



中国移动  
China Mobile

# WTTx: one Way to Monetize the Large Bandwidth

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# Contents

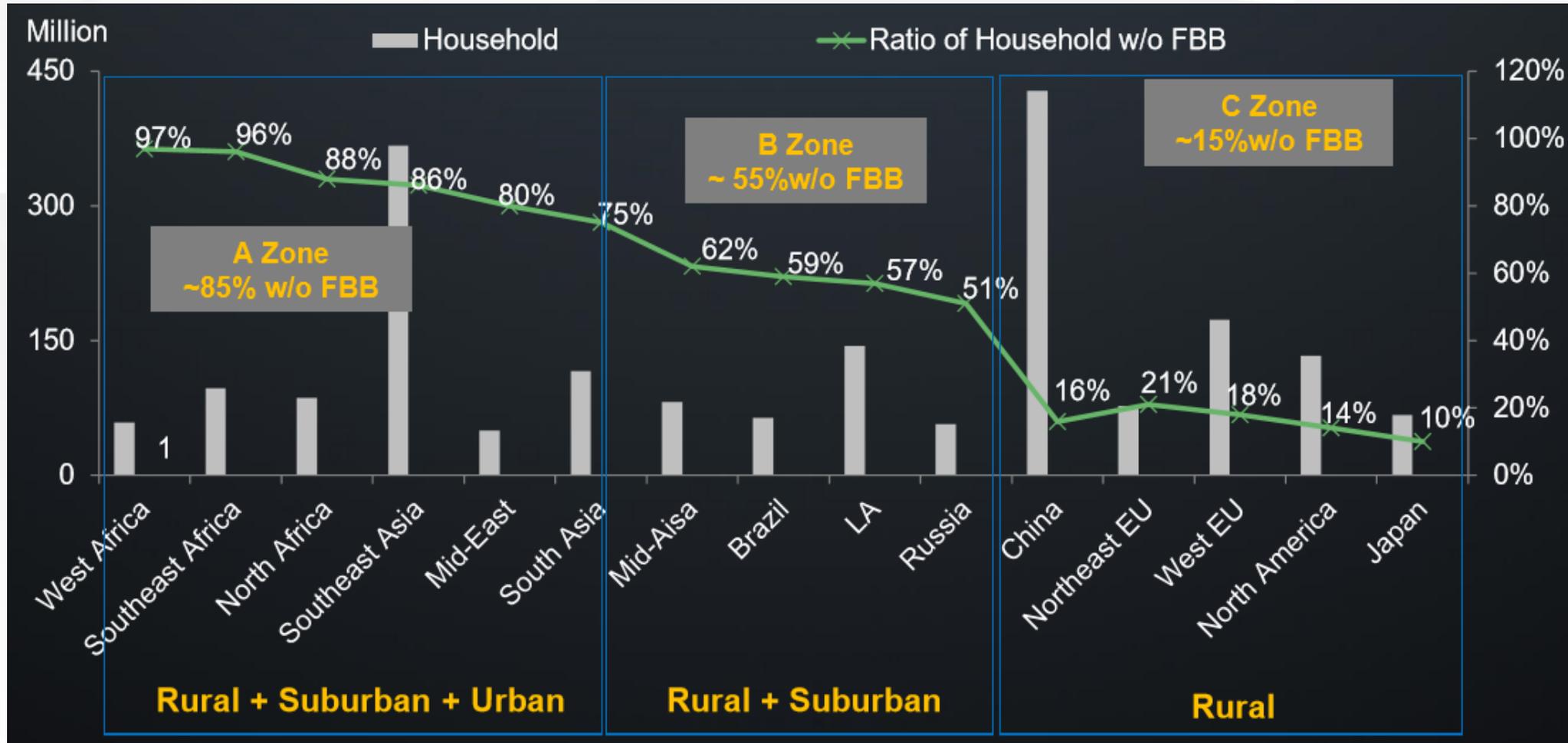
**1** WTTx is one of Operator's Basic Services

**2** Key Issues to develop WTTx

**3** Practice on TDD WTTx



# WTTx is suitable for Rural/Suburban HBB



- **Terrain restricted:** difficult to deploy cable/fiber, Philippines, Indonesi, Nigeria...
- **Policy restricted:** private property, difficult to trench, majority of countries except China /Vietnam.
- **Population density restricted:** low density suburban, high wiring cost, US, Canada, EU.



# WTTx Provide Lower Cost: Connect the Unconnected

	Higher Power	E2E Coordination	More Antennas
	 →  4x20w → 4x40w 1.4X Coverage	 2.3X Coverage 1.5X Capacity	 →  4T4R → 8T8R+SoftSplit 1.7X Coverage 1.8X Capacity
Scenario 1: Coverage limited	 →  1.4X Single User Cost <b>-30%</b>	<b>-69%</b>	 →  1.7X Single User Cost <b>-41%</b>
Scenario 2: Capacity limited	—	<b>-33%</b>	<b>-44%</b>

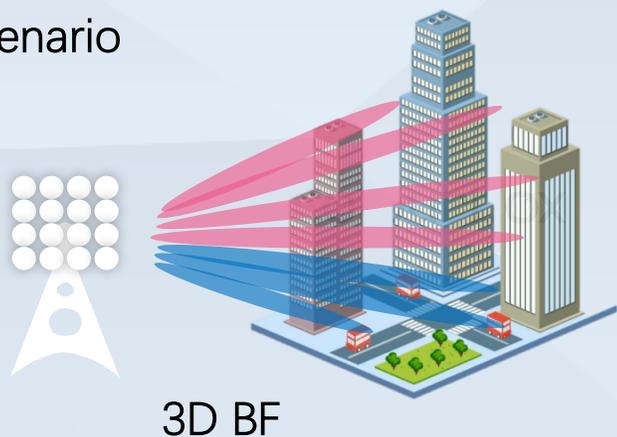
- High power 4T4R / 8T8R RRU, lower per user cost
- E2E coordination further reduce per user cost

*Note: if considering the increment cost of eNB, per user cost reduction should change accordingly*

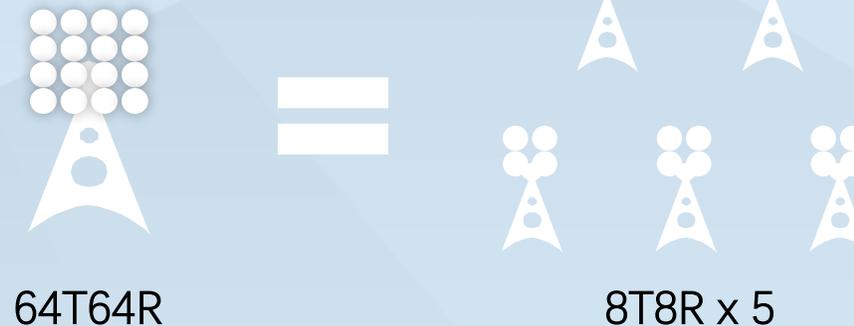


# Lower Cost: Massive MIMO Leverages Connections in Urban

## Urban Scenario



## Great Saving of Sites Cost



## Great Saving of Spectrum Cost



## Great Saving of Per-User Cost



Single User Cost **-80%**

*Note: if considering the increment cost of eNB, per user cost reduction should change accordingly*



# Fiber-class wireless broadband needs large bandwidth

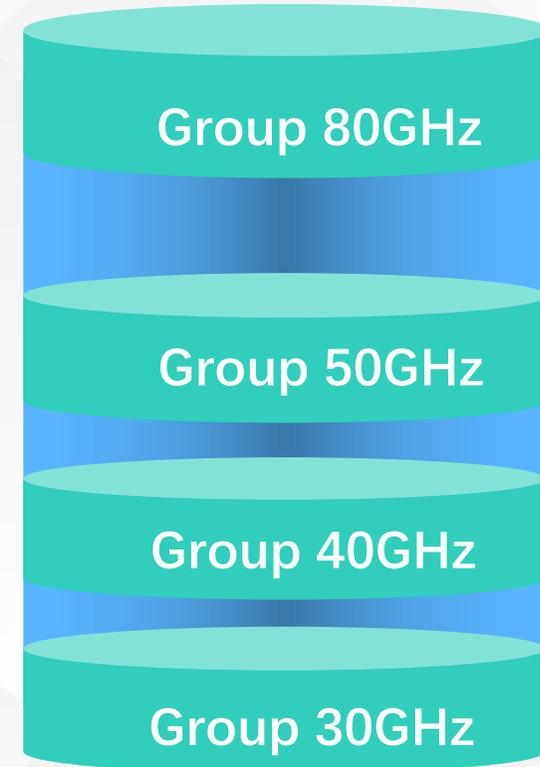
Large  
Contiguous  
Bandwidth

## Sub-6GHz



**Potential 1540MHz TDD  
Spectrum Released by 2020**

## Above 6GHz

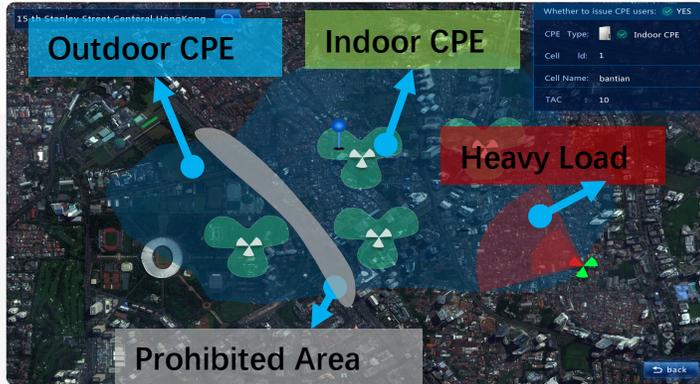


**Potential TDD Spectrum  
6GHz above beyond 2020**

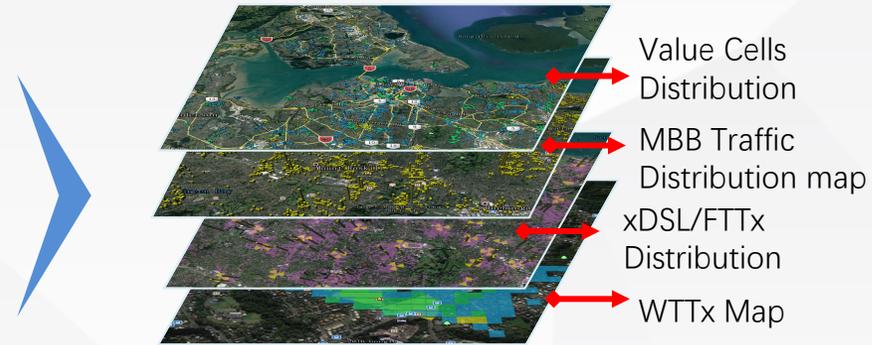


# Enable Fast & Precise User Development

## WTTx Map



## Multi-Dimensions Evaluation



**Where** Deploy?



**Which** Type?

## Precise Post Analysis

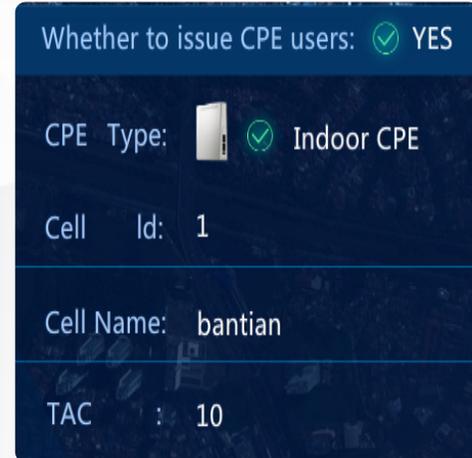
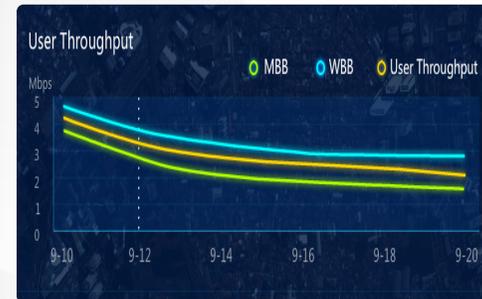
### Top N Related Cell Analysis:



### CPE Monitor & Detection:



### WBB & MBB Comprehensive Analysis



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**1 WTTx is one of Operator's Basic Services**

**2 Key Issues to Develop WTTx**

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## **3 Key issues** to Develop WTTx

- 1 ) Customer's requirement**
- 2 ) ROI & Spectrum Resource**
- 3 ) Device Ecosystem**



# industry is ready to support the NBP goal

## Country Pace: Most below 10Mbps

### LTE-A capability not yet fully revealed

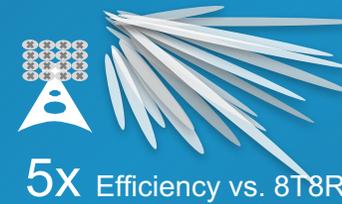
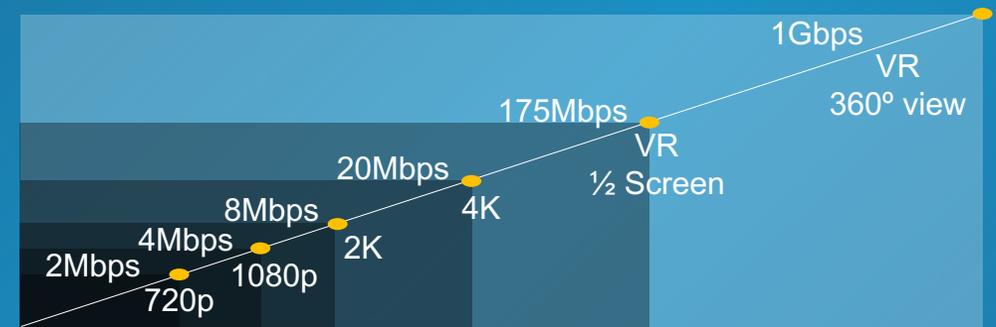
		Min. Broadband Speed Definition (Mbps)			2016 Actual User Speed (Mbps)*		Average User Speed (Mbps)	
		Latest Target (Mbps)	Completion Year	Chance to Revisit	FBB	MBB	FBB	MBB
With New Broadband Speed Definition	Japan	1000			18	11.6	14.3	10.7
	Korea	1000			26.3	11.2		
	Australia	100			9.6	12.8		
	Sweden	100			19.7	12.1		
	Germany	50-100			13.7	13.1		
	USA	25			16.3	7.5		
	China	25	2020	2017	8.49	8.9		
Low or No Broadband Speed Definition	Egypt	25	2021	2017	2.7	8	6.5	6.3
	Saudi	10		2017	4.9	4.7		
	Argentina	10		2017	5	3		
	Canada	5		2017	13.8	8.9		
	South Africa	5	2016	2017	6	5		
	India	4		2017	4.1	3.5		
	Indonesia	2	2014	2017	6.4	10.9		
	Nigeria	1.5	2018	2018	3	3.1		
	Brazil	1	2013	2017	5.5	4		
	Colombia	1		2017	4.8	5		
	Thai	Nil		2017	11.7	6.1		
	UAE	Nil			8.3	13.3		
Mexico	Nil		2017	7	6.7			
Iran	Nil		2017	3.7	7.3			

US/EU: Increasing frequent review on NBP goal (>25Mbps) but development still lag behind expectation (push for speed up implementation is needed)

Many countries still adopt old target (<10Mbps), many still focus on fixed line. 2017 could be a chance to review target (push for planning is needed)

## Industry Pace: +25Mbps for vMoS 4.0 Exp

### Moving to 4K & Massive MIMO

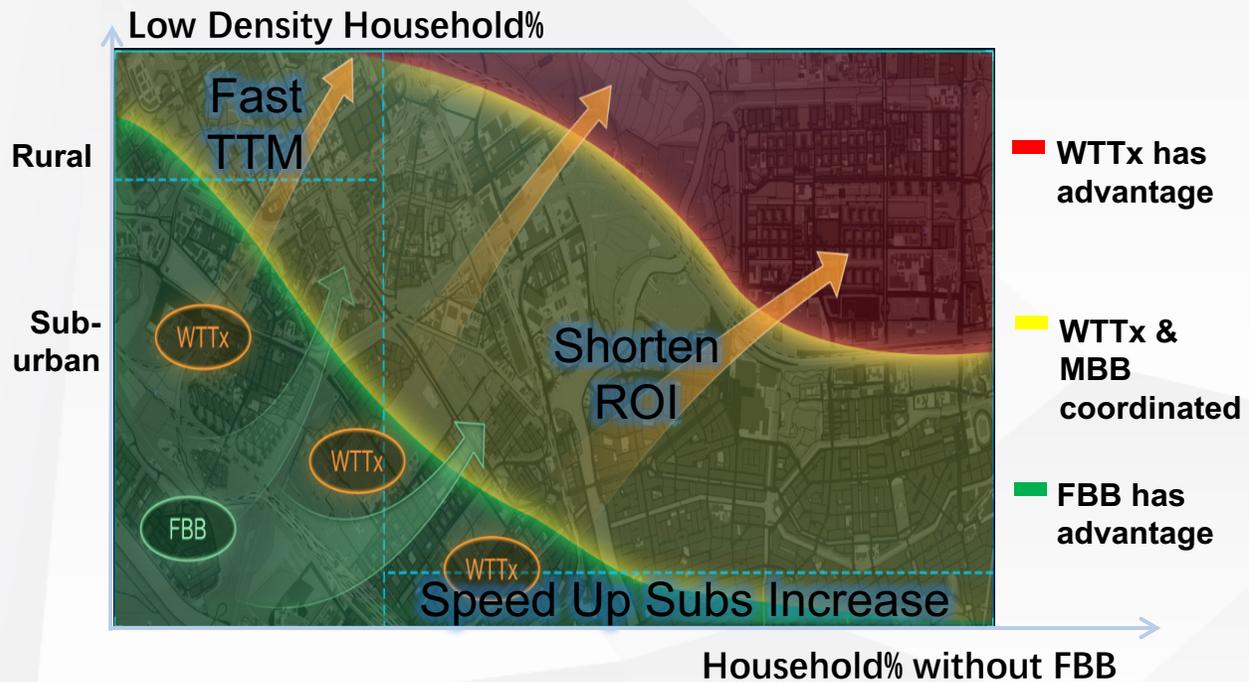


2016~2017Q1

\* Note: based on 2Rx UE

▶ WTTx require lower cost to speed up

## WTTx & FBB Synergy Speeds Up HBB Development



## Recent High Price Auction Discourage Deployment

Thai  
900MHz  
(2016)



Sold at \$2.125 billion  
(slow deployment so far)

India  
700/900MHz  
(2016)



Unsold



# Low + High Bands to balance coverage & per GB cost

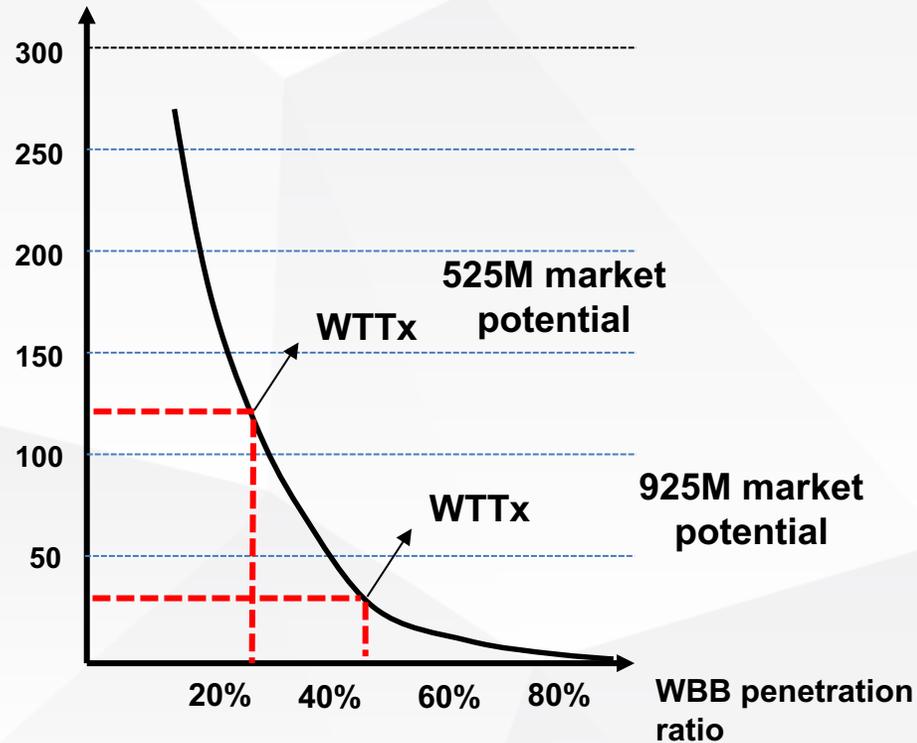
## Reasonable price for spectrum (700M/2.3/2.6/3.5GHz) facilitates to build a healthy ecosystem

The More Carriers, the Lower Per Bit TCO



Assume 800M + 1800M + 2600M + 2600M

Yearly WBB Cost /User (\$)



# 2 Years Return Of Investment

Can GSMA-industry work out some spectrum price design guidelines to prevent overcharge?



# Chipset: 4.5G Features are Becoming Mature



### 2016H2

**MSM  
8976**

SnapDragon652  
DL 2CC CA  
UL 2CC CA  
UDC

**MSM  
8996**

SnapDragon820  
DL 3CC CA  
4\*4 MIMO Single Carrier  
DL 256QAM  
UL 64QAM

**MSM  
8998**

SnapDragon835  
1Gbps  
F+T 4CC CA  
4\*4MIMO + 2CC CA  
LTE-U LAA

3.5G



**Balong  
750**

4\*4 MIMO (TM3/4/9)  
4\*4 MIMO + 2CC CA  
F+T 3CC CA  
UL 2CC CA  
UL 64QAM

3.5G

### 2017H2

**Balong  
765**

1Gbps  
F+T 5CC CA  
256QAM  
LTE-U  
340M~Sub 6GHz

3.5G

**MDM  
9x6x(X20)**

1.2Gbps  
4\*4 MIMO + 3CC CA  
DL 5CC CA  
2018 Launch

3.5G



**Helio  
X20**

Cat6  
DL 2CC CA  
G/U/T/L

**Helio  
X25**

Cat6  
DL 2CC CA  
G/U/T/L

**Helio  
X30**

Cat10  
DL 3CC CA  
G/U/T/L

**XMM  
7480**

Cat10/13  
DL 4CC CA (up to 60MHz)  
UL 2CC CA  
DL 256QAM  
UL 64QAM

3.5G

**XMM  
7560**

1Gbps  
4\*4MIMO  
DL 5CC CA  
UL 3CC CA  
DL 256QAM

3.5G

Cat6/7

Cat9~11

Cat12/13

Cat16

Cat18



Enlarging the global scale help chipset manufactures to release high-performance low-cost chipsets

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## Value proposition: Bridge the digital divide

- No household broadband access for families in rural area and mountain area

## WTTx vs FBB

- **FBB:** Stable performance but huge cost for last Mile and long time to market
- **WBB:** Effective solution for scenario with less user density, high cabling and trenching construction cost

## WTTx with MBB Evolution

- Reuse MBB network, co-site, co-carrier



## Internet + VoIP

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### Basic Revenue of WTTx

- Fiber speed internet access
- Voice Over IP

## Home Entertainment

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### High Value Add-on

- OTT Video / IPTV
- Video broadcasting

## Small/Medium Enterprises

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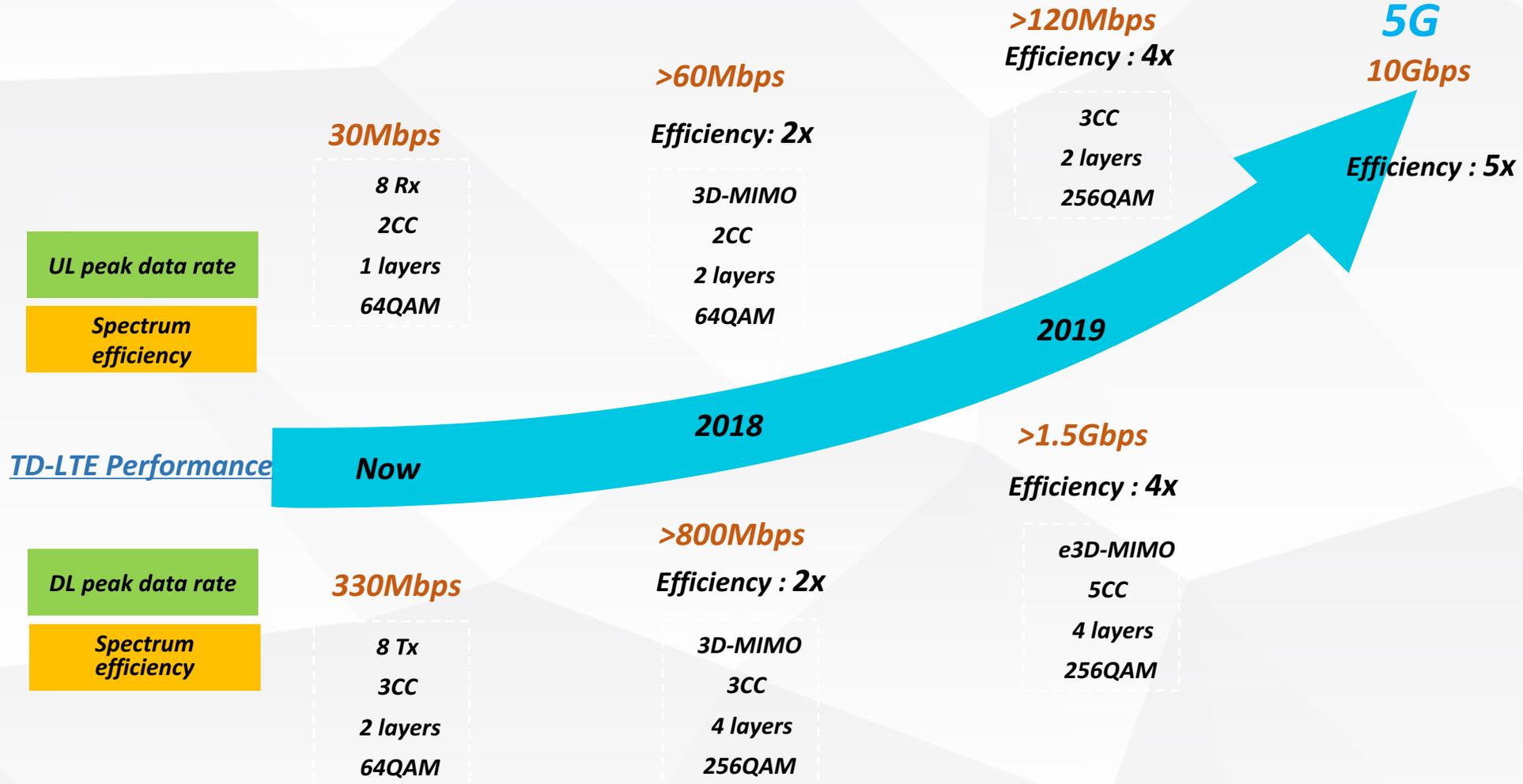


### High APRU Subscribers

- Fiber speed internet access
- Guaranteed QoS
- L2/L3 VPN



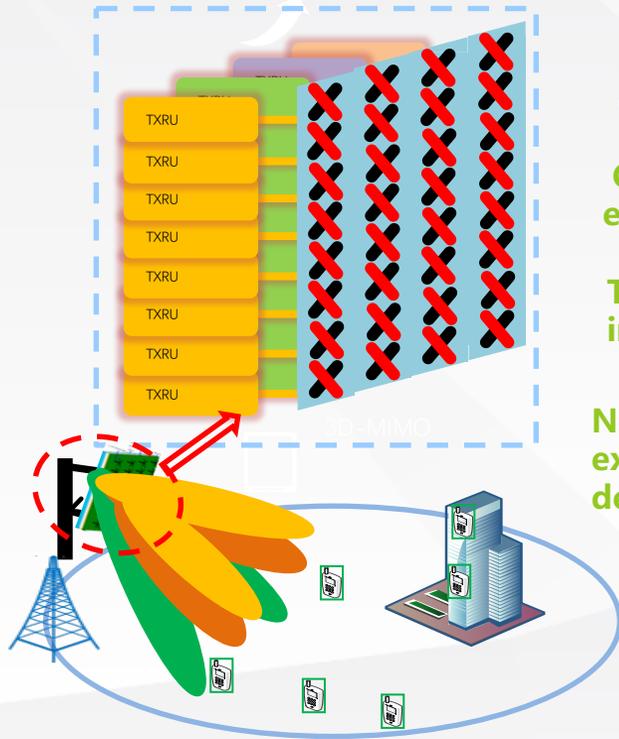
# WTTx : Roadmap for further evolution





## Massive MIMO, Key Technology of 5G in 4G

### Technology Advantages



Facilitate 4G to evolve to 5G

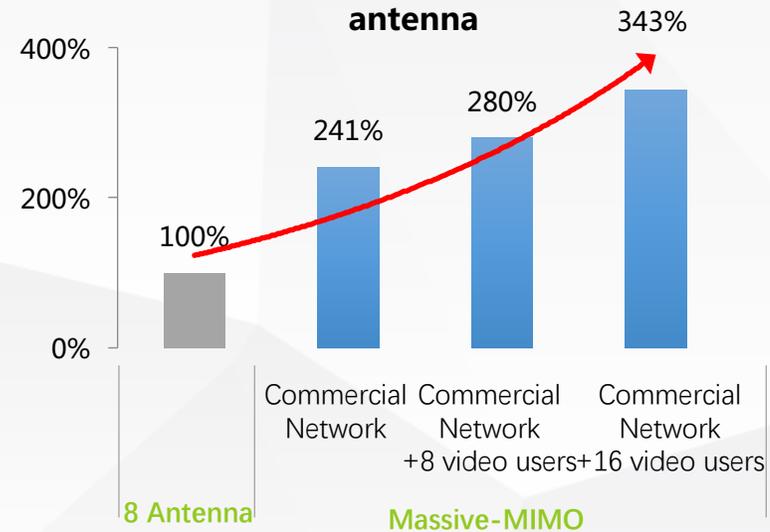
Coverage enhancement

Throughput improvement

No change to existing TD-LTE device

### Tested in commercial network with 50+ BS in biggest cities of China

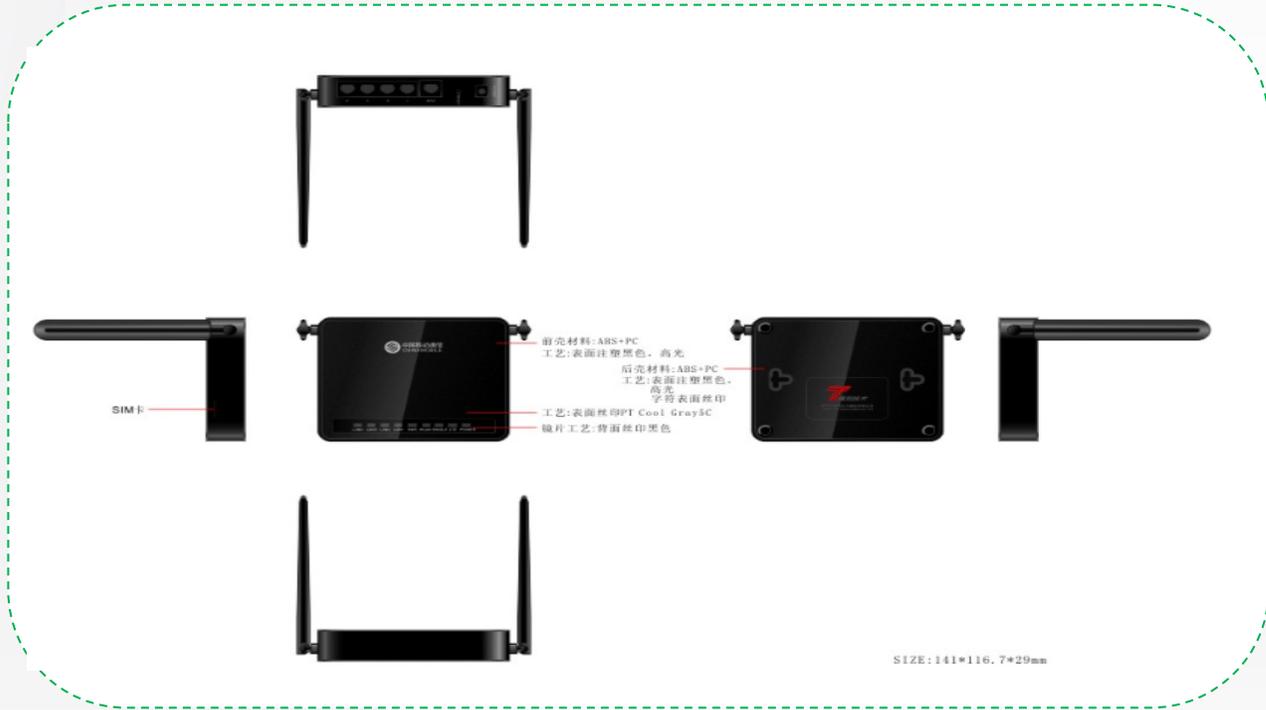
#### Significant gain from Massive-MIMO than 8 antenna





# Indoor CPE portfolio

**CPE deployed in 2016:**  
 Indoor CPE : 700,000  
 Outdoor CPE: 400,000



## Indoor CPE

Parameter	configuration
Memory	Flash 16MByte,DDR 64MByte
WiFi	2.4GHz , 300Mbps
Features	Low power consumption ,SMS, software upgrade remotely or locally
Bands supported	TDD-LTE Band38、 Band39、 Band40、 Band41 FDD-LTE Band1、 Band3 TD-SCDMA Band34、 Band39 GSM Band3、 Band8
User interface	RJ45 Ethernet interface : 4 Wi-Fi interface USIM card interface
Power supply	100V~240V , 50Hz~60Hz



## Outdoor CPE portfolio

### CPE for outdoor



Parameters	Configuration
SIM card	1.8V/3V SIM/USIM card
WiFi	2.4GHz , 2*2 MIMO
Feature	Web based remote management , simple installation, data volume billing, Webpage based SMS
Band supported	TDD-LTE Band38、 Band39、 Band40 FDD-LTE Band3、 Band7、 Band8、 Band17 TD-SCDMA Band34、 Band39 GSM 900/1800M
User interface	RJ45 Ethernet Interface : 4 Wi-Fi interface SIM/USIM card interface
Power supply	100V~240V , 50Hz~60Hz

Thank you