Embedded Systems
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ArtistDesign Workshop on Embedded Systems in Healthcare 2009

Wim Pasman

A (R)evolutionary Architecture for Philips Cardio Vascular

Abstract

One of Philips Healthcare's largest units, Cardio Vascular (further referred to as "Cardio Vascular"), develops and manufactures professional products for the Healthcare market for minimal invasive medical procedures and open surgery. Today the market segments served are cardiology, neurology, radiology, electro physiology, and surgery. Yet there is not one single product serving all these markets. Consequently, Cardio Vascular has to release over 1 mln. product variations to meet market demands. To manage this complexity, a wide range of components exists, from which products for the various markets are assembled.

The current solution is not future proof. It is based on a software architecture developed for cardiology, as the requirements of the new markets (neurology, radiology, electro physiology, and surgery) were not known at the time. Consequently, it becomes more difficult to release efficiently new product variations. In addition, the market also wants integrated solutions; i.e. the architecture has to ensure that medical equipment provided by multiple suppliers work together seamlessly. Finally, cost-reduction dictates that the architecture has to support the outsourcing of parts to third parties.

This presentation gives a short introduction into Philips Cardio Vascular and outlines our gradual architectural transformation. Designing and realizing this new architecture from scratch is not an option. It would result in a loss of market share, as during the process no effort would be made to maintain and extend the current product portfolio. The presentation will also address our experiences with component-based designing of this architecture using ASD. We believe that this approach will help us in making correct designs that have a good test coverage and that can be maintained more easily over time. Finally, we wish to conclude by advocating a community for exchanging component-based design experiences.

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sense and simplicity

Developing a Revolutionary Architecture for Philips Cardio Vascular

Wim Pasman

December, 2009

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- Philips Cardio Vascular
- Problem Statement
- Vision
- Research Questions

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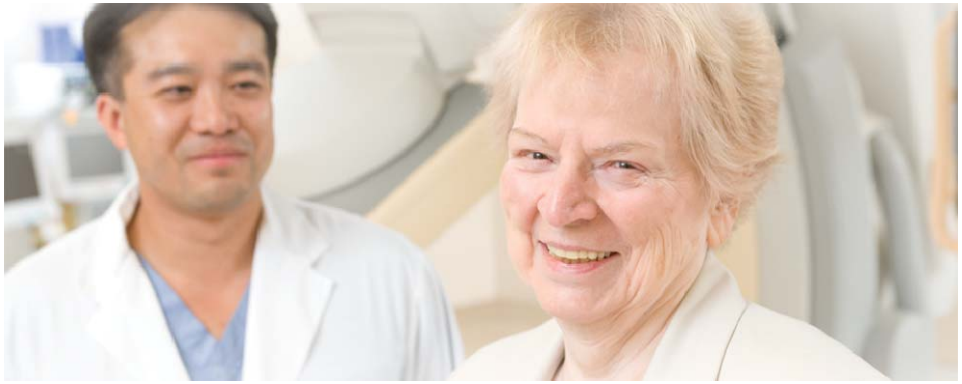
BU CV Vision & Strategy



We are the leading innovator in image-guided interventional solutions

With our partners, we improve the health of patients and save lives, every day, everywhere!

Strategy
Innovation Leadership in Image Guided Intervention & Therapy
Capture share in emerging economies

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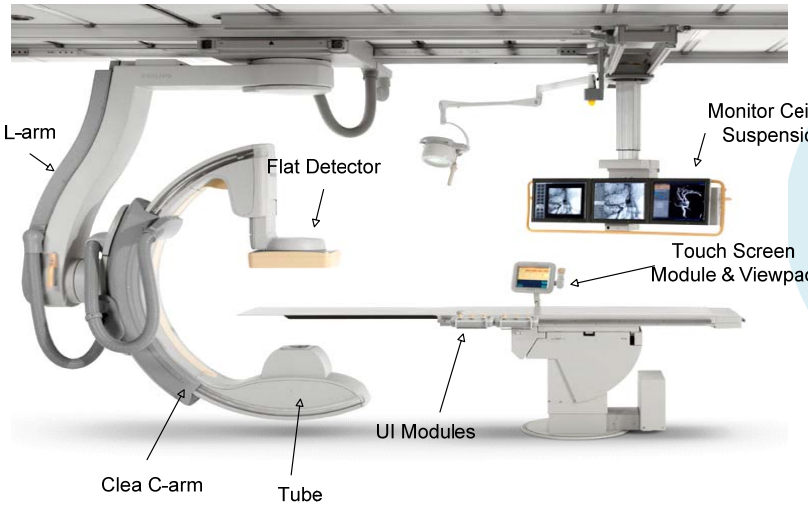
Philips Cardio Vascular: Product Portfolio (1/6)

Control Room



Intervention Room

Software System Architecture

Image Processing

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Philips Cardio Vascular: Image Guided Minimal Invasive (2/6)

- Benefits:
  - Improved productivity.
  - More effective treatments.
  - Better success rate.
  - Increased quality of life patient
- Lowering Healthcare Cost:
  - Shorter hospital stay.
  - Higher throughput.
- People will contribute longer to society.

surgery:
invasive, open

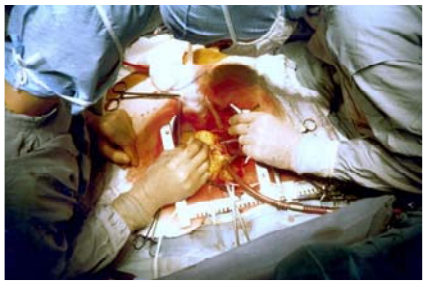
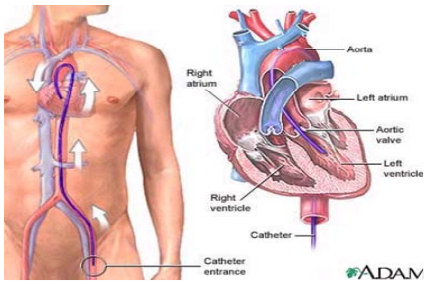


image guided intervention:
minimal invasive, closed



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Philips Cardio Vascular Strategy (3/6)

- Focus on providing image guided minimal invasive solutions to the healthcare market that will help healthcare organizations to provide proper treatment to patients in an effective and safe way.
- Cost-effectiveness of product development by
  - Incorporating 3rd party suppliers
  - Multi-sourcing.
- Solution provider of
  - Philips products.
  - Partners products providing complementary functions.
- Speed of innovation.

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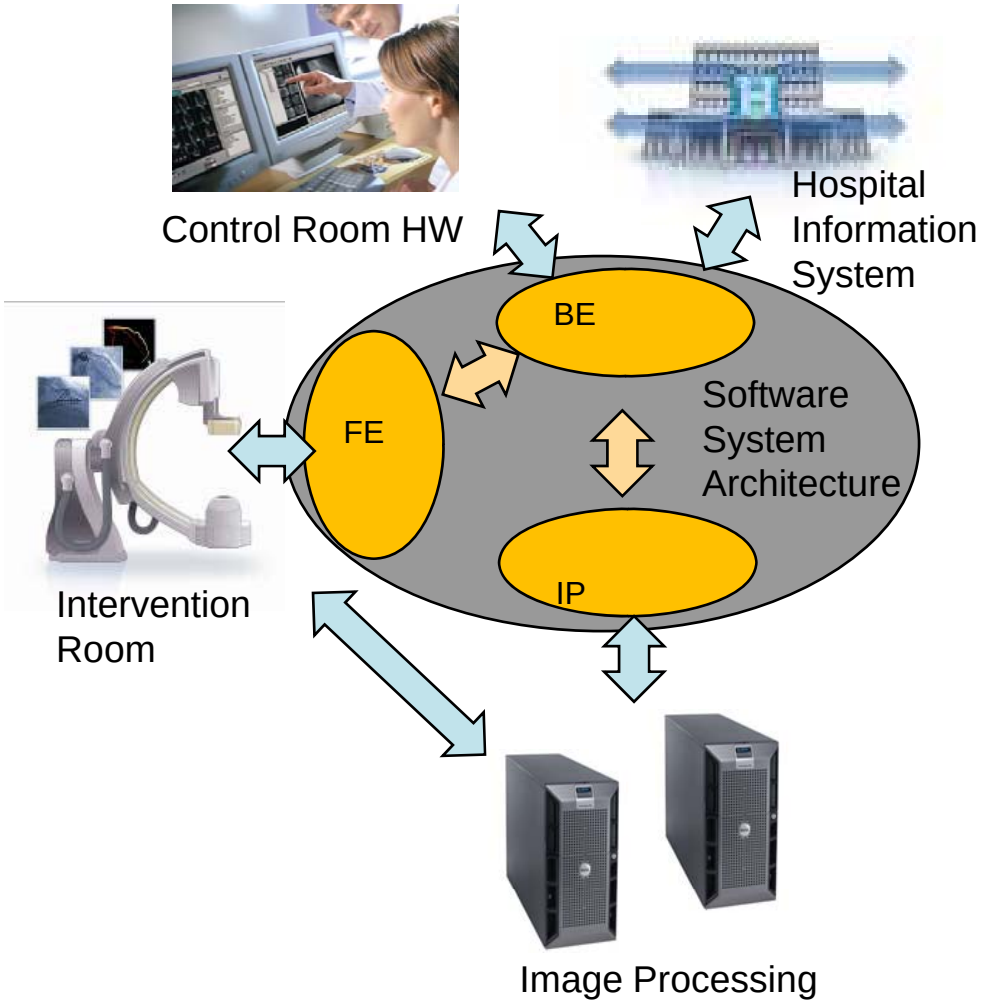
Philips Cardio Vascular Goal (4/6)

Redesign the software system architecture:

- To cater for over 1 million product variations
- Supporting fast the clinical segments (Cardio, EP, Neuro/Rad, and Surgery).
- That allows for 3rd party suppliers and warm integration with partners offering complementary solutions.
- That allows for products that can be serviced for 10 years.
- In incremental steps. (No revolutionary design from scratch).



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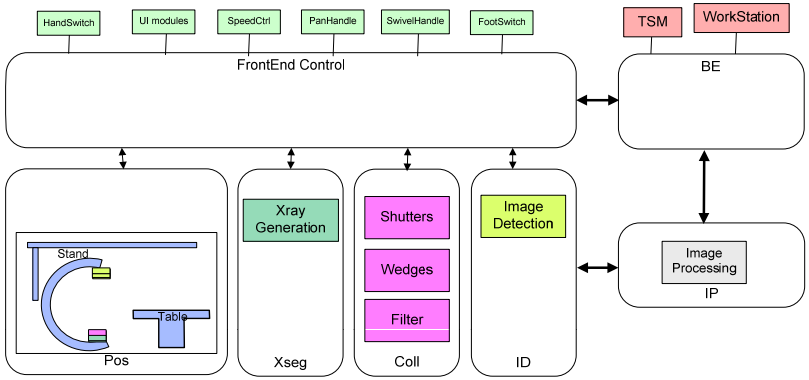
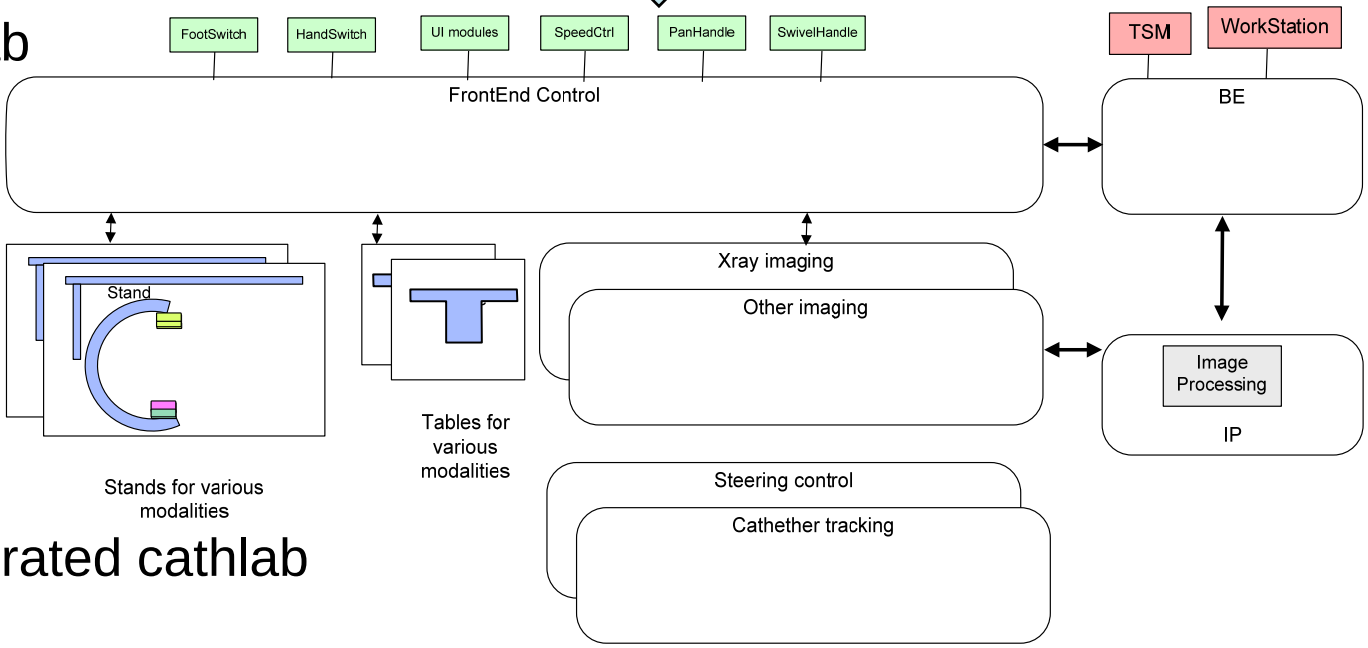
Philips Cardio Vascular
Front End Control Evolution (5/6)



Drivers for SOLL:
- Multimodality Integration
- CPR
- Time To Market

IST: X-Ray cathlab



SOLL: integrated cathlab

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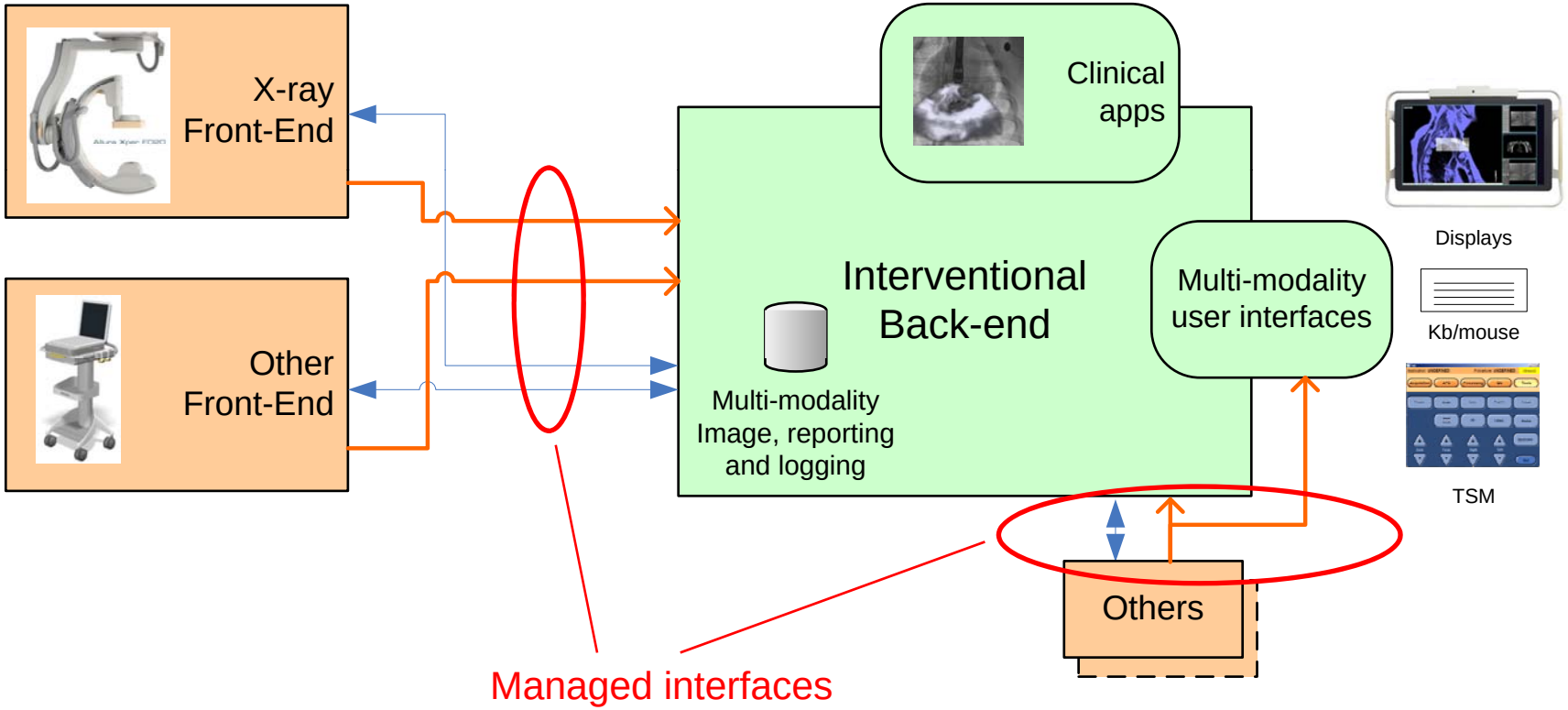
Philips Cardio Vascular
Back End Evolution (6/6)



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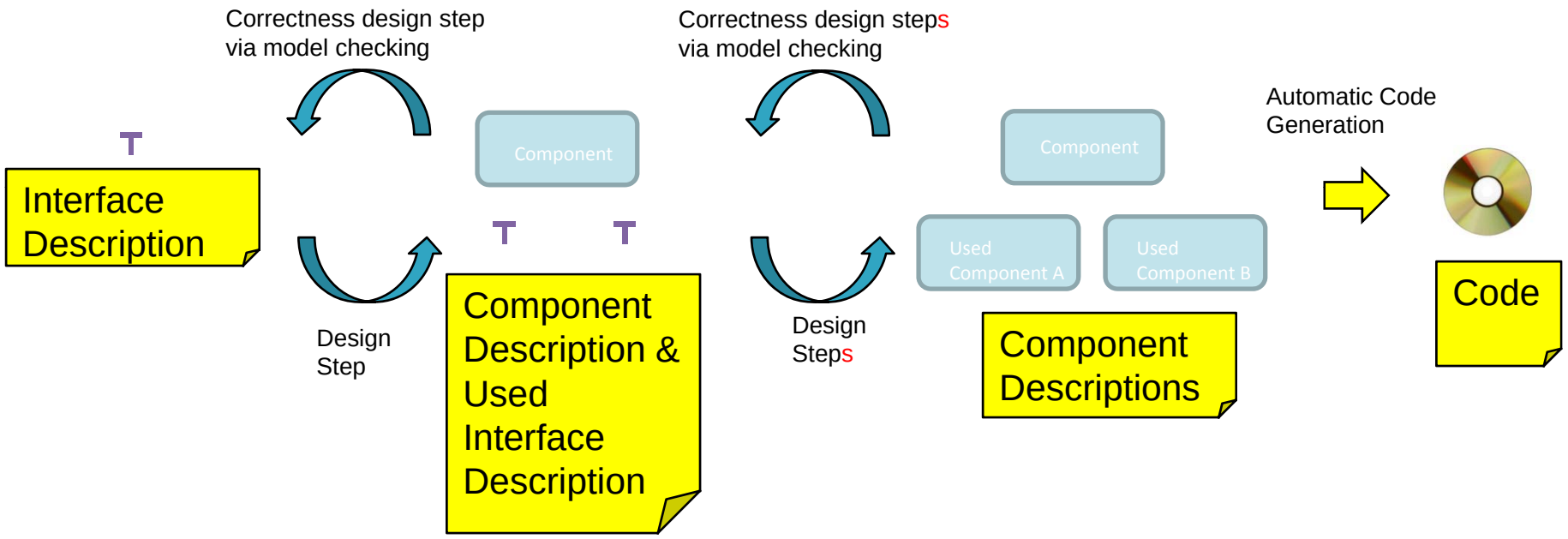
ASD
Analytical Software Design

Component-based Design & Code Generation:



Compliance Test Framework allows you to test legacy code against an ASD interface description.

T = Interface

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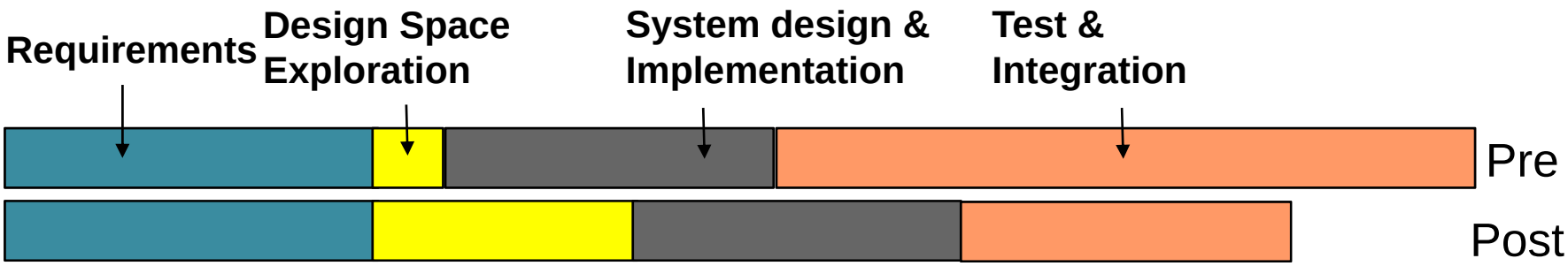
Program Aims - Speed of Innovation



Improve speed of innovation

- by impact analysis and architecture exploration
- improved implementation methods
- system behaviour modeling and analysis
- formal verification

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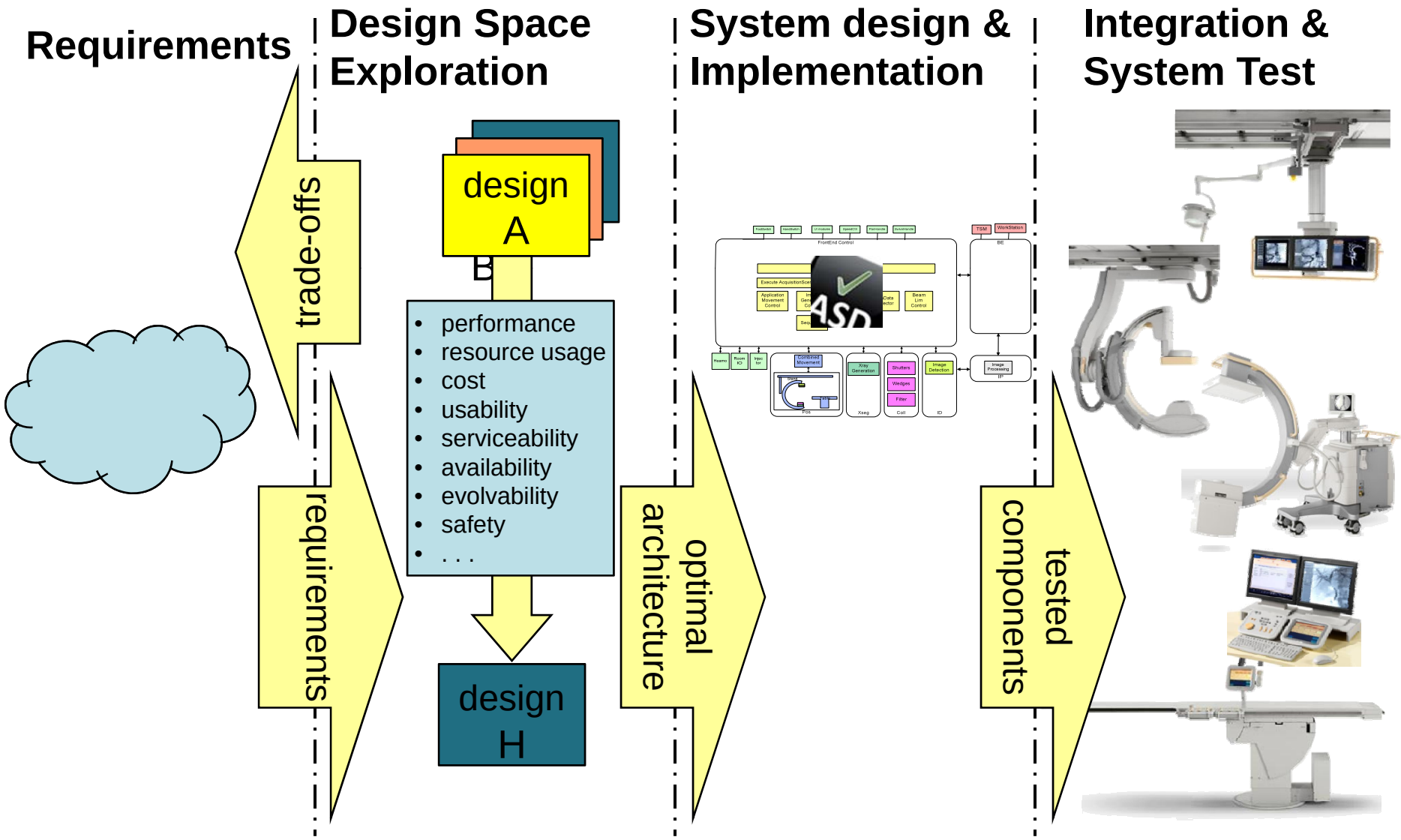
Problem Domain



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Allegio (WIP)

Developing a Revolutionary Architecture for Philips Cardio Vascular

Version 2

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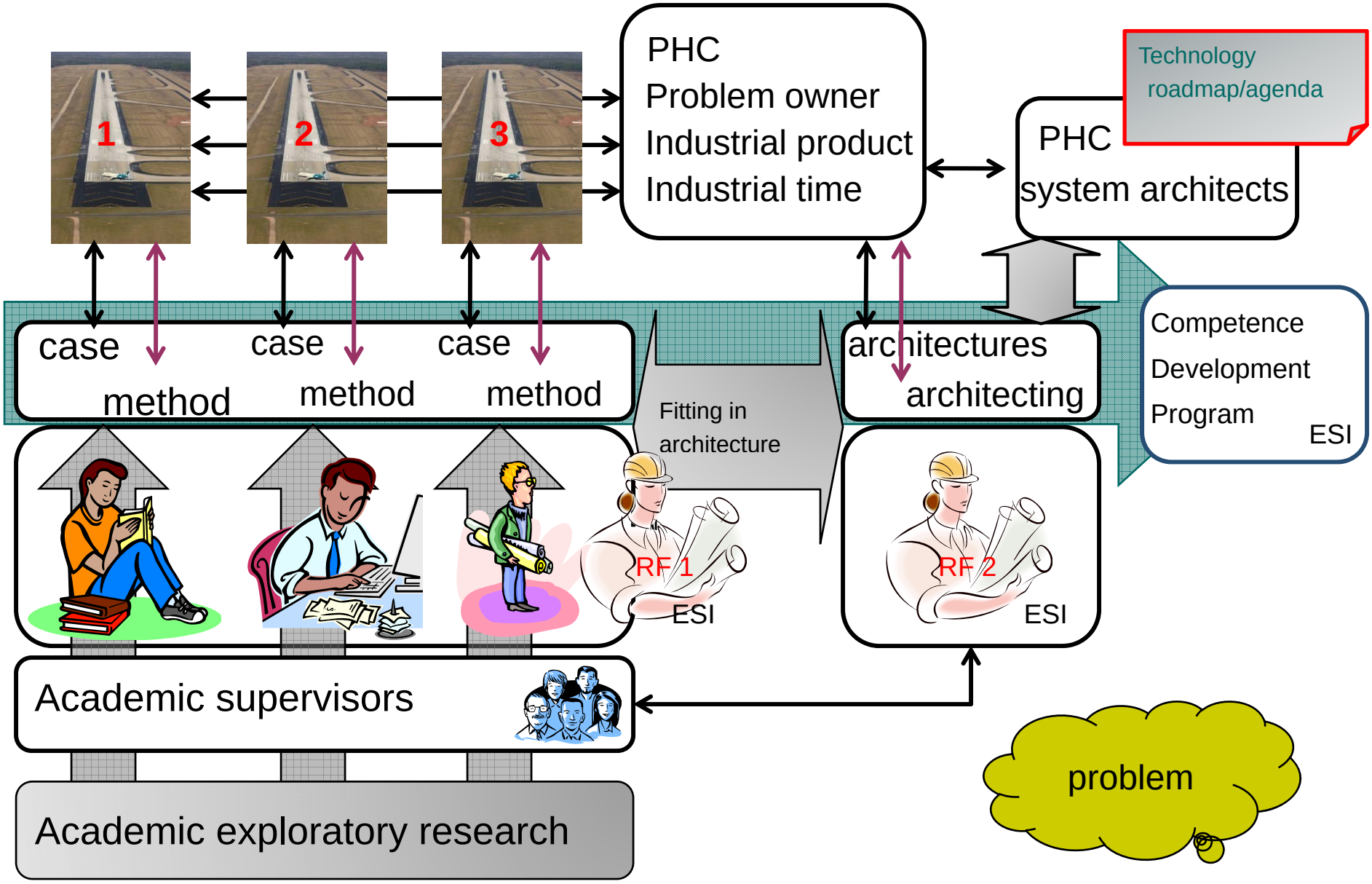
Way of working Allegio(1/2)



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Way of working Allegio(2/2)

- Partners to provide suitable candidates for review asap
  - Positions have to be filled no later than June-2010.
- Candidate characterization:
  - Bridge gap between industry and academic world.
  - Problem-solving.
  - Work in a concerted approach to improve the software system design.
  - Will have their office in Best, i.e. 80% of their time.
- Supervisors will
  - Infuse actively Philips with their academic know-how.
  - Provide full Phd-coaching of students. Philips will only facilitate the Phd-research.
- Have half-yearly reviews to evaluate program.

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Vision – PHC Architecting 2015

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Research Questions

- In the context of developing a new management and control software architecture, answers to the following research questions are desired:
  - What is the best way to communicate consistently over system and software architectures in a multi-disciplinary environment?
  - How can we best develop evolvable software M&C architectures?
  - To what extend can we get support on correct by design techniques ?
  - How can we address performance and data in modeling the interfaces and components of the architecture ?
  - Relations between release policies for new products , upgrades and maintenance and System architecture?