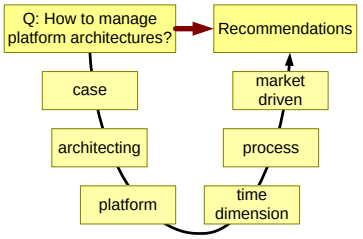
# How to Create a Manageable Platform Architecture?

by *Gerrit Muller* University of South-Eastern Norway-NISE
e-mail: gaudisite@gmail.com
www.gaudisite.nl

**Abstract**

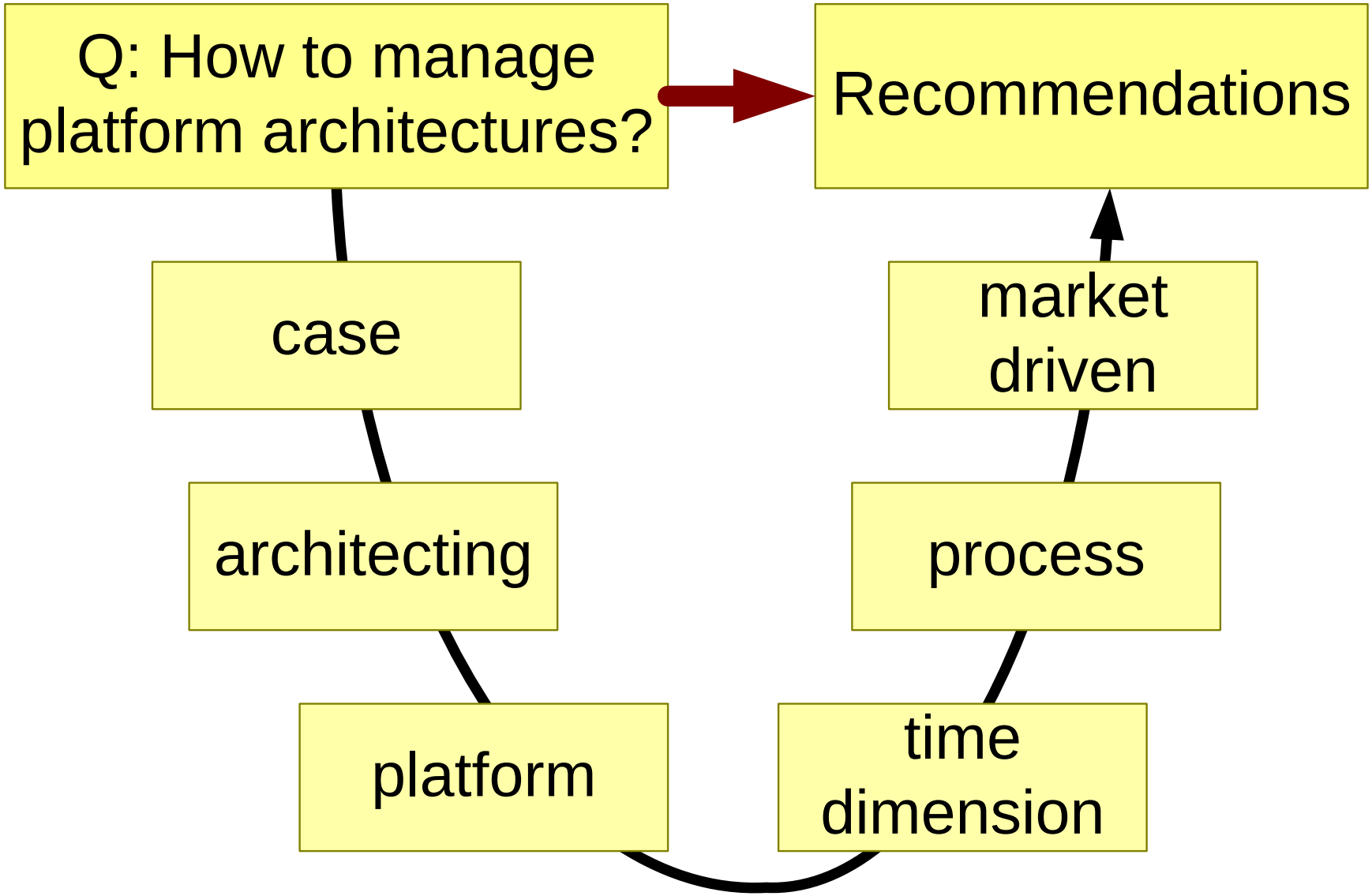
Today's fast pace of the market and the technology development forces the product creators to rethink their development approach. One of the directions is to maximize the return on investments of frequently used functions, for instance by re-use, component based design or by a platform approach. The architecting effort is a key success factor to combine re-use approaches with fast and innovative product creation.
In this presentation we will present a case, discuss the role of the architecture, and elaborate the essential architecture ingredients for a successful platform creation, and evolution, and innovative product creation.



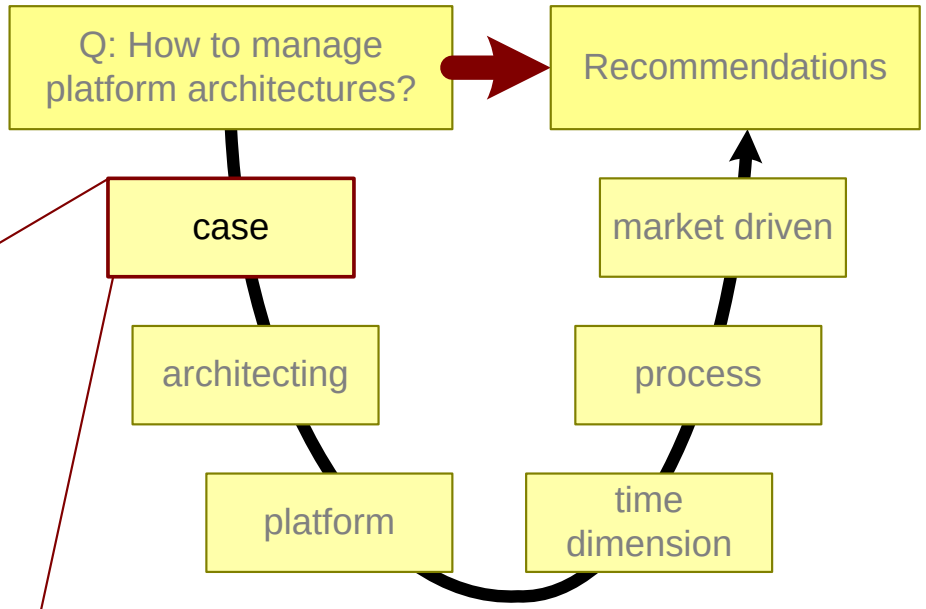



September 6, 2020
status: concept
version: 1.0

# Presentation Outline



# Case Outline

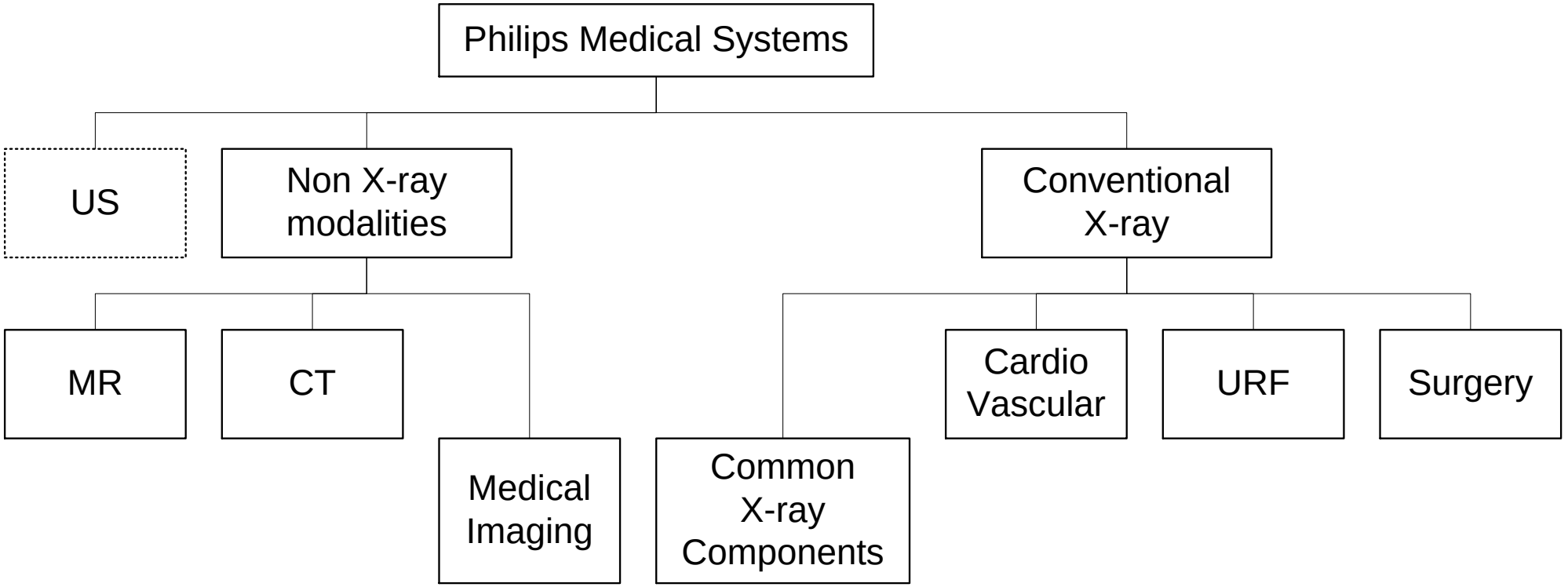



case:

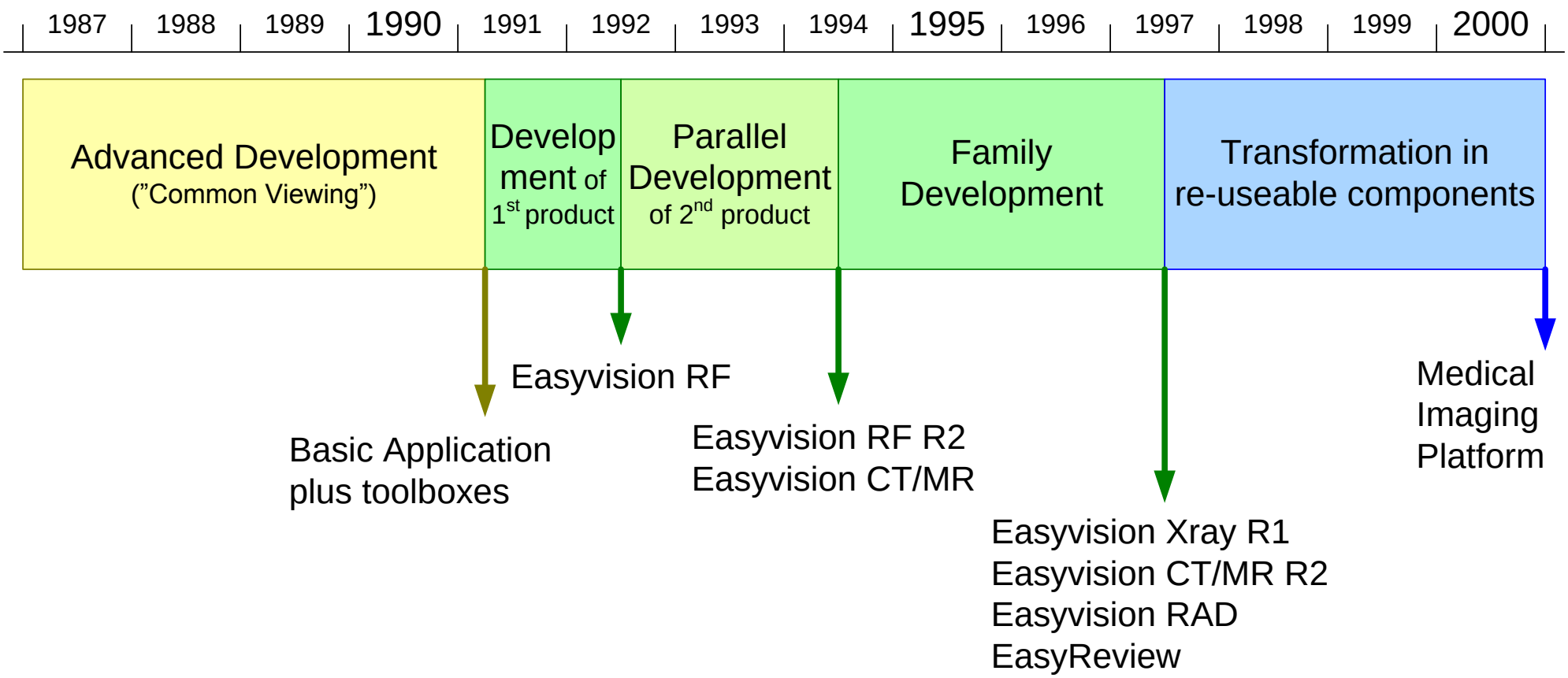
- company overview
- time line
- technology innovations
- 1991, 1992, 1994, and 1996

context, product(s) and design

# Philips Medical Systems, schematic organization



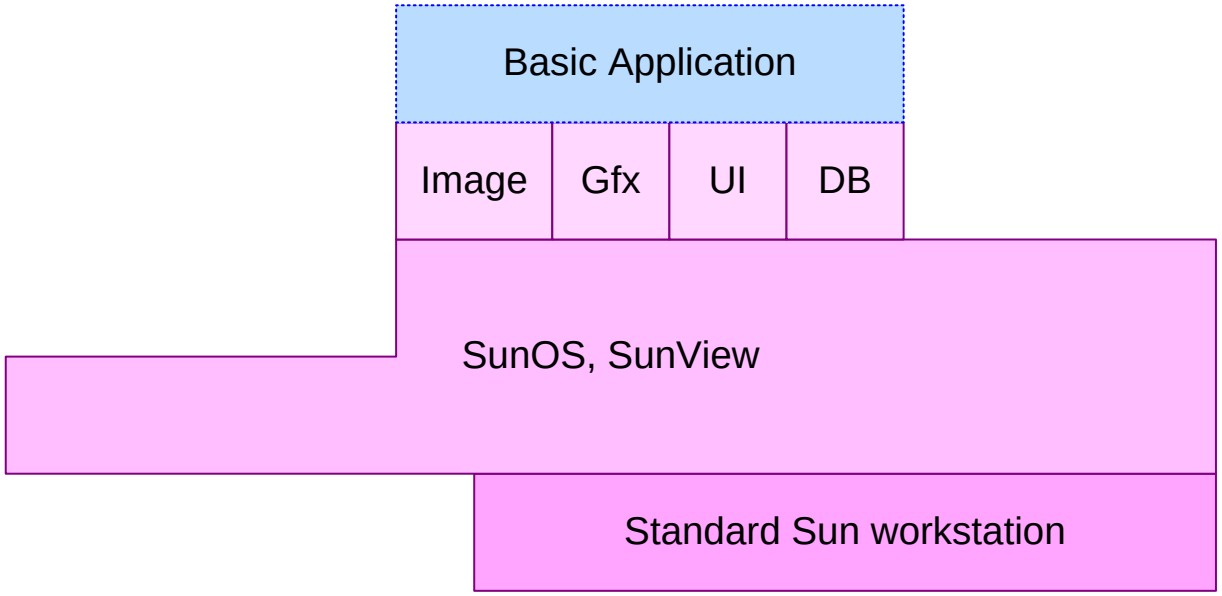
# Phases of Medical Imaging

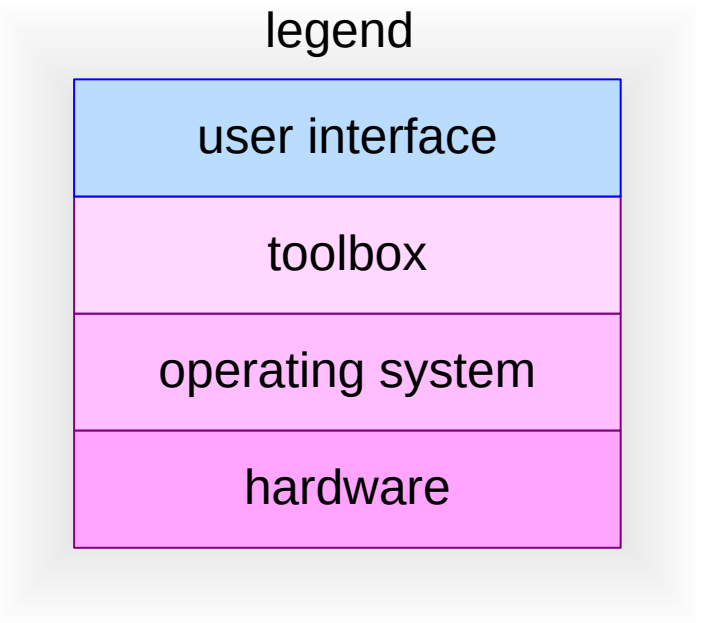


# Technology innovations by Common Viewing

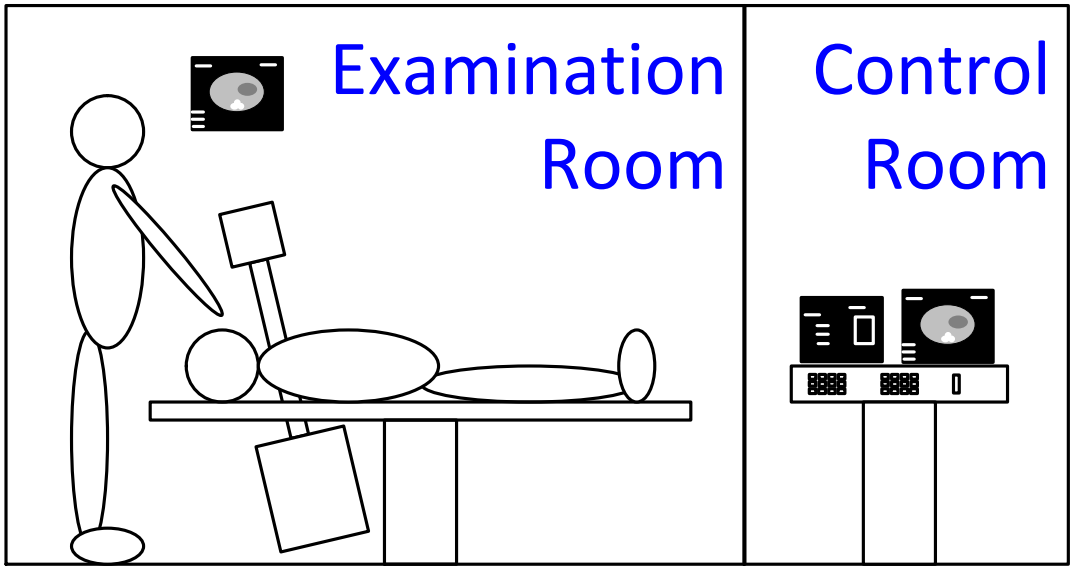
- standard UNIX based workstation
- full SW implementation, more flexible
- object oriented design and implementation (Objective-C)
- graphical User Interface, with windows, mouse et cetera
- call back scheduling, fine-grained notification
- data base engine, fast, reliable and robust
- extensive set of toolboxes
- property based configuration
- multiple co-ordinate spaces

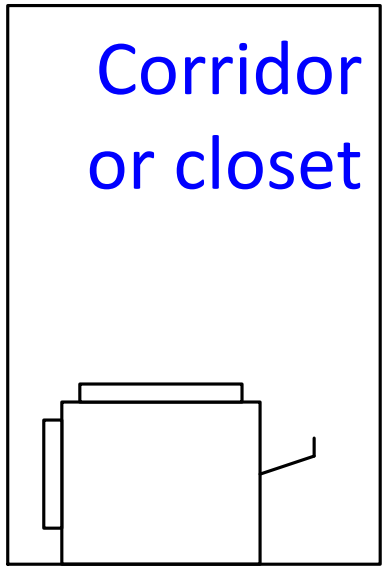
# Idealized layers September 1991

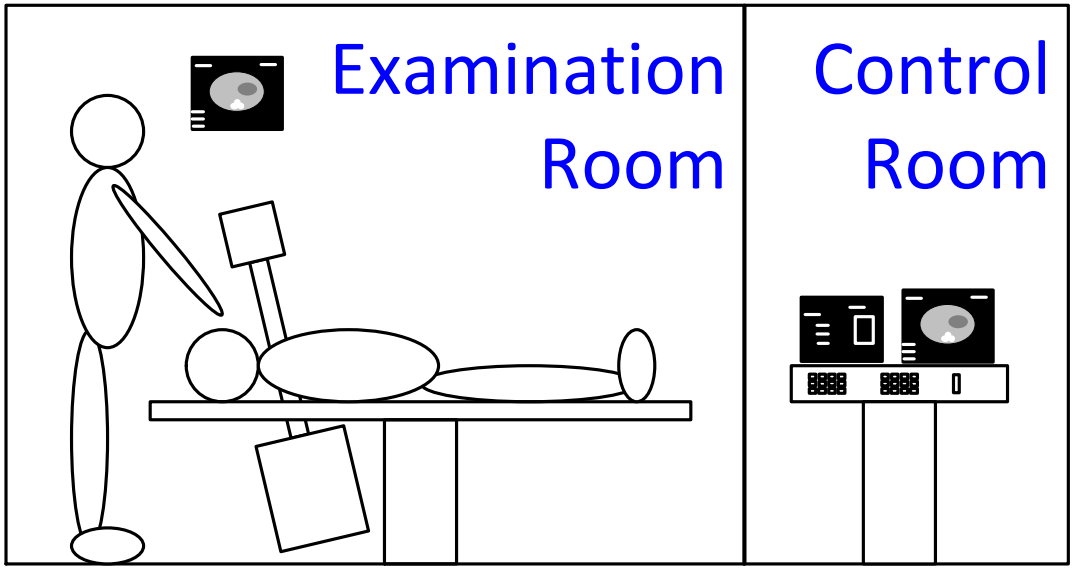


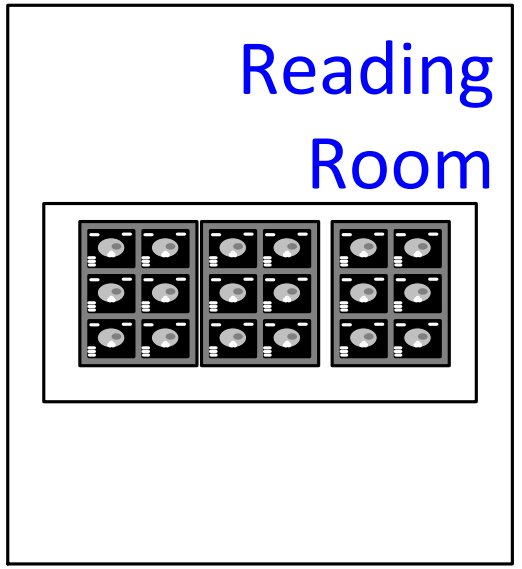



# X-ray rooms from examination to reading around 1990

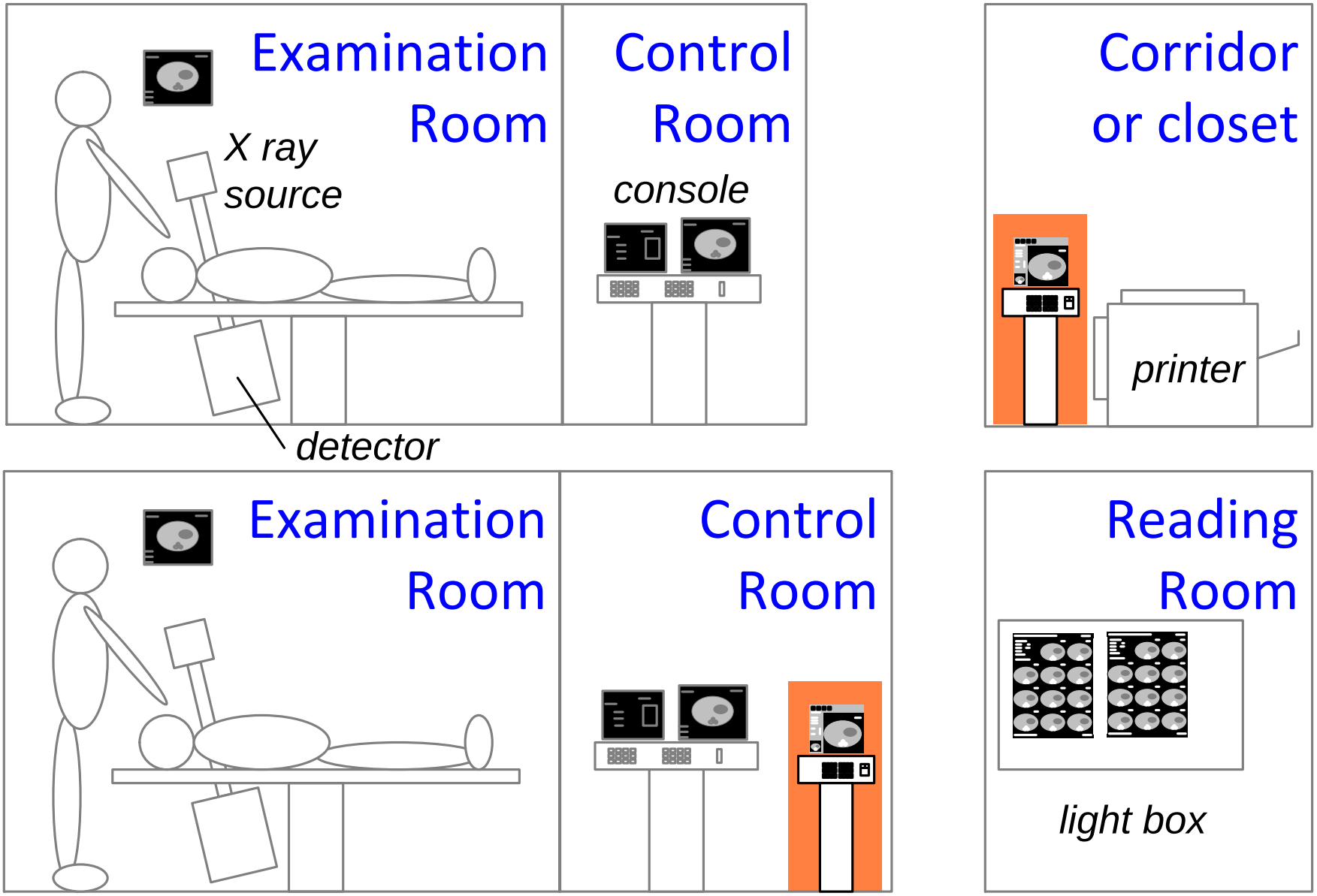


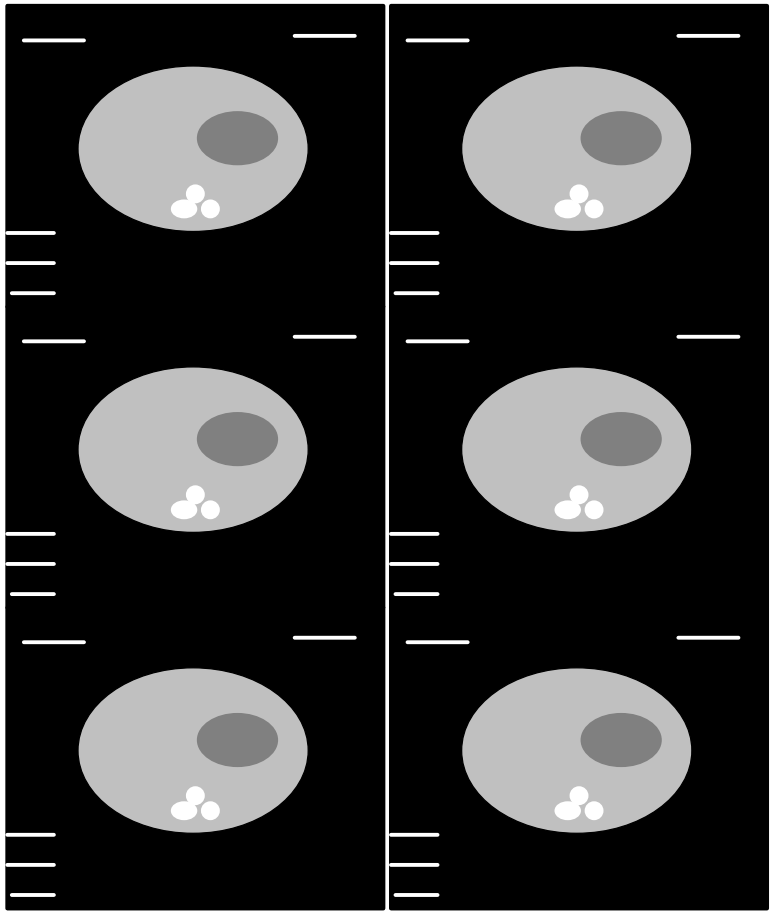



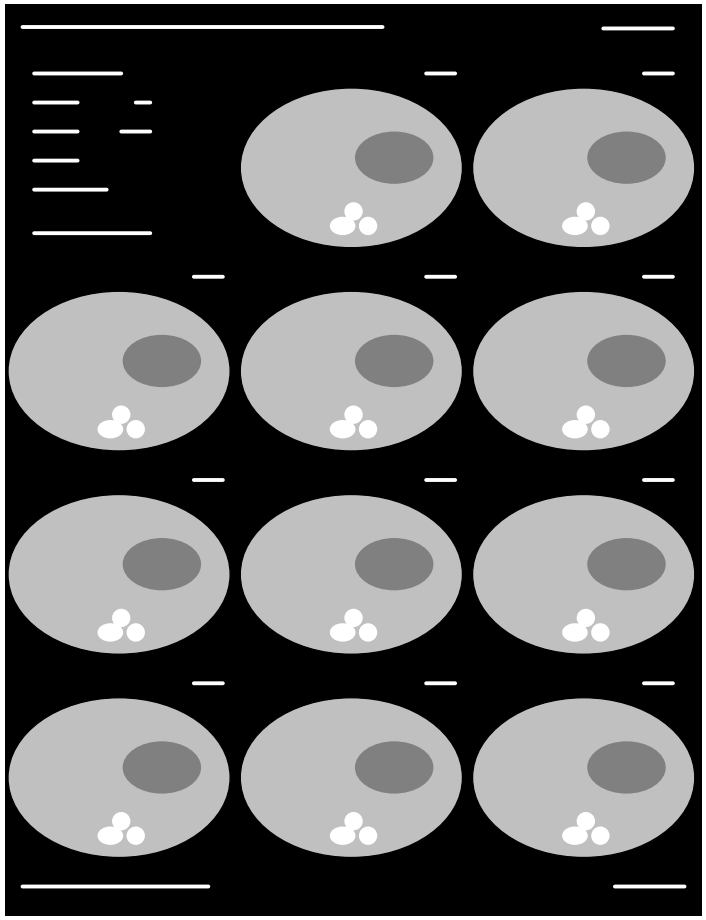
# X-ray rooms with Medical Imaging applied as printserver



# Comparison *screen copy* vs *optimized* film



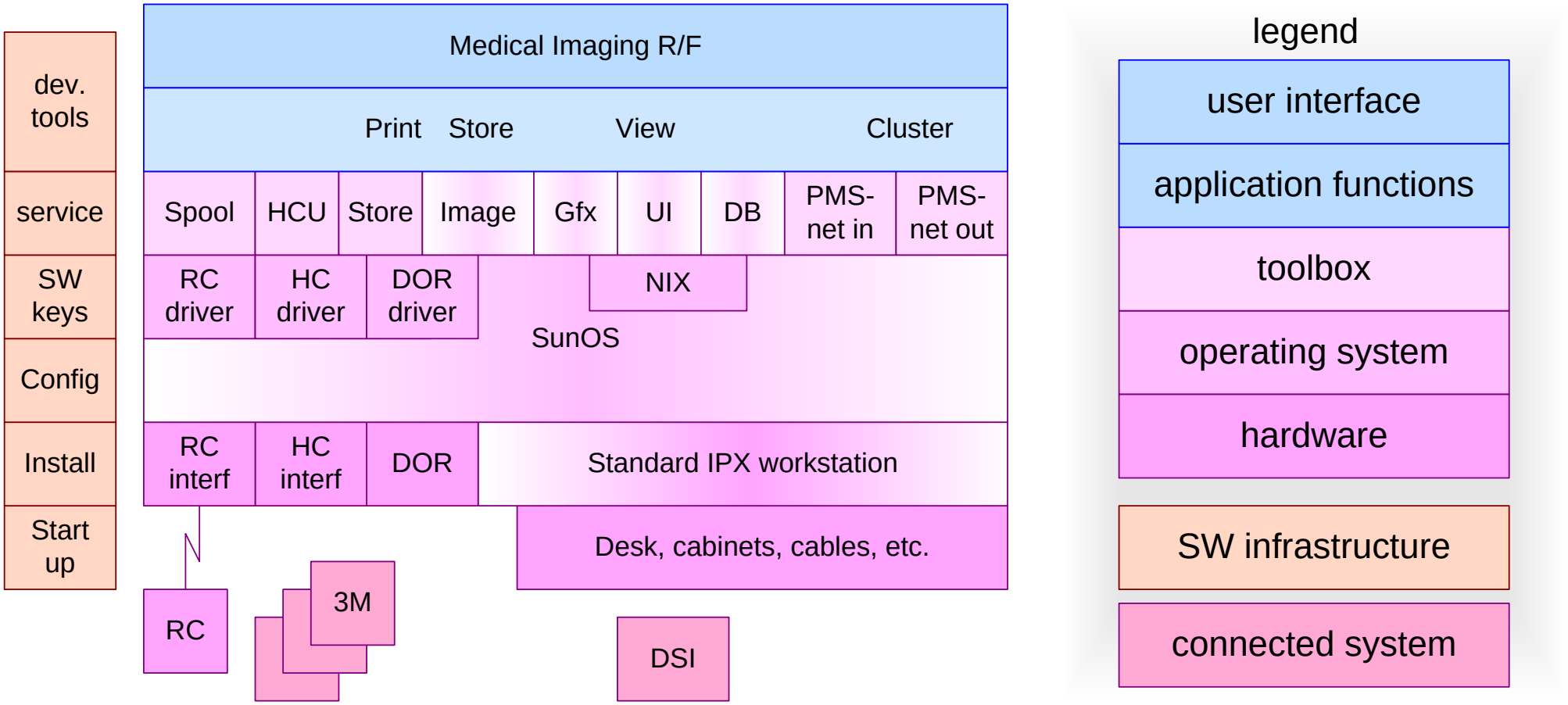
old: screen copy



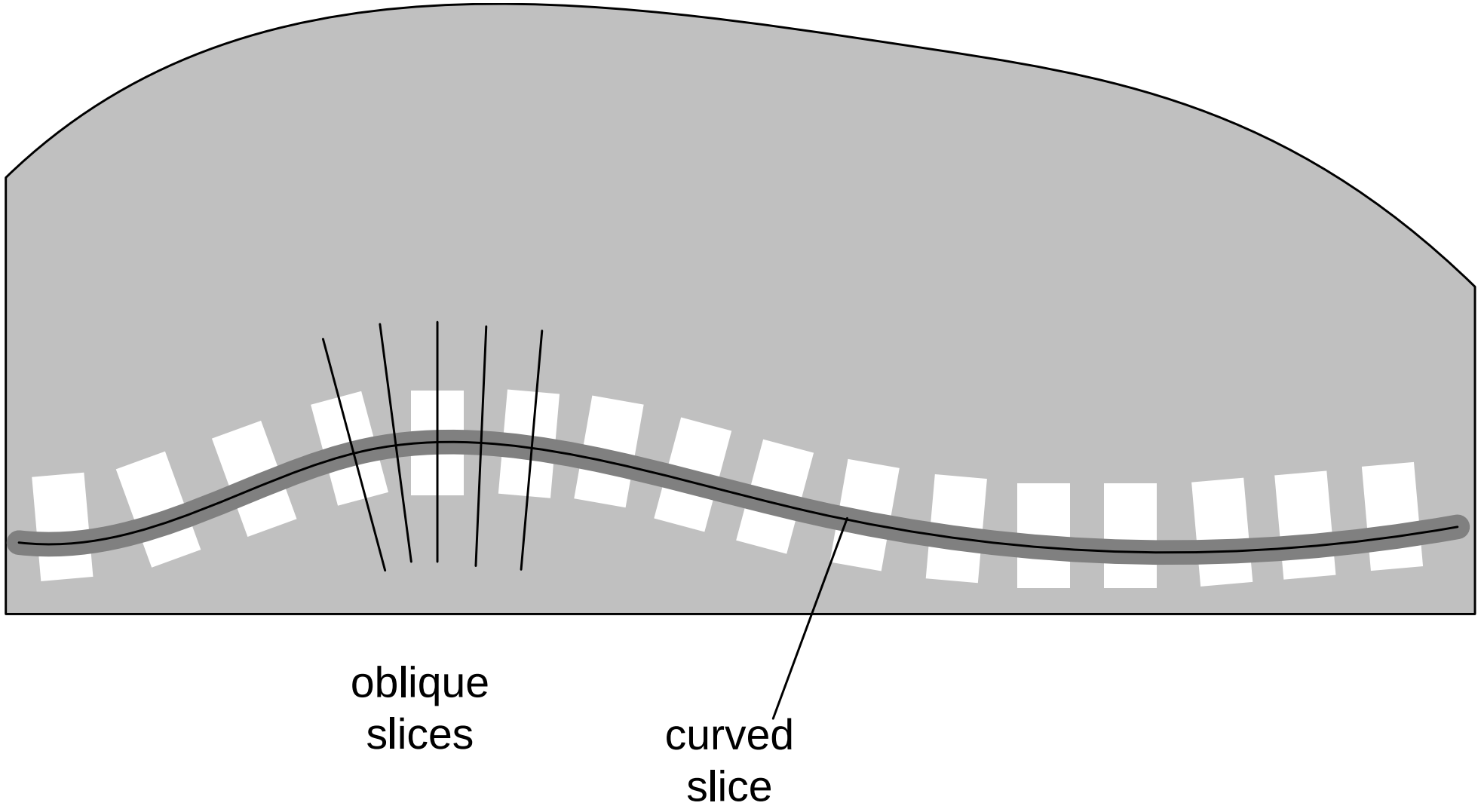
new: SW formatting

20 to 50% less film needed

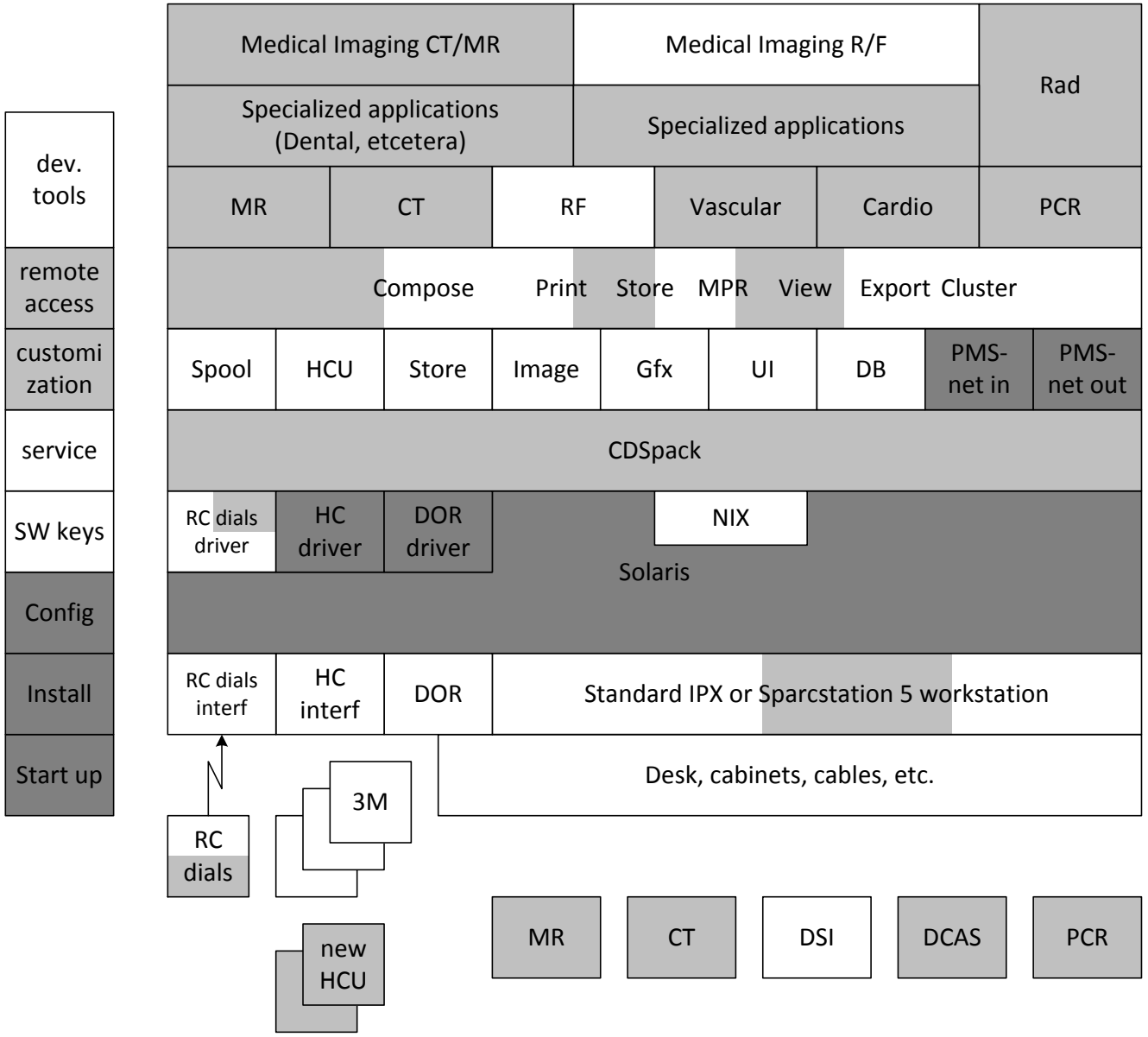
# Idealized layers september 1992



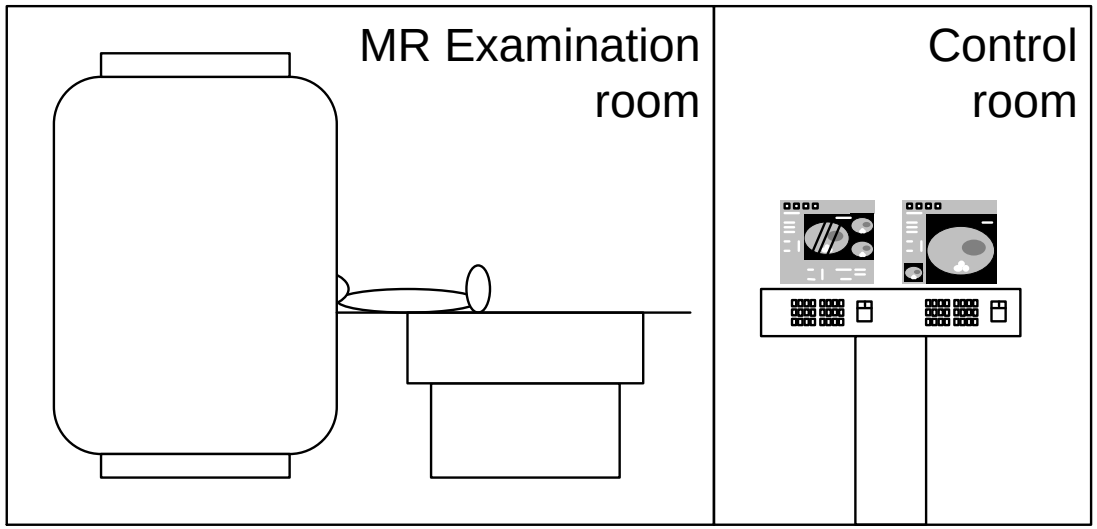
# Example Multi Planar Reconstruction

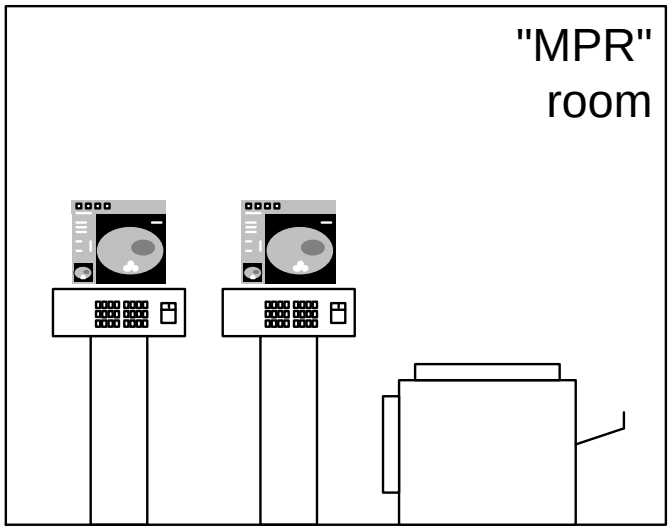


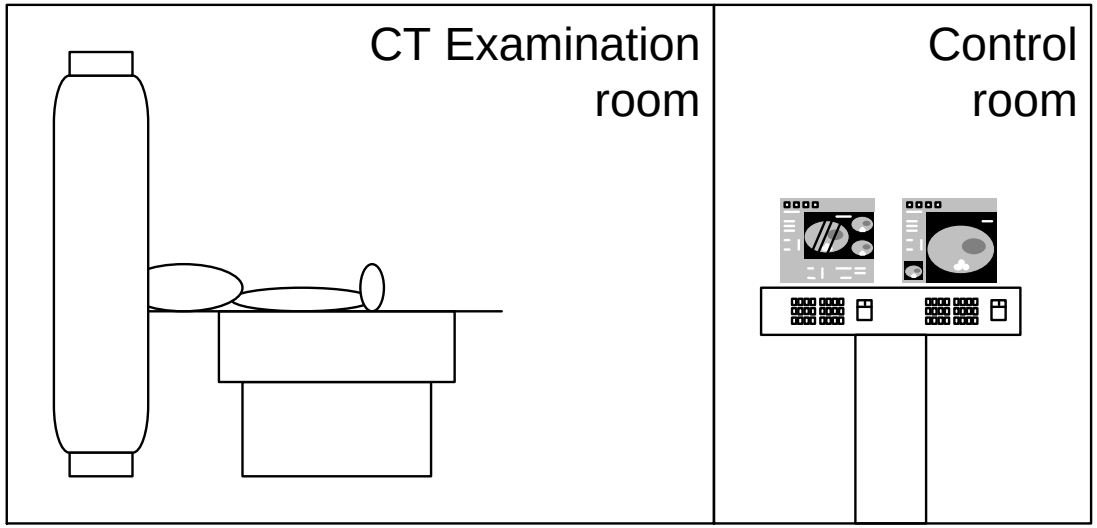
# Idealized layers june 1994

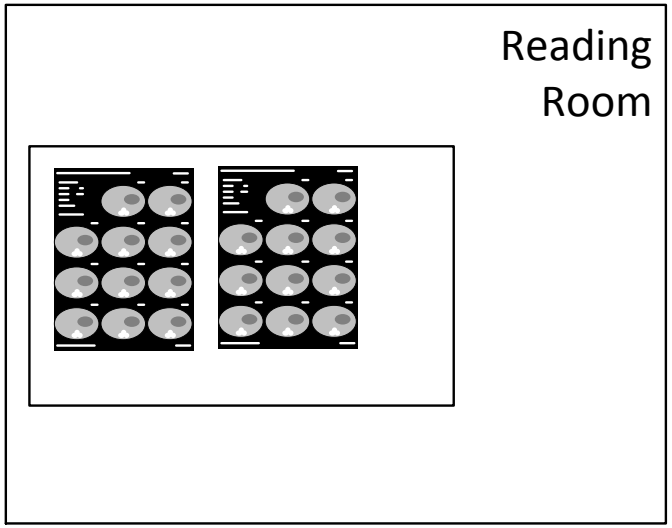


# Example CT/MR department

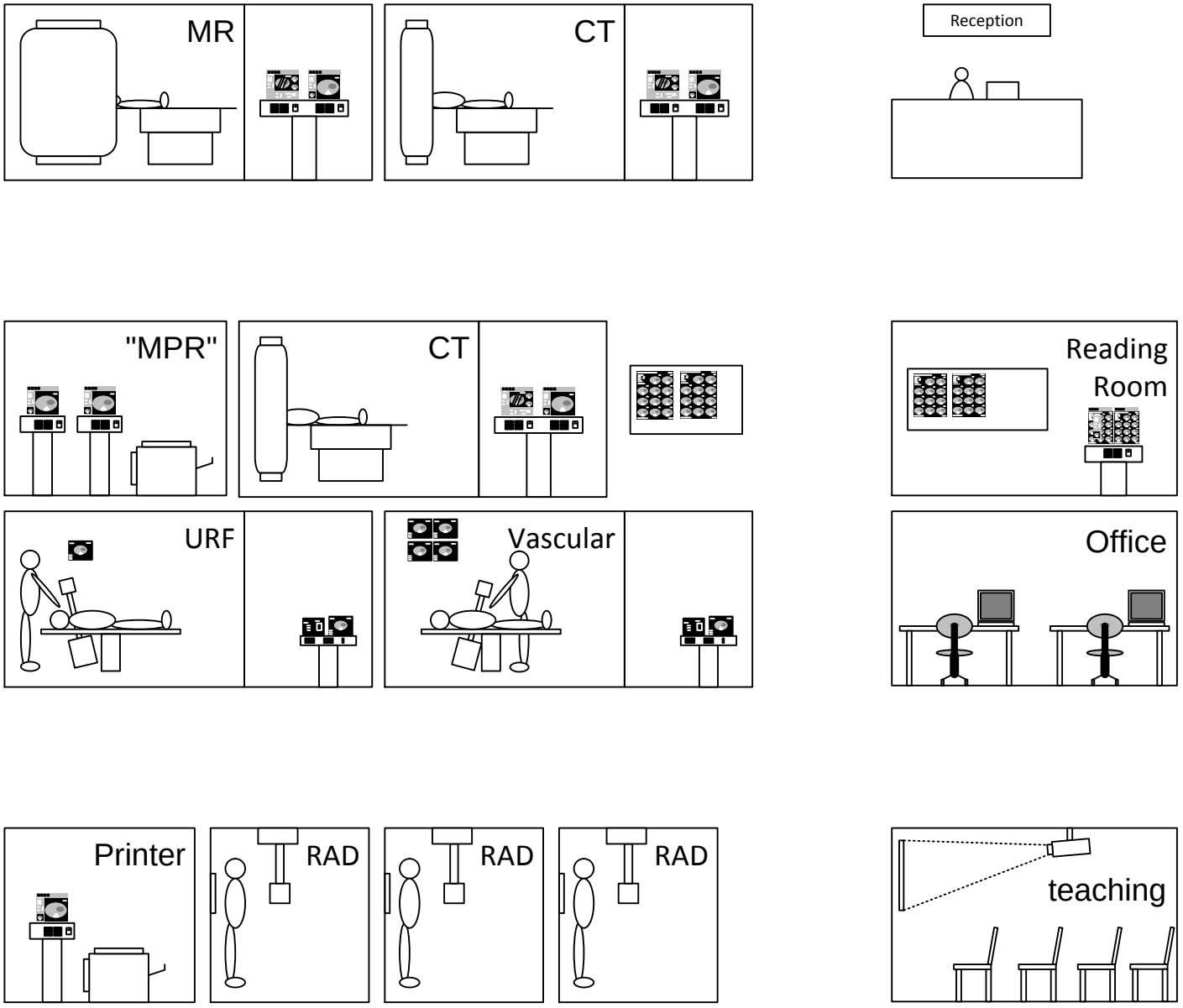


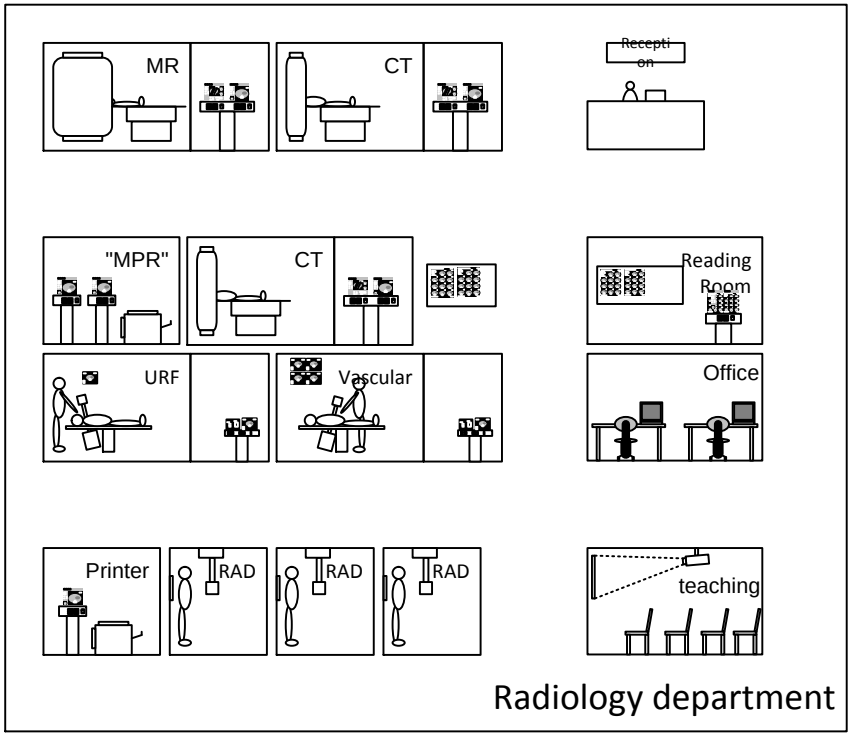



# Radiology Department

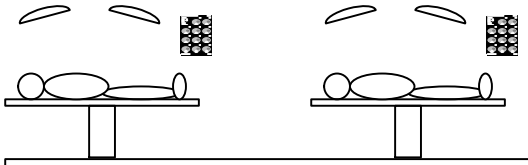


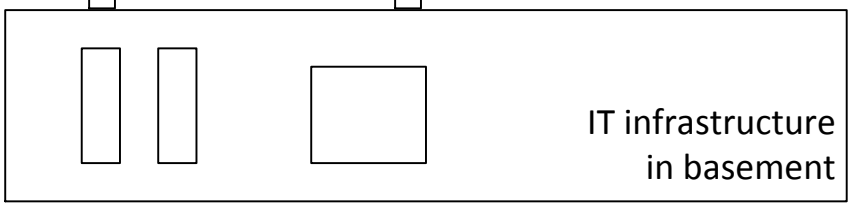
# Vision: Medical Imaging in Healthcare



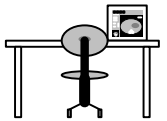

Operating theatre

trauma room



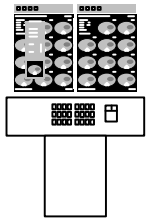



Radiologist at home

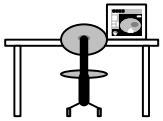


Radiologist somewhere in the hospital

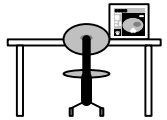
Radiologist at other hospital



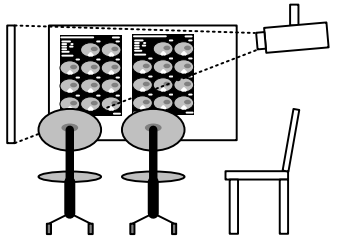
Referring Physician



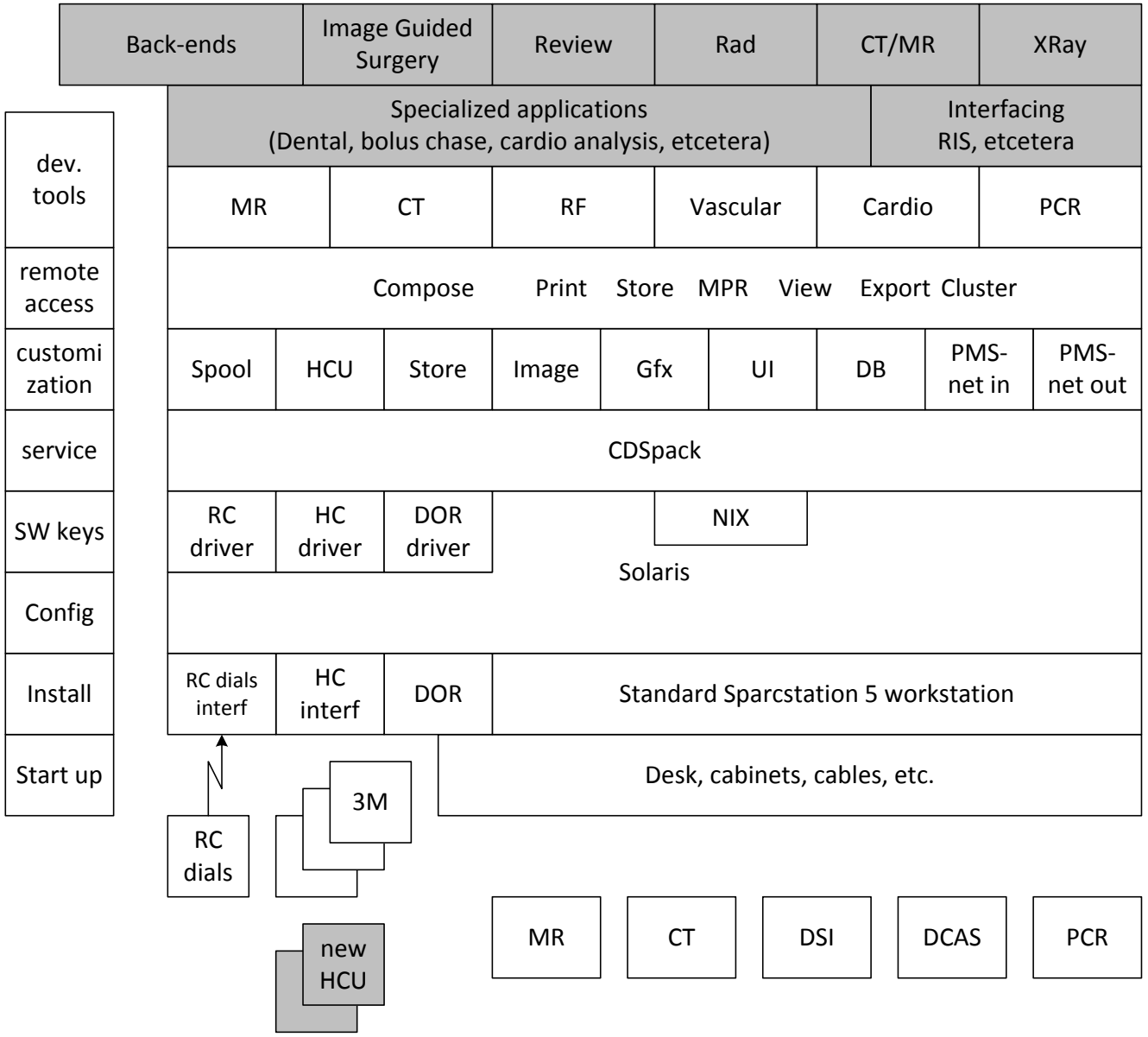
Referring Physician



Conference room



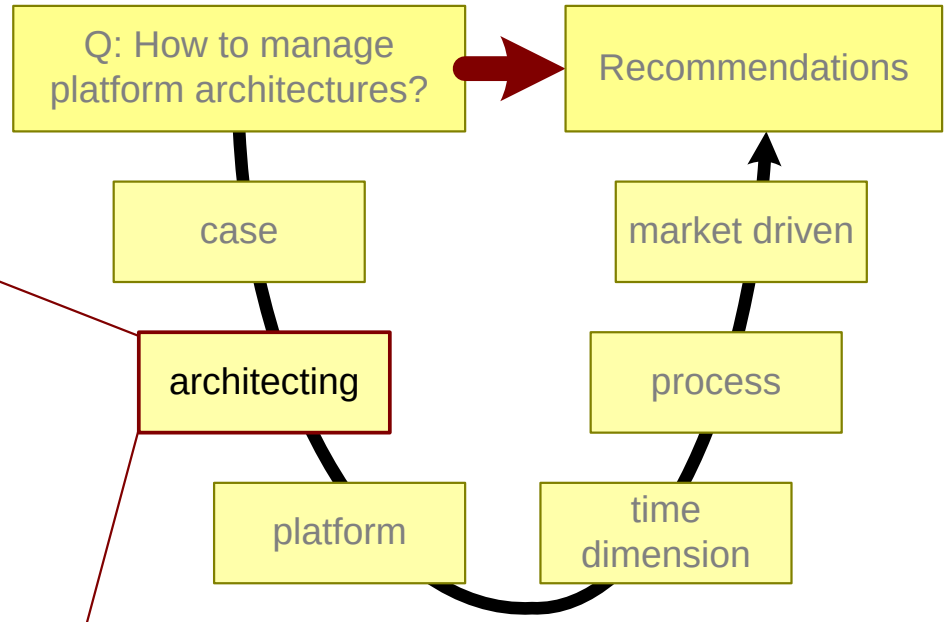
# Idealized layers 1996



# Architecting Outline

Architecting:

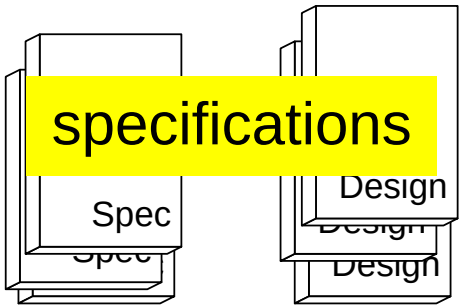
- What is Architecture?
- Architecture vs Description
- My View on Architecture
- ”Guiding How”
- The Art of Architecting
- More than Decomposition



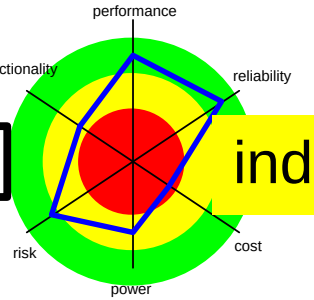
# What is Architecture?

## Mark all applicable boxes ☒

☐ specifications




☐ indicators




☐ overarching vision

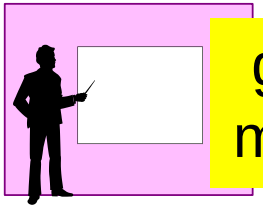
market, business, technology
process, product

☐ API's

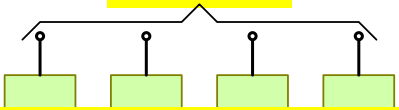
☐ high level rules

layer n !calls n-k; k>1
layer n !calls n+k; k>0

☐ guidance
monitoring

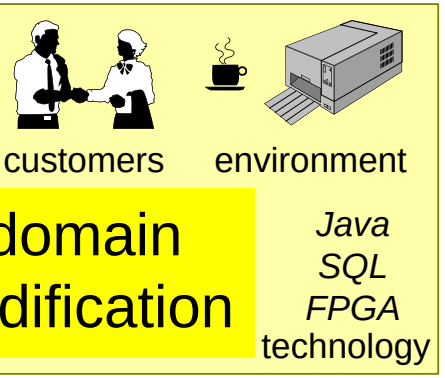


☐ components
(implementations)



☐ concepts

audio
pipeli
message
routing
whit
communication




☐ infrastructure

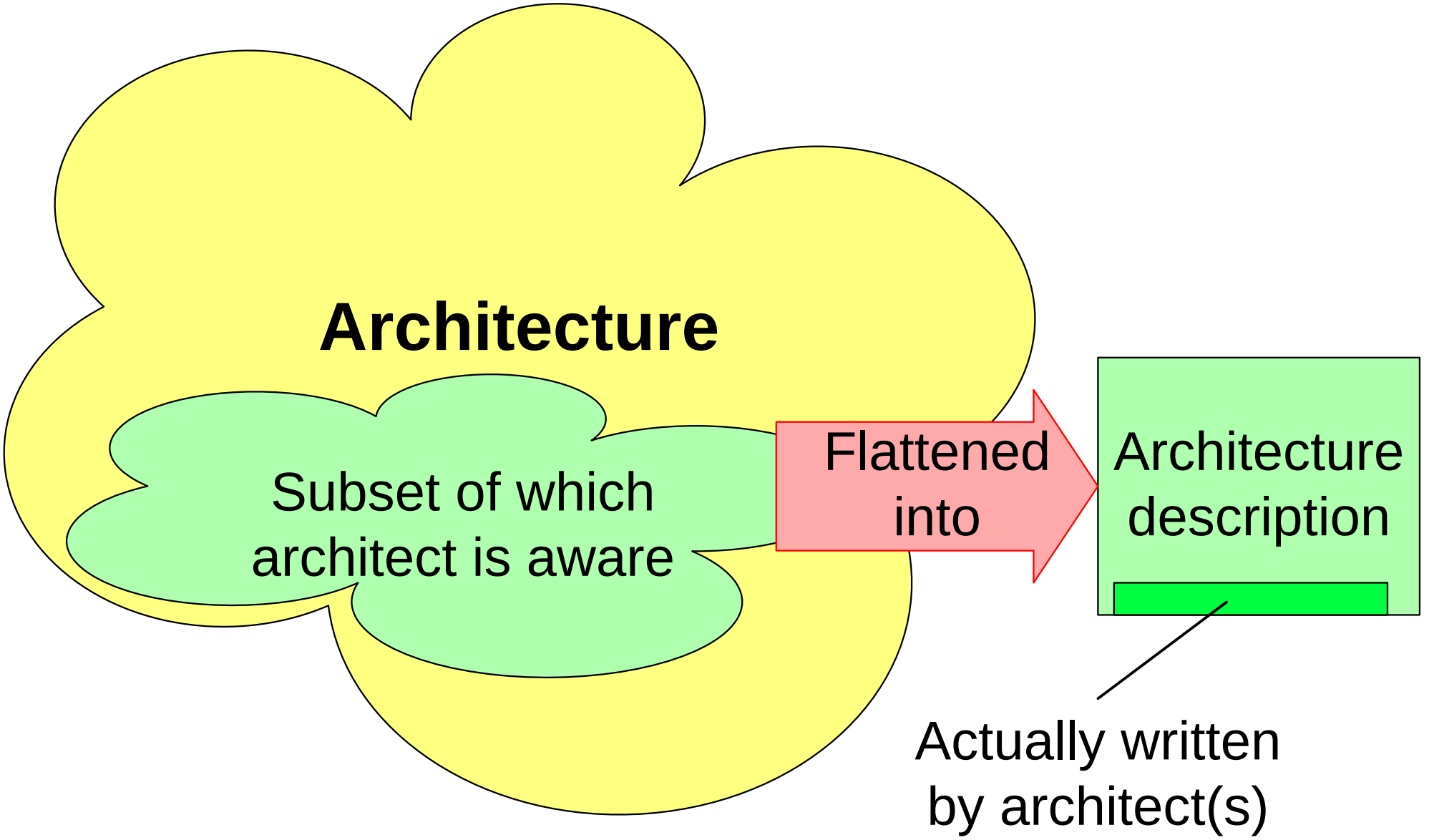
OS
file system
bus
memory
I/O

☐ standards

http
DVB
IPTV
WMA
MP3
JPEG

☐ other...

# Architecture vs Description



# My View on Architecture


*Do the right things*

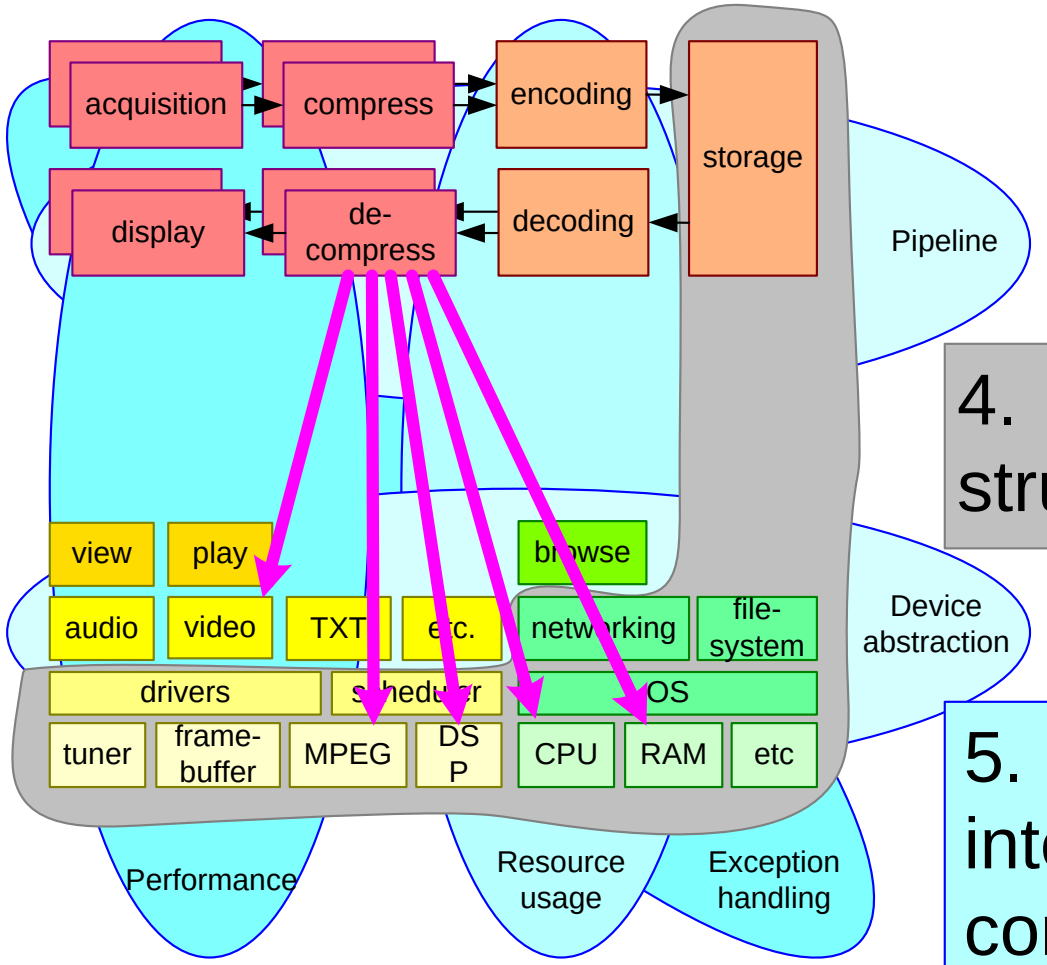
*Do the things right*

# ”Guiding How” by providing rules for:

1. Functional Decomposition

3. Allocation

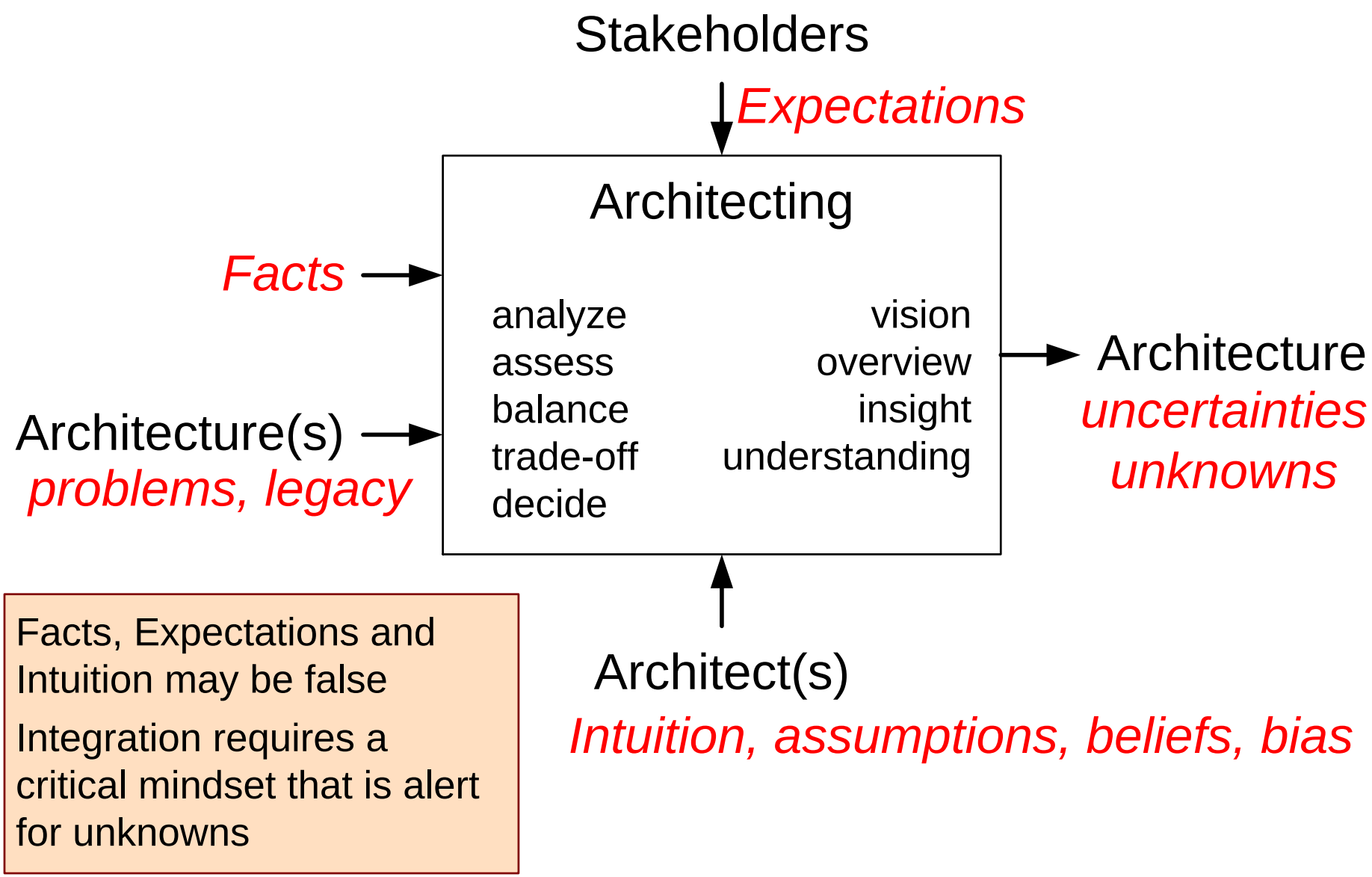
2. Construction Decomposition




4. Infra-structure

5. Choice of integrating concepts

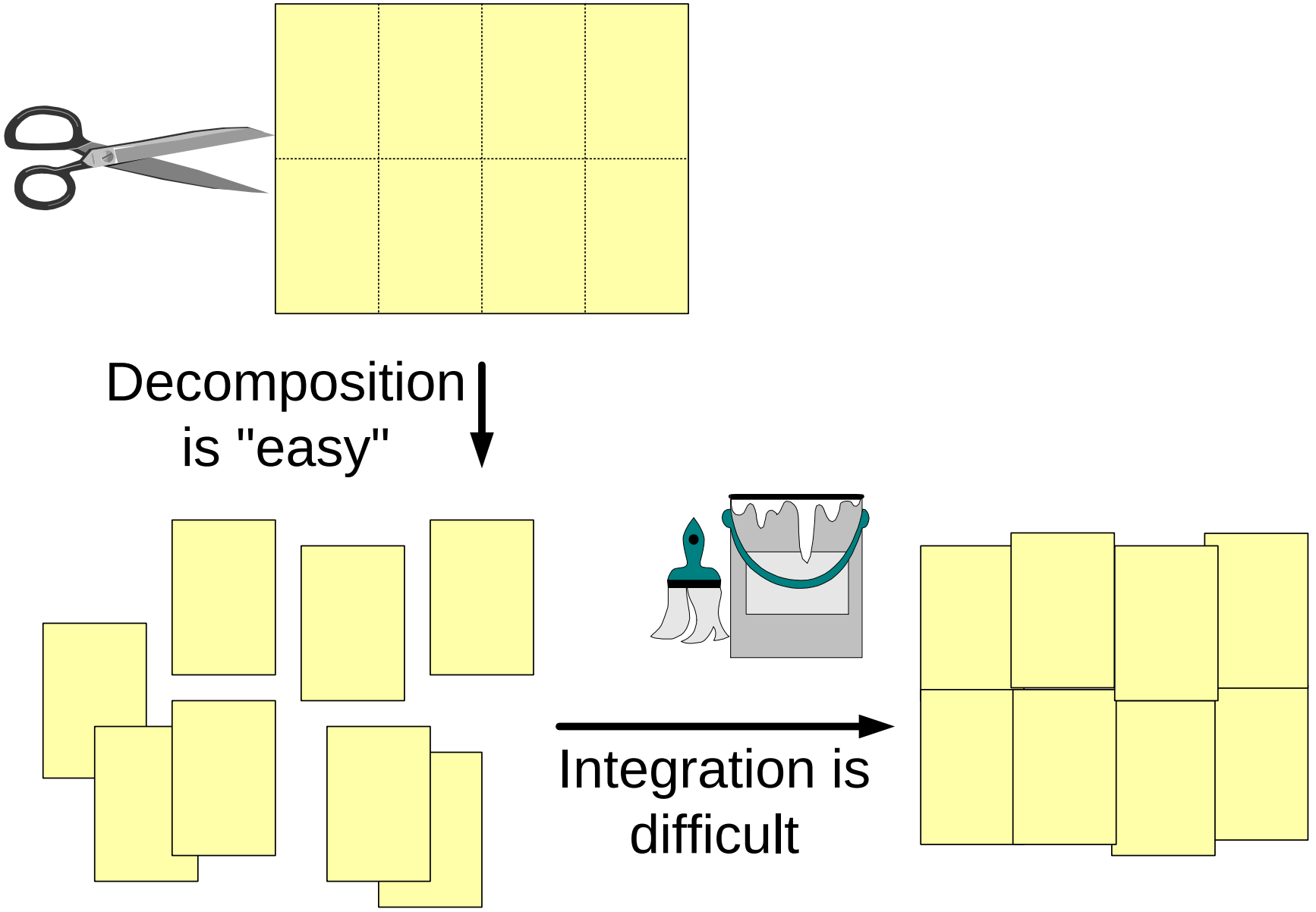
# The Art of Architecting



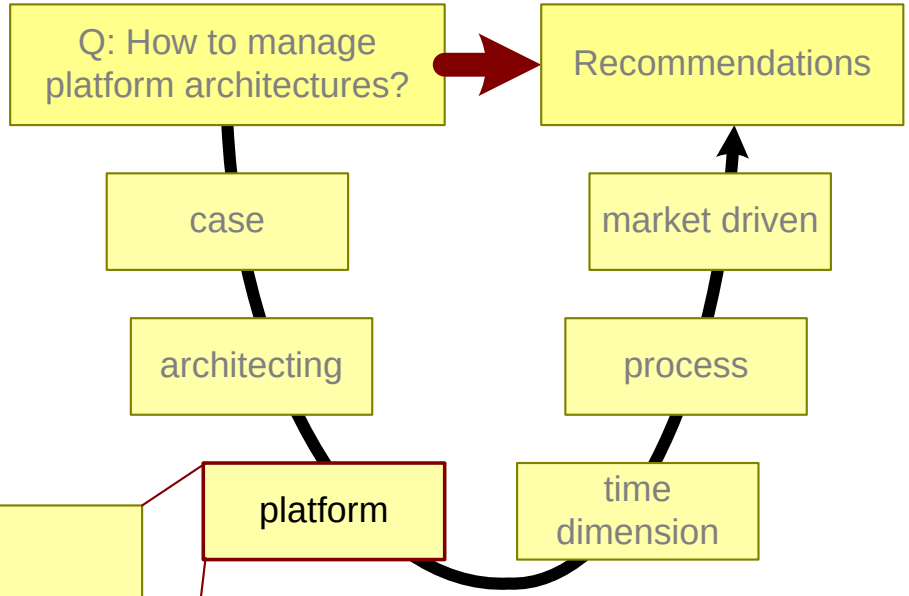

Facts, Expectations and Intuition may be false

Integration requires a critical mindset that is alert for unknowns

# Architecting is much more than Decomposition

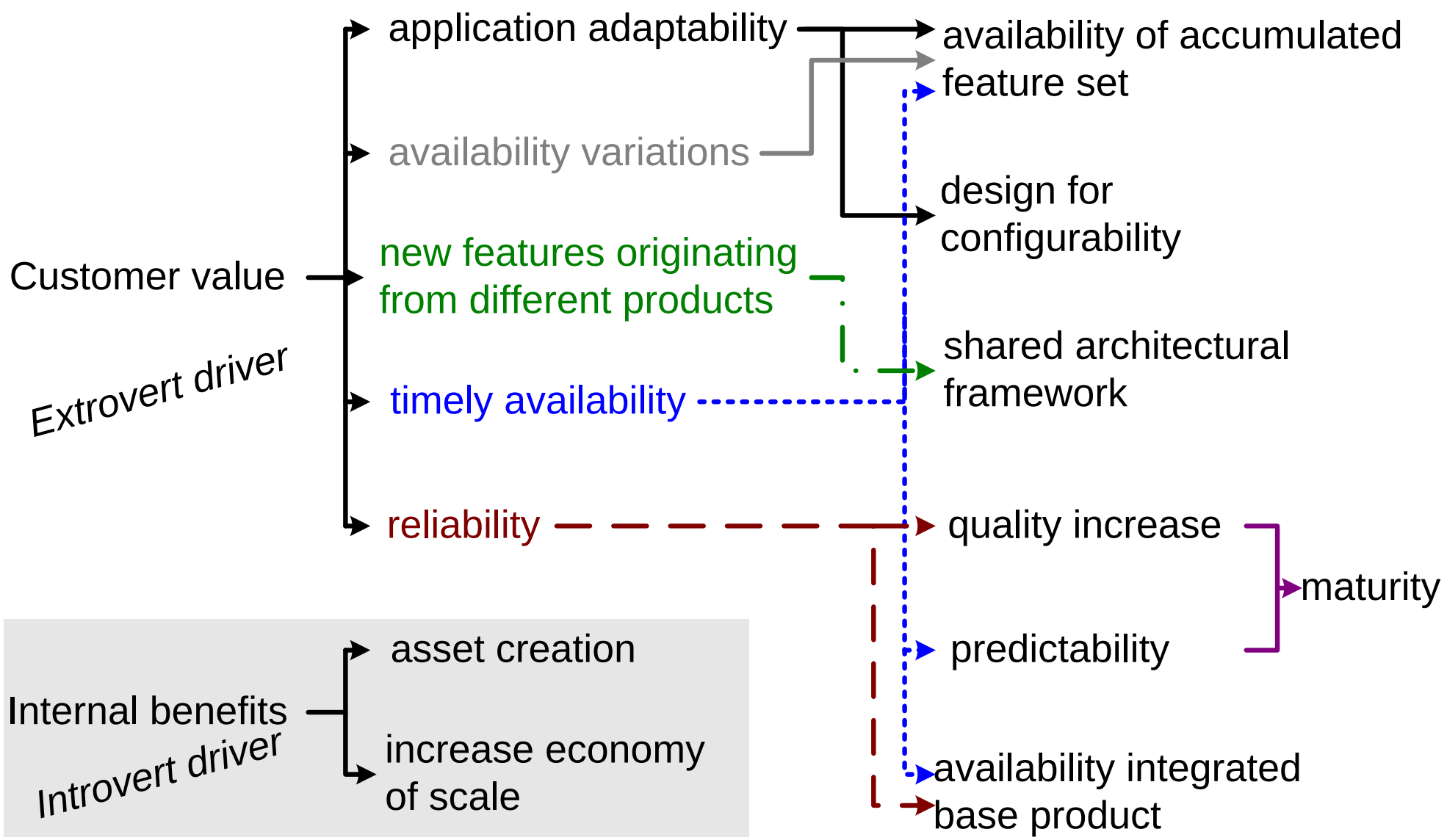


# Platform Outline




Platform:
- Why Platforms?
- What is a Platform?
- Platform Source Deliverables
- Example of Platform Efficiency
- Embedding Costs of Purchased SW

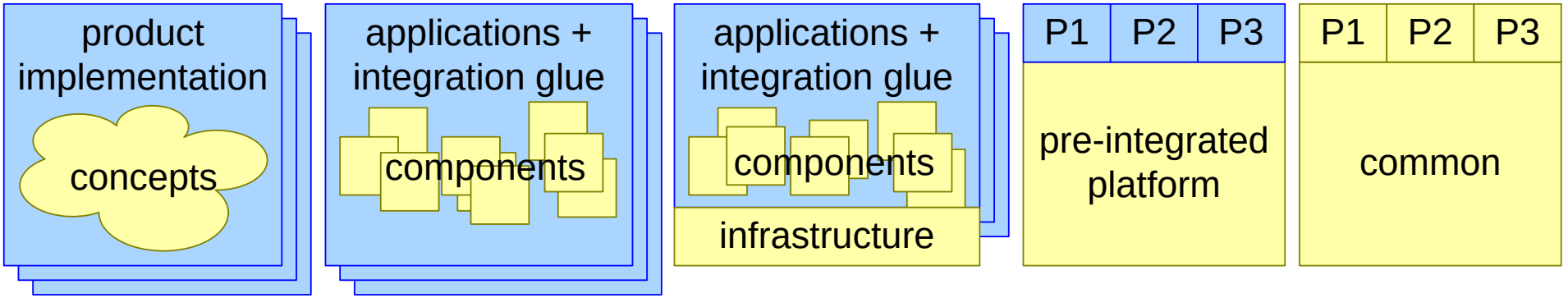
# Why Platforms?

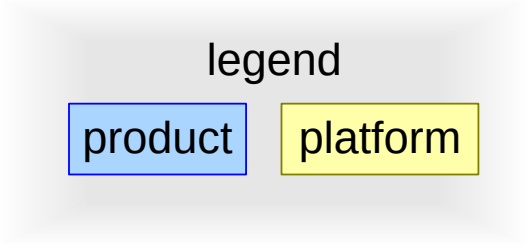


# What is a Platform?

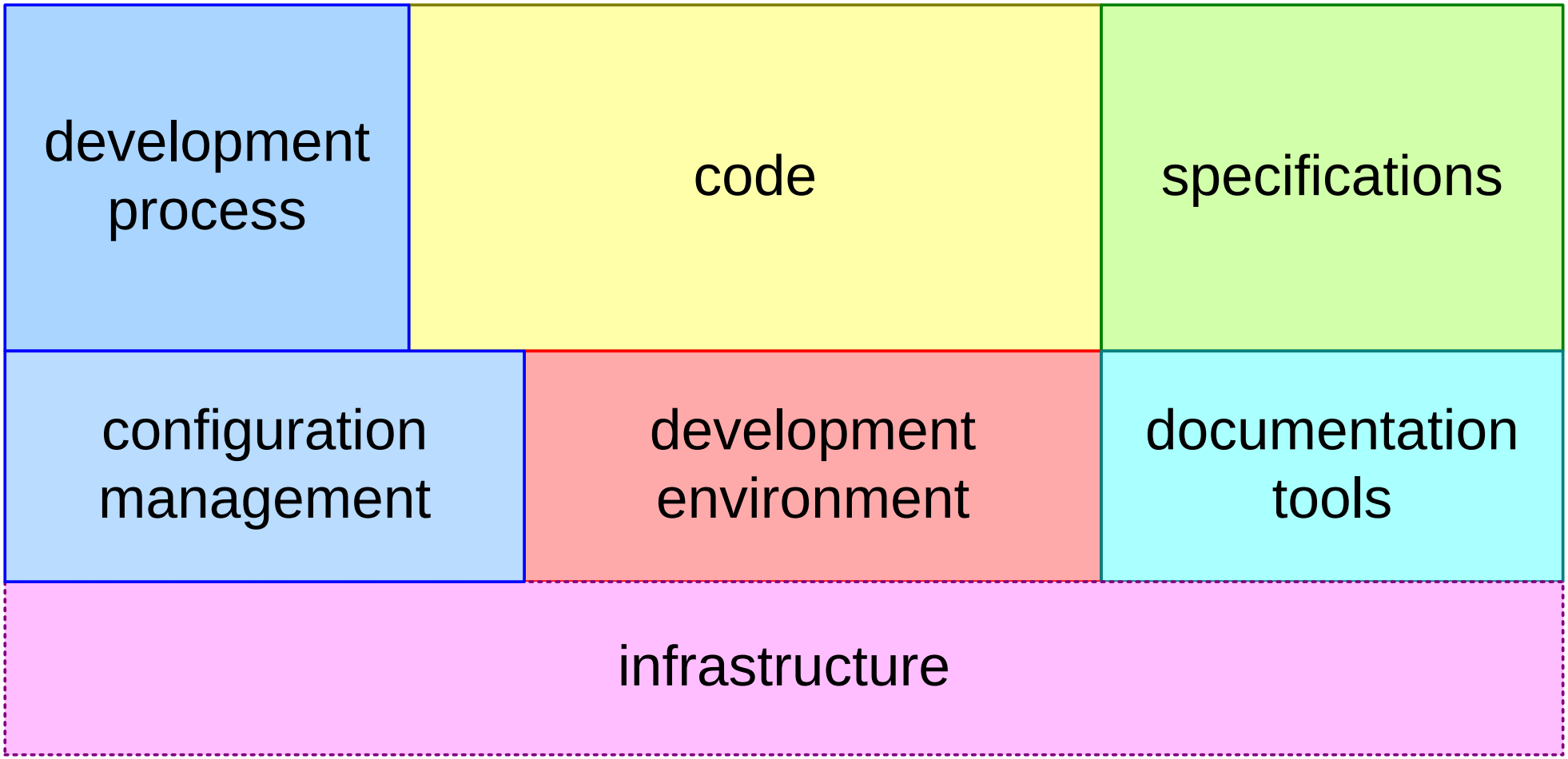
*huge product integration effort*
*very flexible*
*low coupling*
*configuration management???*

*no product integration effort*
*not flexible*
*high coupling*
*configuration management*

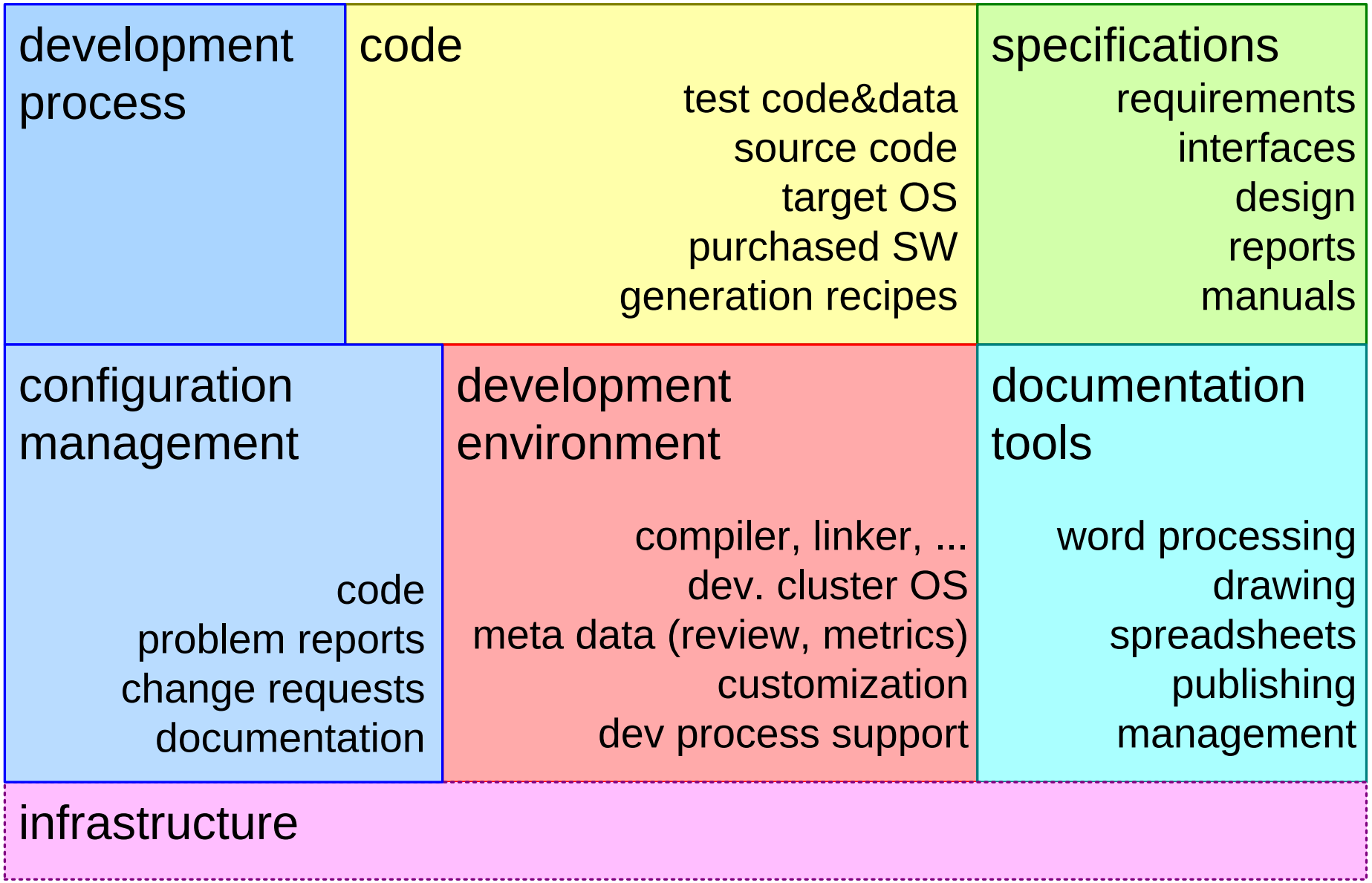


# Platform Source Deliverables



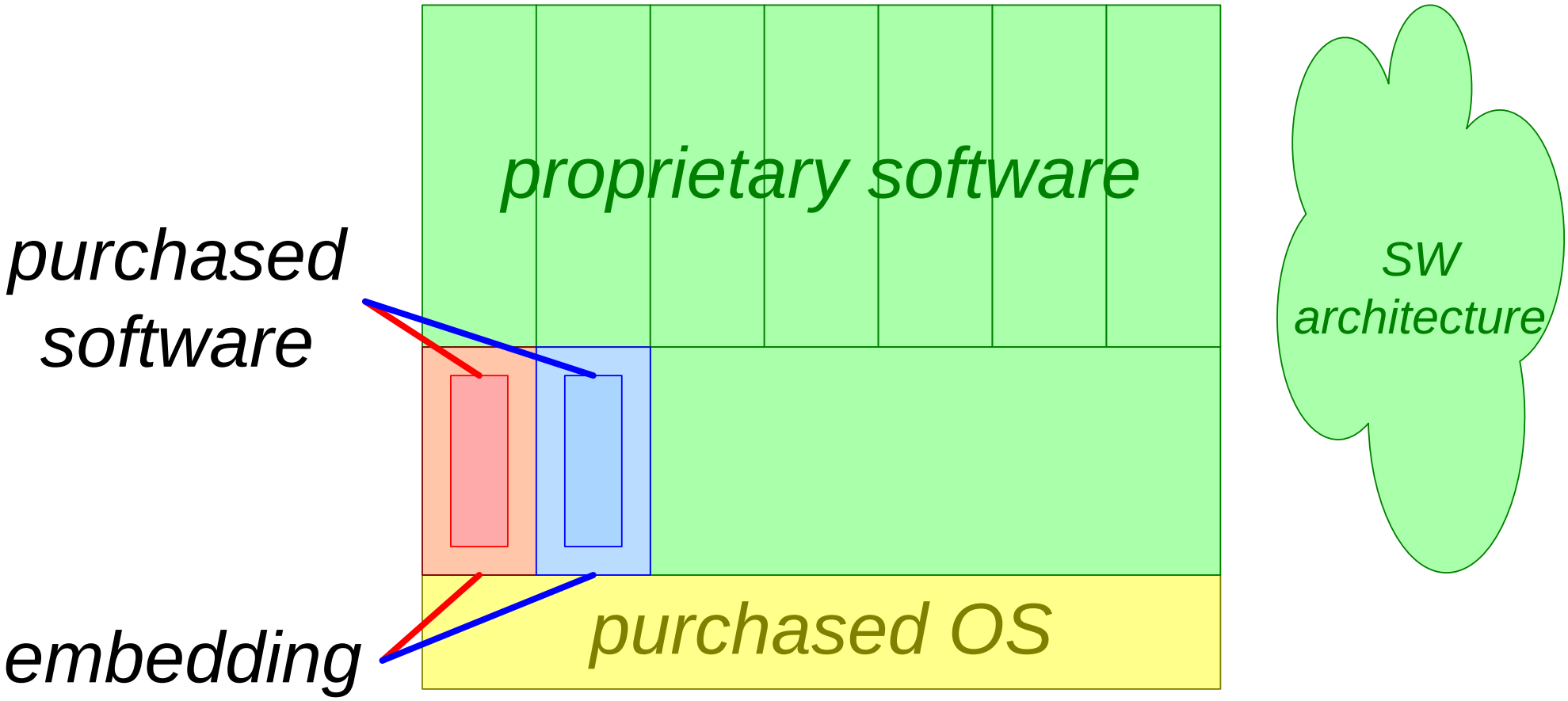
# And now in More Detail...



# Example of Platform Efficiency

| | | *1992* | *1993* | *1994* | *1995* | *1996* |
|---|---|---|---|---|---|---|
| *value metric* | applications | 1 | 4 | 8 | 16 | 32 |
| | number of inputs (a.o. modalities) | 1 | 5 | 10 | 15 | |
| *number of people* | platform | | | 35 | 37 | 38 |
| | applications | | | 27 | 35 | 41 |
| | total | | 52 | 62 | 72 | 79 |
| *efficiency* | people per application | | 13 | 8 | 5 | 3 |

# Purchased SW Requires Embedding



# Embedding Costs of Purchased SW

- Installation
- Configuration
- Customization
- Start up, shutdown
- Specifications
- Interface to application SW
- Exception handling
- Resource allocation and monitoring provision
- Resource tuning, see above
- Safety design
- Security design

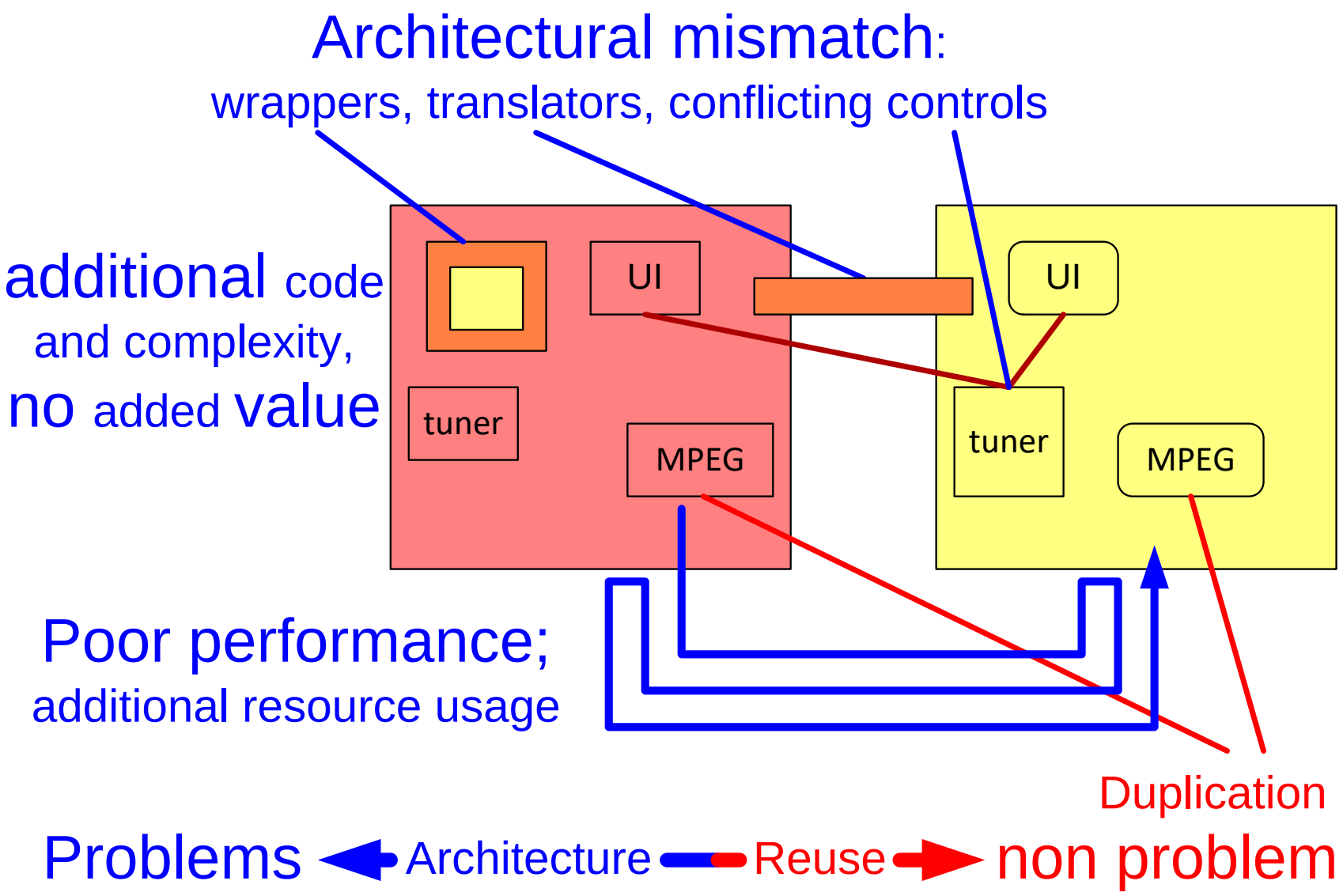
functional
system design
sw design

add semantics level
use of appropriate low level mechanisms
match to high level mechanisms:
- notification, scheduling
- job requests, subscriptions

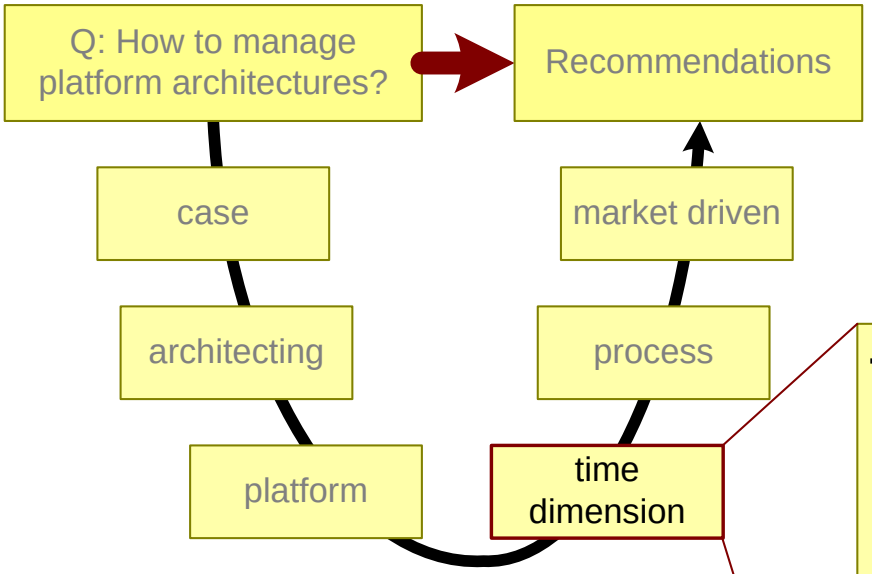
System monitor
Error propagation
Logging

CPU
Memory
Disk

# Example of Embedding Problems



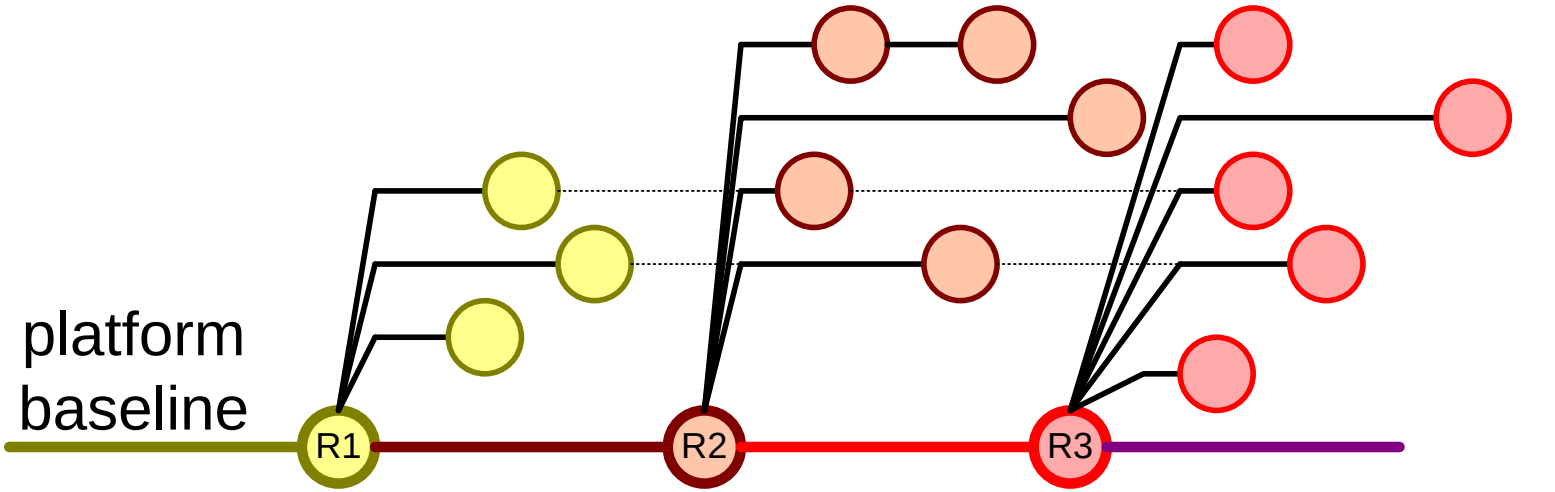
# Time Dimension Outline

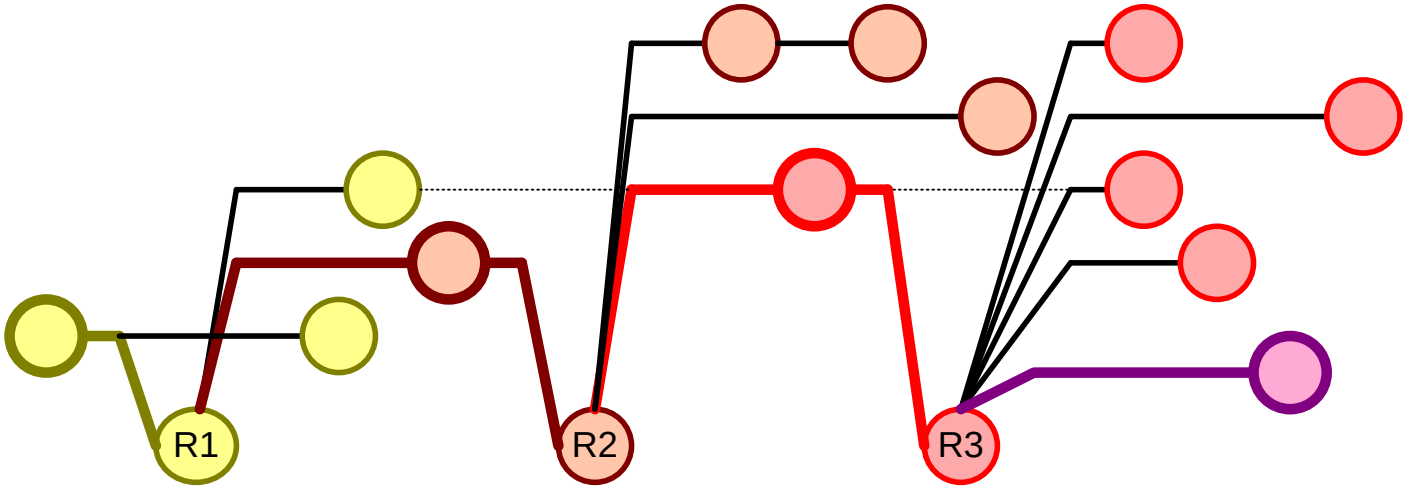



Time Dimension:

- Who is First: Platform or Product?
- Platform Stability
- The First Time Right?
- Evolution of Easyvision Platform
- Lifecycle Differences

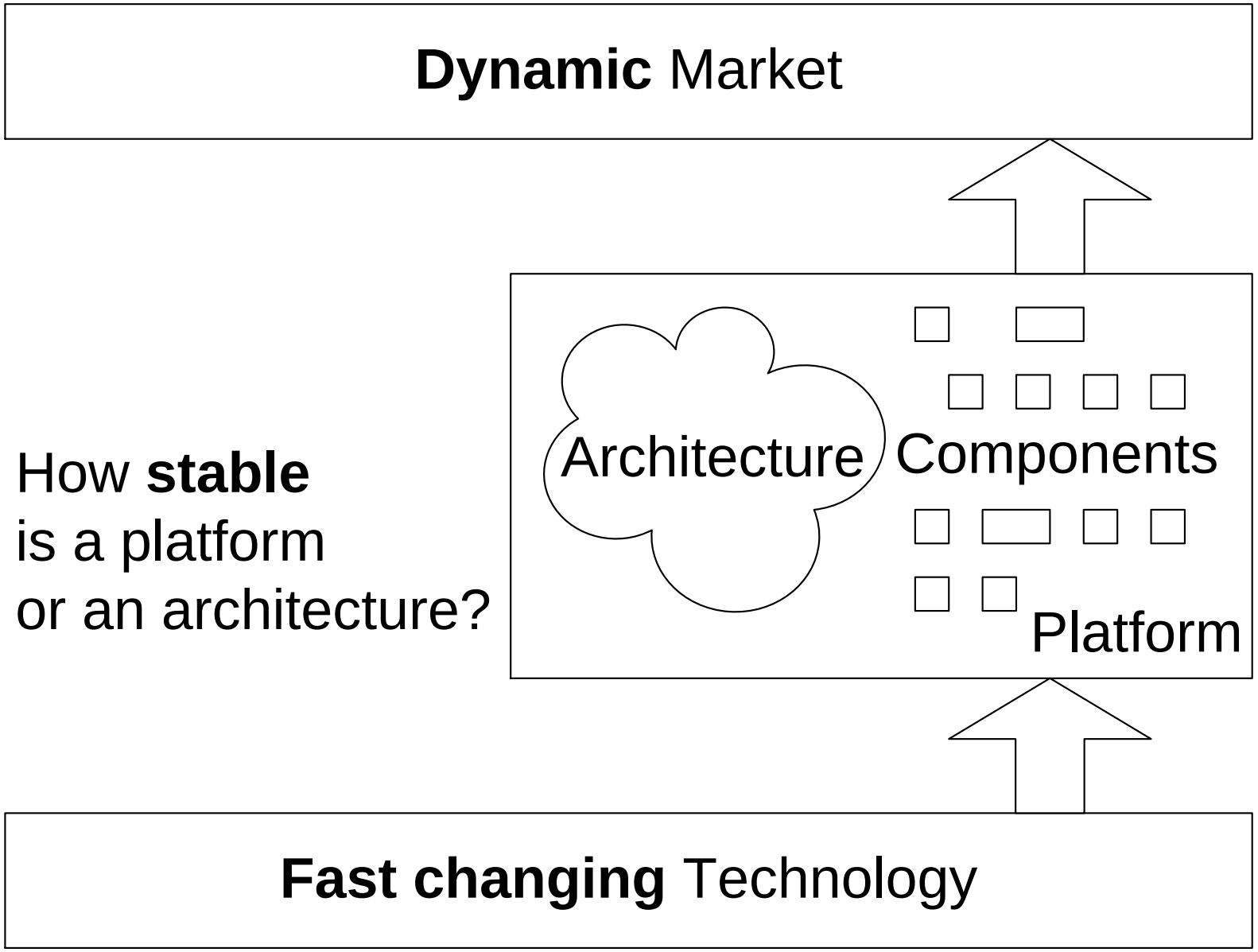
# Who is First: Platform or Product?



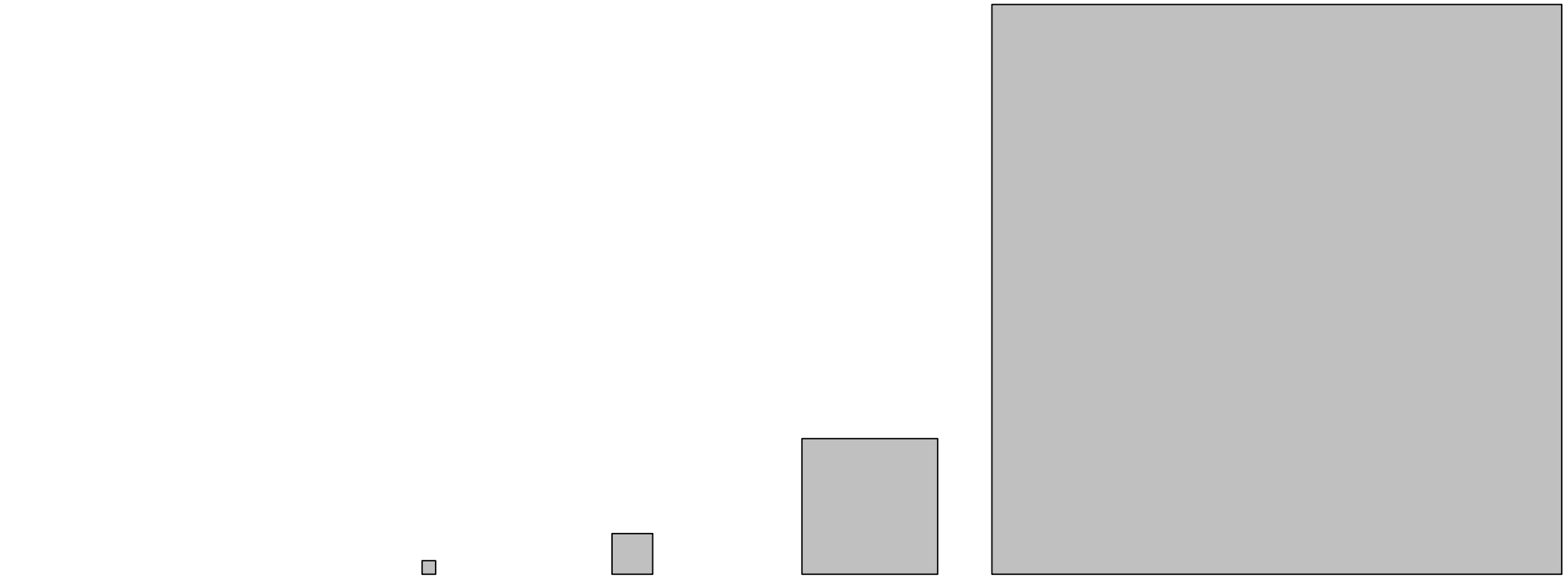




platform
as consolidation baseline

# Myth: Platforms are Stable

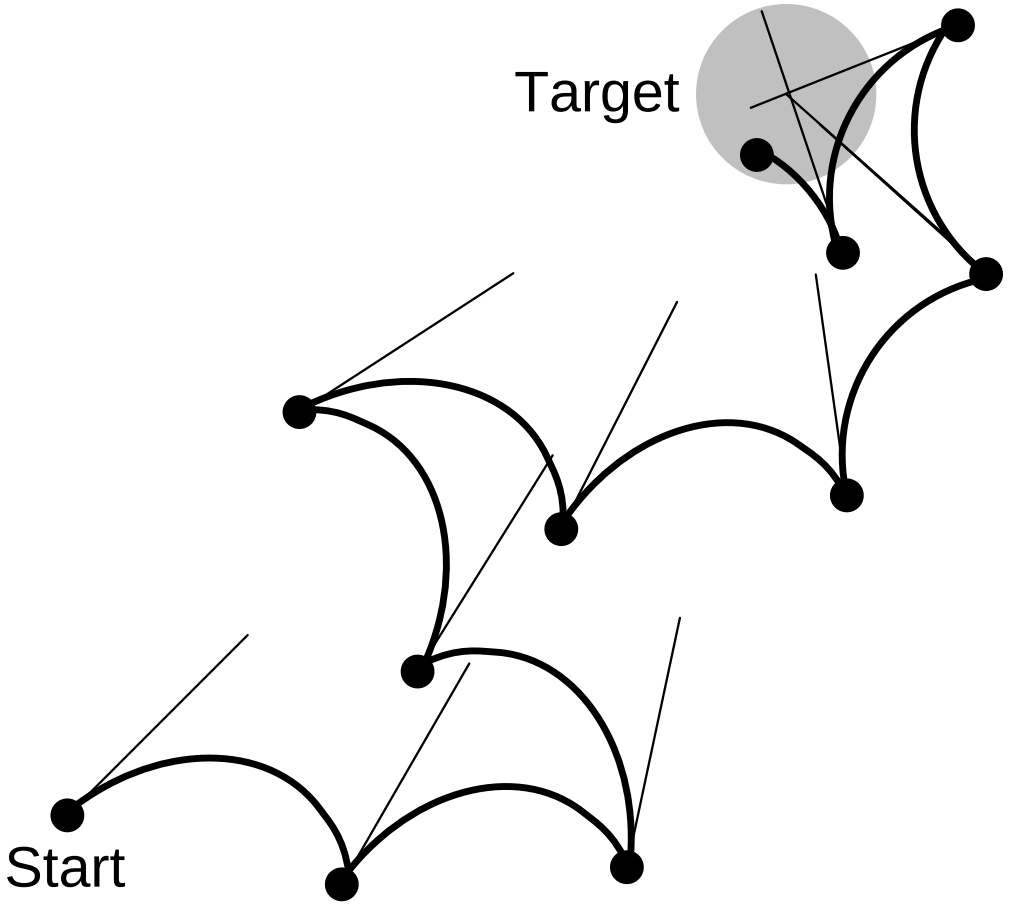


# The First Time Right?



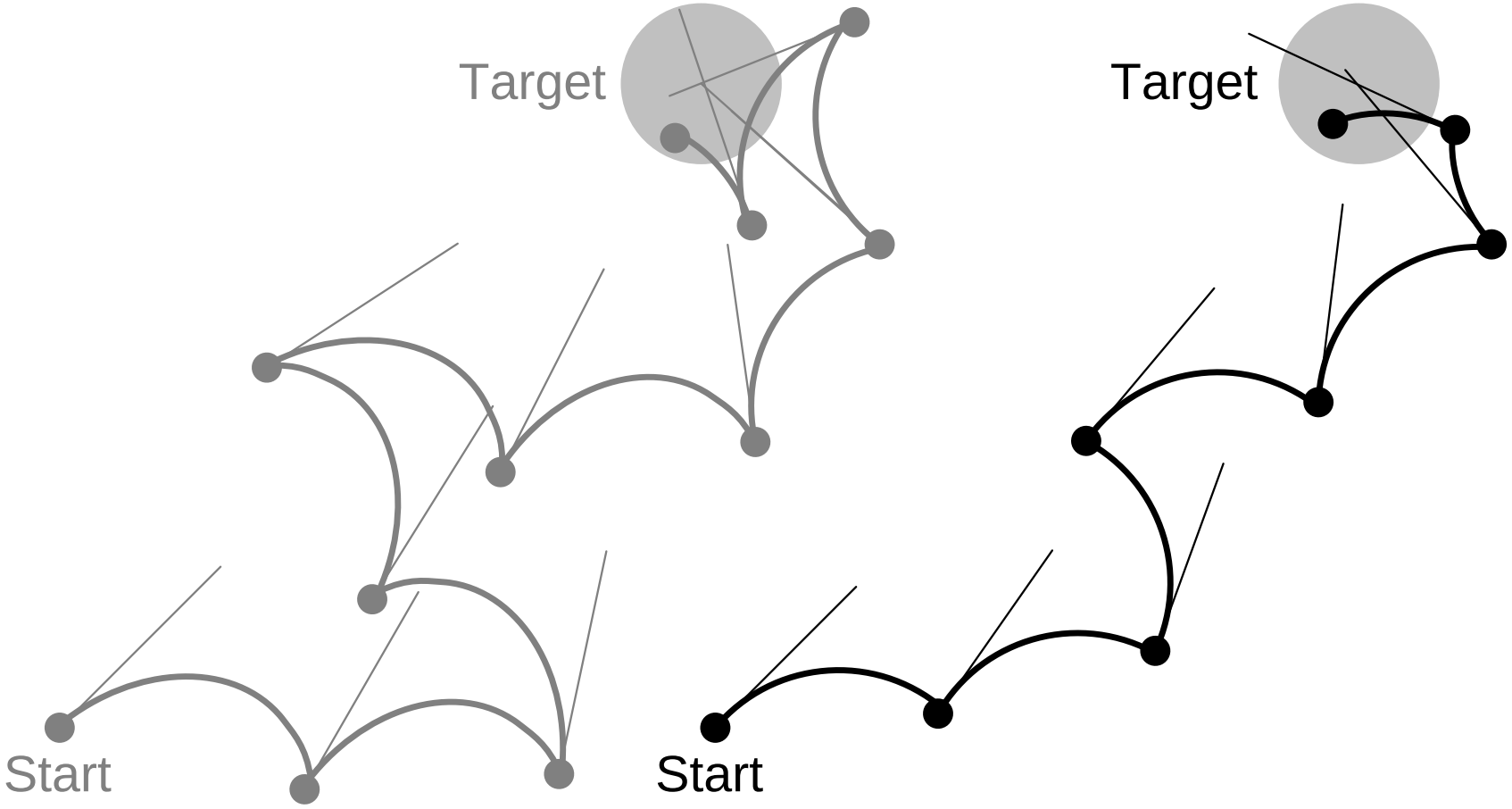
# Feedback

stepsize: 3 months
elapsed time: 25 months

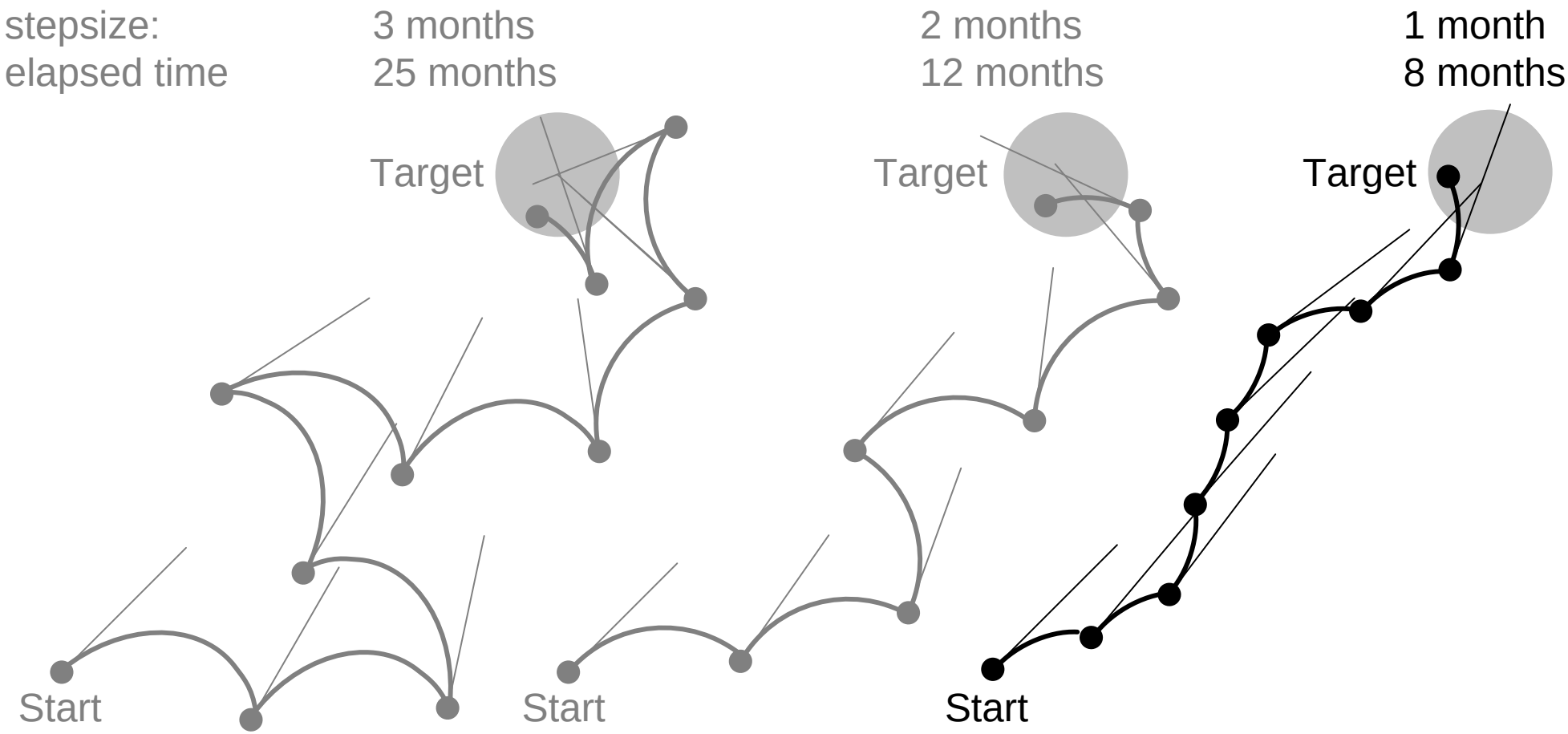


# Feedback (2)

stepsize: 3 months 2 months
elapsed time 25 months 12 months

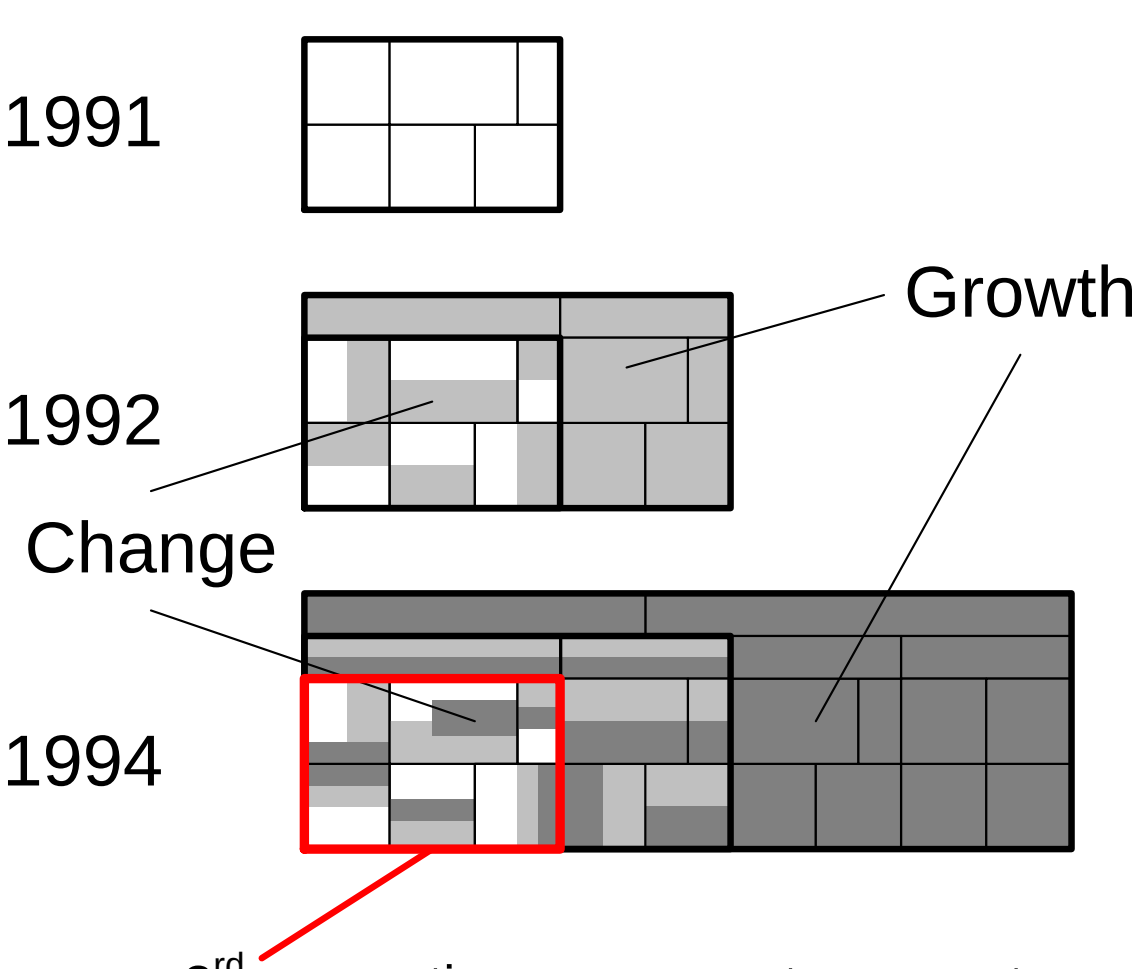


# Feedback (3)




Small feedback cycles result in Faster Time to Market

# Platform Evolution (Easyvision 1991-1996)




Last changed in:

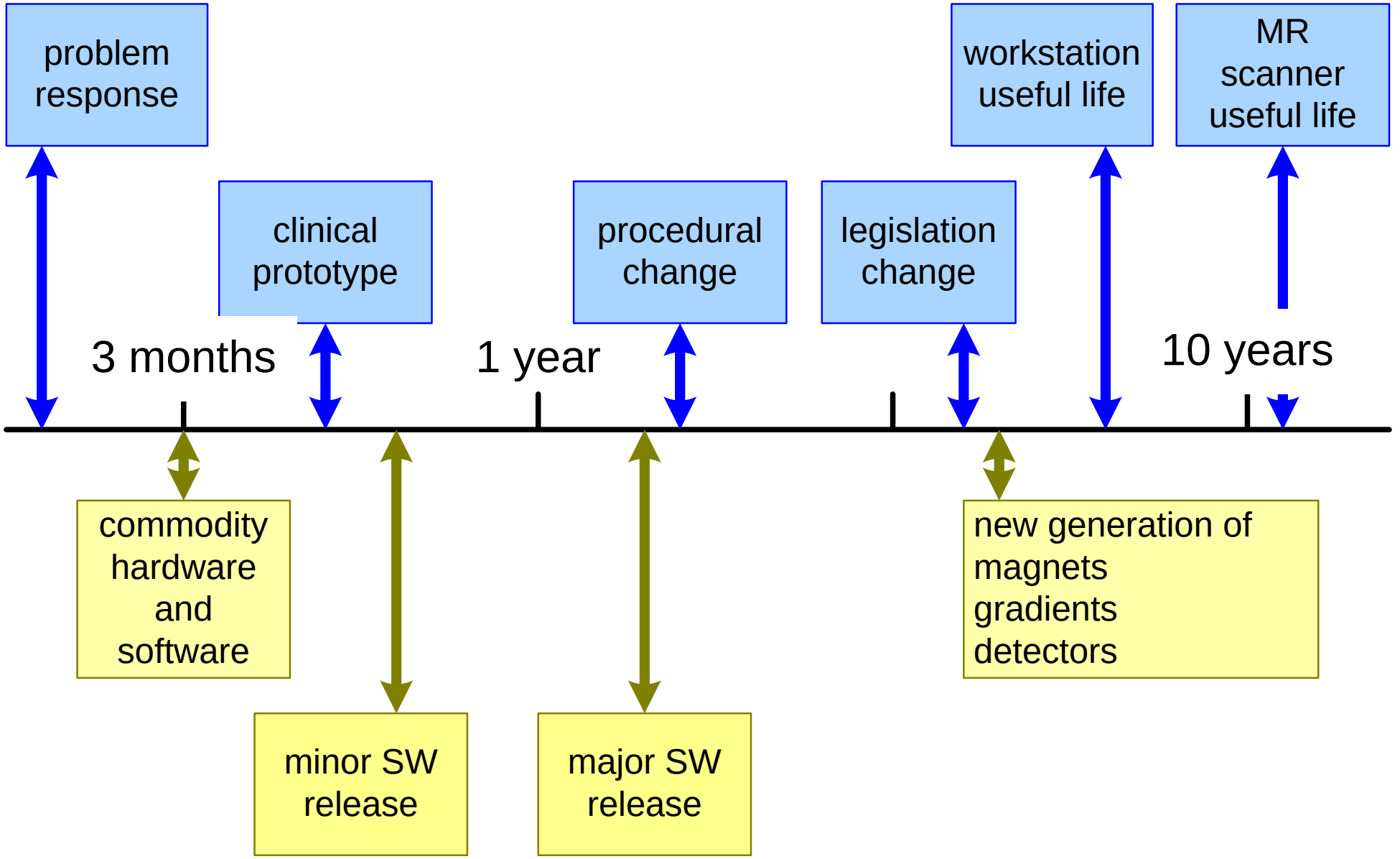
1991

1992

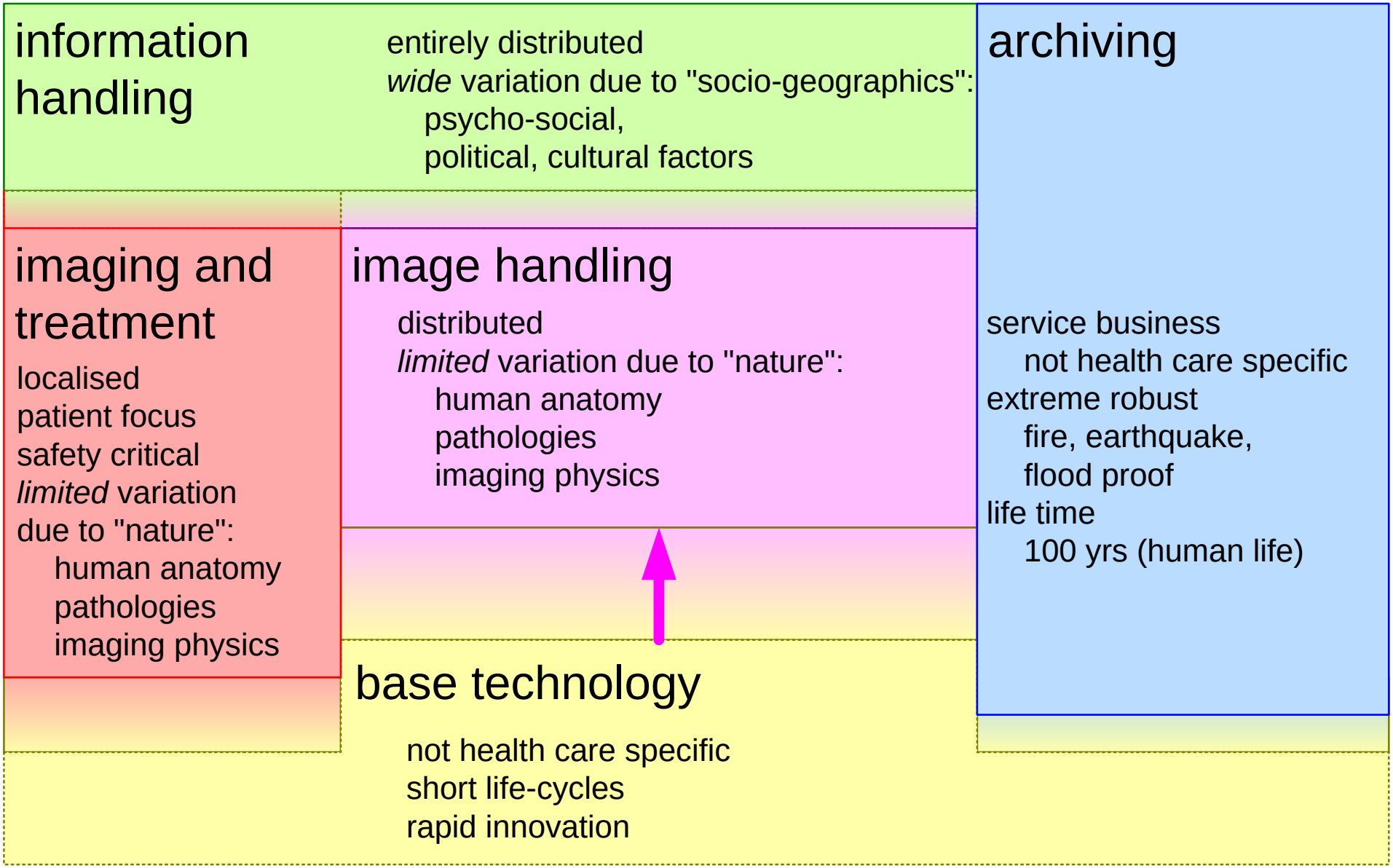
1994

3rd generation components are mature, active maintenance needed.
Growth and change continues, some "old" components become obsolete

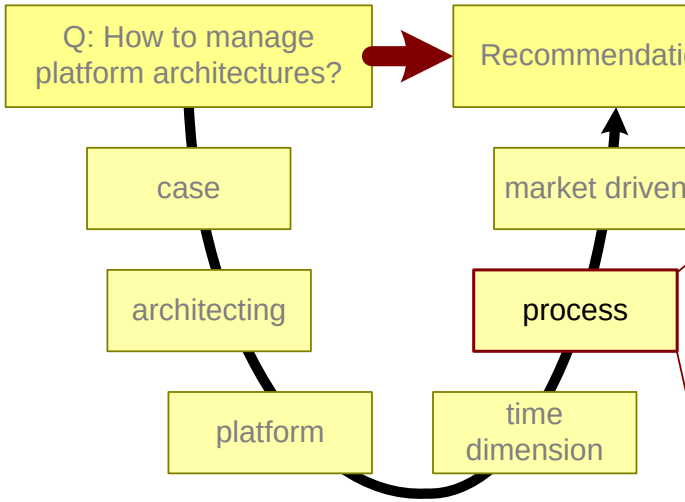
# Lifecycle Differences



# Reference Model for Healthcare Automation



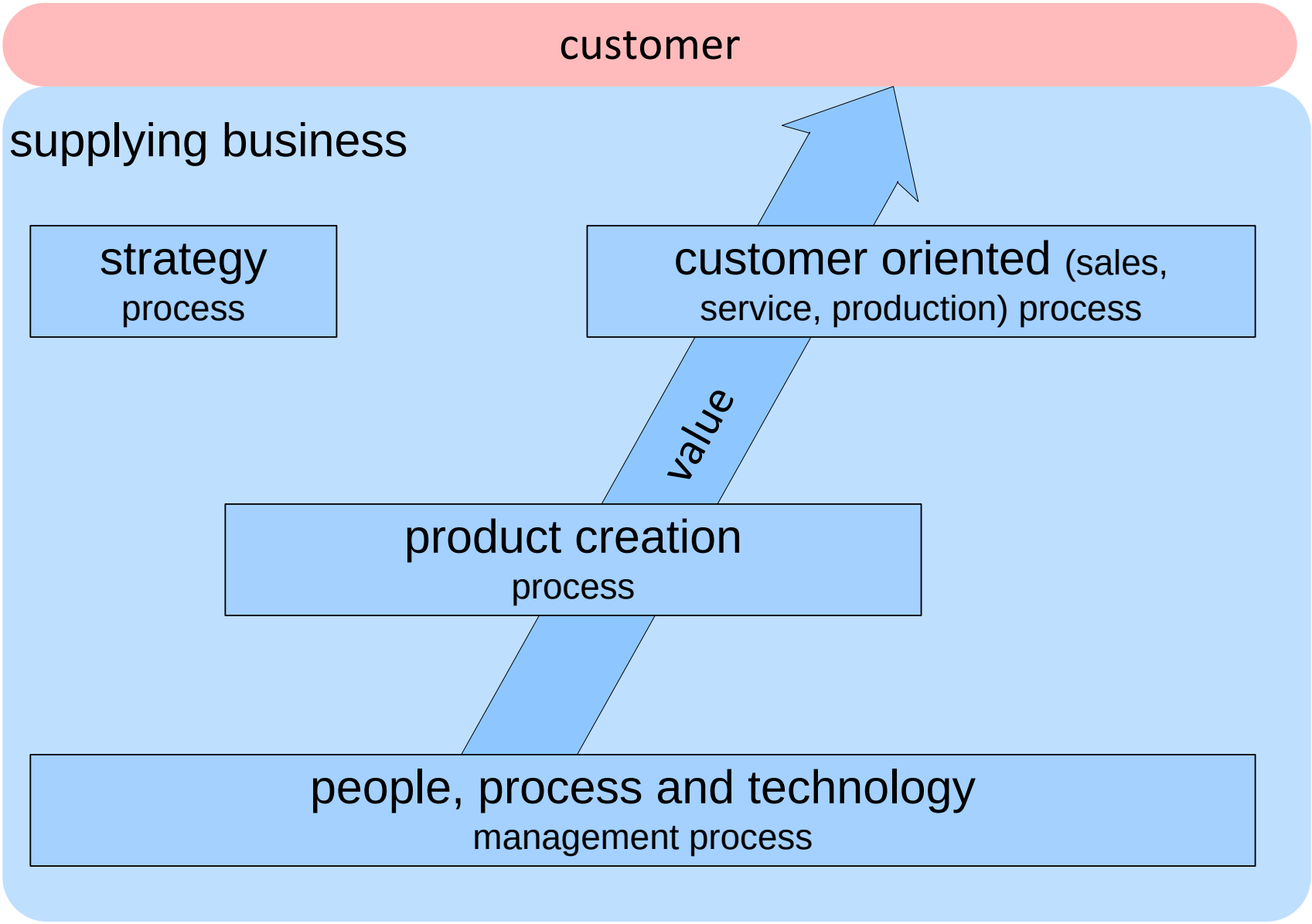
# Process View Outline



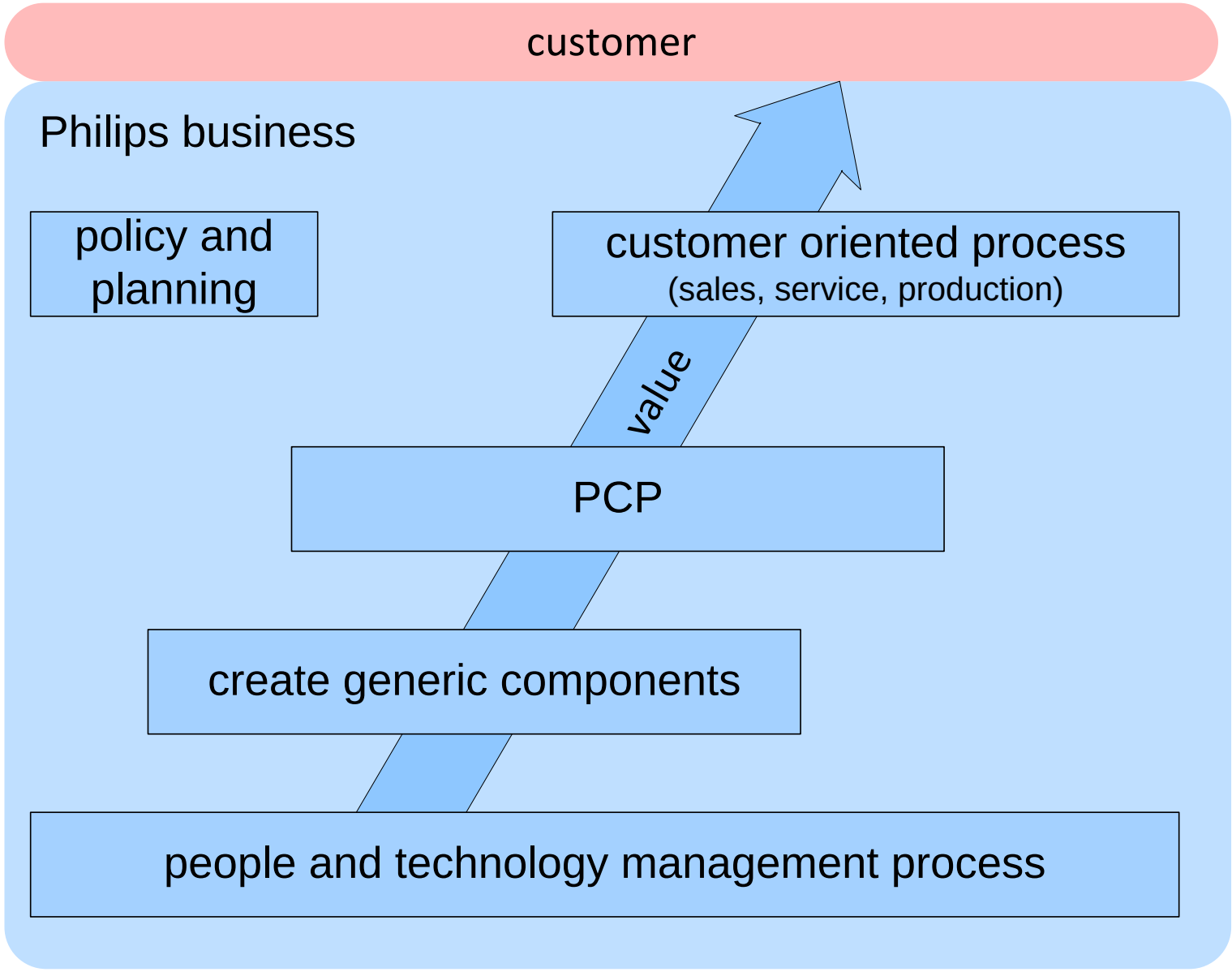

Process View:

- Simplified Process Decomposition
- Financial View on Process Decomposition
- Value and Feedback Flow
- Propagation Delay
- Sources of Failure
- Models for Generic Development

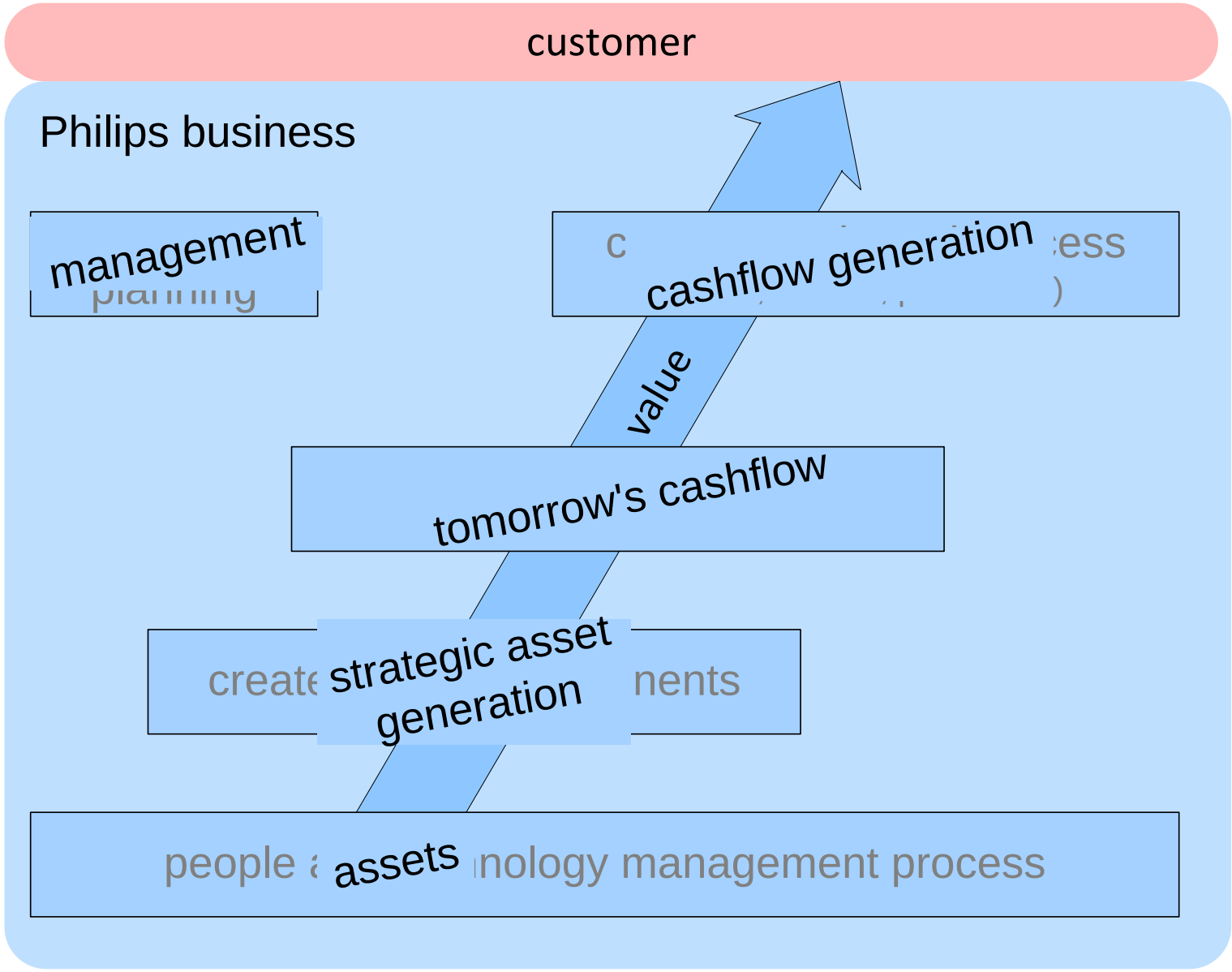
# Simplified Process Decomposition



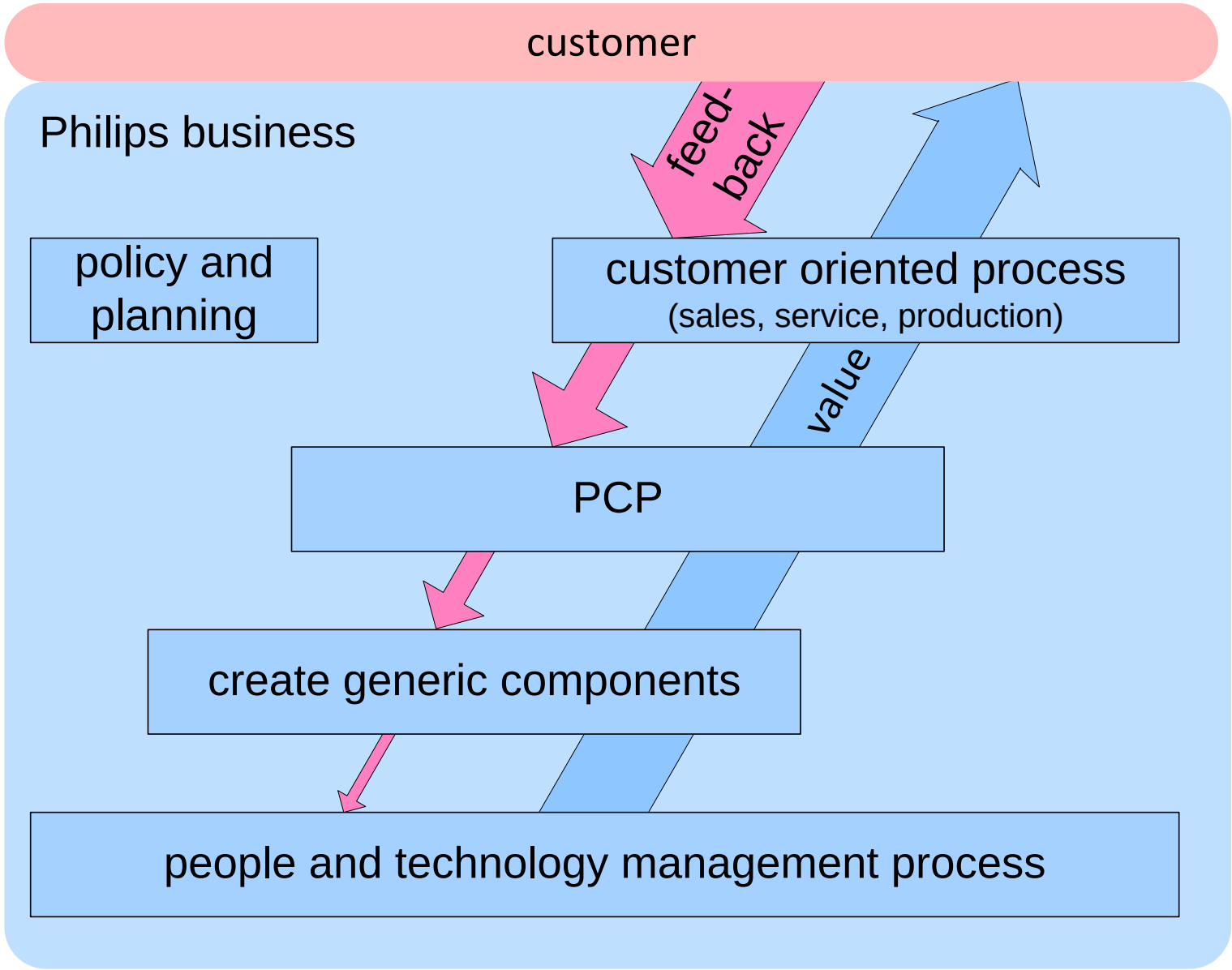
# Modified Simplified Process Decomposition



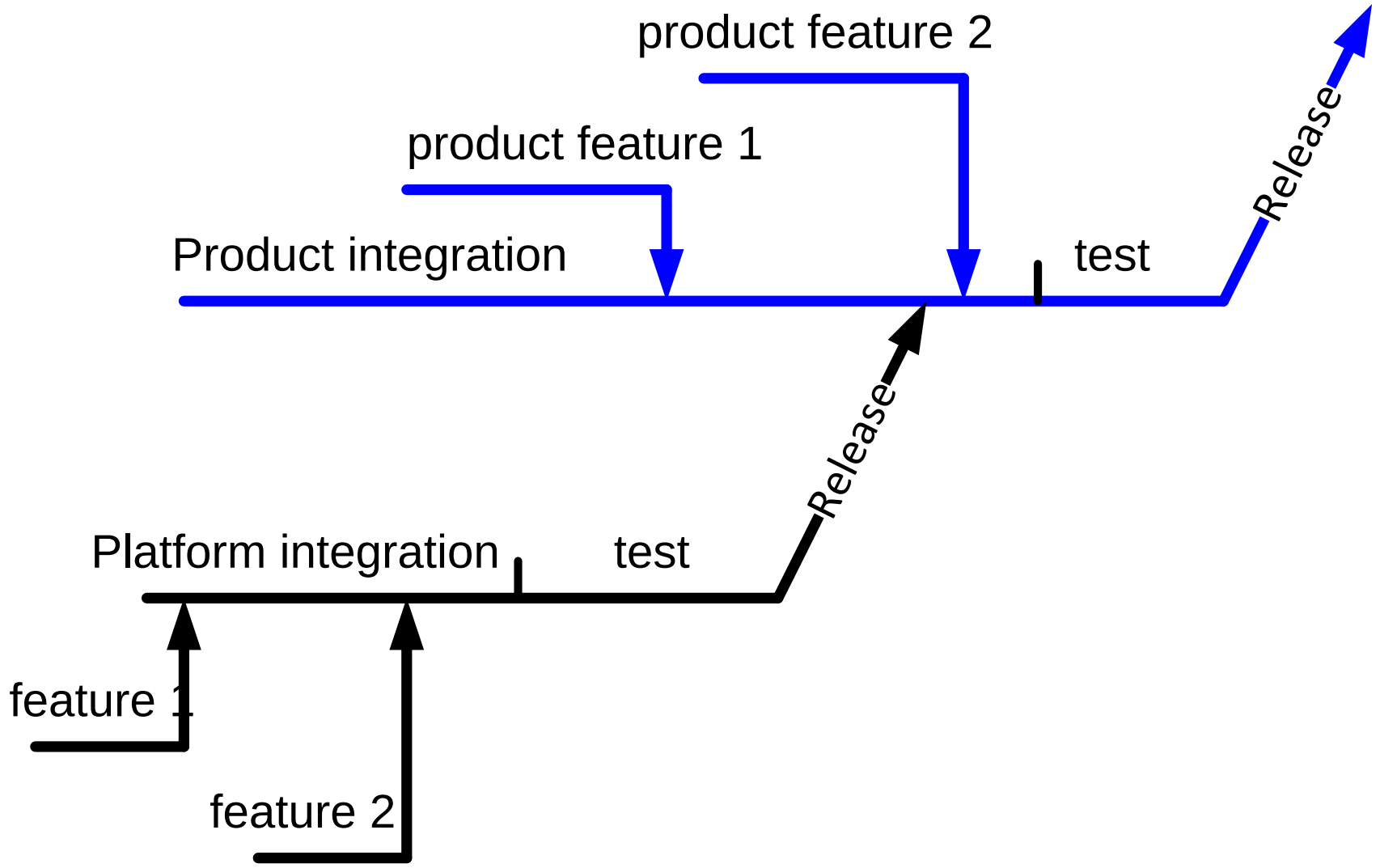
# Financial View on Process Decomposition



# Value and Feedback Flow



# Propagation Delay Platform Feature to Market



# Sources of Failure in Platform Developments

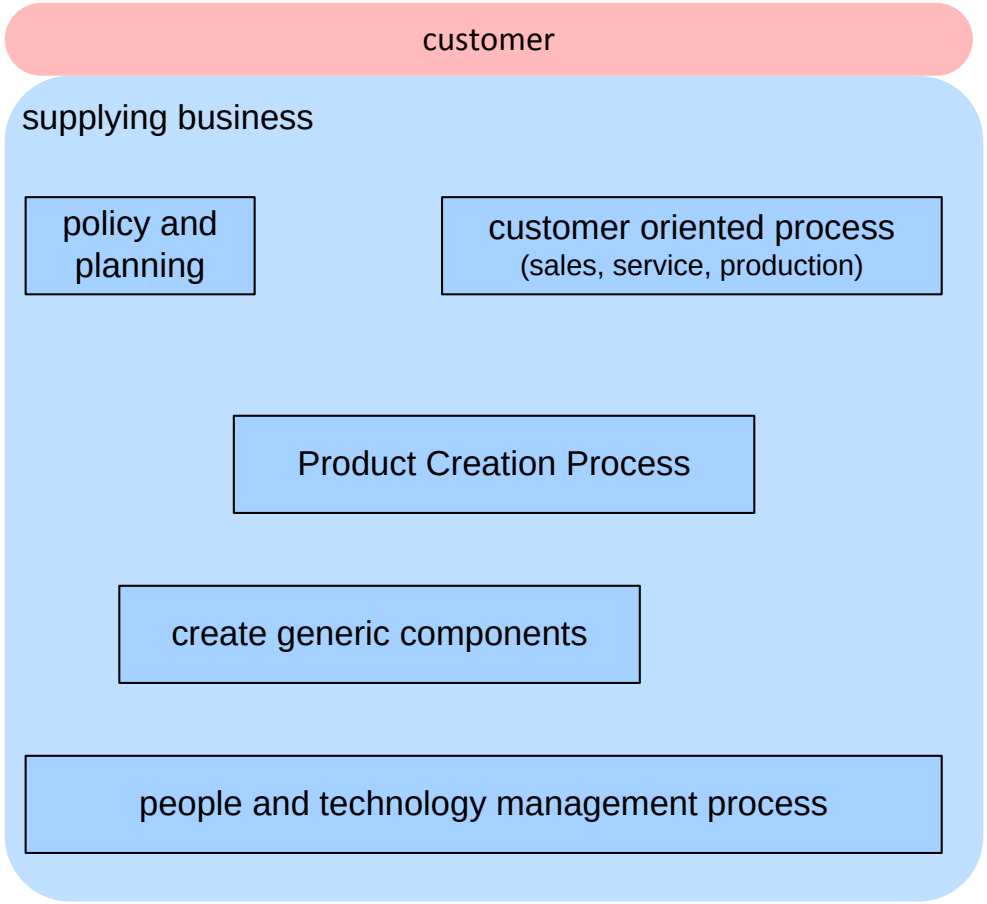
*Technical*

- Too generic
- Innovation stops (stable interfaces)
- Vulnerability

*Process/People/Organization*

- Forced cooperation
- Time platform feature to market
- Unrealistic expectations
- Distance platform developer to customer
- No marketing ownership
- Bureaucratic process (no flexibility)
- New employees, knowledge dilution
- Underestimation of platform support
- Overstretching of product scope
- Nonmanagement, organizational scope increase
- Underestimation of integration
- Component/platform determines business policy
- Subcritical investment

# Models for Platform Development



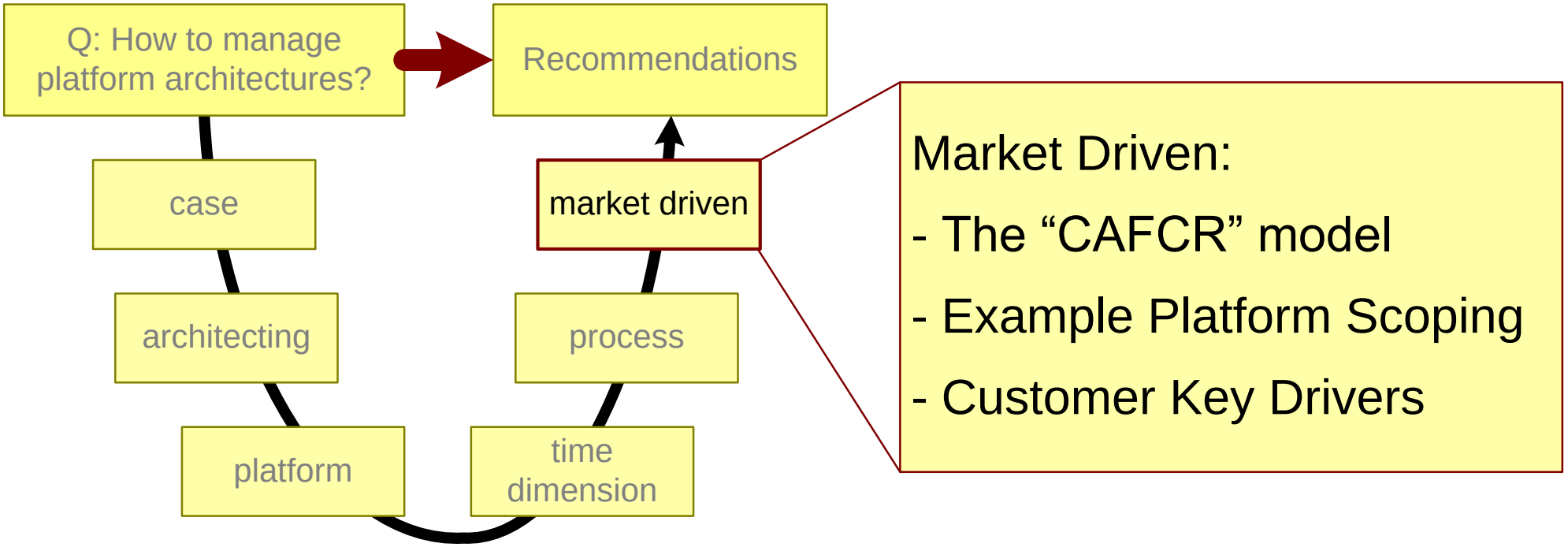

lead customer — direct feedback, too specific?

carrier product — product feedback, product specific?

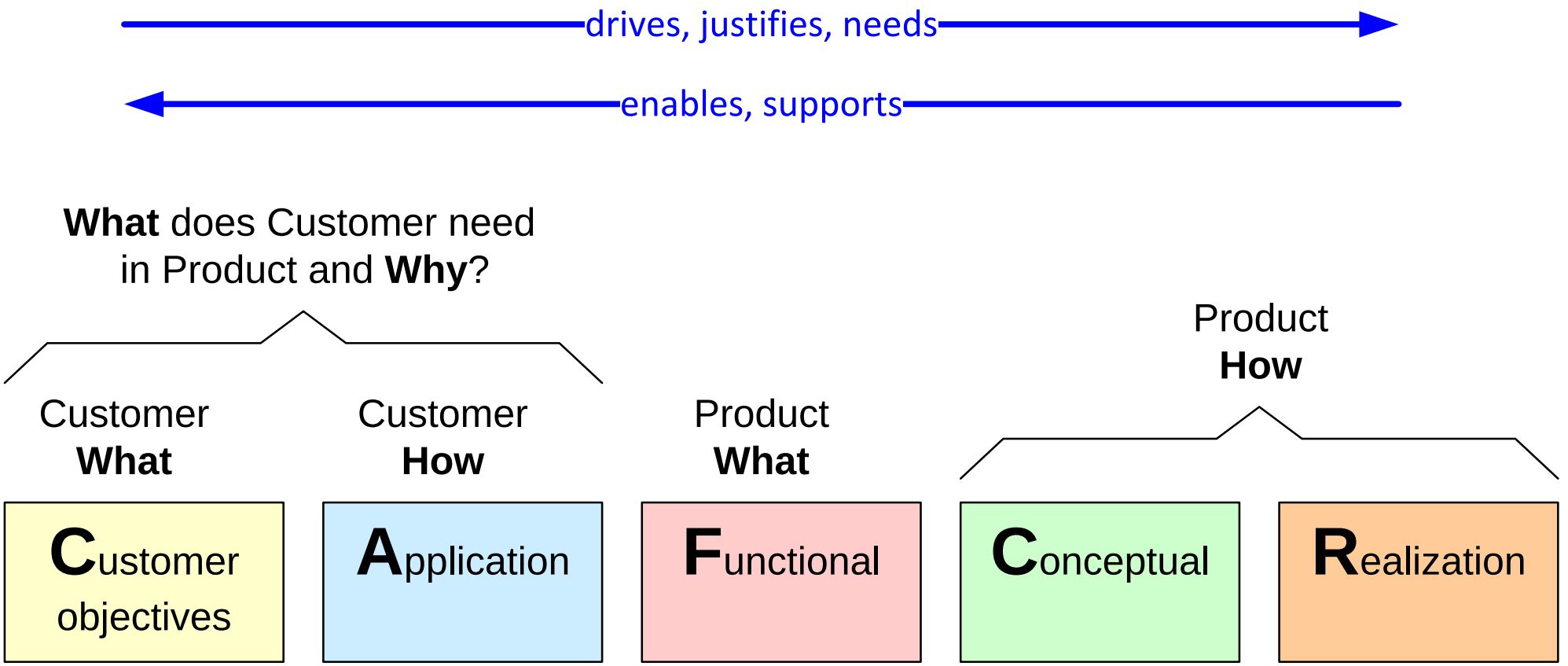
platform — feedback problem, too generic

technology push — no feedback

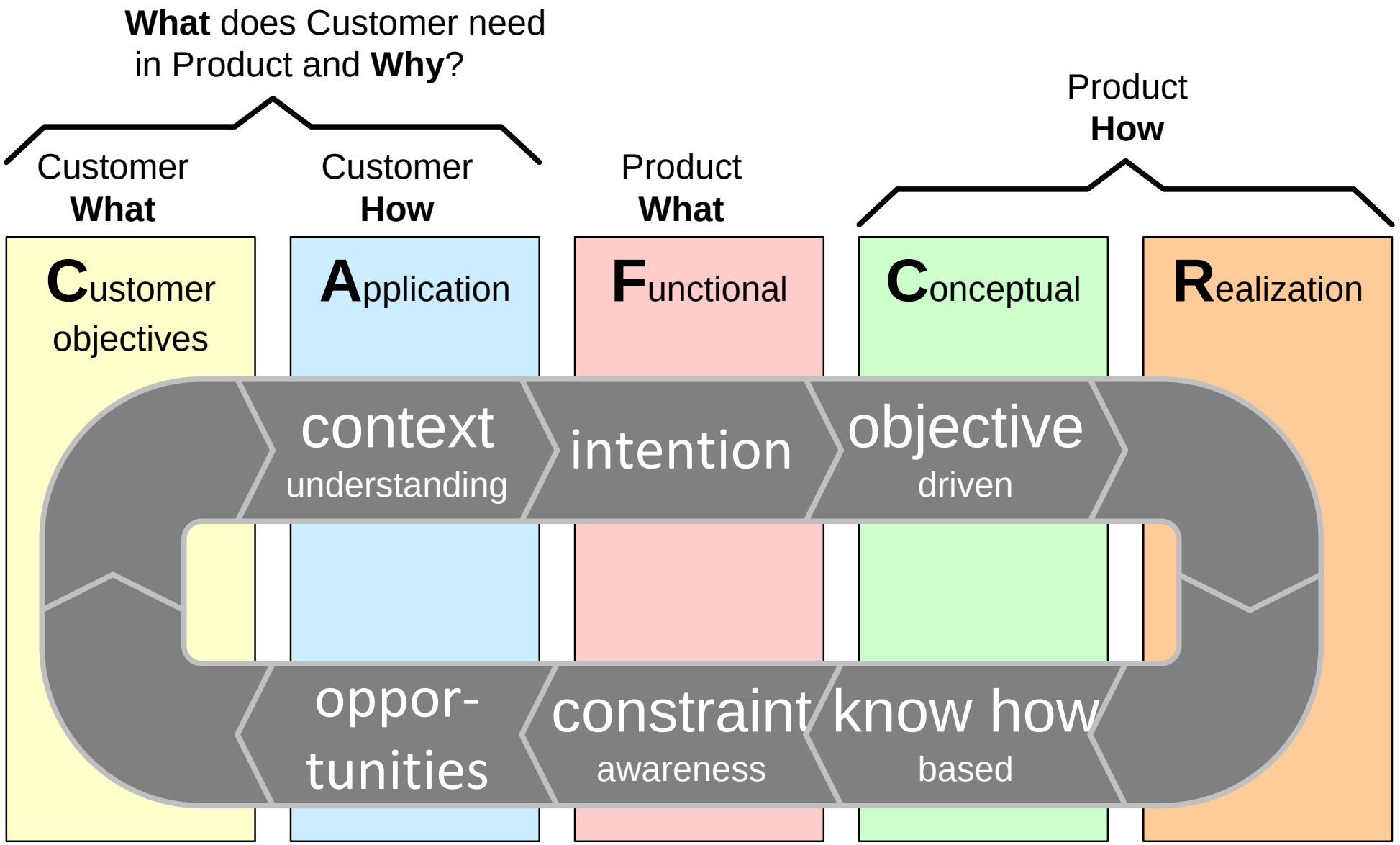
# Market Driven Outline



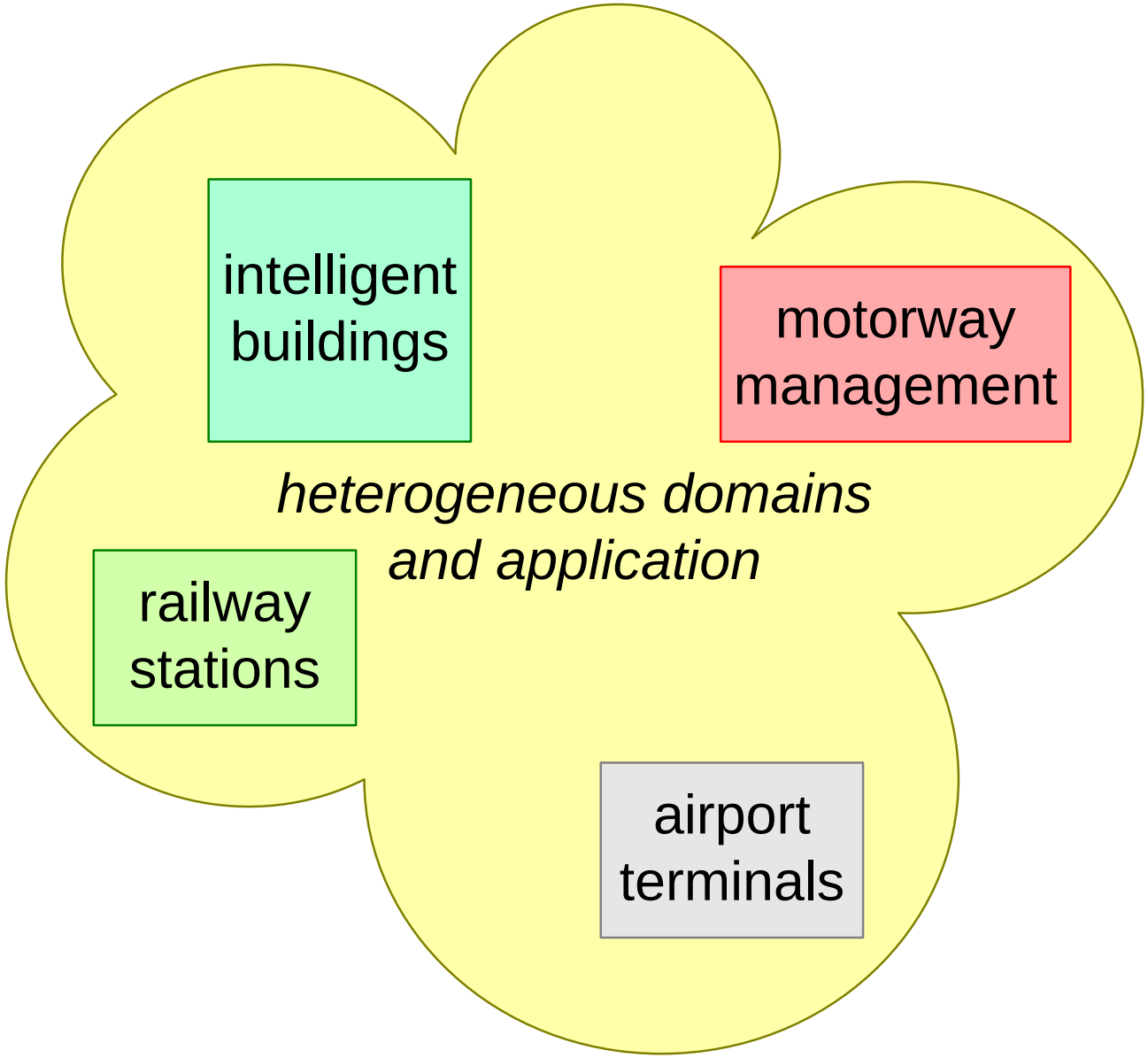
# The “CAFCR” model



# Five viewpoints for an architecture



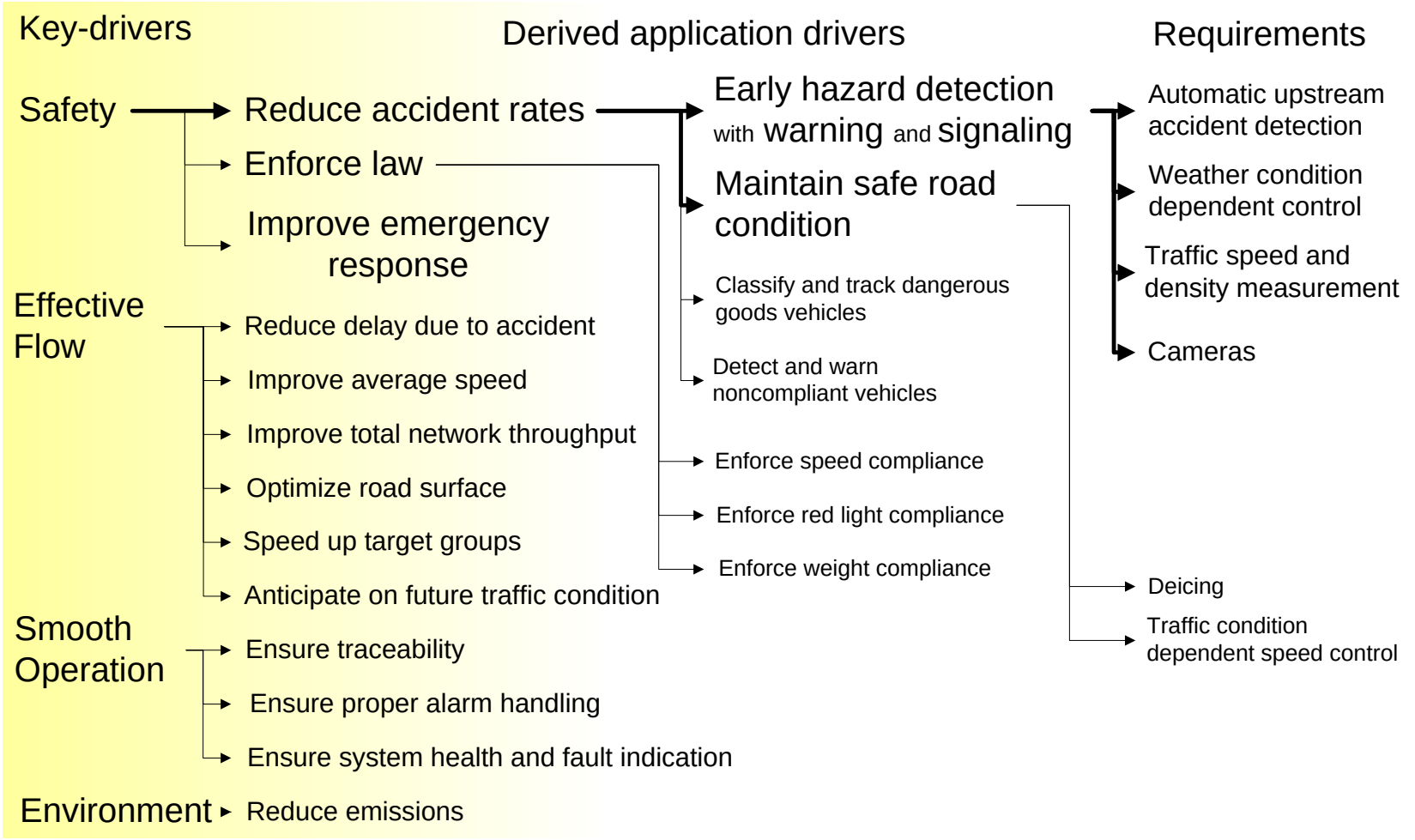
# Example Platform Scoping




*shared core technology*

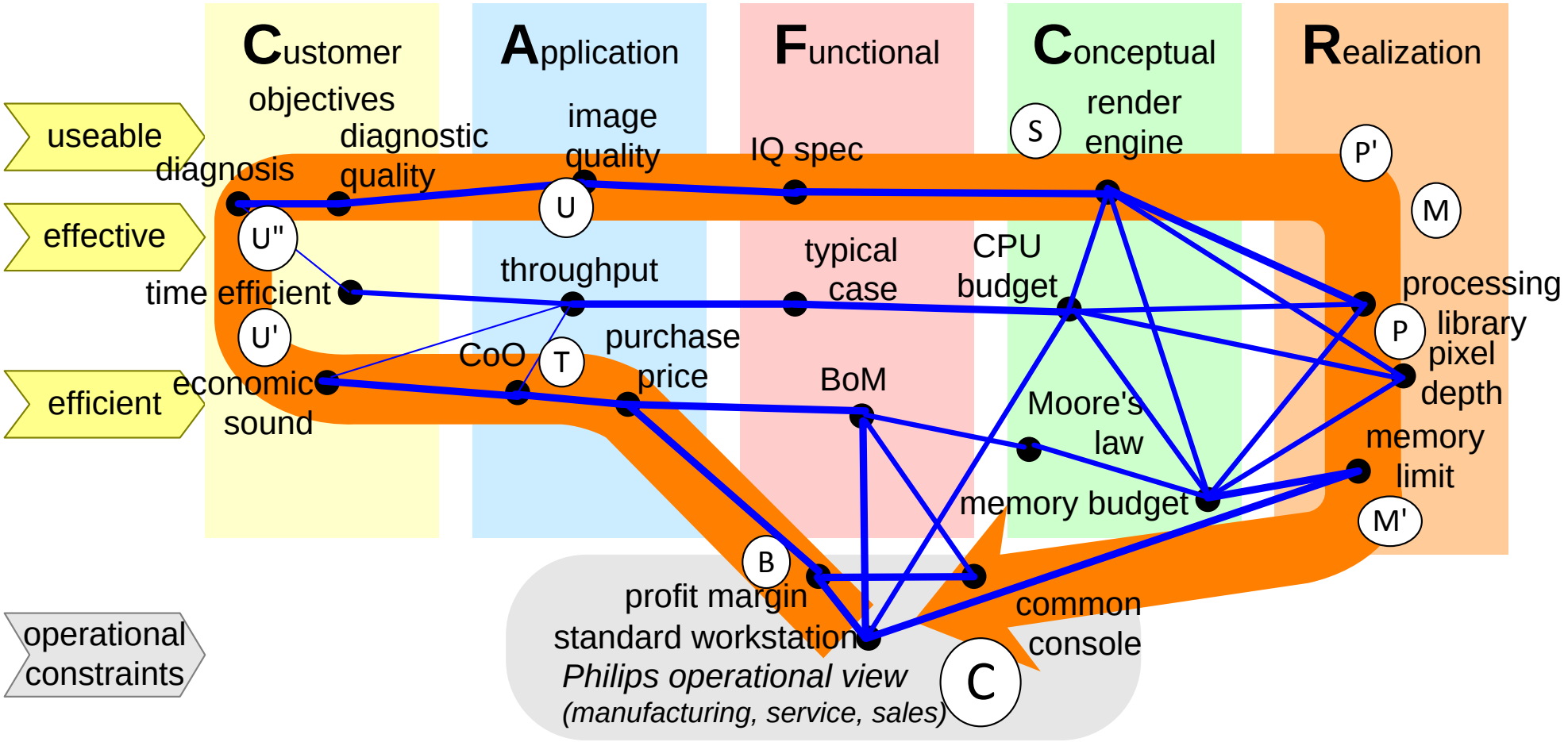
- Closed Circuit TV
- audio broadcasting
- access control
- networking

# Customer Key Drivers Motorway Management




*Note: the graph is only partially elaborated for application drivers and requirements*

# Finally All Design Decisions are Related to Market




cost revisited in context of clinical needs and realization constraints; note: original threads are significantly simplified

# Recommendations