

Developments in JDF for Digital Printing⁺

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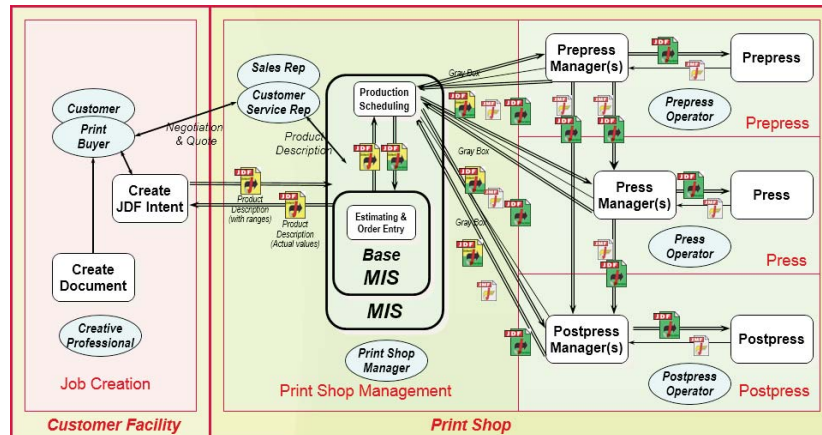
Abstract

Many vendors of systems that support JDF-enabled integration, and printers that have implemented JDF, are fixed on version 1.3. However, the growing prominence of digital printing in the marketplace, as well as developments in digital printing capabilities means that changes in JDF 1.4 and changes underway in the forthcoming JDF 1.5 are of critical importance to vendors and printers alike, and there are more challenges unique to digital printing that the CIP4 technical working groups are considering.

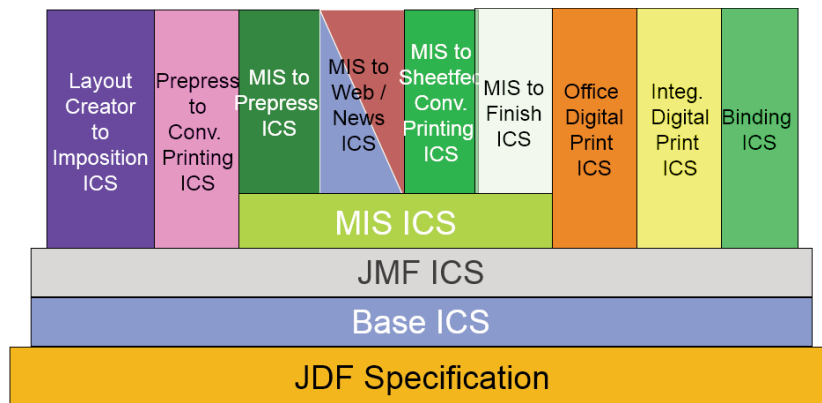
Overview of Where We are Today — The Job Definition Format (“JDF”) is an XML-based specification for the interchange of data in print production workflows that was introduced in 2000 and was first available in the marketplace around 2004. JDF has four major functions. First, it provides a common language for the life cycle of a production job; the concept being that data is captured at its entry point in the workflow, preserved throughout the workflow, and increasing detailed job data is added, until there is enough data available to set-up and drive production devices on the shop floor. Secondly, JDF provides a flexible method for describing any workflow. A series of production processes are defined in JDF, along with the parameters and materials (collectively the “resources”) that are required by each process. Processes can be grouped and organized however the workflow is designed, and in JDF a “JDF Node” is defined for each step of production. Once all the parameters and materials are ready for a JDF Node, it can then be automatically set to run. In this manner, like a series of dominoes, the workflow is automated, one JDF Node at a time (note parallel processing is also supported in JDF).

Thirdly, JDF provides a command and control language called the Job Messaging Format (“JMF”) that is used to enter jobs into a device’s queue, point to resources needed by the device, modify jobs in the queue, and allow devices to respond with job status, error messaging, data on completed jobs and so forth. Finally, the fourth function of JDF is to allow a device’s general or current capabilities to be reported to a managing system.

So in the conventional model of JDF-enabled automation (see above), JDF starts with customer intent data captured in the order estimating and estimated process (yellow JDF), and at the job is scheduled and produced, process data (green JDF) is made available to devices in prepress, press and postpress, and those systems to respond back with JMF, allowing the MIS to gather reporting information, used for invoicing, process improvement and customer reporting.



The JDF specification is like a giant cookbook; there are process, resource, messages, and methods of organizing automation that can support virtually any workflow. However, no single device can be expected to support everything that JDF support ... and in many ways, that wouldn't make sense. A palletizer doesn't need to know parameters for necessary to RIP a file.

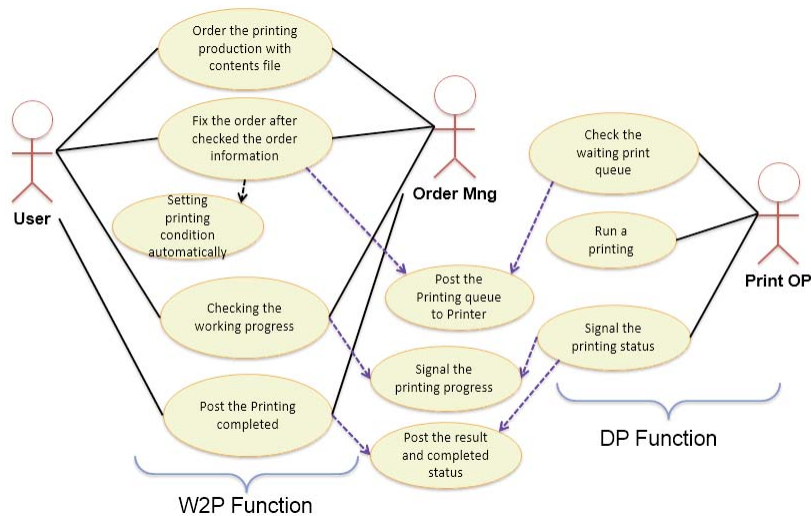


CIP4 has defined a set of “Interoperability Conformance Specifications” or ICS documents that more narrowly define what systems are expected to support and how they are expected to behave. In order to do so, each ICS document deals with a common interface, such as between an MIS system and finishing systems or between prepress and conventional printing. There are two current ICS document that define digital printing, one for office level digital printing and one for integrated digital printing systems .. complete inline systems as you would typically see used in transactional printing applications. Notably, commercial digital printing isn't yet covered in the ICS documents. I part that is because digital printing has been evolving and until recently, it wasn't practical to define digital printing: digital printing is unique.

Digital Printing: A different Kind of Animal — There are some aspects of digital printing that make automation of digital printing different than automation of commercial printing. If digital printing equipment is used to essentially produce ultra-short run printing jobs, then JDF could be applied to digital print automation going back to version 1.1a of the specification in 2002. However, many digital printing applications include storefronts that use predefined workflows for templated jobs in an online catalog. Digital printing may include personalized content and layout, and may even include matching custom components for individualized pieces. Many digital printing workflows include ganging of like jobs from multiple customers, and a variable imaged job may not be composed and laid out until it reaches the press or RIP. These differences create some interesting issues for automating digital printing...

- In a template based workflow, it is the client that initiates production: in some applications, other than paper handling and loading, once a job is ordered and enters production, there may not be any operator intervention.
- In a template based workflow, once an order is completed and enters production, the job data isn't "intent" as JDF uses it ... with ranges and loose definitions that are tightened up into process data later ... the job may automatically enter into production.
- In variable digital printing there is no waste, or make-ready waste... every impression is unique and deliverable.
- In variable digital printing errors may require other components in production that are matched be held and requires that a portion of the job be recreated or held in memory, depending on where and how final composition is prepared.
- Status reporting may not be to the "job" but to individual impressions and pieces.
- Likewise in postpress, where custom components must be matched, there are new issues in QA. Many systems employ barcodes, but there are multiple barcode types in use, and different workflows where barcode may be on a separation sheet or in a trim area.

Furthermore, jobs initiated by storefront web-to-print systems may include both financial and job data, and may involve order approval from a customer manager (see above). Messaging may include status of work in progress as well as completion and delivery status delivered.



The Status of JDF in Digital Printing — There is a lot that can be done today to automate digital printing with JDF-enabled systems. According to a 2011 study by Printing Industries of America, at the time 42.9% of printers had employeeed some level of automation, be it from simple system pairs to entire plants and a majority of those printer were planning on expanding their workflow automation.

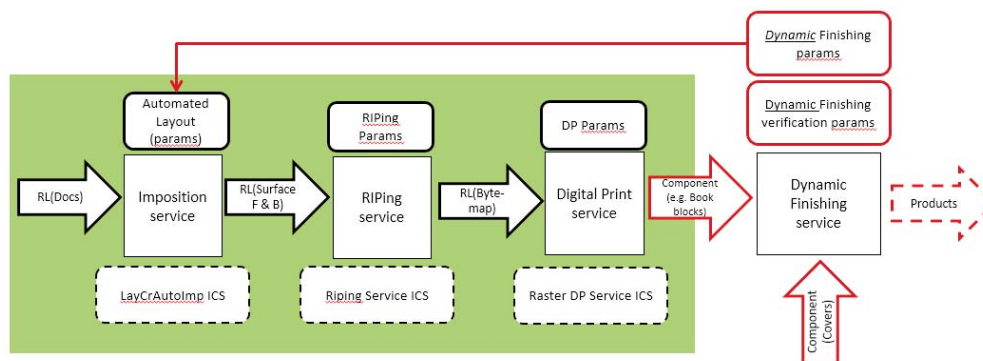
Naturally, printers are not automating just their conventional printing workflows and we've seen many examples of JDF-enabled automation applied to digital printing. CIP4 has been collecting very detailed case studies since 2006 through its CIP4 International Print Production Innovation (CIPPI) awards program and these case studies, freely available to the public at www.cip4.org, offer some examples of digital print automation. There are numerous case studies of hybrid workflow automation projects, were conventional and digital print production share common MIS, scheduling, planning, prepress and postpress processes and automation. There are several CIPPI case studies that are specific to only digital printing. The author suggests the Canon Marketing case study, where a photobook production operation is full automated, including postpress and the emphasis in the case study is on achieving competative advantage against select competitors. Another notable case study is from Associates Internation, which runs a third shift of digital press operations with *no staff on site* ... literally, a lights-out digital print automation case study.

As mentioned, early JDF can be used to automate digital printing it is being used to do short-run production. However, there are important developments in JDF 1.4, forth coming in JDF 1.5, and in consideration by presently by CIP4. JDF 1.4 introduced several improvemens that are important for s

- Content creation was improved to include iterative processing over multiple cycles, which is important for digital printing applications, such as processing PDF/VT files. Modification also allows for approximate positioning of element, which is necessary for variable layout applications.

- Anchor elements in JDF allow for relative positioning of elements to a parent element. So for instance, if multiple variable jobs are imposed to a sheet, elements such as images can be organized to be placed relative to the job or impression to which they belong, rather than an absolute position on the sheet.
- Layout creation was expanded to support automated layout and layout for variable data
- Dynamic marks are supported that allow printer marks to be automatically sized, rotated and placed.
- Parameters (resources) for a process can be retained and the product ID replaced ... this means that parameters for a variable job do not need to be communicated with each unique impression, but can be carried forward.
- JDF 1.4 also added “reliable signals” for JMF. Prior to JDF 1.4, if a message was sent to a device, it was on a fire-and-forget basis. If there is an error or a network failure, work could be lost. If you are running a couple of dozen jobs a day, this may not be a significant issue, but in digital printing, where jobs are ultra-short run or even single impressions, this can be problematic. JDF 1.4 systems can subscribe to reliable signals, which means that the sender does not consider a message delivered until it is acknowledged by the receiving device and may be periodically resent automatically until acknowledged.

JDF 1.5 will be release in the Fall of 2013, most likely at Print 2013. Some of the new features in development include supporting the ganging of multiple jobs from multiple customers ... a common practice in digital printing of products such as buisness cards, photos, postcards, and so on. There are also features for supporting roll-to-roll digital print production and finishing, new digital finishing features, and support for wide format digital printing applications. Inconjunction with JDF 1.5, work is underway on a parrallel PrintTalk 1.5 and the release of new ICS documents for wide format digital printing and automated layout creation and imposition.



— Interoperability points to be resolved

There is still more work to be done. CIP4's Digital Printing Workflow Working Group has modeled ICS documents of digital printing applications such as the forthcoming automated layout creation and imposition ICS, as well as for ripping services and raster digital printing services (see above). However, we still need to model dynamic finishing. Dynamic finishing includes the use of barcodes, and because of the QA and error handling issues discussed above, requires nearly real-time messaging between the finishing system and either the press or the production management system (depending on whether finishing is in-line or near-line). Furthermore, there are multi-function finishing systems on the market tailored to digital printing that need to be considered. There is also a market desire for simplifying the integration of storefront systems with production systems. Longer-term issues to study may include dealing with job originating for mobile smart devices and dealing with remote users/cloud applications.

Conclusion — JDF provides a foundation for print automation and early JDF supports some digital printing applications. However, personalized and variable printing provide some unique issues and challenges, some of which are addressed in JDF 1.4 and JDF 1.5. There is still a need for CIP4 to continue its work in developing JDF in light of new digital printing technologies and workflows beyond JDF 1.5.

Vendors of systems and software for digital printing applications are encouraged to get involved in CIP4 technical working groups, to provide their ideas, perspective, and input. Some of the CIP4 technical working groups that they should consider joining and participating in, which are doing this work, include:

- Digital Print Workflow Working Group
- Finishing Working Group
- Wide Format Working Group
- Content Description Working Group — which is responsible for the PrintTalk specification
- J-Digital Discussion Group — A non-technical group within CIP4 for executives and managers that identifies and defines areas of needed development.
- Japan Technical Working Group — A special working group that operates in Japanese and covers topics that span other CIP4 technical working groups, and which includes many Japanese vendors of digital printing systems and software.

Printers are also welcome to join and get involved, as all of the vendors value and respect printer input. In North America, users that want to stay abreast of developments in JDF-enabled digital print automation and also be able to contribute input to CIP4 developments should also get involved in the Automated Solutions Network, a user group managed by Printing Industries of America (see www.printing.org/automation/.)