SysML 1.0 Fundamentals

abelski

Introduction to SysML

Background

"Technology evolves from the primitive over the complicated to the simple." (Antonie de Saint Exupery)

"Things had been much simpler in the past. You had been able to put something up and get it running with just a handful of people. Today the number of people you need quickly runs up to a hundred to develop a decent system. And even then they don ' t normally get things right … With all those experts from all kinds of disciplines…" (Tim Weilkiens)

Background

❖ Today systems are highly complex comparing with those systems we knew in the past.

❖ During the last years more and more businesses go through an over all computation process while adopting various ERP systems and other sophisticated software based systems that computerize their entire business processes.

❖ Conventional development methods are no longer suitable for today developed systems.

Background

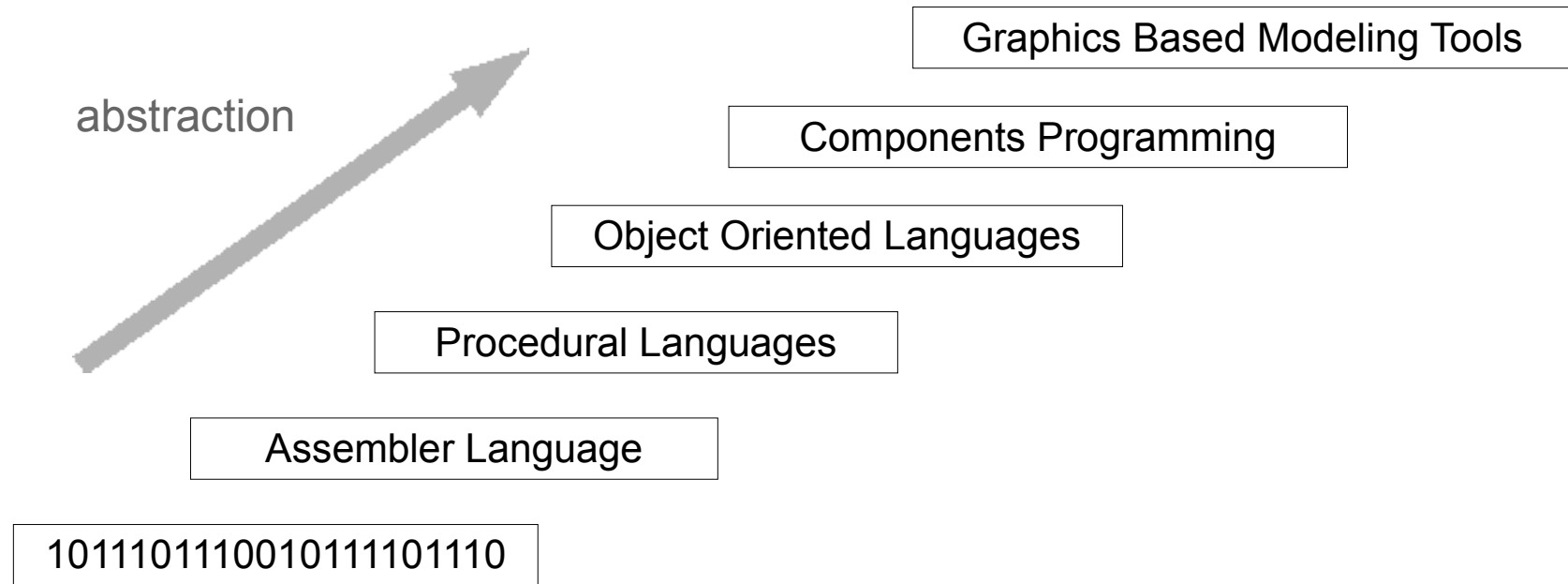❖ The boundaries between the different disciplines continue to blur.

Software is used in more and more fields and various expertises is required for each one of those fields.

❖ Proven methodologies usually continue to "work" for each component separately. However, the complexity involved with putting all components to work together is extremely difficult to overcome.

The complete system is more than just the sum of its components.

Background

❖ Overview the software technology evolution during the last decades we can identify a growing abstraction.

abstraction

Graphics Based Modeling Tools

Components Programming

Object Oriented Languages

Procedural Languages

Assembler Language

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Holistic Approach

❖ Given the growing range of difficulties involve with systems

developing, the need for an holistic line of thinking

constantly evolves.

Given this growing complexity there is an emerging need for new approach

methodologies and new sets of graphics based modeling notations.

System Engineering

❖ "A system is an artifact created by humans that consists of components or blocks that pursue a common goal that cannot be achieved by each of the single elements. A block can consist of software, hardware, persons, or any other units" (INCOSE)

System Engineering

❖ "Systems engineering concentrates on the definition and documentation of system requirements in the early development phase, the preparation of a system design, and the verification of the system as to compliance with the requirements, taking the overall problem into account: operation, time, test, creation, cost and planning, training and support, and disposal" (INCOSE)

System Engineering

❖ "Systems engineering integrates all disciplines and describes a structured development process, from the concept to the production to the operation phase and finally to putting the system out of operation. It looks at both technical and economic aspects to develop a system that meets the users' needs. As such, systems engineering stands above specific disciplines, such as software development, for example." (Tim Weilkiens)

Holistic Approach

❖ Systems engineering stands above all other disciplines.

Serving as a meta discipline dealing with the entire approach starting from

getting the idea, creating the system, developing, implementing and using it.

Holistic Approach

❖ Many of the system engineering concepts, tools and methodologies are relevant when dealing with the specific disciplines as well.

❖ The specific disciplines system engineering covers include, among others, the following specific ones:

Projects Management

Requirement Analysis, Definition & Management

System Design, Verification, Integration & Validation

Risk Management

The SIMILAR Process Model

❖ The SIMILAR process model includes the following phases:

Stating The Problem

Investigating Alternatives

Modeling The System

Integration Phase

Launching The System

Performance Assess

System Re-evaluation

What is SysML?

"The OMG systems Modeling Language (OMG SysML™) is a general-purpose graphical modeling language for specifying, analyzing, designing, and verifying complex systems that may include hardware, software, information, personnel, procedures, and facilities. In particular, the language provides graphical representations with a semantic foundation for modeling system requirements, behavior, structure, and parametrics, which is used to integrate with other engineering analysis models."   (OMG)
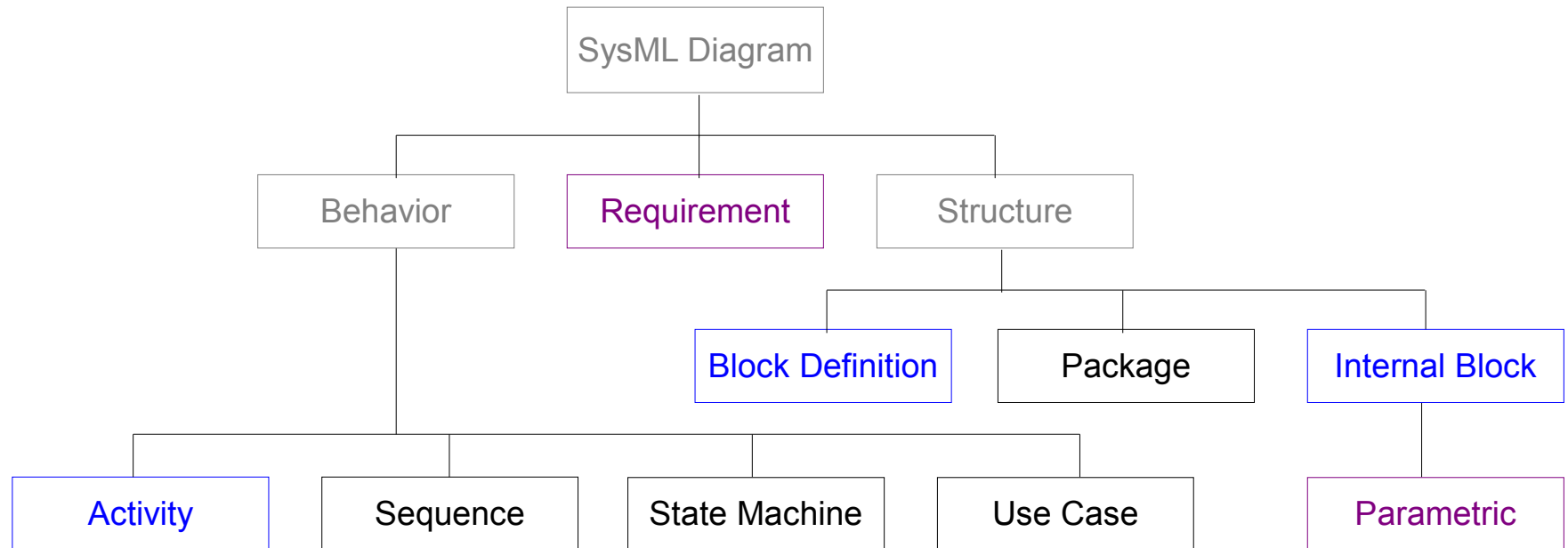
SysML & UML

❖ SysML is a subset of UML with special extensions required to fulfill its goal.

UML   SysML
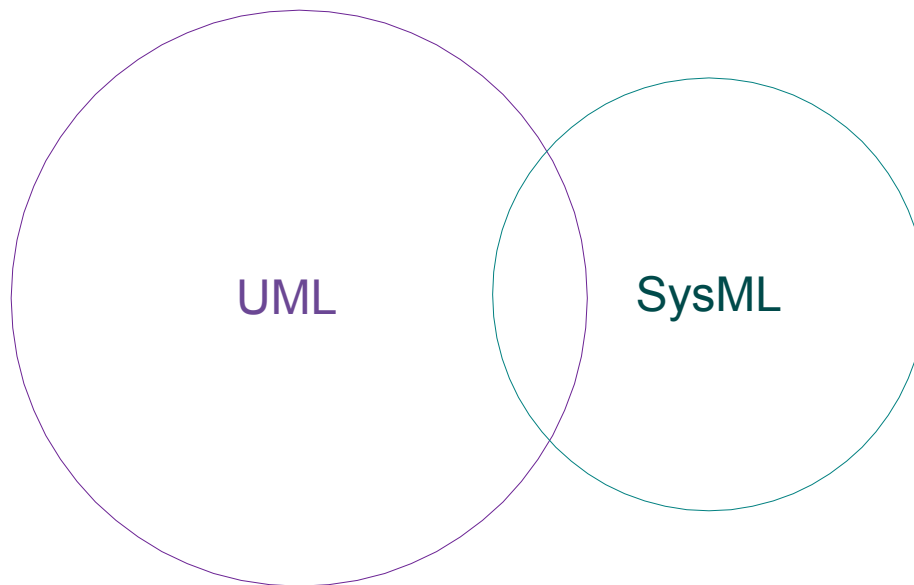
SysML Diagram Types

❖ SysML diagrams can be described via the following

hierarchy diagram:

Same as in UML   New Diagrams   UML Modified Diagram