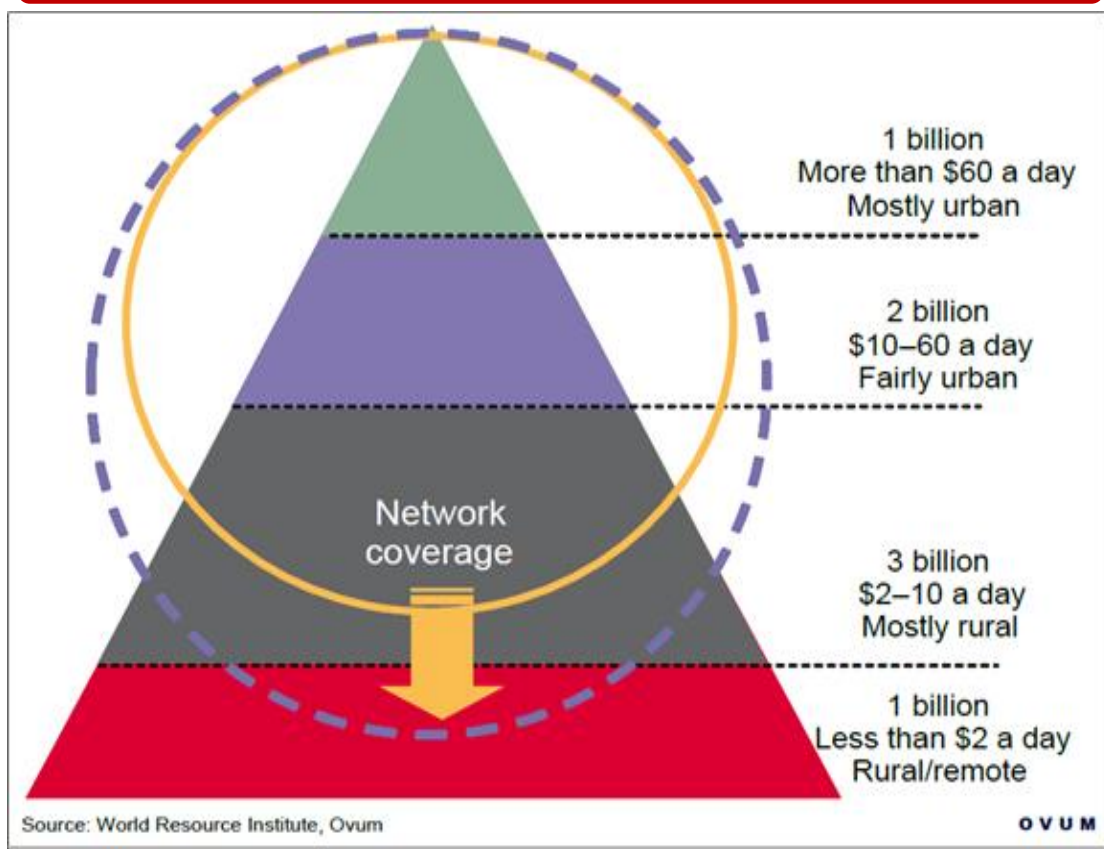


Extending MBB Service to Rural Area



Huge Potential Market in Rural Broadband

The next billion in the global socioeconomic pyramid



Government Continue invest on Bridge the Digital Divide for Rural



Rural Economic and Life Condition Improved by Wireless Broadband



Connect 1 billion people in rural with the city, improve the telecom infrastructure is the best way to develop rural economic
Low population density and hard deploy condition require low cost solution

Challenges for USF Deployment

Tunisia requirement for USF

- Provide basic communication services
- Deploy Public Communication centers
- Provide internet access with minimum speed of 128Kbps

Operator's Challenges

- Spread populated , low ARPU
- No electricity/high-cost electricity
- Difficult transmission
- Difficult deployment, high-cost maintenance
- Risks of theft or vandalism

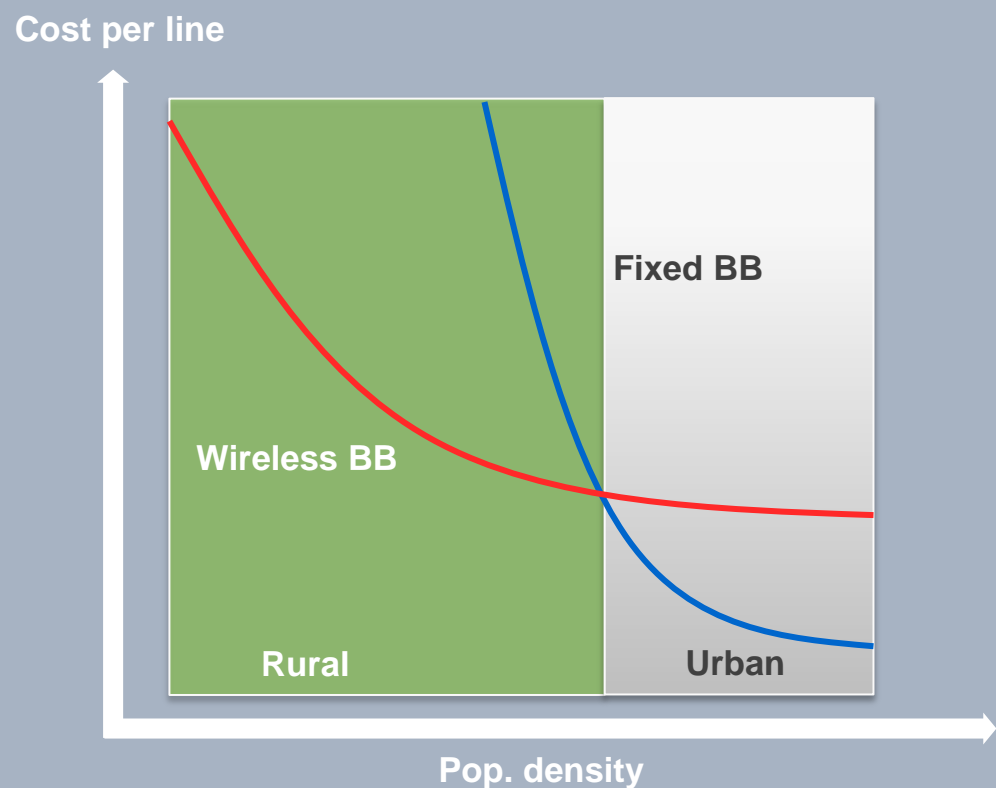
Solution Considerations

- Technology choice to fulfill the best coverage with required capacity.
- Network/RAN sharing for cost saving
- Site solution for fast deployment and cost saving
- Transmission solution to connect remote sites

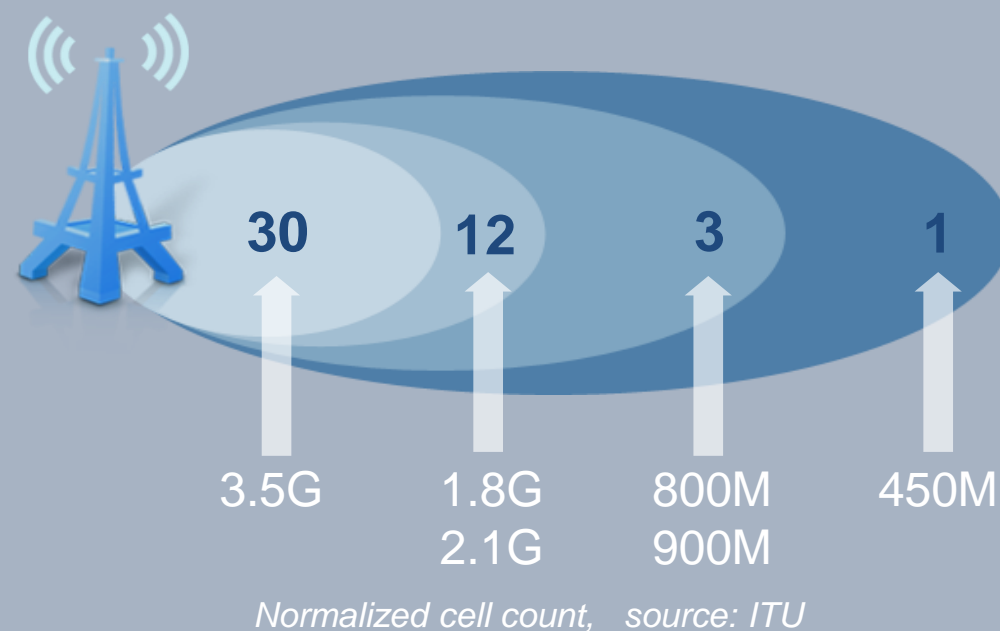


Wireless is the best option ... Which frequency to use?

Wireless BB has Lower Cost in Rural Areas



Coverage comparizon by frequency



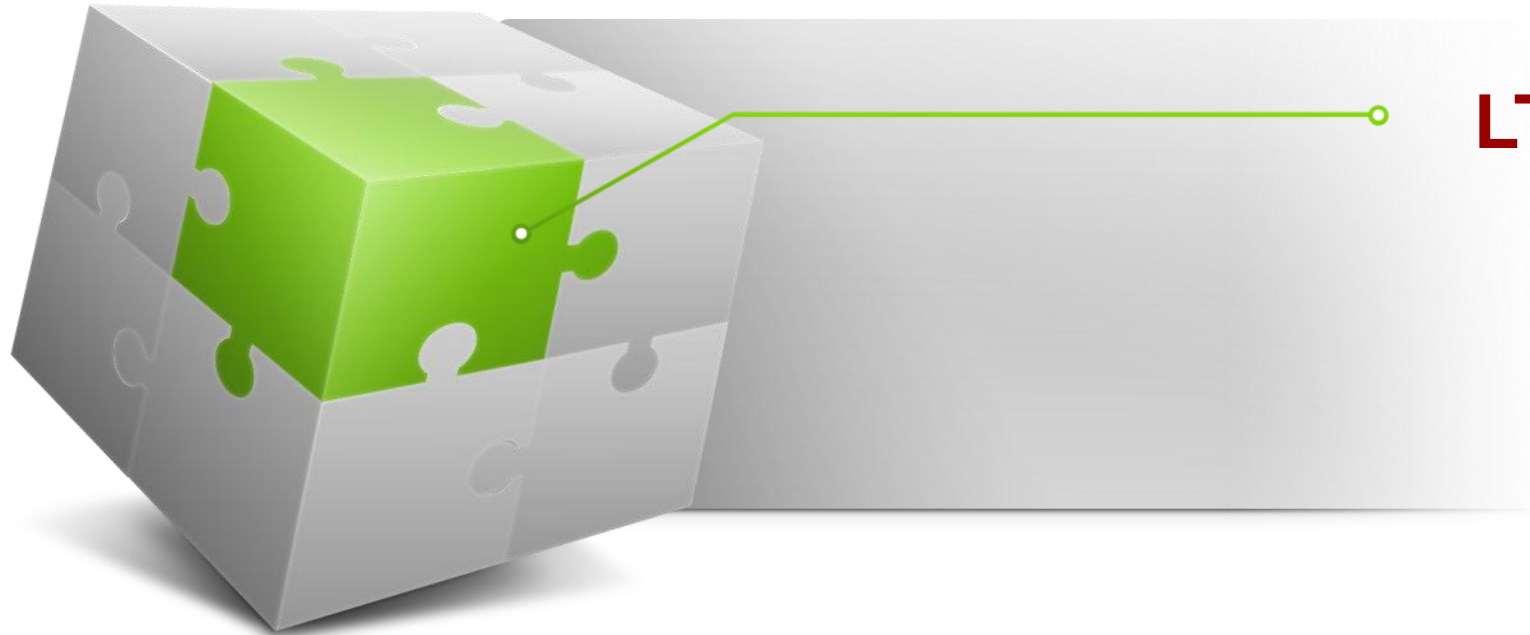
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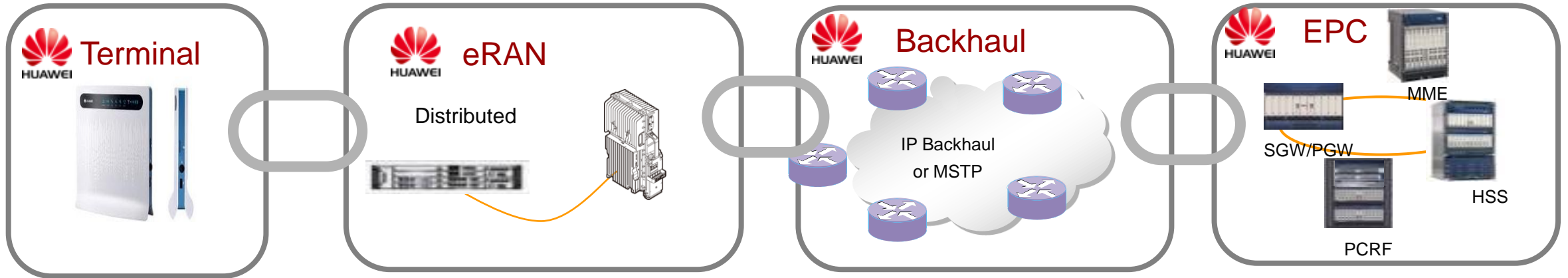
3 Site Solution

Wireless Technology Choice



LTE-450

LTE 450 E2E Solution Ready for Launch



CPE B593

- LTE Cat 3: 5M BW
- Data service, LTE DL 2*2 MIMO
- 2 RJ11 VOIP interface;
- Support WEP/WPA/WPA2

eNodeB

- **BBU:** 19 inches standard size/2 U high
- **RRU:** 1T2R/2T4R/2T2R
 - 1TxR: 1*40 w
 - 2TxR: 2*20 w
 - Volume(1T2R): 485*285*200 mm

Single Backhaul

- All packet IP backhaul
- Single Backhaul for 2G/3G/LTE

SingleEPC

- **Control Plane:** ACTA Platform; Integrate MME,HSS,PCRF
- **Data Plane:** PGP Platform; Integrate S/P-GW

UKKO 1st Commercial LTE 450M launch



Ukkomobile

UKKOMOBILE
LTE 4G

KATTA
99,9%
SUOMALAISISTA

450 MHz

SUOMEN KATTAVIN
MOBIILIDATAVERKKO

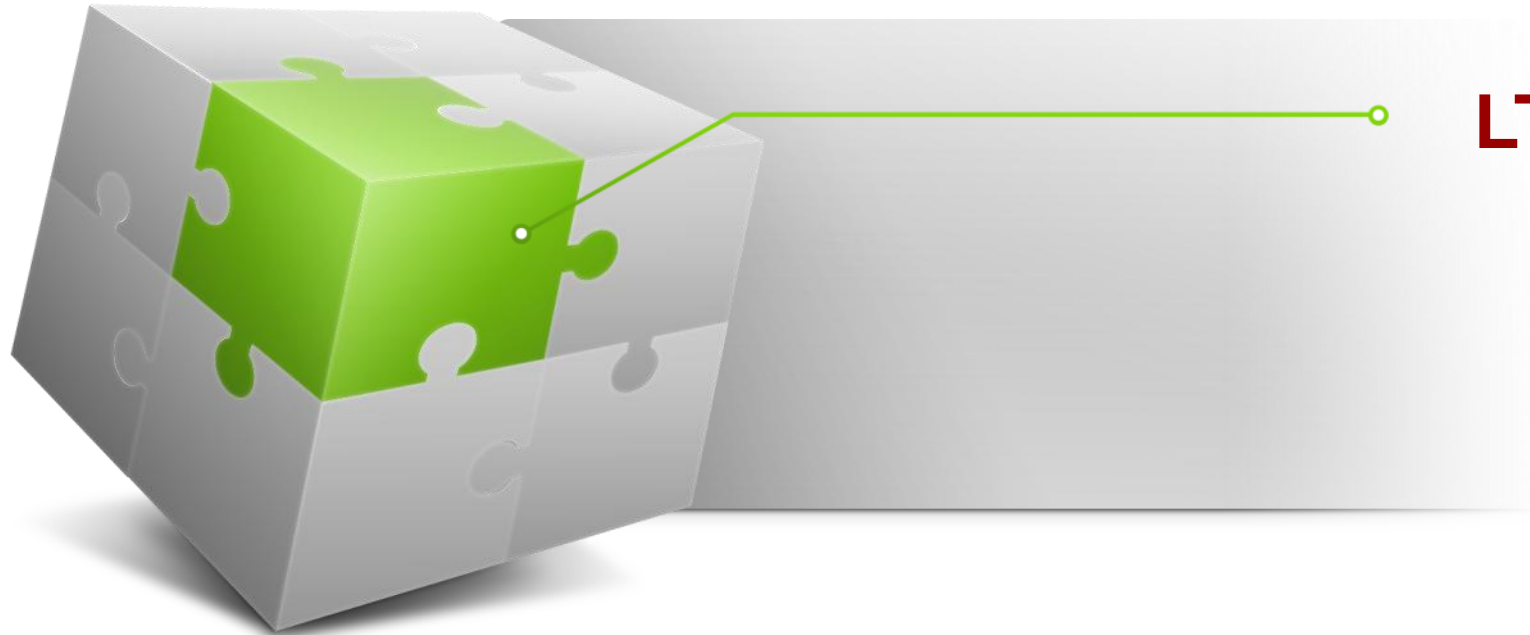
Yrityksille
Viranomaisille
Vaativille
loppukäyttäjille



- **Commercial launch** on 17th, Nov, 2014
- **2xx sites** cover 99.9% Finish population
- World's 1st Commercial LTE450M network

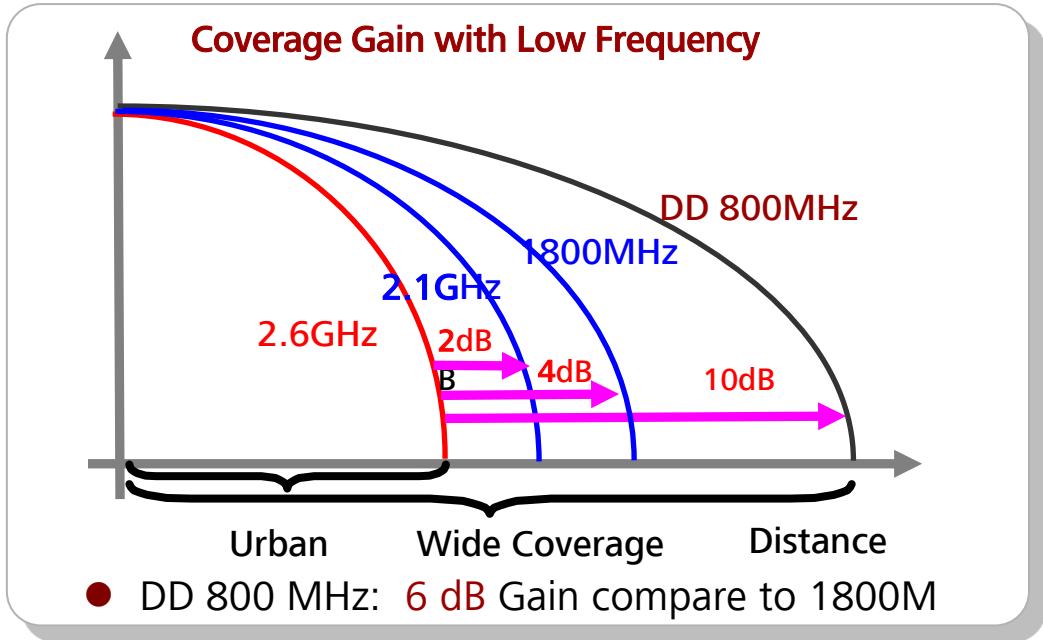
- Wireless broadband for whole country
- Backhaul of WiFi for train and bus
- Public security network (future)

Wireless Technology Choice



LTE-DD800

DD800 Has Great Coverage Gain Compare to High Band



Commercial LTE 800(Band20) devices, announced by 35 vendors, Huawei is far ahead

Devices shown include:

- Huawei (33 Devices)
- iPhone 5s(New) Nokia(7 Devices)
- Samsung(18 Devices)
- HTC(5 Device)
- LG (6 Devices)

DD 800MHz is suitable for nationwide coverage especially rural coverage thanks to its propagation attribute. In addition, terminal ecosystem is mature.

Germany Vodafone, First DD800 LTE commercial network in The World

2010, Huawei worked with VDF launched DD800 network with LTE voice and data service.

Background:

- 2.7M families in Germany have no wideband access or access speed less than 1Mbps, government is pushing the commercialize of digital dividend 800M
- The winners must first use the spectrum to provide service in rural areas

Strategy:

Phase 1:Rural Coverage

- Fixed-mobile access users in rural areas where broadband access is poor
- 800MHz coverage
- Cheap device, cheap package
- Data card, CPE only (VOIP service provided)

Phase 2:Major Cites

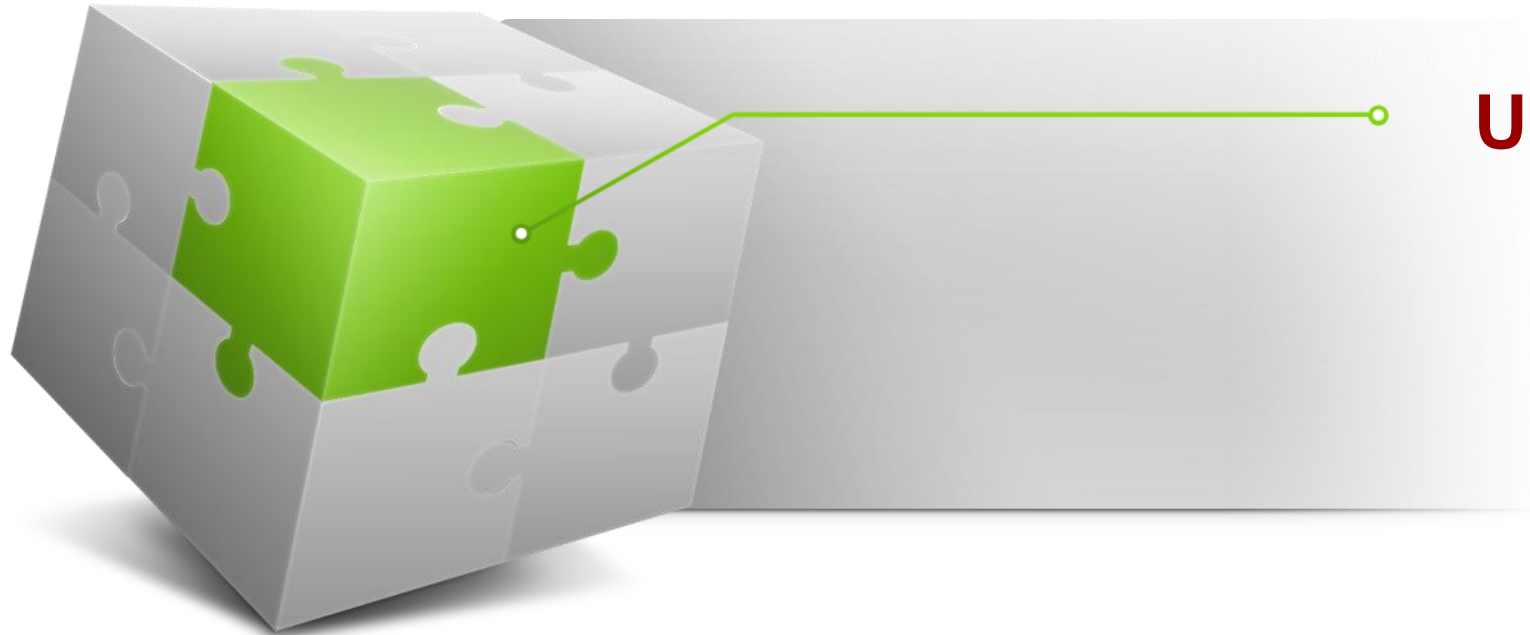
- Urban area, provide LTE broadband service to replace DSL
- 800MHz coverage, 2.6GHz to increase capacity
- Excellent QoE
- Data card, CPE only

Phase 3:Hotspot In Dense Urban

- 2.6GHz in hot spot
- Excellent QoE in hotspot
- Data card, CPE , Smart phone, tablet

	Voice	Data	Service fee
Internet 3600	2 cents / min	•Up to 3.6 Mbps •5 GB volume	€ 19.99/month
Internet 7200	2 cents / min	Up to 7.2 Mbps 10 GB volume	€ 29.99/month
Internet 21600	2 cents / min	Up to 21.6 Mbps 15 GB volume	€ 39.99/month
Internet 50000	cents / min	Up to 50 Mbps 30 GB volume	€ 59.99/month
Telephone & Internet XX	Flatrate5	Same to Internet XX service	+€ 10

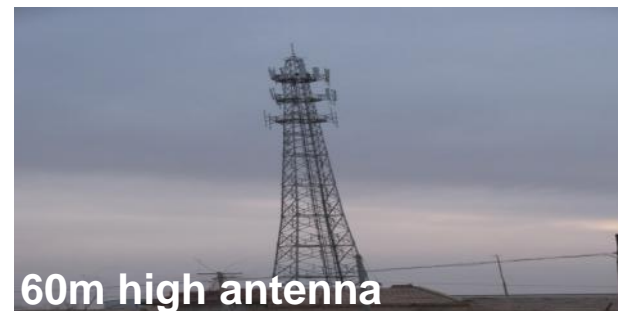
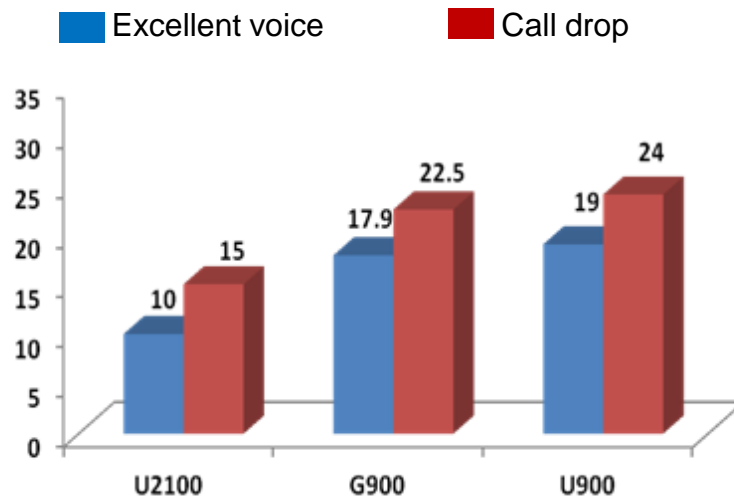
Wireless Technology Choice



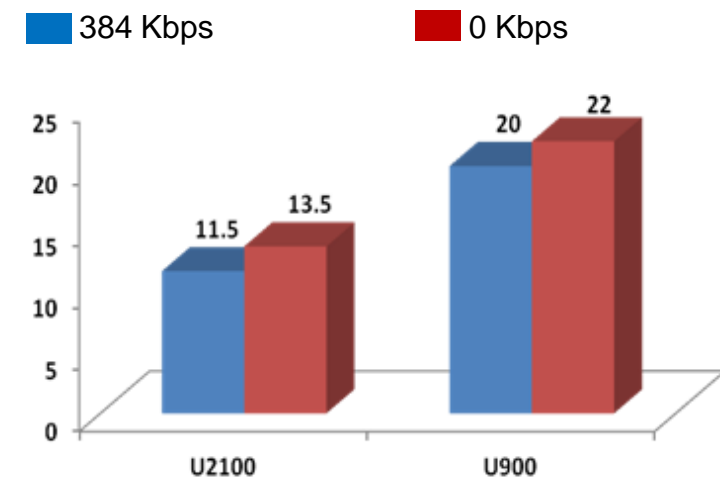
UMTS-900

Wide Coverage Capability Test in Rural Area

Voice service coverage test (Km)



HSDPA service coverage test (Km)



Excellent voice:

Cover distance of U900 is 1.9 times of U2100

Call drop:

Cover distance of U900 is 1.6 times of U2100

HSDPA 384Kbps:

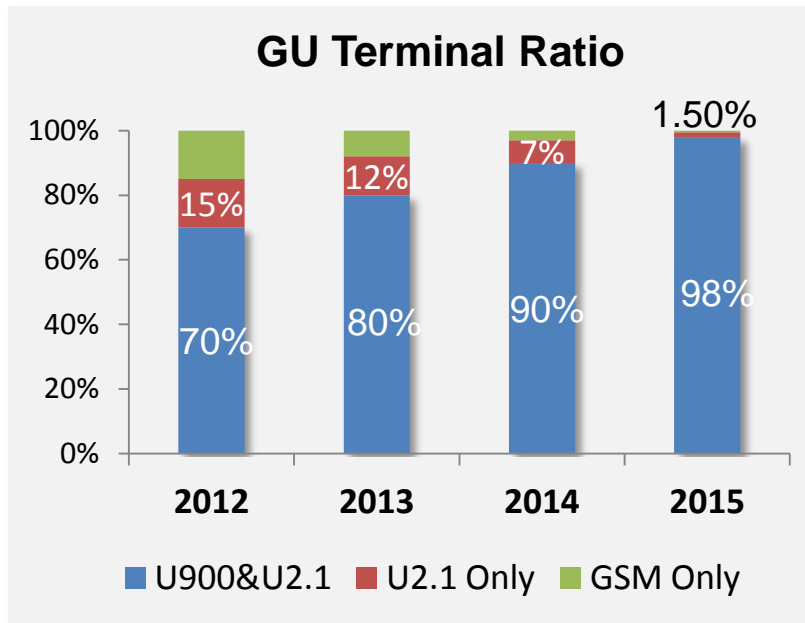
Cover distance of U900 is 1.7 times of U2100

HSDPA 0Kbps:

Cover distance of U900 is 1.6 times of U2100

U900 Industry Chain is Mature, all Popular UEs can Support U900

1500~2000 U900 Terminals



Source: GSA Estimate, 2014 Oct.

Apple

iPhone 6/Plus iPhone 5/5s iPad (mini)



Huawei

P7 Mate7



Samsung Galaxy

i9220 7100/7101



Blackberry

9380 9700



HTC

One X One S 8 S



All star terminals support U900 & U2100

Technologies comparaison

	LTE-450	LTE-DD800	UMTS-900
Coverage	20Km	13Km	12Km
Available spectrum	5MHz	30MHz	35MHz
Ecosystem	**	***	*****
Terminal availability in Tunisia	N/A	*	***
Max speed per cell	40Mbps	150Mbps	21Mbps
Interference risks	Low	High	Low

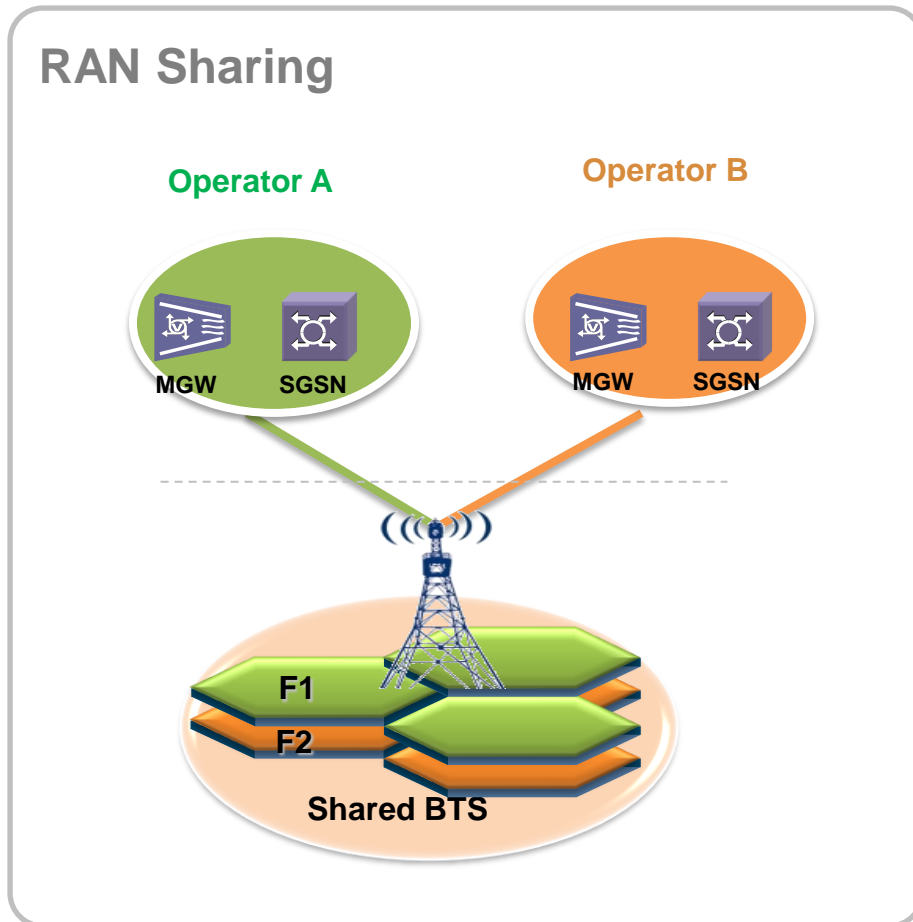
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2 **RAN Sharing**

3 **Site Solution**

RAN Sharing: Helps Operators to Implement National wide Coverage



- RAN sharing is an advanced network sharing solution.
- Not only allows reusing site auxiliary equipments, but also to share the whole wireless access equipment.
- It is an effective way to share the costs between operators to cover the rural areas.

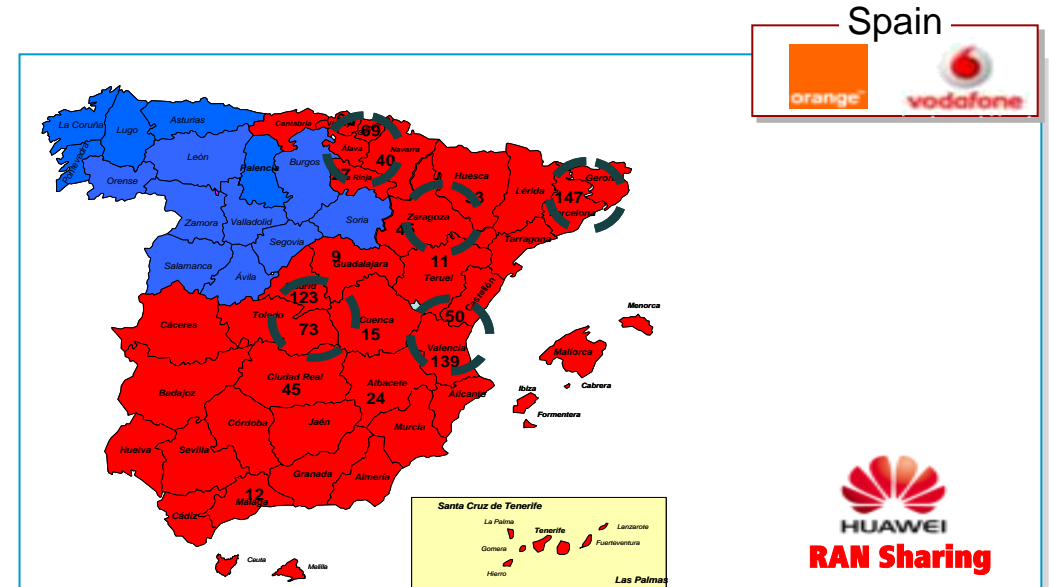
Vodafone Spain- Dedicated Carrier solution

Brief Introduction

- Need to Provide 70% coverage within time claimed and balance TCO savings and expanded coverage with inevitable loss of independence
- Share their Networks in towns between 1,000 and 25,000 inhabitants based on Dedicated Carrier solution.
- Each operator is in charge of managing its own traffic and quality of service.
- In October 2007, 1,000 node B has been shared. And 5,000 NodeB will be shared (2,500 per Operator) in the next 4 years.

Benefits

- Reduce 40% sites, Reduce 40% CAPEX ; Increase 25% coverage.
- Vodafone launch HSDPA/HSUPA services
- User experience improved



Business Mode

- VDF deploy its Network and share with Orange.
- Standard common procedures have been defined between OR and VF: Migrations, lu and cell integrations, etc.

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Making Offgrid Sites Possible

Solar hybrid for off grid or poor grid, peak sun hour > 3 hours. Solar is the main power source.

S1: Pure Solar



- Low power
- 'Zero' OPEX
- Green energy

S2: Solar & Diesel



- Medium & large power
- Best price/performance
- Smooth evolution from diesel to solar

S3: Solar & Grid (Diesel)



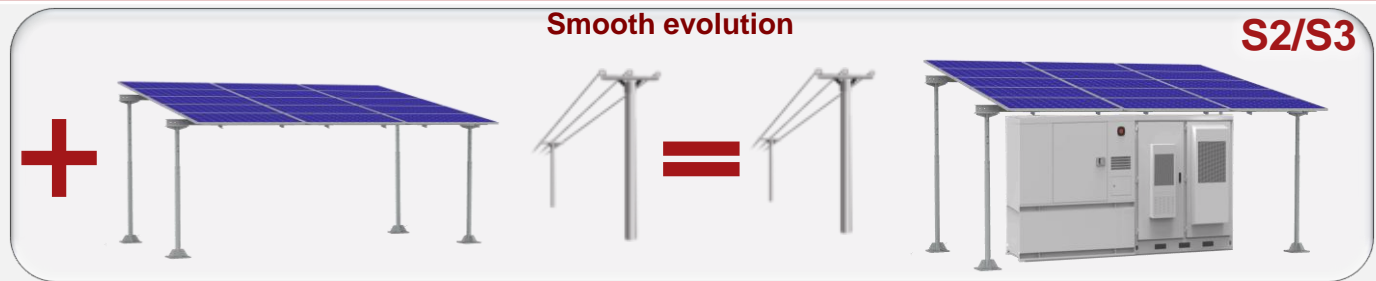
- Poor grid: Solar complements grid
- Good grid: Solar is priority

Diesel hybrid for off grid or poor grid. Diesel is the main power source.

D1: Diesel & ESS



- 40~60% fuel saving & 90% maintenance costs saving
- 75% footprint saving & fast deployment



Grid hybrid for poor grid(Class II, Class III, Class IV grid). Grid is the main power source.

G2: Advanced Fast Charging



Energy storage:

- Full charging < 2hrs
- 4~5yrs lifespan

Advanced lithium energy storage control tech.

- Removing D.G. or 'Zero' D.G. running time

G3: Enhanced Fast Charging



Energy storage

- Full charging < 3hrs
- 4~5yrs lifespan

Advanced Hybrid energy storage control tech.

G4: Standard Fast Charging



Energy storage

- Full charging < 4hrs
- 3~4yrs lifespan

Advanced lead-acid energy storage control tech.

- Smooth evolution to solar hybrid system

G4Mini: Mini-Standard Fast Charging



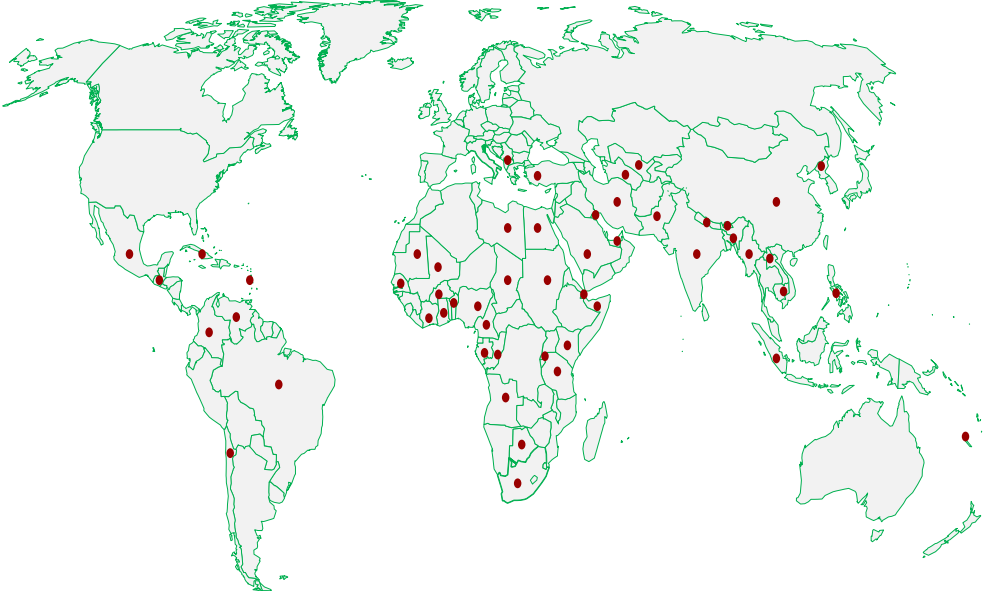
Energy storage:

- Full charging < 4hrs
- 2yrs lifespan

Advanced lead-acid energy storage control tech.

Huawei Hybrid Power Global Application

80 countries, 115 operators , 24,000 sets



- 130+** service branches spread all over the world
- 1100+** professional partners
- 7 x 24** hours service
- Localized service close to customers**





Thank you

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