COS
Computersystemer

Lektion #5

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Pointgivende aktivitet.

Den 1. oktober 2021 kl.: 12:15-13:00 afholder vi den 1. pointgivende aktivitet i jeres klasselokale. Det er vigtigt, at du er klar kl.: 12:15, da du ellers ikke kan deltage i prøven.

- Aktiviteten er *ikke* obligatorisk, men ved at deltage kan du score op til 5 point, som du kan lægge oven i din præstation til eksamen.
- Hvis du ikke deltager i den pointgivende aktivitet, kan du ***ikke*** få et andet forsøg. Dette gælder også i tilfælde af evt. Sygdom.
- Aktiviteten udføres som en *Multiple Choice Test* under *itslearning*.
- De udleverede pdf-dokumenter med *ASCII*-tabel, Boolsk Algebra, *Logic Gates* og *Tal repræsentationer, slides fra de fagets lektioner, lærebogen* samt egne noter, må benyttes under testen. Udover kladdepapir og blyant, er andre hjælpemidler ***ikke*** tilladt.
- Instruktorerne vil agere ”eksamens vagter”.

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Pointgivende aktivitet.

Den pointgivende test bliver tilgængelig kl.: 12:15 på:
”itslearning/resourcer/pointgivende aktivitet/pointgivende aktivitet 1”

- Vær på plads til tiden.
- I har 45 minutter til testen.
- Sørg for at have tisset af inden starten, så du undgår at forstyrre de andre. (Testen varer kun 45 min.)
- Lad Venligst lad vær med at snakke og larme, hvis du bliver færdig før de 45 min. er gået. Bliv siddende stille på din plads af hensyn til dem, som ikke er færdige.

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De logiske operationer er ”bit-wise”!

```
    01010101
AND 11110000
    --------
    01010000


    01010101
OR  11110000
    --------
    11110101


    01010101
XOR 11110000
    --------
    10100101
```


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Bitwise Problems as Python Code

```
print(bin(0b10011010 & 0b11001001))
# Prints '0b10001000'

print(bin(0b10011010 | 0b11001001))
# Prints '0b11011011'

print(bin(0b10011010 ^ 0b11001001))
# Prints '0b1010011'
```

AND

OR

XOR

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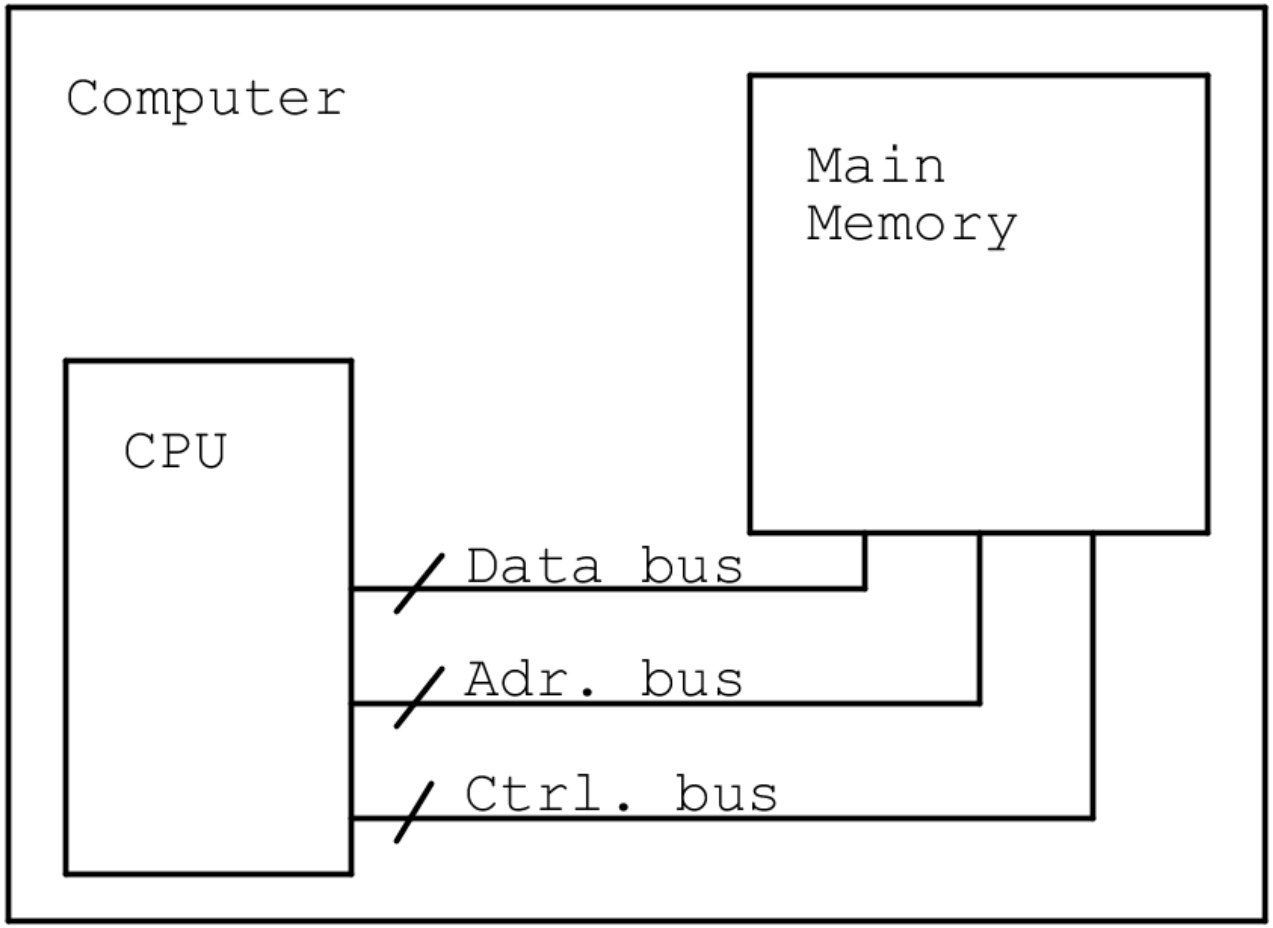
Computerens arkitektur.



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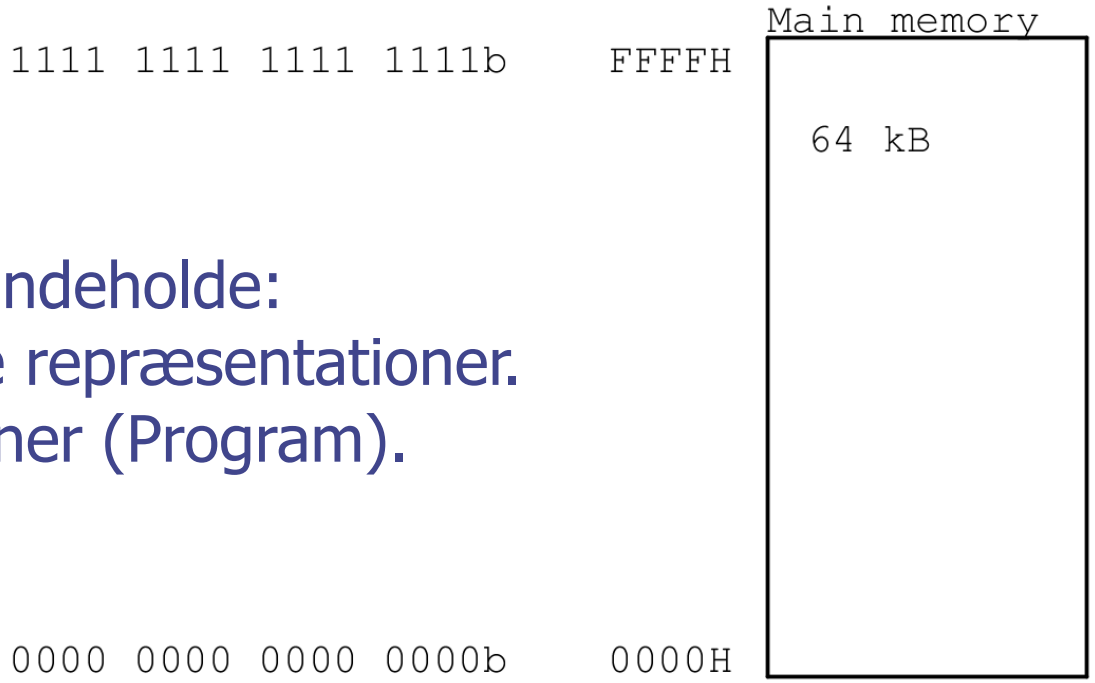
Main memory.



Main memory kan indeholde:

- Data i forskellige repræsentationer.
- Maskininstruktioner (Program).

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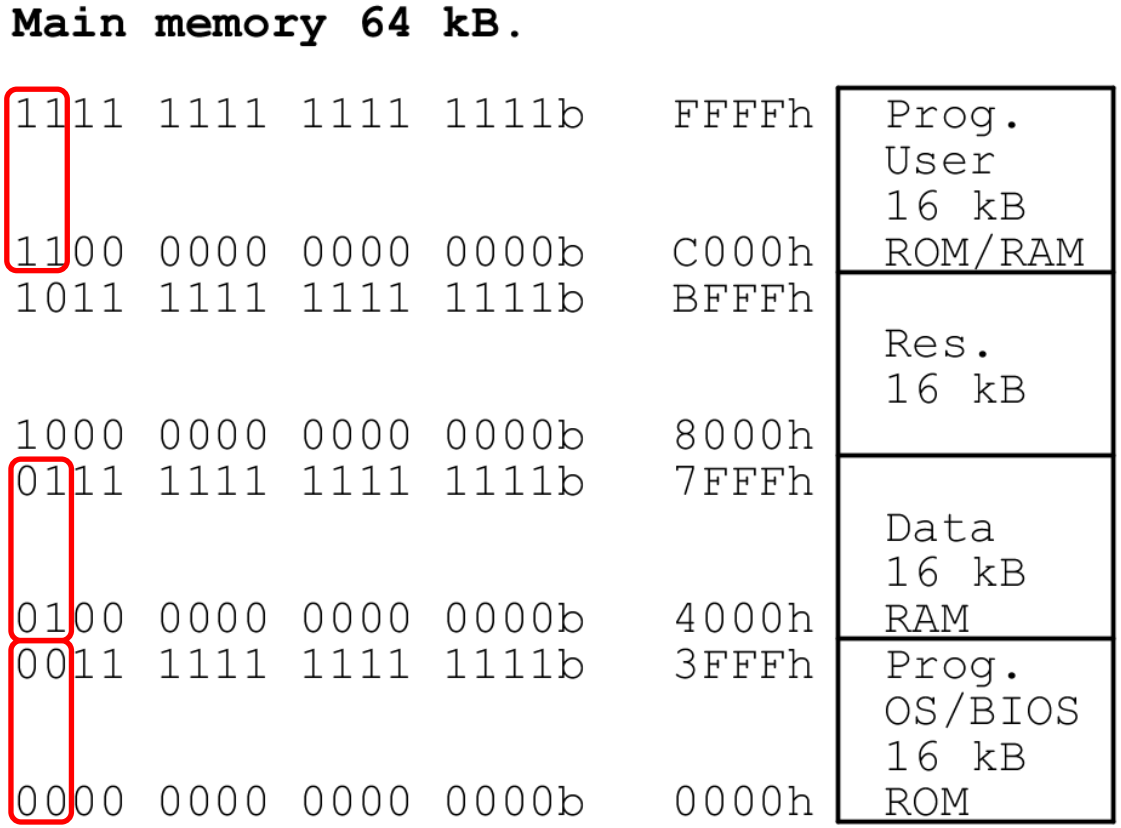
Memory Map.



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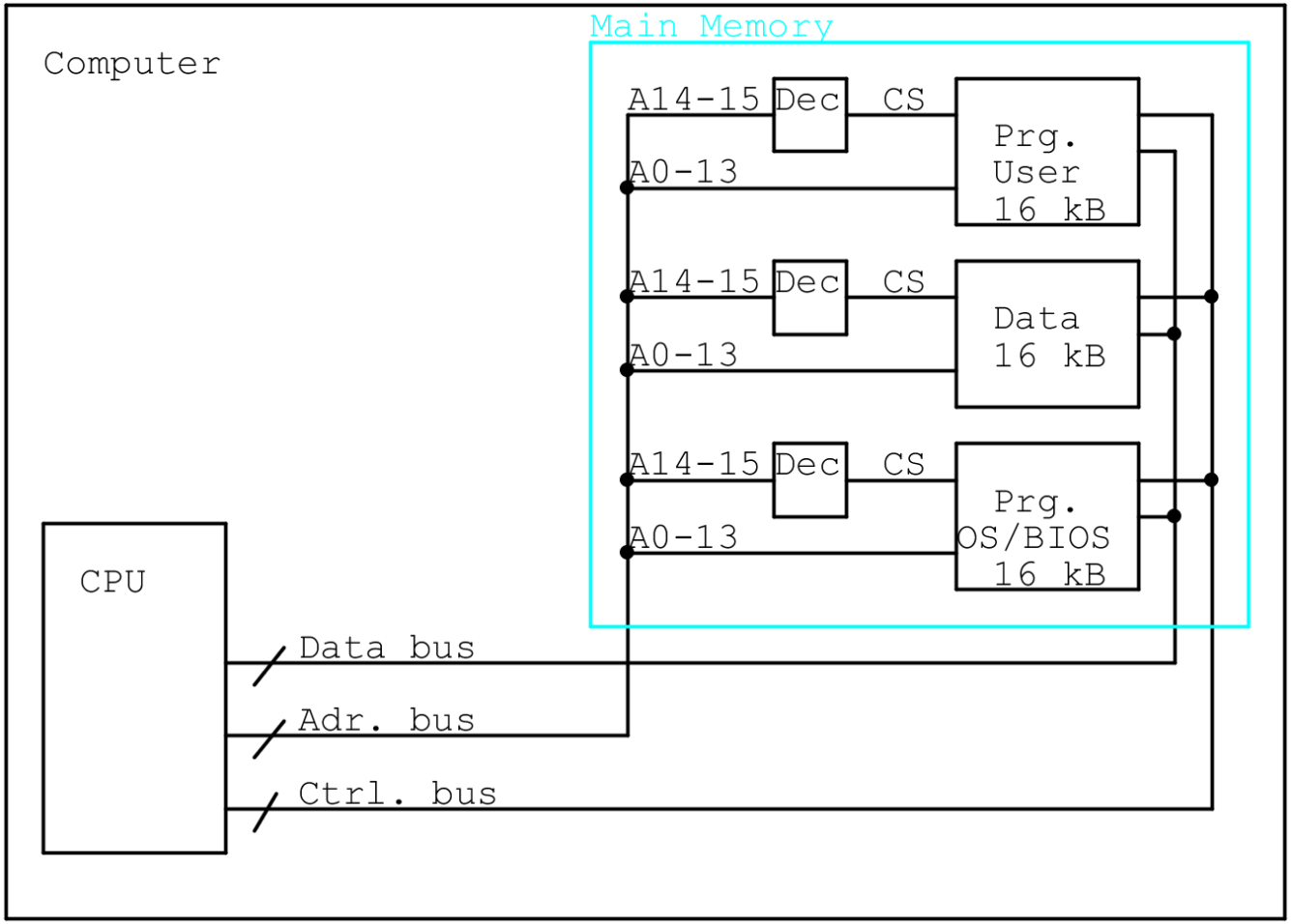
Adress decoding



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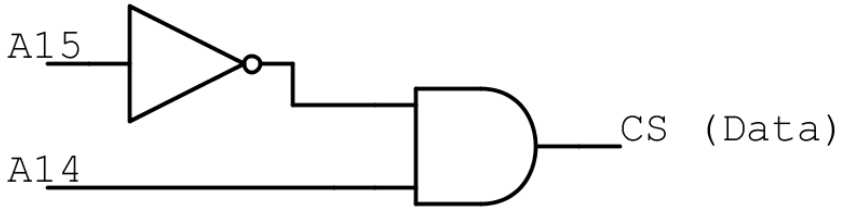
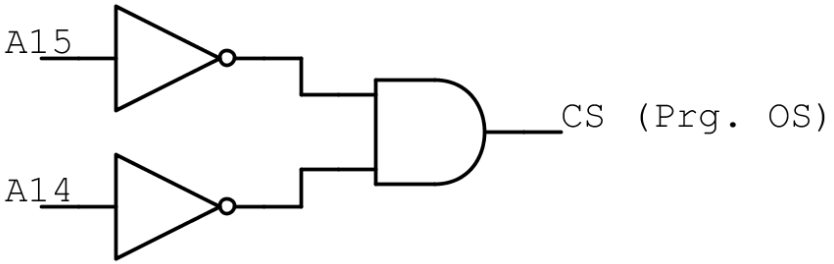
Adress decoder

Adress decoder Prg. User: Adr.: 11xx xxxx xxxx xxxxb, A15,A14 = 1,1

Adress decoder Data: Adr.: 01xx xxxx xxxx xxxxb, A15,A14 = 0,1



Adress decoder Prg. OS/BIOS: Adr.: 11xx xxxx xxxx xxxxb, A15,A14 = 0,0



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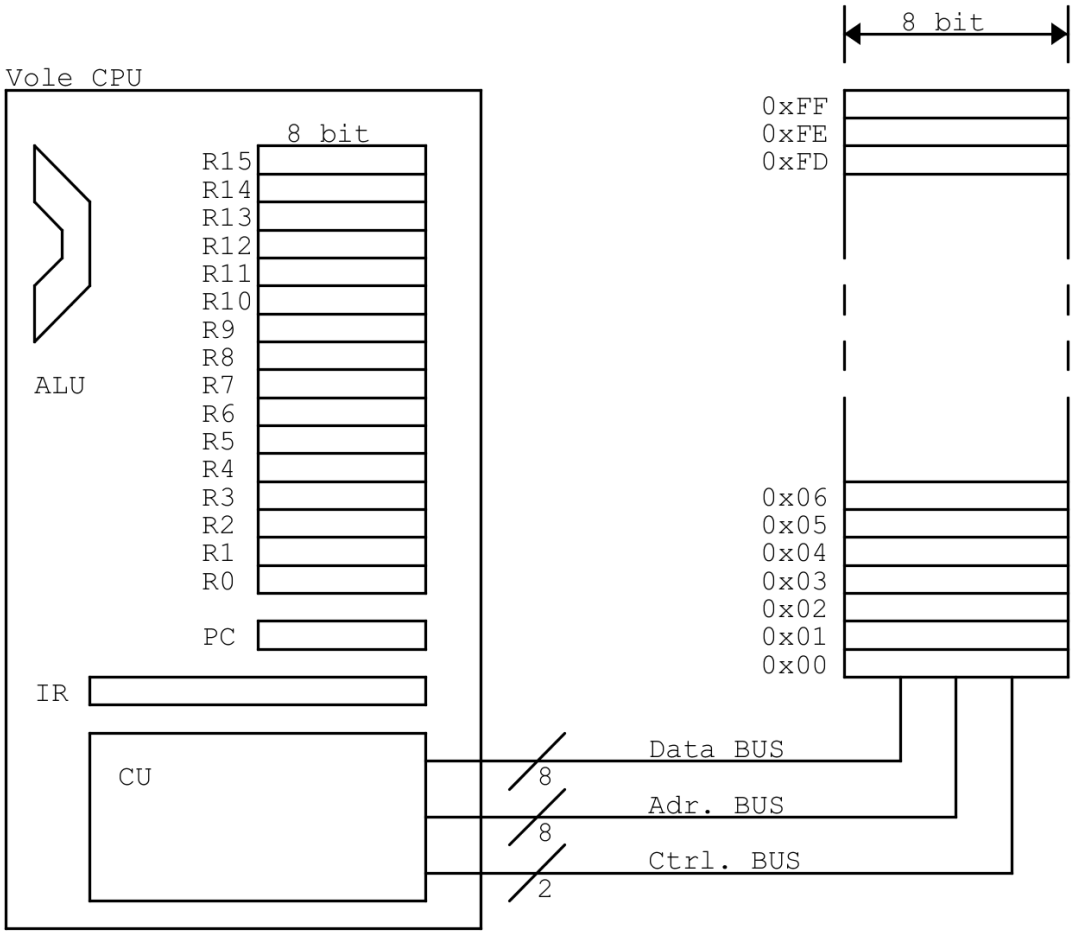
VOLE i Appendix C



Data BUS: 8 bit data.
Adr. BUS: Antal memory celler = $2^8 = 256$.
Ctrl. BUS:

- $\overline{RD}/WR$
- *Enable*

Instruktioner:

- LOAD
- STORE
- MOVE
- ADD
- OR
- AND
- XOR
- ROTATE
- JUMP
- HALT

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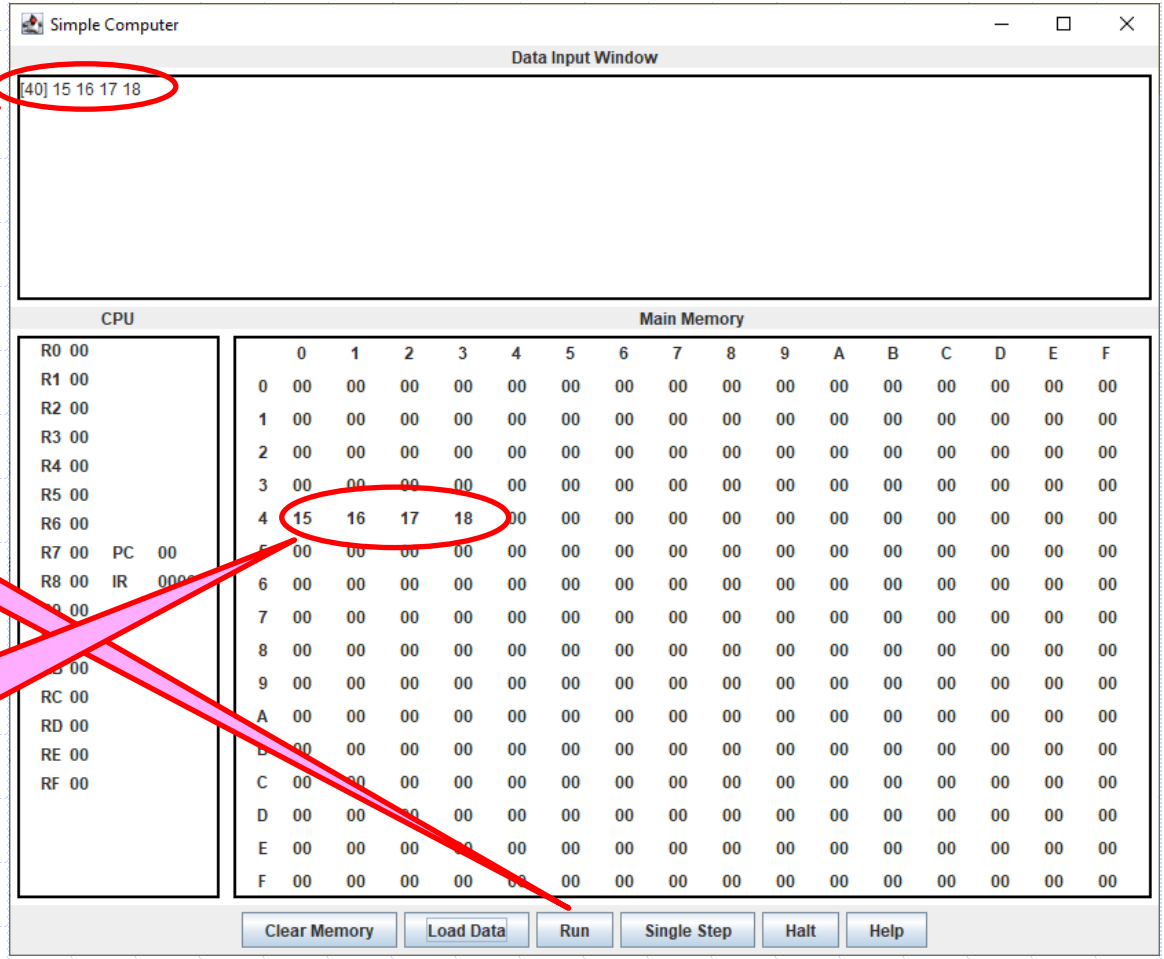
Vores Vole computer (simulator).

Ingen runtime input/output



Input:
Læg værdier i memory

Run

Output:
Aflæs værdier i memory

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Input / Output

```
# Calculates the hypotenuse of a right triangle

import math

# Inputting the side lengths, first try
sideA = int(input('Length of side A? '))
sideB = int(input('Length of side B? '))

# Calculate third side via Pythagorean Theorem
hypotenuse = math.sqrt(sideA**2 + sideB**2)

print(hypotenuse)
```


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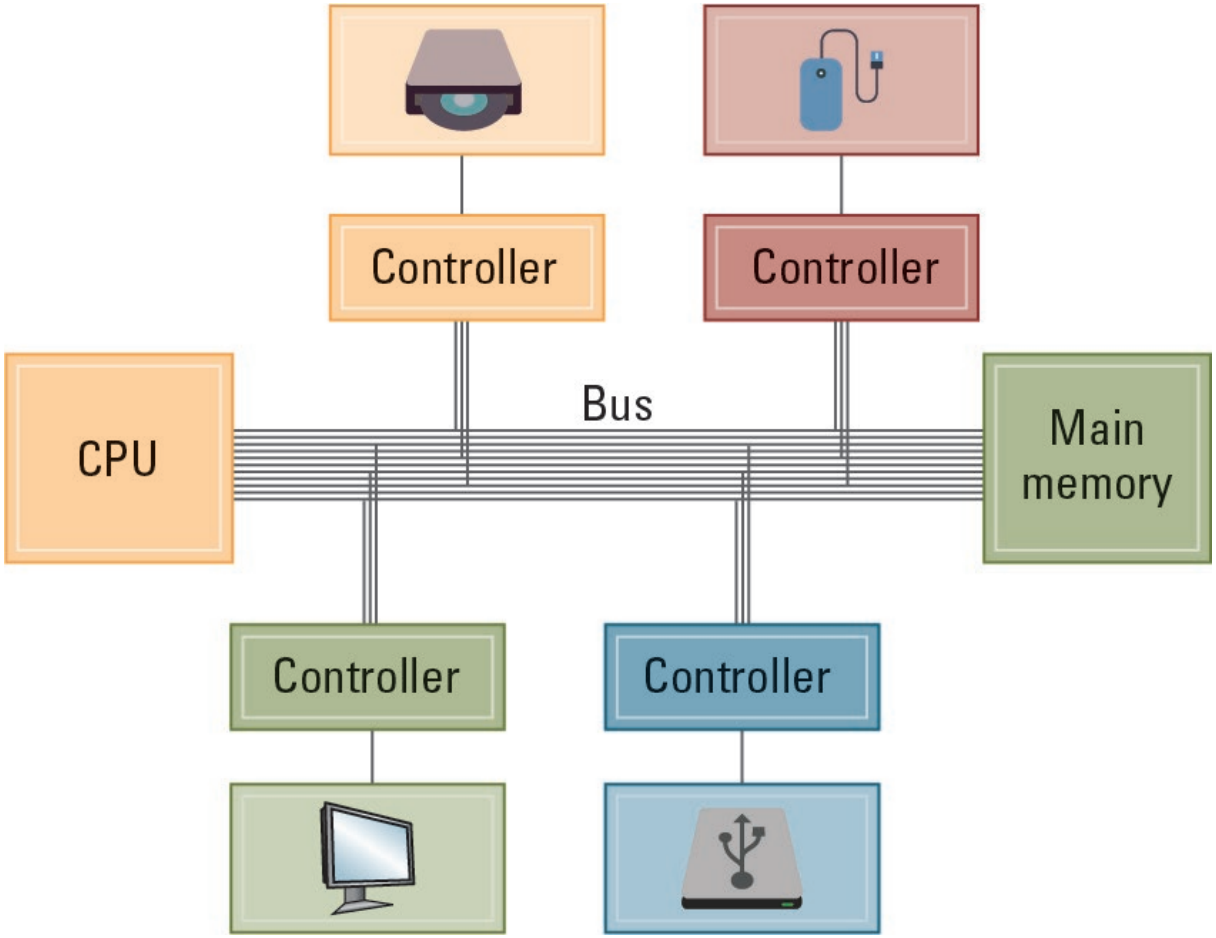
2.5 Communicating with Other Devices

- **Controller:** handles communication between the computer and other devices
  - Specialized (by type of device)
  - General purpose (USB, HDMI)
- **Port:** The point at which a device connects to a computer
- **Memory-mapped I/O:** devices appear to the CPU as though they were memory locations

Figure 2.13 Controllers attached to a machine's bus

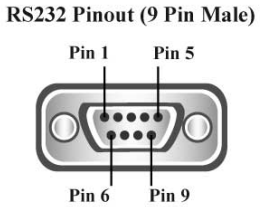


Eksempler på ydre enheder

- Lagerenheder
  - HD
  - CD/DVD
  - Memory sticks
- HMI (Human Machine Interface)
  - Mus
  - Tastatur
  - Game controllers
- Multimedie
  - Skærme
  - Højtalere
  - VR
- Datakommunikation
  - RS232 Serial Port
  - Internet
    - Ethernet
    - Wifi
    - Mobildata
  - Bluetooth
  - USB

RS232

Pin 1	DCD
Pin 2	RXD
Pin 3	TXD
Pin 4	DTR
Pin 5	GND
Pin 6	DSR
Pin 7	RTS
Pin 8	CTS
Pin 9	RI



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Eksempler på USB enheder

- Mus.
- Tastaturer.
- Printere.
- Scannere.
- Eksterne diske.
- Flash drives.
- Digitale kameraer.
- Højtalere.
- Head sets.
- Smart watches.
- Smart phones.
- Serial port.

USB (Universal Serial Bus):

- Plug-And-Play
- Op til 127 enheder pr. port

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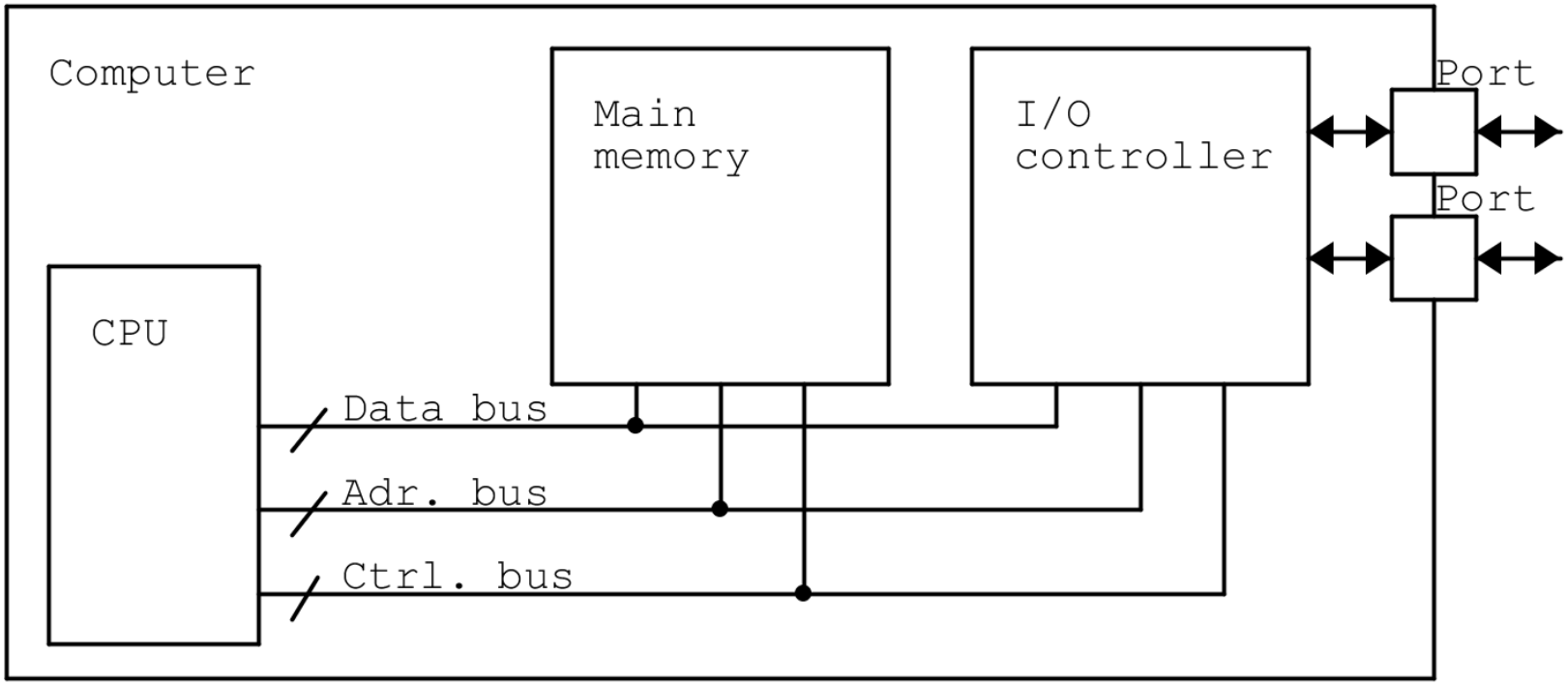
Computer med I/O. (I/O mapped I/O).



Ydre enheder

Control BUS:

1 bit til angivelse af READ eller WRITE.

1 bit til at angive timing i dataoverførslen.

1 bit til angivelse af Main memory eller I/O.

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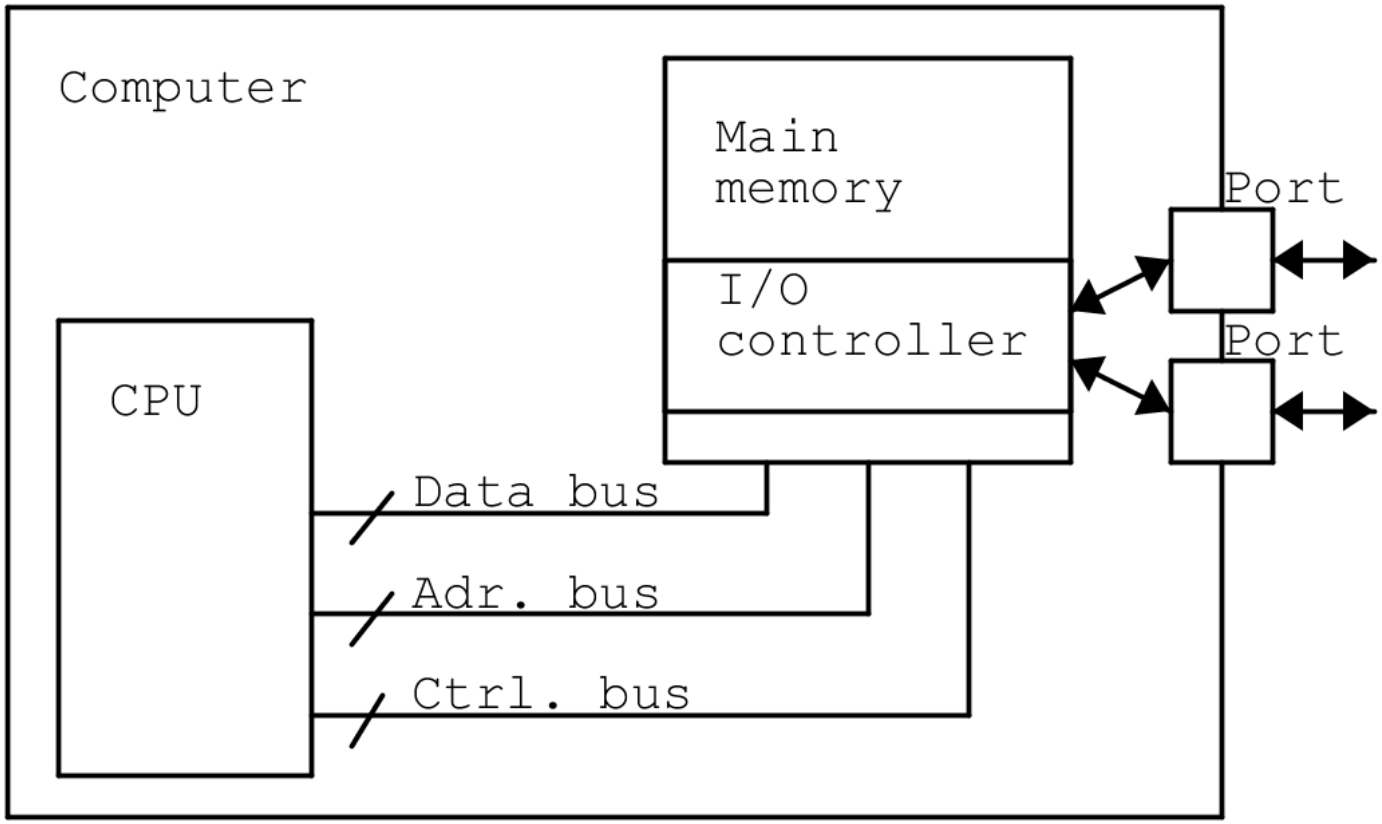
Memory mapped I/O



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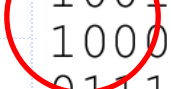
Memory mapperd I/O. Memory Map.

A15, A14, A13 = 1,0,0



Main memory 64 kB.

1111 1111 1111 1111b	FFFFh	Prog. User 16 kB ROM/RAM
1100 0000 0000 0000b	C000h	
1011 1111 1111 1111b	BFFFh	Res. 8 kB
1010 0000 0000 0000b	A000h	
1001 1111 1111 1111b	9FFFh	I/O 8 kB
1000 0000 0000 0000b	8000h	
0111 1111 1111 1111b	7FFFh	Data 16 kB RAM
0100 0000 0000 0000b	4000h	
0011 1111 1111 1111b	3FFFh	Prog. OS/BIOS 16 kB ROM
0000 0000 0000 0000b	0000h	

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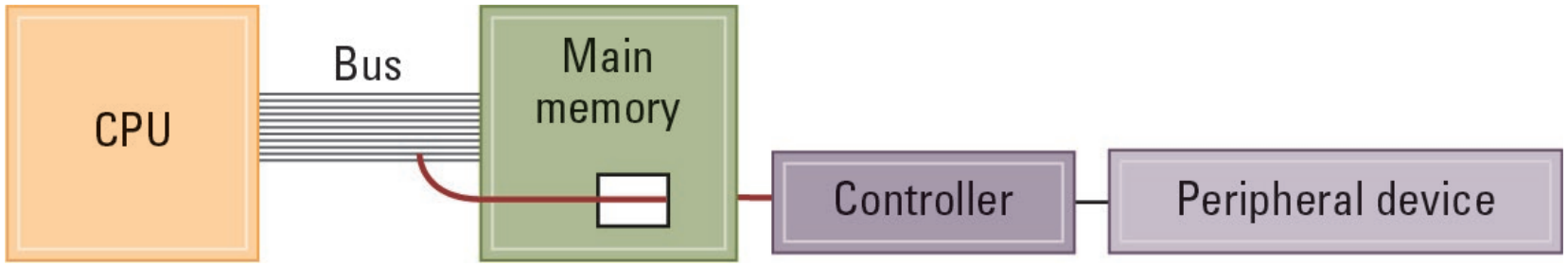
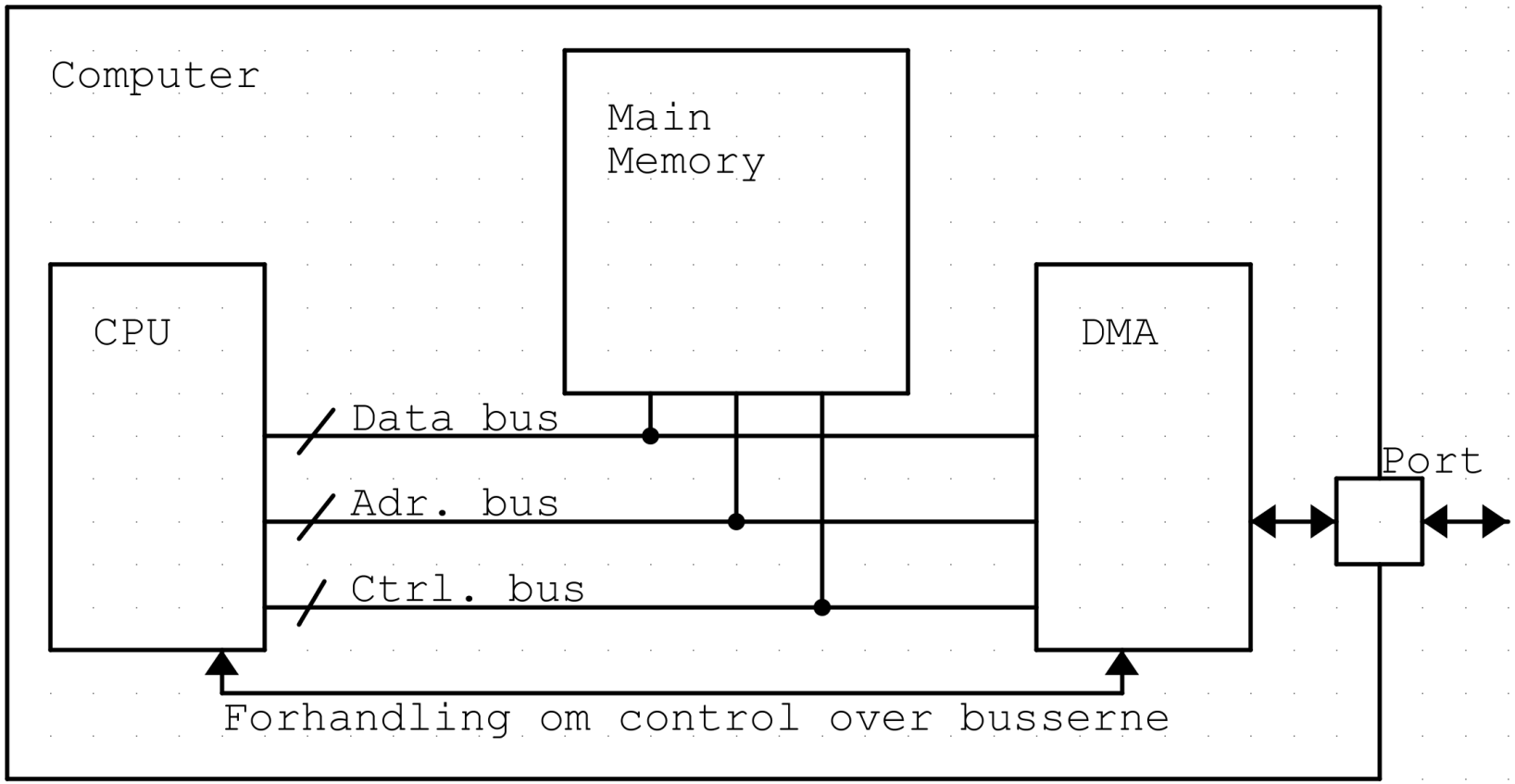
Figure 2.14 A conceptual representation of memory-mapped I/O



Communicating with Other Devices (continued)

- **Direct memory access (DMA):** Main memory access by a controller over the bus
  - **Von Neumann Bottleneck:** occurs when the CPU and controllers compete for bus access

DMA



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Handshaking

- **Handshaking** er koordinering af dataoverførsel mellem to eller flere enheder (software eller hardware)
- **Handshaking** er overholdelse af en protocol.
- **Aftal en "Protokol".**
  - Computerens kommunikation med ydre enheder.
  - Multiprocess systemer
  - Distribuerede systemer
  - Netværk
  - Internet
  - Interface
  - API
  - Standard eller proprietær.

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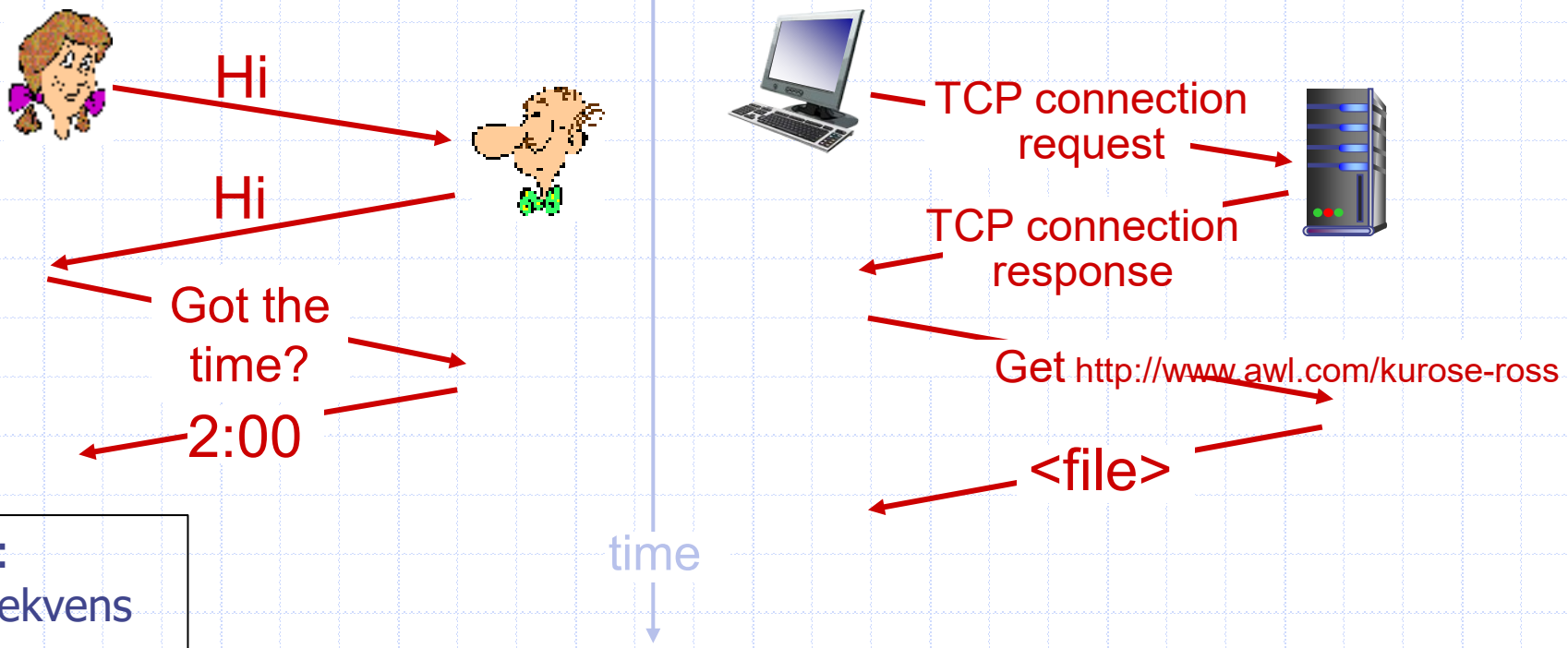
What's a protocol?

a human protocol and a computer network protocol:



Aftal:
- Sekvens
- Sprog
- Format
- Hastighed
- ...andet

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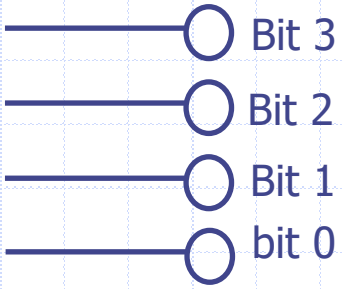
Communicating with Other Devices (continued)

- **Popular Communication Media**
  - **Parallel Communication:** Several signals transferred at the same time, each on a separate "line" (computer's internal bus)
  - **Serial Communication:** Signals are transferred one after the other over a single "line" (USB, FireWire)

Parallel / Seriel kommunikation




```
Bit 3 = 0V = '0'
Bit 2 = 5V = '1'
Bit 1 = 5V = '1'
Bit 0 = 0V = '0'
```

0 1 1 0

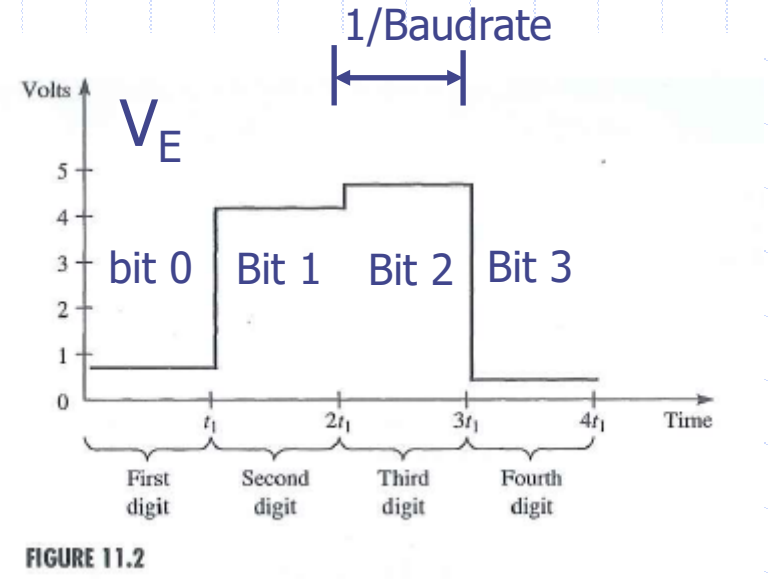


FIGURE 11.2

0 1 1 0

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I/O standarder.

- RS-232 Serial port.
- USB (Universal Serial Bus).
- HDMI
- VGA
- Ethernet
- Analog audio

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Data Communication Rates

- Measurement units
  - bps: bits per second
  - Kbps: Kilo-bps (1,000 bps)
  - Mbps: Mega-bps (1,000,000 bps)
  - Gbps: Giga-bps (1,000,000,000 bps)
- Bandwidth: Maximum available rate

Kommunikations hastighed

- Communication rate [bps][Baud-rate]
- Bandwidth [bps]
- Delay [s]

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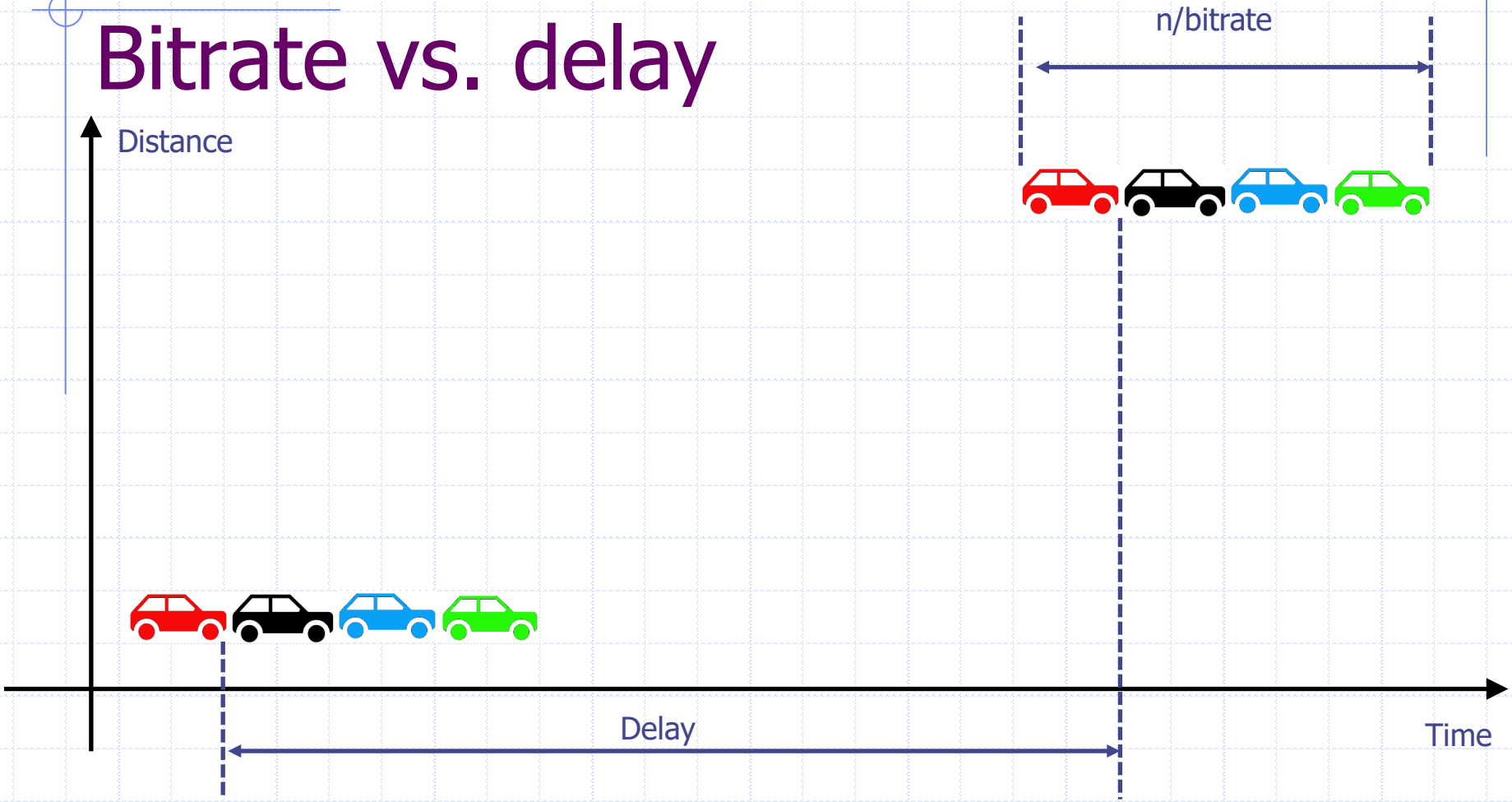
Communication rate
Bitrate vs. delay



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2.7 Other Architectures

- Technologies to increase throughput:
  - Pipelining: Overlap steps of the machine cycle
  - Parallel Processing: Use multiple processors simultaneously
    - SISD: Single Instruction, Single Data
      - No parallel processing
    - MIMD: Multiple Instruction, Multiple Data
      - Different programs, different data
    - SIMD: Single Instruction, Multiple Data
      - Same program, different data

Spørgsmål?

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