Cost-Based Prevention of Violations of Service Level Agreements in Composed Services Using Self-Adaptation

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TALK OUTLINE

Outline

- Motivation

- Approach Overview

- Cost-Based Optimization

- Conclusions

MOTIVATION

Motivation –
Service Level Agreements

- **Service Level Agreements** (SLA)

  - Essential concept in service-based environments

- Contractual agreements about client-perceived quality

  - Violating SLAs is expensive (penalty payments!)

  - Hence: providers want to prevent SLA violations at runtime

- Questions:

  - How should a service provider decide if he should adapt?

  - **How should the provider decide, which actions to use?**

  - **Is it even economically beneficial to adapt?**

APPROACH OVERVIEW
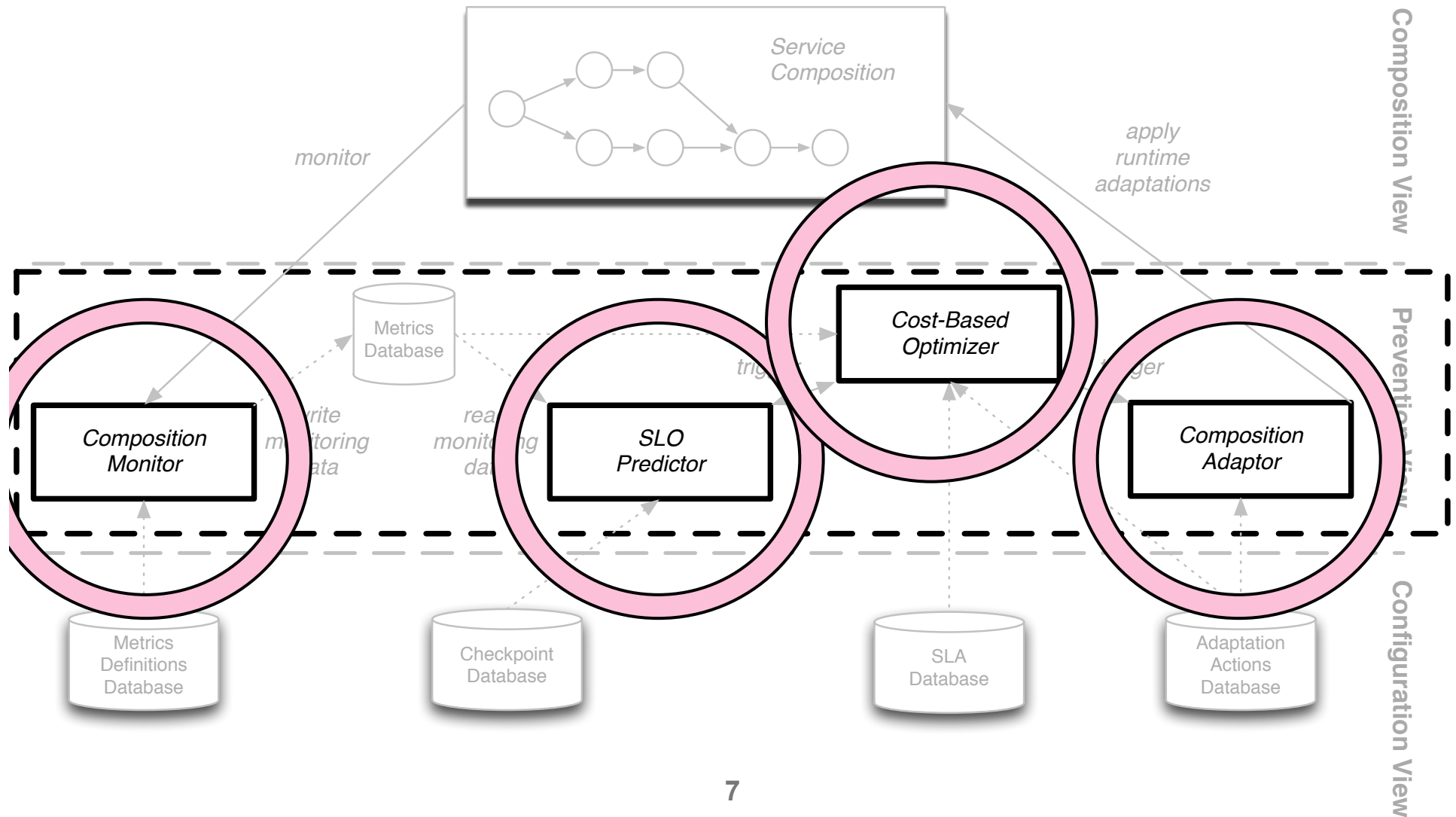
COST-BASED OPTIMIZATION

Cost-Based Optimization – Problem Formulation

- Minimize the predicted total costs (TC) for the service

$$TC(A^*) \approx v(A^*) + \sum_{s_x \in S} e_{sx}^i + \sum_{a_x \in A^*} c(a_x) \to min!$$

- Three terms:

  – Estimated costs of SLA violations

  – Costs of adaptation

  – Penalty term if incompatible actions should be applied

Cost-Based Optimization – Algorithms

- **Deterministic Algorithms:**

  – Branch and Bound

  – Does not scale to larger optimization problems

- **Heuristic Algorithms:**

  – Greedy Randomized Adaptive Search Procedure (GRASP)

  - Local optimization with 'smartly' selected start solutions

  – Genetic Algorithms

  – Memetic Algorithms

  - Combination of Genetic Algorithm and local optimization

Taxonomy of Adaptation Actions
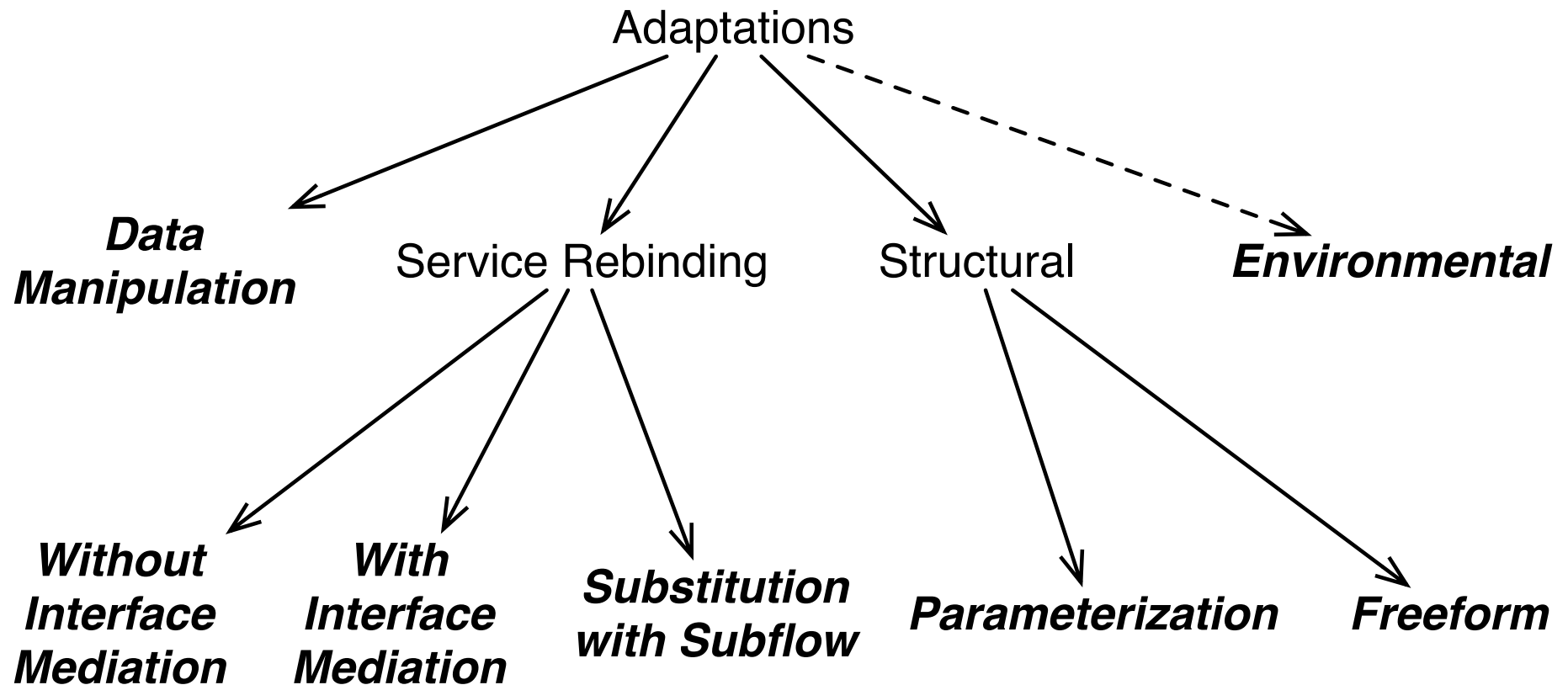
CONCLUSIONS

Conclusions

- **Summarizing …**

  – Autonomic computing approach to self-optimizing compositions

  – Automatically attempts to predict and prevent SLA violations

    - But only if it is cost-optimal to do so

- **Current caveats:**

  – Only instance-level SLOs (no aggregated SLOs)

  – No environmental adaptation

  – Some implicit cost factors (e.g., customer satisfaction) not considered

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