AGCOM

The «Misura Internet» Project

Italian quality measurement system for fixed broadband Internet access services

Agcom's QoS monitoring system

MisuraInternet project , to measure quality of fixed broadband internet access services (Agcom Deliberation 244/08/CONS)

- Certified measurements aimed at increasing comparability of the main ADSL offers by Italian operators
- Consumer empowerment by making available free and open softwares, such as the software agent «Ne.Me.Sys.» (Network Measurement System) and the MisuraInternet Speed Test
- Dedicated website: https://www.misurainternet.it/ with comparitive statistical values

MisuraInternetMobile.it project , to measure quality of mobile Internet access service (Agcom Deliberation 154/12/CONS)

- Measurement campaigns based on drive tests
- Dedicated website: www.misurainternetmobile.it with measurement campaigns reports

Evolution of MisuraInternet

Agcom Deliberation 131/06/CSP

Challenges: comparability between actual *vs* advertised speeds; information about minimum guaranteed speed; no possibility to withdraw from the contract without penalty

Follow-on ⟶ Technical Board with ISPs

System requirements, measurement points, metrics and methods, update of main IAS offers characteristics and performances

Deliberation 244/08/CSP ⟶ Adoption of the QoS monitoring system
Launch of the measurement tool

www.misurainternet.it

ISP Measurements

Ne.Me.Sys

2014 public consultation
Technical and legal adjustments

Del. 656/14/CONS

MisuraInternet Governance

Steering Committee

AUTORITÀ PER LE GARANZIE NELLE COMUNICAZIONI
AGCOM

FUB Fondazione Ugo Bordoni Ricerca e Innovazione

ISCOM

TECH BOARD

AGCOM deliberation 188/09/CSP established a Steering Committee with coordination, drafting and control responsibilities.The Steering Committee is coordinated by Agcom and plays the role of supervisory body, attended by ISCOM and FUB.

ISCOM is a branch of the Italian Ministry of Economic Development - Communication Department. It has certified Ne.Me.Sys. and is responsible of supervision of the Technical Board activities, and of reporting to the Steering Committee.

FUB is a research foundation and was appointed by Agcom to perform measurements in its capacity of independent measuring organisation. The Steering Committee also defined measurement methods and system requirements which were presented and discussed with the Technical Board.

Stakeholders' participation

In 2009, before the system deployment, ISPs and their representative organisations were given the opportunity to participate in a hearing held, where FUB presented the MisuraInternet project and funding mechanism.

Similarly, in 2011 Agcom's decision regarding quality monitoring of mobile IAS (decision n. 154/12/CONS) was subject to a public consultation.
On top of that, Agcom conducted a study on Data Quality Services on Mobile Networks and outcomes relied also on formal and informal interaction with stakeholders.

Involvement of research institutions was critical for development and roll out MisuraInternetMobile. The project is based on preliminary studies carried out with FUB, and published on Agcom's website:
1) International benchmarking and analysis of the European framework;
2) Metrics and methods;
3) Guidelines for quality monitoring system on mobile networks.

- **Metrics for quality measurements and different system methodologies;**
- **Statistical analysis for mobile QoS;**
- **Software analysis for mobile QoS assessment;**
- **Guidance for quality monitoring system.**

MisuraInternet Description

- **ISP Measurements** based on dedicated “probes” located in the main urban areas of the Country, in order to measure the performance of main IAS offers for each ISP.
- **End-user measurements** allow users to measure their own fixed line performances through a software called Ne.Me.Sys.

Both measurement methods employ the same Network Measurement System, based on a software agent running on a standard Personal Computer.

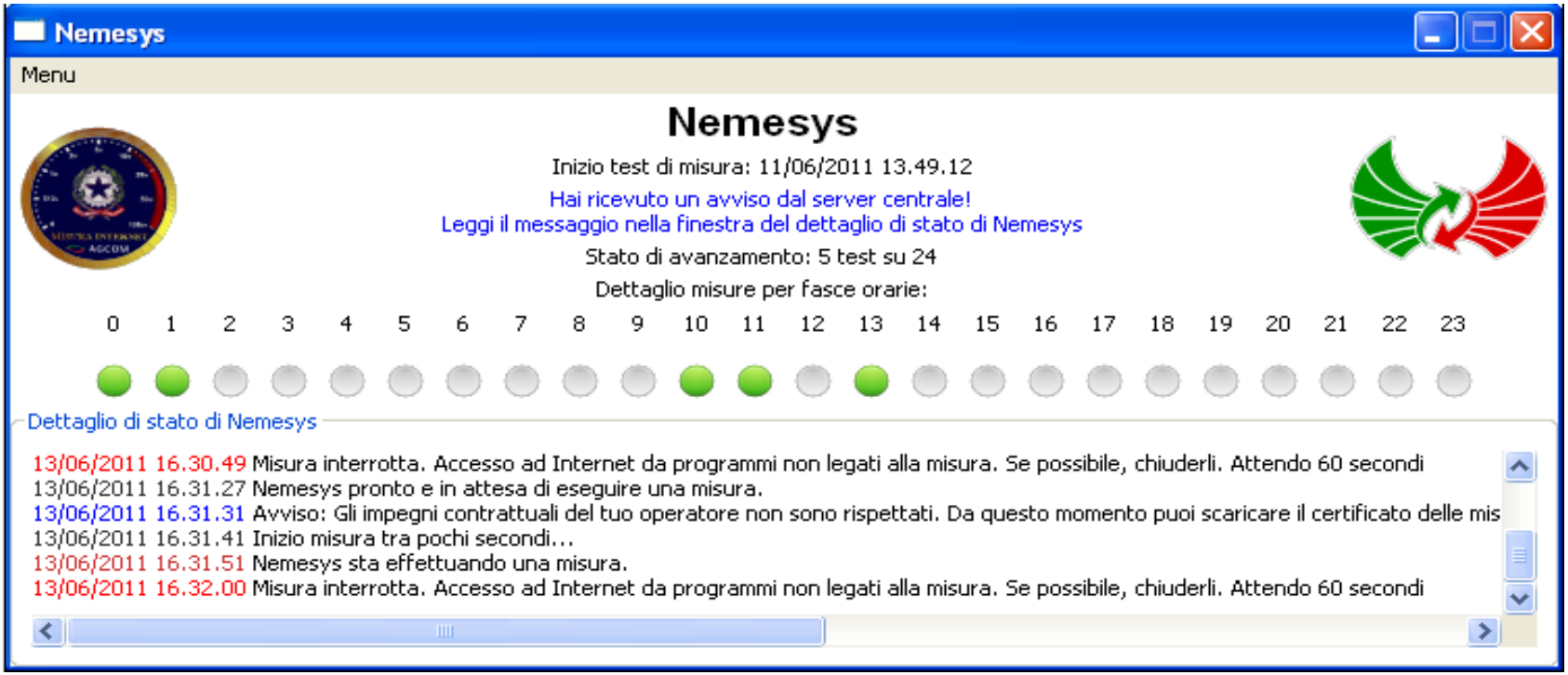
MisuraInternet
QoS parameters

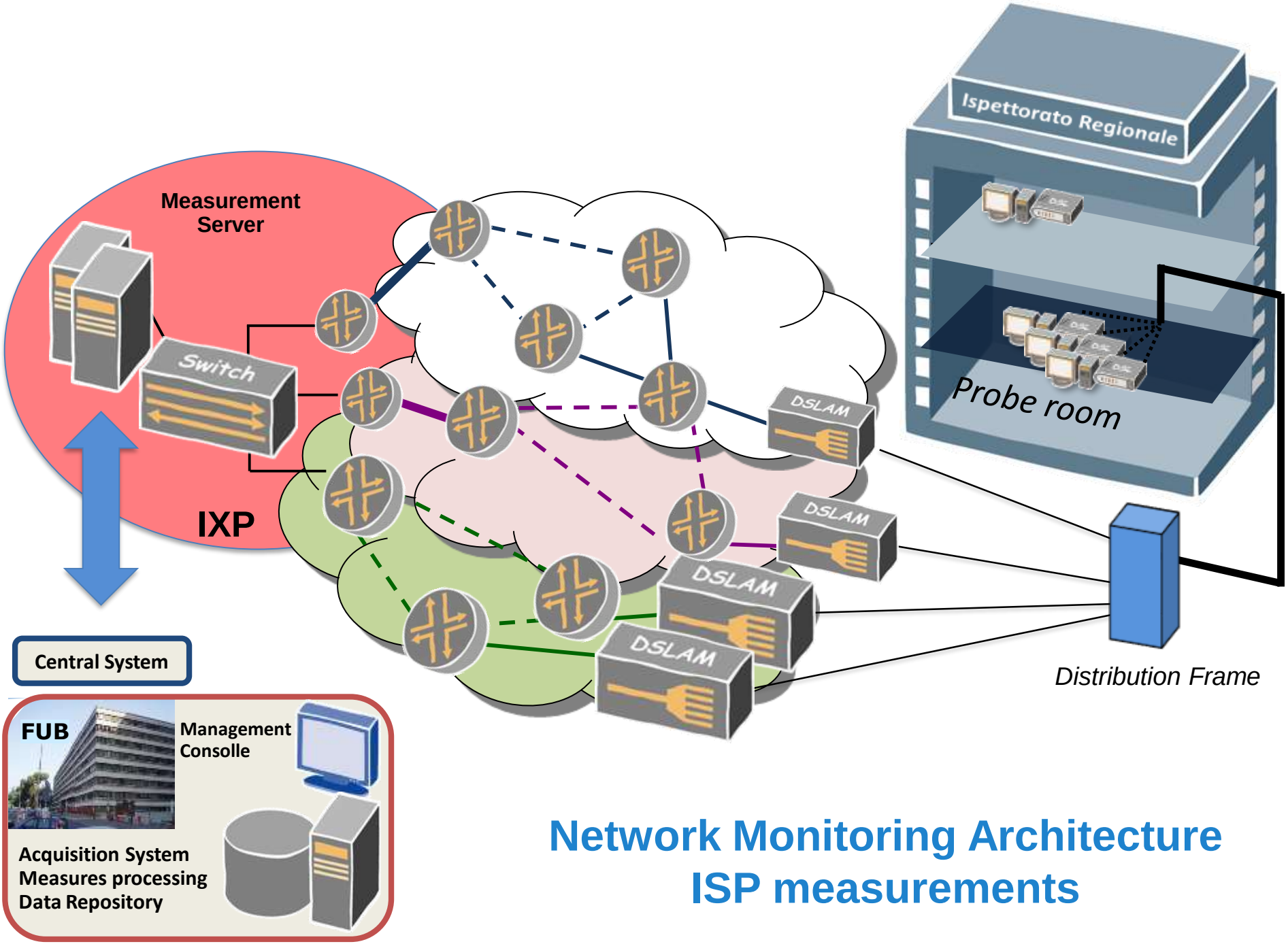
AGCOM selected the following QoS parameters to measure internet access performances, as defined by ETSI Guide EG 202 057 057-4

- **Data transmission speed**
  - Data transmission rate achieved separately for downloading and uploading; specified test files between a remote server and a user's computer
- **Packet Delay (one way transmission time)**
  - half the time in milliseconds, needed for an ICMP Echo Request/ReplyPacket (Ping Command) to a valid IP address
- **Packet loss ratio**
  - the ratio between the number of not replied Ping commands to the total number of sent Ping commands
- **Unsuccessful data transmission ratio**
  - the ratio of unsuccessful data transmissions to the total number of data transmission attempts in a specified time period

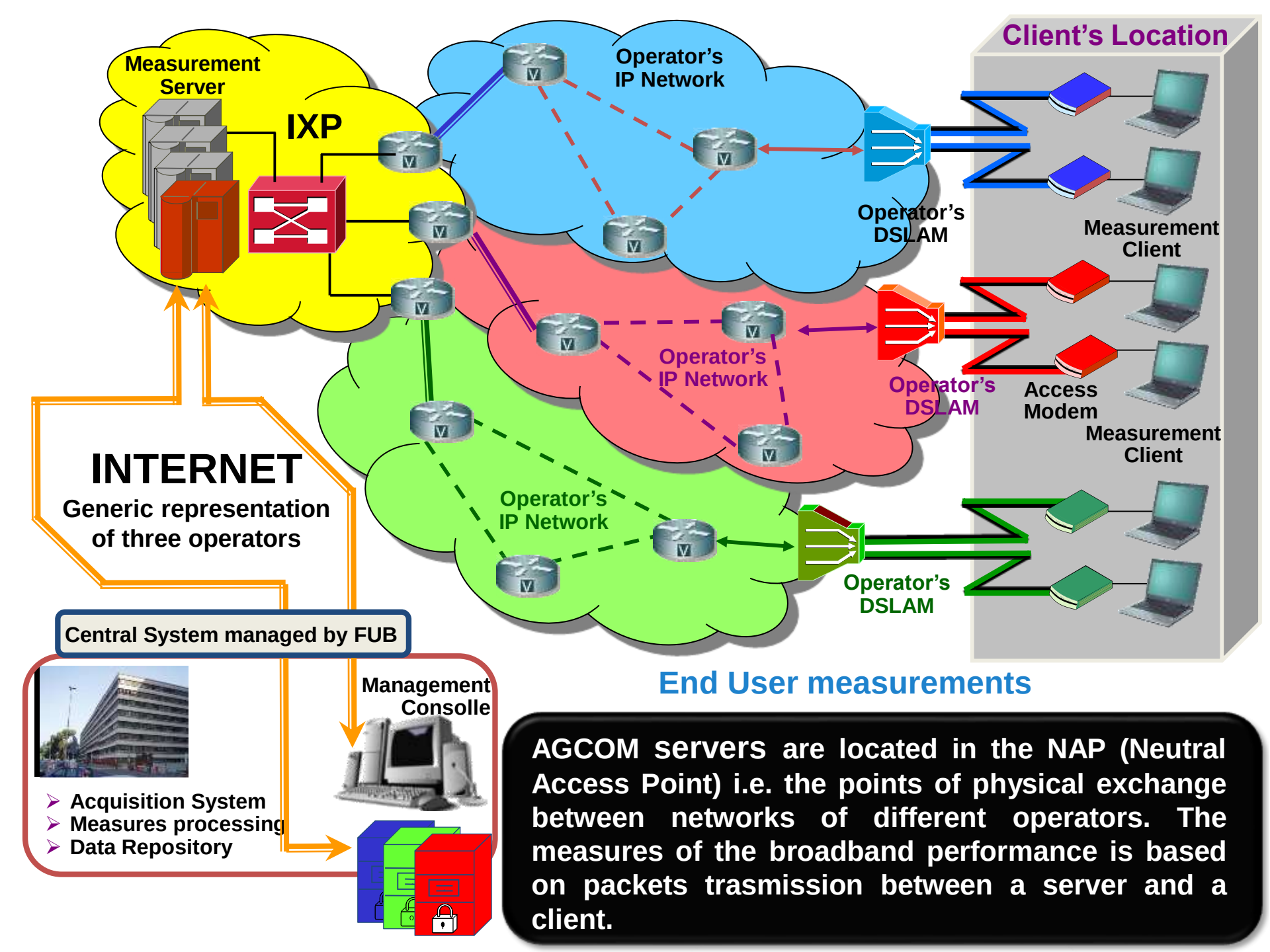
Network Measurement System

- Ne.Me.Sys. is a software agent (developed in Python) running on PCs
- It is able to run with all operative systems
- It runs some preliminary checks that allow or not consumers to execute measures:
  - The impact on speed of PC set-up (customer equipment)
  - The impact of having more than one computer using a broadband connection
  - Wi-Fi working connection
  - CPU busy, RAM busy, Other processes already running
  - Bandwidth hungry applications running (i.e.p2p software etc)





Network Monitoring Architecture
ISP measurements



End User measurements

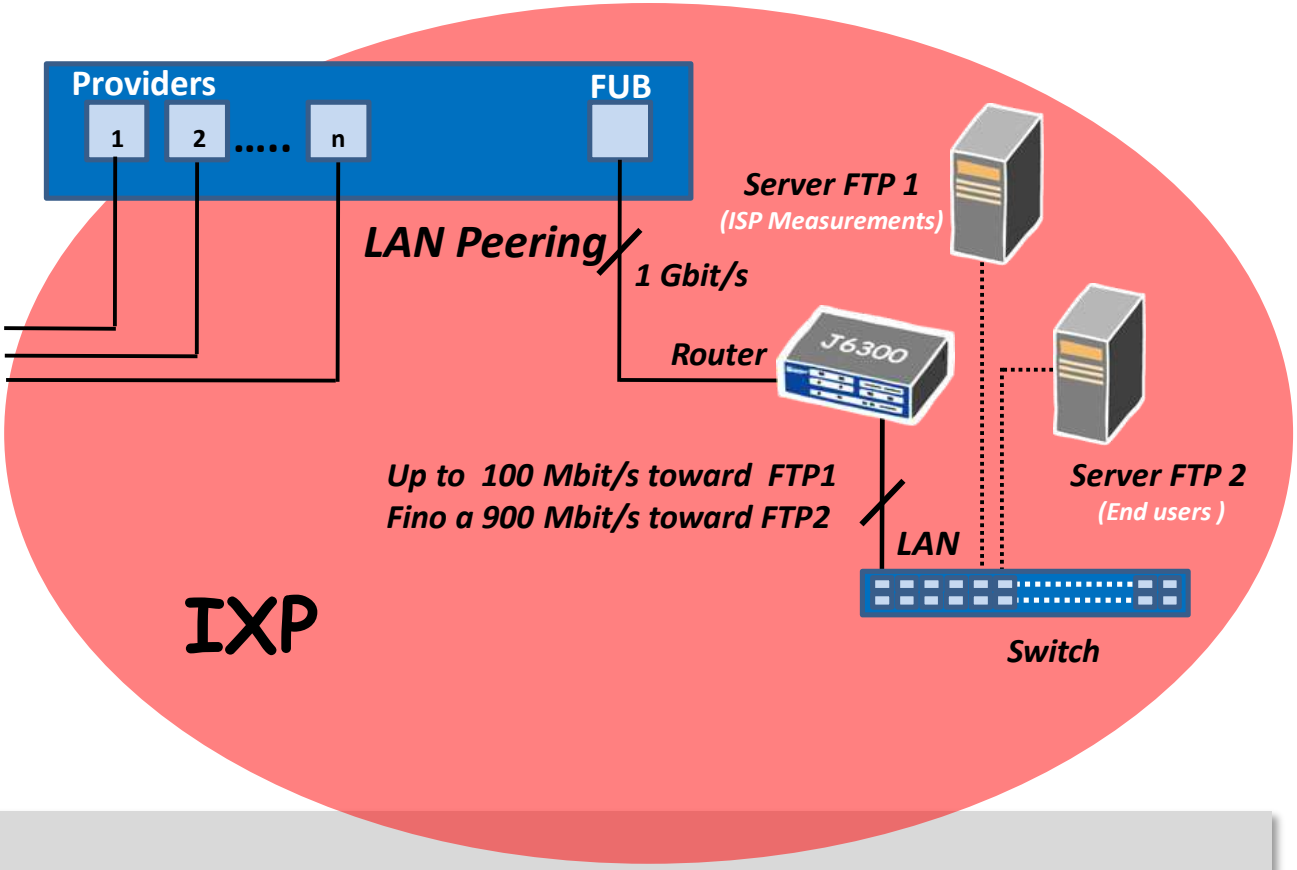
AGCOM servers are located in the NAP (Neutral Access Point) i.e. the points of physical exchange between networks of different operators. The measures of the broadband performance is based on packets trasmission between a server and a client.

IXP (Internet eXchange Point) Milan (MiX) architecture

One or more network switch, connecting the participating ISPs to each other.

- *It is a physical infrastructure through which ISPs exchange Internet traffic between their networks (autonomous systems).*

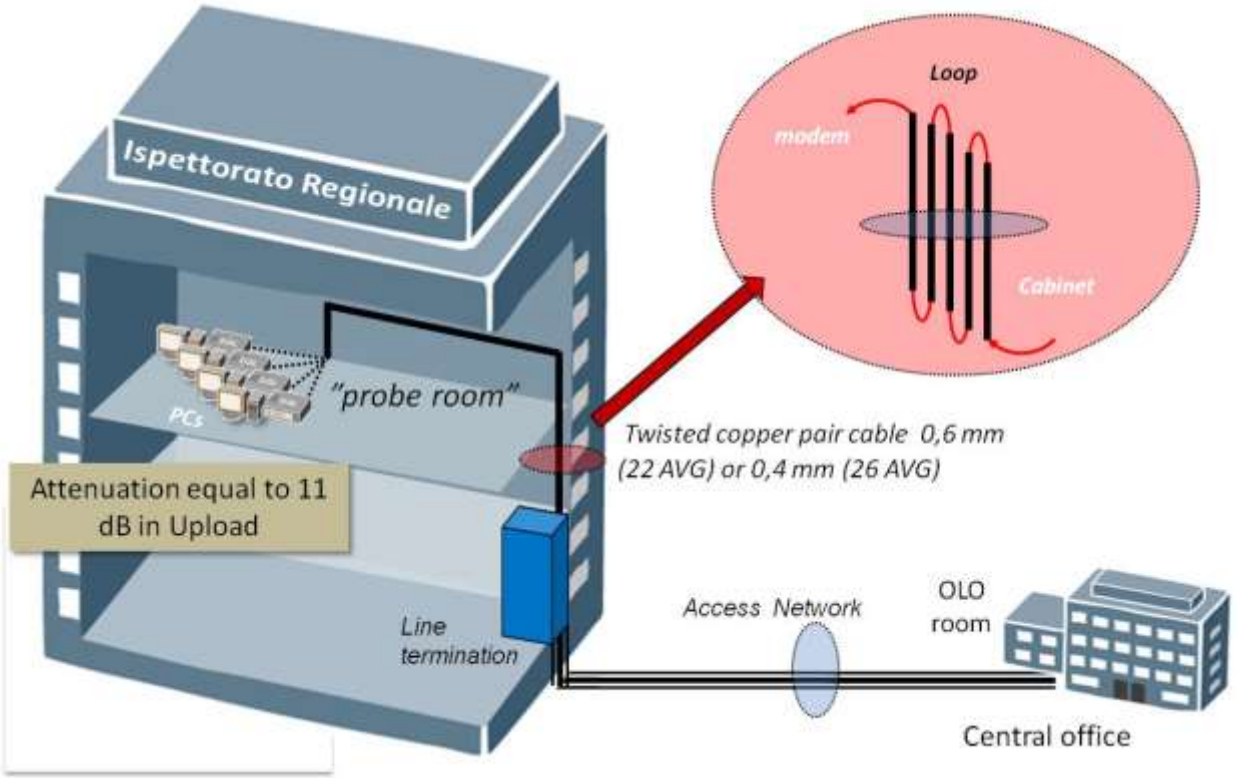
- *The primary purpose of an IXP is to allow networks to interconnect directly, via the exchange, rather than through one or more 3rd party networks*



Through a measurement server located in IXP, it is guaranteed that each client measures only performances related to its own ISP Network. This approach has been chosen since it allows comparable and reproducible results

- *Upload line attenuation is considered because it is less affected by frequency.*
- *The Italian average distance between customers and exchange is about 1,2 km and the corresponding average upload Line Attenuation is 11 db*
- *11 db in upload line attenuation & 1,2 km between users and Central Office (Exchange) regards 50 % of xDSL consumers in Italy*

ISP
www.misurainternet.it/stats.php



To have a comparison between ISP performances also Line Attenuation must be the same

Web site www.misurainternet.it

The site is divided into 2 areas:

It contains general information including:

- **Access to AGCOM Resolutions**
- **Technical discussions**
- **FAQ**
- **Definitions**
- **Help**
- **Gallery of useful links**

It offers, after registration, the possibility to download Ne.Me.Sys software and by the end of 2012 its Speed Test version, activate the procedure to execute the tests, and finally obtain the pdf certificate containing Ne.Me.Sys results.

Reporting and Publication of Measurement Results

- **The technical board periodically convenes, on a regular basis, in order to discuss reporting before the publication of "server oriented" monitoring (every 6 months), as well as the need for technical adjustments.**

- **Comparative statistical values and aggregated national data are published on the MisuraInternet website.**

- **In the client-oriented system, measurements are performed by consumers and can be used for complaints. The MisuraInternet website provides for updated information that allows comparability in terms of minimum guaranteed bandwidth**

Publication of comparative statistical values

Clicking on the Italian Regions, it is possible to access statistical data related to the main IAS offers for each ISP.

Regione Toscana

Dati relativi alle misure effettuate nel periodo 1 luglio - 31 dicembre 2010 ai sensi della Delibera n. 244/08/CSP

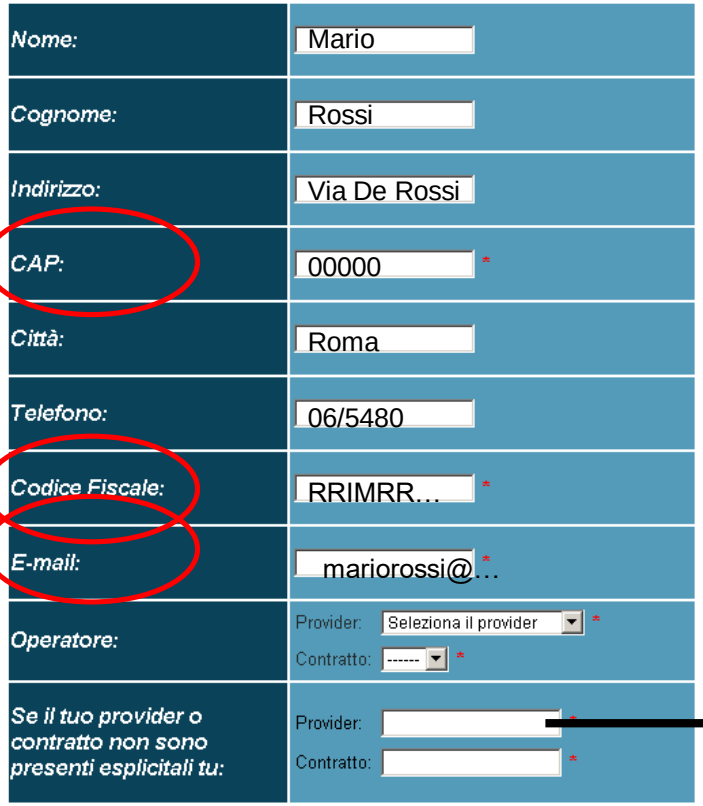
Operatore	Profilo commerciale	Indicatore	Media	St.Dev	5p	95p
EUTELIA	Profilo 2 - 7Mbps/256 kbps	upload (kbps)	486	13,1	443	493
		download (kbps)	3282	1610,6	914	5827
		rtt/2 (ms)	34	24,9	22	86
FASTWEB	Profilo 1 - 12 Mbps/1 Mbps	upload (kbps)	750	14,4	732	769
		download (kbps)	10101	343,1	9899	10402
		rtt/2 (ms)	15	1,6	14	19
	Profilo 3 - 6 Mbps/1 Mbps	upload (kbps)	752	12,8	741	772
		download (kbps)	5214	74,8	5119	5237
		rtt/2 (ms)	7	2,8	6	12
FLYNET	Profilo 1 - 4 Mbps/512 kbps	upload (kbps)	427	30,6	374	471
		download (kbps)	2914	637,4	1586	3949
		rtt/2 (ms)	13	3,0	9	15
	Profilo 2 - 7 Mbps/512 kbps	upload (kbps)	538	7,8	537	542
		download (kbps)	3481	1258,7	1116	5927
		rtt/2 (ms)	15	3,0	11	18
[illegible]	Profilo 1 - 2Mbps/512 kbps	upload (kbps)	496	3,9	494	498
		download (kbps)	1749	34,2	1710	1769
		rtt/2 (ms)	13	2,6	10	15
KPNQWEST Italia	Profilo 1 - 1,28 Mbps/512 kbps	upload (kbps)	459	25,3	409	488
		download (kbps)	1166	62,9	1101	1215
		rtt/2 (ms)	17	2,4	15	21
	Profilo 2 - 2 Mbps/512 kbps	upload (kbps)	493	12,6	486	498
		download (kbps)	1884	134,8	1674	2044
		rtt/2 (ms)	15	2,5	12	19

Network Measurement System

- Ne.Me.Sys is a software agent (developed in Phyton) running on PCs:
- It is able to run with all operative systems
- It runs some preliminary checks that allow or not consumers to execute measures:
  - The impact on speed of PC set-up (customer equipment)
  - The impact of having more than one computer using a broadband connection
  - Wi-Fi working connection
  - CPU busy, RAM busy, Other processes already running
  - Bandwidth hungry applications running (i.e.p2p software etc)

First Step: Registration

Ne.Me.Sys can be freely downloaded from the site following the registration procedure. The User who wants to register, must first connect to the site by typing the address: www.misurainternet.it



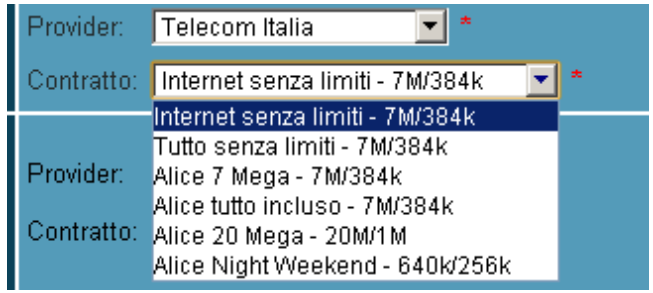
MANDATORY FIELD

MANDATORY FIELD

MANDATORY FIELD

End-user measures generate a legal document; people who are willing to perform the measures, need to fill in a special form available on the web site

Select from the dropdown menu your provider and internet offer



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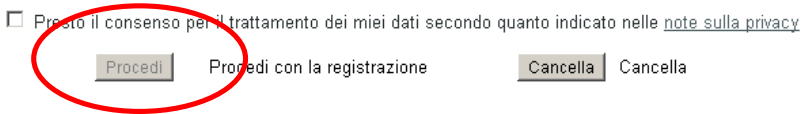
Click on “procedi” to go on:



Registration Confirmation

You will receive an email with confirmation of successful registration and all the information needed to log in and to access the download area:
Username: user e-mail
Password: an alphanumeric string assigned to the user by the system

Downloading Ne.Me.Sys

To download Ne.Me.Sys, you have to log in using username and password sent by email.

In the download area you can download software, start measurement and obtain final document containing the Ne.Me.Sys results.

The Measure

Ne.Me.Sys measures the quality of the line, making at least one measure per hour throughout the day.

To fully characterize the line, the software has to make a measurement in each time slot; This is necessary to evaluate the evolution of performance as a function of network load.

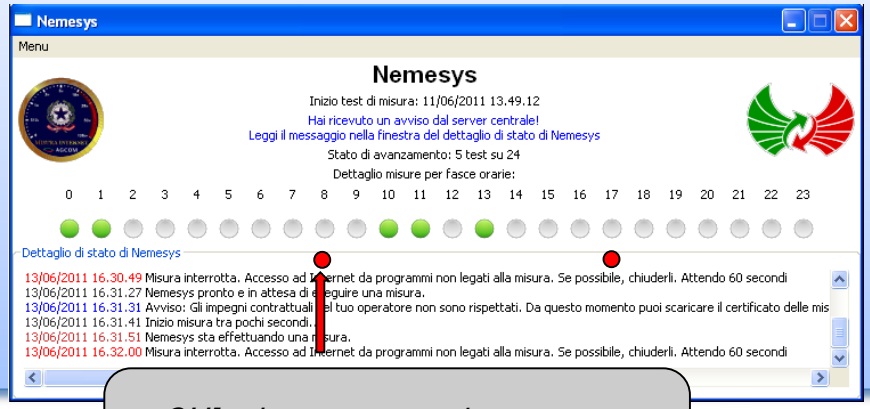
The evaluation of the line is made by at least 24 independent measurements taken in each time slot.

Each measure is made of :

- **20 FTP download session**
- **20 FTP upload session**
- **10 ping**

Measure Progress on user's pc

The Graphic User Interface shows the log of each measure as soon as it is performed and informs the user when the guaranteed minimum bandwidth is not compliant with the corresponding promised value.

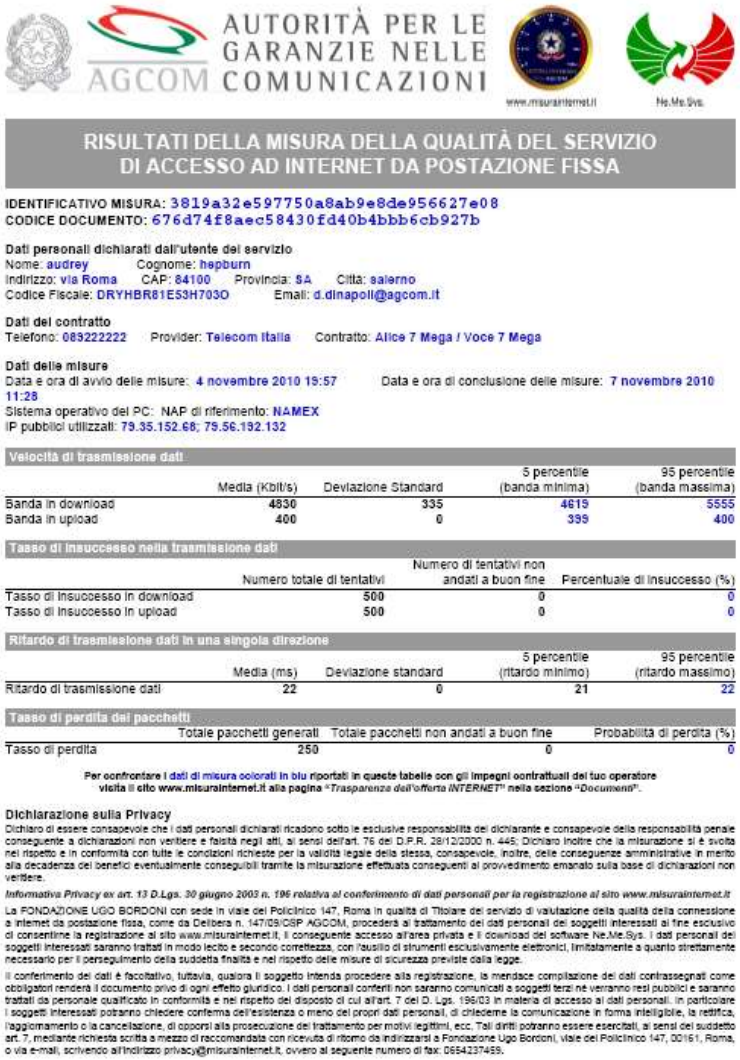


GUI shows measuring progress the red intervals show measures to be repeated

FTP file size, dimensioned not on headline speed but on the real line speed; at the beginning of each measure, a fast test is performed to reveal the effective access line speed. The FTP file size is based on the aforementioned test to make the duration of each test independent from the particular line speed (15 minutes).

PDF immediately released as soon as one of the five KPI measured by Ne.Me.Sys is less than the promised value. In this case the user has not to wait for the end of 24 measures to get the outcome document.

Measurement results



AUTORITÀ PER LE GARANZIE NELLE COMUNICAZIONI
AGCOM

www.misurainternet.it — Ne.Me.Sys.

RISULTATI DELLA MISURA DELLA QUALITÀ DEL SERVIZIO DI ACCESSO AD INTERNET DA POSTAZIONE FISSA

IDENTIFICATIVO MISURA: 3819a32e597750a8ab9e8de956627e08
CODICE DOCUMENTO: 676d74f8aec58430fd40b4bbb6cb927b

Dati personali dichiarati dall'utente del servizio
Nome: audrey Cognome: hepburn
Indirizzo: via Roma CAP: 84100 Provincia: SA Città: salerno
Codice Fiscale: DRYHBR81E53H703O Email: d.dinapoli@agcom.it

Dati del contratto
Telefono: 089222222 Provider: Telecom Italia Contratto: Alice 7 Mega / Voce 7 Mega

Dati delle misure
Data e ora di avvio delle misure: 4 novembre 2010 19:57 Data e ora di conclusione delle misure: 7 novembre 2010 11:28
Sistema operativo del PC: NAP di riferimento: NAMEX
IP pubblici utilizzati: 79.35.152.68; 79.56.192.132

Velocità di trasmissione dati

	Media (Kbit/s)	Deviazione Standard	5 percentile (banda minima)	95 percentile (banda massima)
Banda in download	4830	335	4619	5555
Banda in upload	400	0	399	400

Tasso di insuccesso nella trasmissione dati

	Numero totale di tentativi	Numero di tentativi non andati a buon fine	Percentuale di insuccesso (%)
Tasso di insuccesso in download	500	0	0
Tasso di insuccesso in upload	500	0	0

Ritardo di trasmissione dati in una singola direzione

	Media (ms)	Deviazione standard	5 percentile (ritardo minimo)	95 percentile (ritardo massimo)
Ritardo di trasmissione dati	22	0	21	22

Tasso di perdita dei pacchetti

	Totale pacchetti generati	Totale pacchetti non andati a buon fine	Probabilità di perdita (%)
Tasso di perdita	250	0	0

Per confrontare i dati di misura colorati in blu riportati in queste tabelle con gli impegni contrattuali del tuo operatore visita il sito www.misurainternet.it alla pagina "*Trasparenza dell'offerta INTERNET*" nella sezione "*Documenti*".

Dichiarazione sulla Privacy

Dichiaro di essere consapevole che i dati personali dichiarati ricadono sotto le esclusive responsabilità del dichiarante e consapevole della responsabilità penale conseguente a dichiarazioni non veritiere e falsità negli atti, ai sensi dell'art. 76 del D.P.R. 28/12/2000 n. 445; Dichiaro inoltre che la misurazione si è svolta nel rispetto e in conformità con tutte le condizioni richieste per la validità legale della stessa, consapevole, inoltre, delle conseguenze amministrative in merito alla decadenza dei benefici eventualmente conseguibili tramite la misurazione effettuata conseguenti al provvedimento emanato sulla base di dichiarazioni non veritiere.

Informativa Privacy ex art. 13 D.Lgs. 30 giugno 2003 n. 196 relativa al conferimento di dati personali per la registrazione al sito www.misurainternet.it

La FONDAZIONE UGO BORDONI con sede in viale del Policlinico 147, Roma in qualità di Titolare del servizio di valutazione della qualità della connessione a Internet da postazione fissa, come da Delibera n. 147/09/CSP AGCOM, procederà al trattamento dei dati personali dei soggetti interessati al fine esclusivo di consentirne la registrazione al sito www.misurainternet.it, il conseguente accesso all'area privata e il download del software Ne.Me.Sys. I dati personali dei soggetti interessati saranno trattati in modo lecito e secondo correttezza, con l'ausilio di strumenti esclusivamente elettronici, limitatamente a quanto strettamente necessario per il perseguimento della suddetta finalità e nel rispetto delle misure di sicurezza previste dalla legge.

Il conferimento dei dati è facoltativo, tuttavia, qualora il soggetto intenda procedere alla registrazione, la mendace compilazione dei dati contrassegnati come obbligatori renderà il documento privo di ogni effetto giuridico. I dati personali conferiti non saranno comunicati a soggetti terzi né verranno resi pubblici e saranno trattati da personale qualificato in conformità e nel rispetto del disposto di cui all'art. 7 del D. Lgs. 196/03 in materia di accesso ai dati personali. In particolare i soggetti interessati potranno chiedere conferma dell'esistenza o meno dei propri dati personali, di chiederne la comunicazione in forma intelligibile, la rettifica, l'aggiornamento o la cancellazione, di opporsi alla prosecuzione del trattamento per motivi legittimi, ecc. Tali diritti potranno essere esercitati, ai sensi del suddetto art. 7, mediante richiesta scritta a mezzo di raccomandata con ricevuta di ritorno da indirizzarsi a Fondazione Ugo Bordoni, viale del Policlinico 147, 00161, Roma, o via e-mail, scrivendo all'indirizzo privacy@misurainternet.it, ovvero al seguente numero di fax: 0654237455.

The legal value of measurements

In order to simplify consumer complaints procedure, Agcom, in April 2014, has launched a **new electronic procedure** which allows consumers to notify their ISP a validation certificate of measurement results stating that their QoS values are lower than the minimum guaranteed. Measurement results can acquire legal value only if user performs the measurements twice.

If results are confirmed after a second measurement, the validation certificate can be used as a proof, and entitles the consumer to **withdraw from the contract without penalties** if the ISP fails to handle the complaint within 30 days.

2011-2013 Release of (simplified) Misura Internet Speed Test

- 2013 November a short version of Ne.Me.Sys. has been released. Such a version is named **MisuraInternet Speed Test**.
- MisuraInternet Speed Test allows consumers to have an immediate result.
- The Speed Test results have not the same legal value as the Ne.Me.Sys. certificates in order to withdraw from contracts.
- The Speed Test results are collected with the aim of monitoring the growth and evolution of fixed broadband in Italy.

Ne.Me.Sys

Wired line complete characterization.
Very long measure (24h collected samples) and reliable results with an official value.

MisuraInternet SpeedTest

Short wired line characterization, with reliable results within the time slot it has been carried out.

Agcom also launched a trial version of MisuraInternet Speed Test, that allows users to perform one measurement without prior registration

Speed Test runs some checks during the measure to verify:

- The impact on speed of CPU busy

- The impact on speed of RAM busy

- The impact of having more than one computer using a broadband connection

- The presence of wireless working connection

- The presence of mobile working connection

- Other processes already running

No checks prevent the execution of the measure (differently from the Nemesys software)

Deliberation n. 656/14/CONS

Deliberation 656/14/CONS: Relevant novelties

- **Upgrade of the current measurement tool** in order to extend the scope of measurements to wireless connections from fixed locations, and certify more robust results for IAS over 30 Mbit/s
- Compliance with **ETSI ES 202 765-4 V1.2.1 (March, 2014)** "Speech and multimedia Transmission Quality (STQ). QoS and network performance metrics and measurement methods" (HTTP Protocol)
- Consumer empowerment: **free commercial downgrade** in addition to the right to withdraw with no penalties
- Publication of annual reports presenting collection and analysis of user's complaints

Deliberation n. 656/14/CONS

Ensuring future-proofness

- Implementation of ETSI ES 202 765-4 V1.2.1 (March, 2014) requires adjustments for both client-oriented and server-oriented software that are currently in use.
- The measurement tool shall switch from single session FTP protocol to **multiple session** HTTP. Replacement of current metrics for "data transmission speed" should allow more accurate measurements when speed approximates to 100 Mbit/s and data transmission delay is more than 40 msec.

Consumer empowerment

- **Free commercial downgrade** is intended as alternative to withdrawal from contract, in case an operator does not accommodate consumer complaints submitted through the electronic procedure available on the MisuraInternet restricted webpage.
- If the operator does not restore quality parameters that have been certified lower the minimum guaranteed, within 30 days from the complaint, consumers have **the right to modify contract terms by selecting and subscribing to a lower rate offer**, among those available on the ISPs and MisuraInternet website.

The new measurement software

- **The new measurement software for MisuraInternet**
  - In 2016 the project MisuraInternet updated its measurement software of a quality of internet access from a fixed location, in line with that established by **the ETSI standard ES 202** 765.
  - **The new software allows you to measure the lines with more than 30 Mbps** throughput.
  - A **new software control interface** was created: directly from the website a page provides information on performance measures (http://www.misurainternet.it/nemesys_gui.html)

The new measurement software

- **The throughput measurement**
  - For throughput testing transmitting a test file between the measurement server and measurement client, separately for download and for the upload, observed over a fixed period of time.
  - In particular the speed of a data transmission V, measured in bits / s is V = N / T where N is the number of bits counted during transmission and T is the observation period, set equal to 10 seconds.
  - The size of the test file (potentially infinite) is such as to allow the download and upload for a much longer time to temporal observation interval.
  - The measure has a duration equals to 12 seconds while keeping the observation period useful for the calculation of indicator of 10 seconds, by excluding from the calculation the first two seconds of the measurement.

The new measurement software

- **How to measure connections with speed over 30 Mbps**
  - The protocol used to carry out the new measures a speed the data transmission is the **HTTP,** which allows to exploit the mechanism of the **multi-session,** and then to measure connections with speed over 30 Mbps.
  - Through multi-session you can get all the bandwidth available regardless of operating system of measuring client and regardless of bandwidth-delay product. Inparticular:
    - to saturate the bandwidth available for download are used six parallel sessions;
    - to saturate the available bandwidth in upload is necessary to use parallel sessions and proceed with **the imposition of a transmission window (client and server side) in proportion to the bandwidth * delay product.**

The new measurement software

- **The measuring cycle**
  - Measurement definition:
    - 4 pings,
    - 1 http test down,
    - 1 test http up
  - The required number of samples for line characterization is 96 for each indicator
    - The value is derived from the formula given in ETSI EG 202 057 annex C and provides an estimate with a lower confidence interval of 5%
    - A measurement is performed every 15 minutes
  - 95 quantile of 96 samples consists of 5 tests for each indicator
    - If 5 tests, in any order, are below the minimum guaranteed speed, the system will release a Ne.Me.Sys the early release certificate for the end user