



HIGH-PERFORMANCE VARIABLE DATA PRINTING USING PDF

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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%.

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

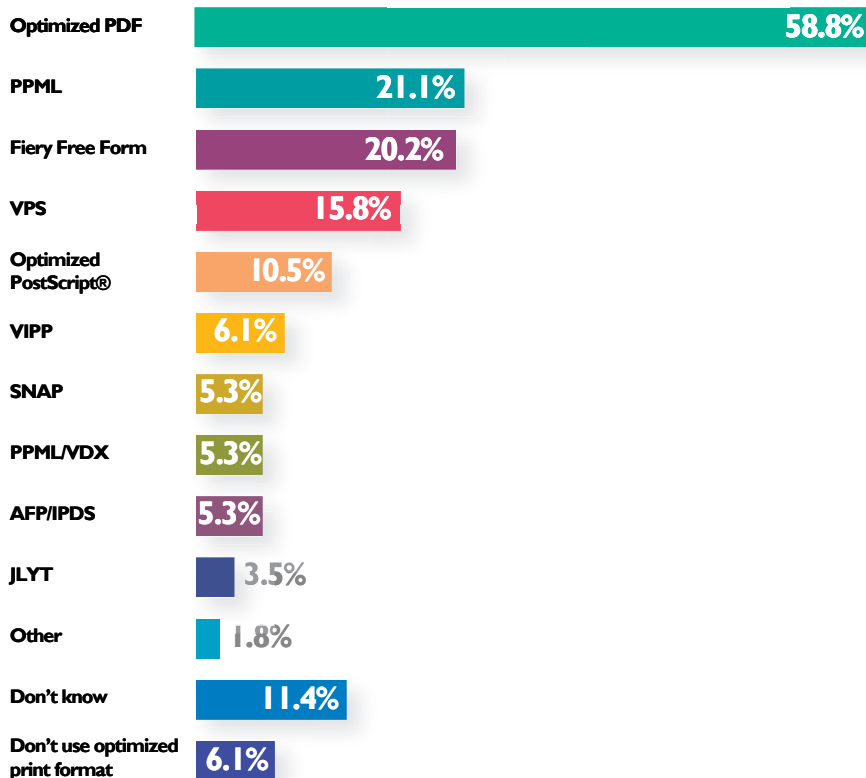
Variable data is now printed at more print sites than ever before, driven by an overall growth in digital printing, and by a transfer from printing customer mail in the data center to workflows that are more closely related to the graphic arts.

VDP optimizations in Harlequin RIPs provide world beating performance without losing workflow benefits such as viewing.

Optimized print output language usage

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

End-User Workflow Survey, InfoTrends 2010.



Digital production presses and variable data print have developed greatly over the last decade or so. Presses are much faster than they were ten 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.

In parallel with that a new breed of ultra high speed ink-jet web press, printing at over 500ft/min (150m/min) has emerged. The Hewlett-Packard T300, T350 and T400 presses are examples of this class of press. Achieving ROI on these requires that they be driven at or near full engine speed, for all of every shift, only stopping for scheduled maintenance.

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. 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, which 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.

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.

- 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. By drupa 2012 it's likely to be starting to be seen as overly restrictive as the next generations of DFEs for formats such as optimized PDF 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.


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


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 to 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

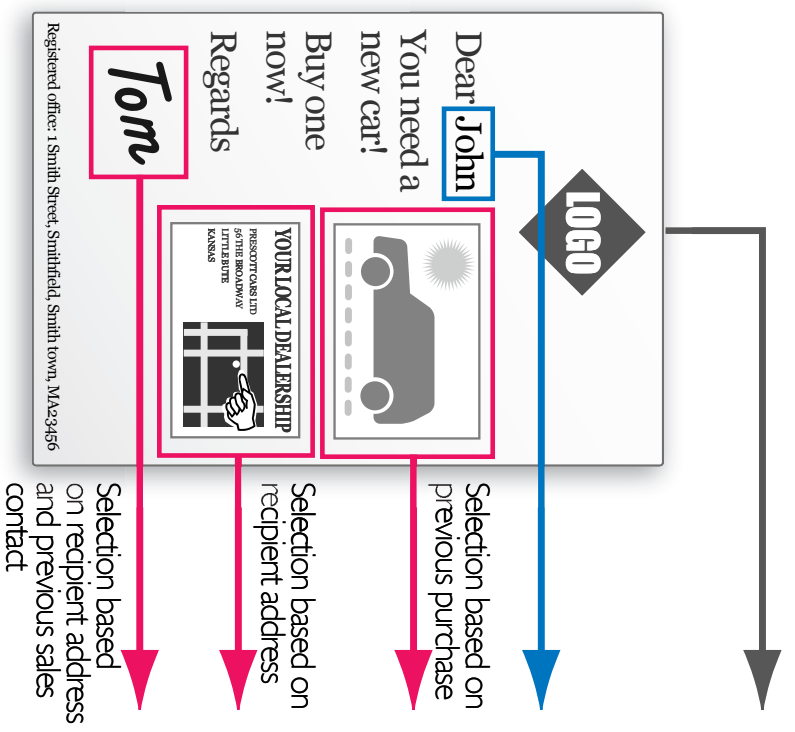
Global Graphics Software is the creator of the Harlequin RIP, an important component in digital production DFEs. In 2007 it set about ensuring that using PDF for VDP would achieve the highest possible performance. Harlequin VariData™ is an expanded and improved replacement for the PDF Retained Raster functionality, released in Global Graphics' Harlequin Server RIP® version 8.0, launched at drupa 2008.

Harlequin VariData automatically analyses 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.

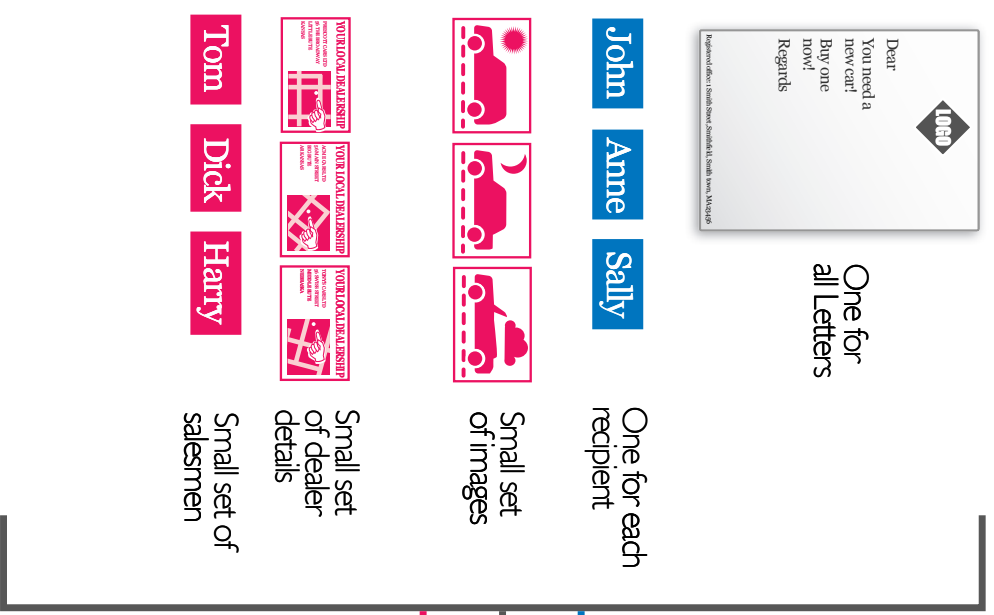
Simplified example of variable data print workflow within a DFE using External Harlequin VariData™ in a Harlequin RIP

Each page in the PDF

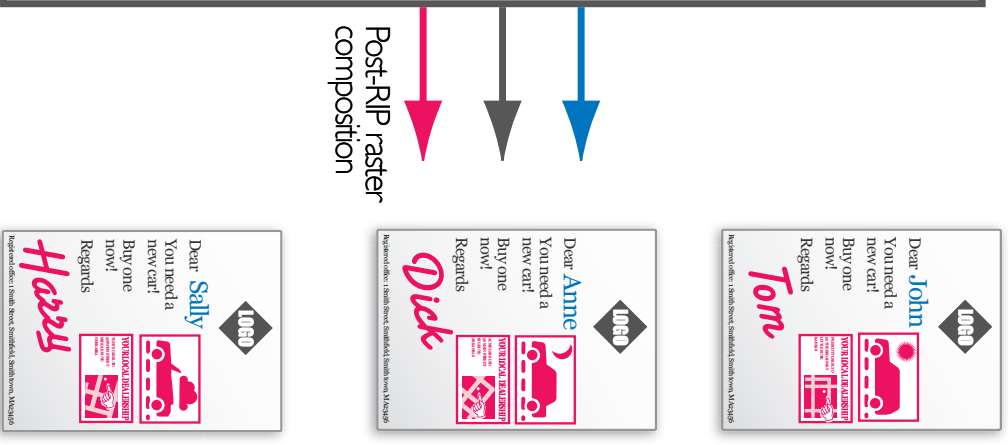


Harlequin VariData in the Harlequin RIP automatically recognizes combinations of graphical elements that are re-used on multiple pages. In a VDP job, and delivers each as a separate raster. Post-RIP raster composition technology can be used to build each final page for print, producing maximum throughput for a minimum bill of materials.

Rasters generated by the RIP



Printed pages



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.

Conclusion

Thus 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.



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