

ITU Workshop on “Performance, QoS and QoE for Multimedia Services” Johannesburg, 24-25 July 2017

**ITU-T REC. Y.1545.1:
Framework for monitoring the QoS of IP network
services**

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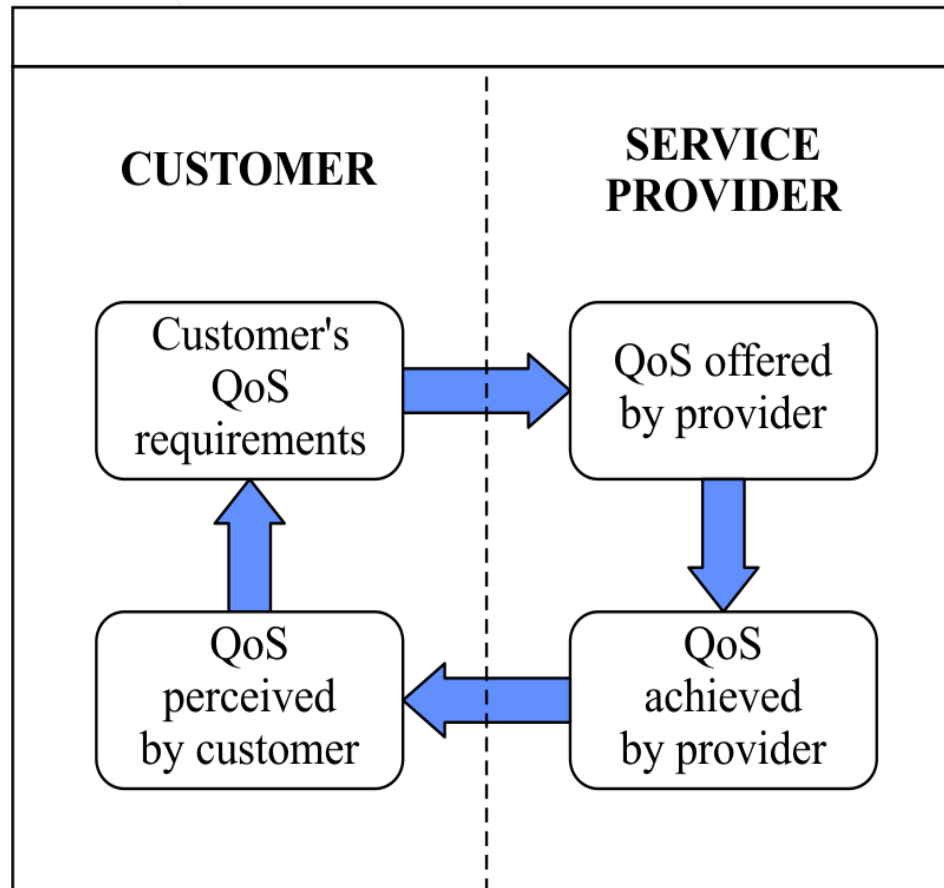
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Summary

- This presentation focuses on ITU-T Recommendation Y.1545.1
- Different aspects of quality of service;
- Parameters: e.g: Data rate (download and upload)
- IP QoS Measurement methods
- Testing tools
- QoS evaluation scenarios
- Sampling methodology

Different Aspects of Quality of Service



Y.1545.1(17)_F01

Four viewpoints of QoS [ITU-T G.1000] mapped with QoS requirements of IP-based network services.

Different Aspects of Quality of Service (Cont...)

QoS offered and QoS delivered

Service characteristics used by ISPs may not be satisfactory to define the service as:

- Services may be sold without providing guaranteed minimum QoS to subscribers;
- Subscribers are not given any guidelines on how service characteristics can be interpreted;
- QoS figures provided by different ISPs are not comparable;
- Subscribers are not well informed on the QoS that the Internet connection is able to provide.

To improve the situation, regulators are advised to:

- Set QoS parameters and related thresholds
- Monitor QoS delivered to end users
- Publish test results (benchmarking reports)
- Avail trusted tool to end users, to test themselves



Data Rate (download and upload)

- **Mean data rate achieved:** The average of the data transfer rate achieved for a given number of samples.

Formula: Mean Data Rate achieved $= \frac{\sum_{i=1}^N H_i}{N}$

- **% of the mean data rate:** Denotes the deviation between the data rate contracted/advertised and the data rate achieved.

Formula: % of Mean Data Rate $= \frac{\text{Mean Data Rate achieved}}{\text{Data Rate contracted}} \times 100\%$

QoS Measurement Methods

- Two methods for measuring IP network service: Active and Passive measurement methods:

Active measurement method

Advantages:

- The data (probing packets) are originated from a controlled source with predefined settings and therefore types of services can be fully controlled;
- Easy benchmarking/comparison between measurements obtained from different Internet connections provided by different ISPs.

Disadvantages:

- Requires that the line under test be fully available;
- Test design must ensure that the line is idle before testing;
- Requires both sending and receiving probes (monitoring tools).

Passive measurement method

Advantages:

- The probe needs only one connection point to the network which means less hardware;
- Does not 'take over' the line under test, so is never an inconvenience to end users.

Disadvantages:

- Unknown traffic type makes it difficult to test maximum line capability;
- Difficult to average different tests as the data traffic is not consistent.

Testing Tools

Hardware-based Tools

1. **1st option:** probes completely replace the end user's equipment and no other equipment can be connected to the Internet while the probe is performing measurements.
2. **2nd option:** probes share Internet access with ordinary traffic.
3. **3rd option:** a testing application programming interface (API) is embedded into the customer's residential gateway, through a firmware update, in order to act as a probe and test the fixed Internet connection.

Software-based tools

1. **A web-based tool:** download and execution of measurement software is initiated via the end user's web browser by accessing a specific webpage.
2. **A dedicated software client:** measurement software is permanently installed on the end user's terminal equipment.
3. **A testing API:** an API can be included in the code of one popular website in order to perform test transparently every time the users access the website.

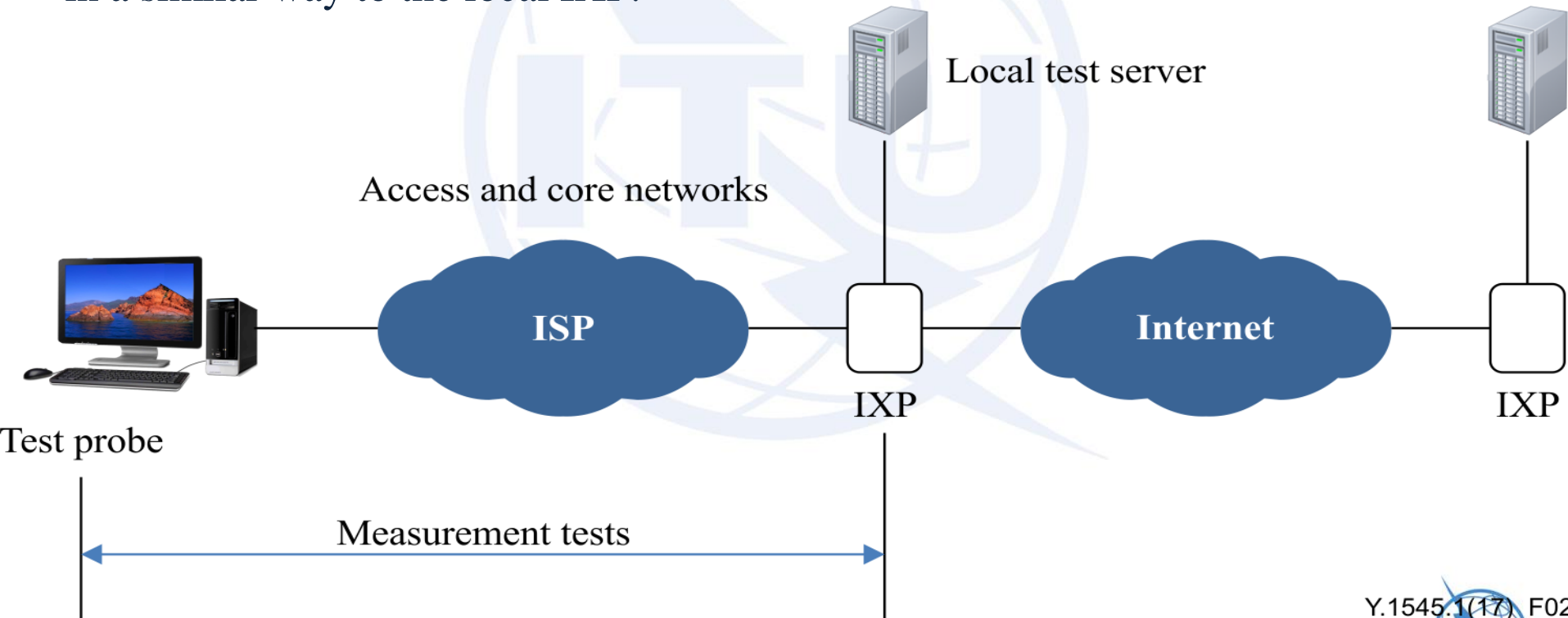


QoS Evaluation Scenarios

- Scenarios:
 - Evaluation scenario at a national level (test server located at local Internet exchange point (IXP));
 - Evaluation scenario at the international level (test server located at an international IXP).
- Measurements are conducted on the selected QoS parameters that have impact on the user's experience when utilizing IP network services.

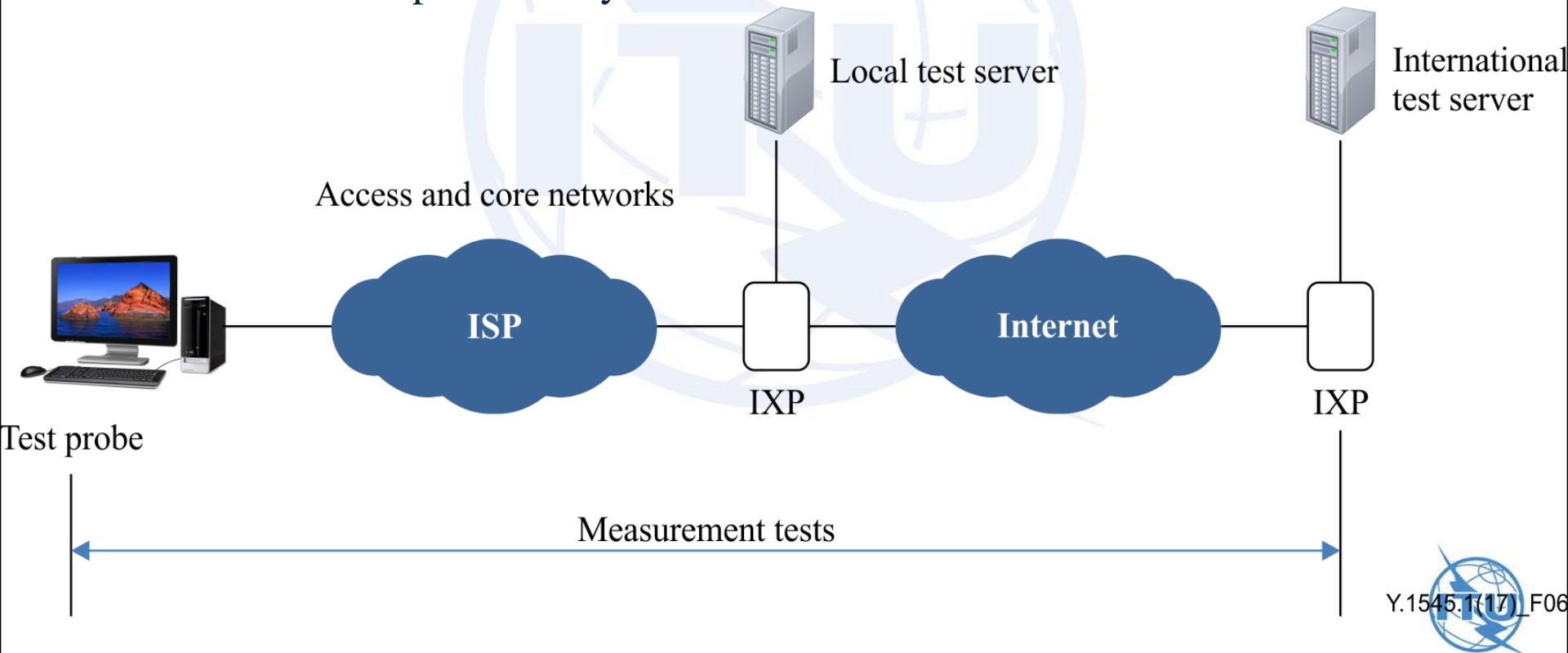
Evaluation scenario at a national level

- ❖ Test server is located at local IXP and probes are installed at the end user's premises;
- ❖ Measurements can be carried on by ISPs or regulators;
- ❖ Comparability of the ISPs can be best reached, in cases where all ISPs are connected in a similar way to the local IXP.



Evaluation scenario at international level

- ❖ Test server is located at an international IXP
- ❖ Internet connection that ISPs provide to customers is to the entire Internet.
- ❖ More bandwidth capacity in the ISPs' connections, the better the quality of the Internet connection provided by the ISPs will be.



Sampling methodology

- Number of probes for testing QoS should be enough so that data collected are sufficient from a statistical perspective;
- Selection of panelists can be done, based on factors: like technologies, Internet data rate packages and locations;
- Selection of access lines for each speed package:
 - ❖ **% of access lines of ISPs:** to be selected in rural, suburban and urban regions should be statistically representative.
 - ❖ **For mobile Internet:** a number of hotspots should be selected for measurements across the country, depending on:
 - Size of the country,
 - Geographic coverage percentage and
 - Classification of rural, urban and suburban areas.



Sampling methodology (Cont.)

❖ For fixed Internet:

- It is necessary to access the consumer premises (which is challenging).
- This challenge can be solved through development of cooperation between regulators, consumers and ISPs.
- To develop cooperation and attract sufficient numbers of volunteers, each attempt should be led by appropriate advertising campaigns and publication of information using various media channels.

• Selection of measurement moments:

- ❖ Better measurement moments should cover high and low traffic
- ❖ For simplicity, measurement moments may cover only high traffic hours;
- ❖ If the internet access service works properly in high traffic hours, it can be concluded that QoS in low traffic hours is at acceptable level;
- ❖ Frequency of the measurements can be based on the number of users participating in the campaign





THANK YOU



