



Meeting Quality of Service Requirements

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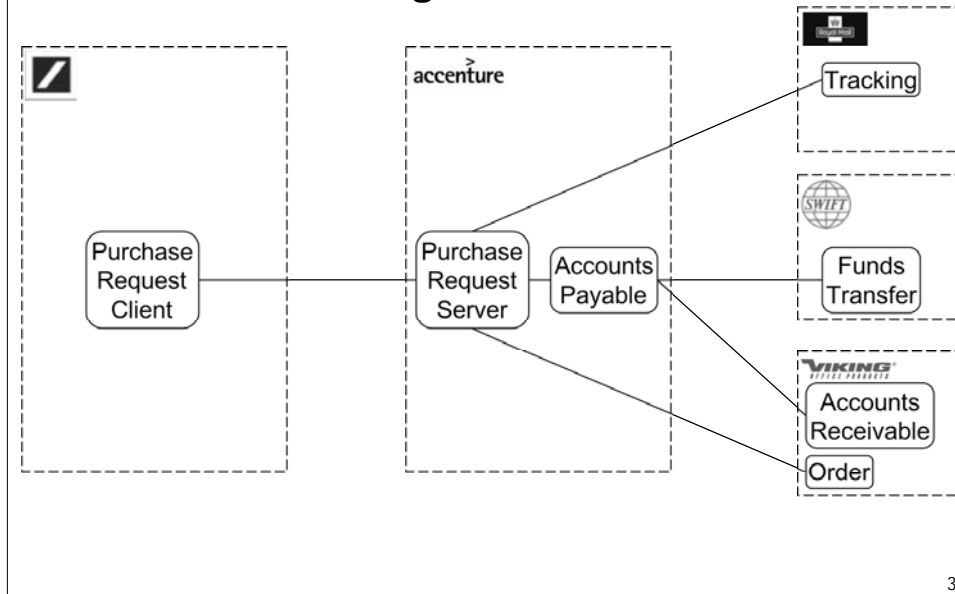


Setting the scene

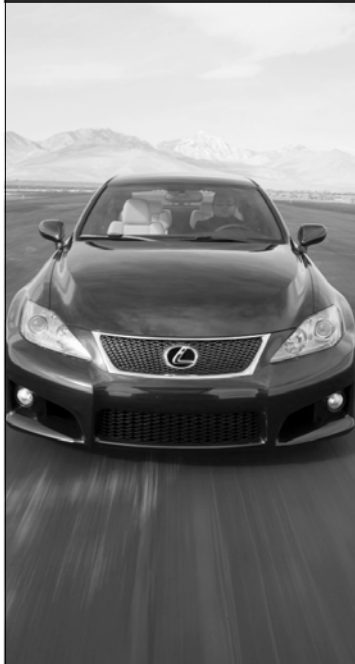
“Deutsche Bank AG has agreed to outsource two internal business processes to Accenture Ltd. as part of its ambitious program to cut costs and increase efficiency by moving non-core operations to external service providers. Under the service agreement announced Thursday, Deutsche Bank will outsource its worldwide corporate purchasing and accounts payable services to Accenture. The global consultancy and software development group, located in Hamilton, Bermuda, will provide IT systems and tools to manage the bank's entire procurement-to-payment process.”

[Source: IDG, 30 Jan 2004]

Setting the scene



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Quality of Service in SOAs

- Current SOA standards mainly focus on functionality
- But organizations depend on quality of services provided by external providers
- Their service needs to be delivered with agreed quality
 - Availability / Timeliness
 - Reliability
 - Confidentiality
 - Integrity, ...

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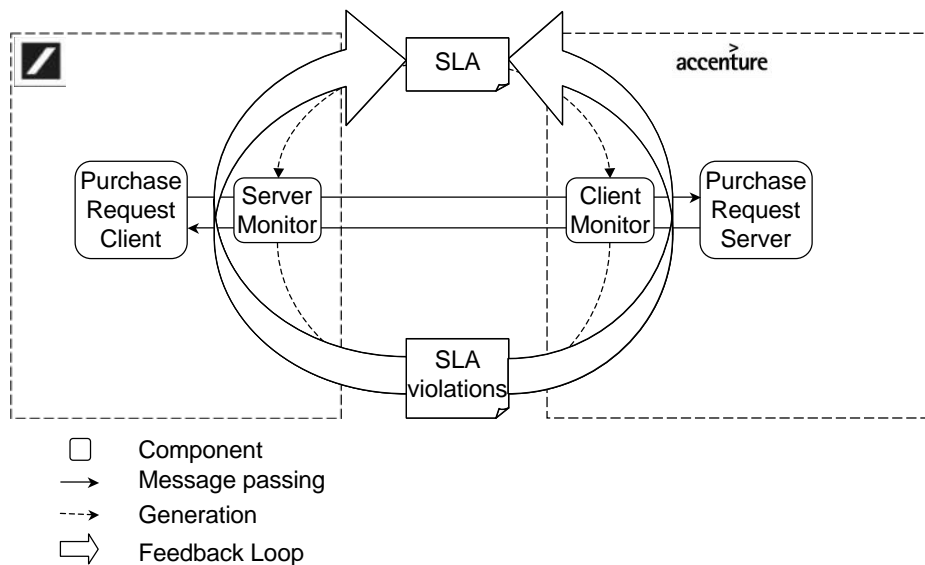


QoS Management

- Testing alone insufficient because service dependability determined by
 - Resource provision available in the run-time environment
 - Service usage profile
 - Dependability of 3rd party providers
- For services, we need to
 - have quality norms and standards
 - know how to measure quality
 - have continuous quality monitoring
 - use quality criteria for service selection
- These need to be reified at run-time

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Quality of Service Management in SOAs



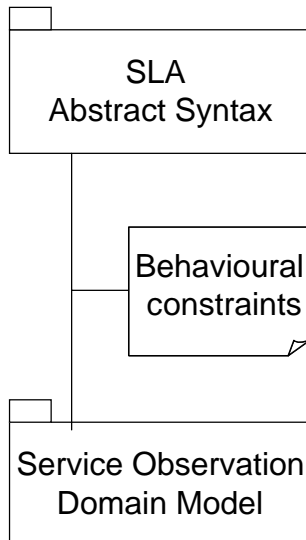
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Service Level Agreements

- Associate penalties to aberrant service behaviour
- Are often part of service delivery contracts
- Mitigate risk
- Previously mostly written in natural language
 - Ambiguous
 - Incomplete
 - Inconsistent
- We focus on SLAs in formal languages

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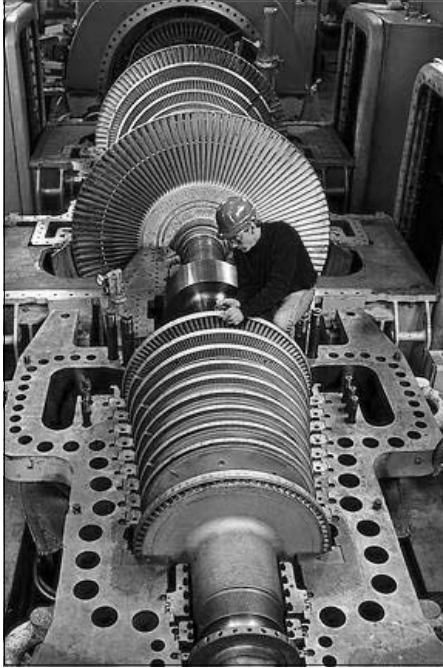


SLA Language Engineering

- Aim: defining precise and unambiguous SLAs language
- Use OMG's Meta Object Facility (MOF) to define
 - Abstract syntax of SLA language
 - Service observation domain model
- Define semantics of SLA language in model denotational style
 - Behavioural constraints between syntax and domain model

See: J. Skene, D.D. Lamanna and W. Emmerich: Precise Service Level Agreements. Proc. ICSE 04

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Generating SLA Monitors

- SLAs machine readable
- MOF gives standard representation
- Idea: Generate monitoring component from SLA
- Given service observation data monitor decides whether actual service level complies with SLA

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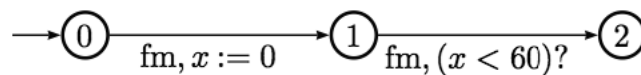
Key idea

- SLAs concern many timeliness constraints:
 - Latency
 - Input and Output Throughput
 - Reliability
 - Availability
- Events can be intercepted and time stamped without changing web service requester and provider
- Monitors can be expressed using *timed automata*
- Detection of SLA violations reduces to acceptance of timed words that consist of timed events

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Expressing Web Service Reliability Constraints

- Negate constraint (i.e. timed automaton accepts timed word that indicates non-reliability)
- In this example, no more than one failure occurrence (fm) per minute.



- Online monitoring per transition is efficient (constant in number of outgoing transitions per state).

See: F. Raimondi, J. Skene, W. Emmerich & B. Wozna: A Methodology for On-line Monitoring Non-Functional Requirements Specifications of Web Services. Proc. PROVECS Workshop at Tools Europe. Zurich. 2007.

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Research Questions

- Compositionality
 - E.g. integrate SLAs into BPEL
- Are SLA parameters safe?
 - Use quantitative model checking?
- Does candidate architecture live up to an SLA
 - Integration of SLAs with performance/load testing

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