A CLOUD SERVICE BROKER WITH LEGAL-RULE COMPLIANCE CHECKING AND QUALITY ASSURANCE CAPABILITIES

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Tender Cloud4Europe

• Goal of the tender was to investigate the state of the art in the research domain in order to produce pre-commercial outcomes in the cloud computing focused on some special challenges:
  • Federated Certified Service Brokerage
  • Secure, Legislation-Aware Storage
  • Legislation Execution

• The solutions is oriented to PPAA services and it must include *privacy-by-design* approach

• *Legislative Executor* module guarantees the compliance checking with the legislation and the legal framework
Motivation

• Compliance with law/regulation is an emerging issue in cloud service.
  • It’s core to establish trust
  • It’s core to facilitate the adoption in government and critical sectors
  • It’s an element for calculating metrics
Motivation

• Cloud Service Brokers will play an important role in **law/regulation compliance management**
  • compliance checking in service on-boarding phase and service evolution phase (run time)
  • third party independent audit in the whole service life cycle
  • discovery of law/regulation compliant services
  • aggregation, composition, orchestration of cloud services compliant with legislation
  • run time monitoring of SLA and legal rule fulfilment
  • **service adaptation to maintain compliance**
User Scenario

- request for service, SLA and utility
- matching service optimizing utility
- run-time Legal compliance checking
  - Optimization of customer/broker utility & adaptation
  - Service aggregation/composition
- service on-boarding change of contract service update system reconfiguration
- deployment run-time monitoring adaptation

Marketplace:
Cloud service providers ecosystem

Interaction with legal knowledge engineers

Changes in legislation (notified or detected)

Network of brokers
Interoperability with other brokers
Proposed solution: the broker architecture

![Diagram showing proposed solution architecture]

- **Service Providers**
  - Accreditation
  - Account Management
  - Service on-barding
  - Service Providers Interfaces

- **Service Consumers**
  - Account management
  - Service discovery & presentation
  - Contract management
  - Monitoring
  - Billing
  - Service Consumers Interfaces

- **Knowledge (Data Models)**
  - Analytics
  - Legislation Management
  - Planning and Optimization
  - Execution and Deployment
  - Quality Assurance & Optimization
  - Service Quality Assessment
  - Service Monitoring
  - Resources (IaaS, PaaS, SaaS)

- Legal engineers

- Resources (IaaS, PaaS, SaaS)

- **Off-line verification collection of data**

- **Monitoring service metrics parameters**

- **Analysis of data for predict SLAs violation**

- **Execute policy interact with IaaS, PaaS or SaaS**

- **service re-configuration, resource provisioning, traffic re-routing**
Proposed solution: The legislation aware autonomic manager

Legislation Aware Autonomic Manager

Broker Architecture

- Service Providers
- Service Consumers
- Accreditation
  - Account Management
  - Service on-bording
- Legal engineers
- Resources (IaaS, PaaS, SaaS)
- Analytics
  - Legislation Management
- Service Monitoring
- Service Providers Interfaces
- Service Consumers Interfaces
- Knowledge (Data Models)

Quality Assurance & Optimization

- Service Quality Assessment
- Analysis
- Legislation Management:
  - to monitor and analyse the law and regulation landscape
  - to check the compliance to legislation in term of non-functional requirements, business processes, standard adherence and other constraints
- Planning and Optimization:
  - to maintain the compliance with law and regulation
  - to guarantee that all the non-functional constraints are satisfied and the broker/customer utility is maximised
  - service re-configuration, service selection, resource provisioning, traffic re-routing

MAPE-K

Legislation Management

- Monitor
- Knowledge
- Analyser
- Planner
- Executor
- Execution and Deployment

MAPE-K
Standards

• Akoma Ntoso
  - XML standard for modelling legal document adopted by the EU Parliament, EU Commission and other Parliament/Gazette in EU (e.g. UK, IT, etc.)

• LegalRuleML
  - Deontic operators (right, obligation, permission, prohibition, violation, reparation)
  - Defeasible operators (overruling, ranking of the rules and qualification of the rules: strict, defeasible, defeater)
  - Temporal and jurisdiction metadata

• BPMN2.0
Conclusions

• **Integrated** approach for the solution of the autonomic management of run-time legal-rule compliance of cloud services
  
  • **Modelling** of the BPM in *forward* approach using privacy-by-design approach - **Monitoring module**
  
  • **Detection** of the violations in *backward* - **Service Quality Assessing/Analysis modules**
  
  • **Validation** on-demand of the services or broker - **Executive module**

• **Transparent** process based on standards XML in open format for permitting audit and accountability

• **Dynamic** detection of violation and of the legislative changes for minimizing the violation

• **Patterns** approach in order to store static rules in the KB
Questions?

Thanks for your attention

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