

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/rdPnc1.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?

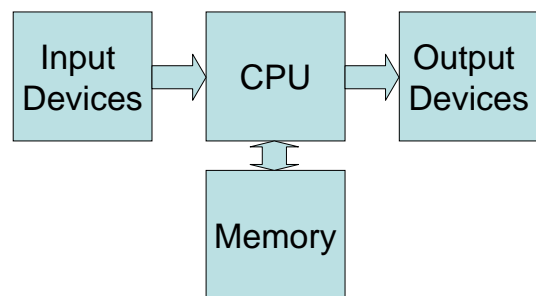


A computer's functionality is not determined at the time of design, but can be changed at any time just by loading new software.

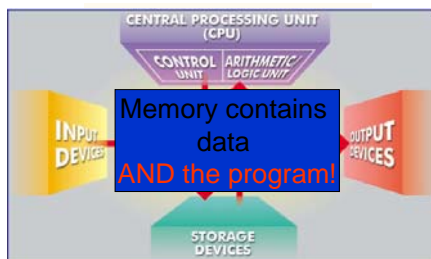
Computer and Peripherals



CPU, Memory, Input & Output Devices



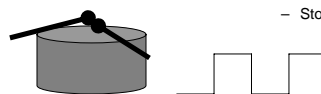
Computer: Von Neumann Architecture



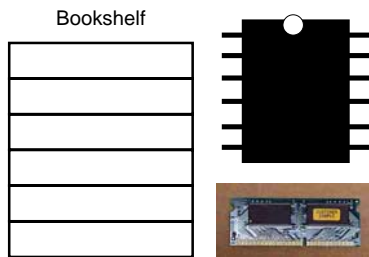
CPU: Central Processing Unit



- 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 the clock, it executes the next step
 - Fetch next command
 - Retrieve operands (values)
 - Execute command
 - Store results



Memory

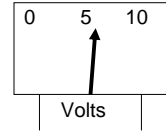


Analog vs. Digital Computers

- 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.

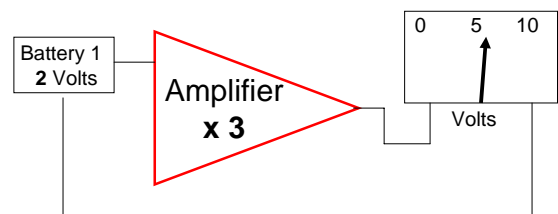


Analog Adding



$$2 + 4 = 6$$

Analog Multiplication



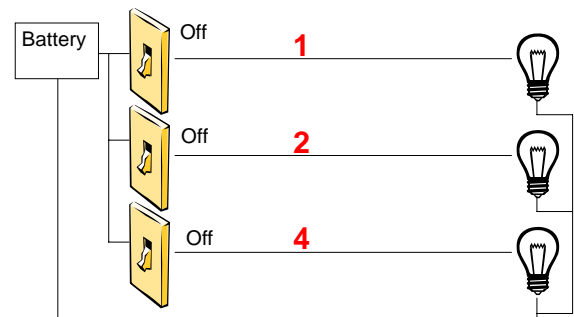
$$2 * 3 = 6$$

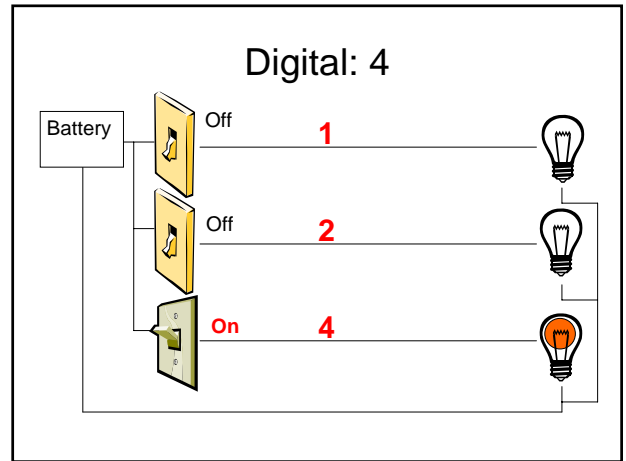
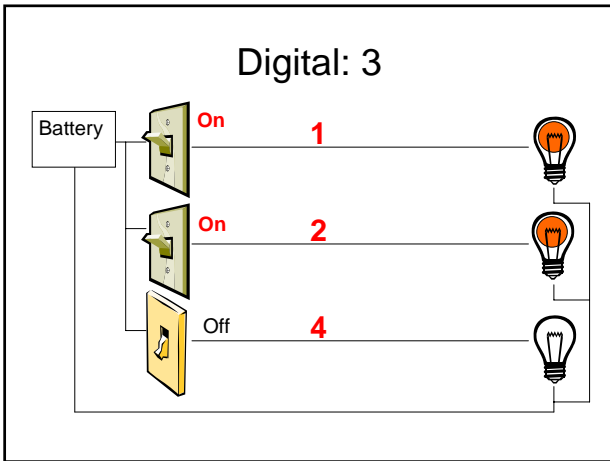
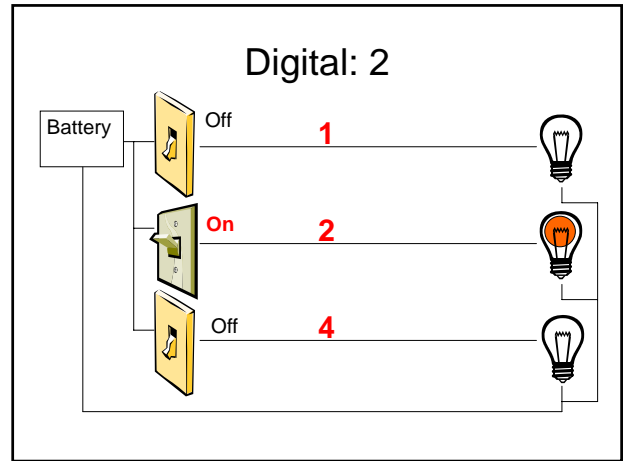
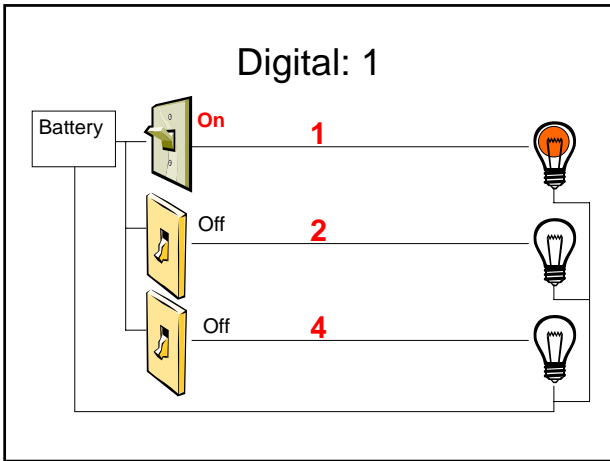
Problems with Analog

- Expensive Systems
- Lack of Reliability
- Transmission Errors

→ Dominance of Digital Computers

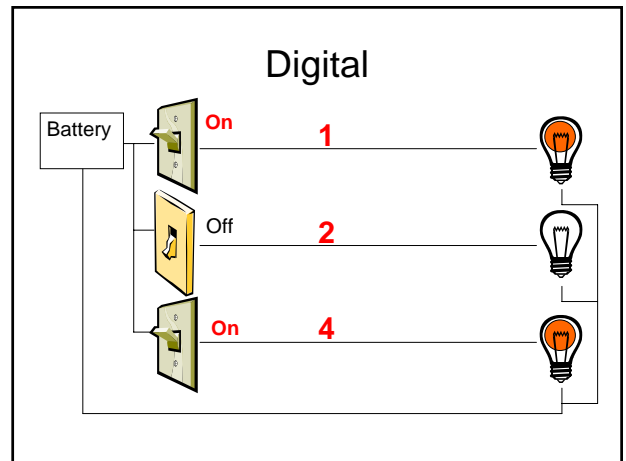
Digital





How would the number 5 be represented?

➔



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

8 Bits = 1 Byte



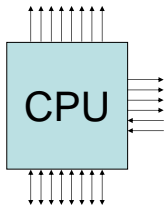
One byte represents any number from 0 through 255

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

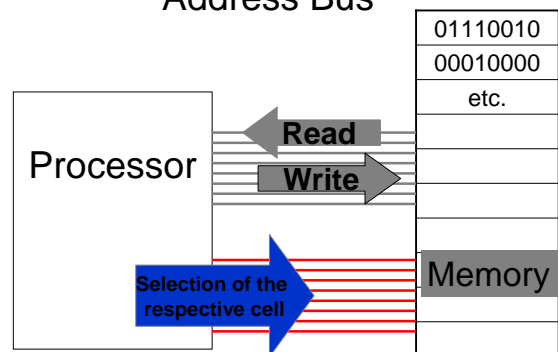
Address Bus:
Which memory cell is to be used?

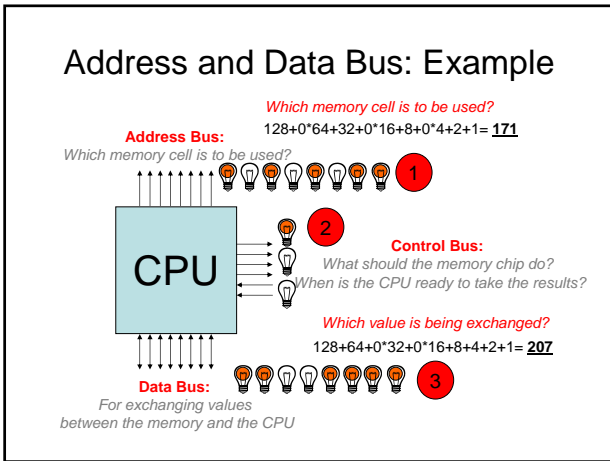
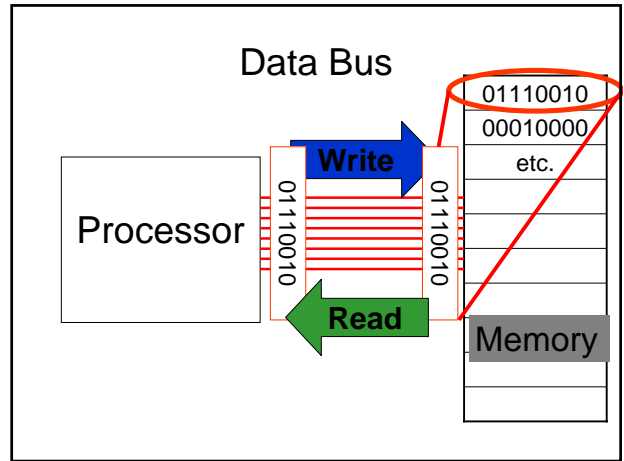
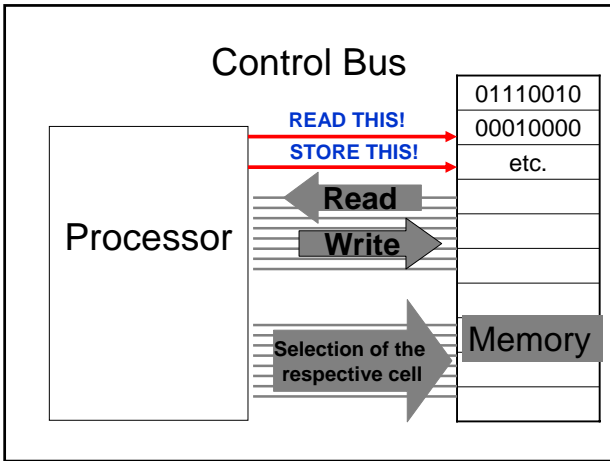


Control Bus:
What should the memory chip do?
When is the CPU ready to take the results?

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

Address Bus





Memory Size

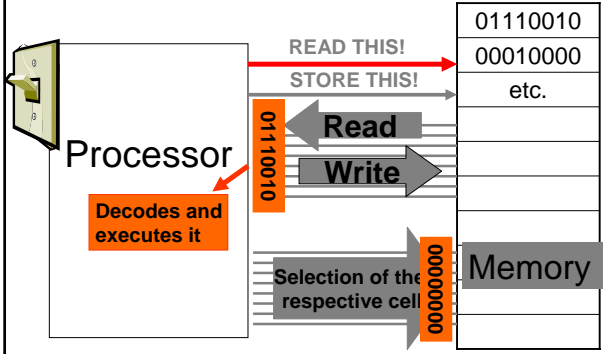
- KB = 1024 Byte
- MB = 1024 * 1024 Byte
- GB = 1024 * 1024 * 1024 Byte
- TB = 1024 * 1024 * 1024 * 1024 Byte
- $1024 = 2^{10}$

Why does the processor know what to do?

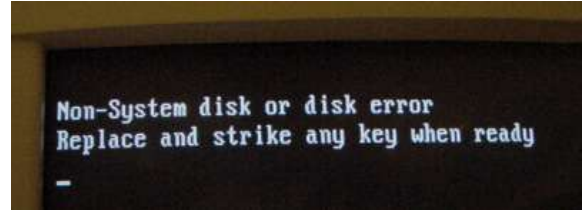
Memory contains values **and** instructions

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)



<http://computer.howstuffworks.com/bios.htm/printable>

Basic Input / Output System (BIOS)



<http://computer.howstuffworks.com/bios.htm/printable>

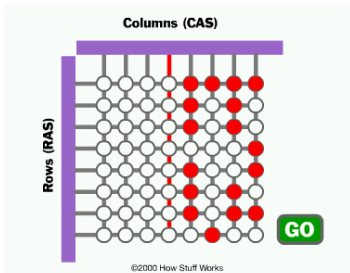
Random Access Memory



The capacitor in a dynamic RAM memory cell is like a leaky bucket. It needs to be refreshed periodically or it will discharge to 0.

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

Random Access Memory



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

Random Access Memory

SIMM



DIMM

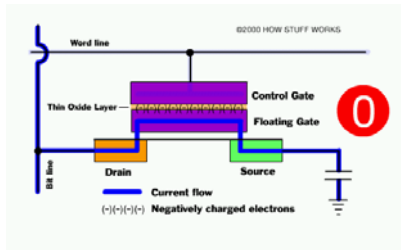


SODIMM



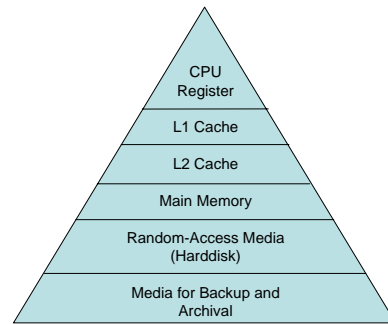
<http://computer.howstuffworks.com/ram.htm/printable>

Flash Memory



<http://computer.howstuffworks.com/flash-memory.htm/printable>

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!