



# Gigabit Network Analysis: Making Sure You're Getting The Whole Picture

## Executive Summary

This paper describes the pros and cons of the two methods for analyzing a gigabit network:

- Using a gigabit switch's span/mirror port
- Accessing the data stream with an optical TAP (Test Access Point) and a full dual-receive NIC (such as provided by Network Instruments' line of hardware solutions for gigabit analysis)

Because of the architectural limitations of most switches, a TAP is the only solution that meets all the must-have requirements for analyzing full-duplex links at wire speed. For reasons that this paper will explain, high-load networks require the use of a TAP.

## Overview

There are two methods to capturing the data stream from gigabit networks:

- You may connect an analyzer or probe to the span/mirror port on a switch.
- You can connect an analyzer or probe to a gigabit TAP to monitor a gigabit link.

To choose the right method, there are two questions you must ask:

1. What percentage of the gigabit bandwidth will my network use, now and in the future? Because the switch must replicate the data stream it sends to the span/mirror port, networks with high bandwidth usage may cause the span/mirror port on the switch to drop packets.
2. Do I need to capture and analyze packets from both the send and receive channels of the full-duplex gigabit link? If so, a software analyzer using standard NIC hardware will work only until the total bandwidth usage reaches 50% per channel: a standard gigabit NIC card is equipped to only receive one half of the full-duplex channel.

## Gigabit Monitoring Method 1: Capturing Packets from A Switch's Span/Mirror Port

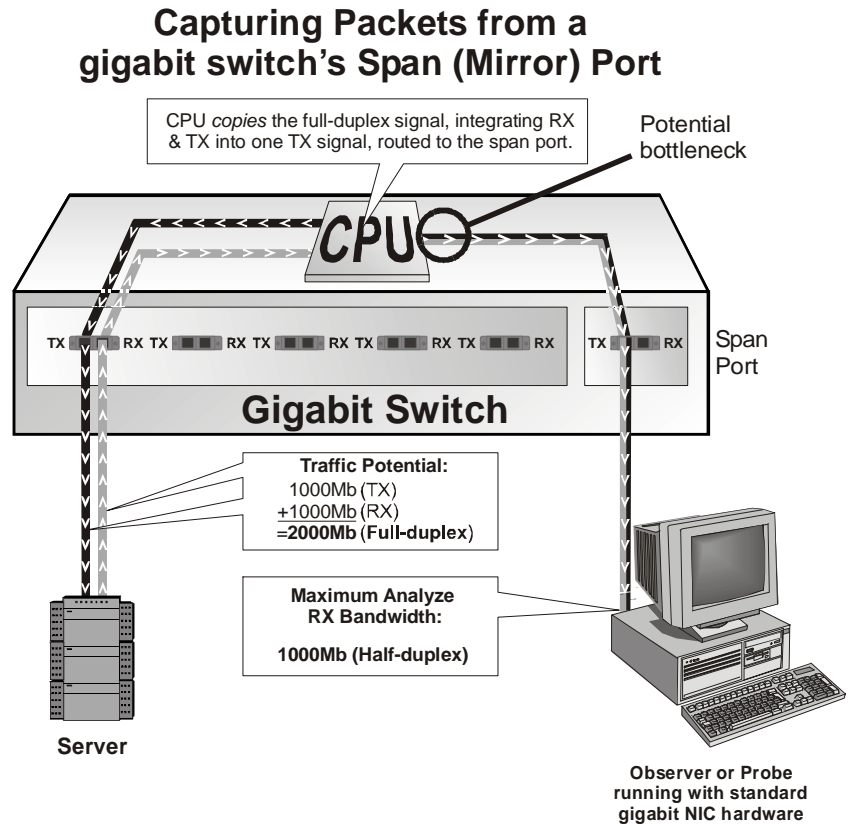
Any Observer product, either software or hardware-based, can capture packets from a span/mirror port. You should, however, make sure that you understand (and can live with) the limitations of this method before you settle on it.

Because all gigabit links are full duplex, when you enable the span/mirror port on your switch, the switch attempts to do the following:

1. Copy both the send and receive data signals.
2. Reconstruct an integrated data stream from the two signals.
3. Route the integrated signal to the receive channel of the span/mirror port.

This creates two potential problems:

- a) As the total bandwidth usage for both channels exceeds 1000 Mbit (in other words, half of a full-duplex link), the switch starts dropping the redirected packets. There just isn't enough bandwidth on the span/mirror port's receive channel to carry both sides of the full-duplex connection.
- b) The switch's CPU must act as both a gigabit capable switch **and** a packet replicator. The switch's CPU clock must also integrate the two data streams (send and receive) together correctly. Both packet copy/redirection and channel integration is affected by switch load. It therefore may not predictably deliver accurate captures under heavy load. Moreover, there will be no easy way to tell *when* it will start dropping packets.



If your network load is low enough to use this method to capture the data (i.e. always less than 1000 Mbits total), and your switch's CPU is able to manage the spanning and integration of the full-duplex data stream, you can use any of the Observer gigabit products, with satisfactory results. But if total full-duplex bandwidth usage exceeds 1000Mbits, the span/mirror port's bandwidth will be insufficient to keep up with the traffic, causing the span/mirror port to start dropping packets. This invalidates the captured data for purposes of analysis.

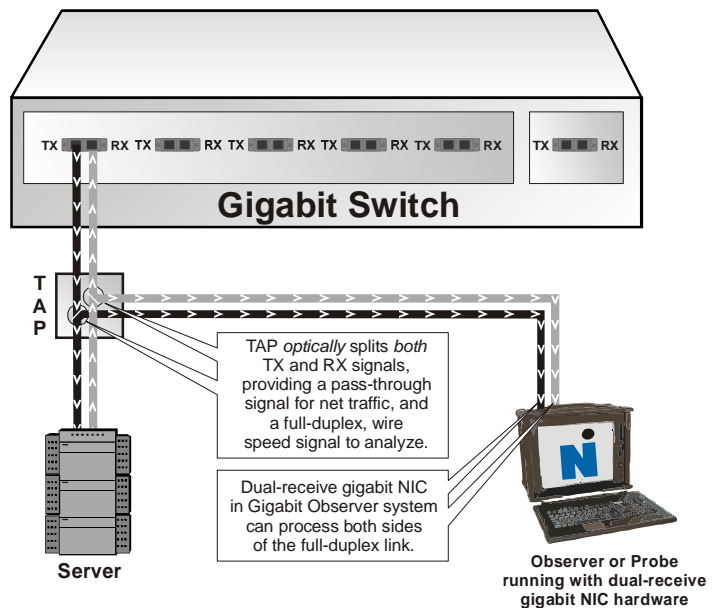
## Gigabit Monitoring Method 2: Capturing Packets from a TAP

A TAP (Test Access Point) is a passive splitting mechanism that you install between a gigabit "device of interest" and the gigabit network.

The TAP use prism optics to passively split the full-duplex gigabit signal into two identical full-duplex data streams. One signal is passed through to the network, while the other is simultaneously passed to the gigabit analyzer. Because the TAP provides a copy of both the send and receive channels from your full duplex link to the analyzer (where the data is integrated) the analyzer can monitor a full wire-speed, (i.e. 2000 Mbit – 1000 Mbit send + 1000 Mbit receive) gigabit network independently of a switch's limitations.

Because the TAP is providing an exact image of the bits from both sides of the duplex connection, you need special hardware on the analyzer to receive and integrate these signals and feed them to the Observer analyzer or Probe in real time. Network Instruments' gigabit NIC is custom-designed to provide the necessary dual-receive channels and dedicated processing power to receive and integrate the signals, thus providing a full-duplex gigabit data stream to the analyzer.

## Capturing Bits from a TAP (Test Access Point)



TAPs deliver a number of conveniences in addition to eliminating the technical limitations of using span/mirror ports:

- TAPs (unlike analyzers) are inexpensive enough that you can leave them permanently installed. This allows you to connect and disconnect the analyzer as needed without breaking the gigabit signal.
- Unlike the port span/mirror mechanism on a switch, a TAP simply cannot drop packets.
- TAPs do not use any of a switch's CPU resources.
- TAPs are completely passive, and in no way interfere with your gigabit network.

## Conclusion

Monitoring a gigabit connection via the span/mirror port of a switch is valid only for consistently very low bandwidth gigabit networks. In low bandwidth environments you should only use the span/mirror port on your switch for obtaining statistics (i.e. not for capture or Expert). This is because the switch provides no warning or indication of packets being dropped.

Monitoring a gigabit connection using Network Instruments' optical TAP and dual-receive gigabit card insures complete wire-speed and full-duplex capture for statistics, trending and most importantly, capture/Expert analysis.