PSTN/ISDN emulation and IMS/NGN Reference Benchmarking

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Presentation Outline

- Why is IMS Benchmarking needed
- History
- Benchmark Development Process
- Benchmark Information Model
- Use-case
- Call flow
- Load profile
- Metrics and design objectives
- Benchmark Test
- Benchmark report
- Q.3933 “Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks”

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 work load
  - Define the metrics to be measured
  - Standardize the test procedure, the test parameters and the Benchmark test report

History

- 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*

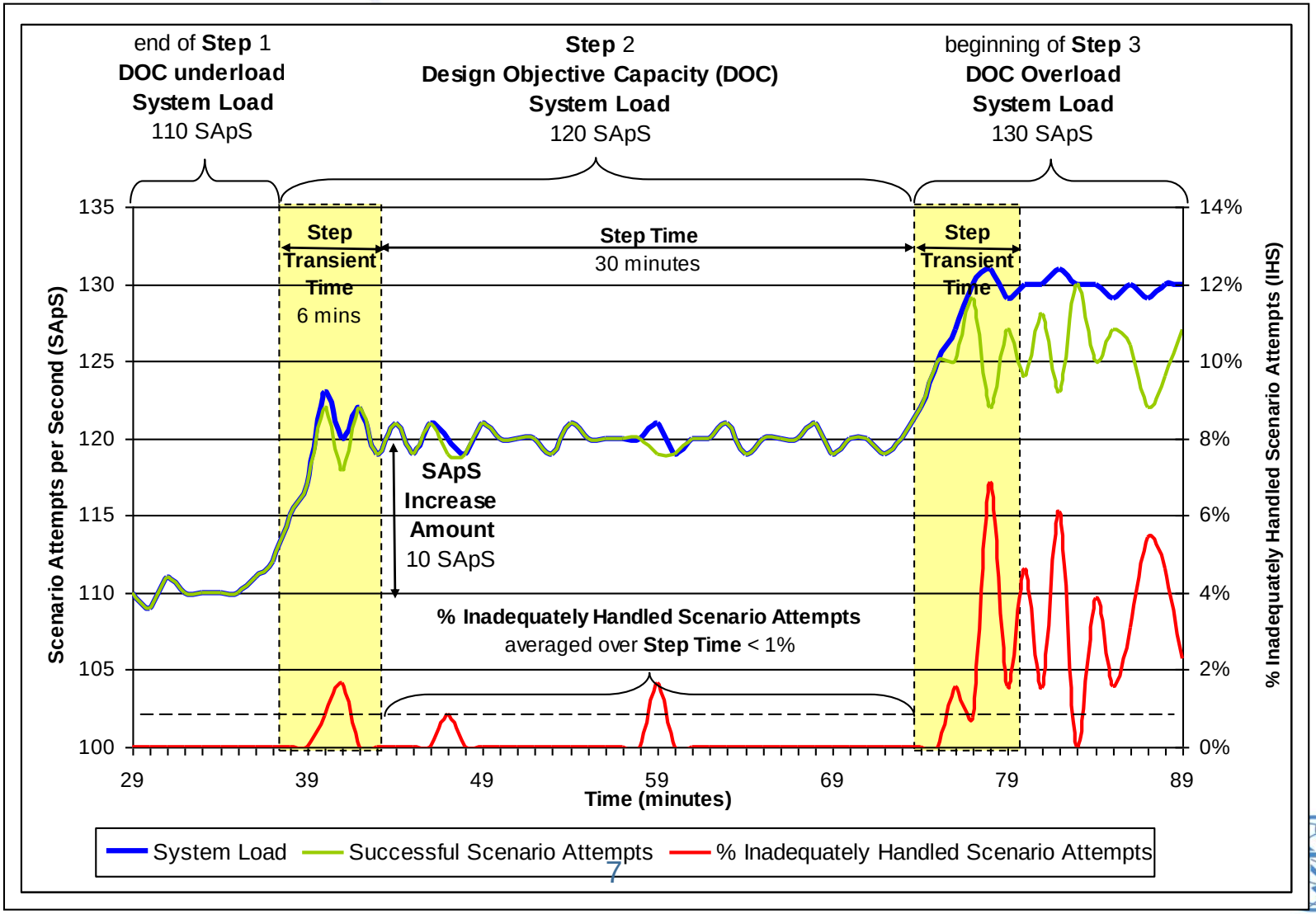
History

- 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

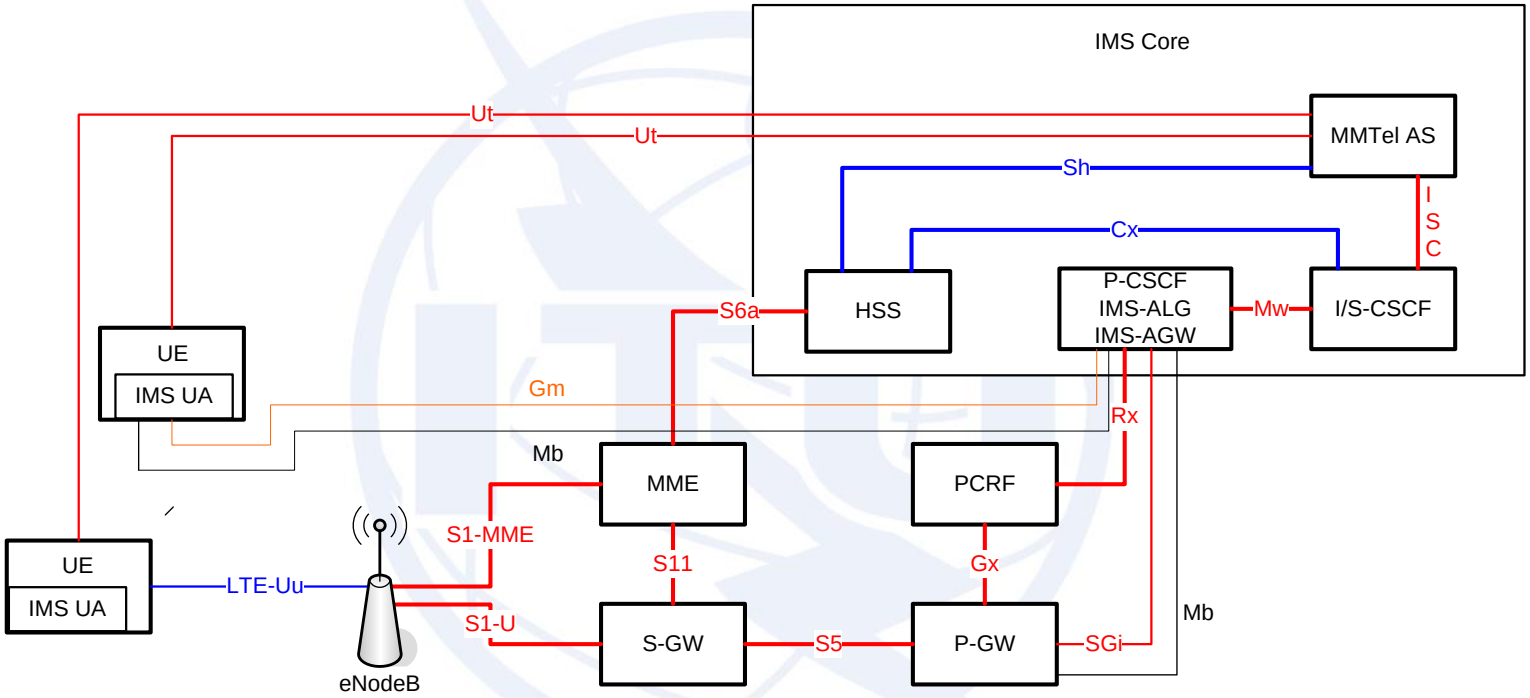
Involved Bodies

- **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

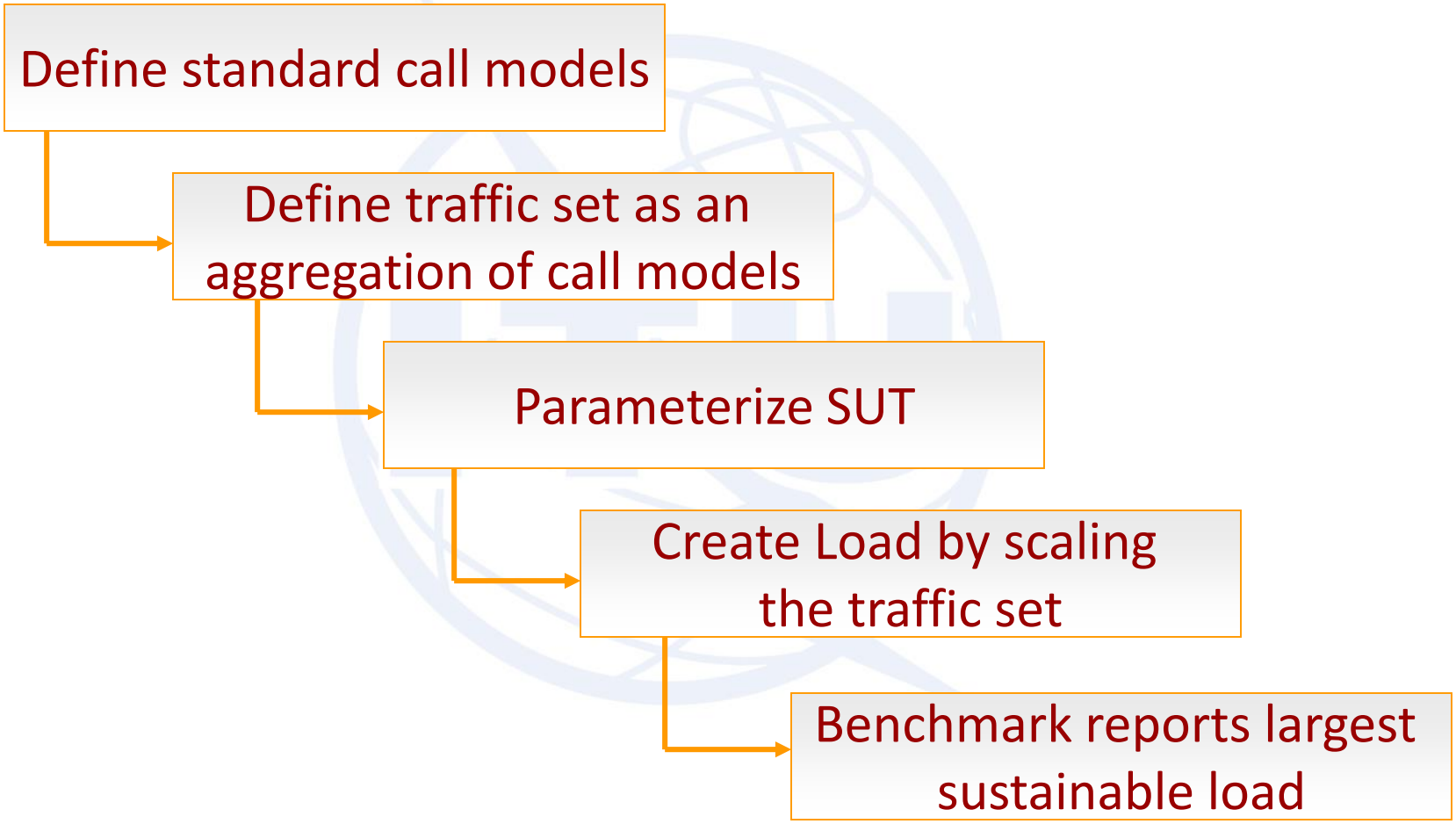
Motivating Example



Scope of IMS/LTE Performance Benchmarking



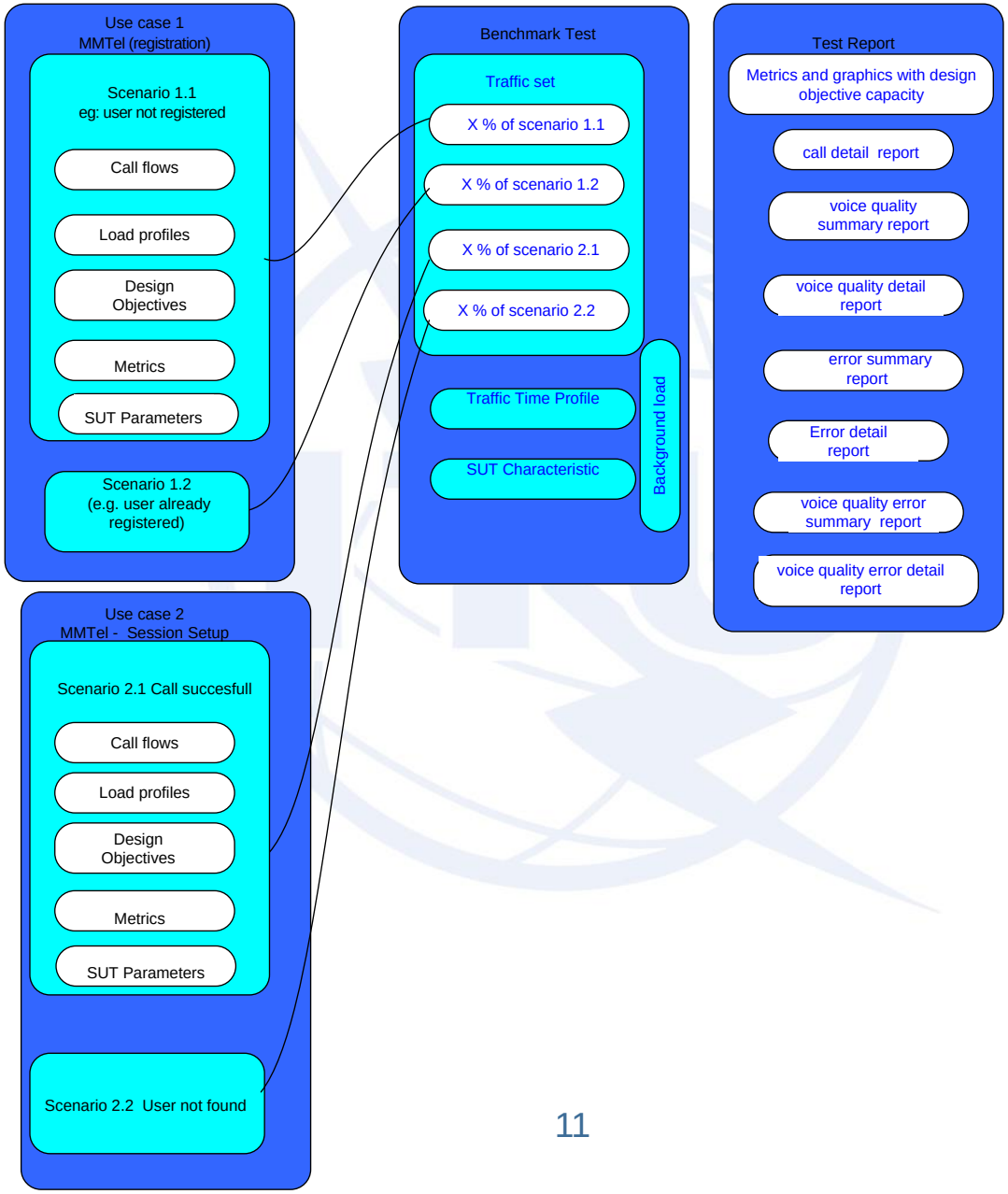
Benchmark Development Process



Use-case

- The top level of the individual behavioural model is the use-case. A use-case describes the goal that a user has in interacting with a system

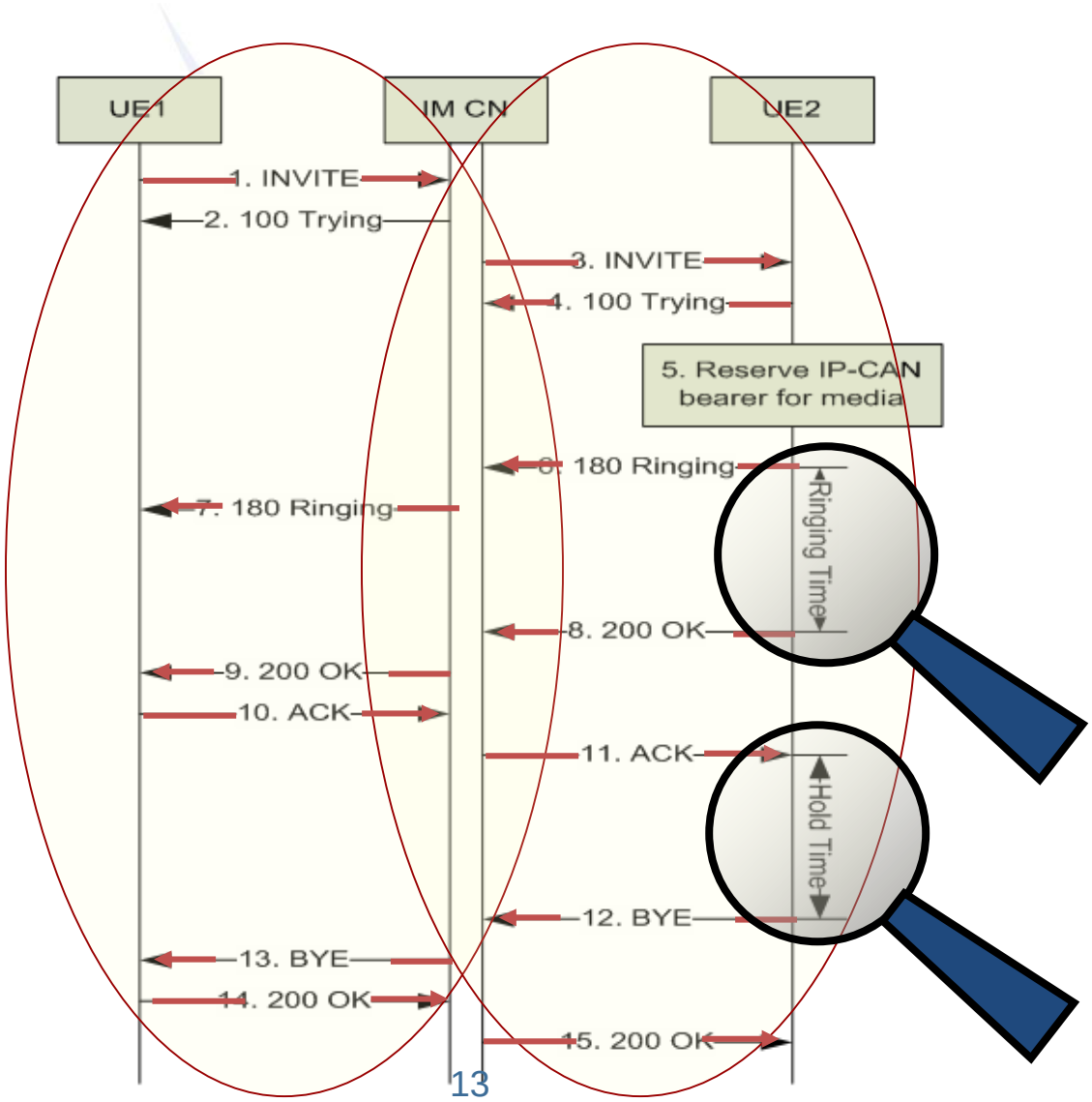
Benchmark Information Model



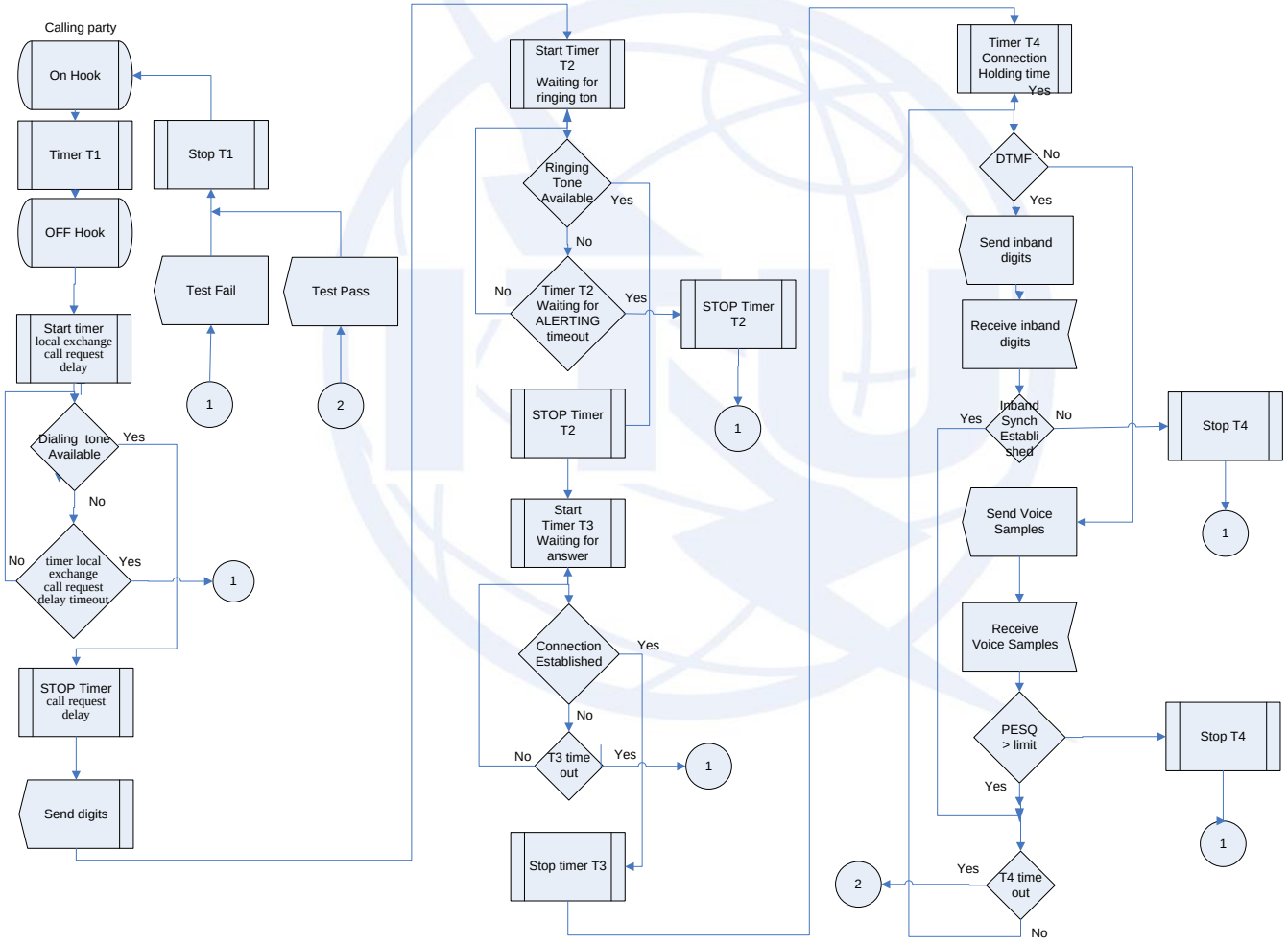
IMS/LTE Use Cases

- IMS/PES to IMS/PES
- Registration/de-registration use-case
- MMTel to MMTel Use case
- ISDN to MMTel Use case
- MMTel to ISDN Use case
- MMTel to PSTN Use case
- PSTN to MMTEL Use case
- ISDN to VoLTE Use case
- VoLTE to ISDN Use case
- VoLTE – PSTN Use case
- PSTN to VoLTE Use case
- VoLTE to VoLTE Use case
- VoLTE to MMTel Use case
- MMTel to VoLTE Use case

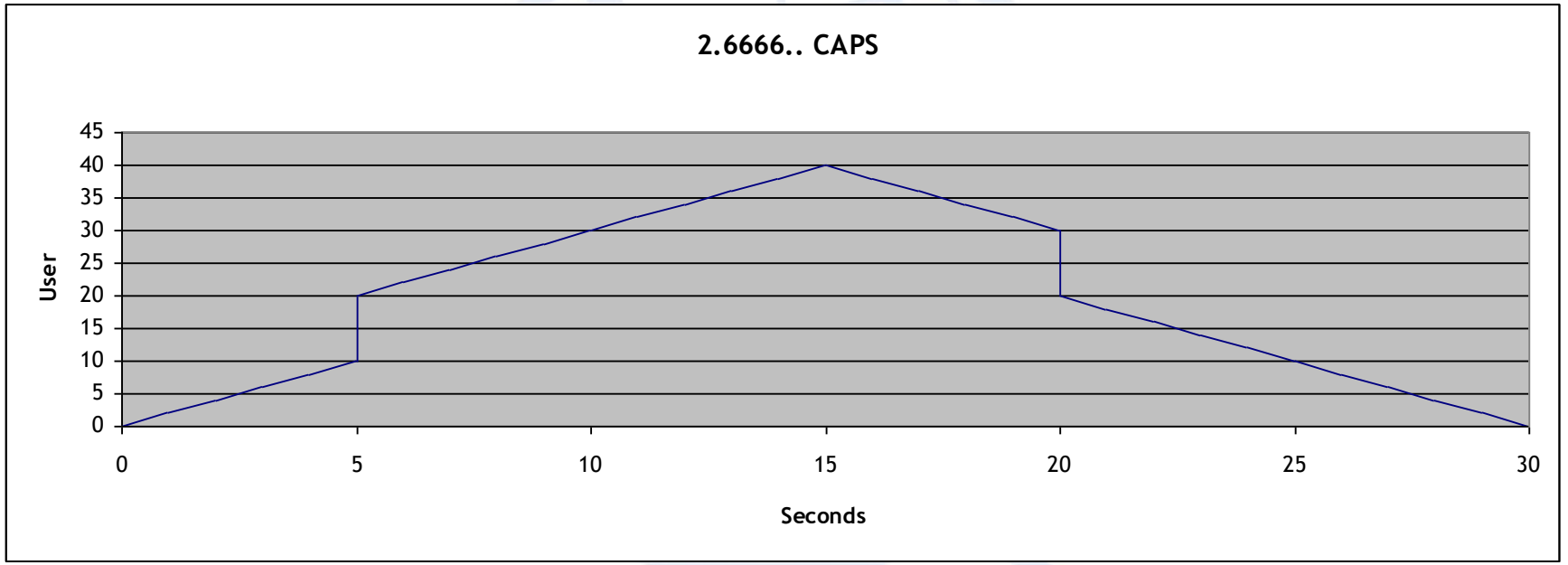
IMS/LTE Scenario Example: IMS Call



Call flow example IMS/PES environment calling side



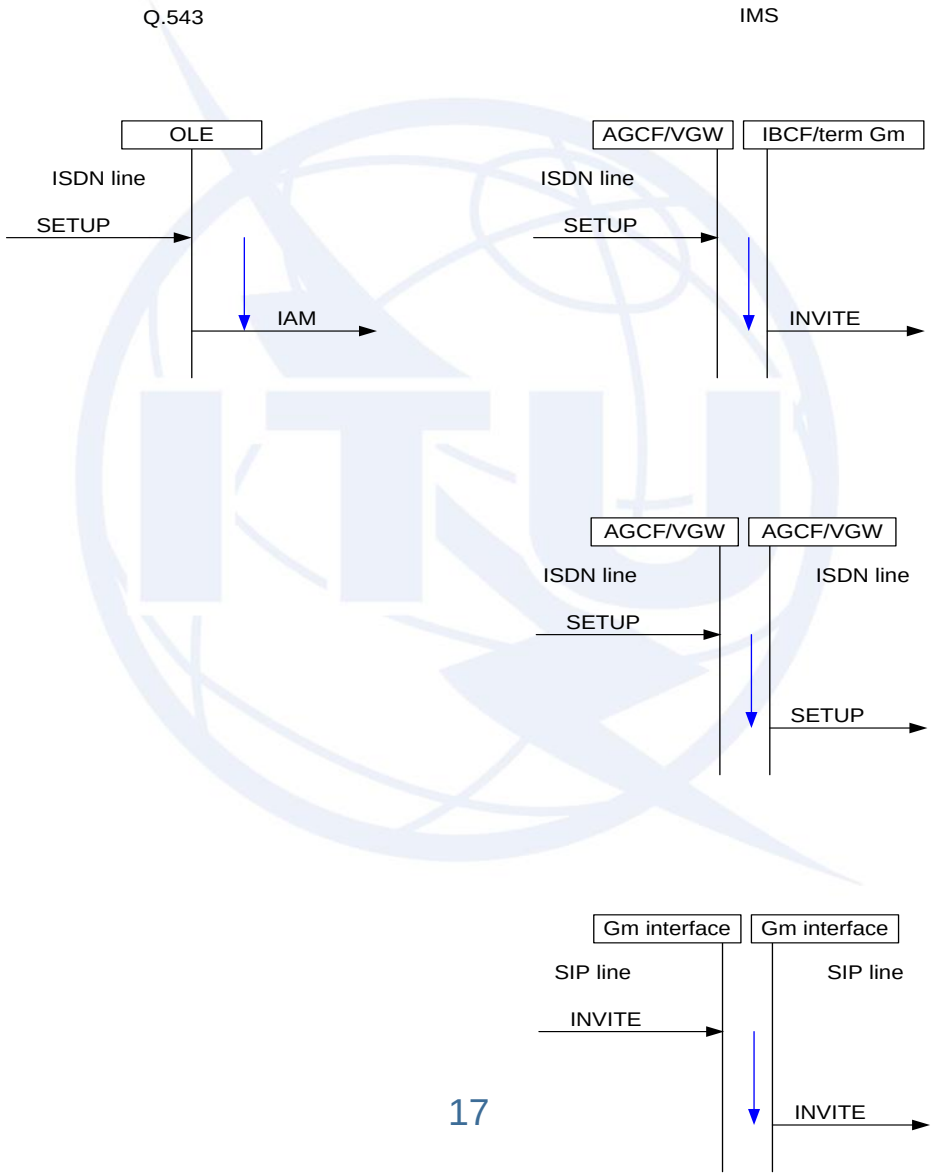
Load profiles example



Metrics and design objectives
Delay probability (1)

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Call set up delay: en Block sending is used						
ISDN SUBSCRIBER LINES **Call set up delay using en-block signalling.**	clause 2.4.3.1 [2] Exchange call setup delay for originating outgoing traffic connections. For call attempts using en-bloc sending Call set-up delay is defined as the interval from the instant when the signalling information required for routing is received from the incoming signalling system until the instant when the corresponding signalling information is passed to the outgoing signalling system. The time interval starts when the SETUP message received contains a "sending complete indication" or when the address information necessary for call set-up is complete and ends when the call setup is sent on the outgoing signalling system.	ISDN [3] Call set-up delay is defined as the interval from the instant when the signalling information including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding INVITE signalling information is passed to the Ic interface.	≤ 450 ms	≤ 650 ms	≤ 800 ms	≤ 950 ms
		ISDN [3] Call set-up delay is defined as the interval from the instant when the signalling information including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding INVITE signalling information is passed to the terminating Gm interface.	≤ 350 ms VGW ≤ 400 ms	≤ 550 ms VGW ≤ 600 ms	≤ 700 ms VGW ≤ 800 ms	≤ 850 ms VGW ≤ 1 000 ms
		ISDN [3] Call set-up delay for Internal traffic is defined as the interval from the instant when the SETUP including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding SETUP signalling information is passed to the called line signalling system (see note).	≤ 350 ms VGW ≤ 500 ms	≤ 550 ms VGW ≤ 750 ms	≤ 700 ms VGW ≤ 1 000 ms	≤ 850 ms VGW ≤ 1 200 ms
IMS SUBSCRIBER Call set up delay using for Internal traffic.		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Gm interface to the called user.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms
		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Ic interface to the called user (without preconditions).	≤ 350 ms	≤ 550 ms	≤ 700 ms	≤ 850 ms
NOTE: **If SC (#) is not included the setup delay may increase up to the digit collection timer (15 s).**						

Metrics and design objectives
Delay probability (2)



Traffic Set Example

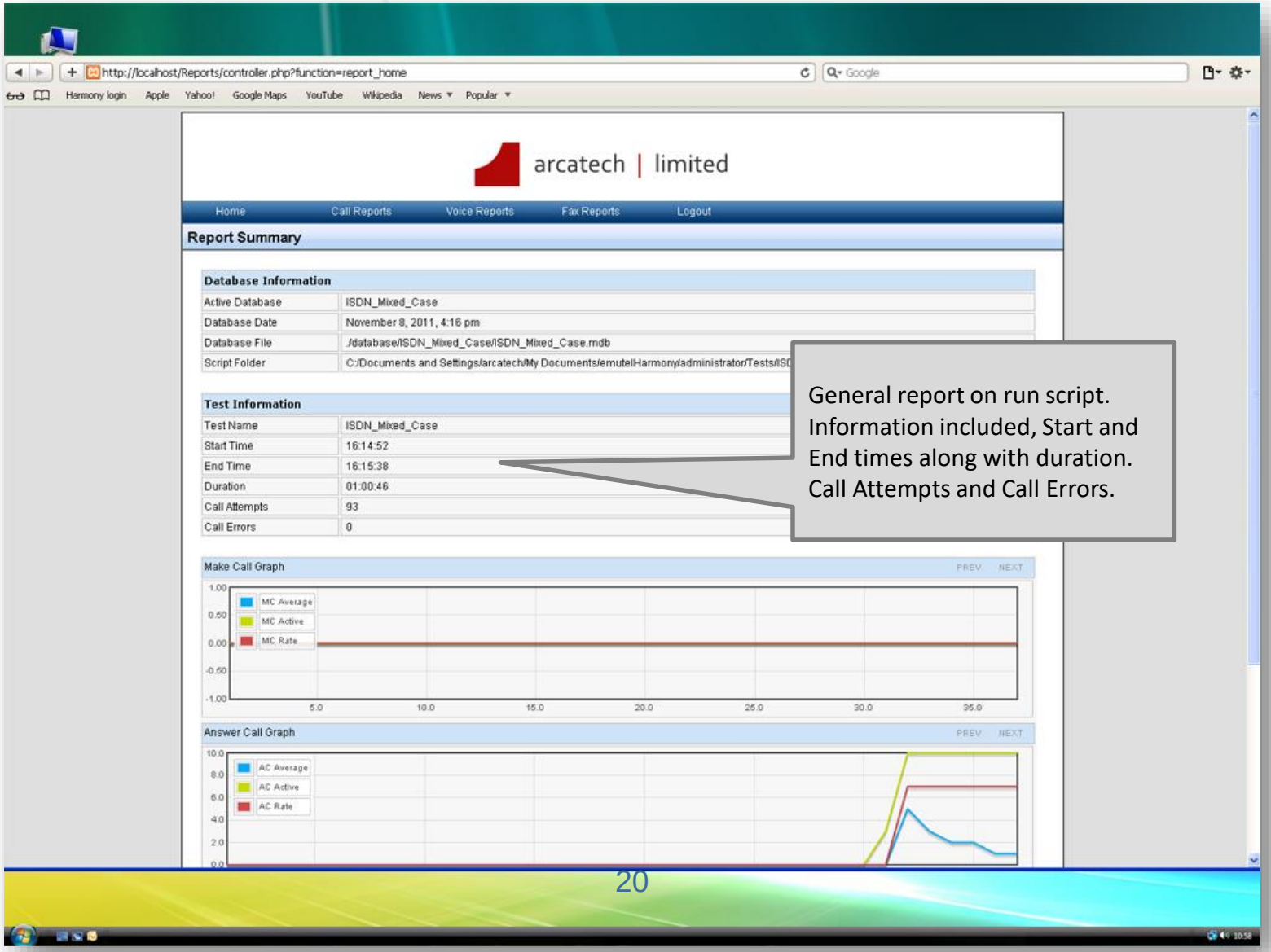
- Traffic mixture: a combination of percentages of all scenarios

Use Case Section	Test Scenario	Scenario % of System Load	Scenario Arrival Distribution	Scenario Duration Distribution
Use case 1	Scenario1.1	20 %	Poisson	Mean = 110 sec
	Scenario 1.2	20 %	Poisson	Mean = 110 sec
Use case 2	Scenario 2.1	15 %	Poisson	Mean = 90 sec
	Scenario 2.2	15 %	Poisson	Mean = 90 sec
Use case 3	Scenario 3.1	15%	Poisson	Mean = 90 sec
	Scenario 3.2	15 %	Poisson	Mean = 90 sec

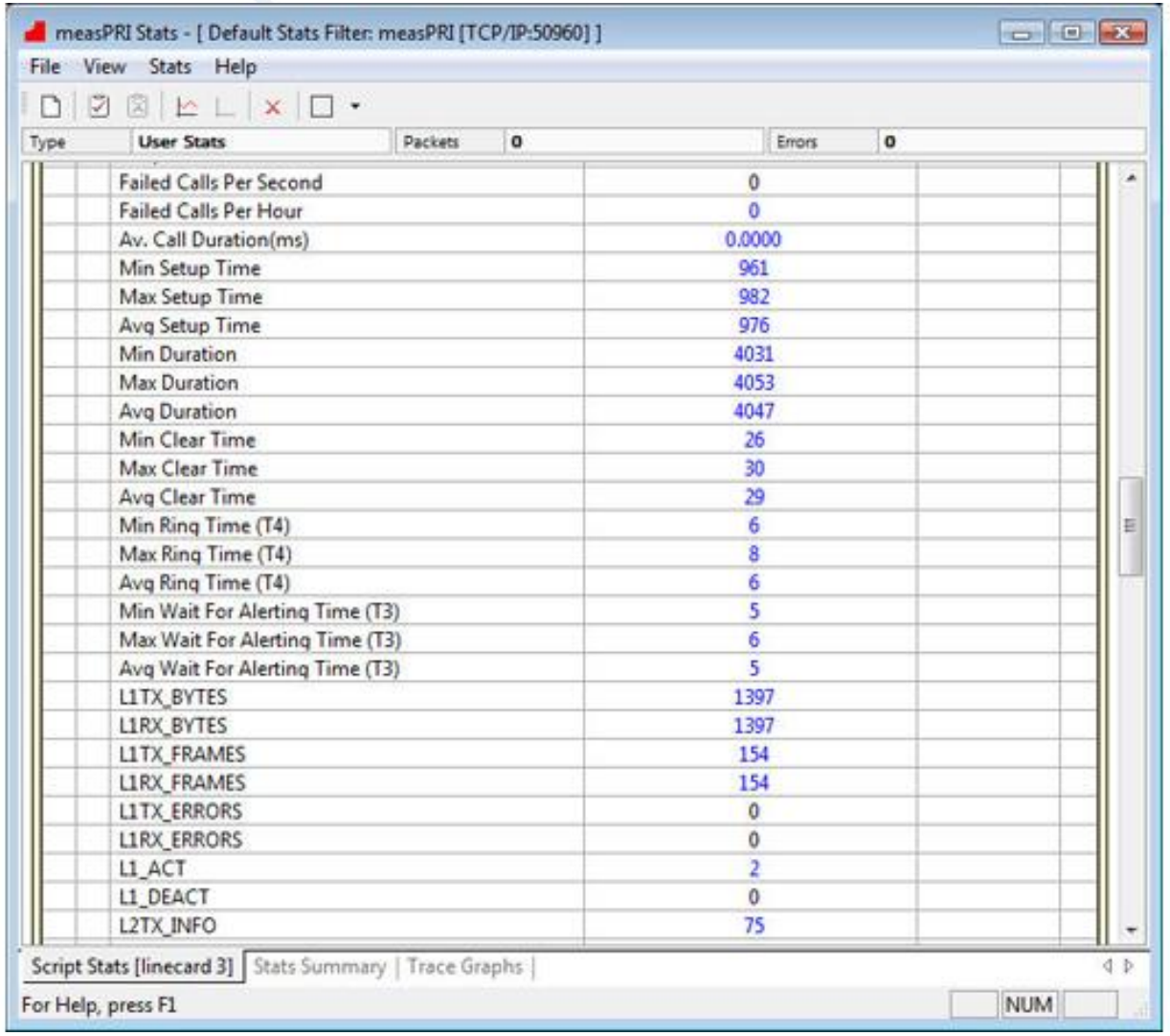
Benchmark report

- A test report is a document, with accompanying data files, that provides a full description of an execution of a benchmark test on a test system. The results of the test include data, represented as charts and data sets, depicting the behaviour of the SUT over the elapsed time of the test.

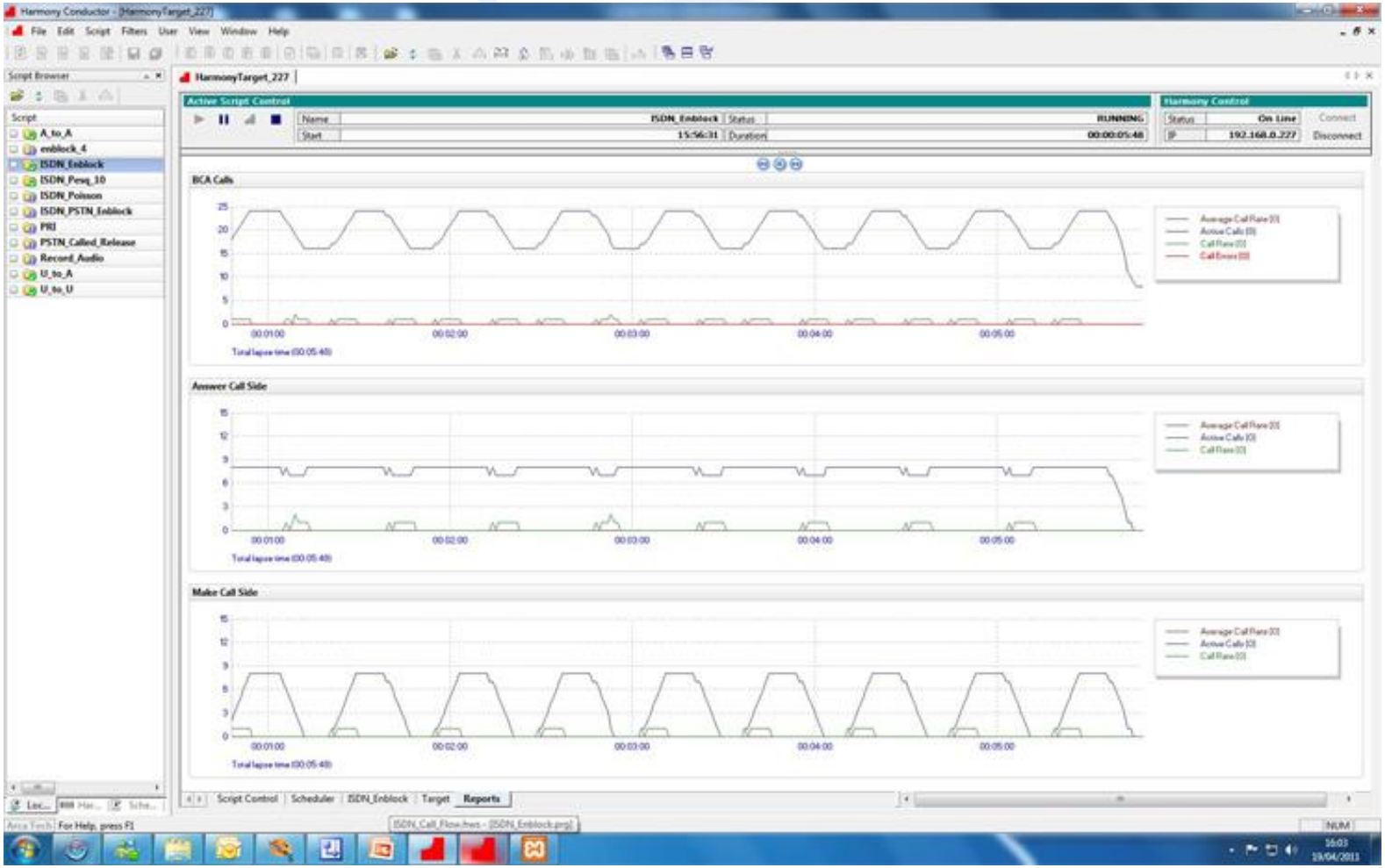
Report in the reality – Implementation Arcatech Implementation Arcatech



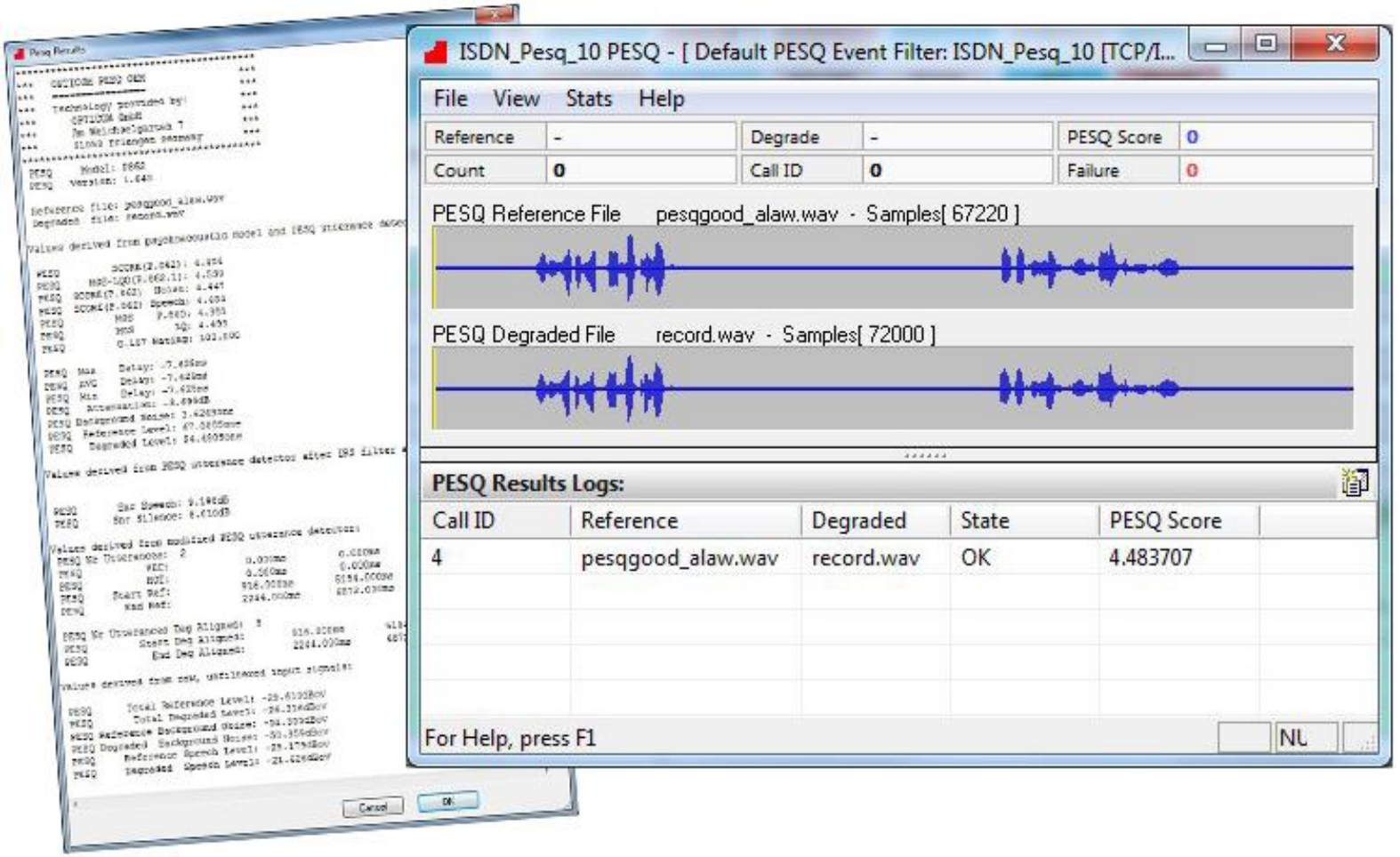
Metrics and design objectives in the reality – statistic Implementation Arcatech



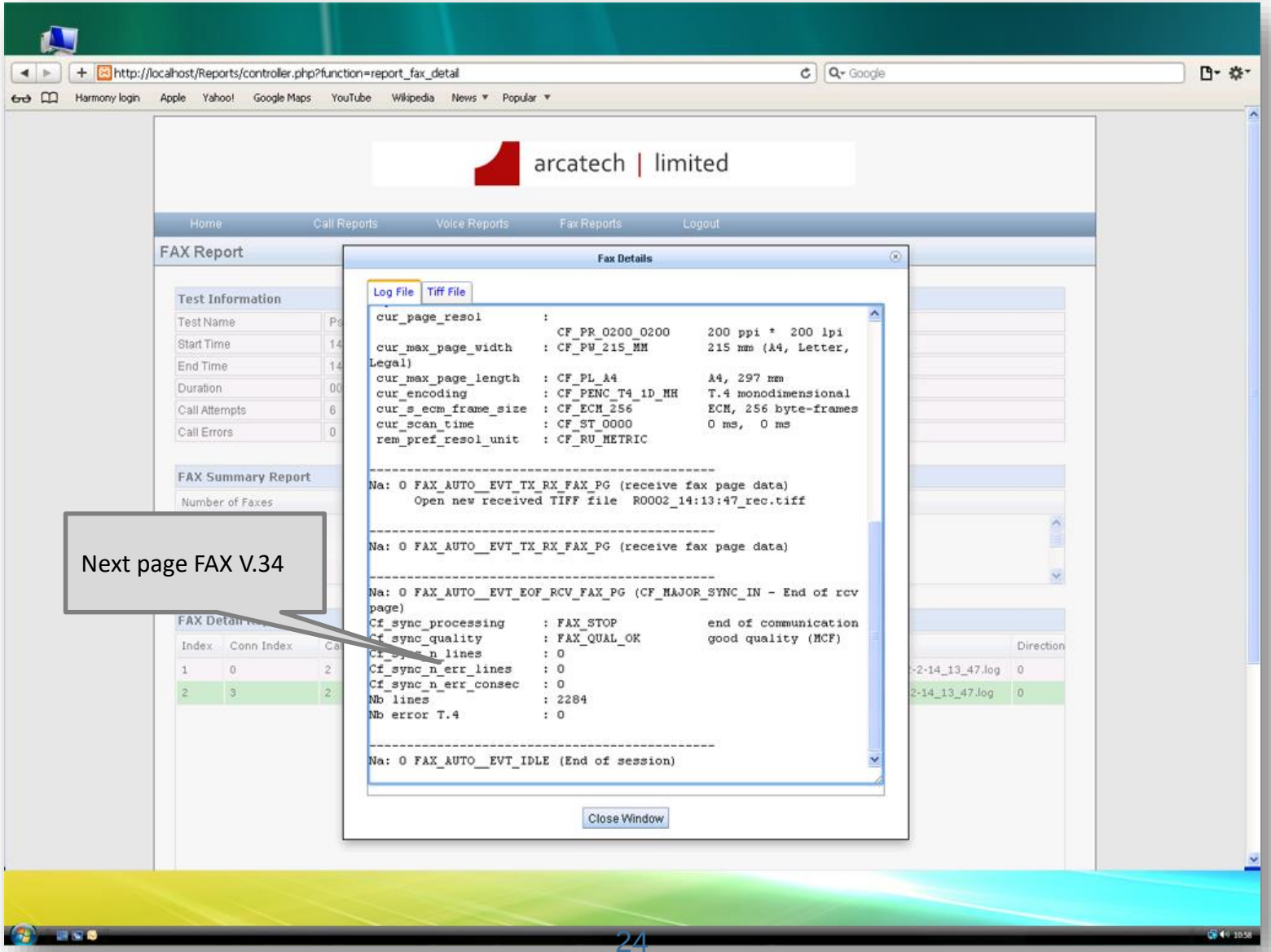
Metrics and design objectives in the reality - charts for ramp traffic Implementation Arcatech



Example of a call detail report in the reality Implementation Arcatech



Example of a V.34 FAX detail report in the reality Implementation Arcatech



Q.3933
Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks

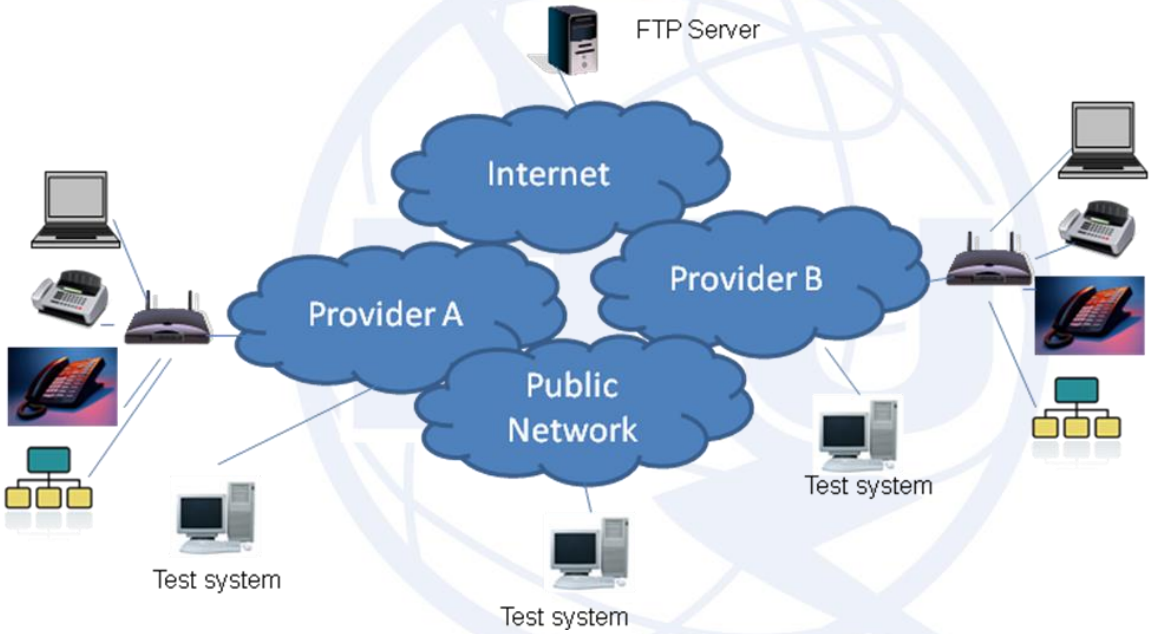
Scope

The Recommendation Q.3933 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.

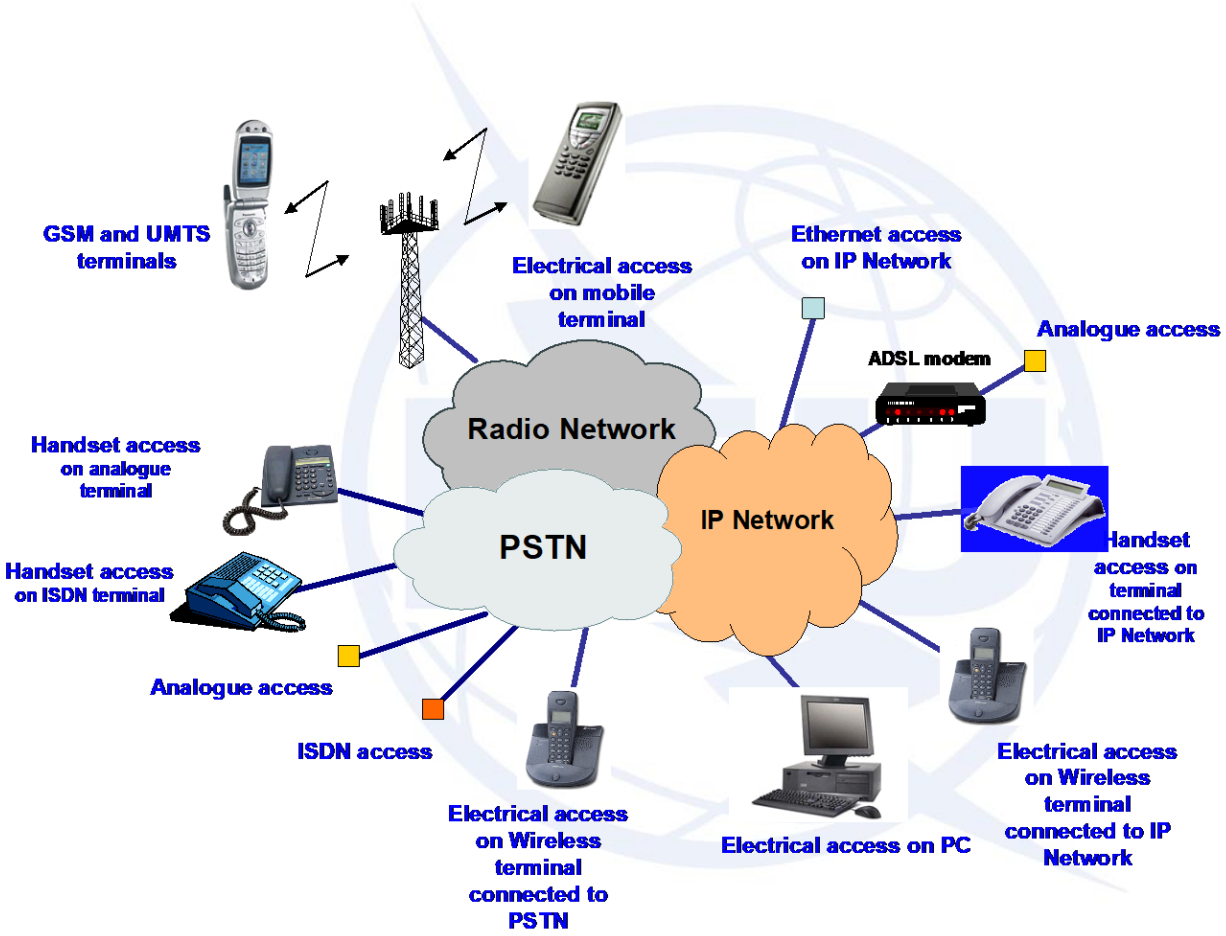
Setup of the multiplay and benchmarking platform



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).

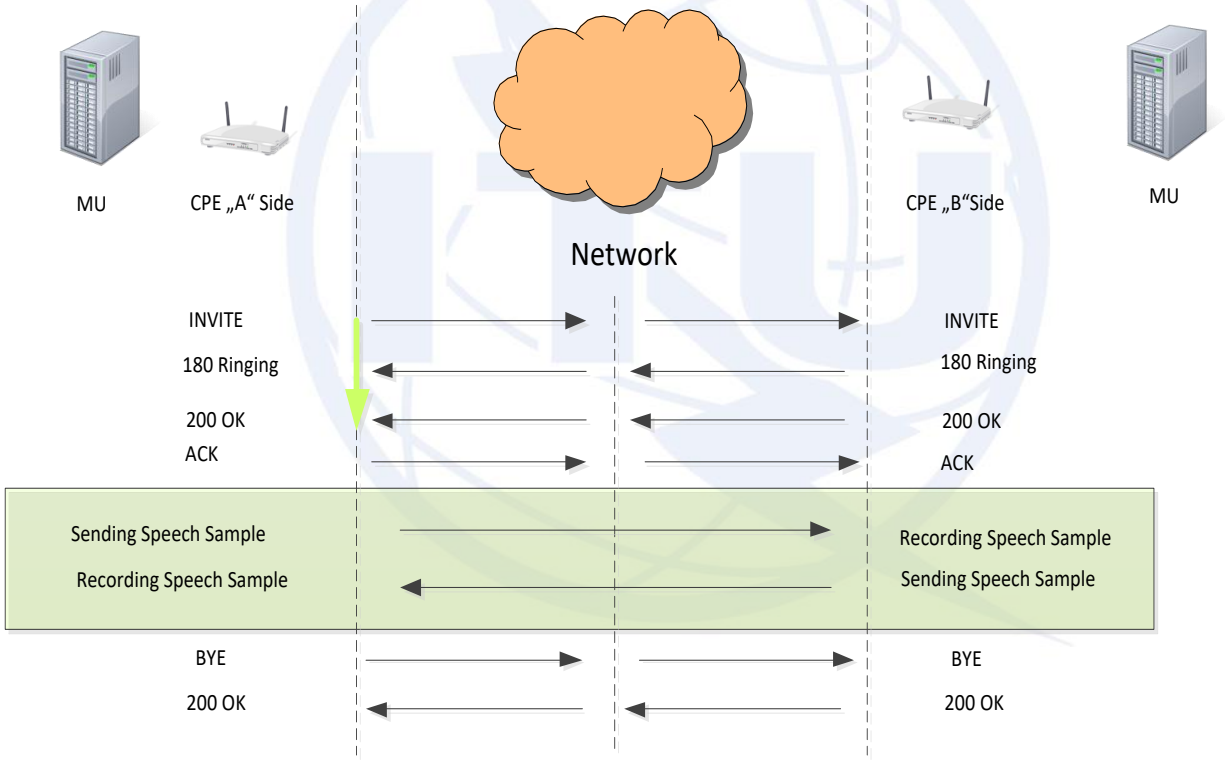
Possible configurations and interfaces in context of user characterization



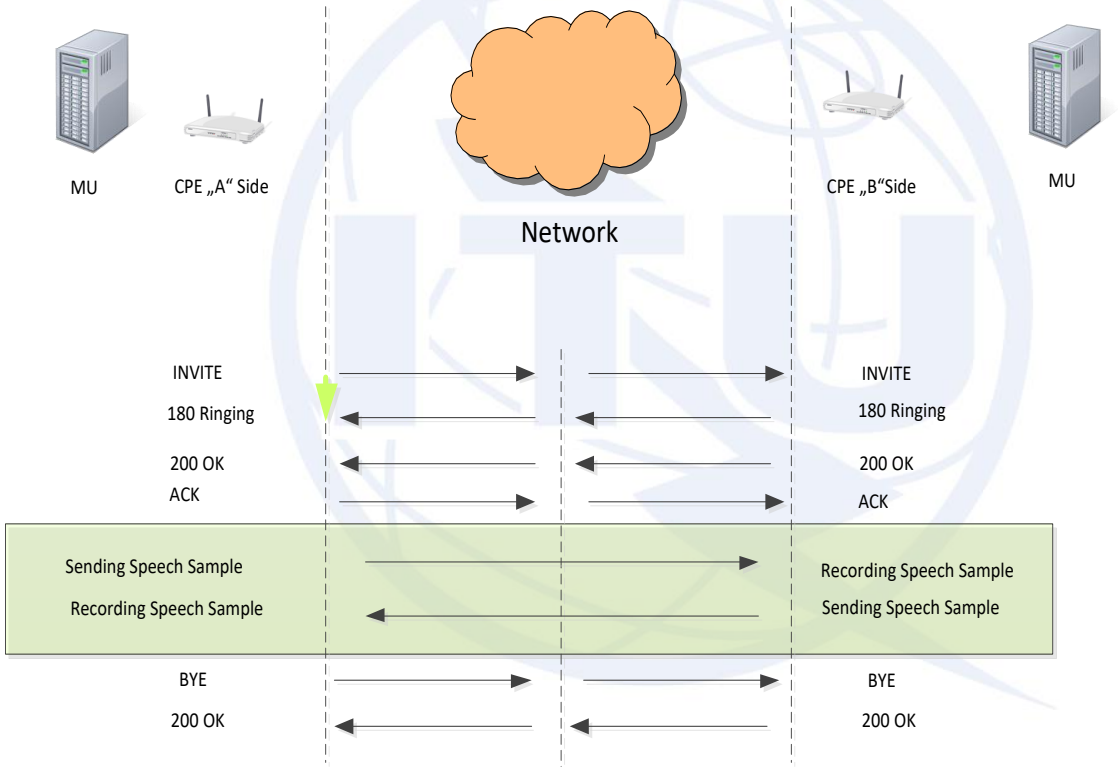
Overview of Quality characteristics for voice quality measurements

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)

Example: Call set-up time (1)



Example: Call set-up time (2)



Thank you!

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