

Computer Communication

An introduction

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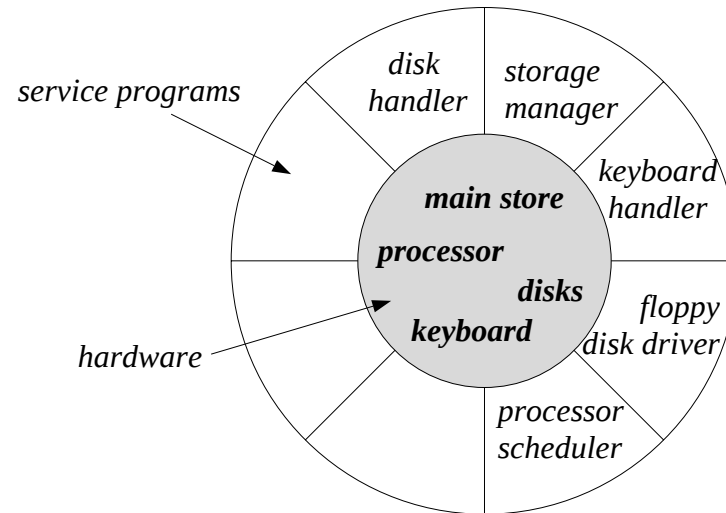
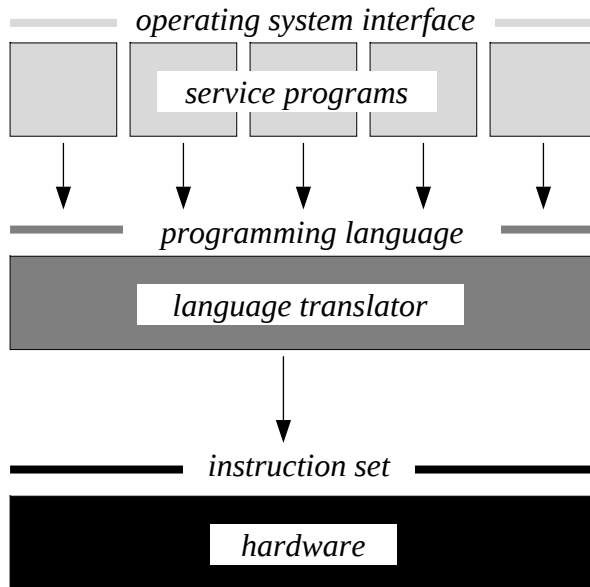
Structure of the introduction

1

- **Part 1**, "light" intro; focus:
 - Issues, problems in computer communication
 - A "flavour" of solutions
 - The "structure" of study in the field
- **Part 2**, more "technical" intro; focus:
 - taxonomy, internet context
 - overview
 - terminology

Starting from computers: the principles

2



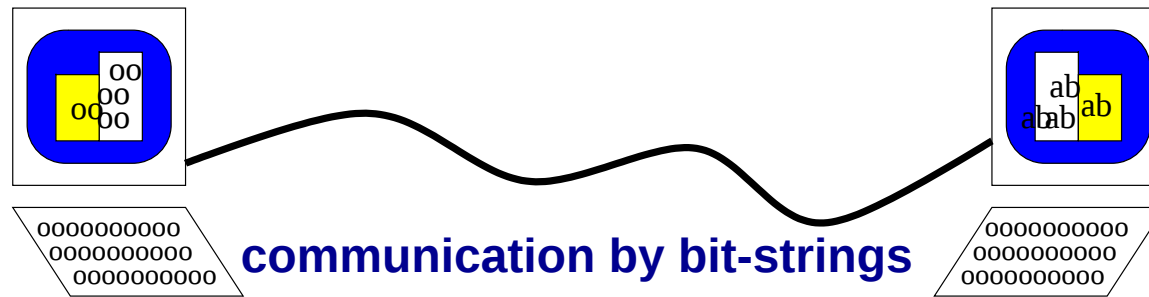
A computer: virtual, multi-layered machine^a

^aunlabeled figs are from "Computer and Network Organization" by van Steen, Sips, Pr. Hall, 1996

Operating system: collection of service programs; resource manager, *shield* between user and hardware

A very simple “network”

3



two computers linked through some transmission medium

The transmission can be

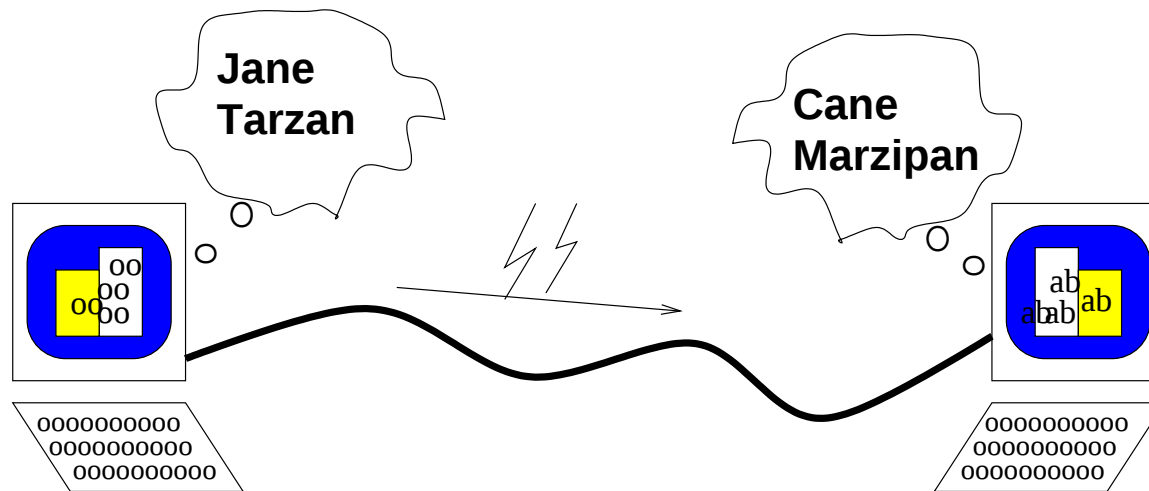
- (a) **wired** (e.g. by electrical/optical wire), or
- (b) **wireless** (e.g. by radio/satellite connection)

Assume we programmed interface/drivers to take care of bit transfers

First problems...

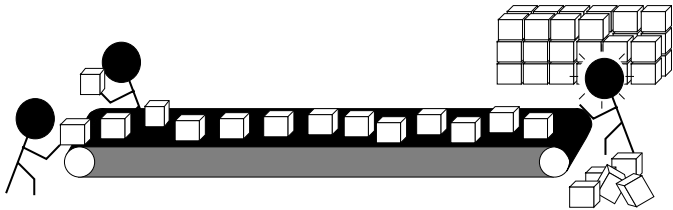
4

1. Transmission Errors (Unreliable links)

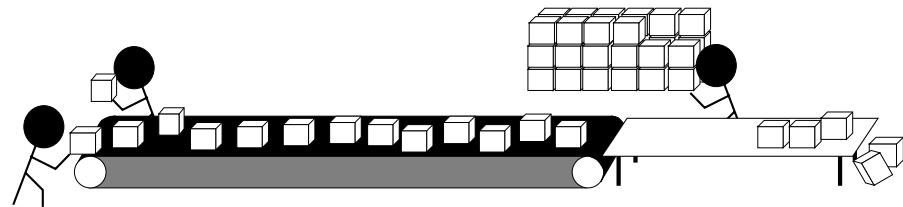


Need for error detection & correction methods (parity, error-correcting codes, ...)

2. “Producer-Consumer” problems



similar to the effect of e.g.
not properly balancing the
work on a conveyor belt



Using a **buffering** area to
assist removal of boxes

... **BUT STILL** boxes can get lost, i.e. we have an
unreliable network.

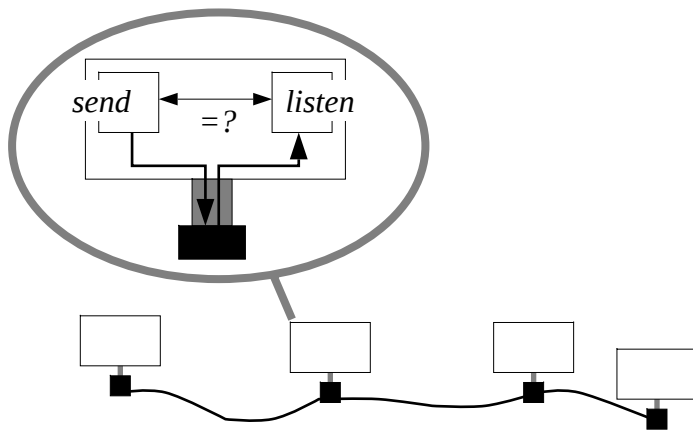
Need for methods to make it reliable (ack's, retransmission,
seq. numbers, ...)

Expanding the network

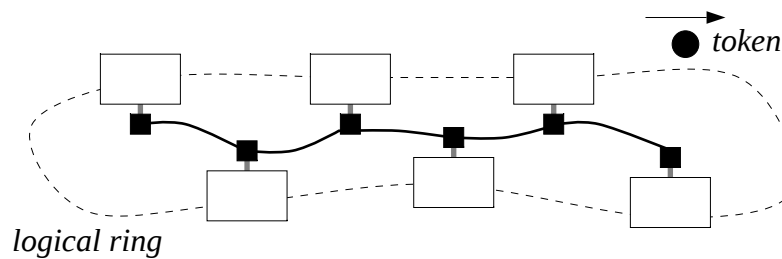
6

1. Sharing a single transmission medium (e.g. bus, ...)

i.e. need to cope with **message collisions**



detect collisions & retry

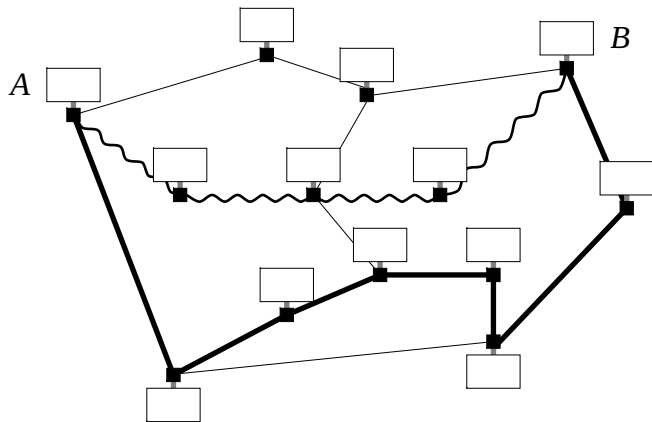


avoid collisions (e.g. use a token for exclusion)

Expanding the network (cnt)

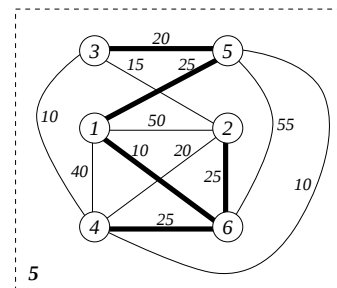
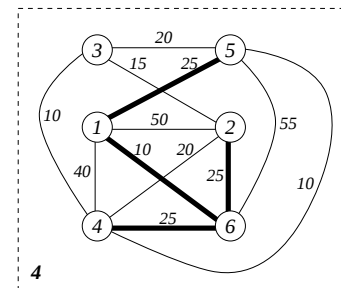
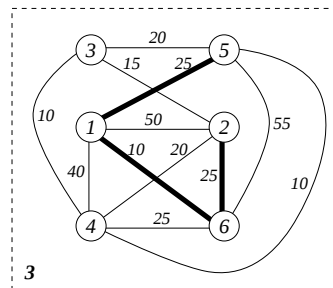
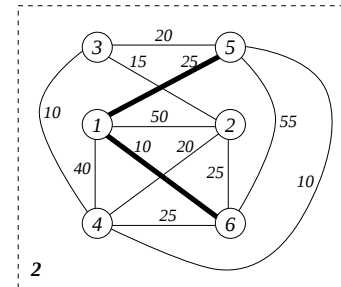
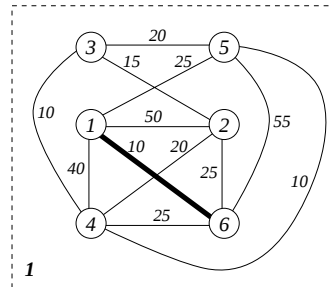
7

2. Point-to-point transmission



must do **routing**

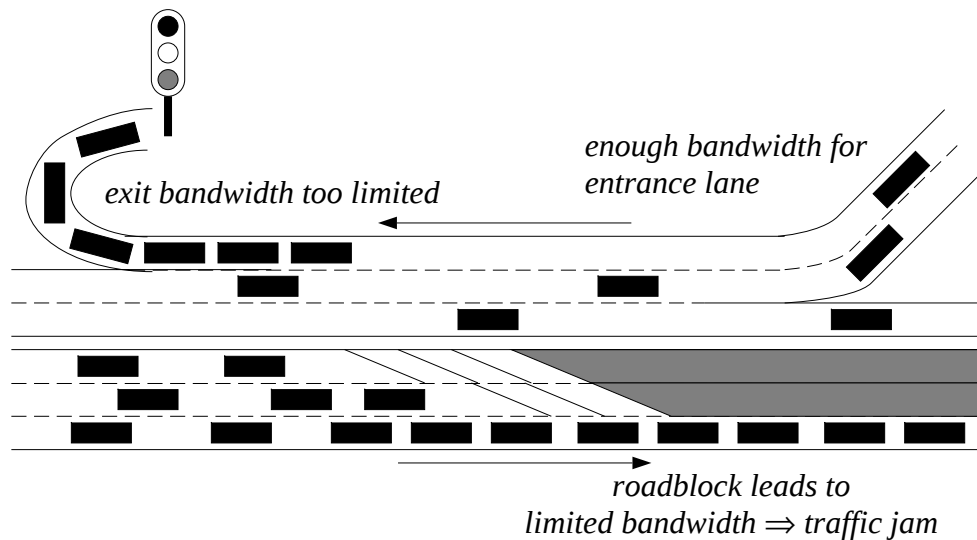
e.g. least-cost, a la Dijkstra;
issues: static routing vs. dynamic, centralised vs. distributed, routing devices, etc; related with ...



Expanding the NW: Point-to-point transmission (cnt.)

8

... congestion and flow-control



dependent on the **bandwidth** available (recall also the buffering discussed earlier)

From *LAN* to *WAN* to *inter-networking* (or internet-working)
... “*Information superhighway*” or “*Information dirt road*”?

- **Sizes** increasing exponentially
- Different “**protocols, standards**” in different networks
- Different traffic (e.g. voice, data, ...) with different **requirements** in the same (inter)network
- Many new problems due to **mobility** (naming & locating hosts, bandwidth allocation, ...)

An example with humans

10

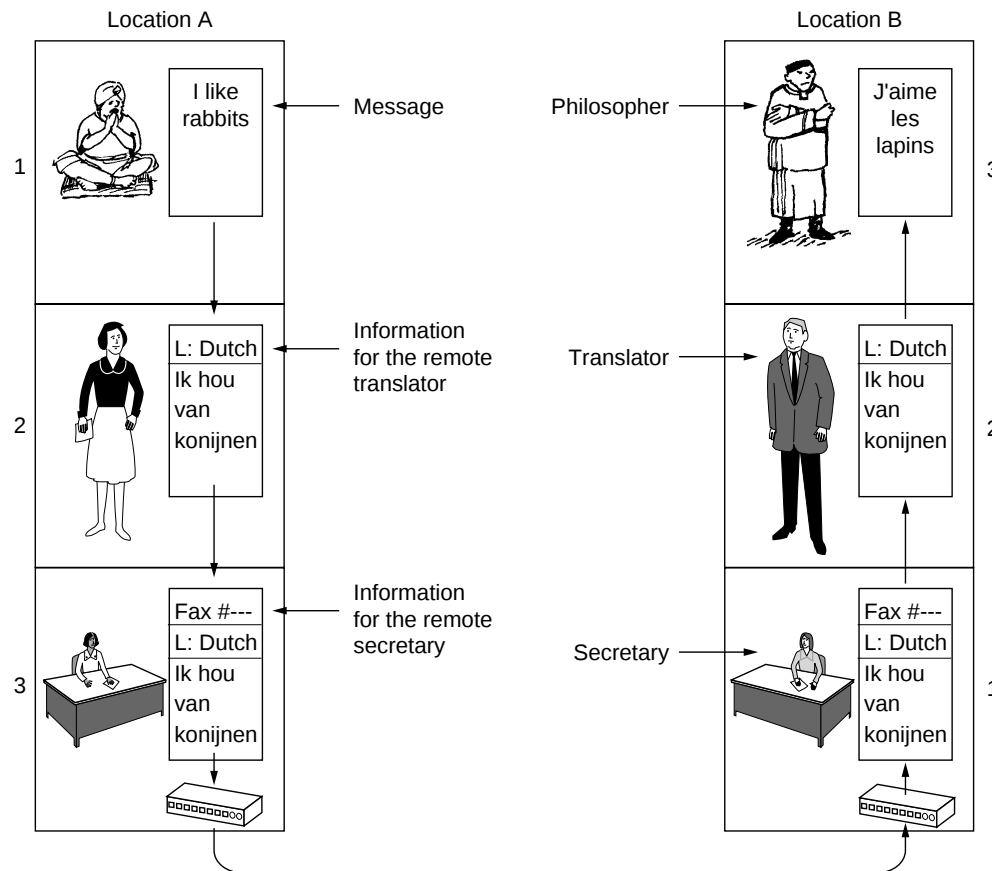
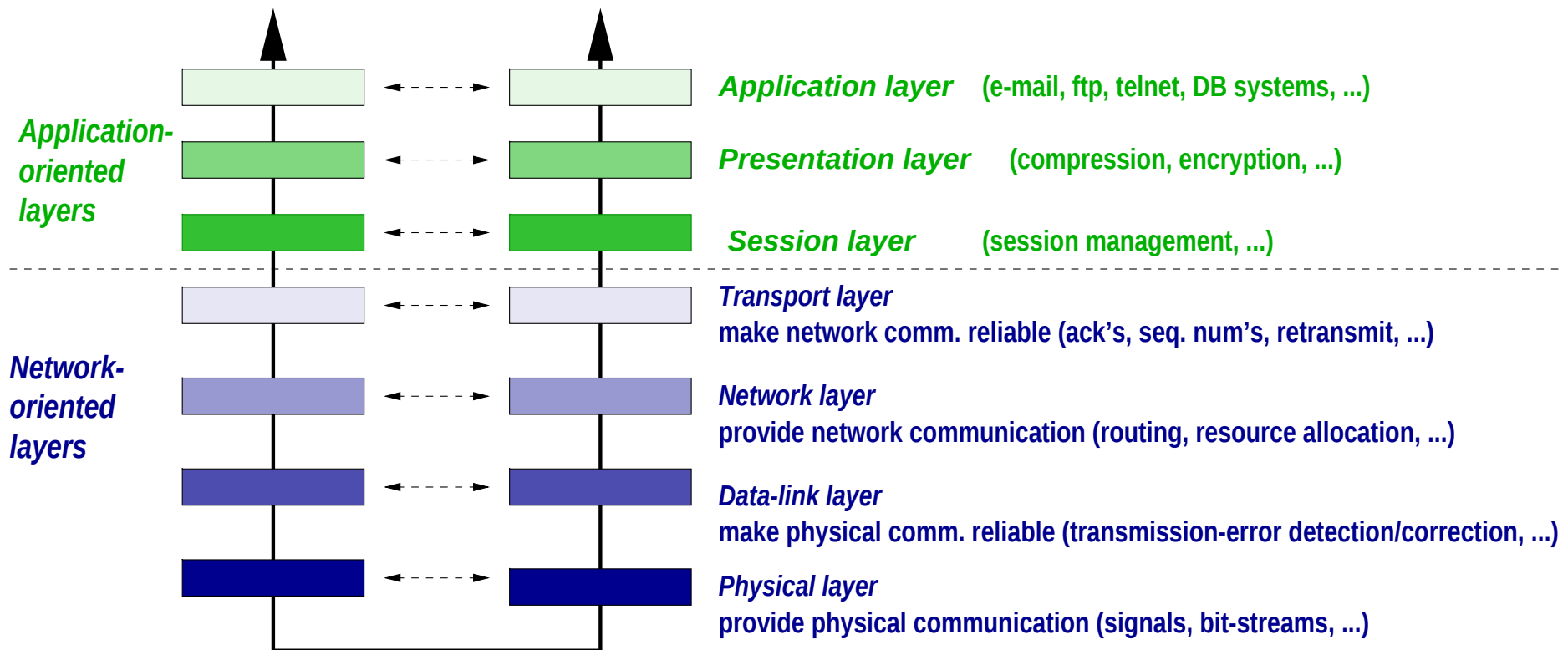


Fig. 1-10. The philosopher-translator-secretary architecture.

Studying & managing computer communication:

... layering (again): ISO standard

11



This class ...

12

- ... **is** about
 - problems, issues in networking
 - possible solutions
 - (possible) solutions within the existing context (Internet, ATM perspectives)
- We have a lot of material to cover...
- ... of diverse character:
 - algo+math-oriented
 - architecture-oriented
 - (some) 3-5-letters-initials-oriented

Some advice ...

13

- ... to be able to put things in perspective:
 - come to classes (if you miss some, speak with people who came)
 - read on-line (don't wait until last weeks)
 - do the labs in time (don't wait until last weeks)
 - excercises, questions, www-site of book+course, practice using protocols following the hints in the book