Overview of ITU-T SG11 testbeds related activities

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Presentation Outline

- SG11 structure
- Remote testing as one of SG11 activities (WTSA-16 Res.76)
- Testing on the distributed model networks (ITU-T Q.3900, ITU-T Q.4060)
- Signalling for probes to be used for remote testing (ITU-T Q.3056)
- Draft ITU-T Q.API4TB "Open APIs for interoperable testbed federations“
- Performance Measurements according to ITU-T Q.3930 and considerations in Benchmarking
- Performance requirement specifications for reliable comparison of measurement figures
- Internet performance measurements (ITU-T Q.3960 and Q.Sup71)
- PSTN/ISDN emulation and IMS/NGN Reference Benchmarking according the Q.3932.x series
- Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks according ITU-T Q.3933

SG11 overview

Mandate:

- **signalling protocols**
- **test specifications for all types of networks**
- **combating counterfeiting of ICT devices**
- **combating the use of stolen ICT devices**

CHAIRMAN: Andrey Kucheryavy (Russia)

VICE-CHAIRMAN:

- Isaac Boateng (Ghana)
- Jose Hirschson Alvarez Prado (Argentina)
- Shin-Gak Kang (Korea (Rep. of)
- Karim Loukil (Tunisia)
- Awad Ahmed Ali Hmed Mulah (Sudan)
- Khoa Nguyen Van (Viet Nam)
- João Alexandre Moncaio Zanon (Brazil)
- Xiaojie Zhu (China)

Action plan (ref. *SG11-TD173/GEN*):

- **Signalling requirements for existing and emerging technologies/services**
- **SS7 security (e.g. call spoofing, calls intercept, OTP intercept, etc.)**
- **5G/IMT-2020 control plane and signaling requirements for 5G's services**
- **Interconnection of 4G (VoLTE/ViLTE) and 5G/IMT-2020 networks**
- **Implementation of C&I Programme**
- **Recognition procedure of testing laboratories and joint ITU/IEC certification schemes (through ITU-T CASC)**
- **Combating counterfeit and mobile devices theft**

SG11 structure (3 WPs, CASC, two RGs and 14 Questions)

WP1: Signalling requirements and protocols for emerging telecommunications networks

Chairman: Xiaojie Zhu (China Telecom, China)

WP2: Control and management protocols for IMT-2020

Chairman: Shin-Gak Kang (ETRI, Korea (Rep.of)

WP3: Conformance and interoperability testing, combating counterfeit ICT and mobile device theft

Chairman: Kaoru Kenyoshi (NICT, Japan)
VC: Awad Ahmed Ali Hmed Mulah (NTC, Sudan)
VC: João Alexandre Moncaio Zanon (NTA, Brazil)

Conformity Assessment Steering Committee (CASC)

Chairman: Isaac Boateng (NCA, Ghana)
VC: Khoa Nguyen Van (NTA,MIC, Viet Nam)
VC: Karim Loukil (CERT, Tunisia)

ITU-T SG11 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG11RG-EECAT)

Chairman: Alexey Borodin (Rostelecom, Russia)
VC: Nastassia Lahutsik (Belarus)

ITU-T SG11 Regional Group for Africa (SG11RG-AFR)

Chairman: Isaac Boateng (NCA, Ghana)
VC: Amna Alrayan Alhafyan (TPRA, Sudan)
VC: Karim Loukil (CERT, Tunisia)
VC: Sidi Mohamed Raliou (Ministry of Posts, Telecommunications and the Digital Economy, Niger)

WTSA-16 Resolution 76: Studies related to conformance and interoperability testing, assistance to developing countries, and a possible future ITU Mark programme

Considering

…

e) that the remote testing of equipment and services using virtual laboratories will enable all countries, especially those with economies in transition and developing countries, to conduct C&I testing, while at the same time facilitating the exchange of experience among technical experts taking into account the positive results achieved in implementing the ITU pilot project for the creation of such laboratories;

…

Resolves

…

6 that a set of methodologies and procedures should be developed for remote testing using virtual laboratories;

Distributed Model Networks (ITU-T Q.3900, 09/2006)

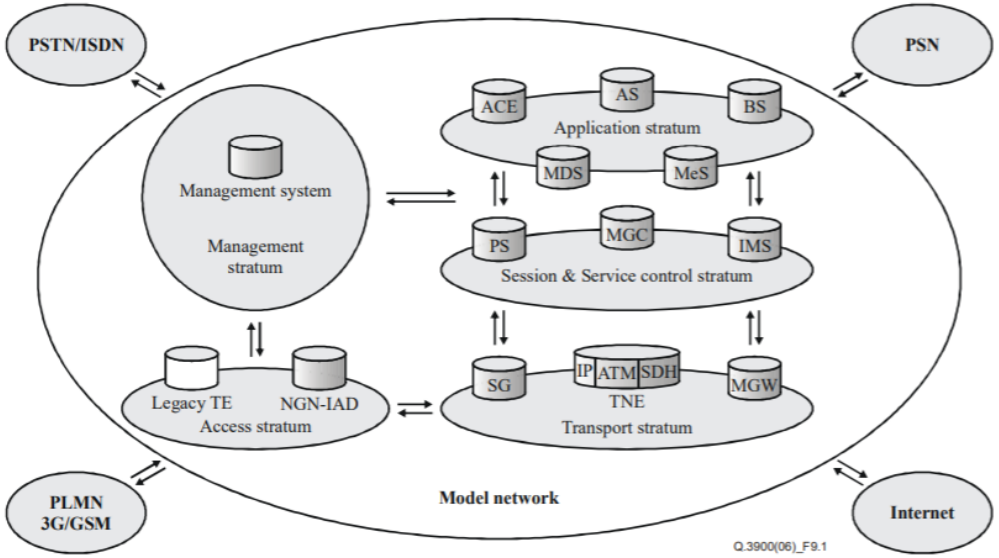


Figure 9-1 – Basic architecture of a model network

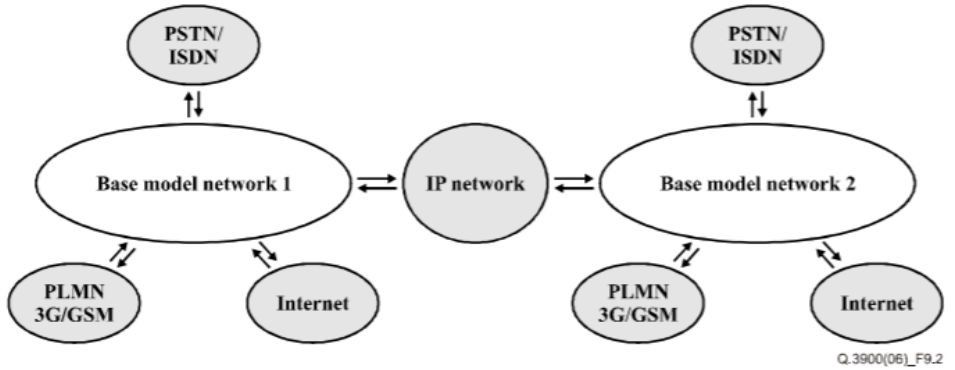
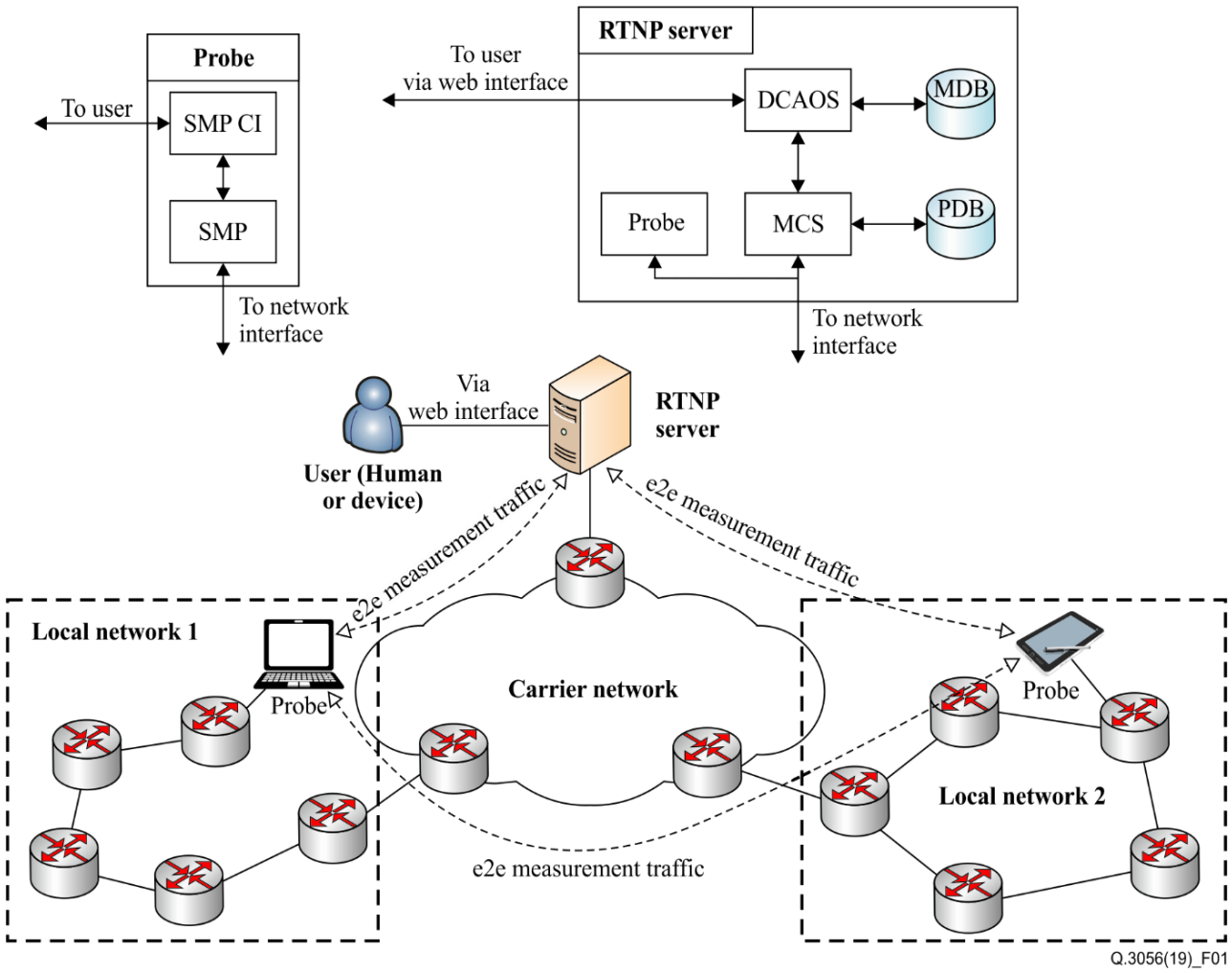


Figure 9-2 – Architecture of a distributed model network in minimum-size configuration[4]

- Testing of implemented functionality
- Testing of Interconnection
- Service testing
- End-to-end testing
- QoS testing
- Mobility & roaming testing

ITU-T Q.3056 Signalling procedures of the probes to be used for remote testing of network parameters (12/2019)

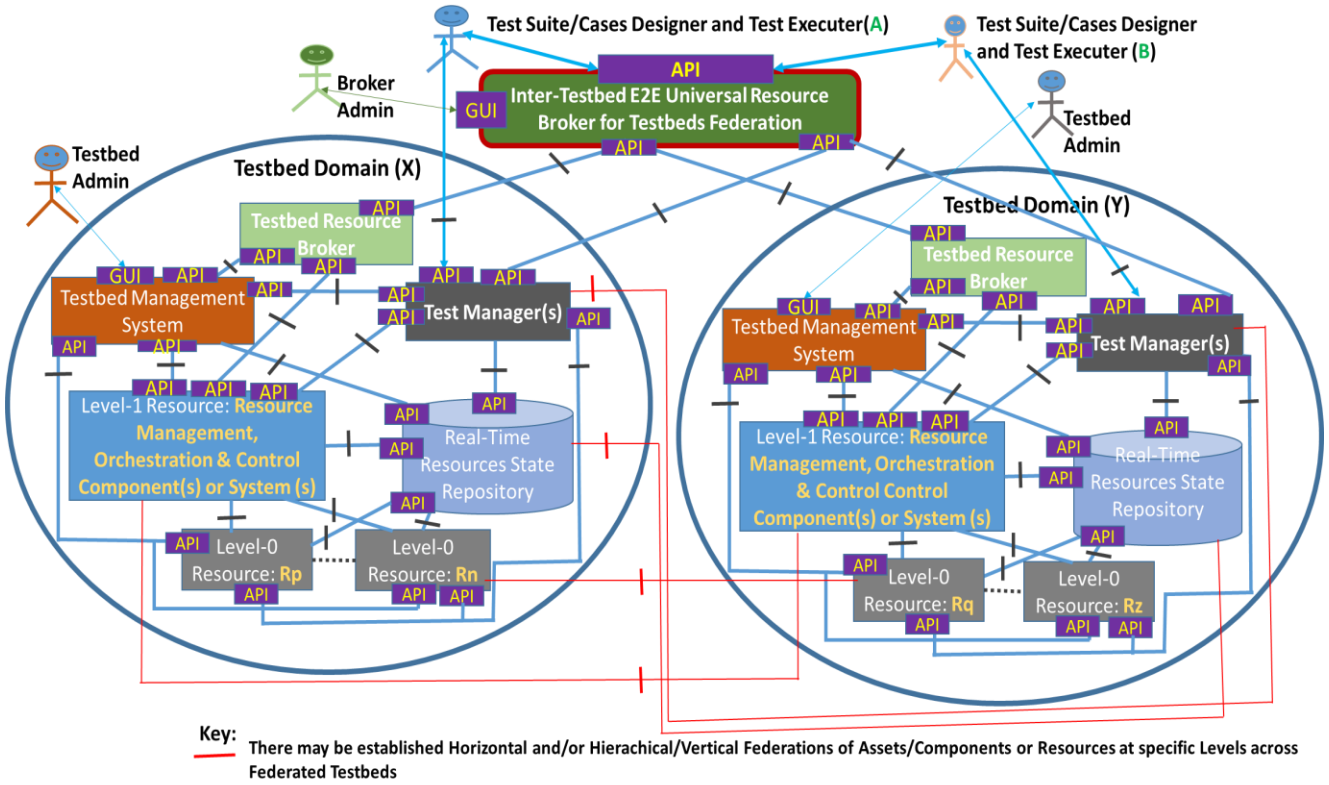
ITU-T Recommendations defines requirements for high level signalling procedures intended for use in controlling probes used for remote testing of network parameters. These procedures enable a probe to function as a "black box" recording all events on the subscriber side, and suitable for a trusted system in resolving disputes between various ICT stakeholders.



Q.API4TB "Open APIs for interoperable testbed federations"

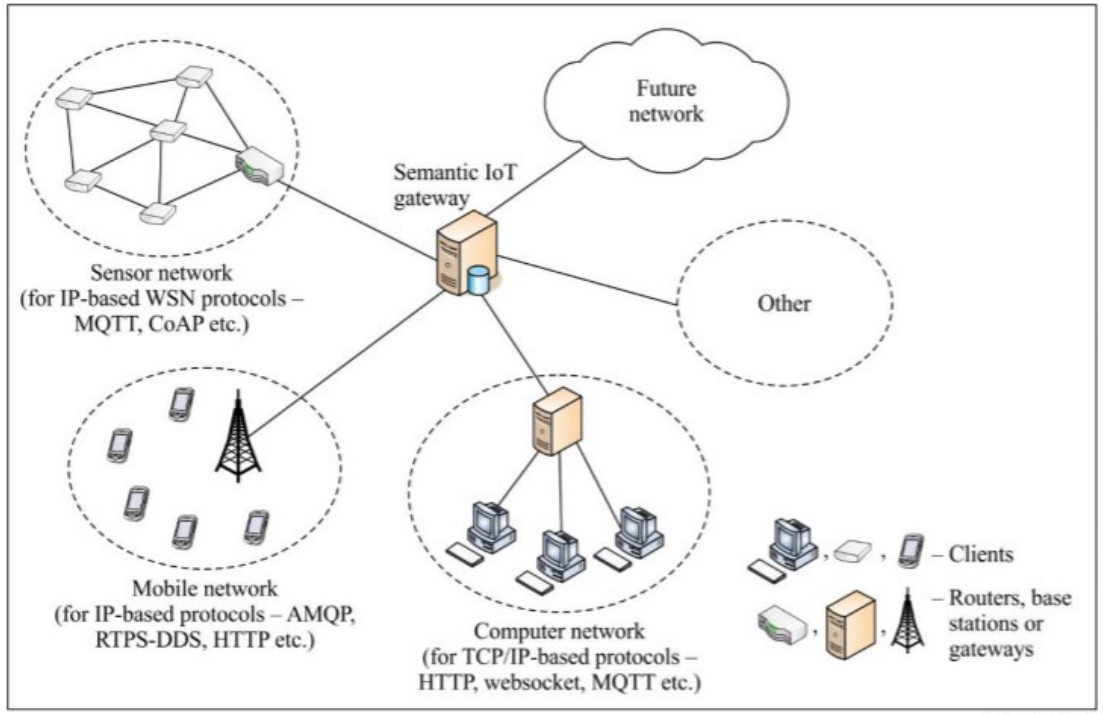
This draft Recommendation contains a technical framework consisting of guidelines, which provides a common reference for developers in order to facilitate the implementation and promotion of interoperability of testbeds. It more specifically:

- defines the potential of improvements of testbed interoperability and federation to enhance the interoperability of testbeds;
- describes a reference model and technical framework for interoperable testbeds federation;
- specifies open APIs enabling interconnection and interoperability among different testbeds;
- provides reference metrics to be standardized in terms of data format, in order to ease the integration and interoperability of testbeds.



Recommendation ITU-T Q.4060 : The structure of the testing of heterogeneous Internet of things gateways in a laboratory environment (10/2018)

It describes the testing methodology of the heterogeneous network gateway which is to be used for communication among IoT devices.



Performance Measurements according to ITU-T Q.3930 and considerations in Benchmarking

Recommendation ITU-T Q.3930: Performance testing of distributed systems – Concepts and terminology

The objectives of the recommendation is to establish a common base for discussions about performance and performance testing.
The recommendation covers the following aspects of system performance and performance measurements:

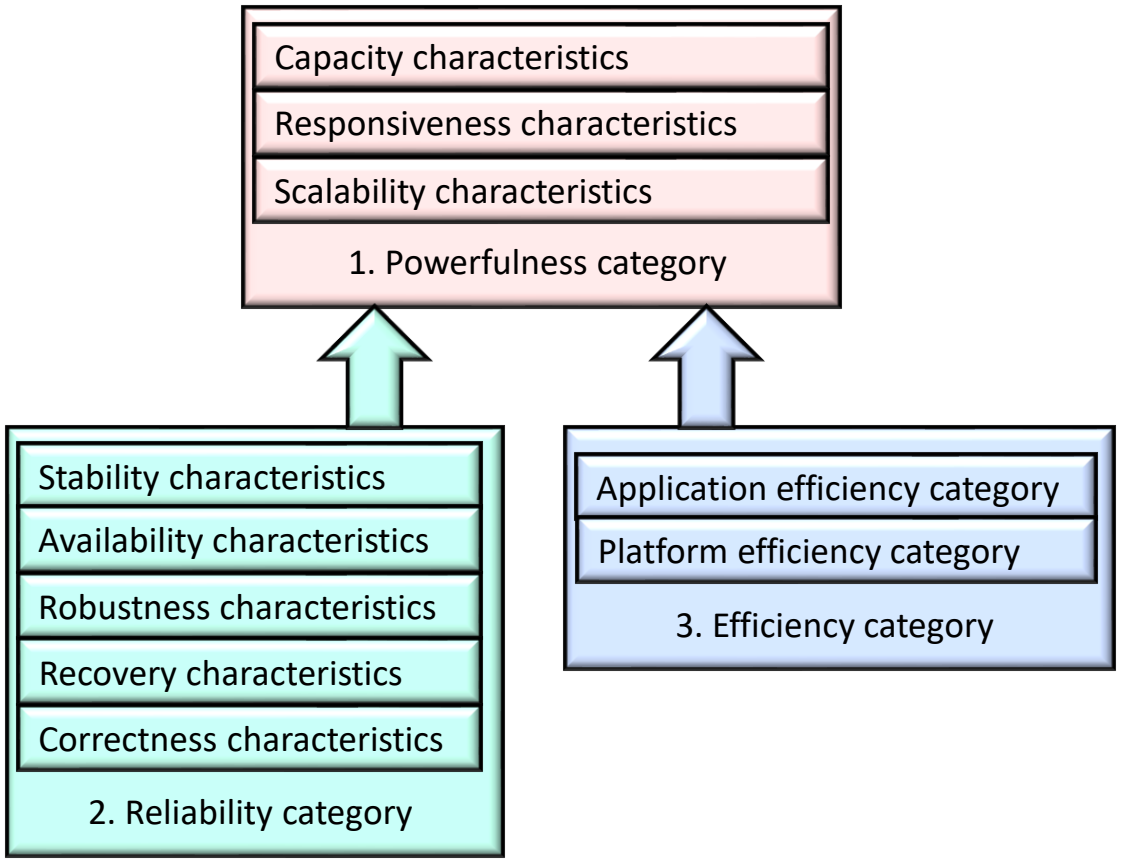
1. It describes three categories of performance characteristic.
2. Measured objects and service characteristics.
3. Requirements on metrics and collected data.
4. Processing of performance data.
5. General performance test concepts
6. Performance test environment
7. Performance test specifications
8. Workload definitions

Item 1 and 3 are described on the following pages.

Recommendation ITU-T Q.3930: Performance testing of distributed systems – Concepts and terminology: 1. Categories of performance characteristics.

Three categories of performance characteristic describe how the measured system behaves:

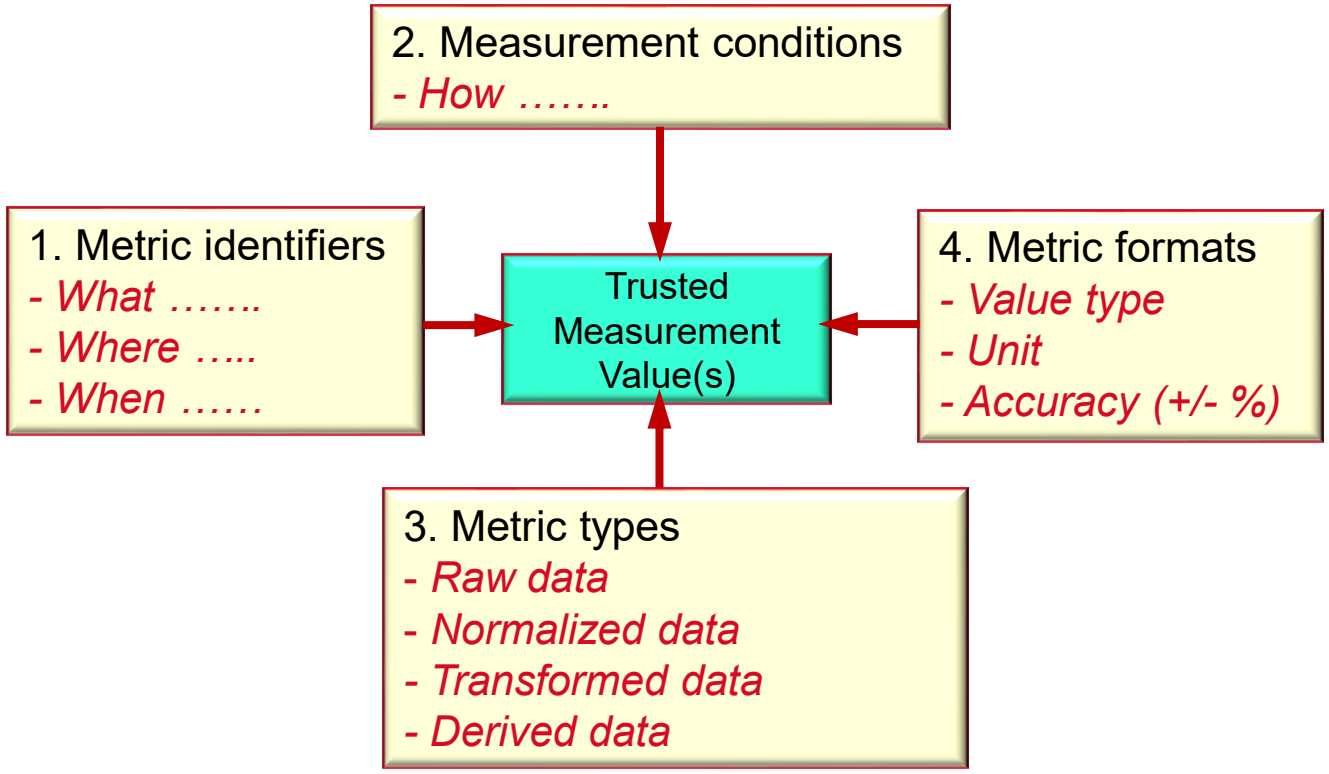
1. The powerfulness category of performance characteristics covers what is commonly regarded as performance, i.e. capacities and speed of operation.
2. The Reliability category of characteristics add credibility to the measured characteristics of the Powerfulness category, i.e. how well will the Powerfulness characteristics be maintained in production.
3. The efficiency category of characteristics add a value evaluation to the measured characteristics of the Powerfulness category, i.e. how efficiently are service requests processed (Application efficiency) and how efficiently are resource demands by the application provided by the application platform (Platform efficiency).



Recommendation ITU-T Q.3930: Performance testing of distributed systems – Concepts and terminology: 3. Requirements on metrics and collected data.

Four groups of requirements determine the value of collected measurement data:

1. *Metric identifiers*. What is measured, where, and when. Without the metric identifiers measurement data are without value.
2. *Measurement conditions*. Did the right conditions apply when measurement values were captured?
3. *Metric types*. What type of metric does the measurement value represent. It can be anything from raw data to derived data or KPI:s.
4. *Metric formats.* What are the formats of the metric value. This is important when comparing different measurement values.



Performance requirement specifications for reliable comparison of measurement figures.

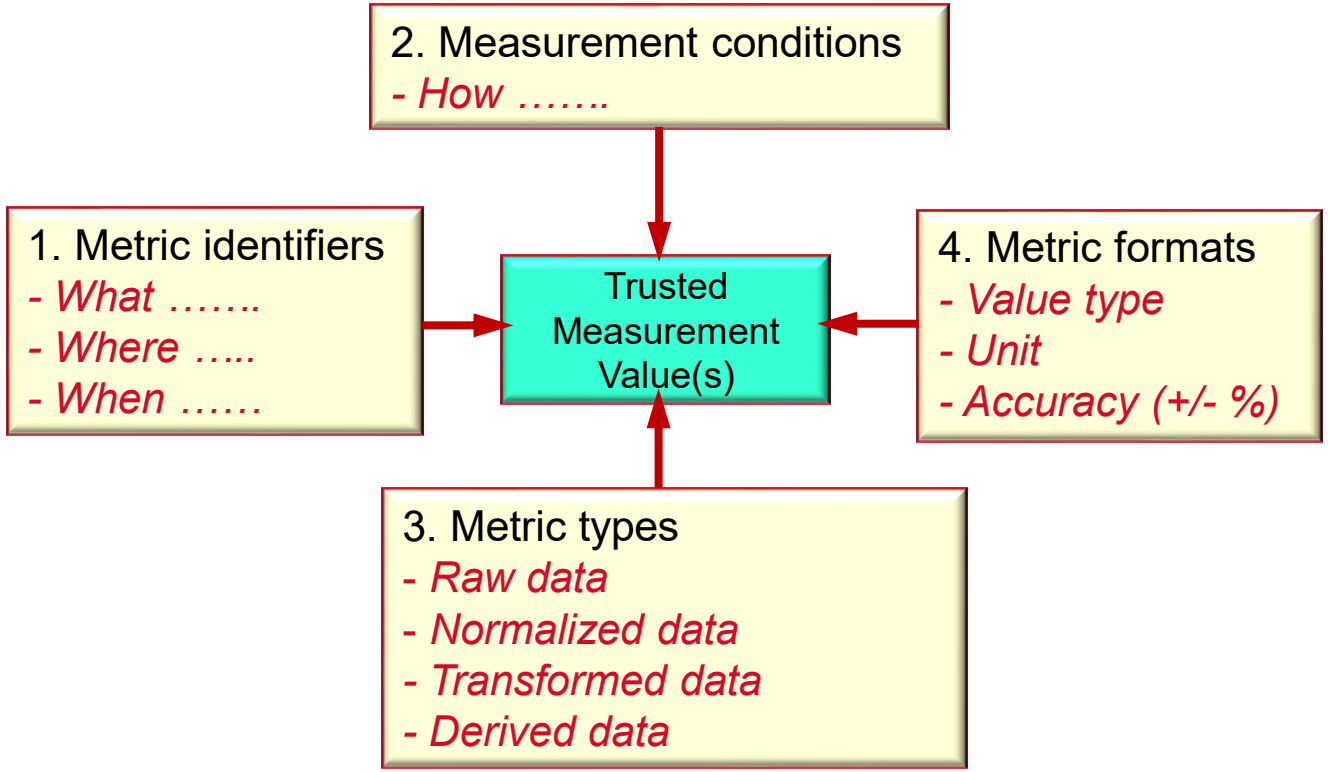
Performance requirement specifications for reliable comparison of measurement figures.

This is a work item with the following objectives:

1. *Provide generalized specifications of performance requirements*. This is an extension to Recommendation Q.3930.
2. *Automated generation of performance test cases*. This will enable performance measurements to be part of agile development with continuous delivery.
3. *A standard for storage of captured performance data*. This will be the source for AI supported performance testing and optimized performance measurements.

Performance requirement specifications for reliable comparison of measurement figures.

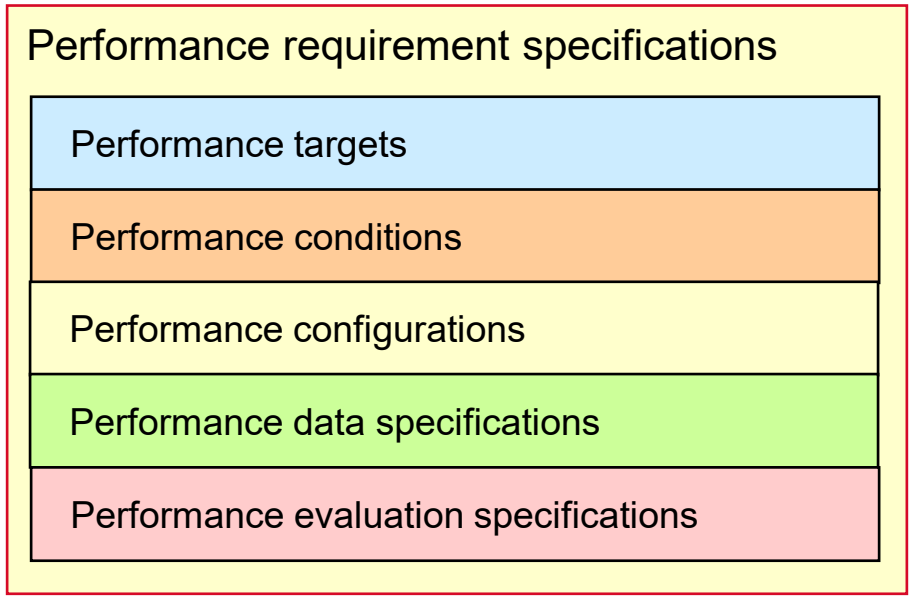
The work will be an extension to the requirements on metrics and collected data presented in Q.3930:



Performance requirement specifications for reliable comparison of measurement figures.

The work will explore:

1. *Performance targets*. What must be achieved.
2. *Performance conditions*. What conditions must apply when measurement data are captured?
3. *Performance configurations*. Requirements on performance measurement platform.
4. *Performance data specifications.* Requirements on data assigned to simulated users during performance measurements.
5. *Performance evaluation specifications.* How shall captured measurement data be evaluated.



General info about internet performance measurements

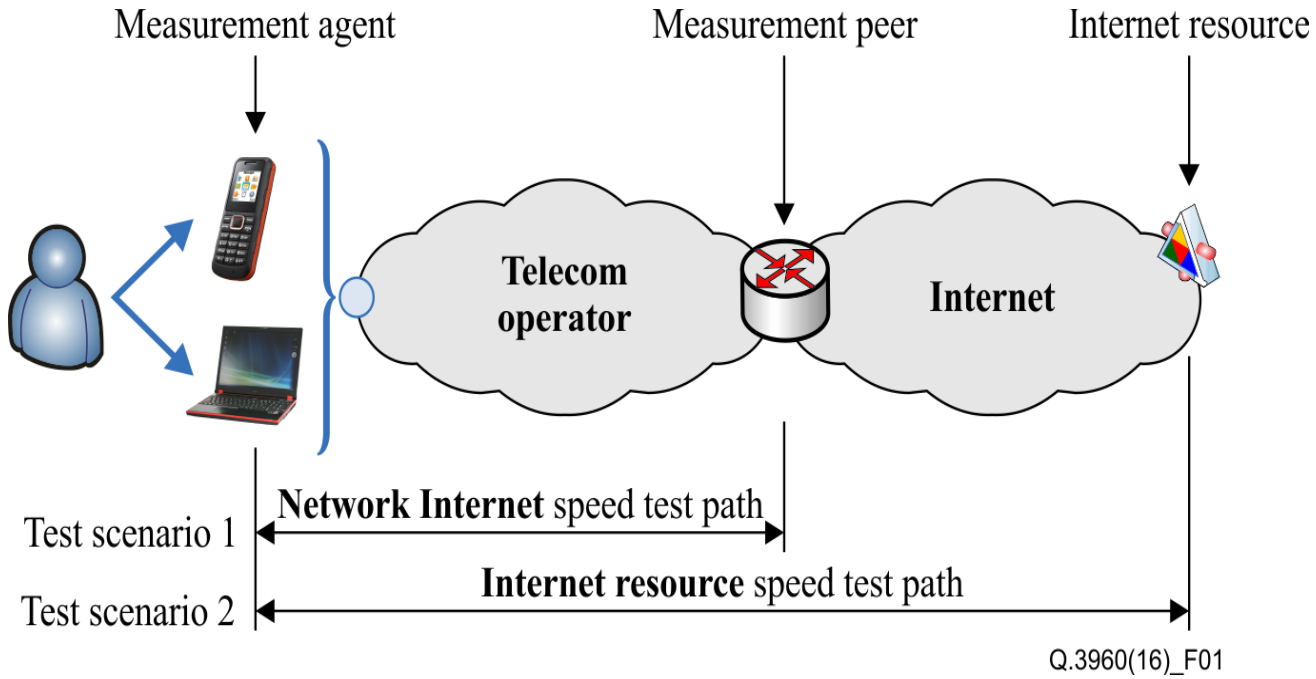
- The project internet performance measurements was a joint project between ITU-SG11, ETSI TC INT and the Austrian Regulator RTR. The documents are based on the approaches being taken in OECD countries to measure broadband and the BEREC “Net Neutrality Regulatory Assessment Methodology”
- Published Recommendations and Standards
  - Recommendation ITU-T Q.3960: Framework of Internet related performance measurements
  - Q.Sup71 : Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operator’s networks

More details are available here

Recommendation ITU-T Q.3960: Framework of Internet related performance measurements

It describes the framework for Internet related performance measurements

- which can be established at the national or international level and
- can be used for measuring Internet related performance measurements from the customer to a particular Internet resource



Q.Sup71 : Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operator's networks

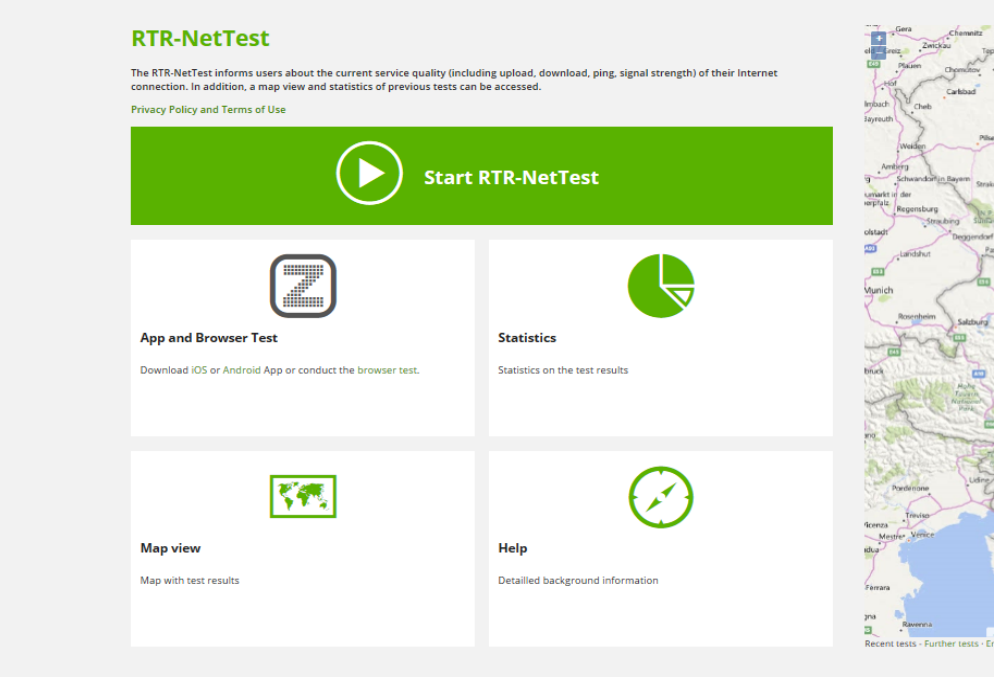
- The Q.Sup71 Recommendation describes the testing procedures of data transmission speed within the fixed and mobile operator's networks (2019)
- The proposed methodology is based on the concept of the ITU-T Q.3960 "Framework of Internet related performance measurements" (2016)
- The documents are based on the approaches being taken in OECD countries to measure broadband and the BEREC "Net Neutrality REgulatory Assessment Methodology"

ITU Workshop on Benchmarking of emerging technologies and applications. Internet related performance measurements, Geneva, 11 March 2019

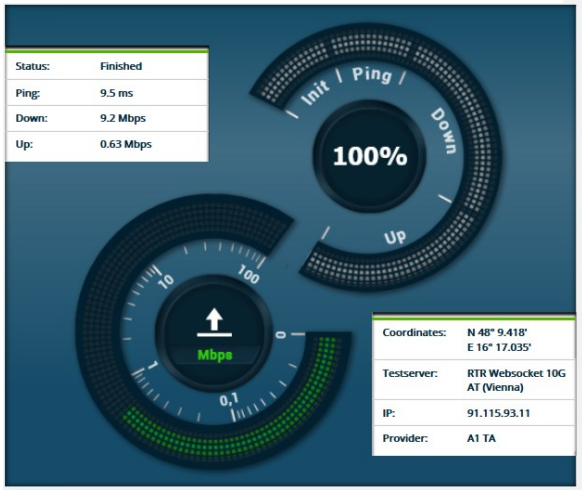
Implementations in Europe

RTR Implementation with Web-Browser

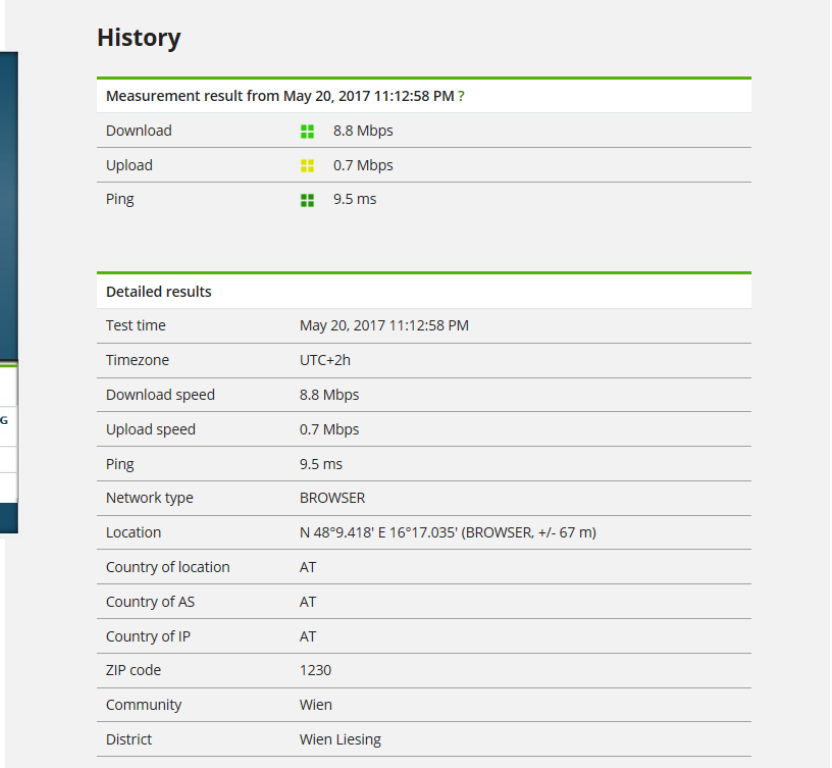
https://www.netztest.at/en/



RTR Implementation Testing procedure



RTR Implementation Test Results



History

Measurement result from May 20, 2017 11:12:58 PM ?	
Download	8.8 Mbps
Upload	0.7 Mbps
Ping	9.5 ms

Detailed results	
Test time	May 20, 2017 11:12:58 PM
Timezone	UTC+2h
Download speed	8.8 Mbps
Upload speed	0.7 Mbps
Ping	9.5 ms
Network type	BROWSER
Location	N 48°9.418' E 16°17.035' (BROWSER, +/- 67 m)
Country of location	AT
Country of AS	AT
Country of IP	AT
ZIP code	1230
Community	Wien
District	Wien Liesing

PSTN/ISDN EMULATION AND IMS/NGN REFERENCE BENCHMARKING

Why is IMS Benchmarking Needed?

- Goal - performance benchmark for IMS/LTE components
  - Performance and scalability testing of all PSTN and IMS and related components
  - Measurement and analysis of important QoS parameters
  - Regression Tests with applications after Release Change
- Why
  - Creation of objective means to compare overall IMS of different systems by performance (and price)
  - Check ability of hardware/software to run the IMS
- How
  - Define standard scenarios and traffic models for the workload
  - Define the metrics to be measured
  - Standardize the test procedure, the test parameters and the Benchmark test report

History (1/2)

- March 2011 - Q.3931.1: Performance benchmark for the PSTN/ISDN emulation subsystem of an IP multimedia system - Part 1: Core concepts
- March 2011 Q.3931.2: *Performance benchmark for the PSTN/ISDN emulation subsystem of an IP multimedia system - Part 2: Subsystem*
- June 2015 Q.3931.3: *Performance benchmark for the PSTN/ISDN emulation subsystem of an IP multimedia system - Part 3: Traffic sets and traffic profiles*
- June 2015 Q.3931.4: *Performance benchmark for the PSTN/ISDN emulation subsystem of an IP multimedia system - Part 4: Reference load network*

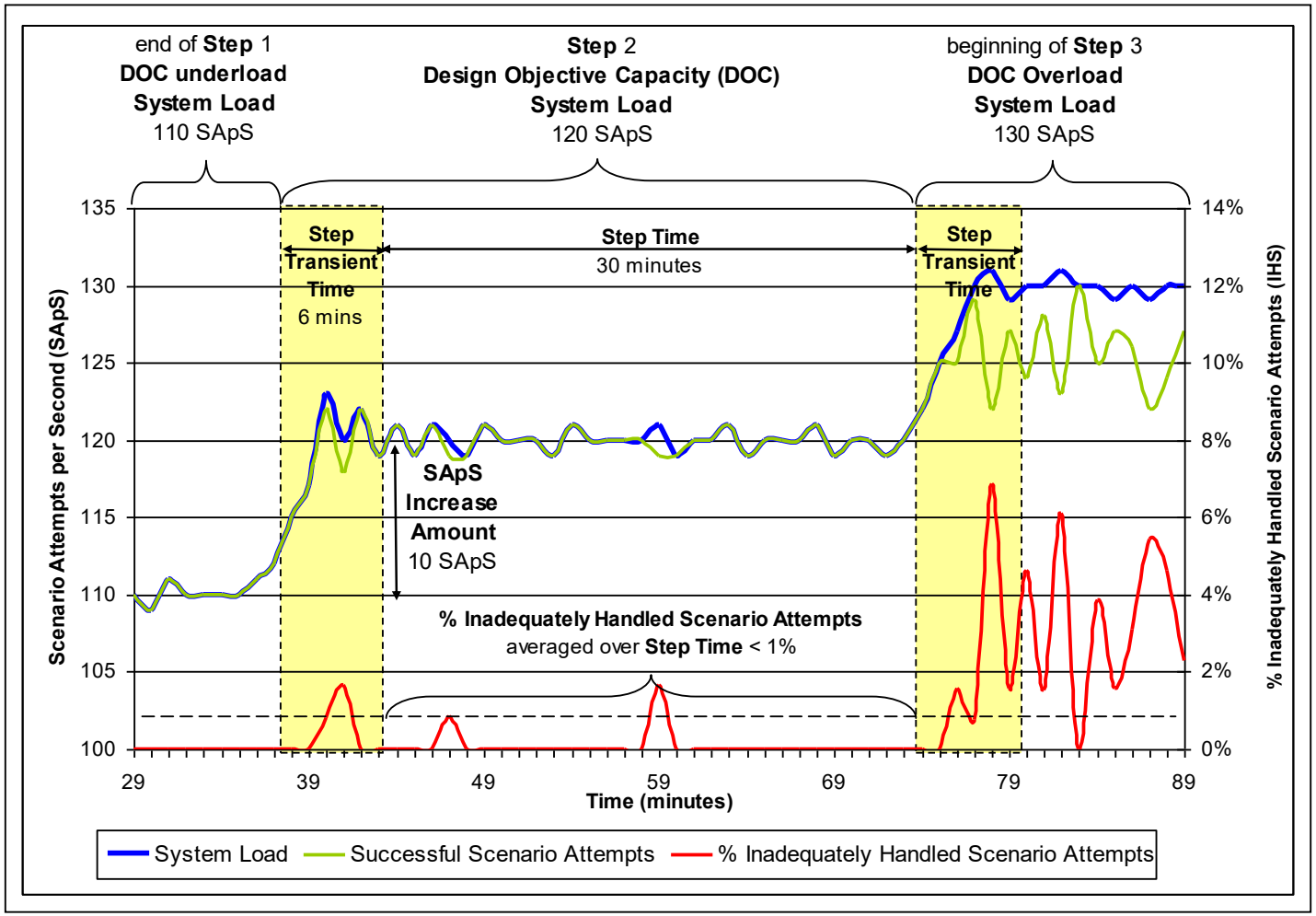
History (2/2)

- June 2015 – Q.3932.1: IMS/NGN performance benchmark Part 1: Core concept
- June 2015 - Q.3932.2: IMS/NGN performance benchmark Part 2: Subsystem configurations and benchmarks
- June 2015- Q.3932.3: IMS/NGN performance benchmark – Part 3: Traffic sets and traffic profiles
- June 2015- Q.3933 "Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks"
- Mai 2016- Q.3932.4: IMS/NGN performance benchmark - Part 4: Testing of the performance design objectives

Involved Bodies

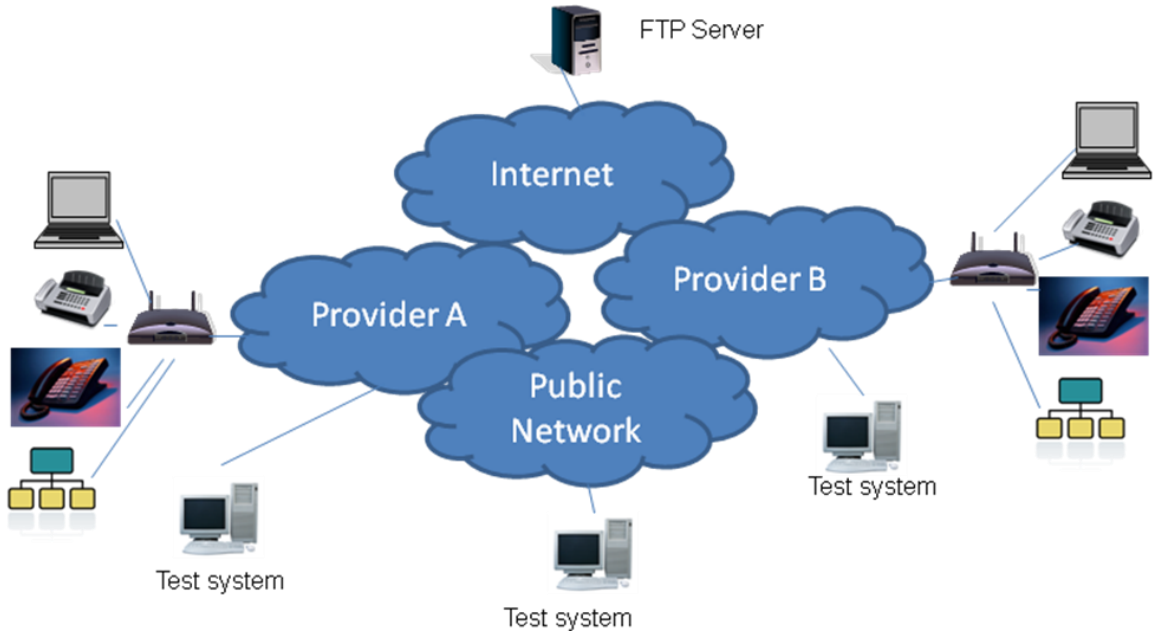
- **ETSI TC MTS**
  - Testing framwork and description
- **ETSI TC TISPAN**
  - standardization of PSTN/ISDN Emulation Sub-system (PES) benchmark
- **ETSI TC INT**
  - Benchmark IMS
- **ETSI TC STQ**
  - Benchmark IMS
- **ITU-T**
  - SG11

Motivating Example



Recommendation ITU-T Q.3933: Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks

It describes Key Performance Indicators and benchmarking methods for the spectrum of potential applications. Access technologies considered are all technologies offered by the operator



Scope of Functionality (1)

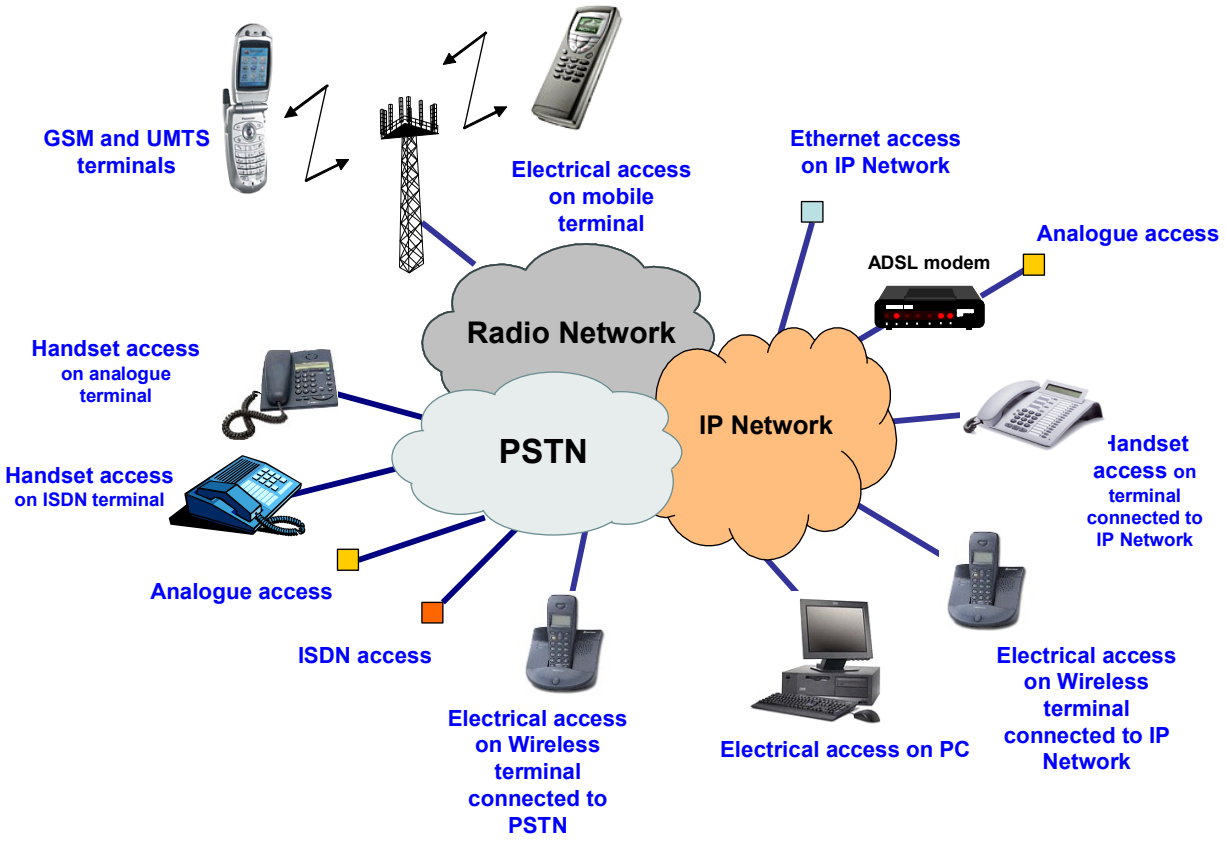
The benchmarking platform can be distributed across a larger region or an entire country.

In this case, several server systems should be also part of the set-up, including a system for evaluating media (e.g., video, audio, and voice) quality.

Scope of Functionality (2)

The measurement systems at the user premises can be connected with IP, FXS or ISDN ports via a voice gateway (VGW), integrated access device (IAD), or directly to a CPE or Ethernet port (e.g., multimedia telephony service (MMTel) fixed access).

Possible configurations and interfaces in context of user characterization



Overview of Quality characteristics for voice quality measurements

1.	call set up delay
2.	call set-up time (Post Dialling Delay)
3.	Call Setup Time Standard Deviation
4.	Premature release probability (Call Failure Rate)
5.	Call Drop Rate
6.	Unsuccessful call ratio
7.	Media establishment delay
8.	Level of active speech signal
9.	Noise level
10.	Noise to signal ratio
11.	Speech signal attenuation
12.	Talker echo delay
13.	Listening speech quality
14.	Listening speech quality stability
15.	End-to-End audio delay
16.	End-to-End audio delay standard deviation
17.	End –to-End audio delay variation
18.	Frequency response
19.	Fax transmission T.30 (Fax, bit rate ≤ 14,4 kbit/s and Fax, bit rate ≥ 14,4 kbit/s)

Thank you!

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