

Combining SLA Prediction and Cross Layer Adaptation for Preventing SLA Violations

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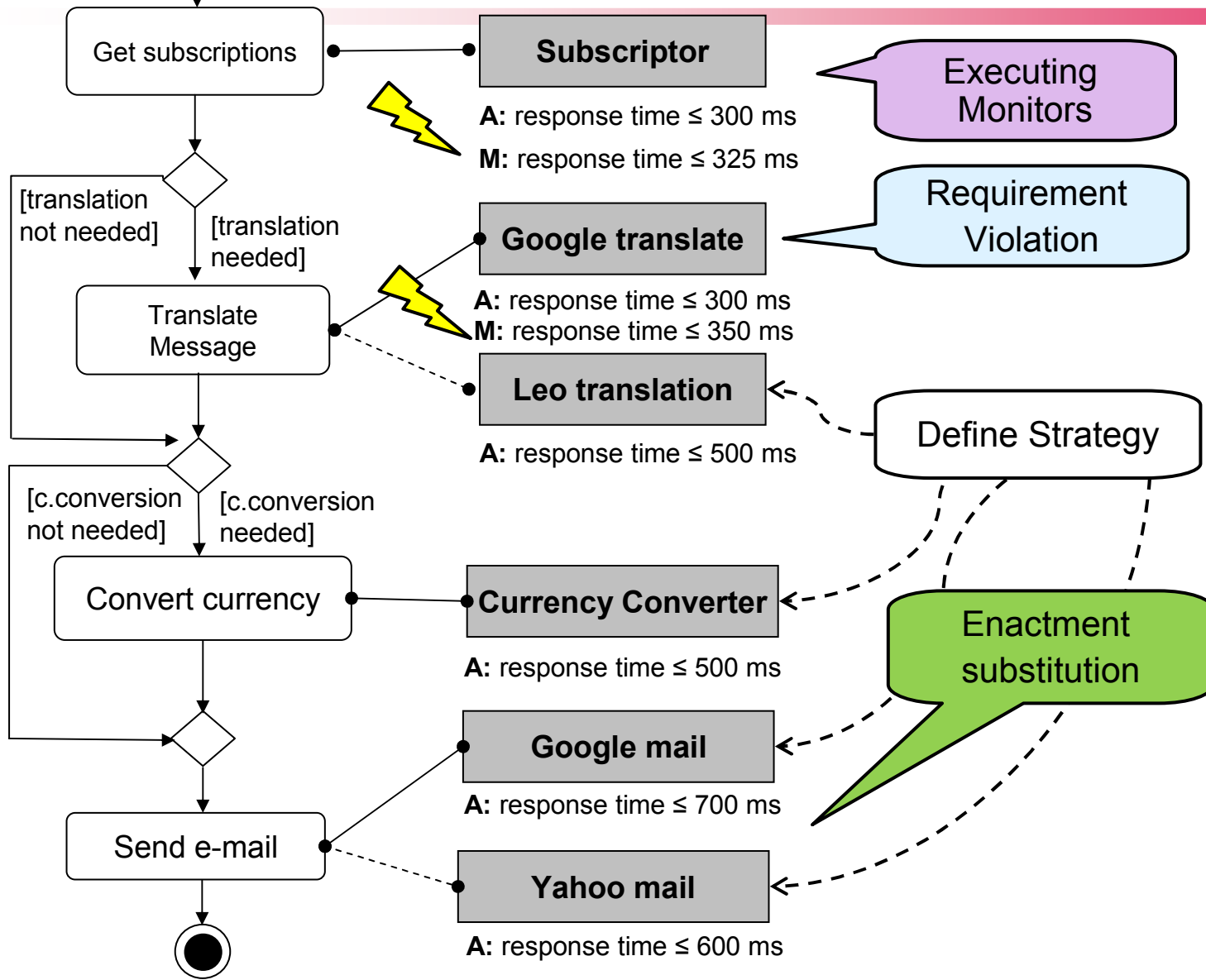


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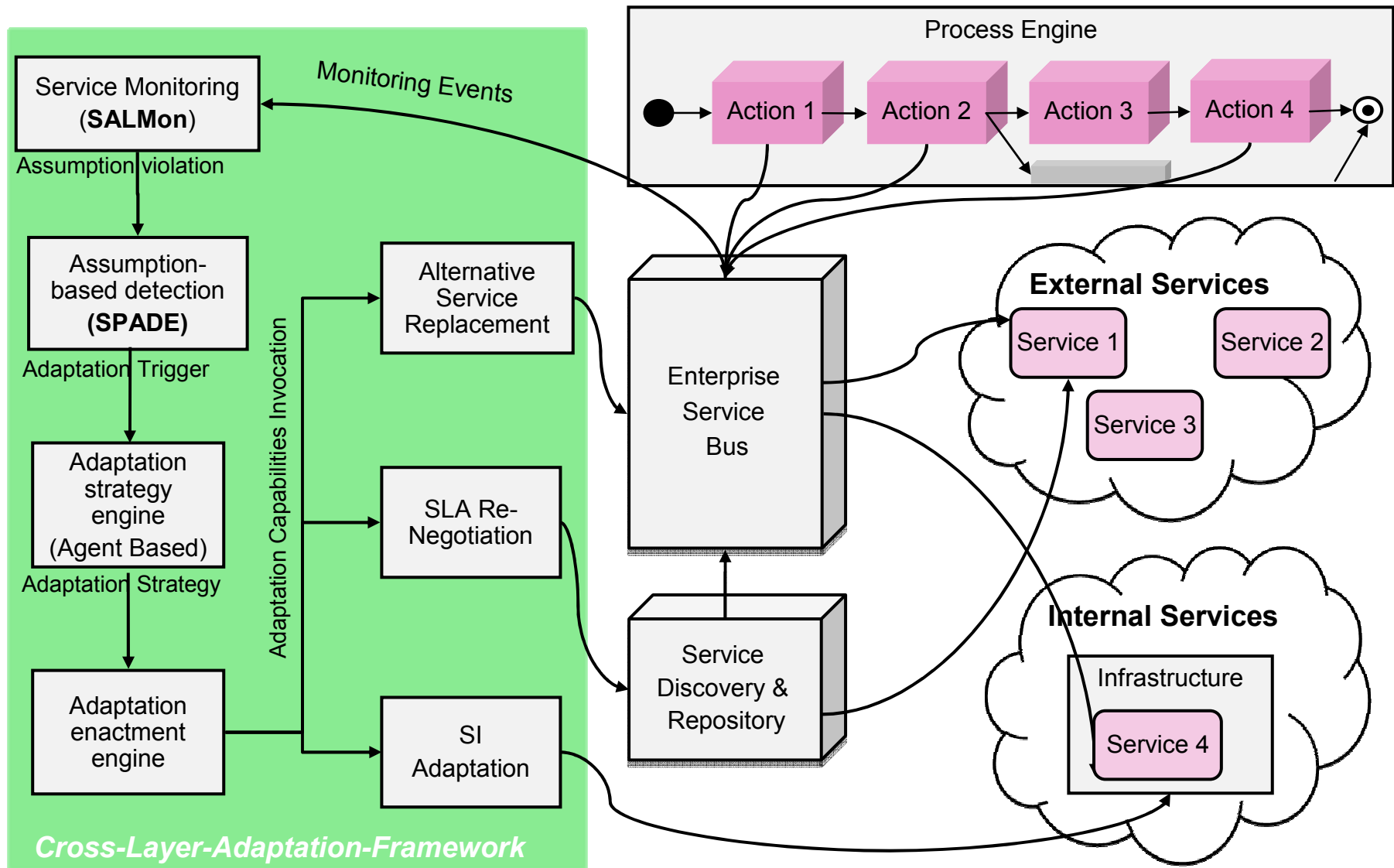


- Service-based Applications (SBA) are typically deployed in highly dynamic and distributed settings
 - Parts of the executing environment are controlled by various third parties
- Adaptation is needed on all layers
 - Business Process Management: end-to-end QoS
 - Service Composition and Coordination: service compositions
 - Service Infrastructure (SI): individual service executions
- Problem: SLA violations are costly -> need to avoid those
 - Existing cross-layer adaptation mechanisms are reactive
 - Existing SLA violation prevention mechanisms are limited

● R = 1850 ms



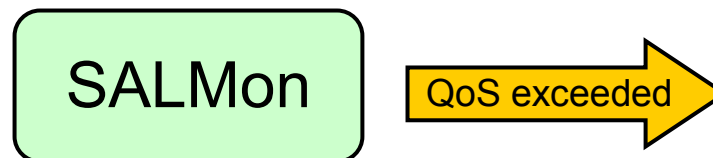
Architectural view



Service monitoring



- SALMon is able to
 - monitor the QoS of services in a Service Based Application (SBA)
 - check if the measured QoS matches with expected values
 - monitor process KPIs like end-to-end response time
- SALMon accepts registrations for notifications in case of QoS metrics reaches given thresholds

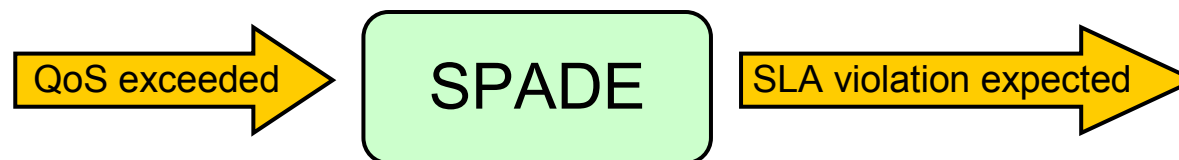


Assumption-based detection of adaptation needs



■ SPADE

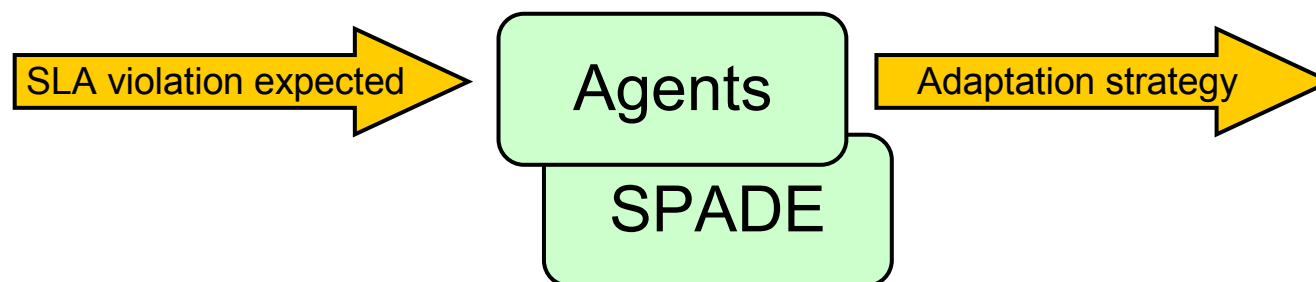
- evaluates the impact of the violated assumptions on the corresponding application requirement
 - SPADE performs a run-time verification of the process model against the requirements
- If overall requirements are still satisfied, then the execution is continued. Otherwise the adaptation strategy engine is invoked.



Adaptation Strategy Engine



- Multi-agent platform
 - Process Agents are responsible for the proper and timely execution of service compositions
 - Internal and external services are represented by Service Agents, responsible for individual service executions and their adaptations
- Adaptation strategy
 - Adaptation need is signaled by the monitoring component
 - Possible solutions and final selection are collected using agent negotiation mechanisms



Adaptation capabilities



- Service replacement
 - Automatic run-time service discovery for replacement candidates
 - Selection based on structural, behavioral and quality characteristics of services
 - The actual service replacement is performed via the ESB by rerouting the service invocations to the replacing service.
- SLA re-negotiation
 - The SLA negotiation broker performs the SLA negotiation for each candidate service
 - The QoS characteristics of each candidate service are negotiated in order to achieve the best possible SLA
- Service Infrastructure Adaptation
 - Modify the infrastructure executing services: change host, assign more CPU time, etc.
 - Applicable for services running in the infrastructure managed by the framework

Conclusions

- **Novelties**
 - Combination of SLA violation prevention with cross-layer-adaptation
 - Use of all SBA layers for SLA violation prevention
 - Multiple adaptation mechanisms

Thank you!

It's time for **questions!**

Further info:

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