

Opportunities and challenges in embedded systems

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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.

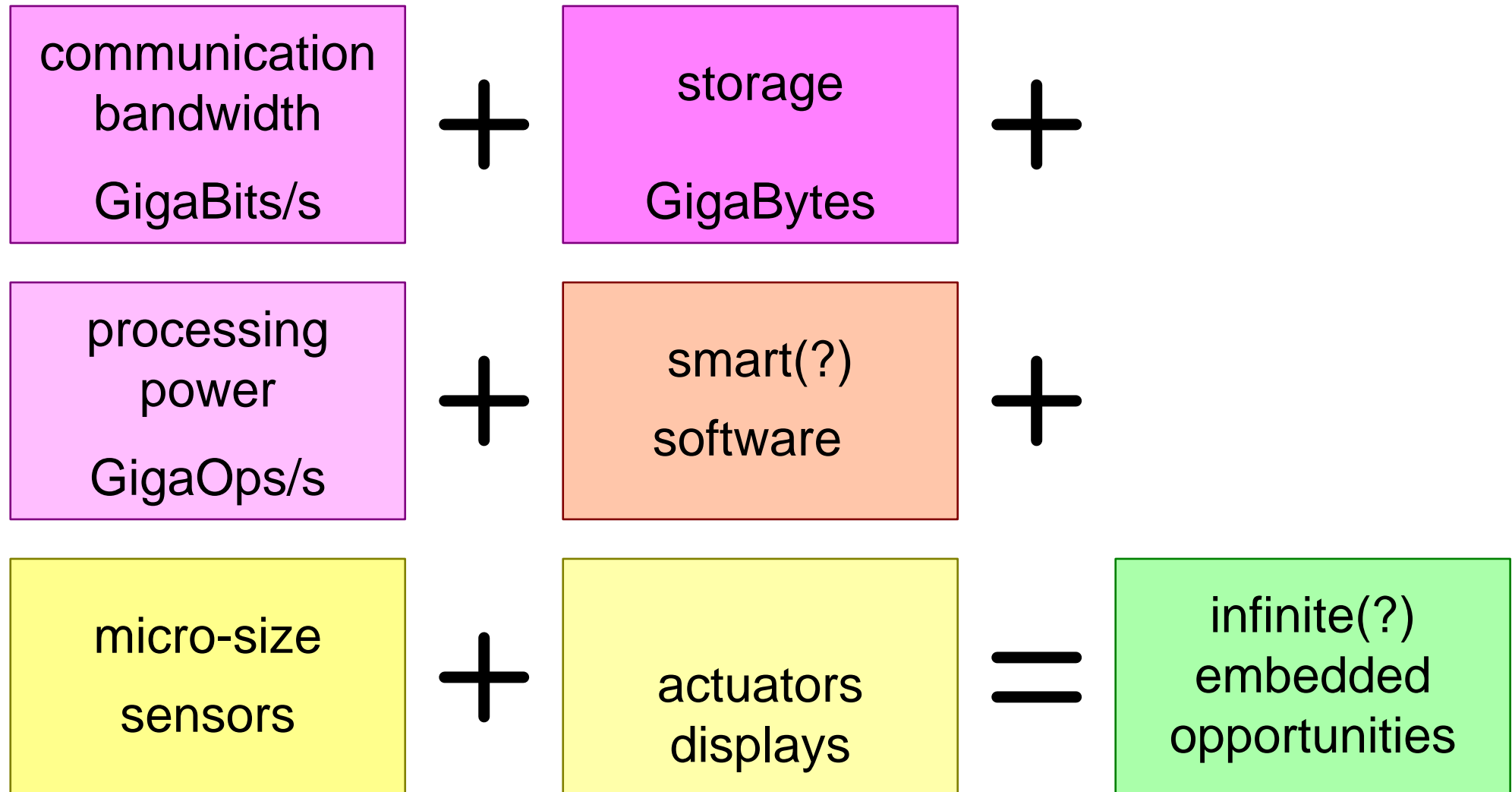
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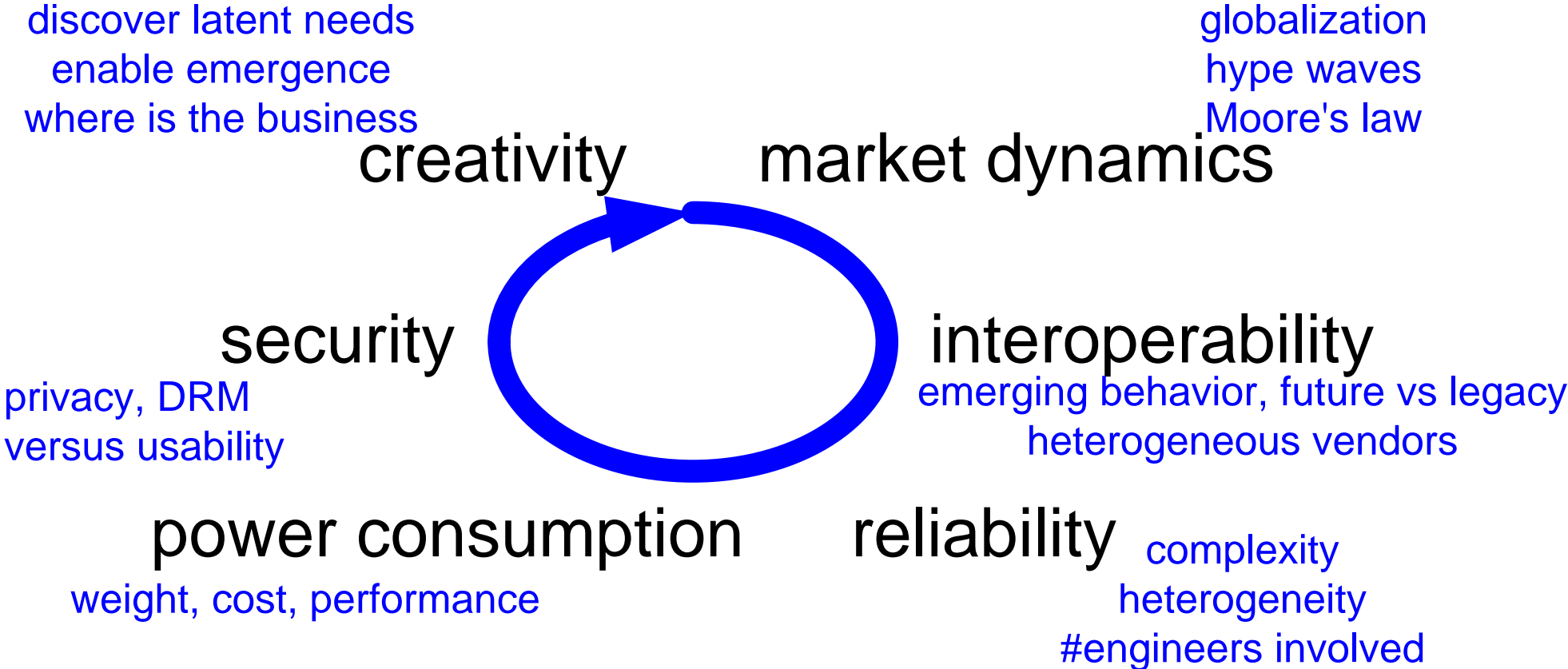
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logo
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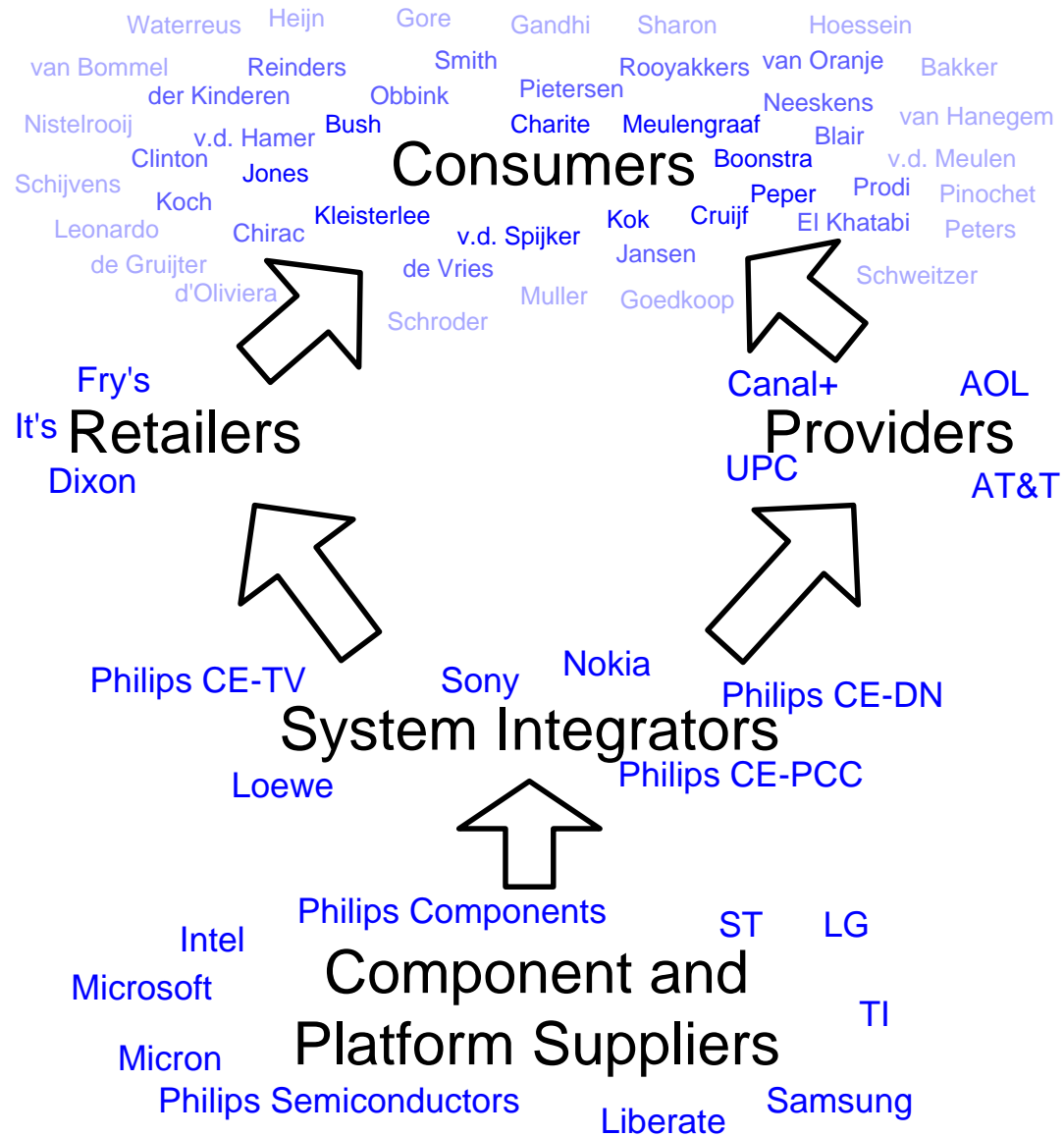
Giga embedded opportunities



Hit list of challenges

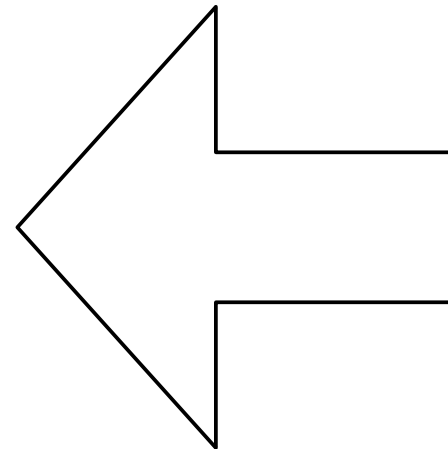
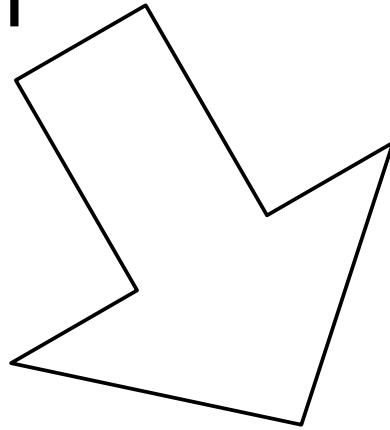


Value Chain in Consumer Electronics



Trend: convergence

Telecom



Computer

Consumer

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



Communicator



Ambient Intelligence
living room



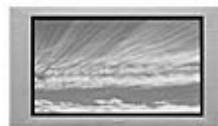
car navigation



computer

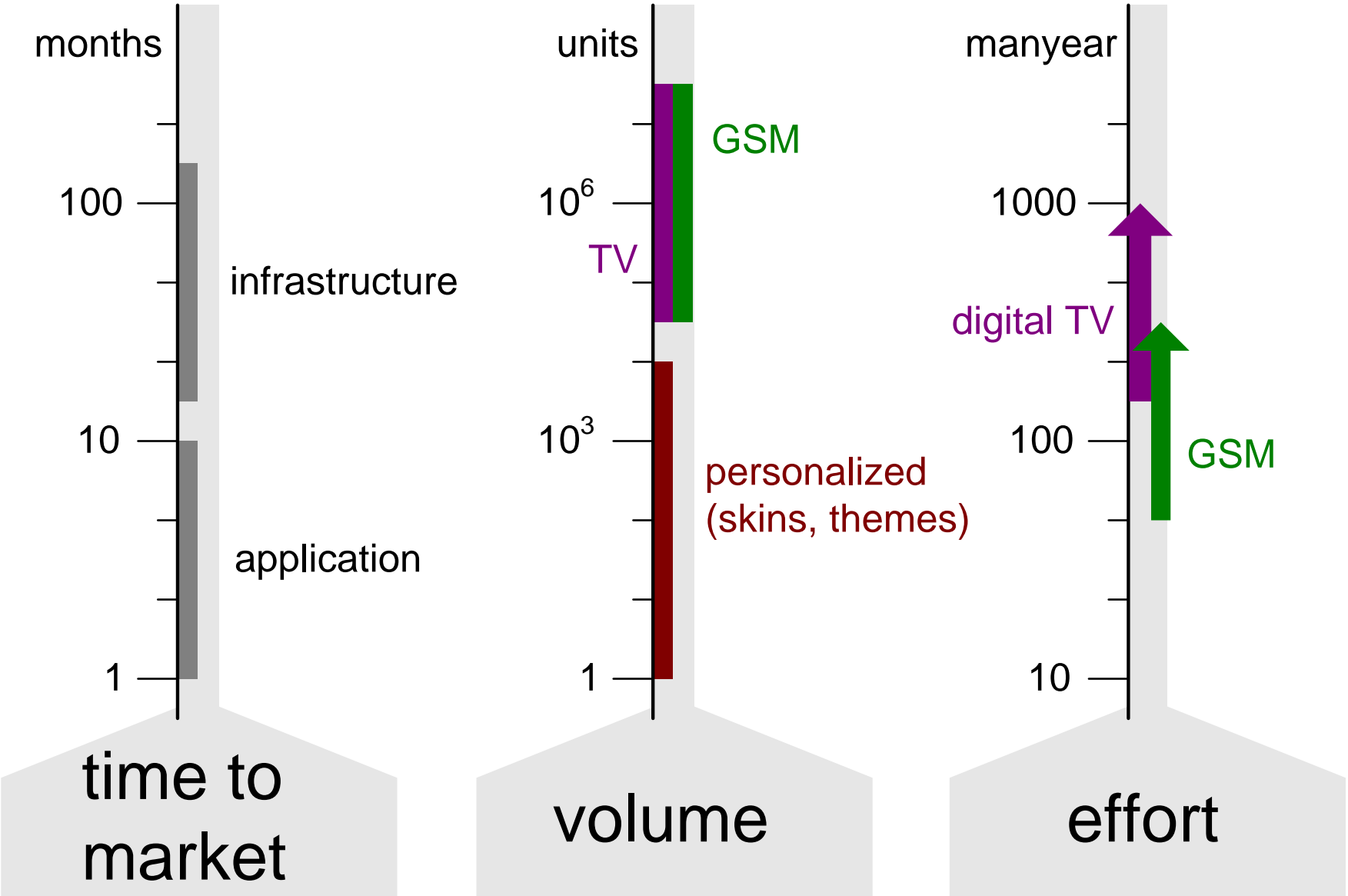


games



flat display

System Integrator Problem Space - Business



Is reuse **the** solution to effort?

trends



features



performance expectations



number of products



release cycle time
years → months



openness
interoperability

consequences



feature interaction



complexity



amount of software



integration effort



reliability

solutions



new methods
new tools



hardware performance



new software technology

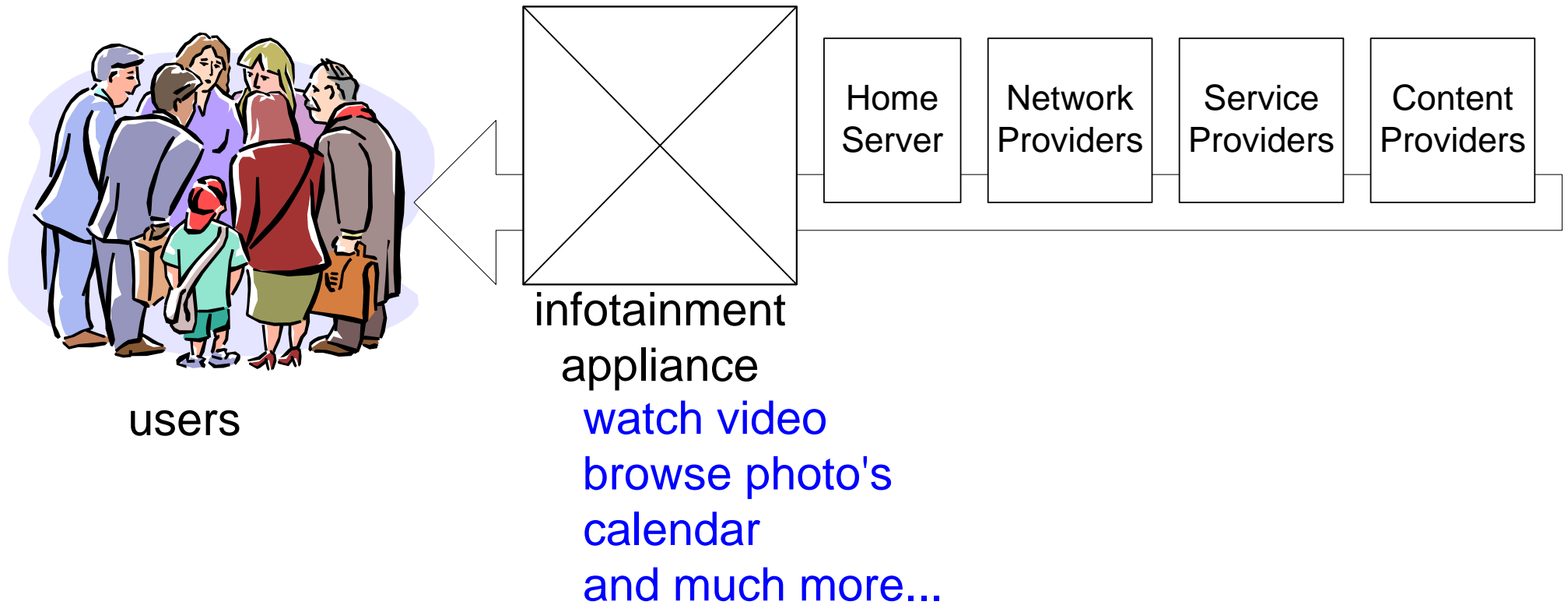


new standards

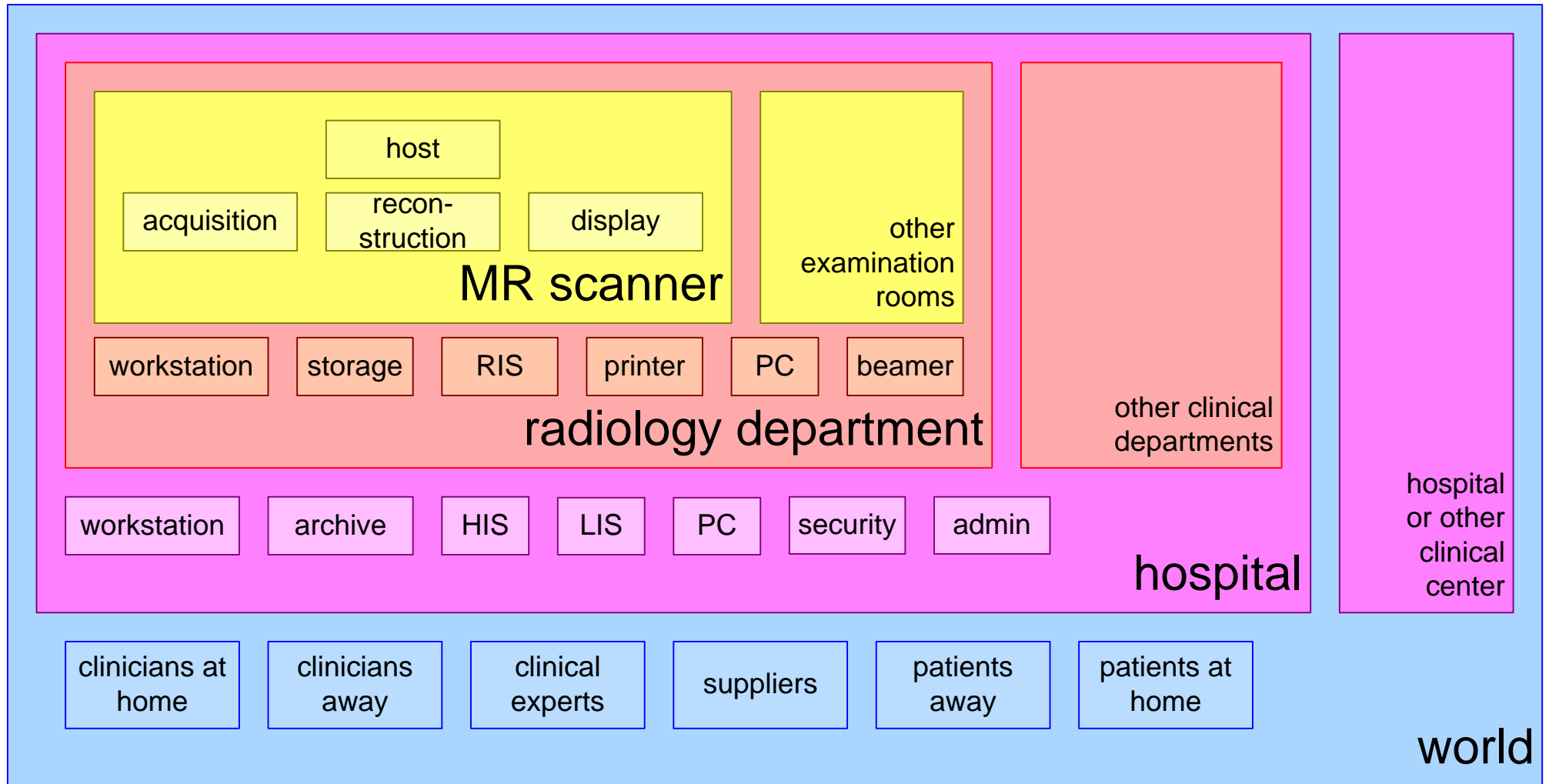


reuse

Applications depend on chain of systems



Interoperability: systems get connected at all levels



Multi dimensional interoperability

integrating **multiple**

applications

clinical 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

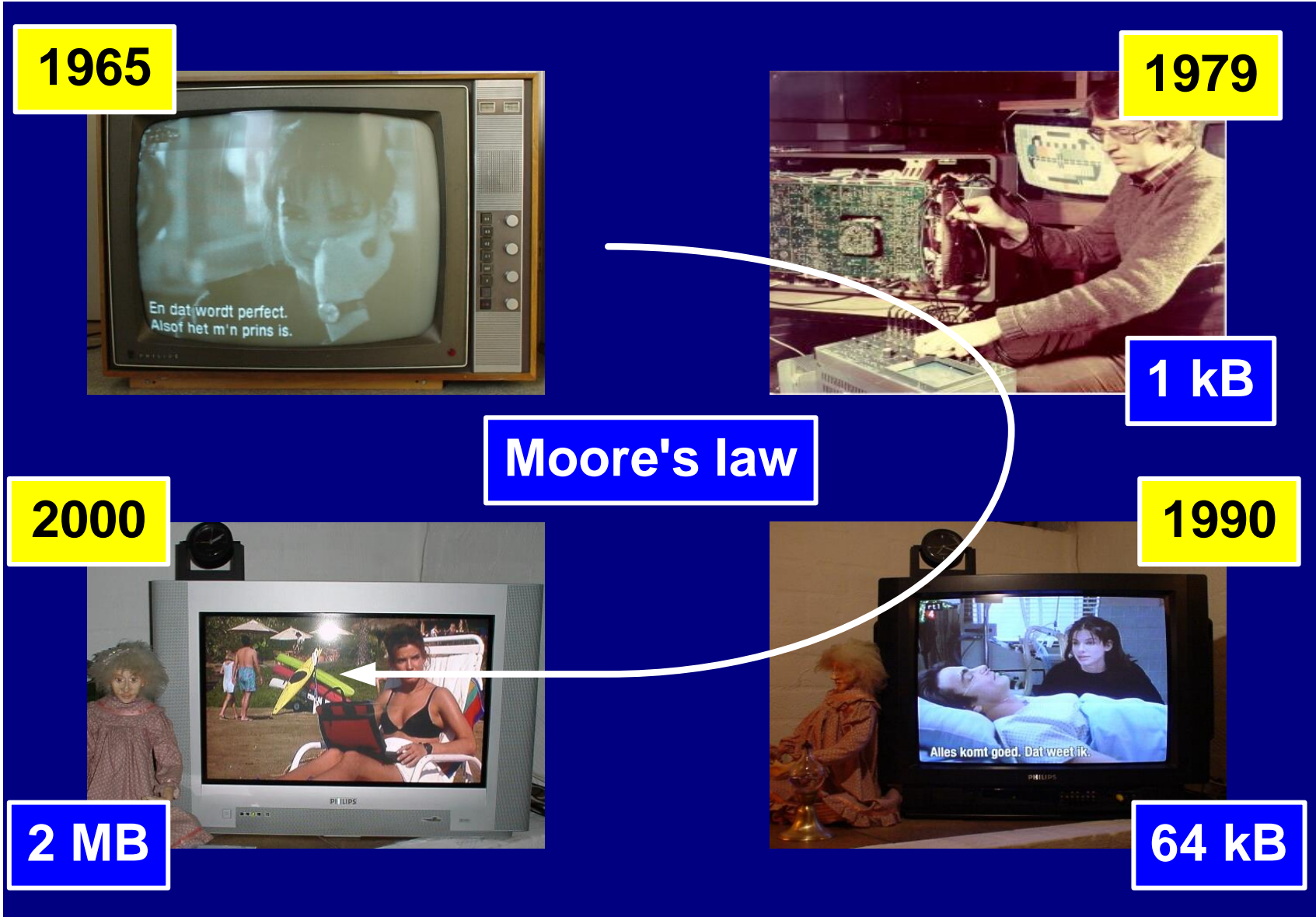
and **multiple**

releases

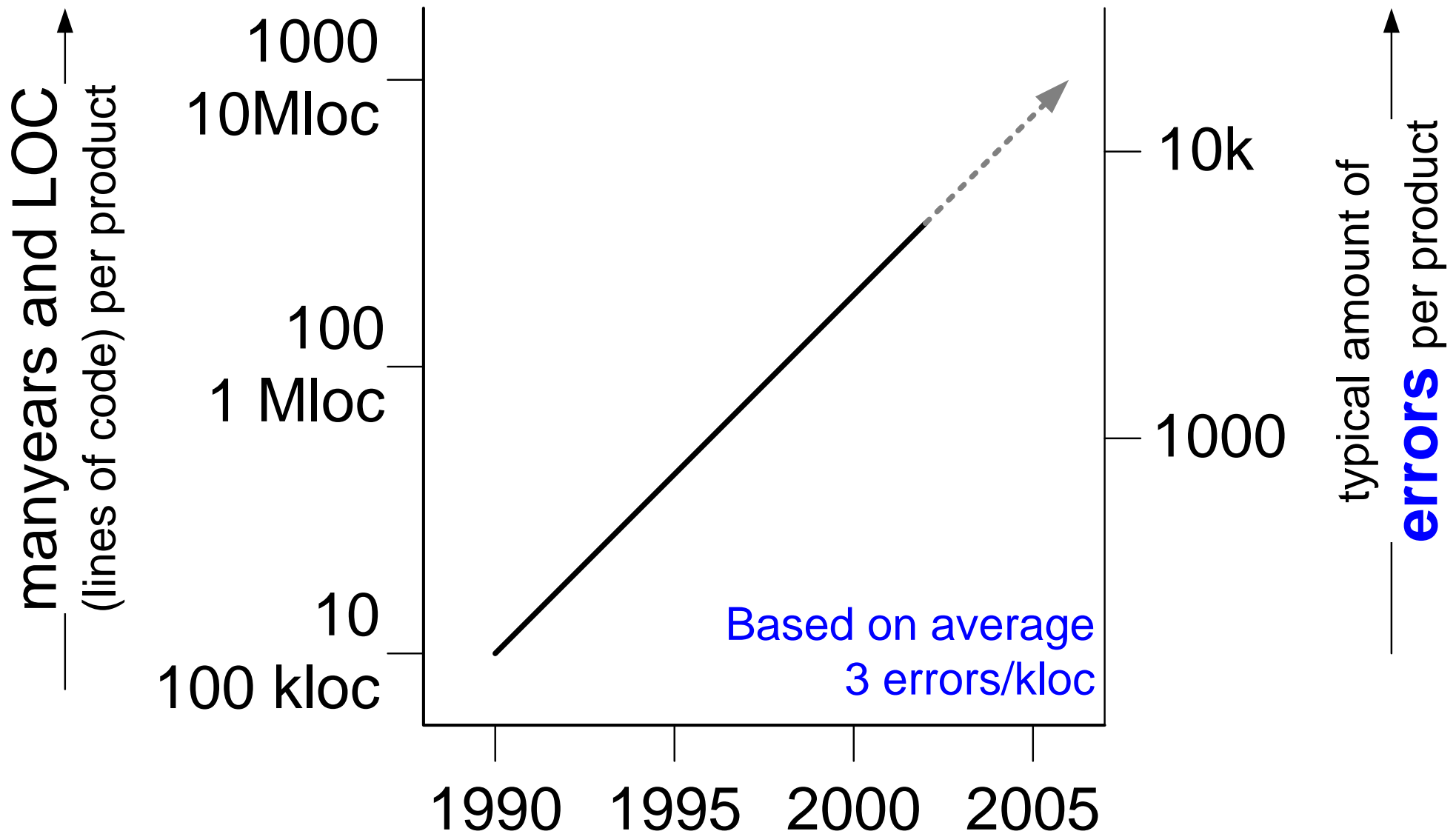
R5
R6.2
R7.1

SW increase in televisions

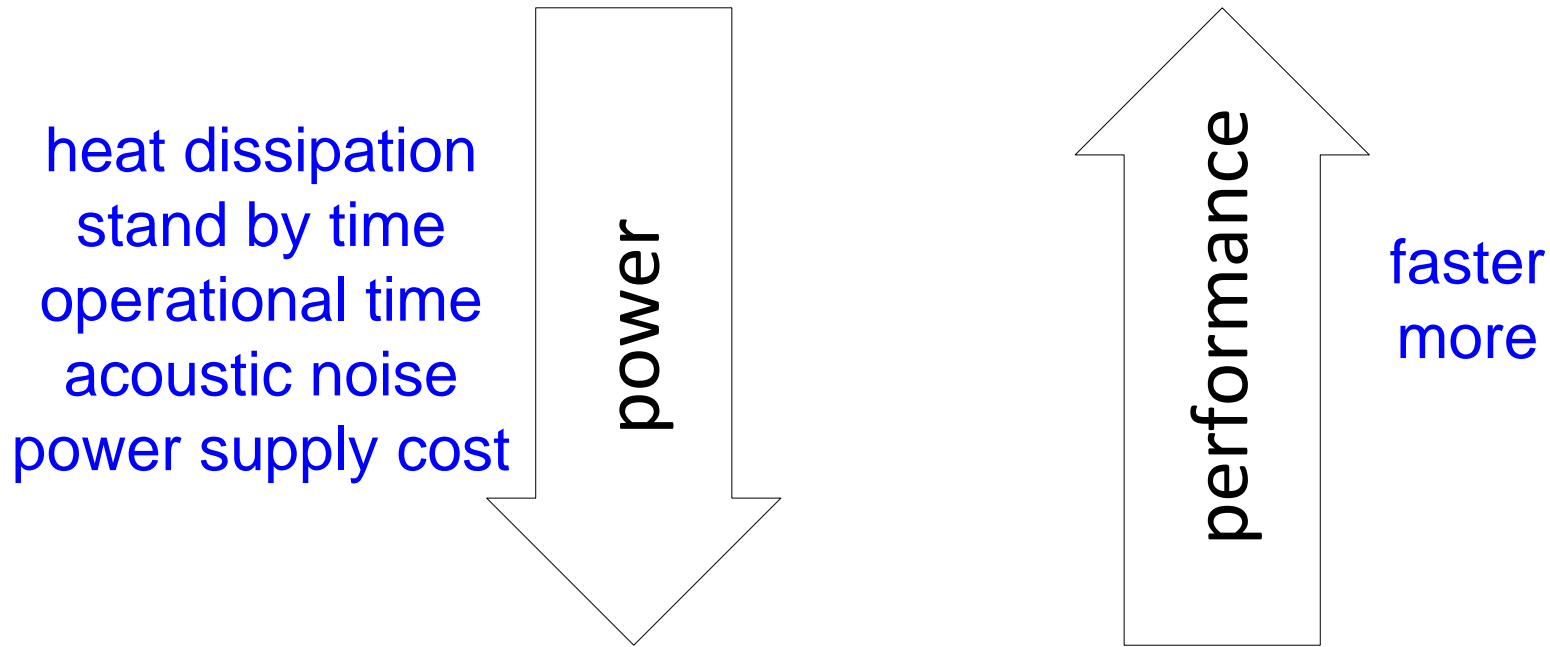
From: COPA tutorial, Rob van Ommering



Increase of software threatens Reliability

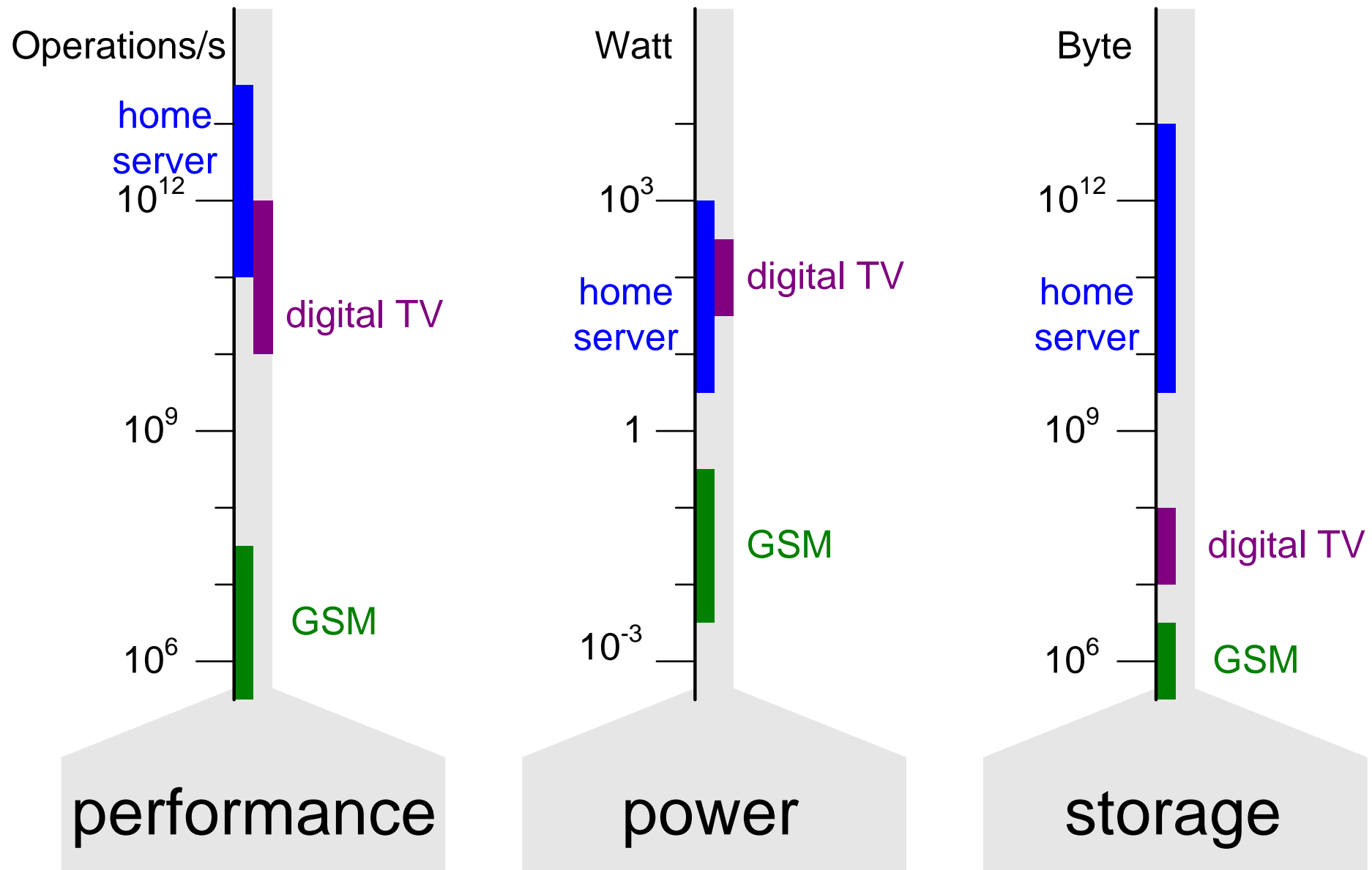


Power consumption and dissipation

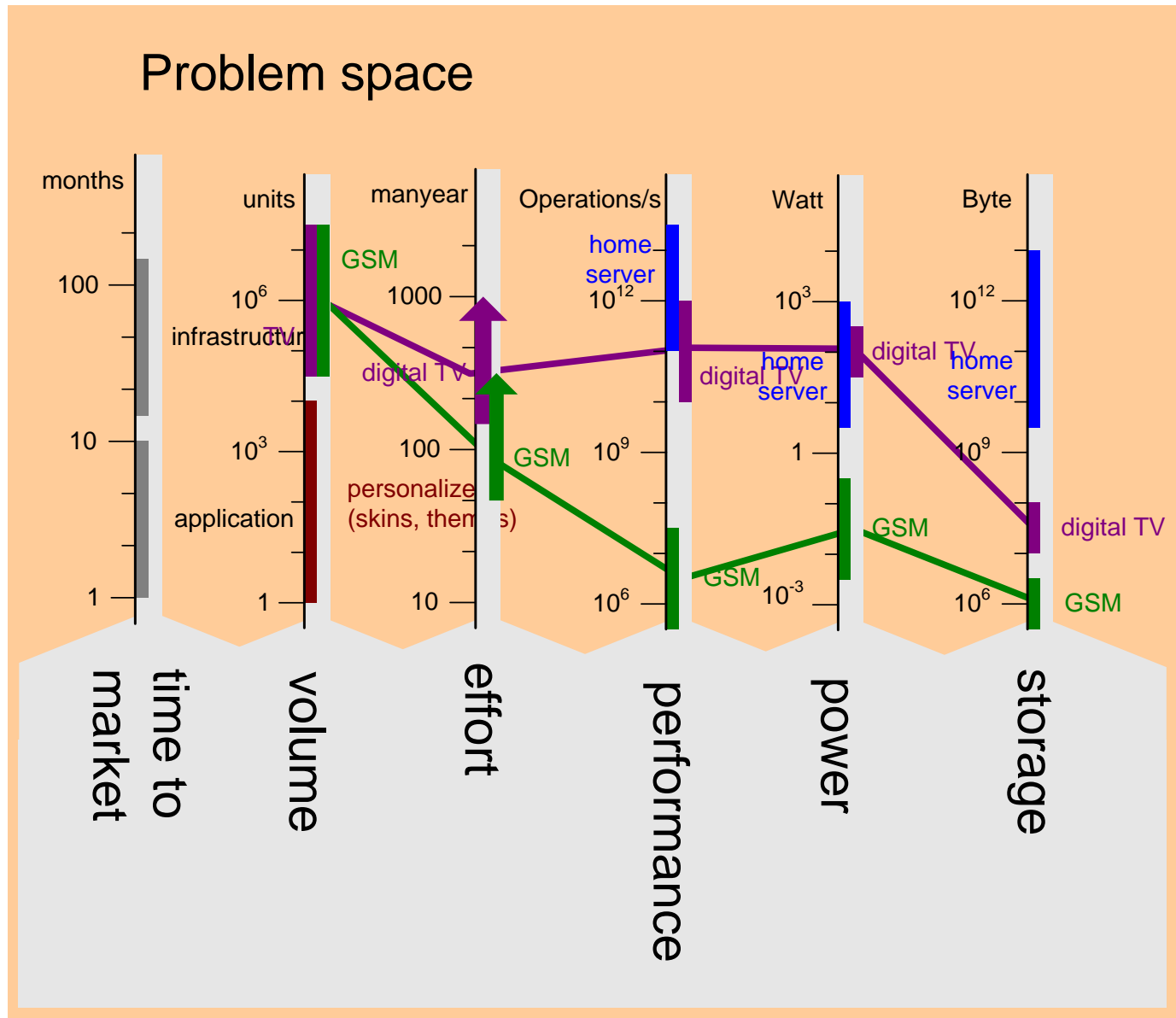


	examples	
<i>3G phone</i> standby time operational time wireless video	<i>data centers</i> insufficient power in Amsterdam	<i>desktop</i> silent fanless <i>MRI gradients: 66 mT/m</i> kWatts: cost, noise, heat

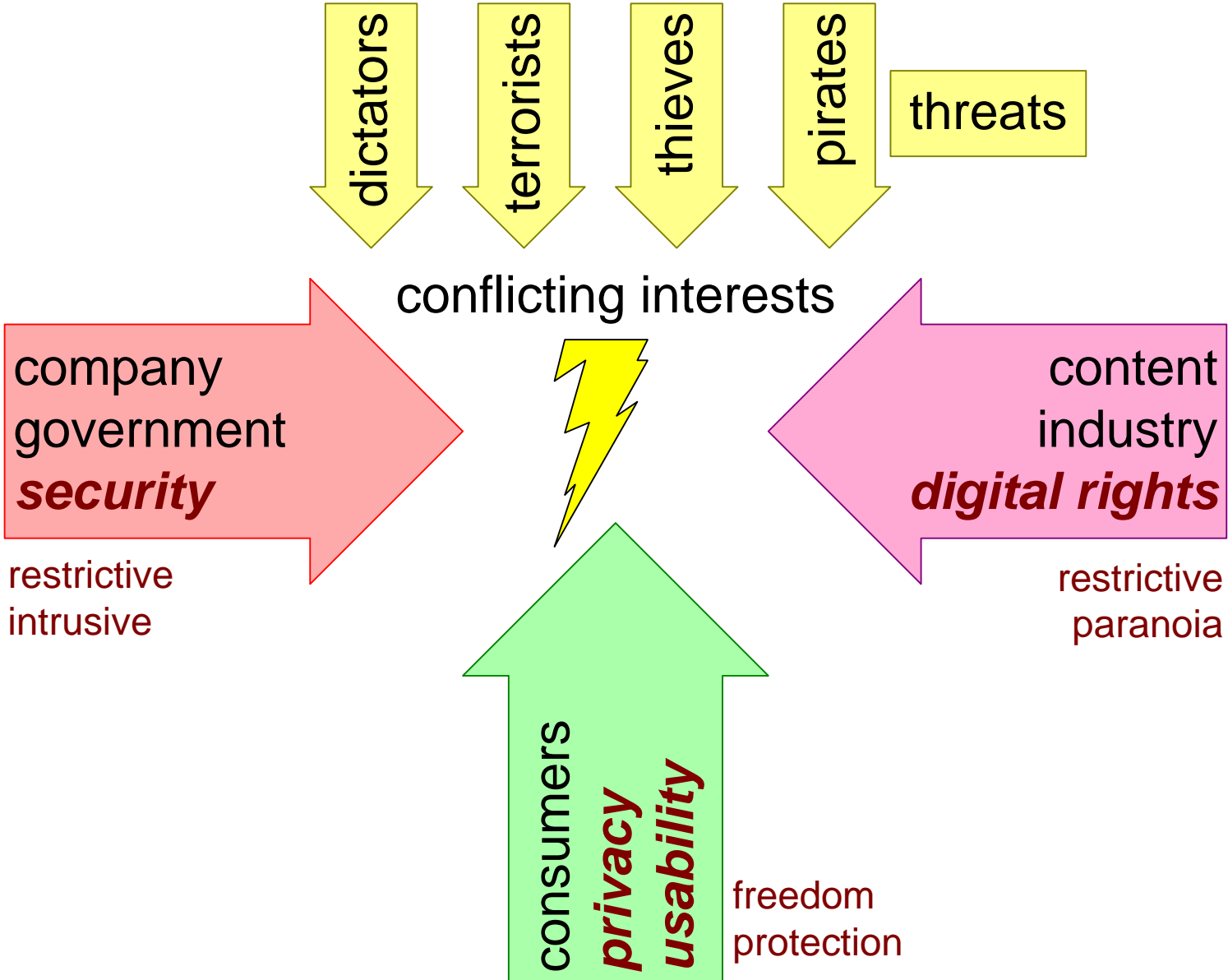
System Integrator Problem Space - Technology



Profile of Digital TV and GSM



Security conflicting interests



Creativity as limiting factor

