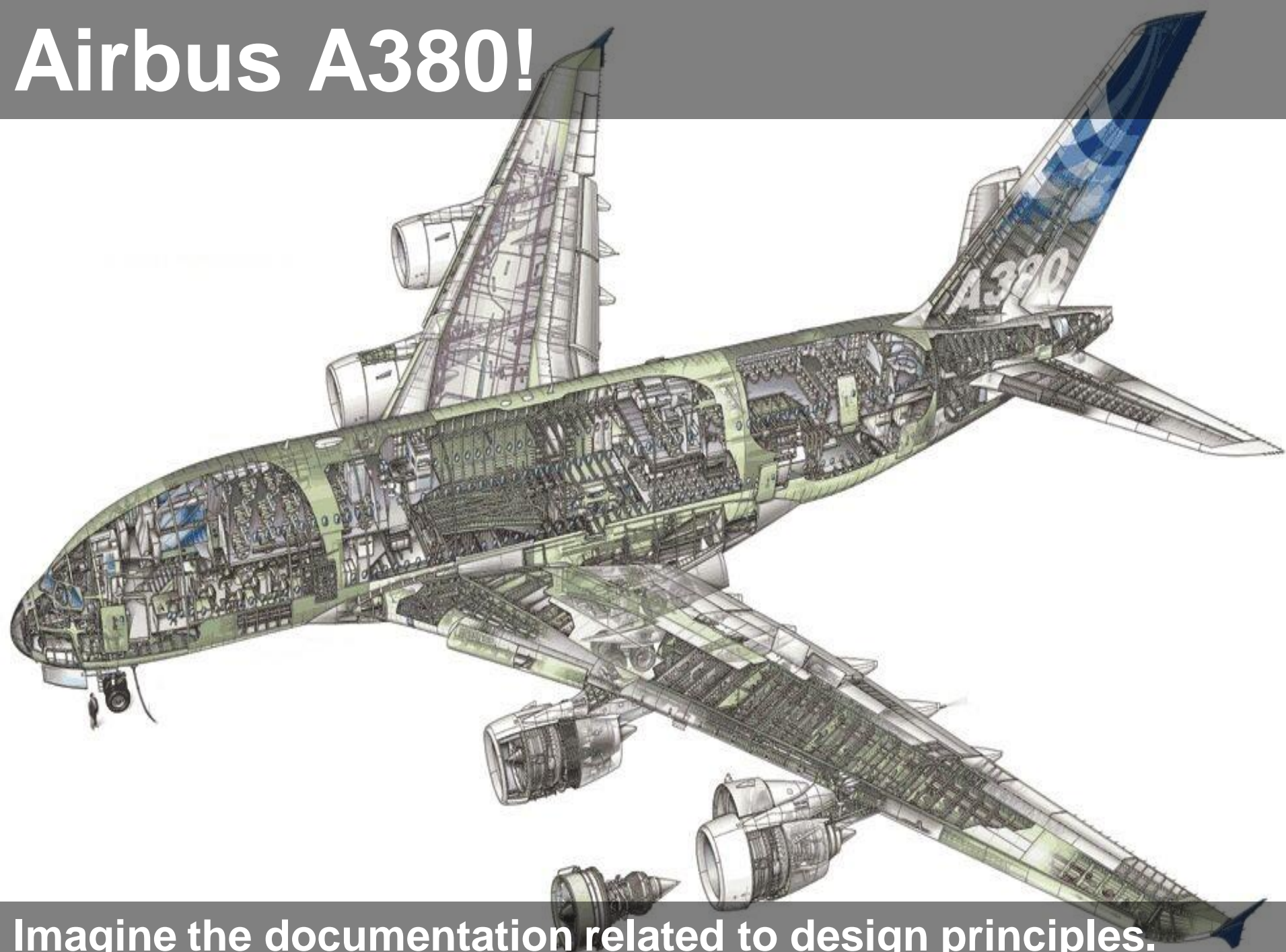


Demonstrations

What is the problem?

Airbus A380!

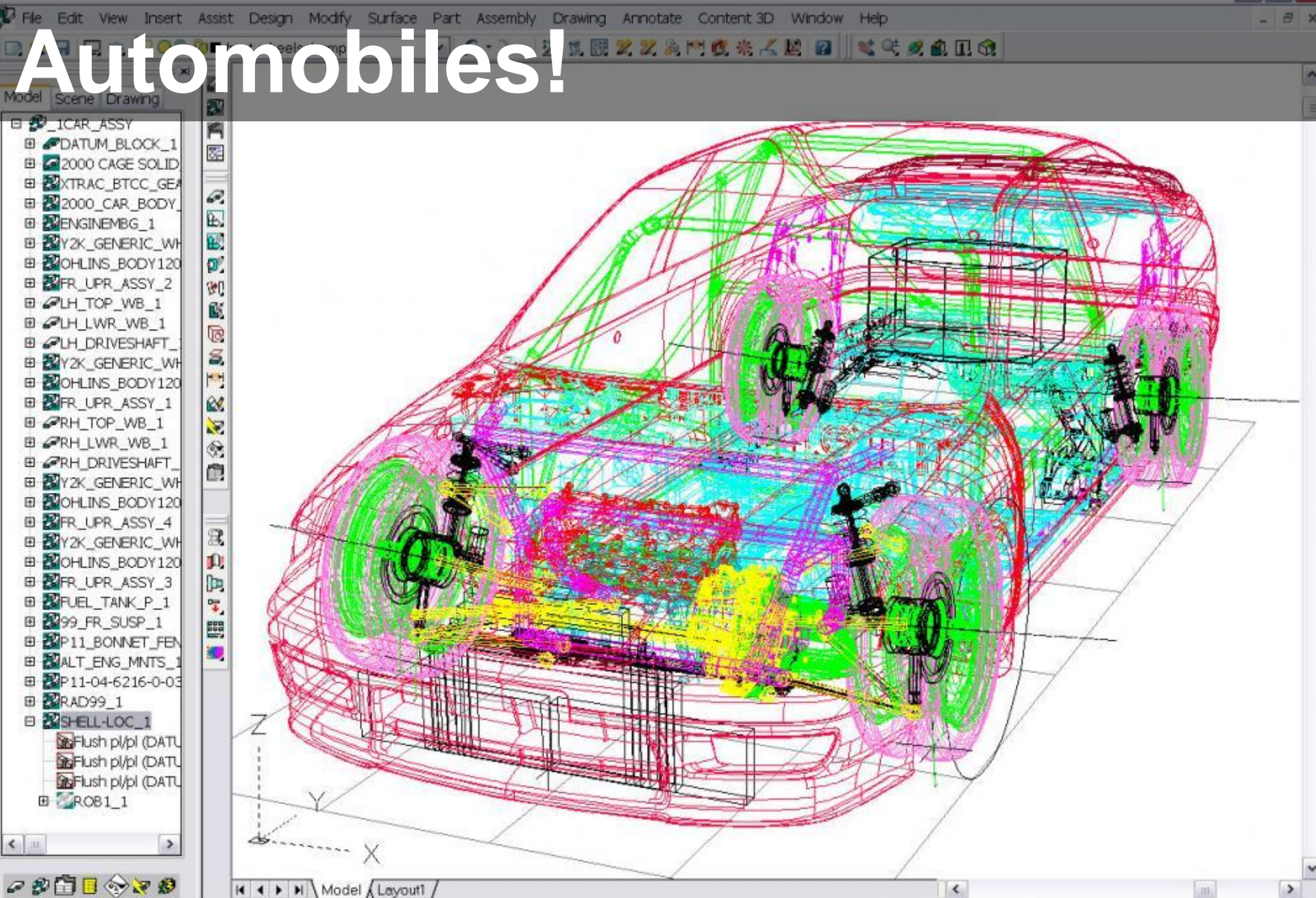


Imagine the documentation related to design principles.

Plants!



Imagine the documentation of a construction site.



Automobiles!

Imagine the technical specifications

Documentation!



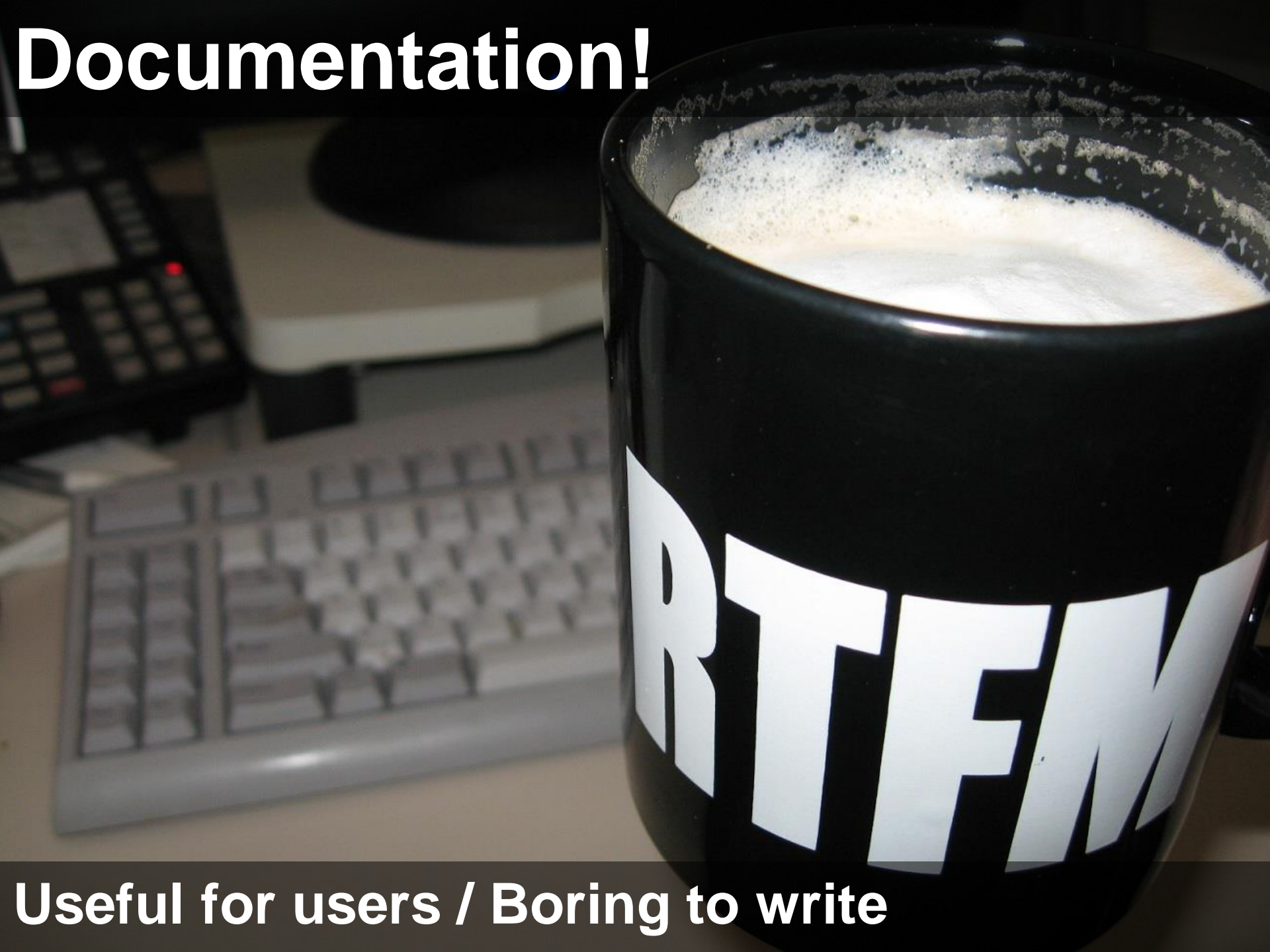
Write once ... and never look at after

Documentation!



Hard to keep it up-to-date

Documentation!



Useful for users / Boring to write

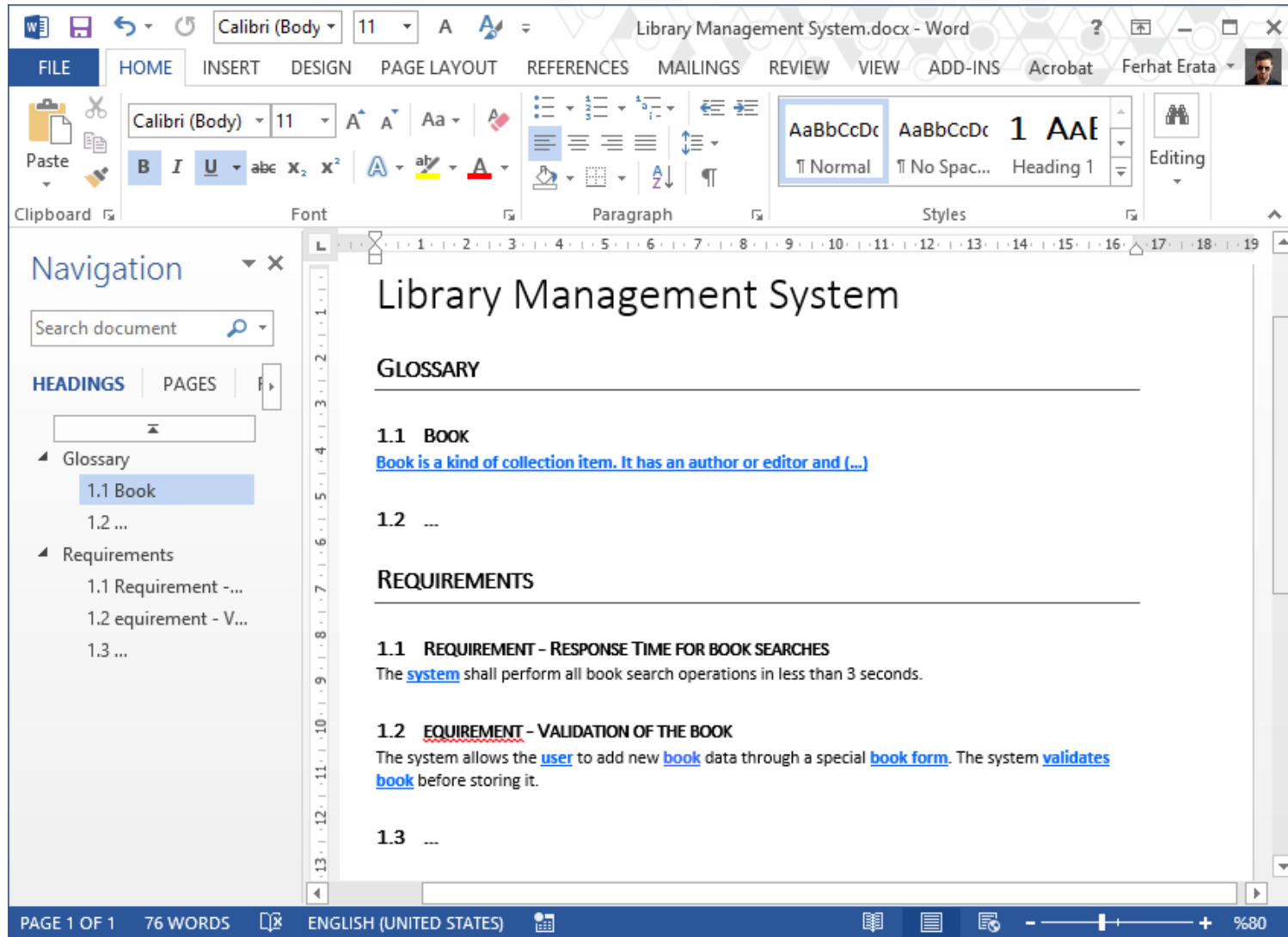
Semantics!

No meaning of syntax (words, sentences ...)

What is a text?

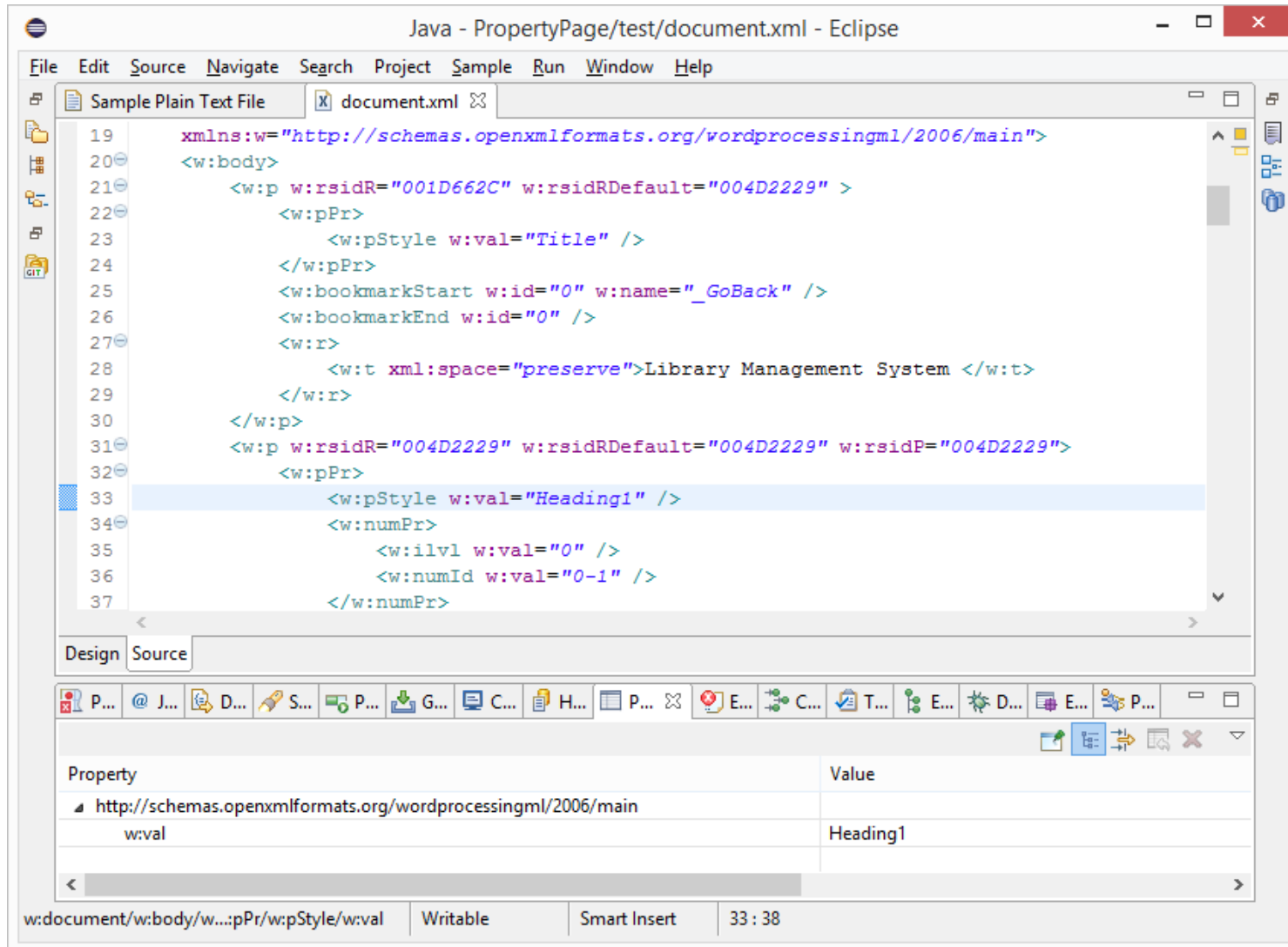
What is a text? (document file formats)

Office Open XML (.docx) (ISO/IEC 29500)



What is a text? (document file formats)

Office Open XML (.docx) (ISO/IEC 29500)



```
19  xmlns:w="http://schemas.openxmlformats.org/wordprocessingml/2006/main">
20  <w:body>
21    <w:p w:rsidR="001D662C" w:rsidRDefault="004D2229" >
22      <w:pPr>
23        <w:pStyle w:val="Title" />
24      </w:pPr>
25      <w:bookmarkStart w:id="0" w:name="_GoBack" />
26      <w:bookmarkEnd w:id="0" />
27      <w:r>
28        <w:t xml:space="preserve">Library Management System </w:t>
29      </w:r>
30    </w:p>
31    <w:p w:rsidR="004D2229" w:rsidRDefault="004D2229" w:rsidP="004D2229">
32      <w:pPr>
33        <w:pStyle w:val="Heading1" />
34        <w:numPr>
35          <w:ilvl w:val="0" />
36          <w:numId w:val="0-1" />
37        </w:numPr>

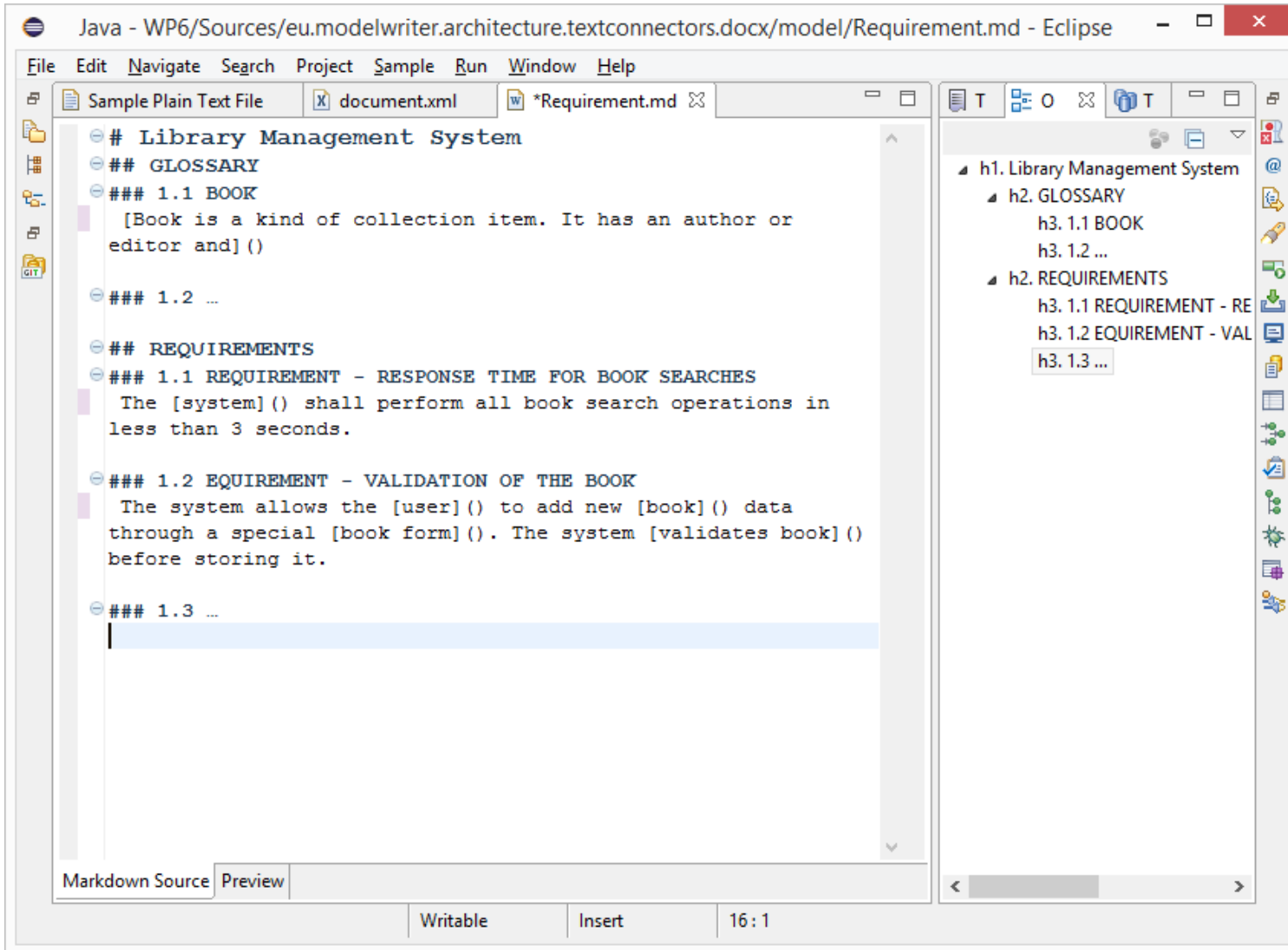
```

Property	Value
http://schemas.openxmlformats.org/wordprocessingml/2006/main	
w:val	Heading1

w:document/w:body/w:p/w:pPr/w:pStyle/w:val Writable Smart Insert 33 : 38

What is a text? (.md source file)

text/markdown (ICANN Standard)



The screenshot shows the Eclipse IDE interface. The main editor window displays a markdown file named `*Requirement.md`. The file content is as follows:

```
# Library Management System
## GLOSSARY
### 1.1 BOOK
[Book is a kind of collection item. It has an author or
editor and]()

### 1.2 ...

## REQUIREMENTS
### 1.1 REQUIREMENT - RESPONSE TIME FOR BOOK SEARCHES
The [system]() shall perform all book search operations in
less than 3 seconds.

### 1.2 EQUIREMENT - VALIDATION OF THE BOOK
The system allows the [user]() to add new [book]() data
through a special [book form]() . The system [validates book]()
before storing it.

### 1.3 ...
```

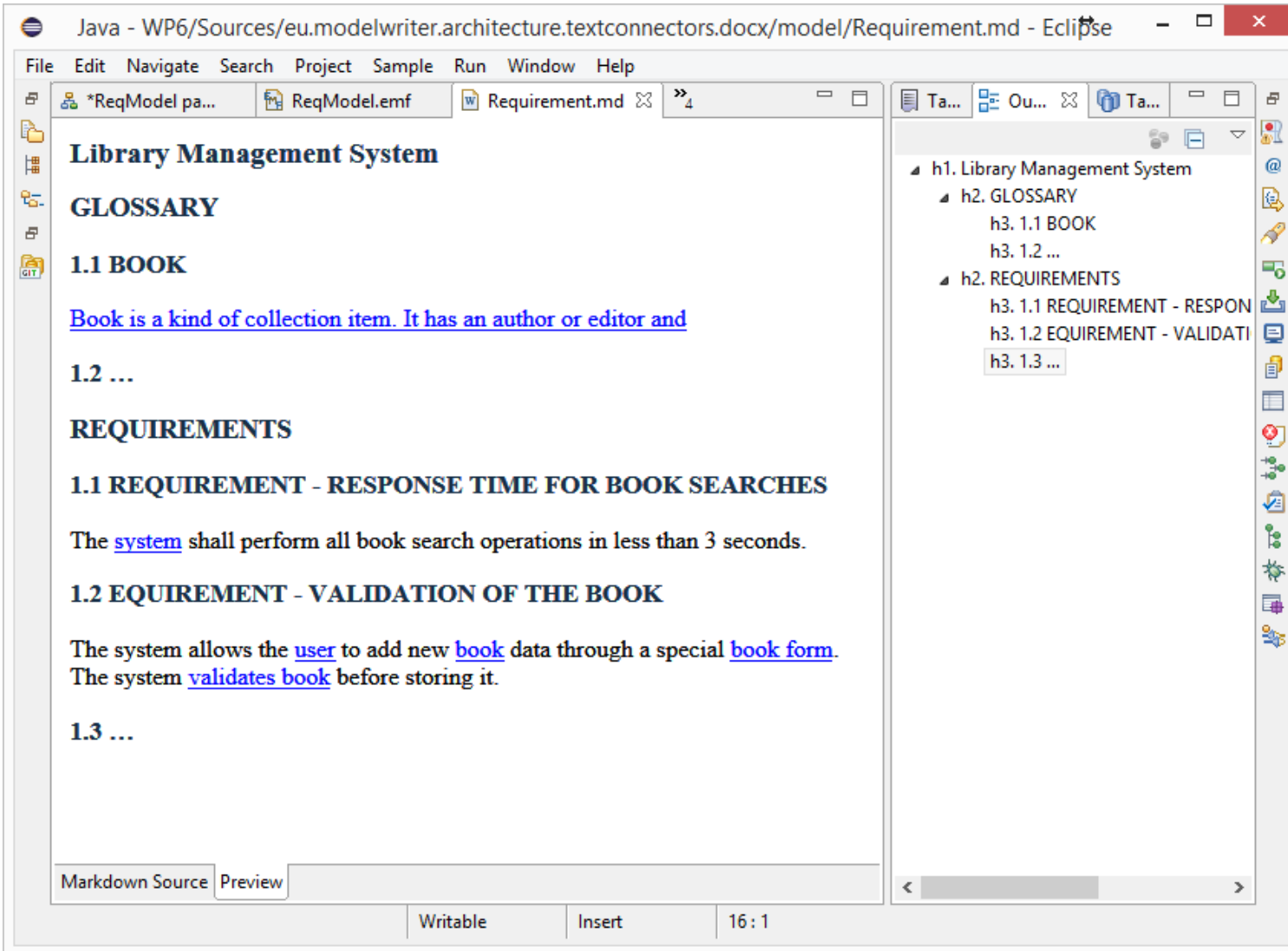
The right-hand side of the IDE features a tree view showing the document structure:

- h1. Library Management System
 - h2. GLOSSARY
 - h3. 1.1 BOOK
 - h3. 1.2 ...
 - h2. REQUIREMENTS
 - h3. 1.1 REQUIREMENT - RE
 - h3. 1.2 EQUIREMENT - VAL
 - h3. 1.3 ...

The bottom status bar indicates the current mode is "Markdown Source", the file is "Writable", and the cursor is in "Insert" mode at line 16, column 1.

What is a text? (HTML Preview)

text/markdown (ICANN Standard)



Java - WP6/Sources/eu.modelwriter.architecture.textconnectors.docx/model/Requirement.md - Eclipse

File Edit Navigate Search Project Sample Run Window Help

*ReqModel pa... ReqModel.emf Requirement.md »4

Library Management System

GLOSSARY

1.1 BOOK

[Book is a kind of collection item. It has an author or editor and](#)

1.2 ...

REQUIREMENTS

1.1 REQUIREMENT - RESPONSE TIME FOR BOOK SEARCHES

The [system](#) shall perform all book search operations in less than 3 seconds.

1.2 EQUIREMENT - VALIDATION OF THE BOOK

The system allows the [user](#) to add new [book](#) data through a special [book form](#).
The system [validates book](#) before storing it.

1.3 ...

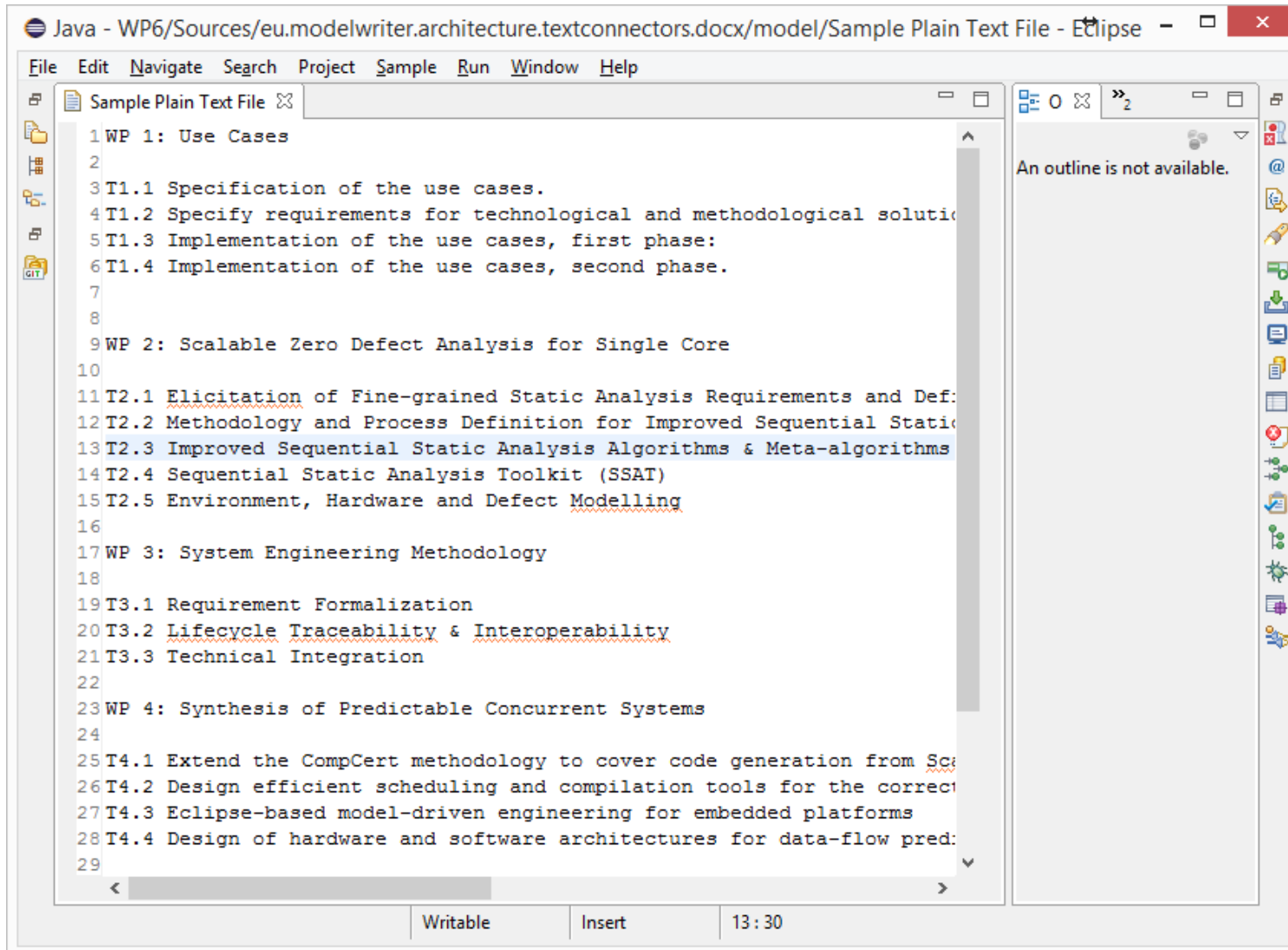
- h1. Library Management System
 - h2. GLOSSARY
 - h3. 1.1 BOOK
 - h3. 1.2 ...
 - h2. REQUIREMENTS
 - h3. 1.1 REQUIREMENT - RESPON
 - h3. 1.2 EQUIREMENT - VALIDATI
 - h3. 1.3 ...

Markdown Source Preview

Writable Insert 16 : 1

What is a text? (unformatted text)

text/plain (ICANN Standard)



Java - WP6/Sources/eu.modelwriter.architecture.textconnectors.docx/model/Sample Plain Text File - Eclipse

File Edit Navigate Search Project Sample Run Window Help

Sample Plain Text File

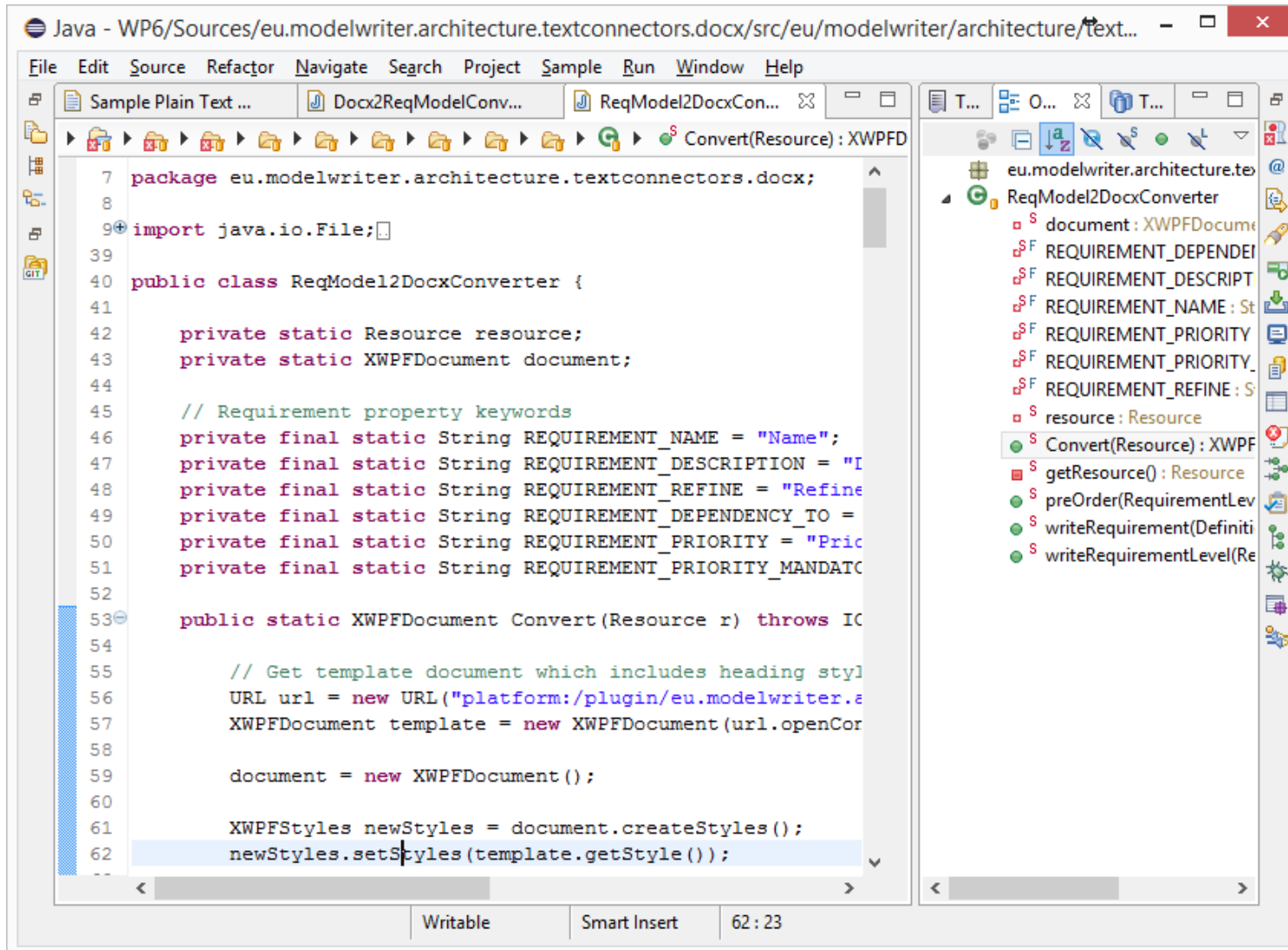
```
1 WP 1: Use Cases
2
3 T1.1 Specification of the use cases.
4 T1.2 Specify requirements for technological and methodological solutions
5 T1.3 Implementation of the use cases, first phase:
6 T1.4 Implementation of the use cases, second phase.
7
8
9 WP 2: Scalable Zero Defect Analysis for Single Core
10
11 T2.1 Elicitation of Fine-grained Static Analysis Requirements and Definitions
12 T2.2 Methodology and Process Definition for Improved Sequential Static Analysis
13 T2.3 Improved Sequential Static Analysis Algorithms & Meta-algorithms
14 T2.4 Sequential Static Analysis Toolkit (SSAT)
15 T2.5 Environment, Hardware and Defect Modelling
16
17 WP 3: System Engineering Methodology
18
19 T3.1 Requirement Formalization
20 T3.2 Lifecycle Traceability & Interoperability
21 T3.3 Technical Integration
22
23 WP 4: Synthesis of Predictable Concurrent Systems
24
25 T4.1 Extend the CompCert methodology to cover code generation from Specifications
26 T4.2 Design efficient scheduling and compilation tools for the correct compilation
27 T4.3 Eclipse-based model-driven engineering for embedded platforms
28 T4.4 Design of hardware and software architectures for data-flow prediction
29
```

An outline is not available.

Writable Insert 13:30

What is a text? (code files)

Java, C++ ... Programing Languages



The screenshot shows an IDE window titled "Java - WP6/Sources/eu.modelwriter.architecture.textconnectors.docx/src/eu/modelwriter/architecture/text...". The main editor displays the following Java code:

```
7 package eu.modelwriter.architecture.textconnectors.docx;
8
9 import java.io.File;
10
39
40 public class ReqModel2DocxConverter {
41
42     private static Resource resource;
43     private static XWPFDocument document;
44
45     // Requirement property keywords
46     private final static String REQUIREMENT_NAME = "Name";
47     private final static String REQUIREMENT_DESCRIPTION = "Description";
48     private final static String REQUIREMENT_REFINE = "Refine";
49     private final static String REQUIREMENT_DEPENDENCY_TO = "Dependency To";
50     private final static String REQUIREMENT_PRIORITY = "Priority";
51     private final static String REQUIREMENT_PRIORITY_MANDATORY = "Mandatory";
52
53     public static XWPFDocument Convert(Resource r) throws IOException {
54
55         // Get template document which includes heading styles
56         URL url = new URL("platform:/plugin/eu.modelwriter.architecture.textconnectors.docx/ReqModel2DocxConverterTemplate.docx");
57         XWPFDocument template = new XWPFDocument(url.openConnection().getInputStream());
58
59         document = new XWPFDocument();
60
61         XWPFStyles newStyles = document.createStyles();
62         newStyles.setStyles(template.getStyle());
63     }
64 }
```

The right sidebar shows a project explorer with the following structure:

- eu.modelwriter.architecture.textconnectors.docx
 - ReqModel2DocxConverter
 - document: XWPFDocument
 - REQUIREMENT_DEPENDENCY_TO
 - REQUIREMENT_DESCRIPTION
 - REQUIREMENT_NAME: String
 - REQUIREMENT_PRIORITY
 - REQUIREMENT_PRIORITY_MANDATORY
 - REQUIREMENT_REFINE: String
 - resource: Resource
 - Convert(Resource): XWPFDocument
 - getResource(): Resource
 - preOrder(RequirementLevel)
 - writeRequirement(Definition)
 - writeRequirementLevel(RequirementLevel)

What is a model?

Everything is a model! (ReqIF Standard)

Requirements Interchange Format

ProR - platform:/resource/LibraryManagementSystem/My.reqif - formalmind Studio

File Edit Search Requirements fmStudio Window Help

Quick Access ProR

My.reqif Requirements Document

ID	Name	Description
1		
1.1	Librarian	Librarian
1.2	Response Time for Book Searches	The system shall perform all book search operations in less than 3 second
1.3	Add new Book	A user form to add new book
1.4	Validation of the Book	Validation of the Book

Outline

- Spec Hierarchy
 - Librarian
 - The system shall
 - A user form to
 - Validation of th

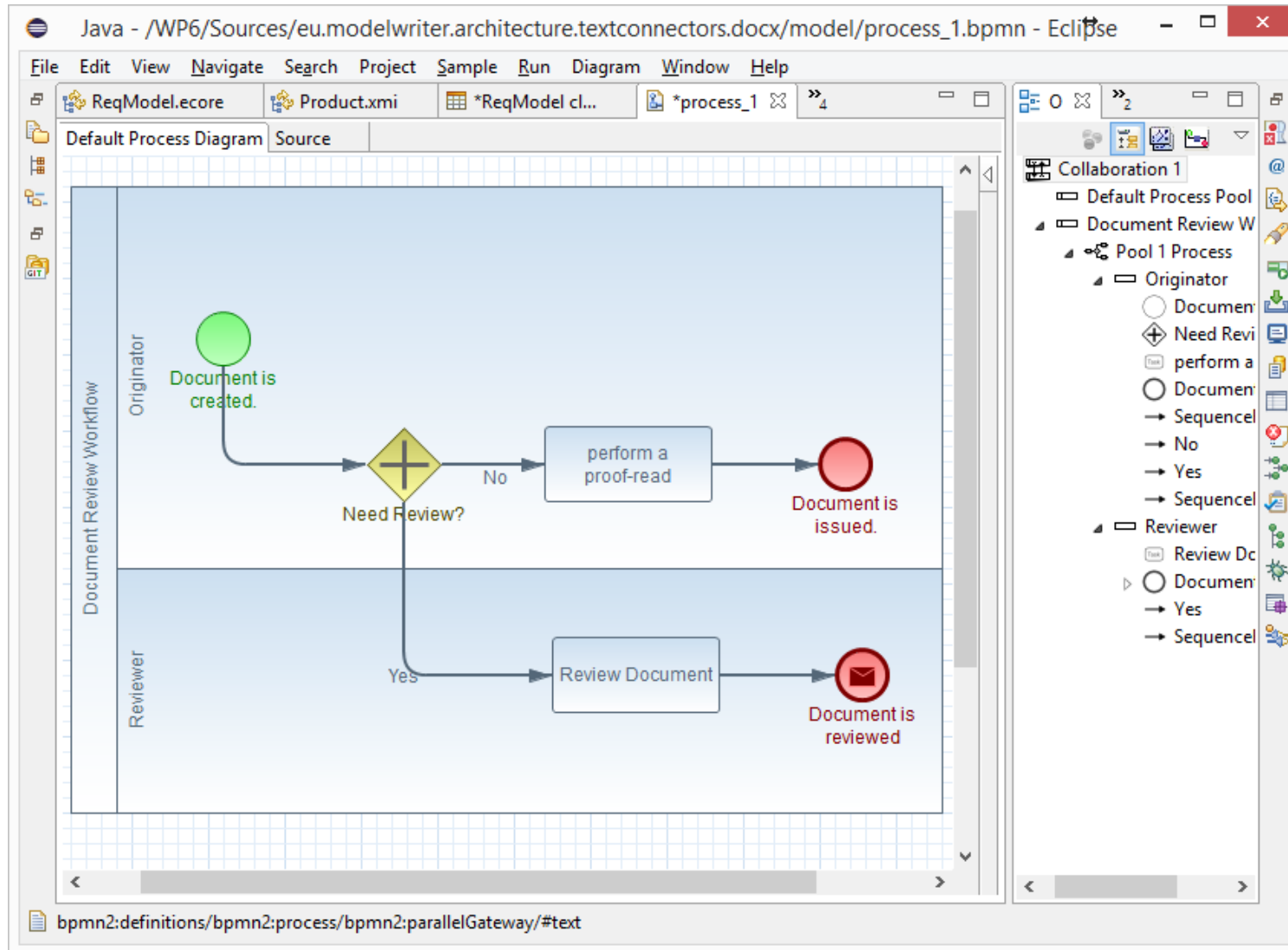
Properties

Property	Value
Requirement Type	
Description	The system shall perform all book search operations in less than 3 second
ID	R123
Name	Response Time for Book Searches
Responsible	Ferhat
Version	1
Spec Object	
Type	Requirement Type (Spec Object)

Standard Attributes All Attributes

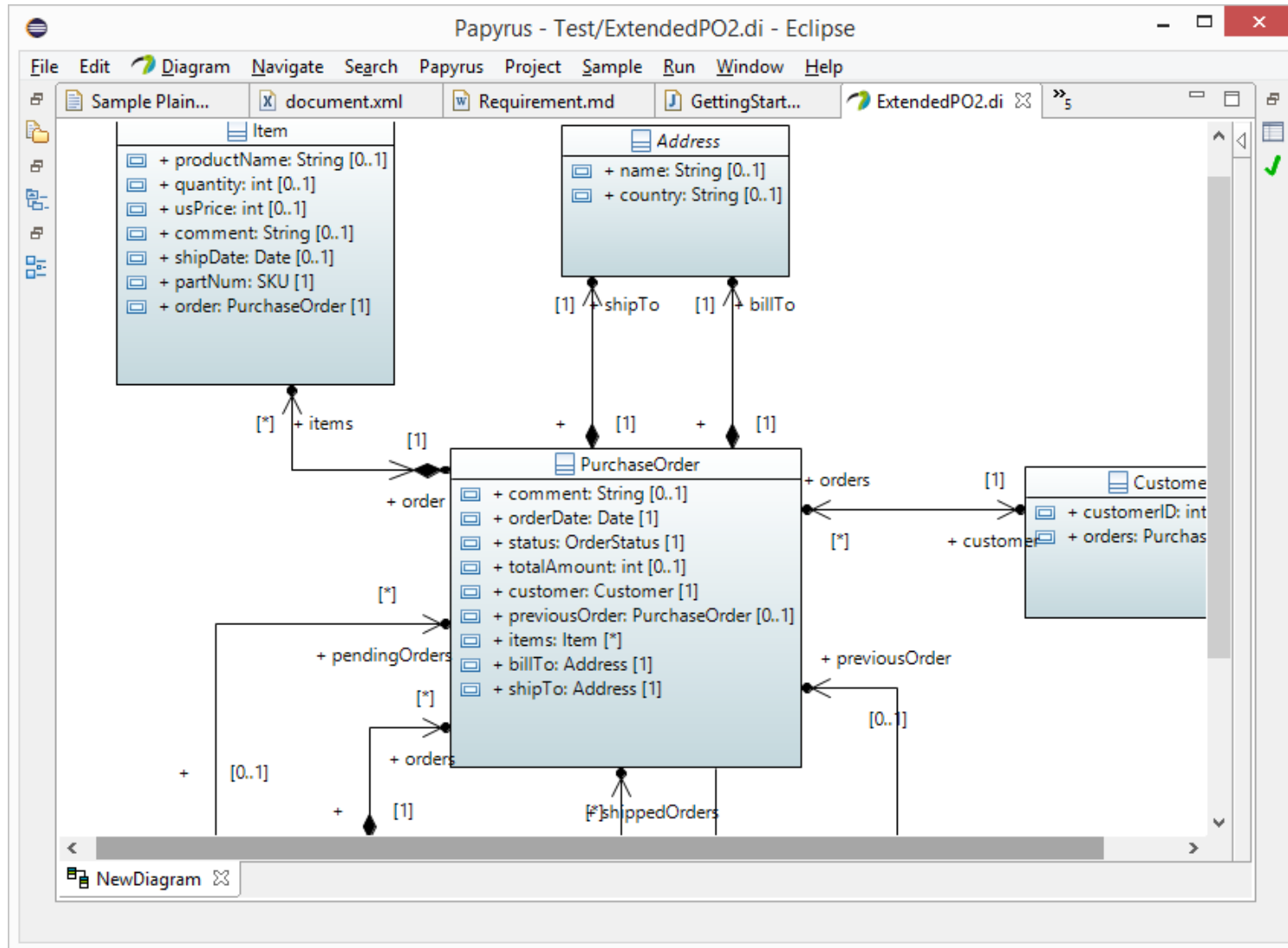
Everything is a model! (BPMN Standard)

Business Process Model & Notation

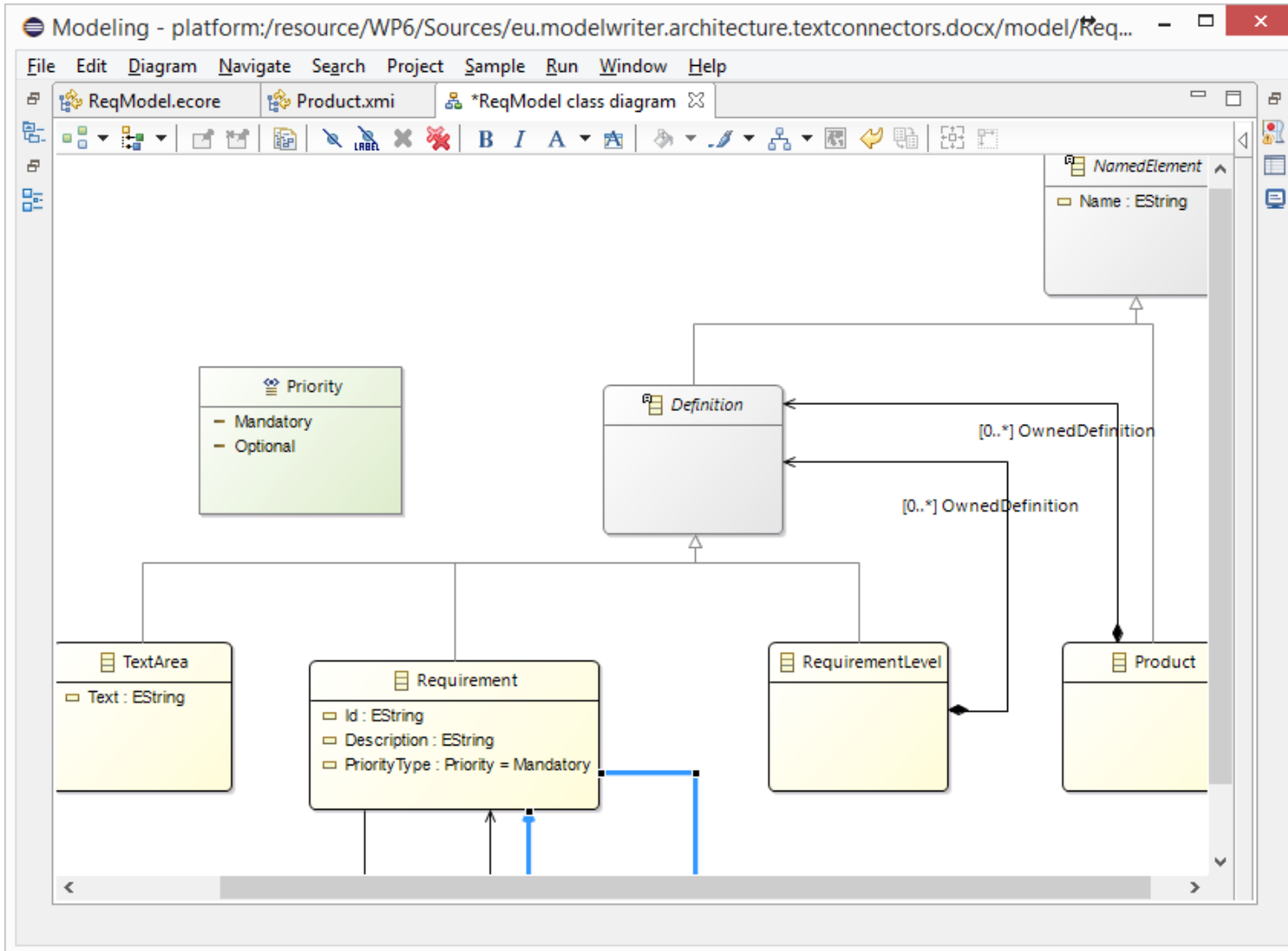


Everything is a model! (UML Standard)

UML Modeling Languages



Everything is a model!



Everything is a model!

Tree-based or Tabular Representations

Modeling - platform:/resource/WP6/Sources/eu.modelwriter.architecture.textconnectors.docx/model/Req...

File Edit Navigate Search Project DTable Sample Run Window Help

ReqModel.ecore Product.xmi *ReqModel class table

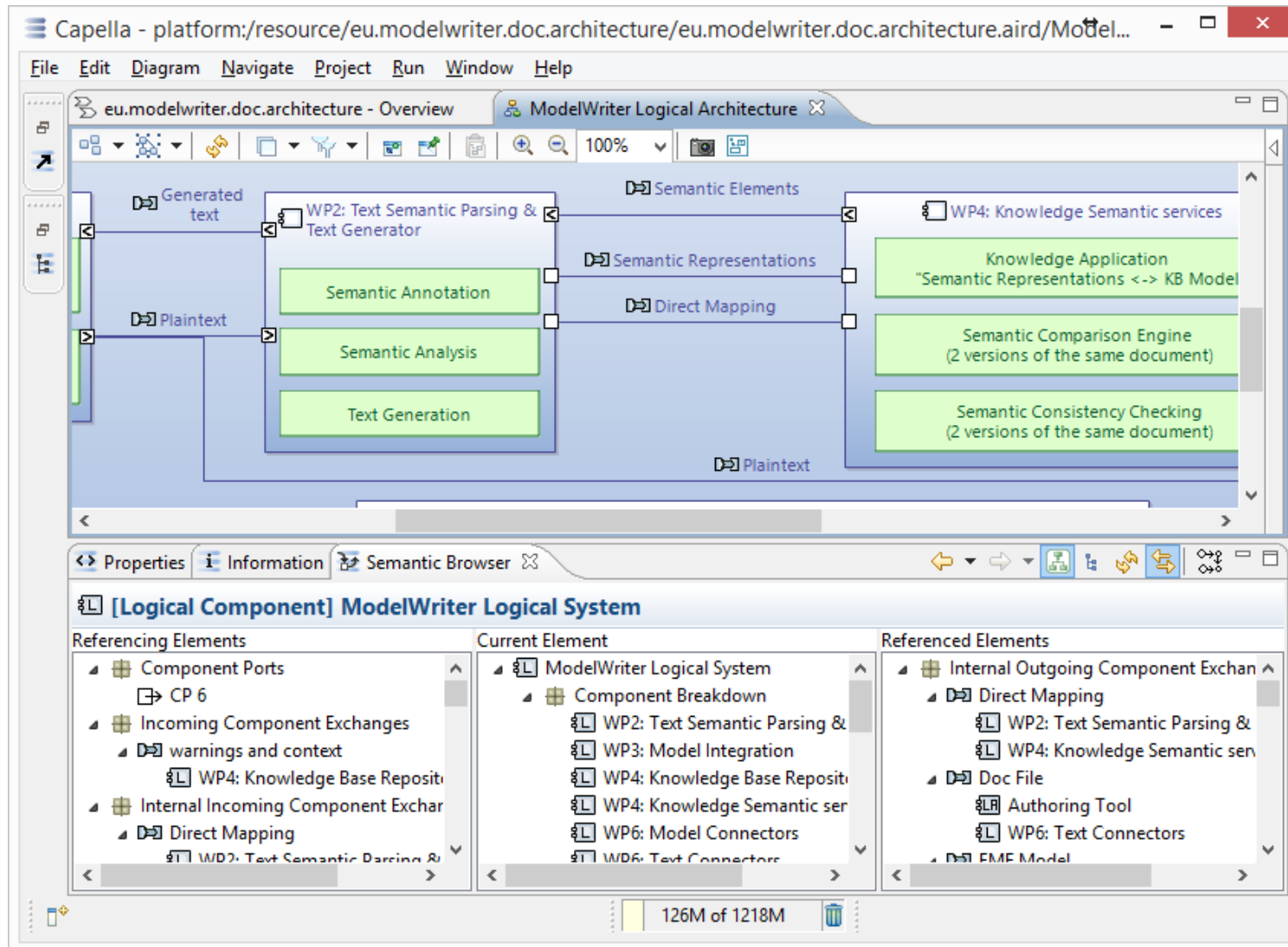
Name
NamedElement
Name : EString
Product -> NamedElement
OwnedDefinition : Definition
Definition -> NamedElement
RequirementLevel -> Definition
OwnedDefinition : Definition
Requirement -> Definition
Id : EString
Description : EString
Refine : Requirement
DependencyTo : Requirement
PriorityType : Priority
TextArea -> Definition
Text : EString

NamedElement

Property	Value
NamedElement	
Abstract	true
Default Value	
ESuper Types	
Instance Type Name	

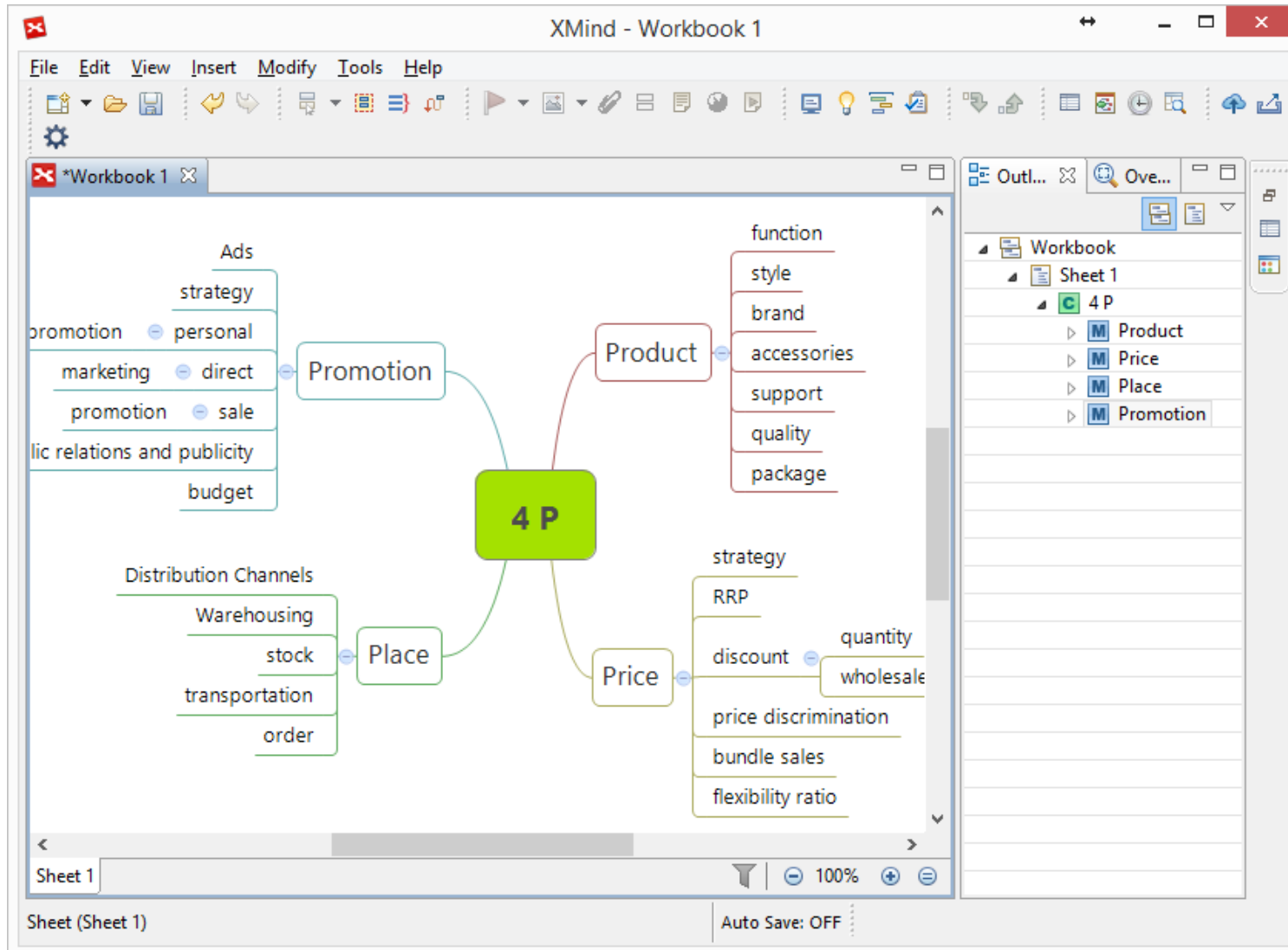
Everything is a model!

Software/System Architecture Design



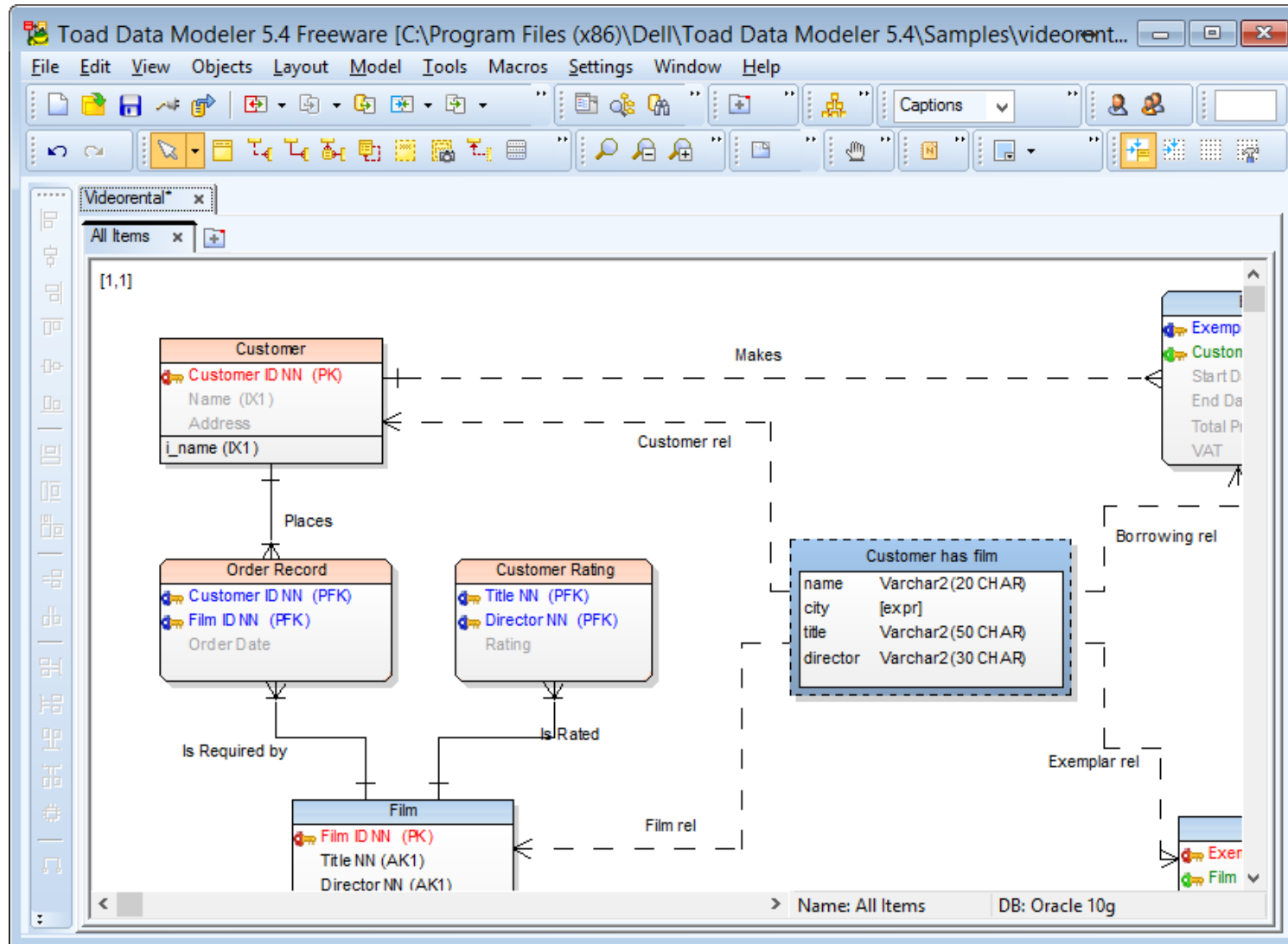
Everything is a model!

Topic Maps, Mind Maps, Vocabularies ...



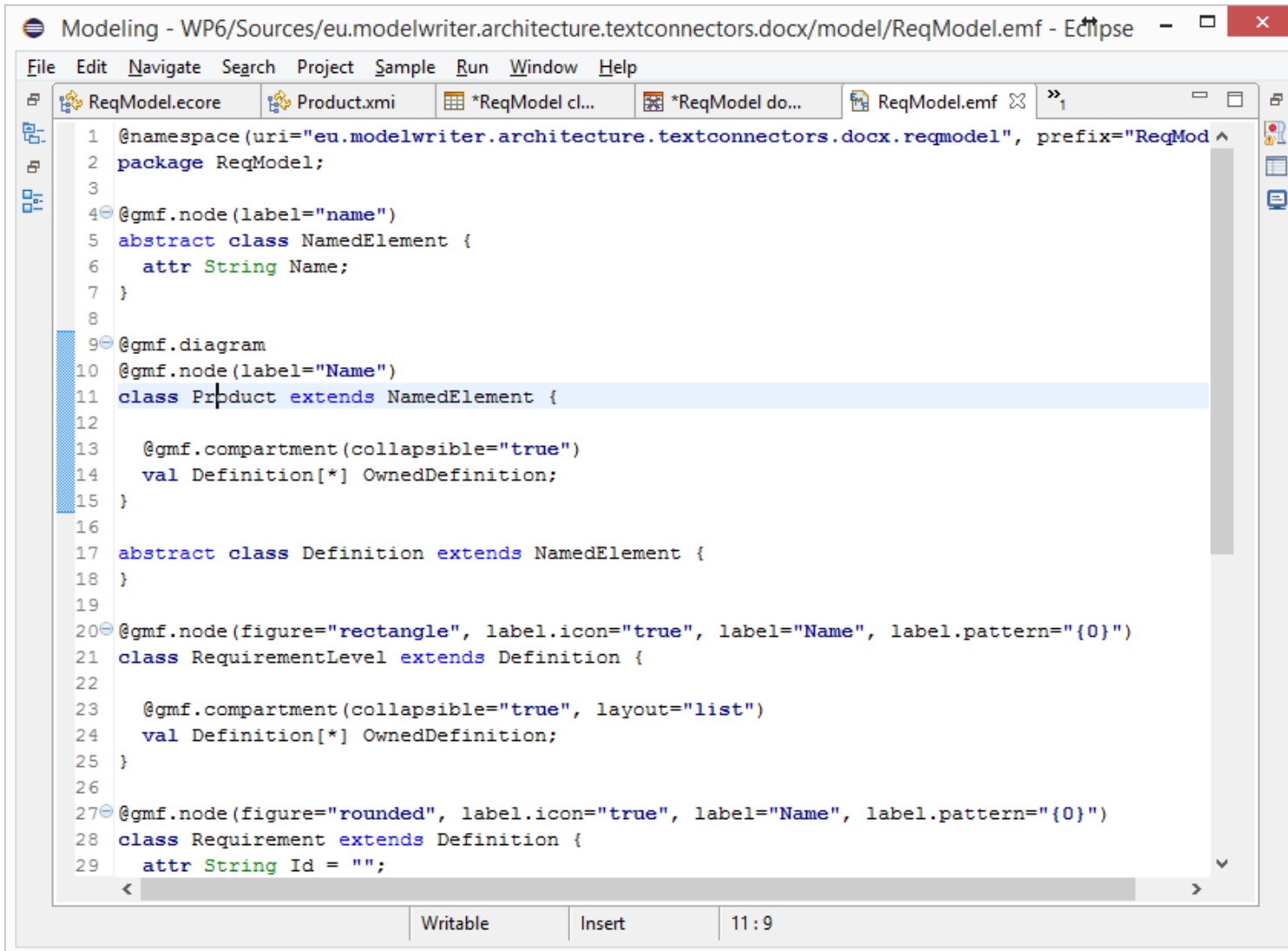
Everything is a model!

Databases (ER, IDEF1.x)



Everything is a model! (Textual Lang.)

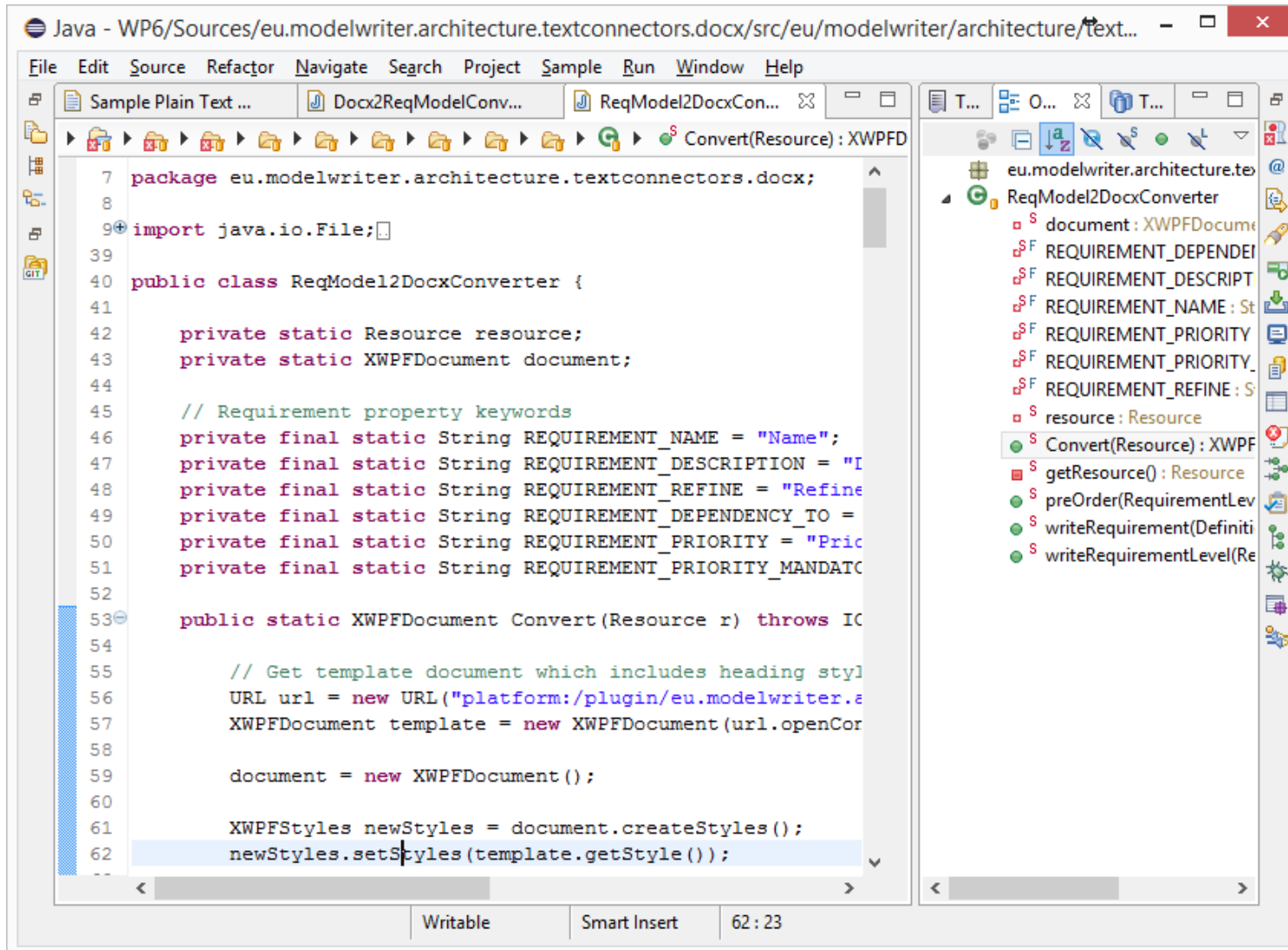
Domain Specific Languages



```
1 @namespace(uri="eu.modelwriter.architecture.textconnectors.docx.reqmodel", prefix="ReqMod
2 package ReqModel;
3
4 @gmf.node(label="name")
5 abstract class NamedElement {
6     attr String Name;
7 }
8
9 @gmf.diagram
10 @gmf.node(label="Name")
11 class Product extends NamedElement {
12
13     @gmf.compartment(collapsible="true")
14     val Definition[*] OwnedDefinition;
15 }
16
17 abstract class Definition extends NamedElement {
18 }
19
20 @gmf.node(figure="rectangle", label.icon="true", label="Name", label.pattern="{0}")
21 class RequirementLevel extends Definition {
22
23     @gmf.compartment(collapsible="true", layout="list")
24     val Definition[*] OwnedDefinition;
25 }
26
27 @gmf.node(figure="rounded", label.icon="true", label="Name", label.pattern="{0}")
28 class Requirement extends Definition {
29     attr String Id = "";
```


Everything is a model! (Java, C++, etc.)

Even Programming Languages (ASTs)



The screenshot shows an IDE window titled "Java - WP6/Sources/eu.modelwriter.architecture.textconnectors.docx/src/eu/modelwriter/architecture/text...". The main editor displays the source code for the `ReqModel2DocxConverter` class. The code includes package declarations, imports, and a `Convert` method that processes a resource into an XWPF document. The right-hand side of the IDE shows the "Project Explorer" with the project structure, including the `eu.modelwriter.architecture.textconnectors.docx` package and the `ReqModel2DocxConverter` class. The "Outline" view on the far right lists the methods and fields within the class.

```
package eu.modelwriter.architecture.textconnectors.docx;

import java.io.File;

public class ReqModel2DocxConverter {

    private static Resource resource;
    private static XWPFDocument document;

    // Requirement property keywords
    private final static String REQUIREMENT_NAME = "Name";
    private final static String REQUIREMENT_DESCRIPTION = "Description";
    private final static String REQUIREMENT_REFINE = "Refine";
    private final static String REQUIREMENT_DEPENDENCY_TO = "Dependency To";
    private final static String REQUIREMENT_PRIORITY = "Priority";
    private final static String REQUIREMENT_PRIORITY_MANDATORY = "Mandatory";

    public static XWPFDocument Convert(Resource r) throws IOException {

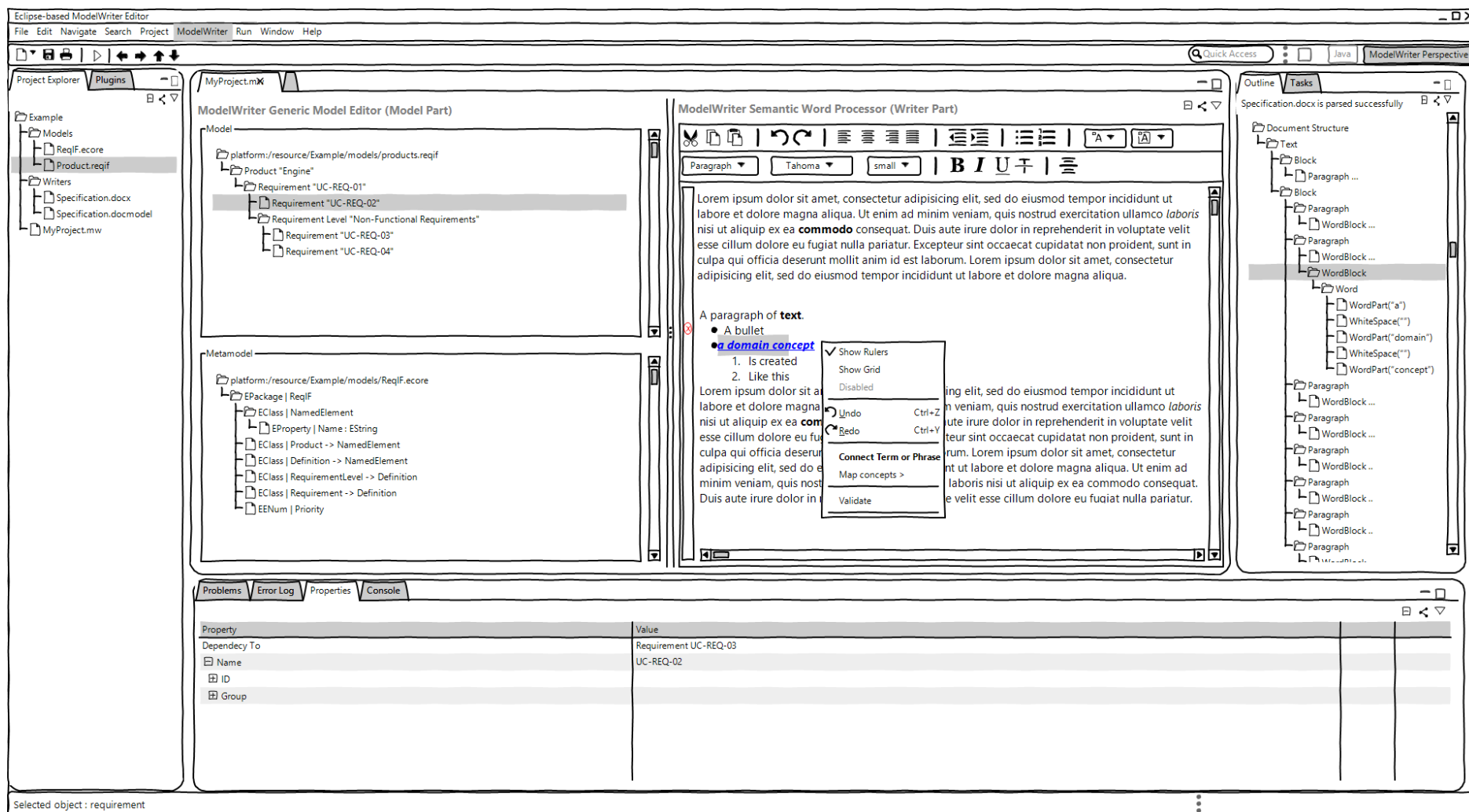
        // Get template document which includes heading styles
        URL url = new URL("platform:/plugin/eu.modelwriter.architecture.textconnectors.docx/ReqModel2DocxConverterTemplate.xwpx");
        XWPFDocument template = new XWPFDocument(url.openStream());

        document = new XWPFDocument();

        XWPFStyles newStyles = document.createStyles();
        newStyles.setStyles(template.getStyle());
    }
}
```

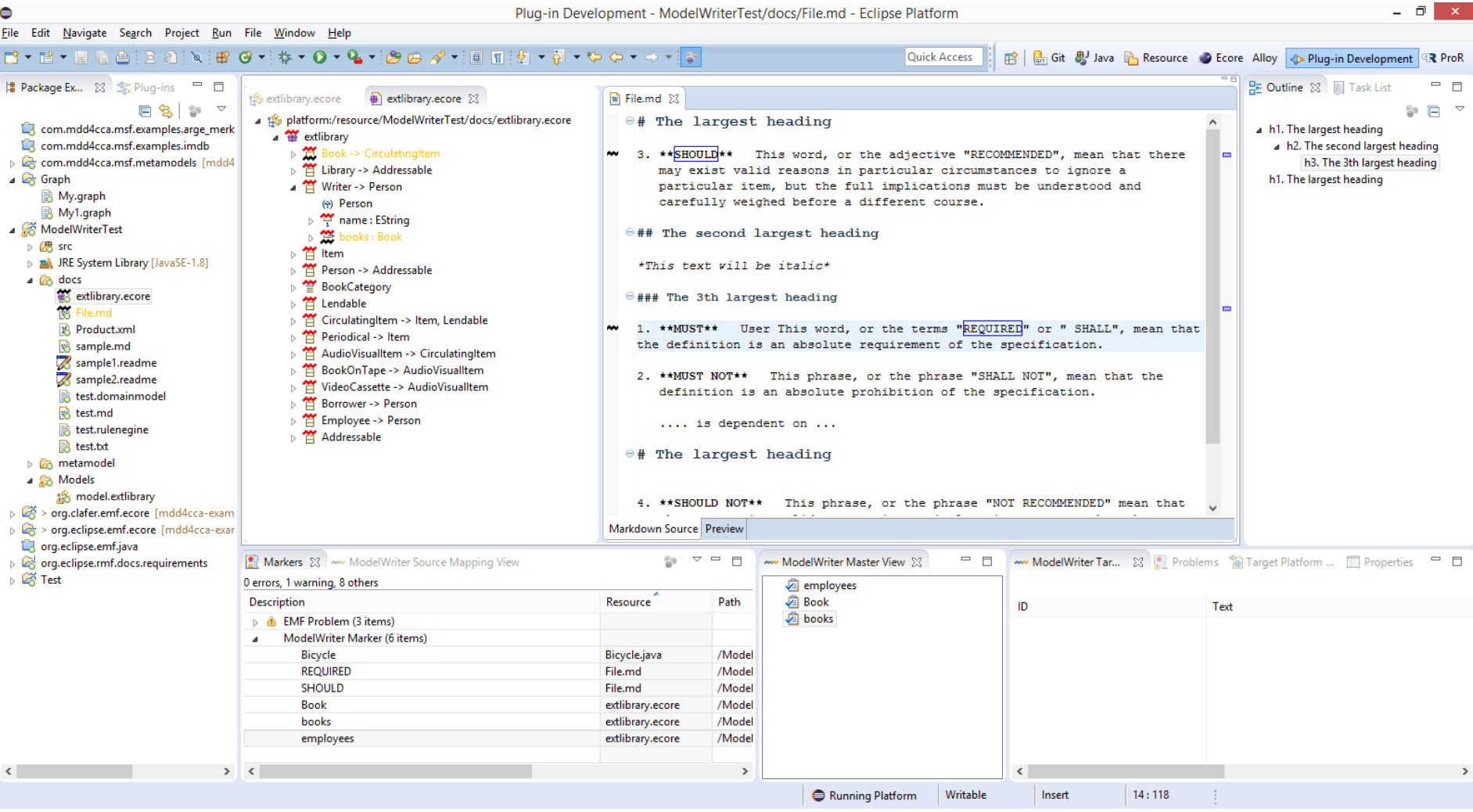
**Is it possible to connect and
keep arbitrary software/system
engineering artifacts
synchronized ?**

ModelWriter – The Solution



Text & Model-Synchronized Document Engineering Platform

Solution – Knowledge Capture



Text & Model-Synchronized Document Engineering Platform

Solution – Knowledge Capture

The screenshot displays the Eclipse IDE interface for a project named 'ModelWriterTest'. The main editor shows the 'Bicycle.java' file, which contains the following code:

```
1 package ModelWriter;
2
3 public class Bicycle {
4
5     // the Bicycle class has
6     // three fields
7     public int cadence;
8     public int gear;
9     public int speed;
10
11     // the Bicycle class has
12     // one constructor
13     public Bicycle(int startCadence, int startSpeed, int startGear) {
14         gear = startGear;
15         cadence = startCadence;
16         speed = startSpeed;
17     }
18
19     // the Bicycle class has
20     // four methods
21     public void setCadence(int newValue) {
22         cadence = (int)newValue;
23     }
24
25     public void setGear(int newValue) {
26         gear = newValue;
27     }
28 }
```

The Package Explorer on the left shows the project structure, including the 'src' directory with 'Bicycle.java' and 'MountainBike.java', and the 'docs' directory with 'File.md' and 'Product.xml'. The 'ModelWriter' package is also visible.

The bottom of the IDE features several views:

- Markers:** Shows 0 errors, 1 warning, and 11 others.
- ModelWriter Source Mapping View:** A table mapping resources to paths.
- ModelWriter Master View:** A tree view showing the project structure.
- ModelWriter Target Platform View:** A table showing the target platform configuration.

Description	Resource	Path
Bicycle	Bicycle.java	/Mc
cadence	Bicycle.java	/Mc
gear	Bicycle.java	/Mc
speed	Bicycle.java	/Mc
REQUIRED	File.md	/Mc
SHOULD	File.md	/Mc
Book	extlibrary.ecore	/Mc
books	extlibrary.ecore	/Mc
employees	extlibrary.ecore	/Mc

ID	Text

Text & Model-Synchronized Document Engineering Platform

Solution – Knowledge Capture

Plugin Development - ModelWriterTest/docs/extlibrary.ecore - Eclipse Platform

File Edit Navigate Search Project Run File Design Window Help

Quick Access

Package Explorer

extlibrary.ecore

```
<?xml version="1.0" encoding="UTF-8"?>
<ecore:EPackage xmi:version="2.0" xmlns:xmi="http://www.omg.org/XMI" xmlns:xs="http://www.eclipse.org/emf/2002/Ecore" name="extlibrary" nsU
nsPrefix="extlib">
  <eClassifiers xsi:type="ecore:EClass" name="Book" eSuperTypes="#//Circulati
  <eStructuralFeatures xsi:type="ecore:EAttribute" name="title" eType="ecor
  <eStructuralFeatures xsi:type="ecore:EAttribute" name="pages" eType="ecor
    defaultLiteral="100"/>
  <eStructuralFeatures xsi:type="ecore:EAttribute" name="category" eType="#
    unsettable="true"/>
  <eStructuralFeatures xsi:type="ecore:EReference" name="author" lowerBound
    eType="#//Writer" eOpposite="#//Writer/books"/>
</eClassifiers>
  <eClassifiers xsi:type="ecore:EClass" name="Library" eSuperTypes="#//Addres
  <eStructuralFeatures xsi:type="ecore:EAttribute" name="name" eType="ecore
  <eStructuralFeatures xsi:type="ecore:EReference" name="writers" upperBound
    eType="#//Writer" volatile="true" transient="true" derived="true" con
    resolveProxies="false"/>
  <eAnnotations source="http://org.eclipse/emf/ecore/util/ExtendedMetaDa
    <details key="group" value="#people"/>
  </eAnnotations>
  <eStructuralFeatures>
  <eStructuralFeatures xsi:type="ecore:EReference" name="employees" upperBo
    eType="#//Employee" volatile="true" transient="true" derived="true" c
    resolveProxies="false"/>

```

Outline

Task List

ModelWriter Source Mapping View

0 errors, 1 warning, 11 others

Description	Resource	Pat
EMF Problem (3 items)		
ModelWriter Marker (9 items)		
Bicycle	Bicycle.java	/Mc
cadence	Bicycle.java	/Mc
gear	Bicycle.java	/Mc
speed	Bicycle.java	/Mc
REQUIRED	File.md	/Mc
SHOULD	File.md	/Mc
Book	extlibrary.ecore	/Mc

ModelWriter Master View

employees

Book

books

ModelWriter Target View

ID	Text
----	------

Running Platform

Text & Model-Synchronized Document Engineering Platform

Solution – Knowledge Extraction

The screenshot displays the ModelWriter Project application window, which is divided into three main sections:

- File Link Change Statistic**: A menu bar at the top.
- The**: A text editor on the left containing technical specifications. A context menu is open over this text, showing options: **Generate Links**, **Search Link**, **Add Link**, and **Remove Link**. The visible text includes:
2 Pipes shall be used
ABS... shall be used
Flexible Hoses shall be defined with a maximum length of 500 mm regardless of
ABS2195 -LRB- preferred for weight saving -RRB- or NSA5516J P-Clamp Shall be u
Rigid Pipes Shall be segregated to fixed Structure by not less than 10 mm as sh
Flexible Hoses Shall be segregated to rigid Component/Item/Object by not less t
Rigid Pipes Shall be segregated to movable Component/Item/Object by not less
Flexible Hoses Shall be segregated to movable Component/Item/Object by not le
Pipes Shall be fixed
Unions Shall be fixed on Pipes at alternating positions as shown in the attache
Unions Shall be positioned close to one fixation point .
- The Model**: An RDF model editor on the right, showing XML syntax for an RDF document. It includes namespace declarations for various schemas like `airbus-group/aircraft-system`, `airbus-group/installsys/event`, `spinrdf.org/spin`, `qudt.org/schema/qudt`, `purl.org/dc/terms`, `spinrdf.org/arg`, `www.w3.org/2001/XMLSchema`, `www.linkedmodel.org/schema/vaem`, `www.w3.org/2004/02/skos/core`, `voag.linkedmodel.org/voag`, `airbus-group/installsys/component`, `qudt.org/vocab/dimension`, `purl.org/dc/elements/1.1`, `airbus-group/installationMeasure`, `www.linkedmodel.org/schema/dtype`, and `airbus-group/material`.
- The links between text and model**: A panel at the bottom showing the mapping between text elements and model elements. It has tabs for **T2M**, **M2T**, and **Link**. The **Link** tab is active, displaying XML snippets that link text offsets to model identifiers:
`<rdf:Description>
<rdf:Description rdf:about="http://ModelWriter/TxtDocument/id270">
<j.0.hasOffset>270</j.0.hasOffset>
<j.0.isSameAs>http://www.linkedmodel.org/schema/vaem#id</j.0.isSameAs>
<j.0.hasValue>id</j.0.hasValue>
</rdf:Description>
<rdf:Description rdf:about="http://ModelWriter/TxtDocument/attach818">
<j.0.hasOffset>818</j.0.hasOffset>
<j.0.isSameAs>http://airbus-group/opd-function#Attach</j.0.isSameAs>
<j.0.hasValue>attach</j.0.hasValue>
</rdf:Description>
<rdf:Description rdf:about="http://ModelWriter/TxtDocument/attached709">
<j.0.hasOffset>709</j.0.hasOffset>
<j.0.isMorphologySimilarTo>http://airbus-group/opd-function#Attach</j.0.isMorphologySim
<j.0.hasValue>attached</j.0.hasValue>
</rdf:Description>
</rdf:RDF>`

Text & Model-Synchronized Document Engineering Platform



Synchronization is maintained!

Quantification of the expected benefits

- Improvement in quality and productivity of technical documentation.
- Quality increase of the product with consistent requirements and designs.
 - For instance, according to AIRBUS's claims in their use cases, the global saving would be 5 M€ to 7 M€ (A350 Recurring Cost)
- 50% reduction of costs for keeping the documentation up-to-date with the developed software

**Thank you for your attention
We value your opinion and
questions.**