Problem Statement

- Semantic service composition to build complex applications that run in multi domain environments
- The cooperation between heterogeneous service-oriented ubiquitous computing domains
- How to prove the composability of complex services composition schemas

Approach Overview

- Semantic formalization of multi domain service composition based on Constructive Description Logic (BCDL0):
  - Cooperation ontology
  - E-Contract (Services enactments)
- Functional and non-functional view-based modeling of services
- Implementation of the formal proof of “Service composition soundness” by using Isabelle/HOL theorem proving tool
- Hybrid composition approach that preserves the autonomy and confidentiality of the local domains.

Multi Domain Semantic Services Composition Framework

Composition Methodology

1. Semantic Description of the cooperation
2. Consistency Checking
3. Local Process Views Creation
4. BCDL0 specification of views composition
5. Encoding & Soundness proof in Isabelle-HOL
6. Grounding : Mapping Views to Concrete Services, Services choreography, WS-Management and SPML standards

Why BCDL0 ?

- BCDL0 has been used by Bozzato et al [1] to formalize information services composition using three composition operators
- BCDL0 is a subsystem of the constructive description logic BCDL that is used to make constructive interpretation of ALC formulas.

Composition Rules Formalization in BCDL0

Multi-domain Cooperation Ontology (sample)

Service Specification

P : Preconditions
Q : Effects

Flow Control Rule template, with:
- rule : rule name
- x : input Parameter
- PI : list of the services

Consistency Checking and Soundness Proof

Multi domain healthcare services composition

Outcomes and ongoing works

- Extension of BCDL0 composition rules with synchronization and simple merge rules.
- Composition Views that handle services provisioning issues.
- Ongoing Work : (i) Implementation of ubicomp healthcare scenario involving smart home and hospital (ii) Prove automation in Isabelle/HOL

References


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