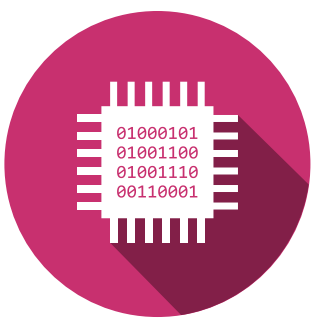
Hes·so VALAIS WALLIS
Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften

Digitales Design (DiD)

Multiplexer und Demultiplexer

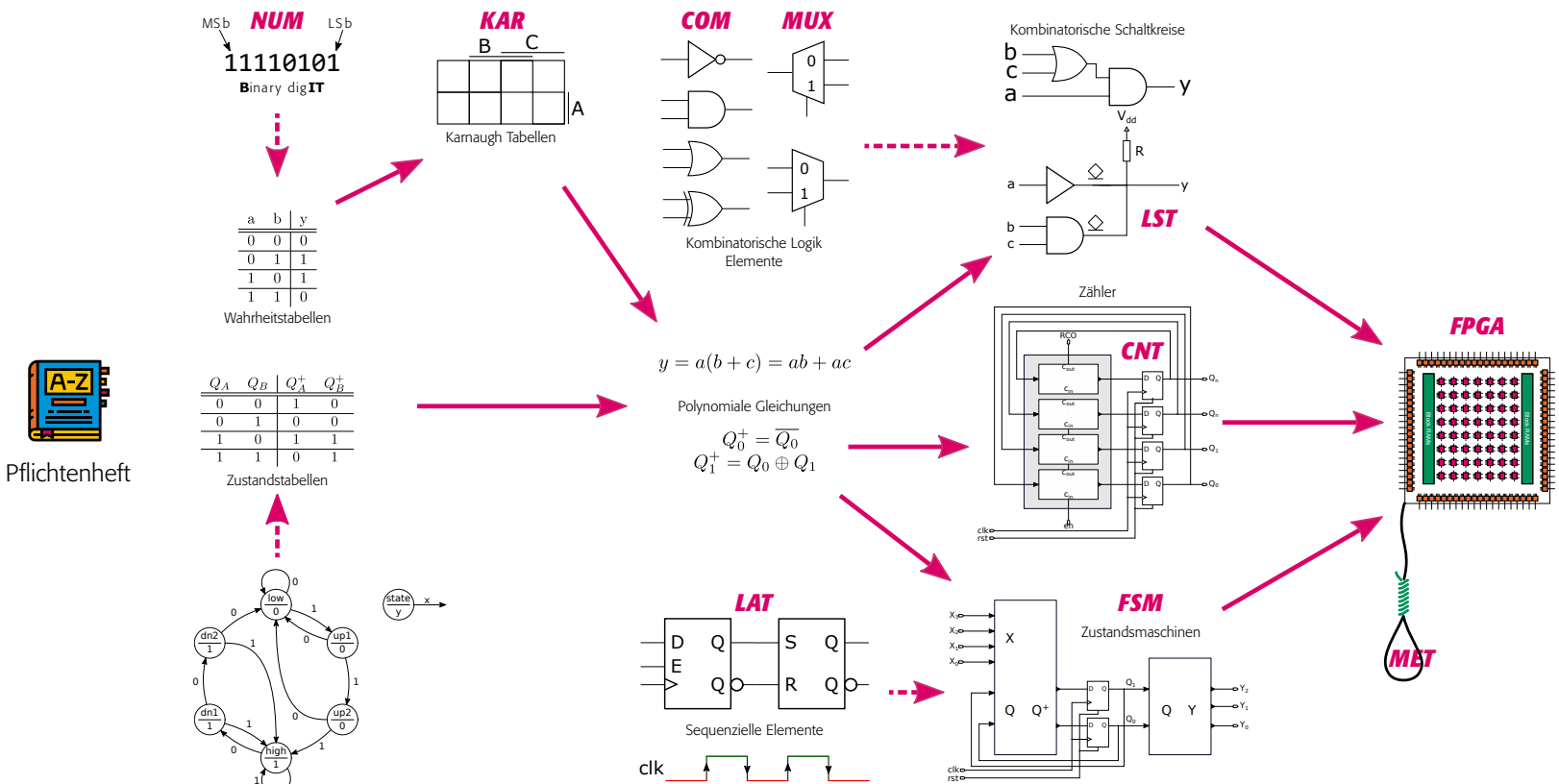
MUX

Studiengang Systemtechnik
Studiengang Energie und Umwelttechnik
Studiengang Informatik und Kommunikationssysteme

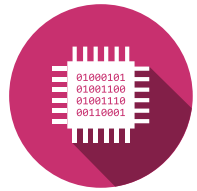


Silvan Zahno silvan.zahno@hevs.ch
Christophe Bianchi christophe.bianchi@hevs.ch
François Corthay francois.corthay@hevs.ch

Aktueller Inhalt des Themas im Kurs



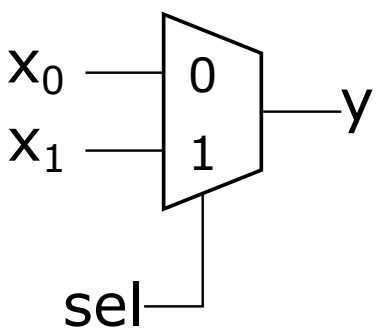
Inhalt



- **Multiplexer**
  - Funktion
  - Universelle Logikfunktion
  - Realisierung von Multiplexern mittels Basislogikgatter
  - Realisierung von Multiplexern mit einer Baumstruktur
  - Vereinfachung
- Demultiplexer

Multiplexer Funktion

2 zu 1 Multiplexer

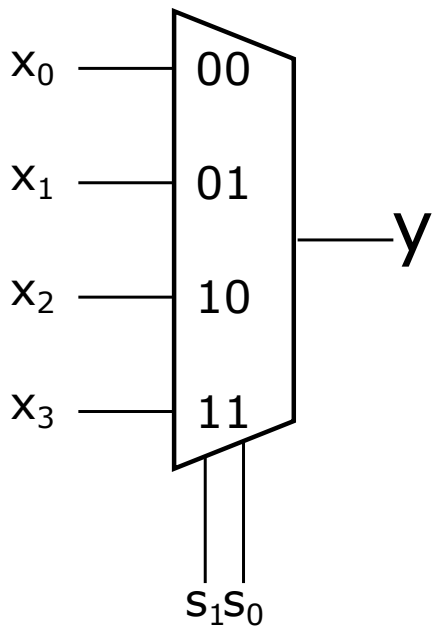


sel	y
0	x_0
1	x_1

Der Multiplexer funktioniert wie ein Zeiger

Multiplexer Funktion

4 zu 1 Multiplexer



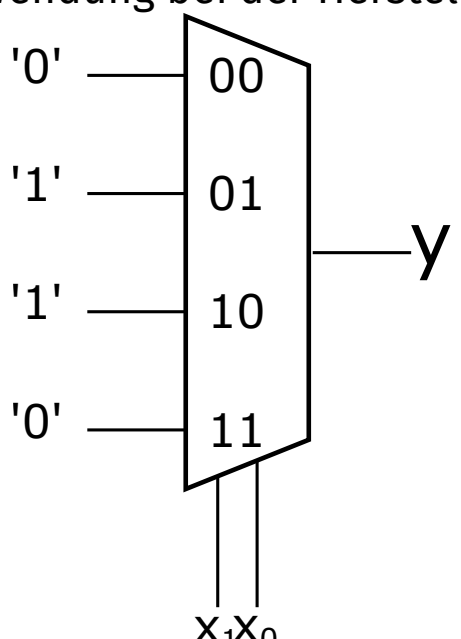
s_1 s_0	y
00	x_0
01	x_1
10	x_2
11	x_3

N signale zur Selektion, 2^N Eingänge

Multiplexer Funktion

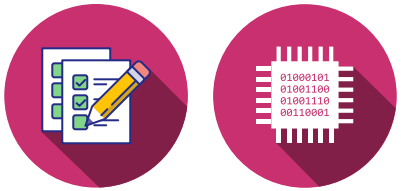
Universelle Logikfunktion

- Beispiel: XOR Funktion
- Die Ausgänge der Wahrheitstabelle gibt uns die Dateneingänge
- Die Einträge in der Wahrheitstabelle liefern uns die Auswahlsignale des Multiplexers
- Zur Verwendung bei der Herstellung programmierbarer Schaltungen



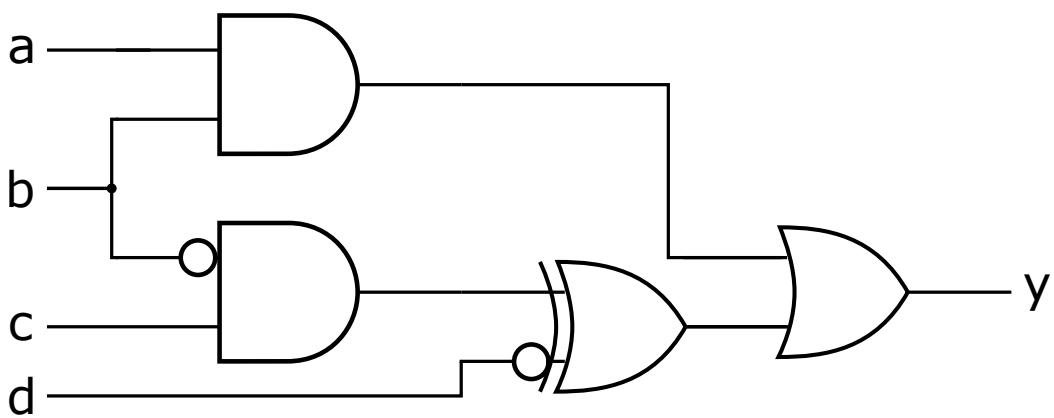
x_1 x_0	y
00	0
01	1
10	1
11	0

Aufgabe 2.1



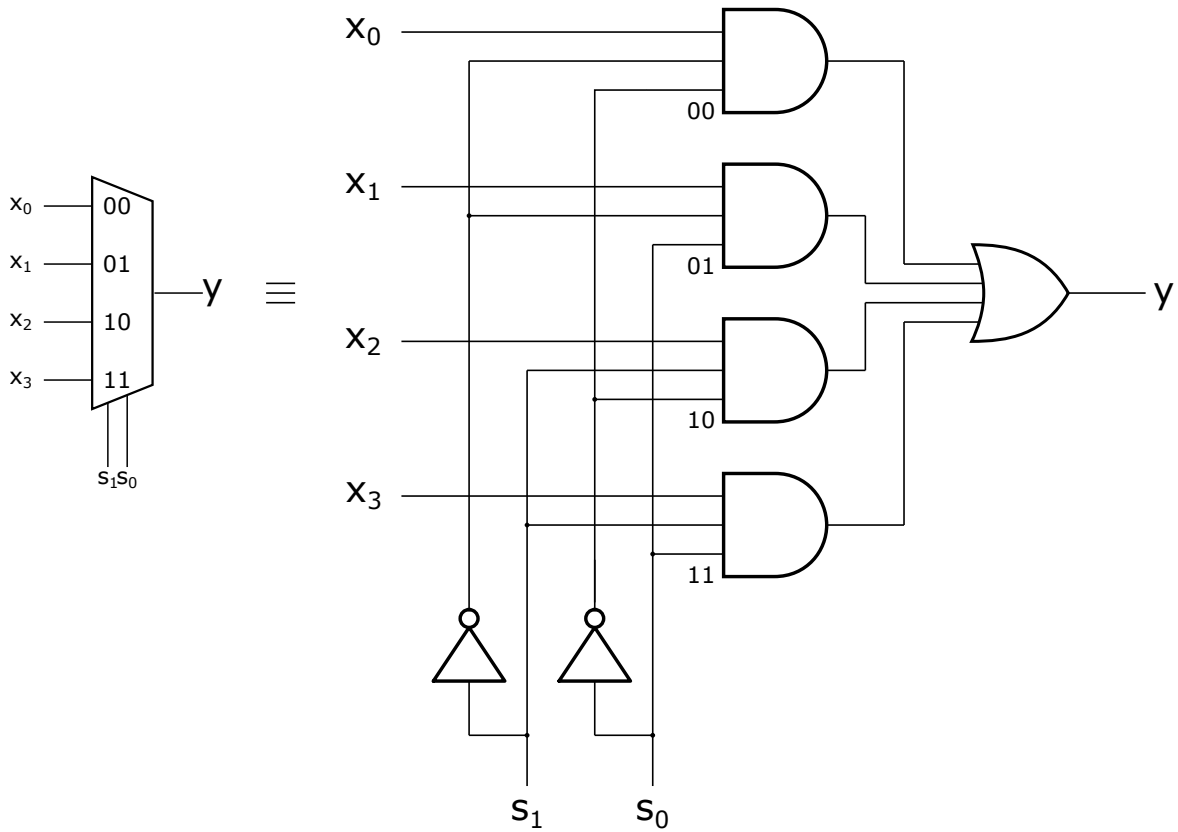
- Erstellung einer Funktion mit Hilfe von Multiplexern

Zeichnen Sie mit Hilfe von Invertern und von Multiplexern von 8 zu 1 eine Schaltung, welche dieselbe Funktion realisiert wie die Schaltung der untenstehenden Abbildung.



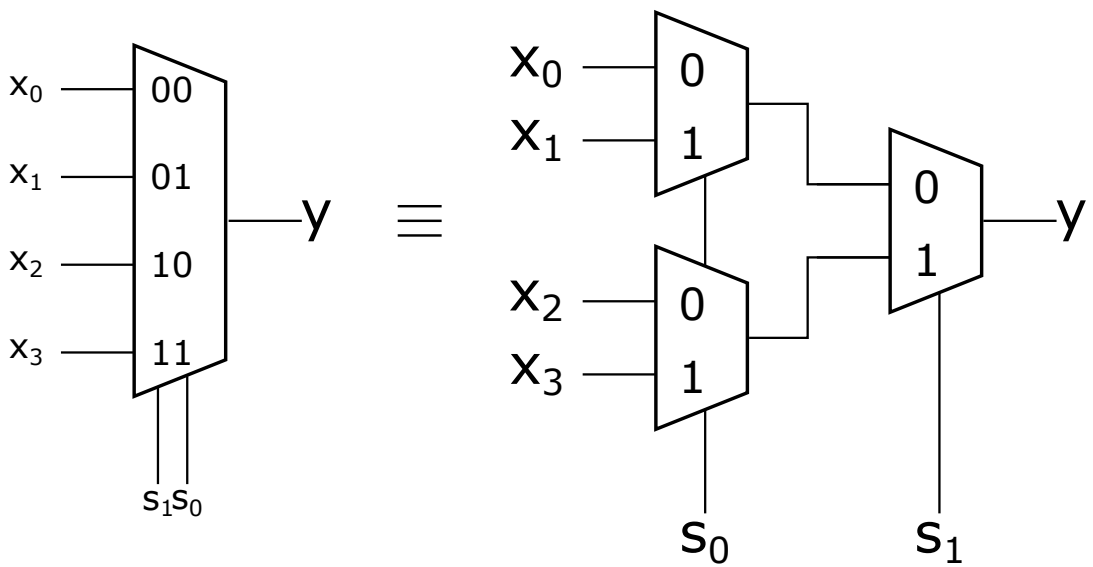
Multiplexer Funktion

Realisierung von Multiplexern mittels Basislogikgatter



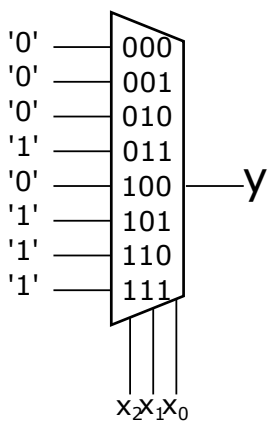
Multiplexer Funktion

Realisierung von Multiplexern mittels Baumstruktur



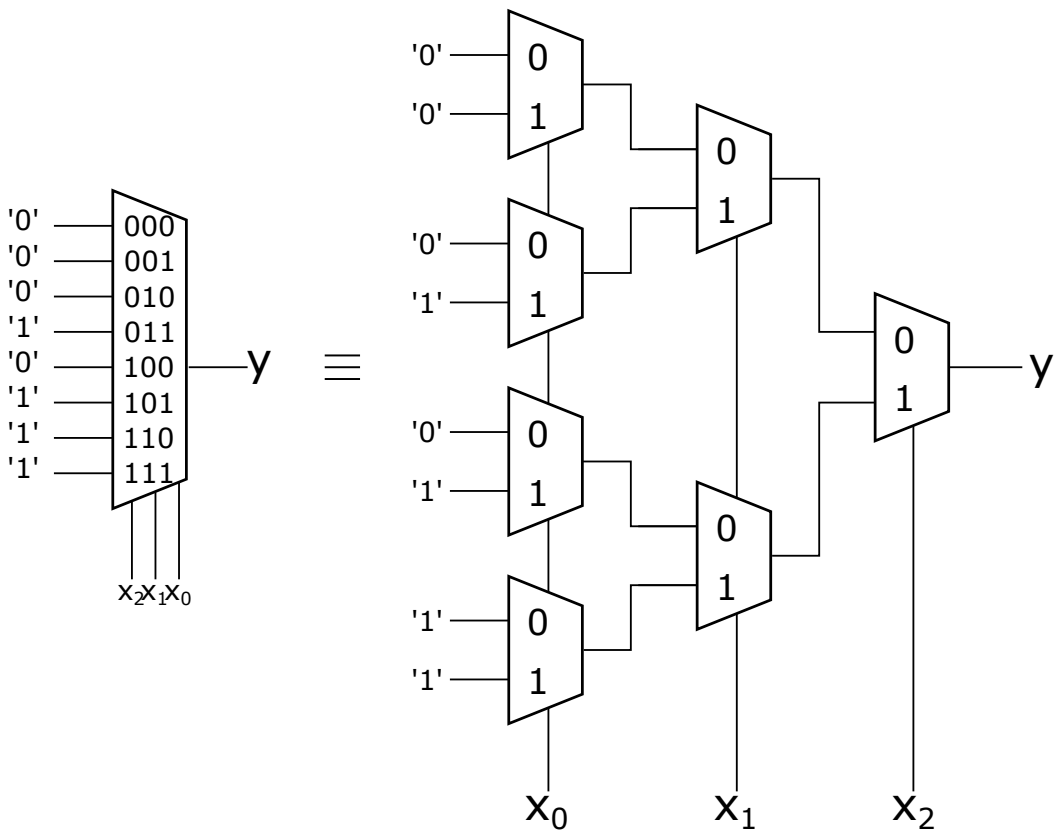
Multiplexer Funktion

Vereinfachung einer Multiplexerfunktion



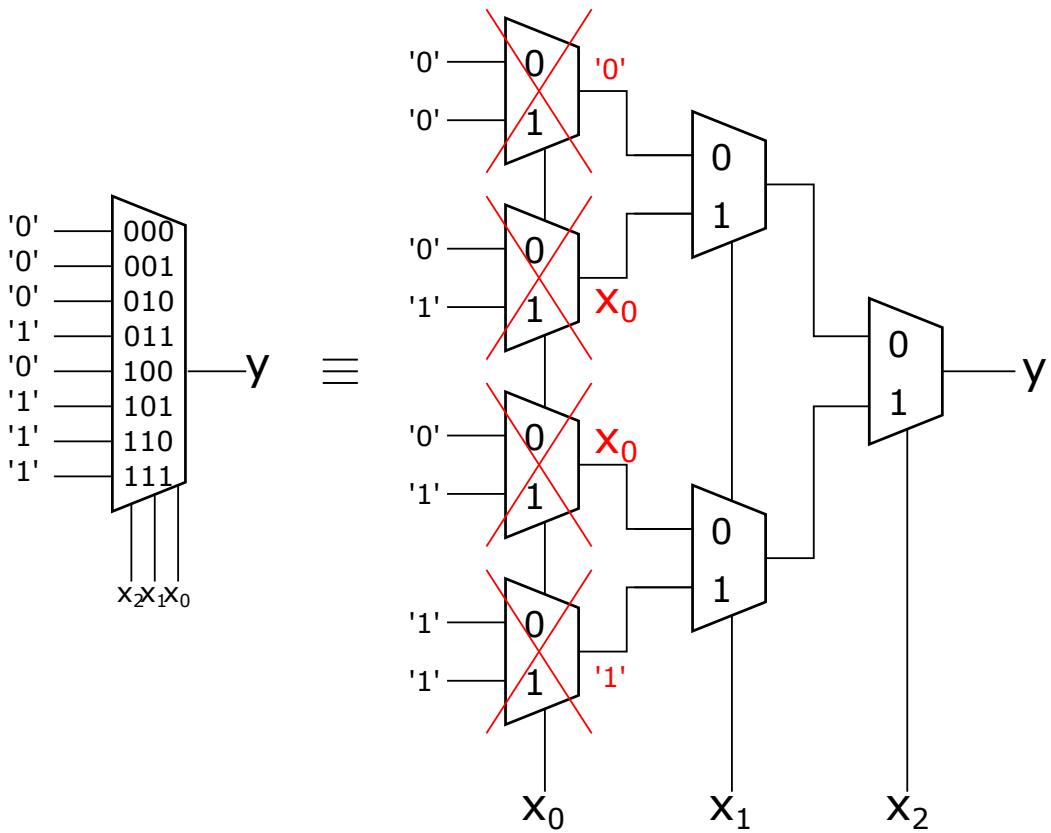
Multiplexer Funktion

Vereinfachung einer Multiplexerfunktion



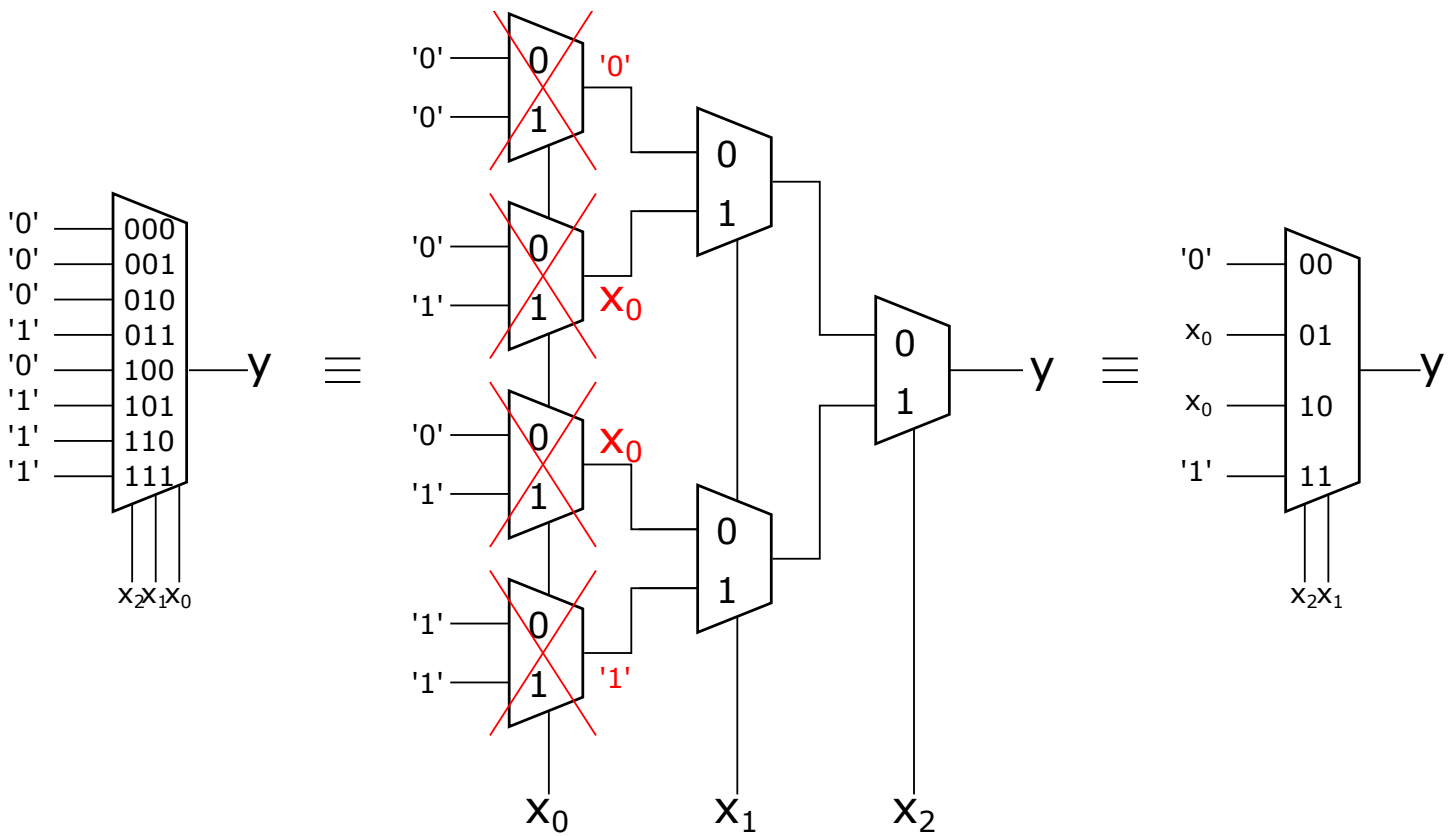
Multiplexer Funktion

Vereinfachung erstes Niveau



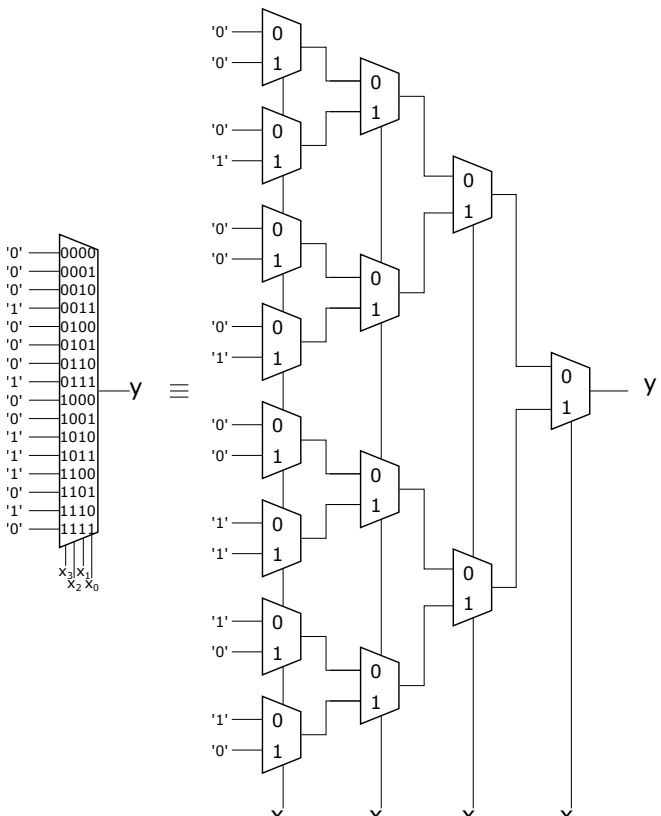
Multiplexer Funktion

Vereinfachung erstes Niveau



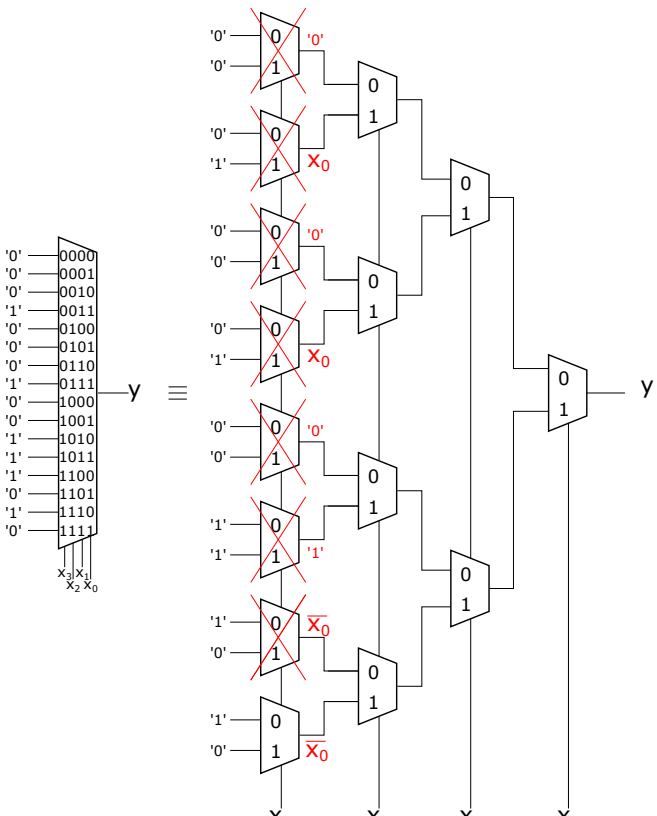
Multiplexer Funktion

Vereinfachung mit 2 zu 1 Mux



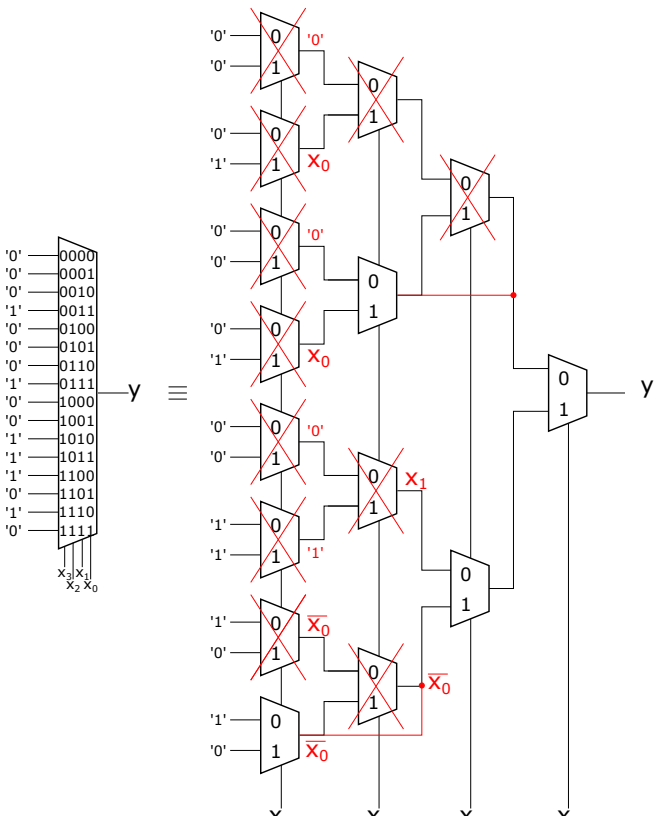
Multiplexer Funktion

Vereinfachung mit 2 zu 1 Mux



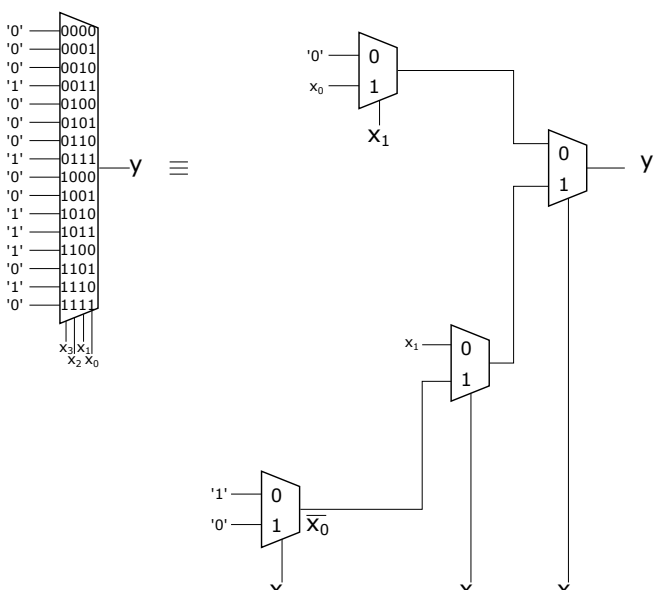
Multiplexer Funktion

Vereinfachung mit 2 zu 1 Mux

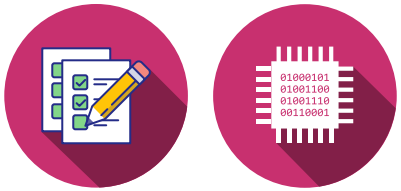


Multiplexer Funktion

Vereinfachung mit 2 zu 1 Mux



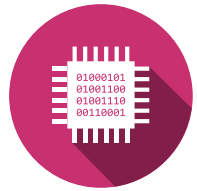
Aufgabe 2.4



- Erstellung einer Funktion mit Hilfe von Multiplexern

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	-	-	-	-	-	-	-	-

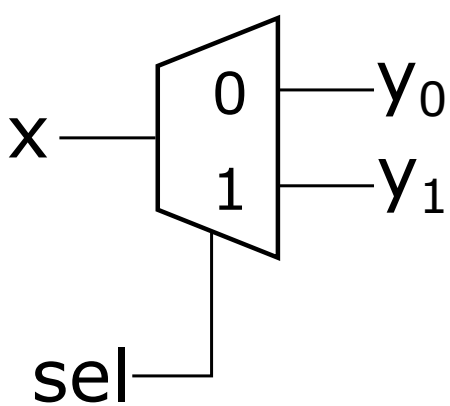
Inhalt



- Multiplexer
- **Demultiplexer**
  - Funktion
  - Realisierung von Multiplexern mittels Basislogikgatter
  - Realisierung von Multiplexern mit einer Baumstruktur

Demultiplexer

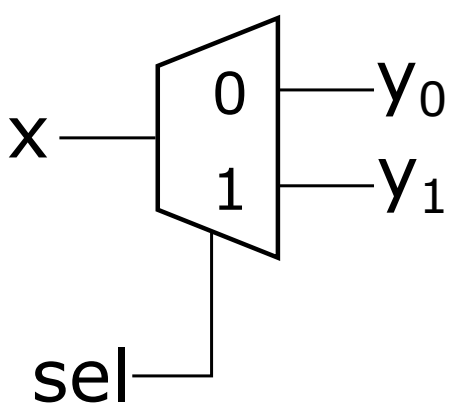
1 zu 2 Demultiplexer



sel	y_0	y_1
0	x	
1		x

Demultiplexer

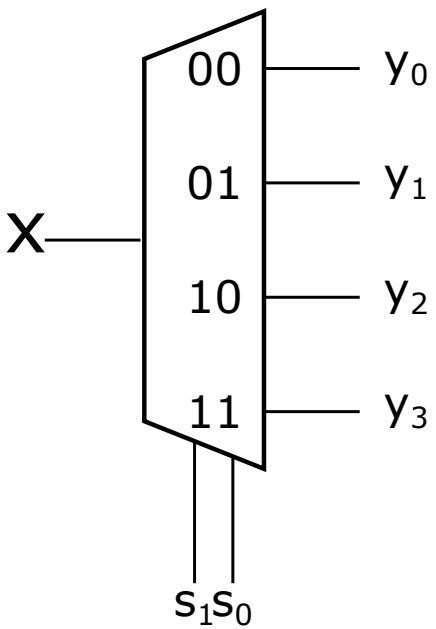
1 zu 2 Demultiplexer



sel	y_0	y_1
0	x	0
1	0	x

Demultiplexer

1 zu 4 Demultiplexer

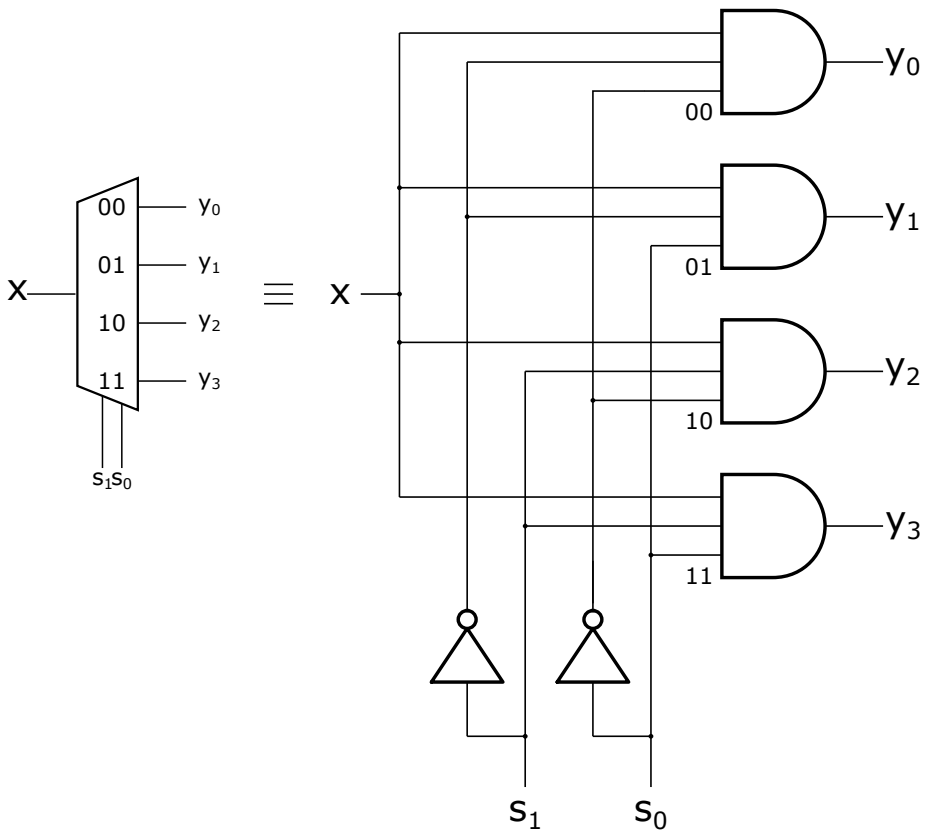


s_1 s_0	y_0	y_1	y_2	y_3
00	x	0	0	0
01	0	x	0	0
10	0	0	x	0
11	0	0	0	x

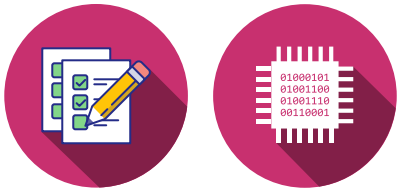
N Selektions Signale, 2^N Ausgänge

Demultiplexer

Realisierung mit Hilfe von Basislogikgatter



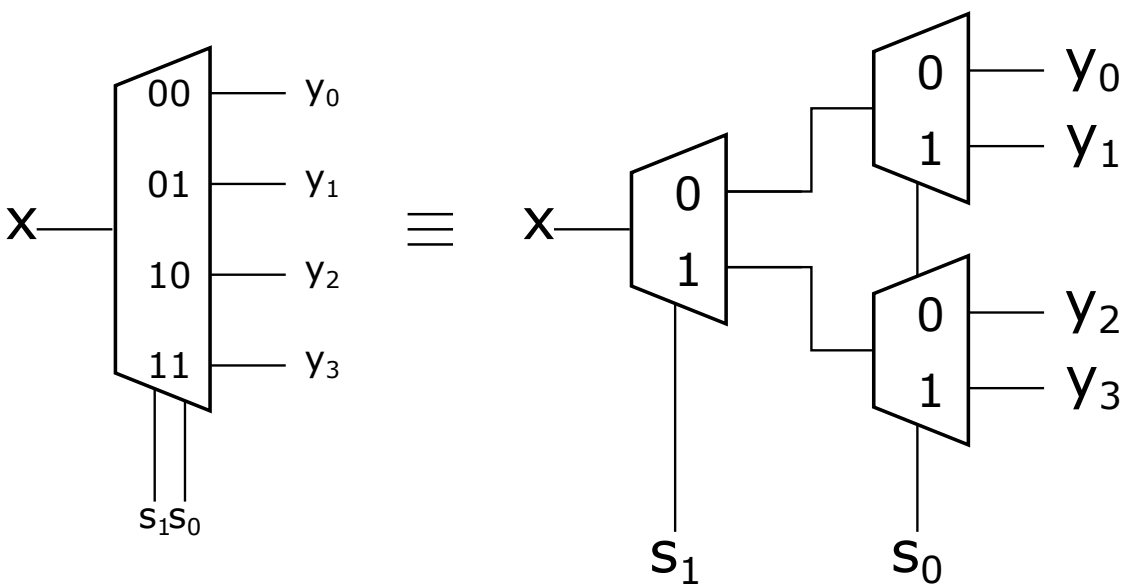
Aufgabe 3.1



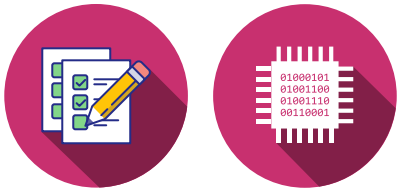
- Demultiplexer von 1 auf 8

Demultiplexer

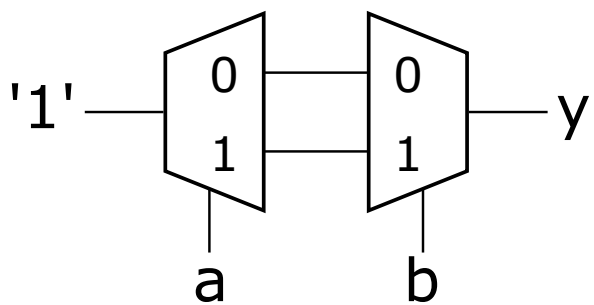
Realisierung mit Hilfe einer Baumstruktur



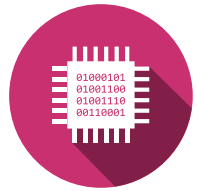
Aufgabe 3.2



- Bestimmen Sie die Logikfunktion der Schaltung der nebenstehenden Abbildung



Referenzen

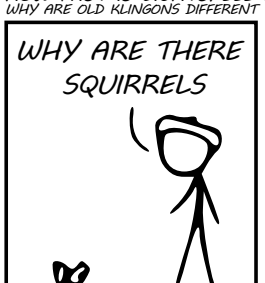


- [Com90] (Englisch) Vollständige Presentation
- [Wak00] (Englisch) Standard Integrierte Systeme, VHDL Code
- [Kat94] (Englisch) Gute Presentation

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 DINOSAUR GHOSTS
WHY IS THERE HELL IF

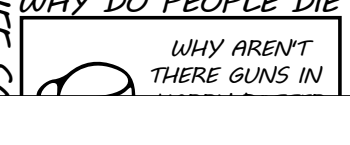
WHY DO IGUANAS DIE
WHY IS THERE CAFFEINE IN MY SHAMPOO
WHY HAVE DINOSAURS NO FUR
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS
WHY ARE SWISS AFRAID OF DRAGONS
WHY AREN'T ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY IS 42 THE ANSWER TO EVERYTHING
WHY CAN'T NOBODY ELSE LIFT THORS HAMMER
WHY IS MARVIN ALWAYS SO SAD
WHY ARE THERE ANTS IN MY LAPTOP
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 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 ARE THERE FEMALE

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 HTTPS IMPORTANT

WHY IS YKK ON ALL ZIPPERS
WHY ARE THERE WEEKS
WHY DO I FEEL DIZZY
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 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
WHAT IS https://xkcd.com/1256/
WHY DO THEY SAY T-MINUS
WHY ARE THERE OBELISKS
WHY ARE WRESTLERS ALWAYS WET

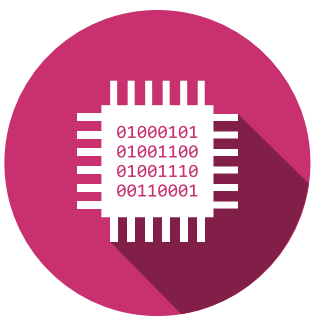
WHY IS LIFE SO
WHY ARE MY BOOBS ITCHY
WHY ARE CIGARETTES LEGAL
WHY ARE THERE DUCKS IN MY POOL
WHY IS JESUS WHITE
WHY IS THERE LIQUID IN MY EAR
WHY DO Q TIPS FEEL GOOD
WHY DO PEOPLE DIE



WHY ARE DOGS AFRAID OF FIR
WHY IS THERE NO KING IN E

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