

PURESaFe

Preventing hUman intervention for IncREased SAfety inFrastuctures Emitting ionizing radiation

Coordinator Prof. Jouni Mattila, TUT, Finland
Budget: 3.95 M€ , 15 ESR's (540 months), 4 VR's (6 months)

SEVENTH FRAMEWORK PROGRAMME: THE PEOPLE PROGRAMME
Initial Training Networks



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Final Conference, 19 th – 23 rd January 2015
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Contents

1. Puresafe Consortium partners and Visiting Researchers
2. PURESAFE motivation
3. Scientific and Technological (S&T) Objectives
4. Training Objectives



The nine participants of the PURES SAFE consortium are 3 universities, 2 international research organisations, 3 industrial partners (SME) and two Associated Partners. 15 ESR's.

1. TUT (3 ESR's)	TUT	Finland
2. Universidad Politécnica de Madrid (2 ESR's)	UPM	Spain
3. Karlsruhe Institute of Technology (2 ESR's)	KIT	Germany
4. European Organisation for Nuclear Research (3 ESR's)	CERN	Switzerland
5. Helmholtz Centre for Heavy Ion Research / Facility for ion and Antiproton Research (2 ESR's)	GSI/FAIR	Germany
6. SenseTrix Ltd (1 ESR)	SENSETRIX	Finland
7. Oxford Technologies Ltd (1 ESR)	OTL	United Kingdom
8. Bgator Ltd (1 ESR)	BGATOR	Finland
Associated Partners		
9. Université de Savoie		France
10. ENSAM ParisTech		France



Visiting Researchers (VR)

- UPM VR (2 mo)
 - Professor Bruno Siciliano, University of Naples
- TUT VR (2 mo)
 - Dr. Wen-Hong Zhu, Canadian Scape Agency
- CERN VRs (1 mo + 1 mo)
 - Julie Le Cardinal, Professor of PM at École Centrale ParisTech
 - Rachid Alami, Prof., Head of RH at LAAS CNRS

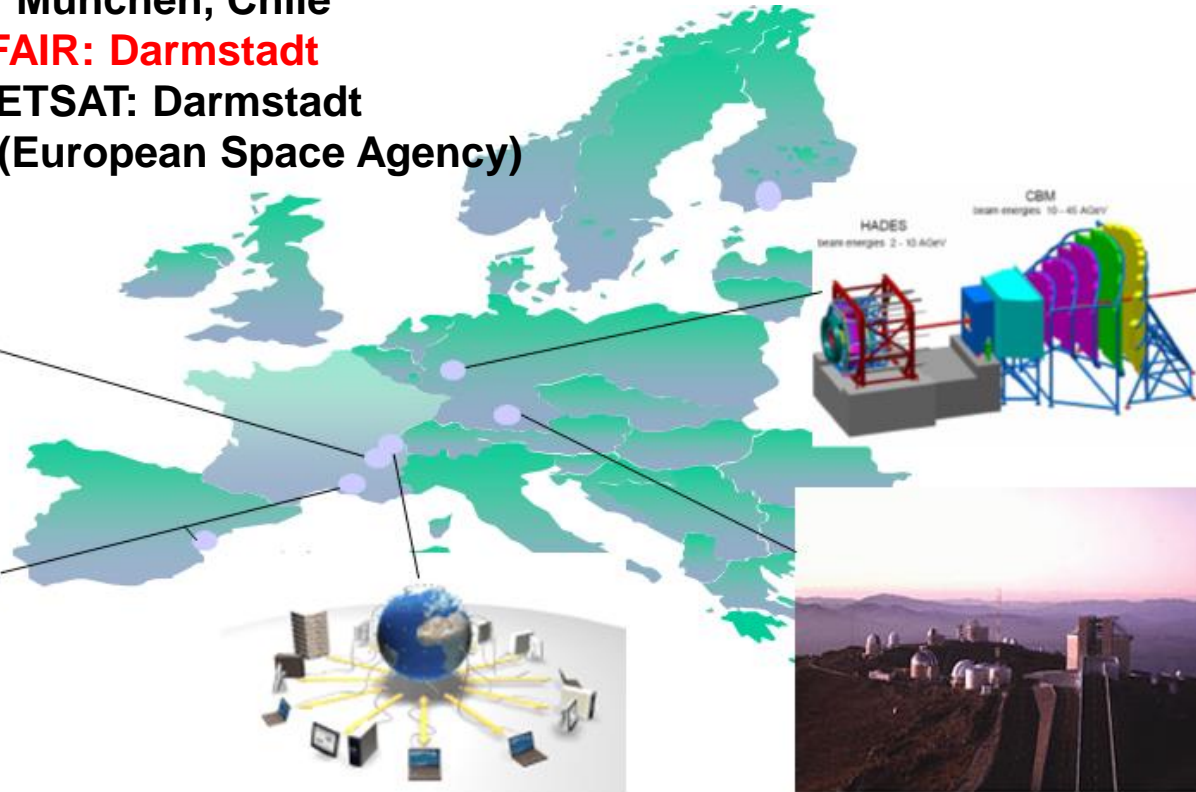
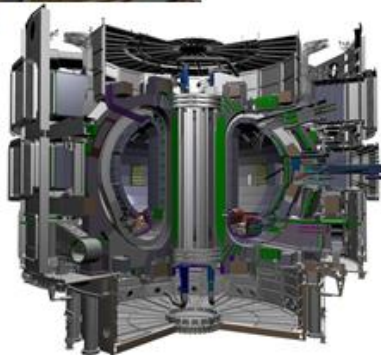


PURESafe motivation



Scientific Infrastructures

1. **CERN, Geneve**
2. **ESRF, Grenoble**
3. **ITER: München, Cadarache, Barcelona**
4. **ESO: München, Chile**
5. **GSI/FAIR: Darmstadt**
6. **EUMETSAT: Darmstadt**
7. **ESA (European Space Agency)**



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Design challenge

- There are over 50 synchrotrons (particle accelerators) around the world and the number is increasing
- The current trend to increase the energy/luminosity of scientific facilities for enhanced research results.
- Energy/luminosity increase leads into very complex machines that are:
 - *Very difficult to operate*
 - *Expensive to own and maintain.*
- The human radiation protection due to the increased radiation levels is becoming an even more crucial
- There are very good career prospects for trained engineers on European industries that develop complex and knowledge intensive products requiring systems engineering



Scientific and Technological (S&T) Objectives for PURESAFE



Research Objectives

– Training through Research

- PURESAFE objective is to development and validate a cost-effective design framework concept including design models, methods and tools
- The design framework aim is the radiation protection of humans and increase of the scientific infrastructures experimental time while keeping the machine life-cycle expenses low
- The joint research programme is focused on the important R&D question: How to build complex design requirements, such as reliability, availability, maintainability and safety (RAMS), into complex scientific infrastructures from the early-stage of design enabling a cost-effective life-cycle
- PURESAFE is driven by CERN and GSI case studies for serving effective Project Based Learning (PBL) for ESR's



The Four Dimensions of the PURESAFE **Integrated** Research and Training Program

Training

•Local training

- Personal career development plan
- Learning diary
- Mentor
- Complementary training

• PURESAFE training network

- Kick-off week
- Two joint training events
- Two summer schools
- Complementary training

Training Though Research

•Integrated research training

- Case studies as Project Based Learning
- 15 individual research projects
- PhD programmes and PhD-thesis supervisors
- Secondments
- E-meetings

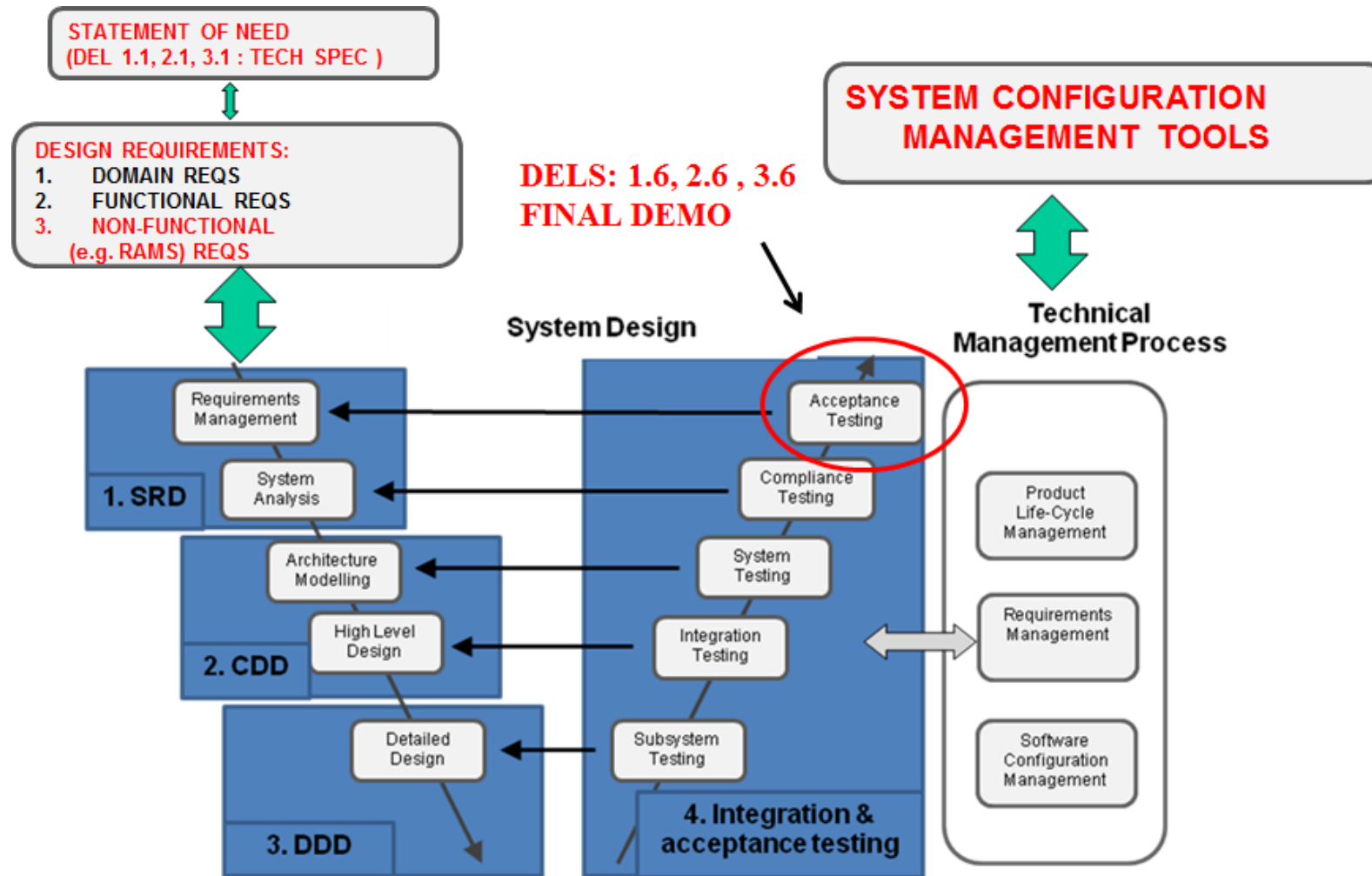
Training Though Interaction and Outreach

•Interaction with the scientific community and public

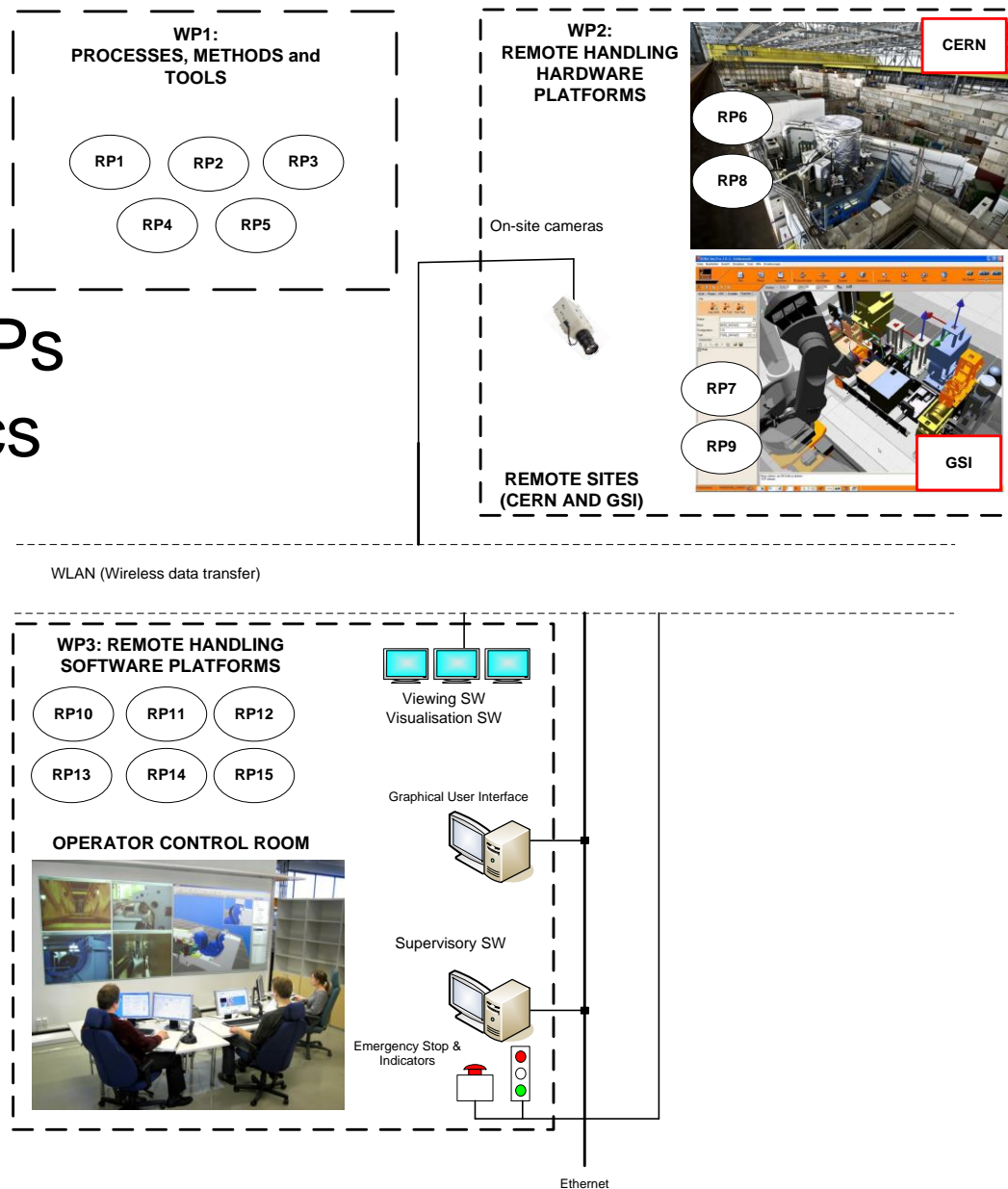
- Participation in international conferences, scientific peer-review publications
- Externally open events (Joint training weeks, Summer schools and Workshops)
- Final network conference
- Webpage
- Media



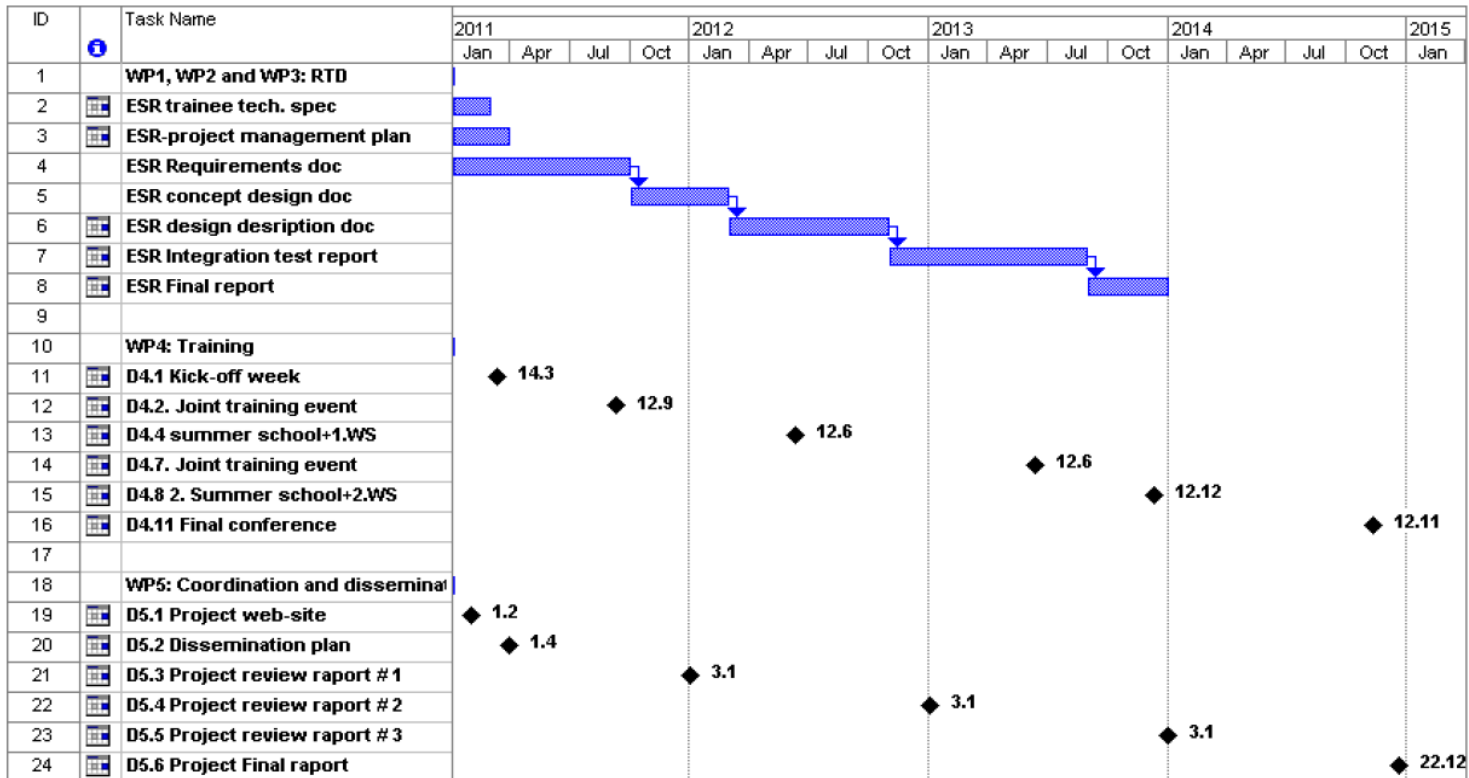
Training through Research - Systems Engineering Methodology (project based learning)



PURESafe WPs and PhD- topics (RPs)

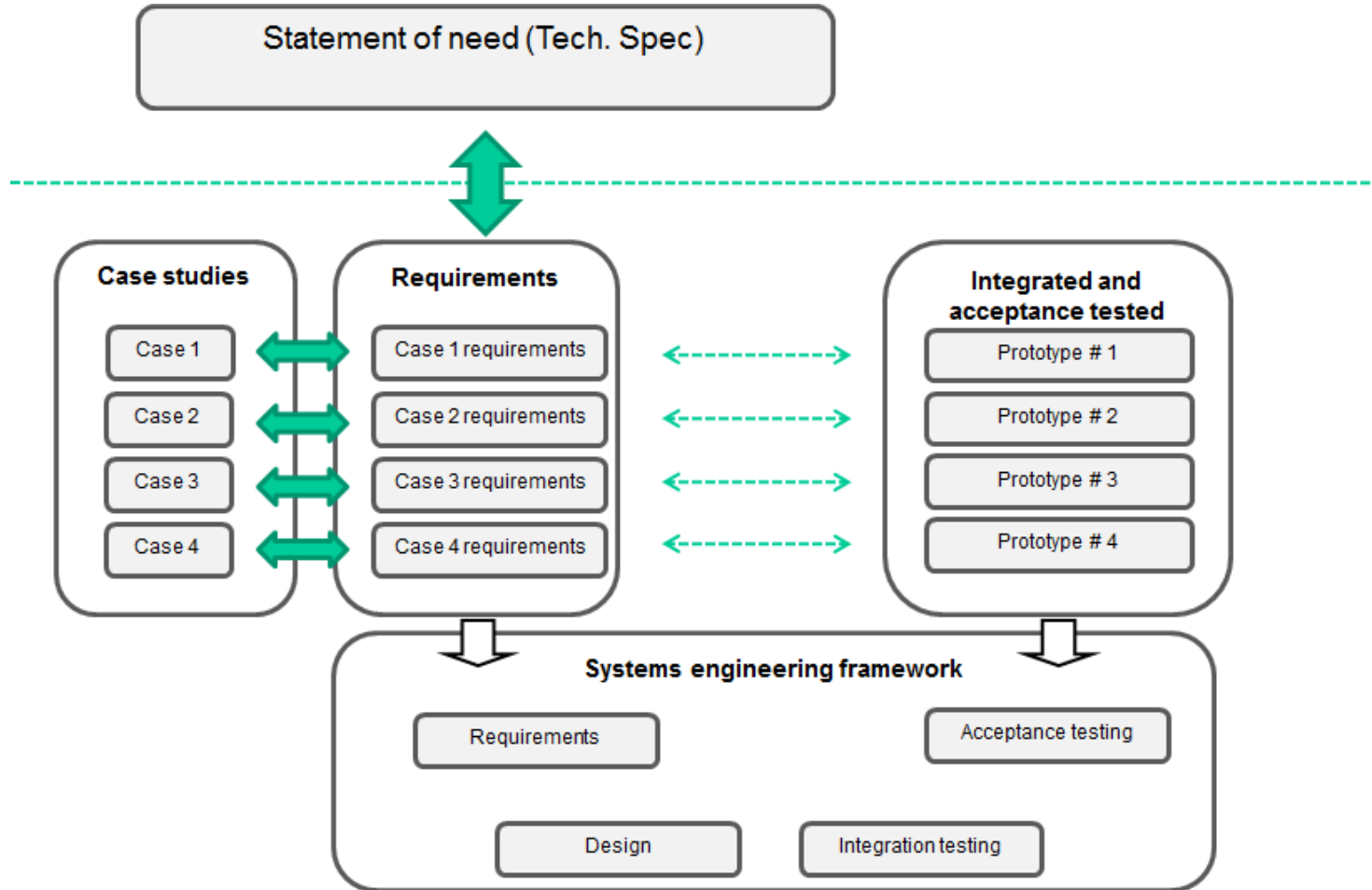


Project based engineering project plan for every ESR



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The Final Project Milestone: SE Design Model Based on Staged Analysis and Synthesis



"Bigger Picture"

Overall Training and S&T Objective

- The overall training and RTD objective is the analyses and synthesis of developed set of Design models, methods and tools towards SE framework.
- In more specific terms the target is a SE design framework for:
 - Maximum **reuse** of artefacts (models, processes and SW and HW modules) across different subsystems and projects
 - **Systematic management and architecting** of different but unified system configurations for Reliability, Availability, Maintainability and Safety (**RAMS**) over **system life-cycle** via developed SE framework
 - Optimize processes by learning from experiences of other projects

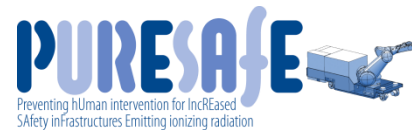




openSE

an **open**, **lean** and **participative**
approach to **systems engineering**

Initiated in the framework of the



ITN

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Training objectives

- The PURESafe Training events (open to external participants)
- Secondments



Training Events

(Open to External Participants)

PURES SAFE TRAINING EVENTS

Scheduled	Organized	Event	Duration (days)	Host	Topics	Milestone
04/2011	09/2011	Kick-Off Week	5	TUT	Introduction to PURES SAFE	D4.1
					Remote Handling	
					RAMS	
					Research Methodology and Management	
10/2011	12/2011	1st Joint Training	4	KIT	PLM	D4.2
					Virtual Engineering	
					Remote Handling	
					Project Management	
	12/2011	WP1 Workshop	1	KIT	Processes and Modelling (WP1)	
07/2012	10/2012	1st Summer School	4	UPM	Robotics	D4.4
					Teleoperation	
					Proposal Writing	
07/2012	10/2012	PURES SAFE Workshop	2	UPM	Telerobotics and Systems Engineering for Scientific Facilities	D4.5

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1st International workshop on Telerobotics and Systems Engineering for scientific facilities @ UPM

- Dr. Carlo Damiani, F4E (ITER)
- Dr. Marco Van Uffelen, F4E (ITER)
- Ivan Fernandez, CIEMAT
- Diego Molpeceres, Tecnatom
- Jordi Artigas, DLR, Germany
- EFDA GOT RH-project trainees

Training events

Kick-off meeting, September 2011, 5 days @ TUT, Finland

- Topics:
 - Remote Handling
 - RAMS
 - Research Methodology and Management

1st Joint Training, December 2011, 4 days @ KIT, Germany

- Topics:
 - PLM
 - Virtual Engineering
 - Remote Handling
 - Project Management
- + 1 day **WP1 workshop** on Processes and Modelling

Training events

Summer School, October 2012, 4 days @ UPM, Spain

- Topics:
 - Robotics, Teleoperation
 - Proposal Writing
- + 2 day **PURESafe workshop** on Telerobotics and Systems Engineering

2nd Joint Training, September 2013, 5 days @ GSI, Germany

- Topics:
 - Advanced Robotics Control by **VR Prof. Bruno Siciliano**
 - Radiation Protection
 - Augmented Reality
 - Proposal Writing
 - Workshop on OpenSE

Training events

Winter School, February 2014, 4 days @ TUT, Finland

- Topics:
 - Advanced Robotics Control by **VR Dr. Wen-Hong Zhu**
 - Entrepreneurship and Innovations, Horizon 2020
 - Industrial Interactions – Visit to Cargotec
 - RAMS
 - Workshop on OpenSE

Final Conference, January 2015 @ CERN

- Topics:
 - Systems Engineering
 - Telerobotics and Remote Handling

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