

EKM



INSIGHT

OPEN PRINT MANAGEMENT

EKM Insight - Technical Overview

White Paper

Release 4 – July 2020

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Introduction

The purpose of this White Paper is to provide a high level technical overview of the EKM Insight Solution.

EKM Insight is a multi-tier application designed to support the delivery of Managed Office Print Services. It supports service delivery processes that enable End User customers or outsource Service Providers to deliver highly automated Asset management, Consumables supply chain management, Incident service chain management, billing reconciliation, active service delivery, as well as management information reporting. In addition, the full product suite supports initial fleet TCO analysis, cost modelling, interactive physical auditing, re-design/optimisation thereby providing support for on-going continuous improvement of the fleet and operational processes.

EKM Insight comprises four components as illustrated below;

- **EKM Insight TCO Analysis** – An efficient analysis tool to enable customers to establish whether there is a business case for change providing an initial base line during project planning.
- **EKM Insight Portal Server** – For centralised remote service delivery across multiple customers. Installed as a private or multi-tenanted Cloud service for processing all information received from the EKM Data Collection Applications (Monitoring application)
 - **EKM Insight Monitoring Application (Data Collection Application)** – Small footprint service installed on the customer network to collect information and report the information back to a Portal server.
 - **Messaging Server** – Delivered as part of the Portal infrastructure and used to pass encrypted XML data securely from the EKM Insight Monitoring application to the EKM Insight Portal Server and authorised service administrators. This is a 'hidden' component and seamlessly integrated onto the Portal structure

In addition, a natural language command system is available to allow remote management, diagnostics and support for all EKM Insight monitoring systems. This language is called IMIL™. This enables remote configuration of the Monitoring Server without VPN access.

EKM Insight monitoring applications discover and monitor network devices using SNMP UDP over port 161, they do not Ping, multicast or broadcast.

Working data is stored in an internal administration database for local processing before transmission to the EKM Insight portal.

Management of the EKM Insight Portal is provided through a web interface running over HTTPS.

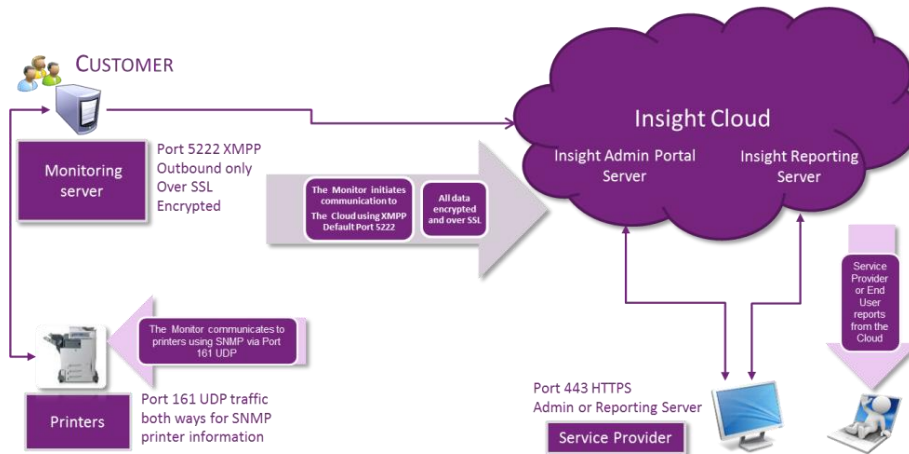


Fig. 1 Typical remote service system diagram

The Management requirement of the monitoring server is minimal and can be achieved remotely via the Portal Server should this be required. Service Management is delivered from the EKM Insight Portal. Further Monitoring or device diagnostic information can be captured via the IMIL™ interface.

Data is transmitted to the EKM Insight Portal via the internet using XMPP, by default over port 5222 TCP. Alternative ports can be used such as port 443 and the Monitoring Application (DCA) will automatically select the port which is available. All data is encrypted and sent via SSL. All communication is initiated by the customer monitoring application.

All communication is outbound only.

The EKM Insight Portal processes this information and enables print service delivery managing the core functions of Asset Management, Consumable supply chain management and Service chain management. Where required, integration with the Service Provider's Service Management or ERP Systems can be implemented. Service Management systems typically provide helpdesk, engineer scheduling, further asset management, stock control, procurement and invoicing systems to which Insight can feed highly qualified structured data for further processing.

Local support and notifications to end user contacts or to contacts in the service or supply chains can be provided via email to defined multiple destinations.

Please note access to IMIL allows a remote user to restart the DCA service or initiate the auto-update to perform a version upgrade. It is possible to block access to **updates.ekmglobal.com** within the firewall to prevent the auto-update process from working. The user account associated with the Windows service can also be changed to a lower, or a non-system privileges account to effectively limit any risk of the DCA affecting the host computer.

Device Import and Discovery

Service take on is by discovery of network print devices connected to the Customer's network using defined IP address ranges or via point discoveries for devices at known locations.

Lists can be created offline or exported from other systems imported into EKM Insight Portal which will be read by the monitoring application the next time it communicates to the portal.

If an HP JAMC is installed, then the device IP will be transmitted to the JAMC automatically for inclusion into the JAMC monitoring.

Once a device has been discovered for the first time, added to the Asset List and registered for management EKM Insight monitoring application will begin to monitor the device.

Moves and changes

The discovery process is designed to support the critical function of active moves and change management providing notifications of change events if required. It is also designed to create minimal network traffic through targeting specific device information only.

Discoveries run at regular intervals to identify changes to the fleet e.g. new, moved or changed devices.

In addition, the monitoring loops will also track any IP address changes, Serial and MAC address changes and change of monitoring application name.

Network Print Device Monitoring

Network device monitoring uses the SNMP protocol on port 161 using UDP for most printing equipment. The EKM Insight application supports SNMP V1, V2 & V3. SNMP V2 provides the best performance together with minimal network traffic. The extra security requirement of SNMP V3 creates extra performance and administration overheads so should be avoided unless the additional security is necessary.

The monitoring process comprises five independent sub-processes that scan devices to confirm they are available, collect alerts, record consumable levels, record media status and record page counts. Device Monitoring is self-optimising with each sub-process only reading the specific information it needs to perform its specific task thereby minimising network traffic and maximising the number of actively monitored devices per server. For very large fleets multiple monitoring applications can be deployed or the network segmented with the data consolidated at a Portal Server.

All data items are checked for validity before being stored in the database. Data that is inconsistent with previous readings and usage trends is rejected then collected during the next monitoring cycle.

The timing of the sub-processes is optimised such that information that is less time critical e.g. page counts is retrieved less frequently than time critical information e.g. device alert status.

The majority of information used by EKM Insight is retrieved from the standard Printer MIB (RFC 1759). In addition, information is also retrieved from the Manufacturer's Private MIB or other sources where required for effective service management.

Information Collected

The information collected during active service management falls into three main categories:

- Asset information, including meter usage information
- Consumables Supply chain information
- Incident Service chain information

The EKM Insight Monitoring applications do not collect any user identifiable information from the network print devices. Although many print devices do record job information, EKM Insight does not retrieve this information.

The EKM Insight monitoring server sends four key types of information back to the EKM Insight Portal Server:

- Asset Information** – manufacturer, model, location, device identification

Customer	Device ID	Zone	Manufacturer	Model	Serial Number	Asset Number	MAC Address	IP Address	Engine Cycles	Discovery Date	Device Location	HP SDS Status	Select
Local Test2	1	Boise_HQ_Floor1	HP	PageWide Pro MFP 477dw *	CN84CHX00P	?			119	06-Feb-2019 18:40:31		Genuine HP consumables	<input type="checkbox"/>
Local Test2	1	Boise_HQ_Floor1	Samsung	CLX-8380ND	1484B1DQ400327E	ID 1234	0015991D0B55	192.168.1.80	8650	30-Mar-2017 16:30:35		Not an HP device	<input type="checkbox"/>
Local Test2	2	London	Kyocera	ECOSYS M6026cdn *	LWC4706687	1234ABC	00C0EE3F8CDD	192.168.1.88	15204	30-Mar-2017 16:30:38		Not an HP device	<input type="checkbox"/>
Local Test2	3	London	Samsung	CLP-600N *	3M21B1BL200013Y	Equipment Number	001599012784	Unknown	22239	30-Mar-2017 16:30:46		Not an HP device	<input type="checkbox"/>
Local Test2	4	London	Kyocera	FS-6950 DN *	XMK6800146	Equipment Number	00C0EE693D09	192.168.1.103	131037	30-Mar-2017 16:30:51		Not an HP device	<input type="checkbox"/>
Local Test2	6	192.168.11-254	Lexmark	Optra T 614 N *	4HFA08	Equipment Number	000400C9198	192.168.1.112	128464	30-Mar-2017 16:31:00		Not an HP device	<input type="checkbox"/>
Local Test2	7	192.168.11-254	HP	OfficeJet 7210 All in one *	MY56TG02W0405	Equipment Number	0009023BC5F	Unknown	2293	30-Mar-2017 16:31:02		Unknown	<input type="checkbox"/>
Local Test2	8	Bristol	HP	Color LaserJet Managed Flow MFP M577cm *	CN8VH85138	Houston001	308D99AFB8EA	192.168.1.95	5719	30-Mar-2017 16:53:00	Carlow	Genuine HP consumables	<input type="checkbox"/>
Local Test2	9	192.168.11-254	HP	LaserJet Enterprise 700 color MFP M775z *	MXCCDD513	Equipment Number	6C8E506A687	192.168.1.118	4355	11-Aug-2017 13:32:58		Genuine HP consumables	<input type="checkbox"/>
Local Test2	10	192.168.11-254	Epson	WorkForce Pro WF-5190DW *	SDY000055	Equipment Number	AC18262A8372	Unknown	1073	28-Nov-2017 14:58:36		Not an HP device	<input type="checkbox"/>
Local Test2	11	192.168.11-254	HP	PageWide Enterprise Color Flow MFP 785f *	MX3CK7511Y	Equipment Number	F430B96F9213	192.168.1.119	132	10-Apr-2018 14:34:10		Genuine HP consumables	<input type="checkbox"/>
Local Test2	12	192.168.11-254	Samsung	CLP-660N	4821B1CP800026A	?	0015993FFA20	192.168.1.86	12067	05-Jul-2019 14:58:53		Not an HP device	<input type="checkbox"/>

- Usage Information** – page counts recorded by the print device both in summary and in detail

- **Incident Service chain Management and alert Information** – alerts reported by the print device

Date	Engine Cycles	Alert Class	Severity	Training	Reason
13-Jul-2020 14:13:30	69,066	Jam	Critical	Untrained	077-103 A paper jam has been detected near the Fuser and Front Cover. User intervention is required to clear paper jam (instructions provided at the UI). Printing has stopped.
08-Jul-2020 10:49:39	69,066	Media Out	Warning (State)	Untrained	075-451 Tray 5 is empty. User intervention is required to add paper to Tray 5. Printing can continue.

Date	Engine Cycles	Alert Class	Severity	Training	Reason	Cleared	Duration	Create Incident
13-Jul-2020 14:13:30	69,066	System Warning	Warning (State)	Untrained	003-974 The machine has scanned the current original and is now waiting for the next original to scan. User intervention is required to load the next original in order to continue the current scan operation. Printing may be stopped.	13-Jul-2020 14:22:43	9m 13s	
13-Jul-2020 14:13:30	69,066	Jam	Critical	Untrained	077-103 A paper jam has been detected near the Fuser and Front Cover. User intervention is required to clear paper jam (instructions provided at the UI). Printing has stopped.			
13-Jul-2020 09:10:51		Availability	[Not set]	[Not set]	Monitoring resumed. This device is now responding	13-Jul-2020 09:13:53	3m 2s	
11-Jul-2020 16:44:01		Availability	[Not set]	[Not set]	Device busy/unavailable for over 24 hours (actual=25 hrs)	13-Jul-2020 09:10:51	1d 16h	
10-Jul-2020 10:32:50	69,066	Jam	Critical	Untrained	077-900 A paper jam has been detected within the Left Cover area of the machine. User intervention is required to clear paper jam condition (instructions provided at the UI). Printing has stopped.	13-Jul-2020 14:13:30	3d 3h	
10-Jul-2020 10:32:50	69,066	Jam	Critical	Untrained	077-901 A paper jam has been detected near the Horizontal Transport and Left Cover areas of the machine. User intervention is required to clear paper jam condition (instructions provided at the UI). Printing has stopped.	13-Jul-2020 09:13:53	2d 22h	
08-Jul-2020 10:58:18	69,066	System Fail	Critical	Field Service	010-327 The machine has detected a fault with the Fuser. User intervention is required to turn the machine power off and on. Field Service is required if the problem persists. Printing is disabled.	10-Jul-2020 10:32:50	1d 23h	

- **Consumable supply chain Information** – consumable levels reported by the print device

MIB Description	SKU	Type	Colour	Current Level	Est. Days Left	Est. Pages Left	Last Updated	Engine Cycles	Request
1 Black Cartridge 982 SETUP HP T0B22A	T0B22A	Toner	Black	33%	418	63	13-Jul-2020 13:09:53	132	
2 Cyan Cartridge 982 SETUP HP T0B19A	T0B19A	Toner	Cyan	78%	3,217	491	13-Jul-2020 13:09:53	132	
3 Magenta Cartridge 982 SETUP HP T0B20A	T0B20A	Toner	Magenta	79%	3,258	497	13-Jul-2020 13:09:53	132	
4 Yellow Cartridge 982 SETUP HP T0B21A	T0B21A	Toner	Yellow	78%	3,064	468	13-Jul-2020 13:09:53	132	
5 Service Fluid Container HP W1B44A	W1B44A	Unknown	Unknown	69%	6,325	966	13-Jul-2020 13:09:53	132	
6 Document Feeder Kit HP J8195A	J8195A	Feeder Unit	No colour	100%	Unknown	Unknown	13-Jul-2020 13:09:53	132	
7 Clean Document Feeder Rollers HP None	None	Feeder Unit	No colour	100%	Unknown	Unknown	13-Jul-2020 13:09:53	132	
8 Printhead Wiper HP W1B43A	W1B43A	Unknown	Unknown	95%	19,593	2,992	13-Jul-2020 13:09:53	132	
9 Tray 1 Roller Kit HP W1B46A	W1B46A	Roller	No colour	100%	Unknown	Unknown	13-Jul-2020 13:09:53	132	
10 Tray 2 Roller Kit HP W1B45A	W1B45A	Roller	No colour	100%	Unknown	Unknown	13-Jul-2020 13:09:53	132	

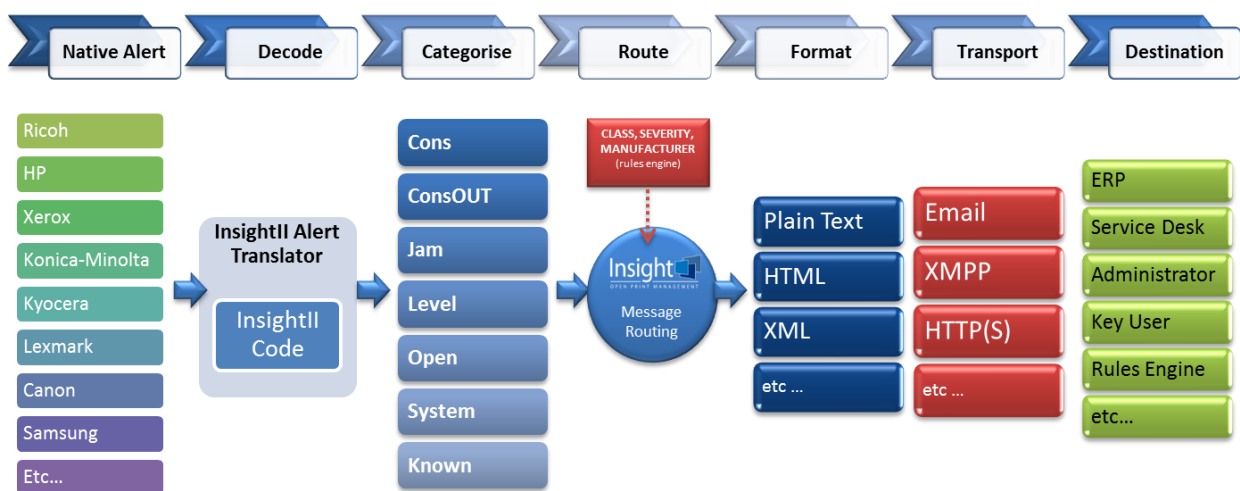
This information is carefully analysed in real-time to generate service management messages and route them to the appropriate destination for action enabling very large fleets to be managed highly effectively by exception.

Device Alerts

The EKM Insight Monitoring application retrieves alert information from the alert table in the MIB of the network print device.

EKM Insight also creates additional alert or notification conditions related to device specific conditions such as moves and changes, devices out of contact and device availability. Network print devices have a wide range of status conditions which can potentially lead to a fleet of devices generating a large number of alerts. Some manufactures devices create repeat alerts for the same event. The EKM Insight portals provide an intelligent alert triage process. This enables the system to review each alert and based on a set of rules determine which alerts need to be actioned and route these to the appropriate destination for attention.

InsightII SNMP Alert Overview



The process essentially covers three key activities;

- Firstly, native alerts from each device are analysed and a standard EKM Insight Code assigned. This ensures that the system can determine that code XYZ from an HP device is the same as code 123 from a Sharp device and are therefore processed consistently.
- Secondly, alerts are allocated to one of a number of clearly defined categories.
- Thirdly, rules determine how alerts in each category are routed and subsequently delivered to a destination for action.

The delivery destination for alerts can include record with no further action, forward alert details via email to the Customer or forward the information to Service Provider to action. Alerts can also be delivered to multiple destinations, for example, record, send an email to the Customer and forward the information to Service Provider.

Further to this the EKM Insight portal has an advanced messaging system which can provide detailed messages to end customer key users or consumable delivery locations to ensure that all participants in the service and supply chain are kept informed significantly reducing helpdesk calls. All message types and their content are fully configurable.

The key purpose of the triage processes is to ensure that only alerts that require active intervention are forwarded and that these are forwarded to the appropriate location within the Customer and/or Service Provider to action.

Consumables Management

EKM Insight Monitoring application retrieves consumable level information from the device MIB of the network print device. This information is used to support Consumables Management and requests can be managed at the EKM Insight Portal. The EKM Insight Portal uses two main methods to determine if a consumable will require replacement. Firstly, the consumable analysis module uses an algorithm to predict consumable use for each device and therefore determine when the device will require a new consumable based on the number of days remaining before empty (typically 5 to 7 days). This is to support MRP planning processes to enable consumable requests to be consolidated enabling optimisation of shipping and stock holding.

Secondly, the consumable analysis module can also determine the actual consumable level in a device and a request can be triggered when actual levels fall below a specified level (for example 5%). When either of these methods determines that a consumable is required the EKM Insight Portal can notify the Service Provider's consumable management processes to ensure consumables are delivered to the Customer.

There are several consumable management workflow models available which can be employed according to your needs including e-mail notifications, batch consumable request processing, Pick list and Dispatch note generation and ERP integration options. There is an entire workflow and status tracking mechanism providing detailed history analysis of each consumable used within the customer service.

These settings are completely configurable according to the service design and operational processes.

Billing and Reporting

The EKM Insight Portal has two key aspects with regard to data reporting functions. Firstly, it processes asset information, page counts, consumable levels and usage characteristics, and other service delivery information and can provide a means to transfer data to Service Provider's ERP system for invoicing, procurement, engineer scheduling or other planning and business management systems. Secondly, it provides day to day administration management information to support the management of the Customer's device fleet.

It does this via API, scheduled output, or structured emails as well as ad-hoc exporting of data via reports and messages if required.

The EKM Insight Monitoring applications retrieve page count and meter information from network devices and send this page count information to the EKM Insight Portal Server daily.

Hardware manufacturers have not agreed a standard list of page counts. This has led to the situation where some simple devices (such as A4 mono printers) have only a single page count and other more complex devices (such as A3 colour multi-functional) have upwards of 250 different page counts! EKM Insight has a consistent method of 'rolling-up' the multitude of page counts into a mono and colour 'click' which can be either size independent or resolved to "small" or A4 equivalent pages. This is an automated process that ensures accurate and consistent page count data across all manufacturers and models.

This 'normalised' count model is available ad-hoc and via the API and through on demand or scheduled reports.

Messaging and Communication

There are three key forms of communication between the EKM Insight Servers and the Service Provider.

- Firstly, print device information is sent to Service Provider using encrypted XML using the XMPP protocol.
- Secondly, e-mail can be configured to provide structured e-mail notifications locally to the customers or service provider onsite staff from the Portal Server.
 - These emails can also contain report data on a scheduled basis and could be sent to a monitored email account
- Thirdly, there is an API available to allow partners to directly pull (and put) data into the Insight portal
 - We also have some custom connectors for some ERP systems

EKM recognises the security implications of remote connections and are willing to follow each Customer's standard security Policy / procedures.

Application Integration to other systems such as a service desk, a procurement system or a billing system can be achieved in several ways. Key is to define the content required to be passed (asset no, serial No. alert reference, description), then the format (XML, .csv, text) then the transport protocol (XMPP, HTTP(s) e-mail). Acknowledgement and exception handling methods may also need to be defined, but is usually handled by the recipient application standard processes. APIs are available to facilitate integration.

Device information, including alerts, is communicated to the Service Provider Insight Portal in encrypted XML via the XMPP protocol over port 5222 TCP or other agreed ports such as 443, using an XMPP server to provide secure presence-based communication. All communication is initiated by the EKM Insight monitoring Servers. Communication conforms to the XMPP standard, is sent via SSL, coded in a custom XML format and is encrypted using a Base64 encryption algorithm. XMPP is an ISO standard which employs point of presence communications including store and forward in the event of lost communication. To enable this communication any Customer Firewalls or Packet Inspection software will require an additional rule that allows the EKM Insight application to initiate a secure session with the Portal Server.

Information is only sent when the destination is 'available' to receive it. When the destination is not 'available' the sending server will store the information to send when secure communication can be established.

Communication to a customer via email uses standard email from the Insight portal, EKM Insight supports secure e-mail configuration options.

Number of Devices Supported

The number of devices that can be monitored by a single EKM Insight monitoring Server depends on a variety of factors including network speed, age and complexity of the printer fleet, DNS efficiency, the longest allowable alert response time, the processor speed and memory capacity of the actual EKM Insight Enterprise or Monitoring Server Servers. It is therefore not possible to provide a definitive answer. As a guide, typically one Monitoring Server can handle between 1 and 7,000 physical devices. If there are more devices to be monitored multiple EKM Insight monitoring applications can be deployed.

There is no limit on the number of devices supported at the Portal server.

Device Support

The data available from different network print devices is variable, and not all manufacturers implement SNMP in accordance with RFC standards.

In general, post-2004 network printers from major manufacturers are likely to supply all or most of the required data, but there is limited industry agreement on the information that should be available from each device model. Devices can exhibit odd and inconsistent behaviour and it is recommended that devices be tested for their manageability prior to deployment. This is especially true of new to market models which may have early firmware revisions. It is also recommended that devices are brought up to their current firmware release prior to management commencing.

EKM provides a device analyser to guide on the manageability of a device.

EKM can advise on the management configuration options best suited to the equipment mix within a fleet of printers and any limitations due to the inherent capabilities of the printing equipment.

EKM Insight Monitoring Server Hardware and Operating System Specification

The EKM Insight Monitoring Server can be installed on most typical Windows PC/Server/VM platforms.

However for live service operation with more than 250 devices we would recommend a server operating system as this will provide a more reliable service. As the system does continuous quality of service monitoring, we further recommend that the server is operating continuously and is not switched off.

It is not recommended to use laptops if at all possible due to the transient nature of these devices.

The minimum hardware specification for the EKM Insight Monitoring application is as follows:

Fleet Size	Hardware / OS / DB
<500 devices or PoC/Trial	Dual Core 'Desktop' CPU 4 GB RAM 100 GB 7200 RPM SATA Gigabit Ethernet Windows 10 / Windows Server 2008/2016 (or above)
<5000 devices	Dual Core 'Server' 2GHz CPU 4 GB RAM 250 GB 10000 RPM SATA Gigabit Ethernet Windows Server 2008/2016 (or above)
>5,000	Customer specific evaluation recommended

Virtual Machines

Deploying on virtual machines is fully supported. EKM Insight is a real-time monitoring application however and this must be taken into account.

The EKM Insight Monitoring Server use very little system resources but do require constant access to the LAN card to perform monitoring of the fleet, VMs needs to be configured to support this method of operation in order to optimise performance.

Data and Network Traffic

The SNMP network traffic generated by the EKM Insight application is generally less than 10Kbits per second.

For device management devices generate approximately 1 Kbyte per device per day. Alternatively this can be viewed as 25 devices creating the same data as a single A4 text only page sent to print.

Network Ports

EKM Insight uses the following TCP/IP ports:

Customer Network:

Protocol	Port (default)	Function
SNMP	Port 161 UDP	Device monitoring
HTTPs (SSL/TLS)	Port 443 TCP	Access to EKM Insight web interface and device web pages
HTTP	Port 80	Device monitoring where done via device web services
SMTP	Port 25 TCP	Internal Customer email communications e.g. email alerts to Customer Helpdesk
HP JAMC	443 / Various	Please see detailed HP JAMC specification for detailed information

Communication to Service Provider:

Protocol	Port (default)	Function
XMPP	Port 5222 TCP (others can be used as long as they allow encrypted XML traffic e.g.443)	Operational Data communication to Service Provider
HTTP	Port 80	Licence verification
VPN	Customer Specific	Remote access to EKM Insight server where needed
HP JAMC	443 / Various	Please see detailed HP JAMC specification for detailed information

External Firewall Rules

Outbound management data

For outbound traffic to the Portal Server the monitoring application must be able to initiate a session with the EKM Insight portal via XMPP IANA defined port for this encrypted XML traffic. This is Port 5222.

Once initiated the session must allow two-way communications.

Please contact EKM or your Service Provider should you wish to use an alternative port, however Port 5222 is the most secure and highly recommended port to use. Please contact your Service Provider for the URL of the Portal server for “whitelisting” should this be required.

Licence verification

Periodically the monitoring server contacts the EKM or service provider licence server via port 80. Please contact your Service Provider for the URL of the Portal server for “whitelisting” should this be required.

If port 80 is unavailable, please contact EKM support and a license file (.lic) can be provided.