

# Embedded Software in Digital Consumer Electronics

## Past Innovation and Today's Requirements

October 6, 2008

KUSHIKI, Yoshiaki

Senior Fellow

Panasonic Corporation

# Today's Topics

---

- Embedded Software Development to Date
- Platform-Based Development Approach
- New Leader's Role in Embedded Development
- Summing Up

# Today's Topics

---

- **Embedded Software Development to Date**
- Platform-Based Development Approach
- New Leader's Role in Embedded Development
- Summing Up

# The Fast-Growing Digital Consumer Electronics Market

● DTV, DVD/BD, and DSC continue rapid growth

Compiled from reports by JEITA, CIPA, IDC, and Gartner

Annual Sales  
(millions of units)

DTV

DSC

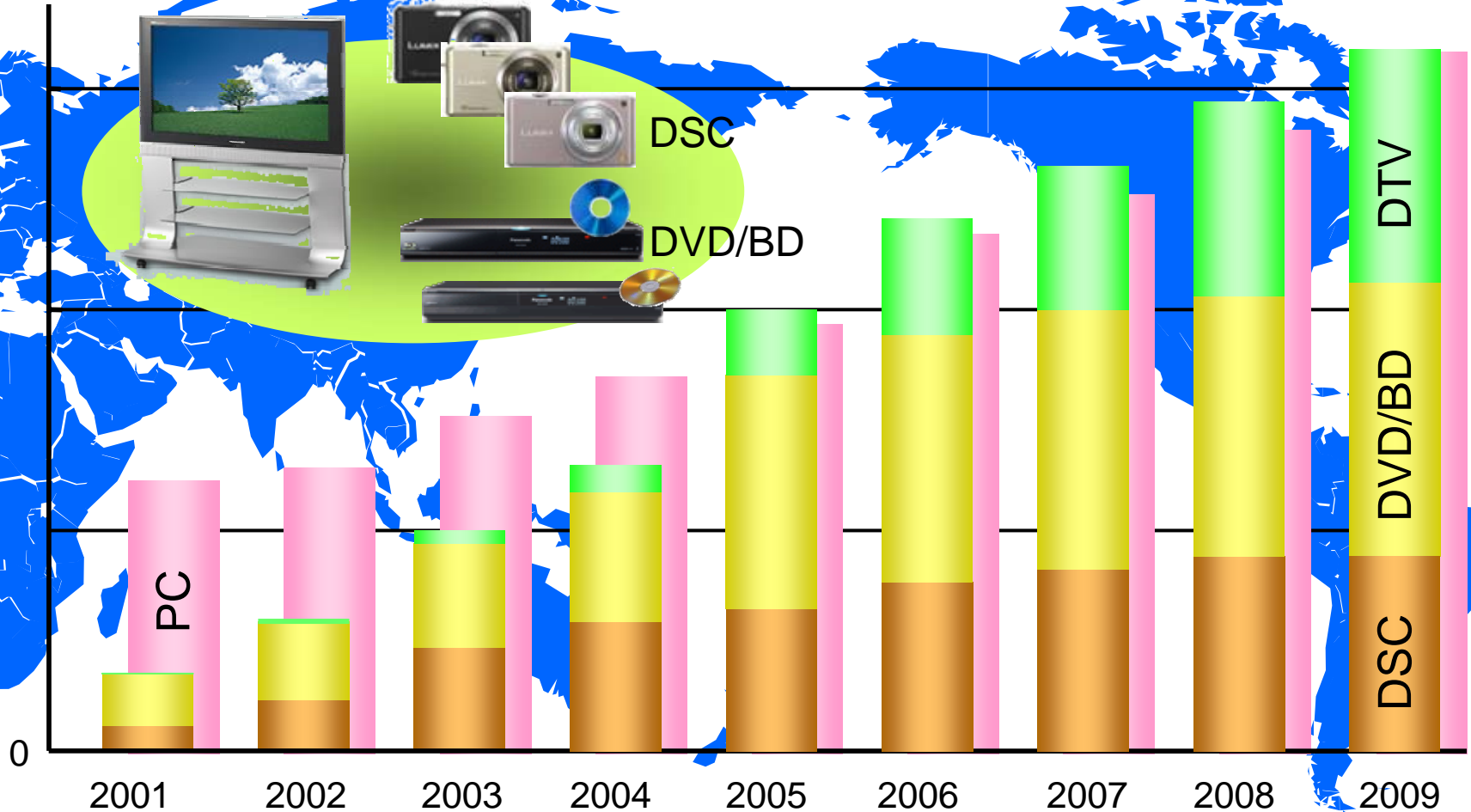
DVD/BD

PC

DTV

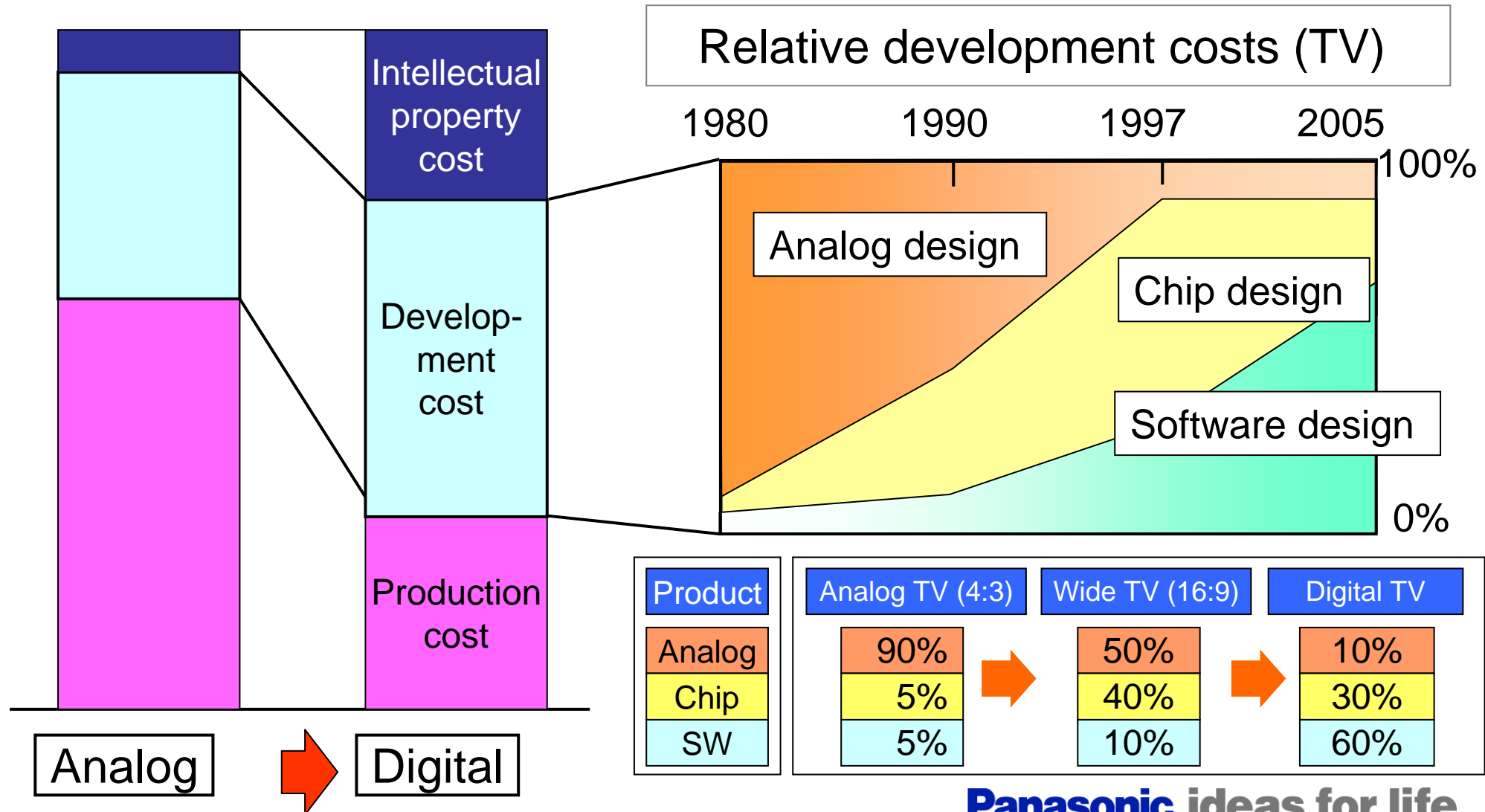
DVD/BD

DSC



# Expanding Role of Embedded Software in Digital Consumer Electronics

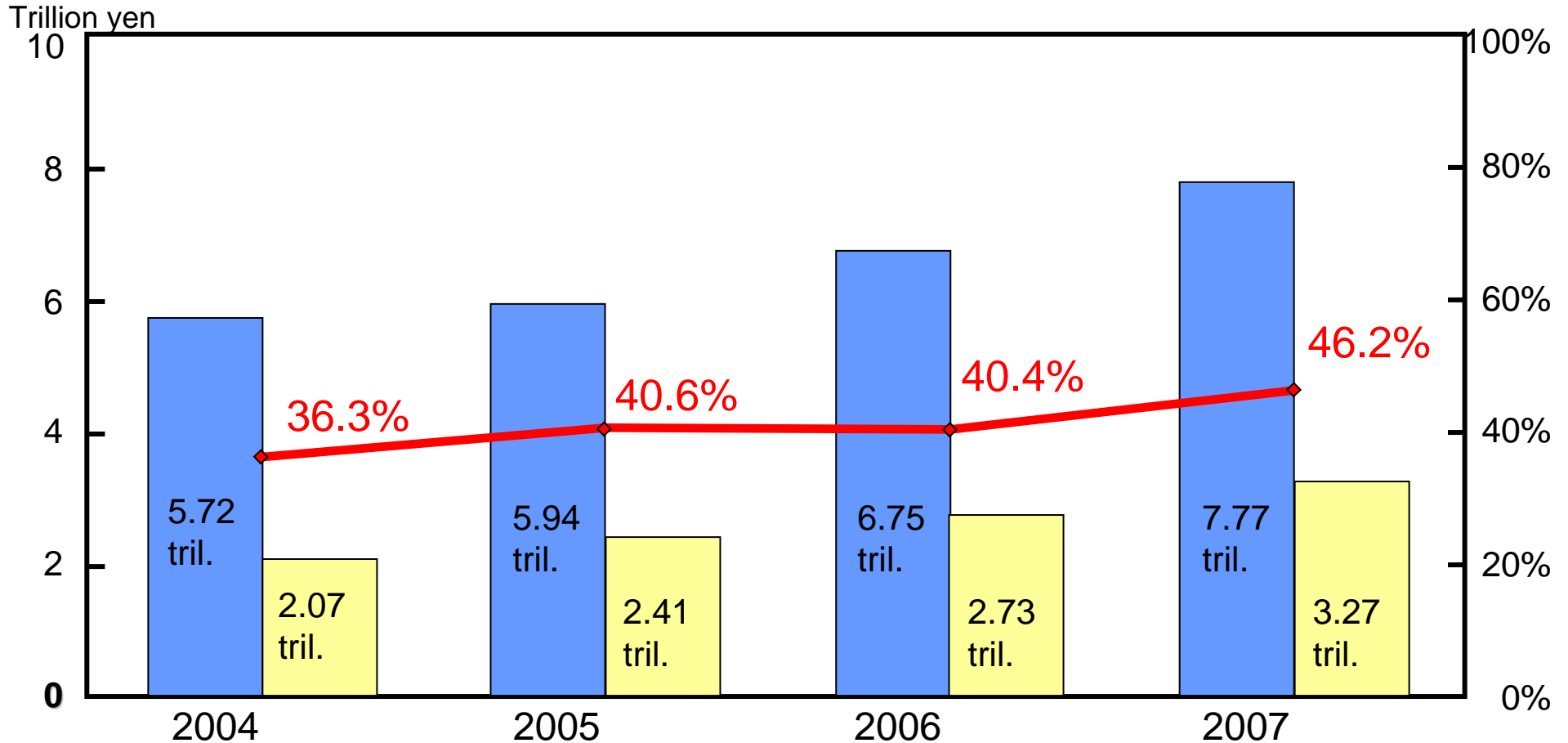
Digitalization causes developments costs (especially **software costs**) to be raised up



# Japan's Growing Embedded Software Industry

Embedded software development cost: **3.3 trillion yen**, ½ of product development costs

■ Embedded product dev.(tril. yen) ■ Embedded software dev. (tril. yen) ◆ Embedded software share of product development costs



Data: 2007 IPA survey

**Embedded software is key to superiority of Japan's manufacturing industry**

# Changes Occurring in the 1990s

## The digital network revolution

Switch from analog to digital products

Standardization lowers barriers to participation

IT revolutionizes management

## Competition on 3 fronts

Development explosion

Shorter product cycle

Rapid drop in prices

In these past 10 years the world of **embedded software** for digital consumer electronics has become **extraordinary competitive**.

# Embedded Software is Responsible for Time to Market

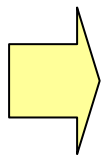
- ◆ Overcoming with the explosion in development volume  
Software development management innovation should be required.
- ◆ Software development determines the delivery date  
Software becomes main factors and issues among hardware, mechanism, and service
- ◆ Rapidly emerging new services and business models are accelerating the drop in product prices  
New business models on the Internet are software driven

It is time for embedded software development leaders to show their skills



# The Leader's Role in Embedded Software Development

- ◆ The strength of an embedded software engineer  
Ability to **understand and analyze other software architectures** and **redesign a new architecture**
- ◆ The aims of an embedded software development leader  
Not a leader in development only, but becoming a leader who is **able to analyze business strategy** and **create and/or modify a new architecture for the business strategy**
- ◆ Rapidly emerging new business models are accelerating product competition, resulting in a sharp drop in product prices  
**Is there an architect** who can map the strategy and architectures to new business models?



**How is the leader's role in embedded software development changing?**

# Three Types “Embedded Software Development Leaders”

1<sup>st</sup> Stage: Digitally controlled appliances—from 1976 (20 years)

**“Project Manager”**



2<sup>nd</sup> Stage: Digital AV—from 1996 (10 years)

**“Platform Architect”**



3<sup>rd</sup> Stage: Network appliances—from 2006 (? years)

**“??”**

# Role of Embedded Software Development Leader (1)

1<sup>st</sup> Stage: Digitally controlled appliances—from 1976

## Products

Home appliances: microwaves, washing machines, refrigerators  
AV/office machines: electronic organs, VCRs, CRT TVs

Leader's role = **project manager**


## Requirements

- Design for quality and safety
- Mechanical device control by Software  
e.g.: neuro control, fuzzy control



Project  
management

CMM

- 
- **Manager who understands hardware and software**
  - Create and Observe process approach for software development

# Role of Embedded Software Development Leader (2)

2<sup>nd</sup> Stage: Digital AV—from 1996

Products

AV equipment: digital TV, DVD, BD

Communications: fixed cordless phone, cell phone

Leader's role = **platform architect**

Requirements

Understanding  
of  
each product market

Platform-based  
development management

CMMI

- Must meet delivery deadlines
- Speed up total line up products development
- Selection of platforms and modification for global products

- Global forum standards compliance
- Budget management

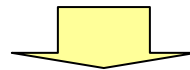
# Today's Topics

---

- Embedded Software Development to Date
- Platform-Based Development Approach**
- New Leader's Role in Embedded Development
- Summing Up

# Software Platform approach for reducing Development Cost

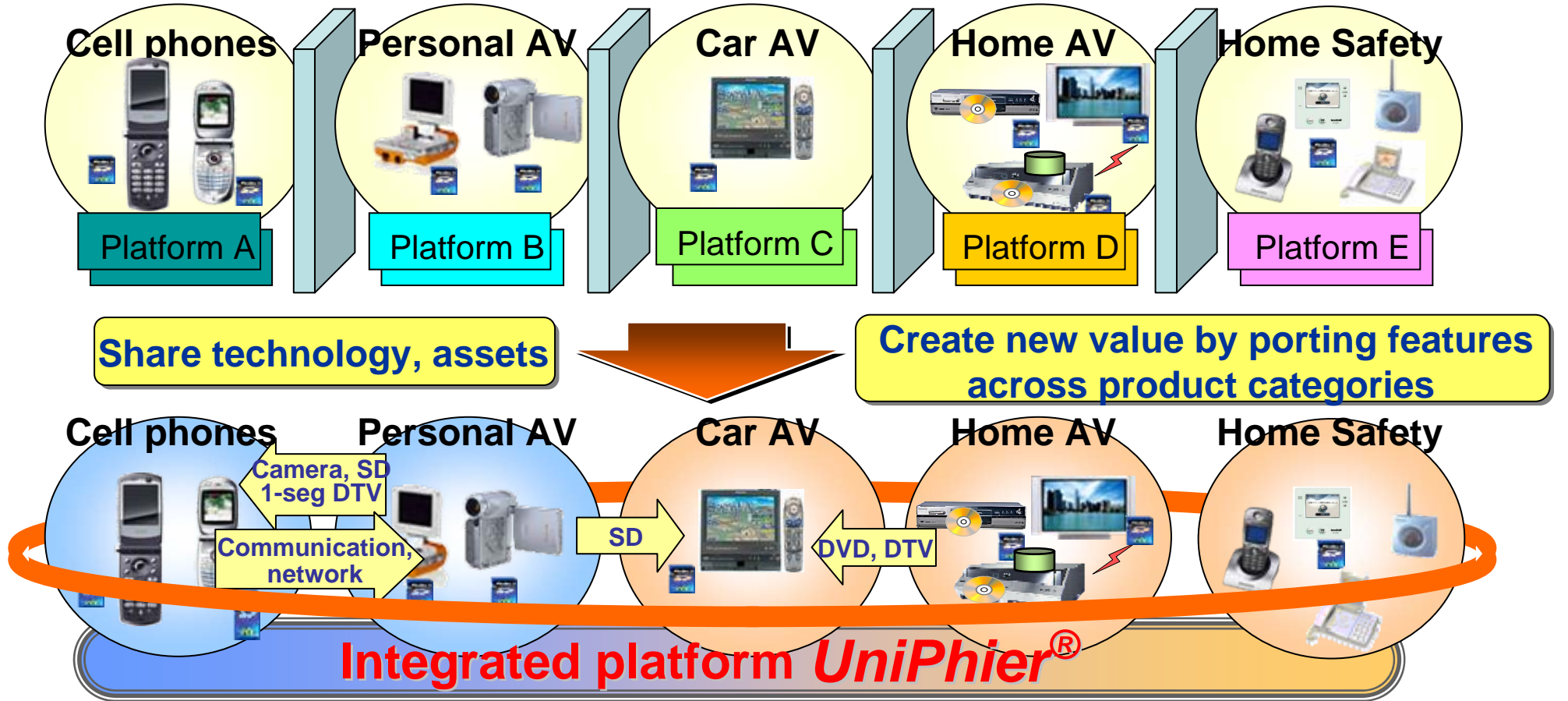
- ◆ Explosion in scale of software for each products
  - **Reuse software parts** to reduce development volume
- ◆ Explosion in software development for many variety of products
  - **Use common software assets** to optimize overall development
- ◆ Increase in features crossing over product categories
  - **Share software assets across product categories**



**Platform-Based Development**

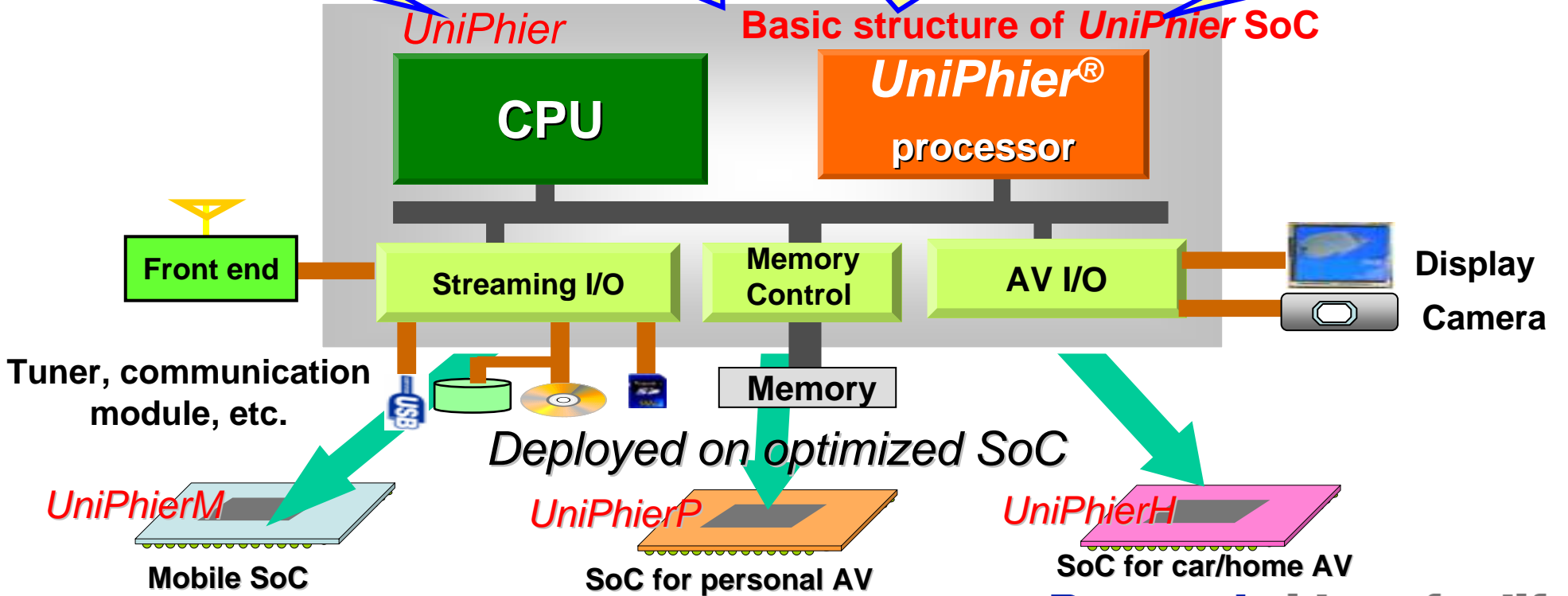
# Example: Panasonic Platform Strategy for Digital Consumer Electronics

Total optimization platform breaking walls between product areas  
 Better development efficiency and design quality from sharing assets and value across product groups  
 → Enhance customer value creation on technology (lateral) value chain



- Panasonic technology integrated on single chips
- Common hardware architecture across product areas (3 implementations)

<b>High-def AV</b> High-efficiency CODEC technology	<b>Low power use</b> System and chip expertise	<b>Real time</b> Optimal distributed processing by CPU and media processor	<b>Secure</b> Hardware and software-based flexible, robust, secure framework
--	---	---	---

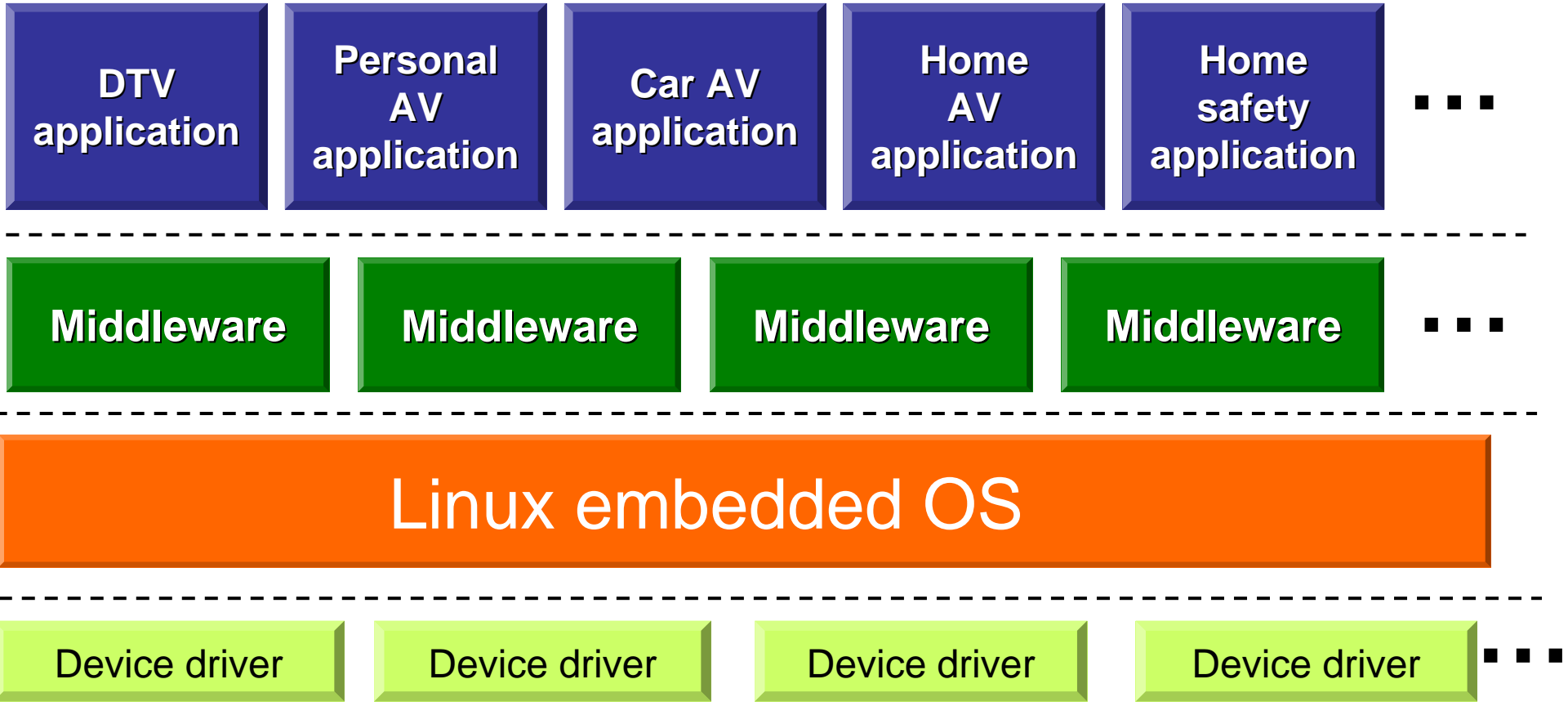




# Panasonic's Software Platform

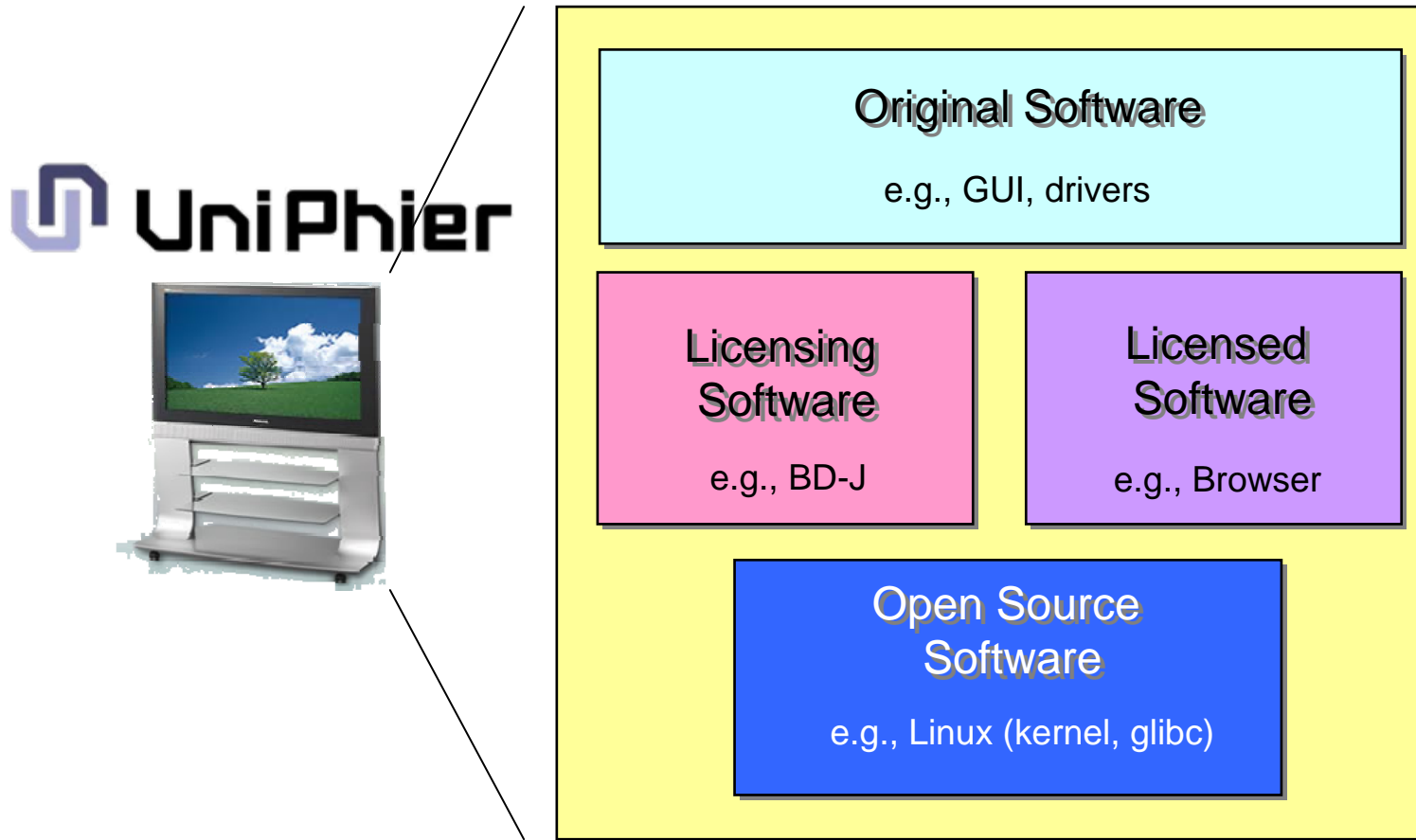
Linux for home electronics field developed as *UniPhier*<sup>®</sup> software base  
Common use of middleware across product areas

Total of 41 series, 127 models (as of July 2008)



# Software Categories

The UniPhier software platform is divided into the four categories below

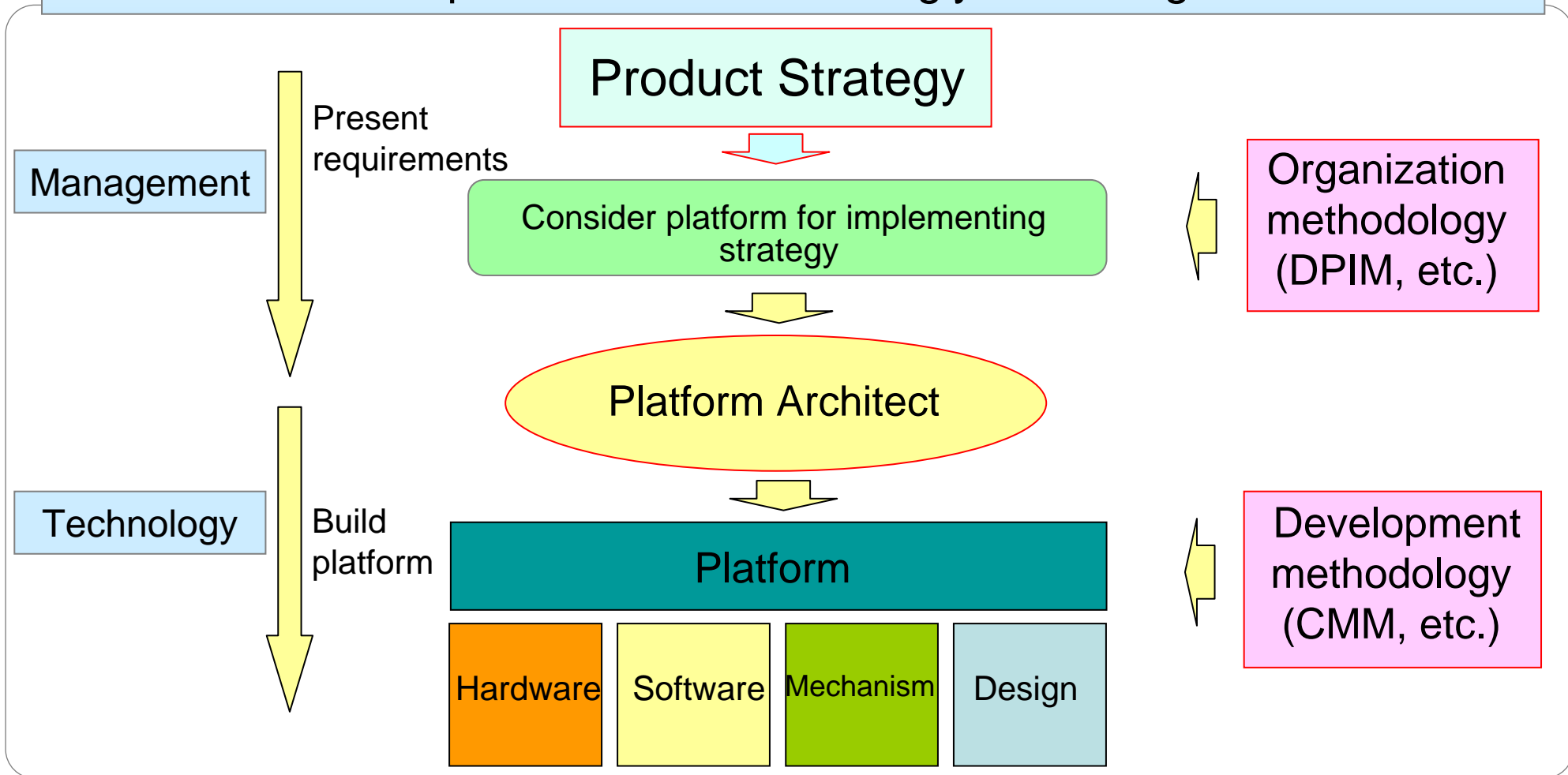


The category adopted for each software module depends on each company's business model.

# A Platform Architect Is a Leader of CE Products

Build necessary platform for efficient product strategy

→ Development leader who understands hardware, software, mechanism  
Software development leader increasingly becoming overall leader



# Today's Topics

---

- Embedded Software Development to Date
- Platform-Based Development Approach
- **New Leader's Role in Embedded Development**
- Summing Up

# Issues Faced

The answer = **global business strategy**

## ◆ Global business strategy

- Are **global standards and national standards** adopted?
- Are the specifications met with country's **market** needs?

## ◆ Networking

- Is the **network** suited to the country?
- What are the country's **network restrictions**?

## ◆ The ecology

- Are the country's **environmental regulations** being met?
- What steps are being taken to **reduce power consumption**?

## ◆ Alliances

- Is **open source** being utilized?
- What **software parts are being sourced** from other companies?

## ◆ Design for safety and quality

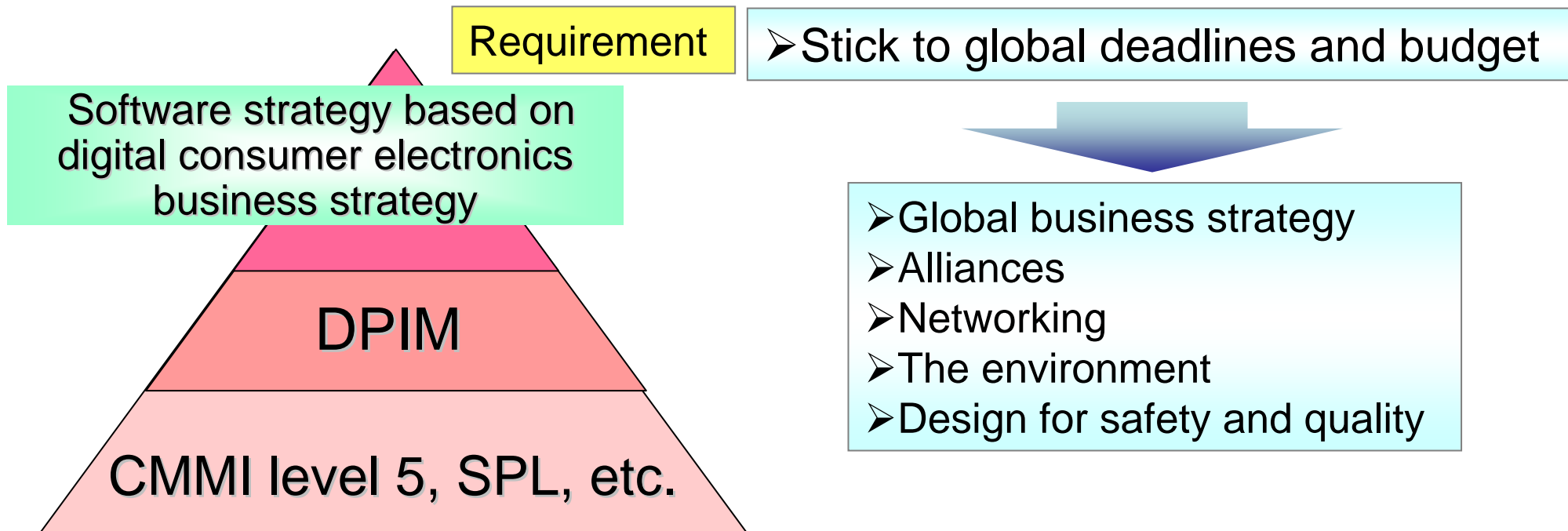
- Is there a **failsafe design** based on the **country's regulation**?
- What consideration is made for **product lifetime**?

# Role of Today's Embedded Software Development Leader

3<sup>rd</sup> Stage: Promote development of network appliances—from 2006

Understand and promote global business strategy as solution to issues faced

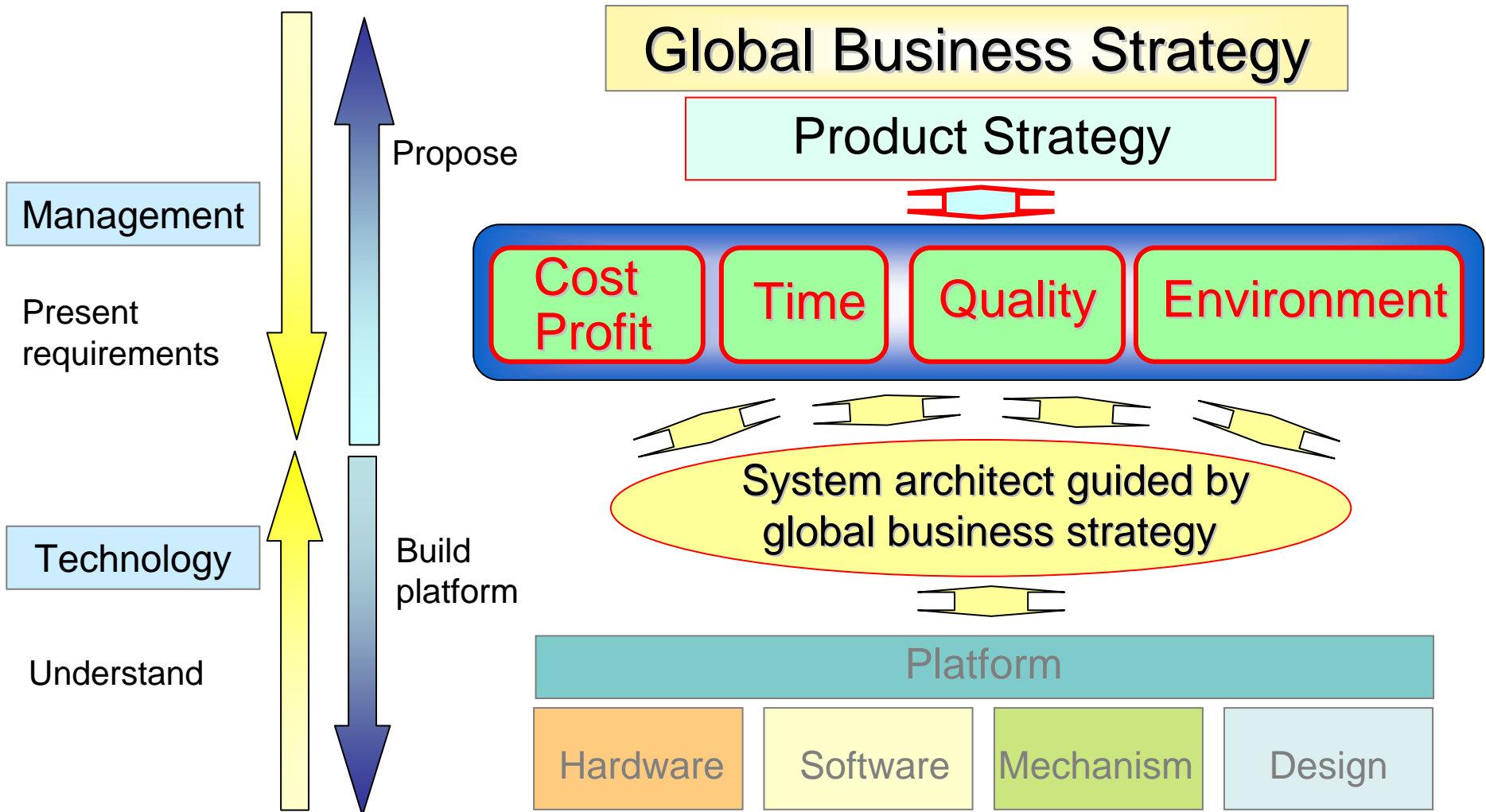
Leader's role = **System architect guided by global business strategy**



# System Architect Guided by Global Business Strategy

## Understanding both management and technology

- Responsible for technology, also for proposing **good design strategy** to management



# Example: Global Marketing of DTV

- Products for each country based on global DTV platform
- Assisting and following Local Standardization based on global DTV standard are required

Support local standardization based on global standards, and build products accordingly

- Ability to plan and develop market-specific products
- Sales organization suited to regional characteristics

Insist on developing optimal products for each country



# DTV Platform with Country-Specific Models

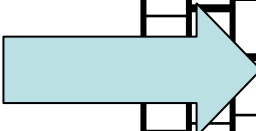
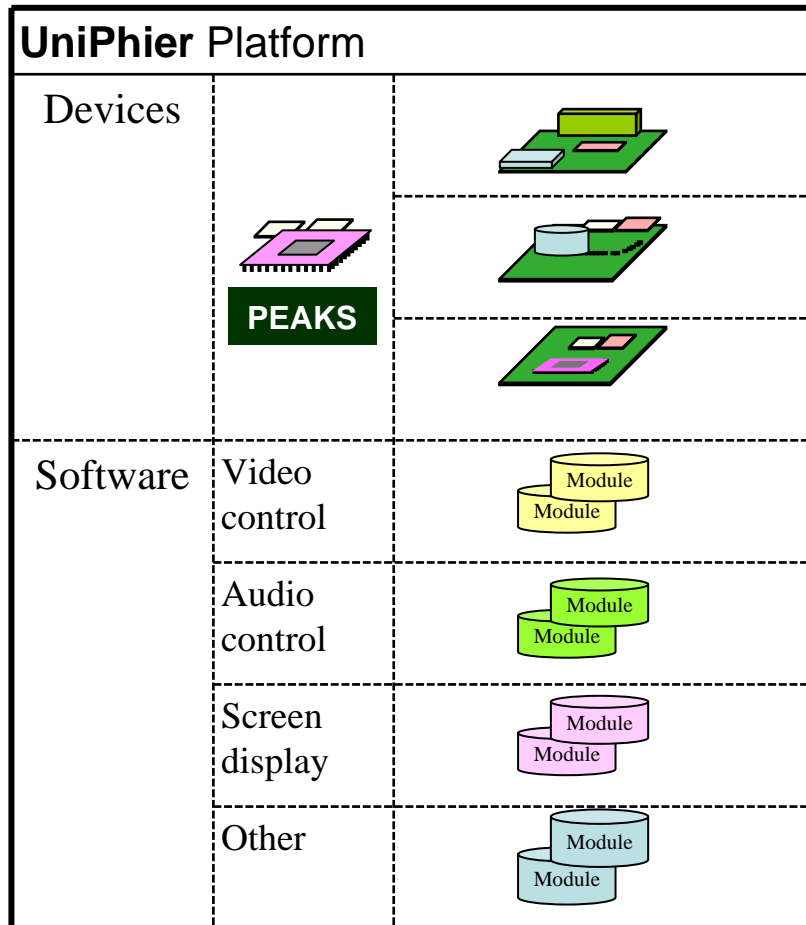


From global standards

To national standards

(1) Create a platform

(2) Deploy as country-specific models



Software: Screen display						
Software: Audio control						
Software: Video control						
<b>Devices</b>				Country	Region	
	2006	2007	2008	2009		
		✓	✓	✓	A	Europe
	✓		✓		B	
		✓			C	
	✓		✓		D	
		✓	✓	✓	G	Asia
	✓		✓		H	
		✓			I	
	✓		✓		J	
		✓			M	South America
	✓		✓	✓	N	
	✓		✓		S	Other
		✓			U	

# Four Standpoints both on Management and on Technology

## ◆ Profit and cost

Invest in developing software that can be concentrated on aspects that deliver value

## ◆ Time

Achieve efficient software development to win out in increasingly fierce short-term competition

## ◆ Quality

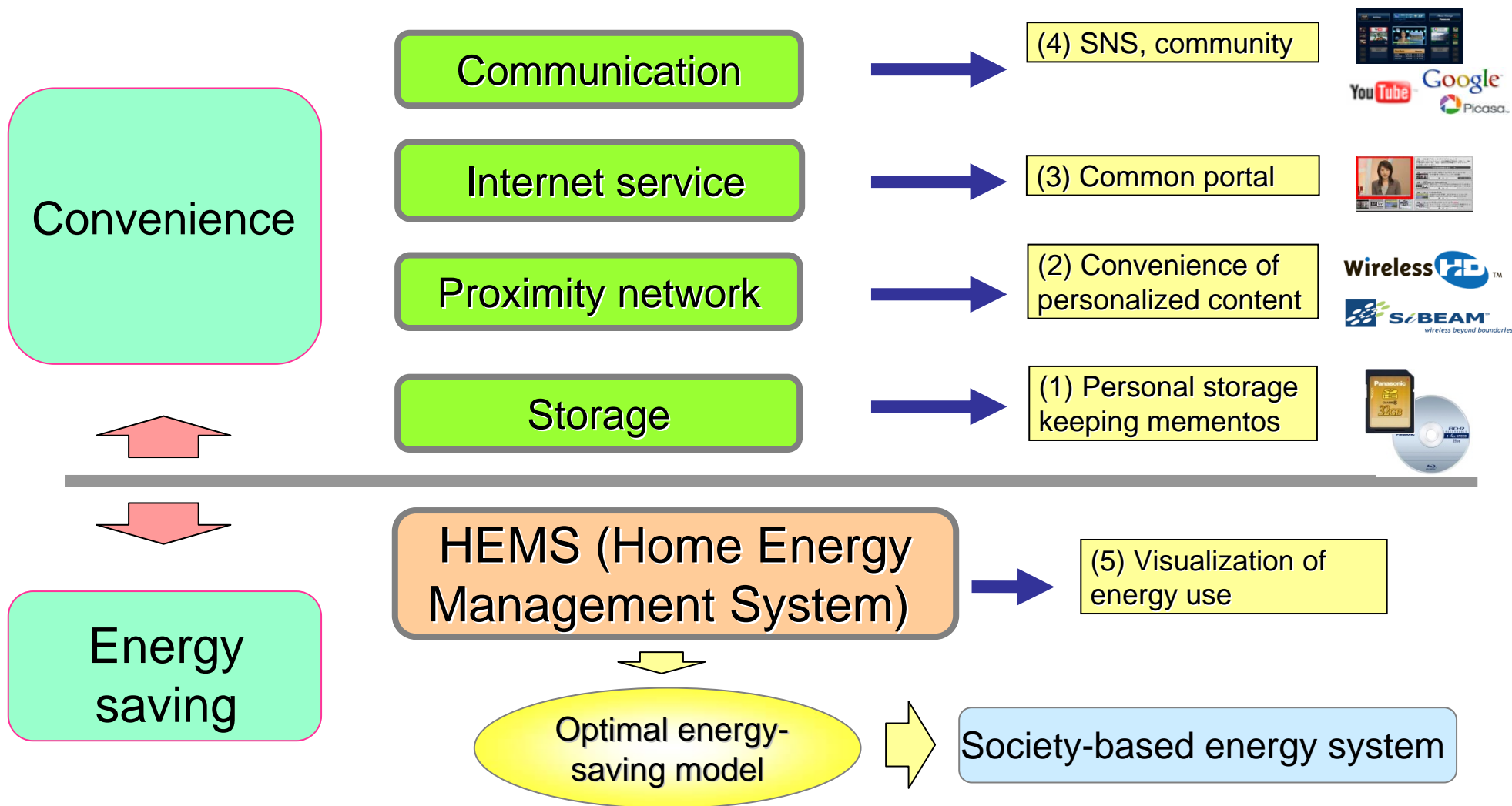
Establish assurance, safety, high quality, high security

## ◆ Ecology

Be sure to achieve energy-saving performance, in compliance with regional standards

# Networking and Environment: Energy Saving Plus Convenience

➤ Pursuit of convenience based on energy-saving foundation



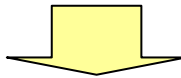
# Today's Topics

---

- Embedded Software Development to Date
- Platform-Based Development Approach
- New Leader's Role in Embedded Development
- Summing Up

# Summing Up

- Establishment of **platform architect**
- Adoption of software development methodologies that ensure **continual process reform**
- Fostering embedded software development leaders that can talk in terms of **management indicators**
- **Ability to propose solutions to new issues such as** global business strategy and environmental matters



- It becomes very important to boost development strength and engineer's leadership.
- ***The key is how to create and train new leaders for a new era who can efficiently bring software innovation.***

# Panasonic

ideas for life

Thanks for your kind attention.

