ITU Conformity and Interoperability & 5G- IOT Programme, Strategy and Implementation

10-14 September 2018
Shenzhen, China

Sameer Sharma , Senior Advisor ITU

ITU at a glance

Meet us

What we do

‘Committed to Connecting the World’

3 Sectors

ITU Radiocommunication
Coordinating radio-frequency spectrum and **assigning** orbital slots for satellites

ITU Standardization
Establishing global standards

ITU Development
Bridging the digital divide

193 MEMBER STATES

+700 INDUSTRY & INTERNATIONAL ORGANIZATIONS

+150 ACADEMIA MEMBERS

MEMBERSHIP

ICTs and the SDGs

"The spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies, as does scientific and technological innovation across areas as diverse as medicine and energy". ***Agenda for Sustainable Development (Paragraph 15)***

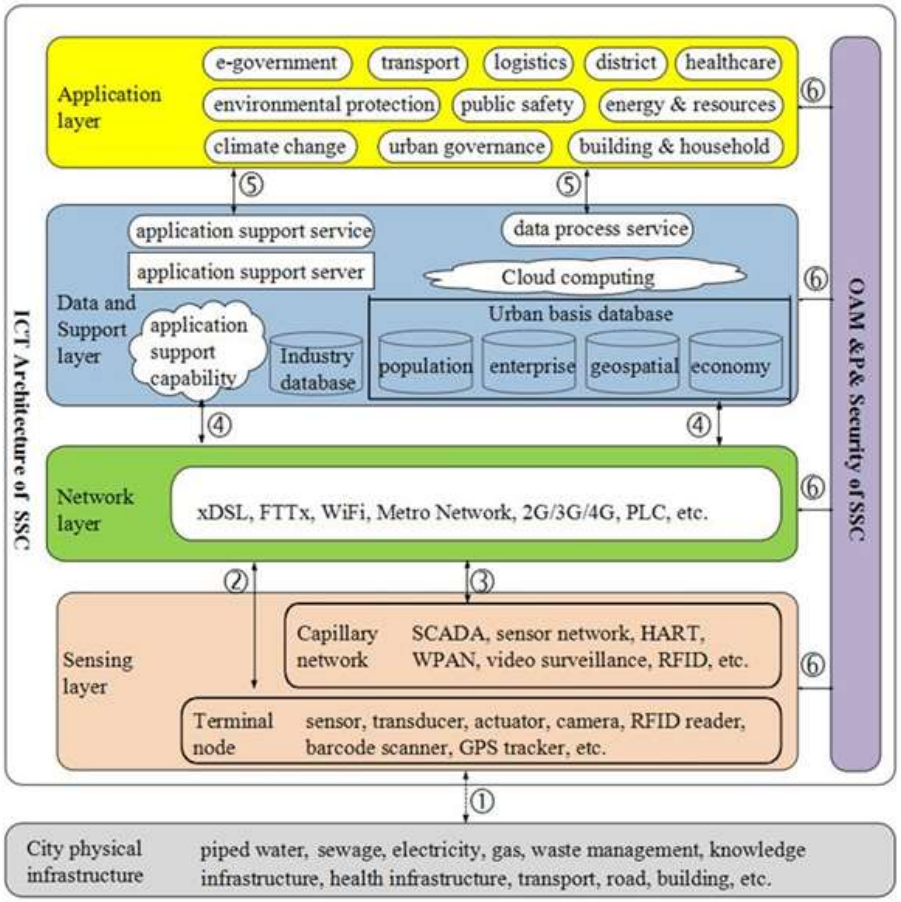
fast forward together
#ICT4SDG

ICTs are catalytic drivers to enable the achievement of all the SDGs

Specifically referenced in the SDG targets:

- SDG4 Quality Education (4b)
- SDG5 Gender Equality (5b)
- SDG9 Industry, innovation and Infrastructure (9c)
- SDG 17 Partnerships for the Goals (17.8, as a means of implementation)

We are sitting on an opportunity curve in this digital society..



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Enabling Environment , Digital Inclusion

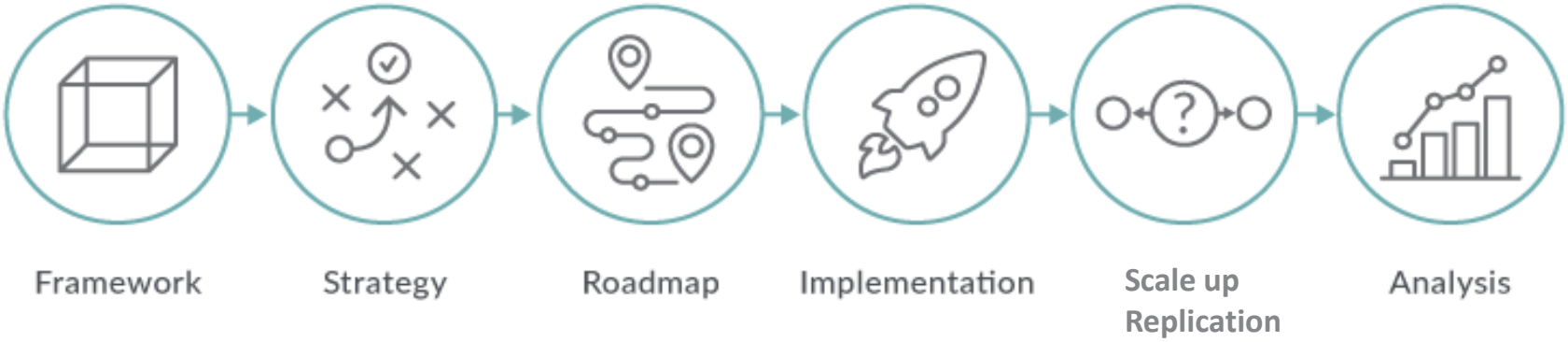
Skills and capacity Building

Innovation

Source: ITU-T Focus Group on Smart Sustainable Cities

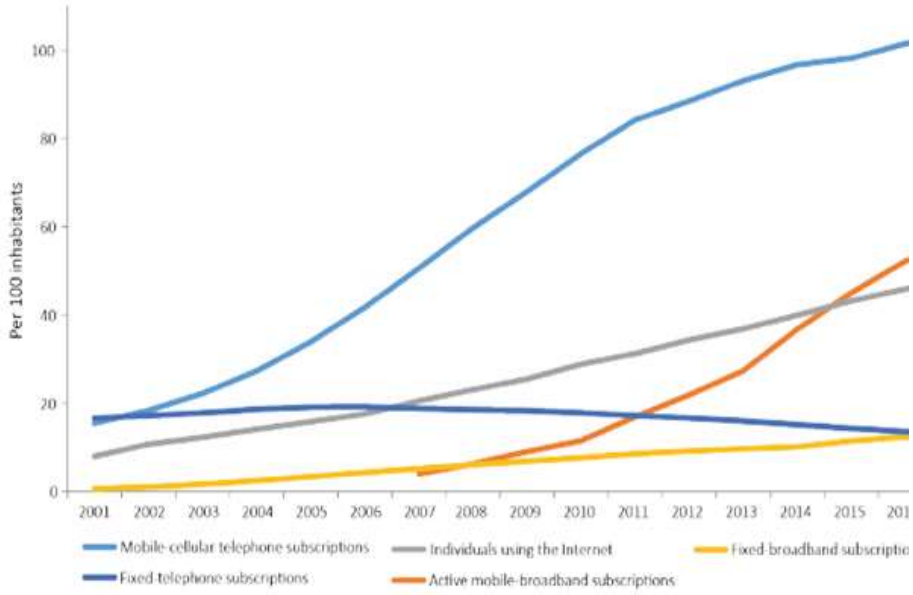
Country/Sector Development priorities:
- **Digital Economy agenda**
- **Universal Health Coverage**
- **End Hunger, Food Security**
- **Education for all**
- **Smart City**

Digital transformation process

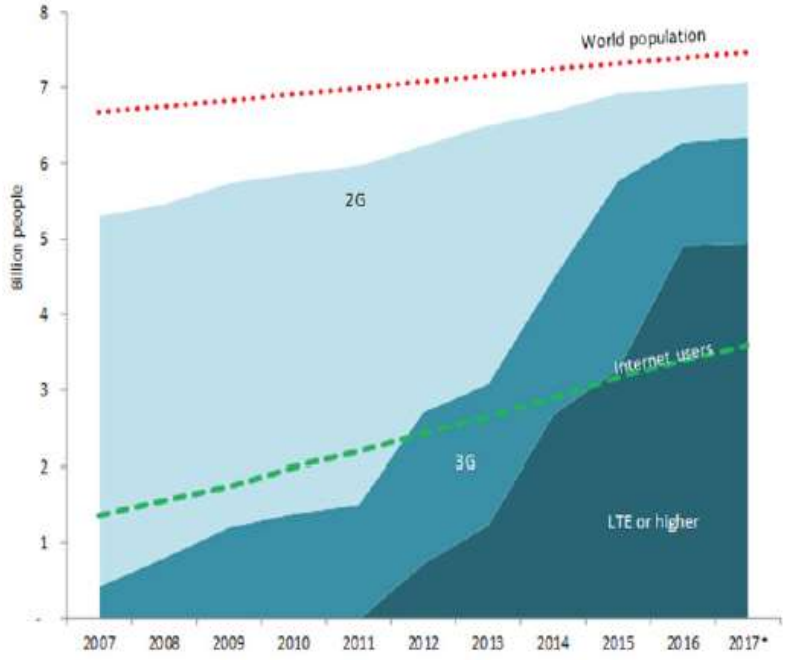


Telecom Status – At a Glance

Chart 1.1: Global ICT developments, 2001-2017*

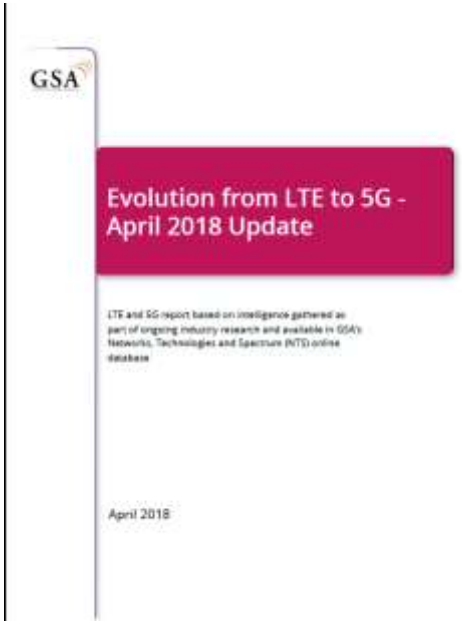


Notes: * ITU estimate.
Source: ITU.



Source: ITU World Telecommunication/ICT Indicators database (* Estimate)

LTE Deployment Status

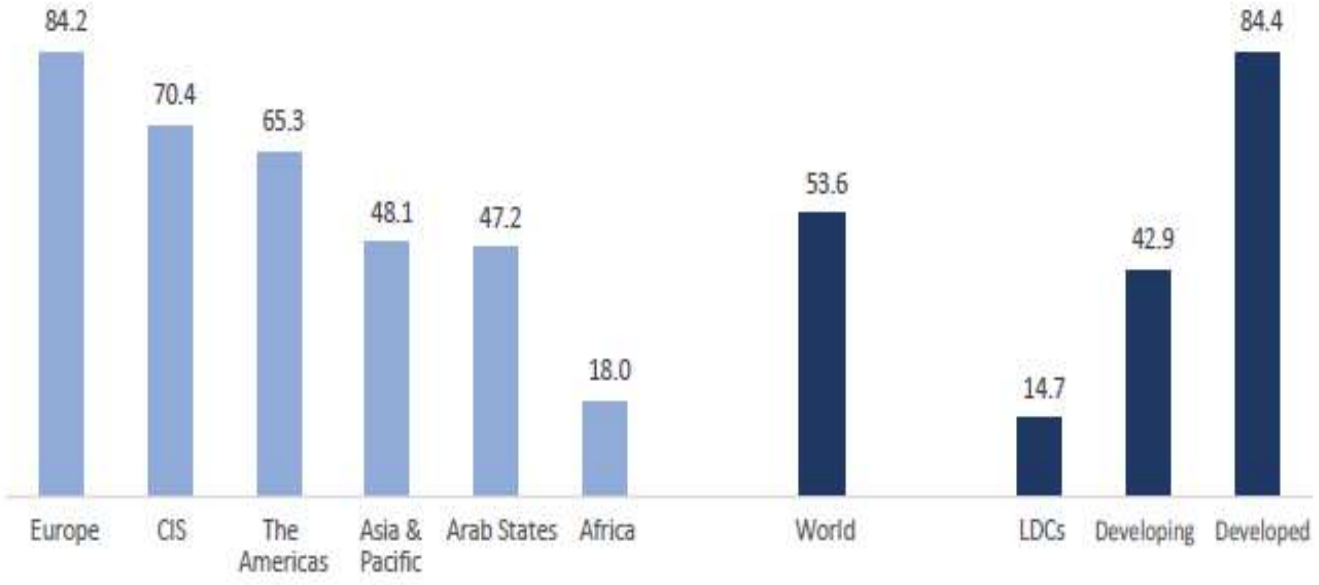


Report: Evolution from LTE to 5G, GSA

https://gsacom.com/

•• **858** operators investing in LTE, including pre-commitment trials.
•• **672** commercially launched LTE or LTE-Advanced networks in **204** countries, including those using LTE for FWA services, and including **111** LTE-TDD (TD-LTE) networks launched in **58** countries.
145 commercial VoLTE networks in **70** countries and **224** operators investing in VoLTE in **102** countries.
•• **241** launched networks that are LTE-Advanced in **115** countries.
•• **four** launched networks that are capable of supporting user equipment (UE) at Cat-18 DL speeds (within limited geographic areas)
•• **680–700** anticipated commercially launched LTE networks by end-2018 (GSA forecast).
•• **50** NB-IoT and **15** LTE-M/Cat-M1 networks commercially launched with **58** other operators investing in NB-IoT and **19** other operators investing in LTE-M/Cat-M1 in the form of tests, trials or planned deployments.
•• **134** operators that have been engaged in, are engaged in, plan to engage in, or have been licensed to undertake 5G demos, tests or trials of one or more constituent technologies.
•• at least **48** operators that have now made public commitments to time-lines for deployment of pre-standards '5G' or standards-based 5G networks in **33** countries.

Proportion of households with Internet access, 2017*

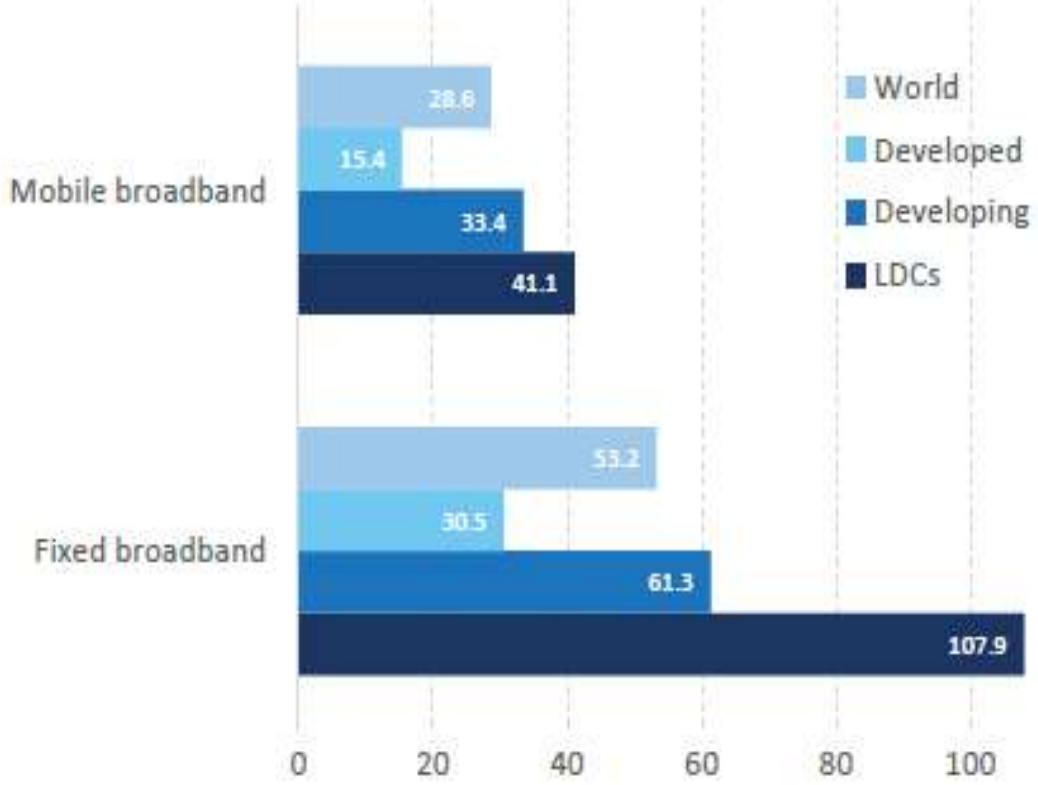


Source: ITU.
Note: * Estimates. CIS refers to the Commonwealth of Independent States.

In developed countries, the proportion of households with Internet access at home is twice as high as in developing countries.

Only 15% of households in LDCs have Internet access at home. In these countries, many Internet users are accessing the Internet from work, schools and universities or from other shared public connections outside the home.

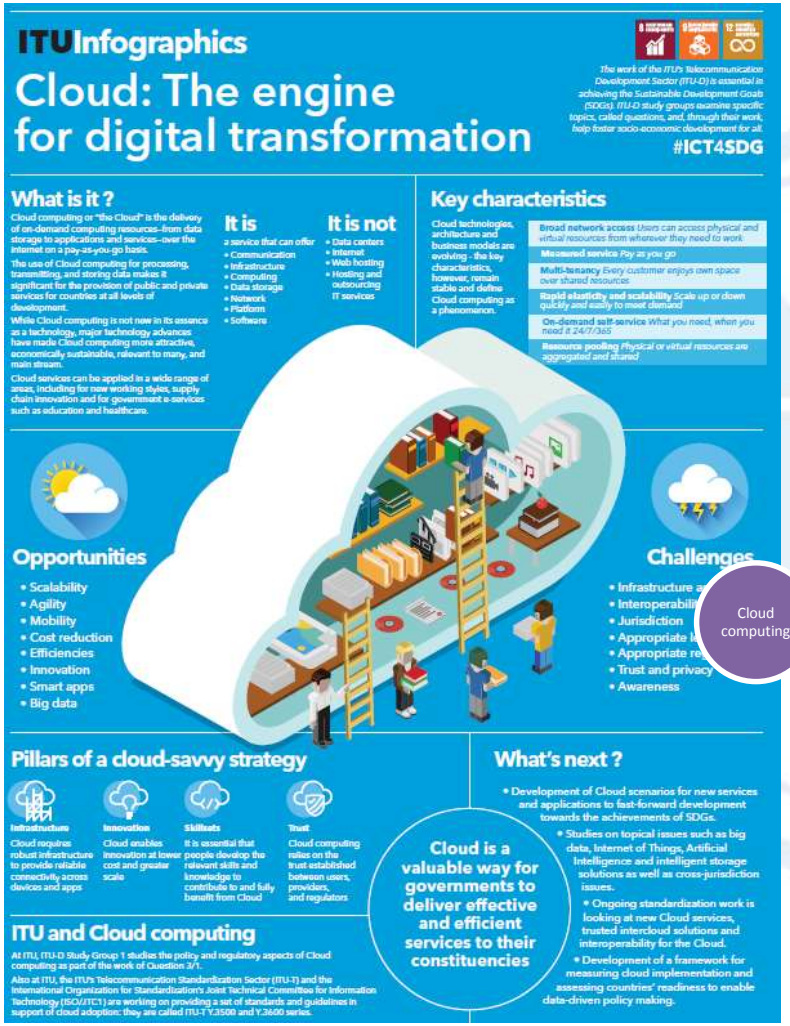
Broadband prices in PPP$, 2016

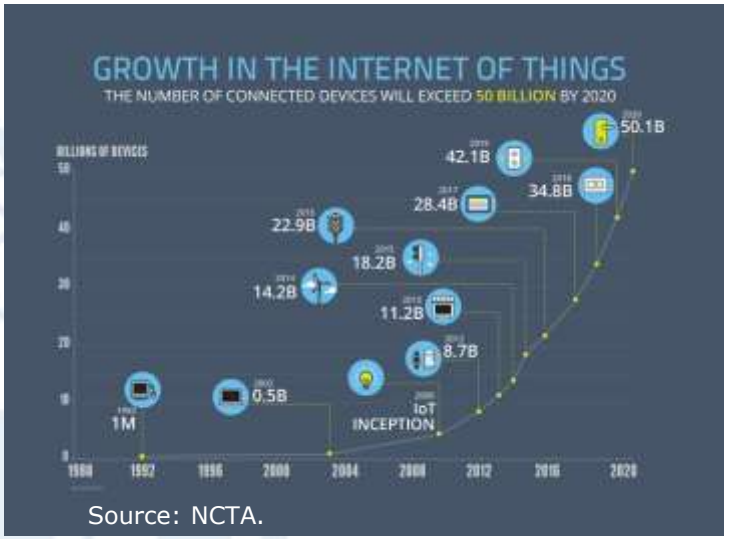


In LDCs, on average, an entry-level fixed-broadband subscription is 2.6 times more expensive than an entry-level mobile-broadband subscription.

Source: ITU.
Note: Based on simple averages including data for 167 countries. Prices are based on entry-level plans with a minimum data allowance of 1 GB per month. PPP$ refers to prices in international dollars, calculated using purchasing power parity (PPP) conversion factors instead of market exchange rates.

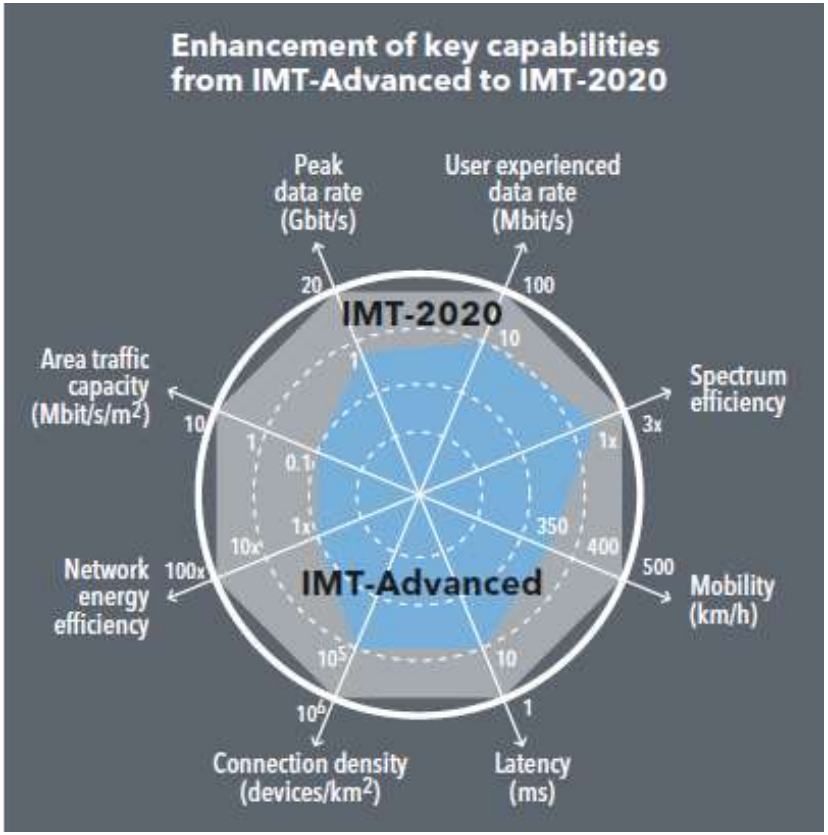
Key Technologies Driving ICT Growth

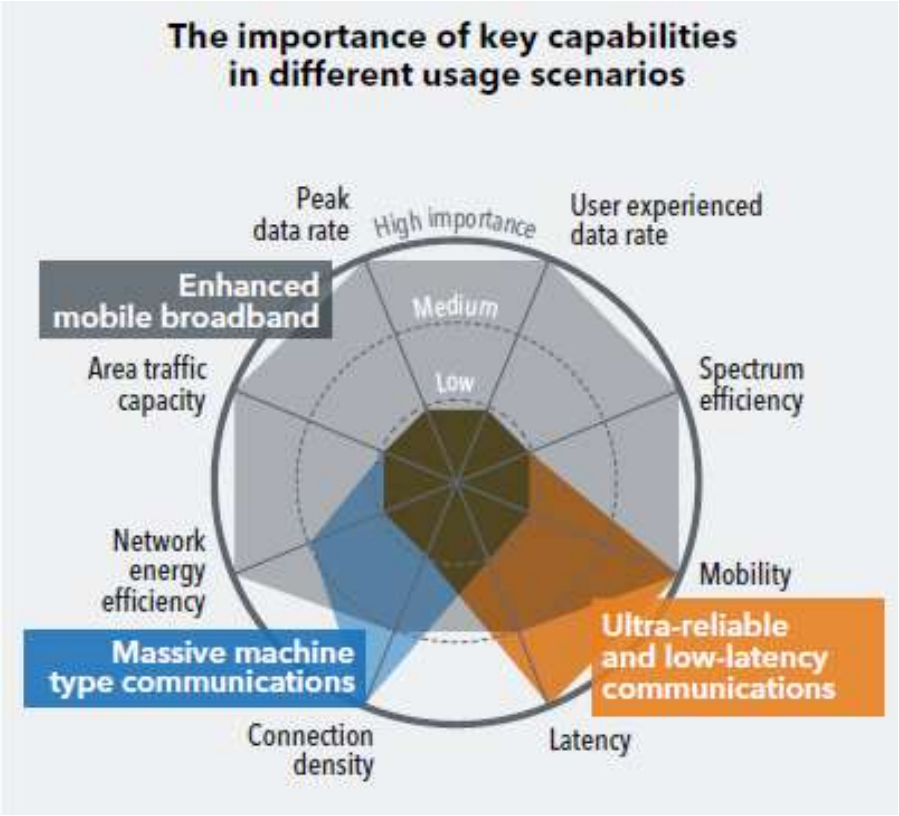




Source: NCTA.

IMT 2020 : 5G and beyond….





The values in the figures above are targets for research and investigation for IMT-2020 and may be revised in the light of future studies. Further information is available in the IMT-2020 Vision (Recommendation ITU-R M.2083)

Source: **ITU-R Recommendations M.2083**

Conformity and Interoperability

Buenos Aires Declaration (WTDC-17), recognized: that widespread conformance and interoperability of telecommunication/ICT equipment and systems through the implementation of relevant programmes, policies and decisions can increase market opportunities, competitiveness and reliability as well as encouraging global integration and trade;

ITU C&I Programme

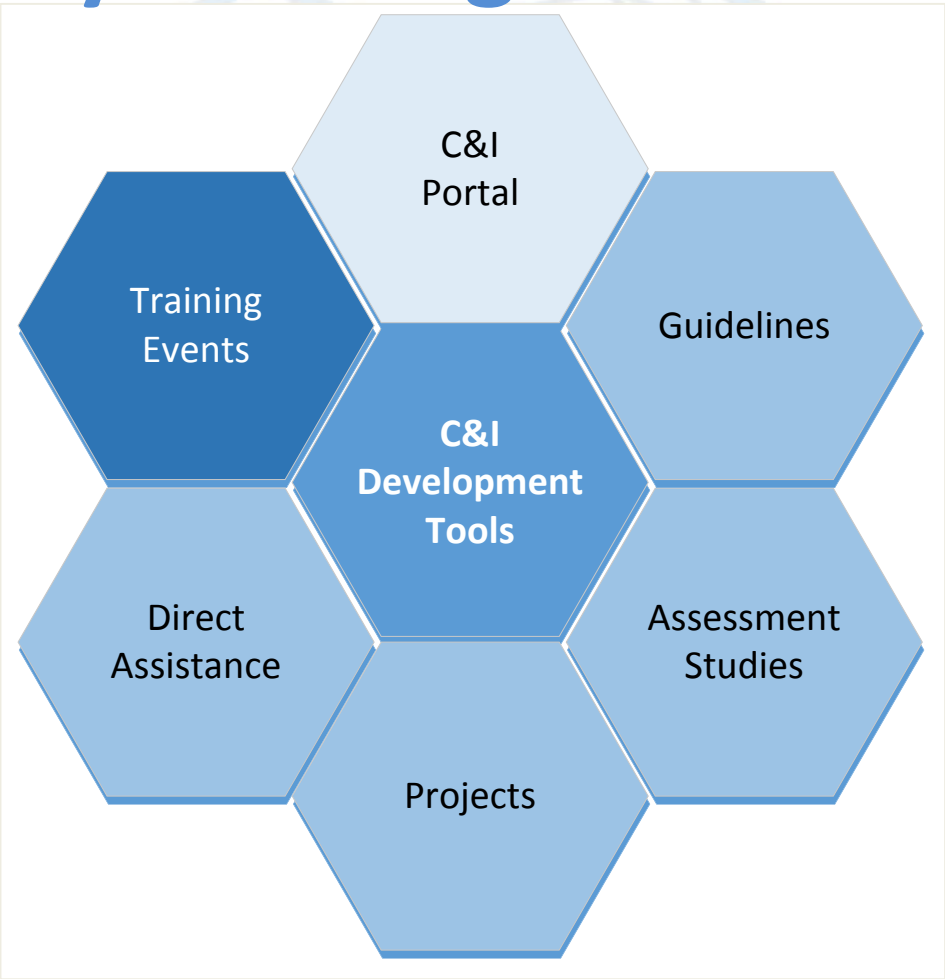
PILLAR 1. CONFORMITY ASSESSMENT

PILLAR 2. INTEROPERABILITY EVENTS

PILLAR 3. CAPACITY BUILDING

PILLAR 4. ASSISTANCE TO DEVELOPING COUNTRIES

ITU C&I Programme
Development tools - PILLARS 3 & 4
Capacity Building and Assistance



Pillar 3 – Capacity Building

ITU Trainings on Conformity and Interoperability

- MoUs signed with Testing Centers in the Regions to promote human capacity building in real testing laboratories
- Objectives: Enhance knowledge; increase awareness; promote experience-sharing, present practical learning on standards, regulations, real lab experience and accreditation procedures
- Lectures on C&I Regimes (e.g. Regulatory framework, market surveillance); and C&I Testing Domains (e.g. mobile, EMC, broadband, and NGN)

For the Asia Pacific Region

Conformity and Interoperability Training for the African Region

YOU ARE HERE HOME > ITU-D > TECHNOLOGY & NETWORK DEVELOPMENT > CONFORMITY AND INTEROPERABILITY TRAINING FOR THE AFRICAN REGION

Conformity and Interoperability Training for the African Region - "Regulatory framework and practical EMC tests including creation of basic lab facilities"
Tunis (Tunisia), 30 April-4 May 2018

DOCUMENTS AND REFERENCES

Invitation letter: English - French
Draft Agenda
Registration form
Fellowship request form
Information note: English - French
Training Material & Presentations
References: C&I Guidelines

CONTACTS

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- Mr Vladimir Daigele: vladimir.daigele@itu.int

C&I Regional Assessement Studies

Introduction

- C&I Assessment Studies looks for promoting the establishment of Harmonized C&I Programmes
- Improve **regional integration**
- Stimulating common standards
- Sharing of C&I infrastructure

Activities and Goals

- Assessemnt of C&I infrastructure in regions/sub-regions/countries are being assessed
- Close collaboration with regional experts
- Setup of a robust framework (base on international procedures – ITU, ISO, IAF, ILAC, etc.)
- Search of innovative tools to be applied on the field

Maghreb (2015/2016)

EAC Countries (2015)

South America (2017)

The Caribbean - CTU (2014-2018)

COMTELCA (2015/2016)

SADC Region (2014/2015)

http://itu.int/go/CI_Assessment_Studies

C&I Activities on Training and Assistance - 2018

Assessment Studies

- Follow-up Regional C&I Assessment
- Events:
  - C&I Workshop and IoT development for youth, Trinidad and Tobago: 25-29/June
  - MRA expert meeting for South America (t.b.c.)

Direct country assistance

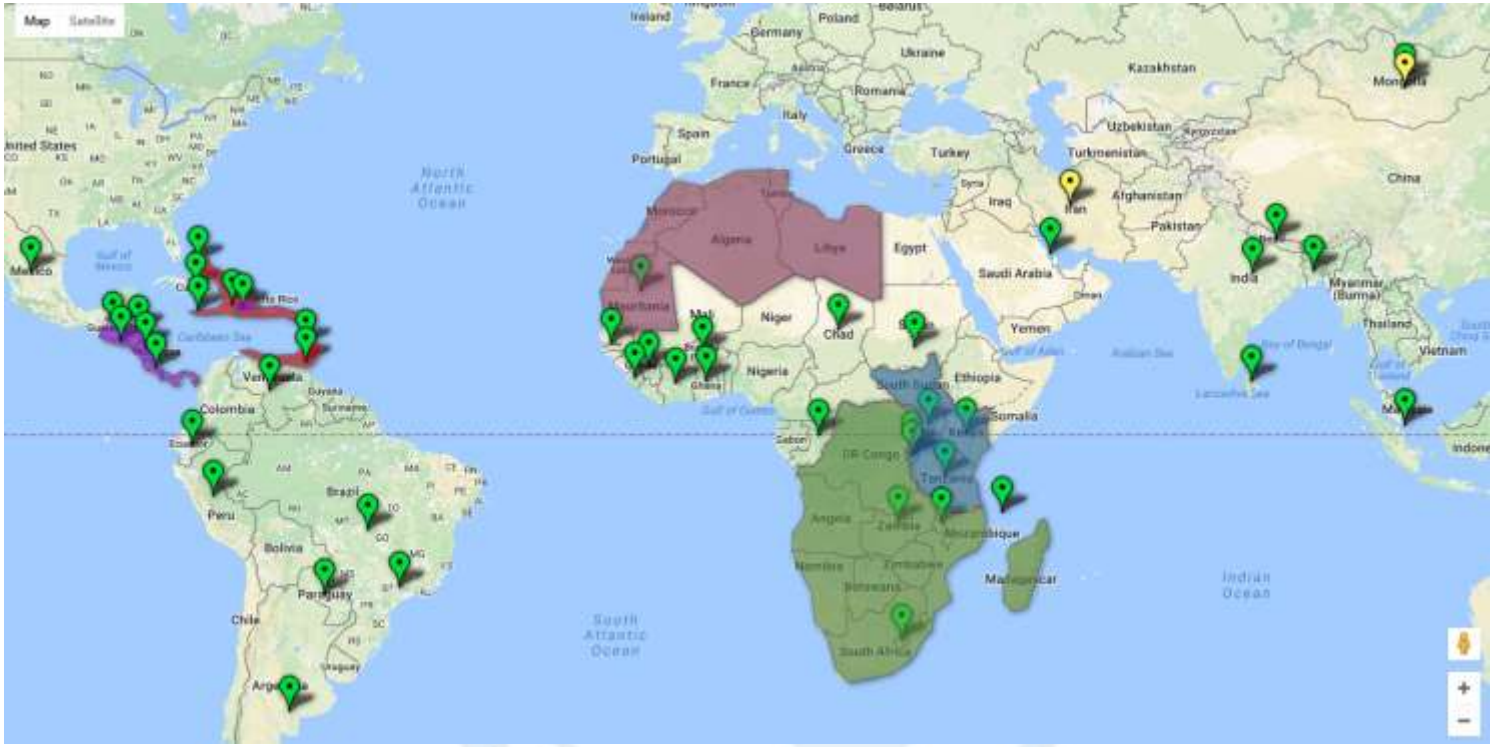
- Revision of national C&I procedures
- specific training on demand

Training on C&I

- AFR, Tunis 30/04 – 4/5 / 2018;
- AMS, 2019
- ASP, 23/04-20/05/2018, CoE
- ASP, 10-14/07/2018 , CoE/CAICT - Conformity and Interoperability' relating to 5G

https://itu.int/go/CI_Events

C&I Activities Summary



- Training provided in real testing facilities through the collaboration with laboratory partners within the C&I Programme
- 5 Regions have received ITU C&I Assessment Studies
- Assistance provided to countries on demand
- More than 50 Case Studies/Country Reports are available through the ITU C&I Portal

https://goo.gl/HcQKFw

Pilar: 1 : CONFORMITY ASSESSMEN
ITU-T KEY ACHIEVEMENTS (1/3)

- **First entries in the Product Conformity Database,** 19 December 2014, www.itu.int/go/tcdb
- **List of mobile phones** which meet the requirements of P.1100/P.1110
- **Pilot projects** of conformity assessment against ITU-T Recs http://itu.int/go/pilot-projects
  - M.3170-series (SG2)
  - Mobile Number Portability (SG11) - completed
  - EPON (SG15)
  - IPTV (SG16)
- **Living list of ITU-T Recommendations on key technologies** suitable for C&I testing http://itu.int/go/key-technologies
- **Reference table of ITU-T Recs and corresponding test specification under C&I testing** http://itu.int/go/reference-table

ITU Product Conformity Database

Product Conformity Database

YOU ARE HERE HOME > ITU-T > ITU CONFORMITY AND INTEROPERABILITY > PRODUCT CONFORMITY DATABASE

SHARE

DISCLAIMER: This database is not certified to be either accurate or complete, but only reflects the information that has been communicated to the ITU secretariat. The ITU secretariat has not verified the veracity or accuracy of such information, nor the relevance of the products to ITU Recommendations

E-Health Devices | Mobile Phones | Ethernet services

Product	Company	Model Number	Conformity to ITU-T Recommendation
Austonio Application for Android	Intel	Asus Memo Pad 8	ITU-T H.810 (2013-12)
Digital Thermometer	A & D Medical	UT-201BLE	ITU-T H.810 (2013-12)
Digital Blood Pressure Monitor	A & D Medical	UA-651BLE as Type A	ITU-T H.810 (2013-12)
Energy Smart Blood pressure monitor	IDT	BPU321 (as Type A)	ITU-T H.810 (2013-12)
Accu-Chek Active GB	Roche	GB revision 2	ITU-T H.810 (2013-12)
NTT Docomo - Mobile phone HDP manager platform, Android mobile phone	Fujitsu Limited	F-04G	ITU-T H.810 (2013-12)
Manager Platform for Android	Sharp	SHARP Manager Platform	ITU-T H.810 (2013-12)
Precision Health Scale	A & D Medical	UC-352BLE	ITU-T H.810 (2013-12)
A&D Digital Weighing Scale (with Body Composition Analyzer)	A & D Medical	UC-411PBT-C as Type D. AD-6209PBT-C, UC-355PBT-Ci, UC-351PBT-Ci and UC-325PBT-Ci as Type U.	ITU-T H.810 (2013-12)
Bosch Blood Pressure Monitor	Robert Bosch Healthcare GmBH	BP5000 BT	ITU-T H.810 (2013-12)
SHARP HDP Manager Platform for Android (XN-DLBT40)	Sharp	XN-DLBT40 (SH-01F) as Type D. SHL23, 302SH, SH-01F DRAGON QUEST, DM016SH and SH-02F, 303SH, SHT22 and SHL24 as Type U.	ITU-T H.810 (2013-12)

http://www.itu.int/go/tcdb

ITU-T KEY ACHIEVEMENTS (2/3)

- Finalized the **requirements and relevant test specifications for SIP-IMS (web)**
- Finalized the **work plan on benchmarking of IMS platform**
- **Approved** Recommendation ITU-T Q.3920 "**Terms and definitions for conformance and interoperability**"
- Conducted **Workshop on VoLTE/ViLTE interconnection** (web)
- Approved new ITU-T Q.3640 **"Framework of interconnection of VoLTE/ViLTE-based networks" and relevant test specifications** Q.3953
- Approved new Rec. ITU-T Q.3952 "**The architecture and facilities of Model network for IoT testing**"
- Approved ITU-T Q.3905 "**Conformance test plan for Number Portability requirements defined by ITU-T Q.Suppl.4**"
- Approved ITU-T Q.4040 "**The framework and overview of Cloud Computing interoperability testing**"

ITU-T KEY ACHIEVEMENTS (3/3)

- New Recommendation **ITU-T Q.3960 "Framework for Internet related performance measurements"**
- SG16 started a new **pilot project of conformity assessment against ITU-T H.700-series IPTV**
- SG16 has established an **IPTV testing team** for conformity testing of IPTV
- The IPTV testing team and Keio University conducted successful **conformance testing on ITU-T H.721** at the January 2017 meeting of SG16
- **Collaboration agreement** between **ITU-T SG11 and ETSI TC INT** is in force since December 2015

Collaboration with ETSI TC INT

Collaboration agreement between ITU-T SG11 and ETSI TC INT is in force since December 2015 (TD913-GEN/11)

Topics for collaboration:

- SIP-IMS conformity testing (web)
- Internet related performance measurements (web)
- Framework of an interconnection among VoLTE/ViLTE-based networks
- Requirements and test specifications for signalling protocol "DIAMETER" to be used in the IMS-based network for VoLTE/ViLTE interconnection

Joint meetings: 1 (Sept. 2015, Vienna); 2 (March 2016, Sofia Antipolis; June 2016, Geneva)

Outcomes:

- finalized the SIP-IMS Work plan (Rel.10)
- ITU-T SG11 approved Rec. ITU-T Q.3960 *"Framework of Internet related performance measurements"* (July 2016)
- The testing method of e2e bitrate is under development now (draft ITU-T Q.3961)
  NOTE: ETSI incorporates the Q.3960 and Q.3961 into one standard
- Started work item on VoLTE/ViLTE interconnection framework (Q.30xx)

PILLAR 2: ITU INTEROP EVENTS

CONDUCTED EVENTS

- **Fourth ITU test event on compatibility of mobile phones and vehicle's hands-free terminals***
  (Busan, Korea, 25-28 September 2017, during ITU Telecom World)
- **ITU test event on IPTV**
  (Geneva, 17 January 2017)
- **Third ITU test event on compatibility of mobile phones and vehicle's hands-free terminals***
  (Bangkok, Thailand, 15-16 November 2016, during ITU Telecom World)
- **IPTV test event**
  (Geneva, 14 September 2016)

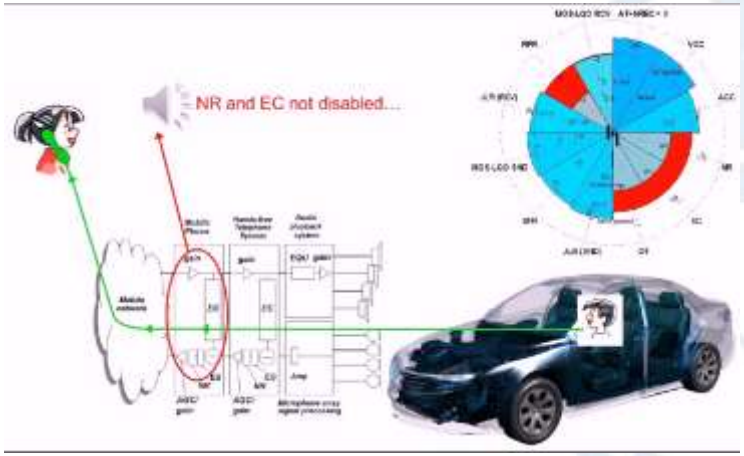
** 10 March 2017, ITU-T conducted a Roundtable between phone and car industries to discuss to discuss possible approaches to address found issues at the relevant test events*

Full list of test events is available here

COMPATIBILITY OF MOBILE PHONES AND VEHICLE HANDS-FREE TERMINALS

BACKGROUND

Many mobile phones do not work properly with car's HFT's system and thereby significantly degrading the speech quality of the complete system



Video 1, YouTube (2016)
Video 2, YouTube (2017)

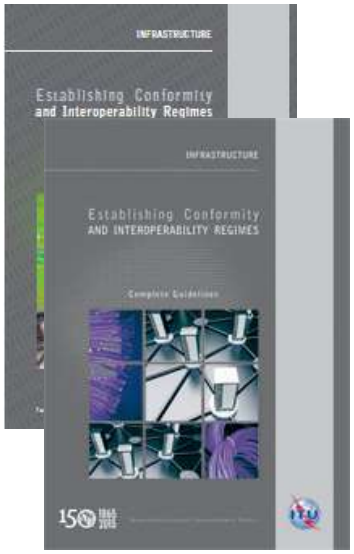
LIST OF ITU TEST EVENTS
May 2014; **May 2016**; **November 2016 Roundtable** (10 March 2017); **September 2017**

LIST OF BEST PERFORMERS

GENERAL STATISTIC

- 58 mobile phones (state-of-art devices)
- 89 tests (55 Narrowband and 34 Wideband)
- **30 % mobile phones comply** with the requirements ITU-T P.1100&P.1110 (1st event)
- **22% mobile phones comply** with the requirements ITU-T P.1100&P.1110 (2nd event)

ITU C&I Guidelines

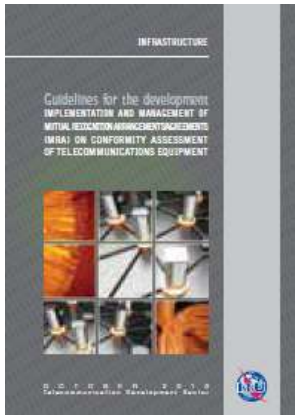


Establishing Conformity and Interoperability Regimes – Basic Guidelines (2014) and Complete Guidelines (2015)

These Guidelines address challenges faced by developing countries as they plan and review their own C&I regimes. Aspects covered by this publication include, inter alia, conformity assessment procedures; legislation to promote an orderly equipment marketplace; surveillance; coordination across regulatory agencies; and relevant international standards.

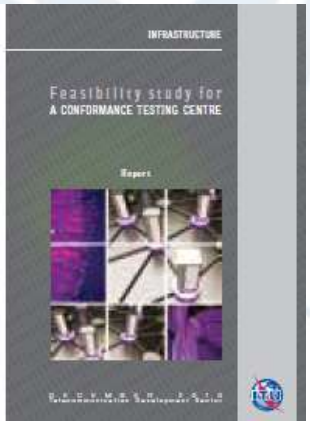
Guidelines for developing countries on Establishing Conformity assessment Test Labs in Different Regions (2012)

This set of guidelines is the first publication on C&I, its valuable content includes information concerning: The process required for building testing labs; A site analysis (e.g. existing testing labs, know-how);Collaboration mechanisms; Best practices; Reference standards and ITU Recommendations



Guidelines for the Development, Implementation and Management of Mutual Recognition Arrangements/Agreements on Conformity Assessment (2013)

These guidelines promote the understanding and establishment of Mutual Recognition Agreements (MRAs)
on conformity assessment that are intended to promote efficiency and resource sharing as well as to streamline the flow of products among participating Parties such as ITU Member States and private sector organizations, such as testing laboratories



Feasibility Study for the establishment of a Conformance Testing Centre (2013)

This feasibility study describes environments, procedures and methodologies to be adopted to establish, manage and maintain a testing center covering different kinds of conformance and interoperability testing areas

http://itu.int/go/CI_Guidelines

Internet of Things

The ITU-T's definition of the IoT calls it "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies"

What Is It?

"A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication" (ITU-T)

Who Makes It?

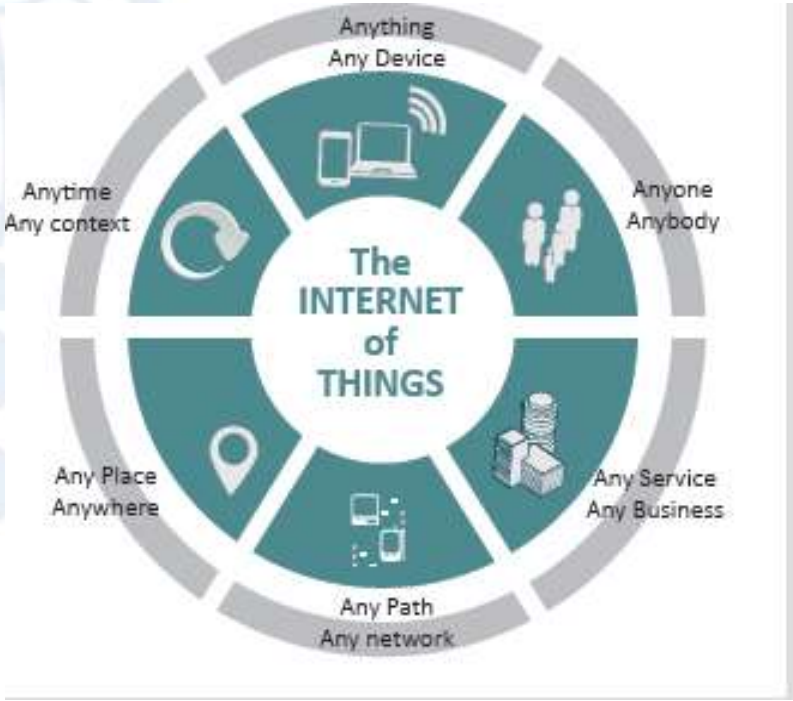
Device manufacturers, network operators, application platforms, software developers and (cloud-based) data analytics services providers

How Is It Accessed?

Connection of IoT devices via Wi-Fi, Bluetooth, mobile phone networks, specialized radio networks, global Internet

Main current areas of investment

- Smart cities
- Smart metering & grids
- Connected vehicles
- Healthcare



ITU-T Activities on IoT & Smart Sustainable Cities

Development and implementation of standards

ITU-T Study Group 20

Research & pre-standardization work

Focus Group on **Data Processing Management (FG-DPM)**

U4SSC

Open platform for knowledge sharing & Forward looking research

United for Smart Sustainable Cities (U4SSC)

Resolution 98
Enhancing the standardization of IoT and Smart Cities and Communities for global development

IoT4SDGs: *Considers the importance of IoT to contribute to achieving the 2030 Agenda for Sustainable Development.*

ITU-T Study Group 20: Internet of things (IoT) and smart cities and communities (SC&C)

Responsible for studies relating to IoT and its applications, and smart cities and communities (SC&C).

It includes studies relating to Big data aspects of IoT and SC&C, e-services and smart services for SC&C

Lead study group on

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

Last meeting: 4-15 September 2017

ITU-T SG20 main results

October 2015 – August 2017

9 New Recommendations approved

- ITU-T Y.4113 **"Requirements of the network for the Internet of Things"**
- ITU-T Y.4114 **"Specific requirements and capabilities of the IoT for Big Data"**
- ITU-T Y.4115 **"Reference architecture for IoT device capability exposure"**
- ITU-T Y.4451 "
  networking ir
- ITU-T Y.4452 "
  Objects"
- ITU-T Y.4453 "
  devices"
- ITU-T Y.4553 "
  node for IoT a
- ITU-T Y.4702 "
- ITU-T Y.4805 "
  interoperabili

9 New Supplements agreed

- ITU-T Y.Supp.42 to ITU-T Y.4100 series
  "Use cases of User-Centric work Space (UCS) Service
- ITU-T Y.Supp.34 to ITU-T Y.4000 series
  "Smart Sustainable Cities - Setting the stage for stakeholders' engagement"
- ITU-T Y.Supp.33 to ITU-T Y.4000 series
  art Sustainable Cities - Master plan"
  Y.Supp.32 to ITU-T Y.4000 series
  rt sustainable cities - a guide for city leaders"
  Y.Supp.31 to ITU-T Y.4550 series
  art Sustainable Cities - Intelligent sustainable ings"
  Y.Supp.28 to ITU-T Y.4550 series
  grated management for smart sustainable cities";
  Y.Supp.29 to ITU-T Y.4250 series
  ti-service infrastructure for smart sustainable cities w-development areas";
  Y.Supp.30 to ITU-T Y.4250 series
  rview of smart sustainable cities infrastructure";
  Y.Supp.27 to ITU-T Y.4400 series
  ing the framework for an ICT architecture of a t sustainable city".

Most recent approved ITU-T Recommendations

Recommendation ITU-T Y.4114 "Specific requirements and capabilities of the IoT for Big Data".

This Recommendation complements the developments on common requirements of the IoT [ITU-T Y.2066] and functional framework of the IoT [ITU-T Y.2068] in terms of the specific requirements and capabilities that the IoT is expected to support in order to address the challenges related to Big Data.

Recommendation ITU-T Y.4115 "Reference architecture for IoT device capability exposure"

This Recommendation specifies reference architecture of IoT device capability exposure (IoT DCE) which supports IoT applications in DCE devices (e.g., smart phones, tablets and home gateways) to access device capabilities exposed by IoT devices connected to the DCE device.

Recommendation ITU-T Y.4805 "Identifier service requirements for the interoperability of Smart City applications".

This Recommendation explores the set of requirements for identifier services used in Smart City. An identifier service for Smart City must be scalable and secure, and not only promote interoperability among different Smart City applications, but also compatible with any existing practices in the application domain.

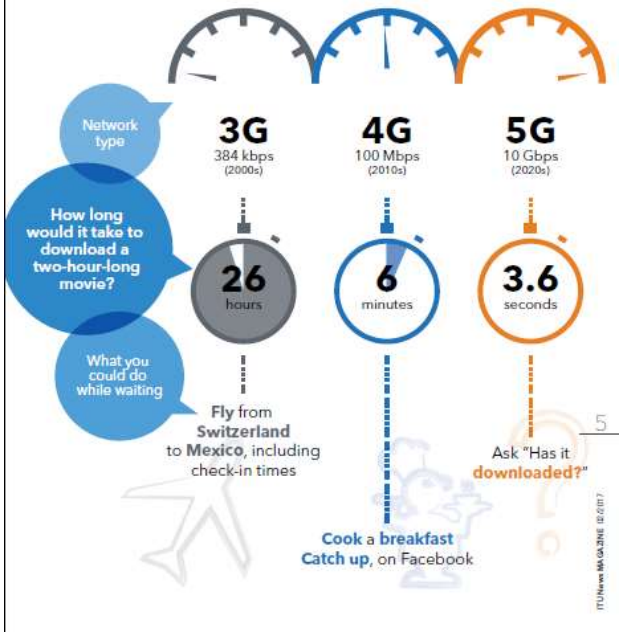
Some ongoing work items under study

- Y.Accessibility-IoT - Accessibility requirements for the Internet of things applications and services
- Y.del-fw - Framework of delegation service for the IoT devices
- Y.IoT-DA-Counterfeit - Information Management Digital Architecture to combat counterfeiting in IoT
- Y.IoT-Interop - An Interoperability framework for IoT
- Y.IoT-IoD-PT - Identity of IoT devices based on secure procedures and ensures privacy and trust of IoT systems
- Y.ODI - Open Data Indicator in smart cities
- Y.smartport – Requirement of smart managements of supply services in smart port
- Y.frame-scc - Framework and high-level requirements of smart cities and communities
- Y.fsn - Framework and Service scenarios for Smartwork

IMT 2020 : 5G

(5G Infographics)

Looking forward to 5G video



ITU News MAGAZINE 02/2017

What could 5G bring to you?	What's new with 5G?	Why not today?
Amazing volume, amazingly fast	Spectrum extension; millimetre waves; cell densification; increased spectrum efficiency; advanced antennas; 3D beam-forming techniques; new electronic components; backhaul optimization; D2D; moving networks (vehicle-based cells)	Spectrum saturation; limited spectrum aggregation; current hardware not able to function at high frequencies; expensive deployment and maintenance of small cells
Always best connected	Combination of 4G, 3G, Wi-Fi, and new radio access to create an integrated and dynamic radio access network; connectivity management mechanisms	Seamless handover (e.g. cellular to Wi-Fi) not supported
No perceived delay	Ultra-low latency; software-defined networks; decoupling functional architecture from the underlying physical infrastructure; network intelligence closer to users; mobile edge computing (MEC); D2D	4G latency ≥ 10ms
Massive amounts of connected things and people	New waveform; cell densification; much less signalling traffic and no synchronization; radio access network (RAN) architecture	Current frequency-division multiplexing (FDM) waveform limitations; interference prevents scaling up; 4G chipset cost; energy consumption
Energy efficiency	Millimetre waves for front-haul and backhaul; new operation mechanisms for dense networks; pooling of base station processing; on-demand consumption; massive machine communications; power amplifiers; digital signal processing (DSP) – enabled optical transceivers; harvesting ambient energy; optimization of sleep mode switching	Base stations' idle time not optimized; unused functions activated; air interface/ hardware not energy optimized
Flexible, programmable networks	Software-defined networks; network function virtualization; decoupling functional architecture from the underlying physical infrastructure; application program interfaces (APIs)	Many various network management software; not interoperable; bundling of network functions in hardware boxes
Secure networks	Physical channel authentication; virtualized authentication	Security as add-on not by design; fragmented approach

Source: European Commission 2015.
A Digital Single Market Strategy for Europe

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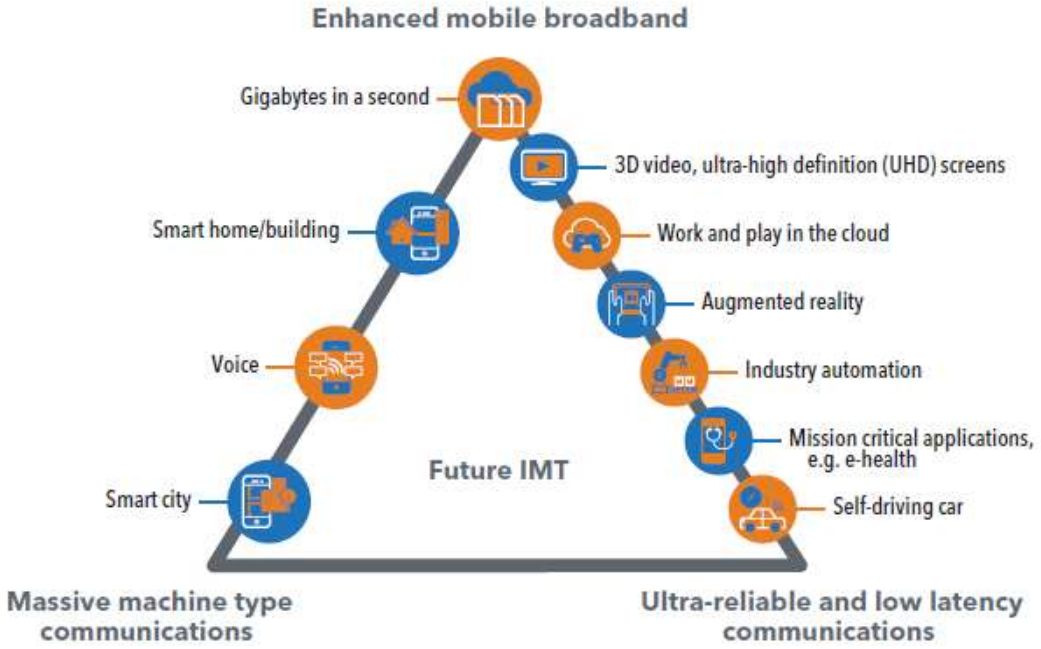
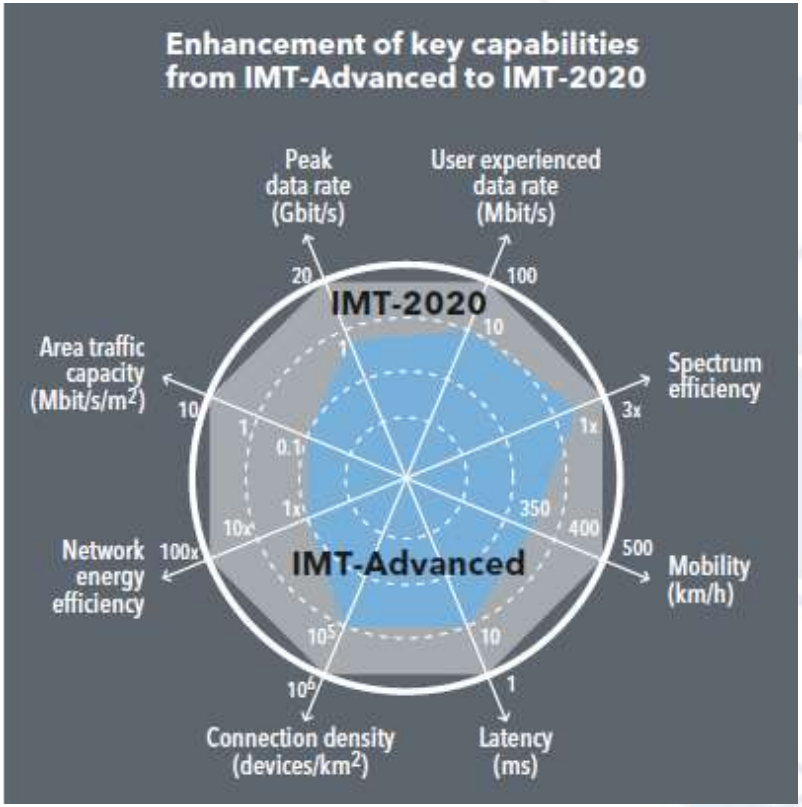
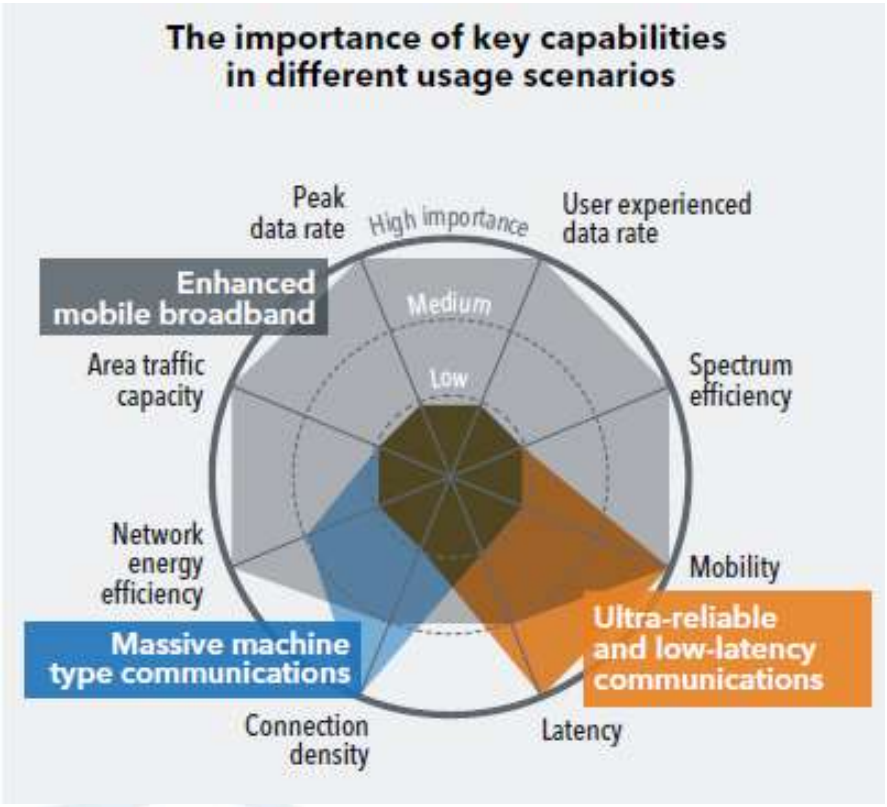
5G in an ideal world

5G usage scenarios from the ITU-R IMT-2020 Vision Recommendation



IMT-2020 standardization process





The values in the figures above are targets for research and investigation for IMT-2020 and may be revised in the light of future studies. Further information is available in the IMT-2020 Vision (Recommendation ITU-R M.2083)

Source: **ITU-R Recommendations M.2083**

C&I Training :ITU-CAICT China 2016

- ITU ASP COE Training on Conformity and Interoperability 17 – 21 October 2016, Chongqing, China
- The course objectives included :
- To equip participants with an understanding of Strategic of ITU Conformity and Interoperability, Programme, Implementation, Conformity Assessment Principles and to build participants' knowledge and skills with the strategies, regulations, technical standards, network technology and conformity and interoperability of 4G-LTE

Learning Outcomes:

✓Understand the development and implementation of conformity assessment programmes;

✓Understand the basic C&I frame for new technology , focusing on what to do, how to do;

✓Understand the network technology and services interoperability of IMS;

✓Understand the strategies, regulations, technical standards, network technology and conformity and interoperability of 4G-LTE. .

✓The training course was attended by 49 registered participants

C&I Training :ITU-CAICT China 2017

- ITU Asia-Pacific Centres of Excellence Distance Learning Course “Conformity And Interoperability (C&I) For 4G LTE” 17 April to 15 May, 2017. The course objectives included :
- To develop basic knowledge of conformity assessment programme based on ITU and Chinese framework and experiences; To understand technology of 4G LTE; To understand the C&I for 4G LTE network and terminal; Share experiences and challenges concerning C&I for ICT products

Methodology:

✓Course materials: Each week one module was discussed and the relevant course material were made available on the website.

✓Online Discussion Forums: Participants were expected to participate actively in discussion forums on selected topics throughout the week.

✓Chat sessions: Chat sessions were conducted in real time every week where discussions were held with the instructor (s) on a particular topic.

✓Quizzes: Two mandatory quizzes were held during the course

✓73 participants registered while 36 participants from 16 countries undertook the course while (joined an exercise that involved evaluation). 23 participants successfully completed the course.

Conformity and Interoperability' relating to 5G: ITU-CAICT Shenzhen 2018

- To equip participants with an understanding of ITU Conformity and Interoperability, Programme, its Implementation, as well as Conformity Assessment Principles;
- To build knowledge to participants with 5G standards progress in the main standardization organizations, such as ITU and 3GPP.
- To build knowledge to participants with the 5G key technologies and main aspects, including access network, antenna, and spectrum, etc.
- To introduce and build the knowledge of 5G testing technologies and protocols, including the user equipment and system equipment.
- To introduce 5G evolution practice from the aspects of operators and manufacturers.
- To build participants' knowledge with the application of 5G, including the main 5G service scenarios, technical KPI, and the application directions, etc.

Evaluation Parameter EVALUATION The assessment of the participants shall be based on the - time	Weightage (in %) spent on the training and the following parameters:
Attendance	10 %

Thank you

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