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UML 2.0 Redux for HPEC

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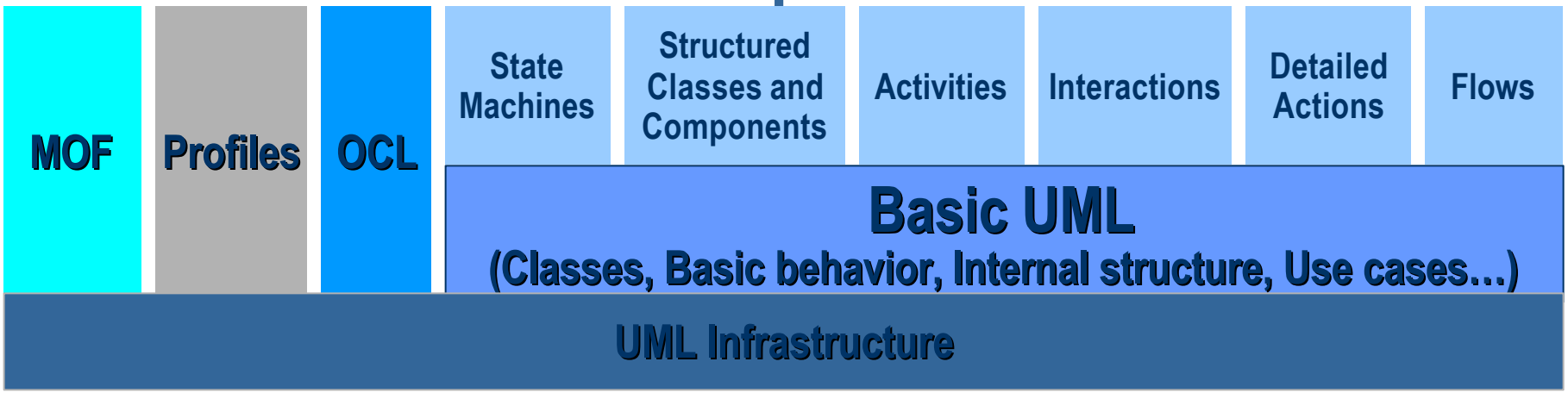
UML Overview

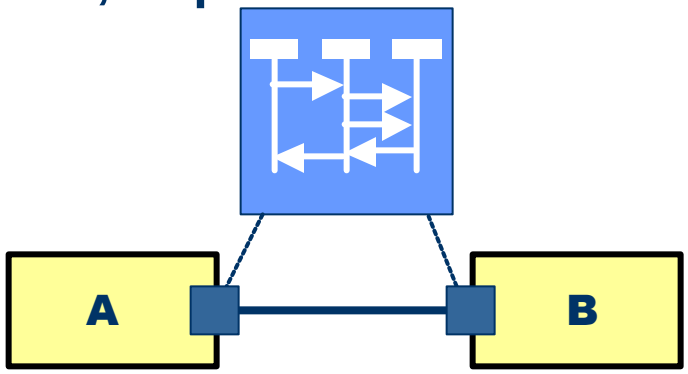
- Visual modeling language
  - Providing controllable levels of abstraction
  - Definition of static and dynamic model features
  - Communicating/predicting application design characteristics in domain-terms
  - Supporting automation of development process
  - Derived from OMT, Use Case and Booch (Component)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



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

Richer Language Features

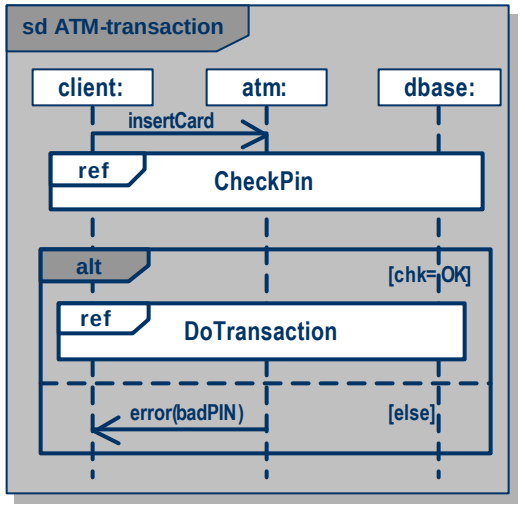
- Architectural modeling: composition and stronger encapsulation via structured classes
  - Components model internal structure, required interfaces and support deployment
  - Ports connect class interfaces to environment
  - Protocol definable on connection
  - Data or control flow



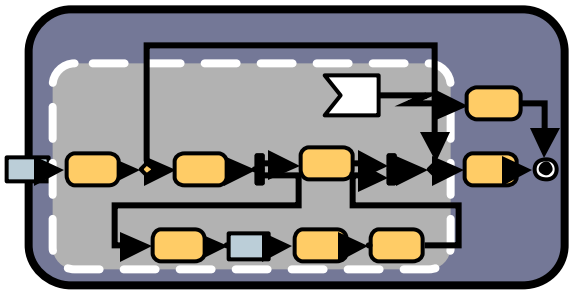
- Deeper profile extension mechanism (than stereotypes, tags and constraints) with UML meta-model extensions
  - Platform-specific terminology, UML symbols and semantics
  - Full integration with MOF providing tool integration

Enhanced Behavioral Modeling Capture Problems at Model Level

- 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, ...

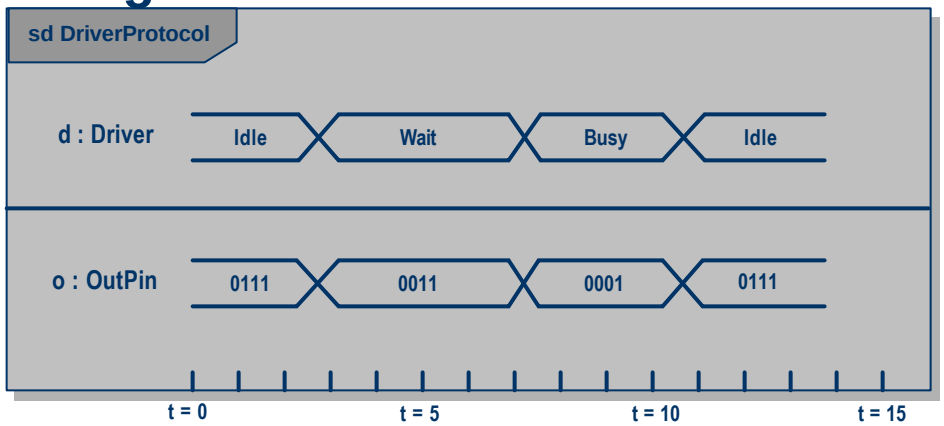


- Activities permit more flexible parallelism, I/O options and data/control flow modeling
  - Petri Net model to derive concurrency
  - Unstructured activities possible
  - Pre/post conditions
  - HPEC features described in HPEC 2001 e.g. interruptible regions and execution ordering



Timing and State Modeling

- 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

UML 2.0 Provides HPEC "Potential" for Software Design Automation

- 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)