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migraTion of legacy Software*

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Business Feasibility Tools M30

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Abstract:	<p>This document is intended to accompany the ARTIST Business Feasibility Tool (BFT) software and has to be considered as integral part of ARTIST Project deliverable D5.4.3 - “Business Feasibility Tool M30”.</p> <p>The prototypes presented in this document represent the results of a new iteration in the process of exploring possible answers to some of the questions raised during the first phase of the design of the ARTIST BFT.</p>
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Document Description

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Terms and abbreviations

EC	European Commission
EPF	Eclipse Process Framework
BFT	Business Feasibility Tool
BFT-Specs	Business Feasibility Tool Specifications
BFT-OM	Business Feasibility Tool Object Model
BSW	Business Scenario Workbench
CBA	Cost-Benefit Analysis
MAT	Maturity Assessment Tool
PK	Process Toolkit
SaaS	Software as a Service
TFT	Technical Feasibility Tool

Executive Summary

This document is intended to accompany the ARTIST Business Feasibility Tool (BFT) software and has to be considered as integral part of ARTIST Project deliverable D5.4.3 - “Business Feasibility Tool M30”.

The set of prototypes described by this document comprises:

- The Business Scenario Workbench (BFT-BSW) provides a Graphical User Interface (GUI) to describe a business model according to the BFT Object Model (BFT-OM).
- The Business Scenario Simulator (BFT-SIM) has the responsibility to manage the interactions between the GUI of the BFT (i.e. the Scenario Workbench) and the Multi-Agents Simulator. Its main purpose is to decouple the Scenario Workbench from the specific technology implementing the Multi-Agent Simulator.
- The Business Scenario Assessment Dashboard (BFT-DSH) prototypes the functionalities to support the analysis of the data produced by the simulation runs.
- The Cost-Benefit Analysis (BFT-CBA) prototypes the collection of reports supporting analysis of simulation data according to the cost-benefit analysis methodology
- The Process Toolkit (BFT-PK) prototypes the collection of key processes which should be modified by a company to be cloud-compliant due to the migration process and hence could be the focus of simulations.

The prototypes presented in this document were developed to explore possible answers to some of the questions raised during the first phase of the design of the ARTIST BFT:

- Which kind of visual language should be offered by the BFT to support the editing of business models in the contexts envisaged by the BFT use cases?
- Which type of Eclipse framework (e.g. Eclipse GMF, UML Profiles in Papyrus) would be the most suitable for the implementation of the editors of the BFT?
- Which are the techniques and components that could be used to implement a simulator to generate a collection of possible time-series suitable for the assessment criteria of a Business Scenario?
- Which are the techniques and components that could be used to capture in the simulation some key aspect of Business Scenarios (e.g. variability of performances of human resources)?
- Which are the techniques and components that could be used to model more accurately the human decision-making process within simulations of Business Scenarios?
- Which are the techniques and components that could be used to implement a dashboard for the assessment of business scenario based on the time-series generated by its simulation runs?

The answers incarnated by the artefacts presented in this deliverable will be evaluated by the evaluation activities already planned in the project work plan (WP13). The assessment results will be reported in the further coming deliverable D13.2.2 – “Use case assessment report M36”.

1 Introduction

1.1 About the deliverable

This document is intended to accompany the ARTIST Business Feasibility Tool (BFT) software and has to be considered as integral part of ARTIST Project deliverable D5.4.3 - “Business Feasibility Tool M30”.

1.1.1 Document structure

This document is organised as follows: Chapters 2-6 present the five prototypes developed to support the design of the BFT and Chapter 7 draws the conclusions and highlights future work.

1.2 Methodology

ARTIST BFT is being designed following an iterative prototyping approach: within an iteration, a design phase is followed by a development phase. The purpose of each development phase is to answer those design questions that are too hard to be answered on paper [1]. The development phase aims to provide an answer by developing artefacts exploring alternative design options (answers) to the open design questions. The artefacts can vary in nature and range from mock-ups on paper to actual running software.

ARTIST deliverable D5.1.1 – “Specification of the Business and Technical Modernization assessment in ARTIST” contains the initial requirements for the ARTIST BFT.

To limit the complexity that would be implied by the development of a single artefact suitable to answer all design questions raised during one phase, we adopt a “divide & conquer” approach as proposed in [1].

During each iteration of the prototyping process, the set of open design questions is broken down into as much as possible independent sets. Then, a set of artefacts is developed in parallel, each artefact targeting a subset of questions.

Each artefact in a set is classified according to the type of design questions addressed by each prototype [1] :

- *Role*: the function that an artefact serves in a user’s life
- *Look & Feel*: the concrete sensory experience of using an artefact
- *Implementation*: the techniques and components through which an artefacts perform its function

The *Integration prototypes* bring together the artefacts, intended design in term of role, look and feel and implementation. An integrated prototype is intended to help designers to balance and resolve constraints arising in different design dimensions; verify that the design is complete and coherent; find synergies in the design of the integration itself (i.e. to discover whether useful properties emerge from the integration of the partial answers)

The aim of the classification is to clarify the role played by each prototype with respect to the evaluation of the solutions as well the complementarities and the interactions existing among them.

Below, the set of prototypes that were developed to explore possible answers to some of the questions raised during the first phase of the design of the ARTIST BFT is presented. **Figure 1** shows the positioning of these prototypes in the space corresponding to design questions addressed (integration prototype are represented by markers laid out in the inner dotted triangle [1]):

The **Business Scenario Workbench** (BSW) prototype aims to investigate both the graphical language for the description of Business Scenarios and its implementation in the Eclipse framework. It is not intended as a tool to investigate the impact of the BFT on the business feasibility process. Hence it is laid down in between the “Implementation” and “Look&Feel” vertices. More information about the BSW prototype can be found in Chapter 2.

The **Business Scenario Simulator** (SIM) prototype aims to investigate the implementation issues concerning the simulation of key aspect of Business Scenarios and human decision making processes, e.g. the variability of performances or risk aversion. The role of this prototype is mainly “Implementation”. The implementation of the SIM prototype is described in Chapter 4.

The **Business Scenario Dashboard** (DSH) prototype aims to investigate the implementation issues concerning a dashboard for the assessment of business scenarios based on a time-series generated by a BFT simulator. A description about the implementation of the DSH prototype can be found in Chapter 5.

Both the **Cost-Benefits Analysis** (CBA) prototype and the **Process Toolkit** (PK) prototype were developed with the aim of investigating how the BFT might impact the cost-benefit analysis and process re-design activities. The focus here is not about their final visual/interactional aspects or implementation; instead they focus on providing additional information to the user about the BFT itself. Hence, these two prototypes are positioned towards the “Role” vertex of the space. However, the CBA also aims to address some issues related to the actual function of cost-benefit analysis and is therefore positioned closer to the “Implementation” vertex than the PK prototype. The CBA prototype and PK prototype are described in Chapter 6 and Chapter 7 respectively.

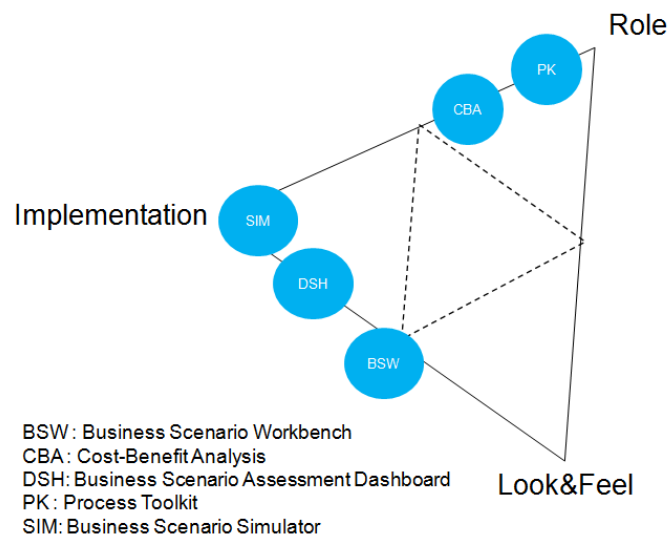


Figure 1: Positioning of BFT prototypes M12

1.3 Innovation and novelties

The ARTIST BFT support Business Feasibility Analysis by providing tools to describe (BSW, PK), simulate (SIM) and assess (DSH, CBA) cloud-based business scenarios.

Key innovations of the ARTIST BFT include:

- a rich object model (BFT-OM) supported by a graphical editor providing the possibility to describe both qualitative and quantitative aspects of cloud-based business models
- possibility to simulate business models also considering key aspects of Business

Scenarios and human decision-making processes, e.g. adaptation, variability of performances, risk aversion.

repository. The other components of the workbench store, query and navigate the BFT repository by means of the FinderAPI interface offered by the Repository Finder.

The Scenario Editor utilises the *Questionnaire Compiler* component to obtain the translation of a MAT filled-in questionnaire into queries for the BFT Repository. The Questionnaire Compiler is thus motivated by those extended BFT use cases (i.e. Create Business Model in [2]) where the user is allowed to utilise questionnaires to query the BFT repository.

The *Simulation Cockpit* component implements the functionalities supporting the interactions between the users and the running simulations. The Simulation Cockpit utilises the FinderAPI interface to retrieve, via the Repository Finder, the Business Scenarios from the BFT repository. The Simulation Cockpit relies on the Control interface offered by the Business Scenario Simulator to control (e.g. start/stop) simulations. The Simulation Cockpit relies on the Monitoring interface to observe the current values of simulation variables during the execution of a simulation.

The *Assessment Dashboard* component implements all the functionalities supporting decision-makers in the context of the assessment of Business Scenarios informed by simulation results (e.g. the *Assess Results* use case in [2]). It provides a collection of reports supporting the assessment of Business Scenarios. The Cost-Benefit Analysis module is one of the primary inner components of the Assessment Dashboard: it is responsible for the creation of the Cost-Benefit Analysis Report of a scenario. The values presented by the reports provided by the Assessment Dashboard are computed using both values resulting from simulations and values computed by the Technical Feasibility Tool (TFT) [2]. The Assessment Dashboard supports the BFT Query to enable external components to programmatically query the values presented by reports.

Business Scenario Simulator

The Business Scenario Simulator has the responsibility to manage the interactions between the GUI of the BFT (i.e. the Scenario Workbench) and the Multi-Agents Simulator. Its main purpose is to decouple the Scenario Workbench from the specific technology implementing the Multi-Agent Simulator. In particular, it operates the decoupling at two abstraction levels:

- Model-level since it translates the Business Scenarios compliant with the BFT Object Model into descriptions of Multi-Agent Systems that are compliant with the models supported by a specific Multi-Agent Simulation technology.
- Deployment-level since it manages the connections with the MAS Simulators running remotely to exploit high performance computing infrastructures.

MAS Simulator

The *MAS Simulator* is an off-the-shelf component of the BFT architecture providing the functionalities for the execution of Multi-Agent simulations. The present specification does not prescribe the use of any specific Multi-Agent Simulation technology. The MASSimulationAPI in the figure 2 denotes the native interface offered by a specific MAS Simulator component.

The only BFT component interacting with the MAS Simulator is the Business Scenario Simulator. The Business Scenario Simulator is the only component affected by the replacement of a specific MAS Simulator with an alternative exposing a different interface.

BFT Repository

The BFT repository implements all the functionalities to manage the persistence and the retrieval of Business Scenarios. The BFT repository may coincide with the ARTIST Repository.

An important element of the BFT repository is the Process Toolkit. It is a collection of “ideal” business processes that users can use to derive the description of processes customised for specific Business Models based on Cloud computing technologies.

2.1 Fitting into overall ARTIST solution

The next picture highlights where the BFT stands in what respects to the overall ARTIST architecture.

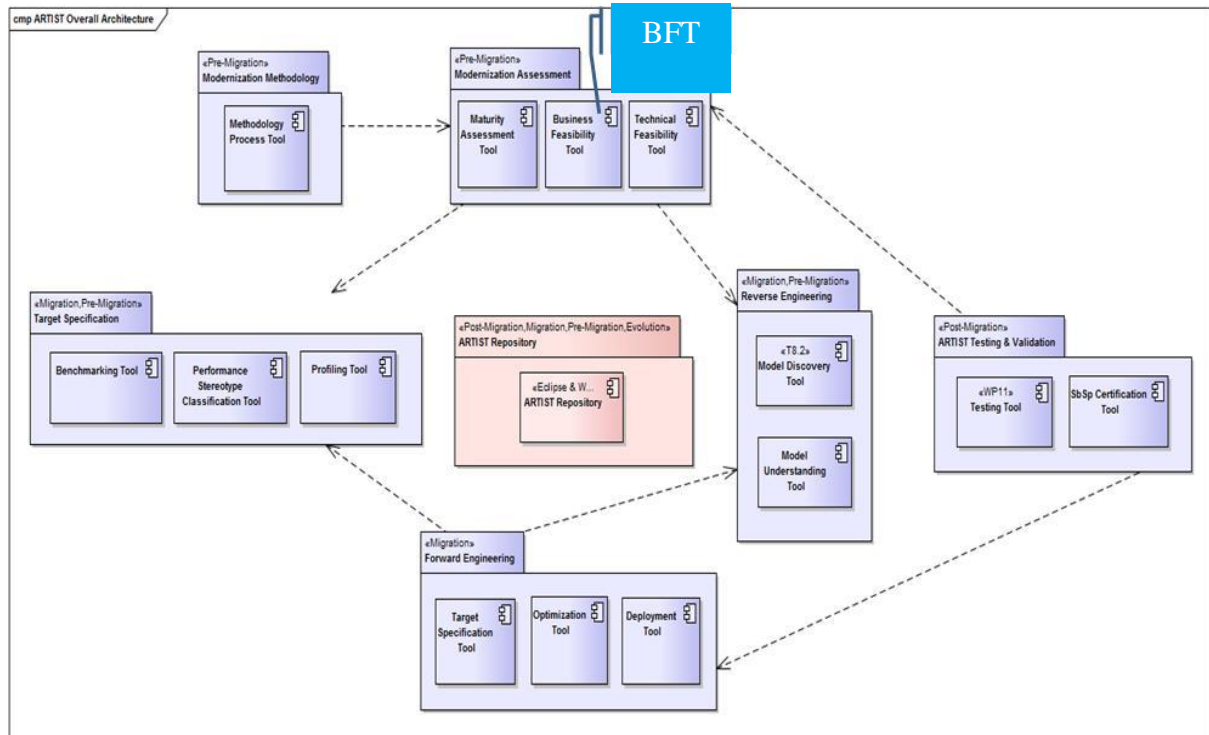


Figure 3: BFT in the overall ARTIST architecture

3 Business Scenario Workbench (BFT-BSW) Prototype

3.1 Implementation

This section describes the purpose, set up and usage of the version 2.3.0 of the Business Scenario Workbench (BFT-BSW) prototype.

3.1.1 Functional description

The BFT-BSW provides a Graphical User Interface (GUI) to describe a business model. In particular, in order to express various aspects of a business model, the BFT-BSW prototype currently provides the following diagram editors:

- The *Entity Types Editor*: allows describing the types of entities, the data items and the technologies involved in the scenario;
- The *Relationships Editor*: allows describing the agents involved in a business scenario and their interactions;
- The *Goals Editor*: allows describing the goals of the agents;
- The *Process Editor*: allows describing the processes involved in a business model;
- The *Global Editor*: allows describing some other business model elements (e.g. interfaces and operations, messages etc.) reused within the other diagrams;
- The *Math Expression Editor*: allows describing math expressions (e.g. arithmetic logical and relational expressions) reused within other diagrams (for example to define constraints).

The BFT-BSW prototype herein presented was developed to explore possible answers to some of the questions raised by the design of ARTIST BFT [2].

- Which kind of visual language should be offered by the BFT to support the editing of business models in the contexts envisaged by the BFT use cases?
- Which type of Eclipse framework (e.g. Eclipse GMF, UML Profiles in Papyrus) would be the most suitable for the implementation of the editors of the BFT?

These diagram editors are described in details in section 3.2.4.

3.1.2 Technical description

3.1.2.1 Prototype architecture

The *Scenario Workbench* architecture is based on the Eclipse plug-in architectural pattern¹.

The Eclipse Platform is built upon a small core and all further functionalities are provided by a set of plug-ins (see Figure 4). A *plug-in* in Eclipse is a component (i.e. an object that can be configured and deployed in a system) providing certain functionalities within the context of the Eclipse *Workbench* that constitutes the user interface of Eclipse (i.e. editors, views and perspectives). All these plug-ins are managed by the *Eclipse Platform Runtime* that supports the discovery of new plug-ins and the initialization and maintenance of existing ones.

¹ http://www.eclipse.org/articles/Article-Plug-in-architecture/plugin_architecture.html

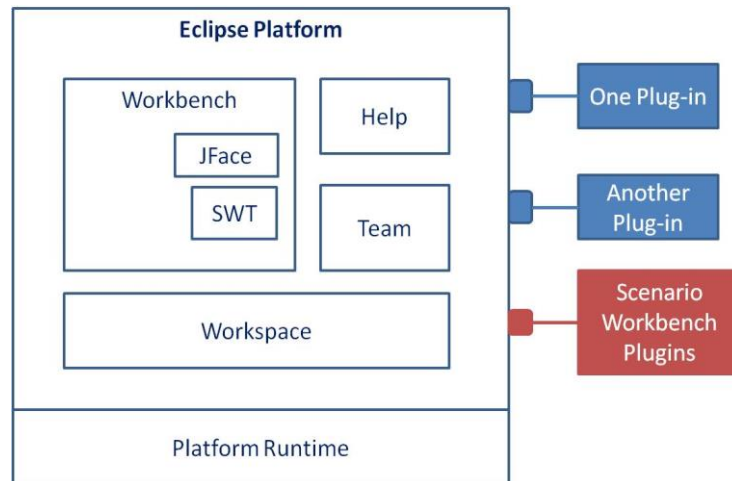


Figure 4: Scenario Workbench plugins within the Eclipse architecture

The Eclipse Platform uses the concept of extensibility and *Extension Points* to integrate external tools providing extra functionalities to the core Eclipse Platform. In this sense, the Scenario Workbench realizes a set of new plugins that, once deployed, extend the Eclipse Platform providing graphical editors used to model different aspects of a business scenario. In particular, the diagram editors provided by the BFT-BSW have been developed using the Sirius technology² that permits to create graphical modeling workbenches by leveraging the Eclipse Modeling technologies. The current version of the BFT-BSW is compliant with the version 2.0.0 of the Sirius framework, also included in the Eclipse Luna³ release.

The models of the business scenario created by means of the BFT-BSW are stored in an Eclipse *Workspace* that is the top-level container of all the resources managed by the user (e.g. projects, files and folders).

3.2 Delivery and usage

3.2.1 Package information

The following BFT-BSW distributions are provided:

- *Eclipse standalone distribution*: this distribution provides a standalone Eclipse environment on which the BFT-BSW is already installed;
- *Eclipse plugins distribution*: this distribution contains the set of BFT-BSW plugins that can be installed in an Eclipse Kepler SR2 64-bit environment⁴.

3.2.1.1 Eclipse standalone distribution

The BFT-BSW standalone distribution is released as a single zip file named `BFT-BSW_Standalone_v2.3.0_final.zip`. This archive file contains the “*eclipse/*” and “*repository/*” folders, according to the Eclipse software packaging.

3.2.1.2 Eclipse plugins distribution

The BFT-BSW plugins distribution is released as a single zip file named `BFT-BSW_Plugins_v2.3.0_final.zip`. This archive file conforms to the feature packaging

² <http://eclipse.org/sirius/>

³ <https://projects.eclipse.org/releases/luna>

⁴ Eclipse Kepler SR2 Packages - <http://www.eclipse.org/downloads/packages/release/Kepler/SR2>

mechanism of the Eclipse platform. A feature archive is used to define a group of versioned plugins and/or plug-in fragments deployable within the Eclipse environment. In particular, the BFT-BSW feature package is structured as follows:

- *features/*: this directory contains the BFT-BSW deployable feature;
- *plugins/*: this directory contains the set of plugins, implementing the BFT-BSW, included in the feature;
- *artefact.jar* and *content.jar*: these jar files are generated during the Eclipse's feature packaging process to describe the set of installable artefacts (i.e. available features and plug-ins) provided in the software package.

3.2.2 Installation instructions

This section describes how to install the BFT-BSW software distributions. After the installation procedure, some configurations must be made, as described in section 3.2.3.

3.2.2.1 Eclipse standalone distribution

In order to install the BFT-BSW standalone distribution, it is sufficient to unzip the archive file in a suitable location of the file system. Then, the tool can be started by running the executable `BFTLauncher.exe` available under directory "eclipse/" situated within the installation directory.

At the start up, the BFT-BSW presents to the user a dialog to select the folder where the Eclipse Platform will store the projects created by means of the workbench.

3.2.2.2 Eclipse plugins distribution

This section describes how to install the BFT-BSW plugins distribution within the Eclipse Kepler SR2 64-bit environment. To proceed with the deployment of this feature, the following technologies must be installed in the eclipse platform.

- Eclipse Kepler Modeling Tools (<http://www.eclipse.org/downloads/packages/eclipse-modeling-tools/keplersr2>);
- Sirius framework (<http://download.eclipse.org/sirius/updates/releases/2.0.0/kepler/>).

The BFT-BSW can be installed via the Eclipse Update Manager using the procedure described in APPENDIX A.

3.2.3 Configurations after installation

The first time the BFT-BSW is run, some configurations for the chosen workspace are needed. The configuration steps to execute are described below.

1. **Open the Sirius perspective.** The chosen workspace must be configured with the Sirius Perspective as depicted in Figure 5 and Figure 6.

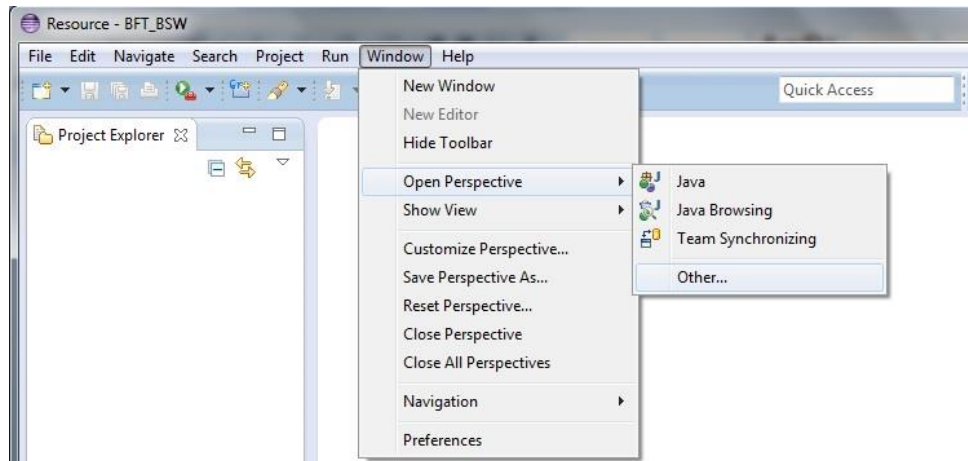


Figure 5: BFT-BSW Configurations – Open Perspective dialog

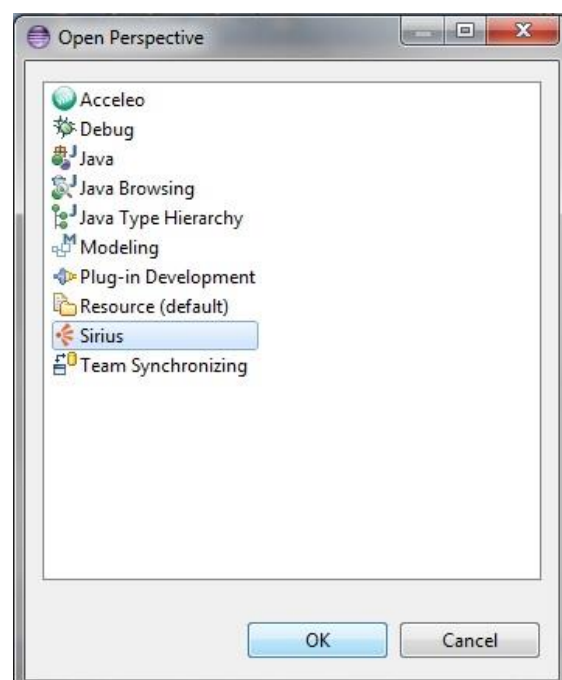


Figure 6: BFT-BSW Configurations – Select Sirius Perspective

2. **Create of a new Modeling Project.** In order to start working with a Business Model a Sirius Modeling Project must be created as depicted in Figure 7.

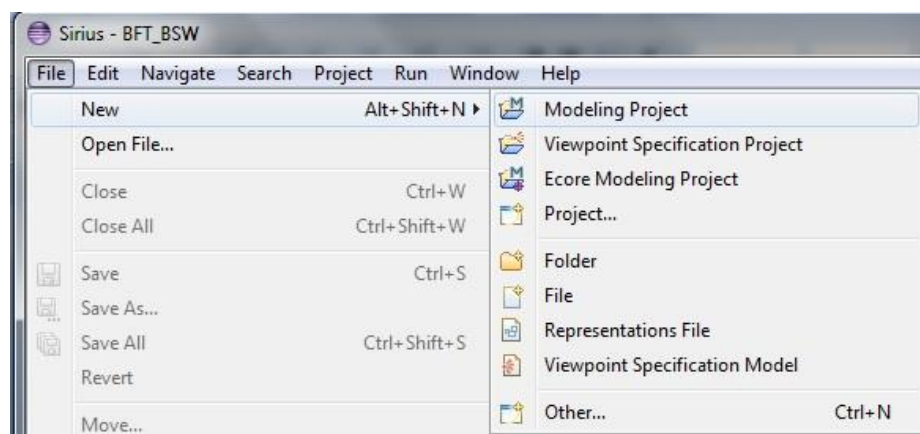


Figure 7: BFT-BSW Configurations - Create a Sirius Modeling Project

3. **Create a BFT Business Model.** Under a Modeling Project it is possible to create the Business Models as depicted in Figure 8.

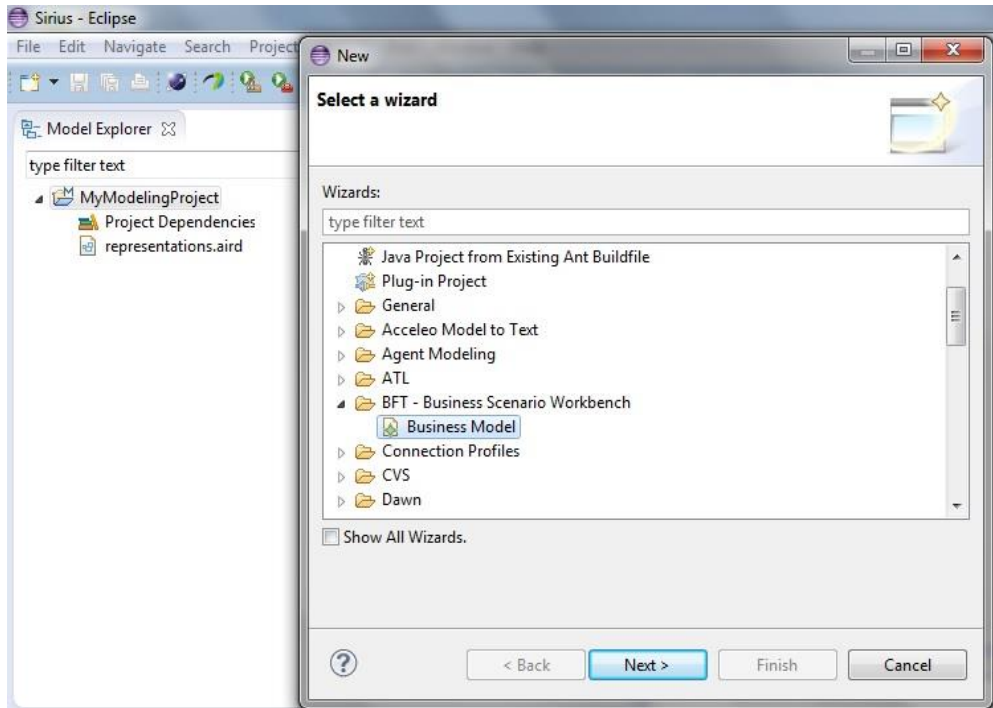


Figure 8: BFT-BSW Configurations – Create a new Business Model

4. **Enable BFT-BSW Viewpoints.** Once a Business Model has been created, the BFT-BSW views must be enabled. To do that, select the “Viewpoint Selection” option that appears with a right-click on the Modeling Project (see Figure 9). Finally, all the Viewpoints that appear on the list must be enabled (see Figure 10).

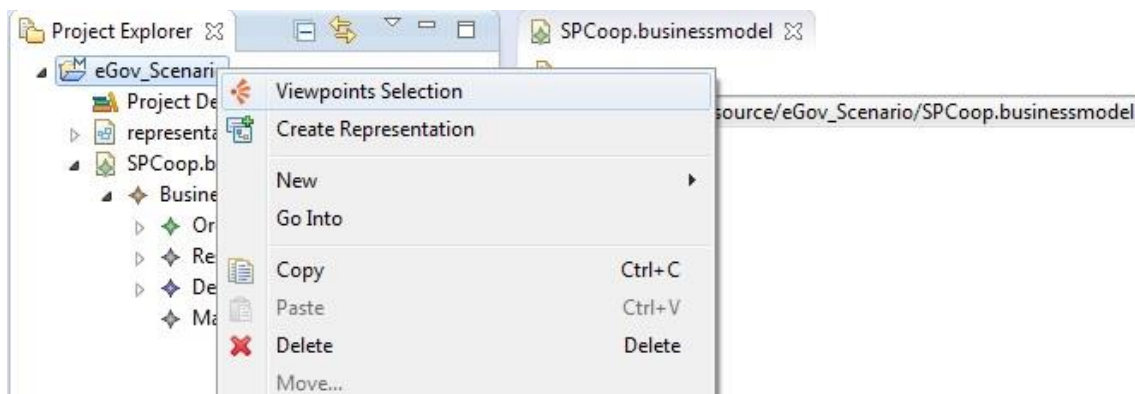


Figure 9: BFT-BSW Configurations - Viewpoints Selection

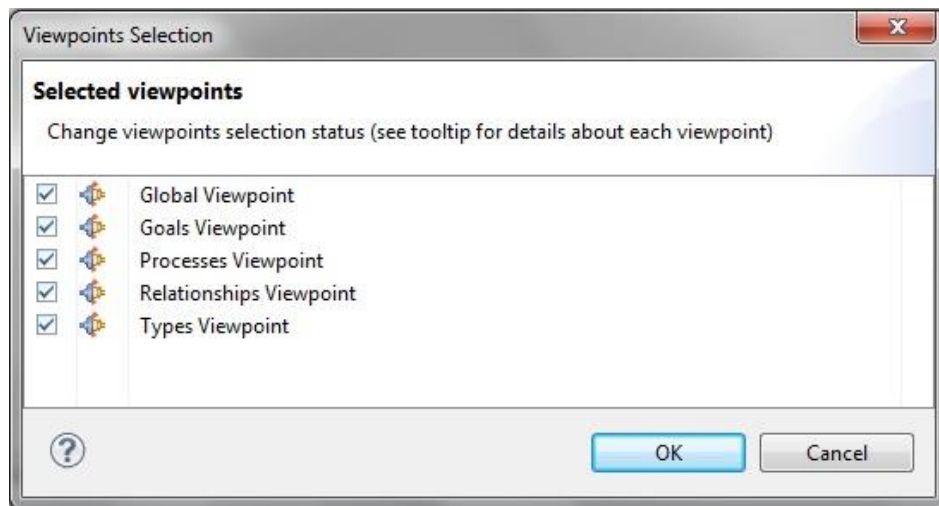


Figure 10: BFT-BSW Configurations - Enable Viewpoints

At this point, the created Business Model can be edited by means of the diagram editors corresponding to the enabled viewpoints (see Figure 11). In particular, these editors are listed under the business model element they refer to. For instance, the Entity Type diagram, modeling the business model resources, is listed under the 'Resources' element; the Relationships diagram, modeling the business model organisational structure, is listed under the "Organisational Structure" element. The user can click on one of these diagram editors to open and use them.

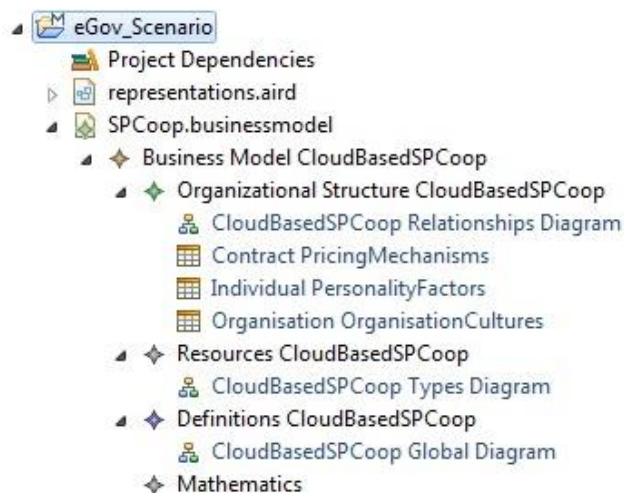


Figure 11: BFT-BSW Configurations – Diagram editors

3.2.4 User Manual

Within an Eclipse modeling project, the user can create one or more business models using the procedure described at [step 3](#) of section 3.2.3. Once the business model has been created, the user can edit it using the diagram editors currently supported by the BFT-BSW. This section presents these editors, using as reference the SPCoop example of the eGov scenario.

3.2.4.1 The Entity Types Editor

The Entity Types Editor allows for describing the types of resources, the data items and the technologies involved in the business scenario (Figure 12). The current prototype allows for specialising nine types of resources: Financial, Intellectual, Physical, Human, Server, Software, Service, Network and Switch. The user can specify “is-a” relationship between types.

For a technology, in the “Properties” tab, the user can specify the supported interfaces. These interfaces along with their operations are defined in the Global Editor (see section 3.2.4.5).

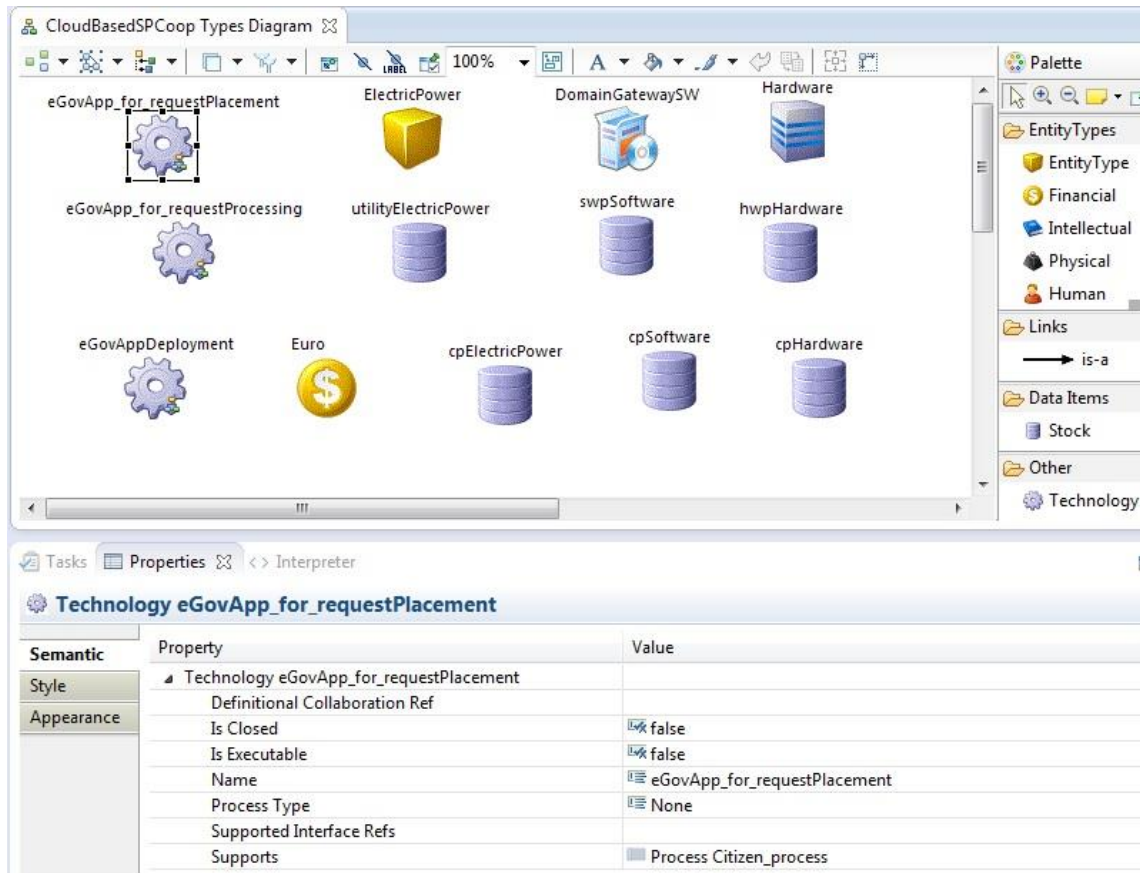


Figure 12: BFT-BSW Entity Type Editor

In the example shown in Figure 12, a user has specified an entity resource type (ElectricPower), a financial resource type (Euro), a software resource type (DomainGatewaySW) and a server resource type (Hardware). The user described six stock data items (utilityElectricPower, swpSoftware, hwpHardware, cpElectricPower, cpSoftware and cpHardware). For each of these stock items, the user can describe information such as capacity, level, agent owner, etc. in the “Property” tab. Moreover, in this example the user described three technologies (eGovApp_for_requestPlacement, eGovApp_for_requestProcessing and eGovAppDeployment) supporting three different processes (Citizen_process, Municipality_process and CloudProvider_process respectively).

In addition, making a right-click on a selected technology, it is possible to create (or open if they already exist) some other models associated to this element. In particular, since a technology represents a particular process, it is possible to navigate to the Process Editor or, as depicted in Figure 14, navigate to the editor tables enabling the user to express the technology tools and QoS.

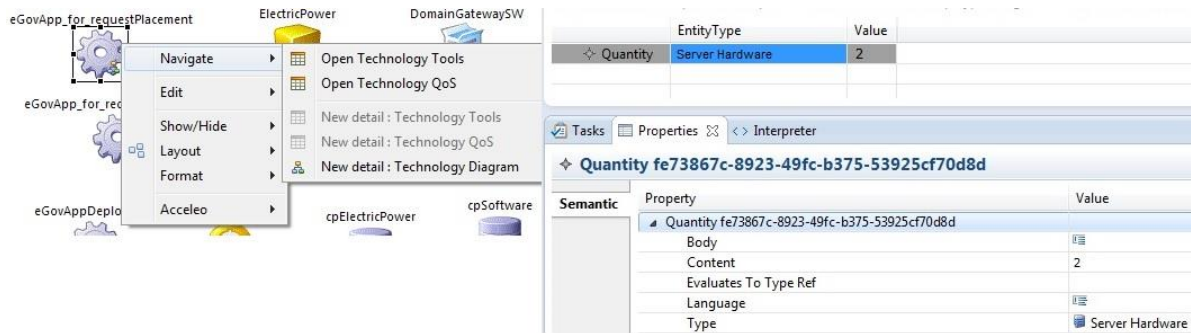


Figure 13: BFT-BSW Diagrams associated to a technology

3.2.4.2 The Relationships Editor

The Relationships Editor allows describing the types of agents involved in a Business Scenario along with the abstract relationships and revenue streams relationships describing their potential interactions. Using the editor, the user can draw the organisational structure graph with nodes representing roles and edges representing relationships (Figure 14). The current prototype provides a generic role (Role) and four specialisations (CustomerSegment, KeyPartner, Individual, and Organisation).

The prototype allows for introducing all the predefined types of relationship present in the palette (i.e. the relationships included under the “Relationships” and “Revenue streams” categories). A relationship between two roles can be declared by first selecting the type of relationship from the palette and then connecting the two roles.

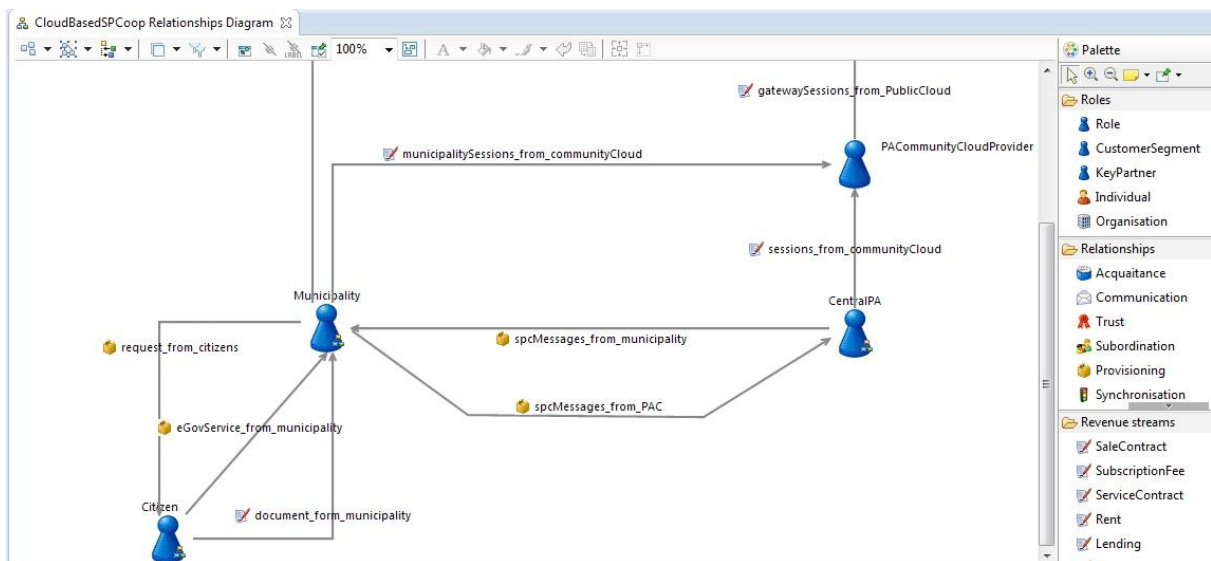


Figure 14: BFT-BSW Relationships Editor

In the example shown in Figure 14, the user has described an organisational structure comprising different roles. In particular, the subset of roles depicted in the figure contains PAComunityCloudProvider, CentralPA, Municipality and Citizen.

Moreover, between these roles she introduced four provisioning relationships: spcMessages_from_municipality, spcMessages_from_PAC, request_from_citizens and eGovService_from_municipality. These relationships mean that the Depender role depends on the Dependee role for the provisioning of some type of resource. As an example, the CentralPA depends on the Municipality for the provisioning of SPCoop messages from

Municipality, and the Municipality depends on CentralPA for the provisioning of the SPCoop messages from PAC.

Between the subset of roles depicted in Figure 14, the user also introduced three revenue streams relationships: municipalitySessions_from_communityCloud, sessions_from_communityCloud and document_form_municipality. These relationships indicate that the Depender role depends on the Depende role for the purchase of some type of resource. For instance, the CentralPA depends on PACommunityCloudProvider for the purchase of sessions from the cloud provider.

The BFT-BSW provides also a “PersonalityFactors” editor table that permits to model some attributes specific to the Individual role, and a “OrganisationCultures” editor table that permits to model some attributes related to the Organisation roles (see Figure 15 and Figure 16).

	Abstractness	Apprehension	Dominance	EmotionalStability	Liveliness	O...	P...	P...	R...	S...	S...	T...	S...	V...	W...
Individual A	1	2	0	1	3	0	0	0	0	0	0	0	0	0	0
Individual B	1	2	2	0	3	1	2	0	0	0	0	0	0	0	0
Individual C	3	4	1	3	2	2	0	0	0	0	0	0	0	0	0

Property	Value
End Point Refs	
Interface Refs	
Knowhow	
Max Num Agents	0
Min Num Agents	0
Name	C
Process Ref	Process

Figure 15: BFT-BSW Individual PersonalityFactors Table Editor

	Aggressiveness	AttentionToDetail	Innovation	OutcomeOrientation	R...	S...	T...
Organisation A	1	0	3	2	4	0	0
Organisation B	2	1	2	3	1	0	0

Property	Value
End Point Refs	
Interface Refs	
Knowhow	
Max Num Agents	0
Min Num Agents	0
Name	A
Process Ref	Process

Figure 16: BFT-BSW Organisation Cultures Table Editor

Moreover, the “Contract PricingMechanisms” table editor enables the user to define the pricing mechanisms of the Business Scenario (Figure 17). In particular, the user can define five types of pricing mechanisms: ListPrice, PerCustomerSegment, VolumePricing, ProductFeature, FlatFeePrising. Once defined, they can be used in the revenue streams relationships.

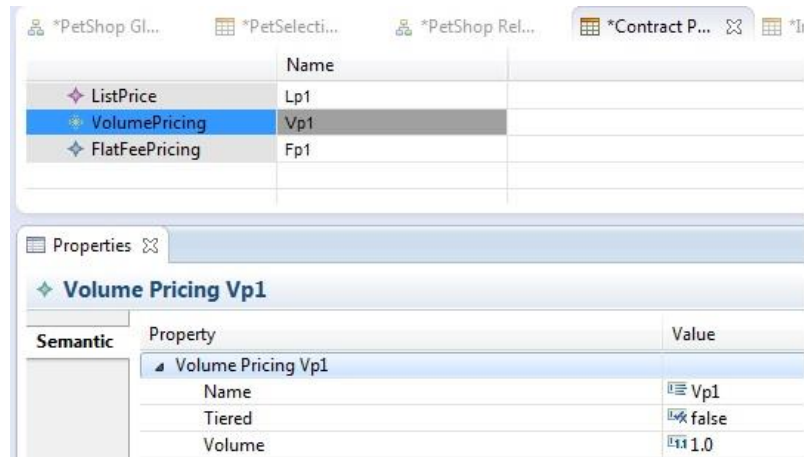


Figure 17: BFT-BSW Contract PricingMechanisms Table Editor

3.2.4.3 The Goals Editor

The Goals Editor allows a user for describing the goals of agents. The user edits a goal expression using a graph where the nodes represent the key structural elements (Atomic Goals, Composite Goals, Horizons and Constraints) of the BFT Goal Model and the edges their relationships.

In order to edit the goals of an agent by means of the Goal Editor, the user can make a right-click on a role defined in the Relationships Editor and choose to open the goal model.

The editor allows for specifying both hard and soft constraints for an atomic goal. User can also specify a horizon for the satisfaction of the constraint associated to a goal. The editor allows for specifying both Temporal and Goal horizons. The Maintain and Achieve links allow for specifying whether the constraint of the goal has to be achieved before the horizon and, once achieved, maintained after the horizon. For a given goal, it is possible to specify both, an achieve clause and a maintain clause.

Atomic goals can be composed by introducing into the graph one of the logical operators available in the "CompositeGoal" panel. Composite goals can be connected to their components goals using the Subgoals link from the palette.

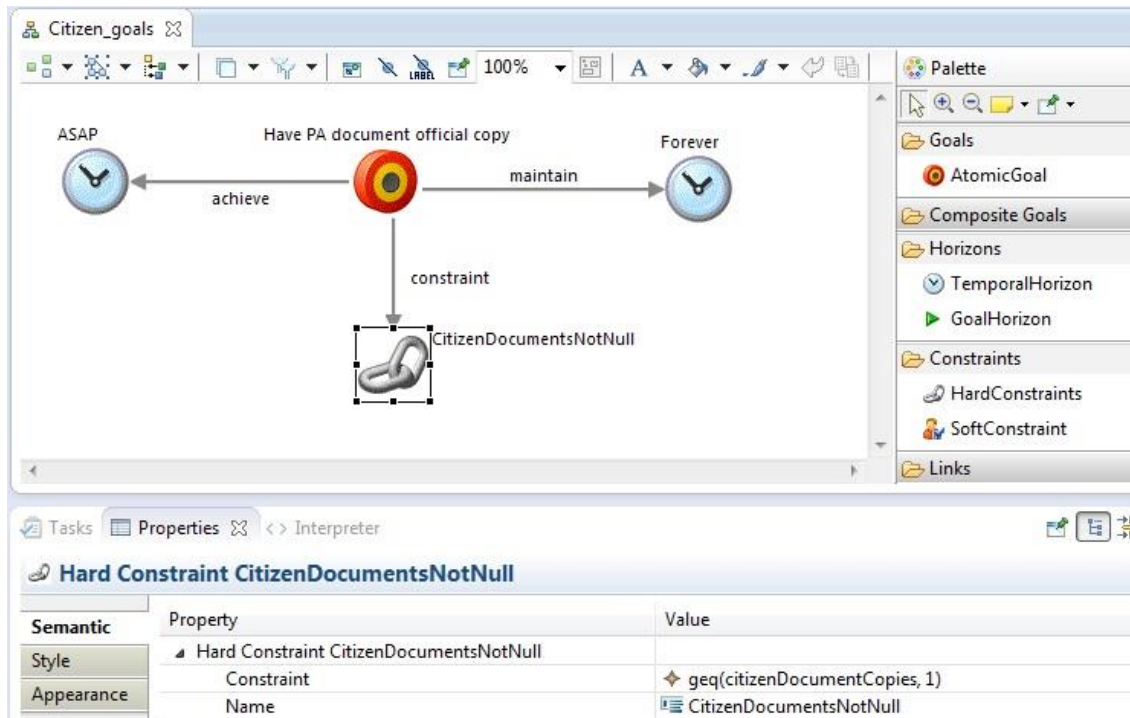


Figure 18: BFT-BSW Goals Editor

In the example shown in Figure 18, the user has described a goal for the Citizen role. The goal is defined in term of hard constraints named *CitizenDocumentsNotNull*. This constraint expresses the requirement that the *PA Document* resource of a Citizen must be greater than or equal to one. As depicted in Figure 18, this requirement is specified using the $\text{geq}(\text{citizenDocumentCopies}, 1)$ math expression defined in the Math Expression Editor (see section 3.2.4.6).

Moreover, the user specified an *achieve* and a *maintain* horizon for the goal. The former expresses the requirement that constraint must be valid since the initial time instant, the latter that it has to be maintained forever.

3.2.4.4 The Process Editor

The Process Editor allows describing the processes involved in a Business Scenario. The user can describe processes using the Business Process Management Notation (BPMN) [3]. Although full support for BPMN processes is envisaged, this version of the Process Editor prototype supports a subset of the notation including: start/end events, activities, transformation, exclusive/parallel gateways, sequence flows, data associations, data stores and sub-processes.

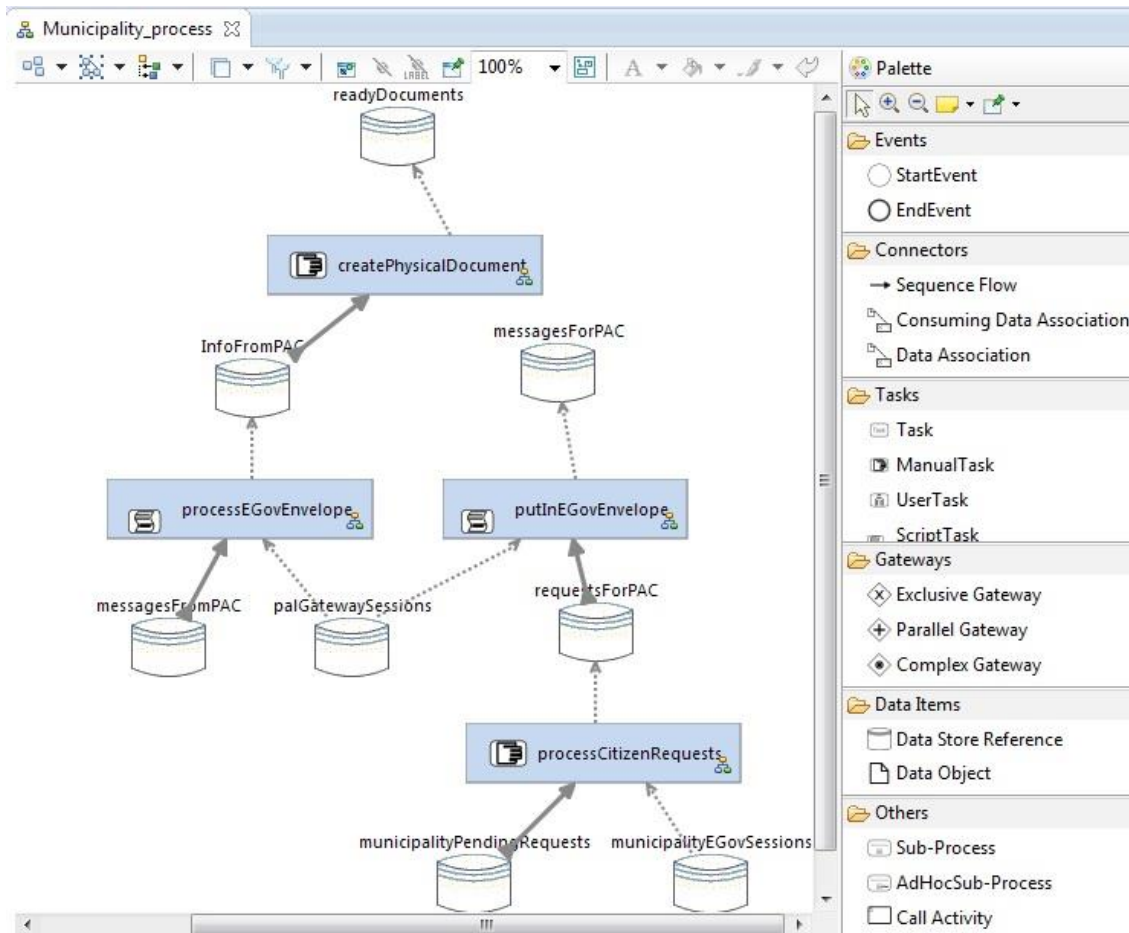


Figure 19: BFT-BSW Process Editor

In the example shown in Figure 19, the user has described the process associated to the Municipality agent. The process is characterized by two manual tasks (`processCitizenRequests` and `createPhysicalDocument`) and by two script tasks (`processEGovEnvelope` and `putInEGovEnvelope`). The user defined also eight data items (`municipalityPendingRequests`, `municipalityEGovSessions`, `requestsForPAC`, `palGatewaySessions`, `messagesFromPAC`, `messagesForPAC`, `InfoFromPAC` and `readyDocuments`). Each of these data items represents a data store reference since they refer to the data stores defined in the Entity Types Diagram. Moreover, in the example the user has defined different data associations. A Data Association describes how data move from data items and how they are used as inputs or outputs of activities. In particular, dashed lines represent standard BPMN data associations, while plain lines represent consuming data associations. This kind of association has been introduced in the tool in order to represent data that are consumed and transformed by the activity. For instance, the data association connecting the data item `municipalityPendingRequests` and the task `processCitizenRequests` is a consuming data association, while the connection between the data item `municipalityEGovSessions` and the task `processCitizenRequests` represents a standard BPMN data association.

3.2.4.5 The Global Editor

The Global Editor allows defining other elements required to model the Business Scenario. In particular, the user can currently use this editor to define interfaces along with their operations and the messages involved on these operations.

In the example shown in Figure 20, the user has defined an interface named `PhysicalDocumentCreation` and two messages, `InfoFromPAC` and `PhysicalPADocument`.

With a right-click on the interface element, the user can open the “Operations” Table Editor and defines the operations. In the example shown in Figure 21, the user has declared the operation `Create Physical Document` mapping `info from PAC` to `physical PA document`.

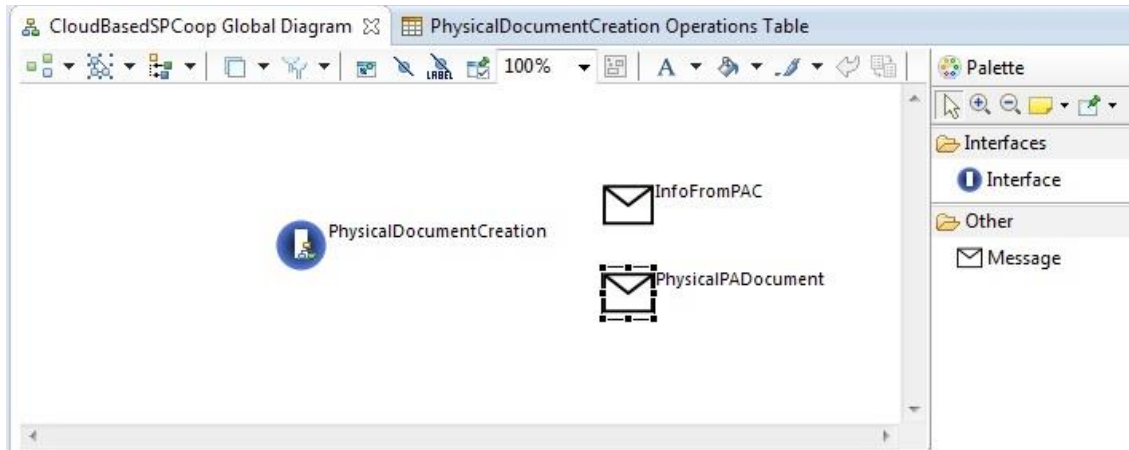


Figure 20: BFT-BSW Global Editor

CloudBasedSPCoop Global Diagram		PhysicalDocumentCreation Operations Table	
Operation Name	In Message	Out Message	
Create Physical Document	Message InfoFromPAC	Message PhysicalPADocument	

Properties		Interpreter	Problems
Operation			
Semantic	Property	Value	
	Operation Create Physical Document		
	Error Refs		
	Implementation Ref		
	In Message Ref	Message InfoFromPAC	
	Name	Create Physical Document	
	Out Message Ref	Message PhysicalPADocument	

Figure 21: BFT-BSW Interface Operations Table Editor

3.2.4.6 The Math Expression Editor

The Math Expression Editor allows defining mathematical expressions. Using the editor the user can express arithmetic expressions (addition, multiplication, subtraction and division), logical expression (and, or, xor and not) and relational expression (equals, greater than, greater than or equal, less than, less than or equal and not equals).

In order to edit the math expressions, the user can make a right-click on the “Mathematics” element under the Business Model tree and choose to open the Math Expression Editor (Figure 22).

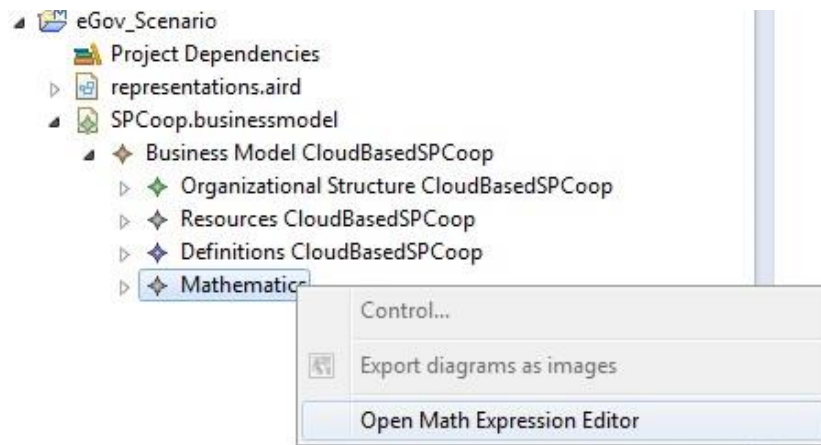


Figure 22: BFT-BSW Open Math Expression Editor

As depicted in Figure 23, the Math Expression Editor is composed by a “Defined Expressions” box where the already defined expressions are listed. In particular, in this list are automatically included the data stores defined in the Entity Types Editor so that new math expressions can be defined using them.

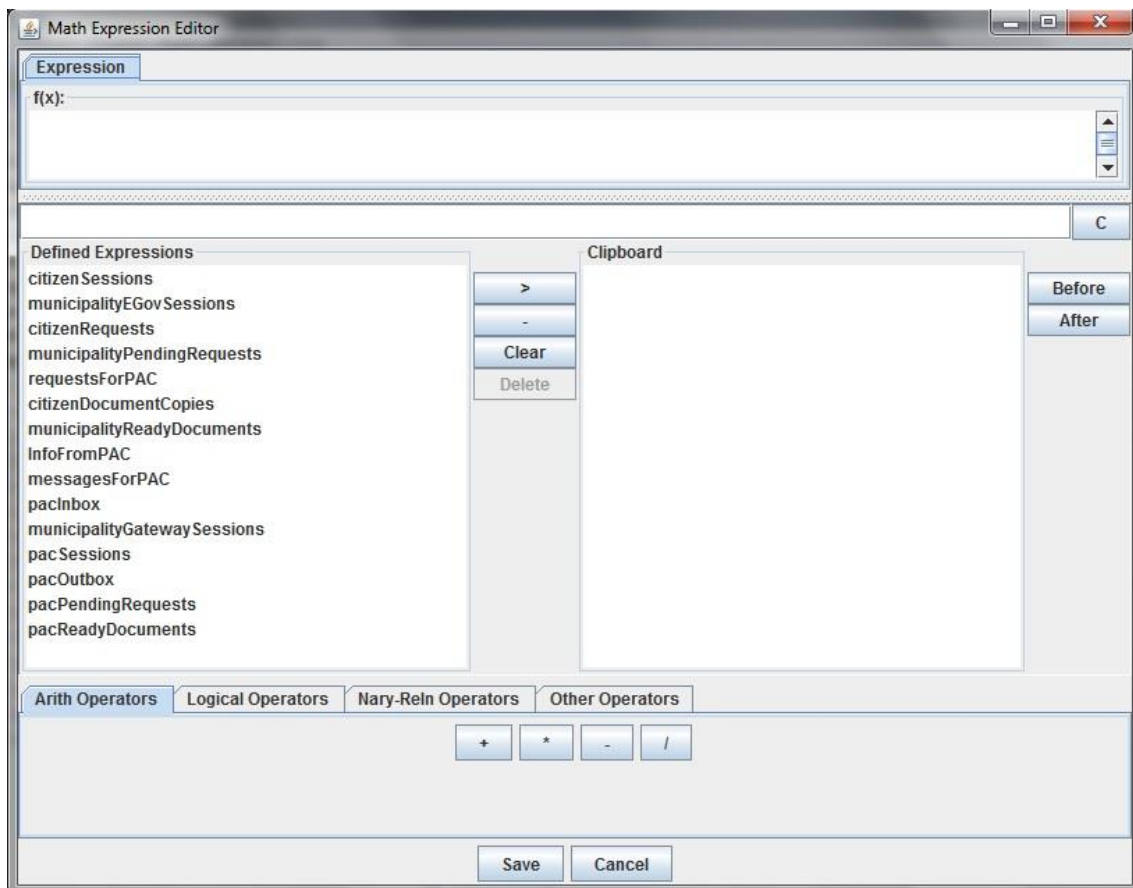


Figure 23: BFT-BSW Math Expression Editor

The “Clipboard” box contains the new defined constants (that can be added by typing the name in the text field and pushing the “C” button) and the expressions moved from “Defined Expressions” box by means of the “Add to clipboard” (>) button. Once on the clipboard, the expressions can be used to create new ones.

In the lower part of the diagram, the operands enabling the creation of the arithmetic, logical or relational expressions are provided. If the user pushes one of these buttons the corresponding math expression will be created involving the elements present in the clipboard. The order of these elements impacts the creation of the new expression, therefore they can be moved after using “Before” and “After” buttons, respectively.

In the example shown in Figure 24, the user has moved the `citizenDocumentCopies` data store identifier to the clipboard and added the “1” constant. Then, the user has defined the new relational expression `get(citizenDocumentCopies,1)` which means that the `citizenDocumentCopies` data store must be greater than or equal to one.

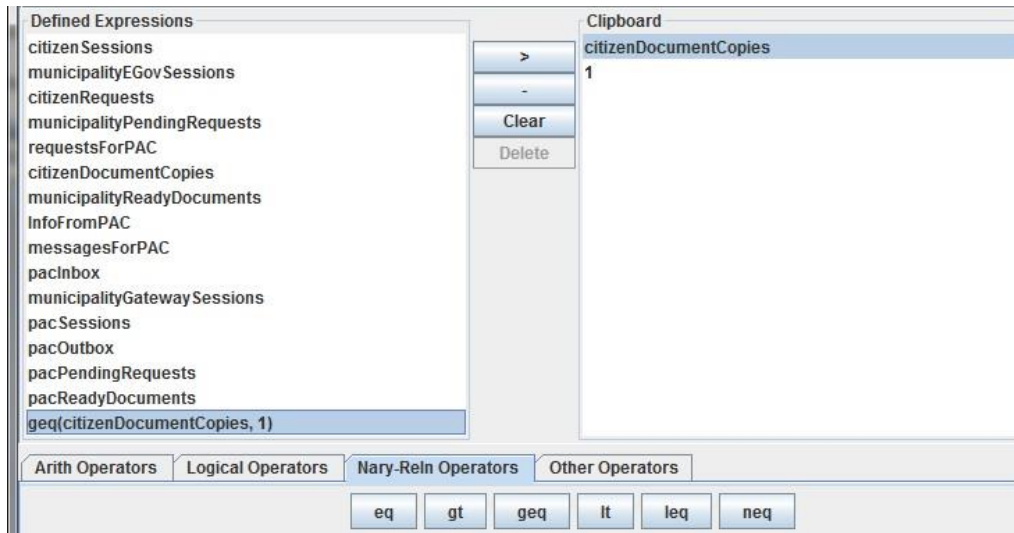


Figure 24: BFT-BSW New Expression Definition

3.2.5 Licensing information

The plug-in is proprietary software (i.e. closed-source software). It is possible to use the plug-in binary distribution but it is not allowed to modify the software or distribute it to others.

3.2.6 Download

A binary distribution of the ARTIST Business Model Editor can be obtained from Engineering – Ingegneria Informatica S.p.A. by sending a request to domenico.presenza@eng.it or stefania.dagostini@eng.it.

4 Business Scenario Simulator (BFT-SIM) Prototype

4.1 Implementation

This section describes the purpose, set up and usage of the version 1.0 of the Business Scenario Simulator prototype.

4.1.1 Functional Description

The Business Scenario Simulator serves to explore possible dynamics (time-series) for the key variables characterising the business scenarios described by means of the BFT-BSW.

The Business Scenario Simulator prototype herein presented was developed to explore possible answers to some of the questions raised by the design of ARTIST BFT [2]:

- Which are the techniques and components that could be used to implement a simulator to generate a collection of possible time-series suitable for the assessment criteria of a Business Scenario?
- Which are the techniques and components that could be used to capture in the simulation some key aspect of Business Scenarios (e.g. variability of performances of human resources)?
- Which are the techniques and components that could be used to model more accurately the human decision making process within simulations of Business Scenarios?

4.1.2 Technical Description

4.1.2.1 Prototype architecture

The Business Scenario Simulator prototype comprises three main components:

Simulation Service: a SOAP Web Service offering operations to run and control (e.g. start, pause, restart, stop) Business Scenario Simulations.

Control Cockpit: an Eclipse plug-in providing a Graphical User Interface (GUI) allowing users to interactively control the simulation runs.

Simulation Database: a MongoDB⁵ database storing the time-series generated by the simulation service.

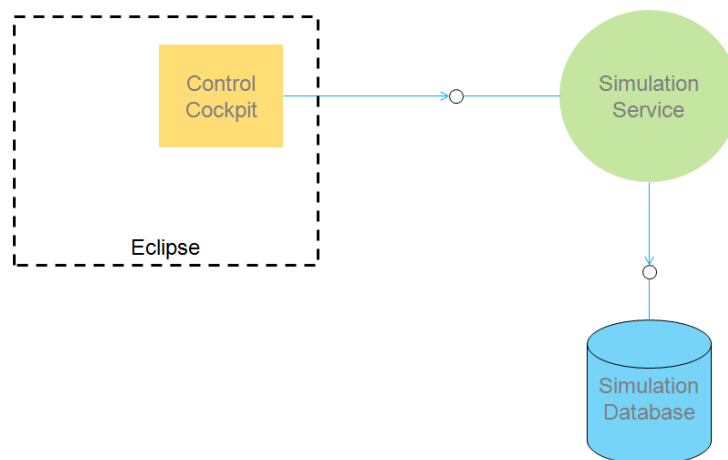


Figure 25: Business Scenario Simulator Architecture

⁵ MongoDB is available at <http://www.mongodb.org/>

4.2 Delivery and usage

4.2.1 Package information

The BFT Scenario Simulator (BFT-SIM) is distributed as a single zip file:

ARTIST_D5.4.2_ScenarioSimulator_prototype_v1.0.zip

4.2.2 Installation Instructions

In order to install the BFT-SIM:

1. Unzip the distribution file in a suitable location on your file system.
2. Copy the `BFTCockpit_1.0.1.201407211305.jar` within the plugins directory of your local Eclipse installation.
3. Create a database named `bftdb` within your MongoDB installation. Please make sure that MongoDB is listening on the standard port 27017 on the same host running the simulator.

4.2.3 User Manual

The Simulation Service can be started by running the script `ARTIST_SimulationService.bat` available under the installation directory. The simulation service will be listening at URL <http://localhost:8194/Simulator>.

Once the Simulation Service is started, the user can consume it using the Control Cockpit deployed within the Eclipse IDE. The simulation of a business model can be started by selecting the node representing the business model within the Model Explore view of the Eclipse IDE (see Figure 26).

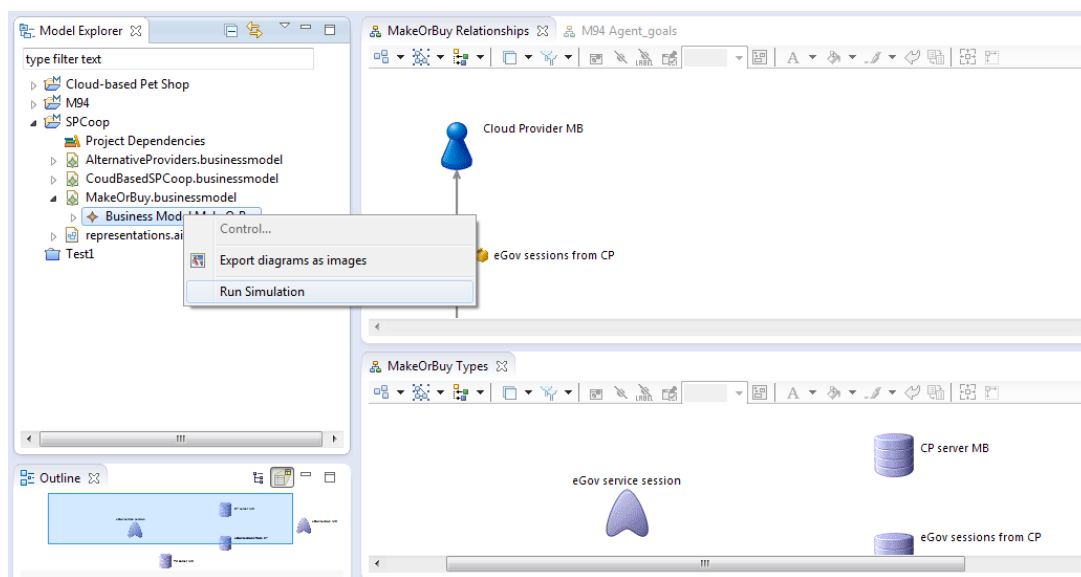


Figure 26: Starting a BFT scenario simulation

The selection of the "Run Simulation" contextual action produces the activation of the BFTCockpit plugin depicted in Figure 27.

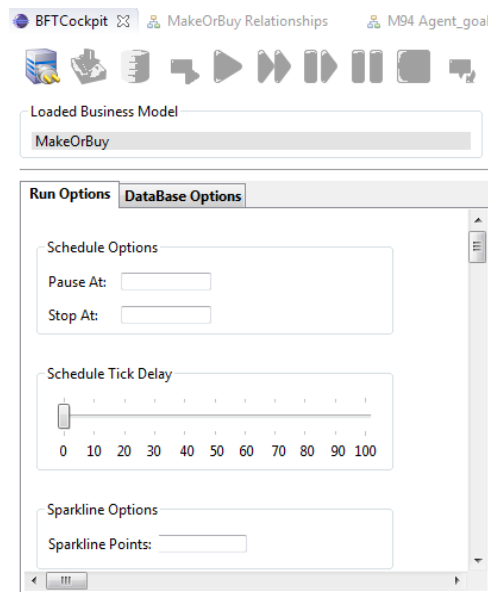


Figure 27: The BFT Control Cockpit

The BFTCockpit plug-in allows a user to run and control simulations in a remote Simulation Service. The connection URL of the Simulation Service can be specified using the "Connect to Simulation Service". A popup window provides the user with the possibility to enter the respective URL (see Figure 28).

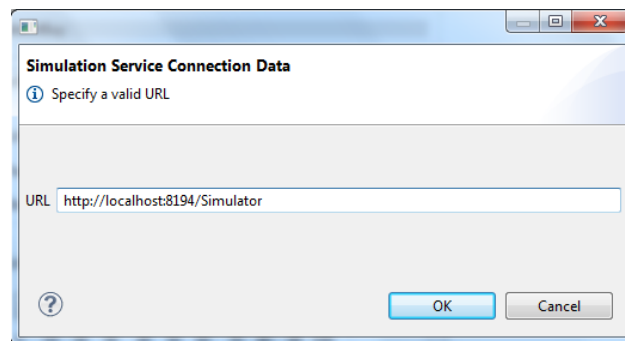


Figure 28: Connecting to the Simulation Service

Using the buttons from the cockpit toolbar, a user can:

1. Upload the selected business scenario to the selected simulation service.
2. Initialize a simulation.
3. Run a simulation.
4. Run a simulation batch.
5. Make a single step in a simulation.
6. Pause a simulation.
7. Stop a simulation.
8. Reset a simulation.

During each step, the simulator stores the values computed for the scenario variables within the `bftdb` database available from the local MongoDB installation.

During each run, the simulator creates four collections within the `bftdb` database:

- Individuals: values of variables characterizing single agents.
- Interactions: statistics of interactions between couple of agents.
- Model: values of variables characterizing the overall model.
- Resources: levels of resources exchanged between agents.

The actual name of collections are prefixed by the start date and time of the simulation run that generated them, e.g. "17-giu-2014 17.04.00_Individuals", "17-giu-2014 17.04.00_Interactions", "17-giu-2014 17.04.00_Model", and "17-giu-2014 17.04.00_Resources".

4.2.4 Licensing Information

The plug-in is proprietary software (i.e. closed-source software). It is possible to use the plug-in binary distribution but it is not allowed to modify the software or distribute it to others.

4.2.5 Download

A binary distribution of the ARTIST Business Model Simulator can be obtained from Engineering – Ingegneria Informatica S.p.A. by sending a request to domenico.presenza@eng.it or stefania.dagostini@eng.it.

5 Business Scenario Assessment Dashboard (BFT-DSH) Prototype

5.1 Implementation

This section describes the purpose, set up and usage of the version 1.0 of the Business Scenario Assessment Dashboard prototype.

5.1.1 Functional Description

The Business Scenario Assessment Dashboard component implements all the functionalities supporting decision-makers in the context of the assessment of Business Scenarios informed by simulation results.

The Business Scenario Assessment Dashboard prototype herein presented was developed to explore possible answers to one of the questions raised by the design of ARTIST BFT [2]:

- Which are the techniques and components that could be used to implement a dashboard for the assessment of business scenario based on the time-series generated by its simulation runs?

5.1.2 Technical Description

5.1.2.1 Prototype architecture

The Business Scenario Assessment Dashboard v1.0 consists of a cost-benefit report implemented using the BIRT reporting platform (<http://www.eclipse.org/birt/>).

More specifically, it is a BIRT report (`CostBenefitAnalysis.rptdesign`) obtaining data from the BFT simulation database (see Section 3.1.2.1).

5.2 Delivery and usage

5.2.1 Package information

The BFT Scenario Assessment Dashboard (BFT-DSH) is distributed as a single zip file:

`ARTIST_D5.4.2_AssessmentDashboard_prototype_v1.0.zip`

5.2.2 Installation Instructions

In order to install the BFT-DSH:

1. Unzip the distribution file in the workspace folder of your Eclipse installation.
2. Import the BFT-DSH project you obtained with the previous step in your Eclipse workspace.
3. Edit the data source named “BFT database” to point to your BFT database (Figure 29).

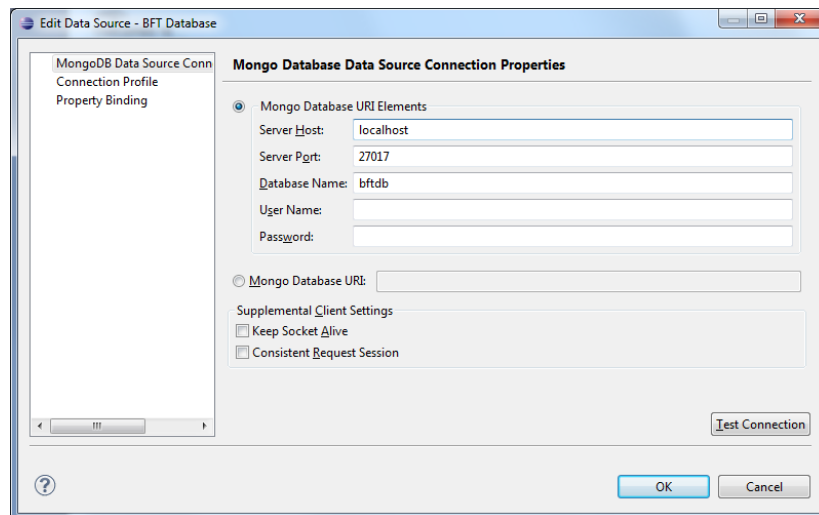


Figure 29: Configuration of the BFT database connection

5.2.3 User Manual

In order to visualize the Cost-Benefit report using the data from a simulation run, perform the following steps:

1. Edit the datasets Agents, CashFlowOfSelectedAgents, IncomesOfSelectedAgents, OutComesOfSelectedAgents, to point to the respective result from the simulation run you want to assess (see Figure 30).

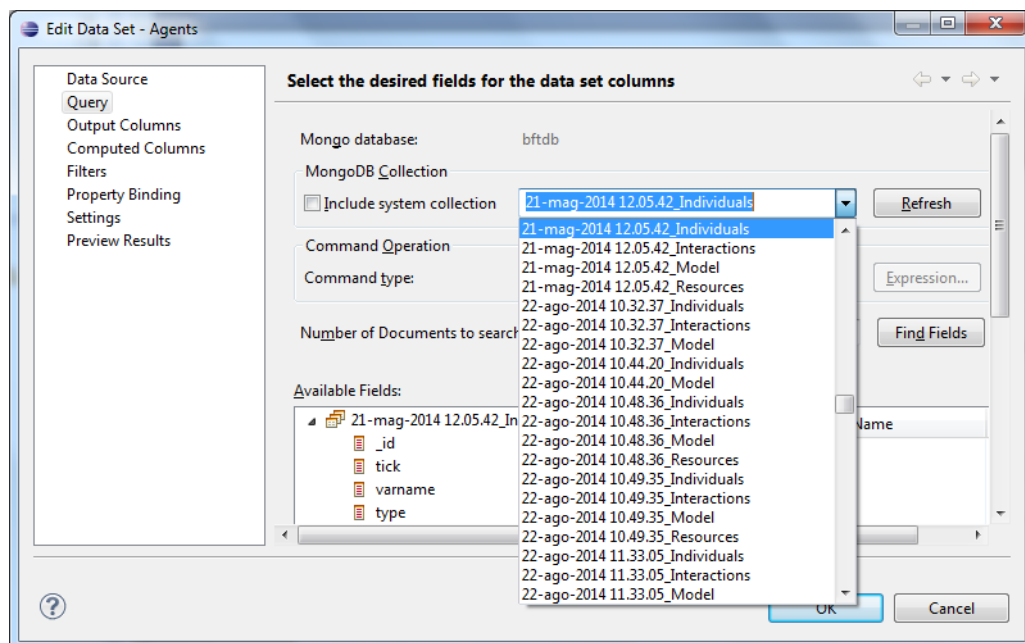
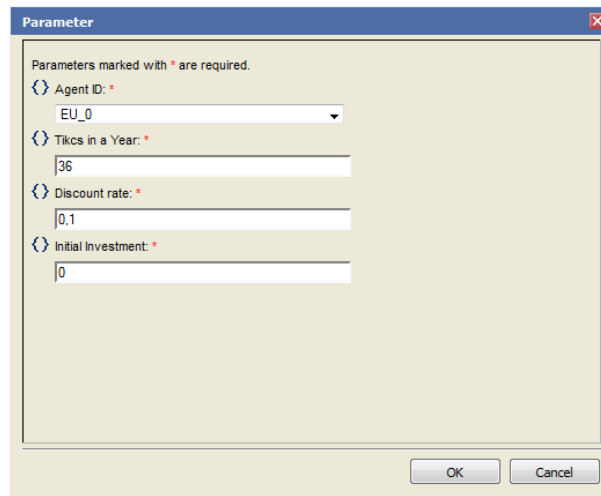


Figure 30: Example of configuration of the BFT data collections

2. Run the report by selecting the menu item **Run > View Report > In Web Viewer** from the Eclipse menu bar.
3. Using the dialog displayed by your web browser, specify the report parameters (see Figure 31):
 - Agent ID: the identifier of the agent whose cost-benefit you want to assess.
 - Ticks in a Year: the number of simulation ticks representing a year.
 - Discount rate: the discount rate to apply for the cost-benefit analysis.

- Initial Investment: the estimated initial investment for the set-up of the business model.



The screenshot shows a 'Parameter' dialog box with a title bar and a close button. Inside, a message states 'Parameters marked with * are required.' Below this, there are four input fields, each preceded by a blue icon of a document with a checkmark. The first field is 'Agent ID: *' with a dropdown menu showing 'EU_0'. The second field is 'Ticks in a Year: *' with a text input containing '36'. The third field is 'Discount rate: *' with a text input containing '0.1'. The fourth field is 'Initial Investment: *' with a text input containing '0'. At the bottom right, there are 'OK' and 'Cancel' buttons.

Figure 31: Dialog for specifying the parameters of the cost-benefit report

After the specification of the parameter, the Web browser will present the cost-benefit analysis report concerning the selected agent.

5.2.4 Licensing Information

The plug-in is proprietary software (i.e. closed-source software). It is possible to use the plug-in binary distribution but it is not allowed to modify the software or distribute it to others.

5.2.5 Download

A binary distribution of the ARTIST Business Scenario Assessment Dashboard can be obtained from Engineering – Ingegneria Informatica S.p.A. by sending a request to domenico.presenza@eng.it or stefania.dagostini@eng.it.

6 Costs-Benefits Analysis (BFT-CBA) Prototype

6.1 Implementation

6.1.1 Functional description

This deliverable presents the second prototype of a cost-benefit analysis (CBA) for those companies that are thinking of migrating to the cloud. As presented in Deliverable 5.4.2 [4], a CBA is a way of calculating and comparing benefits and costs of a project, investment or even government policies. The purpose of a CBA is twofold:

1. To determine if the investment to be made is feasible and justifiable.
2. To provide means to compare investments or decisions. In the case of a migration to the cloud, the comparison would be between migrating totally, partially or developing from scratch, with the main purpose of analysing whether the benefits outweigh the costs and by how much.

CBA's are expressed in terms of monetary units and adjusted for the time value of money, so that all flows of costs and benefits are calculated on a common basis even though they occur in different moments and periods of time.

The main goal of this second prototype is to determine how the selection of a pricing model affects the Profit and Loss Account of a company. To do so, three pricing models have been modelled. These are the pay-per-use model, the freemium model and the tiered model. Each of these models is presented in a different tab in the prototype. Finally, a tab summarizing the P&L's of all three models considering a similar customer base is presented to the end user so that (s)he can compare the profitability of each of the different pricing models.

6.1.1.1 *Fitting into overall ARTIST solution*

The CBA is a component inside the Business Feasibility analysis, which in turn, is part of the modernization assessment toolset and the pre-migration phase if we are speaking in terms of the methodology. The BFT is focused on providing a decision support to aid decision-makers towards the convenience of migrating compared to developing from scratch. The CBA is centred mainly on the economic perspective with the two objectives mentioned beforehand. The goal of this CBA is twofold. On one hand, it provides objective data on the Return on Investment or Payback, so that managers can at least predict how much time will pass until they have recovered their investment. The data provided in a CBA are usually based on estimations, so accuracy of results will vary depending on the exactness of the provided data. In the case of the ARTIST CBA, these data are captured from the MAT (mainly entered manually) and from the TFT, as well as from other components of the BFT. On the other hand, it analyses, based on similar contract values and customer base, which pricing model is the most suitable one for this application in the medium-term.

The execution of the CBA is located in the pre-migration phase. Considering this phase, the BFT is used in the task called BUSFEAS (marked in a darker color), being the CBA a part of it.

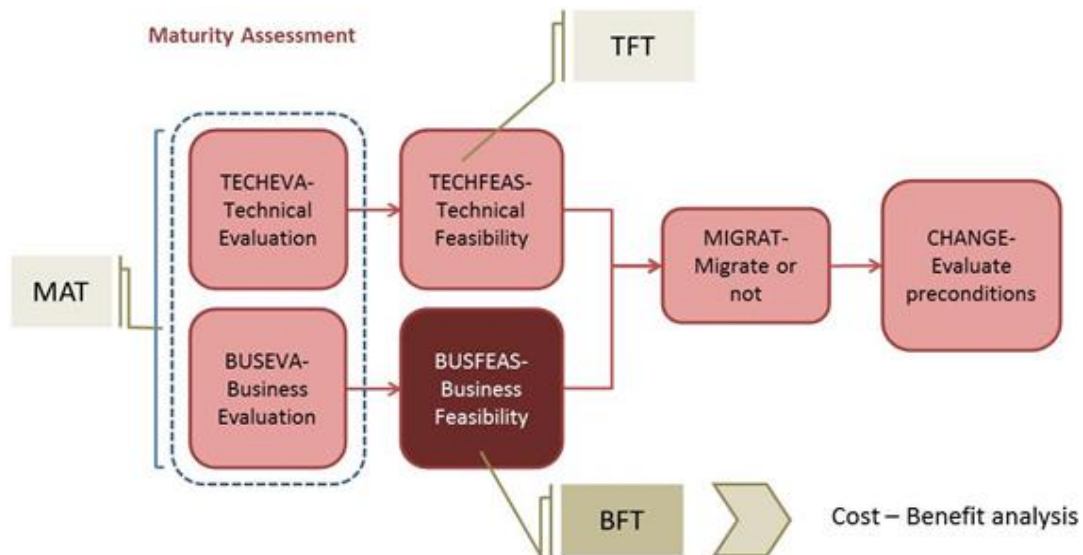


Figure 32: CBA place within the ARTIST methodology

As explained above, the CBA is a component of the BFT tool. The next picture highlights where the CBA stands according to the overall ARTIST architecture.

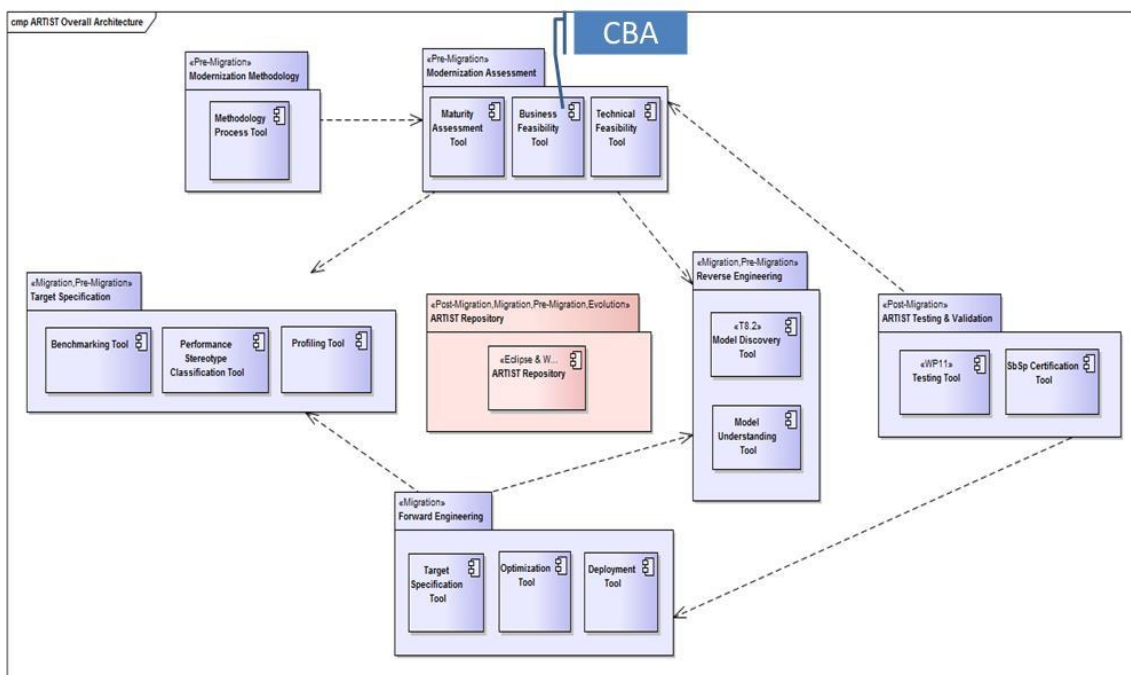


Figure 33: CBA component in the overall ARTIST architecture

The following figure shows a more detailed architecture of the BFT components. In there, the CBA is part of the “Assessment Dashboard” component and is also highlighted for clarification purposes.

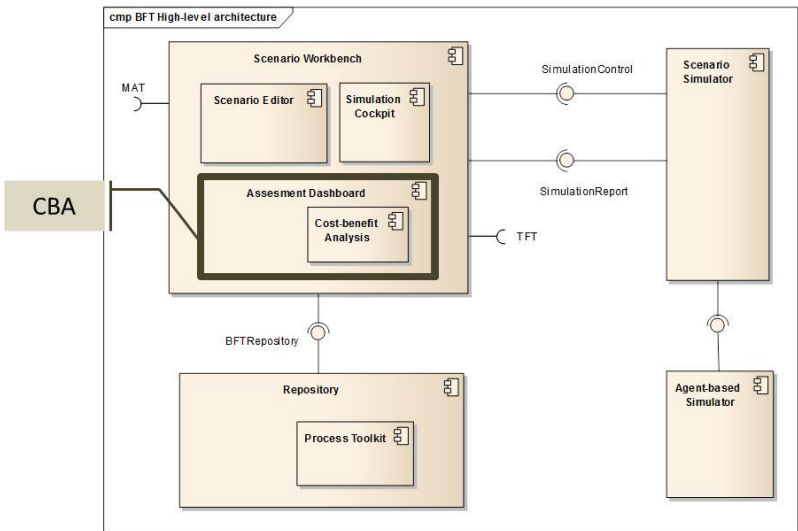


Figure 34: CBA in the BFT detailed architecture

6.1.2 Technical description

N/A because the CBA is provided in this version as an Excel spread sheet that can be stored in any PC. Please refer to the User Manual (Section 6.2.3) for getting more insights on different elements composing the spreadsheet.

6.1.2.1 Prototype architecture

N/A

6.1.2.2 Components description

N/A

6.1.2.3 Technical specifications

N/A

6.2 Delivery and usage

6.2.1 Package information

The CBA is provided in this version as an Excel spread sheet that can be stored in any PC.

6.2.2 Installation instructions

No installation is needed. To open it, any Excel compatible tool can be used.

6.2.3 User Manual

The starting point of this CBA is the acquisition of certain baseline data. This baseline data is completed by means of interviews with relevant stakeholders. The data set presented here is an initial approach that can be modified or improved any time depending on the nature of the company, the product, and the basic operational costs. In this first step, the data gathered mainly include tangible expected benefits, one-time costs and recurring costs. The data provided in that first phase is transmitted automatically to the following phases. For this example, fake data are provided.

The following table explains the initial concepts considered in the current CBA.

Table 1: CBA Concepts Breakdown

Type	Concept	Explanation
Benefits	Cost reduction or avoidance	Process of removing costs deemed unnecessary without having a negative impact on product quality.
	Error reduction	More updates and with more frequency reduce the time spent in correcting grave errors. Regression tests in SaaS applications are continuously run every time a new version comes out. In traditional applications, regression tests are less frequently run, since in most cases, there is only a yearly update and that is when regression tests are mostly executed.
	Increased flexibility to customize solutions	In the case of SaaS, only the presentation layer has to be customized. In the case of legacy applications, in most occasions, the application has to be customized ad-hoc for the customer (e.g. setting up the infrastructure, creation of a new DB schema, workflows, etc.)
	Savings for not having to travel to install the solution	On-premise applications, even when they are 2 or 3 tiered applications, need a certain configuration in the hardware (e.g. Database, Application server, etc.) that needs to be prepared by the software provider and its consultants. This involves trips and consultancy services. This concept can be calculated as Number of customers * travel costs.
	Savings for not having to maintain several versions of an application for different environments	Maintaining a version of a software system for several operating environments implies a huge number of costs: teams dedicated to each configuration, dedicated configuration management servers, licenses and other infrastructure items. On the other hand, SaaS applications run on an IaaS (or multiple IaaS but with the entire same configuration) and thus, only development environment needs to be set up and maintained.
	Improvement in management planning and control	Controlling items of one configuration and one technology stack is easier in a SaaS application due to the need of maintaining only one operational environment.
	Savings for reusing code	Original source code may be reused in the event that the programming language of the old application coincides with the programming language of the target platform. In this case, a previous analysis of potential reuse of snippets of code has to be performed (mainly concerned with business logic). This reuse can imply savings compared to developing it from scratch or completing the automatically generated code.
One-time costs	Development costs	Cost of migrating the application or starting it from scratch.
	Creation of the new IaaS (in the case of a	If the company decides to run the application on a private cloud, they will have to set it up. This concept includes labour costs of

Type	Concept	Explanation
	private cloud)	setting it up and the purchase of the infrastructure.
	New software licenses	For both the creation of the application and the IaaS in case of a private cloud.
	User training	Roles will be changing now that the application is servitized. This includes the costs of the application of the roles alignment process. Not only the developers will have to be trained in new architectural concerns, implementation of business models (how to translate the functional concepts of a business model to the different application components), but also other roles will have to be changed to satisfy the helpdesk service (different levels), the marketing, customer services, etc.
	Adequation and institutionalization of the organizational processes	Several organizational processes will have to be changed and then institutionalized. This cost is covering this activity, a similar cost to that of process improvement related activities.
Recurring costs	Application software maintenance and update	SaaS applications are continuously updated and maintained. New versions are released in short periods of time without the end user noticing. This continuous update impacts the number and severity of errors since regression, unit and integration tests are run before each release.
	IaaS Maintenance (in the case of a private cloud)	In the case in which the SaaS is offered using a private cloud delivery model, this private cloud needs to be taken care of: updates, upgrades and patches need to be installed and set up, etc.
	Cloud provider (in case of a public cloud provider)	In the case of a SaaS deployed on a public cloud provider (although a private cloud), the platform and infrastructure costs will come in bills from the cloud provider. Most cloud providers follow a pay per use basis. The bills can be monthly or annually or any other period of time, depending on the customer's likes.
	New application functionalities	In order for a SaaS to be competitive, new functionalities are commonly offered to the consumer. These new functionalities are often the response of customer's requests and are offered following a tiered business model.
	Marketing	Marketing efforts are keys in a SaaS company since the market is now global and less local than before. This involves a new marketing strategy with a clear focus of the target customers.
	Helpdesk service	An incidence Management service must be established. This service is usually configured in levels, depending on the severity of the incidences and the established response time in the SLA.

Type	Concept	Explanation
	Customer service	Related to answering all concerns by the customers, new customer acquisition, SLA generation, monitoring and compliance.

Once this data is gathered, a break-even analysis is performed (Tab "Break even analysis"). In this case, the break-even analysis consists of a comparison of the costs of the proposed migrated system against the costs of the current system. It can happen that, due to the factors considered, the point of balance is never found, thus implying that the costs of the migrated system (or the existing one) are always lower than the other one. This can drive further the decision. An example of this situation can be found in Figure 35.

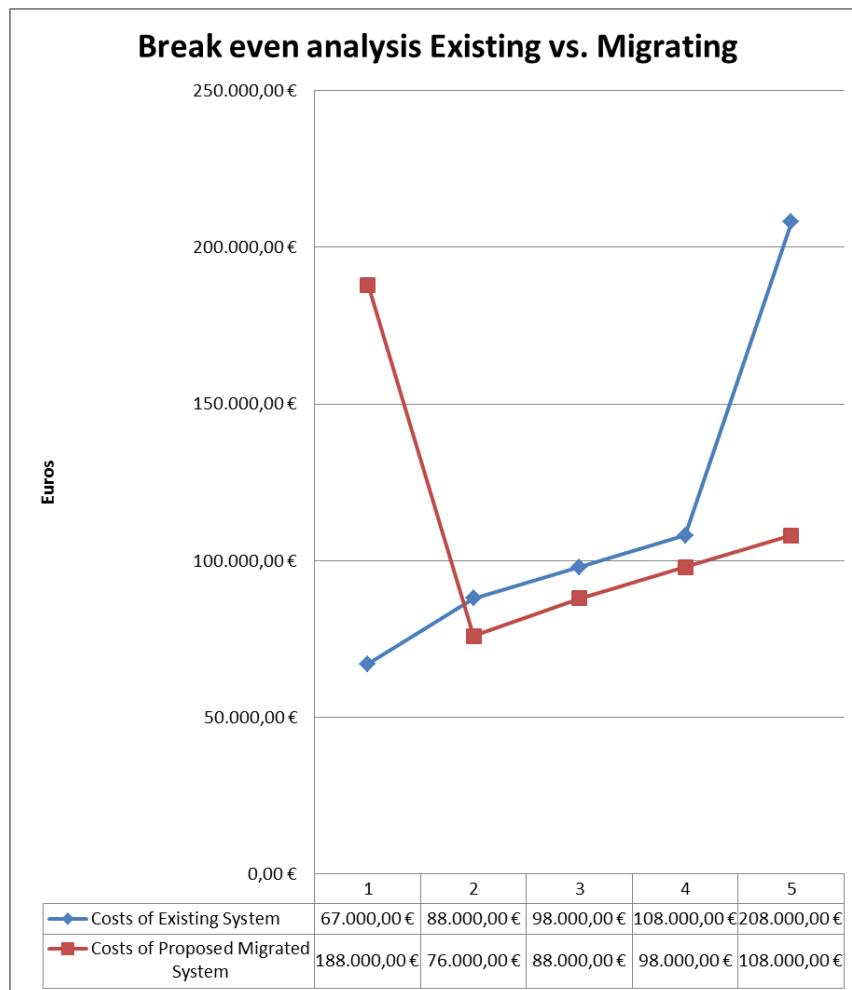
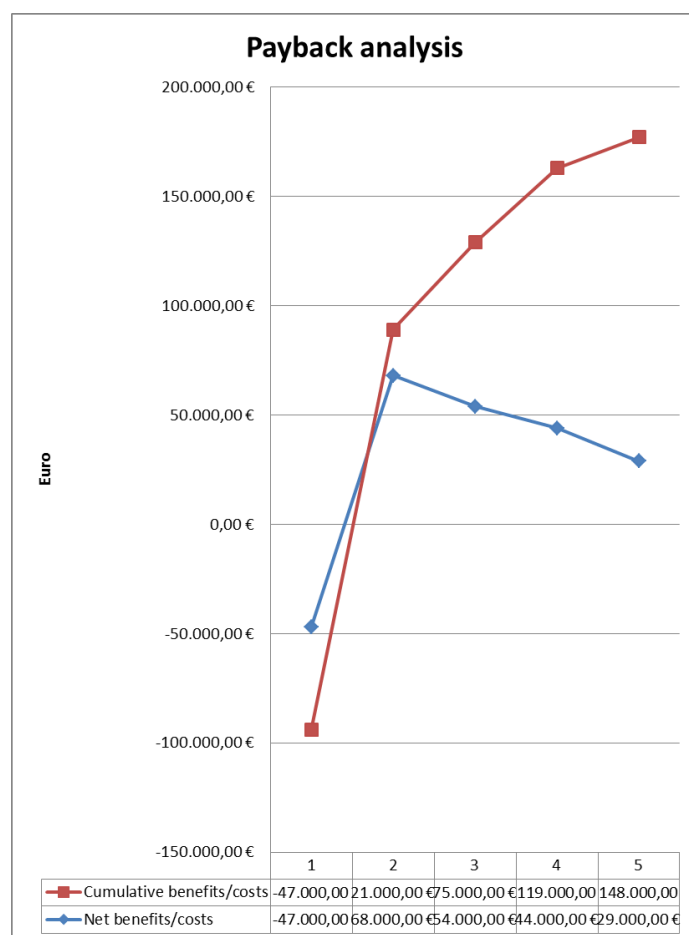
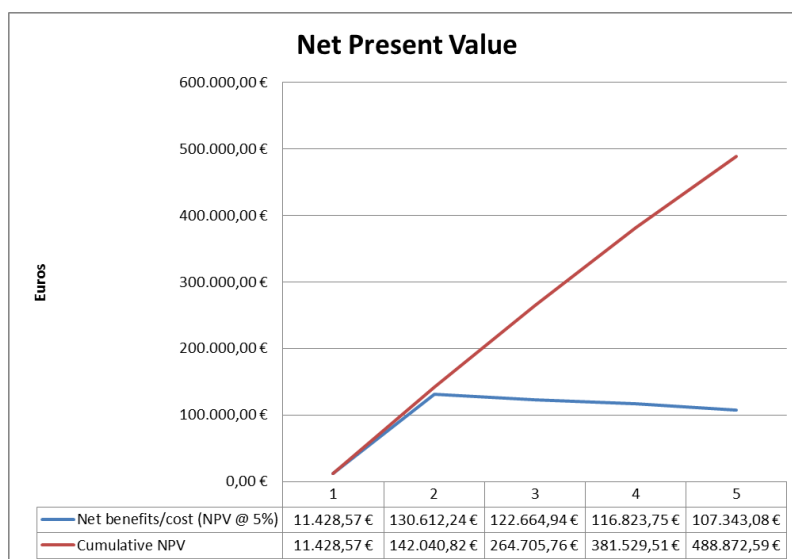


Figure 35: Break-even analysis of costs of existing system vs. migrated system

Based on the same data and in parallel, without any user intervention, a payback analysis is performed (Tab Payback analysis). The aim of this payback analysis is to provide the user with an estimation of when the company will recover the investment, taking into consideration the net benefits and costs and the cumulative benefits and costs. In this theoretical exercise, payback = 1.69 years, as depicted in Figure 36.

**Figure 36:** Payback Analysis

Another economic value included in this CBA is the Net Present Value (PV), as it shows the value as of today of the investment of migrating the software system with a discount rate of 5%. The respective value is depicted in Figure 37.

**Figure 37:** Net Present Value

The final economic indicator provided to the user is an overview of all the previous data, showing him the Net Present Value of costs, of benefits and the cumulative difference (cf. Figure 38). The discount rate remains 5%.

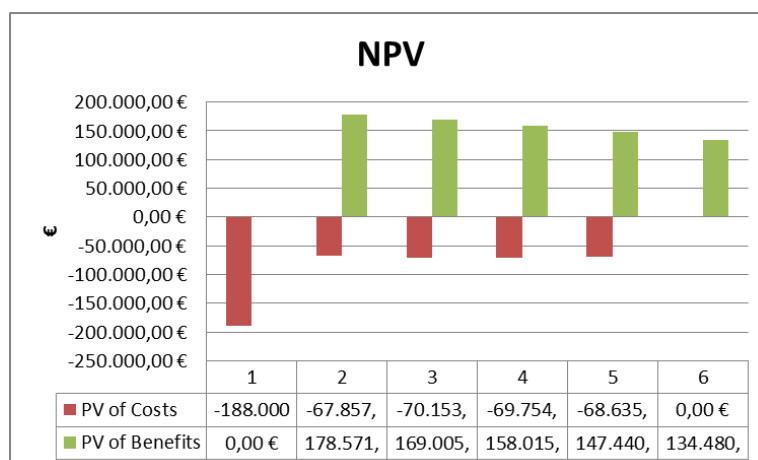


Figure 38: Net Present Value of Costs, Benefits and Cumulative Difference (Author's own contribution)

Finally, a ROI value is also presented. The ROI is calculated as follows:

$$ROI = \frac{NPV \text{ Benefits} - NPV \text{ Costs}}{NPV \text{ Costs}}$$

For this theoretical exercise, the ROI results in:

	Year 1	Year 2	Year 3	Year 4	Year 5
ROI	-30,21%	6,62%	27,75%	40,62%	69,58%

The Excel sheet now also presents four additional tabs for the simulation of three pricing strategies: Pay per instance use, Freemium and Tiered model. In all three cases, the starting cells are the pricing model, the discount rate, the margin (in %), the cost of capital and the cost of service. The pricing model and the margin vary depending on the selected model. For instance, in the case of the pay per instance use, the information that needs to be included is shown next:

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Pricing model			10	10	10	10	10
Avg Instance Use	(price per month)		200,00	200,00	200,00	200,00	200,00
Avg # of tenants	(price per month)		4,00	4,00	4,00	4,00	4,00
Operational costs	(price per month)		50,00	50,00	50,00	50,00	50,00
Discount Rate							
After 36 months	10%						
Margin							
%	(monthly margin per customer)		10,00%	10,00%	10,00%	10,00%	10,00%
	(monthly margin per customer)						
Cost of Capital (WACC)			10,00%	10,00%	10,00%	10,00%	10,00%
Cost of Service			15,00%	15,00%	15,00%	15,00%	15,00%

Figure 39: Setting up the prices in the pay per instance use (Author's own contribution)

However, in the case of the Tiered model (with three tiers), this is the required information:

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Pricing model							
Basic	(price per month)	10,00	10,00	11,00	12,00	13,00	14,00
Limited	(price per month)	20,00	20,00	21,00	22,00	23,00	24,00
Enterprise	(price per month)	30,00	30,00	31,00	32,00	33,00	34,00
Discount Rate							
After 36 months	10%						
Revenue							
Basic	(monthly margin per customer)	1,00	1,00	2,00	3,00	4,00	5,00
Limited	(monthly margin per customer)	2,00	2,00	3,00	4,00	5,00	6,00
Enterprise	(monthly margin per customer)	3,00	4,00	5,00	6,00	7,00	8,00
Cost of Capital (WACC)			10,00%	10,00%	10,00%	10,00%	10,00%
Cost of Service			15,00%	15,00%	15,00%	15,00%	15,00%

Figure 40: Setting up the prices in 3-tiered model (Author's own contribution)

The next step is to fill in the Churn related metrics. In this case, these metrics calculate the number of new customers that decide to buy the service, compared to the number of customers that decide to abandon the service creating thus the Net New Customers metric. In the case of the 3 tiered model, the upgrades and downgrades are also of special relevance. White cells indicate data that needs to be manually inserted, while brown cells indicate data that is calculated automatically.

Churn Metrics							
Basic		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total # of Customers		10,00	15,00	20,00	25,00	30,00	35,00
# of new Customers			10,00	10,00	10,00	10,00	10,00
# of churned Customers			(5,0)	(5,0)	(5,0)	(5,0)	(5,0)
Net New Customers			5,0	5,0	5,0	5,0	5,0
# of Customers Limited-Basic			1,00	1,00	1,00	1,00	1,00
# of Customers Enterprise-Basic			1,00	1,00	1,00	1,00	1,00
Limited		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total # of Customers		10,00	15,00	20,00	25,00	30,00	35,00
# of new Customers			10,00	10,00	10,00	10,00	10,00
# of churned Customers			(5,0)	(5,0)	(5,0)	(5,0)	(5,0)
Net New Customers			5,0	5,0	5,0	5,0	5,0
# of Customers Basic-Limited			4,00	1,00	1,00	1,00	1,00
# of Customers Enterprise-Limited			1,00	1,00	1,00	1,00	1,00
Enterprise		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total # of Customers		10,00	15,00	20,00	25,00	30,00	35,00
# of new Customers			10,00	10,00	10,00	10,00	10,00
# of churned Customers			(5,0)	(5,0)	(5,0)	(5,0)	(5,0)
Net New Customers			5,0	5,0	5,0	5,0	5,0
# of Customers Basic-Enterprise			1,00	4,00	1,00	1,00	1,00
# of Customers Limited-Enterprise			1,00	1,00	1,00	1,00	1,00

Figure 41: Churn metrics (Author's own contribution)

Based upon the Net New Customers, downgrades, upgrades and Revenues by tier, automatic calculations are performed to analyse the Annual Recurring Revenue. New ARR is related to new customers, Churned ARR is related to those customers that have abandoned the system while Growth ARR is related to both upgrades and downgrades from customers.

Annualized Recurring Revenue (ARR)		Total	972	1200	1296	1404	1524
Basic		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	New ARR		120,00	240,00	360,00	480,00	600,00
negative values	Churned ARR		(60,0)	(120,0)	(180,0)	(240,0)	(300,0)
	Growth ARR		48,0	168,0	36,0	48,0	60,0
	Net New ARR		108,0	288,0	216,0	288,0	360,0
	Starting ARR		200,0	308,0	596,0	812,0	1.100,0
	Ending ARR	200,0	308,0	596,0	812,0	1.100,0	1.460,0
Limited		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	New ARR		240,00	-120,00	-180,00	-240,00	-300,00
negative values	Churned ARR		(120,0)	(180,0)	(240,0)	(300,0)	(360,0)
	Growth ARR		(60,0)	(24,0)	(24,0)	(24,0)	(24,0)
	Net New ARR		60,0	(324,0)	(444,0)	(564,0)	(684,0)
	Starting ARR		200,0	260,0	(64,0)	(508,0)	(1.072,0)
	Ending ARR	200,0	260,0	(64,0)	(508,0)	(1.072,0)	(1.756,0)
Enterprise		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	New ARR		480,00	600,00	720,00	840,00	960,00
negative values	Churned ARR		(240,0)	(300,0)	(360,0)	(420,0)	(480,0)
	Growth ARR		(36,0)	(36,0)	(36,0)	(36,0)	(36,0)
	Net New ARR		204,0	264,0	324,0	384,0	444,0
	Starting ARR		200,0	404,0	668,0	992,0	1.376,0
	Ending ARR	200,0	404,0	668,0	992,0	1.376,0	1.820,0
ARR Consolidated							
	New ARR		560,00	560,00	560,00	560,00	560,00
negative values	Churned ARR		(420,0)	(600,0)	(780,0)	(960,0)	(1.140,0)
	Growth ARR		(48,0)	108,0	(24,0)	(12,0)	-
	Net New ARR		372,0	228,0	96,0	108,0	120,0

Figure 42: ARR calculations (Author's own contribution)

Customer churn metrics are usually shown in percentages in the SaaS Business world, and in relation to the ARR, as shown below.

% Customer Churn							
Basic		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	% Customer Churn		0,5	0,3	0,3	0,2	0,2
	% ARR Churn		(0,3)	(0,4)	(0,3)	(0,3)	(0,3)
	% ARR Growth		0,2	0,5	0,1	0,1	0,1
	% Net ARR Churn		0,4	0,5	0,0	(0,0)	(0,1)
Limited		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	% Customer Churn		0,5	0,3	0,3	0,2	0,2
	% ARR Churn		(0,6)	(0,7)	3,8	0,6	0,3
	% ARR Growth		(0,3)	(0,1)	0,4	0,0	0,0
	% Net ARR Churn						
Enterprise		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	% Customer Churn		0,5	0,3	0,3	0,2	0,2
	% ARR Churn		(1,2)	(0,7)	(0,5)	(0,4)	(0,3)
	% ARR Growth		(0,2)	(0,1)	(0,1)	(0,0)	(0,0)
	% Net ARR Churn		(0,9)	(0,5)	(0,3)	(0,3)	(0,2)

Figure 43: ARR calculations (Author's own contribution)

In the ecommerce world, there is a set of economic metrics that measure the health of the company. These are CAC, LTV, the CAC:LTV ratio and the months to recover the CAC. All these metrics are explained in D5.1.3. These metrics are calculated automatically based on the data inserted previously.

Economics (new customers)		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Basic							
	LTV		170,00	415,49	1693,89	3852,28	6311,25
	CAC		35,00	35,00	35,00	35,00	35,00
	LTV to CAC Ratio		4,9	11,9	48,4	110,1	180,3
	Months to Recover CAC		0	0	0	0	0
Limited							
	LTV		(408,0)	172,2	(39,7)	(295,4)	(585,1)
	CAC		35,0	36,0	37,0	38,0	39,0
	LTV to CAC Ratio		(11,7)	4,8	(1,1)	(7,8)	(15,0)
	Months to Recover CAC		0	0	0	0	0
Enterprise							
	LTV		(154,5)	(534,4)	(1.293,6)	(2.607,4)	(4.700,3)
	CAC		35,0	36,0	37,0	38,0	39,0
	LTV to CAC Ratio		(4,4)	(14,8)	(35,0)	(68,6)	(120,5)
	Months to Recover CAC		(1)	(1)	(1)	(1)	(1)

Figure 44: SaaS economics calculations (Author's own contribution)

The final set of metrics calculated is the Subscriptions rate. Subscriptions are calculated using the price and the number of new customers. This information is interesting to analyse the number of customers we are being able to attract.

Subscription		Total	10800	15120	19800	24840	30240
Basic		Total	1800	2640	3600	4680	5880
	Subscriptions Basic (new custs)		1200,00	1200,00	1200,00	1200,00	1200,00
	Average Months paid upfront						
	ARA (Average ARR) for new customers		12,00	12,00	12,00	12,00	12,00
	ARA across the installed base		20,53	29,80	32,48	36,67	41,71
Limited		Total	3600	5040	6600	8280	10080
	Subscriptions Limited (new custs)		2400,00	2400,00	2400,00	2400,00	2400,00
	Average Months paid upfront						
	ARA (Average ARR) for new customers		24,00	24,00	24,00	24,00	24,00
	ARA across the installed base		17,33	-3,20	-20,32	-35,73	-50,17
Enterprise		Total	5400	7440	9600	11880	14280
	Subscriptions Enterprise (new custs)		3600,00	3600,00	3600,00	3600,00	3600,00
	Average Months paid upfront						
	ARA (Average ARR) for new customers		48,00	48,00	48,00	48,00	48,00
	ARA across the installed base		26,93	33,40	39,68	45,87	52,00

Figure 45: Subscription calculations (Author's own contribution)

Finally, the main outcome of this set of metrics is the simulation of the profit and loss of a company. The main indicator expected by financial managers is the EBITDA. The only data that needs to be included are related to the operational costs of the company. The EBITDA is automatically calculated.

Summary Financial Metrics (P&L)		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	Billings		10800,00	15120,00	19800,00	24840,00	30240,00
	Revenue		972,00	1200,00	1296,00	1404,00	1524,00
	Cost of Goods Solds - COGS		165,24	204,00	220,32	238,68	259,08
	Gross Margin		806,76	996,00	1075,68	1165,32	1264,92
	Gross Margin %		83,00%	83,00%	83,00%	83,00%	83,00%
	Total Expenses		640,00	650,00	660,00	670,00	680,00
	Sales & Marketing		350,00	360,00	370,00	380,00	390,00
	Development		180,00	180,00	180,00	180,00	180,00
	General & Administrative		110,00	110,00	110,00	110,00	110,00
	EBITDA		166,76	346,00	415,68	495,32	584,92

Figure 46: Summary of financial metrics (Author's own contribution)

For the end user's convenience, the Profit and Loss is shown also in a graphical manner as shown next.

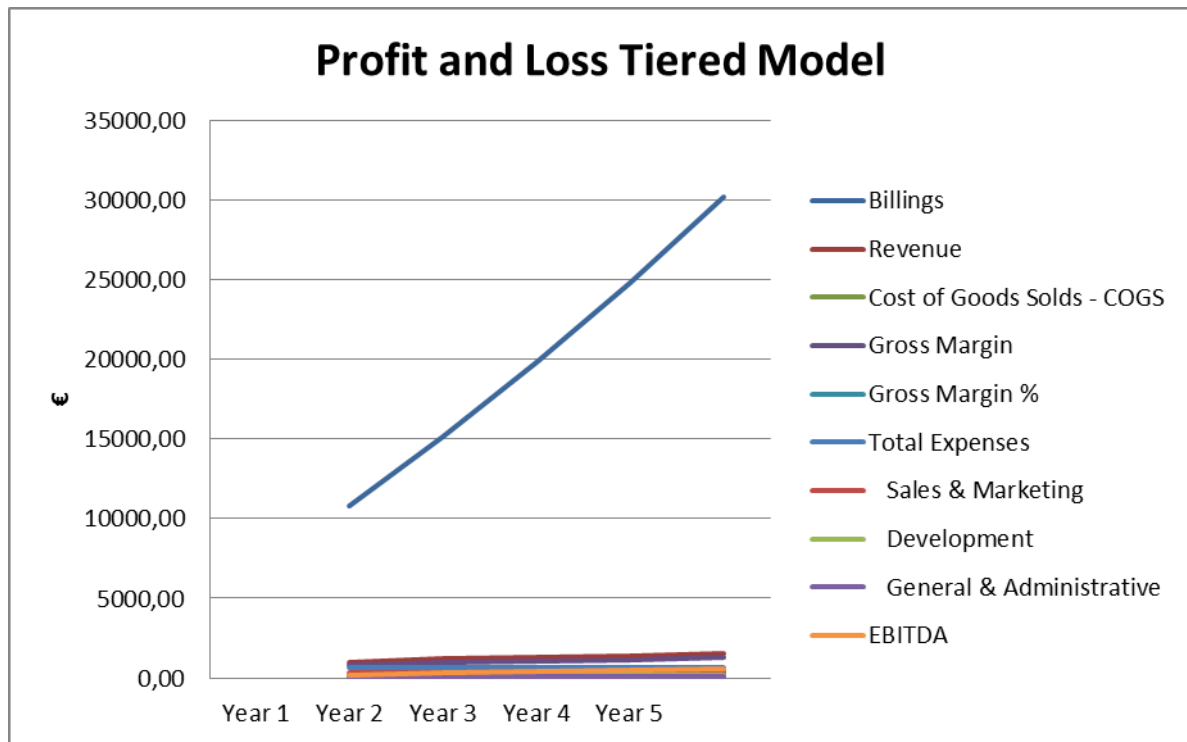


Figure 47: Summary of financial metrics (Author's own contribution)

As summary, all three pricing models are shown in an explicit tab in order to facilitate the decision to decision makers as to which model is the most suitable one in economic terms for the customer base that the company has.

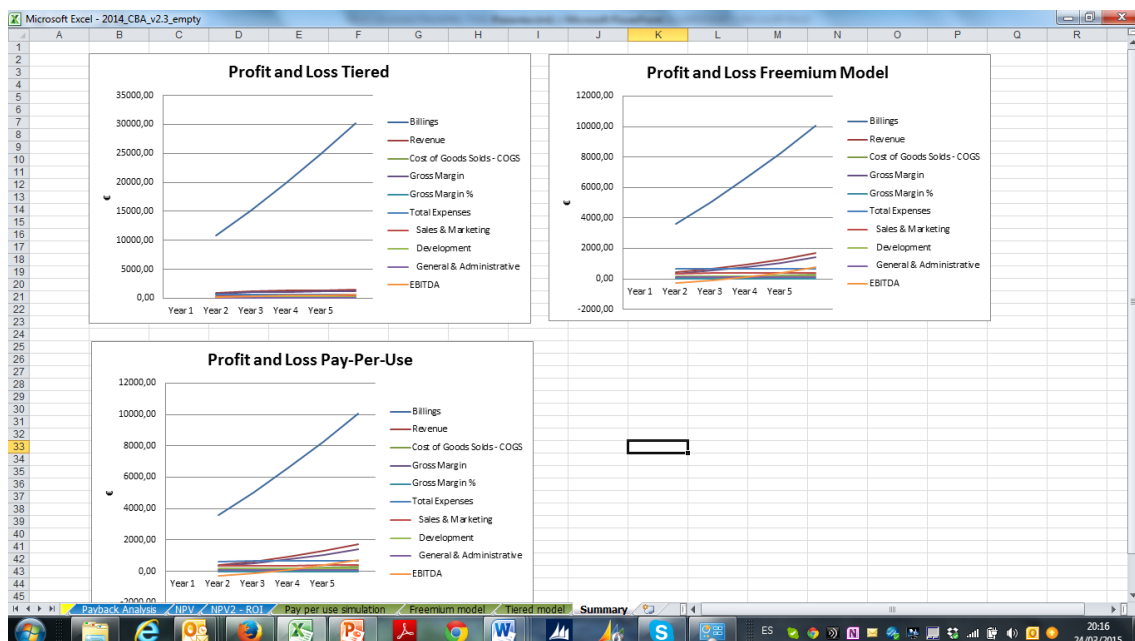


Figure 48: Comparison of the three modelled pricing models (Author's own contribution)

6.2.4 Licensing information

Currently the use of it is free.

6.2.5 Download

The Cost Benefit Analysis is available for downloading it at:

<https://github.com/artist-project/ARTIST-Tooling/tree/master/pre-migration/business%20feasibility%20tool/CBA/eu.artist.premigration.bft.cba.m30>

7 Process Toolkit (BFT-PK) Prototype

This prototype has not changed from the previous version in Month 24. The work carried out in the process kit in these last months is focused on aligning the work with the WP6 as the definition of these key processes has been taking into account in the methodology of the WP6.

7.1 Implementation

7.1.1 Functional description

This prototype provides the definition of the key processes which should be ideally modified by a company to be cloud compliant due to the migration process.

In order to align the processes of the prototype of M12 with the CCRA standard⁶, an extensive analysis has been carried out.

The following table represents the changes in the process in order to be aligned with the existing standard.

Table 2: Process Kit changes

Process Kit Prototype M12	D5.4.2 Process Kit Prototype
Update Process	Update and maintenance Process
Incidence Management Process	Incidence management and resolution process
SLA Management Process	SLA Management Process
Helpdesk Process	Monitor customer request process
Marketing Process	Marketing Process
Accountability Process	This process has been deleted in this version of the process kit because it has been included as part of the business analysis.
Cloud Provider Management Process	Cloud Provider Management Process
Roles Alignment Process	Roles Alignment Process
Development process	Development process

In the following sections, the definition and description for these new key processes is detailed. The description of the different tasks of the processes can be seen in the EPF plug-in prototype.

⁶ ISO/IEC JTC 1/SC 38 Distributed application platforms and services (DAPS), "ISO/IEC JTC 1/SC 38 Distributed application platforms and services (DAPS)," 2012. [Online]. Available: <http://isotc.iso.org/livelink/livelink?func=ll&objId=15838397&objAction=Open>. [Accessed 24th February 2014].

7.1.1.1 Update and maintenance Process

Objective

The objective of this process is to deploy releases into production and establish effective use of the service in order to deliver value to the customer and to be able to handover to service operations.

Figure 49 shows the representation of this process in the Eclipse Process Framework (EPF).

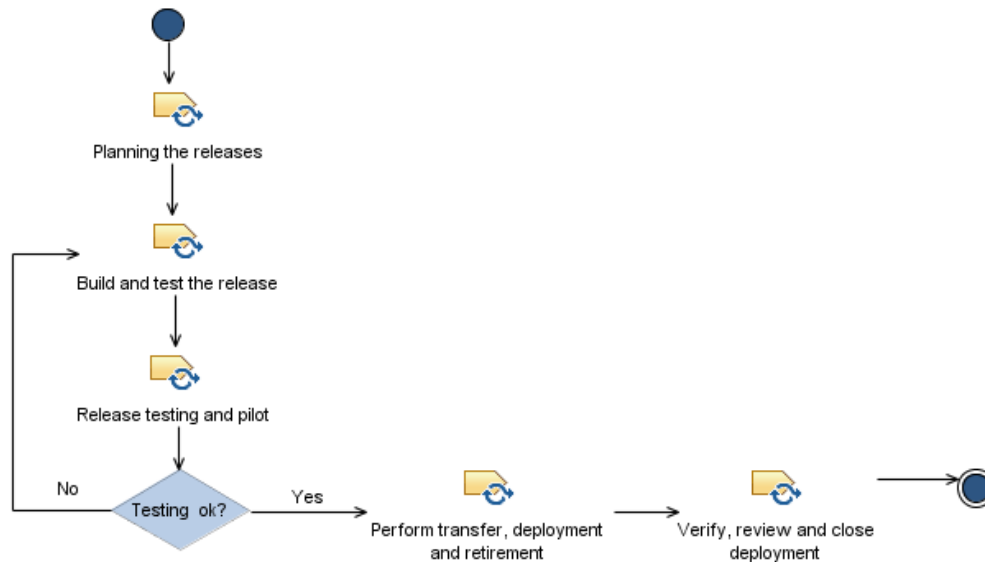


Figure 49: EPF implementation of Update and Maintenance Process

7.1.1.2 Incidence management and resolution process

Objective

The primary goal of the Incidence Management and resolution process is to restore normal service operation as quickly as possible and minimize the unfavourable impact on business operations, thus ensuring that the best possible levels of service quality and availability are maintained.

Figure 50 shows the representation of this process in EPF.

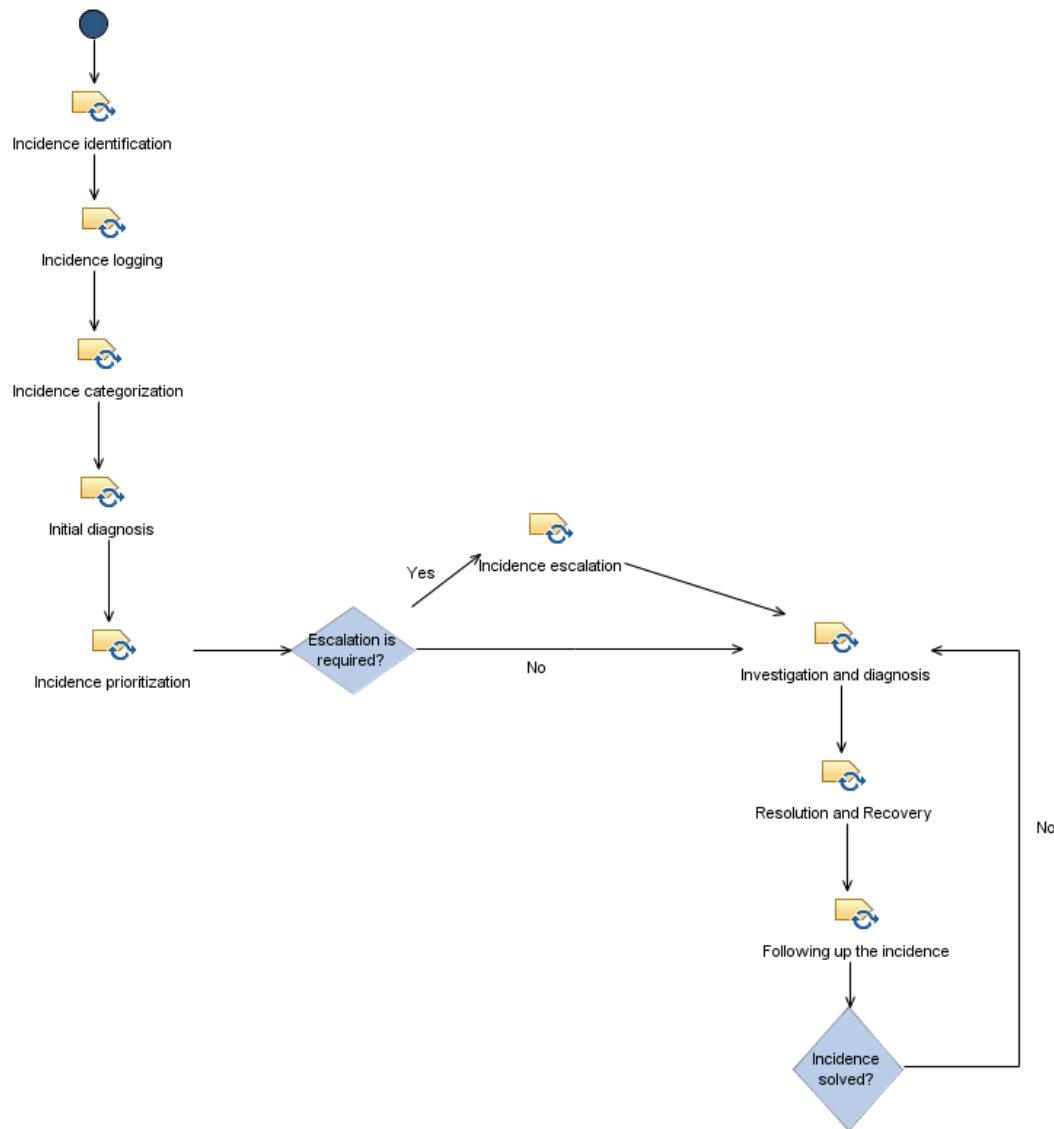


Figure 50: EPF implementation of Incident Management and Resolution Process

7.1.1.3 SLA Management Process

Objective

The goal of SLA management process is to ensure that an agreed level of IT services is provided for all current IT services and that the future services are delivered to agreed achievable targets. SLA management process should ensure that all operational services and their performance are measured in a consistent, professional manner throughout the IT organization, and that the services and the reports produced meet the needs of the business and customers. SLA management process provides a consistent interface to the business for all service related issues. It provides the business with the agreed service targets and the required management information to ensure those targets have been met. This process is not only concerned with ensuring the current services and SLAs are managed, but is also involved in ensuring new requirements are captured.

Figure 51 shows the representation of this process in EPF.

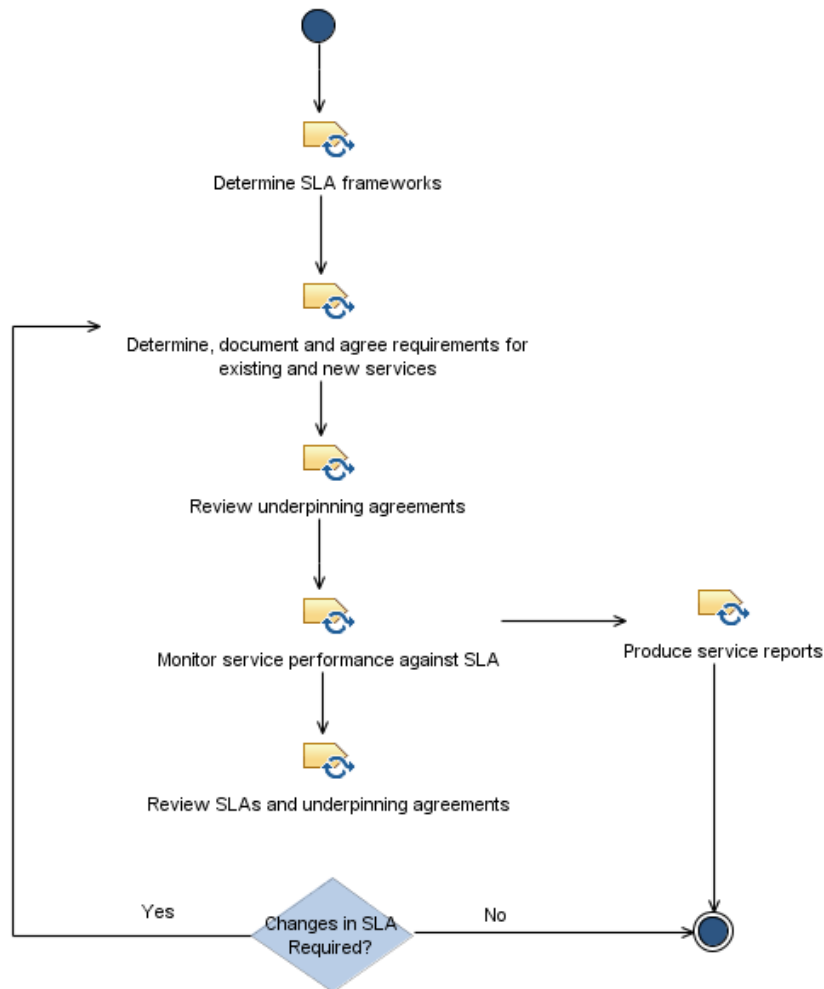


Figure 51: EPF implementation of SLA Management Process

7.1.1.4 Monitor customer request process

Objective

The main objective of this process is to provide a unique point of contact between users and the provider of the services in order to act as the center of all the service support. It is therefore essential that:

- It is accessible.
- It offers a uniform service of consistent quality.
- It keeps users regularly informed and logs all interaction with them.
- It provides support for the business.

Figure 52 shows the representation of this process in EPF.

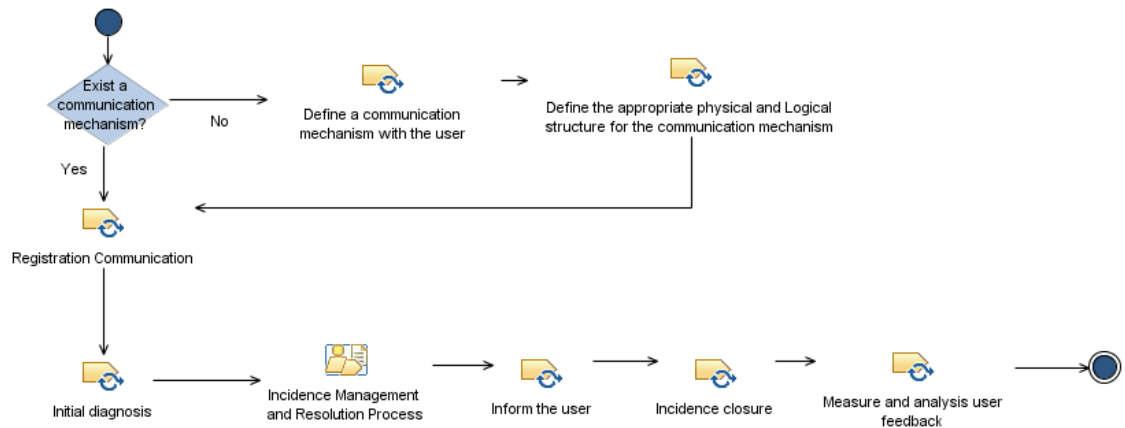


Figure 52: EPF implementation of Monitor Customer Request Process

7.1.1.5 Marketing Process

Objective

The aim of marketing process is to know and understand the customer so that the product or service fits him (and is sold).

Figure 53 shows the representation of this process in EPF.

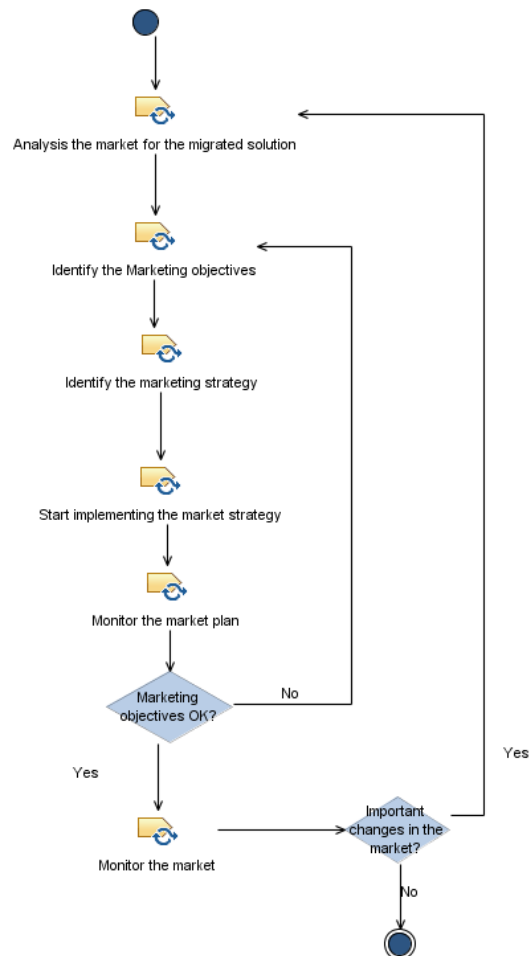


Figure 53: EPF implementation of Marketing Process

7.1.1.6 Financial management process

It has been considered that this process is strongly related with the Business decisions of the organization, and very dependent from these decisions. The activities of this process will be covered as part of the Business tasks in the methodology detailed in the deliverable D6.2.2 "ARTIST Methodology M24".

7.1.1.7 Cloud Provider Management Process

Objective

The objective of this process is to manage and control the service provided for the cloud provider in order to contract the most appropriate one for the organisation's requirements, and to monitor, measure and control that the agreement is fulfilled.

Figure 54 shows the representation of this process in EPF.

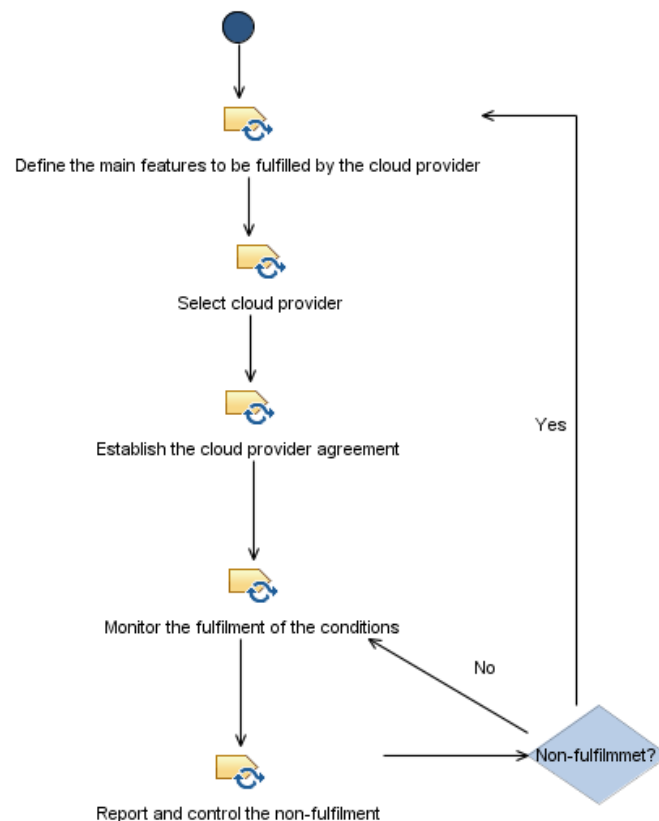


Figure 54: EPF implementation of Cloud Provider Management Process

7.1.1.8 Roles Alignment Process

Objective

This process is focused on the adaptation and creation of new roles in the organization due to the new business model. It is essential to define the roles and responsibilities within the organisation in order to cover all the activities created with the new business model. If new roles are necessary, these roles should have assigned activities and responsibilities, and those should be known by the people involved.

Figure 55 shows the representation of this process in EPF.

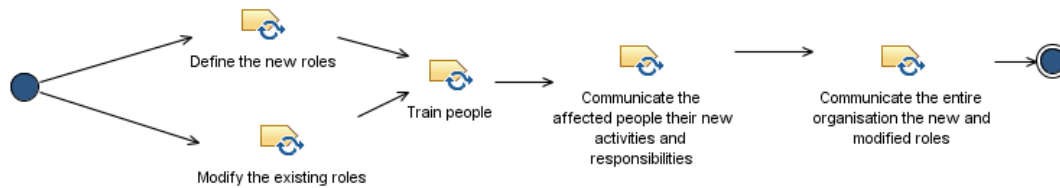


Figure 55: EPF implementation of Roles Alignment Process

7.1.1.9 Development process.

Objective

The main objective of this process is to develop SaaS applications that fulfil the following characteristics using an agile method:

- Support multi-tenancy: It should be designed to support concurrent accesses by multiple tenants and handle their sessions in isolation.
- High reusability: Services providers develop and deploy cloud services and expect that the services would be reused by a large number of consumers.
- High availability: Cloud services are not just for specific users; rather they are for any potential unknown consumers who may wish to use the services anytime and anywhere.
- High scalability: Cloud services should be highly scalable even in the situation that an extremely high number of services invocations and so their associated resource requests are requested.

In order to fulfil the above criteria, it is appropriate to follow an agile methodology for the development of SaaS applications.

Figure 56 shows the representation of this process in EPF.

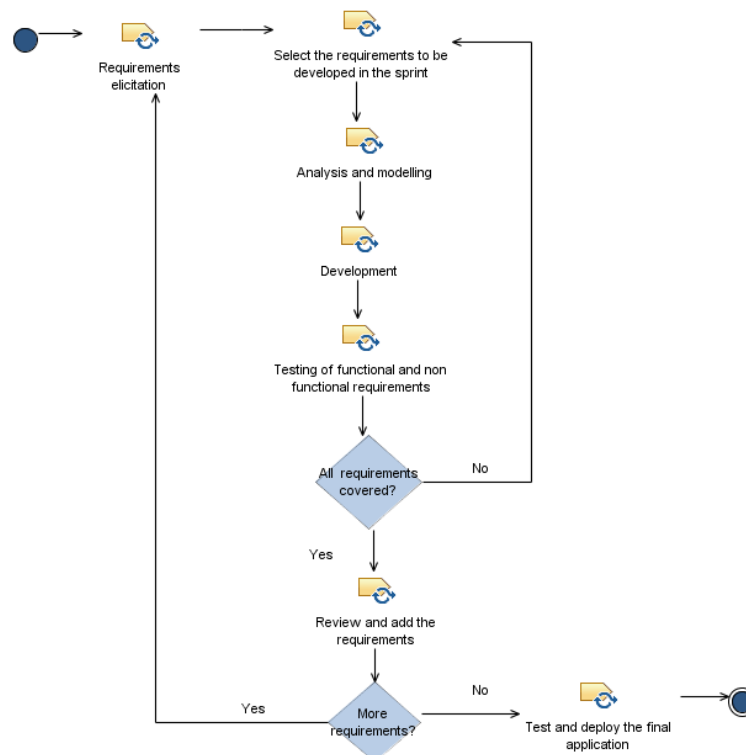


Figure 56: EPF implementation of Development Process

7.1.1.10 Fitting into overall ARTIST solution

The Process Kit prototype is a component inside the BFT. BFT uses an economic, strategic and analytic approach for evaluating and justifying Cloud migration projects. BFT-PK is focused on the strategic approach. BFT-PK provides the definition of the key processes in an ideal company that offers all their applications as a service and accomplishing the Cloud model. These ideal processes should be customized according to the characteristics and requirements of the each specific migration project.

The execution of the PK is located in the pre-migration phase, as depicted by Figure 57.

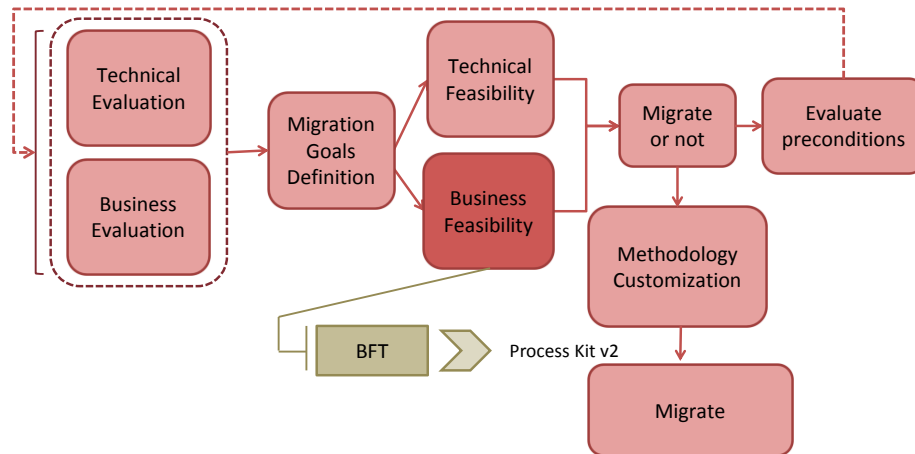


Figure 57: Process Kit in pre-migration phase

7.1.2 Technical description

This prototype is implemented as an EPF (Version: 1.5.1.5) Method Plug-in

The plug-in is composed by:

- A method content where the tasks, roles and work products are implemented and described.
- The processes themselves where all the processes are describe as capability process.

The structure is depicted in Figure 58.

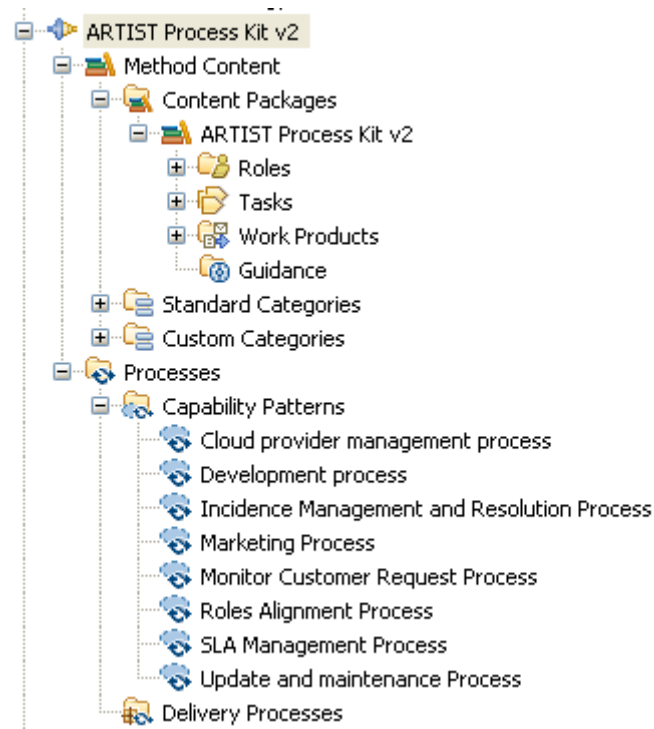


Figure 58: Plugin ARTIST process kit v2 structure

7.1.2.1 *Prototype architecture*

N/A

7.1.2.2 *Components description*

N/A

7.1.2.3 *Technical specifications*

N/A

7.2 Delivery and usage

7.2.1 Package information

This prototype is an EPF plug-in method, exported from EPF.

The plug-in has the structure shown in Figure 59.

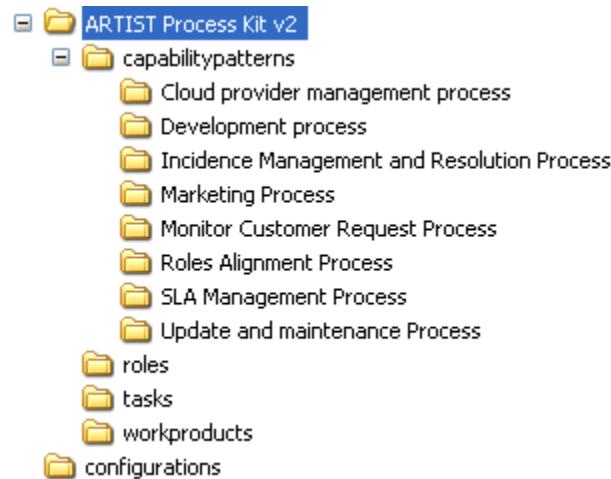


Figure 59: ARTIST Process Kit Plugin Package

Each role, task, work product and capability pattern is described as an XMI file in the correspondent folder.

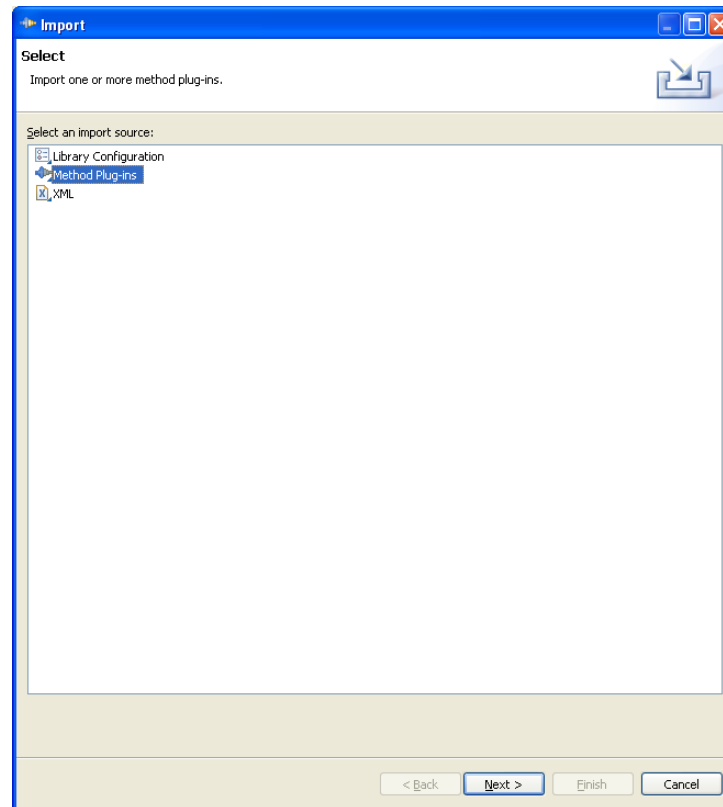
7.2.2 Installation instructions

In order to use this plug-in, it is required to import it in EPF using the following steps.

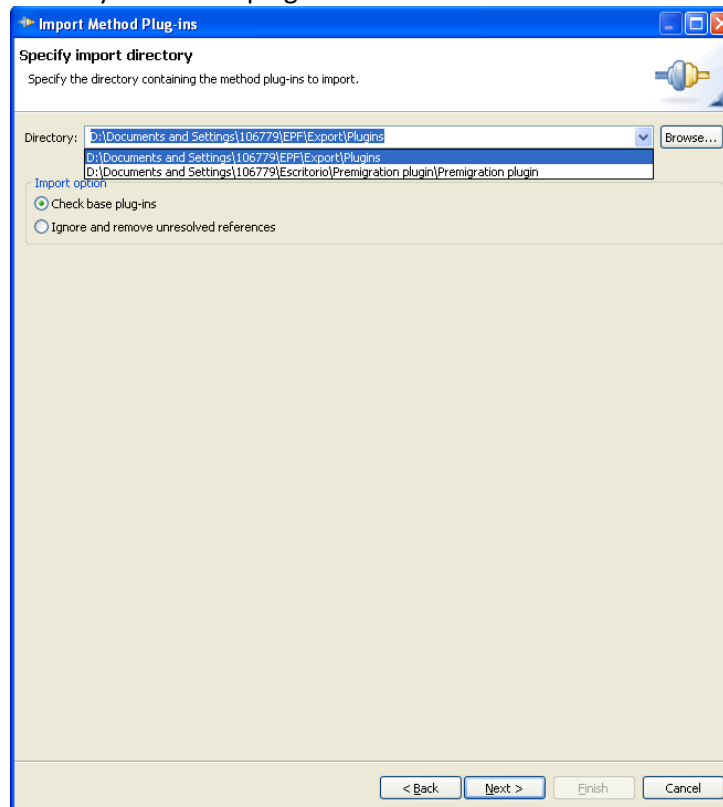
1. Click File→ Import



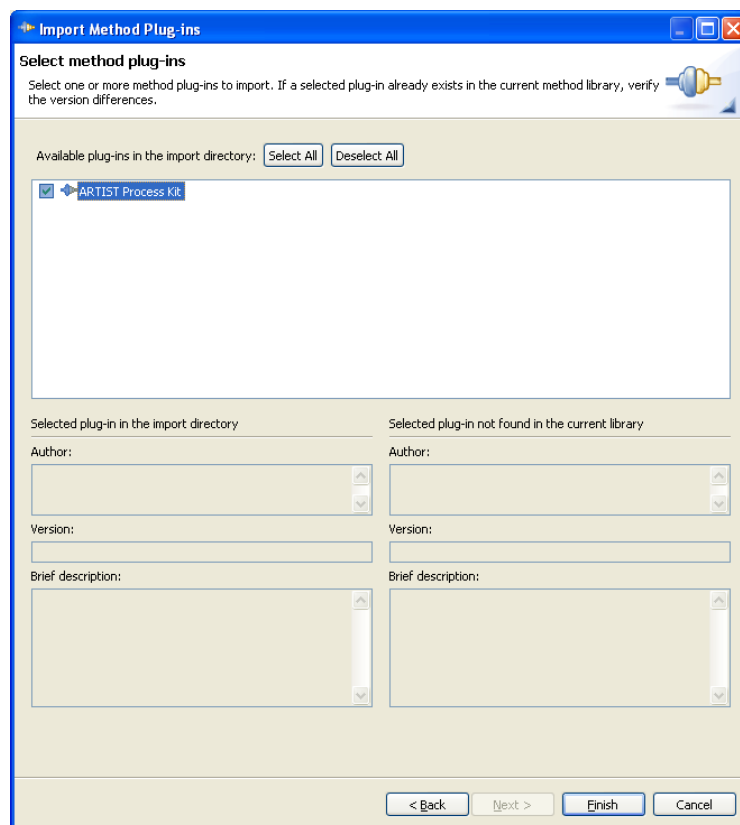
2. Select Method plug-in



3. Select the directory where the plug-in is stored



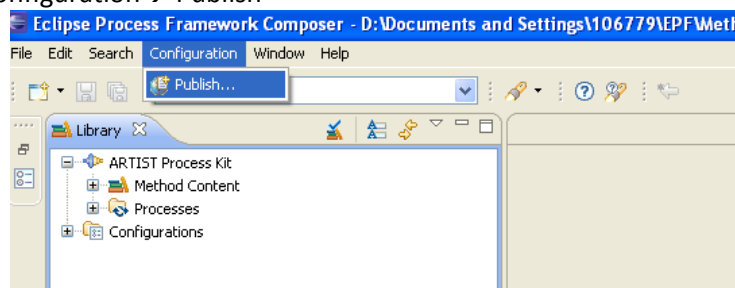
4. Select ARTIST Process kit



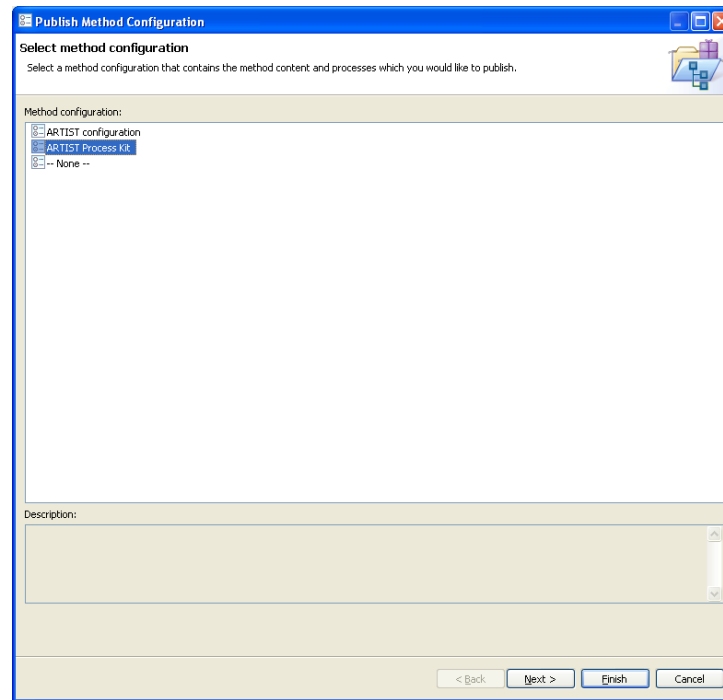
7.2.3 User Manual

If required, once the plug-in is imported in EPF, it can be published as a Web page. For doing this, it is required to follow these steps:

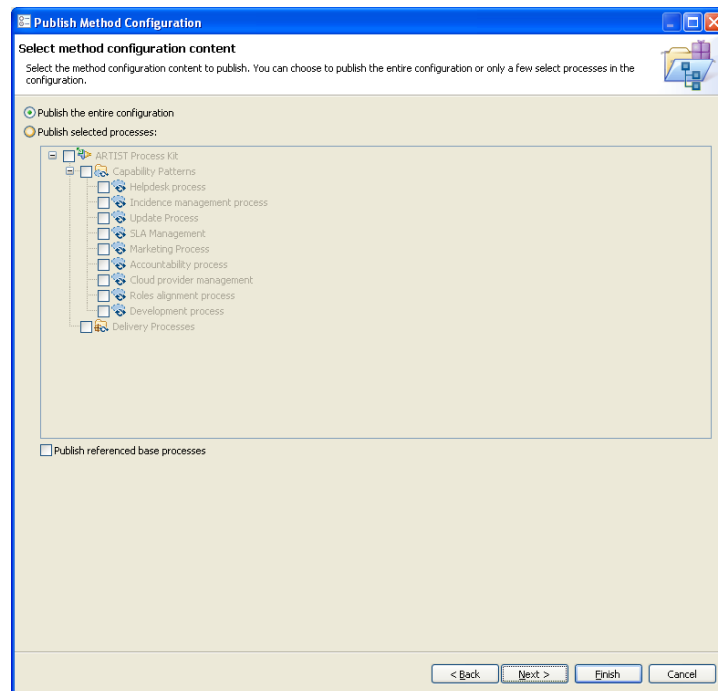
1. Click on Configuration → Publish



2. Select the method configuration “ARTIST process kit”



3. It can be selected whether to publish the entire configuration or a set of selected processes.



4. Select the publishing options. These options will be used to customize the look and behaviour of the published Web site.

Publish Method Configuration

Select publishing options
Select the publishing options. These options will be used to customize the look and behavior of the published website.

Title and links
 Title:
 About content:
 Feedback URL:

Glossary and index
☐ Publish glossary ☐ Publish index

Look and feel
 Banner image:

Validation
☐ Check external hyperlinks ☐ Convert broken hyperlinks to plain text

Diagrams
☐ Publish activity detail diagrams that have not been manually created
☐ Publish activity diagrams for unmodified activity extensions

Layout
☐ Show relationship sub-folders in navigation trees
☐ Show related elements for roles, tasks and work products in navigation trees
☐ Show task descriptors in navigation trees
☐ Include method content in descriptor pages
☐ Replace descriptor page with linked content element page
☐ Publish process usage in role, task and work product pages linking to related descriptors
☐ Show all indirect (green) occurrences in extended patterns
 Default tab for activity pages:

5. Select the destination directory and format for the published Web site.

Publish Method Configuration

Select destination directory and Web site format
Select the destination directory and format for the published Web site.

Directory:

Web site format
☒ Static Web site
☐ Java EE web application packaged in a WAR file (requires Java Servlet 2.3 or above compliant servlet container)
☒ Include search capability
 Web application name:

7.2.4 Licensing information

The plug-in is usable under the Eclipse Public Licence - EPL.

7.2.5 Download

The Process Toolkit is available for downloading it at:

<https://github.com/artist-project/ARTIST-Tooling/tree/master/pre-migration/business%20feasibility%20tool/PK/eu.artist.premigration.bft.pk.M24/Process%20kit%20v2%20M24>

8 Conclusions

The five prototypes presented in this deliverable represent possible answers to the questions raised by the design of the ARTIST Business Feasibility Tool:

- **Q:** Which kind of visual language should be offered by the BFT to support the editing of business models in the contexts envisaged by the BFT use cases?

A: For the representation of business roles and their relationships was defined a graph-like notation where icons (nodes) represent business roles and arrows (edges) represent relationships. The BPMN Process notation was selected to describe the behavior of agents. However it was required to extend the notation for data associations to allow the description of activities consuming/producing items from/in data sources (i.e. System Dynamics's flows). For the representation of business goals was adopted a graph-like notation where nodes may represent either goals or temporal constraints (i.e. deadlines) and arrows represent dependencies among them. To represent pricing mechanism was adopted a tabular notation.

- **Q:** Which type of Eclipse framework (e.g. Eclipse GMF, UML Profiles in Papyrus) would be the most suitable for the implementation of the editors of the BFT?

A: The Sirius framework has been used for the development of the GUI of the BFT. Some difficulty was experienced due to the lack of a comprehensive documentation and tutorials. In particular in some situations it is difficult to understand how to customize the interaction predefined by the framework.

- **Q:** Which are the techniques and components that could be used to implement a simulator to generate a collection of possible time-series suitable for the assessment criteria of a Business Scenario?

A: The BFT simulator generates the time-series for the variables of business models using Agent Based Simulation and was prototyped using the RePast toolkit. The experience showed that both choices allowed to keep small the gap between the BFT-OM and the model used in the simulation. This eased the development and debugging of the simulator.

- **Q:** Which are the techniques and components that could be used to capture in the simulation some key aspect of Business Scenarios (e.g. variability of performances of human resources)?

A: The BFT-OM allows to describe parameters of psychological traits both at individual and organisational level. Within simulation this allows to reproduce to some extent possible biased behaviours of entities representing human actors.

- **Q:** Which are the techniques and components that could be used to model more accurately the human decision making process within simulations of Business Scenarios?

A: Within the simulator the decision making modelled using a connectionist approach and reinforcement learning. The two approaches allows to simulate the adaptation process of business entities in response to changing business conditions (e.g. moving from the "make" to the "buy" option in a "make-or-buy" dilemma).

- **Q:** Which are the techniques and components that could be used to implement a dashboard for the assessment of business scenario based on the time-series generated by its simulation runs?

A: The Eclipse BIRT platform resulted to be suitable to implement the BFT Assessment Dashboard (BFT-DHS) as a collection of standard BIRT reports using as data source the MongoDB database populated by the BFT Simulator.

These answers will be challenged in the context of the validation activity of the ARTIST project.

References

- [1] C. Hill S.Hounde, "What do Prototypes Prototype?," in *Handbook of Human-Computer Interaction*, T.K. Landauer, P. Prabhu M. Helander, Ed.: Elsevier Science B.V., 1997, ch. 16.
- [2] VV.AA., "Specification of the Business and Technical Modernisation assessment in ARTIST M12," ARTIST Consortium, Deliverable D5.1.1, September 2013.
- [3] OMG, "Business Process Model and Notation (BPMN)," OMG, formal/2011-01-03, January 2011. [Online]. <http://www.omg.org/spec/BPMN/2.0>
- [4] ARTIST Consortium. (2014, September) Documents ARTIST Project. [Online]. http://www.artist-project.eu/sites/default/files/D5.4.2%20Business%20Feasibility%20Tools_M24_08102014.pdf
- [5] J. Daniels J. Cheesman, *UML Components*.: Addison-Wesley, 2001.
- [6] J. Ferber, *Multi-Agent Systems: An Introduction to Distributed Artificial Intelligence*.: Addison-Wesley, 1999.
- [7] E. Yu, "Modelling Strategic Relationships for Process Reengineering," Department of Computer Science, University of Toronto, PhD thesis 1995.
- [8] Y. Pigneur A. Osterwalder, *Business Model Generation*.: John Wiley & Sons, Inc., 2010.
- [9] Srivastava S. John O.P., "The Big-Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives," in *Handbook of personality: Theory and research*. New York: Guilford Press, 1999.
- [10] IBM. IBM Developerworks. [Online]. <http://www.ibm.com/developerworks/library/ws-multitenantpart2/>
- [11] Bezemer and Zaidman, "Multi-tenant SaaS applications: maintenance dream or nightmare?," in *Joint ERCIM Workshop on Software Evolution (EVOL) and International Workshop on Principles of Software Evolution (IWPSE) (IWPSE-EVOL '10)*, New York, 2010, pp. 88-92.
- [12] Bo Gao et al., "A Non-intrusive Multi-tenant Database Software for Large Scale SaaS Application," in *e-Business Engineering (ICEBE)*, 2011, pp. 324 - 328.
- [13] S., Grust T., Jacobs D., Kemper A., and RittingerJ. Aulbach, "Multi-Tenant Databases for Software as a Service ," in *ACM SIGMOD 2008*, Vancouver, Canada, 2008, p. 1195.
- [14] T. & Mohindra, A. Kwok, "Resource Calculations with Constraints, and Placement of Tenants and Instances for Multi-tenant SaaS Applications," in *ICSOC* , 2008, pp. 633-648.
- [15] Safenet. Safenet Whitepaper on SaaS pricing and packaging. [Online]. <http://www.safenet-inc.com/resource/ResourceRequest.aspx?ID=8589941774&resourcelang=1033>

9 APPENDIX A: BFT-BSW prototype installation instructions

The BFT-BSW prototype can be installed via the Eclipse Update Manager using the following procedure:

1. In the Eclipse environment select Help > Install New Software...(Figure 60)

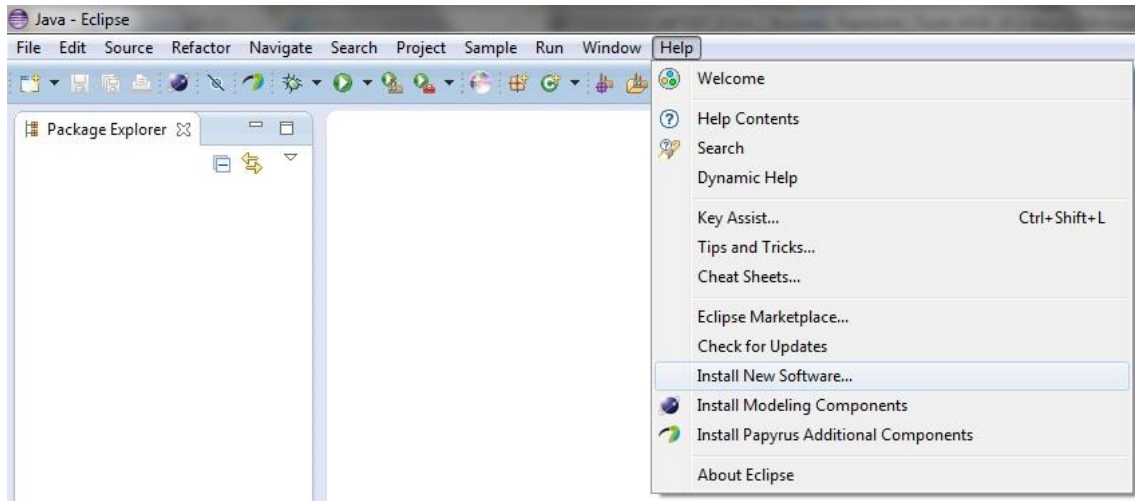


Figure 60: BFT-BSW Installation – Start Eclipse Update Manager

2. Select the Add button. In the Add Repository dialog box choose a name for the BFT_BSW feature and, in the location field, load the BFT-BSW archive file (Figure 61).

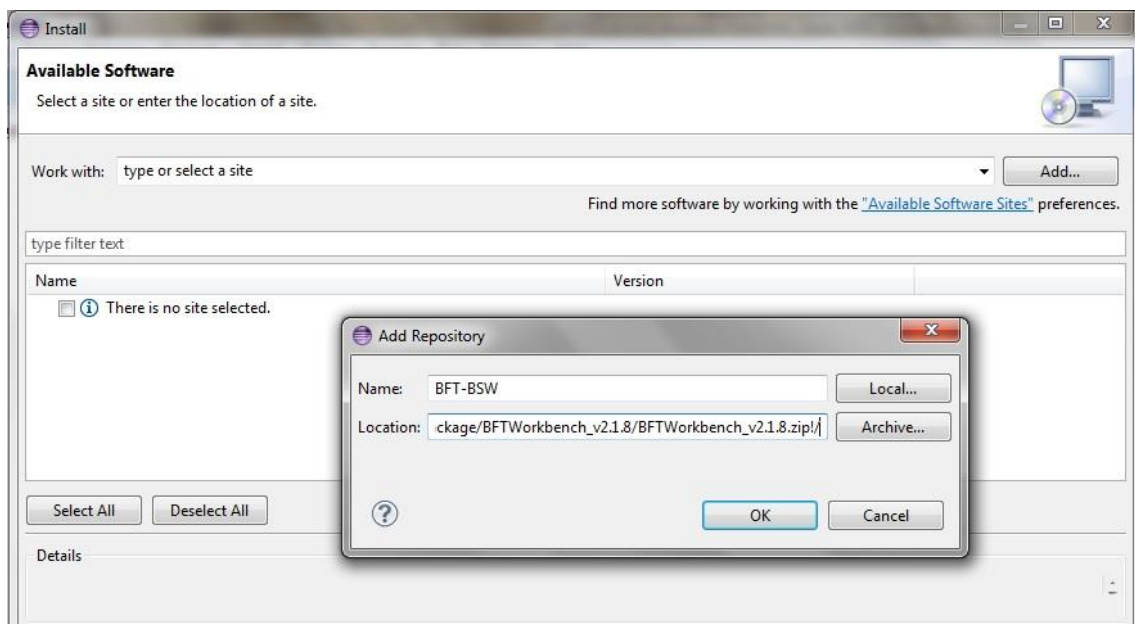


Figure 61: BFT-BSW Installation – Load BFT-BSW feature archive file

3. Uncheck the "Group items by category" field so that the feature to install appears in the window. Select it and click the Next button to proceed with the installation (Figure 62).

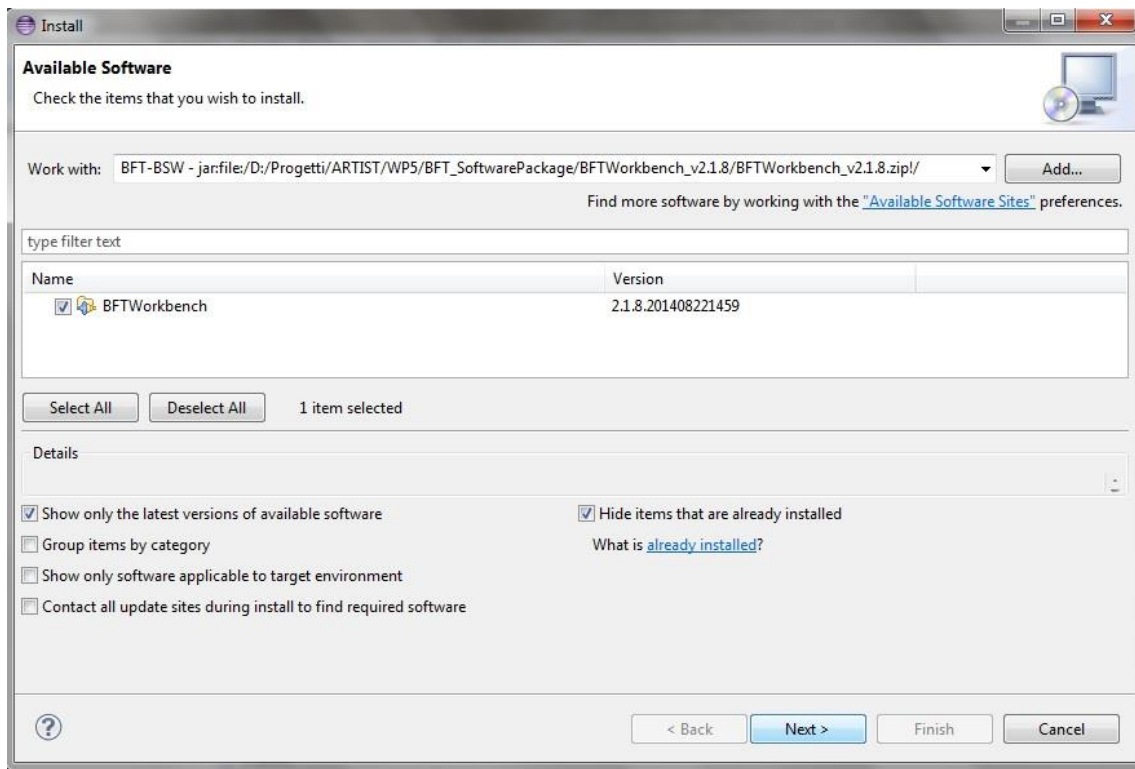


Figure 62: BFT-BSW Installation – Select the feature to install

- As depicted in Figure 63, the installation process checks if the requirements and dependencies of the BFT-BSW software are resolved. If some dependencies are missing, they will be listed in the installation window, otherwise the Review Installation Details window will be shown (Figure 64).

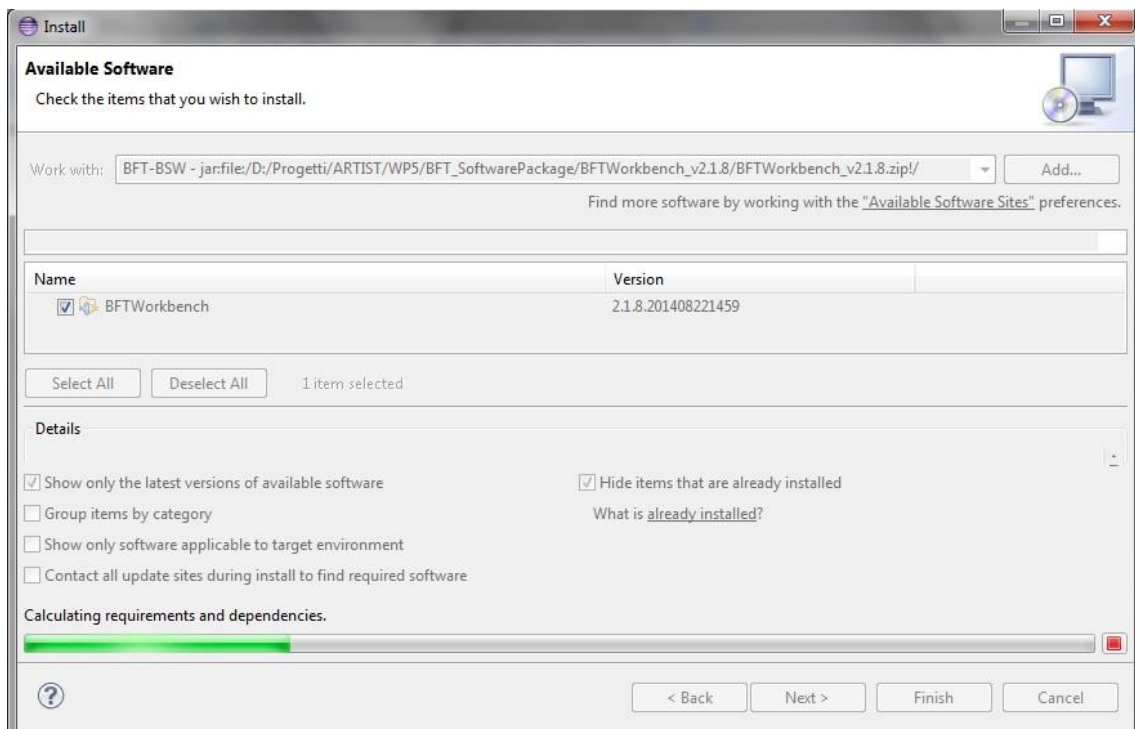


Figure 63: BFT-BSW Installation – Calculating BFT-BSW requirements and dependencies

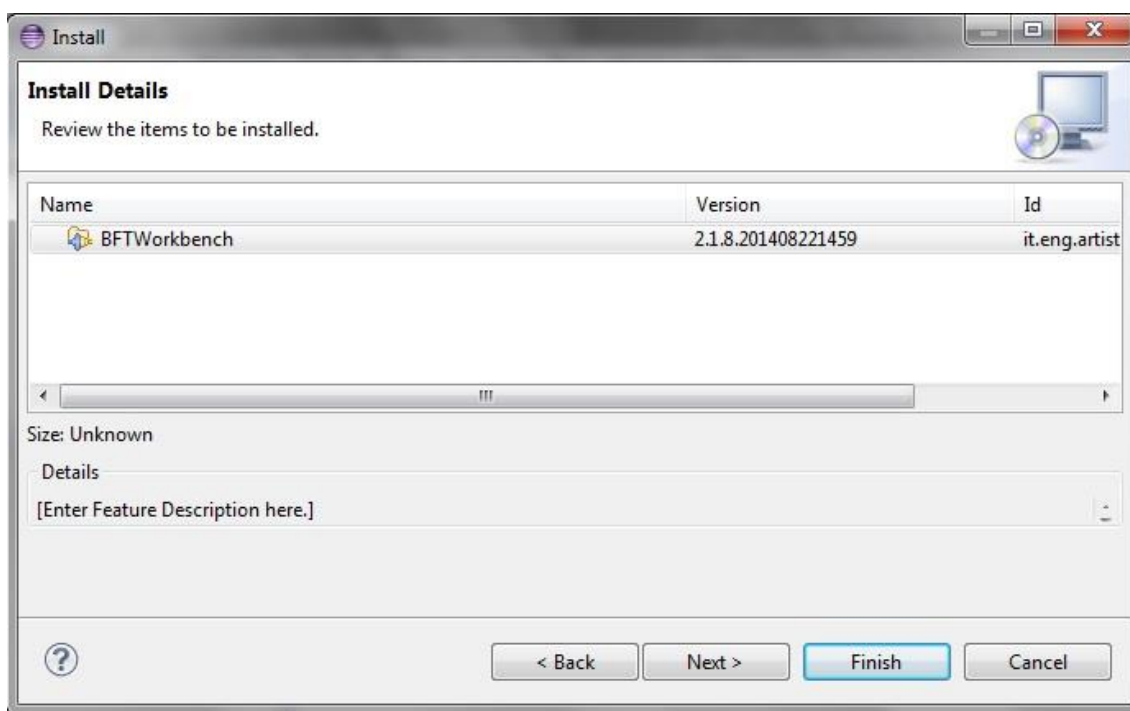


Figure 64: BFT-BSW Installation – Review BFT-BSW installation details

5. Accept the terms of the license agreement and click on the Finish button (Figure 65). To complete the BFT-BSW installation, you need to restart the Eclipse environment.

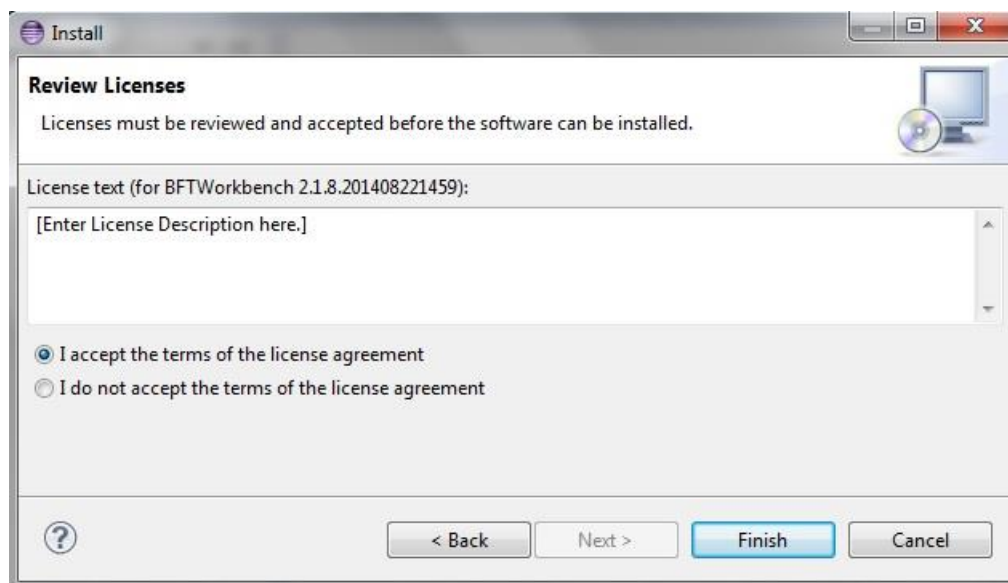


Figure 65: BFT-BSW Installation – Accept BFT-BSW license agreement