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BPA with SA

Technical Paper

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Overview

Business Process Analysis (BPA) is the technique of modeling all of the core business processes of an organization, and analyzing them so you can make the organization more efficient and be able to manage change.

Business Process Modeling Notation (BPMN) is an industry standard for modeling business processes, and is an enabler of Business Process Analysis (BPA) and Business Process Management (BPM)performing BPA.

BPMN notation is designed to be easy to use and understand, but also provides the ability to model business processes to a fine level of detail and complexity, so that it can be:

- Simulated and optimized
- Mapped to the Business Process Execution Languages (BPEL), which is used to perform Business Process Management (BPM) – where the processes are executed on actual systems – Business Process Management Systems (BPMS).

Architecting and executing business process models can encompass:

1. Modeling the processes of an organization or section of an organization using BPMN.
2. Analyzing the processes in an organization using the reporting features of the modeling tool. This includes running analytics on the processes.
3. Analyzing the processes in an organization against other Enterprise Architecture aspects of the organization, using the reporting features of the modeling tool.
4. Simulating the processes and optimizing them for efficiency.
5. Making the processes available to be executed on a Business Process Management Systems (BPMS) by publishing them to BPEL.
6. Performing BPM by orchestrating the web services into end-to-end business flows by assembling them and coordinating their behavior. Business Process Management Systems (BPMS) are employed for this stage.

BPMN is a specification initially established by Business Process Management Initiative (BPMI) and is now owned and cared for by the Object Management Group (OMG).

Using BPMN to Model Business Processes

BPMN is designed to be easy to use and understand. To model a business process flow, you simply model the events that occur to start a process, the processes that get performed, and the end results of the process flow. Business decisions and branching of flows is modeled using gateways. A gateway is similar to a decision symbol in a flowchart.

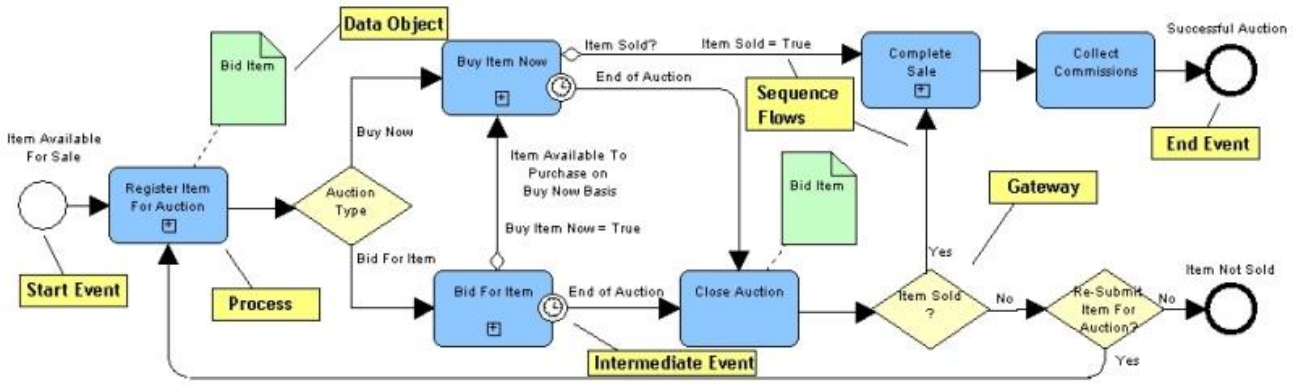


Figure 1. Simple BPMN Business Process Diagram for an on-line auction system.

Business Processes, Sub-Processes, and Tasks

At the core of business process modeling are the processes themselves. There are three types of processes – the **process**, the **sub-process**, and the **task**. Each is graphically depicted by the same rounded rectangular symbol; the use of different nouns simply reflects the hierarchical relationships between them, as the following text explains:

- **Process:** A process is a network of 'doing things'. You draw it as a rounded rectangle on your top-level BPMN Business Process diagram. A process in the flow can contain sub-processes, which can be graphically shown by another Business Process Diagram connected via a hyperlink to a process symbol – a 'child diagram' in System Architect parlance.
- **Sub-Processes:** You can specify the inner details of a process by creating or attaching another Business Process diagram to it. The sub-diagram is considered a 'child' diagram. A process that has a child diagram gets a '+' marker in its body.

  Graphically showing the details of a process with another Business Process diagram is considered 'decomposing' the process. You can continue to decompose a process without any restriction -- creating a child diagram for a process, and child diagrams for the processes on the first child diagram, and so forth. Processes that you draw on 'child' diagrams are considered **sub-processes**.
- **Tasks:** The lowest-level process, which you do not decompose further, is considered a task. A '+' mark in the process symbol denotes that the process is decomposed; if it doesn't have a '+' mark, it is a task.

Figure 4 shows a BPMN business process diagram on which the process Register Item for Auction has been modeled. The '+' mark in the process's body tells you that there is at least one 'child'

business process diagram hyperlinked to this process, and on that diagram is a graphical depiction of the details of this process.

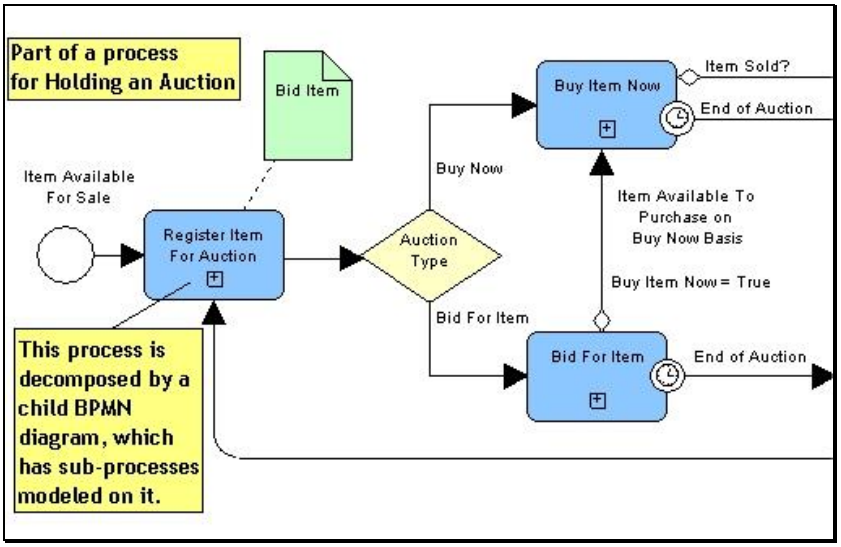


Figure 2. Part of a BPMN Business Process diagram for an on-line auction system.

Figure 5 shows part of the 'child' BPMN Business Process diagram to the *Register Item for Auction* process. Since they are on a 'child' diagram, the processes are considered sub-processes. Processes on this diagram that are not further decomposed (no '+' mark in their center) are considered tasks. As you can see, it is easy to pick out a task on a diagram – simply those rounded rectangles without a '+' mark at their center.

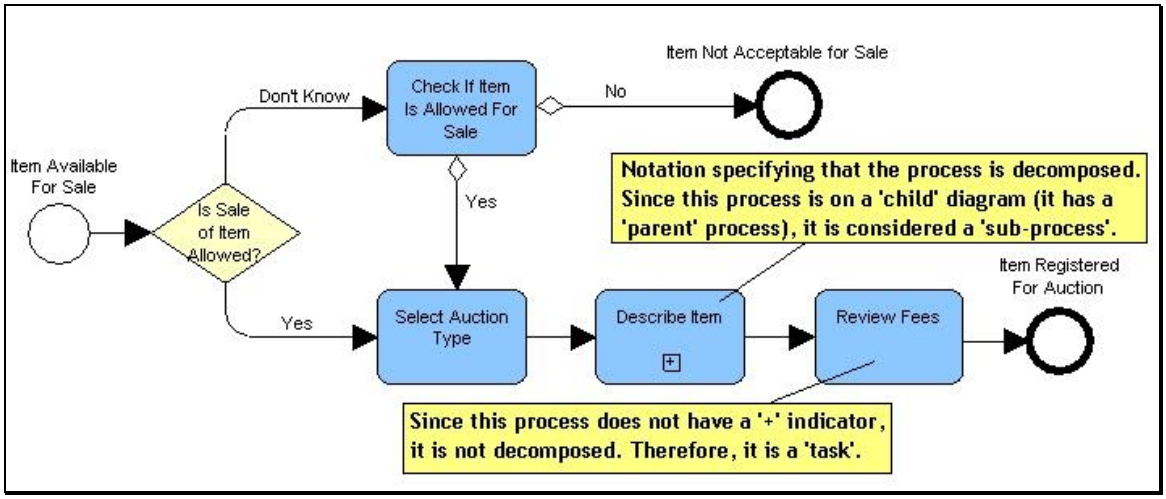


Figure 3. Sub-processes and tasks.

Easily Viewing Process Complexities

Again, the BPMN diagram is designed to be easily understood by viewers. To help readers understand the complexities of processes, you may graphically show a thumbnail of a 'child' process flow on a process symbol itself. In System Architect, this is done by clicking on the '+' mark in the process symbol's center, which presents the thumbnail sketch. In this way, you can view a BPMN Business Process diagram and quickly see which processes are complex, and that decompose to further levels.

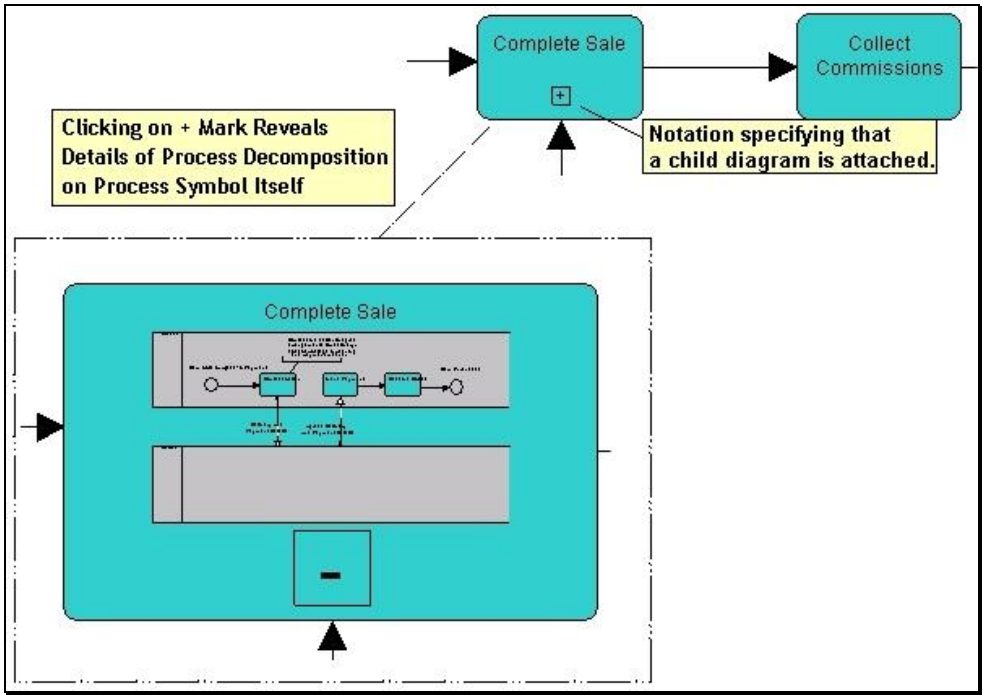


Figure 4. Showing a thumbnail sketch of the child diagram on a process.

Reuse of Processes

As you build processes, they are stored in the underlying repository for reuse. You can view them in System Architect's explorer, and drag-and-drop them onto the diagram workspace.

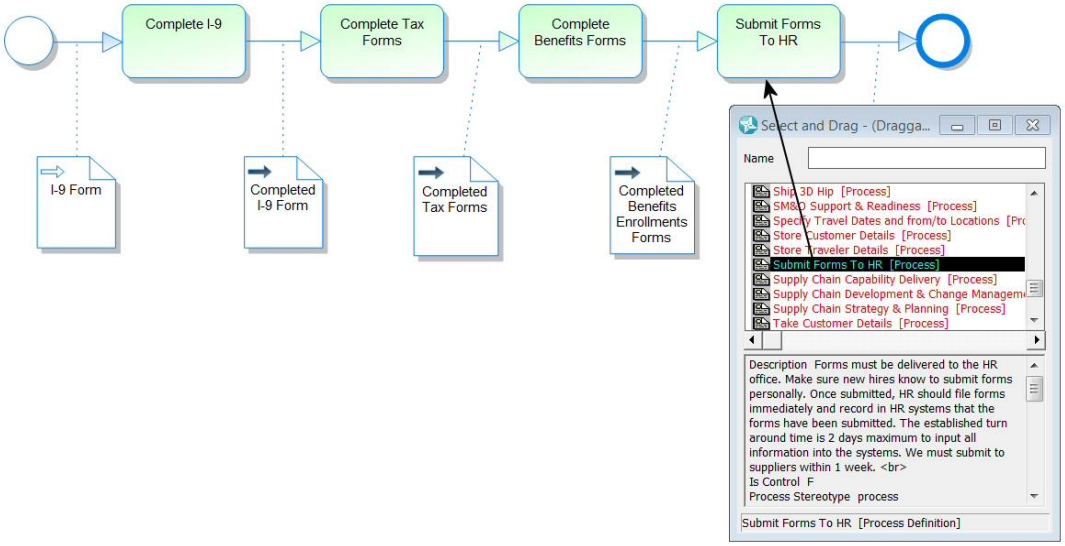


Figure 5. Reusing processes from the System Architect repository.

Modeling the Sequence Flow of a Process

To show the order of execution of processes, you connect them with a Sequence Flow. A Sequence Flow is drawn as a line with a filled-in arrowhead. A Sequence Flow is used to show the sequence of processes ***in*** an organization or department.

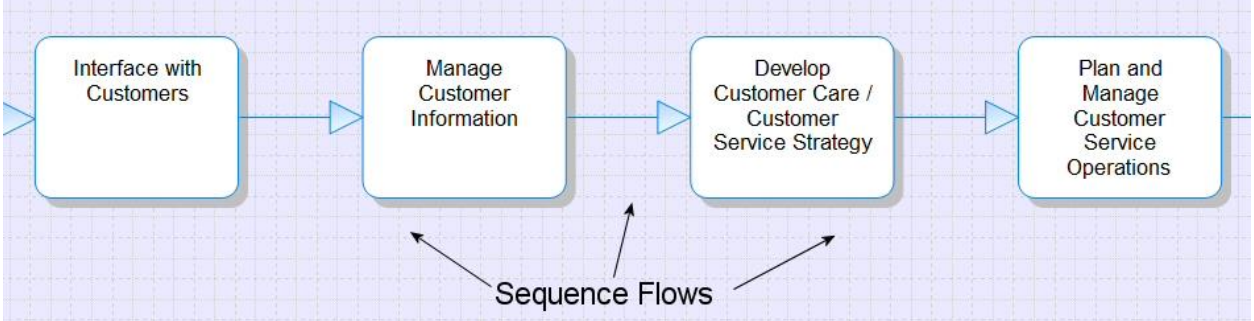


Figure 6. Showing a thumbnail sketch of the child diagram on a process.

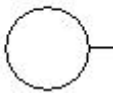
System Architect provides numerous automatic drawing modes to allow easy drawing:

- Select **Format, Diagram Auto Routing, Assign Connections or Retain Connections** to allow System Architect to route lines as you draw
- Select **Format, Symbol Format, Line Style** to specify lines being Straight – Orthogonal, Straight – Any Orientation, or Elliptical. For BPMN Sequence and Message Flows, Straight – Orthogonal is best.
- Select **Format, Center-to-Center Routing** to turn on/off center-to-center line routing, or edge-to-edge line routing. For BPMN Sequence and Message Flows, not having Center-to-Center on is best.

Events

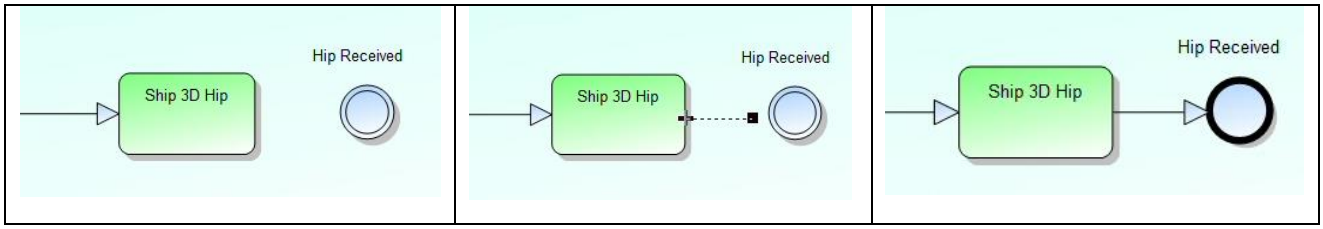
During business process modeling, you model the events that happen in the business, and show how they affect process flows. An event either kicks off a process flow, or happens during a process flow, or ends a process flow. BPMN provides a distinct notation for each of these types of events, shown in the table below.

Table 1: Basic event types in BPMN and their notations.

Start Event		Intermediate Event		End Event	
Start Event 	Starts a process flow.	Event	Happens during the course of a process flow.	End Event	Ends a process flow.

Intelli-sense

System Architect's intelli-sense drawing automatically changes the shape of a symbol based on BPMN rules – for example, draw a Sequence Line from a Process to an Event, and the Event changes shape to be an End Event.

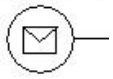
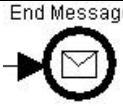
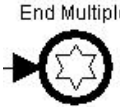


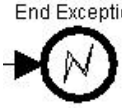
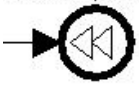
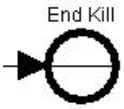
More Complex Events -- Specifying Trigger Types

When you model more complex process flows, such as web services, you need to model more complex business events, such as messages, timers, business rules, and error conditions. BPMN enables you to specify the trigger type of the event, and denote it with a representative icon, as specified in Table 2.

Specifying a trigger type to an event puts certain constraints on the process flow that you are modeling, which are explained in the table. For example, a timer cannot end a process flow. You can only draw message flows from and to message events. These types of modeling rules, which are actually kinds of business rules, should be enforced automatically by the modeling tool providing support for BPMN.

Table 2: Event Trigger Types.

Start Events	Intermediate Events	End Events	Description
Start Message 	Message	End Message 	A start message arrives from a participant and triggers the start of the process, or continues the process in the case of an intermediate event. An end message denotes a message generated at the end of a process.
Start Timer	Timer	A Timer cannot be an End Event.	A specific time or cycle (for example every Monday at 9am) can be set to trigger the start of the process, or continue the process in the case of an intermediate event.
Start Rule	Rule	A Rule cannot be an End Event.	Triggers when the conditions for a rule become true, such as “Stock price changes by more than 10% since opening.”
Start Link	Link	End Link	A link is a mechanism for connecting the end event of one process flow to the start event of another process flow.
Start Multiple	Multiple	End Multiple 	For a start multiple event, there are multiple ways of triggering the process, or continuing the process in the case of the intermediate event. Only one of them is required. The attributes of the event define which of the other types of triggers

			apply. For end multiple, there are multiple consequences of ending the process, all of which will occur (for example, multiple messages sent).
An Exception cannot be a Start event.	Exception	End Exception 	An end exception event informs the process engine that a named error should be generated. This error will be caught by an intermediate exception event.
Start Events	**Intermediate Events**	**End Events**	**Description**
A Compensation event cannot be a Start event.	Compensation	End Compensation 	An end compensation event informs the process engine that a compensation is necessary. This compensation identifier is used by an intermediate event when the process is rolling back.
An End event cannot be a Start event.	An End event cannot be an Intermediate event.	End Cancel	An end event means that the user has decided to cancel the process. The process is ended with normal event handling.
An End Kill event cannot be a Start event.	An End Kill event cannot be a Intermediate event.	End Kill 	An end kill event means that there is a fatal error and that all activities in the process should be immediately ended. The process is ended without compensation or event handling.

Events that Happen While a Process Is Being Performed

Oftentimes an event happens while a particular process is being performed, causing an interrupt to the process, and triggering a new process to be performed. Or, a process will complete, causing an event to start, and a new process to be performed. You can model these intermediate events by placing an event symbol directly on the process that it is associated with.

In Figure 3, you can see a message event being triggered when a process Check Inbox completes, causing a message Password Request to be sent to the Send Password process. This type of BPMN notation makes it crystal clear to the reader that the Check Inbox process generates a message event that sends a message to another process.

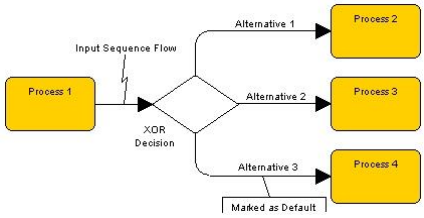
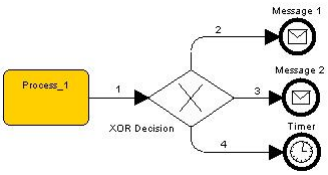
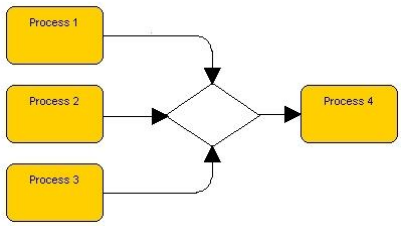
Figure 3. A message event is triggered at the end of the Check Inbox process, sending the Password Request message to the Send Password process.

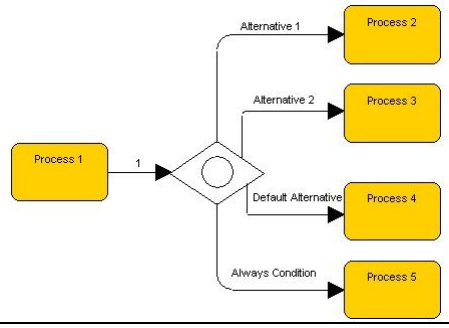
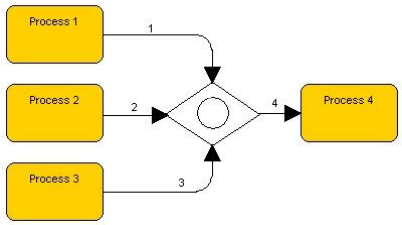
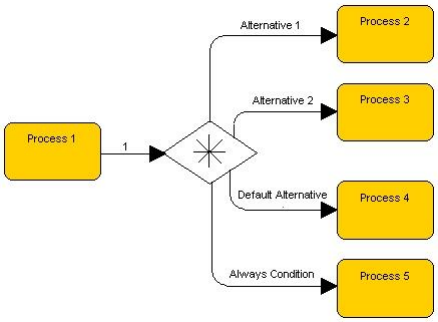
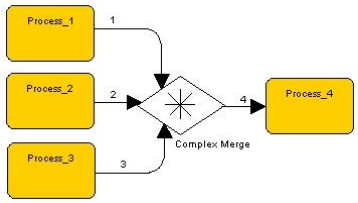
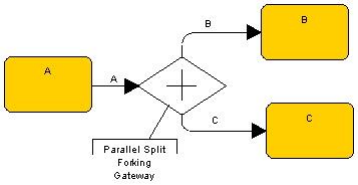
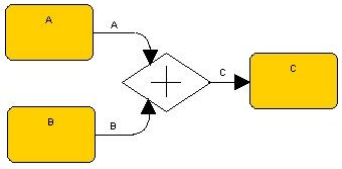
Modeling Decision Points with Gateways

Decisions, merges, forks, and joins in the process flow are modeled with a **gateway** symbol. A gateway can be thought of as a question that is asked at a point in the process flow. The question has a defined set of alternative answers, which are in effect gates.

You may set the stereotype of a gateway, and thus change the logic specified by it, and the symbol representing it, as described in Table 3.

Table 3. Types of Gateways and Associated Symbols

Gateway Stereotype	Explanation
Exclusive Decision (XOR) Data-Based XOR Decision:  Event-Based XOR Decision:  	XOR gateways are used to model data-based or event-based decisions. Data-based XOR decisions are the most common XOR gateways used. A data token traverses the Process Flow and arrives at the XOR gateway. The path that it flows out on is chosen based on condition expressions for each gate of the gateway. It can only go out on one flow. An event-based XOR gateway represents a branching point where the alternatives are based on an event that occurs at that point in the process flow. A specific event, usually the receipt of a message, determines which of the paths will be taken. For example, you can model a process flow wherein the system waits for a response from a customer. The customer's response will either be a Yes message or a No message, and that determines which path is taken.
Gateway Stereotype	**Explanation**
Exclusive Merge (XOR)  	XOR gateways are used to model data-based or event-based merges. Exclusive means only one of many inputs is chosen to be output from the gate.

Inclusive OR Decision 	Inclusive (aka 'including') means one or more of the outgoing Sequence Flows from the decision may be taken. There cannot be zero output flows -- you **must** specify a default flow.
Inclusive OR Merge 	Inclusive (aka 'including') means that the process flow continues when the first input signal (a Token) arrives from any of the set of input Sequence Flows. If other signals subsequently arrive from the other input Sequence Flows, they are not used.
Complex Decision 	You specify a complex flow condition that references outgoing Sequence Flow names. The expression determines which output flow is taken.
Complex Merge 	You specify a complex flow condition which references incoming Sequence Flow names and/or process data that is coming into the gateway. The expression determines when the task starts.
Gateway Stereotype	**Explanation**
Parallel Forking (AND) 	A Parallel gateway is also called an AND gateway. All Sequence Flows drawn out of the AND gateway are taken.
Parallel Joining (AND) 	The AND gate must receive an input signal (a Token) from **all** input Sequence Flows for the output flow to be taken. The process flow waits for all signals to arrive at the AND gateway before it can continue.

Who Does What – Pools and Lanes

As you drive further into business analysis, you specify 'who does what' by placing the events and processes into shaded areas called pools that denote who is performing a process. You can further partition a pool into lanes. A pool typically represents an organization and a lane typically represents a department within that organization (although you may make them represent other things such as functions, applications, and systems).

By taking processes and placing them in pools or lanes, you are specifying ***who*** does ***what***, for events you specify ***where*** they occur, and for gateways you specify ***where decisions*** are made, or ***who*** makes them.

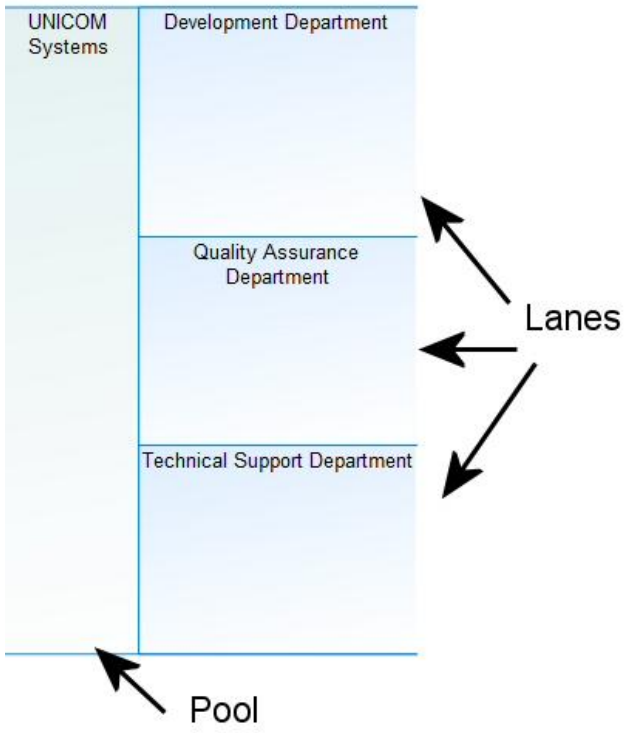


Figure 7. Pools and Lanes show who performs processes or makes decisions, or where events occur.

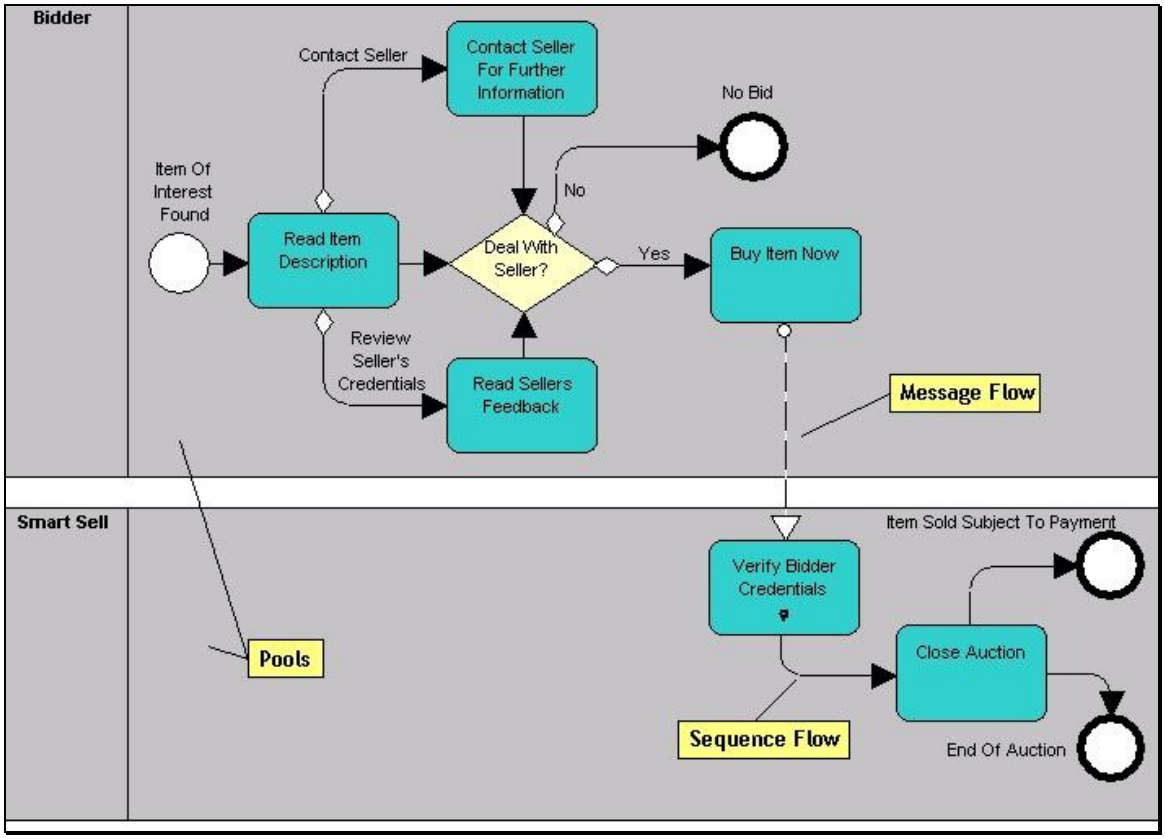


Figure 8. BPMN Business Process Diagram with processes drawn in pools.

A Pool Can Represent Many Things

A pool can represent other things besides an **organization**, such as a **function** (something that the organization performs, like Marketing or Sales or Training), an **application** (or computer software program), a **location** (a physical location in the company), a **class** (a software module in an object-oriented computer software program), or an **entity** (representing a logical table in a database). It can only represent one thing, but that thing comes from this 'heterogeneous list' of different types of things.

The System Architect definition for a pool and for a lane is Participant. The Participant definition provides a property to specify what it represents – you can choose from a 'heterogeneous list' of relevant definitions (Entity, Function, Application, Location, etc).

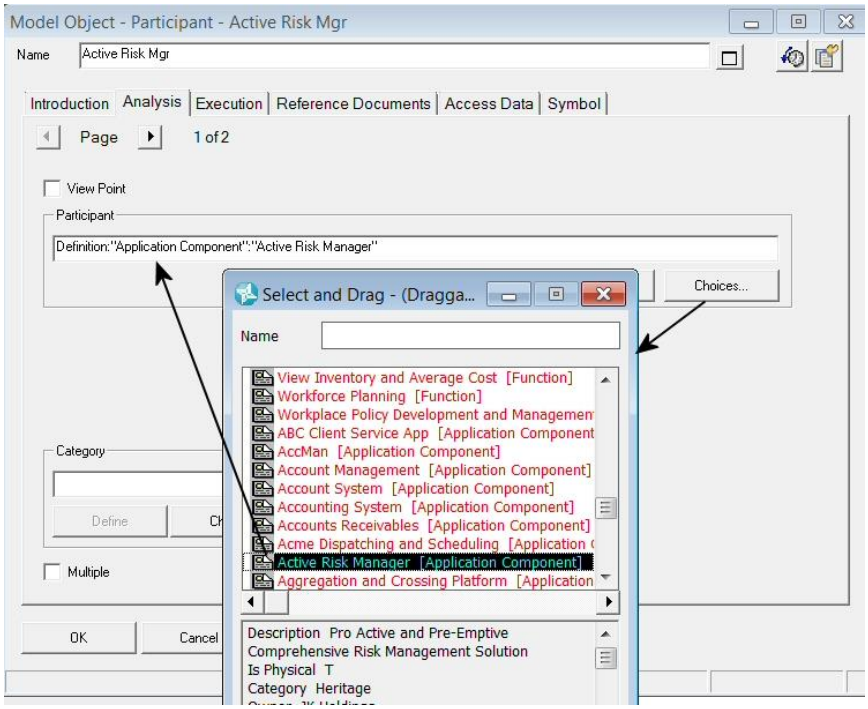


Figure 9. A Pool or Lane is defined by 'Participant' and associated with an Organization, Application, Entity, Location, or any other kind of Resource

Swimming Pool and Its Lanes

The analogy between this representation and swimming pools is a useful one. You can imagine a process swimming down a lane, and changing lanes as need be to perform an activity, within a pool. The pool can be considered a 'pool' of resources. There are occasions when the process needs to jump to another pool, because it has different resources needed to complete the activity.

This is particularly apt where there is a need to describe business-to-business processes, where different organizations pass messages among one another to perform an activity. This is described in the next section, *Modeling Message Flows*.

Modeling Message Flows

As mentioned previously, one goal of the BPMN business process diagram is to enable modeling of business-to-business messaging. You do this with a Message Flow line, so that you can model people or machines sending messages to one another – an important part of depicting and understanding business-to-business and business-to-consumer processes.

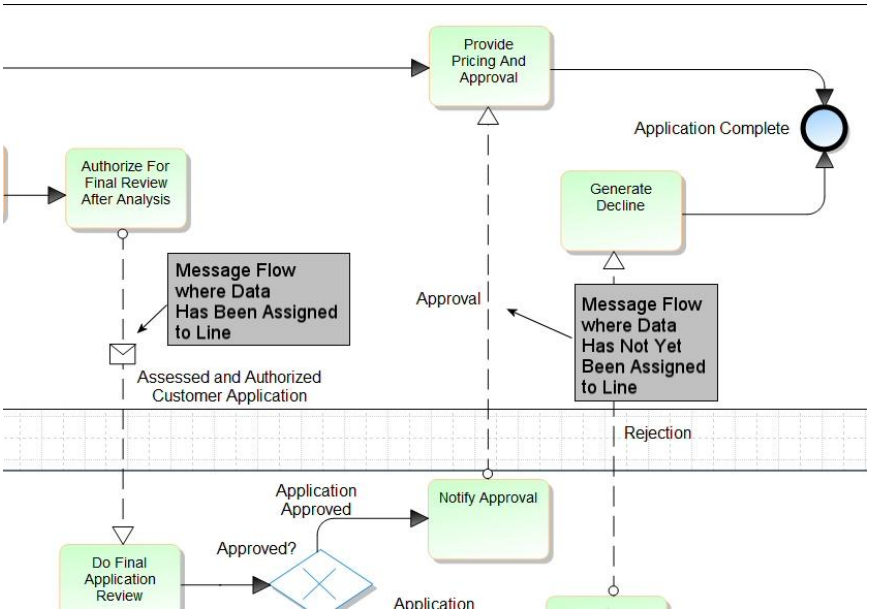


Figure 10. Messages Flows are used to model message passing between organizations or applications.

You specify the data that flows on the Message Flow line within its definition. You can specify one or more pieces of data – from a heterogeneous list of data-related definition types: Entity and Class.

Automatic Rules Enforcement

BPMN specifies certain rules for modeling message flows and sequence flows.

- Sequence Flows can only be drawn among events, processes, and gateways within the same pool. That includes being able to draw Sequence Flows between events, processes, and gateways in different Lanes of the same Pool.
- Message Flows can only be drawn between events, processes, or gateways that exist in different pools – since messages are only passed between different organizations or applications, and so forth.

System Architect enforces these drawing rules by presenting a ghostbuster symbol and disallowing connections between the wrong elements; it only allows connections to proper model elements. This helps you prevent introducing errors or logical inconsistencies into the business process flows as you build them.

Black Boxes and White Boxes

There are times when you are modeling that you don't care how a process is performed in a company. It may be another company or a customer that is outside your scope; you have no control over it. You don't care how the company creates a message; you only care that the message has been delivered to you and contains information that you can use. Or you don't care what a company does with a message that you deliver to it – you trust that it does the right thing with it.

You can treat the company (or application, function, and so forth) as a 'black box' – only draw Message Flows to or from the pool representing it, and not show any details inside the pool. This is

in contrast to the pools that you model processes in, which can be considered 'white boxes' – you can see into them and examine their details.

Figure 10 shows messages drawn from and to processes in a 'white box' pool (representing the Bidder in our example) to and from a 'black box' pool (representing the Seller).

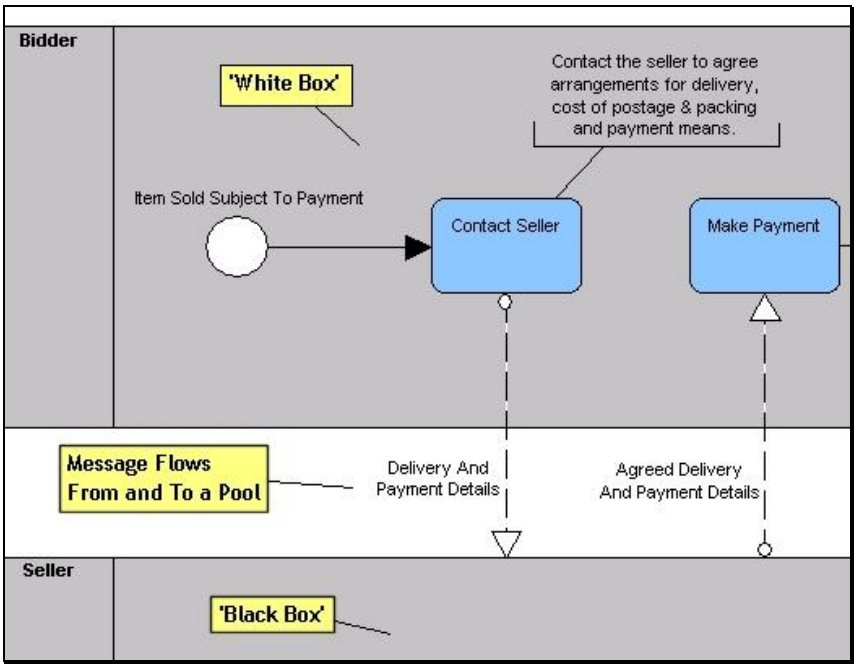


Figure 11. Message flows drawn between a 'white box' and a 'black box'.

You can also show messages passed between two 'black boxes', as shown in Figure 11.

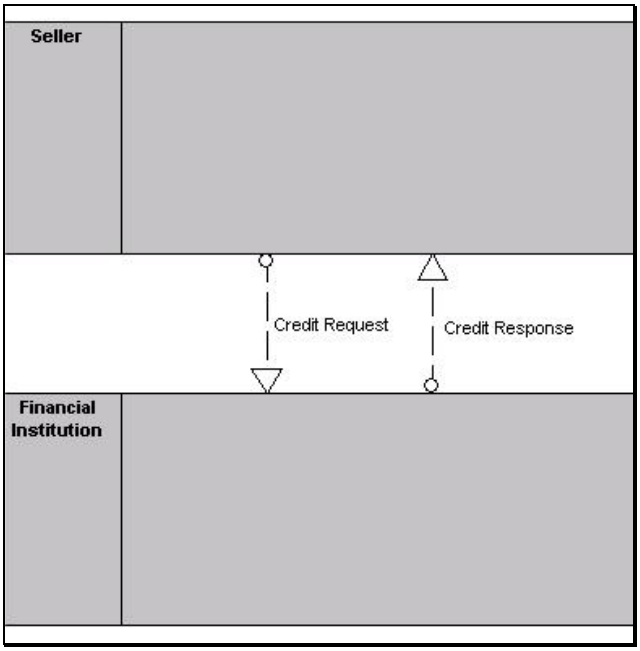


Figure 12. Message Flows drawn between two 'black boxes'.

Understanding How Data Is Transformed

Remember that processes transform data in your organization. An order request causes an order to get generated. When the product is shipped to the customer, the order is fulfilled. A bad credit card might cause the order to be cancelled. A customer might update their account information with a new credit card number or address.

You can model how data is transformed during a process flow by depicting **data objects** on the BPMN business process diagram. Data objects are artifacts that may represent many different types of electronic or physical items. Since they represent data, they are defined by a combination of one or more entities (corresponding to a database tables) or classes (corresponding to object-oriented software modules that contain data).

A data object is depicted by a rectangle with a folded-over upper-right corner, making it resemble a document.

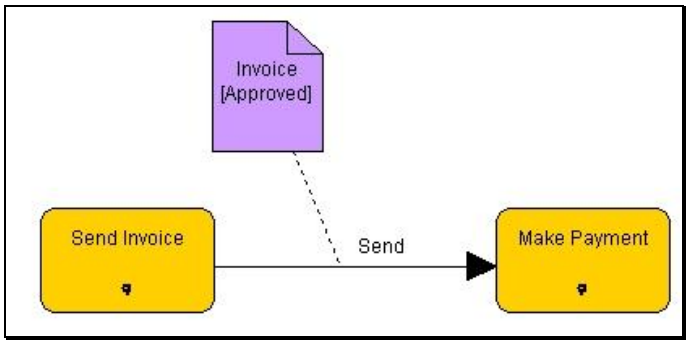


Figure 13. Attaching a data object to a Sequence Flow.

Modeling data objects is optional – they do not have any direct effect on the process flow. They simply provide information about what the process flow does. You can either attach a data object to a Sequence or Message flow with a dashed line (shown in Figure 12), or draw association lines to and from data objects and processes (shown in Figure 13), creating data flows within the process flow.

You may specify the state of the data object in brackets below the name of the data object. This provides information on how it is being transformed during the process. In Figure 12, you can see that Invoice is being approved when it is sent from the Send Invoice process to the Make payment process. In Figure 13, you can see that the process Approve Purchase Order changes the state of a Purchase Order data object from Complete to Approved.

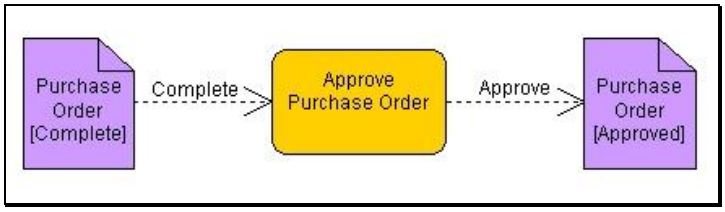


Figure 14. Drawing association lines between data objects and a process.

Annotating the Models with Text

A picture is worth a thousand words, so the saying goes. Conversely, sometimes a picture isn't enough – you need words to describe the nuances of something that a picture cannot do justice to. Thus BPMN provides you with a textual annotation that can be affixed to any model element, so that you may describe extra details about the element in good old-fashioned words.

You may use Text Annotations on all model elements of the BPMN Business process diagram. Text Annotations are displayed within an open rectangle, attached to the symbol by a straight line, as shown in Figure 14.

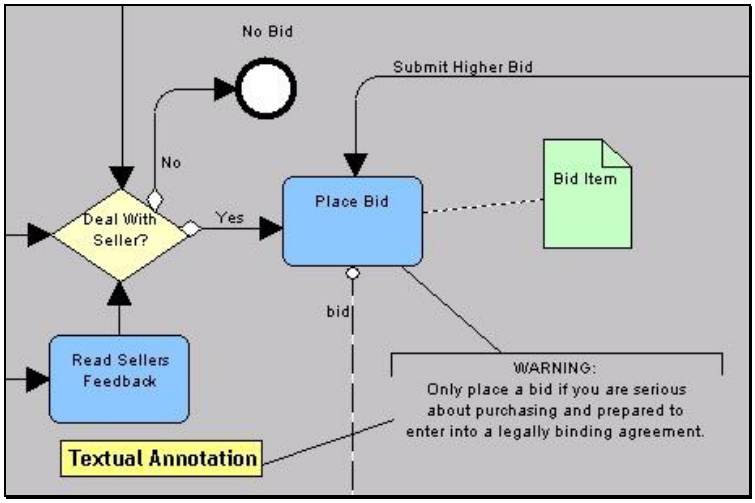


Figure 15. Textual Annotation; for circumstances where pictures aren't enough.

Modeling BPMN on the Web with SA XT

SA XT (for eXtended Team) is the web, sister product to rich-client System Architect. SA XT enables you to add/edit/delete information from the architecture, view the live output of reports in the web interface, and model or edit BPMN diagrams in the web.

You can have users working in SA XT on the same encyclopedia (database) at the same time that other users are editing information via the rich client System Architect.

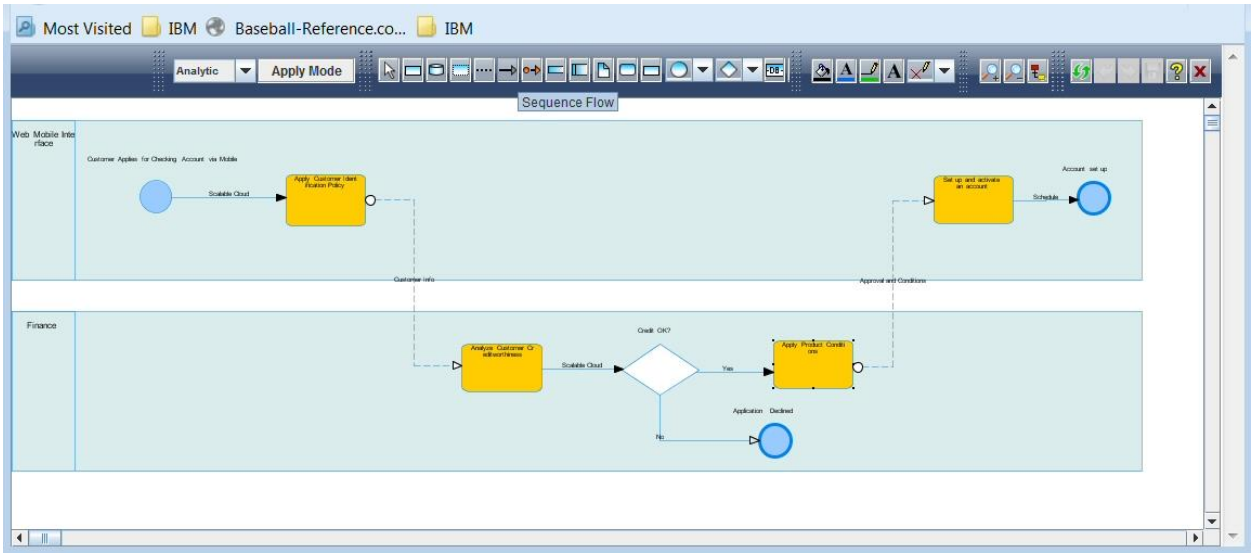


Figure 16. Modeling BPMN process flows on the web with SA XT.

Modeling Processes across the Enterprise

You can create your own tabs in the Explorer (Browser) and create folders to categorize elements of the architecture. For example, you might create folders for all of the information pertaining to the Human Resource dept, the Product Development dept, the Training dept, etc. The names of the folders you create are up to you, capturing whatever categorization of the architecture you desire. You may also create as many tabs as you like.

You have two choices of folders to create

- a static folder that you drag-and-drop information into, and
- a dynamic folder that is populated automatically by the running of reports. For example, you might automatically populate the Human Resource dept folder with all the BPMN Process diagrams for human resources, by running a report that gets all processes with "Human Resources" in the name.

These are categorizations -- providing no namespace (unlike UML folders) -- so you can have, for example, the same process model appearing in several folders -- in our example, in the Product Development organization folder, and in the Testing folder.

Figure 17. Reusing processes from the System Architect repository.

Current State versus Future State Business Architecture

System Architect provides a functionality called “Workspaces”, which enables you to baseline a version of your architecture, and continue working on the information on that baseline in new to-be layers – adding, deleting, or modifying information in the baseline to create the future architecture. You may create alternative, side-by-side to-be architectures, and then do comparisons across workspaces – comparing alternative architectures, or comparing as-is and to-be architectures.

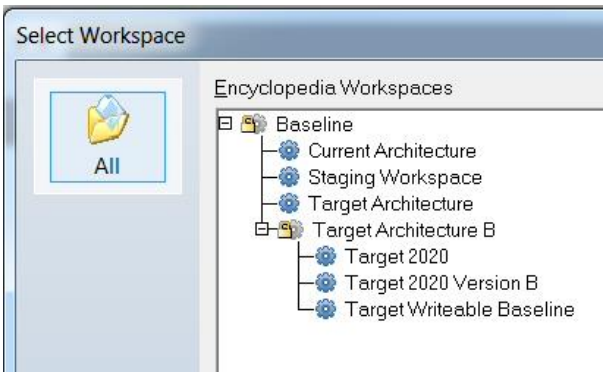


Figure 18. Drawing association lines between data objects and a process.

An encyclopedia must be ‘workspace enabled’ via the SAEM tool (which comes with the product). Instructions are in the help – you basically add to the schema of the underlying repository to enable workspaces. Once enabled, you may use SAEM or System Architect itself to create workspaces.

When you open a workspace-enabled encyclopedia, you are asked what workspace you want to work in. After that, you work as usual – the fact that you are working in a layer is only noticeable to you in the title bar of the tool.

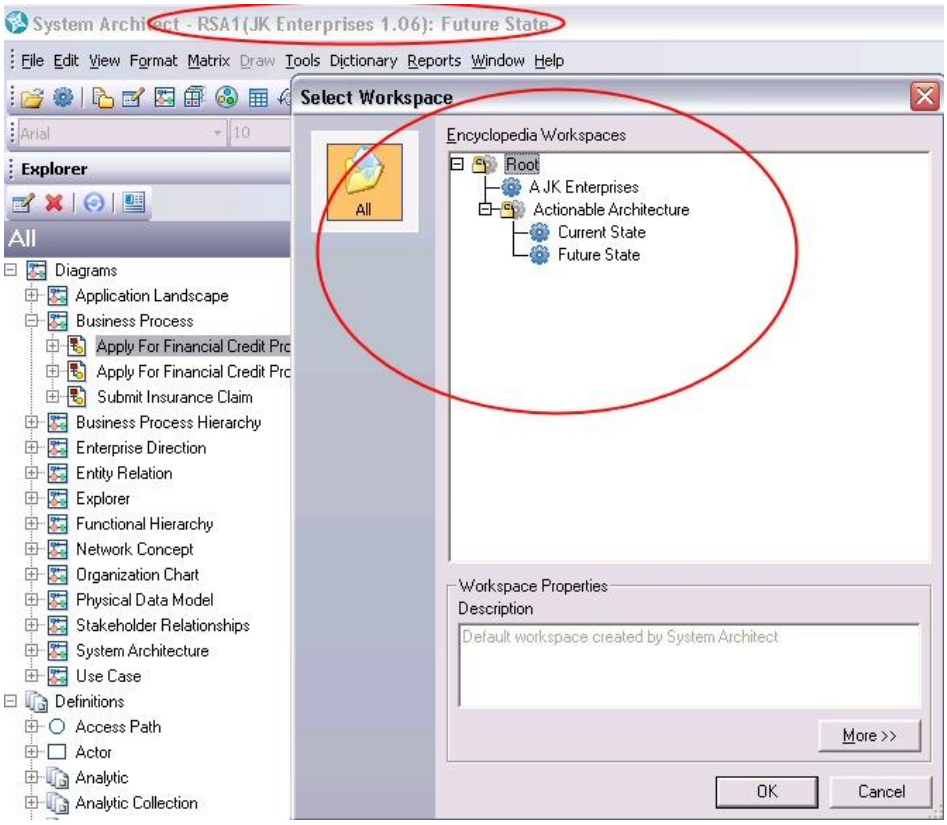


Figure 19. Drawing association lines between data objects and a process.

Comparing and Merging Across Workspaces

As teams develop business models and/or Enterprise Architecture artifacts in different workspaces, you can at any point compare and selectively merge information from one workspace to another.

Support for Standard Patterns

TMForum Reference Models

An add-in to System Architect provides an encyclopedia with prebuilt reference models of the Telecommunications Forum (TMForum) -- TAM logical applications, eTOM processes (hierarchy and example BPMN flows), and SID.

The eTOM processes provide a taxonomy list of standard processes used in the Telecommunications Industry, and standard patterns of how they are orchestrated. The TMForum Frameworx reference models are available as a pre-built System Architect encyclopedia, enabling you to jump start your work.

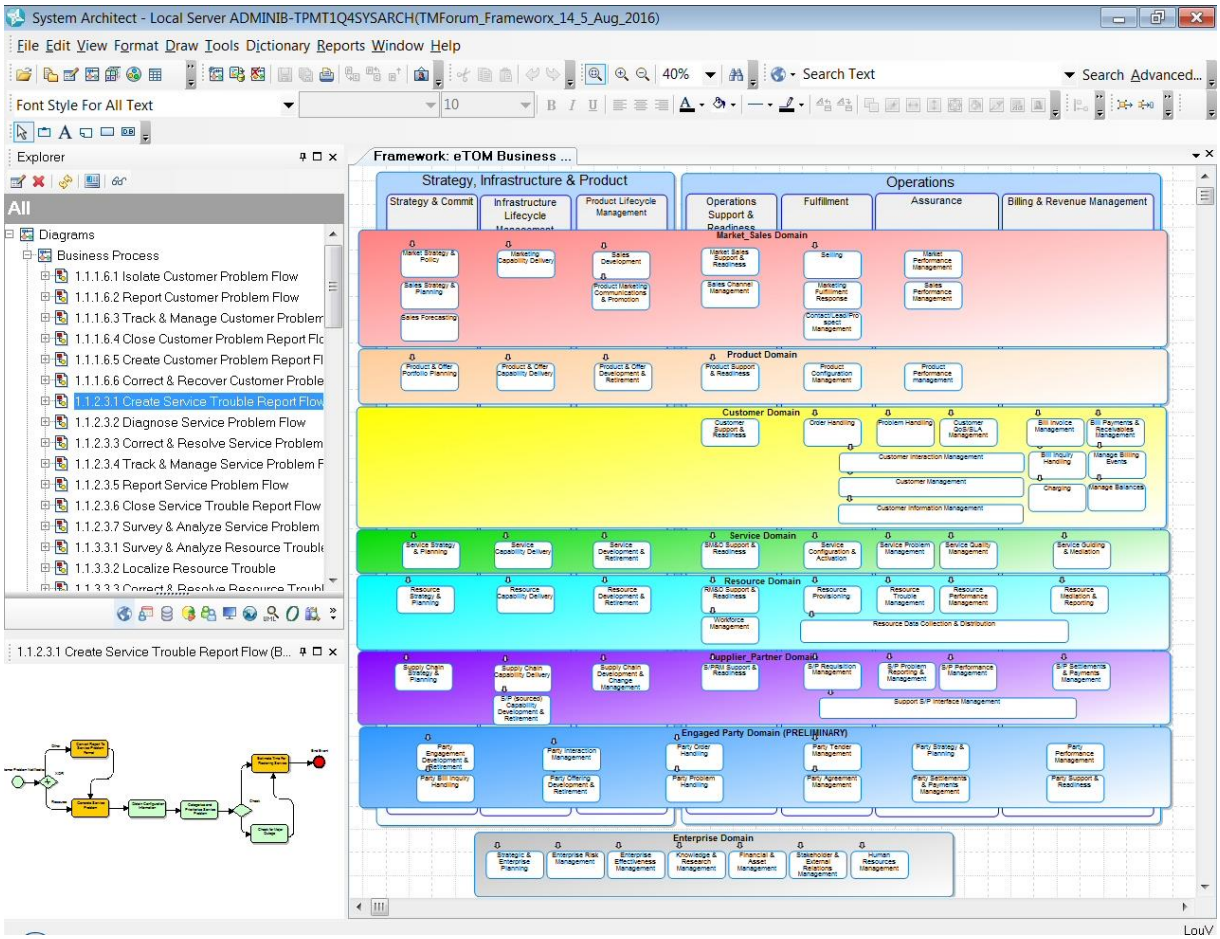


Figure 20. TMForum is provided in a pre-built encyclopedia; here the eTom is shown – high-level processes laid out in a landscape Explorer view. The encyclopedia also contains the process flow patterns of eTom.

APQC Reference Models

The American Productivity and Quality Center (APQC) has established a standard taxonomy list of business processes used by various industries. You may use them as guidance to construct process flows representing what goes on in your organization -- similar to the way you use words from a dictionary to create your own sentences.

The APQC has reference models for the following industries:

- Automotive

- Banking
- Consumer Electronics
- Aerospace and Defense
- Retail
- Electric Utilities
- Consumper Products
- Healthcare
- Broadcasting
- Pharmaceuticals
- Telecom
- Petroleum Upstream
- Petroleum Downstream
- Cross Industry

These taxonomies are available in pre-built System Architect encyclopedias, so you can jump start your business process analysis work.

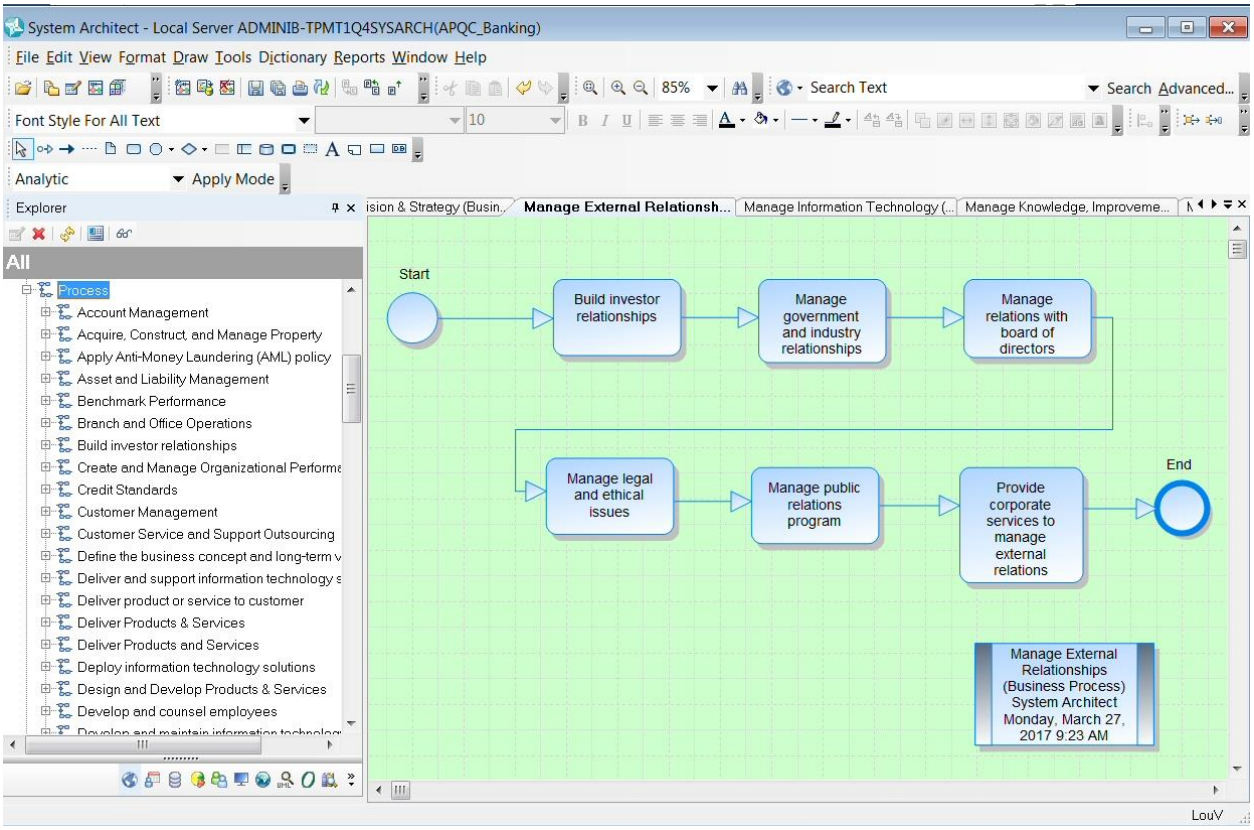


Figure 21. APQC industry taxonomies with flow patterns are provided in a pre-built encyclopedia; here the Banking framework is shown.

FEA Reference Models

Federal Enterprise Architecture Framework 2.0 and 1.0 are supported via the paid add-on, FEA Reference Model Add-on. FEAF 2.0 includes the Business Reference Model (BRM), Technical Reference Model (TRM), Services Reference Model (SRM), and Security Reference Model.

The add-in is designed to allow you to import the latest reference models from whitehouse.gov, align your architecture with the reference models (through the property set), and then auto-generate pertinent parts of OMB 300 reports that can be submitted to the US Office of Management and Budget to obtain funding on a system or proposal. The reference models are used also by the EA teams of commercial companies.

SCOR Reference Models

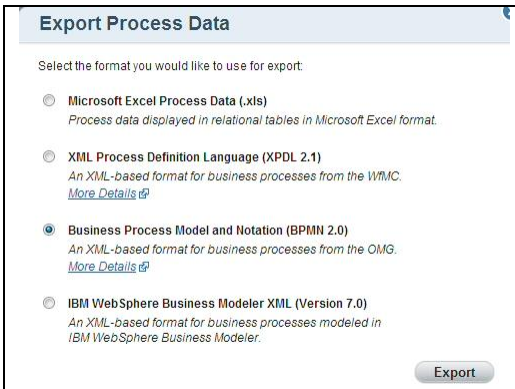
A paid add-in to System Architect provides reference process models for SCOR.

BPMN 2.0 Interchange

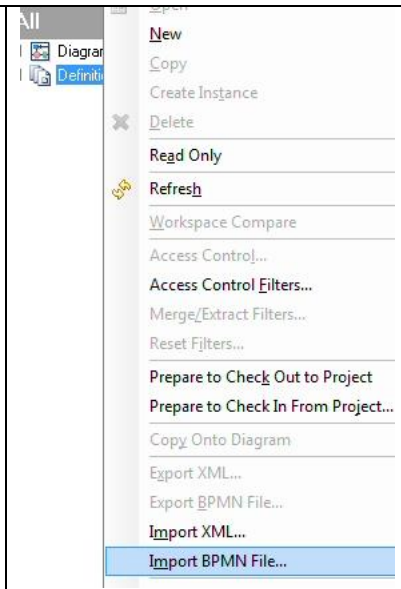
System Architect supports import and export of the .BPMN 2.0 interchange format, which means you can interchange BPMN 2.0 models from other tools that support the interchange format. Most BPMN-compliant modeling tools should support the BPMN 2.0 interchange format, allowing you to import or export BPMN models in between System Architect and the other tool.

The BPMN 2.0 interchange format supports the model information as well as the positioning of symbols on a BPMN diagram.

For example, to import a BPMN model from IBM BlueWorksLive, you select Export Process from the Process Blueprint tab, to open the Export Process Data tab. There you choose to export the process to BPMN 2.0. A zip file is generated. In System Architect, you right-mouse click on Definitions in the Explorer (Browser) and choose to Import XML.



Export to BPMN 2.0 in IBM BlueWorksLive



Import BPMN 2.0 in System Architect

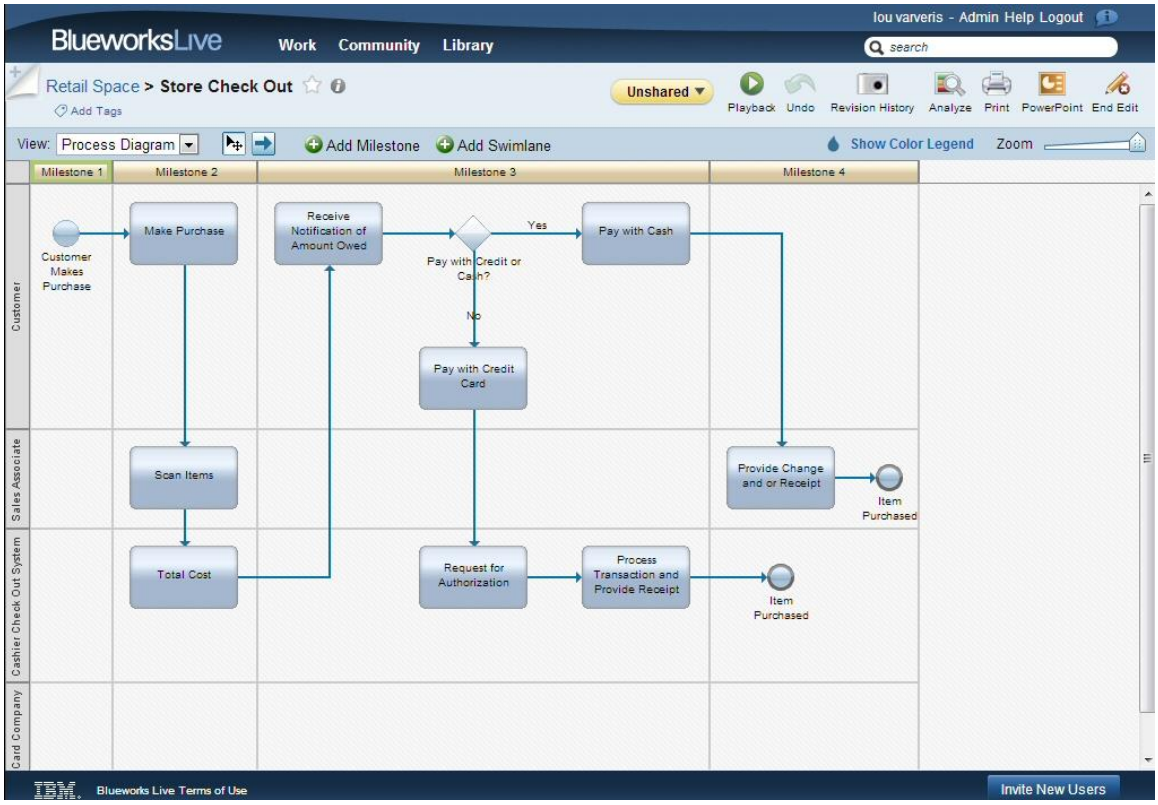


Figure 22. BPMN 2.0 diagram in IBM BlueWorksLive

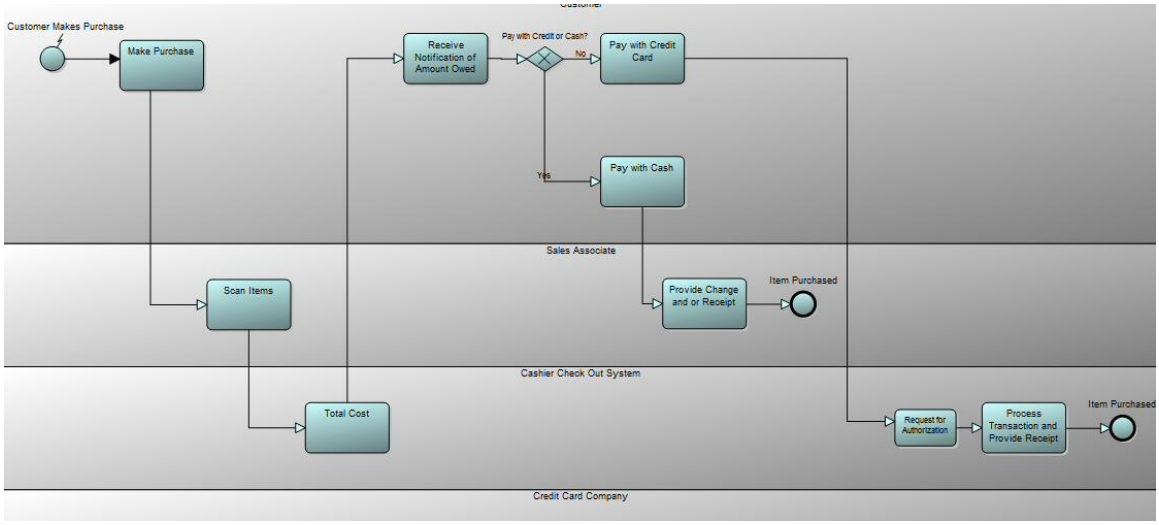


Figure 23. BPMN 2.0 diagram in System Architect, imported from IBM BlueWorksLive

Business Process Analysis – Reporting

An important aspect of Business Process Analysis is running reports to understand the process flows, and their relationship to the business. System Architect has a built in, native report generator which you can use to build any and all kinds of reports on your architecture, and generate it out to text, Grid, or HTML (with stylesheets applied). This reporting engine also serves as the basis for all of the analytics (described above) that you can run against the repository information.

Out-of-Box BPA Reports

System Architect comes with pre-built reports for Business Process Analysis in the BPMN.rpt file.

To access the BPMN.rpt file:

1. Select Reports, Report Generator.
2. Select File, Open Report File.
3. Select and open the BPMN.rpt file from the C:\Program Files (x86)\UNICOM Systems\System Architect Suite\System Architect\Reports directory.

You can also build your own reports and put them in your own report files.

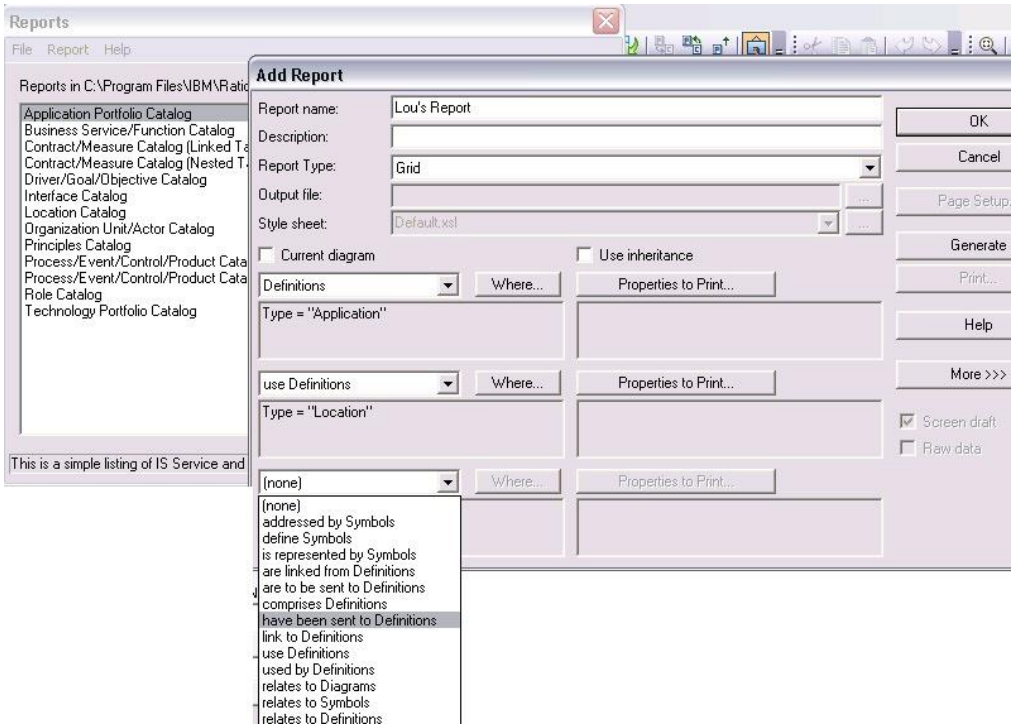


Figure 24. Example of Report GUI used to navigate and build SQL-like queries

For example, a Data Object definition defines the Data Object symbol, that is linked to the Sequence Flow symbol, that connects symbol Process, that is defined by Process definition. The report below creates a SQL query that follows this path, and outputs the Data Object name and Data contents, and from/to Process Name, total cost, related Functions, and related Applications.

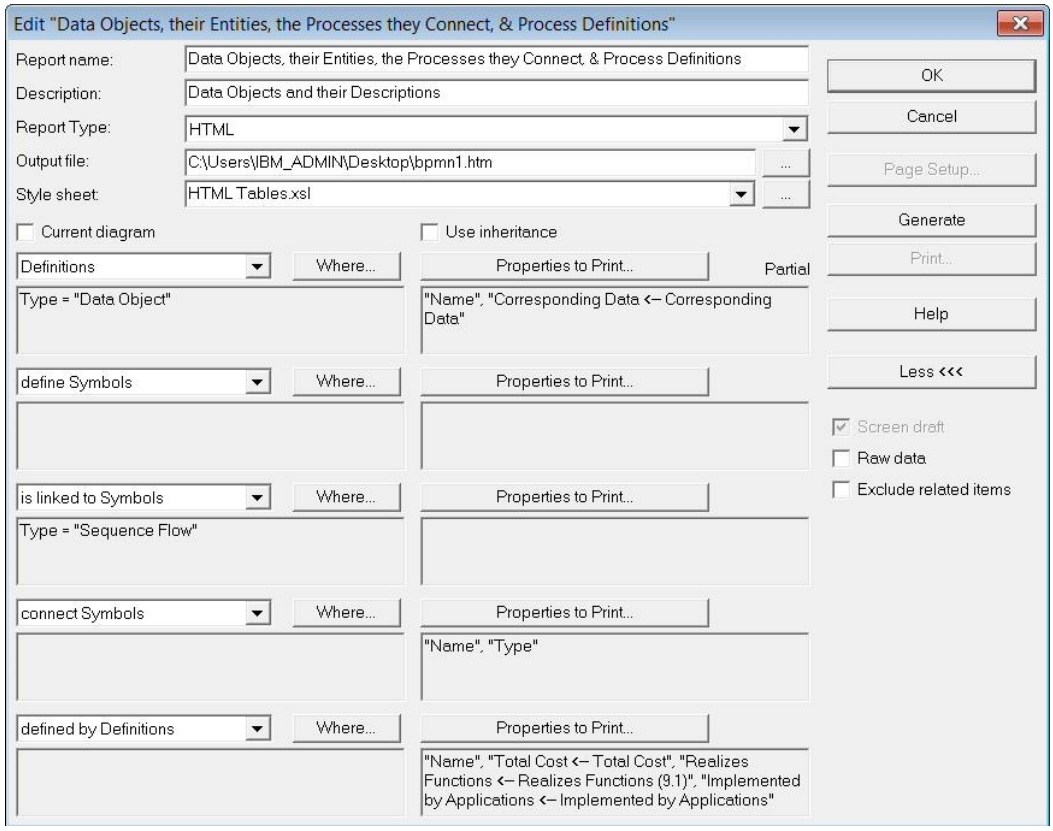
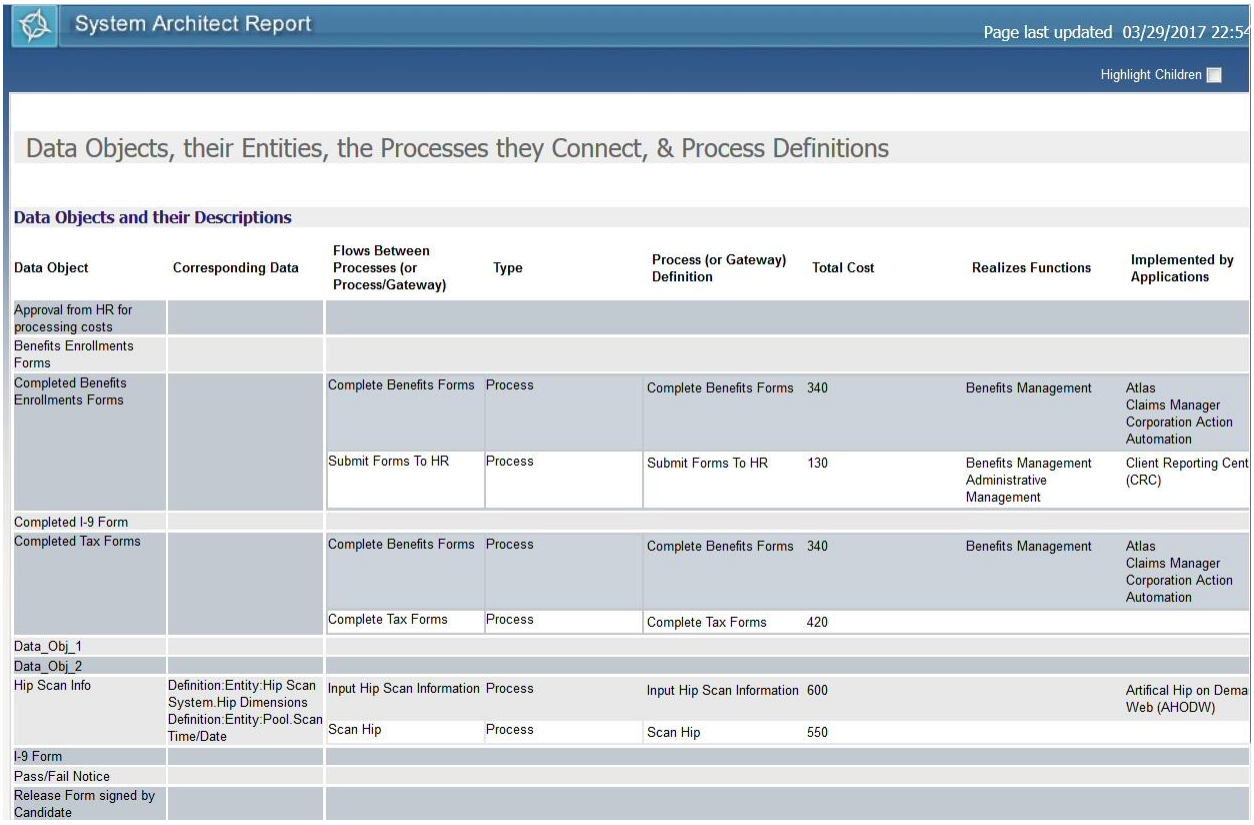


Figure 25. An SA report showing SQL query joins to get Data Objects & related Processes.

The output of the report is shown below.



System Architect Report

Page last updated 03/29/2017 22:54

Highlight Children

Data Objects, their Entities, the Processes they Connect, & Process Definitions

Data Objects and their Descriptions

Data Object	Corresponding Data	Flows Between Processes (or Process/Gateway)	Type	Process (or Gateway) Definition	Total Cost	Realizes Functions	Implemented by Applications
Approval from HR for processing costs							
Benefits Enrollments Forms							
Completed Benefits Enrollments Forms		Complete Benefits Forms	Process	Complete Benefits Forms	340	Benefits Management	Atlas Claims Manager Corporation Action Automation
		Submit Forms To HR	Process	Submit Forms To HR	130	Benefits Management Administrative Management	Client Reporting Cent (CRC)
Completed I-9 Form							
Completed Tax Forms		Complete Benefits Forms	Process	Complete Benefits Forms	340	Benefits Management	Atlas Claims Manager Corporation Action Automation
		Complete Tax Forms	Process	Complete Tax Forms	420		
Data_Obj_1							
Data_Obj_2							
Hip Scan Info	Definition:Entity:Hip Scan System.Hip Dimensions Definition:Entity:Pool.Scan Time/Date	Input Hip Scan Information	Process	Input Hip Scan Information	600		Artifical Hip on Dema Web (AHODW)
		Scan Hip	Process	Scan Hip	550		
I-9 Form							
Pass/Fail Notice							
Release Form signed by Candidate							

Figure 26. An SA report of Data Objects, Processes, and related EA artifacts.

You can output reports to Grid, or to HTML, or you can print them to PDF (if you have Adobe Acrobat Distiller installed). Printing to Grid produces the report in a System Architect grid dialog, which you can save to Excel. Just as importantly, you can double click on any item in the grid to access its definition and edit it.

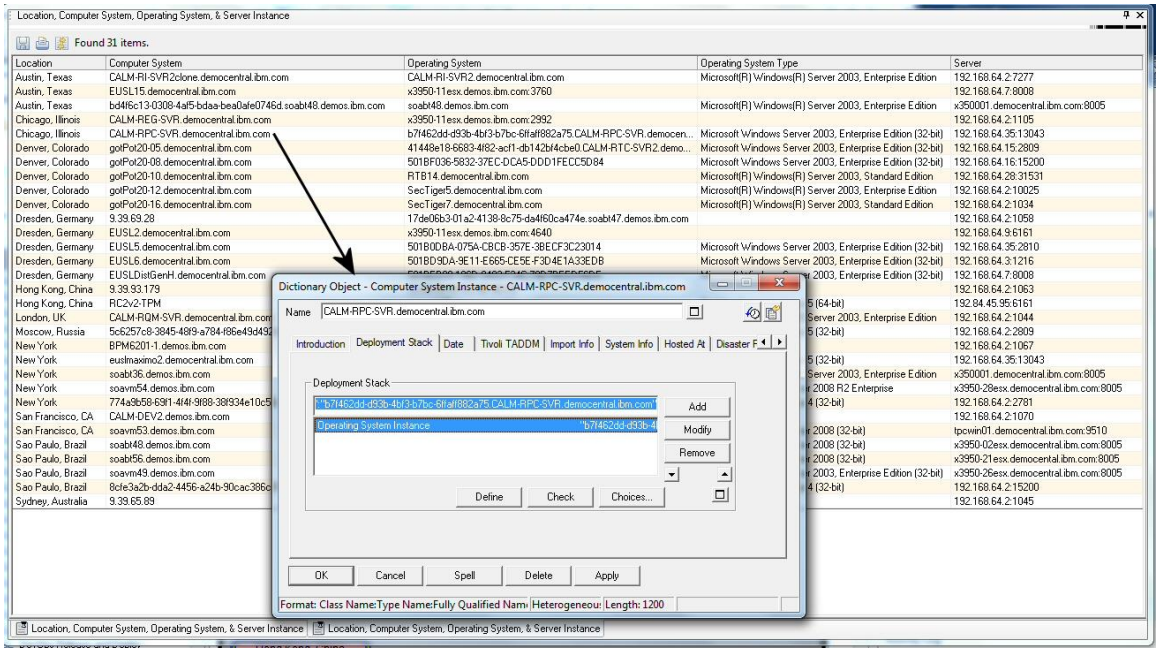
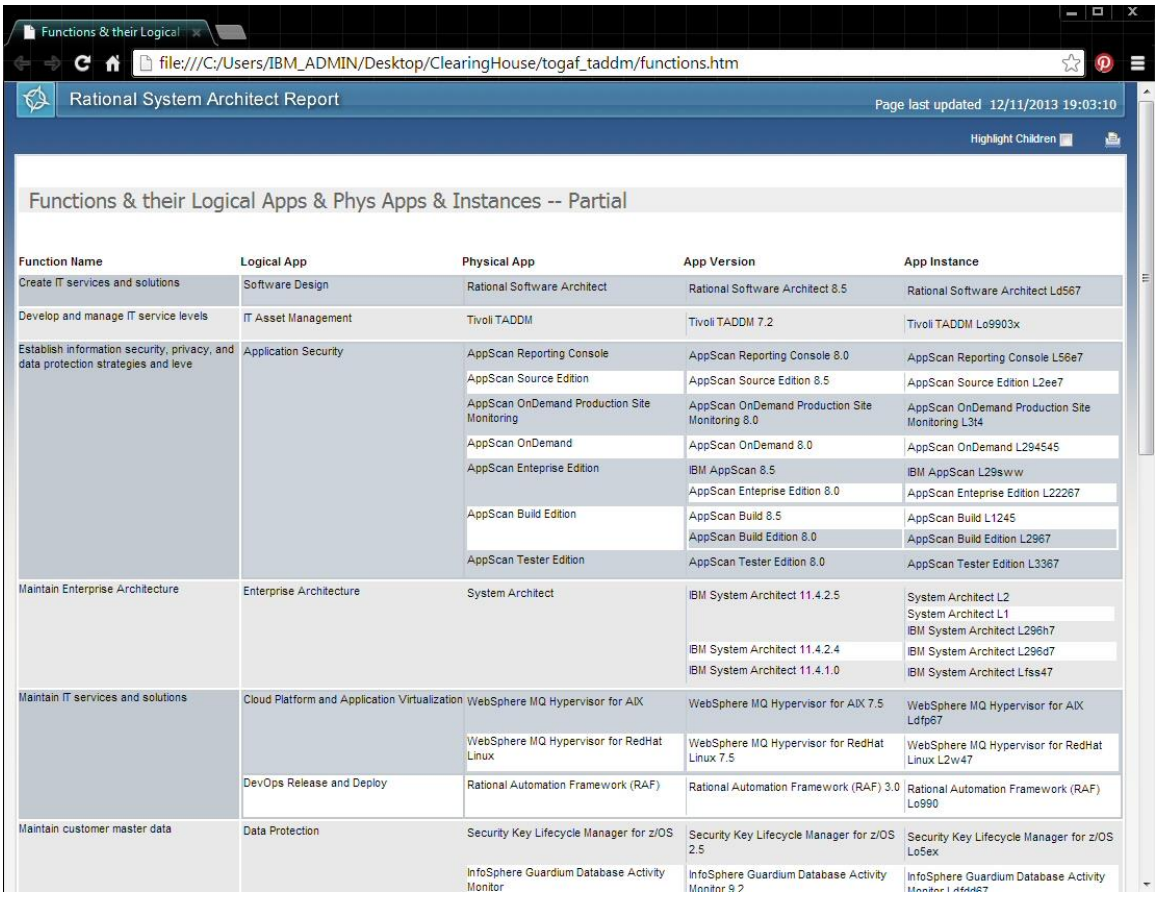


Figure 27. Example of Report output to Grid -- so that you can double-click on any of the cells in the report to access and edit the information.



Function Name	Logical App	Physical App	App Version	App Instance
Create IT services and solutions	Software Design	Rational Software Architect	Rational Software Architect 8.5	Rational Software Architect Ld567
Develop and manage IT service levels	IT Asset Management	Tivoli TADDM	Tivoli TADDM 7.2	Tivoli TADDM Lo9903x
Establish information security, privacy, and data protection strategies and leve	Application Security	AppScan Reporting Console	AppScan Reporting Console 8.0	AppScan Reporting Console L56e7
		AppScan Source Edition	AppScan Source Edition 8.5	AppScan Source Edition L2ee7
		AppScan OnDemand Production Site Monitoring	AppScan OnDemand Production Site Monitoring 8.0	AppScan OnDemand Production Site Monitoring L3t4
		AppScan OnDemand	AppScan OnDemand 8.0	AppScan OnDemand L294545
		AppScan Enteprise Edition	IBM AppScan 8.5	IBM AppScan L29sww
			AppScan Enteprise Edition 8.0	AppScan Enteprise Edition L22267
		AppScan Build Edition	AppScan Build 8.5	AppScan Build L1245
			AppScan Build Edition 8.0	AppScan Build Edition L2967
		AppScan Tester Edition	AppScan Tester Edition 8.0	AppScan Tester Edition L3367
Maintain Enterprise Architecture	Enterprise Architecture	System Architect	IBM System Architect 11.4.2.5	System Architect L2
				System Architect L1
				IBM System Architect L296h7
			IBM System Architect 11.4.2.4	IBM System Architect L296d7
			IBM System Architect 11.4.1.0	IBM System Architect Lfss47
Maintain IT services and solutions	Cloud Platform and Application Virtualization	WebSphere MQ Hypervisor for AIX	WebSphere MQ Hypervisor for AIX 7.5	WebSphere MQ Hypervisor for AIX Ldfp67
		WebSphere MQ Hypervisor for RedHat Linux	WebSphere MQ Hypervisor for RedHat Linux 7.5	WebSphere MQ Hypervisor for RedHat Linux L2w47
	DevOps Release and Deploy	Rational Automation Framework (RAF)	Rational Automation Framework (RAF) 3.0	Rational Automation Framework (RAF) Lo990
Maintain customer master data	Data Protection	Security Key Lifecycle Manager for z/OS	Security Key Lifecycle Manager for z/OS 2.5	Security Key Lifecycle Manager for z/OS Lo5ex
		InfoSphere Guardium Database Activity Monitor	InfoSphere Guardium Database Activity Monitor 9.2	InfoSphere Guardium Database Activity Monitor Ldfd467

Figure 28. Example of Report output to HTML using a CSS stylesheet.

Visual Analytics

The same reports (and reporting GUI) above can be used to run analytics against artifacts in the encyclopedia. A wizard-driven Heatmap Manager enables users to quickly build a report, specify visual analytics, and run the analytic report on any diagram.

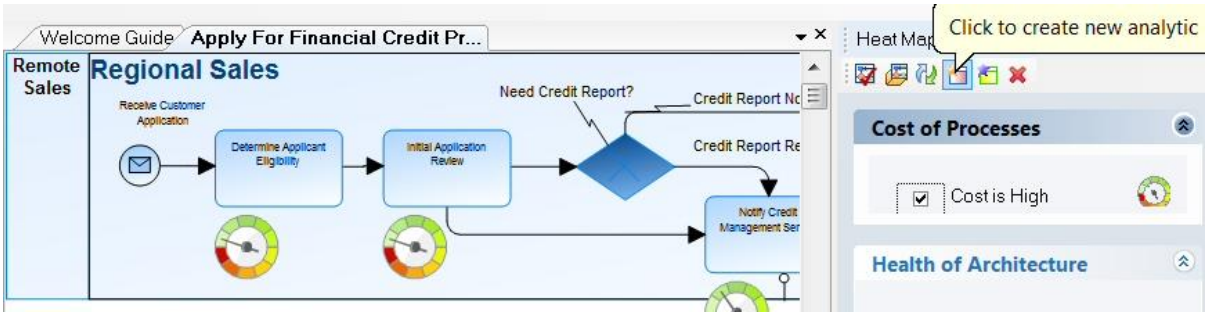


Figure 29. Analytics run against a BPMN diagram to show gauges that show how expensive a process is, based on analyzation of its Activity Based Cost.

Business Processes within Enterprise Architecture

System Architect provides BPMN modeling and Business Process Analysis within the context of Enterprise Architecture. You may integrate your business process flows with other aspects of the business architecture, application architecture, data architecture, technical architecture, and infrastructure architecture.

High-Level Business Concept Diagrams

A Business Concept diagram is available for you to conceptualize aspects of the architecture and how business processes fit within it. Sometimes called Value Stream Analysis, you can model abstract business concepts and specify flows between them to gain value in the organization. The flows may be control flows, optional sequences, and material flows, and other types of relationships you wish to add to the diagram. You may provide your own graphics, or pick from a library of .wmf and .svg images that System Architect provides.

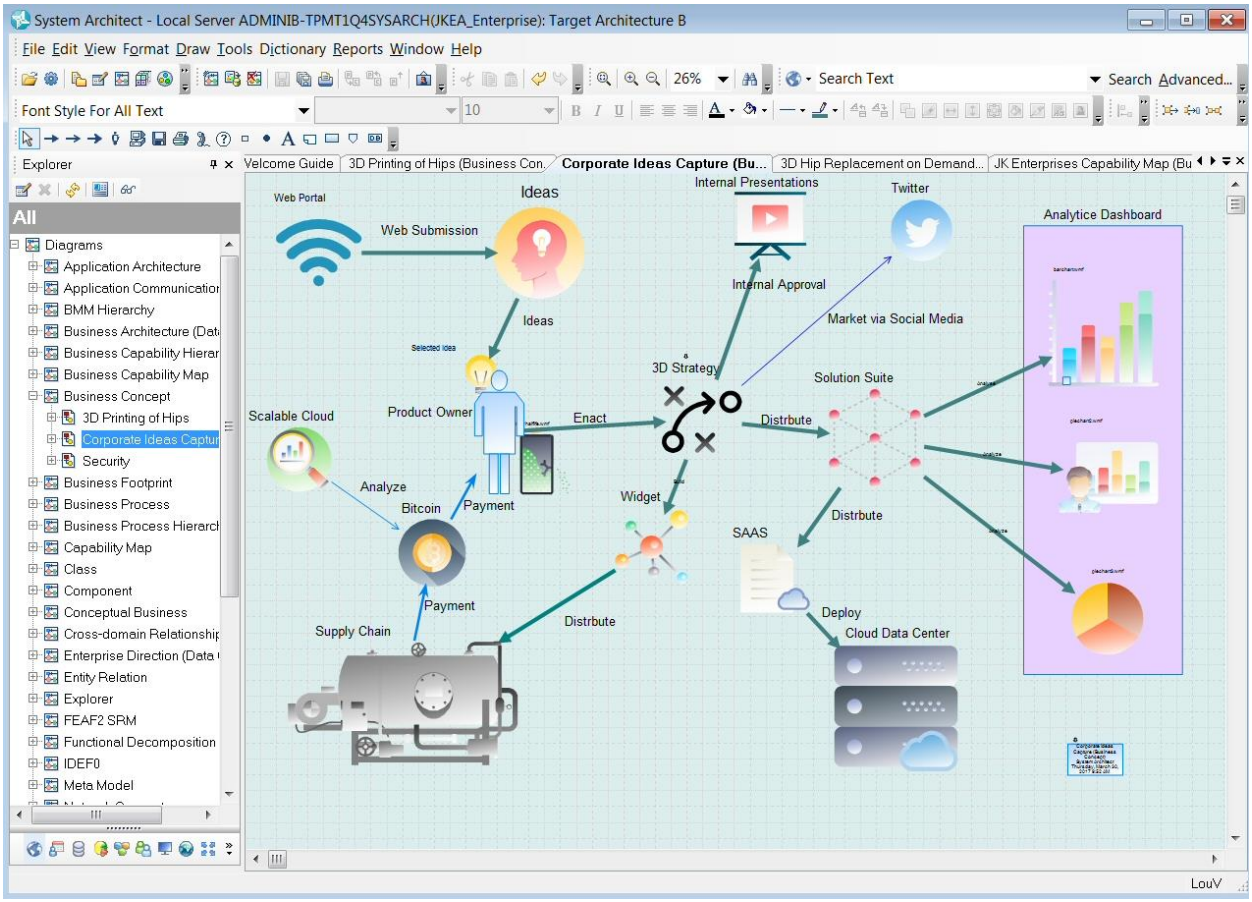


Figure 30. Business Concept diagram shows a Value Stream.

Capability Maps

Capability Maps allow you to model high-level business Capabilities and lower-level, specific business Capabilities as symbols contained within the parent Capability box.

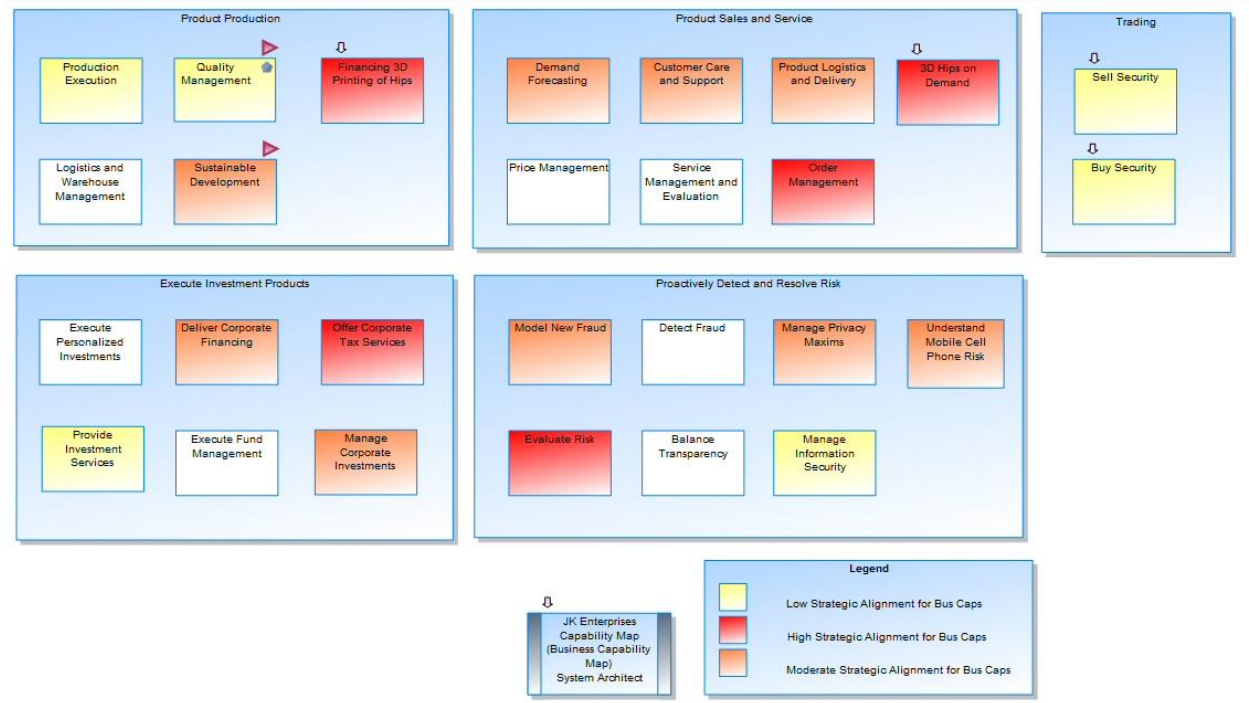


Figure 31. Capability Map with automatic Analytics run to show strategic importance of each Capability.

The diagram is data centric meaning if you put a new Capability into a parent box, it effects the underlying model information – the parent/child relationship will automatically show itself in other diagram viewpoints, such as the Capability Hierarchy diagram (below).

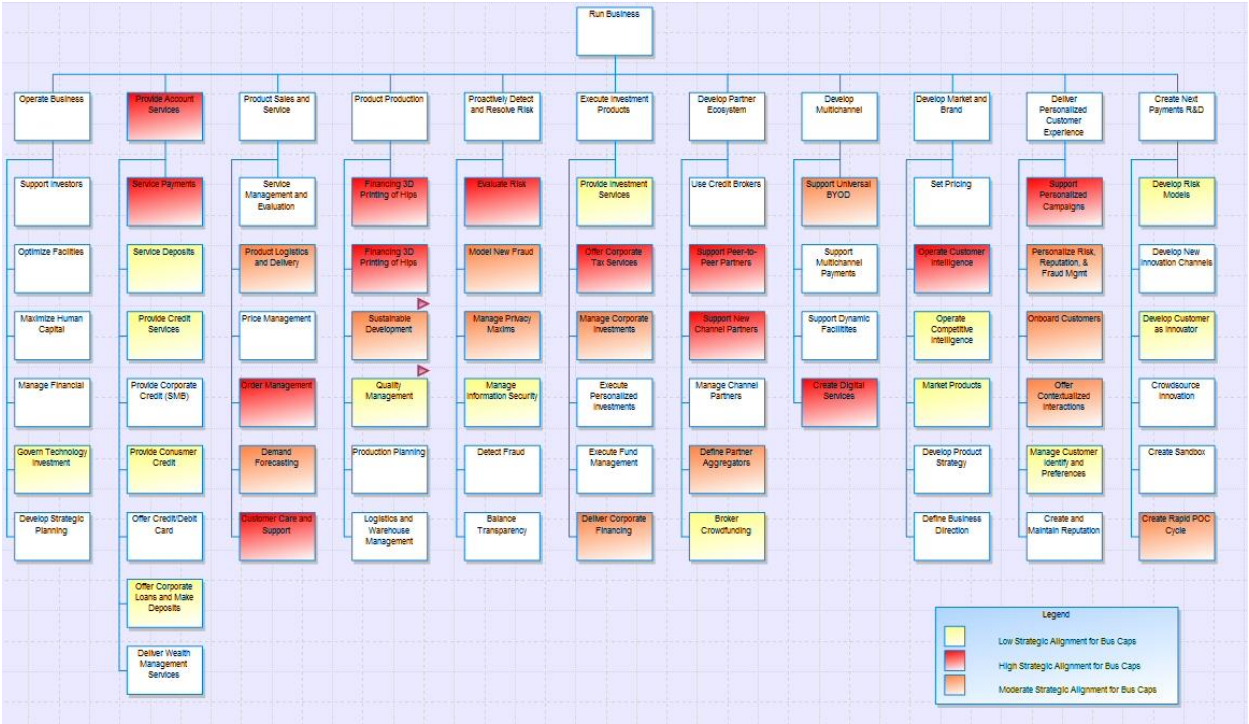


Figure 32. Capability Hierarchy automatically showing same information as Capability Map but different view.

Capabilities and their Relationship to Business Processes

The concept of Business Capability, and how it is enabled by other elements of the Enterprise Architecture, is a hotly debated topic. There is no real answer for what enables a Capability – a set of business processes, applications, people, systems – really some combination of many things in the business.

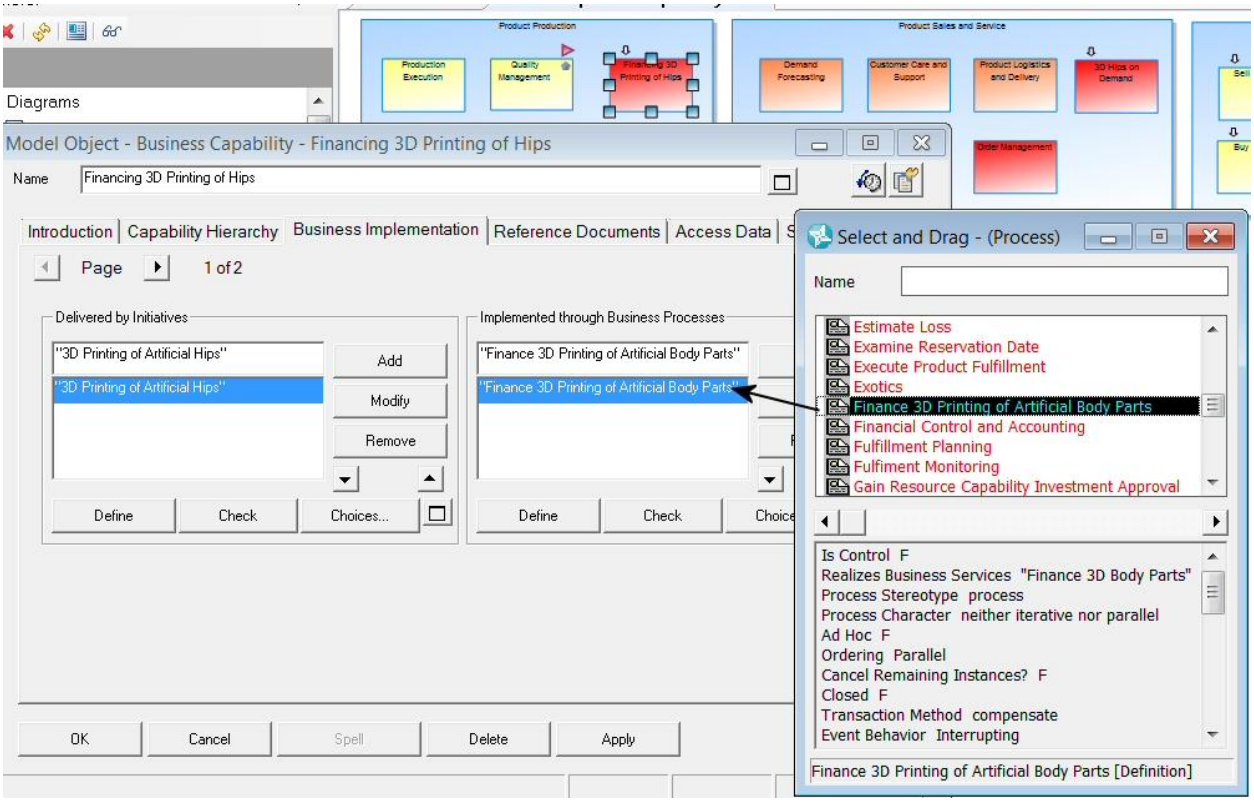


Figure 33. Associating Processes directly to Capabilities in Custom properties of the Capability

Strategy Maps and Balanced Scorecards

Strategy Maps and Balanced Scorecards (as defined in the standard Kaplan and Norton), allow you to map Business Objectives (from the Business Motivation Model) against Balanced Scorecard Perspectives.

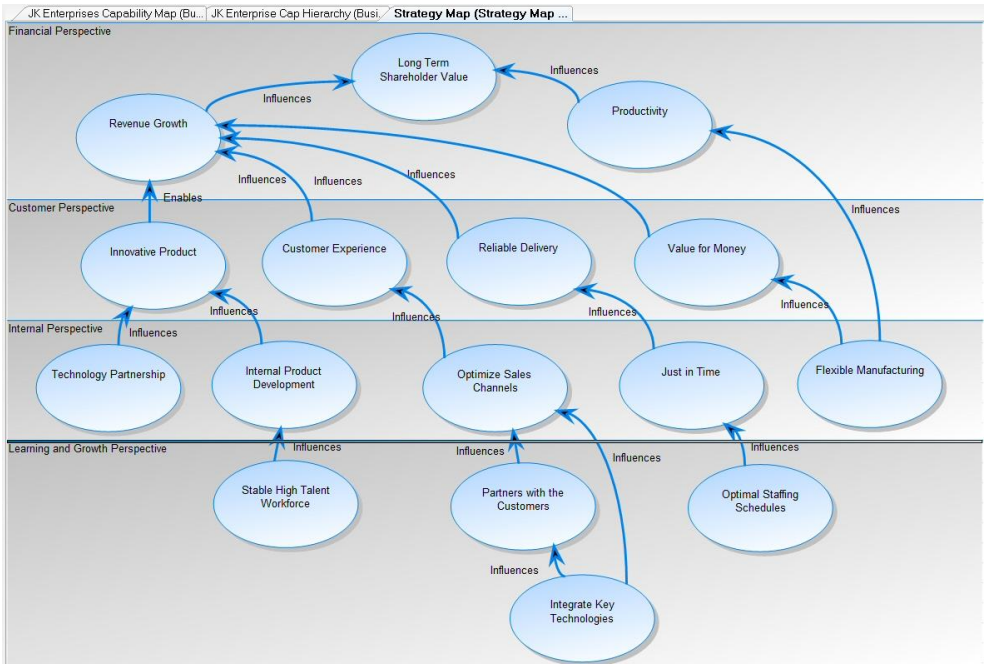


Figure 34. Strategy Map in System Architect shows Objectives mapped against Balanced Scorecard Perspectives (swimlanes). Data Centric diagram – place an objective in a swimlane and it becomes part of that perspective

The Business Objectives may be organized in the Business Motivation Model, and visualized in a view that shows their alignment with the strategic ends and means of the business.

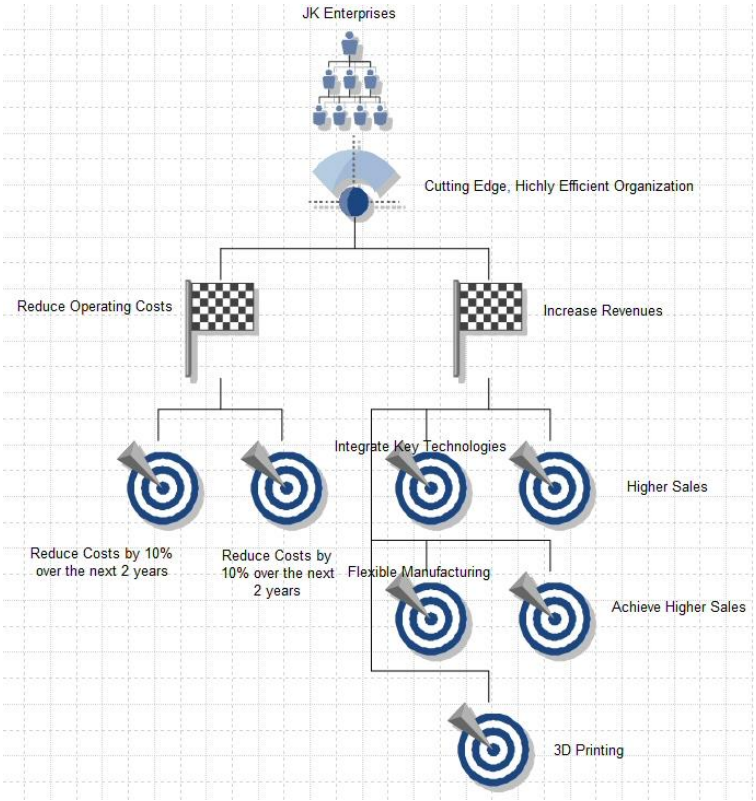


Figure 35. Objectives on a Business Motivation Model.

Business Processes Use Data

Business Processes use and effect data in the business. You can specify what data that business processes Create, Read, Update, or Delete in a CRUD matrix, one of dozens of matrices that System Architect provides to view or create interrelationships of information.

Process/Entity

Process \ Entity	Account	Applied Customer Billing Rates	Contact History	Contact Record	Control Tran
Accept Offer					
Accept Payment Details					
Account Coordination					
Account Management					
Account Planning			02-Read	03-Update	
Adjust Loss					
Administer Commercial Arrangement for Production and Distribution Capability					
Advise Customer					
Analyze Customer Creditworthiness					
Analyze Deal					
Apply Customer Identification Policy			03-Update		
Apply Product Conditions					
Approve Resource Capability Investment			03-Update		
Assess Risk					
Authorize For Final Review					
Authorize For Final Review After Analysis					
Authorize for Final Review					
Authorize for Final Review After Analysis					
Benefits Overview Class					
Bill Inquiry Handling		06-CU			
Bill Invoice Management		03-Update			
Bill Payments & Receivables Management		03-Update			

Figure 36. CRUD Matrix associating Business Processes to Entities

Business Processes Relationship to Applications, Services, and Functions

According to the TOGAF metamodel, functions are orchestrated by business processes, which in turn are realized by business services, which themselves are realized by logical and physical applications.

System Architect supports this metamodel natively, and customers often make changes to it – they may eliminate the logical application or business service layer and relate processes directly to physical applications, for example. It depends on the goal of their architecture and how much they want to capture.

Line of Sight through the Architecture

You can graphically view a line of sight from strategy, to capability, to business processes, to business services, to data and applications, to application versions, to technology used via the Cross Domain Relationships diagram. Relationships on the diagram are automatically drawn when dragging artifacts onto it. This enables you to examine threads thru the organization and how business processes are involved.

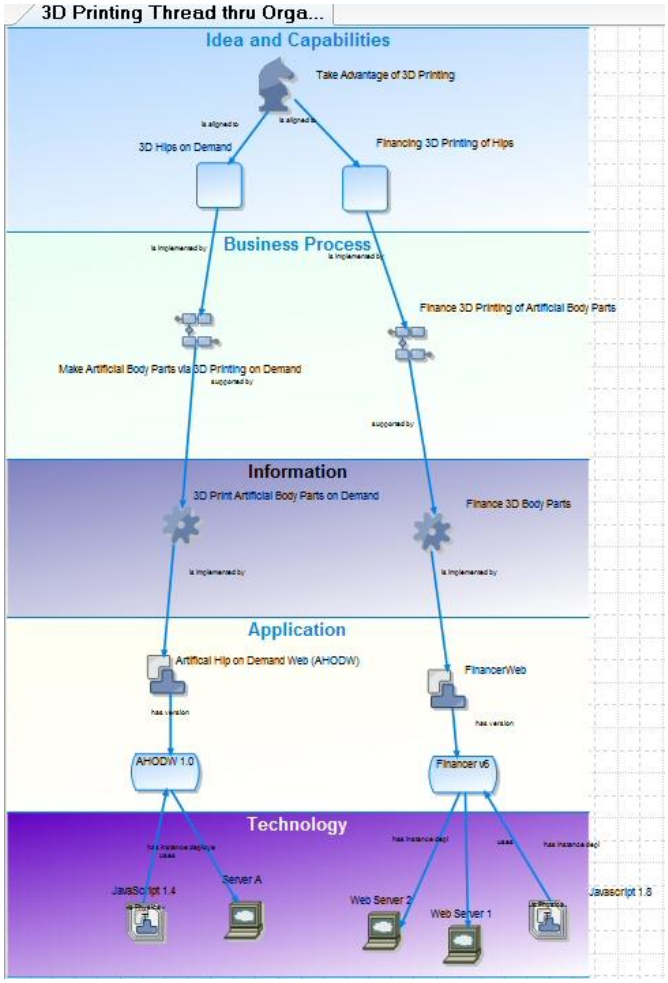


Figure 37. Cross-Domain view automatically showing threads thru organization of Vision to Capability to Process to Service to Data/Applications to Application Versions to Technology.

Explorer Cause-Effect Analysis

Explorer diagrams, Explorer Object Reports, and Explorer Relationship Reports provide a highly visual method of identifying and illustrating dependencies, both direct and inferred, assessing degree of impact of proposed changes, and for spotting gaps.

- Explorer diagrams are unique functionality in that they reflect the visual output of running SQL reports against the repository information.
- Explorer Object Reports are run to put a filtered set of objects on the diagram – filtered by the running of some report (ie, show all locations that have servers installed at them – aka data centers).
- Lines drawn reflect the output of an Explorer Relationship report – so a line may reflect an inferred (Calculated) relationship – if x is related to y is related to z, show a line between x and z on a diagram.
- Note that Explorer Relationship Reports may be run on any diagram type, not just Explorer diagrams.

This enables 20,000 foot view of the architecture, clearly visualizing impact of change. It is important to note that the scope of the Explorer analysis applies to any modeling viewpoint and content and is not restricted to just the business, organizational, or compliance aspects.

The example in the figure below shows 'calculated' relationships found between Locations (that have data centers) to Server instance to Phys Application Version installed; likewise Phys App Versions to Phys App to Business Service, and then Business Service to Business Capability. Analytics were then run to color Business Capabilities and their Strategic Importance, and Phys App Versions and their security vulnerabilities based on information brought in from Black Duck.

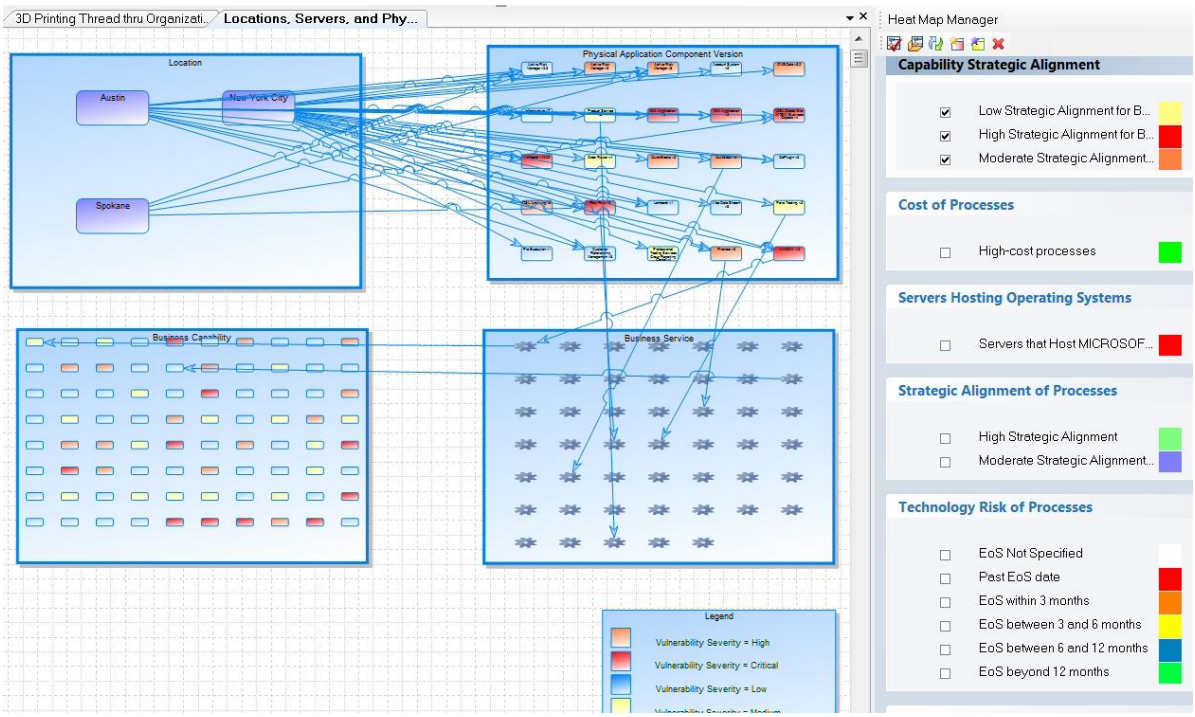


Figure 38. Cause-Effect Explorer Network diagram, showing output of SQL reports run against repository, visualizing direct or indirect (calculated to n levels) relationships.

Selective analysis in System Architect (turning on the "*Hide Relationships Not Attached to Selected Node*") enables you to highlight a thread through these architecture artifacts, as shown in the figure below.

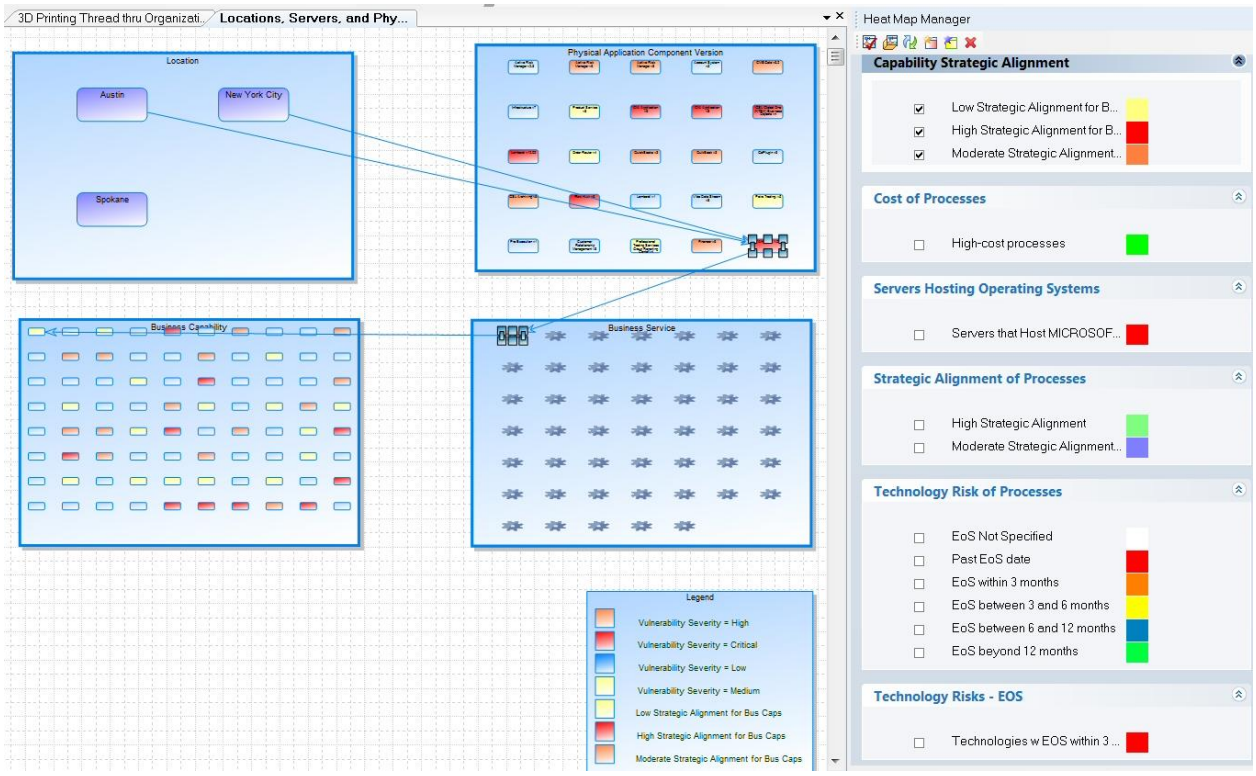


Figure 39. Automatic isolation of cause-effect pathways for selected symbols.

Landscape Heatmap Analysis

The same functionality, when applied to a Landscape Style Explorer Diagram, allow auto-creation of a Landscape diagram, where symbols are automatically drawn inside other symbols.

Again this can be inferred (calculated) relationships. In the example below, a report is run to only place on the diagram Locations that have Servers (data centers) located at them. Then a report is run to go from Location to Server/Device installed, to Physical App Version, to Physical App – and display the Physical Apps inside the Location boxes.

Analytics are run – in the example below, Physical Apps with a Black Duck Security Scan of Vulnerability are highlighted in Red.

All reports are collected in a HeatMap Manager (right side) for easy push-button running of reports and wizards for on-the-fly report creation.

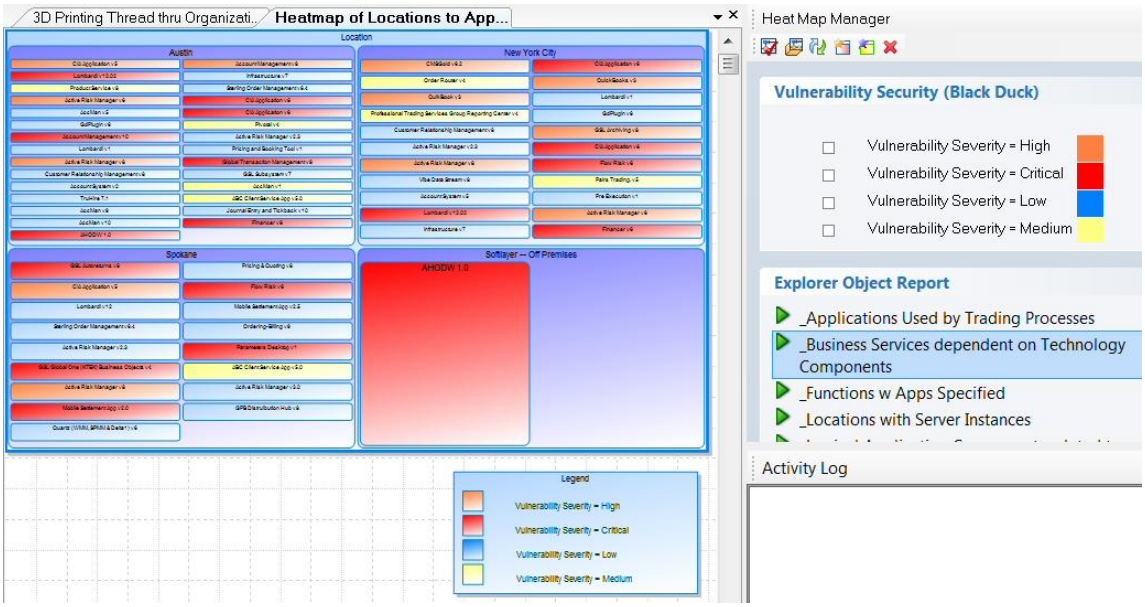


Figure 40. Explorer Landscape Heatmap View, with Heatmap Manager user interface (right) offering dashboard for reports and wizard-driven off-the-cuff report creation.

View References -- See What's Related to What

Select View, References at any time to open the References pane. Anything you touch from that point forward (a symbol on a diagram, a definition in the browser, etc) will have all its references shown in the dockable References pane. Right-mouse click on an item in the References pane and select Referenced By to see **its** references.

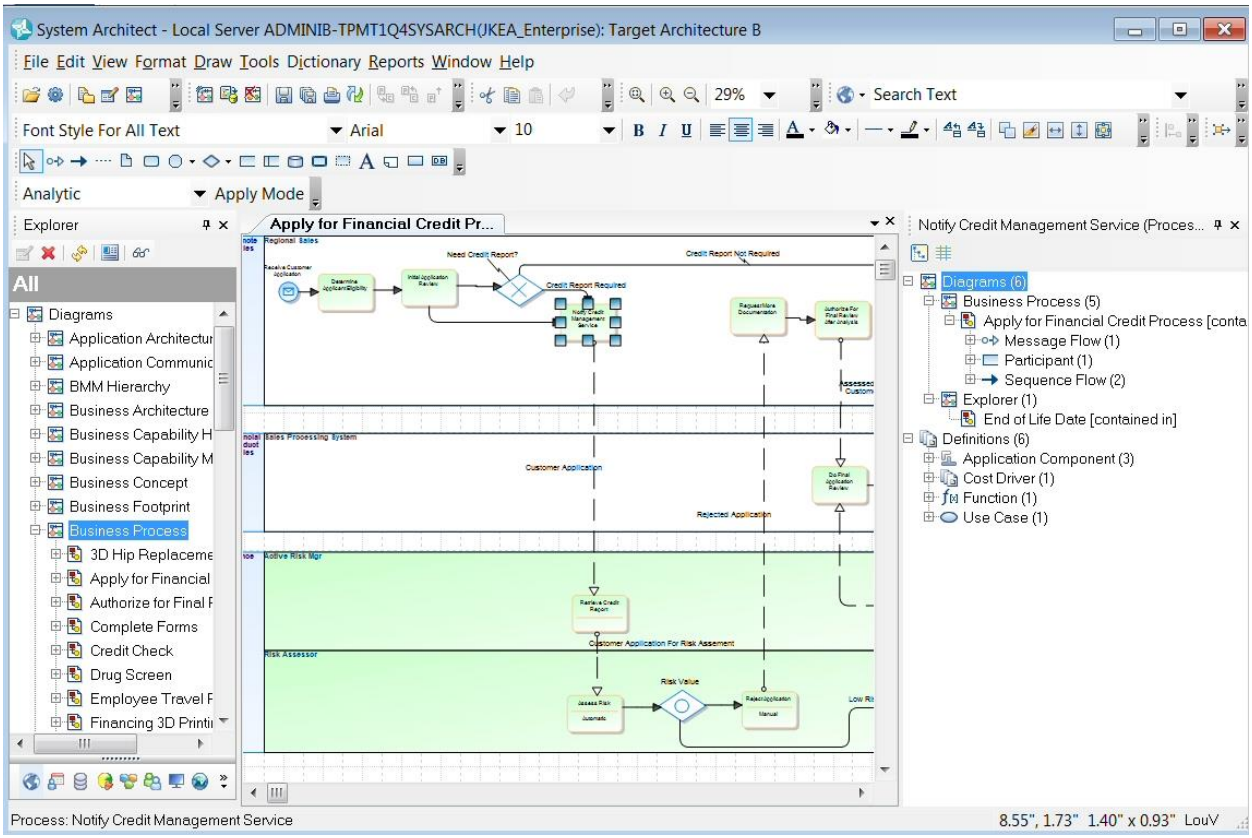


Figure 41. References dialog shows you everywhere in the architecture that a selected artifact (in this case a business process on a BPMN diagram) is used.

Federating Information across Multiple Tools: OSLC Linking

The business processes that you build, as well as all other EA artifacts, can be linked to artifacts in other tools via the Open Service for Lifecycle Collaboration (OSLC) standard. System Architect supports the Requirements Management (RM), Configuration Management (CM), and Architecture Management (AM) specs. The tools that System Architect plays with are listed on the Open Services website.

This enables you to simply right-mouse click on any artifact in the EA, and choose to link it to an artifact in another tool that you have established a password-secured friendship relationship to. Once the link is established, it is notated with a purple arrowhead. If you hover over the arrowhead, you get a popup summary of the information for the related artifact in the other tool. You can click on the title of the popup to open the artifact in the other tool.

This allows you to align your EA artifacts, including your business processes, to requirements in a requirements management tool, or change requests in a CR tool, documents in a tool such as Microsoft Sharepoint, or other architecture elements in another architecture tool – or even to other artifacts in a different System Architect encyclopedia or workspace.

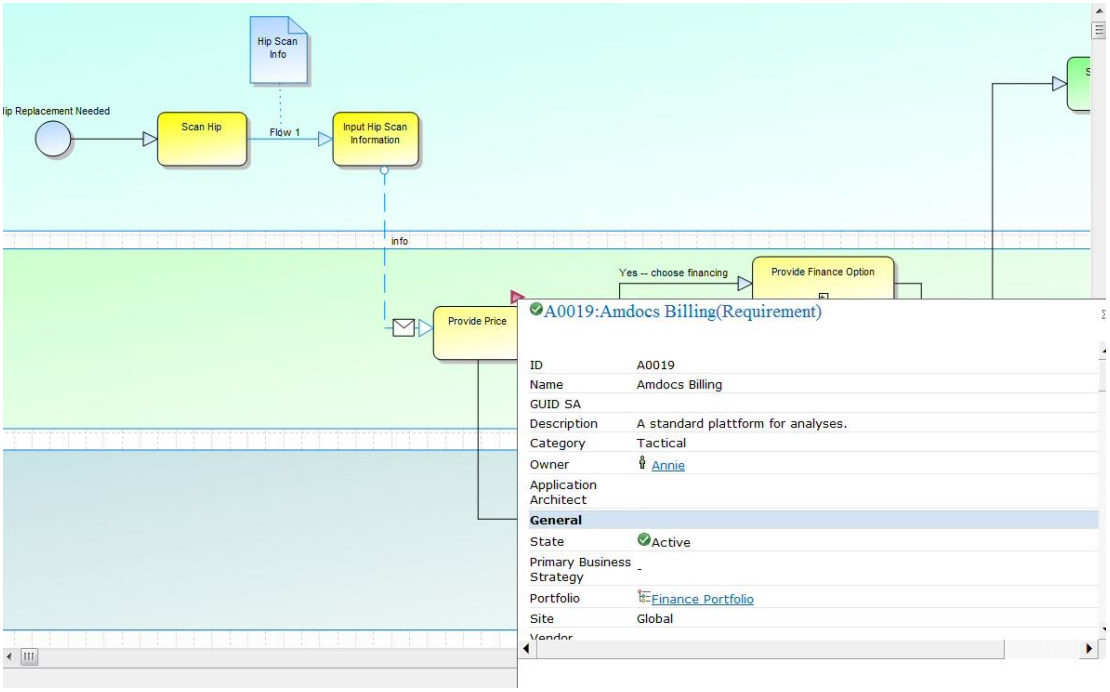


Figure 42. Hovering over an OSLC Link of a Process in System Architect pops up a dialog that shows live summary of a linked artifact in another tool – in this case a requirement in Focal Point. You can click on the link to open the artifact in the other tool.

Simulating and Optimizing Business Processes

You can simulate the business processes modeled with BPMN in the System Architect Simulator add-on. Discrete-event simulation is a powerful technique available to business analysts to analyze their models prior to their realization. A model, when simulated, mimics the operations of the business, by stepping through the events in compressed time while displaying an animated picture of the flow.

Because simulation software keeps track of statistics about model elements, performance metrics can be evaluated by analyzing the model output data. This enables you to avoid expensive mistakes by thoroughly reviewing the efficiency of a business model before actually implementing it.

Simulation helps you answer the following questions:

- What is the projected utilization of our resources?
- Will additional capacity help us in peak periods?
- What is the projected revenue based on our business model?
- What is the longest amount of time a customer will be in the checkout line?
- Can we reduce processing time by adding more resources?
- Which process creates the biggest bottleneck?
- What is the expected ratio of filled orders versus backorders?

Adding Simulation Information to the BPMN Models

A business process model needs to be augmented with sufficient detail in order to be simulated. You will not be simulating every business process in your organization – to do so would be overwhelmingly time consuming. Instead, a typical method to follow is as follows:

1. Determine the business problem to be addressed through simulation.
2. Develop a simulation-ready business process model.
3. Set the scope of the simulation via simulation parameters (ie, how long to run the simulation for, etc)
4. Define the objects that will be processed.
5. Enter the arrival profiles for each simulation object (in the object definition's Object Arrival Profile property).
6. Enter Service Time Profiles for each process (how long a process takes to complete).
7. Specify routing rules in Gateways (probability, shortest queue, time in model, etc).
8. Assign resources to processes (Roles and Resource Allocation – how long is a shift, etc)
9. Associate costs to Objects, Roles, and Processes.
10. Set Service Level Goals.
11. Validate the Simulation model.
12. Run the simulation.
13. View the animation, and analyze the results through reports and charts.

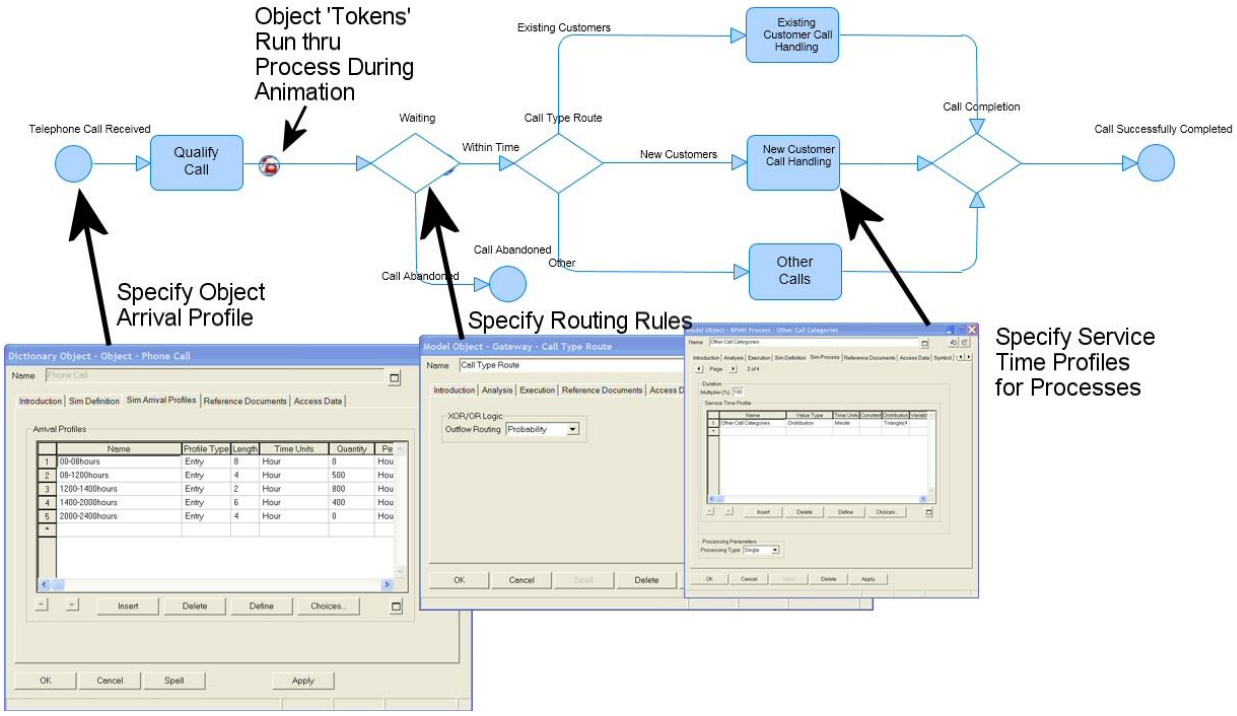


Figure 43. Simulating a BPMN business process diagram.

Mapping to Business Execution Languages

Business Process Modeling Languages are XML-based meta-languages used as a means of modeling business processes in an XML format that can be digested by Business Process Management Systems. BPMS's orchestrate participants (applications, people, partners) into executable, end-to-end processes and close the gap between strategy and business execution.

Both of the standards provide specifications for:

- Dataflow
- Messages
- Events
- Business Rules
- Exceptions
- Transactions (Distributed, Compensating, Synchronous, Asynchronous)

System Architect generates the Business Process Execution Language (BPEL) from BPMN diagrams.

Summary

In summary, System Architect and its SA XT web product, provide strong support for Business Process Analysis via the BPMN notation and associated tool functionality. You can easily model business processes, perform analysis of them via automatic reporting and analytics, add details to selected process to simulate them, and generate the processes to an execution language so they can be automatically orchestrated on a BPMS.

Modeling with BPMN is essential to understanding and communicating business processes across the enterprise. BPMN provides a powerful augmentation to other modeling techniques such as relational data modeling, application and system design with Enterprise Architecture frameworks such as TOGAF, ArchiMate, and DoDAF. These modeling techniques enable a firm to understand and design its enterprise architecture, which enables it to react to change quicker, and in a safer manner.

More Information

For more information on Enterprise Architecture and System Architect, please visit the following resources:

UNICOM Systems, Inc. A Division of UNICOM Global	System Architect product pages on Unicomsi.com	http://unicomsi.com/products/system-architect/
YouTube	System Architect Train on Youtube	https://www.youtube.com/user/SystemArchitectTrain
	System Architect on Twitter	https://twitter.com/unicom_sa
	System Architect on Facebook	https://www.facebook.com/SystemArchitect/
	System Architect on Pinterest	https://www.pinterest.com/systemarchitect/