



# Optimis

## OPTIMIS: Improving Cloud Management With Dynamic SLAs

Salt Lake City, July 18

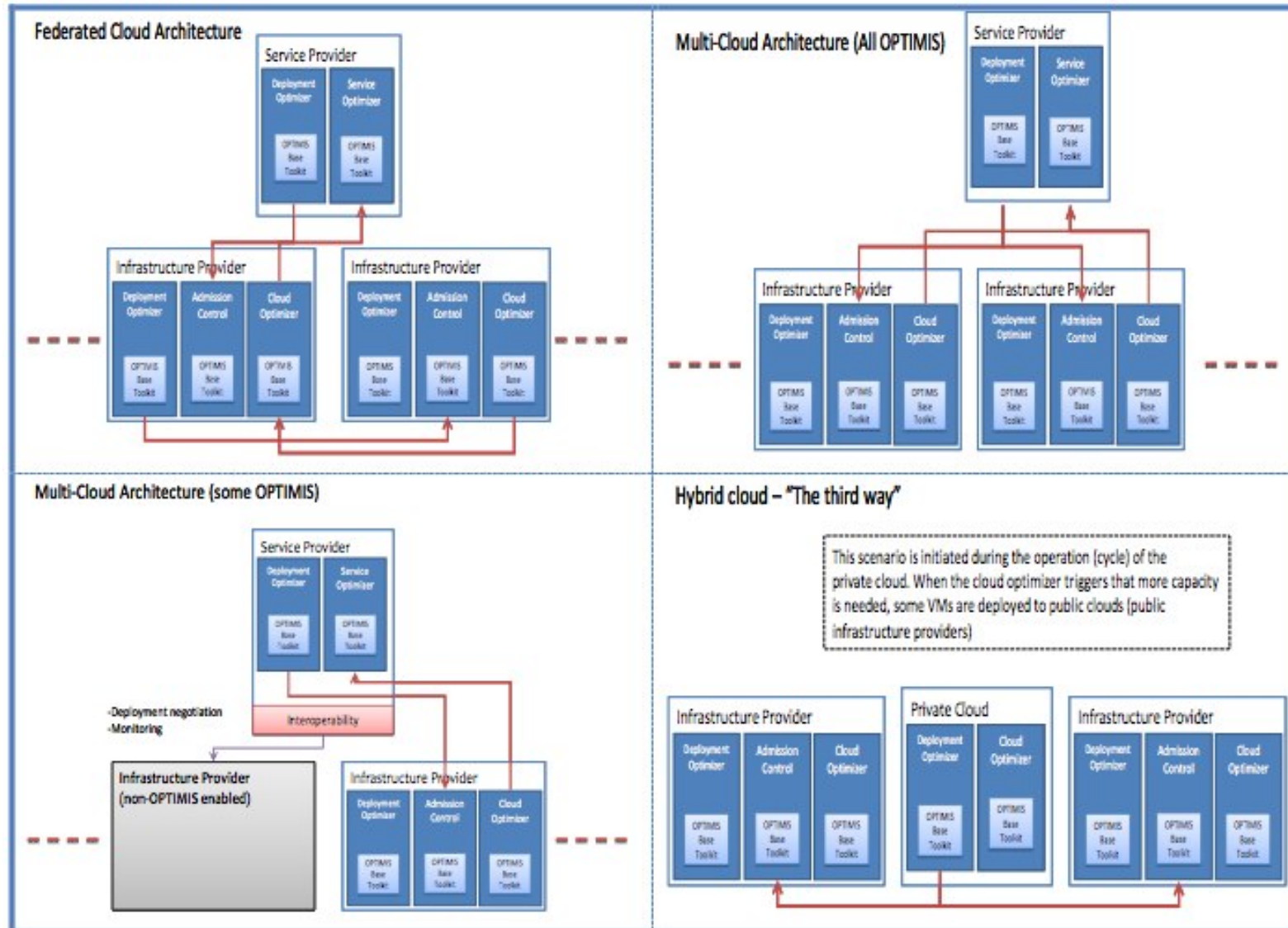
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# OPTIMIS Project

- IP 5th call
- June 2010 - May 2013
- 13 Partner
  - Atos Origin SAE
  - Umeå University
  - The 451 Group
  - Universität Stuttgart
  - National Technical University of Athens
  - Barcelona Supercomputing Center
  - SAP
  - Fraunhofer Institute for Algorithms and Scientific Computing
  - University of Leeds
  - Leibniz University of Hanover
  - Flexiant
  - British Telecom
  - Arsys
- Total cost: 10.533K€

# OPTIMIS Scenarios



## SLA use in OPTIMIS

- Provide SLA-aware infrastructure services with extended QoS capabilities
  - SLAs between infrastructure providers and service providers
- Support for self-\* and elasticity
- Definition and standardisation of new term languages
  - Trust
  - Risk
  - Eco-efficiency
  - Cost
  - Data security & legal constraints
- SLAs based on Service Manifest of the Service Provider

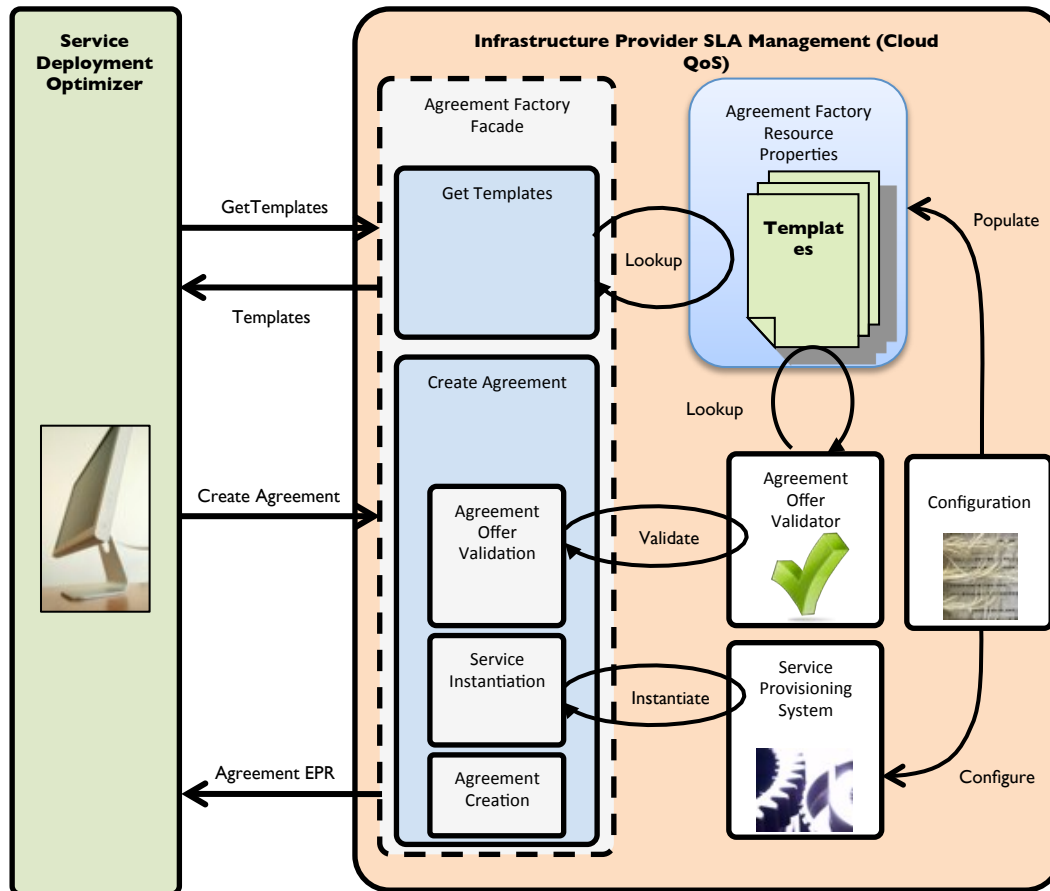
# OPTIMIS SLA Management

## Cloud QoS

- OPTIMIS SLA Management
  - Standard compliant SLA Management component
  - Full support of the OGF WS-Agreement specification
  - SLA Negotiation supported through WS-Agreement Negotiation
  - Based of the WSAG4J SLA Management Framework developed at Fraunhofer SCAI
- Functionality of the SLA Management Layer
  - Mediates between SDO and IP components
  - Negotiates IP services and triggers deployment
  - Basic integration with IP components for service deployment implemented
  - Integration of SLA monitoring planned for year 2
- Innovations
  - Support of TREC parameters as part of the SLA
    - Enables self-management and self-optimization operations based on TREC parameters
  - Dynamic SLA creation, monitoring and accounting
    - Rule-based definition of SLA guarantees
  - Dynamic detection of SLA compliance and violations
    - Trigger self-management and self-optimization actions in order to prevent SLA violations
    - Triggers accounting in case of SLA violation

# SLA Management

## SLA Creation



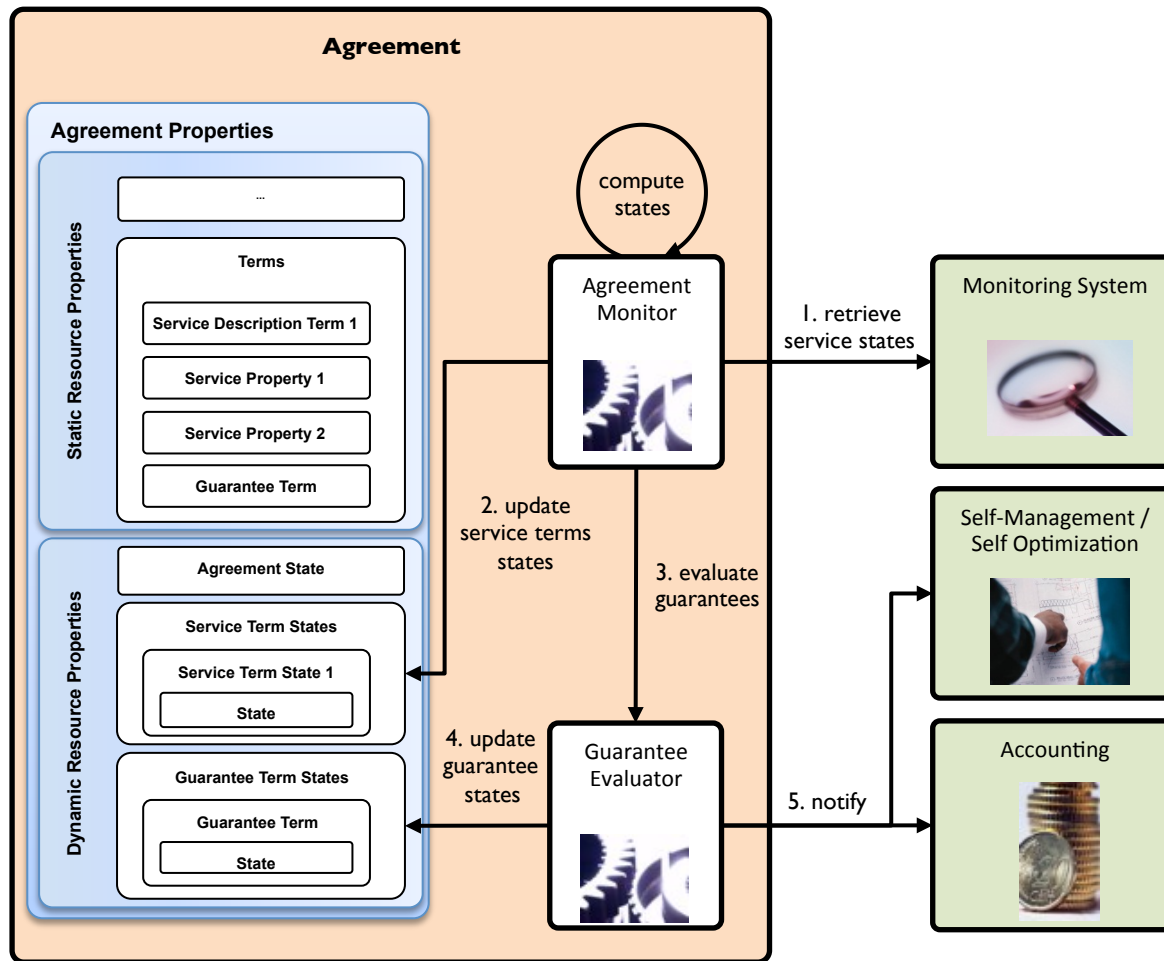
### SLA Validation

- Template based creation of SLAs
- Templates contain restrictions on valid agreement offers
  - Structural restrictions, i.e. which element must be contained in the offer and how often
  - Value restrictions, i.e. what are valid values for specific elements
- Enforcement of offer integrity
  - Constraint validation before service instantiation
  - Protection of IP components

### Service Instantiation

- Admission of services done by IP admission control component
- Deployment agreed services initiated by IP cloud optimizer

# SLA Management Monitoring

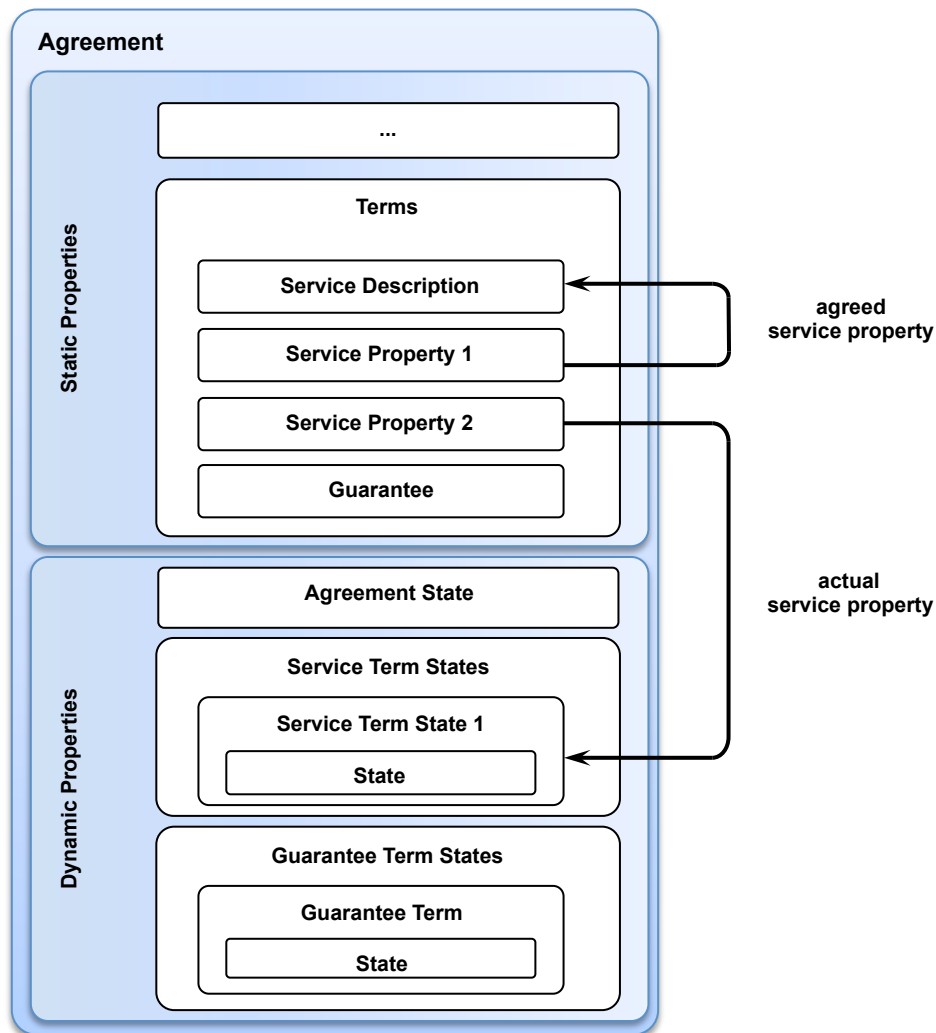


## SLA Monitoring

- Periodical monitoring of deployed services and guarantees
- Guarantee states are computed based on definition in SLA
- Guarantees can specify either an importance or monetary values
- Penalties and rewards with monetary values result in notifications to an accounting system
- Penalties and rewards with an importance result in notifications to the self-management and self-optimization components

# SLA Management

## Monitoring of SLAs



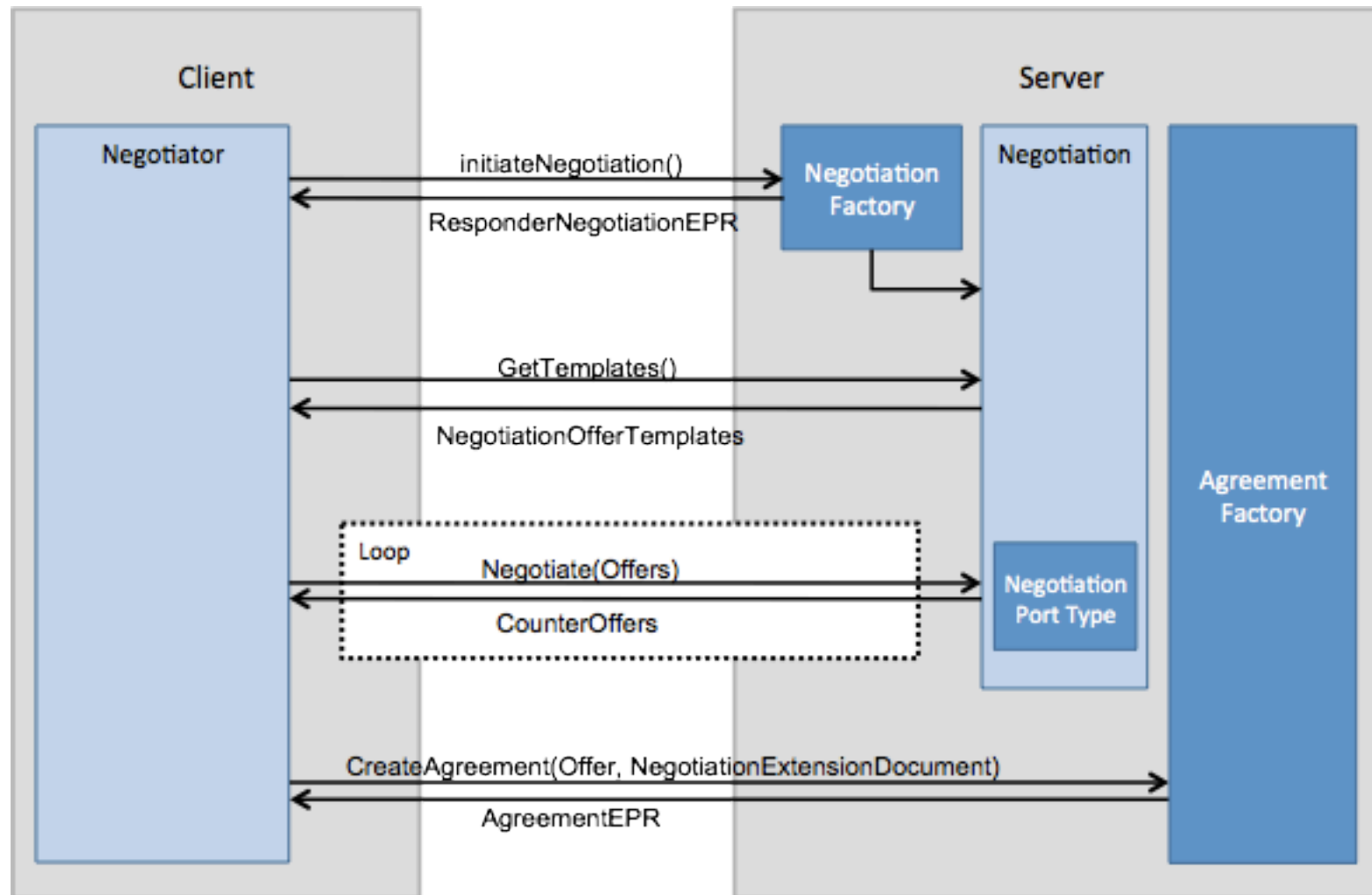
### Static Properties

- **Service Description**
  - Specify the user requirements on the service provisioning process
  - Can be changed by the user with respect to the agreement creation constraints
- **Service Properties**
  - Define variables in order to resolve static and dynamic property values
  - Are used to define the service level objectives in SLA guarantees
- **Guarantees**
  - Specify service level objectives
  - Define self management events and accounting models in form of penalties and rewards

### Dynamic Properties

- **Service Term States**
  - Dynamically generated during SLA monitoring
  - Contain detailed information on the current service delivery
- **Guarantee Term States**
  - Are automatically evaluated by the SLA management
  - Accounting and Self-management capabilities are triggered based on evaluation results

# SLA Negotiation

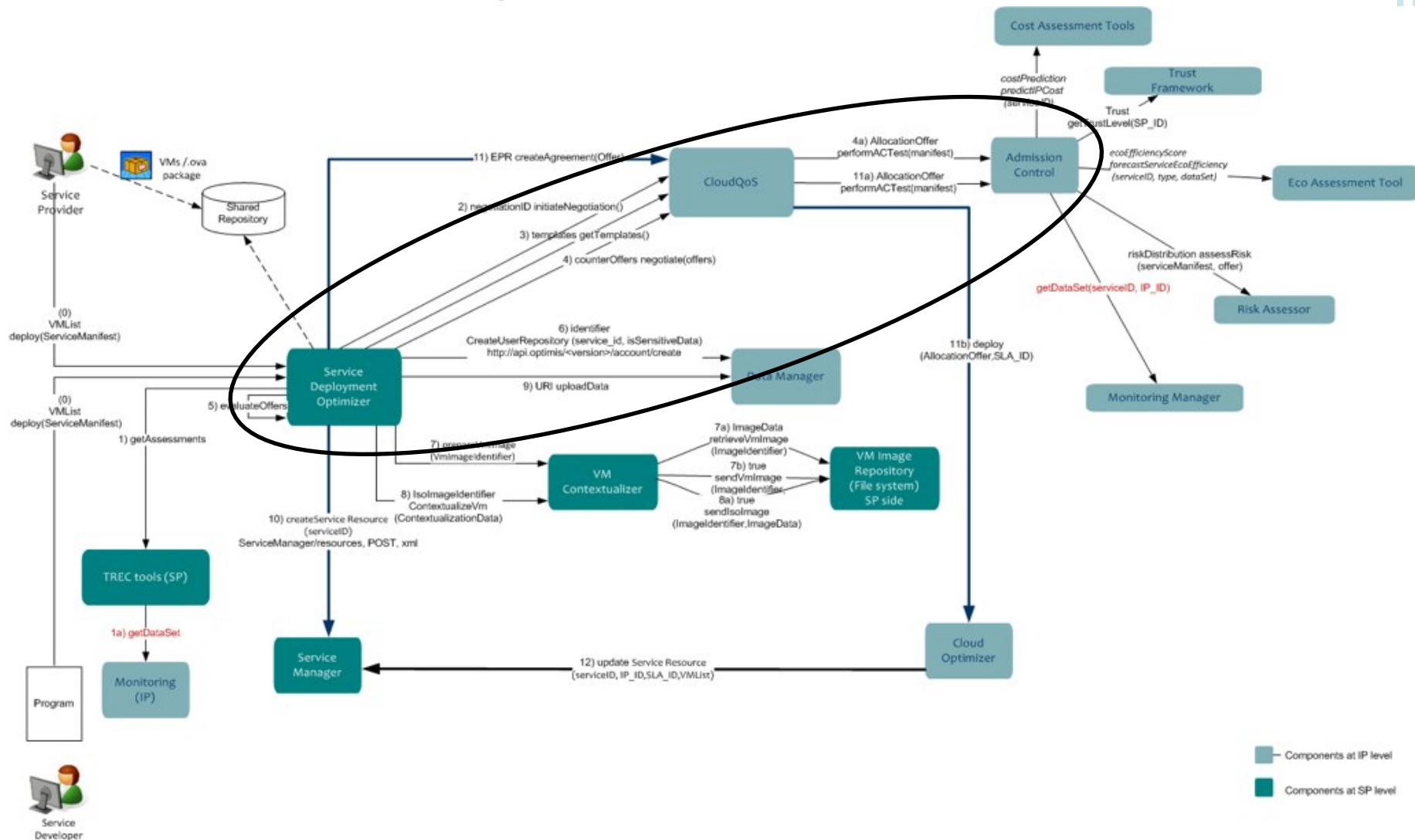


# OPTIMIS Service Manifest

Service

```
<opt:ElasticitySection>
<ws:ServiceDescriptionTerm ws:Name="TREC" ws:ServiceName="MultipleImages">
  <opt:TRECSection>
    <opt:TrustSection>
      <opt:TrustLevel>5</opt:TrustLevel>
    </opt:TrustSection>
    <opt:RiskSection>
      <opt:AvailabilityArray>
        <!-- defines a minimum availability of the VM of 98% at a day -->
        <opt:Availability opt:AssessmentInterval="P1D">98</opt:Availability>
        <!-- defines a minimum availability of the VM of 99% at a month -->
        <opt:Availability opt:AssessmentInterval="P1M">99</opt:Availability>
      </opt:AvailabilityArray>
    </opt:RiskSection>
    <opt:EcoEfficiencySection>
      <opt:LEEDCertification>NotRequired</opt:LEEDCertification>
      <opt:BREEAMCertification>NotRequired</opt:BREEAMCertification>
      <opt:EuCoCCompliant>false</opt:EuCoCCompliant>
      <opt:EnergyStarRating>No</opt:EnergyStarRating>
    </opt:EcoEfficiencySection>
    <opt:CostSection>
      <opt:Price opt:currency="EUR">100.00</opt:Price>
    </opt:CostSection>
  </opt:TRECSection>
</ws:ServiceDescriptionTerm>,
  <opt:EncryptionAlgorithm>AES</opt:EncryptionAlgorithm>
  </opt:DataEncryptionLevel>
</opt:DataProtectionSection>
```

# OPTIMIS SLA Negotiation



# Service Details Examples (TREC, Elasticity, Data Protection)

- Trust
  - TrustLevel 5
- Risk
  - minimum availability of the VM of 99% at a month
- Eco Efficiency
  - No certification required
- Cost
  - 100.00 Euro (maximum cost)
- Elasticity (jboss instances)
  - 100 users per thread, with a tolerance of 5% (so trigger at more than 105 users, and down again at below 95 users)
- Data Protection
  - Data Protection Level DPA
  - Encryption Algorithm AES