

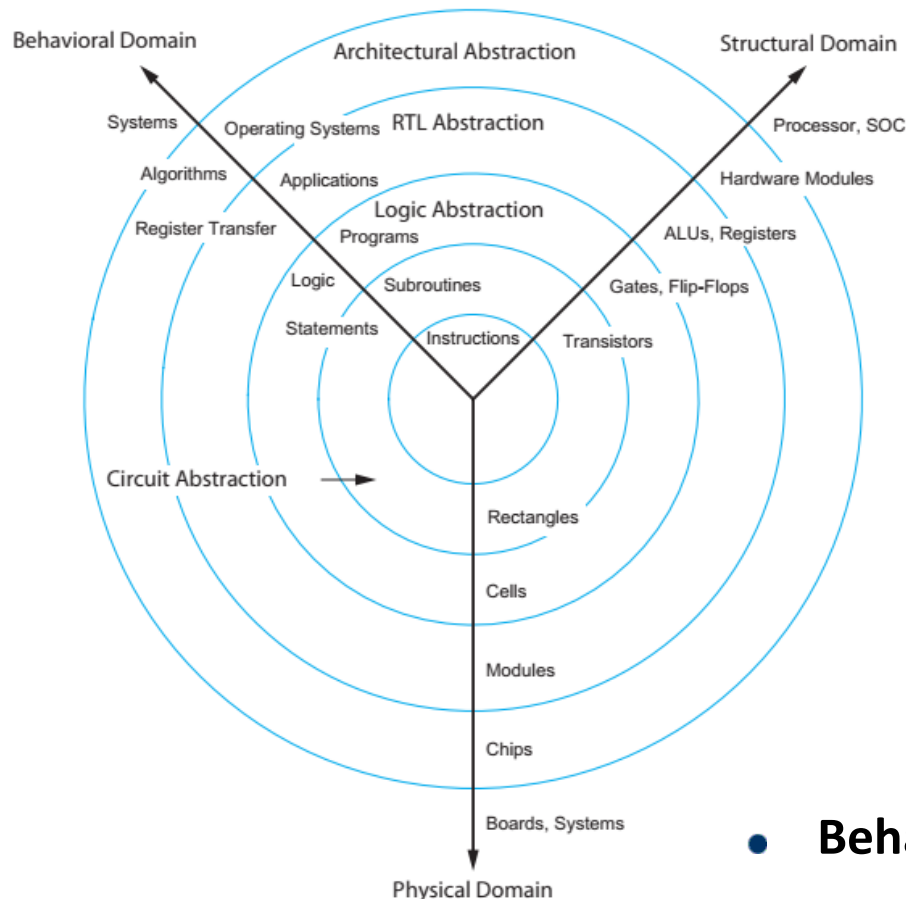
CMOS Design Methodology

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Outline

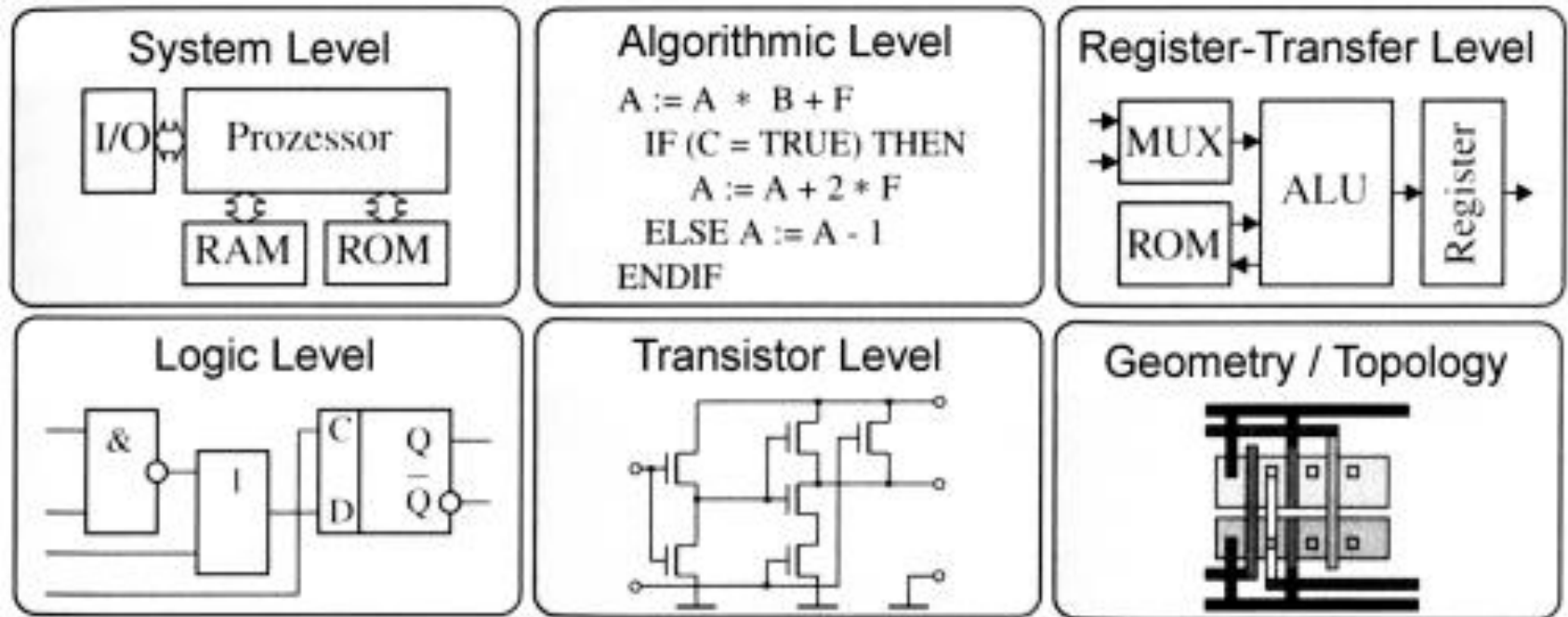
- Design Levels
- Key Parameters in design process
- Design Principles
 - Hierarchy
 - Regularity
 - Modularity
 - Locality

Design Levels



- A visual representation of IC design methodology.
- Depicts the relationship between design domains and levels of abstraction.
- Helps organize and manage complexity in digital and analog circuit design.
- **Behavioral Domain:** Defines functionality.
- **Structural Domain:** Details interconnections.
- **Physical Domain:** Manages physical layouts

Design Levels



Key Parameters for Design Success

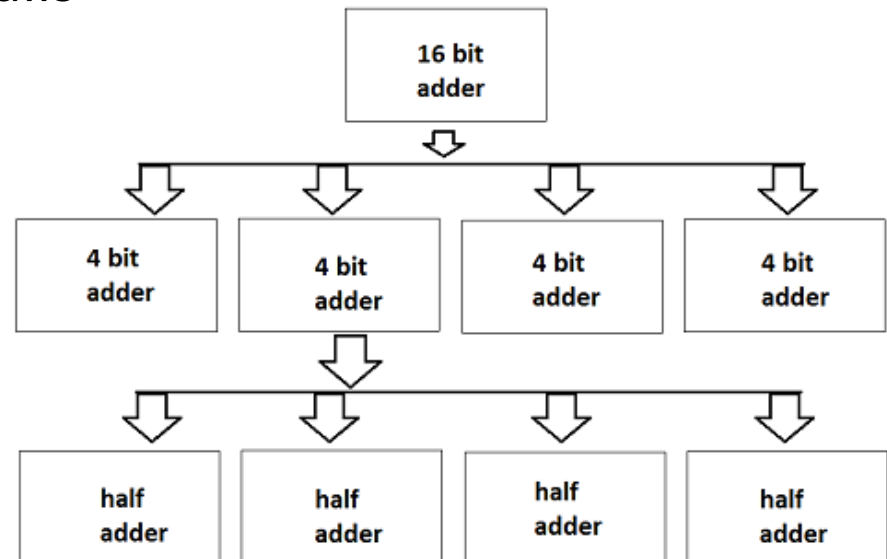
- **Performance:**
 - Speed, power, functionality, and flexibility.
- **Die Size:**
 - Affects manufacturing and costs.
- **Time to Design:**
 - Impacts engineering resources and schedules.
- **Verification and Testability:**
 - Ensures correctness and reduces debugging effort.

Design Principles

- **Hierarchy:** Divide and Conquer
 - Recursively partition system into modules
- **Regularity**
 - Reuse modules wherever possible
 - Ex: Standard cell library
- **Modularity:** well-formed interfaces
 - Allows modules to be treated as black boxes
- **Locality**
 - Physical and temporal

Hierarchy

- **Hierarchy:** Divide and Conquer
- It involves dividing complex design into various modules and submodules
- This division done until the complexity of submodules is at an understandable level of details



Regularity

- Designer divides the hierarchy into sets of similar building blocks
- Regularity is the design of array structures consisting of identical cells. *Example : RAM composed of identical cells*
- *Regularity can be there at many levels*
 - *At Transistor level*
 - *At identical GATE level*
 - *At micro block*
 - *At macro block*

Modularity

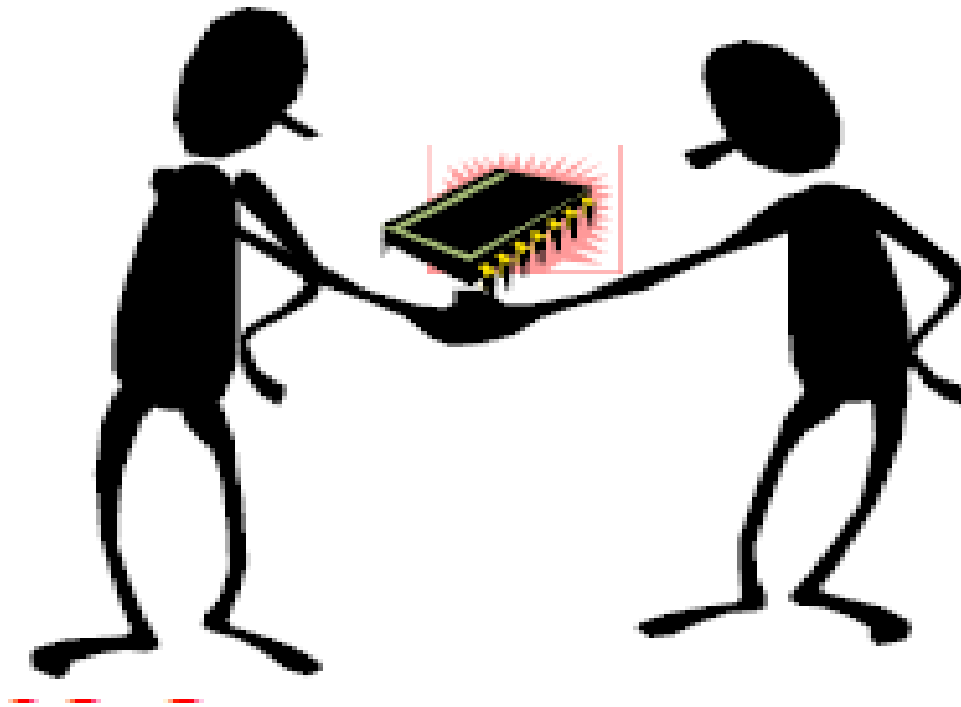
- Modularity means various functional blocks has well defined functions and interfaces, so that they can be implemented and tested separately
- All the blocks can be combined easily at the end of the design process to form large system

Locality

- Locality ensures that the connection between modules or blocks avoids long distance connection
- Locality ensures that internal connection of each module is not important for other modules
- Locality ensures that the internals of modules are not visible to any exterior interfaces
- This enables the outside world to treat each module as a block box with well defined input and outputs

Design Principles

Design Principle	Software	Hardware
Hierarchy	Subroutines, libraries	Modules
Regularity	Iteration, code sharing, object-oriented procedures	Datapath, module reuse, regular arrays, gate arrays, standard cells
Modularity	Well-defined subroutines interfaces	Well defined module interfaces, timing and loading data for modules, registered inputs and outputs
Locality	Local scoping, no global variables	Local connections through floor planning



Thank you !

Happy Learning