Grundzüge der Wirtschaftsinformatik
Introduction to Business Information Systems

Unit 2

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http://www.heppnetz.de/teaching/gwi/

Logistics

- **Lecture**
  - Tuesdays, 13:15 - 14:45, Auditorium Maximum (Building 33)
- **Tutorial and Exercises (Begin: October 17)**
  - Wednesdays, 11:30 – 13:00, Building 33 Room 2401 (in German)
  - Thursdays, 09:45 - 11:15, Building 43 Room 4/126 (in German)
  - Thursdays, 15:00 - 16:30, Building 33 Room 2216 (in German)
  - Thursdays, 16:45 - 18:15, Building 33 Room 2116 (in English)
- **Exam (tentatively, to be confirmed)**
  - December 18, 2007 – 13:00 – 15:00

Office Hours and Contact

Prof. Dr. Martin Hepp

- By appointment only (Tuesdays 15:00 – 16:00)
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Learning Resources (2)

- Course Web page
  - http://www.heppnetz.de/teaching/gwi/
- All slides will be put on-line *after* the lecture
- Some materials may be password protected
  - User: unibw
  - Password: unibw2007
- Test run: Video recording of the lecture for your exam preparation
  - Will be made available online shortly

Structure of the Lecture

Unit 1: Introduction
Unit 2: Central Processing Units
Unit 3: Storage and Data Structures
Unit 4: Input and Output Devices
Unit 5: Software
Unit 6: Networks, Data Interchange, and the Internet
Unit 7: Design, Development, Deployment, and Operations of Information Systems
Unit 8: Office Applications
Unit 9: Enterprise Applications
Unit 10: Supply Chain Applications and E-Business
Unit 11: Management Support Systems
Unit 12: Exam Review

Link to the Previous Unit

- Last Unit: Economic dimension of using computers for mechanizing tasks
- Today: Fundamental principles of computers
  - Why are computers able to execute software?
  - What is the basic structure of any computer?

Assignment from Last Week

- Get the books
- Review the slides
- Read the following paper

  Leonard E. Read: "*I, Pencil. My Family Tree as told to Leonard E. Read*", Dec. 1958

  http://www.econlib.org/library/Essays/rdPncl1.html,

  PDF version:

  http://www.fee.org/pdf/books/I.%20Pencil%202006.pdf

What's a Computer?

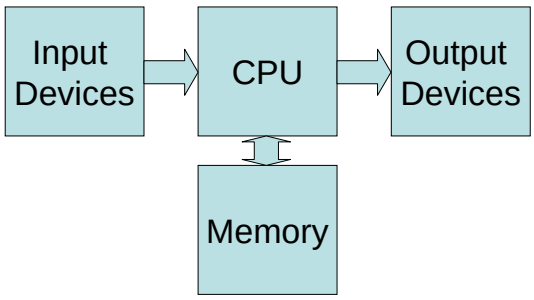
There are lots of intelligent devices...

... but are they computers?

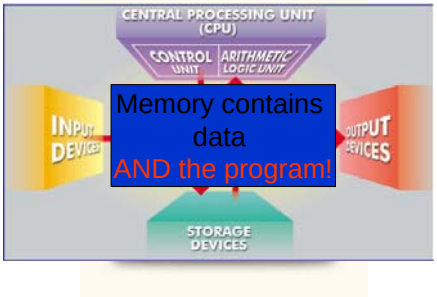
A computer's functionality is not determined at the time of design, but can be changed at any time just by loading new software.

Computer and Peripherals

CPU, Memory, Input & Output Devices



Computer: Von Neumann Architecture

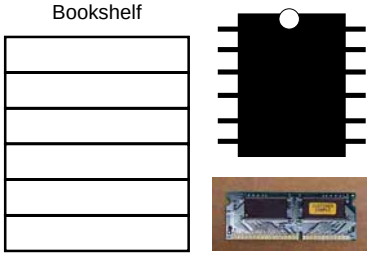


CPU: Central Processing Unit

- The CPU is the heart of any computer.
- It is controlled by an internal or external clock generator.
- The CPU can execute a small set of simple commands.
- At each „beat" of of the clock, it executes the next step
  - Fetch next command
  - Retrieve operands (values)
  - Execute command
  - Store results

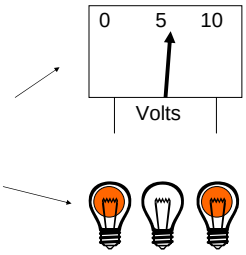
Memory

Bookshelf

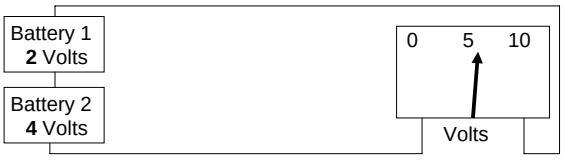


Analog vs. Digital Computers

- There are two principal ways of implementing a computer:
  - **Analog**: A value is represented by a respective voltage (1 = 1 volts, 2 = 2 volts, ...)
  - **Digital:** Values are represented **by a pattern** (combination) of multiple signals that can take only one of two voltage levels.

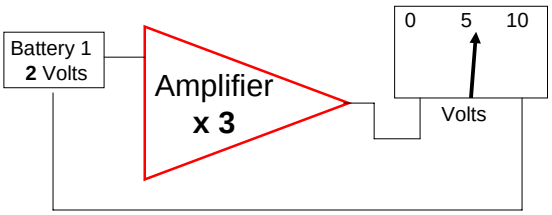


Analog Adding



2 + 4 = 6

Analog Multiplication



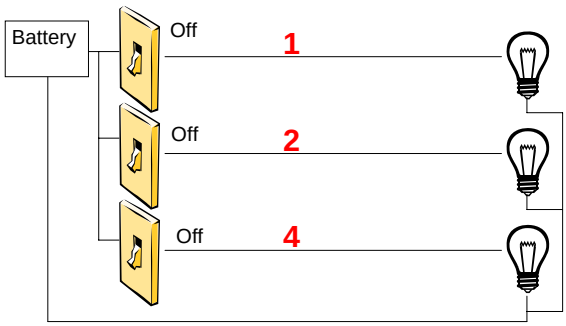
2 * 3 = 6

Problems with Analog Systems

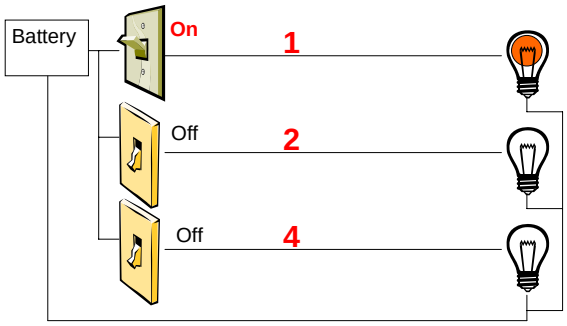
- Expensive
- Lack of Reliability
- Transmission Errors

→ Dominance of Digital Computers

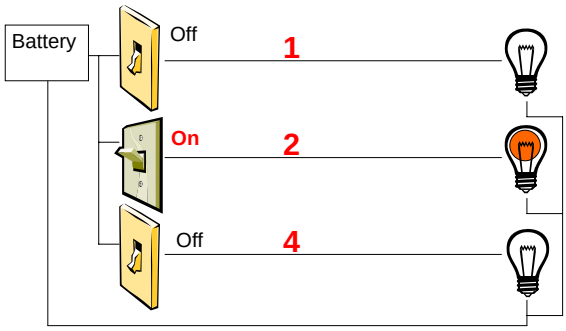
Digital



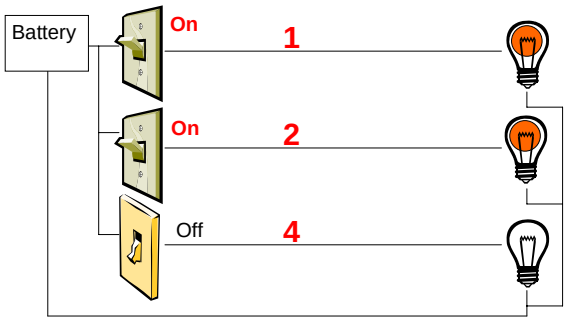
Digital: 1



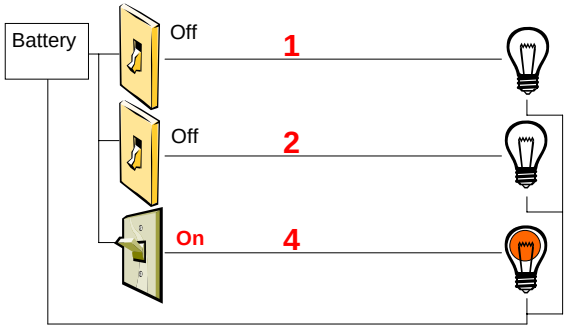
Digital: 2



Digital: 3

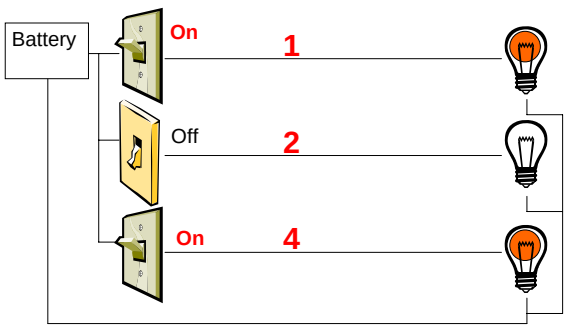


Digital: 4



How would the number 5 be represented?

Digital



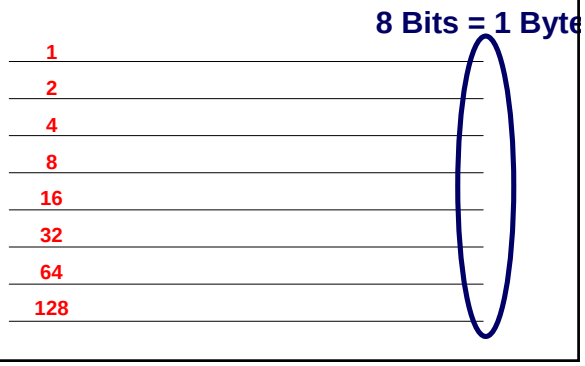
Binary Numbers

4	2	1	Value
Off	Off	Off	0
Off	Off	On	1
Off	On	Off	2
Off	On	On	3
On	Off	Off	4
On	Off	On	5
On	On	Off	6
On	On	On	7

Binary Numbers

4	2	1	Value
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Usually 8 Wires



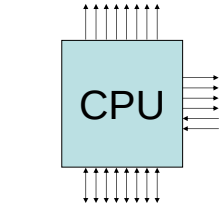
One byte represents any number from 0 through 255

128 Bit 7	64 Bit 6	32 Bit 5	16 Bit 4	8 Bit 3	4 Bit 2	2 Bit 1	1 Bit 0	
0	0	0	0	0	0	0	**1**	1
0	0	0	**1**	0	**1**	0	0	20

Address and Data *Bus*

Two sets of wires that represent binary values

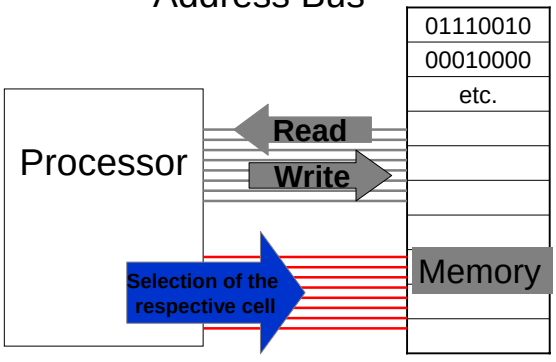
Address Bus:
Which memory cell is to be used?



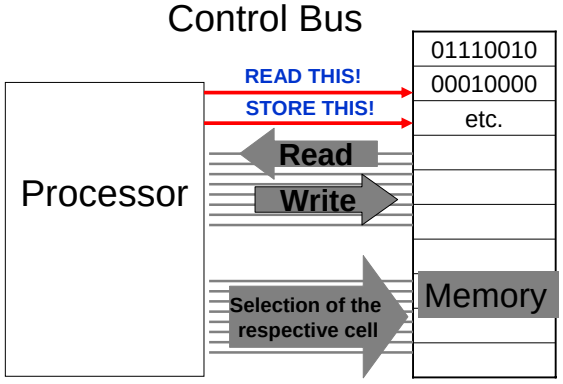
Control Bus:
What should the memory chip do?
When is the CPU ready to take the results?

Data Bus:
For exchanging values between the memory and the CPU

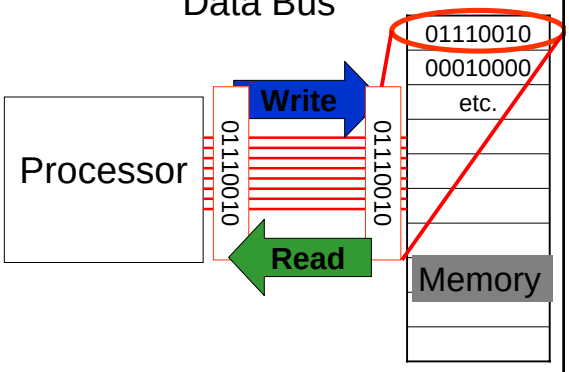
Address Bus



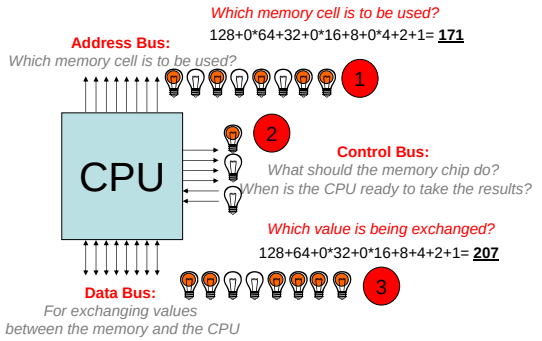
Control Bus



Data Bus



Address and Data Bus: Example



Memory Size

- KB = 1024 Byte
- MB = 1024 * 1024 Byte
- GB = 1024 * 1024 * 1024 Byte
- TB = 1024 * 1024 * 1024 * 1024 Byte

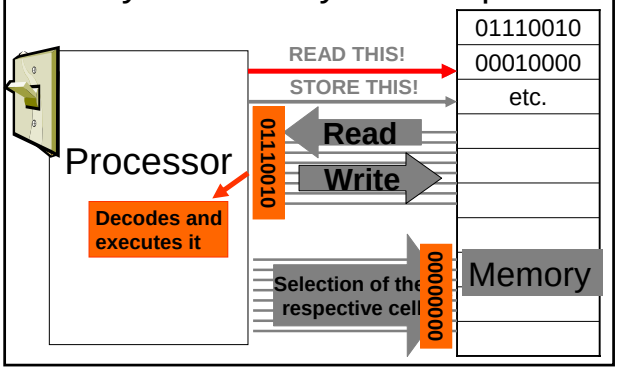
- $1024 = 2^{10}$

Why does the processor know what to do?

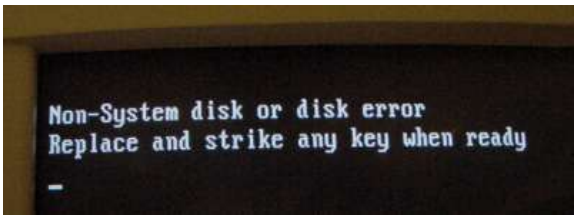
Memory contains values **and** instructions

Cell No.	Value	Meaning
0	120	ADD to Buffer
1	4	4
2	140	JUMP to …
3	10	cell no. 10

When you turn on your Computer…



Basic Input / Output System (BIOS)



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Basic Input / Output System (BIOS)

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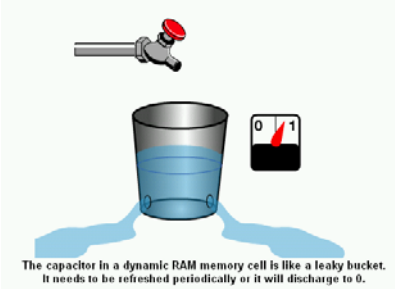
Random Access Memory



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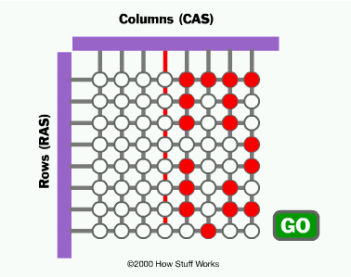
Random Access Memory



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Random Access Memory

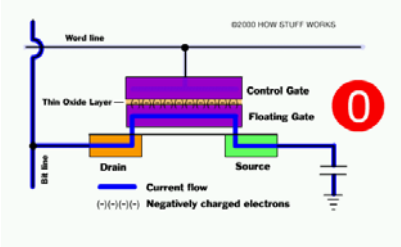
SIMM

DIMM

SODIMM

http://computer.howstuffworks.com/ram.htm/printable

Flash Memory



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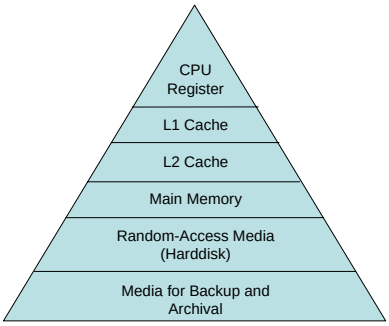
Memory Hierarchy



Thank you!

The slides and additional materials will be available at
http://www.heppnetz.de/teaching/gwi/
shortly.

Don't forget: Tutorials will not start until Oct 17!