IMT Technologies Are we bridging the standardization gap in mobile broadband?

Rubens Fujiki Maeda
CPqD

ITU Regional Forum for AMS Region
IMT Systems - Technology, Evolution and Implementation
Panama, 18-19 August 2014

Agenda

- CPqD's Overview
- Digital Gap
- Broadband Public Policies
- How does CPqD contribute to decrease the Gap in Mobile Broadband?

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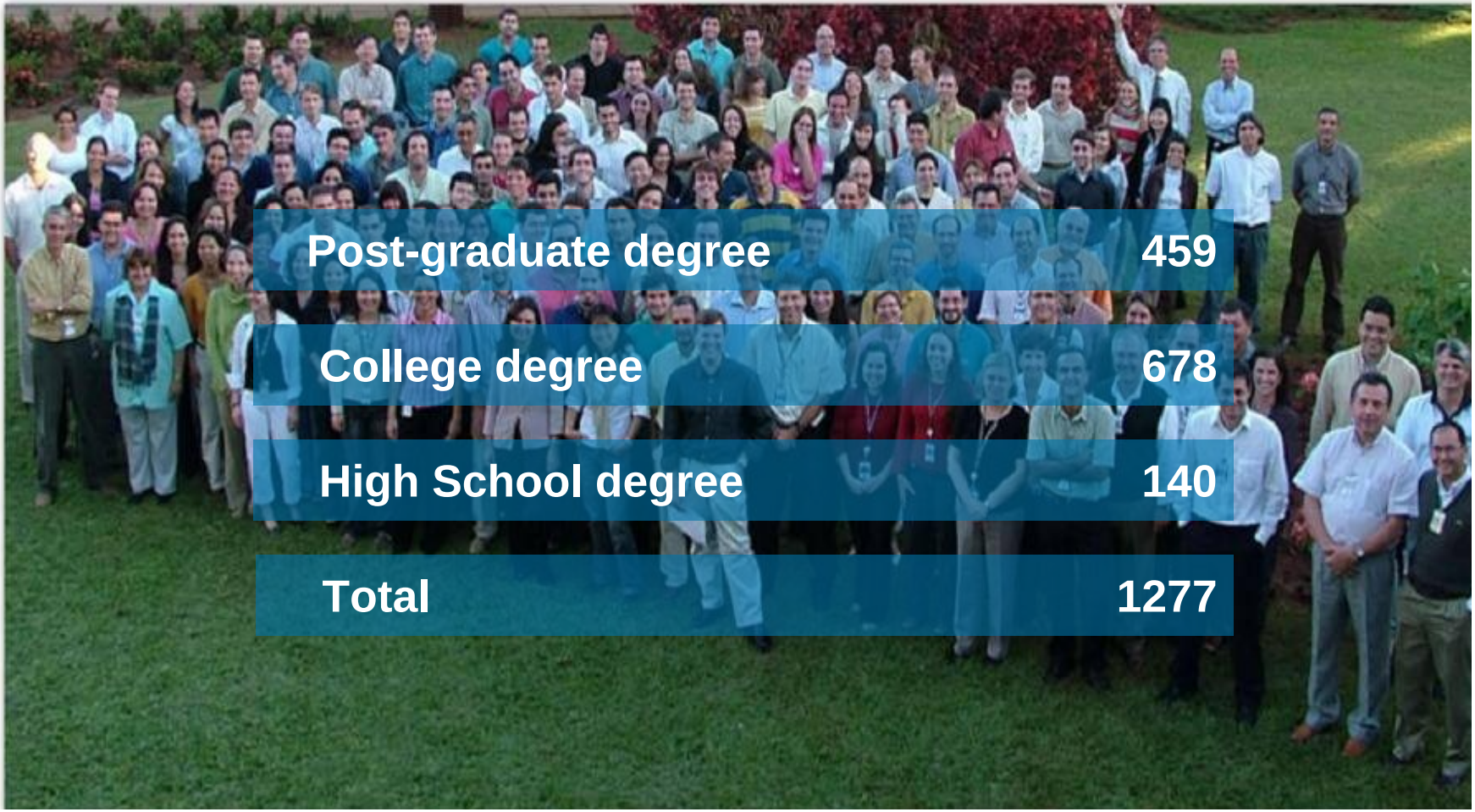
CPqD

An organization focused on innovation through Information and Communication Technologies (ICT)

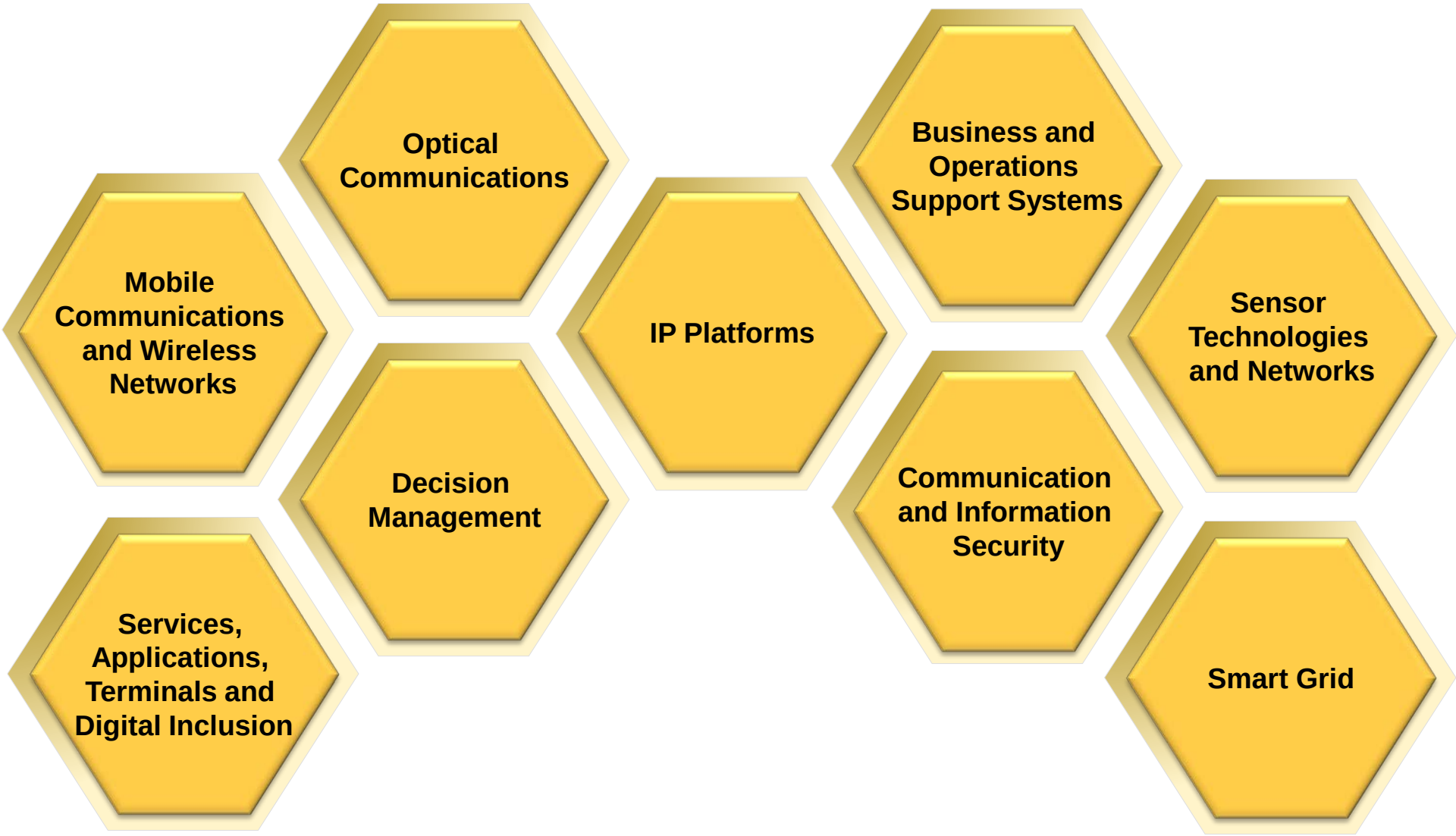
Aiming at

Increasing client's competitiveness and society's digital inclusion

Our Team


Post-graduate degree 459
College degree 678
High School degree 140
Total 1277

Main R&D areas



Agenda

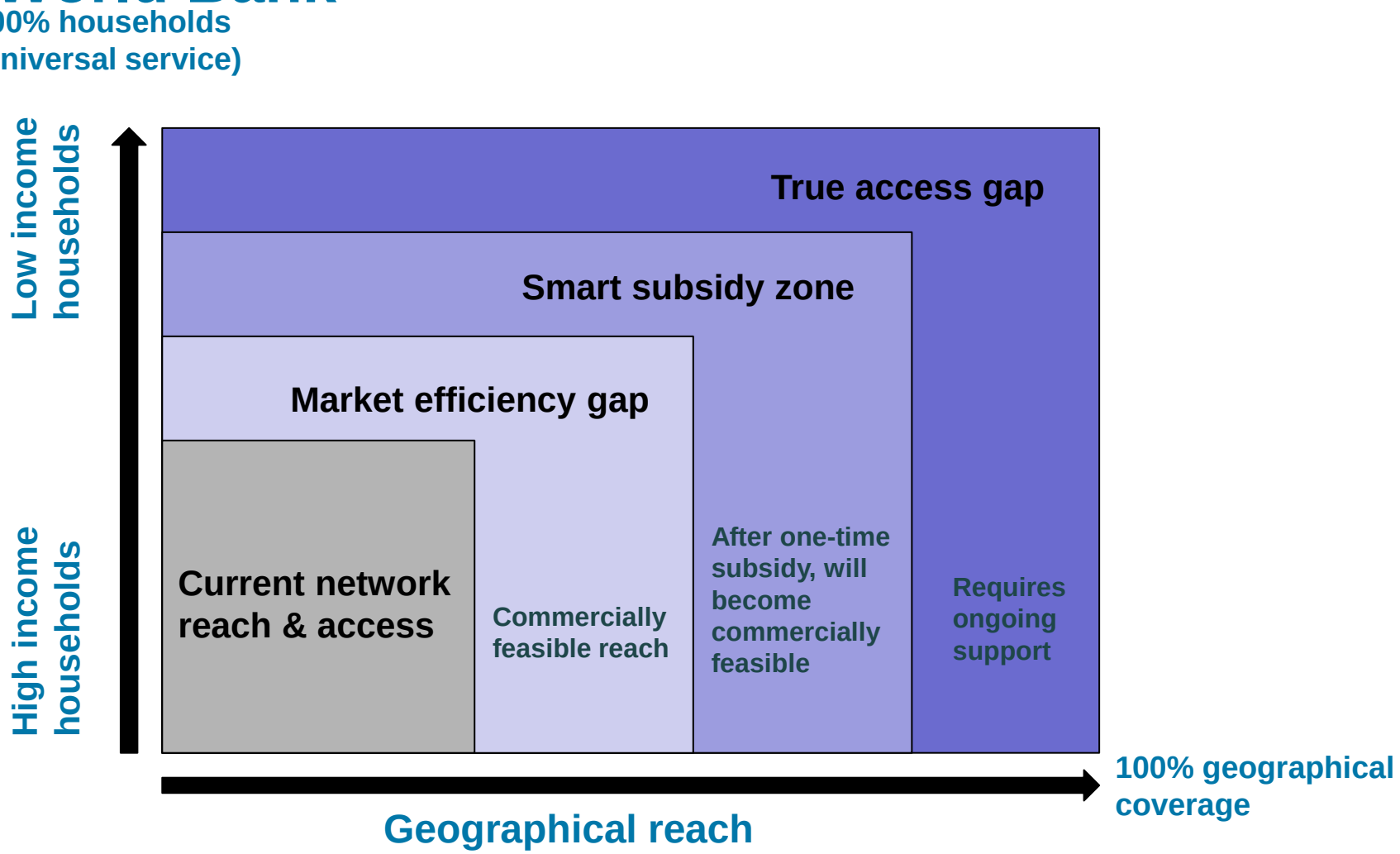
- About CPqD
- **Digital Gap**
- Broadband Public Policies
- How does CPqD contribute to decrease the Gap in Mobile Broadband

Digital Gap

- The concept of digital gap or digital divide is characterized by unequal access to information through digital media.

- There are different ways for addressing the issue:
  - Combination of different state control degrees and public service provision.
  - Combination of public funding with provision of services by the private sector.

Gap Model - Methodology developed by The World Bank



Source: Initial concept in “Telecommunications & Information services for the Poor: Towards a Strategy for Universal Access”, by J. Navas-Sabater, A. Dymond, N. Juntunen, 2002. Modified by Intelecon

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International Experience in Broadband Policies

Country	Timeline	Main Goal
Australia	2010-2017	100 Mbps broadband by optical fiber to 90% of households, schools and businesses. Wireless access to the other 10%.
Finland	2009-2015	Coverage of 1 Mbps to 100% of households by 2010. Increase to 100 Mbps by 2015.
Germany	2009-2018	1 Mbps broadband to 100% of households by 2010. Access of 50 Mbps to 75% of households by 2014.
United States	2009-2020	100 Mbps broadband to 100 million households by 2020. Increase the spectrum in 500 MHz by 2020. Accessible broadband to 100% of the population by 2020.

Source: Table adapted from Ministry of Communications. *O Brasil em alta velocidade: Um plano nacional para banda larga*.
Available at: http://www.governoeletronico.gov.br/anexos/plano-nacional-de-banda-larga/download (10Aug2014).

Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Objectives
  - Expanding infrastructure and telecommunications services, promoting access by the population and looking for best price, coverage and quality conditions.

Expand access to broadband making services and terminals more accessible	Expansion of telecommunications services to rural and remote areas	Encourage investment in telecommunications infrastructure	Regulatory and tax arrangement to reduce prices and charges	Improve the quality of services (QoS) for voice and data

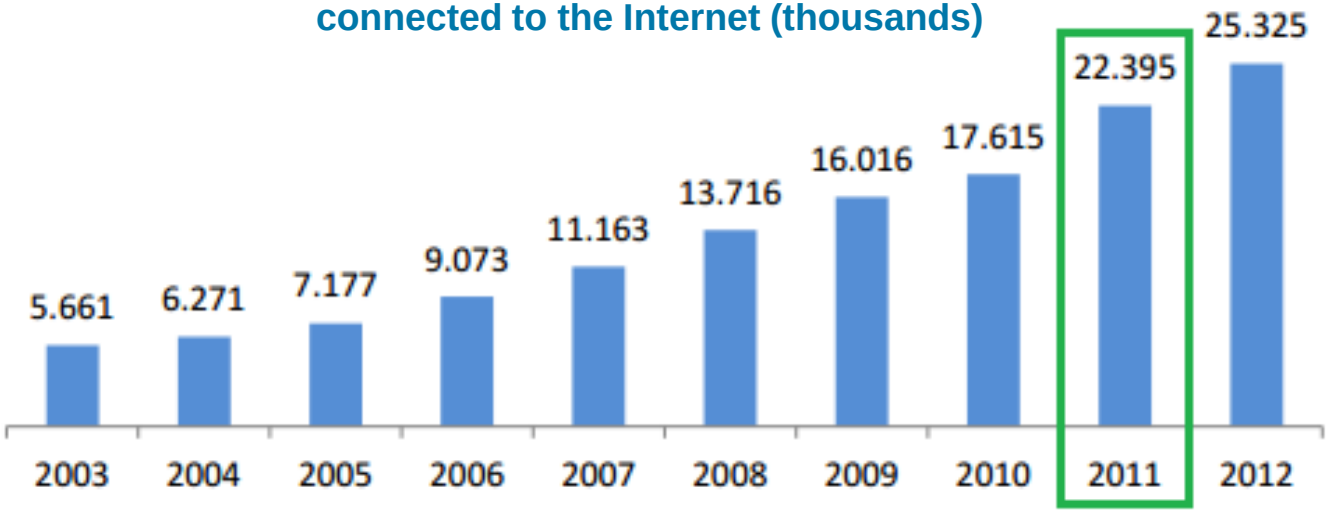
Source: Table adapted from Ministry of Communications. *Programa Nacional de Banda Larga PNBL*.
Available at: http://www.comunicacoes.gov.br/formularios-e-requerimentos/doc_download/1851-balanco-pnbl (08Aug2014).

Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Released in May 2010.
- In October 2011, the package of 1 Mbps starts to be offered for R$ 35 (about USD 15) in most states, and R$ 30 (about USD 12.5) in those where there is taxes exemption.
- Goal for 2014 - Reaching 40 million households connected to the World Wide Web.

Number of households with computers connected to the Internet (thousands)



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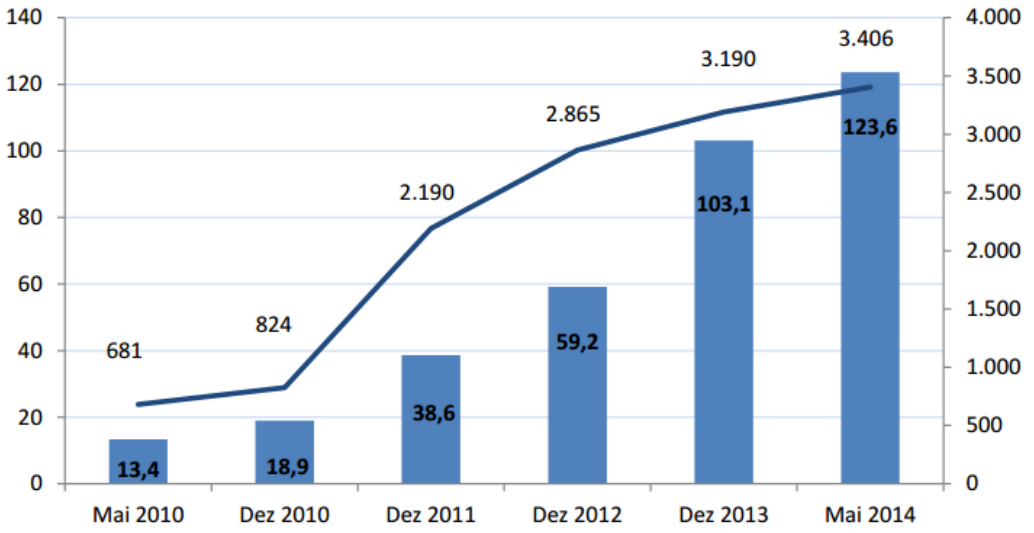
Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Main Results
  - Mobile Broadband

Mobile Broadband - Brazil
Number of accesses (millions) and number of cities covered



- In May 2014:
  - 3,406 cities covered
  - 123.6 million accesses
- Growth since PNBL launch:
  - 400% of the number of cities
  - 825% of the number of accesses
- 4G in June 2014:
  - 118 cities covered
  - 2.83 million accesses

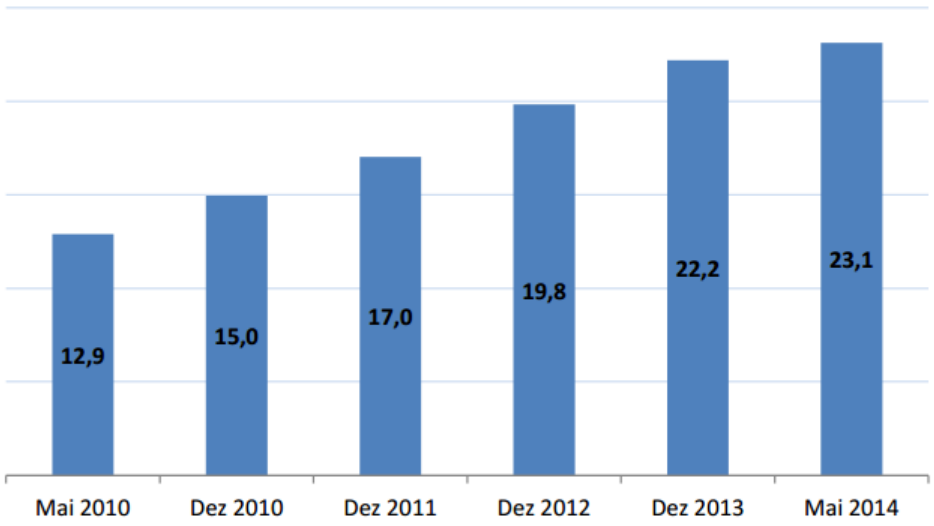
Source: Adapted from Ministry of Communications. *Programa Nacional de Banda Larga PNBL*.
Available at: http://www.comunicacoes.gov.br/formularios-e-requerimentos/doc_download/1851-balanco-pnbl (08Aug2014).

Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Main Results
  - Fixed Broadband

Fixed Broadband - Brazil
Number of fixed broadband accesses (millions)



- In May 2014:
  - All cities served
  - 23.1 million accesses
- 79% increase from the launch of PNBL
- Fixed broadband PNBL in March 2014:
  - 4,633 cities served
  - 2.6 million accesses (11% total)
- Telebras Network already reaches 885 cities

Source: Adapted from Ministry of Communications. *Programa Nacional de Banda Larga PNBL*.
Available at: http://www.comunicacoes.gov.br/formularios-e-requerimentos/doc_download/1851-balanco-pnbl (08Aug2014).

Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Main Activities
  - Taxes reduction or exemption for:
    - Microcomputers, modems, tablets, smartphones and routers conditioned to national production.
    - Terminal and broadband service aimed at rural areas (450 MHz and satellite).
    - Materials and services related to deployment of telecom network infrastructure.
  - Service price
    - 1 Mbps per R$ 35 (about USD 15) in all cities by the end of 2014.
    - 30% reduction in the price of wholesale broadband.
    - Broadband 0800: access paid by the content provider (reverse charging).

Brazilian Broadband Policies

National Broadband Plan (*Plano Nacional de Banda Larga* – PNBL)

- Main Activities
  - Increase of service coverage, speed and quality
    - Auction for 450 MHz, 700 MHz and 2.5 GHz frequency bands.
  - Digital inclusion
    - Broadband Public Schools Program: free connection to urban and rural schools.
  - Expansion of terrestrial networks
    - Expansion of optical transport network.
    - International optical outputs through submarine cables and South American optical ring.

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R&D Projects – LTE 450 MHz

3GPP standardization

- Sep. 2012 - 3GPP created a Work Item
- CPqD's specialists and engineers, worked with 3GPP at:
  - Channelization (band arrangement).
  - Coexistence with adjacent services.
  - Performance of radio parameters for transmission and reception.

- All this work was developed in accordance with ITU recommendations for the Americas Region.
- Sep. 2013, 3GPP completed the standardization process of the 450 MHz band by designated Band 31 (Release 12).

R&D Projetcs – LTE 450 MHz

Solution for wireless broadband access in rural and suburban areas

- Development of prototypes and technology transfer - CPE (Customer Premisses Equipment) Indoor and Outdoor and eNodeB

CPE Outdoor

Características	
Padrão	3 GPP R. 8/9 / Banda 31
Potência de Transm./Sens.	23 dBm (25 dBm) / -101 dBm

eNodeB

Especificação	
Potência Tx:	40 dBm
BW:	5 MHz
Faixa:	450 a 470 MHz (Anatel 558 / 2010)
Padrão	3 GPP Release 8 / 9
Taxas PHY (pico):	35 Mbps (DL) / 18 Mbps (UL)
Antenas	SISO ou MIMO
Alimentação:	AC 110-220 V / DC-48V
Interface Backhaul	Ethernet
Cobertura	30 -> 38 -> *45 km*
# usuários simult.	64-100
Setores	1

Field Tests – System reaches 36.7 km

Laboratories for certification tests

- The Brazilian Regulatory Agency (*Agência Nacional de Telecomunicações* — ANATEL) needs to regulate the entry of new technologies in the country. As technologies have evolved very fast, a great effort is required to maintain the regulatory and technical requirements for product certification updated.

- In this regard, CPqD has contributed to Anatel on:
  - Development of technical requirements and test standards to certificate telecommunication products with new technologies.
  - Laboratory infrastructure in the state of the art in terms of technology.

Laboratories for ce[illegible]ests

ISO/IEC 17025

Support for national technology development

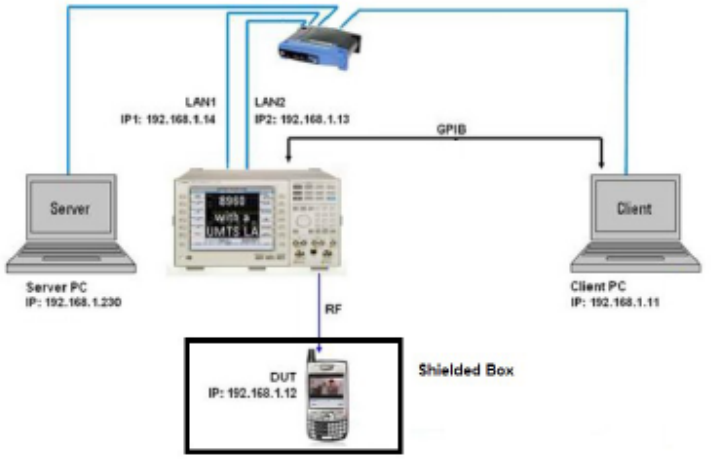
- Reference environment in wireless broadband

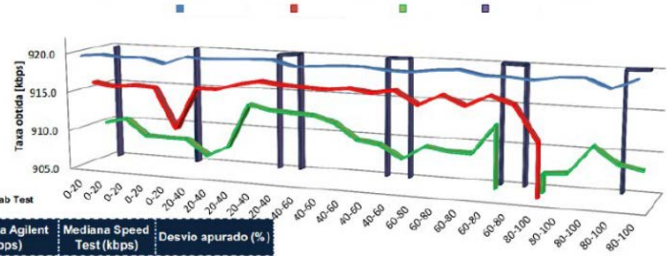
  - Product and network optimization.
  - Applications optimization for lower bandwidth consumption.
  - Adequacy of communication protocols and signaling.
  - Analysis of interference between different communication technologies.
  - PIM and continuous monitoring of the network.

Validation of application used to evaluate quality of mobile broadband

- Evaluate the application capability to properly measure the download rate of the cellular network.
- As exercise tool of smartphone memory and processor, an dedicated application named “Zombie” was developed by CPqD.
- Simulated operator network using the infrastructure of CPqD Lab.
  - Full control over the network, without data traffic competition.
- More than 1000 tests performed.

Ambiente laboratorial elaborado para a realização dos ensaios





Resultados resumidos do Lab Test

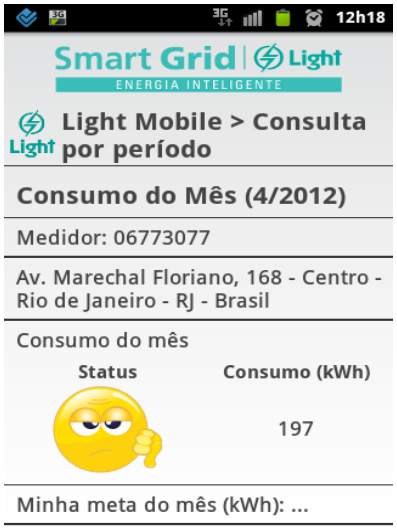
Smartphone	Mediana Agilent (kbps)	Mediana Speed Test (kbps)	Desvio apurado (%)
	959,99	919,83	-4,18%
	948,86	915,83	-3,48%
	944,46	909,91	-3,66%
	958,01	920,01	-4,11%
Média Geral	953,23	916,39	-3,86%

kbps				
Mínimo	918,9	910,4	906,6	919,8
Máximo	920,3	917,1	913,6	920,1

Relação entre mínimo e máximo: 1,49%

Development applications for electricity consumer interactivity

- The purpose of these applications is allow the consumers to monitoring their consumption and help them to planning the expenses.
  - Applications are available on:
    - Smartphone
    - Tablet
    - Web Pages
  - Services available to the consumer:
    - Monitoring consumption goals
    - Monthly consumption history
    - Daily consumption
    - Detailed consumption



Awards

FINEP's 2013 Innovation Award

Best in Brazil

Science and Technology Business

Thank You!

*www.**cpqd**.com.br*