The Design Warrior’s Guide to FPGAs
Devices, Tools, and Flows. ISBN 0750676043
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Computer-aided Design

- Can’t design FPGAs by hand
  - way too much logic to manage, hard to make changes
- Hardware description languages
  - specify functionality of logic at a high level
- Validation - high-level simulation to catch specification errors
  - verify pin-outs and connections to other system components
  - low-level to verify mapping and check performance
- Logic synthesis
  - process of compiling HDL program into logic gates and flip-flops
- Technology mapping
  - map the logic onto elements available in the implementation technology (LUTs for Xilinx FPGAs)

Applications of FPGAs

- Implementation of random logic
  - easier changes at system-level (one device is modified)
  - can eliminate need for full-custom chips
- Prototyping
  - ensemble of gate arrays used to emulate a circuit to be manufactured
  - get more/better/faster debugging done than possible with simulation
- Reconfigurable hardware
  - one hardware block used to implement more than one function
  - functions must be mutually-exclusive in time
  - can greatly reduce cost while enhancing flexibility
  - RAM-based only option
- Special-purpose computation engines
  - hardware dedicated to solving one problem (or class of problems)
  - accelerators attached to general-purpose computers