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5G in Brazil – the state of affairs

Authors: Ernst-Jan Bakker, Bas Leferink, Petra Smits, Holland Innovation Network Brazil. August 2019.

Brazil is preparing to auction frequencies for the 5th generation of communications infrastructure (5G) in 2020. In the meantime, telecom providers are running pilot projects with 5G equipment from several technology companies (without showing ambition to start a 5G race amongst them) and the government is launching programs, including funding, to stimulate Internet of Things (IoT) applications in agriculture, health, smart cities and industry. Brazil is collaborating with the European Union in joint R&D calls on 5G; a new joint call is expected in 2020. Specific challenges such as coverage of remote areas, largescale expansion of the supporting fibre-based network and avoiding interference with other signals (e.g. TV) could provide opportunities for international collaboration in research or in business.

5G is the latest (5th) generation of communications infrastructure to be introduced to the market, replacing 4G LTE as the fastest network available, due to the fact that it makes use of radio waves with higher frequencies than those used for 4G. Transforming data traffic, 5G would serve as the infrastructure for the Internet of Things (IoT) and applications such as self-driving cars, remote surgery, and virtual reality (VR) and augmented reality (AR). This article from the Holland Innovation Network Brazil describes the status of 5G development in Brazil, the main challenges and main actors involved.

Auction of 5G frequencies in 2020

In May 2019, the Brazilian telecommunications agency ANATEL officially announced the auction of the frequencies 700 MHz, 2,3 GHz, 3,5 GHz and 26 GHz for 5G [1], predicted to take place in March 2020 [2]. The agency is considering auctioning these frequencies on a basis of regional blocks, in order to increase viability for smaller parties to enter the market. Anatel's announcement took place one day before a 5G workshop organised by FIESP, the Federation of Industries of the State of São Paulo, where all 5G technology providers interested in developing 5G for Brazil were present: Huawei, Ericsson, Nokia, NEC and Qualcomm.

In August 2019, ANATEL informed that 5G (in the 3,5 GHz band) might interfere with parabolic TV antennas mainly used in rural areas [3], which could potentially affect 19 million households. Analysing and solving this issue could delay the current timeline for the auction. ANATEL estimates that the 5G auction could generate around EUR 4,5 billion, where half of this amount would be paid for the frequencies and half would be investments in infrastructure (by the telecom providers).

After the auction, the first pilots with 5G on a commercial scale in cities are expected to take place in 2020 and 2021. ANATEL thinks that 5G will reach the country's large urban centres[1] from 2021 onwards, others suspect it might take 1 or 2 years more. The 4 main telecom companies stated that the 5G implementation in Brazil should not turn into a race between them, but that implementation should be targeting specific locations where sound business cases can be made [5]. This statement seems to agree with the fact that these companies still have an estimated 2 to 3 years of growth potential in their current 4G networks [4].

Pilot projects

Small-scale tests with 5G have already taken place in Brazil, with the country's telecom providers being in various stages of preparation for adoption of the technology. The Brazilian telecom market's main players are Claro, Vivo, Oi and TIM. Claro executed its first test in October 2016 in collaboration with Ericsson and in October 2018 the provider gave a 5G demonstration with Huawei technology, as did competitor Vivo. Vivo started testing Ericsson's technology in August 2018. In June 2019, TIM started its first 5G pilot project in Brazil, reaching download speeds of almost 1 Gbps using the 3,5GHz frequency. This pilot project took place at applied research institute CERTI (Centers of Reference in Innovative Technologies) in Florianópolis, where IoT solutions are being developed for e.g. Industry 4.0 and telemedicine.

[1] In Brazil about 85% of the population lives in urban areas, which represent about 0,63% of the national territory.

The Chinese company Huawei and the 5G technology it offers, have been the topic of international controversy, with some countries barring the company from entering (part of) the market to develop 5G infrastructure there. In July Brazil's Vice-president confirmed Brazil would not ban Huawei from the 5G network [6].

Challenges and opportunities

Implementation of 5G in Brazil will face several challenges. Besides a solution for aforementioned potential interference with TV antennas, a large expansion of the fibre-based networks is necessary; about 5-fold the amount currently installed [1]. Another challenge will be getting permits for the large amount of new antennas that are required[2] which has proven to be a time-consuming process.

And given Brazil's size, coverage of remote or rural areas is a challenge in general. This applies to all generations of communication infrastructures, but for 5G the challenge is more significant given the relatively limited range of the used frequencies. A reliable and economically viable solution is not only relevant for the population in these regions, but also for agriculture. In 2018, the total revenue of the Brazilian agro-business industry amounted to 1,44 trillion R$, which represents about one-fifth of the country's GDP. 5G coverage in rural areas would facilitate the large-scale implementation of Precision Agriculture, an IoT application. Precision Agriculture is an agriculture management concept in which farm productivity is optimised by monitoring and optimizing all parameters that influence production (e.g. pH, humidity, temperature, lighting), and to use these data as feedback input to adjust all systems and machines in use, to keep conditions at an optimal level and optimise the use of resources, such as water, fuel and fertilizer.

Besides applications such as precision agriculture and autonomous driving, 5G also offers benefits to the consumer market. Brazil is the fifth country in smartphone usage in the world at this moment and for about 60% of all Brazilian internet users, the smartphone is the primary source of connection.

Government programmes and funding

The Ministry of Science, Technology, Innovation and Communication (MCTIC) is taking steps to stimulate the development of 5G and its applications in Brazil. The ministry was one of the public institutions behind the foundation of the so-called 'IoT Chamber' in 2014. Officially known as the Machine-to-Machine and Internet of Things Systems Management and Monitoring Chamber, nowadays the IoT Chamber is made up of 60 member institutions, including government bodies, private enterprises, universities and research centres. MCTIC is coordinating the IoT Chamber with further guidance from representatives of four other ministries. The IoT Chamber's goal is to guide the evolution and emergence of M2M and IoT applications, and to stimulate policy-making and promote technical cooperation in the field. Among other things, the IoT Chamber oversees the implementation of the National Plan for IoT; the Brazilian government's strategy to expand the implementation of IoT solutions in the country. The National Plan for IoT [7] was released in January 2018 by MCTIC, and in June 2019 the plan was institutionalised by presidential decree. The National Plan for IoT contains seven focal points (listed below) and, according to MCTIC, serves as a guideline for the realisation of concrete actions with feasible goals:

- Societal impact
- Regulatory environment
- Infrastructure and connectivity
- Talents
- Innovation and ecosystem
- Internationalisation
- Investment and financing

In line with the National Plan for IoT, other governmental institutions have also been active in promoting the development of IoT applications in Brazil. In 2018 the national development bank BNDES initiated a programme called 'IoT Pilots', as part of which a total sum of EUR 6,75 million in subsidies was awarded to IoT research and development projects in the fields of smart cities, health and agriculture [8]. BNDES also offers credit lines for which IoT development is be eligible [9]. The Funding Authority for Studies and Projects (FINEP) has also launched two programmes, in 2018 [10]

[2] 5G's high frequency signal can only reach up to 250 meters, and is blocked by built structures and trees. This means that, in the average city, antennae would have to be installed every 200 meters, e.g. attached to lampposts and traffic lights. This makes 5G as much a city planning challenge as a technological one.

and 2019 [11]. For these programmes funds of EUR 340 million and EUR 45 million respectively were made available as credit for IoT research and development projects.

Collaboration with EU

In 2016, the European Union and Brazil signed a joint declaration on developing 5G. In 2017 an industrial agreement was signed between the respective industrial associations (the EU's 5G Infrastructure Association 5G IA and 5G Brasil, a private autonomous project under the Telebrasil umbrella) and a joint 5G call was launched under H2020 [12]. The total budget of this call (EUR 1 million) was awarded to one project, called 5G-RANGE.

The 5G-RANGE project consortium includes universities from Spain, Germany and Finland, provider Vivo's Spanish mother company Telefónica, 5G developer Ericsson and Brazilian organisations such as the National Institute of Telecommunications (INATEL), the ICT research & development centre CPqD, University of São Paulo, Federal University of Ceará and University of Brasília. The goal of the 5G-RANGE project is to design, develop, implement and validate the mechanisms to enable the 5G network to provide an economically effective solution for Internet access for remote areas.

In 2020, another joint call is expected (ICT-43-2020). This call fits into the 5G Public Private Partnership (5G PPP), a subprogram of Horizon2020 and its successor Horizon Europe. News on this call was first published in November 2017, but since then further details about when the action will be initiated and how to qualify have not been shared. The next updates from 5GIA on the call are expected to be published in November 2019 [13].

5G R&D in Brazil

Several institutes and universities in Brazil are developing knowledge and technology for 5G. Besides the aforementioned 5G-RANGE project and its Brazilian partners, it's worth mentioning that Inatel has set up a Reference Center in Radio communications (CRR), with support from MCTIC, which has recently obtained about EUR 1,4 million in federal funding to continue development of a 5G modem for remote areas [14]. And the Brazilian MackGraphe institute, supported by FAPESP, is researching graphene as material for new electronics, batteries and heat dissipation in 5G systems [15] (Brazil is one of the world's largest graphite producers). Private research institutes, e.g. Senai Innovation Institute for ICT (ISI TICS), aforementioned CERTI foundation, and the Recife Center for Advanced Studies and Systems (CESAR), are mainly focused on developing new IoT applications, based on 5G.

More information

Ernst-Jan Bakker (Advisor for Science, Technology and Innovation) of the Holland Innovation Network Brazil, at the Consulate General of the Kingdom of the Netherlands, São Paulo – Brazil.
Email: SAO-IA@minbuza.nl

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