A Programming Framework for Mobilizing Enterprise Applications

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Insurance Application





Motivation: Rich Client for Mobile Clients



Server-based Application on Provisioning Server

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Localized and Tethered Application Components

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Rich Client

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Disconnection in a Mobile Client

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Client





Presentation Overview

- Model-based replication framework
- Service Data Objects Synchronization
- Status and Future Work

Data Services Layer

- Broker between multiple information models and storage models
 - Application-level data requirements
 - System-level QoS
- Support for multiple update semantics
 - Synchronization
 - Messaging

- Coordination
- Application-level declarative policies
- Applicable to Multiple Client types: e.g., Browser, WCT





Two Main Goals

- Re-usable infrastructure that can support many different model-based approaches
 - Client and server store abstractions
 - Performance
 - Young codebase
 - Overhead of current sync mechanisims is potentially high for an application design point
- Support for a model-based approach to federation and replication
 - Focus on customer applications that used heterogeneous data sources
 - Easy (enough) programming model



Example Model – Service Data Objects

- Web Services standard first proposed by IBM, BEA
- Object model of data
 - Objects contain typed attributes, references, and lists/sequences
 - Collection of objects form a datagraph
 - Datagraphs have "closure" property
- Standard API defined by SDO specification
 - XPath-like querying of datagraph
 - Java API to manipulate datagraph
 - Creation of SDO datagraphs defined by separate mediator specification
- Implementation of version 1.0 closely tied to Eclipse Modeling Framework
 - Tool for defining models and automatically generation code
 - Meta-models built using EMF/MOF
 - SDO is really just a bit-flip away



Re-usable Model Distribution Stack





Current Prototype: SDOSync





Internal Organization of SDOStore

- Organization of models as SDO datagraphs
 - Datagraph (Model) set
 - Datagraph (Model) collection
- Store and retrieval primitives using XPath-like expressions
- Elementary algebra for simple data manipulation (select, join)







Consistency over Models

- Support for multiple consistency models
 - Traditional optimistic consistency using explicit synchronization sessions
 - Weaker approach to synchronization using messaging semantics
- Declarative consistency policy files
 - Synchronization agent consults policy files to determine consistency requirements
 - Change consistency model based on semantics of the data or the performance requirements of systems
 - Currently using XML formatted file and playing with "Priority" and "Granularity"





Declarative Consistency Policies

<syncpolicy> <copyset name='custrecords'> /CompanyData/CustomerRecords/ </copyset name='agentinfo'> <copyseb /CompanyData/AgentInfo/ </copyset> <copylaw role='owner' priority=10 granularity='property' name='custrecords'/> <copylaw role='assistant' priority=1 granularity='datagraph' name='agentinfo'/> <acl> <role name='owner'> <userid>Polly</userid> <userid>Anna</userid> </role> <role name = 'assistant'> <userid>Alfred</userid> </role> </acl></syncpolicy>

- Policy-based synchronization between SDOStores
- Policy file formatted in XML
- Exploring some consistency degrees of freedom
 - Priority
 - Granularity
 - Still evaluating primitives: perhaps only 2-3 consistency modes needed?
- Point-to-Point and Multipoint synchronization policies



Conclusions

- Status working SDO Sync prototype for insurance application
- Building better support for declarative consistency policies
- Understanding performance requirements
- Related Work at IBM Watson
 - EJB Sync (preserve transactional semantics for disconnected applications)
 - Live Data (message-based semantics for keeping data synchronized, e.g. soft-state)