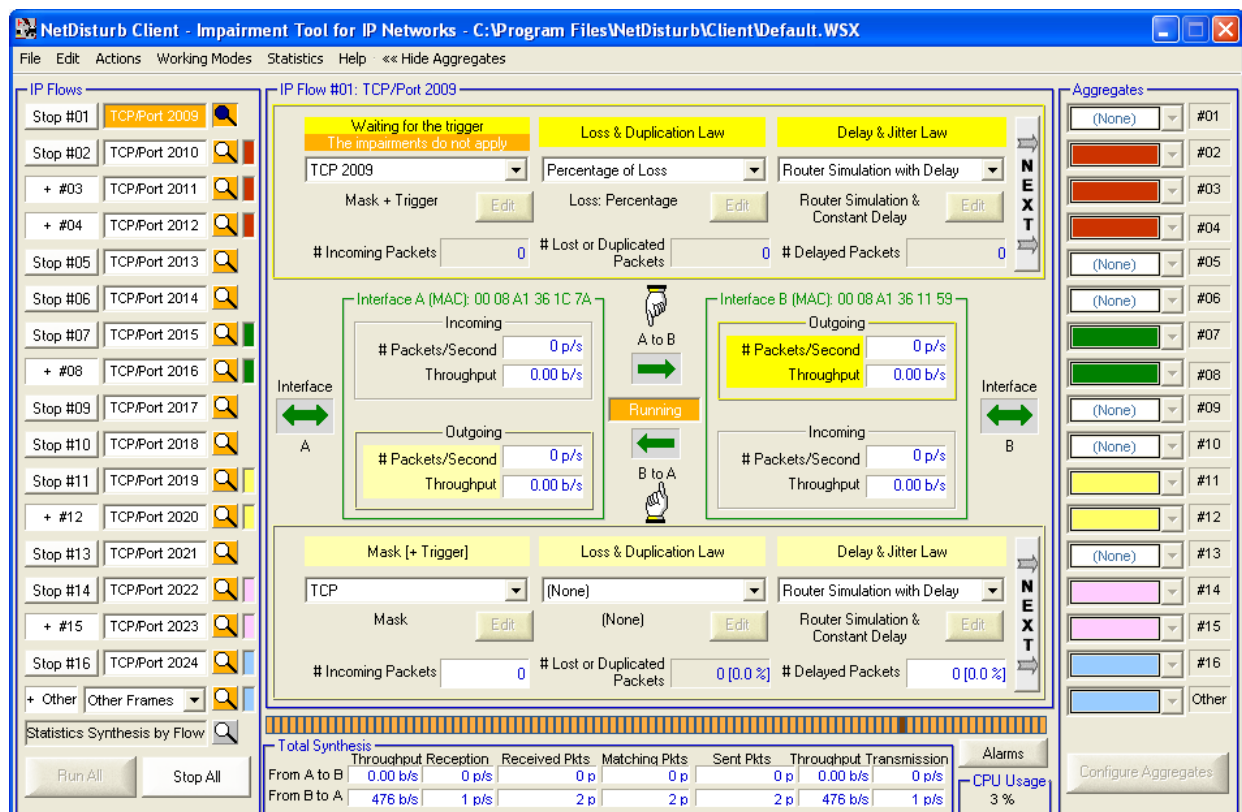




Version 4.6

Impairment Emulator Software for IP Networks (IPv4 & IPv6)



Read Me First

Summary

PART 0	PREFACE.....	3
0.1	ORGANIZATION OF THIS MANUAL.....	3
0.2	MINIMUM SYSTEM REQUIREMENTS.....	4
0.3	TECHNICAL SUPPORT	4
PART 1	NETDISTURB OVERVIEW	5
1.1	PRODUCT REQUIREMENTS	6
1.2	CONFIGURATIONS.....	6
1.3	PRODUCTS FEATURES	7
1.3.1	Key features	7
1.3.2	How does it work?	10
1.3.3	Introduction of a Trigger for the Mask	11
1.3.4	Packet impairments.....	12
1.3.5	Working modes.....	13
1.3.6	IP Flows and Aggregates	14
1.3.7	Statistics & Alarms.....	15
1.4	PERFORMANCES	18
1.5	CUSTOMER REFERENCES.....	21
1.6	CONDITIONS OF USE	21
1.7	DELIVERY.....	21
PART 2	WHAT'S NEW IN NETDISTURB VERSION 4.6?	22
PART 3	INSTALL NETDISTURB	23
3.1	FOREWORDS BEFORE UPGRADING FROM VERSIONS 4.2, 4.3, 4.4 AND 4.5	23
3.2	FOREWORDS BEFORE UPGRADING FROM VERSIONS 4.1 AND UNDER.....	23
3.3	HOW TO INSTALL THE SOFTWARE DOWNLOADED FROM THE INTERNET	23
3.4	HOW TO INSTALL THE SOFTWARE FROM THE CD-ROM.....	23
3.5	HOW TO INSTALL THE NETDISTURB CLIENT ONLY (FROM THE CD-ROM).....	23
3.6	DURING THE INSTALLATION	24
3.6.1	NetDisturb packages in a few words.....	24
3.6.2	Which package should I install?	25
3.7	WHAT HAS BEEN INSTALLED ON MY COMPUTER?	26
3.7.1	IMPORTANT STEP: I must configure the driver before running NetDisturb.....	26
3.7.2	Start Menu Shortcuts Created.....	26
3.8	HOW TO REINSTALL ANOTHER PACKAGE?.....	27
3.9	HOW TO TRANSFER THE SOFTWARE TO ANOTHER COMPUTER?.....	27
PART 4	HOW TO HANDLE YOUR LICENSE?	28
4.1	NETDISTURB TRIAL	28
4.1.1	NetDisturb Server License Information window	28
4.1.2	End of the fifteen-day trial period	28
4.2	NETDISTURB & SOFTWARE PROTECTION KEY.....	29
4.2.1	Installation of the Software Protection Key	29
4.2.2	Software Protection Key Transfers.....	31
4.3	NETDISTURB & <i>USB SOFTWARE PROTECTION KEY</i>	36
PART 5	UNINSTALL NETDISTURB	36
PART 6	RUN NETDISTURB.....	37
6.1	FIRST RUN	37
6.2	DETAILED DESCRIPTION OF THE SERVER AND CLIENT STARTUP.....	44
6.2.1	The NetDisturb Server Startup Modes	44
6.2.2	The NetDisturb Client Startup Options.....	44

Part 0 Preface

0.1 Organization of this manual

This user guide is aimed at helping you to discover and use **NetDisturb**. This manual is organized as follows:

- **Part 1: Product Overview**

Briefly describes the key features of the **NetDisturb** software.

- **Part 2: What's new in **NetDisturb** version 4.6**

Is a general overview of new features, main improvements provided with **NetDisturb** version 4.6.

- **Part 3: Install **NetDisturb****

Presents the product requirements, how to install the software downloaded from the Internet or from the CD-ROM, provides important information to upgrade from previous versions and explains how to choose the most suitable **NetDisturb** package.

- **Part 4: How to handle your license?**

Describes how to proceed for the license transfer

- **Part 5: Uninstall **NetDisturb****

Describes how to uninstall the software.

- **Part 6: Run **NetDisturb****

Describes how to run the **NetDisturb** Server and **NetDisturb** Client.

In this document, you will find the following symbols: They mean:



Warning



Zoom or Advice



Note or Remark

0.2 Minimum System Requirements

To appropriately operate **NetDisturb** you need the following minimum system requirements:

- Windows 2000, XP or Server 2003
- Pentium processor with 256 MB memory at least
- Two identical Ethernet NICs: Ethernet, Fast Ethernet, or Gigabit Ethernet network interface card.
- 1024 x 768 display, DPI setting = Normal size (96 DPI) and Font size = Normal.
- 20 MB free hard disk space



*Acrobat Reader is needed to display the **NetDisturb** Help. If Acrobat reader hasn't been installed, a warning message is displayed to inform that **NetDisturb** is available but without the help file.*



PCs with multiprocessors or processor with hyper-threading are also supported.

0.3 Technical Support

ZTI Technical Support can assist you with all your technical problems from installation to troubleshooting.

Before contacting our Technical Support, please read the relevant sections of the product documentation and the "Read Me First" file.

Before contacting our technical support, make sure you record the following information:

- Product name and version.
- Trial license or unlimited licensed product.
- System configuration.
- Problem details: settings, error messages...
- If the problem is persistent, give the details of how to create the problem.

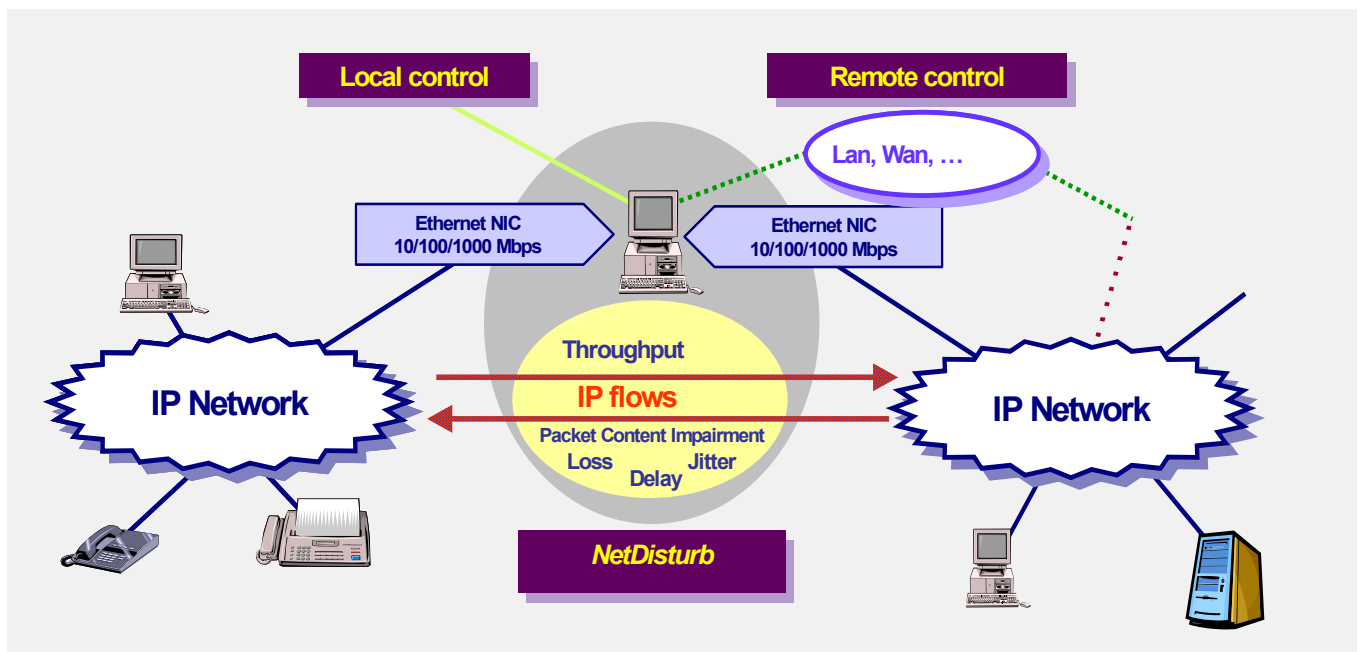
You can contact Technical Support by:

Email	Send as many details as possible to support@zti-telecom.com or support@zti.fr
Fax	Send as many details as possible to +33 2 9648 1485
Telephone	Telephone support is available from 09:00 am to 06:00 pm (GMT +01:00 or +02:00), Monday to Friday. Call on +33 2 9648 4343

Part 1 NetDisturb Overview

NetDisturb is an IP network emulator software that can generate impairments like: latency, delay, jitter, bandwidth limitation, lost, duplicate packets and impaired the content over the IP networks (IPv4 and IPv6). **NetDisturb** allows the user to disturb flows on an IP network and so to study the behavior of applications, devices or services in a disturbed network environment.

NetDisturb is inserted between two Ethernet segments (on the same IP network or two different IP networks) and operates bi-directional packet transfer on Ethernet, Fast Ethernet and Gigabit network interface cards.



1.1 Product Requirements

- * Platform: Pentium PC running Windows 2000, XP or Server 2003 with Microsoft TCP/IP installed and at least 256 MB Ram.
- * Hyper-threading and PC multiprocessors are also supported.
- * Two Identical Network Interfaces Cards (NIC): Ethernet, Fast Ethernet, or Gigabit Ethernet network interface card.
- * 1024 x 768 display, DPI setting = Normal size (96 DPI) and Font size = Normal.

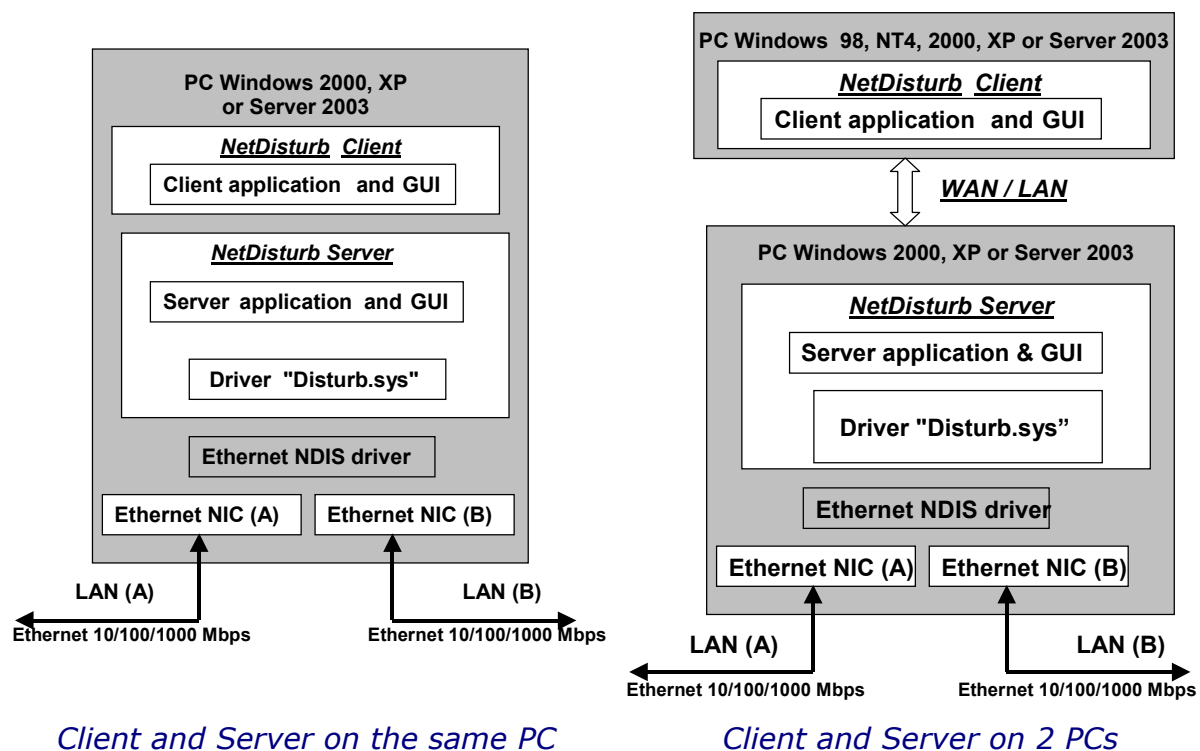


1.2 Configurations

Based on Client Server architecture, the **NetDisturb** software is made of two parts: a Server and a Client. The Server handles the impairment characteristics and the Client manages the Server using a simple graphical interface.

This allows two configurations where the Server and the Client parts may be installed on the same PC host (local control), or the Server part is located on one PC and the Client part is located on a second PC (remote control). In this second configuration, the Client dialogs with the Server by using a Wan (for example: PSTN or ISDN) or a LAN link.

Both configurations require two identical Ethernet Cards for the Server.



The "Disturb.sys" driver is located in the kernel of the operating system and is installed above the NIC drivers. This driver is used by **NetDisturb** to handle the exchanges with the NICs.

1.3 Products features

What are the major features of **NetDisturb** V4.6?

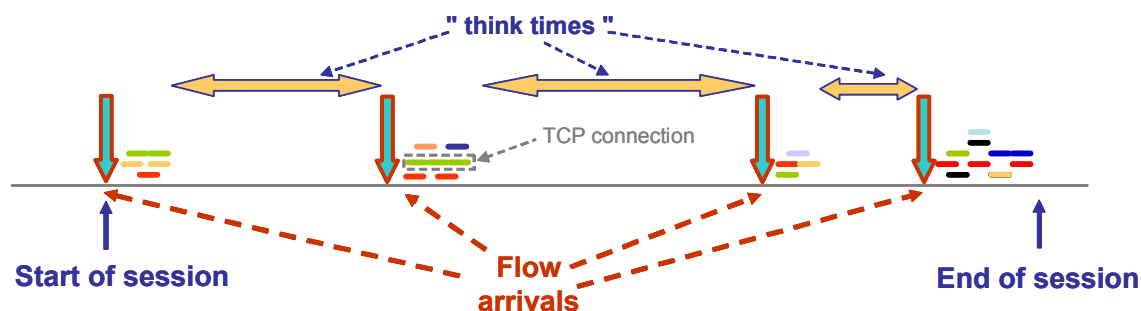
1.3.1 Key features

- Client-Server Architecture based on the SOAP mechanism which uses the HTTP protocol and the XML format for the exchanges between the client and the server.
- NetDisturb is an Ethernet Bridge to avoid any network configuration.
- Impairments: Latency, Loss, Duplication, bandwidth limitation, Delay and Jitter, Content Impairment (mathematical laws and user-defined files)
- 16 configurable IP flows per direction with optional trigger condition
- Aggregates of IP flows can be defined (set of IP flows sharing the same Delay & Jitter Law)
- Unidirectional or bi-directional packet impairments
- Change the Law and the mask on-the-fly
- Connections per IP flow: impairments are applied to the IP flow or to each connection of the IP flow
- Ethernet / Internet modes (packets out of sequence)
- Easy to use and intuitive Graphical User Interface
- Statistics display and export detailed statistics in a file
- Command Line Interface (CLI) to use NetDisturb in test beds
- Ability to handle Ethernet Jumbo frames (payload up to 17976 bytes)
- Ability to impair the remaining network traffic that could be either only the IP packets or all the Ethernet frames.

NetDisturb is based on the notion of IP flows.

A flow is a set of packets with a set of common packet properties, and can be unidirectional or bi-directional.

Flows are part of sessions (successions of flows and "think times") related to some homogeneous user activity (e-commerce, mail, MP3 file, web, etc.).



An IP flow is described by using a n-tuple.

In the typical case, the following 5-tuple is used: IP addresses, protocol and port numbers.

An IP flow is composed of connections (such as TCP connections to make FTP transfer by example).

To define the n-tuple for an IP flow, **NetDisturb** uses the notion of mask. A mask is the combination of the following optional parameters:

Frame Type (ARP Frame or IP Frame:IPv4, IPv6 or IPv4 & IPv6)

Ethernet header

- MAC destination address
- MAC source address

List of VLAN-ID (Ethernet frames 802.1Q)

IP Header

- Destination IP address
- Source IP address
- Protocol (ICMP, TCP, UDP, SIP, RTP...)
- Differentiated services (TOS)

List of Ports (for TCP or UDP packets)

- Destination port list
- Source port list



A trigger can be associated optionally with the mask.

With **NetDisturb** you can define up to 16 masks, i.e. 16 IP flows. An additional item named "Other IP Flows" is in charge to handle all IP flows that have not been user defined. For this item no mask can be defined, but impairments can be applied.

NetDisturb manages up to 10 000 connections – all flows included.

The client window below illustrates the management of IP flows by **NetDisturb**.

NetDisturb Client - Impairment Tool for IP Networks - C:\Program Files\NetDisturb\Client\Default.WSX

File Edit Actions Working Modes Statistics Help Show Aggregates >>

IP Flows

- Run #01 VLAN
- + #02 ICMP
- Run #03 SIP
- Run #04 RSVP
- + #05 UDP
- + #06 TCP
- Run #07
- Run #08
- Run #09
- Run #10
- Run #11
- Run #12
- Run #13
- Run #14
- Run #15
- Run #16
- Run Other Frames
- Statistics Synthesis by Flow
- Run All Stop All

IP Flow #04: RSVP

Mask [+ Trigger]: RSVP

Loss & Duplication Law: % of Loss & Time

Delay & Jitter Law: Delay & F.(Throughput, Time)

Mask Edit Loss: Percentage & Duration Edit Constant Delay & File (Throughput, Duration) Aggregate

Incoming Packets 0 # Lost or Duplicated Packets 0 [0.0 %] # Delayed Packets 0 [0.0 %]

Interface A (MAC: 00 08 A1 36 1C 7A)

Incoming: # Packets/Second 0 p/s Throughput 0.00 b/s

Outgoing: # Packets/Second 0 p/s Throughput 0.00 b/s

Interface B (MAC: 00 08 A1 36 11 59)

Outgoing: # Packets/Second 0 p/s Throughput 0.00 b/s

Incoming: # Packets/Second 0 p/s Throughput 0.00 b/s

Mask [+ Trigger]: RSVP

Loss & Duplication Law: Burst Uniform Loss

Delay & Jitter Law: Delay & F.(Throughput, Time)

Mask Edit Loss: Burst Uniform Law Edit Constant Delay & File (Throughput, Duration) Aggregate

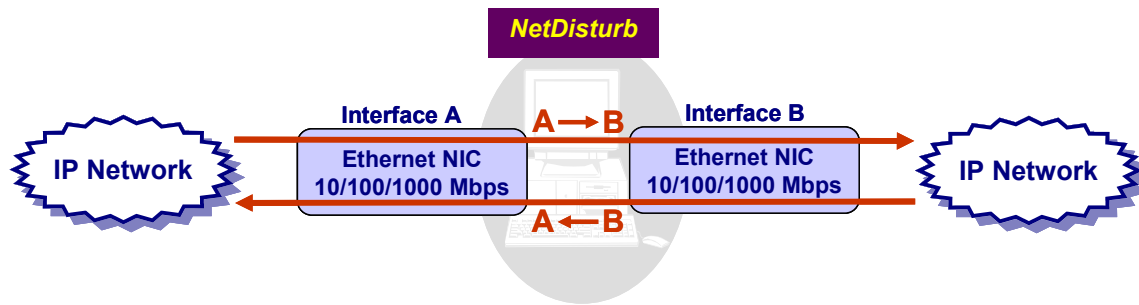
Incoming Packets 0 # Lost or Duplicated Packets 0 [0.0 %] # Delayed Packets 0 [0.0 %]

Total Synthesis

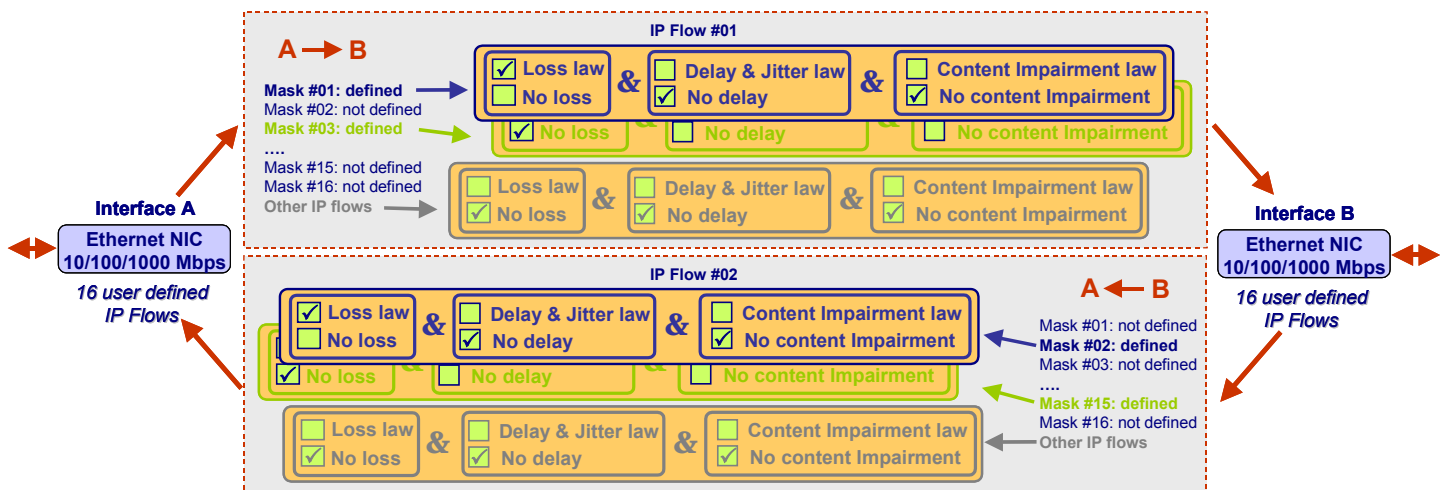
	Throughput Reception	Received Pkts	Matching Pkts	Sent Pkts	Throughput Transmission	Alarms
From A to B	0.00 b/s	0 p/s	0 p	0 p	0.00 b/s	0 p/s
From B to A	0.00 b/s	0 p/s	0 p	0 p	0.00 b/s	0 p/s

CPU Usage 2 %

The graphical user interface represents the NIC cards as "Interface A" and "Interface B" as illustrated below.



For each direction $A \rightarrow B$ or $B \rightarrow A$, 16 flows can be defined by the user. And for each IP flow, loss & duplication and / or delay and / or content impairment laws can be applied as shown in the figure below.



In the above example, **NetDisturb** has been configured with the following parameters:

Direction $A \rightarrow B$

- The Mask #01 defines the "IP Flow #01", and a loss law is applied to the packets of this flow,
- The Mask #03 defines the "IP Flow #03", a delay law and a content impairment law are applied to the packets of this flow,
- As no loss, no delay and no content impairment law is applied to the 'Other IP flows', all non-matching packets with the masks #01 and #03 are relayed directly from A to B.

Direction $B \rightarrow A$

- The Mask #02 defines the "IP Flow #02", and a loss law is applied to the packets of this flow,
- The Mask #15 defines the "IP Flow #15", a delay law and a content impairment law are applied to the packets of this flow,
- As no loss and delay law is applied to the 'Other IP flows', all non-matching packets with the masks #02 and #15 are relayed directly from B to A.

1.3.2 How does it work?

The Figure 1 illustrates how **NetDisturb** handles incoming packets from the A interface to the B interface.

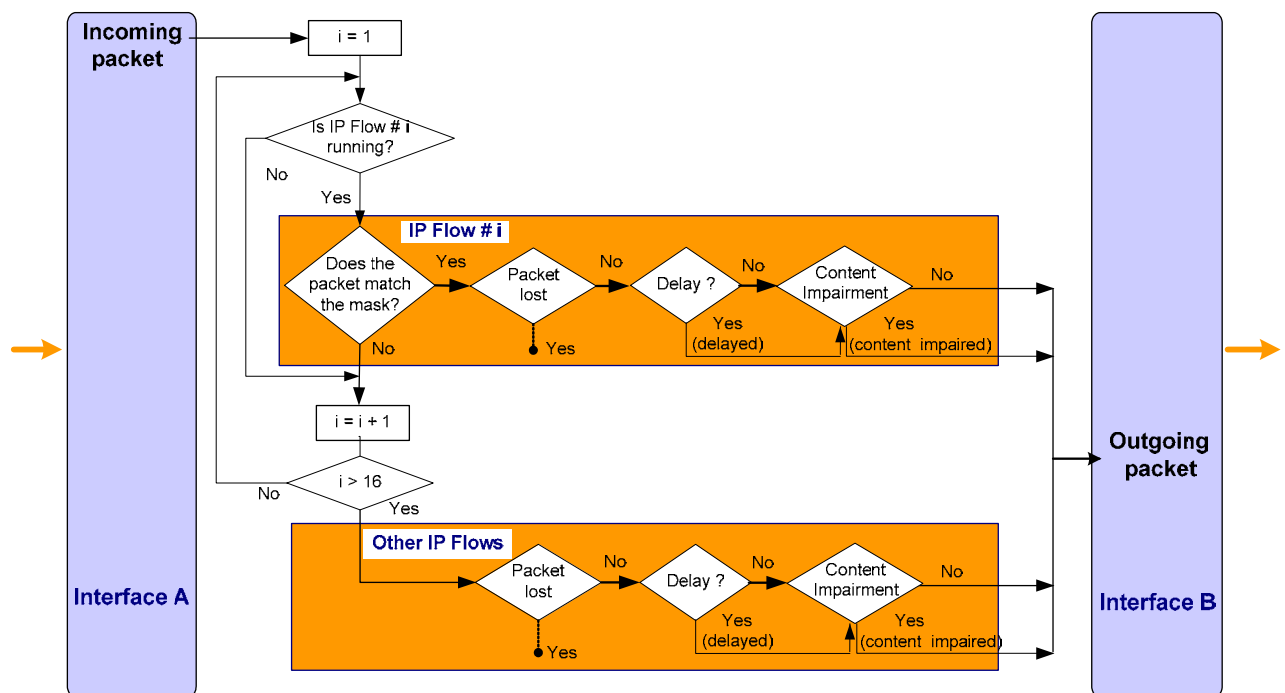


Figure 1 - NetDisturb Incoming Packets Management

Depending on the active user-defined IP flows, **NetDisturb** identifies if the incoming packet belongs to an IP flow before applying loss, delay or content impairment treatments.

If this packet matches with the mask of an IP Flow (IP Flow #i for example), then **NetDisturb** identifies if this packet must be lost/duplicated and/or delayed and/or if its content must be impaired.

If this packet does not match any mask (a mask defines an IP flow), then **NetDisturb** applies the treatments for the 'Other IP Flows' and identifies if this packet must be lost/duplicated and/or delayed and/or if its content must be impaired. For each packet received on an interface, **NetDisturb** analyzes in order the masks from 1 to 16 before considering this packet to belong to the "Other IP Flows".

So **NetDisturb** can apply impairments on the IP flows defined by the user either unidirectional ($A \rightarrow B$ or $B \rightarrow A$) or bi-directional (the same impairments are being applied for both directions: $A \rightarrow B$ and $B \rightarrow A$).

1.3.3 Introduction of a Trigger for the Mask

One of the features of **NetDisturb** is the use of a trigger to link the launch of the impairments with an event.

The Trigger is an intermediate step after the frame has been classified in an IP Flow and before the frame is impaired.

The Trigger includes various parameters:

- The **activation condition** based on the Ethernet frame content.
- The **delay before applying the impairments**
- The **impairment duration** (0 = no limit).
- The **number of cycles** for the trigger (0=unlimited) if the impairment duration is not null.

Thus two main categories of triggers are defined:

- The Trigger time-limited to be applied on the impairments
- The Trigger time-unlimited to be applied on the impairments (a loop counter can be used)

As soon as the activation condition is performed, the impairment on the IP flow can be immediate or delayed with a duration expressed in milliseconds (delay of impairment).

If the impairment is immediate, the frame that has triggered can be included or not (if the delay before impairment is null).

The impairment can be time limited according to a duration expressed in milliseconds.

When **NetDisturb** is running an IP flow with a defined trigger, four states are possible:

- ⇒ **Waiting for the Trigger**: the impairments do not apply. This state is the initial state of the Trigger.
- ⇒ **The Trigger was found**: the impairments still do not apply because a delay is defined before the impairments. This state changes to the next state when the activation condition is reached.
- ⇒ **The Trigger is active**: the impairments are applied.
- ⇒ **The Trigger is finished**: the impairments do not apply any more. This is the final state of the Trigger.



A Trigger can remain active permanently if no duration limit was defined.

1.3.4 Packet impairments

Pre-defined Loss and Duplication laws:

- Loss: Constant Law
Parameter: number of packets
- Loss: Uniform Law
Parameters: alpha, beta, threshold
- Loss: Burst Uniform Law
Parameters: alpha, beta, threshold(n), threshold(n + x), depth
- Loss: File (Loss Values)
Parameters: file name, threshold
- Loss: Percentage
Parameter: percentage
- Loss: 1 Packet out of N
Parameter: range(N)
- Loss: Percentage & Duration (time-limited losses percentage)
Parameter: percentage, duration
- Loss: File (Percentage & Duration)
Parameter: file name
- Duplication: Percentage (send n times the received packet)
Parameters: percentage, $\text{Min} \leq n \leq \text{Max}$
- Duplication: 1 Packet out of M (duplicate 1 packet n times every M received packets). Parameters: range(M), $\text{Min} \leq n \leq \text{Max}$
- Duplication: Uniform Law
Parameters: alpha, beta, threshold
- Loss (1 out of N) then Duplication (1 out of M): the loss law (1 Packet out of N) is used first before the duplication law (1 Packet out of M)

Pre-defined Delay & Jitter laws:

- Constant Delay
Parameter = constant delay
- Constant Delay & Exponential Jitter
Parameters: constant delay, λ
- Constant Delay & Uniform Jitter
Parameters: constant delay, alpha, beta
- Constant Delay & File (Jitter)
Parameters: constant delay, user file
- File (Packet Sending Minimum Cadences)
Parameter: user file

- Router Simulation & Constant Delay
Parameters: IP throughput, max memory, constant delay
- Router Simulation & File (Packet Sending Minimum Cadences)
Parameters: IP throughput, max memory, user file
- Constant Delay & File (Throughput & Duration)
Parameters: constant delay, user file

Pre-defined Content impairment laws:

- 1 Packet out of N
Parameter: range(N)
- Percentage
Parameter: percentage
- Normal Law (Laplace-Gauss)
Parameters: average, standard deviation, threshold
- Uniform Law
Parameters: alpha, beta, threshold

1.3.5 Working modes

NetDisturb offers two working modes by applying impairments:

- Enable/Disable desequencing of the packets in a flow,
- Impairment laws apply to the IP flow or to each TCP/UDP connection of the IP flow.

These modes are used together.

For example, **NetDisturb** set with the following modes simulates the Internet network with disturbed flows:

- Enable desequencing of the packets in a flow
- Impairment laws apply to the IP flow

.

Another example: to disturb VoIP communications in the same way on an Ethernet network, use NetDisturb with the following modes:

- Disable desequencing of the packets in a IP flow
- Impairment laws apply to each TCP/UDP connection of the IP flow

.

Enable/Disable Desequencing Packets

Impairment may introduce changes in the packet sequence – for example by introducing different delays for the packets of a flow.

One of the Ethernet characteristics is to keep packets received in order. Internet hasn't got this constraint regarding the packet order: some packets can use one route while others use another one, with the consequence the receiver may get packets unordered.

NetDisturb can simulate the Internet network (enable desequencing packets) or can react as Ethernet does (disable desequencing packets).

Impairment laws apply to the IP flow or to each TCP/UDP connection of the IP flow

NetDisturb can analyze IP packets to dispatch them into the TCP or UDP connection they belong to. This mode makes possible to apply the same impairment values to each packet of each connection. For instance if the impairment has been defined with a loss law: lose the third packet for 10 packets received.

- Impairment laws to be applied to the IP flow*

When this option is selected, every received packet matching the mask for this flow is considered to belong to the same flow. Processing is carried out in "continue". With the previous example of loss law (lose the 3rd packet on 10 received), **NetDisturb** will lose the 3rd packet for ten received packets whatever the TCP/UDP connection belongs to.

- Impairment laws to be applied to each TCP/UDP connection of the IP flow*

When this option is selected, **NetDisturb** analyses each received packet in order to associate this packet to a TCP or UDP connection already existing by using these parameters: protocol, IP addresses and port numbers. If the connection doesn't exist, a new one is created. With the previous example of loss law (lose the 3rd packet on 10 received), **NetDisturb** will lose the 3rd packet for ten received packets of each TCP or UDP connection. Up to 10,000 connections can be handled simultaneously by **NetDisturb**.

1.3.6 IP Flows and Aggregates

Up to 8 aggregates of IP flows can be defined. An aggregate is a consecutive set of IP flows sharing the same Delay & Jitter Laws. All IP flows of an aggregate share only one aggregate's Delay & Jitter law (with one law per direction).

The IP flow order in the aggregate defines the priority of packets to delay. While the top IP flow packets get the highest priority, the other IP flow packets are queuing until there are no higher priority packets.

In the Figure 2 below, two aggregates have been defined:

- The light blue colored aggregate collects three IP flows (#01 and #02)
- The dark blue aggregate collects the IP flows #04, #05 and #06.

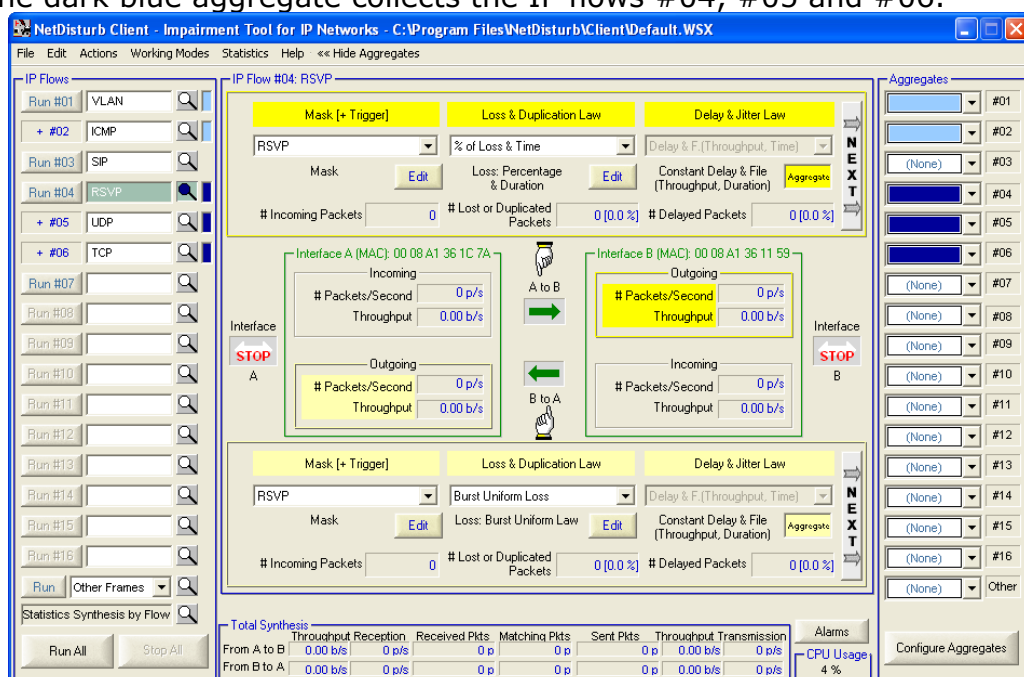


Figure 2 - Two aggregates defined

1.3.7 Statistics & Alarms

Different statistics are calculated and displayed by **NetDisturb**:

- For each IP Flow (and for both directions)
- Statistics synthesis by Flow
- Total synthesis & Alarms

These statistics can be saved in a file for a later use.

Statistics for each IP Flow

For each direction (**A → B** or **B → A**) **NetDisturb** displays:

- The number of packets matching the mask
- The number and the percentage of lost or duplicated packets
- The number and the percentage of delayed packets
- The number and the percentage of the packets where the content has been impaired

The screenshot shows two panels of the NetDisturb interface. The top panel is for the 'A to B' direction, and the bottom panel is for the 'B to A' direction. Each panel has a 'NEXT' button on the right and a 'PREVIOUS' button on the left.

Top Panel (A to B):

- Mask [+ Trigger]:** UDP (Mask) [Edit]
- Loss & Duplication Law:** Percentage of Loss (Loss: Percentage) [Edit]
- Delay & Jitter Law:** Router Simulation with Delay (Router Simulation & Constant Delay) [Edit]
- # Incoming Packets:** 184942
- # Lost or Duplicated Packets:** 173137 [94 %]
- # Delayed Packets:** 11805 [6.4 %]

Bottom Panel (B to A):

- Loss & Duplication Law:** F.(Percentage & Time) (Loss: File (Percentage & Duration)) [Edit]
- Delay & Jitter Law:** Router Simulation with Delay (Router Simulation & Constant Delay) [Edit]
- Content Impairment Law:** Normal Law Impairment (Normal Law (Laplace-Gauss)) [Edit]
- # Lost or Duplicated Packets:** 2443 [70 %]
- # Delayed Packets:** 1050 [30 %]
- # Modified Packets:** 1050 [30 %]

- And a complete view of traffic statistics (number of packets and throughput) over the **A** and **B** interfaces as shown in Figure 3 below:

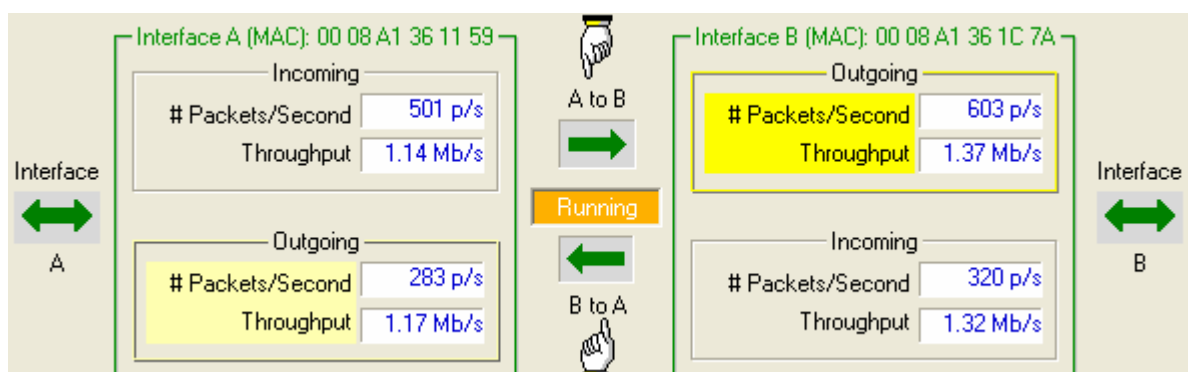


Figure 3 – Complete view of Traffic Statistics between interface A and B

Statistics Synthesis by Flow

The synthesis for all IP Flows displays for each flow and for each direction:

- The incoming throughput and number of received packets per second
- The number of packets matching the mask
- The number of lost packets
- The number of delayed packets
- The number of modified packets
- The outgoing throughput and the number of sent packets per second

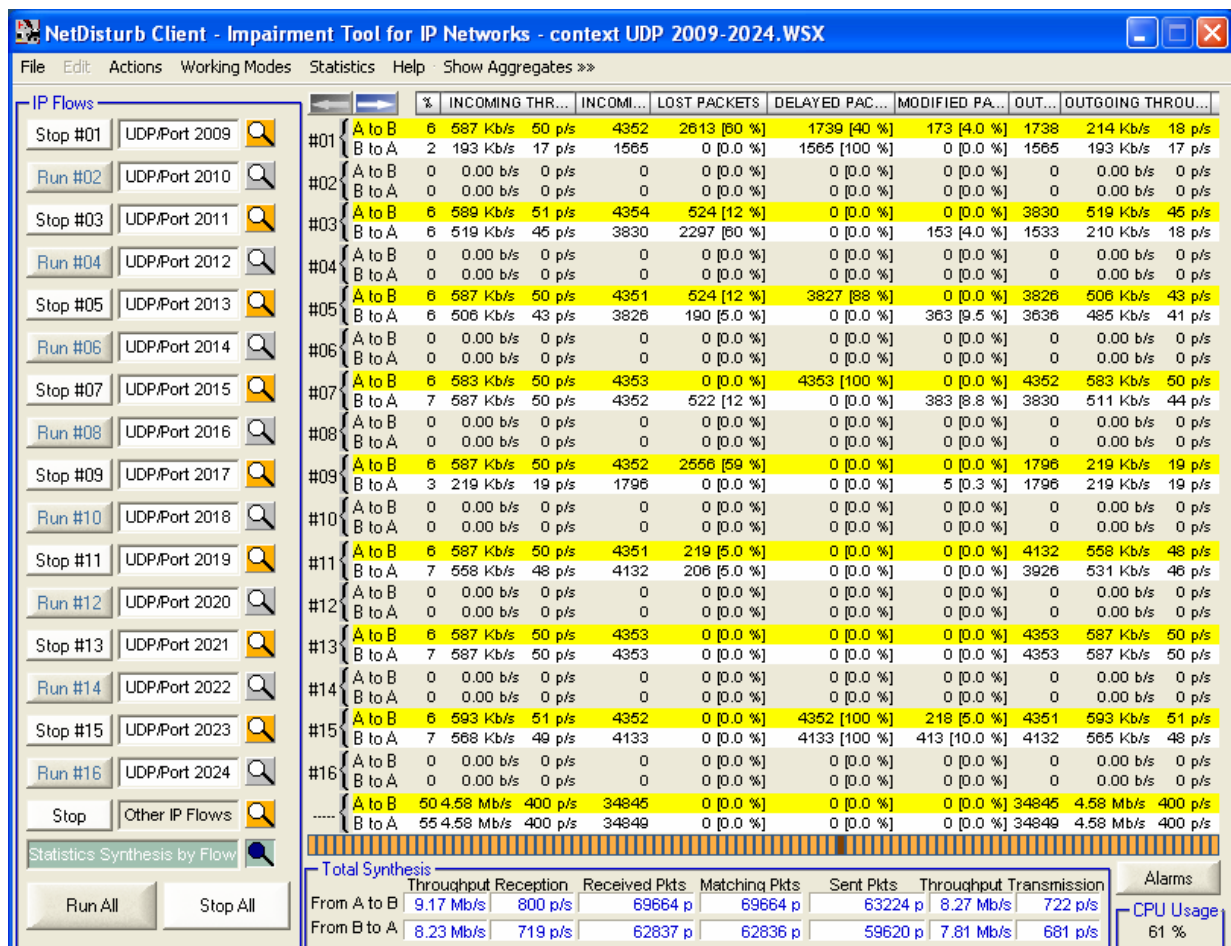


Figure 4 – Statistics Synthesis by Flow example

Total synthesis

At the bottom of the Client window, the total synthesis displays the following parameters for both directions (A → B or B → A):

- Throughput and number of packets per second received
- Number of packets received
- Number of matching packets
- Number of packets sent
- Throughput and number of packets per second transmitted

Total Synthesis							Alarms
Throughput Reception		Received Pkts	Matching Pkts	Sent Pkts	Throughput Transmission		CPU Usage 18 %
From A to B	1.16 Mb/s	491 p/s	28675 p	28381 p	1.12 Mb/s	487 p/s	
From B to A	4.16 Mb/s	745 p/s	81630 p	81630 p	4.16 Mb/s	745 p/s	

Alarms

The alarms encountered by the **NetDisturb** driver can be displayed by the user and are classified per direction for both interfaces:

<i>Incoming direction</i>	<i>Outgoing direction</i>
<ul style="list-style-type: none"> • Number of lost packets • Number of lost bytes • Number of errors returned by the Driver at the Interface • Number of missing buffers to keep packets • Number of ignored flows (when the multi-flows option is active). 	<ul style="list-style-type: none"> • Number of lost packets • Number of lost bytes • Number of errors returned by the Driver at the interface

NetDisturb Client - Alarms Summary

Alarms Linked to the Direction from Interface A to Interface B

Incoming from A

Lost Packets: 0

Lost Bytes: 0

Driver Errors: 0

Missing Buffer Errors: 0

Lost TCP/UDP Connections: 0

A to B

Outgoing to B

Lost Packets: 0

Lost Bytes: 0

Driver Errors: 0

Details

Alarms Linked to the Direction from Interface B to Interface A

Outgoing to A

Lost Packets: 0

Lost Bytes: 0

Driver Errors: 0

B to A

Incoming from B

Lost Packets: 0

Lost Bytes: 0

Driver Errors: 0

Missing Buffer Errors: 0

Lost TCP/UDP Connections: 0

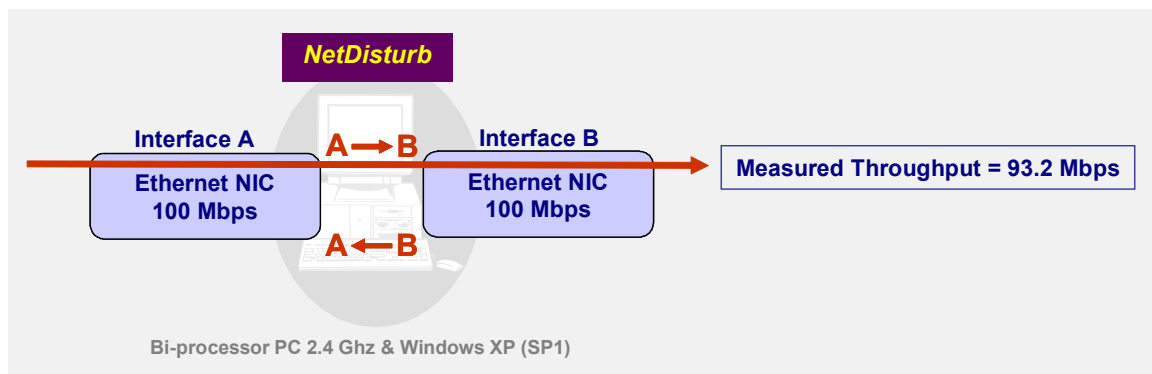
Details

OK Clear Alarms Update Alarms Summary

1.4 Performances

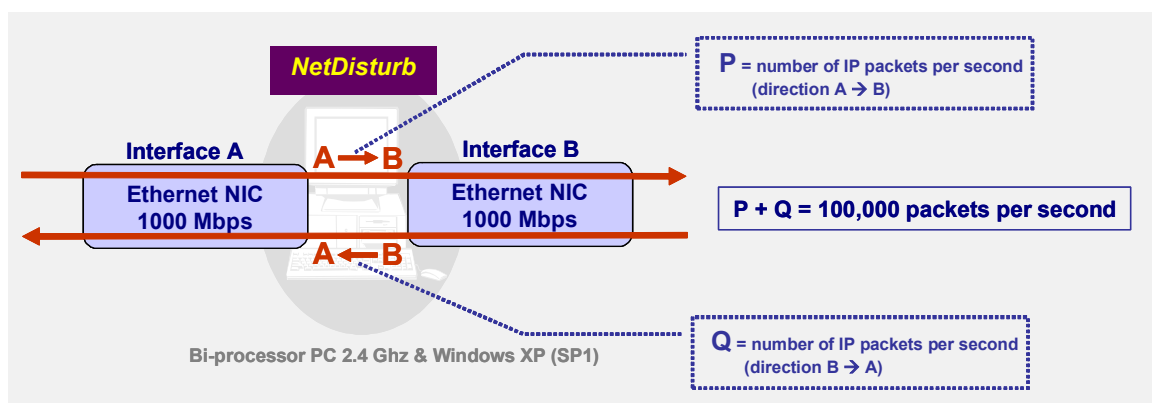
To illustrate the key performances of **NetDisturb**, 2 examples are presented hereafter (by using an Intel Xeon 5140 2.33 GHz with Windows XP SP2).

Example 1: use of 2 Fast Ethernet NICs



NetDisturb is configured with 16 IP flows (no loss and no delay for each flow). With Fast Ethernet NICs, the throughput measured is 97Mbps in one direction.

Example 2: use of 2 Gigabit Ethernet NICs



By using 2 Gigabit NICs, **NetDisturb** can handle up to 150,000 packets per second with 16 IP flows defined (for both directions).

These two examples show some performances of **NetDisturb**. This will avoid heavy investments in expensive hardware solutions.

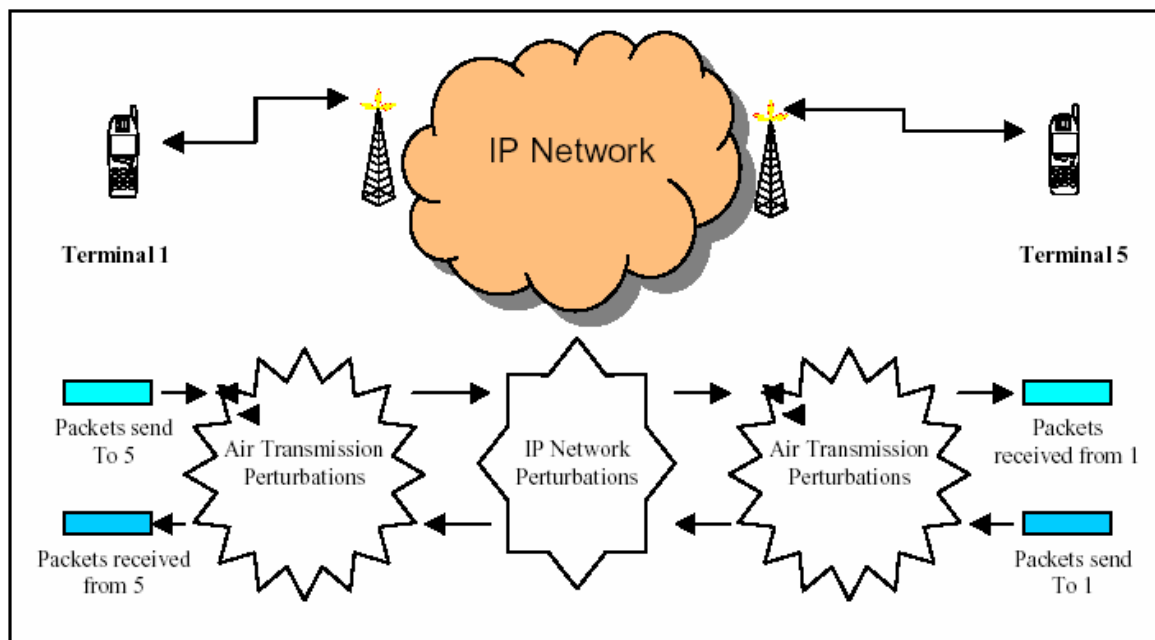
Applications

- *Performance & Acceptance Tests:* Qualify and evaluate the behavior of IP equipments (phone, fax, gateway, etc.) and applications (audio and video streaming, etc.) on IP networks.
- *Configuration and control of IP Equipments for product verification and test:* Define different QoS levels in an Intranet or Internet environment to configure terminals, gateways and routers.
- *Test Laboratories:* **NetDisturb** provides repeatable QoS on different flows using configuration mode and values (loss, duplicate, delay, packet content impairment) defined by the user, and so re-create real world problems in the lab.
- *Applications test:* **NetDisturb** allows testing applications such as Voice over IP, streaming audio and video, and other distributed applications.
- *Emulation of symmetric or asymmetric network conditions (LAN, MAN, WAN):* latency, jitter, packet loss, bandwidth limitations, etc. to test IP applications (VoIP, streaming audio & video, etc.), services and products sensitive to various real conditions.

*Some publications mentioning the use of **NetDisturb***

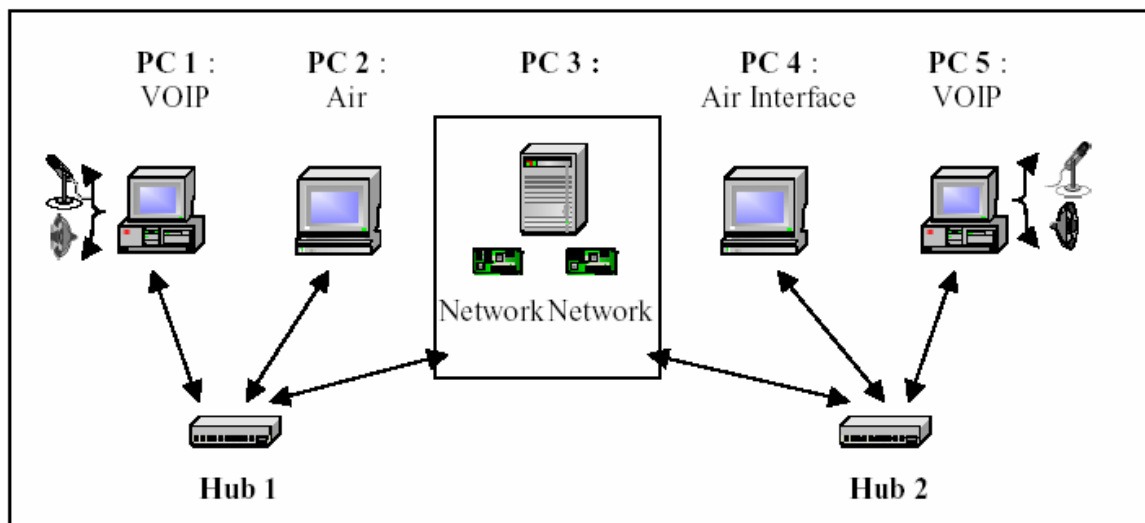
- The Communications and Information network Association of Japan (CIAJ) which represents manufacturers supplying network devices and terminals has published a report in 2002: Report on speech quality investigation of VoIP Terminals (gateways and IP phones): http://www.ciaj.or.jp/tusin/pressrelease/voip_1e.html "We adopted **NetDisturb**, ... as a network simulator because of its ease of installation and operation in Windows".
- 3GPP Technical Specification Group Services and System Aspects TSG-S4
- Test Plan for the Adaptive Multi-Rate Wide-Band (AMR-WB) and Narrow-Band (AMR-NB) in packet switched networks.
- Test Plan for 3G packet switched conversation tests (comparison of quality offered by different speech coders over packet switched networks)
NetDisturb is used as the simulated network.

The following illustrations describe the system that is simulated for these tests.



Packet switch audio communication simulator

This is simulated by using 5 PCs as shown below, with PC# 3 using **NetDisturb** as network simulator.



Simulation platform

1.5 Customer references

Present on the market since 1998, **NetDisturb** is used in more than 40 countries.

See some worldwide references of satisfied customers:

Alcatel, ANZ Bank, AT&T, Bell Canada, Cisco, Commtech Wireless, Department of Defense, Equant, France Telecom, Gensight, Global Crossing, Iwatsu, Juniper, Motorola, Nortel Networks, NEC, NTT, Panasonic, Philips, PIKA Technologies, Polycom, Psytechnics, Raytheon, Schlumberger, Scopus, Tekelec, TF1, Toshiba, UTStarcom, WL Gore, Xerox, etc. as well as many universities and telecom institutes.

1.6 Conditions of use

NetDisturb is licensed on a per workstation basis. You will need to purchase a separate license for each machine that you run it on.

Each licensed copy of the software gets one corresponding USB Software Protection Key that should be inserted on the target PC before starting the **NetDisturb** server.

1.7 Delivery

Includes CD with documentation, printed installation guide, one USB Software Protection Key, technical support and software maintenance (including major and minor software upgrades) for a period of twelve months from the date of purchase.

To download the trial version of **NetDisturb**, please visit us at:
<http://www.zti-telecom.com/pages/main-ip.htm>

Part 2 What's new in NetDisturb version 4.6?

This part is a general overview of new features and improvements provided with **NetDisturb** version 4.6 and important information to upgrade from previous versions.

More details regarding features and improvements included in the different versions of **NetDisturb** can be found in the version.txt file located in the installation directory (default settings: C:\Program Files\NetDisturb).

The new features and improvements provided with **NetDisturb** version 4.6 are listed below:

- ⇒ The licensed version of the software uses a USB Software Protection Key. The USB Software Protection Key is the most flexible way to transfer your license to any other PC.
- ⇒ The Command Line Interface has been added to the NetDisturb Client part. It enables the integration of **NetDisturb** in Command Line tests beds.
- ⇒ The exchanges between NetDisturb Client and NetDisturb Server's parts are based on the SOAP interface. It allows going through Firewall in an easier way.
- ⇒ The previous versions of **NetDisturb** were allowing handling only the remaining IP packets. From version 4.6, **NetDisturb** is also able to impair the complete **remaining Ethernet frames** such as IP Frames, MPLS, Appletalk, IPX frames, and so on.
- ⇒ **NetDisturb** manages the jumbo Ethernet Frame up a size of 17976 bytes.
- ⇒ The context files and the User data files are now located on the NetDisturb Client PC and the user is allowed to change the file location i.e. not only the default directory (C:\Program Files\NetDisturb\Client) can be used but any.
- ⇒ The laws could be changed 'on-the-fly'.
- ⇒ Multiple corrections have been included in the laws management.

To get more details about how to switch from the old software license mechanism to the new **USB Software Protection Key**, please refer to the paragraph 4.3.



The contexts created with version 4.2, version 4.3 RC3, and version 4.4 and version 4.5 are reused automatically. When saved, they get the new NetDisturb v4.6 file format.

Part 3 Install NetDisturb

NetDisturb requires less than 20 MB of free disk-space. The installation procedure is a standard installation program for Windows 2000, XP and Windows Server 2003.



** To run NetDisturb your computer's screen resolution must be at least 1024x768, the DPI setting should be set up with the "Normal size (96 DPI)" value and the Font size should be set up with the "Normal" value.*

** To install NetDisturb under Windows 2000, XP or Server 2003, you must log on with your administrators rights.*

3.1 Forewords before upgrading from versions 4.2, 4.3, 4.4 and 4.5

NetDisturb version 4.6 has introduced a new Software Protection using a USB key but previous users of **NetDisturb** can continue to use their Software License Key. **When upgrading from a previous version of NetDisturb, do not uninstall the previous version to keep your existing license.**

When upgrading from an older **NetDisturb** version, the installation procedure of **NetDisturb** moves the user's files and the context files, located in the previous default **NetDisturb Server** directory, into **NetDisturb Client** directory. All files related to a context (defined using the extension .txt and .wsx) are copied, but the files installed with **NetDisturb version 4.6** will overwrite those files.

3.2 Forewords before upgrading from versions 4.1 and under

You don't need to uninstall the previous version of **NetDisturb** to keep your license scheme. However, this license will not enable you to use **NetDisturb version 4.6**, because the license date of version 4.1 and under is too old. You should contact ZTI (contact@zti-telecom.com) to get back a new unlimited license number when upgrading to version 4.6 with the new site code.

3.3 How to install the software downloaded from the Internet

The installation procedure is a standard installation program.

- If you have downloaded the file **NetDisturb.zip** from our website, you must first unzip this file in a temporary directory. It contains the [Setup_NetDisturb.exe](#) file and the related documentation.
- Then run "[Setup_NetDisturb.exe](#)" from the temporary directory to launch the setup procedure.



NetDisturb** is made of two parts: **NetDisturb Client** and **NetDisturb Server**. **This setup will install both Client and Server parts on the same system.

3.4 How to install the software from the CD-ROM

The installation procedure is a standard installation program. On the CD-ROM, you will find the "[Setup_NetDisturb.exe](#)" file.



NetDisturb** is made of two parts: **NetDisturb Client** and **NetDisturb Server**. **This setup will install both Client and Server parts on the same system.

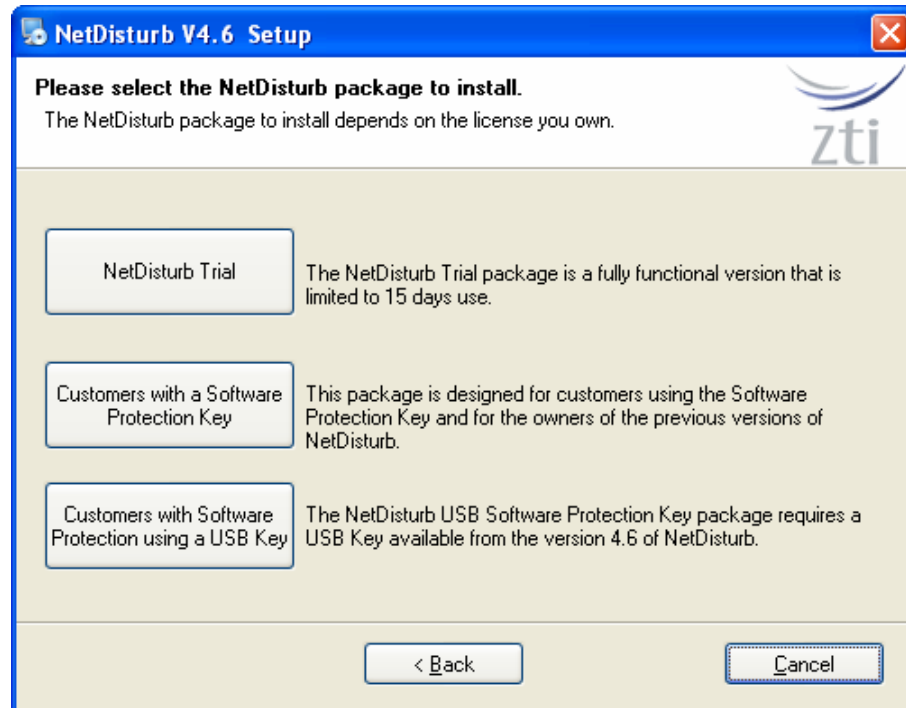
3.5 How to install the NetDisturb Client only (from the CD-ROM)

On the CD-ROM, a second setup allows installing the **NetDisturb** Client on a machine. This is useful if you want to install the **NetDisturb** Server and the **NetDisturb** Client on two different machines.

To install the **NetDisturb** Client on a machine (Windows 98, 2000, XP or Server 2003), run "[Setup_NetDisturbClient.exe](#)" and follow the setup instructions to proceed with the installation.

3.6 During the installation

Follow the instructions until reaching the **NetDisturb** package selection window.



3.6.1 NetDisturb packages in a few words

To use the **NetDisturb** software, there are 3 license schemes:

- The **NetDisturb Trial package** allows you to use **NetDisturb** during 15 days after the first run. When the trial period has expired, the license should be purchased.
- The **NetDisturb Software Protection Key package** has been designed for users owning a **Software License** key and for the users of the previous versions of **NetDisturb**. It keeps your current installation and files, without additional requirement.
- For new users, the **NetDisturb USB Software Protection Key package** requires a USB key with the **NetDisturb** license. The **USB Software Protection Key** is provided with **NetDisturb** from version 4.6. This package allows the installation of **NetDisturb** on several PCs but the only PC able to run **NetDisturb** is the one having the USB Software Protection key plugged in.



As previous users, you may be interested to move to a USB Software Protection Key: please contact your distributor or ZTI to get more details about the license migration program (see 4.3 NetDisturb & USB Software Protection Key for more details).



This software is licensed on a per workstation basis. This means that you will need to get a separate license for each machine you will run it on. The license may be a software license key (for previous users) or the USB Software Protection key. Each new licensed copy of the software gets a USB Software Protection key that can be moved from one installation to the other.



The USB Software Protection key contains only the license information. The software is available on a separate CD-ROM.

3.6.2 Which package should I install?

Depending on your needs, please find here below the package most suitable for you.

3.6.2.1 I want to evaluate **NetDisturb V4.6**

In that case, choose the “**NetDisturb Trial**” package. You will be able to use **NetDisturb** during 15 days only.

3.6.2.2 I already use **NetDisturb** ...



This paragraph is dedicated to the users owning a previous version of **NetDisturb**.

... and I want to upgrade and keep my permanent license

In that case, choose the “**Customers with a Software Protection Key**” package. Your installation will be upgraded and your existing permanent Software Protection Key will be kept.

... and I want to upgrade and use the USB Software Protection Key I bought

In that case, choose the package “**Customers with Software Protection using a USB Key**”. Plug the USB Software Protection Key before launching **NetDisturb**.

3.6.2.3 I just bought **NetDisturb** ...



This paragraph is related to the users purchasing **NetDisturb V4.6**.

... and I chose the Electronic Software Delivery (ESD)

In that case, choose the package “**Customers with a Software Protection Key**”. When you launch the software for the first time, press the “Enter” key when the ZTI logo appears. Then, get the site code and mail it to us with your details and your purchase order reference at contact@zti-telecom.com. We will send you back the site key enabling your permanent Software Protection Key. More details about the way to proceed are available in paragraph “**4.2.1 Installation of the Software Protection Key**”.

... and I received the CDROM & USB Software Protection Key

In that case, choose the package “**Customers with Software Protection using a USB Key**”. Plug the USB Software Protection Key before running **NetDisturb**.

... and I will receive CDROM & USB Software Protection Key in a few days

In that case, choose the package “**Customers with a Software Protection Key**”. You will get a fully functional but time-limited Software Protection Key.

3.7 What has been installed on my computer?

The default settings install **NetDisturb** in the following directory:
C:\Program Files\NetDisturb with the following subdirectories:

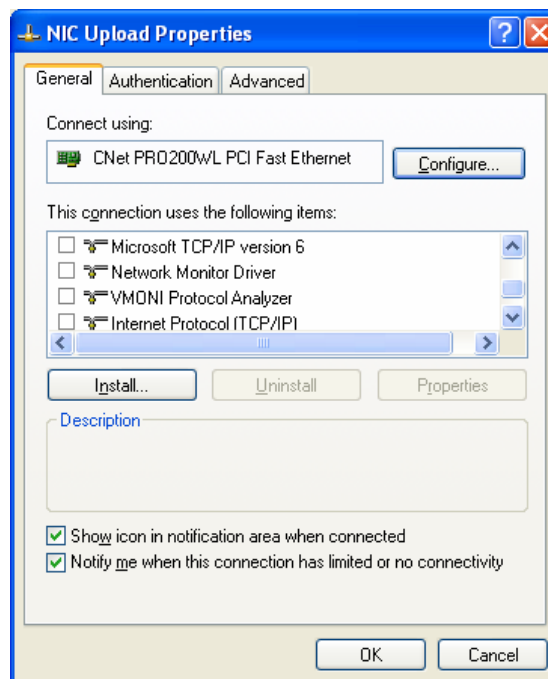
C:\Program Files\NetDisturb\Client
C:\Program Files\NetDisturb\Driver
C:\Program Files\NetDisturb\Server

3.7.1 IMPORTANT STEP: I must configure the driver before running NetDisturb

The setup procedure realizes the installation of the **NetDisturb** driver transparently. It will be installed positioned on top of each Ethernet or wireless NIC if the driver of the NIC is NDIS compatible. The **NetDisturb** driver sets in the kernel of Windows 2000, XP or Server 2003 and handles the exchanges between two NICs. The **NetDisturb** driver linked to the selected NICs is available and transparent. It doesn't appear in the protocol list.

Now there is an important manual operation to do before using NetDisturb:

1. In order to avoid unexpected traffic generated by the protocol stack on the NICs, you should unselect all protocols first (TCP/IP, Client or Microsoft Networks, etc.).
2. To unselect protocols from a NIC used by **NetDisturb**, use the "Control Panel/Network and Dial-up Connections" or the "Control Panel/Network Connections" program and uncheck all protocols.



Example of NIC with all protocols unchecked

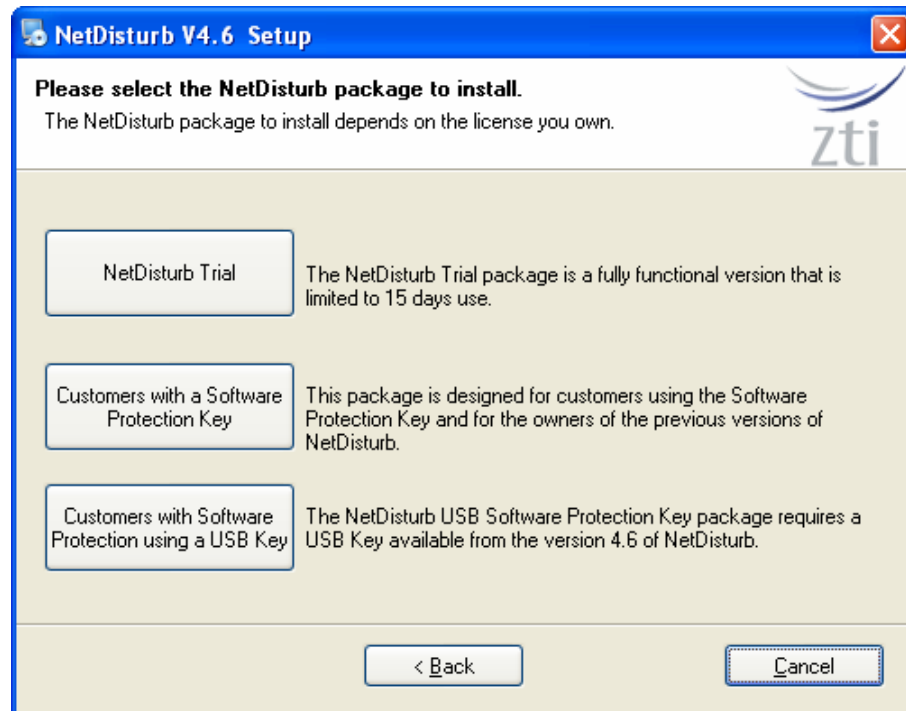
3.7.2 Start Menu Shortcuts Created

Start > All Programs > **NetDisturb**

- ⇒ **NetDisturb (start both Server and Client)**
- ⇒ **1) NetDisturb Server Only**
- ⇒ **2) NetDisturb Client Only**
- ⇒ **USB Key Viewer (USB Software Protection Key version only)**
- ⇒ **Uninstall NetDisturb**
- ⇒ **Read Me First**
- ⇒ **User Guide**

3.8 How to reinstall another package?

If you already have installed one of the **NetDisturb V4.6** packages, click [Setup_NetDisturb.exe](#) and select, in the window below, the new package you want to install.



3.9 How to transfer the software to another computer?

Install the software on the target computer. You don't need to do any particular operation with the *"Customers with Software Protection using a USB Key"* and *"NetDisturb Trial"* packages.

With **NetDisturb** & USB Software Protection Key, you do need to plug the USB key before running the software on the target computer.

With the package *"Customers with a Software Protection Key"*, install the software on the target computer and refer to the paragraph **"4.2.2 Software Protection Key Transfers"** to know how to transfer the Software Protection Key.

Part 4 How to handle your license?

4.1 NetDisturb Trial

You don't need any license to install the **NetDisturb Trial package**. After the first run of **NetDisturb Server**, the **NetDisturb Trial package** can be used during 15 days.

4.1.1 NetDisturb Server License Information window

When you run **NetDisturb Server**, the information about your trial license is displayed, as shown below.



You are now able to use **NetDisturb** during the next 15 days.

4.1.2 End of the fifteen-day trial period

Once the trial period is over, you can't use **NetDisturb** anymore, see below:



When you press the **OK** button, **NetDisturb** will stop running.

To continue to use **NetDisturb** please contact you local distributor or **ZTI** to get an unlimited license.

4.2 NetDisturb & Software Protection Key

Licensed users of **NetDisturb** that are already using the Software Protection Key should not need to refer to the section 4.2.1. To transfer the owned Software Protection Key to another PC or to another directory, please go directly to section 4.2.2.

4.2.1 Installation of the Software Protection Key

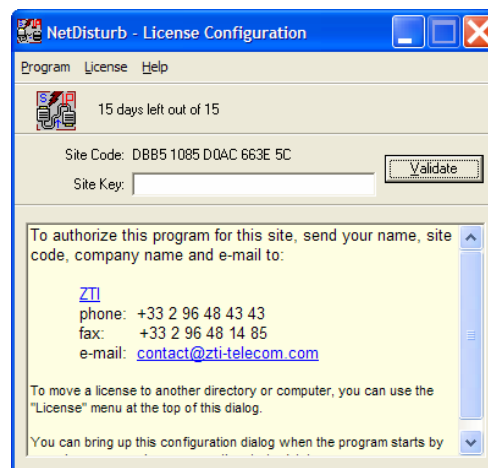


This software is licensed on a per workstation basis. This means that you will need to get a separate license for each machine you will install it on. Each licensed copy of the software installed on a system has a unique **Site Code** that requires a corresponding unique **Site Key** to work. A period of 15 days is automatically enabled at the first installation of the software. If you try to install the software again, the Software Protection Key will disable the trial period.

If you want to configure your Software Protection Key before the time-limited period end, press **Enter** just after launching the **NetDisturb** when the following message is displayed:



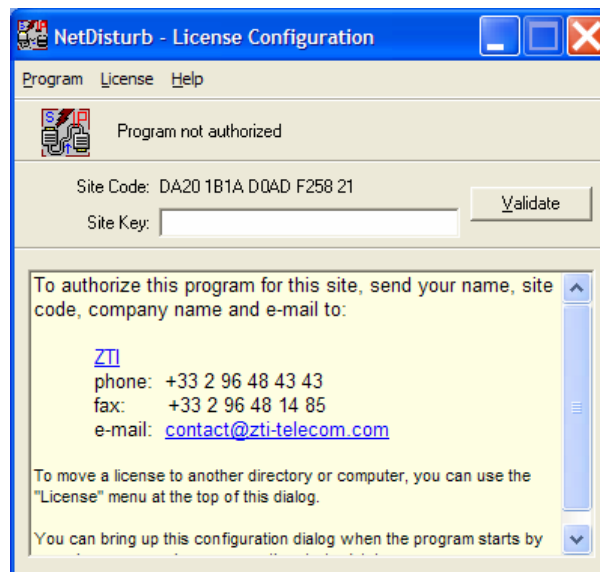
Then, you will see the following Software Protection Key configuration window:



At the end of the trial period when you launch **NetDisturb**, the same Software Protection Key configuration window appears, but saying "Program not authorized" instead of showing the remaining days of use.

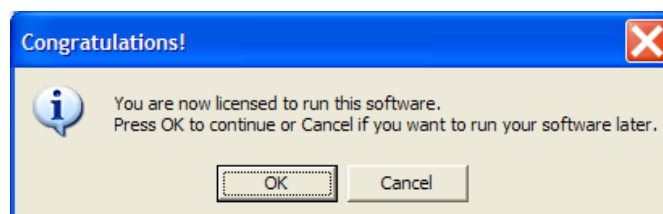
To get the **Site Key** and obtain a permanent license, please send an email to contact@zti-telecom.com or contact@zti.fr with the following information:

- The **Site Code** (you can copy and paste the Site Code displayed in the license window)
- The name of the software: **NetDisturb**
- The OS used
- Your details
- The purchase order's number and date of purchase



We will then email you the **Site Key**. You can now close the license's window.

After you have received the email with the **Site Key**, open the Software Protection Key configuration window again by pressing the Enter key as explained before. Copy the Site Key in and then click "Validate". After validation of the Site Key, you will get the following message:



- ⇒ **Important:** one **Site Code** is associated with one **Site Key**, and only one. A **Site Code** is unique for each PC installed. For security reasons, as soon as you validate a **Site Key** (trial or unlimited), the Software License program generates a new **Site Code** automatically.
- ⇒ For any question or further information, please contact our technical support:
 Email: support@zti-telecom.com or support@zti.fr
 Phone: +33 2 9648 4343
 Fax: +33 2 9648 1485

*When you launch **NetDisturb** with a permanent Software Protection Key, you will see the following window:*



4.2.2 Software Protection Key Transfers



A Software Protection Key transfer is not a duplication of any type. Please contact ZTI or your authorized distributor for site Software Protection Key information and for several Software Protection Keys purchase.

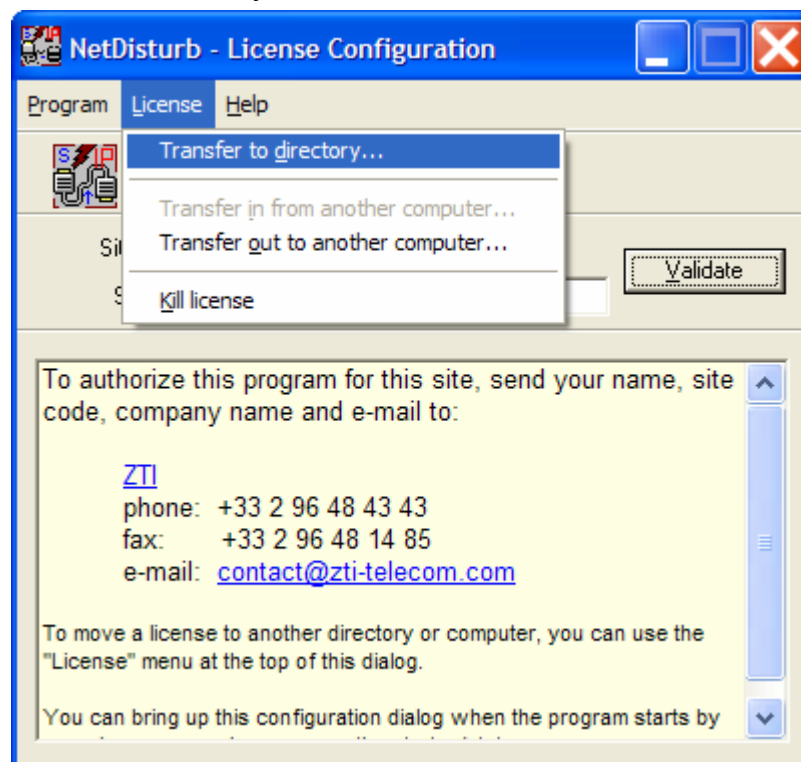
Software Protection Keys can be transferred using one of the following methods:

- ⇒ **Direct transfer:** move the Software Protection Key to another directory of the same PC or between two PCs linked to the same network.
- ⇒ **Transfer by media:** move the Software Protection Key from a source PC to a target PC by using a floppy disk or USB key.

4.2.2.1 Direct Transfer: move the Software Protection Key from one local directory to another

This transfer mechanism must be used to move a Software Protection Key in two cases:

- From a source to a target directory of the same PC
 - From a source to a target directory of networked PCs
- First, copy the program (copy the **NetDisturb** folder) to the target directory.
For example from "C:\Program Files\NetDisturb" to "C:\Temp\NetDisturb"
 - Then run the program from its original directory (from "C:\Program Files\NetDisturb"). When the Software Protection Key configuration window appears, press **Enter** and select "License > Transfer to directory ..." in the License menu as shown below:



- Provide the path name of the target program (for example C:\Temp\NetDisturb\Server\NetDisturbServer.exe)
- The Software Protection Key is now transferred to the new directory.

4.2.2.2 Transfer by Media (USB key) from a source PC to a target PC



A USB key or a floppy disk is needed for this kind of transfer.

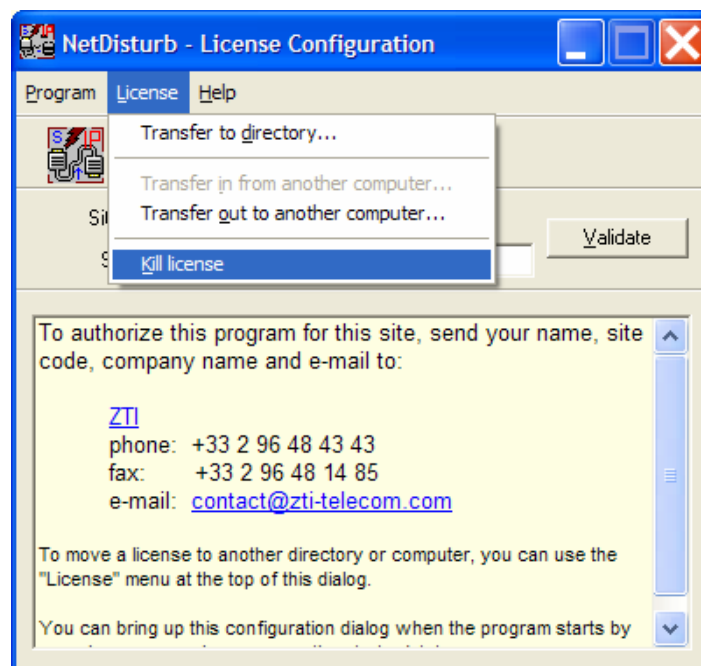
To transfer the Software Protection Key from the source PC (PC #1) to the target PC (PC #2), proceed as described in the following order:

- 1) First install the program on the target PC (PC #2).
- 2) Run the software on PC # 2 and kill the time-limited Software Protection Key in order to get an unauthorized license on this PC.

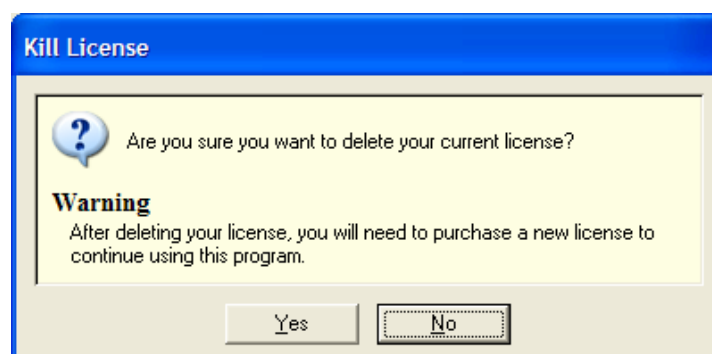
If the "Transfer in from another computer ..." item of the license menu is disabled, you must kill the Software Protection Key.

How to kill the Software Protection Key?

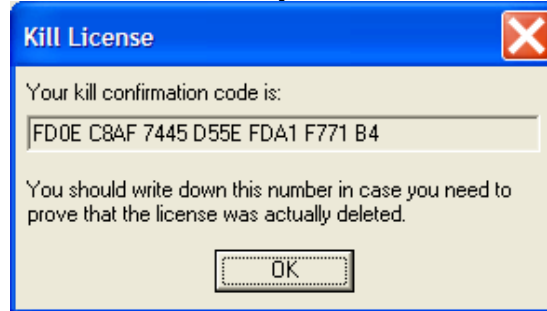
When the Software Protection Key configuration window appears, press **Enter** and select "License > Kill license" in the license menu.



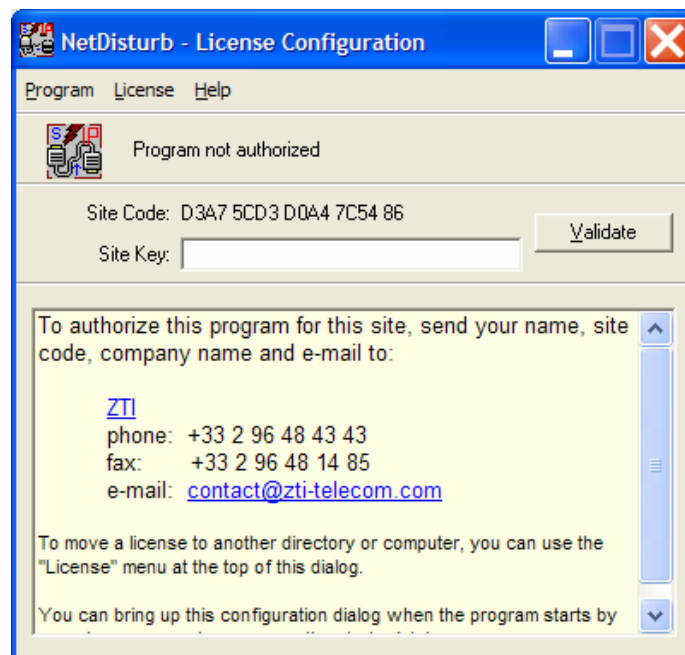
A message box will appear:



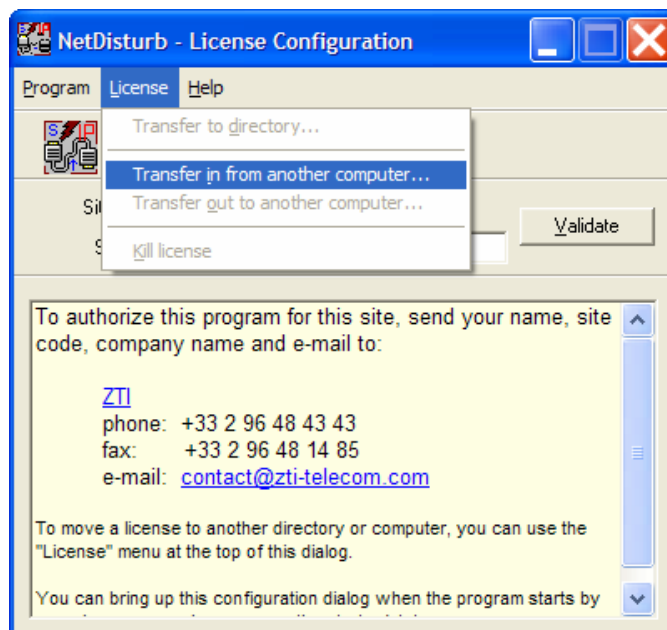
Press 'Yes' to kill the Software Protection Key and a confirmation code is displayed:



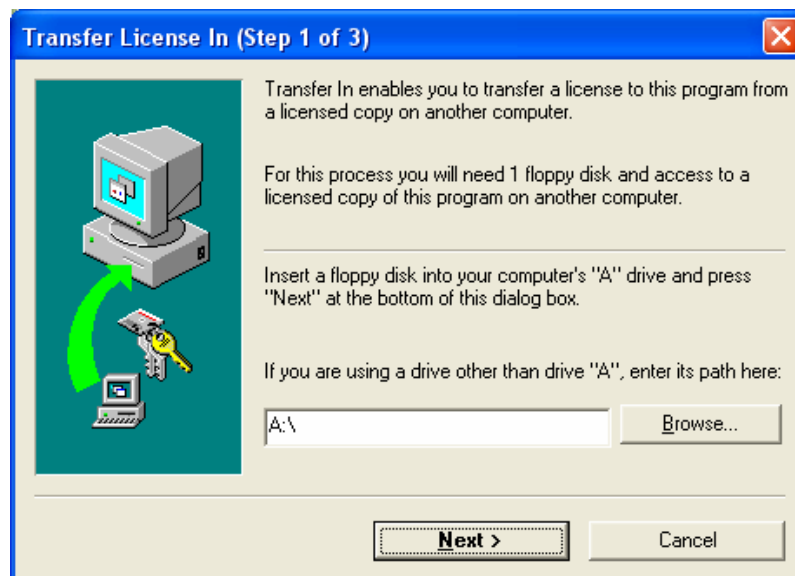
Click 'OK' and the Software Protection Key window displays now "Program not authorized":



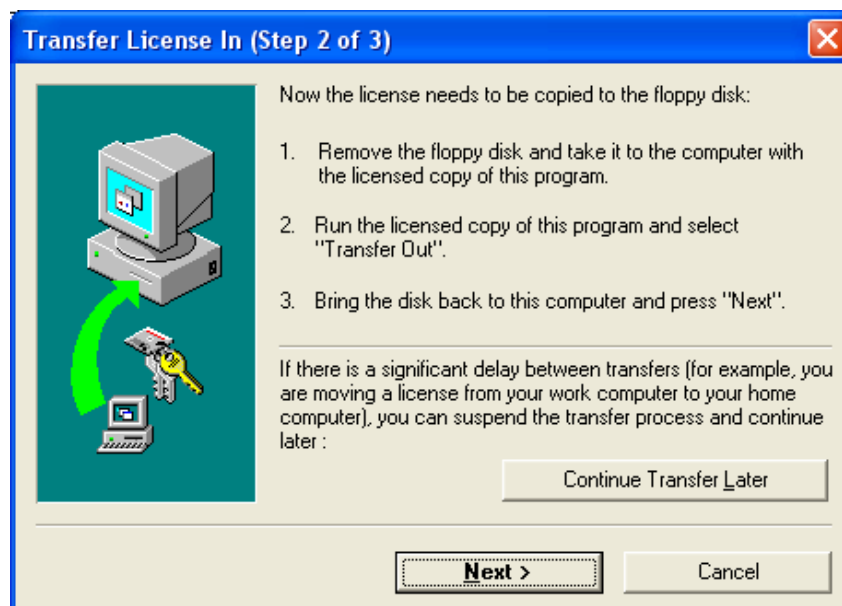
3) Select "License > Transfer in from another computer ..." from in the Software Protection Key License menu:



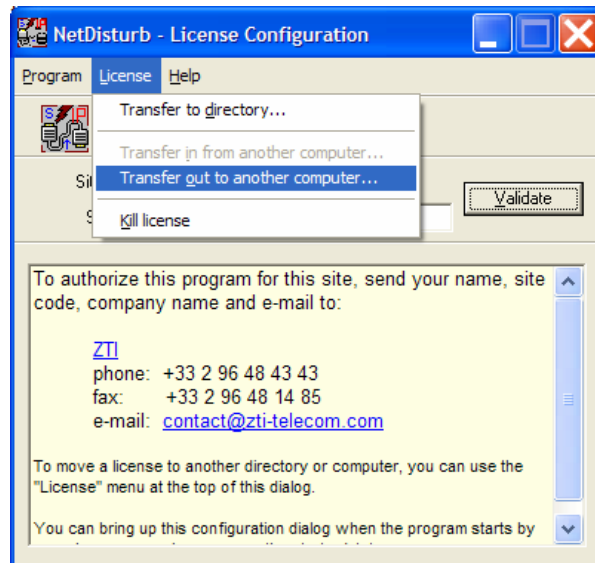
The "Transfer License In (Step 1 of 3)" window is displayed:



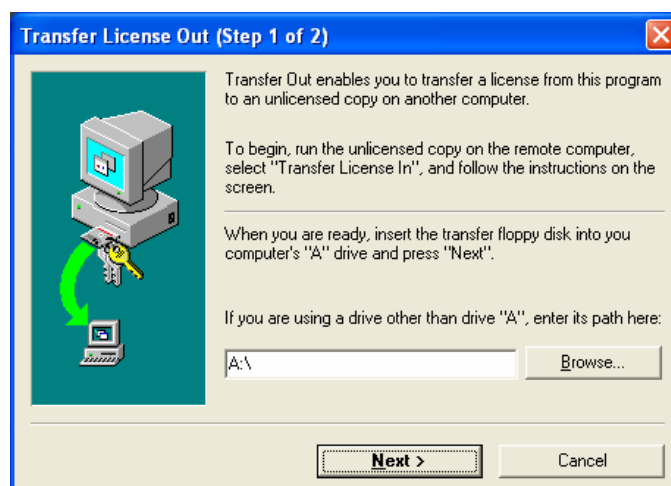
4) Insert a floppy disk or use a USB key as requested in step 1 of 3 and specify the path. Then press "Next >": the "Transfer License In (Step 2 of 3)" window is displayed:



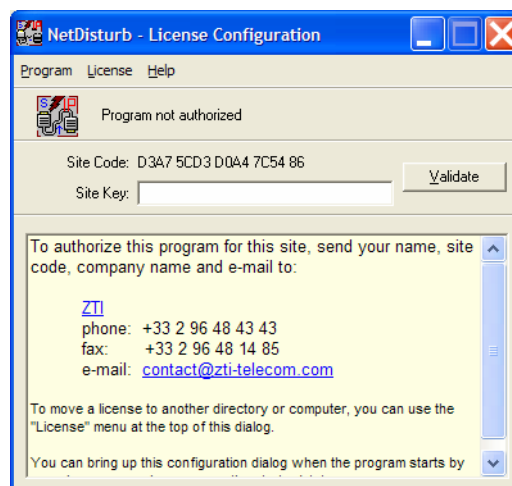
5) Go to the source PC (PC #1) and insert the media (USB key or floppy disk). Then start the program on PC #1. When the license configuration window appears, press **Enter** and select "License > Transfer out to another computer ..." as shown below:



The following window is displayed:



Input the media path (USB key or floppy disk) and then press "Next >". When the license is put on the media, you get the "Program not authorized" message:



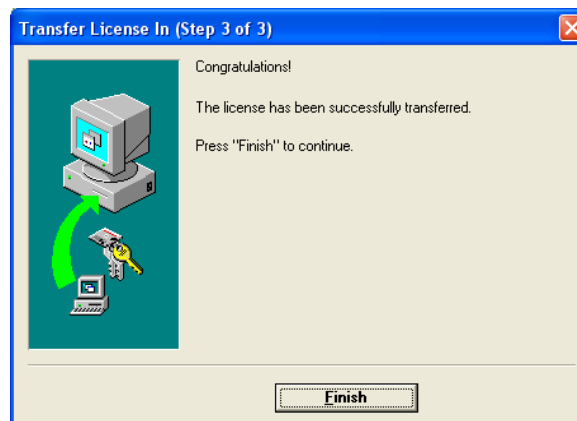


You can check that the Software Protection Key is not available anymore on the source PC since the **NetDisturb** software license is on a workstation basis. Contact us to get information on a Site Software Protection Key (contact@zti.fr or contact@zti-telecom.com).

6) Remove the media from PC #1 and return to PC #2.

Click the 'Next' button on the step 2 of 3 of the “Transfer license in” window (on PC #2) to complete the transfer.

The permanent Software Protection Key is now transferred from the source PC to the target PC, and you get the following message:



Click Finish to continue.

4.3 NetDisturb & USB Software Protection Key

The USB Software Protection Key is the most flexible way to transfer your license to any other PC. Plug it in the computer you want to use **NetDisturb** on.

If you are a user of a previous version of **NetDisturb (version 4.5 and under)** and if the USB Software Protection key interests you, please contact the Sales Offices (sales@zti-telecom.com) to get some information about how to exchange your Site Key to a **USB Software Protection key**.

Part 5 Uninstall NetDisturb

To uninstall **NetDisturb**, please select “Uninstall NetDisturb” in the “Start > Programs > NetDisturb” menu.

All installed components of **NetDisturb** will be removed including the **NetDisturb** driver.

Part 6 Run NetDisturb

As **NetDisturb** is made of 2 parts (**NetDisturb** Server and **NetDisturb** Client), you need to run these two programs in the following order:

1. **NetDisturb Server**
2. **NetDisturb Client**

To run this software in this order, click on:

Start ► All Programs ► NetDisturb ► NetDisturb (start both Server and Client)

6.1 First Run

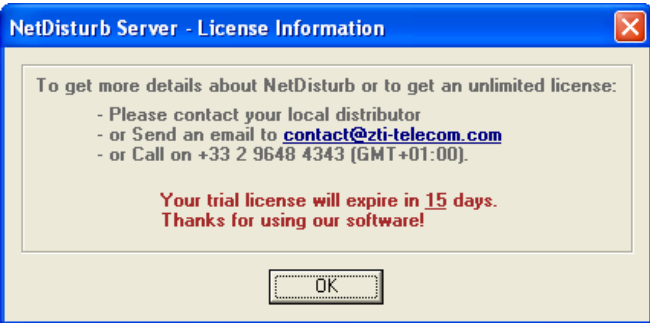

1) The NetDisturb Server startup

NetDisturb Server is started automatically when using the **NetDisturb (start both Server and Client)** shortcut.



You may also start the server independently, for instance when you are using a remote configuration where **NetDisturb Server** doesn't run on the same PC as **NetDisturb Client**. To start the **NetDisturb Server** alone, use the Windows start menu: **Start ► All Programs ► NetDisturb ► 1) NetDisturb Server Only**

After a few seconds and depending on your license, you will get one of the following license windows:

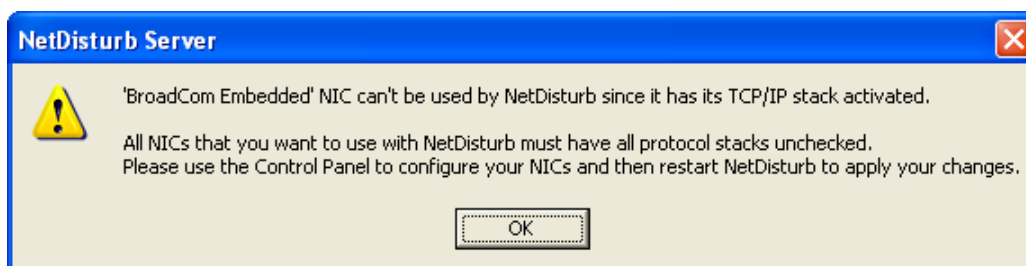
fifteen-day trial version license	Software License version
	
USB Software Protection key	
When you use a USB Software Protection key, there is no window!	

The next window displayed is **NetDisturb Server**

The screenshot shows the 'NetDisturb Server - Version 4.6' window. It is divided into several sections:

- Impairment Interface Configuration and Statistics:** This section contains two columns for 'Interface A : not selected' and 'Interface B : not selected'. Each column has input fields for '# Handled Packets:', '# Lost Packets:', '# Delayed Packets:', 'Desequenced:', and '# Fragmented packets:'. Below these are sections for 'Incoming on A/B' and 'Outgoing on A/B', each with input fields for '# Packets per Second', '# Packets', and 'Throughput'. At the bottom of each column is a red bar labeled 'No transmission'.
- Reset Counters:** A button located between the two interface columns.
- Current Parameters:** A section with input fields for 'Refresh Period (in second):', '# Buffers:', 'Sampling to Compute Throughputs:', 'Desequencing:', and 'Application of Laws:'.
- Current Client Connection:** A section with a 'Client:' label and a text box containing '(No client connected)'. To the right are buttons for 'Show Current Context' and 'Reset Logs'.
- Log Area:** A large text area at the bottom for displaying logs.

If **NetDisturb** has detected some configuration issues, a list of NICs, which can't be used by **NetDisturb**, will be displayed as shown below:




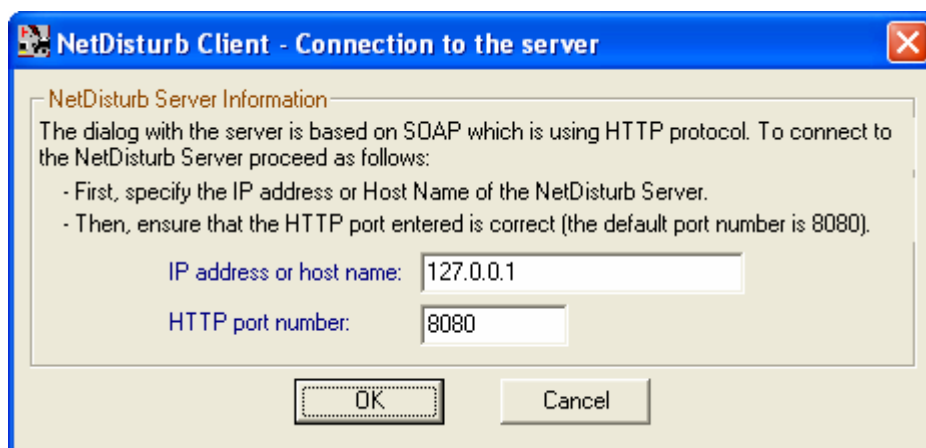
Use **NetDisturb** Client to select the network interfaces (or NICs).

2) NetDisturb Client startup

NetDisturb Client is started automatically when using the **NetDisturb (start both Server and Client)** shortcut. The default connection parameters used to exchange between **NetDisturb Client** and **NetDisturb Server** are:

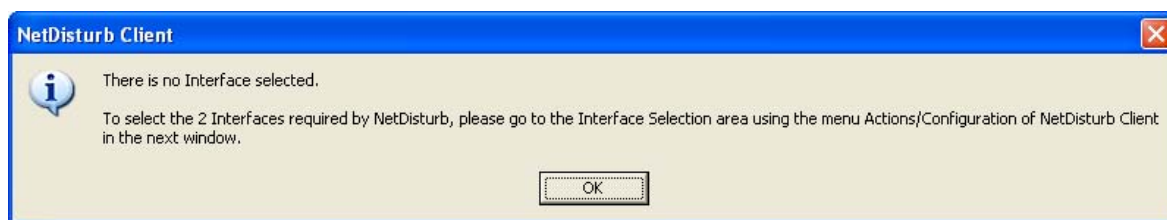
- **NetDisturb Server IP address or Host Name = 127.0.0.1**
(127.0.0.1 = default local IP address if the **NetDisturb Server** and the **NetDisturb Client** are installed on the same machine).
- **HTTP Port Number = 8080**

 You may also start the **NetDisturb Client's** part alone, to connect to a remote **NetDisturb Server**. To start the **NetDisturb Client** alone, use the Windows start menu: **Start ► All Programs ► NetDisturb ► 2) NetDisturb Client Only**. When **NetDisturb Client** starts, it will ask you to enter the parameters to connect to the **NetDisturb Server** machine:

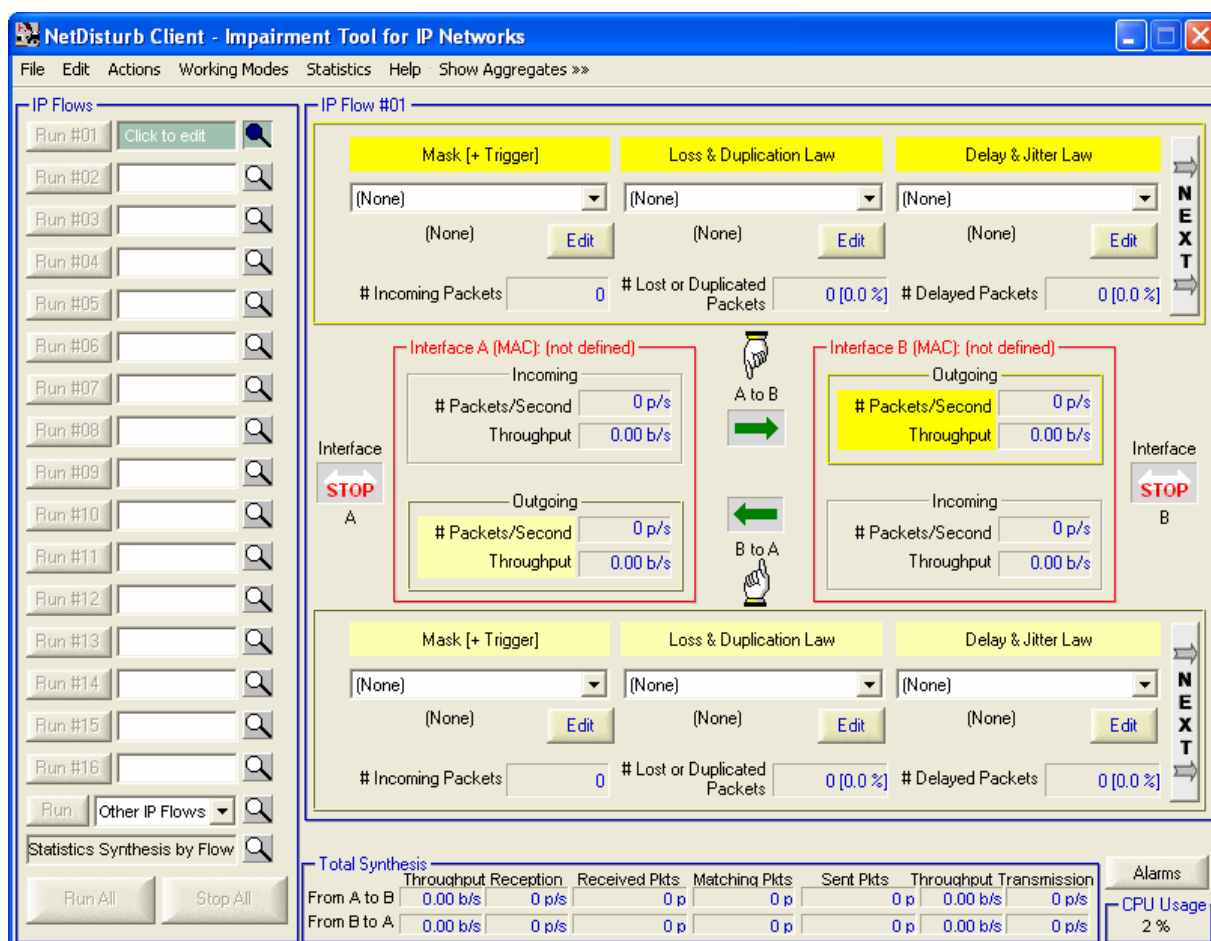




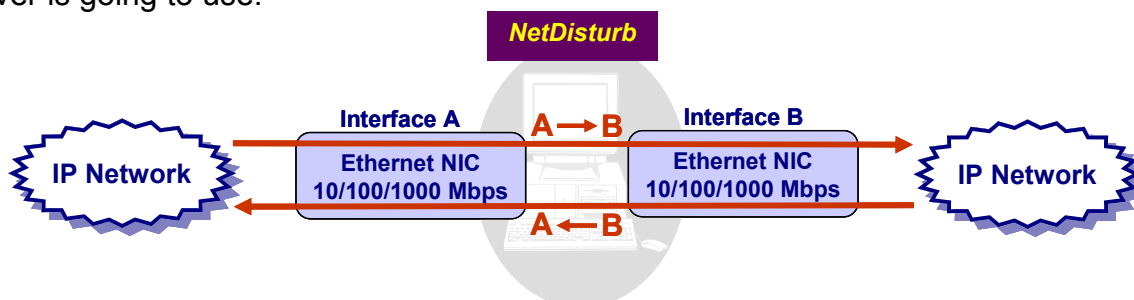
On the first run, there is no Interface defined. **NetDisturb Client** will tell you how to configure those 2 interfaces.



Click “OK” and the **NetDisturb Client** main window will appear:



Then, you need to select the NICs (interface A and interface B) that the **NetDisturb Server** is going to use.



Select “Configuration” in the Actions menu. The Parameters configuration window is displayed:

NetDisturb Client - Parameters Configuration

Display Configuration

Refresh Period: (from 1 s to 60 s)

Sampling period for the throughput calculation: (from 0 s to 60 s)

☐ Instant Throughput ☒ Average Throughput using Sampling Mechanism

NetDisturb Measurement Units

Choose one of the unit below (defined by IEEE Std 260.1-2004) to use with the throughput statistics.

☒ Use kilobyte (kB) and kilobit per second (kb/s) where 1kb/s:= 1,000 bits/s

☐ Use kibibyte (KiB) and kibibit per second (Kib/s) where 1Kib/s:= 1,024 bits/s

Parameter about the 'Laws Apply to each TCP/UDP Connections of the IP Flow' Menu Selection

Number of Buffers containing the Laws Values: (from 2 to 100)

When the Working Mode 'Laws Apply to each TCP/UDP Connection of the IP Flow' is selected, each TCP/UDP connection found in the IP Flow should impaired in the same way. To reach this aim, the values generated by the laws are stored in internal buffers.

There is the same number of buffers for Loss & Duplication laws as for Delay & Jitter laws. Each buffer located in the Kernel memory -a resource to use sparingly- is able to contain 20480 values.

For example, when 2 is the 'Number of Buffers containing the Laws Value' value, 4 buffers of 20480 values are allocated, consuming 320 KBytes of Kernel memory per IP Flow, that is 5,440 Kbytes due to the 17 IP Flows.

This is why the 'Number of Buffers containing the Laws Values' value should be configured carefully.

Interface Selection

Interface A:

Interface B:

At the bottom of this window in the "Interface Selection" part, select one NIC for Interface A and another NIC for Interface B, and then confirm with “OK”.

You should see in the combo-box (Interface A or Interface B) all available and operational NICs. If you don't see any NICs, please follow the steps below:

- Verify that your NICs are installed and operational.
- Enable the needed NICs.
- Stop the **NetDisturb Client**.
- Stop the **NetDisturb Server**.
- Reboot your system if necessary.
- Start the **NetDisturb Server**.
- Start the **NetDisturb Client**.



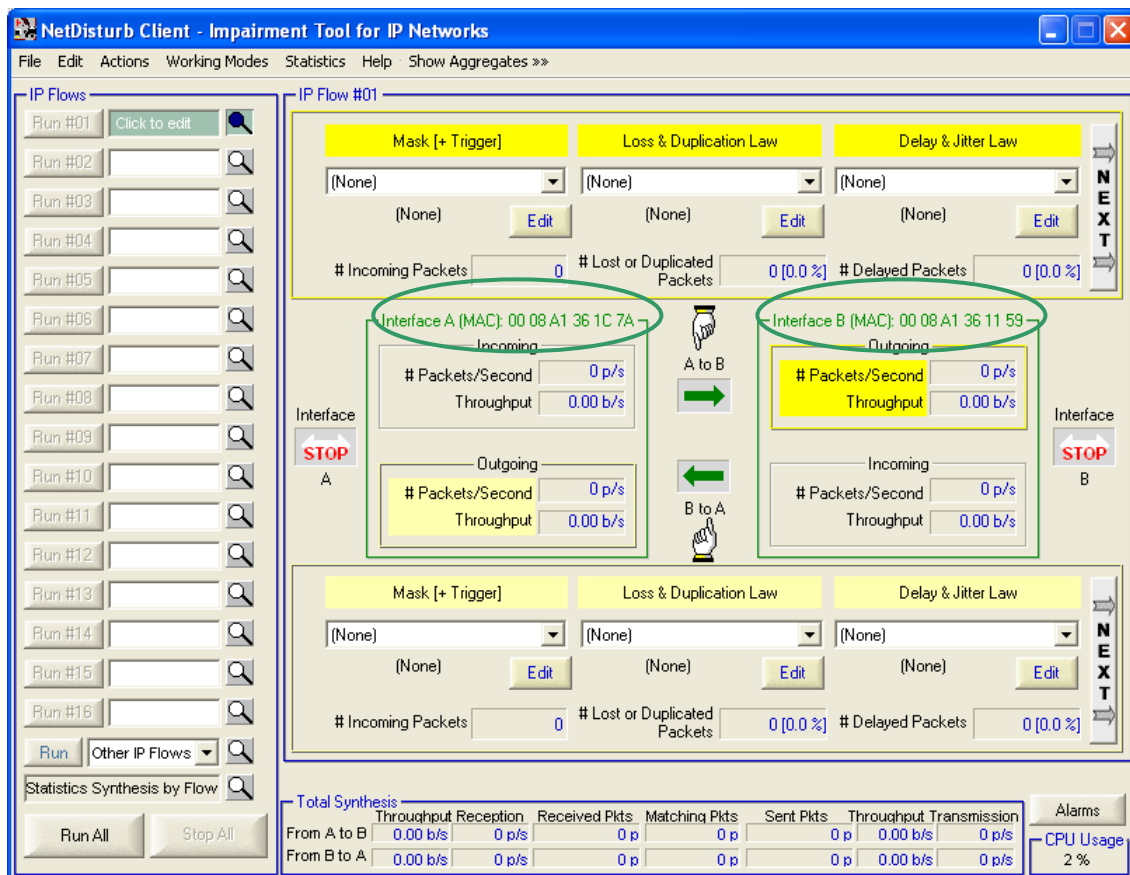
Then you should see your installed NICs in the Interface A and B combo-boxes (see the example below):

The screenshot shows the 'NetDisturb Client - Parameters Configuration' dialog box. It has a blue title bar with a close button. The dialog is divided into several sections:

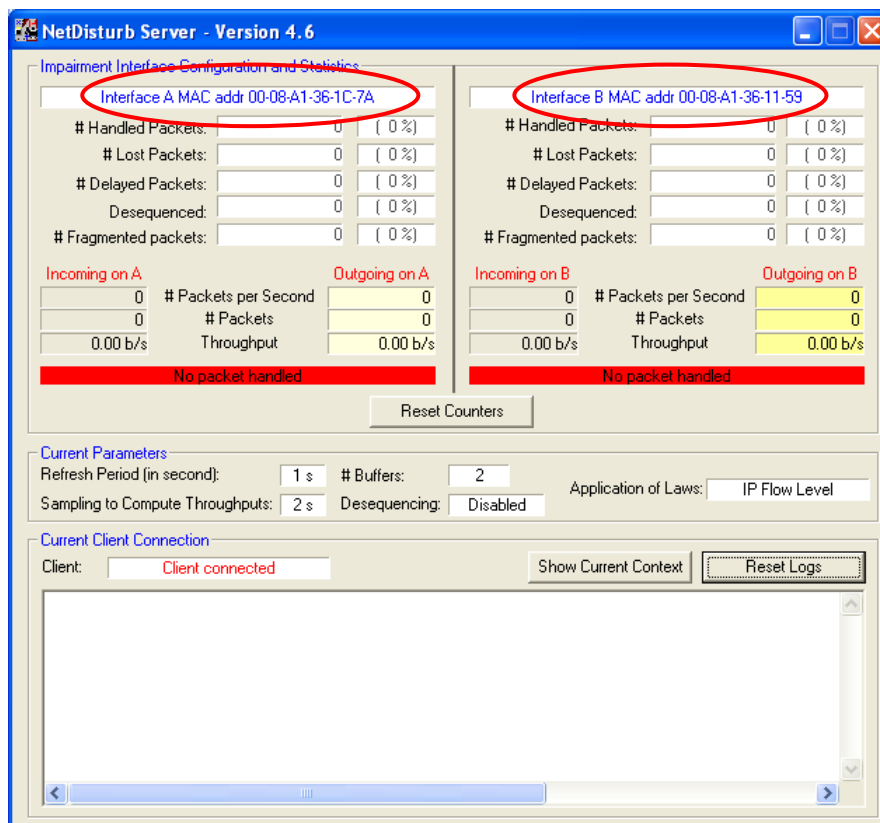
- Display Configuration:** Contains 'Refresh Period' (set to 1, range 1s to 60s) and 'Sampling period for the throughput calculation' (set to 2, range 0s to 60s). There are 'OK' and 'Cancel' buttons. Two radio buttons are present: 'Instant Throughput' (unselected) and 'Average Throughput using Sampling Mechanism' (selected).
- NetDisturb Measurement Units:** A section with the text 'Choose one of the unit below (defined by IEEE Std 260.1-2004) to use with the throughput statistics.' It has two radio buttons: 'Use kilobyte (kB) and kilobit per second (kb/s) where 1kb/s:= 1,000 bits/s' (selected) and 'Use kibibyte (KiB) and kibibit per second (Kib/s) where 1Kib/s:= 1,024 bits/s' (unselected).
- Parameter about the 'Laws Apply to each TCP/UDP Connections of the IP Flow' Menu Selection:** Contains 'Number of Buffers containing the Laws Values' (set to 2, range from 2 to 100). Below this is a text box with detailed information: 'When the Working Mode 'Laws Apply to each TCP/UDP Connection of the IP Flow' is selected, each TCP/UDP connection found in the IP Flow should impaired in the same way. To reach this aim, the values generated by the laws are stored in internal buffers. There is the same number of buffers for Loss & Duplication laws as for Delay & Jitter laws. Each buffer located in the Kernel memory -a resource to use sparingly- is able to contain 20480 values. For example, when 2 is the 'Number of Buffers containing the Laws Value' value, 4 buffers of 20480 values are allocated, consuming 320 KBytes of Kernel memory per IP Flow, that is 5,440 Kbytes due to the 17 IP Flows. This is why the 'Number of Buffers containing the Laws Values' value should be configured carefully.'
- Interface Selection:** Contains two dropdown menus. 'Interface A' is set to 'Interface 1 (100 Mb/s) 00-08-A1-36-1C-7A'. 'Interface B' is set to 'Interface 2 (100 Mb/s) 00-08-A1-36-11-59'.

As soon as the configuration is done, the **NetDisturb** Server recognizes “Interface A” and “Interface B”.

The MAC Addresses of the selected interfaces are displayed in the **NetDisturb** Client and **NetDisturb** Server windows:



Graphical user interface for the **NetDisturb** Client with two Ethernet NICs configured



Graphical user interface for the **NetDisturb** Server with two Ethernet NICs configured

6.2 Detailed Description of the Server and Client Startup

6.2.1 The NetDisturb Server Startup Modes

The level of provided functionalities depends on the availability or not of the **NetDisturb** driver. If the **NetDisturb** driver is lacking, a message warns the user. In that case it is possible to continue in the “restricted mode” where only a few functions are available.

6.2.2 The NetDisturb Client Startup Options

When starting the **NetDisturb Client**, the Connection to Server parameters window is displayed.



This parameters window is made of two sections:

The **NetDisturb** Client needs the following information in order to connect to the **NetDisturb** Server:

1. The **NetDisturb** Server IP address
2. The **NetDisturb** Server HTTP port number

In case of a connection failure (if one of the parameters is invalid), an error window pops up. To go back to the identification window, just click on the OK button.

