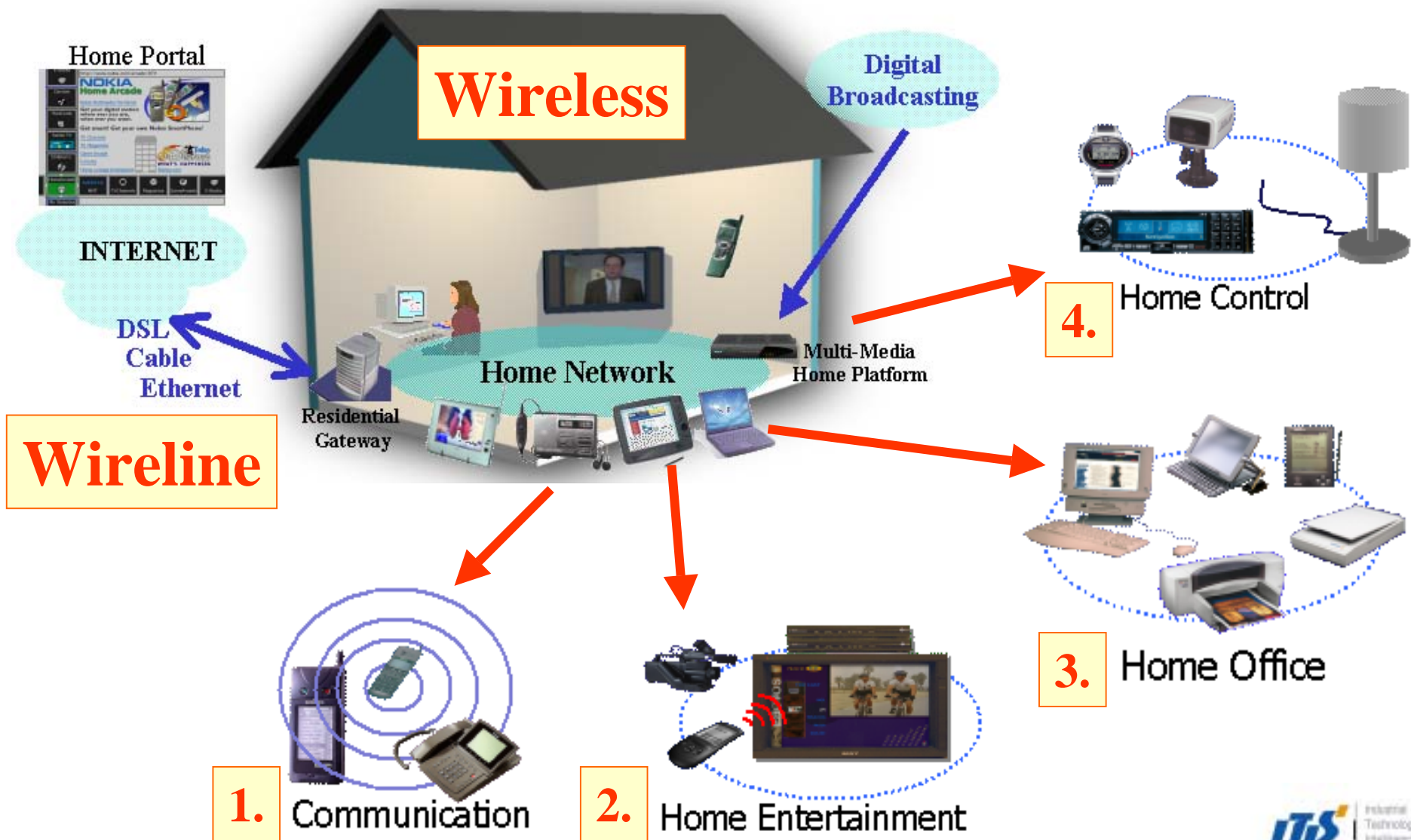


# **Panel**

## **“Multimedia Coding on Academic and Industrial Perspective”**

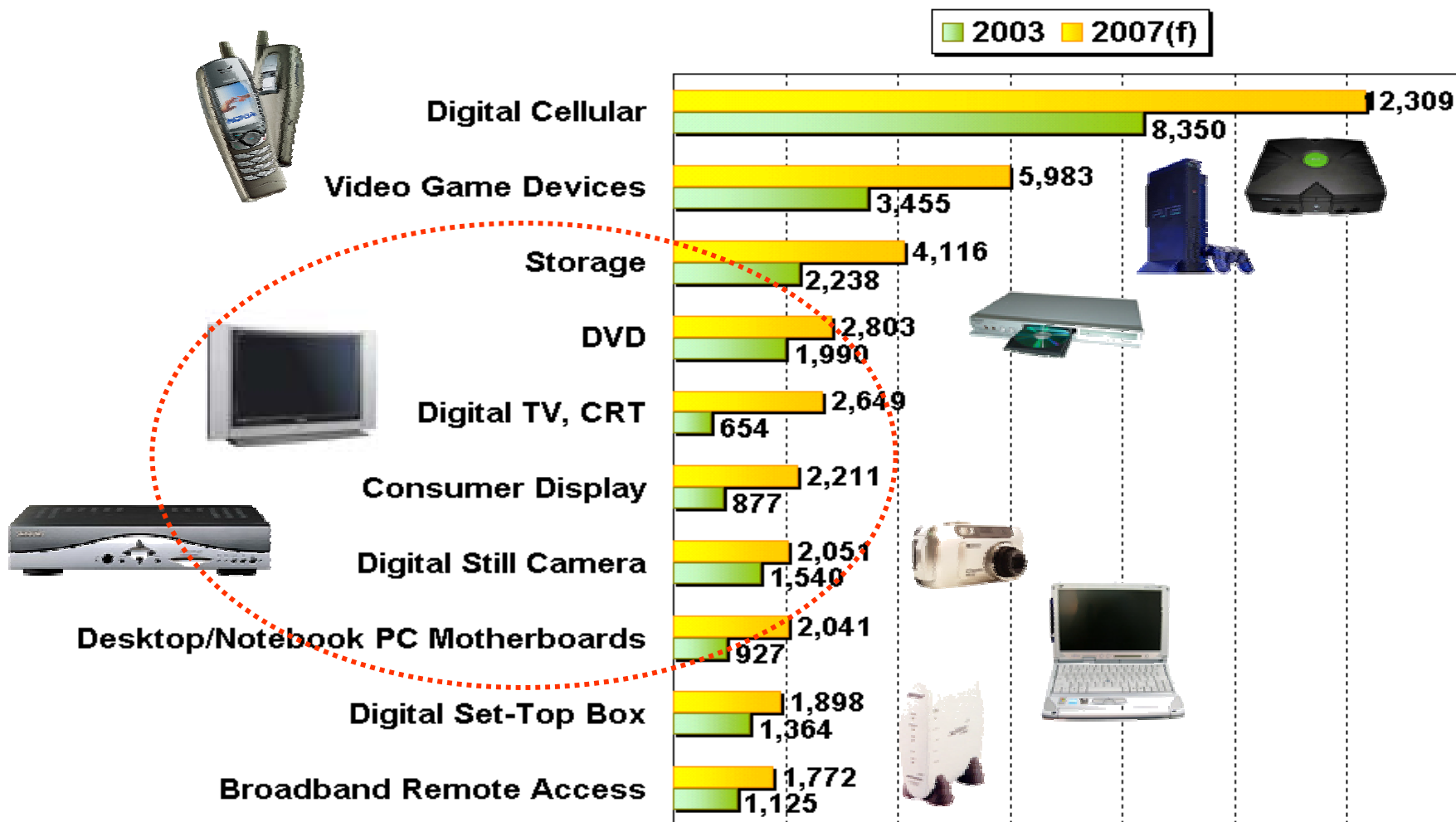
**Liang-Gee Chen**  
**Graduate Institute of Electronics Engineering**  
**National Taiwan University**

# Multimedia Applications---- Digital life is coming

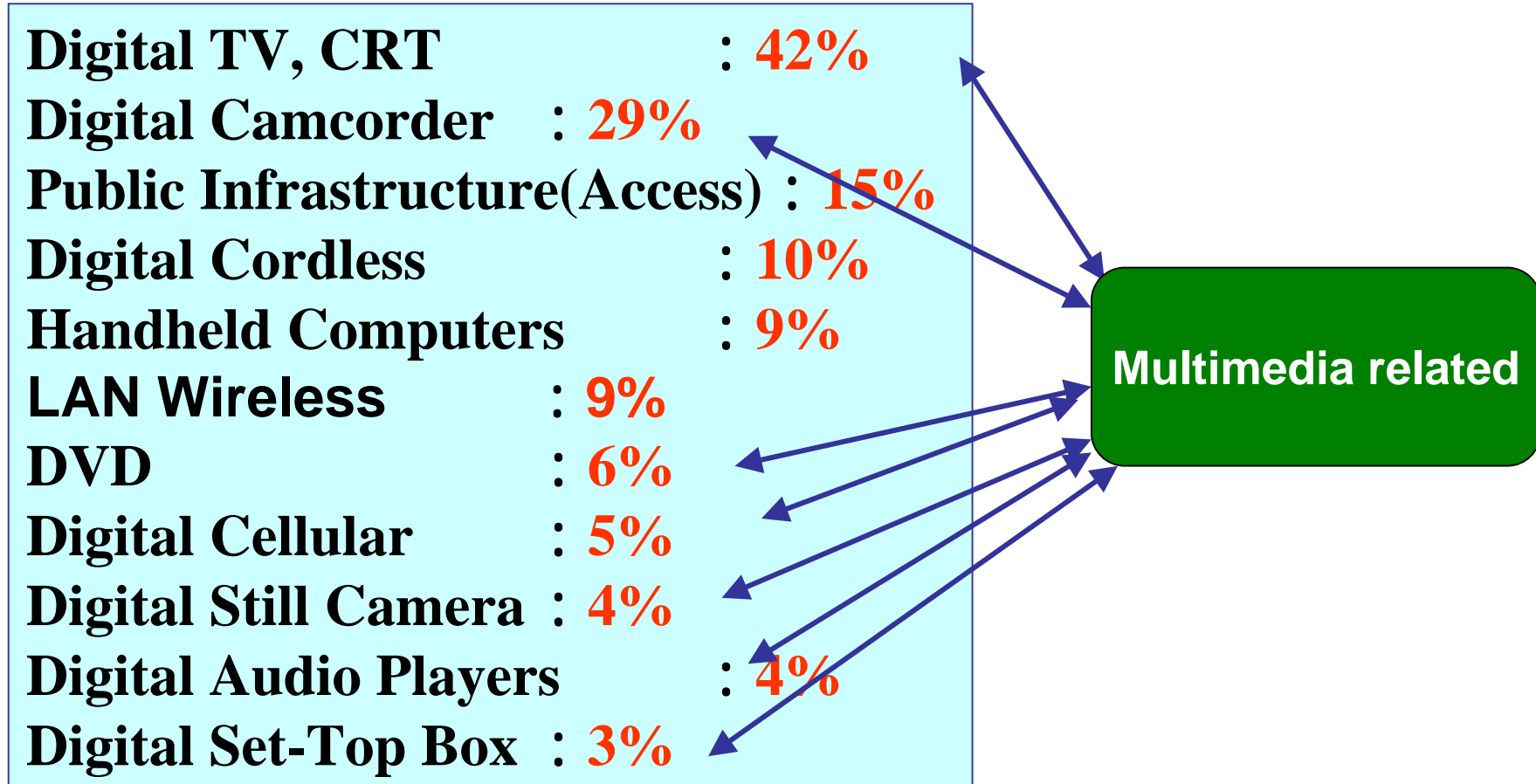




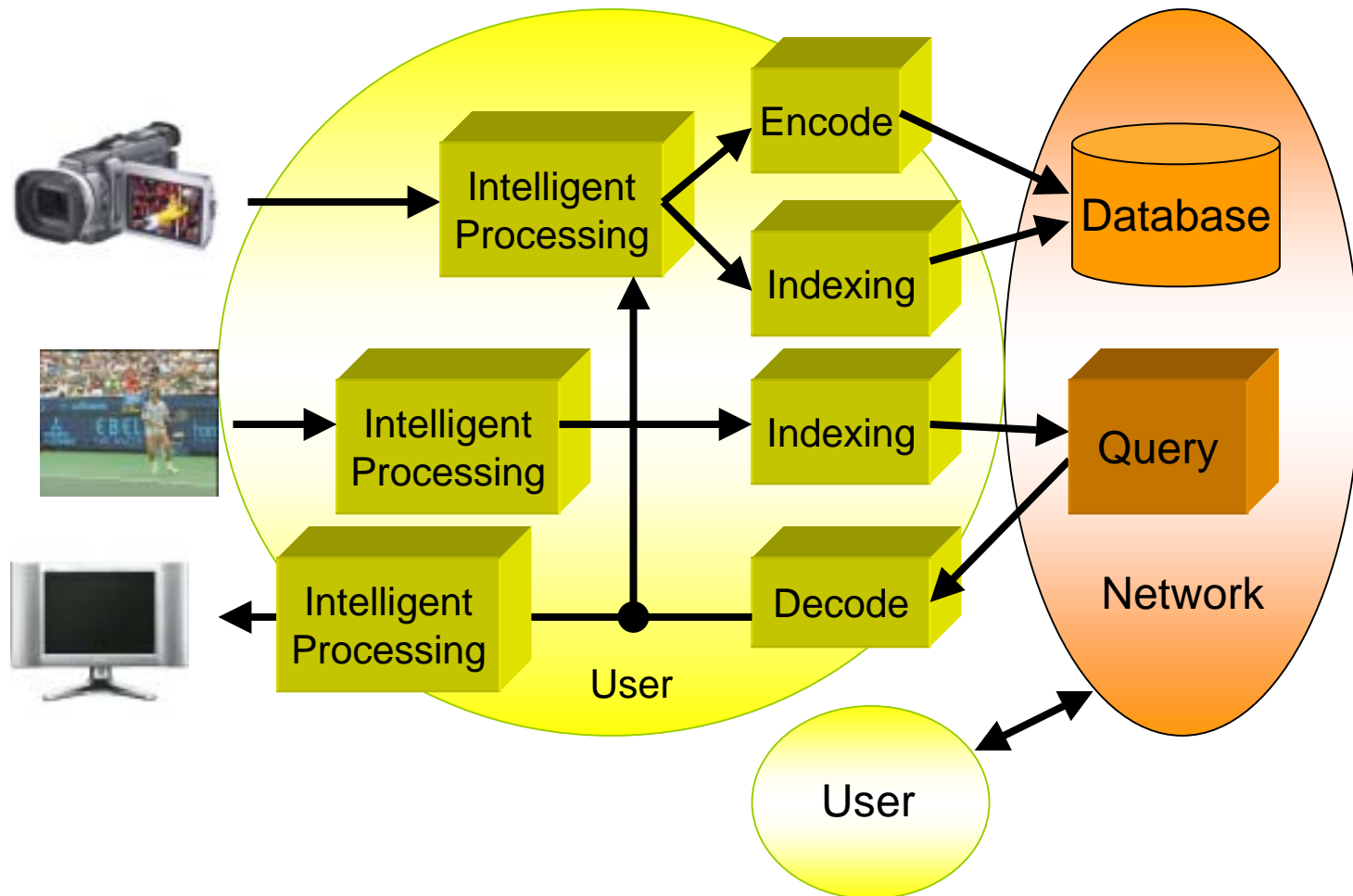
# Top-10 Growth Products



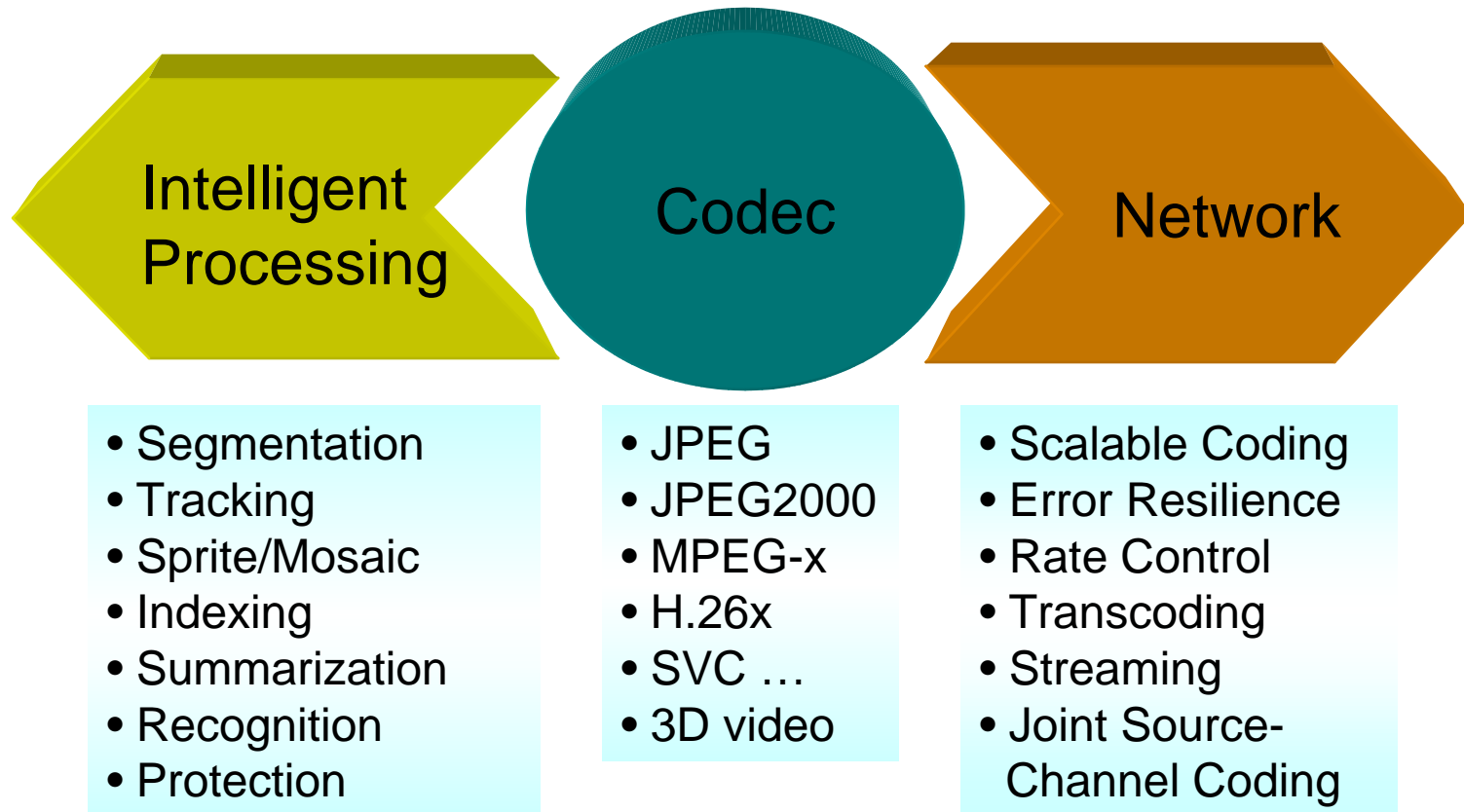
# 2003-2007 CAGR



# Interactive Multimedia



# Elements of Future Multimedia Systems



**Embedded Multimedia Systems (SOC, algorithms and ICs)**

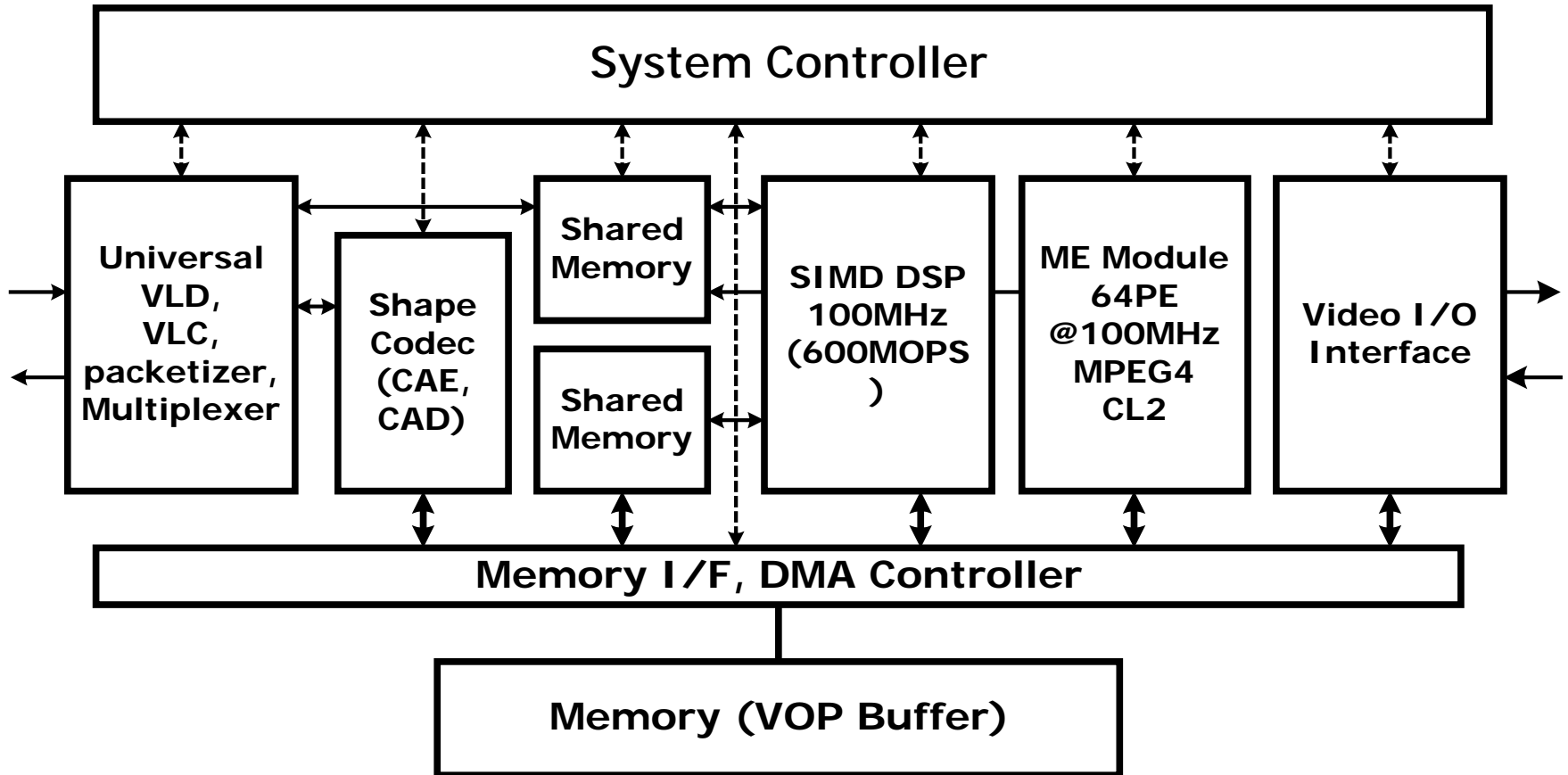
# Increasing Algorithmic Complexity

- H.264/MPEG-4 AVC standard demands for much higher computational resources

<b>CIF 352x288 30fps</b>	<b>MPEG-4 SP</b>	<b>H.264/MPEG-4 AVC</b>
Encoder Side	<b>12,000 MOPS</b>	<b>80,000 MOPS</b>
Decoder Side	<b>200 MOPS</b>	<b>450 MOPS</b>

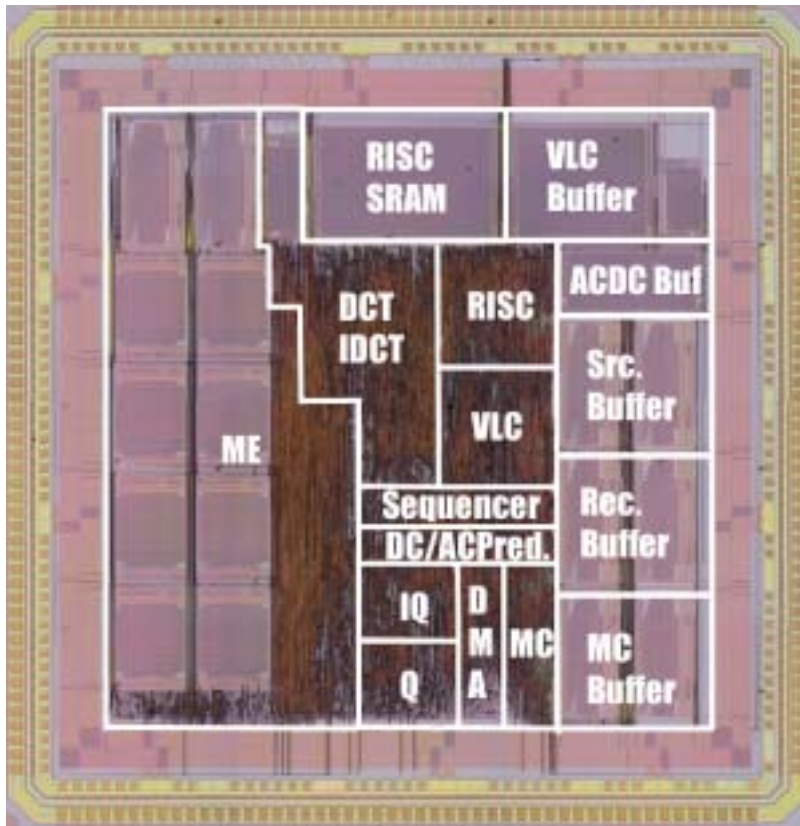
<b>NTSC 720x480 30fps</b>	<b>MPEG-4 SP</b>	<b>H.264/MPEG-4 AVC</b>
Encoder Side	<b>40,000 MOPS</b>	<b>272,000 MOPS</b>
Decoder Side	<b>680 MOPS</b>	<b>1,500 MOPS</b>

# System Architecture Model





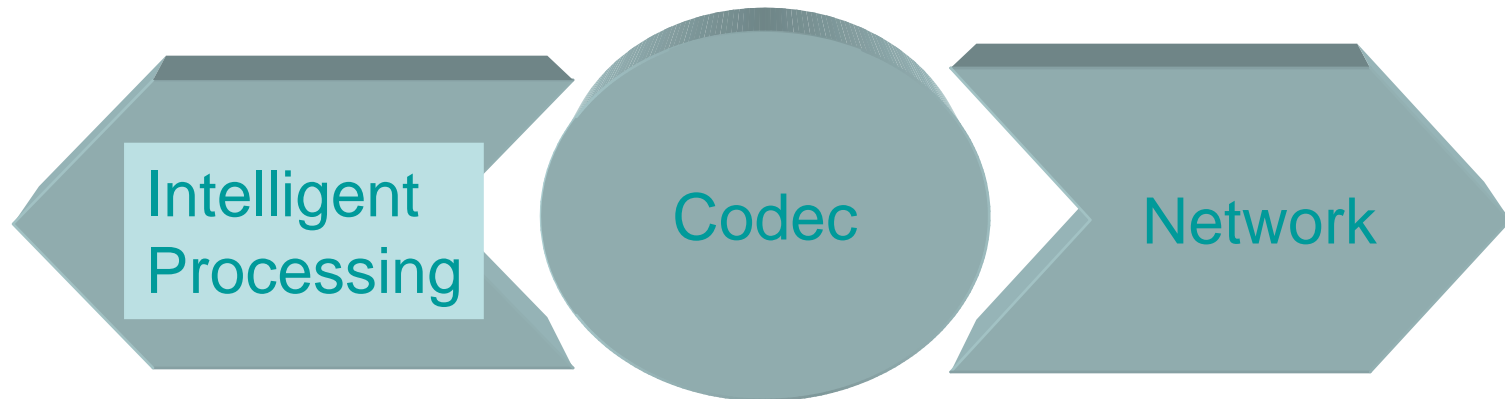
# MPEG-4 Video Encoder Chip



## Chip Summary

Technology	TSMC 0.35 $\mu\text{m}$ 1P4M CMOS
Die Size	5.02 x 5.13 $\text{mm}^2$
Transistor count	828692 trans.
On-chip memory	39,080 bits
Off-chip memory	2,027,527 bits
Clock frequency	40 MHz
Voltage	3.3V
Power consumption	256.8mW
Package	208 CQFP
Function	MPEG-4 SP@L3 video encoder
Motion estimation algorithm	Predictive diamond search & Search range -16.0 +15.5 & Advanced prediction mode
Encoding complexity	352 x 288 at 30 fps

# Prospective of Industry and Academia for Multimedia



- Segmentation
- Tracking
- Sprite/Mosaic
- Indexing
- Summarization
- Recognition
- Protection

- JPEG
- JPEG2000
- MPEG-x
- H.26x
- SVC ...
- 3Dvideo

- Scalable Coding
- Error Resilience
- Rate Control
- Transcoding
- Streaming
- Joint Source-Channel Coding



**Embedded Multimedia Systems  
(SOC, algorithms and ICs)**