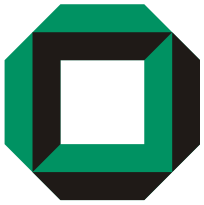

Universität Karlsruhe (TH)
Forschungsuniversität gegründet 1825

Praktikum Ingenieurmäßige Software-Entwicklung

Palladio Component Model – Part IV (PCM)

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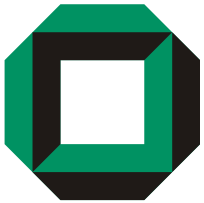
Fakultät für Informatik, Universität Karlsruhe (TH)



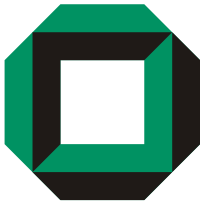
Outline

1. Introduction
   a. Roles, Process Model, Example
   b. Solver (Simulation, Analytical Model)
2. Component Developer
   a. Repository
   b. Component, Interface, Data Types
   c. SEFF
3. Stochastic Expressions
   a. Constants, PMF, PDF, Parameter Characterisation
   b. Parametric Dependencies

Lecture 1

Lecture 2

Lecture 3

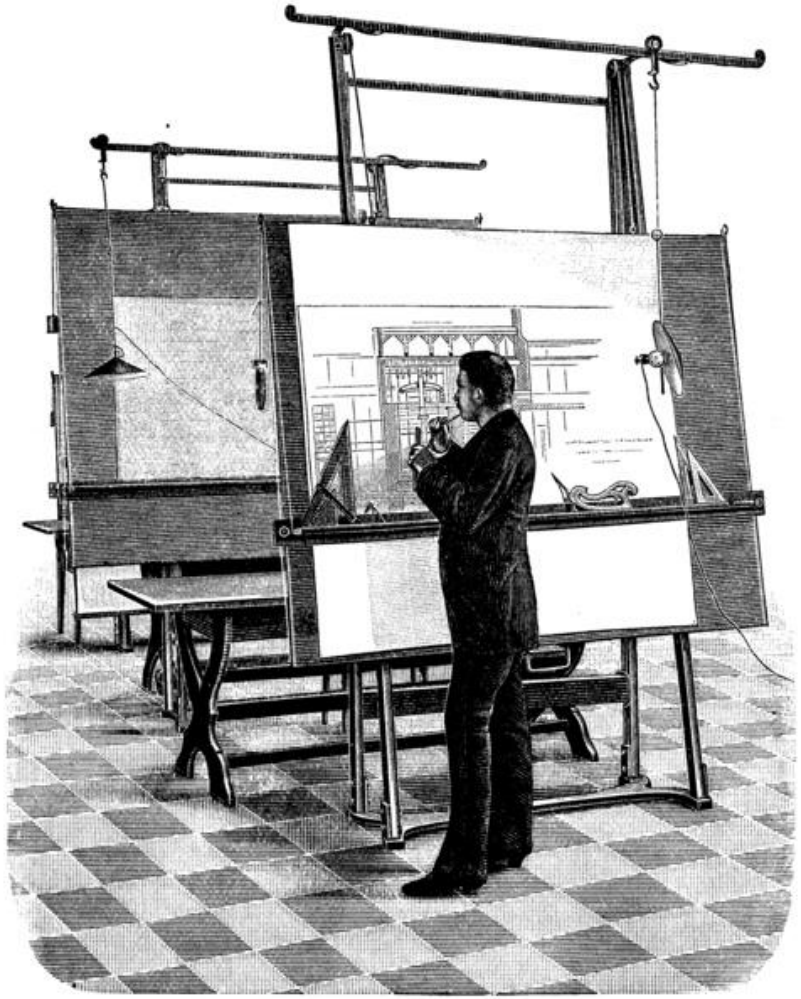


Outline

Lecture 4

Lecture 5

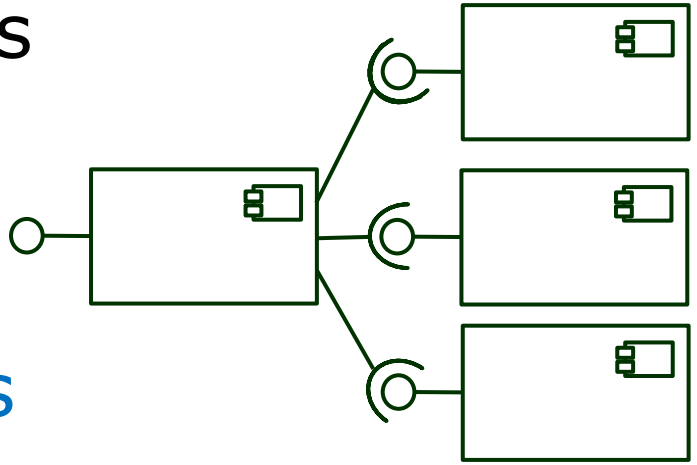
Software Architect



[http://commons.wikimedia.org/wiki/Image:Architect.png]

Software Architect: Tasks (1/2)

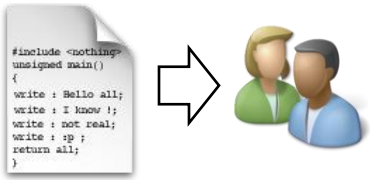
- Specifies an architecture (boxes and lines) from existing components and interfaces
- Specifies new components and interfaces
- Uses architectural styles and architectural patterns
- Analyses architectural specification and makes design decisions



Software Architect: Tasks (2/2)

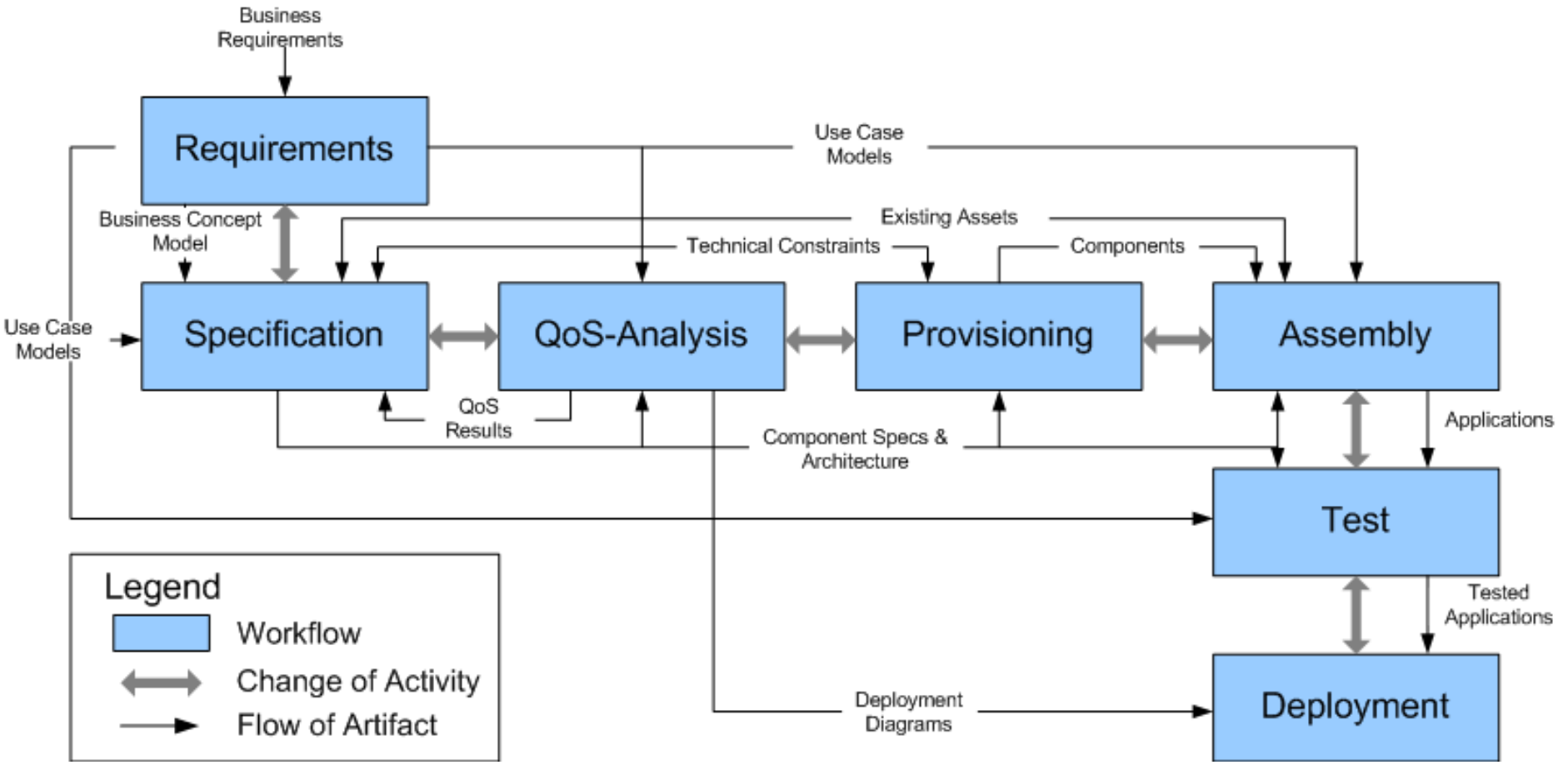
- Conducts performance prediction based on architectural specification

- Delegates implementation tasks to component developers



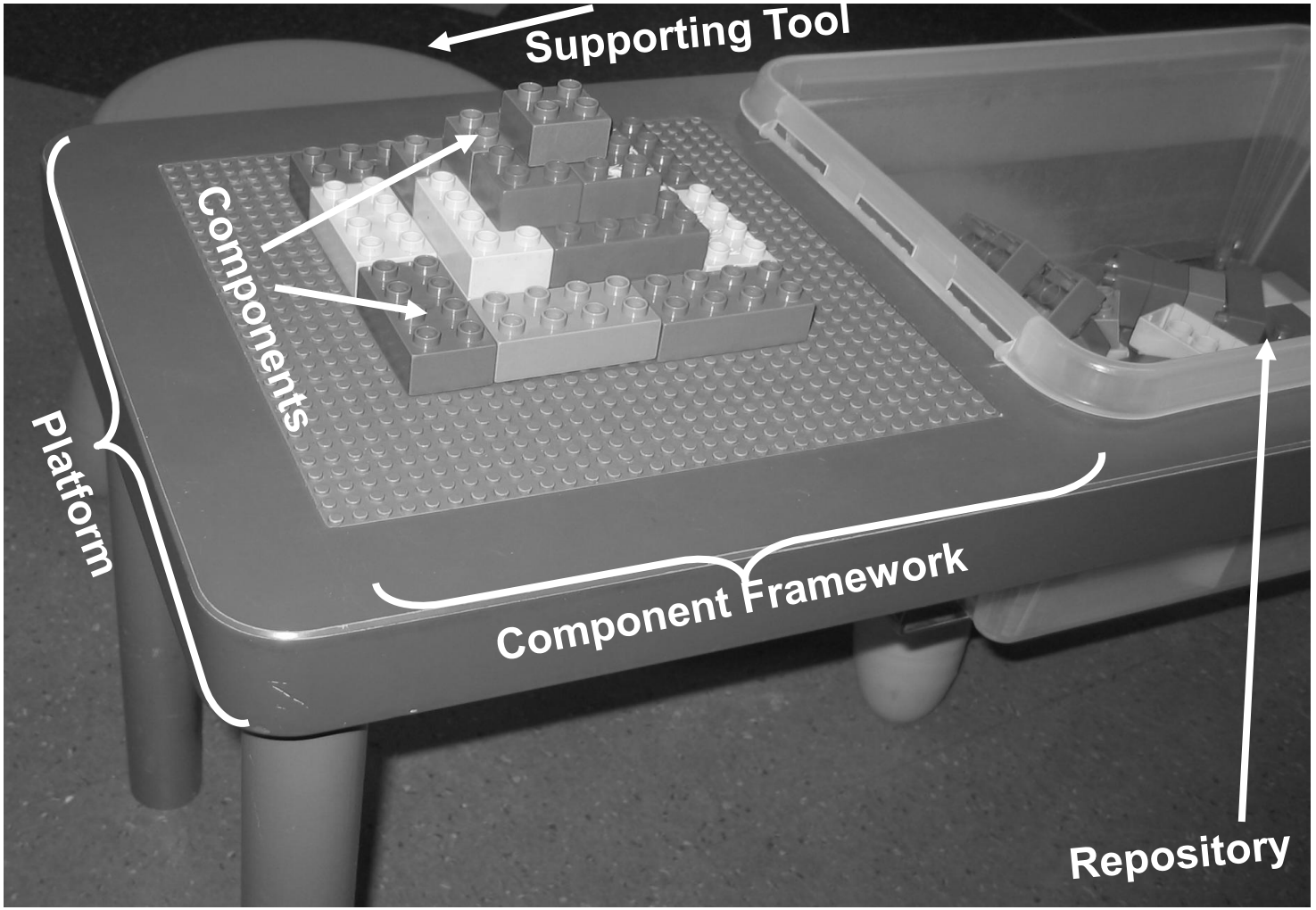
- Guides the whole development process

CBSE Development Process



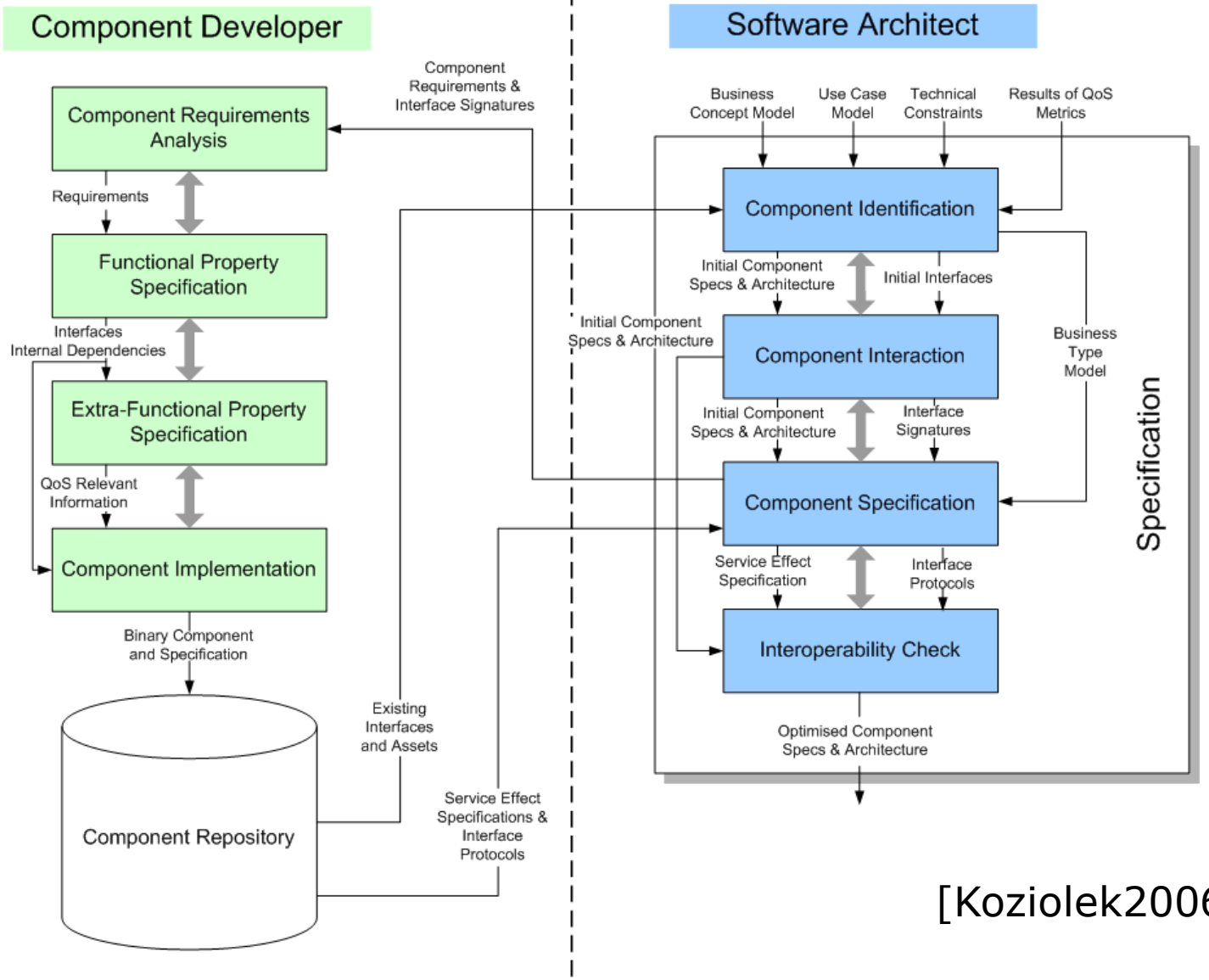
[Cheeseman2000, Koziolek2006a]

Specification Process



[Grunske2007]

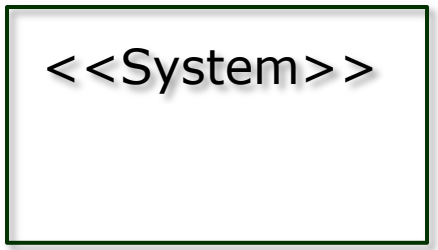
Specification Process



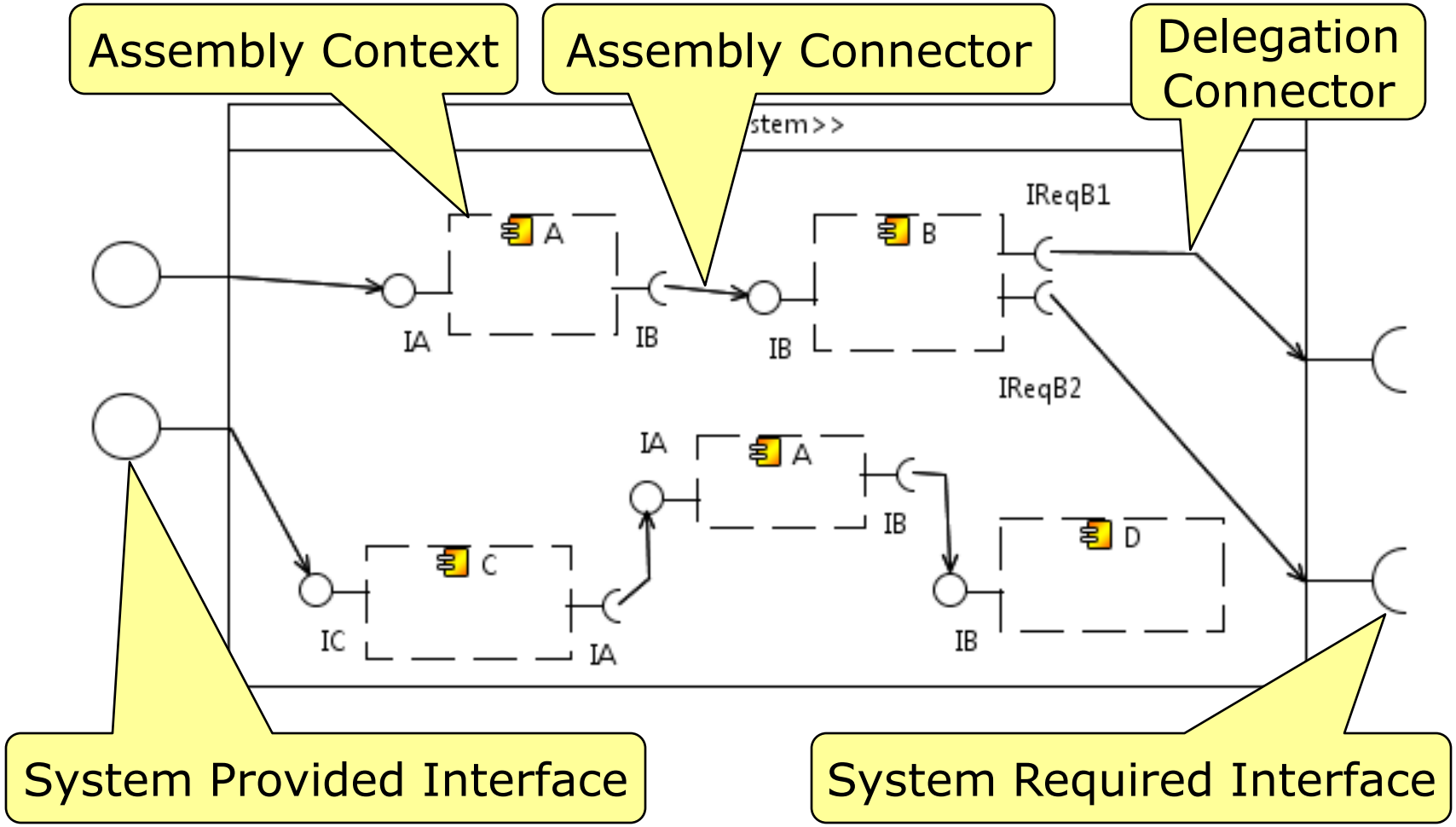
[Koziolek2006a]

System

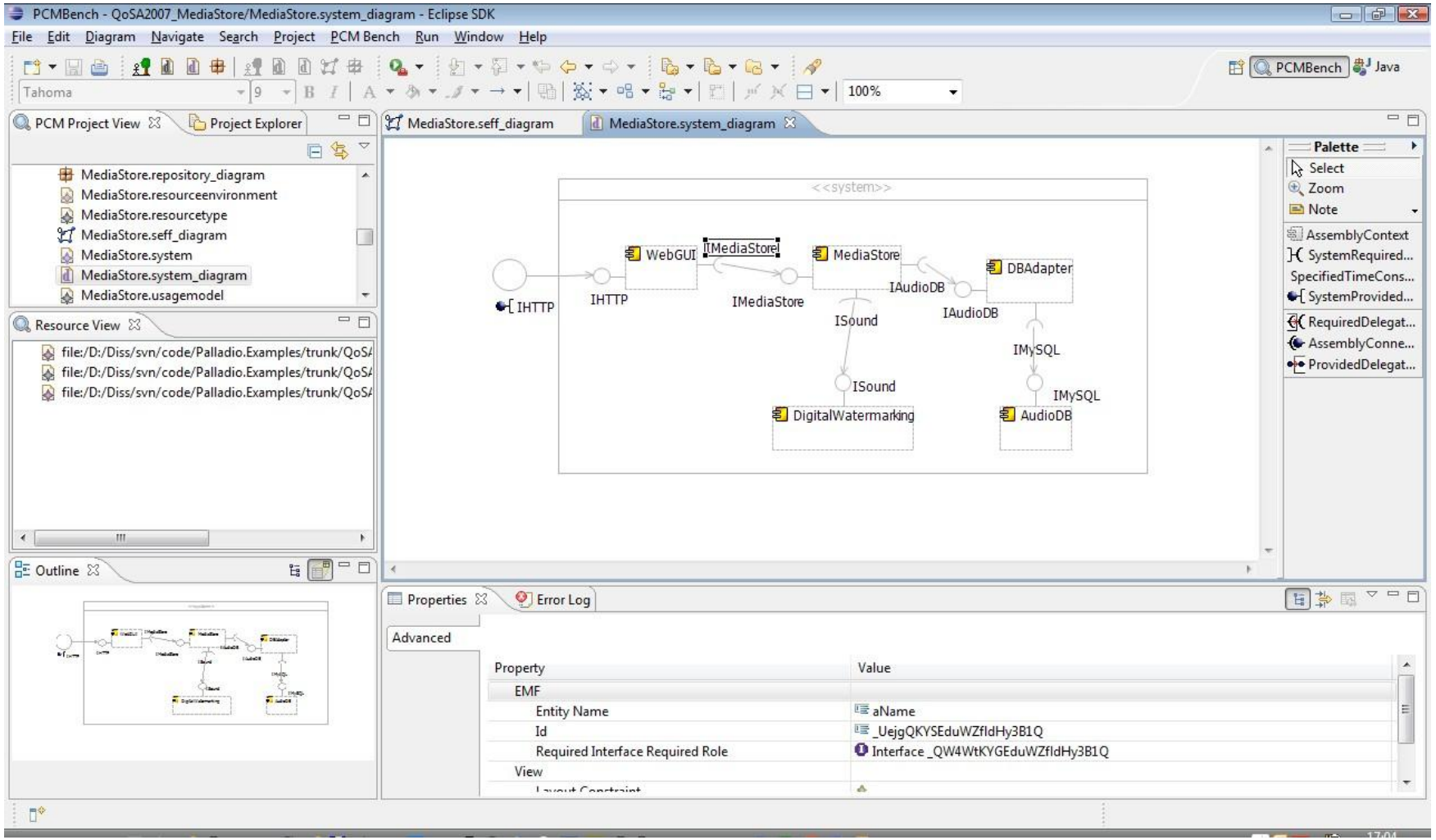
- Models the component-based architecture to be analysed
- May include components from different repositories
- Provides an interface for users
- Excludes uninteresting services and connects to them via system required interfaces
- Is a prerequisite for the system deployer to allocate the components



System Specification

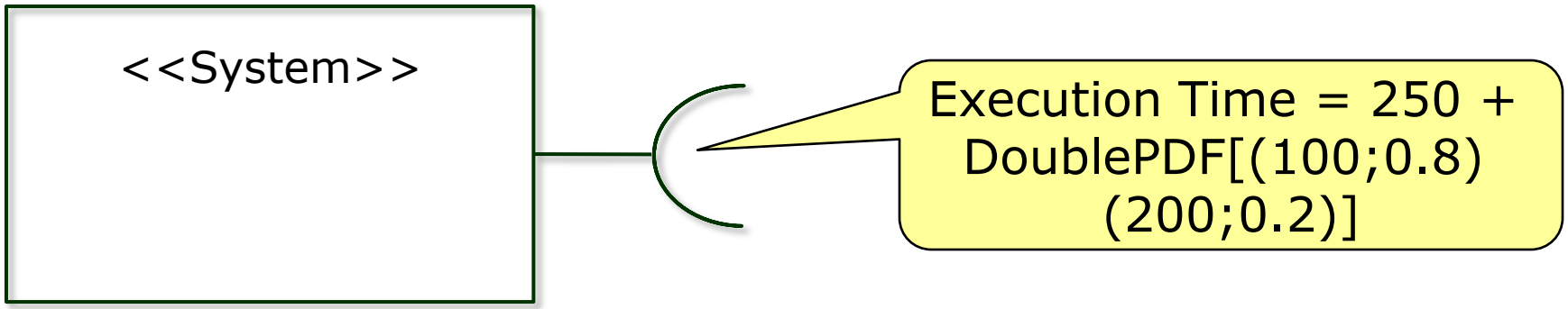


System Specification
PCM Bench

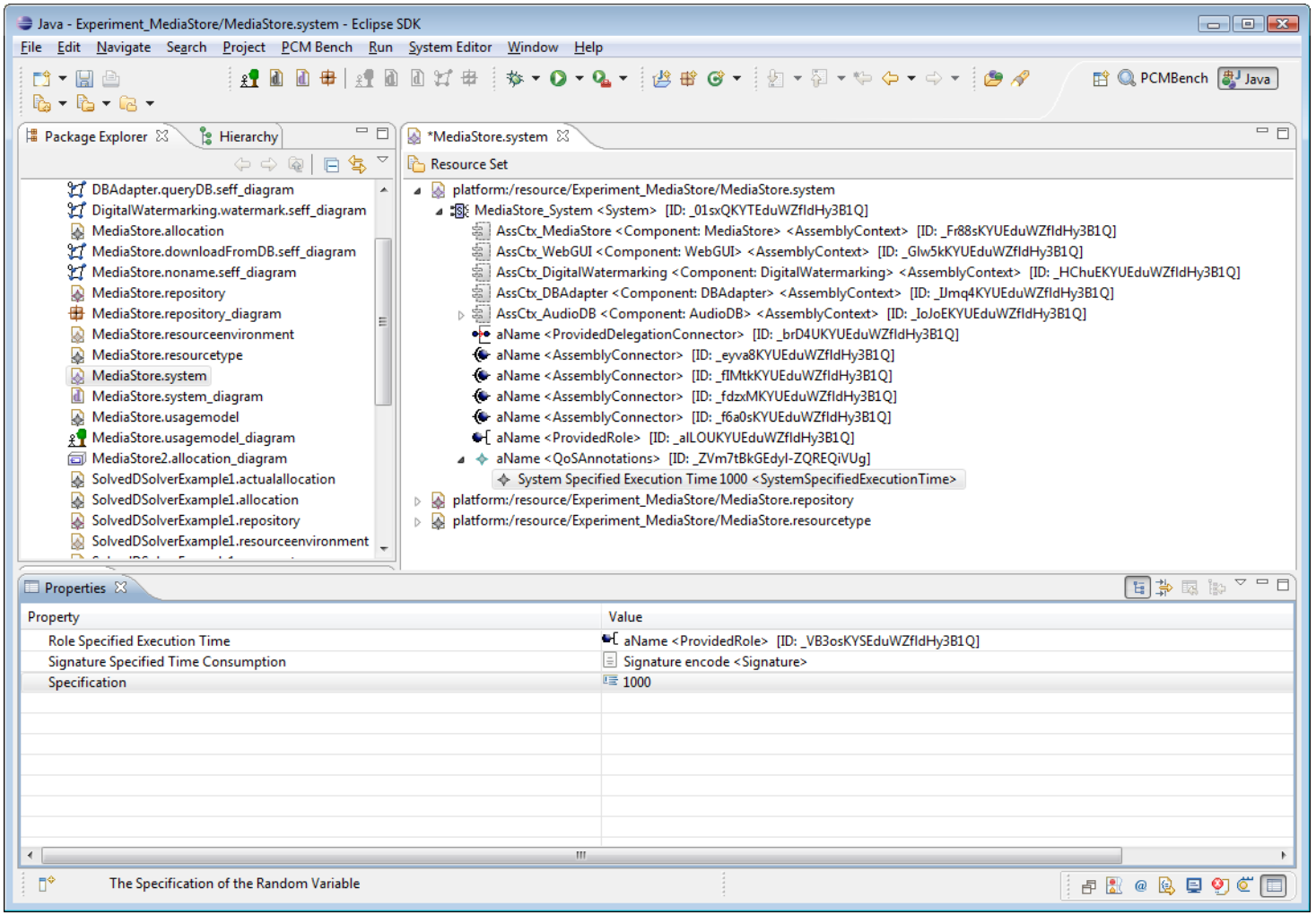


QoS Annotation

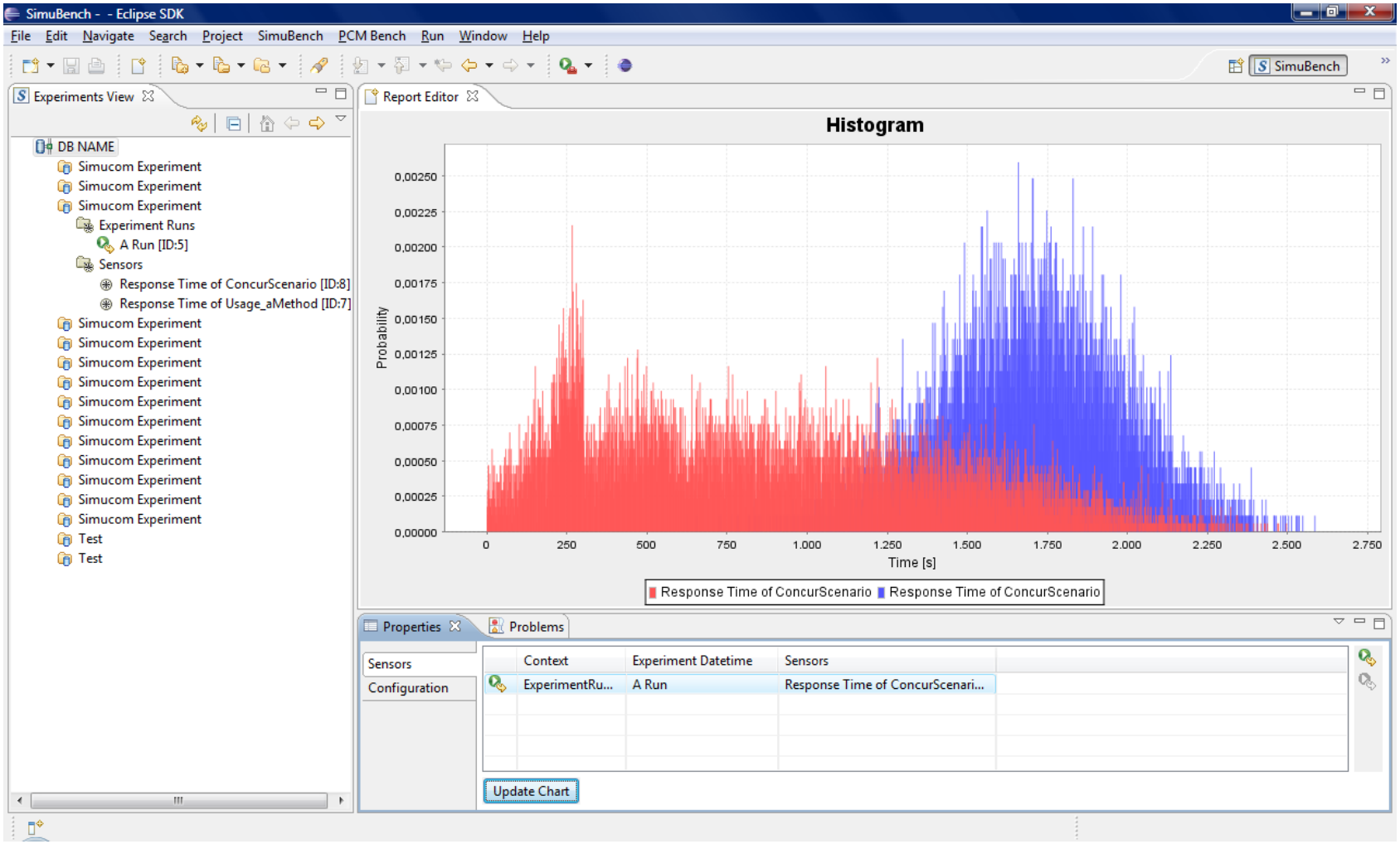
- System Required Interfaces: connection to functionality not modelled in the system
- Example: web service, unknown component
- Execution time specification necessary



QoS Annotation

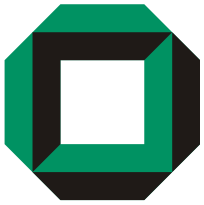


Performance Evaluation



Design alternatives changing performance

- More hardware
- Faster hardware
- Caching
- Resource Pooling
- Replication
- Load Balancing
- Compression
- Reducing communication overhead
- Reimpl. of a component
- Allocation
- Introduce parallel processing
- Use Performance Pattern
- …



Outline

4. Software Architect
   a) System (Composed Structure)
   b) QoS Annotations on System Interfaces
5. System Deployer
   a) Resource Types, Resource Environment
   b) Allocation

Lecture 4

6. Domain Expert
   a. Usage Model
   b. Parameter Characterisations
7. Solver, Result Interpretation
8. Comprehensive Case Study
9. Outlook

Lecture 5

System Deployer

[http://www.dorsetforyou.com/]

System Deployer: Tasks

- Models the resource environment (e.g., middleware, OS, hardware)
- Models the allocation of components to resources
- Sets up the resource environment (e.g., installing application servers, configuring hardware)
- Deploys components on resources (e.g., writing deployment descriptors)
- Maintains the running system

Resource Types

- Abstract specification of resources (e.g. CPU, HD, Net)
- Why?
  - concrete resources (e.g. 2 GHz CPU, 20 MB/s HD, 1 Gbit/s Net) unknown during component specification and implementation
- Thus: component developers provide RDSEFF specifications referring to resource types
- Once the concrete resource environment is specified, timing values can be derived

Resource Types in PCM

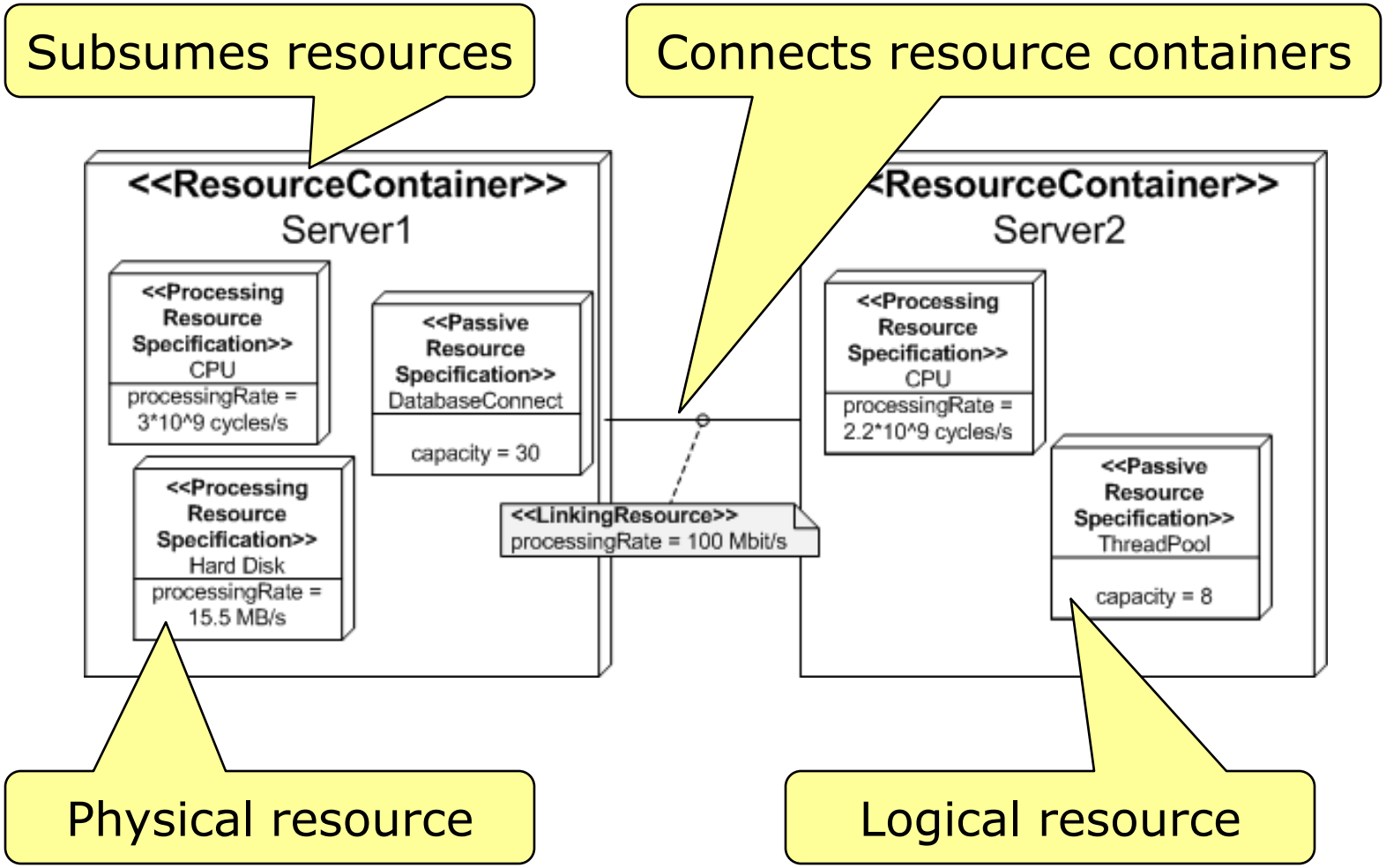
CPU

HD

Network

Memory

Resource Environment

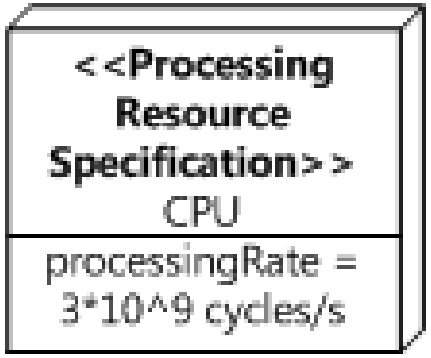


Processing Resources

- Model CPUs, Hard Disks, Networks, etc.
- Specify a processing rate for the resource demands of the RDSEFFs
- Example 1:
  - Processing rate (CPU): 3*10^9 cycles/s = 3 Ghz
  - RDSEFF: Resource Demand = 1,5 * 10^9 cycles

  ➔0,5 seconds execution time
- Example 2:
  - Processing rate (HD): 20 MB/s
  - RDSEFF: Resource Demand = 500 000 Byte

  ➔0,025 seconds execution time

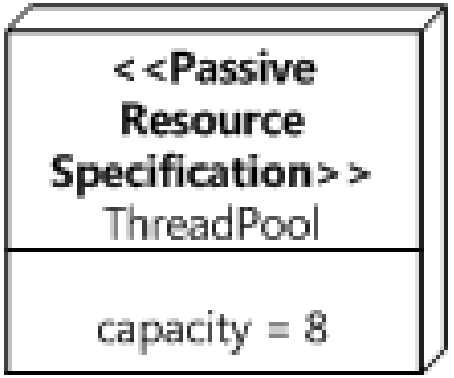


Passive Resources

- Model logical resources
  - Threads, Semaphores, Database connections, …
- Are aquired or released in RDSEFFs
- Specify a maximum capacity
- Example:
  - Capacity (ThreadPool): 8
  - RDSEFF: AquireAction(ThreadPool)

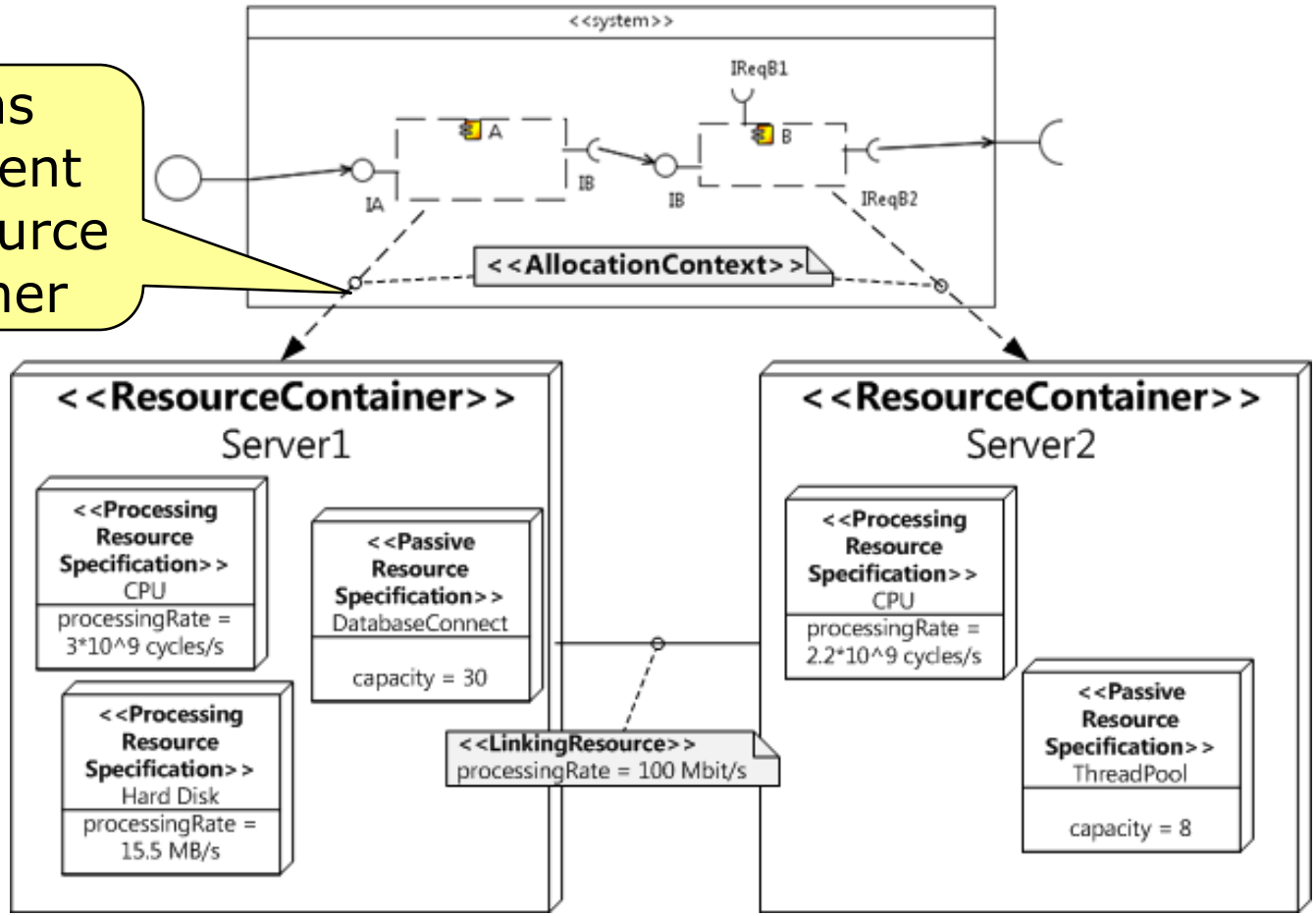
  ➔Afterwards: #available threads decreased by 1
  - RDSEFF: ReleaseAction(ThreadPool)

  ➔Afterwards: #available threads increased by 1

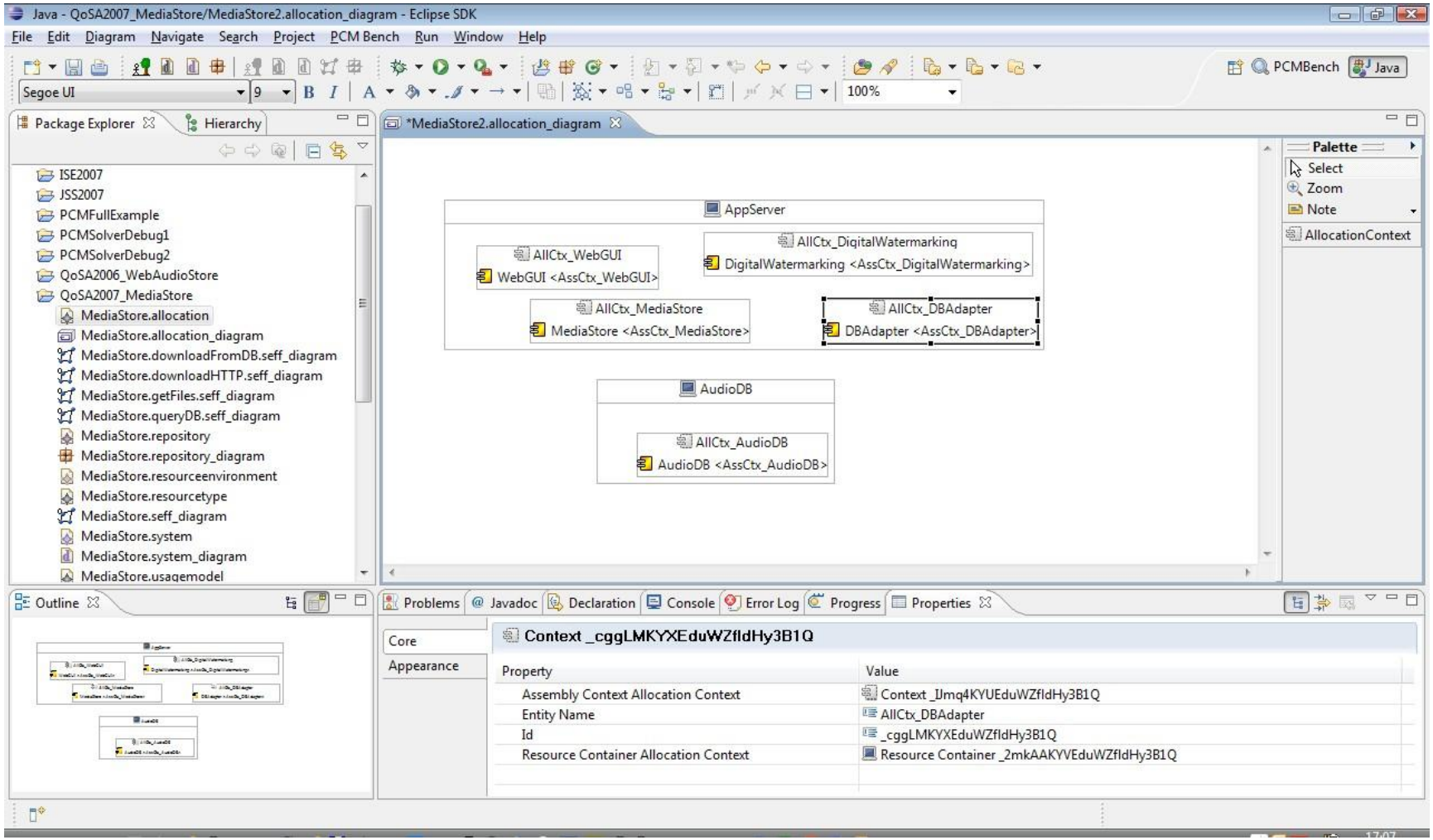


Allocation

Assigns component to a resource container



Allocation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File Edit Diagram Navigate Search Project PCM Bench Run Window Help
PCMBench
Java
Package Explorer
Hierarchy
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JSS2007
PCMFullExample
PCMSolverDebug1
PCMSolverDebug2
QoSA2006_WebAudioStore
QoSA2007_MediaStore
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MediaStore.resourceenvironment
MediaStore.resourcetype
MediaStore.seff_diagram
MediaStore.system
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AudioDB
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Select
Zoom
Note
AllocationContext
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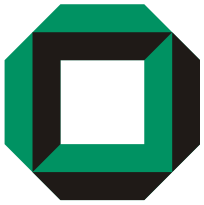

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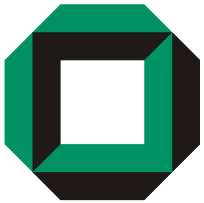
Lecture 5

Lessons Learned Today

- Software Architect
  - Specification of a system
- System Deployer
  - Resource Types
  - Specification of a resource environment
  - Specification of an allocation



Switch to Eclipse