3GPP Standards Update

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Content

- The Role of 3GPP

- The 3GPP population

- Spanning the generations

- Building on Releases

- Home eNodeB and femtocell work

- HNB/HeNB Specifications listing

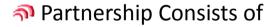- Interoperability Testing

- What is next for 3GPP LTE

The Role of 3GPP

- Maintenance and evolution of Radio Technologies:

  GSM, GPRS, W-CDMA, UMTS, EDGE, HSPA and LTE

- Maintenance and evolution of the related Core Network and Systems Architecture

- Partnership Consists of

  - Regional standards organizations

    (Asia, Europe & North America):

  - and Market Partners representing broader industry:

3GPP Population

- Over 350 Companies participate through their membership of one of the 6 Partners

- Plenary meetings each quarter (Next time is TSG#51, Kansas City, March 2011)

- Over 150 meetings (including Working Groups) in 2010

3GPP Meeting Participation by Region

Asia 41%

EMEA 42%

Americas 17%

Source: 3GPP MCC (December 2010)

Spanning the Generations…

GSM 1G
Analog technology.
Deployed in the 1980s.

GSM 2G
Digital Technology.
First digital systems.
Deployed in the 1990s.
New services such as SMS
and low-rate data.
Primary technologies
include IS-95 CDMA and
GSM.

3G ITU's IMT-2000 required 144
kbps mobile, 384 kbps
pedestrian, 2 Mbps indoors
Primary technologies
include CDMA2000 1X/EVDO, WiMAX,
and UMTS-HSPA.

4G ITU's IMT-Advanced
requirements include ability to
operate in up to 40 MHz radio
channels and with very high
spectral efficiency.
No technology meets
requirements today.
IEEE 802.16m and LTE
Advanced being designed
to meet requirements.

Text adapted from 3G Americas White Paper, September 2010

3GPP Specified Radio Interfaces
- 2G radio: GSM, GPRS, EDGE
- 3G radio: WCDMA, HSPA, LTE
- 4G radio: LTE Advanced

3GPP Core Network
- 2G/3G: GSM core network
- 3G/4G: Evolved Packet Core (EPC)

3GPP Service Layer
- GSM services
- IP Multimedia Subsystem (IMS)
- Multimedia Telephony (MMTEL)
- Support of Messaging and other OMA functionality
- Emergency services and public warning
- Etc.

" …UMTS became the dominant 3G technology, setting the foundations for a single worldwide 4G standard in future years "

Radio-Electronics.com

3GPP Groups

THE Mobile Broadband Standard

Radio Interfaces

- Higher Data Throughput
- Lower Latency
- More Spectrum Flexibility
- Improved CAPEX and OPEX

IP Core Network

- Support of non-3GPP Accesses
- Packet Only Support
- Improved Security
- Greater Device Diversity

Service Layer

- More IMS Applications (MBMS, PSS, mobile TV now IMS enabled)
- Greater session continuity

TSG Structure

Project Co-ordination Group (PCG)

TSG GERAN	TSG RAN	TSG SA	TSG CT
GSM EDGE Radio Access Network	Radio Access Network	Service & Systems Aspects	Core Network & Terminals
GERAN WG1 Radio Aspects	**RAN WG1** Radio Layer 1 spec	**SA WG1** Services	**CT WG1** MM/CC/SM (Iu)
GERAN WG2 Protocol Aspects	**RAN WG2** Radio Layer 2 spec Radio Layer 3 RR spec	**SA WG2** Architecture	**CT WG3** Interworking with external networks
GERAN WG3 Terminal Testing	**RAN WG3** Iub spec, Iur spec, Iu spec UTRAN O&M requirements	**SA WG3** Security	**CT WG4** MAP/GTP/BCH/SS
	RAN WG4 Radio Performance Protocol aspects	**SA WG4** Codec	**CT WG6** Smart Card Application Aspects
	RAN WG5 Mobile Terminal Conformance Testing	**SA WG5** Telecom Management	

Building on Releases

Release 99: Enhancements to GSM data (EDGE). Majority of deployments today are based on Release 99. Provides support for GSM/EDGE/GPRS/WCDMA radio-access networks.

Release 4: Multimedia messaging support. First steps toward using IP transport in the core network.

Release 5: HSDPA. First phase of Internet Protocol Multimedia Subsystem (IMS). Full ability to use IP-based transport instead of just Asynchronous Transfer Mode (ATM) in the core network.

Release 6: HSUPA. Enhanced multimedia support through Multimedia Broadcast/Multicast Services (MBMS). Performance specifications for advanced receivers. Wireless Local Area Network (WLAN) integration option. IMS enhancements. Initial VoIP capability.

Release 11 Interworking - 3GPP EPS and fixed BB accesses, M2M, Non voice emergency communications, 8 carrier HSDPA, Uplink MIMO study

Release 10 LTE-Advanced meeting the requirements set by ITU's IMT-Advanced project.

Also includes quad-carrier operation for HSPA+.

Release 9: HSPA and LTE enhancements including HSPA dual-carrier operation in combination with MIMO, EPC enhancements, **femtocell support**, support for regulatory features such as emergency user-equipment positioning and Commercial Mobile Alert System (CMAS), and evolution of IMS architecture.

Release 8: HSPA Evolution, simultaneous use of MIMO and 64 QAM. Includes dual-carrier HSPA (DC-HSPA) wherein two WCDMA radio channels can be combined for a doubling of throughput performance. Specifies OFDMA-based 3GPP LTE.
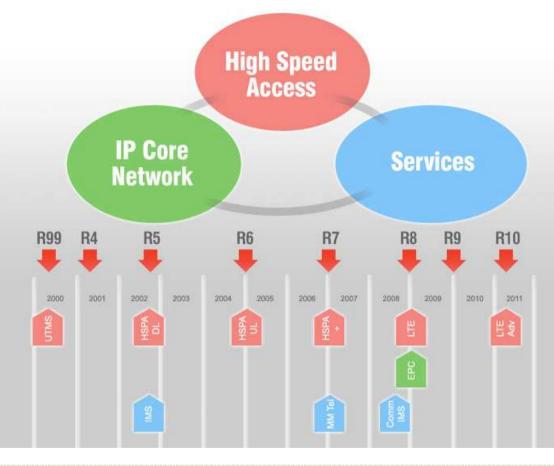
Defines EPC.

Release 7: Evolved EDGE. Specifies HSPA+, higher order modulation and MIMO. Performance enhancements, improved spectral efficiency, increased capacity, and better resistance to interference. Continuous Packet Connectivity (CPC) enables efficient "always-on" service and enhanced uplink UL VoIP capacity, as well as reductions in call set-up delay for Push-to-Talk Over Cellular (PoC). Radio enhancements to HSPA include 64 Quadrature Amplitude Modulation (QAM) in the downlink DL and 16 QAM in the uplink. Also includes optimization of MBMS capabilities through the multicast/broadcast, single-frequency network (MBSFN) function.

Text adapted from 3G Americas White Paper, September 2010

Femto Forum in 3GPP (1 of 2)

- October 2008 – Femto Forum joined 3GPP as a Market Representation Partner (MRP) to work to support residential and enterprise deployments with open or closed access. With open access, any mobile may access the HNB/HeNB. With closed access only mobiles belonging to the assigned closed user group may access the HNB/HeNB

- In time for 3GPP Release 8 LTE specifications

  - December 2008 - The UMTS HNB and HeNB architecture is described in TS 25.467 (UTRAN architecture for 3G Home Node B)
  - January 2009 – Addition of the LTE HeNB architecture in TS 36.300-870, The UTRAN Overall description (Section 4.6 - Support of HeNBs)

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Femto Forum in 3GPP (2 of 2)

- May 2009 – Femto forum, 3GPP and Broadband Forum complete collaboration on 3GPP Rel-8 / BBF TR196 (Femto Access Point Service Data Model) alignment

- March 2011 – Release 10 includes HNB and HeNB mobility enhancements including intra-CSG/inter-CSG in a HNB-GW. Work on H(e)NB security features for UE mobility scenarios (SA3 , 33.320) is on-going, but will be in Release 11.

Key Specifications

The following specifications have been modified to included HNB/HeNB aspects:

TS 22.011	Service Accessibility
TS 25.104	Base Station (BS) radio transmission and reception (FDD)
TS 25.141	Base station (BS) conformance testing (FDD)
TS 36.300	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2
TS 36.413	Evolved Universal Terrestrial Radio Access (E-UTRA) ; S1 Application Protocol (S1AP)
TS 23.060	General Packet Radio Service (GPRS); Service description; Stage 2
TS 23.401	General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access

The following specifications have been created solely for HNB/HeNB:

TS 22.220	Service requirements for Home Node B (HNB) and Home eNode B (HeNB)
TS 23.232	IMS aspects of architecture for Home Node B (HNB)
TR 23.830	Architecture aspects of Home Node B (HNB) / Home enhanced Node B (HeNB)
TS 25.367	Mobility procedures for Home Node B (HNB); Overall description; Stage 2
TS 25.467	UTRAN architecture for 3G Home Node B (HNB); Stage 2
TS 25.468	UTRAN Iuh Interface RANAP User Adaption (RUA) signalling
TS 25.469	UTRAN Iuh interface Home Node B (HNB) Application Part (HNBAP) signalling
TR 25.820	3G Home Node B (HNB) study item Technical Report
TR 25.967	FDD Home Node B (HNB) RF Requirements
TS 32.581	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Concepts and requirements for Type 1 interface HNB to HNB Management System (HMS)
TS 32.582	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Information model for Type 1 interface HNB to HNB Management System (HMS)
TS 32.583	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); Procedure flows for Type 1 interface HNB to HNB Management System (HMS)
TS 32.584	Telecommunications management; Home Node B (HNB) Operations, Administration, Maintenance and Provisioning (OAM&P); XML definitions for Type 1 interface HNB to HNB Management System (HMS)

Femto Forum plugfests

- March 2010 - ETSI and the Femto Forum host the world's first interoperability test of equipment meeting the 3GPP specifications

- January 2011 - The second Femto Forum plugfest a great success. Focus on the effectiveness of the Broadband Forum's femtocell management standard (TR-196) in supporting interoperability between femtocell access points and network equipment

- Next Event - 3rd UMTS Femtocell Plugfest 23-30 April 2011, Lannion (FR)

"Interoperability tests between femtocell network gateways, security gateways, femtocell access point, HNB Mangement Systems and chipsets from key vendors to verify the 3GPP's Iuh interface as defined in release 8.

The program will test the Broadband Forum TR-069 management path between the femtocell access point and the Mangement Platform via a secure IPSec tunnel that terminates at the Security Gateway element of the HNB-GW.

The plugfest will also provide a staging event for the 3rd UMTS plugfest which will involve interoperability testing of 3GPP's Iuh interface as defined in release 9.

What is in the standard?
The standard under test is the new 3GPP release 8 femtocell standard - in particular its specification of the management interface. The Iuh interface standardization was completed in April 2009, and the Broadband Forum's TR-069 management protocol has been extended to incorporate a new data model for femtocells developed collaboratively by Femto Forum and Broadband Forum and published by the Broadband Forum as TR-196."

3GPP Work…Taking LTE beyond 3G

3GPP LTE

- A new radio interface specified in Release 8 and enhanced in Release 9
- Provides:
    - Broadband data throughput:
        - Downlink target 3-4 times greater than HSDPA Release 6
        - Uplink target 2-3 times greater than HSUPA Release 6

- Significantly reduced latency
- High mobility
- The basis for 17 commercial launches (as at 12 Jan)
- 64 commercial launches expected by end of 2012
- 125 operators publicly committed to launch
- LTE set to be _the_ mobile broadband technology

IMT-Advanced

LTE-Advanced is the 3GPP submission for the
ITU's IMT-Advanced system

- Study Item, "LTE-Advanced" approved in 3GPP   - Mar 2008 ✓

- LTE-Advanced Requirements (TR 36.913)   - 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 ✓

- Evaluation Process "Final Decision" by ITU-R   - Oct 2010 ✓

- Completion of LTE-Advanced specifications by 3GPP   - Mar 2011

LTE-Advanced

Release 10

- Not a new technology as such, but a point of maturity along the LTE evolution path. LTE Advanced provides:
- 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
- Uplink transmission scheme
  - Improvements to LTE
  - Data rates up to 500Mb/s
- Relay functionality
  - Improving cell edge coverage
  - More efficient coverage in rural areas
- CoMP (coordinated multiple point transmission and reception)
  - Downlink coordinated multi-point transmission
  - Uplink coordinated multi-point reception
- Local IP Access (LIPA) & Enhanced HNB to allow traffic off-load

3GPP Release 11

- Release 11 completion date set for September 2012
- Many new Features expected:

• Support BroadBand forum Accesses Interworking

• Advanced IP Interconnection of Services

• System Improvements to Machine-Type Communications

• Unstructured Supplementary Service Data (USSD) simulation service in IMS

• SRVCC aspect of enhancements for Multimedia Priority Service

• Network Provided Location Information for IMS

• SIPTO Service Continuity of IP Data Session

• LIPA Mobility and SIPTO at the Local Network

• QoS Control Based on Subscriber Spending Limits

• Optimized Service Charging and Allocation of Resources in IMS whilst Roaming

• Non Voice Emergency Services

• Interworking between Mobile Operators using the Evolved Packet System and Data Application Providers

• Service Awareness and Privacy Policies

• VPLMN Autonomous CSG Roaming

• EEA3 and EIA3 (new Encryption & Integrity EPS security Algorithms)

• Specification of Protection against Unsolicited Communication for IMS

• Codec for Enhanced Voice Services

• Network-Based Positioning Support in LTE

• LTE Advanced Carrier Aggregation of Band 4 and Band 17

• LTE Advanced Carrier Aggregation of Band 4 and Band 13

• Eight carrier HSDPA

• UE demodulation performance requirements under multiple-cell scenario for 1.28Mcps TDD

• Uplink Transmit Diversity for HSPA

http://www.3gpp.org/ftp/Specs/html-info/FeatureListFrameSet.htm

3GPP Release12

🔊 Release 12 content not yet defined, but Study Items (SI) in Release 11 indicate where specification work is likely

- Study on IMS based Peer-to-Peer Content Distribution Services
- Study on IMS based Peer-to-Peer Content Distribution Services (Stage 2)
- Study on Non Voice Emergency Services
- Study on UICC/USIM enhancements
- Study on Alternatives to E.164 for Machine-Type Communications
- Study on enhancements for Machine-Type Communications (MTC)
- Study on Support for 3GPP Voice Interworking with Enterprise IP-PBX

- Study on IMS Network-Independent Public User Identities
- Study on Integration of Single Sign-On (SSO) frameworks with 3GPP networks
- Study on Security aspects of Integration of Single Sign-On (SSO) frameworks with 3GPP networks
- Study on Core Network Overload solutions
- Study on Continuity of Data Sessions to Local Networks
- Study on Non-MTC Mobile Data Applications impacts
- Study on System Enhancements for Energy Efficiency
- Study on Solutions for GSM/EDGE BTS Energy Saving

- Study on Coordinated Multi-Point operation for LTE
- Study on UE Application Layer Data Throughput Performance
- Study on Uplink MIMO
- Study on HSDPA Multipoint Transmission
- Study on Inclusion of RF Pattern Matching as a positioning method in the E-UTRAN

http://www.3gpp.org/ftp/Specs/html-info/FeatureListFrameSet.htm

Future trends (1)

3GPP LTE is a point of convergence

- CDMA Development Group (CDG) joined 3GPP in 2009, CDMA operators are planning their evolution to LTE. Some have already deployed LTE (e.g., Verizon)
- TD-SCDMA Forum paved the way for LTE TDD mode in China. LTE unites both FDD and TDD communities

Many operators have both fixed and mobile assets;

- 3GPP is working with Broadband Forum (BBF) to support convergence using 3GPP EPC
- 3GPP is working with the Telecom Management Forum (TMF) on converged management of fixed and mobile networks
- Clear focus on traffic offload: Local IP Access (LIPA), IP Flow Mobility and Seamless Offload (IFOM) and Selected IP Traffic Offload (SIPTO)

Public Safety Agencies studying LTE

- USA - The FCC has now mandated the use of LTE for public safety to ensure interoperable communications
- TETRA Association is studying migration paths to broadband via Long Term Evolution (LTE) and other technologies, "We will work with people to investigate LTE and integrating aspects into TETRA," said David Chater-Lea, TETRA MoU Association, June 2010

Future trends (2)

Machine Type Communications - Work started in 3GPP Release 10, early specifications cover;

- Overload control (Radio Network Congestion use case, Signalling Network Congestion use case and Core Network Congestion use case)
- Addressing
- Identifiers
- Subscription control
- Security

Building Economies of Scale – LTE will be the network that enables;

- M2M
- Intelligent Transport Systems
- Smart Grids
- Smart Cards, eCommerce, USB, High Speed Interface
- *m*Health
- RFID

Thank You