Light Weight Architecture revisited: the way of the future?

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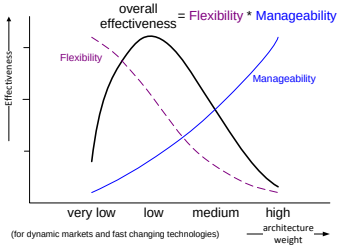
Abstract

Technological developments change the consumer electronics market into a very dynamic market. CE manufacturers are used to realize product innovation by means of standardization, inside products as well as between products. Standardization and innovation are often conflicting activities. An approach is discussed to optimize the balance, based on ”light-weight architectures”.
The weight of an architecture determines how easy an architecture can be realized, changed and applied. An heavy architecture has many mandatory rules, which apply always and everywhere, with a large degree of detail. An heavy architecture provides a lot of certainties and control, but is more difficult to adapt to changing circumstances.



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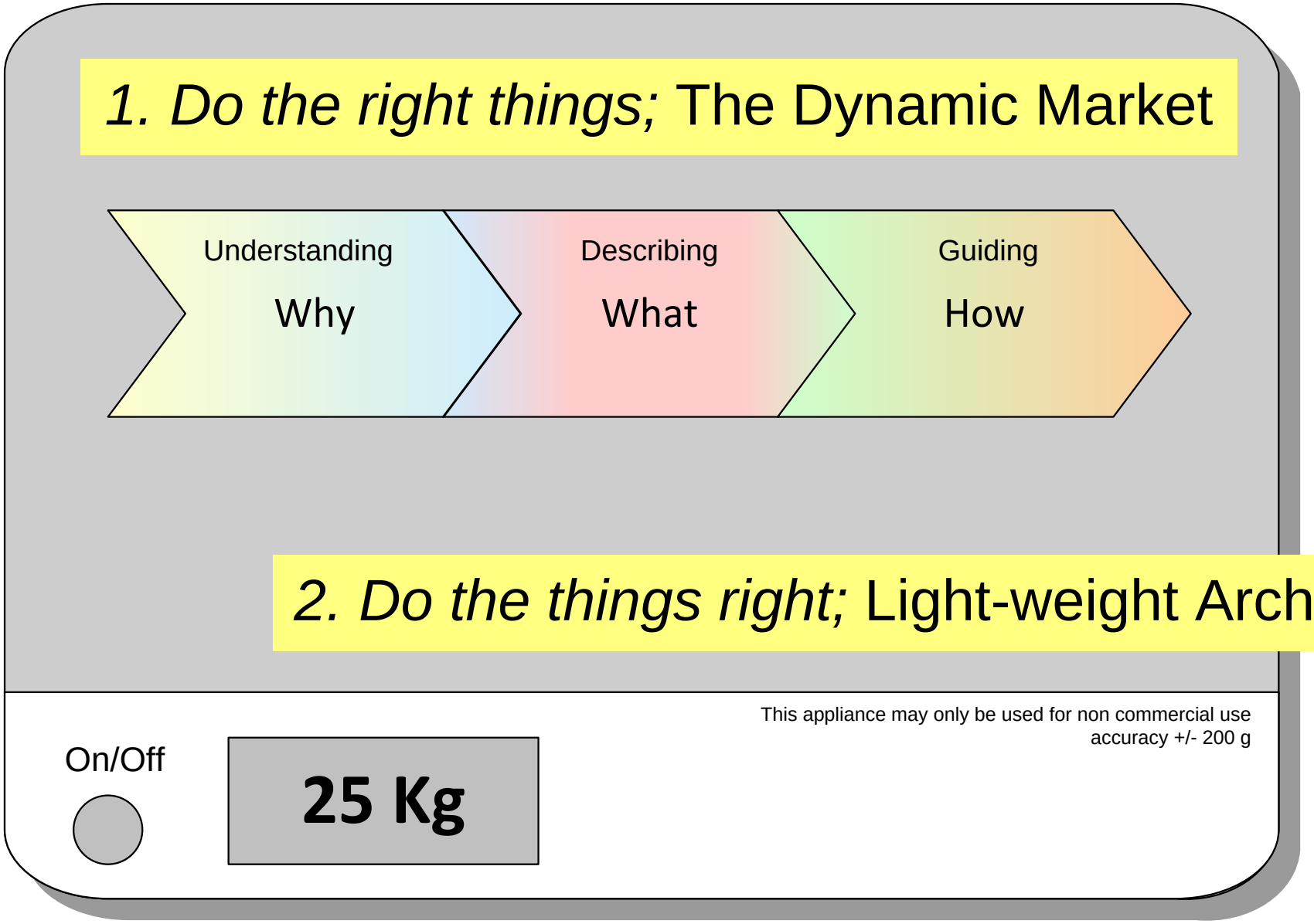
What is Architecture?

Do the right things

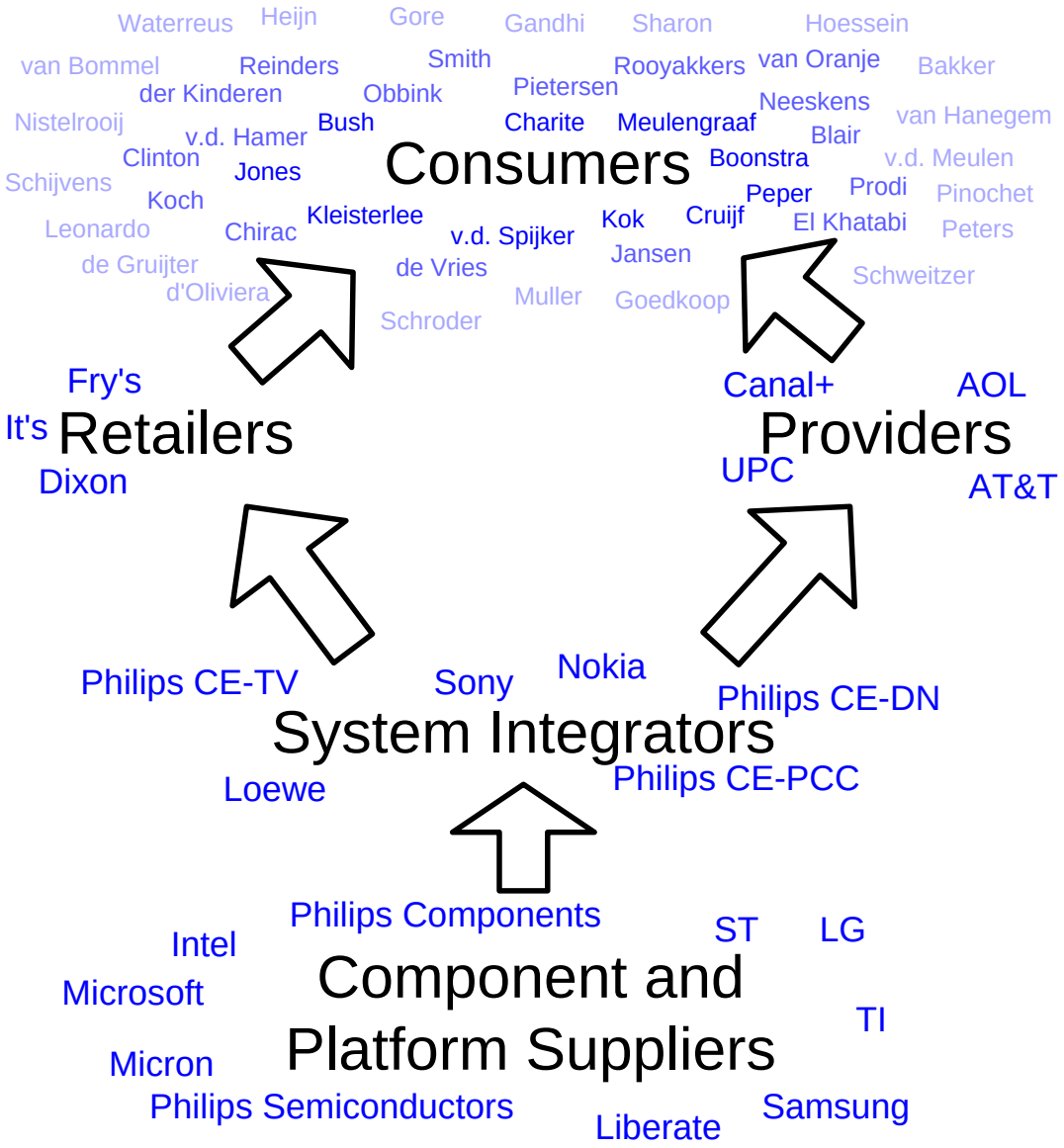
Do the things right

Table of Contents

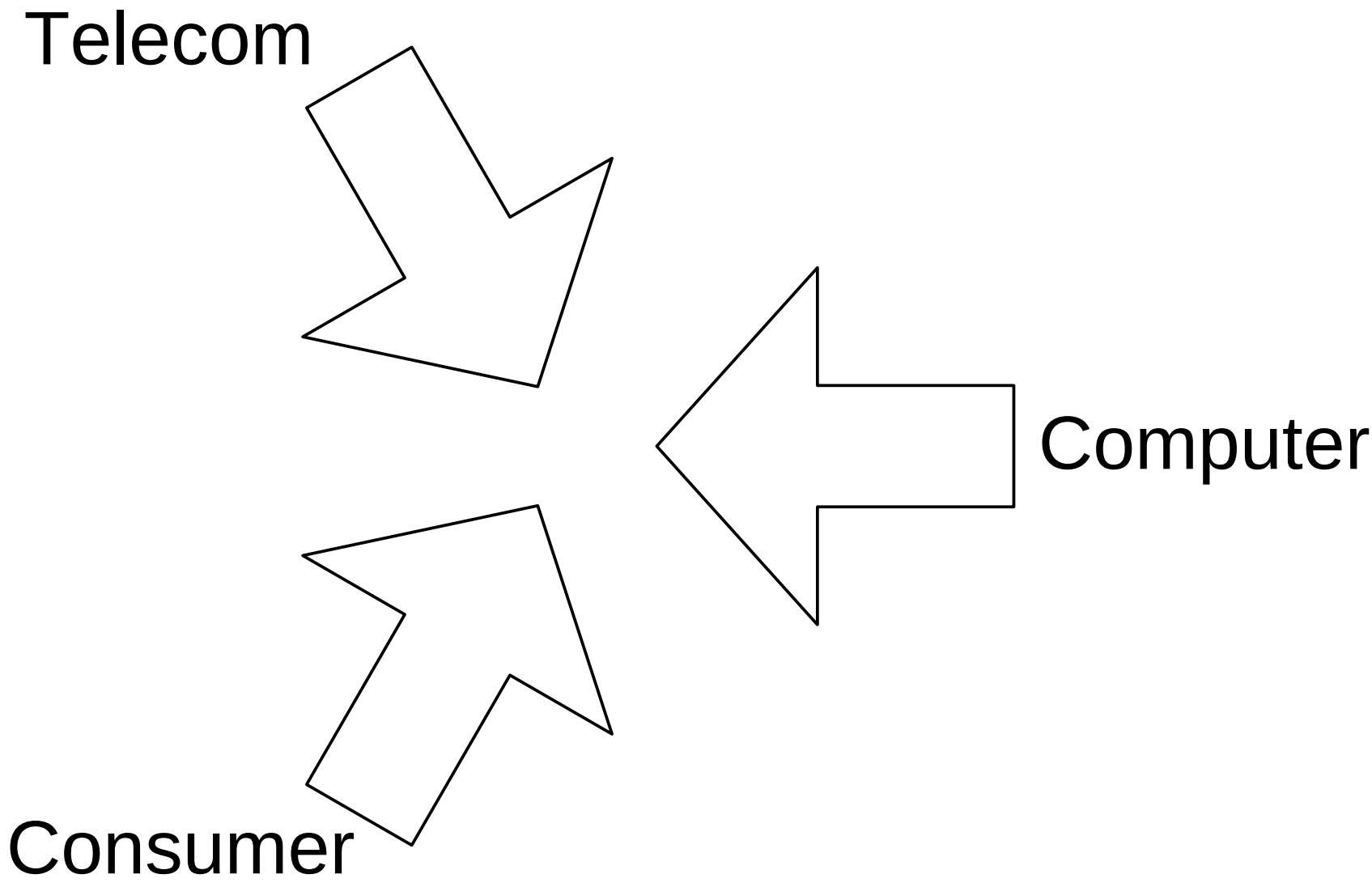


Part 1:
Do the right things;
The Dynamic Market

Value chain


Waterreus
Heijn
Gore
Gandhi
Sharon
Hoessein
van Bommel
Reinders
Smith
Rooyakkers
van Oranje
Bakker
der Kinderen
Obbink
Pietersen
Neeskens
Nistelrooij
Bush
Charite
Meulengraaf
van Hanegem
v.d. Hamer
Blair
Clinton
Consumers
Boonstra
v.d. Meulen
Schijvens
Jones
Peper
Prodi
Pinochet
Koch
Kleisterlee
Kok
Cruijf
El Khatabi
Leonardo
Chirac
v.d. Spijker
Peters
Jansen
de Gruijter
de Vries
Schweitzer
d'Oliviera
Muller
Goedkoop
Schroder
Fry's
Canal+
AOL
It's
Retailers
Providers
Dixon
UPC
AT&T
Philips CE-TV
Sony
Nokia
Philips CE-DN
System Integrators
Loewe
Philips CE-PCC
Philips Components
ST
LG
Intel
Component and
Microsoft
TI
Platform Suppliers
Micron
Philips Semiconductors
Samsung
Liberate

Convergence



Integration and Diversity


GSM phone


firewall


dvd


audio microset


pda


watch


sailboat


surveillance camera


cable modem


set top box


headphone


pen


garment


car


camera


speech


mp3


television


car navigation


computer


games


flat display

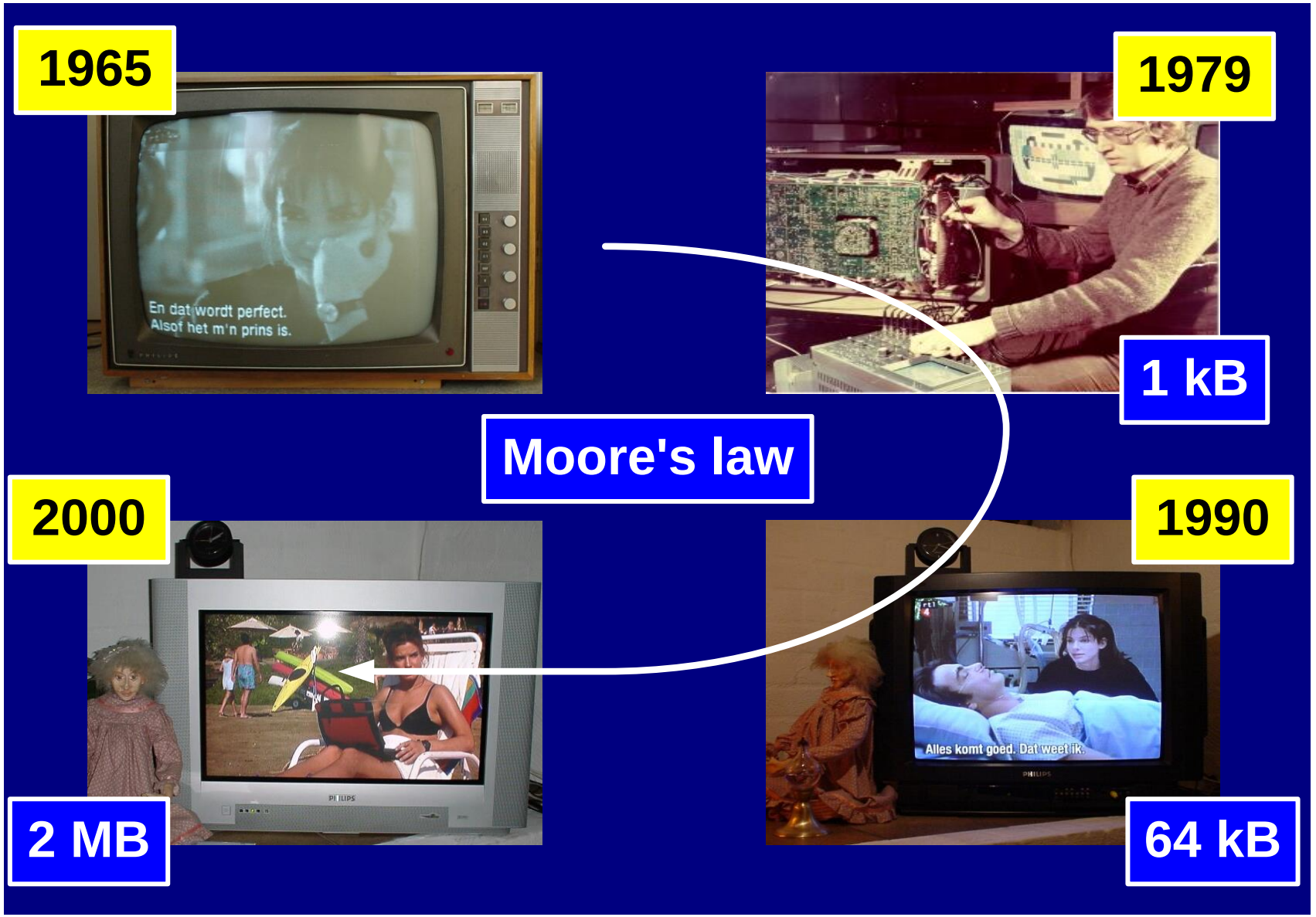

Communicator


Ambient Intelligence living room

Uncertainty (Dot.Com effect)

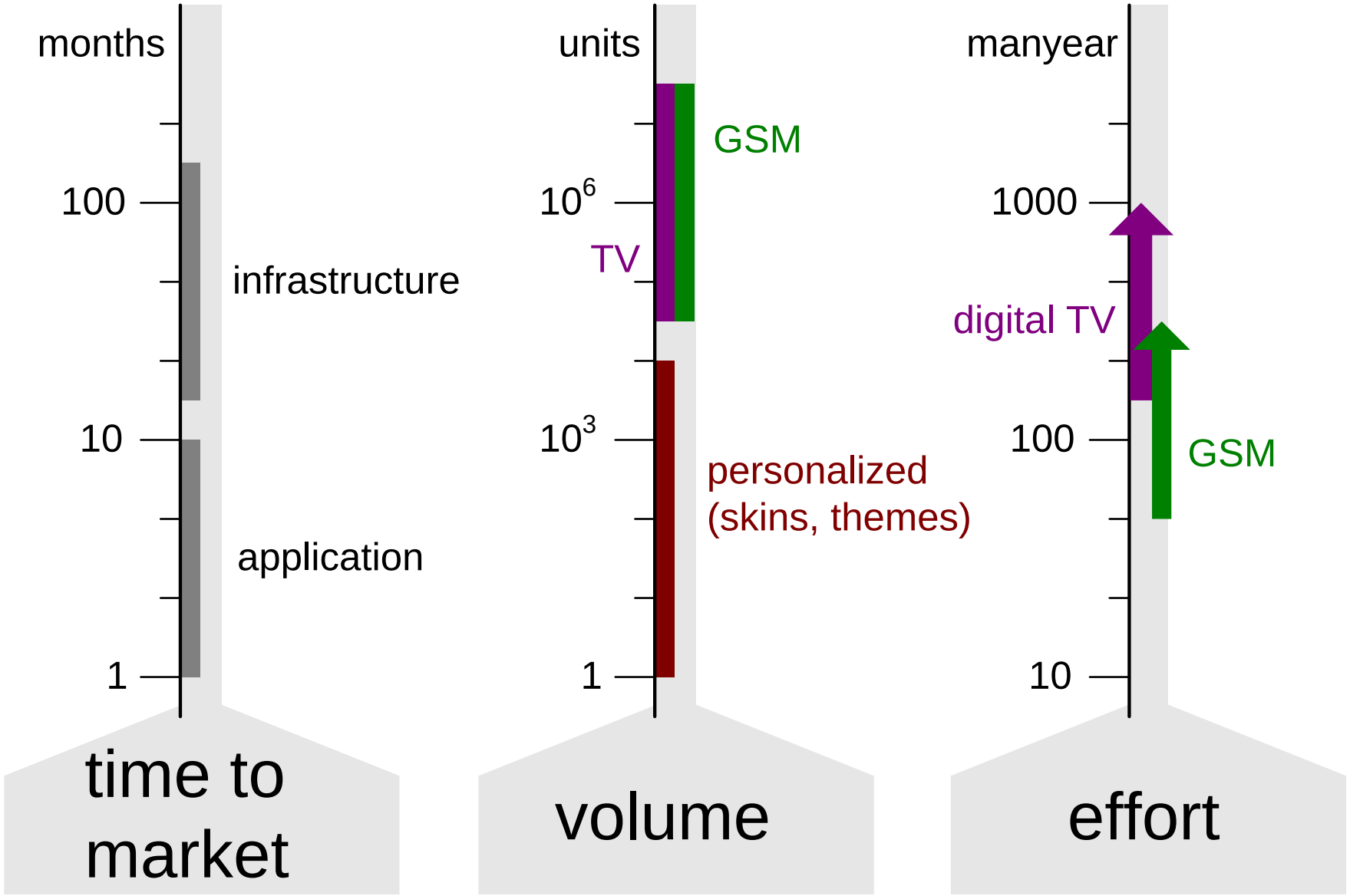
source: BigChart.com
dd march 19, 2001

Moore’s law

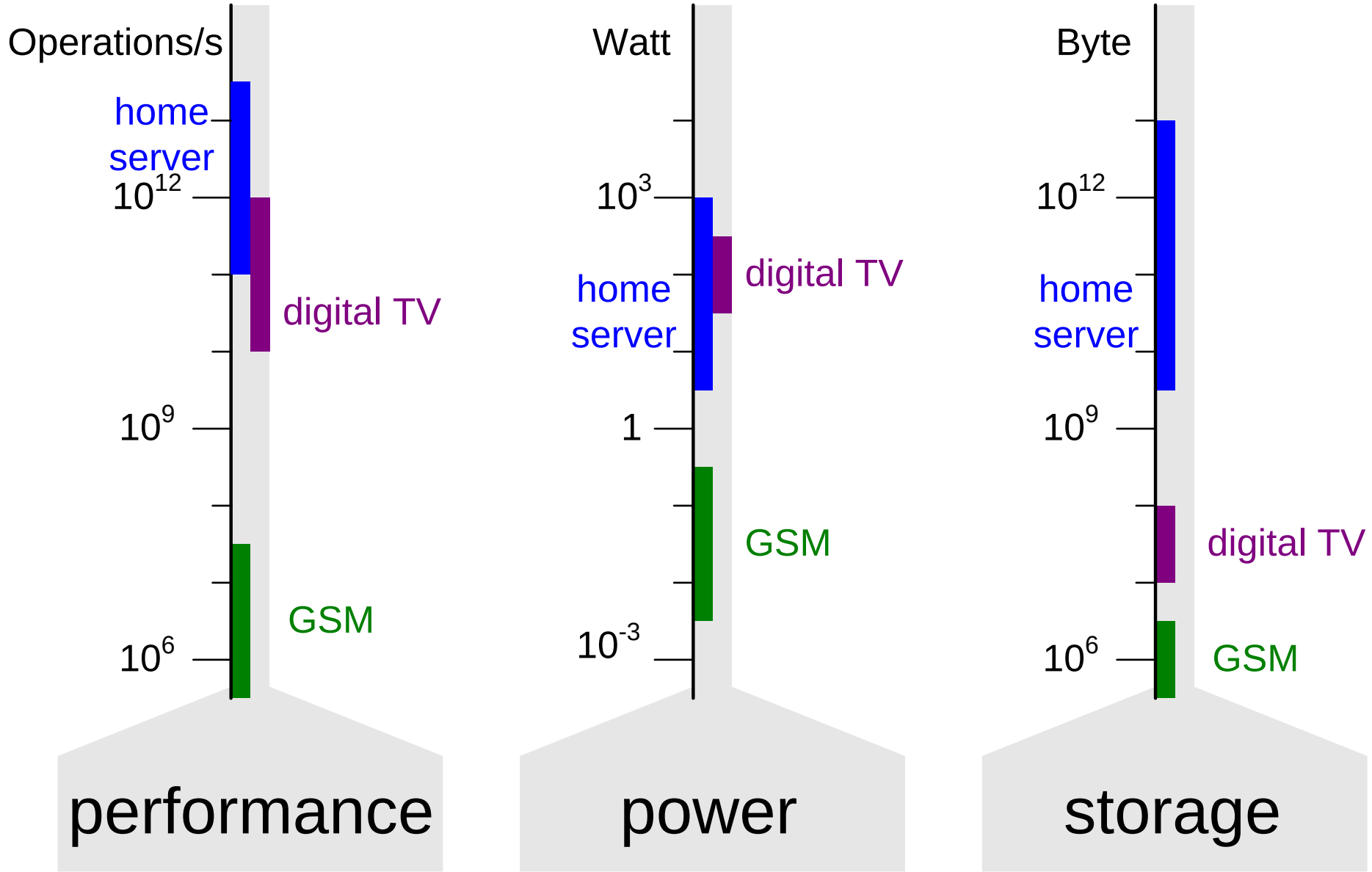


From: COPA tutorial, Rob van Ommering

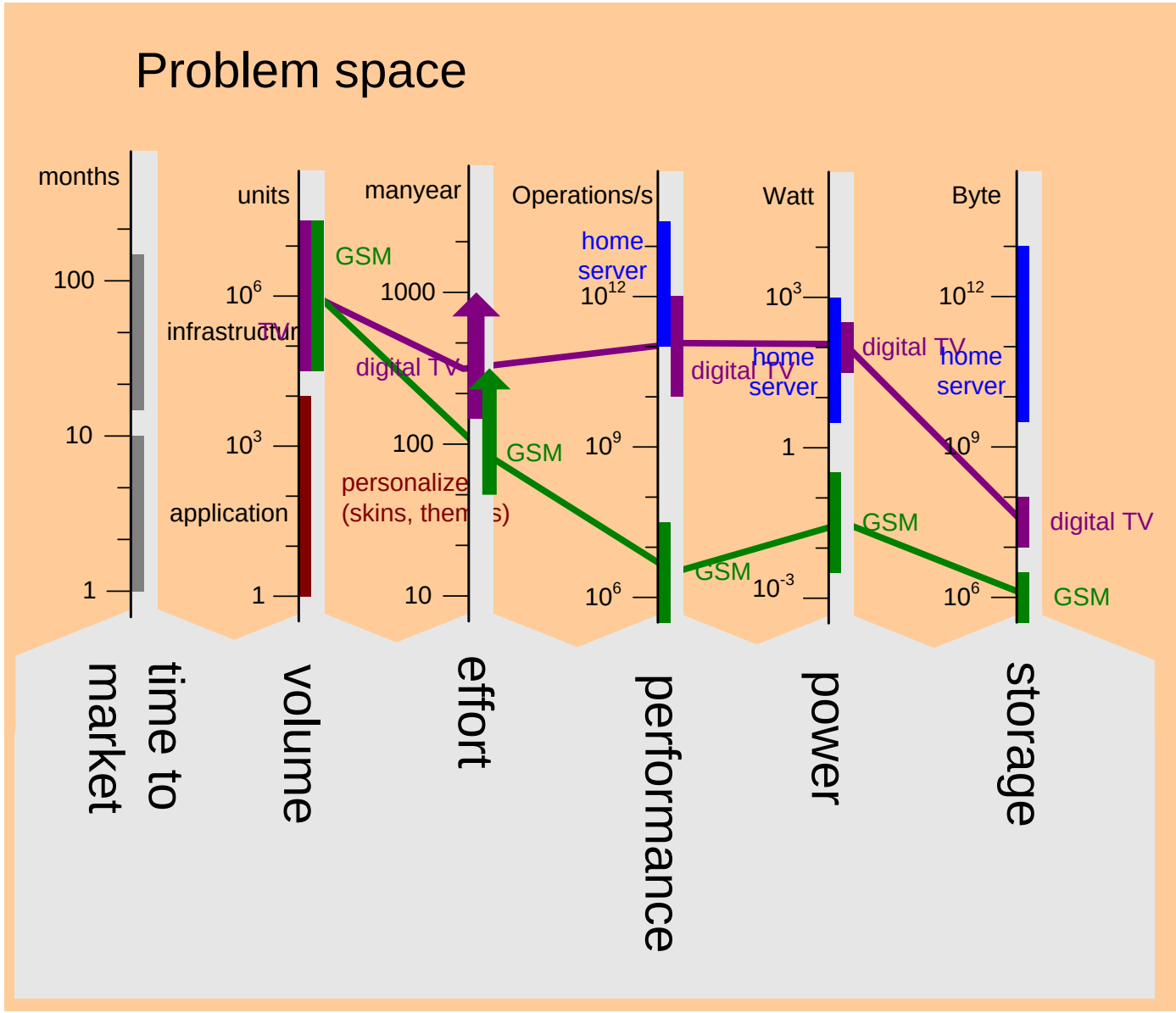
System Integrator Problem Space - Business



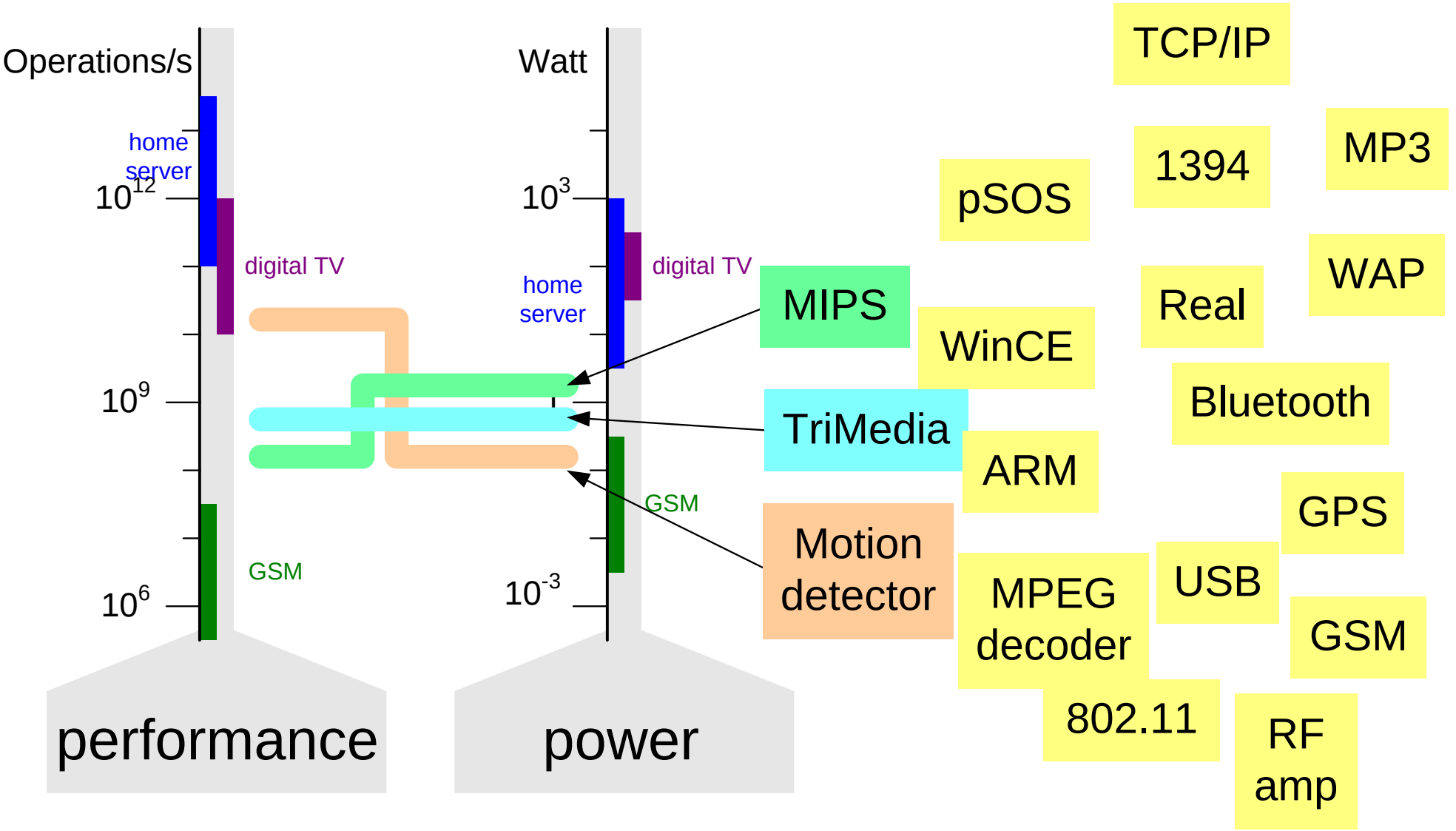
System Integrator Problem Space - Technology



System profile



Semiconductors Technology solutions



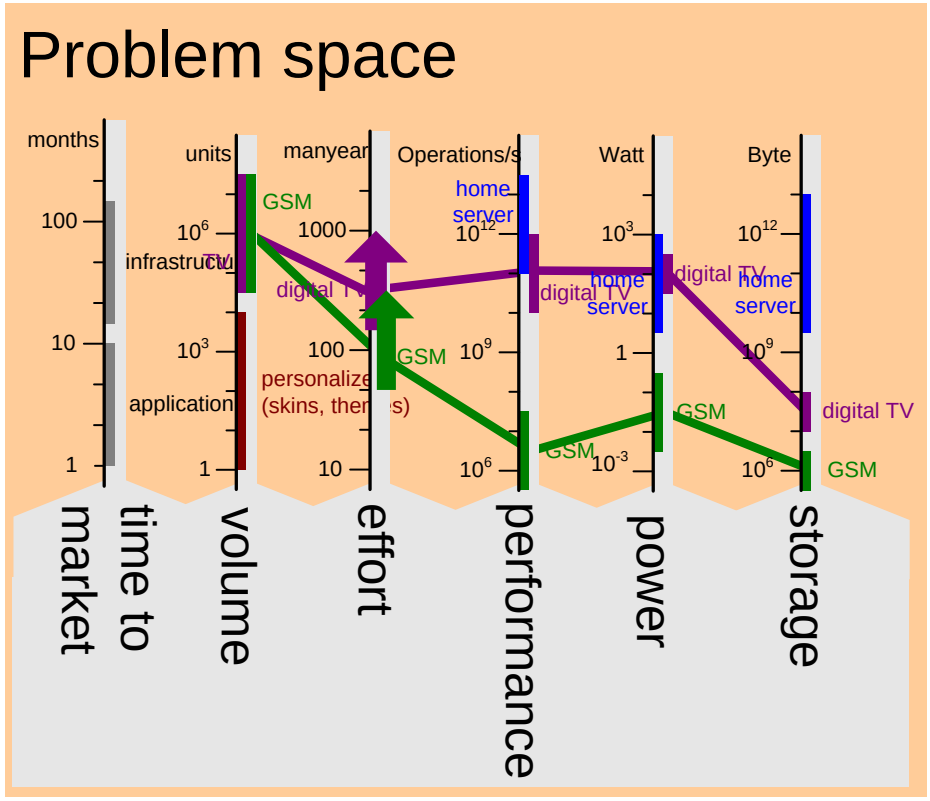
Partial Solution: Configurable Component Platform

Systems \ Technologies	MIPS	TriMedia	MPEG decoder	ARM	Real	GSM	RF amp	Bluetooth	TCP/IP	MP3	pSOS	WinCE	1394	GPS
watch				●	○	○	○	●	○	○	●	○		○
communicator	○	○	○	●	●	●	●	○	●	○	●	○		○
digital TV	●	●	●					○	○	○	●	○	●	
set top box	●	●	●					○	●	○	●	○	●	
pda	○	○	○	●	○	○	○	○	●	○		●		○
camcorder	●	●	●			○	○	○	○	○	●		●	○

● required

○ optional

Exploring problem space and solution ingredients



Systems \ Technologies	MIPS	TriMedia	MPEG decoder	ARM	Real	GSM	RF amp	Bluetooth	TCP/IP	MP3	pSOS	WinCE	1394	GPS
watch				●	○	○	○	●	○	○	●	○		○
communicator	○	○	○	●	●	●	●	○	●	○	●	○		○
digital TV	●	●	●					○	○	○	●	○	●	
set top box	●	●	●					○	●	○	●	○	●	
pda	○	○	○	●	○	○	○	○	●	○		●		○
camcorder	●	●	●			○	○	○	○	○	●		●	○

● required
○ optional

Composable Architecture

Family of products

Configurability

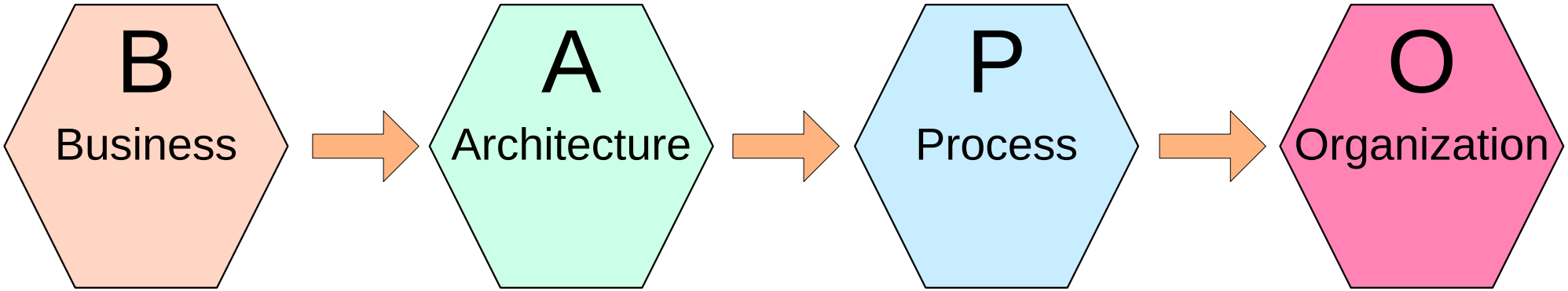
Solution ingredients

Programmability, flexibility

Increase supplier content

Competitive Performance / cost / power

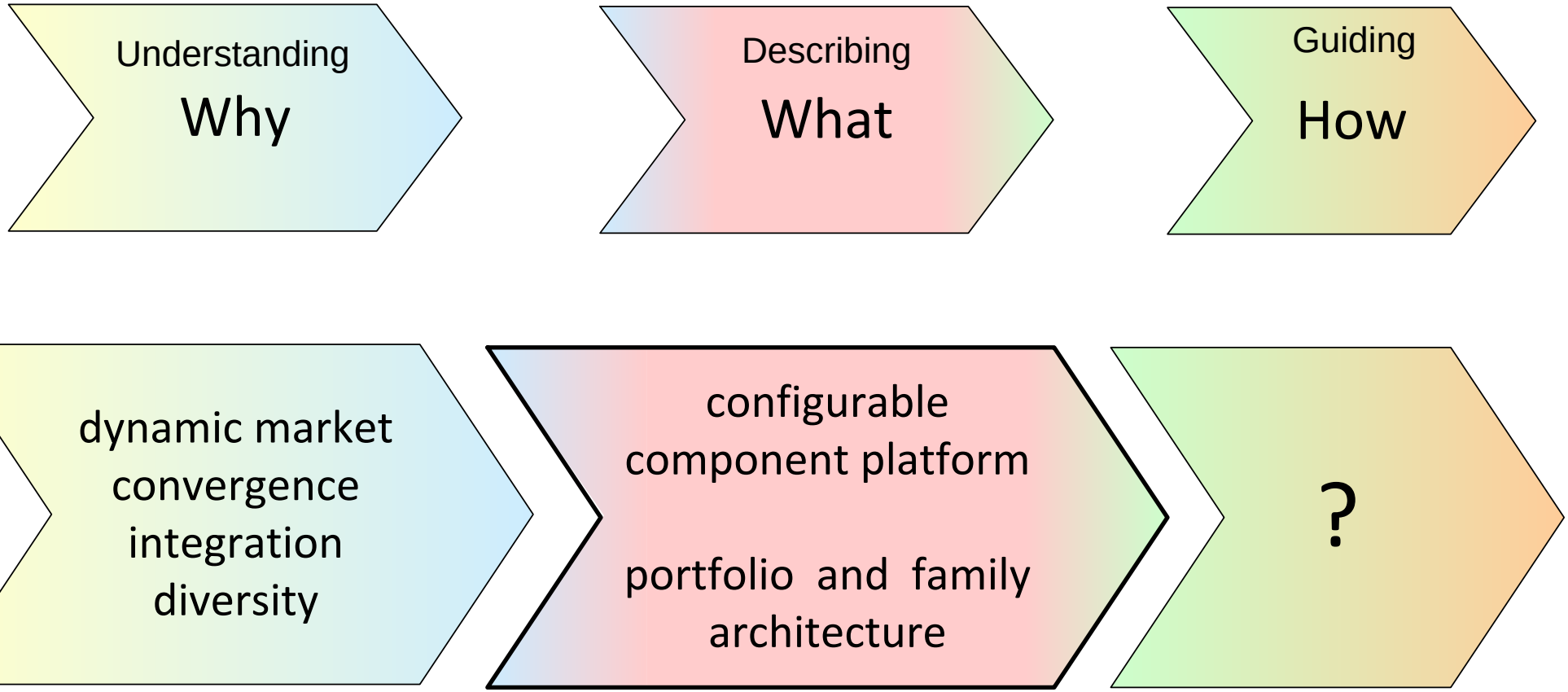
More than Architecture



From: COPA tutorial;
Philips SW conference 2001.

Architecture only works if the complementary viewpoints are addressed consistently

Conclusions Part 1



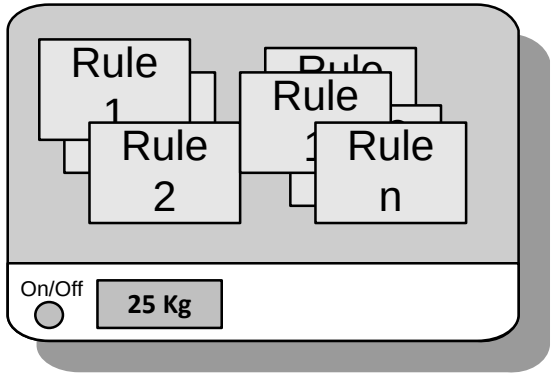
Part 2:

Do the things right: light-weight architecture;

Architectural Chaos or Bureaucratic Control?

Architecture Weight

$$\text{weight(architecture)} = \sum_{\text{all rules}} \text{weight(rule)}$$



weight (rule) = f (level of **enforcement** ,

scope (impact) ,

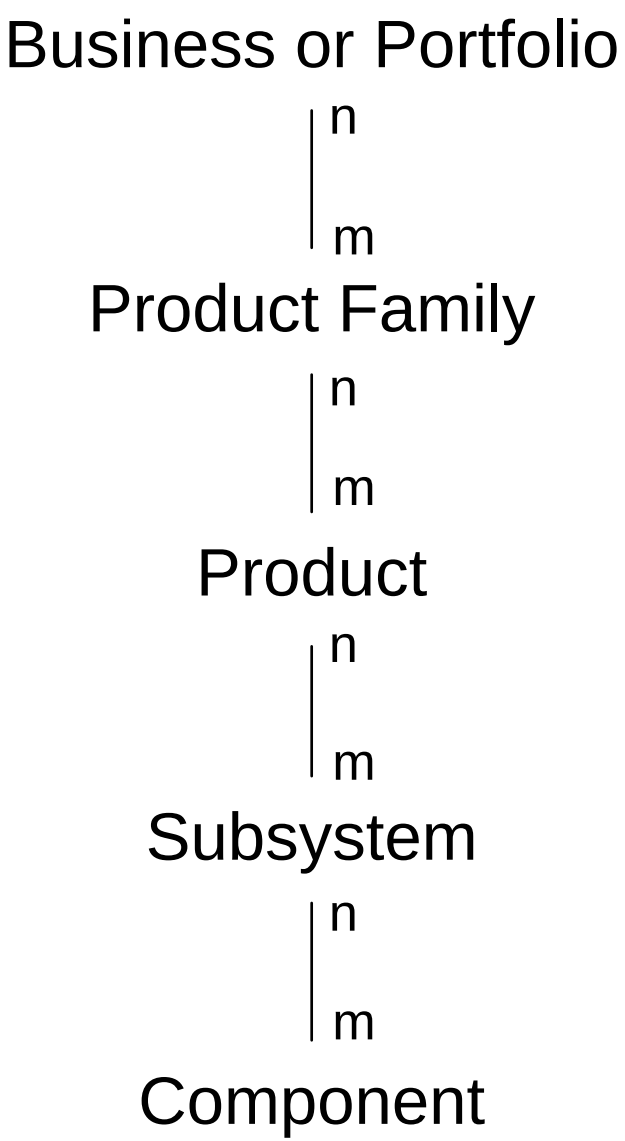
size,

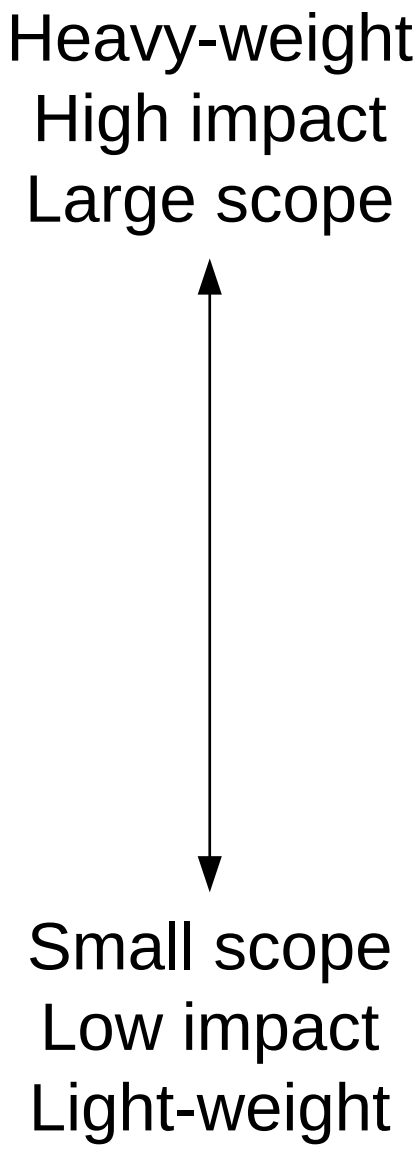
level of **coupling** or number of dependencies)

guideline	conditional rule	mandatory rule
component	product	portfolio
single-line	multi-line	multi-page
stand-alone		builds on many rules

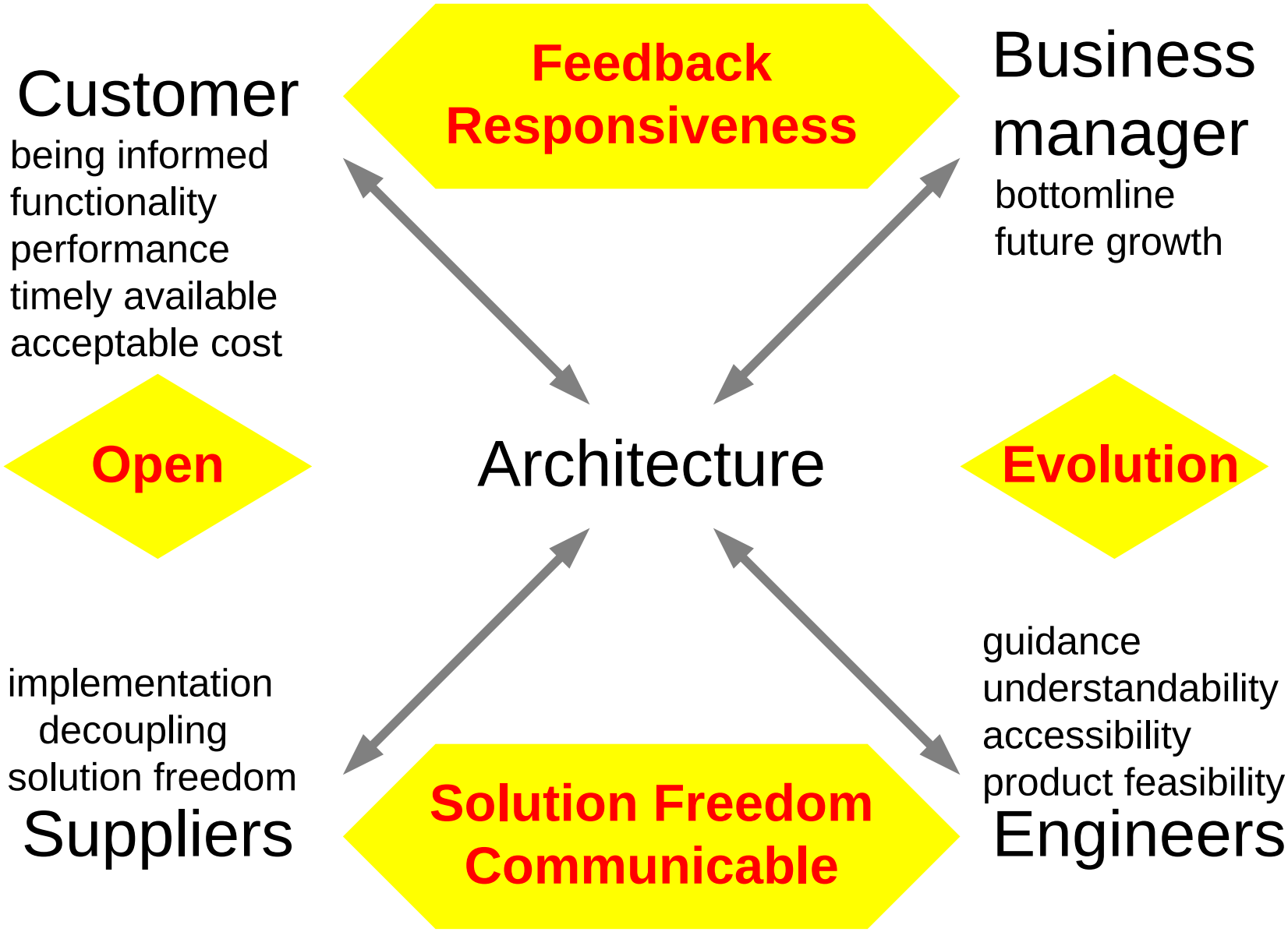
← low —— weight —— high →

Scope and Impact

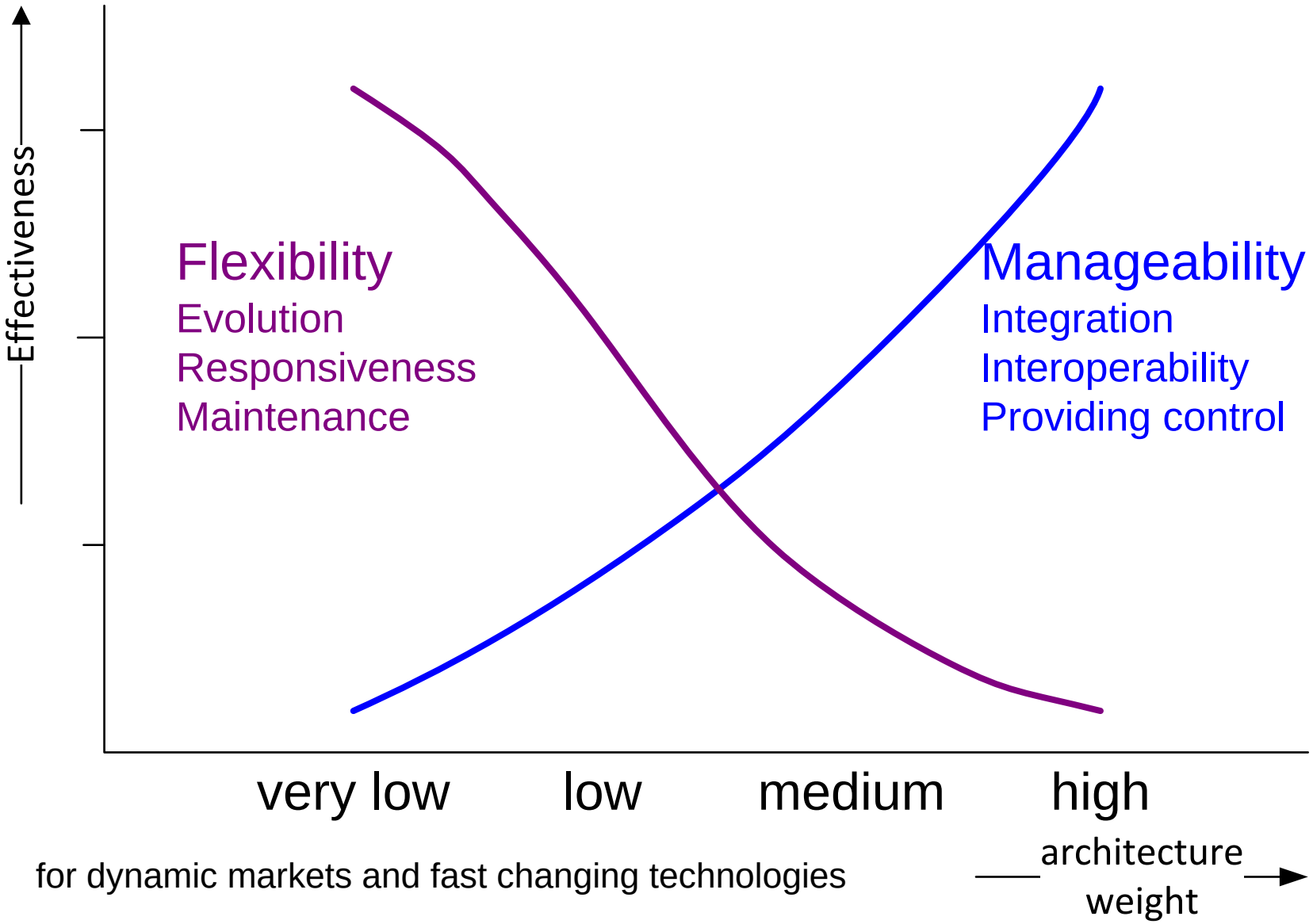




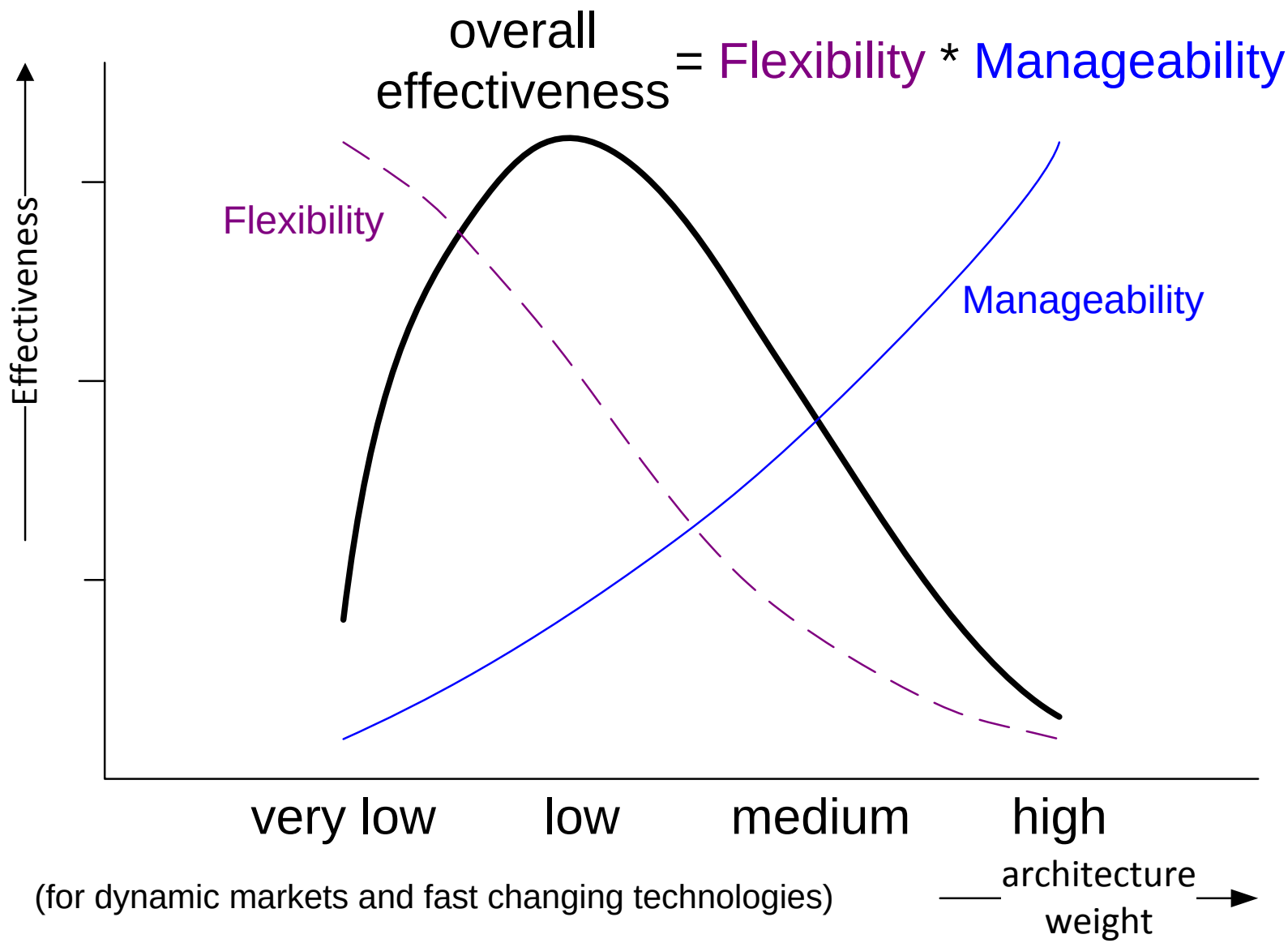
Criterions for an Architecture



Weight versus Effectiveness



Conclusion Part 2



Light Weight How -To

$$\text{weight(architecture)} = \sum_{\text{all rules}} \text{weight(rule)}$$

2. Minimize the weight per rule

1. Reduce the rule set to the (business) essential

Understand

- your customer
- your customer's customer

etcetera

Minimize Rule Weight

weight(rule)=

f (level of **enforcement** ,

scope (impact) ,

size,

level of **coupling** or
number of dependencies)

minimize number of mandatory rules

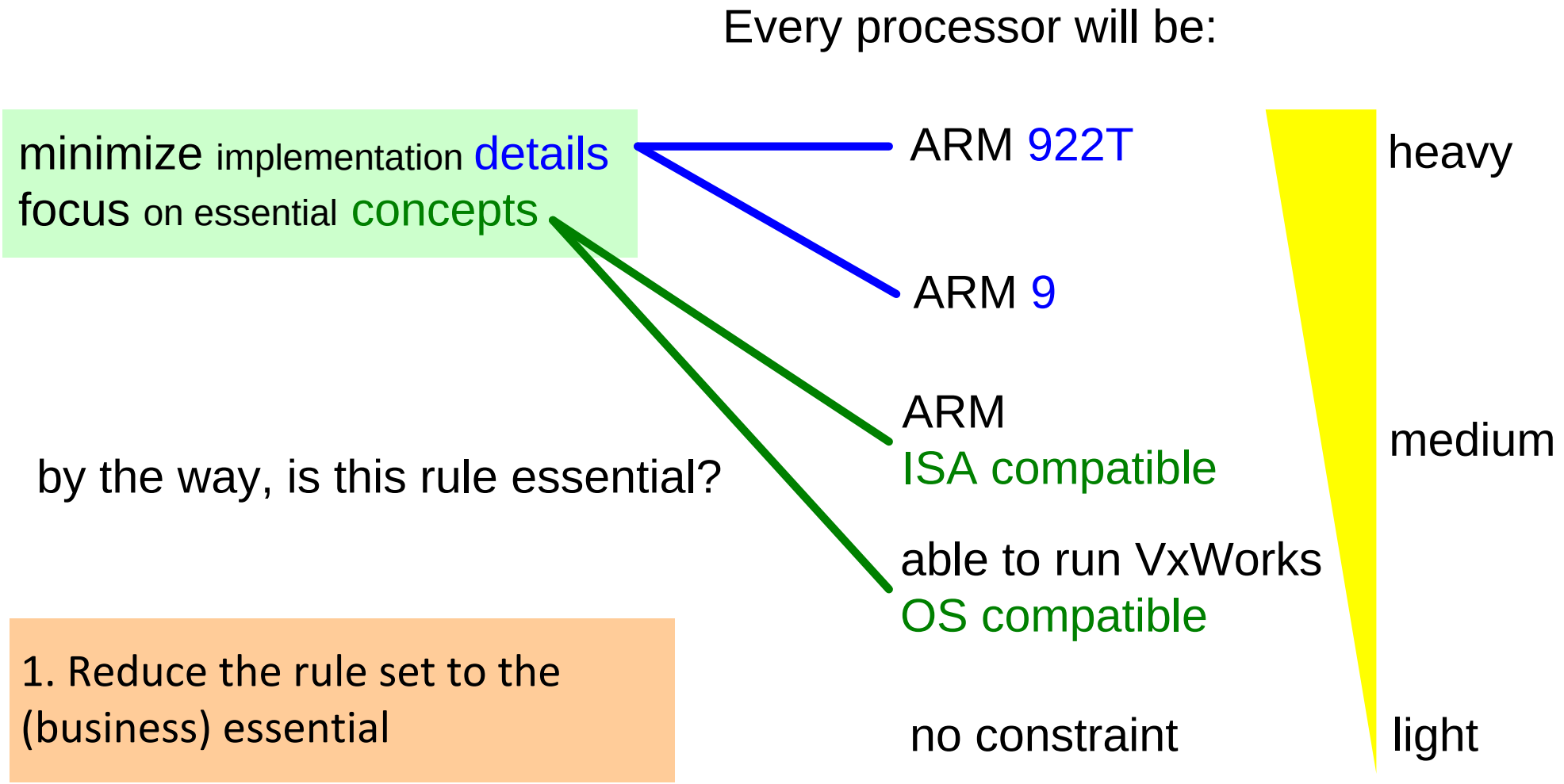
empower, delegate

minimize implementation details
focus on essential concepts

Apply design principles on architecture

Multi-view architecting

Size example: from detail to concept



Scope example

scope (impact) , empower, delegate

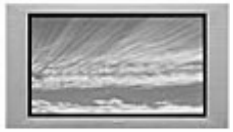
use ARM ISA compatible processor for:

Example product scope of rules

ARM !

GSM phone

ARM ?



flat display

ARM ?

car

ARM ??

pen

Communicator

television

watch

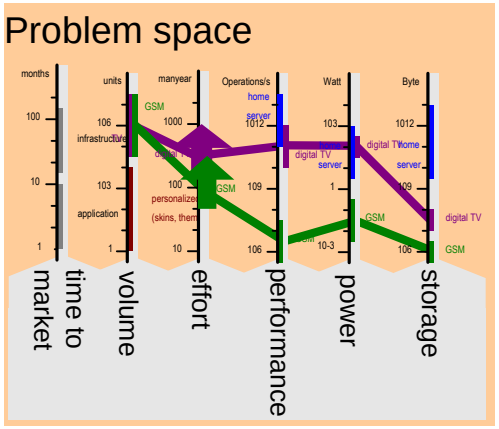
pda

and what about OS:
PalmOS, Symbian, WindowsCE, Linux, VxWorks, dedicated kernel, ...

and what about programming language, storage, network, power, protocols, formats, user interface, ...

Summary

1. Dynamic Market: Understand Your Customer



2. Optimal architecture: Light weight !