S-Cube Learning Package

SOLÚBTHA: A Flexible Business Transaction Model

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Outline

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- SOLÚBTHA Business Transaction Model
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  - Modeling Behavioral properties of Business Transaction
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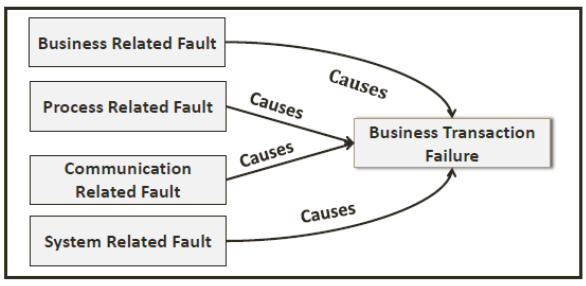
Business Transaction (BT)

- Series of **collaborative activities**
  - Distributed across **multiple partners**
  - Performed in a **flexible manner** by accomplishing the **commitments** agreed upon by the partners.
- Business transaction is **long-running**
  - More risk-prone to abortion than **short-lived** transactions.
- Flexible to prevent abortion
  - **Flexibility** is an important requirement for business transactions.
- A business transaction model supports defining the structure and operational (behaviour) of business transactions.

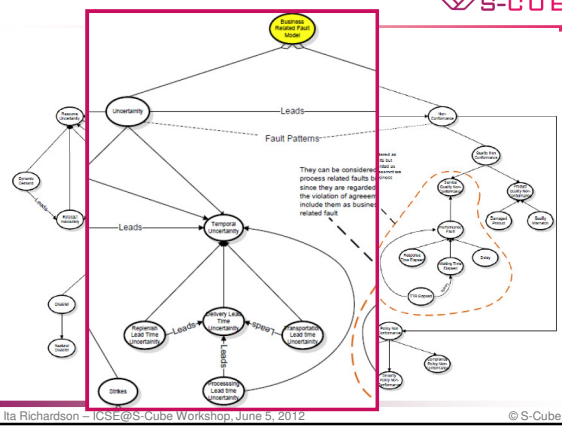
Problem Statement

- In order to support flexible business transactions, a model should be built on techniques or properties that support defining non-atomic operations.
- Many current business transaction models still rely on strict **atomic** principle.
- Some advanced models are built on techniques including **compensation** and **savepoint** that support implementing non-atomic principles
  - Techniques are not sufficient for flexible business transactions

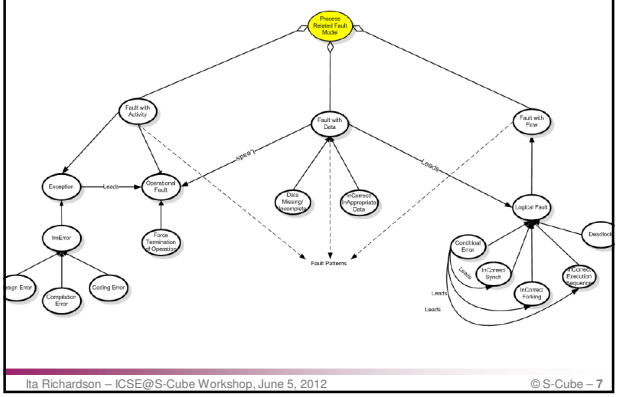
Business Transaction Failure



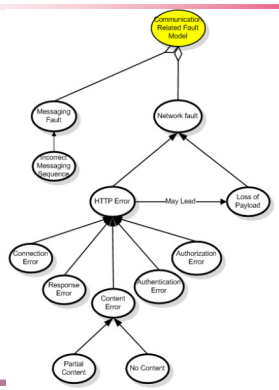
Business Related Fault Model



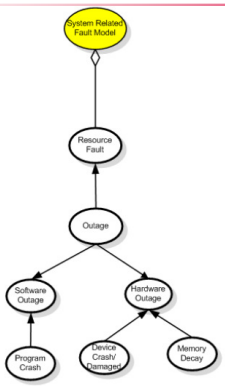
Process Related Fault Model



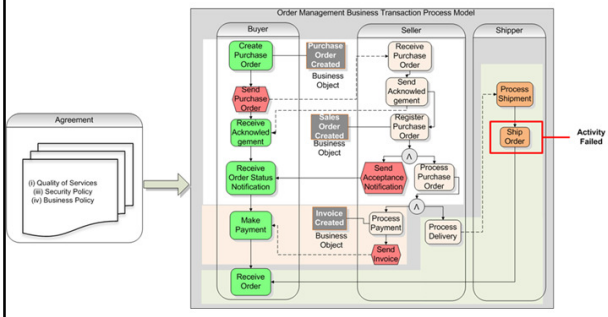
Communication Related Fault Model



System Related Fault Model



Business Transaction - Problem



SOLÚBTHA Business Transaction Model

- Models **structure** and **behavioral property** of business transaction
- Goal is to Support:
  - Modeling transactional business processes by correlating real-world business entities with core transaction functions
  - Defining highly flexible business transactions
- Solúbtha incorporates a list of business entities to support modeling business transaction
- Solúbtha correlates business entities with transaction functions.

SOLÚBTHA Business Transaction Model

- In order to support the definition of a flexible business transaction, Solúbtha
  - Relies on a non-atomic principle called "**eventual failure atomicity**".
  - Provides a set of recovery patterns that recovers business transactions from failure for faults and thus, prevents business transaction abortions
  - Offers property that control behavior of business transaction

Modelling Behavioural Properties of Business Transaction

- Eventual failure atomicity is the fundamental principle that drives the non-atomic behaviour of abstract transaction fragments within business transactions.

  $(\forall T = \{ATF_1 \circ ATF_2 ..... \circ ATF_n\}) \rightarrow \Diamond S_1 \boxtimes \Diamond S_2$ where, S_1 and S_2 denotes states successful and aborted.

- Solúbtha supports defining non-vital activity whose failure will be ignored.

  $((A_{NV} \in ATF) \rightarrow failed) \rightarrow Ignored$

Modelling Behavioural Properties of Business Transaction

- Solúbtha supports defining soft constraints particularly, soft type quality constraints; violation of such constraints will be ignored at runtime.
- Solúbtha offers various recovery patterns including retry, redo, undo, mutualise; these patterns will be used upon failure of vital activity or violation of hard constraints.

Conclusion and Future Work

- Solúbtha support modeling business transaction for service based applications that underpin end-to-end business processes.
- The model facilitates defining a transaction from business perspective which governs operations at runtime.
- The model supports defining flexible properties for business transaction.
- In addition, it supports defining recovery actions that prevent abortion of business transaction and thus flexibility is achieved.
- We are currently validating the Business Model
- Solúbtha needs a language support

Publications from this research

- Carroll, N, Haque R, Whelan E, Richardson I. 2011. Modelling Business Transactions across Service Supply Chain Networks. 20th International Conference on Information Systems Development (ISD2011).
- Taher, Y, Haque R, Parkin M, Richardson I, Whelan E, van de Heuvel W-J. 2011. A Multi-layer Approach for Customizing Business Services. International Conference on Electronic Commerce and Web Technologies.
- Hashmi, S, Haque R, Schmieders E, Richardson I. 2011. Negotiation towards Service Level Agreements: A Life Cycle Based Approach. 7th IEEE World Congress on Services (SERVICES 2011).
- Haque, R, Taher Y, Richardson I, Heuvel WJVD, Koussouris S. 2011. Toward A Framework for Customizing the Public Services. International Conference on Information Technology and Electronic Services.
- Haque, R, Taher Y, Richardson I, Whelan E, van den Heuvel WJ, Tawbi S. 2011. Towards a Framework for Customizing the Views of Reusable Public Service Processes. 17th International Conference on Software and Information Technologies.
- Taher, Y, Haque R, Nguyen DK, Heuvel WJVD. 2011. Designing and Delivering Public Services on the Cloud. International Conference on Cloud Computing and Service Science.
- Haque, R, Taher Y, Richardson I, Whelan E, van den Heuvel WJ, Tawbi S. 2011. A Framework for Public Service Customization. The International Journal of Information Studies.
- Hantry, F, Papazoglou M, v. d Heuvel, Haque R, Whelan E, Carroll N, Karastoyanova D., 2010. Business Process Management. Service Research Challenges and Solutions for the Future Internet: S-Cube - Towards Engineering, Managing and Adapting Service-Based Systems.

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