The Job Definition Format and E-Commerce

Christian Anschuetz
Heidelberger Druckmaschinen AG
Heidelberg, Germany

Abstract

JDF is a new graphic arts industry standard for end to end job ticket specification and is designed to streamline information exchange between different applications and systems. The motivation for JDF, its scope and the most important features beyond the subsequently discussed e-commerce capabilities will be introduced. The e-commerce-relevant features of JDF will be explained in detail. Such features aim to help printers in making their production processes more automated, more transparent and to benefit from new e-commerce technologies. In close cooperation with the PrintTalk consortium, the business information structure and intent resources have been specially designed to support e-commerce-related workflows. As the international standards body, CIP4 is in charge of the ongoing development of JDF. A team has been put together to define additional e-commerce-relevant features of JDF. Various e-commerce business models will be explained and rated.

Introduction

During the Seybold Conference in Boston in spring of 2000 the four companies Adobe, Agfa, MAN Roland and Heidelberger Druckmaschinen AG made a joint announcement that they were to develop the Job Definition Format (JDF) for the graphic arts industry. The goal was to create a new, open standard for the integration of all computer-aided business and production processes. The first draft of the specification and further information was published just in time for DRUPA at the website "www.job-definition-format. org". JDF is not a product or application which users can purchase from their vendors, but rather a new data format which will form the basis for future workflow solutions. It remains in the hands of the vendors to develop such solutions and make future workflows more productive.

Printers generally face the following challenges in their daily business life:

- shorter run length of jobs
- more complex jobs.

A fully automated workflow is required to make today's processes more productive, flexible and transparent. This kind of workflow has to consider management information systems (MIS) as well as latest web technologies which allow a printer to get in touch with his customers via the Internet. We are actually talking about solutions for computer-integrated manufacturing (CIM) in the graphic arts industry. Solutions need a comprehensive, vendor-independent standard.
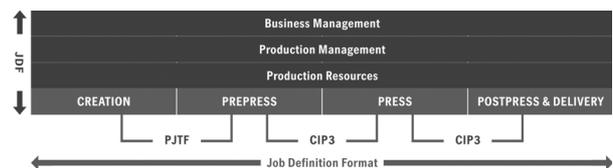

Figure 1. Scope of JDF

Overview JDF Features

JDF is highly flexible to be adjusted to all customer workflows. The reason for this is that JDF is encoded in XML, while also having an internal tree-like structure of top level elements (nodes) which we call products and processes respectively. JDF process elements define larger steps in the production chain which are performed by a device. Setup and execution considerations may be different states of the same process. Product elements are used to model the product which a print buyer may want to get from his printer. If we consider a book, for instance, it becomes clear that such a product usually consists of several components, each of which is part of a hierarchy.

The spawning and merging of partial jobs is one of the prominent features which are directly facilitated by the tree-like structure of the JDF top level elements. As a consequence printers can cooperate with partners in a fully automated way or they can distribute production to various different sites.

Like other data formats, JDF provides a good range of preset values, some of which will be entered into the front-end of an MIS or may already be generated on a web portal, where the user purchases his order directly. Such preset values will be used by subsequent process steps and devices like imposition software, printing presses or folding machines.

This principal advantage of JDF is inherent continuous production control by an MIS. Another is that JDF has a large number of dedicated data structures which hold all the information needed for planning and scheduling jobs. Planning systems will eventually be able to take advantage of the real-time job monitoring features of the JDF-inherent Job Messaging Format (JMF).

In order to be more productive it is most important for users to learn about the hidden opportunities of process optimization. JDF therefore supports job costing in a comprehensive and consistent way throughout the entire process chain.

All these features are absolutely mandatory for data formats that aim to be comprehensive from a workflow point of view. Yet even within the last few years new

business opportunities have emerged on the market which may be gathered together under the roof of e-commerce, while JDF also, of course, offers many features which may help to bridge not only the gap between technical resources and the management information systems of the printers but also between those management information systems and the world of e-commerce.

JDF E- Commerce Features

The range of JDF e-commerce features may be broken down into two groups:

The first group may be considered as a kind of direct support - features of JDF whose primarily aim is to integrate graphic arts production into the world-wide web:

- Dedicated Business Information structures
- Product Modeling
- Intent Resources

JDF also has additional features which will be of value for e-commerce systems and may also be useful for other situations as well:

- Process Modeling with Placeholder resources
- Scheduling of jobs
- Delivery of products
- Customer Information

In summer 2000 a new industry group called PrintTalk (www.PrintTalk.org) was founded. Many well-known e-commerce companies have joined this consortium. PrintTalk aims to support JDF in all aspects of the graphic arts production workflow. There are also additional requirements from a web portal's point of view, but which are not related to the processing of a job and cannot therefore be covered by JDF.

Therefore PrintTalk has defined a wrapping data format to cover all e-commerce-relevant issues that may not fit to the JDF philosophy of the process oriented workflow. It became clear fairly soon that there was a large potential for cooperation between PrintTalk and the authors of JDF. Consequently, many ideas have been adopted and integrated into the JDF specification. JDF also aims to keep its flexibility with respect to other e-commerce-related XML data formats that want to integrate with JDF.

This is the reason why JDF takes advantage of the XML namespace definition. XML namespaces allow nesting of different XML application formats in a very flexible way.

How JDF Refers to Business Information

It is normally assumed that any business information which may be used by a web portal, for instance, is defined in an XML envelope document which may contain JDF data as a subset.

"The PrintTalk implementation is based on widely adopted, openly available XML definition. The business objects that describe the commercial exchange of information between the e-commerce services and print management systems use the cXML standard for the envelope. The job specification is described using the new JDF standard. The job specification is encapsulated within the business object and, as the basis for the exchange of data, will be used to populate the print manager's estimation software."[1]

PrintTalk objects have two parts – a header and a request element, each of which is of a cXML design [2]. While the header contains information about the sender and the recipient, the request element contains the actual business information and - as a part of it - the job-related data in the Job Definition Format.

The following business objects are supported by the PrintTalk specification:

- Request for Quote
- Quote
- Request for Requote
- Requote
- Change Order RFQ
- Change Order Quote
- Change Order Acceptance
- Purchase Order
- Purchase Order Response
- Change Order Confirmation
- Order Status Request
- Order Status Update
- Invoice
- Content Push/Pull
- Report Request
- Report

Although in many cases business information is supposed to be an XML envelope from the JDF point of view, this may not be the case if the printer's management information system is not linked to an e-commerce system. In this case JDF will not be nested in the way previously described and may instead contain a PrintTalk or any other XML-based data set in the BusinessInfo substructure of the JDF root itself.
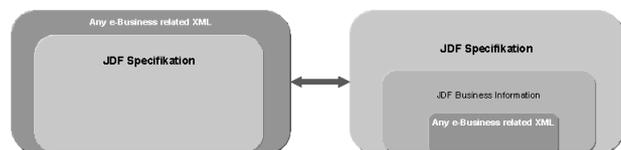

Figure 2. Inverse nesting of XML documents

The BusinessInfo element is an abstract substructure of the nodeinfo element of the JDF root node. In the case of PrintTalk it may contain the information in a non-normative way as described in the draft of the JDF specification. (3)

Product Modeling

JDF makes it possible to model almost every print product that a print buyer may request. To achieve this capability JDF takes advantage of its internal tree-like structure. One possible product which may be described in this way is a book which usually has a cover and contents pages.
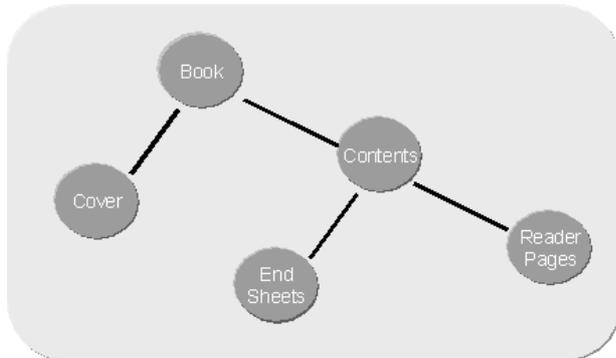

Figure 3. A book as a tree of JDF product nodes

Let us imagine a web portal, which may be operated by the printer himself or by any service provider, where a print buyer may choose such a book from a set of selectable products. Internally, the web application will create a tree of product nodes which first of all define the structure of the product.

Product nodes contain several attributes which are relevant for quoting jobs.

Intent Resources

This model of a product is, however, still rather abstract. It still does not contain a hint that the structure actually defines a book. Therefore JDF additionally provides "intent resources" which make the modeled tree more specific. In order to understand what intent resources are, we first have to define what resources are in general.

Since JDF process nodes merely define the steps required within the graphic arts production chain, we also need to know what these processes use, consume, waste or produce. Therefore every JDF node may contain a set of resource elements which provide this very information.

Resources may be considered as the link between two or more adjacent processes. Input resources may be needed by process nodes to be executable. They can be used, modified or consumed. Output resources define what a process is to produce.

Resources may be of a physical or logical type. A plate, for instance, is always a physical resource while a set of parameters or a referenced data file is of logical type. A printed sheet may simultaneously be both an output resource of a printing process (Fig. 3 Process 1) and the input resource of a folding or cutting process (Fig. 3 Process 2).
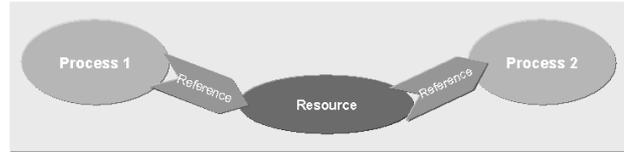

Figure 3. Resources link two or more processes

Resources have names and can be distinguished by their class. One of these classes is called "Intent". Intent resources define the details of products to be produced without having to define the processes involved. In other words, they narrow down the available options of a product.

The following intent resources are available in the JDF specification [5]:

- ProductionIntent resources specify the manufacturing intent and considerations for a JDF job, using information that identifies the desired result or specified manufacturing path.
- MediaIntent resources describe the media to be used for the considered product component.
- ArtDeliveryIntent resources specify the prepress art delivery intent for a JDF job and map the items to the appropriate reader pages and separations.
- ProofingIntent resources specify the prepress proofing intent for a JDF job.
- ColorIntent resource specify the type of ink to be used.
- SizeIntent resources record the size of the finished pages for the product component.
- FoldingIntent resources specify the fold intent of the respective finishing process.
- HoleMakingIntent resources specify the holemaking intent of the according finishing process.
- BindingIntent resources specify the binding intents for JDF jobs
- InsertingIntent resources specify the placing or inserting of components within another component, using information that identifies page location, position and attachment method.
- LaminatingIntent resources specify the laminating intent of the respective finishing process.
- PackingIntent resources specify the packaging intent for a JDF job, using information that identifies the type of package, the wrapping used, and the shape of the package.
- ShapeCuttingIntent resources specify form and line cutting for a job.
- DeliveryIntent resources summarize the options with respect to the delivery of products. JDF makes it possible to distinguish multiple components which may be delivered individually to different destinations.

Intent resources allow users to define ranges of values for various parameters ("Span elements"). Such ranges may spawn a set of requests for quotes, each of them referring to one of the respective values. The customer will eventually be able to specify his preferred value. On the other hand, if print buyers do not have a clear vision about the product in question, they prefer to remain vague in their description. JDF therefore also allows fuzzy product descriptions to be made by the customers. Ranges of values support this idea.

The PrintTalk specification provides extensive use of the JDF intent resources. The following example is taken directly from the PrintTalk Technical Briefing Paper [4] which may be downloaded from the web.

```
<JDF ID="Job1SpecJDF1.1" Type="Product">
    <Comment>Cover</Comment>
    <ResourcePool>
        <InkingIntent/>
        <MediaIntent/>
        <SizeIntent/>
        <ProofingIntent/>
        <LaminatingIntent/>
    </ResourcePool>
</JDF>
```

Placeholder Resources

Product nodes and intent resources allow print buyers to specify exactly what they want to get from their printer, without having to know how the product will be produced. But reversing the process also makes it possible to define a certain method of production without having to know what resources are to be defined for input and output. Placeholder resources are a more formal class and help to define process ordering when the exact nature of interchange resources is still unknown.

If, for example, a print buyer wants to have his product printed on a digital printing press rather than a conventional sheet-fed offset press, he may be allowed to specify this option in a dialog of the web portal.

Scheduling of Jobs

Every process node uses its nodeinfo element to hold job scheduling information with respect to the step in question. Nodeinfo elements are generic parts of all JDF nodes and contain specific information about a job. If the printer has a production planning system, it usually assigns start and end times to every process. A JDF compliant device at the back end may set up an activity schedule to execute the dedicated processes in a specified order on a machine.

Customer and Delivery Information

As soon as a print buyer starts his communication with a printer via a web portal he has to enter all kinds of information about himself in the forms provided. JDF is also able to hold customer information and make it available throughout the whole life cycle of a job. The operator of a folding device, for instance, will basically have the same customer information as the employees of the prepress department. This means that there can be a consistent set of customer-relevant information available for every job processed.

Once the product has been produced it needs to be delivered to the customer or to any other address the customer may have specified. JDF is able to hold all the necessary information about the delivery process. This includes not only the possibility to distinguish different subsets or components of a product, each of which may have a different delivery address, but also to specify the deadline and the method of delivery, such as "ExpressMail" or "InterofficeMail". Eventually JDF will be able to tell the printer whether or not a product is to be picked up by the customer rather than be delivered to a certain address.

The Future of JDF

From the outset, the intention of the four companies drafting the first version of JDF was to make JDF an open standard for the graphic arts industry. Therefore they agreed to transfer JDF-related intellectual property rights to the CIP4 consortium (www.cip4.org) as a vendor-independent standards body.

CIP4 is an international organization which is registered in Switzerland. Both vendors and users are invited to join this organization and to work on future extensions of the JDF specification. For this purpose several working groups have been established, each of which focuses on specific issues of a JDF-based workflow. One of these working groups is in charge of defining e-commerce-related extensions to JDF.

E-Commerce Business Opportunities

The following introduces a couple of e-commerce-related business models which may be of interest for the graphic arts industry.

Marketplaces are basically web-based services which aim to bring together both print buyers and printers. Printers may offer their services to a large community of print buyers, while print buyers can easily choose the cheapest offer. This introduces a high level of competition for printers who are also generally the ones charged by the service provider for every order.

Another kind of web-based service aims at selling print jobs by auction. This kind of business model helps the print buyers to purchase an order at its best, but it also increases the competition for the printers to a maximum. In most cases the printers are charged for every order.
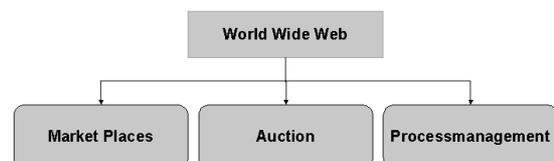

Figure 4. e-commerce-related business models

In order to manage processes properly printers may eventually either run their own website to get orders from their customers, or make use of the

application services of providers (ASP), who offer customized websites to their clients. Heidelberg will only support those products and services which help its customers to be more competitive. JDF-based application services provided by Heidelberg seem to be an appropriate option to follow that way. The question as to whether e-business is capable of making printers successful has to be answered with a definitive "yes". Heidelberg wants to enable printers to exploit the new technologies and create value for the print media, e.g. speed up production using internet tools.

This leads to the next step, where e-business modules are required. Such modules have to cover all processes between quoting and production. Products have to provide modular services which are easy to handle and which will speed up processes rather than slow them down due to their complexity.

Therefore Heidelberg is considering to offer internet-based solutions for all process steps from online-applications for the RFQ and ordering process up to production supporting web-applications to the printers.

This could include for example "transaction services" like a standardized job-specification via templates, an integrated price calculation or an automated proposal generator to save time and money during this process steps.

Several "production services" like online soft-proofing or online preflight-checking could also be possible. With the help of such tools printers can offer their customer a real value add and improve their customer relationships.

eServices for printers should also include "collaboration services" that simplify multi-lateral projects between printers, print-buyers, creatives and agencies and reduce work for repeat orders by providing an eCatalog or for example online-remote-storage.

All Heidelberg e-services will be based on JDF and the PrintTalk specification and integrate with the Heidelberg software portfolio, e.g. with Prinance.

Conclusion

JDF has grown to a vendor-independent standard for all computer-aided processes of graphic arts production. Computer integrated manufacturing (CIM) seems to be rapidly becoming reality in our industry. Alongside the many features which will help to automate future workflows and bridge the gap between management information systems and the production resources, the e-commerce-relevant capabilities of JDF are also set to gain in importance.

References

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Biography

Christian Anschuetz received his degree in Physics from the Johann-Wolfgang-Goethe-University at Frankfurt/M in 1982. Following several years in the automobile industry he has been with Heidelberger Druckmaschinen AG since 1986. He has worked in various positions, starting as a software development engineer, proceeding as a consultant and project manager for the Linotype-Hell sales unit and most recently as a product manager for workflow-relevant software components and JDF. He has been a member of the CIP4 Advisory Board since 2000.