

**LTE Technology and Rural Broadband**  
Verizon / NCC Meeting



**Patrick Welsh**  
**Assistant Vice President, Wireless Policy Development**  
**Verizon Communications**

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**Presentation Outline**

- **US Mobile Marketplace and Current Spectrum Allocations**
- **4G LTE Performance Capabilities**
- **Verizon 4G LTE Deployment Experience**
- **Innovation and Socio-Economic Benefits of 4G LTE Technology**
- **4G LTE Rural Applications**
- **Questions & Answers**



# U.S. Mobile Broadband Marketplace

## Mobile Broadband Technologies

## Spectrum Assets

Sprint

CDMA 1xEV-DO (Rev 0 | Rev A)  
802.16 WiMAX  
LTE

1.9 GHz PCS  
2.5 GHz BRS/EBS \*  
800 MHz SMR

Verizon Wireless

CDMA 1xEV-DO (Rev 0 | Rev A)  
LTE

700 MHz  
850 MHz Cellular  
1.9 GHz PCS  
1.7 / 2.1 GHz AWS

T-Mobile

802.11 WiFi  
HSPA  
HSPA+  
LTE (1H 2013)

1.9 GHz PCS  
1.7 / 2.1 GHz AWS

AT&T

802.11 WiFi  
HSPA  
HSPA+  
LTE

700 MHz  
850 MHz Cellular  
1.9 GHz PCS  
1.7 / 2.1 GHz AWS  
2.3 GHz WCS

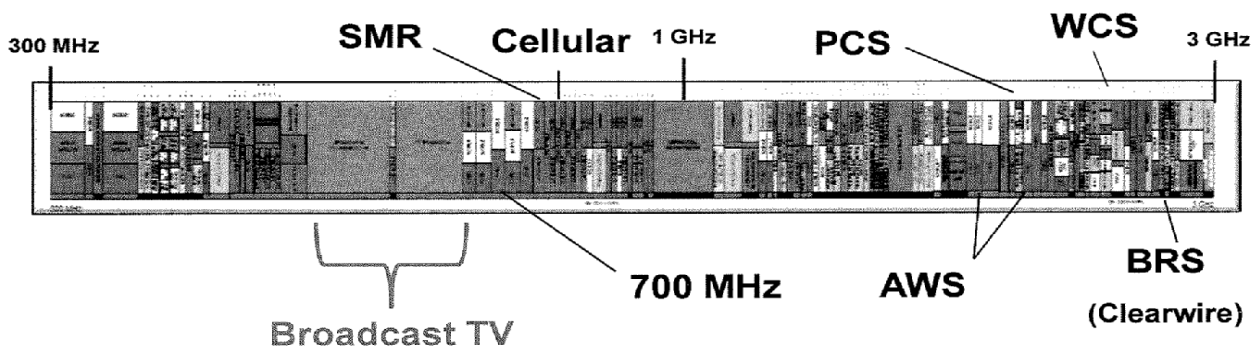
Competition has led to aggressive deployment of mobile broadband and significant capital investment.

\* through partnership with Clearwire

3



# Current Mobile Broadband Spectrum Allocations



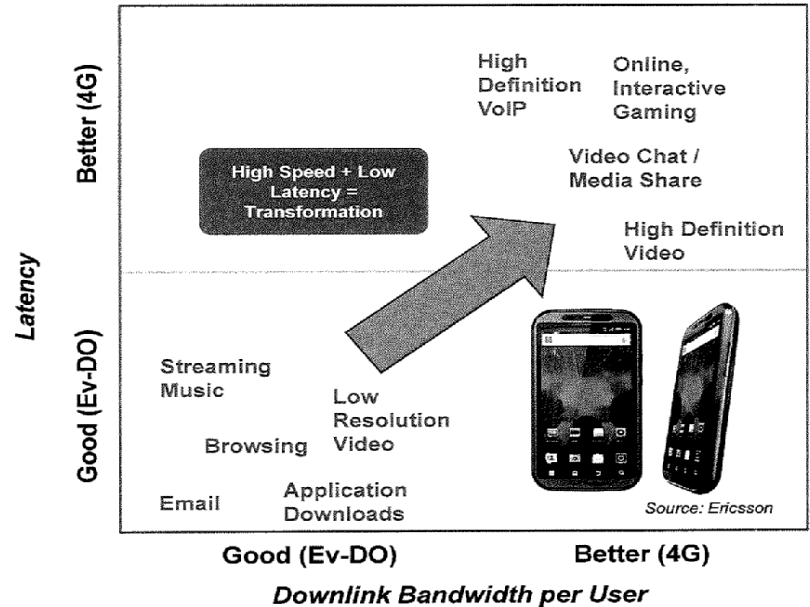
- Cellular – 850 MHz (1983)
- SMR – 800 MHz (1994)
- PCS – 1.9 GHz (1996)
- BRS – 2.5-2.6 GHz (2000)
- AWS – 1.7/2.1 GHz (2006)
- 700 MHz (2008)
- Broadcast spectrum (2014?)

4



# 4G LTE Technology Evolution and Performance Capabilities

- **Downlink and uplink performance:** 5 – 12 Mbps DL and 2 – 5 Mbps UL.
- **Low latency and jitter:** Allows real time communication and interaction.
- **All-IP:** LTE + IP Multimedia Subsystem facilitates the development of converged applications and simultaneous voice and data.
- **High spectral efficiency:** Permits more users in a constrained amount of spectrum.
- **Always on:** Continuous packet connectivity allows 4G devices to efficiently maintain sessions – avoids delays incurred for session set-up.



**LTE's global adoption will drive scale and simplify roaming**

5



# Global 4G LTE Deployment

**Leadership**



**Early Adoption**



**Global**

**300+ Carriers in:**

- |           |             |              |
|-----------|-------------|--------------|
| Argentina | Germany     | Portugal     |
| Armenia   | Hong Kong   | Puerto Rico  |
| Australia | India       | Saudi Arabia |
| Austria   | Indonesia   | Senegal      |
| Bahrain   | Italy       | Singapore    |
| Belgium   | Japan       | South Africa |
| Brazil    | South Korea | Sri Lanka    |
| Brunei    | Kuwait      | Sweden       |
| Cambodia  | Malaysia    | Taiwan       |
| Canada    | Mexico      | Thailand     |
| Chile     | Namibia     | UAE          |
| China     | Netherlands | UK           |
| Colombia  | New Zealand | Uruguay      |
| Ecuador   | Norway      | USA          |
| Egypt     | Pakistan    | Uzbekistan   |
| Finland   | Paraguay    | Venezuela    |
| France    | Peru        | Vietnam      |
|           | Philippines | .....        |

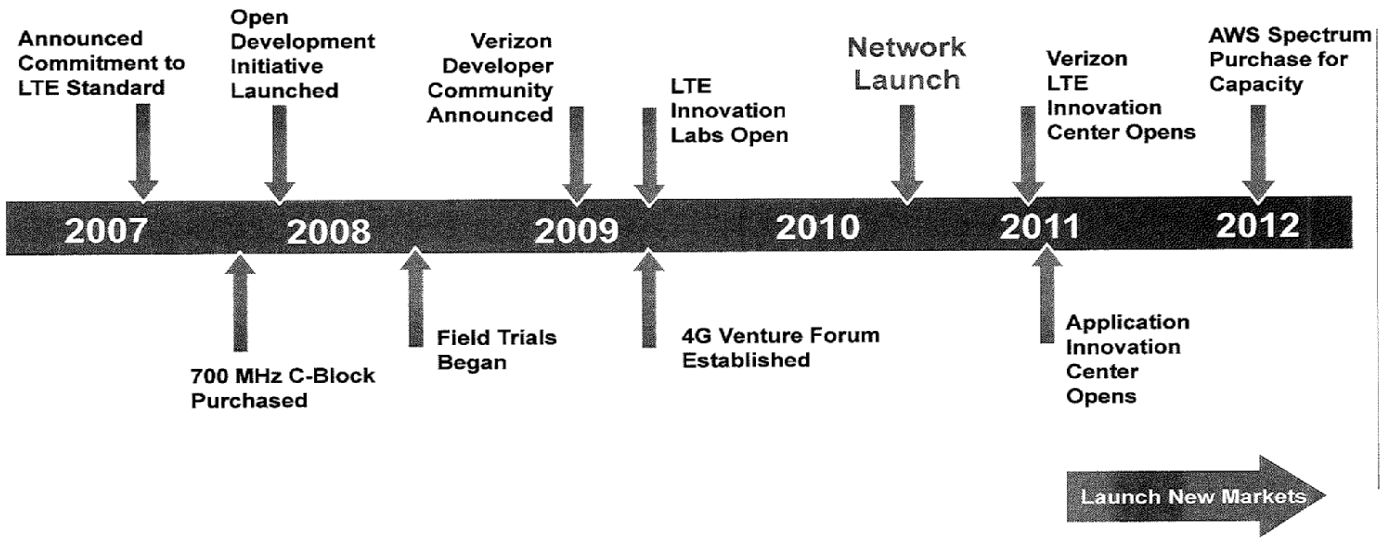
Source: 4GAmericas.org; Oct. 2012

**Verizon: World's 1st large-scale 4G LTE network**

6



## Decision Path to 4G LTE Deployment



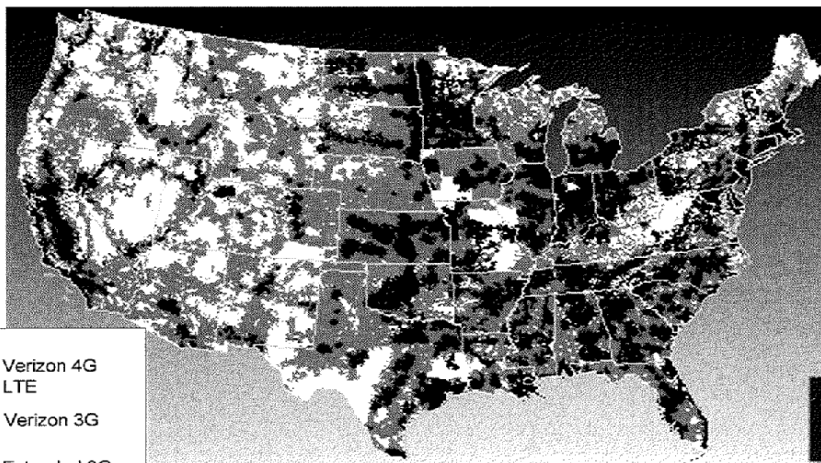
Three years from technology decision to deployment

7



## Verizon LTE Deployment

Verizon Wireless 4G LTE Markets  
Year End 2012: **260m People Covered**



**2010**

4G LTE deployed in 38 markets and 60 major airports, reaching more than 110m people.

**2011**

4G LTE deployed in 190 total markets covering more than 200m people.

**2012**

4G LTE will cover 260m people by the end of the year.

**2013**

4G LTE will cover the entire Verizon 3G footprint, currently more than 290m people.

First large-scale 4G LTE deployment in the world

8



# 4G LTE Ecosystem

Applications & Services

# 4G LTE Ecosystem REAL. HERE. NOW.

Products

- Video
- Music
- Mobile Gaming
- Augmented Reality
- Energy Management
- Advanced Telematics
- New Consumption Models
- Communications & Sharing
- Wireless Home Management
- Mobile Visual Collaboration
- Full Featured Wireless Office
- Collaborative Tele-Healthcare
- Streaming HD Media & Entertainment
- Wireless Video Monitoring & Surveillance

SAMSUNG

MARVELL

Modules & Enablers

LG

ZTE中兴

SIERRA WIRELESS

ERICSSON

QUALCOMM Chipsets

SAMSUNG

HITACHI  
Inspire the Next

GCT

ST ERICSSON

NVIDIA

# 4G LTE

LG

MOTOROLA

INTEL WIRELESS



# Innovation and Socio-Economic Benefits of 4G LTE Technology

**Application Innovation Center**  
(San Francisco, CA)



**LTE Innovation Center**  
(Waltham, MA)

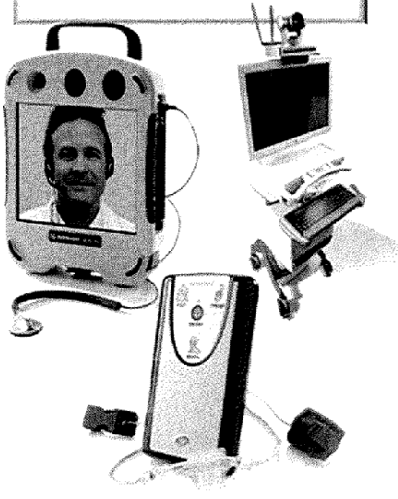
**4G Venture Forum**  
(Basking Ridge, NJ)





## Innovation and Socio-Economic Benefits of 4G LTE Technology

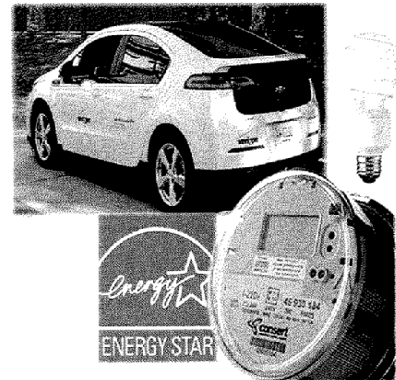
### Healthcare



### Education



### Sustainability

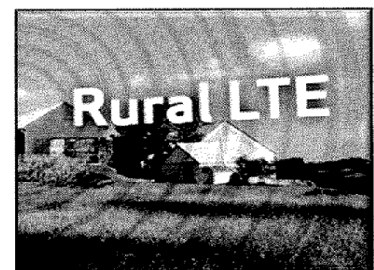


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## 4G LTE Rural Applications

- **Extend LTE mobile broadband service to rural communities.**
  - Bring benefits of 4G services to rural markets quickly and efficiently
  - Expand VzW's national coverage footprint
- **Forge business relationships with qualified program participants who can build and maintain a high-quality 4G LTE mobile broadband network.**
  - Infrastructure Resources
  - Telecommunications Expertise
  - Commitment to Customers
- **Ensure a consistent customer experience in both VzW and participant coverage areas.**
- **Allow rural operators to benefit from Verizon's technical expertise and packet core investment.**

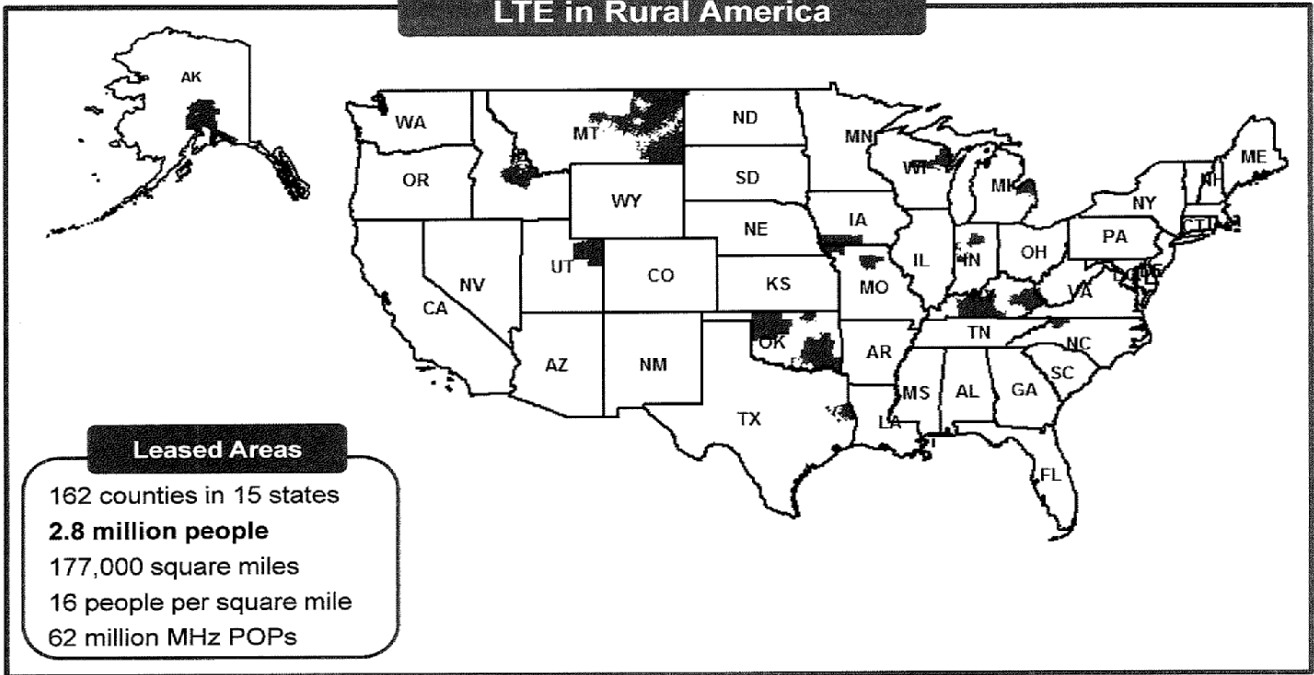


12



## Program Status – Twenty Announced Leases

### LTE in Rural America

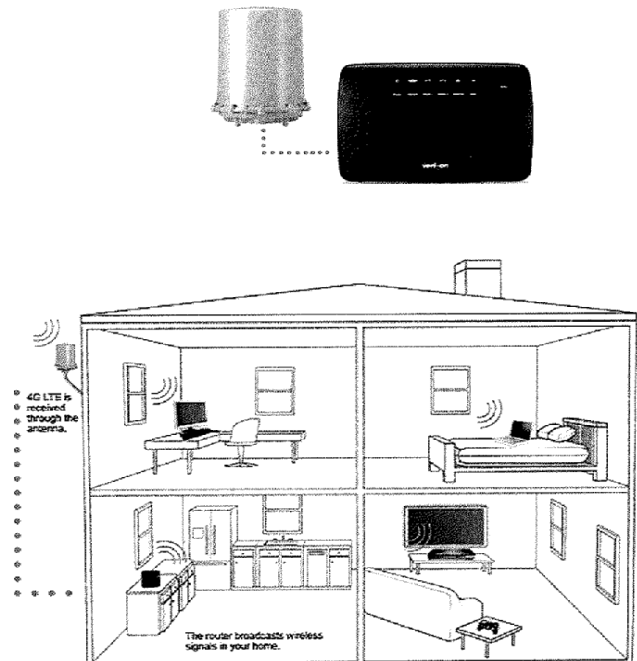


13



## 4G LTE HomeFusion

- In-home LTE-based broadband service
  - Ideal broadband solution for rural areas that traditionally have not had reliable access to high-speed Internet
- Brings the power and speed of our 4G LTE network to the home
- Available nationwide



- US Public Policy Has Enabled Vibrant Mobile Broadband Marketplace
  - Flexible Use of Technology and Spectrum Frequencies
  - Competition
- 4G LTE Delivers Wireline Broadband Speeds in Wireless Environment
- With Advent of 4G LTE, Wireless Technology is at the Point Where it Can Transform Economies
  - Enables Innovation and Delivers Socio-Economic Benefits
- 4G LTE is Well Suited for Reaching Unserved and Underserved Rural Areas

