Use of a UML Model as a Database Repository for Use Cases

Dr. Martin J. Burns

President, Hypertek Inc. for EPRI, EDF

Agenda

- Use Case Templates in Word
- IEC Use Case Methodology Project
- From UML Metamodel to Repository Design
- Repository Structure
- Program Model

Grid-Interop
Driving to Grid 2020

Use Case Templates in Word™

- Domain Experts work well in Word Templates
  - Easy flow of thinking onto page
  - Template can guide writer step by step to more detailed elaboration
- System Engineers work well in CASE tools
  - UML is robust and flexible for design analysis
- Round Trip Engineering
  - Need to iterate between System Engineering View (UML) and Domain Expert View (WORD)
- Needed: Tool that allows traversing between two views

Grid-Interop
Driving to Grid 2020

Use Case Standardization Project

- IEC TC8 Smart Grid Use Case Methodology Team
  - Part 1: Use Case Approach – Motivation and Processes
  - Part 2: Definition of Use Case Template, Actor List and Requirements List for Energy Systems
  - Part 3: Use UML and XMLSchema to Define Repository and Intermediate Use Case Representations
  - Part 4: IntelliGrid Method for Projects
- EPRI IntelliGrid™ Use Case Template
  - Hundreds of Use Cases done using this template since 2004
  - Tools built to allow Import/Export of Use Cases
  - Support for Use Case capture in UML for IEC TC57WG14
  - Publish Use Case Importer/Exporter on SourceForge 2012
  - SGIP IKB Twiki Page: http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/UseCaseTemplate
- Hypertek, Inc.
  - Part of original IntelliGrid team
  - Contracted to Perform Revised Use Case Template Import/Export
  - Worked with EDF/EPRI to implement TC8 Part 2 and Part 3 methodology
  - To be published as Open Source on SourceForge end of 2012

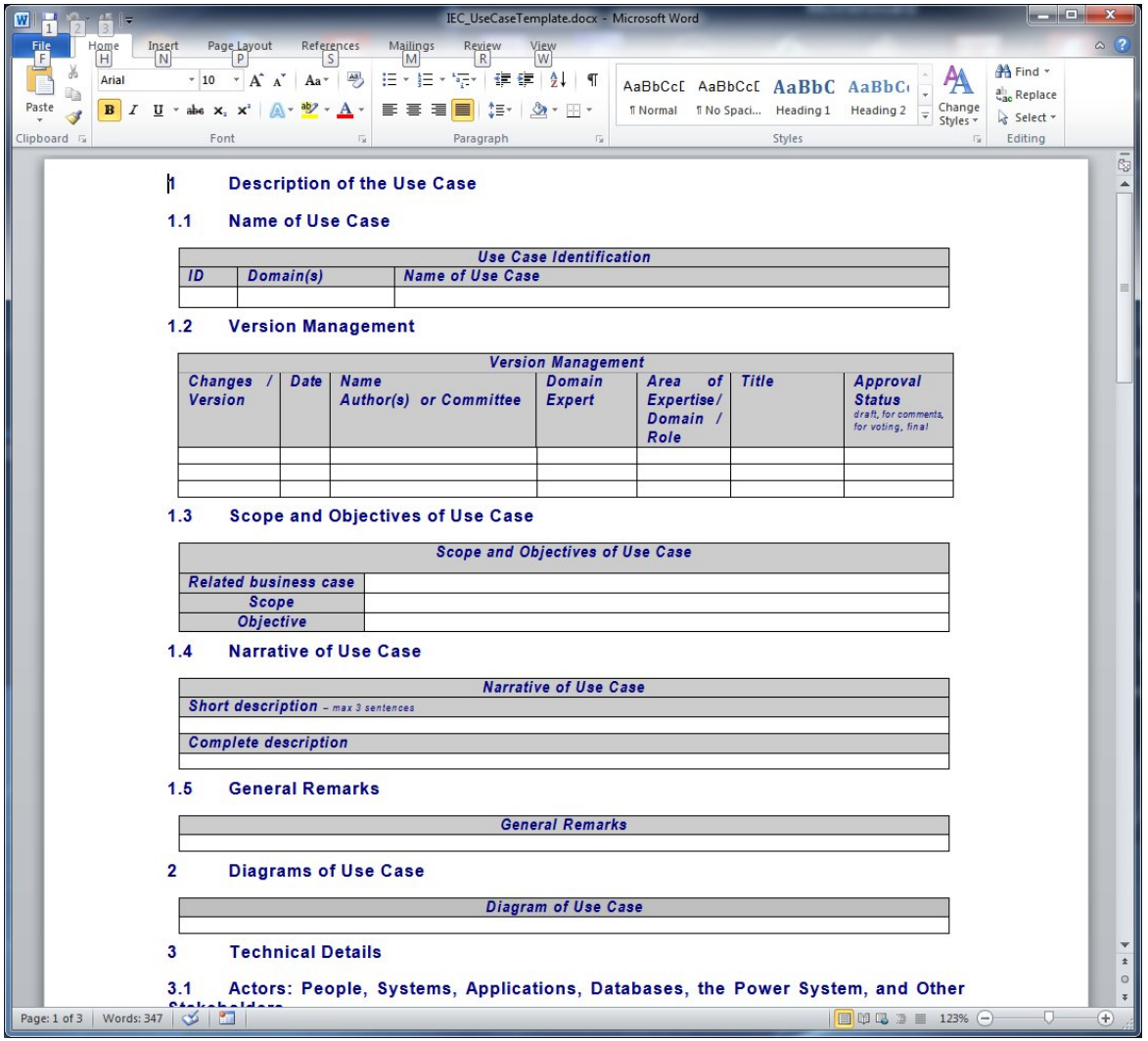
Grid-Interop
Driving to Grid 2020

Use Cases Standardization

- Use Cases provide a useful basis for
  - Interoperability
    - Define how standards are used
    - Define abnormal (error) situation handling
  - Business and Technical requirements
    - IT security and privacy
    - Safety
    - Performance
    - Reliability
    - ...
  - Terminology
  - Standards gap analysis
  - Testing and certification programs

IEC 62559 Use Case Template

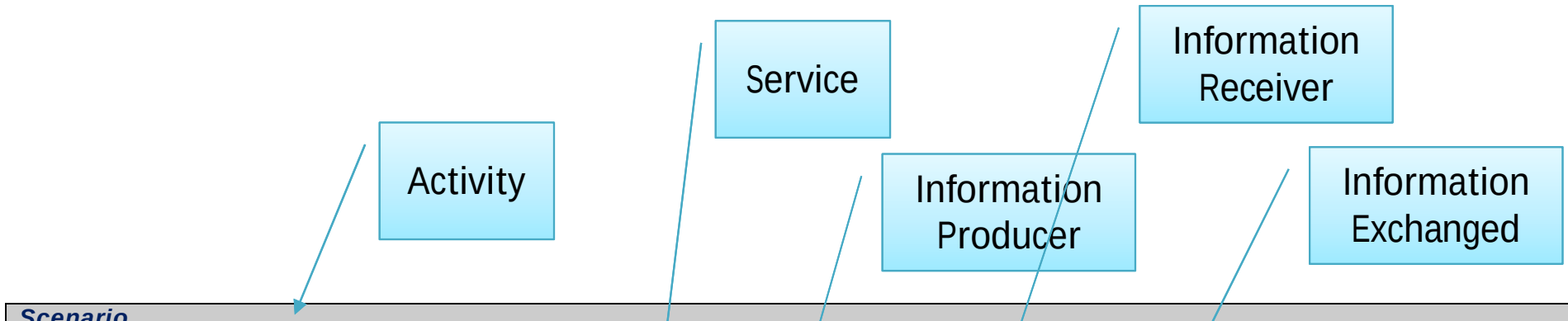
1 Description of the Use Case
1.1 Name of Use Case
1.2 Version Management
1.3 Scope and Objectives of Use Case
1.4 Narrative of Use Case
1.5 General Remarks
2 Diagrams of Use Case
3 Technical Details
3.1 Actors: People, Systems, Applications, Databases, the Power System, and Other Stakeholders
3.2 Preconditions, Assumptions, Post condition, Events
3.3 References / Issues
3.4 Further Information to the Use Case for Classification / Mapping
4 Step by Step Analysis of Use Case
4.1 Steps – Normal
4.2 Steps – Alternative, Error Management, and/or Maintenance/Backup Scenario
4.3 Steps – ....
5 Information Exchanged
6 Common Terms and Definitions



Grid-Interop

Driving to Grid 2020

Use Case Scenario Details



Scenario								
Scenario Name :	Authorized Third Party Establishes Relationship with Data Custodian							
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Requirements , R-ID**
1	Desire to establish Third Party relationship with Data Custodian	Create Third Party ID	Authorized Third Party requests that the Data Custodian establish relationship	CREATE	Third Party	Data Custodian	ApplicationInformation	
2		REPLY	REPLY	REPLY	Data Custodian	Third Party	ThirdPartyID	
3	Desire to check status	Read Service Status	Third Party checks their ability to connect to the service, and obtains the current status of the service	GET	Third Party	Data Custodian	ServiceStatus	

From UML Model to XML Schema*

UML Use Case Metamodel

- Actors, Information, requirements, Scenarios, ...

Provides a model of elements of Use Cases and their relationships

Exchange Profile

- Containment, multiplicity, structure

Establishes directional associations and multiplicities to imply a specific hierarchy

Use Case XSD

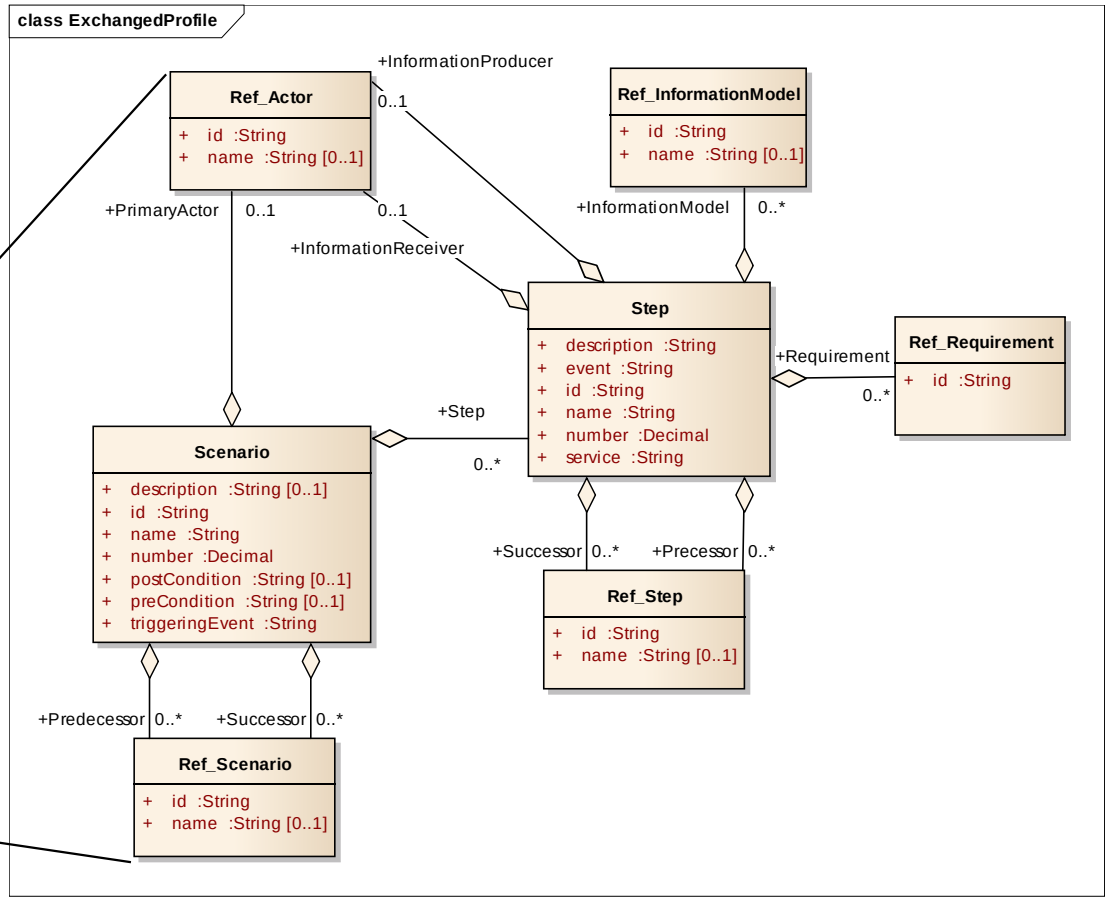
- Allows structured XML representation of a Use Case that mirrors Repository

An explicit XML Schema that defines how parts from the Word template can be extracted and organized based on the metamodel

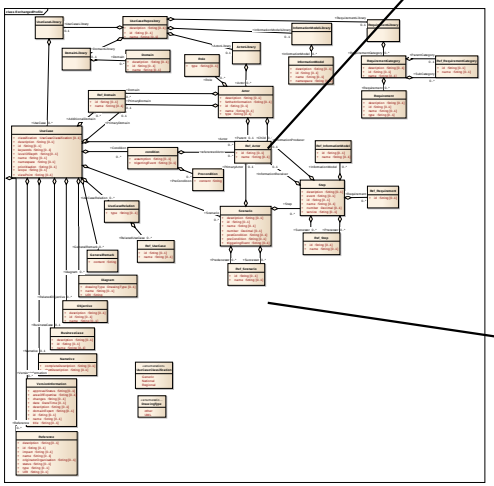
*Concept derived from IEC TC57 methodology for profiling UML models to XML

Use Case Template UML Exchange Profile

Expanded view



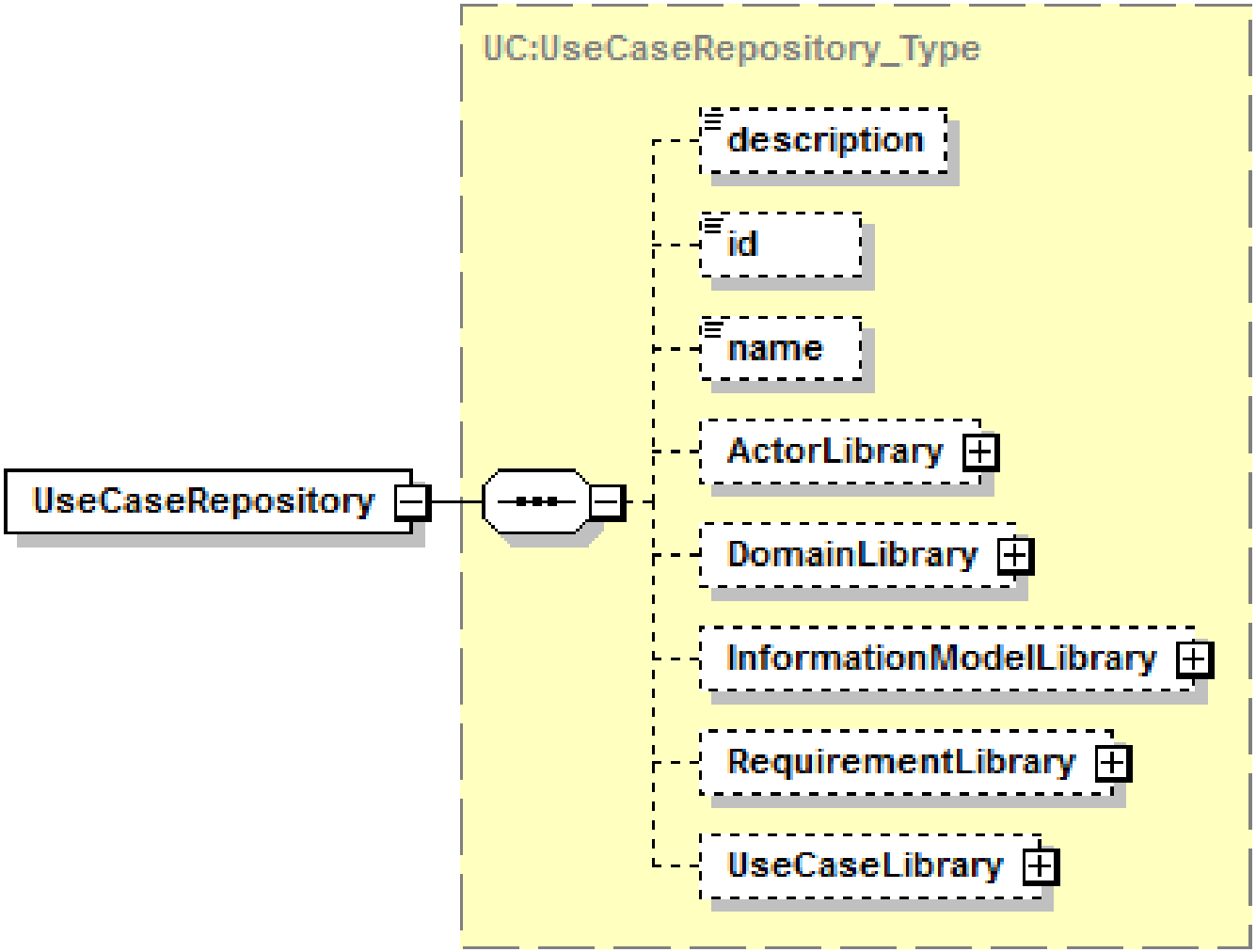
Full model



Grid-Interop

Driving to Grid 2020

Use Case Template XML Schema

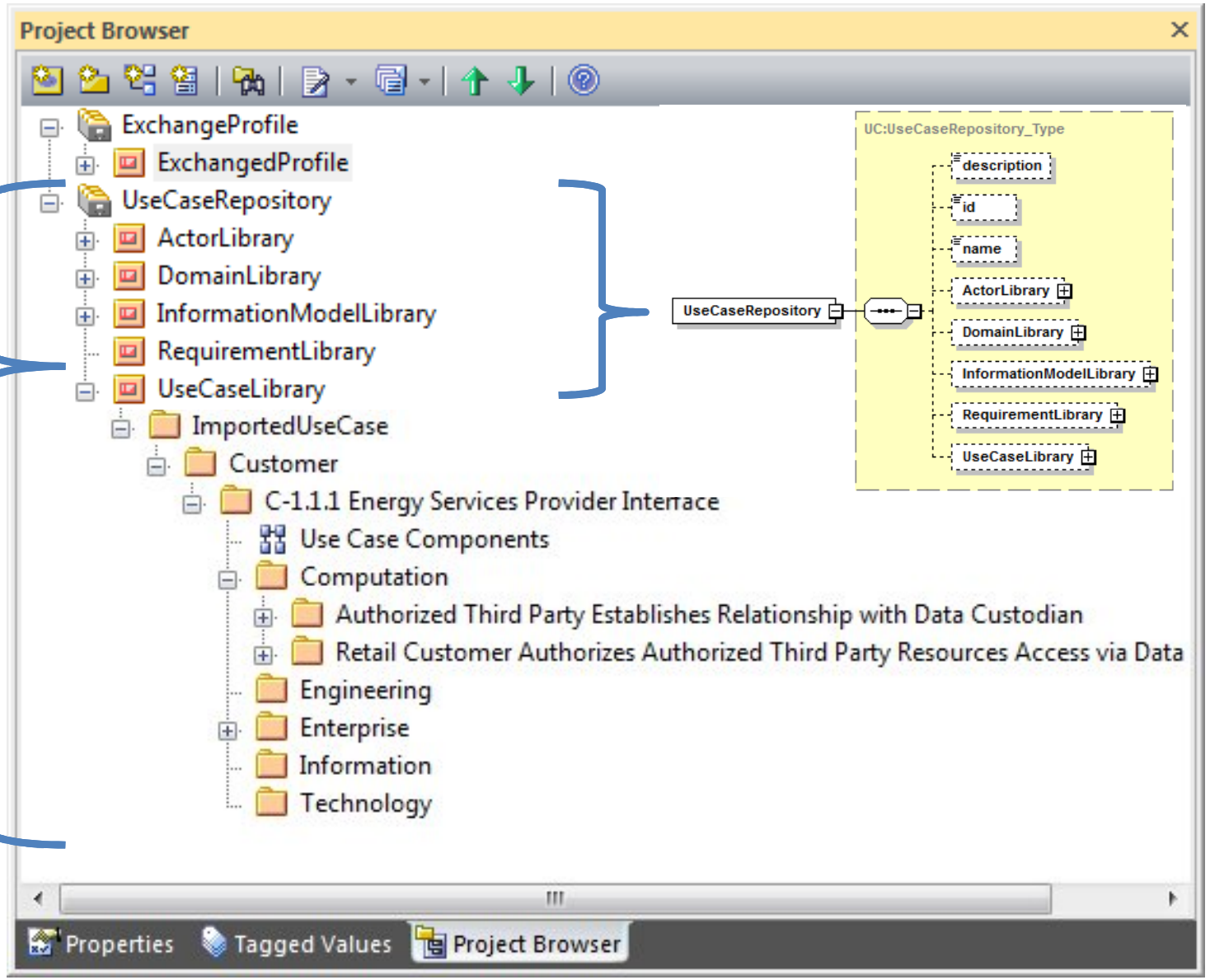


Grid-Interop
Driving to Grid 2020

UML Repository Model

Actors, Information, Requirements are part of Platform Independent Model (PIM)

Object Instance Diagrams

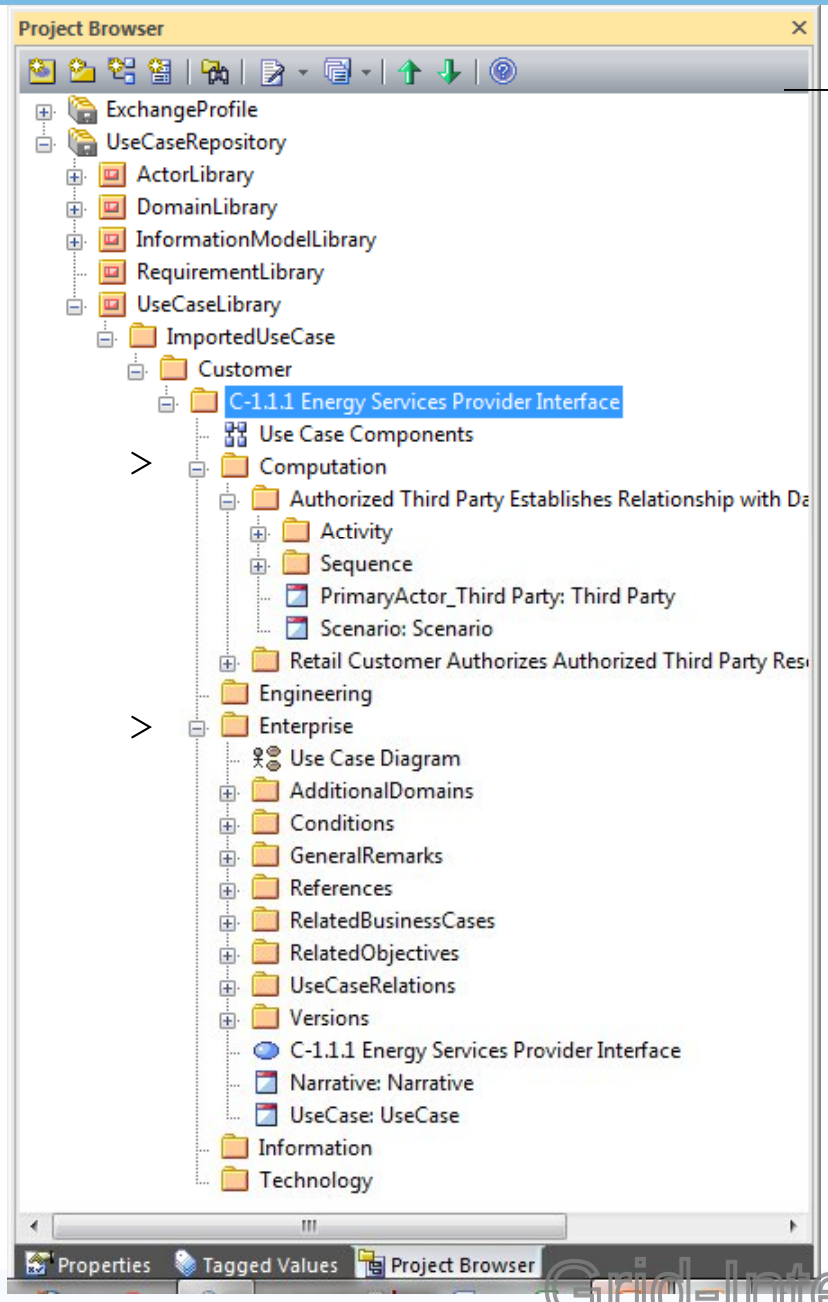


Grid-Interop
Driving to Grid 2020

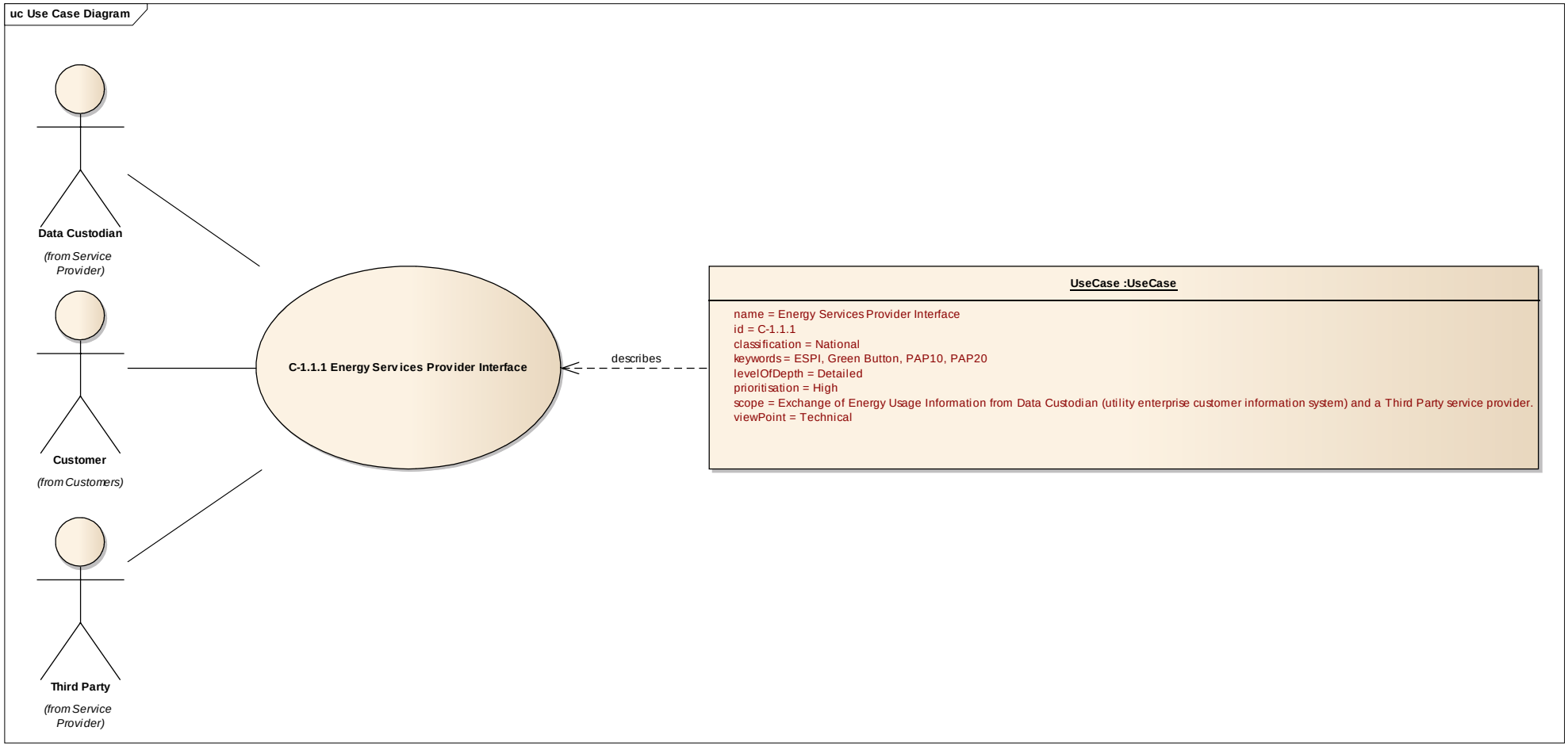
UseCaseLibrary

Dynamic Activity and Sequence Diagrams

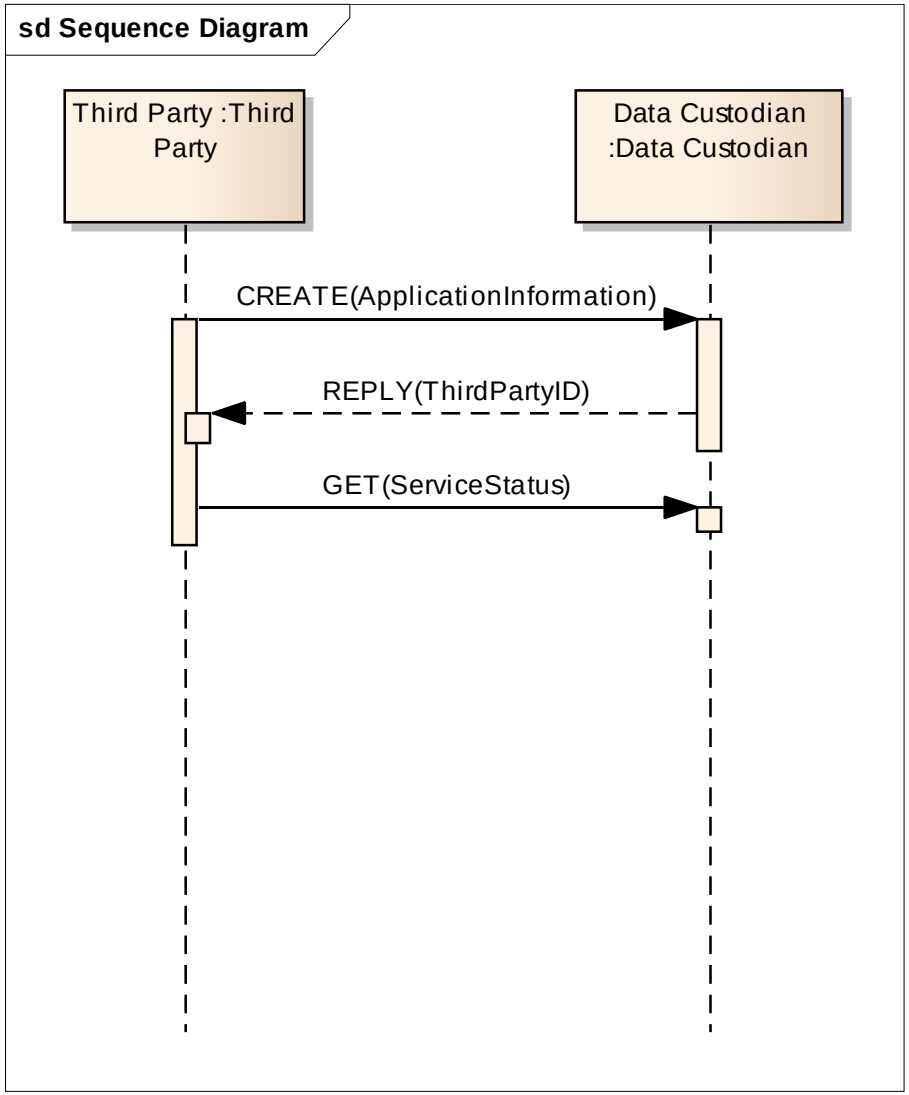
Static Use Case Information



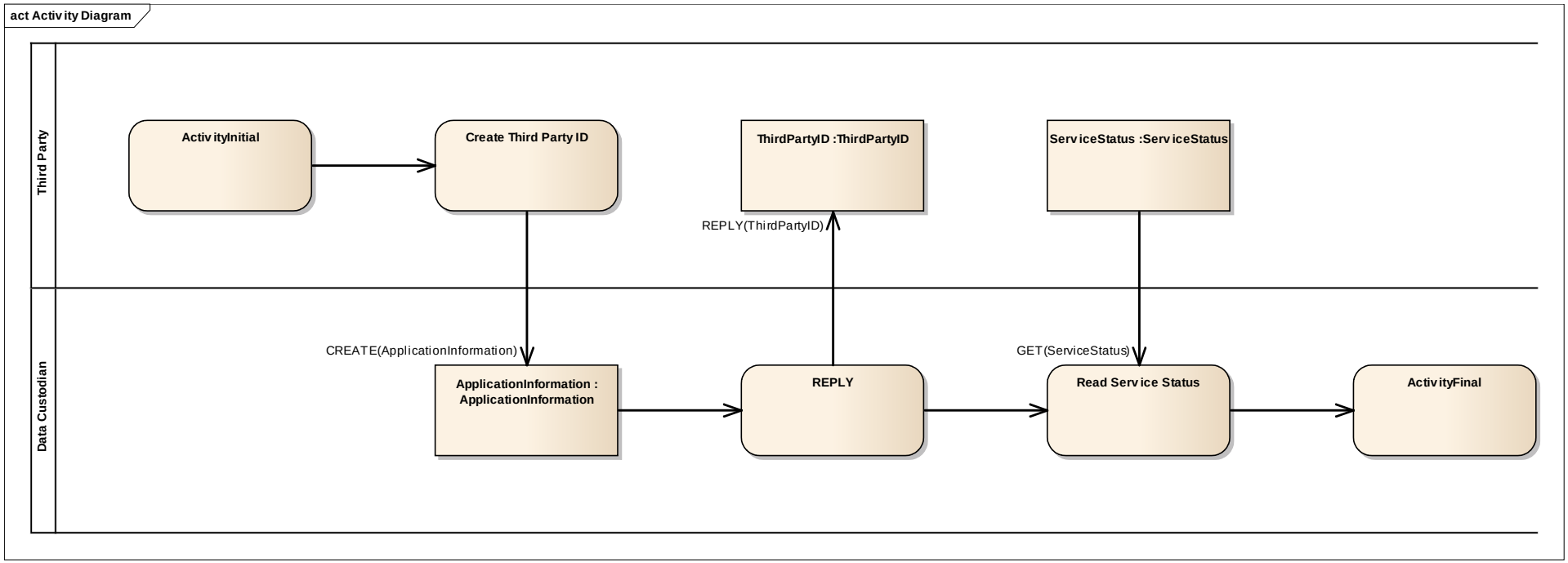
Generated Use Case Diagram



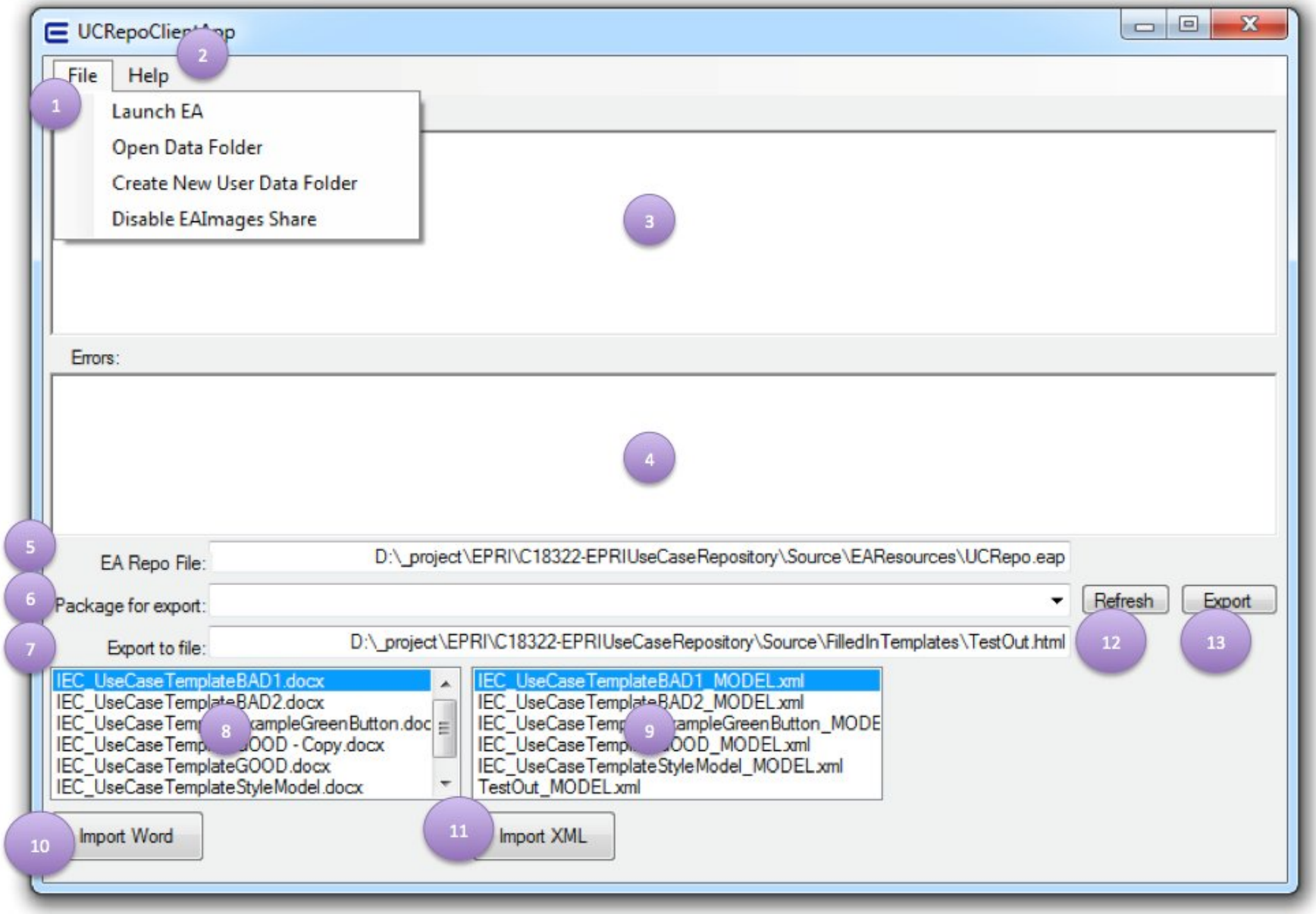
Generated Sequence Diagram



Generated Activity Diagram

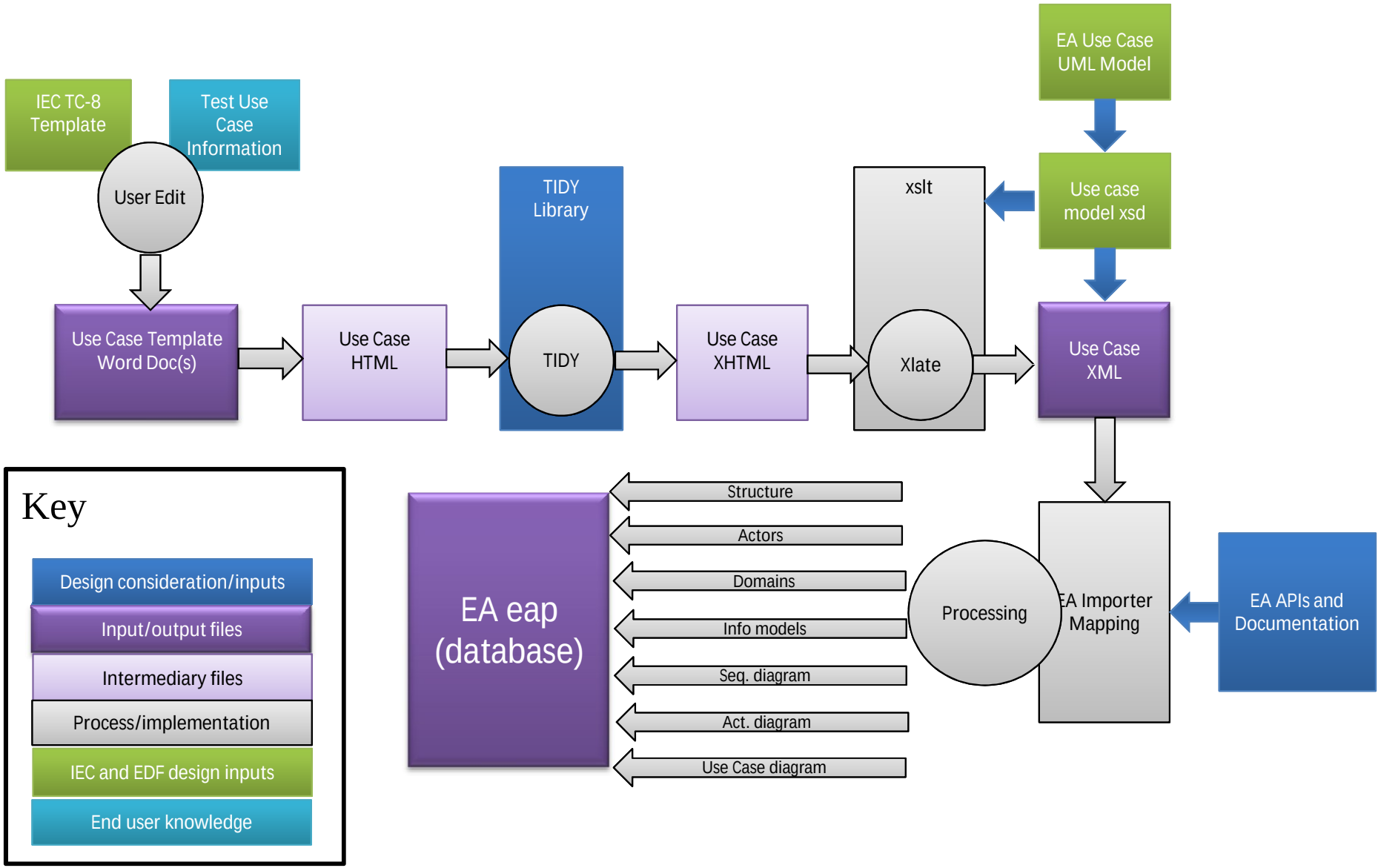


UCRepoClientApp



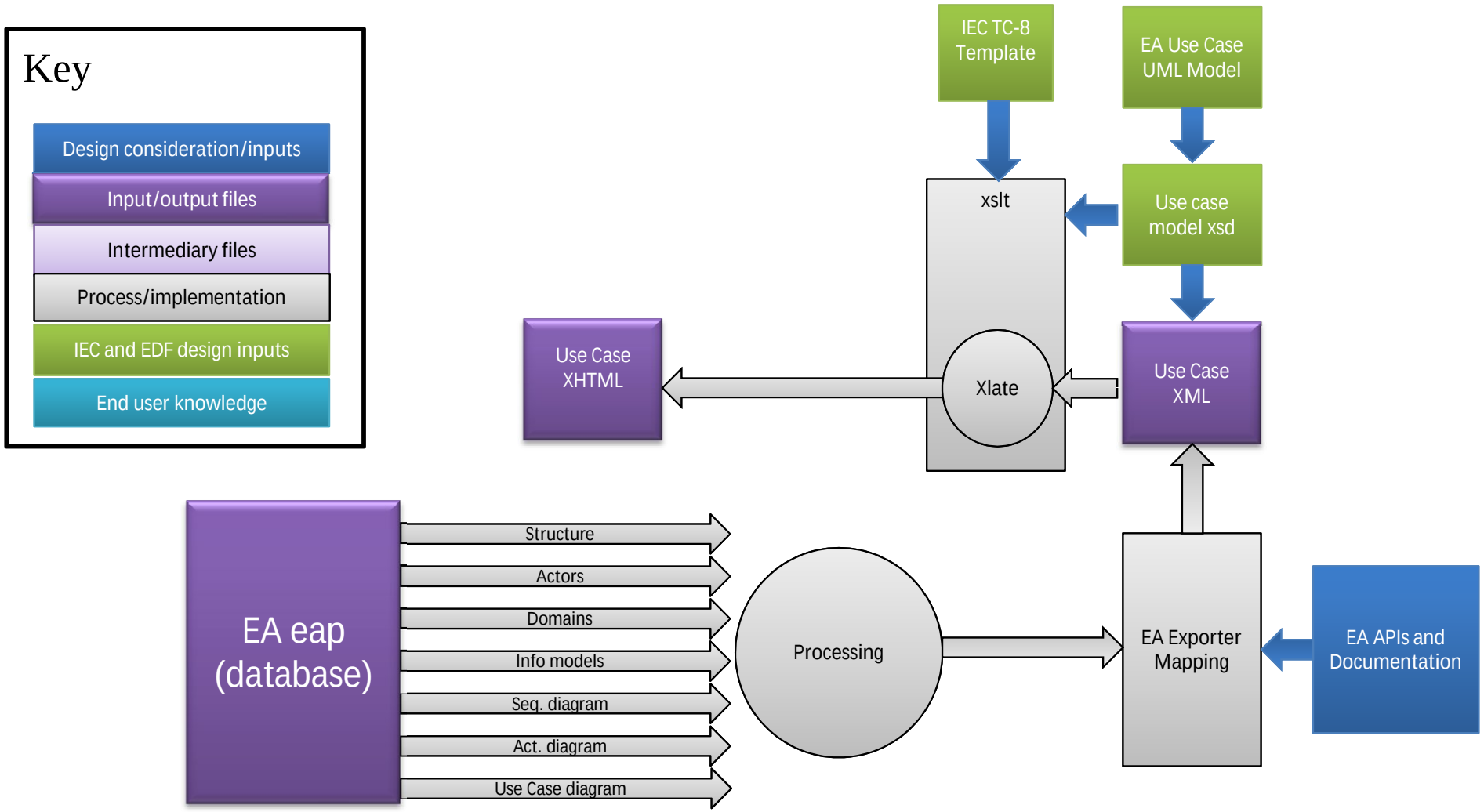
Grid-Interop
Driving to Grid 2020

Use Case Importer



Grid-Interop
Driving to Grid 2020

EA Use Case Exporter



Grid-Interop

Driving to Grid 2020

Questions