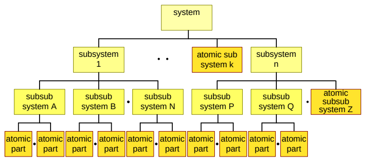
System Partitioning Fundamentals

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

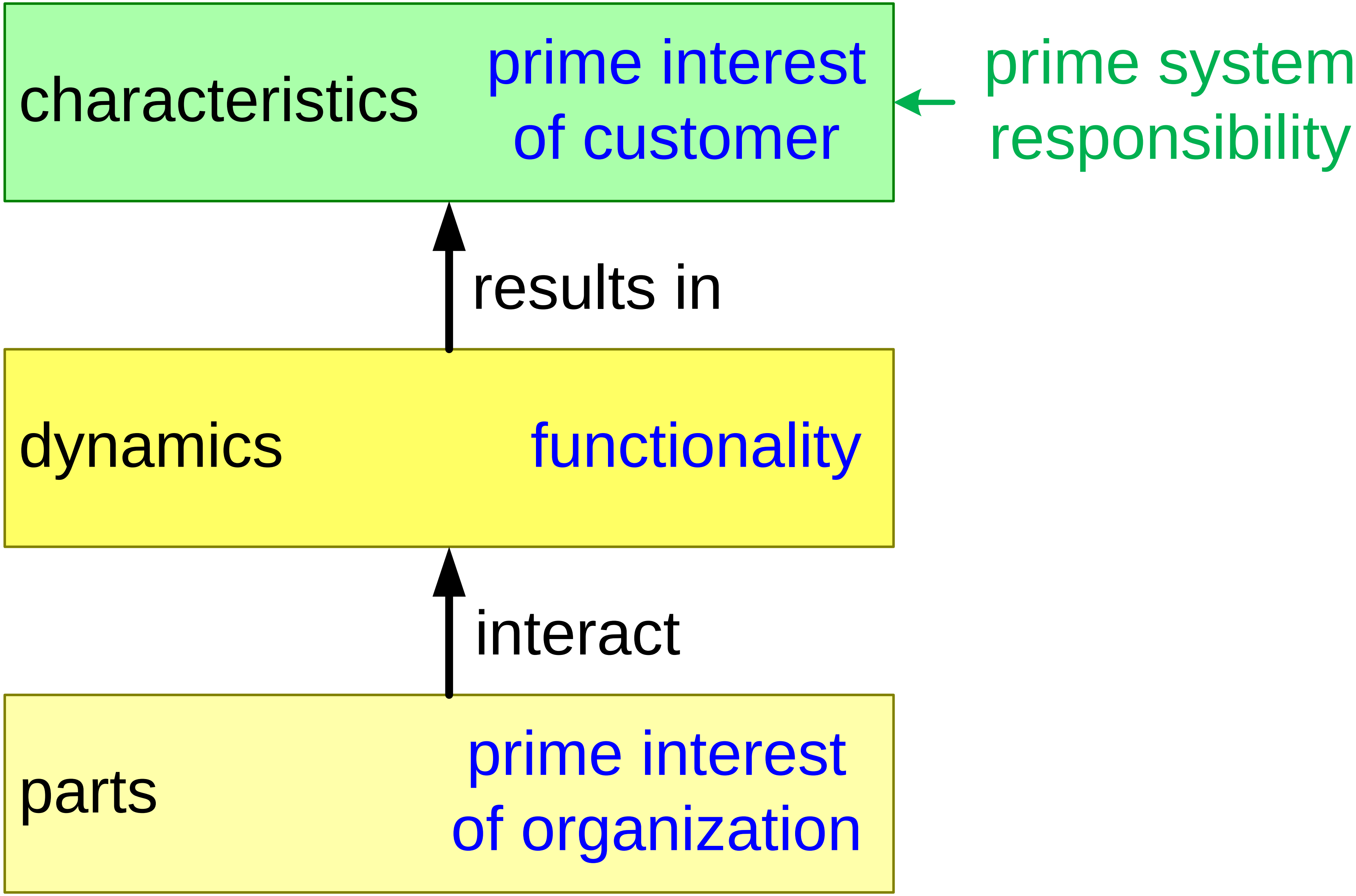
Abstract

The fundamental concepts and approach system partitioning are explained. We look at physical decomposition and functional decomposition in relation to supply chain, lifecycle support, project management, and system specification and design.

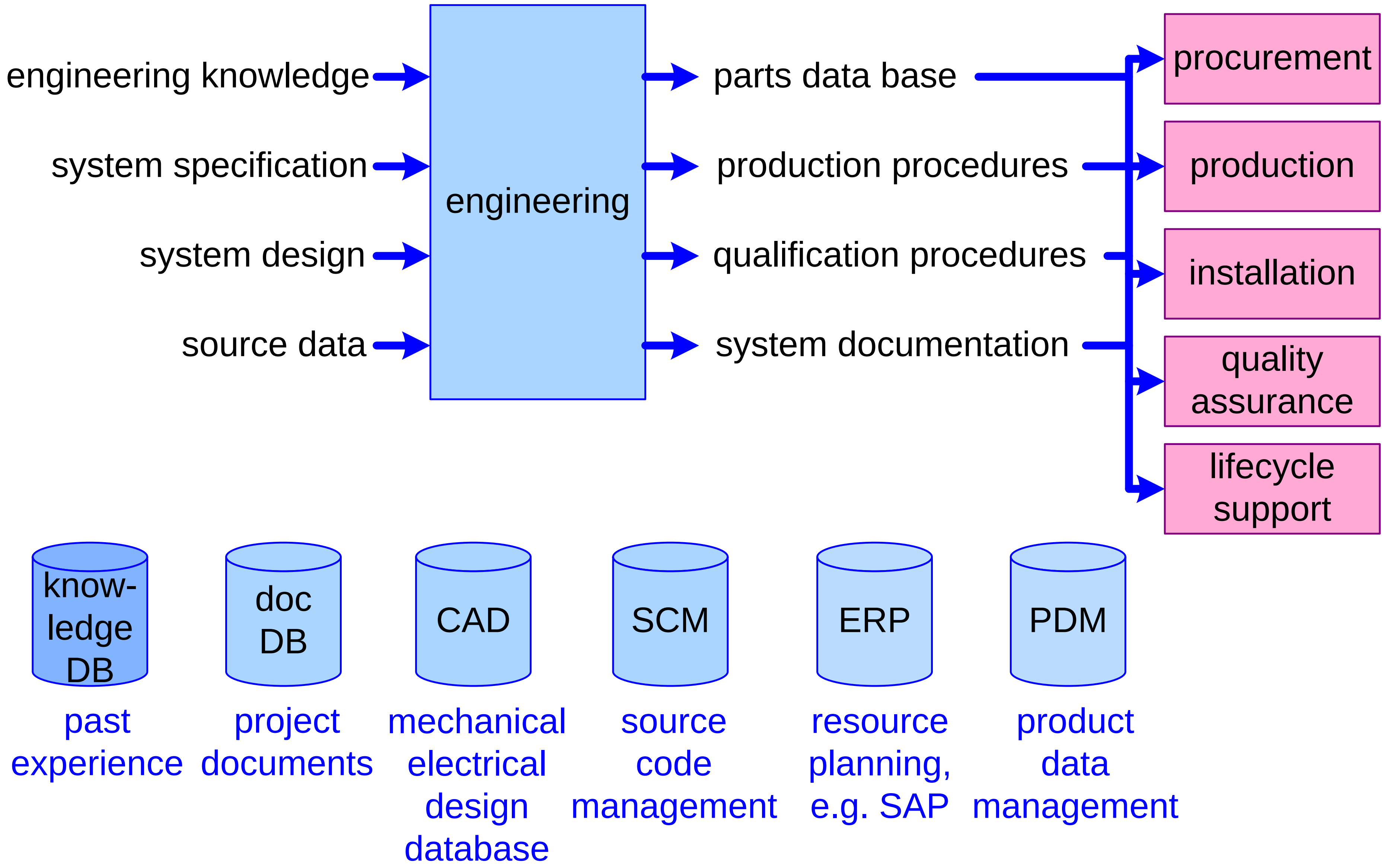
October 4, 2020
status: preliminary draft
version: 0.2



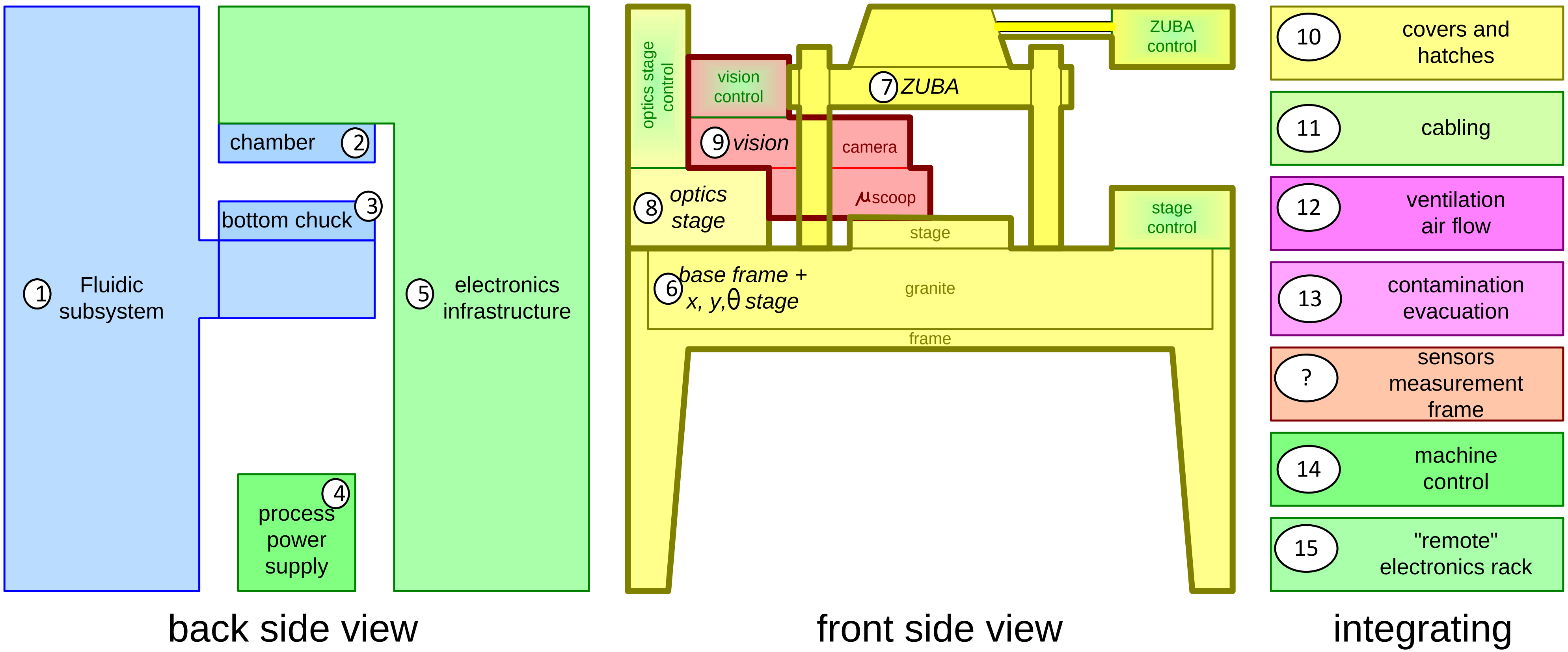
Parts, Dynamics, Characteristics



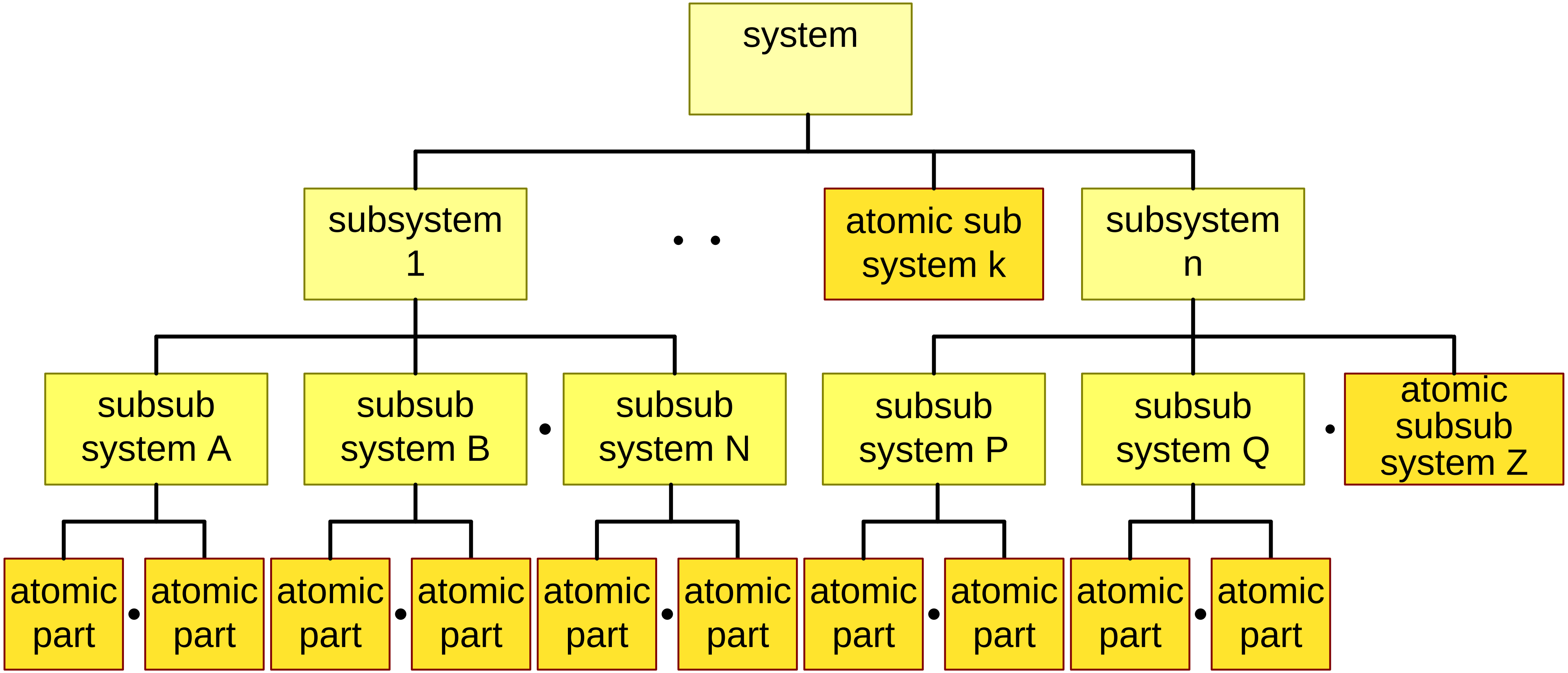
Engineering



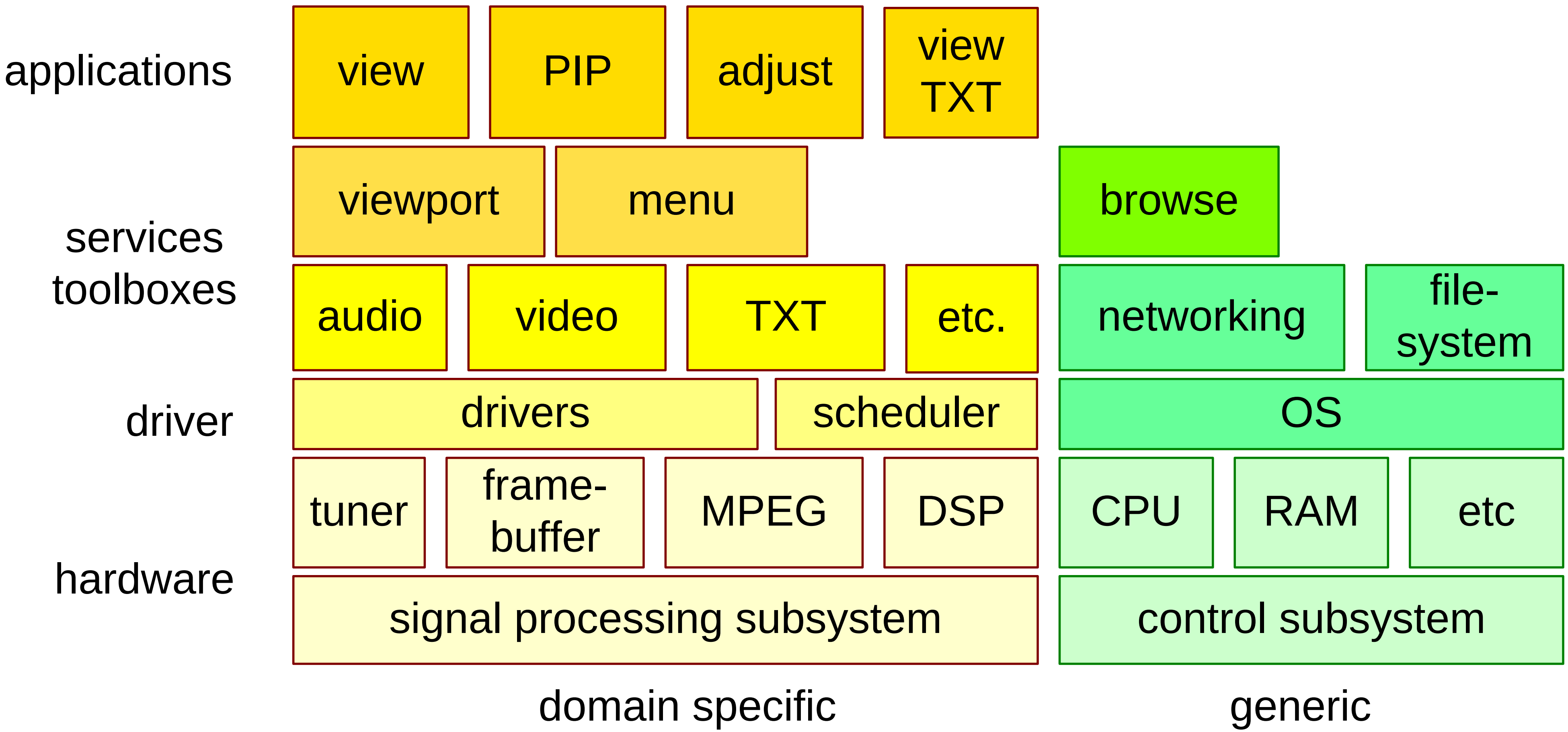
Example Physical Decomposition



Partitioning is Applied Recursively



Software plus Hardware Decomposition



Guidelines for Partitioning

the part is cohesive

functionality and technology belongs together

the coupling with other parts is minimal

minimize interfaces

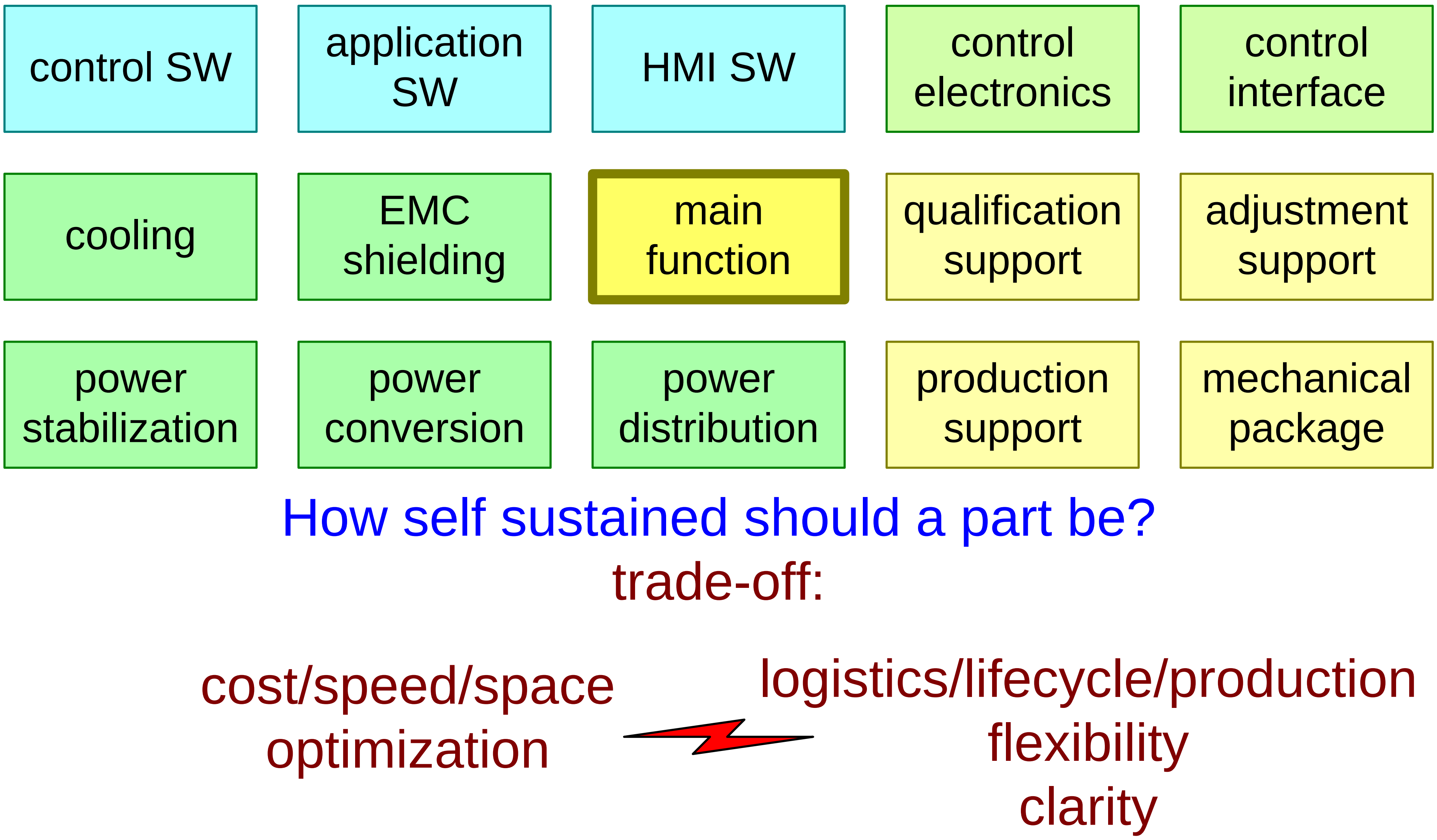
the part is selfsustained for production and qualification

can be in conflict with cost or space requirements

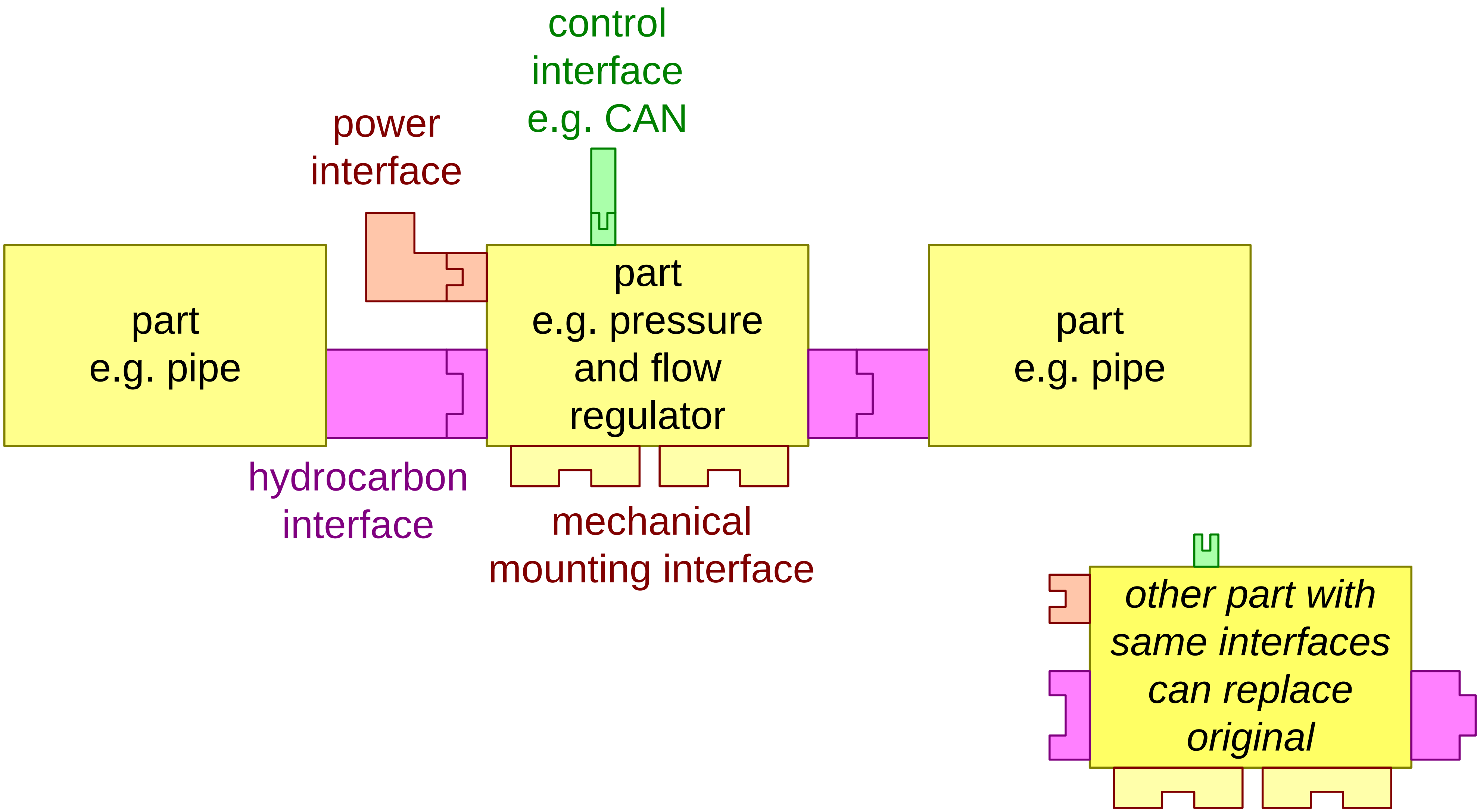
clear ownership of part

e.g. one department or supplier

How much self-sustained?



Decoupling via Interfaces



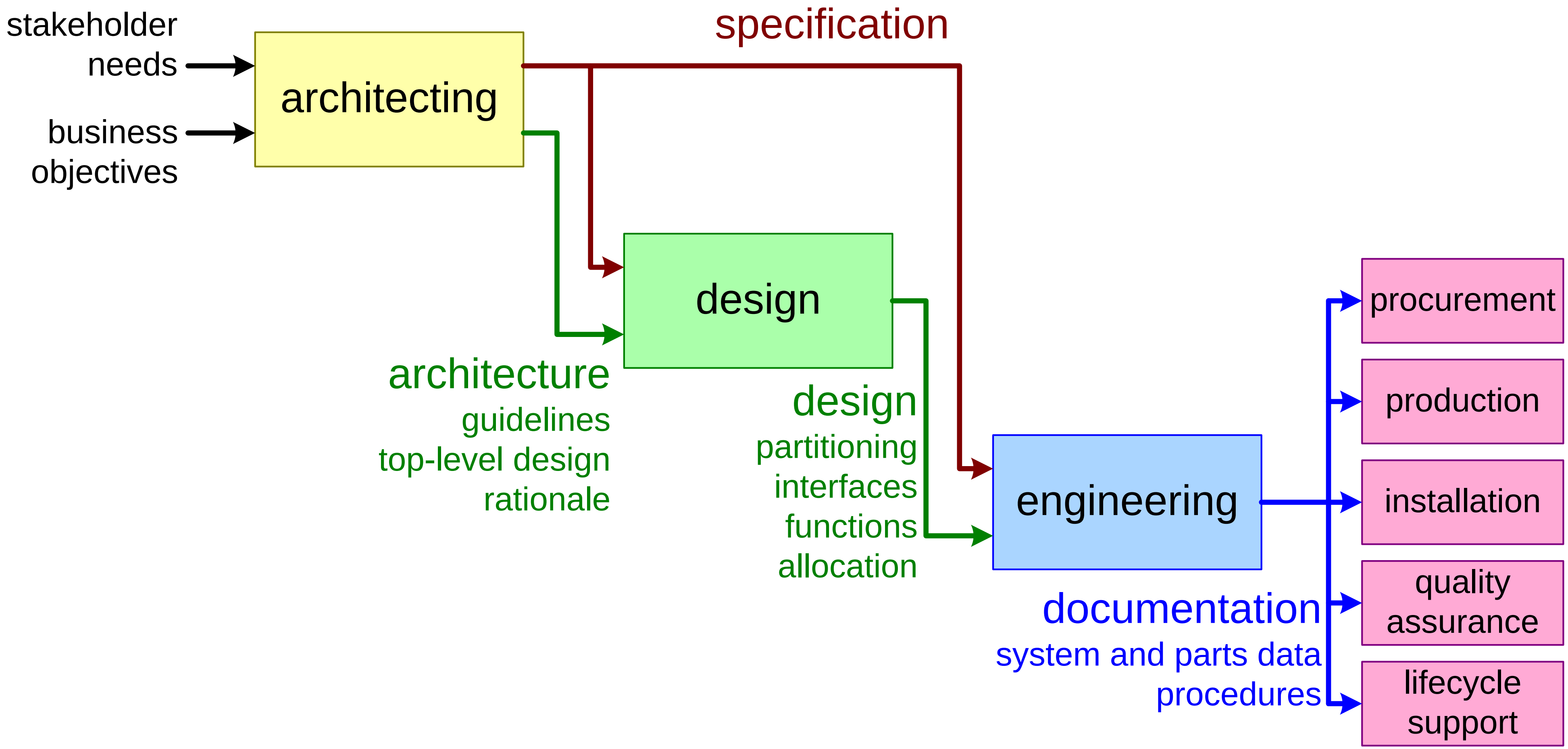
The Ideal Modularity

System is composed

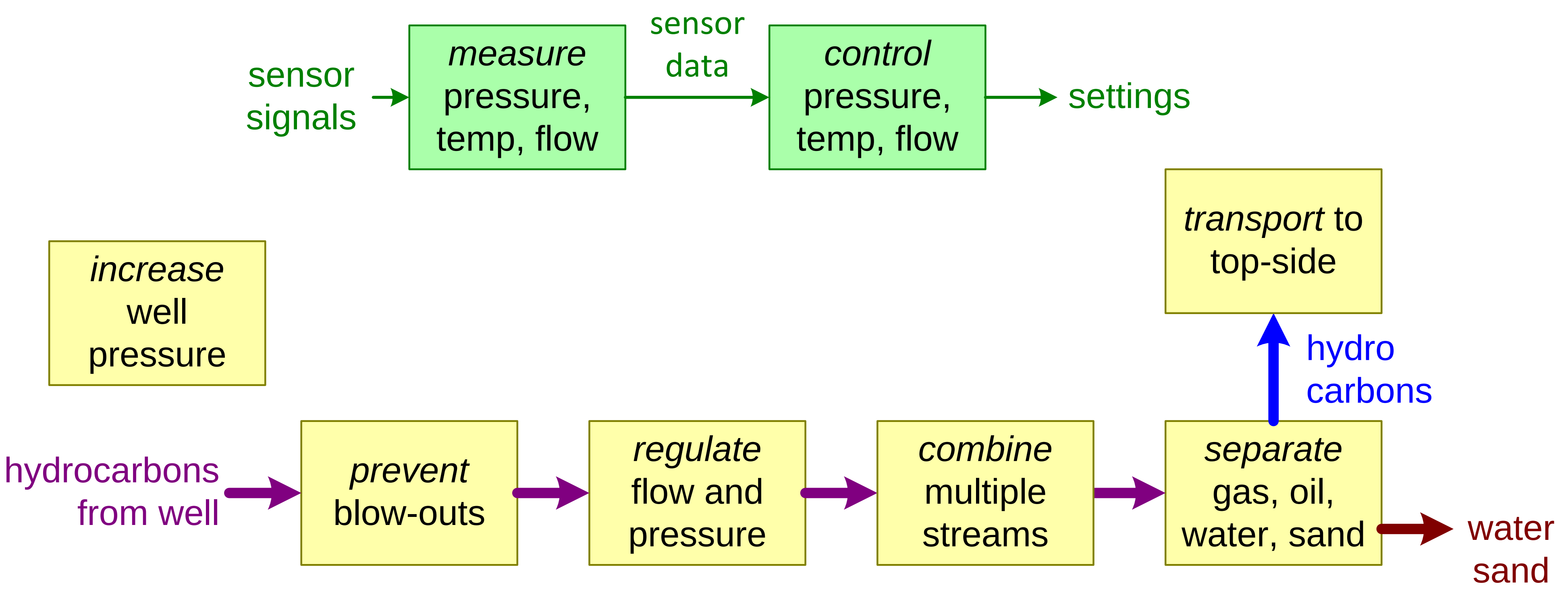
by using standard interfaces

limited catalogue of variants (e.g. cost performance points)

System Creation



Simplistic Functional SubSea Example



Functional Decomposition

How does the system work and operate?

Functions describe *what* rather than *how.*

Functions are *verbs*.

Input-Process-Output paradigm.

Multiple kinds of flows:

- physical (e.g. hydrocarbons)
- information (e.g. measurements)
- control

At lower level one part ~= one function

- pump pumps, compressor compresses, controller controls

At higher level functions are complex interplay of physical parts

- e.g. regulating constant flow, pressure and temperature

Quantification

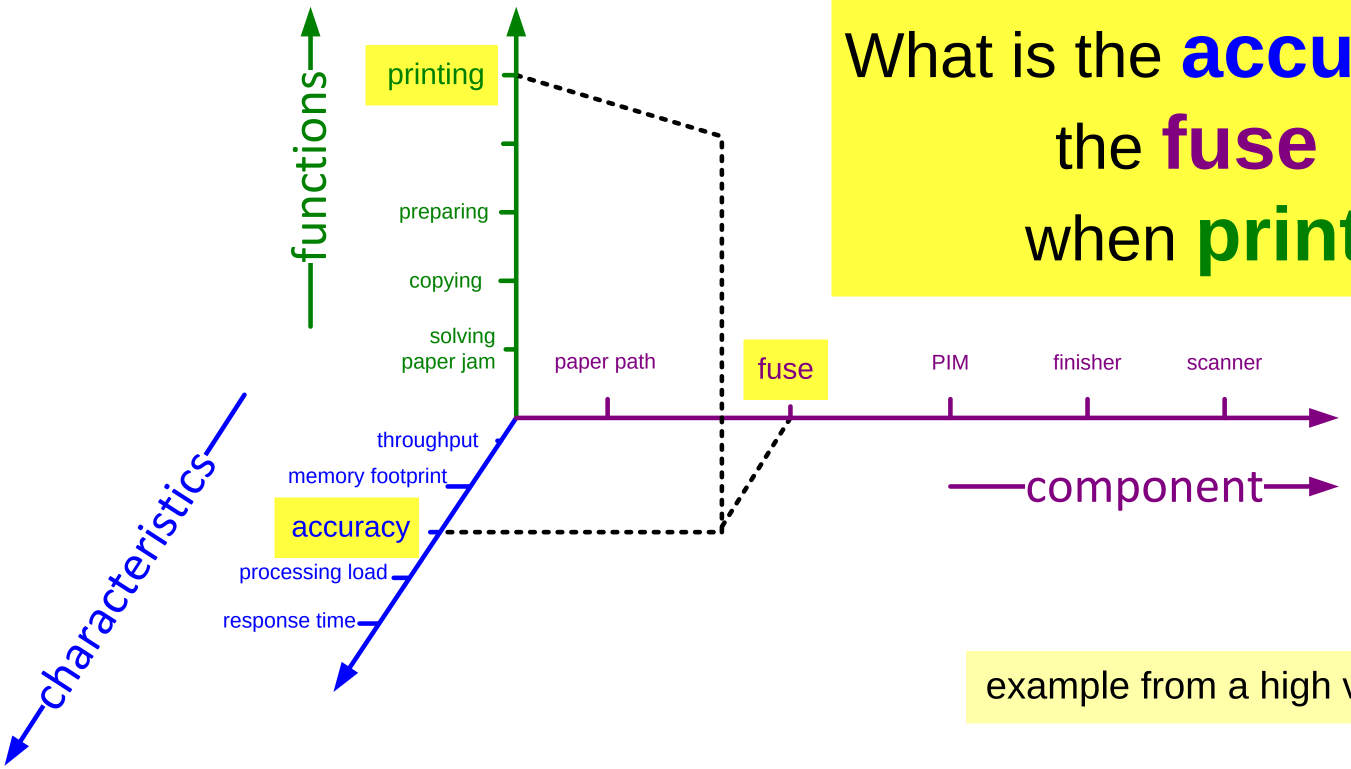
Size	2.4m * 0.7m * 1.3m
Weight	1450 Kg
Cost	30000 NoK
Reliability	MTBF 4000 hr
Throughput	3000 l/hr
Response time	0.1 s
Accuracy	+/- 0.1%

many characteristics of a system, function or part can be quantified

Note that quantities have a ***unit***

Question Generator

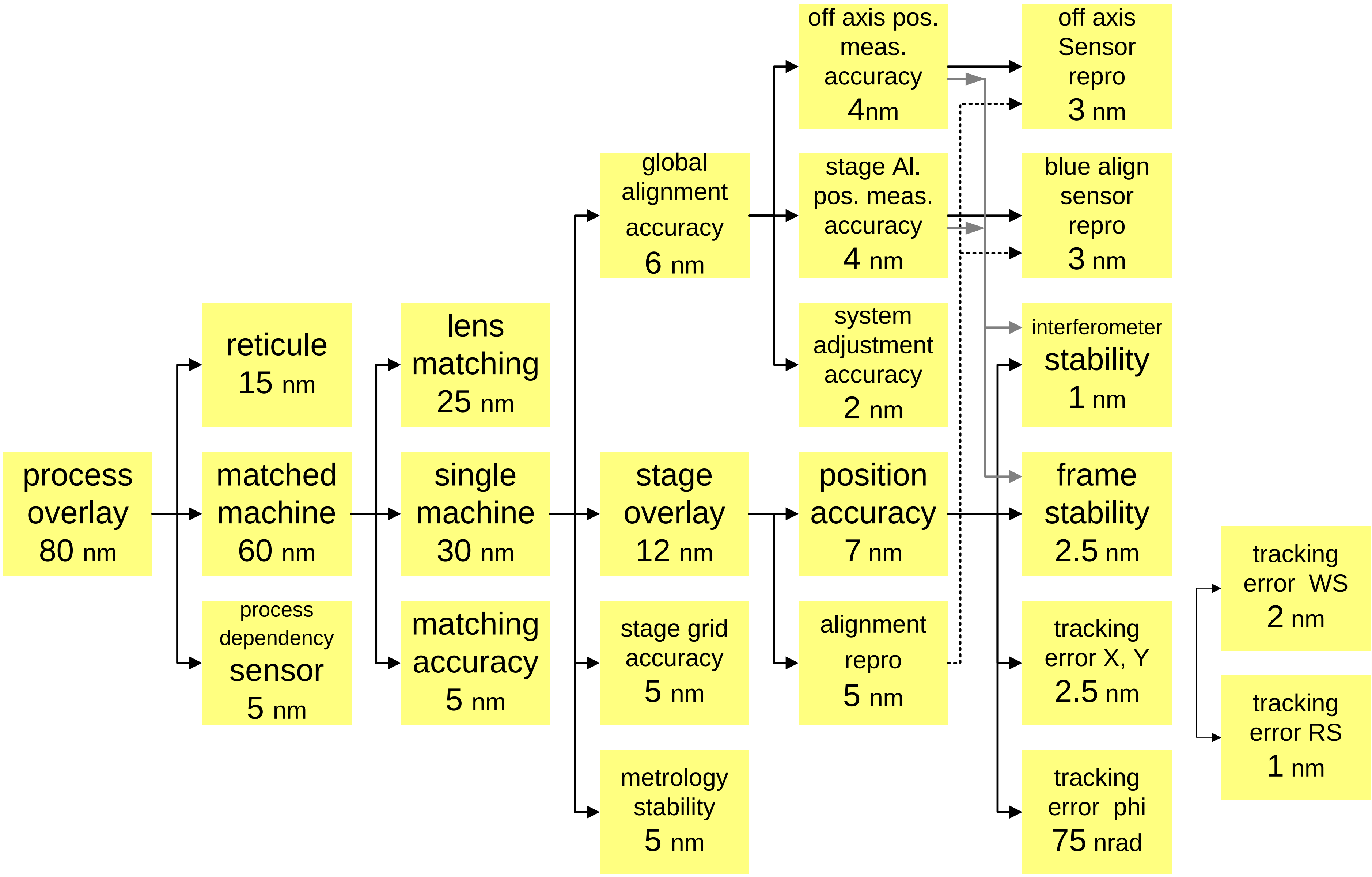
How about the **<characteristic>**
of the **<component>**
when performing **<function>**?



What is the **accuracy** of
the **fuse**
when **printing**

example from a high volume printer

Example Technical Budget



Example of A3 overview