

## Corticon #1 Port Clearance (As Specified)

### Decision Table View

Below are each of the rules represented as decision tables (using the natural language view and the implementation view)

The completeness checker detected missing rules and these have been added to the decision tables.

The rules as specified in the original document will not work correctly without these additions.

No attempt has been made in this example to restructure the rules to reduce the number of rule sheets.

This will be the subject of a separate document.

A ship's hold contains remainders of cargo if the residual cargo measurement is higher than 0.5 mg dry weight per cm<sup>2</sup>.

Conditions	1	2
Is the residual cargo measurement over 0.5 dry weight per cm <sup>2</sup> ?	T	F
Actions		
Post Message(s)		
The hold does have remainders of cargo.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The hold does not have remainders of cargo.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Hold Reminders.ers			
Conditions	1	2	
a Ship.hold.residualCargoMeasurement > 0.5	T	F	
b			
Actions			
Post Message(s)			
A Ship.hold.hasRemainersOfCargo = T	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
B Ship.hold.hasRemainersOfCargo = F	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
c			
Overrides			
Rule Statements			
Ref	Post	Alias	Text
1	Warning	Ship	A ship's hold contains remainders of cargo if the residual cargo measurement is higher than 0.5 mg dry weight per cm <sup>2</sup> .
2	Info	Ship	A ship's hold does not contain remainders of cargo if the residual cargo measurement is higher than 0.5 mg dry weight per cm <sup>2</sup> .

The **hold** of a **ship** must be considered clean if the **hold** does not contain **remainders of cargo**

Conditions	1	2
Does the hold have remainders of cargo?	F	T

Actions	1	2
Post Message(s)		
The hold is considered clean	<input checked="" type="checkbox"/>	
The hold is not considered clean since it has remainders		<input checked="" type="checkbox"/>

Hold Clean.ers

Conditions	1	2
a Ship.hold.hasRemainersOfCargo	F	T
b		

Actions	1	2
Post Message(s)		
A Ship.hold.isClean = T	<input checked="" type="checkbox"/>	
B Ship.hold.isClean = T		<input checked="" type="checkbox"/>
C		

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	The hold of a ship must be considered clean if the hold does not contain remainders of cargo
2	Warning	Ship	The hold of a ship must be considered NOT clean if the hold does contain remainders of cargo

A ship must be categorized as small if the total length of the ship is less than 80 meters

Conditions	1	2
Is the length of the ship under 80 meters?	T	F

Actions	1	2
Post Message(s)		
The ship is considered small	<input checked="" type="checkbox"/>	
The ship is not considered small		<input checked="" type="checkbox"/>

Size Small.ers ✖

Conditions		1	2
a	Ship.totalLength < 80	T	F
b			

Actions		1	2
Post Message(s)			
A	Ship.isSmall=T	<input checked="" type="checkbox"/>	
B	Ship.isSmall=F		<input checked="" type="checkbox"/>
C			

*Overrides*

Rule Statements ✖

Ref	Post	Alias	Text
1	Info	Ship	A ship must be categorized as small if the total length of the ship is less than 80 meters
2	Info	Ship	A ship must NOT be categorized as small if the total length of the ship is at least 80 meters

A ship must be categorized as large if the total length of the ship is at least 80 meters

Conditions	1	2
Is the length of the ship at least 80 meters?	T	F

Actions	1	2
Post Message(s)	<input type="checkbox"/>	<input type="checkbox"/>
The ship is considered large	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The ship is not considered large	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Size Large.ers

Conditions	1	2
a Ship.totalLength >= 80	T	F
b		

Actions	1	2
Post Message(s)	<input type="checkbox"/>	<input type="checkbox"/>
A Ship.isLarge=T	<input checked="" type="checkbox"/>	<input type="checkbox"/>
B Ship.isLarge=F	<input type="checkbox"/>	<input checked="" type="checkbox"/>
C		

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	A ship must be categorized as large if the total length of the ship is at least 80 meters
2	Info	Ship	A ship must NOT be categorized as large if the total length of the ship is under 80 meters

A ship only meets the safety requirements for large unloaded ships if the ship complies with all of the following:

- the ship is categorized as large
- the hold of the ship is clean
- the hold of the ship is double hulled.

Conditions	1	2	3
Is the ship considered Large?	T	T	T
Is the ship's hold clean?	T	F	-
Is the ship double hulled?	T	-	F

Actions	1	2	3
Post Message(s)			
The ship does meet the safety requirements for large ships	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The ship does not meet the safety requirements for large ships	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Safety Large.ers

Conditions	1	2	3
a Ship.isLarge	T	T	T
b Ship.hold.isClean	T	F	-
c Ship.isDoubleHulled	T	-	F

Actions	1	2	3
Post Message(s)			
A Ship.meetsSafetyRequirementsLarge=T	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B Ship.meetsSafetyRequirementsLarge=F	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	A ship only meets the safety requirements for large unloaded ships if the ship complies with all of the following: - the ship is categorized as large - the hold of the ship is clean
2	Warning	Ship	The hold is not clean so does not meet the safety requirements
3	Warning	Ship	The ship is not double hulled so does not meet the safety requirements (for large ships)

- A **ship** only meets the **safety requirements for small unloaded ships** if the **ship** complies with all of the following:
- the **ship** is categorized as **small**
  - the **hold** of the **ship** is clean

Conditions	1	2
Is the ship considered small?	T	T
Is the ship's hold clean?	T	F

Actions	1	2
Post Message(s)		
The ship does meet the safety requirements for small ships	<input checked="" type="checkbox"/>	
The ship does not meet the safety requirements for small ships		<input checked="" type="checkbox"/>

Safety Small.ers

Conditions		1	2
a	Ship.isSmall	T	T
b	Ship.hold.isClean	T	F

Actions		1	2
Post Message(s)			
A	Ship.meetsSafetyRequirementsSmall=T	<input checked="" type="checkbox"/>	
B	Ship.meetsSafetyRequirementsSmall=F		<input checked="" type="checkbox"/>
C			

Overrides

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	A ship only meets the safety requirements for small unloaded ships if the ship complies with all of the following:
2	Warning	Ship	Hold is not clean so does not meet the safety requirements

A ship only meets the safety requirements for unloaded ships if the ship complies with at least one of the following:

- the ship meets the safety requirements for small unloaded ships
- the ship meets the safety requirements for large unloaded ships.

Conditions	1	2	3
Does the ship meet the safety requirements for large ships?	T	-	F
Does the ship meet the safety requirements for small ships?	-	T	F

Actions	1	2	3
Post Message(s)			
The ship does meet the safety requirements	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
The ship does not meet the safety requirements			<input checked="" type="checkbox"/>

Conditions	1	2	3
a Ship.meetsSafetyRequirementsLarge	T	-	F
b Ship.meetsSafetyRequirementsSmall	-	T	F

Actions	1	2	3
Post Message(s)			
A Ship.meetsSafetyRequirementsOverall = T	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
B Ship.meetsSafetyRequirementsOverall = F			<input checked="" type="checkbox"/>
C			

Ref	Post	Alias	Text
1:2	Info	Ship	A ship only meets the safety requirements for unloaded ships if the ship complies with at least one of the following: - the ship meets the safety requirements for small unloaded ships - the ship meets the safety requirements for large unloaded ships.
3	Warning	Ship	The ship does not meet the overall safety requirements for large or small ships

A ship's certificate of registry must be considered valid if the date up to which the registration is valid of the certificate of registry is after the current date

Conditions	1	2
Is the expiry date of the certificate of registration after today?	T	F
Actions		
Post Message(s)		
The ship has a valid certificate of registration	<input checked="" type="checkbox"/>	
The ship does not have a valid certificate of registration		<input checked="" type="checkbox"/>

Registry.ers

Conditions	1	2
a Ship.certificateOfRegistry.expiryDate > now	T	F
b		

Actions		
Post Message(s)		
A Ship.isValidCertificateOfRegistry=T	<input checked="" type="checkbox"/>	
B Ship.isValidCertificateOfRegistry=F		<input checked="" type="checkbox"/>
C		

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	A ship's certificate of registry must be considered valid if the date up to which the registration is valid of the certificate of registry is after the current date.
2	Warning	Ship	A ship's certificate of registry must be considered NOT valid if the date up to which the registration is valid of the certificate of registry is NOT after the current date.

A [ship](#) must comply with the [requirements of the Inspection](#) for [unloaded ships](#) if the [ship](#) complies with all of the following:

- the [ship](#) meets the [safety requirements](#) for [unloaded ships](#)
- the [ship](#) has a [certificate of registry](#) that is valid.

Conditions	1	2	3
Does the ship meet safety requirements?	T	F	-
Does the ship have a valid certificate of registry?	T	-	F

Actions	1	2	3
Post Message(s)			
The ship does meet inspection requirements	<input checked="" type="checkbox"/>		
The ship does not meet inspection requirements		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Inspection.ers

Conditions	1	2	3
a Ship.meetsSafetyRequirementsOverall	T	F	-
b Ship.hasValidCertificateOfRegistry	T	-	F

Actions

Post Message(s)	1	2	3
A Ship.meetsInspectionRequirements = T	<input checked="" type="checkbox"/>		
B Ship.meetsInspectionRequirements = F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C			
D			

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	A ship must comply with the requirements of the Inspection for unloaded ships if the ship complies with all of the following: - the ship meets the safety requirements for unloaded ships - the ship has a certificate of registry that is valid.
2	Warning	Ship	The ship does not meet inspection requirements since it does not meet the safety requirement
3	Warning	Ship	The ship does not meet inspection requirements since it does not have a valid certificate of registry

An unloaded ship may only enter a Dutch port if the ship complies with the requirements of the Inspection for unloaded ships.

Conditions	1	2
Does the ship meet inspection requirements?	T	F

Actions	1	2
Post Message(s)		
The ship is cleared to enter Dutch ports	<input checked="" type="checkbox"/>	
The ship is not cleared to enter Dutch ports		<input checked="" type="checkbox"/>

Port Clearance.ers

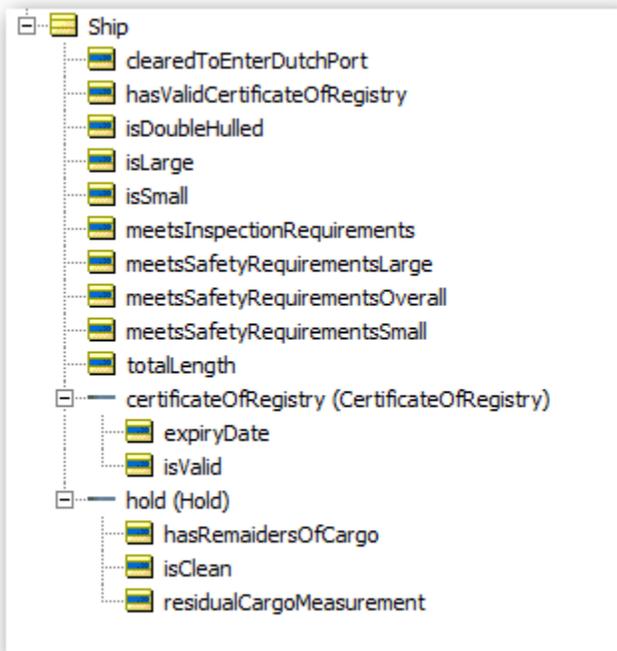
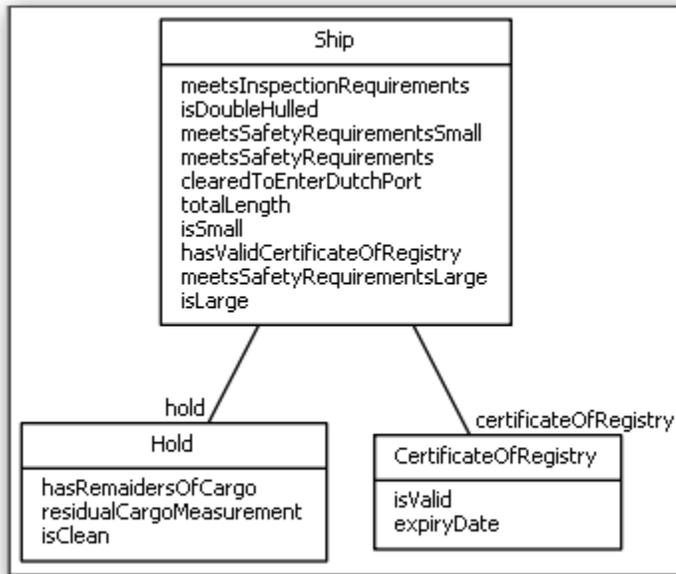
Conditions	1	2
a Ship.meetsInspectionRequirements	T	F
b		

Actions	1	2
Post Message(s)		
A Ship.dearedToEnterDutchPort = T	<input checked="" type="checkbox"/>	
B Ship.dearedToEnterDutchPort = F		<input checked="" type="checkbox"/>
C		

Rule Statements

Ref	Post	Alias	Text
1	Info	Ship	An unloaded ship may only enter a Dutch port if the ship complies with the requirements of the Inspection for unloaded ships.
2	Warning	Ship	The ship may not enter a Dutch port since it does not meet the inspection requirements

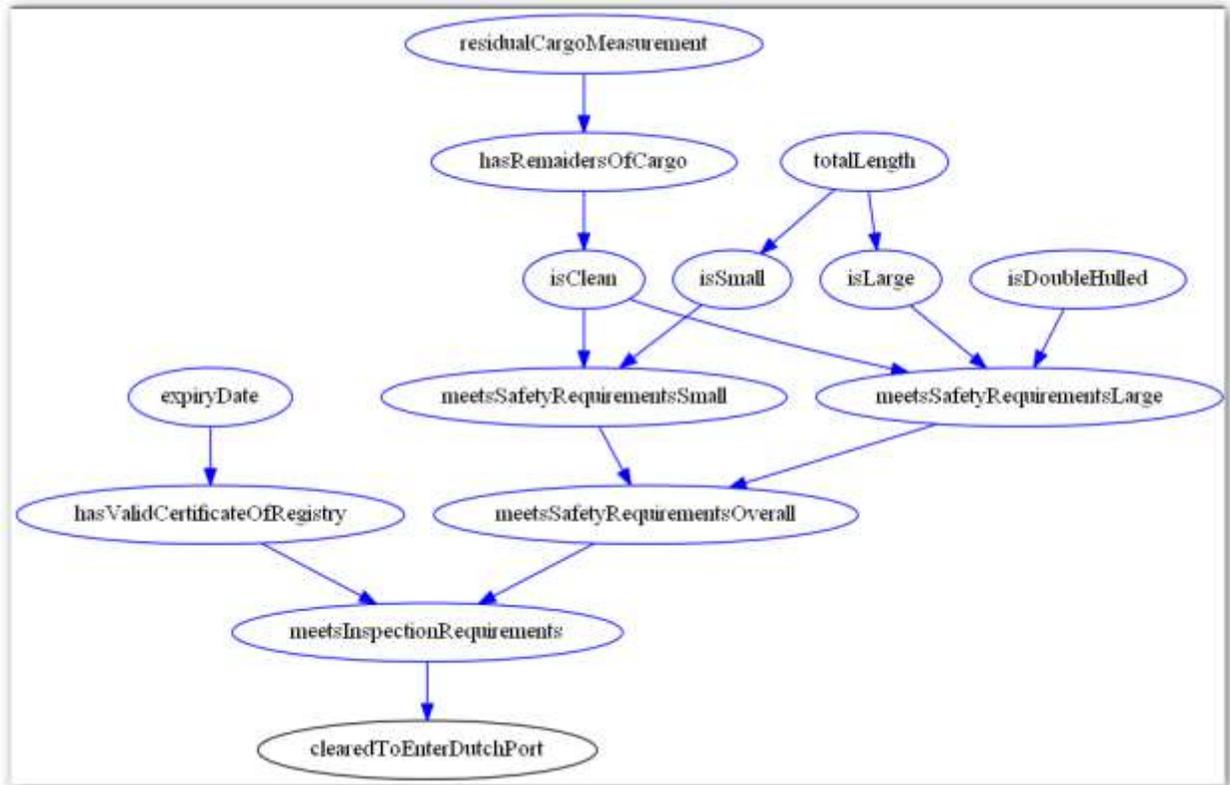
## Data Model



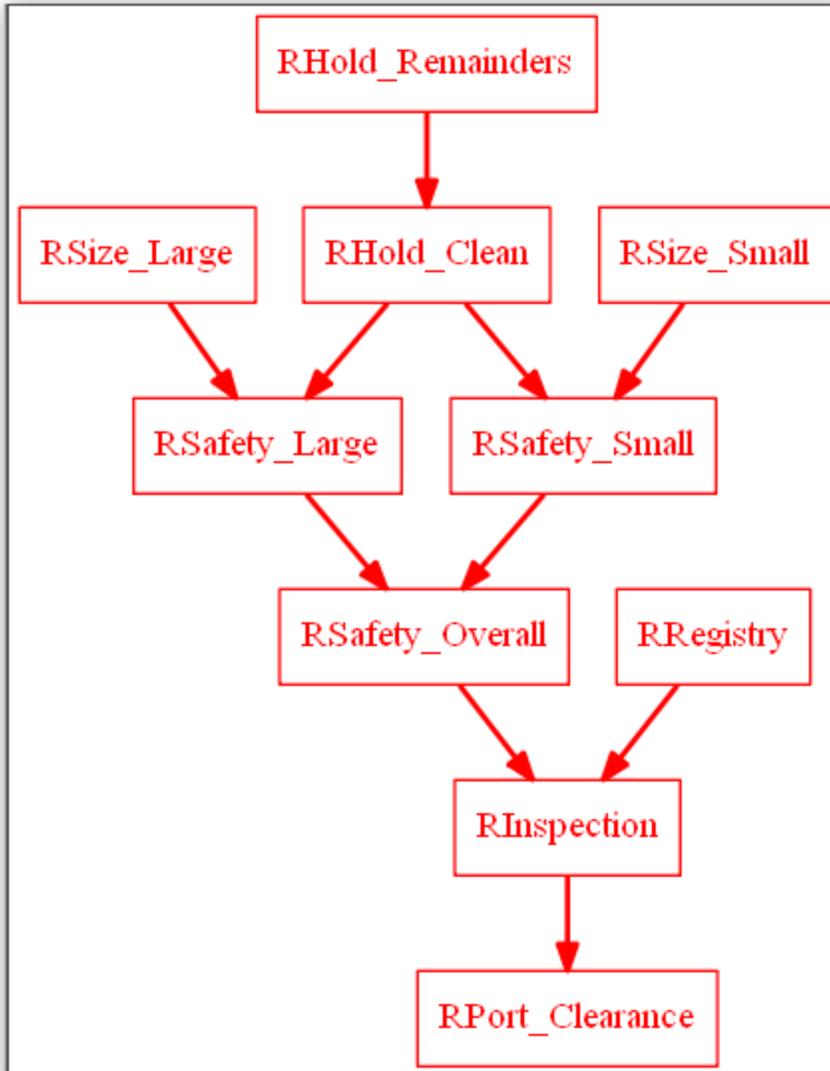
## Creating a Decision

To create a decision these rule sheets need to be assembled into a rule flow.

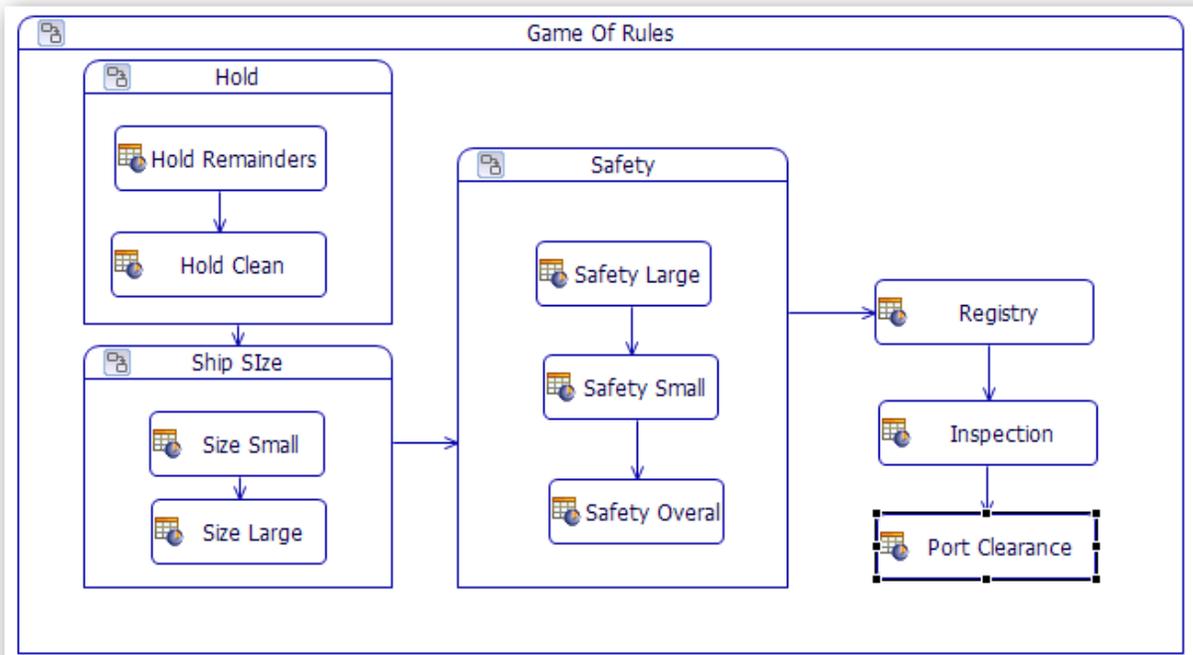
In order to determine the correct order we can analyze the dependencies between the various attributes:



And from this we can determine the dependencies between the rule sheets:



We can then draw a rule flow diagram such as this:



## Test Case

Input	Output
<ul style="list-style-type: none"> <li>Ship [1] {double hulled, &gt;=80, not expired, &lt;= 0.5}               <ul style="list-style-type: none"> <li>isDoubleHulled [true]</li> <li>totalLength [81.000000]</li> <li>certificateOfRegistry (CertificateOfRegistry) [1]                   <ul style="list-style-type: none"> <li>expiryDate [10/1/2015 08:00:00]</li> </ul> </li> <li>hold (Hold) [1]                   <ul style="list-style-type: none"> <li>residualCargoMeasurement [0.400000]</li> </ul> </li> </ul> </li> <li>Ship [2] {not double hulled, &gt;=80, not expired, &lt;= 0.5}</li> <li>Ship [3] {double hulled, &lt;80, not expired, &lt;= 0.5}</li> <li>Ship [4] {not double hulled, &lt;80, not expired, &lt;= 0.5}</li> <li>Ship [5] {double hulled, &gt;=80, expired, &lt;= 0.5}</li> <li>Ship [6] {not double hulled, &gt;=80, expired, &lt;= 0.5}</li> <li>Ship [7] {double hulled, &lt;80, expired, &lt;= 0.5}</li> <li>Ship [8] {not double hulled, &lt;80, expired, &lt;= 0.5}</li> <li>Ship [9] {double hulled, &gt;=80, not expired, &gt; 0.5}</li> <li>Ship [10] {not double hulled, &gt;=80, not expired, &gt; 0.5}</li> <li>Ship [11] {double hulled, &lt;80, not expired, &gt; 0.5}</li> </ul>	<ul style="list-style-type: none"> <li>Ship [1] {double hulled, &gt;=80, not expired, &lt;= 0.5}               <ul style="list-style-type: none"> <li>clearedToEnterDutchPort [true]</li> <li>hasValidCertificateOfRegistry [true]</li> <li>isDoubleHulled [true]</li> <li>isLarge [true]</li> <li>isSmall [false]</li> <li>meetsInspectionRequirements [true]</li> <li>meetsSafetyRequirementsLarge [true]</li> <li>meetsSafetyRequirementsOverall [true]</li> <li>totalLength [81.000000]</li> <li>certificateOfRegistry (CertificateOfRegistry) [1]                   <ul style="list-style-type: none"> <li>expiryDate [10/1/2015 08:00:00]</li> </ul> </li> <li>hold (Hold) [1]                   <ul style="list-style-type: none"> <li>hasRemainersOfCargo [false]</li> <li>isClean [true]</li> <li>residualCargoMeasurement [0.400000]</li> </ul> </li> </ul> </li> <li>Ship [2] {not double hulled, &gt;=80, not expired, &lt;= 0.5}</li> </ul>

Properties
Problems
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Rule Statements

Seve...	Message
Info	[Hold_Remainers,2] A ship's hold does not contain remainders of cargo if the residual cargo measurement is higher than 0.5 mg dry weight per cm <sup>2</sup> .
Info	[Hold_Clean,1] The hold of a ship must be considered clean if the hold does not contain remainders of cargo
Info	[Size_Small,2] A ship must NOT be categorized as small if the total length of the ship is less than 80 meters
Info	[Size_Large,1] A ship must be categorized as large if the total length of the ship is at least 80 meters
Info	[Safety_Large,1] A ship only meets the safety requirements for large unloaded ships if the ship complies with all of the following:- the ship is categorize
Info	[Safety_Overall,1] A ship only meets the safety requirements for unloaded ships if the ship complies with at least one of the following:- the ship meets f
Info	[Registry,1] A ship's certificate of registry must be considered valid if the date up to which the registration is valid of the certificate of registry is after t
Info	[Inspection,1] A ship must comply with the requirements of the Inspection for unloaded ships if the ship complies with all of the following:- the ship meet
Info	[Port_Clearance,1] An unloaded ship may only enter a Dutch port if the ship complies with the requirements of the Inspection for unloaded ships.

Input

- Ship [1] {double hulled, >=80, not expired, <= 0.5}
- Ship [2] {not double hulled, >=80, not expired, <= 0.5}
  - isDoubleHulled [false]
  - totalLength [81.000000]
  - certificateOfRegistry (CertificateOfRegistry) [2]
    - expiryDate [10/1/2015 08:00:00]
  - hold (Hold) [2]
    - residualCargoMeasurement [0.400000]
- Ship [3] {double hulled, <80, not expired, <= 0.5}
- Ship [4] {not double hulled, <80, not expired, <= 0.5}
- Ship [5] {double hulled, >=80, expired, <= 0.5}
- Ship [6] {not double hulled, >=80, expired, <= 0.5}
- Ship [7] {double hulled, <80, expired, <= 0.5}
- Ship [8] {not double hulled, <80, expired, <= 0.5}
- Ship [9] {double hulled, >=80, not expired, > 0.5}
- Ship [10] {not double hulled, >=80, not expired, > 0.5}
- Ship [11] {double hulled, <80, not expired, > 0.5}

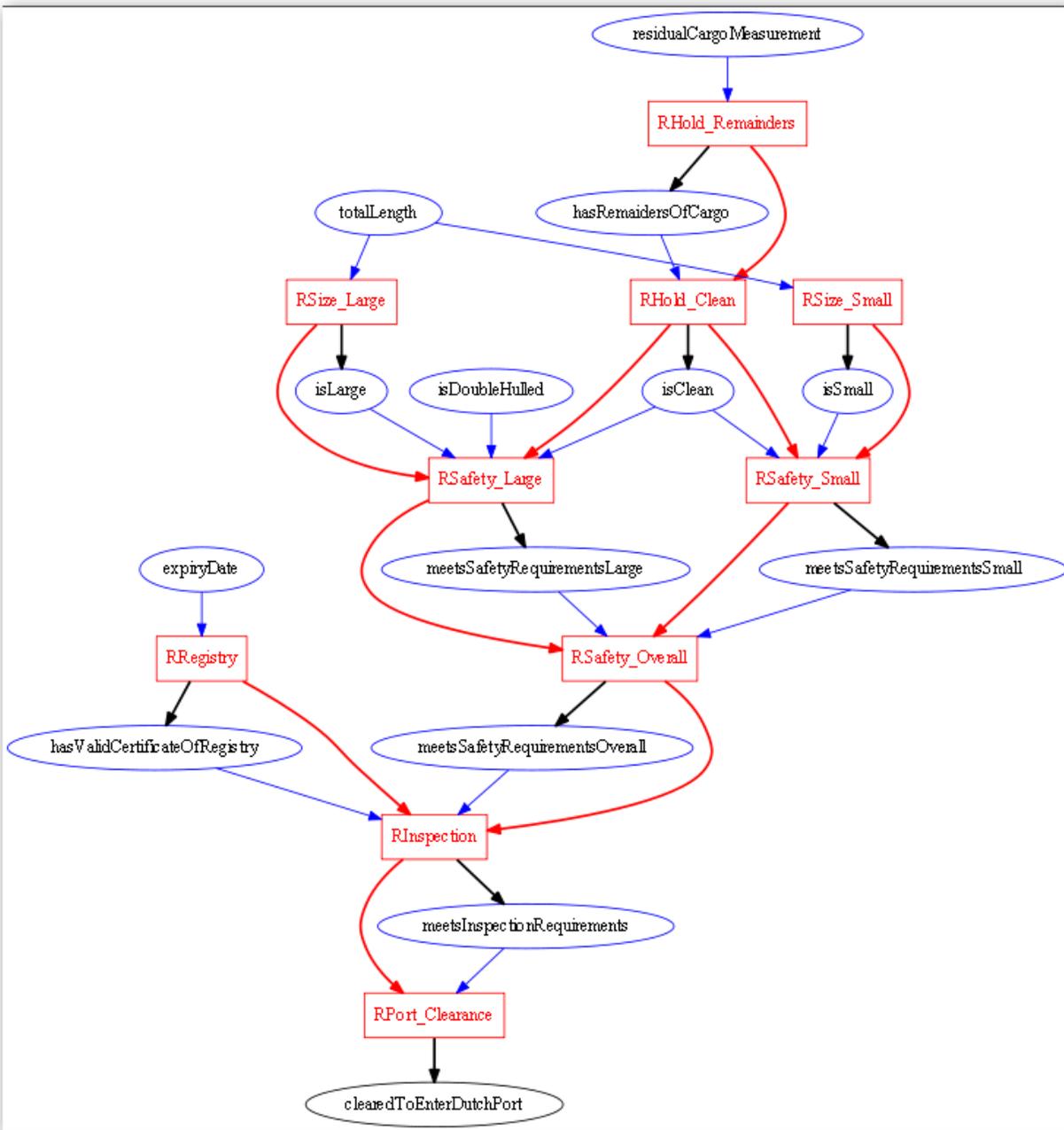
Output

- Ship [1] {double hulled, >=80, not expired, <= 0.5}
- Ship [2] {not double hulled, >=80, not expired, <= 0.5}
  - clearedToEnterDutchPort [false]
  - hasValidCertificateOfRegistry [true]
  - isDoubleHulled [false]
  - isLarge [true]
  - isSmall [false]
  - meetsInspectionRequirements [false]
  - meetsSafetyRequirementsLarge [false]
  - meetsSafetyRequirementsOverall [false]
  - totalLength [81.000000]
  - certificateOfRegistry (CertificateOfRegistry) [2]
    - expiryDate [10/1/2015 08:00:00]
  - hold (Hold) [2]
    - hasRemaindersOfCargo [false]
    - isClean [true]
    - residualCargoMeasurement [0.400000]

Properties
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Severity	Message
Info	[Hold_Remainders,2] A ship's hold does not contain remainders of cargo if the residual cargo measurement is higher than 0.5 mg dry weight per cm <sup>2</sup> .
Info	[Hold_Clean,1] The hold of a ship must be considered clean if the hold does not contain remainders of cargo
Info	[Size_Small,2] A ship must NOT be categorized as small if the total length of the ship is less than 80 meters
Info	[Size_Large,1] A ship must be categorized as large if the total length of the ship is at least 80 meters
Warning	[Safety_Large,3] The ship is not double hulled so does not meet the safety requirements (for large ships)
Warning	[Safety_Overall,3] The ship does not meet the overall safety requirements for large or small ships
Info	[Registry,1] A ship's certificate of registry must be considered valid if the date up to which the registration is valid of the certificate of registry is after the current date.
Warning	[Inspection,2] The ship does not meet inspection requirements since it does not meet the safety requirement
Warning	[Port_Clearance,2] The ship may not enter a Dutch port since it does not meet the inspection requirements

## Combined Dependency Diagram



## Appendix A The Rules

### 1. Clean

**\*Statement** The **hold** of a **ship** must be considered clean if the **hold** does not contain **remainders of cargo**.

### 2. Clearance Dutch Port

**\*Statement** An **unloaded ship** may only enter a **Dutch port** if the **ship** complies with the **requirements of the Inspection** for **unloaded ships**.

### 3. Inspection requirements

**\*Statement** A **ship** must comply with the **requirements of the Inspection** for **unloaded ships** if the **ship** complies with all of the following:

- the **ship** meets the **safety requirements** for **unloaded ships**
- the **ship** has a **certificate of registry** that is valid.

### 4. Large ship

**\*Statement** A **ship** must be categorized as **large** if the **total length** of the **ship** is at least **80 meters**.

### 5. Remainders of cargo

**\*Statement** A **ship's hold** contains **remainders of cargo** if the **residual cargo measurement** is higher than **0.5 mg dry weight per cm<sup>2</sup>**.

### 6. Safety requirements

**\*Statement** A **ship** only meets the **safety requirements** for **unloaded ships** if the **ship** complies with at least one of the following:

- the **ship** meets the **safety requirements for small unloaded ships**
- the **ship** meets the **safety requirements for large unloaded ships**.

### 7. Safety requirements large

**\*Statement** A **ship** only meets the **safety requirements for large unloaded ships** if the **ship** complies with all of the following:

- the **ship** is categorized as **large**
- the **hold** of the **ship** is clean
- the **hold** of the **ship** is double hulled.

### 8. Safety requirements small

**\*Statement** A **ship** only meets the **safety requirements for small unloaded ships** if the **ship** complies with all of the following:

- the **ship** is categorized as **small**
- the **hold** of the **ship** is clean.

### 9. Small ship

**\*Statement** A **ship** must be categorized as **small** if the **total length** of the **ship** is less than **80 meters**.

## 10. Valid certificate of registry

**\*Statement** A ship's certificate of registry must be considered valid if the date up to which the registration is valid of the certificate of registry is after the current date.