IEESIM: An Architecture of Information Exchange and Sharing for NASA Tool Integration

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IEESIM* Overview

- Introduction
- IEESIM: The Proposed Architecture
- Research Issues
- Lessons Learned
- Conclusion

* IEESIM: Integrated, Extensible, Exchangeable, Shared Information Mediator
Context and Challenges

• Two NASA tools (DDP & AskPete) are
  – developed independently,
  – geographically distributed,
  – complementary but related aspects of the same overall task

• How could the tools be integrated in the context of
  – data sharing and exchange
  – operating stand-alone
  – control coordination
  – future integration with other related tools.

• Study on the shared information system for risk assessment, QA, and IV&V
Scenario I: Inter-Use Sharing

Serve as a database library across organizations
Scenario II: Inter-Tool Sharing

Provides Online Access & Manipulation of Data
Benefits

- From enterprise-wide, shared information systems
  - a “lessons learned” data base
  - a repository of corporate knowledge
  - data for case-based reasoning
  - independent assessment and review services
  - trend analysis
Solution Approach

- **IEESIM Approach**
  - *Integrated* views from individual data sources
  - *Extensible* for seamlessly adding future data sources
  - *Exchangeable* data format across risk assessment tools
  - *Shared Information Mediator* to enable organizationally integrated risk assessment
IEESIM: The proposed Architecture

Communication Layer

Mapping

Global View Manager

Local database

Wrapper

AskPete

Data Monitor

XML Translator

Local database

Global View Manager

Wrapper

XML Translator

Global View Manager

Mapping Database

Client for AskPete

DDP

Communication Layer

IEESIM Server

Data Schema Integration Layer

Data Format Exchange & Data Consistency Layer

GUI Layer

Browser

Application

Users

TCP/IP

XML

HTTP

HTML

HTTP

HTML

TCP/IP

XML

GUI server

Data Access Control

API server

Shared database

Wrapper

Data Monitor

XML Translator

DDP

Shared database

Wrapper

Data Monitor

XML Translator

DDP

Global View Manager

Mapping Database

DDP

Local database

SQLX

Data Monitor

Wrapper

AskPete

Data Monitor

XML Translator

Global View Manager

Local database

TCP/IP

XML
Research Issues

- Exchange Data Format
  - translators between every pair of tools.
  - employ a universal data exchange format (XML)
- Data Schema Integration
- Data Consistency Management
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Issue 2: Data Schema Integration

- Global View Mapping (GVM)
GUI for GVM

XML File loaded, Choose a table key to merge.
Issue 3: Data Consistency Management

- Data Change Detection
  - Intrusive method
    - located inside application.
    - between tool and tool database
    - between tool database and shared database
  - External method,
    - as an independent component.
  - Polling vs. trigger
Data Monitoring: An Example
Lessons Learned

- Political Issues to share information
- Different layers of Data Integration
  - Data schema
  - Data Format
  - Data itself
- Importance of Shared Database Utilities
  - Database comparison
  - Data mining
  - Data visualization and statistical analysis
- Easy System Configuration and Migration
Conclusion

- IEESIM is a flexible reference architecture for enterprise-wide, shared information systems
  - *Integrated*
    - through GVM
  - *Extensible, Exchangeable*
    - through XML-based Data Integration
  - *Shared Information Mediator*
    - through GUI/API
More Information

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