Presentations

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

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

- Trainer for Thales on ARCADIA / Melody
  - 90+ sessions, 1100+ 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)

- Define Operational Entities and Capabilities
- Define Operational Activities and describe Interactions
- Allocate Operational Activities to Operational Actors, Entities or Roles
  - [OAB] Create a new Operational Architecture diagram
  - [ORB] Create a new Operational Role diagram
  - [OES] Create a new Operational Entity Scenario
- Transverse Modeling
Operational Architecture Blank
OA: Diagrams Viewer

Operational 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

- Common
- Operational Analysis
  - Operational Architecture Blank
    - [OAB] Operational Context - Operational Architecture Blank
  - Operational Entity Breakdown
    - [OEBD] Operational Context - Operational Entity Breakdown
System Analysis (SA)

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
System Data Flow Blank

Transition From Operational Activities

Define Actors, Missions and Capabilities

Refine System Functions, describe Functional Exchanges

- [ISFB1] Create a new Functional Breakdown diagram
- [ISDFB1] 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
System Data Flow Blank (SDFB)
System Architecture Blank

- 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
SAB: Functions Allocation

Diagram showing functions allocation for a clock radio, including operations like getting the time, setting current time, setting alarm on/off, listening to radio, setting volume, managing clock, managing alarm, and receive radio waves.
SAB + FC
System Exchange Scenario

The previous evening...

User

Clock Radio

alarm on / off

alarm time

OPT

volume

frequency

radio sound

(c) Alarm Time
### SA – OA Matrices

#### Clock Radio System Functions - Operational Activities

<table>
<thead>
<tr>
<th></th>
<th>Wake Up</th>
<th>Get Time</th>
<th>Get News</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage Clock</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Manage Alarm</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Current Time</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Alarm Time</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Time</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Broadcast Radio</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Emit Radio Waves</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Get Time</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Listen to Radio</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receive Radio Waves</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Set Radio</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

#### System Actors - Operational Actors/Operational Entities

<table>
<thead>
<tr>
<th></th>
<th>House</th>
<th>Room</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Radio Transmitter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Class Diagram Blank
SCDB: Exchange Items and Types
SAB: Exchange Item and FE
Semantic Browser
Completed SAB with CEs and Allocations
SAB: Filters Combination
SA: Modes & States Machine

System Analysis

- 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

- Create a new Class Diagram
- Create a new Modes & States Machine
- Create a new State & Mode / Functions matrix
SA: S&M Diagram (Start)
SA: S&M Diagram (with Substates)
SA: Enhanced Scenario (with States)
SA: S&M Matrix

- 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
SA : S&M Matrix

Clock Radio - Activity Explorer
- Clock Radio
  - System State Machine
    - Radio ON
    - Radio OFF
    - Radio AUTO
      - Silent
      - Ringing

[SM&S] Clock Radio - Modes & States

<table>
<thead>
<tr>
<th></th>
<th>Alarm</th>
<th>Receive Radio Waves</th>
<th>Manage Alarm</th>
<th>Manage Clock</th>
<th>Display Time</th>
<th>Broadcast Radio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio ON</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Radio OFF</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Radio AUTO</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Name: Radio ON
Summary:

State Realizations: <undefined>

Do activity: <undefined>
Entry: <undefined>
Exit: <undefined>

Operational Activities / Functions: Manage Clock, Display Time, Broadcast Radio, Receive Radio Waves

Clarity
Logical Architecture (LA)

- Transition from System Functions
- Refine Logical Functions, describe Functional Exchanges
- Define Logical Components and Actors
- Allocate Logical Functions to Logical Components
- Delegate System Interfaces and create Logical Interfaces
- Enrich Logical Scenarios
- Transverse Modeling
SA -> LA Transition

Logical Architecture

- System Analysis
- Logical Architecture
  Develop System Architectural Design
- Physical Architecture

Transition from System Functions

- Perform an automated transition of System Functions
  One Logical Function will be created for each System Function
- Create Traceability Matrix
SA -> LA Transition

System Analysis
- System Functions
  - Radio parameters
  - Root System Function
    - Alarm
    - Manage Clock
    - Manage Alarm
    - Set Current Time
    - Set Alarm Time
    - Display Time
    - Broadcast Radio
    - Emit Radio Waves
    - Get Time
    - Listen to Radio
    - Receive Radio Waves
    - Set Radio
      - Alarm time
      - Current time
      - Alarm
      - Timestamp
      - Timestamp
      - Timestamp display
      - Radio sound
      - Radio waves
      - Radio signals
      - Frequency
      - Volume
      - Radio on/off
      - Alarm on/off

Logical Architecture
- Logical Functions
  - Radio parameters
  - Root Logical Function
    - Alarm
    - Manage Clock
    - Manage Alarm
    - Set Current Time
    - Set Alarm Time
    - Display Time
    - Broadcast Radio
    - Emit Radio Waves
    - Get Time
    - Listen to Radio
    - Receive Radio Waves
    - Set Radio
      - Alarm time
      - Current time
      - Alarm
      - Timestamp
      - Timestamp
      - Timestamp display
      - Radio sound
      - Radio waves
      - Radio signals
      - Frequency
      - Volume
      - Radio on/off
      - Alarm on/off
SA -> LA Transition

Logical Architecture

1. System Analysis
2. Logical Architecture (Develop System Architectural Design)
3. Physical Architecture

Transition from System Functions

- Refine Logical Functions, describe Functional Exchanges
- Define Logical Components and Actors

Perform an automated transition of System Actors

One Logical Actor will be created for each System Actor

[LCBD] Create a new Logical Component Breakdown diagram

[LAB] Create a new Logical Architecture diagram
SA -> LA Transition
LFBD: Logical Functions Breakdown

Logical Architecture

- System Analysis
- Logical Architecture: Develop System Architectural Design
- Physical 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
LFBD: Logical Functions Breakdown
LDFB: Logical Data Flow Blank

Logical Architecture

Transition from System Functions

Refine Logical Functions, describe Functional Exchanges

[LFB] 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
Transition from SES
Transition from SES

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

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

The evening before...

Provide Alarm Settings

Provide Radio Settings

OPT

volume

frequency

Clock the Timestamp

{C} Alarm Time

Trigger Alarm

Broadcast Radio

Listen to Radio

radio sound

alarm

timestamp
To Learn More...

www.polarsys.org/capella/index.html

- www.prfc.fr
- www.incose.org/
- www.afis.fr