Hes·so VALAIS WALLIS

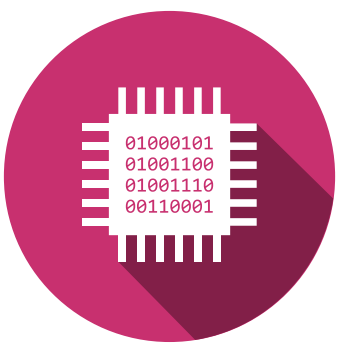
Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften

Conception numérique (DiD)

Mémoire morte

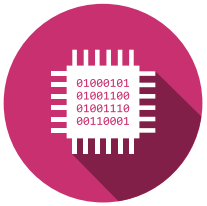
ROM

Filière Systèmes industriels
Filière Energie et techniques environmentales
Filière Informatique et systèmes de communications



Silvan Zahno silvan.zahno@hevs.ch
Christophe Bianchi christophe.bianchi@hevs.ch
François Corthay francois.corthay@hevs.ch

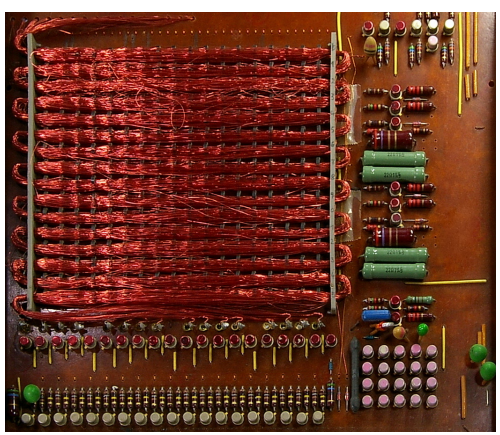
ROM – Read only memory



La mémoire morte (ROM) est une mémoire de données à laquelle on ne peut accéder qu'en lecture et qui n'est pas volatile. Cela signifie qu'elle conserve les données même lorsqu'elle n'est pas alimentée.

Elle est aujourd'hui généralement remplacée par la mémoire flash.

Le domaine d'application principal est la mémoire bios

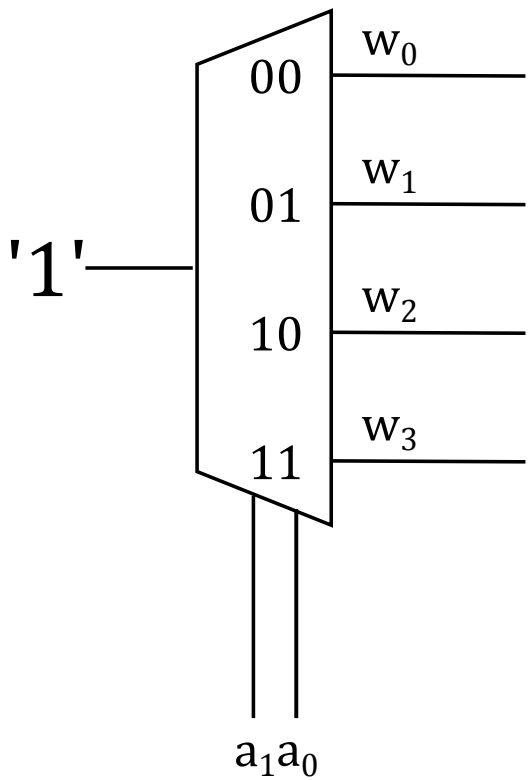


Source : Wikipedia

ROM – Read only memory

Structure avec MUX

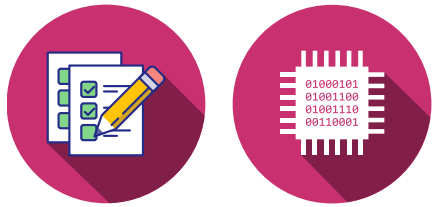
a_1	a_0	w_0	w_1	w_2	w_3
0	0	**1**	0	0	0
0	1	0	**1**	0	0
1	0	0	0	**1**	0
1	1	0	0	0	**1**



- n-Bit entrée de commande
- $2^n n$-Bit sorties possibles

Exercice

Réalisation d'une fonction OR programmable

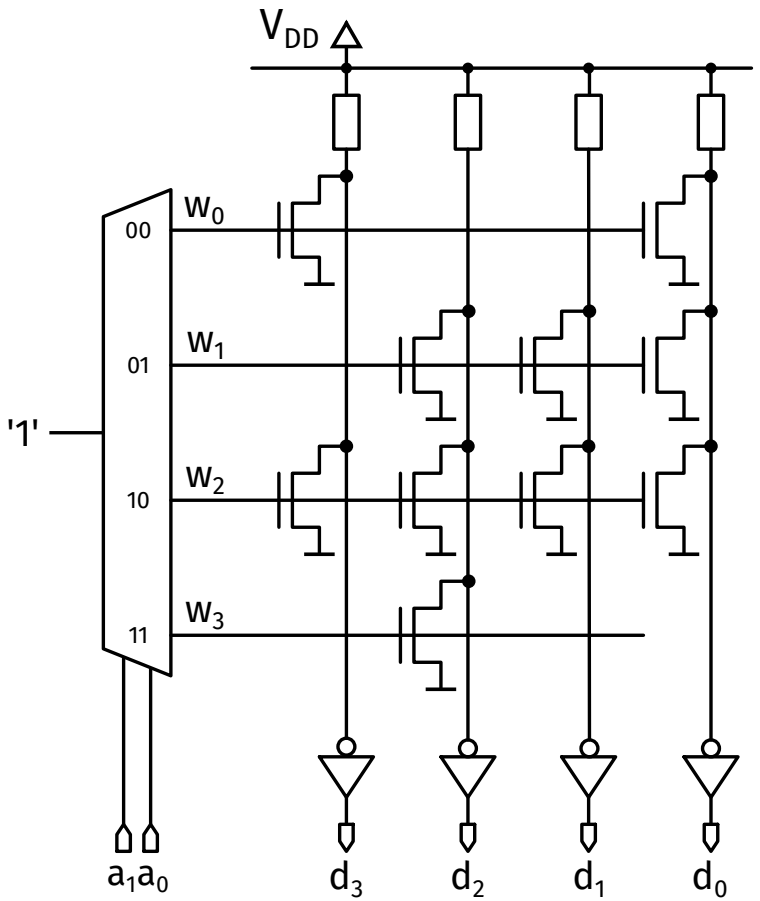


a_1	a_0	w_0	w_1	w_2	w_3	d_3	d_2	d_1	d_0
0	0	**1**	0	0	0	1	0	0	1
0	1	0	**1**	0	0	0	1	1	1
1	0	0	0	**1**	0	1	1	1	1
1	1	0	0	0	**1**	0	1	0	0

$$\begin{cases} d_3 = \overline{a_0} \\ d_2 = a_0 + a_1 \\ d_1 = a_0 \oplus a_1 \\ d_0 = \overline{a_0 * a_1} \end{cases}$$

ROM – Read only memory

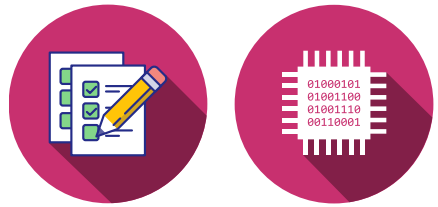
Mux-OR Structure & capacité



$$C = n_w * n_d = 2^{n_a} * n_d$$

Exercice 1.1 *(rom/logic-function-01)*

Tailles de mémoire

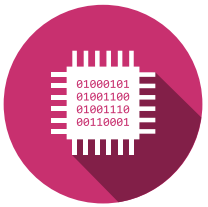


a) Quelle est la capacité de la mémoire du slide précédent ?

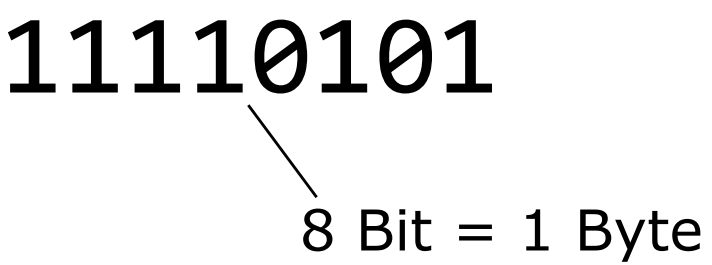
b) Quelle est la capacité d'une mémoire avec 10 lignes d'entrée et 8 lignes de sortie ?

c) Quelle est la capacité d'une mémoire avec 16 lignes d'entrée et 8 lignes de sortie ?

Système binaire - Remise à niveau



- 8 BIT forment un Byte (octet)
  - Purement historique

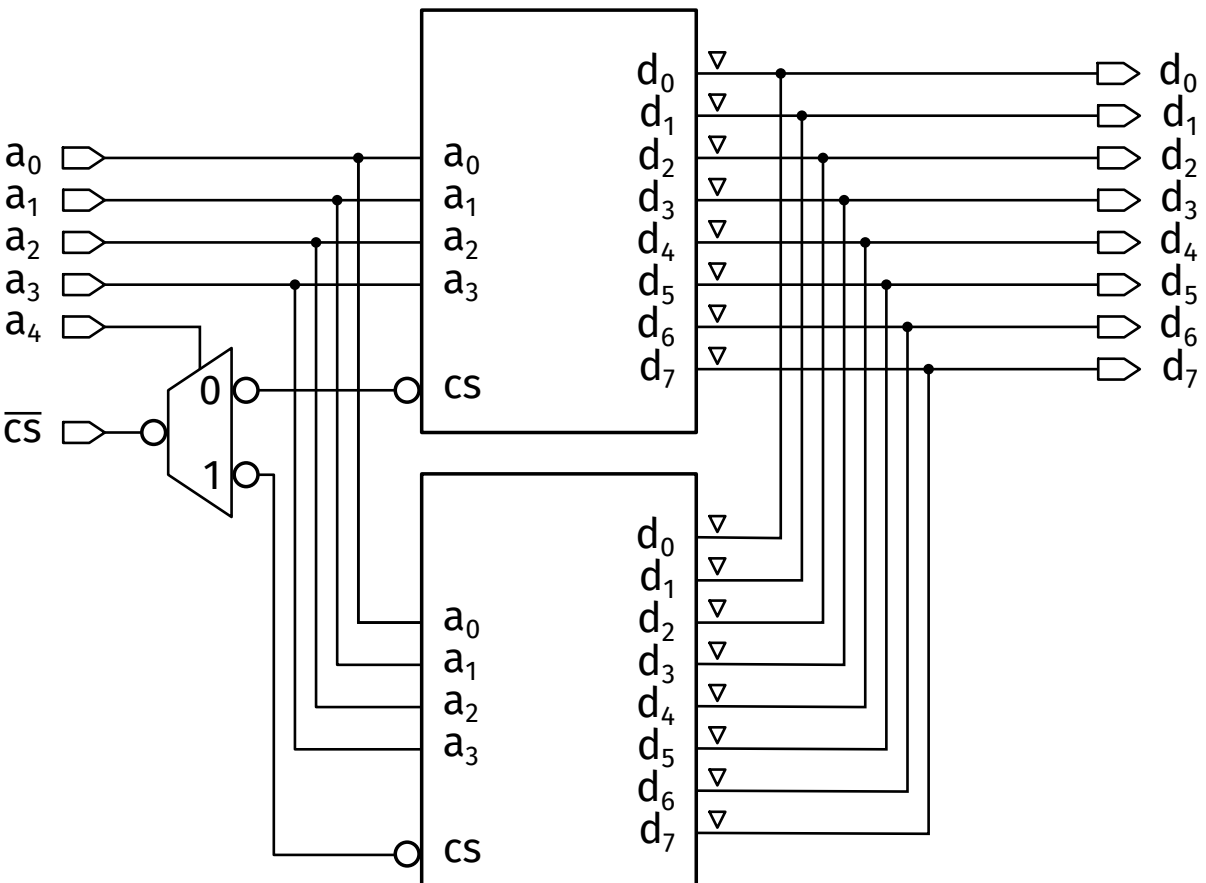


- Using IEC standard:
  - 1 KiB = 1’024 bytes (Note: big K)
  - 1 MiB = 1’024 KiB = 1’048’576 bytes
  - 1 GiB = 1’024 MiB = 1’048’576 KiB = 1’073’741’824 bytes

- Using SI standard:
  - 1 kB = 1’000 bytes (Note: small k)
  - 1 MB = 1’000 kB = 1,000,000 bytes
  - 1 GB = 1’000 MB = 1’000’000 KB = 1’000’000’000 bytes

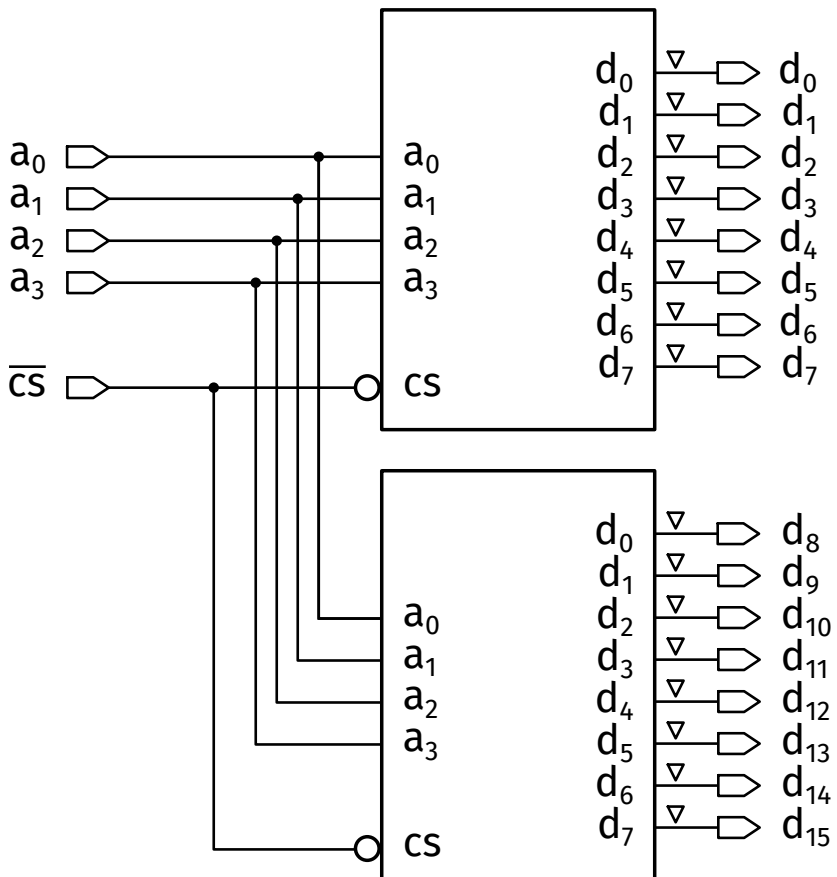
Mémoire Interconnexion

Mise en serie

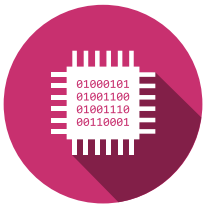


Mémoire Interconnexion

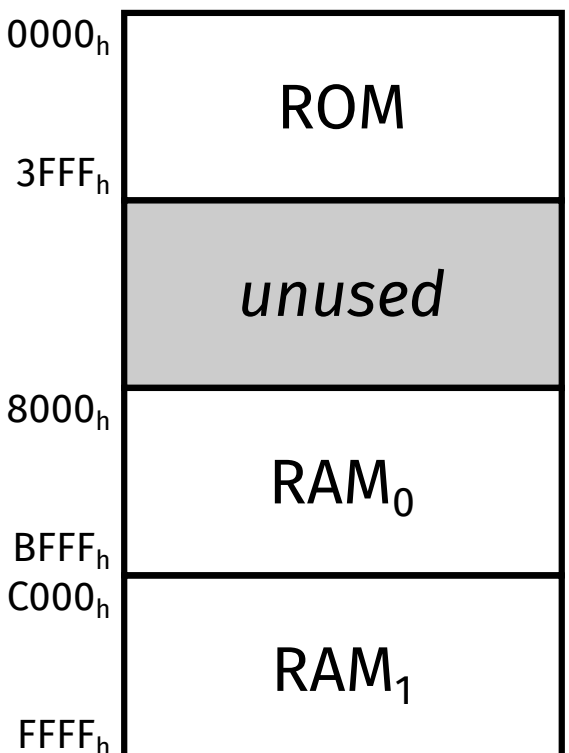
Mise en parallèle



Plan d'occupation de la mémoire

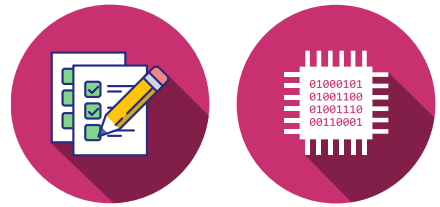


- Plan d'occupation de la mémoire d'un µP à 16 lignes d'adresse

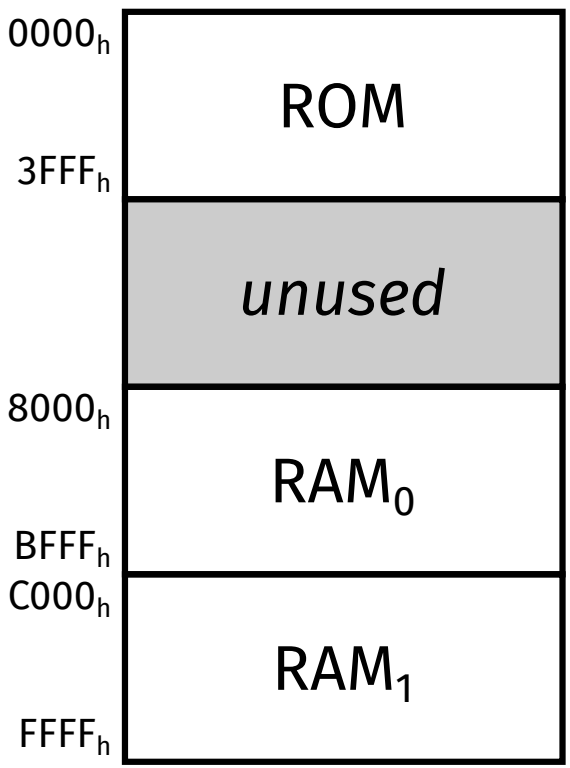


Exercice 2.1 *(rom/rom-circuits-01)*

Décodage ROM

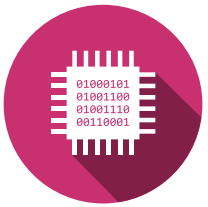


Dessinez le décodage de la ROM de l'occupation de mémoire suivante.



Object file format

Intel HEX

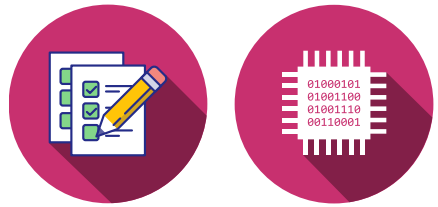


- `:` - Start delimiter
- Byte Count
- Address
- Record Type
  - 00 - Data
  - 01 – End of File
  - 02 – Extended Segment Address
  - 03 – Start Segment Address
  - 04 – Extended Linear Address
  - 05 – Start Linear Address
- Data
- Checksum
  - L'octet de somme de contrôle d'un enregistrement est le complément à deux de l'octet de poids faible (LSB) de la somme de toutes les valeurs d'octets décodées dans l'enregistrement avant la somme de contrôle.

```
:020000020000FC
:10000000000D1925313C47515B636A71767A7E7F1A
:100010007F7F7E7A76716A635B51473C3125190D8B
:1000200000F3E7DBCFC4B9AFA59D968F8A868281A6
:10003000808182868A8F969DA5AFB9C4CFDBE7F316
:00000001FF
```

Exercice 3.1.a *(rom/crc-01)*

CRC Checksum



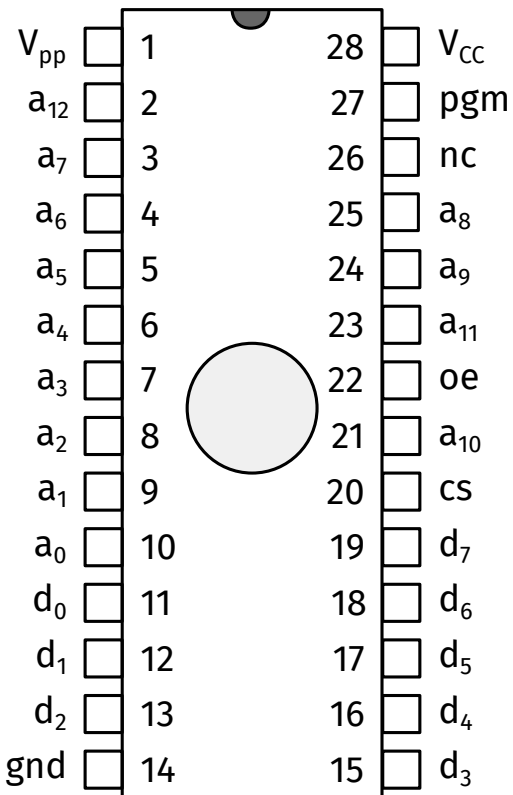
Calculer la somme de contrôle CRC de l'entrée Intel Hex File

```
:0300300002337AXX
```

Mémoire

Types

- PROM
- EPROM
- OTP-ROM
- EEPROM
- Flash

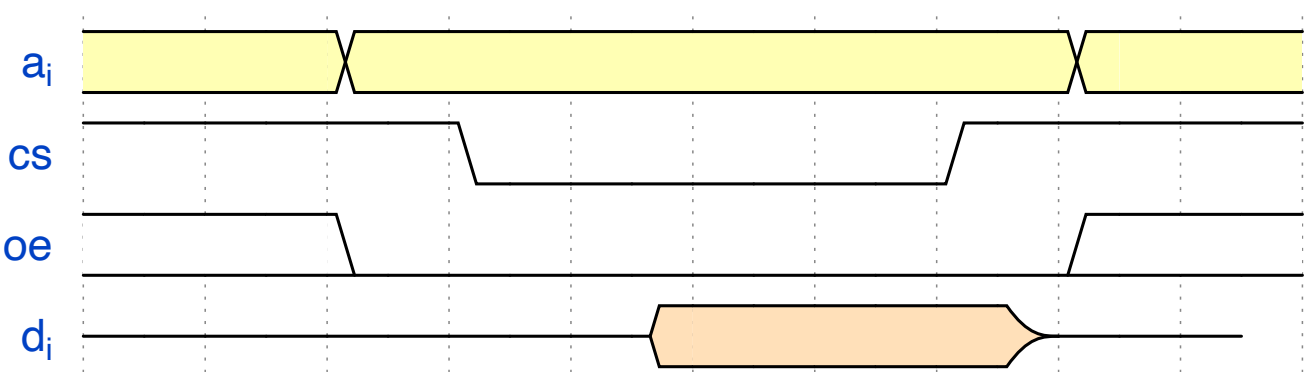


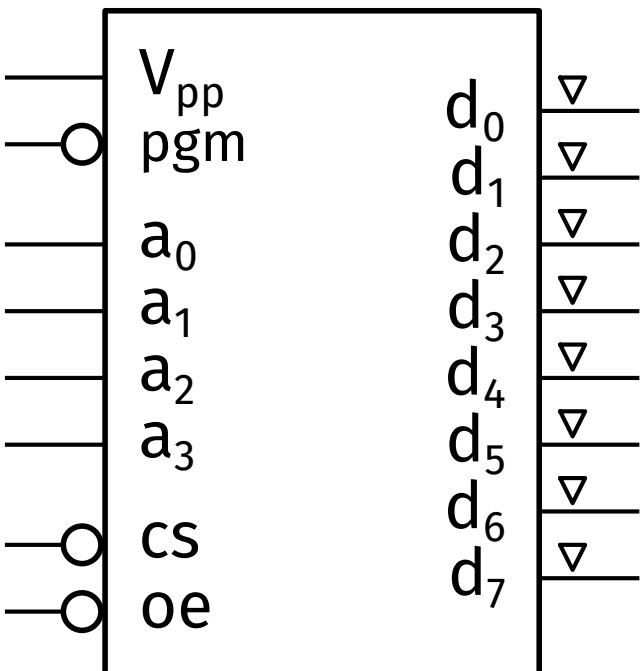
Accès à la mémoire

Interface parallèle

- Plus de signaux
- Bande passante plus élevée

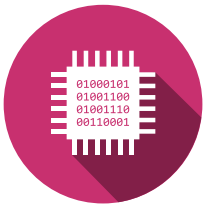
(sans changement de la fréquence d'horloge)





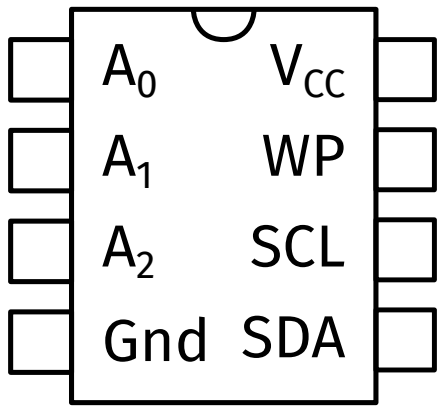
Accès à la mémoire

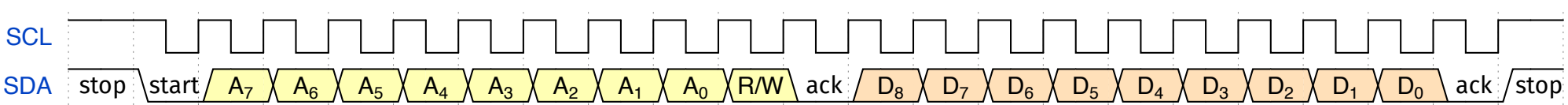
Interface série (I2C)



- Moins de signaux
- Bande passante plus faible

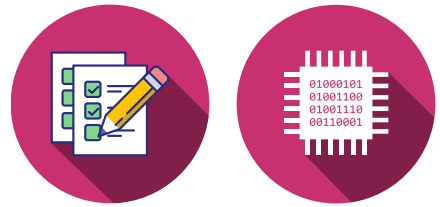
(sans changement de la fréquence d'horloge)





Exercice 4.1 *(rom/rom-types-01)*

ROM bande passante

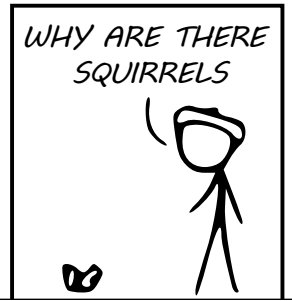


Une ROM est proposée avec une interface sérielle (I2C) et parallèle. La mémoire comprend 8 bits d'adresse et 8 bits de données et est cadencée à 66MHz. Calculez la vitesse d'écriture maximale théorique. En outre, calculez de combien de % le plus rapide est le plus rapide.

QUESTIONS

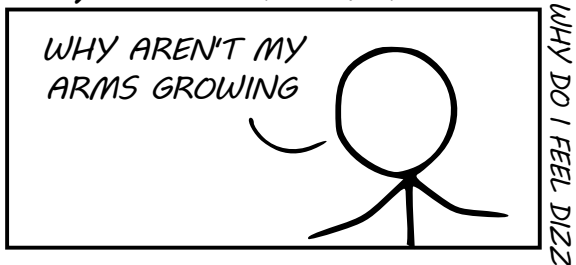
CAN BE ASKED BY ANYONE ANYTIME

WHY ARE THERE MIRRORS ABOVE BEDS
WHY DO I SAY UH
WHY IS SEA SALT BETTER
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS
WHY IS THERE NOT A POKEMON MMO
WHY IS THERE LAUGHING IN TV SHOWS
WHY ARE THERE DOORS ON THE FREEWAY
WHY ARE THERE SO MANY SVCHOST.EXE RUNNING
WHY AREN'T ANY COUNTRIES IN ANTARCTICA
WHY ARE THERE SCARY SOUNDS IN MINECRAFT
WHY IS THERE KICKING IN MY STOMACH
WHY ARE THERE TWO SLASHES AFTER HTTP
WHY ARE THERE CELEBRITIES
WHY DO SNAKES EXIST
WHY DO OYSTERS HAVE PEARLS
WHY ARE DUCKS CALLED DUCKS
WHY DO THEY CALL IT THE CLAP
WHY ARE KYLE AND CARTMAN FRIENDS
WHY IS THERE AN ARROW ON AANG'S HEAD
WHY ARE TEXT MESSAGES BLUE
WHY ARE THERE MUSTACHES ON CLOTHES
WHY WUBA LUBBA DUB DUB MEANING
WHY IS THERE A WHALE AND A POT FALLING
WHY ARE THERE SO MANY BIRDS IN SWISS
WHY IS THERE SO LITTLE RAIN IN WALLIS
WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG
WHY ARE THERE MALE AND FEMALE BIKES
WHY ARE THERE BRIDESMAIDS
WHY DO DYING PEOPLE REACH UP
HOW FAST IS LIGHTSPEED
WHY ARE OLD KLINGONS DIFFERENT



WHY ARE THERE TINY SPIDERS IN MY HOUSE
WHY DO SPIDERS COME INSIDE
WHY ARE THERE HUGE SPIDERS IN MY HOUSE
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE
WHY ARE THERE SPIDERS IN MY ROOM
WHY ARE THERE SO MANY SPIDERS IN MY ROOM
WHY DO SPYDER BITES ITCH
WHY IS DYING SO SCARY
WHY IS THERE NO GPS IN LAPTOPS
WHY DO KNEES CLICK

WHY DO IGUANAS DIE
WHY IS THERE CAFFEINE IN MY SHAMPOO
WHY HAVE DINOSAURS NO FUR
WHY ARE SWISS AFRAID OF DRAGONS
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS
WHY IS HTTPS CROSSED OUT IN RED
WHY IS THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER
WHY IS YKK ON ALL ZIPPERS
WHY IS HTTPS IMPORTANT



WHY ARE THERE WEEKS
WHY DO I FEEL DIZZY
WHY AREN'T ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY IS 42 THE ANSWER TO EVERYTHING
WHY CAN'T NOBODY ELSE LIFT THORS HAMMER
WHY IS MARVIN ALWAYS SO SAD
WHY IS THERE A SWARM OF ANTS
WHY IS THERE PILEGRIM
WHY IS THERE LAVA
WHY ARE THERE SO MANY CROWS IN ROCHESTER
WHY IS TO BE OR NOT TO BE FUNNY
WHY DO CHILDREN GET CANCER
WHY IS POSEIDON ANGRY WITH ODYSSEUS
WHY IS THERE ICE IN SPACE
WHY ARE THERE ANTS IN MY LAPTOP
WHY ARE DOGS AFRAID OF FIR
WHY IS THERE NO KING IN EN
WHY IS THERE HELL IF
WHY IS LIFE SO
WHY ARE THERE FEMALE
WHY IS EARTH TILTED
WHY IS SPACE BLACK
WHY IS OUTER SPACE SO COLD
WHY ARE THERE PYRAMIDS ON THE MOON
WHY IS NASA SHUTTING DOWN

WHY IS THERE AN OWL IN MY BACKYARD
WHY IS THERE AN OWL OUTSIDE MY WINDOW
WHY IS THERE AN OWL ON THE DOLLAR BILL
WHY DO OWLS ATTACK PEOPLE
WHY ARE FPGA's EVERYWHERE
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE TWO SPOCKS
WHY ARE MY BOOBS ITCHY
WHY ARE CIGARETTES LEGAL
WHY ARE THERE DUCKS IN MY POOL
WHY IS JESUS WHITE
WHY IS THERE LIQUID IN MY EAR
WHY DO Q TIPS FEEL GOOD
WHY DO PEOPLE DIE
WHAT IS https://xkcd.com/1256/
WHY DO THEY SAY T-MINUS
WHY ARE THERE OBELISKS
WHY ARE WRESTLERS ALWAYS WET

Hes·so VALAIS WALLIS

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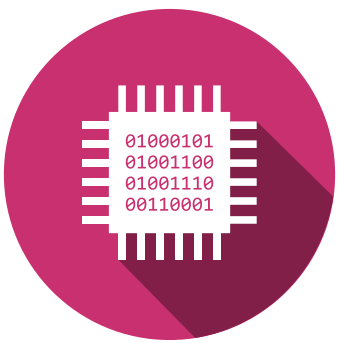

Silvan Zahno silvan.zahno@hevs.ch
Christophe Bianchi christophe.bianchi@hevs.ch
François Corthay francois.corthay@hevs.ch