Developing a Common Print Application Architecture

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Abstract

The development of a new print platform requires a solid understanding of customer needs. As part of the development process for the Heidelberg Digimaster 9110 Network Imaging System, a strategy of having a common platform for a wide variety of print needs was developed, thus providing customers a great deal of flexibility. Previous solutions had been targeted at either document printing or page printing workflows.

To meet the requirements, a total system viewpoint needed to be developed, and a strong understanding of potential trade-offs required to be made in the process. This includes not only front end workflow, but also digital finishing attributes of the system.

Introduction

Traditionally, the market for high speed output devices has been broadly segmented by well defined environments. The need to produce printed documents, with a variety of paper sizes and binding methods was done in commercial printers, quick printers and inplant print shops. Meanwhile, with the advent of computerized accounting systems, a succession of improved digital printers evolved in data centers and service bureaus. Over the past 10 years, the advancements of processing speed in computers, peer-to-peer networking and digital electrophotographic image quality refinements in marking engines has enabled users to combine the once separate departments and organizations physically. However, because legacy printing systems had been developed with discreet application sets in mind, the ease of combining print streams together was an obstacle to success for leading edge customers.

The benefit to customers seeking to combine print operations was most often cost savings, in that capacity of equipment allowed documents to be printed on the same equipment that could, in theory, be used for accounting reports, billing statements and other transactional print applications. Even if the departments did not plan on combining, the ability to have redundancy in the printing system was attractive to mid to large enterprises.

Early attempts to combine these print applications required customers to compromise some aspect of their print operations. Bottlenecks were identified that would require significant changes in legacy printing systems. Since the Heidelberg Digimaster was designed as a digital printing system from the ground up, versus leveraged from a cut-sheet analog copier design, the design and engineering teams had a great deal of flexibility in creating a solution that could fit well into a variety of application environments.

Areas of Impact

All of the subsystems related to the overall productivity and performance of the Digimaster Network Imaging System needed to be considered, and conflicts or shortcomings identified so that improvements over legacy solutions could be realized. Following are the high level considerations for the major subsystems.

Scanning

A large amount of printing work still comes from hard copy documents. While the percentage has decreased as electronic creation tools have improved, the ease of submitting hard copy jobs, and the requirement to handle reproduction of older documents makes quality scanning necessary.

Key attributes for scanning include robust paper handling, consistent image quality and open architecture, combined with workflows that vary from "copy and print" to "scan and repurpose".

Network Printing

As electronic originals become more common, the ability of the printing solution to accept these jobs over one or more networks becomes more important. The customer need is often to work with more than one form of network input, so the ability to configure these connections for maximum flexibility is key to success.

Mainframe computers used to drive high speed printers exclusively, but today the client/server model requires local area network connectivity at the same time as mainframe communications.

The growth of the intranet has also had a positive impact on the type and amount of print activity in a typical customer environment, so the solution set has to be able to work in this environment as well.

Document Storage

Traditional electronic printers were capable of storing certain resources such as fonts, logos and electronic forms. When the print shop began to adopt electronic printing solutions in the mid 1980s, the concept of local storage of complete print-ready documents became common.

Further refinements in the late 1980s allowed job ticket information to be stored with individual documents, thus allowing more automated reprinting processes to be enabled. As this need became more attractive to customers, the need to be able to repurpose these documents across media and device types became more important. Thus the need to store documents in format that are not device specific, in terms of image content, resolution and job ticket characteristics became imperative for long term viability of electronic document libraries.

Document Preparation

Although very sophisticated electronic publishing systems were available back in the 1980s, in practice a high percentage of documents needed to be adjusted in some manner, such as the common need to merge scanned input with documents created electronically from one or more applications.

Key capabilities such as electronic cut & paste, image editing, page numbering and page assembly were often required in the print shop. Previous legacy solutions packaged these capabilities directly on the device. While operators found this convenient and attractive, larger workflow issues emerged on factors such as version control, job security and device independence.

As the Digimaster solution evolved, the ability to maximize potential workflows at customer sites became enabled through the use of web-based tools such as Java applets, which would allow certain aspects of document preparation and proofing to be configured at locations other than directly on the device, or in the print shop for that matter.

Job Queues

With job storage capabilities, and the ability to specify job tickets automatically for reprinting, the ability to apply sophisticated queue control was seen as important for 10-20% of customer installations. Attribute based queues enable automation of tasks and typically faster turnaround for standard jobs.

Given that up to 20 percent of customers sought to automate their queue control, the remaining 80% don't like the concept of jobs automatically printing without first being reviewed and controlled within the print shop. Thus the need to develop methods to allow customer choice in this area was mandatory.

Job Ticketing

As previously mentioned, the ability to store job ticket settings with individual files was a common capability. However, as more sophisticated publishing systems evolved outside the print shop, the ability to integrate the job ticket characteristics upstream in these applications was highly valued by leading edge customers.

In addition to specialized publishing applications, common office applications became more capable of handling a wide variety of documents. The development of custom print drivers and downloaders enable these common applications to replace more sophisticated document management solutions, and thus open up a wider variety of potential users for electronic printing.

Job Spooling

A finer detail in workflow, the ability to control print spooling based on customer needs can prove a disaster if not carefully planned for in the standard architecture of a printing system. Traditionally, the ability to specify job ticket requirements for inline finishing and paper handling, while spooling jobs to a local file directory, was common practice.

However, to dynamically print jobs with variable data and maintain high first set speeds, the need to turn job spooling off, and enable spool-rip-print concurrency is required. Not all jobs can be printed without first spooling, for various reasons such as the speed of processing, network communications and job manipulation. The ideal solution allows for spooling to be controlled on a job by job basis.

Job Rasterizing

Low end printers rasterize one page at a time, and may allow for multiple copies without re-rasterizing on a page basis. In high end solutions, the ability to rasterize complete documents, hold them in memory, and "replay" them for multiple copies is mandatory.

Combined with sophisticated processing options, such as the ability to rasterize and store results, the raster image processing of a system must be able to accommodate a wide variety of input formats, such as Adobe PostScript and PDF, HP-PCL and TIFF. For legacy printing solutions, the ability to handle data transformations of IBM AFP/IPDS and Xerox LCDS/Metacode formats is a requirement in data centric applications.

Job Interruptions

Busy shops frequently need to reprioritize their work, based on client demands and issues related to inventory and bindery capacity. The process of job interruption, allowing operations staff to intervene within a job, override job settings and restart jobs can save or cost shops significant amounts of time and productivity.

Paper Handling

Brochures often cover the specifications of a given printing system, but what they fail to describe is the reliability that each specification implies. Lighter weight paper stocks, heavier paper stocks, and frequent paper supply changes can slow legacy solutions down well below their rated speeds, especially when frequency of jams are taken into account.

As a totally digital design, the Heidelberg Digimaster was optimized for paper pulls, and the digital paper path allowed a very short, simple method of imaging front and back sides. This resulted in benchmarking tests that would allow a 110 ppm device to exceed the throughput of devices rated at 180 ppm for some common print applications.

Image Quality

As electrophotographic devices become better in terms of imaging quality, the ability to replace offset devices becomes technically possible. However, image consistency, peak image quality, and density range are important components that need to be addressed to truly allow migration of many print jobs from offset.

The Digimaster solution needed to account for peak as well as consistent image quality, and customers required the ability to match the image quality of the Digimaster with their legacy print solutions. Tonal curve and aim point control allowed for maximum flexibility for sophisticated users.

Job Finishing

Often overlooked when considering workflow, inline and offline finishing hold the key to productivity. Many legacy solutions leveraged analog finishing devices, which quickly slowed productivity by forcing jobs to rasterize completely before printing. For multiple copies, this may not be a major issue, but for print on demand sets of one, or variable print applications, this becomes a major obstacle.

Flexibility of output options is required in a wide variety of customer jobs. Having productive devices tied inline, while allowing sophisticated offline solutions, maximizes customer solutions.

Summary

While no one solution can completely optimize all customer workflows, the ability to start from a solid base of customer requirements and not be tied to legacy hardware allows the maximum benefit to customers.

As customer needs change, the ability of the system to adapt itself will allow it a longer, more productive life in a wide array of printing applications.

Biography

Len Christopher is the Director of Market Planning for the Black & White Business Unit of NexPress Solutions. For the past five years, he has been involved in the customer requirements that helped define the Heidelberg Digimaster 9110. In past positions for Eastman Kodak, he held various technical and management roles in electronic publishing and printing system. Prior to Kodak, he worked at TRW in Redondo Beach, dealing with automation of printing processes. He graduated with President's Honors from California Polytechnic State University in San Luis Obispo with a bachelor's degree in Graphic Communications, with a dual concentration in Management and Packaging.