DEPARTMENT
OF INFORMATION
TECHNOLOGIES
FEM CULS PRAGUE

Computing Models Overview

CZECH
UNIVERSITY
OF LIFE SCIENCES PRAGUE

Agenda

- What is the computing model?
- Batch processing
- Remote Job Entry and autonomous agents
- Host & terminal
- Desktop PC
- Need for sharing
- File server & workstation
- Client & server
- Three-layer C/S model
- Cloud solution

What is the computing model?

- A complex picture of:
  - Application storage
  - Data origin, data input
  - Application balancing
  - Data processing and storage
  - User roles and actions
- Describes:
  - Time relations
  - Physical relations
  - Ownership

Computing models

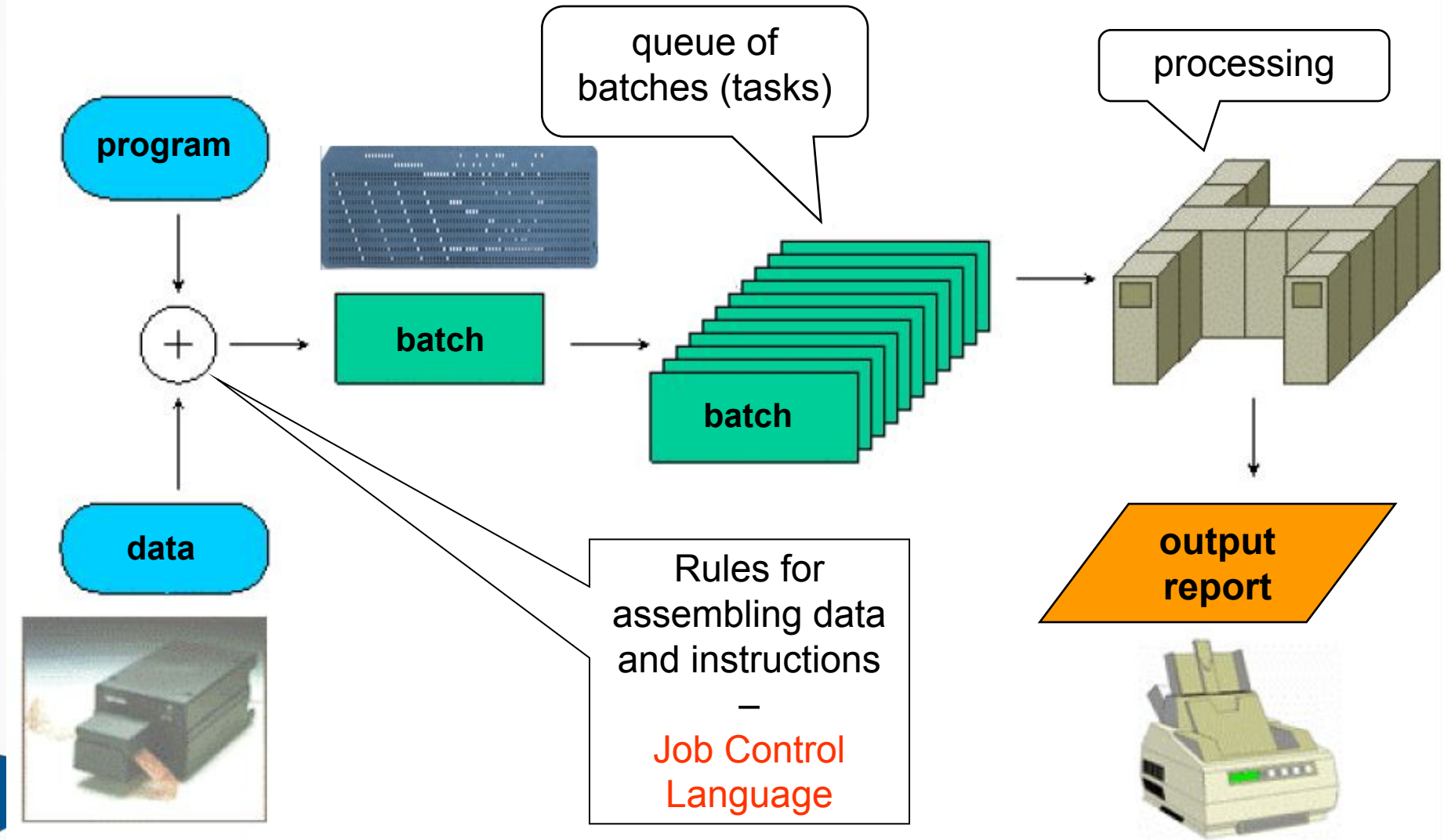
- Depend on:
  - Hardware and software capabilities
  - Networks availability and connection
  - User and manufacturer preferences
  - Pressures to minimize costs
  - Security needs
- The computing model is under constant development

Batch processing

- Computer processing of information that has been assembled into batches of transactions prior to input
- The batch in on the punched card (history) or other media
- Input
- Output printing
- Mainframe or supercomputer
- Today: complex computing tasks solved on supercomputers

Picture: purposeof.com.au

Batch Processing



Source: J.Peterka. www.earchiv.cz,
Punched card picture: en.wikipedia.org

Batch processing

Pros	Cons
Efficient use of hardware	Lack of interactivity
Pressure on user / operator to prepare a bug less batch	Need for advanced user skills

Remote Job Entry & agents

Remote Job Entry (RJE)

- Newer form of batch processing
- The batch prepared on workstation and send to the server (supercomputer)

Autonomous agents

- Software module with data (batch) that conducts the data processing autonomously
- E.g. web crawlers and bots

Decomposition of a complex task

- 2*(23-7)+((14/2)+(8+12)*(9-8))-(8*9)+((7*2)*(6-2))-(((2*3)+(4-7))-(9-7))=*?*

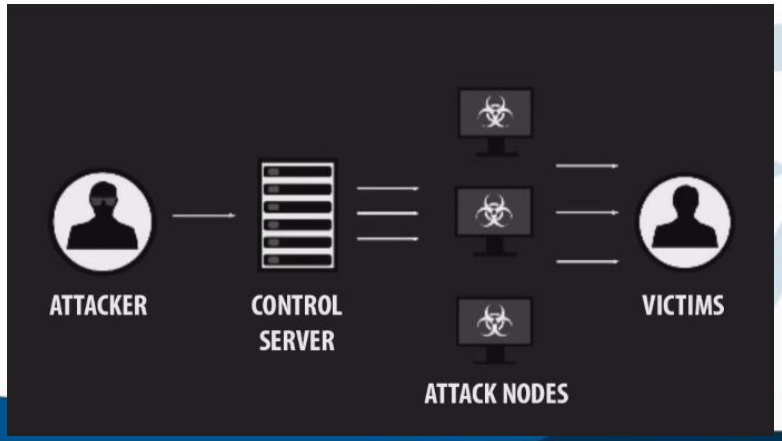
- The task is too time-difficult and space-consuming for one computational power.
- De-composition allows us to solve it using several smaller/slower machines.

Gathering of the computational power

- Voluntary
  - BOINC

- Payed
  - Cryptocurrency

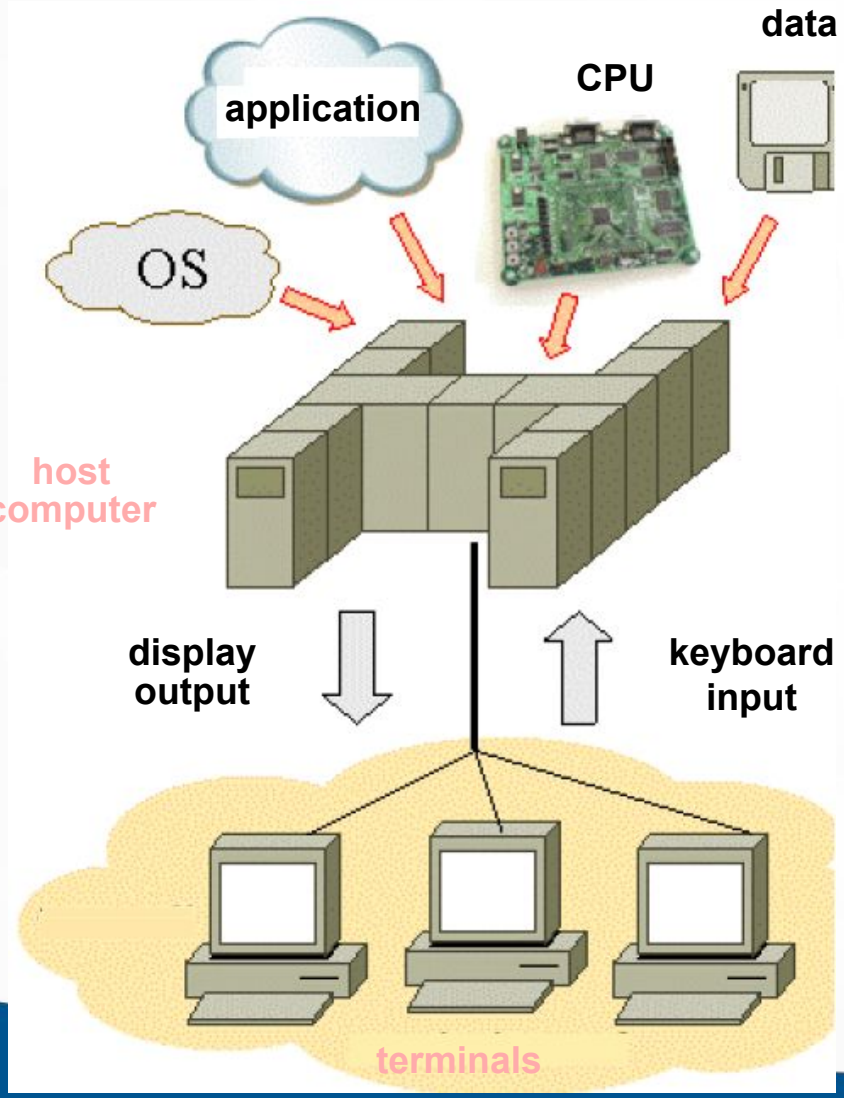
- Stolen
  - Botnets



Interactive processing

- Mainframe < - > terminals/workstations
- Each user action causes a response
- Exchange of information between a user and a computer
- Work in real time

Host / Terminal



Source: J.Peterka. www.earchiv.cz.

Host / Terminal - example

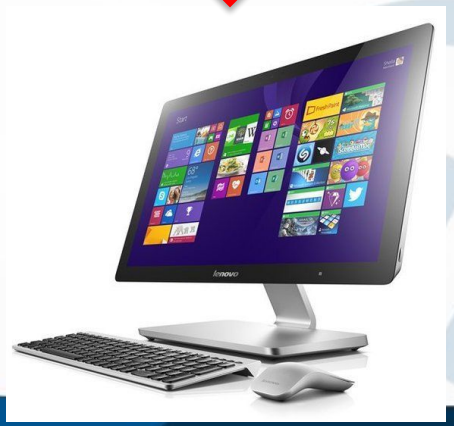
Host / Terminal

- Terminal is an application running on hosting computer
- In practice: remote desktop management (LANDesk, ZENworks, etc.)

Pros	Cons
Fast connection	No or limited graphic interface
Only text is transmitted	Need for command line skills
Easier maintenance	

Desktop PC

- Since 1980s
- Connected with hardware advancements and price decrease
- Major platform: Windows, alternative: Mac
- Change: data processing at the user

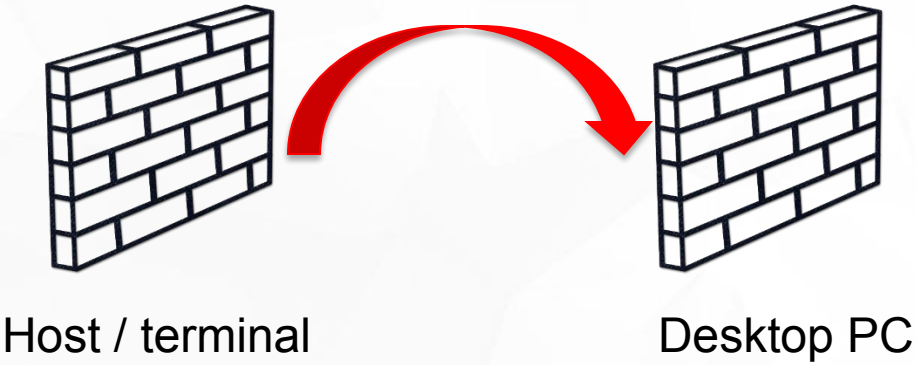


Pictures: purposeof.com.au, pcworld.com

Desktop PC

- A computer intended for stand-alone use by an individual
- Higher productivity of work
- Inexpensive price
- Mass production
- Exponential increase in the power of PC
- Every 2-3 years new hardware and software

Desktop PC



Shift to “decentralization”

Multiplication of management
(x stations = Nx issues)

Seek for compromise

Sharing vs. owning

Sharing	Owning
Storage	Basic input and output devices
Printer	CPU
Network	Memory

Need for sharing – inception of LANs

- LAN = Local Area Networks
- Fast network connection (100 Mbit/s or more)
- Seamless sharing of application and data
- E.g. virtual desktops in FEM computer rooms

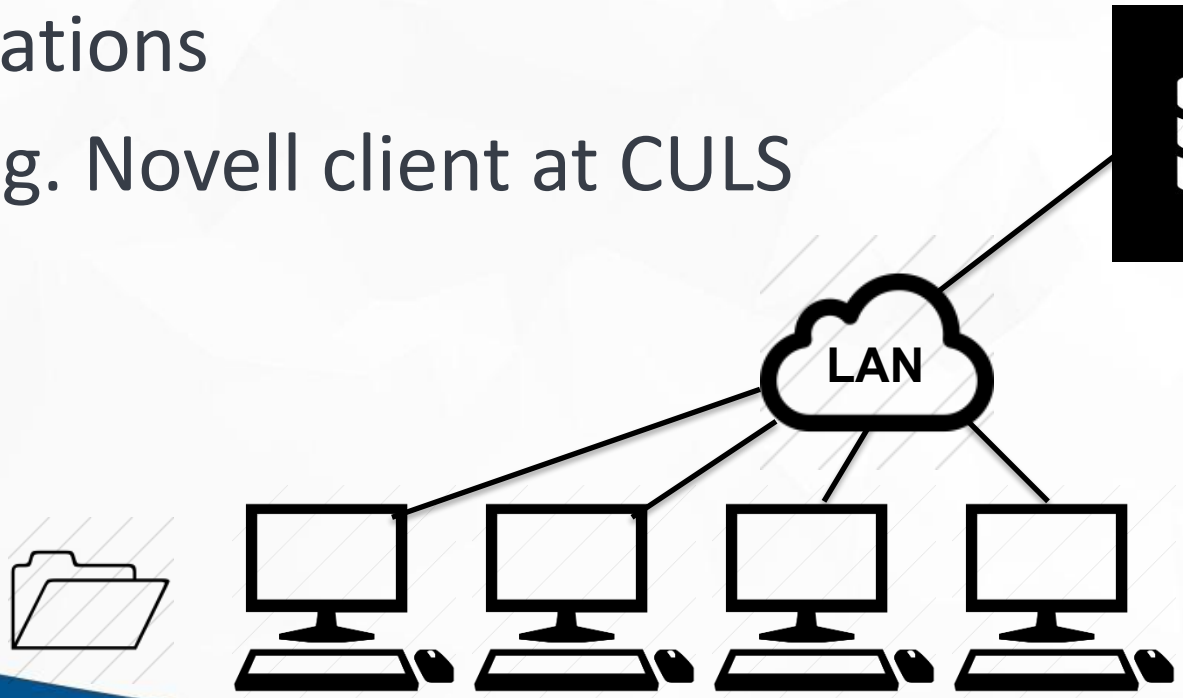
LAN

- Computer network of PC
- One or more servers
- Different topologies/configurations:

  bus, star, ring
- Speed of transmission 10 Mbps -1Gbps
- Transmission medium - coaxial cable, twisted pair, optical fibres

File server / work station

- Server provides files and folders as network drives
- Seamless mapping of network drives on work stations
- E.g. Novell client at CULS

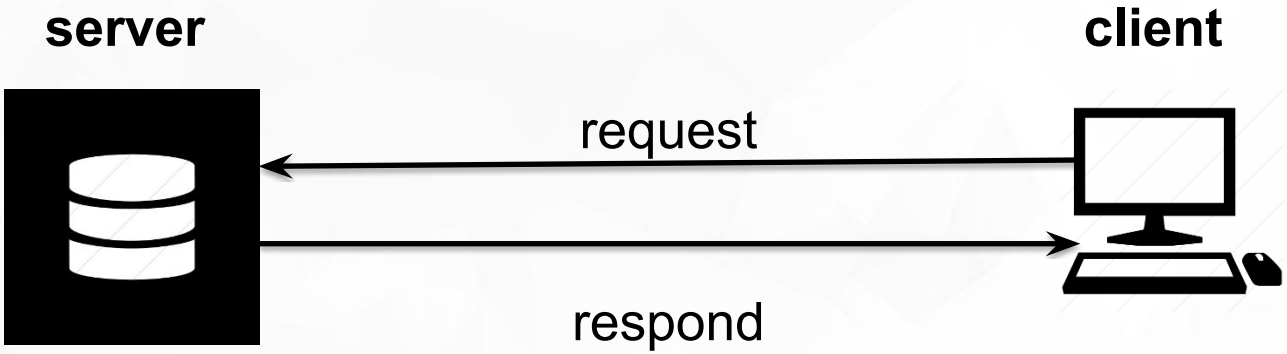


Icons: iconsets.com

File server / work station

Pros	Cons
Data and application sharing	Configuration for multiple users
No network capability needed (e.g. Microsoft Office)	Multiple access to single file
	Large volume transfers

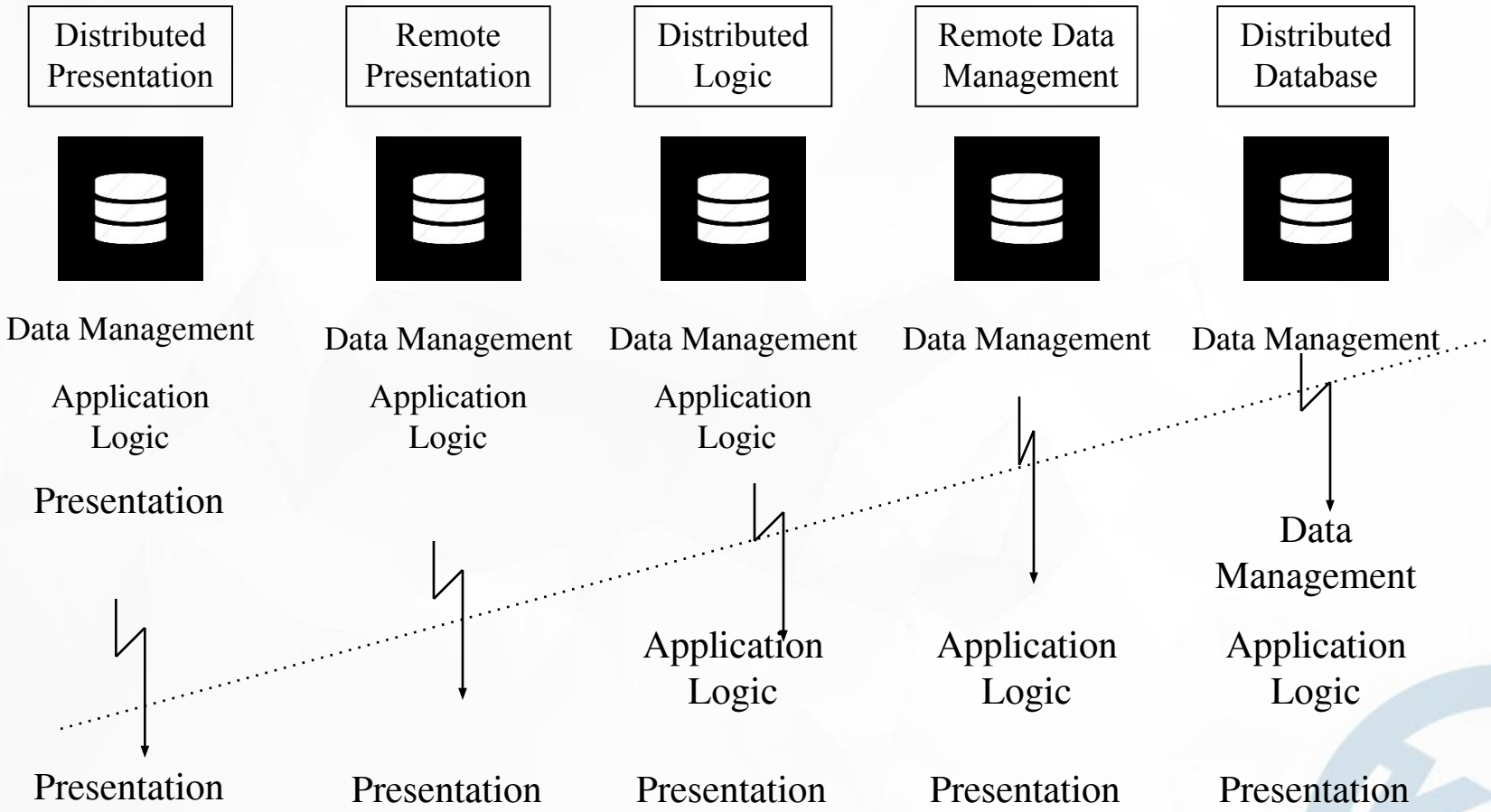
Client / Server



Client / Server Architecture

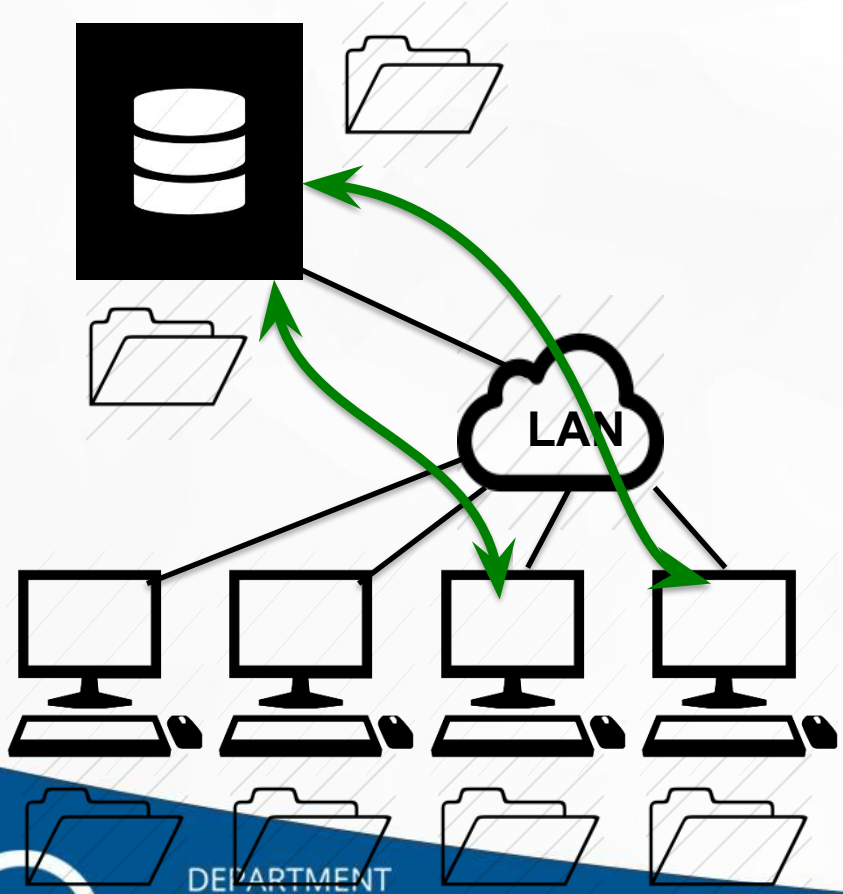
- More general concept - middleware
  - clients - PC
  - servers - database, print, file
- Distribution of tasks in
    - Presentation
    - Computing (application logic)
    - Storage (data)

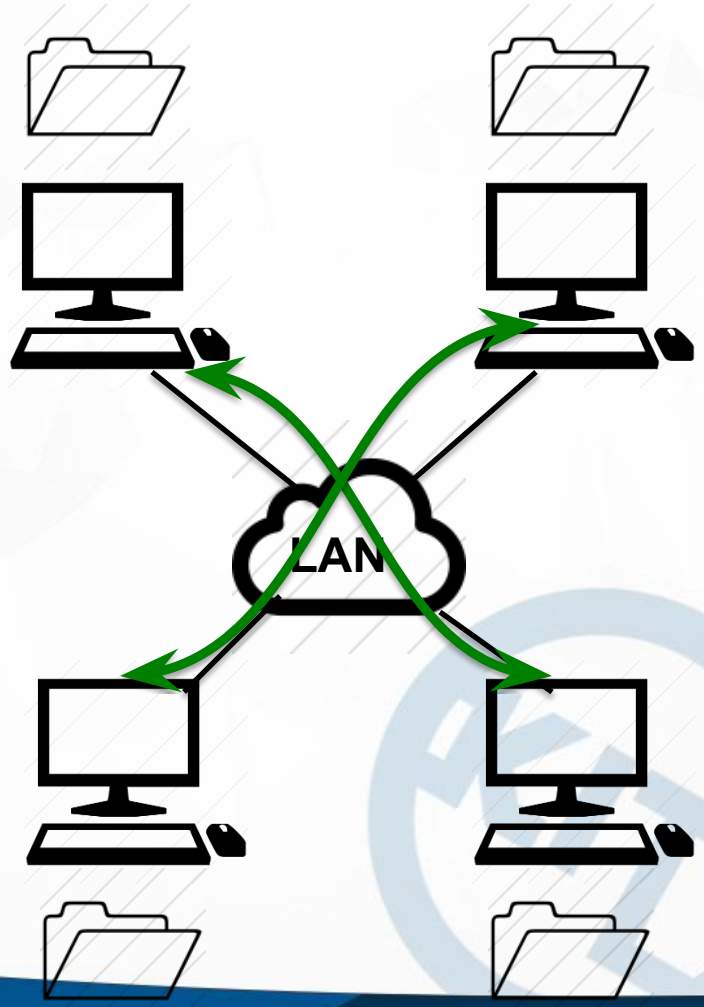
Styles of Client / Server computing



Icons: iconsets.com

Client / server vs. Peer-to-peer





Icons: iconsets.com

Three-layer C/S model

- In traditional C/S model – for each client platform … new client application.
- Updates, compatibility issues.
- Cost of the life cycle.
- Reduce the supported platforms list?
- Or to use general application as „universal client“?
- Which application can be used for this?

Possible solutions

- A virtual environment which is platform-independent
  - Java (JRE)
- Existing platform-dependent application with a general standardized interface
  - WWW client with HTML 5 (aka „web browser“)

Cloud solution

- The provider of a service (application, storage, processing) is physically independent on the user location.
- User is provided just with the entry-point for the services.
- Both parties are connected by some universal network – the Internet.
- Also in-house solution.
- Examples: Office365, Google Apps, iCloud…