UML 2.0 Redux for HPEC

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High Performance Embedded Computing (HPEC) Conference
September 25, 2003

The Ultimate Performance Machine
UML Overview

† Visual modeling language
  † Providing controllable levels of abstraction
  † Definition of static and dynamic model features
  † Communicating/predicting application design characteristics in domain-terms
  † Supporting automation of development process
  † Derived from OMT, Use Case and Booch (Component) methodologies

† Dominant modeling language for software architecture “blueprints”

MOF Profiles OCL

State Machines Structured Classes and Components Activities Interactions Detailed Actions Flows

Basic UML (Classes, Basic behavior, Internal structure, Use cases...)

UML Infrastructure

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Credit Bran Selic, “An Overview of Model-Driven Development and UML 2.0”
Richer Language Features

† Architectural modeling: composition and stronger encapsulation via structured classes
  † Components model internal structure, required interfaces and support deployment
  † Ports connect class interfaces to environment
  † Protocol definable on connection
  † Data or control flow

† Deeper profile extension mechanism (than stereotypes, tags and constraints) with UML meta-model extensions
  † Platform-specific terminology, UML symbols and semantics
  † Full integration with MOF providing tool integration
Extended sequence diagrams permit more detailed complex interactions

- Supports sub-diagrams
- Decomposition of SDL, MSC and LSC messages
- Control structures: loop, parallel execution, alternative execution, protected regions, ...

Activities permit more flexible parallelism, I/O options and data/control flow modeling

- Petri Net model to derive concurrency
- Unstructured activities possible
- Pre/post conditions
- HPEC features described in **HPEC 2001**
  e.g. interruptible regions and execution ordering
Precise modeling of timing via timing sub-diagrams

Previous profile for modeling schedulability, performance and time embedded in UML 2.0

Enables next level of integrating hardware modeling to platform design

Statecharts now have sub-statecharts and inheritance
† Action semantics integrate activities with related low-level actions
† There are many methods of UML-based code generation
  † State translation (I-Logix, Rose RT)
  † **Formal translation** (NU research, Telelogix)
  † Direct template translation (Pathfinder)
  † MDA-based model execution (Pathfinder, Component-X, 88solutions)
  † Generate/discover components (**PCA**)
  † Low-level data/state flow import (MathWorks)
  † Informal indirect translation to non-mainstream tools and PGO (**HPEC 2000**)  
  † Model Integrated Computing (MIC, **MOBIES**)