



Technology Evolution – Impact on Architecture of a Complex Medical Product

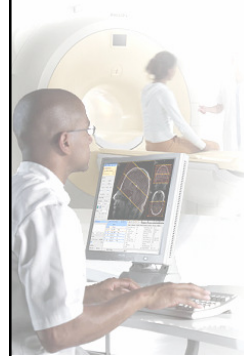
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16th May 2007

Philips Medical Systems –
Software Competence
Centre, India.

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Introduction - Products



- Product Evolution
 - Market Focused Evolution
 - New Features
 - Improvements
 - Technology Focused Evolution
 - Architectural Changes
 - Technology Obsolescence
 - Modality/Physics breakthroughs
 - Strategy for evolution
 - Low Risk
 - Complex Product
 - Time to Market
 - Dual Track
 - New and Old “Co-exist”

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Low Risk Approach - Impact

- New Functionality
 - Typically in newer Technology
 - Unfit to add in old code/design
 - Middle ground approach
 - “Let’s reduce the risk”
- Outcome

Legacy !



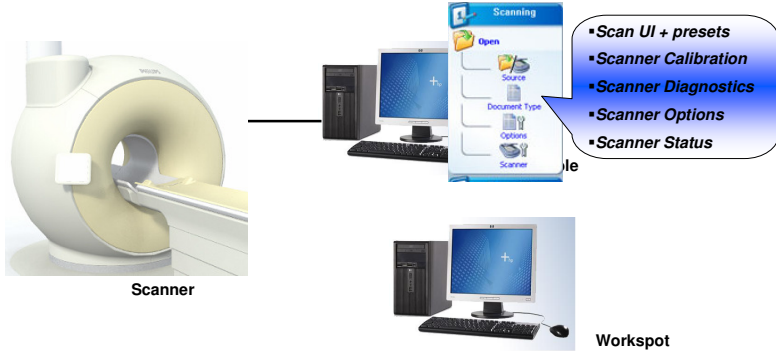
Legacy !

A legacy system is an antiquated computer system or application program which continues to be used because the user (typically an organization) does not want to replace or redesign it.
[\[wikipedia\]](#)

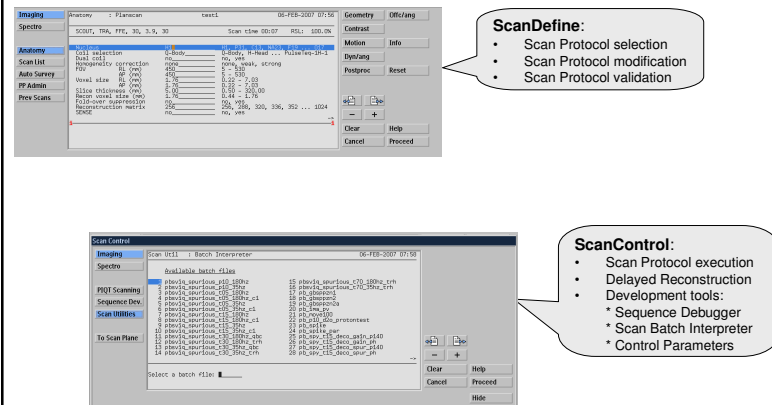
The problem...

- Legacy represents significant value in terms of investment.
- Valuable domain knowledge embedded in source-code.
- Documentation not up-to-date.
- **Result of long-time evolution**
 - **technologies used that are now considered outdated.**

Legacy - Scanner Control Software -



Legacy – SC/SD -



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Legacy – SC/SD / ExamCards -

ScanDefine:

- Legacy Functionalities – Still in the old environment

ExamCards:

- New Functionalities in new environment

switch

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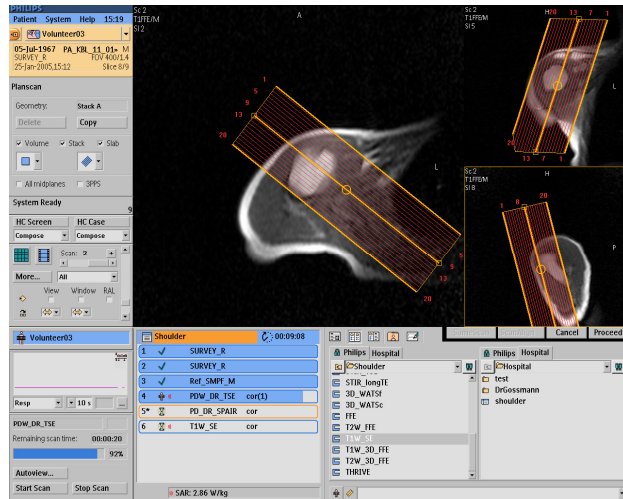
Benefits of ExamCards

- Ease of Use
- Personalized
 - Basic to Advanced
- Standardization
 - Consistent Image Quality
 - Clinically validated
- User community experience
 - ExamCards can be shared!
- Up to date

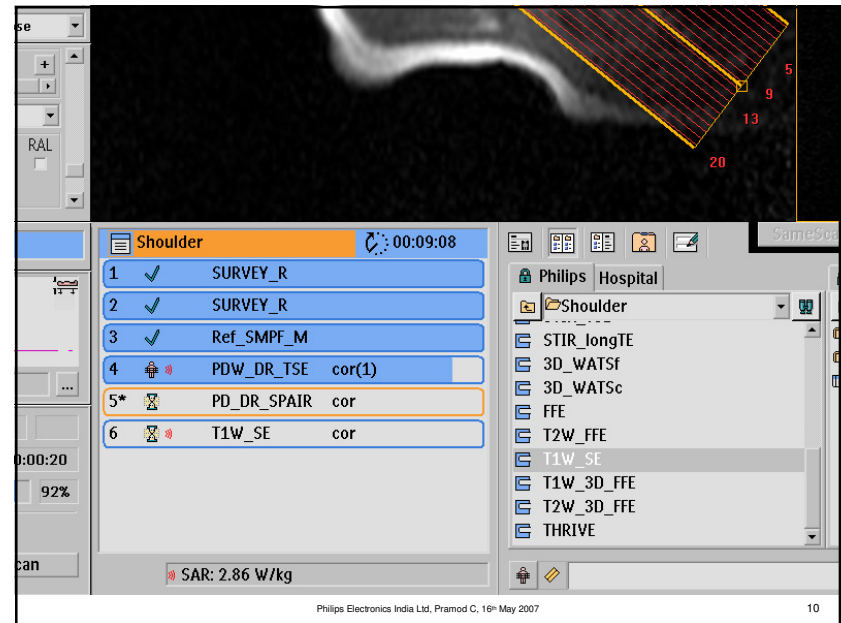
Study	Sequence	Orientation
1	Survey	<none>
2	T2w TSE	Transverse
3	T2w FLAIR	Transverse
4	T1w SE	Transverse
5	T1w SE	Coronal
6	Diffusion	Transverse
7	T1w SE	Transverse
8	T1w SE	Coronal

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ExamCards in Achieva R1



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Legacy – Some conclusions

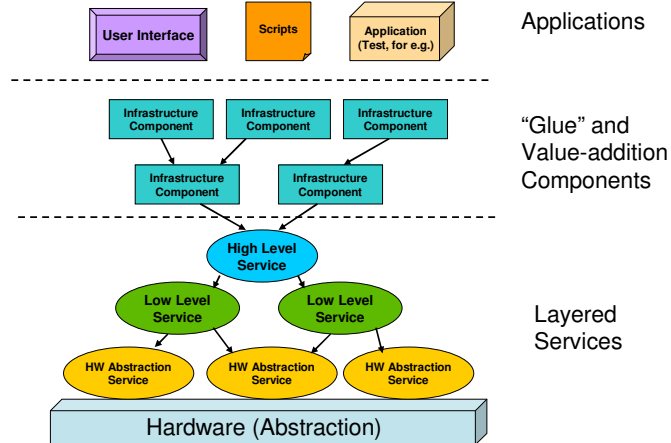
- Low Risk Approach is OK
- However...
 - It Introduces Dual Track
 - Curtails Future Development
 - Maintenance Cost Increases

Lets Take Stock...

- New Functionality
 - Added for various reasons
 - Typically in new technology
 - Co-exists with old design
 - Increasing Cost
 - Decreasing Flexibility
- What can be done?
 - Phase out old functionality
 - Re-Architect ?
- Will Architecture Help ?
 - Look at the system as a set of “Services” offering “end-functionality”



Services View of System



Advantages of Service Approach

- Clear Separation of Concerns
- Each Service
 - Is "Self Sufficient"
 - Has well defined evolution path
- Addition of functionality is easier
 - Flexible system
 - Can be upgraded by parts
- Applications and UI can be diverse
- Common Architecture for flavors of products
- Independent and Geographically divided teams
 - Each Service has an Owner

The Phase Out Story

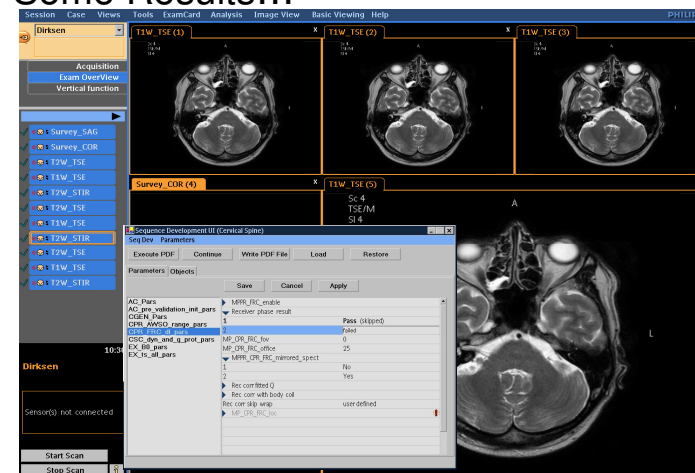
- Step 1: Define the present situation
 - Present Architecture
 - Technology Boundaries
 - Map functionality
 - Draw up an evolution path
- Step 2: Clean up
 - Identify Legacy
 - Plan for Phase out

The Phase out Story

- Step 3: Identify Services
 - A Service provides end functionality
 - A Service can be accessed from anywhere
 - System is also physically broken
 - Define Interfaces
- Step 4: Derive a PHASED approach

The diagram illustrates the evolution of the SeqDevUI across three years:

- 2005:** Two separate components. The left component consists of a central 'SC' node connected to 'PDF' nodes, with a 'SeqDev' label. The right component consists of a central 'EC' node connected to 'PDF' nodes, with a 'SeqDev' label.
- 2006:** The components are refined. The left component now includes 'STT' and 'PDF' nodes. The right component includes 'SE' and 'PDF' nodes. A new 'SeqDevUI -proto-' node is introduced at the bottom.
- 2007:** The final version. The 'SeqDevUI' node is at the top, connected to 'STT' and 'EC' nodes. Both 'STT' and 'EC' are connected to a 'Scan Scheduler' node via 'Protocol' labels.



Challenges

- Identifying “Services”
 - And its Affinity to a system part
- Defining Interfaces
 - Interfaces are the key !
 - Interfaces should not break
 - New functionality
 - Technology change
- Defining roadmaps
 - For each service
 - Technology evolution
 - Product/Feature evolution
- May not be suitable for products
 - With high Turnaround time
 - At Technological bleeding edge

Questions/Discussion

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sense and simplicity