

The Ultimate
**Guide to
Connectivity**
in the printing industry



Introduction

Following successful publication of our previous downloadable JDF Guides, we thought it was time for an update. Deliberately we now seek to broaden the context of the Guide to include the term “Connectivity”.

Whilst JDF standardised automation for the Graphic Arts Industry continues to gain momentum and remains a key consideration for many Print Companies; increasingly Optimus have recognised that significant new trends have emerged when an investment in bespoke automation is being sought.

As a major Management Information Systems provider to the Printing Industry, Optimus has primarily always recognised the importance of JDF to its customers and the wider market. Group Optimus Director, Henny van Esch, has been instrumental in the evolution of JDF Connectivity standards as C.E.O. of the CIP4 MIS working group – a position Henny has held for many years. This means that Optimus is not only involved in ensuring the incorporation of required functionality within Optimus to generate correctly formatted JDF output; but continues help steer the direction of its implementation in co-operation with other vendors.

But when unique solutions, and different technology platforms to connect workflows had to be delivered outside of the defined JDF standard; new ways of thinking have directly evolved to progressively meet those challenges. We are proud to say, as with JDF, Optimus have also been at the heart of delivering sustainable and reliable alternate “Connectivity” solutions for our global customer base.

Therefore, in this booklet we therefore aim to do three things:

1. As the CIP4 organisation continues to positively influence the progression of JDF as an industry standard technology, we thought it useful to also include some background history and context on their origins and their ultimate mission moving forwards.
2. Continue with the same guiding principles of previous published guides, of providing a no-nonsense easy to understand guide as to exactly what JDF is; we also reference what the gains and potential considerations for the end user could be.
3. Finally provide clear explanation of the six different types of technology that are now regularly being used by Optimus customers and why, in order to connect “Non JDF” workflows; hence our broader heading of “Connectivity”.

As with previous guides, the following is deliberately not a technical manual, but it should at least answer many of the questions surrounding the subject.

We look forward to hearing your feedback on this updated guide.



Nicola Bisset
Optimus Group Managing Director

What does the CIP 4 organisation do and how does it influence published JDF standards?

To explain this fully, it is worth briefly outlining how CIP4 came into being. Its history can be traced back to Drupa 1995, when Heidelberg in co-operation with German organisation Fraunhofer Institute for Computer Graphics, launched the Print Production Format (PPF). This was an attempt to standardise digital communication of job metadata between different pieces of production equipment. For this to be developed independently, several companies got together to take the concept further, they operated under the name CIP3 – International co-operation for integration in Pre-press, Press and Post Press.

The PPF format was production focussed. It looked at how digital data could be used to set pre-press and press equipment to be ready for the following job, this utilised proprietary communication languages.

The next major development occurred early in 2000, when Adobe, Agfa, Heidelberg and Man Roland announced they would be working together to create an XML-based job ticket called Job Definition Format or 'JDF', with the idea that business and management information would be incorporated with production details. Later

that year the project was handed over to the CIP3 members under the condition that they re-form as an open and not-for-profit association which, with the addition of 'Processes' became the CIP4 organisation.

Today, the mission of the CIP4 organisation is to primarily foster the adoption of process automation in the printing industry. CIP4 are the organisation that is responsible for setting the published JDF industry standards. A global organisation with representatives from 26 countries; CIP4's membership boasts a diverse membership that includes: Printers, pre-press companies, publishers, vendors of graphic arts systems and software, integrators, distributors, consultants, and educators.

CIP4 organise inter-operability testing bi-annually. The meetings are held in different locations around the world and members attend to test their latest software with other members. This ensures that the CIP4 organisation members continue to develop their products with the intention of linking through JDF to other member offerings.

What is JDF?

JDF is recognised as the industry standard for describing print jobs electronically.

JDF, which stands for Job Definition Format, is a comprehensive XML- based message format designed to enable the exchange of information between different software applications used in job production workflows within the graphic arts industry.

A JDF file contains the management and production details of a job, and in a true JDF environment would seamlessly adjust the setting of each piece of equipment. In turn the MIS system can receive real-time production information back from the equipment through JMF – Job Messaging Format.

Therefore, it is possible to achieve a two-way communication between the software applications managing and controlling the equipment and your MIS system, feeding back real-time production information.

Indeed, it has also been widely recognised that an MIS system plays a key role in the JDF workflow, acting as the 'glue' between each piece of equipment, sending and receiving to multiple applications/equipment and multiple vendors.

When we think of a digital workflow, we normally consider pre-press. However, a JDF workflow would encompass all aspects of production from pre-press to finishing with each stage being fed back to the MIS system. Management should have the ability to not just reduce costs by improving automation, but also ensure that the whole operation is as cost efficient as possible.

How will JDF benefit my business?

Even if you are not using JDF within your business today; we suggest you should potentially be asking about it, enquiring what your suppliers are doing with regards to it, and planning it into your future strategy.

Many suppliers have been developing their systems to ensure they are JDF compliant for the last few years. This trend, (and certainly since the Covid pandemic), has been driven by the significant increase in online ordering, which in turn has further increased demand for shorter print runs.

To meet this demand, JDF and other connected workflows have had to continually evolve. In the early days it was mainly pre-press workflow vendors that were the first to implement JDF projects along with good MIS suppliers, this has widened over the years to include press and post-press operation vendors.

The benefits of a true JDF workflow are at a headline level easy to summarise, that being "greater efficiency through automation". Of course, depending on what you manufacture and how, some of the process related benefits will vary.

But as just one example, taking traditional Offset Lithographic production into account; it's easy to correlate and prove that less wastage in the areas of: Make readies, ink usage and time, are proven benefits that are available today.

The level of automation spreads much further than machinery settings. The information for the digital job ticket comes from the details held in the original estimate. This is held within the MIS system, thereby ensuring that key data is only ever input once. The digital job ticket would in effect, automatically control each item of equipment as it was used to produce the work and feed back into the MIS system. All key data, time taken, and materials used would be captured, whilst also showing the status of the job.

THE FOLLOWING ARE JUST SOME OF THE PRODUCTION BENEFITS OF A JDF DRIVEN WORKFLOW TO THE PRINTER.

- Reduce the potential for errors
- Real-time management information
- Greater automation of the production process
- Faster turnaround of work
- Ability to act quickly to production problems
- Reduce administration and re-keying of information
- Reduce delays by greater control of production
- Easier system integration for smaller companies

In addition to making individual jobs more cost effective to produce, a JDF workflow gives management the opportunity to run their business far more profitably. Jobs that generate the most money can be easily identified as will those that make the least, or worse still, a loss.

Although JDF technology needs careful planning, together with willing suppliers who have proven good relationships with other suppliers, over the years many printers have increased their bottom line through harnessing the power of JDF automation.

THE FOLLOWING ARE A SAMPLE OF SOME OF THE DIRECT FINANCIAL BENEFITS THAT CAN ALSO BE ATTRIBUTED TO JDF.

- Reduce wastage and costs
- Optimise production equipment
- Handle more jobs with fewer staff
- Take out real costs from production
- Reduce turnaround time of jobs
- Identify most profitable work

What preparations do I need to take before investing in JDF technology?

Like any investment, good research can help to avoid potential pitfalls. Therefore, we would respectfully suggest that the very first thing to agree upon is, exactly what you do now, and what you want to achieve in the future? A good start to this is to prepare a flow chart of the administrative steps and the departmental staff involvement for each job. Once completed, involve your chosen partners in the review process – this should include your MIS provider and the equipment suppliers you wish to see within the JDF workflow.

A key consideration to highlight, is that JDF is not 'plug and play' technology. This in our experience means that although the benefits are enormous, with standardisation comes the potential to lose some flexibility when automating your new production workflow. At Optimus we believe the key to delivering a first class JDF workflow, is to provide accurate and complete information at the very start of the process. This means the first procedure to look at in your business, is how the job arrives in your MIS system? The JDF message

is normally generated from an estimate within the MIS system which is turned into a job. Therefore, if you do not prepare estimates for your work or have many changes to a job once it has been booked in, chances are you will not be able to achieve an automated JDF workflow.

Equally roles may need to change within the business. Whereas traditionally Production picked up the job as it was booked in from an estimate, the lines will become blurred as the estimate itself becomes the 'bible' of the JDF workflow, therefore production and estimating may need a far greater cross-over in their roles.

Involve staff from all departments. Although management may have a vision of an automated JDF workflow, staff may not be able to understand the vision and could perceive the strategy as a threat to them. Without buy in from staff, any changes that may be necessary to your processes and procedures may be hindered by lack of cooperation internally.

To ensure the project does not become fragmented with different suppliers providing their solution in isolation, successful best practice suggests that the appointment of a project leader who understands the overall technology structure can also really help to cohesively deliver the desired project outcomes.

Produce a check list of activities along with a schedule of who does what and when – your MIS supplier should be able to help you draw up the list. The important thing to establish is this project needs both you and your suppliers working closely together to achieve one common goal – it is a partnership!

Ensure that your chosen suppliers are fully JDF compliant, but a word of caution – the specification for the JDF standard is extensive with some areas being open to interpretation. This is why we say that JDF is not 'plug and play'. However, a good measure for you is if a supplier is actively involved in the CIP4 inter-operability tests (carried out bi-annually), chances are, they will have working links to other suppliers or the ability to develop the links.

Why is MIS so important?

As previously indicated, a good MIS system is at the heart of a successful JDF environment. Many of the features available via JDF and other forms of connectivity are already in use by printers operating leading MIS systems. These features include Digital job bags, job profitability analysis and time collection. The concept of using the details from the estimate to control subsequent processes and the use of E commerce between the printer and his customer, are also present in most good MIS systems.

The role of the MIS system is to provide two-way communication with all equipment in the factory, from pre-press to finishing using the JDF job ticket created within the MIS. This in combination with JMF messages coming back from the equipment to the MIS system completes the two-way flow.

Optimus has been involved in the JDF process from the very beginning, ensuring that the Optimus MIS system remains fully JDF compliant. Optimus has built successful relationships with many of the key suppliers to the printing industry and is happy to assist customers with their proposed JDF projects, with a level of knowledge and professionalism built on many years of experience within the JDF arena.

As indicated in our introduction though, MIS and certainly an Optimus MIS can handle not just JDF connectivity but other forms of interaction and integration as well. This all practically combines in a modern-day Print environment in the quest to deliver automation; the finer points of these alternative ways of connecting outside of JDF, we will go on to explore further in the guide.

Therefore, in practical terms, talk to your chosen MIS partner about how the links forged between different technologies and pieces of software will be managed and maintained day to day. Version control between different systems is always key, how do they approach testing and support the safe rollout of a combined upgrade? For these reasons, the respective partnership credentials and the true strength of those vendors technical and commercial relationships is worth exploring in detail. Proven longevity of partnerships and case studies that are in the public domain, we feel point the way as to who might be best placed to deliver a stable and sustainable workflow.

So now it's fair to say, look much closer at the overall "Connectivity" capability of your MIS provider, it's important they explain and prove how they can integrate and connect other types of workflows and what technologies and methods that they use that sometimes sit outside the JDF standard. A flexible approach to both is something we would now deem as essential!

Connectivity, other ways I can now connect software applications outside of JDF technology

Providing the right context on this subject we feel is vitally important to position our extended references to “Connectivity” and what that might mean in the broadest sense.

As previously described the aspiration of creating the JDF industry standard was and still is a very noble aspiration which Optimus remain fully committed to. But we will now go on to explore six key distinct ways that Optimus as an MIS provider has regularly connected workflow systems outside of the JDF standard.

So firstly, let's briefly touch again on what JDF technology is:

Please note: This list is deliberately not meant to represent every single form of Connectivity that exists, it focuses on the most commonly used methods that we as a global MIS software provider are regularly used to working with.

JDF TECHNOLOGY – FURTHER EXPLANATION

At its heart, JDF (Job Definition Format) is a way of specifically describing a precisely agreed unified method of data exchange (as agreed by the CIP4 organisation). This provides the ability for packets of data to be sent and received between different software systems throughout the Print & Graphic Arts Industry with the aim of enabling cohesive workflows to automatically function. A by-product of this automation is normally more trusted real time data that can help to inform and guide any decision-making process.

JDF uses an underlying technology commonly called: XML which stands for (Extensible Markup Language). It was chosen by early adopters and creators of JDF, for its sheer breadth of capability

and global suitability to describe simple and complex data messaging formats, it is not unique to the Print Industry. This made it easier to bring together disparate technology platforms that needed to send and receive data between them within our community; and in this regard nothing has changed.

However, the creativity of people has always known no bounds. The aspiration to tackle a problem from different viewpoints and potentially create a commercial advantage, meant that many companies embraced the sheer scale and scope of what JDF could provide as a data messaging format; but then, chose their own unique configuration methods to steer away from the standard of JDF often to solve very specific problems.

This means that the first of our different methods of Connectivity we reference in our guide we simply describe as:

1. Pure XML

As previously described in relation to the JDF standard, the underlying technology used is “XML”, and the reasons and rationale for XML being so suitable are that it uses everyday language, not computer language. XML is therefore readable and understandable, even by novices. XML is no more difficult to code than HTML (Hyper Text Markup Language) this being the language that is typically used to describe the structure of a Web page.

So, with good intent, CIP4 have used XML to create definition, structure, and standardisation of rules to precisely define the sequences of just how XML will be used in a JDF workflow. It therefore stands to reason, that these same underlying XML building blocks can also be used in other modified ways, after all XML existed before CIP4 adopted it, so metaphorically, “the genie has always been out of the bottle”, Pure XML is not new industry technology.

Therefore, in practical terms over the last twenty years, Optimus have regularly encountered what has been presented as a “JDF specified workflow” that requires integration into an Optimus MIS. However, on closer inspection by Optimus, we have often found that some vendors may have deviated slightly from the published standard use of XML as defined by CIP4. This does not mean that the work done by that vendor is not pragmatic, robust, or crucially sustainable, they have just varied the use of XML sufficiently to ensure that “it can’t be called a JDF Workflow in the purest sense”, but it can work and work incredibly well.

Respectful of clients wishes to ultimately benefit from the use of sustainable automation, a commercial view has been adopted by many MIS vendors including Optimus to still use what we would term as “Pure XML code” to deliver these types of Connectivity solutions.

2. CXML:

You may well also encounter the term cXML alongside XML, and that is because cXML is a subset of XML. XML has many subsets, and each subset is specialised for a particular field; cXML is traditionally designed for trading and commerce payloads, hence commerce-XML or cXML. For our industry, usage is therefore typically focused on exchanging data between: E Commerce systems, E Procurement systems, and other business software to streamline (B2B) Business to Business sales processes.

Again, as with other forms of Connectivity, proper assessment is always made by most MIS vendors as to the overall suitability of a particular coding methodology specific to the required task. From an Optimus perspective cXML can and does play a part in some projects, but its usage is very defined.

3. JSON:

In its full definition JSON is known as (JavaScript Object Notation) and is a text-based data exchange format. It was first introduced as part of what was termed "JavaScript" in the early 2000's and expanded gradually to become one of the most used mediums for describing and exchanging text-based data. It is often used for serialising structured data and exchanging it over a network, typically between a server and web applications.

When writing integrations, Optimus are so regularly asked to collaborate with other 3rd party vendors using JSON methodology, that if we deem the task being asked of us is appropriate to the use of JSON, we will always accommodate using this methodology.

WHAT IS THE BENEFIT OF JSON?

One of the main benefits of JSON is its simplicity and readability. JSON is easy to write and understand, as it uses human-readable format of key-value pairs and arrays. JSON does not require any special tags, attributes or schemas, whereas XML does.

WHAT ARE THE WEAKNESSES OF JSON?

As a format, it is less expressive and flexible than XML. This means that there are restrictions on the complexity and variety of data structure and schemas that can be provided. E.G. JSON does not support: Comments, namespaces, or attributes, making it difficult to add metadata or annotations.

HOW TO CHOOSE JSON OR XML?

When deciding between JSON and XML for data processing, there is no one-size-fits all answer; it depends on the nature, purpose, and context of the data and the processing requirements. Factors to consider include the size and complexity of the data, readability and maintainability of the code, performance and efficiency of data processing, data types and validation, as well as compatibility and security.

In our opinion, JSON is better suited for simple and small data, is more readable and maintainable for web developers, is faster and more efficient when being used for web applications or working with different API's. It supports native data types, but lacks a standard schema language, and therefore is more compatible with web technologies but we would suggest is less secure than XML.

Conversely, XML is often deemed to be more suitable for the use with complex and large data projects that require type conversion and validation, JDF adoption being a primary example of this thinking. XML is also inherently more secure than JSON but some might argue is broadly less compatible with some web technologies.

4. APIs

These days one of the most common questions asked of any software vendor is “do you have a published API”? Roughly translated this essentially means “Can you show me how easy it is for another 3rd party software application to send and receive information with your software?” If a company can therefore show and demonstrate the ease with which they can make information available to another party, you have the potential for a sustainable automated and integrated process to take place.

To get the most out of APIs, businesses typically use APIs in the following ways:

- Integrate with other third party APIs
- Build APIs for internal use
- Build APIs and expose APIs for external use

At Optimus we fully embrace the business case for the usage of APIs as we believe they expand the capabilities and breadth of functionality that can be offered. Critically we believe that this can often be done without huge amounts of resource being needed to make an integration work.

Key to the success of API related projects is the use of API Endpoints. Endpoints are physical devices that connect to and exchange information with a computer network. Some examples of endpoints are: Mobile devices, desktop computers, virtual machines, embedded devices, and servers. Endpoints specify where resources can be accessed by APIs and play a key role in guaranteeing the correct function of the software that interacts

with it. In brief, API performance relies on its ability to communicate effectively with API Endpoints.

As a side note to API's and as previously indicated with (cXML being derived from XML) there is often a subset of tools born of the original concept and idea that then get defined in their own right to help manage and deliver connectivity projects. With this in mind, this exact same principle has been employed by many companies who then choose to only expose (part of the API) in essence the only aspects of the API that are relevant to deliver a defined project. For many companies they do this using a method commonly referred to as Web Services.

5: WEB SERVICES

A Web Services environment deliberately sits between the MIS environment and the other nominated 3rd party software package. The benefit of this approach is that the whole of the MIS API does not have to be exposed to send and receive packets of data.

This enables very task specific calls to be passed between systems facilitating a much quicker development cycle which can typically either be delivered by: The MIS provider, the MIS providers customer directly, or indeed another 3rd party who have the relevant skill set.

One typical use case example would be if connecting your MIS with an independent CRM product, you might want to make a request for specific customer record information to be updated in real time between the two environments. Using Web Services as a methodology (potentially in combination with other proprietary export function tools), these connectivity updates can very efficiently be made.

6: DATA COLLECTION FOR NON CONNECTIVITY DEVICES

Specifically in the Print and Graphic Arts arena, many MIS providers have for many years experienced the ongoing challenge of customers wishing to automatically collect data from much older presses or post press hardware devices that were manufactured in the pre JDF era. Some MIS companies including Optimus have therefore found alternative methods to enable the automated feedback from press and post-press resources regardless of equipment age.

The method for achieving this data capture, is to ensure the press or post press resource is electronically hard wired to a dedicated hardware unit/box which captures the data by using either a pulse or sensor which is connected to the equipment to be monitored. This typically enables good or bad quantity information to be automatically provided. An electronic job ticket is normally made available via the MIS which displays all key information about the job. The operator is normally able to then issue materials to the job as well as viewing or inputting job comments.

(Please note: Always check with the manufacturer of any equipment used with the deployment of this type of technical solution; this is to ensure that this will not affect the validity of any warranties that may have issued).

We close there with our brief Connectivity Guide, and we hope you found it useful.

If you need any clarification on any part of the information provided within this guide, please do not hesitate to contact us. We wish you well on your Connectivity journey.



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