



HP Open Extensibility Platform: streamlining paper-intensive business workflows

White paper

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Executive summary

Multifunction peripherals (MFPs) are transforming business workflows. The initial motivator for deploying these devices in the enterprise office was cost savings from the consolidation of copier, print, scan and fax devices. This reduced maintenance costs, power consumption and warranty costs and yielded lower space requirements. Once MFPs were deployed, many companies found that the digital send feature (the ability to scan a document to e-mail) reduced distribution costs and streamlined the movement of paper in the enterprise. This trend for streamlining paper-intensive business processes has continued to the point where the term “multifunction peripherals” is no longer accurate. These devices have now transformed into clients of business processes. Customers are using these imaging kiosks to directly scan documents into enterprise content management systems and into business applications, such as invoice reconciliation and claim processing.

This transformation has placed new needs on the device and the business workflows to which the device attaches:

- Customers are concerned about the stability and longevity of the connection between the device and the workflows. Workflows tend to outlive the lifetimes of devices. It is important, therefore, that a replacement device is backwards compatible with the established workflow.
- The solutions need to work with the installed fleet. It is generally impractical to refresh the fleet in order to enable workflows. For most customers, solutions must span products released over the past three years and protect the investment already made.
- The solutions need to be easy to install and configure across a fleet of devices. It is just not acceptable to have to go to each device and manually configure the device to participate in a solution.

There have been two main approaches to supporting the above needs:

- 1) Make smarter devices (add downloadable business logic to the device).
- 2) Create a common interface to the devices so that remote business logic can control the device (often referred to as a thin client or thin server approach).

Both of the above approaches have benefits and challenges. Smarter devices have the challenges that specialized business logic must be created for each device type and downloaded to each device. The common interface approach has the challenge that it seldom can cover the installed fleet and typically works only if the fleet is refreshed (a costly endeavor for any enterprise).

Today there is a third option: the HP Open Extensibility Platform (OXP). In this approach, HP provides a converter for legacy devices that brings the installed fleet up to a common workflow interface. This approach works with the installed base (overcoming the limits of the conventional common interface approach) and, by leveraging HP Web Jetadmin management tools, overcomes the need to manually configure each device. This approach is meeting great success with HP partners and customers. System integrators are reporting 90 percent reduction in integration times with this new approach, with the benefit of leveraging the installed fleet.

Introduction

The initial motivator for multifunction peripherals entering the enterprise office was cost savings from the consolidation of copier, print, scan and fax devices. This reduced maintenance costs, power consumption and warranty costs and yielded lower space requirements. Once MFPs were deployed, many companies found that the digital send feature (the ability to scan a document to e-mail) reduced distribution costs and streamlined the movement of paper in the enterprise.

Recently, companies have started to integrate MFPs directly into business processes, adding custom task buttons to the device’s front panel to scan documents to records retention systems or invoices into payment systems. Enhanced front panels allow users to select workflow tasks directly at the devices and route jobs into business processes.

With governmental regulations such as the Sarbanes-Oxley Act, the Health Insurance Portability and Accountability Act (HIPAA) and Basel-II, companies need to get control over the movement of sensitive information in the enterprise, whether in paper or digital form. New security approaches such as proximity badge readers, encrypted scans and encrypted print are requirements to MFP and printer vendors, and need to be integrated into companies’ security systems and policies.

In this ongoing evolution, devices that were once considered “peripherals” to PCs are now full-fledged clients of business processes. There is now the challenge of keeping these new clients up-to-date when the servers on which they interact get upgraded. This is almost the inverse of the driver installation problem from years ago. When the device was a peripheral, PCs needed to have converters or drivers to translate from a generic interface to the device-specific features. Today, the new devices need converters or drivers to communicate with off-device services.

The need for workflow integration

In recent years, companies have experienced a growing need for better integration of paper and digital workflows. For workflows like claims processing, it is common to see users with two screens—one for an electronic inbox, with scanned images in Portable Document Format (PDF) files, and a second screen for the enterprise applications into which they enter information. A user pops up the scanned images from his or her inbox and enters the relevant data from scanned documents into SAP or Oracle® applications. While this digital distribution can save considerable costs, these are far from automated workflows.

Examples from a major manufacturer

To further illustrate the need for workflow integration, let's take the case of a large U.S. manufacturer. While this company happens to be in the automotive industry, the issues faced are common across a wide range of enterprises. We'll look here at workflow issues in three areas of the business: purchasing, receiving and legal.

Purchasing

The company's purchasing department asked HP to verify that all parties were agreeing to the same versions of terms and conditions in written contracts. This can be a tricky problem. As documents are repeatedly revised, they get renamed in different ways, and sometimes it's hard to know which document is the most recent, and whether all reviewers have agreed to the same terms and conditions. In addition, there are some cases when a person might quietly change a contract before signing it. The recipient, in turn, might not realize that the document had changed. Problems like these aren't solved with just a scanning device. These are workflow issues. The solution to this version control problem is to tag manage each version of the document with a barcode in a document repository. When the document is scanned, it is checked against the digital original.

Receiving

Elsewhere in the company, the shipping dock had trucks that arrived with parts and bills of lading. When a shipment arrived, the receiving personnel had to determine the department that needed to receive the shipment and then get a message to the right people to advise them to pick up the shipment in a timely manner. The solution was to create an

automated way to notify the right department to come and retrieve the shipment that had arrived at the loading dock. The solution required scanning the bill of lading and extracting the part number, looking up the correct department and routing an e-mail notification to the correct department.

Legal

Finally, this same manufacturer was facing a product-related lawsuit. There was a good deal of debate about whether the issue at hand was a vendor problem or a design problem. For discovery purposes, the company needed to track and sift through all the correspondence with the vendor, whether in e-mail, paper documents or other formats. Here again, it was important to not just scan documents, but index them and categorize them. The solution was to implement an integrated, automated process for capturing, tracking and controlling vendor correspondence.

It's more complex than just a box.

Viewed from a holistic perspective, the focus here is on triggering business processes with the arrival of a document. Companies need to consider how scanned documents are handled. How are the documents indexed? How is information about the document attached? Who can see the documents? Who can modify them? How long do they have to be retained? These are among the questions that have to be addressed in terms of business policies. When looking at compliance and auditing requirements, paper processes are faced with the same regulations governing digital workflows. These policies come all the way down to the device level. For example, approaches to device security—such as proximity badge readers, encrypted scans and encrypted print—now need to be integrated into companies' security systems and policies.

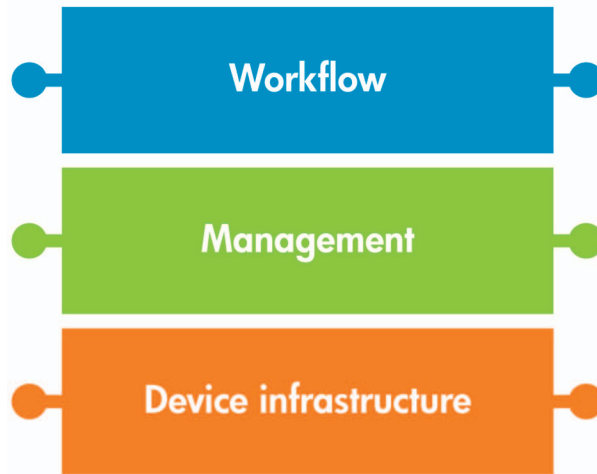
While companies often have excellent solutions for digital documents, attaching these policies to paper documents has been a challenge. Clearly, the need is not for yet another independent authorization or auditing system, but rather about how the device can be integrated into the enterprise document and security processes.

Common integration approaches

Historically there have been two main approaches to helping developers integrate multifunction and printing devices. The first is to make a smarter device (smart MFP) by enabling independent software vendors to download programs that can run locally within the device. The second approach is a service oriented architecture (SOA) approach where programs can control features of the device over the network.

Figure 1. The layers of OXP

The HP Open Extensibility Platform is composed of three main layers, covering devices, management tools and workflow.



The workflow layer

- Provides job submission, routing, tracking, archive and document transformation services. This layer defines a job and a document.

The management layer

- Provides fleet and solution management and configuration services. It discovers devices and tracks pages and usage.

The device infrastructure layer

- Provides marking, digital sending, copying, finishing and I/O services. It interacts with the user for converting documents to/from paper.

Both of these approaches have benefits. The smart client approach enables rich user interaction and considerable control by the application developer. The challenge of this approach is that applications written to one device historically haven't been very portable to other devices (even from the same manufacturer). While theoretically code written in Java™ should be portable, the actual underlying differences from device to device (screen size, color/non-color, available memory, available computational resources and even underlying firmware differences) have caused application developers to spend often as much time porting their applications from device to device as developing new features. In addition, companies are often quite concerned with uninspected code from independent software vendors running on devices. Testing and certifying these programmatic downloads has proven costly.

The second approach of remotely controlling the device has the benefits of keeping the devices simple and testable. The communication protocol can be tested and verified independently of the device. This approach does not tend to suffer the internal device-to-device portability issues. However, this approach has the challenge of fleet compatibility. Historically, vendors have been eager to expose new features through new interfaces, and this means that functionality is inconsistently deployed across the installed fleet of devices, whose ages might span three to seven years. These differences that emerge as the fleet ages have proven to be a daunting task for those maintaining solutions across a fleet of devices.

Meeting the challenge with OXP

OXP provides:

- The ability for solutions to be written once and deployed across an evolving fleet of devices
- Protection of the solution investment for both the installed base of devices and new devices
- Quick configuration rather than complex programming that requires IT certification
- Increased confidence in the security and reliability of solutions

A new, blended approach: OXP

Today there is a third approach to integrating multi-function and printing devices. This new approach, enabled by the HP Open Extensibility Platform, blends the benefits of the smarter client and smarter server approaches, and as far as we can tell suffers none of the issues. What is unique in the OXP approach is that we exploit the smart device approach of the Java virtual machine to teach old devices new interfaces, essentially addressing the challenges usually associated with the common interface approach. With OXP, any device in the fleet can be updated to the same web-services interface, creating a unified, stable, testable web-services interface across the fleet of devices.

The outcomes of this approach include dramatic simplification for workflow integration, stability of solution deployment (since the old devices can be updated to latest fleet compatibility), and dramatic simplification of testing.

Figure 2. Portals for interacting with the layers of OXP

Historically, administrators accessed the workflow, management and device layers through user interfaces or portals.

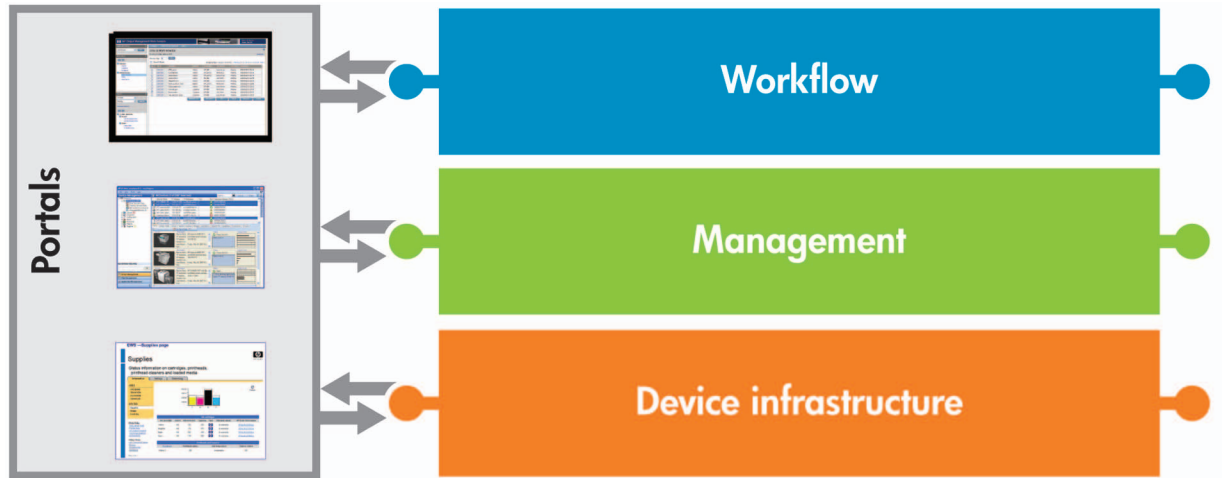
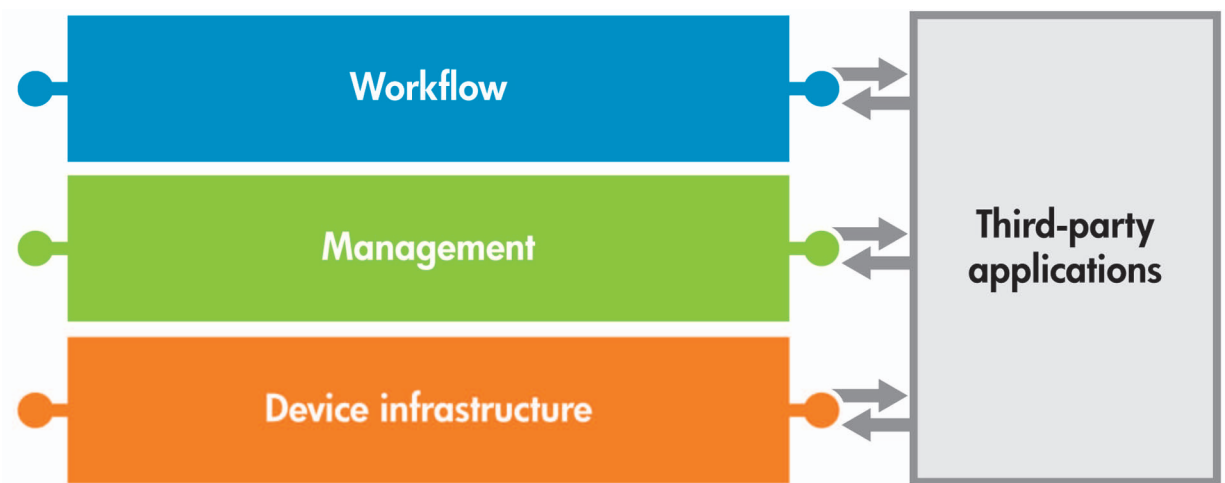


Figure 3. OXP interfaces for third-party applications

Through the use of web services, OXP dramatically simplifies control by computer applications.



HP Open Extensibility Platform

What is OXP?

The HP Open Extensibility Platform is composed of three main components: HP devices, management tools and workflow components. OXP enables independent software vendors and system integrators to control these components through web-services protocols. This interface can be installed on the existing fleet of HP devices, management software and workflow components. Essentially, HP can upgrade older devices to a uniform programmatic interface.

This ability to retroactively install a uniform interface across the fleet of devices and leverage the management and workflow components dramatically simplifies solution deployment and interface maintenance.

Device layer

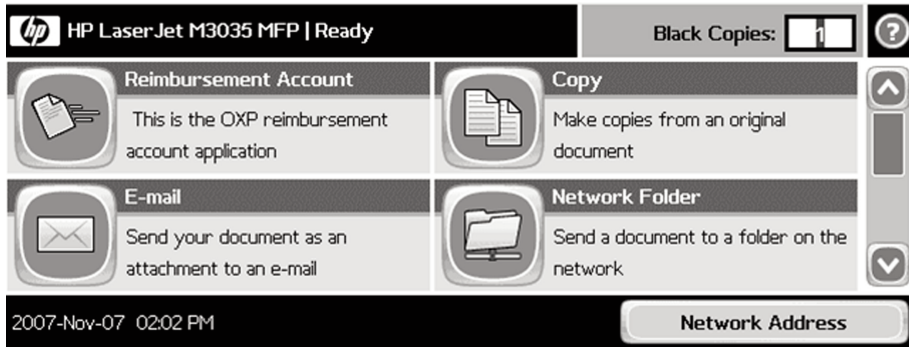
The device layer includes HP printers, scanners and MFP devices. The devices interact with the user for converting documents to and from paper. Through OXP-device, the device can be configured to have specialized front panel buttons linked to remote processes. Additionally, this layer provides marking, digital sending, copying, finishing and input/output (I/O) services.

Management layer

The management layer includes HP Web Jetadmin and Digital Send Configuration Services. This layer discovers devices and tracks pages and usage. This layer also provides fleet and solution management and configuration services.

Workflow layer

The workflow layer includes such components as HP Universal Print Driver, HP Output Server and Digital Send Routing Services that involve document transformations (such as optical character recognition) and routing



Sample OXP application

One of the most common uses for OXP-device is to associate metadata with a scanned document being sent to a workflow. Using OXP-management, an application can discover the devices to be configured and then configure the devices to associate a button on the front panel with a web-services call.

When a user touches the “Reimbursement Account” button, a second dialog appears to retrieve the account number. After the account number is entered, a scan-to-PDF occurs and transfers the scanned image to a specified location. This example is for illustrative purposes only; other file-transfer mechanisms, security systems and configuration types are supported.

of documents. This layer defines a job and a document. It also provides job submission, routing, tracking, and archive and document transformation services.

Historically, we made these layers available through a user interface or portal. These access points allowed an administrator to reach a device’s embedded web server to check the status of toner, for example, or look for alerts or paper jams. An administrator could connect to the HP Web Jetadmin software to check on a fleet or configure settings for a single device or a fleet of devices. And, finally, an administrator could connect to the web portal for HP Output Server to check on the status of a job.

The HP Open Extensibility Platform moves all of this into a new realm. Through the use of web services, OXP dramatically simplifies control by computer applications. In other words, programs can automate work that would otherwise involve multiple user steps, streamlining business applications.

Bringing older devices up-to-date

HP has had the Chai Virtual Machine in our devices since 1999. The device layer of OXP, known as OXP-device, was developed by HP as a Chailet. A Chailet is a downloaded application based on the HP Chai software platform. This Chailet allows companies using HP imaging and printing platforms to deploy OXP on their installed fleets of Chai-enabled devices.

With OXP, HP continues to support all the existing embedded Chai-based solutions used by developers for the past decade (the smart MFP), as well as provide the unifying web-services interfaces on the installed fleet of devices (the fleet unified interface). So with OXP, developers can now use web services to reach

back into a fleet of installed devices and bring them up-to-date, and to a consistent level that improves the fleet’s value. In simple terms, we can now teach old devices new protocols.

OXP-device can be upgraded and maintained across the fleet to create consistency among all devices. Companies using HP imaging and printing platforms now have extensibility by just downloading a new applet. The HP management and workflow layers have similar plug-in approaches.

There are many benefits to this approach. OXP not only allows companies to streamline paper-intensive business workflows, it protects our customers’ and partners’ substantial investments in HP imaging and printing devices and solutions.

Configuring user interfaces

With OXP, each of the three layers has a “plug-in” for exposing web services. In the case of the OXP-device plug-in module, the use of web services enables front panels to be configured for driving business applications and processes, such as invoice capture and contract archiving. This capability simplifies and accelerates development work.

OXP-device is more about configuration than programming. A developer doesn’t need to know about specific device types or user interfaces to deploy a solution across a fleet. It is important to note that OXP-device works across the HP MFP technology lines (Edgeline and LaserJet) and also works with HP digital sender/network scanner products. The key point is that OXP-device enables the same solution to work across all of these devices, regardless of device configuration, color or mono capabilities, number of trays or other characteristics.

HP has a consistent user interface across this fleet of devices. This is a critical component of OXP-device. This common user interface saves retraining and enables the core value proposition of OXP-device—namely working across the fleet. Over the years, HP has spent a huge amount of time and energy—including numerous user studies and time-on-task studies—to get the user interaction right and to refine an intuitive interface. This same knowledge was brought into the ability to configure the user interface through OXP.

With OXP-device, a configuration file is provided that adds a button to the front panel. This button can be configured with a title and description and can be oriented toward a particular authenticated user or toward sets of all users of a device. When the button is pressed, OXP-device will either send a message to a web server or collect further metadata, which can be sent along with the scanned information to simplify routing and processing time.

So how does all this work? The device is sent (or can retrieve) a configuration file. This is a simple Extensible Markup Language (XML) file that says what the button names should be. It is therefore easy to internationalize. This is not “programming” the front panel, but rather configuring the front panel. This is an important distinction. Rather than needing to check the correctness of a program, it is only necessary to verify that a correct configuration was downloaded.

The configurations can be loaded per device or per user. HP Web Jetadmin can be used to set the configuration for each device or fleet of devices and to specify how these configurations are mapped to users. A typical configuration file is less than 24 lines of XML.

Achieving tangible benefits with OXP

The HP Open Extensibility Platform delivers important business and technical benefits for HP customers and the many HP partners who develop and integrate solutions for HP imaging and printing platforms.

HP customers

At a business level, OXP:

- Enables companies to streamline paper-intensive workflows
- Empowers users to create, manage and route new forms of documents, information and communications
- Removes barriers for documents, information and communications to flow to and from devices, whether at home, in the office, in a retail store or at a print shop

- Leverages the power of web collaboration to transform documents, information and conversations
- Increases employee productivity and satisfaction

IT managers

For IT managers, OXP:

- Protects investments in imaging and printing solutions by providing compatibility across a fleet of devices
- Protects investments in devices by working across a fleet of devices and enabling older devices to be brought up-to-date more easily
- Uses configuration files, rather than complex programming approaches, and is easy to test, integrate and deploy
- Enables greater integration and functionality across applications
- Accelerates implementation times for new application rollouts

Partner developers

For partner developers, OXP reduces the time and costs of development efforts. In particular, OXP:

- Reduces testing costs by providing a well-defined testable interface
- Reduces deployment costs through its ability to work across an installed fleet of devices
- Reduces training costs by providing compatibility across a fleet of devices
- Enables partners to leverage one another’s development work
- Exploits the power of HP Web Jetadmin and HP Output Server to simplify solution deployment

HP partners have responded enthusiastically to the arrival of OXP. Here are a few of the responses we have received from developers who have worked with the platform:

- “HP is delivering best-in-class integration opportunities through their OXPd Developer Program. Kofax has been able to easily create unique and powerful capabilities for our mutual customers, and HP provided us with great support.”—Kofax, a Dicom Group Company
- “OXPd provides an excellent tool kit for developing applications for the wide variety of devices from HP and has the greatest level of flexibility at the device to provide for truly personalized and streamlined experiences for end users.”—Omtool, Ltd.
- “We should put money in your bank account for the development time you are saving us.”—Cobra Technologies

Streamlining workflows— and protecting investments

For nearly three decades we have seen a dramatic expansion of how paper-intensive processes have evolved. While cost containment was an initial motivation for MFPs, improving productivity and reducing business risk are now emerging as even more critical business requirements.

As companies link devices into business workflows, it is critical for companies to consider how solutions are installed, configured and managed, and the longevity of the solution (i.e., how it will be migrated, updated and supported as one device retires and another one is added to the infrastructure).

OXP provides a unique approach to address these challenges by leveraging the benefits of smart devices and simultaneously using lessons from web services. With OXP, any supported device in a fleet can now be updated to the same web-services interface, reducing the effort to deploy and configure fleet and workflow solutions. Perhaps more importantly, companies are likely to see the dramatically improved levels of customer satisfaction that come with OXP and its ability to deliver quality solutions and services that provide lasting value.

While enabling this forward-looking transformation, OXP at the same time helps companies protect their substantial investments in their installed fleets of Chair-enabled HP imaging and printing devices and the solutions that use them. This is an important point for any company that wants to transform its imaging and printing environment. Companies should ask their vendors tough questions: Will this solution work with my existing investments? What fleets are covered? How long will this solution be around? How many developers are using this?

At HP, we're confident that we have first-rate answers to questions such as these. That answer is the HP Open Extensibility Platform.

About the author

Keith Moore is the chief technologist for the HP Imaging and Printing Group's Global Enterprise Business. During his 22 years with HP, Moore has served as the senior architect of the HP LaserJet line of printers, senior architect for next-generation HP Indigo Presses and distinguished technologist with HP Labs.

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