

5G Center



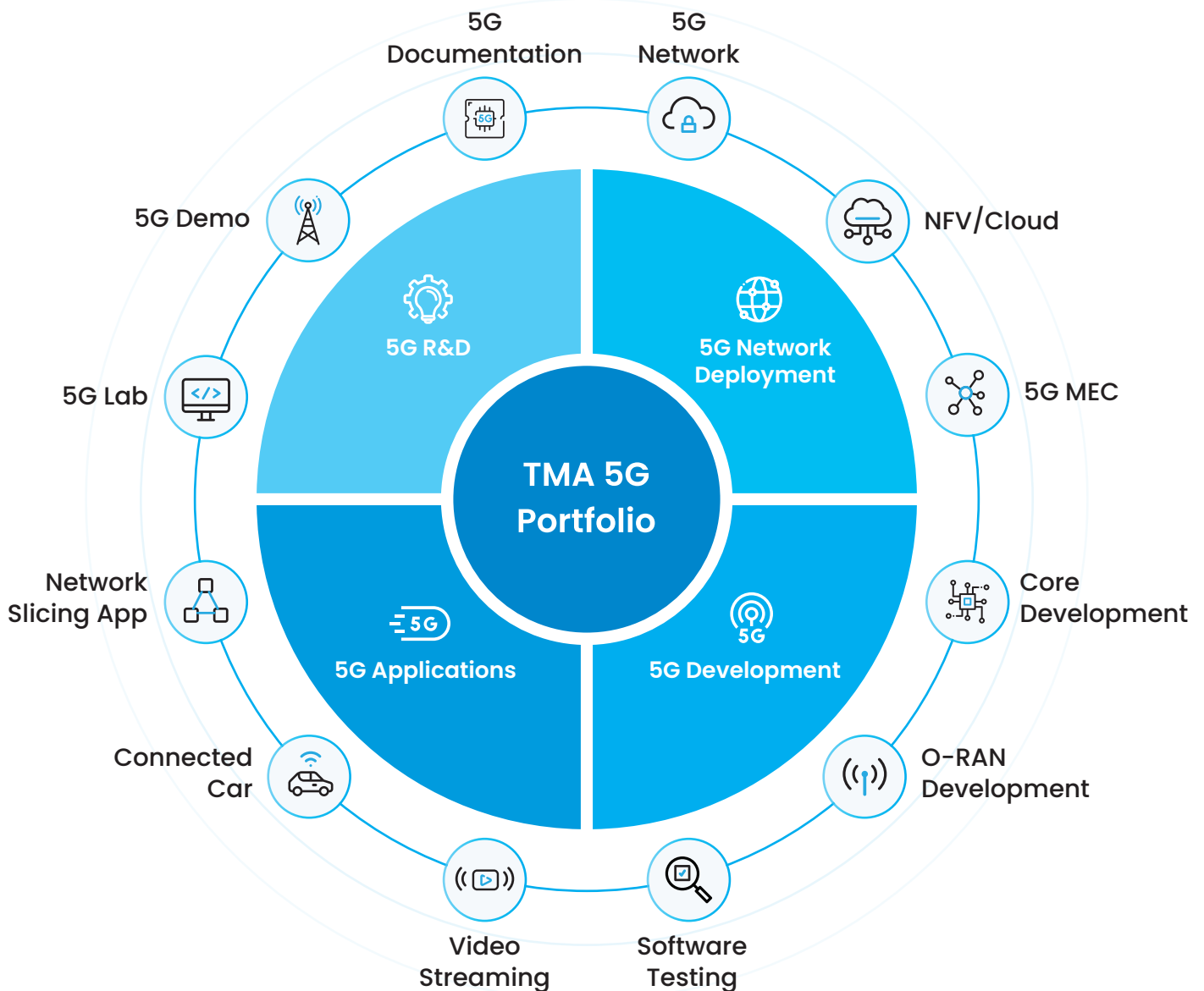
28 Years of experience
in Telecom



2,000 Engineers working
on Telecom projects for
global leading companies



5G Private Lab with
integrated MEC solution





Technologies

eMBB, uRLLC,
mMTC

O-RAN (Open RAN)

Network Slicing

Edge Computing

VNF, NFV, K8S
Cloud

DevOps
Jenkins, CI/CD

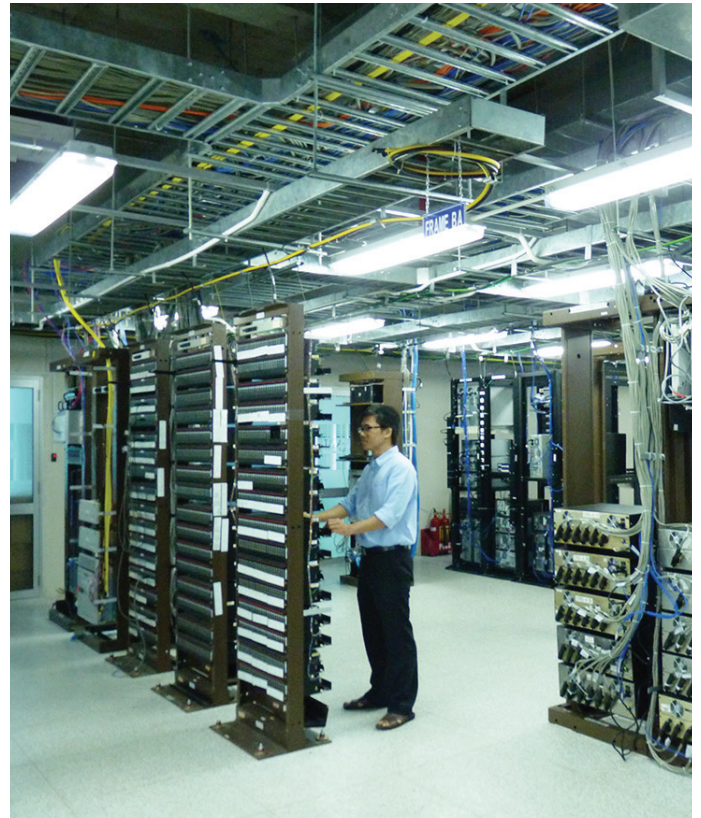
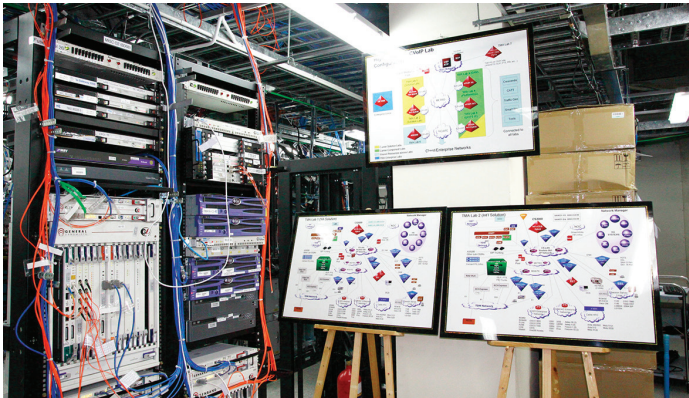
Programming
C/C++, Java,
Python, Go

SDN, Networking

Automation
Robot Framework,
Python

Protocols

HTTP/2, TLS, TCP, UDP, SCTP, IP, GTP, NGAP, NAS,
PFCP, RRC, PDCP, SDAP, RLC, FIAP, E1AP, E2AP, XnAP.



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5G Services



Platform
Development



5G Applications
Development



O-RAN
Development



5G MEC
Deployment



5G Core
Development



NFV/Cloud
Deployment



UE Simulation
Development



VNF
Orchestration



5G
Software Testing



Software
Deployment for
5G Private Network



Private Cloud
Deployment



PoC
Implementation



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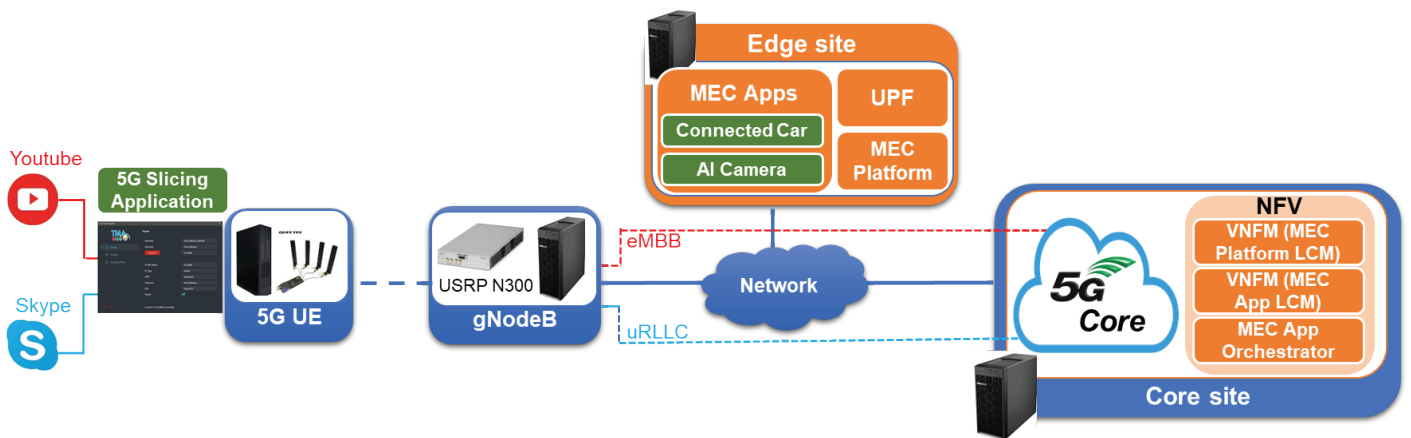
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5G R&D Lab



5G LAB COMPONENTS

Hardware

- PC i7 (X64 HW)
- USRP B210/N300
- Adlinktech MECS-6110

UE

- Quectel: RM500Q-GL
- Sierra: XR-90
- 5G Phone

Software

- gNB: srsRAN
- 5GC: Open 5GS

Release

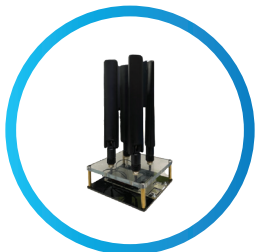
- 3GPP release 17

Bandwidth (UL/DL)

- 60 Mhz
- 30 Mps - 100 Mps

5G NR SA TDD Configuration

- Frequency band: n41
- SCS: 30kHz
- Uplink-Configurations: 64QAM max
- Downlink Configurations: 256QAM max



UE



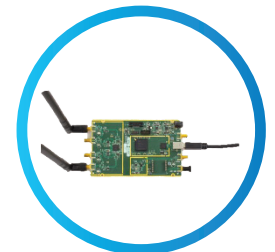
USRP N300



Adlinktech
MECS-6110



PC



USRP B210





5G R&D Lab

5G LAB CONFIGURATION

5G UE/Modem

Simulated RAN/gNodeB
(use USRP B210, USRP N300 for RU)



5G Core

5G MEC
(MEP, MECM, MEAO)

SUPPORT FUNCTIONS

Full operation of 5G core:
AMF, SMF, UPF, AUSF, N3IWF,
NSSF, NRF, UDM, PCF

RAN functions with
simulated gNodeB

5G Components &
System Orchestration

Support both 5G SA
(Standalone) and 5G NSA

Support edge computing
with MEC platform



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5G Case Studies

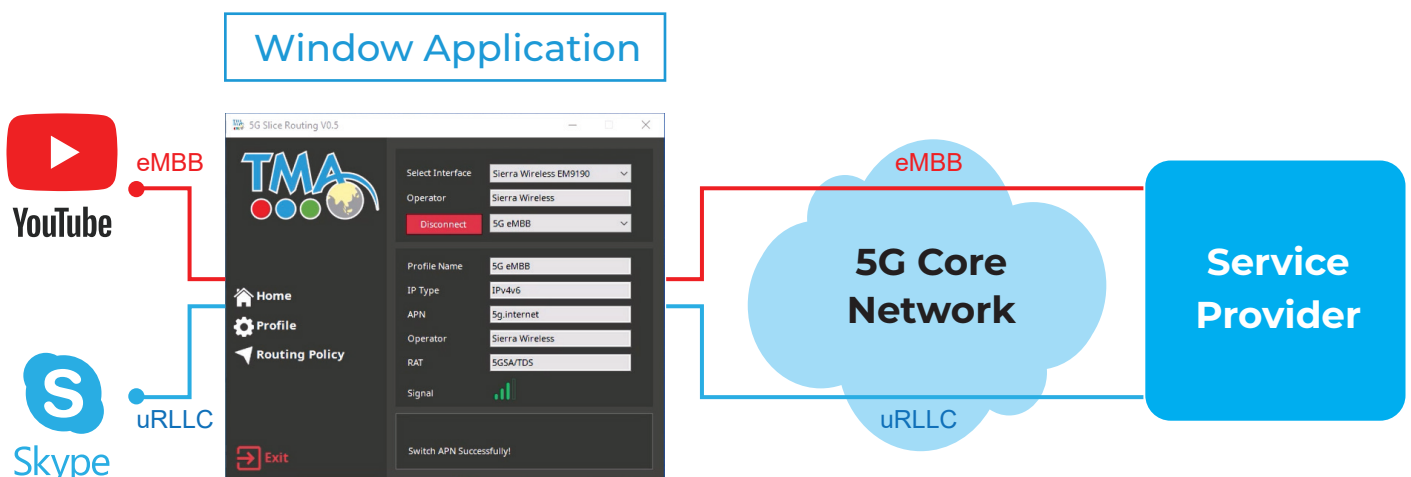
5G NETWORK SLICING WINDOW APPLICATION

Window Application's functions

- Start multiple PDU sessions to different 5G network slices
- Automatically route app traffic to appropriate 5G network slices

Window Application's key features

- Manage Interface, Profile
- Manage Routing Policy for specific application
- Display network connection characteristics
- Automatically switch network slice based on APN and Routing Policy

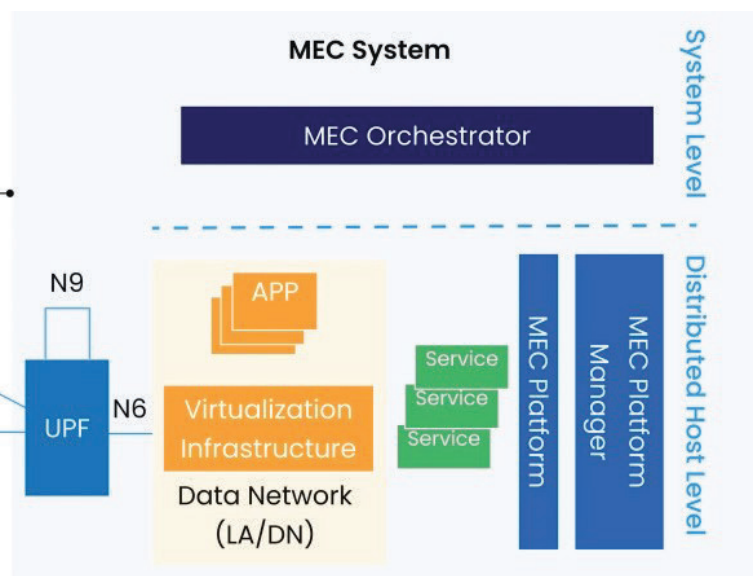
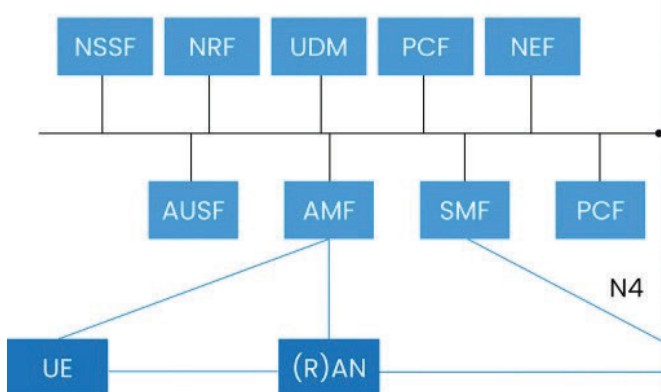




POC – 5G MEC SYSTEM

- Provide an application deployment platform close to the end users (edge site). This MEC platform helps to deploy real-time, compute and resource-intensive applications like video caching, augmented reality, virtual reality, and Internet of Things at the edge
- Help decrease congestion & latency at 5G Core site

- Follow ETSI standard
- 5G Core Network (gNB, Core), 5G Apps
- MEC system includes:
 - MEC Platform (MEP)
 - MEC Manager (MECM)
 - MEC App Orchestrator (MEAO)
- Technologies: Edge Computing, Traffic steering, DNN, LADN





5G Application

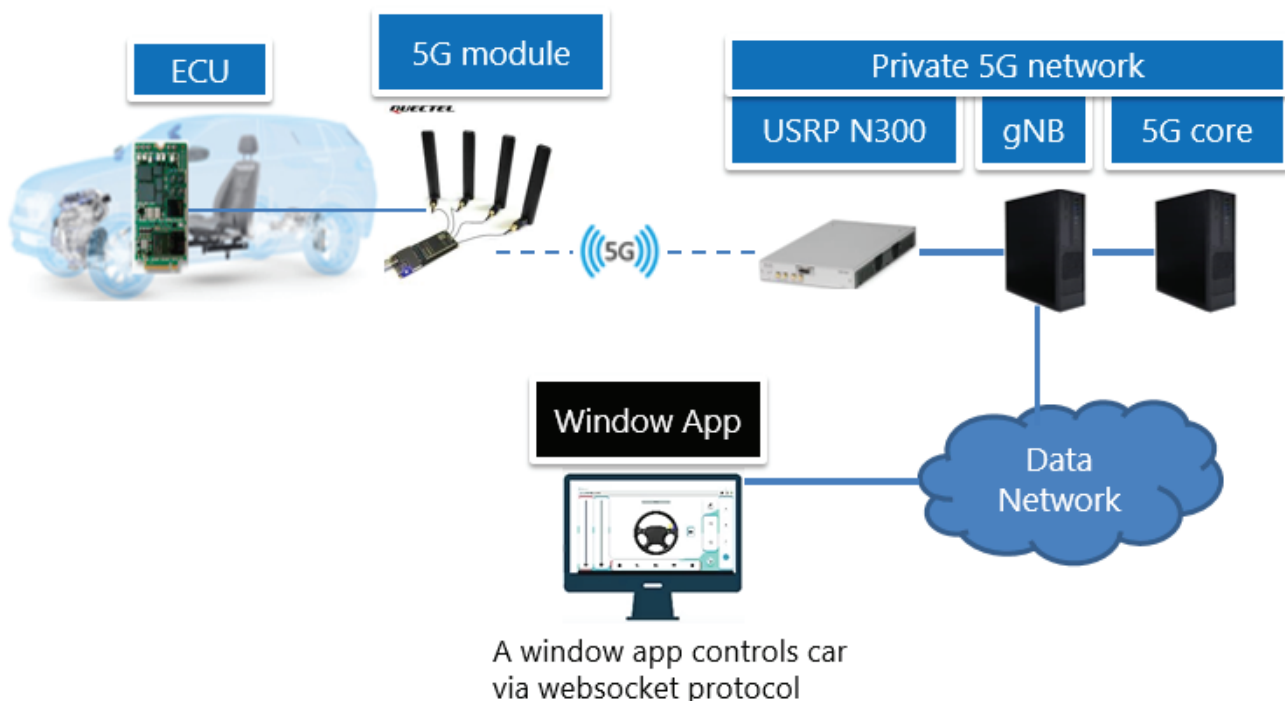
CONNECTED CAR UNDER 5G PRIVATE NETWORK

Application Functions

- Connected Car (by Remote Control) - Car is connected to 5G network and can be controlled remotely by mobile app or window app:
 - Control accelerator/brake to increase/decrease speed
 - Control Steering wheel
 - Turn on/off lights, trumpets
 - Turn on driver assistance features like Cruise Control
 - Video streaming

Technologies

- Computer vision and AI image recognition
- C/C++, Python, OpenCV
- ECU programming
- Protocol: CAN, TCP/IP, USB, Ethernet
- Wireless: 5G, Wifi





5G Application

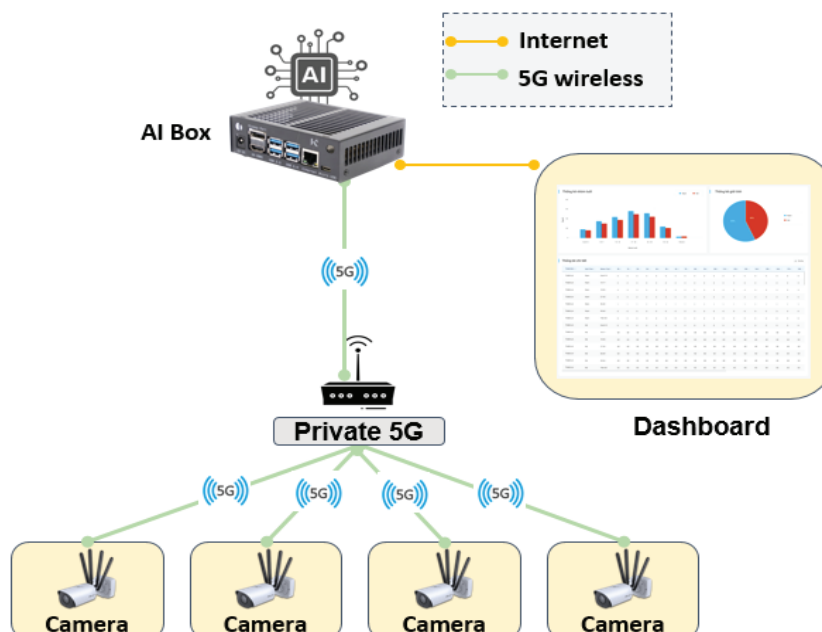
AI CAMERA UNDER 5G PRIVATE NETWORK

Application Functions

- Object Detection: people, vehicle, specific objects
- Face Recognition; Age/Gender Detection
- Extract and store information from video/stream
- Behavior analysis
- Active observation & incident warning
- License Plate Recognition
- Text/Digit Detection and Recognition (OCR)
- Edge processing and Centralized processing
- Network connection with private 5G network

Technologies

- Computer Vision
- Image Processing
- Deep Learning
- Object Tracking, Multiple Camera Processing
- Python, OpenCV, Tensorflow, Pytorch, Caffe, TensorRT, OpenVINO, Onnx
- Restful API, MQTT





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