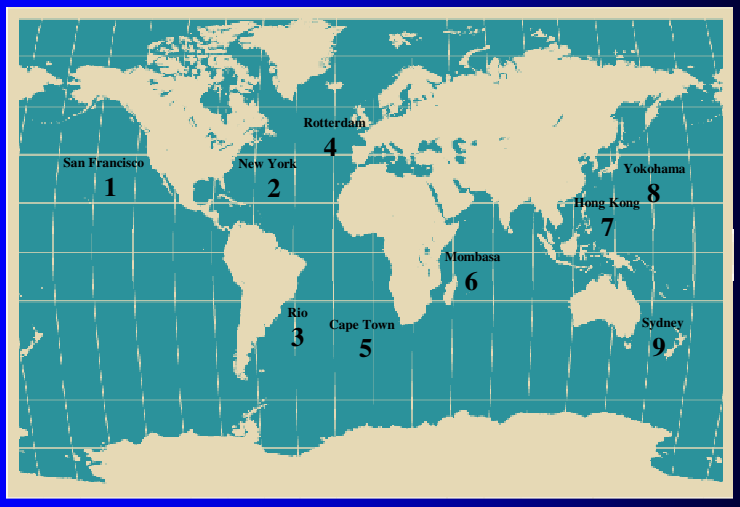
Client processes

Server processes

ftp client
mail server
web client
telnet server

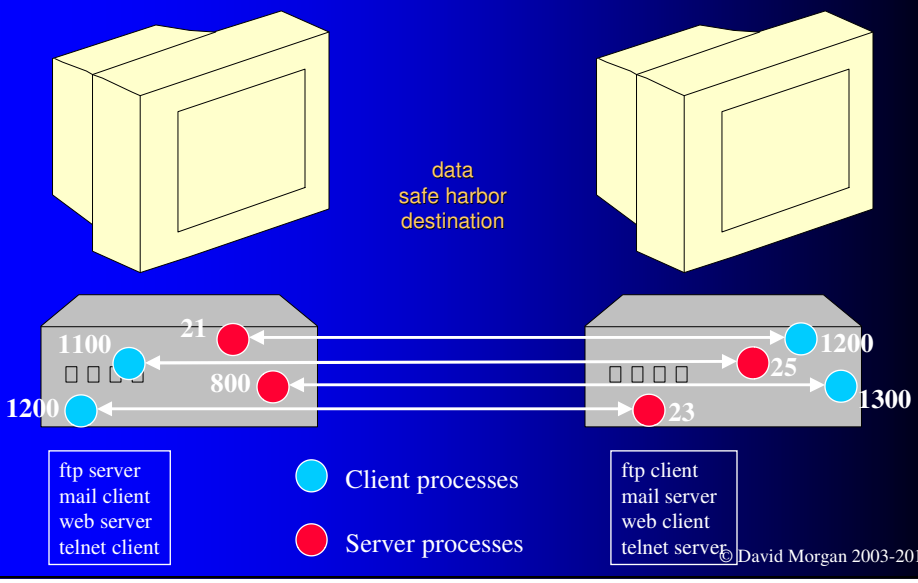
What are port numbers?

ports' numbers?



What are port numbers?

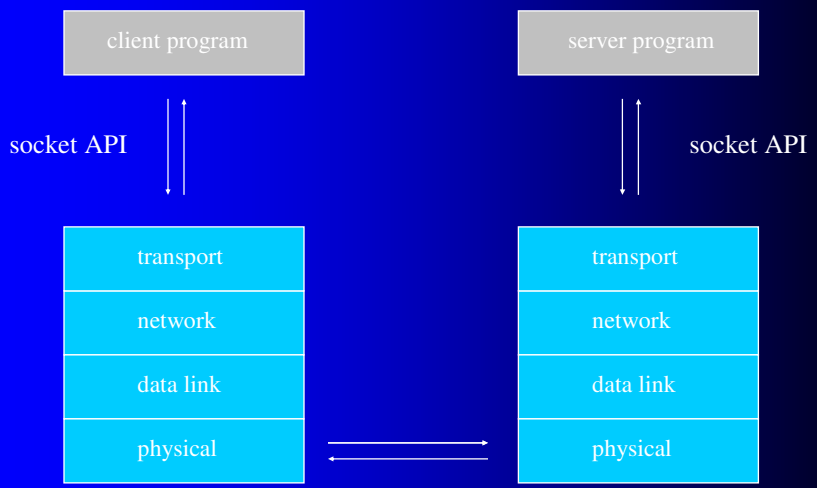
or processes' numbers?



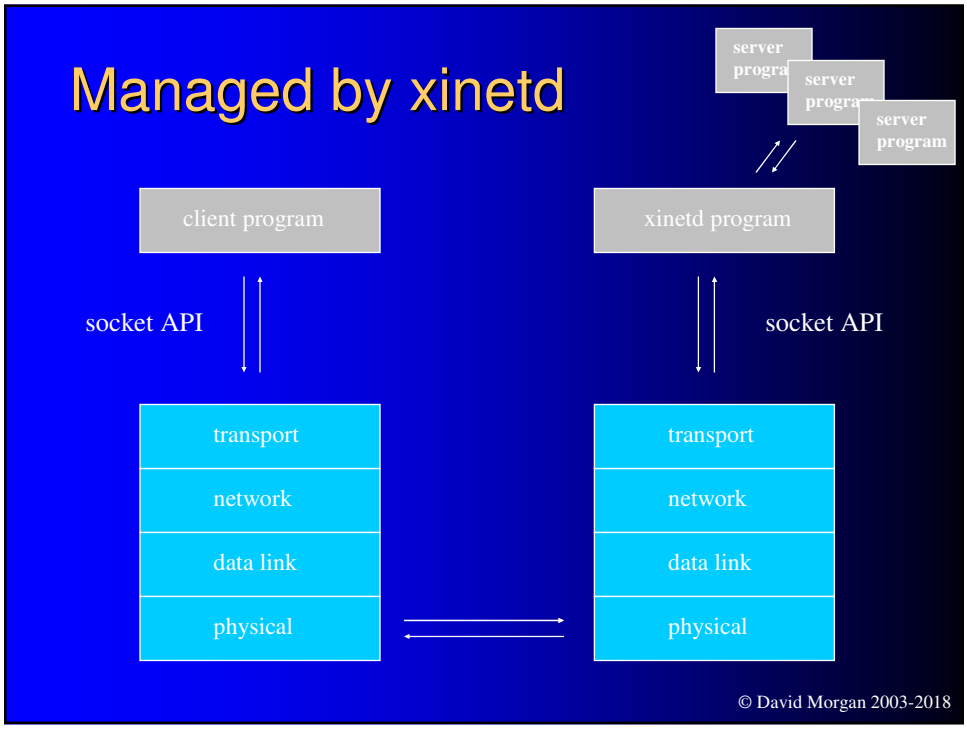
Service processes: 2 ways to run

- As servers in their own right
  - contain socket API code themselves
  - actively listen for incoming connections on a port
- Under control of xinetd "super server"
  - don't contain socket code
  - don't listen for connections
  - xinetd listens on their behalf

Servers in their own right



Managed by xinetd



Examples, run on their own

- httpd web/browsing service
- smtp message transfer (mail) service

Examples, managed by xinetd

- ftp file transfer service
- telnet remote login service
- pop3 message retrieval (mail) service

xinetd operation

- a server that manages servers
- listens to other servers' ports, for them
- responds to an incoming connection
  - starts server associated with connection's port
  - connects server's standard I/O to that port
  - lets server die when connection closes

xinetd purposes

- economize number of services running
- provide access control to managed services
- provide logging to managed services
- let any program be a special-purpose server

xinetd configuration

- /etc/xinetd.conf
- defines services managed by xinetd

```
service <service name>
{
        attribute = value
        .
        .
        .
}
```

Sample configuration: telnet

```
service telnet
{
        disable = no
        flags           = REUSE
        socket_type     = stream
        wait            = no
        user            = root
        server          = /usr/sbin/in.telnetd
        log_on_failure  += USERID
}
```


Default RedHat xinetd.conf

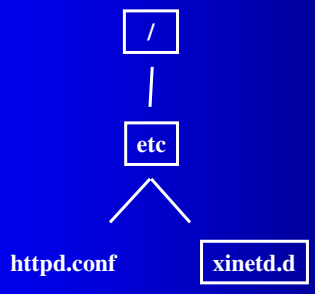
```
# Simple configuration file for xinetd
# Some defaults, and include /etc/xinetd.d/
defaults
{
        instances               = 60
        log_type                = SYSLOG authpriv
        log_on_success          = HOST PID
        log_on_failure          = HOST
        cps                     = 25 30
}

includedir /etc/xinetd.d
```

includedir=/etc/xinetd.d attribute

- all files in /etc/xinetd.d included by extension
- you can specify services one per file
- packages drop config files in /etc/xinetd.d to be picked up automatically by xinetd

Default directories and files



telnet **configures telnet**
wu_ftpd **configs ftp**
ipop3 **configs pop mail**
rsh **configs remote shell**
many others

Required attributes (others optional)

```
service <service name>
{
        socket_type = …
        user = …
        server = …
        wait = …
}
```


Required attributes

- **socket_type** stream/dgram - TCP or UDP
- **user** username - user as whom service should run
- **server** path – path to server executable
- **wait** yes/no – should xinetd butt out till server quits?

Other attributes

- **disable** yes/no – disables service
- **log_on_failure** special – info to log for access denials
- **no_access** matchlist – deny to specified addresses
- **only_from** matchlist – from specified addresses only
- **bind** interface – where to make service available
- **log_type** special – choose log file or syslog
- **redirect** ipaddr – pass traffic to another host

Turning self-managed services on and off

- Services re-read configuration files when restarted
- Restarting
  - /etc/rc.d/init.d/<*script for service*> restart *or*
  - **service <*script for service*> restart**

Turning xinetd-managed services on and off

- Adjust service's config stanza (in xinetd.conf) or file (in /etc/xinetd.d)
  - disable = off (to turn on)
  - disable = on (to turn off)
- Restart xinetd
  - /etc/rc.d/init.d/xinetd start *or*
  - **service xinetd start**

The services file

- /etc/services
- maps service names to port numbers
- used by several standard library routines
- e.g., "telnet mybox smtp" instead of "telnet somebox 25"

/etc/services

```
# /etc/services:

ftp-data        20/tcp
ftp             21/tcp

telnet          23/tcp

smtp            25/tcp          mail

domain          53/tcp          nameserver      # name-domain server
domain          53/udp          nameserver

http            80/tcp          www www-http # WorldWideWeb HTTP
```


Detecting services & conversations

- ps ax | grep <service/daemon name>
  snapshot of active processes/services
- netstat -ap
  displays services corresponding to ports

Talking to a service: SMTP

- Uses port 25
- telnet <mailserver IP> 25
- Try SMTP commands
  - HELO
  - MAIL FROM:<sender>
  - RCPT TO:<recipient>
  - DATA
  - QUIT

Talking to a service: POP3

- Uses port 110
- telnet <mailserver IP> 110
- Try POP3 commands
  - USER username
  - PASS password
  - LIST
  - RETR msg#
  - DELE msg#
  - QUIT

Talking to other services

- FTP
  - telnet <server IP> 21
  - RFC 959
- SSH
  - telnet <server IP> 22

Network Services – quick start

- to serve web pages out of the box, for example*
  - put them in /var/www/html
- to serve files, e.g., out of the box, for example
  - put them in /var/ftp/pub

* on Fedora, having installed httpd web server (apache) and vsftpd file transfer server