# MULTICUBE GLOSSARY

[Ver.6]
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- **API - Application Programming Interface**
  - Set of functions provided by an infrastructure that can be used by the application developers to program the application code.
- **Application**
  - A computer program which is intended to perform a specific task. An application includes an executable file which is invoked to run the desired program.
- **Approximately timed:**
  - A modeling style for which there exists a one-to-one mapping between the externally observable states of the model and the states of some corresponding detailed reference model such that the mapping preserves the sequence of state transitions but not their precise timing. The degree of timing accuracy is undefined.
- **Approximately-timed model**
  - Add a notion of timing on top of functional level model. This timing is usually fed externally into simulations at places where, in reality, time is spent in an operation (e.g. communication, processing or waiting for system resource).
- **ASIC (Application-Specific Integrated Circuit)**
  - The common name for semi-custom integrated circuits. A type of chip which is composed of standard building blocks called cells that are designed to implement a specific customer application. These may include digital, linear, and mixed-level circuits
- **Automatic Design Space Exploration**
  - Automatic version of the design space exploration. It works without the designer in the loop.
- **Benchmark**
  - A design test case which is used to measure the capabilities, limitations, and breakthroughs reported for newly proposed and existing algorithms, architectures and tools.
- **Behavioral modeling**
  - System-level modeling consisting of a functional specification plus modeling of the timing of an implementation. A behavioral model consists of an HDL description of a device or component which is expressed at a relatively high level of abstraction (higher than the register-transfer level or gate level). It uses underlying mathematical equations to represent the functional behavior of the component.
- **Black box optimization**
  - Optimization performed without any knowledge of the target problem except for input and output variables.
- **CAD (Computer-Aided Design)**
  - The electronic design automation of projects that were previously under manual methods considered to be drafting functions;
- **CAE (Computer-Aided Engineering)**
  - The electronic design automation of projects that were previously under manual methods considered to be electronic engineering functions
- **Cycle accurate**
  - A modeling style in which it is possible to predict the state of the model in any given cycle at the external boundary of the model and thus to establish a one-to-one

correspondence between the states of the model and the externally observable states of a corresponding RTL model in each cycle, but which is not required to explicitly re-evaluate the state of the entire model in every cycle or to explicitly represent the state of every boundary pin or internal register. This term is only applicable to models that have a notion of cycles.

- **Design cycle**
  - The period of time required to complete an electronic design of any type, from concept to production.
- **Design entry**
  - The process of creating a new design of any type — chip, board, module, or system — using textual and/or graphical tools such as schematic capture or other high-level graphical methods, hardware description languages, Boolean equations, or other methods.
- **Design flow**
  - A series of connected processes used within the design cycle
- **Design of Experiments, DoE:**
  - Techniques that allow to perform a smart exploration of the design space by extracting as much information as possible from a limited number of evaluations. They are used to identify the planning of experimentation campaign.
- **Design Space:**
  - Set of all possible design configurations.
- **Design Space Exploration, DSE**
  - Design phase used to evaluate different design alternatives by tuning the system parameters.
- **Design Space Exploration Tool**
  - Tool that allows to specify and solve the exploration problem in terms of optimization metrics and constraints. Moreover it provides estimates of the optimal configurations of the use case and automatically interacts with the use case simulator.
- **Design-time Design Space Exploration**
  - DSE phase done at design time to tune statically the system parameters.
- **Dynamic evaluation**
  - Simulation based system evaluation.
- **Electronic system level (ESL)**
  - The utilization of appropriate abstractions in order to increase comprehension about a system, and to enhance the probability of a successful implementation of functionality in a cost-effective manner.
- **Exploration architect:**
  - Designer responsible for interacting with the design space exploration tool, specifying and running optimization strategies for the target Use Case and analyzing the DSE results.
- **Framework**
  - A computing architecture for integrating products from multiple vendors which includes data representation, design data management, methodology management, a user interface, an extension language, and inter-tool communication
- **Functional Level Model**
  - It is a high-level model of digital systems where only the functionality of the different components and their interactions with each other is modeled. This model does not usually contain any timing information associated with communication or processing and hence this model simulates the fastest.

- **HAL - Hardware Abstraction Layer:**
  - Part of the operating system that allows creating the rest of the OS independently from the underlying platform. It is modified when the os is going to be executed in a different platform.
- **HdS - Hardware-dependent Software**
  - Part of the software highly dependent on the Hw platform and that must be rewritten when the code is moved to another platform.
- **IP-Core**
  - A reusable block of semiconductor intellectual property
- **IP-XACT**
  - XML format that can be used to define and describe electronic components and their interconnections. It is a IEEE standard developed to enable automated configuration and integration through tools.
- **ISS - Instruction Set Simulator**
  - Simulator of a processor that reads binary code for that processor and executes the code instruction by instruction.
- **Levels of abstractions**
  - When a digital system is modeled, it can be modeled at various different level of abstraction. More close the model is to the real system, more accurate it becomes, but at the same time it simulates much slower. So various abstraction levels are defined in system models in order to make a trade-off between accuracy and simulation time.
- **MPEG-4 (also called as MP-4)**
  - MPEG-4 (Moving Picture Experts Group-4) is a standard for compressing video into a compact file without losing a significant amount of its quality. Used for the transmission and storage of images and video clips.
- **Multi-objective Optimization, MOO**
  - Multi-objective optimization (or programming), also known as multi-criteria or multi-attribute optimization is the process of simultaneously optimizing two or more conflicting objectives subject to certain constraints.
- **Multiprocessor System on-Chip Architecture, MPSoC**
  - Single chip architecture composed of two or more processors usually targeted for embedded applications. It is used by platforms that contain multiple, usually heterogeneous, processing elements with specific functionalities reflecting the need of the expected application domain, a memory hierarchy (often using scratchpad RAM and DMA) and I/O components.
- **Parameter**
  - A means by which an application or user can customize the behavior or characteristics of a model instance when it is created. A parameter is set to a constant value during design entry
- **PLC, PowerLine Communication**
  - Powerline communications (PLC) are systems for carrying data on a conductor also used for electric power transmission. All power line communications systems operate by impressing a modulated carrier signal on the wiring system. Different types of powerline communications use different frequency bands, depending on the signal transmission characteristics of the power wiring used.

- **POSIX - Portable Operating System Interface [for uniX]**
  - Standards specified by the IEEE to define the application programming interface (API), along with shell and utilities interfaces for software compatible with variants of the Unix operating system, although the standard can apply to any operating system.
- **RTOS - Real-Time Operating System**
  - Operating system with Real-Time qualities, as small, bounded latencies, real-time services.
- **Register Transfer Level Model or RTL model**
  - RTL model describes the electronic system in a high-level hardware description language that describes the registers of a system (and transfer of data between registers) at a low level of abstraction. VHDL and Verilog are examples of RTL languages.
- **Response surface modeling**
  - It is a technique used to create mathematical models for the relationship between one or more responses and a set of input variables.
- **Run-Time Design Space Exploration**
  - DSE phase done when the system is working. It is used to select the system parameters which are run-time tunable (i.e. working frequency and application mapping). A set of optimal configurations for the system is obtained at design time, while at run-time the best configuration is selected considering working conditions.
- **Run-Time Manager**:
  - It is a module (HW or SW) which has in charge the management of the system at run-time
- **Simulator**
  - It is the executable model of the use case and it provides the value of the estimated metrics, for a specific configuration of the architecture
- **Simulation model**
  - Simulation Model is a software-based model designed to replicate the timing and behavior of an IC design for the purposes of verification and debugging.
- **System metrics**
  - Metrics describing the behavior of the whole system. They are obtained considering the system as a black box (also called output variables) and used to drive the design space exploration phase.
- **SystemC:**
  - Set of C++ classes and macros which provide an event-driven simulation kernel in C++, which in certain aspects mimics the hardware description languages VHDL and Verilog, but more oriented to be used as a system-level modeling language.
- **Static evaluation**
  - System evaluation based on analytical models
- **Transaction level (TL)**
  - The abstraction level at which communication between concurrent processes is abstracted away from pin wiggling to transactions. This term does not imply any particular level of granularity with respect to the abstraction of time, structure, or behavior.
- **Transaction level model, transaction level modeling (TLM)**
  - A model at the transaction level and the act of creating such a model, respectively. Transaction level models typically communicate using function calls, as opposed to the style of setting events on individual pins or nets as used by RTL models. Moreover, It is a high-level abstraction model of digital systems where details of communication among different components are separated from the details of the implementation of functional units or of the communication architecture. This is used to explore

different design architectures without the overhead of designing or simulating the details of how particular transforms may be implemented.

- **Use case**
  - Combination of the target architecture and application running on it.
- **Use case and simulator provider**
  - It is the user agent that has in charge to release the use case (architecture and application), the use case simulator program and the definition of the use case design space.
- **Virtual platform**
  - Virtual platforms are software models of complete systems that provide software engineers with high-speed, pre-silicon development environments months before hardware is available. Virtual platforms enable concurrent development of hardware and software, significantly shortening embedded system suppliers' hardware/software integration time and accelerating their products to market. Because they are based on software models, virtual platforms offer unmatched effectiveness for developing and debugging multi-core designs.
- **XML - eXtensible Markup Language**
  - Set of rules for encoding documents in machine-readable form. It is a textual data format oriented to emphasize simplicity, generality, and usability in the representation of arbitrary data structures.