



VoIP Conformance Labs

the Path to Excellence

ALBEDO Telecom Labs emulate actual VoIP architectures to execute acceptance, conformance and interconnectivity procedures.

The design of a VoIP, IPTV, or Multiplay network begins in a small scale model that permits to verify the Architecture and the Connectivity. The following features to address are the Quality and Performance that can be achieved by the protocols, nodes and terminals. This generally is a process previous to any massive investment and roll-out in order to ensure the protect answering questions like:

- **Design:** Is the VoIP network architecture good enough?
- **Conformance.** Are nodes/terminals conform to standards?
- **Selection Process:** Which is the most convenient VoIP phone to be used?
- **Quality Assurance.** Does the VoIP network fulfill end-to-end quality?
- **Connectivity.** Are terminals, nodes, and gateways 100% compatible?
- **Internetworking:** Do new deployments operate with other VoIP networks?
- **Protocols Trunking:** Is it possible interoperation with ISDN/POTS/GSM?
- **Monitoring Systems:** Is the Monitoring and Management System appropriate?
- **Compatibility.** Will VoIP calls work fine under heavy data traffic?

VoIP benchmarking

Specialised engineers may use testing suites to assure the conformance of VoIP equipment and networks on behalf of the certification authority. A VoIP testing suite is a set of procedures that can prove that a VoIP solution or service is compliant with the specifications. These procedures, based on international standards, are intended to assist during the development, and certify them before being installed, while bringing VoIP into service.

“It is not possible to verify VoIP compliance of nodes, terminals and applications using ad-hoc procedures”

Testing suites are not necessarily the unique methods for demonstrating compliance regarding quality, compatibility or internetworking, nevertheless suites are indeed a cost effective strategy and, for sure, the most efficient in terms of time and resources. Mind how difficult is to demonstrate compliance using empirical procedures to benchmark VoIP solutions using the real network: no control on traffic conditions, no test tools, no methodology, and no capacity to reproduce issues.



Lab Architecture

ALBEDO VoIP Laboratories are built on a rack that hosts three subsystems:

- Generation / Analysis of VoIP traffic;
- Emulation of actual traffic conditions;
- Simulation of network services; and
- Replication of a converged network.

These Labs are built using next-generation nodes and the network topology includes access, aggregation, backbone and CPE.

selected devices. An additional set of tests intended to analyse the effects of those parameters that determine VoIP QoE such as delay, jitter or lost; while using measurements as PESQ, PSQM, PAMS, R-Factor.

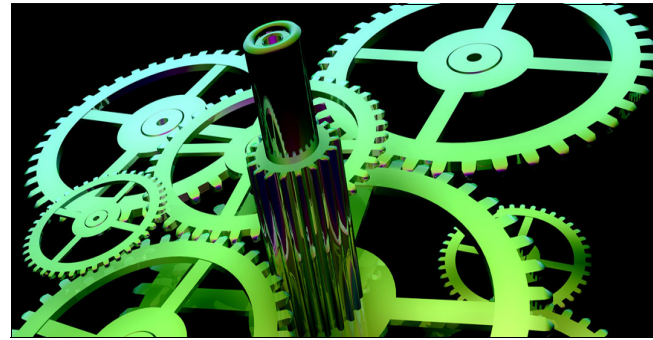
Traffic Conditions

All we know that many issues might occur to IP packets traveling to destination because congestion causes multiple events. For example, packet loss and packet delay affects VoIP causing voice skips, and quality degradation.

Therefore it is essential to emulate in the laboratory all of events and then measure how they modify VoIP quality. Some codecs, terminals and protocols have been designed to be tolerant with network events so that to minimize the incidence of traffic congestion, packet loss, jitter, delay, error, or duplications. Therefore we can which one manage better under actual traffic conditions.

For example, IPTV and VoIP receivers incorporate buffers that absorb the effects of delay variation without losing data. This minimizes the degradation of service but causes the unwanted effect of increasing the delay.

Net.Storm is the ALBEDO generator used to test the network and terminal response to common events and their effects in the form of degradation, will be parameterized following international standards.



that may eventually affect the performance of the measurements.

This point is important since ALBEDO Labs clearly separate signalling subsystem and networking layers to help engineers to identify causes of no conformance or interconnectivity problems.

“Speech level analysis of Voice quality”

100% Control

ALBEDO Telecom Labs build real converged network supporting VoIP services with which operators, carriers and service providers may wish to test and approve specific VoIP features, nodes or terminals which will be used on their actual network.

Comprehensive test suites designed by ALBEDO permit a deep analysis of VoIP terminals, routers and gateways interconnected as they really were on operation. Moreover, there are requirements that can not be verified by black-box techniques, but using a 100% controlled labs to stress the networks elements.

“Generate any SIP message to emulate complex transactions”

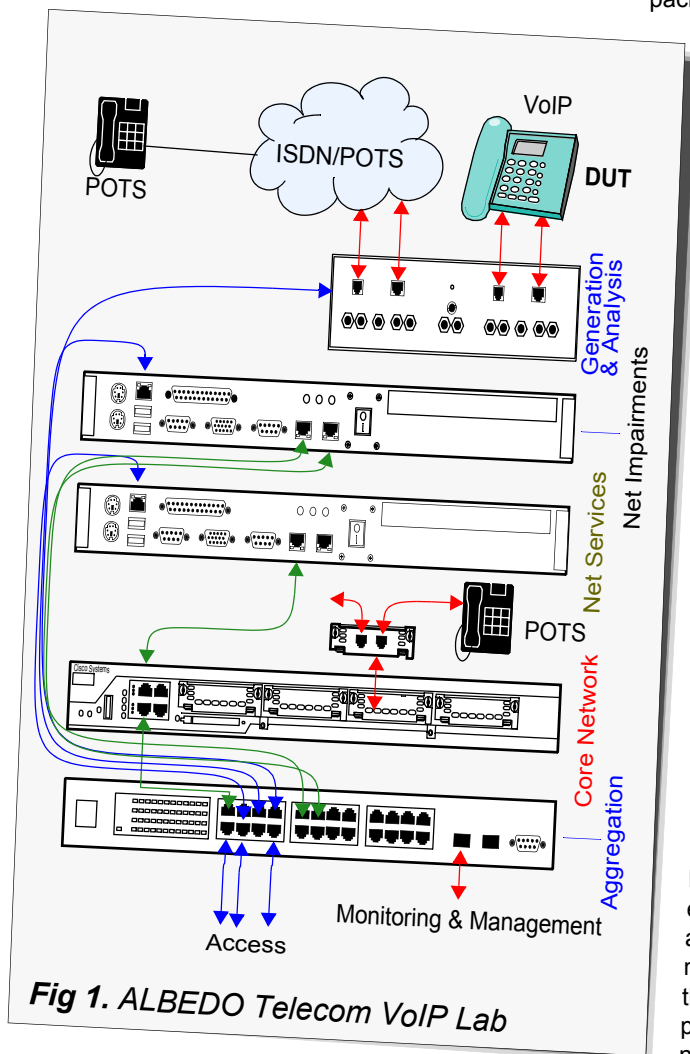


Fig 1. ALBEDO Telecom VoIP Lab

Generation/Analysis of VoIP

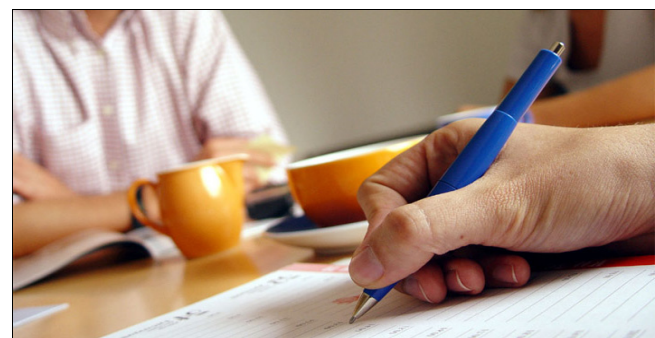
Laboratories are able to generate concurrent VoIP calls that can be routed to the devices under test or simply used to stress the network. It allows the generation of signalling messages that can be set at the highest level of detail.

The scripting capability of signalling messages is used to check the conformity of the equipment under test easily. You can even generate messages with bad syntax to check the performance and tolerance of

VoIP calls Generation

This structural element of the Lab is able to support advanced SIP and H.323 signalling to simulate end users while generates and analyses of VoIP calls.

The switching layer includes a number 10/100/1000BASE-T to connect multiple terminals and, of course, it is powerful enough to avoid becoming a bottleneck



VoIP LABS USERS

- Planning Departments
- R+D Centers
- Acceptance Labs
- Development Engineers
- VoIP Vendors

APPLICATIONS

- Equipment Evaluation
- Acceptance Tests
- Product Conformance
- IP Trunking
- Interoperability Tests
- IMS Interoperability



BENEFITS

- Ensuring successful migration to VoIP services
- Guarantee of competitiveness of all facilities
- Ability to introduce additional enhanced VoIP services
- Prevent rejection VoIP
- Saves deployments costs
- Discover time connectivity limitations
- Buy the most appropriate equipment at the best price

Lab Applications

ALBEDO Labs replicate accurately the actual VoIP scenarios to execute approval and acceptance procedures in optimal conditions that will guarantee new investments on nodes, protocols and terminals.

Evaluation of New Solutions

Evaluating all new devices that are today available can be a very time-consuming task. By taking advantage of ALBEDO expertise you can make this task a lot easier, as we can offer objective methodologies and advice to choose the solution that best meet your infrastructure needs and business goals.

Interoperability Testing Services

Interoperability is the key for most vendors and operators today that do prefer two or more network suppliers. The VoIP laboratory provides all the tools and procedures you need to ensure the quality and growth of the services you offer by means of interoperability.

ALBEDO Telecom supplies everything you may need including network equipment, configuration, guided test suite, comprehensive documentation, and the training always customized to your necessities. Your team of experts will immediately execute not only those procedures that were specified internationally but also those that particularly apply to your organization.

Acceptance and Approval Tests

Approval and acceptance tests make it easier for operators to compare devices from different vendors. Once the VoIP equipment is chosen, every single model is usually tested to confirm that they are working properly before they are accepted. This is essential to make sure that they provide the functionality needed and are compatible with existing technologies. Furthermore when the equipment has been finally selected a series of tests should also be carried out to a percentage and in some cases to every single device to confirm that they are working properly before they were accepted by the buyer.

Nevertheless in many organisations there just simply are not enough resources to carry out these procedures. If this is the case new product enhancements may not always fully verified, or even in some

cases new features may be upgraded to a live network without real benchmarking.

IP Trunking

Service Providers have begun the shift their enterprise customers from traditional ISDN primary interfaces to IP-based SIP trunks. Cost, efficiency and voice/data integration have been stated as drivers for this transition.

A number of test must be executed to certify the compatibility level of IP PBX VoIP terminals to join the provider network and interoperate with other manufacturers within, and outside, the network. ALBEDO VoIP suite helps discovering the ability and limitations to interoperate VoIP with legacy ISDN and POTS solutions.



IMS Interoperability

IMS Conformance/Interoperability to verify products including testing to the IMS specifications, interoperability among IMS components and certification of third-party applications into trusted networks, is one of the most demanded applications of ALBEDO VoIP Labs.

Product Conformance

The laboratory VoIP is ready for certification testing of all VoIP handset models from any vendor. Considering how each one manage under any network condition combining high level of jitter, delay, packet loss or disorder, and errors, then you will be able to compare the most convenient model and vendor.

Even the ability of H.323 and SIP protocols to interconnect with other terminals. We have designed a library of more than 90 tests intended to certify and trace and performance of each terminal.



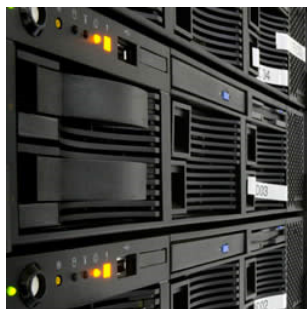
VoIP Suite	
VOIP QUALITY ASSESSMENT	Includes up to 28 tests to assess the quality of the VoIP, i.e. Clarity measurements with/without perturbations, DTMF tone, Delays, etc.
VOIP SIGNALLING TESTS	Includes up to 43 tests to assess the conformance/interconnectivity of the VoIP signalling protocol, SIP INVITE/CANCEL method, and more.
IP LAYER VERIFICATION	Includes up to 17 tests to check the IP layer, i.e. DNS communication with dynamic IP - primary DNS server fails, and more.
OTHER TESTS	Includes an undefined number of verifications highly dependent on the implementation i.e. Dynamic IP assignment.
DOCUMENTATION	Comprehensive description of the Acceptance Suite , plus Full User guide to assist engineers to execute step-by-step the approval & acceptance suite, plus results evaluation by means of PASS/FAIL

VoIP Network Architecture	
AGGREGATION SWITCH	L2 rack 24 or similar.
VOICE OVER IP GATEWAY	Made of a full unified network Ethernet-IP to transport the IP packets.
COPPER ACCESS NETWORK	Copper pair DSLAM supporting ATU-C for ADSL, ADSL2, ADSL2+, VDSL.
FTTx ACCESS NETWORK	Configured P2P as EFM or P2M as GPON or GEAPON.
WIRELESS ACCESS	Wi-Fi or Wi-Max.
RACK CABINET	All the elements are 19' rack-mount. Patch panel, console, screen, keyboard, cables, and other connectors are included.

Test & Measurement Subsystem	
VoIP GENERATOR & ANALYZER	Full capacity to generate and modify SIP protocol for VoIP call control, SIP-T, SIP-I, call control, PESQ, SIP Scripting, PESQ-WB, SIP Signalling Compression.
IP ROUTER	Voice IP Gateway or similar. A full unified network Ethernet-IP to transport the IP packets.
IMPAIRMENTS GENERATOR (Hw)	Hardware based solution. Generates packet perturbances such as lost, jitter, delay, etc. 1 Gbit/s throughput, accuracy 1µs.
IMPAIRMENTS GENERATOR (Sw)	Software based solution. Generates packet perturbances such as lost, jitter, delay, etc. 25 Mbit/s throughput, accuracy 1 ms.
FTTx ACCESS NETWORK	Configured P2P as EFM or P2M as GPON or GEAPON.
VoIP HAND-HELD TESTER	Several models available. Gbit interface, MOS, R-Factor, SIP, H323, Carrier-Ethernet features, RF2544, Y.1541, bandwidth profile, etc.
RACK CABINET	All the elements are 19' rack-mount. Patch panel, console, screen, keyboard, cables, and other connectors are included.

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ALBEDO Telecom VoIP Portfolio:



VoIP Labs



Net.Audit System



CSA tester



QspreeQ



- + UNDERSTAND causes of telecom interoperability issues
- + EXPERIENCE the best QoS in unified networking
- + ASSESS different solutions for hardware and firmware design
- + LEARN from telecom experts by means of network consultancy