Why Use a Fishing Line When You Have a Net?

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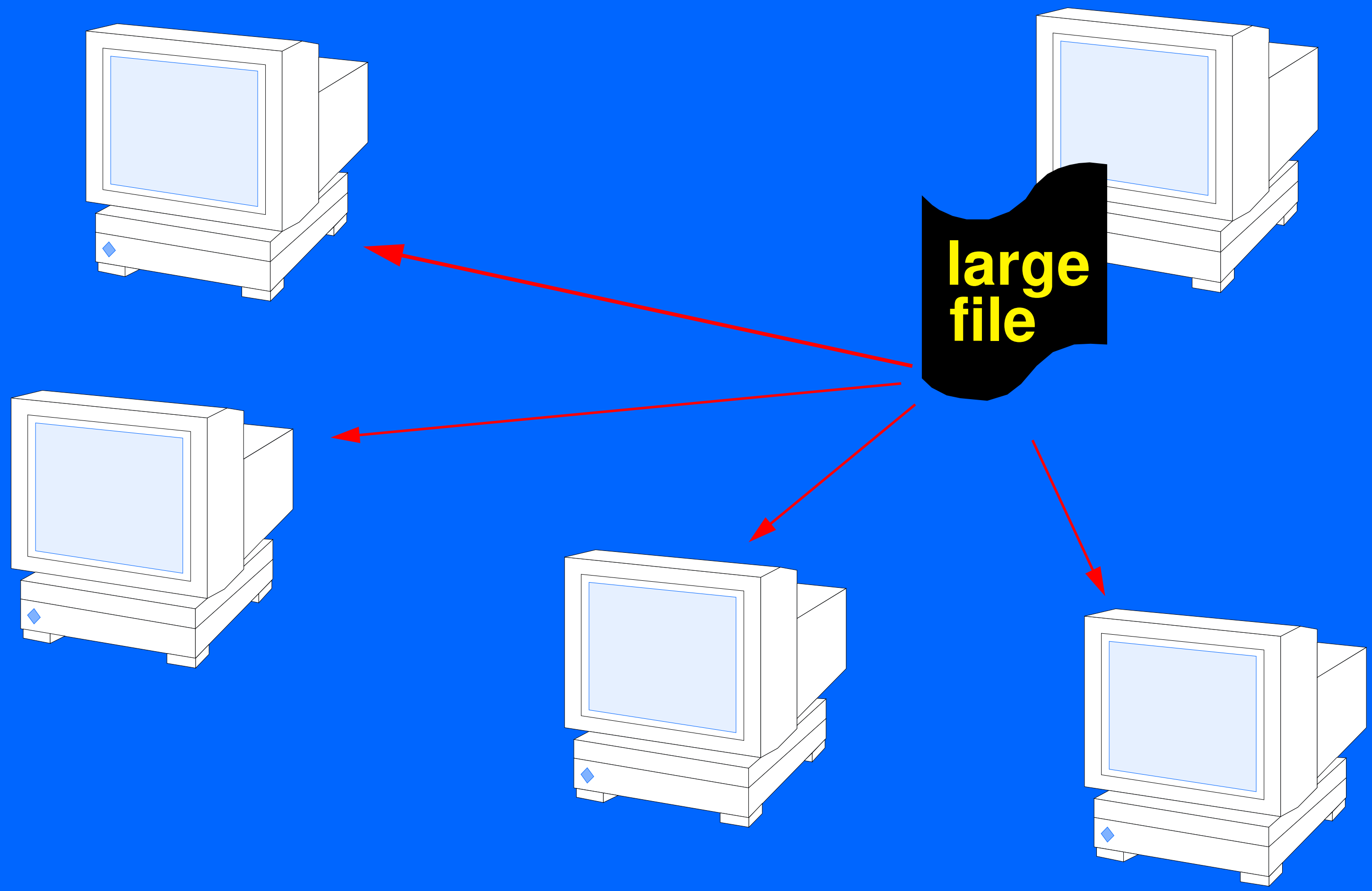
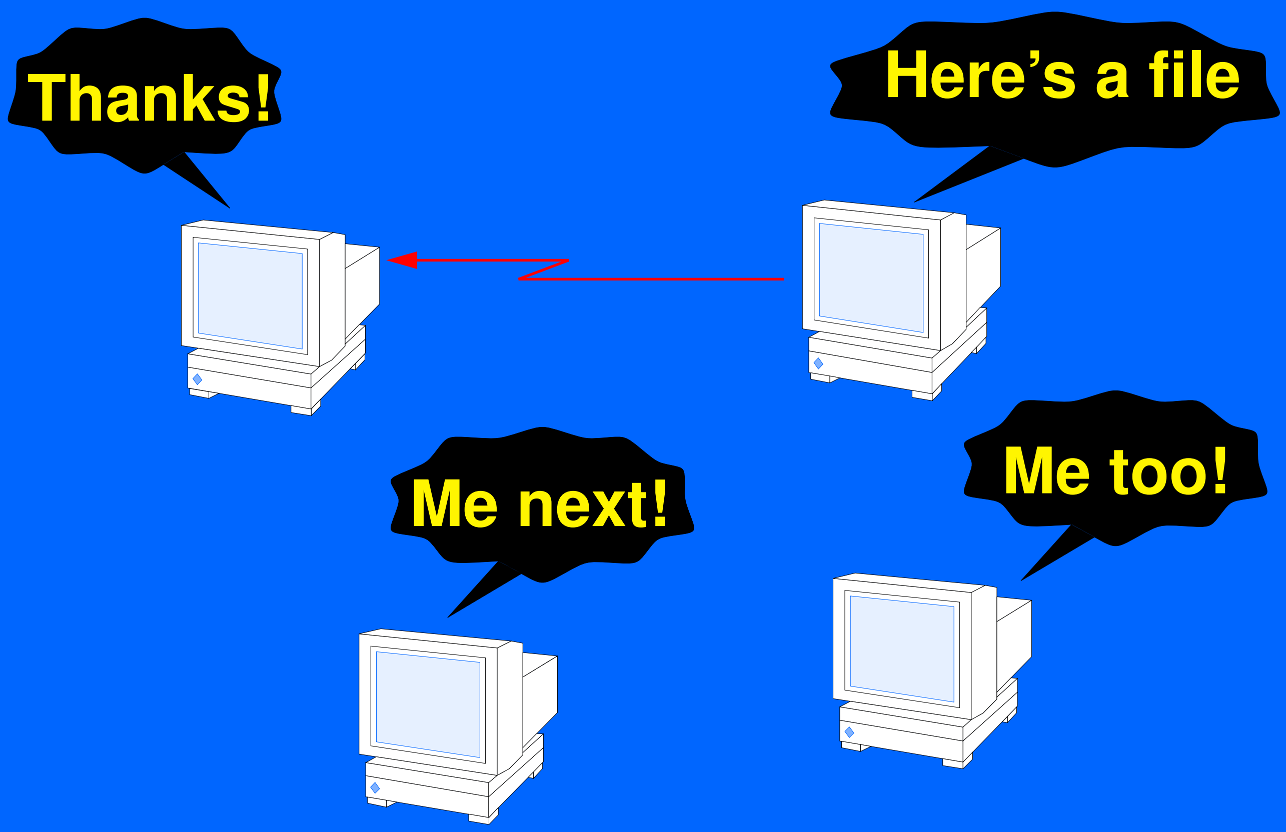
Goal

Distribute large files to multiple machines

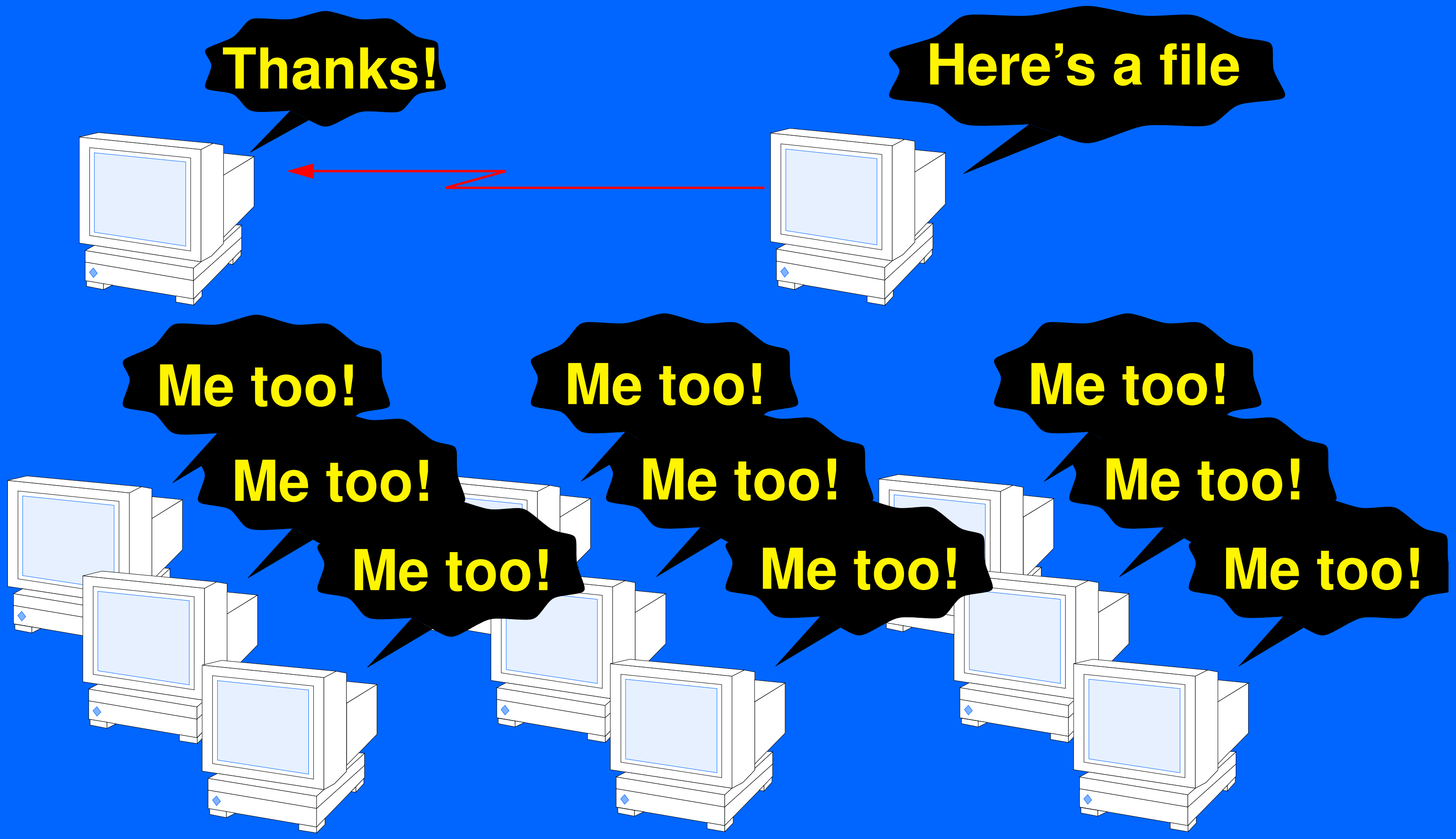


How it's done normally: TCP

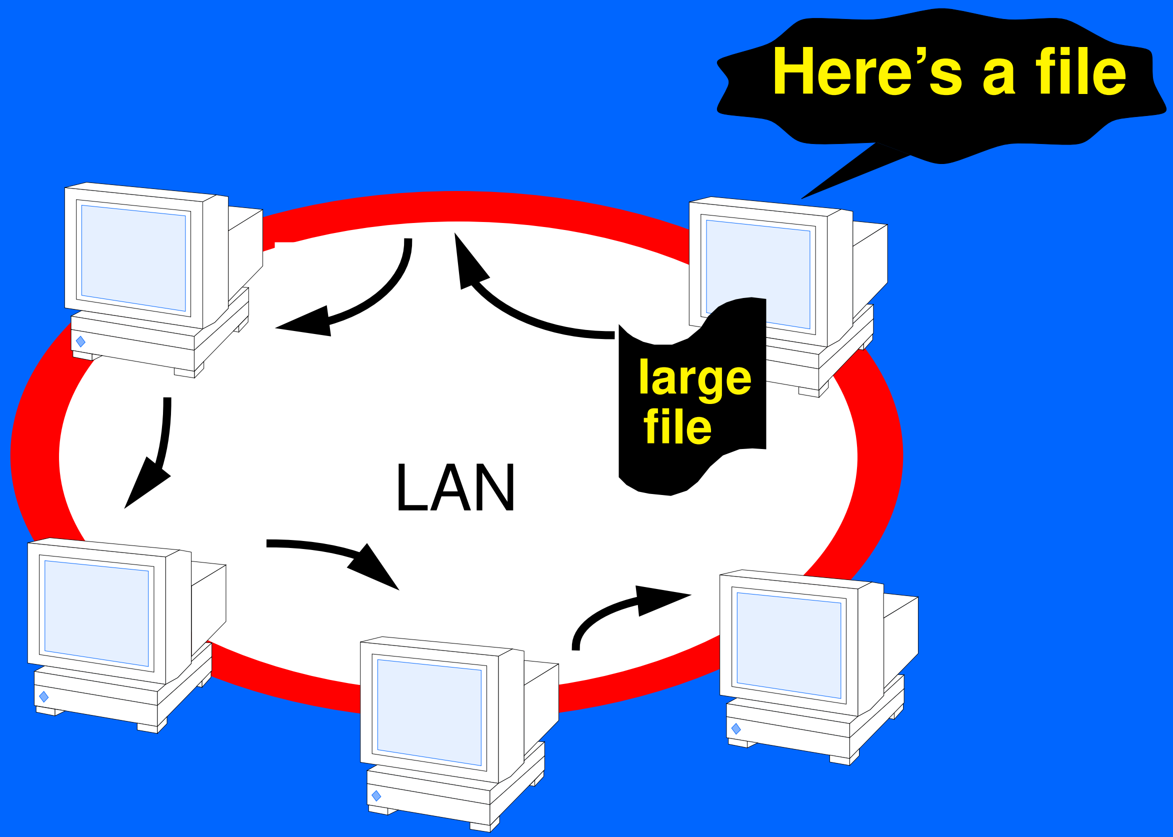
eg. rdist, track, ftp, etc.



Why use a fishing line...?



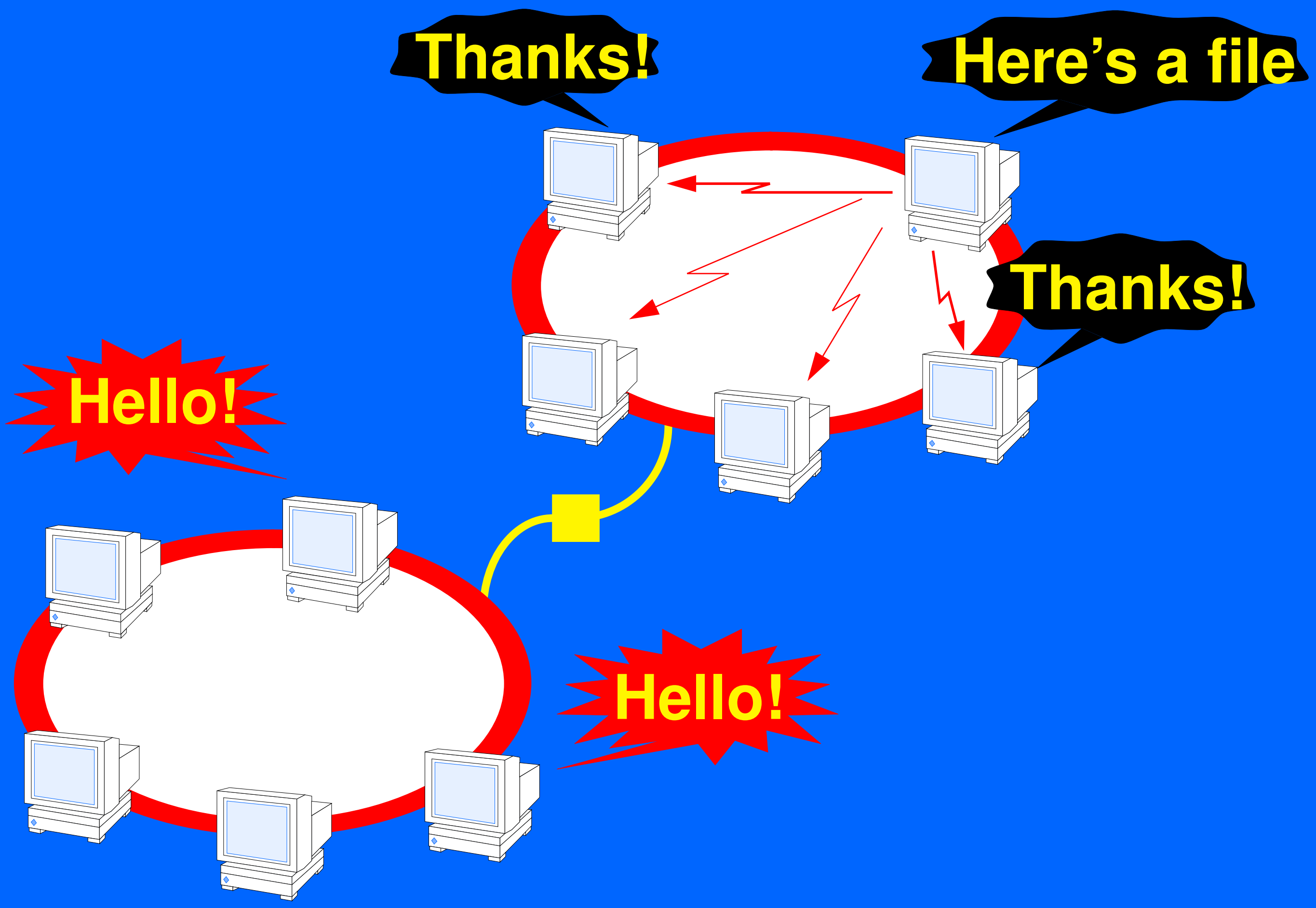
When you have a net(work)?



Motivates a group communication approach

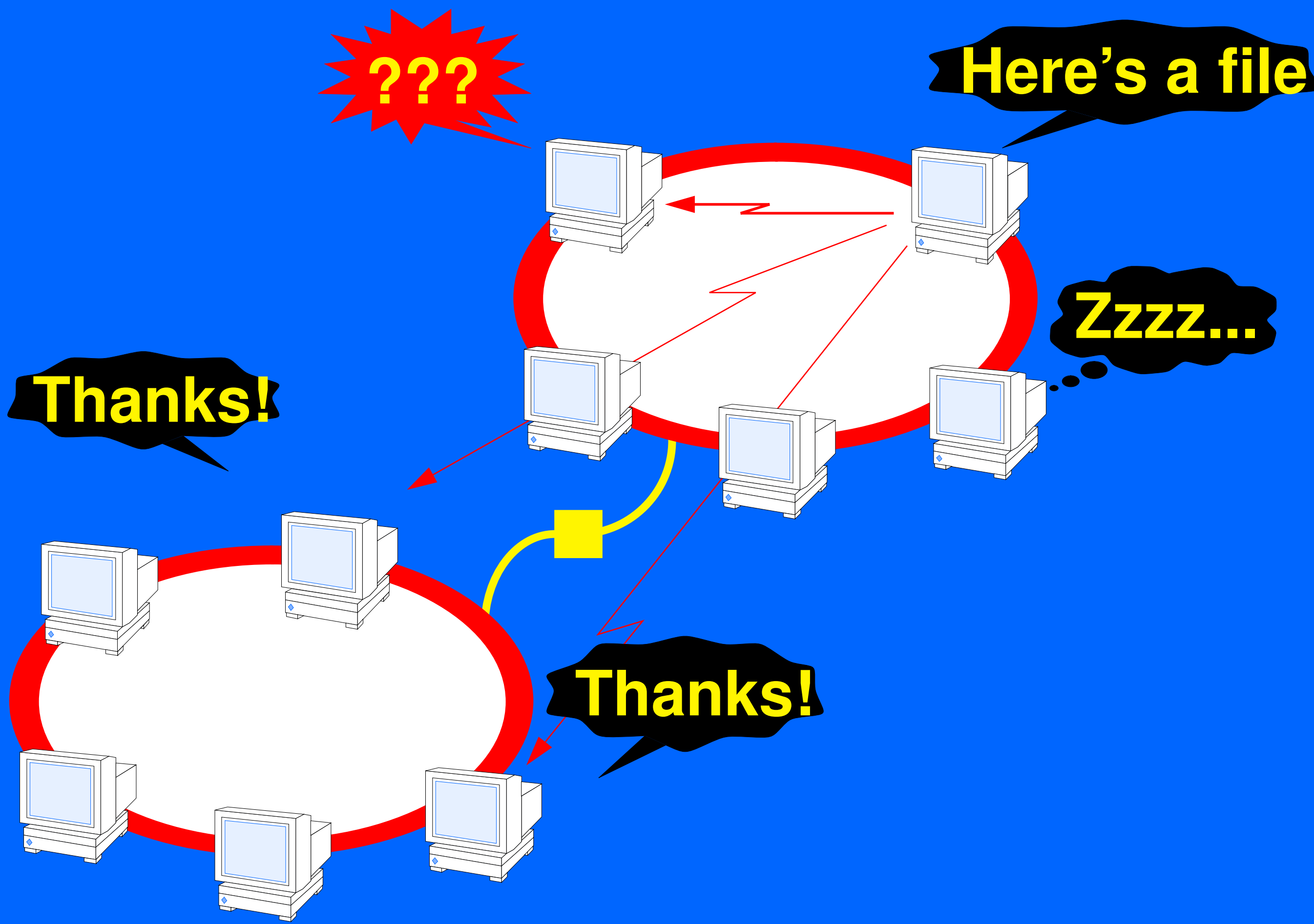
UDP Broadcast

Problem: Broadcast packets cannot travel beyond LAN



UDP Multicast

Problem: Not all hosts support multicast

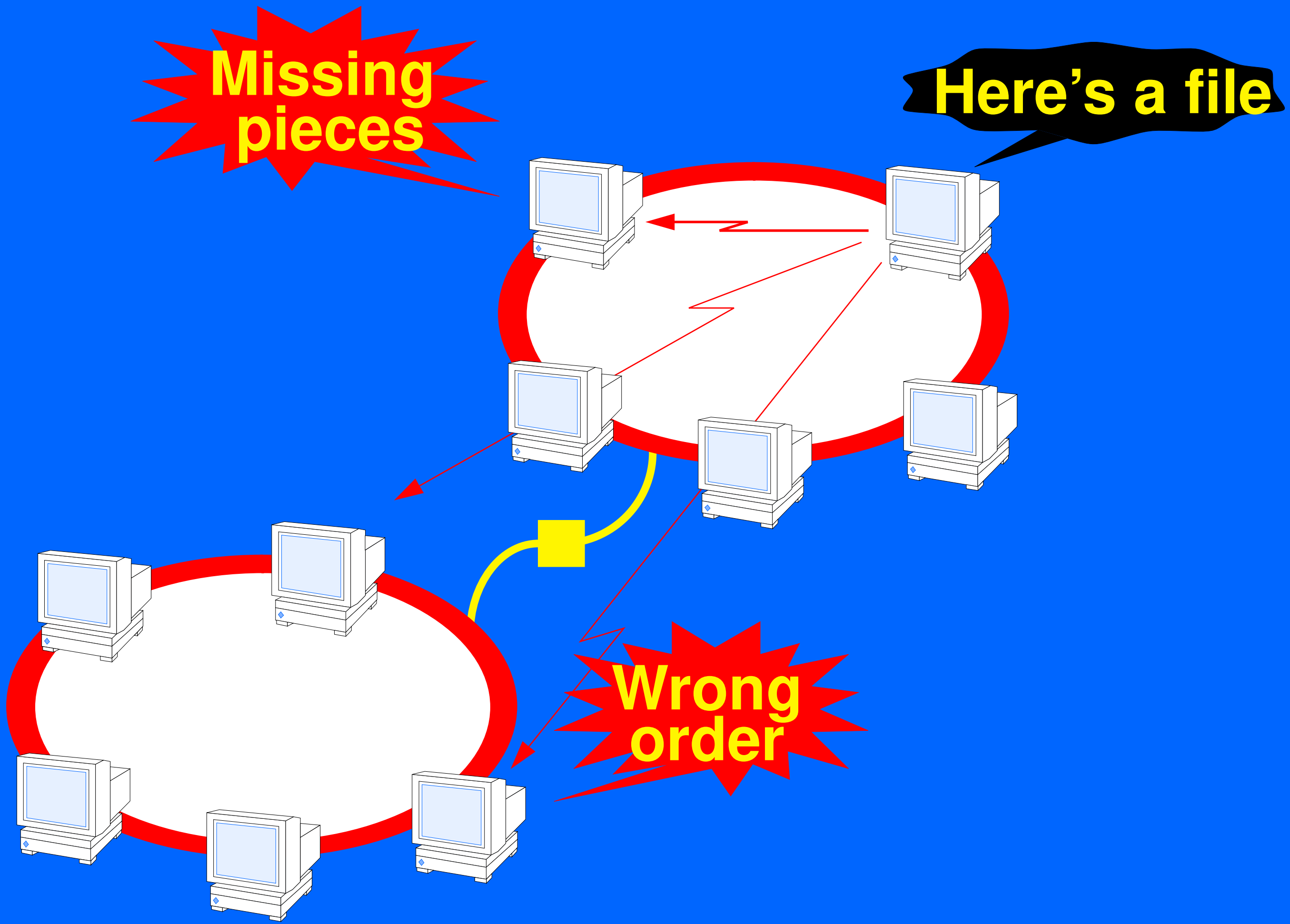


Solution: Hybrid Approach

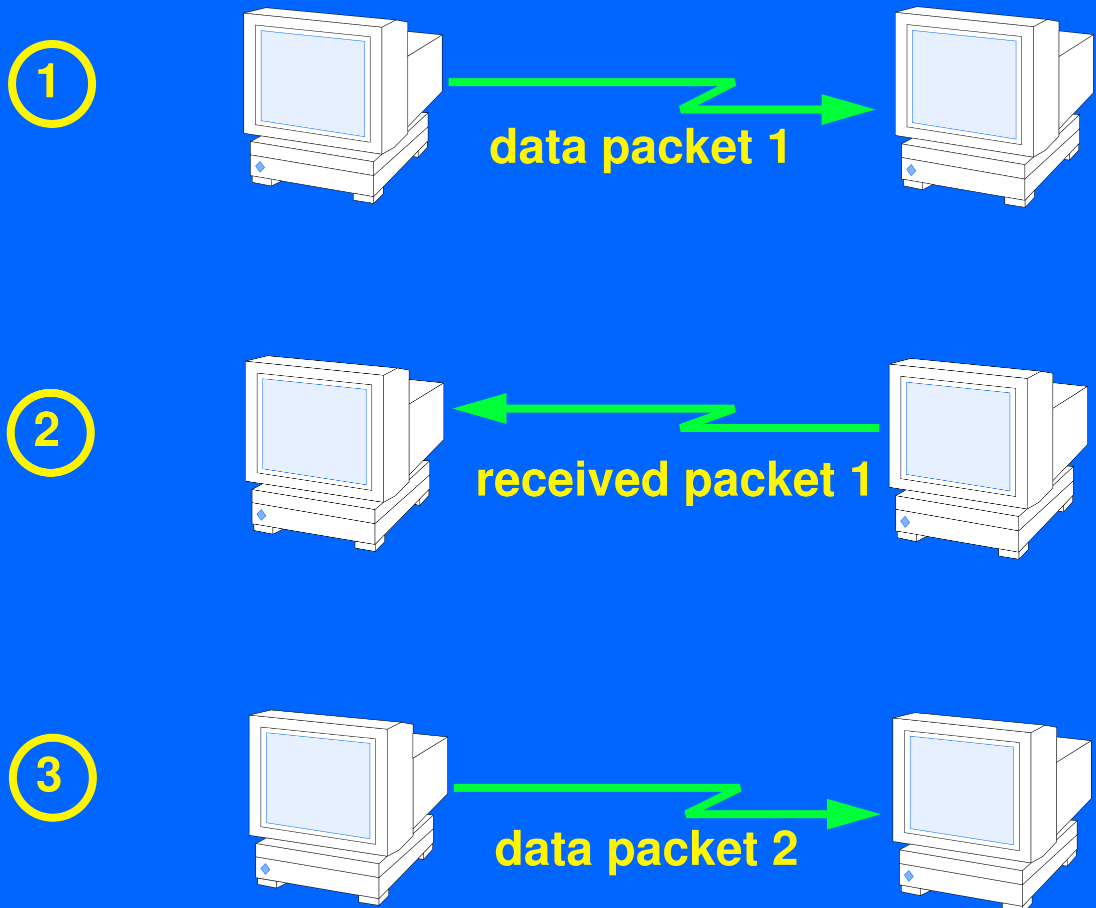
- **multicast** if all hosts support it, else
- **broadcast** if many hosts and all are local, else
- **unicast** to selected hosts

user can set transition threshold from unicast to broadcast

Unreliability of UDP

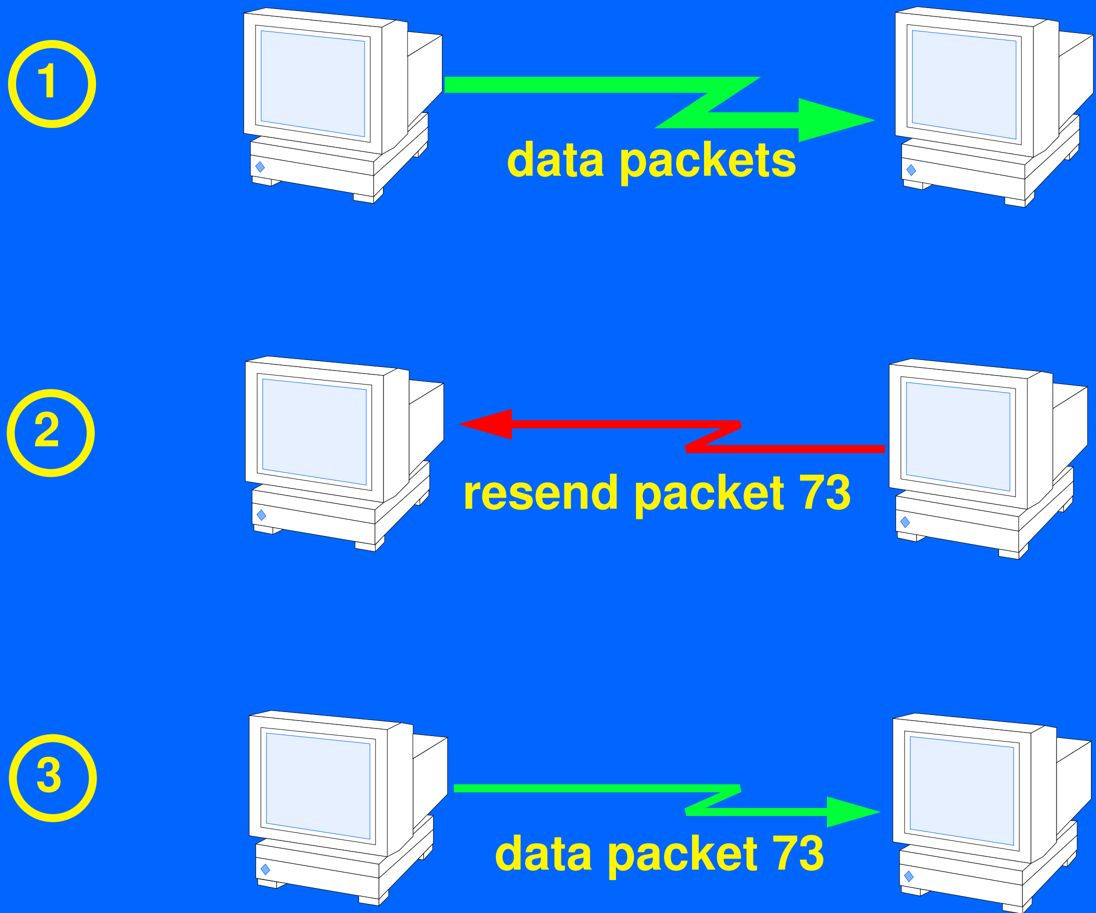


Positive Ack Protocol



Infeasible for large groups

Negative Ack Protocol



Requires far less communication

AFDP

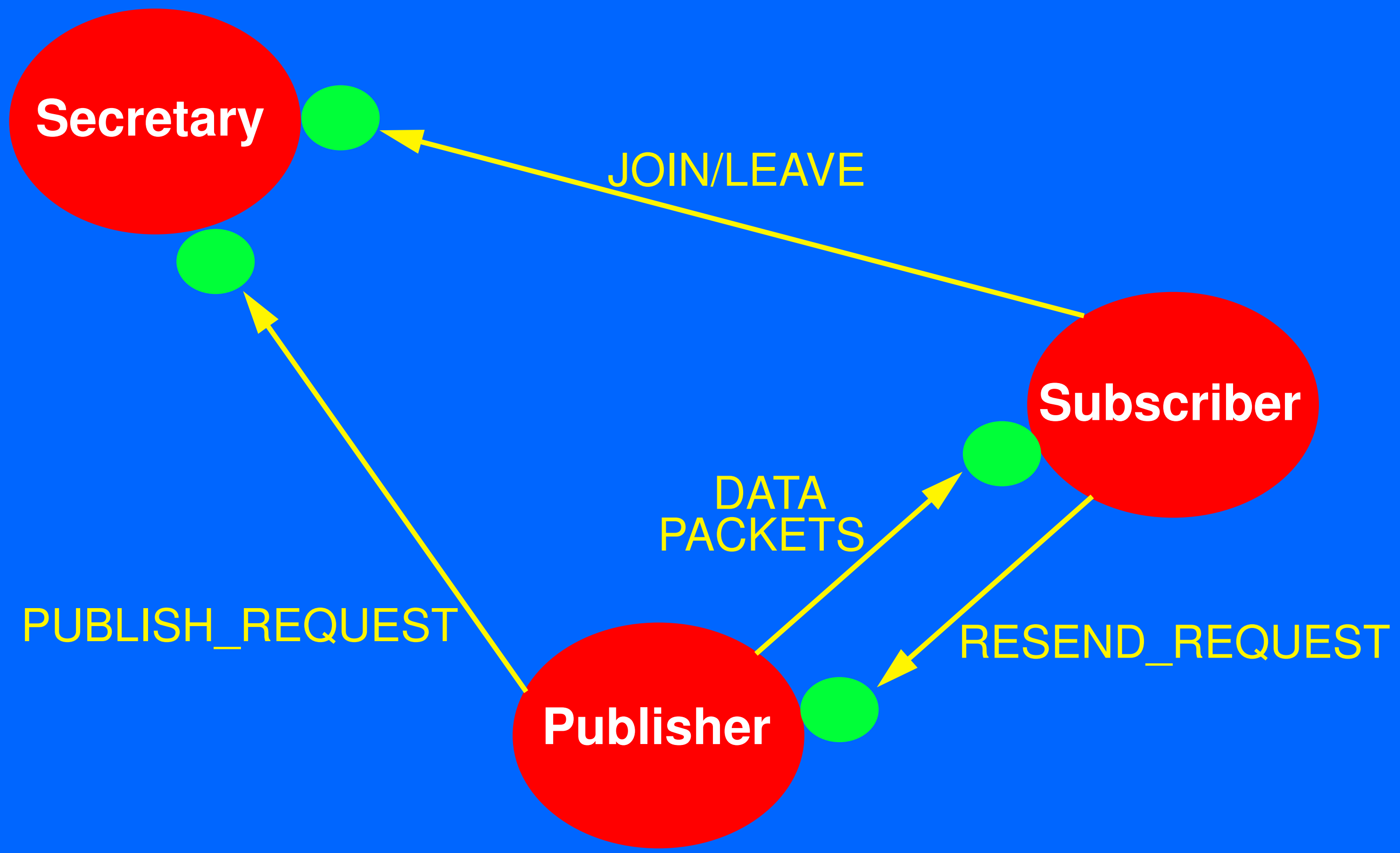
Adaptive File Distribution Protocol

- implemented as two programs:
  afdpjoin and afdpsend
- 6100 lines of C code in total

AFDP Entities

- subscriber: any host wishing to receive data
- publisher: sends data to subscribers
- secretary: co-ordinates group activity

Communication

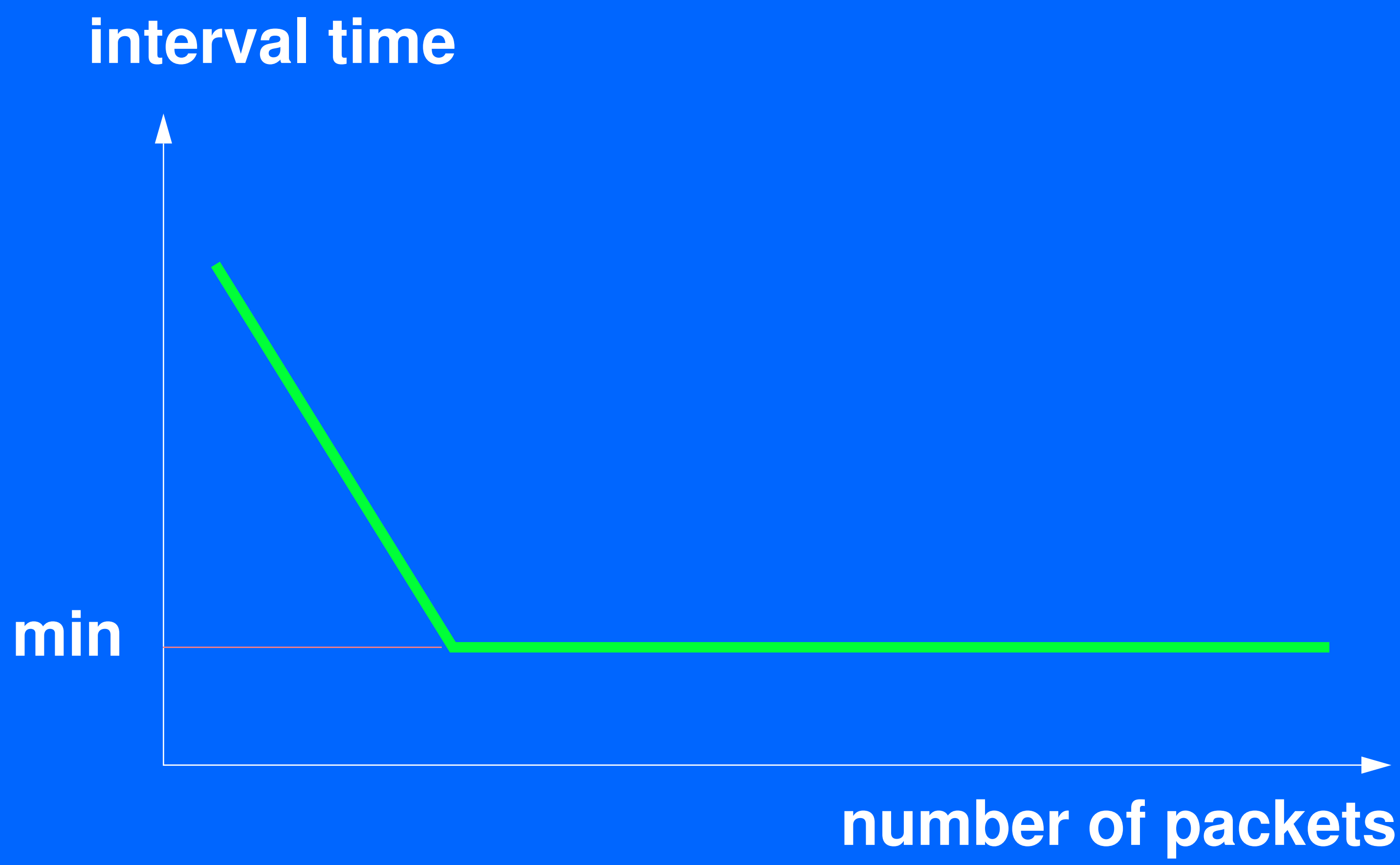


Adaptive:

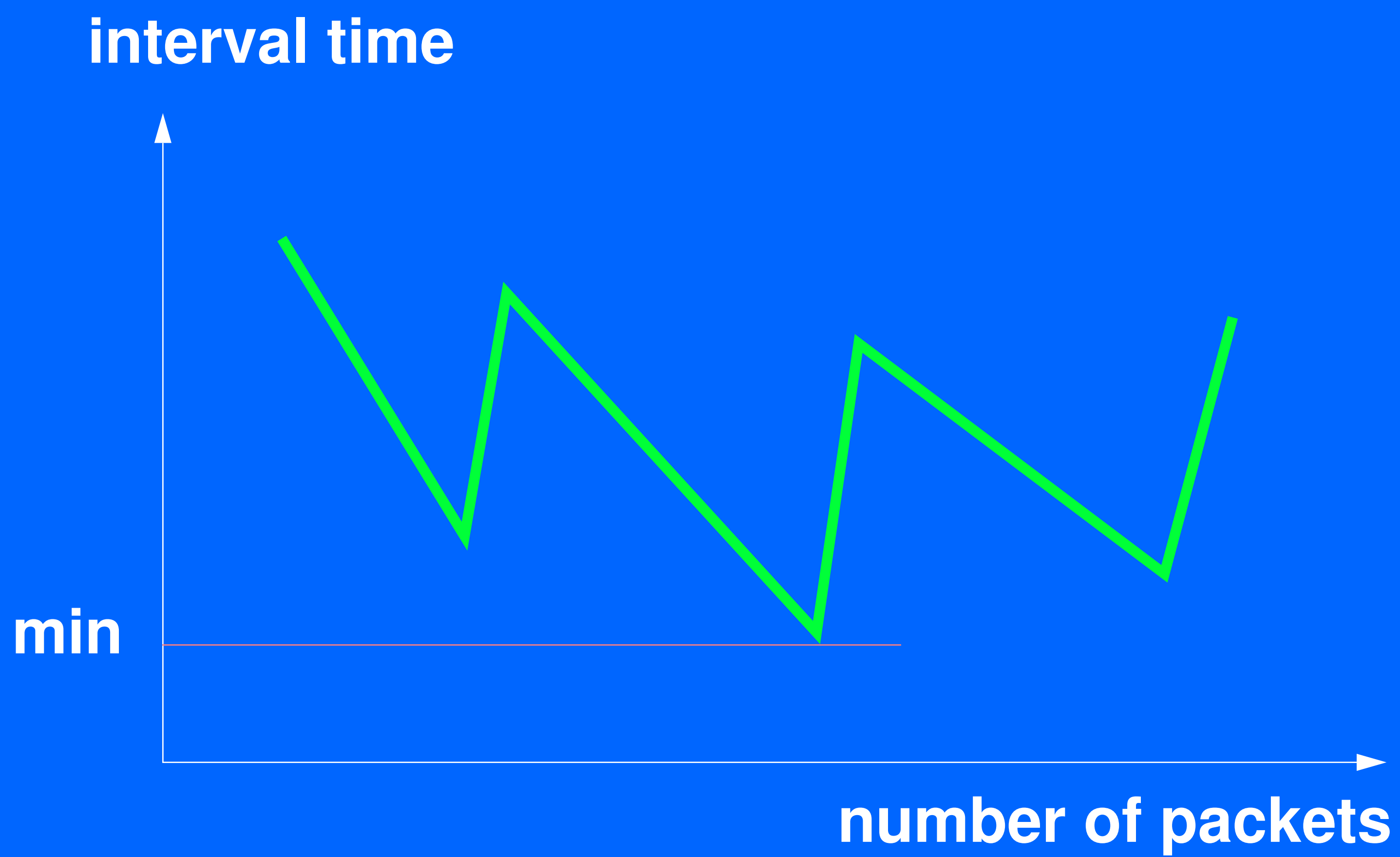
Rate-Based Flow Control

- transmission rate dictated by slowest host
- publisher speeds up while all is well
- publisher slows down when subscribers complain

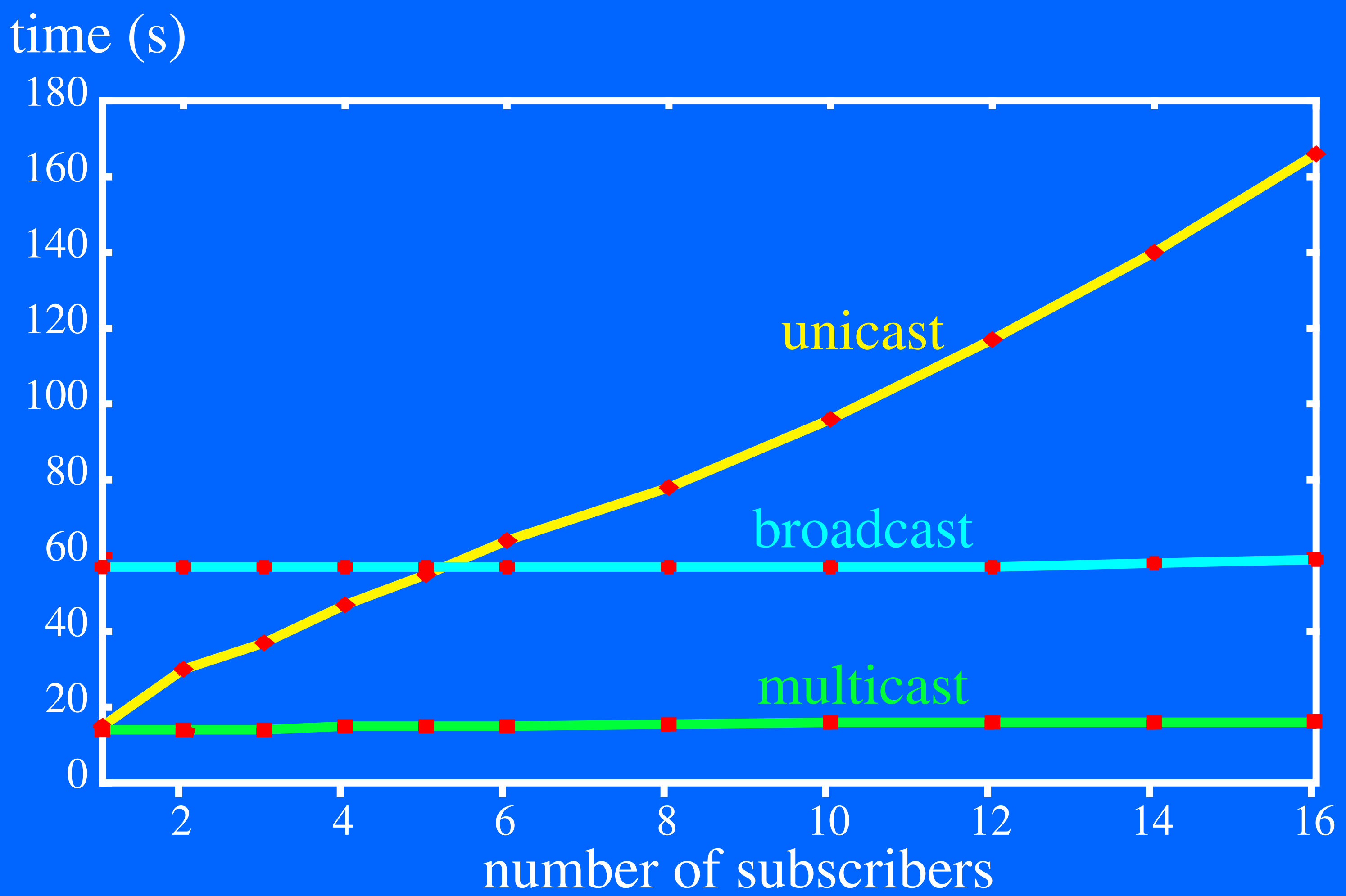
When all is well...



When some host(s) is slow

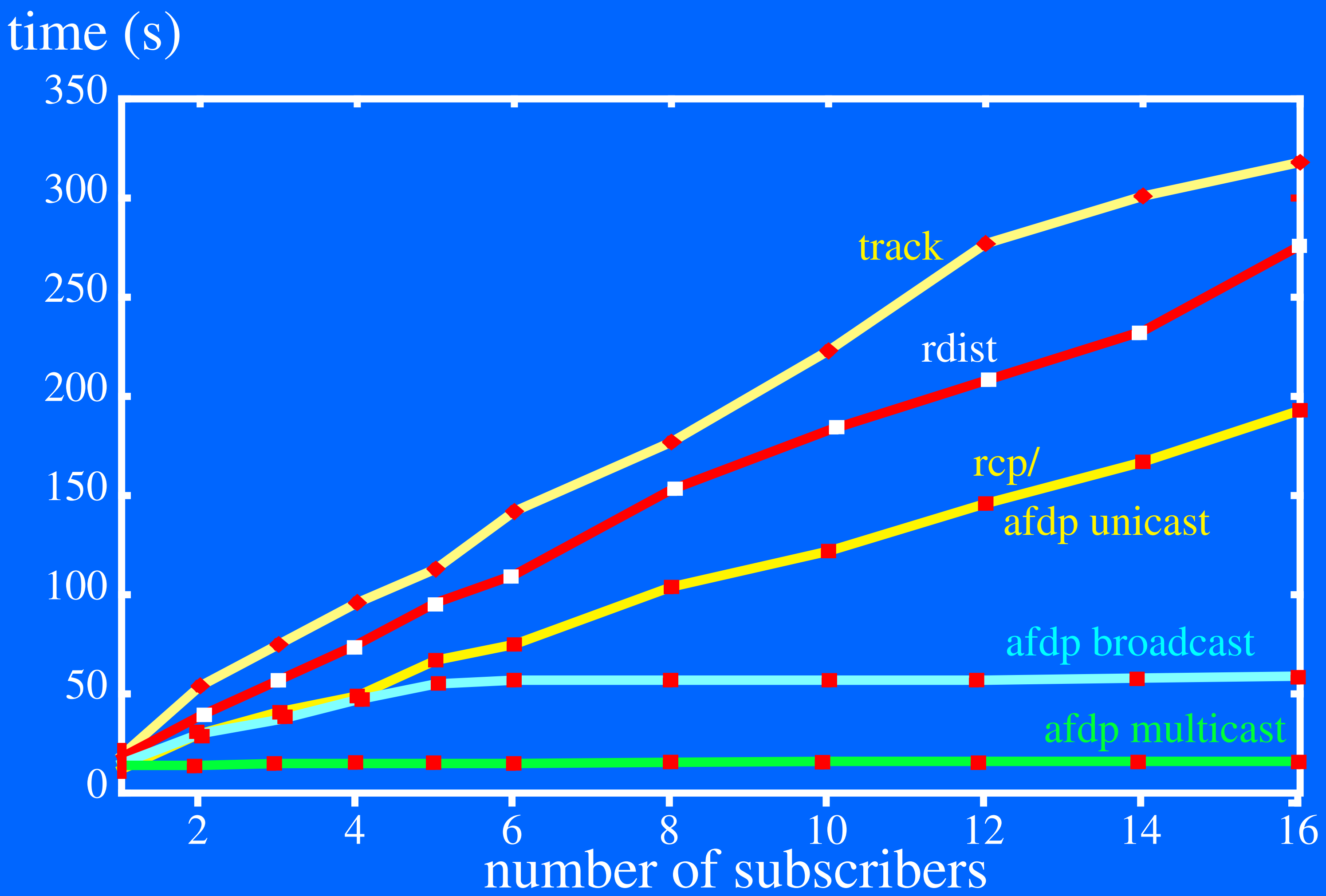


Performance



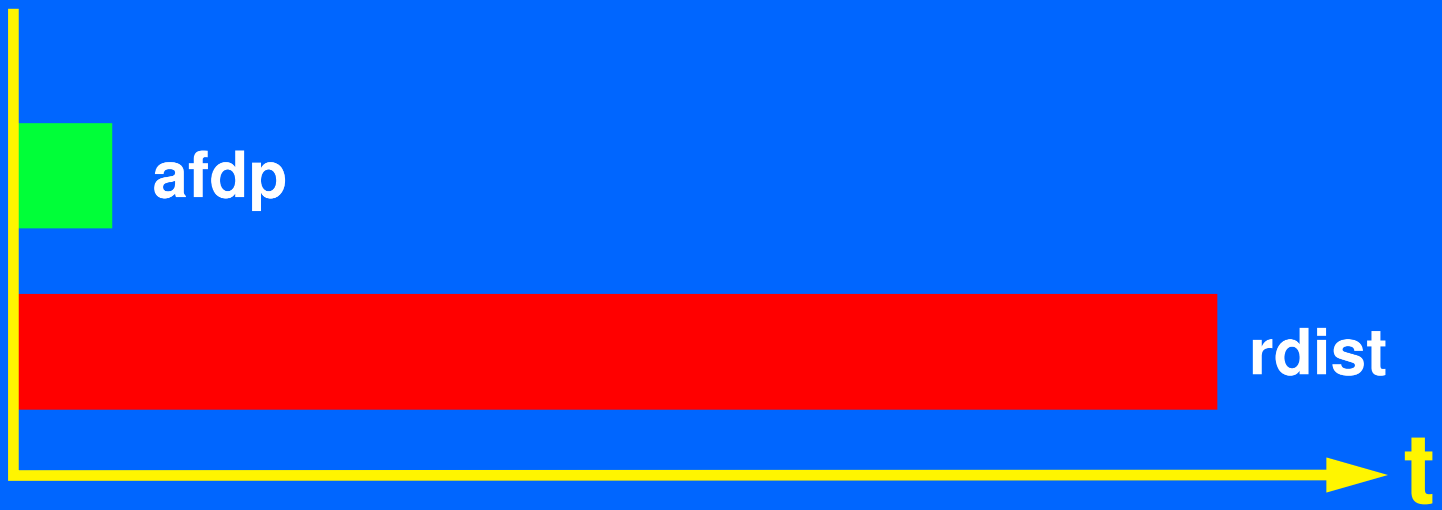
Distribution of a 7.0 MByte file to hosts on a LAN

Comparison



Distribution of a 7.0 MByte file to hosts on a LAN

Real Use



"Performance was impressive. afdpsend of /etc/passwd to sixty-eight machines took 20 seconds. The equivalent rdist took 251 seconds."

- John DiMarco,
Computing Disciplines Facility SysAdmin
University of Toronto

Hooks

Remote command execution

Useful for:

- encryption
- authentication
- end-to-end verification
- applications

Applications

- multimedia demos
- file system updates (afdpdist)
- distributed database searches
- group education
- whatever else you can think of...

Multimedia

afdpsend -c magic-cat map.gif forecast.au

afdpdist

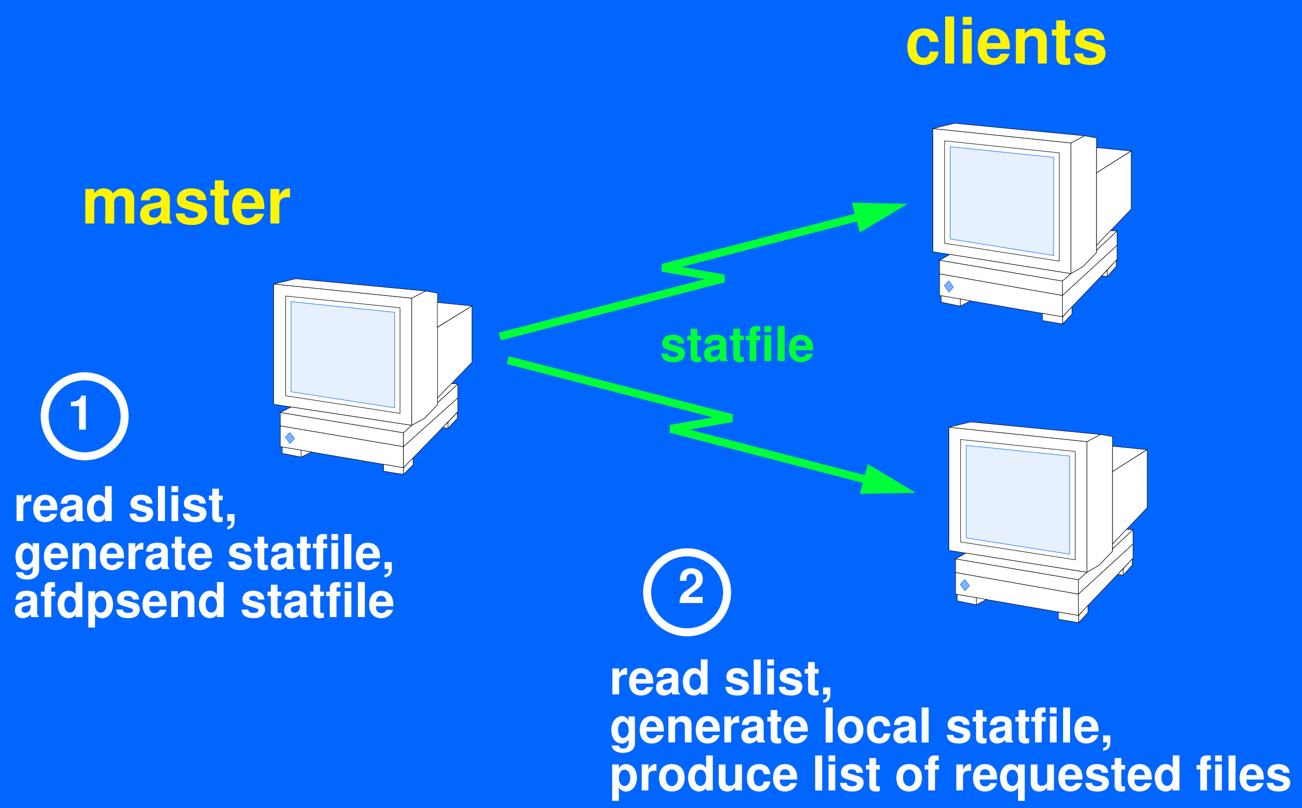
- distributes files similar to track and rdist
- 340 lines of code (most is shell script)

afdpdist files

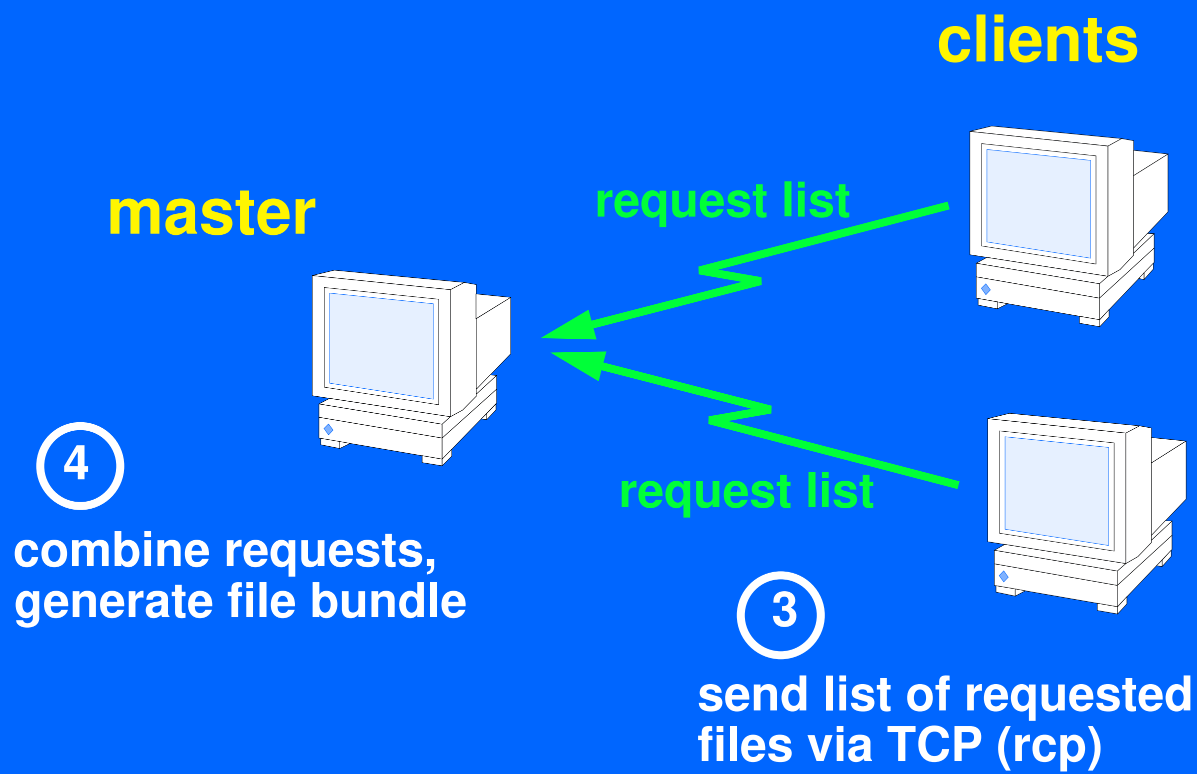
slist (subscription list)
/etc/fstab
/etc/passwd
/etc/motd
/local/libexec

statfile (status information about files)
/etc/fstab 2270 Nov 28 23:42
/etc/motd /share/adm/motd
/etc/passwd 2478 Dec 6 15:01
/local/libexec/bigram 14352 Jan 10 1995
/local/libexec/code 18512 Jan 10 1995
/local/libexec/frcode 14368 Jan 10 1995

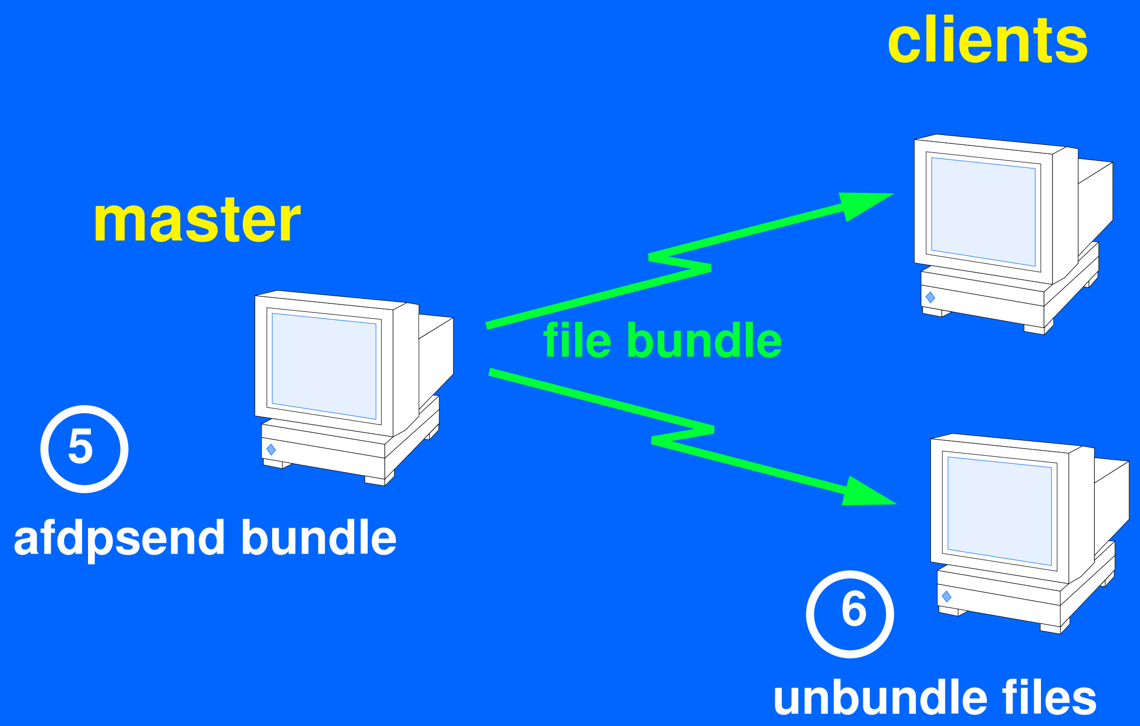
afdpdist in action



afdpdist in action



afdpdist in action



AFDP Summary

- distributes large files rapidly and efficiently
- at best, distribution time independent of group size
- at worst, distribution time linear in group size
- chooses from available communication modes
- works over LAN or internetwork

Questions?

http://www.ecf.toronto.edu/afdp