Client-side Service Composition Using Generic Service Representatives

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Business Web Service

• Data Service: processes client data completely at the server site.
• Task Service: processes client data partially or completely at the client site using the enterprise agent.

Task Services

We define "Task" formally as a triple:

Task = <Task Model, Task Knowledge, Task Data>

- Privacy and security issues
- Large client data files

Extended SOA Model

Service Representative (SR) is a software agent that performs a task on behalf of a service provider at the client side.

Financial Adviser

Task Service Example 1

Skin Detector

Task Service Example 2
Composite Task Services

- Collaborating data and task services provide a composite task service to address the client-side service composition.
- Service representative is equipped with a service orchestrator to execute a composite task.

- A composite task service is modeled by a BPEL process including both data and task service invocations.

Proposed Architecture

Prototype System

Client-side Processing Technologies

Comparison

Clinical Decision Support Systems (CDSS)

Case Study

Guideline-based CDSS: takes patient information and matches it with the patterns obtained from medical experiments and observations.

- They require transferring patient's health information while they are highly sensitive.

Model-based CDSS: initially builds a decision model according to known data (training data) and then applies this model on unknown data (test data).

- They do not consider local data to build their decision models. The local data are often too large to be transferred efficiently to the services.
Using the proposed methodology and implemented tool (EntRep version 1.1), we modeled and developed a secure and context-aware CDSS by a composite task service.

**Service Client**
The service client puts its data and resources into the communication channel.

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**Case Study – Collaborating Services**

1. **Recommender Therapy (task service)** receives a diagnostic report and returns the corresponding medication guidelines.
2. **Database Checker (task service)** receives a database schema and returns a task to verify whether the client database matches with this schema.
3. **Decision Model Builder (task service)** receives a diagnostic report and returns a task to build and apply a decision model based on the client-side patient and visit databases.
4. **Incremental Decision Model Builder (task service)** receives a diagnostic report and returns a task to rebuild, complete, and apply an incremental decision model based on the client-side patient and visit databases.
5. **Recommend Dose (task service)** receives a report and returns the corresponding dose guidelines.
6. **Drug Interaction (data service)** receives a target medication and a list of active medications and returns warnings if there is one or more drug-to-drug interaction.

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**Case Study: Composite Task Model**

- **Evaluation**
  - **Client-side Vs Server-side Service Composition**
    - **Service Message Size (SMS)**
      - Using Task Services, SMS will be independent of the size of the client data.
    - **Service Response Time (SRT)**
      - Task Services overcome the traditional approaches when the client data grows.
  - **Average Response Time (ART)**
    - Task Services process client data in parallel.
**Conclusion**

An efficient model for Task Services using generic Service Representative enterprise agents improves the current state of SOA-based enterprise systems:

- Maintaining clients’ privacy and security.
- Providing less network traffic and more processor power for the server.
- Separating business services from business rules, actions, and processes.
- Facilitating modeling of stateless service.
- Reducing the interoperability issues among collaborating services.

Thank you for your attention.