



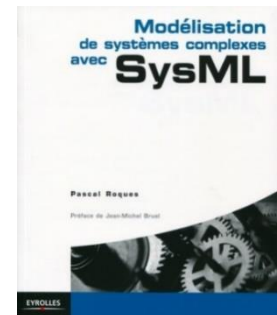
## Clock Radio Example - 07/2015

- Pascal Roques: senior consultant, 25 years of experience
  - SADT, OMT, UML, SysML, ARCADIA

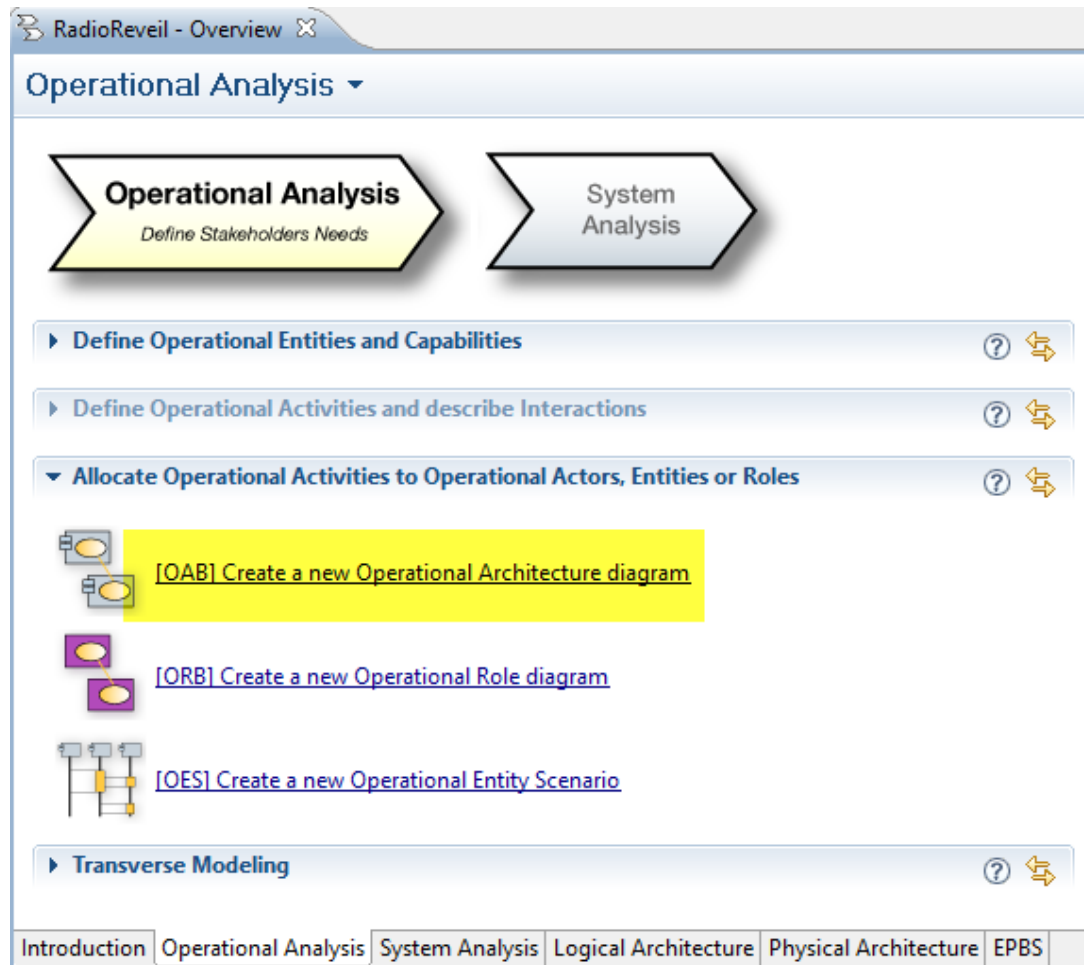
- UML2 and SysML Certified by OMG
- Co-founder of the  association



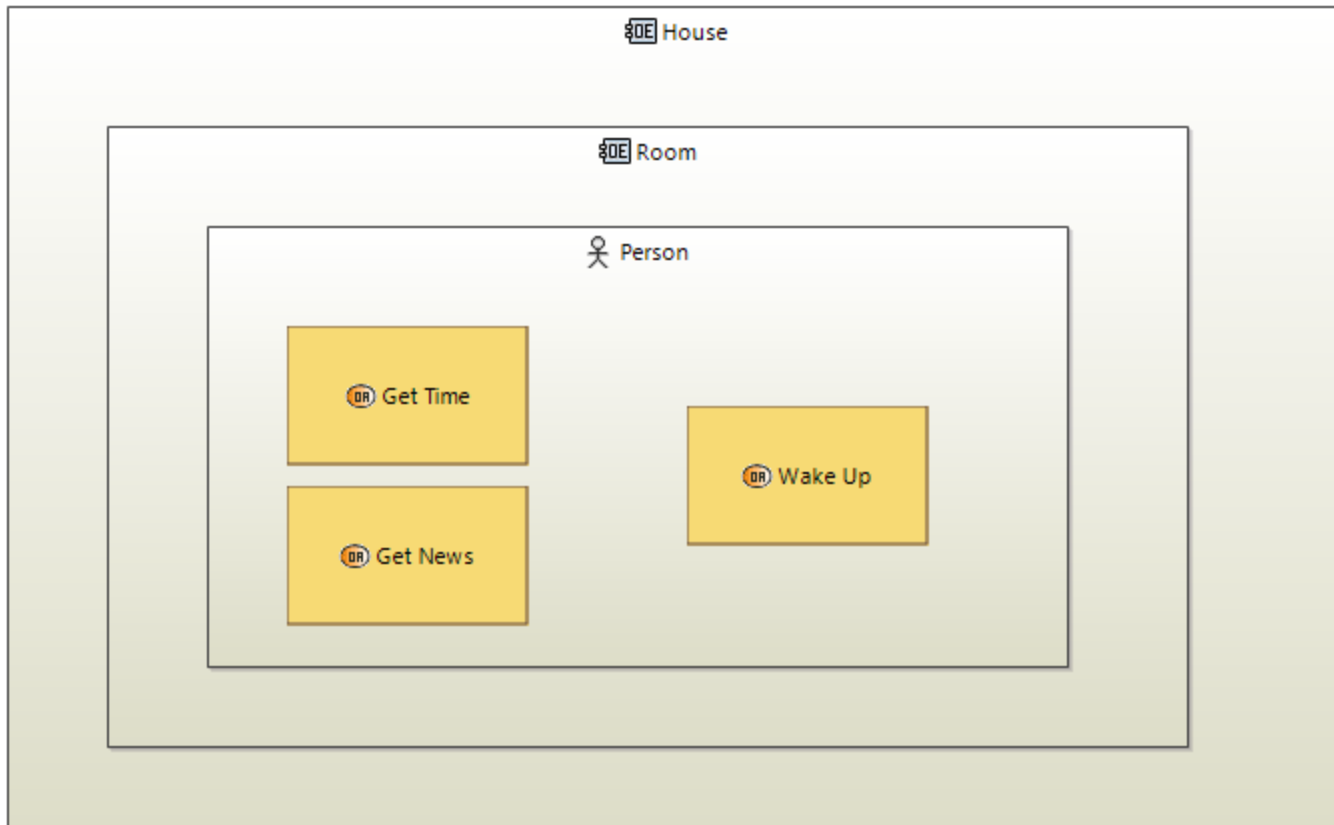
- Trainer for Thales on ARCADIA / Melody
  - 80+ sessions, 1000+ trainees
  - Member of the Clarity consortium
- Author of the most widely read books in France on UML ... and of the first French book on SysML

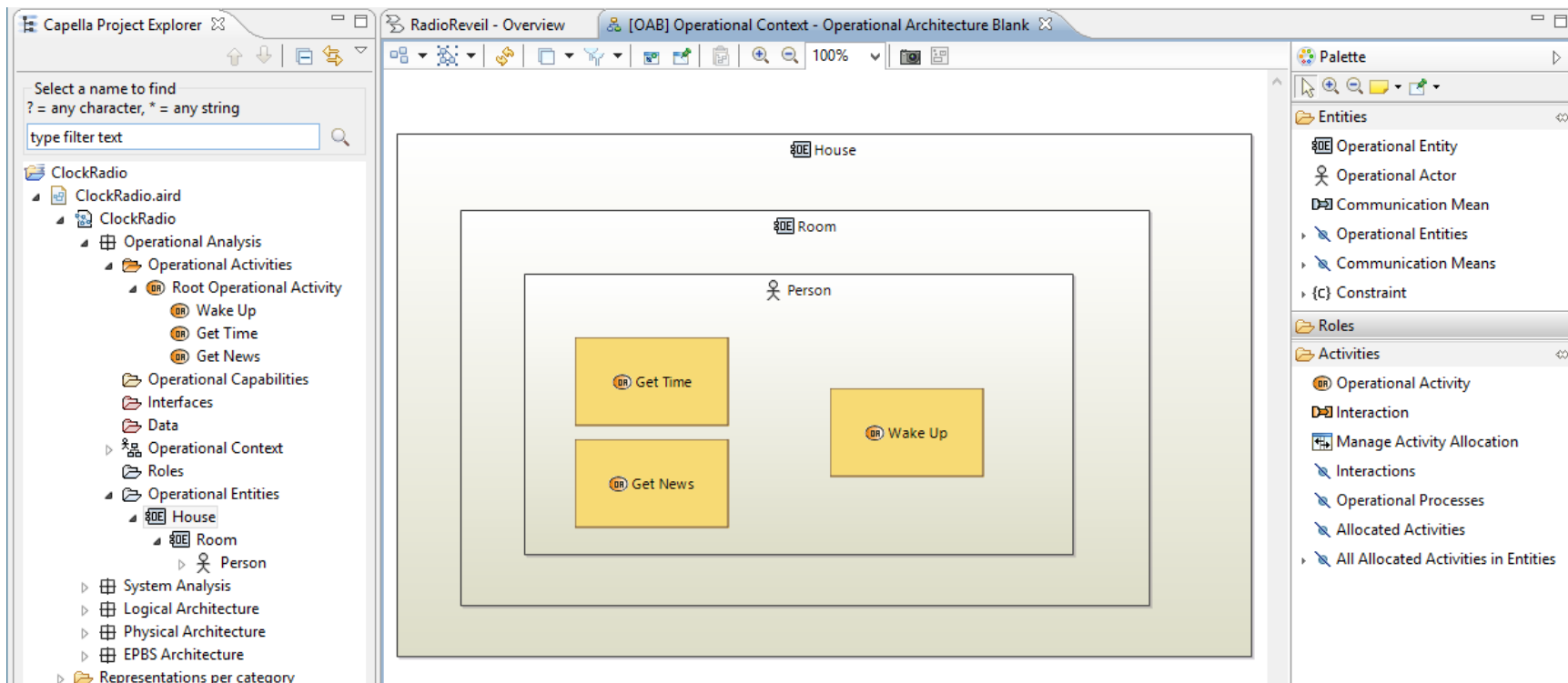


# Operational Analysis (OA)



# Operational Architecture Blank





# OA: Diagrams Viewer

Operational Analysis ▾

Operational Analysis  
Define Stakeholders Needs

System Analysis

▸ Define Operational Entities and Capabilities

▸ Define Operational Activities and describe Interactions

▸ Allocate Operational Activities to Operational Actors, Entities or Roles

▸ Transverse Modeling

Diagrams Viewer


Select a name to find  
? = any character, \* = any string

type filter text

Common

Operational Analysis

- Operational Architecture Blank
  - [OAB] Operational Context - Operational Architecture Blank
- Operational Entity Breakdown
  - [OEBD] Operational Context - Operational Entity Breakdown

 **Clarity**

6

# System Analysis (SA)



# System Data Flow Blank

RadioReveil - Overview

System Analysis ▾

Operational Analysis   **System Analysis** *Formalize System Requirements*   Logical Architecture

▸ Transition From Operational Activities ? ↗

▸ Define Actors, Missions and Capabilities ? ↗

▾ Refine System Functions, describe Functional Exchanges

- [\[SFBF\] Create a new Functional Breakdown diagram](#)
- [\[SDFB\] Create a new Functional Dataflow Blank diagram](#)
- [\[FSI\] Create a new Functional Scenario](#)

▸ Allocate System Functions to System and Actors ? ↗

▸ Define Interfaces and describe Interface Scenarios ? ↗

Diagrams Viewer

Select a name to find  
? = any character, \* = any string  
type filter text

- Common
- System Analysis

Type representation name

Type representation name

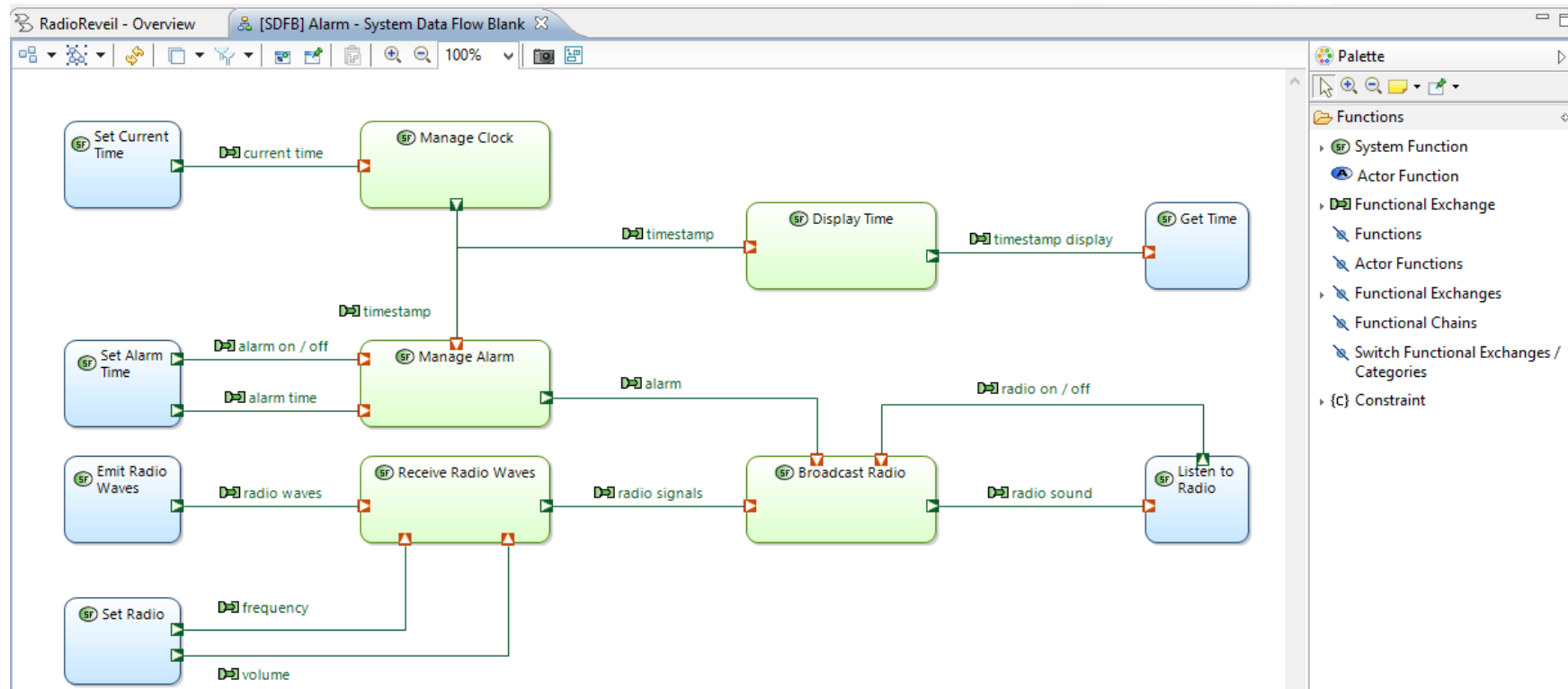
[SDFB] Alarme - System Data Flow Blank

OK Cancel

Introduction Operational Analysis System Analysis Logical Architecture Physical Architecture EPBS



# System Data Flow Blank (SDFB)



# System Architecture Blank

RadioReveil - Overview [SDFB] Alarme - System Data Flow Blank

## System Analysis ▾

Operational Analysis

**System Analysis**  
*Formalize System Requirements*

Logical Architecture

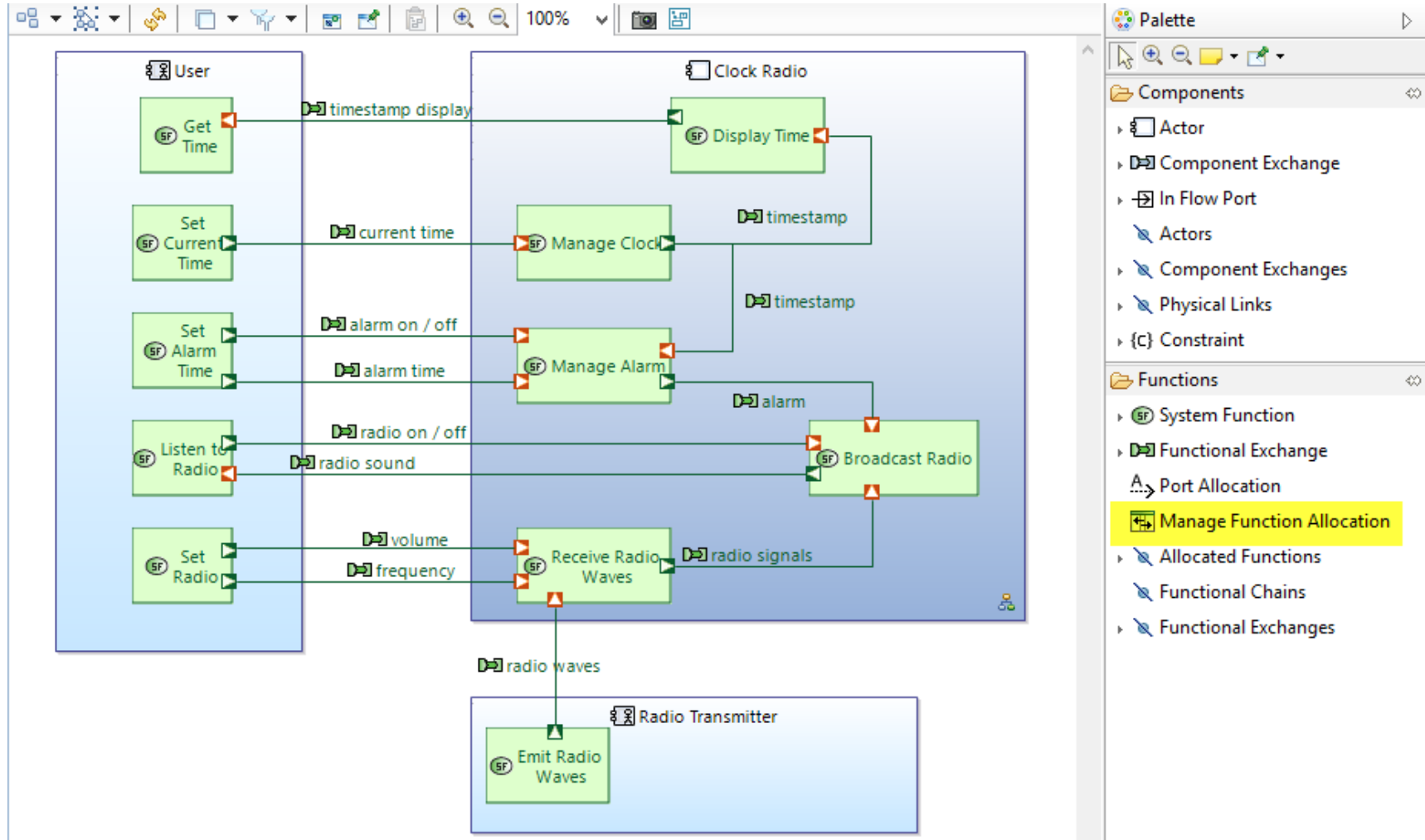
- ▶ Transition From Operational Activities ? ⇅
- ▶ Define Actors, Missions and Capabilities ? ⇅
- ▶ Refine System Functions, describe Functional Exchanges ? ⇅
- ▼ Allocate System Functions to System and Actors ? ⇅
  - [SAB] Create a new System Architecture diagram
  - [ES] Create a new Exchange Scenario
- ▶ Define Interfaces and describe Interface Scenarios ? ⇅
- ▶ Transverse Modeling ? ⇅

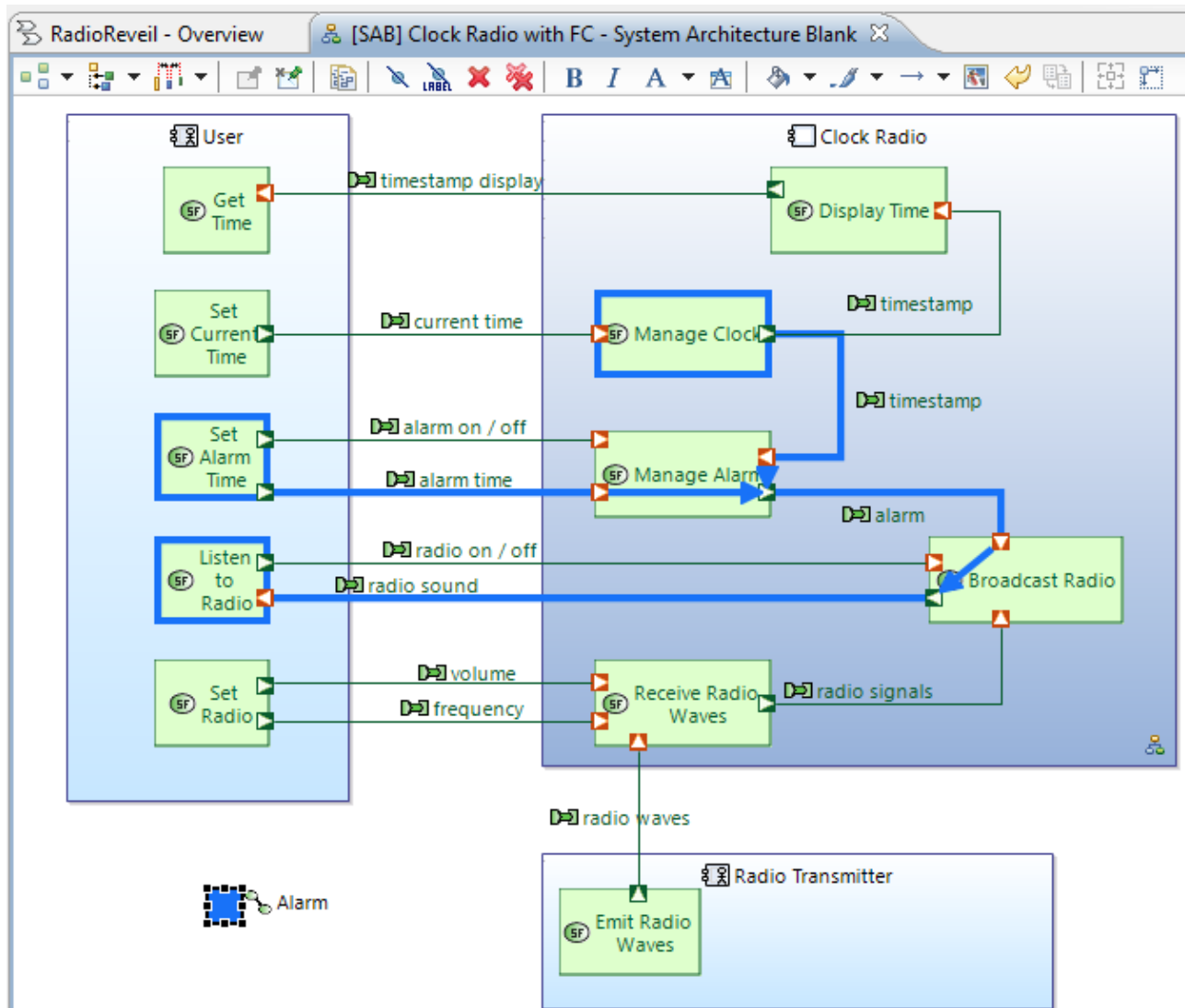
### Diagrams Viewer

Select a name to find  
? = any character, \* = any string  
type filter text

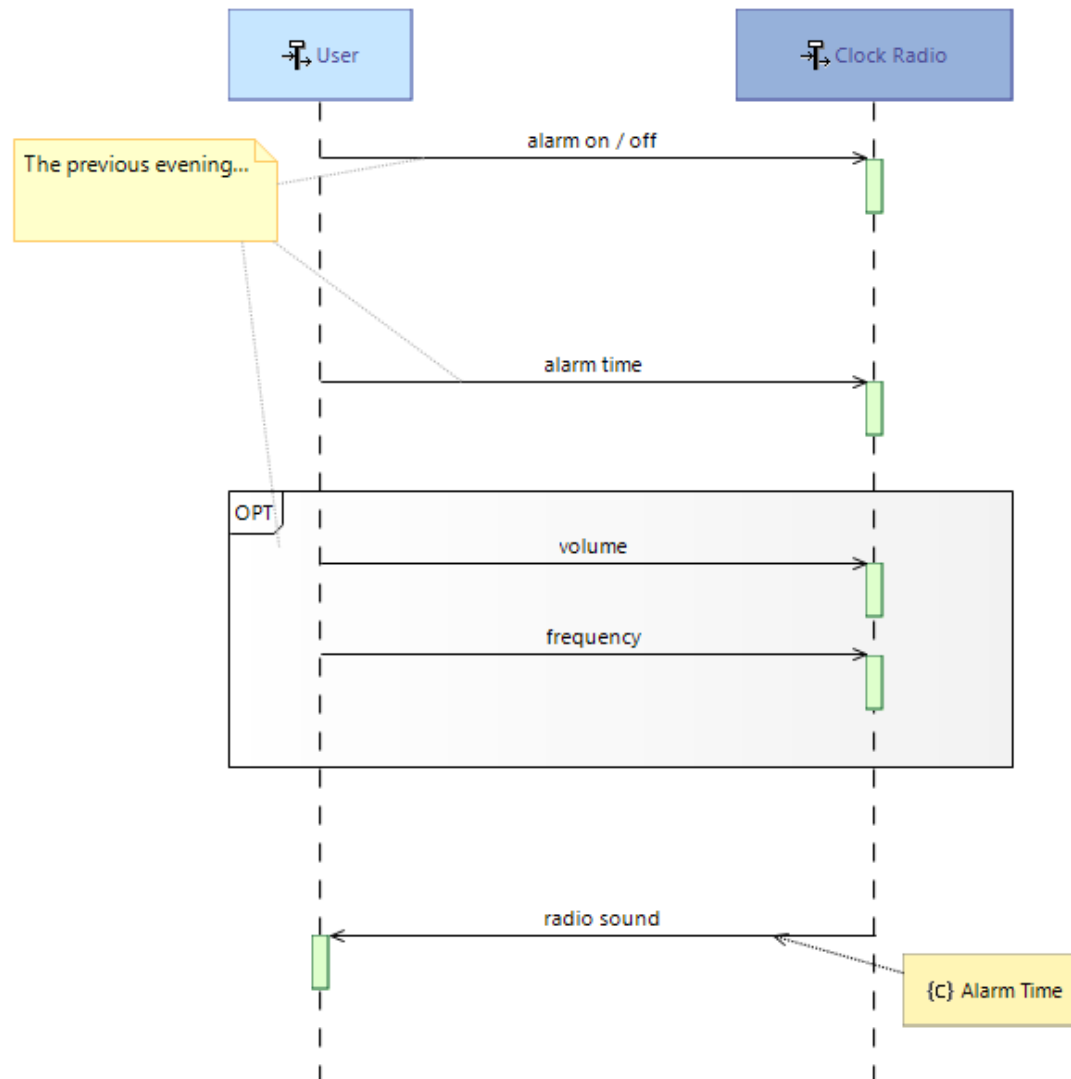
- Common
  - Functional Chain Description
    - [SFCD] Alarme - System Functional Chain Description
  - System Analysis
    - System Data Flow Blank
      - [SDFB] Alarme - System Data Flow Blank

# SAB: Functions Allocation





# System Exchange Scenario



# SA – OA Matrices

RadioReveil - Overview			
	Wake Up	Get Time	Get News
Manage Clock	X	X	
Manage Alarm	X		
Set Current Time		X	
Set Alarm Time	X		
Display Time		X	
Broadcast Radio	X		X
Emit Radio Waves			
Get Time		X	
Listen to Radio			X
Receive Radio Waves	X		X
Set Radio	X		X

RadioReveil - Overview			
	House	Room	Person
User			X
Radio Transmitter			

# Class Diagram Blank

The screenshot shows the RadioReveil software interface. The top tabs are "RadioReveil - Overview", "[SES] Alarme - Exchange Scenario", and "[SAB] Radio-réveil - System Architecture Blank". The "System Analysis" tab is active, showing a workflow with three main steps: "Operational Analysis", "System Analysis" (highlighted in yellow), and "Logical Architecture". The "System Analysis" step is further detailed with a list of tasks: "Transition From Operational Activities", "Define Actors, Missions and Capabilities", "Refine System Functions, describe Functional Exchanges", "Allocate System Functions to System and Actors", and "Define Interfaces and describe Interface Scenarios". Below these tasks is the "Transverse Modeling" section, which includes three options: "[CDB] Create a new Class Diagram" (highlighted in yellow), "[M&S] Create a new Modes & States Machine", and "Create a new State & Mode / Functions matrix". A red arrow points from the "[CDB] Create a new Class Diagram" option to a dialog box titled "Type representation name". The dialog box has a text input field containing "[SDB] Data - Class Diagram Blank" and "OK" and "Cancel" buttons.

RadioReveil - Overview [SES] Alarme - Exchange Scenario [SAB] Radio-réveil - System Architecture Blank

System Analysis ▾

Operational Analysis System Analysis Formalize System Requirements Logical Architecture

▸ Transition From Operational Activities ? ↗

▸ Define Actors, Missions and Capabilities ? ↗

▸ Refine System Functions, describe Functional Exchanges ? ↗

▸ Allocate System Functions to System and Actors ? ↗

▸ Define Interfaces and describe Interface Scenarios ? ↗

▼ Transverse Modeling

[CDB] Create a new Class Diagram

[M&S] Create a new Modes & States Machine

Create a new State & Mode / Functions matrix

Diagrams View

Select a name  
? = any character  
type filter text

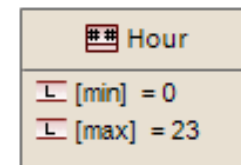
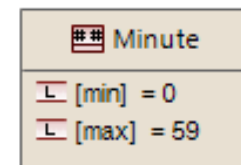
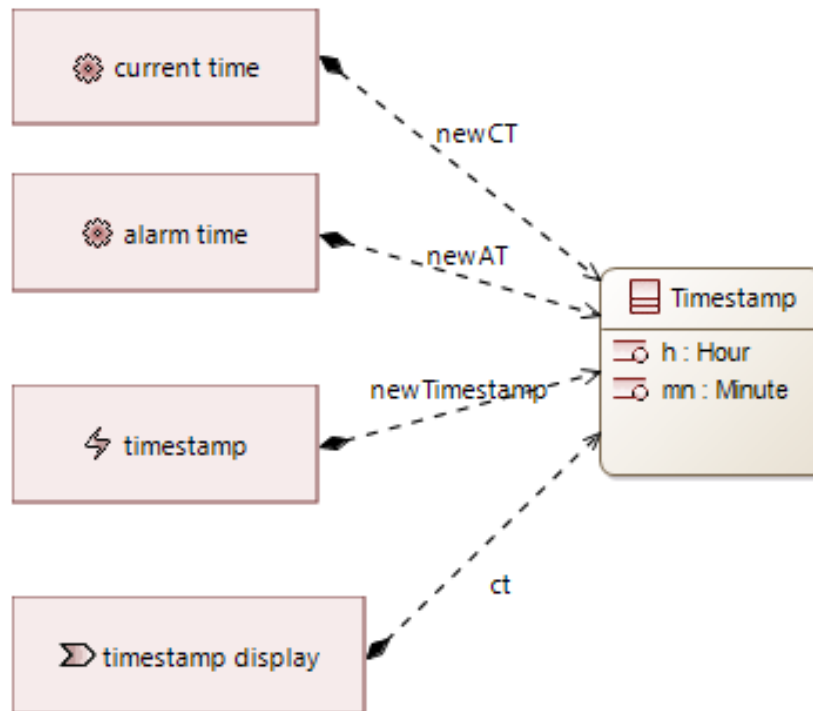
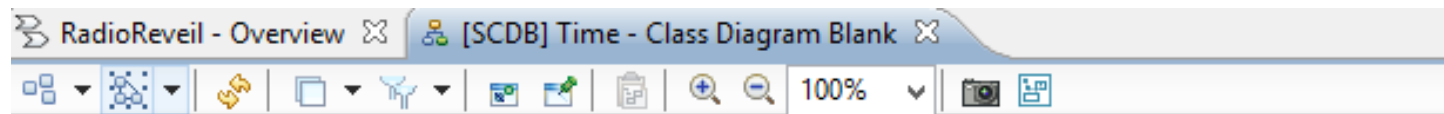
Comm  
Excl  
Fun  
System  
Syst  
Syst

Type representation name

Type representation name  
[SDB] Data - Class Diagram Blank

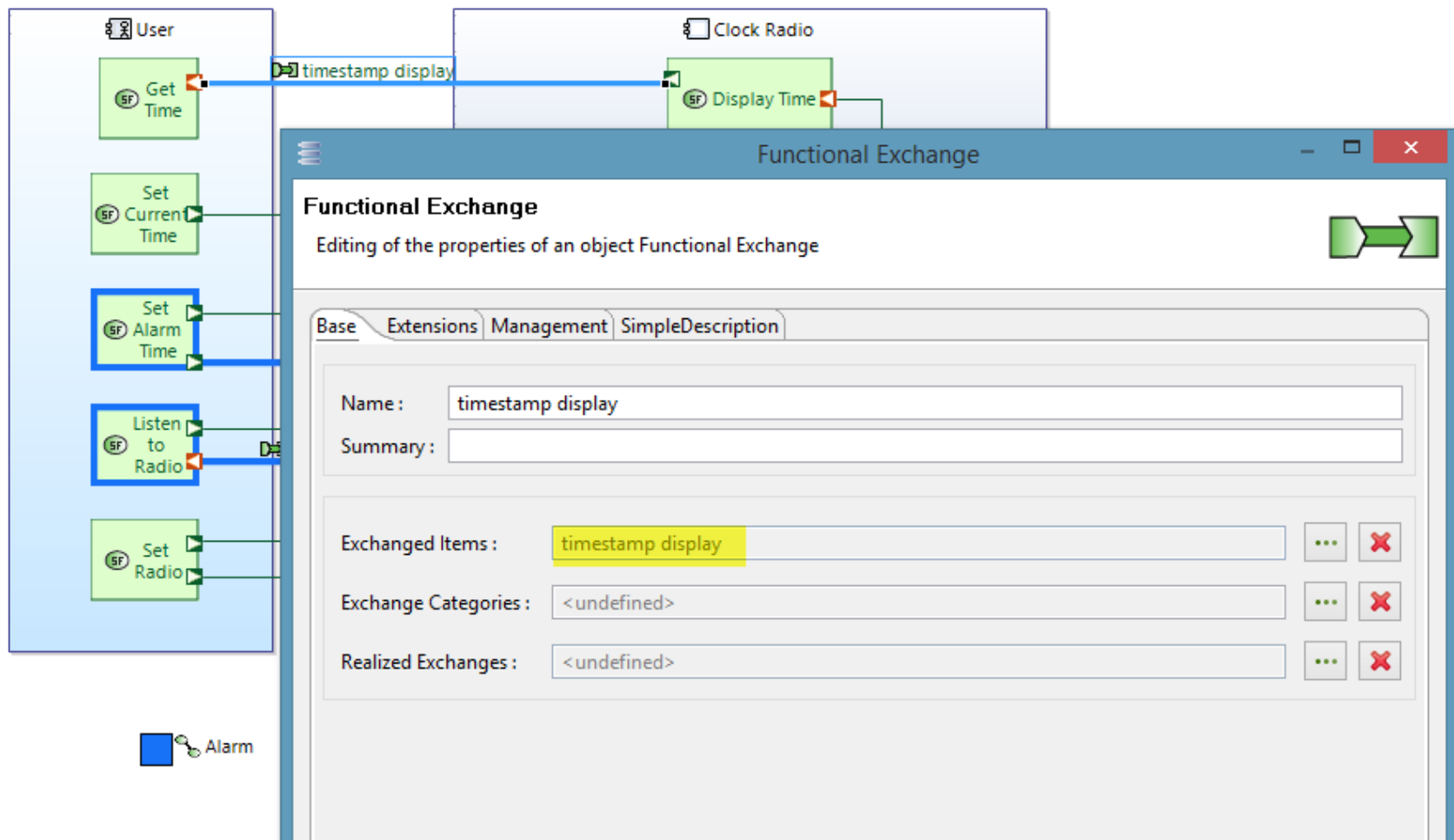
OK Cancel

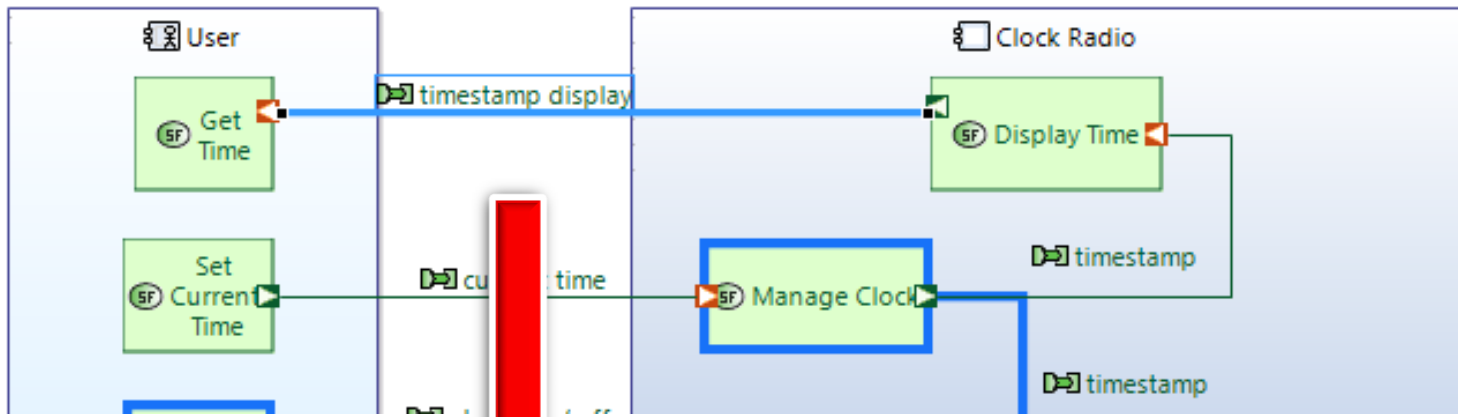
# SCDB: Exchange Items and Types





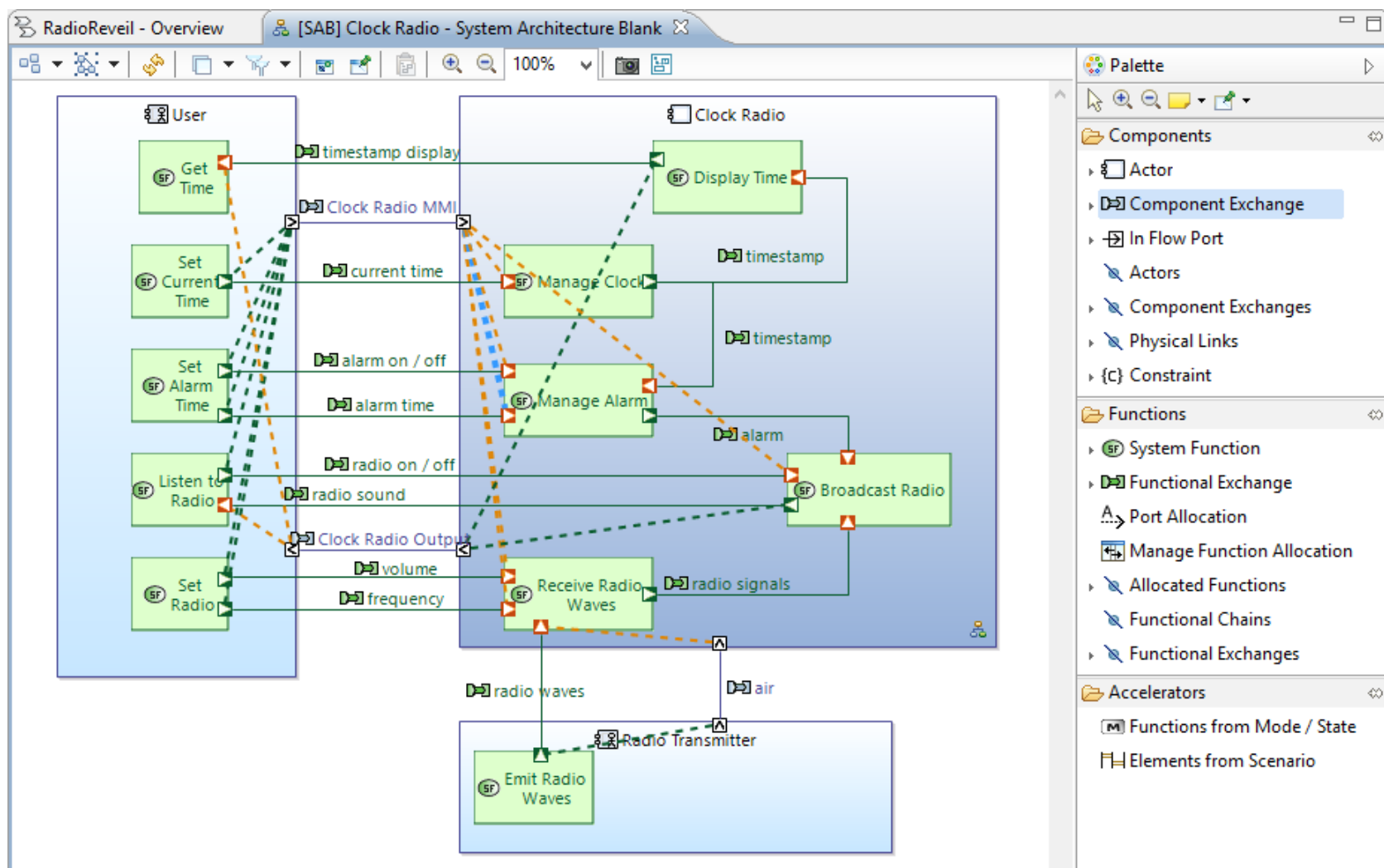
# SAB: Exchange Item and FE



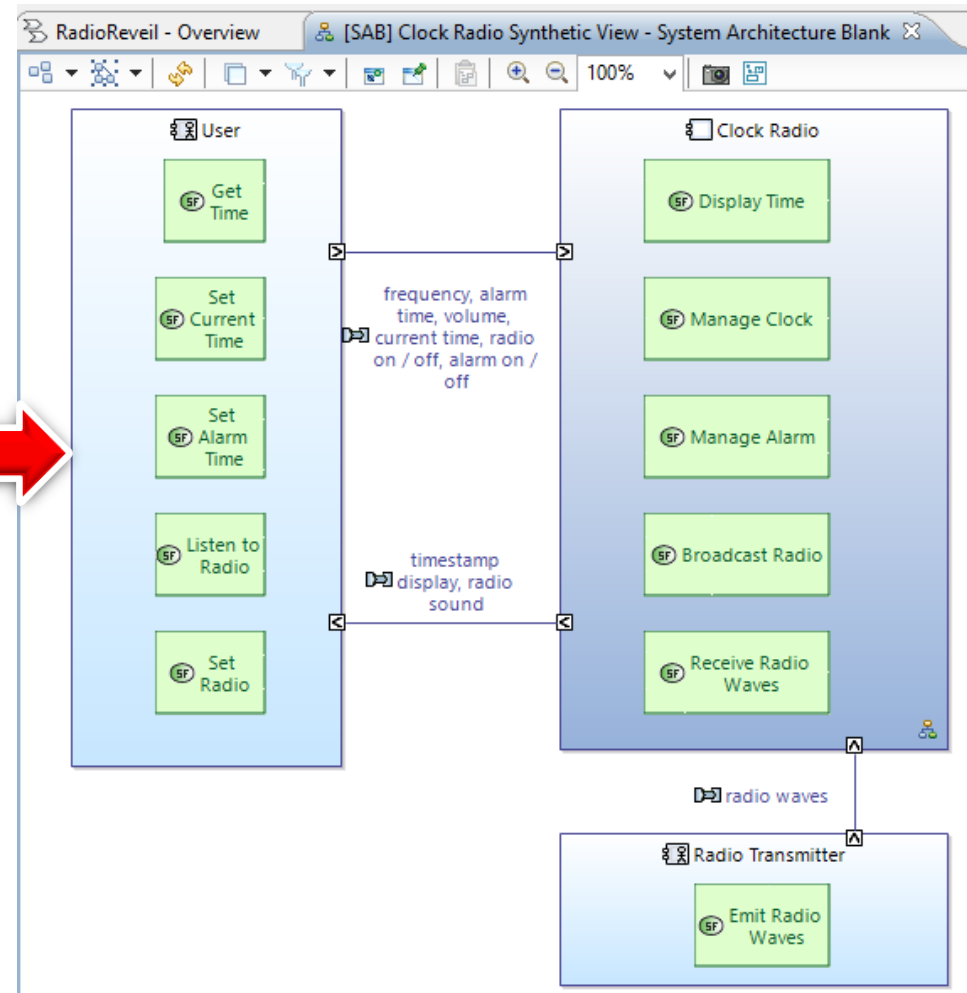
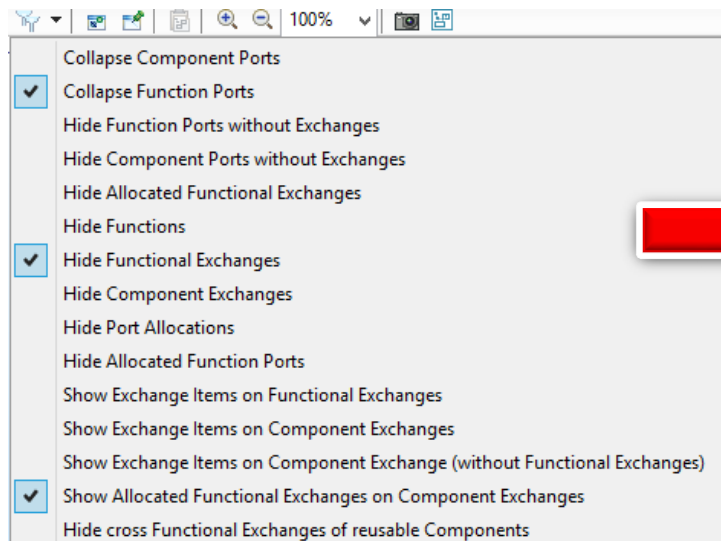


Current Element	Referenced Elements
<ul style="list-style-type: none"> <li>timestamp display                     <ul style="list-style-type: none"> <li>Owner                             <ul style="list-style-type: none"> <li>Root System Function</li> </ul> </li> <li>Related Data                             <ul style="list-style-type: none"> <li>Timestamp</li> </ul> </li> <li>All Related Diagrams                             <ul style="list-style-type: none"> <li>[SAB] Clock Radio Synthetic View - System Architecture Blank</li> <li>[SAB] Clock Radio - System Architecture Blank</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Exchange Items                     <ul style="list-style-type: none"> <li>timestamp display                             <ul style="list-style-type: none"> <li>ct: Timestamp</li> </ul> </li> </ul> </li> <li>Target                     <ul style="list-style-type: none"> <li>FIP 1                             <ul style="list-style-type: none"> <li>Get Time</li> </ul> </li> </ul> </li> </ul>

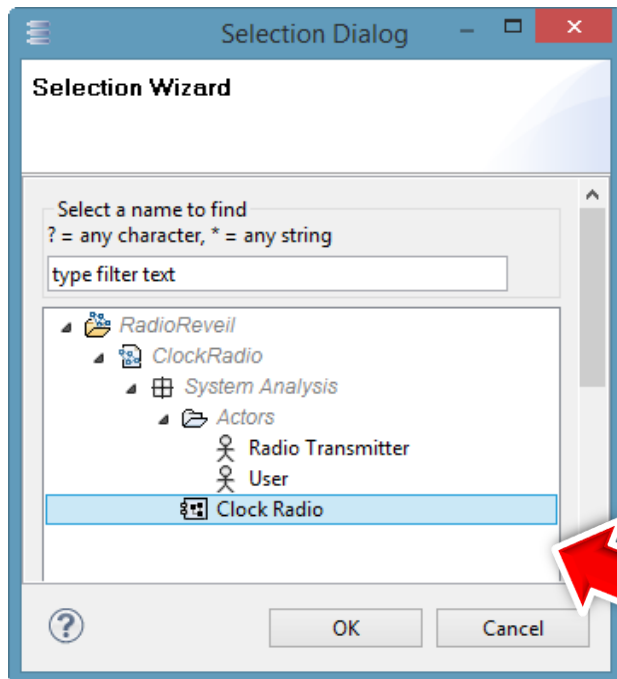
# Completed SAB with CEs and Allocations



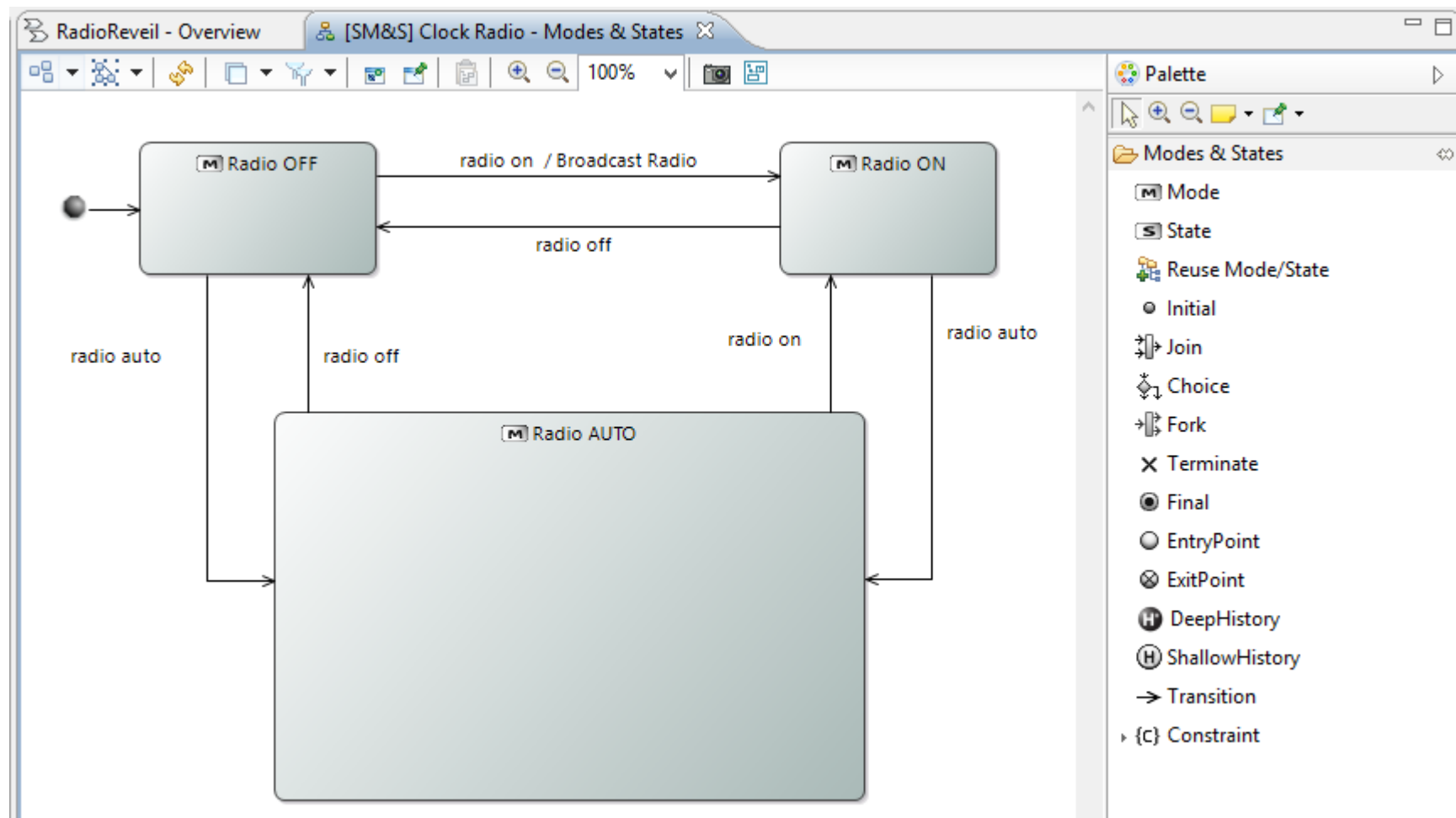
# SAB: Filters Combination



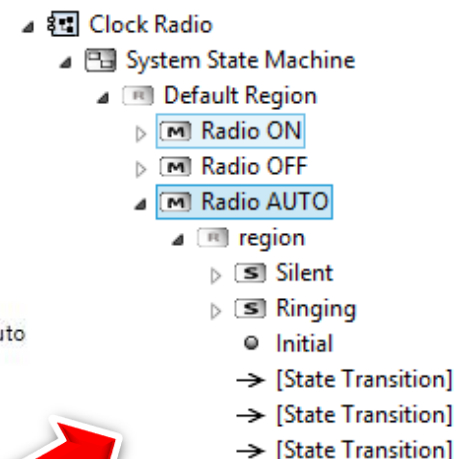
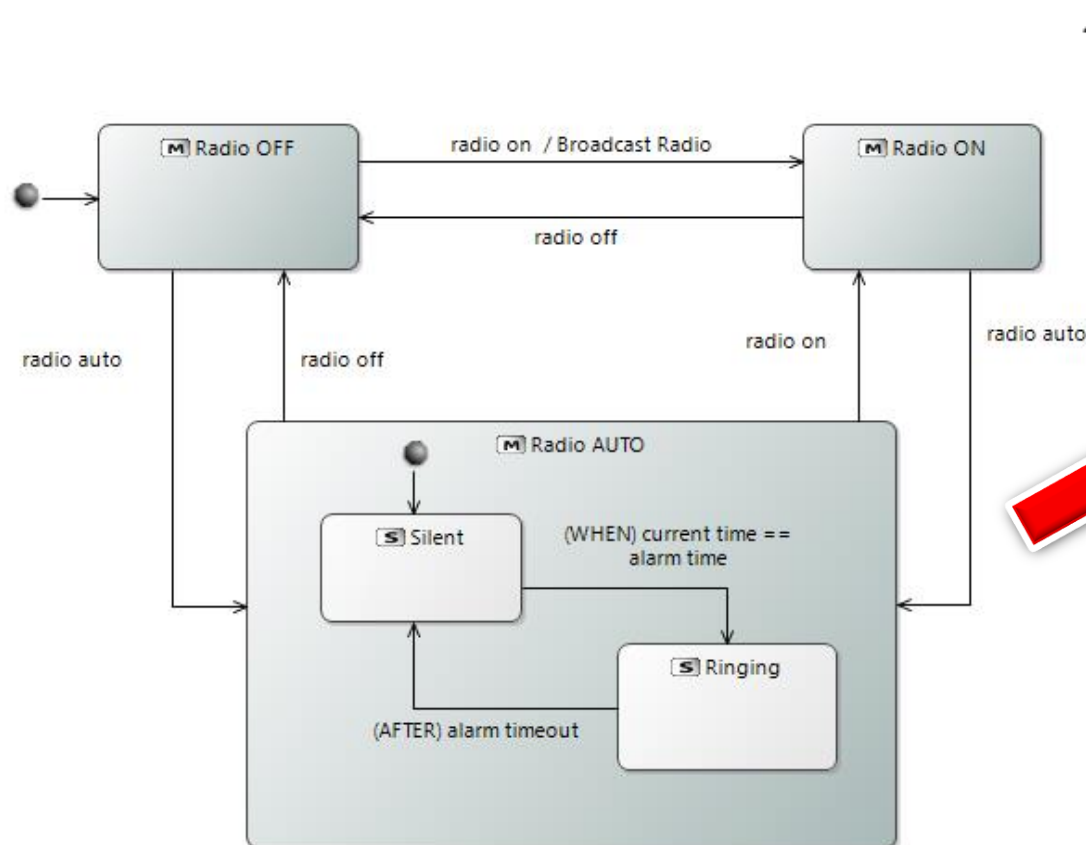
# SA: Modes & States Machine



# SA: S&M Diagram (Start)



# SA: S&M Diagram (with Substates)



- Initial
- [State Transition]
- [State Transition]
- [State Transition]
- [State Transition]
- [State Transition]
- [State Transition]
- [State Transition]
- [SM&S] Clock Radio - Modes & States

Operational  
Analysis

**System Analysis**

*Formalize System Requirements*

► Transition From Operational Activities

► Define Actors, Missions and Capabilities

► Refine System Functions, describe Functional Exchanges

► Allocate System Functions to System and Actors

► Define Interfaces and describe Interface Scenarios

▼ Transverse Modeling



[\[CDB\] Create a new Class Diagram](#)



[\[M&S\] Create a new Modes & States Machine](#)



[Create a new State & Mode / Functions matrix](#)

Describe the State



# SA : S&M Matrix

RadioReveil - Overview	[SM&S] Clock Radio - Modes & States	System State Machine and Function Matrix				
	Alarm	Receive Radio Wav...	Manage Alarm	Manage Clock	Display Time	Broadcast Radio
Clock Radio						
System State Machine						
Radio ON		X		X	X	X
Radio OFF				X	X	
Radio AUTO	X		X	X	X	
Silent						
Ringing		X				X



Name :

Summary :

State Realizations :  ... ✕

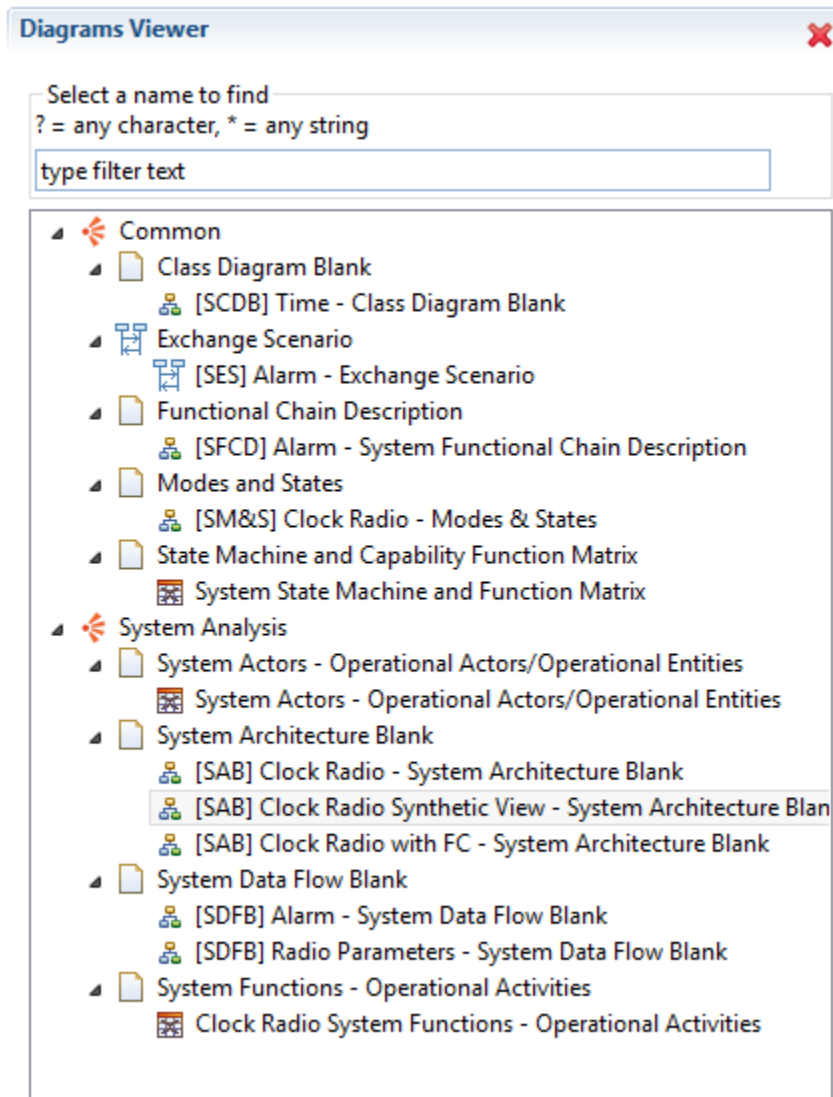
Do activity :  ... ✕

Entry :  ... ✕

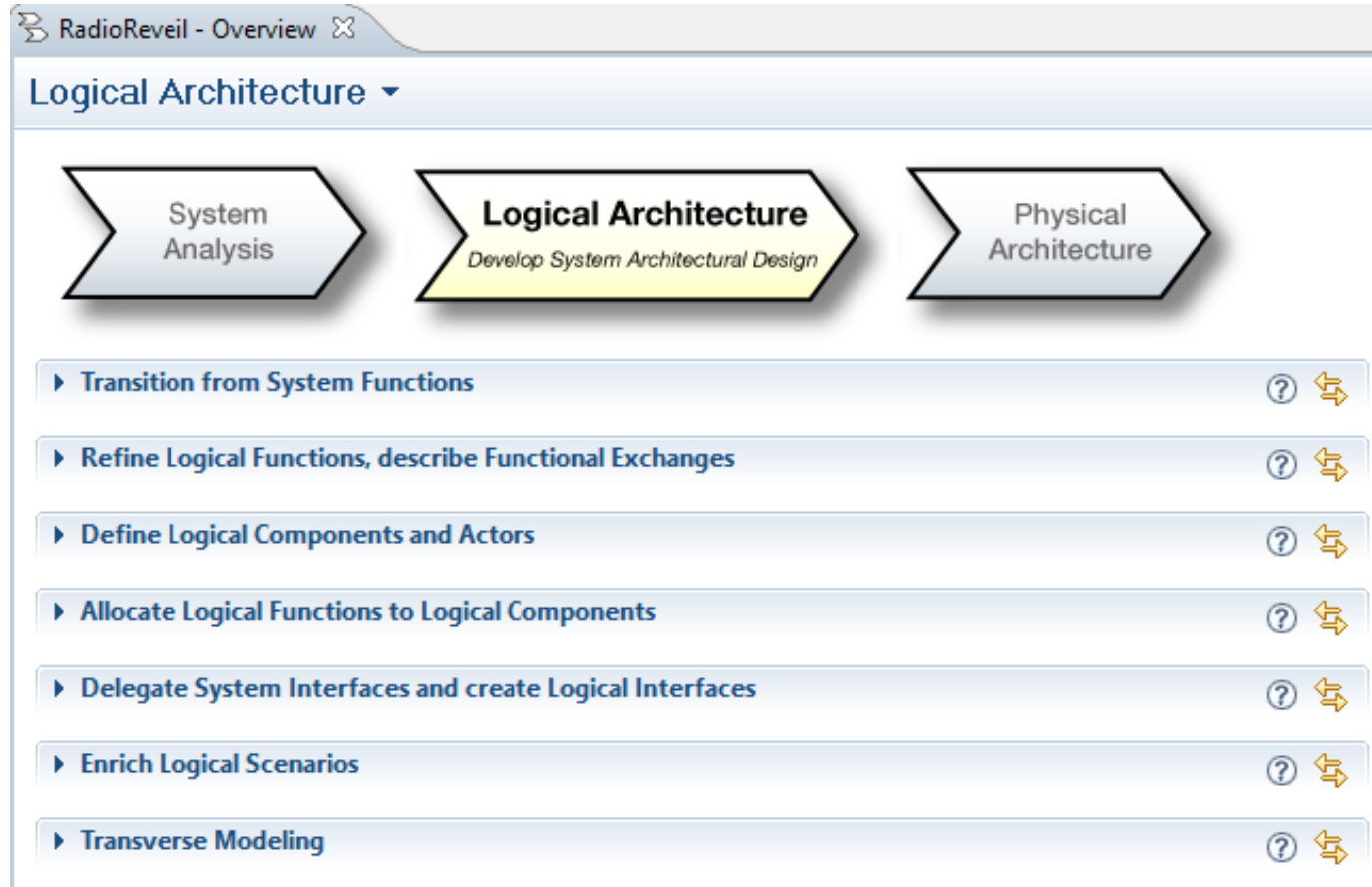
Exit :  ... ✕

Operational Activities / Functions :  ... ✕

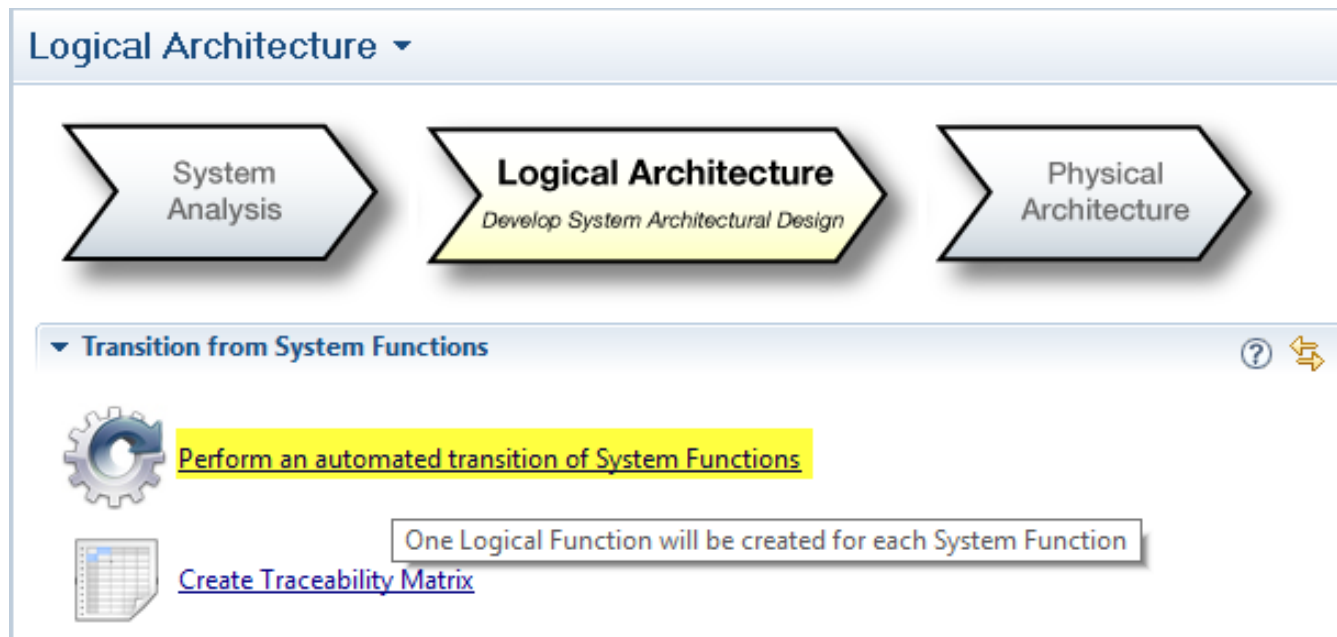
# System Analysis: Diagrams Viewer



# Logical Architecture (LA)



# SA -> LA Transition



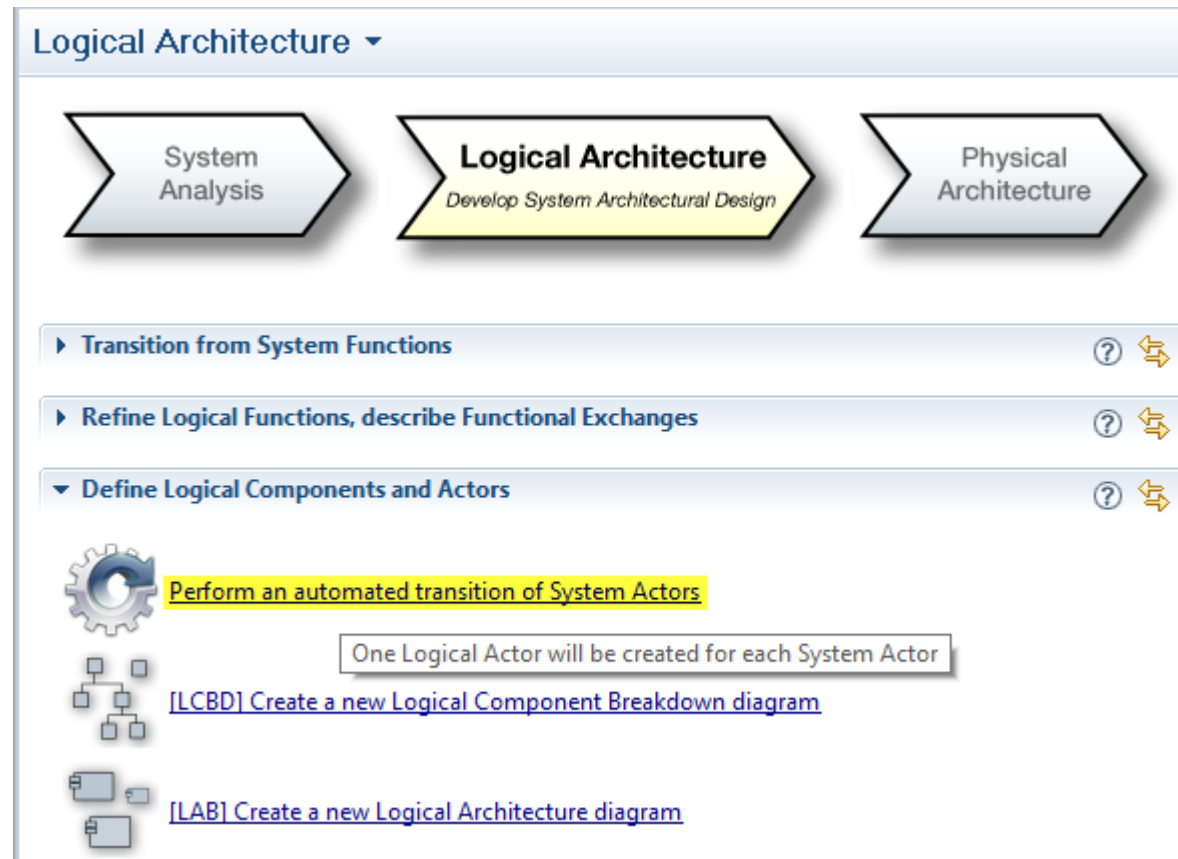
# SA -> LA Transition

- System Analysis
  - System Functions
    - Cat radio parameters
      - SF Root System Function
        - Alarm
        - SF Manage Clock
        - SF Manage Alarm
        - SF Set Current Time
        - SF Set Alarm Time
        - SF Display Time
        - SF Broadcast Radio
        - SF Emit Radio Waves
        - SF Get Time
        - SF Listen to Radio
        - SF Receive Radio Waves
        - SF Set Radio
          - alarm time
          - current time
          - alarm
          - timestamp
          - timestamp display
          - radio sound
          - radio waves
          - radio signals
          - frequency
          - volume
          - radio on / off
          - alarm on / off



- Logical Architecture
  - Logical Functions
    - Cat radio parameters
      - LF Root Logical Function
        - Alarm
        - LF Manage Clock
        - LF Manage Alarm
        - LF Set Current Time
        - LF Set Alarm Time
        - LF Display Time
        - LF Broadcast Radio
        - LF Emit Radio Waves
        - LF Get Time
        - LF Listen to Radio
        - LF Receive Radio Waves
        - LF Set Radio
          - alarm time
          - current time
          - alarm
          - timestamp
          - timestamp display
          - radio sound
          - radio waves
          - radio signals
          - frequency
          - volume
          - radio on / off
          - alarm on / off

# SA -> LA Transition



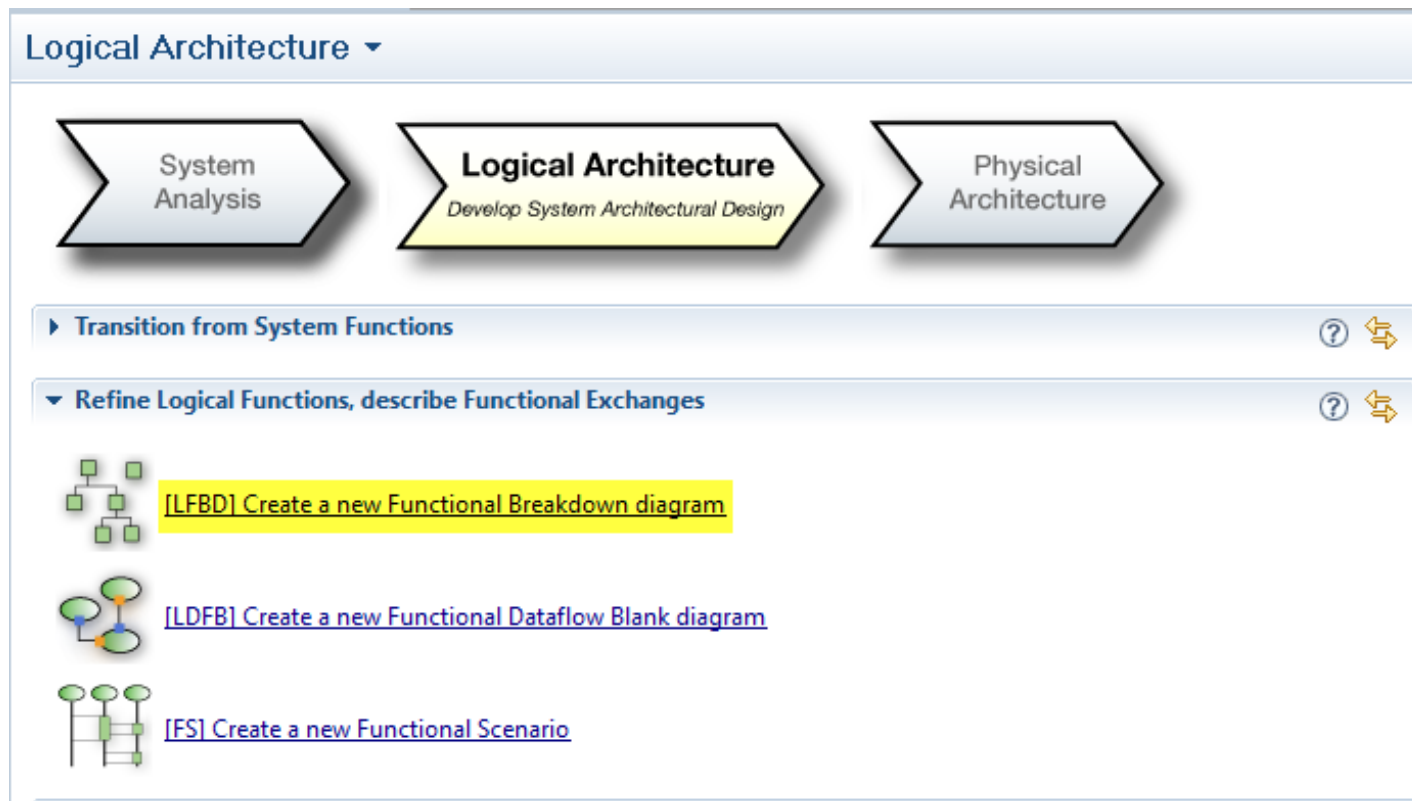
# SA -> LA Transition

- System Analysis
  - System Functions
  - Capabilities
  - Interfaces
  - Data
  - System Context
    - air
    - Clock Radio MMI
    - Clock Radio Output
  - Clock Radio
  - Actors
    - User
    - Radio Transmitter



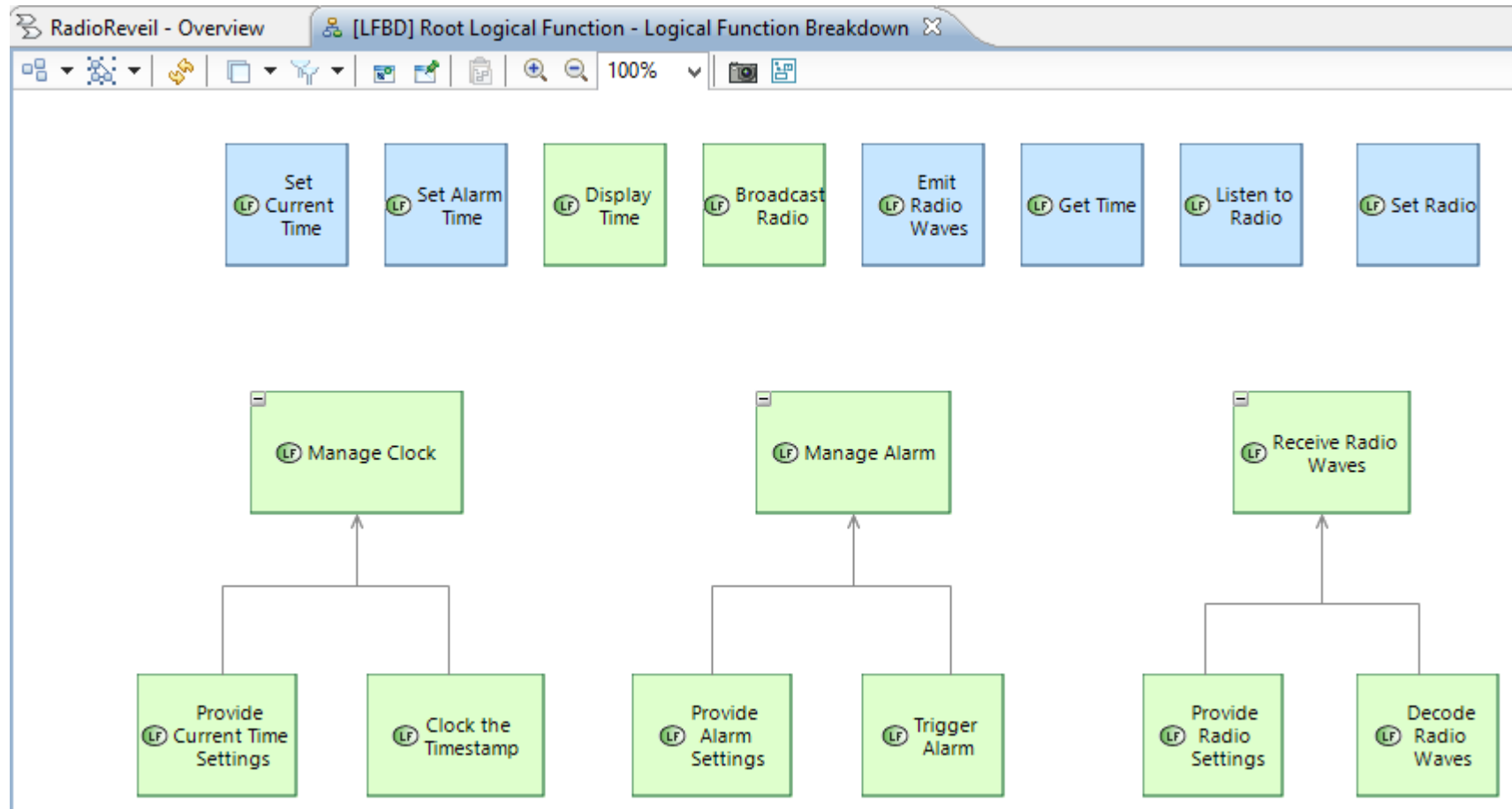
- Logical Architecture
  - Logical Functions
  - Capabilities
  - Interfaces
  - Data
  - Logical Context
    - air
    - Clock Radio MMI
    - Clock Radio Output
  - Clock Radio (LA)
  - Logical Actors
    - User
    - Radio Transmitter

# LFBD: Logical Functions Breakdown





# LFBD: Logical Functions Breakdown



# LDFB: Logical Data Flow Blank

## Logical Architecture ▾



### ► Transition from System Functions



### ▾ Refine Logical Functions, describe Functional Exchanges



[\[LFBD\] Create a new Functional Breakdown diagram](#)

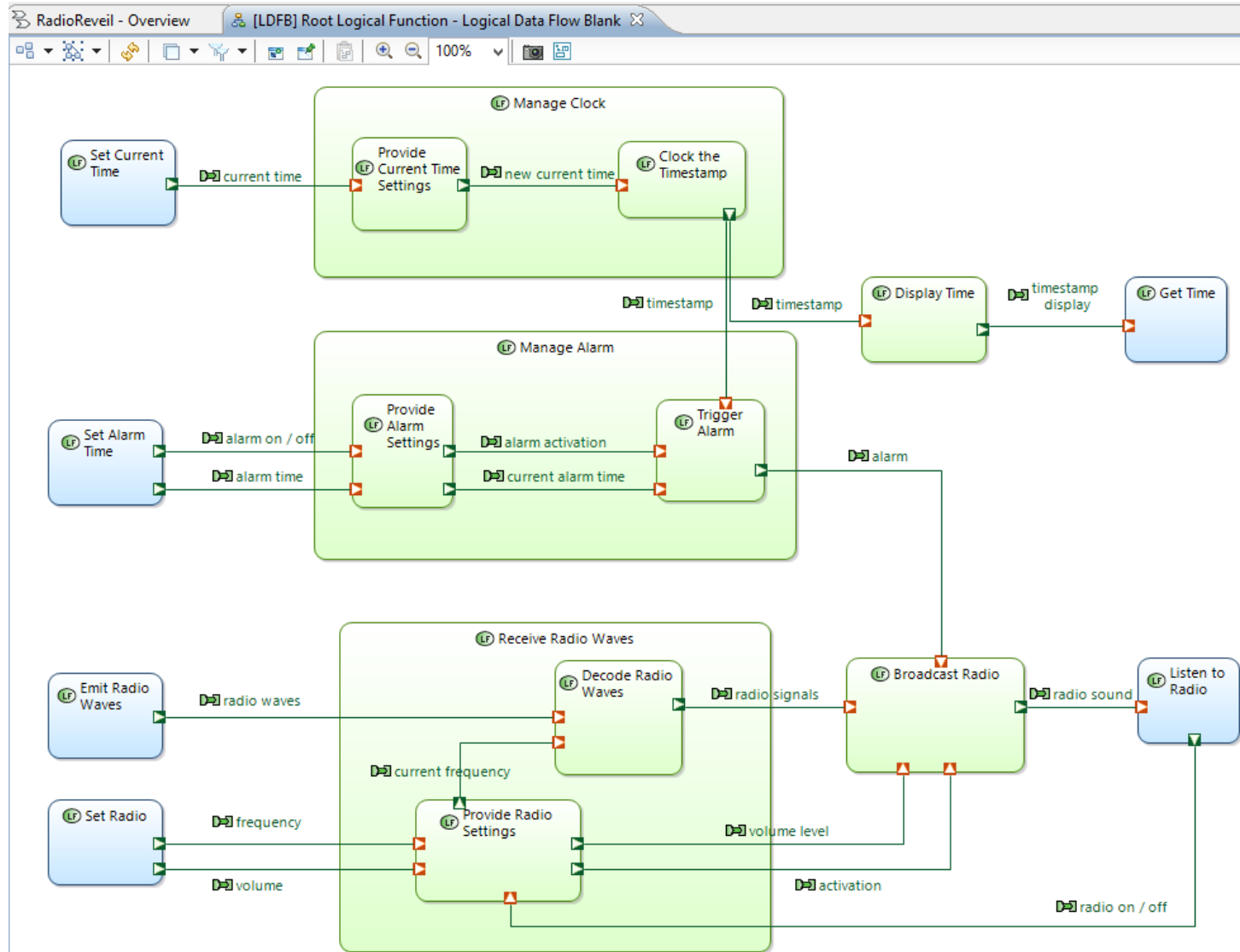


[\[LDFB\] Create a new Functional Dataflow Blank diagram](#)

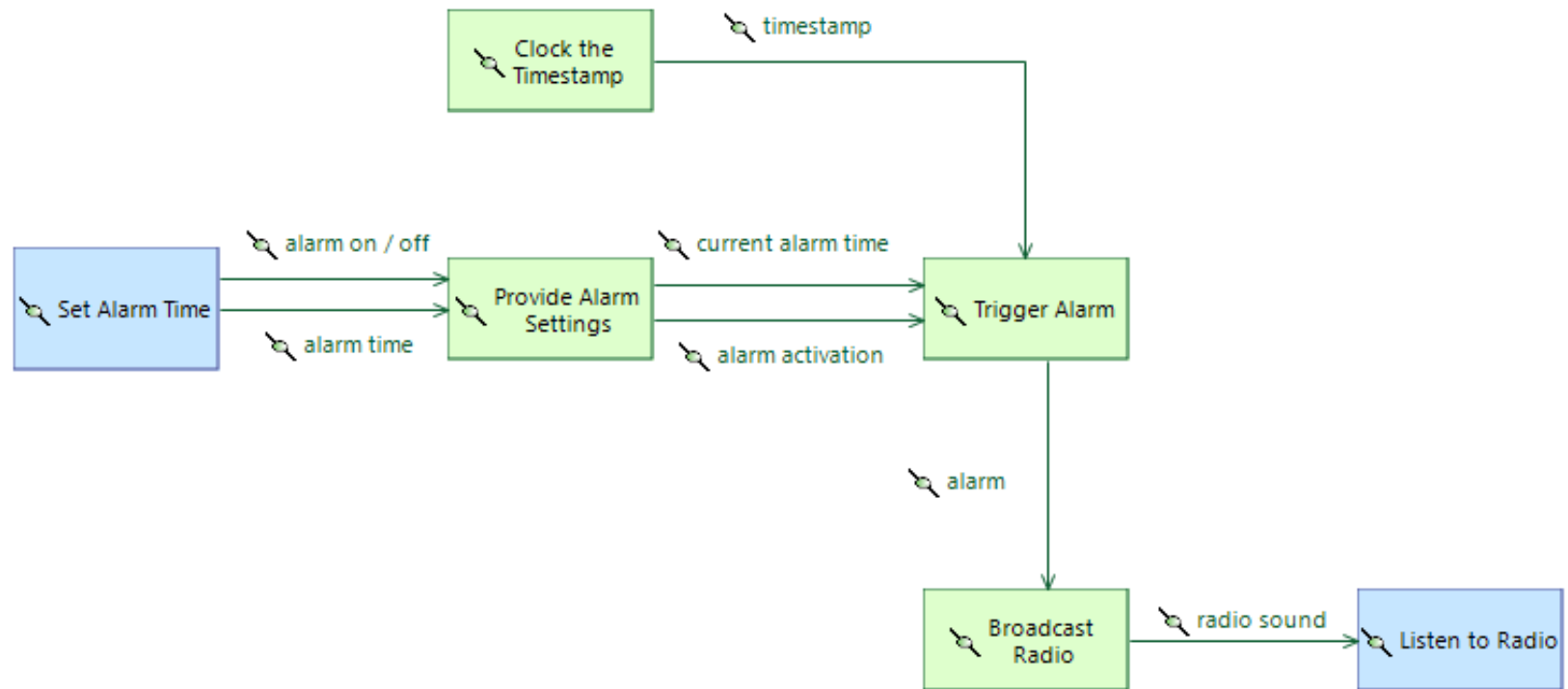


[\[FS\] Create a new Functional Scenario](#)

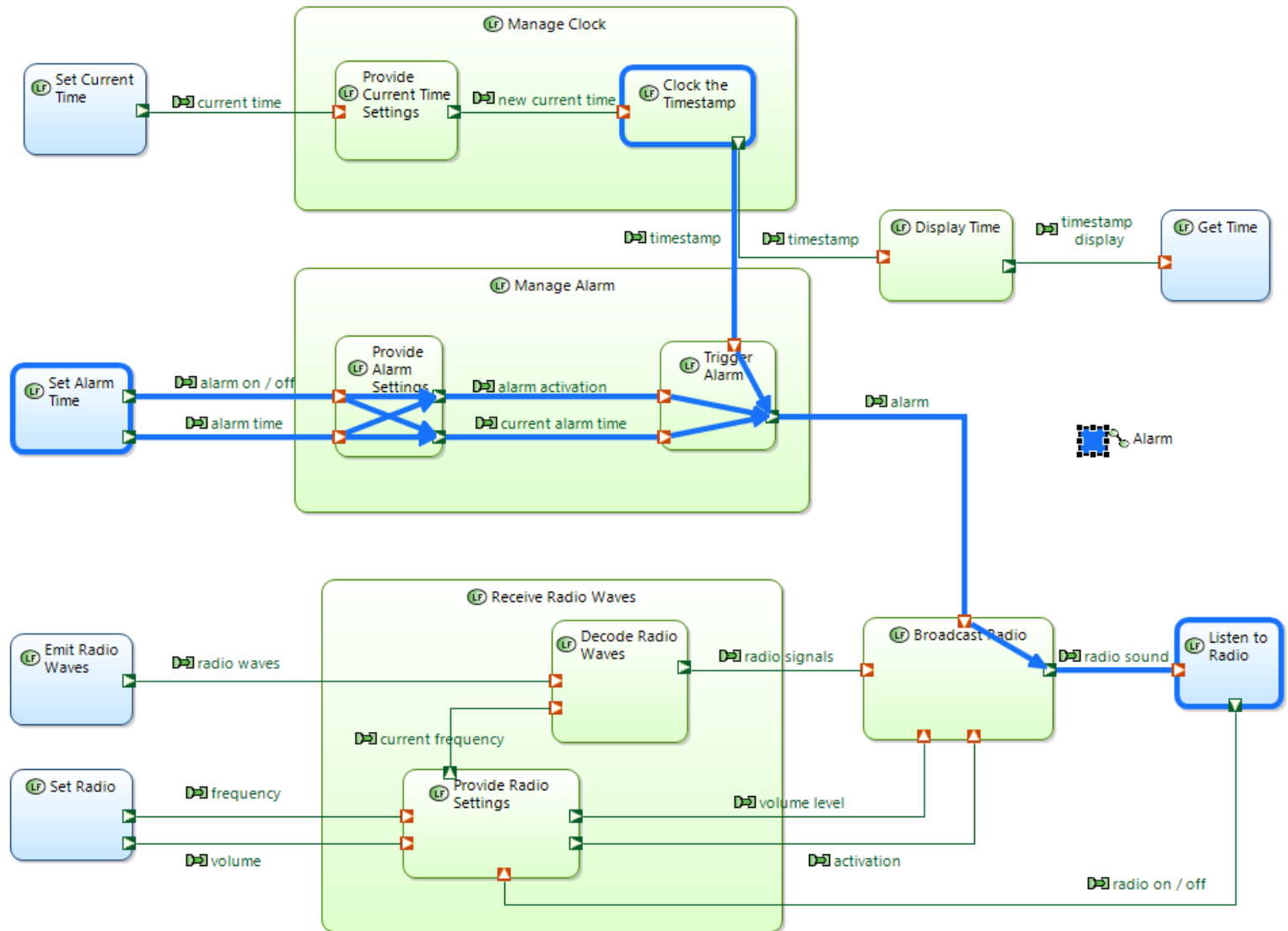
# LDFB: After Modifications



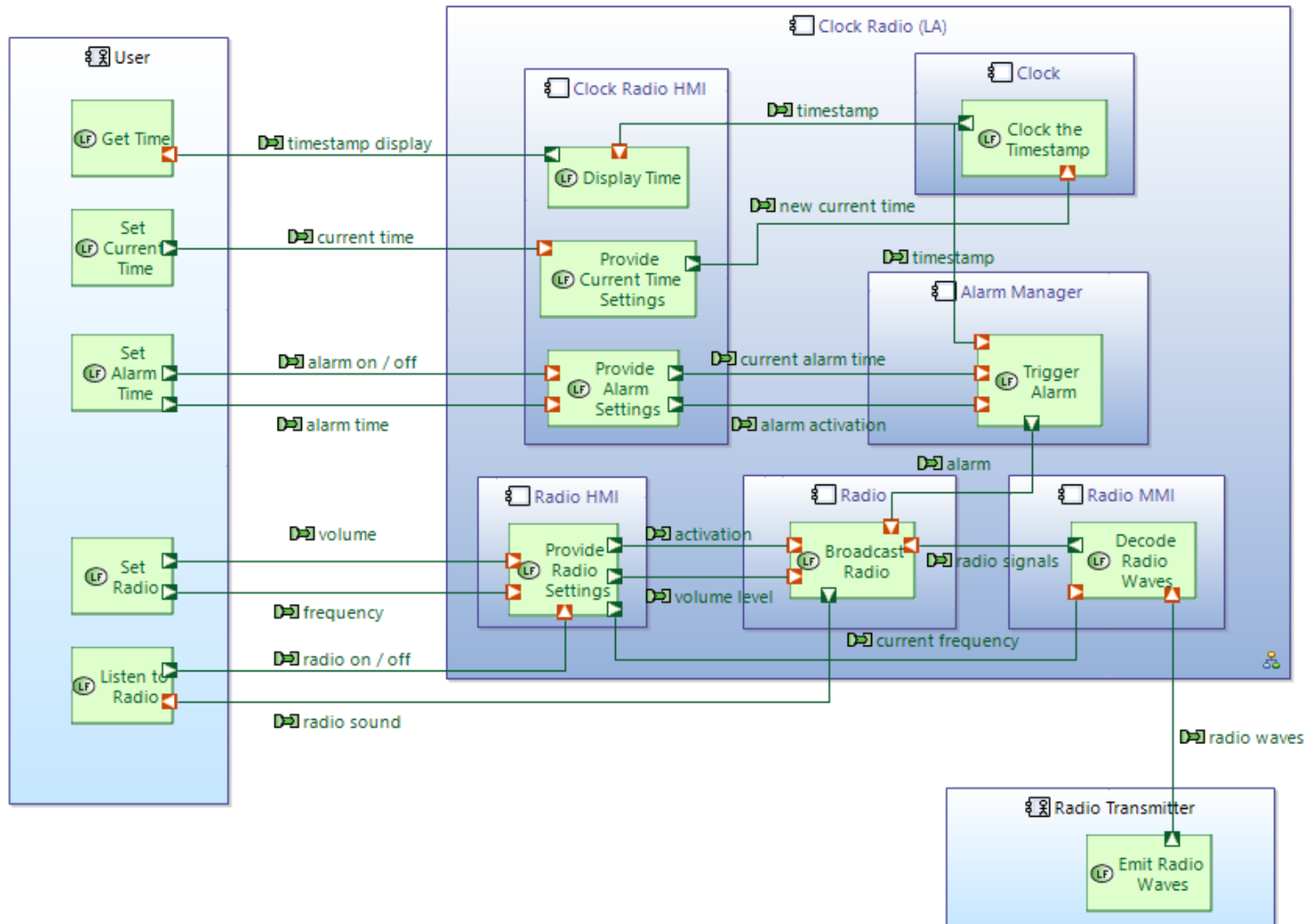
# LFCD: Modified FC



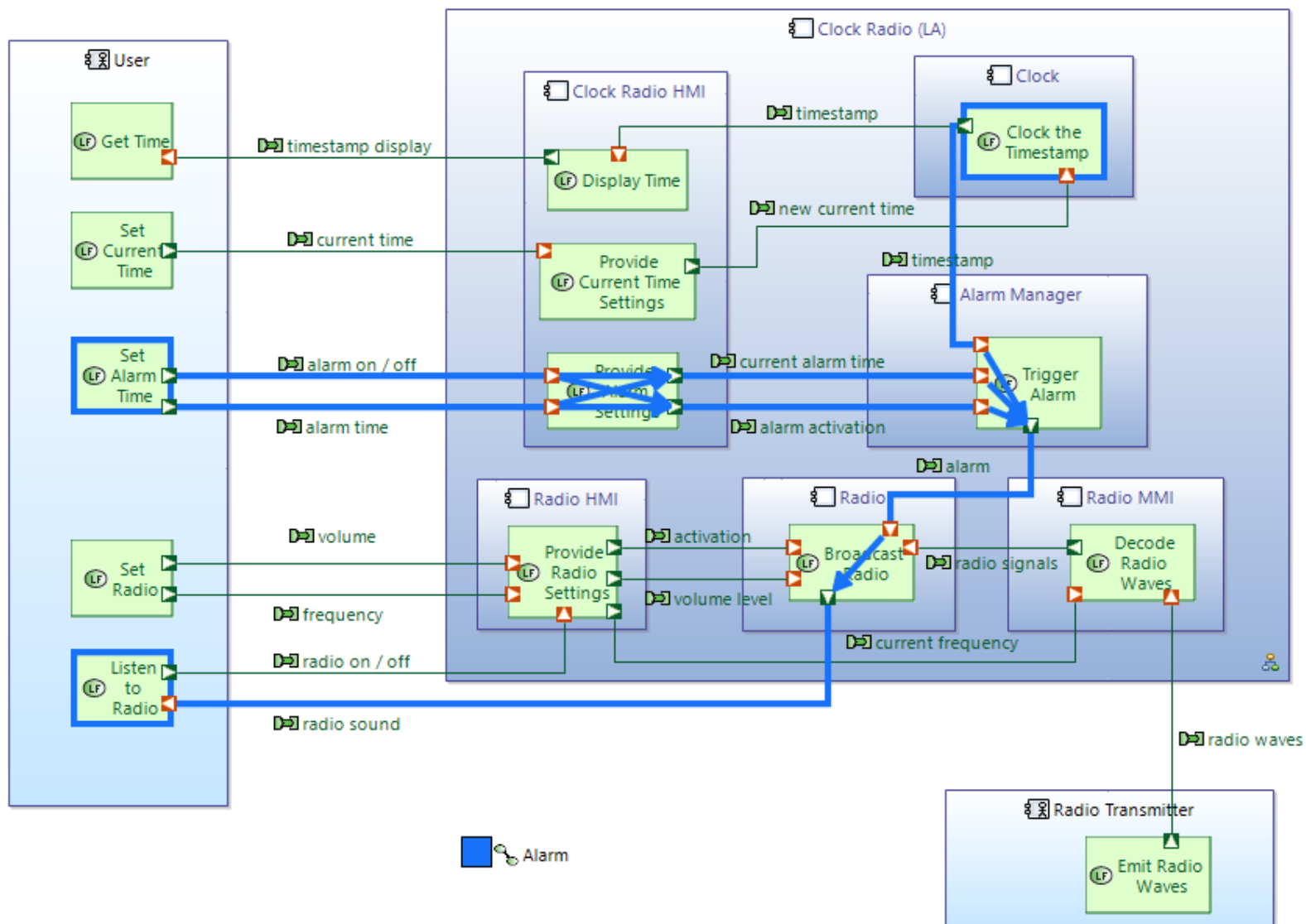
# LDFB: Valid FC After Correction



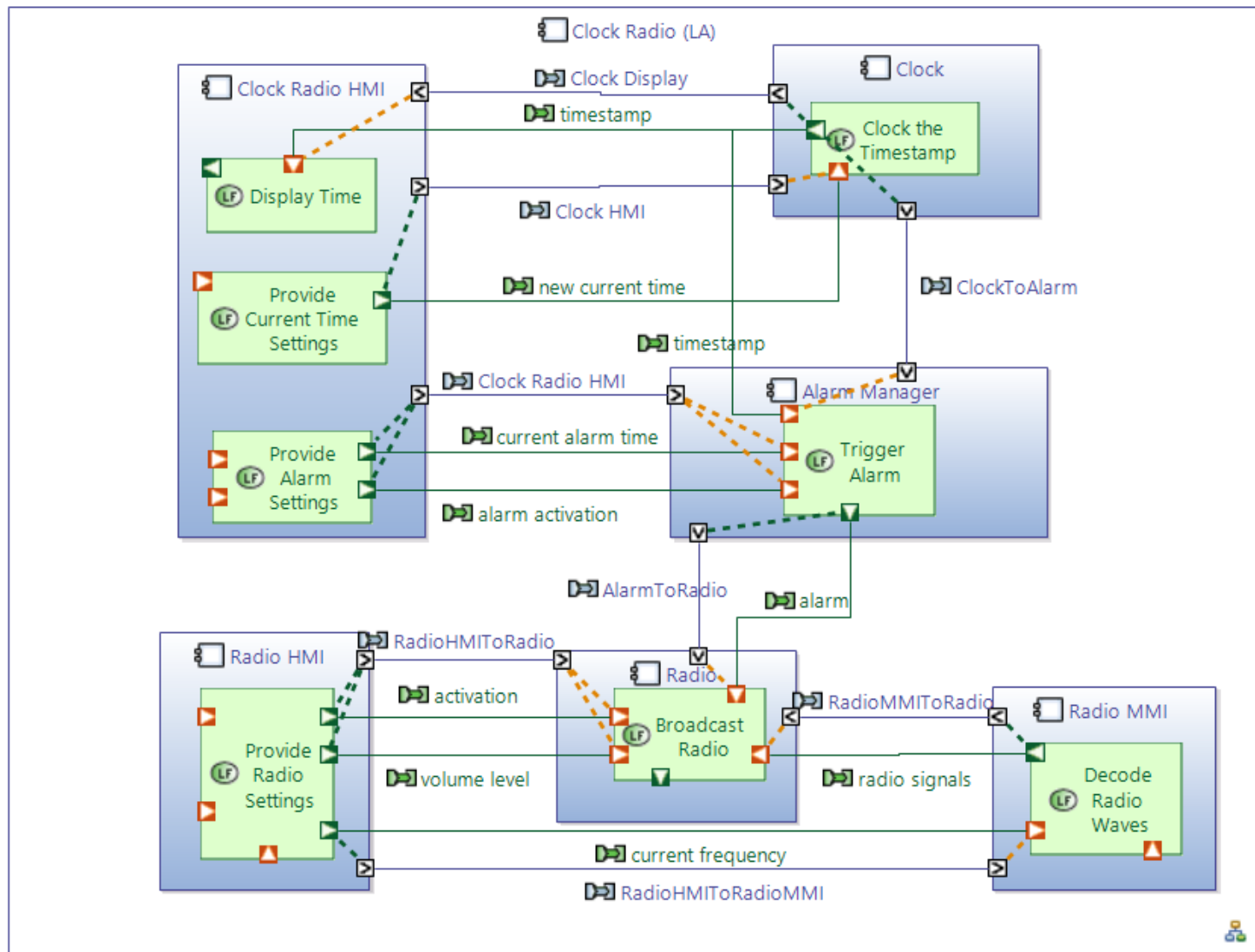
# LAB: Functions Allocation



# LAB: Functions Allocation + FC

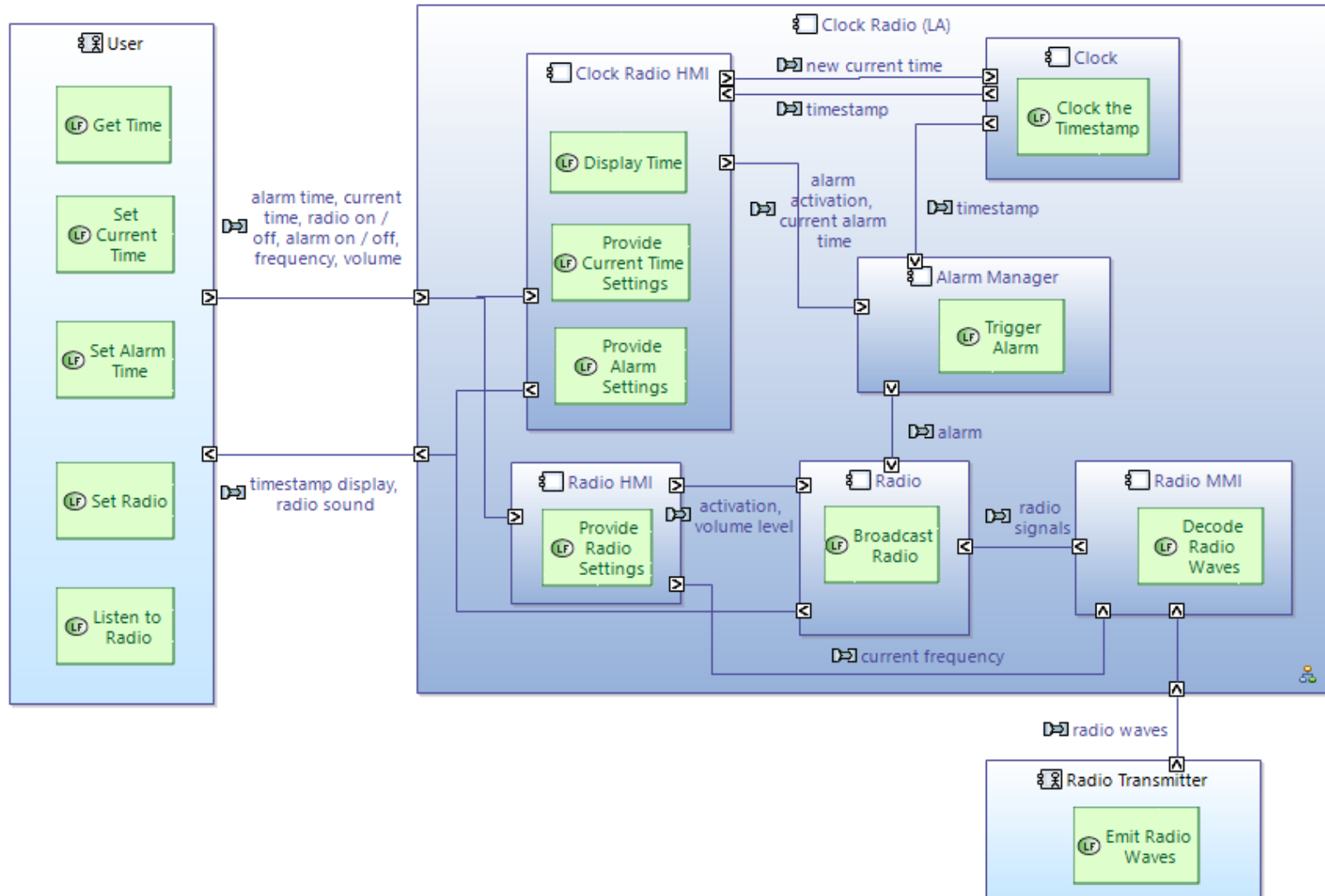


# LAB: Internal CE Between LCs

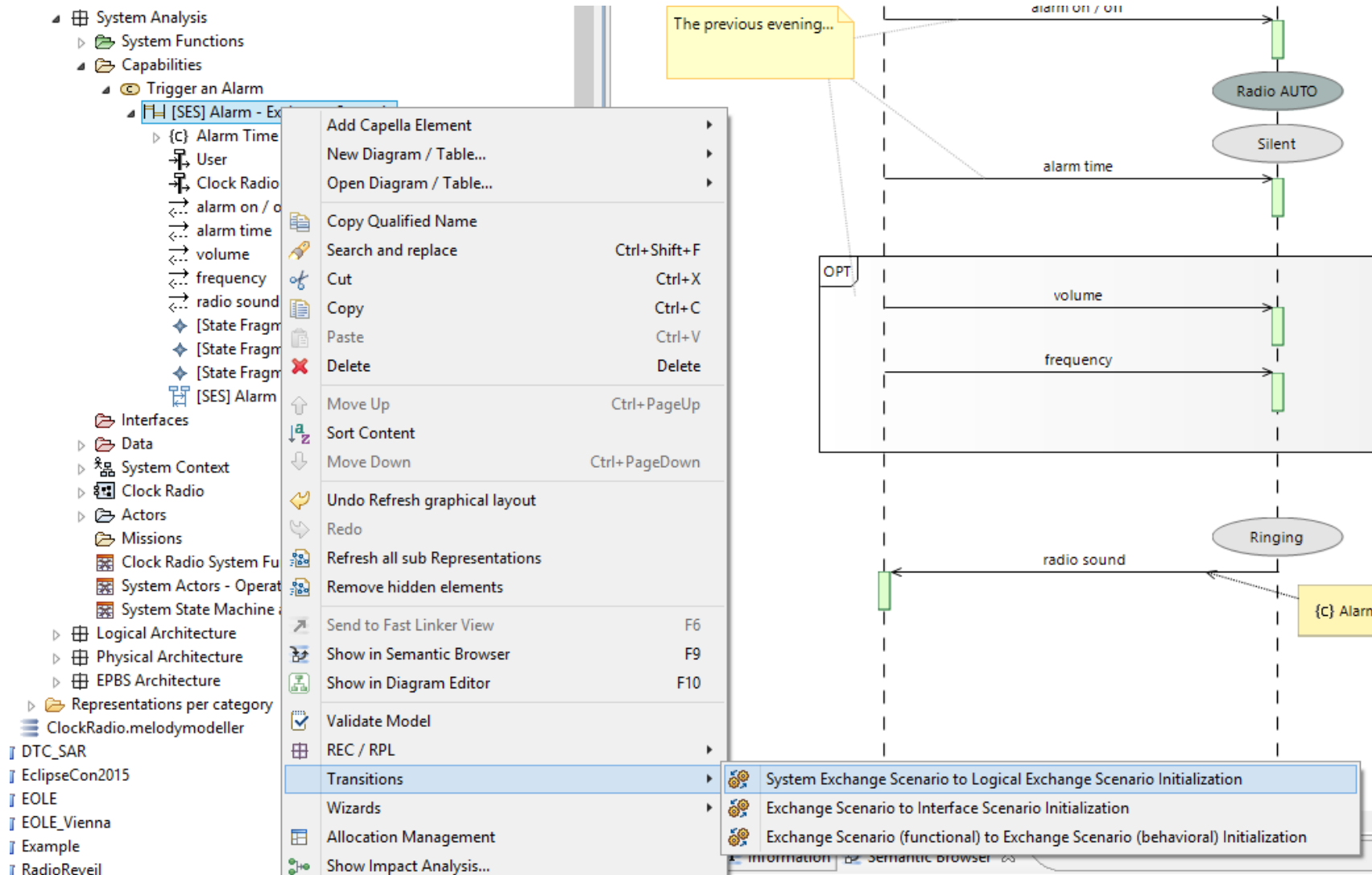




# LAB Simplified View



# Transition from SES



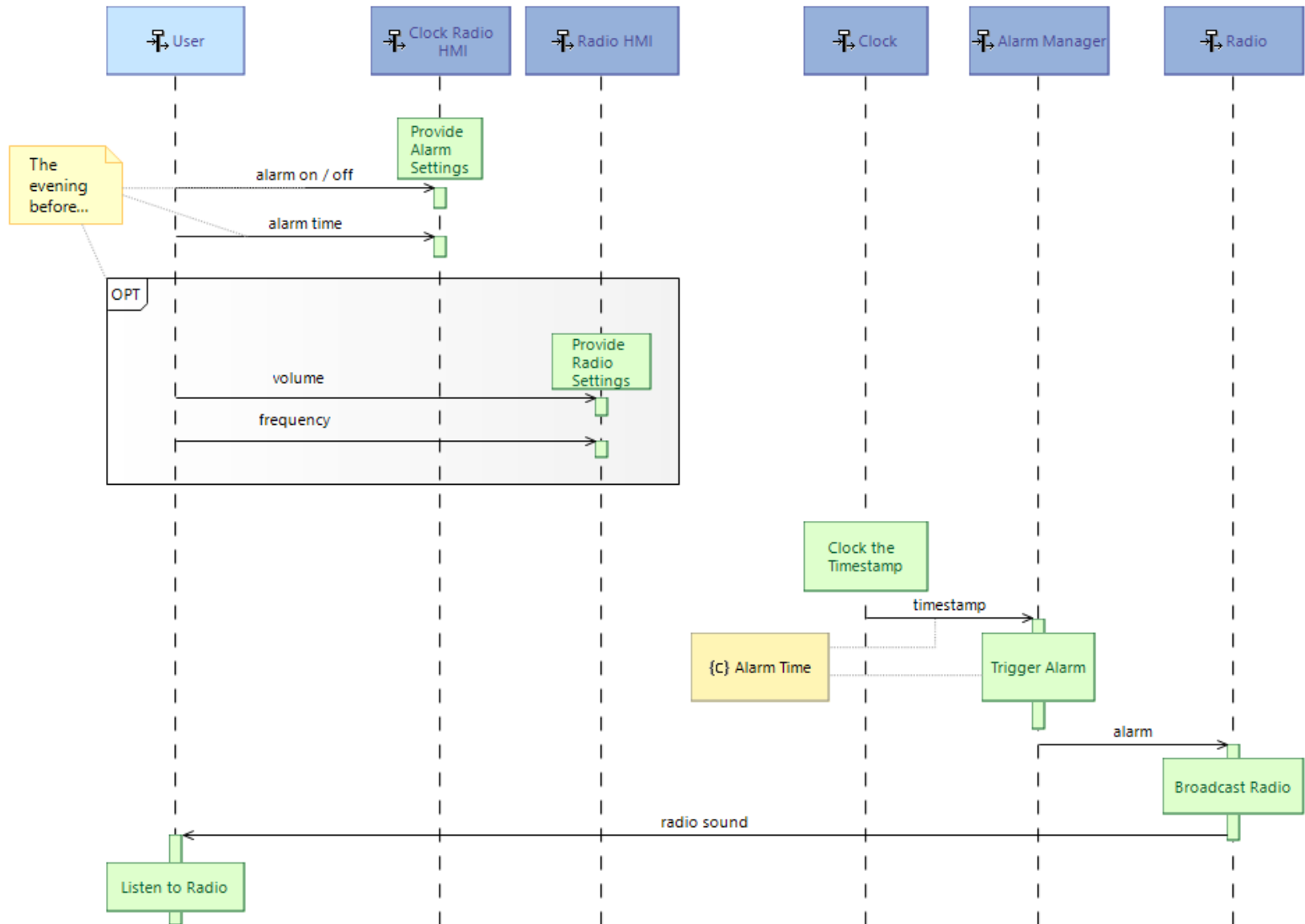
# Transition from SES

- ▲ [Icon] System Analysis
  - ▷ [Icon] System Functions
  - ▲ [Icon] Capabilities
    - ▲ [Icon] Trigger an Alarm
      - ▲ [Icon] [SES] Alarm - Exchange Scenario
        - ▷ {c} Alarm Time
          - [Icon] User
          - [Icon] Clock Radio
          - ↔ alarm on / off
          - ↔ alarm time
          - ↔ volume
          - ↔ frequency
          - ↔ radio sound
          - ◆ [State Fragment]
          - ◆ [State Fragment]
          - ◆ [State Fragment]
          - [Icon] [SES] Alarm - Exchange Scenario



- ▲ [Icon] Logical Architecture
  - ▷ [Icon] Logical Functions
  - ▲ [Icon] Capabilities
    - ▲ [Icon] Trigger an Alarm
      - ▲ [Icon] [LES] Alarm - Exchange Scenario
        - ▷ {c} Alarm Time
          - [Icon] User
          - [Icon] Clock Radio HMI
          - [Icon] Radio HMI
          - [Icon] Clock
          - [Icon] Alarm Manager
          - [Icon] Radio
          - ↔ alarm on / off
          - ↔ alarm time
          - ↔ volume
          - ↔ frequency

# Enhanced LES



To Learn More...

[www.polarsys.org/capella/index.html](http://www.polarsys.org/capella/index.html)

- [www.prfc.fr](http://www.prfc.fr)
- [pascalroquesformationconseil.blogspot.fr/](http://pascalroquesformationconseil.blogspot.fr/)
- [www.incose.org/](http://www.incose.org/)
- [www.afis.fr](http://www.afis.fr)