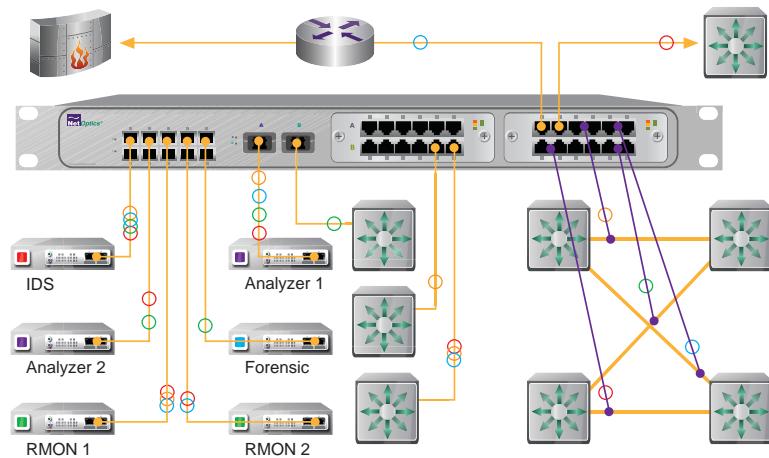


 DIRECTOR™

Data Monitoring Switch



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Introduction

Net Optics Director is a key component for building a comprehensive, consolidated monitoring infrastructure for both network management and security. It extends the range of visibility for data monitoring across converged data and digital voice networks, while eliminating monitoring port contention and minimizing the number of tools needed to optimally manage the network.

A single Director device enables you to tap into multiple network links, and direct their traffic to multiple monitoring ports. It includes aggregation and regeneration functions, so the link-to-monitor-port mapping can be one-to-one, one-to-many, many-to-one, or many-to-many. In addition, it provides filtering: Each Monitor port can be programmed to receive only traffic meeting user-defined filter criteria based on protocol, source and destination addresses, and other criteria. This filtering capability enables specific types of traffic such as voice over IP (VoIP) to be directed to particular monitoring tools.

Matrix switching, aggregation, and regeneration

Each Director chassis supports up to 12 in-line network links or 28 Span ports. For monitoring, up to 14 ports are provided. Network and Span ports can be aggregated and regenerated to output ports in almost any combination.

Modular design

Director is modular to provide configuration flexibility.

- Director Network Modules (DNMs) support SX (multi-mode) and LX (single-mode) fiber links and 10/100/1000 Copper links.
- Each DNM provides either 6 in-line network links or 12 Span ports.
- The Director Chassis includes two DNM slots; they can be populated with the same or different DNM types.
- Ten 1-Gigabit Monitor ports are SFP-based, accepting any mix of Copper, SX, and LX interface modules.
- Four 10-Gigabit ports are XFP-based, accepting SR, LR, and ER interface modules.

Flexible 10 Gigabit support

Four 10 Gigabit ports can be configured as Network, Span, or Monitor ports. They can be configured for the same or different functions. Traffic from multiple 1-Gigabit Network or Span ports can be aggregated to a 10-Gigabit Monitor port. Conversely, traffic from a 10 Gigabit Network or Span port can be dis-aggregated to multiple 1 Gigabit Monitor ports through appropriate filtering. For example, traffic from different IP address ranges could be directed to separate Monitor ports.

Expandable

Two 10 Gigabit ports on the rear of the unit enable daisy-chaining up to ten Director chassis to expand the number of available ports, for a total of 380 ports in a fully expanded system (when available).

Monitor port-based filtering

Director avoids the confusion of pre-filtering versus post-filtering by strictly tying filtering to the Monitor ports. Each Monitor port can be configured to have traffic from any number of Network or Span ports directed to it, and each Monitor port applies up to 30 protocol-, address-, and utilization-based filters to the traffic.

Key Features

Ease of Use

- Tap, aggregation, regeneration, matrix switch, and filter functions in a single device
- 19-inch rack frame, 1U high
- Front-mounted connectors for quick and easy installation
- LED indicators show Power, Link, and Activity status
- Modular design for configuration flexibility
- RMON statistics, including network utilization filtering; data can be used to assemble XML-based end-user reports, or it may be exported to a third party reporting tool such as a protocol analyzer
- Text-based command-line interface (CLI) available through RS-232 serial port
- CLI also available remotely over secure SSH connection
- Field-upgradeable software
- Compatible with all major manufacturers' monitoring devices, including protocol analyzers, probes, and intrusion detection and prevention systems

Monitor port Filtering

- 1,000 filter elements per a chassis
- Exclusive (drop matched packets) and inclusive (pass matched packets) filters
- Filters based on IP protocol, IP addresses, layer 4 ports, MAC addresses, and VLANs
- Source and destination MAC addresses, or ranges of addresses
- Source and destination IP addresses, or ranges of addresses
- Source and destination ports, or ranges of ports
- Supports IPv4 and IPv6 protocols
- VLAN
- Protocols: all IP protocols such as ICMP, TCP, UDP, and RDP

Passive, Secure Technology

- Passive access at up to 10 Gbps
- In-line links do not interfere with the data stream or introduce a point of failure
- Optimized and tested for 10, 100, and 1000Mbps copper and 1 and 10 Gpbs fiber networks
- Redundant power to maximize uptime
- In-line links default to open under a complete power-fail condition, ensuring network availability
- FCC, CE, VCCI, C-Tick, and WEEE certified
- Fully RoHS compliant

Unsurpassed Support

- Net Optics offers technical support throughout the lifetime of your purchase. Our technical support team is available from 8:00 to 17:00 Pacific Time, Monday through Friday at +1 (408) 737-7777 and via e-mail at ts-support@netoptics.com. FAQs are also available on Net Optics Web site at www.netoptics.com.

Director Part Numbers

Chassis Part Number	Description
DIR-3400	Director Main Chassis with 10 SFP monitor ports
DIR-7400	Director Main Chassis with 10 SFP monitor ports, 2 XFP 10GbE ports, 2 XFP uplink ports
DNM Part Number	Description
DNM-100	6-Port 10/100/1000 Copper In-Line Module
DNM-110	12-Port 10/100/1000 Copper Span Module
DNM-200	6-Port Gigabit SX Fiber 62.5µm In-Line Module
DNM-210	12-Port Gigabit SX Fiber 62.5µm Span Module
DNM-220	6-Port Gigabit SX Fiber 50µm In-Line Module
DNM-230	12-Port Gigabit SX Fiber 50µm Span Module
DNM-300	6-Port Gigabit LX Fiber In-Line Module
DNM-310	12-Port Gigabit LX Fiber Span Module
DNM-320	6-Port Gigabit ZX Fiber In-Line Module
DNM-330	12-Port Gigabit ZX Fiber Span Module

Director Architecture

The following diagram shows a schematic view of the architecture of the Director device shown as a Matrix Switch with filtering. The black dots indicate aggregating Matrix Switch connections between Network Ports and Monitor Ports.

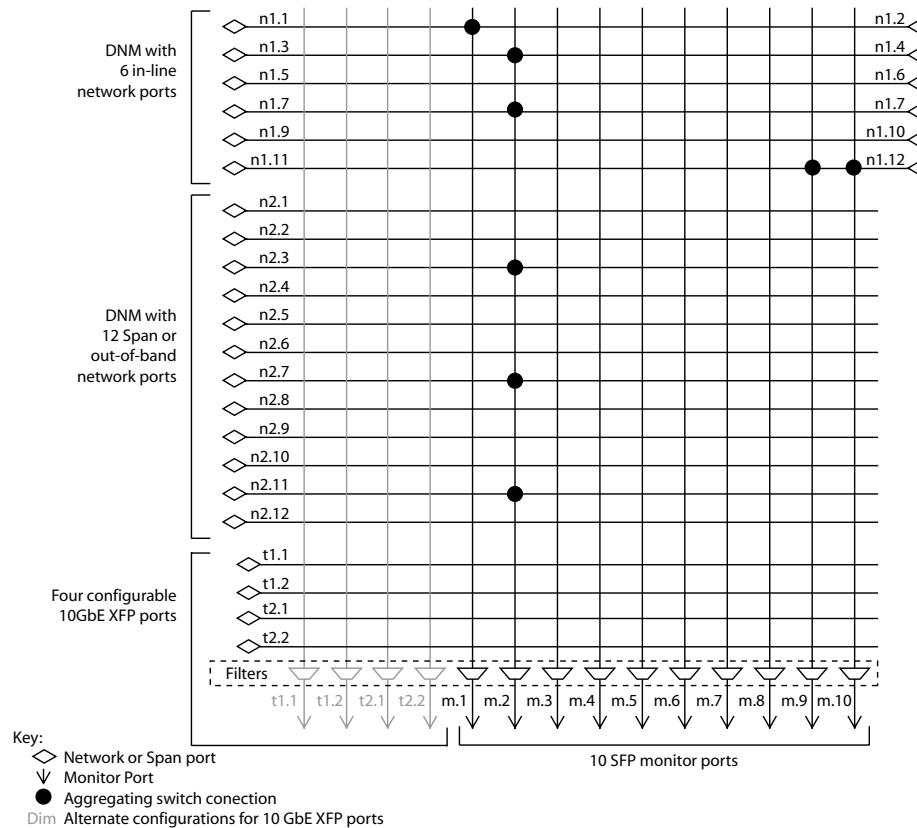


Figure 1: Director internal architecture

Director can be viewed as a matrix switch with up to 28 inputs, or Network ports, and 14 outputs, or Monitor ports. Any number of inputs can be directed to each of the outputs; Director aggregates the traffic from those Network ports and sends them to the Monitor ports. For example, the diagram shows:

- Traffic from the first in-line Network link (n1.1-n1.2) is being directed to the first SFP Monitor port (m.1)
- Traffic from two in-line Network links (n1.3-n1.4 and n1.7-n1.8) plus three Span Network ports (n2.3, n2.7, and n2.11) is being aggregated and directed to the second SFP Monitor port (m.2)
- Traffic from one in-line Network link (n1.11-n1.12) is being regenerated to two SFP Monitor ports (m.9 and m.10)

The traffic from the in-line Network links to the Monitor ports may include the traffic being received at the odd-numbered Network port (at the left side of the diagram), at the even-numbered Network port (at the right side of the diagram), or both; the diagram doesn't include this level of detail.

In addition, filters (shown at the bottom of the diagram) are configured independently for each Monitor port, one or more filters per port, and applied on the aggregated traffic for that port. For example, the second SFP Monitor port could have two filters, where one filter selects the TCP traffic from the two in-line Network links and the second filter selects the UDP traffic from the three Span Network ports.

The inputs are divided into three groups: two DNMs plus the 10GbE ports. In-line DNM models support 6 in-line links, while Span DNM models support 12 Span ports. The diagram shows one in-line and one Span DNM. Both in-line and Span DNMs are available with either Copper or SX, LX, or ZX Fiber interfaces. Different DNM types can be mixed in the same chassis, for example, one in-line Copper DNM and one Span Fiber DNM. The modules are hot-pluggable for easy serviceability. One or both DNM slots can be populated. The DNM slots are numbered 1 for the slot on the left and 2 for the slot on the right. If only one slot is populated, it should be slot 1.

The four configurable 10-Gigabit XFP ports are shown in the first four columns and last four rows of the diagram. The four dark black rows indicate that all four ports are configured as Span inputs. The four dimmed columns indicate that the ports can alternately be configured as Monitor ports. The four ports may be configured as:

- Both Span
- Both Monitor
- One Span and one Monitor

In addition, the two 10 Gigabit ports on the back of the chassis (t2.1, t2.2) can be used as uplink ports to daisy-chain chassis for expansion.

USB port

A USB port located on the back is reserved for future functionality.

Director Management

Director can be configured and managed using a command-line interface (CLI) that will be familiar to most network administrators. The CLI runs locally over an RS-232 serial port or remotely over a secure SSH connection.

Net Optics GUI-based Indigo management tools, which will be available soon, include:

- **Web Manager**—A Web-browser based tool to manage a single Director (at a time) from anywhere in the world
- **System Manager**—An SNMP platform-based tool to manage all the Director and other Net Optics iTap-enabled devices on your network

Typical Application

The following diagram shows a typical application using Director to implement a comprehensive, consolidated monitoring infrastructure.

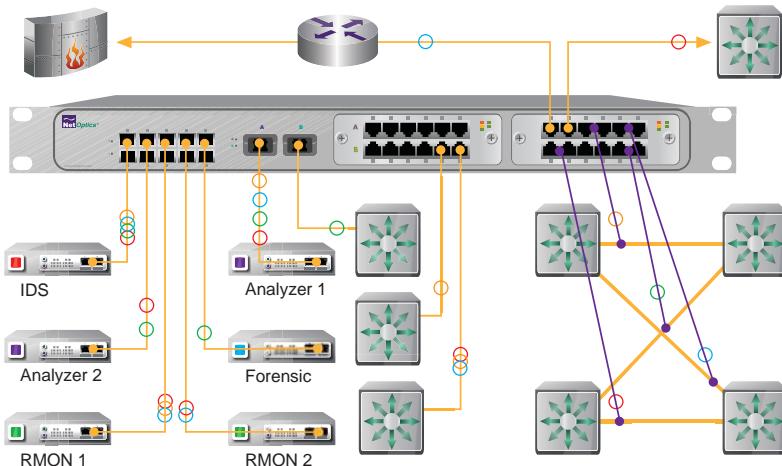


Figure 2: Director-centric network monitoring infrastructure

In this example, eight network links are monitored by six monitoring devices. The company's external access is protected by a firewall, shown in the upper left of the diagram. The link runs through a router, then in-line through Director, and then to a switch that distributes traffic throughout a department.

Network Links

The rest of the department's switches are shown, but only the connections to Director are illustrated. The four department switches shown in the lower right are cross-connected for fault tolerance. All four of the cross-connected links are passed in-line through Director (as indicated by the slanting purple lines) so they can be thoroughly monitored for performance tuning, security, and trouble-shooting. Because so many critical links pass in-line through Director, it's good to know that they are completely passive connections—Director does not slow down or interfere with the in-line traffic, and the links stay open to pass traffic even if both of the Director power supplies are removed. (When power is removed, 10/100/1000 Copper in-line links may be dropped for a short period of time—less than 1 second—while relays switch to open the link. Subsequently, the network re-establishes the links and traffic resumes flowing.)

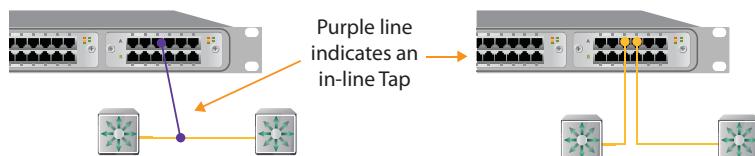


Figure 3: Detail of in-line Taps shown in Figure 2

In the middle of Figure 2, three other departmental switches are monitored through their Span ports. One of the switches handles 10GbE traffic, so its Span port goes to one of the Director 10GbE XFP ports. One of the other switches' 1GbE Span ports carries three distinct types of traffic—e-mail, VoIP, and Web pages—as indicated by the three colored circles on the Span link.

In this installation, Director has ten additional Span ports and one in-line link that are available for expansion, when more links need to be monitored.

Monitoring Tools

Still referring to Figure 2, six monitoring tools are connected to Director. They include protocol and performance analyzers, RMON probes, and an intrusion detection system (IDS). Any of the monitoring tools can be used to observe any of the connected network links, and the connections can be switched easily, using the Director CLI, without ever moving a cable or touching the tools. A set of possible data flows is indicated by the colored circles on the links in the diagram.

One of the network monitoring tools is capable of handling more than 1 Gbps, so it is attached to a 10 Gigabit XFP port. Through this port, the tool can be sent aggregated traffic up to 10 Gbps. For example, the colored circles in the diagram indicate that traffic from four links is being aggregated and sent to this port.

Four streams of traffic are also being aggregated to the red monitoring tool on the upper left. Since this is a 1 Gbps Monitor port, aggregated data up to 1 Gbps can be sent to the red tool. If the aggregated traffic exceeds 1 Gbps, packets will be dropped. To avoid dropping packets, filters should be configured to reduce the aggregated traffic load to 1 Gbps or less.

The two green RMON monitoring tools at the bottom are the same type of tool. Two identical tools provide the capability of monitoring a greater amount of data than a single tool can handle. Another reason to use identical monitoring tools is to provide redundancy in case one of the tools fails. In addition, Director can be configured to send different types of traffic to each tool, for example, all the TCP traffic to one tool, and the UDP traffic to the other.

In-line Monitoring of 10 Gigabit Links

To create an in-line link on a 10 Gigabit network segment, use an external network Tap.

Figure 4 shows an LC Fiber Tap being used to send two half-duplex data streams to two 10-Gigabit Director ports. This configuration creates a fully passive, secure in-line Tap for the 10 Gigabit network link. It is capable of transferring up to 20 Gbps of total traffic from the full-duplex link to Director.

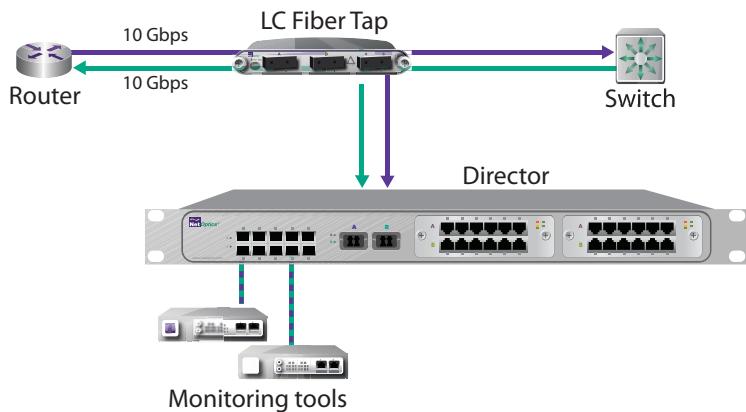


Figure 4: 10 Gigabit in-line network connection using a network Tap

Figure 5 shows a 10 GigaBit Port Aggregator Tap being used to combine the traffic moving in both directions on a full-duplex 10 Gigabit link, and send the resulting traffic stream to a single 10-Gigabit Director port. This Tap is also fully passive and secure. The aggregated traffic from both directions on the link should be less than 10 Gbps; otherwise, it will exceed the capacity of the Port Aggregator's monitor port and packets may be dropped. However, this should not be a problem in most cases because network links typically operate at 30 percent or less capacity to prevent congestion.

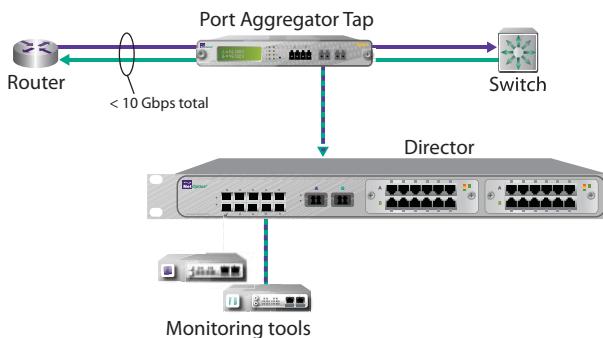


Figure 5: 10 Gigabit in-line network connection using a Port Aggregator Tap

Director Front Panel

The features of the Director front panel are shown in the following diagram.

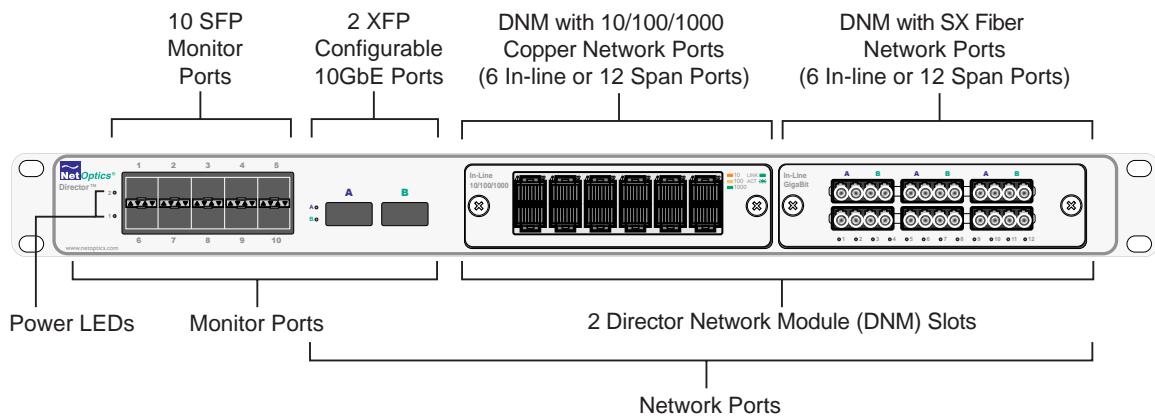


Figure 6: Director Front Panel

Monitor Port LEDs

Each Monitor port has two light-emitting diode (LED) indicators. The Link LED is illuminated when a link is established. The Activity LED blinks when traffic is passing through the port. They are located in the middle between the two rows of SFPs.

DNM / Network Port LEDs

Each 10/100/1000 Network or Span port has two LEDs. The Link LED is illuminated when a link is established. The Activity LED blinks when traffic is passing through the port. The Link LED also indicates the link speed: amber for 10Mbps, yellow for 100Mbps, and green for a 1000Mbps (1 Gbps). They are integrated in the RJ-45 connectors, Link on the left and Activity on the right.

Each 1-Gigabit Fiber Network or Span port has a single LED. It illuminates solid when a link is established, and it flashes when traffic is passing through the port. These Link LEDs are located below the LC fiber connectors.

10 Gigabit Port LEDs

Each configurable 10-Gigabit port has a single LED. It illuminates solid when a link is established, and it flashes when traffic is passing through the port. These Link LEDs are located to the left of the XFP fiber connectors.

Power LEDs

Two LED indicators for power, one for each of the redundant power supplies.

Director Rear Panel

The features of the Director rear panel are shown in the following diagram.

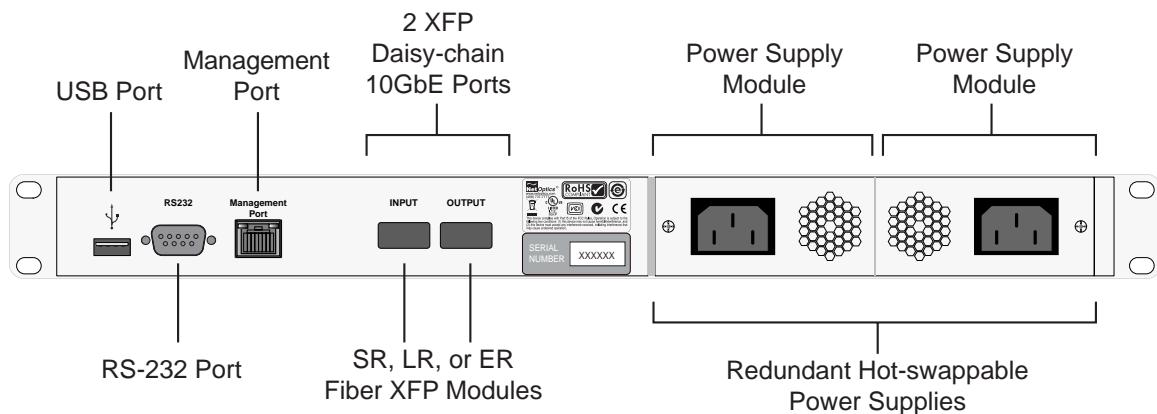


Figure 7: Director Rear Panel

Major features of the rear panel include:

- **USB Port**—Reserved for future functionality
- **RS-232 Port**—DB9 serial port for the CLI
- **Management Port**—A 10/100/1000 network port for the remote management interfaces and software updates; the CLI runs over an SSH connection through this port; Indigo management tools, when available, will connect through this port
- **XFP Daisy-chain 10GbE Ports**—Accepts SR, LR, and ER XFP transceiver modules for daisy-chaining up to 10 chassis
- **Power Supply Modules**—Universal-input (100-240VAC, 0.5Amp, 47-63Hz), hot-swappable power supplies with integrated cooling fans; each supply can power the unit independently; dual supplies provide redundancy to maximize uptime; -48VDC models are also available