SPACE

AINE ADVANCED IP NETWORK EMULATOR

Satellite communications, earth observation, navigation and positioning and control stations

indracompany.com

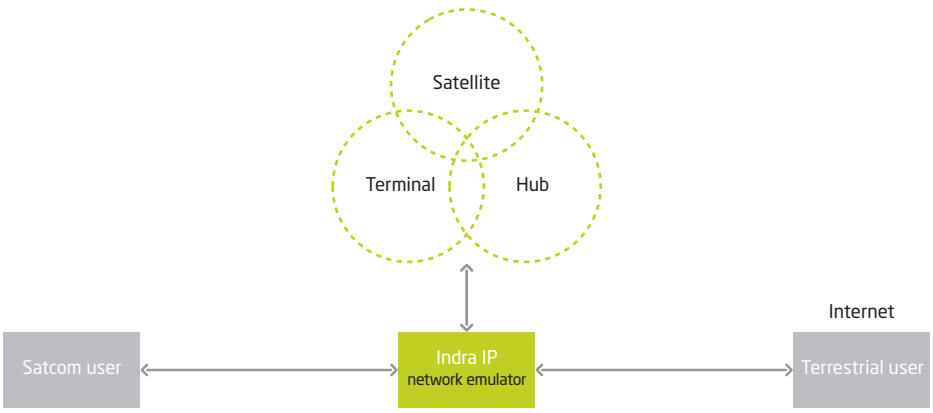
AINE
ADVANCED IP NETWORK EMULATOR

The advantage to know the performance of real applications over an IP network before launch

Introduction

New applications and communications services deployed nowadays are more and more within the so-called "multimedia and IP technology" concept. That paradigm implies using the same network layer (IP) for all types of communications: data, voice and video.

Emulation at IP layer is a very cost effective way to validate applications performance via satellite. Reproduce at lab the final system behaviour emulating in real time the network structure and limitations, such as buffers, delays, jitter, bandwidth bottlenecks and packet losses of real satellite networks.



Success stories II

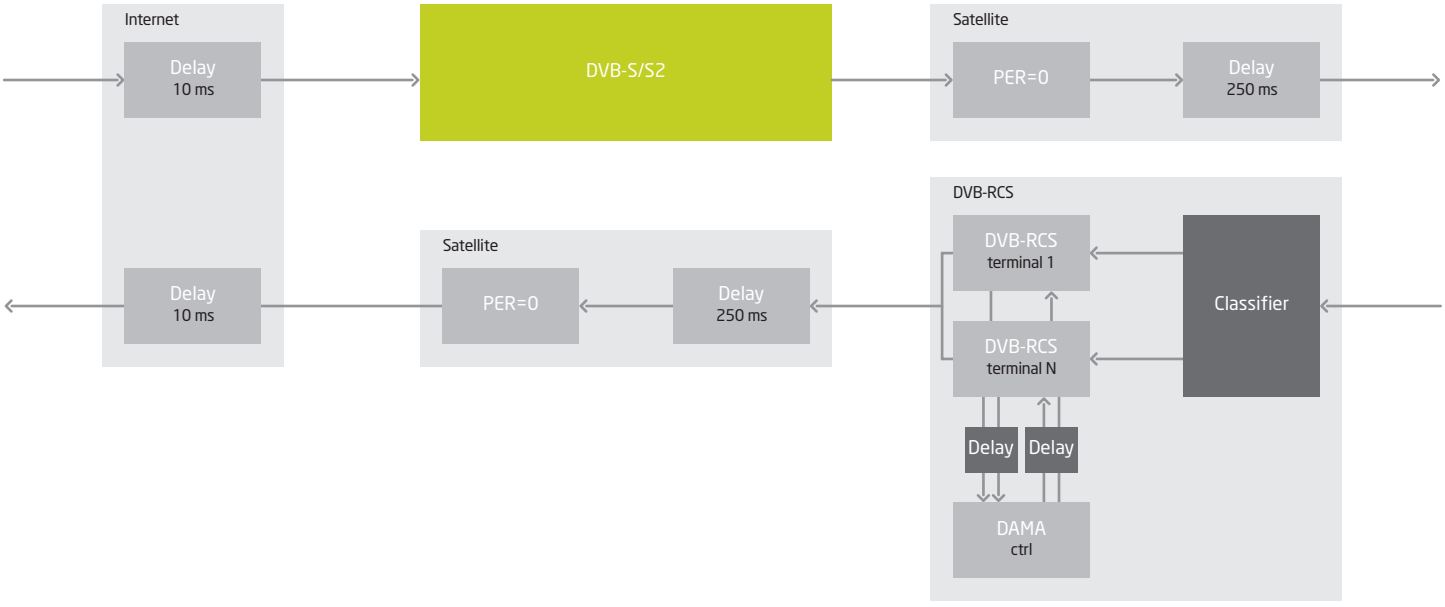
Applications layer QoS in DVB-S/RCS systems (AQoS)

http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=27802

The objective of this project was to provide an overall network performance characterization of a DiffServ and DVB-S/RCS integration architecture for a transparent system. Several mappings between DiffServ traffic classes (EF, AF and BE) and DVB-S/RCS MAC capacity types (CRA, RBDC, VBDC and FCA) where evaluated.

The AINE modelled the DiffServ architecture and all DAMA related aspects of the DVB-S/RCS system with one DVB-S Hub and up to 51 terminals. The network model was divided and executed in two servers, one for the return link and the other for the forward link.

The return link model, with 51 terminals, was executed on a dedicated dual processor server. AINE allowed the client to test a new architecture and to evaluate the expected QoS.



Success stories III

IP-friendly cross-layer optimization of adaptive satellite systems (xLayer)

The goal of the project was to investigate how cross-layer information can help upper layers to take advantage the adaptive physical layer present at DVB-S2. AINE was used to evaluate the different proposed techniques with real TCP/IP protocol stacks.

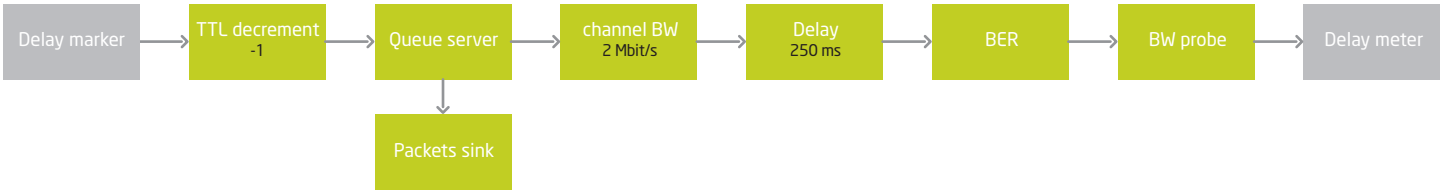
The emulation provided in-depth validation of the proposed cross-layer optimization techniques and algorithms. AINE was used to verify the performance of new algorithms in realistic conditions.

Additional information on the usage of AINE at AQoS and xLayer ESA projects available at:
http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=28656

Overview

The real network is modeled through a set of connected emulation blocks that pass packets from one to another introducing specific impairments or measuring certain parameters, e.g., bandwidth, delay, queue sizes...

Emulation models can be run on a set of PCs and be remotely monitored and controlled from any standard PC using a Java based client GUI.



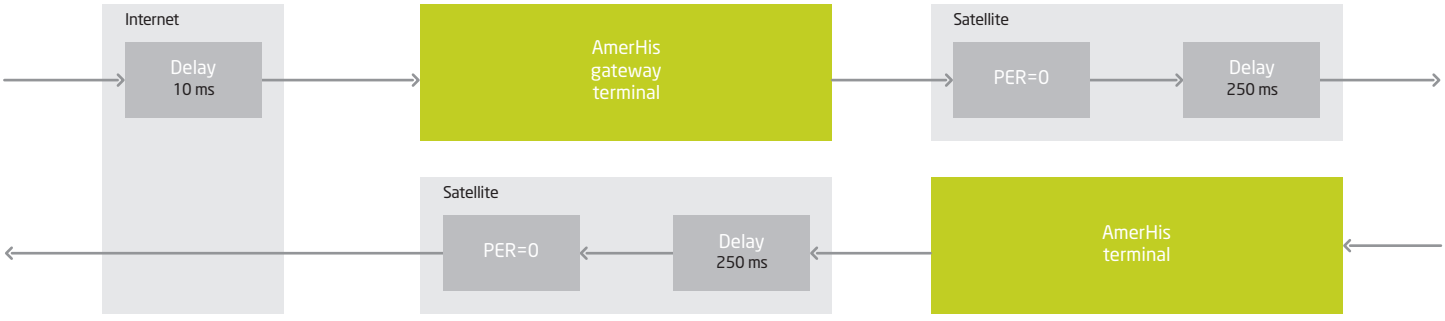
Success stories I

Interactive broadband DVB-S/RCS OBP communication system (AmerHis)

http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=7923

AINE was used to emulate AmerHis system C2P, dynamic bandwidth allocation and packet prioritization to allow in-factory evaluation of the impact of dynamic bandwidth assignment techniques in the services offered by Indra AmerHis gateway: Internet access (web browsing) and VoIP.

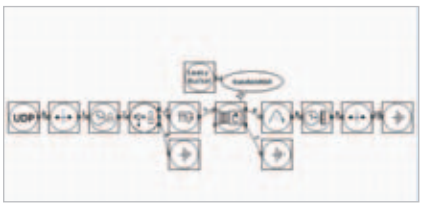
This model was executed on a desktop PC. AINE allowed Indra to test and validate IP services in realistic conditions before the satellite launch.



Highlights

- Modular and flexible: based on blocks with well defined input/output interfaces
- Distributed architecture: complex models can be easily distributed into several hardware platforms
- Extensive library of functional blocks already available to build network models: delay, queues, bottlenecks, BER...
- Flexible and extensible: new emulation model blocks can be included in the library
- Multithreaded implementation that allows efficient use of multiprocessor platforms
- Includes impairments and protocols specific to DVB-S/RCS networks
- GNU/Linux 2.6 x86 platform
- Remote configuration, monitoring and control through a Java based GUI and XML configuration files
- Monitoring results available in real-time
- Multilevel traces of emulation events and alarms
- Flexible storage of monitoring results to flat files
- Three different editions: Entry, Pro and Lab. Engineering and technical support services also available.
- AINE can be executed on customer hardware or remotely accessed to IndraData Center

AINE characteristics



Interfaces	Ethernet in promiscuous mode
Bandwidth and speed	Host scalable from 8 kbps to 10 Gbps
Platform	GNU/Linux kernel 2.6 x86
Monitoring and control	Java-based GUI
Configuration	XML files
Emulator programming language (core)	C/C++
Protocols	IP, Ethernet
Multithreading	Native POSIX Threads Library (NPTL)
Architecture	Distributed
Traffic generation	Internal: UDP/IP with configurable profiles External: end-user applications and bulk traffic generation tools: iperf...
Emulator timers resolution	1 ms (Linux kernel resolution)
Number of results per graph	Scalable

Extensible and feature rich blocks library

Satellite networks specific blocks

L2 emulation: encapsulation of IP packets into lower layer MPEG and ATM cells.

DAMA algorithms: emulation of terminal logon and logoff process. DAMA Agent and DAMA Controller messages exchange and terminals dynamic bandwidth assignment emulation.

RA algorithms: emulation of slots assignments in Random Access Mode combined to the DAMA mode, Supporting slotted Aloha (SA), Diversity SA (DSA) and ESA CRDSA.

Generic packet handling blocks

Traffic classifier, ToS marker, TTL decrement, traffic conditioning blocks (token bucket), MTU limiter, delay, bit-error-rate and packet-error rate, bandwidth limitation (leaky bucket) and queuing emulation.

Network monitoring blocks

Bandwidth probe, packet time stamping and packet delay metering.

AENOR
ER
Empresa Registrada
ER-0682/1996
ISO 9001:2000
IQNet

indra

C/ Mar Egeo, 4
Polígono industrial, 1
28830 San Fernando de Henares
Madrid (Spain)
T + 34 91 627 30 00
F + 34 91 627 30 51
space@indracompany.com
indracompany.com

Roc Boronat 133
08018 Barcelona (Spain)
T + 34 93 463 00 00
F + 34 93 463 09 22

Indra reserves the right to modify these specifications without prior notice.