Building an Experience Factory for a Model-based Risk Analysis Framework

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Agenda

- Introduction to Risk Analysis
  - Definitions
  - CORAS Objectives and Motivations for Experience Management (EM)
- EM in CORAS
  - CORAS Platform
  - CORAS Experience Package (CEP) and other Features
  - Some Results
- Summary
Introduction: Risk Analysis

- Risk involves both uncertainty and loss
- Risk analysis (short: RA) – definitions:
  - A detailed examination including risk assessment, risk evaluation, and risk management alternatives, performed to understand the nature of unwanted, negative consequences to human life, health, property, or the environment
  - An analytical process to provide information regarding undesirable events
  - The process of quantification of the probabilities and expected consequences for identified risks
- RA is widely used in the finance and process industry
- Risk management vs. risk analysis vs. assessment

Introduction: Risk Analysis

- Popular methods used in the process and safety industries:
  - HazOp (Hazard and Operability)
  - FTA (Fault Tree Analysis)
  - FMECA (Failure Mode Effect and Criticality Analysis)
  - GMTA (Goals Means Task Analysis)
  - Markov analysis
  - CRAMM (CCTA Risk Analysis and Management Methodology)
- These methods are used largely independent of each other
- Use in the ICT domain is only just catching on
**Introduction: CORAS Objectives**

- To develop a practical framework, exploiting methods for risk analysis, semiformal methods for object-oriented modeling, and computerized tools, for a precise, unambiguous, and efficient risk analysis of security critical systems.
- To assess the applicability, usability, and efficiency of the framework by applying it in security critical application domains (telemedicine, e-commerce etc.).

**Introduction: The CORAS approach—Model-based Risk Analysis (MRA)**

- Risk analysis
- Graphical OO-modelling
- MRA Model-based Risk Analysis
- FTA, HAZOP, FMECA, Markov, GMTA, CRAMM
- UML
Introduction: Motivations for EM Approach

- CORAS is about DEVELOPING A (TOOL-SUPPORTED) MODEL BASED RISK ANALYSIS FRAMEWORK for security critical applications in the ICT domain
- Why do we need to have a “tool-supported” framework? Why experience management?
  - Knowledge-intensive
  - Time-consuming
  - Involves several if not many people
  - Large solution space
  - Iterative

CORAS Platform = Computerized Part of CORAS Methodology

Platform APIs

Platform developer

Platform internal storage

Platform integrator

CORAS XML
XMI
IDMEF

Tool specific format

User interfaces

CORAS Web Interface

Modelling Tool

RA Tool

VATM Tool

Platform user

Integration platform

Platform APIs
CORAS Platform: Components

- Two repositories:
  - Reusable Element Repository (storing reusable elements/tables templates/guidelines etc)
  - Assessment Repository (storing instantiated or modified result)
  - All elements MUST conform to the XML data models (OMG’s XMI, IETF’s IDMEF, CORAS-developed RA-specific XML)

- Web-based graphical user interfaces – allow for access to the CORAS platform/repository. Some benefits:
  - Benefits of XML technologies – Cocoon, eXist (native XML database), XPath, XSLT and many more!
  - Distributable - can reach a much large group of users and counter-parts
  - Easily updatable; thin-client
  - Cost-effective
  - Availability; 24x7
Taxonomy of Experience Package

An experience package has three parts:
- Characterization (defined by Attributes)
- Relationship (defined by Links)
- Body (defined by Entities)

### Attributes
- **Title**: string
- **Author**: string
- **Date of creation**: string
- **Description**: string
- **Finalized**: Boolean
- **Assessment area**: string

### Links
Linked to: linked to other CEPs

### Body
List of elements: linked to other elements

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**CEP1**
- **Title**: Telemedicine Trial 2
- **Author**: Eva S & Eva S
- **Date of creation**: September 9 2002
- **Description**: teleconsultation services in cardiology
- **Finalized**: No
- **Assessment area**: Telecardiology, WebOnCOLL

**CORAS Experience Package Type**
- **Type**: e.g. Project

**Other Package Type**
- **Type**: Other

**List of elements**:
- `swot1.xml`
- `sys_desc.xml`
- `abstract.xml`
Taxonomy of Experience Package (contd.)

- CEP attributes are useful for searching
- CEP links are useful for associating present CEP with other similarly motivated CEP
- CEP body contains useful elements (and experience) for reuse

Main benefit of using CEP:
- Generally, CEP allows experience to be packaged in a systematic and structured manner thereby enabling the repository to document, store, qualify and update the experience base, as well as supplying those experiences back to projects on demand

CORAS Platform: Reusing Experiences

- Search – via XPATH
  - Mirrors a hybrid structural CBR and textual CBR approach
  - Retrieve only the CEPs
- Navigational structure
- Other features:
  - Semantic/consistency checks between tables and UML diagrams – risk management is iterative!
Some Results

- A working prototype of a “loose” computerized integration platform demonstrating the MRA approach – based on a native XML repository
  - Search for useful elements
  - Instantiate from the reusable libraries
  - Store and package assessment result/experience
  - Follow the risk assessment methodology
- Empirical data is gathered from the telemedicine and e-commerce trials in CORAS
- More trials planned

Summary

- The approach is not perfect
  - Difficulty in building experience – domain/context specific
    - General patterns and rules are difficult to obtain – each case varies so much sometime have to start over!
  - Adaptation/Tailoring cannot be solved in a general way in CORAS
    - Dealing with UML - diagram! Yes we have XMI but it’s often too verbose to be useful
- EF can be extremely useful in addressing real world problems
- First known EF application in risk analysis
- Taking advantage of modern internet-based technology – XML, semantic web etc.
Thank you for your attention!