A Workflow Service for Remote Printing of Technical Documents

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Abstract

HP Remote Printing for AEC (HPRP), is a service developed and operated by Hewlett Packard to improve technical workflows, specifically for the AEC industry (Architecture, Engineering and Constructions). HPRP is an improvement over current paper based workflows providing a quantum leap improvement in speed and cost. This paper describes the system architecture, interfaces and key workflow uses cases

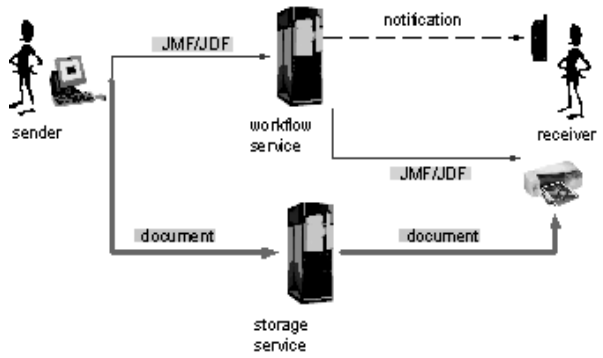

Figure 1. HPRP architecture

1. Introduction

The AEC industry is still using paper based workflows, created around centralized printing systems. On this industry tons of large format plans and specifications are shared between the different actors in the system; usually they are created in centralized printers that can create large volumes of paper at reprographic houses, and then distributed by mailing companies like FedEx or UPS.

HPRP proposes a new distributed printing workflow that can be easily integrated on current paper workflows by allowing virtually sending paper over the internet. HPRP was designed to reduce the costs in messaging and time that face AEC companies, as its main objective. To reduce messaging and time costs, distributed printing was the logical solution, the challenge faced was to find a secure, reliable and simple solution for remote printing of large format documents. This paper describes the solution implemented by HP, its architecture and key components responsibilities.

2. HPRP Architecture

As shown in Figure 1, the HRPR system is composed of different pieces that interact between them, namely:

1. The workflow service (HPRP), a Job Definition Format (JDF) based workflow service for the exchange of sets of jobs or packages; The HPRP provides functionality like job management, contacts management, corporate account handling, user administration, customer support and user notifications. The HPRP service user interface is highly customizable can provide a range of views, like branded versions of the service or voice enabled (VoiceXML) interfaces.
2. The storage service (HPSS) that provides secure and reliable transfer/storage of documents; the HPSS allows us to implement different topologies of storage transparently, according to the users needs, from the centralized HP provided storage, to distributed corporate storage. The HPSS also implements an advanced transmission protocol, with parallel chunking and retries to provide maximum performance and reliability on large document transmissions.
3. The sender client, a generic windows printing client which captures and sends the document to print to the HPRP using a secure, generic and highly compressed form of HPGL/2.
4. The printing appliance or receiver, a device/software that processes JDF tickets and is capable of rendering HPGL/2 to various printing languages supported by large and small format devices.

3. A JDF Based Workflow

The HPRP system is based on the exchange of JDF tickets; the components of the system communicate between them using the job messaging format (JMF) messages.

JDF is a specification for an exchange format for instructions and job parameters. JDF tickets describe print jobs across different components in the system, the job contents can be described in other languages, like PDF, HPGL/2 or PCL.

The CIP4 has also defined the JMF messaging; JMF messages facilitate the interaction between different processors in a workflow through the issuing of direct commands; JMF messages are encoded in XML.

The HPRP service provides a set of JMF interfaces for operations like: a. register senders and receivers, b. send a set of jobs; c. query for jobs ready for certain receiver, d. changing the status of a job, or e. describing a receiver associated device capabilities. These messages are provided through two types of transports, HTTP and the SOAP protocol, for the latter a WDSL document describes the interfaces to the service.

The HPRP service workflow comprises two major use cases: sending packages and receiving jobs for printing. For the first one, (i) the sender agent authenticates the user within the HPRP service, (ii) the sender sends an initial JDF describing the jobs to submit, (iii) the HPRP service allocates space for the job assets at the HPSS, where the sender has to upload them, then a new ticket is sent back with this information, (iv) the sender compresses, encrypts and uploads the assets to the required locations, (v) when the upload is completed the sender notifies the HPRP service.

The second main use case is the receiver querying jobs for printing, (i) the receiver periodically polls the HPRP service for job tickets to print, (ii) when a ticket is received, the receiver starts the JDF processing, including asset downloading, decryption and uncompressing, (iii) the jobs are analyzed to determine which associated device to use and how it should be processed, (iv) the jobs are then processed, transforming them to the page description language (PDL) like RTL or PCL3GUI, supported by the device; (v) the receiver will report back the changing status of the ticket and communicate any error during the previous stages.

4. The Printing Pipeline

The printing pipeline, shown in figure 2, is based on a rendering engine that translates from a generic HPGL/2-RTL language to the specific PDL of the target printer. This takes into account the printer capabilities, like resolution, print modes, physical margins, etc. This engine is present in both sender and receiver of the HPRP service, and is the foundation that allows printing on remote devices exactly as the sender intended, since the same render engine is used by all participants.

The end to end steps for remote printing are:

1. The user prints a document by using the standard Windows File->Print mechanism, to the HP Remote Printing printer installed on his windows system.
2. The printer driver translates windows GDI commands to a generic HPGL/2-RTL file.
3. The file is captured by a Windows port monitor, which forwards the data to the sender application, in charge of handling the files created by the user.
4. Within the sender, the user can preview the files generated, print them locally or send them to a remote printer through the HPRP service..
5. In the case of remote printing, the remote machine will retrieve the files from the HPRP service, and then it will render them to a 32 bit bitmap, which is then converted to the final printer language, and sent to the printer.

5. Conclusion

The HPRP service provides a fast, reliable and secure remote printing mechanism, the architecture created around a JDF workflow makes it broadly applicable for all kinds of remote printing applications, and flexible enough to be extended to other requirements. In this paper we present an implementation to cover the needs of the AEC industry when sharing large format documents.

Since the launch, the service features have been expanded, with functionality such as the instant printing, where no software installation is needed, automatic printing for trusted peers.

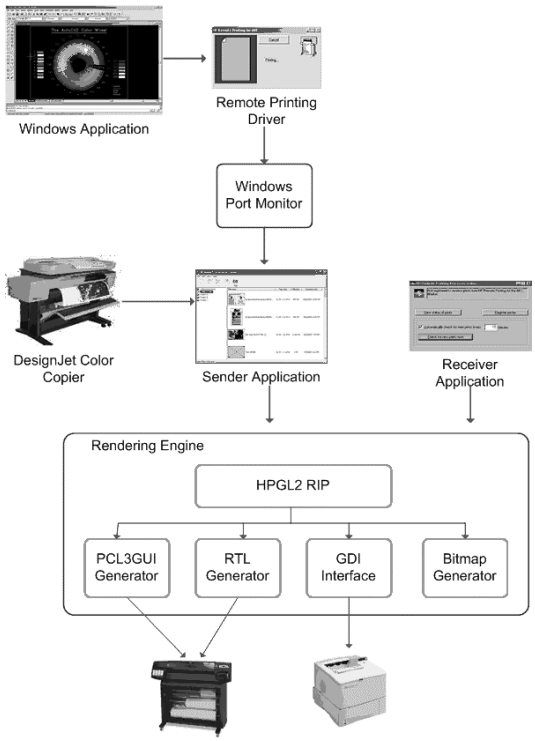

Figure 2. Printing Pipeline

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