Hes·so VALAIS WALLIS

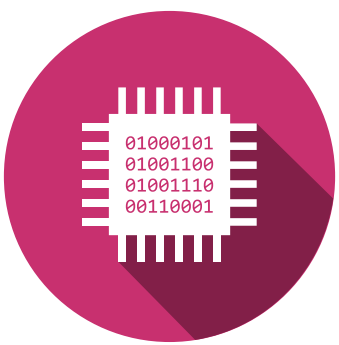
Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften

Conception numérique (DiD)

Multiplexeurs et démultiplexeurs

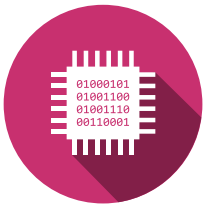
MUX

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

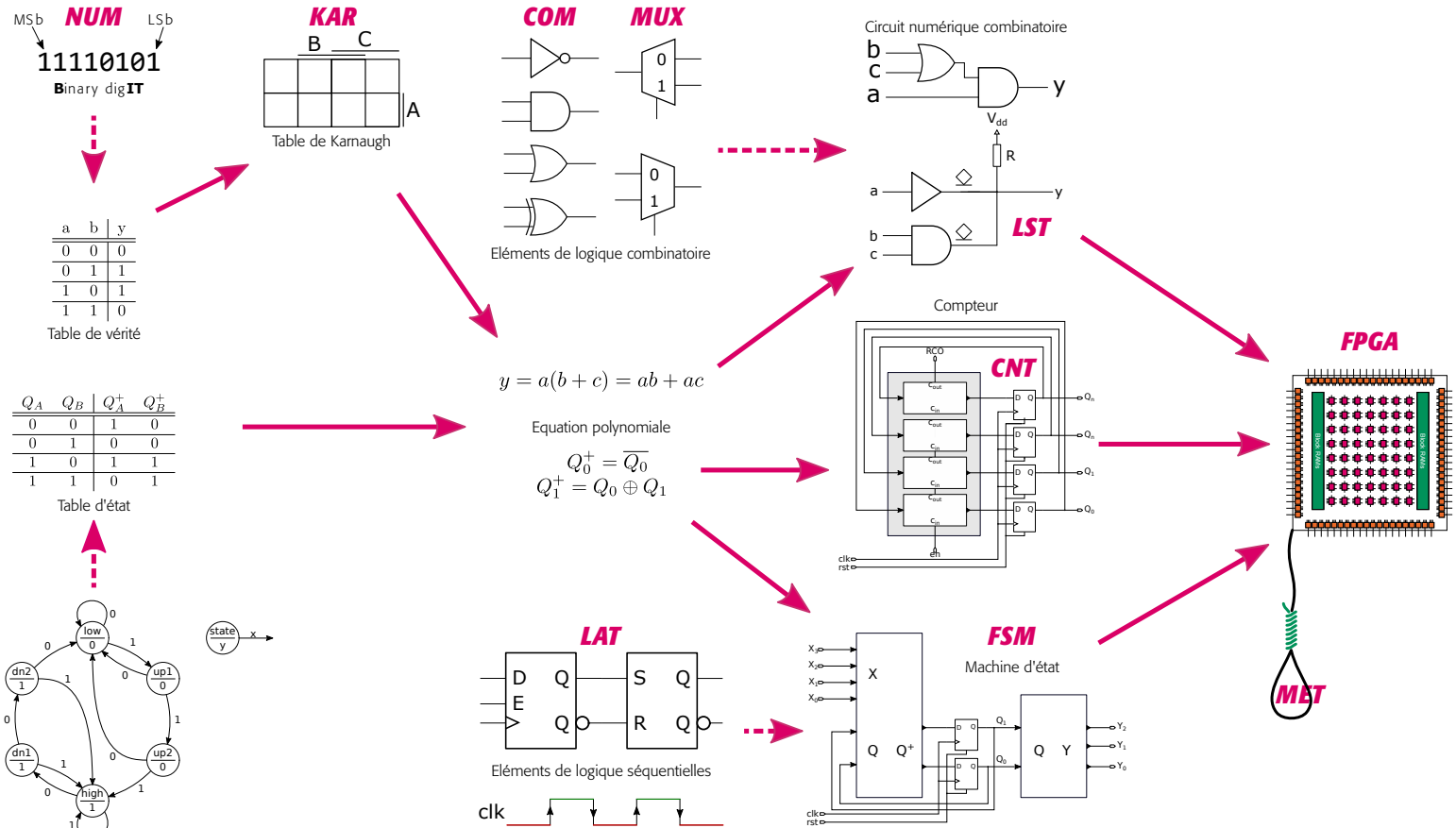


Silvan Zahno silvan.zahno@hevs.ch
Christophe Bianchi christophe.bianchi@hevs.ch
François Corthay francois.corthay@hevs.ch

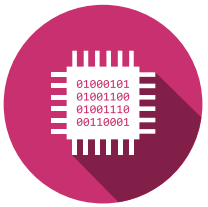
Situatuion du thème dans le cours



Cahier des charges



Contenu

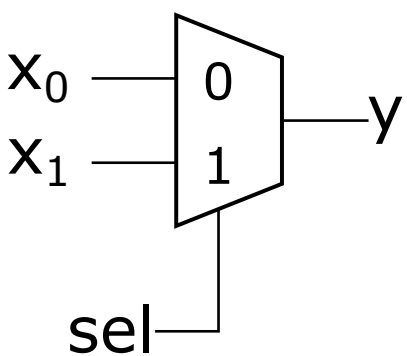


- **Multiplexeurs**
  - Fonction
  - Fonction logique universelle
  - Réalisation à l’aide de portes logiques
  - Réalisation en forme d’arbre
  - Simplifications

- Démultiplexeurs

Multiplexeurs fonction

Multiplexeur de 2 à 1

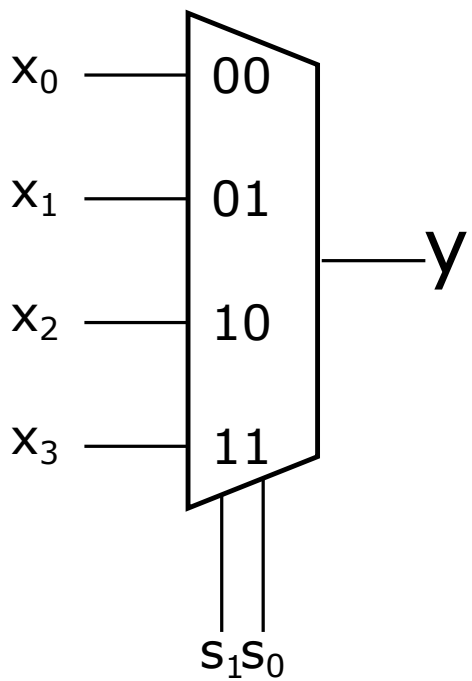


sel	y
0	x_0
1	x_1

Le multiplexeur fonctionne comme un aiguillage

Multiplexeurs fonction

Multiplexeur de 4 à 1



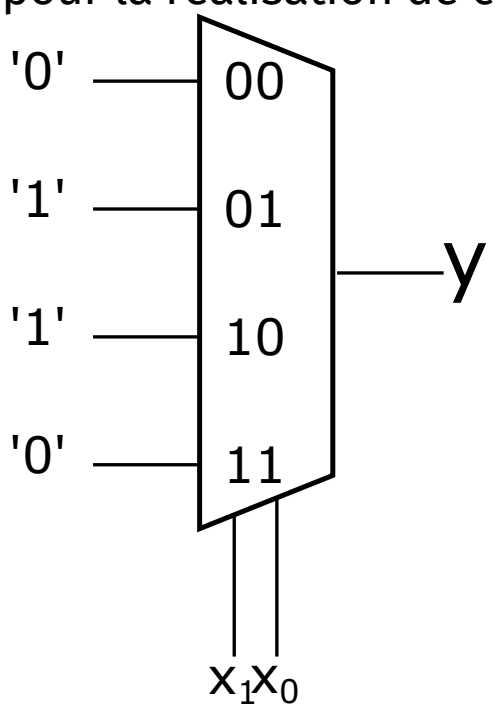
s_1 s_0	y
00	x_0
01	x_1
10	x_2
11	x_3

N signaux de sélection, 2^N entrées

Multiplexeurs fonction

Fonction logique universelle

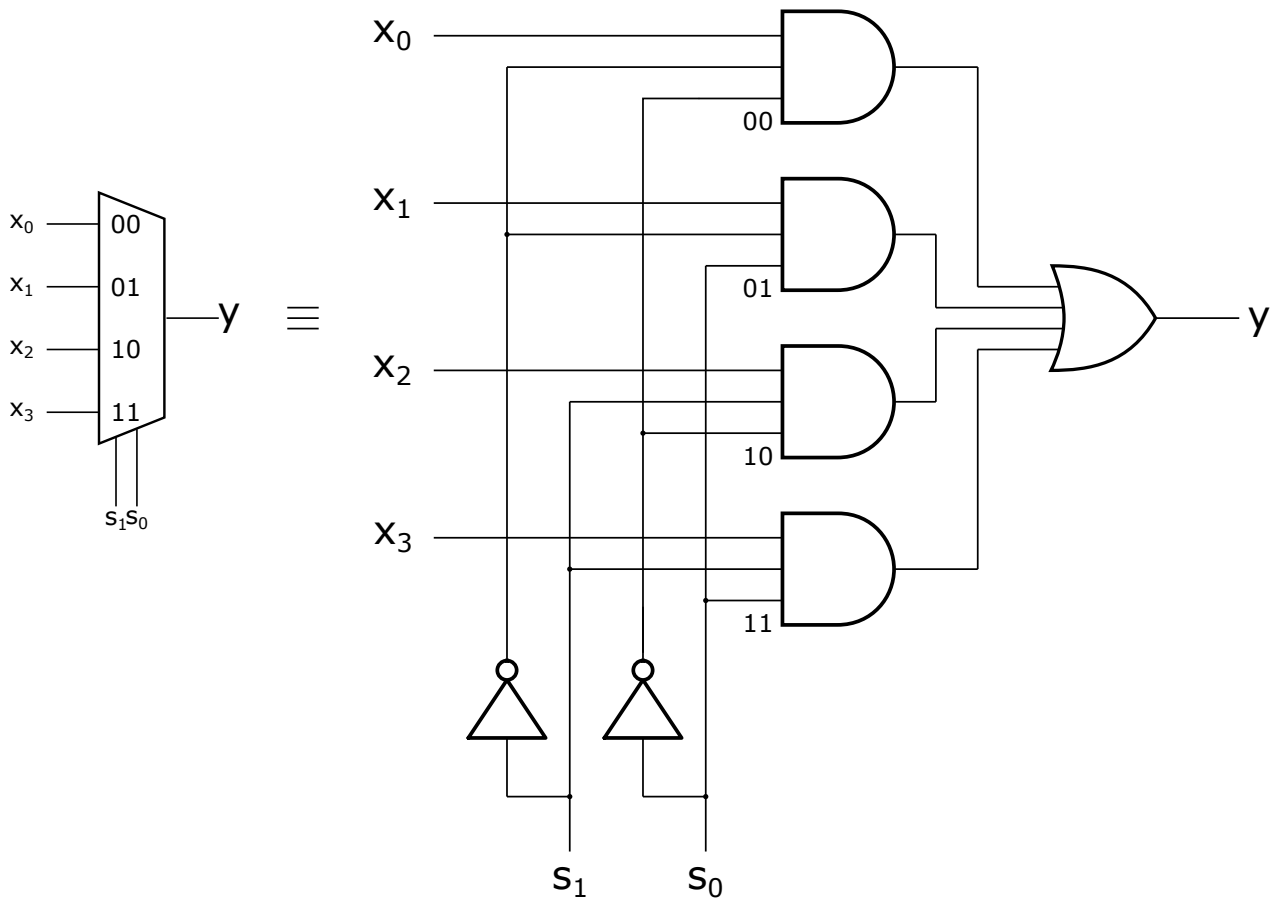
- Example: fonction XOR
- Les valeurs de sortie de la table de vérité nous donne les entrées du multiplexeur
- Les entrées de la table de vérité nous donnent les signaux de sélection du multiplexeur
- S'utilise pour la réalisation de circuits programmables



x_1 x_0	y
00	0
01	1
10	1
11	0

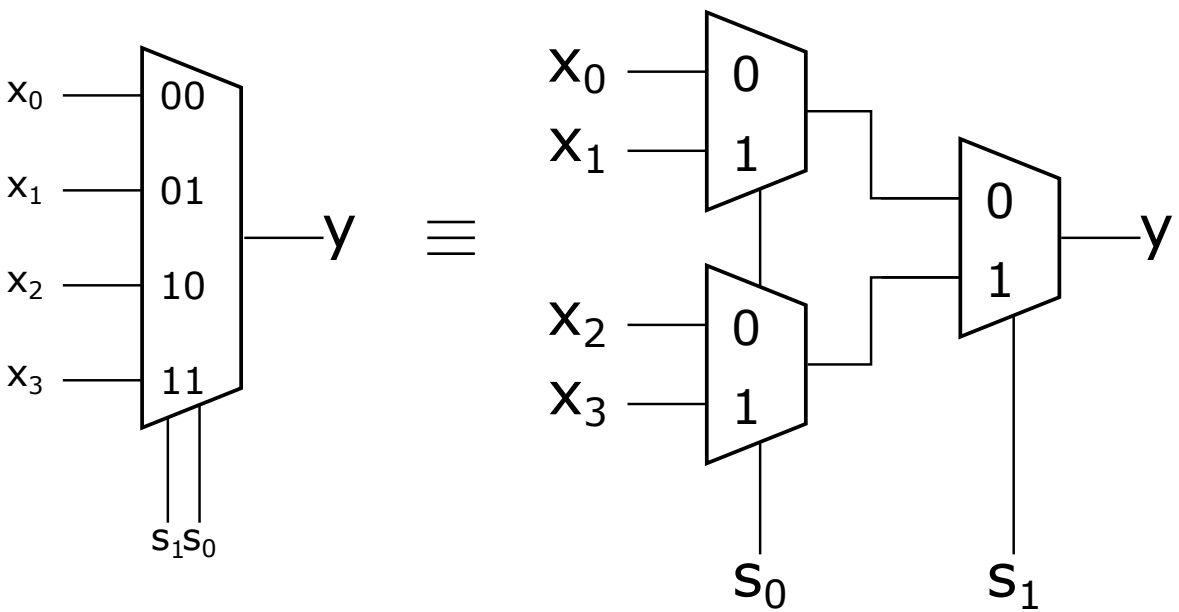
Multiplexeurs fonction

Réalisation d'un multiplexeur à l'aide de portes logiques



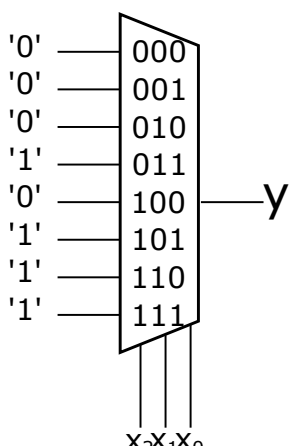
Multiplexeurs fonction

Réalisation de fonctions multiplexeur en forme d'arbre



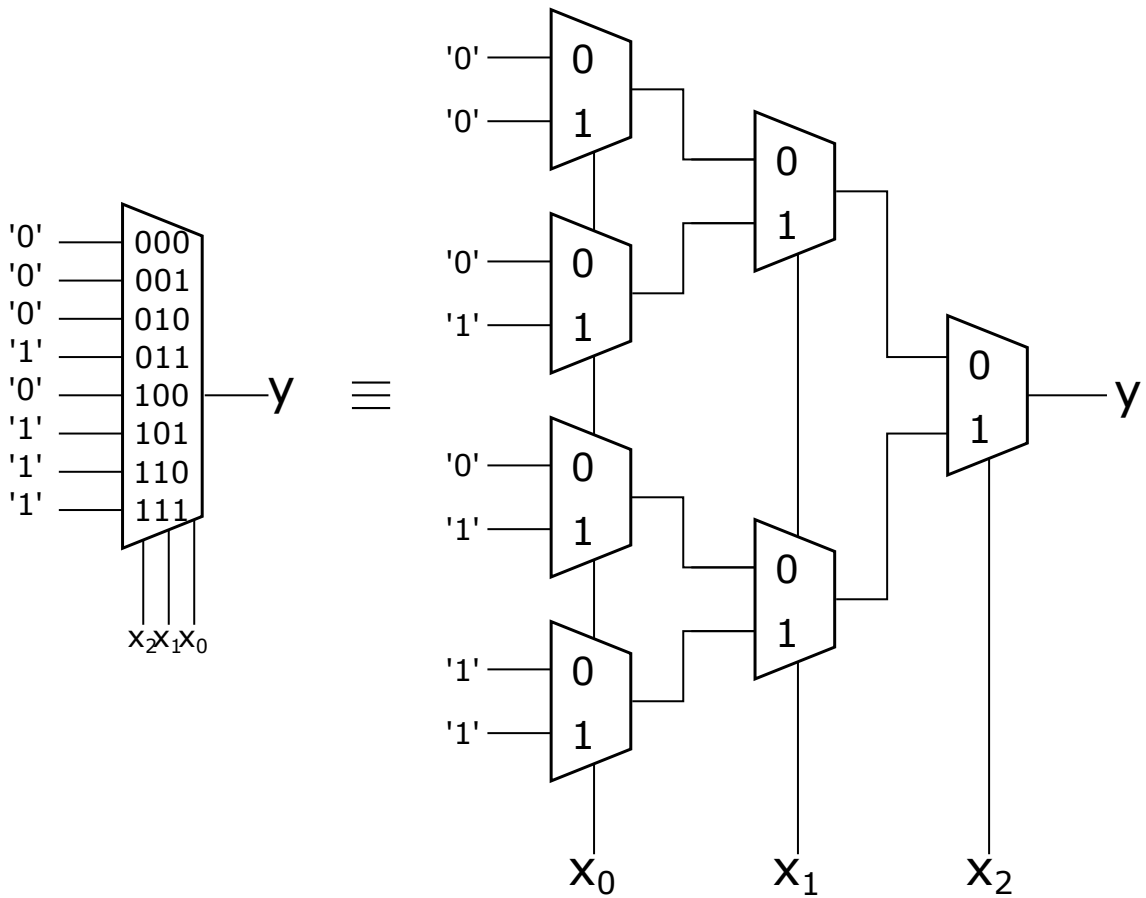
Multiplexeurs fonction

Simplification d’une fonction multiplexeur



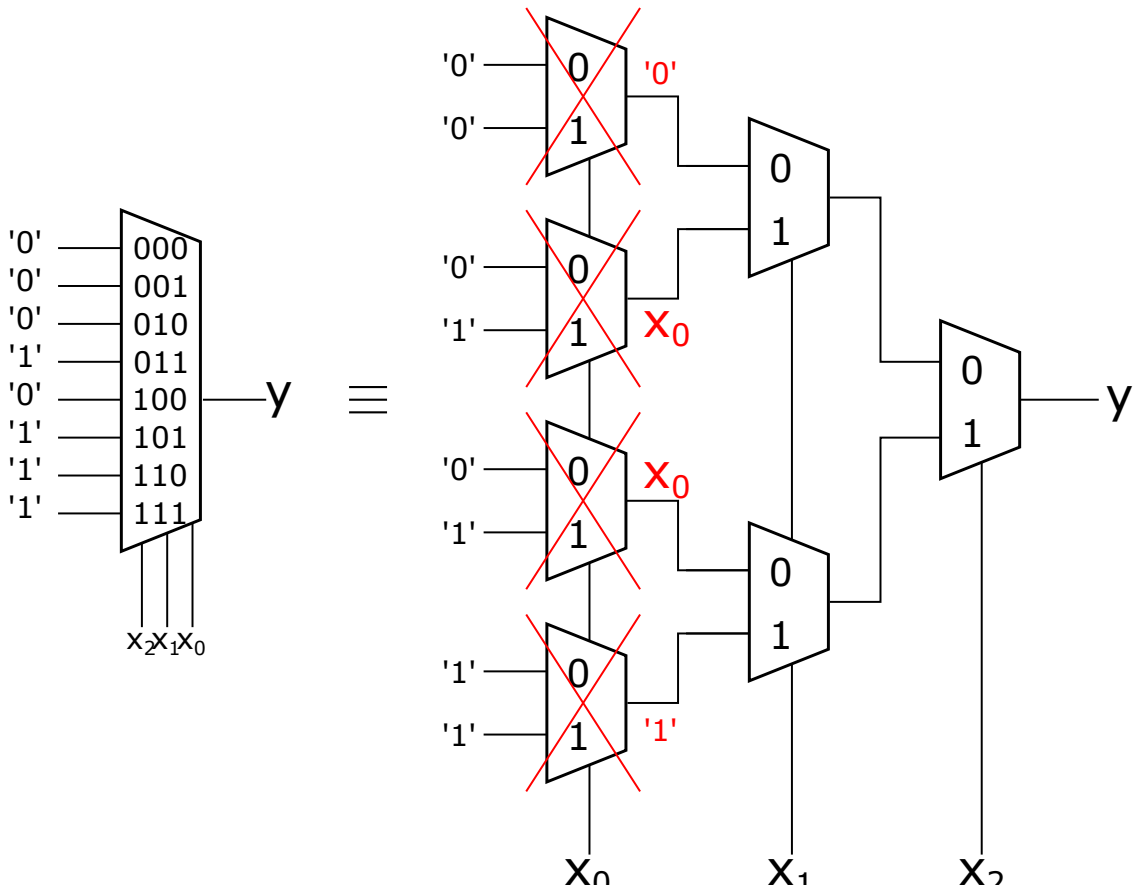
Multiplexeurs fonction

Simplification d'une fonction multiplexeur



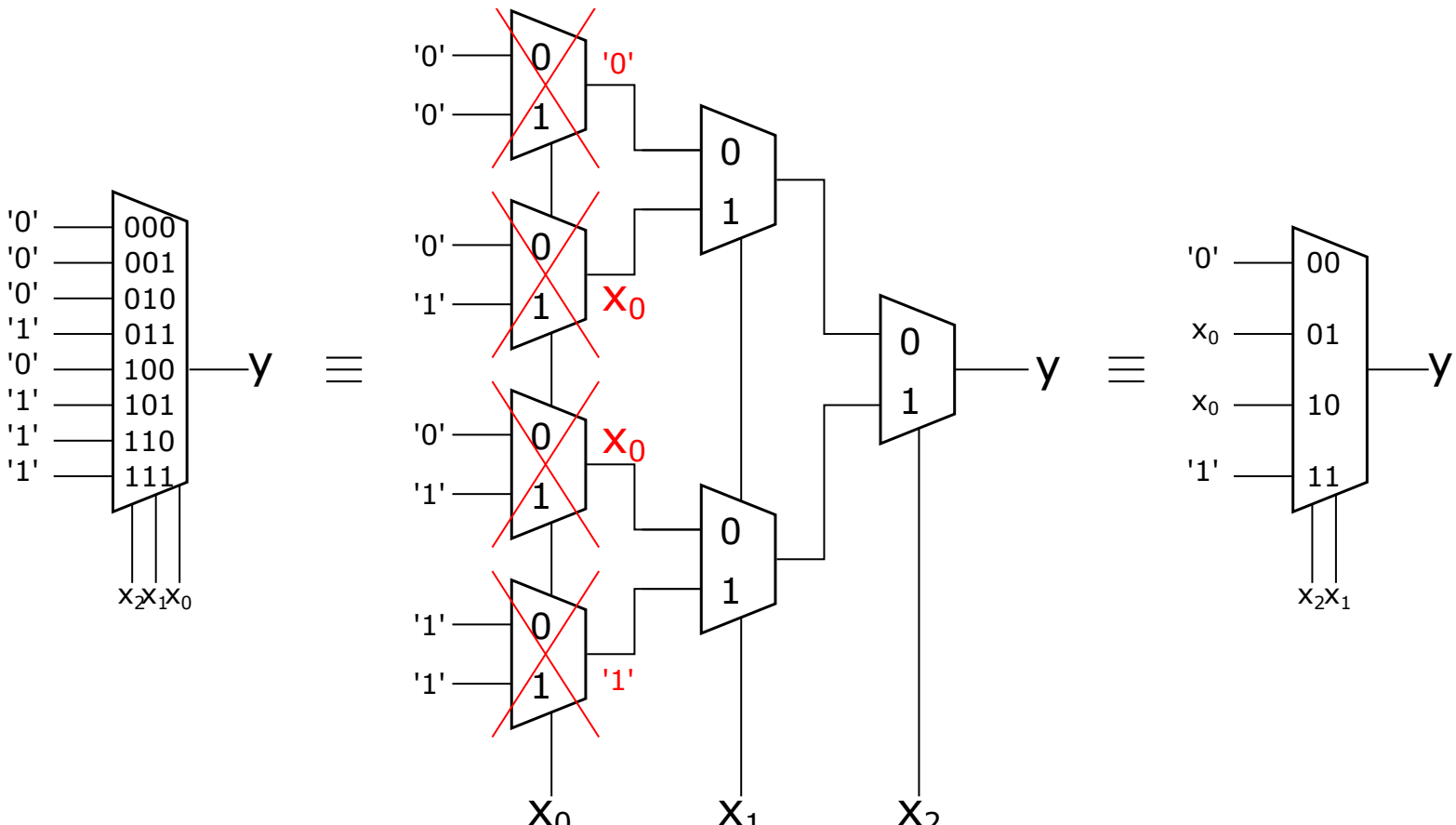
Multiplexeurs fonction

Simplification du premier étage

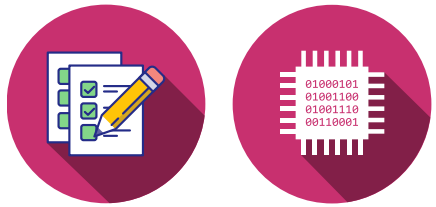


Multiplexeurs fonction

Simplification du premier étage

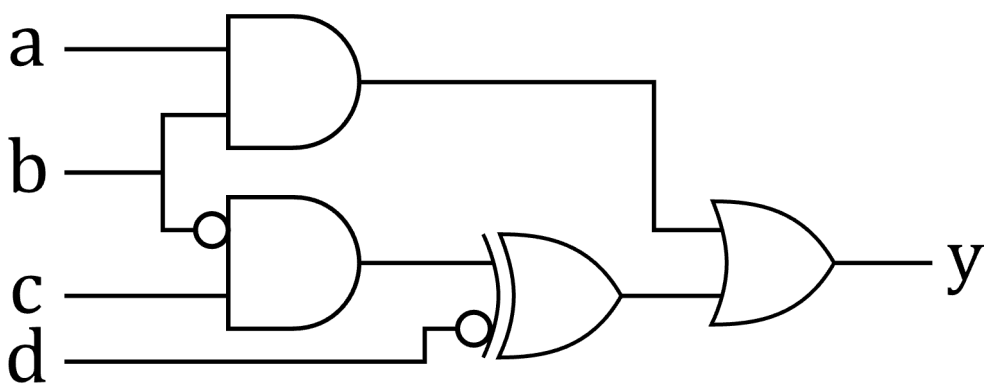


Exercise 1.1 *(mux/mux-01)*



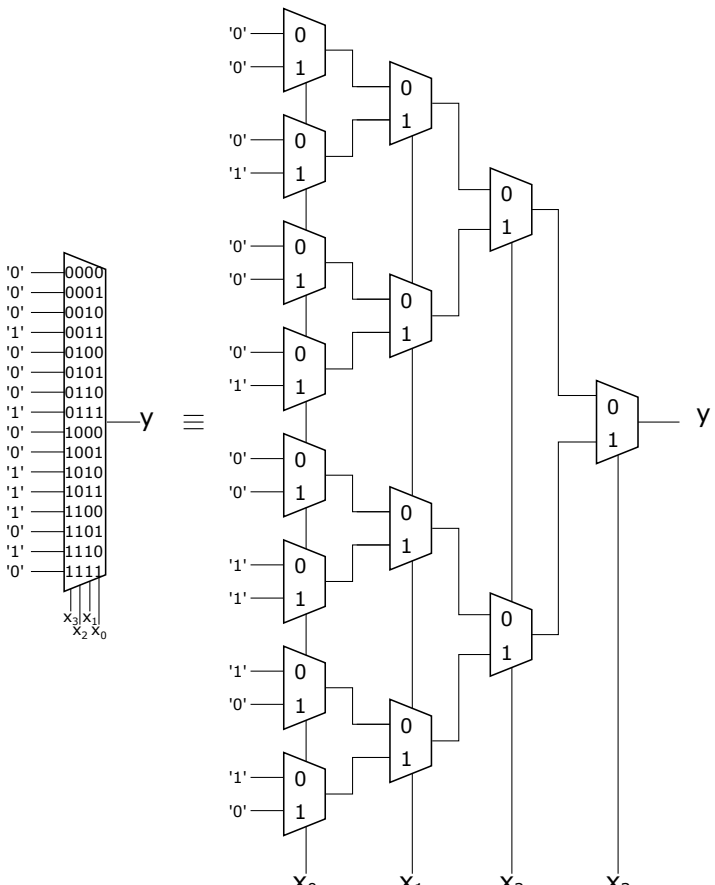
- Réalisation de circuit à l'aide de multiplexeurs

Dessinez, à l'aide d'inverseurs et de multiplexeurs de 8 à 1, un circuit qui réalise la même fonction que le circuit de la figure ci-dessous.



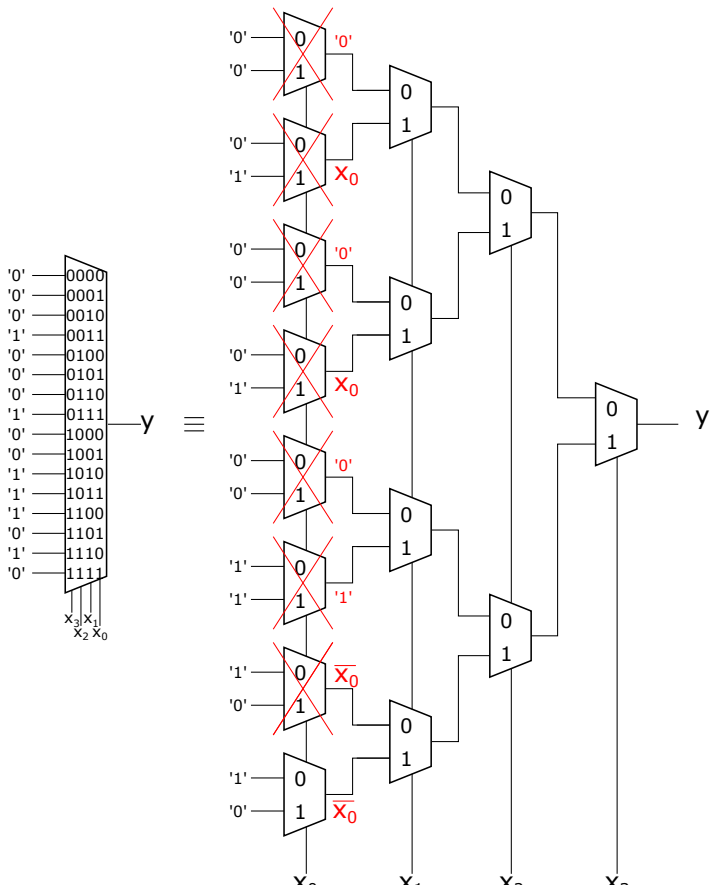
Multiplexeurs fonction

Simplification en mux 2 à 1



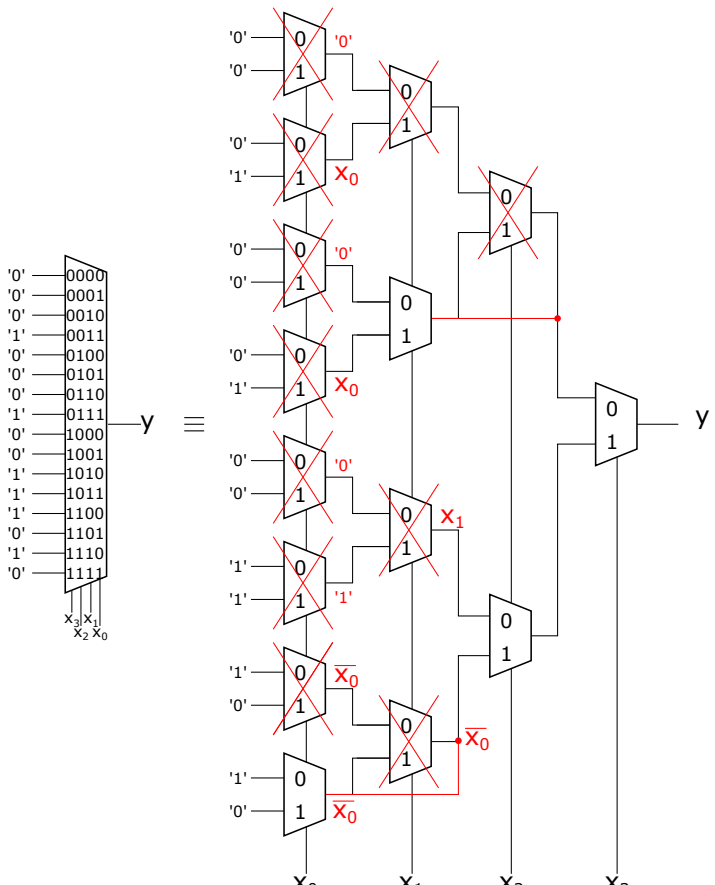
Multiplexeurs fonction

Simplification en mux 2 à 1



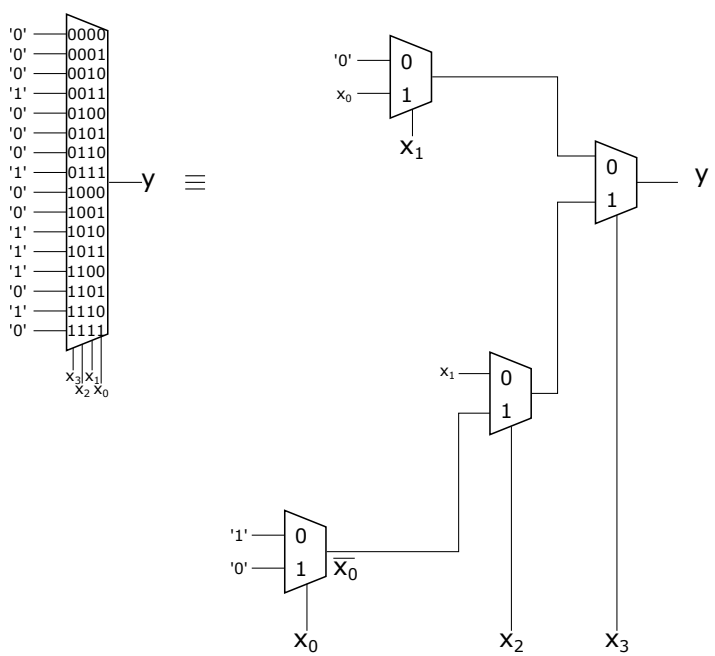
Multiplexeurs fonction

Simplification en mux 2 à 1

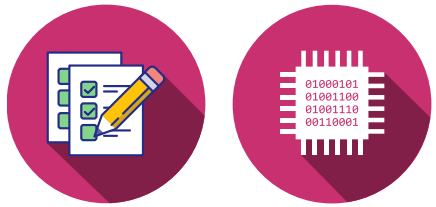


Multiplexeurs fonction

Simplification en mux 2 à 1



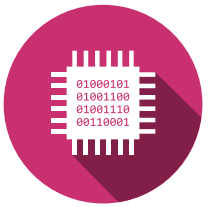
Exercise 1.4 *(mux/mux-02)*



- Réalisation de fonction à l'aide de multiplexeurs

D	C	B	A	S	T	U	V	W	X	Y	Z
0	0	0	0	-	-	-	-	-	-	-	-
0	0	0	1	-	-	-	-	-	-	-	-
0	0	1	0	-	-	-	-	-	-	-	-
0	0	1	1	1	-	1	-	-	1	-	0
0	1	0	0	0	-	-	1	1	-	1	-
0	1	0	1	0	-	-	0	0	-	-	1
0	1	1	0	0	-	-	0	-	1	1	-
0	1	1	1	0	-	-	0	-	0	-	1
1	0	0	0	-	1	1	-	1	-	1	-
1	0	0	1	-	0	0	-	0	-	-	1
1	0	1	0	-	0	0	-	-	1	1	-
1	0	1	1	-	0	0	-	-	0	-	1
1	1	0	0	-	0	-	1	1	-	1	-
1	1	0	1	-	0	-	0	0	-	-	1
1	1	1	0	-	-	-	-	-	-	-	-
1	1	1	1	-	-	-	-	-	-	-	-

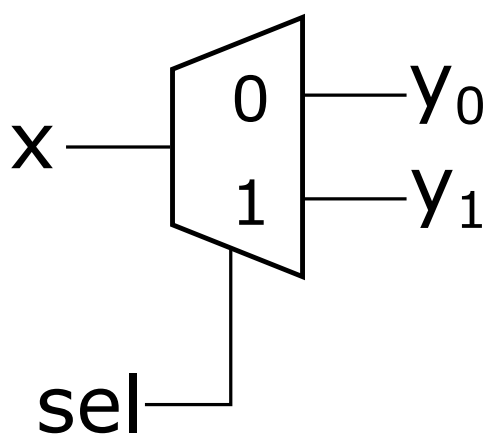
Contenu



- Multiplexeurs
- **Démultiplexeurs**
  - Fonction
  - Réalisation à l’aide de portes logiques
  - Réalisation en forme d’arbre

Démultiplexeurs

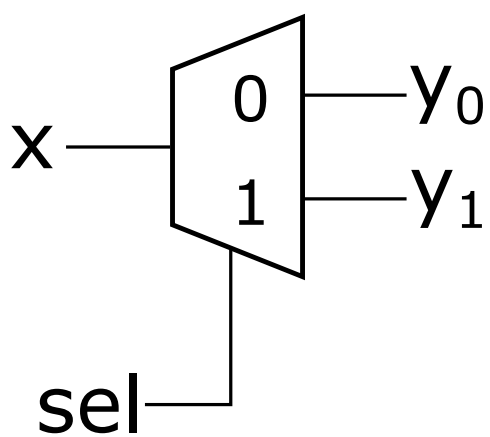
Démultiplexeur 1 vers 2



sel	y_0	y_1
0	x	
1		x

Démultiplexeurs

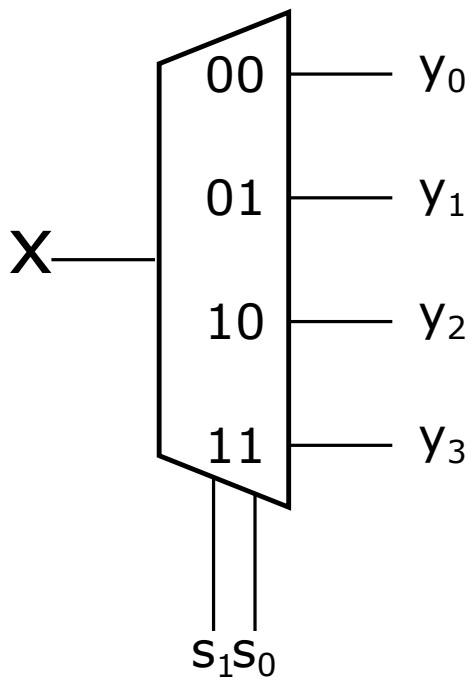
Démultiplexeur 1 vers 2



sel	y_0	y_1
0	x	0
1	0	x

Démultiplexeurs

Démultiplexeur 1 vers 4

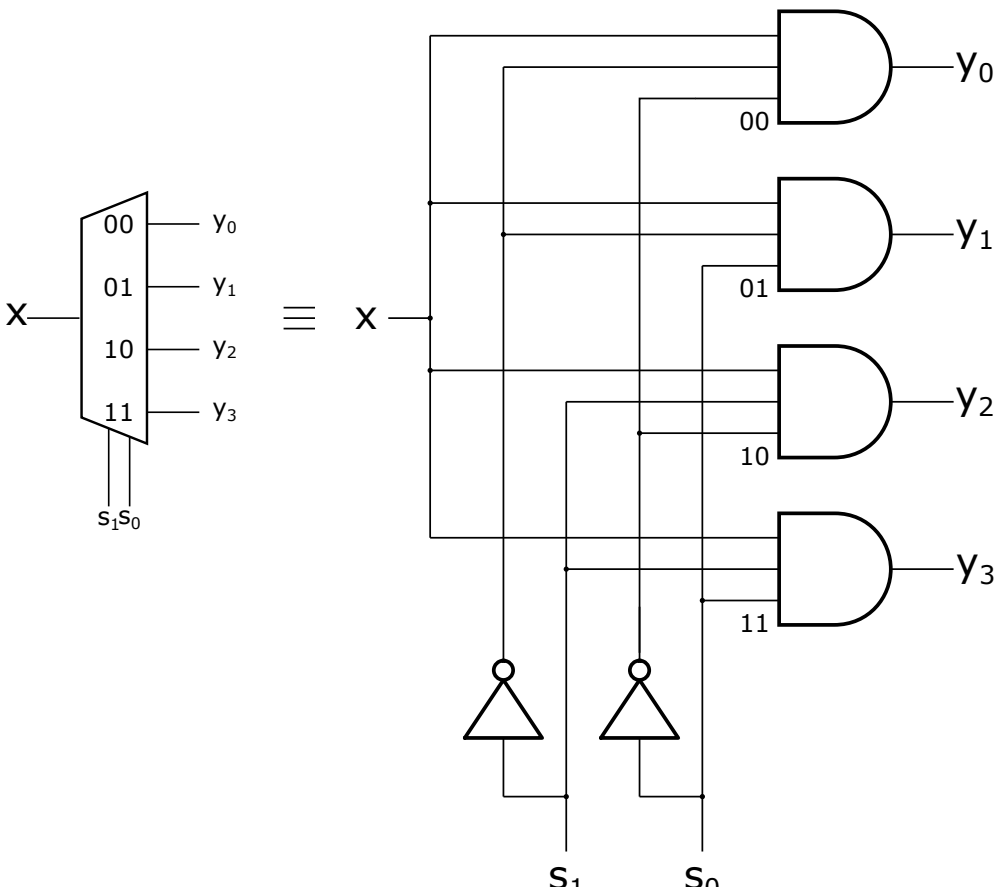


s_1 s_0	y_0	y_1	y_2	y_3
00	x	0	0	0
01	0	x	0	0
10	0	0	x	0
11	0	0	0	x

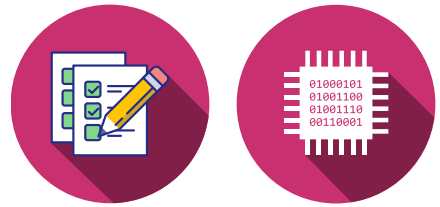
N signaux de sélection, 2^N sorties

Démultiplexeurs

Réalisation de démultiplexeur à l'aide de portes logiques



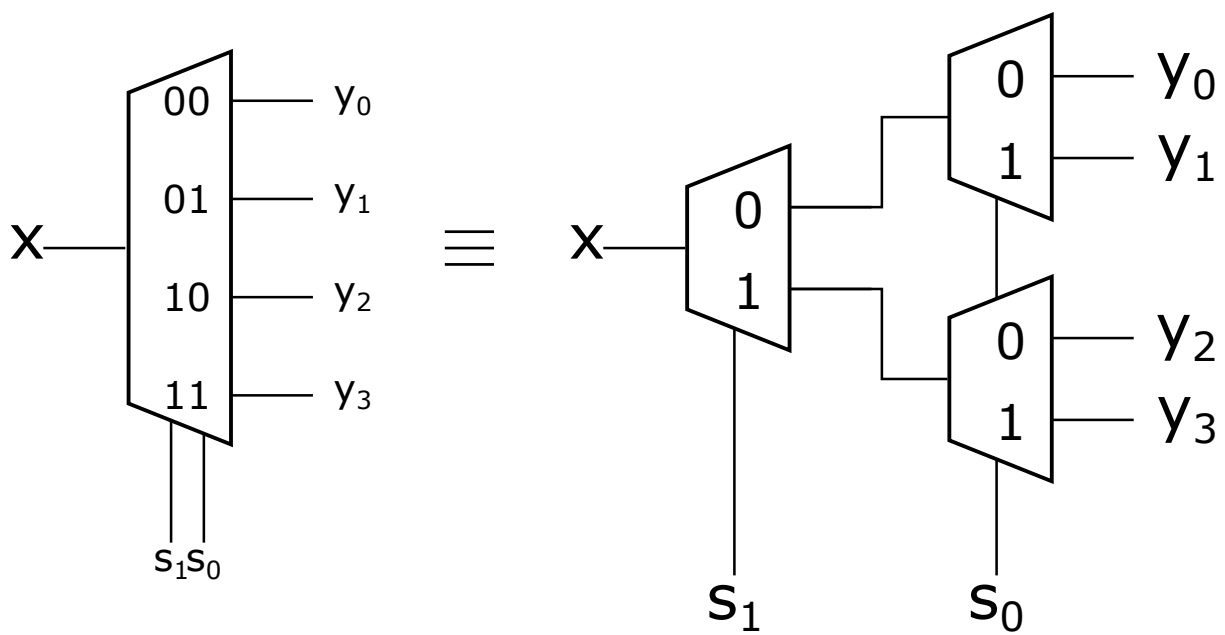
Exercise 2.1 *(mux/demux-01)*



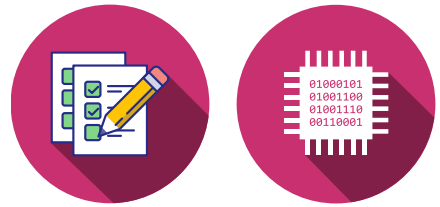
- Réalisation d’un démultiplexeur de 1 vers 8

Démultiplexeurs

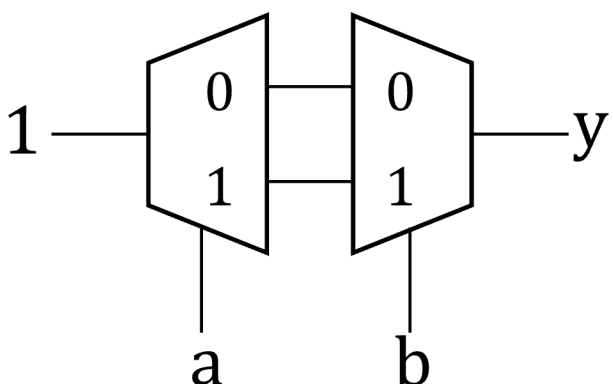
Décomposition en arbre de démultiplexeurs



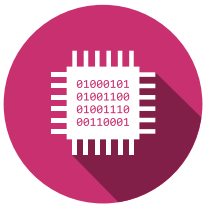
Exercise 2.2 *(mux/demux-02)*



- Déterminez la fonction logique du circuit représenté dans l'illustration ci-contre.



Référénces

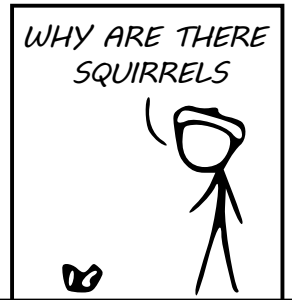


- [Com90] (anglais) Présentation complète
- [Wak00] (anglais) Circuits intégrés standard, code VHDL
- [Kat94] (anglais) Bonne présentation

QUESTIONS

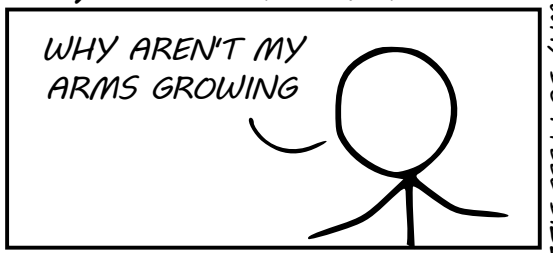
CAN BE ASKED BY ANYONE ANYTIME

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 THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER
WHY IS HTTPS IMPORTANT
WHY IS YKK ON ALL ZIPPERS



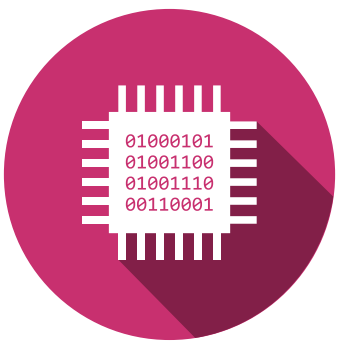
WHY ARE THERE WEEKS
WHY DO I FEEL DIZZY
WHY AREN'T ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY IS 42 THE ANSWER TO EVERYTHING
WHY CAN'T NOBODY ELSE LIFT THORS HAMMER
WHY IS MARVIN ALWAYS SO SAD
WHY IS THERE A SWARM OF ANTS
WHY IS THERE PILEGRIM
WHY IS THERE LAVA
WHY ARE 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 ARE THERE FEMALE
WHY IS LIFE SO

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

Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften



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