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| APTlogogreen3 | ASIA-PACIFIC TELECOMMUNITY |  |
| **The 22nd Meeting of the APT Wireless Group (AWG-22)**  |  |
| 25 – 29 September 2017, Busan, Republic of Korea | 29 September 2017 |

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**questionnaire ON current status and future plan of implementation and deployment of INTERNET OF THINGS in ASIA PACIFIC countries**

**Section 1: Elementary Part**

# Introduction

Internet of Thins (IoT) defined as 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.

The goal of the IoT is to enable things to be connected anytime, anyplace, with anything and anyone ideally using any path/network and any service. Analysts predict that new IoT products and services will grow exponentially in next few years. IoT, as an industry, is still nascent, but that hasn’t stopped many tech companies from developing IoT devices, software and systems.

In many countries, especially Technology developed countries including some APT members country, the enterprises, institutions of higher learning, research centers and individual professionals have taken up the idea of IoT. There is a dramatic race to pick up and adopt IoT with the enthusiasm that was not seen in the past decade. Some countries provided a detailed plan for the implementation and deployment of IoT. These countries are integrating IoT in their day to day activities.

The ITU-R Radio Assembly 2015 (RA-15) has recognized that the globally connected world of IoT builds on the connectivity and functionality made possible by Radiocommunication networks and that the growing number of IoT applications may require enhanced transmission speed, device connectivity, and energy efficiency to accommodate the significant amounts of data among a plethora of devices. RA-15 has approved Resolution 66 on the “Studies related to wireless systems and applications for the development of the Internet of Things”, and resolved to conduct studies on the technical and operational aspects of radio networks and systems for IoT in collaboration with ITU-T and relevant standards development organizations.

WRC-19 agenda including agenda item 9.1 issue 9.1.8 **58 (WRC-15)** calls for urgent studies in preparation for WRC-19 on “*Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work.*” ITU-R WP5D responsible group on this issue.

# Objectives

The objective of this questionnaire is to collect the information on the current status and future plan of IoT in APT members’ country, in-order to facilitate the study on IoT in Asia Pacific region.

Responses to the questionnaire will be utilized for the development of a new draft of APT Report on current status and future plan of implementation and deployment of IoT in APT members country.

# Responsible Group

Task Group on Internet of Things (TG-IoT)

# Rapporteur of the Questionnaire

Dr. Satoshi Tsukamoto, tsukamoto@atr.jp

# Meeting at which the Questionnaire was approved:

AWG-22 Document: AWG-22/OUT-xx

# Target Responder:

APT Members

# Deadline for Responses:

AWG-23

**Section 2: Questionnaire Part**

**2.1 About Your Administration**

Name of Administration :

Name of Contact Person :

Telephone Number :

Postal Address :

Email Address :

***NOTE:*** *It is not necessary for you to all the questions in this Questionnaire. It is greatly appreciated if you could provide any relevant information or considerations as much as possible.*

**2.2. Current status of implementation and deployment of IoT in your country**

**Question 1:**

Is there any IoT implementation and deployment in your country? If yes, please describe.

**Question 2:**

Which type of IoT applications have been deployed in your country? Please provide any other IoT categories should it not listed in the table below.

Situation:

3. very popular (~80%); most of people are using or rely on the devices/services

2. popular (~30% - 80%); many people are using the devices/services and it is easy to find them

1. rare (~10% - 30%); some people are using or the devices/services do exist but is not easy to find them

0. no (> 10%); no such devices/services are used or exist in your country

| **Category** | **Example of Use Cases** | **3** | **2** | **1** | **0** |
| --- | --- | --- | --- | --- | --- |
| Smart City | * Street lights management
* Road and structure sensors
* Waste management
 |  |  |  |  |
| Smart Home | * Water leak detector
* Smart lighting
 |  |  |  |  |
| Smart Agriculture  | * Animal monitoring
* Crop management
 |  |  |  |  |
| Smart Transportation | * Traffic management
* Parking management
* Billboard monitoring
 |  |  |  |  |
| Smart Environment  | * Measure level of water and flow
* Air quality monitoring
 |  |  |  |  |
| Smart Industry | * Product management
* Energy saving
* Product tracking
 |  |  |  |  |
| Healthcare | * Fall assistant
* E-health
 |  |  |  |  |

**Question 3:**

Is there any regulatory licensing regime applied on IoT (operator) in your country? (e.g. spectrum license, network license, etc) If yes, please indicate what kind of license.

***Note:*** *If yes, please proceed with question 4, otherwise please proceed with question 6.*

**Question 4:**

Do you impose license fee and/or spectrum fee for IoT?

**Question 5:**

How many IoT operator for each license are currently operating in your country? Please describe for each license issued.

**Question 6:**

Do you apply or plan to apply ‘Technology Neutral’ spectrum policy for IoT?

If no, what technologies are used for such IoT frequency band allocation and related categories in your country? Please provide any other IoT categories should it not listed in the table below.

|  **Frequency Band Allocation** | **IoT Category (Examples)** | **Type of Technologies (e.g. Cellular, ZigBee, Wi-Fi, RFID, LPWA, etc)** |
| --- | --- | --- |
| aa – bb MHz | Throughput | Low / Mid / High |  |
| Latency | Low / Mid / High |  |
| Resiliency | Low / Mid / High |  |
| Coverage | Short / Long range |  |

**Question 7:**

Do you allocate any spectrum for IoT applications, in term of shared or dedicated, license or unlicensed? If yes, please provide the frequency band(s), channel arrangement/bandwidth and related IoT applications.

**Question 8:**

Do you have any concern of allocating spectrum for IoT application, such as co-and-adjacent channel interference, spectrum sharing within the same frequency band? Please write your concerns for each of the relative frequency band(s).

**Question 9:**

What is technical specification/standards the IoT require to comply with?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Frequency Band** | **Technology** | **Transmit Power (EIRP)** | **Spectrum Access Technique (e.g. Frequency hopping, Duty cycle, Listen before talk, etc)** | **Max Transmission Duration** | **Channel Bandwidth** | **Spurious Emission** | **Others (please specify)** |
|  |  |  |  |  |  |  |  |

**Question 10:**

Please provide the IoT deployment conditions/restrictions for each IoT technology mentioned in question 6 (reference Table 1):

* Approximately number of IoT devices are operated in each authorized frequency band.
* Maximum deployment density for assumed typical use-cases.
* Location of typical deployment.
* Maximum expected speed for the typical mobility use-case.

***Note:*** *Please complete one table for each technology.*

Table Reference table (for the answer)

| **Name of Technology** |
| --- |
| **Letter code** | **No. of devices (in each band)** | **Max. Deployment****Density Per km2 (typical use-case)** | **Location of Typical Deployment** | **Maximum Expected Speed** |
| A | 1-100 | <1 | Indoor small room (Residential) | Fixed(0 km/h) |
| B | 100-10k | 1-100 | Indoor large room (eg factory) | Nomadic stationary(0 km/h) |
| C | 10k-1M | 100-10k | Outdoor urban | Pedestrian(<10 km/h) |
| D | 1M-100M | 10k-1M | Outdoor rural | Vehicular low or medium(10-100 km/h) |
| E | >100M | >1M | Other (Please specify) | Vehicular high or super-high(>100 km/h) |

Table An example answer for the question

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **IoT Technology** | **Authorized Frequency Bands / Frequencies** | **No. of Devices (in each band)** | **Max. Deployment** **Density Per km2 (typical use-case)** | **Location****of Use** | **Maximum Expected Speed** |
| 1  | Cellular | **aa – bb MHz** | C | D | A, B | A, B |
| … |  |  |  |  |
| 2 | Zigbee |  |  |  |  |  |
|  |  |  |  |  |
| 3 | Wi-Fi |  |  |  |  |  |
|  |  |  |  |  |
| 4 | RFID |  |  |  |  |  |
|  |  |  |  |  |
| 5 | LPWA |  |  |  |  |  |
|  |  |  |  |  |
| 6 | Others (please specify) |  |  |  |  |  |
|  |  |  |  |  |

**Question 11:**

If there are other regulations, please describe.

**Question 12:**

Is there any issue related to IoT communication system?

Situation:

3. very serious; cannot resolve

2. serious; number of issues

1. rare; some issue but manageable

0. no; no issue

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **3** | **2** | **1** | **0** |
| Congestion of frequency band |  |  |  |  |
| Security |  |  |  |  |
| Performance |  |  |  |  |
| Interference between IoT and SRD/RFID/others within the same frequency band |  |  |  |  |
| Interference between IoT and services in the adjacent frequency band |  |  |  |  |

**Question 13:**

In your country, do you have any R&D activities on IoT related technologies and/or devices? If yes, please describe.

**2.3 Future plan of implementation and deployment of IoT in your country**

**Question 14:**

Do you have plan to implement any other application (except those mentioned in section 2.2) and/or allow IoT deployment in your country?

***Note:*** *If yes, please proceed with question 15, otherwise proceed with section 2.4.*

**Question 15:**

Which type of IoT applications (e.g. Smart cities, Smart industry, Smart agriculture, Healthcare, etc) are intended/planned to be deployed in your country? Please provide any other IoT categories should it not listed in the table below.

| **Category** | **Example of Use Cases** | **Yes/No** | **Timeline to implement** |
| --- | --- | --- | --- |
| Smart City | * Street lights management
* Road and structure sensors
* Waste management
 |  |  |
| Smart Home | * Water leak detector
* Smart lighting
 |  |  |
| Smart Agriculture  | * Animal monitoring
* Crop management
 |  |  |
| Smart Transportation | * Traffic management
* Parking management
* Billboard monitoring
 |  |  |
| Smart Environment  | * Measure level of water and flow
* Air quality monitoring
 |  |  |
| Smart Industry | * Product management
* Energy saving
* Product tracking
 |  |  |
| Healthcare | * Fall assistant
* E-health
 |  |  |

**Question 16:**

Do you intend/plan to impose licensing regime and other regulation(s) on IoT (operator)? If yes, please describe in detail for each application mentioned above.

**Question 17:**

Do you have any plan (or possibilities) to assign new frequency band(s) or to make available the existing frequency band(s) for IoT in the next five years (including shared and/or dedicated spectrum)? If yes, please provide the information on frequency band(s), bandwidth, technolog(ies), standards, applications and other regulations (If available).

**2.4 Other matters**

**Question 18:**

Do you have any other issue to be addressed in implementation and deployment of IoT? What type of issue(s)?

**Question 19:**

Are there any information or technology trends regarding IoT that you would like to share with the APT Members?