Chula 5G

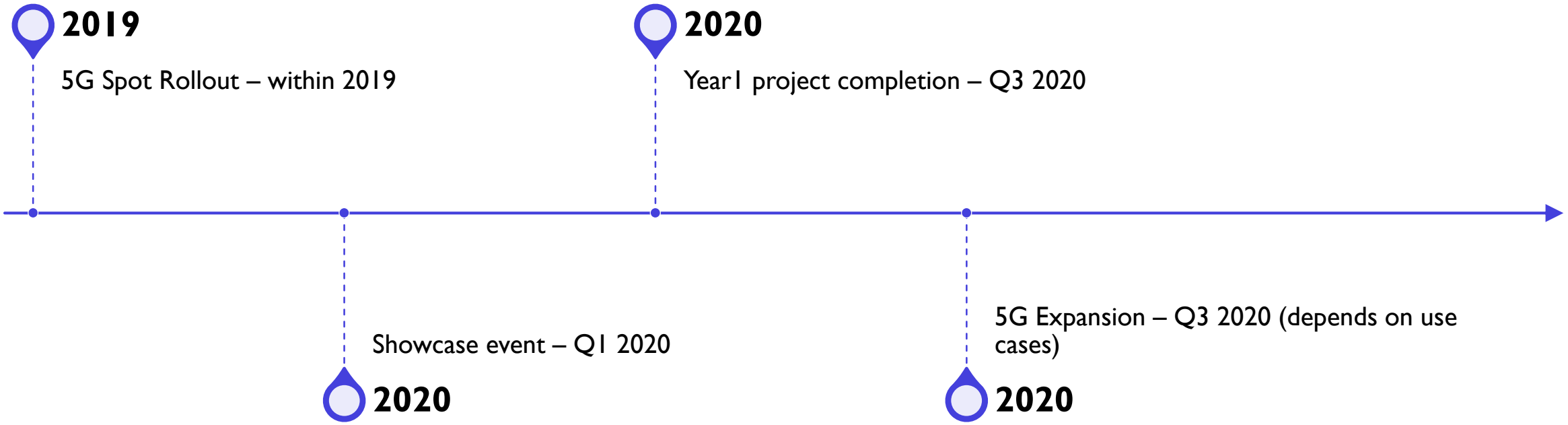
5G AI / IOT INNOVATION CENTER

Testbed Platform @ Chulalongkorn University

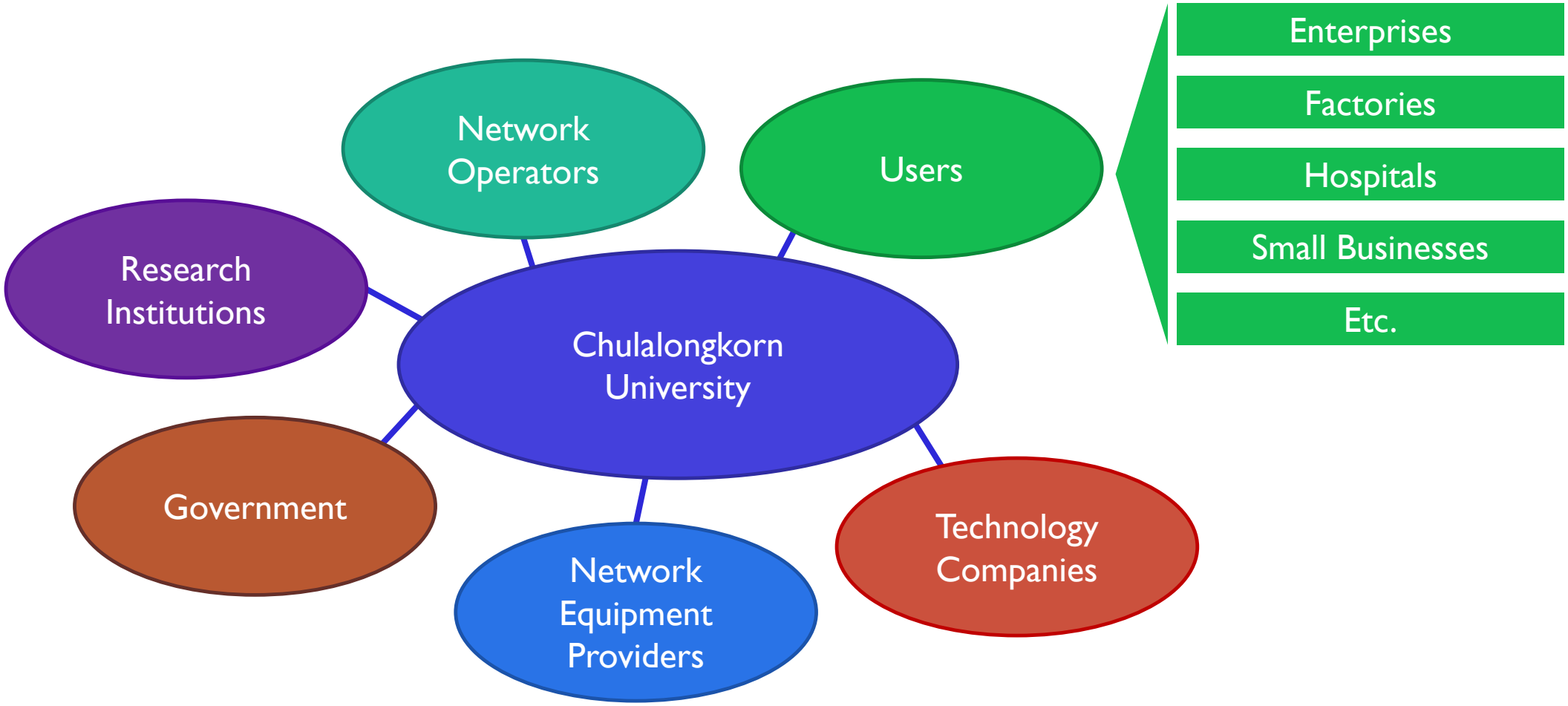
CONTENTS

- Overall Time Plan
- Partners
- Use Cases Targeted (eMMB, MMTC, URLLC)
- Freq Bands
- Target Setup – campus and national network
- Infra – base station and core
- UEs

OVERALL TIME PLAN – CU TESTBED



CU OPEN PLATFORM



MAIN SPONSOR

PARTNERS

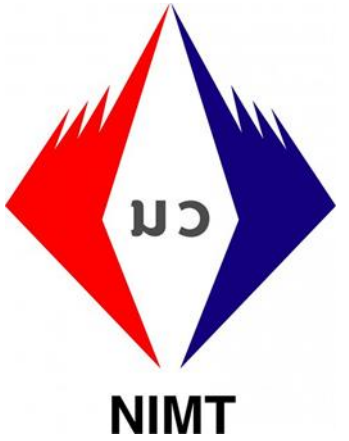

การไฟฟ้านครหลวง
Metropolitan Electricity Authority


PEA
PROVINCIAL ELECTRICITY AUTHORITY


โรงพยาบาลจุฬาลงกรณ์
สภากาชาดไทย


obodroid
Corporation Limited


HG ROBOTICS


มว
NIMT


TOYOTA


EVT

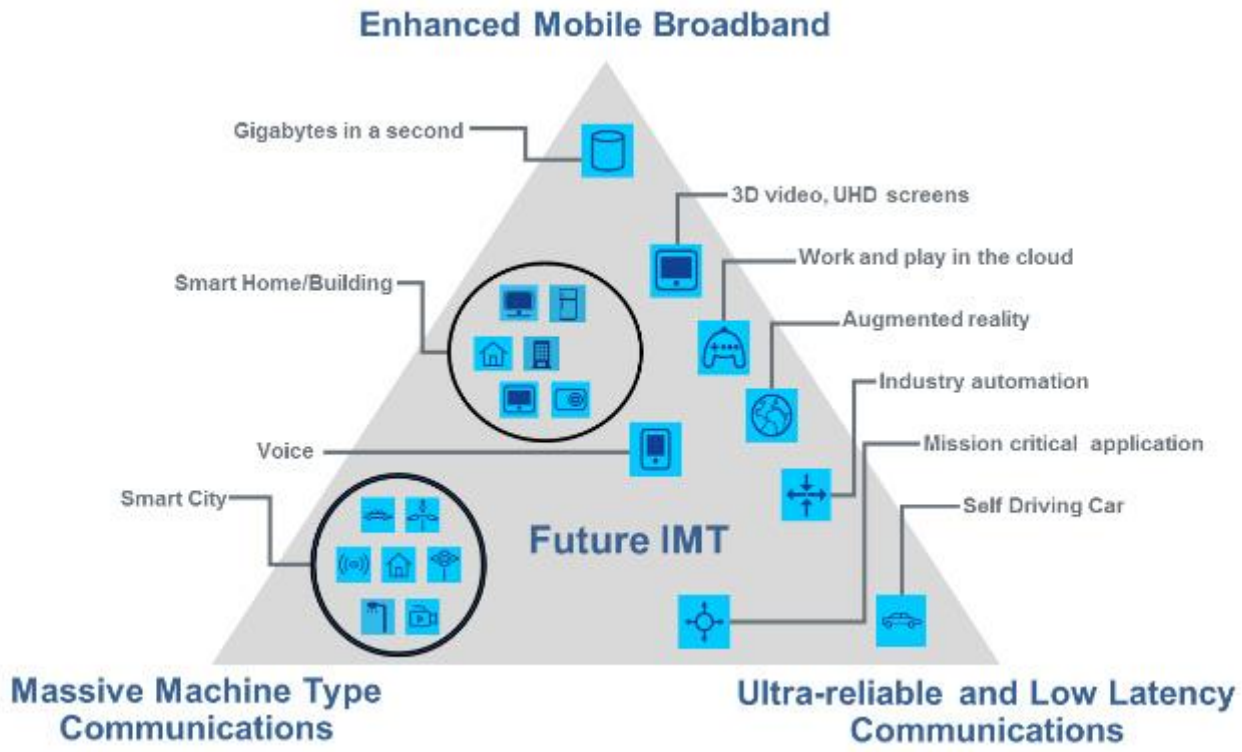

มหาวิทยาลัยเทคโนโลยี
พระจอมเกล้าพระนครเหนือ


มหาวิทยาลัยสงขลานครินทร์

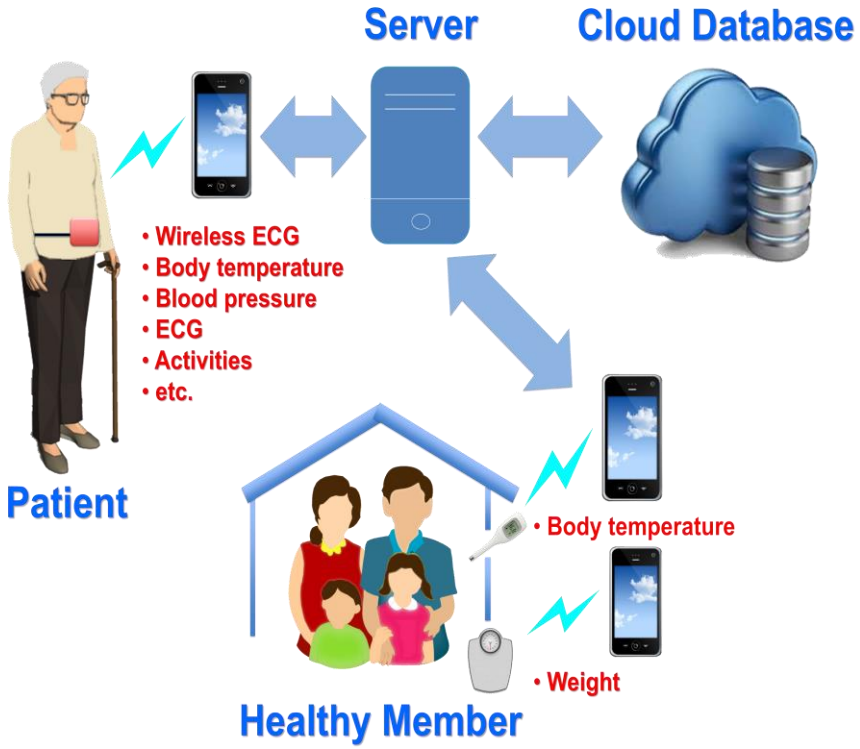
PARTNERS

5G USE CASES

- At this early stage of 5G deployment, the only feature that can be tested is eMBB.
- Use cases, which are more suitable with MMTC or URLLC, will be studied and also implemented with eMBB, if possible, to see what are the key factors/configurations for successful deployment.



TRANSMISSION OF MULTI-PARAMETER VITAL SIGNS FOR TELEMEDICINE



- Aging society will give a large burden on the healthcare industry or hospital.
- To alleviate this demand, the healthcare system should be transformed from the Hospital centric to preventive healthcare.
- With the advancements of electronics, sensor and communication technology, various health parameters can be monitored and transmitted without an in-person visit.

Concept of our home health monitoring system: is to monitor health parameters for each family member regularly. The data can be collected, and stored in electronic forms and Transmitted to desired locations via high speed communication network e.g. 4G/5G.

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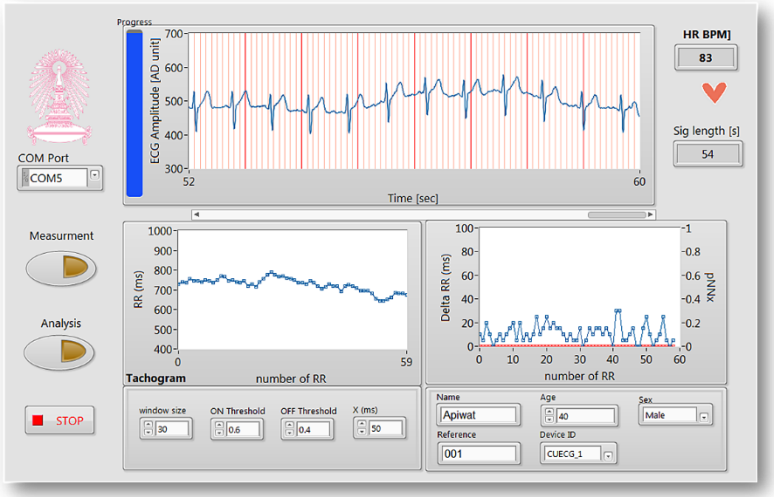
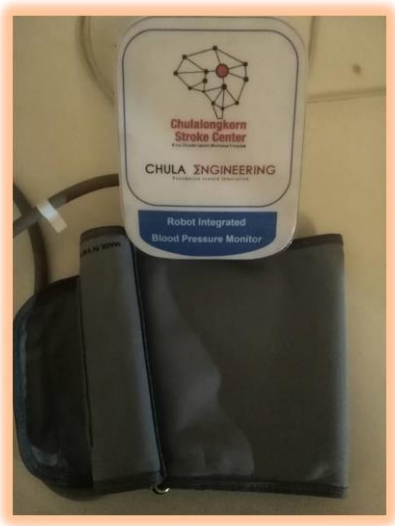
Foundation toward Innovation

TRANSMISSION OF MULTI-PARAMETER VITAL SIGNS FOR TELEMEDICINE

- Prototype of Vital-Sign Monitors developed in our laboratory





Hand-held ECG for home use

Non-Invasive Blood pressure monitor

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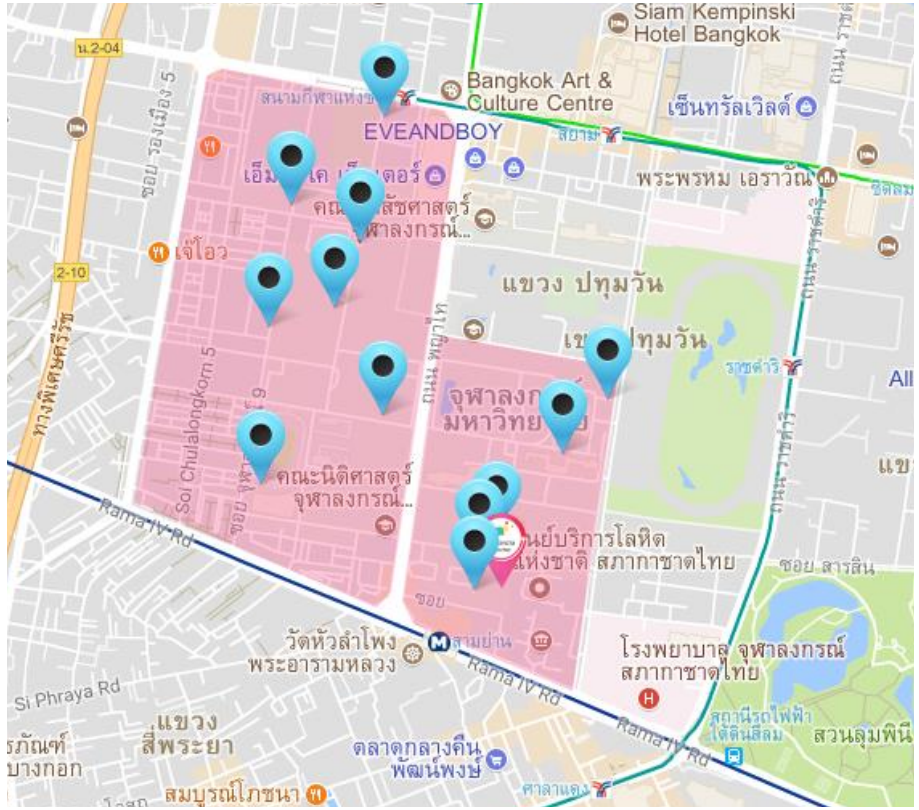
DEVELOPMENT OF AUTONOMOUS DRIVING FOR RELOCATION OF CU TOYOTA HA:MO

1. Development of Automated relocation and parking system using 5G Network



2. Installation of Smart Parking system to control the CU Toyota Ha:mo's Parking under 5G Network

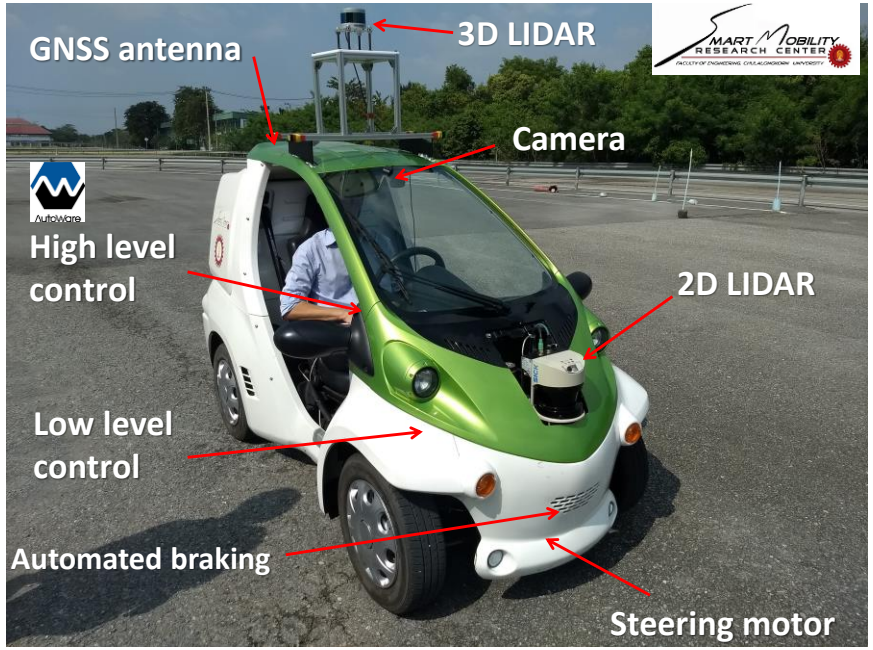
Station A !!
(High demand but no car available)

- ✓ *Automated parking*
- ✓ *Autonomous relocation from B to A*

Station B
(Low demand and has many cars)

DEVELOPMENT OF AUTONOMOUS DRIVING FOR SHARED EV (FIRST-LAST MILE VEHICLE)

1. Development of 5G Tele operated Vehicle



By-wired vehicle equipped with Advanced Driver Assistance System (ADAS)

(Prototype vehicle in this project may look different from the picture)

VDO streaming, Detection from sensors

5G

Speed, Brake, Steering command

Teleoperate cockpit

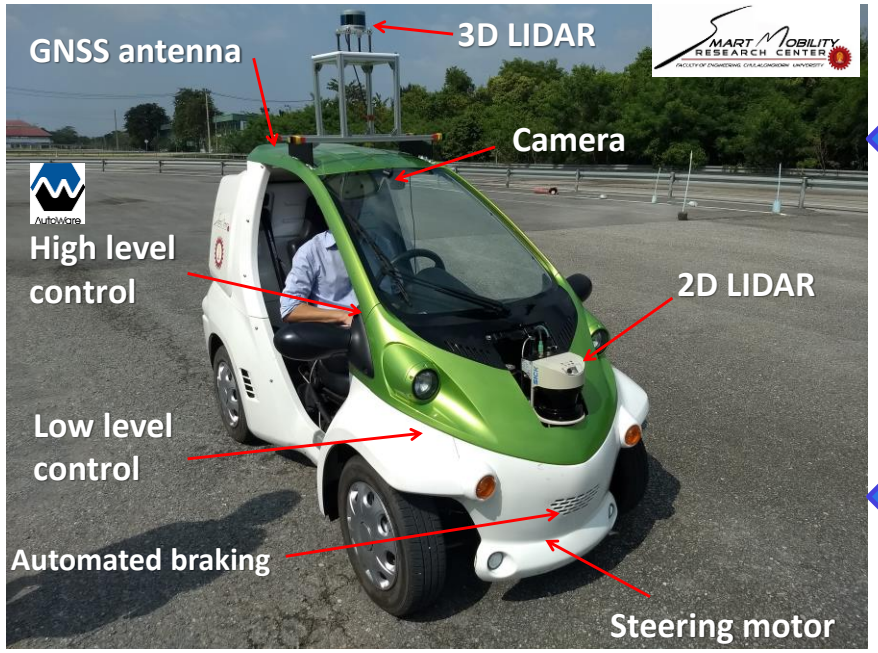
One driver can control many vehicles from one cockpit at the center

Application

- Move shared vehicle/shuttle/delivery vehicle
- Remotely control vehicle in unsafe area
- Remotely take over control of autonomous vehicle in emergency case

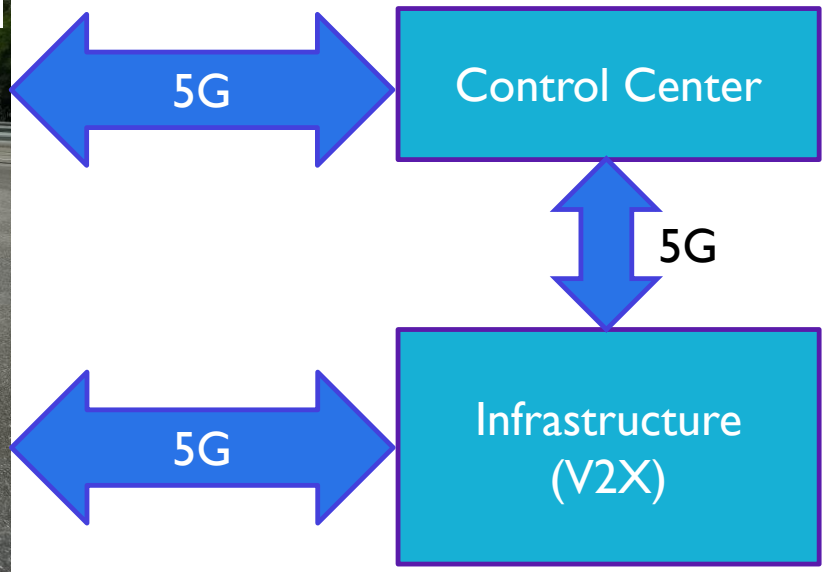
DEVELOPMENT OF AUTONOMOUS DRIVING FOR SHARED EV (FIRST-LAST MILE VEHICLE)

2. Development of Autonomous level 3 Vehicle using 5G network



Level 3 Autonomous vehicle prototype

(Prototype vehicle in this project may look different from the picture)



System control the vehicle from control center / Operator can manually take over the control of vehicle in emergency case.

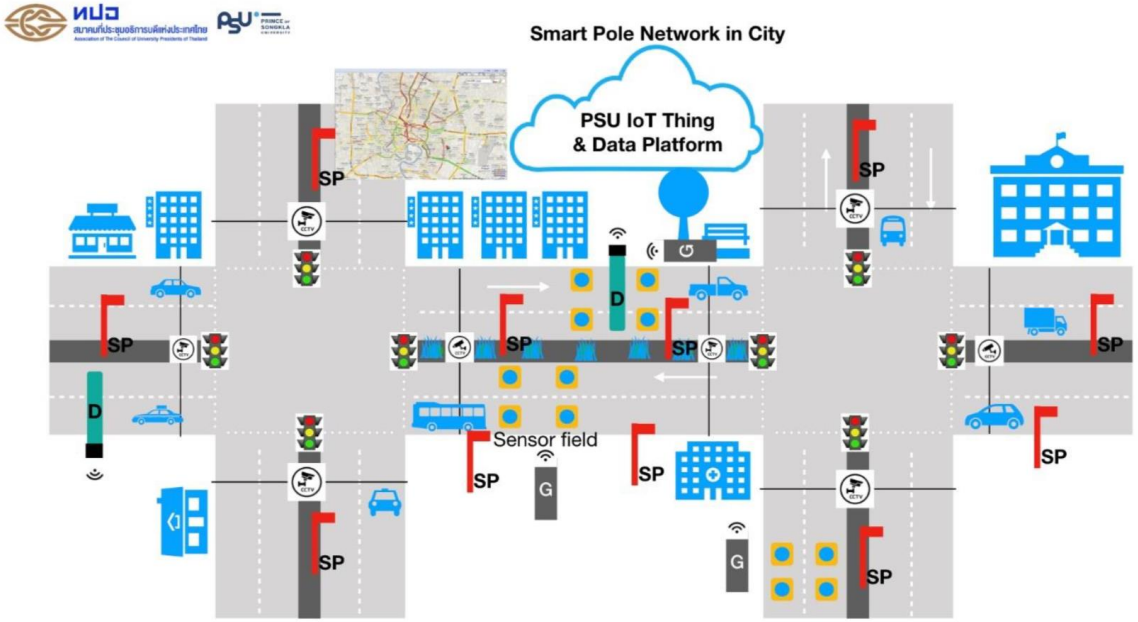
Application (Available in Specific Area)

- Autonomous Shuttle Service
- Autonomous On-demand Vehicle Service

SERVICE ROBOT

- This project, Service Robot that is controlled via cellular network is tested and investigated for its benefits. The robot operates in the human living space to serve us, thus requires many capabilities including effective communication and onboard intelligence. This project focuses on (a) Delivery service and (b) Security use cases
- Enhanced Mobile Broadband (eMBB)
  There are many sensors onboard including vision and microphone. This requires high data transmission throughput for its operation
- Ultra-Reliable Low-Latency Communications (URLLC)
  The channel for an emergency and/or control signal from/to an operator must be reliable and low latency for safe operation. The Realtime service with cloud service (outside the robot) also requires low latency data transmission.

SMART POLE BASED ON 5G TECHNOLOGY



- V2I performance analysis
- Local communication of each devices on Smart pole
- Sharing economy on 5G Smart pole use case
- Support MIMO Project

Lighting Camera Environment Emergency Button WiFi Digital Signage

FREQUENCY BANDS

As of July 2019, Network operators are permitted to test 3.5GHz and 26GHz bands.

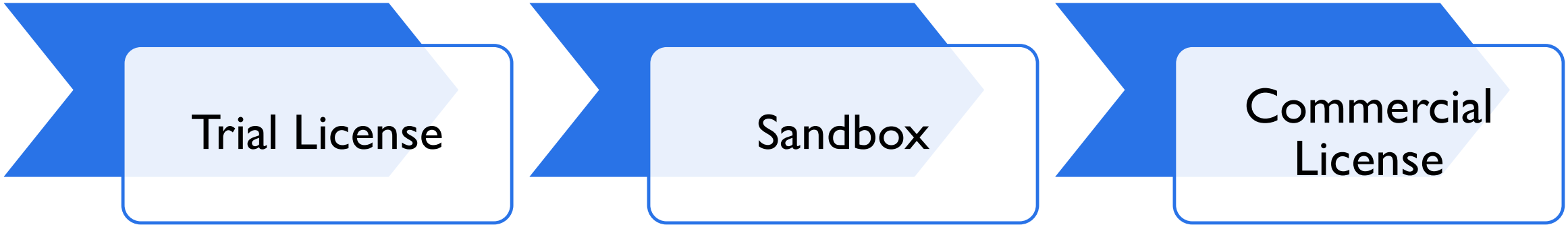
NBTC issued sandbox regulation in August 2019

FREQUENCY BANDS - AUCTION

2.6 GHz and 26 GHz in 2020

1800 MHz and 3.5 GHz later

TARGET SETUP



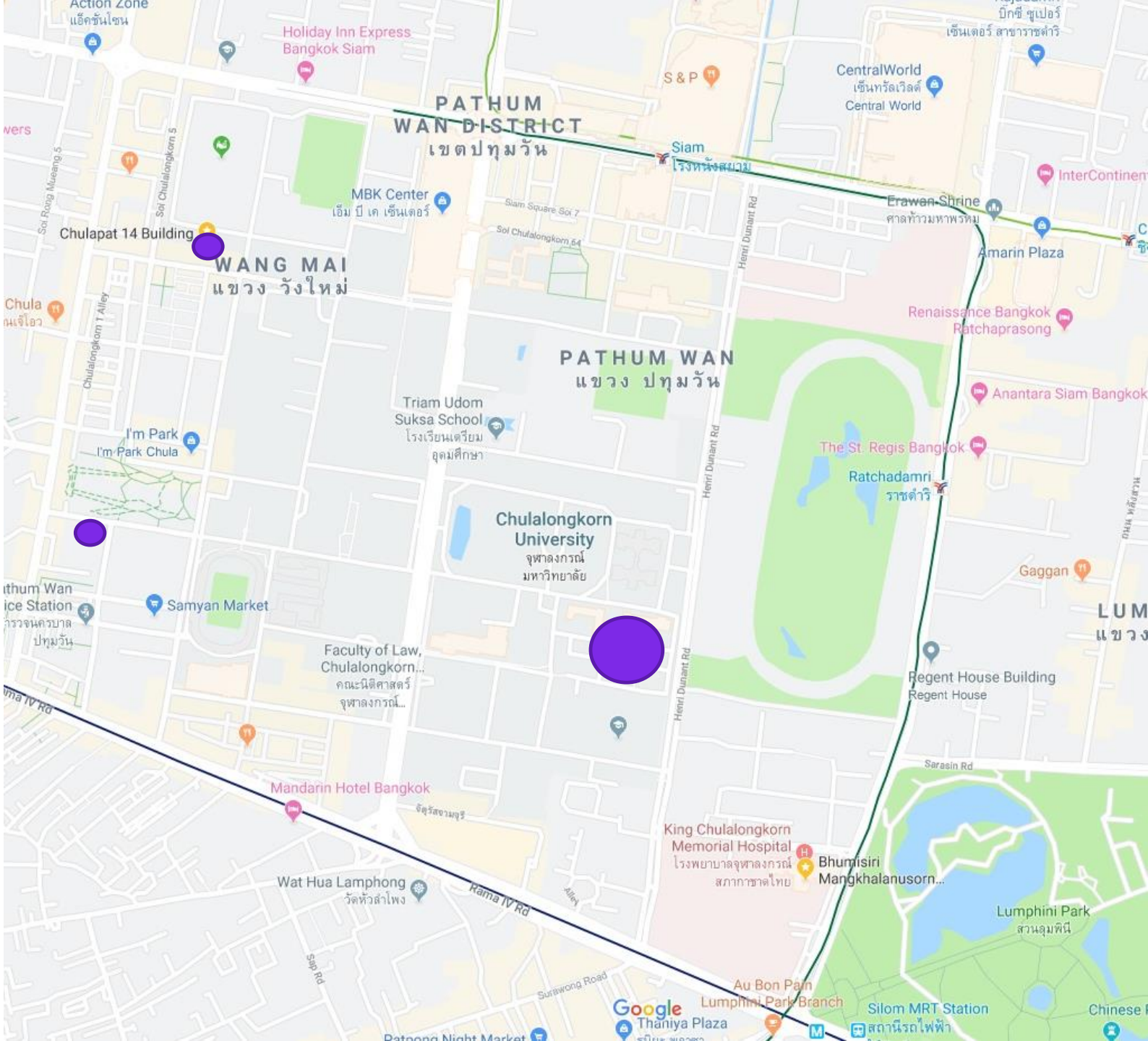
Up to Q3 2019

From Q3 2019

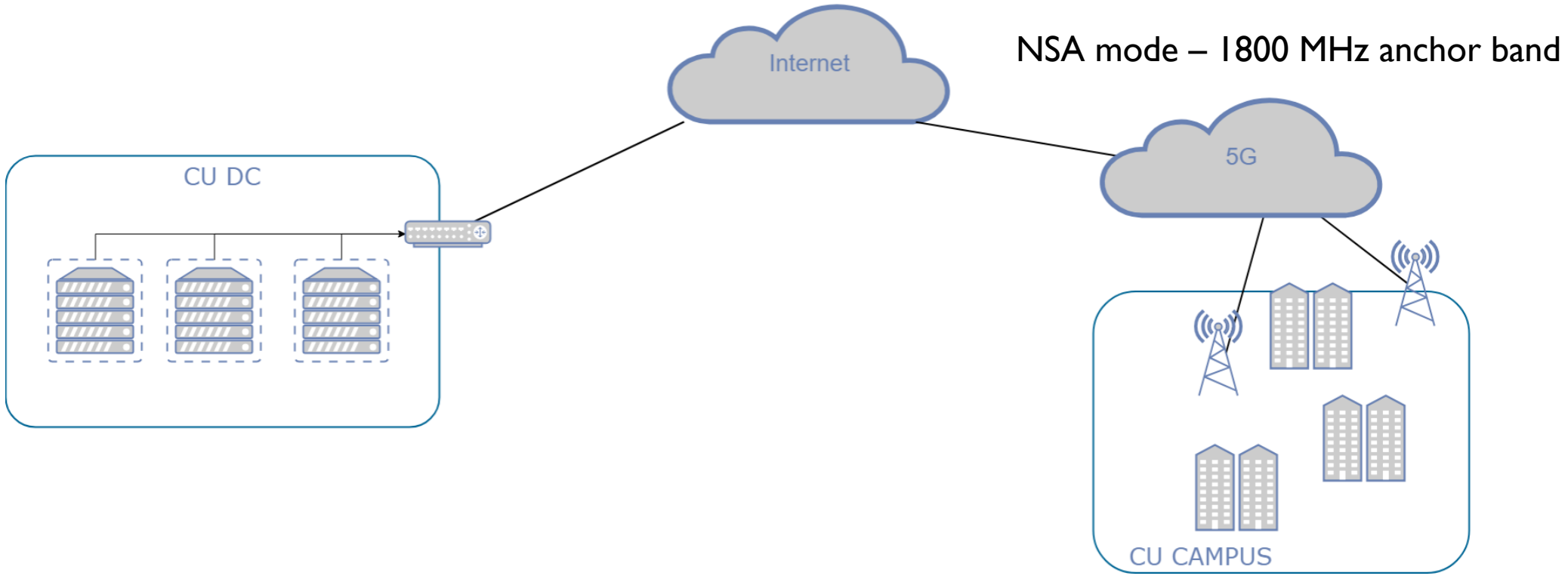
Auction T&C: commercial launch likely in 2021

CU CAMPUS – 5G SPOT 2019-2020

- Faculty of Engineering
- Parking lot near CU Centenary Park
- Test Center at Chulapat 14 Building



INFRASTRUCTURE



INFRASTRUCTURE

NETWORK OPERATORS INSTALL RADIO NETWORK IN CU CAMPUS.

CONNECT TO OPERATORS' 5G CORES

APPLICATIONS MAY LIVE ON SERVERS AT CU DC OR INTERNET

USER EQUIPMENT

Provided by network operators

- UEs from network vendors
- 5G smartphones

New equipment developed by companies joining CU testbed (sandbox)

CHULA 5G Trial Ecosystem

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Stakeholders	Role and Functional Engagement	Use Case Develop-ment	Technology showcase/ Playground	Capability Building
Anchor Users From Vertical Industry	• Develop use cases and in-kind contribution	√√	√√	X
Technology Provider	• Provide business solution platforms • In-kind contribution of technology and resources for training	√√	√√	√
Network Provider	• Support network and operation • Support communication solutions to use cases	√√	√	√
Startups	• Provide new technologies and develop application • Develop flexible, agile, solutions	√√	√√	√
Research and Academic Institutions	• Validate technology solutions to use cases • Research and development on use case application, ecosystem, and policy implications • Propose recommendations on policy and regulation	√√	√	√√

CONTACT US

WEBSITE:
5G.CHULA.AC.TH

EMAIL:
5G@CHULA.AC.TH

TEL. +66 2218 0271