Architecture and Design Fundamentals

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Abstract

Defining and illustrating architectures. Architectures go beyond system structure (parts, interfaces, fucntions, allocation). Architectures connect design to the context, by capturing customer value proposition, and the business proposition.
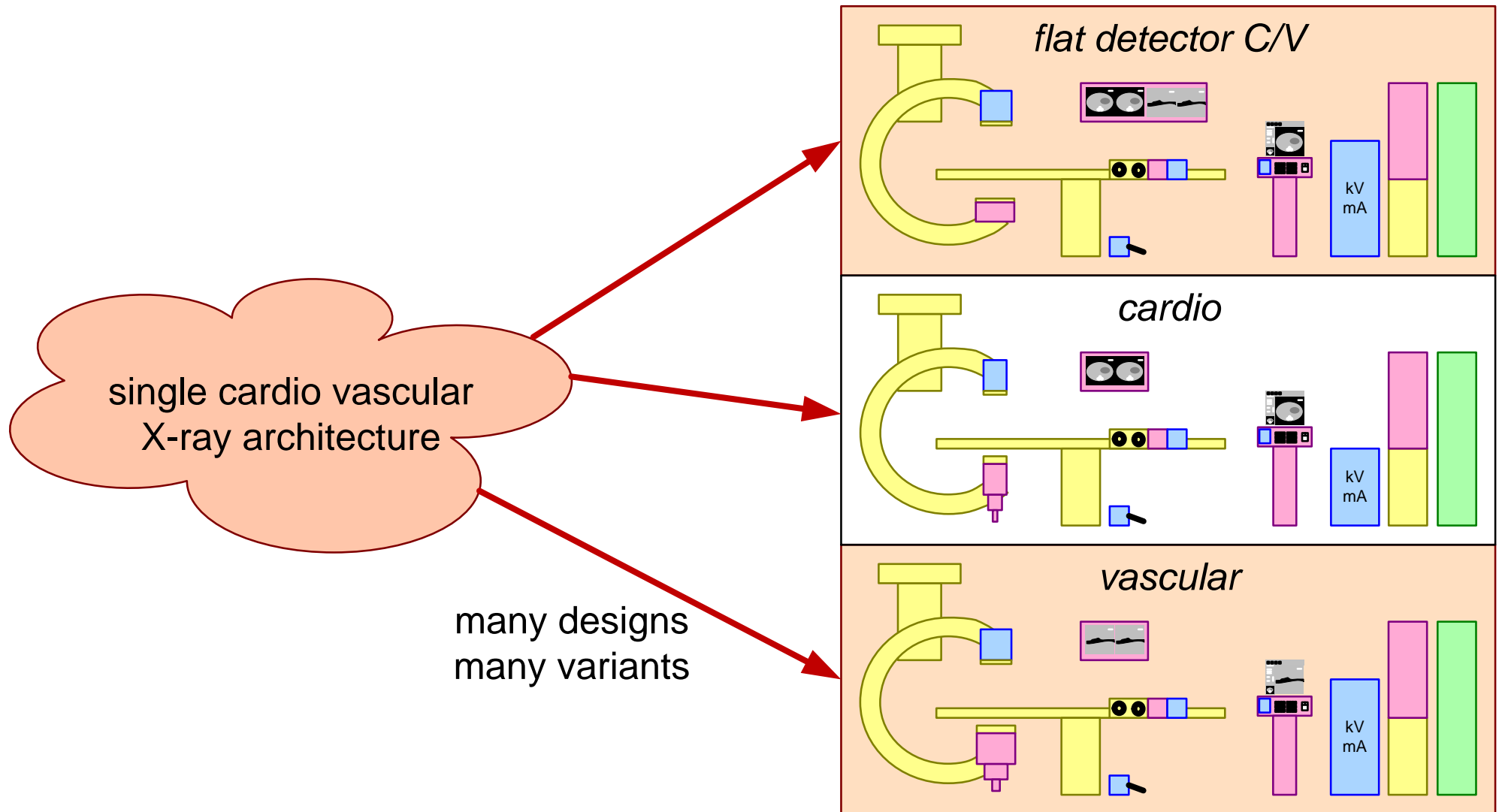
August 21, 2020
status: planned
version: 0

One Architecture Facilitates many Solutions

single cardio vascular
X-ray architecture

many designs
many variants

flat detector C/V

cardio

vascular

kV
mA

Architecture Description

Value Proposition
Why does customer want to buy?
Why do users like to use the system?
customer key drivers
cost of ownership
customer business analysis
customer stakeholders and concerns
work flow or ConOps
et cetera

Business Proposition
How do we earn money?
How do we run a healthy business?
life cycle key drivers
business model
cash flow analysis
life cycle stakeholders and concerns
life cycle model
supply chain

Why

System Specification
What does customer get?
What is the system-of-interest that we deliver?
functions
qualities (e.g. quantified performance)
interfaces
constraints, standards, regulations

What

Design
How will we realize this specification?
How do we ensure performance, safety, robustness, etc.?
partitioning and interfaces
dynamic behavior, e.g. functional model
performance models and budgets
concept and technology selection

Engineering
Getting all details right for all business functions.
technical product documentation

How

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ADFarchitecture

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Functional Model for System Creation

stakeholder needs →

business objectives →

architecting

specification

design

architecture
guidelines
top-level design
rationale

design
partitioning
interfaces
functions
allocation

engineering

documentation
system and parts data
procedures

procurement

production

installation

quality assurance

lifecycle support
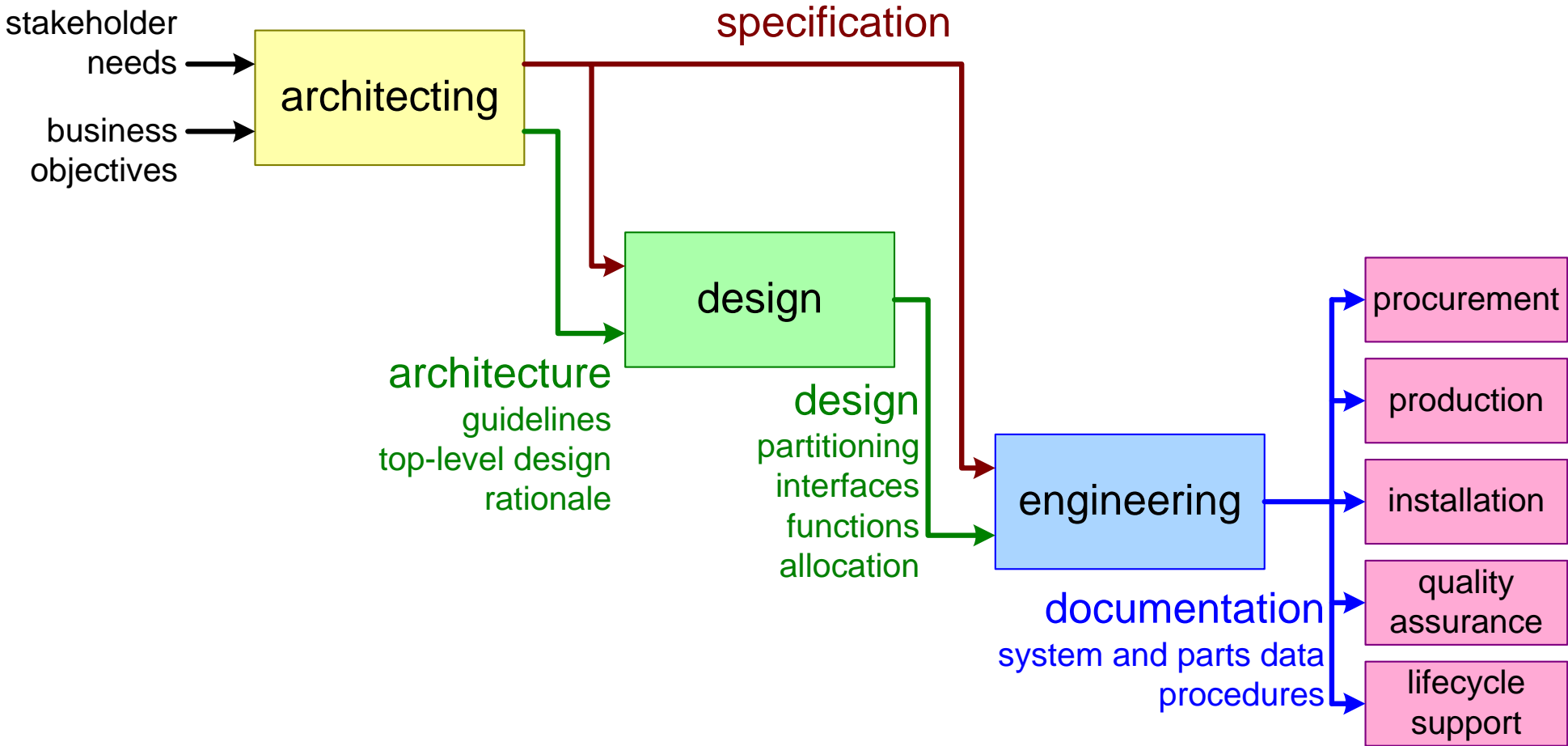
Structure = Parts + Interfaces + Configuration

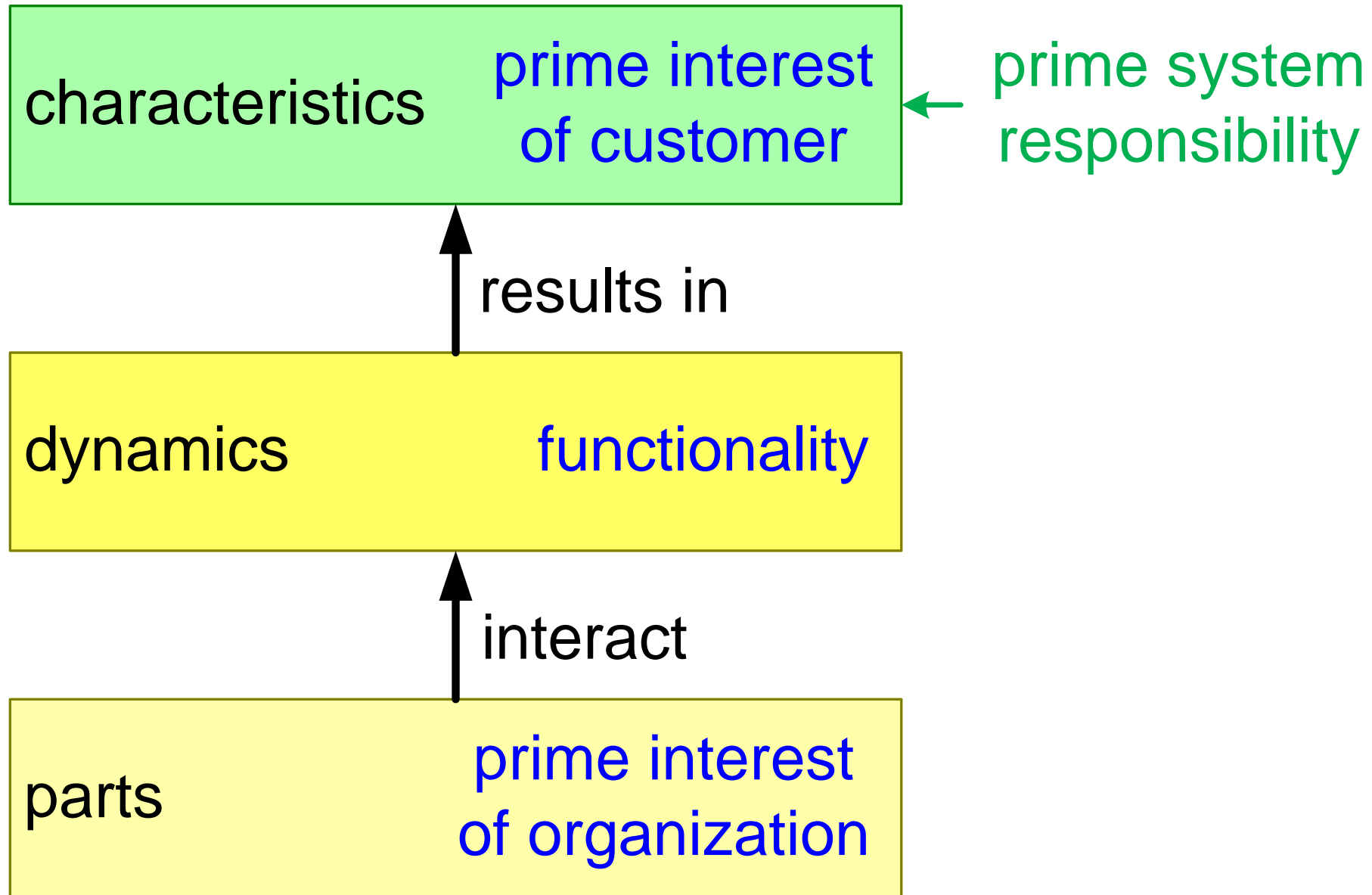| *ultimate goal:*	*to facilitate:*
• modular component catalogue	• fast creation of solutions
• well-defined interfaces	• concurrent engineering
• independent testable	• logistics and production
	• variations and changes

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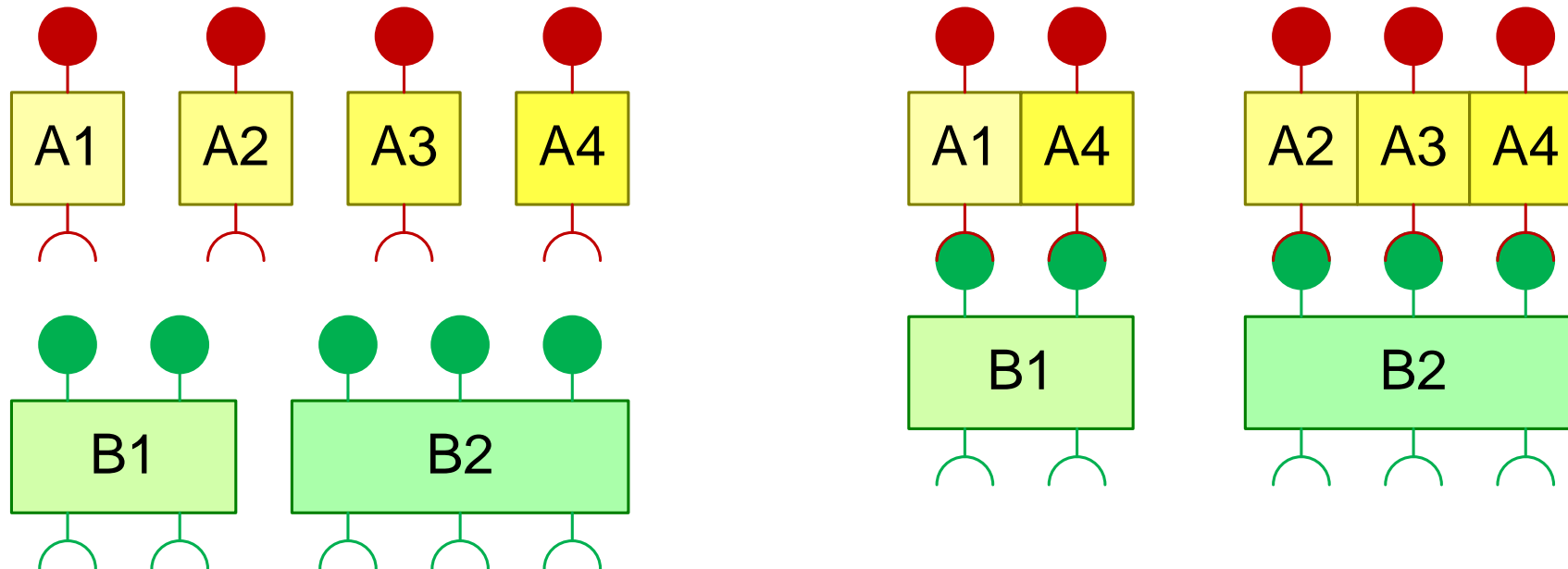
Designing Desired Qualities and Behavior

- How do parts interact to create desired dynamic behavior?

  - allocate functions

- How do desired qualities and performance emerge from the interaction?

  - dimension and configure parts and functions
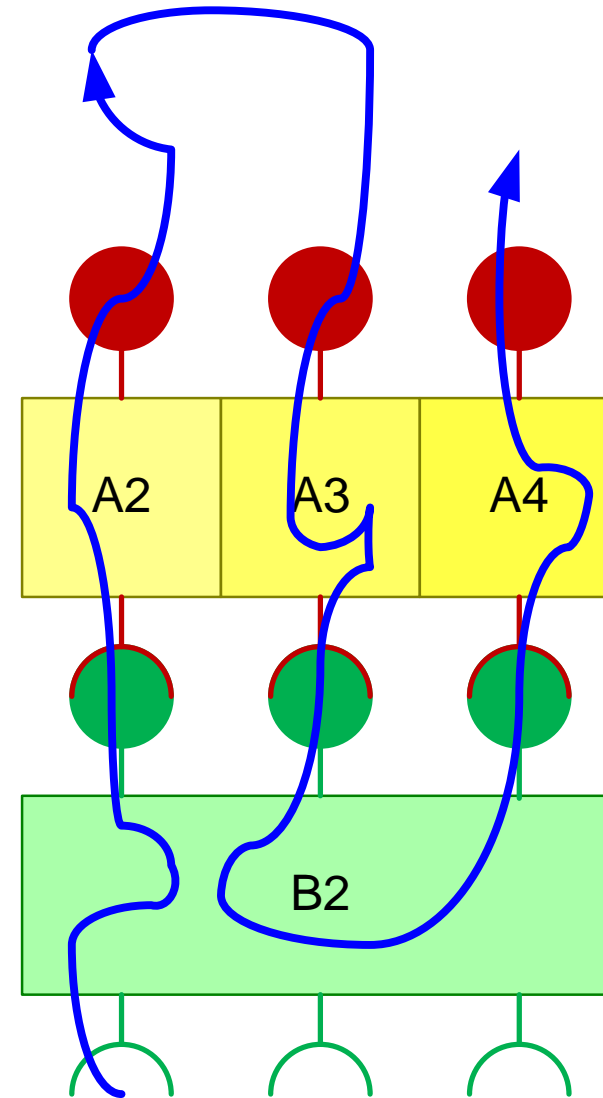
Design = Structure + Dynamics + Quantification

characteristics — prime interest of customer ← prime system responsibility

results in

dynamics — functionality

interact

parts — prime interest of organization

developing organization

architect

system of interest

Context, Zoom-out and Zoom-in
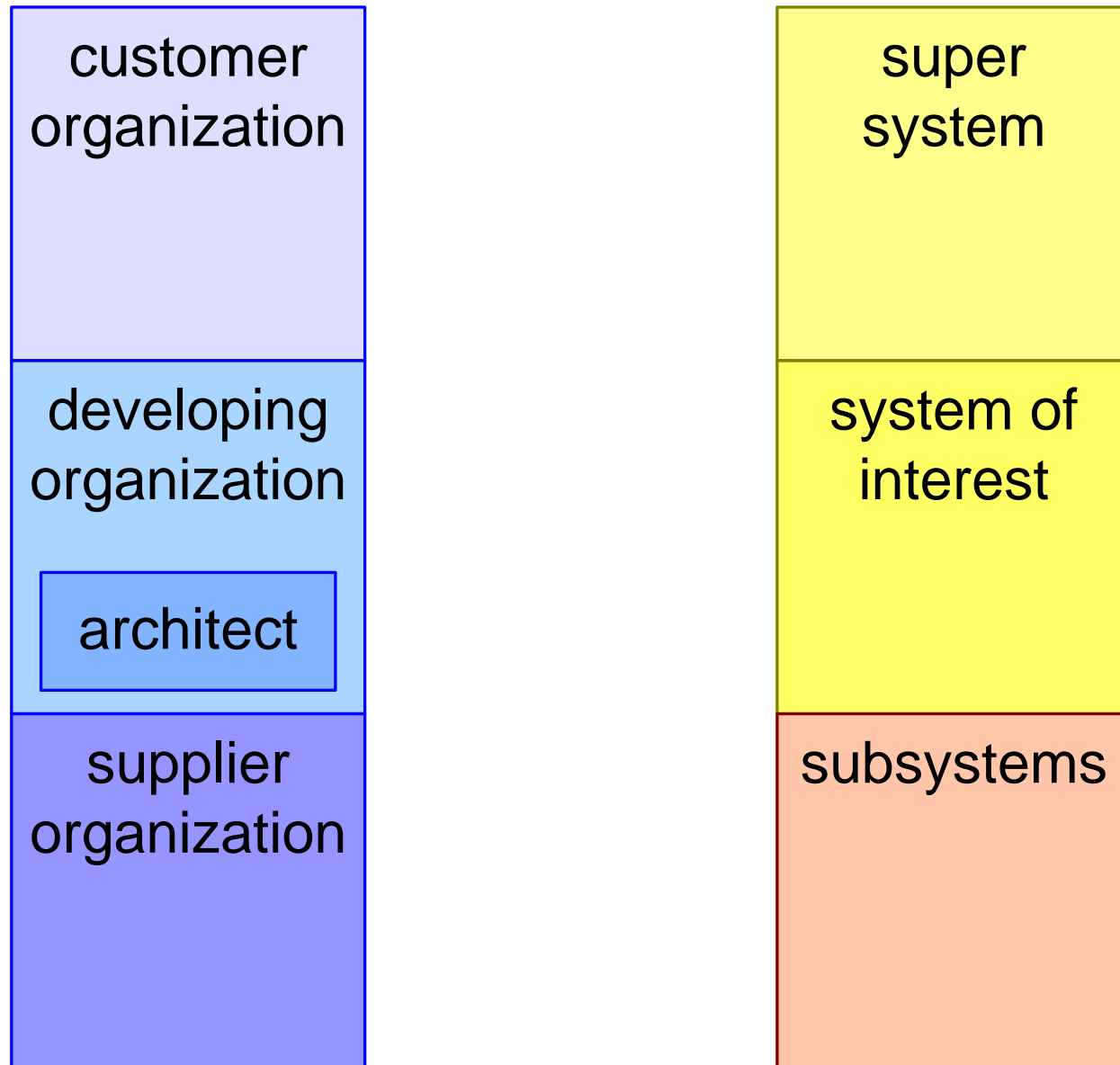
Adding the Time Dimension

past   current   future

customer organization	past super system	super system	future super system
developing organization	past system of interest	system of interest	future system of interest
architect	knowledge → innovation →		
supplier organization	past subsystems	subsystems	future subsystems

based on TRIZ

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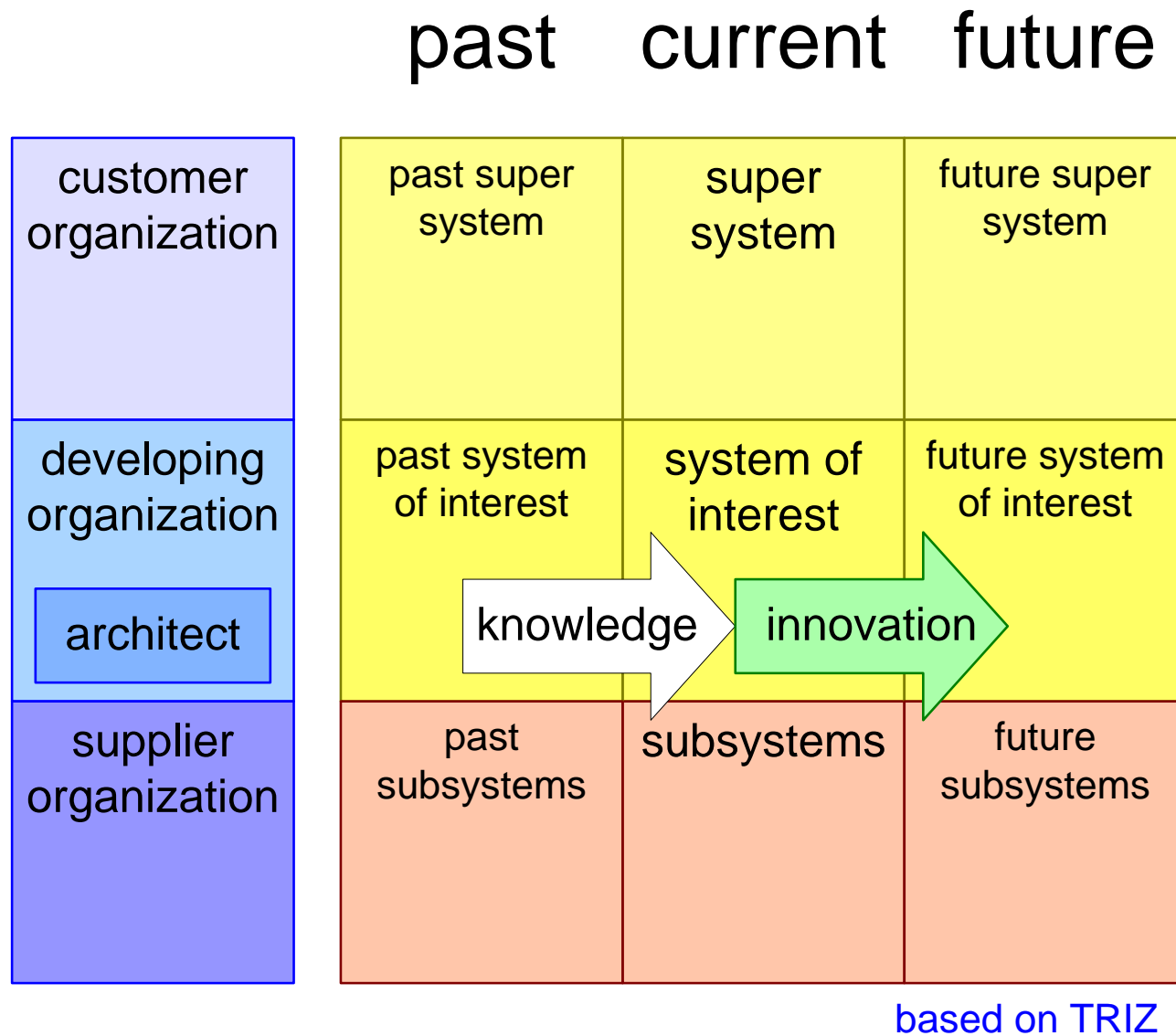
Architect, Architecture, Architecting

past current future

	past super system	super system	future super system
customer organization			
developing organization	past system		
architecting			
architect			
supplier organization	past subsystems		

architecting → **architecture**

based on TRIZ

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