Public Dissemination

INCOSE Challenge Solution

Automatic documentation via Modelio

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1 Introduction

This project details how we can carry out systems engineering with Modelio and describes the solution for the INCOSE 2012 TVC

2 Use Cases

2.1 Actors

Actor	Description
External Environment	
Media	
General Public	
National Weather Service	
Civil Aviation Authority	
Military Aviation Authority	
Air/Rotorcraft Manufacturer	
DOC	
Firefighters	
Firefighting Equipment	
Firefighting Vehicles	
Air/Rotorcrafts	

Table 1 Table of Actors

2.2 Use Cases

Use-Cases	Description
Negotiate Air/rotorcraft specifications	
Communication and Coordination	
Global Operations	
Flight Routes/Plans	
Resource Management	

Table 2 Table of Use Cases

2.2.1 Use Case "Use case Diagram"

This Use case Diagram describes the different actors relating to the PERCC

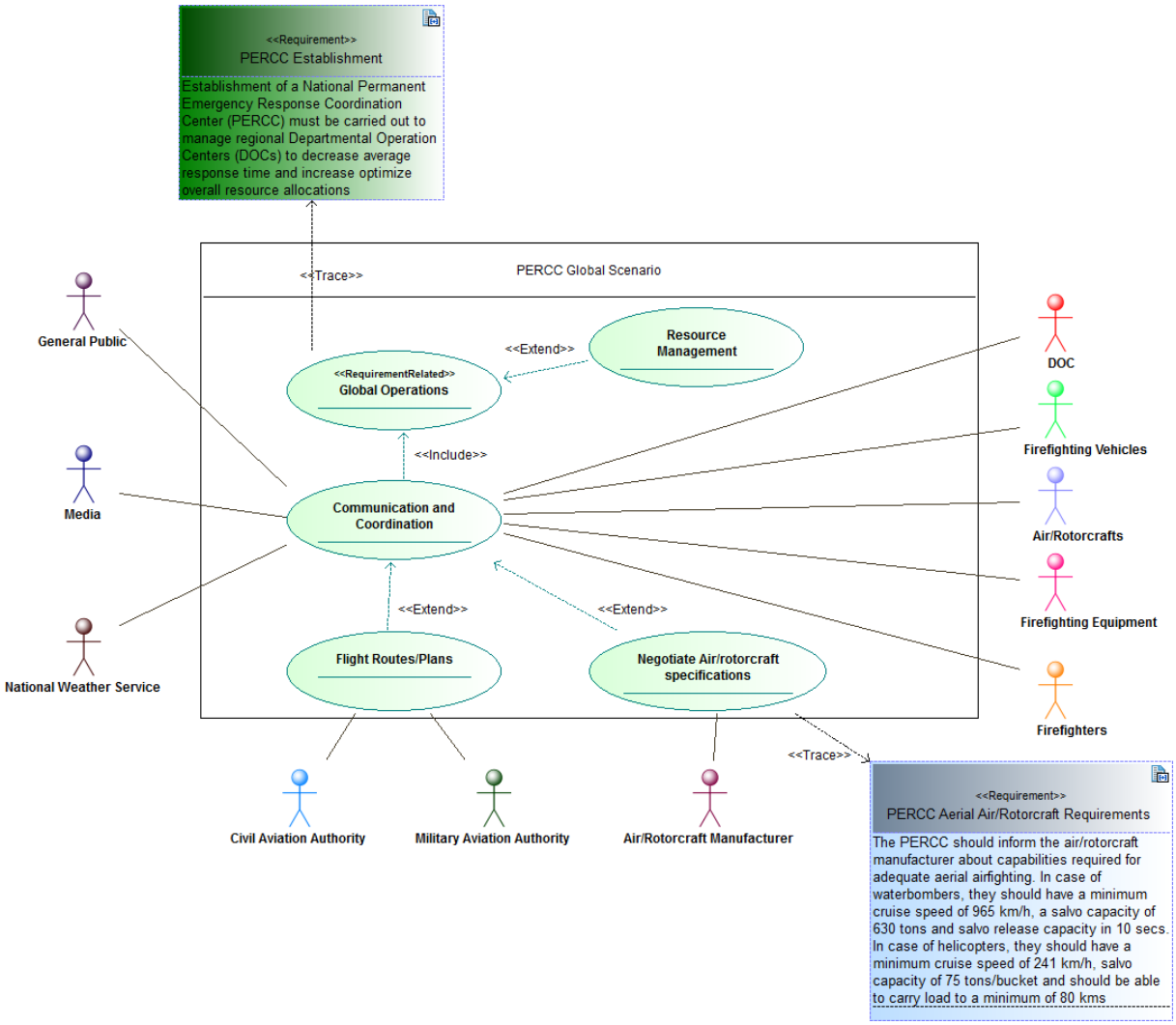

Figure 1 : Use case Diagram

3 Package Index

4 Package "INCOSE_Challenge"

This project details how we can carry out systems engineering with Modelio and describes the solution for the INCOSE 2012 TVC

Name	Summary
Timeline	
External Environment	
PERCC Global Scenario	
PERCC Structure	
Types	
INCOSE Challenge Solution	

Table 3 Owned Packages of Package "INCOSE_Challenge"

4.1 Block "AnalystProperties"

from Package INCOSE_Challenge

Stereotypes: Model Component

4.2 Block "SIDefinitions"

from Package INCOSE_Challenge

Stereotypes: Model Component

4.3 Block "DCI"

from Package INCOSE_Challenge

Stereotypes: Model Component

4.4 Block "DBMS software type"

from Package *INCOSE Challenge*

Stereotypes: Model Component

5 Package "Timeline"

from Package INCOSE Challenge

Name	Type	Description
Timeline		

Table 4 Owned Activity of Package "Timeline"

Activity "Timeline"

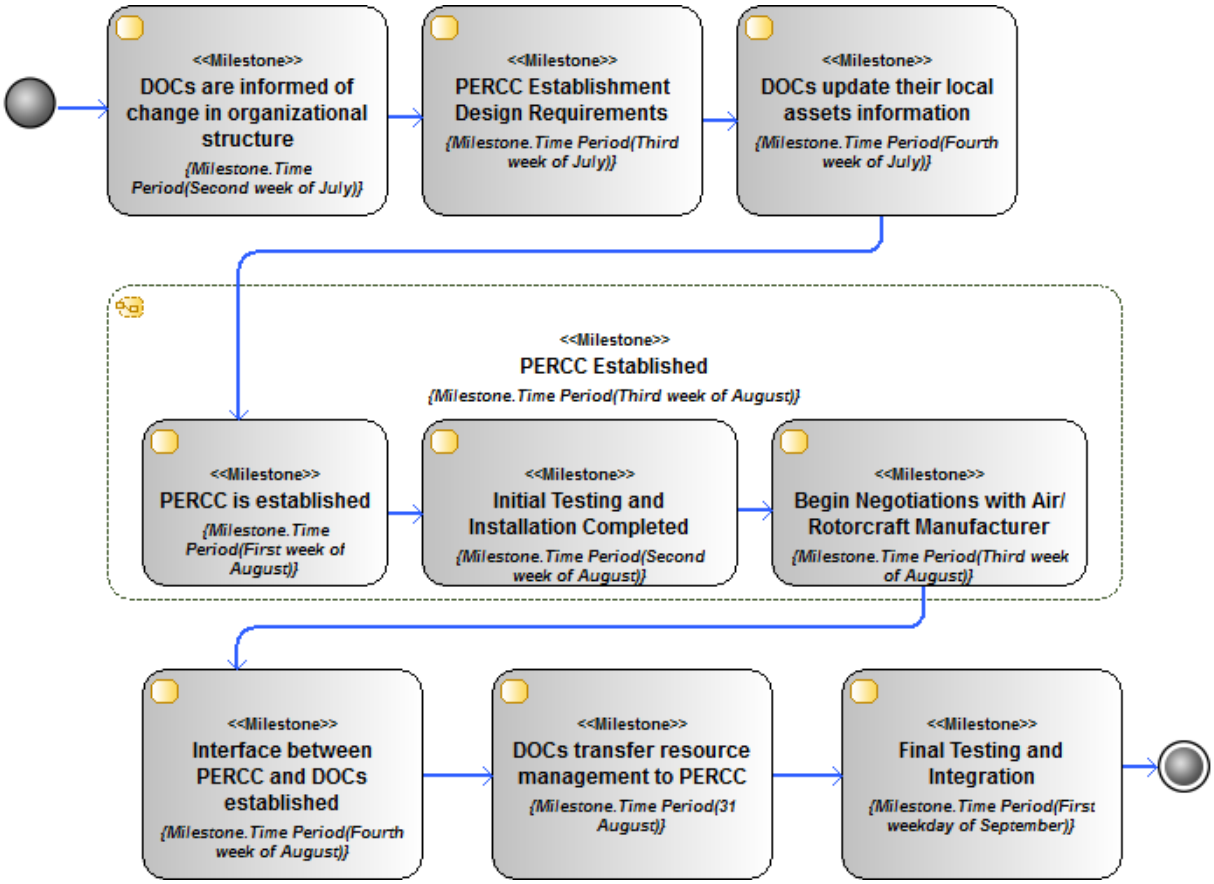

Figure 2 Timeline

This diagram shows the timeline

6 Package "External Environment"

from Package INCOSE_Challenge

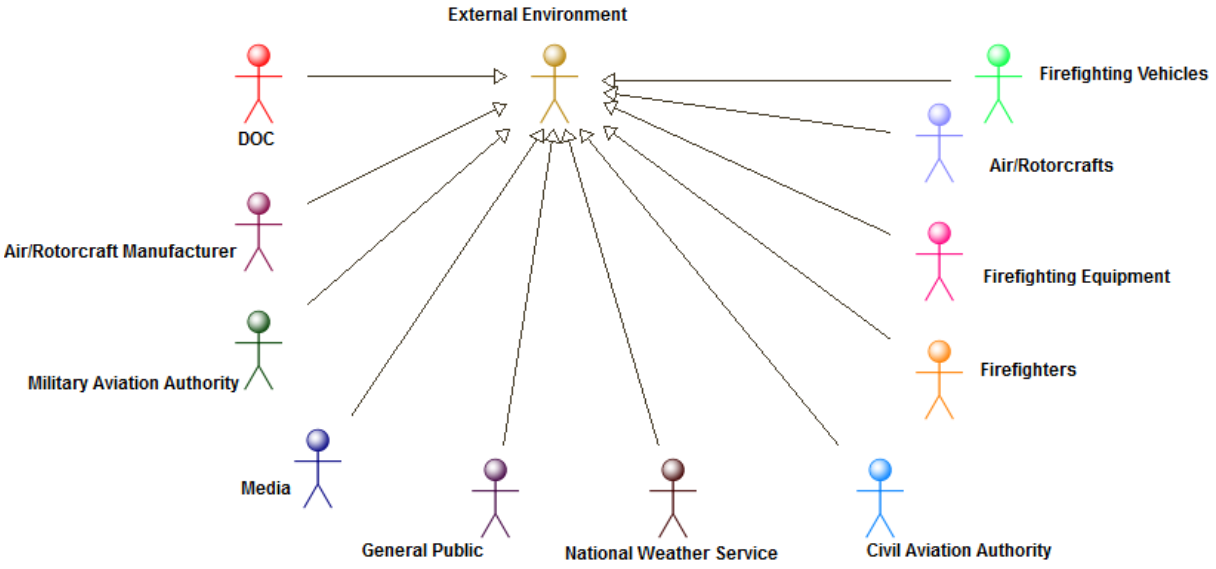

Figure 3 Actors

The hierarchical organization of the actors

7 Package "PERCC Global Scenario"

from Package *INCOSE_Challenge*

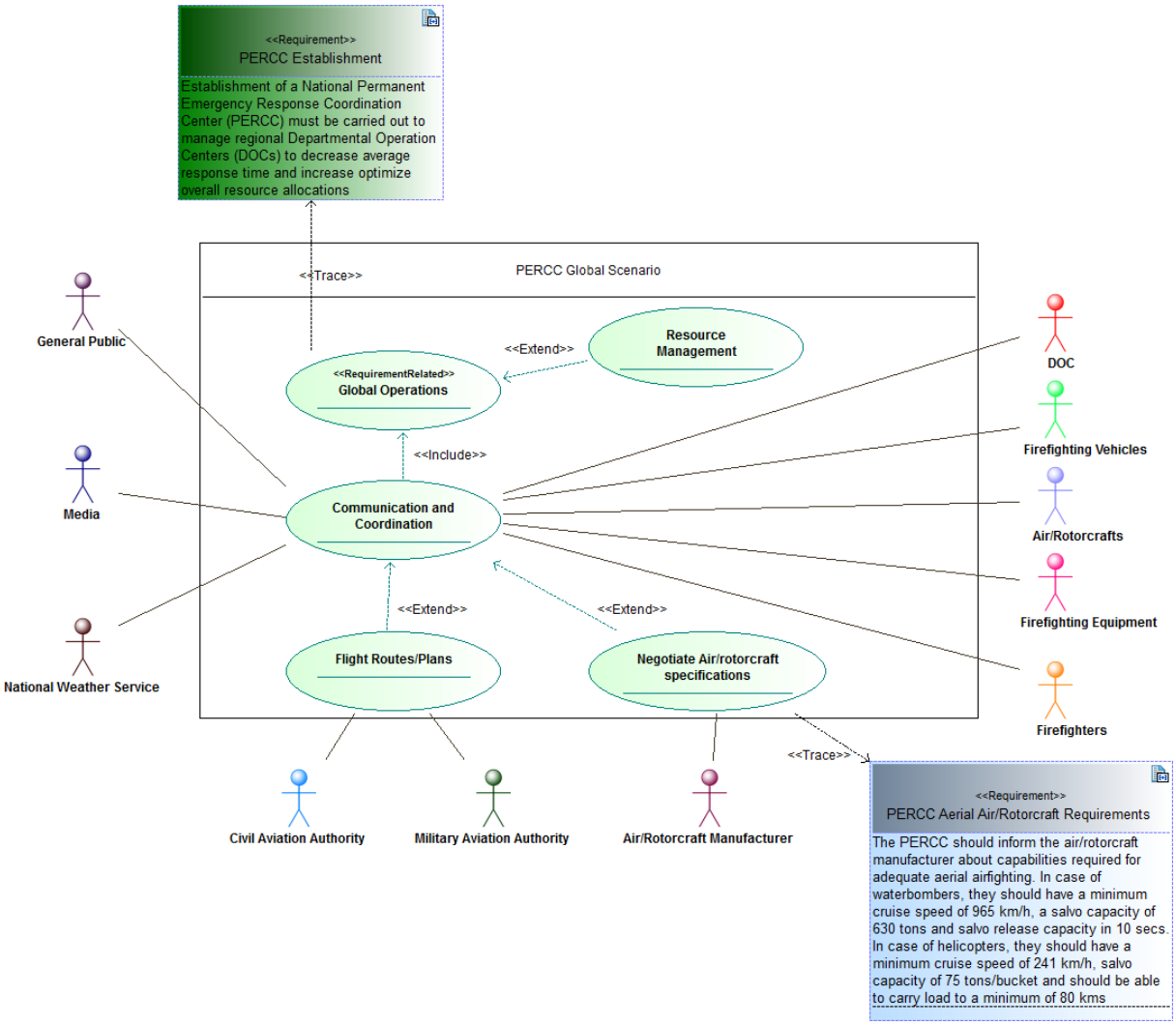

Figure 4 Use case Diagram

This Use case Diagram describes the different actors relating to the PERCC

8 Package "PERCC Structure"

from Package INCOSE_Challenge

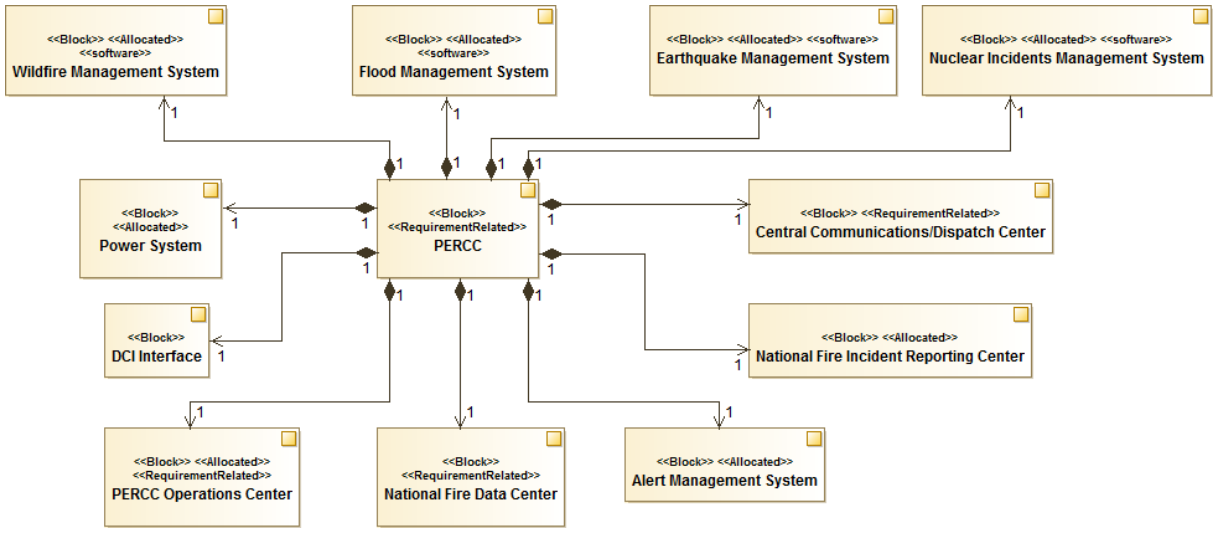

Figure 5 PERCC Block Diagram

This is the block diagram of the PERCC showcasing its overall structure

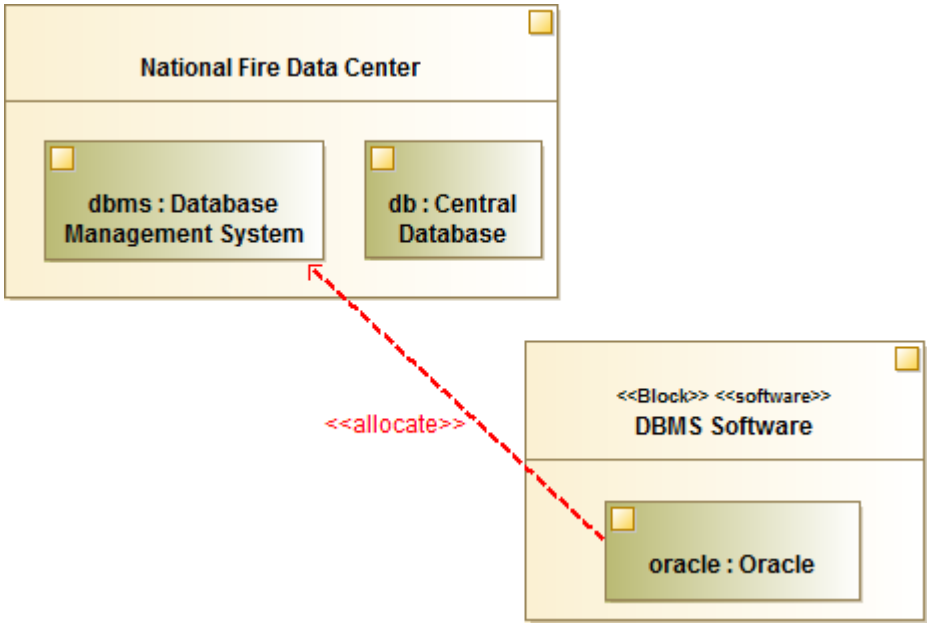

Figure 6 DBMS Software Allocation

This Allocation shows that different user defined or third party IPs can be used. Here the diagram shows the imported oracle block instance is allocated to the dbms instance of the Database Management System

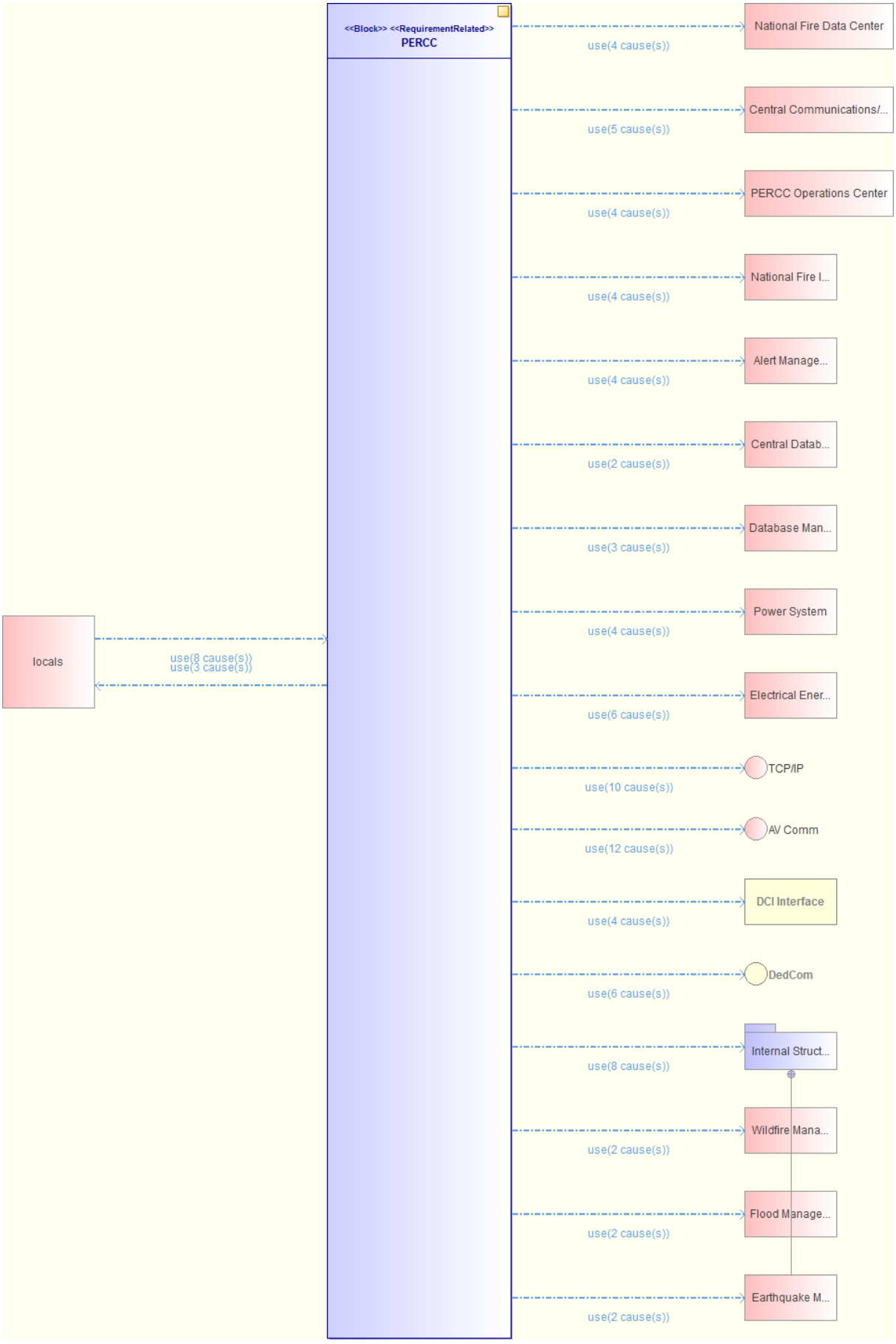
<<Block>> <<RequirementRelated>>
PERCC
National Fire Data Center
use(4 cause(s))
Central Communications/...
use(5 cause(s))
PERCC Operations Center
use(4 cause(s))
National Fire I...
use(4 cause(s))
Alert Manage...
use(4 cause(s))
Central Datab...
use(2 cause(s))
Database Man...
use(3 cause(s))
Power System
use(4 cause(s))
Electrical Ener...
use(6 cause(s))
TCP/IP
use(10 cause(s))
AV Comm
use(12 cause(s))
DCI Interface
use(4 cause(s))
DedCom
use(6 cause(s))
Internal Struct...
use(8 cause(s))
Wildfire Mana...
use(2 cause(s))
Flood Manage...
use(2 cause(s))
Earthquake M...
use(2 cause(s))
locals
use(8 cause(s))
use(3 cause(s))

Figure 7 PERCC (dependency_autodiagram)

Name	Summary
Internal Structure	

Table 5 Owned Packages of Package "PERCC Structure"

Name	Summary
PERCC	

Table 6 Owned Block of Package "PERCC Structure"

8.1 Block "PERCC"

from Package INCOSE_Challenge.PERCC Structure

Stereotypes: Block,RequirementRelated

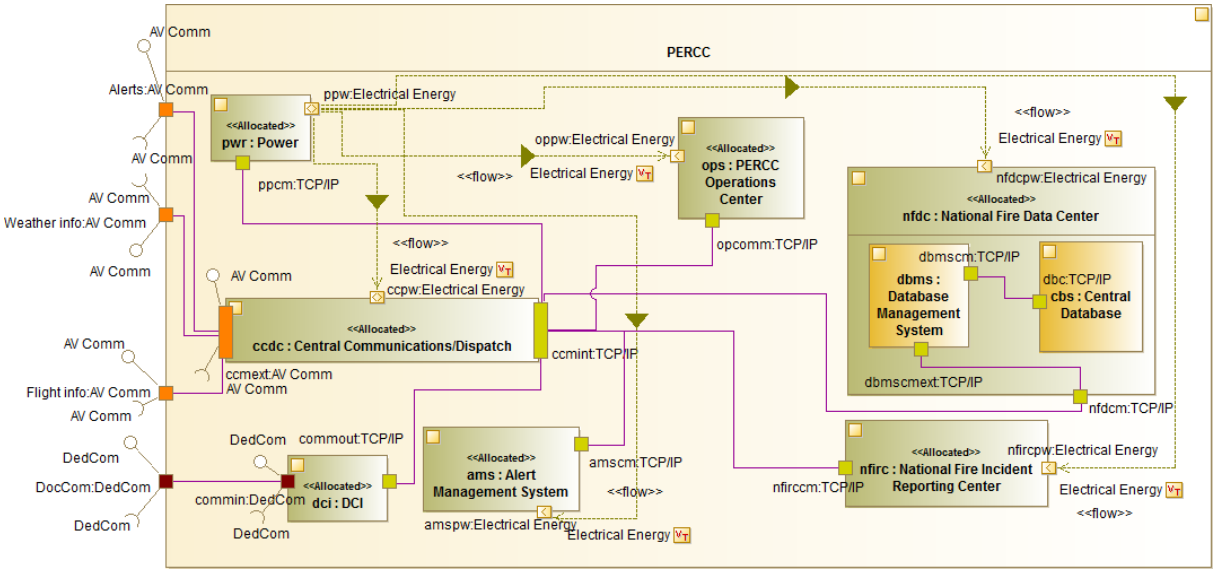

Figure 8 PERCC Internal Block Diagram

This Internal Block Diagram shows the internal composition of the PERCC

Activity "Global PERCC System Activity"

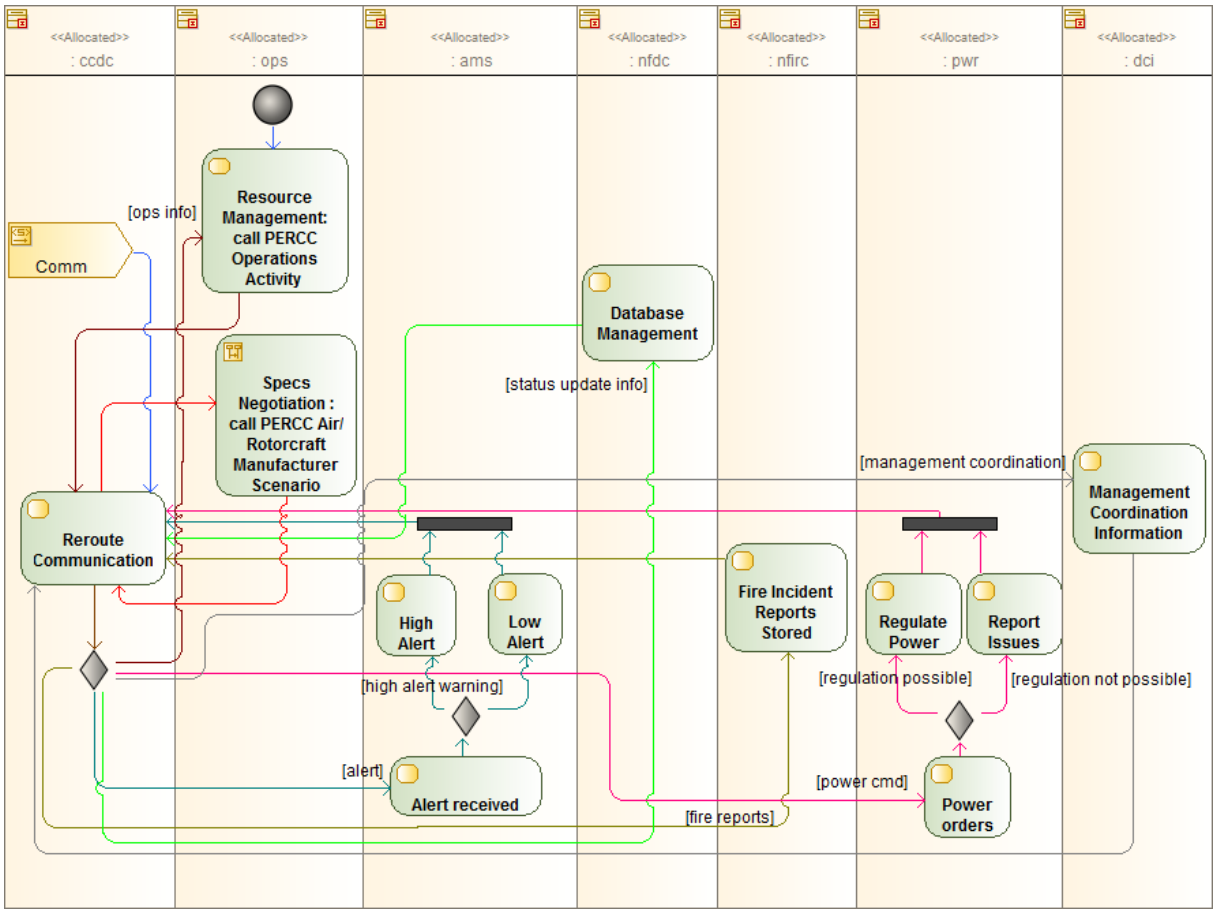

Figure 9 Global PERCC System Activity Diagram

The global activity showcasing the different operations of the PERCC components

Activity "Green Mode Activity"

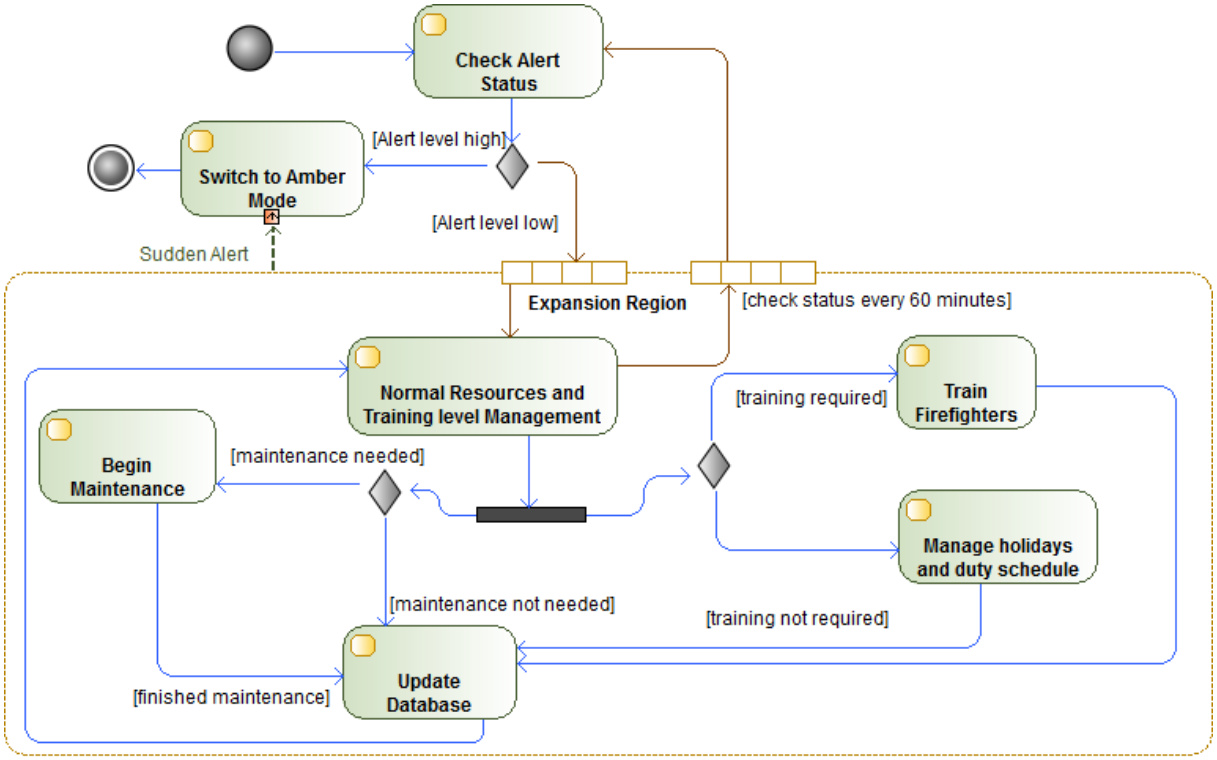

Figure 10 Green Mode Activity Diagram

This diagram shows the activity related to the green mode in case of a wildfire alert

Activity "Amber Mode Activity "

Activity "Red Mode Activity"

Interaction "PERCC Air/Rotorcraft Manufacturer Scenario"

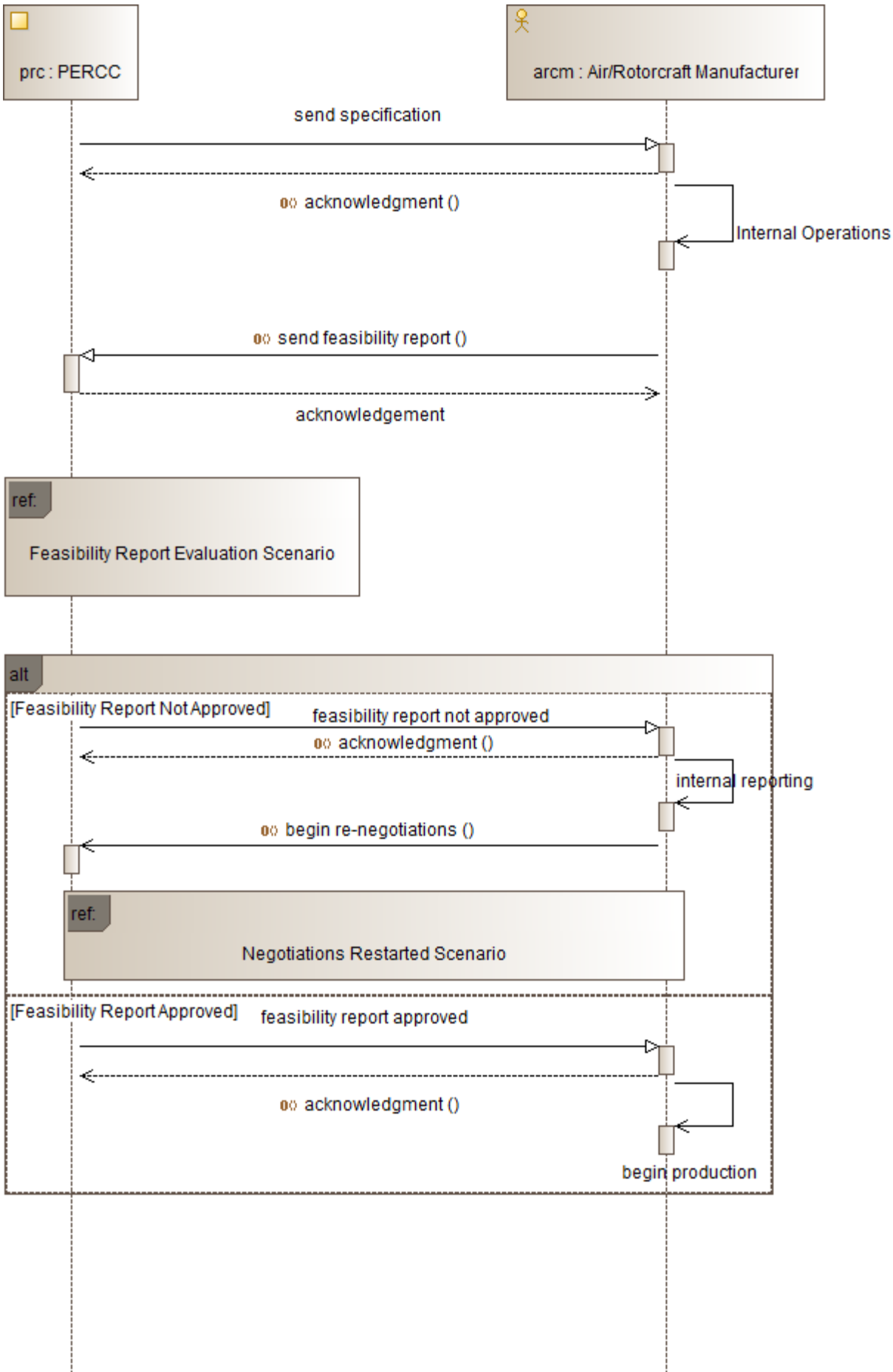
prc : PERCC
arcm : Air/Rotorcraft Manufacturer
send specification
acknowledgment ()
Internal Operations
send feasibility report ()
acknowledgement
ref:
Feasibility Report Evaluation Scenario
alt
[Feasibility Report Not Approved]
feasibility report not approved
acknowledgment ()
internal reporting
begin re-negotiations ()
ref:
Negotiations Restarted Scenario
[Feasibility Report Approved]
feasibility report approved
acknowledgment ()
begin production

Figure 11 PERCC Air/Rotorcraft Manufacturer Scenario Sequence Diagram

The scenario between the PERCC and the Air/Rotorcraft manufacturer

Interaction "Feasibility Report Evaluation Scenario"

Interaction "Negotiations Restarted Scenario"

Activity "PERCC Operations Activity "

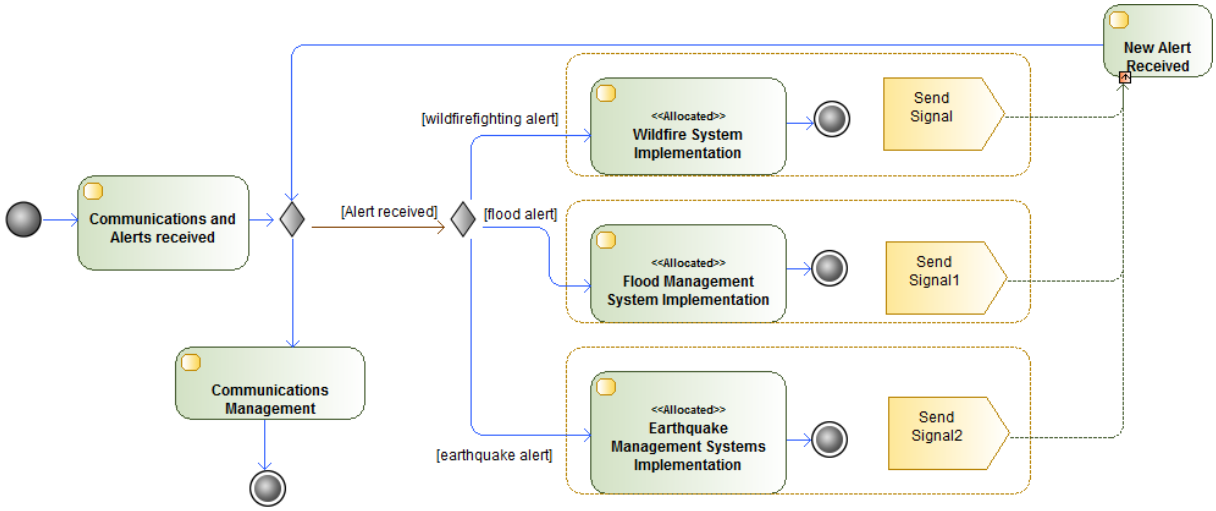

Figure 12 PERCC Operations Activity Diagram

This activity diagram shows the operations of the PERCC

Name	Description
send feasibility report ()	
acknowledgment ()	
begin re-negotiations ()	

Table 7 Operations of Block "PERCC"

Name	Description
-> : [1..1] Power System	
-> : [1..1] PERCC Operations Center	
-> : [1..1] National Fire Data Center	
-> : [1..1] Alert Management System	
-> : [1..1] National Fire Incident Reporting Center	
-> : [1..1] Central Communications/Dispatch Center	
-> : [1..1] DCI Interface	

Name	Description
-> : [1..1] Wildfire Management System	
-> : [1..1] Flood Management System	
-> : [1..1] Earthquake Management System	
-> : [1..1] Nuclear Incidents Management System	

Table 8 Associations of Block "PERCC"

Name	Requires	Provides
Alerts	Interface AV Comm	Interface AV Comm
Flight info	Interface AV Comm	Interface AV Comm
Weather info	Interface AV Comm	Interface AV Comm
DocCom	Interface DedCom	Interface DedCom

Table 9 Ports of Class "PERCC"

9 Package "Internal Structure"

from Package INCOSE_Challenge.PERCC Structure

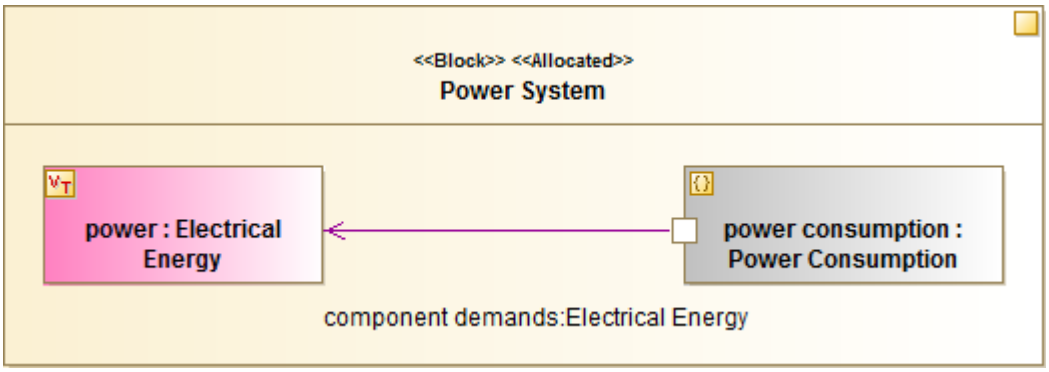

Figure 13 Power System Internal Block Diagram

The Power System Internal Block Diagram shows the power consumption constraint block property and the electrical energy value type

Name	Summary
Parametric	

Table 10 Owned Packages of Package "Internal Structure"

Name	Summary
National Fire Data Center	
Alert Management System	
National Fire Incident Reporting Center	
PERCC Operations Center	
Central Communications/Dispatch Center	
Power System	
Central Database	
Database Management System	
DBMS Software	
Wildfire Management System	
Flood Management System	
Earthquake Management System	
Nuclear Incidents Management System	

Table 11 Owned Block of Package "Internal Structure"

9.1 Block "National Fire Data Center"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,RequirementRelated

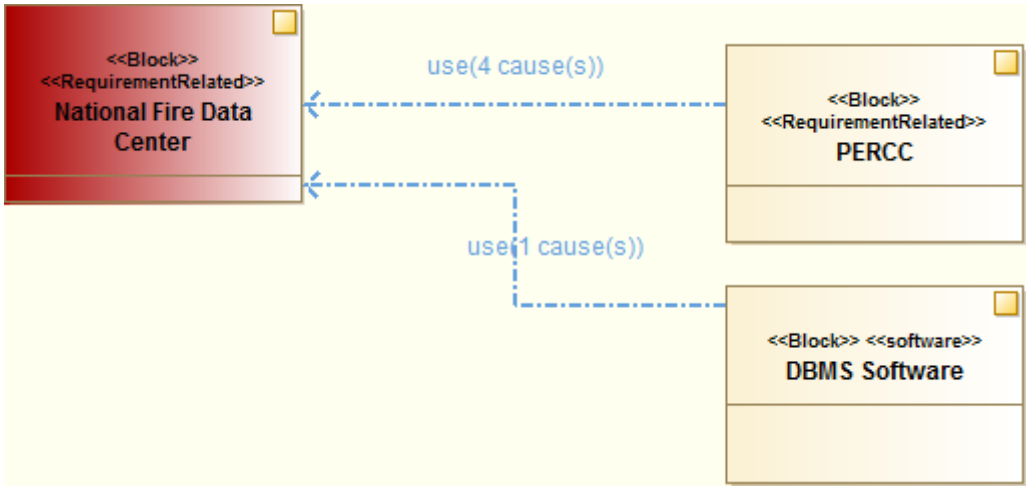

Figure 14 Impact Diagram for "National Fire Data Center"

Name	Description
-> : [1..1] PERCC	

Table 12 Associations of Block "National Fire Data Center"

Name	Requires	Provides
nfdcm		
nfdcpw		

Table 13 Ports of Class "National Fire Data Center"

9.2 Block "Alert Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated

Name	Description
-> : [1..1] PERCC	

Table 14 Associations of Block "Alert Management System"

Name	Requires	Provides

Name	Requires	Provides
amscm		
amspw		

Table 15 Ports of Class "Alert Management System"

9.3 Block "National Fire Incident Reporting Center"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated

Name	Description
-> : [1..1] PERCC	

Table 16 Associations of Block "National Fire Incident Reporting Center"

Name	Requires	Provides
nfirccm		
nfircpw		

Table 17 Ports of Class "National Fire Incident Reporting Center"

9.4 Block "PERCC Operations Center"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated,RequirementRelated

Name	Description
-> : [1..1] PERCC	

Table 18 Associations of Block "PERCC Operations Center"

Name	Requires	Provides
opcomm		
oppw		

Table 19 Ports of Class "PERCC Operations Center"

9.5 Block "Central Communications/Dispatch Center"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,RequirementRelated

	Name	Description
->	: [1..1] PERCC	

Table 20 Associations of Block "Central Communications/Dispatch Center"

Name	Requires	Provides
ccmint		
ccpw		
ccmext	Interface AV Comm	Interface AV Comm

Table 21 Ports of Class "Central Communications/Dispatch Center"

9.6 Block "Power System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated

	Name	Description
->	: [1..1] PERCC	

Table 22 Associations of Block "Power System"

Name	Requires	Provides
ppw		
ppcm		

Table 23 Ports of Class "Power System"

9.7 Block "Central Database"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block

Name	Requires	Provides
dbc		

Table 24 Ports of Class "Central Database"

9.8 Block "Database Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block

Name	Requires	Provides
dbmscm		
dbmscmext		

Table 25 Ports of Class "Database Management System"

9.9 Block "DBMS Software"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,software

9.10 Block "Wildfire Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated,software

State Machine "PERCC Wildfirefighting Modes"

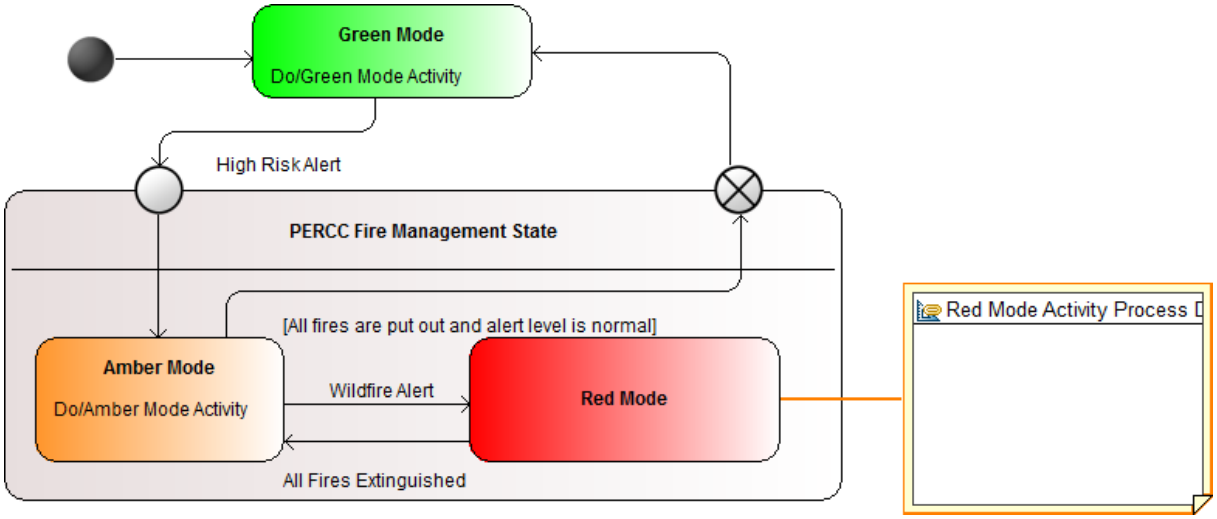

Figure 15 PERCC Wildfirefighting Modes State Machine Diagram

This diagram shows the behavior of the PERCC during wildfire alerts

Name	Description
-> : [1..1] PERCC	

Table 26 Associations of Block "Wildfire Management System"

9.11 Block "Flood Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated,software

Name	Description
-> : [1..1] PERCC	

Table 27 Associations of Block "Flood Management System"

9.12 Block "Earthquake Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated,software

Name	Description
-> : [1..1] PERCC	

Table 28 Associations of Block "Earthquake Management System"

9.13 Block "Nuclear Incidents Management System"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

Stereotypes: Block,Allocated,software

Name	Description
-> : [1..1] PERCC	

Table 29 Associations of Block "Nuclear Incidents Management System"

10Package "Parametric"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure

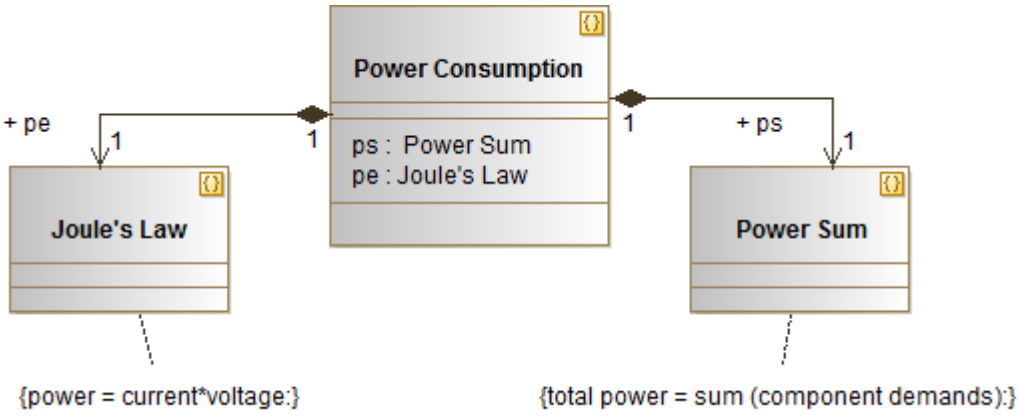

Figure 16 Power Consumation Block Diagram

The Block diagram illustrating relationships between different constraint blocks

Name	Summary
Power Consumption	
Joule's Law	
Power Sum	

Table 30 Owned Block of Package "Parametric"

10.1 Block "Power Consumption"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure.Parametric

Stereotypes: constraint

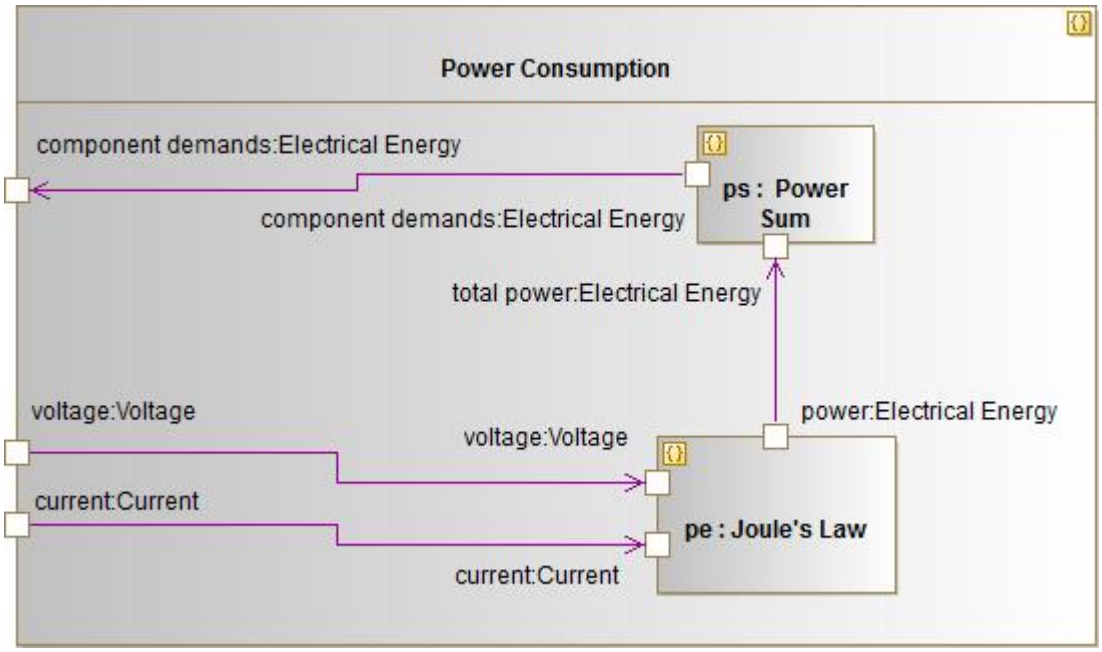

Figure 17 Power Consumption parametric Diagram

The parametric diagram related to the Power Consumption Constraint Block

Name	Description
->pe : [1..1] Joule's Law	
->ps : [1..1] Power Sum	

Table 31 Associations of Block "Power Consumption"

Name	Requires	Provides
component demands		
current		
voltage		

Table 32 Ports of Class "Power Consumption"

10.2 Block "Joule's Law"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure.Parametric

Stereotypes: constraint

Name	Description
-> : [1..1] Power Consumption	

Table 33 Associations of Block "Joule's Law"

Name	Body	Description
power = current*voltage		

Table 34 Constraints of Block "Joule's Law"

Name	Requires	Provides
power		
voltage		
current		

Table 35 Ports of Class "Joule's Law"

10.3 Block " Power Sum"

from Package INCOSE_Challenge.PERCC Structure.Internal Structure.Parametric

Stereotypes: constraint

Name	Description
-> : [1..1] Power Consumption	

Table 36 Associations of Block " Power Sum"

Name	Body	Description
total power = sum (component demands)		

Table 37 Constraints of Block " Power Sum"

Name	Requires	Provides
total power		
component demands		

Table 38 Ports of Class " Power Sum"

11Package "SI Derived Units Expressed In Base Units"

from Component INCOSE_Challenge.SIDefinitions

Name	Representing	Value
Acceleration		
AmountOfSubstanceConcentration		
Area		
CurrentDensity		
Luminance		
MagneticFieldStrength		
MassDensity		
SpecificVolume		
Velocity		
Volume		
WaveNumber		
AmperePerMeter		
AmperePerSquareMeter		
CandelaPerSquareMeter		
CubicMeter		
CubicMeterPerKilogram		
KilogramPerCubicMeter		
MeterPerSecond		
MeterPerSecondSquared		
MolePerCubicMeter		
ReciprocalMeter		
SquareMeter		

Table 39 Instances of Package "SI Derived Units Expressed In Base Units"

12Package "SI Base Units"

from Component INCOSE_Challenge.SIDefinitions

Name	Representing	Value
AmountOfSubstance		
ElectricCurrent		
Length		
LuminousIntensity		
Mass		
ThermodynamicTemperature		
Time		
Ampere		
Candela		
Kelvin		
Kilogram		
Meter		
Mole		
Second		

Table 40 Instances of Package "SI Base Units"

13Package "SI Derived Units With Special Names"

from Component INCOSE_Challenge.SIDefinitions

Name	Representing	Value
AbsorbedDose		
ActivityOfRadionuclide		
Capacitance		
CatalyticActivity		
CelsiusTemperature		
DoseEquivalent		
ElectricCharge		
ElectricConductance		
ElectricPotentialDifference		
ElectricResistance		
Energy		
Force		
Frequency		
Illuminance		
Inductance		
LuminousFlux		
MagneticFlux		
MagneticFluxDensity		
PlaneAngle		
Power		
Pressure		
SolidAngle		
Bequerel		
Coulomb		
Degree Celsius		
Farad		
Gray		
Henry		
Hertz		
Joule		
Katal		
Lumen		
Lux		
Newton		
Ohm		
Pascal		
Radian		
Siemens		
Sievert		
Steradian		

Name	Representing	Value
Tesla		
Volt		
Watt		
Weber		

Table 41 Instances of Package "SI Derived Units With Special Names"

14Package "Types"

from Package INCOSE_Challenge

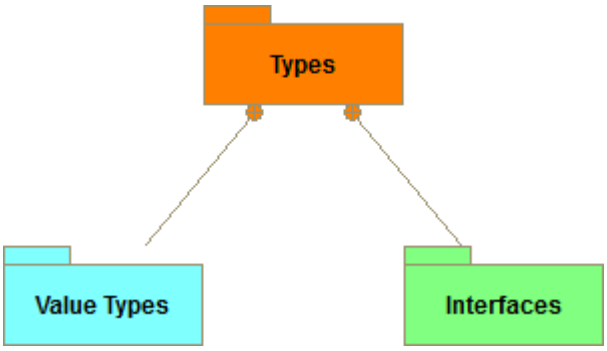

Figure 18 Types

This diagram shows the different types (value types, interfaces) used in the solution

Name	Summary
Value Types	
Interfaces	

Table 42 Owned Packages of Package "Types"

15Package "Value Types"

from Package INCOSE_Challenge.Types

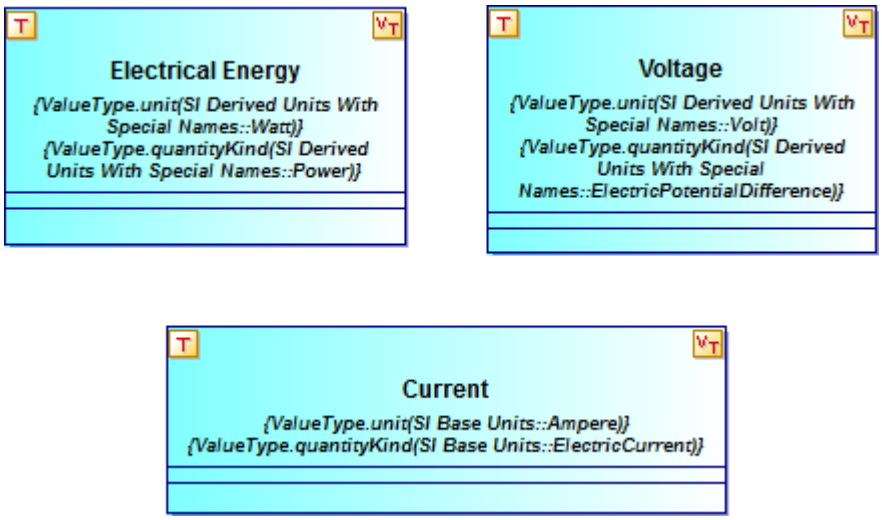

Figure 19 ValueTypes

Here, the "Electrical Energy" user defined valye type is defined, using concepts defined in the Modelio SysML library

Name	Summary
Electrical Energy	
Voltage	
Current	

Table 43 Owned ValueTypes of Package "Value Types"

15.1 ValueType "Electrical Energy"

from Package INCOSE_Challenge.Types.Value Types

Stereotypes: ValueType

15.2 ValueType "Voltage"

from Package INCOSE_Challenge.Types.Value Types

Stereotypes: ValueType

15.3 ValueType "Current"

from Package INCOSE_Challenge.Types.Value Types

Stereotypes: ValueType

16Package "Interfaces"

from Package INCOSE_Challenge.Types

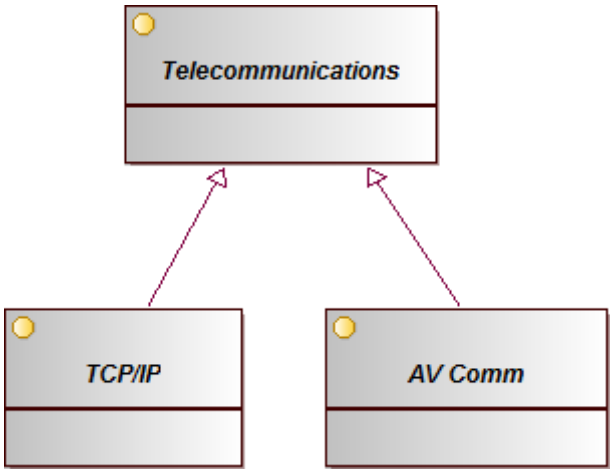

Figure 20 Interfaces

This diagram shows the different interfaces used for communication

Name	Summary
TCP/IP	
AV Comm	
Telecommunications	

Table 44 Owned Interfaces of Package "Interfaces"

16.1 Interface "TCP/IP"

from Package INCOSE_Challenge.Types.Interfaces

Inherits from: Telecommunications

16.2 Interface "AV Comm"

from Package INCOSE_Challenge.Types.Interfaces

Inherits from: Telecommunications

16.3 Interface "Telecommunications"

from Package INCOSE_Challenge.Types.Interfaces

17Package "INCOSE Challenge Solution"

from Package *INCOSE Challenge*

Stereotypes: Document Folder