How Reference Architectures support the evolution of Product Families; the Darwin research project

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Abstract

TBD

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logo
TBD

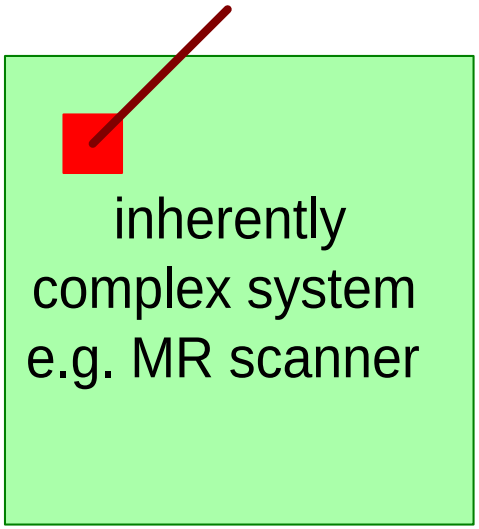
High Level Problem Statement

Installed Base Business Life Cycle Management	costly high effort	*diversity and # of configurations*
Development efficiency	costly high effort too late	
Innovation rate	too low too late	

see next slides

The Innovation Challenge

potential innovation: *change*



Challenge:

how to apply change locally for exploration of potential value and feasibility?

Postulate 1:

for effective exploration the following properties must be maintained

- patient throughput
- system responsiveness
- image quality
- safety
- reliability

Postulate 2:

a system architecture that supports this level of exploration also supports the next phases of innovation: scaling-up and engineering

Postulate 3:

a system architecture that supports this level of exploration also supports life cycle business over many generations

Evolvability Problem Statement

exploration is difficult

too much
time, effort, cost

from idea to tryout

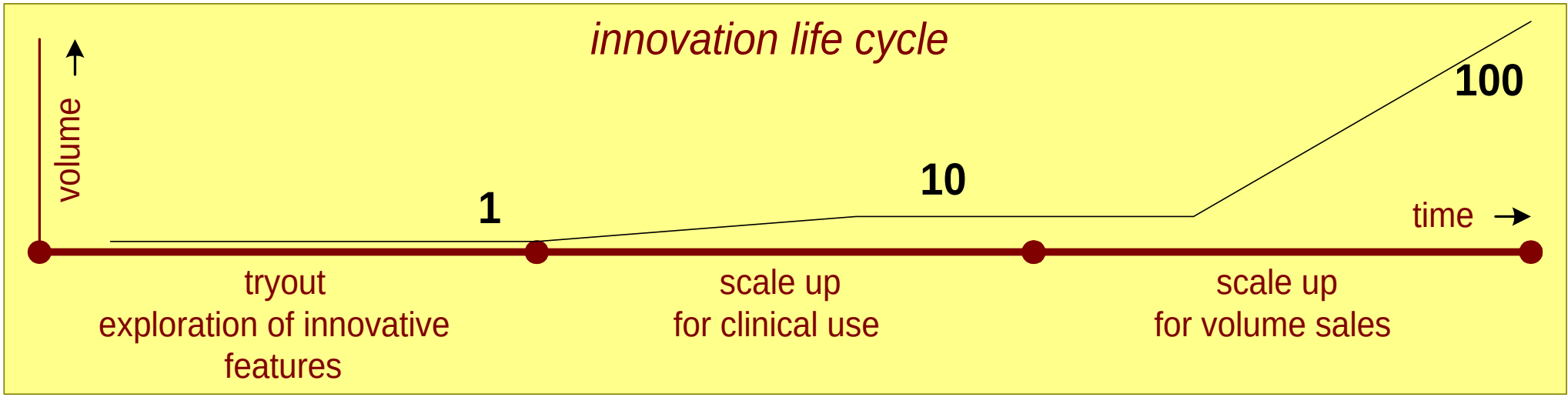
reliable realization is difficult

too much
and unpredictable
development
time, effort, cost

from tryout to realization

engineering is difficult

some new features
late relative to competition
too much
material and labor cost



Evolvability Problem Analysis

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observed causes

25 years of historical growth

lack of overview

large amount of
detailed documentation

size and complexity
of realization

size and complexity
of organization

inherent complexity of
system and context

human and cultural factors

high level of expertise

conservatism

suspected more specific root causes

coupling (dependencies)
higher than needed

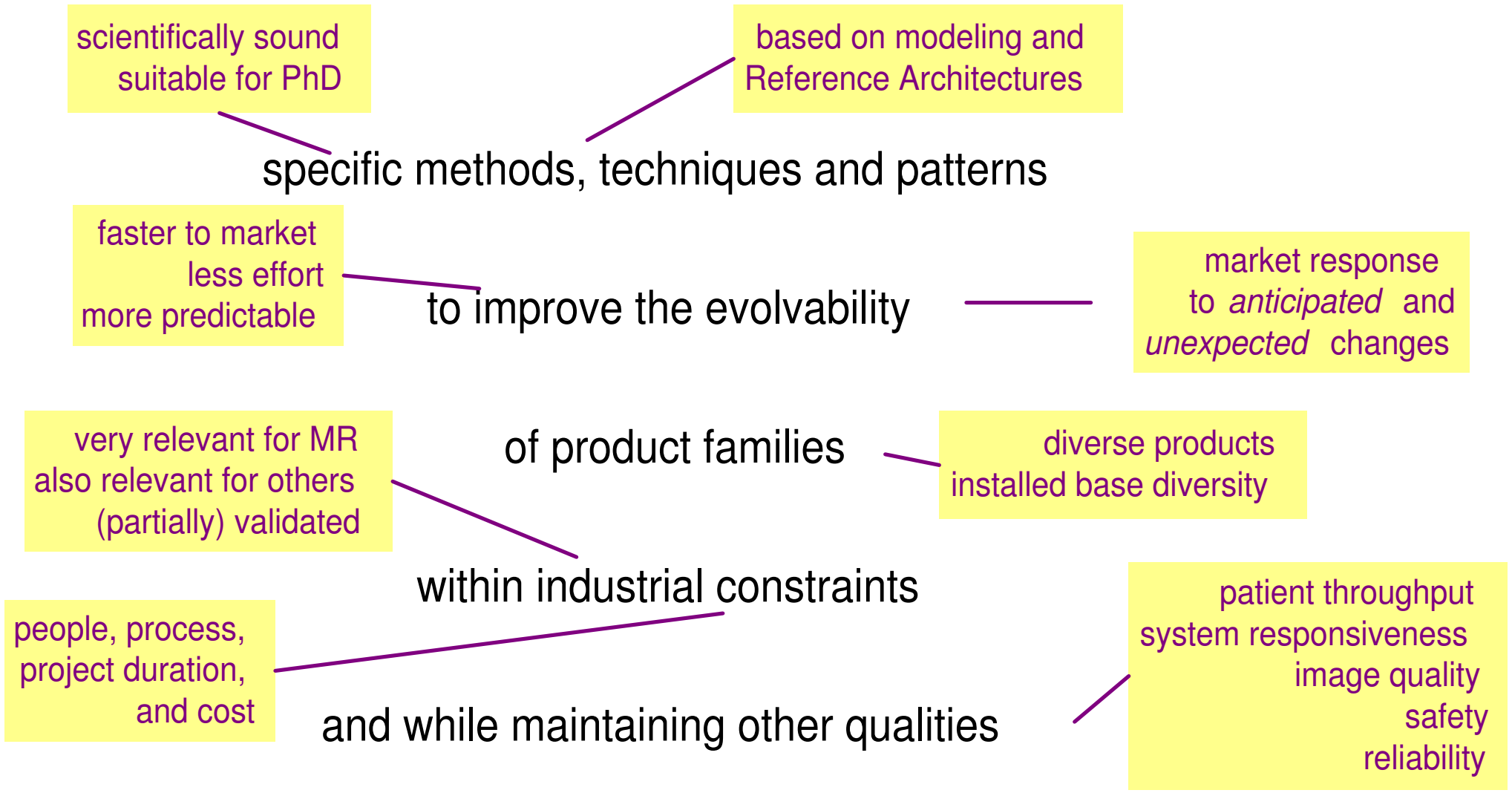
ineffective structure
(decomposition, interfaces)

insufficient
underpinning of decisions
by value and cost

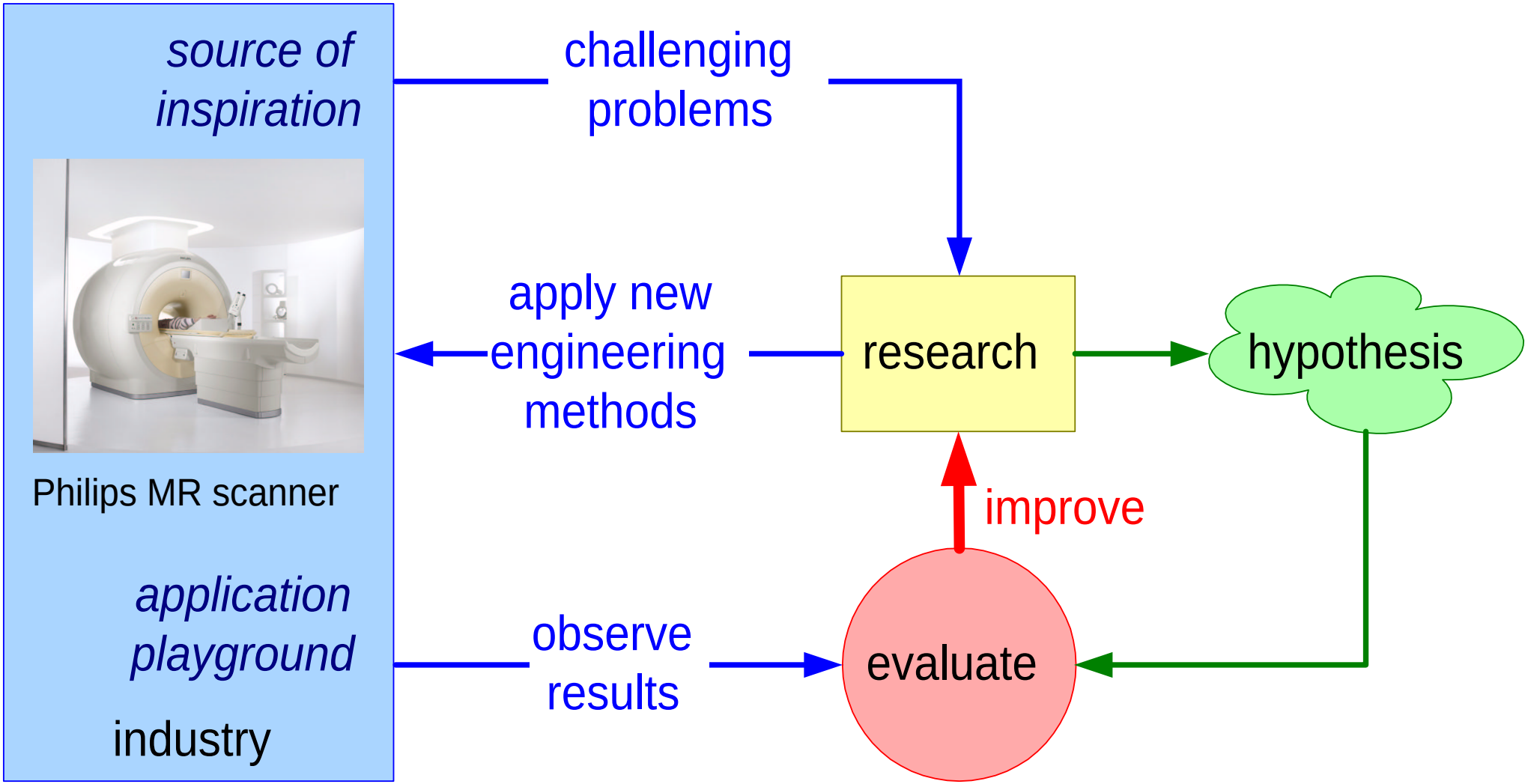
unbalance in
core/key/base

diversity of configurations

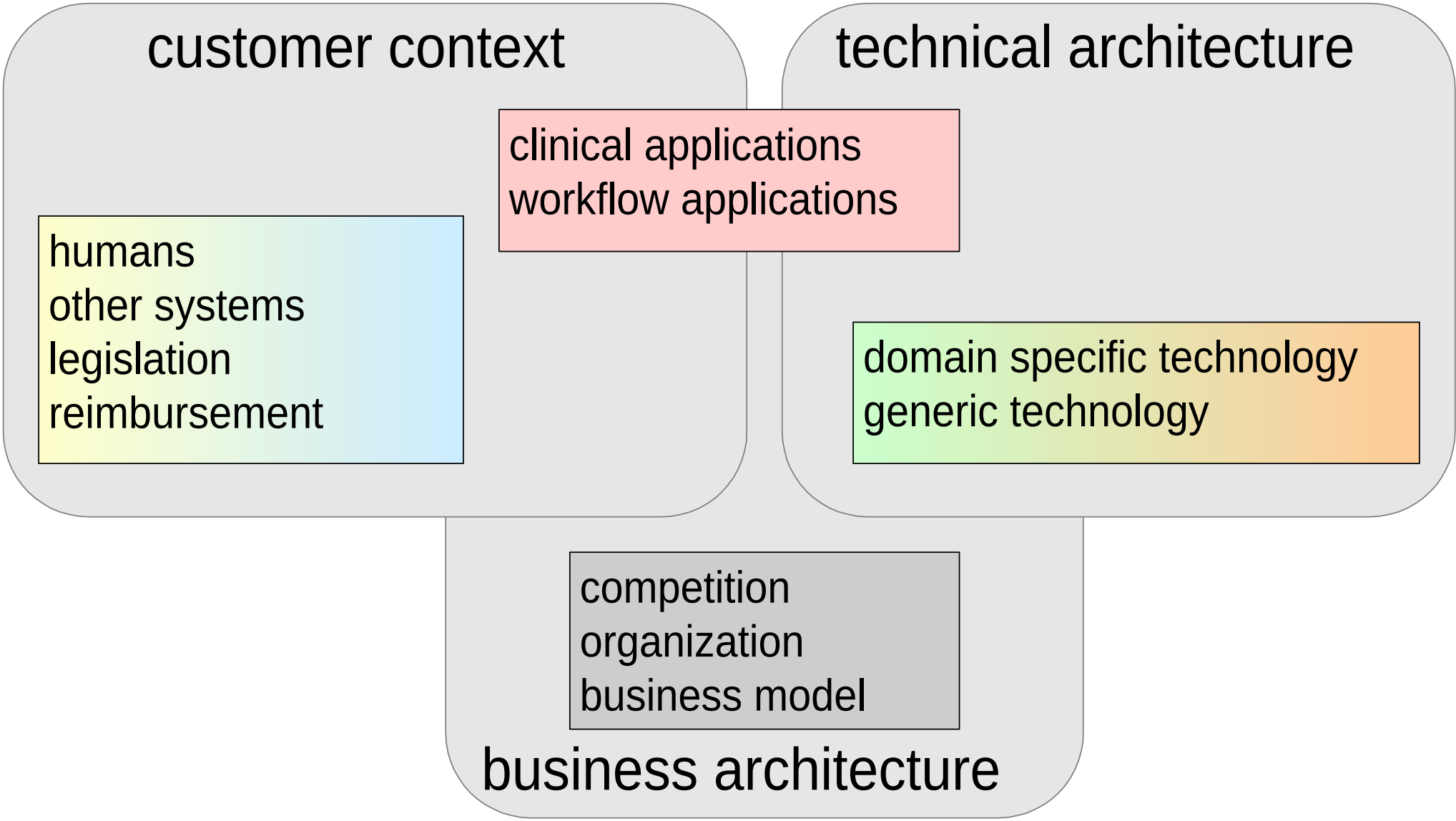
Darwin Project Goal



Darwin Research Model: Industry as Laboratory



Sources of Change



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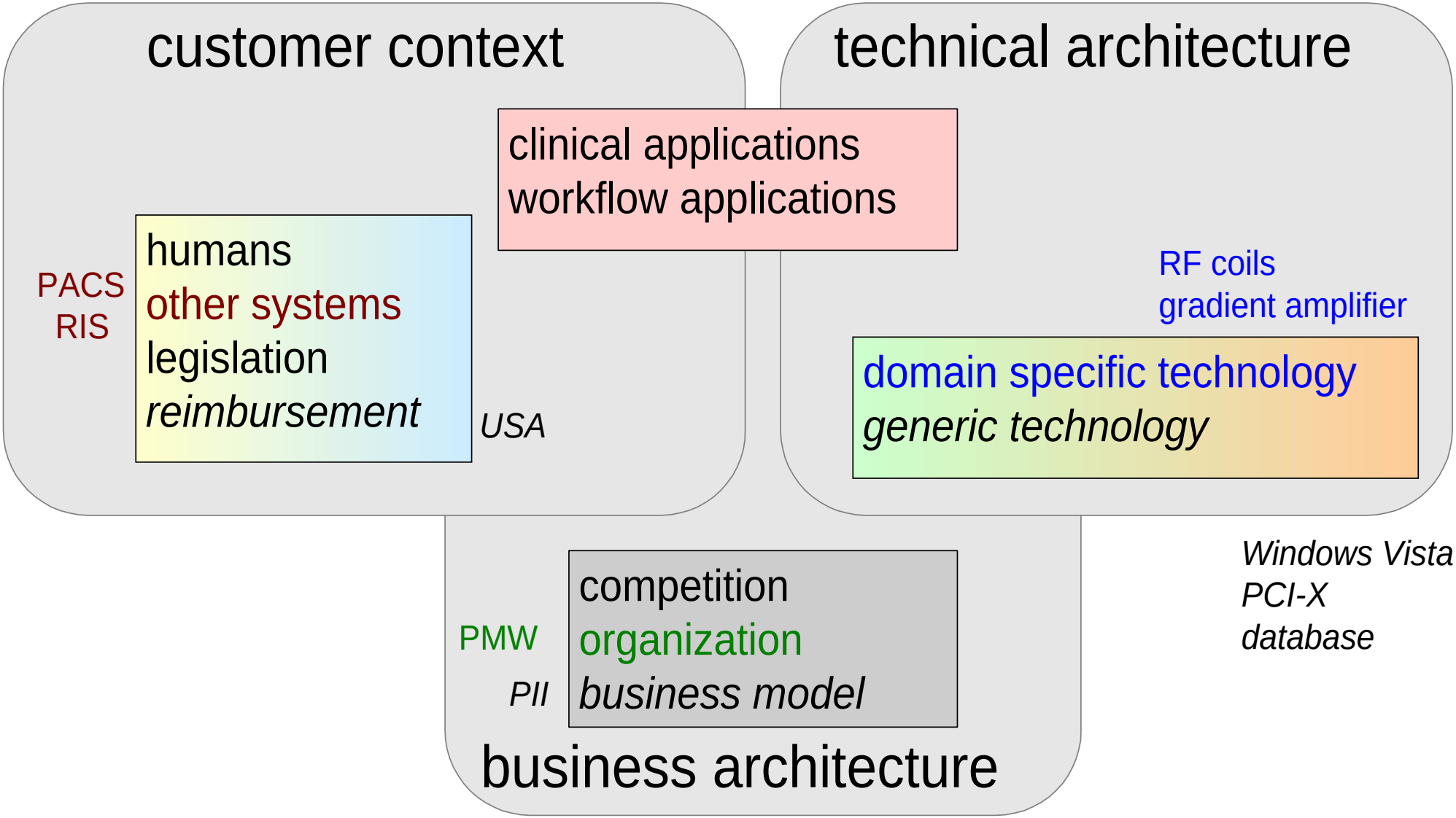


Darwin Research Questions

How to transform into an evolvable product family architecture?

- How to support decision making?
  - business wise
  - technological
- How to create overview?
  - by visualization
  - by high-level modeling
- How to mine the realization for implicit know how?
- What are practical guidelines?
  - for decomposition
  - for interface definition
- What are patterns that support evolvability?

related research areas

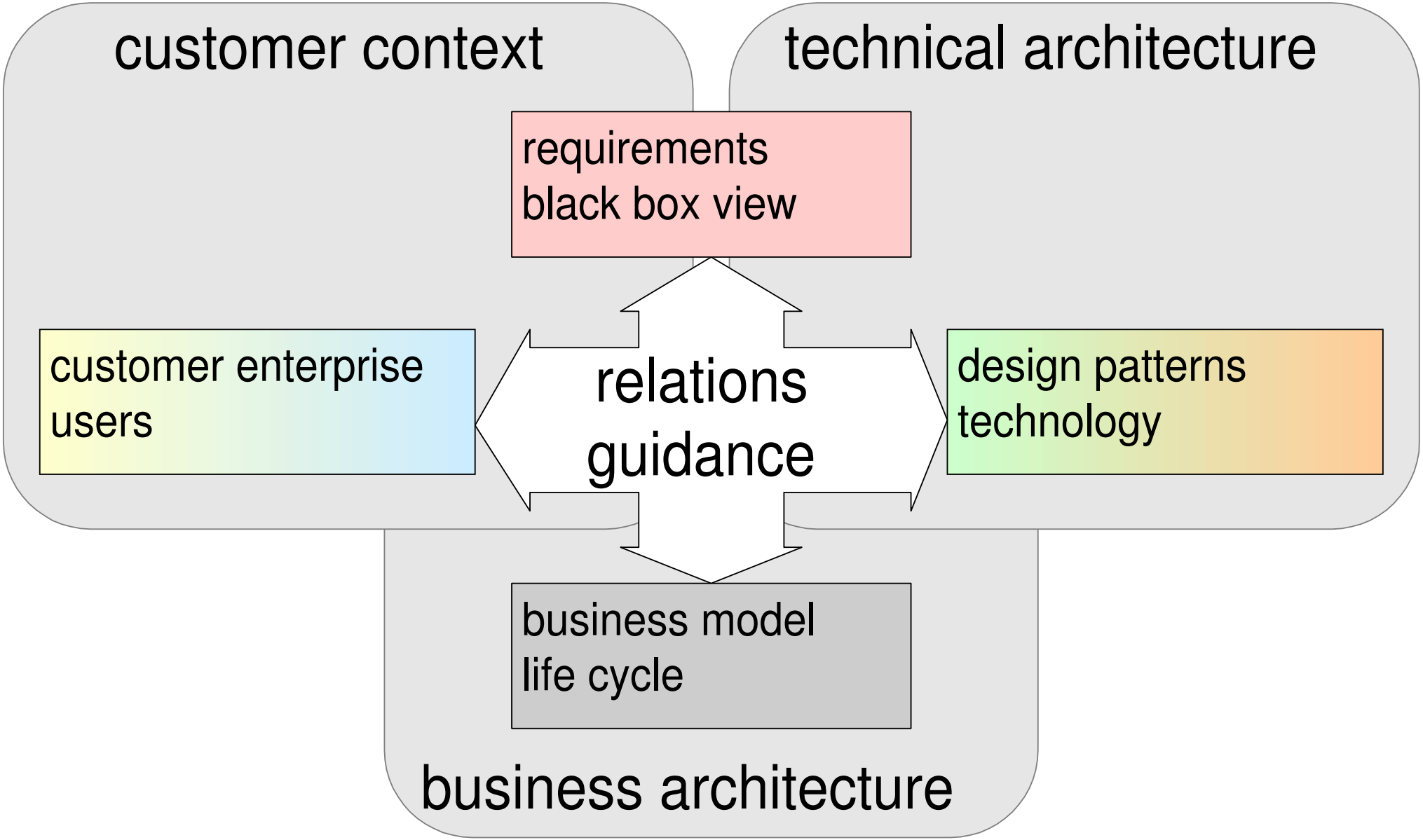
value analysis, e.g. real option
roadmapping

reference architecture
physical models, functional models, budgeting, figures-of-merit, state-diagrams, time-lines

repository meta-data analysis
dynamic dependency analysis
semantic analysis

reference architecture
physical models, functional models, qualities, behavior models
clustering, structure, set-based design

RA = Business Arch. + Technical Arch. + Customer Context

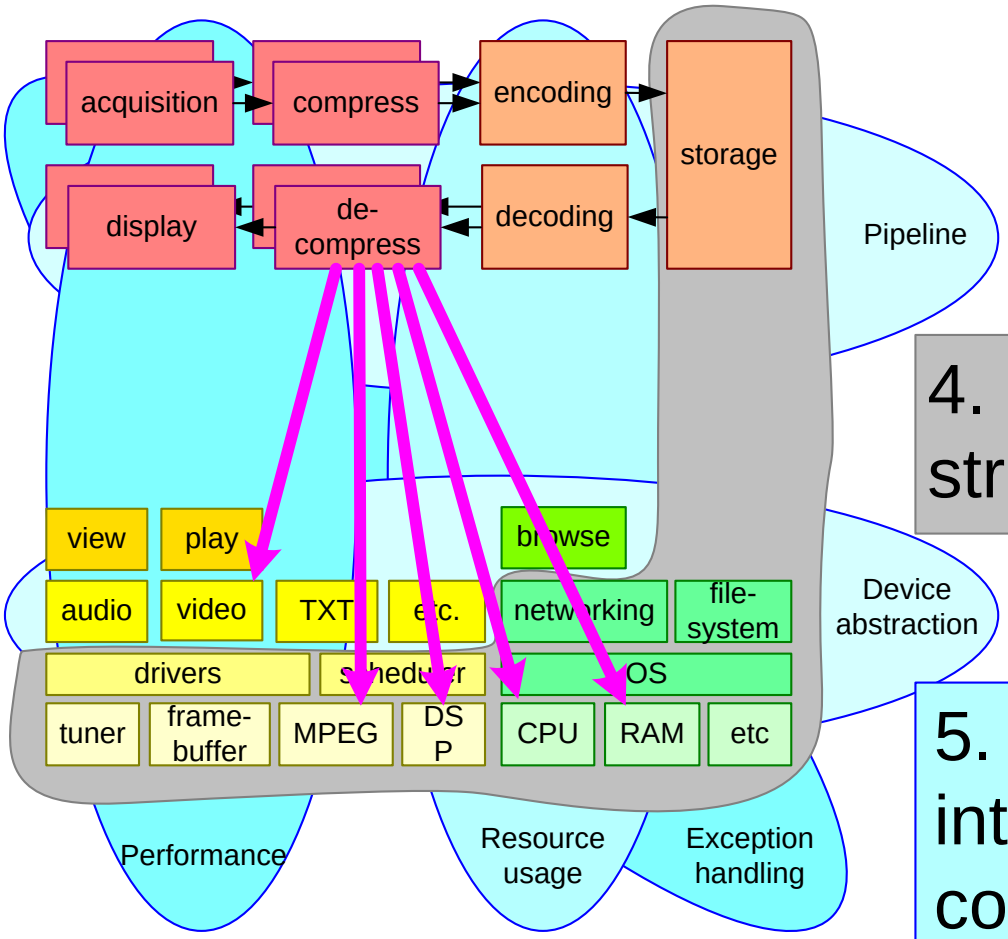


Technical Architecture

1. Functional Decomposition

3. Allocation

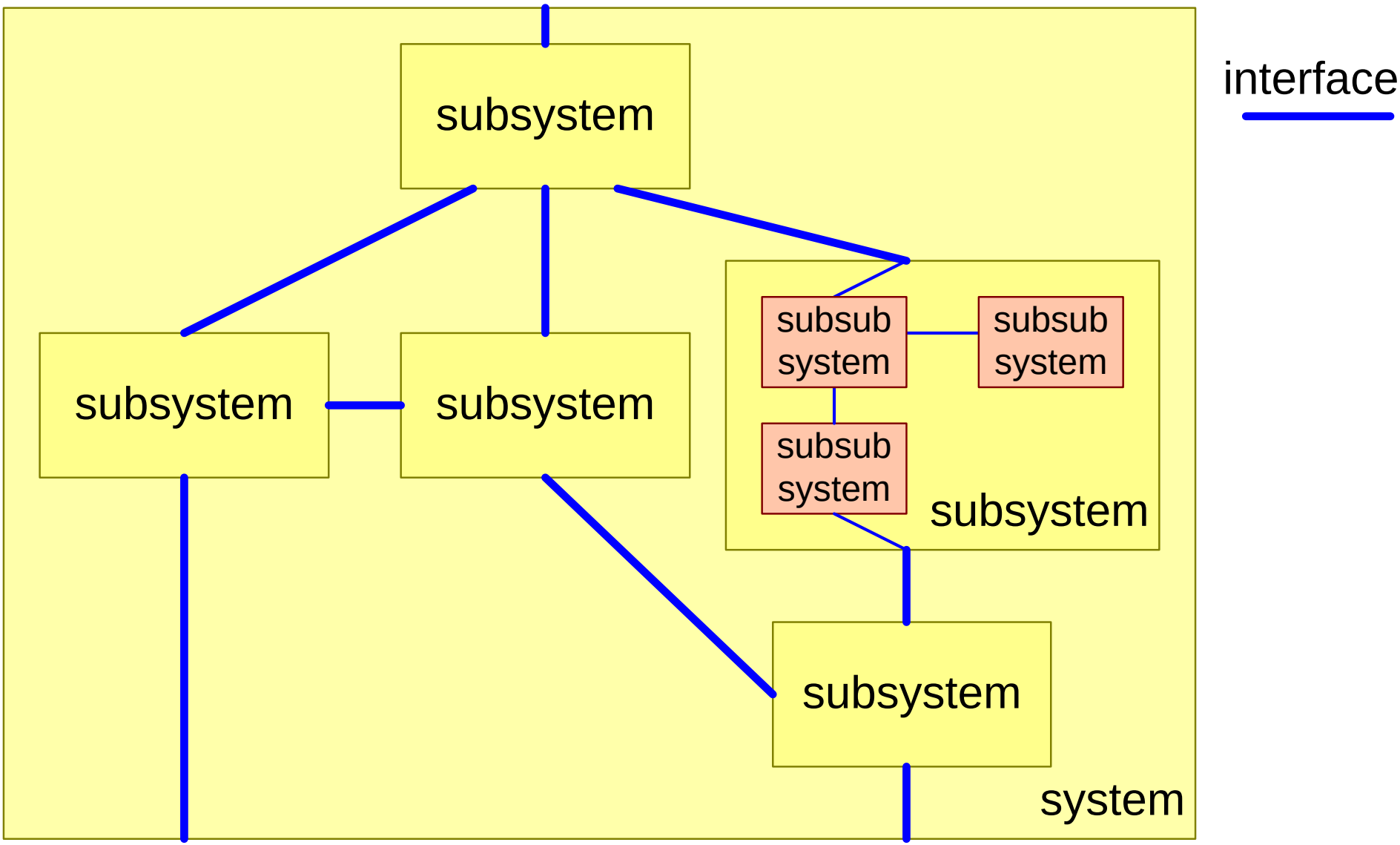
2. Construction Decomposition



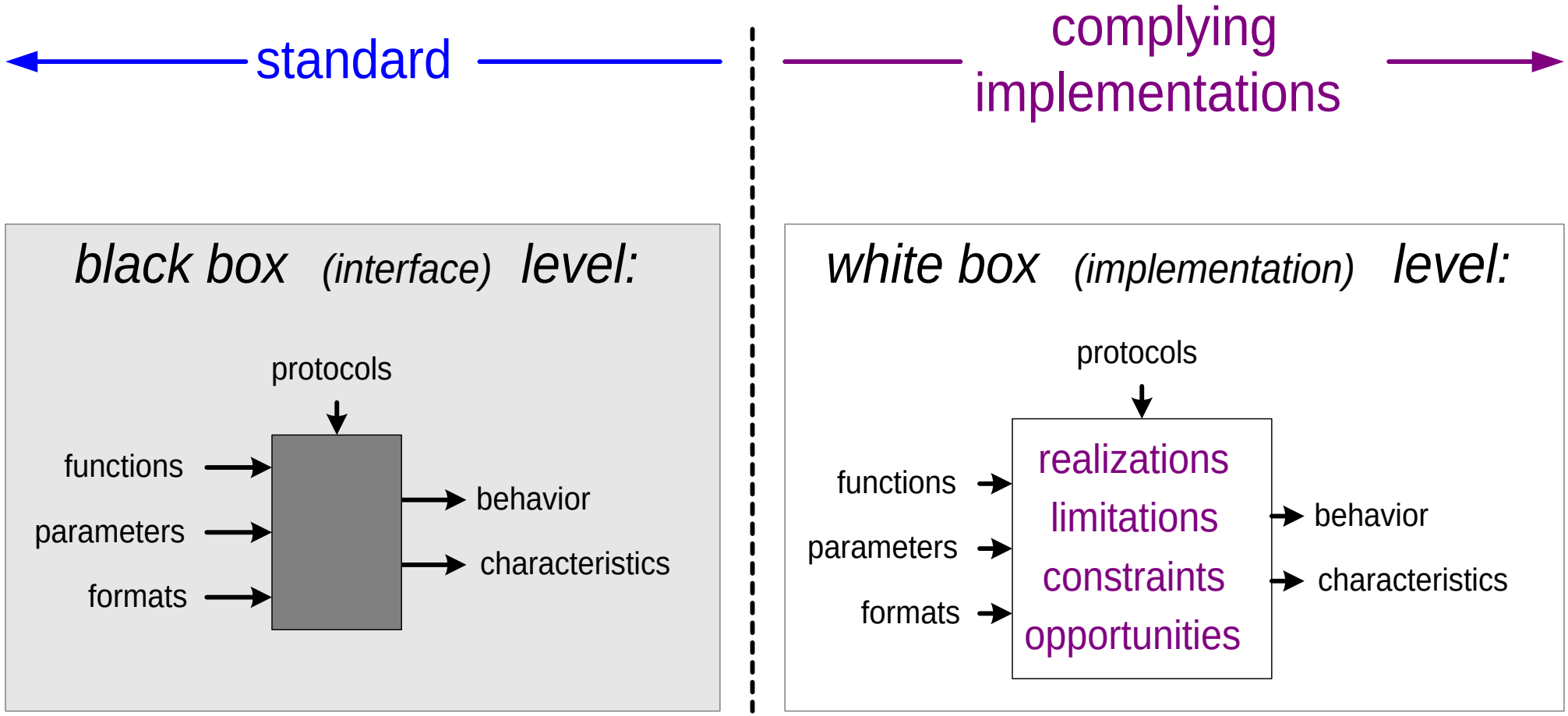
4. Infra-structure

5. Choice of integrating concepts

Decomposition and Interfaces



Interface much more than functions + parameters



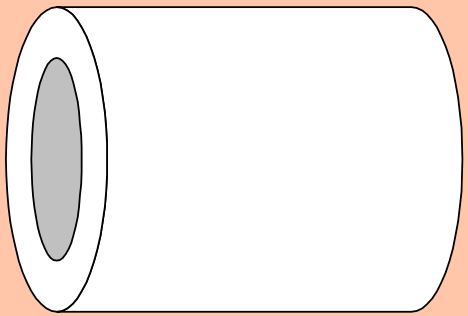
Integration and Diversity

information handling

administration billing scheduling logistics laboratory pharmaceutics

MR image acquisition

bore systems

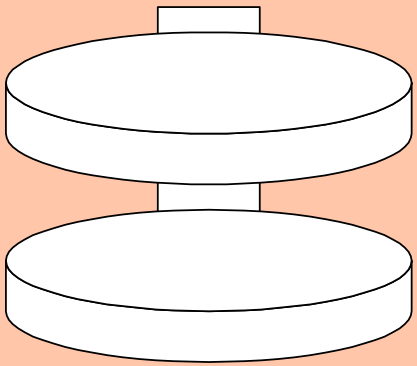


7T

3T

1.5T

open magnets



1T

0.6T

gradients

very fast

fast

economy

RF coils

integrated

dedicated

image handling

prepare diagnosis

treatment planning

diagnosis

research

report

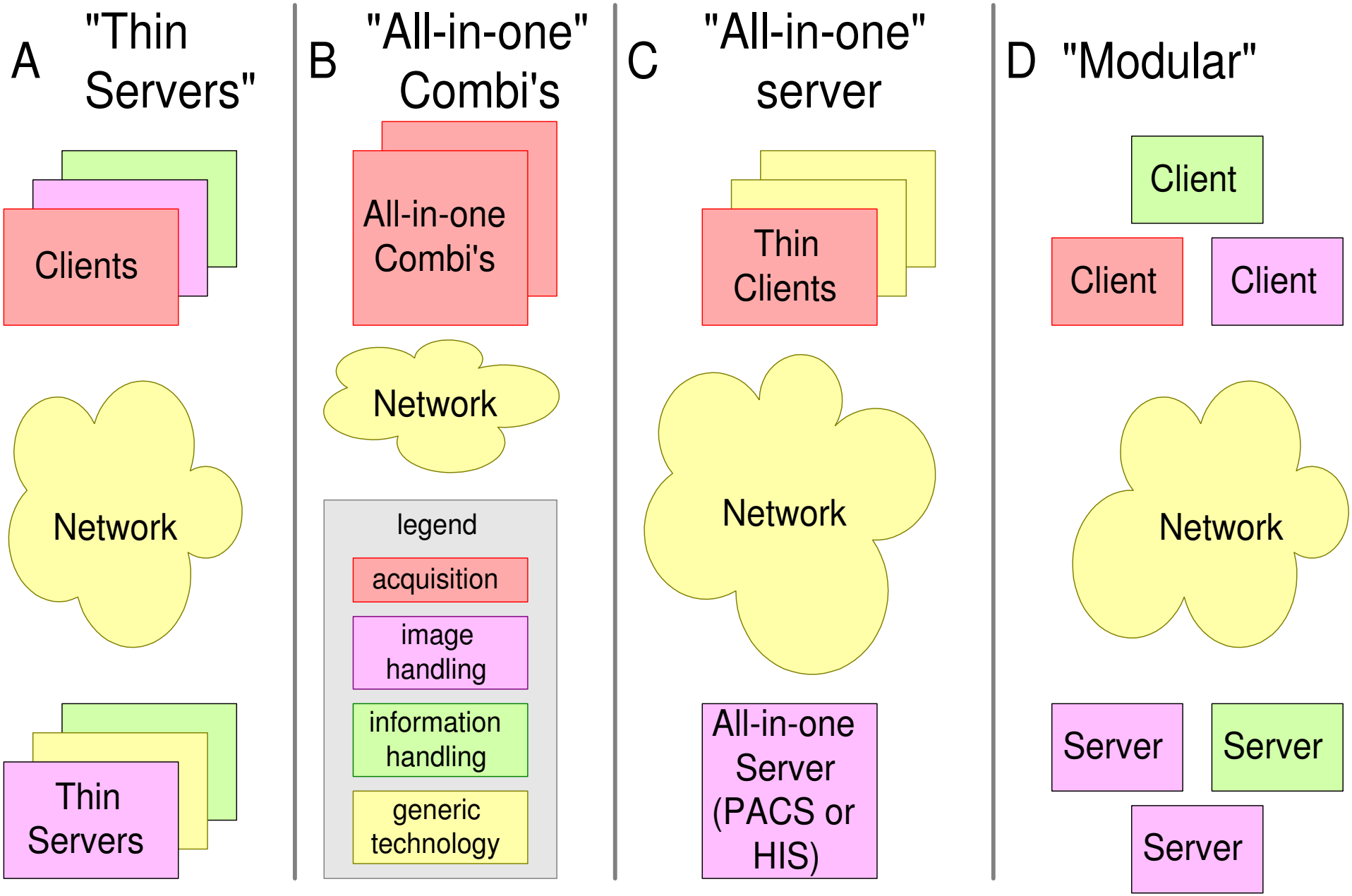
education

authorise

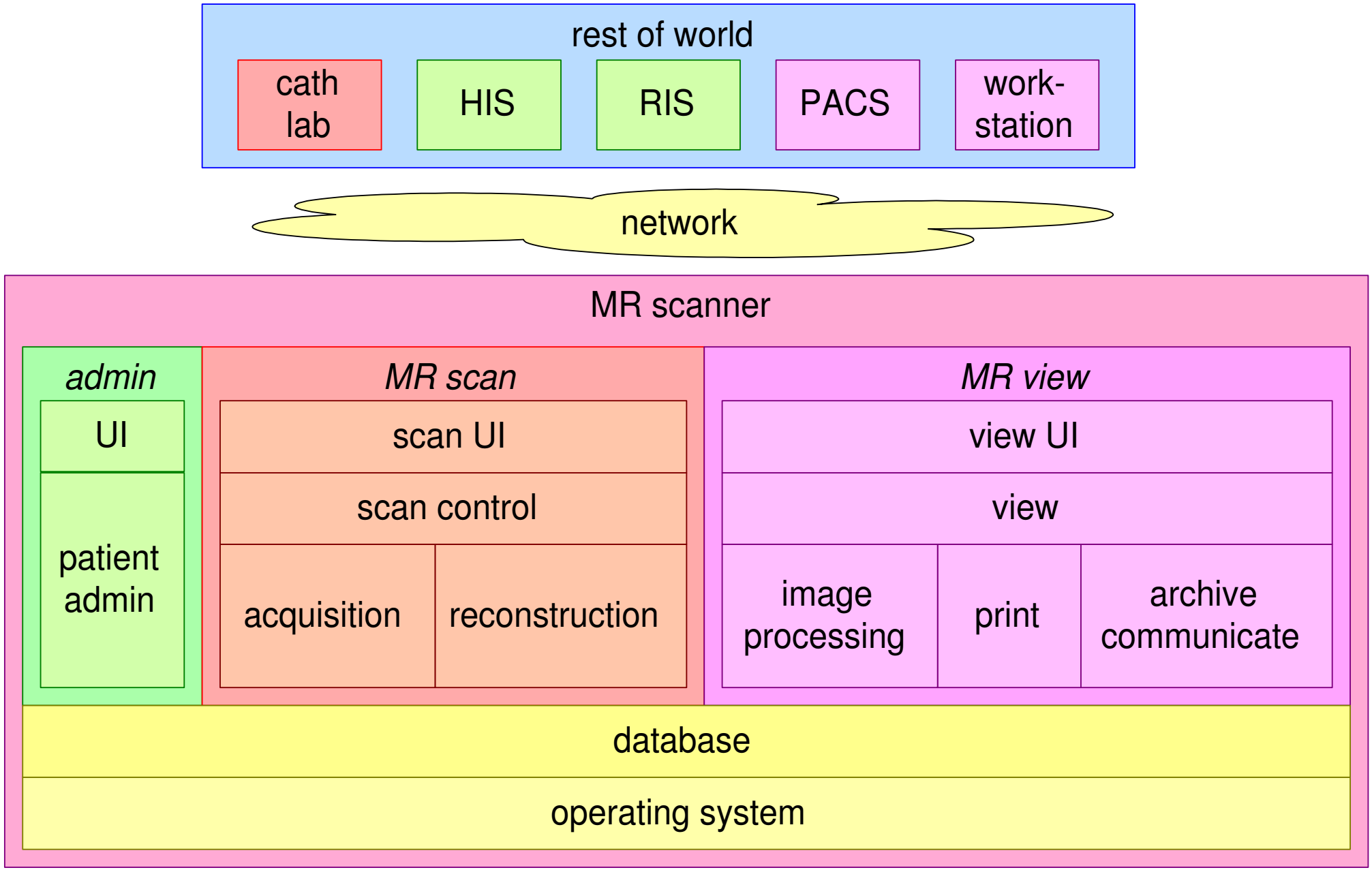
demonstration

clinical review

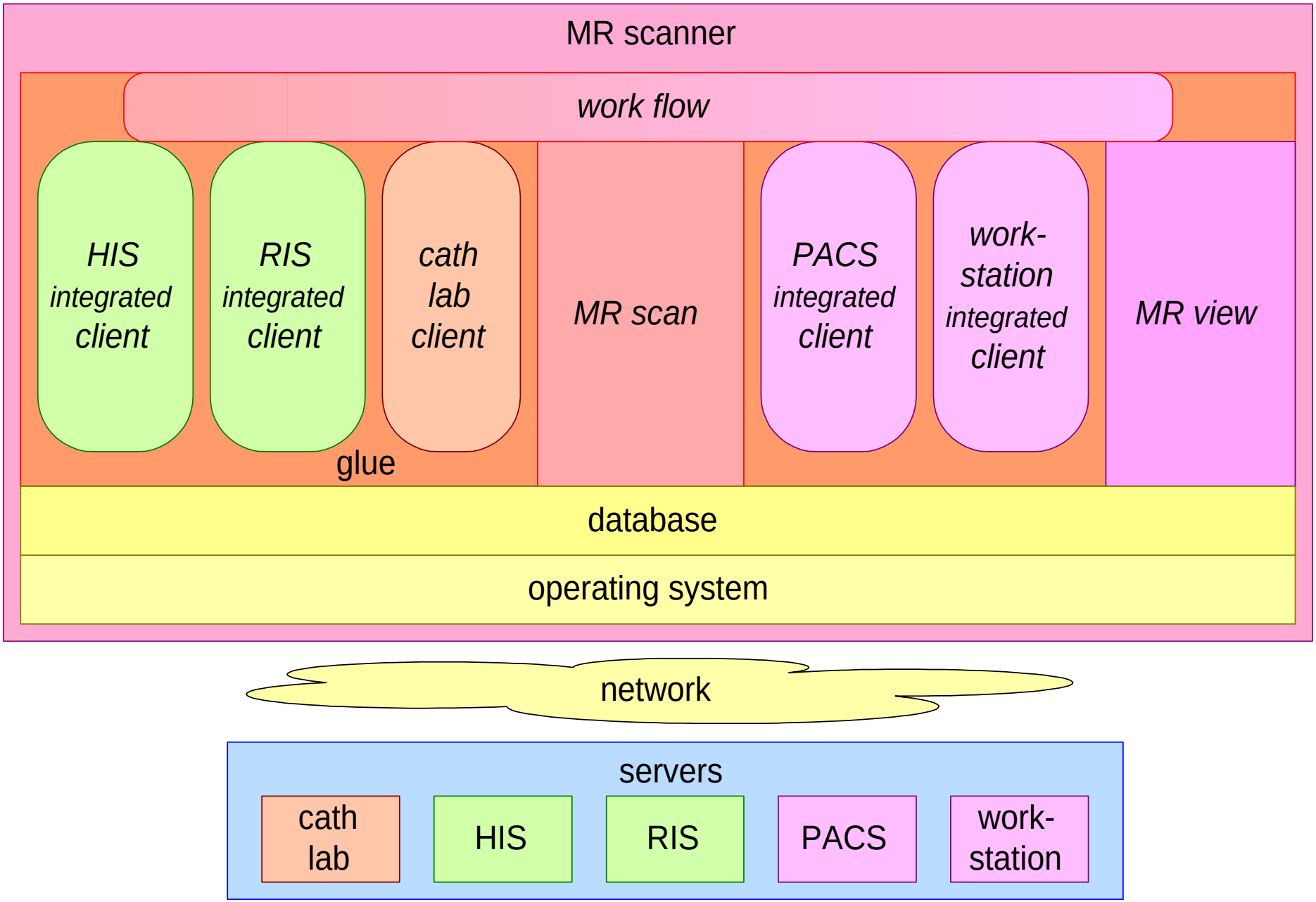
Distribution Scenario's



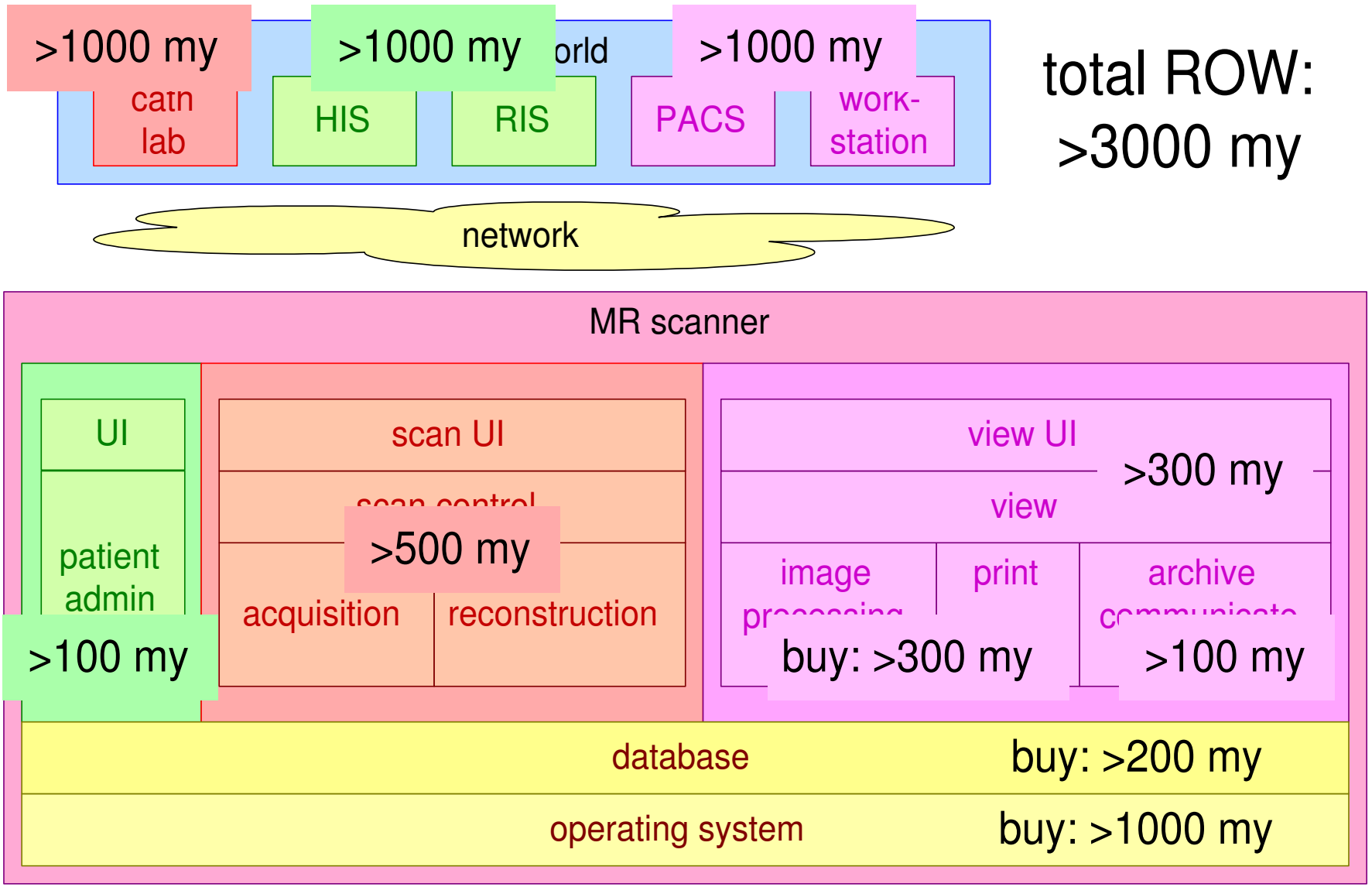
Simplistic Architecture



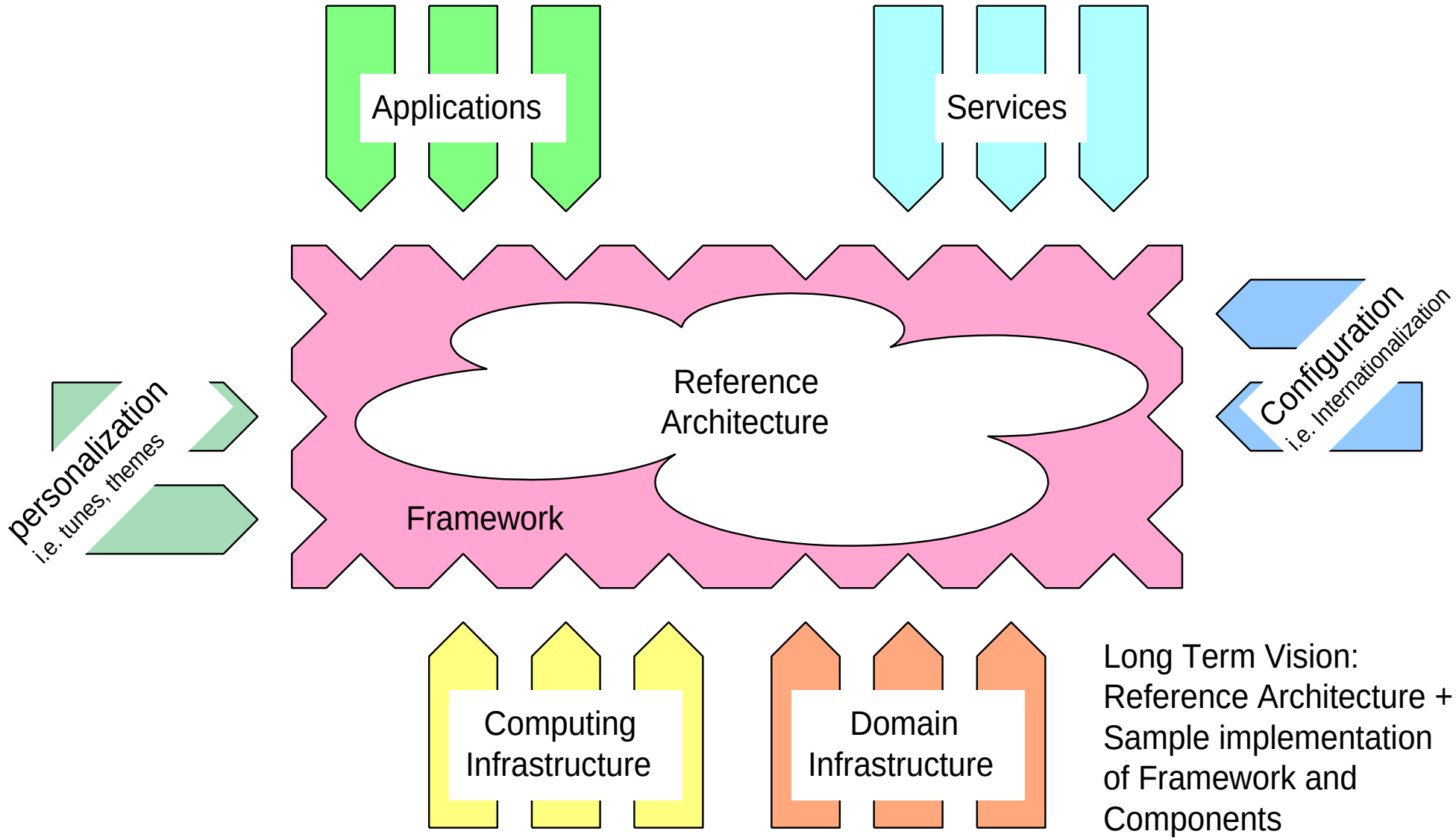
Future Simplistic Architecture



Available Code Assets



Example Long Term Vision



Conclusion: Refactoring the Architecture is a must