

**ITU Regional Seminar for the Africa Region on Conformance  
and Interoperability Testing Centre(s)  
Accra (Ghana), 4-6 July 2011**

**ITU-T standardization activity on testing.  
Global approach for C&I Testing on the Model  
Networks**

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- **ITU-T activities in testing area**
- **Testing methodology history**
- **Technical means (equipment) interoperability**
- **Model Networks**
- **The services interoperability**
- **The QoS interoperability**
- **Benchmarking**
- **Conclusions**

## **ITU-T activities on testing area (1)**

**Resolution 76 “Studies related to conformance and interoperability testing, assistance to developing countries, and a possible future ITU mark program” was approved at the World Telecommunication Standard Assembly (Johannesburg, 2008)**

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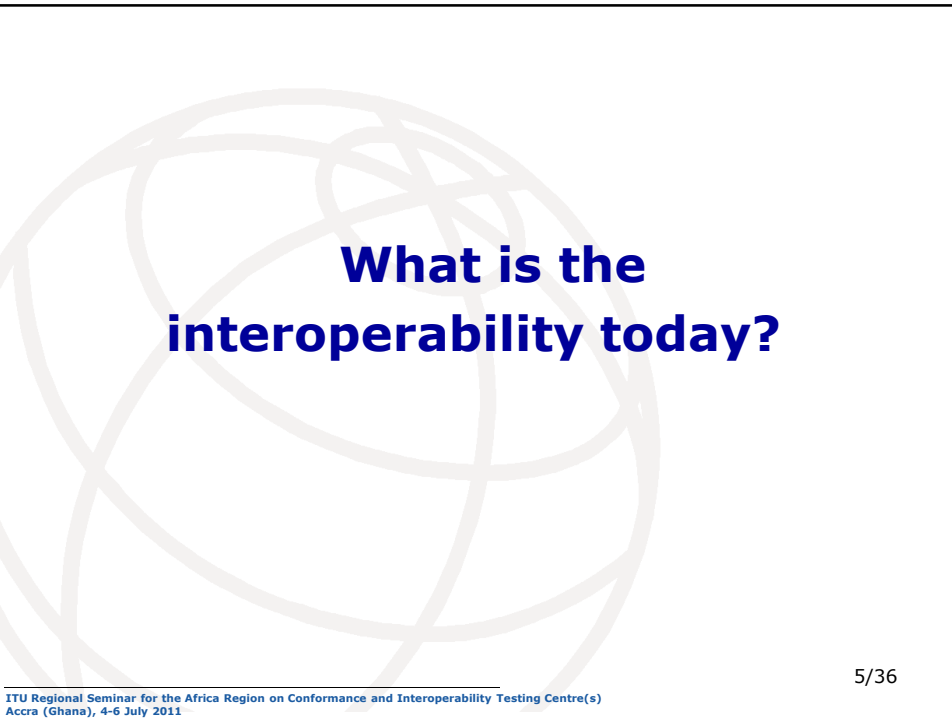
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## **ITU-T activities on testing area (2)**

**“The interoperability of international telecommunication networks was the main reason to create ITU in the year 1865 (International Telegraph Union), and that this remains one of the main goals in the ITU strategic plan”**

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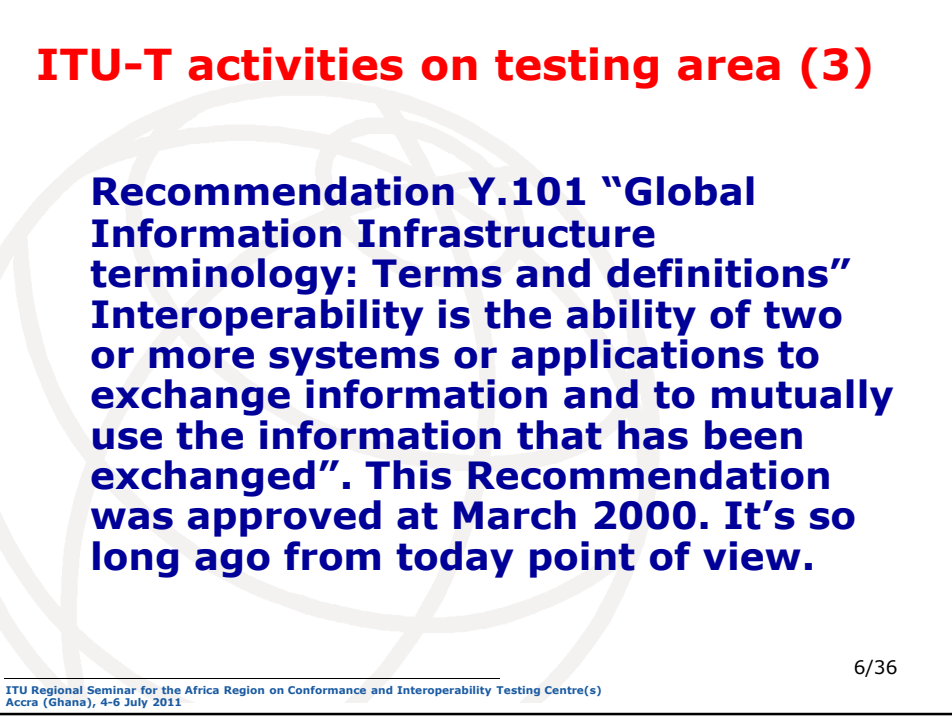


## **What is the interoperability today?**

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## **ITU-T activities on testing area (3)**



**Recommendation Y.101 "Global Information Infrastructure terminology: Terms and definitions" Interoperability is the ability of two or more systems or applications to exchange information and to mutually use the information that has been exchanged". This Recommendation was approved at March 2000. It's so long ago from today point of view.**

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## **The testing methodology history (1)**

- 1. 1995, ITU-T (X.290), ETSI (ETS 300406) – conformance testing based on the ISO/IEC 9646 and specific telecommunication criteria and features.**
- 2. 1999, ETSI (TR 101667) – Network Integral (Interconnection) testing (end-to-end, node-to-node).**

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## **The testing methodology history (2)**

**The conformance testing goal is the specification profiles verification. The network testing goal is the correct, integrity and reliability services for users.**

**The table 1 ETR 101 667 defines the users of both methodologies. The conformance testing methodology users are the vendors at first place and Administrations and operators optionally, the network testing methodology users are the Administrations and operators only**

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## **The testing methodology history (3)**

**The methodology of the model network using for network testing was proposed at ITU-T in 2004 (Q.39xx series)**

**The model network is the network, which simulates the capabilities similar to those available in present telecommunication networks, has a similar architecture and functionality and users, the same telecommunication technical means**

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## **The NGN testing experience**

**ZNIIS Model Network (2004-2011, SSW, IMS, BBA) 6973 tests – 7 % unsuccessful tests**

**Plug Test ETSI (Slovenia, 2008, IMS)  
410 tests – 18% unsuccessful tests  
(Joint ITU-T/ETSI meeting, Moscow, ZNIIS, 10 April, 2009)**

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## Last approval the Q.39xx Recommendation list

- Q.3900** Model Network Architecture (08)
  - Q.3901** NGN testing specification (08)
  - Q.3903** Knowledge Data Base (08)
  - Q.3904** NGN (IMS testing specification) (10/10)
  - Q.3906.1** Broadband access testing specification (wired) (06/10)
  - Q.3909** An overview of NGN Interoperability testing methods (draft)
  - Q.3910** Monitoring parameters set for NGN protocols (06/10)
  - Q.3911** Monitoring parameters set for voice services in NGN (06/10)
- Handbook on testing (09/11)**

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## ITU-T Rec. Q.3900 as a global approach of testing

**Purpose – determination of the Model network as a basic solution for NGN testing**

**Model network** – a network which simulates the capabilities similar to those available in present telecommunication networks, has a similar architecture and functionality and uses the same telecommunication equipment


### **Contents of Q.3900**

- Classification of NGN TM regarding the NGN functionality (Y.2012)
- Determination of testing procedures
- Requirements to the Model network

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# Basic Methodology of NGN testing. ITU-T Recommendation Q.3900 (09/2006)

 INTERNATIONAL TELECOMMUNICATION UNION  
**ITU-T**  
 TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU  
**Q.3900**  
 (09/2006)  
 SERIES Q: SWITCHING AND SIGNALLING  
**Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks**

**CAUTION!**  
**PREPUBLISHED RECOMMENDATION**  
 This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

**Contents**

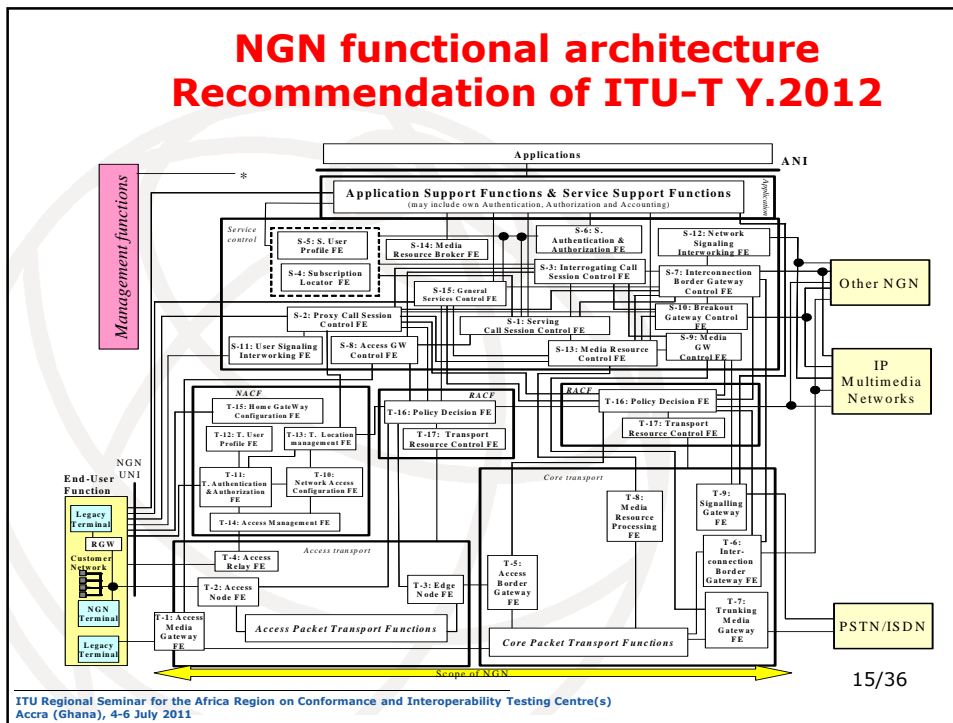
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ITU-T Rec. Q.3900 (09/2006) – Prepublished version

## Classification of NGN Technical Means to be tested

- **Call Session Control System**
  - Media Gateway Controller (MGC)
  - Proxy Server SIP (PS)
  - IP Multimedia Subsystem (IMS)
- **Voice and signaling transmit system**
  - Media Gateway (GW)
  - Signaling Gateway (SG)
  - Transport Network Environment (TNE)
- **Application servers**
  - Application Server (AS)
  - Media server (MS)
  - Messaging Server (MeS)
- **Management and billing system**
  - Management System (MS)
  - Billing system (BS)
- **Access Environment**
  - NGN Integrated Access Devices (NGN-IAD)
  - Media gateway for Legacy Terminal Equipment (GW-LTE)

# NGN functional architecture Recommendation of ITU-T Y.2012



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## Conformance of NGN Functions to NGN Technical Means to be tested

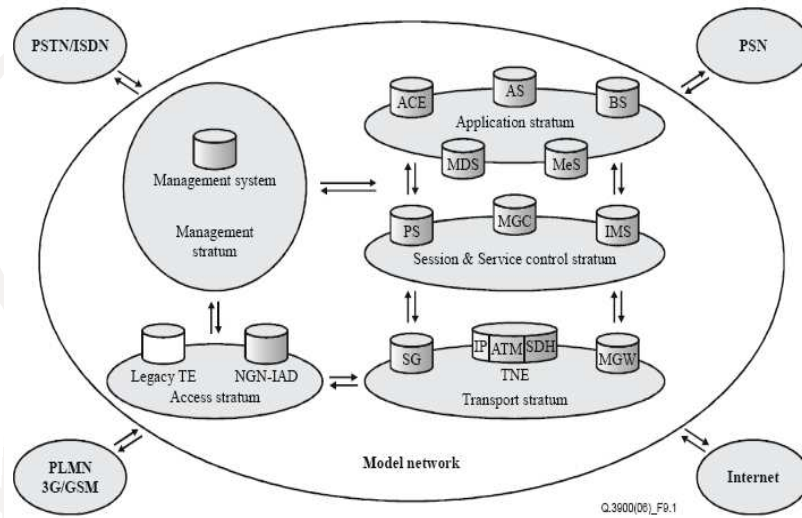
NGN Technical means	NGN Functionality
<b>Call Session Control System</b>	
Media Gateway Controller (MGC)	S3, S7, S9, S10, S12 T10, T11, T12, T13
Proxy Server SIP (PS)	S2, S3, S7, S11, S12 T10, T11, T12, T13
IP Multimedia Subsystem (IMS)	S1, S3, S6, S7, S8, S10, S12, S13 T10, T11, T12, T13, T14, T15, T16, T17
<b>Voice and signaling transmit system</b>	
Media Gateway (GW)	T7, T8
Signaling Gateway (SG)	T8, T9
Transport Network Environment (TNE)	T5, T6, T8
<b>Application servers</b>	
Application Server (AS)	S4, S5, S6, S14, S15
Media server (MS)	S4, S5, S6, S14, S15
Messaging Server (MeS)	S4, S5, S6, S14, S15
<b>Management and billing system</b>	
Management System (MS)	- error processing management - equipment configuration management
Billing system (BS)	- billing system management - service management - security management
<b>Access Environment</b>	
NGN Integrated Access Devices (NGN-AD)	T2, T4, T3, T5, T15, T14
Media gateway for Legacy Terminal Equipment (GW-LTE)	T1, T2, T3, T4, T5

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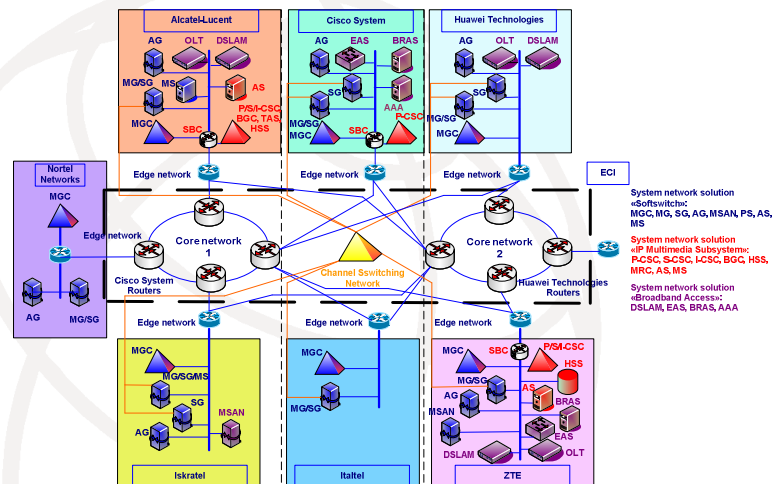
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## Architecture of model network



## ZNIIS Technopark Model network



**Rec. ITU-T Q.3900 Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks**

## **The services interoperability testing (1)**

**The ITU –T recommendations on the services interoperability testing are absent today. Furthermore, the service scenarios for important NGN services are absent too. It's very complicated problem today, but during ITU-T study period 2009-2012 the key recommendations set for service interoperability testing should be developed**

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## **The services interoperability testing (2)**

**The detailed requirements for the services implementation should be developed. It could be include:**

- **service definition and features**
- **network capabilities**
- **network architecture and function elements**
- **access network types and user equipments**
- **service delivery scenarios**
- **call flows**
- **reference points and protocols**
- **service implementation on the non-IMS network**
- **interworking with others services**

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## **The services interoperability testing (3)**

**The testing scenarios, list and types of tests for NGN TS1 basic call and supplementary services, NGN TS1 streaming services and NGN TS1 multimedia services should be developed as separately ITU-T Recommendations**

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## **The Q.39xx recommendation list (services testing)**

**Q.3945** – TS1 (will be approve in Sept. 2011)

**Q.3946** – Testing scenarios, list and types of tests for NGN (TS1) basic call and supplementary services

**Q.3947** - Testing scenarios, list and types of tests for streaming services (TS1)

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## **The QoS interoperability aspects**

**The many networks are realized NGN concept. At first, of course, it's the basic IP network. Furthermore, it could be WiFi (based on Ethernet technology), IPTV and so on**

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## **The QoS interoperability aspects**

**The some QoS mechanisms were developed for QoS supporting at IP-based networks. The recommendation Y.1291 which was approved in 2004 determine four standardized approaches for QoS supporting: Integrated services (IntServ), Differentiated services (DiffServ), MultiProtocol Label Switching (MPLS), IPCablecom Dynamic QoS**

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## **The exist problematic on QoS support**

- ✓ **The network deployment based on packet switching technologies**
- ✓ **Service distribution without correspondence with telecommunication technologies**
- ✓ **The payload increase in transport network in consequence of increase broadband of access layer (on 50 % each of the year) Jakob Nielsen**
- ✓ **Heterogeneous network environment (TDM and IP)**
- ✓ **Reduce of reliability rate in case of usages different vendors solutions**

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## **The typical approach and common problems on QoS astimation**

**At the moment the three basic approach are widely used for estimation quality of distributed media-information contents on the exist operators networks (Rec. ITU-T G.1011):**

- **active (intrusive, PESQ, POLQA)**
- **passive (non-intrusive, P.563)**
- **modeling (E-model)**

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## **The common problems**

### **Active (intrusive, PESQ, POLQA)**

the auxiliary test service traffic QoS estimation on the exist network does not give the objective situation on speech quality on the hole network

### **Passive (non-intrusive, P.563)**

Comparison with the standardized model of the traffic/service (the various services and their profiles complicates process of control – model standardization is required)

### **E-model**

The mathematical model having a divergence with real technical telecom solutions, applied on an operator network

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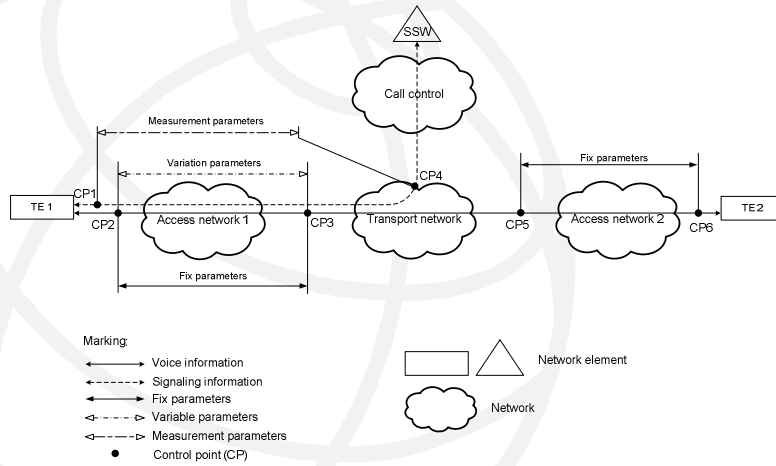
## **INNOVATION APPROACH ON ESTIMATION AND SERVICE QUALITY CONTROL**

- Measurement and finding the limit values for Network performance and network productivity for each network segment for distributing service sessions (Model network – common instrument for this task)**
- Implementation probes on real networks which can simulate services like distributed on exist operators network and which can monitoring/control quality of service**

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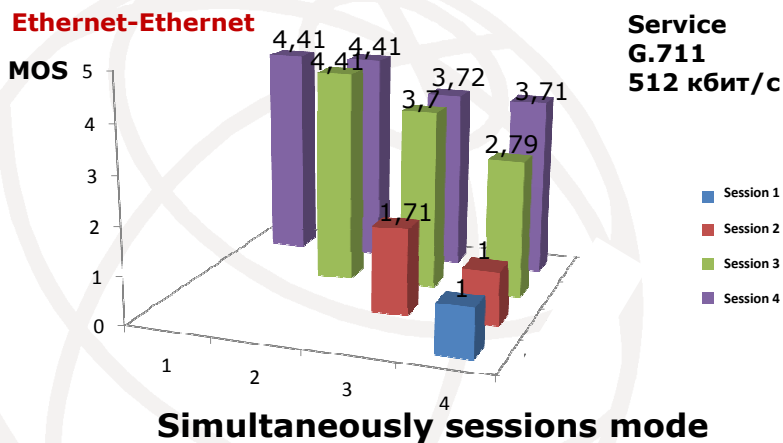
## THE ARCHITECTURE OF MODEL NETWORK FOR NETWORK PERFORMANCE, QOS AND NETWORK PRODUCTIVITY TESTING



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## Substantiation of innovation approach necessity (joint project ITU-ZNIIS CIS-08)



**LNCS. Springer 2011 "Limited values of network performance and network productivity estimation approach for services with required QoS. Service Benchmarking"**  
Denis.Andreev, Konstantin.Savin, Victor.Shalaginov, Viya.Zharikova, Sergey.Ilin

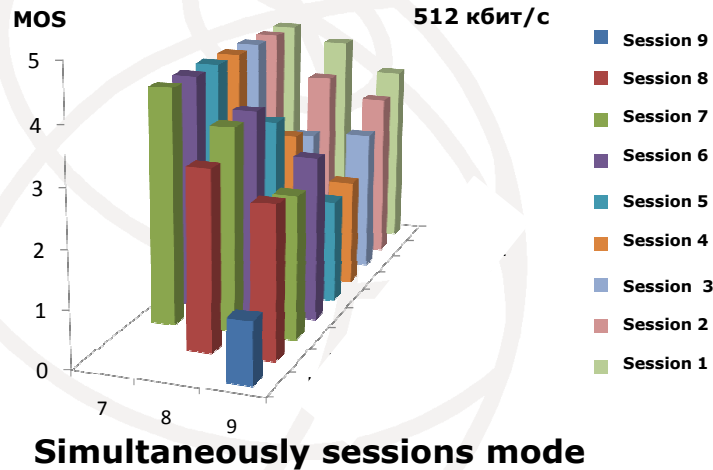
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## Substantiation of innovation approach necessity (joint project ITU-ZNIIS CIS-08)

Ethernet-DSL

Service  
G.729  
512 кбит/с



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## Key tasks for estimation QoS on the Model networks

- ✓ The norms on QoS/NP on the network segment determination for different telecom technologies and services
- ✓ Service modeling
- ✓ Benchmarking solutions and networks
- ✓ Interoperability testing
- ✓ Testing on RFP conformance
- ✓ Determination of optimal functionality of QoS support system before implementation on network
- ✓ Practical training courses for increase network operator's personal qualification

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## Benchmarking Recommendations list (1)

- |                           |  |
|---------------------------|--|
| <b>Q. Bench-IMS-NGN-A</b> | <b>IMS/NGN Performance Benchmark Part 1: Core Concepts</b>                                 |
| <b>Q. Bench-IMS-NGN-B</b> | <b>IMS/NGN Performance Benchmark Part 2: Subsystem Configurations and Benchmarks</b>       |
| <b>Q. Bench-IMS-NGN-C</b> | <b>IMS/NGN Performance Benchmark Part 3: Traffic Sets and Traffic Profiles</b>             |
| <b>Q. Perf-Bench-IMS</b>  | <b>IMS/NGN Performance Benchmark Part 4: Delay objectives for various IMS transactions</b> |

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## Benchmarking Recommendations list (2)

- |                           |  |
|---------------------------|--|
| <b>Q. Bench-PES NGN A</b> | <b>PES Performance Benchmark Part 1: Core Concepts</b>                           |
| <b>Q. Bench-PES NGN B</b> | <b>PES Performance Benchmark Part 2: Subsystem Configurations and Benchmarks</b> |
| <b>Q. Bench-PES NGN C</b> | <b>PES Performance Benchmark Part 3: Traffic Sets and Traffic Profiles</b>       |

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## Conclusions

1. The main goal of testing today should be network testing (interoperability) for supporting the correct, integrity and reliability services for users.
2. This goal could be supported by Model network methodology.
3. The interoperability issues include the technical means, services, QoS classes and parameters. All of these features create the Global Interoperability, which could be tested on the Model network in complex.

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Thank you for your  
attention !!!



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