

Table 1.Create Ontology

Step 3.1			Step 3.2	Step 3.3	Step 3.4		
Step 3.1.1	Step 3.1.2	Step 3.1.3	<u>Active Concept:</u> Sale Quay Side Crane Stack Crane Security Staff Transport <u>Non-active Concept:</u> Start Anchorage Area Ship Tug Terminal Stacking Area Gate Importer Exporter	<u>Concept:</u> <u>Property:</u> <u>Value type:</u> <i>This step is repeated for all the properties in the OP Ontology.</i>	<u>Object property with Domain Range:</u>		
<u>Concepts:</u>	<u>Datatype Properties/slots:</u>	<u>Object Property:</u>			Property	Domain	Range
Place		Enters			Start Sailing	Sail	-Start -Ship
- Start	Cargo	Import			Leave_Terminal	Sail	-Make Way -Terminal
- Destination	Importer	Reaches			Reaches	Sail	Anchorage Area
-- Anchorage Area	Starts	Exports			Tied With Lines	Sail	Tug
Ship Types	Export Plan	Allow to go			Berth	Sail	Terminal
-Ship	Tug	Lift stack			Export	Transport	-Cargo -Exporter
-Tugs	Staff	Exit			Import	Transport	-Cargo -Importer
Sail	Ship Name	Load			Enters	Transport	Gate
Terminal	TransCargo	Place Stack			Exits	Transport	Gate
Quay Side Crane	Area	Discharge			Duty on	Security Staff	-Gate
Stacking Area	Terminal	Place port cargo			Checks Cargo	Security Staff	-Gate -Port
Stack Crane	Cargo Plan	Leave terminal			Allow to Go	Security Staff	-Gate -Port
Port	Ship Start	Tied With Lines			Place	Stack Crane	Stacking Area
Security Staff	Ship Tug	Lift port cargo			Discharge	Stack Crane	Stacking Area
Gate	Ship Types	Start Sailing			Lift	-Stack Crane -Quay Crane	Port
Transport	Crane Cargo	Berth			Place	-Stack Crane -Quay Crane	Port
-Lorries	Transport	Duty on			Load	Quay Crane	Terminal
-Trains	Ship	Checks Cargo			Unload	Quay Crane	Terminal
Exp-Imp	Ship Terminal						
-Exporter	Exporter						
-Importer	Crane						

Table 2.Generate Class Diagram from OWL Ontology

Step 4.1	Step 4.2	Step 4.3	Step 4.4																																																																																
<p><u>Classes:</u></p> <p>Places</p> <p>-Start</p> <p>-Destination</p> <p>--Anchorage Area</p> <p>Make Way</p> <p>Ships</p> <p>-Ships Type</p> <p>-Tug</p> <p>Sail</p> <p>Terminal</p> <p>Quay Side Crane</p> <p>Port</p> <p>Stack Cranes</p> <p>Stacking Area</p> <p>Security Staff</p> <p>Gate</p> <p>Cargo</p> <p>Transport</p> <p>-Lorries</p> <p>-Trains</p> <p>Exp-Imp</p> <p>-Exporter</p> <p>-Importer</p> <p><u>Concrete Classes:</u></p> <p>Sail</p> <p>Quay Side Crane</p> <p>Stack Crane</p> <p>Security Staff</p> <p>Transport</p> <p><u>Association Classes:</u></p> <p>Start</p> <p>Anchorage Area</p> <p>Ships</p> <p>Tugs</p> <p>Make Way</p> <p>Terminal</p> <p>Port</p>	<p>Class:</p> <p>Attribute:</p> <table><tr><td>Start</td></tr><tr><td>-start</td></tr><tr><td>-ship Start</td></tr></table> <table><tr><td>Ships</td></tr><tr><td>-cargo Plan</td></tr><tr><td>-Export Plan</td></tr><tr><td>-ship</td></tr><tr><td>-ship Name</td></tr><tr><td>-Ship Start</td></tr><tr><td>-Ship Terminal</td></tr><tr><td>-Ship Tug</td></tr><tr><td>-Ship Type</td></tr></table> <table><tr><td>Tug</td></tr><tr><td>-Tug</td></tr><tr><td>-Tug Ship</td></tr></table> <table><tr><td>Terminal</td></tr><tr><td>-Terminal</td></tr><tr><td>-Ship Terminal</td></tr></table> <table><tr><td>Quay Crane</td></tr><tr><td>-Crane</td></tr><tr><td>-Crane Cargo</td></tr></table> <table><tr><td>Stack Crane</td></tr><tr><td>-Crane</td></tr><tr><td>-Crane Cargo</td></tr></table> <table><tr><td>Stack Area</td></tr><tr><td>-Area</td></tr></table>	Start	-start	-ship Start	Ships	-cargo Plan	-Export Plan	-ship	-ship Name	-Ship Start	-Ship Terminal	-Ship Tug	-Ship Type	Tug	-Tug	-Tug Ship	Terminal	-Terminal	-Ship Terminal	Quay Crane	-Crane	-Crane Cargo	Stack Crane	-Crane	-Crane Cargo	Stack Area	-Area	<p><u>Class (Operation/function) & Associations:</u></p> <table><tr><th colspan="2">Sail</th></tr><tr><th>Operation</th><th>Association</th></tr><tr><td>-Reach</td><td>-Anchorage</td></tr><tr><td>-Berth</td><td>-Terminal</td></tr><tr><td>-Start Sailing</td><td>-Start</td></tr><tr><td>-leave Terminal</td><td>-Make Way</td></tr><tr><td>-Tied with Lines</td><td>-Anchorage</td></tr><tr><td></td><td>-Tug</td></tr></table> <table><tr><th colspan="2">Quay Side Crane</th></tr><tr><th>Operation</th><th>Association</th></tr><tr><td>-Load</td><td>-Terminal</td></tr><tr><td>-Discharge</td><td>-Terminal</td></tr><tr><td>-lift Port Cargo</td><td>-Port</td></tr><tr><td>-Place Port Cargo</td><td>-Port</td></tr></table> <table><tr><th colspan="2">Stack Crane</th></tr><tr><th>Operation</th><th>Association</th></tr><tr><td>-Lift Stack</td><td>-Stacking Area</td></tr><tr><td>-Place Stack</td><td>-Stacking Area</td></tr><tr><td>-lift Port Cargo</td><td>-Port</td></tr><tr><td>-Place Port Cargo</td><td>-Port</td></tr></table> <table><tr><th colspan="2">Security Staff</th></tr><tr><th>Operation</th><th>Association</th></tr><tr><td>-duty on</td><td>-Gate</td></tr><tr><td>-Checks Cargo</td><td>-Gate</td></tr><tr><td></td><td>-Port</td></tr><tr><td>-allow to go</td><td>-Gate</td></tr><tr><td></td><td>-Port</td></tr></table>	Sail		Operation	Association	-Reach	-Anchorage	-Berth	-Terminal	-Start Sailing	-Start	-leave Terminal	-Make Way	-Tied with Lines	-Anchorage		-Tug	Quay Side Crane		Operation	Association	-Load	-Terminal	-Discharge	-Terminal	-lift Port Cargo	-Port	-Place Port Cargo	-Port	Stack Crane		Operation	Association	-Lift Stack	-Stacking Area	-Place Stack	-Stacking Area	-lift Port Cargo	-Port	-Place Port Cargo	-Port	Security Staff		Operation	Association	-duty on	-Gate	-Checks Cargo	-Gate		-Port	-allow to go	-Gate		-Port	<p>Association:</p> <p>Navigable end:</p> <p>Non Navigable end:</p> <p>Cardinality:</p> <p><i>This step is repeated for all the cardinalities in the OP Ontology</i></p>
Start																																																																																			
-start																																																																																			
-ship Start																																																																																			
Ships																																																																																			
-cargo Plan																																																																																			
-Export Plan																																																																																			
-ship																																																																																			
-ship Name																																																																																			
-Ship Start																																																																																			
-Ship Terminal																																																																																			
-Ship Tug																																																																																			
-Ship Type																																																																																			
Tug																																																																																			
-Tug																																																																																			
-Tug Ship																																																																																			
Terminal																																																																																			
-Terminal																																																																																			
-Ship Terminal																																																																																			
Quay Crane																																																																																			
-Crane																																																																																			
-Crane Cargo																																																																																			
Stack Crane																																																																																			
-Crane																																																																																			
-Crane Cargo																																																																																			
Stack Area																																																																																			
-Area																																																																																			
Sail																																																																																			
Operation	Association																																																																																		
-Reach	-Anchorage																																																																																		
-Berth	-Terminal																																																																																		
-Start Sailing	-Start																																																																																		
-leave Terminal	-Make Way																																																																																		
-Tied with Lines	-Anchorage																																																																																		
	-Tug																																																																																		
Quay Side Crane																																																																																			
Operation	Association																																																																																		
-Load	-Terminal																																																																																		
-Discharge	-Terminal																																																																																		
-lift Port Cargo	-Port																																																																																		
-Place Port Cargo	-Port																																																																																		
Stack Crane																																																																																			
Operation	Association																																																																																		
-Lift Stack	-Stacking Area																																																																																		
-Place Stack	-Stacking Area																																																																																		
-lift Port Cargo	-Port																																																																																		
-Place Port Cargo	-Port																																																																																		
Security Staff																																																																																			
Operation	Association																																																																																		
-duty on	-Gate																																																																																		
-Checks Cargo	-Gate																																																																																		
	-Port																																																																																		
-allow to go	-Gate																																																																																		
	-Port																																																																																		

Stacking Area Gate Importer Exporter Cargo	Security Staff	<table><tr><th colspan="2">Transport</th></tr><tr><th>Operation</th><th>Association</th></tr><tr><td>-Enter</td><td>-Gate</td></tr><tr><td>-Exit</td><td>-Gate</td></tr><tr><td>-Export</td><td>-Exporter -Cargo</td></tr><tr><td>-Import</td><td>-Importer -Cargo</td></tr></table>	Transport		Operation	Association	-Enter	-Gate	-Exit	-Gate	-Export	-Exporter -Cargo	-Import	-Importer -Cargo
	Transport													
	Operation		Association											
	-Enter		-Gate											
	-Exit		-Gate											
	-Export		-Exporter -Cargo											
	-Import		-Importer -Cargo											
	-Staff													
	Transport													
	-transport													
-trans Cargo														
Cargo														
-cargo														
-transCargo														
-crane Cargo														
-cargo Plan														

Table 3.Create CPN model using Onto-UML to CPN mapping scheme

<u>colset:</u>	<u>product colset:</u>	<u>variables:</u>	<u>Substitution Transition:</u>	<u>Places:</u>	<u>Starting Place:</u>	Input Arcs: Transition:	<u>Arc Expression</u> <u>s:</u>	<u>Subpage</u>	<u>Transitions:</u>	Input Arcs: Transition:	Output Arcs: Inputport: Transition:	Manual addition of Intermediate places
Exporter Importer Transport Cargo Staff Start Terminal Ship Name Tug Ship Type Crane Area	TransCargo Ship Ship Tug Ship Termianl Ship Start CargoPlan CraneCargo ExportPlan StackArea	exp imp transCargo cargo transport staff St shipStart ship terminal tug shipTug shipTerminal name shipType cargoPlan crane craneCargo exportPlan area stackArea	Sail Quay Crane StackCrane Security Staff Transport	Ship Start Make way Anchorage Tug Terminal Port Stacking Area Gate Cargo Exporter Importer	Start		. St Ship shipStart tug shipType terminal craneCargo (name,exp) transCargo exp imp	<div>Sea Side</div> <div>Input: Start Ship</div> <div>Output MakeWay</div> <div>I/O: Anchorag e Tug Terminal</div> <div>Quay Crane</div> <div>I/O: Terminal Port</div> <div>Quay Crane</div> <div>I/O: Stack_Ar ea Port</div> <div>Security Staff</div> <div>I/O: Gate Port</div> <div>Transpo rt</div> <div>I/O: Gare Exporter</div>	<div>Person Subpage</div> <div>Sea Side</div> <div>-Reach</div> <div>-Berth</div> <div>-Start Sailing</div> <div>-leave Terminal</div> <div>-Tied with Lines</div> <div>Quay Crane</div> <div>-Load</div> <div>Discharg e</div> <div>-lift Port Cargo</div> <div>-Place Port Cargo</div> <div>-Load</div> <div>Transpo rt</div> <div>-Enter</div> <div>-Exit</div> <div>-Export</div> <div>-Import</div> <div>-Enter</div> <div>Security Staff</div> <div>-duty on</div> <div>-Checks Cargo</div> <div>-allow to go</div>	<i>This step is repeated for all Object Property of Particular active concepts.</i>	<i>This step is repeated for all Object Property of Particular active concepts.</i>	