

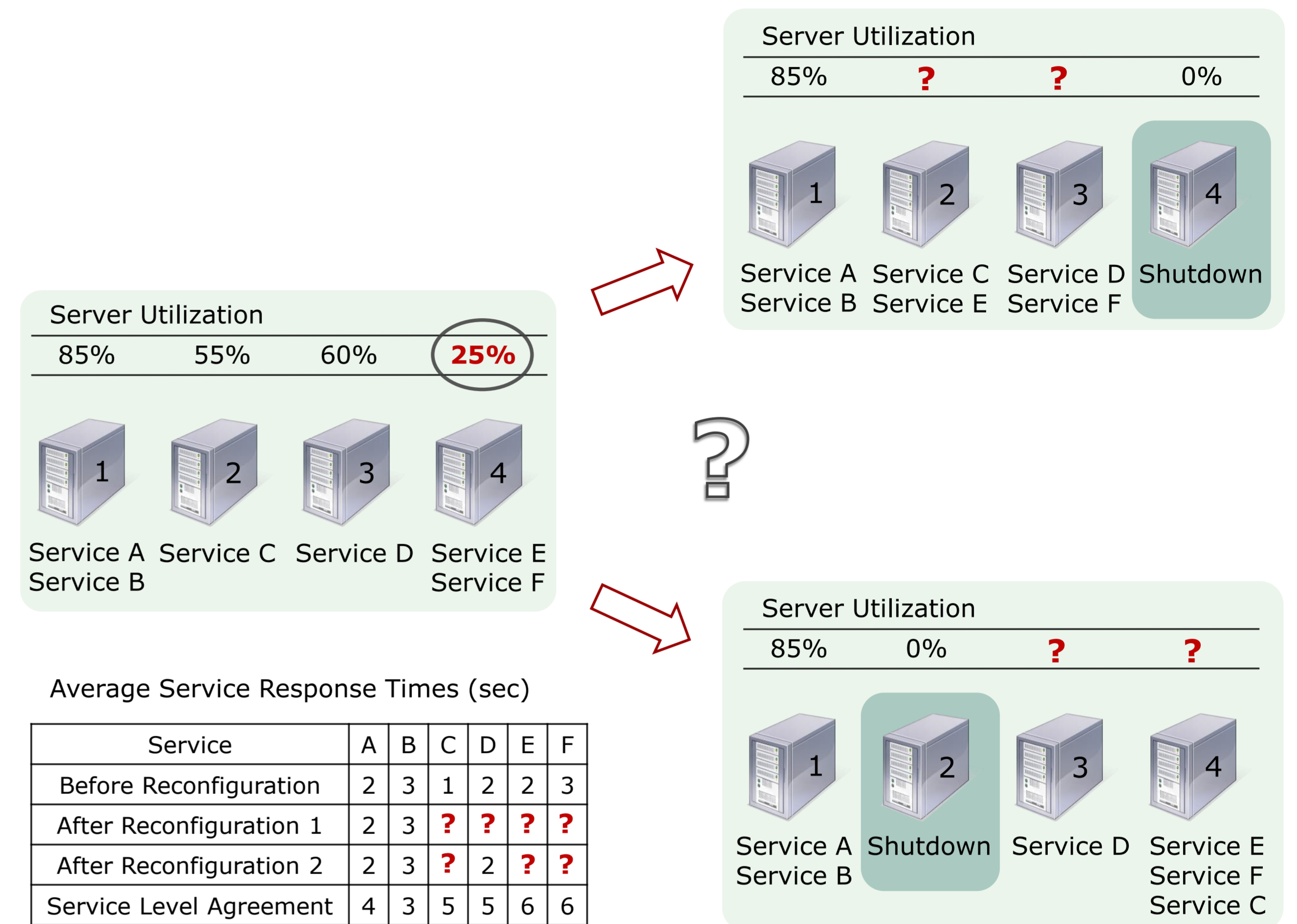
# Descartes Research Group

## Engineering of Self-Aware Software Systems



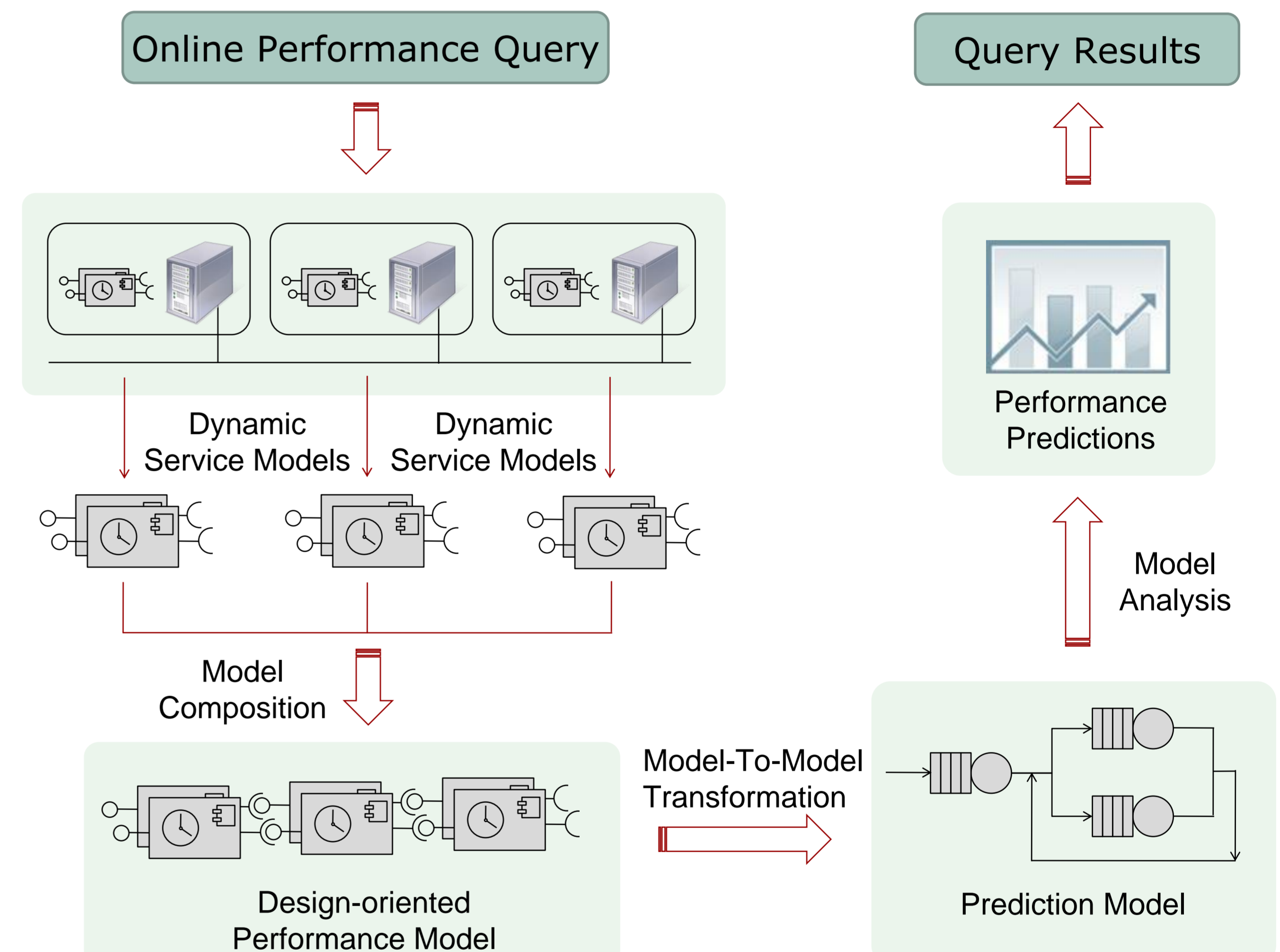
### Motivation

- Modern software systems increasingly complex and dynamic
  - Loosely-coupled highly-distributed and *dynamic* architectures
  - Multi-layered execution environments & virtualized infrastructures
  - Shift towards cloud computing (SaaS, PaaS, IaaS) platforms
  - Independent applications hosted on shared physical infrastructures
- Challenges
  - Lack of direct control over the underlying physical hardware
  - Dynamic resource allocations
  - New threats arising from the use of shared physical infrastructures
- Major showstoppers
  - General lack of trust in virtualized infrastructures & cloud computing
  - Inability to provide end-to-end quality-of-service guarantees
  - Overprovisioning leading to high TCO (Total-Cost-of-Ownership)



### Research Roadmap

- Long-term vision: *Self-aware* software systems that are
  - aware of their quality-of-service and resource efficiency and of the way they are influenced by the environment they are running in,
  - able to predict the effect of changes in the environment, e.g., changing workloads or resource allocations,
  - automatically adapting to such changes to enforce quality-of-service requirements and improve efficiency thus lowering TCO.
- Approach
  - Systems designed with integrated *dynamic* models
  - Models maintained and calibrated automatically during operation
  - Models used at run-time for quality-of-service management
- Benefits
  - Guaranteed end-to-end quality-of-service
  - Higher resource efficiency
  - Lower TCO (Total-Cost-of-Ownership)



"I think, therefore I am..."  
-- René Descartes

<http://descartes.ipd.kit.edu>

