RAPTOR® SERIES

PRODUCT BOOKLET

iS5 COMMUNICATIONS

SERVICES • SUPPORT • SECURITY • SOLUTIONS • SYSTEMS

R A P T O R ®

RAPTOR® iMX350/iMX950 (IEC 61850)

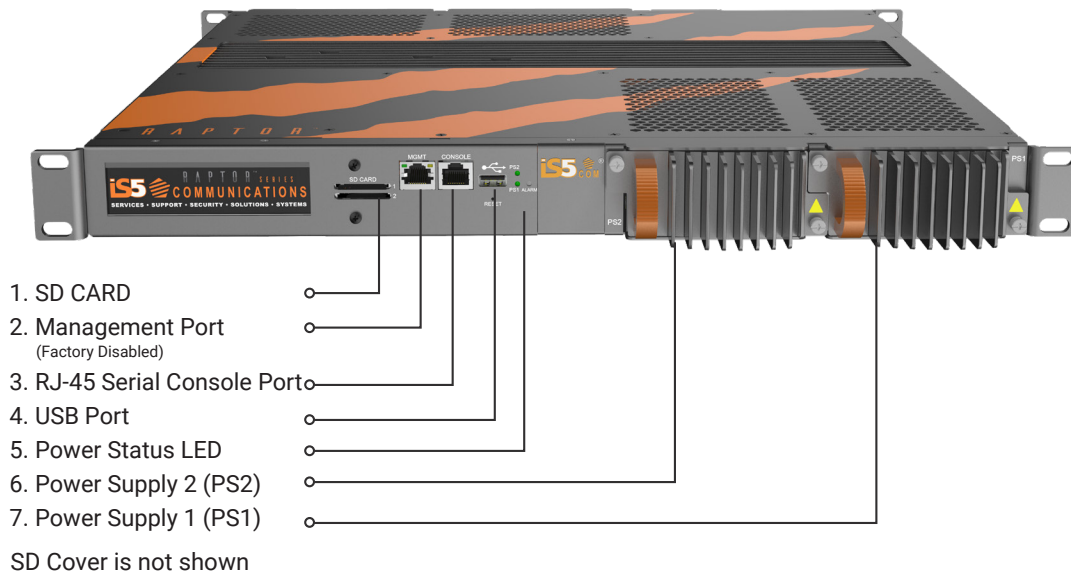Intelligent 28 Port L2/L3 cyber secure platform, IEC 61850 Ed. 2, IEEE 1613 standards compliant

The RAPTOR® iMX350 and iMX950 are Intelligent Cyber Secure Platforms running the iBiome® OS. The iBiome is an all-encompassing operating system that supports switching and routing on a single platform.

The RAPTOR has been designed for future scalability. Its modular system of field replaceable modules, hot-swappable power supplies, and its ability to run third party software applications makes it a very flexible platform for today and the future. The iMX350 and iMX950 have been specifically designed to protect and secure critical infrastructures in the harsh environments found in utility and substation applications. It meets or exceeds the standards set out in IEC 61850-3 and IEEE 1613 for utility communication equipment in substation environments.
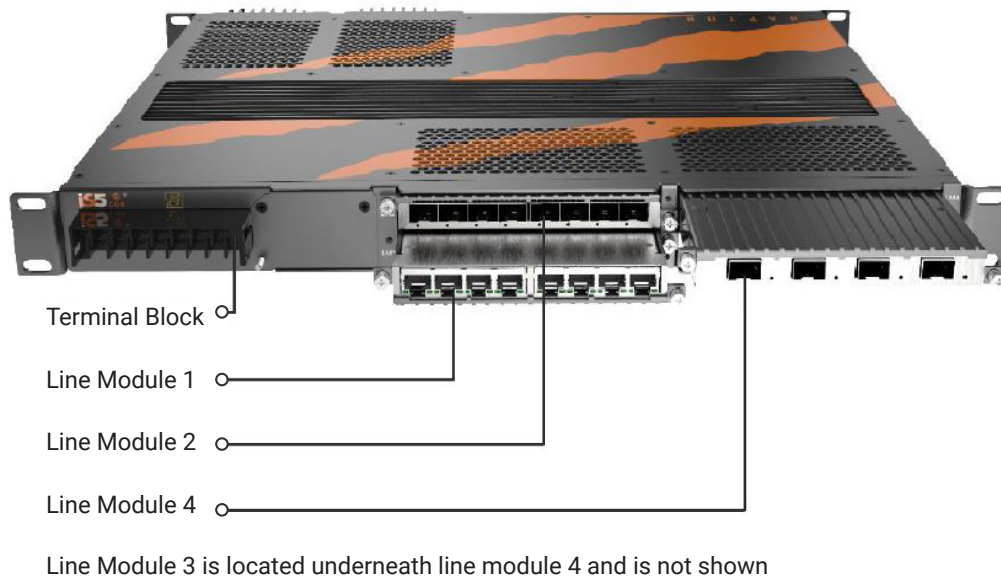
In addition to the switching and routing software capabilities found in the iMX350, the iMX950 supports a stateful firewall, NAT and IPSec capabilities.

iMX350	iMX950
L2	L2
L3	L3
REDUNDANT POWER SUPPLIES	REDUNDANT POWER SUPPLIES
128 BIT AES ENCRYPTION	128 BIT AES ENCRYPTION
1588 V2 TRANSPARENT CLOCK	1588 V2 TRANSPARENT CLOCK
X	IPSEC/VPN
X	STATEFUL FIREWALL
X	NAT

1. SD CARD
2. Management Port
   (Factory Disabled)
3. RJ-45 Serial Console Port
4. USB Port
5. Power Status LED
6. Power Supply 2 (PS2)
7. Power Supply 1 (PS1)

SD Cover is not shown

BACK VIEW

Terminal Block

Line Module 1

Line Module 2

Line Module 4

Line Module 3 is located underneath line module 4 and is not shown

DESCRIPTION

NUMBER OF SLOTS	Up to 4 slots

PORTS

ETHERNET NETWORK PORTS	Slot #1- 3—supports up to 8 x 10/100/1000 RJ45s, or 8 x 100/1000 SFPs, up to 24-ports may be configured to support PoE, see below for details. Slot #4—supports up to 4 x 10GB Base-X or 4x1GB Base-X Uplinks .
SERIAL CONSOLE PORT	RS-232 in RJ-45 connector with console cable. 115200bps, 8, N, 1.
SERIAL COMMUNICATIONS PORTS	Slot #1- 4—supports 4x DB9 serial interfaces or 8x RJ45 serial interfaces RS232/422/485. Maximum 3 serial modules per switch.
USB PORT / SD CARD	USB 2.0 for software and configuration update.
OTHER HARDWARE FEATURES	Modular chassis with hot-swappable modules. Redundant hot-swappable power supplies.
ALARM	Fault Contact: relay output to carry capacity of 1A at 24VDC.

PRODUCT SPECIFICATIONS

TECHNOLOGY

MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 µs Switching bandwidth: 128 Gbps
JUMBO FRAME	Up to 9216 bytes
IEEE 1588 PTP	IEEE 1588 precision timing protocol v2 with Power Profile, in transparent clock mode. Supported in slots 1,2 and 3.

PHYSICAL CHARACTERISTICS

|	
ENCLOSURE	IP40 Satin Coat Steel
DIMENSIONS	486.15 (W) x 446.65 (D) x 44.36(H) mm (19.14 x 17.58 x 1.75 inches)
WEIGHT	9.8 kg (21.6 lbs.)

POWER

REDUNDANT INPUT POWER	Dual Power Supplies available in any combination of 24VDC (Nom.), 48VDC (Nom.), and 100-240VAC/VDC (Nom.)
POWER CONSUMPTION	60 Watts
OVERLOAD CURRENT PROTECTION	Fast Acting Fuse 3.15A (can only be replaced in the factory).

POWER OVER ETHERNET (AVAILABLE ON PoE CONFIGURED iMX950)

MAX PoE POWER FROM iMX350 SWITCH	720 Watts
MAXIMUM PoE POWER FROM 8GRJ45P LINE MODULE	240 Watts
POWER LEVELS AVAILABLE PER PORT	Default up to 30 Watts per port. Two adjacent RJ45 ports may draw up to 60 Watts. For 60 Watt PoE, disable PoE on the neighboring port.
SLOTS WHERE PoE IS SUPPORTED	Slots 1, 2, and 3.
NOTES	Power over Ethernet is a factory configured option on the iMX950. It requires an external power supply to supply the power to PoE ports.

WARRANTY

WARRANTY	5 years, (extendable option with additional terms).

HSR/PRP
Module

Port 1A
Port 1B
Port 2A
Port 2B
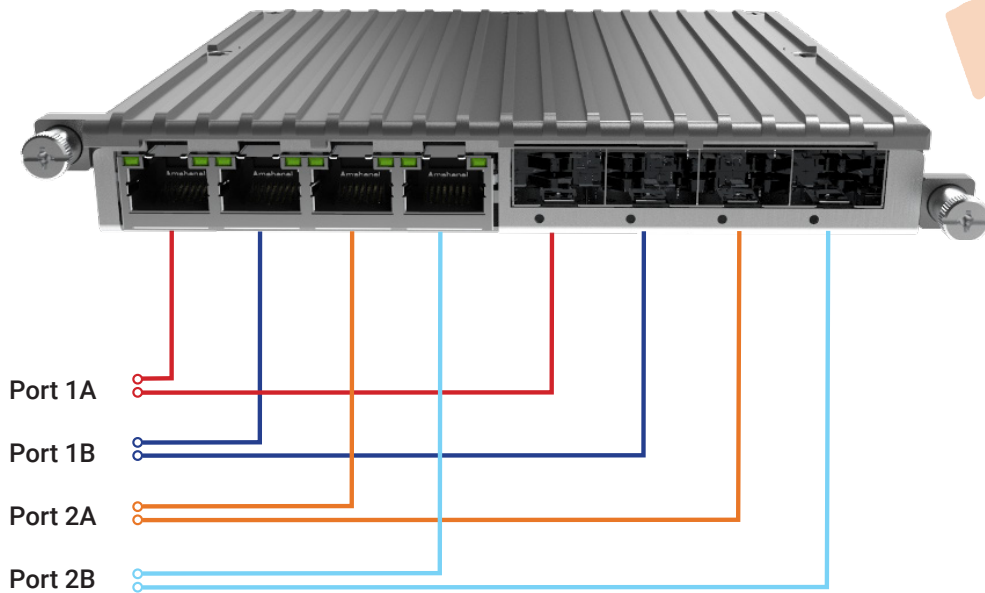
CONFIGURATION	DESCRIPTION
RedBox	Up to two RedBoxes supported. HSR, PRP and HSR-PRP coupling modes are supported
QuadBox	One HSR QuadBox supported

RAPTOR MODULES

Ethernet and Serial Line Modules Available on the RAPTOR

ETHERNET MODULES	DESCRIPTION
	iRM-8GRJ45 8-port 10/100/1000BaseTX, RJ45 Connector **iRM-8GRJ45P** 8-port 10/100/1000BaseTX, RJ45 ConnectorPoE Capable
	iRM-4RJ4SFP 8-port 10/100/1000BaseTX, RJ45 ConnectorPoE Capable
	iRM-8GSFP 4-port 10/100/1000BaseTX, RJ45 Connector plus 4-port 100/1000BaseX SFP blank slots
	iRM-4TGSFP 4-port 1G/10G BaseX SFP blank slots

SERIAL MODULES	DESCRIPTION
	iRM-8SRJ45 8x Serial RJ45 Interfaces, RS232/422/485
	iRM-4DB09 4x Serial DB9 Interfaces, RS232/422/485

iROC

iROC

Hot-Swappable Industrial Computing Module

The iROC computing module is a hot-swappable industrial computing module that can be inserted into slots 1 through 4 of the RAPTOR. The iROC currently ships with Microsoft® Windows® 10 Pro or Linux CentOS 7 (2009). Up to 3 iROCs are supported in the RAPTOR.

The iROC has an Intel E3940 CPU, 8GB of memory, and ships with up to 2TB of industrial rated SSD M.2 storage.
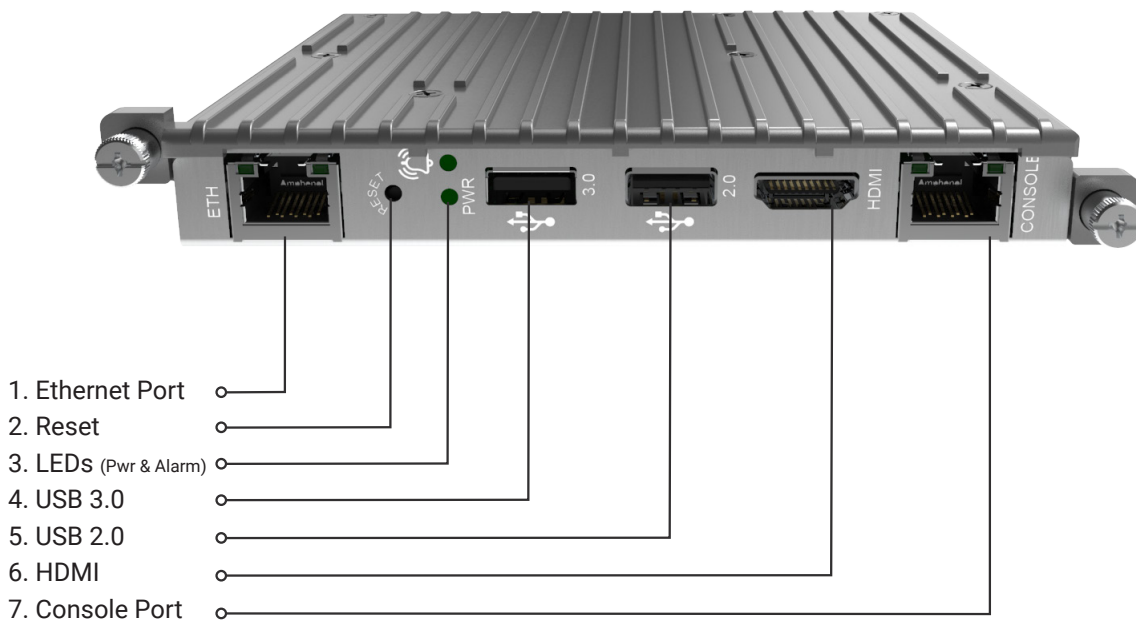

1. Ethernet Port
2. Reset
3. LEDs (Pwr & Alarm)
4. USB 3.0
5. USB 2.0
6. HDMI
7. Console Port

Table 1. iROC Line Module Description

COMPONENT	DESCRIPTION
CPU	Intel E3940 4-core, 4-threads, 1.60 GHz Base Frequency 1.80 GHz Burst Frequency
Storage	256GB, 512GB, 1TB or 2TB Industrial SATA III M.2 SSD Endurance: 3K Program/Erase Cycles
Memory	8GB LPDDR4
Network Interfaces	10/100/1000TX on the Front Up to 3x 1Gbps available to the RAPTOR through the backplane*
USB	1-port: USB 2.0 1-port: USB 3.0
Video	HDMI, version 1.4 Resolution: 1080p
Operating Systems	Microsoft Windows 10 Pro Linux CentOS 8.2 Linux CentOS 7 (2009)

TECHNOLOGY SOLUTION INTEGRATIONS

iS5 Communications has established strategic partnerships with a number of leading providers of OT Cybersecurity solutions. The following products have been integrated and tested on the RAPTOR iROC module, and are available from iS5:

F⬛RTINET.

FortiGate VM — Next-Generation Firewall (NGFW)

FortiGate virtual appliance provides an end-to-end security ecosystem that allows you to mitigate blind spots by implementing critical security controls within your virtual infrastructure. They also allow you to rapidly provision security infrastructure whenever and wherever it is needed. FortiGate virtual appliances feature all of the security and networking services. With the addition of virtual appliances from Fortinet, you can deploy a mix of hardware and virtual appliances, operating together and managed from a common centralized management platform.

Forescout eyeInspect

Forescout eyeInspect enables organizations to:

- Automatically establish a baseline of admissible net work behavior
- Detect security and operational threats using thousands of ICS/OT-specific threat indicators and behavioral checks
- Aggregate thousands of alerts and millions of logs according to their risk level and cause
- Auto-classify and assess devices for policy and regulatory compliance

Xona's Critical System Gateway (CSG)

Xona's Critical System Gateway (CSG) running on the iS5 RAPTOR will add zero trust user access to its best in class Layer 2/Layer 3 networking capabilities for critical OT infrastructure. The CSG is purpose-built to not only provide simple and compliant access to critical assets but also protect these assets from the specific threats posed by distributed workers and remote work environments. The platform relies on hardened components, protocol isolation, and encrypted display to securely deliver access to any industrial system or application—enabling business continuity and work-from-anywhere flexibility on demand.

SyskeyOT

Scribbler Log Manager, running on the iS5 RAPTOR, is a highly secure, scalable, and reliable centralized log management solution for enterprises that value their log data. An invaluable tool for administrators for identifying and diagnosing infrastructure problems, it consists of multiple components that collect, filter, store, analyze, and forward logs in real time. A web-based analytical dashboard provides deep insight about the log data and the progress and state of the system.

MICRORAPTOR®

*Micro*RAPTOR® iMR320/iMR920 (IEC 61850)

Compact 16 Port L2/L3 Substation Switch, IEC 61850 Ed. 2, IEEE 1613 standards compliant

The *Micro*RAPTOR is an Intelligent Cyber Secure Platform running the iBiome OS. The iBiome is an all encompassing operating system that supports switching and routing on a single platform.

The iMR320 and iMR920 each have 8-ports Ethernet as their base unit, with factory options for SFP and RJ45 interfaces. A second factory configurable slot offers options of Ethernet, HSR/PRP, Serial Ports, or an industrial computer.

*Micro*RAPTOR has been specifically designed to protect and secure critical infrastructure and substation applications in the harshest of environments. It is compliant with IEC 61850 Ed. 2, and IEEE 1613 standards. The iMR920, in addition to all features offered on the iMR320, supports IPSec, NAT and Firewall.

Table 1. Features and Benefits of *Micro*RAPTOR®

FEATURE	BENEFIT
SIMPLIFIED GUI - EASY TO USE	Allows easy configuration and monitoring with a web-based User Interface Eliminates the need for more complex terminal emulation programs Reduced cost of deployment; one platform—multiple functions
ROBUST INDUSTRIAL DESIGN	-40°C to +85°C (-40°F to 185°F) operating temperature No fans needed Ingress Protection rating of IP40
IEEE 1588 TRANSPARENT CLOCK	All Ethernet ports on the *Micro*RAPTOR support the IEEE 1588v2 Power Profile for Transparent Clock operation.

Table 2. Common Specification

DESCRIPTION	
*Micro*RAPTOR	The compact layer 3 switch supports up to 16-ports Ethernet. Slot 1 supports: 8-ports Ethernet Slot 2 supports: 8-ports Ethernet or up to 8-ports Serial Ethernet Modules available (Slot 1 or 2): 1) 8-ports 100/1000Base-X SFP 2) 8-ports 10/100/1000BaseTX RJ45 3) 4-ports 100/1000Base-X SFP plus 4-ports 10/100/1000BaseTX RJ45 Serial Modules available (Slot 2 only): 1) 4-ports DB9 Interfaces RS232/422/485 2) 8-ports RJ45 Interfaces RS232/422/485 All configurations are factory configured.v 3) iROC industrial computer 4) HSR/PRP with support for 2 RedBoxes
PORTS	
SERIAL CONSOLE PORT	RS-232 with an RJ45 interface for console cable. 115200bps, 8, N, 1
USB PORT	USB 2.0 for software updates, downloading syslog files and configuration backup/restore
IEEE 1588v2 SUPPORT	IEEE 1588v2 Transparent Clock Support for all Ethernet ports
ALARM	Fault Contact: relay output to carry capacity of 1A at 24VDC
WARNING / MONITORING SYSTEM	Relay output for fault event alarming Syslog client to record and Syslog Relay to forward Syslog messages SNMP

TECHNOLOGY

MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 μs Switching bandwidth: 128 Gbps Max. number of available VLANs: 4K
JUMBO FRAME	Up to 9216 bytes

PHYSICAL CHARACTERISTICS

ENCLOSURE	Aluminum and steel enclosure
DIMENSIONS	82.72 (W) x 197.12 (D) x 188.39 (H) mm (3.26 x 7.42 x 7.76 inch)*
WEIGHT	1.9 kg (4.2 lbs)

POWER

REDUNDANT DC POWER OPTION	Dual Power Supplies available in any combination of: 24VDC Nominal / 10-36VDC Operational 48VDC Nominal / 36-72VDC Operational Redundant DC power supplies are load sharing
AC POWER OPTION	Single Power Supply 100-240 VAC/VDC Nominal 88-300VDC or 85-264VAC Operational
POWER CONSUMPTION	50 Watts
OVERLOAD CURRENT PROTECTION	Fast Acting Fuse 3.15A (can only be replaced in the factory)
INSTALLATION CATEGORY	Overvoltage Category II, Pollution degree II

WARRANTY

WARRANTY	5 years, (extendable option with additional terms)

* Dimensions given are for DIN mount with lug screw terminal block configuration.

MICRO RAPTOR®

*Micro*RAPTOR® iMR350 (IEC 61850)

Rack Mount Ethernet Layer 2 & Layer 3 Switch

The iMR350 is an Intelligent Cyber Secure Platform running the iBiome® OS. The iBiome® is an all encompassing operating system that supports switching and routing on a single platform. *Micro*RAPTOR iMR350 is available with four factory configurable slots which will support up to 32-ports Ethernet. 10Gbps and serial options are also supported.

The iMR350 *Micro*RAPTOR supports layer 2 and layer 3 switching and offers industry specific features such as IEEE 1588v2 precision timing support.

*Micro*RAPTOR has been specifically designed to protect and secure critical infrastructure and substation applications in the harshest of environments. It is compliant with IEC 61850 Ed. 2 and IEEE 1613 standards.

Table 1. Features and Benefits of *Micro*RAPTOR®

FEATURE	BENEFIT
FLEXIBLE RACK MOUNT LAYER 3 SWITCH	The *Micro*RAPTOR iMR350 supports four factory configurable slots for communication interfaces Slot options include, 8-port 100Mbps/1Gbps SFP, 8-port 10/100/1000TX RJ45,4-port 232/422/485 DB9 or 8-port RJ45 serial, 4-port 1/10Gbps SFP
SIMPLIFIED GUI - EASY TO USE	Allows easy configuration and monitoring with a web-based User Interface Eliminates the need for more complex terminal emulation programs Reduced cost of deployment; one platform—multiple functions
ROBUST INDUSTRIAL DESIGN	-40°C to +85°C (-40°F to 185°F) operating temperature No fans needed Ingress Protection rating of IP40

Table 2. Common Specification

PORTS	
SERIAL CONSOLE PORT	RS-232 with an RJ45 interface for console cable. 115200bps, 8, N, 1
USB PORT	USB 2.0 for software updates, downloading syslog files and configuration backup/restore
IEEE 1588v2 SUPPORT	IEEE 1588 precision timing protocol v2 with Power Profile, in transparent clock mode. Supported in slots 1, 2 and 3 for Ethernet Line modules. Supported in all slots for HSR/PRP line modules.
ALARM	Fault Contact: relay output to carry capacity of: • 30VDC, 2A • 110VDC, 0.3A • 220VDC, 0.27A • 125VAC, 0.5A • 250VAC, 0.25A
WARNING / MONITORING SYSTEM	Relay output for fault event alarming Syslog client to record and Syslog Relay to forward Syslog messages SNMP

TECHNOLOGY

MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 µs Switching bandwidth: 128 Gbps Max. number of available VLANs: 4K
JUMBO FRAME	Up to 9216 bytes

PHYSICAL CHARACTERISTICS

ENCLOSURE	Aluminum and steel enclosure
DIMENSIONS	443.56 (W) x 414.95 (D) x 44.20 (H) mm (17.46 x 16.34 x 1.74) inches
WEIGHT	12.6lbs, 5.72kg

POWER

REDUNDANT INPUT POWER	Dual Power Supplies available in any combination of 24VDC (Nom.), 48VDC (Nom.), and 100-240VAC/VDC (Nom.)
POWER CONSUMPTION	50 Watts
OVERLOAD CURRENT PROTECTION	Fast Acting Fuse 3.15A (can only be replaced in the factory)
INSTALLATION CATEGORY	Overvoltage Category II, Pollution degree II

WARRANTY

WARRANTY	5 years, (extendable option with additional terms)
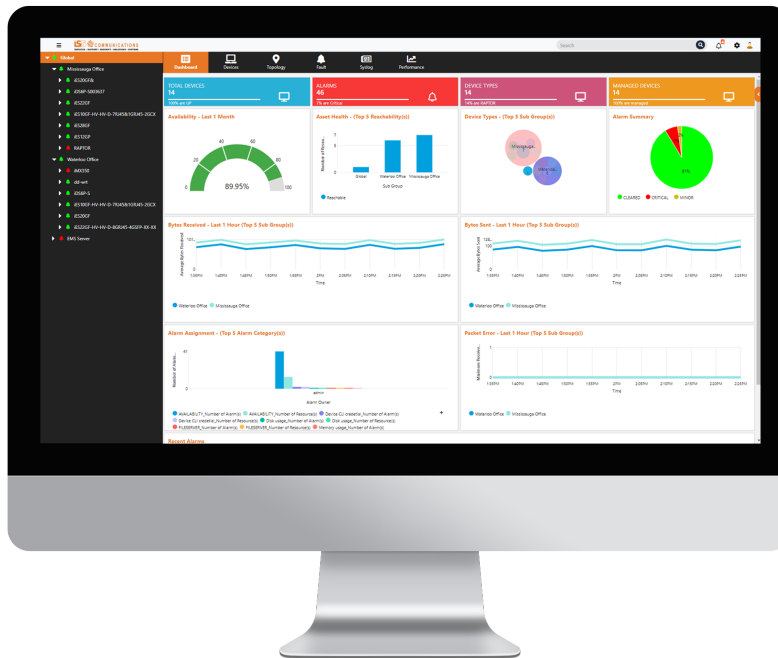
RAPTOR*Eye*®

Network Management System

RAPTOR*Eye*® is a powerful and comprehensive network management system for monitoring networks. To simplify the management of complex networks, RAPTOR*Eye* can be configured with a full complement of Fault, Topology, Performance, and Security features.

RAPTOR*Eye* enables network administrators to efficiently monitor status and performance of all devices and pinpoint bottlenecks in real-time. With the advanced Fault Management capabilities, RAPTOR*Eye* provides alarm filtering, alarm correlation, and alarm handling features that help administrators isolate and correct problems in the network.

The RAPTOR*Eye* user interface has been designed with ease of use in mind and to simplify network administrator's tasks. Navigation between applications is simple and intuitive, with consistent access to reports and screens.

FEATURES

TOPOLOGY DISPLAY	RAPTOR*Eye* has the intelligence to automatically discover devices in a network and display network details in multiple views: 1) Open Street Maps and Google Maps Integration 2) An interactive connectivity view showing all devices and the physical connections between them 3) A link view showing details of each link between devices
CHASSIS VIEW	The chassis view provides an instant physical snapshot of supported iS5Com devices with the real time chassis view. The product image provides a view of each interface, along with asset attributes such as firmware version.
FAULT REPORTING	RAPTOR*Eye* offers an intuitive GUI for tracking alarms and recording of all faults in the network. It has a built-in interface for managing the faults. RAPTOR*Eye* has a range of publishing and display tools including automatic filtering and forwarding of alarms to email for ensuring timely notification of problems.
REPORTS	RAPTOR*Eye* can monitor multiple key performance metrics continuously for each configured network element and displays the results in multiple report formats for the convenience of the administrators. It can generate reports such as Bytes Received, Bytes Sent, or other key metrics within the defined network. These reports help the administrator to identify quickly the bottlenecks and problems within a specific network.
SECURITY	RAPTOR*Eye* includes extensive security features for user and role management enabling administrators to implement fine-grained security policies with user-friendly access tools and provide appropriate controls over access to network resources. Comprehensive audit logs are built into RAPTOR*Eye* providing a detailed history of user actions and system events.
SLA ASSURANCE	RAPTOR*Eye* generates reports on availability of all configured network elements and makes that data available in intuitive report formats. These availability reports help service providers monitor the availability of all equipment within the network to offer a guaranteed SLA (Service Level Agreement) for the end-customer. To help administrators narrow down network problems related to specific equipment, RAPTOR*Eye* provides availability statistics such as MTTR (Mean time to Repair), MTTF (Mean time to Failure) and MTBF (Mean time between Failures). RAPTOR*Eye* also supports enforcing thresholds of various performance metrics. Using the threshold support, administrators can be warned of performance degradation rapidly and take necessary preventive actions to provide the guaranteed SLA.
CONFIGURATION MANAGEMENT	RAPTOR*Eye* has the ability to perform various configuration management functions on the RAPTOR family of devices. It has the ability to perform a scheduled or unscheduled secure firmware update on a set of devices or at an individual device level. There is also the ability to perform configuration backups and restores on the RAPTOR family of devices. In conjunction with the Fault Reporting functionally, RAPTOR*Eye* can generate alarms for configuration events such as devices running unsupported firmware versions, configuration differences, and much more.

SYSTEM REQUIREMENTS

SERVER OPERATING SYSTEM	CentOS 7 Windows Server 2019 Windows Server 2016 Windows 10
SERVER CONFIGURATION	Processor: Quad Core 2.66 GHz Memory (RAM): 8 GB Disk Space: 100 GB
CLIENT BROWSER	Mozilla Firefox Google Chrome

iS5 COMMUNICATIONS

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