SCE 0110 -
Elementos de Lógica Digital I

Contextualização e
Conceitos de Projeto

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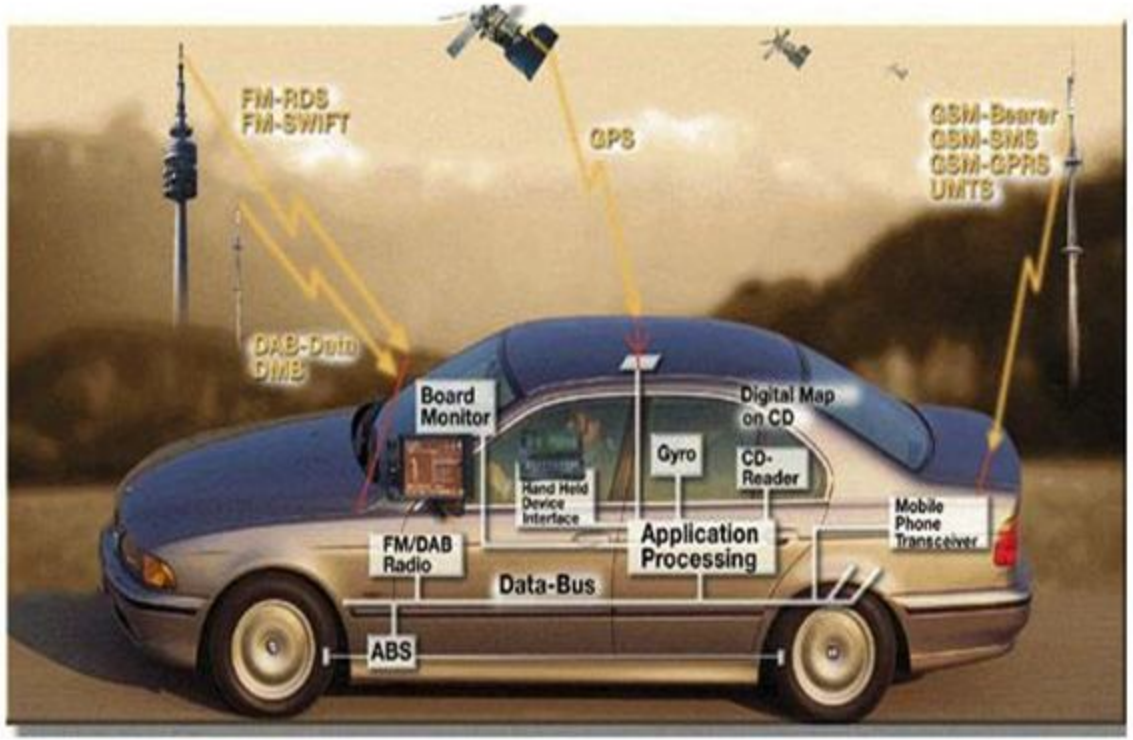
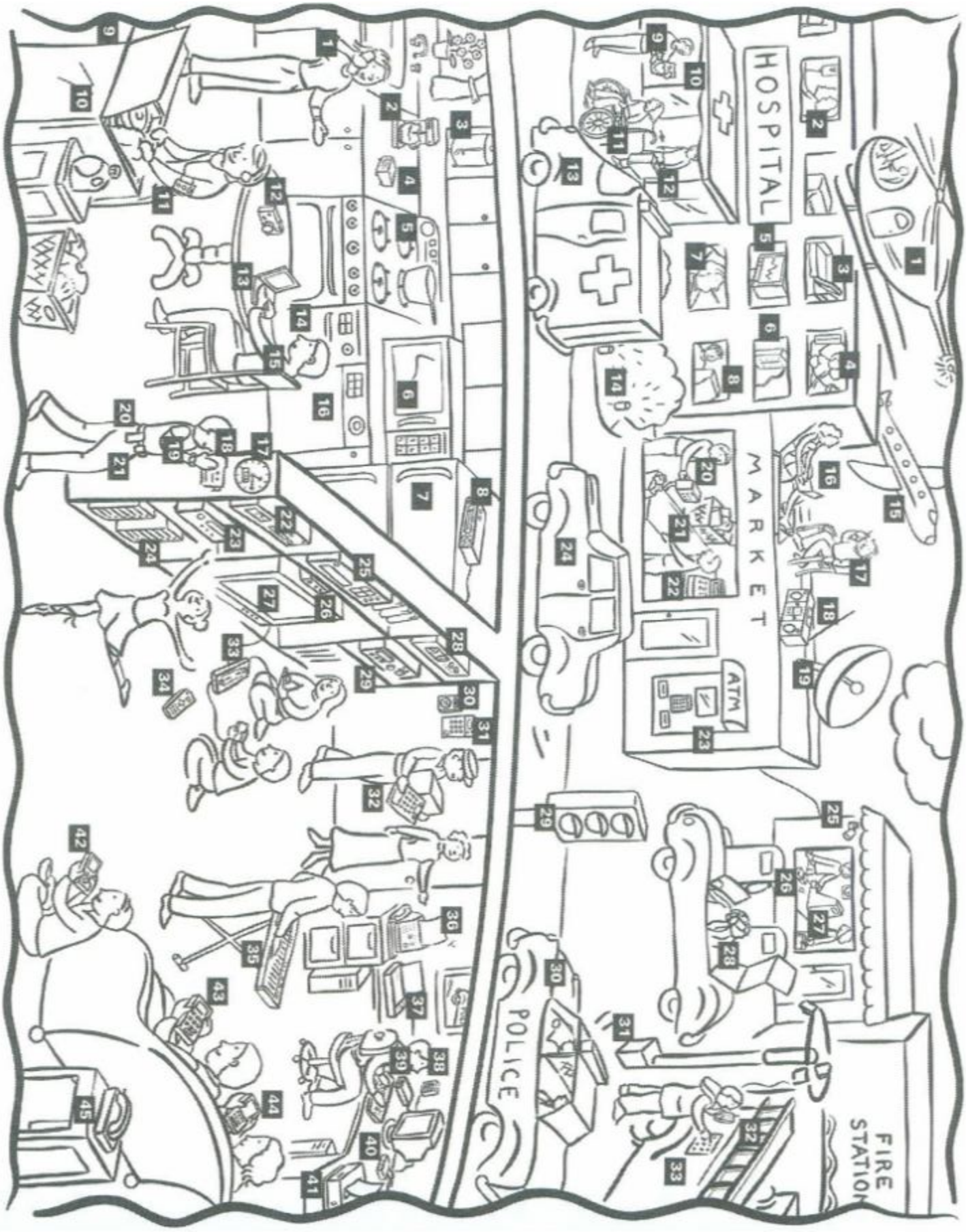
Tópicos da Aula de Hoje

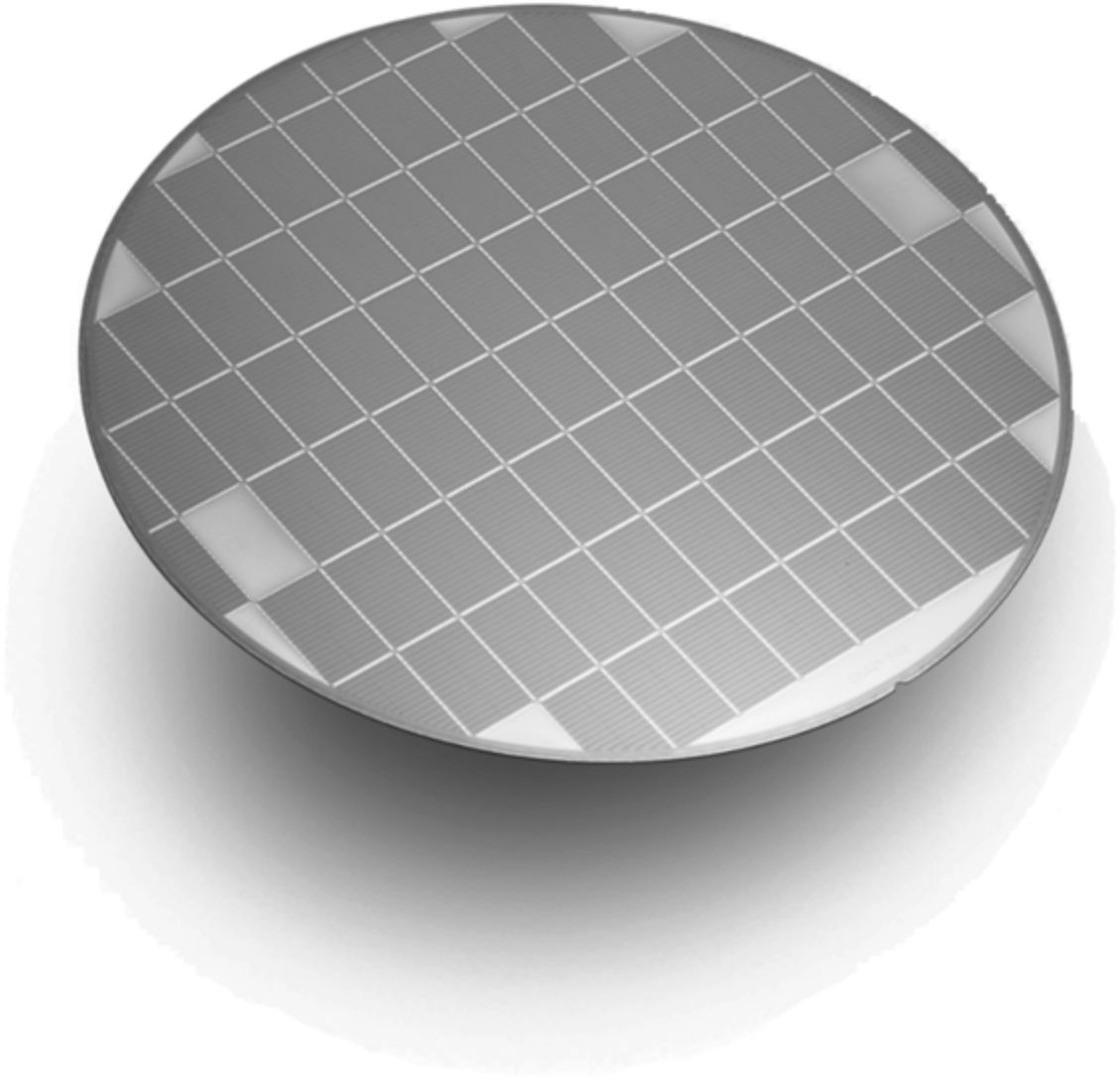
- Por que estudar elementos de lógica digital?
- Fluxo de desenvolvimento de circuitos digitais
- Introdução ao FPGA
  - Ferramentas EDA (Electronic Design Automation) /CAD (Computer Aided Design)


FM-RDS
FM-SWIFT
GPS
GSM-Bearer
GSM-SMS
GSM-GPRS
UMTS
DAB-Data
DMB
Board Monitor
Digital Map on CD
Gyro
CD-Reader
Hand Held Device Interface
Mobile Phone Transceiver
FM/DAB Radio
Application Processing
Data-Bus
ABS



(VAHID; GIVARGIS, 2002)

Wafer de silício para fabricação de circuitos integrados (*chips)*



Estimativa da evolução da tecnologia

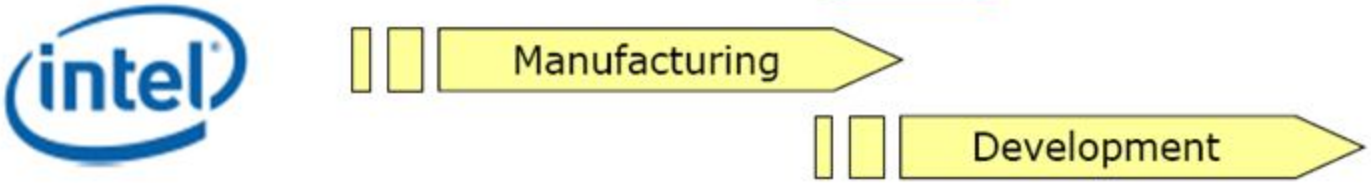
	Year					
	1999	2001	2003	2006	2009	2012
Transistor gate length	0.14 μm	0.12 μm	90 nm	65 nm	50 nm	35 nm
Transistors per cm^2	14 million	16 million	24 million	40 million	64 million	100 million
Chip size	800 mm^2	850 mm^2	900 mm^2	1000 mm^2	1100 mm^2	1300 mm^2

Table 1.1. A sample of the SIA Roadmap.

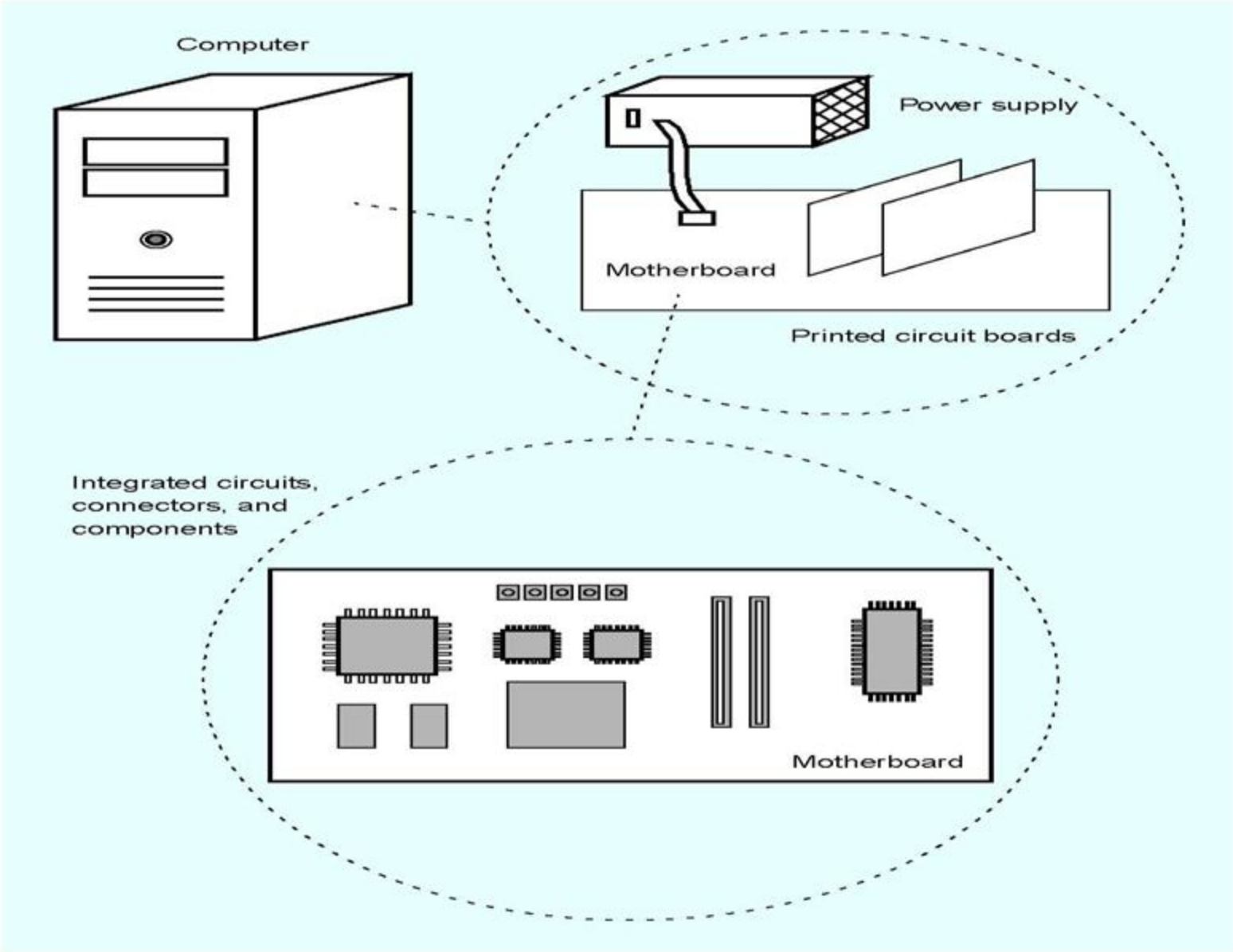
Processos usados pela Intel

- Densidade dos chips na ordem de bilhões de transistores graças ao constante avanço da tecnologia
- Intel® Itanium® com 2 bilhões de transistores

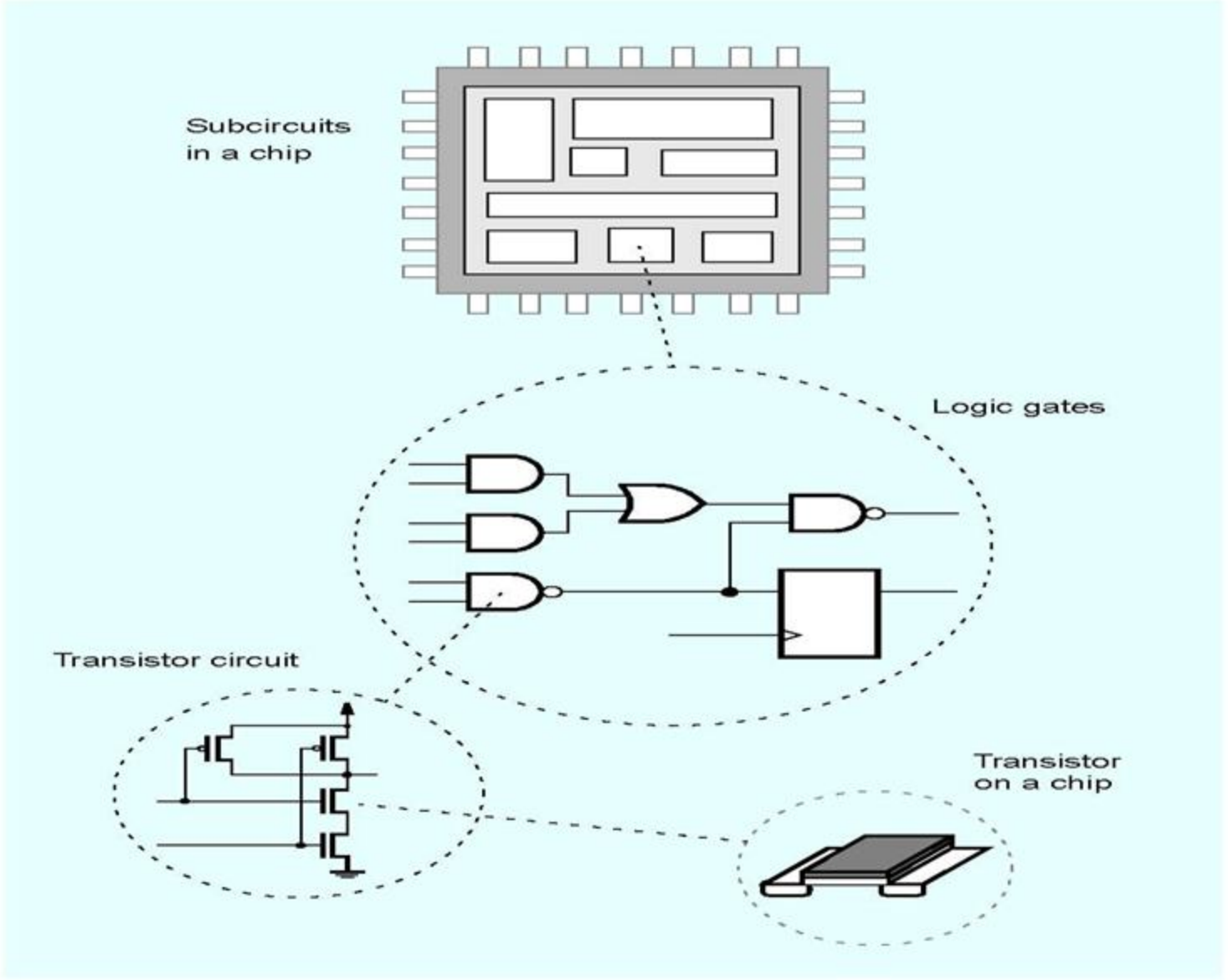
Process Name	P1264	P1266	P1268	P1270	P1272
Lithography	65nm	45nm	32nm	22nm	16nm
1st Production	2005	2007	2009	2011	2013



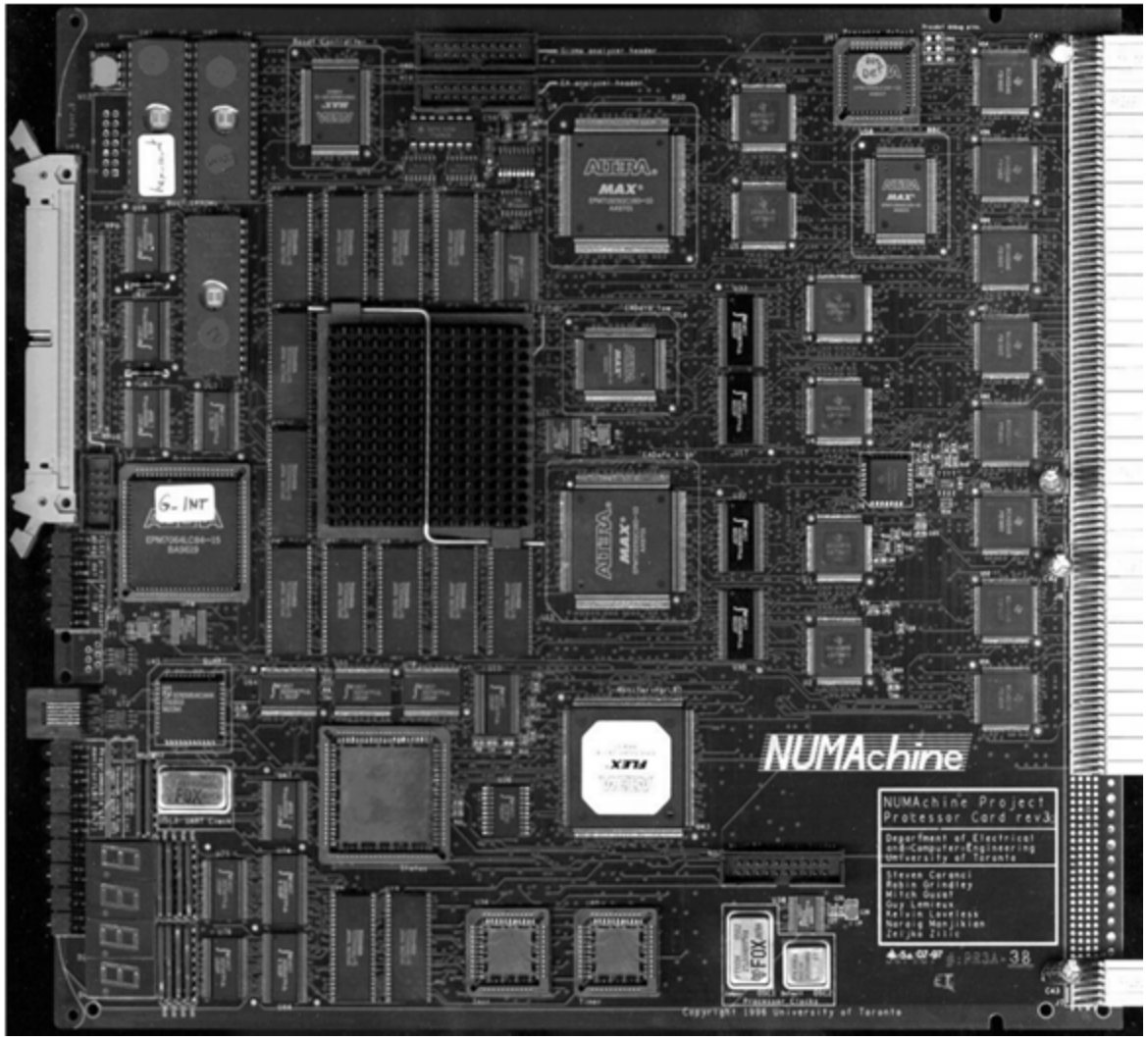
Sistema de hardware digital de um computador (parte 1:2)



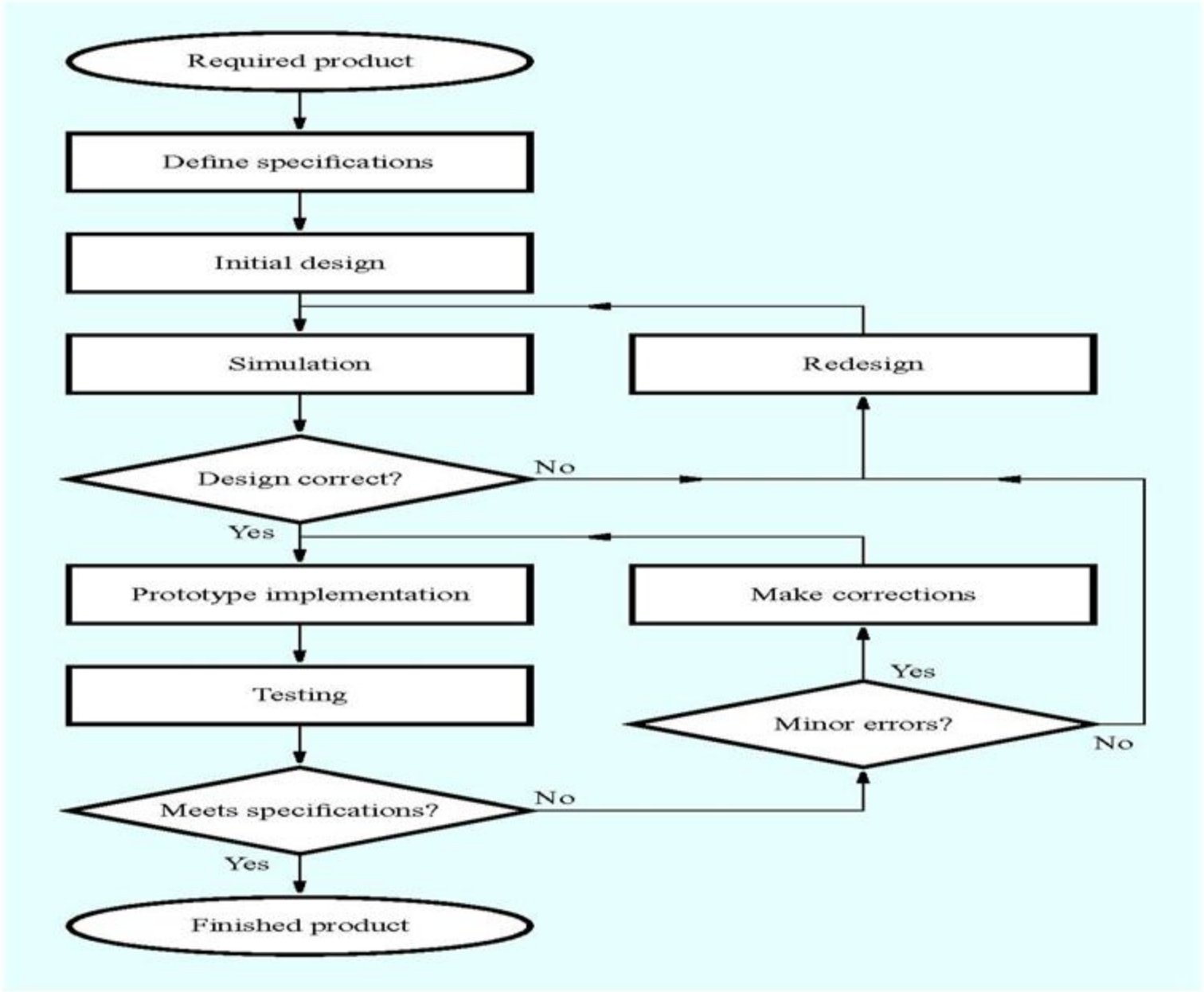
Sistema de hardware digital de um computador (parte 2:2)



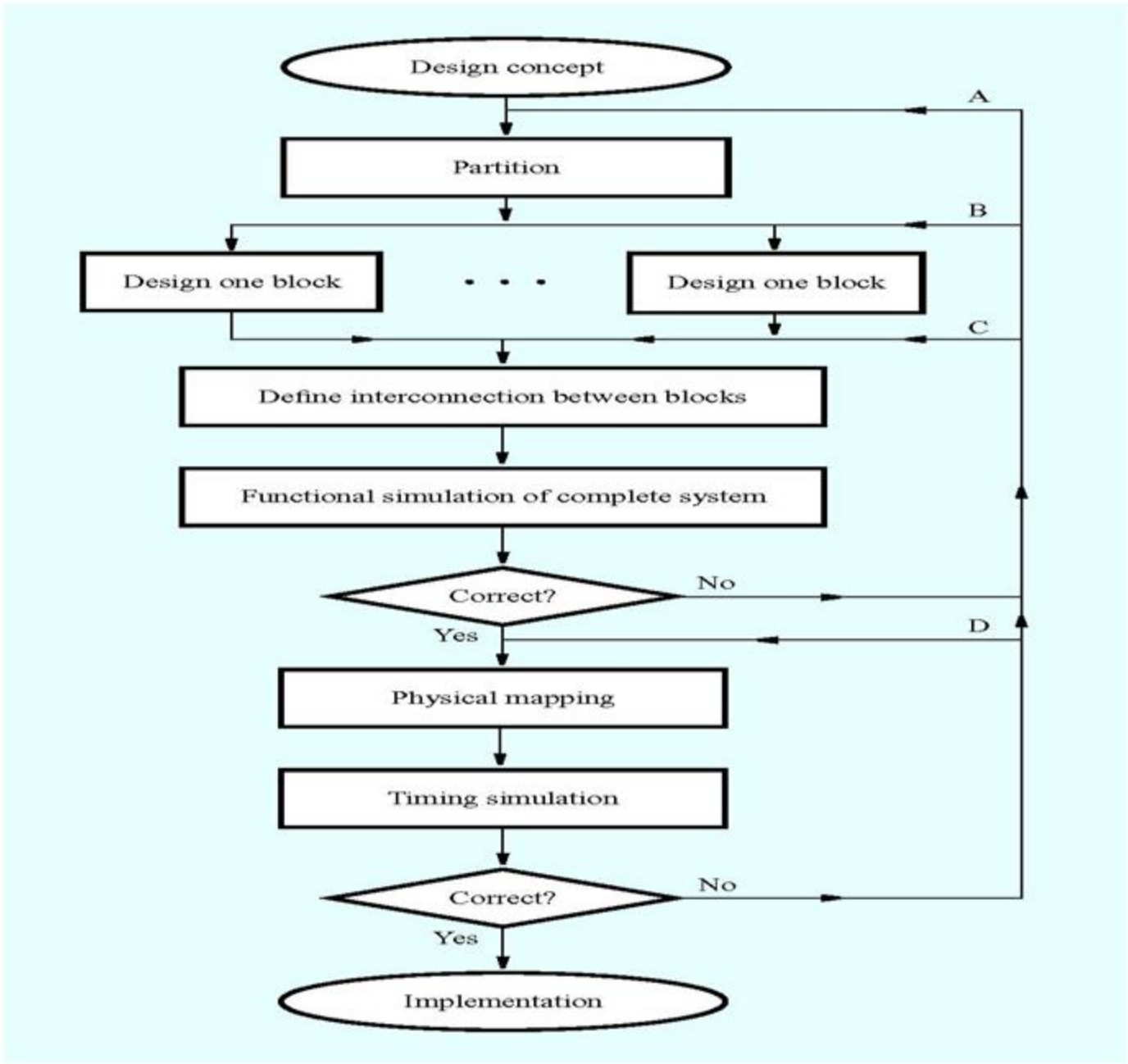
Placa de circuito impresso de uma máquina NUMA



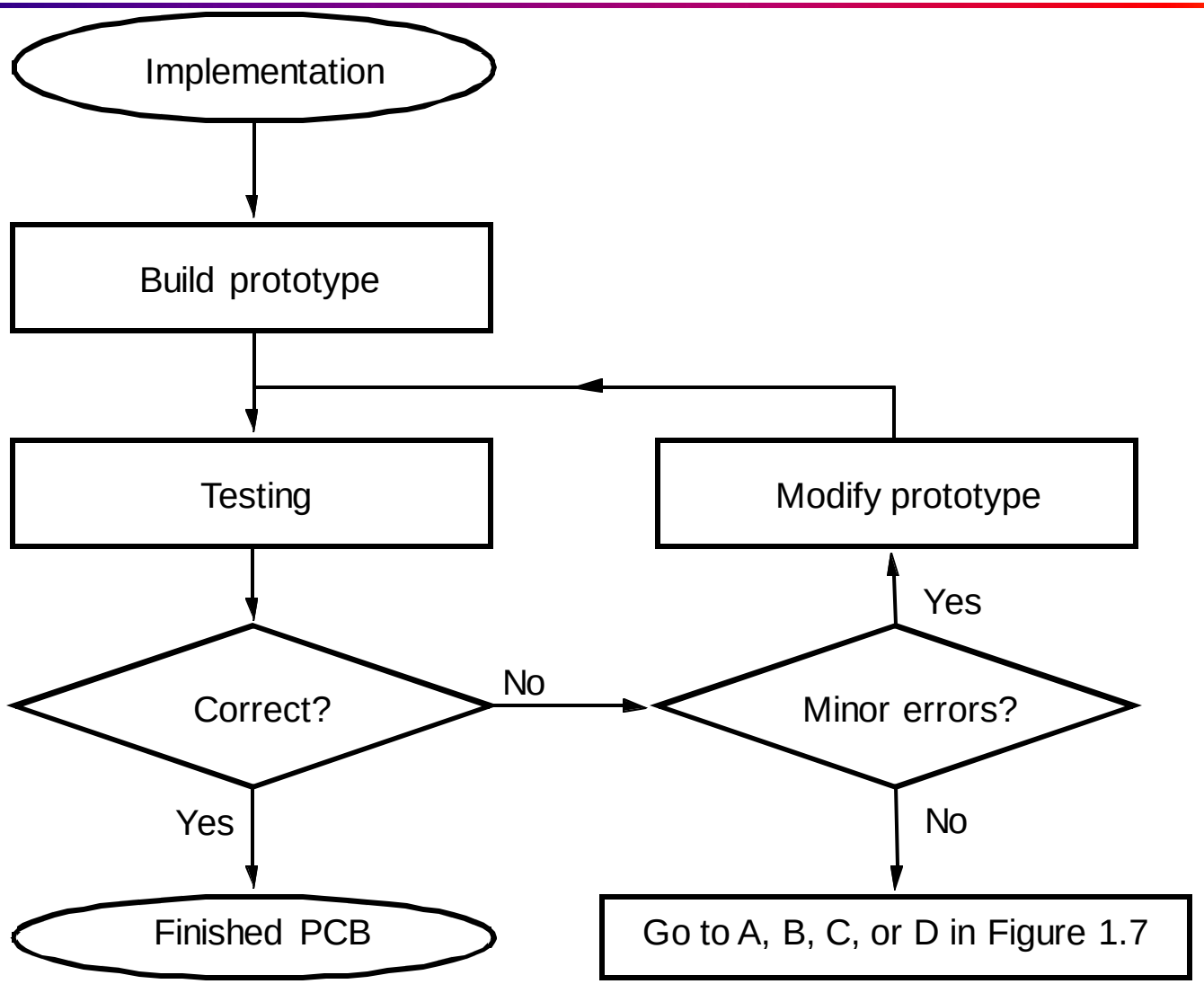
Processo de desenvolvimento tradicional



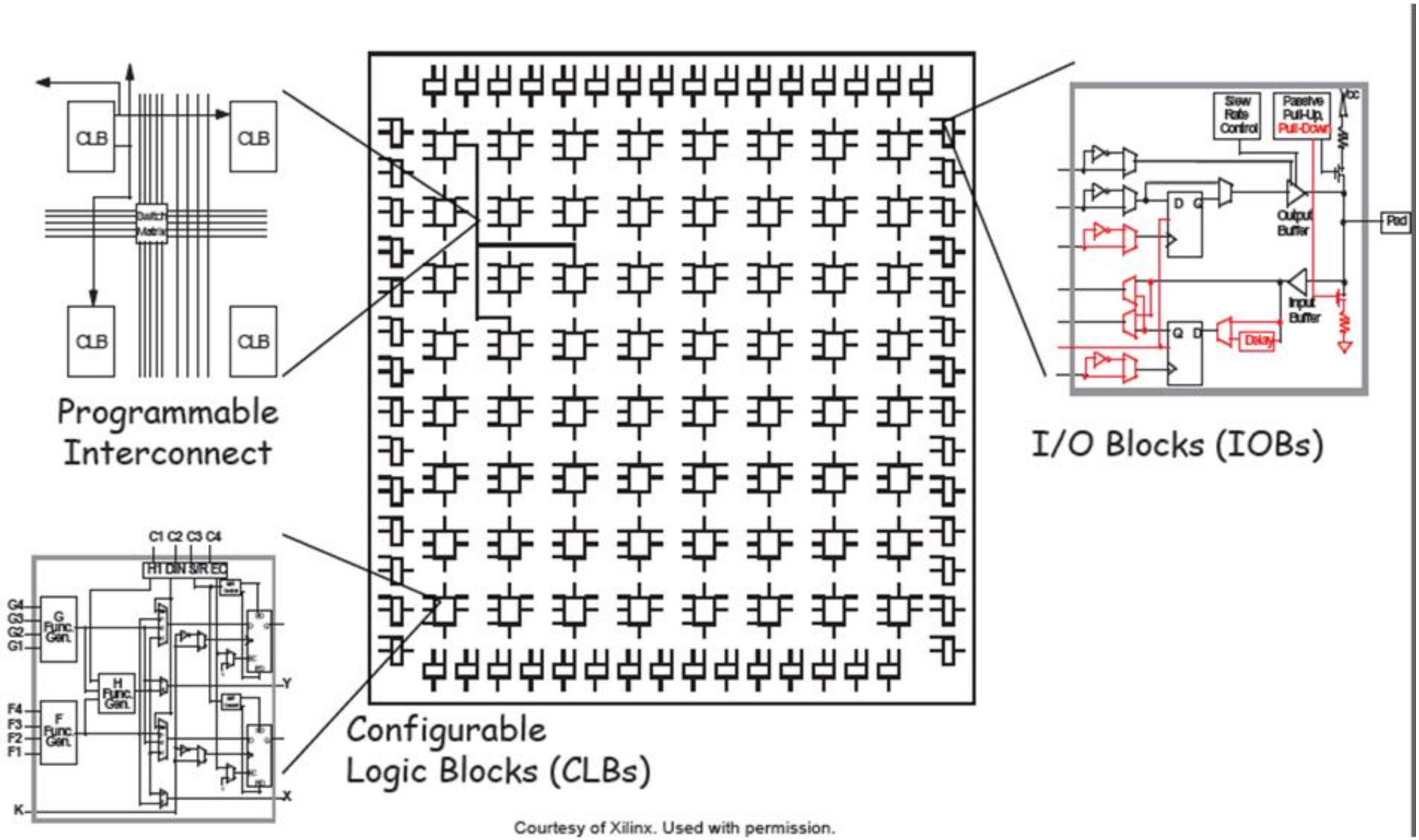
Fluxo de desenvolvimento de circuitos lógicos



Passos para implementar uma placa de circuito impresso (Printed Circuit Board – PCB)

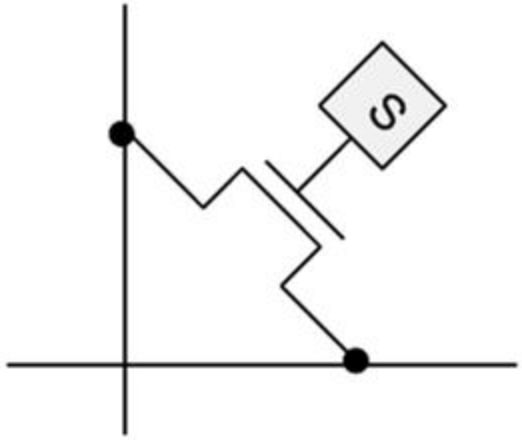


Circuito integrado do tipo FPGA (Field-Programmable Gate Array)

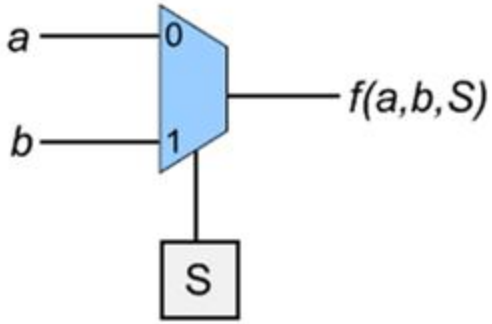


Courtesy of Xilinx. Used with permission.

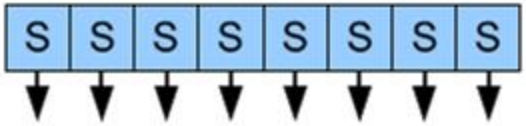
Tecnologia de FPGA do tipo SRAM



Conexão dos barramentos



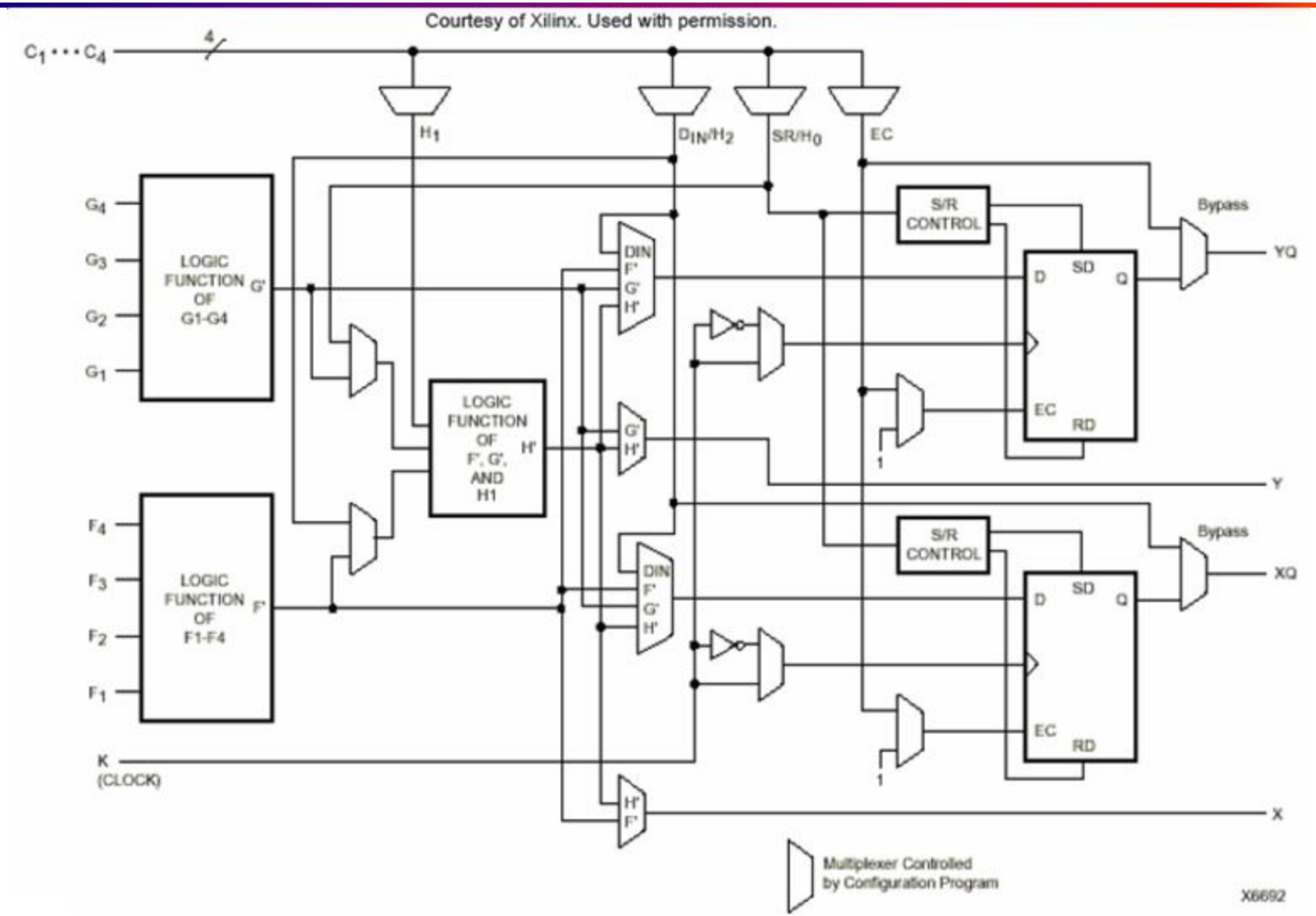
Seleção do multiplexador



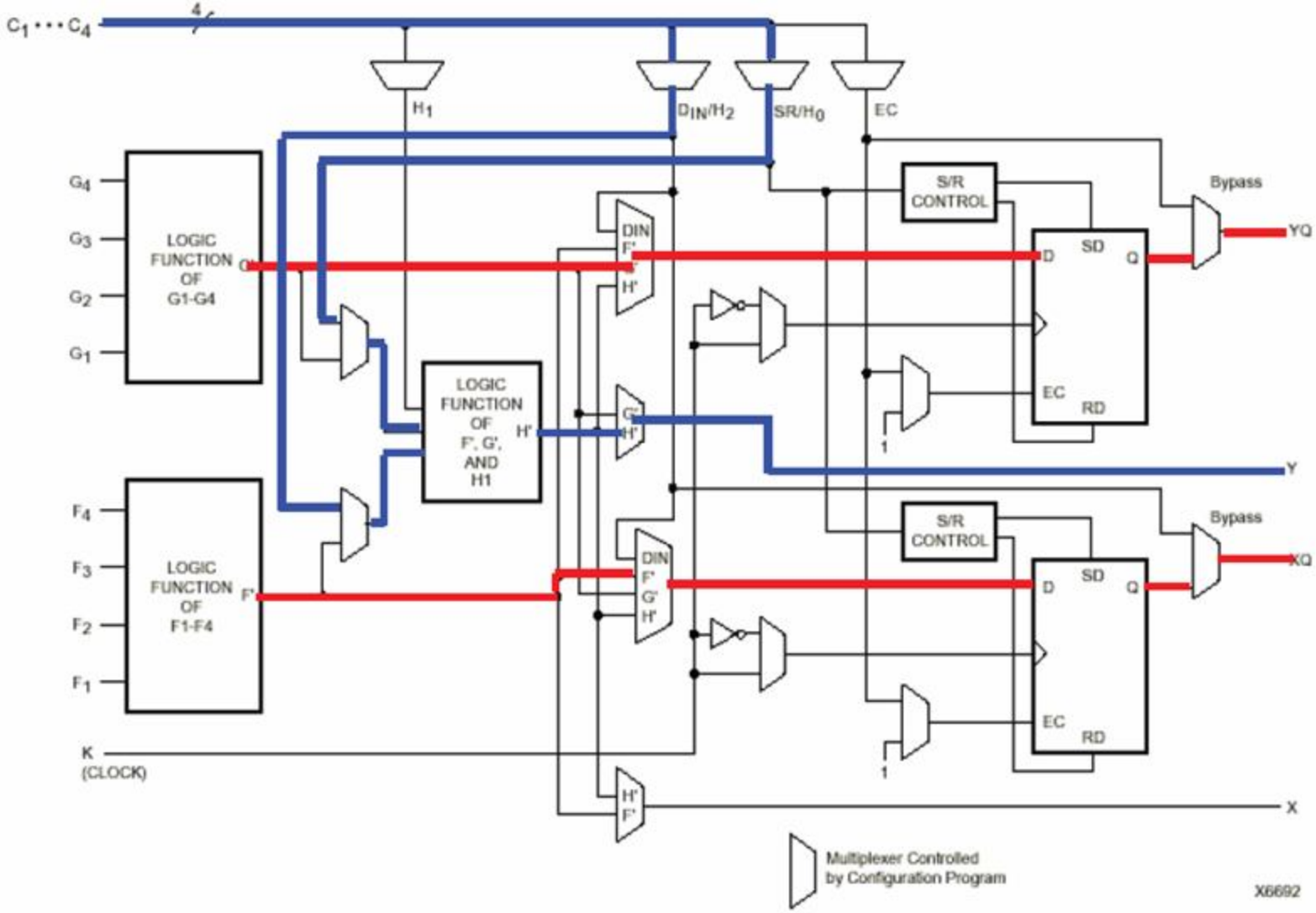
Geração de funções

São necessários milhões de bits para programar um FPGA de última geração com 681k CLBs e 1760 pinos

Exemplo de um CLB



Exemplo de funções implementadas em um CLB



Modos de programação

Linguagem de alto nível (Handel-C, ..)

VHDL (AHDL) Verilog

Esquemático

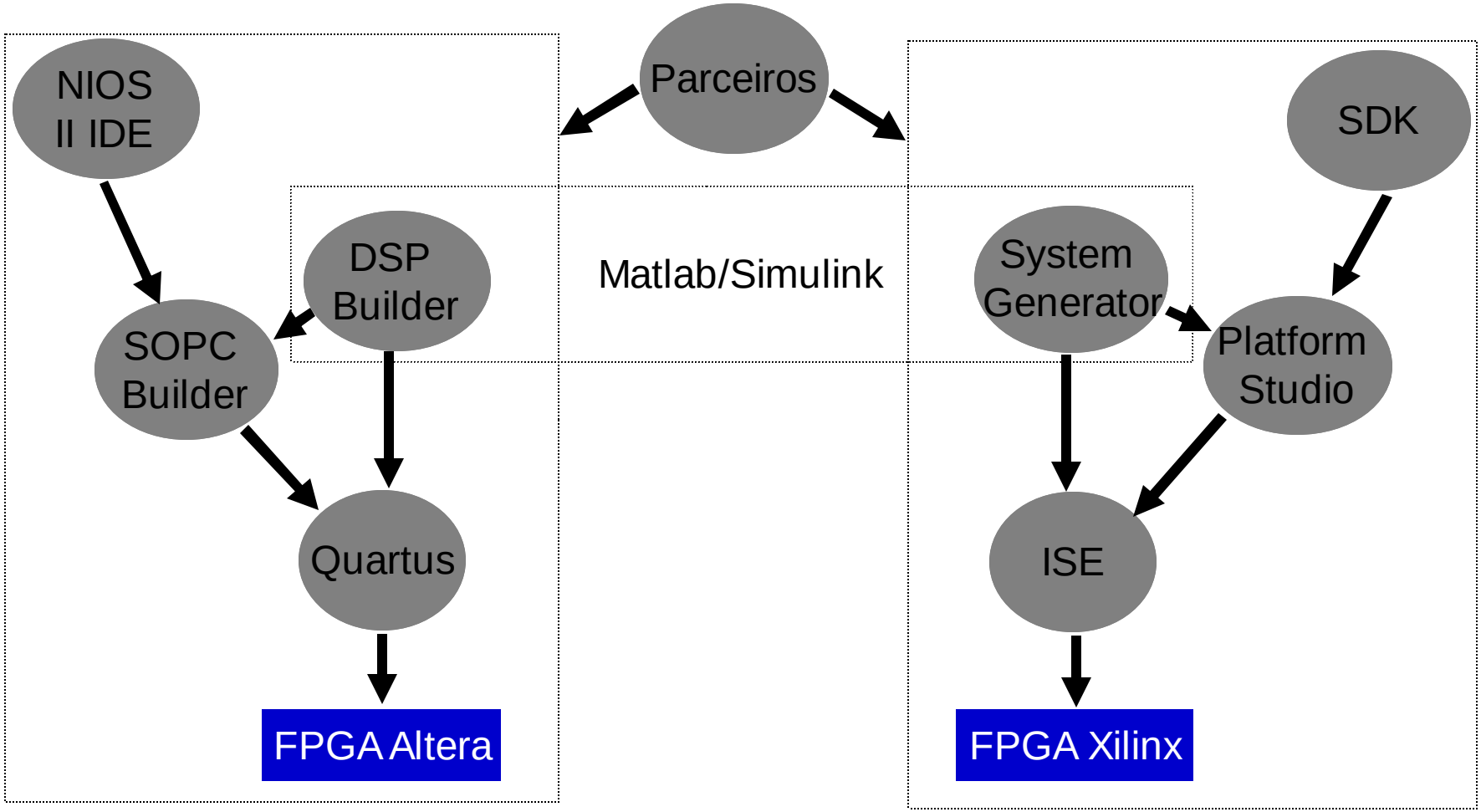
EDIF

Sintetizador

Bitstream

FPGA

Ferramentas EDA (Electronic Design Automation) da Altera e Xilinx



Principais ferramentas EDA de parceiros

Parceiros	Software para criar sistema	Síntese	Verificação
Mentor Graphics	X	X	X
Synplicity	X	X	X
Synopsys	X	X	X
Cadence	X		X
Celoxica	X	X	X
Aldec, Inc.	X		X
Impulse C	X		
...			

Fábrica Virtual de Circuito Integrado

- http://www.necel.com/v_factory/en/index.html

Referências Bibliográficas

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