**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | **and their values** | |
| Date Submitted | May 28, 2014 | |
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| Re: | [Subclause 7.1 of 802.15 TG10 TGD and [TGD Scenario Parameters #319r0](https://mentor.ieee.org/802.15/dcn/14/15-14-0319-00-0010-tgd-scenario-parameters.docx)] | |
| Abstract | [Scenario Parameters for CfFP - Working Document.] | |
| Purpose | [Define the parameters to consider in the scenario for final proposals] | |
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**Introduction**

This document was prepared to suggest some comments on 15-14-0338-02 regarding the operational scenarios which will be included in the TG10 TGD so that the TG10 scenarios **meet all requirements and fit better to real situations, by which proposals can be fairly compared.**

15-14-0338-02 provides the following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | **Scenarios** | | |
| **Parameter** | | | **Mostly Upstream:**  **Smart metering, infrastructure monitoring, Irrigation Optimization** | **Mostly Downstream:**  **Street lighting, smart lighting** | **Balanced upstream and downstream:**  **CEMS, BEMS, HEMS** |
| Packet size | | | 100 bytes | | |
| Data rate | | | 250kbps [1][2] | | |
| Packet birth rate | | | 1 packet every 30 min |  |  |
| Duty cycle | | | 100%, 1%, 0.1% | | |
| Node density | | | 8000 / km2 (household density in Tokyo) [3] |  |  |
| Mobile devices (Y/N) - speed | | | N | N | Y – 1.4m/s (human walking speed) |
| PAN Coord to Device | | Unicast (Y/N) | Y | | |
| Multicast (Y/N) | Y | | |
| Broadcast (Y/N) | Y | | |
| Device to PAN Coord | | | Y | Y | Y |
| Device to device | | Unicast (Y/N) | N | N | Y |
| Multicast (Y/N) | N | N | Y |
| Broadcast (Y/N) | N | N | Y |
| Linear Topology (Y/N) | | | N | Y | N |
| Energy consumption | TX | | 28 mA [1] | 30 mA [2] | |
| RX | | 11.2 mA [1] | 37 mA [2] | |
| Idle | | 1.5 uA [1] | 500 uA [2] | |
| Sleep | | 0.1 uA [1] | 0.2 uA [2] | |
| Tx power | | | 13 dBm [1] | 0 dBm | |
| Rx sensitivity | | | - 97 dBm [1] | -92 dBm [2] | |

**Definitions**:

Data rate: data rate at the physical layer

Packet birth rate: rate at which packets are being generated

Duty cycle: ratio of active/non-active state of device

Device: node other than the PAN coordinator

N: Number of nodes in the PAN

N = 121 (11x11), 999 (33x33), 10,000 (100x100)

For Linear Topology N = 999 (33x33), where the middle row or column has N=100

Unicast: transmission from 1 source to 1 destination

Multicast: transmission from 1 source to n destinations (n < N-1)

Broadcast: transmission from 1 source to N-1 destinations

**Other parameters**

Path Loss model: Two-Ray

**References**

1. <http://www.semtech.com/images/datasheet/sx1272.pdf>
2. MC13202, Low power transceiver for the IEEE 802.15.4 Standard, http://cache.freescale.com/files/rf\_if/doc/data\_sheet/MC13202.pdf?pspll=1&Parent\_nodeId=1141674020187711908069&Parent\_pageType=product
3. Tokyo statistical yearbook, Population and Households, http://www.toukei.metro.tokyo.jp/tnenkan/2012/tn12qa021000.xls

**Some comments for the scenario parameters**

Some parameters and their values are suggested in 15-14-0338-02, which will be used for evaluation of proposals.

However, some parameters seem to be missing in the document, 15-14-0338-02. Therefore some comments regarding the missing parameters and values are to be suggested in this document.

The scenarios had better cover parameter values/ranges specified in the current TGD as much as possible to evaluate the proposals more efficiently. TG10 scenarios should be prepared so that TG10 scenarios **meet all requirements and fit better to real situations, by which proposals can be fairly compared.**

* Otherwise, the TGD needs to be revised so as to include only the parameter ranges to be used in the scenarios if only the confined parameters and values are considered for proposal evaluation.
* As an example, three applications suggested in 15-14-0338-02 have a data rate of 250kbps, which means that routing methods for TG10 working for other data rates will not be verified.
* The same situation is applied for packet size, data rate, and packet birth rate.

Some issues are considered to add some parameters and values to the table:

* Multi subnet should be considered which is specified in the TGD.
* Signal quality and/or link quality may need to be added. It is not seen whether/how two way propagation model solves this issue.
* Multiple entry/exit points, many-to-one communications need to be added.

**Proposed table for parameters and their values**

From the above comments, a new table and definitions are proposed as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Scenarios** | | |
| **Parameter** | | **Mostly Upstream:**  **Smart metering, infrastructure monitoring, Irrigation Optimization** | **Mostly Downstream:**  **Street lighting, smart lighting** | **Balanced upstream and downstream:**  **CEMS, BEMS, HEMS** |
| Packet size | | 100 bytes | | 31 bytes, 255 bytes, 2047 bytes |
| Data rate | | 250kbps | | 1kbps, 250kbps, 27Mbps |
| Packet birth rate | | 1 packet every 30 min |  | 1 packet/sec, 1 packet/min, 1 packet/30min |
| Duty cycle | | 100%, 1%, 0.1% | | |
| Node density | | 8000 / km2 (household density in Tokyo) |  |  |
| Mobile devices (Y/N) - speed | | N | N | Y – 1.4m/s (human walking speed) |
| Link failure rate [4] | between adjacent nodes |  |  | **10-1 and 2x10-1, 10-3** |
| between diagonally adjacent nodes |  |  | **10-2, 10-6 and 2x10-5** |
| Number of entry points | |  |  | 1, 3 |
| Number of exit points | |  |  | 1, 3 |
| PAN Coord to Device | Unicast (Y/N) | Y | | |
| Multicast (Y/N) | Y | | |
| Broadcast (Y/N) | Y | | |
| Device to PAN Coord | | Y | Y | Y |
| Device to device | Unicast (Y/N) | N | N | Y |
| Multicast (Y/N) | N | N | Y |
| Broadcast (Y/N) | N | N | Y |
| Linear Topology (Y/N) | | N | Y | N |
| Multiple devices to device (Y) [4] | |  |  | Y |
| Number of PAN coordinators [4] | |  |  | 1, 3 |
| Energy consumption | TX | 28 mA [1] | 30 mA [2] | |
| RX | 11.2 mA [1] | 37 mA [2] | |
| Idle | 1.5 uA [1] | 500 uA [2] | |
| Sleep | 0.1 uA [1] | 0.2 uA [2] | |
| Tx power | | 13 dBm [1] | 0 dBm | |
| Rx sensitivity | | - 97 dBm [1] | -92 dBm [2] | |

**Definitions**:

Data rate: data rate at the physical layer

Packet birth rate: rate at which packets are being generated **(Is it different from “packet rate”?)**

Duty cycle: ratio of active/non-active state of devices **(What about “active device ratio”?)**

Device: node other than the PAN coordinator

N: Number of nodes in the PAN

N = 121 (11x11), 999 (33x33), 10,000 (100x100)

For Linear Topology N = 999 (33x33), where the middle row or column has N=100

Unicast: transmission from 1 source to 1 destination

Multicast: transmission from 1 source to n destinations (n < N-1)

**n=11 for N=121, n=33 for N=999, and n=100 for N=10000**

Broadcast: transmission from 1 source to N-1 destinations

Multiple devices to device: transmission from n devices to one device

**n=11 for N=121, n=33 for N=999, and n=100 for N=10000**

**References**

1. <http://www.semtech.com/images/datasheet/sx1272.pdf>
2. MC13202, Low power transceiver for the IEEE 802.15.4 Standard, http://cache.freescale.com/files/rf\_if/doc/data\_sheet/MC13202.pdf?pspll=1&Parent\_nodeId=1141674020187711908069&Parent\_pageType=product
3. Tokyo statistical yearbook, Population and Households, <http://www.toukei.metro.tokyo.jp/tnenkan/2012/tn12qa021000.xls>
4. 15-14-0239-02 Proposed operational scenarios of L2R networks for TG10 TGD