Current and Future Trend of Electronic Technology

Aug. 24, 2017

Lee Kang Wan

Personal Background

Lee Kang Wan

- KOICA(Korea International Cooperation Agency) Volunteer
- Working as a electronic instructor at Vavuniya Technical College (2016. 6~)

- Master of Material Science (KAIST in Korea)
- 20 years experience of semiconductor industry
  (Daewoo Semicon, Dongbu Hitech)
- 5 years of experience of LED industry (Fourn4)
- 10 years of experience at various electronic company

Change of Major Player on Electronic Industry

Contents

- TV & Display
- LED & Lighting
- Semiconductor
- Computer & Microprocessor
- IT & IOT

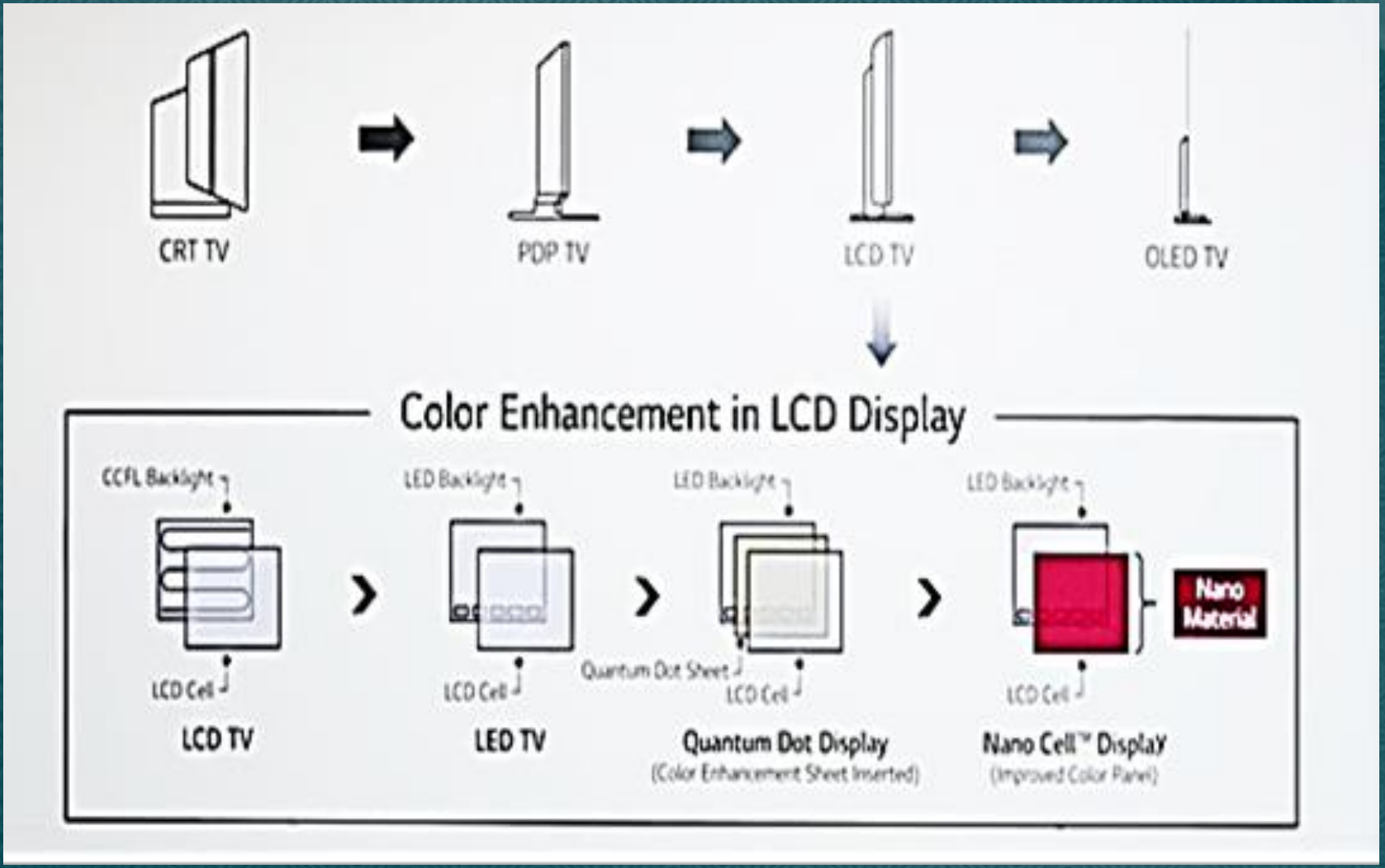
TV & Display

Display

- Display is closely related to human life as a final interface between the user and the machine. (TV, Computer)

- Type of Display
  - CRT
  - LCD/PDP
  - Projection Display
  - OLED/AMOLED
  - Hologram

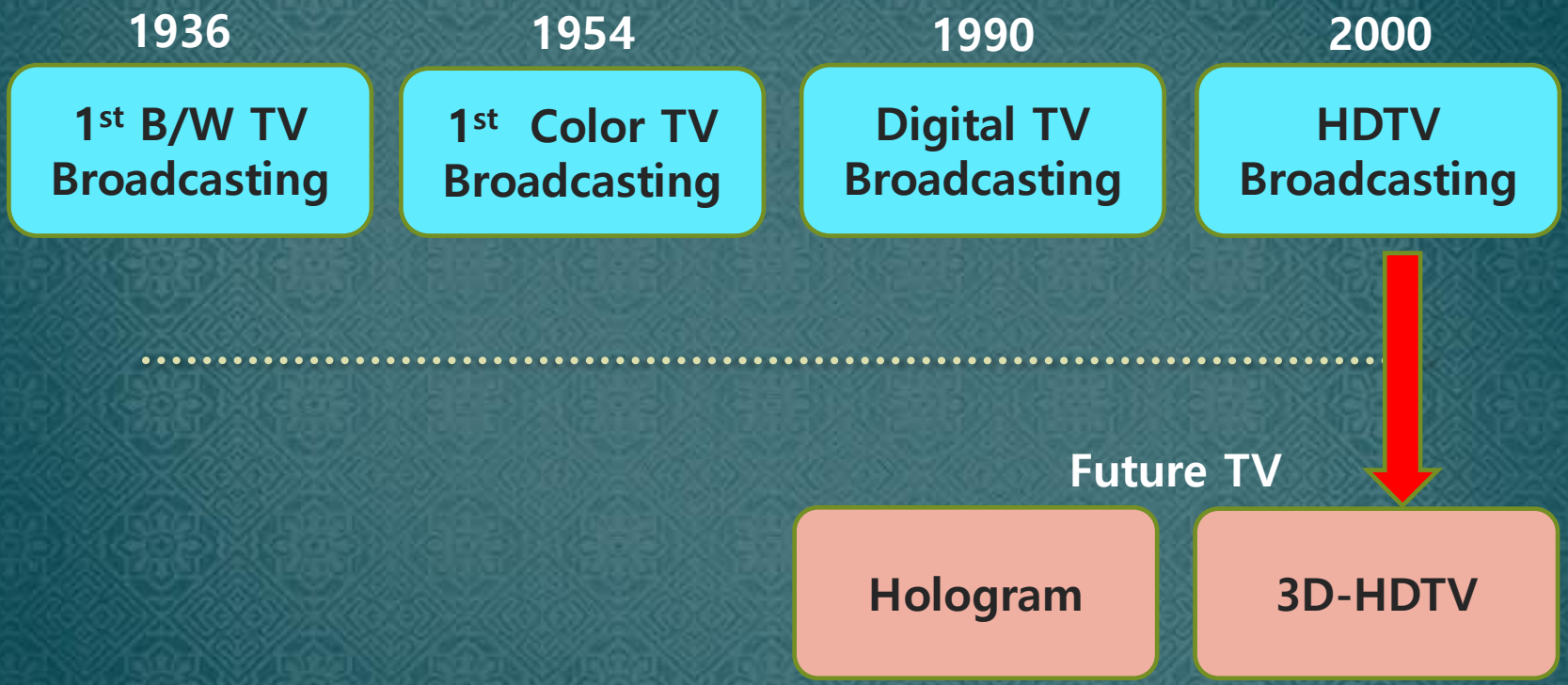
The Evolution of TV Display



Flat Display Market Trend

Entry Market (~2007)	Market Diversification (2008~2011)	Future Market (2012~2020)
. LCD for Notebook, PC Monitor, TV . PDP for TV . Small size AMOLED	. Full HD LCD, PDP . Small size OLED for Cellular Phone . Medium size OLED for TV	. Flexible Display . 3D Display . Large AMOLED

The Development of TV Broadcasting



SDTV (Standard) vs HDTV (High Definition)

<SDTV>

STD : 720 x 480

<HDTV>

HD : 1280 x 720
Full HD : 1920 x 1080

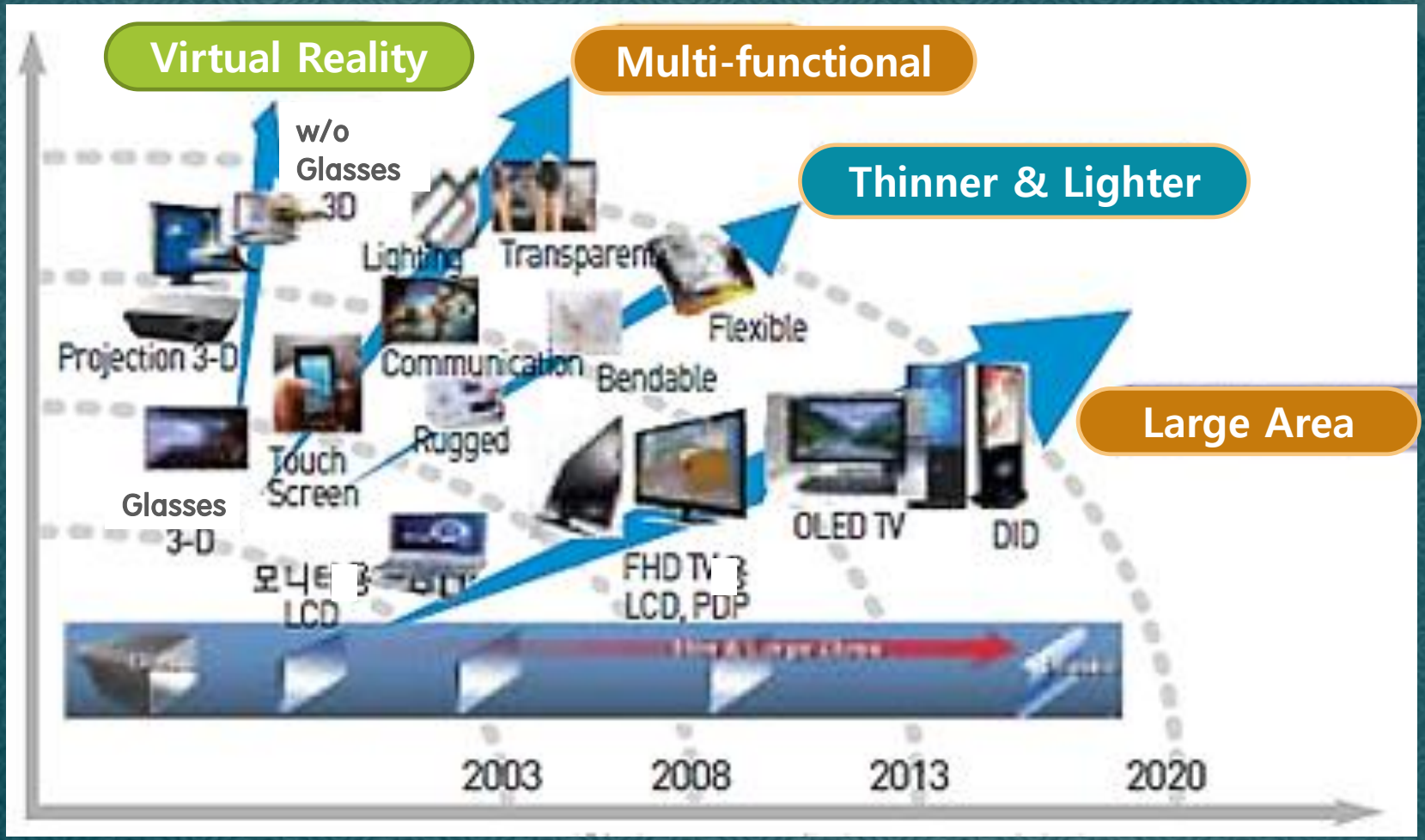
<QHD/UHDTV>

QHD : 2560 x 1440
UHD : 3840 x 2160

Display Future Trend (1)

- Large Size Display
- Flexible Display
  - Curved TV, Edge, Folder
- Transparent Display
- HMD - AR/VR (Augmented/Virtual)
- Hologram(Holography)

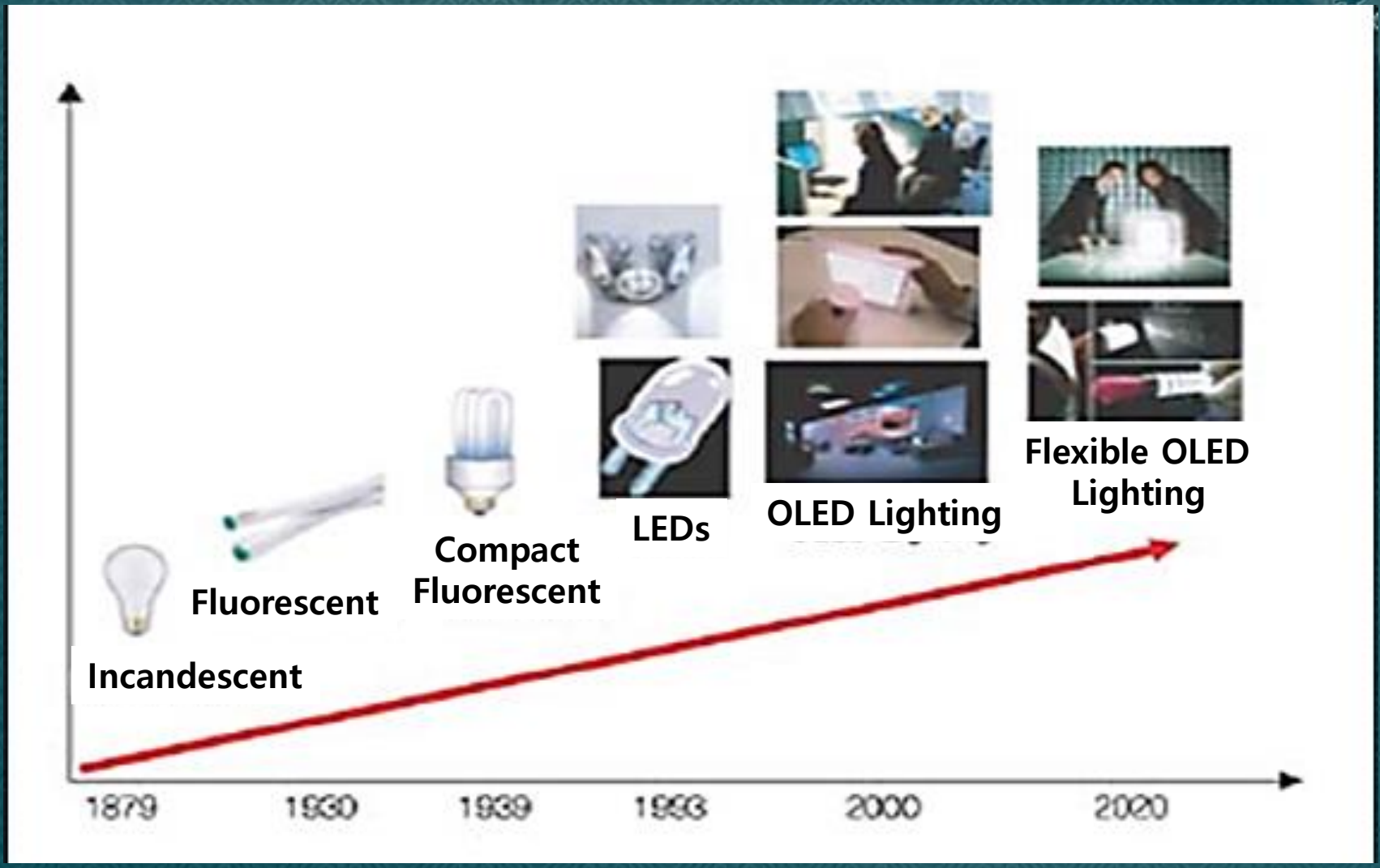
Display Future Trend (2)



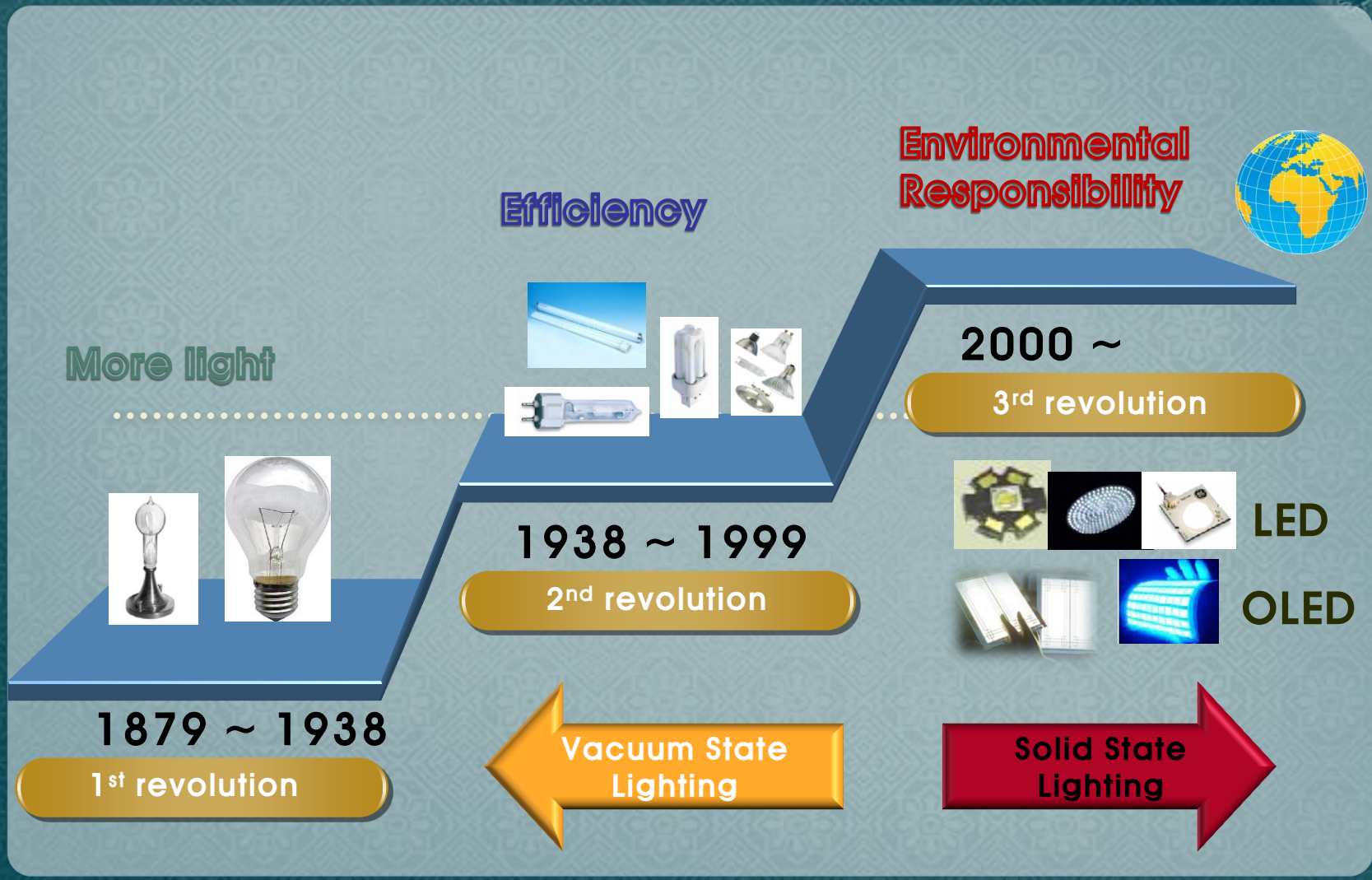
Application of Transparent Display

LED & Lighting

History of Lighting Technology



Mega-trend of Lighting Technology

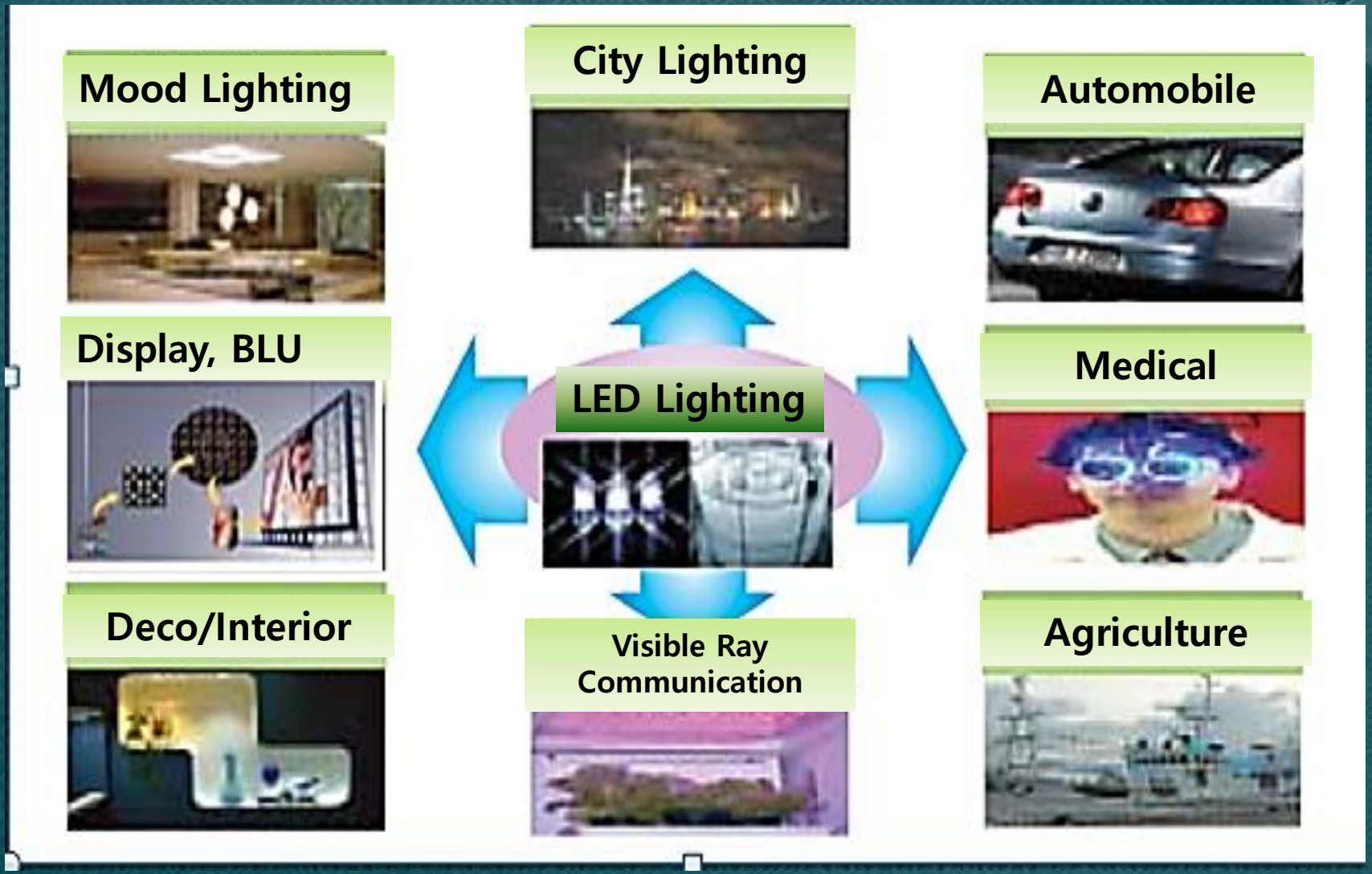


Comparison Table

	Incandescent	Fluorescent	LEDs	OLEDs
Efficacy	17 lm/W	100 lm/W	80–120 lm/W: White 65–80 lm/W: warm white	100 lm/W:CRI 70 71 lm/W:CRI 81
CRI	100	80–85	80 – White 90 – Warm white	95 with 40lm/W
Form Factor	Heat generating	Long or compact gas filled glass tube	Point source high intensity lamp	Large area thin diffuse source, Flexible, transparent
Safety Concerns	Very hot	Contains Mercury	Very hot in operation	None to date
LT70 (K hours)	1	20	50	〉20 with 68 lm/W 〉4 with 100 lm/W
Dimmable	Yes, but much lower efficacy	Yes, efficiency decreases	Yes, efficiency increases	Yes, efficiency increases
Noise	No	Yes	No	No

LED Production Chain

Application of LED Lighting



US ODA Roadmap

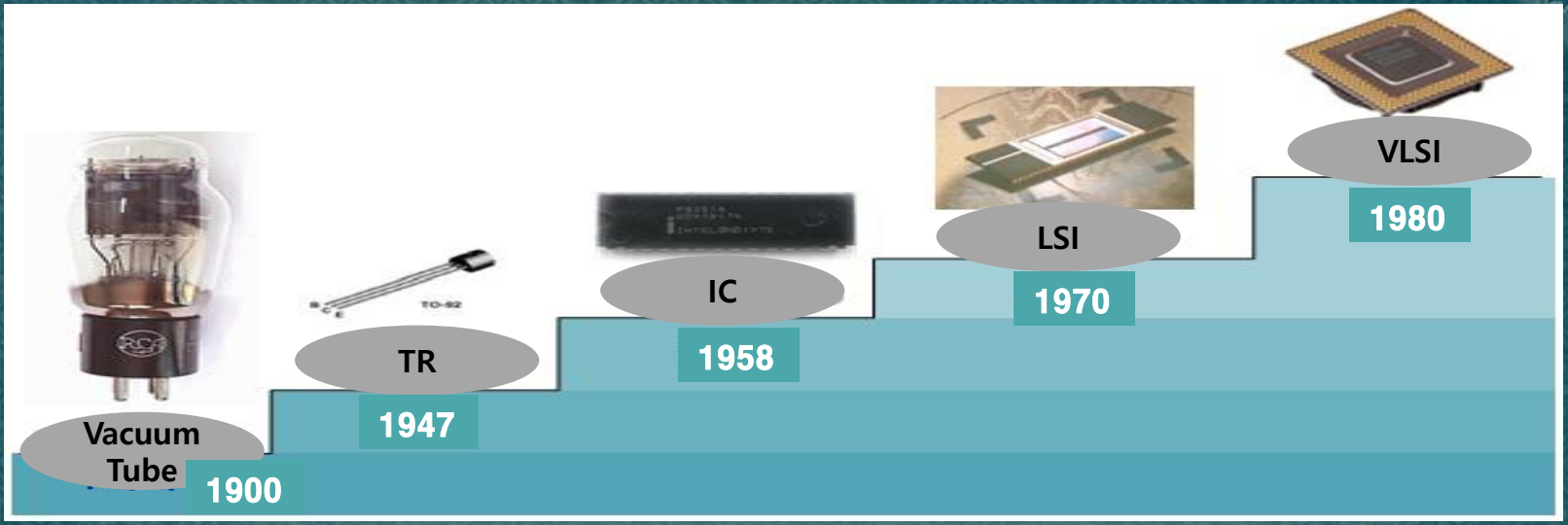
Technology	SSS-LED 2002	SSS-LED 2007	SSS-LED 2012	SSS-LED 2020	Incandescent	Fluorescent
Luminous Efficacy(lm/W)	25	75	150	200	16	85
Lifetime(khr)	20	>20	>100	>100	1	10
Flux(lm/lamp)	25	200	1000	1500	1200	3400
In out Power (W/lamp)	1	27	47	75	75	40
Lumens Cost ($/klm)	200	20	<5	<2	0.4	15
Lamp Cost ($/lamp)	5	4	<5	<3	0.5	5
Color Rendering Index(CRI)	75	80	>80	>80	0.5	75
Lighting Market Penetration	Low-flux	Incandescent	Fluorescent	All		

Future Trend : Smart Lighting

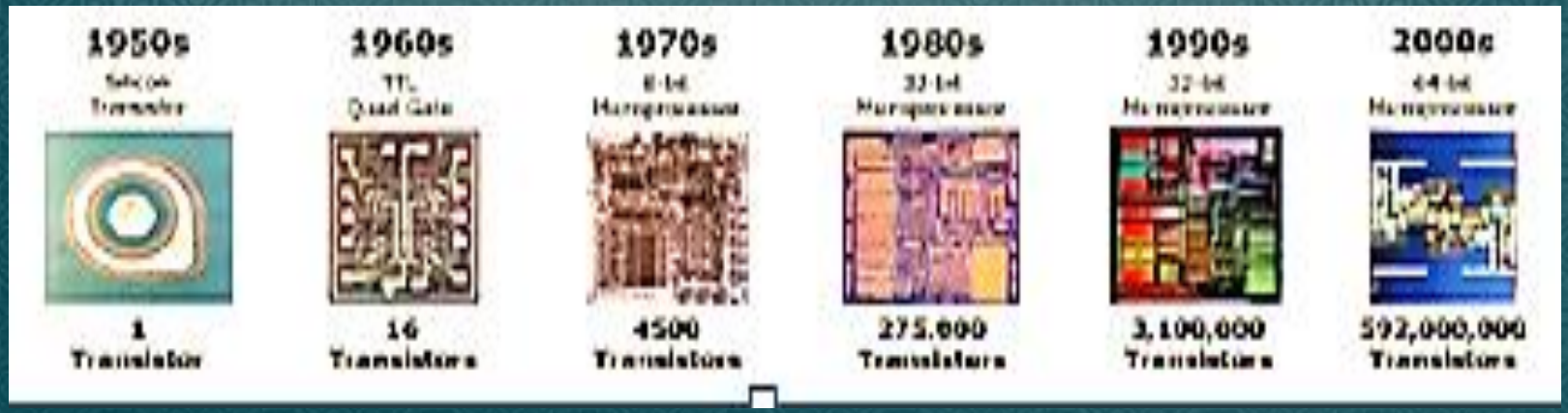
- Lighting control linked to IT network (IOT, Cellular Phone)
- Lighting Technology for
  - Emotional
  - Convenience
  - Energy saving
- Major player are LED and OLED.

Semiconductor

Development of Semiconductor Device



◆ Moore's Law : No. of transistor of IC is doubled every 2 years



Type of Semiconductor Device

- **System IC**

  MPU, MCU, Communication, Automobile,

- **Memory IC**

  DRAM, SRAM, Flash

- **Special IC**

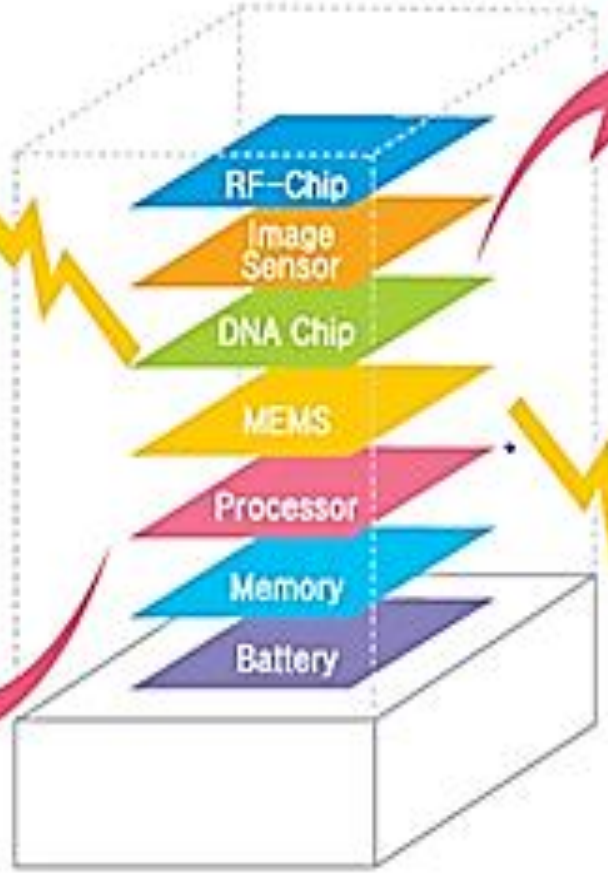
  Power, Optical, High Frequency, Sensor, MEMS

Concept of System and IC

Automobile

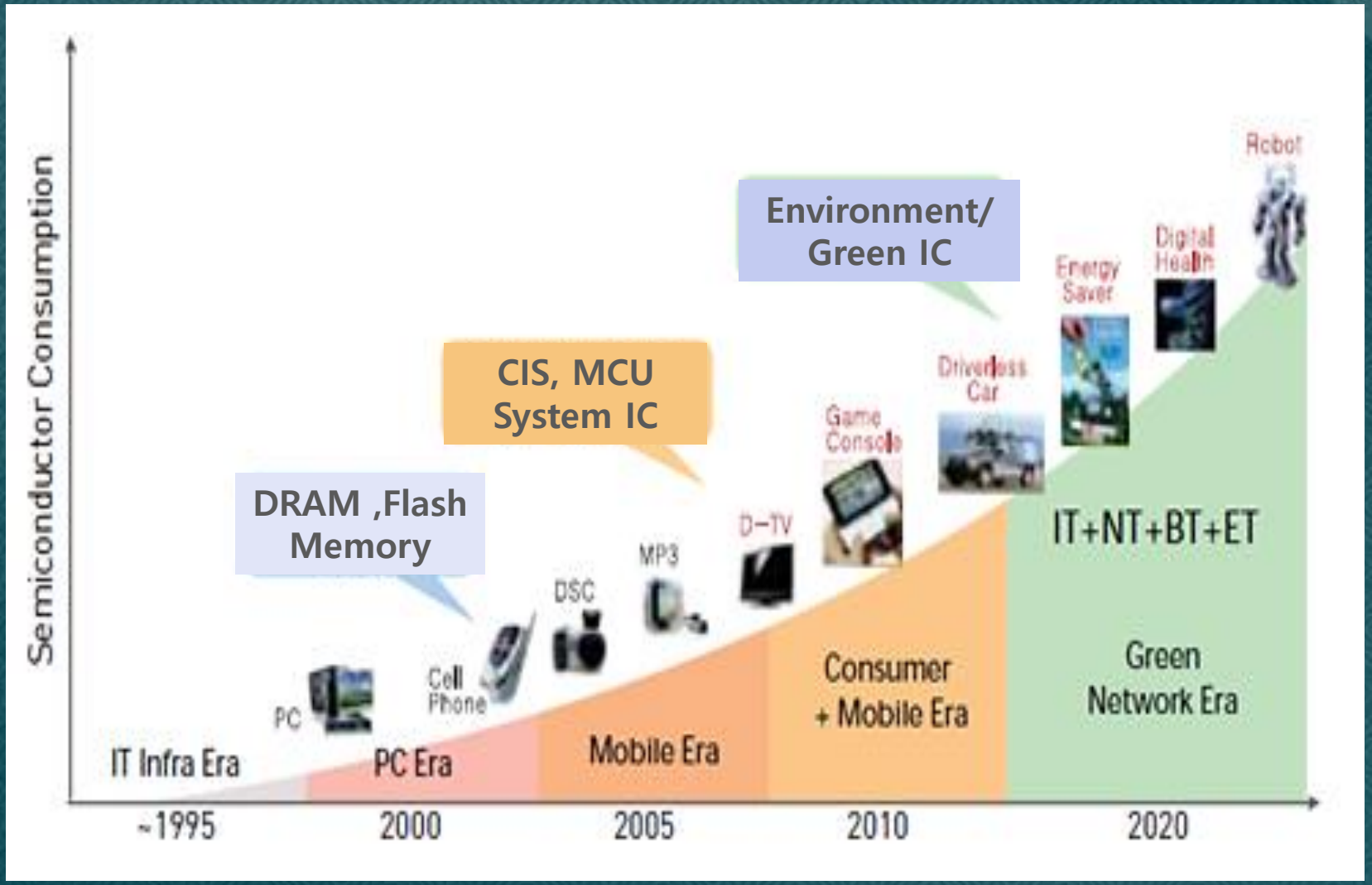
Computer

Green Tech.



Telecom,
Home Electronics

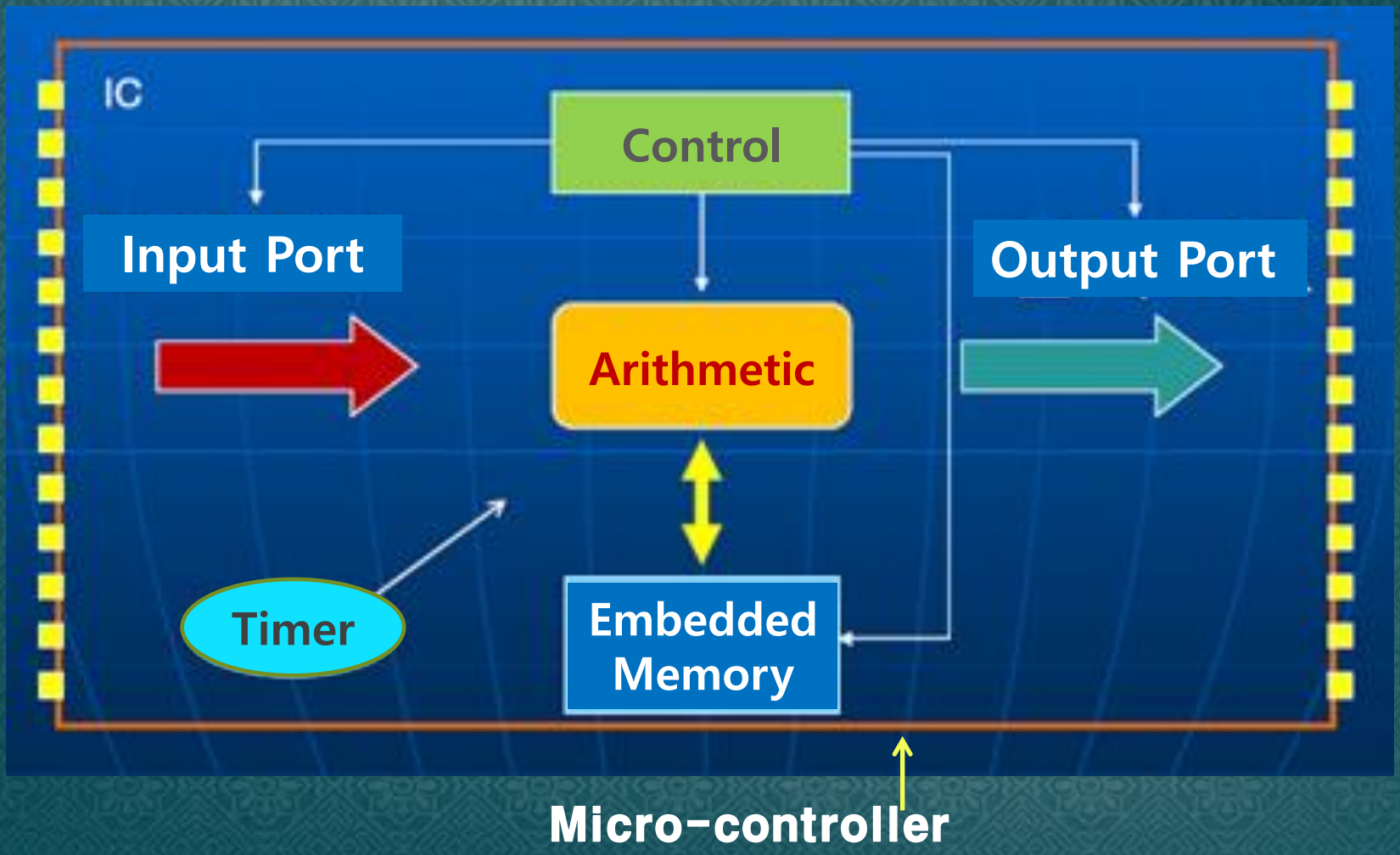
Trend of Semiconductor Application Area



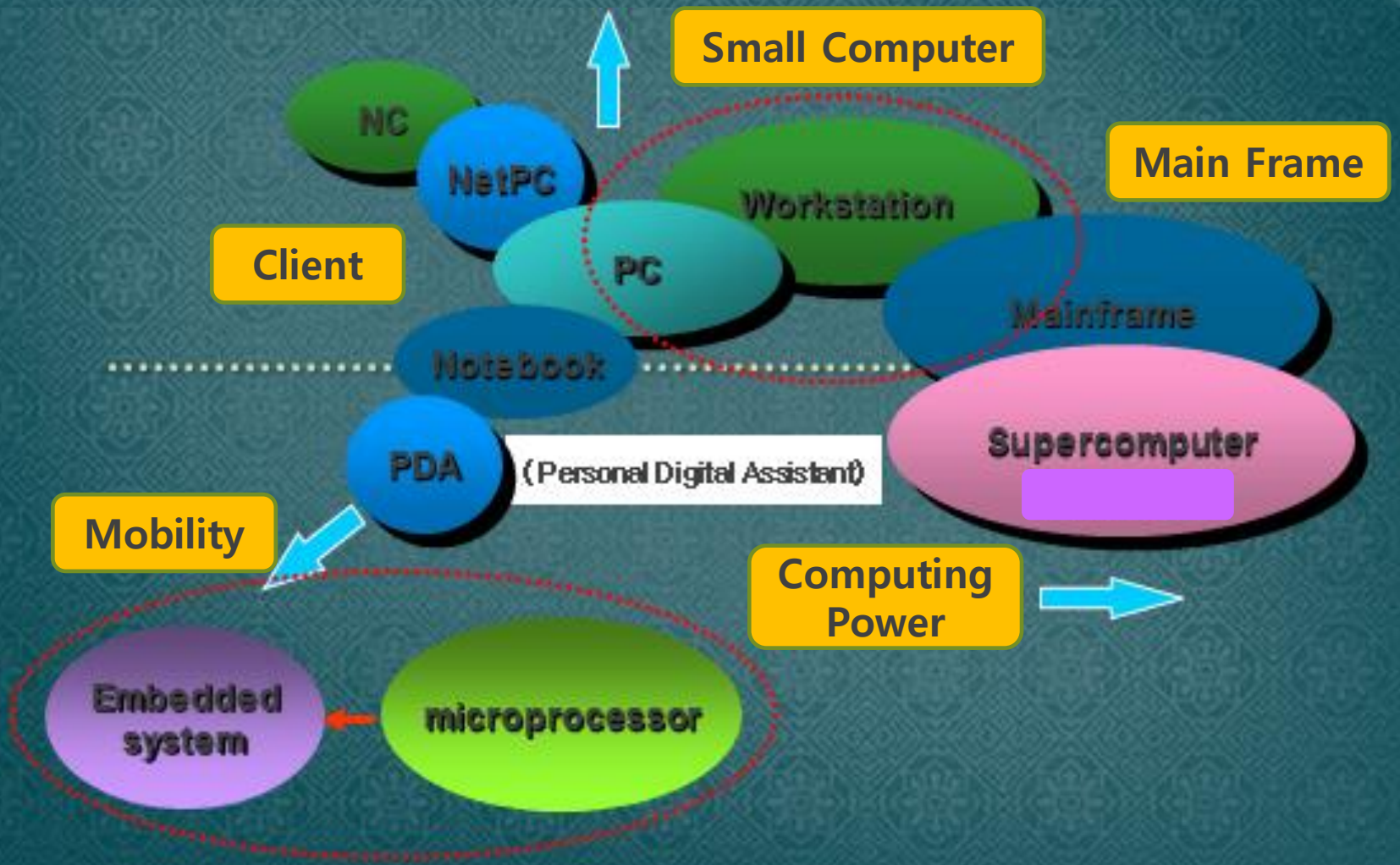
Future Trend of Semiconductor Industry

Micro-controller (MCU)

* Embedded System



Direction of Computer Development



Future Trend of Computer

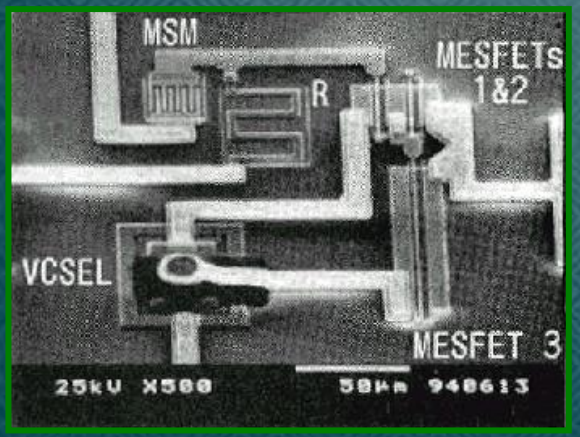
- Multi-media : Large screen, High performance graphic and sound control, Large memory
- Embedded : Converge with telecommunication and home electronics
- Net-working : Internet, IOT, Big Data
- Mobile Computing : Cellular phone, Notebook, PDA

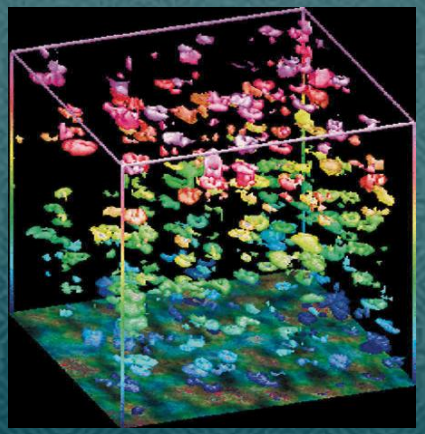
  Wearable Computer (Bracelet, Clothes, Glasses)
- High Performance : High frequency operation, parallel treatment

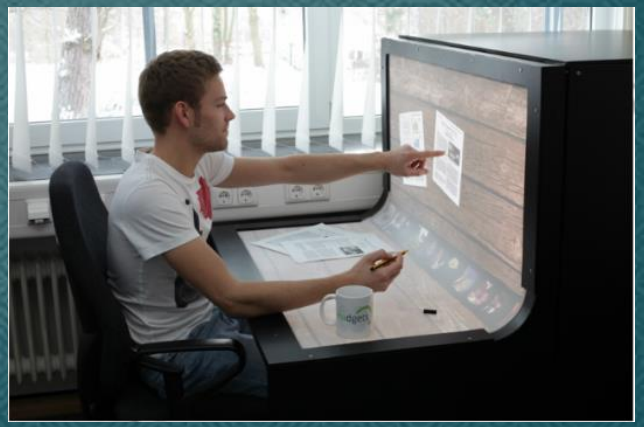
  - Photon Computer : High speed (>1000x), Immune to electrical wave
  - Quantum Computer : Very high speed, use Qbit concept

Future Function of Computer

- AI (Artificial Intelligence)
- Voice Recognition (Voice Command)
- Image Recognition (Face, Finger Print, Iris)
- AR/VR (Augment/Virtual Reality) Control
- Robotics Fine Control







IT & IOT

General Trend of IT Industry

- AI (Artificial Intelligence) and Machine Learning
  - Self-driving Car, VPA (Virtual Personal Assistance), Smart Advisor
- Enterprise Digitalization
  - Networking and Cloud Computing
  - Big Data Analysis

.....

- Cyber Security
- IOT
  - Smart Band (wearable, healthcare)
  - Smart Home, Car, Factory, Farm
  - Smart City (energy, traffic, pollution, garbage)
- AR/VR (Augment Reality/Virtual Reality

Concept of AI Software for Knowledge Intelligence of Big-data

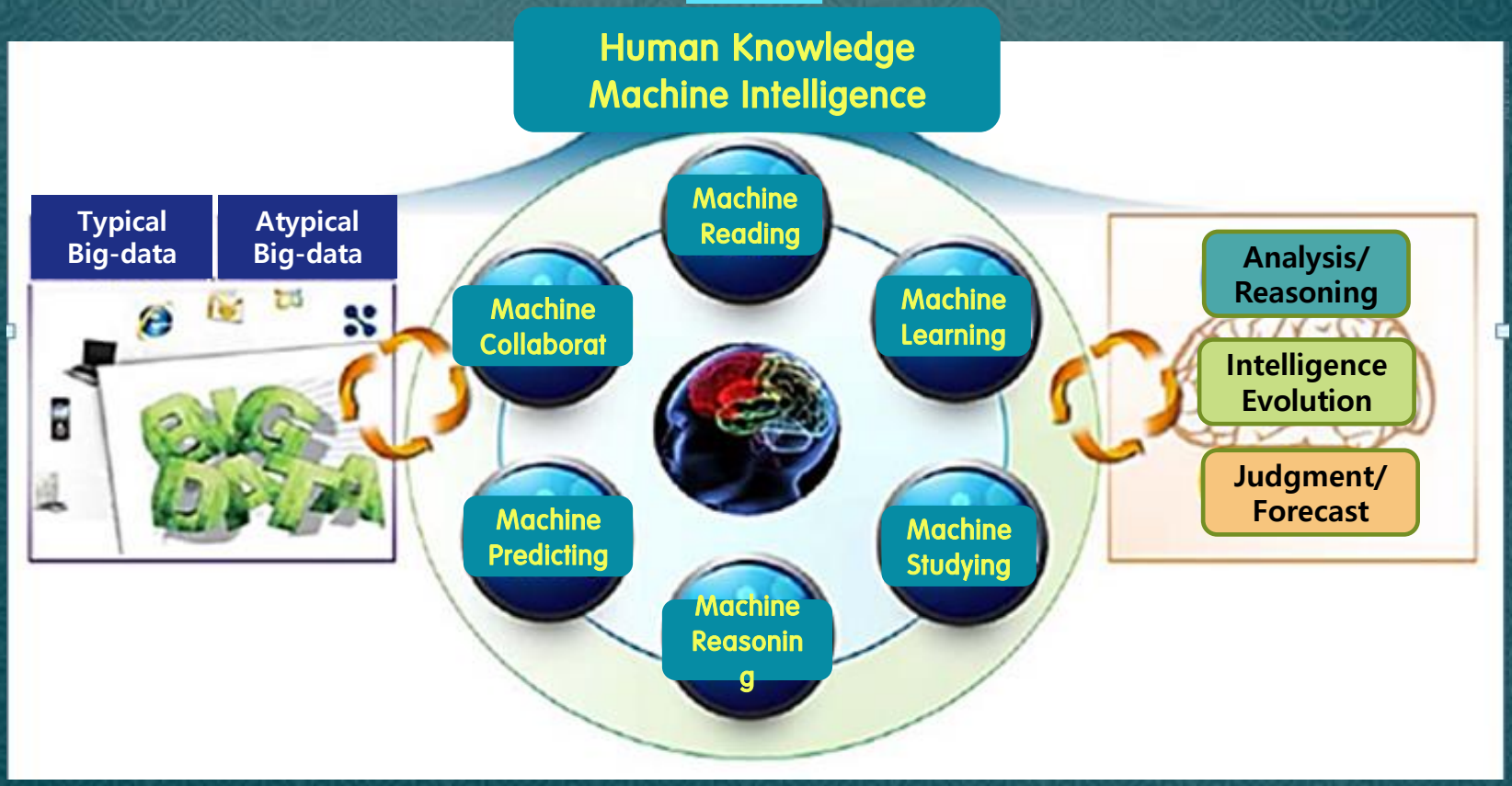
Loaded Intelligence
Robot, Clothes, Automobile

Big-data Intelligence
Support decision making of Company, public

Professional Decision Making
Medical, Health-care

Specialty Consulting
Patent, Lawyer, Management

Daily Life Q&A
Reduce Information load and gap



IOT (Internet of Things)

◆ Concept : Service Infra to provide the better service by connecting everything (Home Electronics, Car, etc.) with Internet

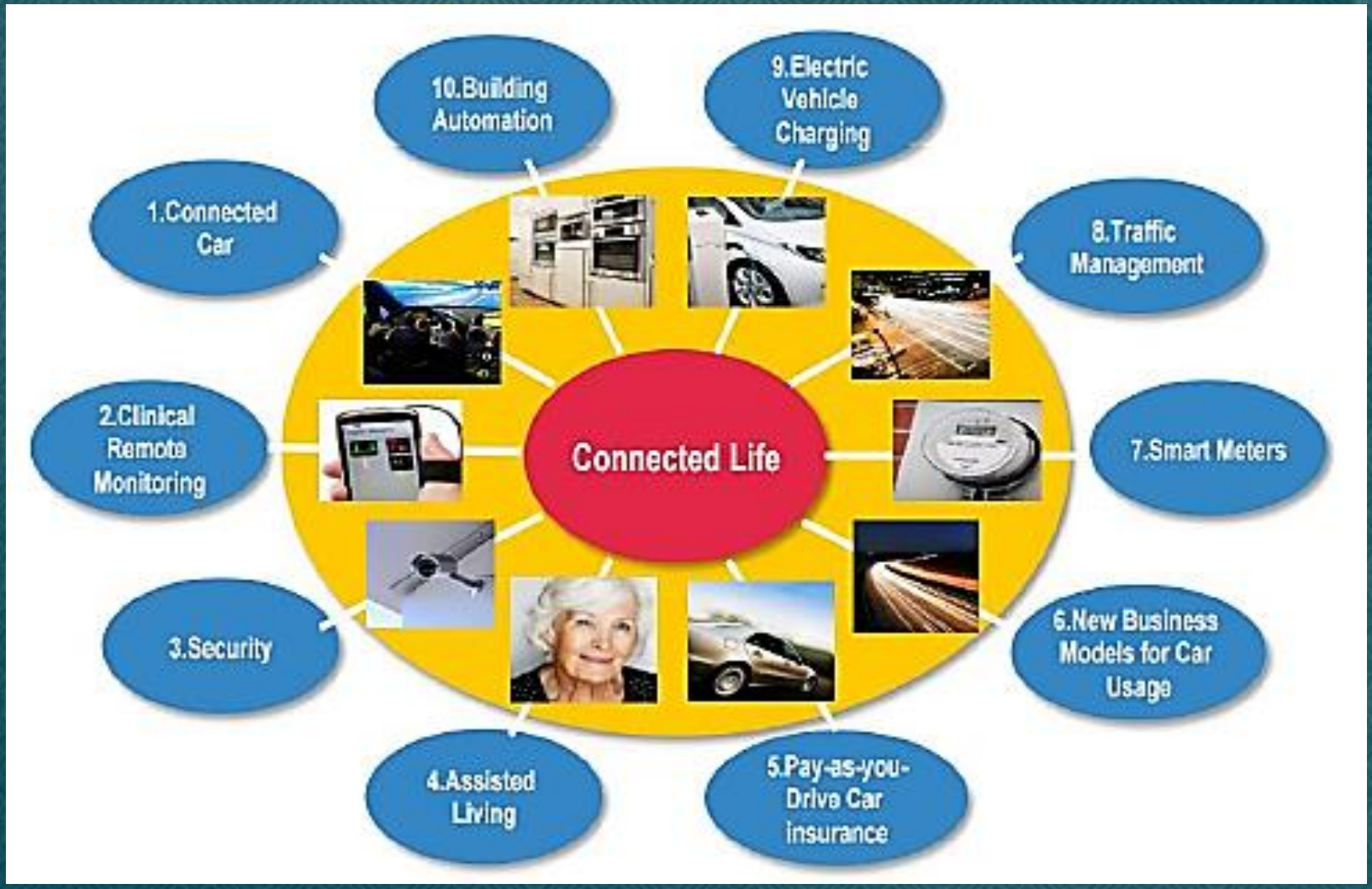
M2M (Machine to Machine Communication)
-> IOT (Internet of Things) -> IOE (internet of Everything)
-> IoST (Internet of Small Things) -> AtO (All to One)

.....

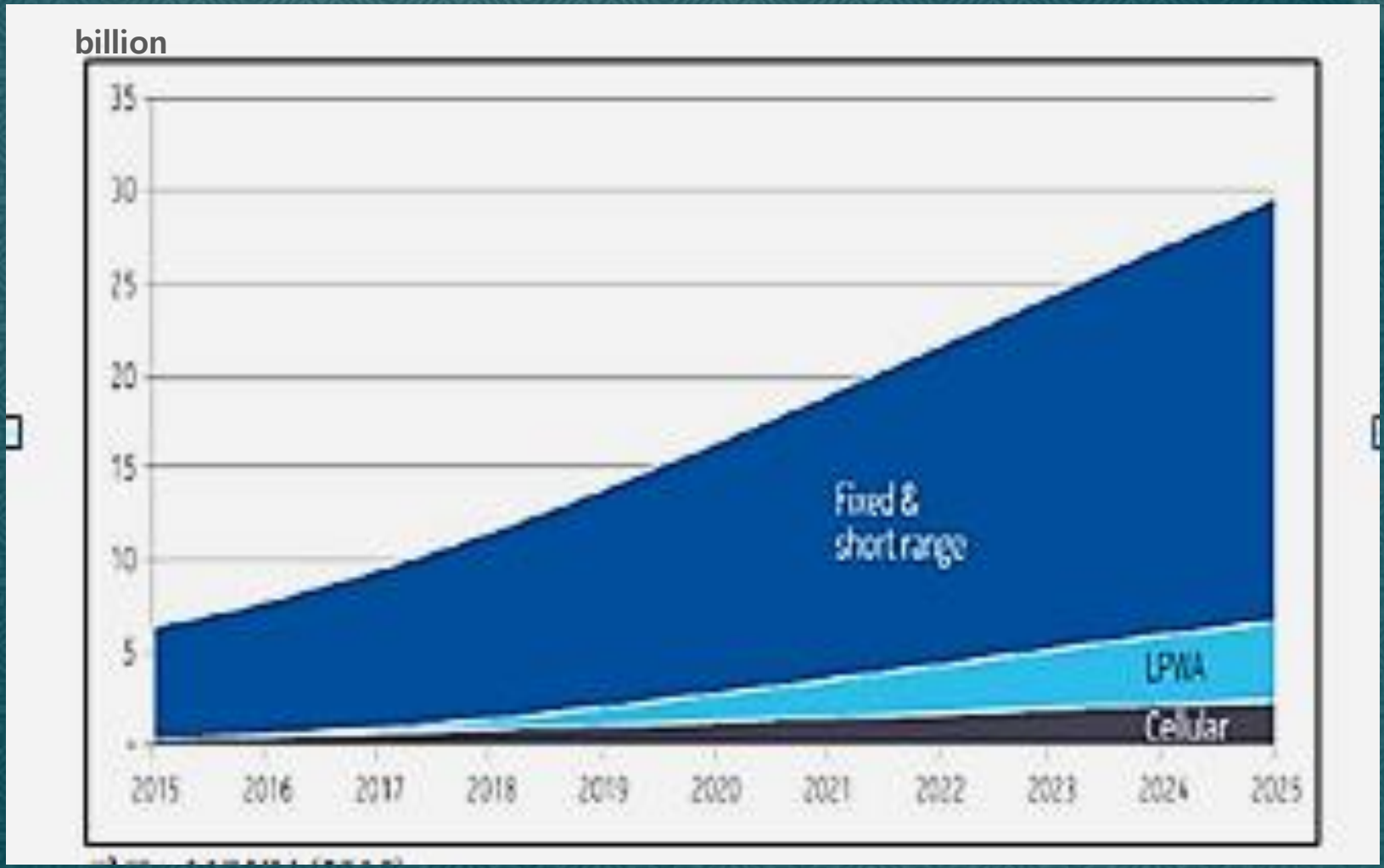
◆ Need New Flat-form and New Data Transmission Methods for Long and Efficient Battery Life-time

◆ Need Various Sensor Technology
Temperature, Humidity, Pressure Sensor, Light Sensor, Movement (Angle, Acceleration) Sensor, Sound Sensor

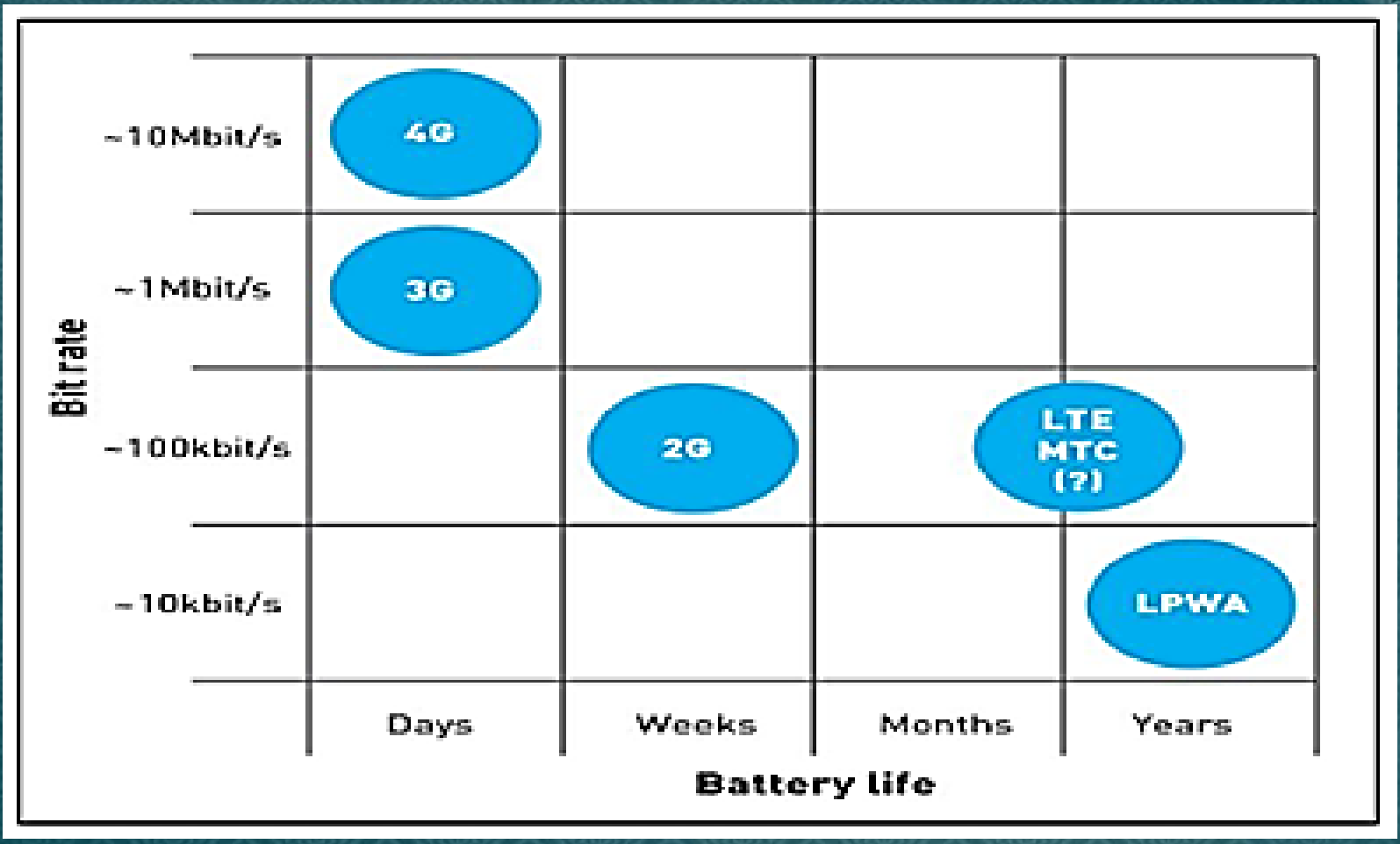
Application of IOT



Number of IOT Connections Forecast

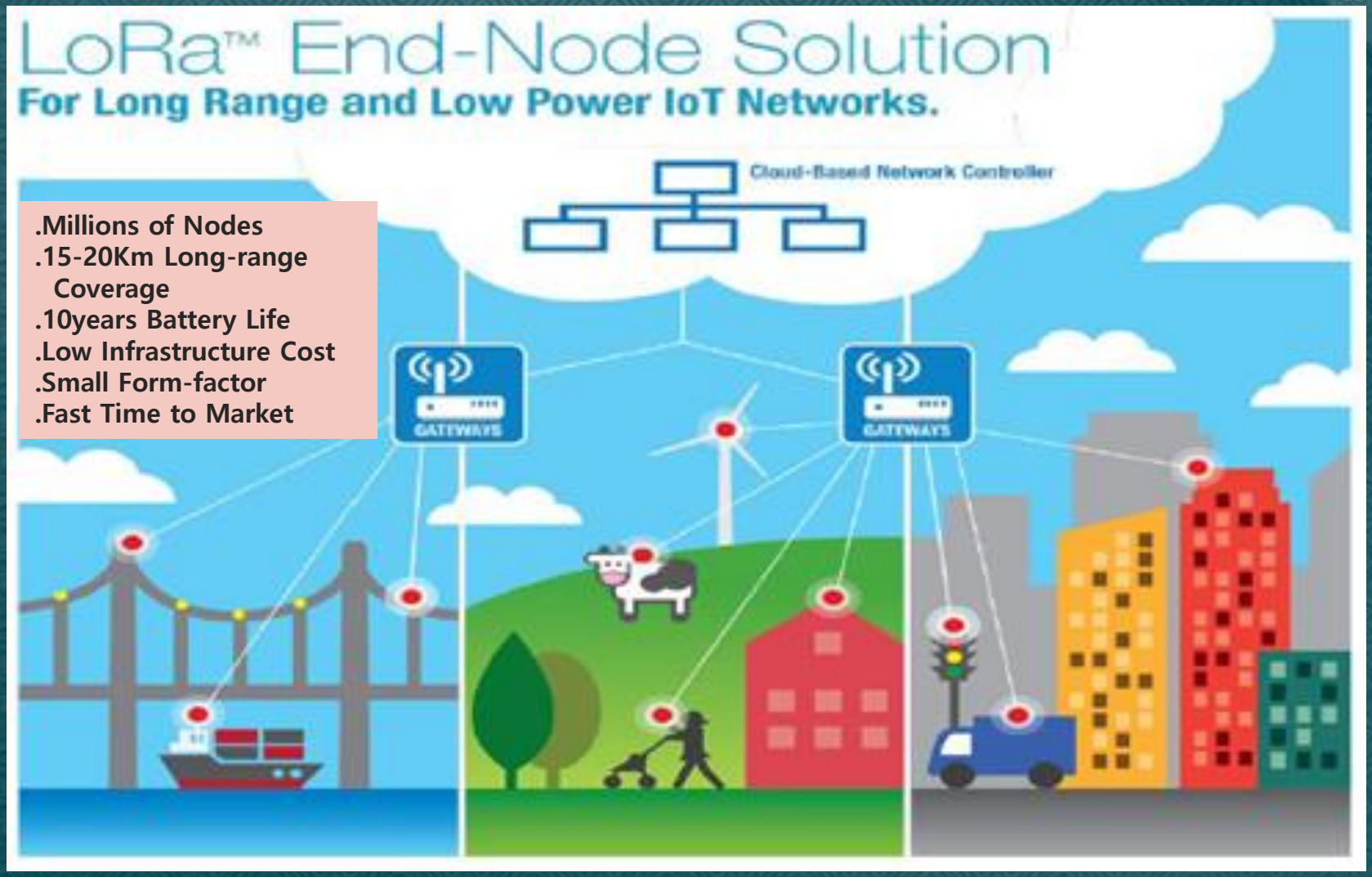


Comparison of Battery Lifetime of Several Transmission Mode



* LPWA : Low Power Wide Area for IOT Interconnection

LPWA Service (Example)



Thanks !