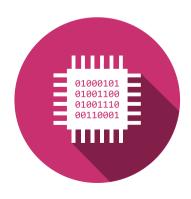




Digitales Design (DiD) Multiplexer und Demultiplexer MUX

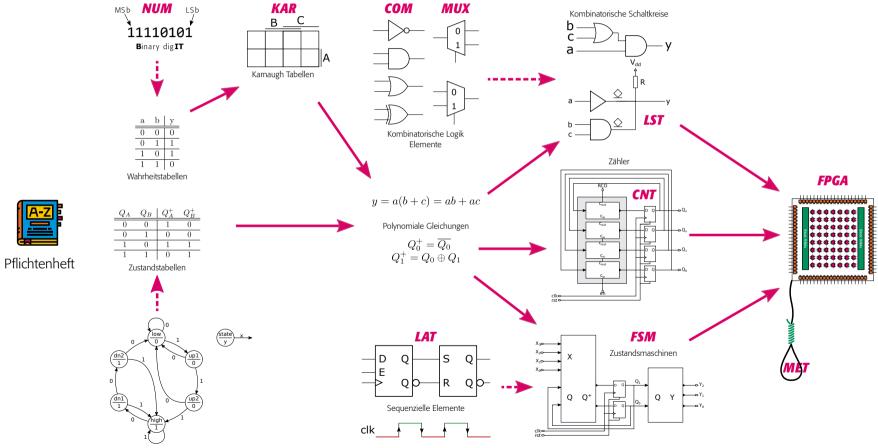
Studiengang Systemtechnik Studiengang Energie und Umwelttechnik Studiengang Informatik und Kommunikationssysteme

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



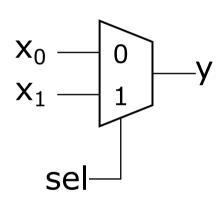
Multiplexer

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

Demultiplexer

2 zu 1 Multiplexer



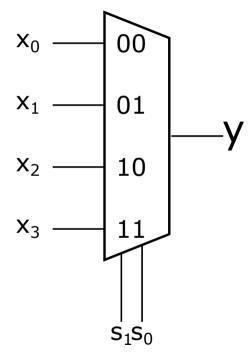


sel	у
0	X_0
1	X ₁

Der Multiplexer funktioniert wie ein Zeiger

4 zu 1 Multiplexer



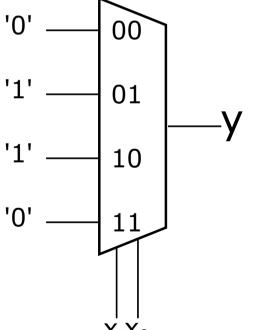


N signale zur Selektion, 2^N Eingänge

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

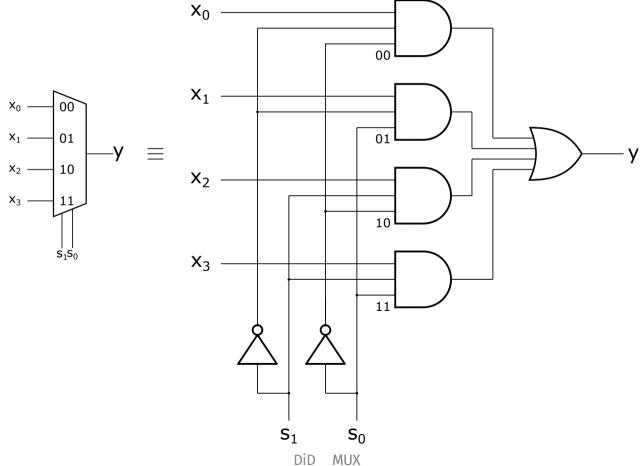


X ₁ X ₀	у
00	0
01	1
10	1
11	0

ZaS, BiC, CoF X_1X_0 DiD MUX

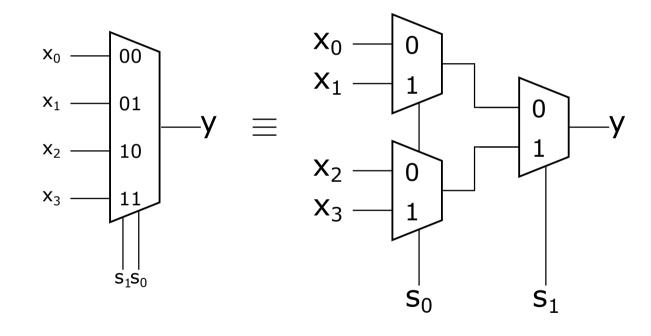
Realisierung von Multiplexern mittels Basislogikgatter





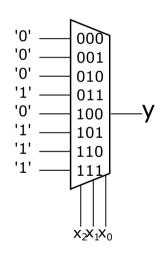
Realisierung von Multiplexern mittels Baumstruktur



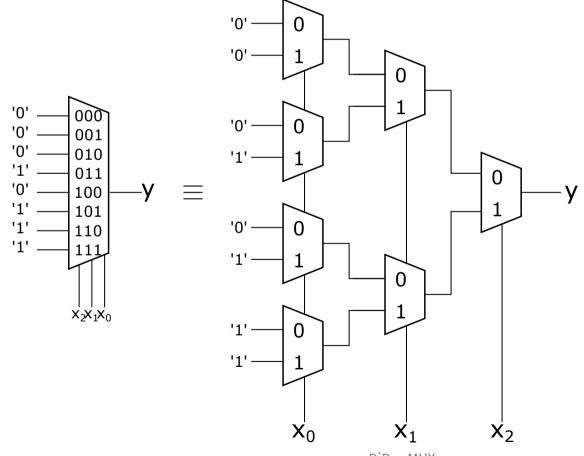


Vereinfachung einer Multiplexerfunktion



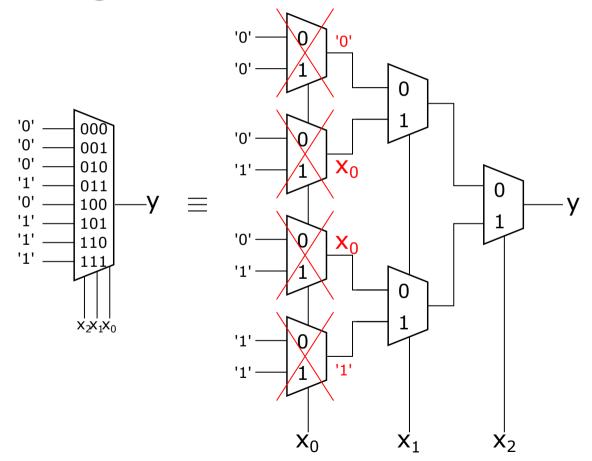


Vereinfachung einer Multiplexerfunktion





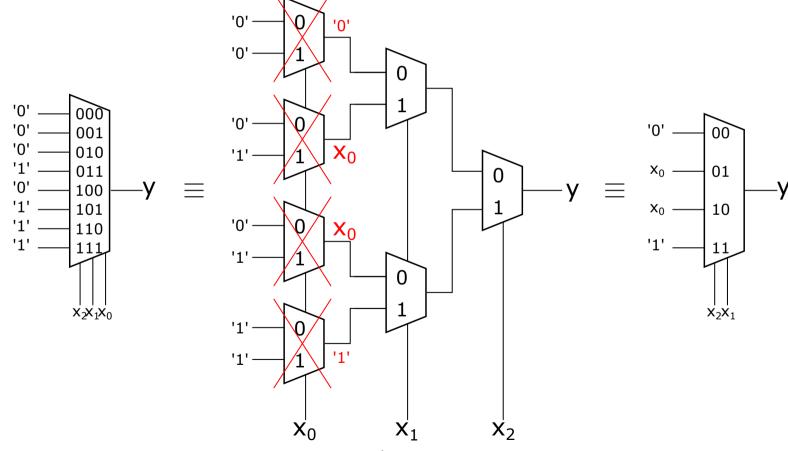
Vereinfachung erstes Niveau





Vereinfachung erstes Niveau





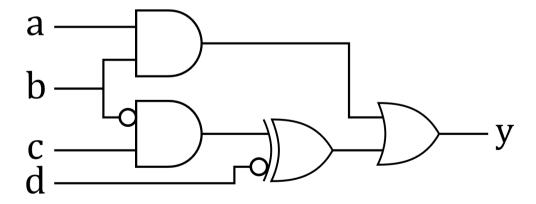
Aufgabe 1.1 (mux/mux-01)





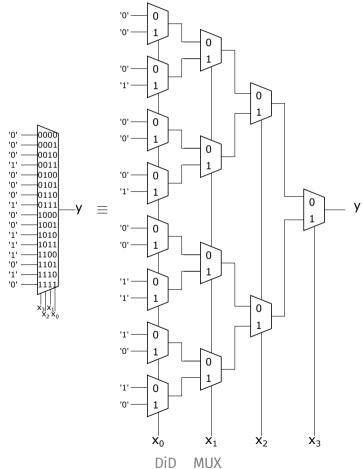
• Erstellung einer Funktion mit Hilfe von Multiplexern

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.



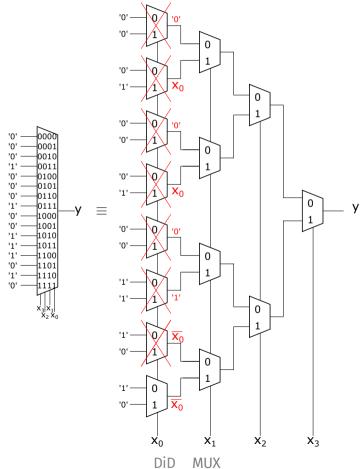
Vereinfachung mit 2 zu 1 Mux





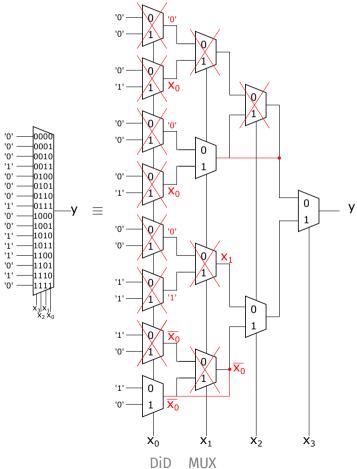
Vereinfachung mit 2 zu 1 Mux





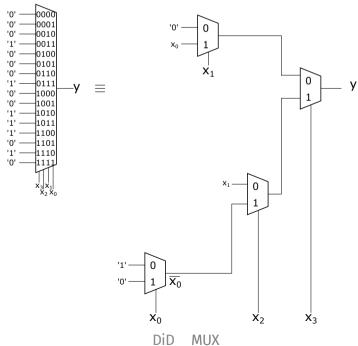
Vereinfachung mit 2 zu 1 Mux





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	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	ı	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



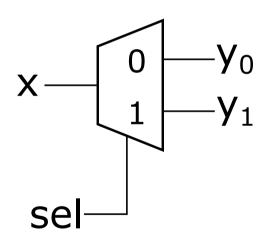
Multiplexer

Demultiplexer

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

1 zu 2 Demultiplexer

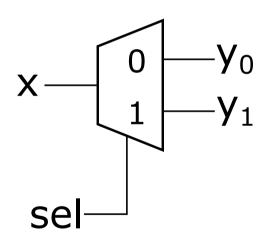




sel	y ₀	y ₁
0	X	
1		X

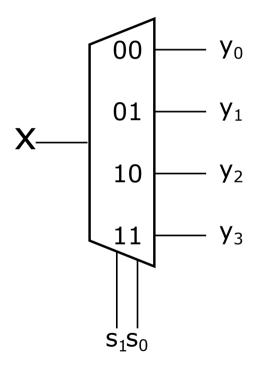
1 zu 2 Demultiplexer





sel	y _o	y ₁
0	X	0
1	0	X

1 zu 4 Demultiplexer



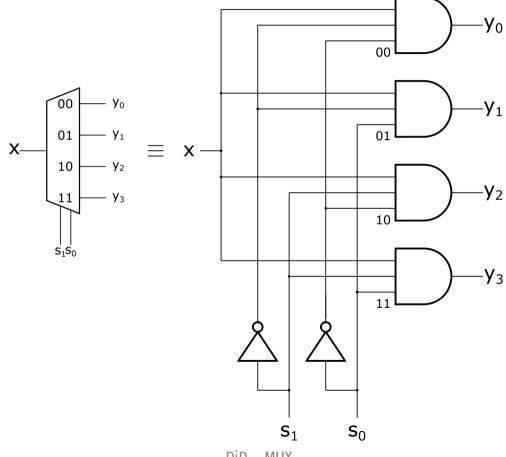




S ₁ S ₀	y o	y ₁	y ₂	y ₃
00	X	0	0	0
01	0	X	0	0
10	0	0	X	0
11	0	0	0	X

Realisierung mit Hilfe von Basislogikgatter





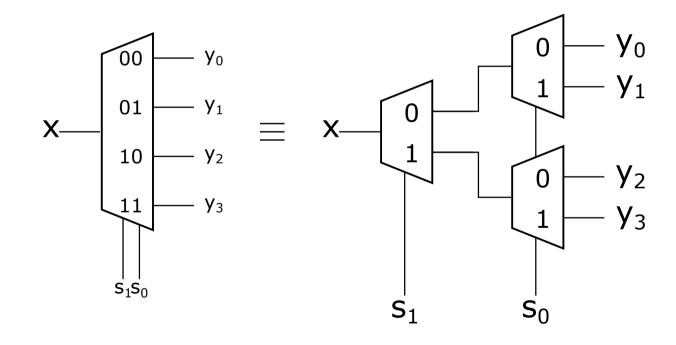
Aufgabe 2.1 (mux/demux-01)

01000101 01001100 01001100 0101100

• Demultiplexer von 1 auf 8

Realisierung mit Hilfe einer Baumstruktur

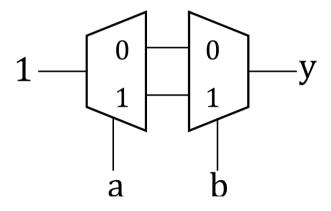




Aufgabe 2.2 (mux/demux-02)



• Bestimmen Sie die Logikfunktion der Schaltung der nebenstehenden Abbildung

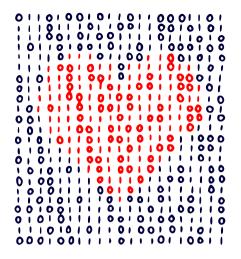


Referenzen



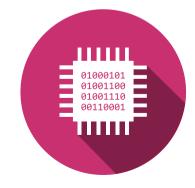
- [Com90] (Englisch) Vollständige Presentation
- [Wak00] (Englisch) Standard Integrierte Systeme, VHDL Code
- [Kat94] (Englisch) Gute Presentation

EWHY IS HITTS CRUSSED OUT IN KED WHY ARE THERE MIRRORS ABOVE BEDS WHY HAVE DINOSAURS NO FUR WHY ARE SWISS AFRAID OF DRAGONS RWHY IS THERE A LINE THROUGH HTTPS WHY DO I SAY UHE TOWHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER ≨WHY IS HTTPS IMPORTANT WHY IS SEA SALT BETTER IT QUESTIONS WHY ARE THERE TREES IN THE MIDDLE OF FIELDS WHY AREN'T MY WHY IS THERE NOT A POKEMON MMO ARMS GROWING WHY IS THERE LAUGHING IN TV SHOWS WHY ARE THERE DOORS ON THE FREEWAY WHY ARE THERE SO MANY SUCHOSTIEXE RUNNING WHY AREN'T ANY COUNTRIES IN ANTARCTICA WHY ARE THERE SCARY SOUNDS IN MINECRAFT WHY IS THERE KICKING IN MY STOMACH WHY AREN'T ECONOMISTS RICH ? WHY ARE THERE TWO SLASHES AFTER HTTP WHY ARE THERE SO MANY CROWS IN ROCHESTER & WHY ARE THERE CELEBRITIES WHY DO AMERICANS CALL IT SOCCER & WHY IS TO BE OR NOT TO BE FUNNY WHY DO SNAKES EXIST WHY ARE MY EARS RINGING WHY DO CHILDREN GET CANCER & & WHY DO OYSTERS HAVE PEARLS WHY IS 42 THE ANSWER TO EVERYTHING 🕏 WHY ARE DUCKS CALLED DUCKS WHY IS POSEIDON ANGRY WITH ODYSSEUS WHY CAN'T NOBODY ELSE LIFT THORS HAMMER 🤇 WHY DO THEY CALL IT THE CLAP WHY IS THERE ICE IN SPACE WHY IS MARVIN ALWAYS SO SAD 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 IS THERE AN OWL IN MY BACKYARD WHY IS EARTH TILTED WHY WUBA LUBBA DUB DUB MEANING WHY ARE THERE WHY IS SPACE BLACK WHY IS THERE A WHALE AND A POT FALLING WHY IS THERE AN OWL OUTSIDE MY WINDOW GHOSTS WHY ARE THERE SO MANY BIRDS IN SWISS WHY IS OUTER SPACE SO COLD WHY IS THERE AN OWL ON THE DOLLAR BILL WHY IS THERE SO LITTLE RAIN IN WALLIS WHY ARE THERE PYRAMIDS ON THE MOON WHY IS NASA SHUTTING DOWN 🚡 WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG WHY DO OWLS ATTACK PEOPLE Y ARE THERE MALE AND FEMALE BIKES WHY ARE THERE BRIDESMAIDS WHY ARE THERE TINY SPIDERS IN MY HOUSE WHY DO DYING PEOPLE REACH UP WHY ARE THERE TINY SPIDERS IN MY HOUSE WHY ARE OLD KUNGONS DIFFERENT WHY ARE OLD KUNGONS DIFFERENT WHY ARE OLD KUNGONS DIFFERENT WHY ARE THERE TINY SPIDERS COME INSIDE WHY ARE FPGA'S EVERYWHERE WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE TO WHY ARE THERE HUGE SPIDERS IN MY HOUSE WHY ARE MY BOOBS ITCHY WHY ARE THERE GODS WHY ARE THERE J WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE WHY ARE CIGARETTES LEGAL WHY ARE THERE TWO SPOCKS SOUIRRELS WHY ARE THERE DUCKS IN MY POOL '' WHY ARE THERE SPIDERS IN MY ROOM TWHAT IS https://xkcd·com/1256/ WHY IS JESUS WHITE IN WHY ARE THERE SO MANY SPIDERS IN MY ROOM WHY IS THERE LIQUID IN MY EAR WHY DO SPYDER BITES ITCH WHY DO THEY SAY T-MINUS WHY DO Q TIPS FEEL GOOD WHY DO PEOPLE DIE WHY IS DYING SO SCARY RWHY ARE THERE OBELISKS A WHY AREN'T MWHY ARE WRESTLERS ALWAYS WET (n TO WHY DO KNEES CLICK F THERE GUNS IN





Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften



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