



Supply Chain Management Use Case Model

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Status of this Document

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1 Introduction

This document presents a high level definition of a Supply Chain Management (SCM) application in the form of a set of Use Cases.

The application being modeled is that of a Retailer offering Consumer electronic goods to Consumers; a typical B2C model. To fulfill orders the Retailer has to manage stock levels in warehouses. When an item in stock falls below a certain threshold, the Retailer must restock the item from the relevant Manufacturer's inventory (a typical B2B model). In order to fulfill a Retailer's request a Manufacturer may have to execute a production run to build the finished goods. In the real world, a Manufacturer would have to order the component parts from its suppliers. For simplicity in this application, we assume this is a manual process which is supported through the use of fax.

Each use case includes a logging call to a monitoring system in order to monitor the activities of the services from a single monitoring service.

The primary goal of the application is to demonstrate all of the scenarios in the WS-I Basic Profile.

2 Glossary

Term	Description
server ID	Identification of the server, including information identifying the implementation provider.

3 Actors

Actor	Description
Consumer	A party that wishes to shop for electrical goods.
Demo User	A party that is exercising the sample application via the WS-I web site.
Demo System	The component of the sample application used to set up and run the demo.
Manufacturing System	A party that manufactures electrical products.
Retailer System	A party that sells electrical products to the general public.

4 Use Case Diagram

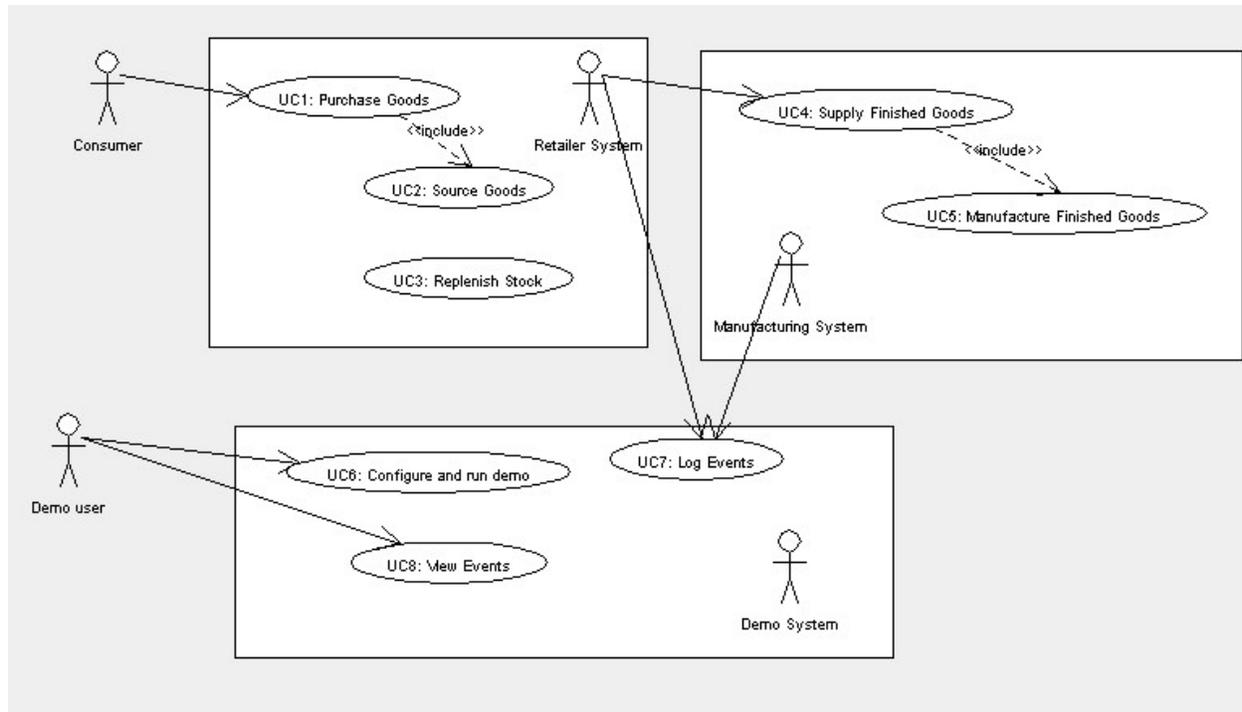


Figure 4-1: Use Case Diagram of the three systems

5 Overall Non-functional Requirements and Assumptions

In order to simplify the design, facilitate delivery of a demonstration application and allow the Working Group to concentrate on Web services and the implementation of the WS-I Basic Profile, the following requirements and assumptions have been defined :

1. A Retailer will have exactly three warehouses (A, B, and C) that it owns.
2. There will be exactly three manufacturers (Brand1, Brand2, and Brand3).
3. Each manufacturer supplies exactly three products (TV, DVD, video camera). Hence there are nine valid products to be offered by a Retailer; Brand1 TV, Brand2 TV, Brand 3TV, Brand1 DVD, etc.
4. All three warehouses stock all nine products.
5. For demo purposes there will be one invalid product Brand4 TV. The product will be visible in the Retailer's catalog but is not stocked (or recognized) by any warehouse.

6. An order may contain multiple line items, where each line item relates to a specific product and quantity required. A product shall not appear more than once in an order.
7. There are no minimum order quantities, and quantities express units of one (true for both Consumer to Retailer and Retailer to manufacturer).
8. Partial shipments of a single product are not supported; either the required quantity of a product in a line item can be fulfilled in full or none are.
9. The requested quantity of a product must be shipped by a single warehouse, or none are shipped i.e. it is not possible to split the shipment of a product across warehouses.
10. Back orders are not supported; either the required quantity of product can be fulfilled in full by a single warehouse (points 7 and 8) or that line item is rejected.
11. The Consumer's information (payment details, address, etc.) are known to the Retailer system via an implicit logon when the demo starts.
12. Payment is not demonstrated, it is assumed that a Consumer has pre-registered credit card details and billing happens out of band.
13. The start of each purchase use case assumes state is set back to predefined values i.e. predefined stock levels, min/max levels, etc.
14. It is assumed that all implementers will implement all use cases in the Retailer and Manufacturing Systems i.e. 1 Retailer with three warehouses (A, B, and C), and three Manufacturers (Brand1, Brand2, and Brand3.)
15. Only implementation team sanctioned implementations can be configured in this demo i.e. these use cases and demo system do not provide a means for third parties to plug in their implementations.
16. A manufacturer will always ship the requested number of a product to a warehouse i.e. we assume it can always manufacture the required amount.
17. To maximize interoperability testing, a non-Roman character set should be used in an appropriate place. The suggestion is for the description of at least one product to be in a non-Roman text.
18. When a purchase request brings a warehouse quantity to below a certain level, the warehouse makes a request of the appropriate manufacturer for more goods.

6 UC1: Purchase Goods

6.1 Definition

Goal of Use Case:	A Consumer goes to the Retailer website with the intent of purchasing Consumer electronic products.
Preconditions:	<ol style="list-style-type: none"> 1. Product Catalog Exists 2. All state (warehouse levels etc) set back to predefined values 3. Payment and address details for Consumer are known
Success Post Conditions:	<ol style="list-style-type: none"> 1. At least one product is shipped 2. The Consumer is returned a Confirmation page outlining which products will be shipped 3. The Retailer has requested the warehouses to ship the available goods. 4. Payment from the Consumer's credit card is triggered.
Failed Post Conditions:	The Consumer is returned an error stating that none of the items in the order can be fulfilled.
Actors:	Retailer System, Demo System, Consumer
Triggers:	This process is started by the Consumer (human interaction)

6.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location

Step	Actor	Description	Branches	
			Condition	Location
1.	Consumer	The Consumer navigates to a shopping page.		
2.	Demo System	The Demo System presents a shopping page, including a catalog of products.		
3.	Consumer	The Consumer enters the number of each product required (i.e. changes the number from zero to a required amount).		
4.	Consumer	Once happy with the quantities, the Consumer submits the order to the Retailer System via the demo system.		
5.	Retailer System	Validate order. An order is rejected completely if it contains a product that does not exist.	No Such Product	ALT1
6.	Retailer System	The Retailer's system determines which warehouse can supply each line item and asks the warehouse to ship them.		UC2
7.	Retailer System	The Retailer System returns the order back to the Consumer indicating which line items have been shipped and which line items could not be shipped.	Nothing Available	ALT2
8.		Trigger payment from the Consumer's pre-registered card (this is a manual process in this system)		
9.		The use case ends		

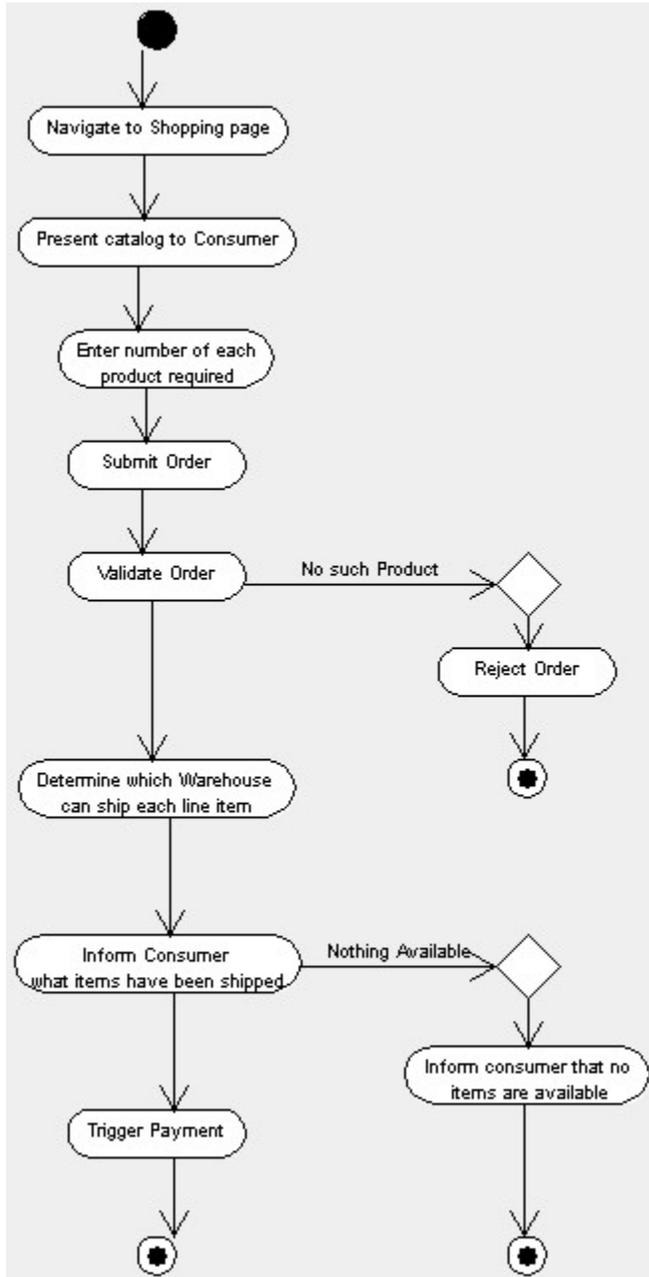
6.3 ALT1: No Such Product

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	The Retailer System returns an error to the Consumer, informing them that they have selected a product that does not exist. The name/brand of the product is reported to them. All items in the order are rejected.		
2.		The use case ends in failure		

6.4 ALT2: Nothing Available

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	The Retailer System informs the Consumer that none of the items in the order can be shipped as no warehouse has the required quantity.		
2.		The use case ends in failure		

6.5 Activity Diagram



6.6 Non-functional Requirements and assumptions

At least one invalid product should be in the catalog displayed to the Consumer.

6.7 Open Issues

None.

7 UC2: Source Goods

7.1 Definition

Goal of Use Case:	To locate ordered goods in a warehouse and request shipment
Preconditions:	none
Success Post Conditions:	<ol style="list-style-type: none"> 1. For each line item in the order, a warehouse is selected that has the available quantity and that warehouse ships the goods. 2. For line items that are accepted, the inventory levels in the shipping warehouse for that product are decreased by the quantity in the line item.
Failed Post Conditions:	There is no stock availability in any Warehouse for all of the line items in the order.
Actors:	Retailer System
Triggers:	Receipt of order from Consumer.

7.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	Present the list of line items to warehouse A and request A to ship those items it has available.		ALT 1
2.	Retailer System	Record the line items that warehouse A is shipping and decrement A's stock levels for the items it will ship.	Warehouse A can't fulfill some items	ALT 1
3.	Retailer System	The use case ends		

7.3 ALT 1: Warehouse A can't fulfill some items

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	For the items that warehouse A could not ship, request warehouse B to ship those items it has available.		
2.	Retailer System	Record the line items that warehouse B is shipping, and decrement B's stock levels for the items it will ship.	Warehouse B can't fulfill some items	ALT 2
3.	Retailer System	The use case ends		

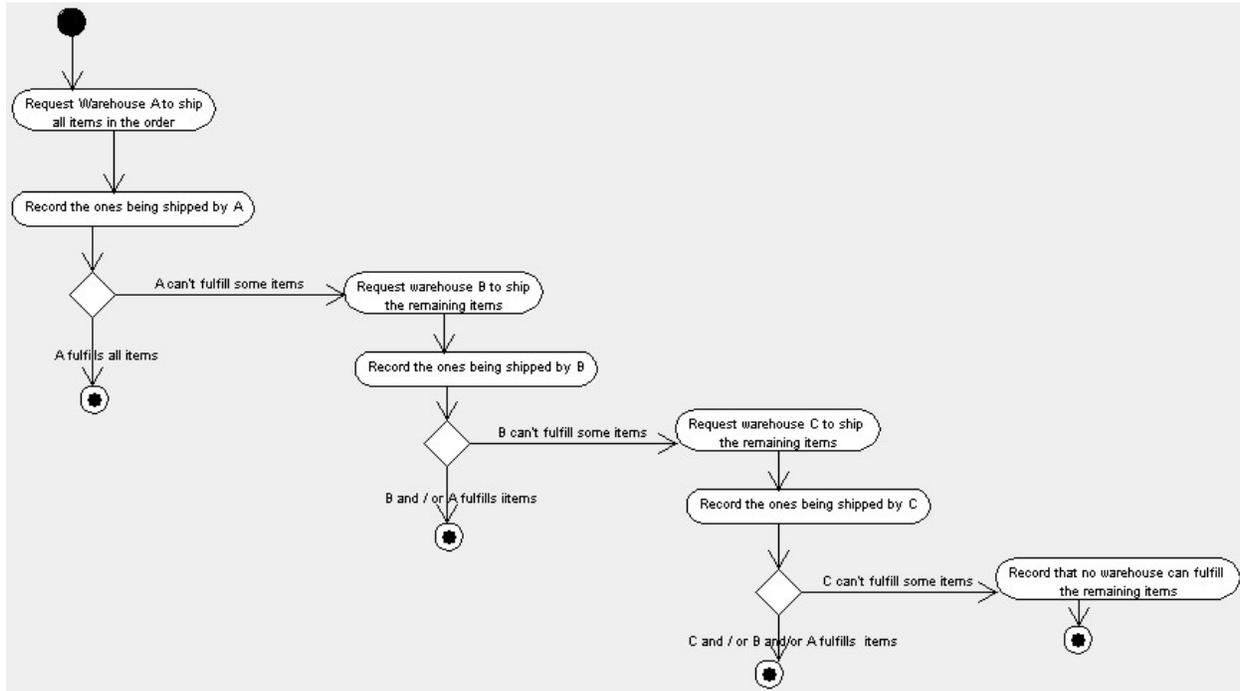
7.4 ALT 2: Warehouse B can't fulfill some items

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	For the items that warehouse B could not ship, request warehouse C to ship those items it has available.		
2.	Retailer System	Record the line items that warehouse C is shipping, and decrement C's stock levels for the items it will ship.	Warehouse C can't fulfill some items	ALT 3
3.	Retailer System	The use case ends		

7.5 ALT 3: Insufficient quantity in warehouse C

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	For the items that are left, record that no warehouse can ship those items		
2.	Retailer System	The use case ends.		

7.6 Activity Diagram



7.7 Non-functional Requirements and Assumptions

None.

7.8 Open Issues

None.

8 UC3: Replenish Stock

8.1 Definition

Goal of Use Case:	The Retailer System orders goods from a manufacturer to replenish stock for a particular product in a particular warehouse.
Preconditions:	The inventory level of a product in a particular warehouse has fallen below its minimum level
Success Post Conditions:	The inventory level of the product in a particular warehouse is at the maximum level.
Failed Post Conditions:	The inventory level of the product in a particular warehouse is not updated and remains under stocked.
Actors:	Retailer System, Manufacturing System
Triggers:	Triggered internally in the Retailer System for each warehouse that detects the pre-condition.

8.2 Main Success Path

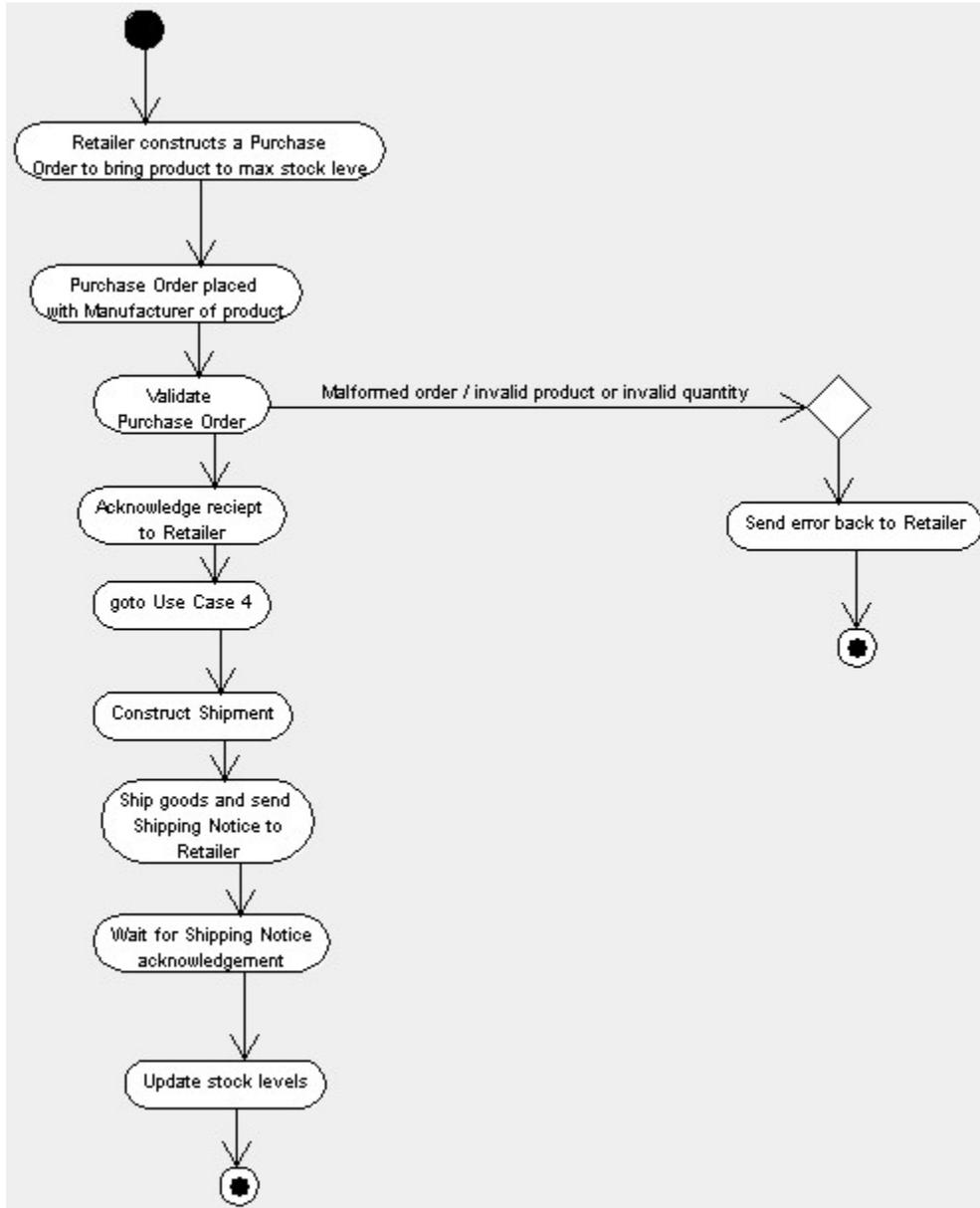
Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System	The Retailer System constructs a purchase order for the product with the necessary quantity to bring the product up to its maximum level for that warehouse.		
2.	Retailer System	Place Order. The Retailer system submits the purchase order to the relevant Manufacturing System (Brand1, Brand2 or Brand3) as dictated by the product.		
3.	Manufacturing System	Validate Order	Malformed order or invalid product or invalid	ALT 1

Step	Actor	Description	Branches	
			Condition	Location
			quantity	
4.	Manufacturing System	Send an acknowledgement back to the Retailer System		
5.	Manufacturing System	The Manufacturing System constructs a shipment of the requested quantity of product.	unconditional	UC4
6.	Manufacturing System	The Manufacturing System ships the goods and sends shipping notice to the warehouse. The shipping notice is the business level reply to the purchase order.		
7.	Retailer System	When the Retailer System receives the shipping notice, an acknowledgement is sent back to the Manufacturing System.		
8.	Retailer System	Upon receipt of the shipment, the warehouse updates its product inventory level based on receipt of the shipped order.		

8.3 ALT1: Malformed Order or No Such Product or Invalid quantity

Step	Actor	Description	Branches	
			Condition	Location
1.	Manufacturing System	The Manufacturing System rejects the order either due to a malformed order, a request for a product that doesn't exist, or a request for an invalid quantity (such as zero or more than the max level for that product). A reply, containing an application error message/code, is sent back to the Retailer System.		
2.		The use case ends in failure		

8.4 Activity Diagram



8.5 Non-functional Requirements and Assumptions

None.

8.6 Open Issues

None.

9 UC4: Supply Finished Goods

9.1 Definition

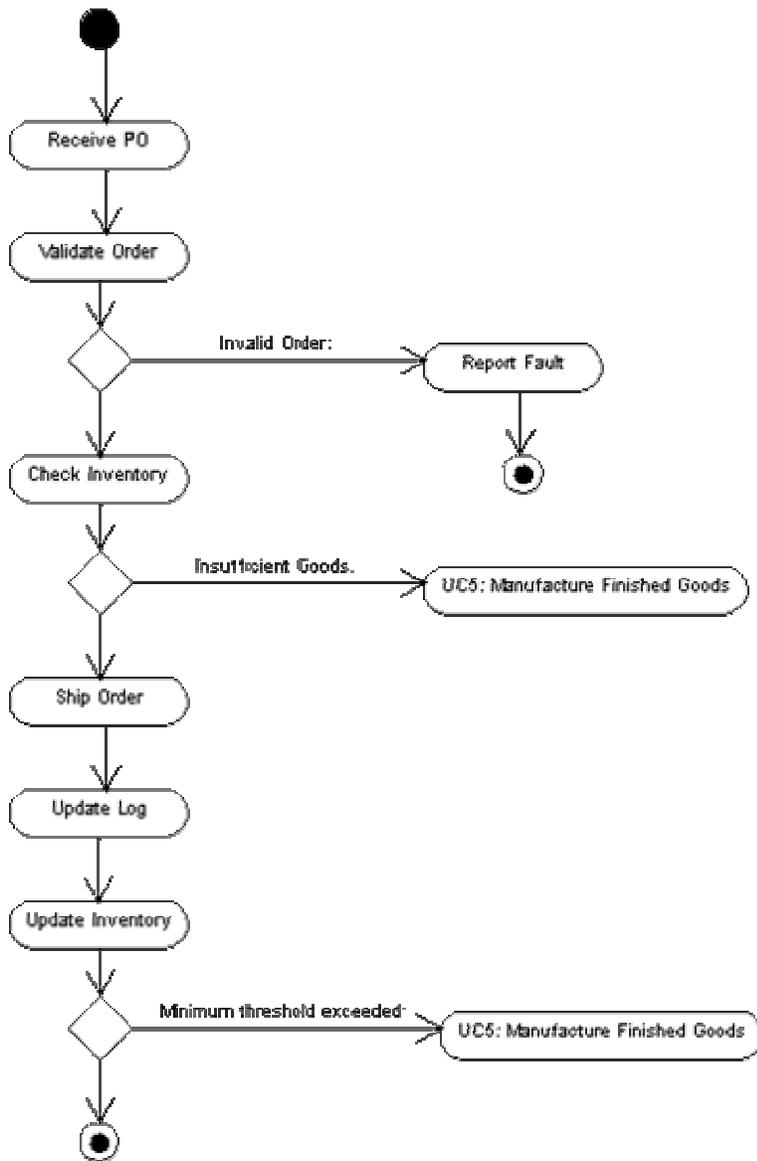
Goal of Use Case:	A manufacturer processes a purchase order from a warehouse.
Preconditions:	Min < Manufacturer's Finished Goods Inventory Level < Max
Success Post Conditions:	The purchase order is fulfilled and finished goods are shipped to Retailer's warehouse.
Failed Post Conditions:	The purchase order is not fulfilled.
Actors:	Manufacturing System, Retailer System
Triggers:	Receipt of a purchase order.

9.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Manufacturing System	Check Inventory. For each item in the purchase order, the manufacturer checks its finished goods level to determine if it can fulfill the order.	Insufficient goods	UC5
2.	Manufacturing System	Ship Order. The manufacturer ships all the finished goods to the retailer's warehouse and sends the warehouse a shipping notification. A single shipping notice is sent even if the purchase order contained multiple items.		

Step	Actor	Description	Branches	
			Condition	Location
3.	Manufacturing System	Update Inventory. The manufacturer updates its finished goods inventory level based on the quantity being shipped in step 3. If the minimum finished goods threshold is exceeded, manufacture more, which is defined by UC5.	Minimum threshold exceeded	UC5

9.3 Activity Diagram



9.4 Non-functional Requirements and Assumptions

No multi-line orders are accepted i.e. an order relates to a single product (finished good).

9.5 Open Issues

None.

10 UC5: Manufacture Finished Goods

10.1 Definition

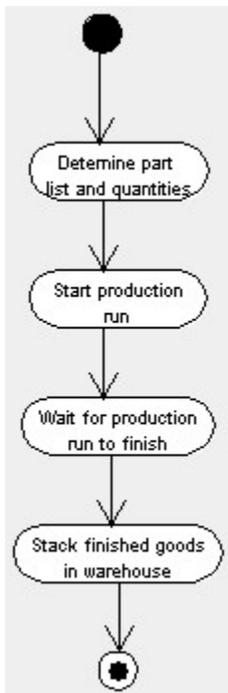
Goal of Use Case:	The goal of this use case is to initiate a production run for the purposes of replenishing the stock levels of a specified product.
Preconditions:	Stock levels for the manufactured product are not sufficient to meet a purchase request or stock levels have fallen below the minimum level for the product. The necessary parts and their quantities for a production run are available.
Success Post Conditions:	The stock level for the manufactured product will be at the maximum level.
Failed Post Conditions:	Stock levels will be left unchanged.
Actors:	Manufacturing System
Triggers:	Manufacturer is requested to supply finished goods

10.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Manufacturing System	Determine part list and quantities required to manufacture product. Quantity to manufacture = order quantity – current inventory level + max inventory level		
2.	Manufacturing System	Start production run.		

Step	Actor	Description	Branches	
			Condition	Location
3.	Manufacturing System	Wait for production run to finish.		
4.	Manufacturing System	Stack finished goods in (manufacturer's) warehouse.		

10.4 Activity Diagram



10.5 Non-functional Requirements and Assumptions

1. A pre-defined unit production time exists for each product.

2. Each production run takes exactly the calculated time to complete.
3. There is an unlimited manufacturing capability, meaning that any requested quantity can be manufactured.

10.6 Open Issues

None.

11 UC6: Configure & Run Demo

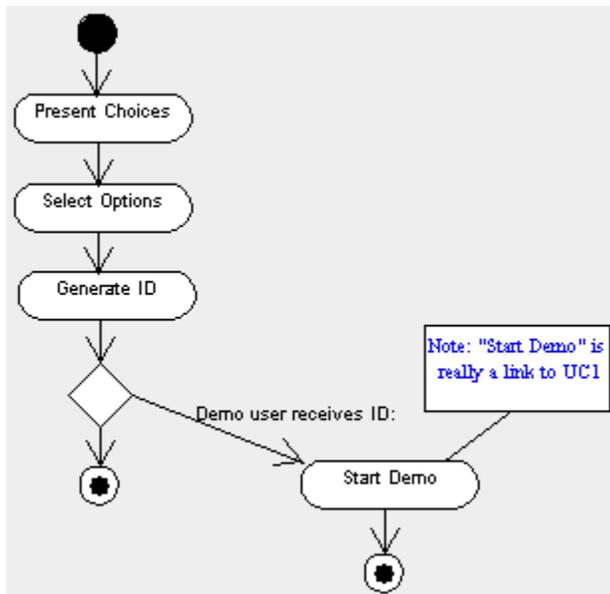
11.1 Definition

Goal of Use Case:	Allow the person operating the demo (a.k.a. demo user) to select from among a list of different, equivalent web service implementations.
Preconditions:	There is more than one implementation of each web service to choose from. Each web service that is offered has been approved by WS-I's Sample Applications Working Group.
Success Post Conditions:	A configuration is selected and the demo is started.
Failed Post Conditions:	1. Incorrect or incomplete configuration selected 2. Endpoints not available
Actors:	Demo User, Demo System
Triggers:	Demo User navigates to the WS-I demo web page.

11.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Demo System	Present Choices. The system presents the demo user with a number of configuration options. It is assumed that the system will not present any invalid options, and that all combinations of options are valid.		
2.	Demo User	Select Options. All options will have randomly generated default selections. The demo user selects implementations of individual web services. Each web service in the demo will be implemented by one or more vendors.		
3.	Demo System	Generate ID. The Demo system generates a unique ID which is used to retrieve the log entries for different (concurrent) demo users.		
4.	Demo User	Start Demo. The demo user records the generated ID and acknowledges receipt of the ID to the system. This acknowledgement causes the system to start the demo, branching to UC1.	Demo user receives ID.	UC1

11.3 Activity Diagram



11.4 Non-functional Requirements and Assumptions

Use UDDI to discover the web service implementations to be presented to the Demo User (step 1, main success scenario).

11.5 Open Issues

None.

12 UC7: Log Events

12.1 Definition

Goal of Use Case:	<p>The goal of this use case is to log events relating to the execution of other use cases for the purpose of enabling a Demo User to view these events. In this way the Demo User will be able to see which web services have been consumed by a given operation and the outcomes of those web services.</p> <p>The events should be able to be viewed at any time. This may mean that for asynchronous operations one or more web services may still be executing.</p>
Preconditions:	none
Success Post Conditions:	Event is logged to the repository.
Failed Post Conditions:	<ol style="list-style-type: none"> 1. An entry will be added to the log, which will include an error code and description outlining the cause of the failure. Or 2. Repository is not available
Actors:	Any web service system as Initiator, Demo System.
Triggers:	Initiation, termination or any significant point in the execution of one of the core use cases.

12.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Retailer System or Manufacturing System	Sends a request to the Demo System to log events.		
2.	Demo System	Receives request to log events.		
3.	Demo System	Validate request.	Invalid request	ALT 1
4.	Demo System	Logs events, including user ID, initiating server ID, responding service ID, unique demo ID, use case ID, date/time of operation and other transaction details. Transaction details can be passed as a long string.	Repository not available	ALT 2

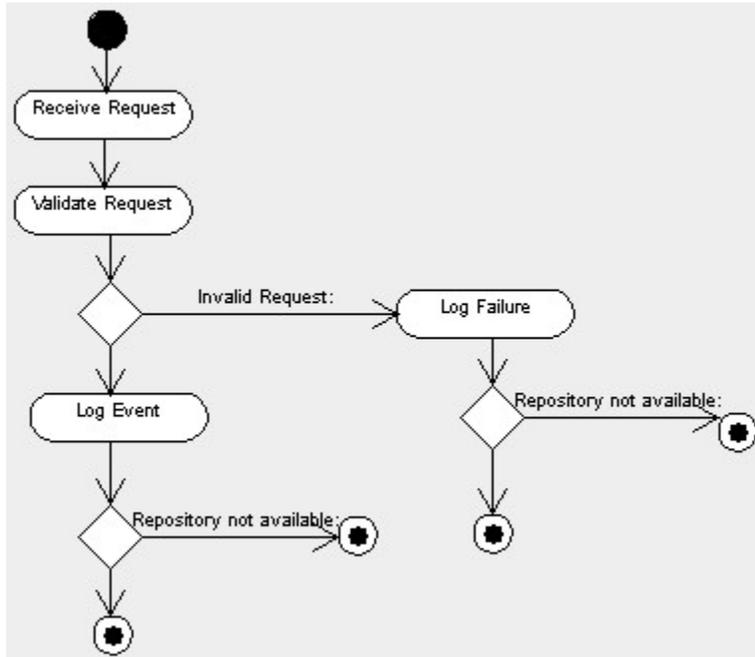
12.3 ALT 1: Invalid Data

Step	Actor	Description	Branches	
			Condition	Location
1.	Demo System	Log reason for failure (e.g. XML fragment does not conform to schema)	Repository not available	ALT 2
2.		Terminate process.		

12.4 ALT 2: Repository not available

Step	Actor	Description	Branches	
			Condition	Location
1.		Terminate process.		

12.5 Activity Diagram



12.6 Non-functional Requirements and Assumptions

Call to log statistics will use the Document Style One-way Message Scenario.

12.7 Open Issues

None.

13 UC8: View Events

13.1 Definition

Goal of Use Case: The goal of this use case is to allow the Demo User to view the log of events that occurred as a result of running the demo.

Preconditions: Events related to the demo user are clearly marked in the log.

- Success Post Conditions:** Events are displayed
- Failed Post Conditions:** Events cannot be located
- Actors:** Demo User, Demo System
- Triggers:** Demo User navigates to an appropriate place in the user interface.

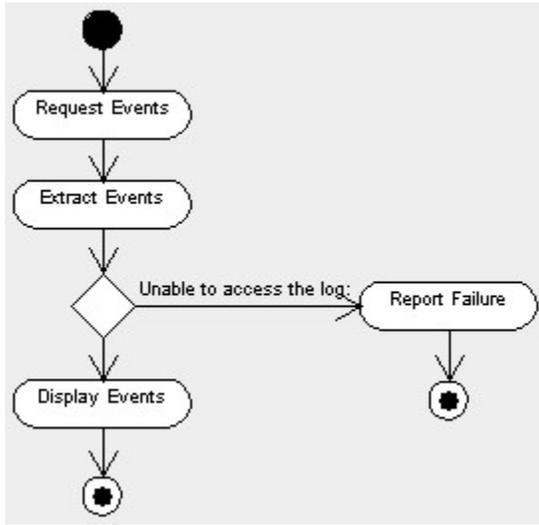
13.2 Main Success Path

Step	Actor	Description	Branches	
			Condition	Location
1.	Demo User	The Demo User requests the display of events related to a demo.		
2.	Demo System	Extracts from the log all the entries related to the latest demo run by the Demo User.	Unable to access the log	ALT 1
3.	Demo System	The Demo System returns to the Demo User a list of the relevant events for them to view.		

13.3 ALT 1: Unable to access the log

Step	Actor	Description	Branches	
			Condition	Location
1.	Demo System	Report back to the Demo User that the events cannot be displayed.		
2.		The use case ends unsuccessfully		

13.4 Activity Diagram



13.5 Non-functional Requirements and Assumptions

None.

13.6 Open Issues

None.