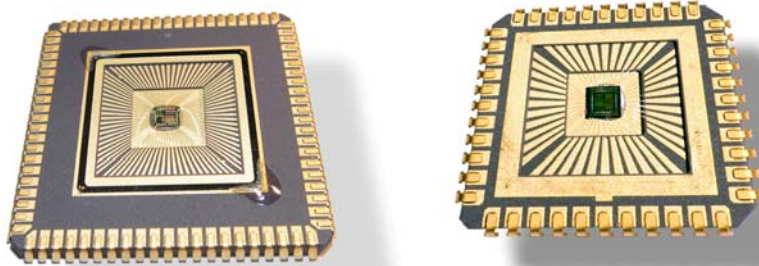


Elektroniksystem



Professor Per Larsson-Edefors

perla@chalmers.se



Konstruktionsalternativ

- Kretskort med diskreta standardkomponenter.
 - Utvecklingskostnad och prestanda låga.
- Applikationsspecifika, integrerade kretsar.
 - Prestanda hög.
 - Utvecklingskostnad hög -> stora serier (standardprodukter) eller stor budget.
 - Hög integration, blandat digitalt och analogt.



Kretskort med standardkomponenter



Innandömet av router



Ethernetswitch Marvell



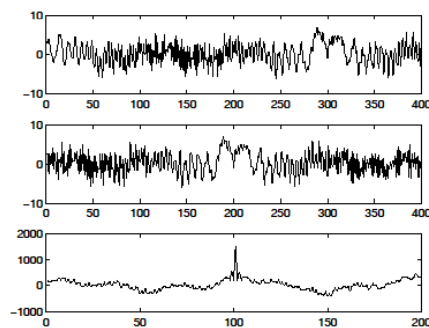
Basbandsprocessor TI



Application-Specific Integrated Circuit (ASIC)



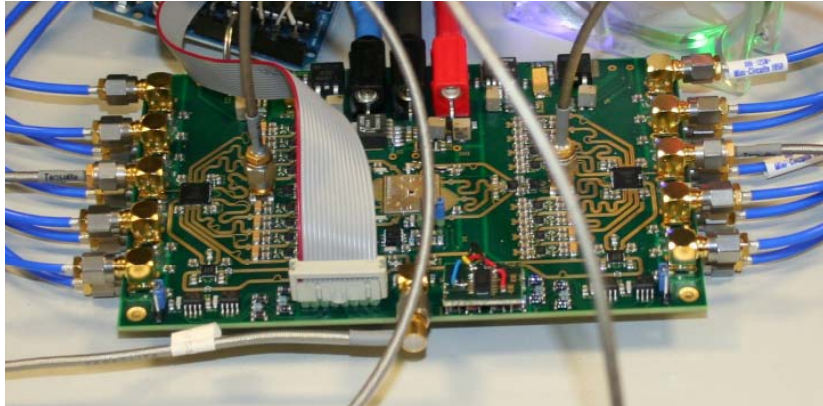
Specialiserad tillämpning: Korskorrelation



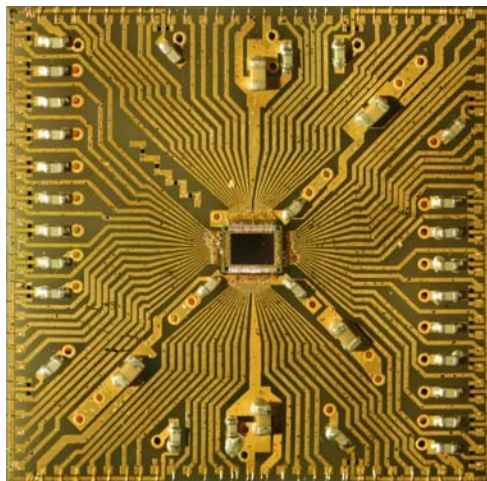
$$(f * g)[n] = \sum_{m=-\infty}^{\infty} f^*[m]g[n+m]$$



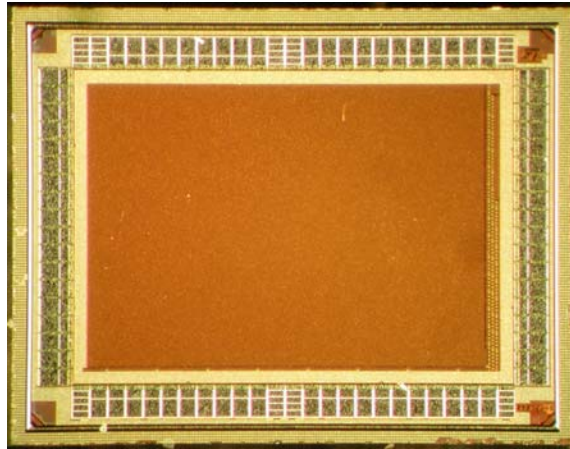
Specialgjort kretskort ...



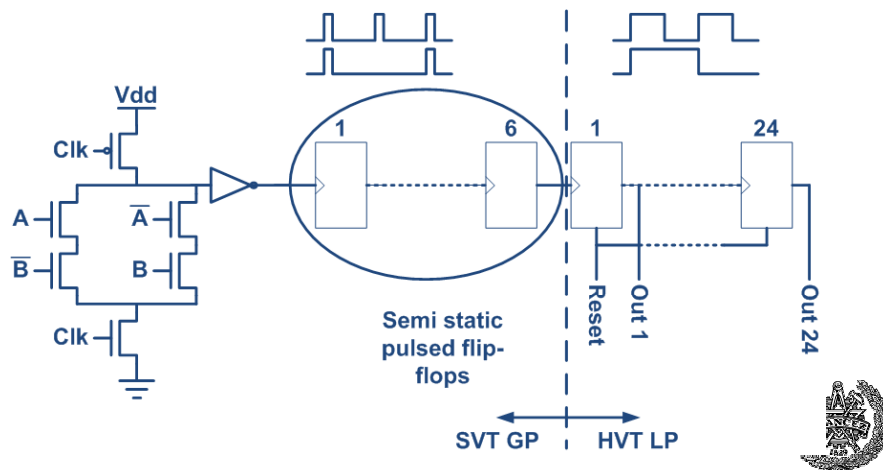
... med specialgjort substrat ...



... med dedicerad IC ...



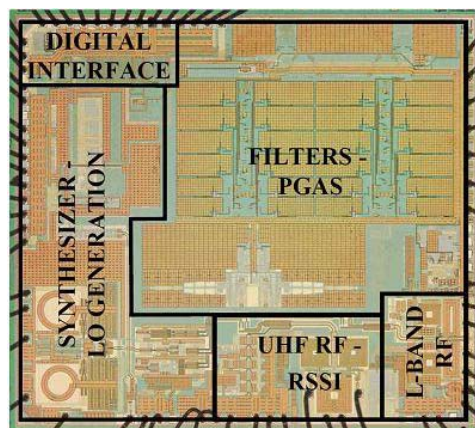
... med specialbyggda kretsar



System-på-kisel (System-on-Chip - SoC)



Komplett DVB-mottagare



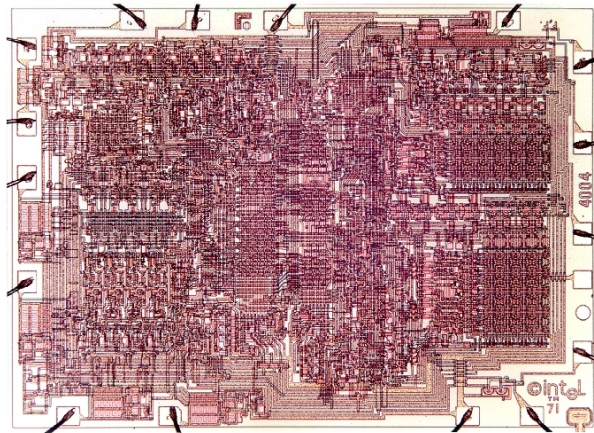
Processorbaserade system



Generella plattformar: Moderkort med processor



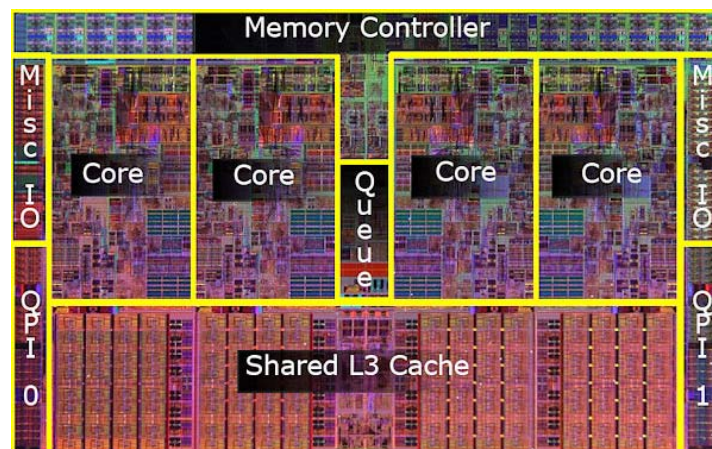
Intel 4004 – 10 μm



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Sida 17

Intel i7 – 45 nm



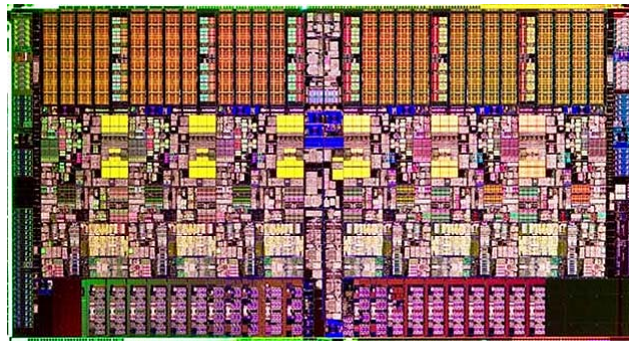
Source: Intel



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Sida 18

Intel Core i7 980X – 32 nm



Source: Intel

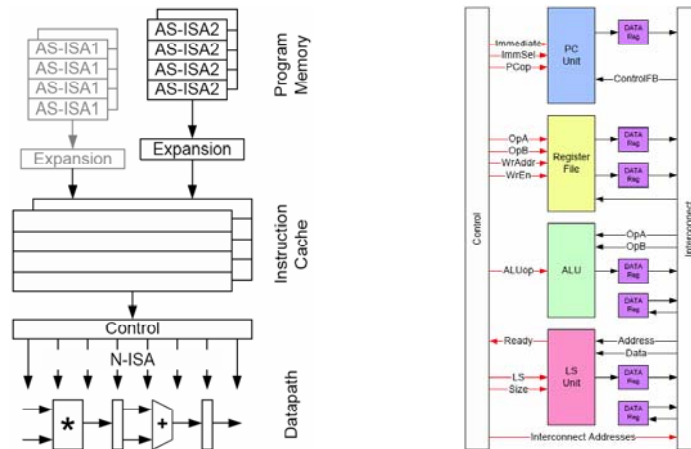


Allt i mjukvara? (mjuk FPGA uP)

Time Taken (%)	Function Name	Total Time (seconds)	Self Time (seconds)	Number of Calls
30.21	MAD_F_MUL_16	49.53	49.53	41731200
23.38	MAD_F_MUL_28	87.88	38.34	161335830
10.69	synth_full	105.40	17.52	1150
9.01	dct32	120.18	14.78	82800
3.96	imdct36	126.68	6.50	100665
3.47	III_huffdecode	132.37	5.70	4600
1.66	XSysAce_RegRead32	135.10	2.73	
1.47	III_requantize	137.50	2.40	142413
1.30	III_imdct_I	139.63	2.12	100665
1.10	XSysAce_ReadDataBuffer	141.43	1.81	
1.05	III_sideinfo	143.15	1.71	1150
1.04	MadFixedToUshort	144.86	1.71	2649600
1.00	mad_bit_read	146.50	1.64	489234
0.93	III_overlap	148.04	1.53	105199
0.93	III_stereo	149.55	1.52	2300
0.91	XIo_EndianSwap16	151.05	1.50	
0.91	mad_frame_decode	152.54	1.49	1528
0.81	MicroBlaze_MP3Decode	153.86	1.32	1
0.74	XSysAce_RegRead16	155.08	1.22	
0.73	III_aliasreduce	156.28	1.20	4398
0.62	play_sound	157.29	1.01	2649600
0.42	III_decode	157.98	0.69	1150
0.38	XSysAce_WriteSector	158.61	0.63	
0.35	III_overlap_z	159.18	0.57	42001
0.34	mad_stream_init	159.73	0.55	1
0.29	mad_layer_III	160.21	0.48	1150
0.28	init_sound	160.67	0.46	1
0.28	XIo_EndianSwap32	161.12	0.45	
0.23	memcpy	161.50	0.38	
0.20	III_freqinver	161.83	0.33	73600
0.18	XUartLite_SendByte	162.13	0.30	

Bilder från Xilinx

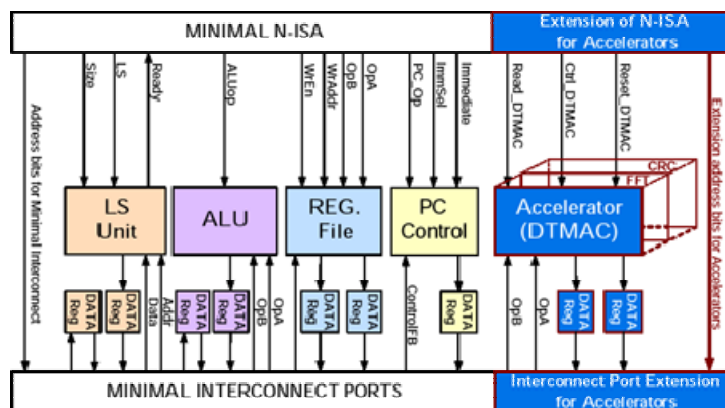
FlexCore (Chalmers)



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Sida 21

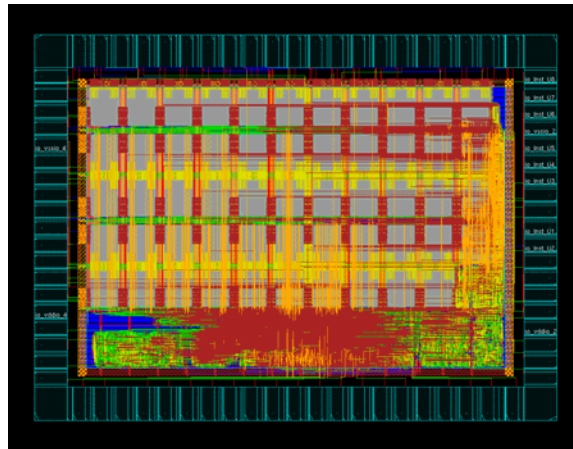
Utbyggbar processor – HW/SW codesign



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Sida 22

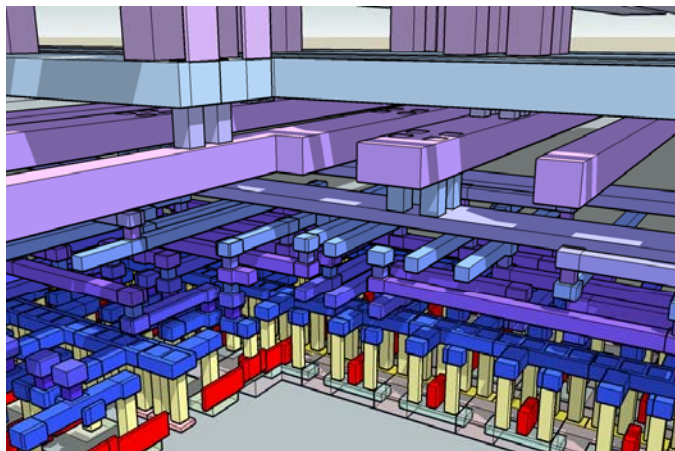
FlexCore-chip



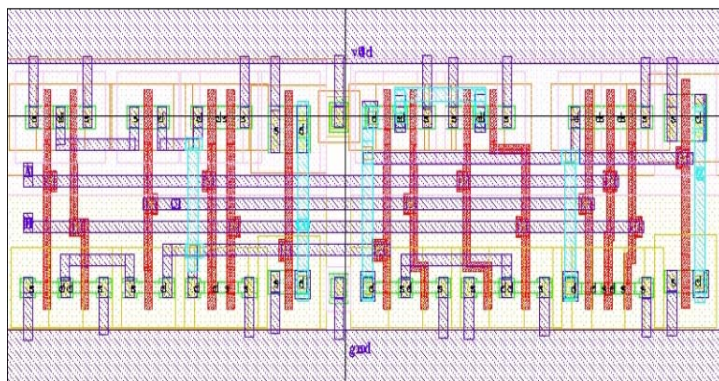
IC-teknologi



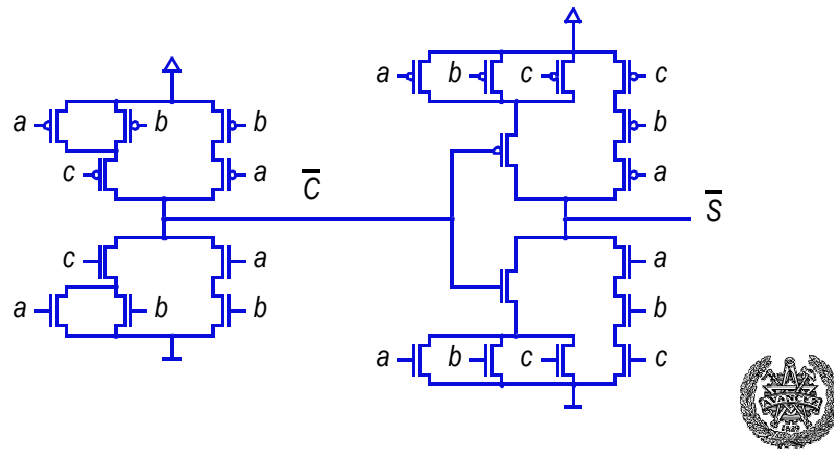
Den integrerade kretsen



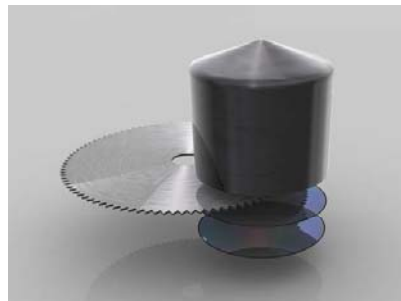
Layout för heladderare



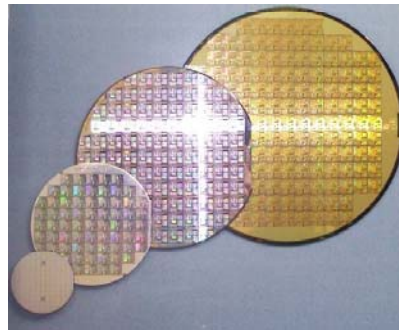
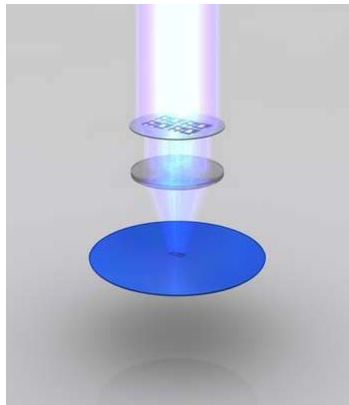
Transistorkrets för heladderare



Tillverkning av wafers

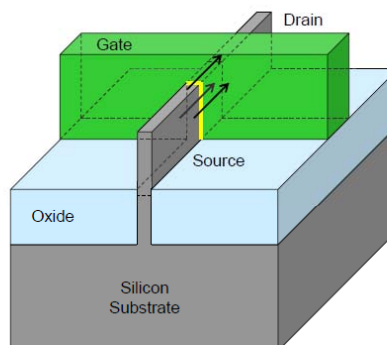


Kostnadseffektiv litografi; hur?



Ny transistortyp krävs

22 nm Tri-Gate Transistor



Sammanfattning

- Många konstruktionsalternativ!
- Olika teknologiplattformar.
 - ASIC, FPGA, standardkomponenter; nyheter på gång!
- Olika konstruktionsmetoder.
 - Manuell vs CAD. Mjukvara vs hårdvara.
Analogt vs digitalt
- Komplexa system krävs för
hög funktionalitet och hög prestanda.
Hur konstruerar vi dessa i framtiden?

