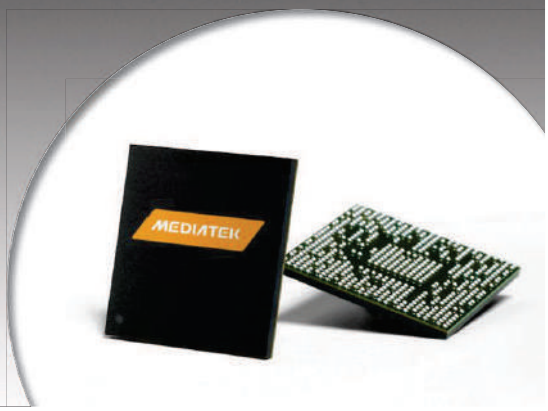
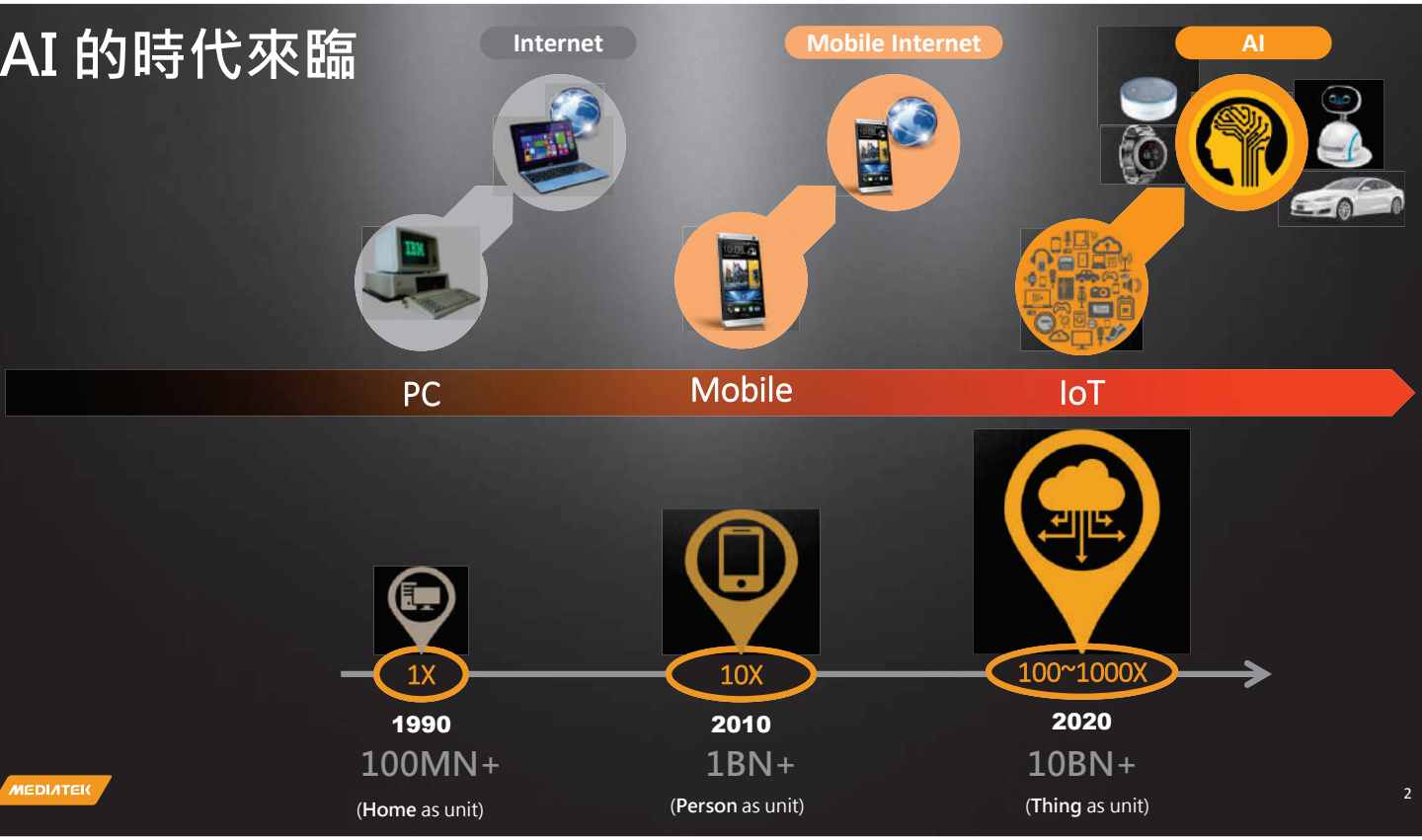
# 智慧系統與晶片技術之發展前景

聯發科技

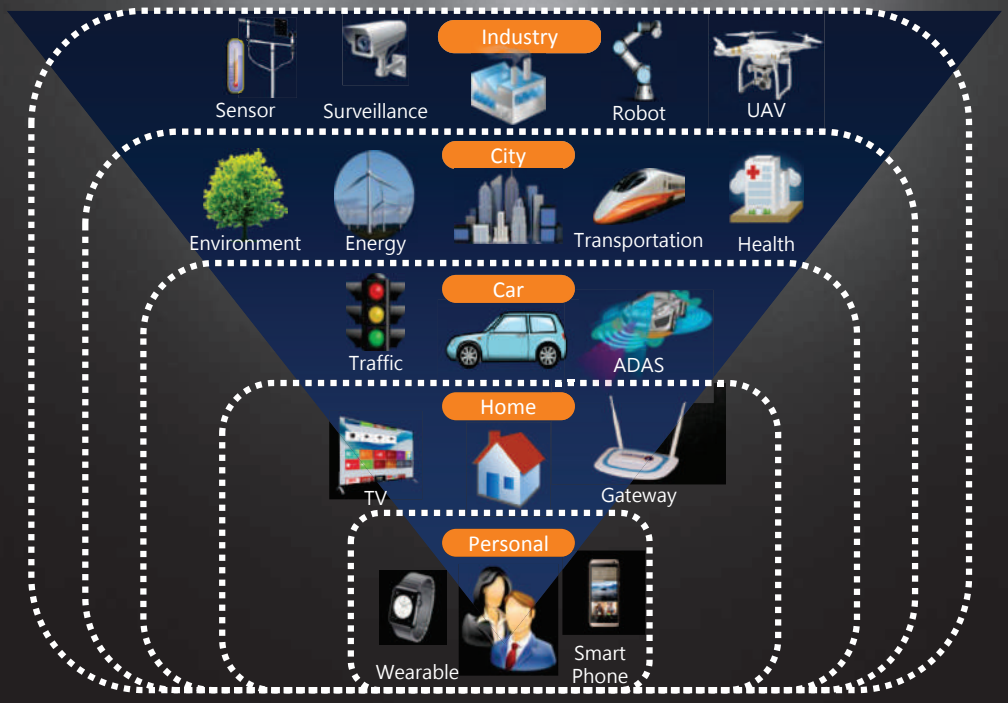
2017. 7. 10




## AI 的時代來臨

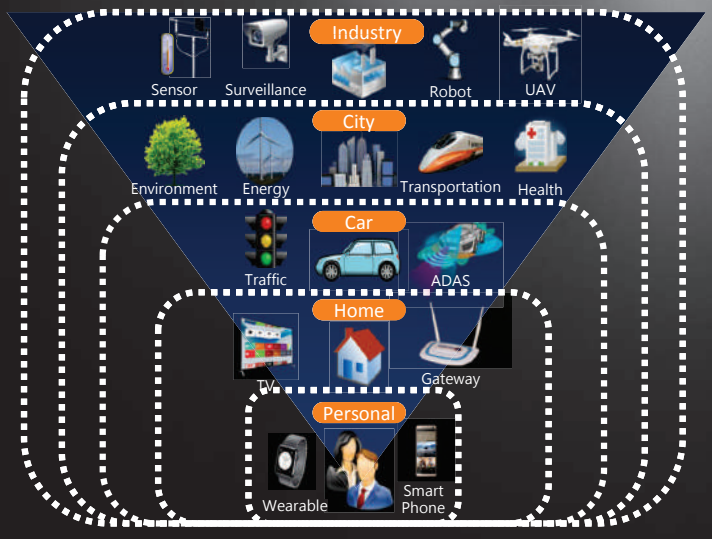


# IoT：智慧型設備進入人類生活各層面

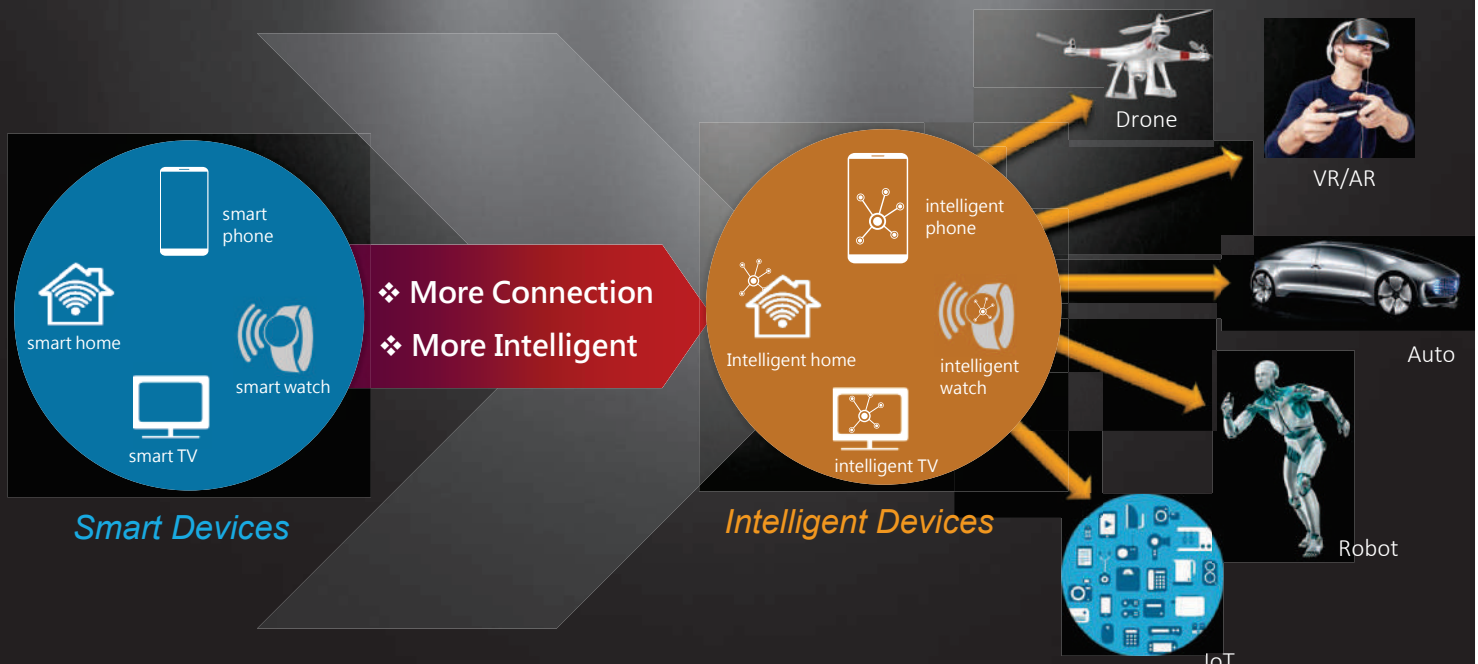





# IoT + AI：人工智慧技術全面提升智慧型平台的能力

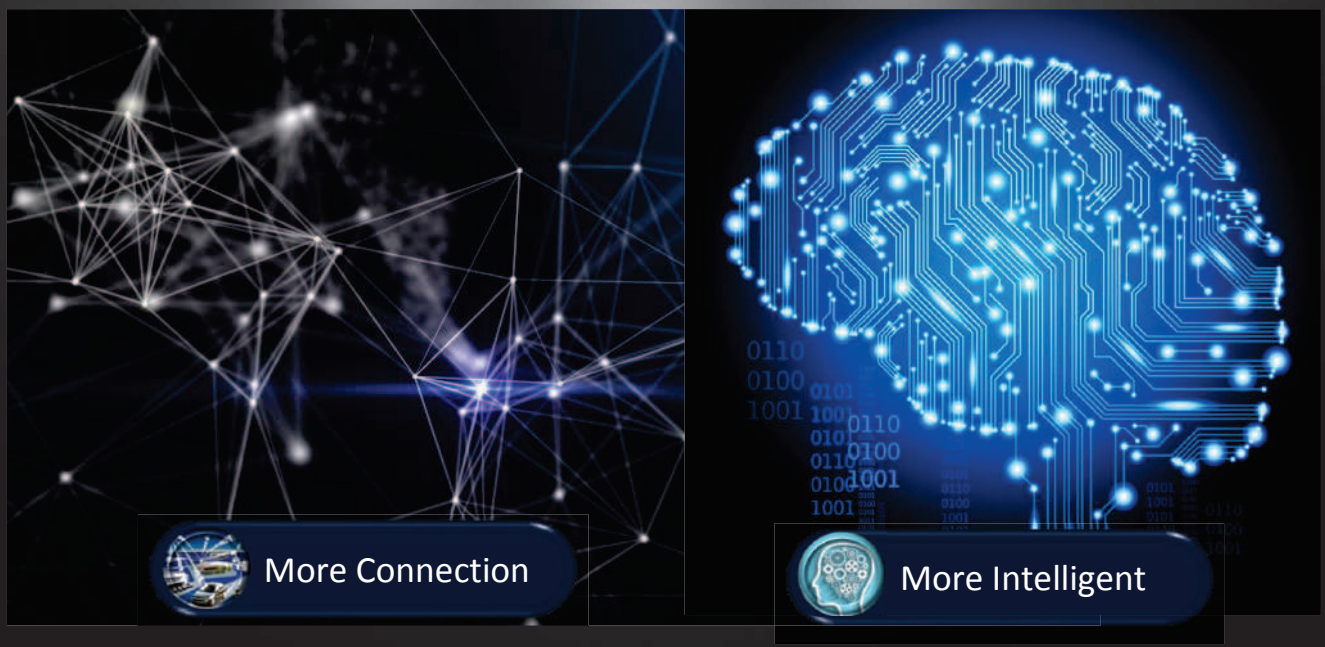



# From Smart Devices to Intelligent Devices

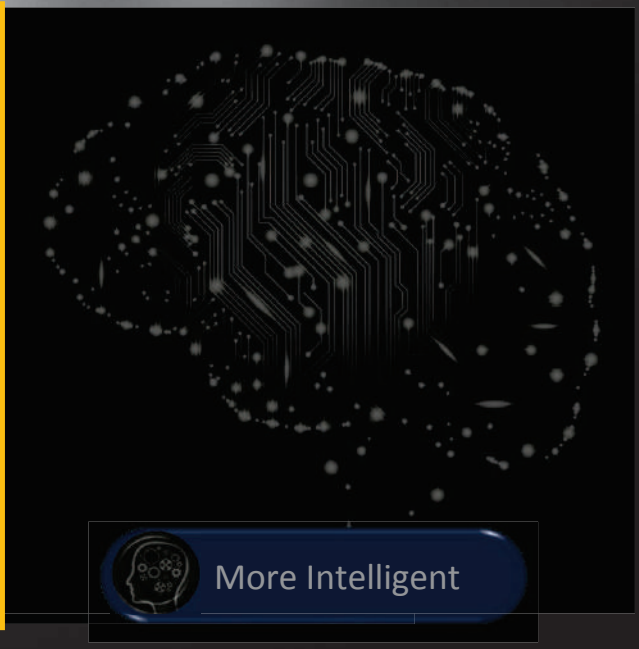





# 智慧裝置兩大核心技術趨勢

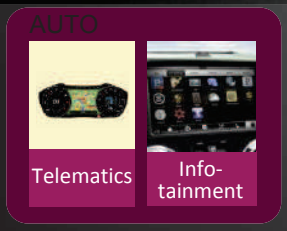


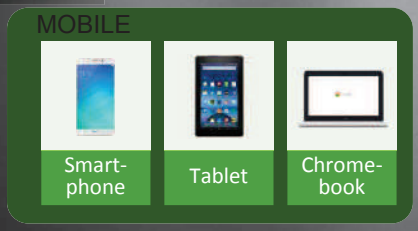
# 智慧裝置兩大核心技術趨勢：更多網路聯結

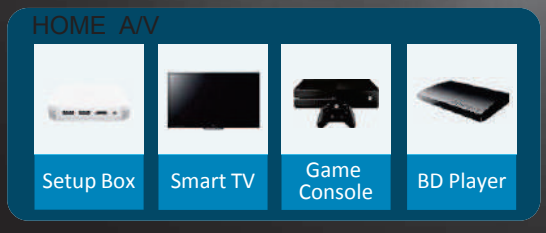






## More Connection





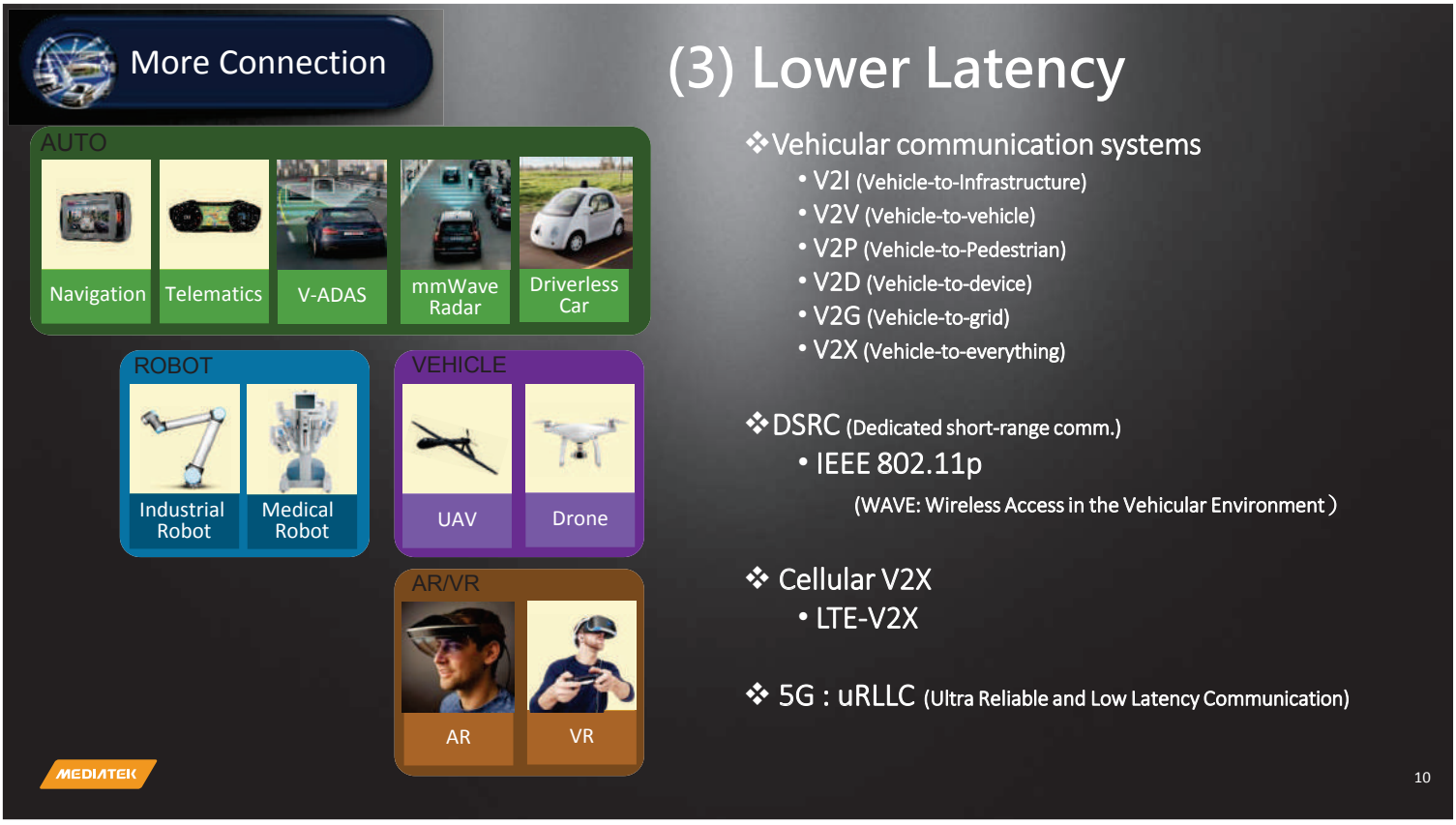
# (1) More Bandwidth

- ❖ Cellular Communication
  - 4G : LTE-A, Pre-5G
  - 5G : eMBB (enhanced Mobile Broad Band)
    - Sub-6G
    - mmWave
- ❖ WiFi
  - 802.11 ax (HEW: High-Efficiency WLAN )
  - 802.11 ad (WiGig) , 802.11 ay
- ❖Cellular Communication with Unlicensed band
  - LWA ( LTE-WLAN aggregation)
  - LTE-U (LTE in Unlicensed band)
  - LAA (Licensed Assisted Access)


# (2) More Devices

- ❖ LPWAN (Low-Power Wide-Area Network)
  - •LTE cat. NB1 : NB-IoT (NarrowBand IOT)
  - • LTE cat. M1 : eMTC (enhanced Machine-Type Comm.)
  - • EC-GSM-IoT
  - • 5G: mMTC (massive Machine Type Comm.)
  - • LoRa
  - • Sigfox
- ❖ WPAN (Wireless Personal Area Network)
  - • Bluetooth
  - • BLE (Bluetooth Low Energy), Bluetooth Smart
  - • Zigbee
  - • Ant+
- ❖WIFI






# (3) Lower Latency

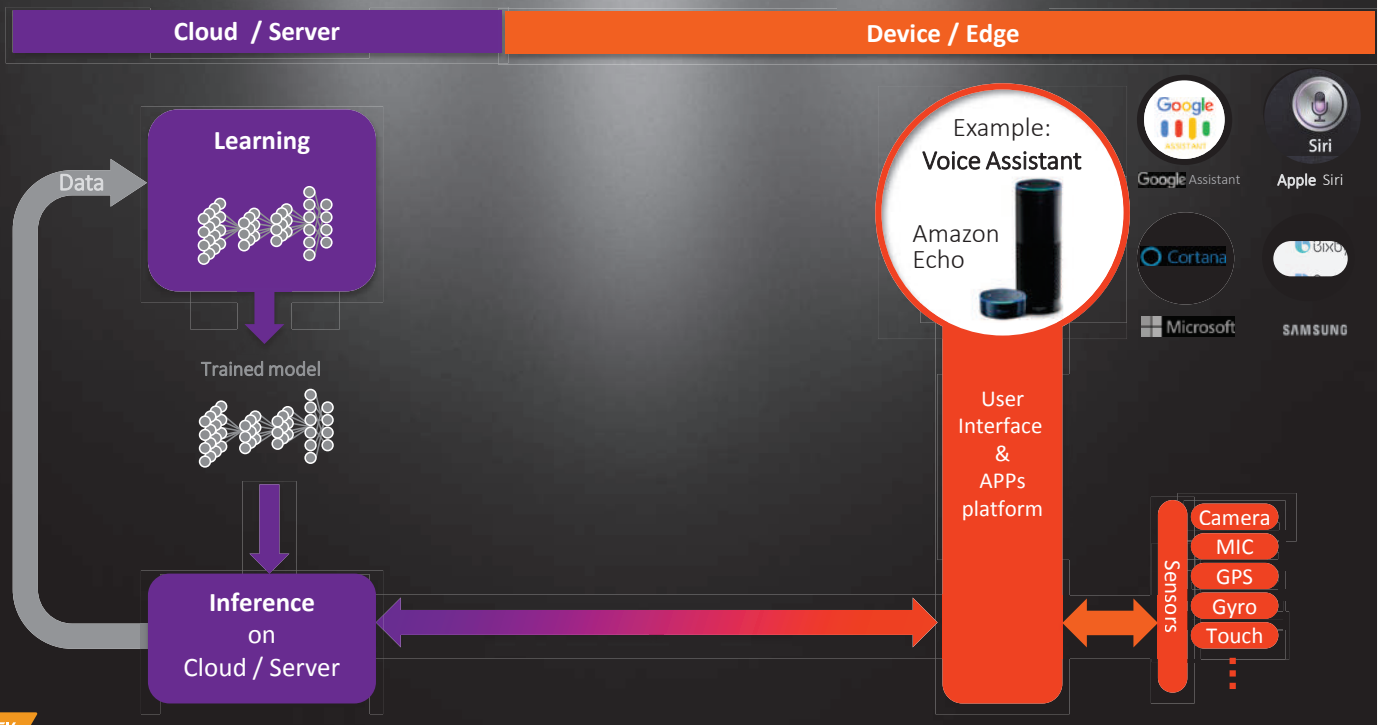
- ❖Vehicular communication systems
  - • V2I (Vehicle-to-Infrastructure)
  - • V2V (Vehicle-to-vehicle)
  - • V2P (Vehicle-to-Pedestrian)
  - • V2D (Vehicle-to-device)
  - • V2G (Vehicle-to-grid)
  - • V2X (Vehicle-to-everything)
- ❖DSRC (Dedicated short-range comm.)
  - • IEEE 802.11p

    (WAVE: Wireless Access in the Vehicular Environment )
- ❖ Cellular V2X
  - • LTE-V2X
- ❖ 5G : uRLLC (Ultra Reliable and Low Latency Communication)

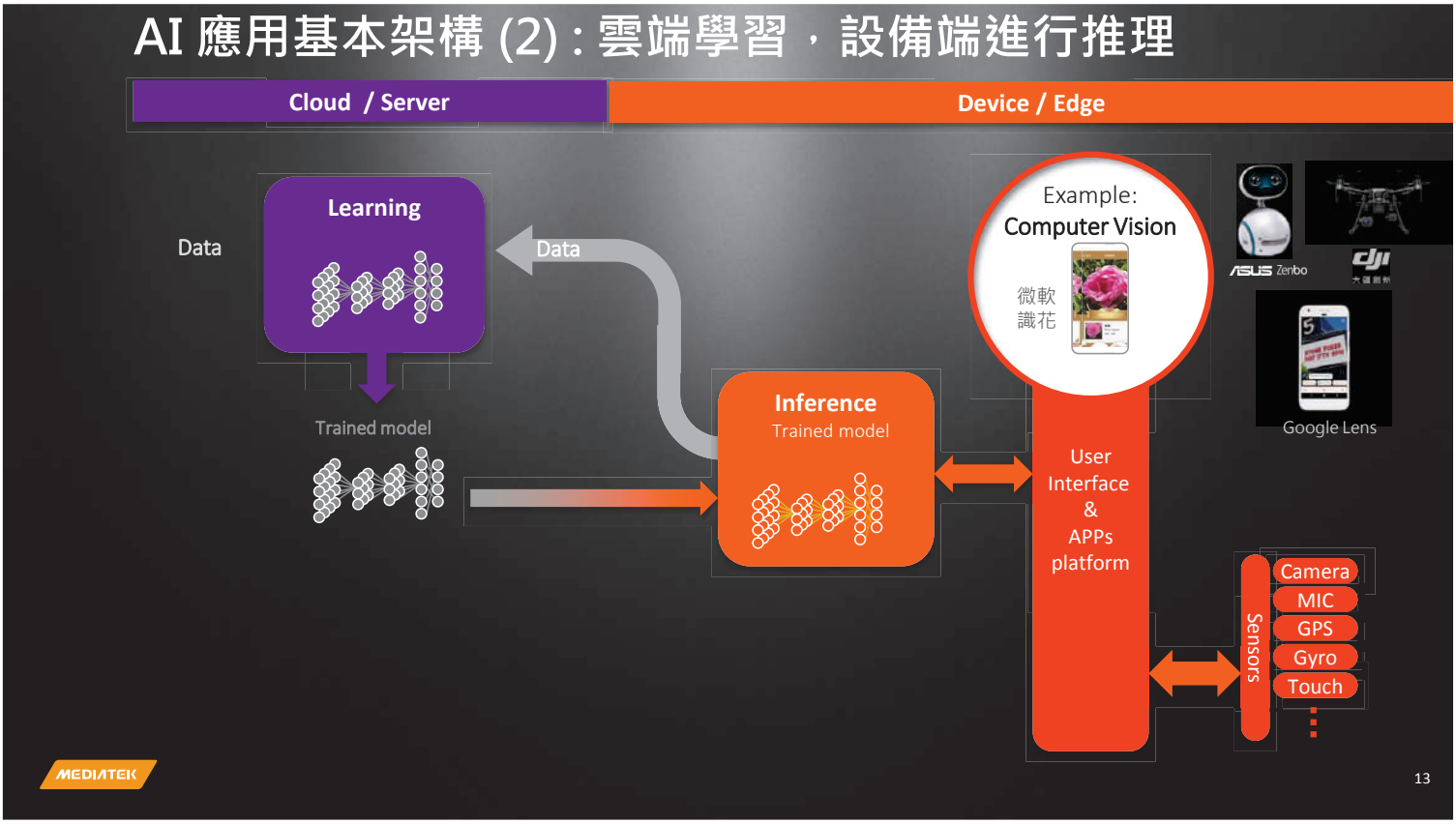
# 智慧裝置兩大核心技術趨勢：更多智慧




# AI 應用基本架構 (1)：學習與推理在雲端進行

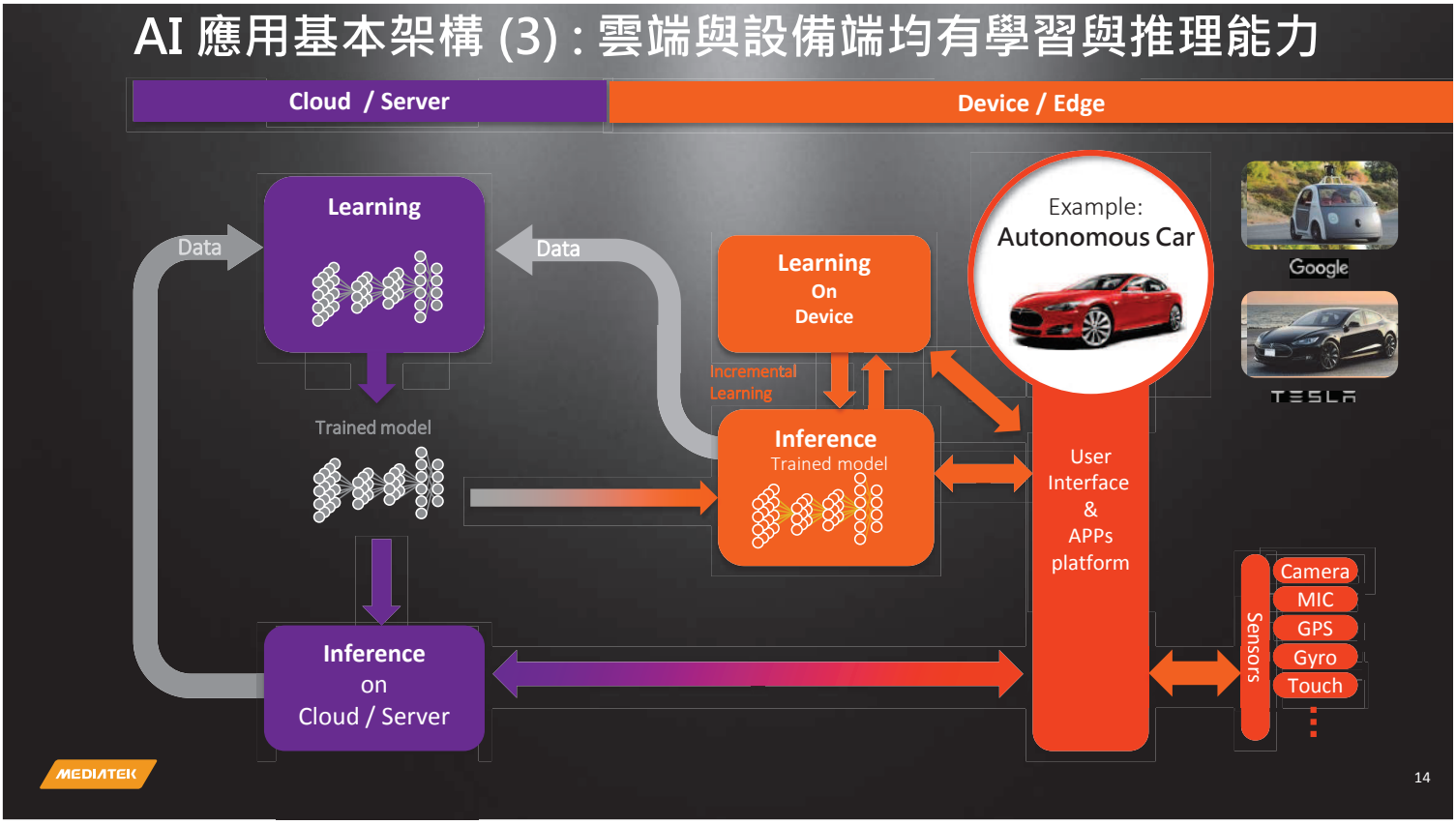


# AI 應用基本架構 (2) : 雲端學習，設備端進行推理

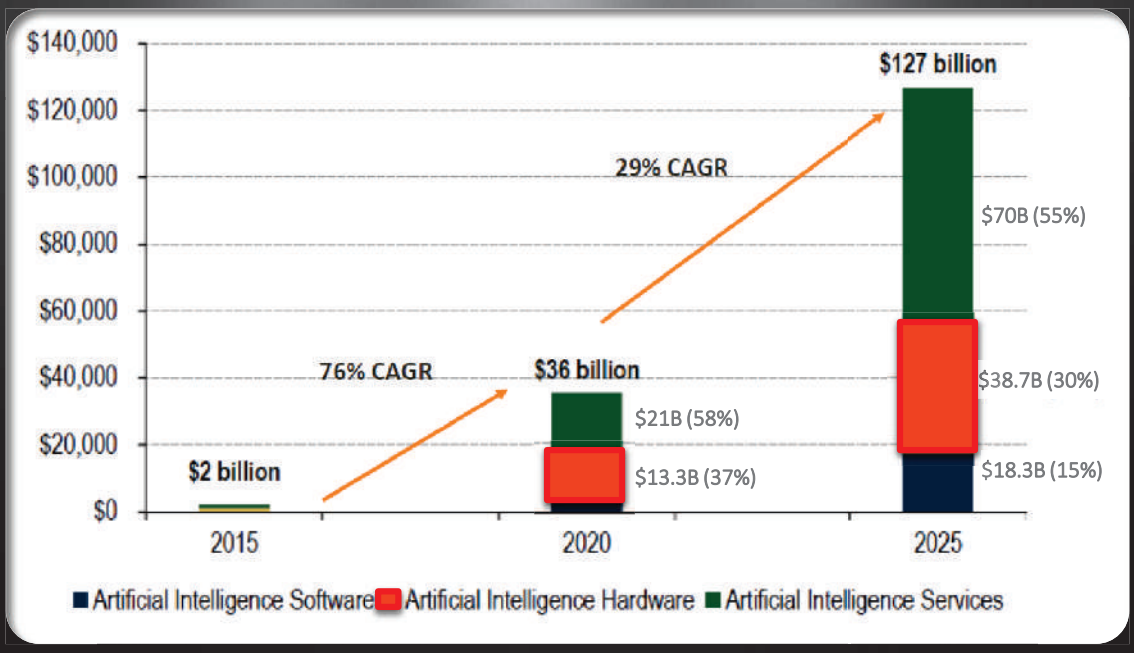





# AI 應用基本架構 (3) : 雲端與設備端均有學習與推理能力



# AI 系統的產值 硬體佔 30%

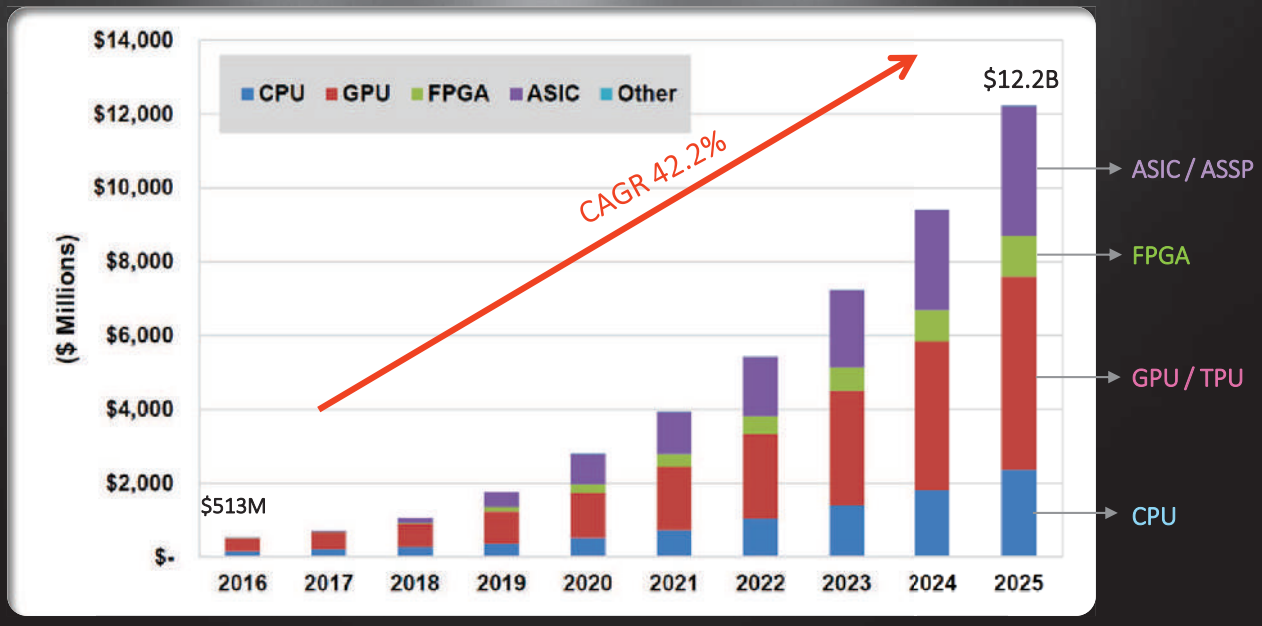



Source: Bank of America



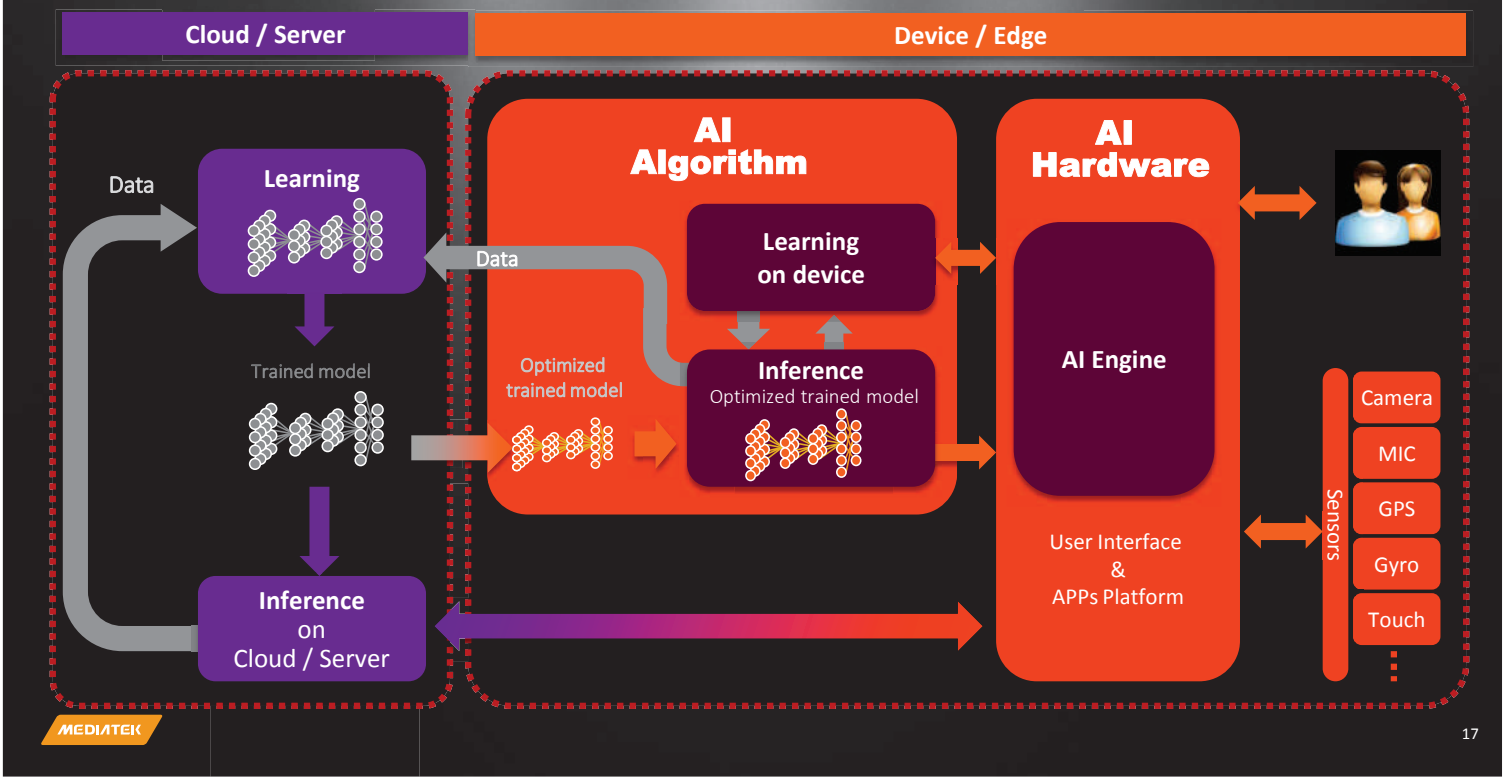
# AI 晶片的產值 2025年達 $12.2B

Deep Learning Chipset Revenue by Type, World Markets: 2016-2025



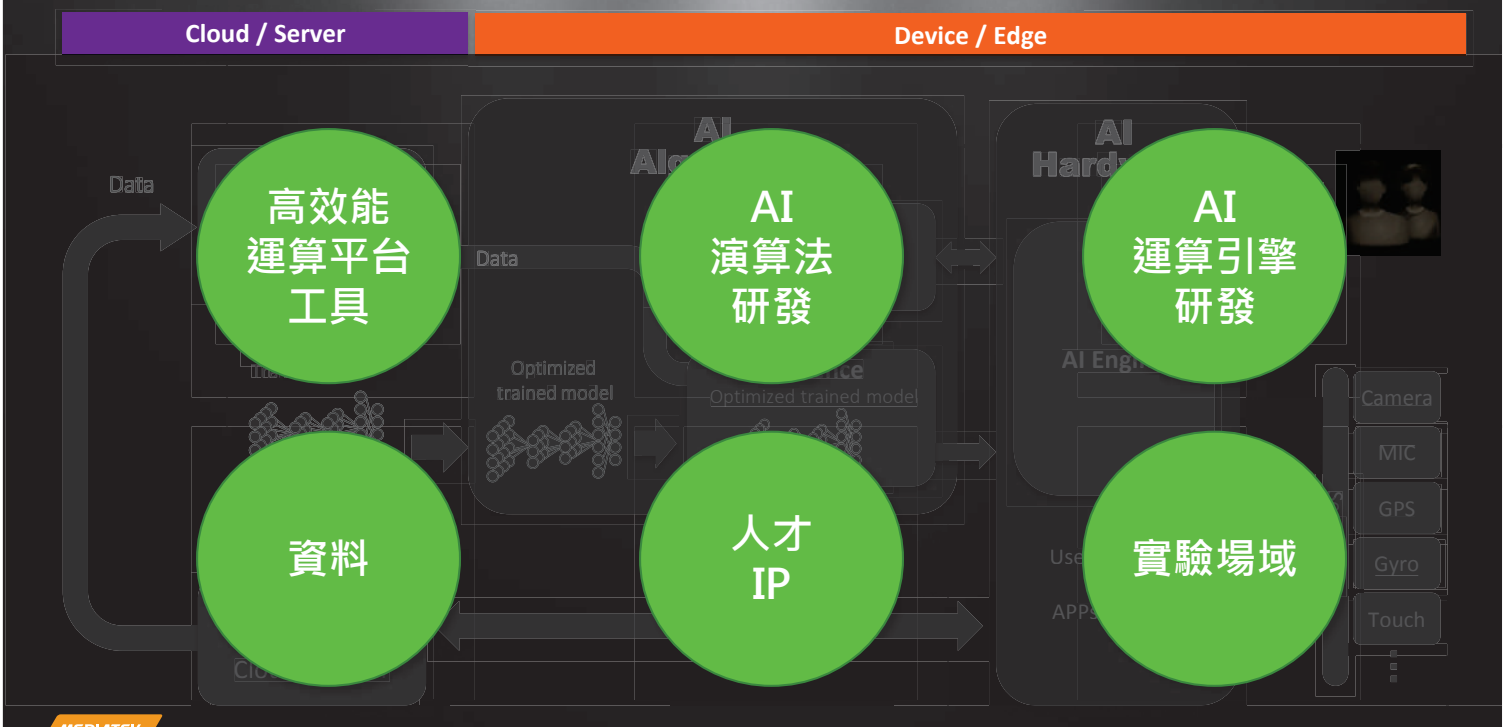

Source: Tractica

# On-Device AI 為台灣重要發展領域






# AI 技術發展的關鍵



# Future: Connecting the Next Billions with AI




# Summary

- ❖ 科技發展由 PC/Internet, Mobile Internet, 進入 IoT/AI 世代
  平台也由 Smart Device 演進成 Intelligent Device

- ❖ Intelligent Device 應著重的技術方向
  - ❖ More Connection
    - ➢ 技術核心： Wireless Comm. (5G, WiFi, LPWAN,..)
    - ➢ 技術方向: More Bandwidth, More Devices, Less Latency
  - ❖ More Intelligent
    - ➢ 技術核心： AI 人工智慧 (Deep Learning, Machine Learning,..)
    - ➢ 技術方向: On-Device AI , AI algorithm, AI Hardware

- ❖ Wireless Comm. 與 AI 是未來 Intelligent Device 的核心技術基礎。
  政府應加強 Wireless Comm. 與 AI 的技術投資，培養人才，鼓勵創新，
  以建立台灣在智慧系統與晶片技術的國際競爭力。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