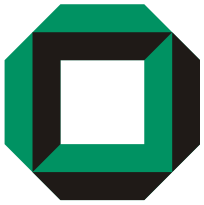

Universität Karlsruhe (TH)
Forschungsuniversität gegründet 1825

Praktikum Ingenieurmäßige Software-Entwicklung

Palladio Component Model – Part V (PCM)

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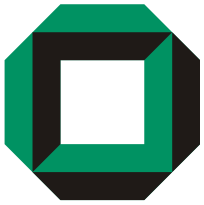


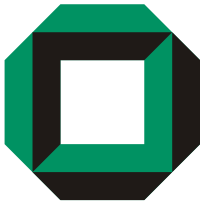
Outline

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

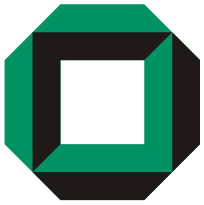
6. Domain Expert
   a. Usage Model
   b. Parameter Characterisations
7. Result Interpretation

Lecture 5



Domain Expert

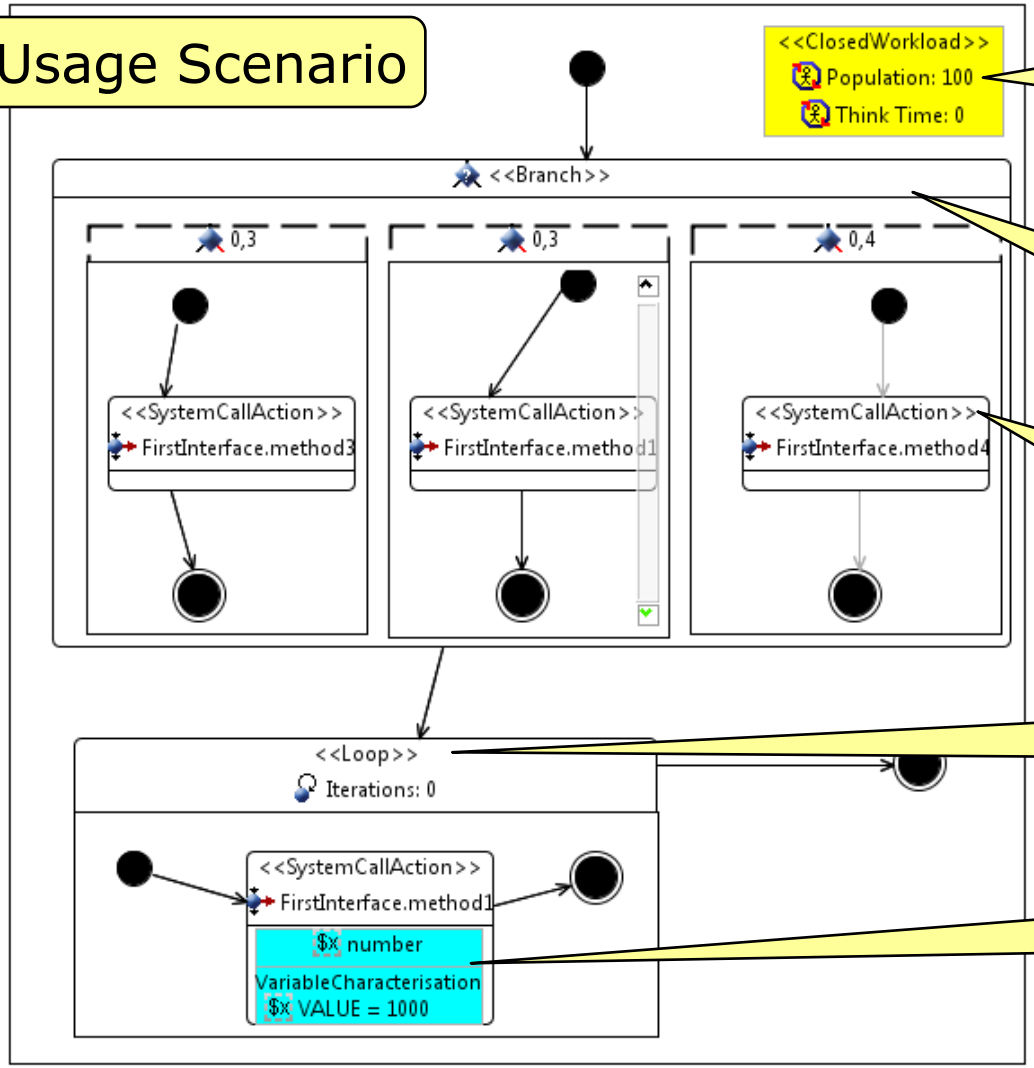
- Familiar with the business domain
- Specifies user behaviour
  - Number of users
  - User Requests to the System
  - Input parameters characterisations as distribution functions



Usage Model

- Models ***user*** behaviour, not component!
- Similar to RDSEFFs, but
  - Does not refer to resources
  - Does not refer to inner components of a system
  - Does not model parametric dependencies
  - Includes a workload specification
- Usage Model
  - *1…n* usage scenarios (1 per use case)
  - *1* workload per usage scenario

Usage Model



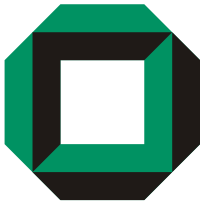
Workload: open or closed (like in SPE)

Branch

Call to a system provided service

Loop

Variable Usage



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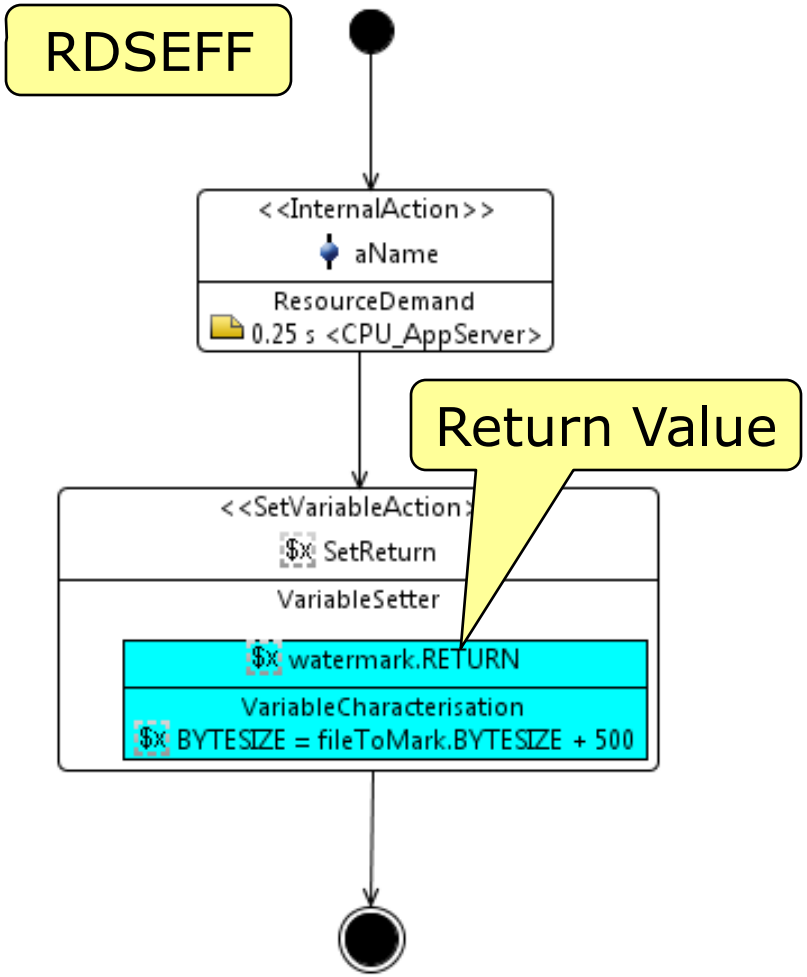
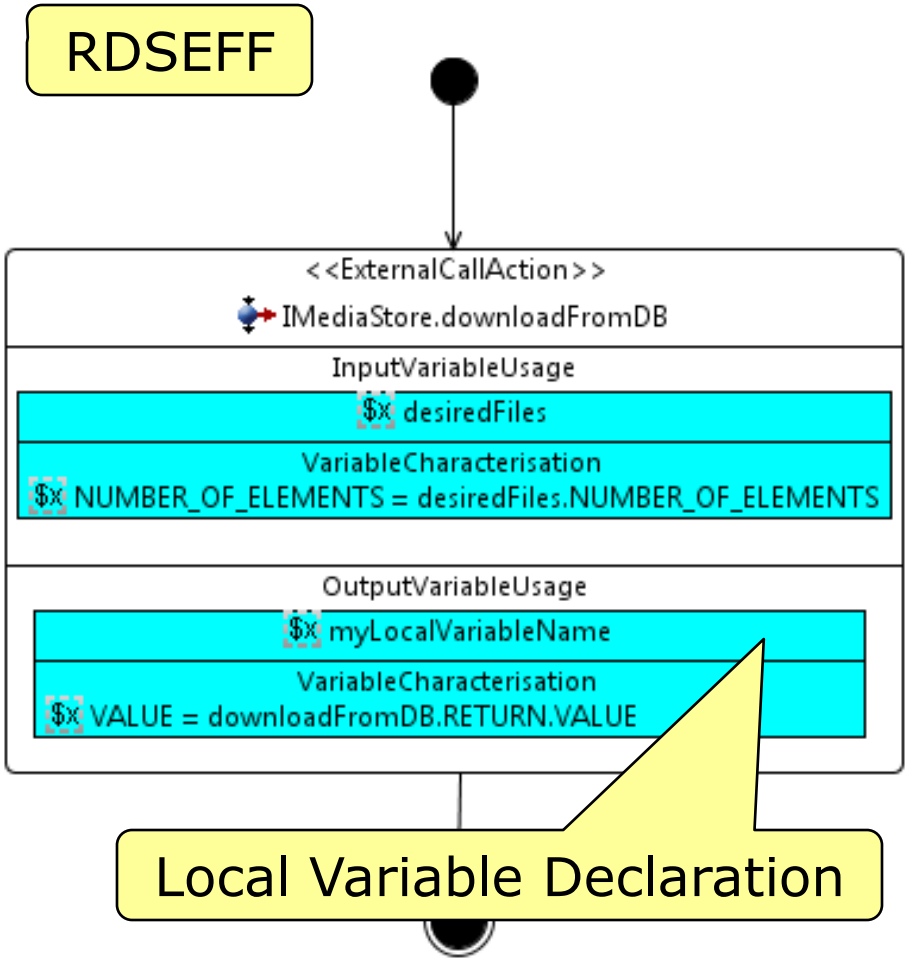
SetVariableAction



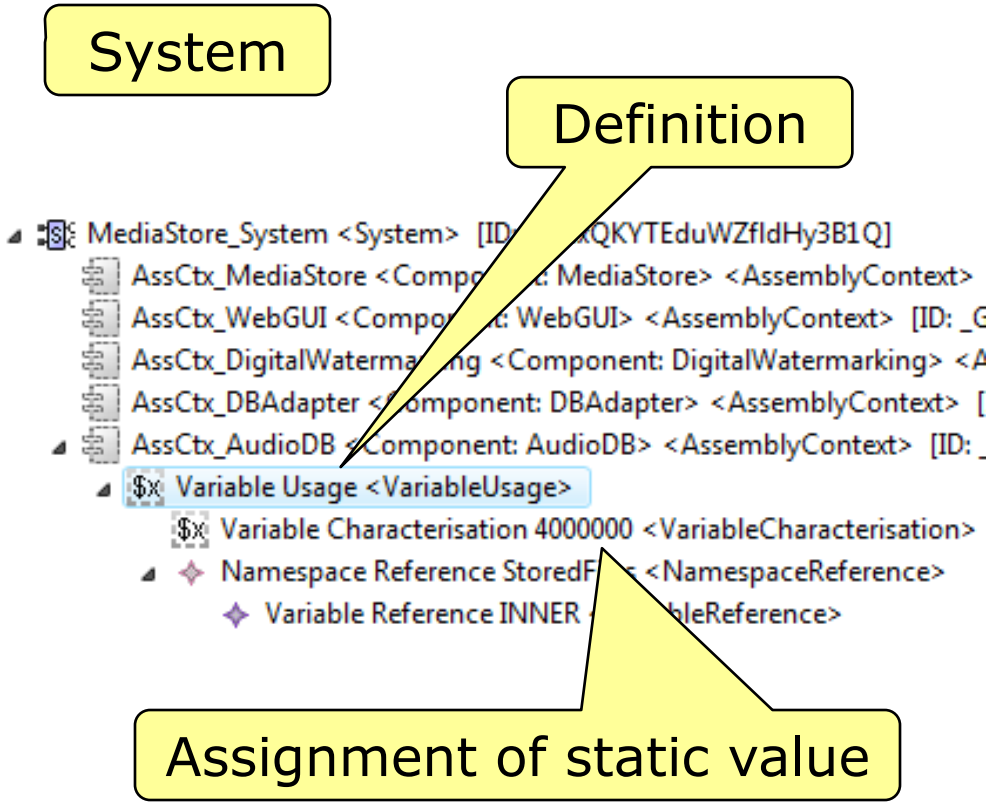
- Characterisation of Return Values
- Only if performance relevant!
- Reserved Keyword RETURN
- May occur in different branches

Using Return Values of ExternalCallActions



- Assignment of output parameter characterisations to local variables
- Use local variables afterwards in parametric dependency specification

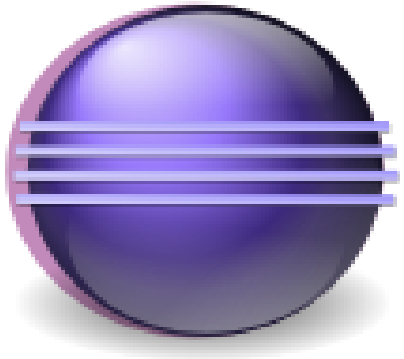
Component Parameters

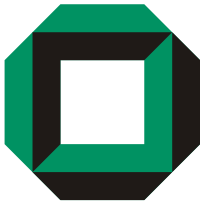


- Global parameters for components
  - Configuration options
  - Static State
  - …
- Declaration per assembly context
- Default value by component developer
- Cannot be changed dynamically (during simulation)

Model Validation

- Switch to Eclipse!





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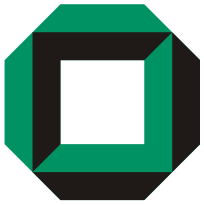
Result Interpretation

- Performance Metrics PCM
- Statistics
- Analysing Histograms
- Analysing Cumulative Distribution Functions

Performance Metrics supported by SimuCom

- Response Time per Time Sensor
  - Histogram
  - Cumulative Distribution Function
  - Point Estimators with R (Statistics Package)
- Utilization per Resource
  - Percentage: Busy Period / Idle Period
- Currenty NOT supported
  - Throughput

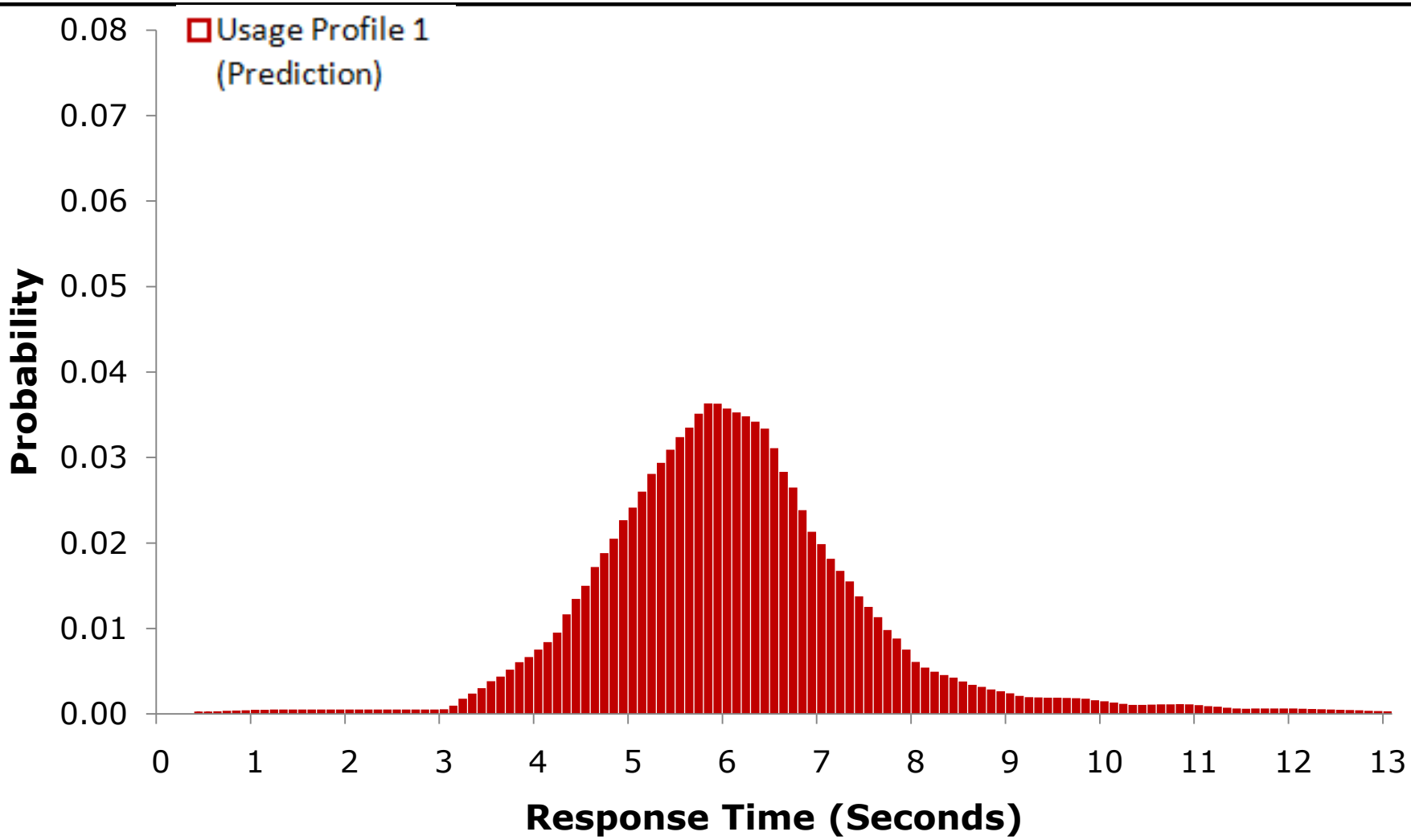


Statistics

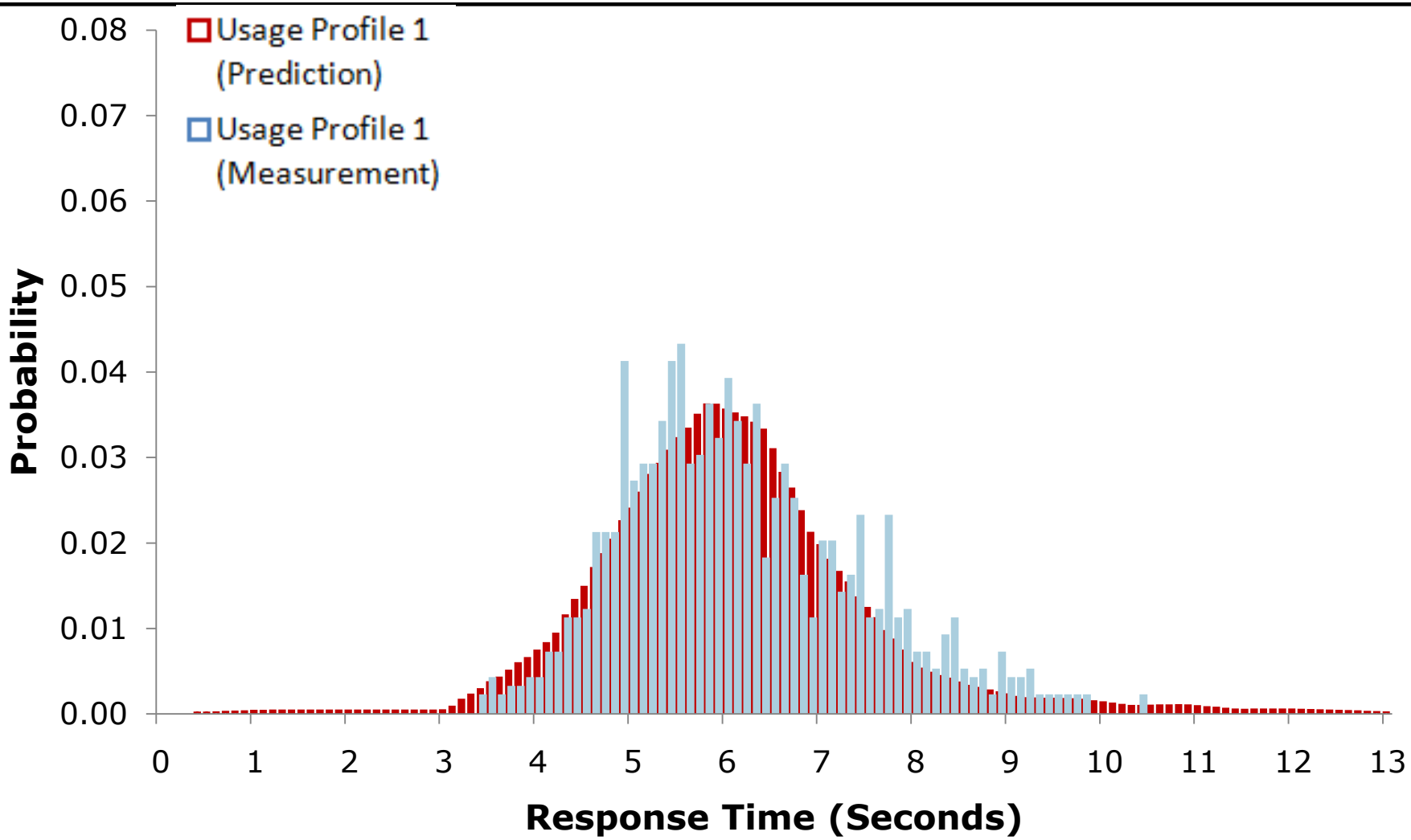
SDQ Software Design and Quality

- Point Estimators
  - Expected Value (Mean)
  - Standard Deviation
  - Variance
  - Median
- Compare Probability Distributions
  - Kolmogorov-Smirnov-Test
  - Chi-Square-Test
  - Anderson-Darling-Test

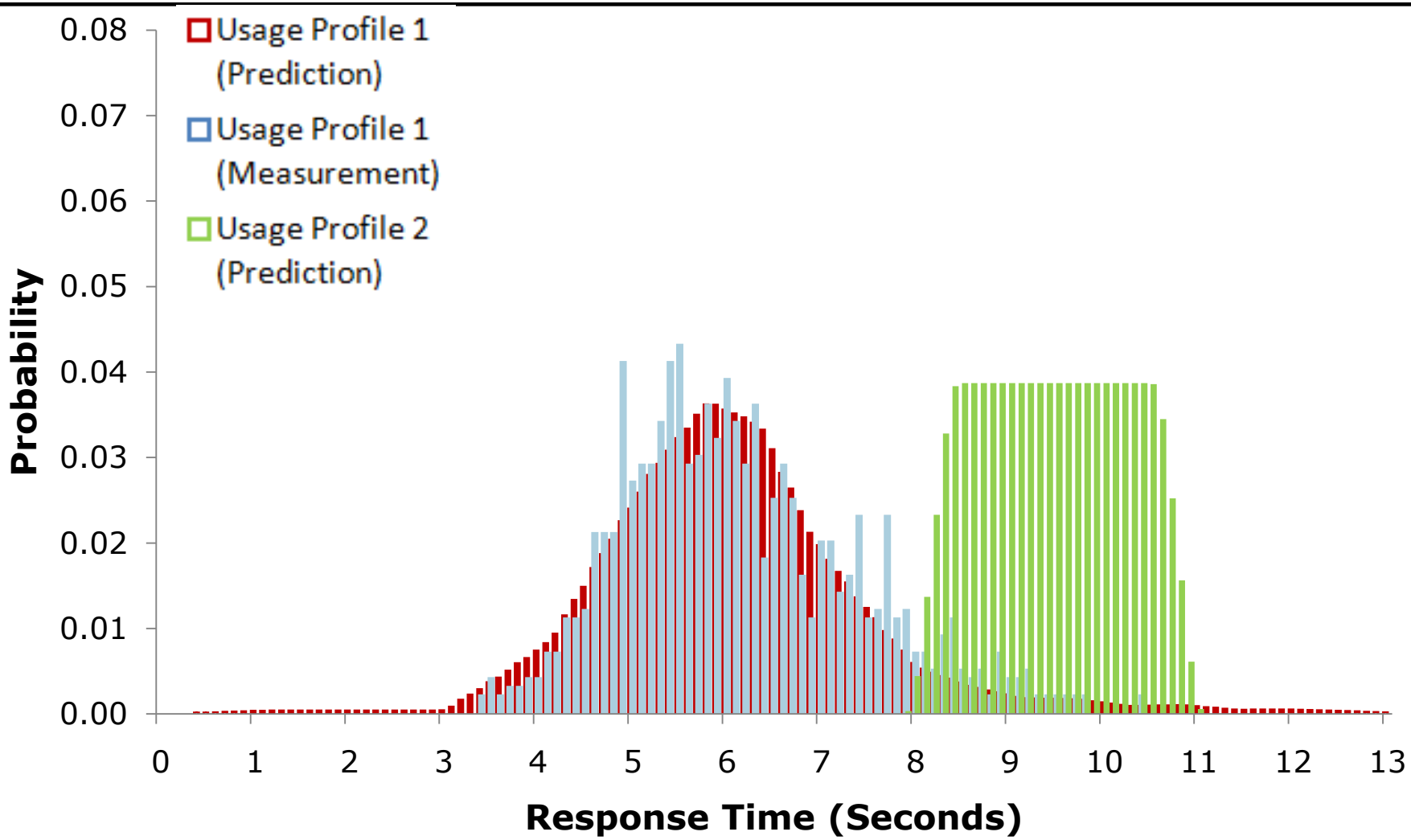
Result Interpretation



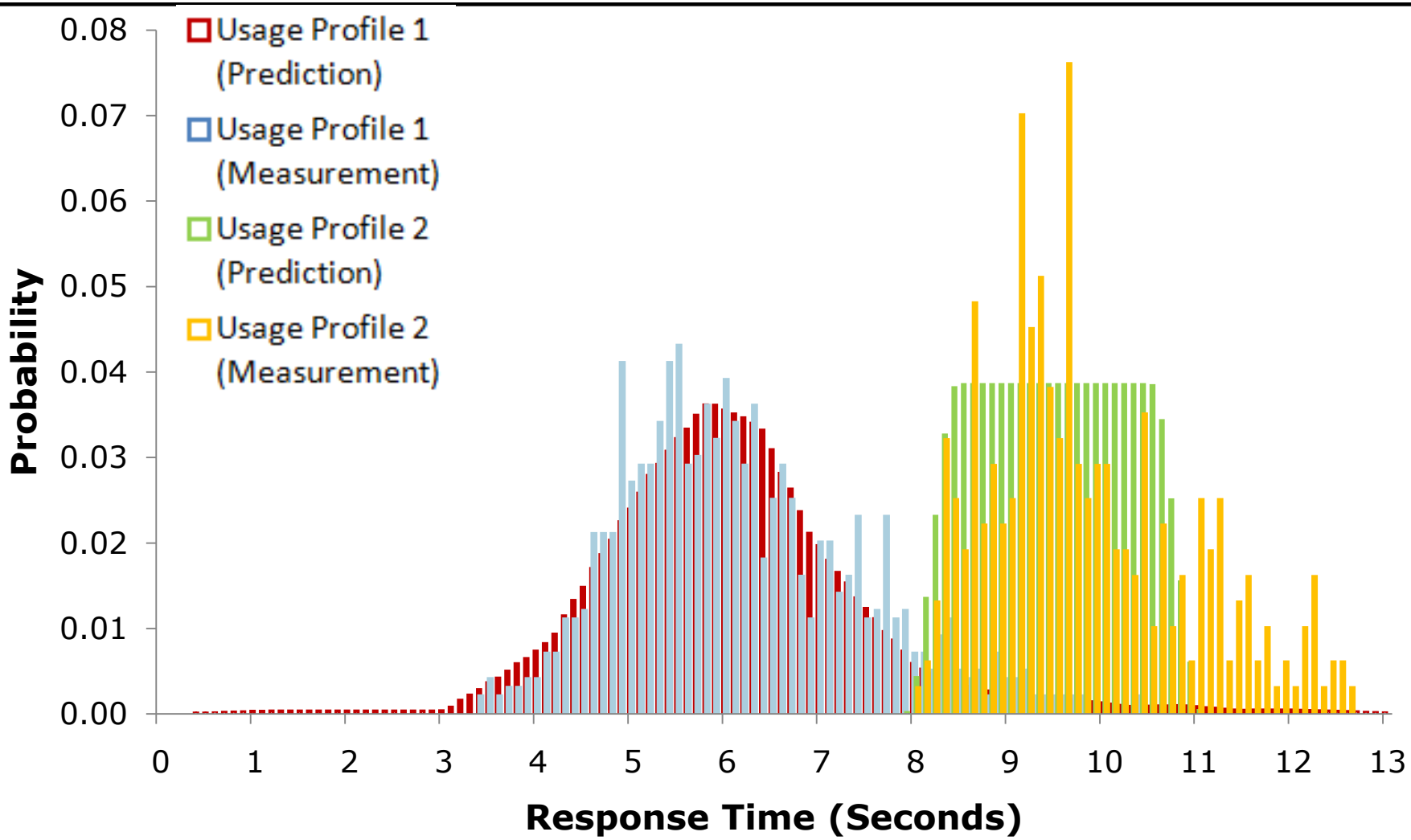
Result Interpretation



Result Interpretation



Result Interpretation



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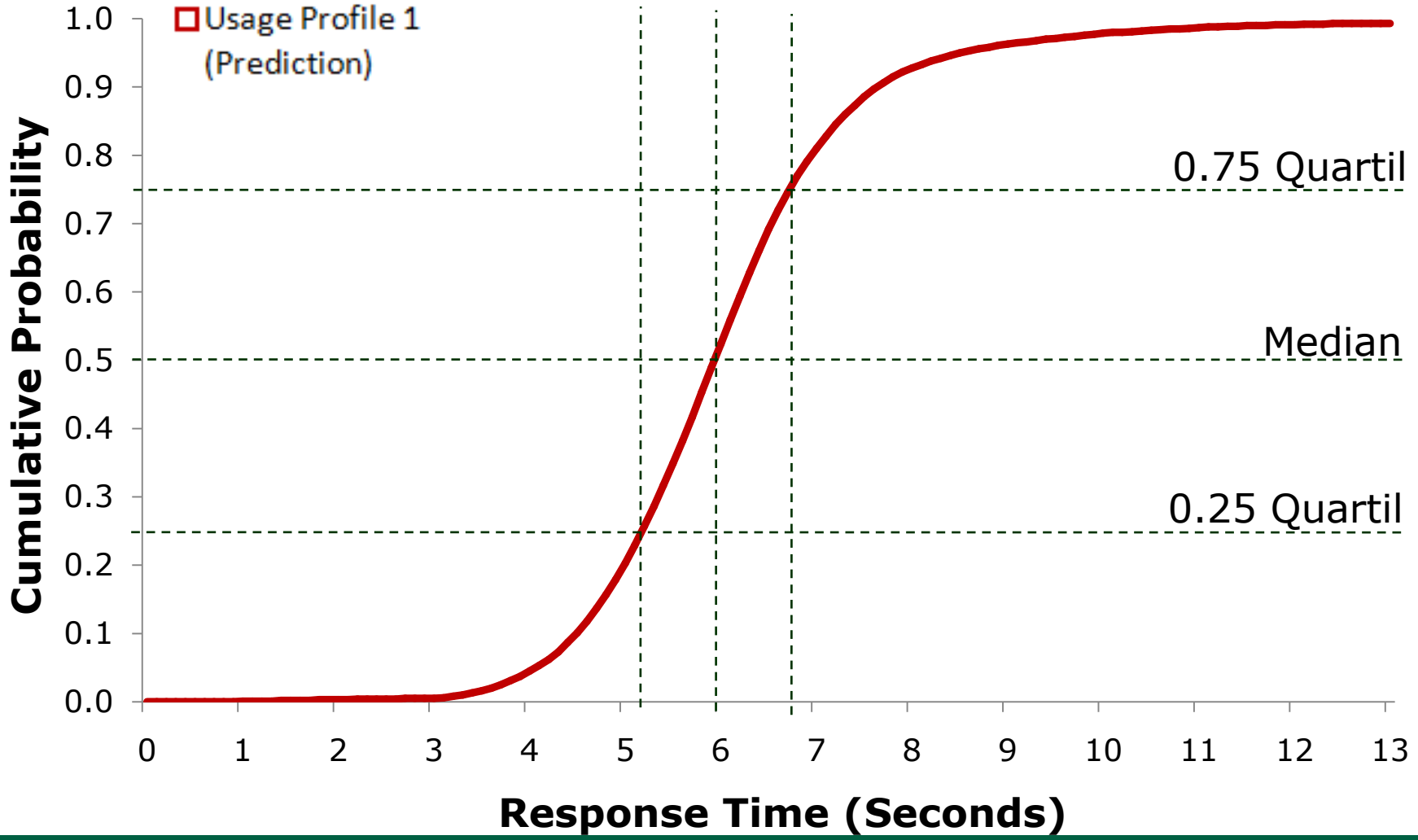

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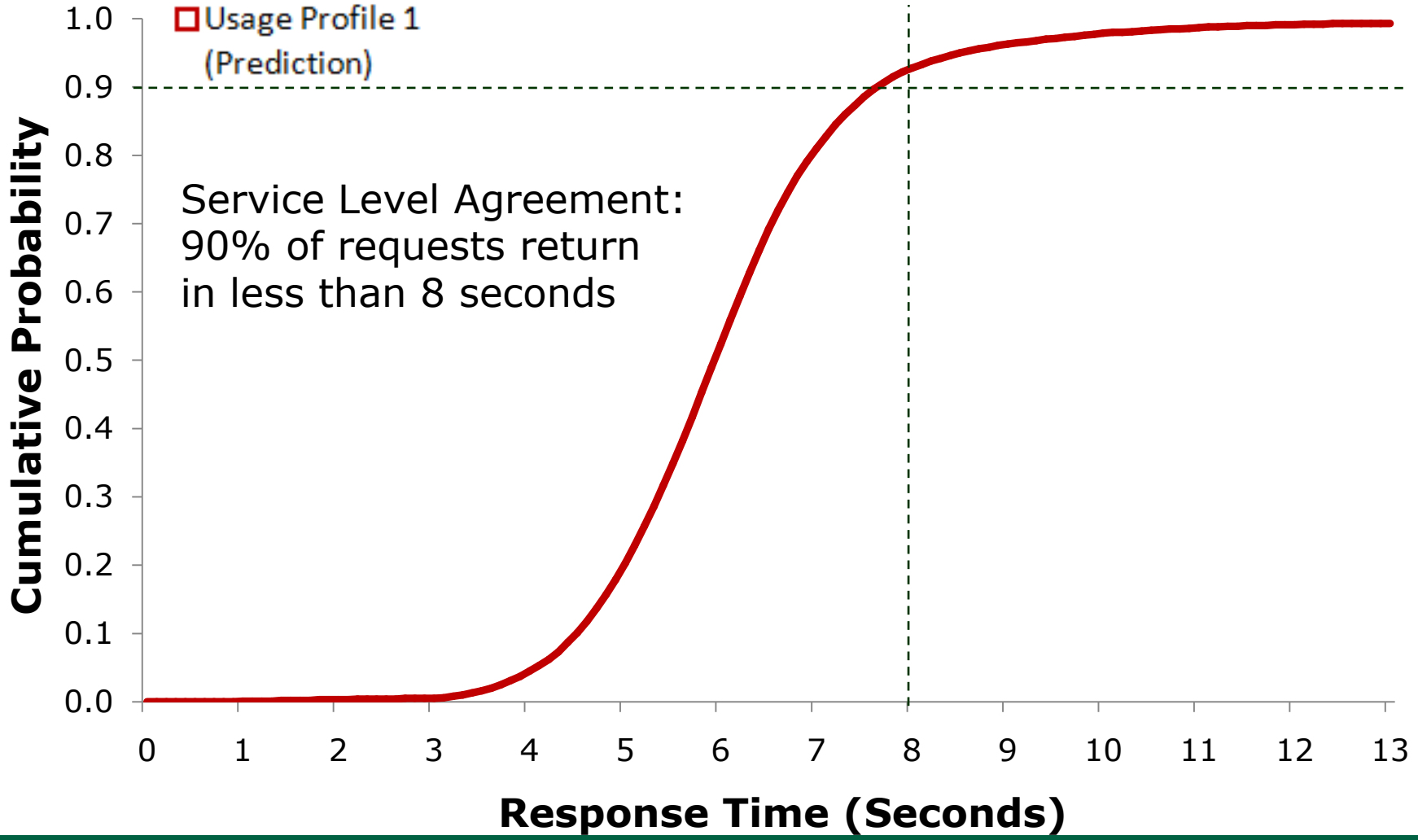

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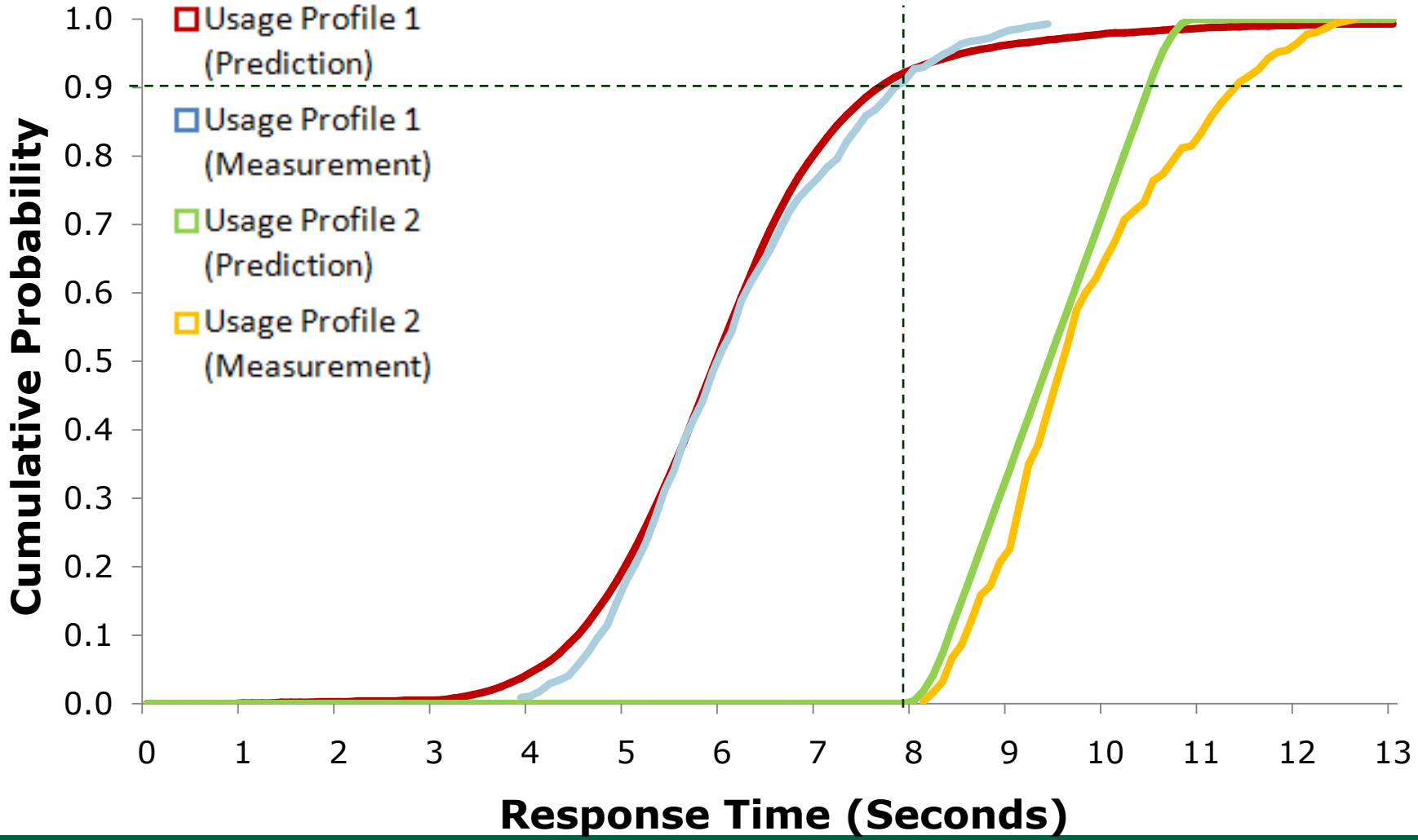
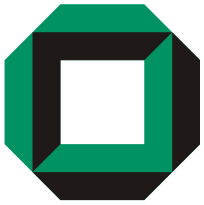
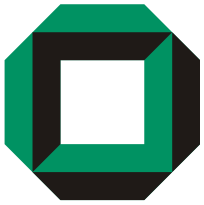




Current Developments (Changelog)

SDQ Software Design and Quality

- Linking Resources
  - work automatically in background
  - latency specification for comm.link.resources
- Scheduling Policies for ProcessingResources
  - FCFS, PROCESSOR_SHARING, DELAY
- System
  - Output parameters for system external calls
  - Broker lookup support for connectors
- Usage Model
  - User Delays (to model waiting/thinking)



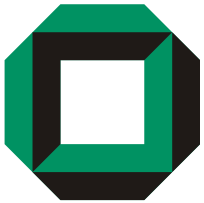
Current Developments (Changelog)

SDQ Software Design and Quality

- Stochastical Expressions
  - AND, OR, NOT for Boolean Expressions
  - Standard Probability Distributions
    - Exp(x), UniForm(x,y), Norm(x), …
- OCL constraints for model validation
- SimuCom
  - Saving simulation results to disk

Lessons Learned Today

- Usage Model
  - for user behaviour
- Return Values
- Component Parameters
- Model Validation
- Result Interpretation
  - Probability distributions
  - Point estimators



Q&A