Radiocommunication Study Groups

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GENERAL ASPECTS

ITU-APT Foundation of India (IAFI)

PROPOSAL FOR A NEW REPORT ON CRITICAL APPLICATIONS OF IMT FOR INDUSTRIAL AND ENTERPRISE USERS

1 Introduction

Question ITU-R 262/5 (2019) calls upon ITU-R to identify specific industrial and enterprise applications that may be supported by International Mobile Telecommunication (IMT) and to study their usages, functionalities, technical characteristics, spectrum scenarios, operational aspects, and capabilities.

Despite continued COVID-19 situation, many countries are working to restart their Industrial and Enterprises expeditiously. The integration of Information technology (IT) to build an automated, agile and intelligence driven manufacturing and services industry will require high speed mobile connectivity. Today's industries and enterprises generate and use a huge amount of data in real time, which is moved and consumed at enormous rates to harness the advantages of digital technologies. Until now, reliable connectivity has remained a critical barrier to realizing the full potential of what is collectively known as Industry 4.0. Efficiencies of these industries and enterprises can be substantially enhanced by supplementing their existing mission critical voice communications with high-quality video and enhanced mobile broadband data support that is now becoming available from IMT.

Report ITU-R M.2441, published in 2018, provides an initial compilation of usage of IMT in specific applications. Further, it introduces potential new emerging applications of IMT in areas beyond traditional voice, data and entertainment type communications as envisaged in the vision for IMT-2020. However, with the approval of IMT-2020 radio interface specifications and implementation of 5G radio networks by many countries, and the identification of a number of bands and multiple gigahertz of spectrum for IMT, it is important to develop further detailed ITU-R Reports and Recommendations, as needed, on various new use cases of IMT.

In line with the approved study question, this contribution proposes to initiate work on a new ITU-R Report focussed on critical applications of IMT for industrial and Enterprise users.

2 Discussion

Today's industrial automation is powered by ICT technology and this trend will increase manifold with advent of new broadband mobile technologies such as IMT-2020, leading to increased business efficiencies, improved safety, and enhanced market agility. Industry 4.0 enables industries

to fuse physical with digital processes by connecting all sensors, machines and workers in the most flexible way available. Tethering them to a wired network infrastructure is expensive and, ultimately, it will limit the possible applications of Industry 4.0. Industrial grade private wireless will unleash its real potential by providing the most flexible and cost-effective way to implement a wide range of Industry 4.0 applications. Current IT based automation solutions are well adapted for day-to-day business communications but are limited in reliability, security, predictable performance, multiuser capacity and mobility, all features which are required for operational applications that are business or mission critical. Similarly, applications in mines, port terminals or airports require large coverage area, low latency and challenging environments, which so far only two-way mission critical radios could meet. In both mining and port terminals, remotely operated, autonomous vehicles, such as trucks, cranes and straddle carriers are used requiring highly reliable mission critical mobile communications.

Taking manufacturing, with thousands of factories with more than 100 employees, as an example, typical business cases revolve around controlling the production process, improving material management, improving safety, and introducing new tools. Research has shown that manufacturers can expect to see a tenfold increase in their returns on investment (ROIs) with IMT-2020, while warehouse owners can expect a staggering fourteenfold increase in ROI. Fortunately, IMT-2020 is available in configurations perfectly suited to building industrial-strength private wireless networks to support Industry 4.0. They bring the best features of wireless and cable connectivity and have proven their capabilities both in large consumer mobile networks area as well as in many industrial segments. The time is ripe for many industries to leverage private and captive IMT-2020 to increase efficiencies and automation. In simple terms –

(i) A private network is a dedicated network of the enterprise involving connections of the people, systems and processes of the enterprise.

(ii) A private network is a dedicated network by the enterprise setup internally in the enterprise by internal IT teams or outsourced.

(iii) A private network is a dedicated network for the enterprise to enable communication infrastructure for the systems and people associated with the enterprise.

The emergence of ultrafast IMT-2020 technology in higher (mmWave) frequency bands as well provides manufacturers with the much-needed reliable connectivity solutions, enabling critical communications for wireless control of machines and manufacturing robots, and this will unlock the full potential of Industry 4.0. Taking manufacturing, with thousands of factories with more than 100 employees, as an example, typical business cases revolve around controlling the production process, improving material management, improving safety, and introducing new tools.

It is expected that manufacturers can expect to see a tenfold increase in their returns on investment (ROIs) with 5G, while warehouse owners can expect a staggering fourteenfold increase in ROI. Fortunately, 5G is available in configurations perfectly suited to building industrial-strength private wireless networks to support Industry 4.0. They bring the best features of wireless and cable connectivity and have proven their capabilities both in large consumer mobile networks area as well as in many industrial segments. The time is ripe for many industries to leverage private and captive 5G to increase efficiencies and automation.

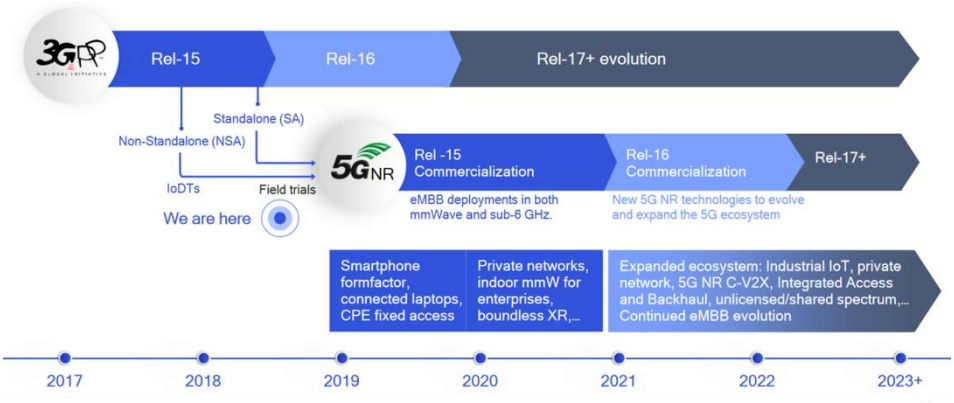
Apart from manufacturing, many other industries are also looking at IMT-2020 as the backbone for their equivalent of the Fourth Industrial Revolution. The opportunity to address industrial connectivity needs of a range of industries include diverse segments with diverse needs, such as those in the mining, port, energy and utilities, automotive and transport, public safety, media and entertainment, healthcare, agriculture and education industries, among others.

Some recent trial of IMT in port operations demonstrated the “New Radio” capabilities for critical communications enablers such as ultra-reliable low-latency communication (URLLC), enhanced mobile broadband (eMBB) to support traffic control, AR/VR headsets and IoT sensors mounted on mobile barges and provides countless possibilities to improve efficiency and sustainability in seaports and other complex and changing industrial environments. In response to the impact of COVID-19 pandemic some ports are increasing/accelerating their adoption of digital processes, automation and other technologies to enhance efficiency and resiliency to crises such as a global pandemic.

Similarly, in mining exploration sites, the drilling productivity could be substantially increased through automation of its drills alone. Additional savings from increased usage of equipment could also lead to lower capital expenditures for mines (CapEx) as well as a better safety and working environments for their personnel.

FIGURE 1

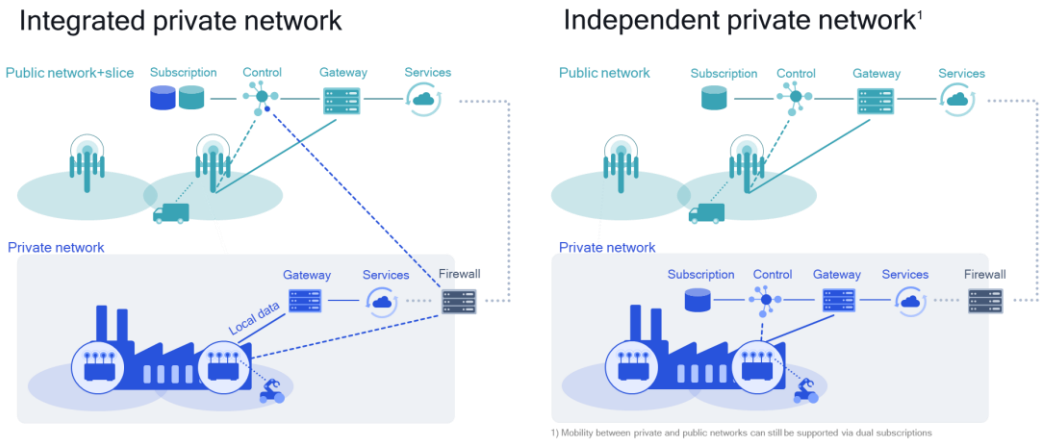
Technology Evolution



Even the most advanced factories of today still largely depend on inexpensive unlicensed wireless networks that have several drawbacks, such as lack of protection and potential interference in dense settings and complex fixed connections that are difficult to manage in large industrial settings. While the unlicensed spectrum is freely available, it is severely limited in quality of service (QoS) and support for mobility. In smart manufacturing, such networks cannot support the mobile requirements of automated guided vehicles (AGVs) or the even some of the faster moving arms of robots. It also does not support low power requirements of sensors and other IoT devices. Further, it cannot support the high density of sensors, devices, robots, workers and vehicles that are operating in a typical manufacturing plant.

FIGURE 2

Examples of private network architectures depending on regulatory aspects and deployments needs



An example of an application in health care that need critical communications that is supported by new capabilities of IMT is remote robotic surgery. A latency of 1 millisecond is critical in providing haptic feedback to a surgeon that is connected through a mobile connection to a surgical robot. A high data rate is needed to transfer high-definition image streams. As an ongoing surgery cannot be interrupted an ultra-reliable communication is needed to keep connection down-time and packet loss very low.

A new generation of private IMT networks is emerging to address critical wireless communication requirements in public safety, manufacturing industries, and critical infrastructure. These private IMT networks are physical or virtual cellular systems that have been deployed for private use by a government, company or group of companies. A number of administrations took the lead to enable locally licensed or geographically shared IMT spectrum available for enterprise use and have begun to recognize spectrum sharing and localised broadband networks in providing flexibility and meeting the needs of critical communications by vertical industries and enterprises. Some administrations have decided to partition the IMT spectrum between commercial carriers and private broadband and others enabled opportunistic use and dynamic access to IMT spectrum that is licensed to commercial carriers.

3 Related ITU-R documents:

Question ITU-R 262/5 - Usage of the terrestrial component of IMT systems for specific applications. (Copy reproduced in Attachment 2).

Recommendation ITU-R M.2083 – Framework and overall objectives of the future development of IMT for 2020 and beyond.

Report ITU-R M.2440–The use of the terrestrial component of International Mobile Telecommunications (IMT) for Narrowband and Broadband Machine-Type Communications.

Report ITU-R M.2441–Emerging usage of the terrestrial component of International Mobile Telecommunication (IMT).

4 Proposal

Question ITU-R 262/5 has called for studies to address the following two questions:

1) What are the specific industrial and enterprise applications, their emerging usages, and their functionalities, that may be supported by IMT?

2) What are the technical characteristics, operational aspects, and capabilities associated with specific industrial and enterprise applications of using IMT?

Accordingly, it is proposed that WP5D starts developing a new report on critical applications of IMT for industrial and enterprise users to provide information, guidance and best practices about these applications of IMT for meeting their needs of critical communications.

Attachments: 1) Preliminary draft workplan
2) Question ITU-R 262/5

ATTACHMENT 1

Workplan for development of a preliminary draft new Report ITU-R M.[xyz.abc]

Title	CRITICAL APPLICATIONS OF IMT FOR INDUSTRIAL AND ENTERPRISE USERS
Identifier	Report
WP 5D Lead Group	WG General Aspects
SWG Chair	
Editor	
Focus for scope and work	Specific industrial and enterprise applications, their usages, functionalities, technical characteristics, operational aspects and capabilities supported by IMT
Related documents	
Milestones	**Meeting No. 38 (16-23 June 2021, [TBD])** 1 Consider input contributions. 2 Send Liaison statement to external organisations, if necessary. 3 Develop workplan as necessary. **Meeting No. 39 (7-14 October 2021, [TBD])** 1 Consider input contributions. 2 Develop working document. 3 Review and revise workplan as necessary. 4. Send liaison statement to external organisations, if necessary. **Meeting No. 40 (8-15 February 2022, [TBD])** 1 Consider input contributions. 2 Further update the working document. 3 Review and revise workplan as necessary. **Meeting No. 41 (15-22 June 2022, [TBD])** 1 Consider input contributions. 2 Complete the working document and elevate it to PDN Report. 3 Review and revise workplan as necessary. **Meeting No. 42 (12-19 October 2022, [TBD])** 1 Consider the received contributions. 2 Finalize the working document and elevate it to DN Report and send to SG5

ATTACHMENT 2

QUESTION ITU-R 262/5

Usage of the terrestrial component of IMT systems for specific applications

(2019)

The ITU Radiocommunication Assembly,

considering

a) that the first IMT systems started service around the year 2000, and since then IMT systems such as IMT-Advanced and IMT-2020 have been developed and enhanced;

b) that IMT systems have contributed to global economic and social development;

c) that IMT-2020 systems provide further capabilities and extend to varied usage scenarios such as enhanced mobile broadband (eMBB), ultra-reliable and low latency communications (URLLC) and massive machine type communications (mMTC), described in Recommendation ITU-R M.2083;

d) that Recommendation of the IMT-2020 terrestrial component radio interface specifications is scheduled to be finalized by 2020 in accordance with its timeline;

e) that IMT systems are leading the growth and development of industries in the field of ICT; and

f) that applicable areas of IMT are expected to be expanded further to various specific applications to facilitate the digital economy, e.g. e-manufacturing, e-agriculture, e-health, intelligent transport systems, smart city and traffic control, etc., which could bring requirements beyond current capabilities of IMT,

recognizing

a) that Resolution ITU-R 50 addresses the role of the Radiocommunication sector in the ongoing development of IMT;

b) that Question ITU-R 229/5 addresses in general terms the further development of the terrestrial component of IMT;

c) that Question ITU-R 209/5 addresses the use of the mobile, amateur and the amateur-satellite services in support of disaster radiocommunications;

d) that Recommendation ITU-R M.2083 defines the framework of the future development of IMT for 2020 and beyond, which includes further enhancement of existing IMT and the development of IMT-2020, as well as a broad variety of capabilities associated with envisaged usage scenarios;

e) that Report ITU-R M.2441 addresses the emerging usage of the terrestrial component of IMT;

f) that Report ITU-R M.2291 contains studies related to the usage of IMT for broadband public protection and disaster relief applications,

noting

a) that several groups and organizations inside and outside ITU-R are studying technologies, usages and spectrum for specific applications based on IMT systems;

b) that IMT systems are now being deployed in industrial and enterprise networks,

decides that the following Questions should be studied

1 What are the specific industrial and enterprise applications, their emerging usages, and their functionalities, that may be supported by IMT?

2 What are the technical characteristics, operational aspects, and capabilities associated with specific industrial and enterprise applications of using IMT?

further decides

1 that the results of the above studies should be included in one or more Recommendations, Reports and/or Handbooks;

2 that the above studies described in *decides* should be completed by 2023.

Category: S2