Brazilian and Colombian Perspectives for IoT Network Slices

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• The Ministry of Science, Technology, Innovation and Communications has created in October 2014, the Chamber of Management and Monitoring of the Machine Type Communication Systems Development.

• The main two objectives of this Chamber are:
  ➢ Monitoring the growth of the Internet of Things in Brazil and encourage its development.
  ➢ Monitoring the impact of tax reduction on machine-to-machine communication (Installation Inspection Fee and Operation Inspection Fee).

• The M2M Chamber is a multisector body, composed of government officials, academia and associations, representing different market sectors.

• This Chamber is being developed together with the Public Policies studies for future 5G implementation.
Spectrum policy objective:
To promote the optimal use of Spectrum, in order to maximize the benefit to the Colombian society and to ensure the availability of this resource for all the radiocommunications services.

ANE was created in 2009 to plan, allocate, monitor and control the Spectrum in Colombia. It is a technical entity that advises the ICT Ministry about the efficient use of this the Spectrum and promotes the knowledge about it.
General view’s

• All current frequency bands and the future ones identified to International Mobile Telecommunication (IMT) could be used by IoT and M2M systems, as well as, non IMT bands.

• IMT is a mobile service and IoT or M2M are applications that can be one or more slices in the IMT-2020 networks.

• Other networks, can be implemented having IoT as an application or using specific wireless technology mainly targetted for M2M and IoT, in different frequency bands (e.g. LoRa – IEEE 802.15.4g), for example unlicensed bands.
### IoT usage cases

#### Coverage zones
- Rural or remote
- Urban or dense

#### Spectrum use
- 1. Licensed
- 2. Unlicensed

#### Type of Networks
- PAN: Personal Área Network
- LAN: Local Área Network
- LPWAN: Low Power Wide Área Network
- WAN: Wide Área Network
- Private mobile VHF – UHF, telemetry, telecontrol, M2M e IoT,
- Satellites
- Oportunistic use of spectrum – White spaces

#### Commercial services
- Public
- Private
- IoT services and network providers - IoT operators.
- Networks owned by the actual IoT service/application providers.
IoT supported on IMT

Future IMT

Enhanced Mobile Broadband
- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application
- Self Driving Car

Massive Machine Type Communications
- Sub-1GHz operation
- High transmission power
- High propagation delay
- Interference management
- Integration with satellite backhaul

Remote areas
- Large coverage
- Sparse Network nodes
- Scarce backhaul links

Rural areas

Smart City

Voice

Smart Home/Building
Network Slices

5G Slice 1
(Mobile broadband access)

5G Slice 2
(High resolution mobile video)

5G Slice 3
(Real time data, voice and video)

5G Slice 4
(very low data rate, low mobility IoT)

Source: Inatel presentation in 2nd Global 5G PPP meeting
IoT connected devices will drive the growth of connections.
1. Licensed IMT

Planning to support growth in connections

Technical and administrative actions oriented to make available IMT spectrum according with the market growth and spectrum needs projections, looking for the best cost-benefit relation for the society.
2. Unlicensed spectrum

- **ANE resolution 711 of October 2016** established the administrative and technical conditions for the usage of unlicensed spectrum.

  - Identification of needs
  - Preliminary consultation to interested parties.
  - Benchmark
  - Validation: Public consultation.

Analysis of more of 50 GHz, bands proposal, applications, impact analysis on current spectrum usage and assignments.

Unlicensed spectrum will allow the development of new ecosystems and applications for IoT and other trends.
2. Unlicensed spectrum

Current % of available unlicensed spectrum

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>After</th>
<th>Before</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLF</td>
<td>100%</td>
<td>78%</td>
</tr>
<tr>
<td>LF</td>
<td>100%</td>
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<tr>
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</tr>
<tr>
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<td>4%</td>
</tr>
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<tr>
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<tr>
<td>SHF</td>
<td>57%</td>
<td>55%</td>
</tr>
<tr>
<td>EHF</td>
<td>9%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Conclusions

• Even though, the M2M applications are under studies in Brazil, Brazil is already the 3rd largest M2M market in the world.¹

• It is being developed LTE technologies in 250 MHz² band by a Brazilian R&D Company (CPqD) mainly for rural areas applications.

• Depending on the IoT application, different frequency bands may be more suitable, for example, 250 MHz, 450 MHz, 700 MHz, 900 MHz etc. Nevertheless, no specific frequency bands should be identified for this application.

• Colombia is committed to ensure the spectrum availability for IoT and M2M applications.

• Even when the plans for spectrum availability are already proposed (for both unlicensed and licensed bands), ANE is looking for continue working with manufacturers, academy, operators and other administrations to promote the development of IoT.

¹: http://blog.futurecom.com.br/brasil-e-o-terceiro-maior-mercado-de-conexoes-m2m-moveis-do-mundo/
²: to avoid high levels of man-made noise, the higher portion of VHF and the lower portion UHF is suitable, as it is described in ITU-R Report M.2224.
Thank you very much!

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