

The way of LTE towards 4G

December 2009

Eiko Seidel, Chief Technical Officer
Nomor Research GmbH, Munich, Germany

Summary

While first signs of commercial LTE deployments appear on the horizon, the standardization organizations are working already on next steps in technological enhancements that shall provide the user with full 4G experience. It looks like the market of 4G technology will be much less fragmented compared to previous generations of mobile communication systems. There are just two candidate technologies remaining with 3GPP LTE-Advanced and IEEE 802.16m. Considering the huge industry support for LTE the vision of an almost unified global 4G standard might not be out of reach anymore. This paper provides some insight into the latest activities on 4G standardization in 3GPP, in ETSI as well as in ITU.

3GPP submission to IMT Advanced

As reported previously 3GPP has been working on LTE Advanced since early 2009 as part of 3GPP Release 9. The first decisions have been taken and will form the basis for LTE Advanced standardization in Release 10 that will start in 2010.

3GPP submitted its LTE Advanced technology to ITU-R as expected with an FDD and a TDD component. The documents had been approved in the RAN#45 in September 2009.

The following documents are the latest versions provided to ITU-R.

- RP-090743 TR TR36.912 v9.0.0
- RP-090744 Approval TR36.912 Annex A3: Self evaluation results
- RP-090746 Approval TR36.912 Annex C2: Link budget template RP-090747 Approval TR36.912 Annex C3: Compliance template
- RP-090745 Approval TR36.912 Annex C1: Updated characteristics template
- RP-090939 Approval 3GPP Submission Package for IMT-Advanced

The documents are publically available at:

http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_45/Documents/

Besides the technology description the 3GPP documents included templates for characteristics and link budget and compliance templates for services, spectrum, and technical performance.

3GPP conducted a Self-Evaluation under ITU-R guidelines of LTE Advanced with participation of 18 companies from around the world. It was shown that LTE already meets most of the 4G requirements. Some enhancements are still needed as part of LTE Advanced to meet the remaining requirements such as the peak data rates.

European 4G activities within ETSI

ETSI has submitted LTE-Advanced as a candidate IMT-Advanced technology, whereas the technical content has been prepared by 3GPP TSG RAN. The submission was completed in time to be treated at the meeting of ITU-R WP5D on 14-21 October (Dresden, Germany). The ETSI Director General participated in parts of the meeting to ensure that the ETSI submission was successfully concluded. As decided by the general assembly, ETSI has registered as an evaluation group for the purposes of IMT-Advanced evaluation.

Overall it looks like that there will be a more passive role of ETSI within the IMT Advanced process, leaving the standardization and evaluation to 3GPP, ITU and other organizations.

Progress of ITU-R on IMT Advanced

Working Party 5D has received at its October 2009 meeting several candidate technology submissions for IMT-Advanced. Six proposals were received, but remarkably these refer to just two technologies which are:

- 3GPP LTE Advanced
- IEEE 802.16m

The IEEE technology was proposed by

1. IEEE
2. Japan
3. TTA

The 3GPP technology was proposed by

1. Japan
2. 3GPP proponents (3GPP organization partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC)
3. China (People's Republic of China)

A third IMT Advanced Workshop was held during the most recent Working Party 5D meeting, where explanations were given for each of the candidate technologies. The 3GPP TSG RAN Chairman Mr. Nakamura presented the LTE-Advanced technology.

WP 5D has initiated the evaluation of the candidate technology submission plans to continue this work with the help of independent evaluation groups.

IMT-Advanced Evaluation Groups

1. ARIB Evaluation Group, Japan (Association of Radio Industries and Businesses)
2. ATIS WTSC, US (Alliance for Telecommunications Industry Solutions Wireless Technologies and Systems Committee)
3. Canadian Evaluation Group (CEG), Canada
4. Chinese Evaluation Group (ChEG), China
5. ETSI, European Union
6. Israeli Evaluation Group (IEG), Israel
7. Russian Evaluation Group (REG), Russia
8. TCOE, India
9. TR-45 - TR-45 Evaluation Group web site
10. TTA PG707, Korea
11. UADE, Instituto de Tecnología, Argentina
12. WiMAX Forum Evaluation Group (WFEG)
13. Wireless Communications Association International (WCAI), US
14. WINNER+ - Winner+ Evaluation Group web site

Last week, on 17-18 of December, a 3GPP IMT-Advanced Evaluation Workshop took place in Beijing, China with participation of most of the evaluation groups. Basically the LTE Advanced technology was presented by key people from the RAN working groups followed by explanations on the 3GPP self evaluation

assumptions and results.

The schedule for the development of IMT-Advanced radio interface recommendations has been published in [5]. It is also likely that 3GPP will organize another IMT-A evaluation workshop before the ITU-R WP5D meeting in June 2010.

LTE Advanced Standardization

3GPP already agreed on the schedule for Release 10 where LTE Advanced will be standardized with:

- functional freeze in December 2010
- ASN.1 freeze in March/June 2011

In practice this means that the Physical Layer specification will have to be completed around September 2010, which leaves just about 9 months time. The protocol, interface and test specification are to be completed by December 2010.

According to the major LTE-A functional enhancements, the following work items have been approved for Release 10:

- Carrier aggregation for LTE
- Enhanced downlink multiple antenna transmission for LTE
- Uplink multiple antenna transmission for LTE
- Latency reductions for LTE

A presentation introducing LTE-A technologies has been published early this year in [4]. The work on Cooperative Multipoint Transmission (CoMP) is still part of the downlink multiple antenna work item. It is stated that the standardization impact of downlink CoMP will be assessed and a decision will be done in March 2010 if downlink CoMP will be standardized as part of this work item.

LTE Advanced will be fully built on the existing LTE specification Release 10 and not be defined as a new specification series. Stage 2 (architecture and functional description) will for instance be added to TS 36.300 in Release 10. Please keep in mind that there are a large number of other work items within Release 10.

Remarkably 3GPP also approved a Work Item on LTE Advanced Relays to improve coverage and improve cell edge throughput. The Work Item was supported by key operators.

References

[1] RP-091353 Meeting Report of the 3GPP TSG RAN meeting #45, Seville, Spain, September 15-18, 2009

[2] IMT Advanced Report, ETSI Director-General ETSI 54th General Assembly meeting, Cannes, 24-25 November 2009

[3] IMT Advanced submission and evaluation process webpage <http://www.itu.int/ITU-R/go/rsg5-imt-advanced>

[4] Draft Report of the 3GPP TSG RAN meeting #46, Sanya, P.R. China, December 1-4, 2009

[5] Nomor Research White Paper: LTE Advanced for 3GPP Release 10, Mai 2009, <http://www.nomor.de/home/technology/3gpp-newsletter/2009-05-lte-advanced-for-3gpp-release-10>

Note: This newsletter is brought to you by Nomor Research GmbH. Documents can be obtained from www.nomor.de. Feel free to forward this issue in electronic format. Please contact us in case you are interested in collaboration on related subjects.

Disclaimer: This information, partly obtained from official meeting reports, is assumed to be reliable, but do not necessarily reflects the view of Nomor Research GmbH. The report is provided for informational purpose only. We do not accept any responsibility for the content of this newsletter. Nomor Research GmbH has no obligation to update, modify or amend or to otherwise notify the reader thereof in the event that any matter stated herein, or any opinion, projection, forecast or estimate set forth herein, changes or subsequently becomes inaccurate.