Opportunities and challenges in embedded systems

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

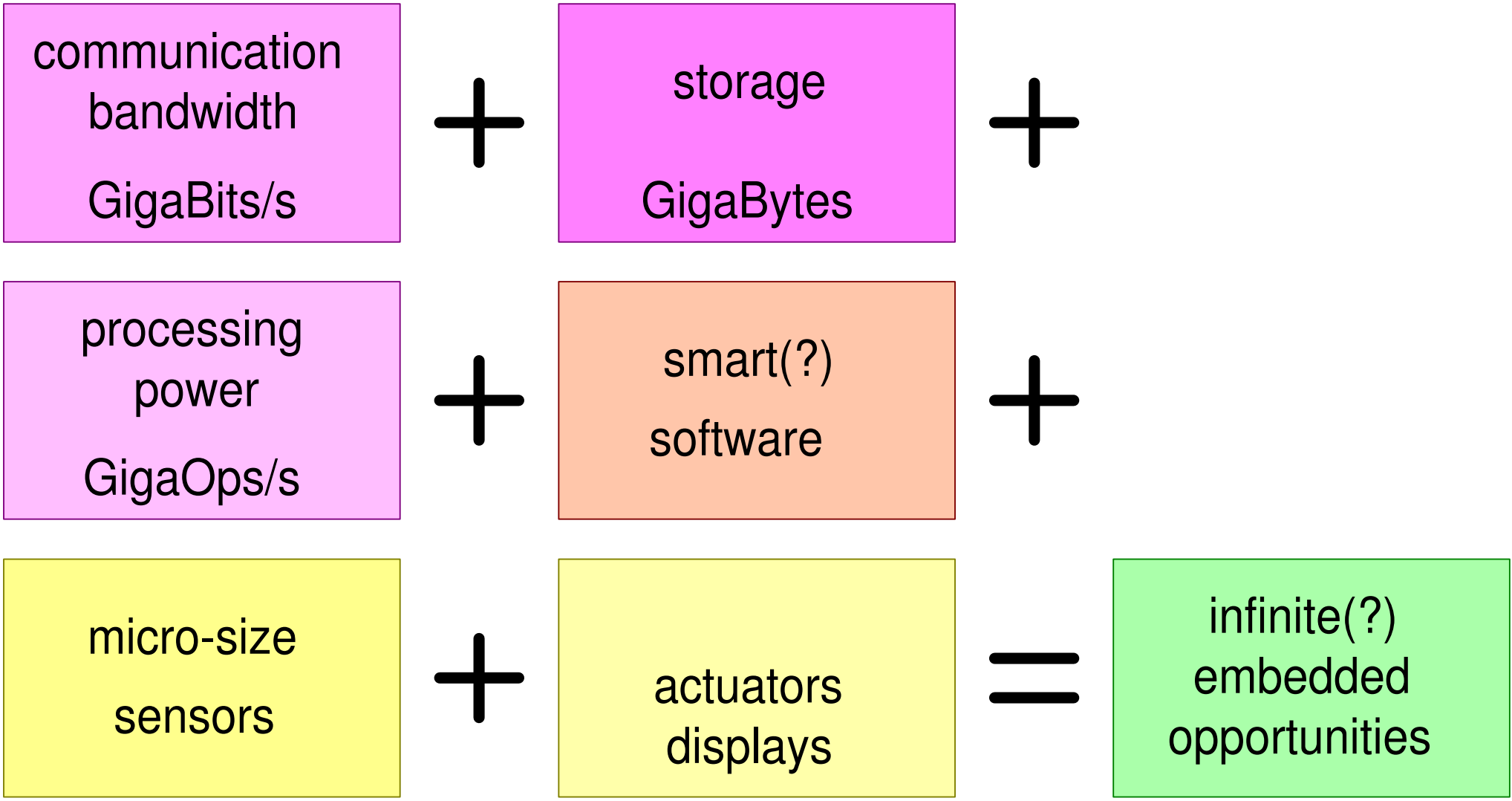
Abstract

The technological advances in processing, communication, storage, actuating and sensing enables a large amount of applications of embedded systems. The challenges of today to realize these opportunities are discussed, addressing six main issues: market dynamics, interoperability, reliability, power, security, and creativity.
The capabilities of the Embedded Systems Institute are discussed briefly.

September 9, 2018
status: concept
version: 1.0

logo
TBD

Giga embedded opportunities



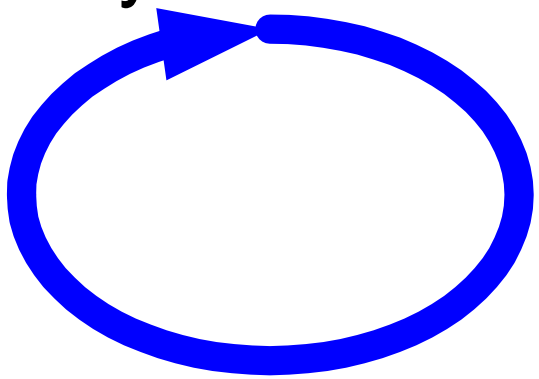
Hit list of challenges

discover latent needs
enable emergence
where is the business

creativity

market dynamics

globalization
hype waves
Moore's law



security

privacy, DRM
versus usability

interoperability

emerging behavior, future vs legacy
heterogeneous vendors

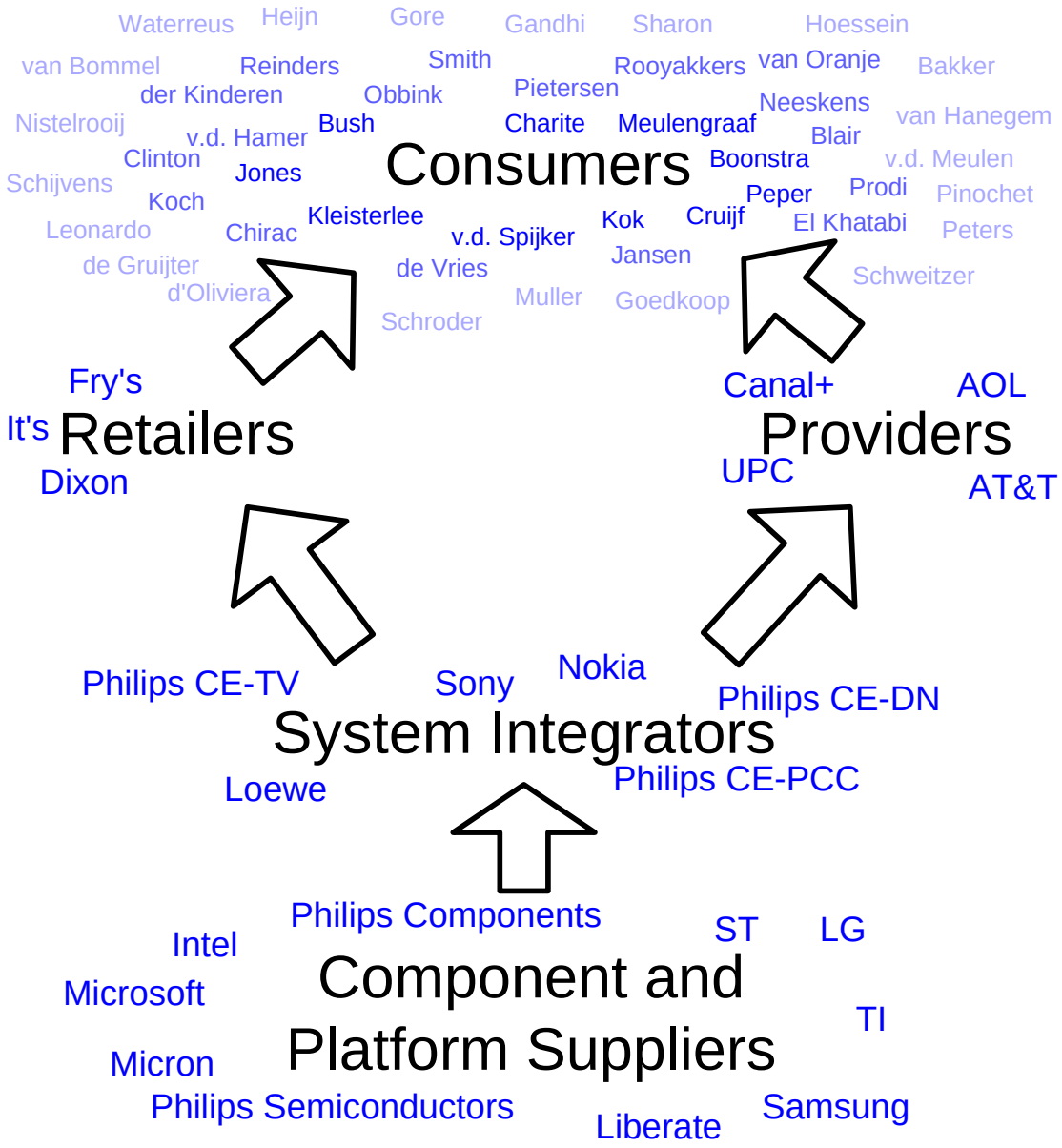
power consumption

weight, cost, performance

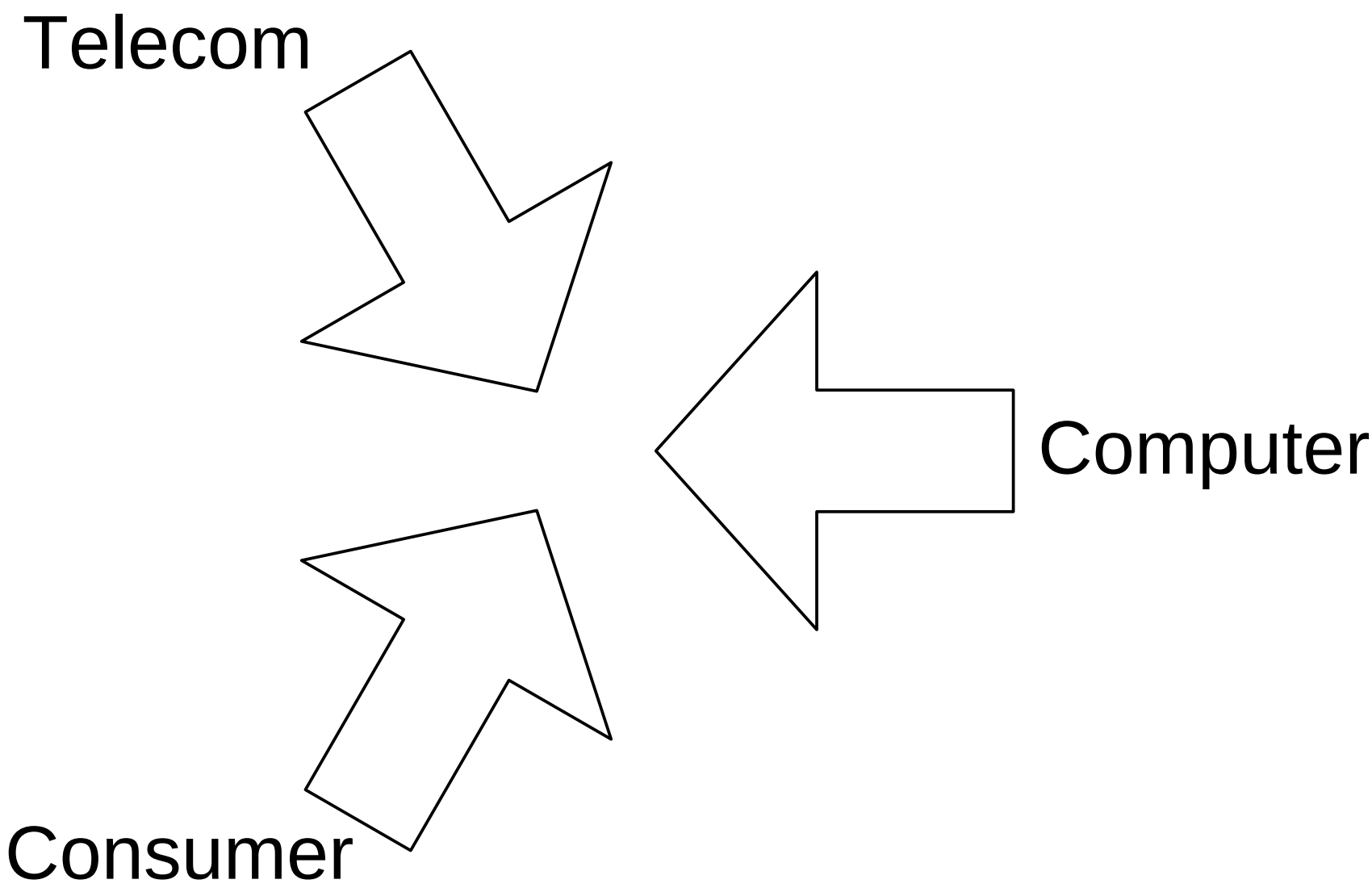
reliability

complexity
heterogeneity
#engineers involved

Value Chain in Consumer Electronics



Trend: 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


Ambient Intelligence living room


car navigation

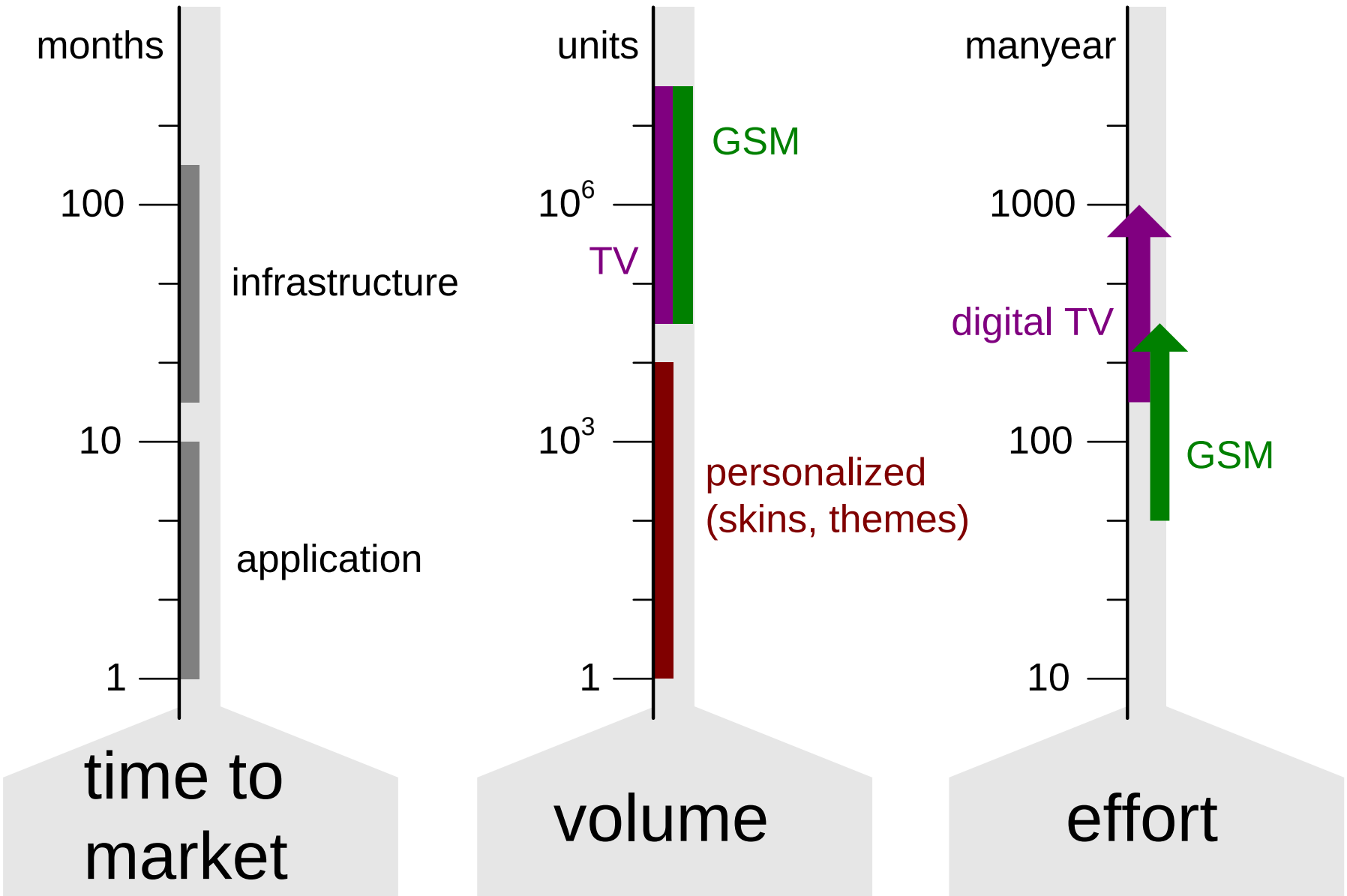

computer


games

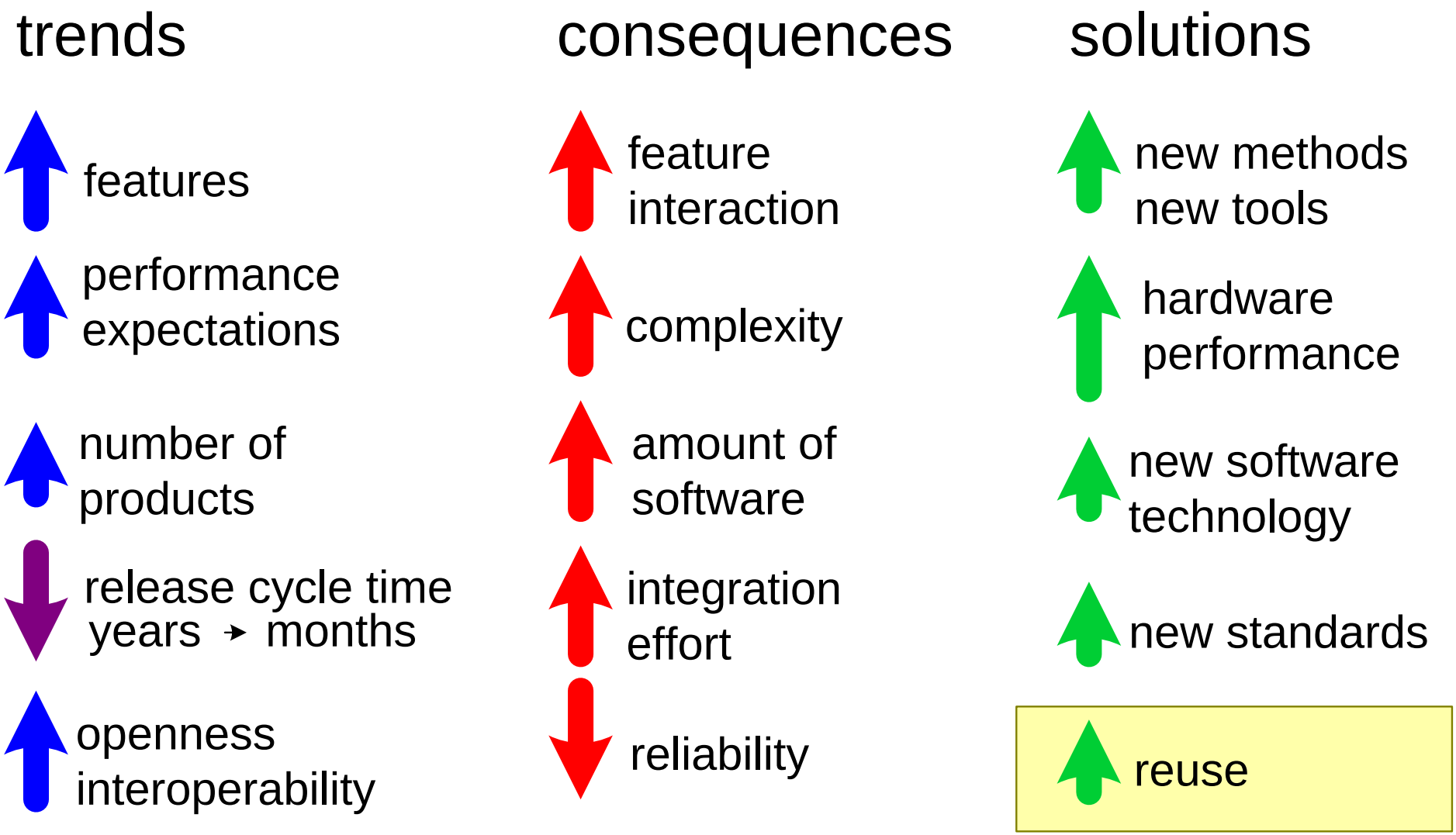

flat display


Communicator

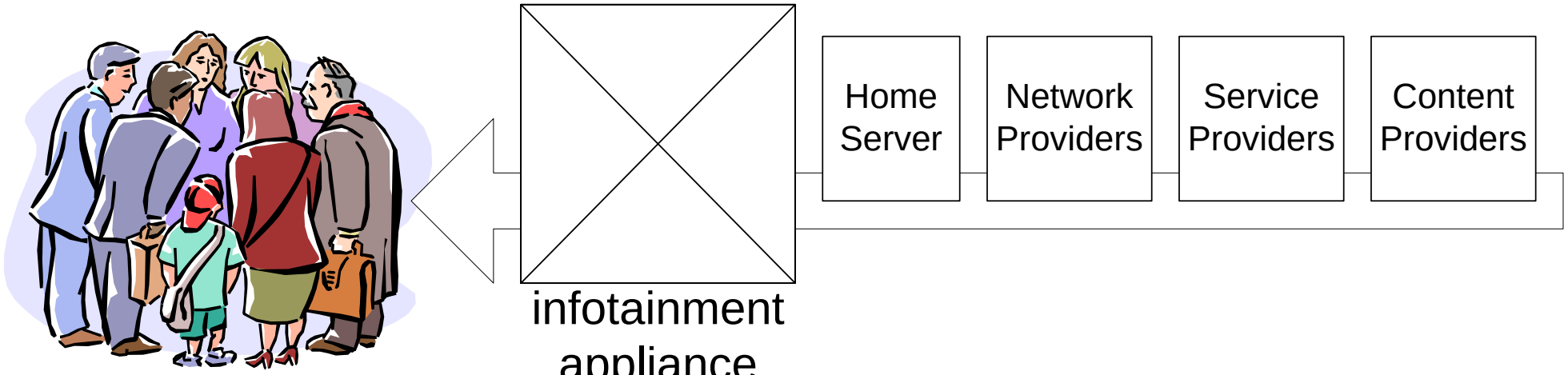
System Integrator Problem Space - Business



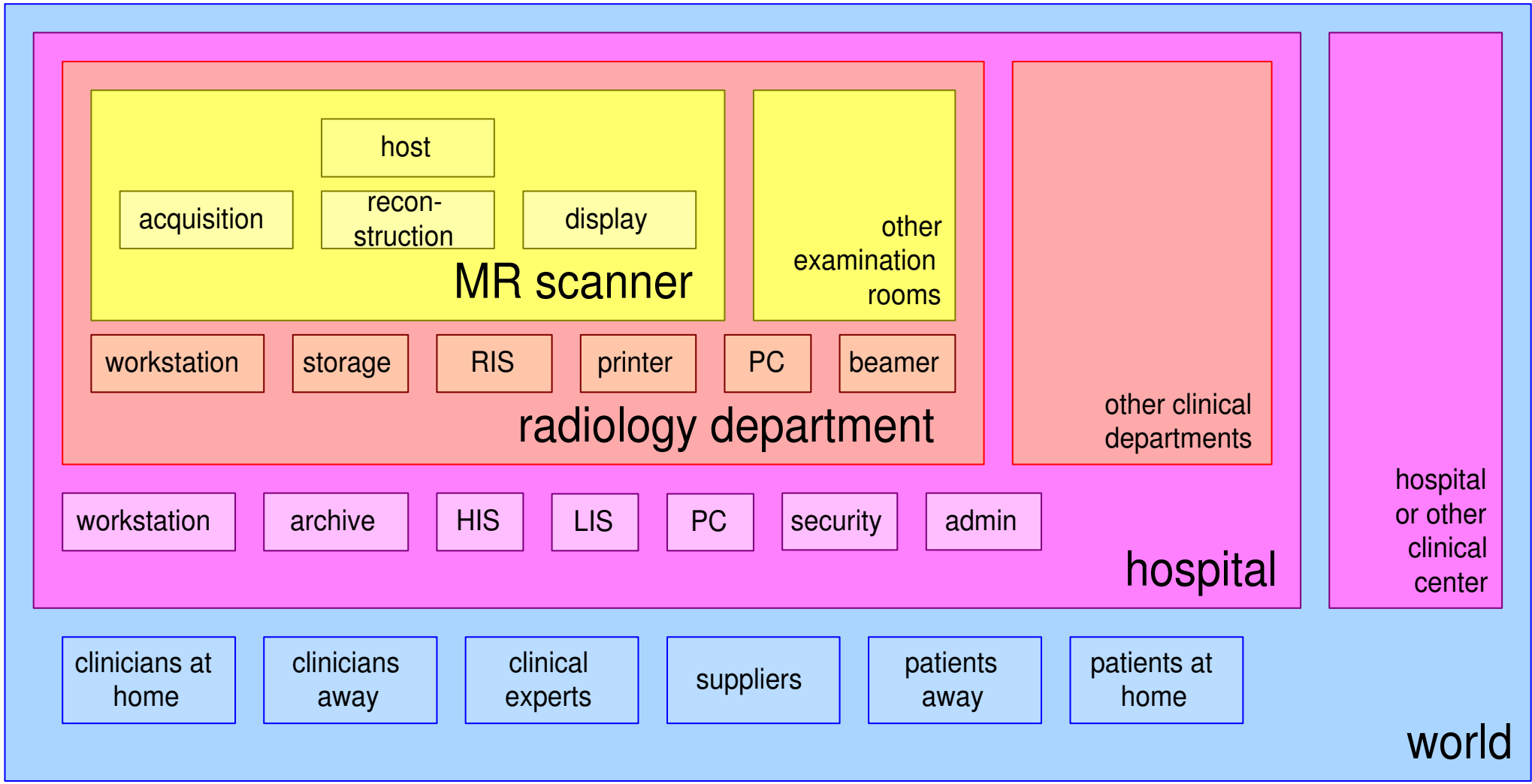
Is reuse **the** solution to effort?



Applications depend on chain of systems



Interoperability: systems get connected at all levels



Multi dimensional interoperability

integrating **multiple**

applications

cilinical analysis
clinical support
administrative
financial
workflow

in **multiple**

languages
cultures

USA, UK,
China, India,
Japan, Korea
France, Germany
Italy, Mexico

delivered by **multiple**

vendors

Philips
GE
Siemens

based on **multiple**

media, networks

DVD+RW
memory stick
memory cards
bluetooth
11a/b/g
UTMS

and **multiple**

standards

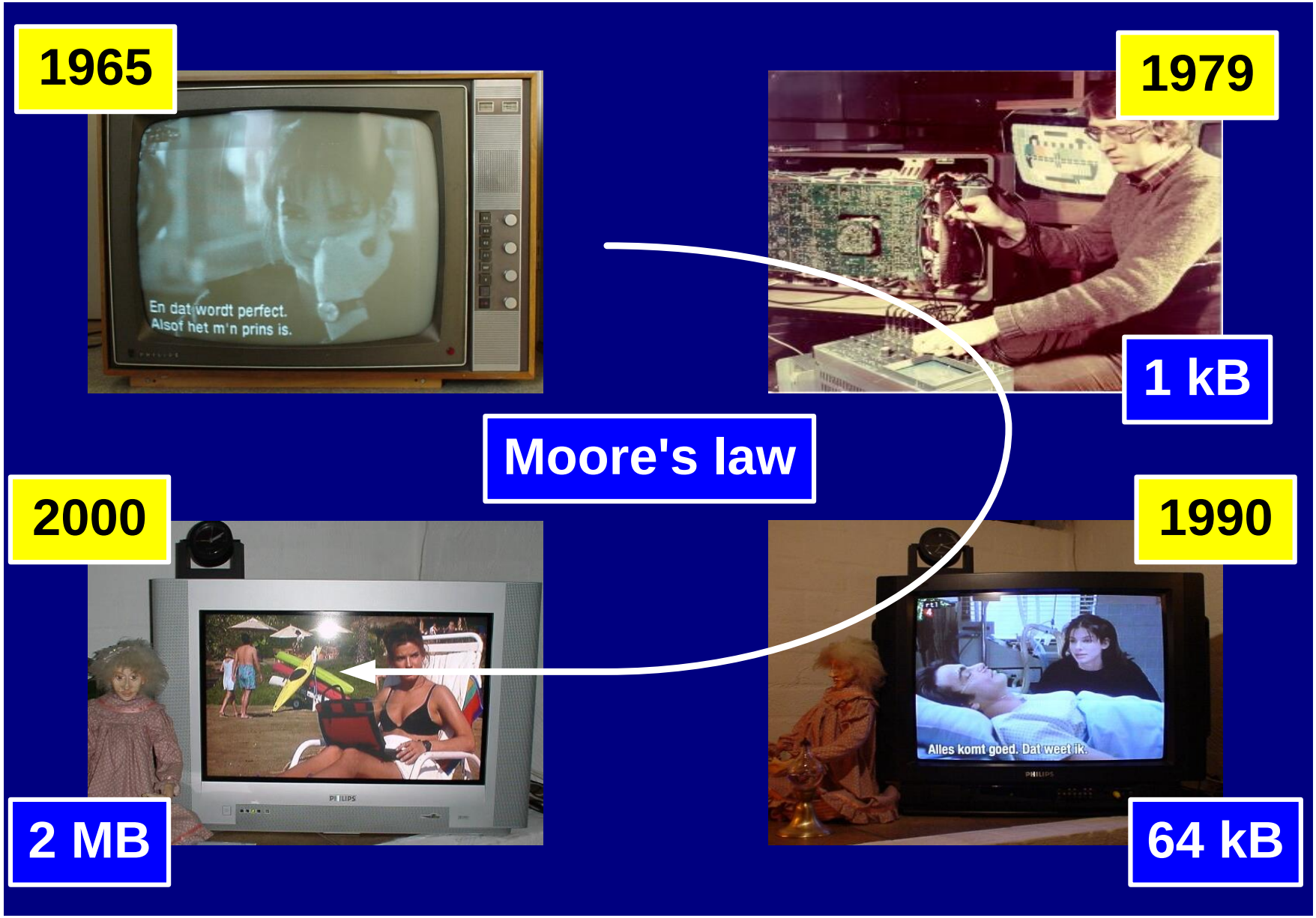
Dicom
HL7
XML

and **multiple**

releases

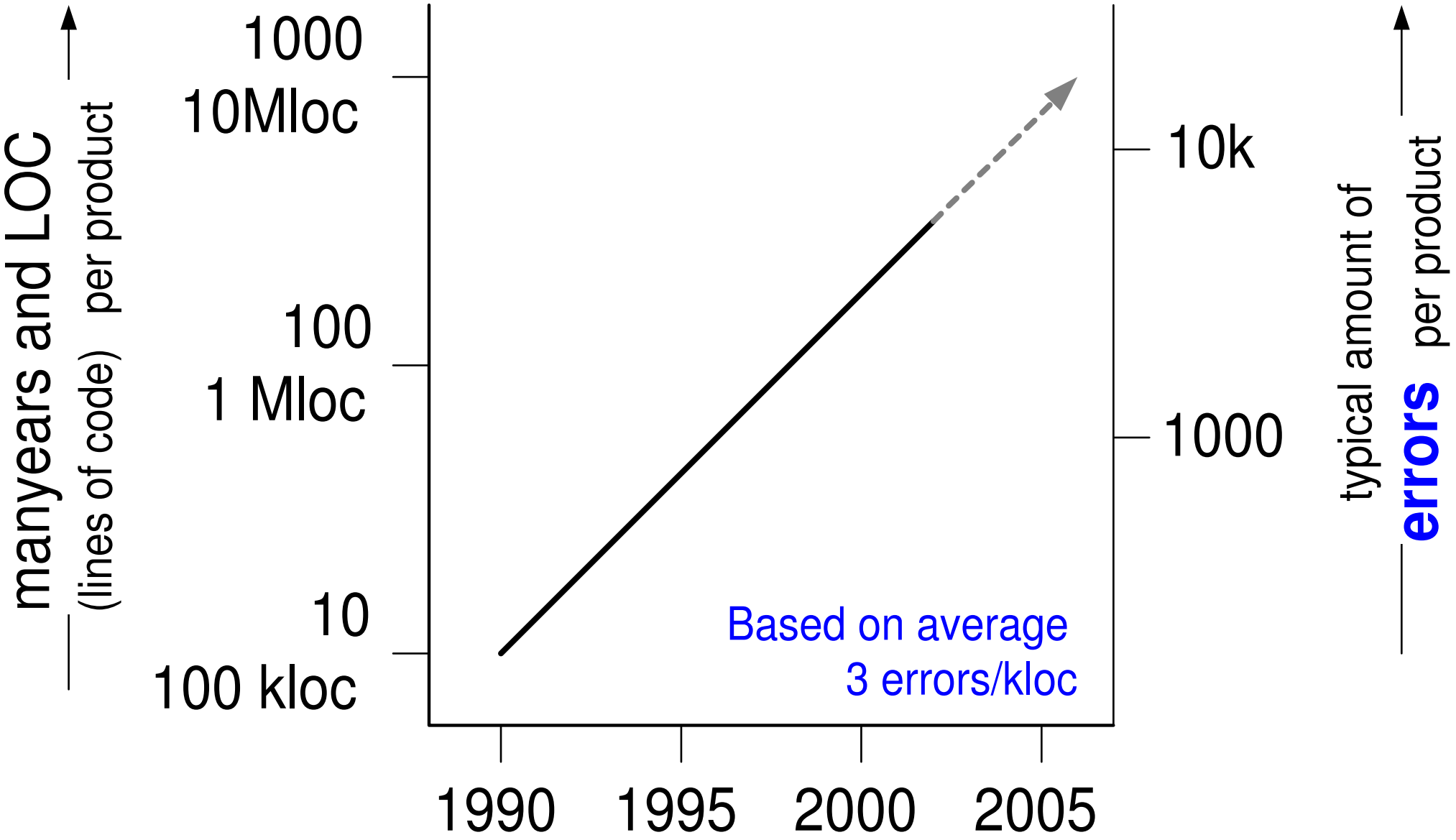
R5
R6.2
R7.1

SW increase in televisions



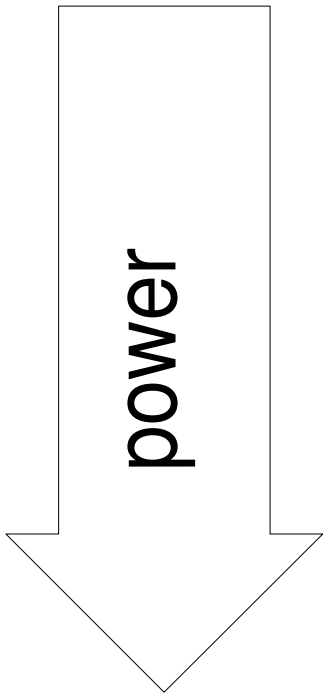
From: COPA tutorial, Rob van Ommering

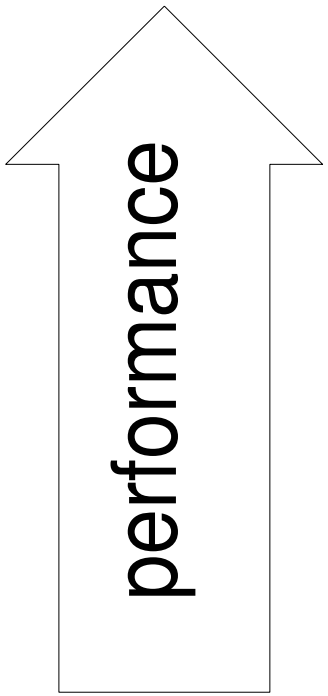
Increase of software threatens Reliability



Power consumption and dissipation

heat dissipation
stand by time
operational time
acoustic noise
power supply cost





faster
more

examples

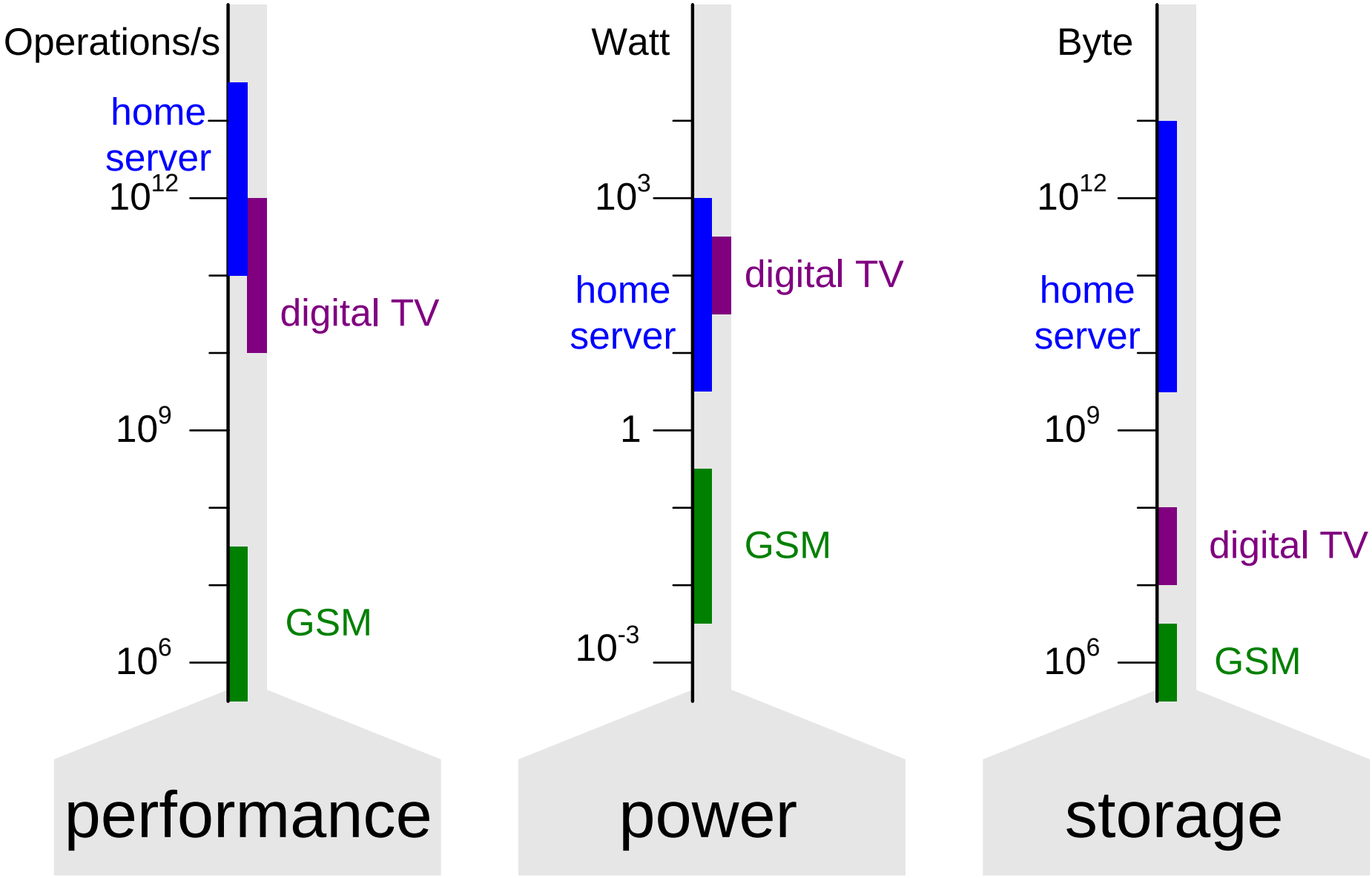
3G phone
standby time
operational time
wireless video

data centers
insufficient power in Amsterdam

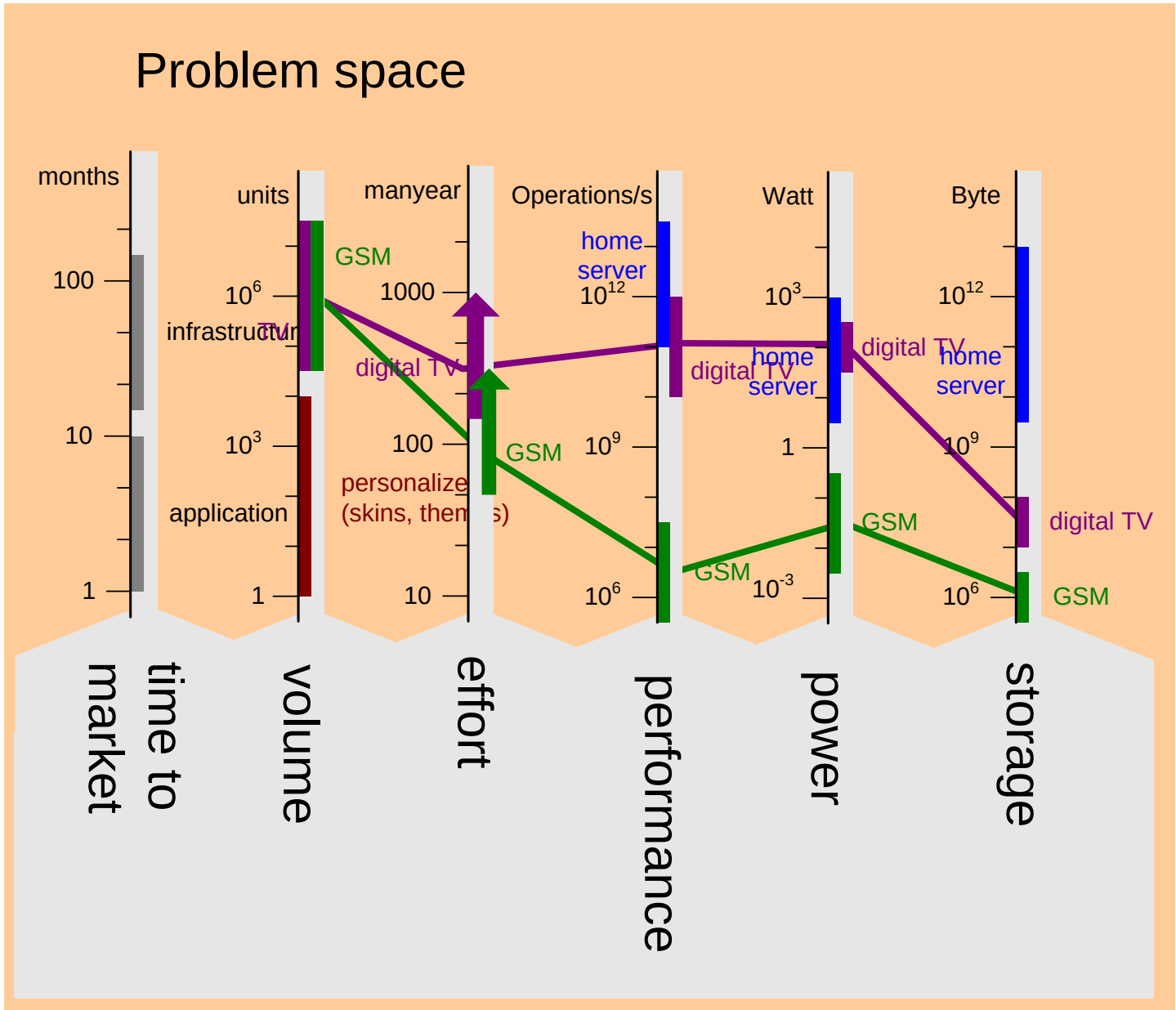
desktop
silent fanless

MRI gradients : 66 mT/m
kWatts: cost, noise, heat

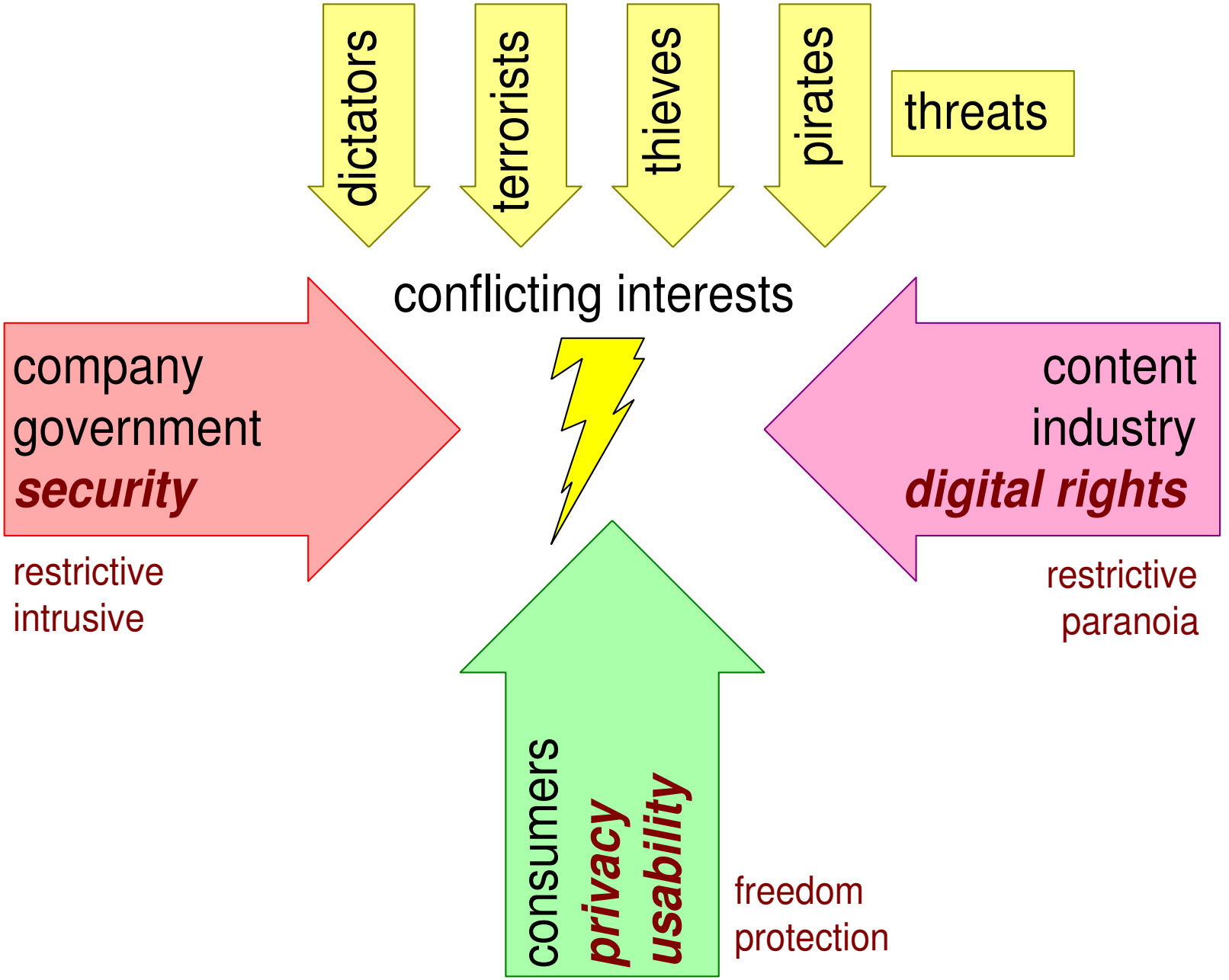
System Integrator Problem Space - Technology



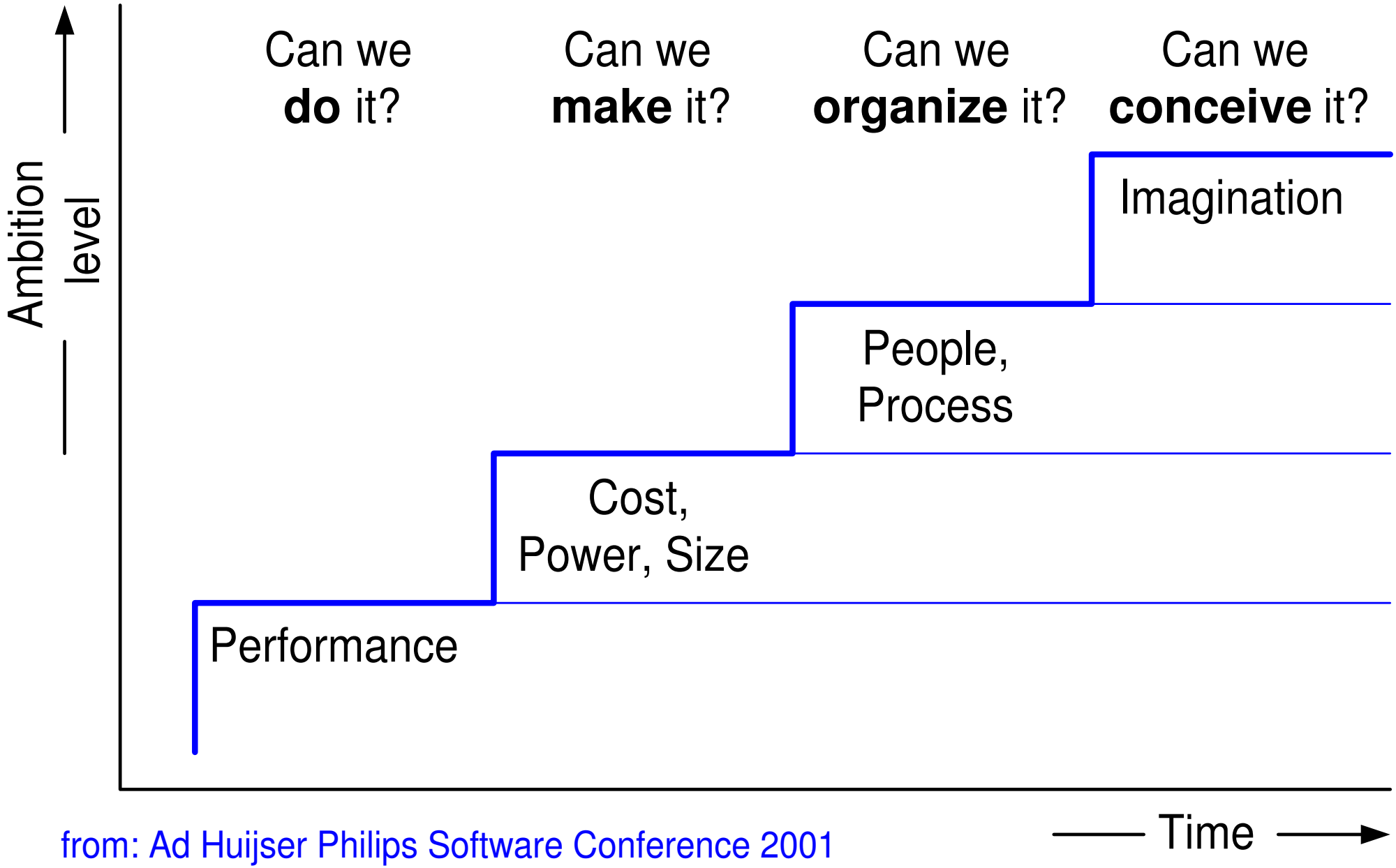
Profile of Digital TV and GSM



Security conflicting interests



Creativity as limiting factor



from: Ad Huijser Philips Software Conference 2001

Role of Embedded Systems Institute ESI