



## **DECLARE: Declarative Performance Engineering**

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## Working Group

### Project PIs

- Dr.-Ing. **André van Hoorn** (Prof.-Vertr.), University of Stuttgart
- Prof. Dr.-Ing. **Samuel Kounev**, University of Würzburg

### Members

- Dr.-Ing. **Dušan Okanović**, University of Stuttgart
- Dipl.-Inform. **Jürgen Walter**, University of Würzburg

### Associated Partners

- **Capgemini** Deutschland GmbH, Stuttgart, Germany

### Collaborators

- Research Group of the Standard Performance Evaluation Corporation (SPEC RG)

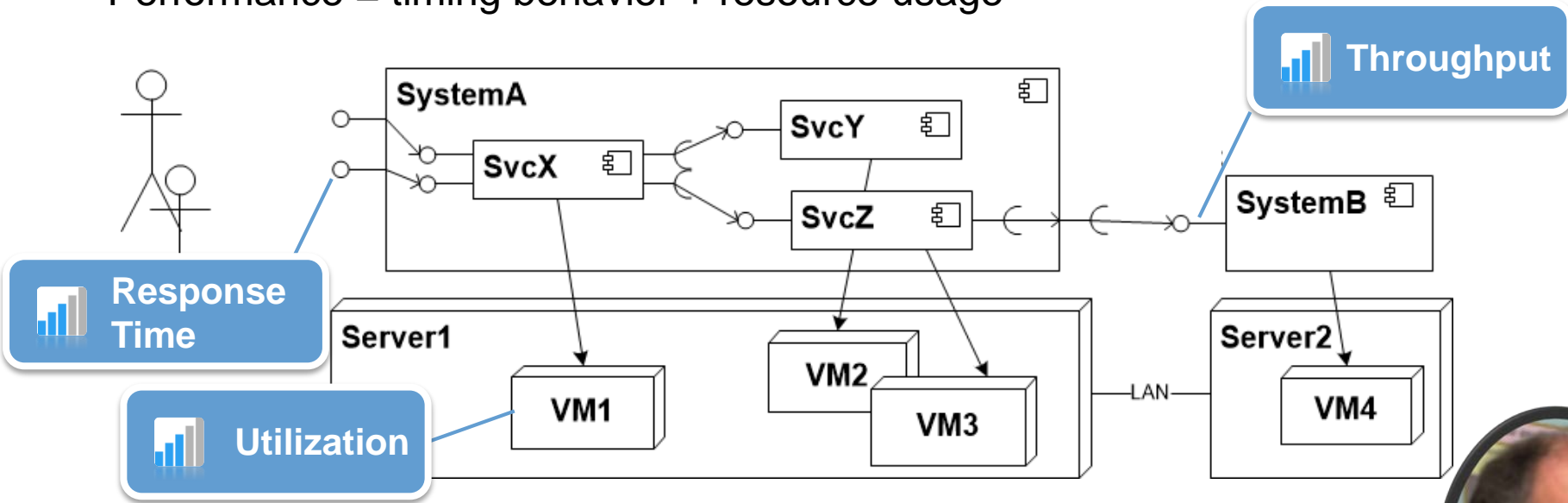


**University of Stuttgart**  
Germany



## Research Context: Software Performance Engineering

- Performance = timing behavior + resource usage

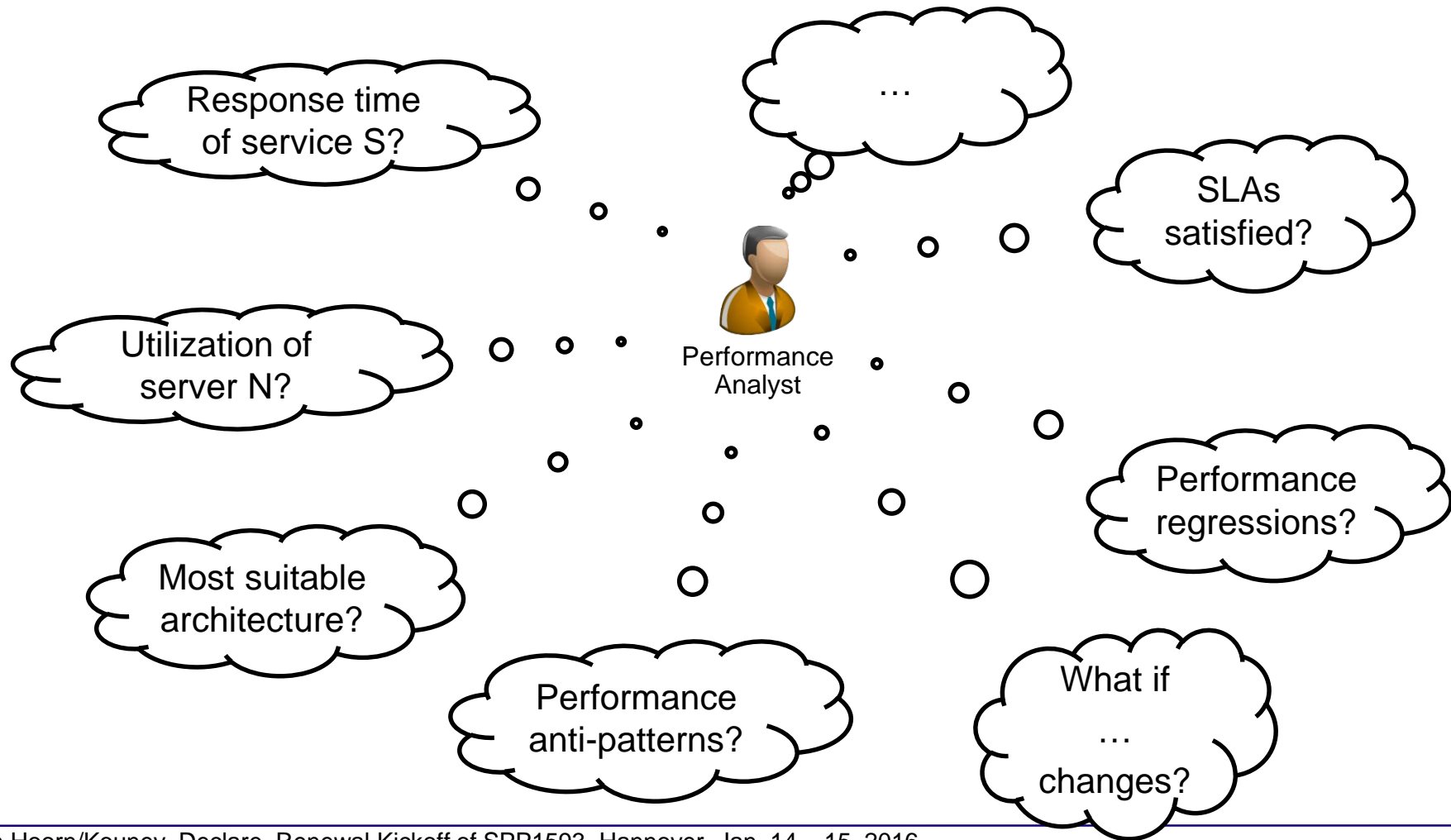


- Software Performance Engineering (SPE)

“the entire collection of **software engineering activities and related analyses** used throughout the **software development cycle**, which are directed to meeting **performance requirements**.”

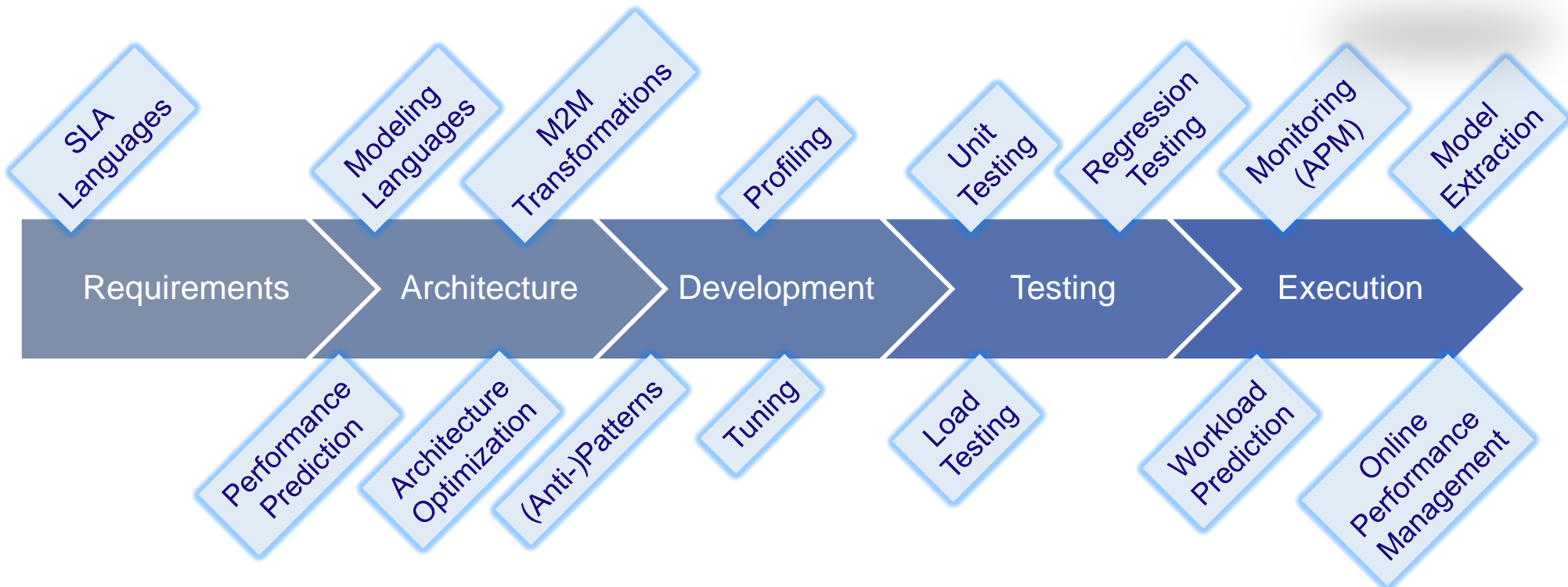


## Performance-Relevant Concerns Spanning the Software Lifecycle

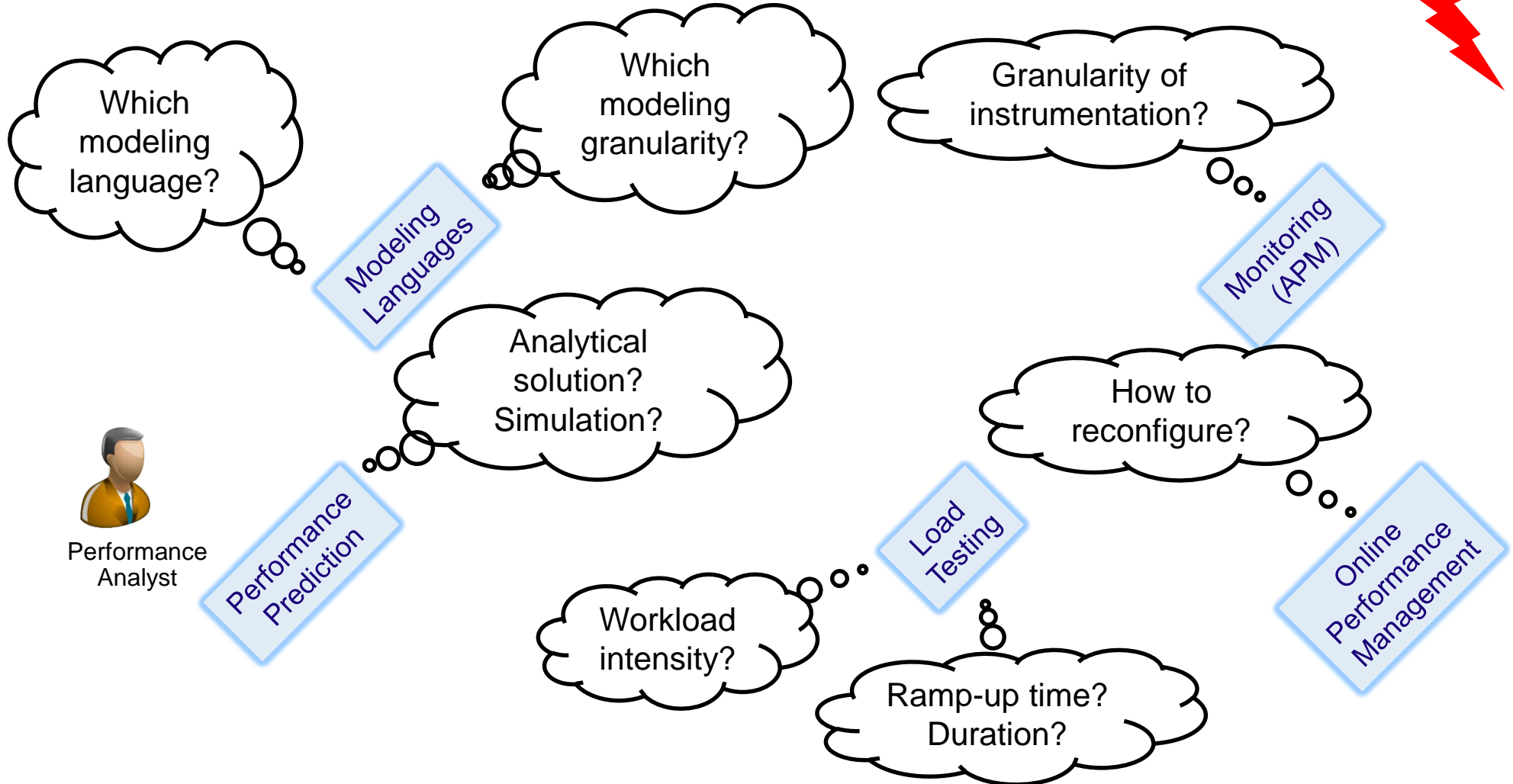




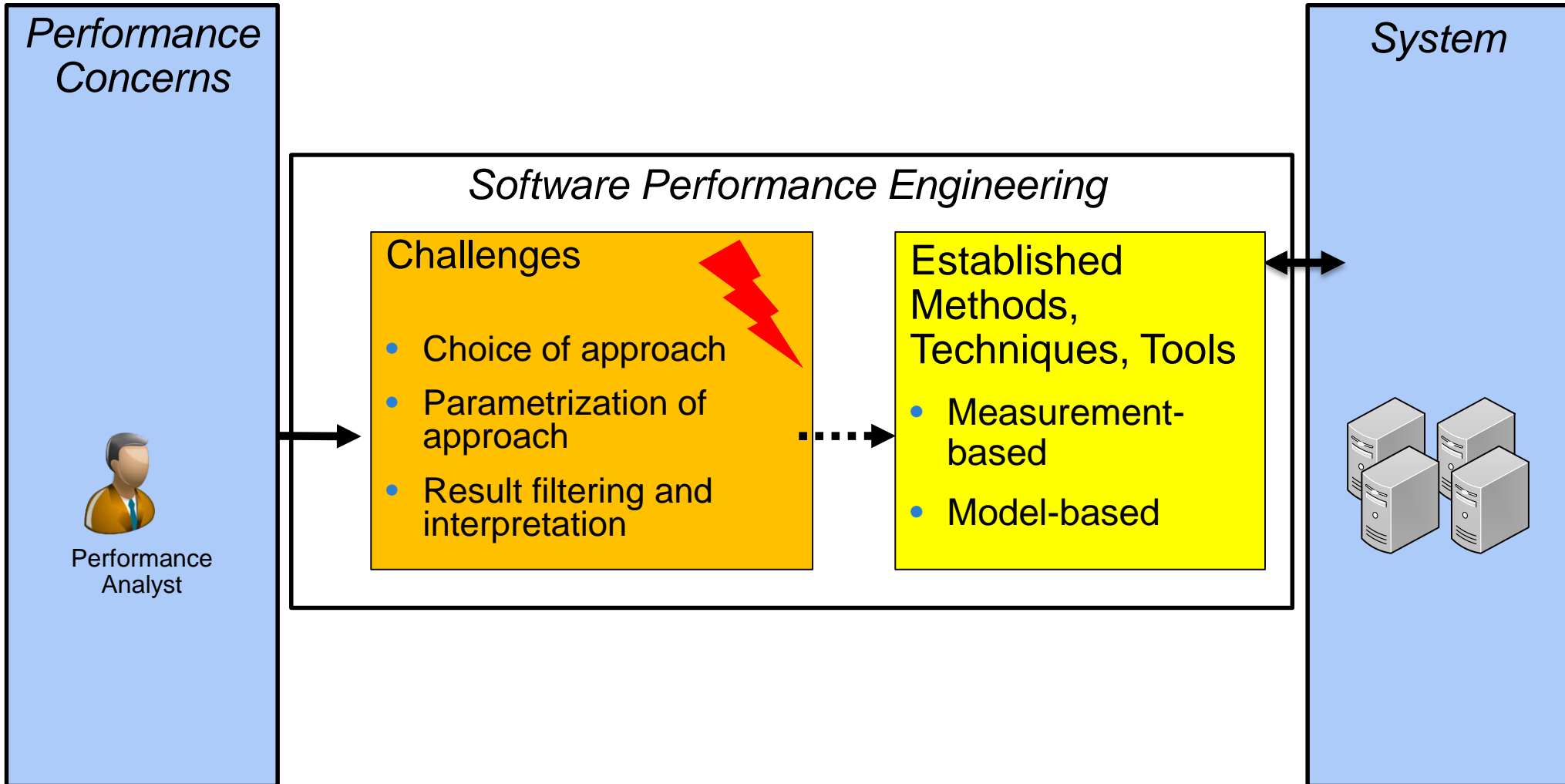
## Extensive Body of SPE Knowledge Exists



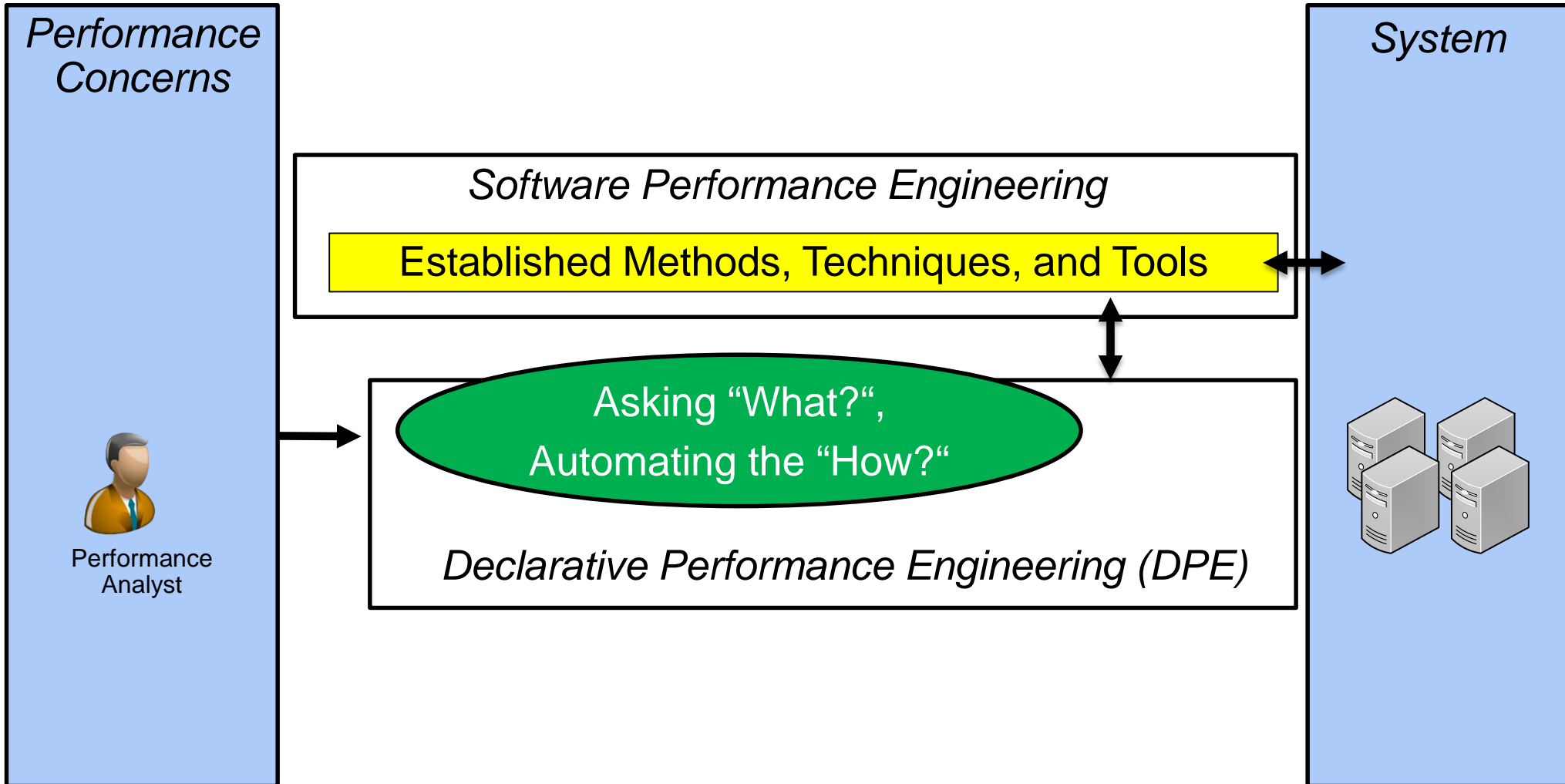
Problem Statement: Various Decisions to Apply SPE Correctly



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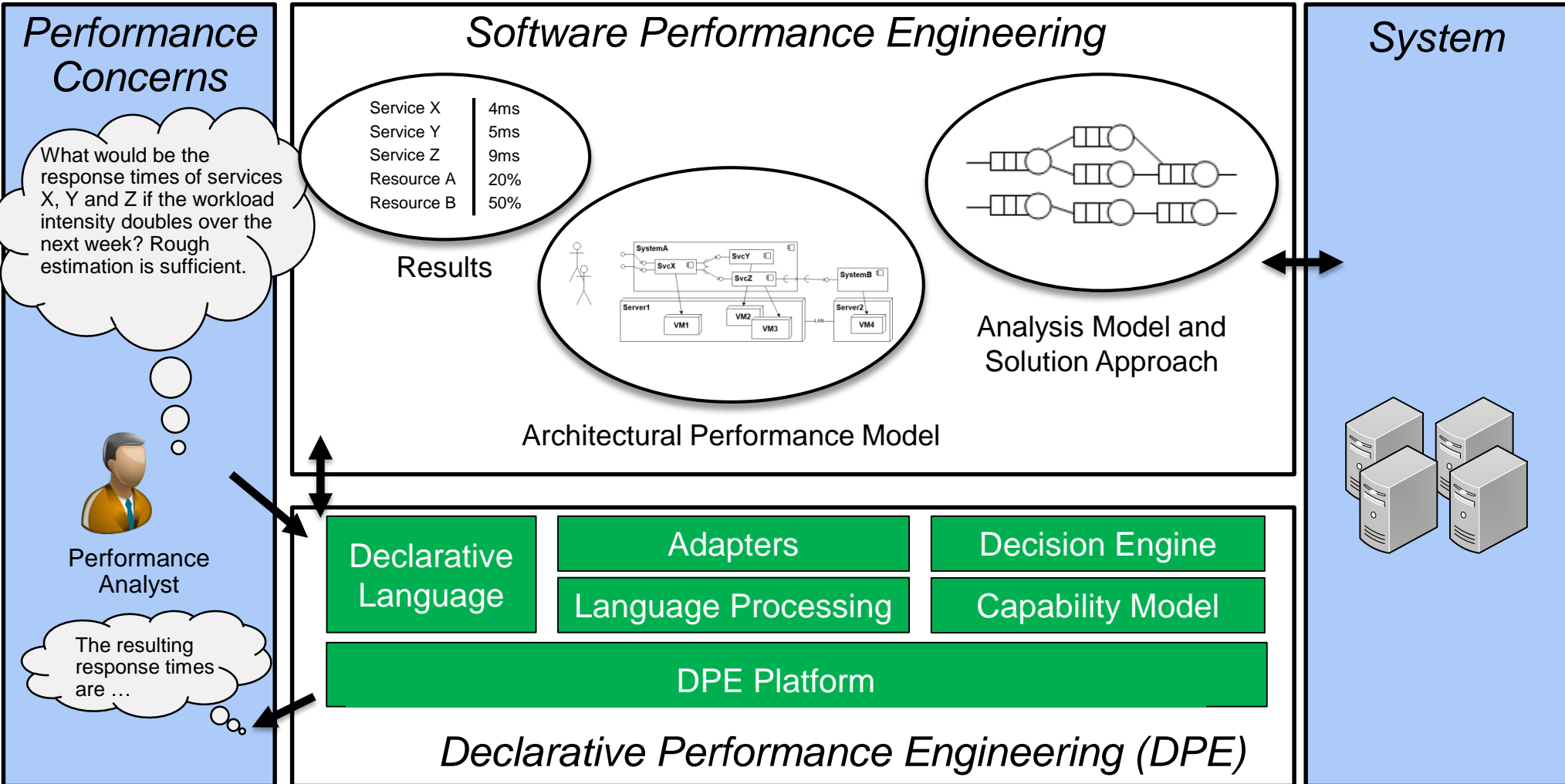


## Vision: Declarative Performance Engineering

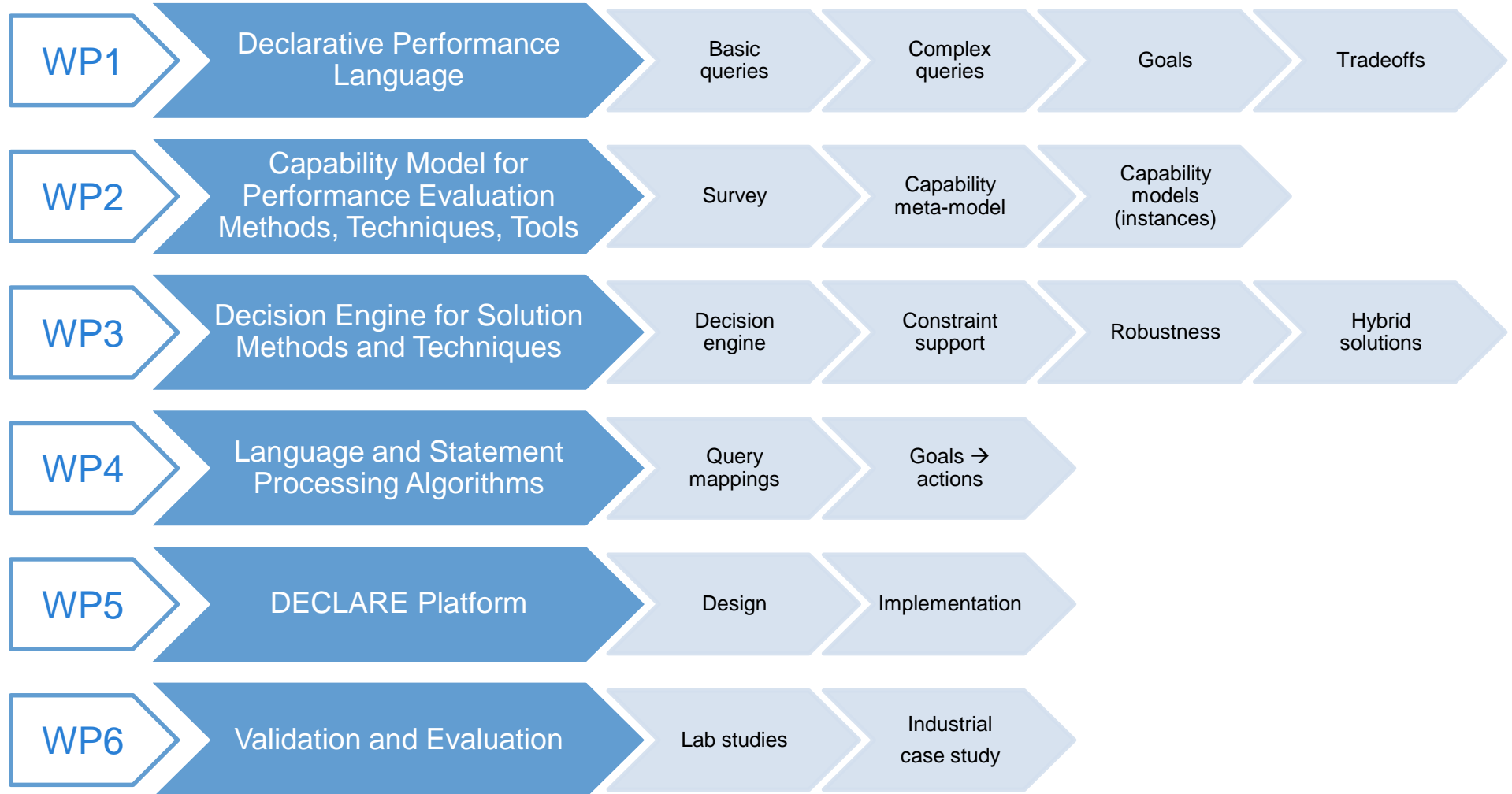




Vision: Declarative Performance Engineering



## Work Programme



## Preliminary Work

### ▪ **University of Stuttgart**

- Monitoring, dynamic software analysis (e.g., Kieker)
- Model-based software analysis and capacity management (e.g., MAMBA, SLAStic)
- Workload modeling, extraction, generation (e.g., WESSBAS)

### ▪ **University of Würzburg**

- Model-based performance prediction and management (e.g., QPN, DML)
- DSL for performance queries (e.g., DQL)
- Comparison of performance modeling approaches

### ▪ **Joint Work**

- DSL for runtime adaptation (S/T/A)

## Project and Case Study Collaborations within SPP 1593



# iObserve



- Exchange of performance models and analyses
- Load testing environment (usage profile, driver, ...)
- New DevOps scenario and environment
  - Microservice-based version
  - Continuous deployment pipeline
- Many common topics (collaboration ongoing), e.g. DSLs, performance models and evaluation, and evaluation scenarios
- Co-evolution of performance models
- Knowledge transfer MDS
- (Incremental) performance evaluation

- Additional collaborations to be discussed here in Hannover ...

## Publications on Preliminary Work

- Walter, J., van Hoorn, A., Koziolok, H., Okanovic, D., and Kounev, S. **Asking “What?”**, **Automating the “How?”: The Vision of Declarative Performance Engineering**. In Proc. 7th ACM/SPEC International Conference on Performance Engineering (ICPE 2016, to appear).
- Brosig, F., Meier, P., Becker, S., Koziolok, A., Koziolok, H., Kounev, S. **Quantitative Evaluation of Model-Driven Performance Analysis and Simulation of Component-based Architectures**. *IEEE Transactions on Software Engineering (TSE)*, 41(2):157-175, 2015.
- Brunnert, A., van Hoorn, A., Willnecker, F., Danciu, A., Hasselbring, W., Heger, C., Herbst, N., Jamshidi, P., Jung, R., von Kistowski, J., Koziolok, A., Kroß, J., Spinner, S., Vögele, C., Walter, J., and Wert, A. (2015) **Performance-oriented DevOps: A Research Agenda**. Technical Reports of the SPEC Research Group, SPEC-RG-2015-01.
- Frey, S., van Hoorn, A., Jung, R., Hasselbring, W., and Kiel, B. **MAMBA: A Measurement Architecture for Model-Based Analysis**. Technical Report TR-1112, Department of Computer Science, University of Kiel, Germany, 2011
- Gorsler, F., Brosig, F., and Kounev, S.. **Performance Queries for Architecture-Level Performance Models**. In Proc. 5th ACM/SPEC International Conference on Performance Engineering (ICPE 2014).

## Publications on Preliminary Work (Cont'd)

- van Hoorn, A.. **Model-Driven Online Capacity Management for Component-Based Software Systems**. Dissertation, Faculty of Engineering, Kiel University. 2014.
- van Hoorn, A., Vögele, C., Schulz, E., Hasselbring, W., and Krcmar, H. **Automatic Extraction of Probabilistic Workload Specifications for Load Testing Session-Based Application Systems**. In Proc. 8th International Conference on Performance Evaluation Methodologies and Tools (ValueTools 2014), pages 139–146, 2014.
- van Hoorn, A., Waller, J., and Hasselbring, W. **Kieker: A Framework for Application Performance Monitoring and Dynamic Software Analysis**. In Proc. 3rd ACM/SPEC International Conference on Performance Engineering (ICPE '12), pages 247–248. 2012.
- Huber, N., van Hoorn, A., Koziolok, A., Brosig, F., and Kounev, S.. **Modeling Run-Time Adaptation at the System Architecture Level in Dynamic Service-Oriented Environments**. *Service Oriented Computing and Applications Journal (SOCA)*, 8(1):73-89, 2014.
- Kounev, S., Brosig, F., Huber, N. **The Descartes Modeling Language**. Technical report, Department of Computer Science, University of Wuerzburg, 2014
- Vögele, C., van Hoorn, A., and Krcmar, H. **Automatic Extraction of Session-Based Workload Specifications for Architecture-Level Performance Models**. In Proc. 4th International Workshop on Large-Scale Testing (LT 2015) @ ACM/SPEC ICPE 2015.