



# SoC DESIGN PROCESS

# SPECIFICATION PROBLEMS

- First part of design process
  - Most crucial, challenging, lengthy phase of project
- Why it is so important
  - Specification is your destination
    - If you know it exactly, you can spot the error path and fix it quickly
    - If not, you may not spot major errors until late
- Now the question
  - When shall you document your specification
    - **Early phase** in the design cost less and more valuable
    - Later phase may only delays the project or be skipped



# PURPOSE OF SPECIFICATION

- Specification for Integration
  - Functional/Physical/ Design requirements
  - The block diagram
  - Interfaces to external system
  - Manufacturing test methodology
  - Software model
  - Software requirements
- Specification for block Design
  - Algorithm spec
  - Interface spec
  - Authoring guide
  - Test Spec – lint & coverage
  - Synthesis constraints
  - Verification environment, tools used



# TYPES OF SPECIFICATIONS

- Written in natural language
  - Traditional, ambiguous, incompleteness, erroneous
- Formal specification
  - Desired characteristic (functionality, timing, power, area,...), independent to implementation
  - Not widely used, important research topic
- **Executable specification**
  - Description of functional behavior
  - Parallel with RTL Model in the TestBench



# EXECUTABLE SPECIFICATION

- Procedural language for behavioral modeling
  - Design productivity
    - Easy to model complex algorithm
    - Fast execution
    - Simple testbench
  - Tools
    - Native C/C++ through PLI/FLI
    - Extended C/C++ : SpecC, SystemC
- Verify it on the fly!
  - Test vector generation
  - Compare RTL code with behavioral model
  - Coverage test

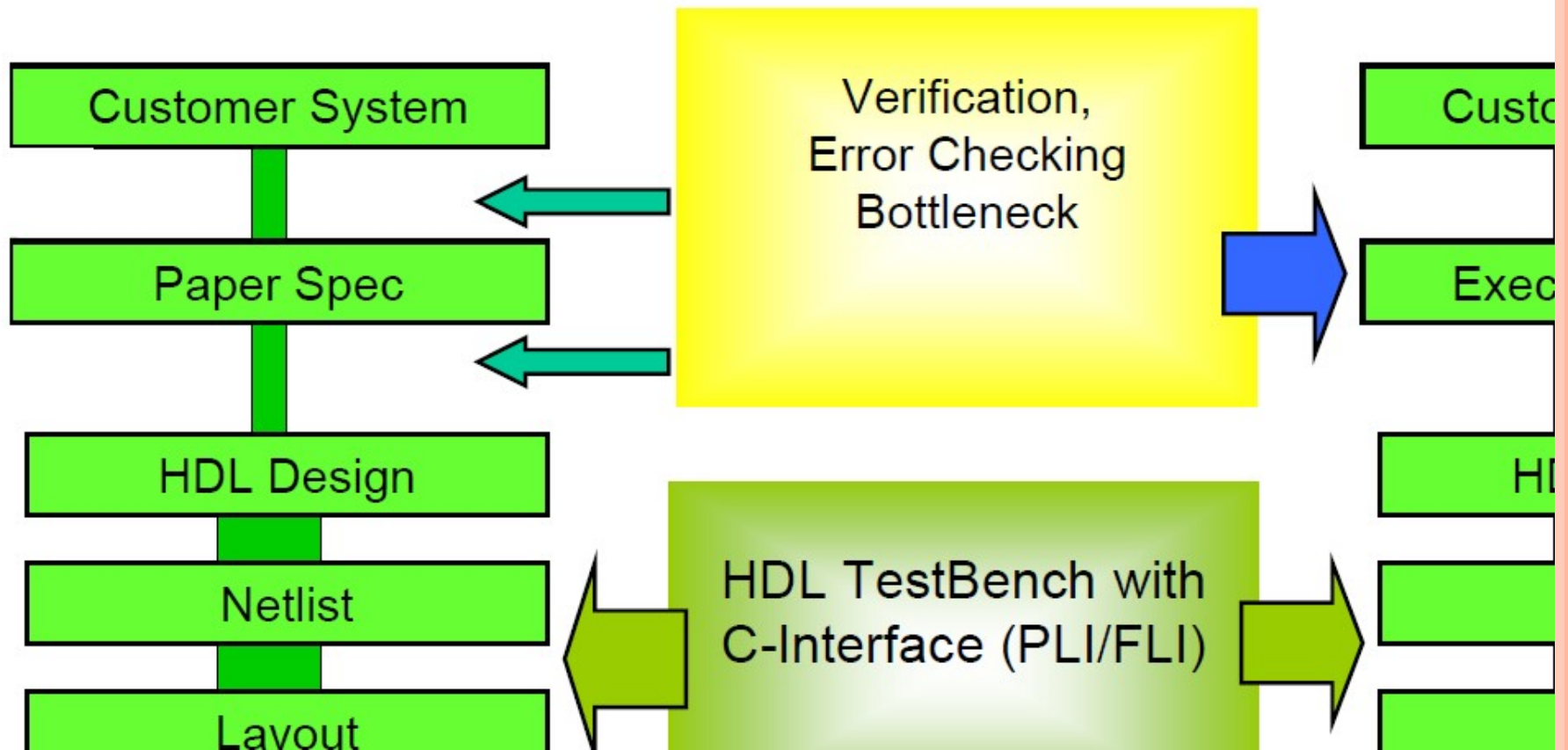


# USING EXECUTABLE SPECIFICATIONS

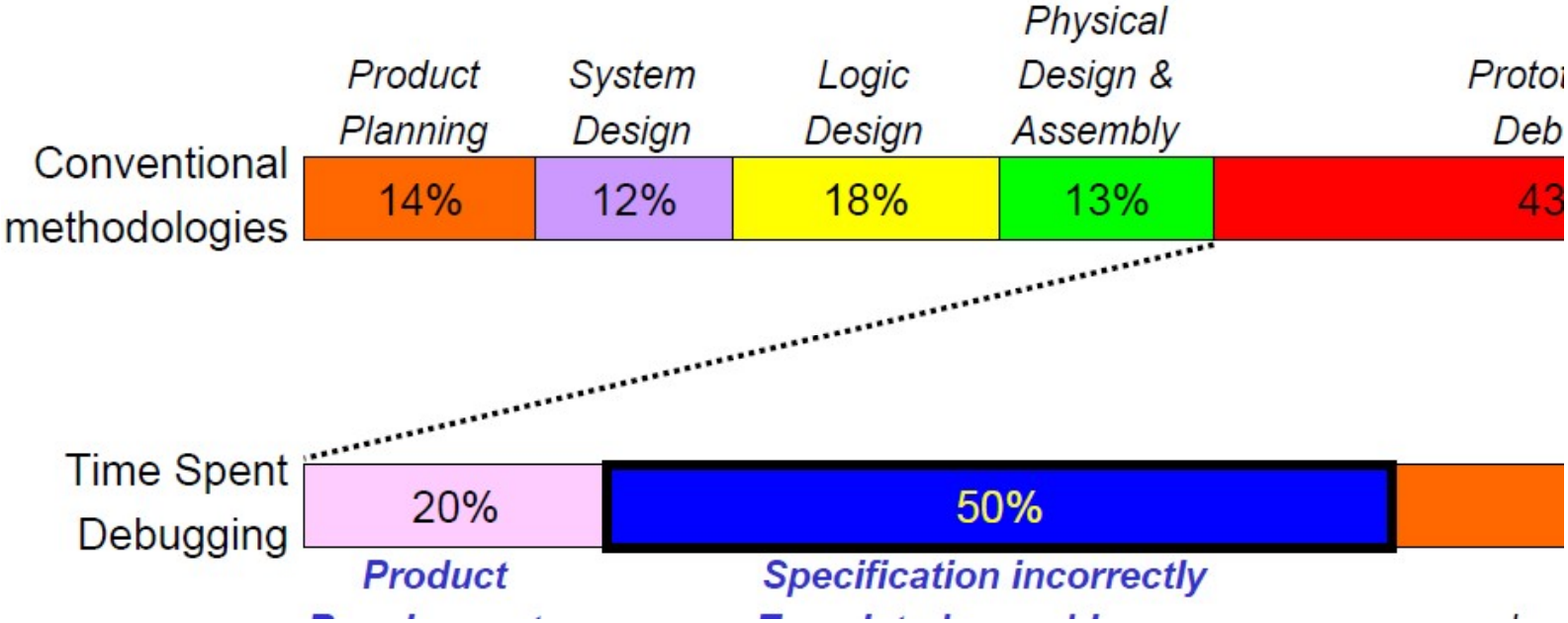
- Ensure **completeness** of specification
  - Even components(e.g. peripherals) are so complex
  - Create a program that behave the same way as the system
- Avoid **unambiguous** interpretation of the specification
  - Avoids unspecified parts and inconsistencies
  - IP customer can evaluate the functionality up-front
- **Validate system functionality** before implementation
  - Early feedback from customer
  - Create early model and validate system performance
- Refine and test the implementation of the specification
  - Test automation improves time-to-market



# EXECUTABLE SPEC MOTIVATION

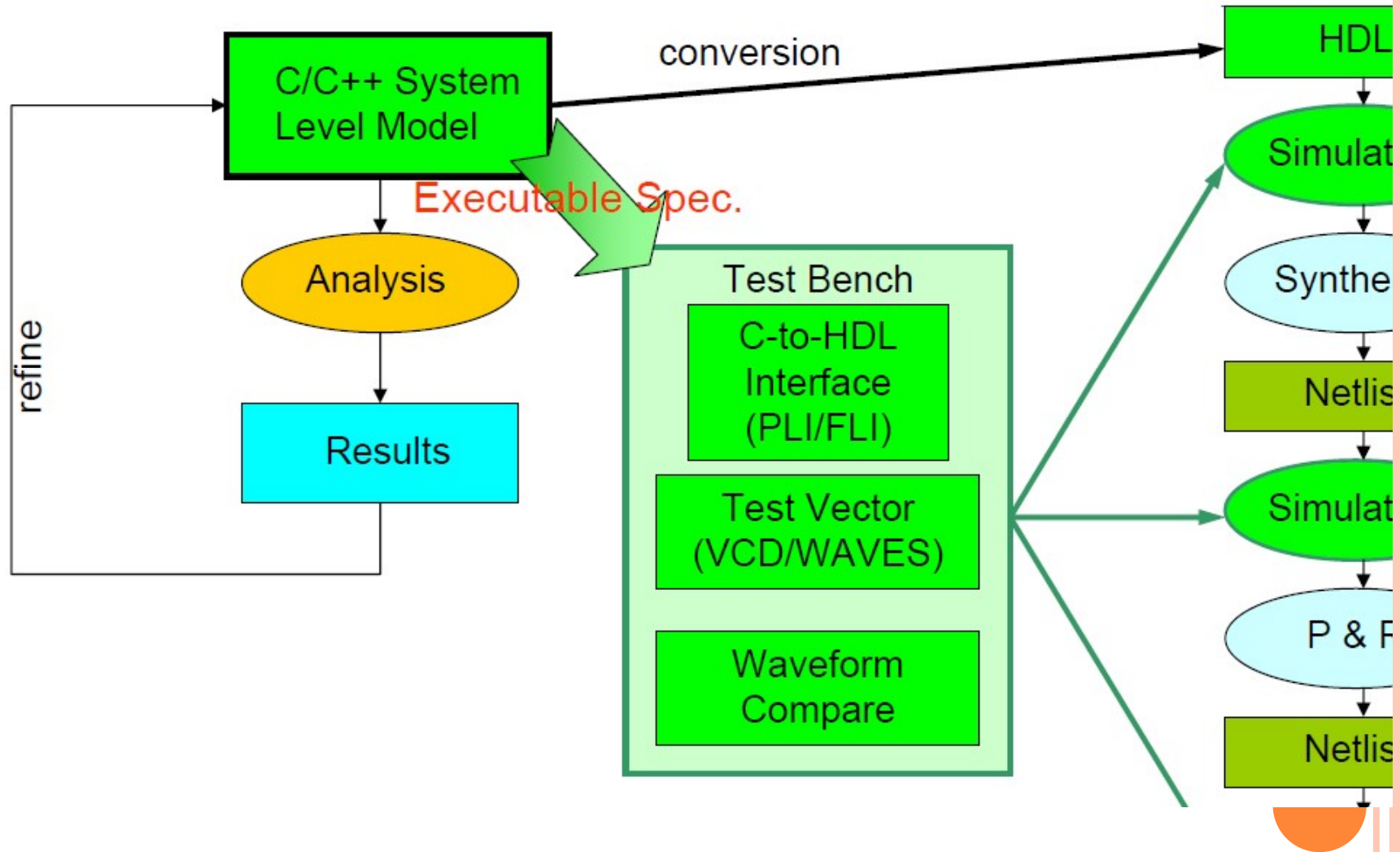


# TIME SPENT IN DESIGN PHASES





# SPECIFICATION BASED DESIGN



# SYSTEM DESIGN PROCESS

