An Open System Architecture to Link Conventional and Digital Print Media Production Systems for Digital Production Printing

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Abstract

The Job Definition Format, JDF, allows integration of conventional and digital systems into a heterogeneous workflow environment. Initially, the properties and issues with current conventional and current digital workflows are described in the context of a JDF workflow:
- Properties of a "typical" conventional sheet-centric workflow.
- Properties of a "typical" digital document-centric workflow.

A comprehensive workflow that allows selection of digital, conventional or hybrid production equipment is analyzed. Both currently available solutions and ideas for the future will be presented. Issues that are investigated include:
- Description and analysis of branching points in the workflow, where digital, conventional or hybrid workflows are selected.
- Effects of form size variations
  - for impositioning
  - for printing
  - for finishing
  - for costing
- Aligning sheets, documents and finished products in a hybrid workflow.
- Color management in a hybrid environment
- Architectural implications of tightly coupled or loosely coupled digital and conventional production systems.
- Integration of Management Information Systems and Production Workflow Systems.

Introduction

The Print Shop of the future will have more diverse equipment for different production requirements. This means, that both conventional printing devices and digital printing devices will coexist in one location. To deal with these different devices is a challenge for the workflow as well as for the printer.

The Job Definition Format,[1] allows integration of conventional and digital systems into a heterogeneous workflow environment. Whereas conventional sheet-centric workflows will describe a job without knowledge of the actual content data other than metadata such as sheet size, page size, colorants on a page and number of pages, a digital workflow is typically document content driven. Prepress, press and even finishing steps are tightly coupled in a digital integrated device. On the other hand the typically smaller sheet sizes for digital printing makes imposition and finishing work much simpler in a digital printing environment.* Real world use cases that combine digital and analog workflows may either be used to produce one job completely digitally for a short initial run and completely conventionally for a later longer run or may combine both digital and conventionally produced parts of a job in a hybrid workflow and product.

Current Workflow

Typical workflow configurations as described by the CIP4 ICS (Interoperability Conformance Specifications) define a restriction of JDF that is content driven in the case of digital workflow[2] and sheet-oriented in the conventional workflow.[3] Note that in both cases the final output of the complete workflow will be a bound component. Intermediate products such as covers or printed sheets are also described in JDF as components. The partial components may be combined in various phases of the workflow. For instance, offset preprinted covers may be inserted into feeders of a digital press with inline finishing or a conventional saddle-stitcher may be fed with digitally printed inserts. Printing digitally on preprinted material can also be described. Since JDF printing and finishing processes may consume components and also produce components, the workflow description may be configured flexibly to match the production workflow of a given print shop.

Combining digitally and conventionally produced components that are not personalized or versioned is essentially equivalent to binding of conventionally produced material. No additional issues regarding the version variability of the printed material arise. As soon as one part of the workflow is versioned, the entire workflow system must be capable of supporting versions. This requires additional effort of behalf of the conventional systems, which are not typically designed to support versioned production.

Technology Limitations

The different technology limitations in digital and conventional workflows will require that some steps must be done individually for a job that is produced both in digital form for short run and in analog form for a long run.

The different substrate sizes that can economically be printed will lead to different impositioning of the pages and thus also different folding and further finishing requirements such as trimming.

The color gamut which the devices can cover is also an issue. If the digital devices are used to generate short runs that are as close as possible to the final conventional print output, they are essentially used as proofing devices and must therefore be limited to the gamut of the offset devices. On the other hand, spot colors are easy to print on conventional presses whereas many digital printers are limited to either CMYK or monochrome.

Workflow Requirements

One key requirement for workflow systems of the future is to enable flexible selection of digital and conventional workflows in a mixed environment according to the short term production requirements such as availability, short run, reprint, proof, first edition etc.

This includes the tasks of aligning the production views of digital and conventional devices, i.e. documents, sheets and finished or partial products. A system based on JDF can fulfill these requirements, since it has an open interface to the production devices and the flexibility to easily switch between different workflow options for the same content data. Digital devices are included as generic output devices that produce components that can be processed in an identical manner to conventional output.

References

* Wide format digital printing deals with large sheet sizes but is not generally used to create imposed forms of multiple pages.

1. "Job Definition Format (JDF), Version 1.2", published May 7, 2004 and "Errata", JDF Specification Release 1.2. Available at: http://www.cip4.org.

2. Integrated Digital Printing ICS, Version 1.0, published January 2005, available at http://www.cip4.org.

3. MIS to Conventional Printing - Sheet Fed ICS, Version 1.0, published January 2005, available at http://www.cip4.org.

Biography

Rainer Prosi is a high-energy particle physicist turned workflow architect working with Heidelberg since 1998 as a Senior Workflow Architect. He received his Ph.D. in physics from the University of Kiel, Germany in 1992. He worked at the particle physics laboratories CERN and DESY.

He has been involved with the Job Definition Format (JDF) project from its early phases in 1999 and is one of the primary authors of the JDF specification. He is currently working on a number of workflow and JDF related projects within Heidelberg. He is also the Chief Technical Officer of CIP4 where he is coordinating the technical development efforts related to JDF.