GTPRN October 2020 Newsletter

Welcome to the GTPRN October 2020 Newsletter

We wish that you and your beloved ones are in a good health. I do personally hope that major conferences in the coming few months such TPRC and ITS will not be conducted virtually. Beside missing being on a plane, physical interactions and discussions are an essential part in exchanging knowledge, and one ultimate goal of GTPRN has been to conduct regular international conferences for all telecom policy scholars around the world. With several countries start to lockdown again due to COVID-19, we hope we will overcome this and will be able to meet and talk to each other in the near future.

We have the privilege this issue to have two exclusive contributions for GTPRN by two of the main profiles in the Standardization (ITU-T) and Radiocommunication (ITU-R) Sectors of the International Telecommunication Union (ITU).

The first article is by Dr. Abdulhadi AbouAlmal, Head of Technology Standardization & Spectrum Management, Etisalat, on a quite interesting new topic, which is the use of IMT system for fixed wireless broadband. Such topic is relatively revolutionary in terms that it advocates utilizing IMT systems for fixed applications rather than being traditionally mobile. Dr. AbouAlmal is a main contributor in the different spectrum management activities within the ITU, and he has led the Arab countries in different occasions including the additional mobile allocation in the 700 MHz in WRC-15. His article can be found on GTPRN website here, and at the end of this Newsletter.

The second article is by Dr. Ramy Ahmed Fathy, Vice-Chair of ITU-T SG20 and Co-Chair of WP1/20 with respect to the recent ITU-T activities related to the advancement of the Internet of Things and Smart Cities and Communities related technologies. Dr Ramy is a true advocate and supporter of introducing the different pillars of the 4th Industrial Revolution in the developing countries. Additionally, he has led the Arab world in the past years through the different activities of the ITU-T, especially during the World Telecommunication Standardization Assembly (WTSA). His article can be found here on GTPRN website.

Regarding online events, please check the following list for different telecom policy webinars:

- ITS Webinar on the Future of Remote Work (October 23, 2020, 10:00 AM, U. S. Eastern Time). Event details are here.
- Foreign Policy magazine on Bridging the Digital Divide, and how the extraordinary potential of 5G can support both national and global connectivity (22nd October, 11:00AM - 12:00PM EDT). Event information is here.
- Interdigital 6G Symposium, a two-day virtual conference organized by InterDigital and the Institute for Wireless Internet of Things at Northeastern University that will gather industry, academia, and government's brightest minds to help shape the road to 6G (20th October 2020). Event details are here.
- CARGC Colloquium "China, Africa, and the Shifting Worlds of Tech Labor" (October 29 @ 12:00 pm - 1:00 pm EDT). Registration is here
- ITS Webinar on EU ICT Cybersecurity (October 28, 2020, 3:00 - 5:45 pm CET). Event information is here.
- ITS Webinar on The Future of Remote Work (October 23, 2020). Registration is here.

Below is a list of recent reports and studies covering different telecom policy areas.

- The Global Symposium for Regulators conducted by the ITU in last September has issued an excellent sets of guidelines for regulators here.
- Another important report is also by the ITU on Economic impact of COVID-19 on digital infrastructure. It can be found here.
- The World Bank and the ITU have been working on the Digital Regulation Handbook. It is an updated important piece of work for regulators and telecom policy scholars. It can be downloaded here.
- The 2020 editions of the International Radio Regulations (RR), the most important treaty document on wireless communications for 193 countries are now available and can be downloaded here.
- Prof. Rob Frieden, Pioneers Chair and Professor of Telecommunications and Law, Penn State University, has a quite interesting opinion on 5G public private partnership. You can check it here
- The 3rd edition of Ericsson Fixed Wireless Access handbook can be found here

With respect to telecom policy journals, please find below these latest releases:

- The November 2020 issue (Volume 54) of Telematics and Informatics is available here
- The December 2020 issue (Volume 55) of Telematics and Informatics is available here
- Volume 52 (September 2020) of Information Economics and Policy is available here
- Volume 44/9 (October 2020) of Telecommunications Policy is available here

It is worth mentioning that the ITU has recently launched a platform named ‘Connect2Recover’ to reinforce digital infrastructure in countries affected by COVID-19. Connect2Recover will initially focus on selected countries in Africa which are some of the least well connected countries and likely to be hit hard by the pandemic in socio-economic terms. More details can be found here

Finally, please share with us and with the GTPRN community your articles, views, news, announcements. If you have a specific topic that you want to share an update or opinion on in one to three pages, please do not hesitate to share it with us via news@gtprn.org

Kindly also help us by spreading the word about the GTPRN community and forward this newsletter to your colleagues or students. You are more than welcome to join our Facebook or LinkedIn Groups, or to subscribe directly to our website www.gtprn.org where you have the chance to comment on each article or post.

Take care, stay safe and well.

Mohamed El-Moghazi

GTPRN Team - news@gtprn.org

IMT Adoption for Fixed Services (Opportunities and Challenges)

Dr. Abdulhadi AbouAlmal
Head of Technology Standardization & Spectrum Management, Etisalat

Introduction

There are growing needs for fixed broadband services worldwide. The Covid-19 pandemic provided an important evidence to the real necessity of developing cost effective wireless solutions based on international standards for catering the demands for fixed broadband service across wide coverage areas (e.g. including sub-urban and rural areas). In addition, such international ecosystem will be beneficial for several fixed broadband use-cases under fixed services including high-resolution surveillance cameras. The potential has further increased due to Covid-19 pandemic considering the increasing number of people engaged in work from home, distance learning …etc.

International Mobile Telecommunication (IMT) is the terminology used by the International Telecommunication Union (ITU) to represent the widely adopted platform that encompasses IMT-2000, IMT- Advanced, IMT-2020 and future development of IMT systems. The ITU is the UN organization responsible for regulating the global use of radiocommunication services and systems. The IMT technologies support mobile and fixed services worldwide as well as other radiocommuniation services including terrestrial broadcasting. In addition, IMT specifications, air interfaces and core functionalities are being used by other services and systems, including Low Earth Orbit satellites, to get the benefits of such international ecosystem. ITU-R Resolution 221 (Rev.WRC-07) addresses the use of IMT in HAPS systems, which was identified for spectrum allocated to fixed service, to support wireless access networks in remote and rural areas. In general, IMT-2020 capabilities are significantly growing to manage the requirement of multiple services, verticals and industries including fixed broadband in more efficient and effective ways.

As emphasized by ITU and other international organizations, the IMT has formed a substantial pillar of our modern societies that contributes to the socio-economic development over decades. It grew rapidly to supports connectivity, applications, and services and to form a global force for change and empowerment. IMT becomes a major platform worldwide for accessing information and communication.

The 3rd Generation Partnership Project (3GPP) is the organization that creates and maintains the technical standards for global communication technologies, including UMTS, LTE, 5G, and beyond ...etc. The 3GPP organization is leading the development of specifications in coordination with ITU that sets the guidelines and requirements for these international ecosystem to be adopted globally. ITU has set the framework for IMT standards, encompassing IMT-2000, IMT-Advanced and IMT-2020, spans the 3G, 4G and 5G industry technologies, which will continue to evolve.

Some of the other terminologies used in this paper are defined in accordance with the relevant ITU-R Radio Regulations (RR), Reports and Recommendations as follow:

- Fixed service (FS) is defined as radiocommunication service between specified fixed points as per section III on Radio services of ITU-R RR article (1) on terms and definitions.
- Fixed wireless access (FWA) is defined as wireless access application in which the location of the end-user termination and the network access point to be connected to the end-user are fixed.

In addition, ITU has defined different categories of radiocommunication services in terms of the associated spectrum allocation; namely primary and secondary services. The secondary service shall not cause harmful interference to stations of primary services to which frequencies are assigned. In addition, secondary service cannot claim protection from harmful interference from stations of a primary service to which frequencies are assigned. On the other, services can claim protection, however, from harmful interference caused by stations of the same or other service(s) in the same primary or secondary categories, to which the frequencies are assigned.

Motivation and Global Challenges

There is a global demand to bridge the digital divide worldwide through providing broadband services to rural and under-served areas. There is still shortage in broadband service in even urban environment across number of countries. Broadband services can be provided through wired or wireless communication systems. The use of international IMT ecosystem for Fixed Broadband and FWA can provide feasible solutions to support broadband agenda in developing and developed countries.

International research on the fixed broadband has shown limited penetration by end of 2019. Around 45% of the households worldwide had broadband connectivity by end of 2019, where almost one third of these connections belonged to Chinese households. Such broadband shortage seems to be a future

driver to the growth of FWA solutions. However, efficient and cost effective FWA technologies can be developed based on international IMT standards (e.g. 3GPP compliant technologies) to ensure long-term investment and future proof.

During Covid-19 pandemic, the fixed broadband requirement becomes a priority rather than a luxury including within rural areas. Accordingly, mobile operators were forced to use their mobile networks for fixed services to respond to the rapidly growing fixed broadband demands. The Global mobile Suppliers Association (GSA) has recently issued number of reports on the number of operators launching FWA services over IMT-based 3GPP technologies in more than 160 countries. In June 2020, 426 operators and 83 operators were identified as investing in LTE broadband FWA and 5G FWA services, respectively. In July 2020, 797 operators launched LTE networks offering broadband fixed wireless access and/or mobile services and 84 operators launched one or more 3GPP compliant 5G services. In August 2020, the number grew to 96 operators launching 5G services. The 5G deployment will continue to play important role in the FWA growth worldwide.

Before the Covid-19 pandemic, number of telecom operators in some countries have been using 3GPP compliant IMT systems (e.g. LTE technology) in the bands allocated to fixed services in their territories noting that these IMT systems were originally developed in other countries based on the mobile allocation existing in the same bands. It should be noted that the same frequency range can be allocated to the mobile service in certain region/countries and to the fixed service in other region/countries. However, the 3GPP compliant IMT systems were conventionally developed whenever mobile allocation exist.
Some of the traditional challenges for the wide deployment of the wired and wireless fixed broadband networks including FWA networks on large coverage scale are:

- Complexity and cost burdens associated with deployment fiber networks, in particular within under-served areas.
- Lack of international ecosystem that can achieve economies of scale and provide cost effective solutions for nationwide implementation, in particular within rural areas.
- Lack of international standards of fixed wireless solutions developed within the frequency bands allocated to fixed service within the ITU Radio Regulations (RR), but may not be allocated to mobile service or identified to IMT across ITU regions. Today, most of these fixed wireless solutions are based on proprietary technologies where both the network stations and user equipment are provided by same suppliers that are usually lacking for future development and economies of scale.

The use of mobile networks to support the fixed broadband requirement in addition to the mobile broadband users has provided quick solution for many countries during the Covid-19 pandemic. However, the risk is increasing for overloading mobile networks with the high fixed broadband demands considering the following:

- There is higher pressure to maintain the minimum throughput offered for fixed broadband users where traffic profiles can be higher than mobile users which are usually offered services on best effort basis.
- The fixed broadband users may have significant impact on the quality of service and experience of the mobile broadband users when deployed within dense and urban areas.
- The cost of mobile spectrum is usually much higher than fixed spectrum. This could add the burden of wasting expensive mobile spectrum resources among much less number of fixed broadband users when compared with the large span of mobile broadband users.

ITU Role in IMT development and potential for fixed services

ITU Plenipotentiary Resolution 139 (Rev. Dubai, 2018) called for "Use of telecommunications/information and communication technologies to bridge the digital divide and build an inclusive information society" and Resolution 37 (Rev. Buenos Aires, 2017) called for "Bridging the digital divide". The adoption of international wireless ecosystems is important to achieve economies of scale for fixed broadband solutions in response to these ITU Resolutions and to help bridging the digital divide worldwide.

The ITU has been identifying the use of IMT within certain frequency bands on global, regional or country basis. Traditionally, these frequency bands identified for IMT were usually allocated to mobile service. Such IMT identification plays significant role to facilitate the implementation and harmonization of IMT broadband networks worldwide. For example, the IMT identification has led to the international adoption of 3GPP 3G/4G/5G technologies within certain frequency bands in alignment with the ITU radio regulations and standards for the corresponding IMT platforms.

Similarly, it is proposed within ITU process to identify the use of IMT systems for fixed services intended for fixed wireless broadband including FWA within some of the frequency bands with primary allocation to the fixed service on global or regional basis. During ITU World Radiocommunication Conference 2019 (WRC-19), the author represented UAE Administration to initiate this proposal in WRC-19 to be considered for study under the new agenda of the next ITU WRC-23 conference, which was supported by other Arab countries (Kingdom of Bahrain, State of Kuwait and Tunisia). WRC-19 has finally agreed to include this subject for study as part of WRC-23 agenda. In addition, WRC-19 has approved

new ITU Resolution on the use of IMT within the frequency bands allocated to the fixed service on primary basis. Such usage of IMT systems in the relevant frequency bands with primary allocation to fixed service should be in accordance with the ITU-R Radio Regulations and the relevant ITU-R studies.
The WRC-19 discussion on this topic was conducted under agenda item 10, which is the tool for Administrations to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.

One example of the frequency band proposed during the conference was 10.7-11.7 GHz, which has already primary allocation to the fixed service in the ITU RR. Recommendation ITU-R F.387 on fixed wireless systems operating in the 10.7-11.7 GHz band recognizes the IMT-2020 usage and demands. This frequency band has been used for long period to deploy fixed wireless systems across the three ITU regions under fixed services. However, number of proprietary technologies have been used for several years. The development of IMT-2020 system within such band can provide potential alternative technology for fixed broadband in many countries due to:

- Current usage for fixed deployment in many countries (point to multi-point and point-to-point),
- Better propagation characteristics for coverage purpose in comparison with bands above 20 GHz,
- Large bandwidth availability for catering growing capacity demands.

There are number of frequency bands that have primary allocation to the fixed service within ITU RR. The following table includes some examples of these frequency ranges along with bandwidth availability in accordance with Article 5 of ITU-R Radio Regulations, in particular section IV on Table of Frequency Allocations. Some of the frequency ranges are grouped for simplicity, however, it should be noted that primary allocations and relevant conditions may differ across ITU Regions within the whole or part of the given frequency ranges. Also, it should be noted that the given frequency bands have already primary allocation to mobile service, or mobile except aeronautical mobile service, within the whole or part of the given frequency ranges in one or more ITU Regions. The allocation to mobile service, or mobile except aeronautical mobile service depends on the ITU Region under consideration.

Table: Examples for frequency ranges allocated to Fixed Service on primary basis
(within one or more ITU Regions)

Frequency range	Available Bandwidth
3.6-4.2 GHz	600 MHz
4.4-5 GHz	600 MHz
5.925-8.5 GHz	2.575 GHz
10.5-13.25 GHz	2.75 GHz
14.3-15.35 GHz	1.05 GHz
17.7-18.7 GHz	1 GHz
21.4-23.6 GHz	2.2 GHz
27.5-29.5 GHz	2 GHz
31.5-33.4 GHz	1.9 GHz

Note: The above table provides examples of some frequency bands but not an exclusive list for the spectrum resources with primary allocation to fixed service.

Conclusions

In accordance with the above, the use of IMT technologies for fixed wireless broadband including FWA will provide the developing and developed countries capabilities to develop fixed broadband networks on nationwide basis utilizing cost effective international ecosystems as well as to support multiple growing fixed use-cases on timely manner.

The ongoing international development of IMT ecosystem to support advanced capabilities while achieving the economies of scale through multi-suppliers of networks and user equipment provide international benefits for using IMT for Fixed Wireless Broadband including:

– Potential for large countries to bridge digital divide within rural and under-served areas through cost effective wireless solutions based on international IMT standards.
– IMT technologies are supported by multi-stakeholders and suppliers to ensure future development and capabilities enhancement, while most of proprietary FWA technologies operating in spectrum allocated to fixed service today are based on dedicated suppliers, which add technical and cost burdens on the widespread of broadband services in many countries.

With 14 years of international professional experience, Dr. Abdulhadi AbouAlmal is Director of Technology Standardization & Spectrum Management who has held various leadership roles in Etisalat Group. Before 2008, he joined many UAE universities and research centers. He has led many projects including Smart City development, Radio Access Transformation in UAE (e.g. 5G)…etc. He is also advisory board member of UAE universities including American University of Sharjah and Ajman University. He led several national and international projects including propagation modeling for Gulf region, cost modeling of telecom services, business analysis, and modeling of wireless networks. He is leading Etisalat and regional contributions in many international organizations (e.g. ITU, 3GPP, GSMA, SAMENA).

He has been chairing various national and international expert groups such as ITU-T SG20 on IoT & Smart City, Vice-chairman of ITU-R Task Group 6/1 and Chairman of WG CPM Development on radiocommunication aspects. He is representative of Etisalat Group, UAE Administration, Arab Spectrum Management and Arab Standardization Groups in ITU, 3GPP and several mobile industry fora. Also, he is Liaison Rapporteur of ITU-T SG20 with ITU-R and 3GPP.

Dr. Abdulhadi obtained his PhD degree in wireless and mobile communication from University of Bradford, UK, in addition to MSc degree in Engineering Systems Management, and BSc in Communication Engineering. He is the author and co-author of many journal and conference papers.

Recent Advances in IoT and Smart Cities ITU-T Related Standards

Ramy Ahmed Fathy, PhD
Vice-Chair of ITU-T SG20
Co-Chair of WP1/20

Introduction

The ITU is the United Nations specialized agency for information and communication technologies – ICTs. Originally founded in 1865 to promote cooperation among international telegraphy networks of the day, the ITU is known for its long historical accomplishments in the domain of telecommunication standardization and radio regulations.

The ITU has three main areas of activities organized in 'Sectors' which work through conferences and meetings. The ITU's Radiocommunication Sector (ITU-R) coordinates radiocommunication services, and manages the radio-frequency spectrum and satellite orbits related assignments and service allocations. The ITU's Standardization Sector (ITU-T) is responsible of developing international standards (known as ITU-T Recommendations) which act as defining elements in the global infrastructure of information and communication technologies (ICTs). Finally, the Telecommunication Development Sector (ITU-D) fosters international cooperation and solidarity in the delivery of technical assistance and in the creation, development and improvement of telecommunication and ICT equipment and networks in developing countries [1].

Standards are critical to the interoperability of ICTs and ensure markets competitiveness. By developing a market led consensus based industry views, intertwined with views from academia, SMEs, and governments, the industry ensures that their products and systems conforming with ITU-T Recommendations can realize the maximum market adoption and regulatory compliance. On the other hand, adopting Recommendations by governments sort of presents some guarantees that standards conforming technologies can in a way alleviate issues related to vendors lock-in and the elevated costs of some elements in the technology stack.

Caution must be exercised though, to select the standard that is backed up by the maximum number of industry supporters from different regions; as this in a way presents a thermometer of the degree of the technology evolution roadmap. Another important consideration is related to the interworking with other related standards, developed by other de facto and/or de jure organizations. The more the standardized system is designed to seamlessly integrate and interwork with other

relevant standardized systems (even if they are developed by other standards developing organizations), the higher the chances that such a technology would be adopted by different markets.

In this article, a brief overview would be present on the ITU-T activities related to the advancement of the Internet of Things and Smart Cities and Communities related technologies. The standardization activities of the ITU-T is carried out by the technical Study Groups (SGs) in which members of the ITU-T develop Recommendations (standards) for the various fields of international telecommunications. Study Group 20 is responsible for studies relating to Internet of Things (IoT) and its applications, and Smart Cities and Communities (SC&C). This includes studies relating to big data aspects of IoT and SC&C, e-services and smart services for SC&C [2].

IoT and Smart Cities and Communities Technologies' Standardization

Study Group 20 is working to address the standardization requirements of Internet of Things (IoT) technologies, with an initial focus on IoT applications in smart cities and communities (SC&C). SG20 develops international standards to enable the coordinated development of IoT technologies, including machine-to-machine communications, IoT platforms, and ubiquitous sensor networks. A central part of this study is the standardization of end-to-end architectures for IoT, and mechanisms for the interoperability of IoT applications and datasets employed by various vertically oriented industry sectors. The group is identified within the ITU-T as the lead study group that have a mandate on developing standards and other non-normative works on:

- Internet of things (IoT) and its applications
- Smart Cities and Communities (SC&C), including its e-services and smart services
- Internet of things identification

Notable industry reports have estimated that the number of IoT devices in some regions will pass the mark of 50 billion devices in less than a 5 years timeframe. Hence, there is a clear necessity to develop coherent standards across different relevant standards developing organizations, while focusing on aspects like interoperability, security, and interworking.

To address these myriad technology concerns, SG20 has divided its activities into two Working Parties (WP) and seven Questions. WP1/20 is responsible of leading the collective standards development effort of four Questions, which deal with connectivity, interoperability, infrastructures, requirements, capabilities, and use cases across verticals. Additionally WP1/20 is also responsible of coordinating and directing standardization efforts related to architectures, protocols and e/Smart services, applications and supporting platforms. WP2/20 on the other hand focuses on leading the collective standards development effort

of three Questions, which deal with research and emerging technologies, terminology and definitions, security, privacy, trust and identification for IoT and SC&C evaluation and assessment. Table 1 illustrates the current structure of SG20, as well as SG20 regional groups created to stimulate and develop synergies of IoT and SC&C relevant standards development activities conducted on a regional basis.

Table 1. ITU-T SG20 Structure and Key Responsibilities

ACRONYM	TITLE
WP1/20	
Q1/20	End to end connectivity, networks, interoperability, infrastructures and Big Data aspects related to IoT and SC&C
Q2/20	Requirements, capabilities, and use cases across verticals
Q3/20	Architectures, management, protocols and Quality of Service
Q4/20	e/Smart services, applications and supporting platforms
WP2/20	
Q5/20	Research and emerging technologies, terminology and definitions
Q6/20	Security, privacy, trust and identification for IoT and SC&C
Q7/20	Evaluation and assessment of Smart Sustainable Cities and Communities
Regional groups	
SG20RG-LATAM	ITU-T SG20 Regional Group for the Latin American Region
SG20RG-EECAT	ITU-T SG20 Regional Group for Eastern Europe, Central Asia and Transcaucasia
SG20RG-ARB	ITU-T SG20 Regional Group for the Arab Region
SG20RG-AFR	ITU-T SG20 Regional Group for the Africa Region
Other groups under SG20	

JCA-IoT and SC&C	Joint Coordination Activity on Internet of Things and Smart Cities and Communities

Recent Advances of Standardization Work of SG20

At its last meeting, held from 6-16 July 2020, SG20 has received a total of 95 contributions with 230 participants from all over the world. The group received a total of 46 incoming liaison statements and produced a total of 24 outgoing liaison statements from different standards developing organizations.
The meeting produced a total of 12 approved Recommendations with the faster Alternative Approval Process (AAP). Additionally, the meeting determined that three other Recommendations were sufficiently mature and accordingly they were sent to the member states for consultations since they were perceived by the SG20 members to have policy and regulatory implications (the process of approving this Recommendation in such cases is called Traditional Approval Process - TAP). The meeting also approved the start of 19 new standardization project in different relevant topics as shown in Table 2.

Table 2. New Work Items

Working Party	Question	Rec/Tech.Rep./Suppl	Title
WP1/20	2/20	Recommendation	Requirements of IoT-based civil engineering infrastructure health monitoring system
WP1/20	2/20	Recommendation	Requirements and capability framework of smart shopping mall
WP1/20	2/20	Recommendation	Service requirements and capability framework of IoT-related crowdsourced systems
WP1/20	2/20	Supplement	Use cases of IoT based smart agriculture
WP1/20	3/20	Recommendation	Data format requirements and protocols for remote data collection in smart metering systems
WP1/20	3/20	Recommendation	IoT Service Management API REST Specification

Working Party	Question	Rec/Tech.Rep./Suppl	Title
WP1/20	3/20	Recommendation	IoT Device Management API REST Specification
WP1/20	4/20	Recommendation	Requirements and reference architecture of smart service for public health emergency
WP1/20	4/20	Recommendation	Framework for data middle-platform in IoT and smart sustainable cities
WP1/20	4/20	Recommendation	Requirements and functional architecture of smart sharing bicycle service
WP1/20	4/20	Recommendation	Requirements and reference architecture of IoT and smart city & community service based on federated machine learning
WP1/20	4/20	Recommendation	Requirements and functional architecture of smart power bank rental service
WP1/20	4/20	Recommendation	Requirements and functional architecture of smart door lock service
WP1/20	4/20	Recommendation	Vocabulary for blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects
WP2/20	6/20	Recommendation	Reference framework of cybersecurity risk management of IoT ecosystems on smart cities
WP2/20	6/20	Technical Report	Intelligent Anomaly Detection System for IoT

Working Party	Question	Rec/Tech.Rep./Suppl	Title
WP2/20	7/20	Recommendation	Sensing quality assessment framework of IoT systems
WP2/20	7/20	Recommendation	A Methodology for Next Generation Urban Measurements
WP2/20	7/20	Supplement	Use Cases for Next Generation Urban Measurements

Ramy Ahmed Fathy is a senior telecom executive and advisor, with 20 years of technical advisory and project leaderships in tech R&D space focusing on intelligent solutions, and embedded systems design. Ramy is currently leading teams focusing on developing AI solutions and use cases for regulatory agencies, preparing technology strategy and roadmaps as well as leading R&D and

industrial projects related to new digital initiatives, setting architectures, specifications, RFPs, and operational plans of digital services.

Fathy is currently leading 150+ international standardization experts; driving research and standards development in IoT security, identification, systems interoperability, innovative architectures, and IoT platforms development. Over the past decade, he has been selected as a senior advisor on digital solutions design and implementation for a wide range of digital services (smart cities, smart water management, precision agriculture, digital TV, Intelligent Transportation Systems (ITS) for highways and urban systems).

Fathy has a PhD in electronics and communications. He has led R&D projects in radio network planning and optimization, cognitive radio systems, video coding, cryptography, DSP/FPGA/GPP based implementations of consumer electronics products and satellite communication systems. He has numerous publications and contributions in IoT and Smart Cities related standardization work in addition to other scientific journals and conferences, and he's the co-author of one book in electronics.