



# Mobile Edge Network for Wireless 5G

*Fang-Chu Chen / ITRI*  
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**Keep Local Traffic in Local  
i.e.  
at the edge of the network  
with  
Direct Communications when possible  
*and still  
in the control of the Networks***



# Rationale for Mobile Edge Network

- A lot of traffic occur in local areas
  - Shopping malls, sport stadium, mobile edge computing, enterprise applications, moving vehicles, vehicular communications, IoT
- Keep the traffic in a confined areas will
  - Offload the traffic from the core, therefore increase the total system capacity
- Direct communications
  - Offload most of the traffic between communicating devices and equipment
  - The best way to achieve low latency
- Network controlled and assisted
  - To reduce interference
  - To increase the efficiency of resource usage



# Key Challenge

- Traffic being kept local and between communications nodes, but still monitored and controlled by the networks

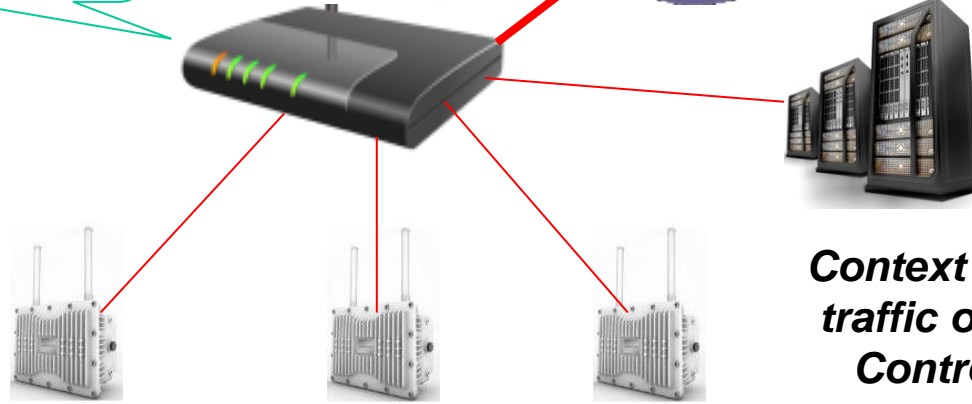
# Mobile Edge Network

EPC Network  
Functions and SON  
Functions Caching



MEC Gateway

EPC



Context Aware  
traffic offload  
Controller

Service Discovery  
Announcing

Relay Wireless  
Backhaul

Legacy Small Cell

Small Cell/Wi-Fi-AP  
with MEC Platform

Application Service  
Caching for  
providing  
computation  
Resource

Direct Communication based Mobile Edge Cloud Network

# Network Assisted Direct Communications

- Operators not involved
- Unlicensed bands
- Short range (<100m)
- Interference
- connected devices (<100)
- Slow device discovery (>10s)
- Low reliability

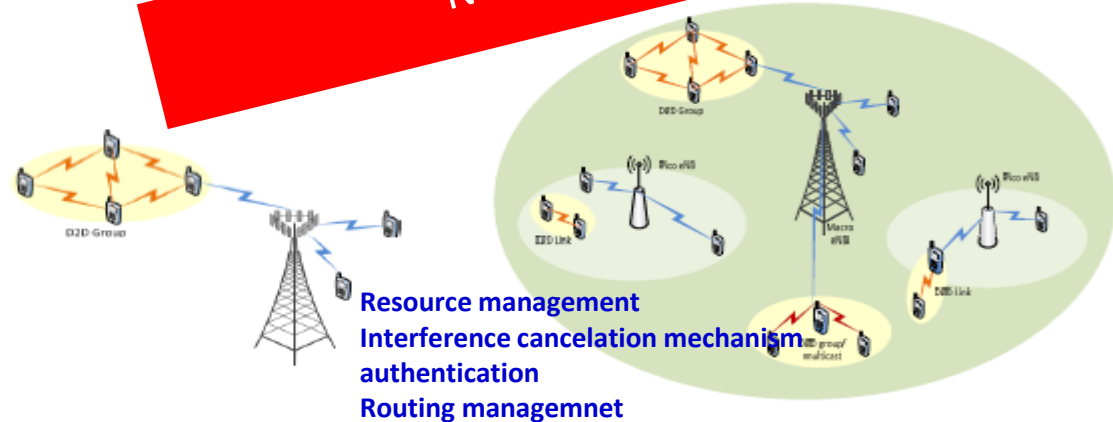
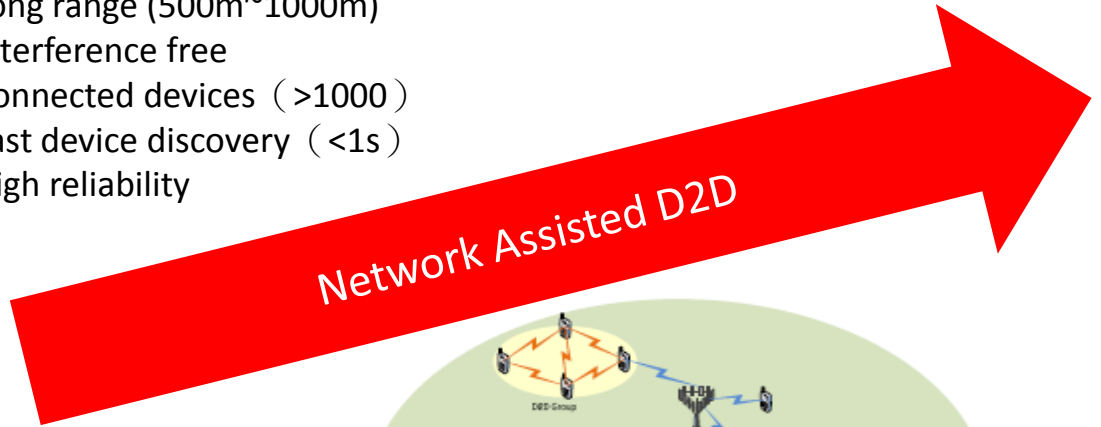
- Operators in charge
- Licensed and unlicensed bands
- Long range (500m~1000m)
- Interference free
- Connected devices (>1000)
- Fast device discovery (<1s)
- High reliability



Stand-alone  
and  
Self-organizing

WLAN D2D

(E.g. WiFi Direct,  
Bluetooth, NFC)



Network Assisted  
or  
Network Controlled

WAN + WLAN D2D

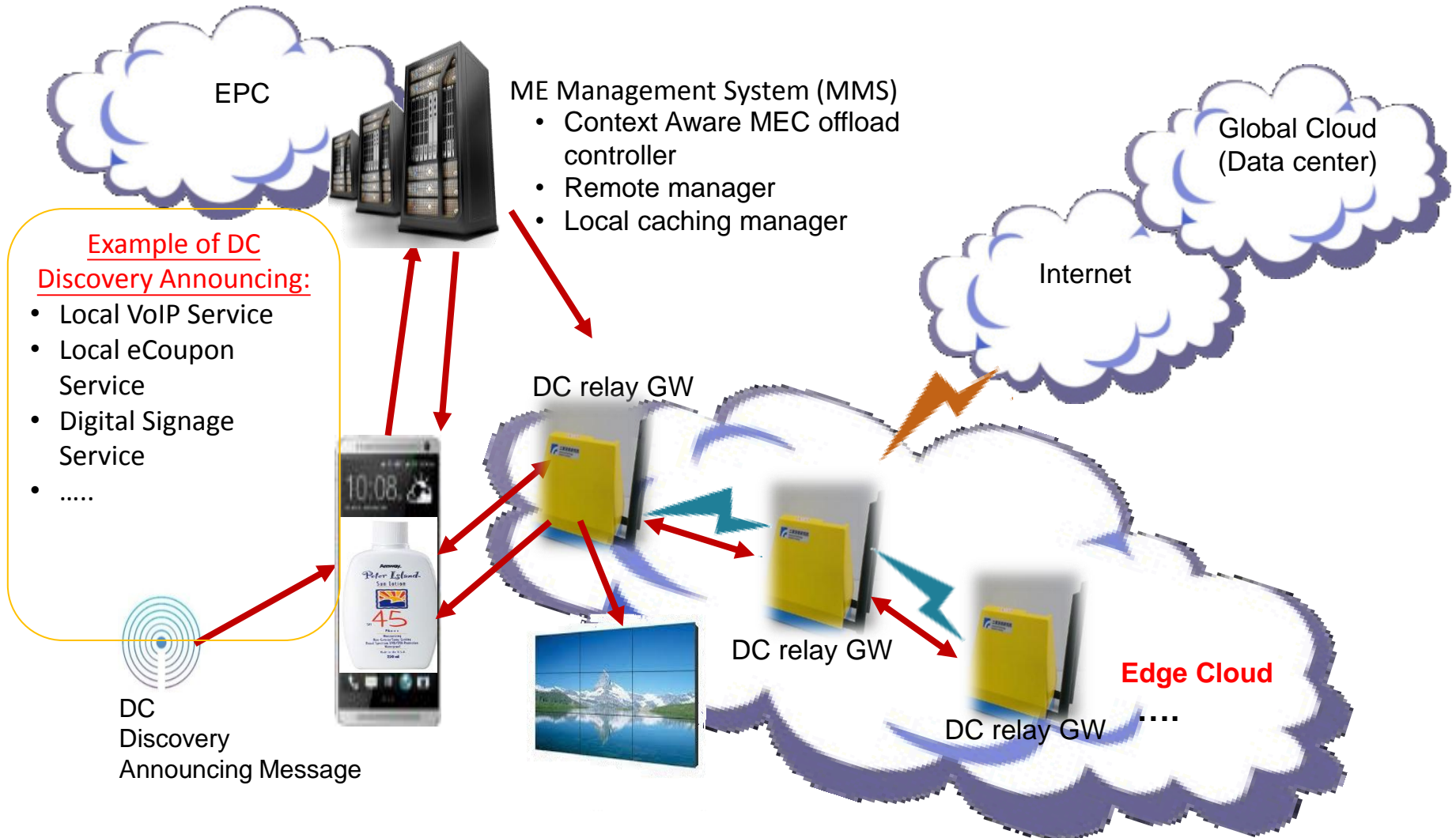
(E.g. LTE + WiFi Direct)

Network Integrated  
and  
Heterogeneous Network

WAN D2D

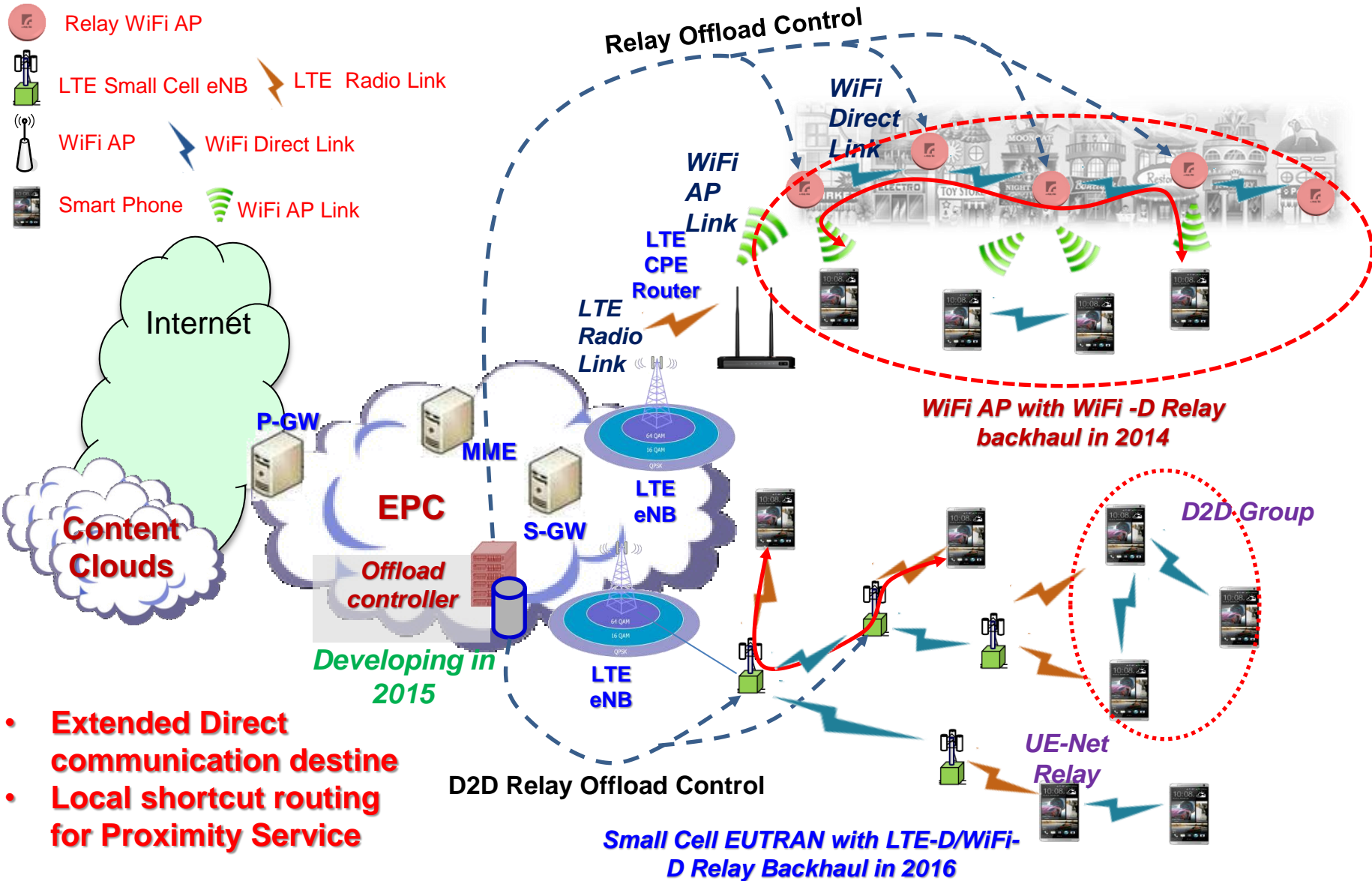
(E.g. 3GPP LTE D2D)

# Direct Communications Relay Based ME Network Application Scenario





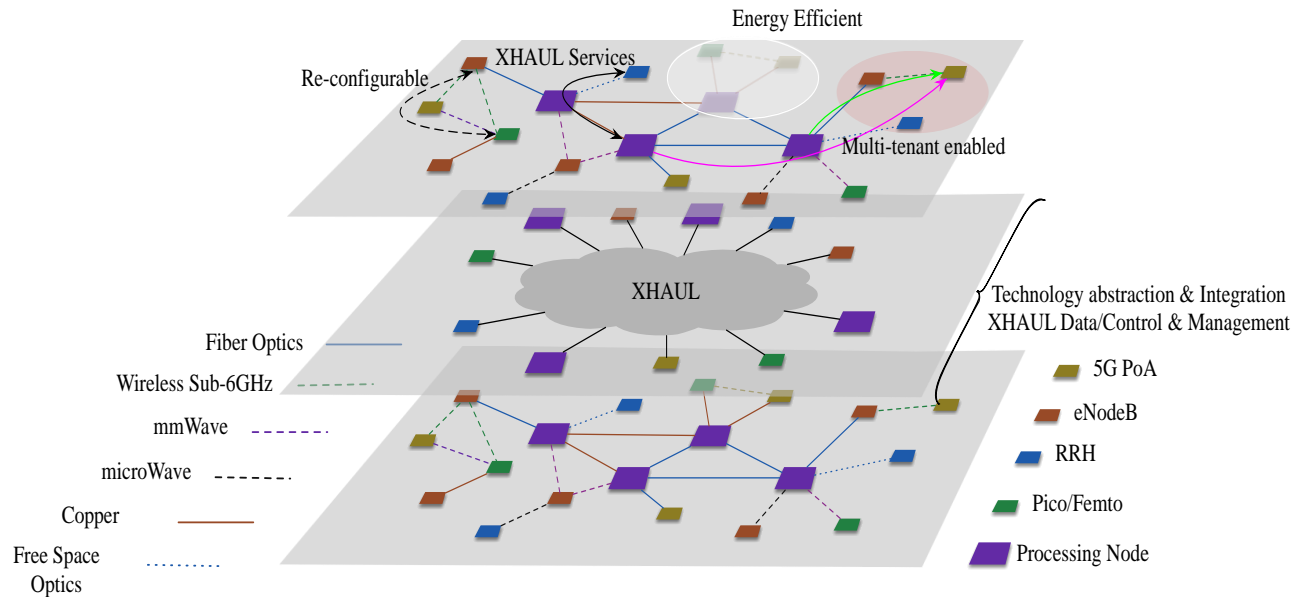
# Network Assisted Direct Communications Offloading



- **Extended Direct communication destine**
- **Local shortcut routing for Proximity Service**



# Leveraging Functional Architecture of 5G-Crosshaul



- The transport network of the edge network can leverage the 5G-Crosshaul technologies

# Leveraging METIS II Holistic Air Interface Harmonization Framework

**Legacy**  
(or unfortunate 5G outcome):

Air interface variants tailored towards different services, cell types, frequency bands, spectrum usages etc.

Legacy examples could be LTE-A, Wi-Fi, LORA etc.

**Targeted 5G System**  
Maximum extent of harmonization and integration of AI variants (without performance sacrifice) to jointly cover all 5G services

Protocol stack examples only!

Example: xMBS served via LTE-A and a novel 5G AI in dual connectivity

Example: xMBS served via co-located wide area and mmWave AIs with carrier aggregation

Example: mMTC and uMTC served by the same MAC/PHY (but different PDCP flavors)

Please note that:

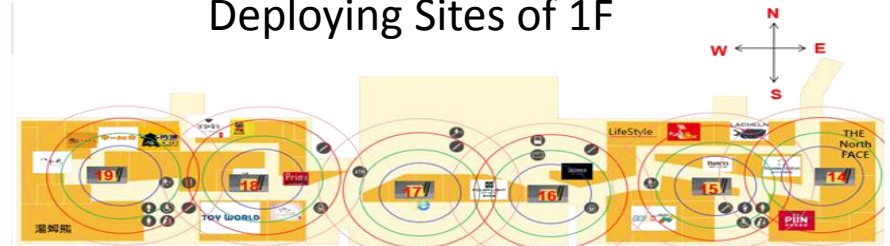
- Suitable extent of harmonization and integration to be researched in METIS-II
- METIS-II takes orientation in 3GPP protocol names, but does not exclude changes
- Key research in METIS-II is to see how Network Slicing is reflected in RAN design

# ITRI ExpoGlobal Mall Test Bed

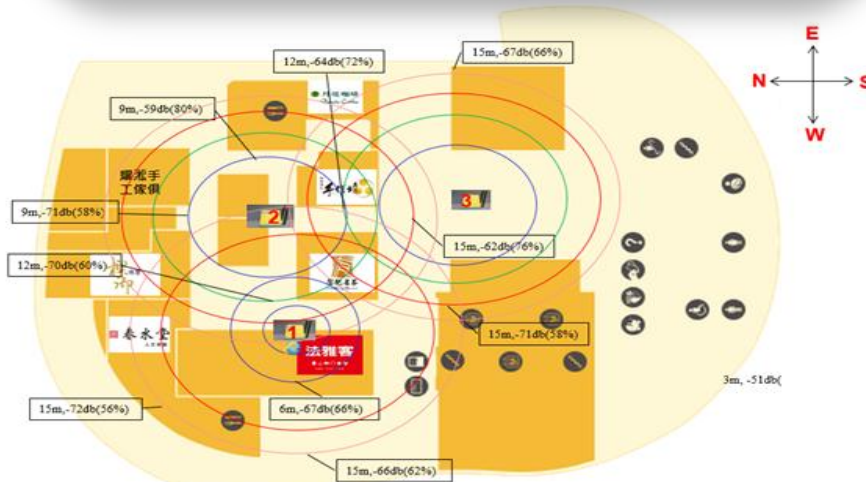
1. Complete Experimental Trail-Field of ProSe Offload Service in **Hsinchu Taiwan Pavilion ExpoGlobal Mall**. The contractor of Global Mall **signs the MOU**.
2. Finish deploying in July FY104, and Finish **the first deploying and test of D2D/Multicast Offloading App Service in September FY 104**
3. Deploying LTE Small Cells will be completed in October in FY104, so it is convenient to offer and transmit the offloading-controlling signal by LTE Network to UE 以 for testing of offloading capability of D2D/Multicast.



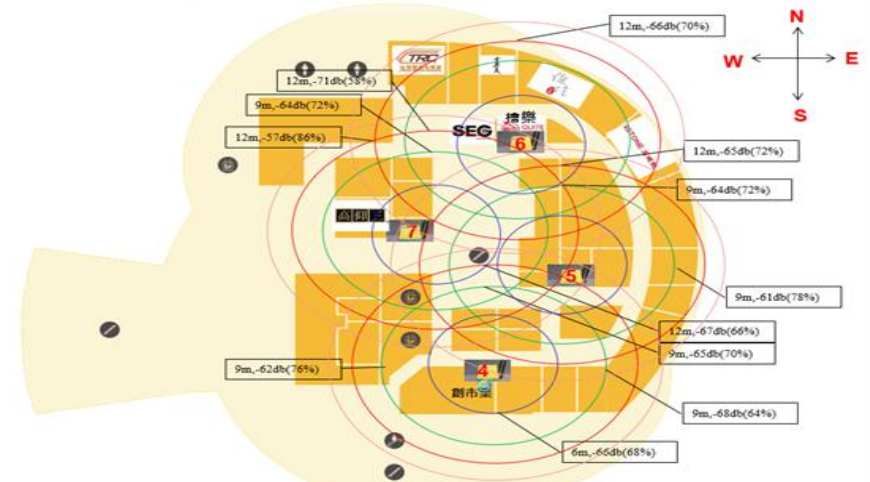
Deploying Sites of 1F



Deploying Sites of 2F



Deploying Sites of 1F of Global Mall

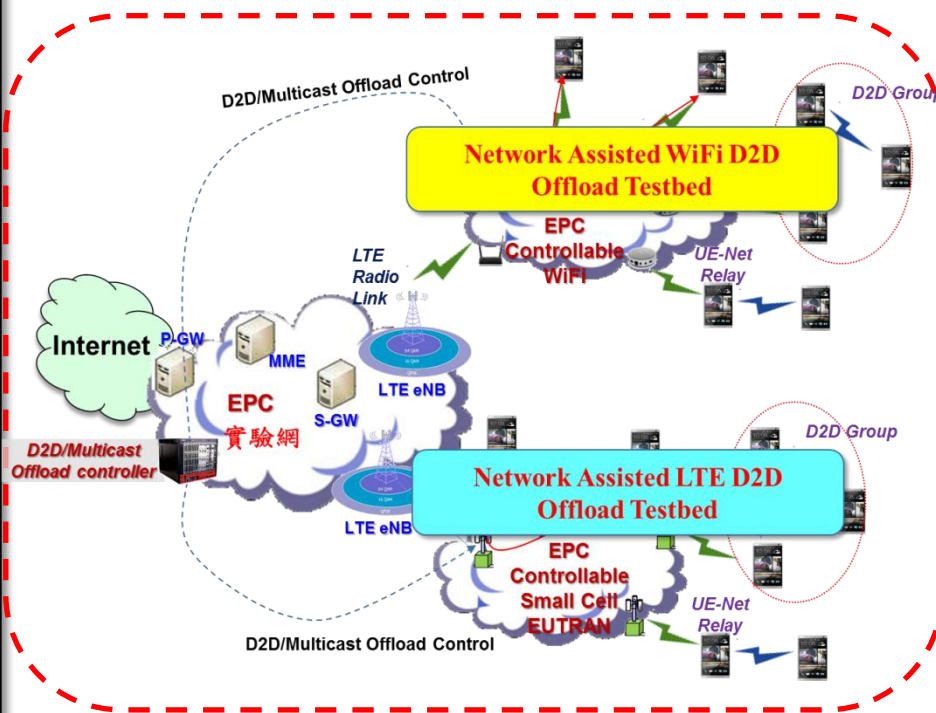


Deploying Sites of 2F of Global Mall



# ITRI Direct Communications Based Edge Network - in Shopping mall

D2D/Multicast Offloading Release : 1. FY104 IP Level (3GPP ANSDF Specification); 2. FY105 EPC level



Network Assisted small cell/D2D/Multicast

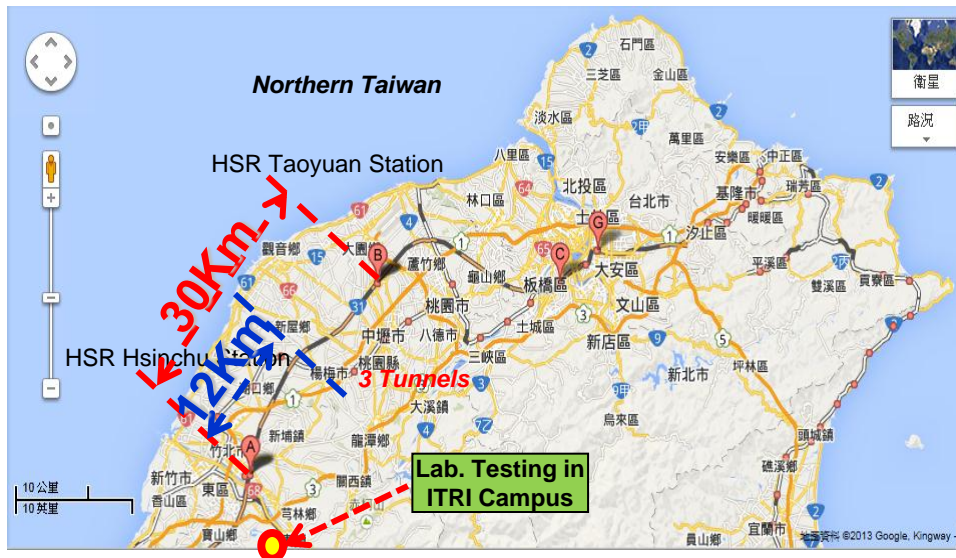
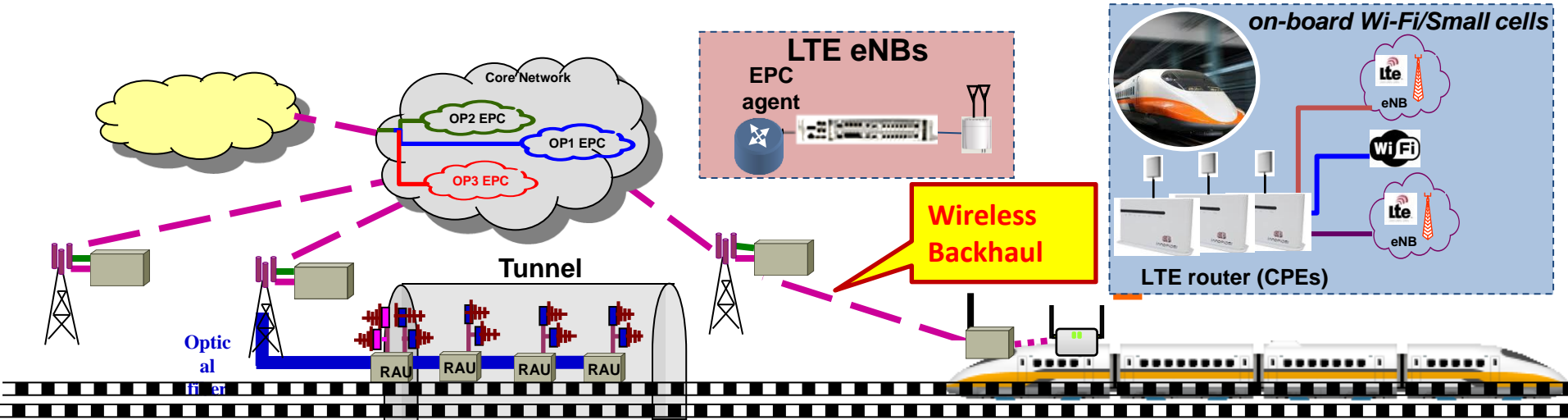
## App Service which can be used in the mall

- The function of Attracting Customers
  1. Digital Signage
  2. Push eCoupon
  3. Multicast Ad films
  4. Shopping Guide
- The function of Community share
  1. Mobile calls Proximity Offloading
  2. Multi-media instant discussion groups

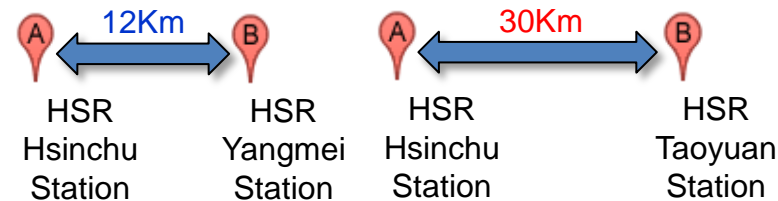




# ITRI's Current LTE HSR project - LTE HSR Test Field



## Field Test Bed :



## Deployment:

- Time: 2014/01/01~2014/12/31
- Technology: LTE
- Number of eNB: 4 (10) (Based on WiMAX Deployment)
- Number of EPC: 1
- Number of RoF pair: 10 (16)
- Backbone & RoF's Fibers : 96C

# HSR Test Bed

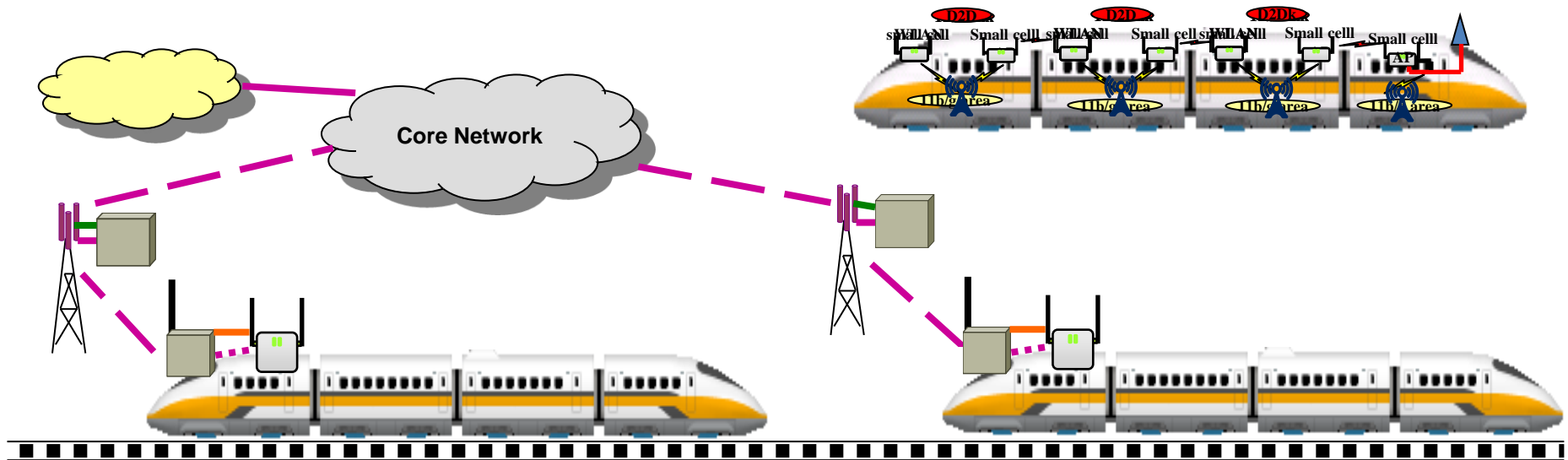
## - On Board Edge Network

### ■ Road Side backhaul

- Roadside base stations provide wireless backhaul connectivity

### ■ On-board Edge Network

- small Cell + direct communications backhaul





*Thank You*