

Tele Assistance: A Self-Adaptive Service-Based System Exemplar

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Contribution

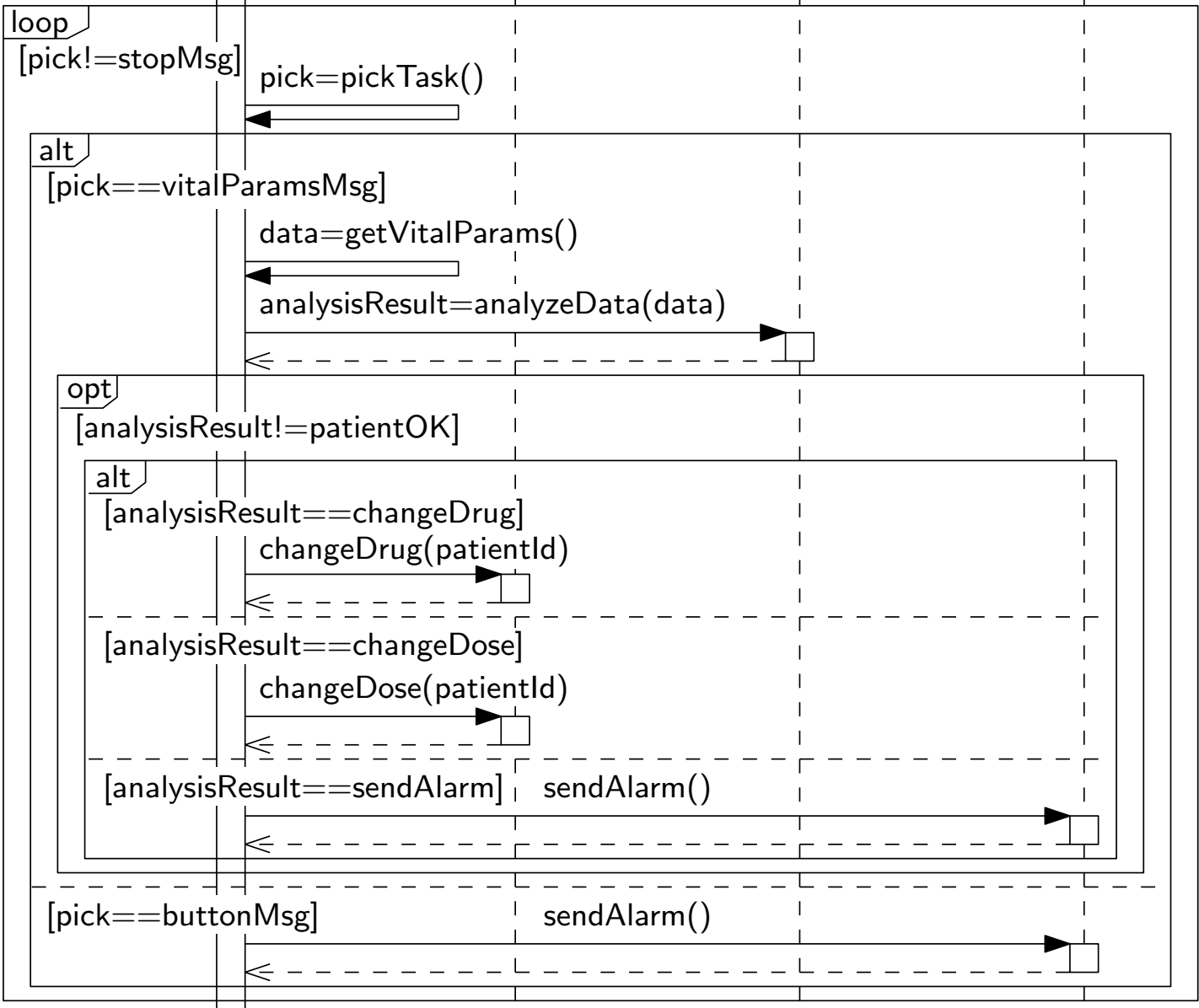
- A reference implementation of a Tele Assistance System (TAS) application
- Predefined adaptation scenarios
- Environment for developing new exemplars

Outline

- Motivation
- Description of the exemplar
- Adaptation scenarios
- Realization
- Using TAS
- Conclusions

Motivation

- Exemplars as drivers for research in our field supporting the comparison of alternative approaches
- Service-based systems are widely used in practice
- These systems increasingly rely on self-adaptation to cope with the uncertainties associated with third-party services



Originally introduced by Baresi et al. IET [2007]

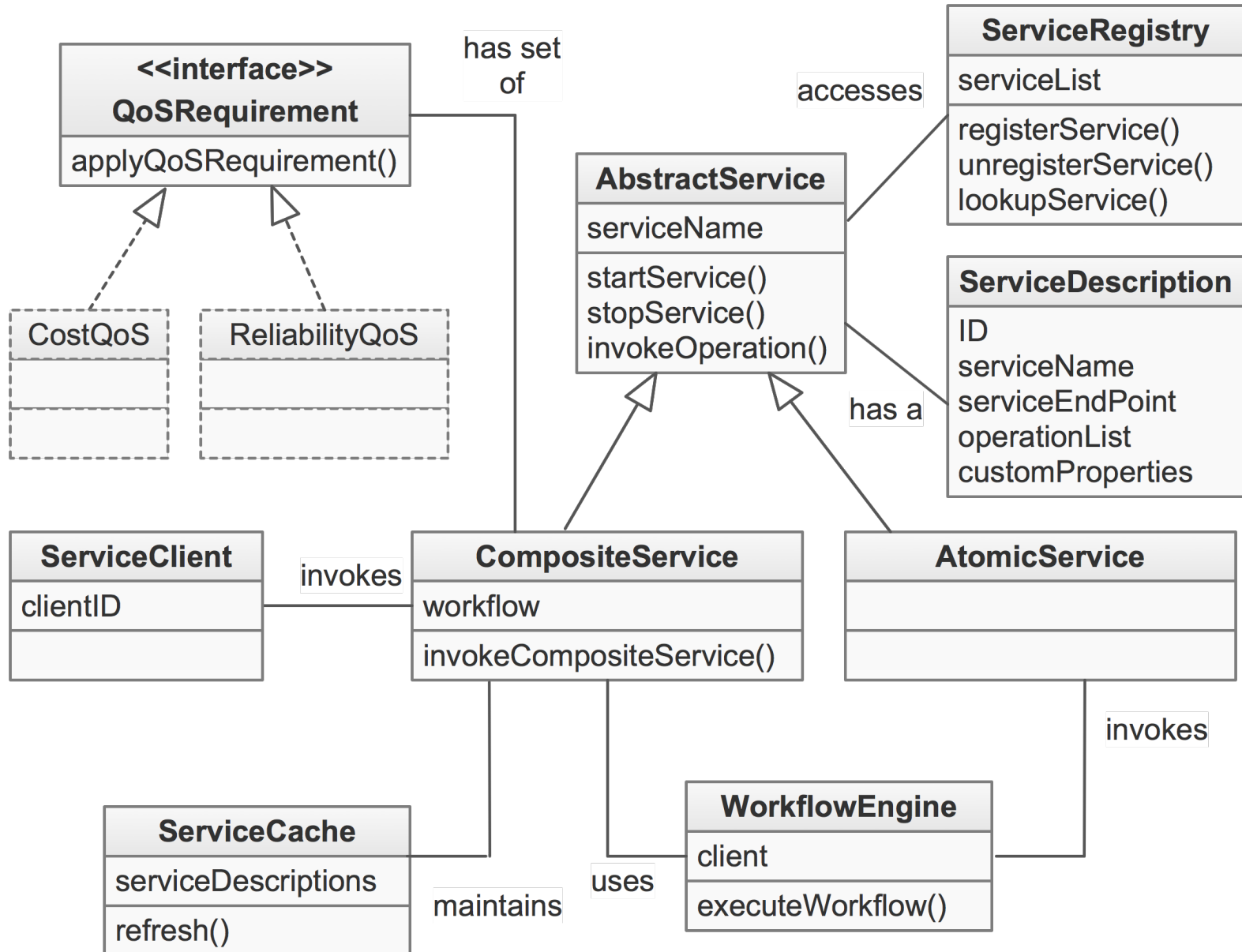
Used in several adaptation efforts [ICSE09, TSE11, CACM12]

Adaptation Scenarios

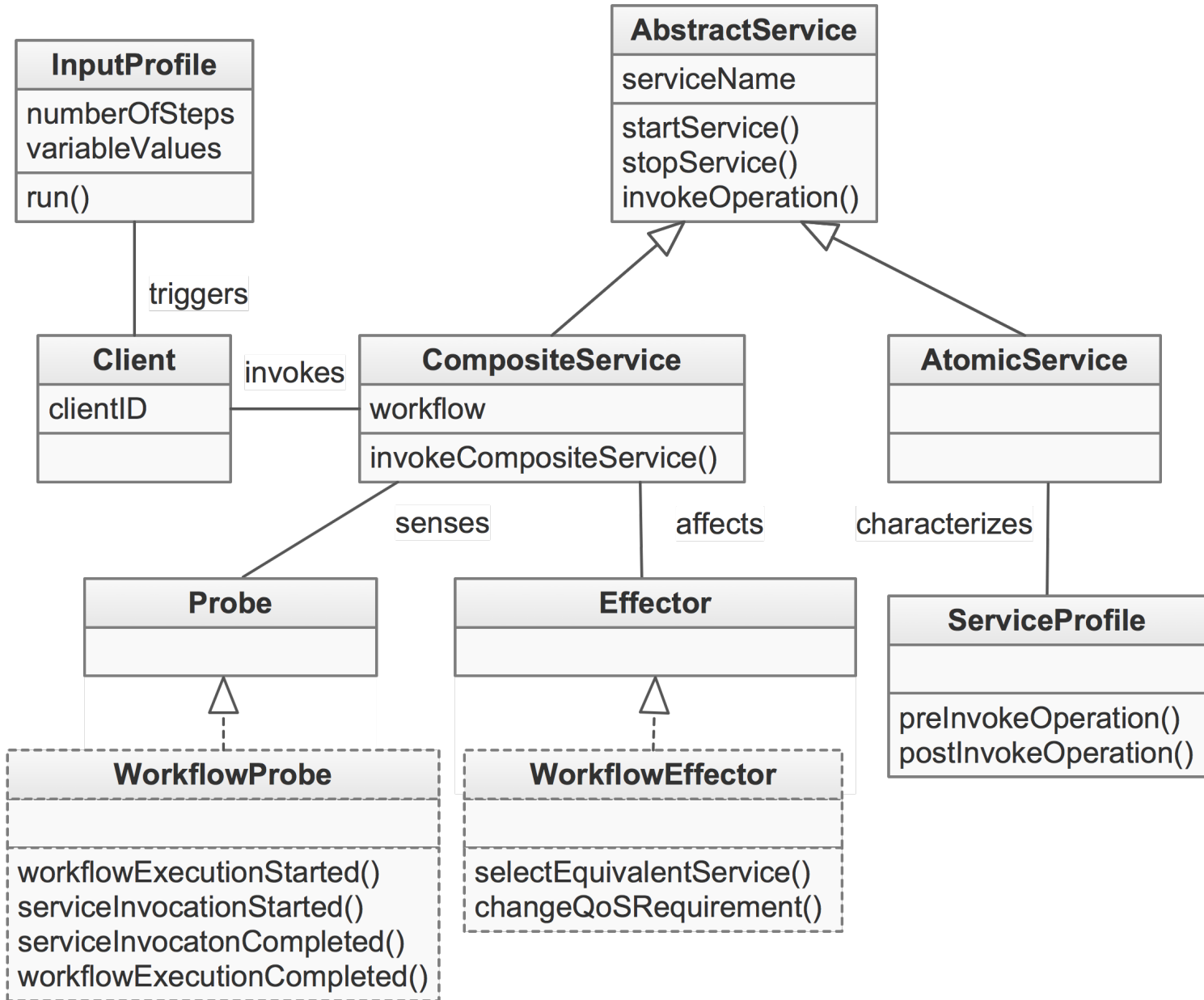
Scenario	Type of uncertainty [13]	Type of adaptation [2]–[4], [8], [10]
S1	Unpredictable environment: service failure	Switch to equivalent service; Simultaneous invocation of several services for idempotent operation
S2	Unpredictable environment: variation of service response time	Switch to equivalent service; Simultaneous invocation of several services for idempotent operation
S3	Incomplete information: new service	Use new service
S4	Changing requirements: new goal	Change workflow architecture; Select new service
S5	Inadequate design: wrong operation sequence	Change workflow architecture

Quality attribute	Metrics
Reliability	Number of failed service invocations Number of specific operation sequence failures Mean time to recovery
Performance	Number of specific operation sequences exceeding allowed execution time
Cost	Cumulative service invocation cost over given time period
Functionality	Number of faulty process executions

Realization (ReSeP)



Realization



Small Demo

Tele Assistance System

TAS Configuration Open Configure Help About

Available Concrete Services

- MedicalService2
- MedicalService3
- MedicalService1
- DrugService
- AlarmService1
- AlarmService3

Workflow Diagram Workflow Text

```

sequenceDiagram
    participant T as TeleAssistanceService
    participant M as MedicalAnalysisService
    participant D as DrugService
    participant A as AlarmService

    T->>M: analyzeData( data )
    alt if analysisResult==changeDrug
        T->>D: changeDrug( patientId )
    else
        alt if analysisResult==changeDoses
            T->>D: changeDoses( patientId )
        else
            T->>A: 
        end
    end
  
```

TAS Experimentation Open Save No Adaptation Simple Adaptation Progress 50 / 50

Input Profile

- CostQoS
- PreferredQoS
- ReliabilityQoS

Reliability Performance Cost

Service	Invocati...	Fail	FailRate	Success...
MedicalService3	35	5	0.143	0.857
DrugService	24	0	0.0	1.0
AlarmService3	21	7	0.333	0.667
AssistanceService	50	12	0.24	0.76

Using TAS

- Select/define:
 - scenario, requirements, metrics
 - service and input profiles
 - probes and effectors
- Execute and compare results

Conclusions

- Reference implementation for TAS that aims to:
 - Promote understanding among researchers in self-adaptive systems; focus on service-based systems
 - Allows comparing self-adaptation approaches
 - Advance research and practice of our field
 - <http://self-adaptive.org/exemplars/tas>
 - <http://homepage.lnu.se/staff/daweaa/TAS/tas.htm>

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