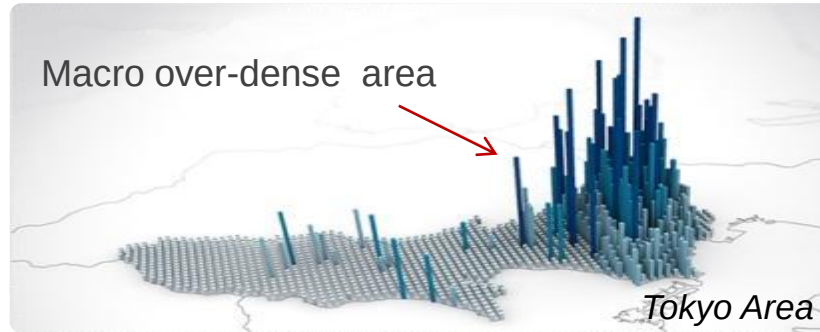


Huawei Small Cell Solution

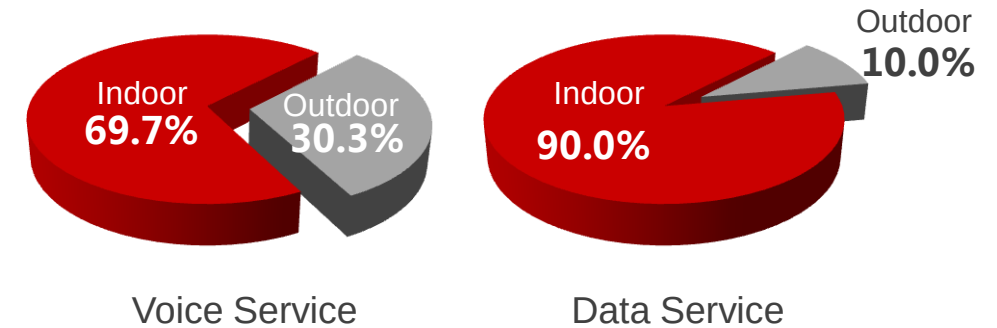
20-Mar-14

Unbalanced Network Load Needs Small Cell

Unbalanced load needs accurate deployment

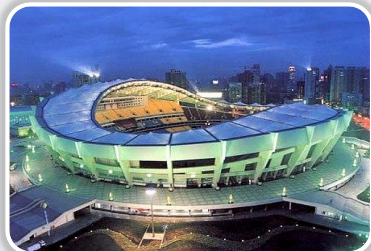


Unbalanced indoor/outdoor load need new solution



Source: Huawei LAB

Outdoor



Stadium



Downtown Street



Shopping Mall

Indoor



Office

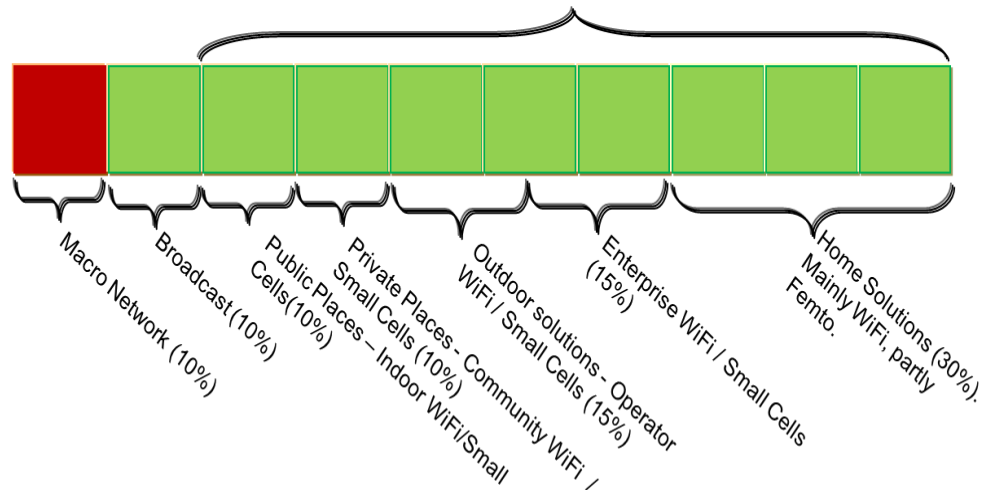


Cafeteria

Massive Small Cell Deployment Forecast

Y2020 Mobile Traffic Distribution Anticipation

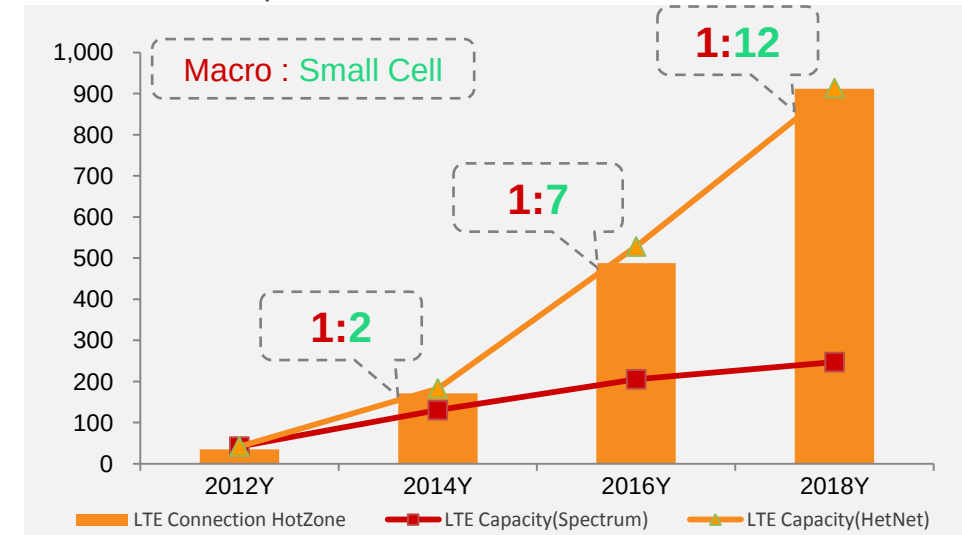
80% traffic with small cell solutions!



Source : Orange Group

Dense urban needs massive small cells

Connected User per Macro Sector



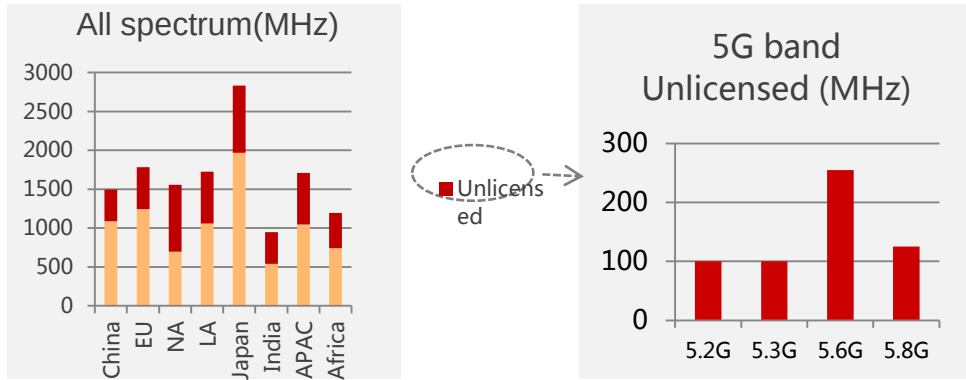
Dense urban area traffic forecast

Source: Huawei simulation

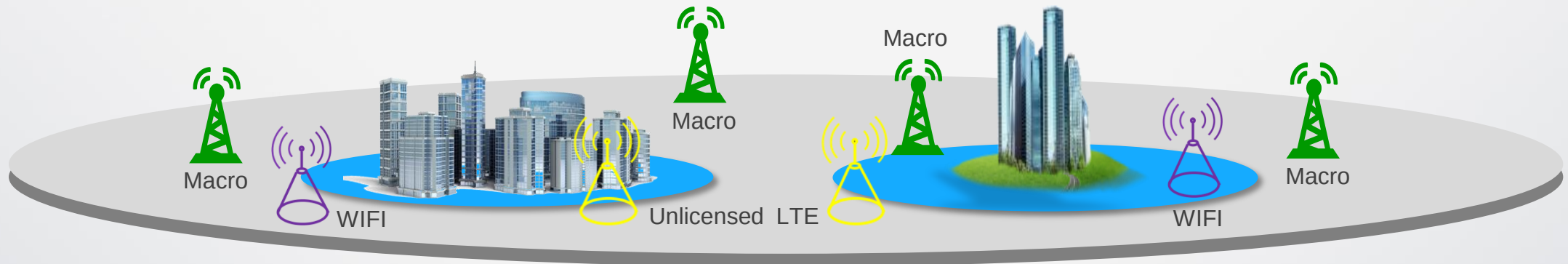
Massive Small Cell Deployment are major solution for the best MBB user experience

Small Cell Unleash Efficiency of Unlicensed Spectrum

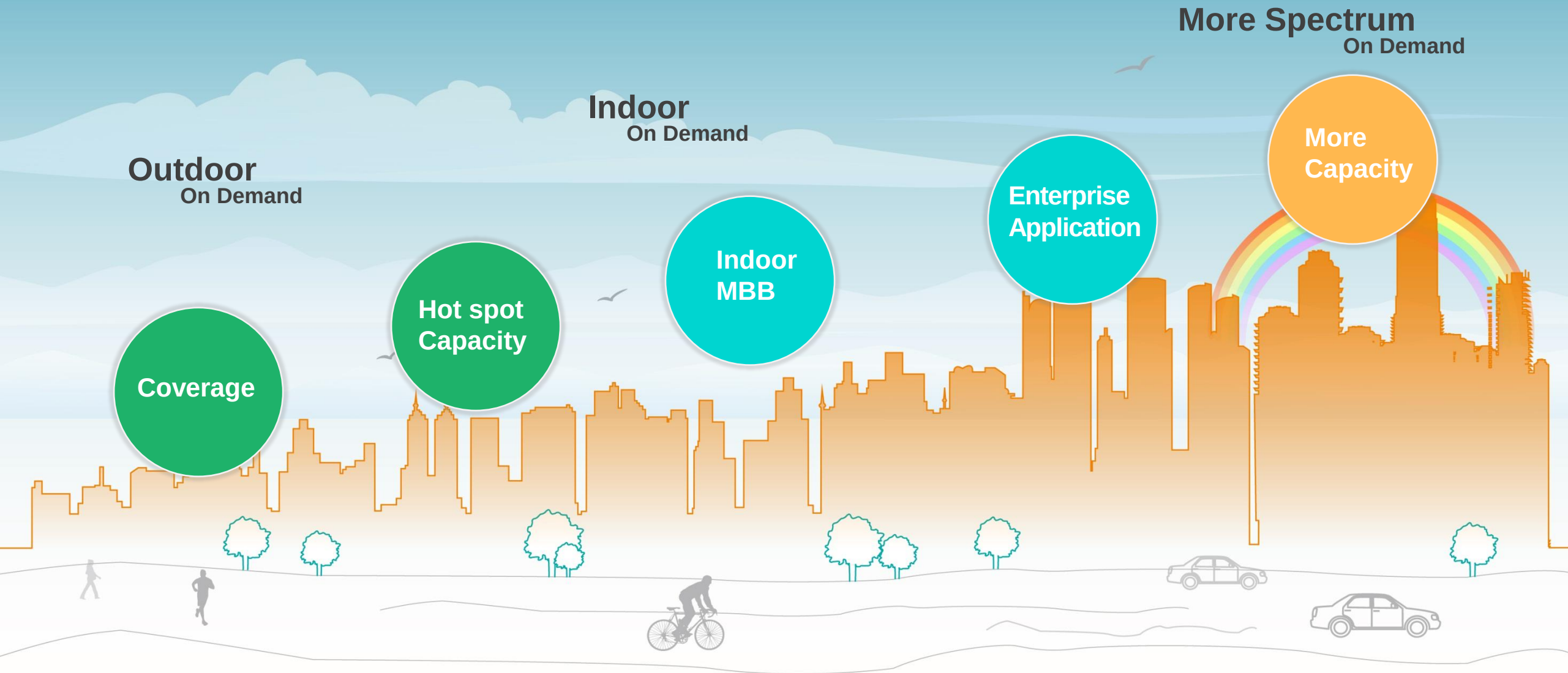
More Unlicensed Spectrum Available



- **Licensed + Unlicensed** bring extra capacity and consistent customer's experience.
- **LTE over unlicensed spectrum** is the hot trend

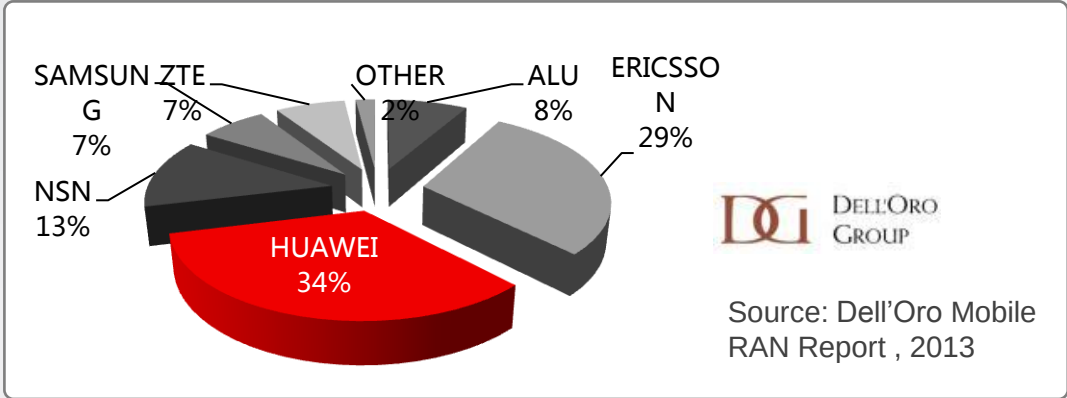


Small Cell On Demand for Evolving MBB City



Huawei Small Cell Leading Commercialization and Innovation

Market Share of Vendors in Small Cell 2013 (by Shipment)



Best Innovation Award from Small Cell Forum 2013





Best Innovation in Commercial Deployment
2013 Small Cell World Summit in London

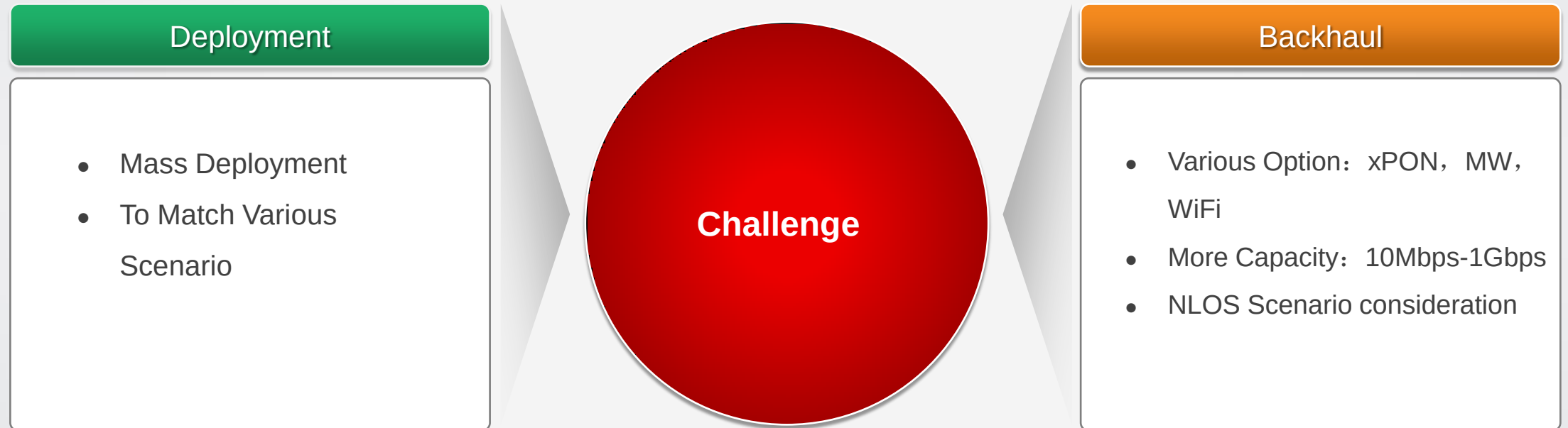
Huawei Leading Small Cell Market

 Spain	 Germany	 Canada	 Mexico	 Hongkong	 Japan	 Korea	 French
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Outdoor On Demand



Challenge of Outdoor Small Cell



Easy Deployment - One Site, One Box, One Cable

Most Compact Micro BTS



- UMTS or LTE
- 4*1W
- U/L: 2 Cell/1*20MHz
- Integrated/External Antenna
- Integrated WiFi

World's 1st Wide Band Micro BTS



- Multi-Mode, Multi-Band
- 2*10W
- UL: 4 Cell + 1*20MHz
- Integrated/External Antenna
- Integrated WiFi

One Box: Baseband, RF, Antenna in one box

One Cable: One PoE for electronic Power and Transmission Port

Crowd-sourcing Mode: Innovative Site Solution Enables Mass Deployment

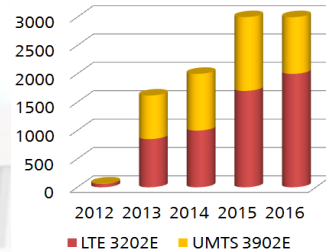


Massive site acquisition



TELUS®

Small Cell Shipment & Forecast



Environment friendly design



- **Multi-win** cooperation
- **Flexible** backhaul Solution
- **1000+** bus station available

Full use of existing property



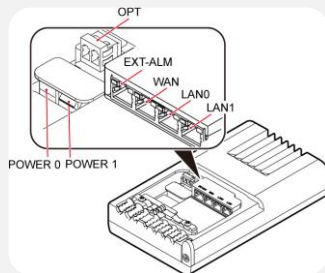
PCCW®
電訊盈科

- **Full reuse** of legacy property
- **New site mode:** WiFi Hotspot + Small Cell
- **3000+** phone booths available

Comprehensive Backhaul Solution

Rich Transmission Interface Inside

Rich Transmission Interface



xPON
Optical FE/GE
Electrical FE/GE
xDSL

Wired Backhaul

xPON/FTTx/DSL

LTE Relay

WiFi

Microwave

Full-Band Wireless Backhaul Solution

1st LTE Relay

LTE TDD 2.6/3.5GHz Released
LTE FDD 2.6GHz 2014Q4

NLOS,P2MP

Flexible NLOS,P2MP Backhaul

190Mbps
500m
WiFi
5GHz

Unlicensed NLOS,PTP/PMP Microwave

450Mbps
<2Km
4.9-6 GHz
PTP 2014Q1
PMP 2014Q4

Unlicensed LOS Microwave

450Mbps
300m
60GHz
2014Q2

Lite licensed E-Band Microwave

4Gbps
3km
80GHz
released

Wireless Backhaul

Huawei AtomCell Family for HetNet



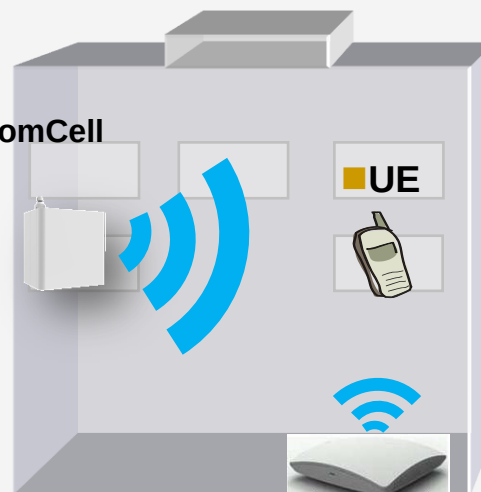
■ AtomCell
■ BTS 3902E/BTS 3202E



■ AtomCell
■ BTS 3803E/BTS 3203E



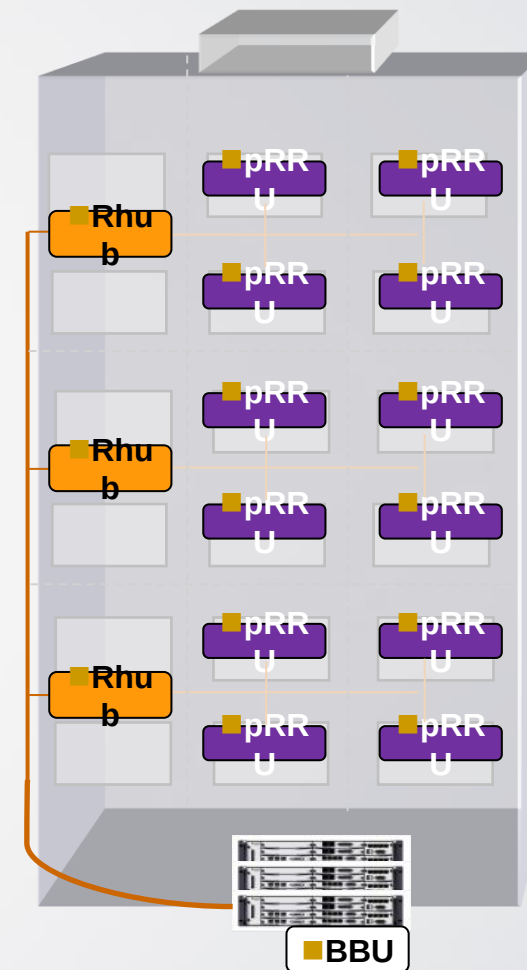
■ AtomCell



■ WiFi WA201DK-NE



■ LampSite



AtomCell Micro Go to MKT



■ 850M



■ BTS3902E
■ 850M
■ UMTS
■ 2*5W

■ 1.8G



■ BTS3203E
■ 1.8G LTE
■ 4*1W

■ 1.8G only for
specific project

■ 2.6G



■ BTS3202E
■ LTE 2*5w
■ 2.6G

■ AWS



■ BTS3202E
■ LTE AWS
■ 2*5w



■ BTS3902E
■ AWS UMTS
■ 2*5W

■ 2.1G



■ BTS3902E
■ 2.1G UMTS
■ 2*5w



■ BTS3202E
■ 2.1G LTE
■ 2*5W Korea



■ BTS3203E
■ 2.1G LTE
■ 4*1W (2*1.7) Japan



■ BTS3803E
■ 2.1G UMTS
■ 4*1W

■ Dual mode Micro is
on Planning stage,



■ BTS3911
■ 2.1G U+L
■ 2*5 W

■ PCS



■ BTS3902E
■ 1.9G UMTS
■ 2*5W



■ BTS3803E
■ 1.9G UMTS
■ 4*0.5W Pico

■ PCS band 3902E used
for Micro
■ 3803E used for Pico
scenario

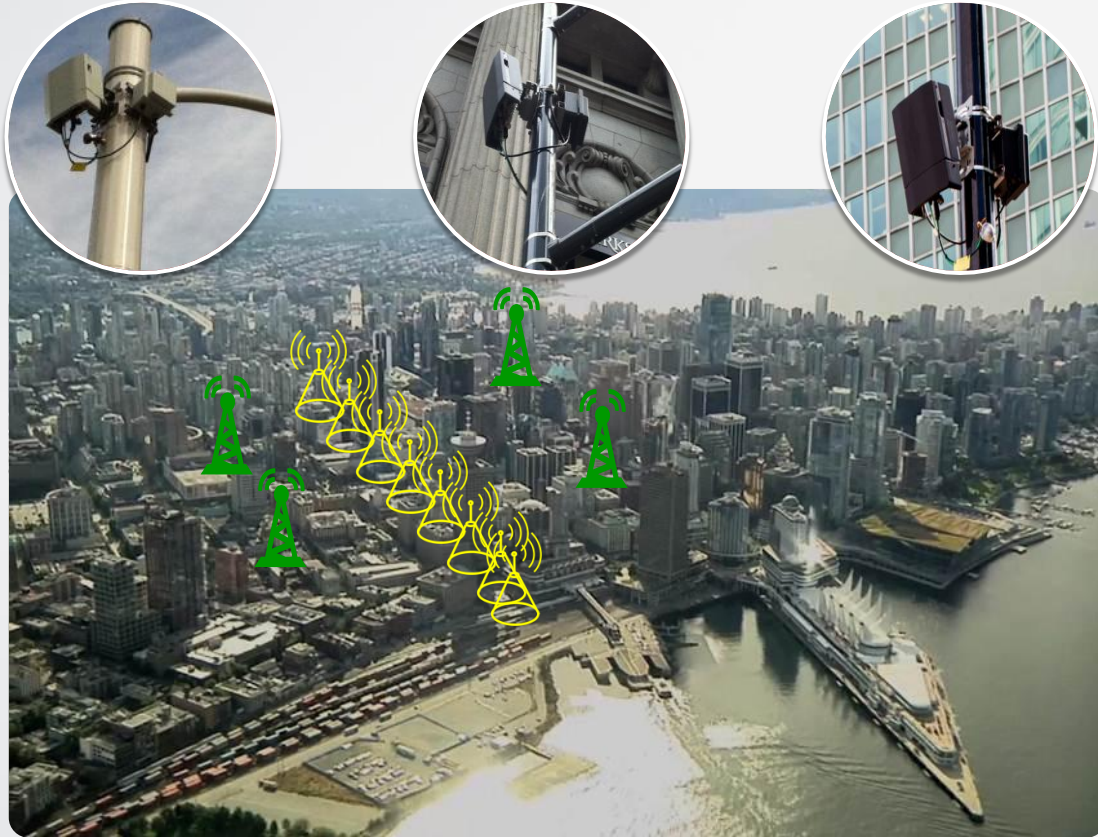
■ 2012,Q2

■ 2013,Q2

■ 2013,Q4

■ 2014,Q2

Case1: Small Cell is for Network Evolution

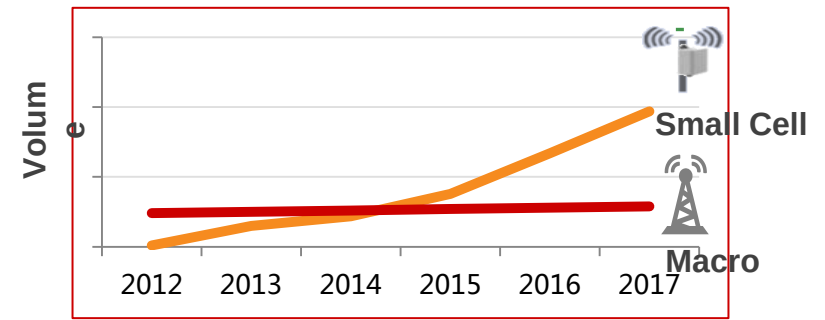


- **10,000+** pole acquisition for small cell deployment
- **U/L, Co-carrier** deployment, **40+%** traffic increase



60% small cell / macro in 2013

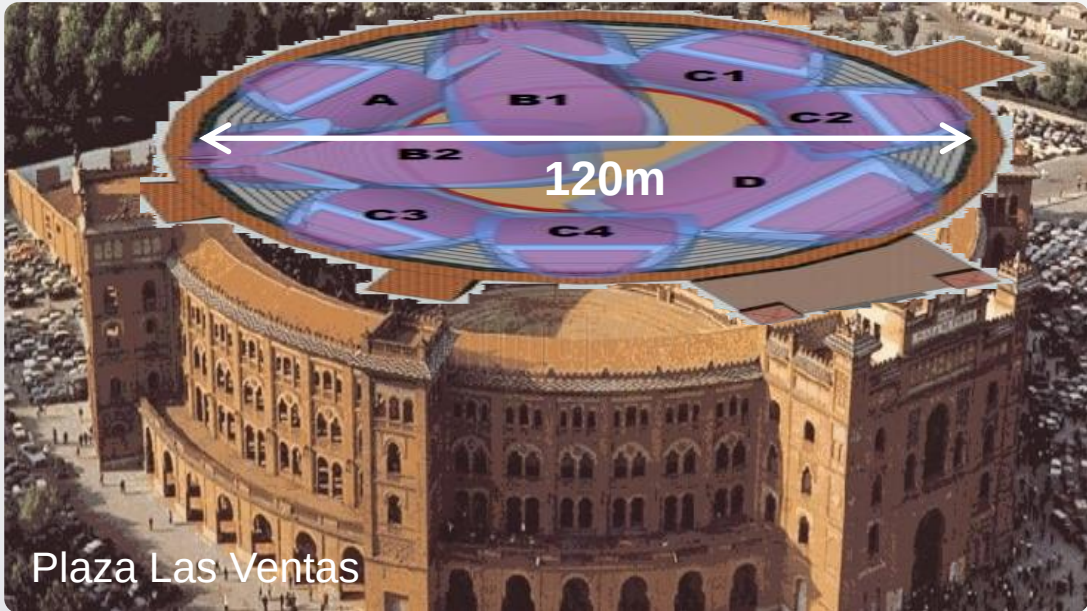
Number of Small Cell will Surpass Macro in 2014



Eros Spadotto
TELUS EVP

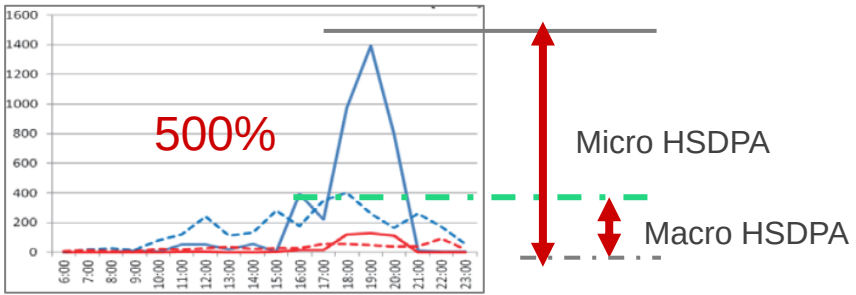
*"TELUS uses small cell to Break the Frequency resource limitation ...
...Micro Number 3 times than competitor."*

Case2 : Best MBB Experience for Big Event



- **23,798** people in a big event
- **+200Kbps** per active user
- **500%** Traffic Increased by Small Cell
- **Flexible eRelay** Solution

Real Event Performance



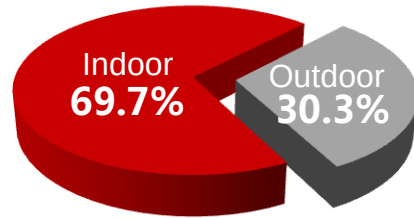
Indoor On Demand

and

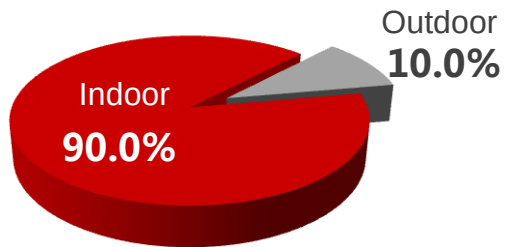


Heavier Indoor Traffic Needs Various Solutions

Indoor Takes Up 90% Data Traffic



Voice Service



Data Service

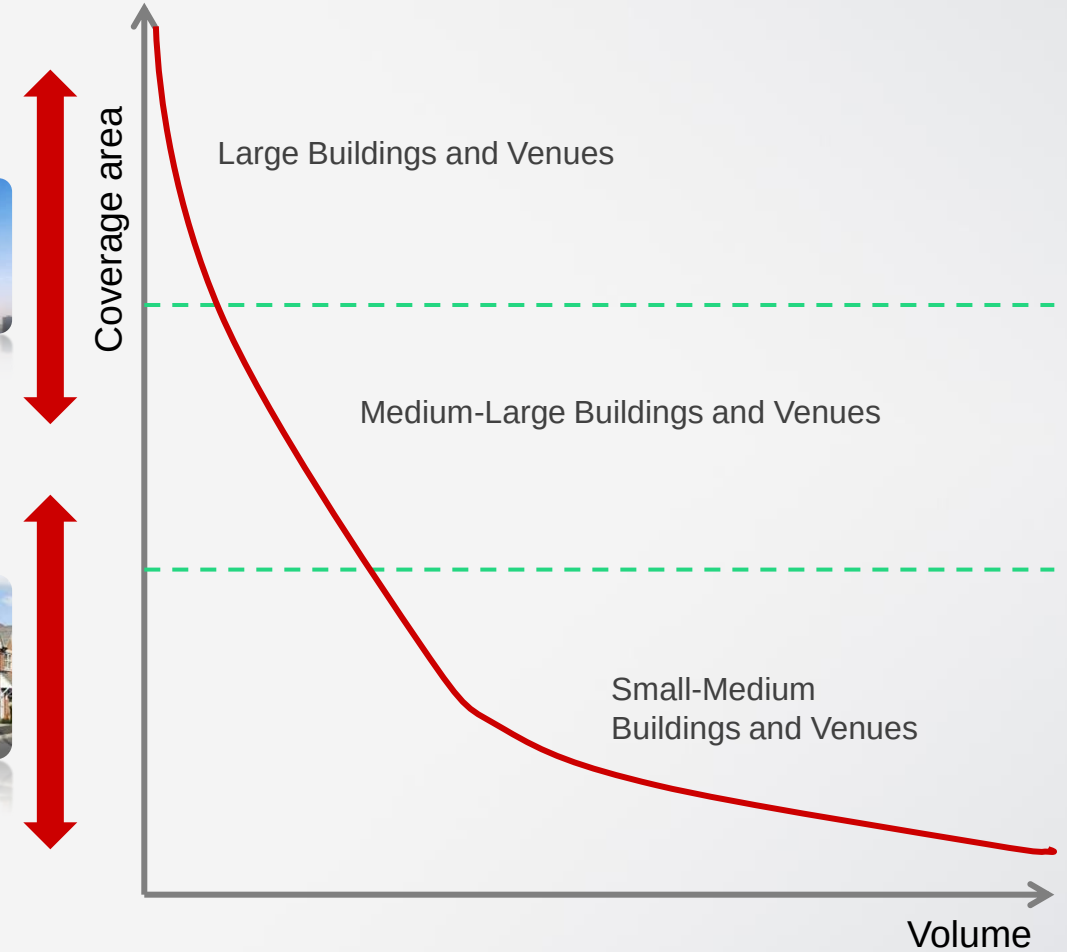
Source: Huawei LAB



LampSite



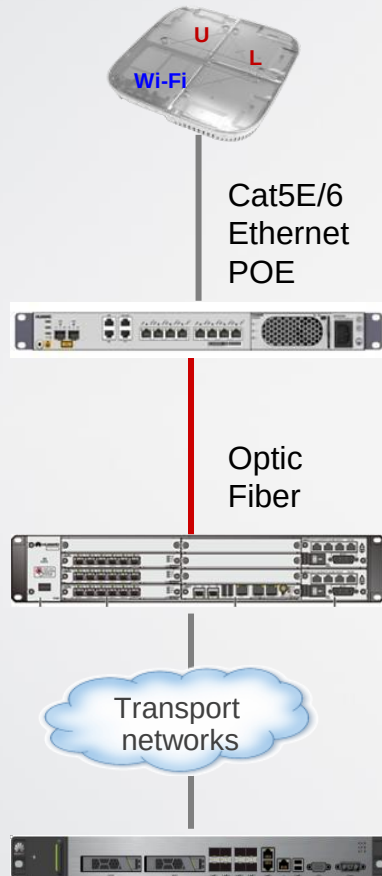
Pico



Indoor coverage Overall scenarios



Large Buildings Indoor Coverage Solution - LampSite



pRRU

- Multi-Mode, Multi-Band
- 2x100mw MIMO
- Only 2.6L, <3Kg

rHUB

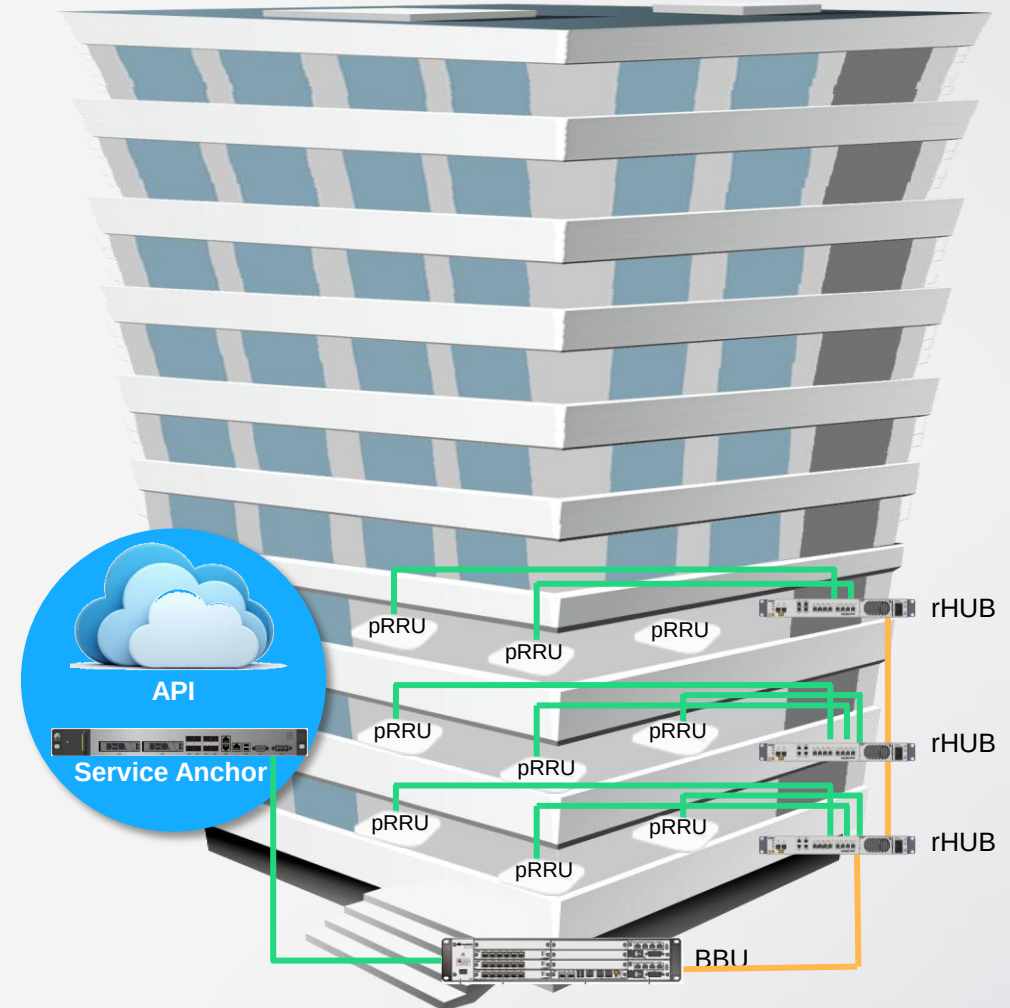
- CPRI Hub for pRRU
- 4 Level Cascade
- 8 pRRU/rHUB

BBU

- Multimode
- Share BBU with Macro
- Single OSS

Service Anchor(Optional)

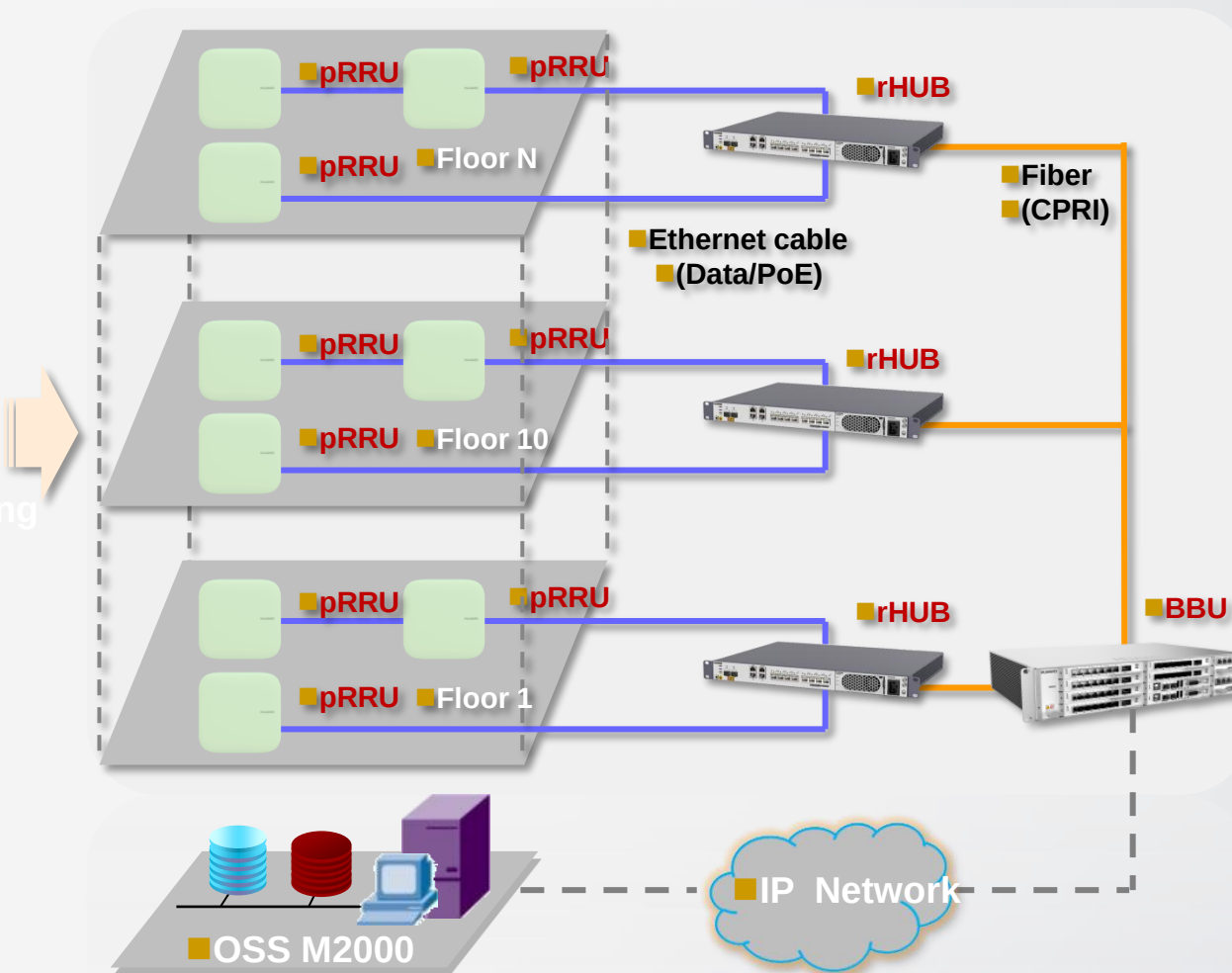
- Gateway
- WiFi AC
- Interference Control
- Service Open Platform (API)



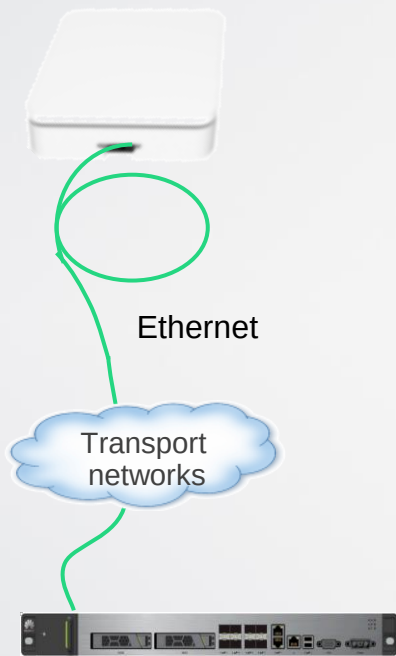
Huawei Indoor Coverage solution: LampSite



■ **LampSite= BBU+rHUB+pRRU**



Small-Medium Buildings Indoor Coverage Solution - Pico

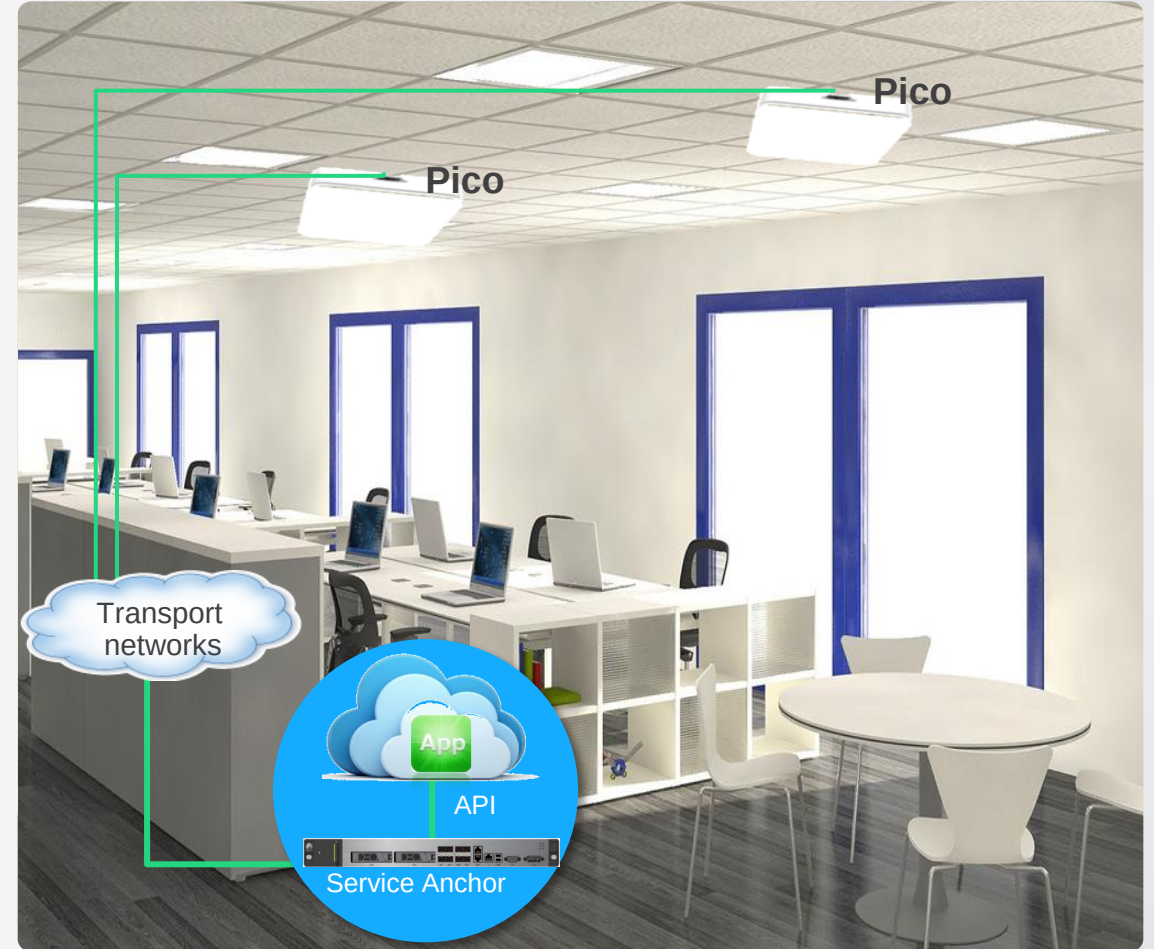


Pico

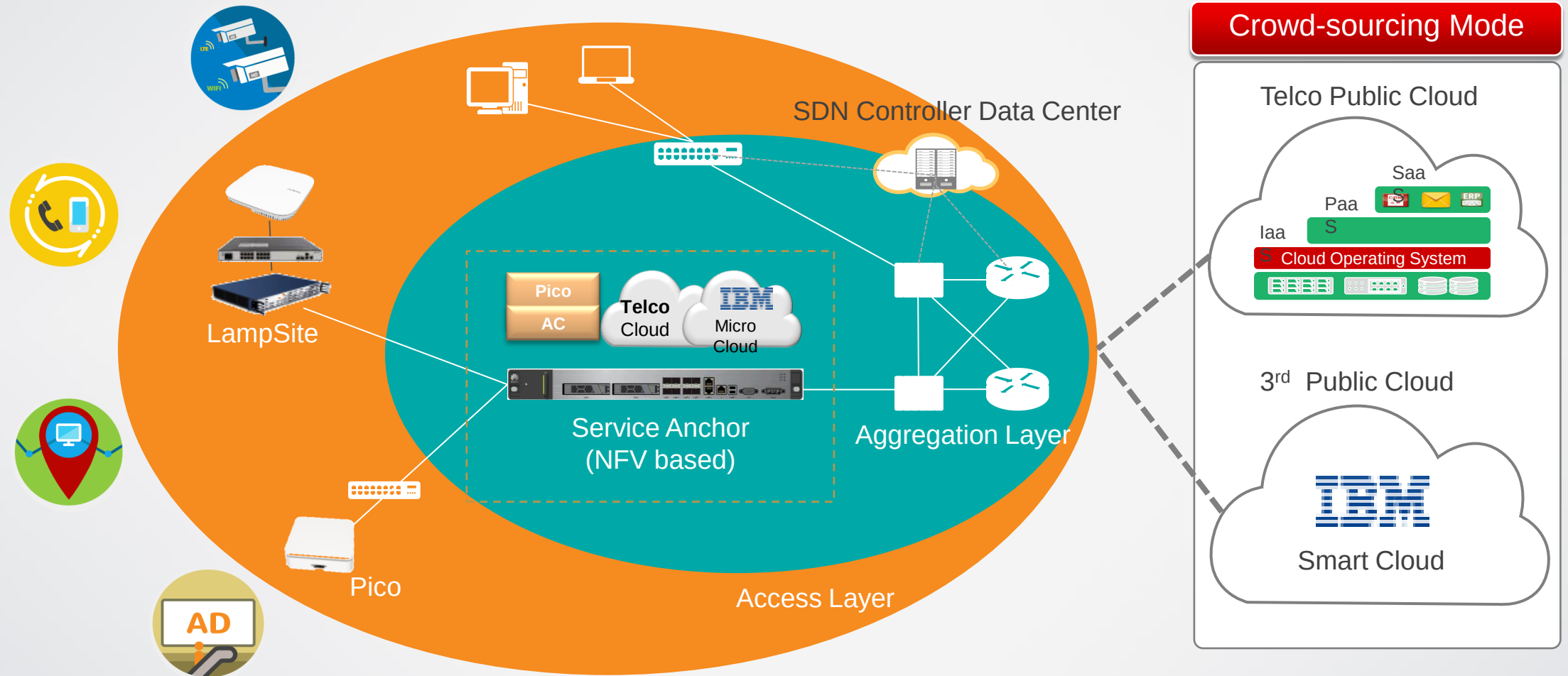
- Multi-Mode, Multi-Band
- WiFi inside
- 2*125mW MIMO
- <3L, 2.5Kg

Service Anchor(Optional)

- Gateway
- AG/ WiFi AC
- Interference Control
- Service Open Platform (API)



Huawei Innovative Solution Enables Enterprise Services



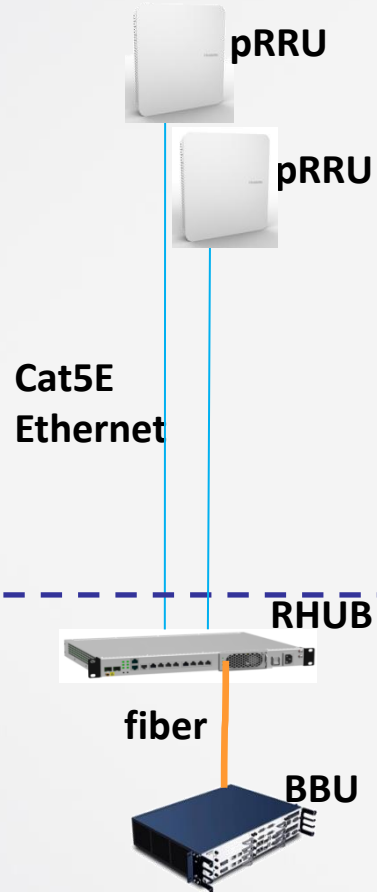
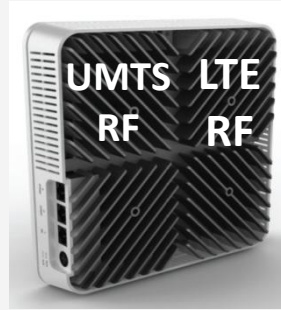
LampSite: Going to indoor market



Traditional DBS



LampSite



pRRU with Antenna and POE port
(Cat5E Ethernet)

- pRRU : UL dual mode
■ (UMTS2100/LTE1800)
- 2*100mW MIMO
- WiFi Optional
- Dual-mode + Wifi < 2L & 2kg

■ LampSite 2013Q4 GA

■ LampSite 4 HighLight

■ High Capacity

- Cell Split as capacity increase
- LTE 2*2 MIMO

■ Fast Deployment

- 3box, Ethernet+Fiber
- Ethernet replace RF cable
- Save labor 60%

■ Manageable

- E2E OM , share M2000

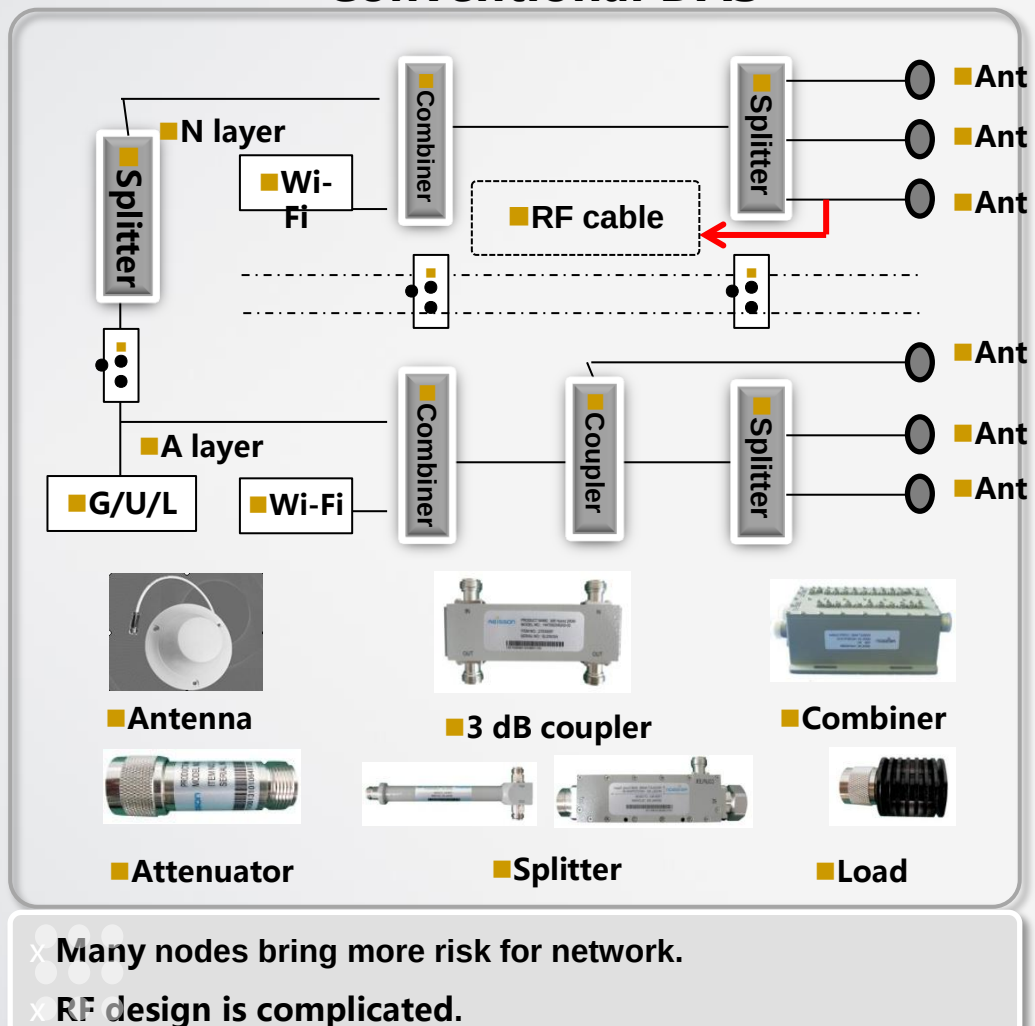
■ Easy Evolution

- GUL evolution , support refarming
- Add module like add light

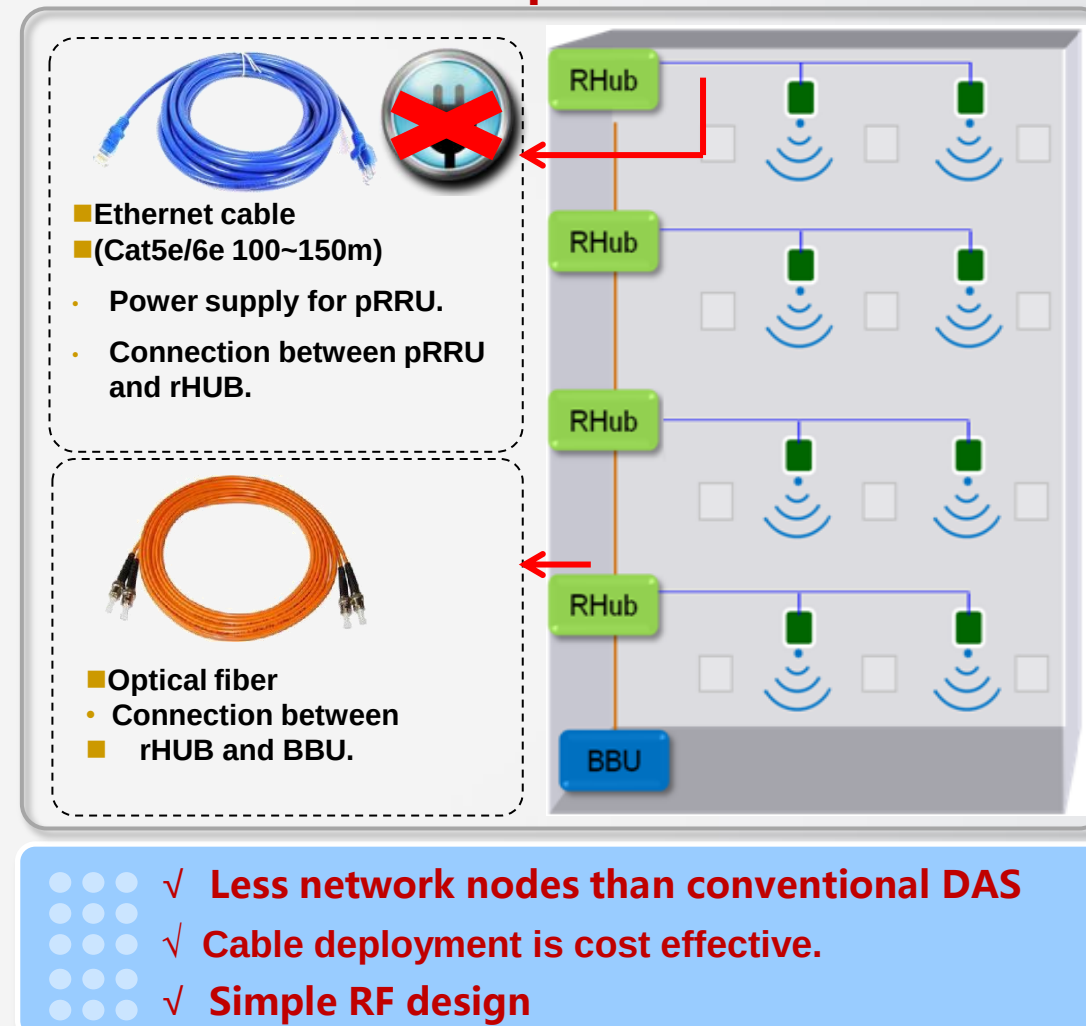
Cost effective and easy Engineering



Conventional DAS

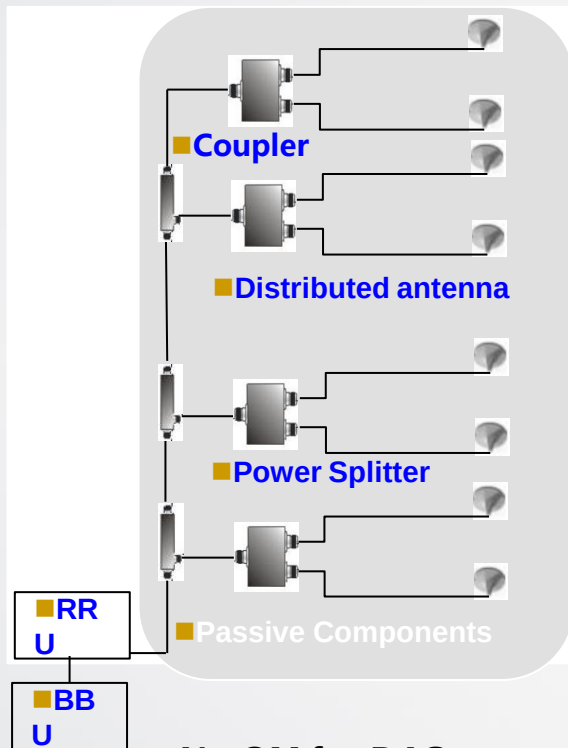


LampSite



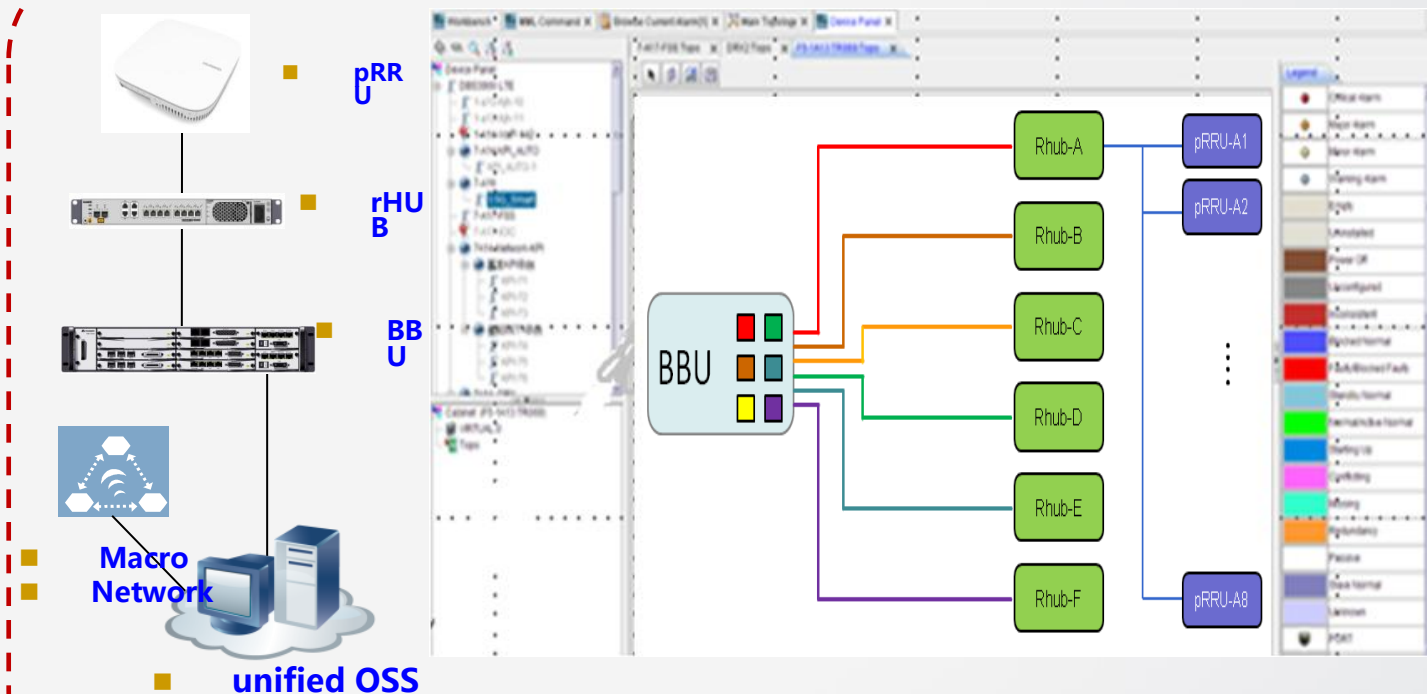
Same OSS to manage Macro network and LampSite

Traditional DAS



■ No OM for DAS

LampSite

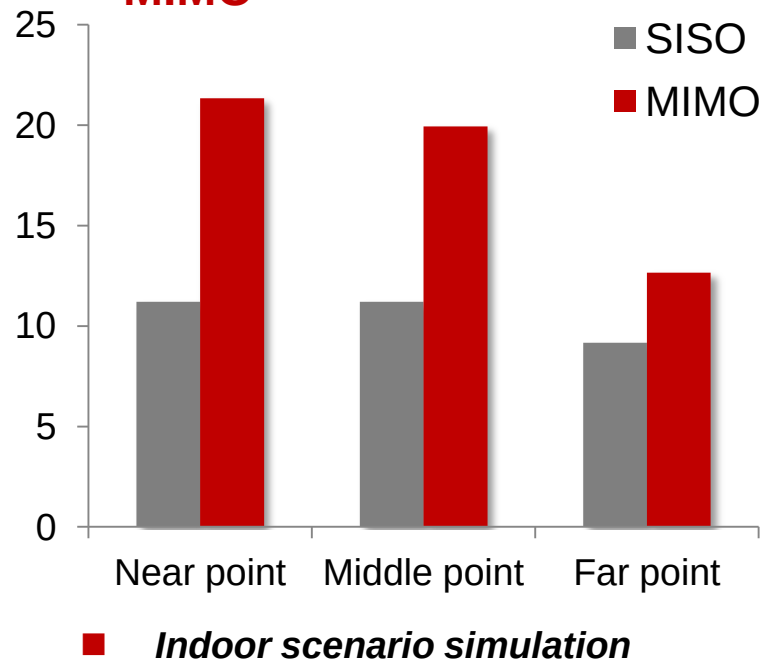


■ Monitoring all end nodes, no blind spot

■ Clear KPI traffic distribution, easy troubleshooting

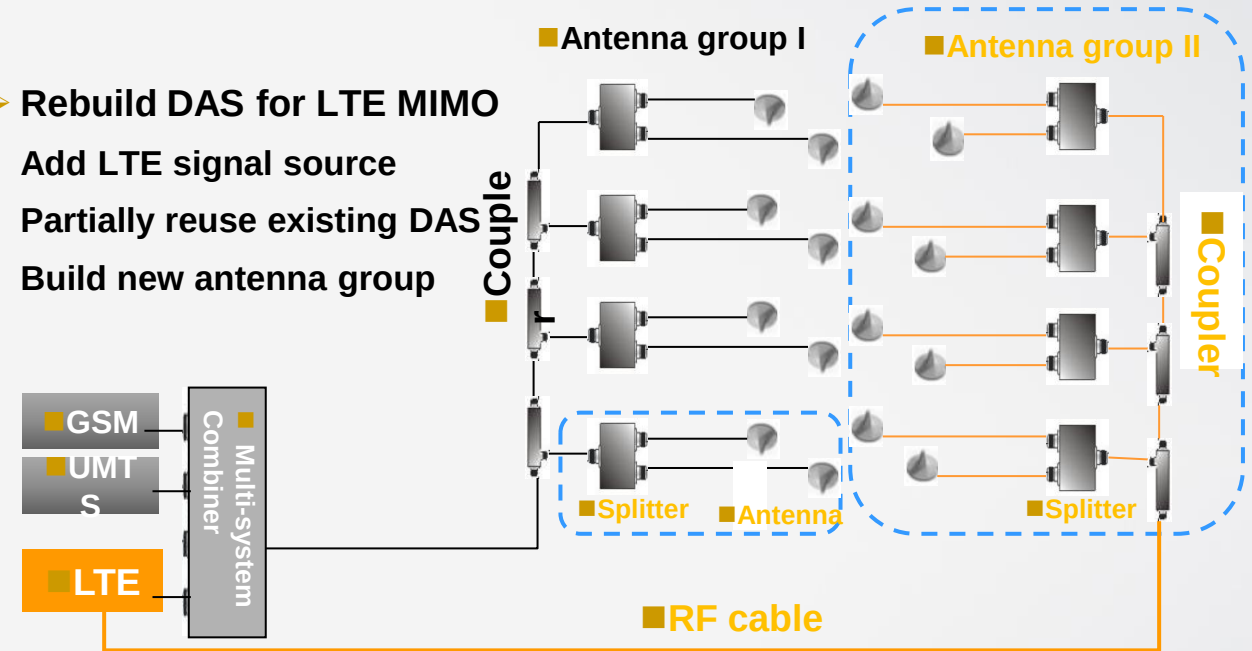
LTE MIMO in one module

■ Better user experience from MIMO



➤ Rebuild DAS for LTE MIMO

- Add LTE signal source
- Partially reuse existing DAS
- Build new antenna group



➤ LTE MIMO is inherent for LampSite pRRU



rHUB



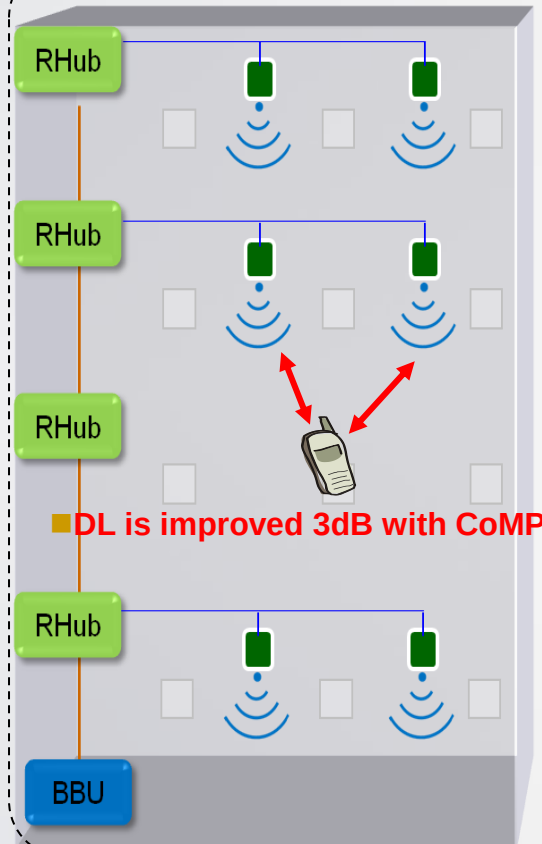
pRRU

■ One Ethernet cable to get LTE MIMO

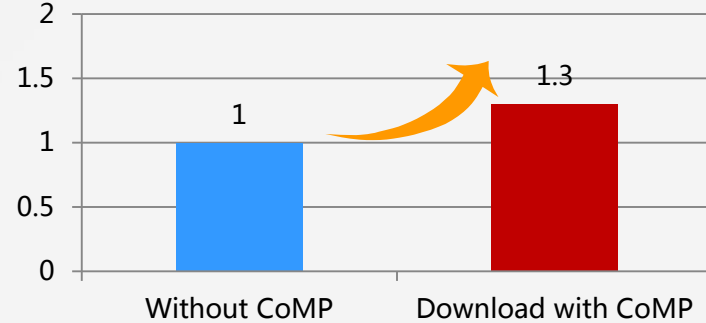
■ LampSite LTE MIMO saves TCO without complicate network re-building

Upload/download performance improvement

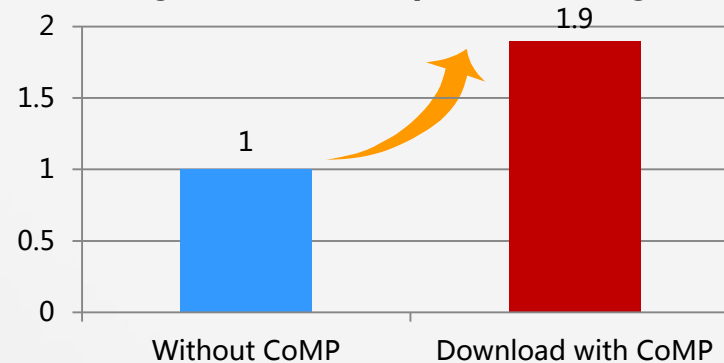
Download, CoMP



Download coverage area 30% larger

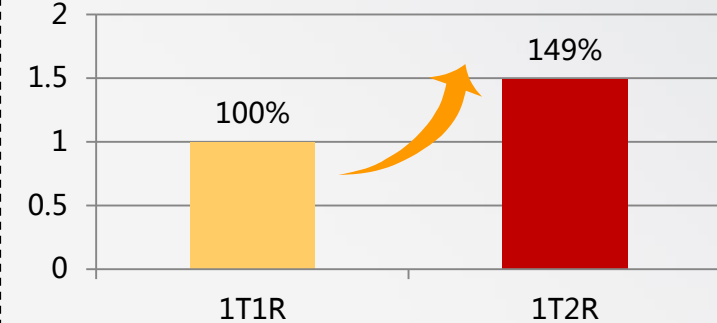


Edge Download speed 90% higher

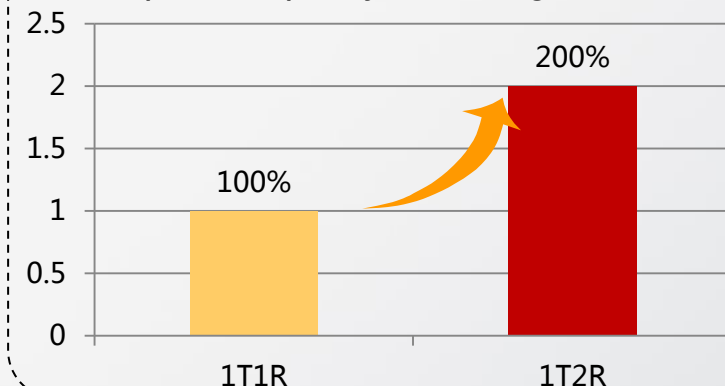


Upload, 1T2R(UMTS)

Upload coverage 49% larger



Upload capacity 100% higher

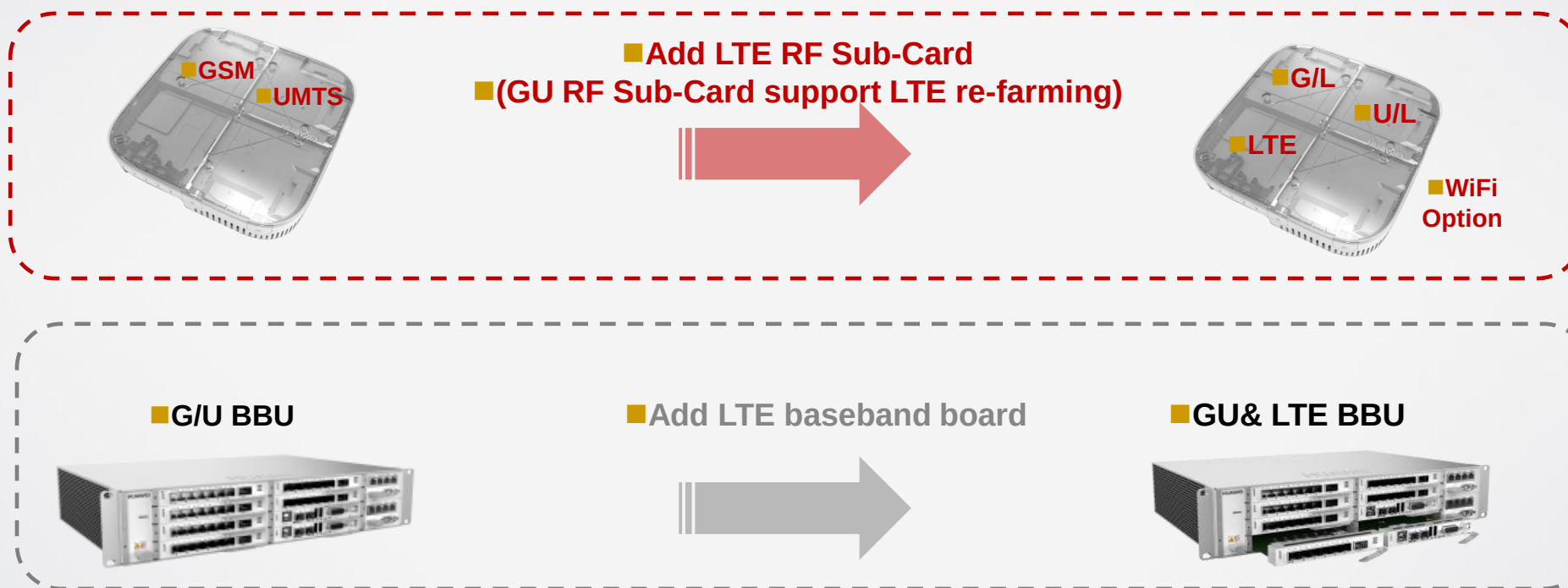


Better user experience: Higher speed, Larger coverage!

Smooth Evolution For New RAT Mode

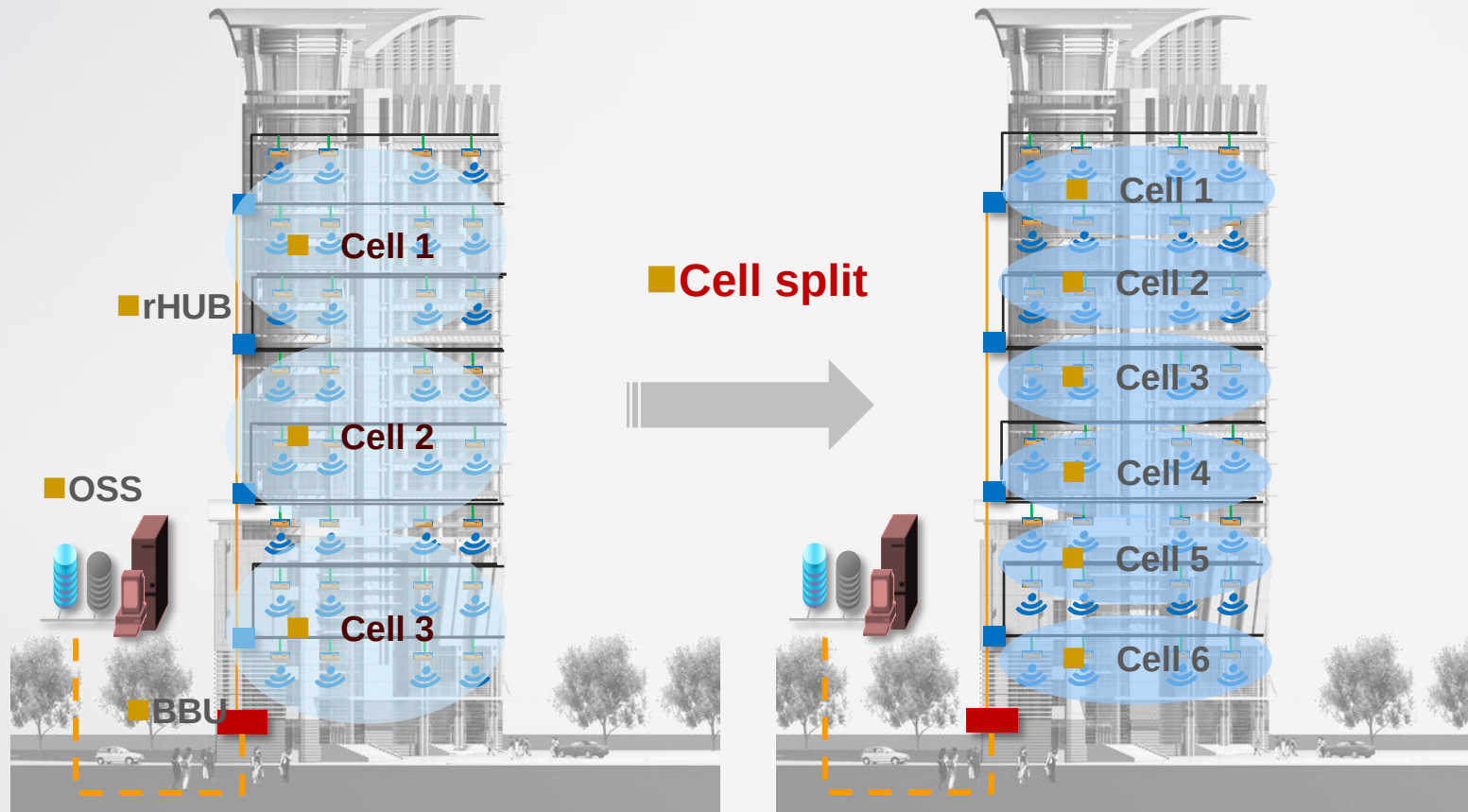
■ GSM/UMTS/LTE + WiFi Modular Design

■ Upgrade indoor G/U coverage to LTE coverage



■ Flexible multi-band /standard for different stage of deployment

Soft Expansion By Remote Configuration

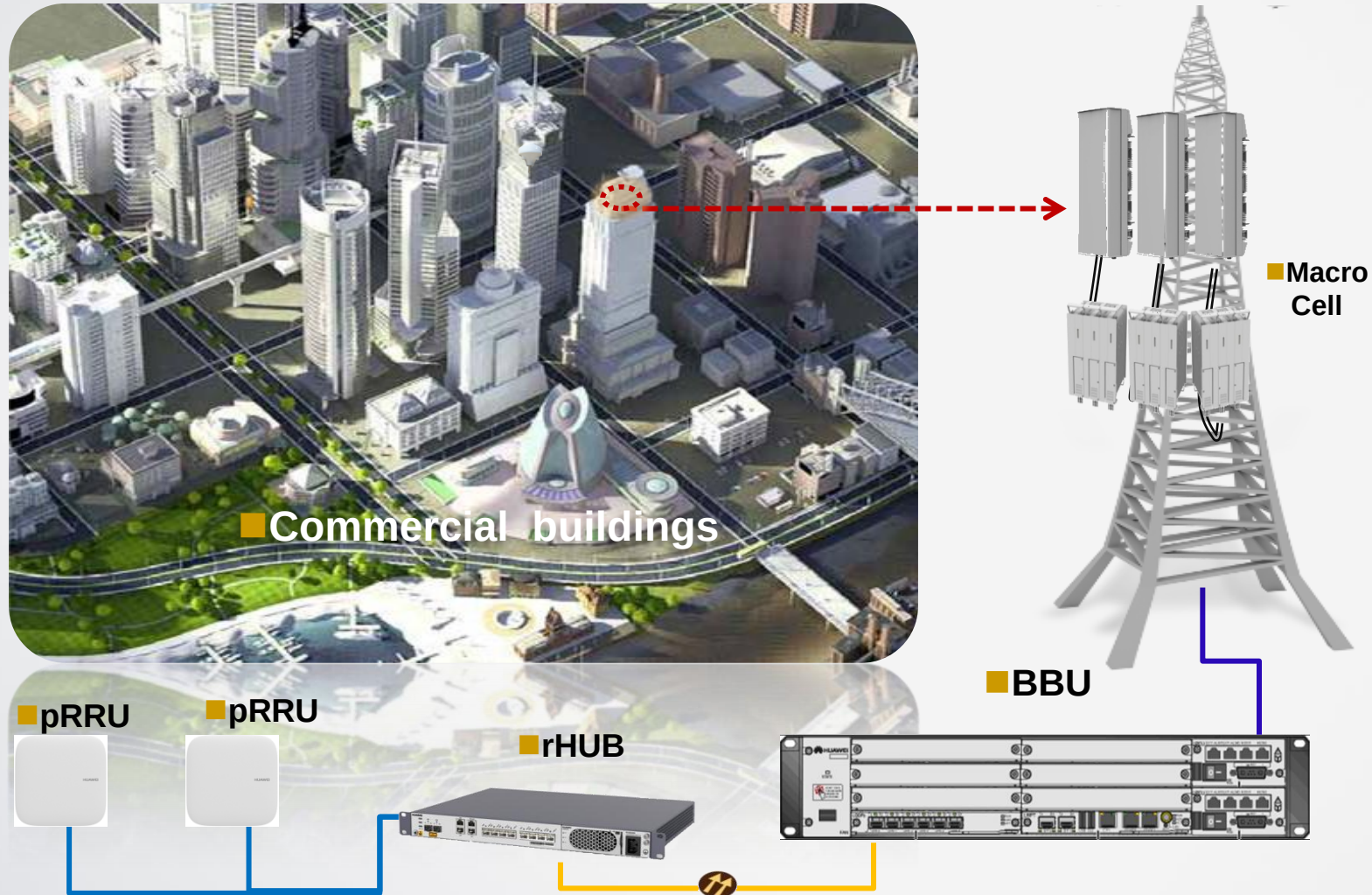


■ Indoor capacity
■ **Double** instantly

■ RF engineering
■ **Zero** touch

- › Cell re-planning/re-configuration can be done by **O&M remotely**
- › **New HW/cabling isn't needed** excluding potential demand on
■ baseband card

BBU coordinates indoor and outdoor coverage



Benefits

- › One BBU , pRRU share capacity with Macro
- › Allow inter-pRRU and pRRU-macro interference cancellation
- › Collaborate to control indoor signal leakage
- › Avoid ping pong handover at building gate
- › SON : neighbor optimization, pilot control, handover

Indoor and outdoor automatic coordination

Automatic Neighbor cell configuration

Delete neighbor



Update neighbor information

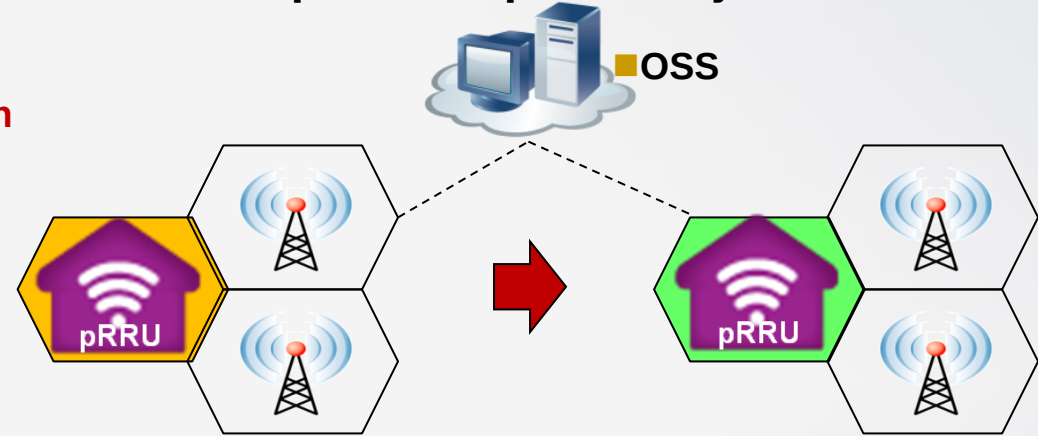


Add neighbor



Automatic pilot and power adjustment

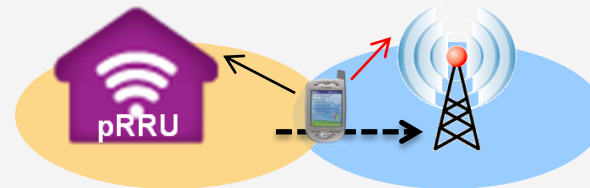
OSS



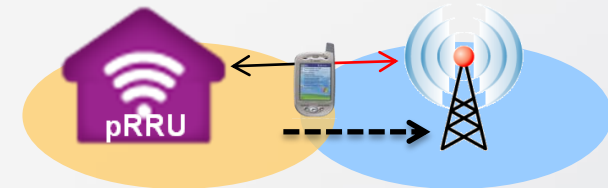
Dynamic adjust parameters



Early handover



Late handover



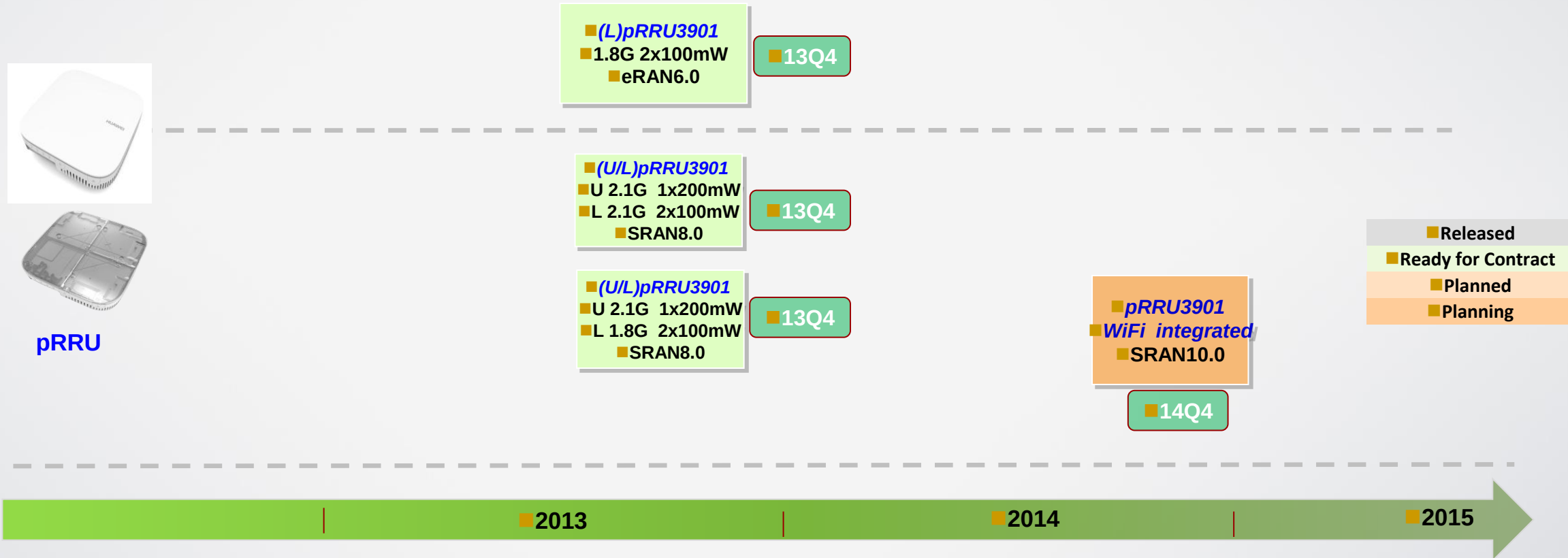
Ping pong handover

Self-Configuration , Self-Optimization , Self-healing

LampSite: the right solution for indoor coverage



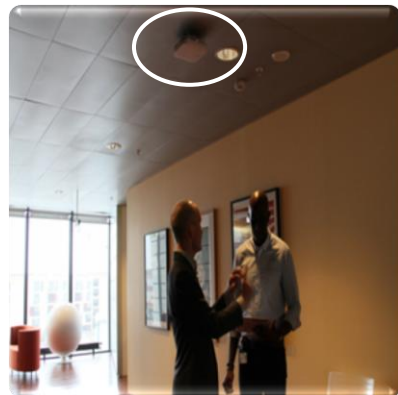
Small Cell Hardware Roadmap---Lampsite



Case1: LampSite Significantly Improved Indoor User Experience



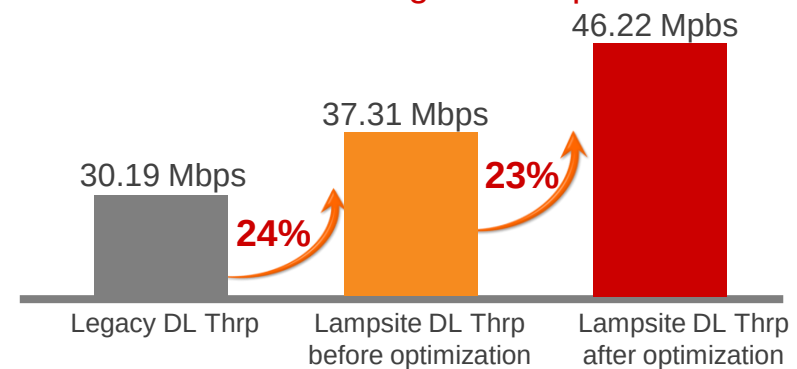
- **Weak signal** penetration with traditional DAS
- **6000** sq.m., **2000** employees
- **6** floors in Telenor Fornebu, Norway



- **46Mbps** on average
- **3 hrs** quick deployment per pRRU, including Site survey, installation, commissioning, put on air all steps.
- LampSite **UL Dual-Mode**



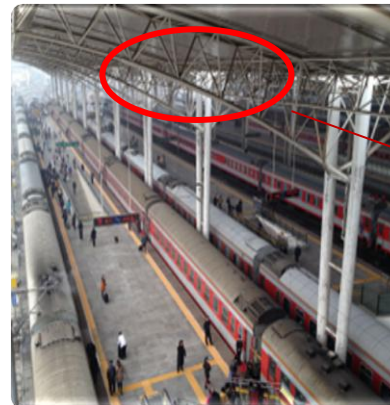
All Floors Average DL Thrp



Case2: LampSite Deliver Performance of Zhengzhou Railway Station

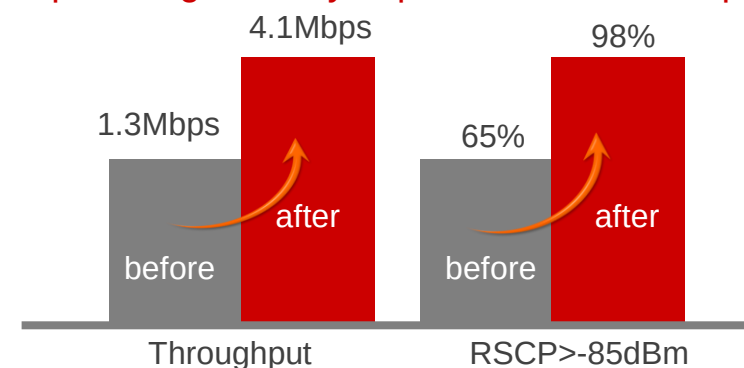


- **150,000** people flow per day
- **144,000** sq.m.,
- **Biggest** luggage&parcel transfer station in China.



- Easy deployment
- Smooth evolution
- Big capacity
- Visual on OSS

LampSite Significantly Improved KPI and Capacity



10+ LampSite Commercial Network Experience

Huawei Small Cell: Evolving with City



THANK YOU

www.huawei.com

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