

5G indicator subgroup - EGTI 2020

Introduction

The vision of 5G has become clearer in 2020, as the ITU works on the world-wide applicable standards for 5G. Several countries have rolled out IMT 2020 5G networks that promise new levels of connectivity that will not only bring new services to citizens, but also connects machines, automobiles, city infrastructure, and more. Other countries are preparing to deploy IMT 2020 5G networks, and are at various stages of readiness.

The 10th Meeting of the ITU Expert Group on Telecommunication / ICT Indicators (EGTI), which took place in Geneva, Switzerland, on 17-18 September 2019, agreed to create a subgroup within EGTI to develop a document which provides suggestion on possible IMT 2020 5G indicators and corresponding definition and methodologies that could be used to collect and then analyse comparable data at the international level. The sub-group was open to all interested EGTI members, and experts from both developed and developing countries participated.

Definition of 5G

One key task facing the subgroup before proposing any new indicators for measuring 5G deployments is to identify a definition of 5G. The working group used as the basis for subsequent discussions the following technical requirements to define a 5G network:

Table 1: 5G requirements

IMT-2020 5G REQUIREMENTS (SOURCE: ITU-R)

Requirement		Value
Data rate	Peak	Downlink: 20Gb/s Uplink: 10Gb/s
	User experience	Downlink: 100Mb/s Uplink: 50Mb/s
Spectral efficiency	Peak	Downlink: 30 bit/s/Hz Uplink: 15 bit/s/Hz
	5th percentile user	Downlink: 0.12-0.3 bit/s/Hz Uplink: 0.045-0.21 bit/s/Hz
	Average	Downlink: 3.3-9 bit/s/Hz Uplink: 1.6-6.75 bit/s/Hz
Area traffic capacity		10 Mbit/s/m ²
Latency	User plane	1ms-4ms
	Control plane	20ms
Connection density		1,000,000 devices per km ²
Energy efficiency		Loaded: see average spectral efficiency No data: Sleep ratio
Reliability		This is $1-10^{(-5)}$ success probability of transmitting a layer 2 PDU (protocol data unit) of 32 bytes within 1ms
Mobility		0km/hr-500km/hr
Mobility interruption time		0ms
Bandwidth		100MHz

Summary of group work

To provide context and material to begin the discussion around the development of 5G indicators, the group examined indicators proposed by the European 5G Observatory, which are focussed on showing 5G readiness in Member States.¹ These indicators are primarily based on the amount of radio spectrum and national 5G strategies available at national level, as well as on preparatory actions by market players in view of commercial launch in cities as well as large-scale trials and pilots. In addition to these indicators, GSMA proposed the addition of two new indicators to the list for consideration. The indicators that were initially considered are detailed in Table 1.

Table 2: Initial indicators for considered for discussion by the subgroup

Dimensions	Descriptions	Indicators
Wide-area and hot-spot coverage	Coverage indicators	Early deployment indicators Number of 5G base stations (Base Stations using 5G pioneer bands) Coverage & quality maps
QoS (Service quality level)	Service levels/service categories defined for monitoring purpose, in relation to the requirements they can meet	Response time/latency Reliability Peak data traffic User device mobility Uplink/downlink symmetry
Focussed and local deployment patterns / Private networks	Geographical deployment pattern for main types of applications	Coverage within each target deployment pattern Number of private networks
Other service characteristics	“Network slicing”, “mobile edge computing” (MEC), distributed cloud facilities, or enhanced reliability	Percentage of target geographical areas offering MEC service Capacity of communications services available for a given application type
Available 5G spectrum	Available 5G spectrum for MNOs	Available low band, Available midband Available mmWaves

¹ https://ec.europa.eu/information_society/newsroom/image/document/2019-20/5g_deployment_-_concept_paper_-_draft_587B1CC1-D2C8-ABA0-3CD2A1569FD76E33_59211.pdf

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Fixed Wireless Access	Status of fixed wireless access (FWA) / wireless to the everything (wttx)	FWA penetration (%)
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In subsequent discussions, including a May 2020 conference call, the subgroup discussed the value of each indicator, as well as the possible methods of data collection and reporting. Eventually, the group collaborated on a prioritisation exercise that saw the field narrowed to the top proposed indicators, as shown in the table below.

Table 3: Outcome of prioritization exercise, May 7th 2020.

Indicator	Measurement approach	Prioritization rank
•5G coverage (%)	% of population	1
•Available low band	Measured in MHz	1
•Available midband	Measured in MHz	1
•Available mmWaves	Measured in MHz	1
•Number of 5G subscriptions	% of population	2
•Uplink/downlink symmetry	Need to know the split (70-30 or 80-20 is typical). Can be captured in peak data traffic.	2
•Number of private networks	Per capita? Per number of connections? Number of networks authorized?	2
•Number of 5G base stations (Base Stations using 5G pioneer bands)	As a % of 4G base stations	2
•5G FWA coverage (%)	Population % / % of connections	2
Backhaul Indicator (microwave, fiber etc.)	Not yet defined	2
5G smart phones	Not yet defined	2
•5G connected devices (enterprise)	Not yet defined	2
•Response time/latency	End-to-end response time (for consumers) in milliseconds	2
•Reliability	Network availability	2
•Speed	Mbps	2
•Peak data traffic	Mbps, per user / per cell	2

While all indicators were discussed and considered, it is beyond the scope of this summary document to provide the rationale for the prioritization ranking of each individual proposed indicator. Overall, the criteria that were used to determine the prioritization rank were:

- The relevance of each indicator for accurately gauging the extent / progress of a 5G deployment
- The feasibility / practicality of gathering and reporting each proposed indicator



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- Maintaining, wherever possible, consistency and continuity with previous ITU indicators.

Each of the indicators were judged against those guiding criteria, and each priority 2 indicator fell short against at least one of those. One proposed priority indicator that is worthy of specific mention is the “*Number of 5G subscriptions*” proposed indicator. While this indicator is similar to other indicators in the ITU Handbook (such as “*Mobile cellular telephone subscriptions (post-paid + prepaid)*”) and would thus seem to warrant consideration, ultimately the subgroup decided not to prioritize this indicator, for the following reasons:

1. In most cases, this information is not available because it is not yet reported by operators.
2. There is concern that the indicator would not be possible to measure in every country where 5G has been deployed, as in some markets there is not yet a specific 5G subscription tariff, but rather there is a standard mobile subscription tariff that allows the use of 5G networks where available but is otherwise indistinguishable from other tariffs.

The subgroup therefore concluded that at this moment it is not desirable to proceed with an indicator that specifically attempts to measure 5G subscriptions. There are too many methodological nuances to consider that make the indicator difficult to effectively collect at this time. The subgroup does, however, recommend that the ITU consider introducing a new indicator to measure 5G subscriptions in due course, when the information from operators is more readily available and other methodological considerations have been sufficiently addressed.

For the remaining indicators that were identified as priority 1, the next phase of group work was focused on determining which would be suitable to recommend to the ITU for adoption. The following section provides an overview of that discussion.

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Discussion of priority indicators

The highest priority indicators concerned two topics: the extent of 5G coverage as a percentage a country's population, and available and allocated 5G spectrum.

To measure 5G as a percentage of population would require an update to the language found in Indicator 14. It was universally agreed by subgroup participants that this exercise was warranted and beneficial.

The second discussion, around 5G spectrum is more complex. First, the group concluded that the appropriate measure to focus on was *assigned* spectrum, not available spectrum. However, there were other points raised in the discussion, summarised below:

- Anything that singles out “5G spectrum” will be problematic as most countries issue licenses on a technology neutral basis and assigned mobile spectrum can be used for any generation.
- Since spectrum volumes are tracked comprehensively the two spectrum indicators approved already in EGTI 2019, it would be advisable to use these two indicators to include 5G- oriented bands in each country. Note the two indicators as approved by EGTI- 19 are:
 - Amount of spectrum offered for IMT systems; spectrum made available for use (allocated)
 - Amount of spectrum licensed for IMT systems; volume of spectrum assigned for use for IMT systems
- Both indicators are divided in three intervals of bands or blocks:
 - block < 1 GHz, subdivided in 6 different frequency bands
 - block 1- 6 GHz, subdivided in 12 frequency bands
 - block > 6 GHz (WRC- 19), subdivided in 12 frequency bands
- Related to 5G bands, only a subset of the bands in block 2 and 3 are affected (and some countries allocate as well the 700/ 600 MHz band, block 1).

In light of this discussion, instead of proposing a new 5G spectrum indicator, we would like to propose to review the spectrum indicators mentioned above to ensure that they reflect the most recent developments, with special attention paid to:

- Reviewing the break down by bands which would have to be updated to reflect results of WRC-19
- Methodology proposed in terms of counting amount of MHz to reflect use of different band plans within bands in different regions

The subgroup has therefore concluded that we will not proceed with a proposal for a 5G spectrum indicator.

Proposed indicator

As an outcome of the Subgroup's consultations and discussions, we propose the following indicator for tracking IMT2020 5G:

Proposed Indicator: Percentage of the population covered by a 5G mobile network
<p>Definition: <i>Percentage of the population covered by 5G mobile network</i> refers to the percentage of inhabitants that are within range of at least a 5G mobile-cellular signal, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by a 5G mobile-cellular signal by the total population and multiplying by 100.</p>
<p>Clarifications and scope: This indicator captures mobile-broadband coverage, and refers to the proportion of the population that lives within range of a consistently usable 5G mobile-cellular network signal (as defined by ITU-R IMT 2020 5G Requirements), regardless of whether they actually subscribe to the service or use it. It is based on where the population lives, and not where they work or go to school. It excludes the percentage of the population only covered by mobile-cellular technologies such as WCDMA (UMTS) and associated technologies such as HSPA, CDMA2000 and related technologies such as EV-DO, mobile WiMAX 802.16e and LTE. It also excludes the percentage of the population covered by a 3G or 2G mobile-cellular network, and by GPRS and EDGE technologies. Coverage should refer to all broadband mobile-cellular technologies. If this is not the case, it should be specified in a note.</p>
<p>Method of collection: The data can be collected from licensed 5G mobile-cellular operators in the country. However, they are likely to have different levels and locations of coverage. Another method would be to request each operator's 5G coverage maps, which can then be overlaid with maps showing the population of the country.</p>
<p>Relationship with other indicators: This indicator is a component of Indicator 14 (Percentage of the population covered by a mobile-cellular network).</p>
<p>Methodological issues: Some countries have difficulty calculating overall broadband mobile-cellular population coverage. In many cases, data refer only to the operator with the largest coverage, and this may understate the true coverage. If the coverage only refers to one operator, this should be specified in a note.</p>
<p>Example: The national regulatory authority in Switzerland publishes data on land and population coverage of GSM and broadband UMTS mobile networks (see example 10 in the ITU Handbook for the Collection of Administrative Data https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-PDF-E.pdf)</p>

Example 10. Mobile-cellular coverage, Switzerland, 2009

