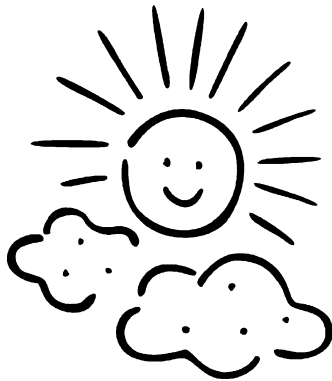
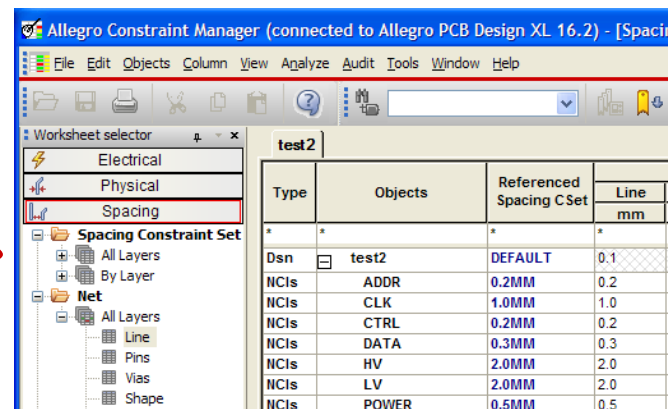
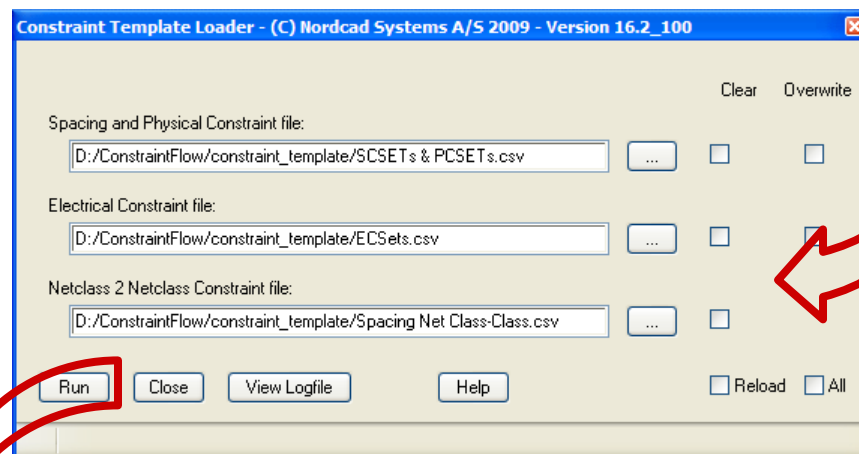
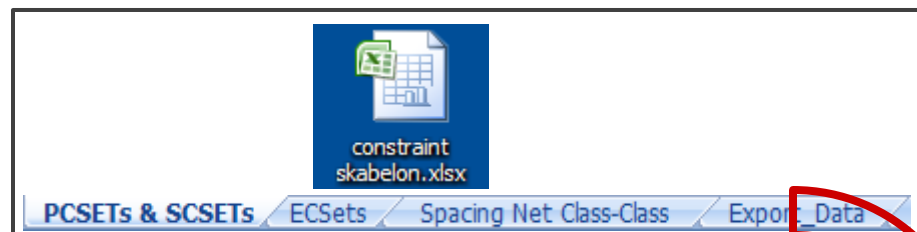


# Constraint Template



# Constraint Template

- Nem metode til angivelse af constraints
- Udviklet af Nordcad Systems A/S
  - 2 udgaver (låst skill code og ulåst)
  - Ulåst til redigering/tilpasning mv.
- Baseret på opdeling af net i Netklasser
- Metode
  - Excel håndtering
  - Exporter regneark til csv under "Export\_Data"
  - Kør Nordcad program i PCB Editor
  - Anvend Netklasse navne i Capture CIS
  - Ved netlist import automatiseres opsætningen af constraints
- 3 domæner
  - Fysiske og Spacing constraints
  - Elektriske constraints
  - Netclass-class spacing



# Design Flow

- Designer

- Fastlæg constraint værdier for
  - Sikkerhedsafstande (spacing)
  - Banebredde (physical)
  - Elektriske constraints som impedans, længder mv. (electrical)
  - Netklasse navne
- Udfyld Excel ark efter behov
  - Spacing og Physical krydstabel
    - Brug netklasse navne og bredde/afstandsønsker
  - Electrical Constraints
  - Netklasse→Netklasse afstandskrav udover normale Spacing hierarki
- Anvend
  - Netklasse og Electrical Constraint Set navne i Capture
- Brug selv Constraint Template Loader
  - Eller lever videre til PCB Bureau (internt/eksternt)

- PCB Designer (eller designer)

- Eksporter data fra Excel fil
- Angiv evt. Board Stackup
- Kør Constraint Template Loader
  - Angiv de ønskede filer
  - Electrical Constraints sætter licenskrav
- Finjuster de oprettede constraints
  - F.eks. specielle afstandsregler for de forskellige objekttyper
- Hent netlisten fra Capture ind i board filen
  - Automatisk matchup mellem net og constraints

# Simple fysiske og spacing cons.

- Fysiske constraint set navne i første kolonne
  - Brug mm syntaks for at få pågældende bredde
  - Brug OHM syntaks for at få 50ohms baner
    - Kræver korrekt Stackup opsætning
- Spacing constraint set navne i første række
  - Brug mm syntaks for at få pågældende spacing
- Udfyld Netklasse navne under den ønskede spacing og banebredde
  - Adskil med komma og uden mellemrum
- I Capture anvendes navnene ved properties
  - Net\_Spacing\_Type
  - Net\_Physical\_Type

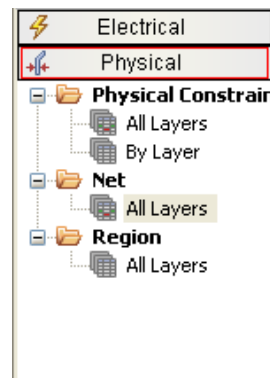
## PCSETs & SCSETs

	A	B	C	D	E	F	G	H
1	Spacing Constraint Sets							
2			0.1MM	0.2MM	0.3MM	0.5MM	1.0MM	2.0MM
3		0.1MM						
4		0.2MM			data		clk	
5		0.3MM						
6		0.5MM				power		
7		1.0MM						
8		2.0MM						hv, lv
9		50OHM		addr, ctrl				

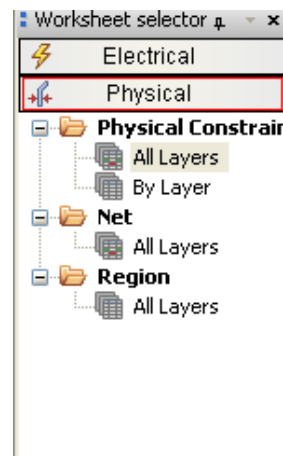
- NB: Brug ikke semikolon

# Physical Constraint Sets & NCIs

	A	B	C	D	E	F	G	H
1	Spacing Constraint Sets							
2			0.1MM	0.2MM	0.3MM	0.5MM	1.0MM	2.0MM
3		0.1MM						
4		0.2MM			data		clk	
5		0.3MM						
6		0.5MM				power		
7		1.0MM						
8		2.0MM						hv, lv
9		50OHM		addr, ctrl				



Type	Objects	Referenced Physical CSet	Line Width	
			Min	Max
			mm	mm
Dsn	test2	DEFAULT	0.1	0.0
NCIs	ADDR	50OHM	1.7	0.0
NCIs	CLK	0.2MM	0.2	0.0
NCIs	CTRL	50OHM	1.7	0.0
NCIs	DATA	0.2MM	0.2	0.0
NCIs	HV	2.0MM	2.0	0.0
NCIs	LV	2.0MM	2.0	0.0
NCIs	POWER	0.5MM	0.5	0.0



Type	Objects	Line Width	
		Min	Max
		mm	mm
Dsn	test2	0.1	0.0
PCS	DEFAULT	0.1	0.0
PCS	0.1MM	0.1	0.0
PCS	0.2MM	0.2	0.0
PCS	0.3MM	0.3	0.0
PCS	0.5MM	0.5	0.0
PCS	1.0MM	1.0	0.0
PCS	2.0MM	2.0	0.0
PCS	50OHM	1.7	0.0

# Spacing Constraint Sets & NCIs

	A	B	C	D	E	F	G	H
1	Spacing Constraint Sets							
2			0.1MM	0.2MM	0.3MM	0.5MM	1.0MM	2.0MM
3		0.1MM						
4		0.2MM			data		clk	
5		0.3MM						
6		0.5MM				power		
7		1.0MM						
8		2.0MM						hv, lv
9		50OHM		addr, ctrl				

Type	Objects	Line To					
		Line mm	Thru Pin mm	SMD Pin mm	Test Pin mm	Thru Via mm	BB Via mm
Dsn	test2	0.1	0.1	0.1	0.1	0.1	0.1
SCS	DEFAULT	0.1	0.1	0.1	0.1	0.1	0.1
SCS	0.1MM	0.1	0.1	0.1	0.1	0.1	0.1
SCS	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2
SCS	0.3MM	0.3	0.3	0.3	0.3	0.3	0.3
SCS	0.5MM	0.5	0.5	0.5	0.5	0.5	0.5
SCS	1.0MM	1.0	1.0	1.0	1.0	1.0	1.0
SCS	2.0MM	2.0	2.0	2.0	2.0	2.0	2.0

Type	Objects	Referenced Spacing CSet	Line		
			mm	mm	mm
Dsn	test2	DEFAULT	0.1	0.1	0.1
NCIs	ADDR	0.2MM	0.2	0.2	0.2
NCIs	CLK	1.0MM	1.0	1.0	1.0
NCIs	CTRL	0.2MM	0.2	0.2	0.2
NCIs	DATA	0.3MM	0.3	0.3	0.3
NCIs	HV	2.0MM	2.0	2.0	2.0
NCIs	LV	2.0MM	2.0	2.0	2.0
NCIs	POWER	0.5MM	0.5	0.5	0.5

# Elektriske Constraints

- Elektriske constraint set navne i første kolonne

ECSETs

- I Capture anvendes navnene ved property
  - Electrical\_Constraint\_Set

- NB: Brug ikke semikolon

	A	B	C	D	E	F	G	H	I	J	K	L	
1				Wiring							Impedance		Min/Max Propag
2		Name	Verify Schedule	Schedule	Stub Length	Max Via Count	Max Exposed	Max Parallel	Layer Sets	Target	Tolerance	Pin Pairs	
3		Example	Yes	Far-end Cluster	2mm				Inner	50	2	Longest Pin Pair	
4		data_addr	Yes	Daisy-chain	2mm							Longest Pin Pair	
5		diff-clk											

Worksheet selector

Electrical

Electrical Constraint

- Signal Integrity
- Timing
- Routing
  - Wiring
  - Impedance
  - Min/Max Prop
  - Total Etch Lei
  - Differential P.
  - Relative Prop

test2

Type	Objects	Pin Pairs	Min Delay	Max Delay
			ns	ns
Dsn	test2			
ECS	DATA_ADDR	Longest/Shortest Pin Pair		75.0 MM
ECS	DIFF-CLK	All Drivers/All Receivers		
ECS	EXAMPLE	Longest/Shortest Pin Pair		115.0 MM

# Netclass-class spacing constraints

- Fysiske constraint set navne i første kolonne
  - Anvend samme navne som under "PCSETs & SCSETs"
- Vælg Spacing relation i tabellen
- NB: Brug ikke semikolon

Spacing Net Class-Class

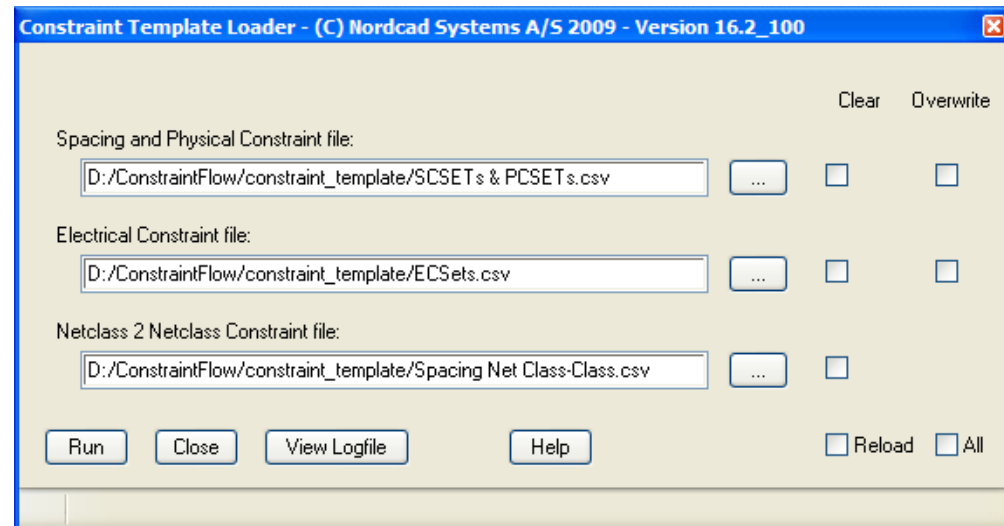
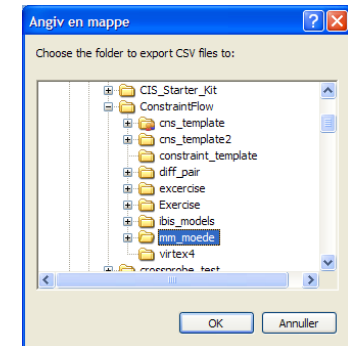
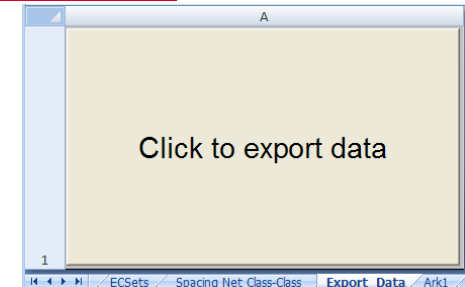
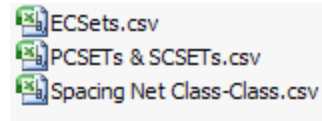
	A	B	C	D	E	F
1	Spacing Net Class					
2			data	ctrl	clk	power
3		data		1.0MM		
4		ctrl			0.2MM	
5		clk				
6		power			0.2MM	
7						

Type	Objects	Referenced Spacing CSet	Line To						
			Line mm	Thru Pin mm	SMD Pin mm	Test Pin mm	Thru Via mm	BB Via mm	Test Via mm
Dsn	<input type="checkbox"/> test2	DEFAULT	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NCIs	ADDR	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NCIs	<input type="checkbox"/> CLK	1.0MM	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NCC	CTRL	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NCC	POWER	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NCIs	<input type="checkbox"/> CTRL	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NCC	CLK	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NCC	DATA	1.0MM	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NCIs	<input type="checkbox"/> DATA	0.3MM	0.3	0.3	0.3	0.3	0.3	0.3	0.3
NCC	CTRL	1.0MM	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NCIs	HV	2.0MM	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NCIs	LV	2.0MM	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NCIs	<input type="checkbox"/> POWER	0.5MM	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NCC	CLK	0.2MM	0.2	0.2	0.2	0.2	0.2	0.2	0.2



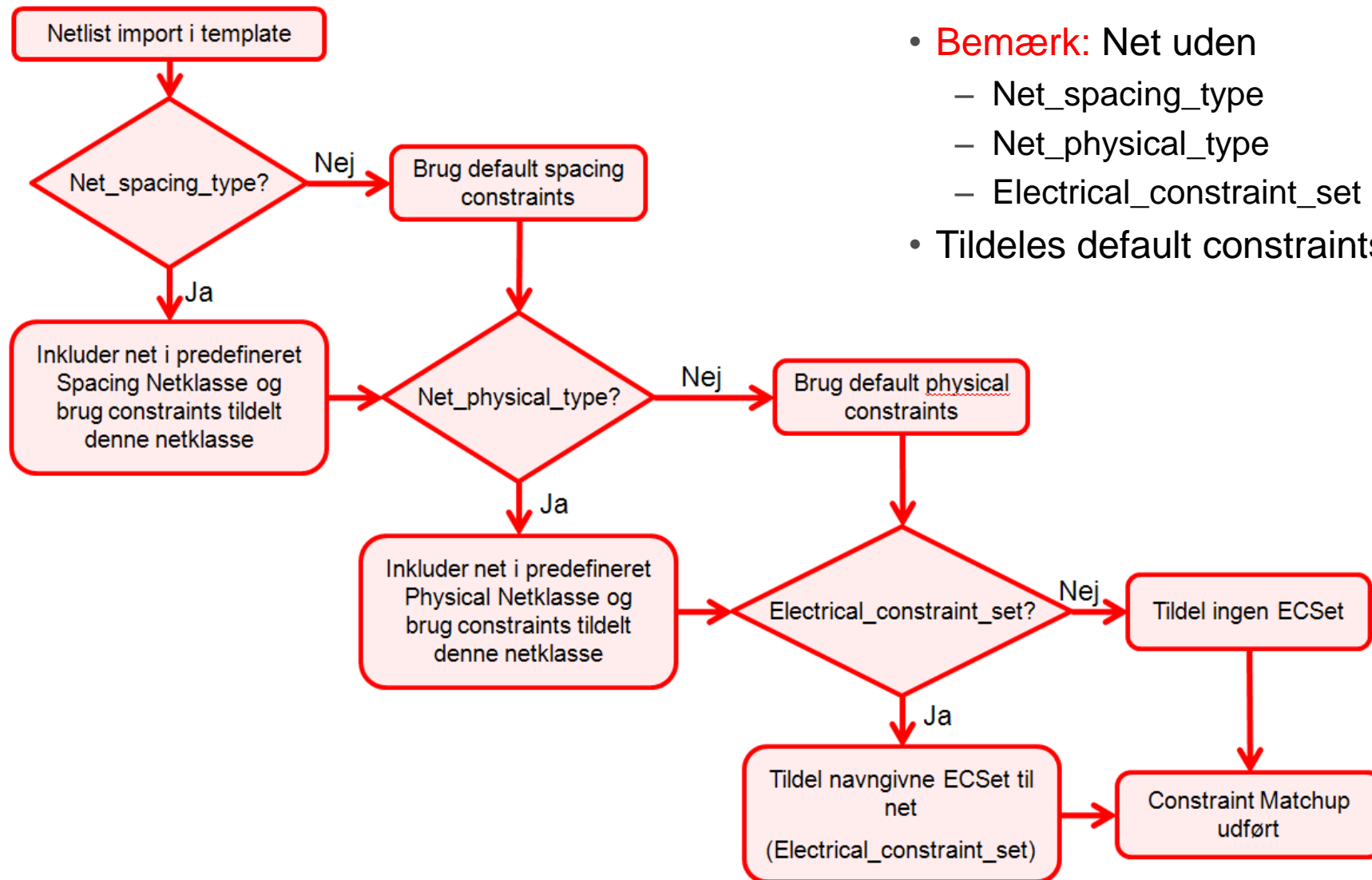
# Export constraints

- Skift til regnearket "Export\_Data" og tryk på "Click to export data" knappen
  - Vælg folder til eksporterede data
  - 3 csv filer oprettes (semikolon adskilt)
- Start et nyt job i PCB Editoren
  - Setup stackup (Setup→Cross-section)
  - Kør Constraint Template programmet
    - ns\_csv2cm
- Der oprettes
  - Constraint Sets (P,S og E)
  - Netclasses
  - Cset assignments



# Anvend i Capture flow

- Anvend korrekte navne i Capture for matchup ved netlist import



- Bemærk:** Net uden
  - Net\_spacing\_type
  - Net\_physical\_type
  - Electrical\_constraint\_set
- Tildeles default constraints

# Eksempel - Physical

Spacing Constraint Sets

	0.1MM	0.2MM	0.3MM	0.5MM
0.1MM				
0.2MM			data	
0.3MM				
0.5MM				power

Physical Constraint Sets

Property Editor

New Row... Apply Display... Delete Property Filter by: Cadence-Allegro

	A	B
	AD7	AD6
CLK_2OUT_MIN		
CLK_SKEW_MAX		
CLK_SKEW_MIN		
CLOCK_NET		
DIFFERENTIAL_PAIR		
ECL		
ECL_TEMP		
ELECTRICAL_CONSTRAINT_SET		
EMC_CRITICAL_NET		
ID	4986	4988
MAX_EXPOSED_LENGTH		
MAX_FINAL_SETTLE		
MAX_OVERSHOOT		
MAX_SSIN		
MAX_UNDERSHOOT		
MAX_VIA_COUNT		
MAX_XTALK		
MIN_BOND_LENGTH		
MIN_HOLD		
MIN_LINE_WIDTH		
MIN_NECK_WIDTH		
MIN_NOISE_MARGIN		
MIN_SETUP		
Name	AD7	AD6
NET_PHYSICAL_TYPE	DATA	DATA
NET_SCHEDULE		
NET_SPACING_TYPE	DATA	DATA
NO_GLOSS		

Electrical

Physical

Physical Constraint Set

All Layers

By Layer

Net

All Layers

Region

All Layers

Type	Objects	Referenced Physical Cset	Line Width	
			Min mm	Max mm
Dsn	New board	DEFAULT	0.1	0.0
NCIs	ADDN	50OHM	50.0	0.0
NCIs	CLK	0.2MM	0.2	0.0
NCIs	CTRL	50OHM	50.0	0.0
NCIs	DATA	0.2MM	0.2	0.0
Net	AD0	0.2MM	0.2	0.0
Net	AD1	0.2MM	0.2	0.0
Net	AD2	0.2MM	0.2	0.0
Net	AD3	0.2MM	0.2	0.0
Net	AD4	0.2MM	0.2	0.0
Net	AD5	0.2MM	0.2	0.0
Net	AD6	0.2MM	0.2	0.0
Net	AD7	0.2MM	0.2	0.0
NCIs	HV	2.0MM	2.0	0.0
NCIs	LV	2.0MM	2.0	0.0
NCIs	POWER	0.5MM	0.5	0.0

# Eksempel - Spacing

Spacing Constraint Sets				
	0.1MM	0.2MM	0.3MM	0.5MM
0.1MM				
0.2MM			data	
0.3MM				
0.5MM				power

Property Editor

New Row... Apply Display... Delete Property Filter by: Cadence-Allegro

	A	B
	AD7	AD6
CLK_2OUT_MIN		
CLK_SKEW_MAX		
CLK_SKEW_MIN		
CLOCK_NET		
DIFFERENTIAL_PAIR		
ECL		
ECL_TEMP		
ELECTRICAL_CONSTRAINT_SET		
EMC_CRITICAL_NET		
ID	4986	4988
MAX_EXPOSED_LENGTH		
MAX_FINAL_SETTLE		
MAX_OVERSHOOT		
MAX_SSN		
MAX_UNDERSHOOT		
MAX_VIA_COUNT		
MAX_XTALK		
MIN_BOND_LENGTH		
MIN_HOLD		
MIN_LINE_WIDTH		
MIN_NECK_WIDTH		
MIN_NOISE_MARGIN		
MIN_SETUP		
Name		
NET_PHYSICAL_TYPE	AD7 DATA	AD6 DATA
NET_SCHEDULE		
NET_SPACING_TYPE	DATA	DATA
NO_GLOSS		

P0.0 39 AD0

P0.1 38 AD1

P0.2 37 AD2

P0.3 36 AD3

P0.4 35 AD4

P0.5 34 AD5

P0.6 33 AD6

P0.7 32 AD7

Electrical

Physical

Spacing

Spacing Constraint Set

- All Layers
- By Layer
- Net
  - All Layers
    - Line
    - Pins
    - Vias
    - Shape
    - Bond Finger
    - Hole
    - BB Via Gap
  - Net Class-Class
    - All Layers
  - Region

new\_board

Type	Objects	Referenced Spacing CSet	Line mm
Dsn	new_board	DEFAULT	0.1
NCIs	ADDR	0.2MM	0.2
NCIs	CLK	1.0MM	1.0
NCIs	CTRL	0.2MM	0.2
NCIs	DATA	0.3MM	0.3
Net	AD0	0.3MM	0.3
Net	AD1	0.3MM	0.3
Net	AD2	0.3MM	0.3
Net	AD3	0.3MM	0.3
Net	AD4	0.3MM	0.3
Net	AD5	0.3MM	0.3
Net	AD6	0.3MM	0.3
Net	AD7	0.3MM	0.3
NCIs	HV	2.0MM	2.0

# Hvordan kommer jeg i gang?

- Se filmen på [www.nordcad.dk](http://www.nordcad.dk) under Film → Constraint og SI træning
  - Download Constraint Templatén samme sted
- e-SERVICE nr. 106 udsendt d. 1. september 2009
  - Omhandler og beskriver Constraint Templatén

## Nordcad

### e-SERVICE nr. 106

#### Cadence webseminarer

Deltag i Webseminaret "SMPS Design og analyse med Cadence PSpice teknologi" eller et af de andre seminarer som Cadence afholder i august og september.

Se mere og tilmeld dig [her](#)

Date	Webinar title	Technology challenges
8/28/2009	SoC I/O Pinning Optimization using Cadence SPB Co-Design Technology	Power Integrity
8/27/2009	Switch-Mode Power Supply Design and Analysis with Cadence PSpice Technology	Power Integrity
9/23/2009	Concurrent Team Design for Complex PCBs	Power Integrity

#### Gratis Constraint Template

Vi frigiver i dag første udgave af vores constraint template der vil hjælpe med at specificere og overlevere constraints fra diagramtegning til printudlægning.

Constraint Templatén består af

- Et Excel regneark
- Et tillægsprogram "Constraint Template Loader" til OrCAD/Allegro PCB Editoren (inkl. demo udgaven)

Ideen bag Constraint Templatén er at designeren på højt niveau i et Excel regneark angiver de ønskede constraints for

- Sikkerhedsafstande for netklasser og evt. netklasse til netklasse
- Banebredder for netklasser
- Elektriske constraints såsom matchede længder, impedanser, max længder mv.