

Empowering the Service Economy with SLA-aware Infrastructures in the project **SLA@SOI**

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Ramin Yahyapour
Technische Universität Dortmund.

Vision

- A business-ready service-oriented infrastructure empowering the service economy in a flexible and dependable way.

Business-readiness requires

- predictability & dependability → prerequisite for acceptance & uptake of (new) services
- holistic SLA management → transparent IT management
- automated negotiation → dynamic, scalable service consumption

Impact on the knowledge economy

- decreased time to market for new services
- increased productivity and competitiveness
- lower entry barriers, especially for SMEs

Service Consumer

- dynamic demand for complex business solutions at low costs

Flexible usage
Business
Services

Software Provider

- SOAs provide unprecedented flexibility

Engineering of
predictable
services

Service Provider

- service economy requires dependable services

Automated SLA
negotiation and
management

Infrastructure Provider

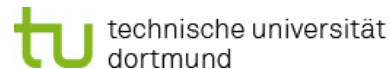
- virtualization technologies allow for adaptive SOIs

SLA enforcement
via adaptive
infrastructures

Vision of SLA@SOI

A business-ready
service-oriented
infrastructure
empowering the
service economy
in a flexible and
dependable way

SLA@SOI Project



POLITECNICO DI MILANO



DIPARTIMENTO DI ELETTRONICA E INFORMAZIONE



Duration

- June 2008 – May 2011

13 Partners

- 6 industrial, 1 SME, 4 academic, 2 research centres
- 7 countries: Austria, Germany, Ireland, Italy, Slovenia, Spain, United Kingdom

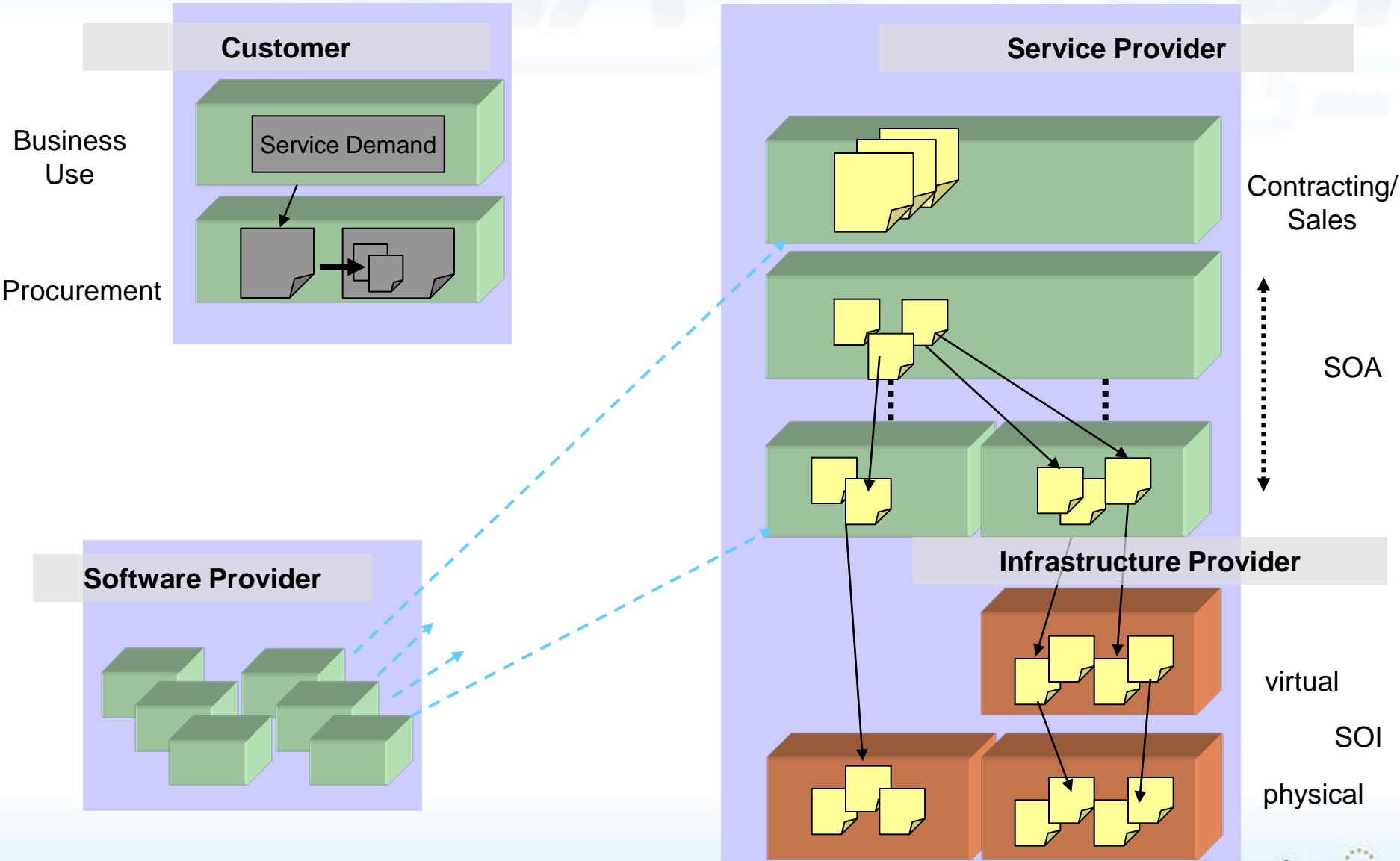
Budget

- 15.2 M€

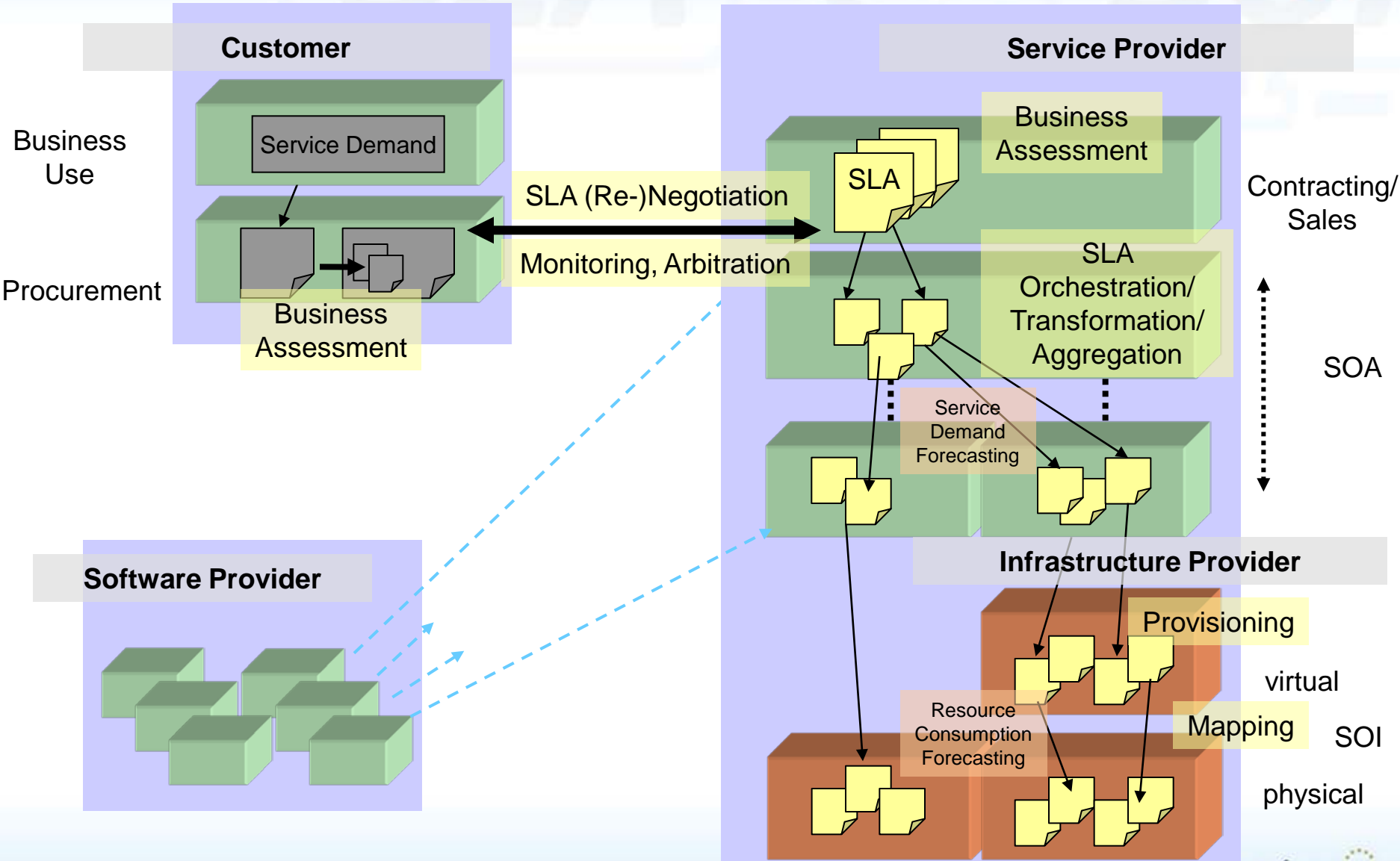
Info

- <http://www.sla-at-soi.eu>

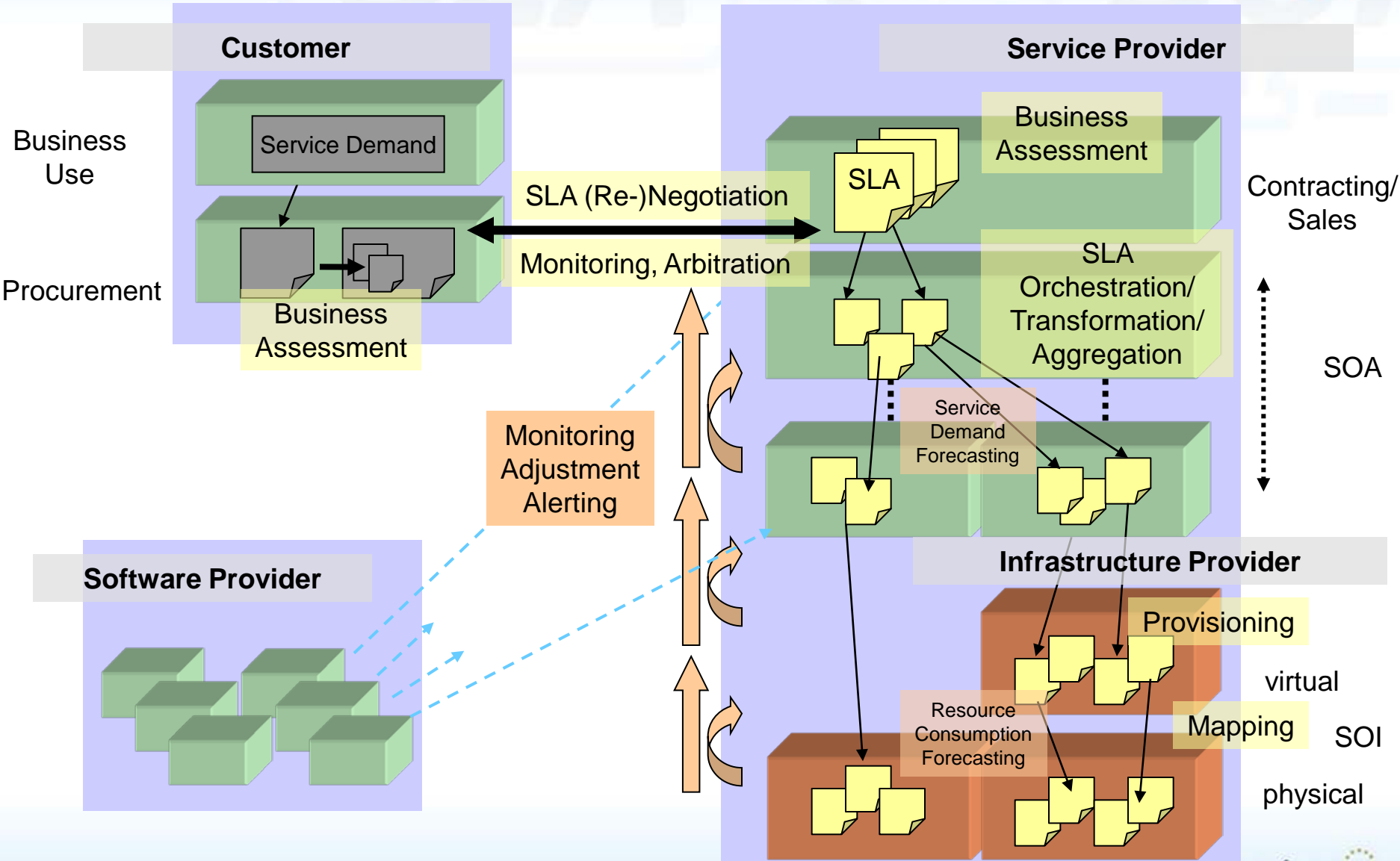
Envisioned Interaction

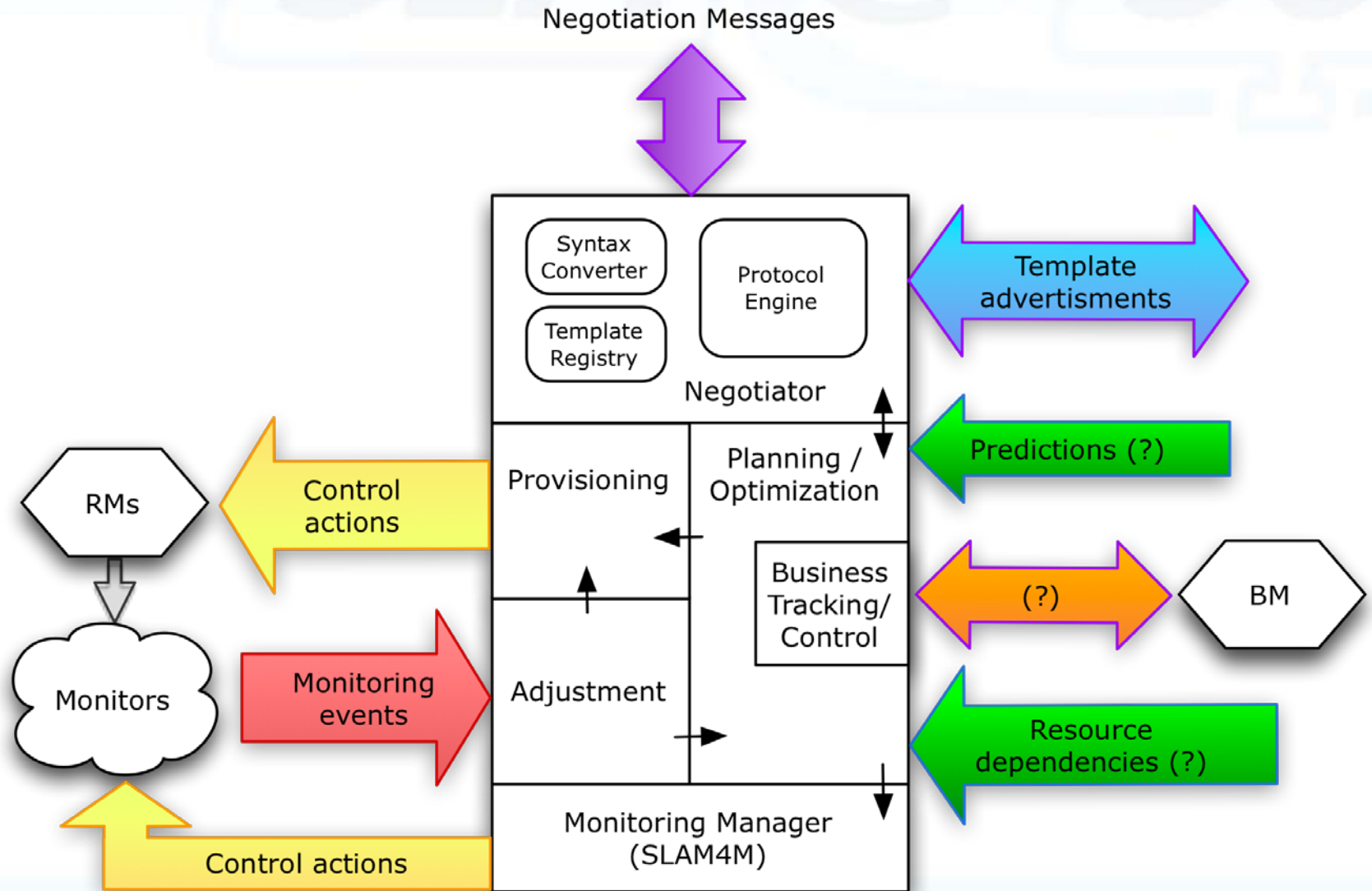


Envisioned Interaction



Envisioned Interaction





Main innovations

- **SLA management framework**
 - ◇ harmonizing perspectives of relevant stakeholders (software/service/infrastructure provider and customer)
 - ◇ standards for SLA specification and negotiation & systematic multi-layer SLA management (planning, optimization, and provisioning), monitoring and accounting
 - guaranteed QoS in a dynamic and end-to-end fashion via consistent SLA handling across IT stack
- **adaptive SLA-aware infrastructures**
 - ◇ standardized interfaces for adaptive infrastructures with harmonized access to different virtualization technologies.
 - ◇ advanced technologies for SLA enforcement on infrastructure level
 - efficient resource usage w/ reliable SLA enforcement at infrastructure level
- **engineering methods for predictable service-oriented systems**
 - ◇ modelling techniques and prediction tools for SOA and SOI components
- **business management suite for e-contracting**
 - ◇ covers complete business lifecycle of a service provisioning/delivery

Multiple service types hosted

- Communications,
- Social networking, media, entertainment,
- Enterprise.

On a heterogeneous infrastructure :

- Data centres, grid,
- Wired, wireless.

With associated diversity of :

- Margin and profitability,
- Customer expectations and satisfaction requirements,
- SLA 'levels' – platinum ... bronze ... etc,
- Workload patterns and scheduling / provisioning requirements.

Constraints

- Internal governance
 - ◇ Logging for billing,
 - ◇ Auditability,
 - ◇ Licensed product management.
 - Internal efficiency
 - ◇ Managed resource consumption,
 - ◇ Utility cost minimisation,
 - ◇ Operational cost minimisation,
 - ◇ And third party resources and services.
 - External events
 - ◇ 'Slashdot effect',
 - ◇ Resource failure,
 - ◇ SLA adjustments.
- planned
- unforeseen

Constraints expressed in Service Level Objectives

- 'Make composite resource available between 09:00 and 11:30.'
- 'Complete processing of a daily data transformation by 14:00.'
- 'Sustain average throughout of 3000 transactions/hour.'
- 'Peak throughput of 150 transactions/minute for up to 10 minutes.'

Statistical constraints

- 'deliver 99.98% availability'
- 'ensure <1% transaction timeouts'
- 'ensure 90% transactions complete within 1sec.'

Complex provisioning challenge

Normal lifecycle

- Negotiation → planning/optimisation → provisioning → execution
- Monitoring provides a feedback loop for adjustment at run time.

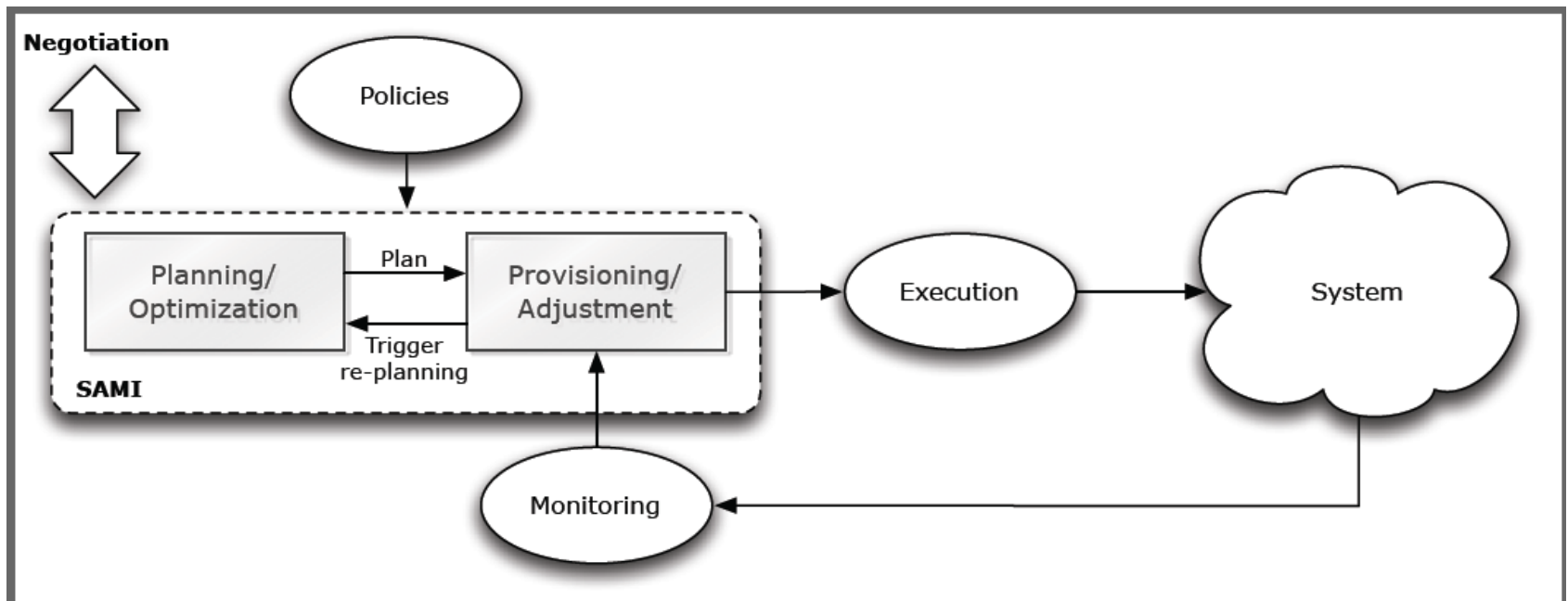
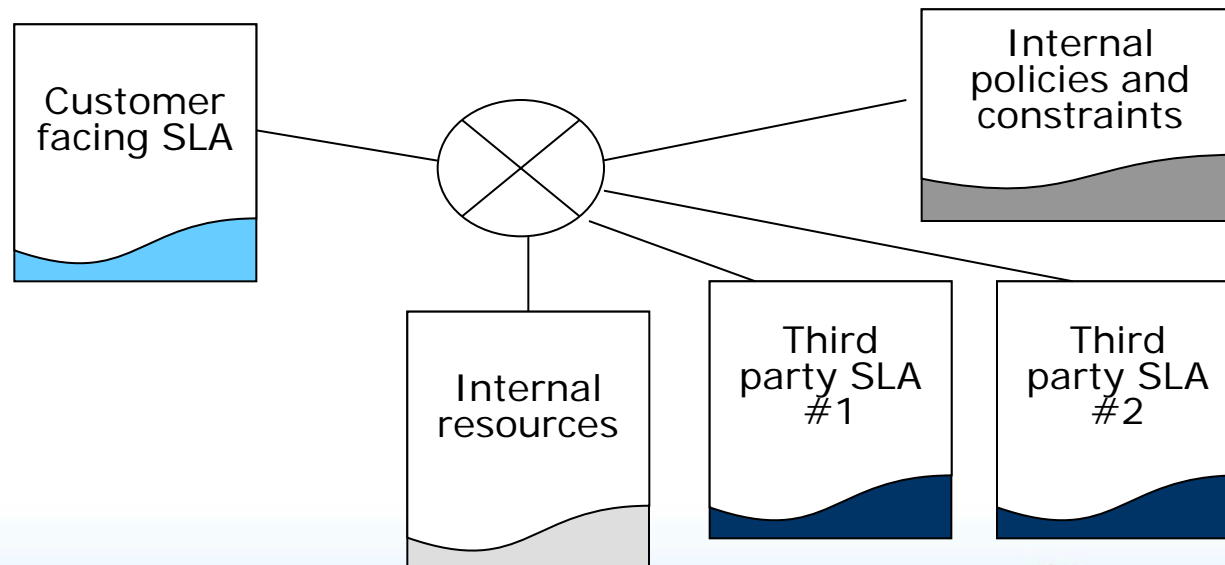


Diagram : SLA@SOI internal reference

Implications from service level objectives –

- Selection and configuration of individual resources based on performance and cost.
- Statistical likelihood of SLA compliance with end customer.
- Calculation and expression of SLOs, negotiation of SLAs with third party providers.
- Final orchestration and provision of service to end customer.



Run time phase

Proactive adjustment

- Predictive analysis of monitoring data.
- Adjustment –
 - ◇ Dynamic resource allocation to any part of the service chain.
 - ◇ Full re-provisioning of any part of the service chain followed by re-orchestration.

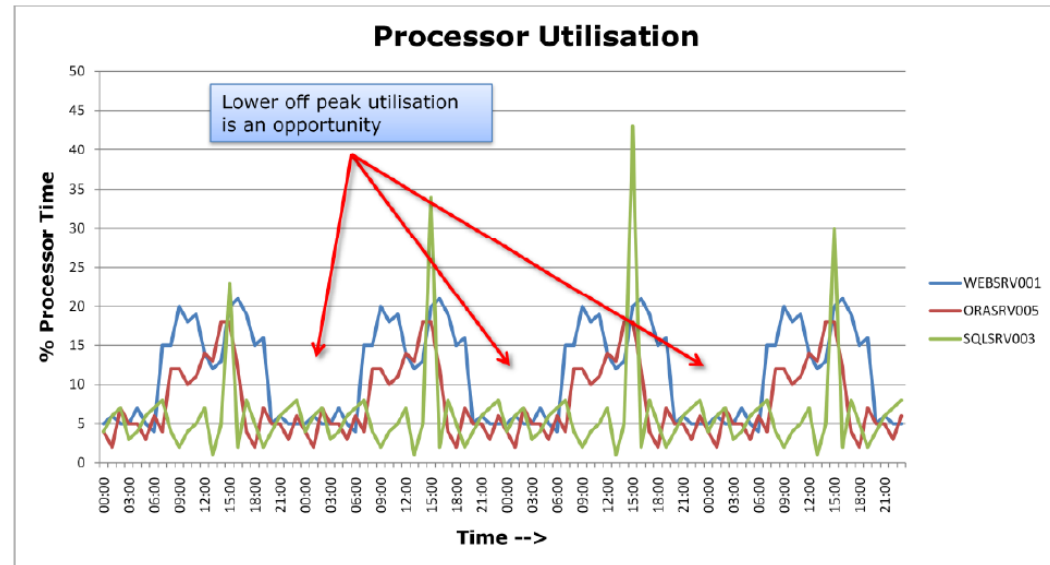


Diagram : SLA@SOI Use Case Specification - Enterprise IT.

Reactive adjustment

- Recovery from failure.
- Adjustment –
 - ◇ Full re-provisioning of any part of the service chain followed by re-orchestration.

Complexities

- Management of SLO parameter variation
- Mapping of provided vs. consumed resources SLAs.
- Workload patterns and variations,
- Internal policy objectives and constraints.

Responses

- Prediction, reasoning and optimisation
- SLA encapsulated elasticity rules
- Run time SLA adjustment
- Automated SLA (re)negotiation

Tangible Results

- Providing a complete SLA management model ad framework
- Adapted and verified by several industrial use cases
- Supporting NEXOF

Thank you!

<http://www.sla-at-soi.eu>