Defining an Adaptable Mobile Transaction Service

Context

Abstract
- Mobile environments are characterized by frequent variations in connection and bandwidth rates as well as by restrained resources on portable devices. This variability complicates data management and, in particular, transaction execution. We consider that to deal with environment variability it is necessary to be adaptable. This paper introduces both a Mobile Transaction Service (MTS) and an Adaptable Mobile Transaction model (AMT) which offer environment awareness and transaction execution adaptability. The MTS is a middleware that besides coordinating the execution of mobile transactions, supports mobile environment awareness. The AMT allows the description of different semantical equivalent ways of executing mobile transactions. Thus, depending on the environment mobile transactions will be executed.

Motivation

Requirements for supporting:
- Mobile environment variations and mobile constraints
- How transactions could survive to mobile environments variations?

Several execution models at the same time:
1. The MTS is initiated by an MH and entirely executed on FHs
2. The MT execution is distributed between an MH and FHs
3. The MT execution is distributed among several FHs
4. The MT is entirely executed on the MH

The Mobile Transaction Service (MTS)

A mobile transaction (MT) is a transaction where at least one mobile host takes part in its execution.
- It is a generic service which coordinates the execution of mobile transactions.
- It provides support to the four execution models of MTS.
- It adapts the MT execution to the mobile environment variations.
- Going from an execution model to another depending on mobile environment variations.
- Environment awareness with events.
- It provides disconnection process.

An Adaptable Mobile Transaction Model (AMT)

Adaptable mobile transaction model

AMT = (T, CT, ES)

ES = (ΔA) = (ED, EP, BD) = (BD, (T, coord))

ΔA relationship dependence over EPs

T = (T) = ACID component transactions

CT = (CT) = Compensating transactions

AMT example

Component transactions:

- T0: capture (new_objects)
- T1: insert (new_objects)
- T2: compare (old_objects, new_objects)

Compensating transactions:

- CT0: delete (old_objects)

AMT properties?

- AMT with execution models 1 and 4 guarantee ACID properties (since component transactions are ACID).
- As we consider local data (stocked on MHs) as replicas, in 4, after disconnection, a synchronization process with FHs must be executed. We think that this issue is more a representation problem than a transaction problem.
- Problems to provide ACID properties in 2 and 3:
  - Global consistency
  - Global atomicity

Ongoing works

Related works

Mobile transactions
- Research works: Clustering, Two-tier replication, Promotion, Reparting, Semantics-based, Prewite, Kangaroo transactions, MDSTP, Moflex transactions...
- Commercial solutions: Oracle Lite, DB2 Every Place, Sybase Mayrower solutions...

Execution alternatives & contingency transactions
- DORI transaction model
- Flex transaction model

Conclusions

The contributions of our research are:
- Adaptability of MT execution based on mobile environment awareness.
- Proposal of an adaptable mobile transaction model which:
  - supports different MT execution models
  - allows to describe necessary MT characteristics
  - allows the description of semantical equivalent alternatives