

# Modeling@SAP

Why class models are rarely used

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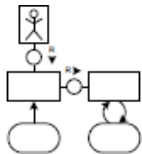
## Abstract

In 1999, SAP started to combine the Unified Modeling Language (UML) and the Fundamental Modeling Concepts (FMC) language. The result is an SAP internal standard for modeling, called Technical Architecture Modeling (TAM). TAM comprises block diagrams, component diagrams, package diagrams, class diagrams, activity diagrams, sequence diagrams, state diagrams, and use case diagrams. TAM is used for both conceptual modeling as well as design modeling

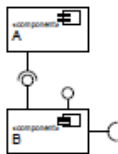
While many works on reasoning on conceptual schemas focus on class diagrams and state diagrams, the most often used diagram type at SAP is the block diagram. For example, class models are used rarely, as they are “too close to real code.” In general, developers and architects prefer structural diagrams (e.g., block diagrams), thus we need to ask ourselves the questions, if we can reason over such models and what kind of properties help to improve the software development.

# Conceptual Modeling at SAP

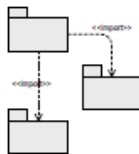
## Technical Architectural Modeling (TAM)



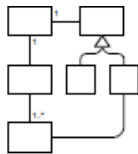
Block Diagram



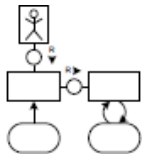
Component Diagram



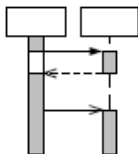
Package Diagram



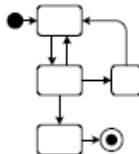
Class Diagram



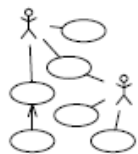
Activity Diagram



Sequence Diagram



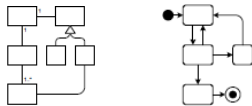
State Diagram



Use Case Diagram

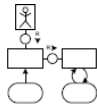
## Academia

- Many works reasoning over
  - Class models (e.g., with OCL constraints)
  - ER models
  - State charts



## At SAP

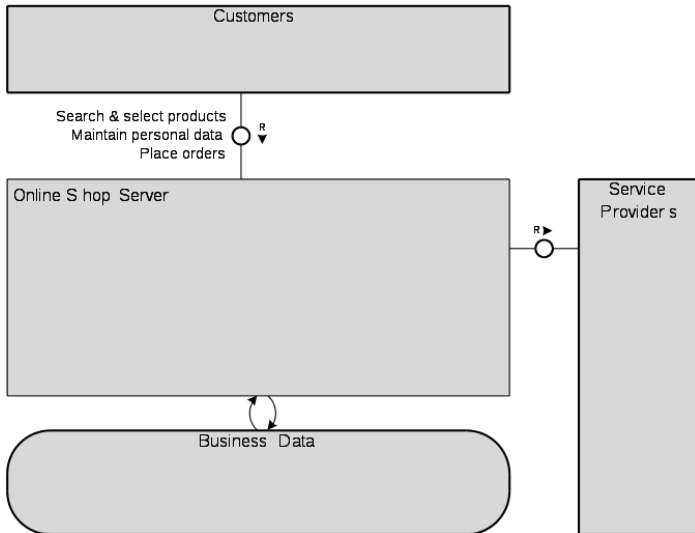
- Most common diagram type:
  - Block diagram
- Also used
  - State diagram
  - Activity diagram (BPMN)
  - ...



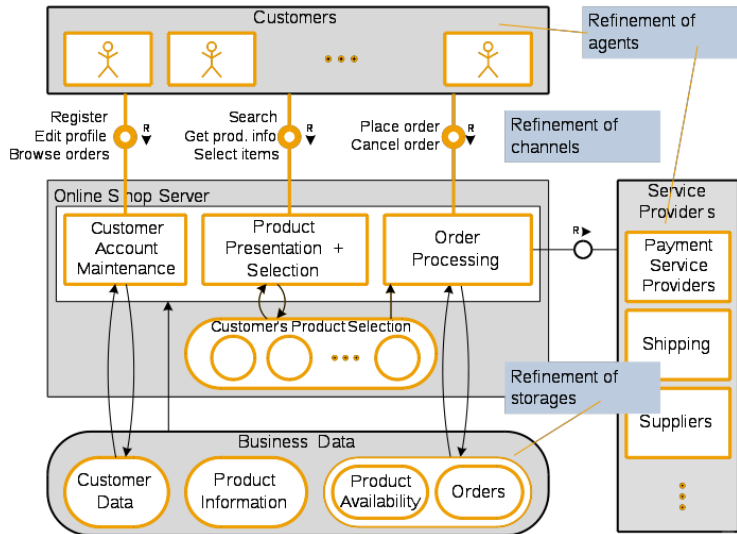
## Quotes from architects and developers:

- Class models (and ER models) are not conceptual, they are code
- Behavioral modeling is only done for complex behavior (incomplete)

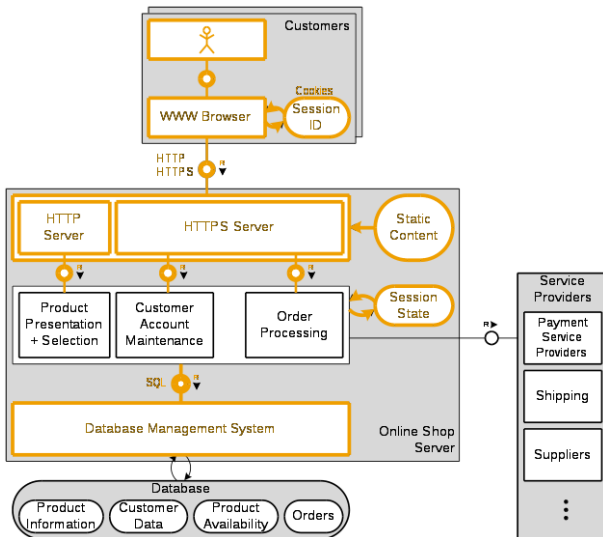
## Block Diagrams: Abstract View



# Block Diagrams: Concrete View I



# Block Diagrams: Concrete View II



# Software Development Life Cycle

## When are Models Used?





## Idea-to-Market

### Management processes

Manage **G3** solution strategy

Manage solution portfolio

Manage releases

Improve processes (CIP)

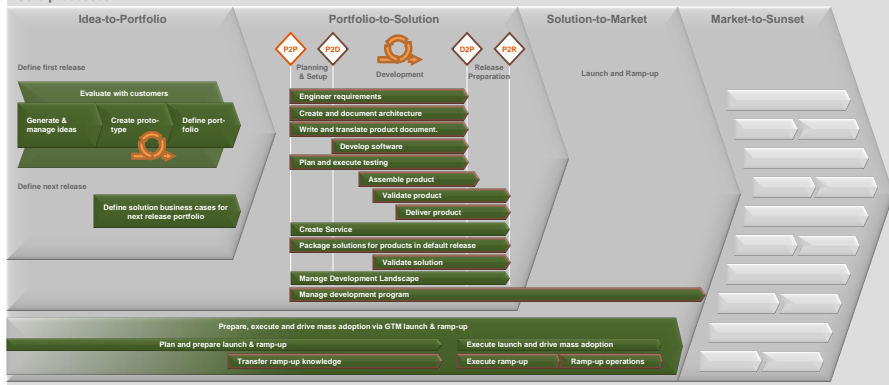
Manage Product Standard compliance



Current QMS scope,  
corresponding to former PIL

G4

## Core processes



## Support processes

Provide patches for security vulnerabilities detected by external security researchers

### Many open questions:

- How to make class models “more abstract” to use them early in development
- How to integrate reasoning at later steps (e.g., datatype definitions in a PL)
- How to link the different models (diagrams) for reasoning (behavioral models)  
Ultimately: How to reason over different model types
- What kind of reasoning can be done on block diagrams
- ...

### What we are currently starting

- Motivate the use of “refined” block diagrams (including technical details)
- Development of “light-weight” reasoning techniques supporting threat-models
  - Exclude certain threats/countermeasures
  - Propagate threats/countermeasures
  - Infer requirements for models/implementation in later development steps

**Goal:** Reduce effort necessary for passing production quality checks/validation

**Thank you!**



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