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| **VCCS – System/Susbsystem Specifications**  **VCCS (MG BoK v2 Sample)** |
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**Executive Summary**

VCCS System Specification.

# Introduction

## Purpose

<This document provides requirements with their properties including requirement id, requirement name, requirement text and the dependencies.>

## Scope

<Provide a short description of the system being specified and its purpose, including relevant benefits, objectives, and goals.>

## Overview

<Describe what the document contains and explain how the document is organized>

# 1 Problem Domain

### 2 System Context

#### 1 Users & Other Systems

### 3 Use Cases

### 4 Measures of Effectiveness

## 2 White Box

### 2 Conceptual Subsystems Communication

#### 1 Conceptual Interfaces

#### 2 Conceptual Subsystems

##### 1 Cooling

##### 2 Heating

##### 3 Processing

###### 1 Conceptual Interfaces

##### 4 Human-Machine Interacting

### 3 Functional Analysis

### 4 MoEs for Subsystems

## 3 Exchange Items

## 4 Traceability

# 2 Solution Domain

## 1 System Requirements

### 1 System Requirements Metrics

### SR-1 SRS for VCCS

#### SR-1.1 Setting Desired Temperature

The user shall be able to specify the temperature he/she desires in the cabin.

#### 

#### SR-1.2 Human-Machine Interactions

The system shall be able to accept data and commands from the user.

#### 

#### SR-1.3 Getting Ambient Temperature

The system shall take the ambient temperature from the vehicle temperature sensor.

#### SR-1.4 Cabin Air

The system shall be able to draw air out of the cabin and blow comfortable air back.

#### SR-1.5 Heating

The system shall be able to heat the air, if the user desires to increase the temperature in the cabin.

#### 

#### SR-1.6 Cooling

The system shall be able to cool the air, if the user desires to decrease the temperature in the cabin.

#### 

#### SR-1.7 Central Processing

The system shall "decide" whether to cool or to heat the air in the cabin. For this, it shall take the ambient temperature and compare it to the desired temperature set by the user.

#### 

#### SR-1.8 Output Information Display

The system status and ambient temperature in the cabin shall be always displayed in some information output device.

#### 

#### SR-1.9 Max Energy Consumption

The system shall consume maximum 3.518 kWh.

#### 

#### SR-1.10 Hot Air Removal form VCCS

The hot air shall be transferred to the outside of the system.

#### 

#### SR-1.11 Waste Removal VCCS

The waste generated during the cooling process shall be removed from the system.

## 2 System Structure

### 1 Logical Interfaces

### 2 Exchange Items

### 3 Logical Subsystems

## 4 System Parameters

### 1 Parameter Values

## 5 Traceability

# 2.1 Cooling System Solution Domain

## 1 Subsystem Requirements

### 1 Subsystem Requirements Metrics

### SSR-1 SRS for Cooling System

#### SSR-1.1 Cooling Approach

The Cooling System shall be able to compress, condense, and evaporate the refrigerant.

##### 

##### SSR-1.1.1 Air for Cooling

The Cooling System shall be able to draw the air out of the cabin and blow back the cooled air.

##### 

##### SSR-1.1.2 Hot Air Removal

The hot air shall be transferred to the outside of the Cooling System.

##### 

##### SSR-1.1.3 Waste Removal

The waste generated during the cooling process shall be removed from the Cooling System.

#### 

#### SSR-1.2 Cooling System Working States

The main working states of the Cooling System shall be Off and On. Being in the On state, the Cooling System shall visit the Initializing, Idling, and Operating sub-states.

##### 

##### SSR-1.2.1 Internal Communication

The Cooling System shall get control signals from the Central Processing (CP) System send back the response.

##### SSR-1.2.2 Initialization

The Cooling System shall be initialized by the CP System. If the initialization succeeds, the Cooling System shall transit to the Idling state and wait there for the signal to start cooling.

##### 

##### SSR-1.2.3 Idling

The Cooling System shall go to the Idling state either after the successful initialization or when the CP System requires it to stop cooling.

##### 

##### SSR-1.2.4 Operating

While working the Cooling System shall cool down the cabin air until the CP System requires to stop.

#### 

#### SSR-1.3 Max Energy Consumption for Cooling

The Cooling System shall consume maximum 1.2 kWh.

## 2 Subsystem Structure

### 1 Logical Interfaces

### 2 Exchange Items

### 3 Logical Components

## 3 Subsystem Behavior

## 4 Subsystem Parameters

## 5 Traceability

# 2.2 CP System Solution Domain

## 2 Subsystem Structure

### 1 Logical Interfaces

### 2 Exchange Items

### 3 Logical Subsystems

## 3 Subsystem Behavior

# 3 Configuration Domain

## 2 System Structure

## 3 System Behavior

## 4 System Parameters

### 1 Parameter Values

## 5 Traceability

# 4 Implementation Domain

## 1 Implementation Requirements

### PR-1 Implementation Requirements Specification for Cooling System

#### PR-1.1 Electronics & Electric

##### PR-1.1.1 Electric Relays

For accepting electric impulses, a general purpose electromagnetic relay, 11-pins, 3PDT contact type, available for the common coil voltages of 12 V DC, shall be used.

#### PR-1.2 Mechanics

##### PR-1.2.1 Refrigerant Pipe

Refrigerant pipes shall be of copper, with smooth bend elbows.

###### PR-1.2.1.1 Pipe Diameter

The diameter of the pipe shall be 19.5 mm.

###### PR-1.2.1.2 Line Capacity

The liquid line capacity shall be at minimum 22 kW. The gas line capacity shall be at minimum 2 kW.

#### PR-1.3 Fluids

##### PR-1.3.1 Refrigerant

Refrigerant liquid shall be R-1234yf HFO.

#### PR-1.4 Generic Characteristics

##### PR-1.4.1 Max Energy Consumption by Components

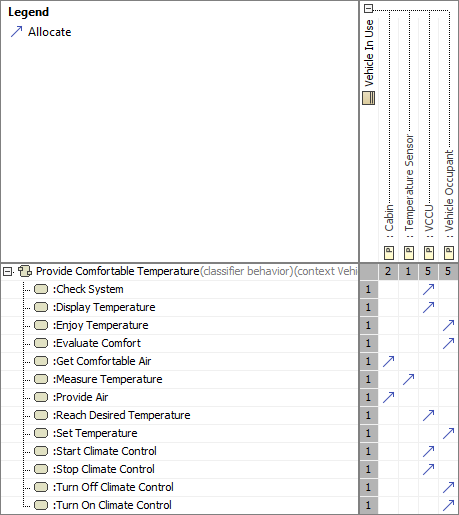
Each component shall consume no more than 0.2 kWh of energy.

## 2 Traceability

# Appendix A: Diagram

## BB Functions To Context

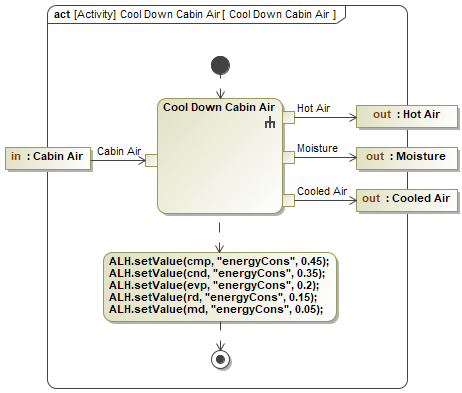
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1. BB Functions To Context

## Cool Down Cabin Air

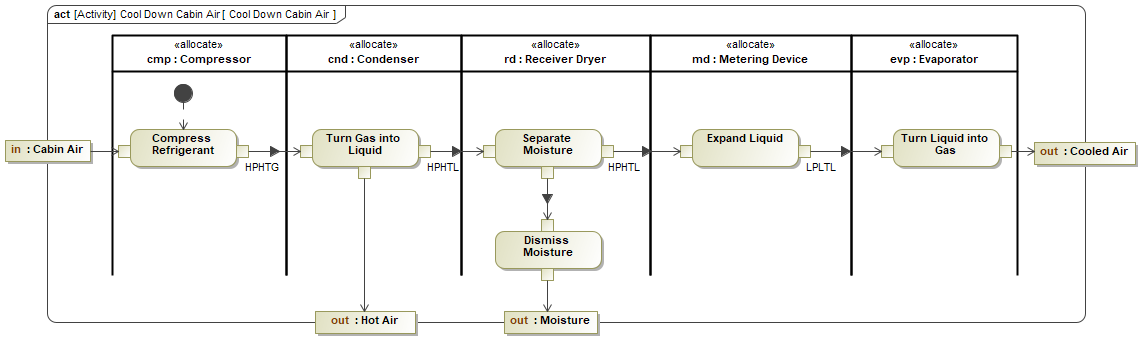
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1. Cool Down Cabin Air

## Cool Down Cabin Air

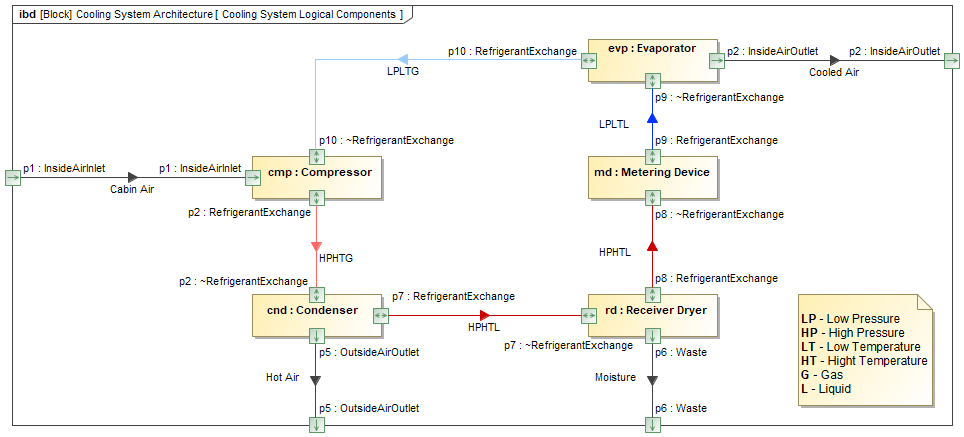
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1. Cool Down Cabin Air

## Cooling System Logical Components

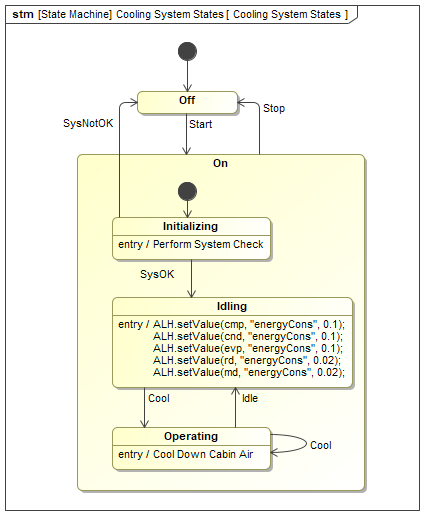
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1. Cooling System Logical Components

## Cooling System States

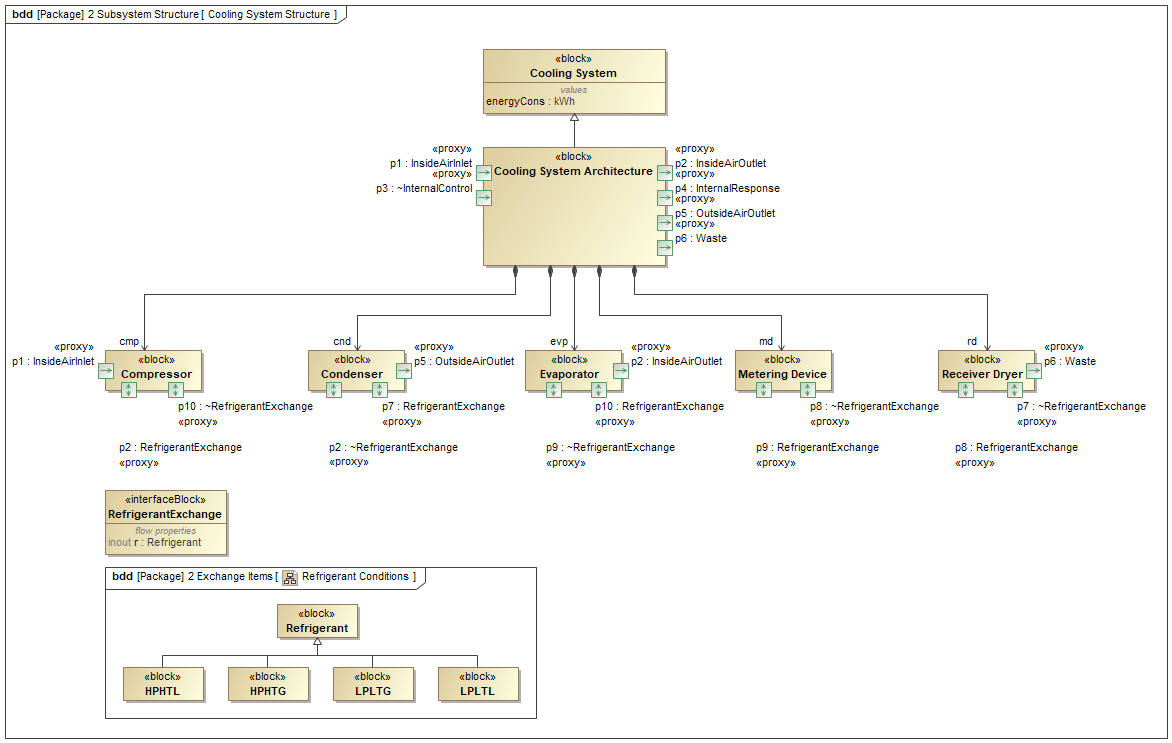
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1. Cooling System States

## Cooling System Structure

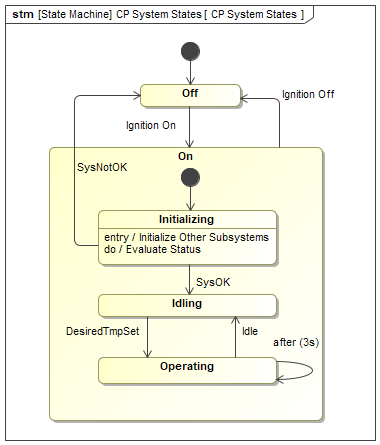
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1. Cooling System Structure

## CP System States

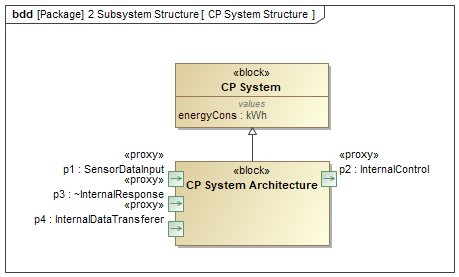
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1. CP System States

## CP System Structure

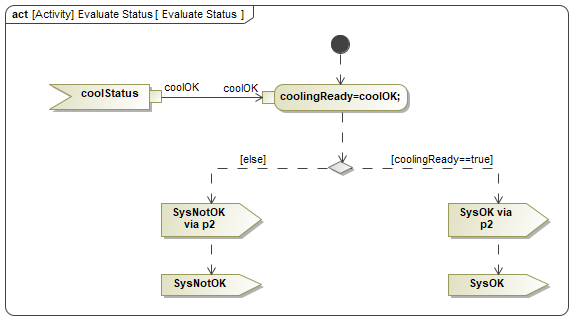
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1. CP System Structure

## Evaluate Status

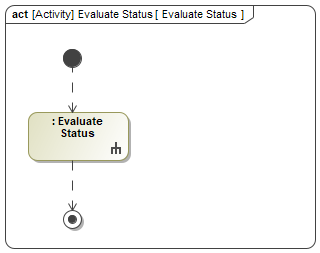
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1. Evaluate Status

## Evaluate Status

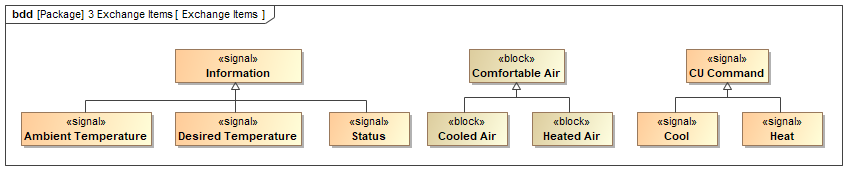
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1. Evaluate Status

## Exchange Items

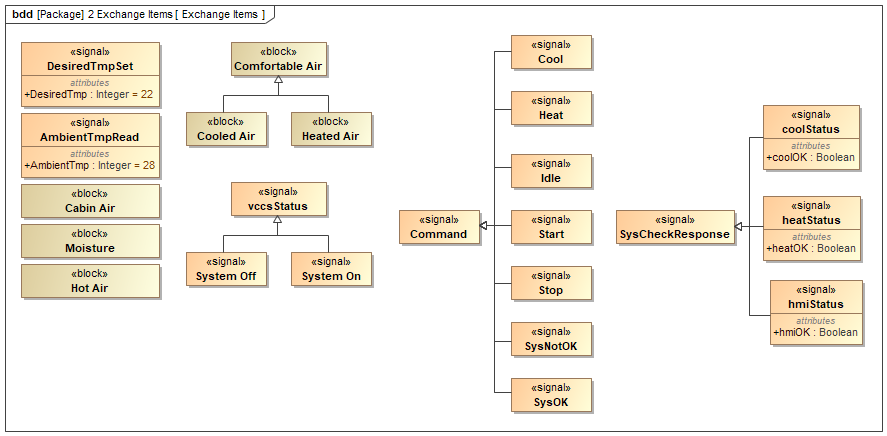
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1. Exchange Items

## Exchange Items

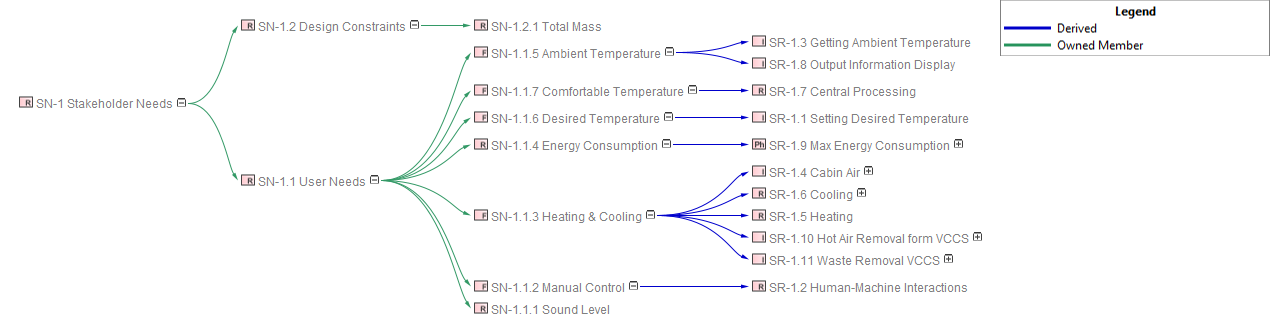
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1. Exchange Items

## From SNs to SRS

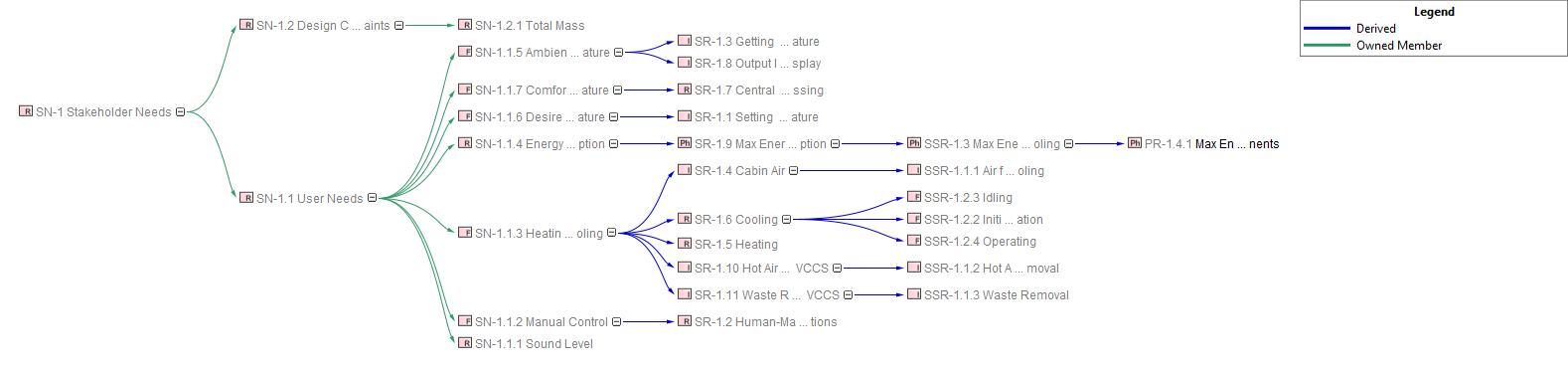
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1. From SNs to SRS

## From Stakeholder Needs to Physical Requirements

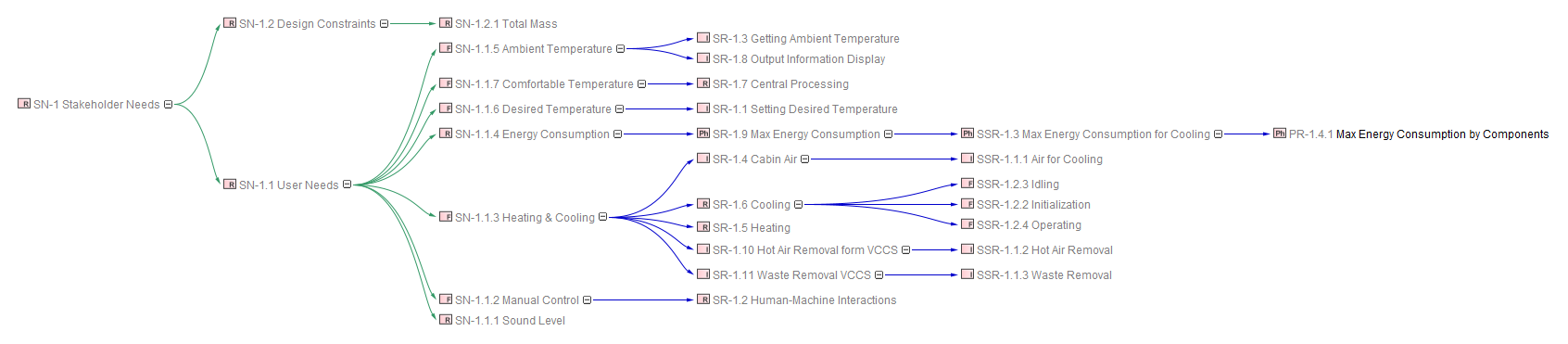
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1. From Stakeholder Needs to Physical Requirements

## From Stakeholder Needs to Subsystem Requirements

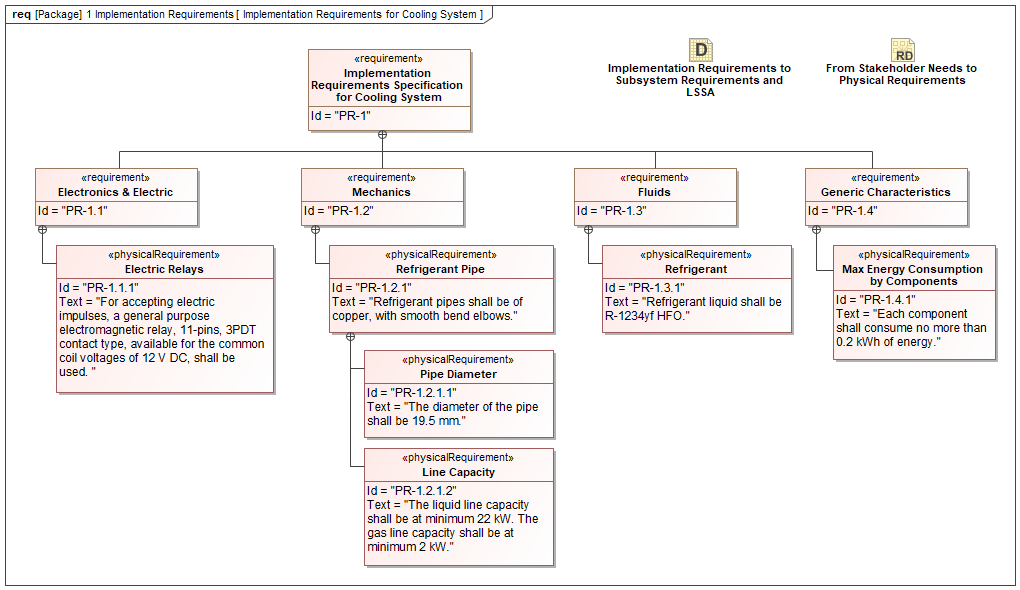
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1. From Stakeholder Needs to Subsystem Requirements

## Implementation Requirements for Cooling System

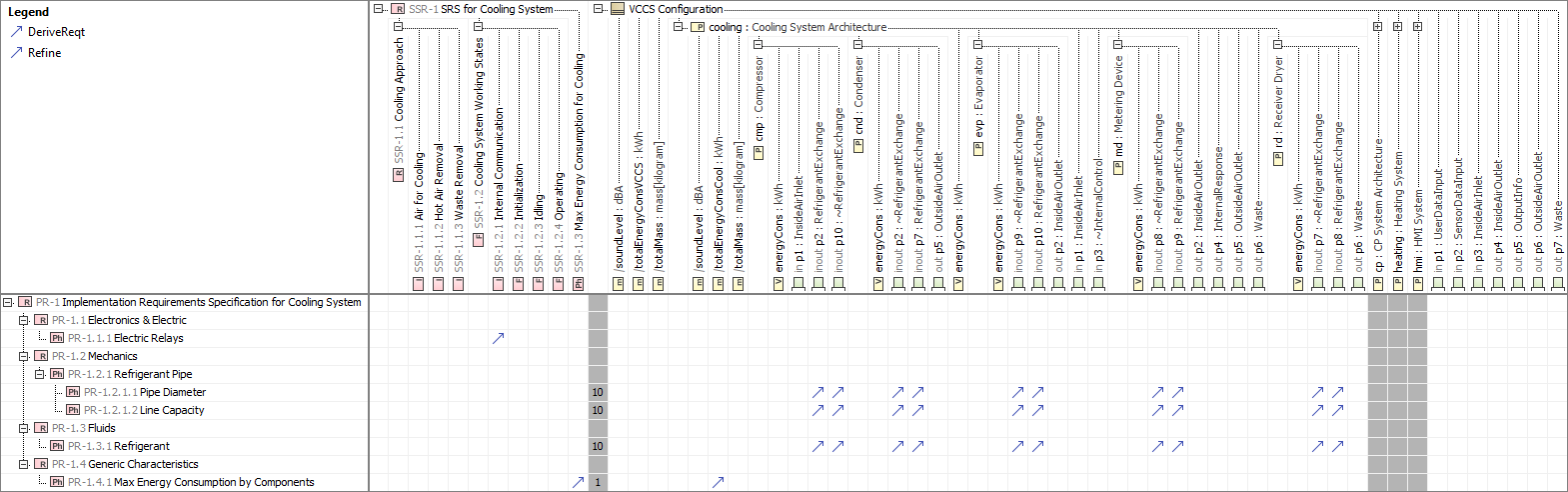
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1. Implementation Requirements for Cooling System

## Implementation Requirements to Subsystem Requirements and LSSA

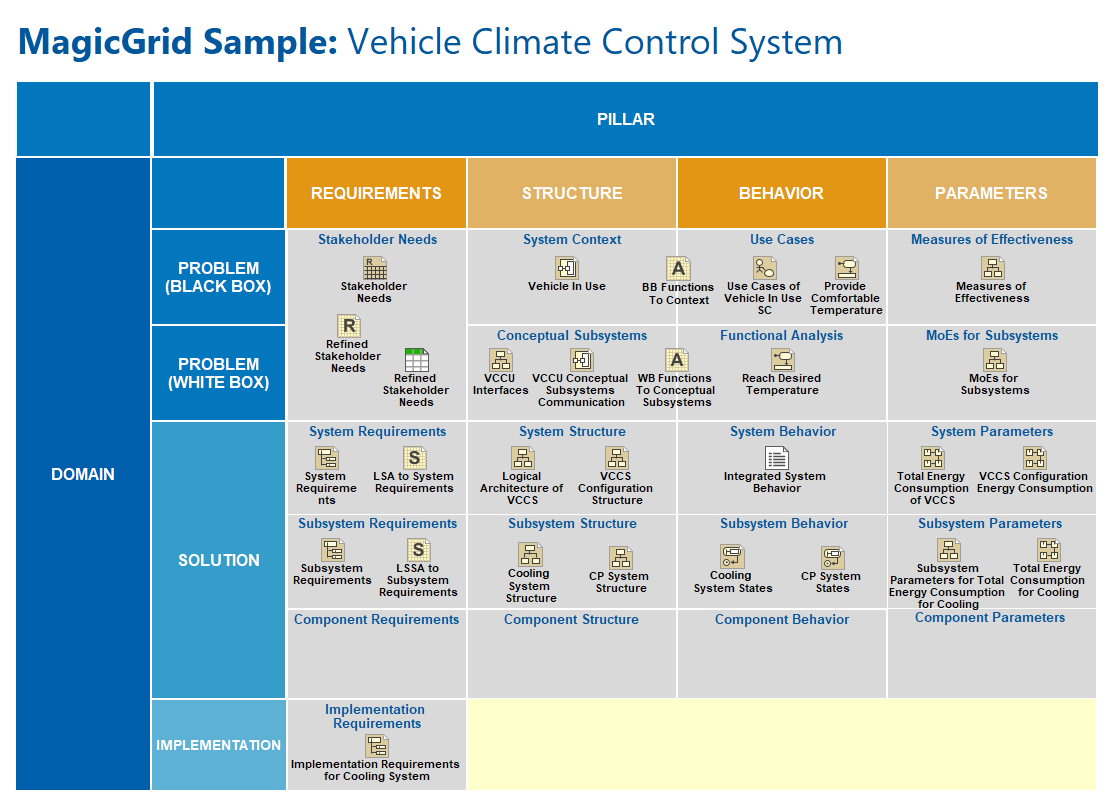
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1. Implementation Requirements to Subsystem Requirements and LSSA

## Index

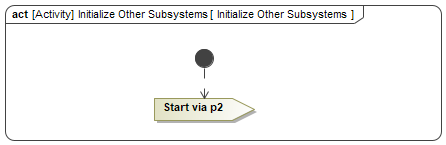
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1. Index

## Initialize Other Subsystems

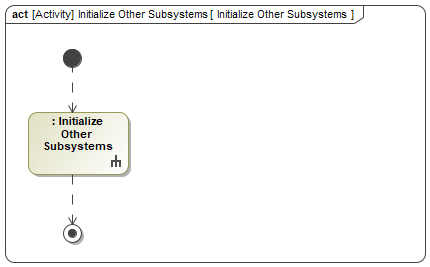
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1. Initialize Other Subsystems

## Initialize Other Subsystems

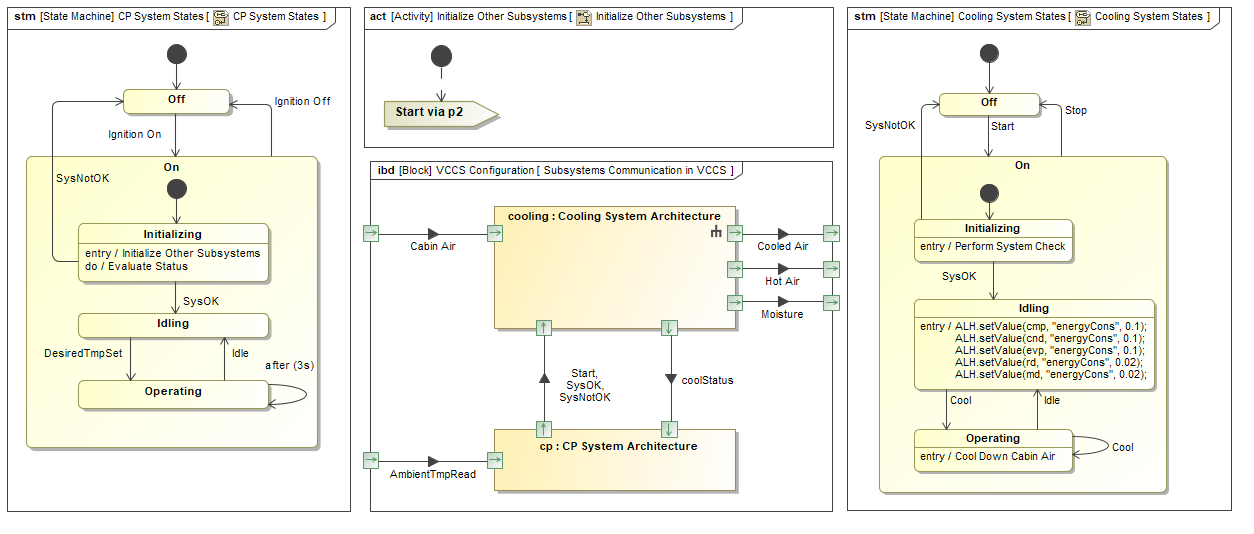
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1. Initialize Other Subsystems

## Integrated System Behavior

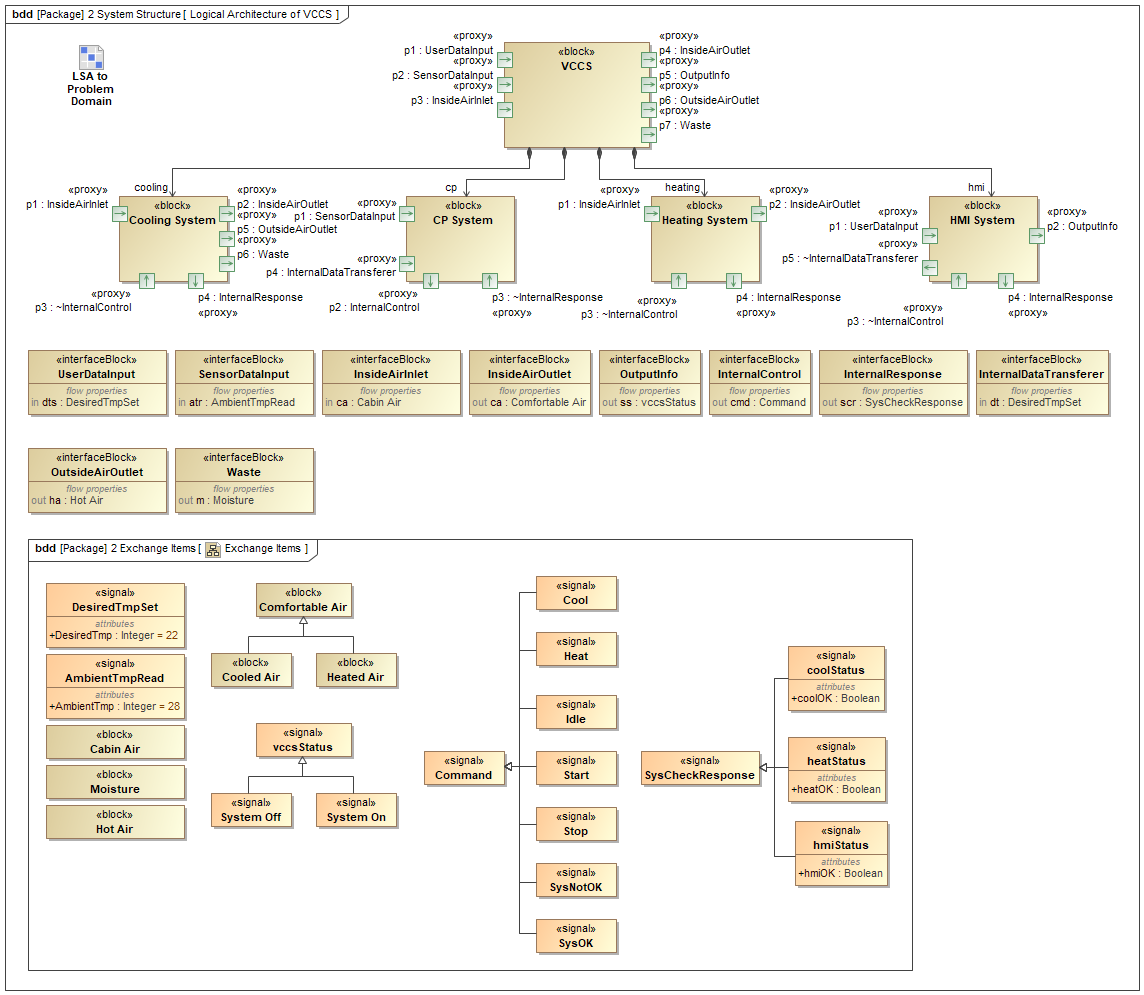
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1. Integrated System Behavior

## Logical Architecture of VCCS

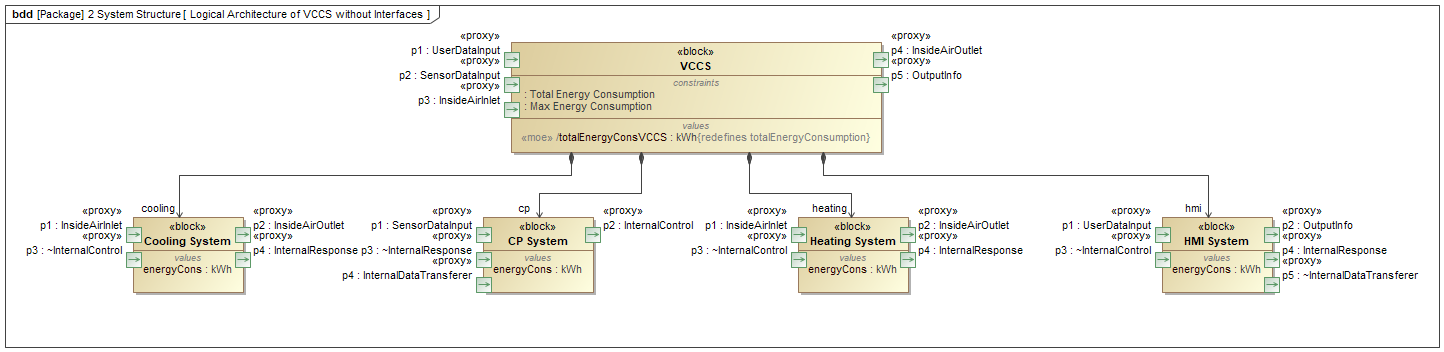
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1. Logical Architecture of VCCS

## Logical Architecture of VCCS without Interfaces

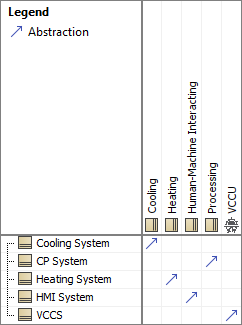
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1. Logical Architecture of VCCS without Interfaces

## LSA to Problem Domain

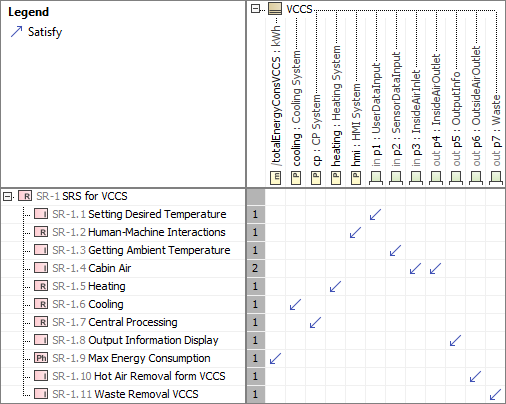
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1. LSA to Problem Domain

## LSA to System Requirements

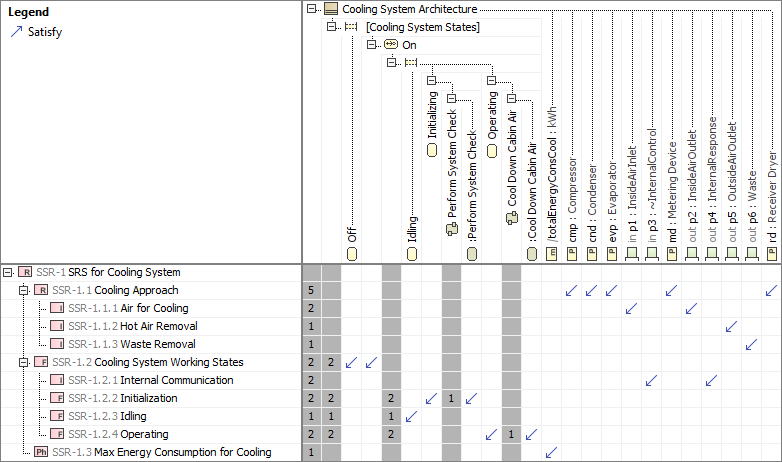
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1. LSA to System Requirements

## LSSA to Subsystem Requirements

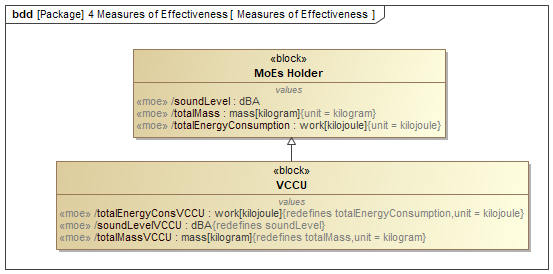
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1. LSSA to Subsystem Requirements

## Measures of Effectiveness

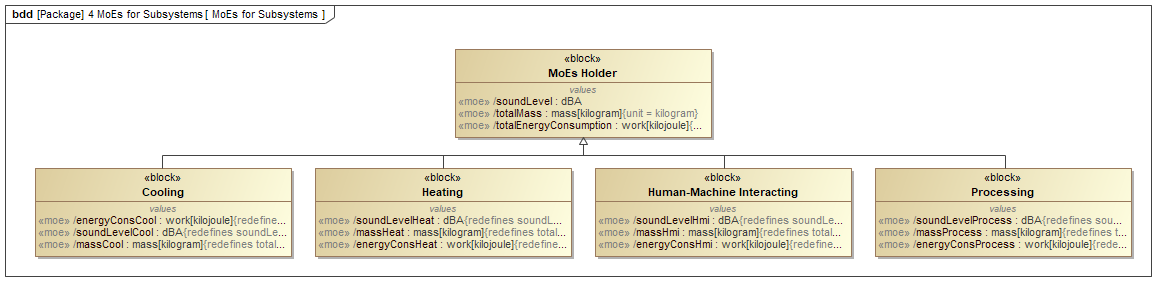
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1. Measures of Effectiveness

## MoEs for Subsystems

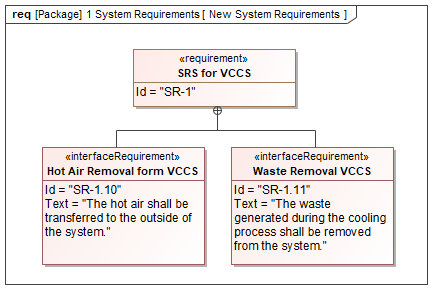
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1. MoEs for Subsystems

## New System Requirements

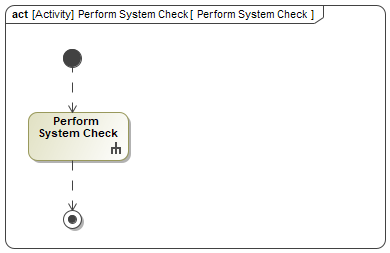
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1. New System Requirements

## Perform System Check

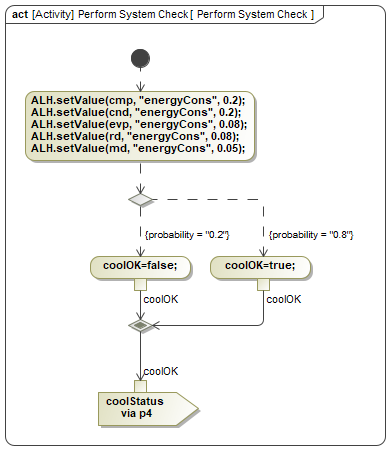
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1. Perform System Check

## Perform System Check

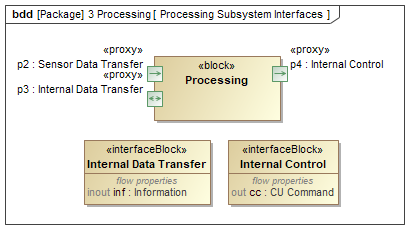
NA



1. Perform System Check

## Processing Subsystem Interfaces

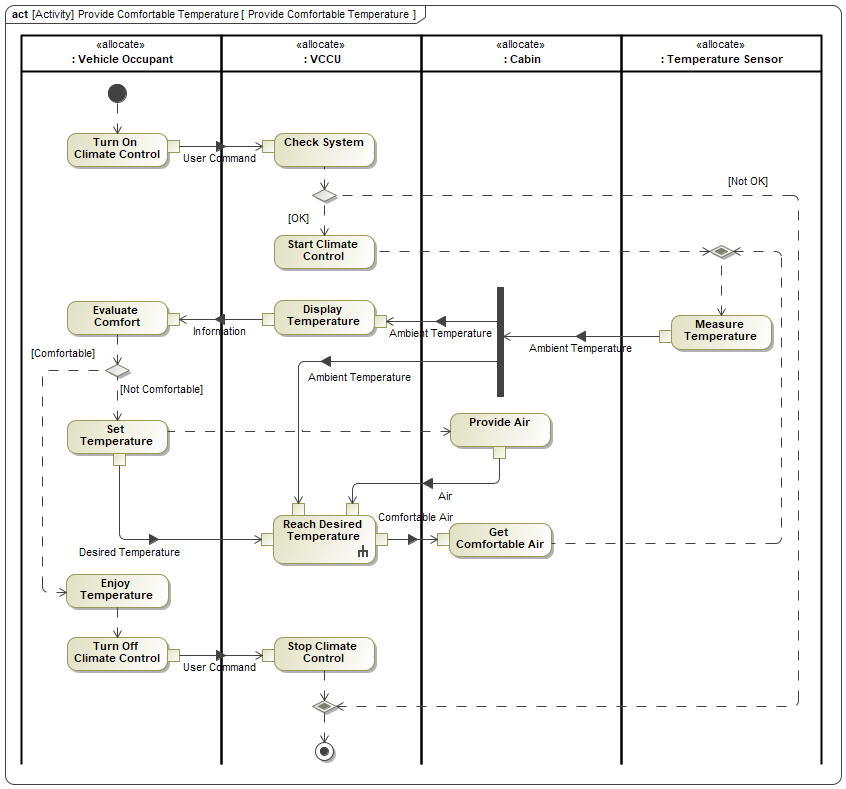
NA



1. Processing Subsystem Interfaces

## Provide Comfortable Temperature

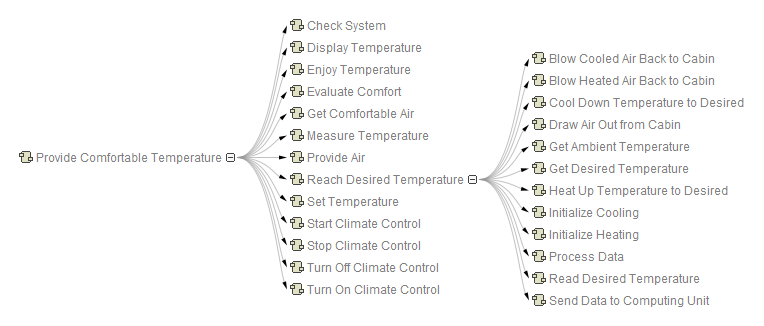
NA



1. Provide Comfortable Temperature

## Provide Comfortable Temperature

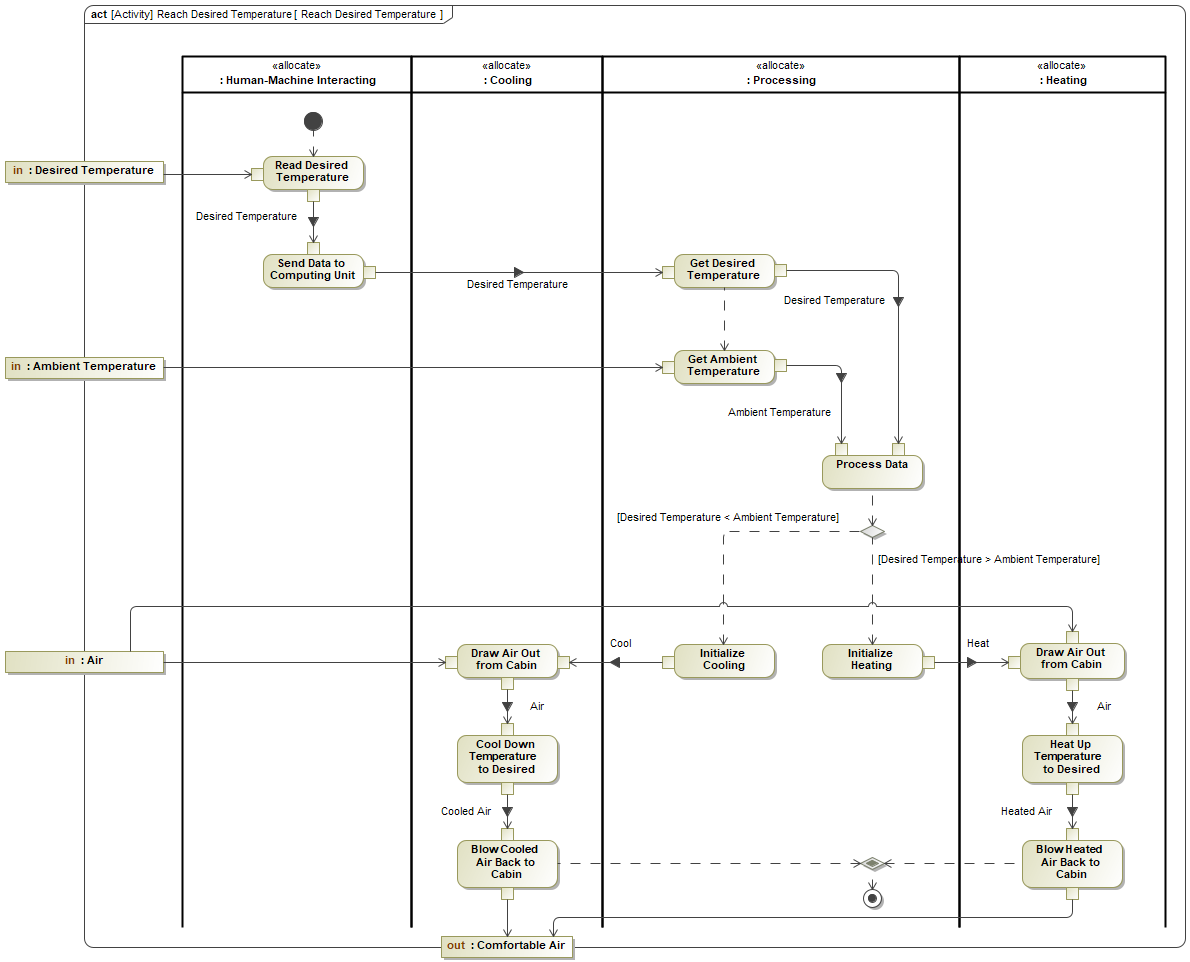
NA



1. Provide Comfortable Temperature

## Reach Desired Temperature

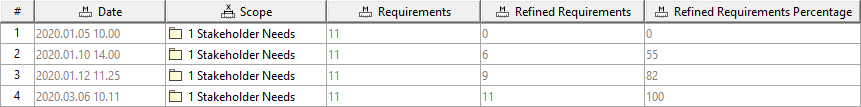
NA



1. Reach Desired Temperature

## Refined Stakeholder Needs

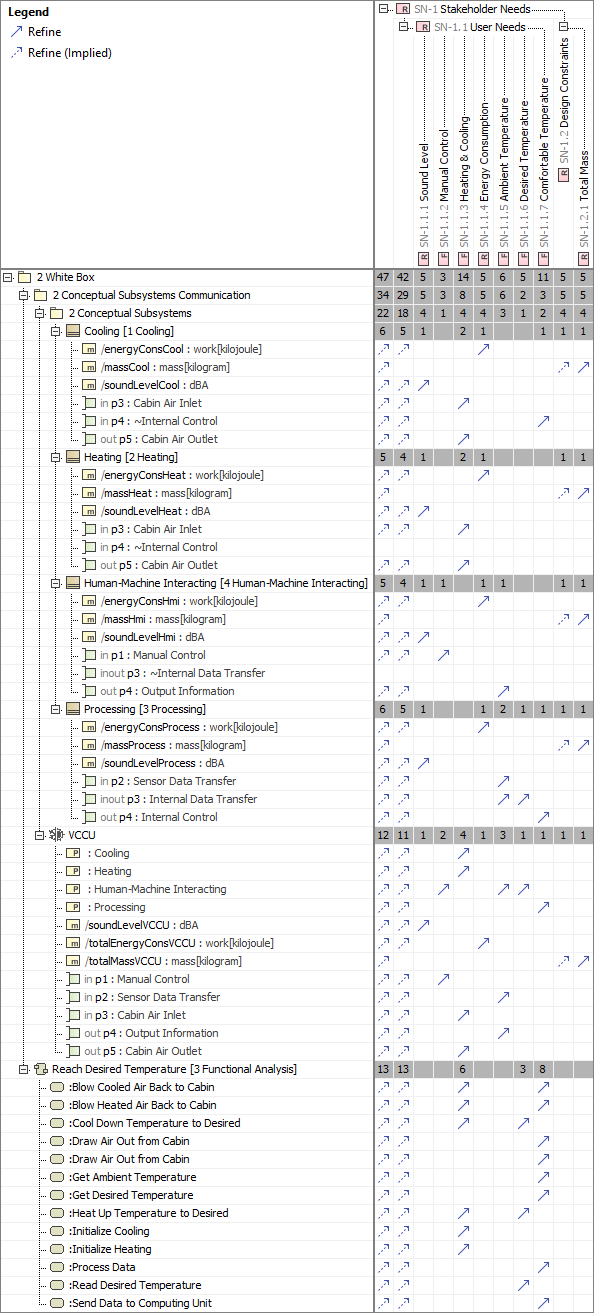
NA



1. Refined Stakeholder Needs

## Refined Stakeholder Needs

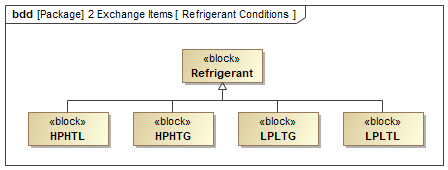
NA



1. Refined Stakeholder Needs

## Refrigerant Conditions

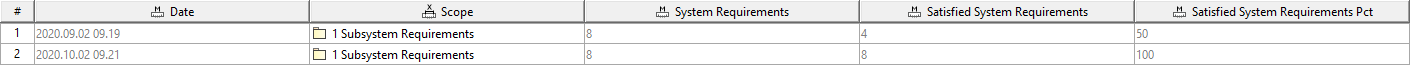
NA



1. Refrigerant Conditions

## Satisfied Subsystem Requirements

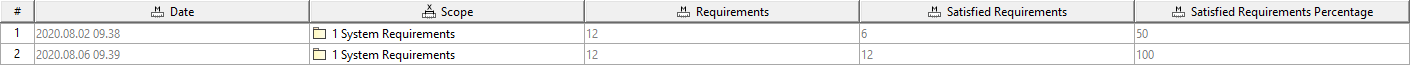
NA



1. Satisfied Subsystem Requirements

## Satisfied System Requirements

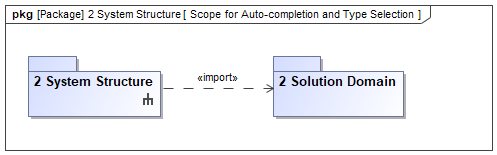
NA



1. Satisfied System Requirements

## Scope for Auto-completion and Type Selection

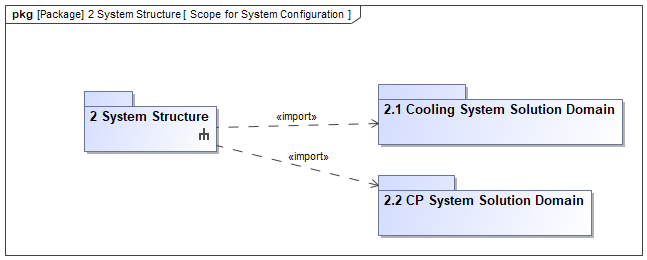
NA



1. Scope for Auto-completion and Type Selection

## Scope for System Configuration

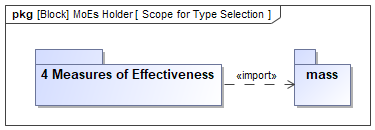
NA



1. Scope for System Configuration

## Scope for Type Selection

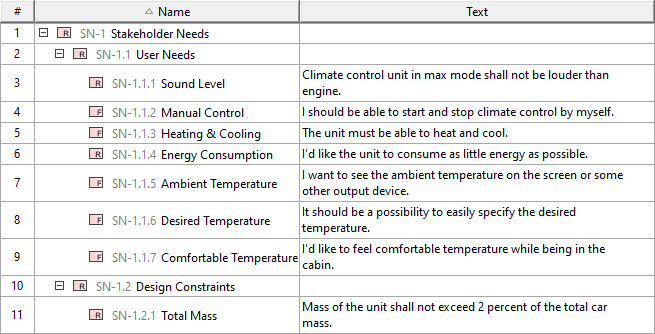
NA



1. Scope for Type Selection

## Stakeholder Needs

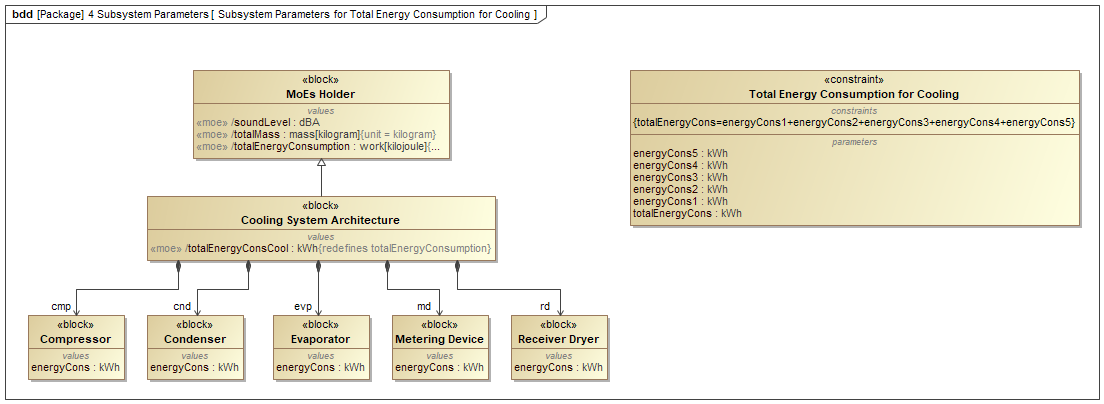
NA



1. Stakeholder Needs

## Subsystem Parameters for Total Energy Consumption for Cooling

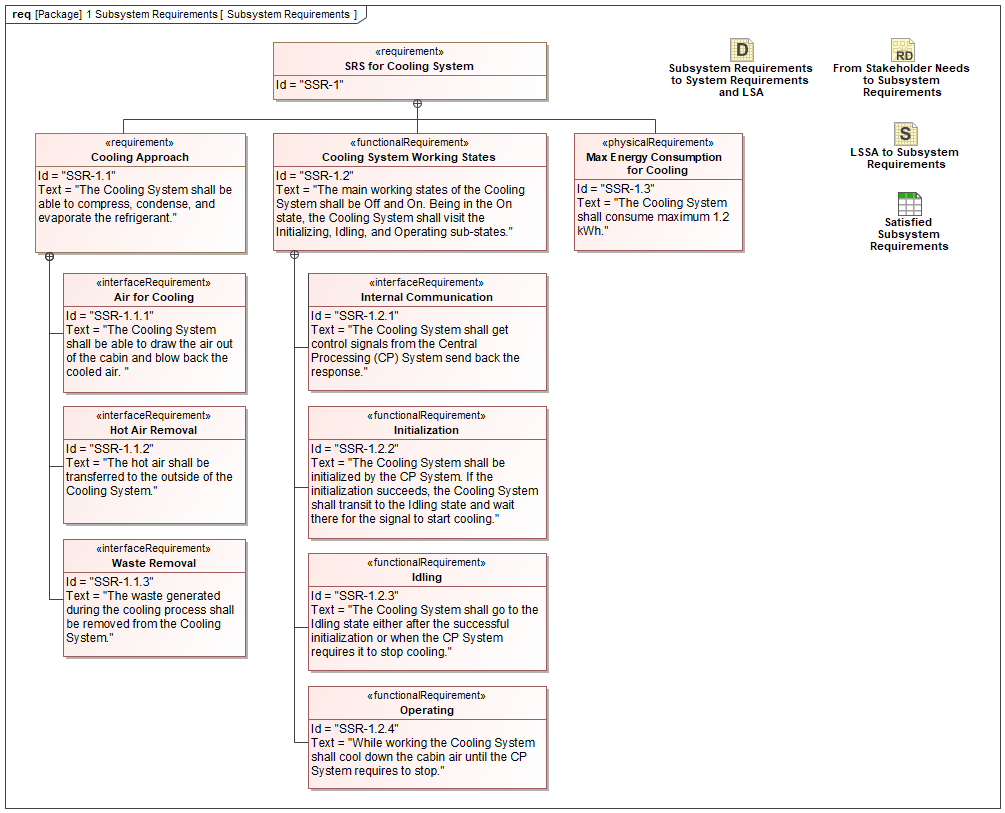
NA



1. Subsystem Parameters for Total Energy Consumption for Cooling

## Subsystem Requirements

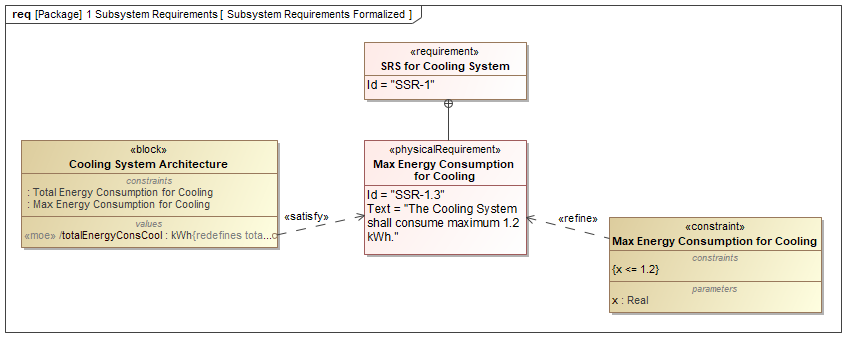
NA



1. Subsystem Requirements

## Subsystem Requirements Formalized

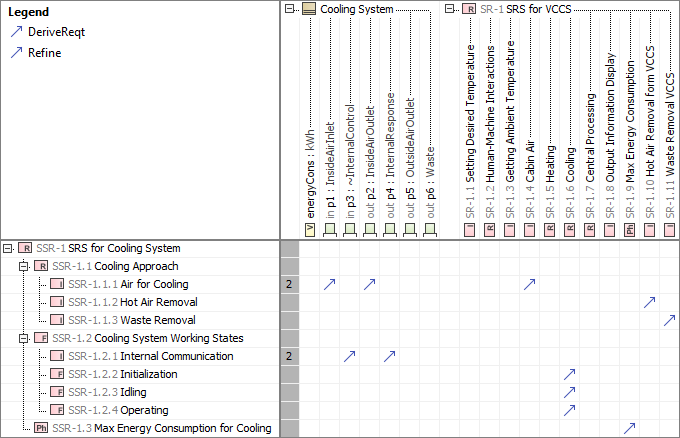
NA



1. Subsystem Requirements Formalized

## Subsystem Requirements to System Requirements and LSA

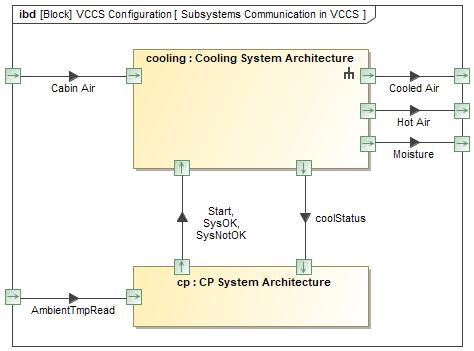
NA



1. Subsystem Requirements to System Requirements and LSA

## Subsystems Communication in VCCS

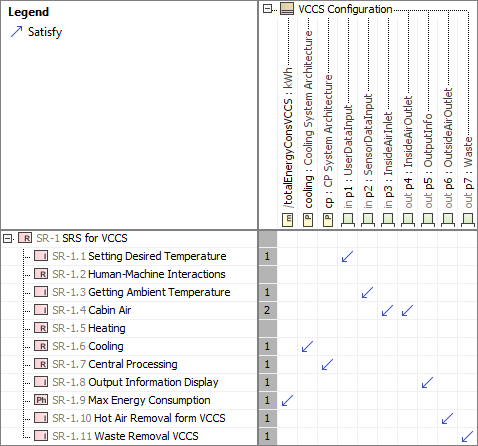
NA



1. Subsystems Communication in VCCS

## System Configuration to System Requirements

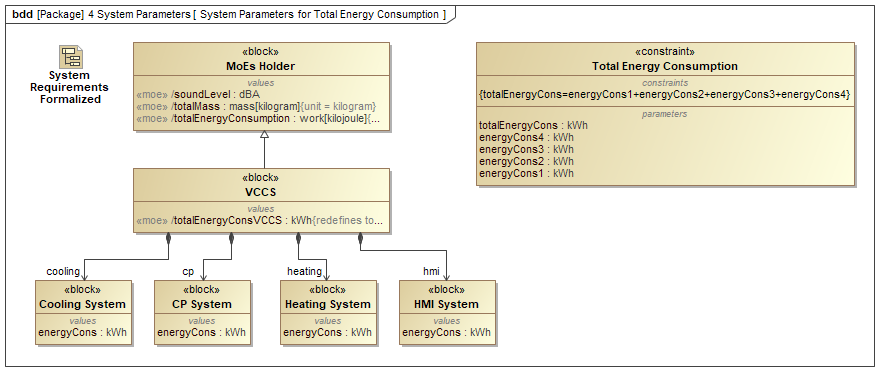
NA



1. System Configuration to System Requirements

## System Parameters for Total Energy Consumption

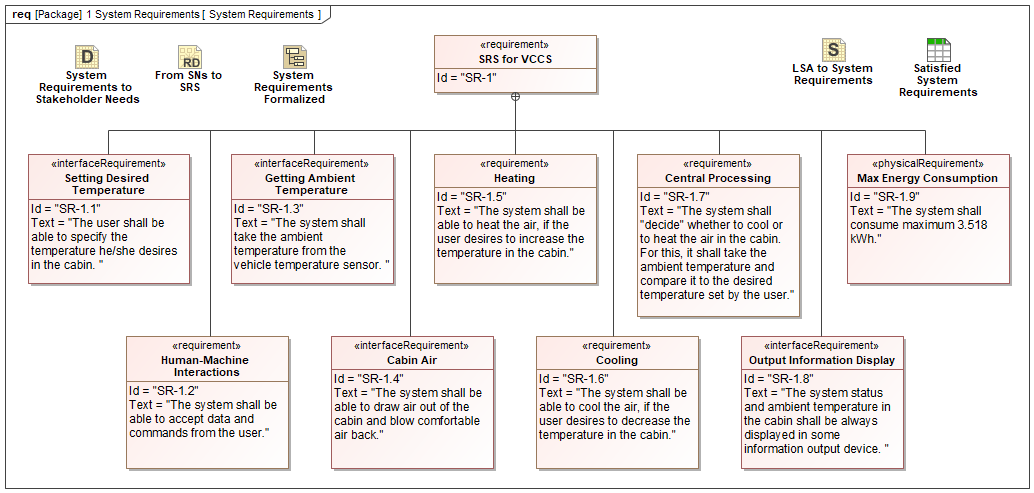
NA



1. System Parameters for Total Energy Consumption

## System Requirements

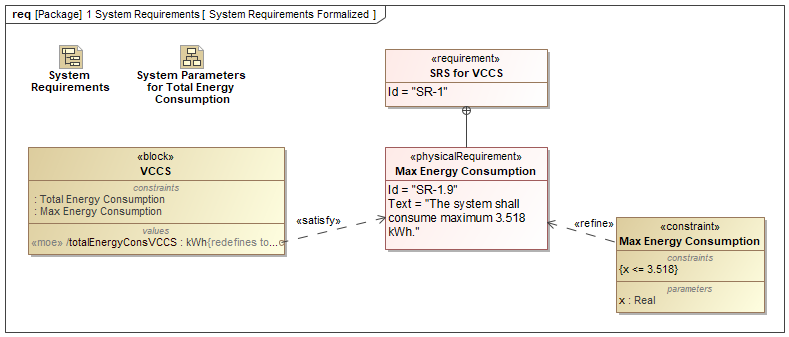
NA



1. System Requirements

## System Requirements Formalized

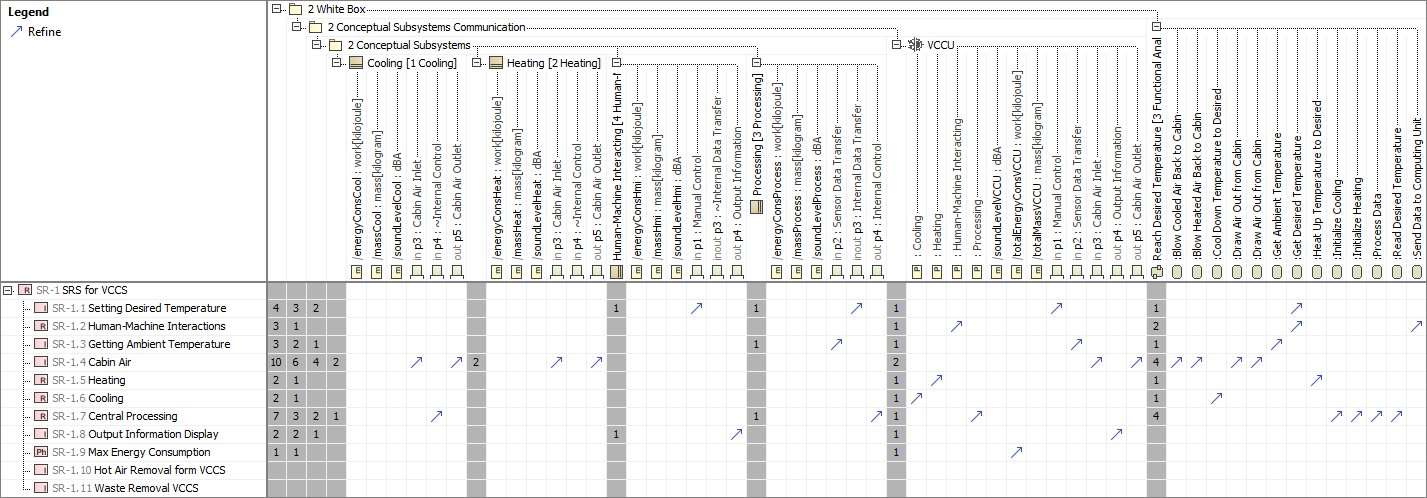
NA



1. System Requirements Formalized

## System Requirements to Problem Domain

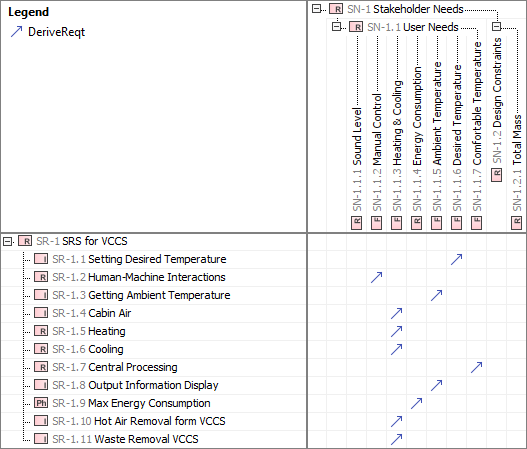
NA



1. System Requirements to Problem Domain

## System Requirements to Stakeholder Needs

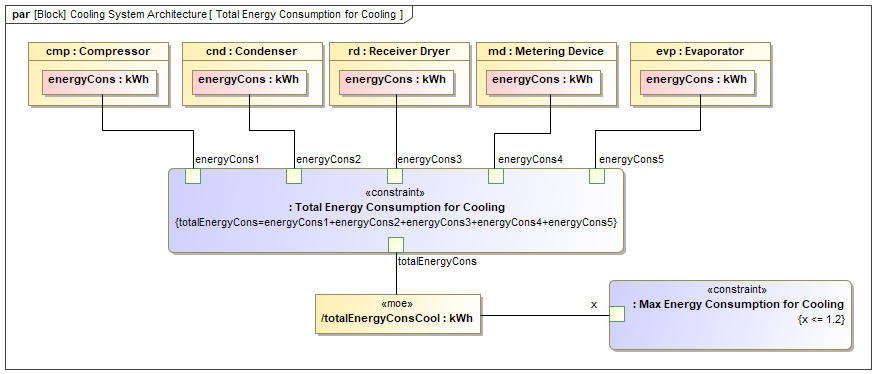
NA



1. System Requirements to Stakeholder Needs

## Total Energy Consumption for Cooling

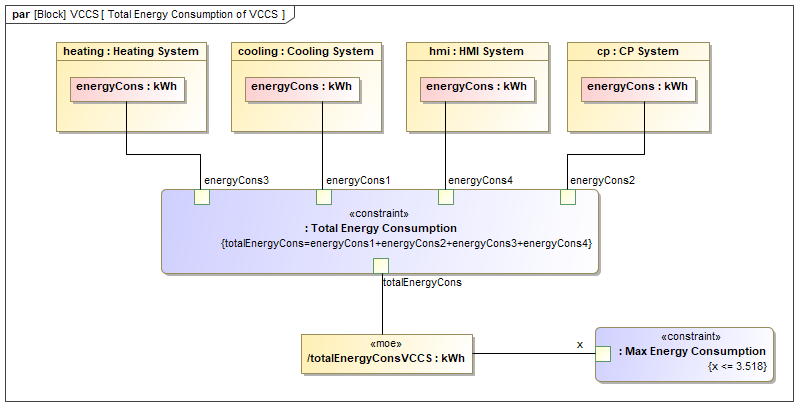
NA



1. Total Energy Consumption for Cooling

## Total Energy Consumption of VCCS

NA



1. Total Energy Consumption of VCCS

## Total Energy Consumption Values

NA

846899283.png

1. Total Energy Consumption Values

## Total Energy Consumption Values

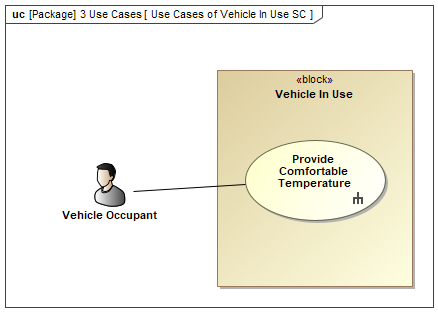
NA

-1690319122.png

1. Total Energy Consumption Values

## Use Cases of Vehicle In Use SC

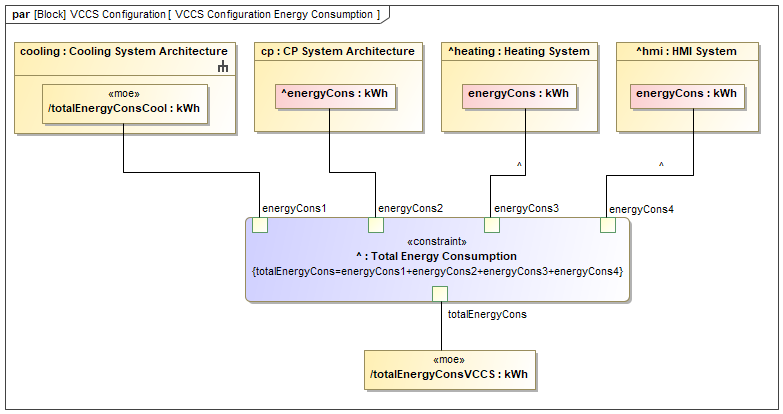
NA



1. Use Cases of Vehicle In Use SC

## VCCS Configuration Energy Consumption

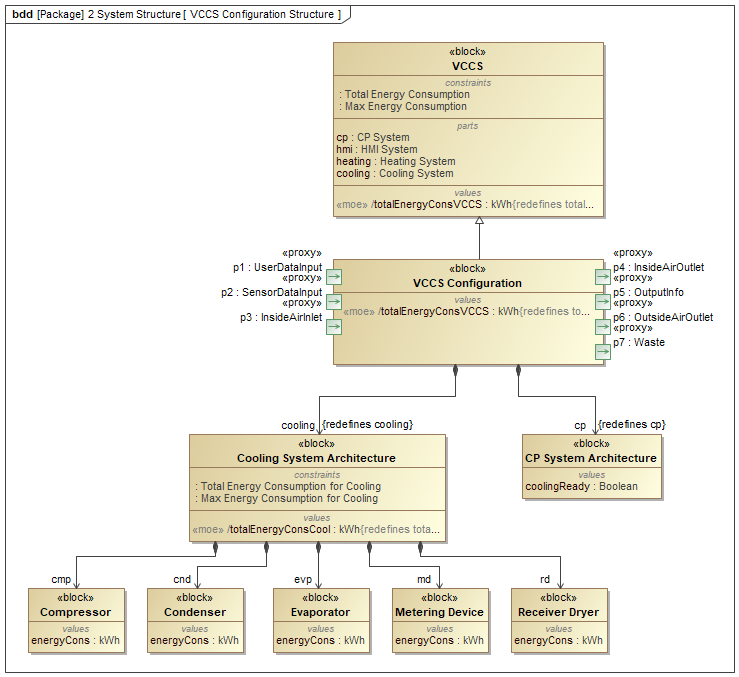
NA



1. VCCS Configuration Energy Consumption

## VCCS Configuration Structure

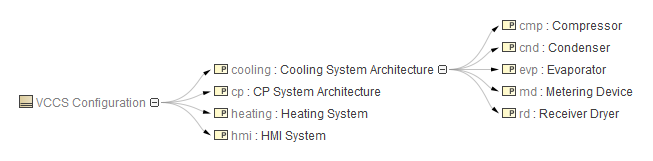
NA



1. VCCS Configuration Structure

## VCCS Configuration Structure

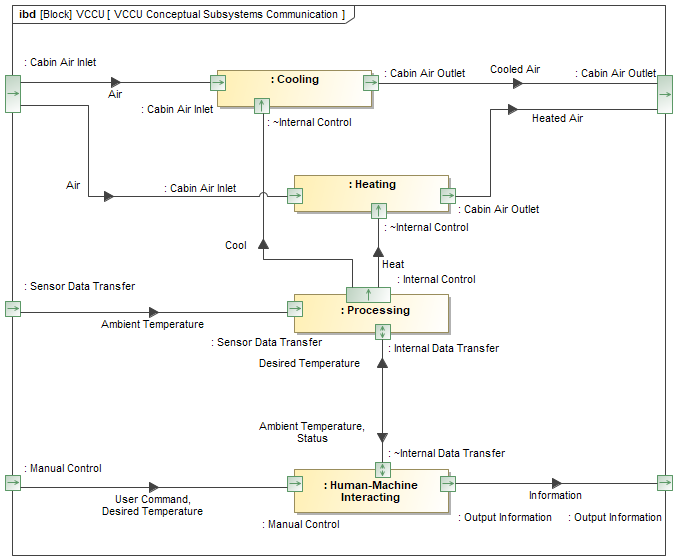
NA



1. VCCS Configuration Structure

## VCCU Conceptual Subsystems Communication

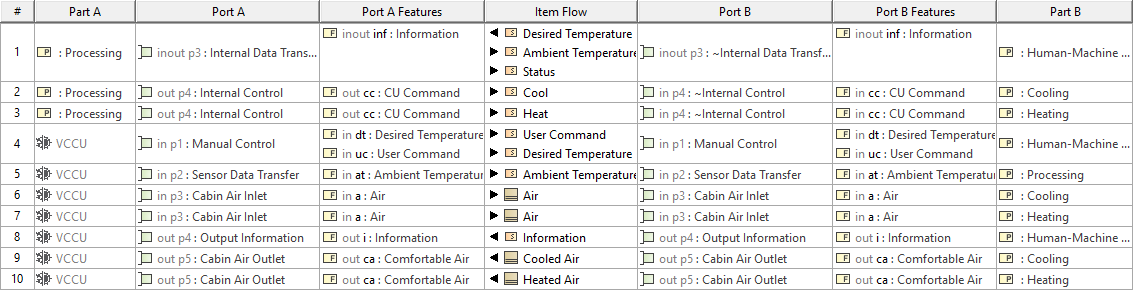
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1. VCCU Conceptual Subsystems Communication

## VCCU ICD Whitebox

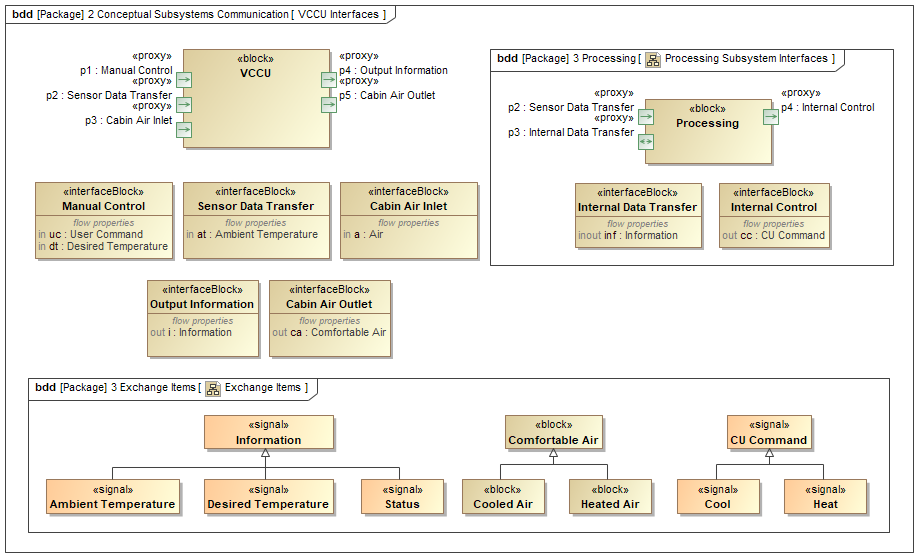
NA



1. VCCU ICD Whitebox

## VCCU Interfaces

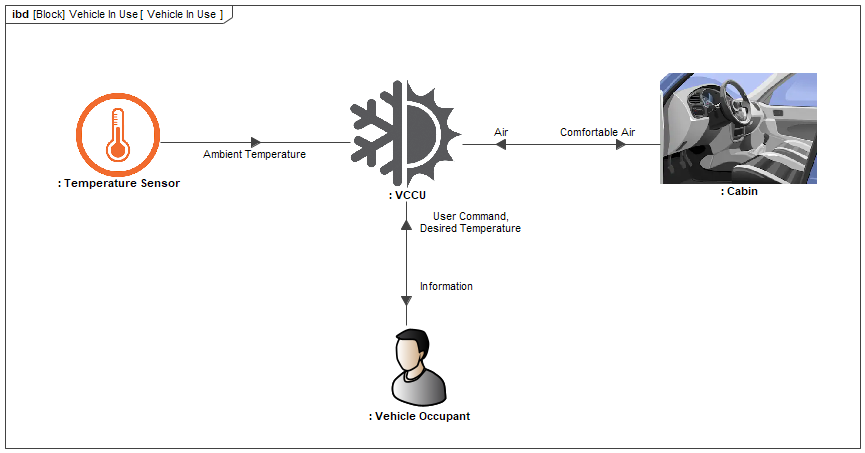
NA



1. VCCU Interfaces

## Vehicle In Use

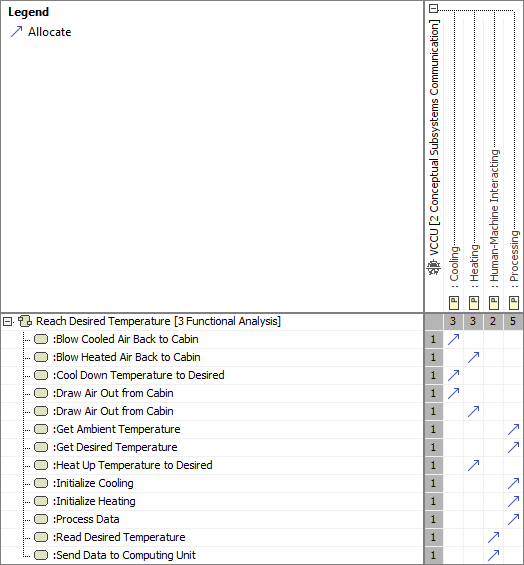
NA



1. Vehicle In Use

## WB Functions To Conceptual Subsystems

NA



1. WB Functions To Conceptual Subsystems