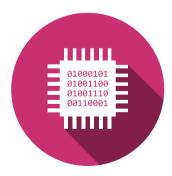




Digitales Design (DiD) Multiplexer und Demultiplexer MUX

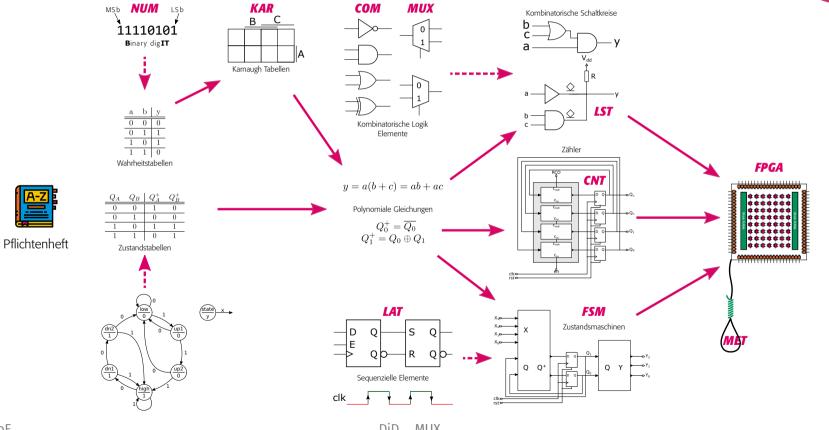
Studiengang Systemtechnik Studiengang Energie und Umwelttechnik Studiengang Informatik und Kommunikationssysteme

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



Aktueller Inhalt des Themas im Kurs





Inhalt



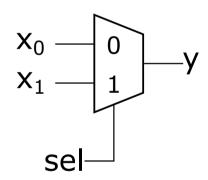
Multiplexer

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

Demultiplexer

2 zu 1 Multiplexer



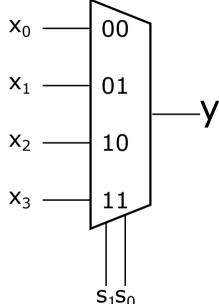


sel	у
0	X_0
1	X ₁

Der Multiplexer funktioniert wie ein Zeiger

4 zu 1 Multiplexer



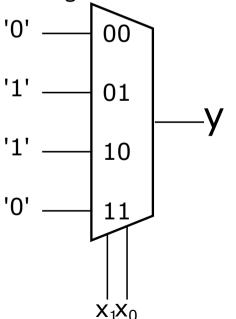


N signale zur Selektion, 2^N Eingänge

s ₁ s ₀	у
00	X_0
01	X ₁
10	X_2
11	X ₃

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	у
00	0
01	1
10	1
11	0

D MUX 6

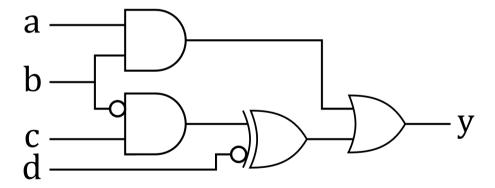
Aufgabe 1.1 (mux/mux-01)





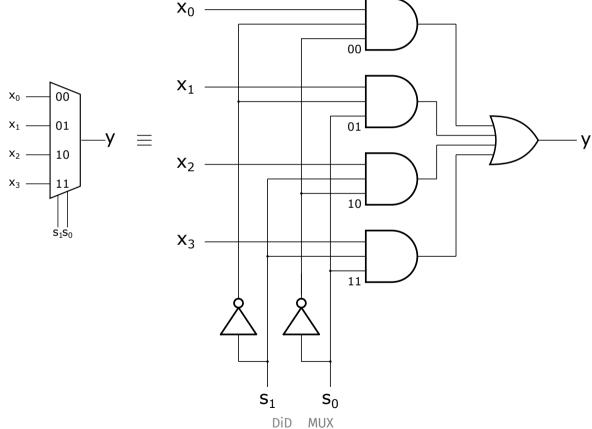
• Erstellung einer Funktion mit Hilfe von Multiplexern

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.



Realisierung von Multiplexern mittels Basislogikgatter

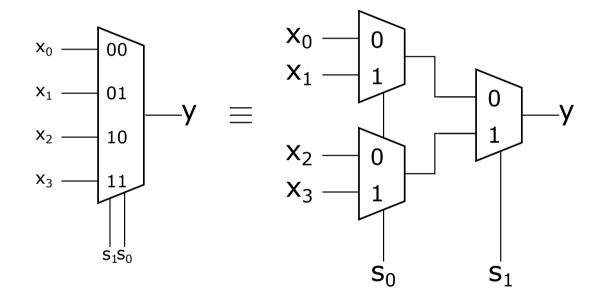




ZaS, BiC, CoF

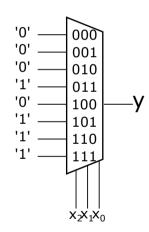
Realisierung von Multiplexern mittels Baumstruktur



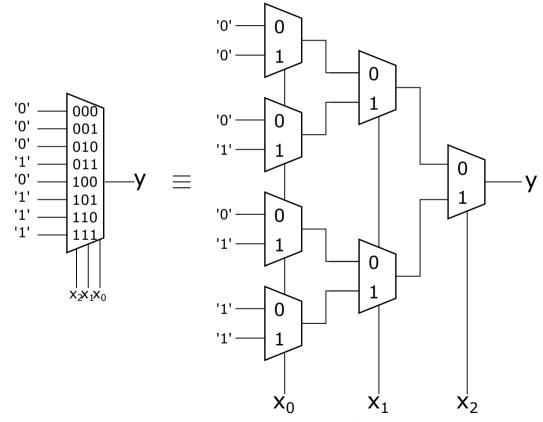


Vereinfachung einer Multiplexerfunktion



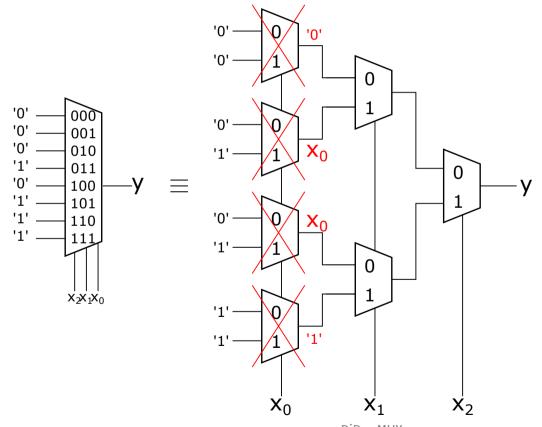


Vereinfachung einer Multiplexerfunktion





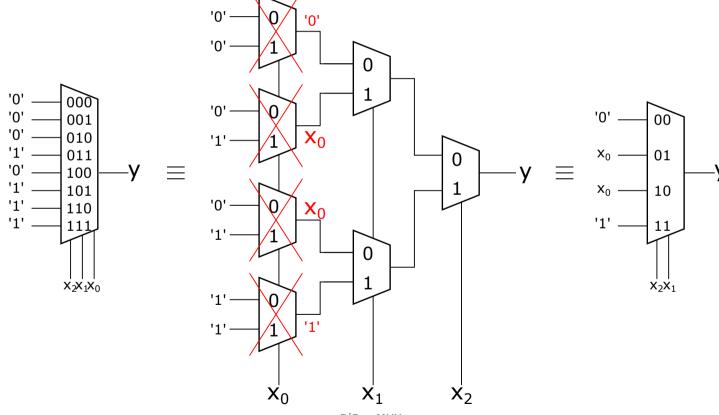
Vereinfachung erstes Niveau





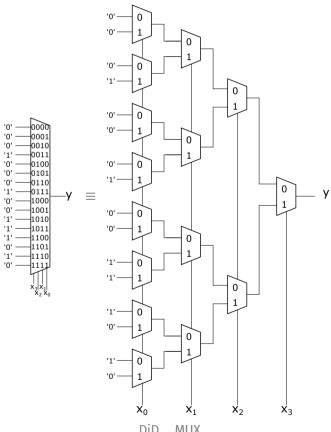
Vereinfachung erstes Niveau





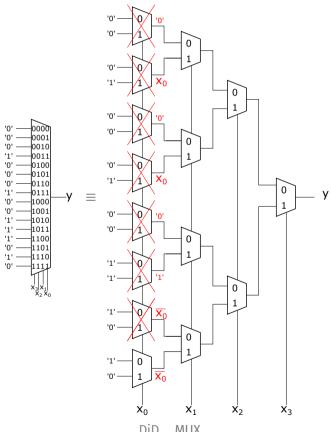
Vereinfachung mit 2 zu 1 Mux





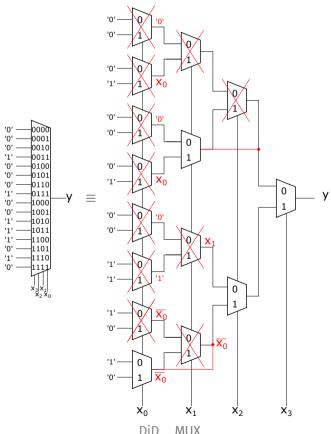
Vereinfachung mit 2 zu 1 Mux





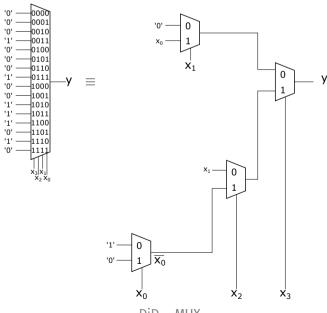
Vereinfachung mit 2 zu 1 Mux





Vereinfachung mit 2 zu 1 Mux





Aufgabe 1.4 (mux/mux-02)





• Erstellung einer Funktion mit Hilfe von Multiplexern

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

Inhalt



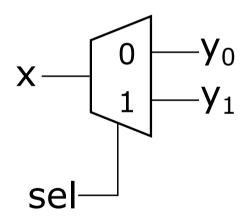
Multiplexer

Demultiplexer

- Funktion
- Realisierung von Multiplexern mittels Basislogikgatter
- Realisierung von Multiplexern mit einer Baumstruktur

1 zu 2 Demultiplexer

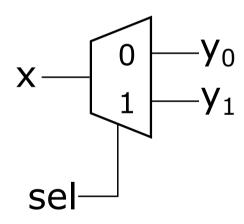




sel	y _o	y ₁
0	X	
1		X

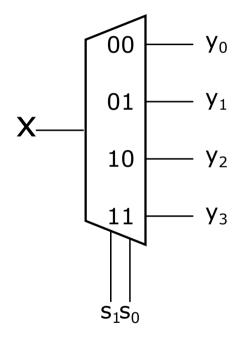
1 zu 2 Demultiplexer





sel	y ₀	y ₁
0	X	0
1	0	X

1 zu 4 Demultiplexer



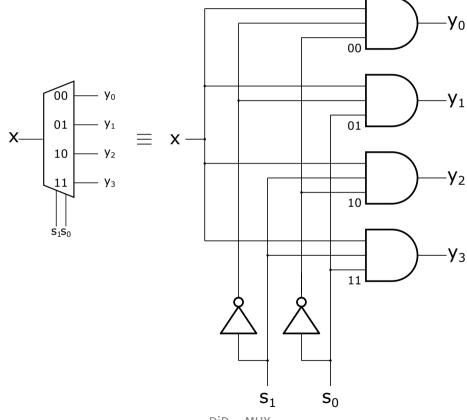




S ₁ S ₀	y _o	y ₁	y ₂	y ₃
00	X	0	0	0
01	0	X	0	0
10	0	0	X	0
11	0	0	0	X

Realisierung mit Hilfe von Basislogikgatter





Aufgabe 2.1 (mux/demux-01)

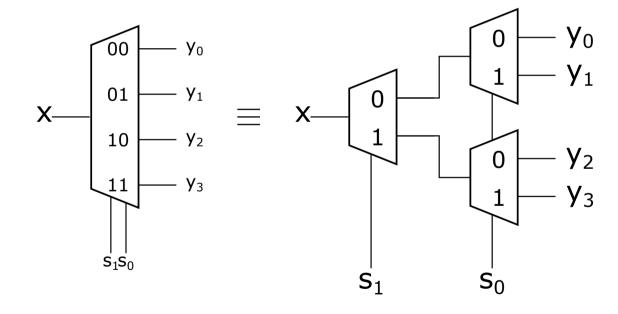




• Demultiplexer von 1 auf 8

Realisierung mit Hilfe einer Baumstruktur



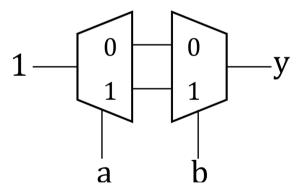


Aufgabe 2.2 (mux/demux-02)





• 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

WHY ARE THERE MIRRORS ABOVE BEDS

WHY DO I SAY WHY IS SEA SALT BETTER IN

WHY IS THERE NOT A POKEMON MMO WHY IS THERE LAUGHING IN TV SHOWS ARE THERE DOORS ON THE FREEWAY ARE THERE SO MANY SVCHOST-EXE RUNNING 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 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 HAVE DINOSAURS NO FUR WHY ARE SWISS AFRAID RWHY IS THERE A LINE THROUGH HI

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 S **SWHY IS THERE ICE IN SPACE** WHY IS MARVIN ALWAYS SO SAD

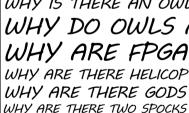
WHY IS SPACE BLACK WHY IS OUTER SPACE SO COLD WHY ARE THERE PYRAMIDS ON THE MOON WHY IS NASA SHUTTING DOWN A

THERE MALE AND FEMALE BIKES WHY ARE THERE BRIDESMAIDS WHY DO DYING PEOPLE REACH UP HOW FAST IS LIGHTSPEED WHY ARE OLD KLINGONS DIFFERENT E WHY ARE THERE TINY SPIDERS IN MY HOUSE ' DO SPIDERS COME INSIDE

WHY ARE THERE HUGE SPIDERS IN MY HOUSE $_{
m H}$ WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE $\overline{oldsymbol{\lambda}}$ 为WHY ARE THERE SO MANY SPIDERS IN MY ROOM

SPYDER BITES ITCH

WHY ARE THERE **GHOSTS**



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 MY BOOBS ITCHY WHY ARE THERE GODS

'IS https://xkcd·com/1256/ THEY SAY T-MINUS WHY ARE THERE OBELISKS MWHY ARE WRESTLERS ALWAYS WET

TO WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER

WHY AREN'T MY ARMS GROWING WHY ARE THERE SO MANY CROWS IN ROCHESTER &

WHY IS TO BE OR NOT TO BE FUNNY

WHY DO CHILDREN GET CANCER 🗢

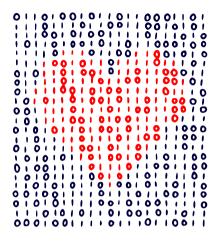
WHY IS POSEIDON ANGRY WITH ODYSSEUS

WHY DO Q TIPS FEEL GOOD

WHY AREN'T

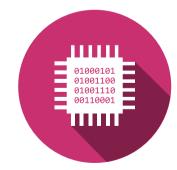
THERE GUNS IN

WHY ARE THERE SQUIRRELS









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