Rethink Possible

Smart and Fast:
Embracing the Mobile Broadband Future
The North American Marketplace and Release 12

3GPP Workshop on Release 12 Onward
June 11-12, 2012
Ljubljana, Slovenia
RWS-120018

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Attaining The Next Decade's Goals
Release 12: Beyond Advanced

- The Marketplace
- LTE for Nomadic and Fixed Use
- Device Service/Application Awareness
- Additional Mobility Enhancements
- Mesh Networks
- Other Important Aspects for Continued Development/Improvement
- Release 12 Timeline

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21st Century Goals

- Increase speed
- Improve commerce
- Improve communications

2006 – 2011

- Mobile Data Traffic Up 20,000%
- Smartphones, tablets, internet devices reach 43 million
- Mobile data connections double to more 74 million
- Total wireless subs up 70% to 103 million

AT&T 2011 Network Improvements
What do operators face?

- Added 700,000 square miles of mobile broadband coverage
- Built 1,400 new cell sites
- Installed 80,000 new antennas
- Added 30,000 carriers
- Installed 200 distributed antenna systems
- 80% of data traffic on enhanced backhaul

Courtesy: CommScope

Pervasive 3GPP Technologies

HSPA

- HSPA deployed by 202 mobile network operators in 100 countries
- HSPA+ is the standard for mobile broadband worldwide.
- **100 million HSPA/HSPA+ connections in North America through 2011**

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Pervasive 3GPP Technologies

LTE

- 2 million subscriptions added in North America in 4Q11
- 5.3 million subscriptions in N.A. through 2011
- North America has 71 percent of global LTE subscriptions

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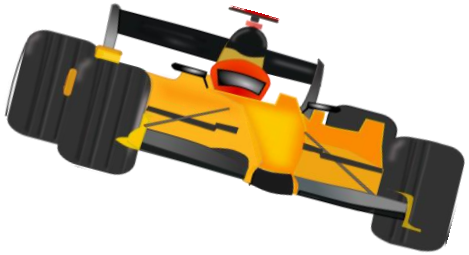
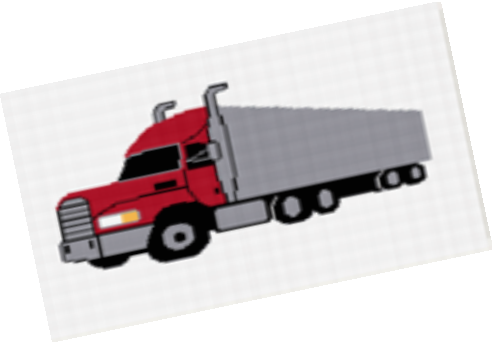
Improving Capacity, Throughput, Coverage and Latency





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LTE for Nomadic and Fixed Use

Optimize LTE network for Nomadic and Fixed uses

Relook at the system with an aim to simplify network aspects such as

- Mobility architecture
- QoS / Charging architecture

Solution should not impact access of any services by mobile user(s) i.e. no impact on the terminal and the air interface

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Device Service/Application Awareness

Device and RAN both become Service/Application aware through coordination/communication

Goal: **access/admission customization and differentiation to achieve balance between network resource utilization and user experience**

- **Network indicates to UE the load condition so UE can "bundle or delay" delay tolerant applications**
- **UE can proactively bundle based on user interactivities**
- **Network can "learn" the characteristics of device based on history of its access to customize resource treatment (parameters controlling resource allocation).**
- **UE can indicate to Network the "type" or "characteristics" of applications/service it runs**

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Additional UE Enhancements

Mobility-based idle mode speed detection and layer management using UE sensors

- **Better idle mode load balance between layers: with less network signaling and improved UE battery life**

Coordinated UE + Network data activity characterization and bundling

- **Reduce signaling and battery life impact of chatty background applications: using UE intelligence and network coordination**

Coordinated UE + Network battery and signaling conservation

- **UE and network collaborate to conserve battery life when needed most**

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Mesh Networks

Through Release 11 we seem to have developed many of the underpinnings of what might be necessary to support a mesh network capability such as:

- Small Cells
- Relays
- HetNets
- Expanded X2 capabilities
- SON

What else would it take to develop “mesh” network capabilities?

Consider a Study Item in Release 12 on “mesh” networks

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Other Important Aspects for Continued Development/Improvement

Carrier Aggregation Expansion

- **Address a greater and more flexible span of uplink/downlink pooling**

MTC/M2M

- **Retention of capabilities, better economics , and lower power consumption to promote a higher degree of applicability and embedded roles as a growth opportunity**

Spectrum Efficiency

- **Continued efforts to raise effective *system* spectral efficiencies though advance antenna systems, interference management, inter eNB carrier aggregation, general capacity enhancements and other means**

Het Net Transport Flexibility

- **By enabling highly effective inter-site COMP and interference coordination**
- **Improved resource management between technology and Het Net Layers**

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Continued Development and Improvement (2)

Advanced DL MIMO for LTE

- **Increase throughput of 4 Tx MIMO and improve user experience with Active Antennas, Massive MIMO and 3D antenna configurations**

Enhanced UL Coverage

- **Enhance uplink coverage to improve quality of VoLTE and increase reliability of connectivity and communications of low-cost MTC devices.**

Further Cost Reduction of MTC devices on LTE *and* HSPA

- **Expand cost reduction of MTC devices on LTE *and* HSPA devices, by leveraging cost-effective HSPA chipsets and a dominant HSPA footprint**

More intelligent cooperation with Wi-Fi and UMTS for hand-over, access, and load balancing, including Small Cells.

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Thoughts of the Release 12 timeline

Needs to be very responsive to the rapidly expanding LTE deployed marketplace and especially to the ever shifting market drivers for both consumers and enterprise users and those developing and delivering the various applications, etc.

Does not need to be the same extremely high complexity level as was Release 10 where we significantly raised the bar of the entire RAN LTE.

Should be a "medium to lower complexity level" release

Release 12 Stage 1 through 3 and ASN.1 freezing should be timed/managed to permit product availability for year-end 2015 or early 2016 marketplace

Stage 1:	March 2013 RAN #59
Stage 2:	September 2013 RAN #61
Stage 3:	March 2014 RAN #63
ASN.1:	June 2014 RAN #64
Product:	~ Dec 2015 (approx 15 months after ASN.1)

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RWS-120018

AT&T Radio Standards

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