



Defining 4G

Understanding the ITU Process
for the Next Generation
of Wireless Technology

Revised August 2008

Defining 4G: Understanding the ITU Process for the Next Generation of Wireless Technology

3G Americas
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1.0 DEFINING 4G WIRELESS SYSTEMS¹

The communications industry is witnessing significant posturing regarding wireless technologies and systems that are claiming to be “4G.” Any claim that a particular technology is a 4G technology or system today is, in reality, simply a market positioning statement by the respective technology advocate. Such claims must be verified and substantiated against a set of requirements in order to qualify as 4G.

The International Telecommunication Union (ITU)² is the internationally recognized entity chartered to produce an official definition of the next generation of wireless technologies. Its Radiocommunication Sector (ITU-R) is establishing an agreed and globally accepted definition of 4G wireless systems that is inclusive of the current multi-dimensioned and diverse stakeholder universe.

The ITU³ is close to releasing a full set of documentation for this definition. It has held ongoing consultations with the global community over many years on this topic in Working Party 8F⁴ under the scope of a work item known as *Question ITU-R 229-1/8 “Future development of IMT-2000 and systems beyond IMT-2000.”* Following a year-end 2007 restructure in ITU-R, this work is being addressed under the new Study Group 5 umbrella (replacing the former Study Group 8) by Working Party 5D⁵ which is the new name for the former WP 8F.

This work in WP 8F, and now WP 5D, has woven together a definition, recipe, and roadmap for the future beyond 3G that is comprised of a balance among a Market and Services View, a Technology View, and a Spectrum View. These, along with Regulatory aspects, are the key elements for business success in wireless.

Significant work has been completed in ITU-R, establishing the nucleus of what should be encompassed in a 4G system. In particular, ITU-R, working under a mandate to address systems beyond 3G, has progressed from delivering a vision of 4G in 2002 to establishing a name for 4G in 2005 (*IMT-Advanced*). In 2006, ITU-R set out the principles for the process of the development of *IMT-Advanced*. These early deliverables have stimulated research and development activities worldwide, spawned ideas for potential technologies and promoted views on spectrum required to address a rapidly growing wireless world.

By mid-2008, ITU-R advanced beyond the vision and framework and developed a set of requirements by which technologies and systems can, in the near future, be determined as a part of *IMT-Advanced* and in doing so, earn the right to be considered 4G.

During 2008 and through 2009, ITU-R will hold an open call for the “first invitation” of 4G (*IMT-Advanced*) candidates. Subsequent to the close of the submission period for the “first invitation” an assessment of those candidates’ technologies and systems will be conducted under the established ITU-R process, guidelines, and timeframes for this *IMT-Advanced* “first invitation.” The culmination of this open process will be a 4G, or *IMT-Advanced* family. Such a 4G family, in adherence to the principles defined for acceptance into this process, is globally recognized to be one which can grow to include all aspects of a marketplace that will arrive beyond 2010, thus complementing and building upon an expanding and maturing 3G business.

¹ While the term 4G is in general use in the industry, ITU-R utilizes the nomenclature *IMT-Advanced* to describe these systems and seeks to avoid the use of the term 4G in its work.

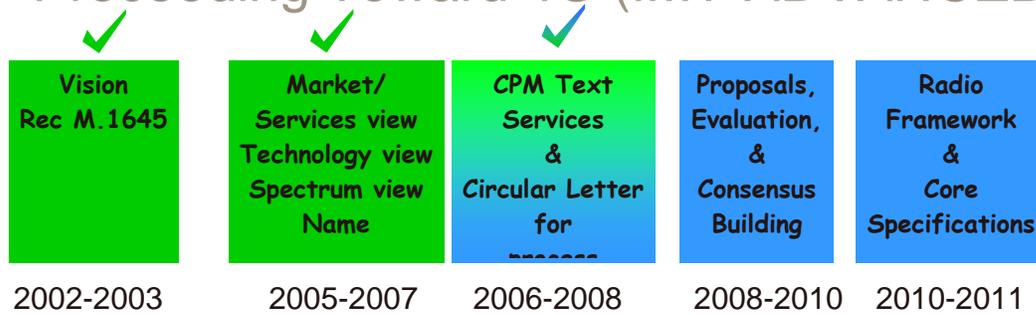
² <http://www.itu.int>

³ ITU materials used by permission

⁴ Working Party 8F held responsibility for the *IMT-2000* and “Beyond *IMT-2000*” from its inception in the year 2000 through its disbanding in 2007 when it was superseded by WP 5D. The archive records of this work on *IMT* may be found at <http://www.itu.int/ITU-R/index.asp?category=study-groups&rlink=rwp8f&lang=en>

⁵ The home page for WP 5D is <http://www.itu.int/ITU-R/index.asp?category=study-group&rlink=rwp5d&lang=en>

Proceeding Toward 4G (*IMT-ADVANCED*)



Setting the Stage for Future
Vision, Spectrum, and Technology Views

Defining the
Technology

Figure 1: The Progression Towards 4G (simple view)

Conclusion

Third Generation Systems began as a concept that envisioned what a future wireless mobility marketplace would look like. Thus began a global process to foster the development of technologies to support that vision. What truly defined, and continues to define, the term "3G" is the evolving wireless marketplace. The definition of what comprises a "generation" manifests only after particular technologies enjoy deployments in major marketplaces globally. This is currently occurring for 3G technologies, and will certainly happen for 4G as well.

As a defined generation of wireless, 4G is therefore only in its adolescence. It remains the task of the stakeholders to take 4G forward over time. As it was for 3G, 4G will be defined in stages. The 4G development work is poised to move into the next stages: establishing criteria for *IMT-Advanced* and ultimately screening the technologies for inclusion in the *IMT-Advanced* family. Only then will we understand what is and can be rightly called a 4G technology/system.

2.0 REFERENCES & FURTHER BACKGROUND

These materials, available from the ITU,⁶ provide a deeper understanding of the 4G (*IMT-Advanced*) future. Specific details from some of the cited relevant references are provided as additional background.

This section addresses:

- 2.1 – Understanding the Future Vision, Market, Services and Technology Concepts
- 2.2 – Understanding the Future Spectrum
- 2.3 – Naming 4G and Establishing Principles for a Process for Development of 4G
- 2.4 – Establishing the Criteria for 4G, the Call for Submissions, Deciding on the Technologies
- 2.5 – ITU-R Web page for IMT-Advanced

2.1 - Understanding the Future Vision, Market, Services and Technology Concepts

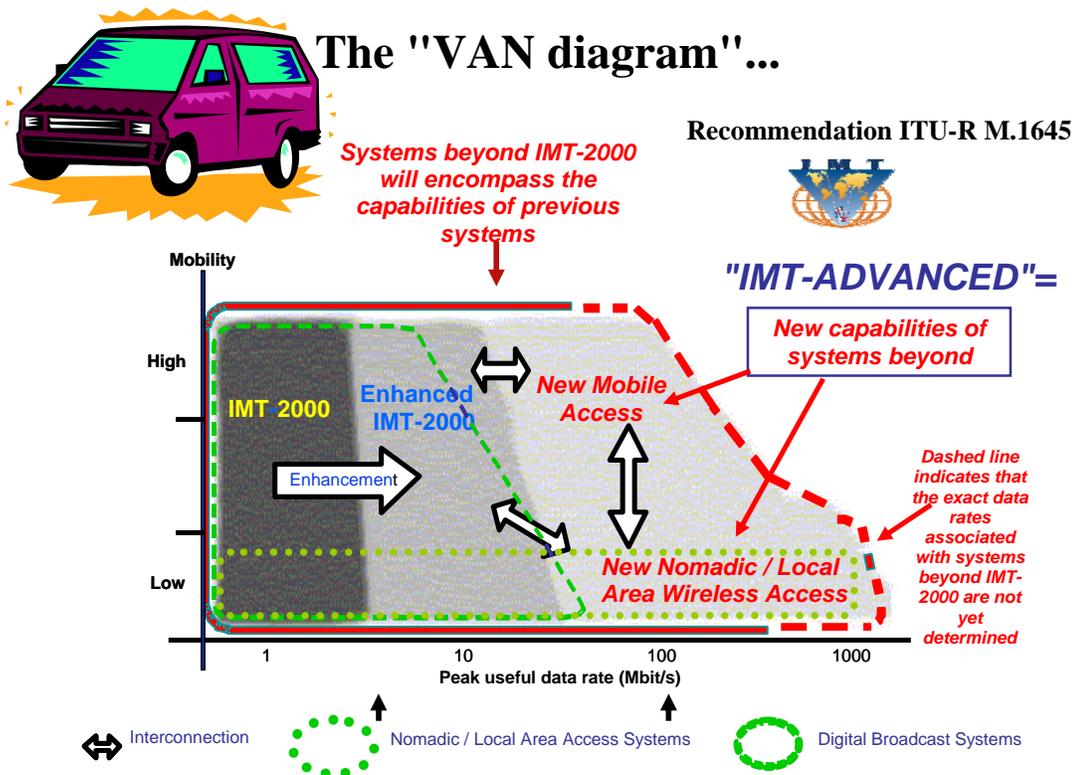
Vision (completed 2002/2003 ITU-R deliverable)

Recommendation ITU-R M.1645: Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000.

A new radio access interface(s) is envisaged to handle a wide range of supported data rates according to economic and service demands in multi-user environments with peak data rates, as targets for research, of up to approximately 100 Mbit/s for high mobility applications such as mobile access, and up to approximately 1 Gbit/s for low mobility applications such as nomadic/local wireless access.

⁶ Publications for the ITU-R are specifically available at: <http://www.itu.int/publications/sector.aspx?lang=en§or=1>

A picture that is "worth a thousand words" towards understanding the vision of 4G is included in M.1645 and is reproduced below.



Market (completed 2005 ITU-R deliverable)

Report ITU-R M.2072: World mobile telecommunication market forecast

Report ITU-R M.2072 provides a summary of the market analysis and forecast of evolution of mobile market and services for the future development of IMT-2000, systems beyond IMT-2000 and other systems. This report has derived market-related parameters and provided forecasts for 2010, 2015 and 2020 for the mobile market. These parameters were essential inputs in developing a spectrum estimate, for future development of IMT-2000 and systems beyond IMT 2000 at the World Radiocommunication Conference 2007. The findings of this report are based on internal and external studies to the year 2020 as well as detailed data on the traffic forecasts in different parts of the world. It also provides examples of potential services and applications of future development of IMT-2000 and systems beyond IMT-2000 from the year 2010 onwards.

Technology (completed 2005 ITU-R deliverable)

Report ITU-R M.2038: Technology Trends

Report ITU-R M.2038 provides information on many of the technology trends concerning radio access networks foreseen at the time of preparation of Recommendation ITU-R M.1645.

The report addresses technology topics that appear relevant to the future development of IMT-2000 and systems beyond IMT-2000. The report considers these topics in three broad categories:

- technologies which have an impact on spectrum, its utilization and/or efficiency in this context;
- technologies which relate to access networks and radio interfaces;

- technologies which relate to mobile terminals.

Report ITU-R M.2074: Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000

Report ITU-R M.2074 describes technical matters related to radio aspects, such as requirements for technical characteristics needed for spectrum requirements calculations, values of the required radio parameters, spectrum efficiency values and suitable spectrum range preference from a technical aspect. These matters are reflected in the process to calculate the required spectrum and to determine suitable frequency ranges for the future development of IMT-2000 and systems beyond IMT-2000 from the year 2010 onwards to fulfill the framework shown in Recommendation ITU-R M.1645.

Services (completed 2007 ITU-R deliverable)

Recommendation ITU-R M.1822: Framework for Services delivered by IMT

Recommendation ITU-R M.1822 addresses the high-level requirements for services to be supported by IMT, including the future development of IMT-2000 and IMT-Advanced. It includes service descriptions, service enablers, service description parameters and service classifications of IMT. Various case studies are included.

2.2 - Understanding the Future Spectrum

Another important aspect in the future of 4G markets is the establishment of the spectrum needs that 4G would require. If 4G provides the building, the spectrum provides the real estate for this future marketplace. The understanding of what spectrum might be accorded to systems of the future, and what frequency bands, constraints, bandwidth, etc., that candidate spectrum may have, is crucial to the development of 4G type technology/systems that support data rates up to 1 GB/s over a wide range of environments. Many of these spectrum issues were addressed at the ITU-R World Radio Conference 2007, which was held in October/November 2007.

Spectrum (completed 2006 ITU-R deliverables)

Recommendation ITU-R M.1768: Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000

Recommendation ITU-R M.1768 addresses the spectrum calculation for the future development of IMT-2000 and IMT-Advanced. New concepts were introduced, including a mix of services, multiple complementary systems and Radio Access Techniques Groups (RATG) which are required to encapsulate a wide-ranging wireless future. It weaves together key impacts on spectrum needs into a complex multi-dimensional model accommodating a diversity of services and market demand scenarios with forward-looking technology aspects.

Report ITU-R M.2078: Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced

The majority of the future traffic is changing from speech-oriented communications to multimedia packet communications. Consequently, the methodology on terrestrial spectrum requirement estimation for IMT has been updated to accommodate the diverse aspects of IMT.

As indicated by Report ITU-R M.2078, the predicted total spectrum bandwidth requirement for both existing mobile cellular systems, including pre-IMT-2000 and IMT-2000 and its enhancements, and IMT-Advanced for the year 2020, was calculated for both low and high user-demand scenarios to be 1280 MHz and 1720 MHz, respectively. It should be noted that the lower figure (1280 MHz) is higher than the requirements for some countries. In addition, there are some countries where the requirement is larger than the higher value (1720 MHz). The spectrum prediction is based on an

assumption of one network deployment. In case of several parallel network deployments in a country, spectrum requirements will be higher as provided by Report ITU-R M.2078.

Report ITU-R M.2079: Technical and operational information for identifying Spectrum for the terrestrial component of future development of IMT-2000 and IMT-Advanced

Report ITU-R M.2079 indicates that the prioritized candidate bands should focus on bands between 400 MHz and 5 GHz. Details are provided on the various bands with regard to world-wide applicability, as well as various advantages and disadvantages of each.

2.3 – Naming 4G and Establishing Principles for a Process for Development of 4G

A significant step towards the reality of 4G is the establishment of a more formal name for these systems as well as the development of principles to guide the development and selection process designed to qualify technologies and systems as 4G.

ITU-R has established two critical elements of 4G systems and technologies. The adoption of these key ITU-R Resolutions was successfully concluded at the ITU-R Radio communication Assembly in October 2007. These views, initially crafted in 2005 and 2006 had already been mainly accepted by the stakeholders of a future 4G world, and are generically referred to as the *Name Resolution* and the *Principles Resolution*.

The *Name Resolution* specifies the nomenclature for the future development of IMT-2000 and Systems Beyond IMT-2000 through names uniquely associated with the advancement and continuation of International Mobile Telecommunications (IMT), and gives us the now accepted term *IMT-Advanced*.

The *Principles Resolutions* takes this further towards 4G by establishing the principles for the process of the development of *IMT-Advanced*.

To reach the ultimate goal of determining what a 4G system is, and what constitutes the *IMT-Advanced* technology set, ITU-R finalized and announced in early 2008, through the mechanism of an ITU-R Circular Letter, a process that satisfies the framework of the above principles.

Naming (completed 2005 ITU-R deliverable)

Draft New Resolution ITU-R 56: Naming for International Mobile Telecommunications

In the Resolution ITU-R 56, the following conclusion is reached:

resolves

1. that the term “IMT-2000” encompasses also its enhancements and future developments⁷;
2. that the term “IMT-Advanced” be applied to those systems, system components, and related aspects that include new radio interface(s) that support the new capabilities of systems beyond IMT-2000⁸; and
3. that the term “IMT” be the root name that encompasses both IMT-2000 and IMT-Advanced collectively.

⁷ The detailed specifications of the IMT-2000 radio interfaces are in Recommendation ITU-R M.1457.

⁸ As described in Recommendation ITU-R M.1645, systems beyond IMT-2000 will encompass the capabilities of previous systems, and the enhancement and future developments of IMT-2000 that fulfil the criteria in *resolves* 2 may also be part of IMT-Advanced.

Principles (completed 2006 ITU-R deliverable)

Draft New Resolution ITU-R 56: Principles for the Process of Development of IMT-Advanced (Question ITU-R 229/8)

Resolution ITU-R 57 forms a foundation for the process by establishing the guidelines and principles for such a process that will ultimately result in not only the defining aspects of IMT-Advanced, but also the actual selection of qualifying technologies for a 4G future. It is, in part, as follows:

that, in light of the above *resolves*, this process shall include:

- a) the definition of minimum technical requirements and evaluation criteria, based on the framework and overall objectives of IMT-Advanced, that support the new capabilities expressed in Recommendation ITU-R M.1645, taking into account end-user requirements and without unnecessary legacy requirements;
- b) an invitation for Members of ITU-R, through a circular letter, to propose candidate radio interface technologies for IMT-Advanced;
- c) additionally, an invitation to other organizations to propose candidate radio interface technologies for IMT-Advanced, under the scope of liaison and collaboration with such other organizations through Resolution ITU-R 9-3. In such invitations the attention of these organizations shall be drawn to the current ITU-R Intellectual Property Rights (IPR) policies;
- d) an evaluation by ITU-R of the radio interface technologies proposed for IMT-Advanced to ensure that they meet the requirements and criteria defined in 6 a) above. Such an evaluation may utilize the principles for interaction of ITU-R with other organizations as detailed in Resolution ITU-R 9-3;
- e) consensus-building with the objective of achieving harmonization in response to the *considering* and *recognizing* paragraphs of this Resolution and which would have the potential for wide industry support of the radio interfaces that are developed for IMT-Advanced;
- f) a standardization phase where ITU-R develops the IMT-Advanced radio interface specification Recommendation(s) based on the results of an evaluation report (defined in *resolves* 6 d)) and of consensus-building (defined in *resolves* 6 e)) ensuring that the specifications meet the technical requirements and evaluation criteria as defined in 6 a) or 6 g). In such a standardization phase, work may proceed in cooperation with relevant organizations external to ITU in order to complement the work within ITU-R, using the principles set out in Resolution ITU-R 9-3;
- g) reviews of the minimum technical requirements and evaluation criteria defined in 6 a), taking into account technology advances and end-user requirements changing with time. As the minimum technical requirements and evaluation criteria are changed, these will be designated as separately identifiable versions for IMT-Advanced. The process will include review of existing versions to determine whether they should remain in force;
- h) an ongoing and timely process where new radio interface technology proposals may be submitted and existing radio interface specifications can be updated. The process should have flexibility to allow proponents to seek evaluation against any version of the approved criteria currently in force

2.4 – Establishing the Criteria for 4G, the Call for Submissions, Deciding on the Technologies

One of the concluding aspects of defining 4G (*IMT-Advanced*) could be considered the actual publication of criteria for 4G, and the call for technology submissions the subsequent evaluations, assessments and decision making. This will launch the quantification of these developing technologies and ultimately establish the family of 4G systems.

In this stage of 4G, *IMT-Advanced* builds upon and expands the IMT-2000 (3G) foundation established by ITU-R and defined in Recommendation ITU-R M.1457, *Detailed specifications of the radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)*. It is anticipated that relevant Recommendations paralleling M.1457 will be developed specifically for *IMT-Advanced*.

It is acknowledged that the Partnership Projects (3GPP⁹ and 3GPP2¹⁰) and industry Standard Development Organizations (SDOs) are and will continue to be an integral part of this global process. Other technology proponent entities will also be important contributors and an integral part of this process.

The basic processes utilized in the past, and currently for *IMT-2000/3G*, can and will continue to be successfully leveraged for *IMT-Advanced/4G* following the principles outlined.

In early July 2008, Working Party 5D concluded the work on the technical performance requirements for *IMT-Advanced*. This information is captured in Draft New Report ITU-R M. [IMT.TECH], *Requirements related to technical system performance for IMT-Advanced Radio interface(s)*.¹¹

In keeping with the normal method of work, ITU-R has announced to its members and externally to relevant organizations the details of this process, the established timeline and the criteria for the first invitation of *IMT-Advanced*.

This announcement was provided in Circular Letter 5/LCCE/2 and its Addenda, *Invitation for submission of proposals for candidate radio interface technologies for the terrestrial components of the radio interface(s) for IMT-Advanced and invitation to participate in their subsequent evaluation*.

The purpose of the Circular Letter (initially released in March 2008) is to invite the submission of proposals for candidate radio interface technologies (RITs) or a set of RITs (SRITs) for the terrestrial components of *IMT-Advanced*.

The Circular Letter also initiates an ongoing process to evaluate the candidate RITs or SRITs for *IMT-Advanced*, and invites the formation of independent evaluation groups and the subsequent submission of evaluation reports on these candidate RITs or SRITs.

Two key figures directly extracted from Document ITU-R IMT-ADV/2-1 as revised in July 2008¹² (which forms the basis for this same information contained in the official ITU-R *IMT-Advanced* webpage operating under the guidance of Circular Letter 5/LCCE/2) provides a time schedule for the first invitation for candidate RITs or SRITs and a flow diagram for the detailed procedure. The Figure numbers used here correspond to those in the *IMT-ADV/2 Rev 1* document.

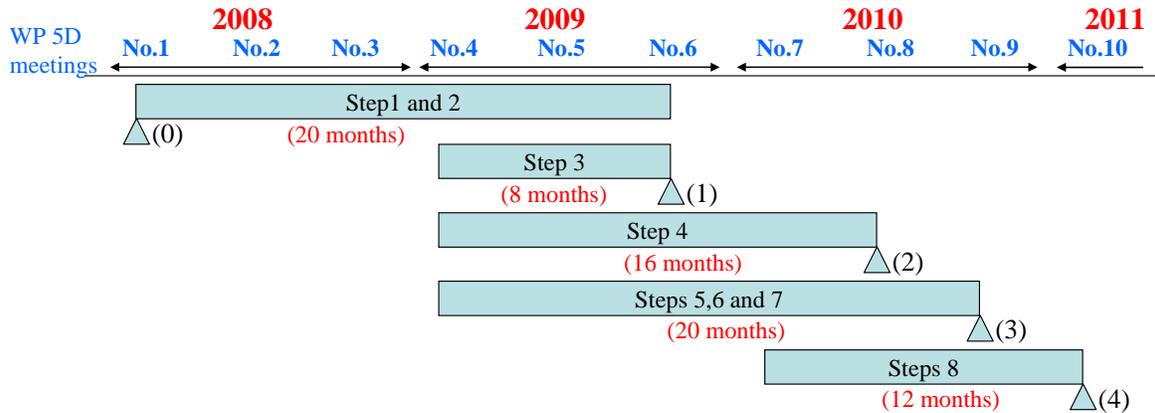
⁹ Third Generation Partnership Project, <http://www.3gpp.org>

¹⁰ Third Generation Partnership Project 2, <http://www.3gpp2.org>

¹¹ Draft New Report ITU-R M.[IMT.TECH] is submitted to the November 2008 meeting of ITU-R SG 5 for approval under the procedure of ITU-R Resolution 1-5.

¹² The ITU-R *IMT-ADV* document series may be found at: <http://www.itu.int/md/R07-IMT.ADV-C>

FIGURE A2-1
Schedule for the development of IMT-Advanced radio interface Recommendations



Steps in radio interface development process:

- | | |
|---|--|
| Step 1: Issuance of the circular letter | Step 5: Review and coordination of outside evaluation activities |
| Step 2: Development of candidate RITs and SRITs | Step 6: Review to assess compliance with minimum requirements |
| Step 3: Submission/Reception of the RIT and SRIT proposals and acknowledgement of receipt | Step 7: Consideration of evaluation results, consensus building and decision |
| Step 4: Evaluation of candidate RITs and SRITs by evaluation groups | Step 8: Development of radio interface Recommendation(s) |

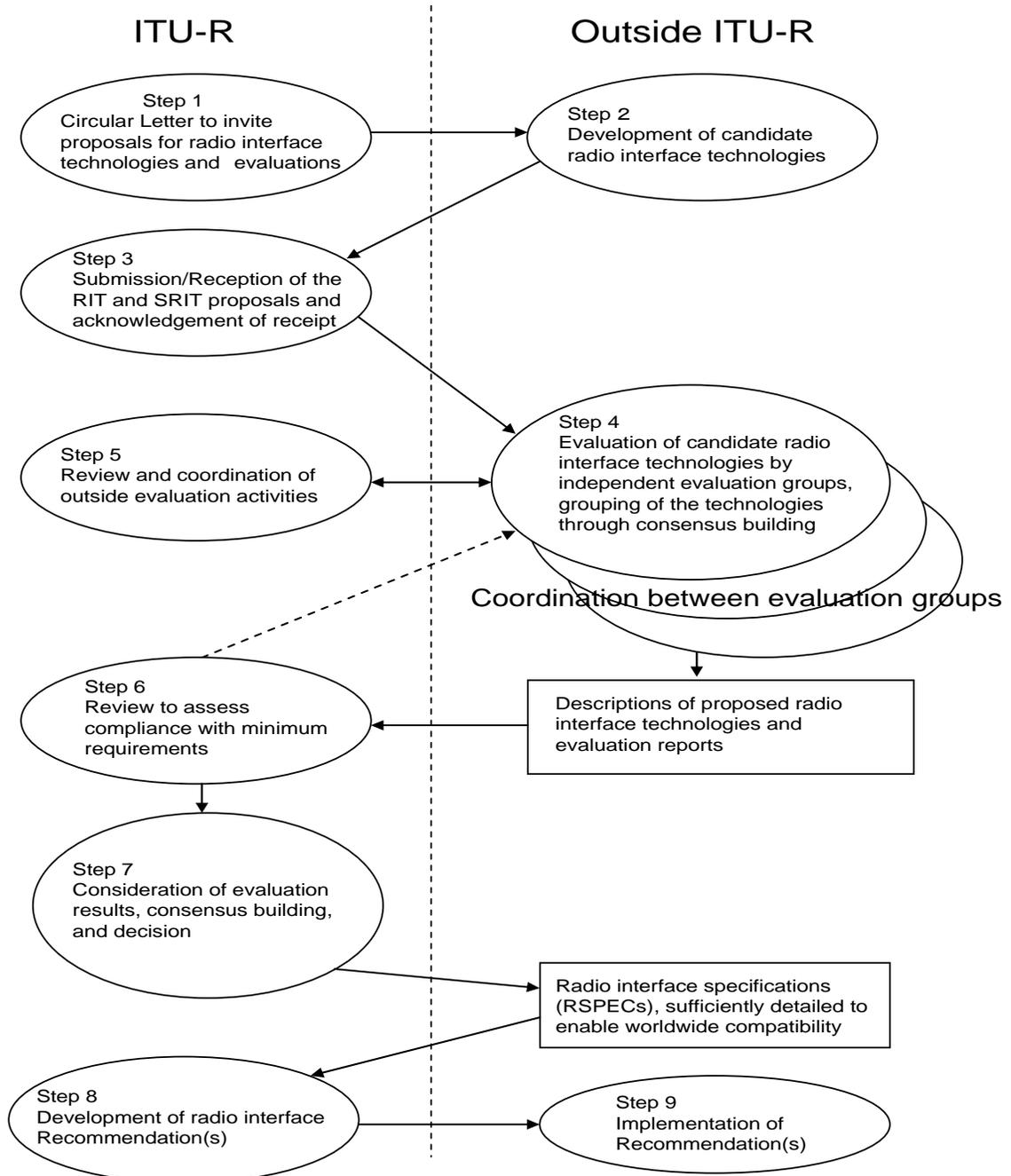
Critical milestones in radio interface development process:

- | | | | |
|--|--------------|---|---------------|
| (0): Issue an invitation to propose RITs | March 2008 | (2): Cut off for evaluation report to ITU | June 2010 |
| (1): ITU proposed cut off for submission of candidate RIT and SRIT proposals | October 2009 | (3): WP 5D decides framework and key characteristics of IMT-Advanced RITs and SRITs | October 2010 |
| | | (4): WP 5D completes development of radio interface specification Recommendations | February 2011 |

IMT-Advanced A2-01

FIGURE A2-2

IMT-Advanced terrestrial component radio interface development process



[IMT-Advanced A2-02]

In August 2008, the ITU-R released an Addendum to Circular Letter 5/LCCE/2 which announced the availability of “the further relevant information associated with the IMT-Advanced requirements, evaluation criteria and submission templates for the development of IMT-Advanced.”

The Circular Letter Addendum draws attention to the IMT-Advanced web page. Of note is document Draft New Report ITU-R M.[IMT.REST], *Requirements, evaluation criteria, and submission templates for the development of IMT-Advanced*.¹³

This report supports the process for IMT-Advanced initiated by Circular Letter 5/LCCE/2 and its Addendums. It addresses the requirements, evaluation criteria, as well as submission templates required for a *complete submission* of candidate radio interface technologies (RITs) and candidate sets of radio interface technologies (SRITs) for IMT-Advanced. In essence it can be considered as an umbrella document providing the context and relationships among these critical portions of the IMT-Advanced.

As part of the umbrella, the Report M.[IMT.REST] points, for the specific details of the on the technical performance requirements for IMT-Advanced, to work concluded in early July 2008 by Working Party 5D which is captured in Draft New Report ITU-R M.[IMT.TECH], *Requirements related to technical system performance for IMT-Advanced Radio interface(s)*.¹⁴ This is a foundation document and it is instructive to quote Section 4 from the draft version of the document:

“4 Minimum requirements¹⁵

IMT-Advanced can be considered from multiple perspectives, including the users, manufacturers, application developers, network operators, and service and content providers as noted in section 4.2.2 in Recommendation ITU-R M.1645 “Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000”. Therefore, it is recognized that the technologies for IMT-Advanced can be applied in a variety of deployment scenarios and can support a range of environments, different service capabilities, and technology options. Consideration of every variation to encompass all situations is therefore not possible; nonetheless the work of the ITU-R has been to determine a representative view of IMT-Advanced consistent with the process defined in Resolution ITU-R 57, “Principles for the process of development of IMT-Advanced” and the requirements defined in this report.

The requirements presented in this document are for the purpose of consistent definition, specification, and evaluation of the candidate RITs or SRITs for IMT-Advanced in ITU-R in conjunction with the development of Recommendations and Reports such as the framework and key characteristics and the detailed specifications of IMT-Advanced. The intent of these requirements is to ensure that IMT-Advanced technologies are able to fulfill the objectives of IMT-Advanced and to set a specific level of minimum performance that each proposed technology need to achieve in order to be considered by ITU-R for IMT-Advanced.

These requirements are not intended to restrict the full range of capabilities or performance that candidate technologies for IMT-Advanced might achieve, nor is it intended to describe how the IMT-Advanced technologies might perform in actual deployments under operating conditions that could be

¹³ Draft New Report ITU-R M.[IMT.REST] is to be submitted to the November 2008 meeting of ITU-R SG 5 for approval under the procedure of ITU-R Resolution 1-5.

¹⁴ Draft New Report ITU-R M.[IMT.TECH] is submitted to the November 2008 meeting of ITU-R SG 5 for approval under the procedure of ITU-R Resolution 1-5.

¹⁵ In the event of differences between the draft version and the final approved version, the approved version takes precedence.

different from those presented in ITU-R Recommendations and Reports on IMT-Advanced.”

One additional aspect of importance is the evaluation of the candidate technology submissions. The ITU-R in Working Party 5D is concluding work on the document Preliminary Draft New Report ITU-R M.[IMT.EVAL], *[Guidelines for evaluation of radio interface technologies for IMT-Advanced]*.¹⁶ The Report (as currently envisioned) is anticipated to provide guidelines for both the procedure and the criteria (technical, spectrum and service) to be used in evaluating the proposed IMT-Advanced Radio Interface Technologies (RITs) or Sets of RITs (SRITs) for a number of test environments and deployment scenarios for evaluation. These test environments are chosen to simulate closely the more stringent radio operating environments. The evaluation procedure is designed in such a way that the overall performance of the candidate RITs/SRITs may be fairly and equally assessed on a technical basis. It ensures that the overall IMT-Advanced objectives are met. This Report provides, for proponents, developers of RITs/SRITs and external evaluation groups, the common methodology and evaluation configurations to evaluate the proposed RITs/SRITs and system aspects impacting the radio performance.

2.5 ITU-R Web page for IMT-Advanced

The ITU-R Radiocommunication Bureau has established an “IMT-Advanced” web page (<http://www.itu.int/ITU-R/go/rsg5-imt-advanced/>) to facilitate the development of proposals and the work of the evaluation groups. The IMT-Advanced web page provides details of the process for the submission of proposals, and will include the RIT and SRIT submissions, evaluation group registration and contact information, evaluation reports and other relevant information on the development of IMT-Advanced.

¹⁶ Preliminary Draft New Report ITU-R M.[IMT.EVAL] is scheduled for conclusion in WP 5D in October 2008 and will be submitted to the November 2008 meeting of ITU-R SG 5 for approval under the procedure of ITU-R Resolution 1-5.

3.0 RELEVANT ITU-R RESOLUTIONS, RECOMMENDATIONS AND REPORTS

TYPE	NUMBER	TITLE
Recommendation ITU-R	M.1822	Framework for Services delivered by IMT
Resolution ITU-R	56	Naming for International Mobile Telecommunications
Resolution ITU-R	57	Principles for the process of development of IMT-Advanced (Question ITU-R 229/8)
Recommendation ITU-R	M.1645	Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000
Recommendation ITU-R	M.1768	Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000
Report ITU-R	M.2038	Technology Trends
Report ITU-R	M.2072	World mobile telecommunication market forecast
Report ITU-R	M.2074	Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000
Report ITU-R	M.2074	Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000
Report ITU-R	M.2078	Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced
Report ITU-R	M.2079	Technical and operational information for identifying Spectrum for the terrestrial component of future development of IMT-2000 and IMT-Advanced
Draft New Report ITU-R	M.[IMT.REST]	Requirements, evaluation criteria, and submission templates for the development of IMT-Advanced
Draft New Report ITU-R	M.[IMT.TECH]	Requirements related to technical system performance for IMT-Advanced Radio interface(s)
Preliminary Draft New Report ITU-R	M.[IMT.EVAL]	[Guidelines for evaluation of radio interface technologies for IMT-Advanced]

Acknowledgements

The mission of 3G Americas is to promote and facilitate the seamless deployment throughout the Americas of GSM and its evolution to 3G and beyond. 3G Americas' Board of Governors members include Alcatel-Lucent, AT&T, Cable & Wireless, Ericsson, Gemalto, HP, Huawei, Motorola, Nokia, Nortel Networks, Openwave Systems, Research In Motion, Rogers Wireless, T-Mobile USA, Telcel, Telefónica and Texas Instruments.

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