WHITE PAPER

HIGH-PERFORMANCE VARIABLE DATA PRINTING USING PDF

GLOBAL GRAPHICS® software

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2020

Introduction

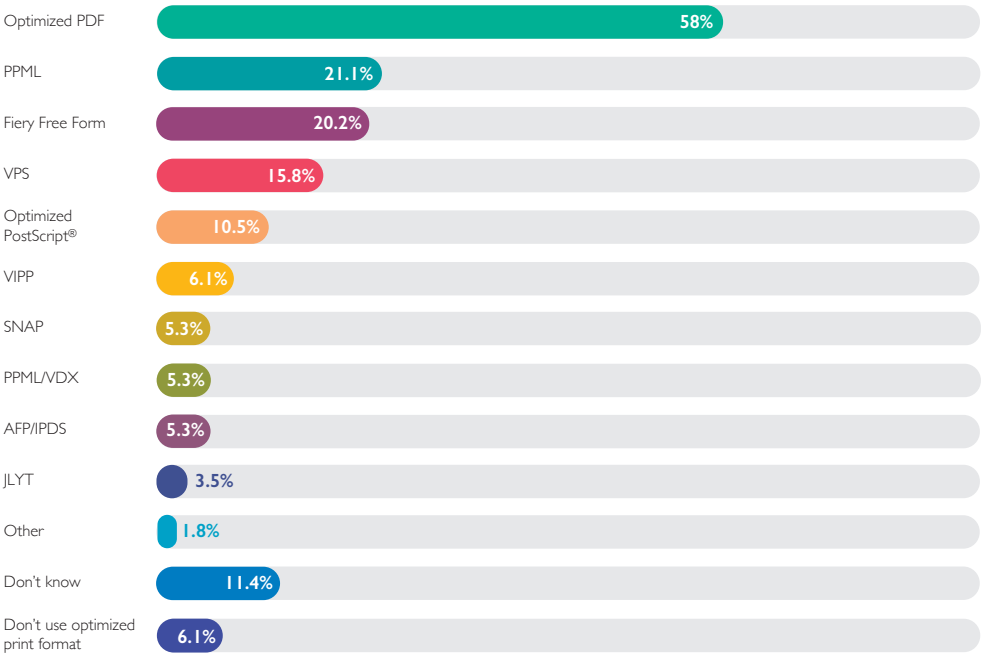
InfoTrends' End-User Workflow Survey, 2010 asked the question: "Please select the top two optimized print output formats used for variable data job production." The data that they collated clearly shows that the run-away winner at the top of the list was "Optimized PDF" with nearly 60%. In the years since the InfoTrends survey anecdotal evidence indicates more and more use of PDF rather than specialist formats for variable data printing

For years many variable data print (VDP) vendors had said that you can only achieve high throughput on press by using specialist VDP languages; the market appears to disagree.

This White Paper runs through a brief explanation of the traditional formats used for variable data printing before looking at how variable data is optimized in the Harlequin RIP®

Variable data is now printed at more print sites than ever before, driven by an overall growth in digital printing, and by a transfer from printing customer mail in the data center to workflows that are more closely related to the graphic arts.

Optimized print output language usage



End-User Workflow Survey, InfoTrends 2010.

FIG 1 – Users were asked to select the top two optimized print output formats used for variable data job production (Multiple responses permitted).

Digital production presses and variable data print have developed greatly over the last couple of decades. Presses are much faster than they were twenty years ago and often running at higher resolution. The computing power available for inclusion in a controller or digital front end (DFE) has also been increasing, while its cost has dropped. On balance it's now easier to render jobs fast enough to achieve full engine speed on a sheet-fed press than it used to be… as long as you print the simple VDP pages that were being processed back then. A third trend that's occurred at the same time is that the complexity of print jobs has risen, increasing the demands on processing power in the DFE again.

Presses are much faster than they were ten years ago, often running at higher resolution. Computing power has increased but print jobs are much more complex.

In parallel with that a new breed of ultra high speed ink-jet web press, printing at over 1000fpm (300m/min) has emerged. The Hewlett-Packard T300, T350 and T400 presses are examples of this class of press. Minimizing ROI on these requires that they be driven at or near full engine speed, for all of every shift, only stopping for scheduled maintenance.

Variable data in labels and packaging

Variable data printing has been a growth area in the graphic arts space, e.g. for direct mail, for many years, and this white paper therefore draws its examples from that established market. Digital printing is now expanding rapidly in the label space, and starting to spread into folding carton, flexibles and corrugated packaging. In those markets digital print tends to still be regarded primarily as just a more efficient way to print short runs, which is how it started in the graphic arts as well. Over time, however, printers began to take advantage of opportunities that only a digital press can achieve, and we anticipate that the same will happen for printers and converters in the labels and packaging sectors. We're already seeing evidence of that as people combine the printing of a label or package with the addition of serial or batch numbers, or of unique track-and-trace identifiers on each item.

At the time of writing, variable data printing in labels & packaging is a bit of a specialist niche market. But if you're just building a digital press you will definitely need to take into account how the market will change over the next few years. A significant increase in variable data printing is very likely to be part of that change.

Traditional VDP formats

A successful personalized marketing campaign needs the printed product to be novel, attractive and compelling enough to persuade the recipient to read it before discarding it. The tools used by designers for creating general and publication print have become richer and more complex over time; designers for VDP pieces, quite naturally, want to take advantage of those tools and to match the graphics used for advertising and collateral. This can lead to a tension between designers and the print production team over what features can be used while still achieving high enough performance in the DFE and on press to be commercially viable.

Vendors have always tried to build solutions that are capable of the most efficient processing possible using technology available at the time. Historically this lead to the creation of a variety of specialist VDP page description languages (PDLs). By using something like PPML it was possible to reduce the amount of processing that the DFE had to do in order to achieve a given final appearance. The tools that create the PPML stream do some of the work for the DFE in identifying which parts of each page are used many times, so the DFE only needs to render each of those shared page elements once. It then renders all of the elements that were not shared. Finally the shared and variable elements for each page are stitched together (often using hardware assistance) and the page is printed.

That model may enable the highest possible throughput in the DFE and the press for relatively simple jobs, but it carries a number of hidden costs:

a) There are many VDP-specific PDLs, some only supported by a single DFE vendor. A print site running presses from multiple suppliers may need to make files differently for each press, leading to higher costs for creation tools and training and a lack of flexibility in late decisions. Even nominally 'universal' VDP PDLs like PPML suffer because it's often implemented differently by each vendor.

b) Several proprietary VDP PDLs include assumptions that all DFEs that will process them include specialist hardware designed to aggregate rasters post RIP. This makes it difficult to scale the use of exactly the same VDP PDL over a whole range of digital presses from light production to high volume, again meaning that different PDLs are required for different printers and presses.

Harlequin VariData ensures that performance can be maximised for VDP jobs created today and into the future.

c) Most VDP-specific PDLs were designed by a vendor who supplies a creation tool or a digital press with its associated DFE, so other aspects of the VDP production process are often not well

served by the design; there's more to workflow than making a VDP data stream in one place and printing it through a DFE and press at another, including viewing, proofing, preflight etc.

d) When most of the VDP-specific PDLs were first specified it was possible to use them to create pages as rich as those used in commercial and publication print at the time. Since then the use of live transparency in PDF has become commonplace. PPML has now been updated to v3.0 to address this, but most of the proprietary VDP PDLs have not and PPML 3.0 has not been widely implemented. It's also remained true to its roots in constraining users to the graphical effects that can be processed most efficiently in today's DFEs. Formats such as optimized PDF now deliver higher performance without those limitations.

e) Almost all long VDP jobs are created using specialist tools. But shorter VDP jobs created in-house by companies who have less frequent needs are often made with tools that were not designed to make VDP-specific PDLs. The PSP or CRD still needs to receive the documents to be printed in a stable, reliable format.

It's not all that surprising that a lot of companies creating VDP jobs, and print companies who print them have elected to use PDF instead of something more specialized for the task. The ability to explain to all customers what they need to submit, to send the same file to (almost) all DFEs, to view the final file virtually anywhere, and to create files as rich as the customer demands all go at least some way to balancing out the potential for a drop in performance in the DFE.

VDP in Harlequin RIPs

Global Graphics Software is the creator of the Harlequin RIP, an important component in digital production DFEs. For the last decade we have worked to ensure that the highest possible performance can be achieved when using PDF for VDP. Harlequin VariData™ is the result of that work.

Harlequin VariData automatically analyzes a PDF file to identify those pages that use shared elements. It therefore takes advantage of optimized structures in PDF files made with specialist VDP creation tools, including those saved as PDF/VT (ISO 16612-2). At the same time it works almost as well for PDF files made by general tools that are not specialized for VDP.

Once a shared element has been identified it is only rendered once, while the variable data on each page is rendered separately. The benefits of the specialized VDP PDLs can therefore be achieved while using PDF.

Harlequin VariData can be used in two configurations:

- Pre-rendered re-used elements are stored in RAM within the RIP and combined with variable data for each page at rendering time. This produces a very significant performance gain, but is very easy to implement into a new DFE because all of the work is performed within the RIP and it does not require any technology from other parties.
- Rasters for re-used and variable data elements are delivered by the RIP with masks and metadata to allow caching technology supplied by the DFE vendor to manage them, and to aggregate them into whole-page rasters for printing outside of the RIP. This produces the highest possible performance.

The ability to configure the Harlequin VariData to work entirely within the RIP, or to export rendered elements for aggregation after the RIP, makes it a very scalable solution. It can be used in a wide variety of solutions at different price points, including allowing for field-upgrades by the addition of a hardware stitching board, for instance.

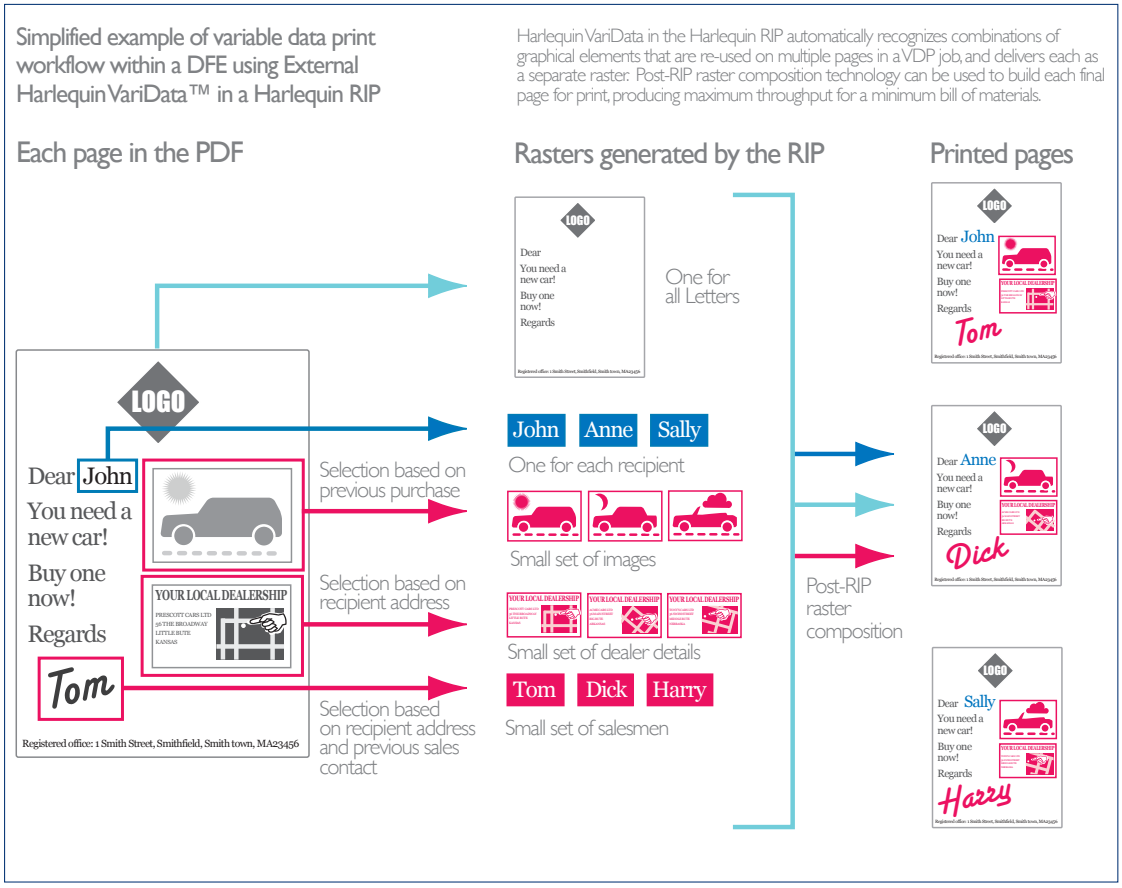


FIG 2 – variable data print diagram

Conclusion

Harlequin VariData addresses the key drawbacks of VDP-specific PDLs, while ensuring that performance can still be maximized for VDP jobs created today and into the future:

a) The same PDF data stream can be submitted to a wide variety of DFEs and presses.

b) Viewers, preflight tools and other components are widely available for PDF, enabling easy construction of complete workflows.

c) The creator and print company can jointly agree on the level of graphical richness that's appropriate for a specific job. The use of some options for live transparency in PDF may cause a job to run slower or require additional horsepower in the DFE, but selecting PDF does not impose artificial constraints.

d) Just about anyone, with any software, can create a PDF file that will work well with Harlequin VariData.

The InfoTrends figures show the dominance of optimized PDF in variable data printing, and Global Graphics believes that trend will grow into the future, especially as PDF/VT is adopted.

But those same figures also show that formats such as PPML still have a place in the VDP mix.

The Harlequin RIP's ability to process EPS, PDF, TIFF and JPEG within a single renderer, and with consistent color management makes it a perfect part of any solution addressing the GA subset of PPML, and, of course, it can also be used to process optimized PostScript.

Harlequin RIPs with both internal and external Harlequin VariData can be made available to qualified companies wishing to evaluate Global Graphics' solutions for inclusion in DFEs.

The use of PDF for variable data provides significant benefit in compatibility across multiple digital presses, widespread availability of proofing and approval solutions, ability to render the same complex graphics that a brand owner uses in other contexts, etc. But a poorly created PDF file can, unfortunately, still run more slowly through a digital press' DFE than a simpler format. To assist in countering that risk Global Graphics has produced a booklet called "Do PDF/VT Right™", which is available from http://www.globalgraphics.com/doPDFVTright.

About the author

Martin Bailey, CTO, Global Graphics Software

Martin Bailey works to analyze and understand current and future needs for workflows across many sectors of print. This enables him to guide Global Graphics' industry-leading printing technology. He represents Global Graphics on a number of industry bodies and standards committees including acting as the primary UK expert on the committees working on PDF, PDF/X and PDF/VT.

Martin has over 30 years of experience building, using, supporting and improving products for processing digital documents and the print industry in technical support, product management and programming as well as in consulting and production environments.

About Global Graphics Software

Global Graphics Software http://www.globalgraphics.com is a leading developer of platforms for digital printing, including the Harlequin RIP®, ScreenPro, Fundamentals and Mako. Customers include HP, Canon, Durst, Roland, Kodak and Agfa. The roots of the company go back to 1986 and to the iconic university town of Cambridge, and, today the majority of the R&D team is still based near here. Global Graphics Software is a subsidiary of Hybrid Software Group (Euronext: GLOG).

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