Ibis Instruments
Measurement & Telecommunication Systems

Quality of service and trends in fixed and mobile networks

Ibis Instruments intro

Leading **OSS-BSS integrator**
Big Data & Analytics innovative
and **Measurement** company

founded	HQ	presence
1996	**Belgrade**	**SEE**

70+ Employees

Key facts

- Market proven solutions
- Skilled team
- Financial stability
- ITIL certified
- ISO 9001 & 27000

IBM Platinum Business Partner™
ClickSoftware Making Service Click
Microsoft
Check Point Software Technologies Ltd
VIAVI
Keysight Technologies
ATDI
alladin
Microsemi
narda Safety Test Solutions
Fujikura
TEOCO

In search of QoS best practices…

- Growth in telecommunication technologies and markets has increased the variety of services and providers available to consumers
- Competition has brought lower prices for advanced services
- Price is no longer the sole factor in purchasing decisions; quality is the key

NRA's worldwide are requiring telecommunication operators to measure QoS for separate services:

- Fixed line telephony
- Universal service
- Mobile telephony
- Internet

	United Kingdom	France	Germany	Austria	Italy	Netherlands	Belgium	Denmark	Portugal	Finland	Latvia	Czech Republic	Slovakia	Romania	Switzerland	Turkey	United States	Canada	India	Singapore
Types of services under QoS regulation																				
Universal service	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔			✔	✔
Fixed-line telephony		✔	✔		✔		✔				✔	✔		✔		✔	✔	✔	✔	✔
Mobile telephony					✔		✔				✔	✔				✔			✔	✔
Internet					✔		✔				✔			✔					✔	✔
Parties measuring QoS																				
Operators	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Regulatory agencies		✔									✔									
Third party	✔				✔											✔				
Frequency of publication of QoS data																				
Quarterly reports		✔				✔			✔	✔				✔		✔		✔	✔	✔
Half-year reports	✔				✔		✔						✔							
Annual reports		✔	✔	✔	✔			✔			✔	✔			✔		✔			

Ibis Instruments
Measurement & Telecommunication Systems

Ibis Instruments
Measurement & Telecommunication Systems

Why Agencies do this measurements?

- To encourage competition between operators
- To provide customers totally independent results about QoS, which is in accordance with ITU QoS regulation requirements
- To fulfill law and rules requirements assigned to the Agency

Ibis Instruments
Measurement & Telecommunication Systems

Factors affecting mobile network performance

One of the largest investments made by mobile network operators is in infrastructure, such as 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.

Factors affecting quality

- The number of users varies from cell to cell

- People move about, traffic varies, accidents happen, congestion occurs, 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 through the day

- Weather, especially rain

- Obstacles between terminals and antenna, whether fixed (buildings) or moving (vechiles)

- The distance between the terminal and the antenna varies when users are in motion

The importance of measuring quality objectively

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 that test results are representative of the network situation within the area of service
- Use suffcient testing times of at least 24 hours

Competition and transparency as a source of quality improvement

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 users and service providers.
- Generating a peer pressure mechanism among operators so that the quality differentiation promotes sustained investments in continuous improvements

Ibis Instruments
Measurement & Telecommunication Systems

Encouraging infrastructure deployment directly impacts quality

- The most densely populated areas require more network resources.
- More antennas means a higher signal level and longer duration for mobile device batteries
- Macro stations are proposed to be used for fast traffic, low power micro cell for a slow traffic / pedestrian and pico cell / femto cell for indoor use.

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, TVs and radio antennas.

Antennas are the objects that produce electromagnetic radiation

The structures (towers) housing the antennas do not produce electromagnetic radiation

Quality of service of internet service provider networks: State of the art and new trends

These ten last years, the emergences of new applications through Internet such as multimedia applications (VoIP, video broadcasting ...) or networked control application, users need more and more quality of service (QoS) when using Internet. However, the requested QoS is not the same, it depends from application to application. Some of them request a lot of bandwidth like video broadcasting, others need short guaranteed delays. Several new models to manage internet traffic have been proposed.

Ibis Instruments
Measurement & Telecommunication Systems

To ensure that end-users have access to comprehensive, comparable and user-friendly information regarding the Internet access service quality it is necessary to implement and regularly renew a set of legislative regulatory acts and to provide monitoring of the quality of Internet access services regarding the current European Regulatory Framework.

The actual situation regarding the quality of service monitoring solutions in different countries depends on national regulatory initiatives and public awareness. The service monitoring solutions are implemented using different measurement methodologies and tools.

Overview of basic measurement principles

What parameters should be measured, how and where they should be measured – these are essential questions for receiving comparable information on the quality of Internet Access Services. Classification of measurement principles by QoS assessment reference points is possible by the following scenarios:

- *QoS Evaluation of the Internet Service Provider Leg*
- *QoS Evaluation of the Access to National Internet Exchange Point*
- *QoS Evaluation of Access to International IXP*

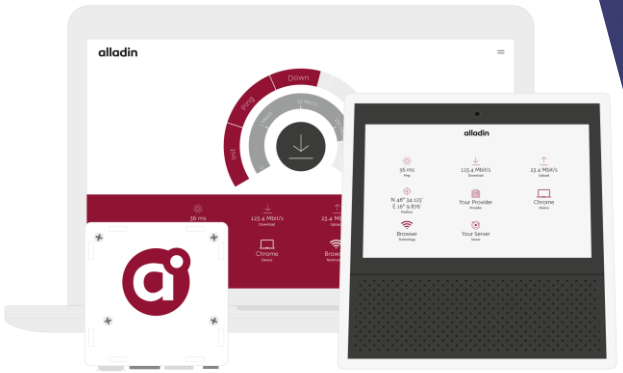
Relevant parameters for internet access QoS assessment

Based on the analysis provided by ECC, it may be concluded that five groups of parameters are relevant for inclusion in the minimum set for the general evaluation of the Internet access services:

- *Transmission Speed*
- *Delay*
- *Delay Variation*
- *Packet Loss Ratio*
- *Packet Error Ratio*

Benefits from the solutions available

- 24/7 evaluation of connection quality, network neutrality, reliability and user satisfaction nationwide and ISP-neutral.
- Determination of the level of compliance with coverage requirements
- Net Neutrality rating of internet services (SPS vs IAS)
- End-user empowerment: provision of knowledge base for informed consumer decisions
- Increased competition and network quality due to greater market and performance transparency.
- Full compliance to BEREC Recommendations



Ibis Instruments
Measurement & Telecommunication Systems

Thank you for your attention!

www.ibis-instruments.com