HoliDes

Holistic Human Factors **Des**ign of Adaptive Cooperative Human-Machine Systems

D8.2 – Tailored HF-RTP and Methodology Vs0.5 for the control room domain

Project Number:	332933
Classification:	Public
Work Package(s):	WP8
Milestone:	M2
Document Version:	V1.0
Issue Date:	12.09.2014
Document Timescale:	Project Start Date: October 1, 2013
Start of the Document:	Month 8
Final version due:	Month 10
Deliverable Overview:	Tailored HF-RTP and Methodology Vs0.5 for the control room domain
Compiled by:	Ian Giblett – CAS-UK
Authors:	Ian Giblett – CAS-UK Luca Cattani – IREN
Reviewers:	Lars Weber - OFF Dr. Holger Bracker – EAD-DE-CAS
Technical Approval:	Jens Gärtner, EAD-DE-IW
Issue Authorisation:	Sebastian Feuerstack, OFF

DISTRIBUTION LIST		
Copy type	Company and Location	Recipient
T	HoliDes Consortium	all HoliDes Partners

RECORD OF REVISION		
Date (DD.MM.JJ)	Status Description	Author
31.07.14	Initial Draft	Ian Giblett
12.09.2014	Reviews Version	Ian Giblett

Table of Contents

1 Introduction

The purpose of this document is to describe how the HF-RTP and methodology received from WP1 will be tailored to control room domain. It will describe the rationale for every tailoring step and will give feedback with regard to the application of the rules. This document is the first of 4 iterations. Each iteration thereafter will add more functionality and tools into the RTP instance. For more information regarding the RTP topic please refer to D1.3.

1.1 RTP Tailoring

RTP tailoring is the process by which one takes a specific subset of all the tools from the Holides RTP and set them up to support an engineering team in a particular design process.

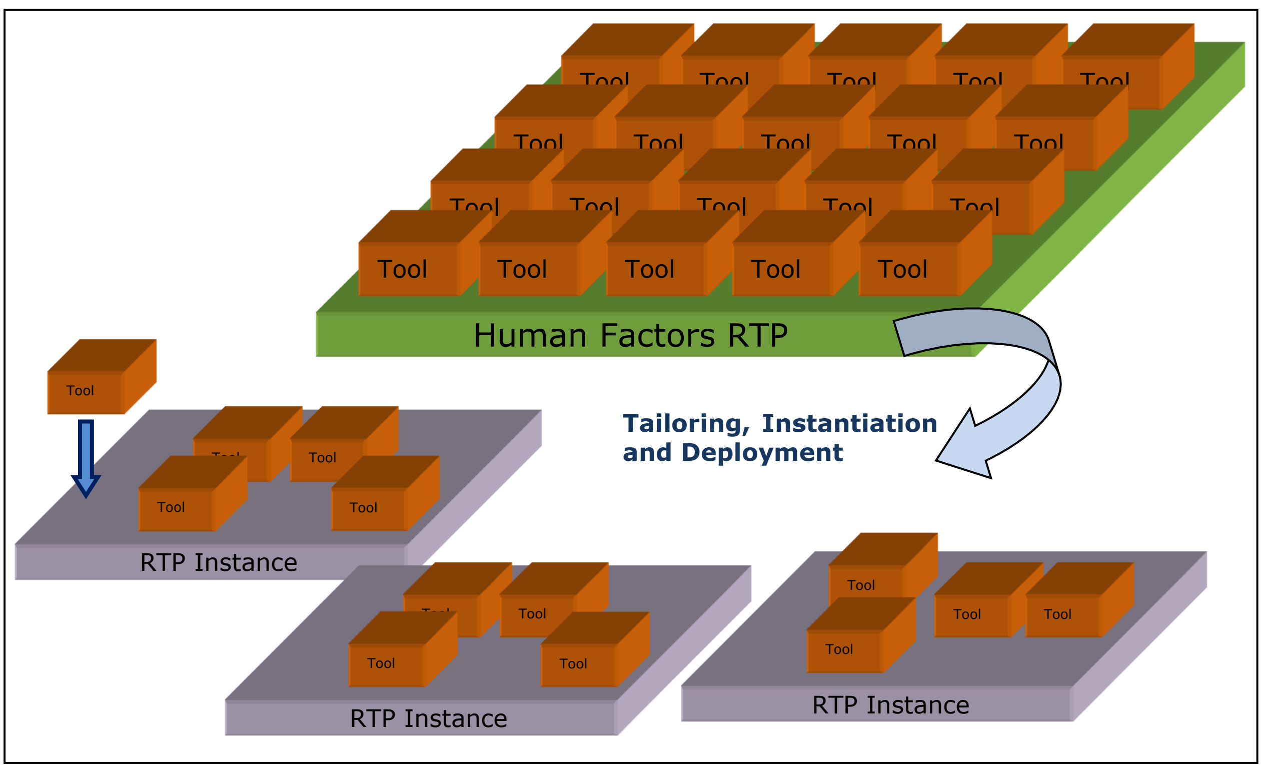


Figure 1 - Making an RP Instance

1.2 Abbreviations used in the Documents

Table 1 - Abbreviations

C2I	**Command and Control Information**
COP	Common Operational Picture
SA	System Architect (IBM)
DoD	Department of Defence
DoDAF	Department of Defence Architecture Framework
MoDAF	Ministry of Defence Architecture Framework
NAF	NATO Architecture Framework
SV	System View
HV	Human View
OV	Operational View
TV	Technical View
HMI	Human Machine Interface
RTP	Reference Technology Platform
OSLC	Open Services for Lifecycle Collaboration
IOS	Interoperability Specification
HEE	Human Efficiency Evaluator
WP	Work Package
ADCOS	Adaptive Cooperative System
PED	Procedure Editor

2 The Control Room Domain

Work Package 8 covers two control rooms. One is based around border surveillance and one based around an Energy control room. Each control room will have their own RTP instance.

Figure 2 - A control Room

2.1 Adaptivity

In the control room domain, the adaptation of technical systems according to the mental and physical state of the user shall increase the effectiveness of the control room. If the operator is in a sub optimum state then measures can be taken to ensure that the performance of the control room is not compromised. Two main questions are *what to adapt* and to know *when to adapt*. The human machine interface can be prompted to adapt based on the following:

- Presence/absence of the operator from their workplace at a given point in time or for a given period of time;
- Lack of movement for a given time of an operator present at their workplace, suggesting that he is asleep;
- Particular behaviours that suggest tiredness and/or lack of concentration.
- The skills and experiences of an operator. For example, an inexperienced operator might be shielded from overload/stress by limiting the quantity and complexity of allocated tasks.
- The culture of the staff.

All the traits and characteristics related to the examples above (some of them might not be necessary or not be allowed in some case) must be surveyed by the system constantly. If any change of state takes place and is noticed by the system (operator becomes sleepy), the system takes one of the following actions:

- Motivate the operator to remedy the situation (return to his desk or take measures to overcome his fatigue)
- Notify the supervisor about an operator status that could interfere with proper system operation
- Suggest measures (replace sleepy operator, transfer tasks away from him to resolve overload) or initiate a workflow (e.g. process transfer) to resolve situation (see functional area Load Balancing).

The decision on how to handle such a situation must be taken by the superior officer. The system can only provide hints or workflows to assist in the solution.

3 Border Surveillance RTP Instance

3.1 Background to Border Surveillance ADCOS

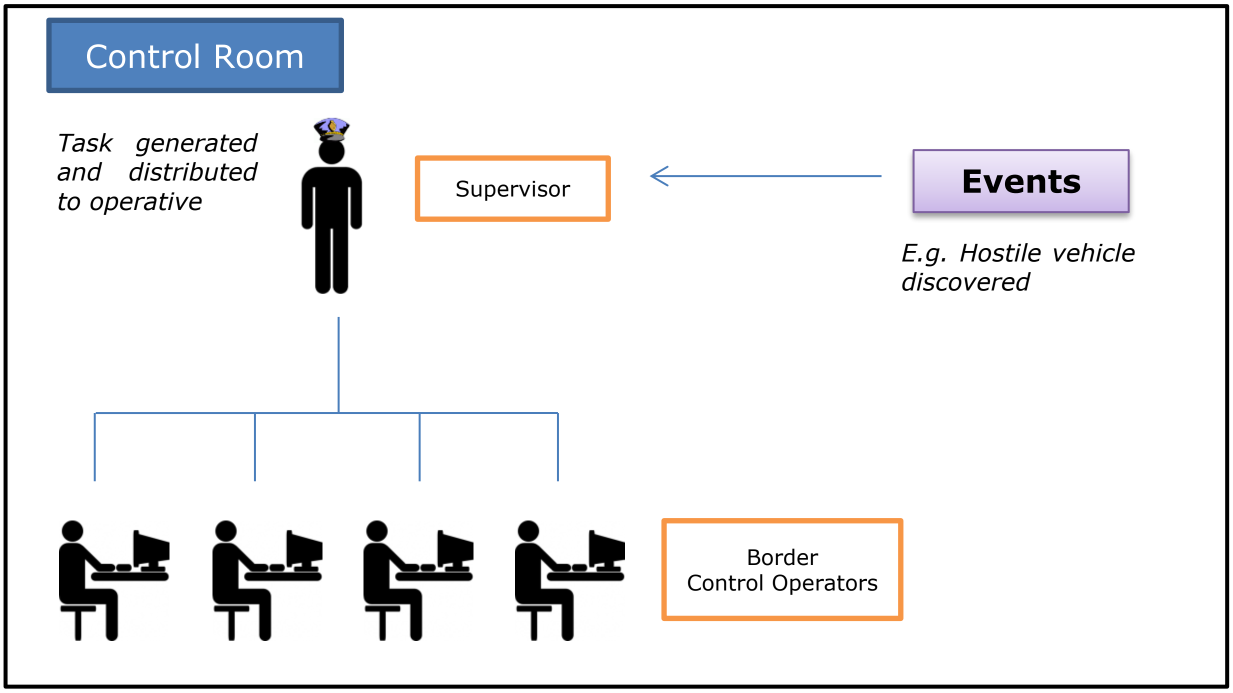


Figure 3 Hierarchy of a control room

The ADCOS for the border control room surveillance solutions comprise: (a) sensors, (b) a central Command & Control Information (C2I) system and (c) distributed sites where human and/or machine agents execute the orders and provide their input into the C2I system. This type of system already leverages some adaptive features like the generation of tailored displays of the so-called Common Operational Picture (COP), which shall support the human operators' situation awareness (SA) in the Control Room. Additional support is available to the operators who execute control tasks in form of alerts, recommendations (e.g. presentation of predefined tasking orders to resolve critical situations) and facilities for evaluating potential threats. However, the introduction of more sophisticated adaptivity capabilities in

HoliDes will greatly enhance the level of adaptive cooperation between human and machine agents. As a first example, thanks to the adaptivity

features that will be deployed, within the Control Room system it will be possible to identify operators struggling with a workload which is too high.
This could achieve by monitoring eye movements, blood flow and how the user interacts with the user interface. For example, eyes flicking back and fore, increased blood flow and frantic movements and of the mouse with high rates of keyboard errors could indicate the user is struggling with primary tasks.

Adaptation will take into account the operator profiles (e.g. role, education, level, culture), experience and country-specific regulatory constraints.
The specific area surveillance AdCoS application to be designed will be tailored for the most promising and urgent areas to be improved within the Control Room domain.

3.1.1 Frameworks

The architectural tools for the border control room system, Sparx Enterprise Architect, have been chosen due its native support of Enterprise Architecture Frameworks. In particular, NAF, MODAF and DODAF will be looked at as the products they employee to some extent can or do support human views.
The following figure shows how they sit together.
Enterprise Architectures can be thought of as framework which describes how a system. Either how it is today or how it should be. It helps the architect to document and visual a system by using agreed models to describe the system from certain viewpoints. There are many frameworks existing to do this and the NATO Architecture Framework, Ministry of Defence Architecture Framework and Department of Defence Architecture framework are but three. They are all similar but some of them have extra viewpoints to suit slightly different needs but for the most part they are the same. They all breakdown their available views into 3 types: Operational, System and Technical. Operational views document *what* should happen, system views show the infrastructure which supports those operations and technical views show the applicable operational, business, technical, and industry policies, standards, guidance and constraints, that apply to capability and operational requirements, system engineering processes, and systems and services.
Traditionally these frameworks haven't dealt with humans specifically so a new human view was devised based on the models of the existing views to

describe such things as training and experience into the models. Human Views will be discussed in more detail later in this document.

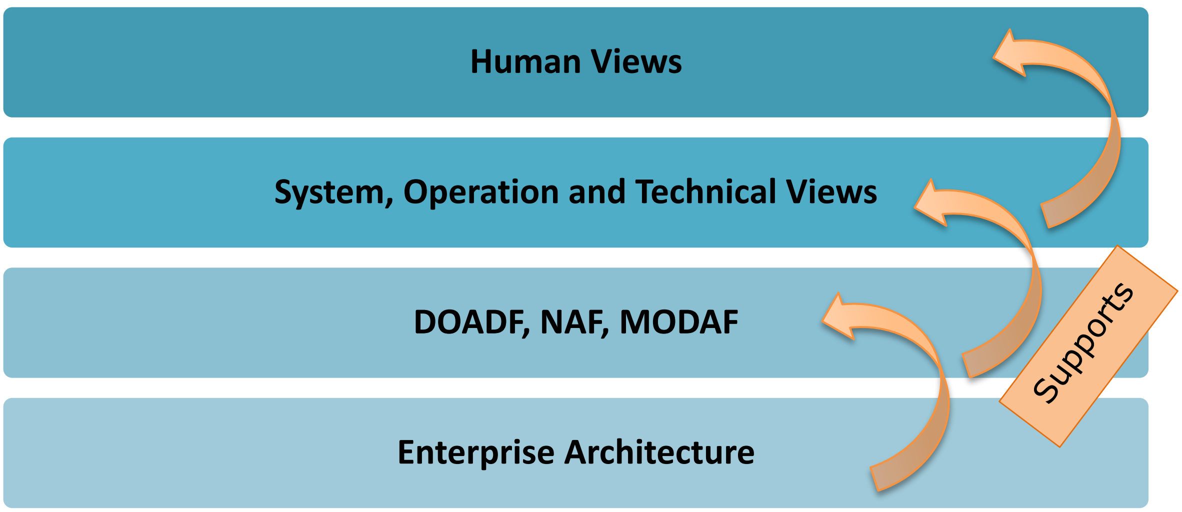


Figure 4 - How Human Views are supported

Currently, most architectural tools support the standard frameworks such as DODAF, NAF and MODAF but they don't support the human views. This means that the chosen tool, Enterprise Architect will have to be customised in order that human views can be achieved in Holides.

3.2 Border surveillance with an RTP instance

The purpose of the RTP is to assist the development of the border surveillance ADCOS by linking together lifecycle information to ease integration. Chapter 3.7 in D1.3 provided a first insight into how a control room would be developed. In essence, a set of architectural models developed in Enterprise Architect would be developed from a set of requirements which were held in DOORS.

The architectures would hold the human views as defined by the "Ministry of Defence Architecture Framework" MODAF. MODAF is an architectural framework which provides the principles and procedures for creating architecture. This is done with a series of models, often known as products.

In MODAF, these products are separated into three layers: Operational Views, System Views and Technical Views.

The operational views describes 'how' the system should functions and what things needed to be done I order achieve the system's goals. The system views described what hardware needs to be in place to support those operations. Finally, the technical view describes the technical constraints and standards that the final system should adhere to.

Many modelling tools such as System Architect, Rhapsody and Enterprise Architect support these frameworks. They allow you to create models which conform to the various framework standards.

On top of this, a new set of views known as Human Views have been proposed. The idea of the human views is that they describe the humans in such a way as to encourage the architect to think about the human's place in the system and how they work. For example: the training, experience and even career aspirations of the human individuals. All of these things can have an effect on how the system works and so it makes sense to take them into account during the development of a system.

The tool of choice for Airbus Defence and Space, Enterprise Architect, has profiles for standard DODAF, MODAF etc but not the human views. As the current metal model does support this it will need to be developed. The human views are covered in more detailed later in this document.

The Human Efficiency Evaluator tool, (HEE) by Holides partner OFFIS has been identified as a candidate for analysing the task performance and workload of the the human operators interacting with the central Command & Control Information System (C2I). HEE can be used to analyse the user interface designs of the C2I. These models are then used to calculate the length it takes to perform certain series of actions and to predict the operator workload. There is a potential it could be incorporated into the border surveillance tool chain for assessing the software used by the control room operative. The operator has an interface which needs to be interacted with when events are created. For example, an unidentified vehicle might have come in to view and so a patrol needs to be dispatched. A model of the user interface could be created in the HEE tool and a timing analysis added between interactions to identify blocking points.

3.3 RTP instance versions.

This document is the first of 4 versions of the border control surveillance application. The first version of the RTP Instance will be very basic. As the project progresses and the user’s needs are better understood, more technologies and tools will be added to the design process. These will be reflected in the design process. Note, beyond version 0.5 of the RTP, the versions listed here are only proposals and as such are subject to change.

3.3.1 Border Surveillance RTP version 0.5

The first version of the border surveillance RTP will comprise of only Enterprise Architect with human view implemented. The human views will be implemented using the DODAF profile which comes as an add-on for Sparx Enterprise Architect. The human views are covered in more detail later on in this document.

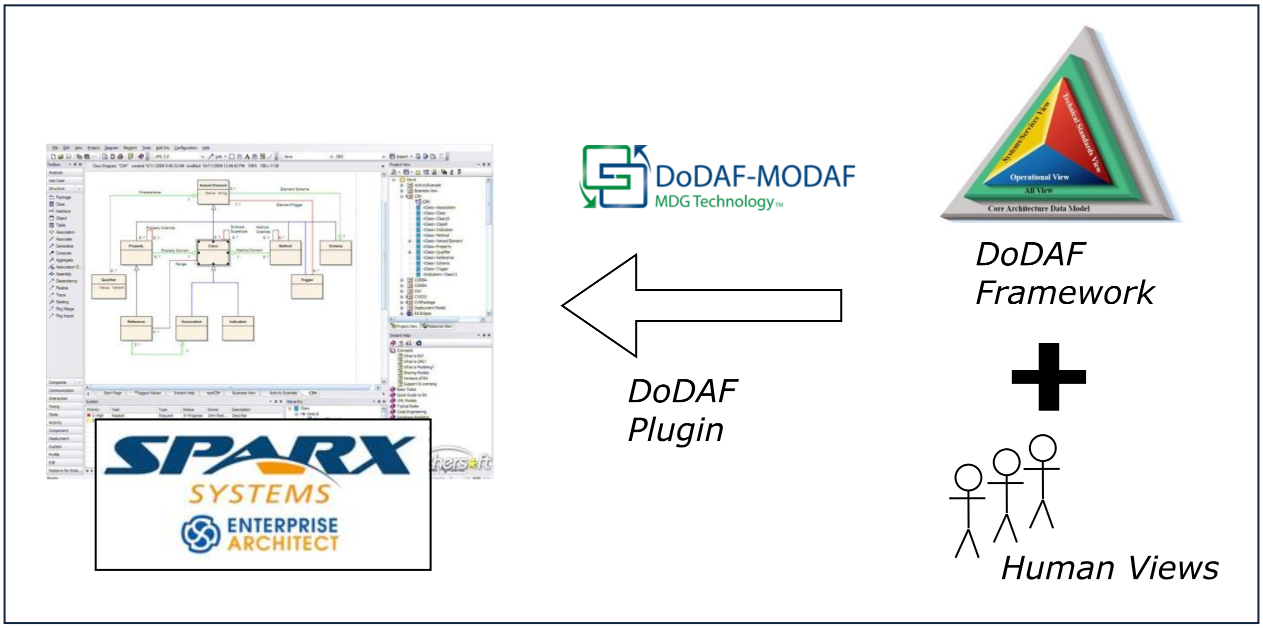


Figure 5 - Version 0.5 of the Border Surveillance Tailored RTP Instance

Sparx Enterprise Architect

Enterprise Architect is a comprehensive UML modelling analysis and design tool. It possesses built-in requirements management capabilities and the ability to model in a variety of modelling profiles such as Sysml, BPML and other open standards.

Enterprise Architect allows the behaviour of models to be tested with dynamic model simulation. This allows one to verify the correctness of a model and understand how a business system works. This allows the engineer to trial multiple architecture configurations to see what the effects are in order to improve the business outcomes. Enterprise Architect also supports code engineering. That is, model can be translated into code which an be executed straight away.

Department of Defence Architecture Framework (DoDAF)

DoDAF is an architecture framework developed by the United States Department of Defence[1]. It provides a visualisation for stakeholders which it does through a series of viewpoints or views of the system. Each type of view contains a number of model styles which can be used to describe various aspects of the system. Models in DoDAF are known as products.

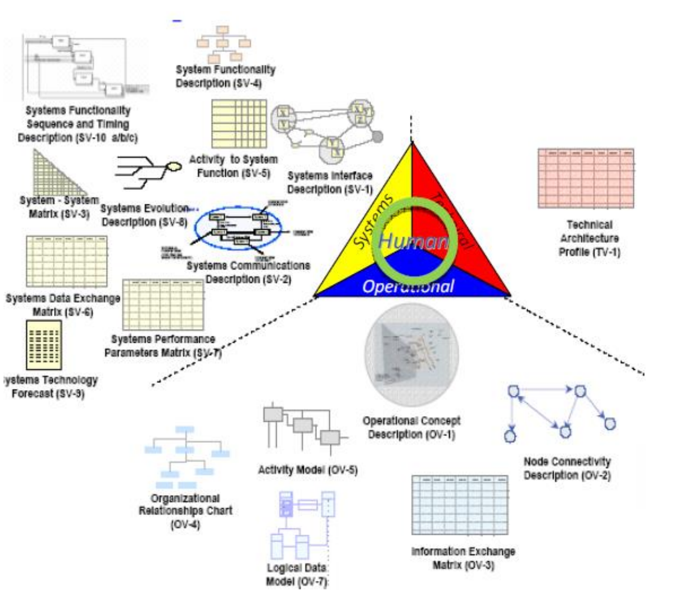


Figure 6 - The DoDAF Views

(1)The *Operational Views* describe the tasks and activities, operational elements, and information exchanges required to accomplish missions. Products of the operational views begin with OV and then a number.

(2) The *Systems and services view (SV*) is a set of graphical and textual products that describe systems and services and interconnections providing for, or supporting, DoD functions. SV products focus on specific physical systems with specific physical (geographical) locations.

(3) *Technical standards view (TV)* products define technical standards, implementation conventions, business rules and criteria that govern the architecture.

[1] http://dodcio.defense.gov/Portals/0/Documents/DODAF/DoDAF_v2-02_web.pdf

The DoDAF profile is supported in Enterprise Architect through a separate plug-in also created by Sparx.

List of DoDAF Operation Views	
OV-1 High Level Operational Concept Graphic	High level graphical and textual description of operational concept (high level organizations, missions, geographic configuration, connectivity, etc.).
OV-2 Operational Node Connectivity Description	Operational nodes, activities performed at each node, and connectivities and information flow between nodes.
OV-3 Operational Information Exchange Matrix	Information exchanged between nodes and the relevant attributes of that exchange such as media, quality, quantity, and the level of interoperability required.
OV-4 Organizational Relationships Chart	Command, control, coordination, and other relationships among organizations.
OV-5 Operational Activity Model	Activities, relationships among activities, inputs and outputs. In addition, overlays can show cost, performing nodes, or other pertinent information.
OV-6a Operational Rules Model	One of the three products used to describe operational activity sequence and timing that identifies the business rules that constrain the operation.
OV-6b Operational State Transition Description	One of the three products used to describe operational activity sequence and timing that identifies responses of a business process to events.
OV-6c Operational Event-Trace Description	One of the three products used to describe operational activity sequence and timing that traces the actions in a scenario or critical sequence of events.
OV-7 Logical Data Model	Documentation of the data requirements and structural business process rules of the Operational View. (In DoDAF V1.5. This corresponds to DIV-2 in DoDAF V2.0.)

Table 2 - System Views of DoDAF

List of DoDAF System Views	
SV-1 Systems/Services Interface Description	Depicts systems nodes and the systems resident at these nodes to support organizations/human roles represented by operational nodes of the OV-2. SV-1 also identifies the interfaces between systems and systems nodes.
SV-2 Systems/Services Communications Description	Depicts pertinent information about communications systems, communications links, and communications networks. SV-2 documents the kinds of communications media that support the systems and implements their interfaces as described in SV-1.
SV-3 Systems-Systems, Services-Systems, Services-Services Matrices	provides detail on the interface characteristics described in SV-1 for the architecture, arranged in matrix form.
SV-4a/SV-4b Systems/Services Functionality Description	The SV-4a documents system functional hierarchies and system functions, and the system data flows between them. Although there is a correlation between OV-5 or business-process hierarchies and the system functional hierarchy of SV-4a, it need not be a one-to-one mapping, hence, the need for the Operational Activity to Systems Function Traceability Matrix (SV-5a), which provides that mapping.
SV-5a, SV-5b, SV-5c Operational Activity to Systems Function.	Operational Activity to SV-5a and SV-5b is a specification of the relationships between the set of operational activities applicable to an architecture and the set of system functions applicable to that architecture.
SV-6 Systems/Services Data Exchange Matrix	Specifies the characteristics of the system data exchanged between systems. This product focuses on automated information exchanges (from OV-3) that are implemented in systems. Non-automated information exchanges, such as verbal orders, are captured in the OV products only.
SV-7 Systems/Services Performance Parameters Matrix	Specifies the quantitative characteristics of systems and system hardware/software items, their interfaces (system data carried by the interface as well as communications link details that implement the interface), and their functions.
SV-8 Systems/Services Evolution Description	Captures evolution plans that describe how the system, or the architecture in which the system is embedded, will evolve over a lengthy period of time. Generally, the timeline milestones are critical for a successful understanding of the evolution timeline.

SV-9 Systems/Services Technology Forecast	Defines the underlying current and expected supporting technologies that have been targeted using standard forecasting methods. Expected supporting technologies are those that can be reasonably forecast given the current state of technology and expected improvements.
SV-10a Systems/Services Rules Model	Describes the rules under which the architecture or its systems behave under specified conditions.
SV-10b Systems/Services State Transition Description	A graphical method of describing a system (or system function) response to various events by changing its state. The diagram basically represents the sets of events to which the systems in the architecture will respond (by taking an action to move to a new state) as a function of its current state. Each transition specifies an event and an action.
SV-10c Systems/Services Event-Trace Description	Provides a time-ordered examination of the system data elements exchanged between participating systems (external and internal), system functions, or human roles as a result of a particular scenario. Each event-trace diagram should have an accompanying description that defines the particular scenario or situation.
SV-11 Physical Schema	One of the architecture products closest to actual system design in the Framework. The product defines the structure of the various kinds of system data that are utilized by the systems in the architecture. (In DoDAF V1.5. This corresponds to DIV-3 in DoDAF V2.0.)

Human Views

As well as the standard views described above (1)-(3), there are also a set of views known as the "Human Views". These provide a fully integrated set of products that can be used to inform and influence system design and development. This ensures that the human is considered in the architecture by structurally including them in the system engineering planning.[2]

The human views provide a structured language for communicating with other disciplines during system development.

[2] NATO Human View Quick Start Guide, Human Factors and Medicine Panel Research Technical Group HFM-155 Human Systems Integration for Network Centric Warfare

Human View Products

In all, there are 8 human views which are labelled HV A–H.
Table1 shows a list of all the views and Figure3 shows how they are related. Not every product will be used in the context of Holides, only those that are interesting and are able to be visualised in Enterprise Architect. The current thinking is that the products HV-A to HV-E will be used.

Table 3 - List of the Human Views

Name	*Description*
HV-A: Concepts	High-level representation of the human components in the system.
HV-B: Constraints	Repository for different classes of human limitations
HV-C: Tasks	Describes the human specific activities
HV-D: Roles	The job functions that have been defined for the human interacting the system.
HV-E: Human Network	The human to human communication patterns that occur in teams.
HV-F: Training	Account of training requirements strategy and implementation.
HV-G: Metrics	Repository for human-related values, priorities and performance criteria.
HV-H: Human Dynamics.	The feeder data and set up scheme for a complete simulation of humans in the system.

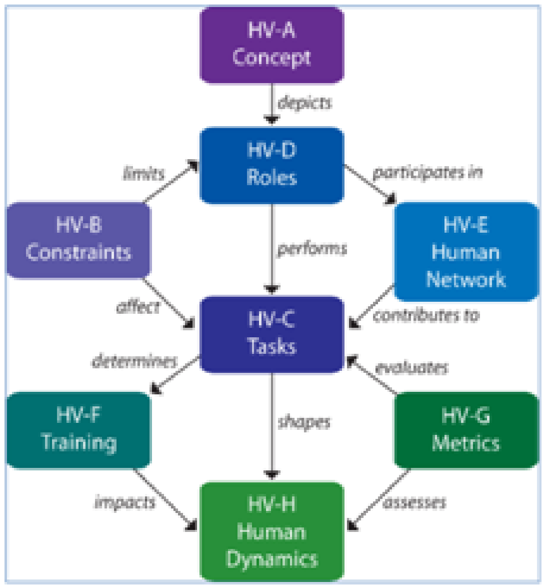


Figure 7 - The Human View Products

3.3.2 Border Surveillance RTP version 1.0

The third version of the border surveillance RTP instance will evolve to incorporate the OFFIS Human Efficiency Evaluator tool (HEE).

The HEE tool is an analysis application which allows the user to develop a model of the Human Machine Interface. This model is then used to specify paths which the end user might follow through the system. Timings are added at each step which is used to calculate the overall duration of a particular action. The border surveillance operative will interact with the system via the HMI on the terminals. A cumbersome HMI can add to the stress to the operator when performing basic operations such as navigating the menus.

Note, that there exists already a DOORS link to Enterprise Architect but this

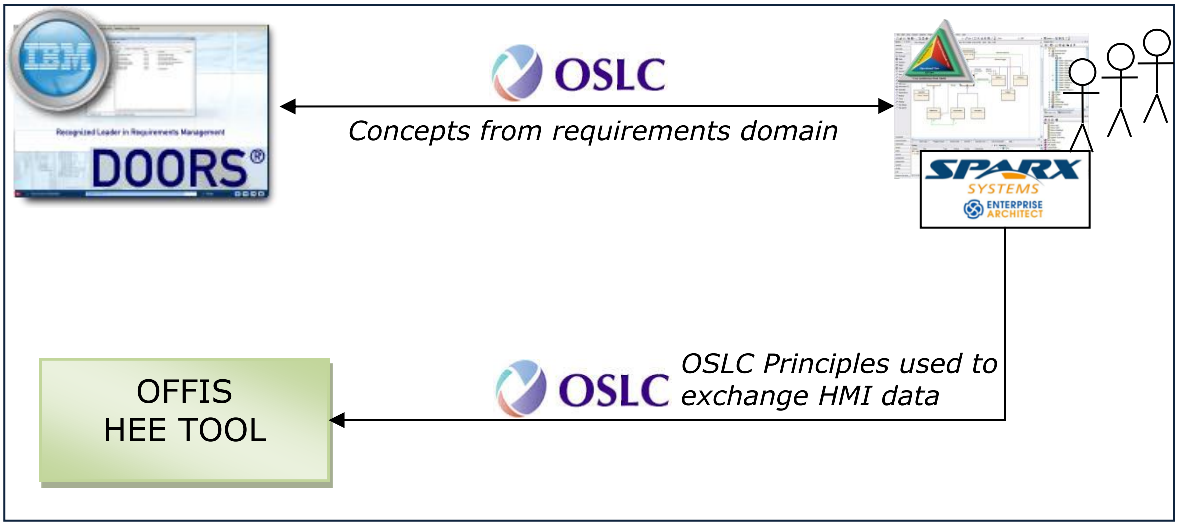


Figure 8 – Version 1.0 of the Border Surveillance RTP will link Doors with EA via OSLC.

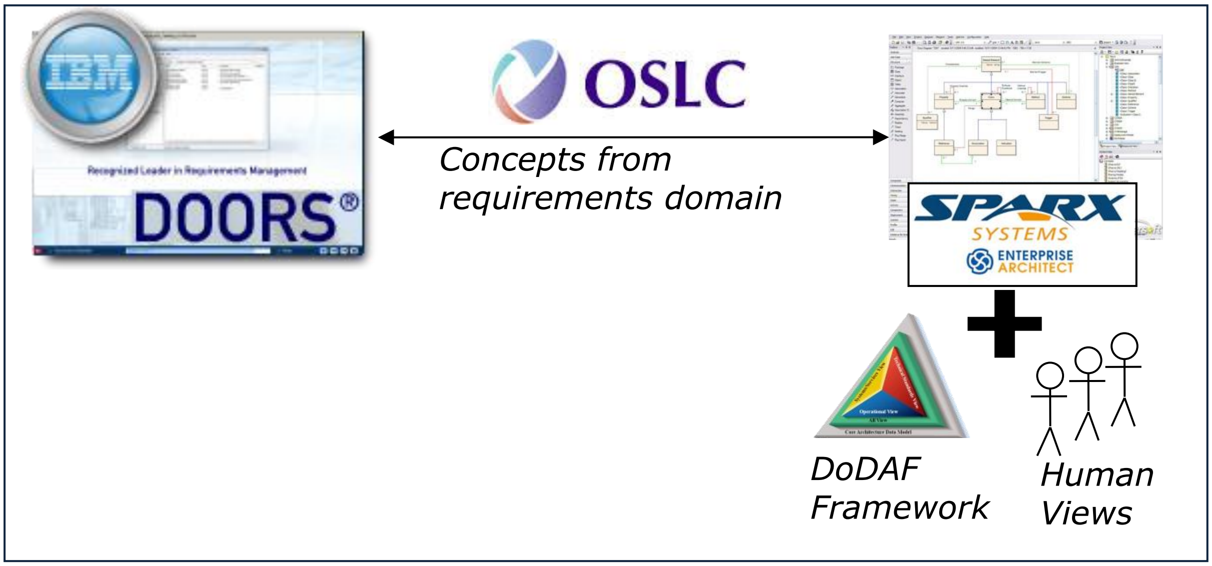
is not done with OSLC. Enterprise Architect does already have some OSLC capability but it's only an early release and so some investigative work will need to be done in order to see if or how it can be applied in this scenario. Currently EA is an OSLC requirements provider like DOORS and not a consumer. With this in mind it is likely that some sort of EA consumer plugin will have to be created.

3.3.3 Border Surveillance RTP version 1.5

The HEE tool has been identified as a tool which can provide some empirical assessment as to how effective a user interface is by predicting the operators' workload and their task performance. It doesn't need a finished interface to work with and interface models can be made up from rough drawings and early drafts. The third version of the RTP will look to incorporate sequence diagrams from the Enterprise Architecture models into the design of HMI models for the HEE tool for earlier assessment into the development lifecycle.
Another possibility for input into the HEE would be instead to the task models as defined in the human views under the product of HV-C.

Eclipse is currently used by Airbus Defence and Space for the development border security applications. How it could be used in an RTP context is not

clear at this point but it might be possible to perform some sort of user interface assessment with the HEE tool consuming development information from Eclipse.



3.3.4 Border Surveillance RTP version 1.8 (Final)

The final version of the border surveillance RTP instance could extend to incorporate the data from physical devices for the purpose of analysis. Current sensor applications are being looked at to determine things such as if the operator is asleep, present etc. so that the system can adapt accordingly. One such sensor is remote eye tracking which can detect if the The operator is fatigued or not.

It might be that during the design phase of the load balancing modules, you would want to test how many times during an 8 hour shift an operator spent in a highly stressed/fatigued state. Multiple tests could be carried out with different parameters and configurations of load balancing logic under different scenarios.

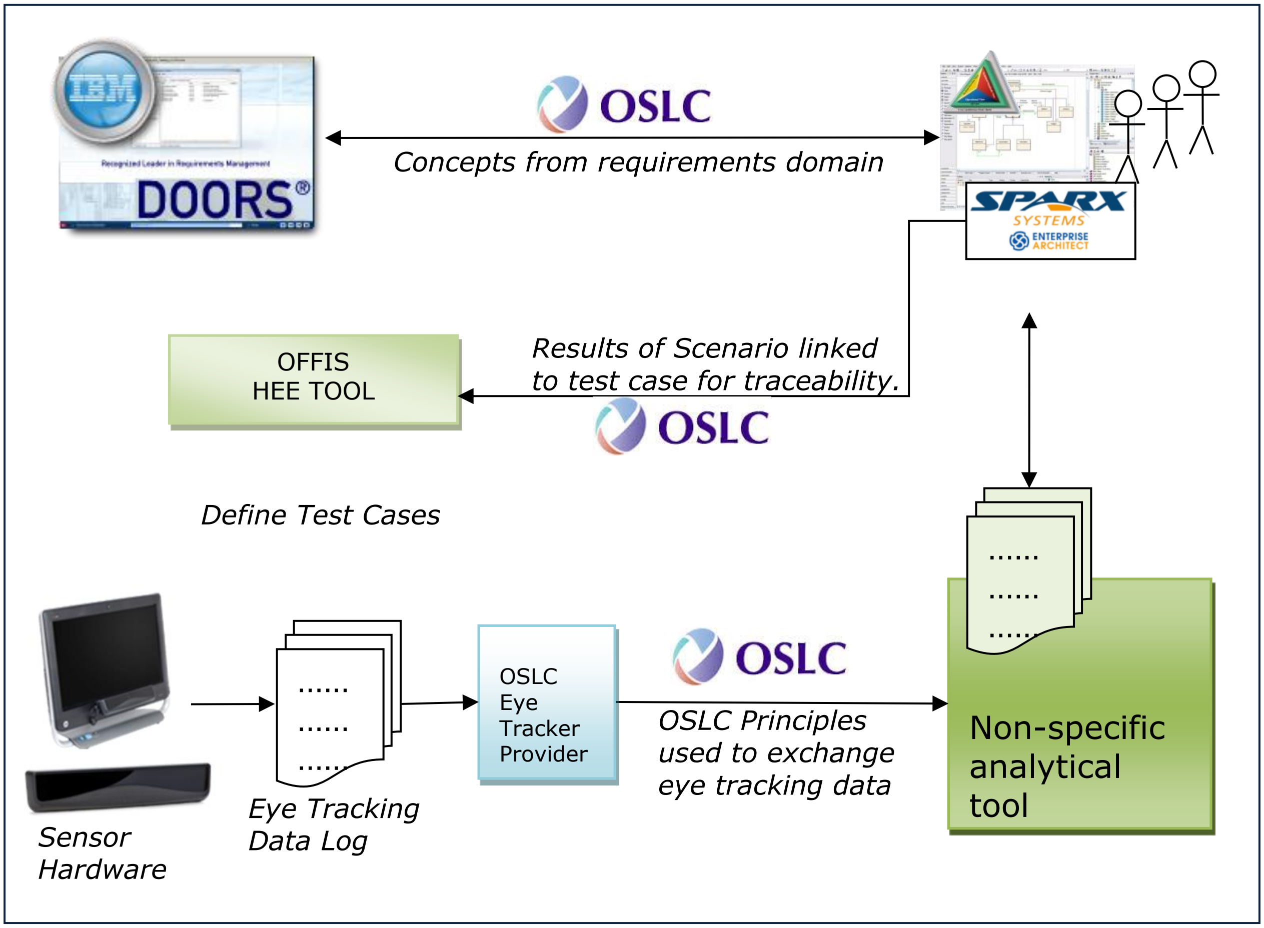


Figure 10 - Version 1.8 of the Border Security RTP Instance

The data from the operator's eye movements could be used to detect stress during a post-test analysis. The RTP concepts could be a useful concept here as it would allow the analysis tool access to the sensor data.
The advantage of this tool chain would be that it could easily break down the silos between engineering design and test teams. It would be increase the efficiency at which iterative loops could be completed. The availability of eye tracking data through OSLC mean the results of tests can be quickly harvested assessed and compared to an appropriate test case.

4 Energy Control Room RTP Instance

The Iren AdCoS will consist of a renewed and integrated human-machine interface that coordinates the two software application for managing incoming calls in the Iren Control Room, namely Genesys and CCE.

This new interface will jointly cover two main and constituent functions of the now available software, where Genesys manages the incoming calls and allocates them to the available operators while CCE enables these last ones to fill in the informative forms with essential information concerning the signalled emergency to be delivered to operational teams on the field.
Iren AdCoS can be thus considered as a unique system covering six functional areas which in turn could be described as adaptive tools or (sub) systems *per se*.

IREN AdCos use cases are presented below.

- Management of not pertinent calls
- Peak of incoming calls - Emergency for an exceptional event
- Collection of relevant information for the correct interpretation of the malfunctioning
- Communication between the operator and the operational teams in the field
- Non Italian speaking caller
- Collection of historical information about intervention of each installations for future events

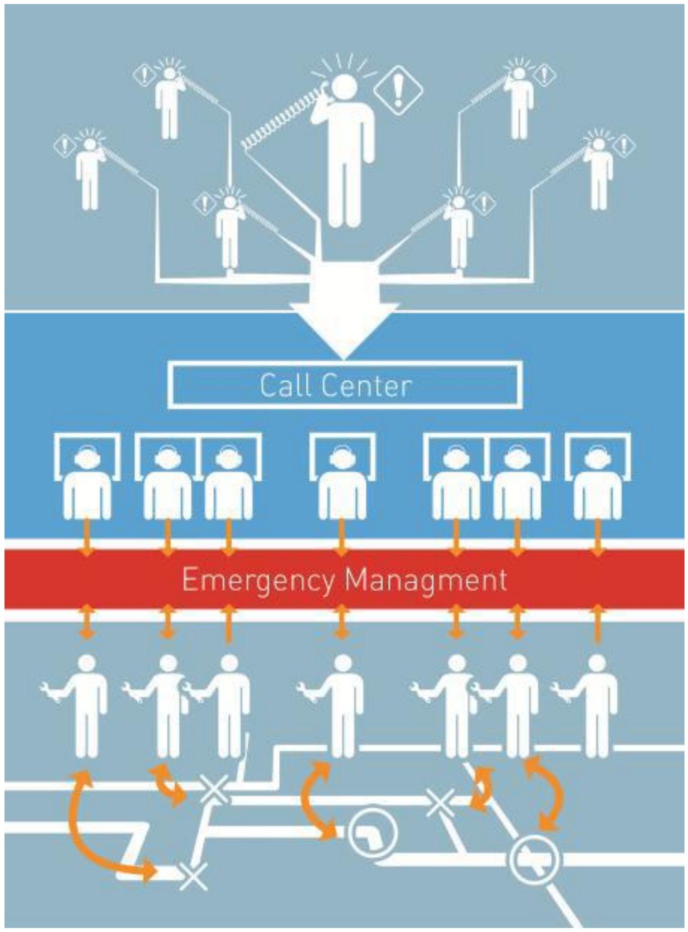


Figure 11 - Present information flow in the incoming call managing system of the IREN Energy Control Room

4.1 Background to IREN ADCOS

Today, the Iren Control Room incoming calls management is run via two different applications dealing with, respectively, the allocation of calls to the available operators and the recording and transmission of relevant information to the operative teams. The first task is performed by Genesys which collects the calls, drives the pre-selection phases and allocates calls consequently to the available operators. The only "adaptive" feature employed in the whole process is represented by a discrimination between the different services the Control Room surveys (eg. Gas grids, electric networks, water cycle, etc.) as the Italian law imposes to keep a phone line and an operator fully available for gas-related emergency calls. On the other hand, the recording and transmission of relevant information is performed by operators thanks to the CCE software. Once the Control Room operator has accepted the call, CCE links it to a new file displayed in its interface onto which the operator marks down the relevant information to be recorded and transmitted.

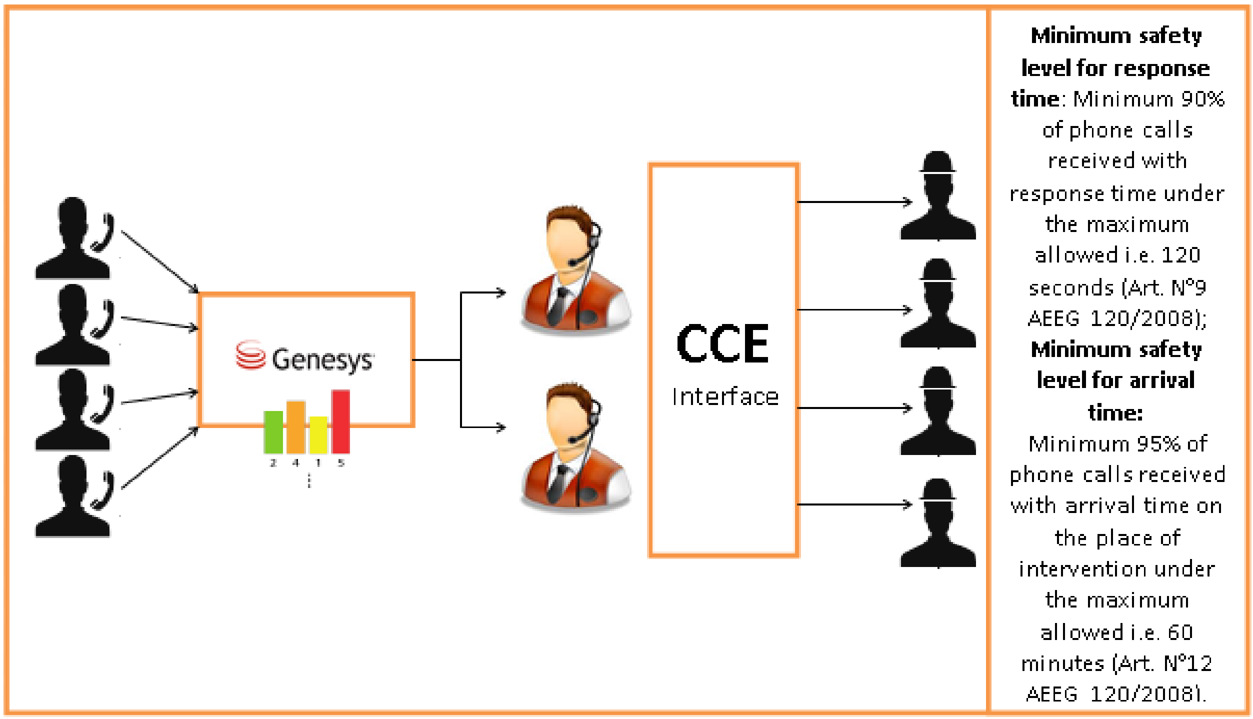


Figure 12 - IREN Energy Control Room "AS IS": the requirements identified by Italian regulations, displayed in the right-hand side box, can be utilised as performance indicators for the whole Emergency calls management system.

4.2 IREN Energy Control Room with an RTP instance

Adaptivity is intended here in a broader way by encompassing the traditional adaption to users' mental and physical states plus additional HMI aspects capable to enhance and optimize the Control Room operators' performance. In fact, the basic idea is to develop a system with a redesigned human-machine interface through which six functionalities newly developed will be put in place to assist operators. The traditional assessment of the operators' physical/mental state will be limited to the fatigue/tiredness dimension onto which a new system of pre-selection and allocation of incoming calls to operators will be designed. In addition, a set of six functionalities will be encapsulated into the new system in order to ease the management of those situations described in the Use Cases mentioned above and reported in D8.1 along with the relative requirements.

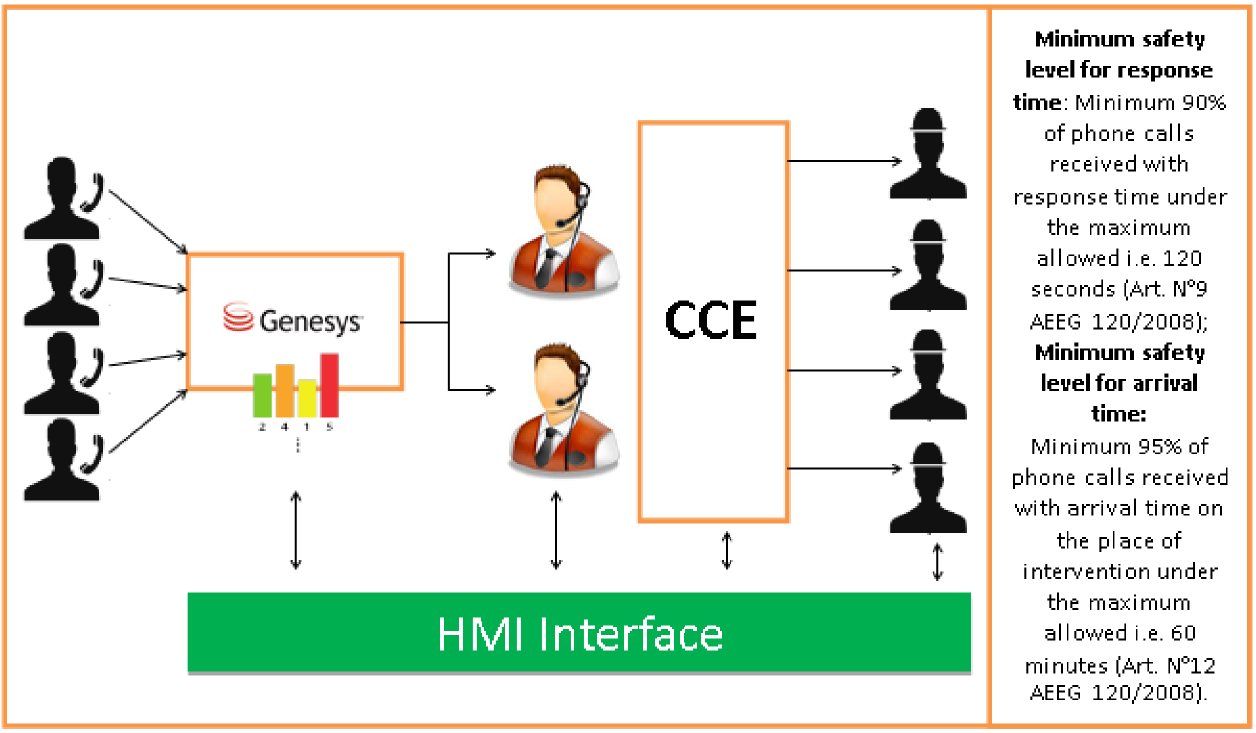


Figure 13 - IREN Energy Control Room with the redesigned HMI interface

Basically, the collected requirements are translated into a set of constituent tasks to be modelled using OFFIS PED or, alternatively, the MagicDraw application. These tasks, in turn, will be subjected to a first evaluation, which will be run with a specific feature comprised in the OFFIS PED tool, and then recoded into Eclipse in order to develop the HMI prototype which will be finally evaluated via simulations in the HEE.

The core of this workflow can be considered to rely in the development of the HMI prototype in collaboration with RE:Lab on the basis of the task modelling along with its consequent evaluation. When considering these three different phases, represented by the task modelling, the development of the prototype and its evaluation, it is worth remarking how the focus of IREN commitment to the project is set on the ease and acceleration of the development cycles to be pursued via early design stages feedbacks along with and increased communication between the stages themselves. At an operational level the modelling, development and evaluation of prototypes are thus interlinked and held together in a sort of triangle where the corners are represented by the three different phases whereas the sides represent the two-way relationships between them.

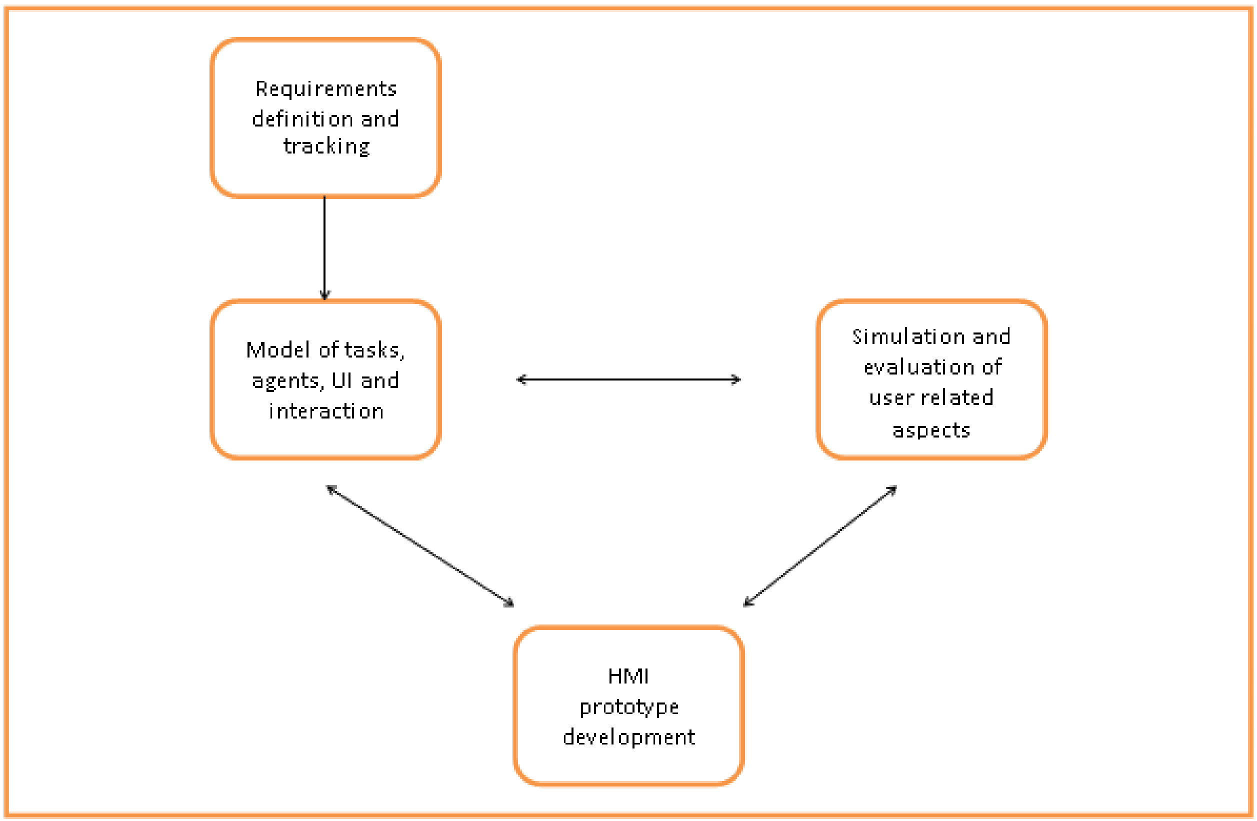


Figure 14 - IREN HMI Prototype development workflow

4.2.1 Energy Control Room RTP version 0.5

The first version of the IREN Control Room RTP is represented by the task modelling in PED on the basis of the requirements identified in the early stages of the project. It is not clear however, which form these requirements will take and which tools will be utilised to get them systematized. Their relatively small dimension and the limited extent of complexity of the system has suggested to discard the idea to utilize a software (e.g. DOORS) to manage them. Requirements are by now held in MS Word and this solution is to be considered as provisional until the emerging of new tools from HoliDes WP2.

OFFIS PED
The Procedure Editor PED enables rapid prototyping of cognitive task models. It is based on an Hierarchical Task Analysis. PED has been used already to model tasks from the automotive, aeronautic, and maritime domains.
PED consists of a graphical editor and a simulation component, so that models can be simulated directly in PED, which shortens the evaluation cycle for the inexperienced modeller. In addition, PED outputs are readable by CASCaS, which enables a safer and faster way to early stages feedbacks and evaluations.

4.2.2 Energy Control Room RTP version 1.0

The second version of the Control Room RTP will include a preliminary evaluation of some user related aspects and the tasks associated with the redesigned HMI interface and modelled via OFFIS PED. This phase is intended to extend the RTP to the utilisation of OFFIS HEE, a tool designed for prediction of human task performance and workload and therefore capable to produce valuable early stages feedbacks concerning the overall feasibility of the new tasks modelling. In fact, task models designed in PED can be preliminarily evaluated in a dedicated feature encompassed in that tool. In addition, in case the task model has been designed with PED and the new user interface dialogs are implemented as design mock-ups/pictures or photos, it is possible to make a first evaluation of these last ones with the OFFIS HEE before developing the HMI prototype by coding in Eclipse. There is therefore the chance to evaluate to what extent the HMI interface design

optimizes the operators' task performance and workload before proceeding to the implementation of the prototype.
For an in-depth description of OFFIS HEE see also §3.3.3

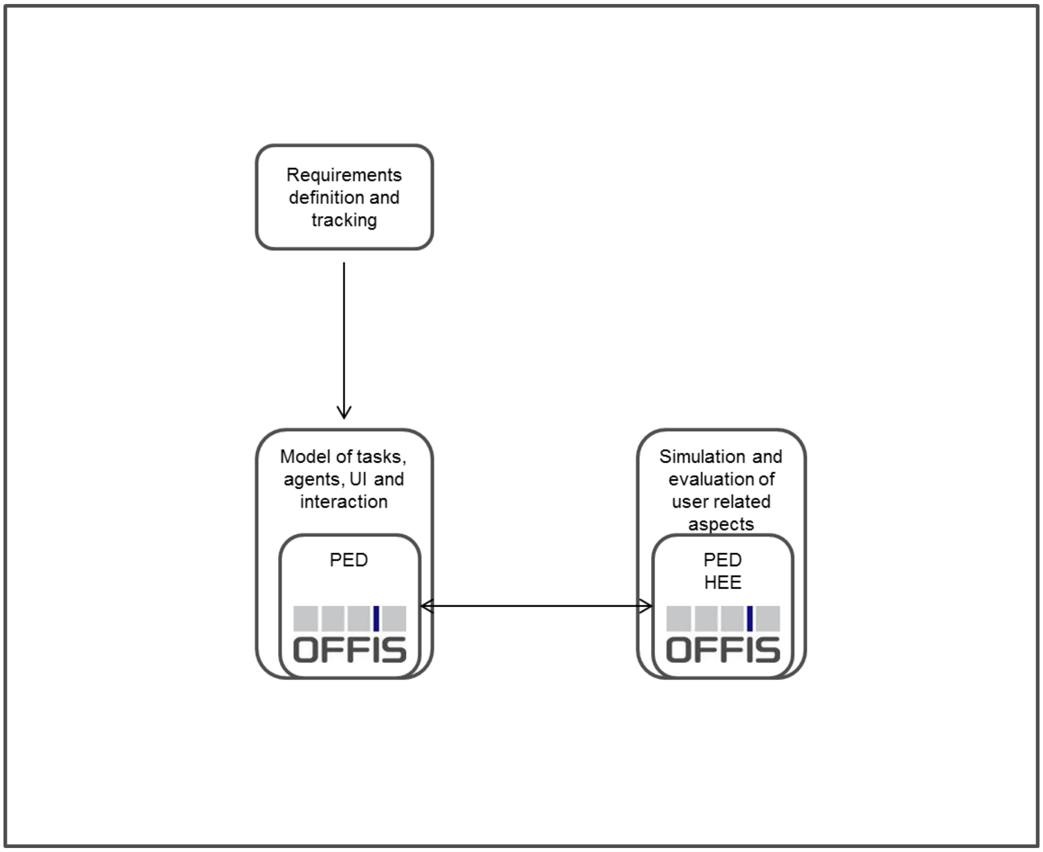


Figure 15 - Energy Control Room RTP v1.0

4.2.3 Energy Control Room RTP version 1.5

The third version of the RTP consists in coding via Eclipse the redesigned HMI interface for the IREN Control Room. Eclipse is an integrated development environment that allows developing applications with a vast set of choices as far as the programming language is concerned.

Eclipse is currently used by both RE:Lab and IREN ICT dept. for the development of several applications. It is not clear at the moment how

Eclipse will be enabled to interact with the other tools incorporated in the toolchain. This is especially true for upstream applications while downstream further developments, with reference to the simulation activities, will be put in place via a second user interface assessment cycle with the HEE (see version 1.8).
Including the OFFIS HEE in the toolchain requires identifying suitable ways to connect it to the other tools. Given the possibility to evaluate a prototype starting from mock-ups and screenshots in HEE, it is relatively simple to think of a second cycle of simulations linking to it the outputs of the HMI prototype development with Eclipse. On the other hand, there is the need to establish a connection between the PED and the HEE in order to deliver the task models to a first cycle of simulations/evaluation.

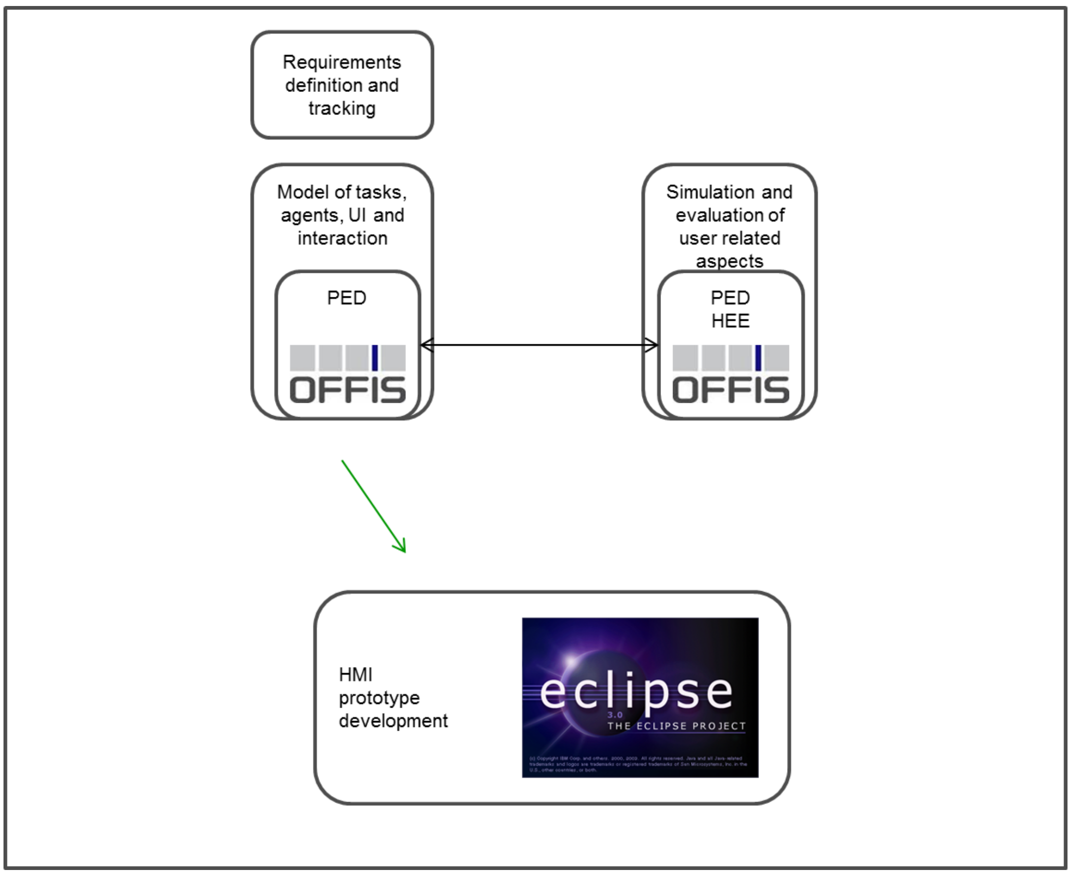


Figure 16 Energy Control Room RTP v1.5

4.2.4 Energy Control Room RTP version 1.8 (Final)

The final version of the RTP is achieved by including simulations of the overall functioning of the redesigned HMI interface. In this final stage the OFFIS HEE will be applied, to evaluate and test the final HMI prototype developed by Iren and RE:Lab and to evaluate the total task performance and workload optimizations gained.

.

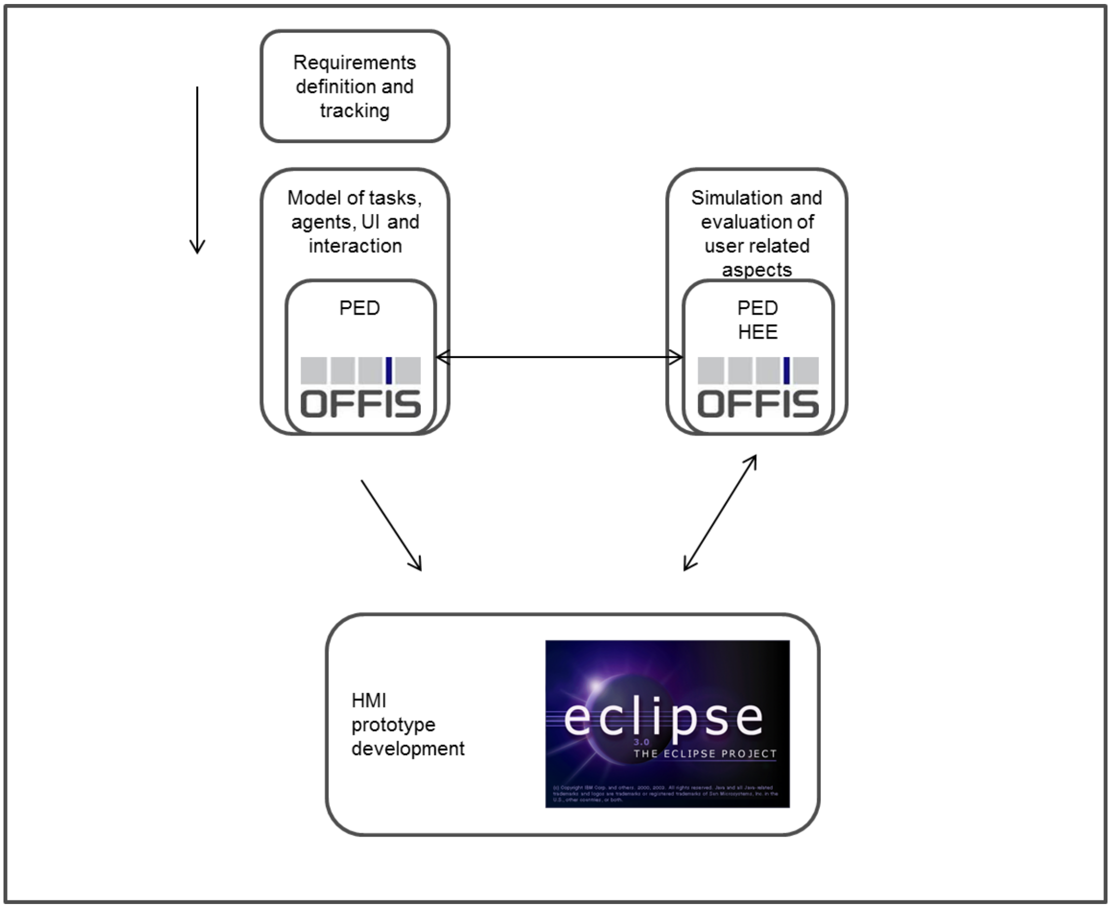


Figure 17 Final Energy Control Room RTP Toolchain v1.8

5 Conclusion

This document has described how the RTP Instances could look like for the development of two control room applications. One border security control room and one energy control room.
The RTP instances will be instantiated from the Holides RTP, which comprises the tools needed for Human Factors engineering in some pre-integrated state. As the application provider chooses which tools they require for their development process a tailoring process is done to suit the specific needs of that use case.

It should be noted that the approach taken in WP8 is bottom-up. As it is not always known what can be achieved with human factors engineering, more emphasis is being put discovering 'what' can be achieved rather than 'how'. With that in mind the RTP instances defined here are subject to change and further refinement as Holides progresses.