

Net.Storm WAN emulator



High Performance Generator of IP packet impairments



World FIRST



Net.Storm - Handheld WAN simulator

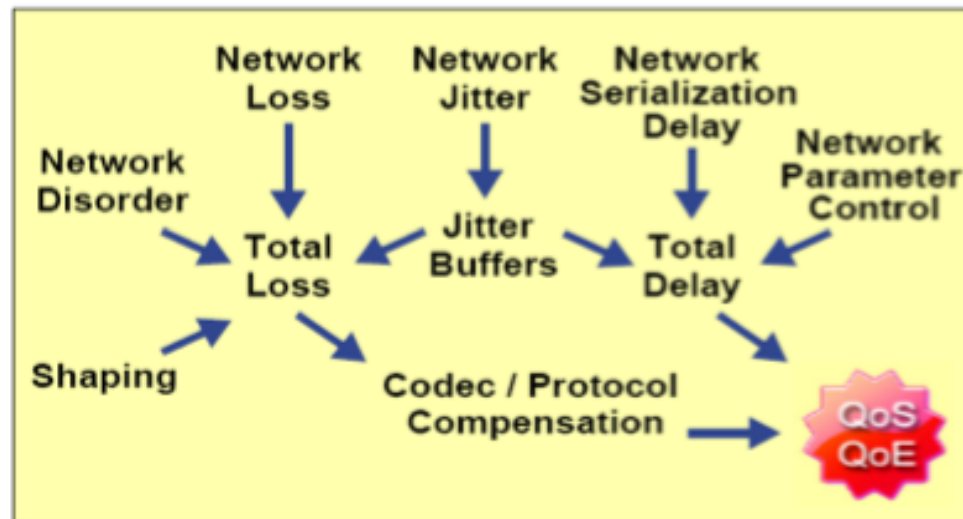
Introduction - QoS Requirements

- ◆ Convergence is moving all applications to IP
- ◆ However routers, and IP networks were designed to transport Data
- ◆ Video, Voice, TV, Internet, Data, etc.: all have specific QoS needs
- ◆ Can any network support next gen services?
- ◆ Are applications tolerant enough to real networks?
- ◆ Are routers, devices appropriate?

QoS	ITU-T Y.1541 - Applications	Delay	Jitter	Loss	Error	Order
Class 0	Real-Time, Jitter Sensitive, High Interaction (VoIP, VConf)	100 ms	50 ms	1×10^{-3}	1×10^{-4}	U
Class 1	Jitter Sensitive, Interactive (VoIP, Audio Streaming)	400 ms	50 ms	1×10^{-3}	1×10^{-4}	U
Class 2	Transaction Data, Interactive (Signalling)	100 ms	U	1×10^{-3}	1×10^{-4}	U
Class 3	Transaction Data, Interactive (Enterprise critical data)	400 ms	U	1×10^{-3}	1×10^{-4}	U
Class 4	Low Loss (Bulk Data, Video Streaming, VoD on local disk)	1 s	U	1×10^{-3}	1×10^{-4}	U
Class 5	Best Effort IP Networks (Traditional IP applications, www)	U	U	U	U	U
Class 6	Real-Time, Jitter Sensitive, High Interaction (IPTV, VConf)	100 ms	50 ms	1×10^{-5}	1×10^{-6}	1×10^{-4}
Class 7	Jitter Sensitive, Interactive, Low error (HDTV, IPTV, VTC, VoD)	400 ms	50 ms	1×10^{-5}	1×10^{-6}	1×10^{-4}

Introduction - Testing requirements

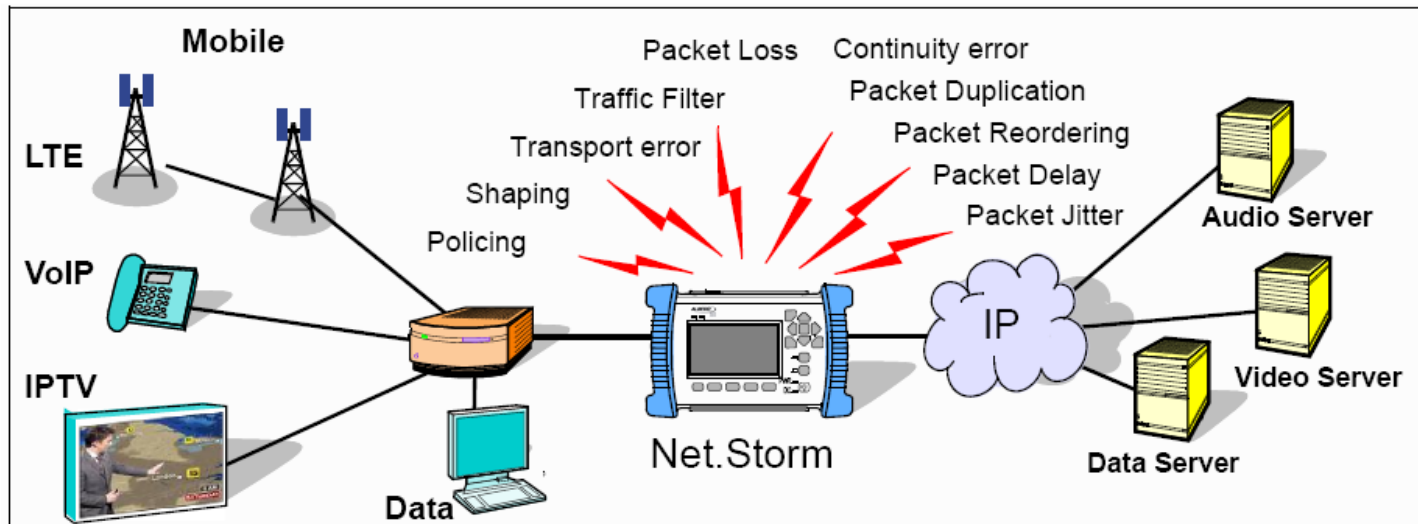
- ◆ Quality of Service (min bandwidth, max latency) are harder to test, compare than simple best-effort delivery
- ◆ Nodes, Terminals, Protocols, and Applications are harder to "pin down" and test thoroughly
- ◆ Some features such as multicast delivery require larger, more complex test environments
- ◆ Access technologies (HFC, xDSL, FTTH, WiMax, PLC, WiFi) can be highly asymmetric and expensive to test



End-to-end Real Traffic Conditions

ALBEDO NetStorm emulates real IP actual network conditions

- ◆ Managed, Partially Managed, Unmanaged
- ◆ Real traffic pass-through then
 - Packet Loss, Error, Duplication, Reordering,
 - Packet Delay, Jitter, Bandwidth shaping, and Throttling
- ◆ Control per traffic flow and filters



Net.Storm - Description

Firmware-based WAN emulator in a battery operated hand-held.

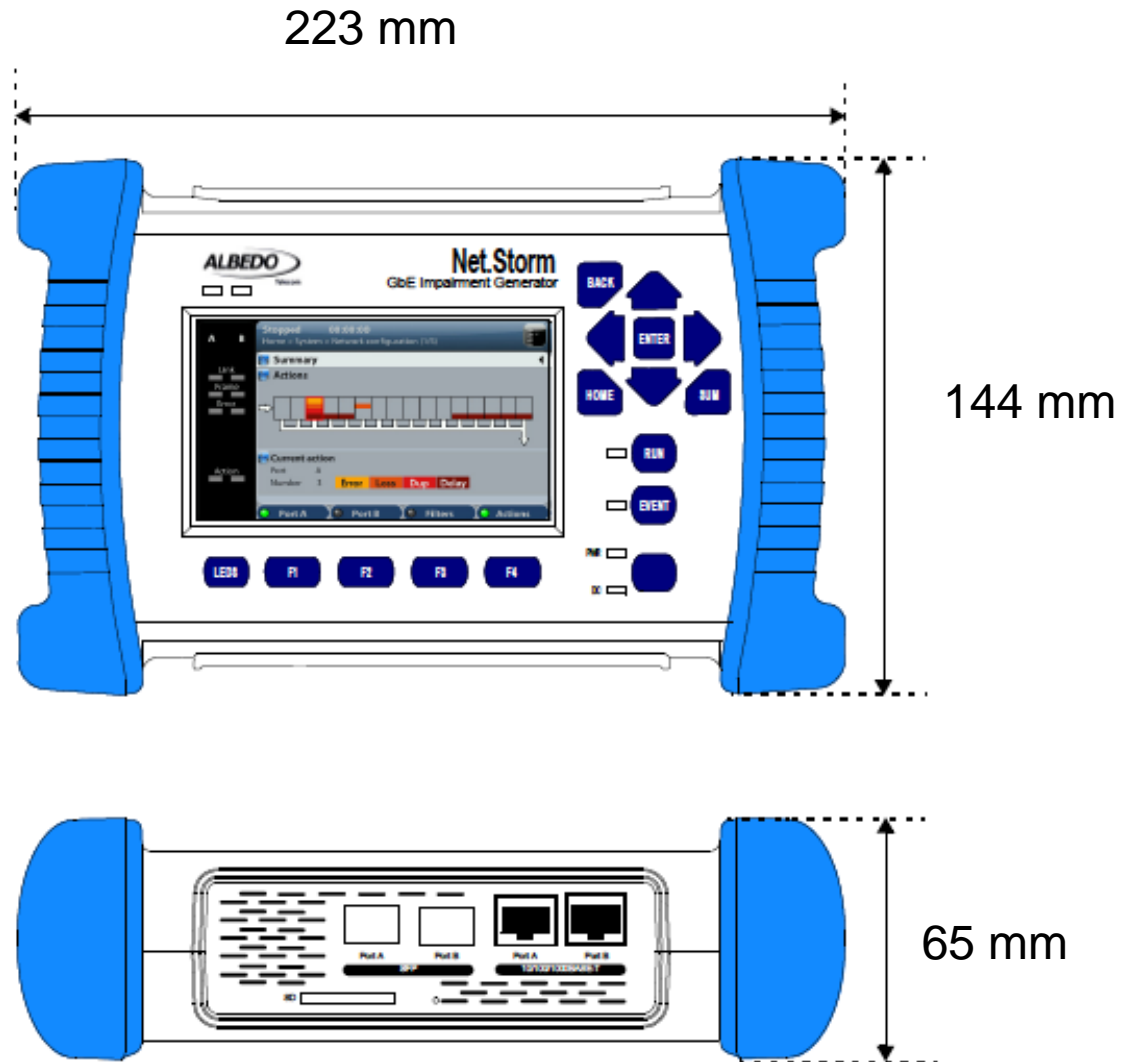
- ◆ Hardware accuracy (< 1 nsecs) at top bit rate
- ◆ Process capacity of 1,5 millions frames/second
- ◆ 16 x Filters based on layer 1, or layer 2, or 3 or higher...
- ◆ All impairments: delay, loss, jitter, error, duplication, etc.
- ◆ Traffic Shaping & Policing



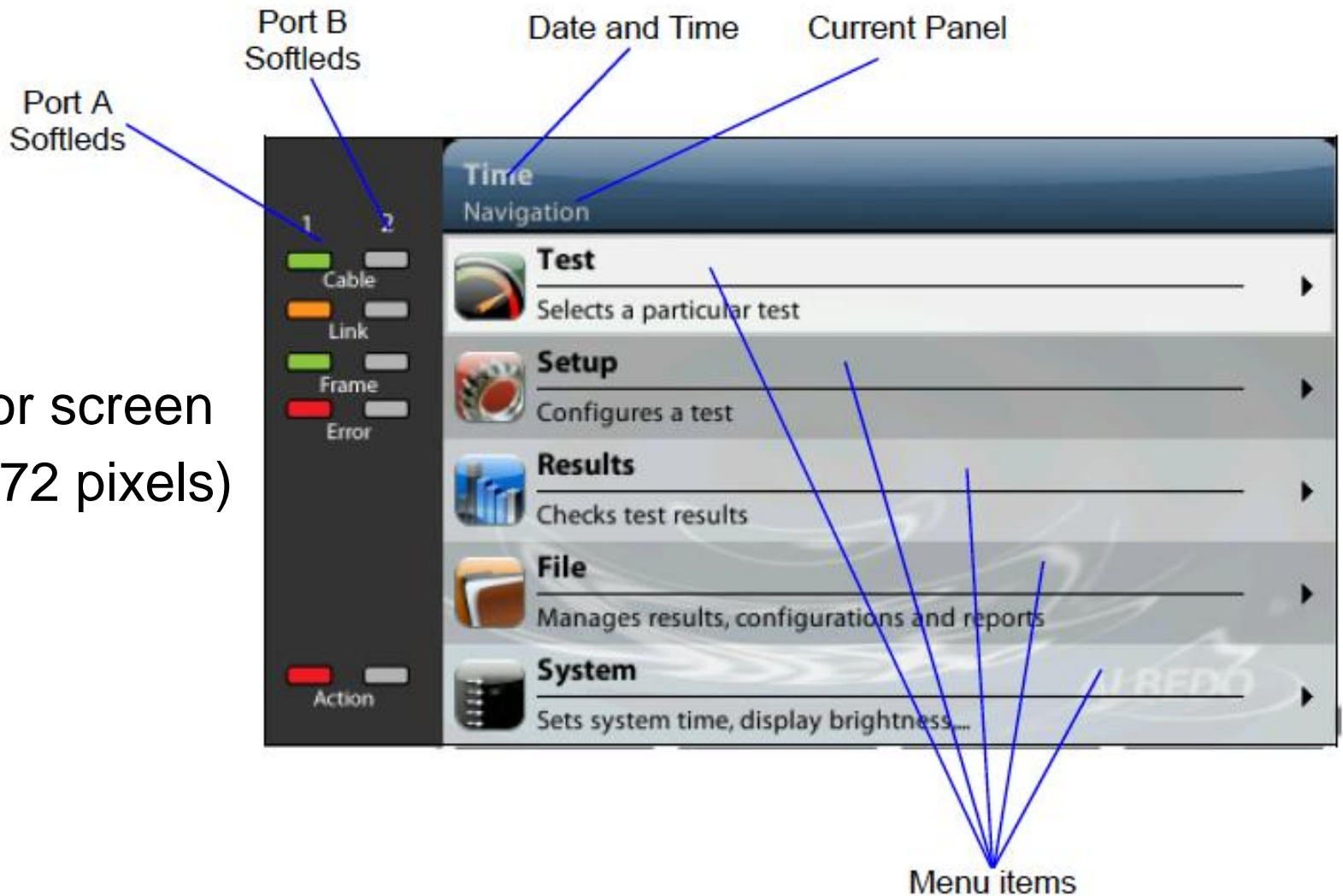
Net.Storm - Description

Net.Storm Dimensions

Small size
1 Kg weight

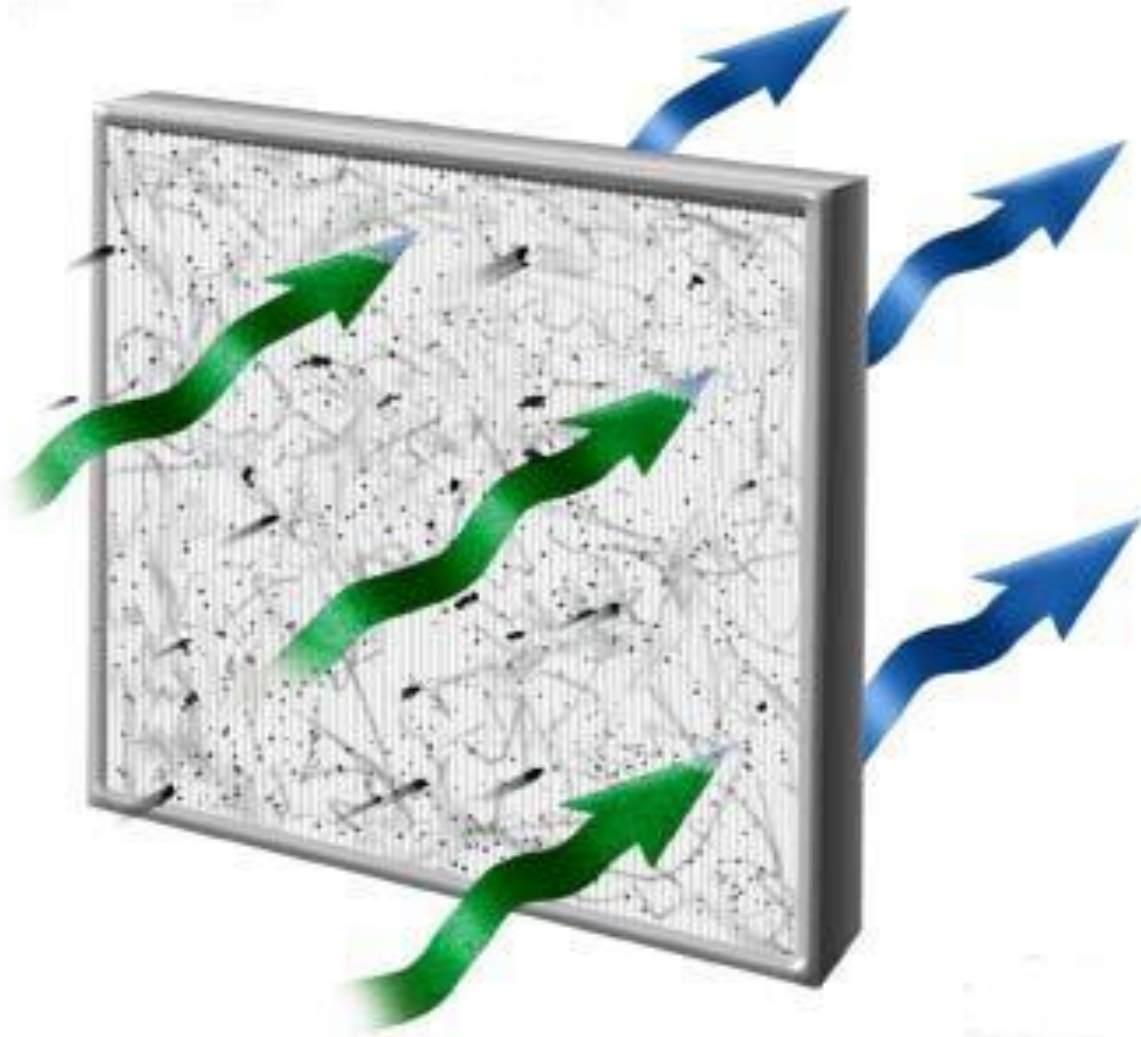


Net.Storm - Description

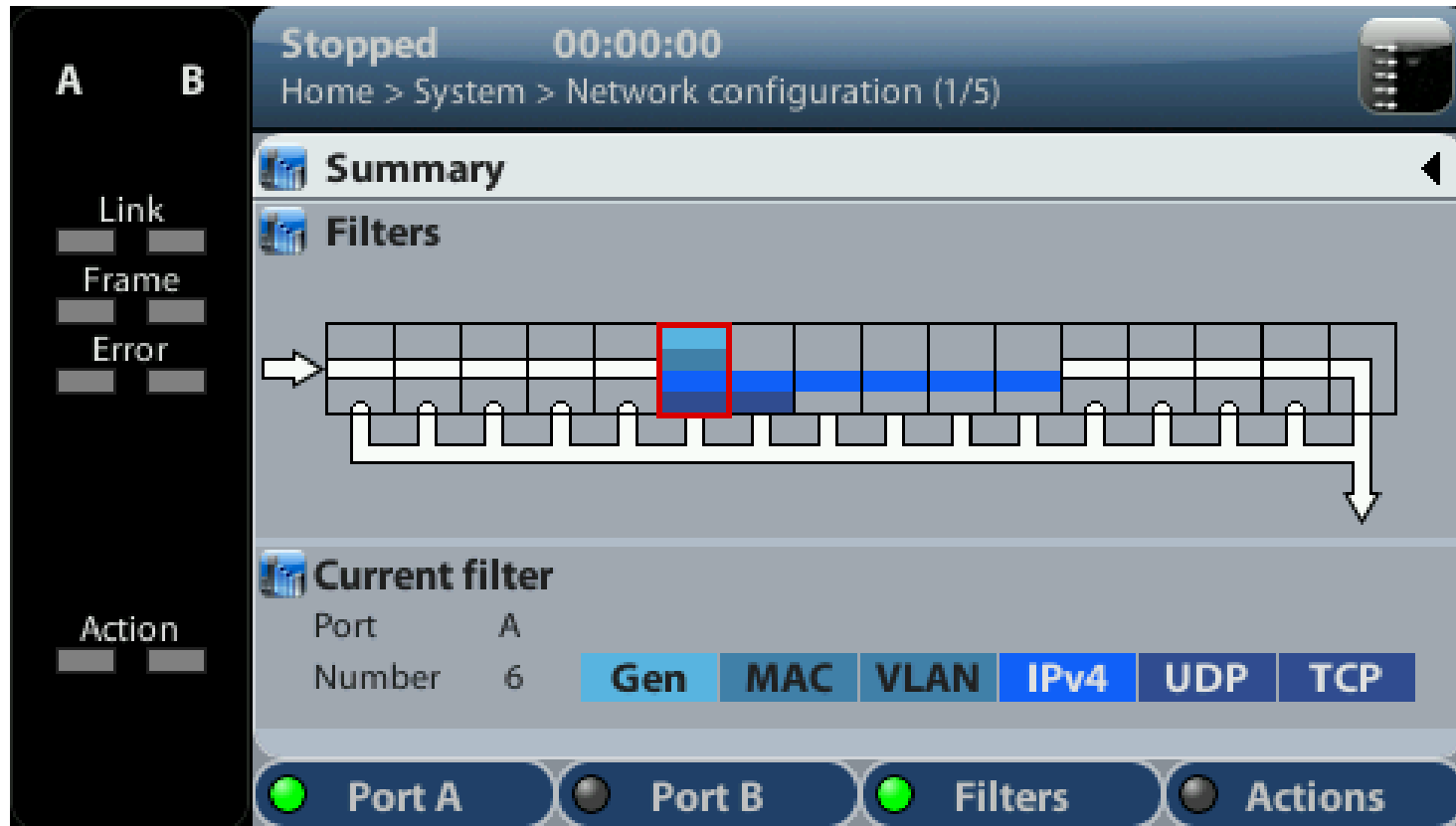


TFT color screen
(480 x 272 pixels)

Net.Storm - Filtering



Net.Storm - Filtering



Net.Storm is equipped with 15 filters plus one special filter for background traffic (BG filter).

Net.Storm - Impairment



Net.Storm - Impairment

The screenshot displays the Net.Storm software interface. On the left is a control panel with two columns, A and B. Column A has buttons for Link, Frame, Error, and Action. Column B has buttons for Link, Frame, Error, and Action. The main window shows a 'Stopped' status with a timer at 00:00:00. The breadcrumb path is 'Home > System > Network configuration (1/5)'. The 'Summary' section is visible. The 'Actions' section contains a diagram of a network topology with a central horizontal line and several vertical branches. A white arrow points to the left end of the main line, and another white arrow points to the right end. A red and orange bar is positioned on the main line, and a red bar is on one of the branches. The 'Current action' section shows 'Port A' and 'Number 3'. Below this, four colored boxes represent impairment types: 'Error' (yellow), 'Loss' (orange), 'Dup' (red), and 'Delay' (dark red). At the bottom, there are four buttons: 'Port A' (green), 'Port B' (grey), 'Filters' (grey), and 'Actions' (green).

Net.Storm - Impairment

Bandwidth control:

- Traffic Policing
- Traffic Shaping

The screenshot displays two configuration panels for traffic control. The top panel is for 'Delay & Jitter (7)' and the bottom panel is for 'Loss (6/11)'. Both panels show a 'Stopped' status and a timer at '00:00:00'. The top panel has a control panel with 'Link', 'Frame', and 'Error' buttons. The bottom panel has 'Link', 'Frame', 'Error', and 'Action' buttons. The settings are as follows:

Flow	Mode	Delay (ms)	Minimum delay (ms)	Maximum delay (ms)
Flow 1 (Delay & Jitter)	Shaping	0.0000	0.0000	0.0000
Flow 2 (Loss)	Policing	0.000	1	0.000
Flow 2 (Loss)	Burst length (ms)	0.000		
Flow 2 (Loss)	Burst length (fr)	1		
Flow 2 (Loss)	Burst separation (ms)	0.000		
Flow 2 (Loss)	Burst separation (fr)	1		
Flow 2 (Loss)	Rate (fr/s)	2000000.0000		
Flow 2 (Loss)	Queue length (fr)	255		
Flow 2 (Loss)	Loss probability (%)	0.0000		
Flow 2 (Loss)	Alternative loss prob. (%)	50.0000		
Flow 2 (Loss)	Mean length (fr)	16383		

Net.Storm - Markets

(1) LABs

- Verification of new architectures
- R+D centers
- Tuning VoIP codecs
- Tuning IPTV profiles

(2) FIELD tool

- Troubleshooting
- Instalation / configuration
- Network tolerance certification
- Verification of teleservices under stress

(3) Enterprise

- Developers of software
- Teleapplications are tested unders real conditions
- One-way delay sensitive applications



Field Applications

Fast Setup & Run, no PC needed

- ◆ VoIP, IPTV, troubleshooting
 - Real traffic conditions
 - Internetworking
 - Tolerance to impairments

- ◆ High Speed Data verification
 - At customer premises

- ◆ Critical Data Access
 - Gateways to Internet
 - User Terminals
 - One-way Delay



Lab Applications

- ◆ Planning Department
 - Simulation of the network
 - Testing new features
 - Definition of the Architecture

- ◆ Full Performance
 - Immediate changes implemented
 - The whole network in a rack

- ◆ Minimize Risks
 - Everything can be replicated
 - Full testing of new applications



Net.Storm - Competitors



Net.Storm - Competitors

ALBEDO Net.Storm	Anue / Spirent GEM	IXIA ImpairNet EIM1G4S
		
Apposite Linktropy 5500	Apposite Netropy N60	Shunra vCat STN
		

Why Net.Storm



In Feb. 2010 we needed a tool:

- ◆ COMPLETE: any network condition can be emulated
- ◆ CARRIER-CLASS: battery operated, fault tolerant
- ◆ 4 x WHEEL-DRIVE: laboratory and field use
- ◆ INDEPENDENT: no host required to Setup & Run

We did not find it and we built it!

That's all



ALBEDO

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the Path to Excellence