INSIGHT TECHNICAL OVERVIEW

WHITE PAPER

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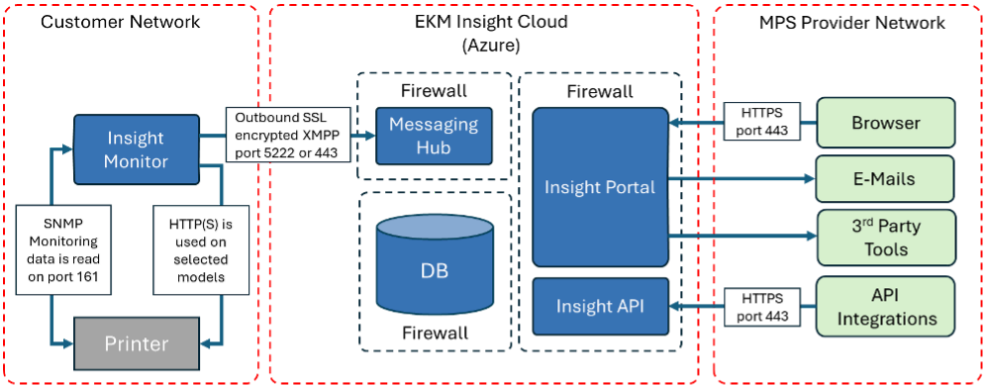
TABLE OF CONTENTS

INTRODUCTION

EKM Insight is a highly scalable, cloud-based web application designed to automate the delivery of Managed Print Services. It has been built from the ground up to enable individual users to manage large fleets of printers.

At a high level, EKM Insight is comprised of the following major components (in blue):



INSIGHT MONITOR

This light-weight service is installed on the customer network and is used to collect printer information and report it back to the Insight Portal. Each installer is digitally signed/notarized and can be installed on all major operating systems or provided as a stand-alone appliance. The service is designed to be highly robust and reliable, with minimal user intervention required. It uses self-healing techniques to recover from outages and can optionally remote update.

Printer Communication

Once configured, the monitor scans user-defined IP address ranges to discover and monitor networked printers. For most printer manufacturers this is achieved using SNMP (UDP) over port 161. To minimize the network overhead, each printer is individually scanned, the monitor does not use ping, multi-cast or broadcast techniques. The Insight Monitor supports SNMP V1, V2 and V3.

Most of the information used by the Insight Portal is retrieved from the standard printer MIB (RFC 1759) supplemented with manufacturer specific information from each manufacturer's private MIB.

In addition to SNMP, some models, such as wide format printers, provide an embedded web service interface that is read using HTTP(S) (ports vary by manufacturer).

Printer Support

The data available from different network printers is variable, and not all manufacturers implement SNMP in accordance with RFC standards. Printers can exhibit inconsistent behavior, and it is recommended that they are 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 printers are brought up to their current firmware release prior to deployment.

Monitoring Loops

The monitoring process comprises six independent sub-processes that scan printers to confirm they are available, collect asset data, collect alerts, record consumable levels, record media status and record page counts.

Monitoring is self-optimizing with each sub-process only reading the specific information it needs to perform its specific task thereby minimizing network traffic and maximising the number of actively monitored printers. For very large fleets multiple Insight Monitors can be deployed or the network segmented with the data consolidated at the Insight Portal. The timing of each sub-processes is optimized such that information that is less time critical e.g., page counts is retrieved less frequently than time critical information e.g., printer alert status.

Information Collected

The Insight Monitor sends five key types of information back to the Insight Portal:

- Asset Information – manufacturer, model, location, serial number, MAC address, firmware, IP address, hostname
- Usage Information – page counts recorded by the printer, both in summary and in detail
- Alert Information – alerts reported by the printer
- Consumable Information – consumable levels reported by the printer
- Media Information – Paper/label levels reported by the printer

Although many printers do record job information, the Insight Monitor does not retrieve this information or any other user identifiable information.

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

Portal Communication

After quality checking, the printer information is transmitted to the Insight Portal via the Messaging Hub. All communication with the Messaging Hub is initiated by the Insight Monitor, it uses the XMPP protocol on port 5222 or 443, all data is encrypted and sent via SSL.

Remote Configuration

Remote configuration of the monitor is performed from the Insight Portal using the built-in command language IMIL, which largely eliminates the need for remote access or site visits. IMIL can be used to perform tasks such as re-scanning printers, adding IP discovery ranges or restarting the monitoring service. It cannot be used to interact with the host operating system, any external process or any non-print devices on the customer network. (See the guide 'DCA IMIL Command Reference' for more information, which is available on the support website.)

Number of Printers Supported

The number of printers that can be monitored by a single Insight Monitor depends on a variety of factors including network speed, age and complexity of the printer fleet, DNS efficiency, the longest allowable alert response time and processor speed. It is therefore not possible to provide a definitive answer. As a guide, typically one Insight Monitor can handle between 1 and 5,000 physical printers. If there are more printers to be monitored multiple Insight Monitors can be deployed.

There is no limit on the number of printers supported at the Insight Portal.

Automated Updates

The Insight Monitor has a semi-automated update process. The software can download and apply updates, but only when directed to do so by the service provider, providing fine grained change control. The update process can optionally be disabled, see Appendix 2 – Network Requirements.

Optional Extensions

The Insight Monitor also has the following optional extensions that provide enhanced monitoring capabilities:

- EWS Remote Connector – This component provides remote access to web management interfaces provided by many printer manufacturers. More information on this component can be found in Appendix 3 – EWS .
- HP Jet Advantage Management Connector (JAMC) – This component provides enhanced monitoring for HP printers that support HP Smart Device Services. More information on this component can be found in Appendix 4 – HP JAMC and HP Cloud DCA
- HP Smart Device Agent (SDA) – The component can be used in conjunction with HP JAMC to monitor non-networked HP printers via USB. More information on this component can be found in Appendix 5 – HP Smart Device Agent.

INSIGHT CLOUD

Excluding the Insight Monitor, which is installed in the customer's network, all other components of the Insight service are hosted in one of over 40 secure regional data centres, provided by Microsoft Azure. This ensures that monitoring data is stored in the same jurisdiction from where it was acquired, providing data sovereignty compliance.

Azure data centers are highly reliable, with multiple levels of redundancy provided by default. They are also highly secure, complying with a wide range of global security standards. (https://learn.microsoft.com/en-us/azure/compliance/offerings/)

In addition to traditional security measures (firewalls, virus scanning etc), the Insight Cloud services are also protected by an advanced, AI based, intrusion detection system. This technology uses pattern analysis to identify potential security threats in near real-time. In the event of a threat

detection, the system automatically alerts our 24/7 Security Operations Centre for further investigation.

MESSAGING HUB

The Messaging Hub is used to pass encrypted data securely from the Insight Monitor to the Insight Portal. This highly scalable messaging solution uses XMPP, an industry standard defined by the IETF under RFC 3920 and 3921. This same technology is used by NATO for secure near real time communication between military systems.

The protocol is a point of presence protocol meaning that both the Insight Monitor and the Insight Portal must be present and securely logged in for data transmission to take place, maintaining both security and data integrity.

INSIGHT PORTAL

The Insight Portal processes information sent from Insight Monitors and enables efficient print service delivery via an easy-to-use web interface (provided over HTTPS). Role based access controls combined with a configurable authentication mechanism (credentials/MFA) ensures users have secure access to the functions they require.

The main features provided by the Insight Portal are:

- Printer management
- Consumables management
- Alert management
- Billing reconciliation
- Reporting
- Event notifications
- 3rd party integrations (HP, Epson, Zebra, PrintReleaf, e-Automate, etc.)

Printer Management

The Insight Portal provides printer management at scale, the user interface has been specifically designed to provide fast and efficient access to the data needed to perform any job role. The user interface is configurable and extensible with role-based access to data and functions. Many tasks can be performed in bulk on filtered lists of printers, reducing hours of repetitive work to a single action.

Consumables Management

The 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 printer and therefore determine when the printer will require a new consumable based on the number of days remaining before empty (typically 5 to 7 days). This is to support MRP processes to enable consumable requests to be consolidated, optimizing 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 the level falls below a specified threshold (for example 5%). When either of these methods determines that a consumable is required the 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. These include e-mail notifications, batch consumable request processing and various 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.

Alert Management

The Insight Portal provides an intelligent alert triage process for printer alerts. 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.

The process covers three key activities:

- Firstly, native alerts from each printer are analyzed and allocated a standardized code. This ensures that the system can determine that code XYZ from an HP printer is the same as code 123 from a Sharp printer (for example) and are therefore processed consistently.
- Secondly, alerts are allocated to one of several 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.

Billing Reconciliation

Printer manufacturers have not agreed a standardized way to measure page counts.This has led to the situation where some simple printers (such as A4 mono printers) have only a single page count and other more complex devices (such as A3 color multi-function devices) have upwards of 250 different page counts.

The Insight Portal contains a consistent method of 'rolling up' the multitude of page counts into a standardized billing model. This is an automated process that ensures accurate and consistent page count data across all manufacturers and models.

Reporting

The Insight Portal provides ad-hoc reporting through a wide variety of built in reports. Each report has configurable columns and can be filtered and exported as required. Reports can also be scheduled for delivery via e-mail at a user defined cadence (Daily, Weekly, Monthly).

If the report you require is not available, we also offer a custom report service that can produce bespoke reports to meet most needs.

Event Notifications

The Insight Portal includes a highly configurable notification system, this can be used to send templated e-mails to end-users when the trigger events occur. These trigger events include:

- Monitor Events (First Contact, Offline)
- Printer Events (Discovery, Offline, Moves/Changes, Alerts etc)
- Consumable Events (Level Changes, Replacement, Request States)

Each event can then be filtered at many levels to provide very precise notifications. For example, when a Ricoh model IM 430F with firmware version 1.10.1 goes offline for 3 consecutive days send an e-mail.

3rd Party Integrations

The Insight Portal supports a wide range of integrations with 3rd party systems and service providers, such as:™

- e-Automate
- Evatic
- Forza
- Jim2
- PrintReleaf
- HP Smart Device Service
- Epson Remote Service

INSIGHT API

The Insight API provides a JSON/REST based interface to most of the functions provided by the Insight Portal user interface. This machine-to-machine interface can be used to automate workflows with external applications. (For example, Service Management, ERP or CRM systems).

Secure authentication is achieved using OAuth 2.0 (RFC 6749) and granular access can be controlled from the Insight Portal. Data is segmented at multiple levels, meaning service providers and customers can be given read or read/write access only to their data.

APPENDIX 1 - HARDWARE AND O/S REQUIREMENTS

The Insight Monitor can be installed on most modern hardware/VM platforms. However, for live service operation with more than 250 devices we would recommend an always-on server environment, as this will provide a more reliable service. It is not recommended to use laptops, as these tend to be configured with aggressive sleep/power save, which will interrupt monitoring.

The minimum hardware specification for the Insight Monitor is as follows:

O/S	FLEET SIZE	HARDWARE/OS/DB
Windows 10/Windows Server 2008 (or above)	<500	Dual Core 'Desktop' CPU 4 GB RAM
Windows Server 2008 (or above)	<5000	Dual Core 'Server' 2GHz CPU 8 GB RAM
Windows Server 2008 (or above)	>5000	Customer specific evaluation recommended
macOS Catalina (or above)	<500	Intel or M1 processor
Linux	<5000	Arm/Amd64/aarch64 (Known to run on Ubuntu 20.04 LT5 and Debian 10.13, compatible with most GUI)
Raspberry PI	<500	Processor: 1 GHz Memory: 1 GB Ram SD card: Class 10 16GB card with 200 MB free

NOTE: Windows systems with multiple NICs (network interfaces are supported, Windows dictates the NIC that InSight Monitor uses.

NOTE: The user account running the Insight Monitor can also be restricted to a non-system privileges account to limit the risk of the DCA affecting the host computer.

Virtual Machines

Deploying on virtual machines is fully supported. The Insight Monitor is a real-time monitoring application however and this must be considered.

The Insight Monitor uses minimal system resources, but it does require constant access to the LAN to perform monitoring of the fleet, virtual machines need to be configured to support this method of operation to optimize performance.

APPENDIX 2 - NETWORK REQUIREMENTS

Each printer under SNMP monitoring will generate approximately 1 KB of network traffic per day.

The Insight Monitor uses the following ports on the customer network:

PROTOCOL	PORT (DEFAULT)	FUNCTION
SNMP	Port 161 UDP	Device Monitoring
HTTP(s)	Various ports TCP (dependent on manufacturer	Device monitoring via device web services (optional)
XMPP	Port 5222 TCP (Or Port 443 TCP)	Communication to the InSight Portal via the messaging hub
HTTPS (SSL/TLS)	Port 443 TCP	Licence verification (optional) Automatic updates (updates.ekmglobal.com) (optional)

External Firewall Rules

Outbound management data
For outbound traffic to the Insight Portal the Insight Monitor must be able to initiate a session with the Messaging Hub over XMPP on port 5222 (or 443) for encrypted XML traffic. Once initiated the session must allow two-way communications.

Please contact your Service Provider for the URL of the Messaging Hub for whitelisting, should this be required.

Licence verification
Periodically the Insight Monitor contacts the Insight license server IP address 52.182.175.212 via HTTPS on port 443. Please contact your Service Provider for the URL of the Portal server for whitelisting, should this be required. The license server is only for license validation and not required for operation - no operational data is stored on this server.

If the license server cannot be reached, or if port 443 is unavailable, please contact InSight support and an optional license file (.lic) can be provided.

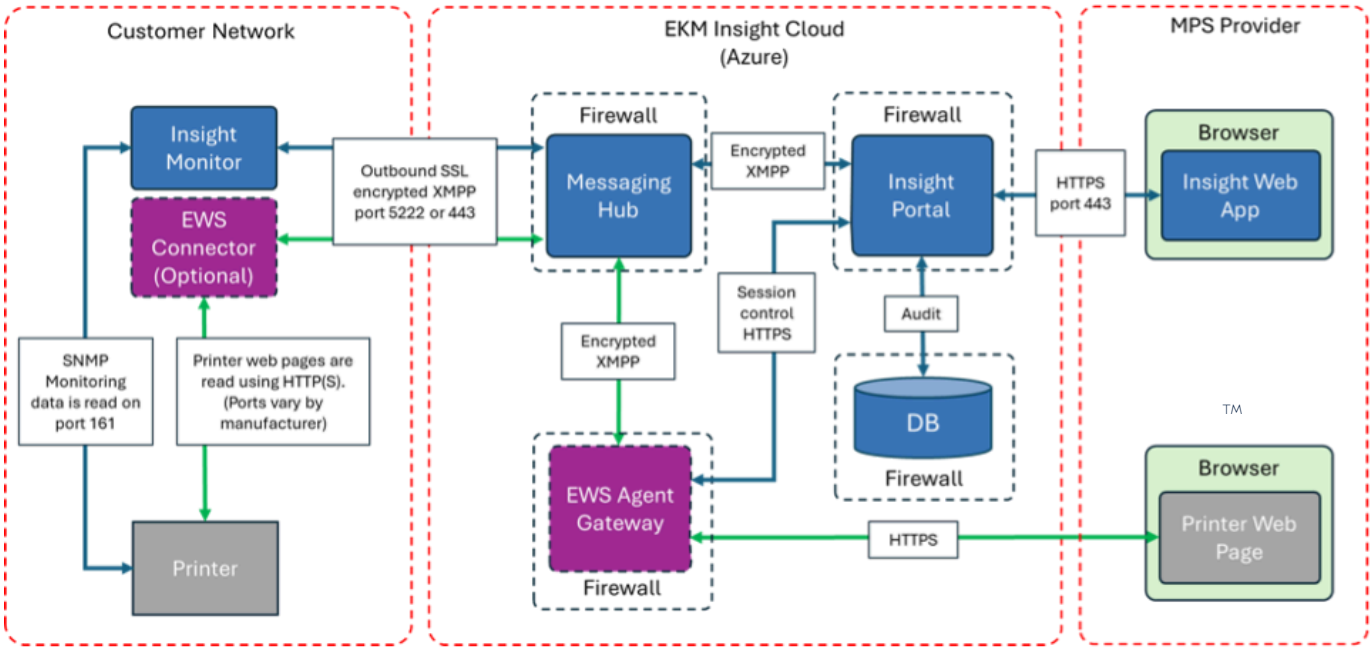
Insight Monitor updates / Zebra firmware update

The endpoint updates.ekmglobal.com may need to be whitelisted to allow the Insight Monitor to update. It is also possible to block access to the update site to prevent the update process from working.

The Zebra Firmware update feature of the Insight Monitor also uses the updates.ekmglobal.com endpoint, it will not be possible to update the firmware on Zebra label printers if the update site is blocked.

APPENDIX 3 - EWS REMOTE CONNECTOR

The EWS Remote Connector is an optional extension to the Insight Monitor. Once installed, it can provide secure remote access to the embedded status and management web pages found on many modern printers. These embedded web services vary by manufacturer, but often provide access to additional printer features such as enhanced diagnostics and firmware updates.



Installation

The EWS Remote Connector can be selected as an option during the standard Insight Monitor installation process. The installer will then add an additional application component to the monitor installation directory. If the customer chooses not to install the EWS Remote Connector, then the component will not be added, and the feature will be disabled.

The EWS Remote Connector uses the existing XMPP messaging system to provide remote access to the embedded web services, so no additional firewall ports need to be configured.

Usage

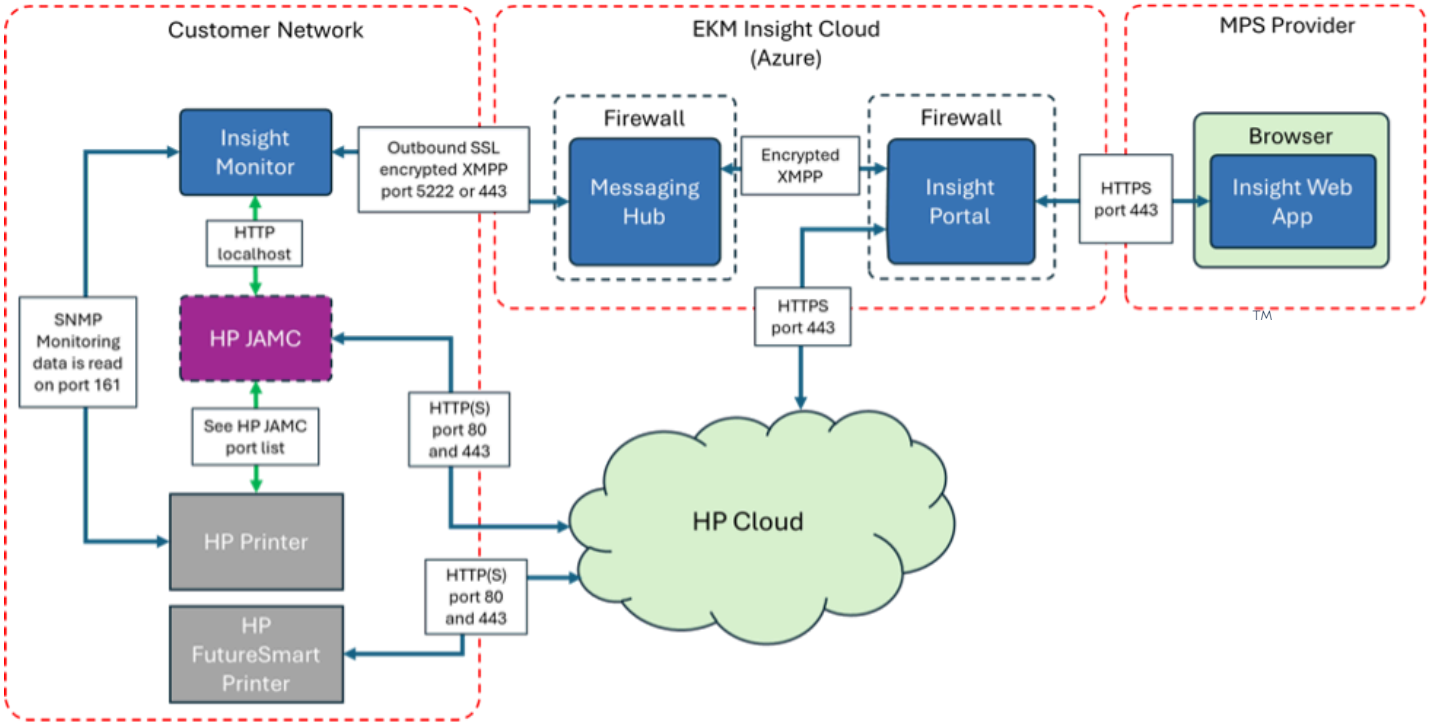
After authenticating with the Insight Portal, authorized users can navigate to the Remote EWS tab of a managed printer. Clicking the start button here will perform the following steps:

- ·The users request will be audited in the Insight Portal, recording which user requested the session and when.

- The Insight Portal will then communicate with the Insight Monitor and perform the following security/identity checks:
  - Is the request for a known managed printer?
  - Is the requested printer online?
  - Does the IP address currently belong to the printer?
  - Does the identity of the printer (manufacturer, serial number, MAC address) match the requested printer?
- If all these checks pass, then the monitor will start the EWS Remote Connector process and respond to the Insight Portal with a successful security check
- The Insight Portal will then communicate with the EWS Remote Agent Gateway and generate a randomized session URL. This session URL is time limited and will be revoked after 20 minutes.
- Finally, the session URL is passed back to the user

APPENDIX 4 - HP JAMC AND HP CLOUD DCA

The HP Jet Advantage Management Connector provides additional features for HP printers. These features include remote restart, remote firmware update and advanced diagnostics.

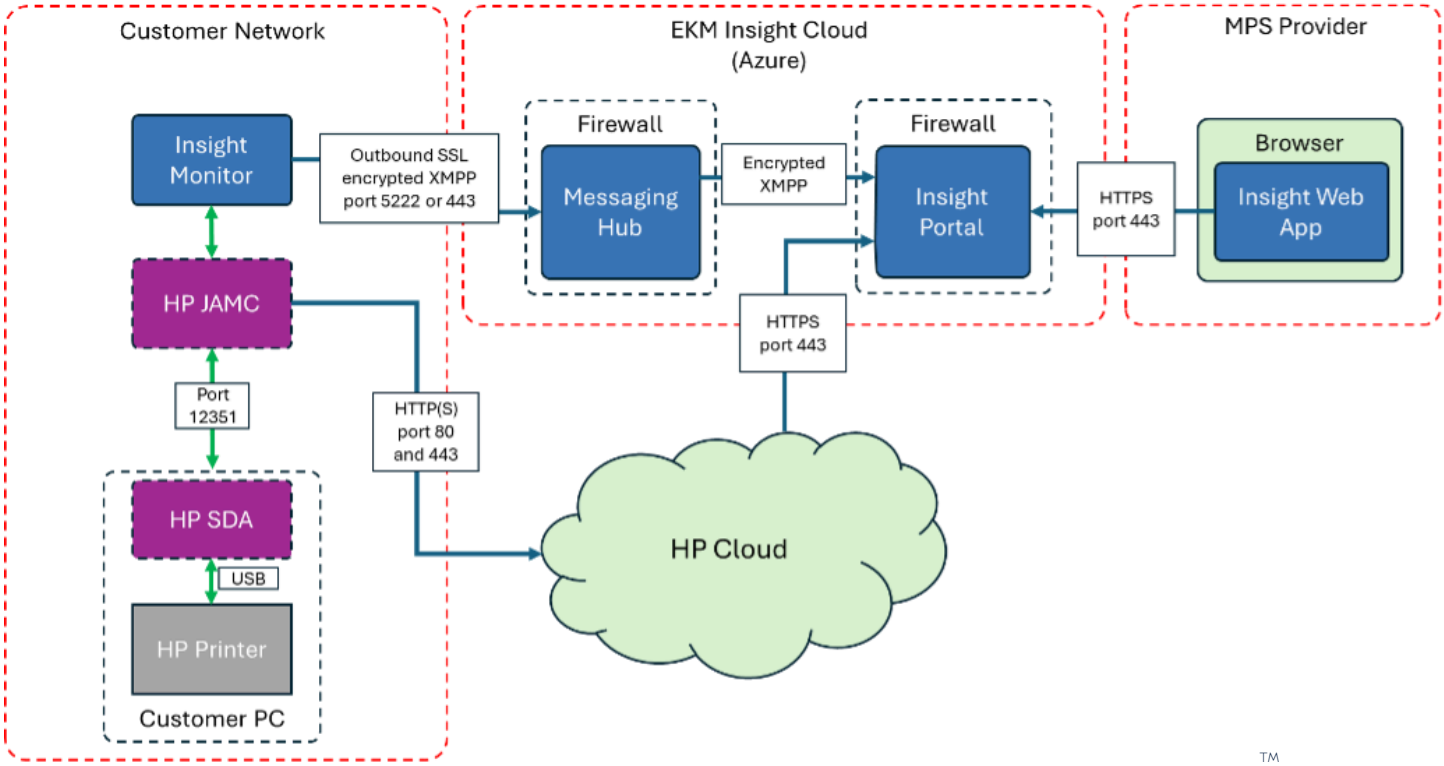


The extension uses several communication protocols to monitor HP printers, a complete list is available in the guide 'Insight HP JAMC requirements', which is available from the support website. It is currently supported by Insight Monitors installed on Windows platforms only.

The Insight Portal also supports the HP Cloud DCA, this allows HP Future Smart printers to connect directly to the HP cloud and provide monitoring and management data without installing an agent in the customers network.

APPENDIX 5 - HP SMART DEVICE AGENT

The HP Smart Device Agent extends the HP JAMC monitoring functions to USB attached HP printers. The HP Smart Device Agent is a light-weight process that is installed on each Windows PC that has a HP printer connected via USB. This process then communicates with the HP JAMC to send monitoring data to the HP Cloud and from there into the Insight Portal. Each JAMC can support up to 200 USB connected printers.



More information can be found from the guide 'Insight HP Smart Device Agent System Requirements', which is available from the support website.