

Computer architecture

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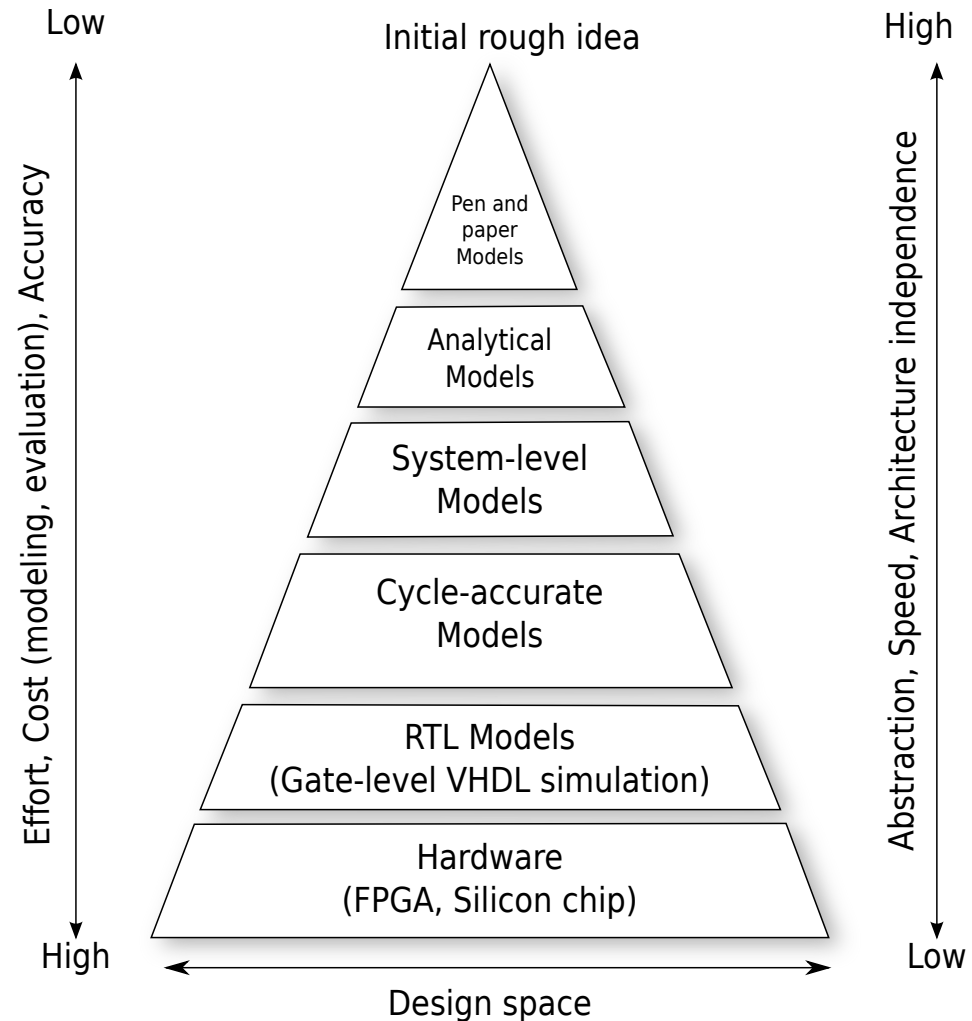


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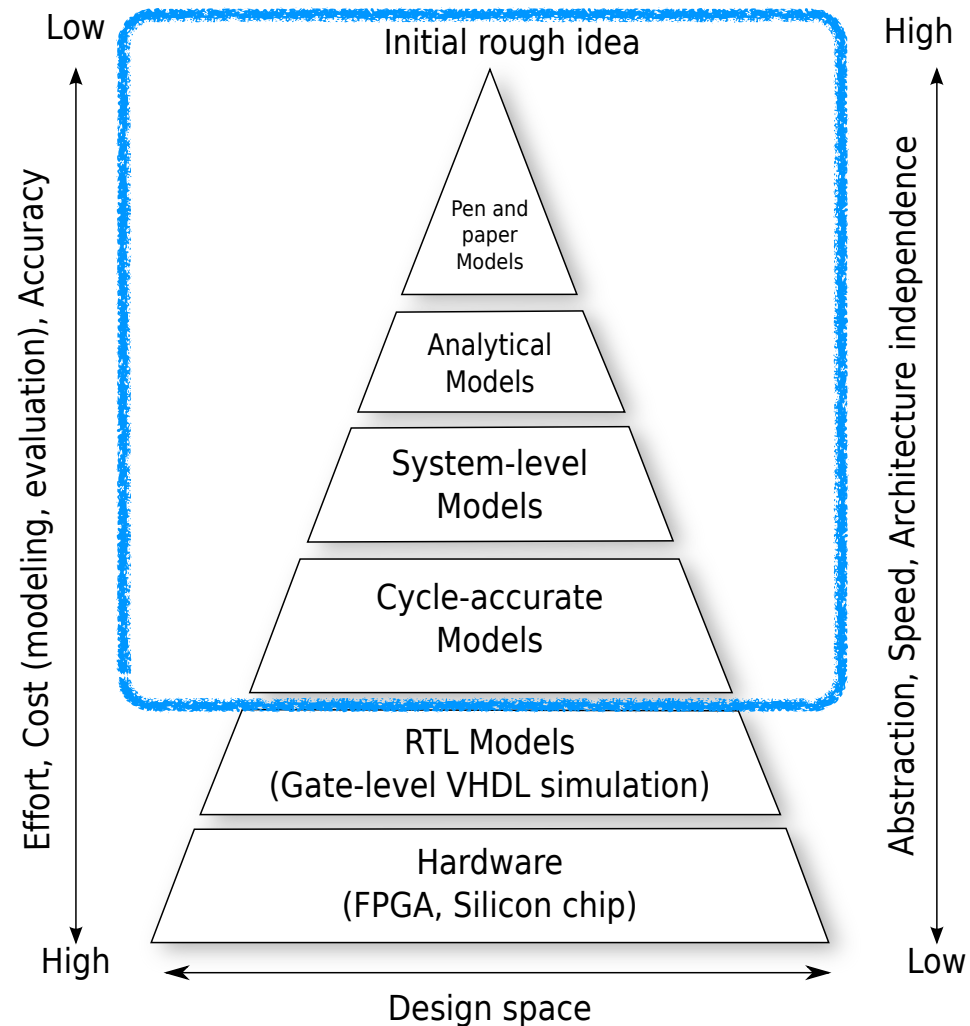
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System design pyramid

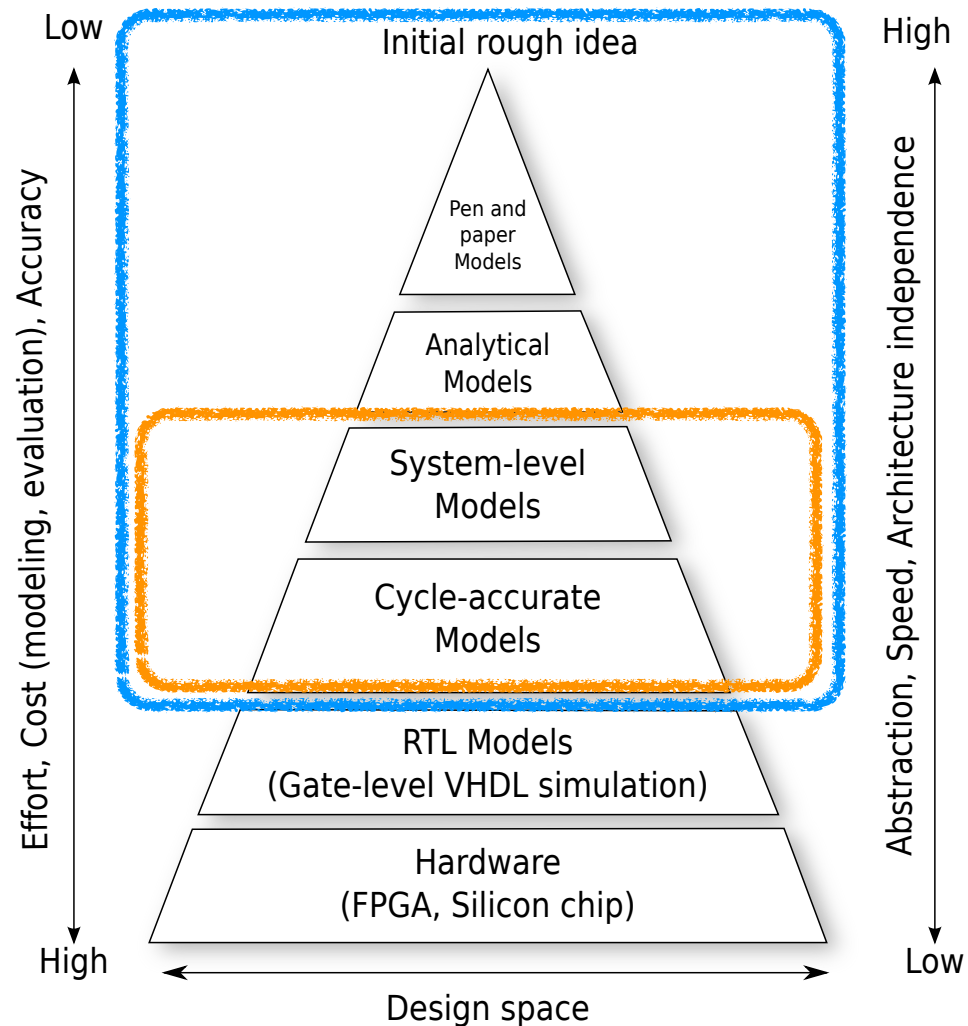


System design pyramid



Computer systems
architecture
(SNE/CSA)
@ UvA

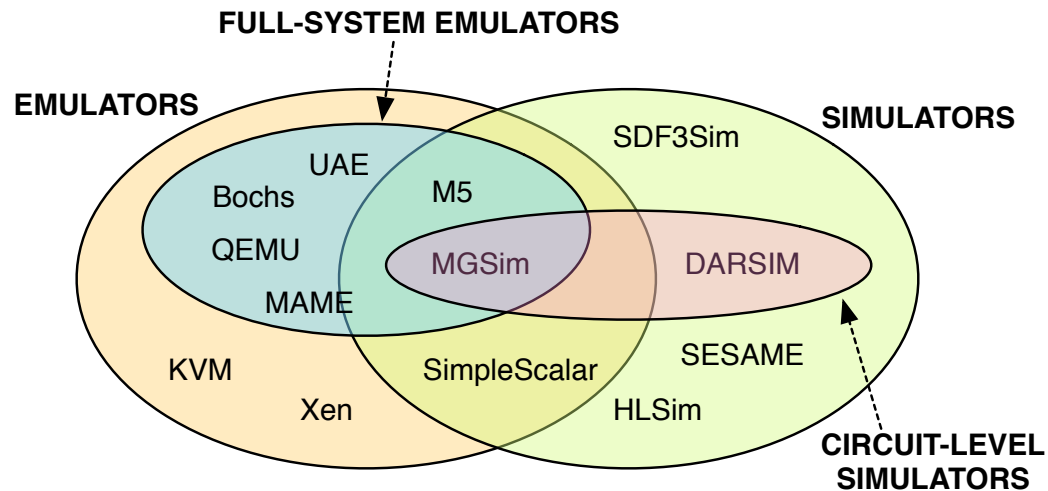
System design pyramid



Computer systems
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MGSim project

Requirement: Full-system emulation + Circuit-level simulation



- **Emulators:** implement a **software execution environment**
= fully programmable platform
- used to **develop, validate, analyze and debug software**
- **Full-system needed when disrupting the ISA and system topology**
- **Simulators:** implement a **behavior model** for components and systems
- used to **validate system designs** and **predict system behavior**
- **Circuit-level needed when disrupting the micro-architecture or memory protocol**

MGSim:

What's in the box?

- Simulation **framework (C++)**
- Library of **example component models**
- Parameterizable **example full system model**
= “MGSim simulated platform”
- **Trace processing utilities (Python)**
- **Documentation** and (some) support
- As an add-on (sister project):
C language tool chain + guest OS
for the MGSim platform

MGSim in education

- CA @ Leiden
 - Inspect machine execution
 - From C code to assembly to pipeline behavior
 - Implement a new ISA
 - Tested with C cross-compiler
 - Analyze/optimize C code for performance
 - Use MGSim for detailed performance metrics
 - Observe cache hits/misses, flushes, stalls etc.

Project proposals

- MGSim's current UI is terminal-based
 - **Project: a GUI for MGsim**
 - Challenge: must not reduce performance
- No interesting virtual input device
 - Not possible to test interactive programs
 - **Project: virtual input devices in MGSim**
 - Challenge:
must keep a record of inputs for deterministic re-play

Requirements

- Experience with C++ programming
- Passing grade in CA
- (Optionally)
experience with GUI/game programming