

5G

Cloud



# 利用Private 5G及虛實整合技術 提昇工廠運作效率

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IT

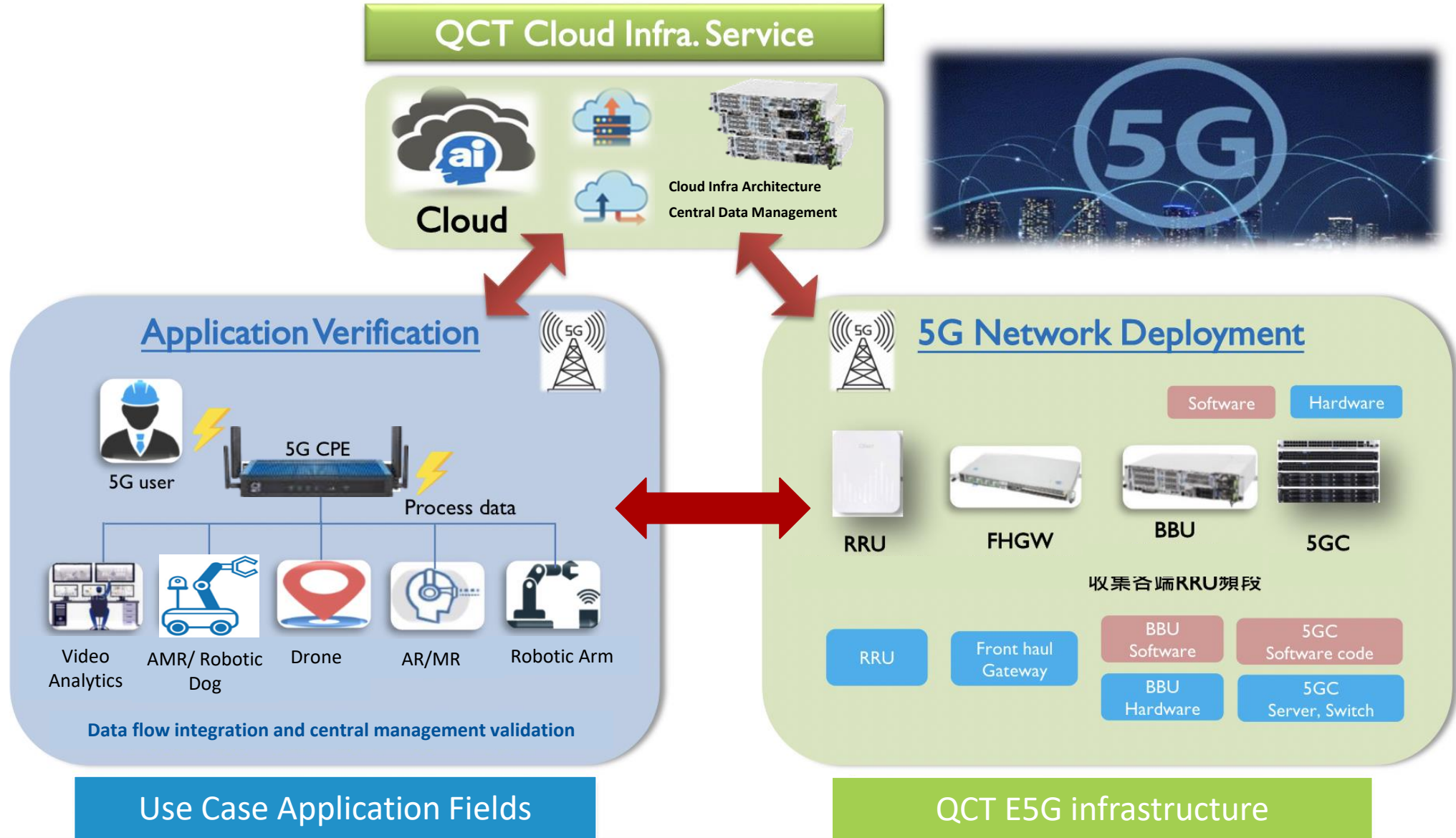
AI

# AGENDA

- Edge Transformation with Private 5G
- 5G+AR Use Cases
- 5G+Digital Production Line
- QCT 5G Smart Manufacturing Solution

# 5G Enhances the Connectivity in Fields

## Reshape the Network Edge and the Device Edge



# Business Driven 5G Technology Evolvment

- Covid-19
- Supply Shortage?
- ...

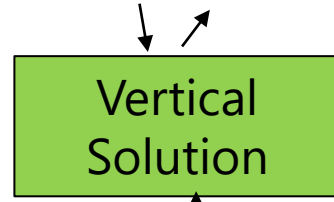
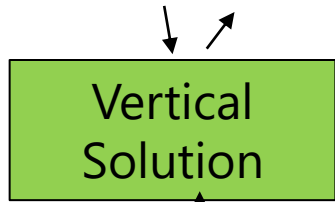


- Industry 4.0
- AI, 5G
- ...



- E2E Supply chain visibility
- Smart Planning
- Smart Procurement

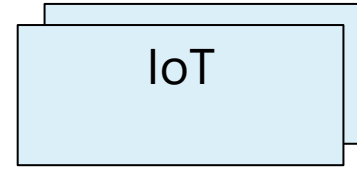
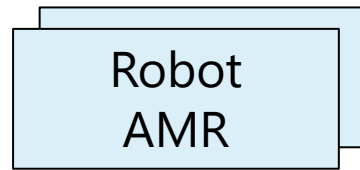
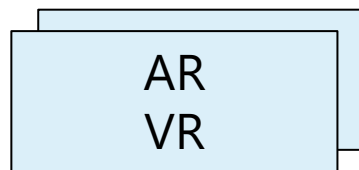
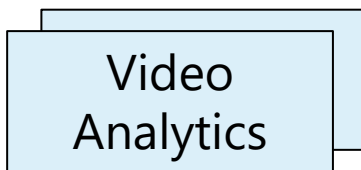
Vertical Knowledge



SDK



Common Use Case



5G Spec Evolvment

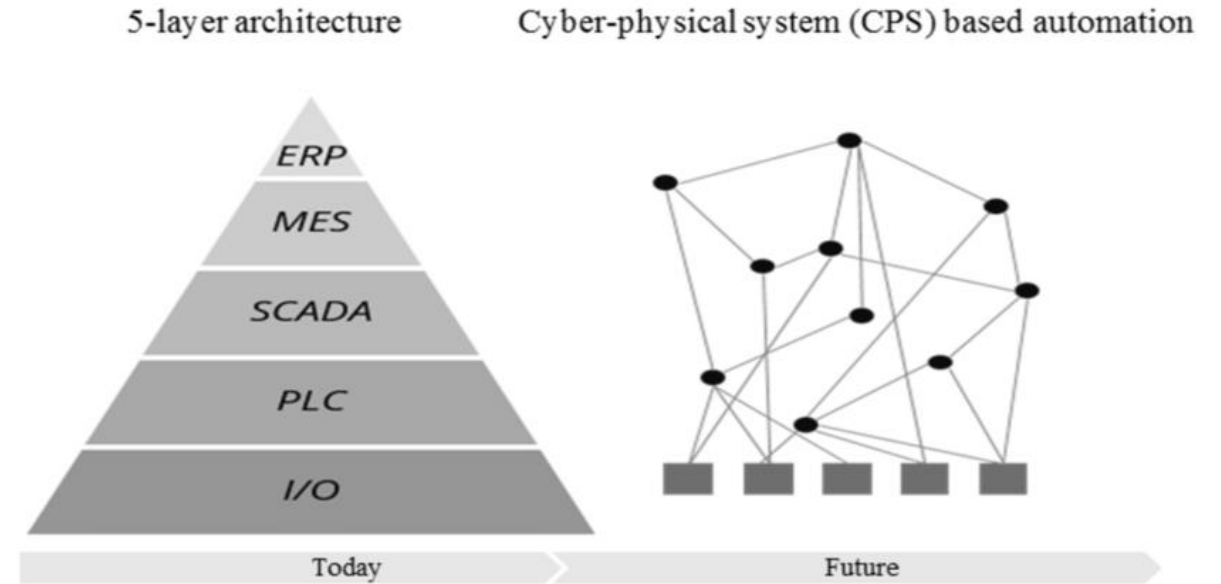
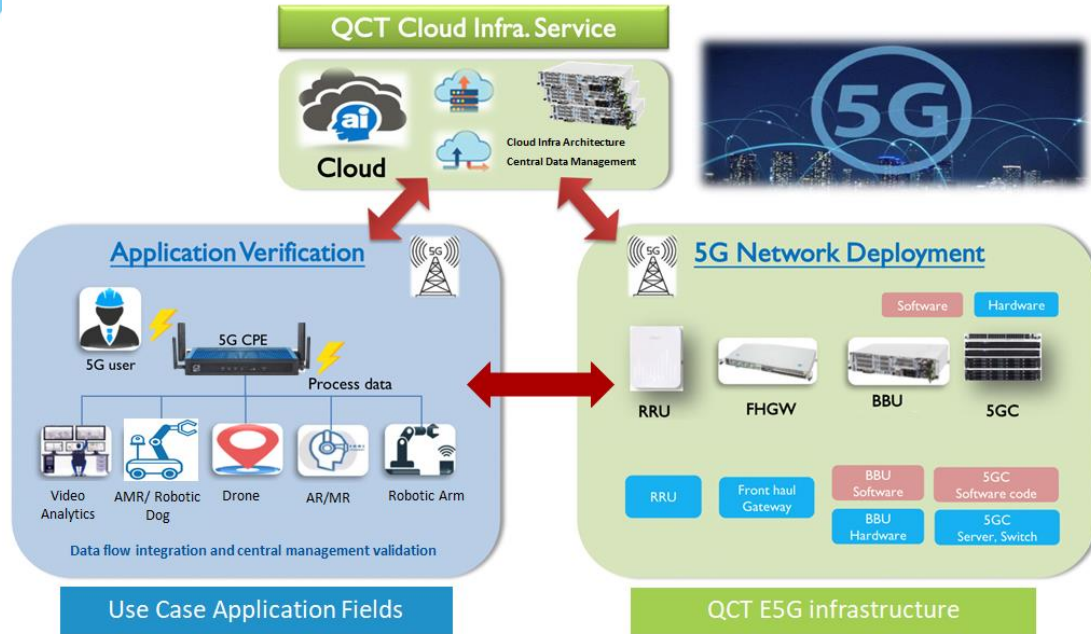


R15

R16

R17

# Edge Transformation with 5G Empowers Industrial 4.0



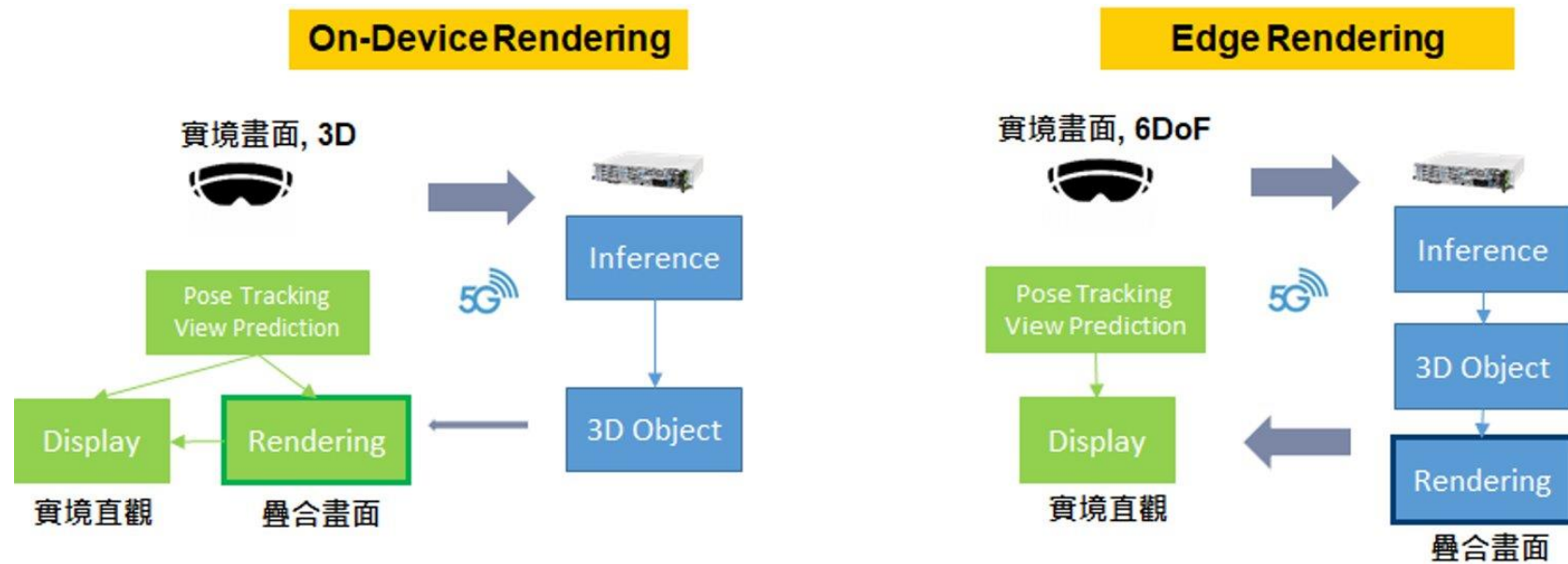
Industry 4.0 in Germany - The Obstacles Regarding Smart Production in the Manufacturing Industry  
Comparison of the 5-layer architecture and CPS-based automation: according to Lueth

- Technology from Cloud to Edge
- Connectivity from Wired to Wireless
- Computing from Device to Network

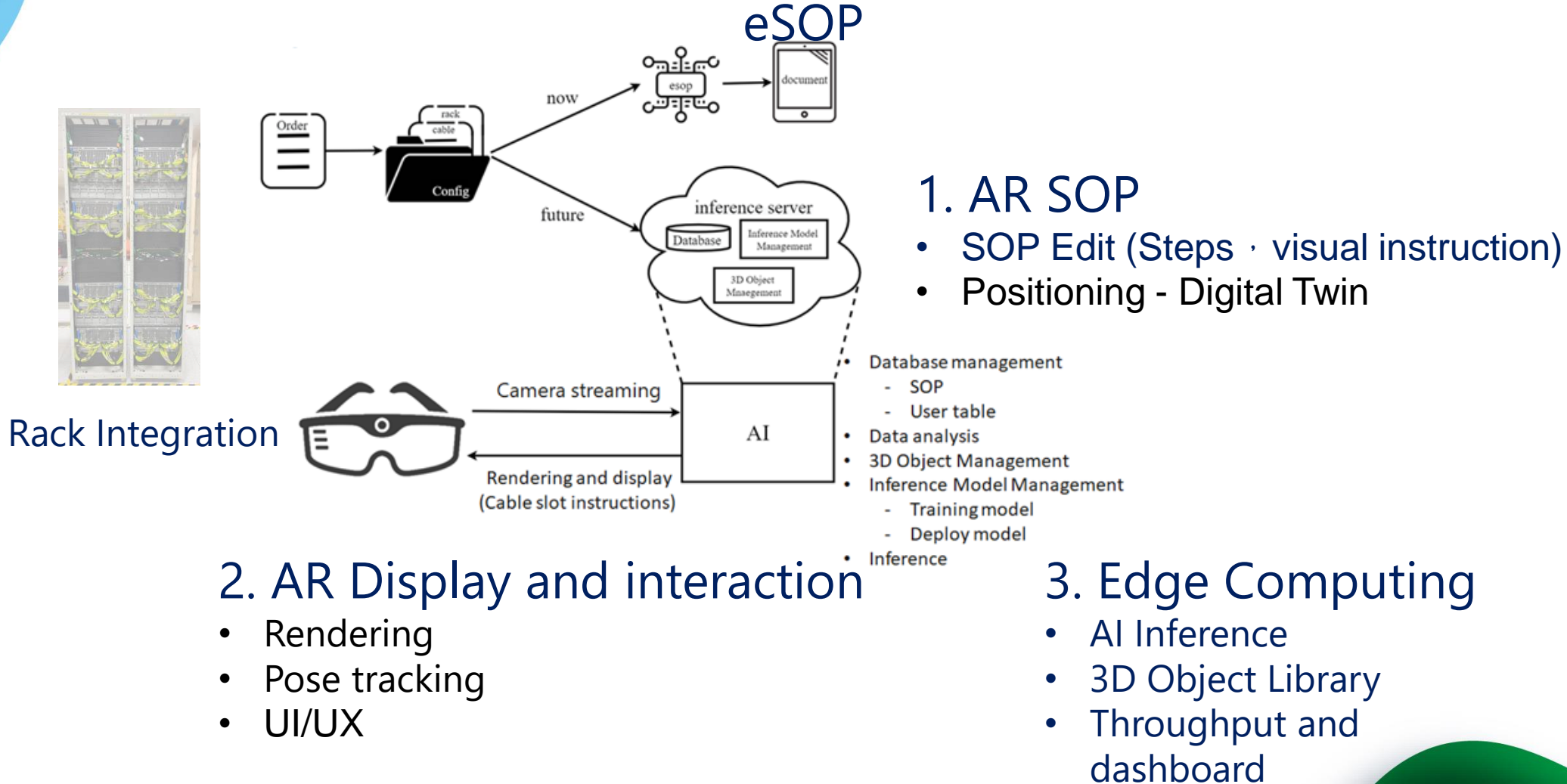
- Portable Machine
- Reconfigurable Production Line
- Federated Global Supply Chain

# 5G + AR brings together Cloud-based technologies and AI to deliver superior experiences

- **Uplink:** AI Inference
- **Low Latency** eMBB Augmented Reality, 3GPP QoS 5QI=80



# AR Rack Integration – Three domains considered



# Benefit Analysis – Learning and Cycle Time Measurement

## Goal

- Measure the difference in assembly time between the guidance of AR and Veteran
- Evaluate AR Learning Curve on REAL job with the AR SOP Guidance

## Measurement

- 1<sup>st</sup> and 2<sup>nd</sup> Assembly Time with AR Guide
- Assembly Time with Veteran Guide

## Result

- 1<sup>st</sup> AR Guide takes the same assembly time as Veteran Guide
- 30% reduction in assembly time for the 2<sup>nd</sup> AR use
- Reducing rework rate is another and even more important KPI
- The More Complex the Process, the More Obvious the Benefits



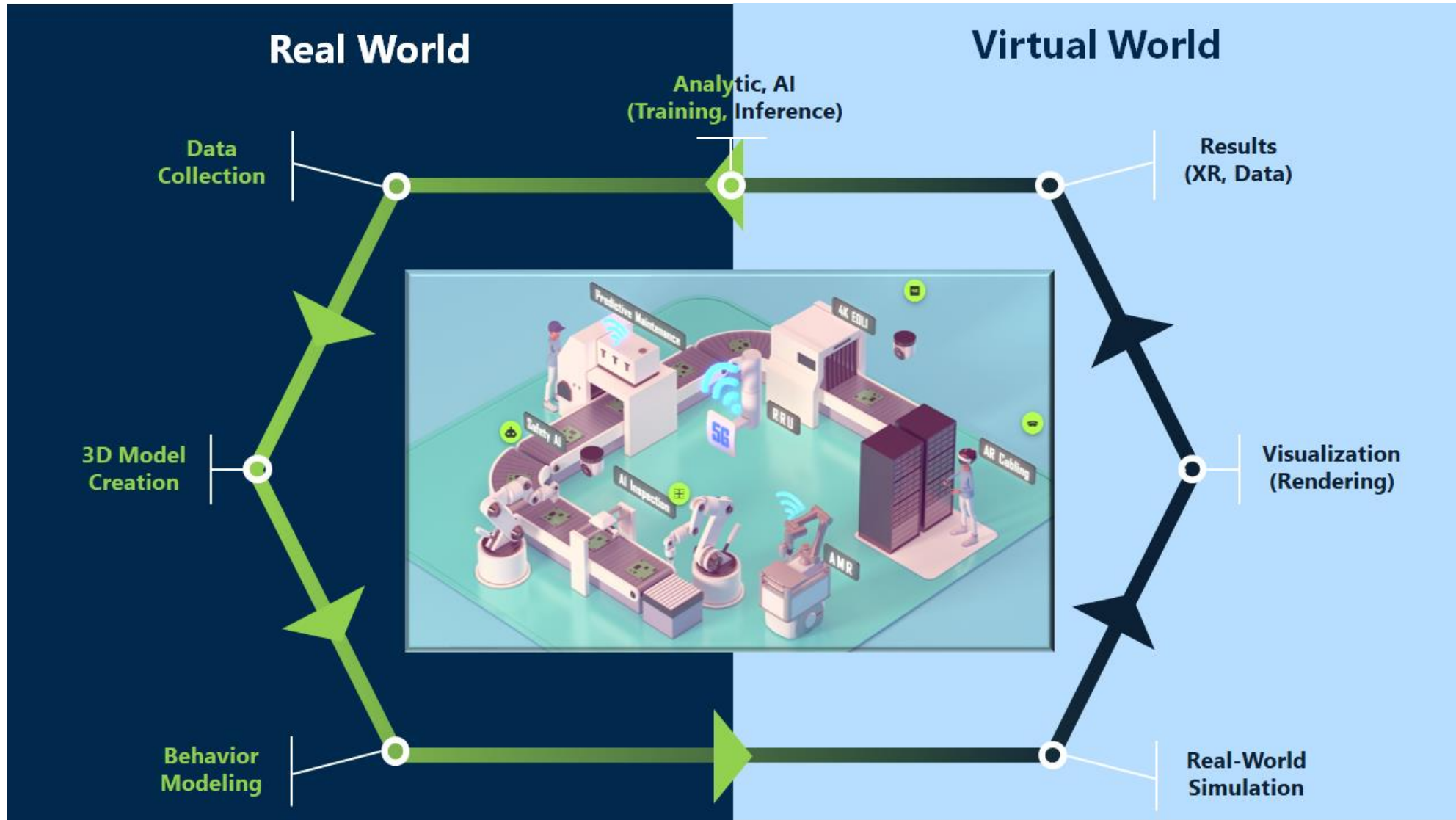
# Manufacturing AR APP

APP	AR維修應用	Rack測試可視化	組裝作業指導	遠距技術支援
類型	作業輔助	生產資訊可視化	作業輔助	技術支援
說明	AR輔助快速查找PCBA零件位置	AR輔助取得可視範圍內機櫃測試狀態	AR 輔助進行組裝作業	RD 與工廠間、WW工廠間技術交流
效益指標	維修作業效率 人員訓練時間	作業效率 人員訓練時間	出錯台數 訓練與作業工時	安裝時間 出差次數

# Sales & Marketing AR APP

APP	5G Open Lab	Marketing	Server安裝驗證	遠距技術支援
類型	展演	展演	教育訓練	展演及技術支援
說明	Lab 導覽、產品展示及互動式體驗	外部大型活動產品展示及互動式體驗	透過AR教育訓練與指導安裝	全球直播展示 Lab Collaboration
效益指標	用戶體驗 空間使用效率 Partner 技術支持	用戶體驗 設備與運費成本	安裝時間 訓練時間	安裝時間 問題解決效率 出差次數

# Cyber-Physical 7 Steps Closed Loop (實轉虛，虛輔實)



# Cyber Production Line in QCT lab - Train, Simulation, Deployment

1. SMT Production Line with AMR Logistics
2. Multi-Robotic Arms Assembly for Cycle Time simulation
3. NG Data Training for Visual Quality Inspection



# QCT Private Network Global Customer Rollout Experience

**QCTUS Lab**  
3x SI Lab  
1x Smart Performing

**US**

**Germany**  
QCTG Lab  
1x Lab

**South Korea**  
1x Smart Manufacturing  
1x Smart Campus  
1x Lab

**Japan**  
1x Smart Agriculture  
1x Smart City  
2x SI Lab

**Taiwan**  
HQ 5G x AI Open Lab  
4x Smart Manufacturing  
1x Smart Healthcare  
2x Smart Touring  
1x Smart Performing  
1x Smart Public Sector  
5x SI lab

**Malaysia**  
1x Smart Manufacturing

**Singapore**  
Singapore Office Lab  
1x Smart Campus

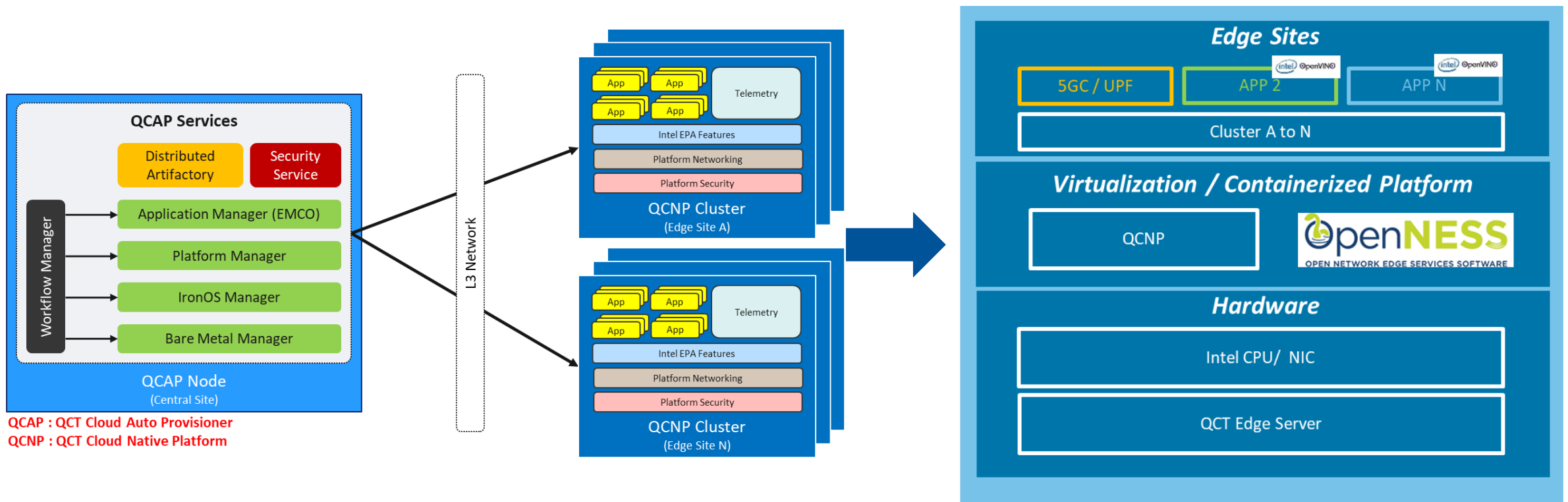
### QCT Private Network Roll-Out Cases

<b>16</b> Smart Vertical	<b>16</b> QCT Office Lab + SI Lab
<b>6</b> Smart Manufacturing	<b>2</b> Smart Campus
<b>1</b> Smart Agriculture	<b>1</b> Smart City
<b>2</b> Smart Performing	<b>1</b> Smart Healthcare
<b>2</b> Smart Touring	<b>1</b> Smart Public Sector



# QCT IronCloud Edge Cloud Solution From Infra to Service

- Flexible Cloud Native Platform for QCT Private 5G (E5G) to Serve Dynamic Use Case
  - Provide more elastic and scalable Cloud Native Architecture
  - Provided to meet the needs of Multi-Cloud Architecture of Edge
  - Provide the ability of Orchestrator to meet the deployment of Multi-Cloud for 5G network services and Edge Computing applications to achieve Life-cycle Management
  - Provide customized and adjustable architecture for performance requirements to meet QCT's self-developed products



QCAP : QCT Cloud Auto Provisioner  
QCNP : QCT Cloud Native Platform

# NxN Use Case Building Block of QCT's Private 5G

**N-Verticals**

HER    Healthcare    Manufacturing    Transportation    Logistics    Performing Arts    .....    Others

**N-Use Case**

**Scenario**    Video / Data Analytics    Video Live Streaming    MR eSOP / Info / Navigation    Mobile Robot Device Remote Control    .....    Others

**Technology (SDK)**    AI Inference    5G Positioning    AR/VR/MR    Video Decode / Encode    Remote Control    .....    Others

**End Device**    Camera    AR/VR/MR Goggle    Phone/PAD    Sensor    AMR / AGV    Robot Dog    Drone    .....    Others

**5G- QCT Private 5G OmniPOD**

Open Architecture    Stability    **R15 High Bandwidth Low Latency**    **R16 TSN / Positioning Ultra Low Latency**    R17 Others    +    **QCT POD Management Compute Storage**

# QCT 5G Smart Manufacturing Solution

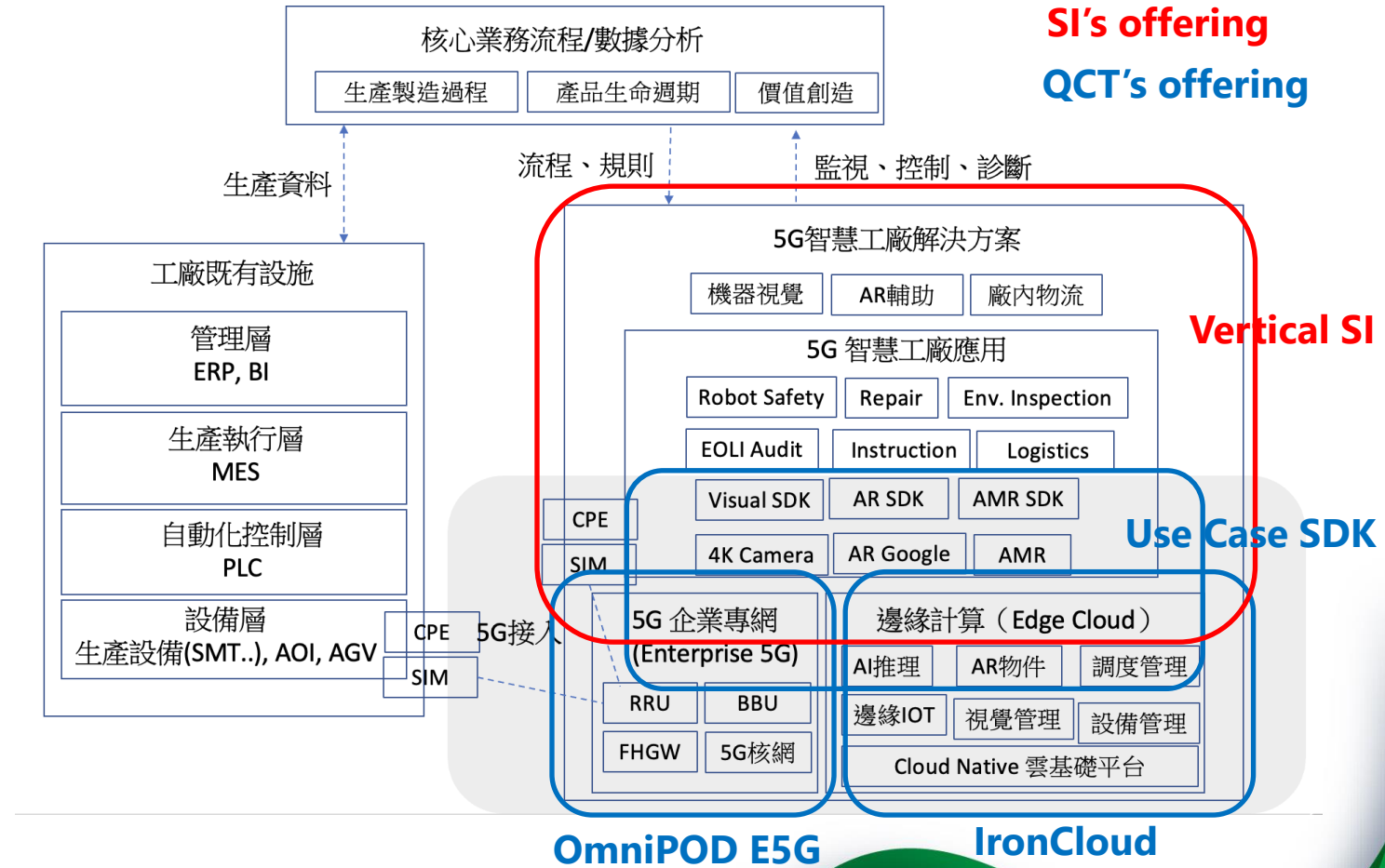
## OmniPOD E5G+IronCloud+Use Case SDK for Vertical Solution Development

### Use Cases

- Visual Intelligence
- AR/MR Application
- Cyber-Physical System based Automation
- Various Mobile Devices

### Benefits

- Improve Operation Efficiency
- Worker Empowerment
- Upgrade Edge Architecture







**Thank You!**