



# Mobile Broadband The Evolution to LTE and Beyond

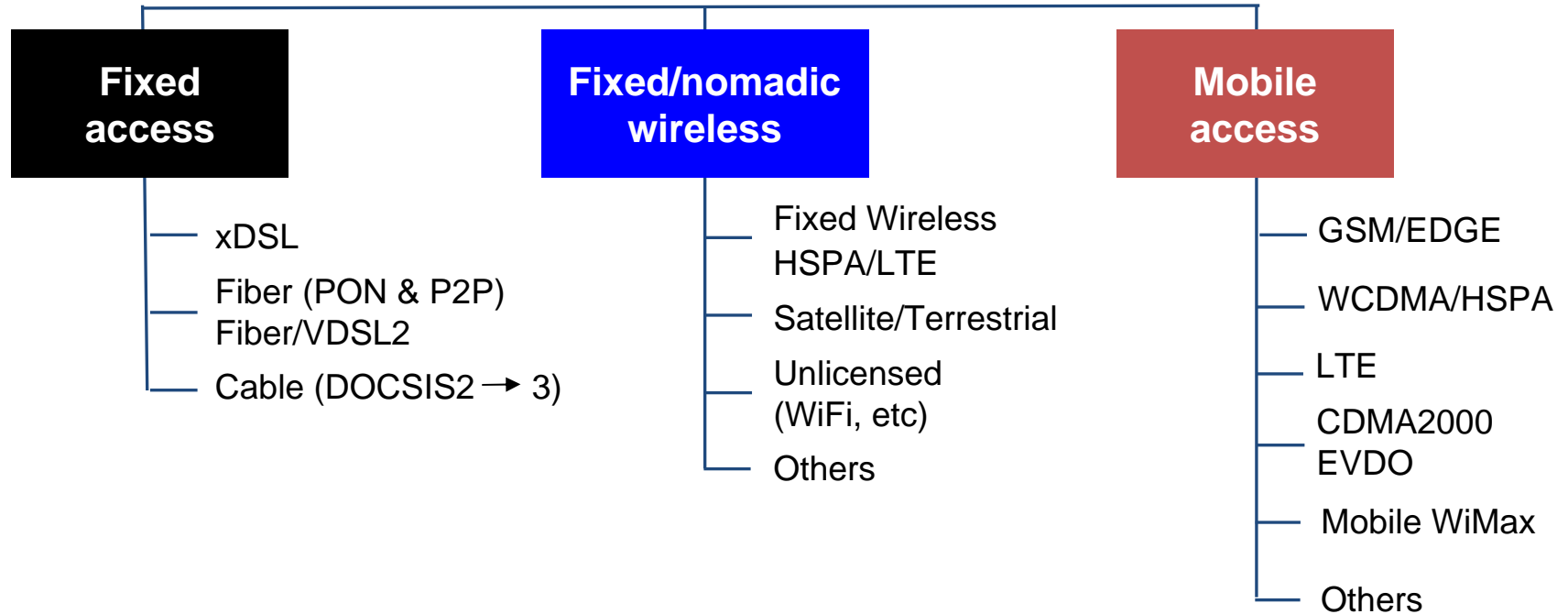
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Group Function Technology and Industry

Ericsson

# Broadband Access

comes in many flavors



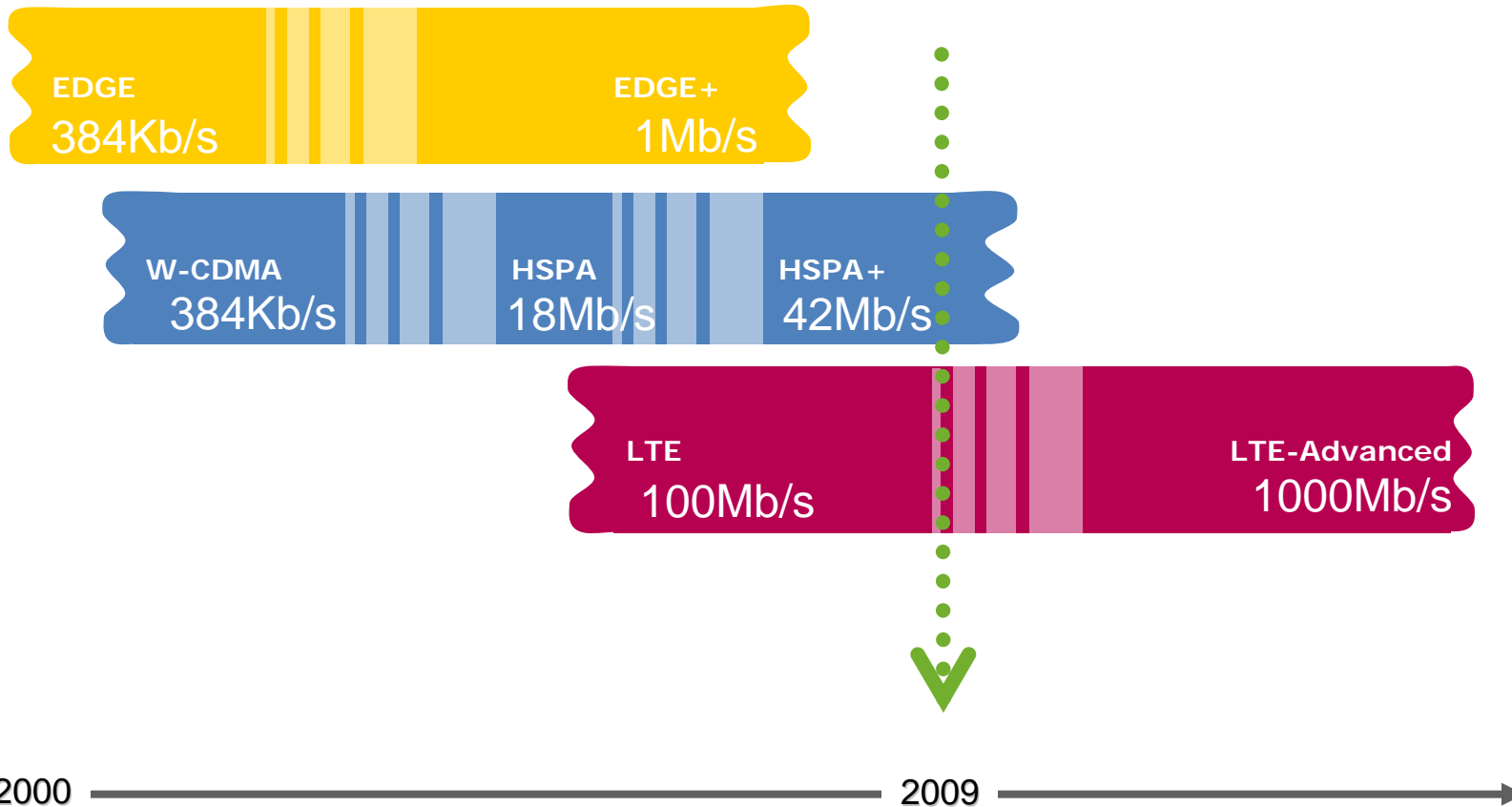
The borderline between fixed and mobile is getting less clear

Slide taken from 3GPP SA Chairmans' slide set on convergence and use of IMS

# Focus on 3GPP Family Evolution

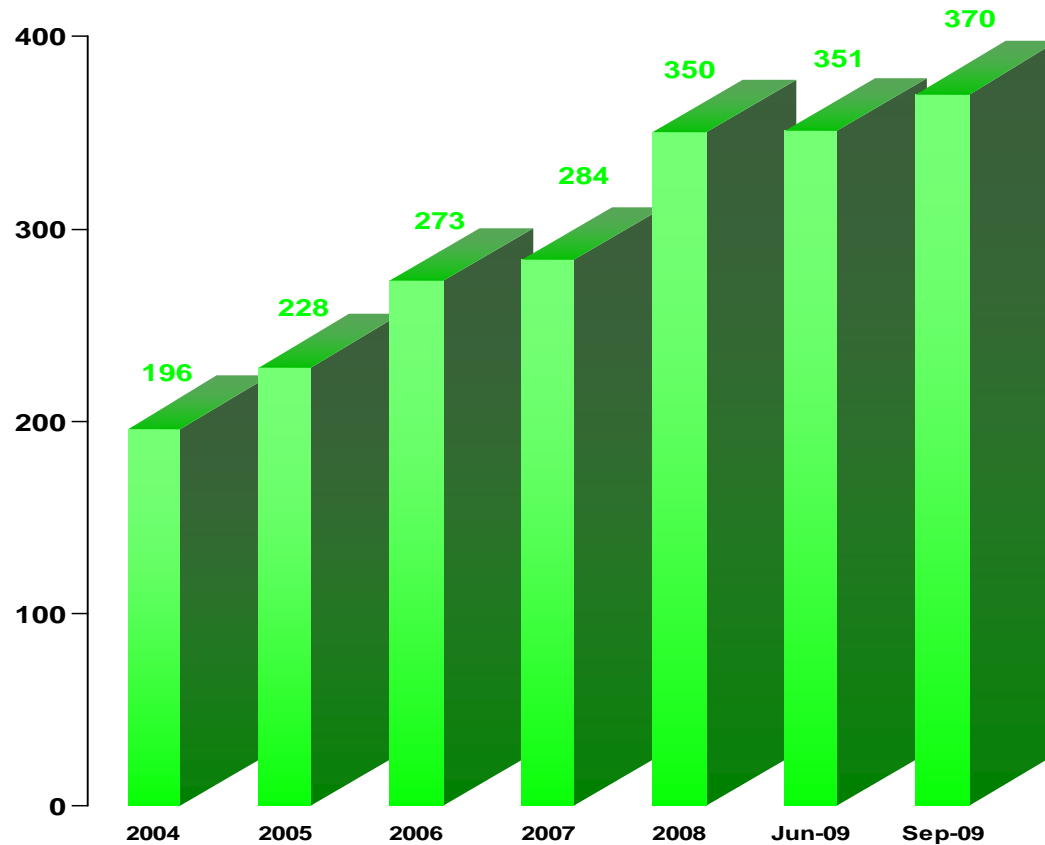


## Standards availability



# 3GPP Membership

Number of  
companies  
active in 3GPP



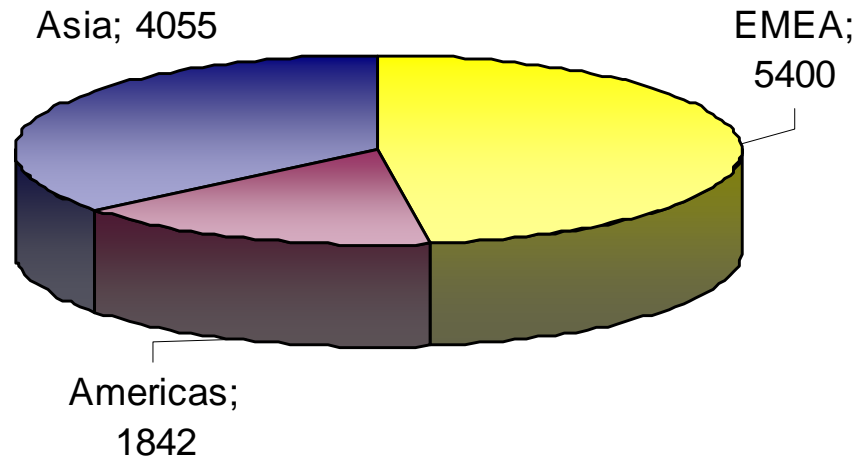
# 3GPP Meeting Participation per Region

**Region 1:** Europe, Middle East, Africa (48%)

**Region 2:** Americas (16%)

**Region 3:** Asia (36%)

**3GPP meeting participation by ITU region**



\* Based on delegates' postal addresses

# Meeting Industry Requirements

 NGMN Alliance have stated:

*“Based on the results of technology evaluation, the NGMN board concluded in June 2008 that LTE/SAE is the first technology which broadly meets NGMN recommendations. The NGMN Alliance therefore approves LTE/SAE as its first compliant technology”*

NGMN Alliance,  
June 08

 LSTI results from LTE field trials are highly promising:

*“Early LTE equipment is meeting Industry requirements”*

LSTI, 26/Jan 09

# Operator commitment\* to LTE



- 📶 3
- 📶 Aircell
- 📶 AT&T Mobility
- 📶 Bell Canada
- 📶 CenturyTel
- 📶 China Mobile
- 📶 China Telecom
- 📶 Chunghwa Telecom
- 📶 Cox
- 📶 CSL Ltd
- 📶 eMobile
- 📶 HK CSL Ltd
- 📶 Hutchison 3
- 📶 KDDI
- 📶 KTF
- 📶 MetroPCS
- 📶 Mobilkom
- 📶 NTT DoCoMo
- 📶 Orange
- 📶 PCCW
- 📶 Piltel
- 📶 Rogers Wireless
- 📶 SK Telecom
- 📶 SmarTone-Vodafone
- 📶 Softbank Mobile
- 📶 Tele2 Sweden
- 📶 Telecom Italia
- 📶 Telecom NZ
- 📶 Telefonica O2
- 📶 Telenor Sweden
- 📶 TeliaSonera
- 📶 Telstra
- 📶 Telus
- 📶 T-Mobile
- 📶 Verizon Wireless
- 📶 Vodafone
- 📶 Zain

\*(LTE operator commitments – August 26, 2009, Source: Global mobile Suppliers Association (GSA) [www.gsacom.com](http://www.gsacom.com))



# What is in Release 8?

- LTE and SAE form the basis of 3GPP Release 8
- LTE and SAE are IP based, bringing reduced latency, better spectrum efficiency & flexibility, larger & more efficient cell size, access
- Provides inter-working with legacy standards (GSM, UMTS, CDMA, TD-SCDMA)

## Radio

- 3G Long Term Evolution – Radio Access part (both FDD and TDD)
- UTRAN / GERAN - LTE Inter-working
- Enhancements for HSPA+
- Home NodeB (Femtocell)
- New Spectrum: UMTS 1500, UMTS 700, UMTS 2300, UMTS / LTE 3500
- LTE-Advanced requirements setting

## Core

- System Architecture Evolution - Evolved Packet System
- IMS enhancements
- Mobility between 3GPP and non 3GPP Systems

- Release 8 is the basis for commercial LTE deployment



# A rigorous approach to LTE R8 Testing

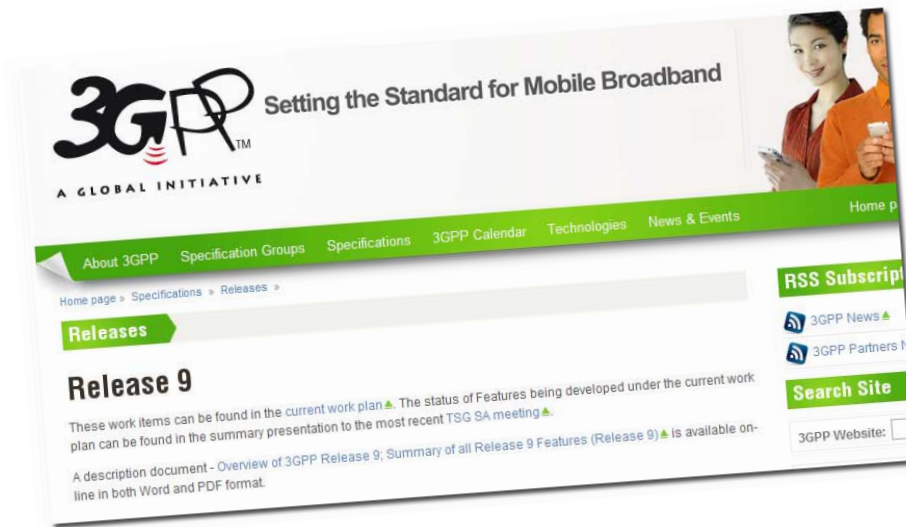
- 3GPP invests considerable effort in UE conformance testing
- A very practical approach has been applied, ensuring that only those requirements within the specs which are *essential* for early LTE deployment are tested
- NGMN and UE manufacturers have proposed 450 test cases which they believe are essential for UE signalling conformance. An additional 50 test cases have been identified for UE RF conformance
- GCF has prioritised the 450 test cases (P1-P4, with 100-120 cases in each group)
- The baseline for R8 testing, is March 2009 specifications

# A rigorous approach to LTE R8 Testing

- 📶 All Test Cases (both FDD and TDD) are described in prose and developed in TTCN3
- 📶 More than 1MEur devoted to LTE TTCN development in 2009, complemented by more than 0,5 MEur of voluntary funding (equating to a total of 18 experts)
- 📶 4 test equipment manufacturers are directly involved in the development of test cases
- 📶 First certified UEs expected by Q4 2010 (based on P1 and P2 TCs)
- 📶 Certified UEs compliant with all Test Cases (P1-P4) expected by 2011

# What will Release 9 add?

- 📶 Release 9 underway with completion expected by end 2009
- 📶 Continuing femtocell integration
- 📶 Added functionality, broadens LTE deployment scenarios
- 📶 Results of valuable feedback from first LTE deployments
- 📶 R9 also advances non-LTE technologies



Overview of 3GPP Release 9 V0.0.7 (2009-09)

Overview of 3GPP Release 9 V0.0.7 (2009-09)

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[www.3gpp.org/releases](http://www.3gpp.org/releases)

# Release 9 Features (1/2)

- Services Alignment and Migration
- Registration in Densely-populated area (RED)
- End-User Identity
- Customized Ringing Signal
- Public Warning System
- Enhancements to Multimedia Priority Service
- Support of Personal Area Networks and Enhancements to Personal Network Management
- Multi-Media Telephony Service enhancements
- User Data Convergence
- Enhanced Home NodeB/ eNodeB
- Protection against Unsolicited Communication for IMS (PUCI)
- IMS Services Centralization and Continuity
- Enhancements of IMS Customized Alerting Tone (CAT) Service
- Service Specific Access Control in EPS
- Support for IMS Emergency Calls over GPRS and EPS
- LCS for LTE and EPS
- MBMS support in EPS
- Access Network Discovery and Selection Enhancements
- GTP-based S8 chaining
- Multiple PDN to the Same APN for PMIP-based Interfaces (Stage 2)
- Multi Access PDN Connectivity (Stage 2)
- Access Security Enhancements

## Release 9 Features (2/2)

- 📶 GBA Push enhancements
- 📶 IMS Media Plane Security (Stage 2)
- 📶 Timed Graphics
- 📶 Managing MTSI Media Adaptation
- 📶 PSS and MBMS extensions
- 📶 Improved Video Support for PSS and MBMS
- 📶 IMS based PSS and MBMS User Service extensions
- 📶 Various OAM&P Improvements
- 📶 Value-Added Services for Short Message Service
- 📶 Definition of 3GPP UICC services over the new high-speed interface
- 📶 CS-IBCF and CS-TrGW definition in 3GPP specifications
- 📶 IMS –Interconnection Border Control Function (IBCF) –Transition Gateway (TrGW); Ix Interface; Stage 3
- 📶 IMS Application Level Gateway Control Function (ALGCF) –IMS Access Media Gateway (IMA-MGW); IqInterface; Stage 2 and Stage 3
- 📶 Rel-9 Improvements of the Radio Interface
- 📶 Rel-9 RAN improvements
- 📶 LTE improvements
- 📶 Self-Organizing Networks (SON)
- 📶 Voice services over Adaptive Multi-user channels on One Slot
- 📶 Local Call Local Switch
- 📶 + around 30 Studies




# New Services in Release 9



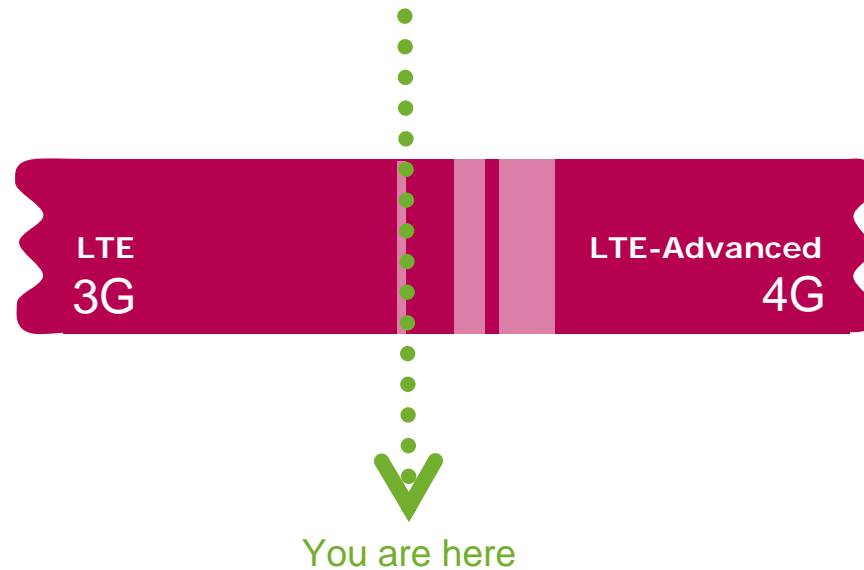
- 📶 Public Warning System, Earthquake and Tsunami Warning System (ETWS)
- 📶 Service Specific Access Control
- 📶 VOIP (IMS) upgrades to various services
- 📶 Machine to Machine Network Improvements

# New Deployment & Migration Scenarios in Release 9



-  Circuit Switched to VOIP, Service continuity improvements
-  3GPP/Non-3GPP accesses -> LTE
-  LTE HNB (Femtocells)

# LTE-Advanced



- 📶 Smooth transition from 3G to 4G
- 📶 LTE-Advanced to be the main feature of 3GPP Release 10
- 📶 LTE-Advanced has been submitted to the ITU-R as a candidate IMT-Advanced system

# Timelines for IMT-Advanced



- 📶 Study Item, “LTE-Advanced” approved in 3GPP - Mar 2008 ✓
- 📶 LTE-Advanced Requirements (TR 36.913) approved by 3GPP - Jun 2008 ✓
- 📶 LTE-Advanced “Early Submission” made to ITU-R - Sep 2008 ✓
- 📶 “Complete Technology Submission” to ITU-R - Jun 2009 ✓
- 📶 “Final submission” to ITU-R - Oct 2009 ✓
- 📶 Completion of LTE-Advanced specifications by 3GPP - 2010 / 2011

# What will LTE-Advanced deliver?

 Support for wider Bandwidth (Up to 100MHz)

 Downlink transmission scheme

- Improvements to LTE by using 8x8 MIMO
- Data rates of 100Mb/s with high mobility and 1Gb/s with low mobility

 Up link transmission scheme

- Improvements to LTE
- Data rates up to 500Mb/s

 Relay functionality

- Improving cell edge coverage
- More efficient coverage in rural areas



# 3GPP provides much more....

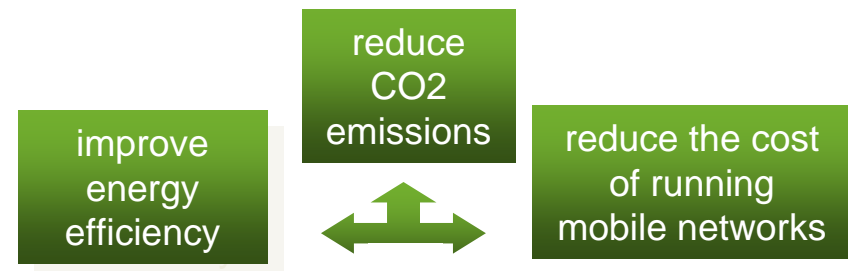


- 📶 3GPP not only produces standards for fast and efficient networks that will enhance the user experience, but produces much more....
- 📶 3GPP LTE is *the* point of convergence and will unite the world's operators on a common technology platform
- 📶 This is good news, but also places very high responsibility on 3GPP to take care of societal and public interest issues
- 📶 3GPP has an active programme of work in such areas
  - Earthquake and Tsunami Warning System (ETWS)
  - Public Warning System (PWS)
  - eCall
  - In Case Of Emergency (ICE)

# The Green Agenda

- 📶 The Standardization community has an obligation to look at the impact of technology evolution on Society
- 📶 3GPP is taking environmental issues very seriously
- 📶 Reducing the Carbon footprint and improving energy efficiency are key requirements for 3GPP Members
- 📶 Dedicated Feasibility Study included in **Release 9** on Energy Savings Management (3GPP TR [32.826](#)). This will include the study of:

- Retrieval of energy consumption measurements
- Retrieval of traffic load measurements
- Adjustment of Network Resources capabilities



# Availability of Specifications

- 📶 All 3GPP specifications can be freely downloaded from [www.3gpp.org](http://www.3gpp.org)
- 📶 Or can be obtained from the 3GPP Organisational Partners (ARIB, ATIS, CCSA, ETSI, TTA, TTC)
- 📶 A DVD of the full set of 3GPP specifications is available at this event, from the 3GPP booth.



# Conclusions



- 📶 3GPP LTE is the major enabler for mobile broadband
- 📶 Industrial input to the standards process is of an unprecedented level
- 📶 More than 35 operators (including the world's largest operators) have committed to deploy this technology
- 📶 The first commercial contracts for LTE have been announced based on 3GPP Release 8
- 📶 LTE is an evolution path which unites the GSM/UMTS and CDMA families
- 📶 There is a bigger picture, LTE also contributes to Public Safety and the Green Agenda

# Thank you for your attention...



For more information:

[www.3gpp.org](http://www.3gpp.org)

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Or any of the 3GPP Market Representation Partners:

<http://www.3gpp.org/Management/MRP.htm>

