NMK20603

Computer Architecture

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Introduction to CAD Tools and HDL

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Computer Aided Design

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- CAD tools (software)

  ⇒ used in various fields

  → E&E

  → Mechanical

  → Civil

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- Common CAD-based design flow:
  - ⇒ Design entry (input)
  - ⇒ Design check (optional)
  - ⇒ Design simulation/synthesis (process)

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Design Entry @ Representation

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- Classic methods:

  ⇒ Graphical - Schematic

  ⇒ Text – Netlist, HDL

- Not-so-classic method:

  ⇒ Abstract representation

  → e.g. state diagrams

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Digital Systems Design ?

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✔ Usually involves HDL

Hardware Description Language

- HDL code ... not program!

  ⇒ text-encoding of system

  ⇒ describe structure / function

- Mostly used HDL:

  ⇒ VHDL (VHSIC HDL)

  ⇒ Verilog HDL

✔ Most industry-standard tools support both

VHDL

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- strongly typed, verbose
- precise represention
- case in-sensitive
- system level integration

Verilog

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- C-like standard (simple?)
- easier for entry-level
- case sensitive
- simulation-friendly

VHDL vs Verilog

- Both have strength/weakness
- Some uses both!
- We choose Verilog

HDL

Coding Style

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- Structural

  ⇒ Specify exact electrical lines

  → Absolutely synthesizable

- Register Transfer Level @ RTL

  ⇒ Specify logic functions

  → Mostly synthesizable

  → May not be optimized

- Behavioral

  ⇒ Specify abstract behavior

  → May NOT be synthesizable

  → OK for behavior verification

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✔ Will mostly do structural & RTL

Digital systems

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- logic gates (combinational)
- flip-flops (sequential)

Structure!

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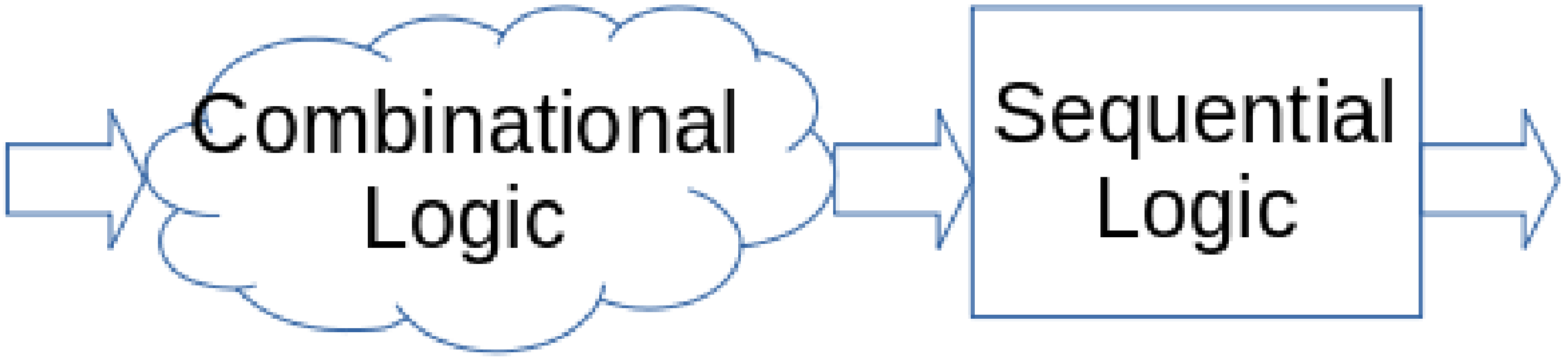

⇒ Synthesizable!

Design Simulation
& Synthesis (Processing)

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Simulation tools for HDL-based design

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- Icarus Verilog
  - → Open Source
  - → Cross Platform

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⇒ Verilog compiler and simulator ONLY

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- ModelSim
  - → from Mentor Graphics
  - → now, Siemens

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⇒ Complete Design Environment

Editor/Simulator/WF Viewer

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Happy Coding!