



LEADING NEW ICT

Explore the Way with MulteFire —Huawei eLTE-U Solution

eLTE-U, a MulteFire Pathfinder

LTE: high QoS , but expensive license

✓ **Massively** deployed all over the world

200+
countries

700+
operators

2B+
subscribers

✓ **High QoS** benefit from 3GPP

- Wide coverage
- Seamless mobility
- Massive concurrent users
- Carrier-grade robustness

✗ **High cost** to get licensed spectrum

WiFi: easily obtain, but low QoS

✓ **Enough spectrum** with no charge

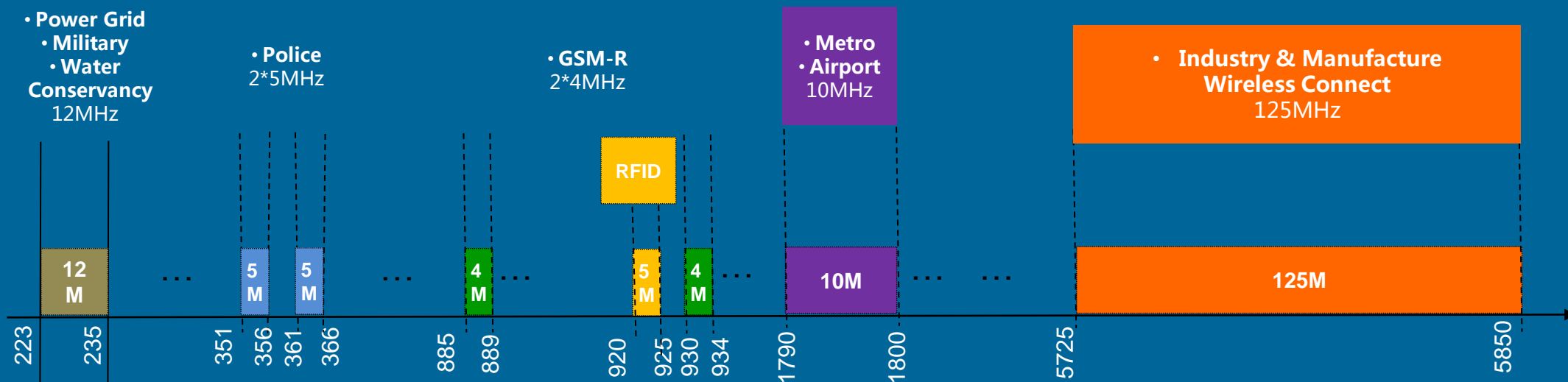


✓ **Simplified topology, easy deployment**

✗ **Low QoS, low security**

➤ **LTE-like QoS + WiFi-like simplicity**

125MHz Spectrum @5.8G in China



China 5.8GHz Technical Requirements

- Frequency Span: 5725~5850MHz
- EIRP: 25mw(SRD),2W(other)
- Spectral Density: 19dBm/MHz
- Emission:
 - -36dBm/100k@30~1000MHz
 - -54dBm/100k@76~118MHz,167~223MHz,470~798MHz
 - -40dBm/MHz@2400-2483.5MHz,5150-5350MHz
 - -33dBm/100kHz@5470-5850MHz

- China assigned lots of industrial spectrum, but most case not enough to broadband services.
- 5.8G band has rich spectrum, up to 125MHz.
- More industry customers expecting broadband services based on 5.8GHz.

eLTE-U Key Advantages (Inherit from MF)



Anti-blockage

Better coverage

- SINR improved with MRC(Maximal Ratio Combining) for multi-path signals
- Throughput increased with HARQ
- 10 dB higher receive sensitivity



Anti-interference

No broken even Encounter co-channel interference (CCI)

- 180KHz granularity interference detection and avoidance
- Advanced receiver with IRC



High efficiency

Up to 95% transmission efficiency

- Can simultaneously transmit control and data plane in one slot
- 20% higher than others



TCO saving

Up to 50% saved per site

- 2 sectors with 1 AirNode/AirEdge
- 3 sectors with 2 AirNode/AirEdge



More security

Carrier-grade E2E security

- Bi-directional authentication and encryption



More users

More concurrent users

- Schedule both in spectrum and time domain by OFDMA
- Stable system performance



High speed mobility

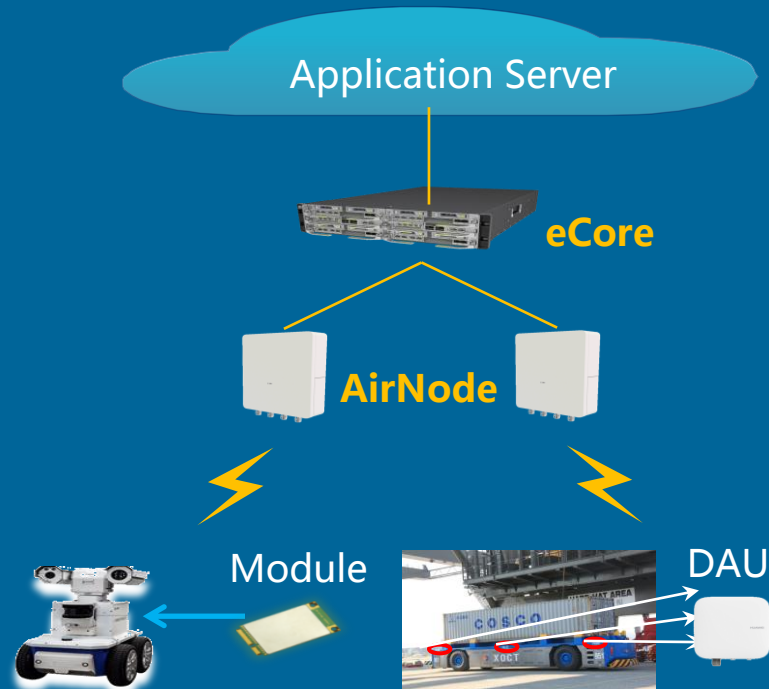
Up to 160km/h supported

- AFC (automatic frequency control)
- Handover method

Flexible Networking of eLTE-U

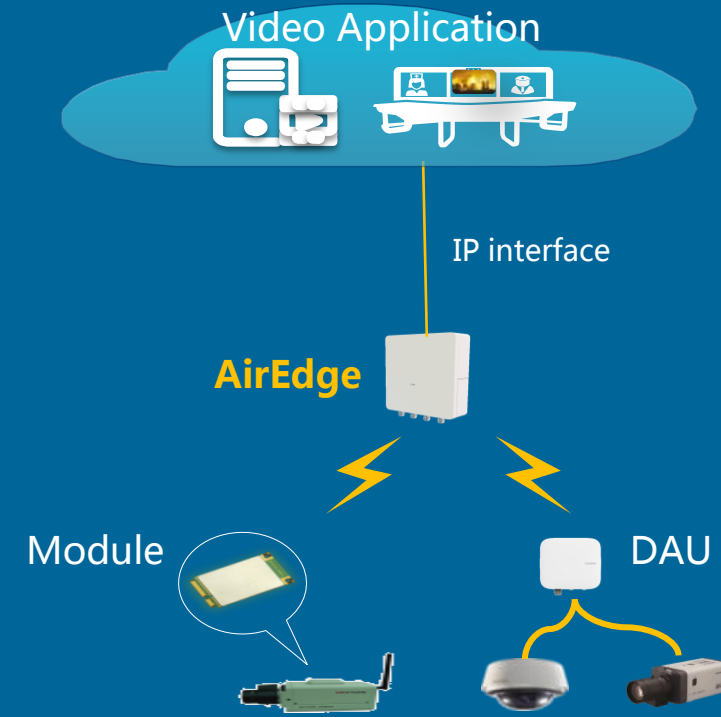
3GPP Networking

- Supports inter-cell handover
- 9-level QoS control
- For wISP and industrial parks, etc



Fat-AP-like Networking

- Huawei Innovation
- Low cost and easier deployment
- For the backhaul of fixed video surveillance



Various Industrial eLTE-U Terminals from Partners

Barcode Scanner Gun

Barcode scanner gun with eLTE-U inside

- OS: Windows Embedded, Windows CE
- Protection class: IP67
- Operating temperature: -20°C to $+50^{\circ}\text{C}$
- Dimensions: 182mm x 83mm x 42mm
- Battery life: ~ 5 hours in use

eLTE-U Mini-PCIE inside



Business card like Wireless Router

5.8GHz eLTE-U wireless router

- Small size: 103mmx80mmx43mm
- 1x10M/100M/1000M RJ45 port
- Input: DC 12V; optional adapter for 110/220V to DC 12V
- Indoor deployment: in the cabinet or on the office desk



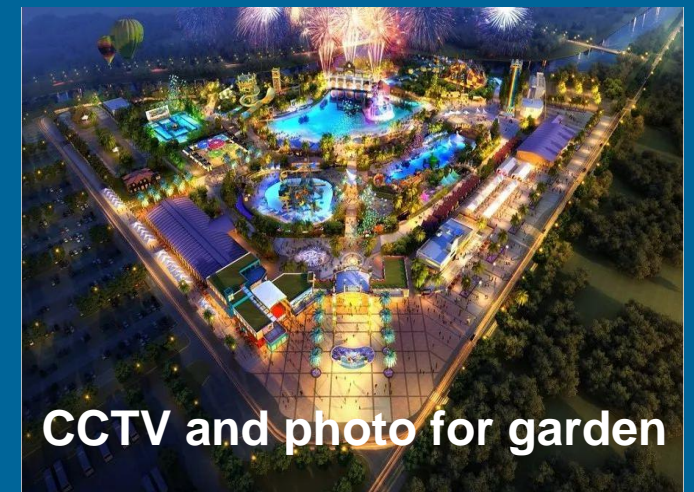
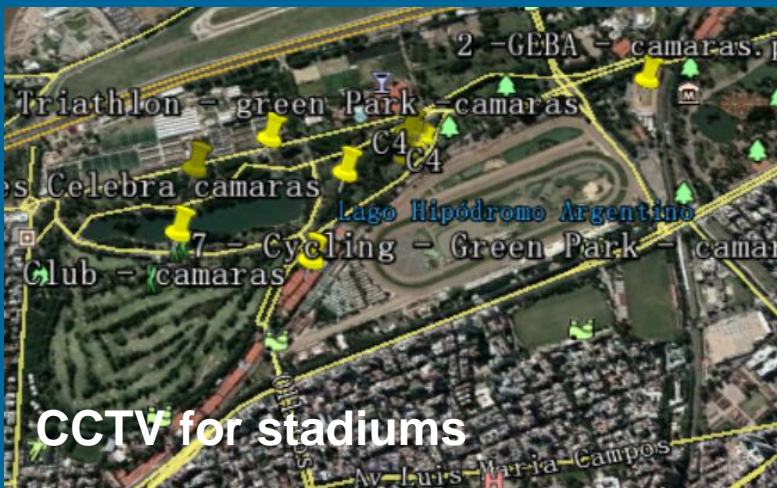
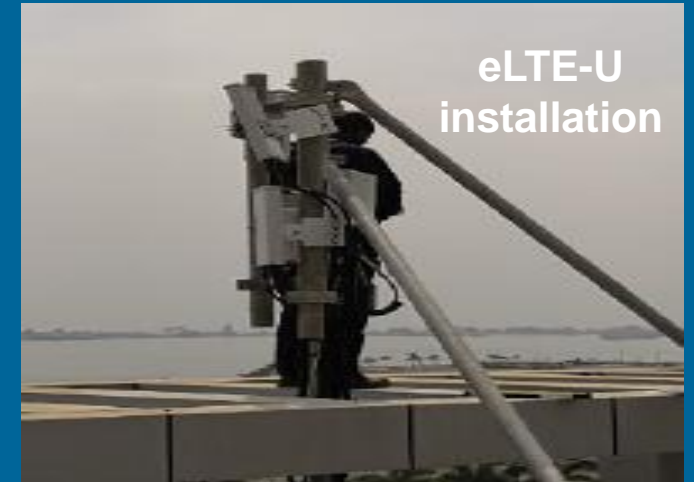
Business-card-like
DAU for the robot



Use Cases of eLTE-U

eLTE-U As Backhaul of	Video surveillance	AGV	Data	Wi-Fi	Bar Code Gun
Safe City	√				
Metro	√		√	√	
Port		√			
Warehousing		√			√
Manufacturing	√	√			√
Mining, oilfield	√		√		
Agriculture	√				
Fishery	√		√		
Garden	√			√	
wISP			√	√	
Grid	√		√		

Backhaul for Video Surveillance with eLTE-U



AGV with eLTE-U in Yangshan Port, Biggest in the World

✘ Wi-Fi first, but failed

- Latency > 50 ms (when large number of users)
- Limited connections (~27 AGVs in 200m x 90m area)
- Lack of on-line handover and QoS (~0.1% packet loss)
- Too much equipment (100m per AP)

✓ eLTE-U perfectly act as the savior

- 20ms to 30ms stable latency (LTE scheduling feature)
- All 50 AGVs successfully connected
- Always On-line due to on-line handover

✓ Biggest automated port in the world

70% ↓ Man power reduction

30% ↑ Efficiency improvement

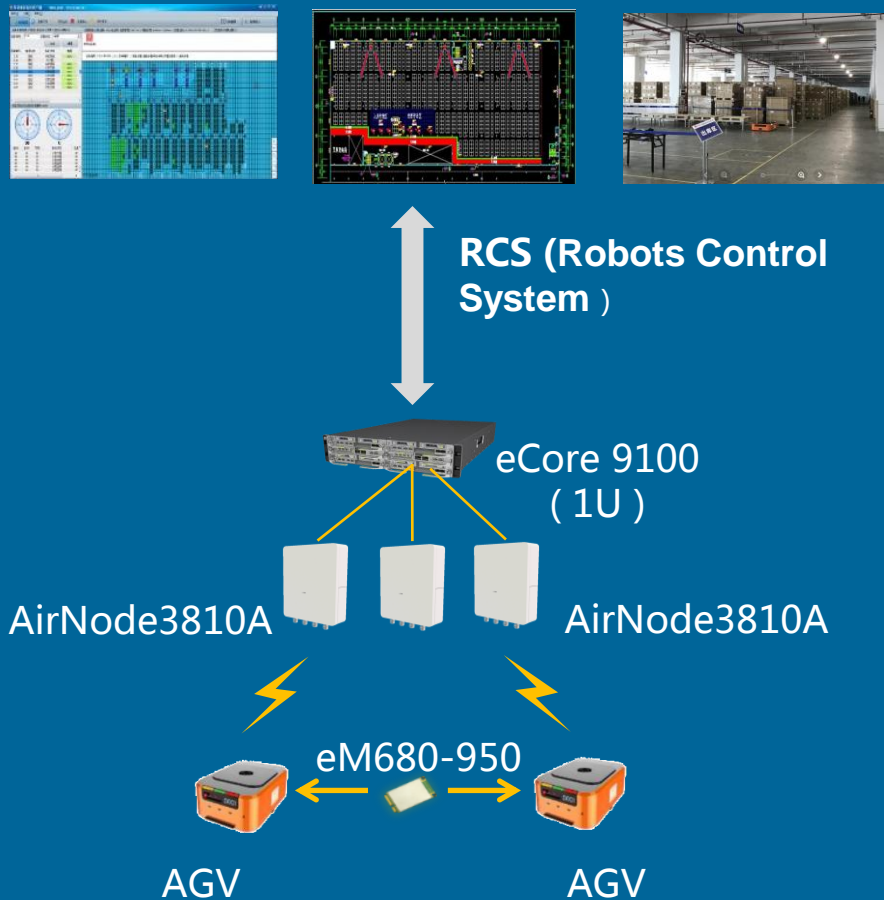


Reported by CCTV and Sohu :

- <http://tv.cctv.com/2017/12/10/VIDEfKDI0ZTQRReFVzti2Mu8V171210.shtml>
- http://www.sohu.com/a/209578241_391452

AGV Robots with eLTE-U in Warehouse Logistic Center

AGV Robots with eLTE-U Inside



Key value from eLTE-U

- **Zero disconnection = zero manual intervention**
 - short time delay
 - Good mobility with handover method
Wi-Fi don' t support handover ON-line.
- **10 times Wider coverage**
 - One AirNode module support 2 physical sectors with 2 directional antennas.
 - 10dB higher sensitivity
 - only 3 eLTE-U sites cover the same area of 32 WiFi sites.
- **Easy deployment**
 - AirNode is installed on the wall
 - The terminals, mini-PCie of eM680-950, are integrated in AGV.

Business Forecast: \$9 Billion Market Space in 3~5 Years

Smart factory \$3B



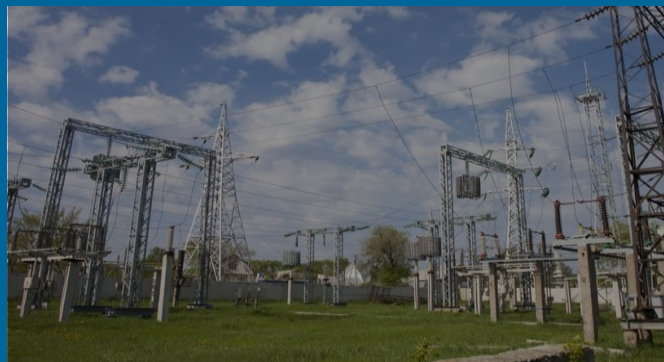
CCTV \$3B



Smart Port \$0.5B



Smart Grid \$1B



Smart Port \$0.5B



Transportation \$0.8B





THANK YOU

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