GSMA

Latin
America

MOBILE QUALITY OF SERVICE

A joint effort for continuous improvement

Contents

Facing the digital tsunami

The meteoric growth of mobile services in the world and in Latin America - a region with more than 100% mobile penetration - has put immense pressure on mobile operators, who are working rapidly to respond to the digital tsunami arising as a result of exponential growth in data services.

The quality of all mobile services is a factor that operators in the region are working on in an integrated manner, including evaluations and improvements in areas such as:

- Customer service channels.
- Billing systems.
- Technological services provided over the net, such as voice, data and sms.

All this makes it possible to meet the expectations of increasingly demanding users to achieve a ubiquitous and satisfying communication experience.

MOBILE OPERATORS ARE COMMITTED TO CONTINUOUS IMPROVEMENT OF QUALITY OF SERVICE

Mobile companies are naturally interested in improving the quality of the services they provide, because their survival in the markets where they operate depends on this.

MOBILE TRAFFIC LATIN AMERICA (MONTHLY PETA BYTES)

DATA TRAFFIC IN LATIN AMERICA WILL GROW AT 66% COMPOUNDED ANNUALLY TO 2018

■ voice ☐ data

2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020

SOURCE: ERICSSON MOBILITY REPORT 2014
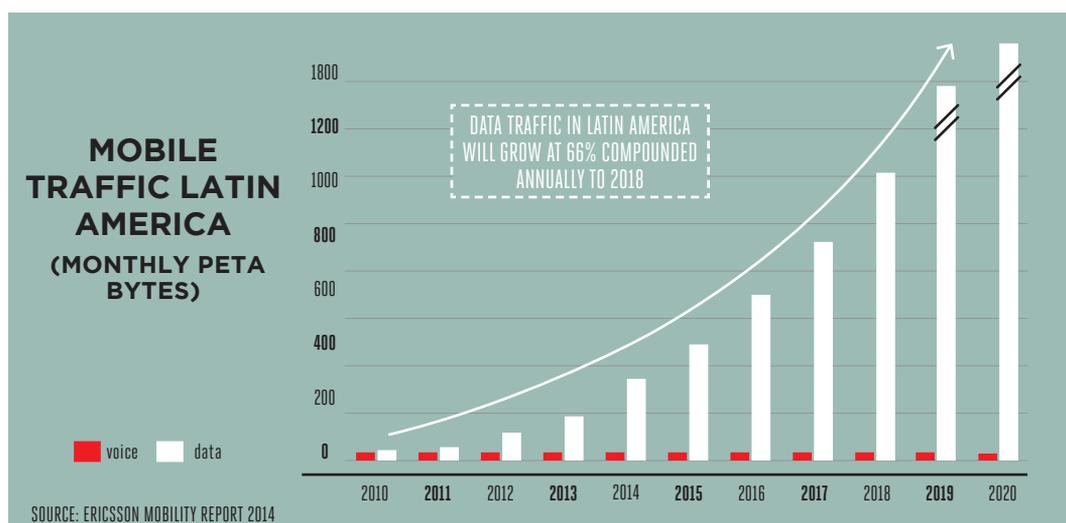
UNIQUE MOBILE SUBSCRIBERS

2013
320M
52%
PENETRATION RATE

2020
390M

59%
PENETRATION RATE

CONNECTIONS*

2013
694M
112%
PENETRATION RATE

2020
890M

134%
PENETRATION RATE

SOURCE: GSMA. THE MOBILE ECONOMY LATIN AMERICA 2014

TRAFFIC EQUIVALENCES

NEW DEVICES DEMAND MORE NETWORK RESOURCES

SMARTPHONE
x35
BASIC MOBILE PHONES

TABLET
x120
BASIC MOBILE PHONES

LAPTOP
x500
BASIC MOBILE PHONES

PORTABLE CONSOLE*
x60
BASIC MOBILE PHONES

*Comprises portable consoles with Wi-Fi and/or 3G connection
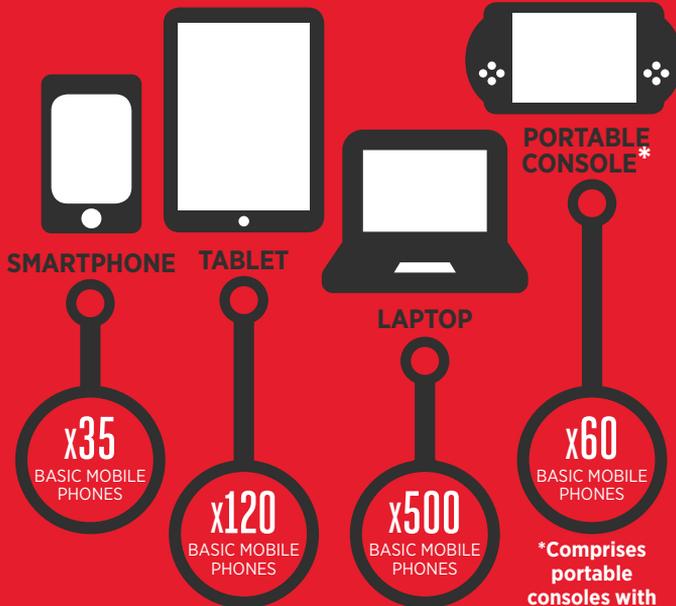
SOURCE: CISCO, OVUM, TRIMESTER REPORTS NINTENDO AND SONY

SMARTPHONE CONNECTIONS

2013
154M

2020
605M

SOURCE: GSMA. THE MOBILE ECONOMY LATIN AMERICA 2014

Mobile services have experienced unprecedented diversification compared to other industries

MOBILE DEVICES HAVE UNIVERSALISED ACCESS TO VOICE SERVICES AND ARE NOW DOING THE SAME WITH THE INTERNET.

Continuous network improvement has entailed very high levels of investment for the region over the years (US$144B) and the estimated projection for the 2014-2020 period is even higher (US$193B).

Launches of new products and services follow on from changes in technology and increased network capacity.

The exponential growth of smartphone penetration makes the mobile phone the main factor in democratising and universalising access to internet services.

MOBILE CONNECTIONS LATIN AMERICA, BY DEVICE
(IN MILLIONS)

MILLIONS OF SUBSCRIBERS

Legend: ☐ MOBILE PC / ROUTER/ TABLET ■ SMARTPHONE ▨ BASIC PHONE

THE SUBSCRIBER GROWTH RATE CONTINUES TO RISE AND SMARTPHONES TEND TO BE THE MAIN DEVICE FOR ACCESSING MOBILE INTERNET.

Y-axis: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900

X-axis: 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
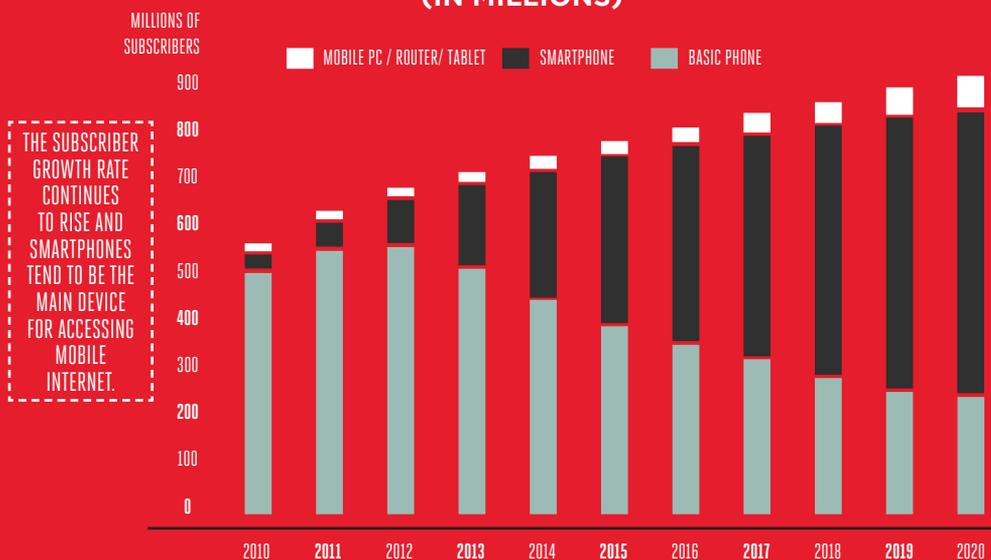
INVESTMENT GROWTH, SERVICES AND CONNECTIONS IN LATIN AMERICA

INVESTMENTS
(CAPEX)
(BILLIONS OF US$)

30

25

20

15

10

5

0

US$ 193 B (E)

US$ 144 B

(ESTIMATED CAPEX)

2G
VOICE, SMS

3G
DATA, CHAT, VIDEO CONFERENCING,
INTERNET, TELEMEDICINE, E-LEARNING,
MOBILE MONEY, IDENTITY, SMART CITIES

4G
INTERNET OF THINGS, AUGMENTED
REALITY, SMART-LIFE, MOBILE
SECURITY, HEALTH, ENERGY,
PERSONAL DATA

5G
DRIVERLESS CARS
INTELLIGENT
TRANSPORTATION
REMOTE SURGERY

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CONNECTIONS	130 M					300 M							600 M		700 M						890 M
PENETRATION	34%					61%							96%		108%						134%

SOURCE: GSMA INTELLIGENCE

Factors affecting mobile network performance

One of the largest investments made by mobile network operators is in infrastructure, such as the installation of base stations to provide coverage and delivery capacity.

But quality of service does not depend solely on the number of antennas installed. Unlike fixed networks, several factors impact network performance.

QUALITY FROM THE ANTENNA TO THE TERMINAL ALSO DEPENDS ON FACTORS BEYOND PLANNING AND BUILDING THE NETWORK.

FACTORS AFFECTING QUALITY

THE NUMBER OF USERS VARIES FROM CELL TO CELL

PEOPLE MOVE ABOUT, TRAFFIC VARIES, ACCIDENTS HAPPEN, CONGESTION OCCURS, PROTESTS TAKE PLACE, GROUPS GATHER, EVENTS ARE HELD, ETC.

IN A SINGLE CELL THE NUMBER OF USERS VARIES DEPENDING ON THE TIME AND THE DAY

THE CONSUMPTION PATTERN IN EACH CELL VARIES SIGNIFICANTLY THROUGHOUT THE DAY

WEATHER, ESPECIALLY RAIN

OBSTACLES BETWEEN TERMINALS AND ANTENNA, WHETHER FIXED (BUILDINGS) OR MOVING (VEHICLES)

THE DISTANCE BETWEEN THE TERMINAL AND THE ANTENNA VARIES WHEN USERS ARE IN MOTION

INDISCRIMINATE USE OF JAMMERS AND AMPLIFIERS

Competition and transparency as a source of quality improvement

The HHI index (Herfindahl-Hirschman Index), which measures market concentration, has declined in the region in recent years, indicating an increase in competition.

The implementation of number portability in many markets has facilitated user migration from one operator to another. This makes it essential for mobile companies to invest in the quality of their services to keep customers satisfied and sustain growth.

Competition can be made more efficient by providing information so users can make the best decisions in each case, and public policy can help by promoting transparency. This is achieved by:

• Reducing information asymmetries between

ENHANCING COMPETITION AMONG OPERATORS PROMOTES SUSTAINED IMPROVEMENT IN QUALITY.

users and service providers.

• Generating a peer pressure mechanism among operators so that the quality differentiation promotes sustained investments in continuous improvements.

DECLINE IN MARKET CONCENTRATION IN LATIN AMERICA

2010   2014

N   NUMBER OF OPERATORS

HHI

HHI - HERFINDAHL-HIRSCHMAN INDEX: MEASURES LACK OF COMPETITION IN A MARKET. THE LOWER THE VALUE, THE GREATER THE COMPETITION.

12000
6000
4000
2000
0

SOURCE: GSMA INTELLIGENCE

ARG | BOL | BRA | CHI | COL | COS | ECU | ELS | GUA | HON | MEX | NIC | PAN | PAR | PER | URU | VEN

Public policies on quality should not disregard inclusion or affect access

Regulations that affect the prices of goods and services are regressive public policies, as they affect the ability to offer a wider range of services to meet various demands and do not allow improvements in the quality of life of the less fortunate.

Fee-based quality requirements benefit those who already have access, at the expense of delaying the entrance of those with no access or simply locking them out.

Poor regulation can trap regulators, businesses and consumers in a scenario where competition and market mechanisms are increasingly reduced. A lack of access to a good or service is the worst quality a good or service can have.

REGULATIONS THAT AFFECT PRICES REDUCE ACCESS TO SERVICES FOR THE LOWEST INCOME SECTORS OF THE POPULATION.

RELATION BETWEEN QUALITY OF SERVICE (QOS) REGULATION AND NUMBER OF USERS

PRICE ($)
(ABILITY TO PAY)

MORE REGULATION = GREATER ACCESS GAP

COST WITH QUALITY OF SERVICE

COST

COST INCREASE

DEMAND (USERS)

ACCESS WITHOUT QOS

ACCESS WITH QOS

INCREASE IN ACCESS GAP
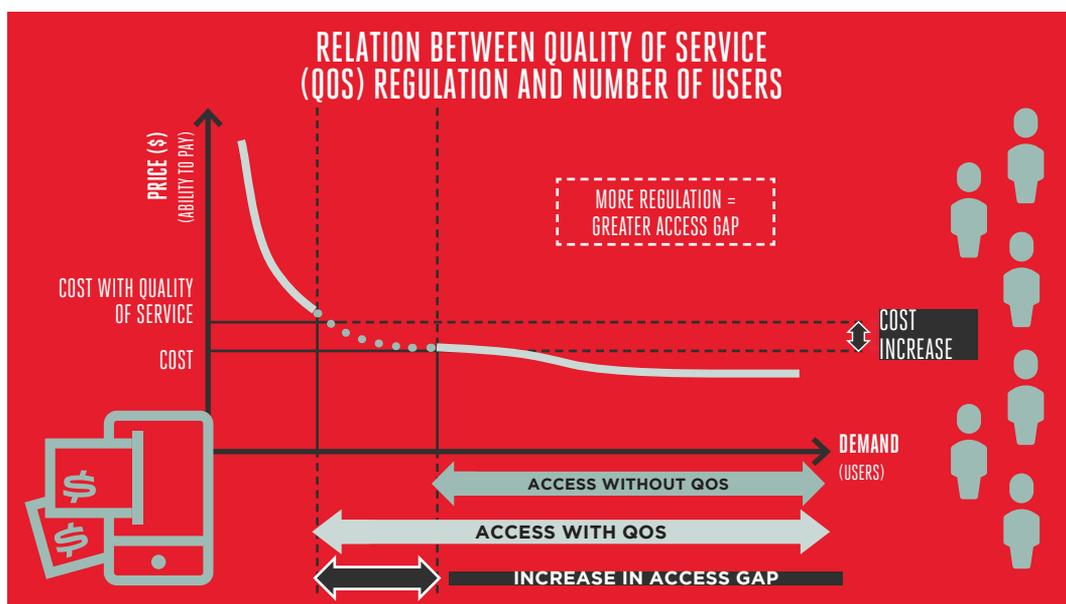
The importance of measuring quality objectively

Technical measurements of network quality performed by regulators are very important for promoting competition.

The key aspects to effectively and objectively measure quality are:

- Consider a combination of statistical measures generated by the operator and third party testing.
- Use automated methods for drive tests, with no manual intervention.
- Perform tests on an end-to-end basis on a single network.
- Apply a significant call sample size to ensure test results are representative of the network situation within the area of service.
- Use sufficient testing times of at least 24 hours.

Tests conducted from user terminals, through various applications, provide one-sided information that depends on factors outside the network:

- Number of users
- Average speed measurement methodology
- Sample update
- User location
- Quality of the measurement reporting device and its use profile

Applications used as measurement tools could be a reference, but under no circumstances should they be the only way to measure quality. By no means can they be used as a basis for subsequent sanctions for failing to reach certain levels.

OBJECTIVE MEASURES OF QUALITY OF SERVICE FACILITATE PROGRESS TOWARDS IMPROVED SERVICES AND AVOID DISPUTES IN SITUATIONS OPEN TO MORE THAN ONE INTERPRETATION.

A joint effort on a case by case basis is the key to solving quality problems

The results of objective measurements should be used effectively to discuss with operators the problems encountered and the best solutions available to design improvement plans.

Problems are often zone-specific (installation permits not granted, interference, insufficient spectrum, plans in progress, etc.) and therefore the solutions are holistic and situation-specific.

Allowing a reasonable timeframe before publicly announcing the results of any new measurement lets mobile service providers:

- Check the accuracy of the measurements.
- Work on any network problems they may be unaware of to improve the indicators.
- Explain the findings and

SOLUTIONS TO IMPROVE QUALITY OF SERVICE ARE SPECIFIC TO EACH CASE AND REQUIRE PARTICULAR MEASURES BY OPERATORS AND REGULATORS

the consequent steps to deal with them.

OBJECTIVE MEASUREMENTS → **WORK ON PROBLEMS DETECTED** (VERIFY ACCURACY OF FINDINGS) → **IMPROVE ESTABLISHED INDICATORS** → **PUBLISH RESULTS**
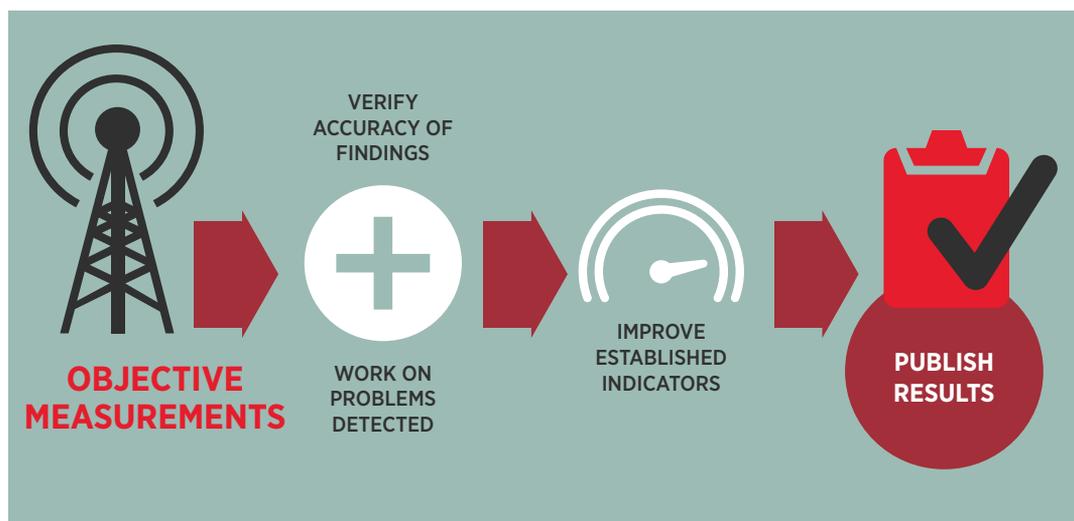
# MOBILE NETWORKS DO NOT HAVE DEDICATED ACCESS SEGMENTS

A DEDICATED RESOURCE IS, BY DEFINITION, ONE THAT IS AVAILABLE TO USERS 100% OF THE TIME

MOBILE NETWORKS CANNOT BE MEASURED IN THE SAME WAY AS FIXED NETWORKS

MOBILE ACCESS NETWORKS ARE BUILT ENTIRELY OF SEGMENTS THAT SHARE RESOURCES AMONG SEVERAL USERS

THE FIRST SEGMENT OF THE CONNECTION, FROM THE TERMINAL TO THE ANTENNA, IS AVAILABLE TO EVERYONE WHO DEMANDS IT, PROVIDED SPECTRUM CAPACITY EXISTS.

THE ANTENNA HAS FINITE CAPACITY THAT DEPENDS ON NETWORK PLANNING AND DESIGN, TECHNICAL CAPABILITIES OF THE EQUIPMENT, THE AMOUNT OF SPECTRUM AND THE FREQUENCY BAND IT USES.

MOBILE INTERNET

FIXED INTERNET

DEDICATED RESOURCE

SWITCHING

SWITCHING

TRANSIT

TRANSIT

GATEWAY

GATEWAY

GATEWAY

GATEWAY

CONTENT PROVIDER

CONTENT PROVIDER

ACCESS NETWORK

INTERNET ACCESS PROVIDER

PUBLIC INTERNET NETWORK

PAST THIS POINT IS BEYOND THE OPERATOR'S CONTROL
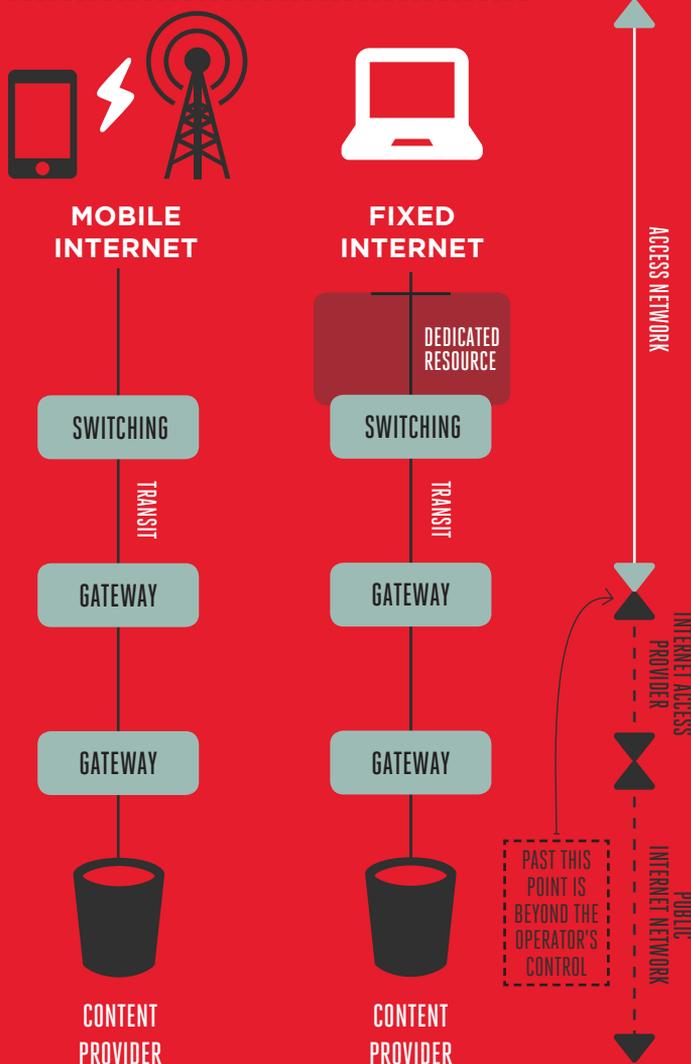
Sanctions do not necessarily contribute to continuous improvement

Regulatory actions designed to improve quality of service in mobile communications must focus on being efficient and promoting the right incentives for mobile operators to adequately sustain and direct their investments.

An exclusively sanctions-oriented approach could have unwanted consequences such as disincentivising innovation, distorting the market, reducing products and lowering efficiency and competition. It could also lead to the delivery of a homogenous product incapable of meeting the needs of the most diverse groups of users.

Automatic compensation approaches deserve special mention, as they are a burden for companies and the financial pressure they entail prevents allocation of resources to improve the various elements in the service supply chain.

IT IS ESSENTIAL TO MOVE FORWARD WITH COOPERATIVE MONITORING SCHEMES THAT ALLOW RESOURCES TO BE ALLOCATED TO SOLVE THE PROBLEMS IDENTIFIED.

% ANNUAL

EXAMPLE OF PERU: NUMBER OF LINES IN SERVICE GROWS WHEN SANCTIONS ARE REMOVED

ANNUAL % VAR. IN MOBILE LINES IN SERVICE

REMOVAL OF SANCTIONS REGIME

REINSTATEMENT OF SANCTIONS REGIME

SOURCE: OSIPTEL

180.0 160.0 140.0 120.0 100.0 80.0 60.0 40.0 20.0 0.0 -20

1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
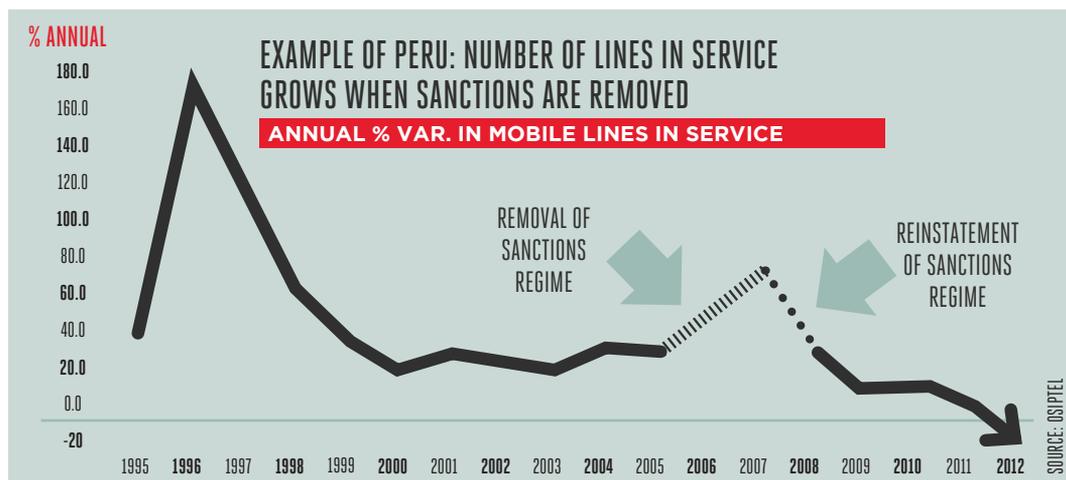
DIFFERENT APPROACHES TO QUALITY OF SERVICE REGULATION

REGULATION ORIENTED MODEL

→ SELF REGULATED
AUSTRALIA

→ REGULATED

COMPLIANCE THRESHOLD REQUIREMENT
(AMONG INDICATORS COMMON TO MOST COUNTRIES)

INFORMATIVE

SPECIFICITY
(ZONE, TECHNOLOGY, USER, NETWORK ELEMENT OR MANUFACTURER)
New telecommunications regulations or laws at discussion stage

CLIENT ORIENTED MODEL

→ UNITED STATES

CANADA

UNITED KINGDOM
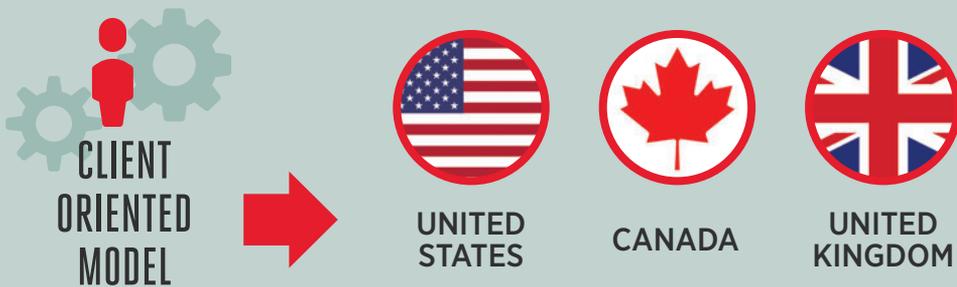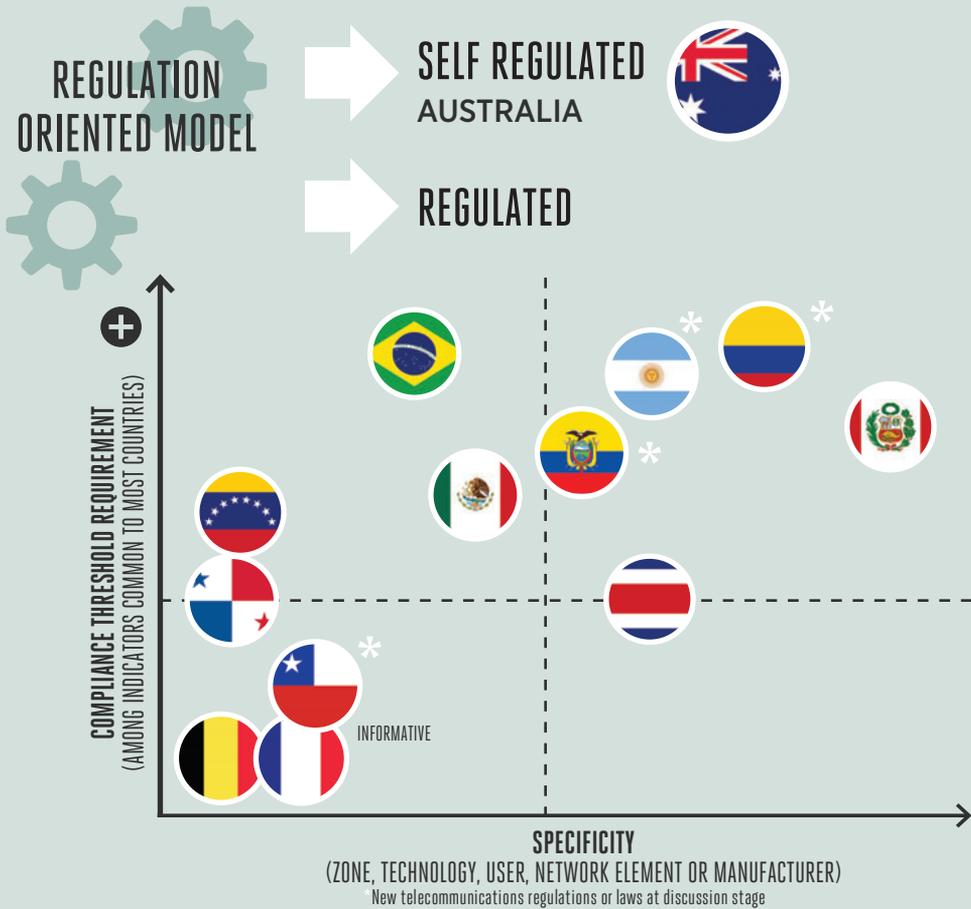
Having sufficient spectrum is essential for providing quality services

The amount of spectrum allocated to each operator largely determines its capacity to provide a faster data transfer speed, better levels of coverage, improved call quality and a lower dropped-call rate, among other variables.

ITU estimates concur with GSMA studies indicating that 1600-1800 MHz will be required by 2020. As 1GHz has already been identified for IMT/mobile broadband, GSMA recommends, as an average, that WRC-15 should attempt to obtain an additional 600-800 MHz worldwide.

The amount needed in each national market will vary depending on the level of demand for data and the priorities of each country.

IT IS ESSENTIAL FOR OPERATORS TO HAVE SUFFICIENT SPECTRUM AND PROSPECTS FOR FUTURE ALLOCATION THAT WILL ALLOW THEM TO FORECAST THE INVESTMENTS REQUIRED.

	CURRENT SPECTRUM	MINIMUM AND MAXIMUM ESTIMATED FOR 2020	
		—	+
ARGENTINA	350 MHz	1,093 MHz	1,628 MHz
BRAZIL	634 MHz	1,129 MHz	1,676 MHz
CHILE	450 MHz	893 MHz	1,327 MHz
COLOMBIA	415 MHz	1,057 MHz	1,578 MHz
MEXICO	210 MHz	977 MHz	1,454 MHz

THERE IS A GAP BETWEEN THE CURRENT LICENSED SPECTRUM FOR MOBILE SERVICES AND ESTIMATED NEEDS FOR 2020

SOURCE: ITU-R REPORT M2290

SOURCE: GSMA

Encouraging infrastructure deployment directly impacts quality

The most densely populated areas require more network resources. However, it is precisely in these areas where it is more difficult to install new antennas, masts, base stations or any other network infrastructure component. At the same time, sharing resources in remote areas is critical. Three key public policy elements to encourage network improvement are:

REMOVAL OF MUNICIPAL BARRIERS: Obtaining installation permits can be complicated and discretionary. It is important to have a single, nation-wide process based on technical considerations and international standards to avoid delays.

USE OF PUBLIC BUILDINGS AND SPACES: Regulators can help by facilitating permits to install base stations in public buildings, banks, police stations, parks and other public areas to provide alternatives for network deployment.

INFRASTRUCTURE SHARING: Voluntary infrastructure sharing agreements give mobile operators joint use of masts, buildings and

INSTALLATION OF ANTENNAS REQUIRES REMOVAL OF MUNICIPAL BARRIERS, PROMOTION OF SHARING AND MANAGEMENT OF THE USE OF PUBLIC SPACES.

even antennas, avoiding unnecessary duplication of resources, especially in less profitable areas.

BARRIERS TO DEPLOYMENT AFFECT COVERAGE
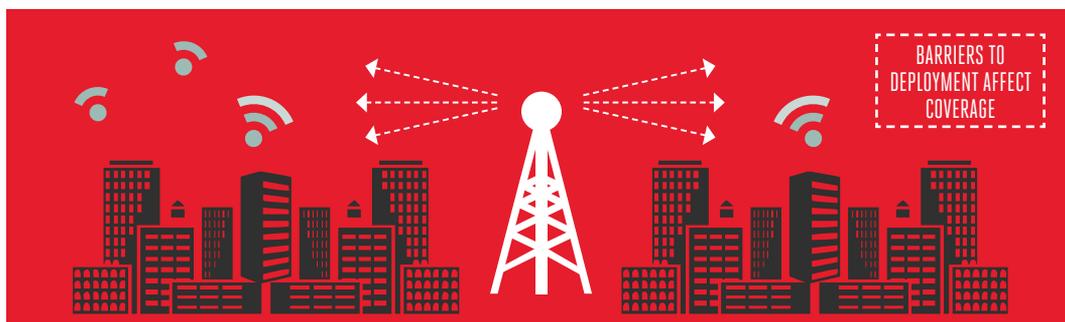
Facilitating installation permits is essential

A key aspect of providing certainty to operators lies in the processes in place for granting permits to install base stations and antennas.

When the criteria are consistent across the country and are based on technical considerations, operators can more accurately assess the implications and the terms of investments and allocation of resources.

As a result, this would encourage continued investment in infrastructure deployment, such as the infrastructure needed to install 4G networks to improve customer experience when users migrate from current 3G and 2G networks to the new network.

Governments that enable investments in mobile networks and remove obstacles to network

UNIFYING CRITERIA NATIONWIDE CREATES VERY POSITIVE CERTAINTIES THAT PROMOTE CONTINUED INVESTMENTS.

infrastructure deployment accelerate the provision of mobile services to the public.

MORE ANTENNAS MEANS A HIGHER SIGNAL LEVEL AND LONGER DURATION FOR MOBILE DEVICE BATTERIES

ENCOURAGING NETWORK
DEPLOYMENT DIRECTLY IMPACTS QUALITY

Myths about the effects of antennas on health must be dispelled

Misinformation has led to myths and unfounded fears among the public about living near mobile antennas.

Authorities and operators can work together by providing valid and reliable information to educate the public and raise awareness about the safety of electromagnetic emissions from base stations.

According to the World Health Organization, it has not been confirmed that the use of mobile phones has adverse effects on health.

A lack of knowledge makes people target antennas as one of the elements that radiate most electromagnetic energy, when in fact we are exposed every day to much more powerful devices, such as microwave ovens and TV and radio antennas.

EDUCATION IS THE MOST EFFICIENT TOOL IN ACHIEVING THE ACCEPTANCE AND UNDERSTANDING OF SOCIETY WHEN DEPLOYING INFRASTRUCTURE.

ANTENNAS ARE THE OBJECTS THAT PRODUCE ELECTROMAGNETIC RADIATION

THE STRUCTURES (TOWERS) HOUSING THE ANTENNAS DO NOT PRODUCE ELECTROMAGNETIC RADIATION

SOCIAL EDUCATION INITIATIVES

DISTRIBUTION OF INFORMATION LEAFLETS

AWARENESS CAMPAIGNS IN THE MASS MEDIA

TALKS BY EXPERTS AT SCHOOLS AND COMMUNITY CENTRES

Conclusions

QUALITY OF SERVICE IS ALWAYS A PRIORITY FOR OPERATORS.

Quality of service is a factor of competition in the mobile market. Because of this, operators continuously strive to improve quality and adapt it to their business strategy.

Competitive markets with low regulation have more capacity to provide the quality of service customers expect.

Various aspects that affect user experience are beyond the control of operators (internet servers, content providers, type of device and propagation environment).

It is important to promote transparency in quality of service to facilitate user decision making.

It is essential to work together before publishing results to solve quality problems effectively.

In many cases, implementation of tools for measuring quality appears to ignore essential aspects of the service (such as resource sharing, or when the cause of the failure is in a portion of the network not controlled by the operator).

With limited spectrum and municipal restrictions on antenna deployment, sanctions will not be effective in increasing quality of service.

The regulatory framework of a country must facilitate all types of agreements for active and passive infrastructure sharing and allow the use of public spaces and buildings.

The regulator in each country must assess the compliance of jammers and signal inhibitors, manage and monitor the installation of these devices and establish penalties for people who use and/or sell them without the permission of the competent authorities.

Solutions to improve quality of service are specific to each case and require particular measures by operators and regulators.

Other studies published

eWaste in Colombia 2015
February 2015,
GSMA Latin America

The Mobile Economy Latin America 2014
November 2014,
GSMA Intelligence

AWS Situation in the Americas
May 2014,
Convergencia Research

eWaste in Latin America 2014
May 2014,
GSMA Latin America

License renewal in Latin America
February 2014,
BlueNote Management Consulting

Mobile Broadband at the Bottom of the Pyramid in Latin America
July 2014,
Telecom Advisory Services

International Roaming Development in Latin America
July 2013,
BlueNote Management Consulting

WE CARE

Working together to provide a safer and more reliable mobile experience

The 'We Care' programme is a regional campaign in which operators in each country carry out various initiatives to provide users with a more reliable and safer mobile environment. Through a variety of actions, operators cooperate with government and regulatory authorities, civil associations and non-profit organisations to address social problems by leveraging the ubiquity of mobile technology.

For more information visit www.gsmala.com/wecare

Latin
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ABOUT THE GSMA

The **GSMA** represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organisations in adjacent industry sectors. The **GSMA** also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

For more information, please visit the **GSMA** corporate website at www.gsma.com.
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