uniFLOW

“One driver to rule them all”
Secure Printing and Job Routing
White Paper

Version 2.0

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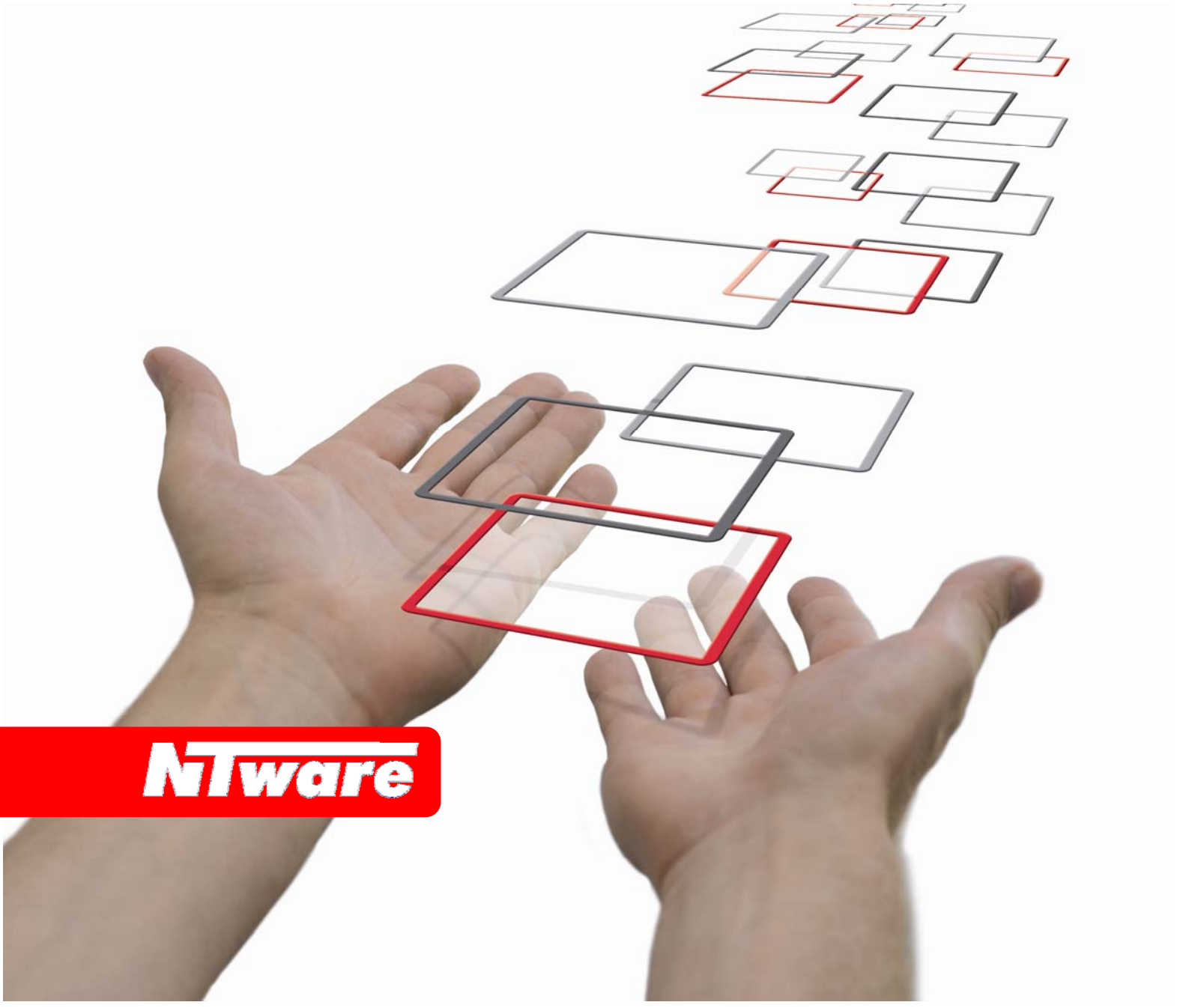


NTware

Introduction

Many companies now understand the importance of implementing an output management system as part of their printing infrastructure as this lowers costs and waste while increasing security and user efficiency. Two major functions in any output management system are the ability for the user to securely print their job to any device ("pull print") and for the job to be printed on the most suitable printer ("job routing")

While most multi-functional devices come with some secure printing functions included as standard, these do not allow the user to walk to a different device to retrieve the job or authenticate with a door entry card. There are no such *job routing* functions built into the device, so these must always be added by use of software.

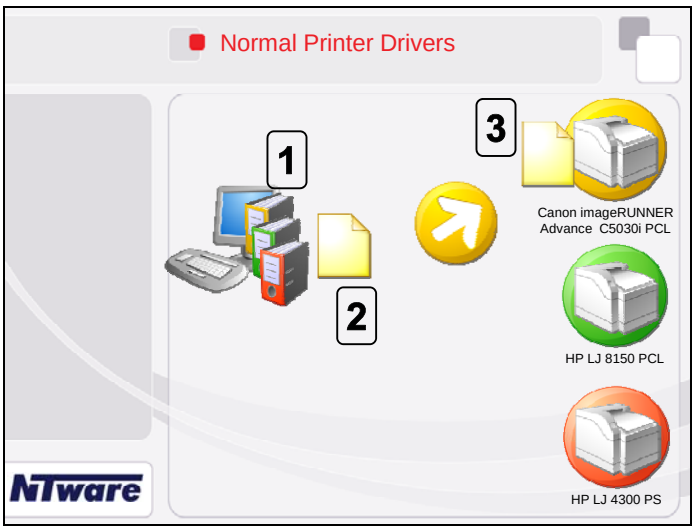
There are several products on the market that offer enhanced *pull printing* type systems. All of these appear to offer a similar user workflow: The user prints a job, walks to the multifunctional device of their choice, authenticates and selects the jobs they want to release. Similarly, most of these systems also offer *job routing* functionality where the user will print a job to their normal printer and the system will offer the user a choice to move it to more appropriate and cheaper device if certain conditions are met.

However, there is a major problem with most *pull printing* and *job routing* systems when multiple MFD types are used, even from the same manufacturer, as these may not be compatible with each other. This could result in the user not getting the printout they originally requested, or worse still, no print out at all.

There is one system that is different – uniFLOW. By using its own universal driver technology the user can be confident that they will get the printout they expect, regardless of make or model of the MFD.

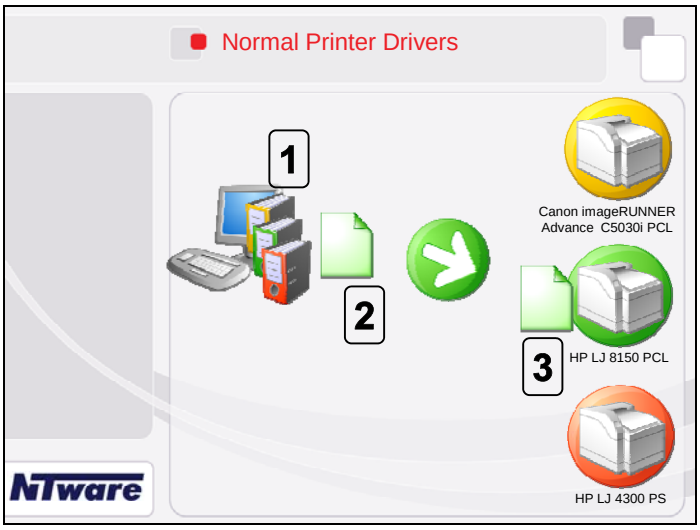
The problem with printer drivers

Every printer and MFD manufacturer will create a printer driver for the specific make and model of device that they sell. While this can result in a user having multiple drivers installed on their PC, it does mean that they will always get the correct output when printing directly to an output device.



1. User selects Canon imageRUNNER Advance C5030i PCL driver from installed drivers
2. Document is spooled using Canon imageRUNNER Advance C5030i PCL commands
3. Document is printed correctly on the Canon imageRUNNER Advance C5030i

When the user wants to print to another device, they simply select the printer driver for that device.



1. User prints another document and selects HP LJ 8150 PCL driver
2. Document is spooled using HP LJ 8150 PCL commands
3. Document is printed correctly on the HP LJ 8150

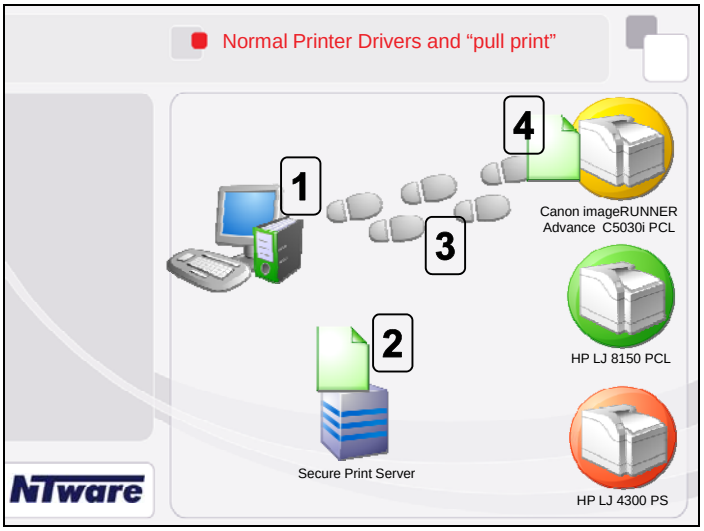
This is fine when the user wants to print directly to the device, but what happens when the user wants to print via a secure *pull printing* system or *route* the job to another device?

Most *pull printing* systems use an "input print queue" to store the print job on a central print server. When the user walks to the printer or MFD to release the job, the software moves the printer spool file to the print queue of the device that the user is standing next to for it to be printed. Crucially, the job cannot be changed by the print server at this point, so the printer commands for the first "input print queue" are used regardless of the device type where the job is finally released.

With *job routing* systems, the principle is the same. The user prints their job using the normal printer driver and the system will move the unchanged spool file to the new device.

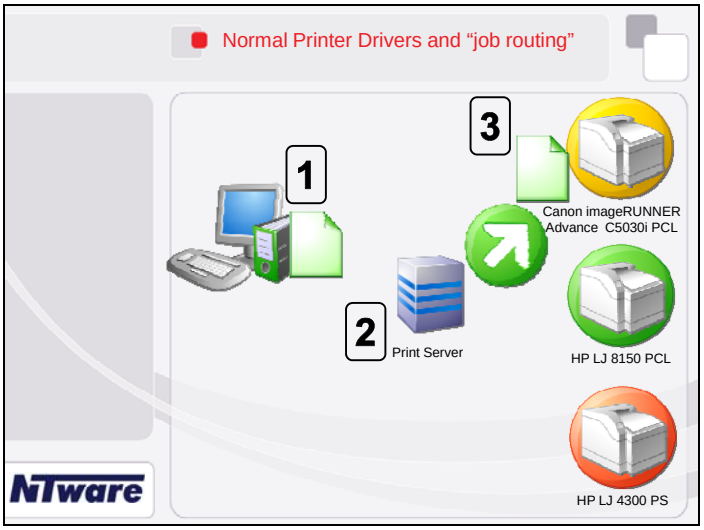
But what happens if the new printer is a different make or model than the original input queue?

In a *pull print* scenario, the job is created with the specific printer command codes of the driver model used in the input queue. These are not changed if the user walks to a different make or model of device, so the output cannot be guaranteed.



1. User prints to *secure queue* using HP LJ 8150 driver
2. Job is stored on the print server, waiting for the user to authenticate
3. User walks to a Canon imageRUNNER Advance C5030i device, authenticates and selects the job to release
4. The print job with HP LJ 8150 print commands is printed on a Canon imageRUNNER Advance C5030i. These two devices may not be compatible so the output may be incorrect

In a *job routing* scenario, the situation is similar



1. User prints large job to HP LJ 8150 using HP LJ 8150 driver
2. Job routing software on print server decides to send job to cheaper Canon imageRUNNER Advance C5030i
3. The print job with HP LJ 8150 print commands is printed on a Canon imageRUNNER Advance C5030i. These two devices may not be compatible so the output may be incorrect

There are several "universal printer drivers" available from different manufacturers, some of which even talk about being "truly universal", allowing users to print to devices from other manufactures as well[1]. These drivers, however, will not fix the problem of secure *pull printing* and *job routing* to different makes and models of printers as the specific control commands are still applied when the user submits a job to the input queue. When the user walks to another device, these universal drivers will not change the printer commands, so the problem remains the same.

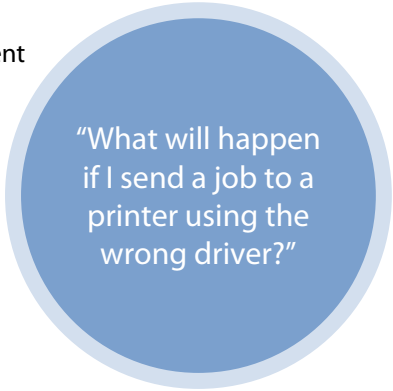
[1] Xerox Global Print Driver, June 2010 - SFTWP-02U.PDF, Page 2

What is the impact for the user?

Two of the most important questions are: "Why does this matter? What will happen if I send a job to a printer using the wrong driver?"

In the best case, the document will be printed as expected, however the document could also be printed incorrectly or not at all. There are many factors that will determine if the job will be printed correctly or not. These include:

- Which printer driver was used on the "input queue"?
- Which printer has the user selected to release the job?
- Which application was used to create the job?
- Which printer language is used?
- Has the user asked for double sided printing?
- Has the user asked for paper to come from a specific paper tray?
- Has the user asked for stapling?
- Has the user asked for printing in colour?



The following is a set of results to see what happens when printing to a Xerox WorkCentre 7435 using a variety of different drivers from different manufacturers:

	Xerox PCL Universal Driver configured as "WorkCentre 7435"	Xerox PCL Universal Driver configured as "Generic Device"	Xerox PCL Universal Driver configured as "WorkCentre 4150"	Xerox ColorQube 9203	HP PCL Universal Driver	Ricoh Afficio 3232C PCL	Canon iR4580i PCL
Colour	OK	OK	Only Black/White output	OK	OK	OK	Job does not print. Pages are printed as random characters
Duplex	OK	OK	OK	OK	OK	OK	
Staple	OK	Staple cannot be selected	Staple does not work	Staple does not work	Staple does not work	Staple does not work	
Tray 1	OK	OK	Comes from tray 2	OK	OK	Comes from tray 4	
Tray 2	OK	OK	Comes from tray 1	OK	OK	OK	
Tray 3	OK	OK	Comes from tray 4	OK	OK	Comes from tray 1	
Tray 4	OK	OK	Comes from tray 3	Comes from tray 5	OK	OK	
Tray 5 (Manual feed)	OK	Device error selecting tray 5	OK	OK	Comes from tray 4 selecting tray 5	OK	

These simple tests were conducted using a normal PDF file printing from Adobe Acrobat. It shows that the only way to get the output expected was to use the correct printer driver for the model.

Every driver tested, apart from the correct Xerox 7435 driver, caused the output to be printed incorrectly. This ranged from stapling not being available even when it has been requested by the user, to the job not printing at all. The most common failure was to do with paper tray selection. Even for other Xerox drivers, the user could find that their job is printed on letterhead paper rather than the normal paper they were expecting.

Even using a different driver from the same manufacturer does not give the correct output. This has major implications for *pull printing* systems as these are often installed with multiple model types from the same manufacturer.

The results for other manufacturer models are no different.

The table below shows the same tests for a Canon iRC4580i

	Canon iR4580i PCL	Xerox PCL Universal Driver configured as "WorkCentre 7435"	Xerox PCL Universal Driver configured as "Generic device"	Xerox PS Universal Driver configured as "Generic device"	HP PCL Universal Driver	Ricoh Afficio 3232C	Ricoh PCL6 universal driver
Colour	OK	OK	OK	OK	OK	OK	Job does not print. PCL XL Error message printed on page
Duplex	OK	OK	OK	OK	OK	OK	
Staple	OK	Staple does not work	Staple does not work	Staple cannot be selected	Staple does not work	Staple does not work	
Tray 1	OK	Comes from tray 2	Comes from tray 2	OK	Comes from tray 2	Comes from tray 3	
Tray 2	OK	Comes from tray 1	Comes from tray 1	Comes from manual feed	Comes from tray 1	Comes from tray 1	
Tray 3	OK	OK	OK	Comes from tray 2	OK	Comes from tray 2	
Tray 4	OK	Comes from Tray 3	Comes from tray 3	Comes from tray 3	Comes from tray 3	OK	
Manual feed	OK	OK	OK	Comes from tray 1	OK	OK	

Again, as soon as the user requests something other than simple printing and tries to use some functions such as staple or selecting a different paper tray, then the output is incorrect. There are also cases where the job is not printed at all. The only way to ensure that the output is correct is to use the standard Canon printer driver.

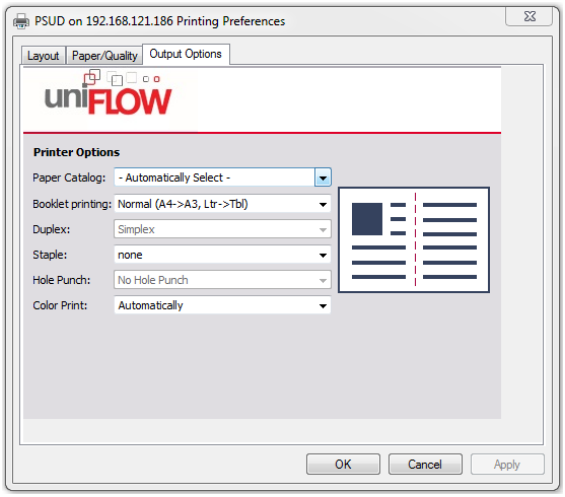
In a *job routing* environment, if the printer make and model the user selects first is not the same as the one the job is been routed to, it can be printed incorrectly resulting in costly reprints and more calls to the IT helpdesk. Instead of reducing costs, these systems may instead increase them.

"Even using a different driver from the same manufacturer does not give correct output"

uniFLOW Universal Driver

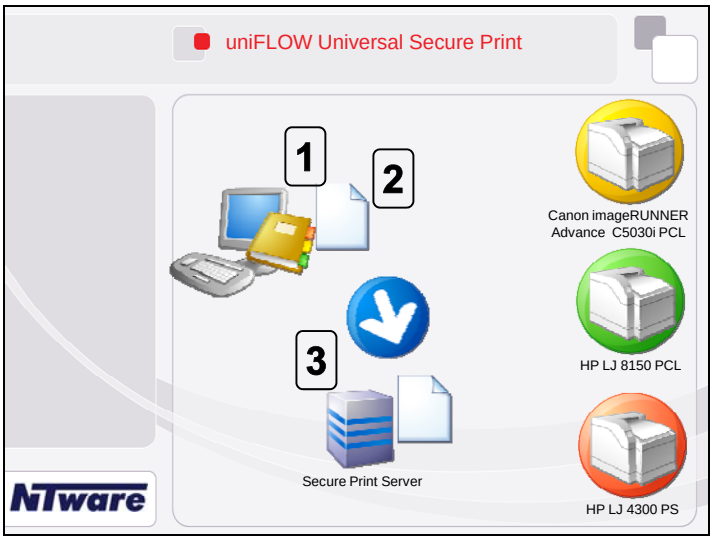
Not all output management systems are the same. To implement the *pull printing* and *job routing* functions, uniFLOW uses its own "universal driver" to solve these problems.

The main difference between the uniFLOW universal driver and the other systems on the market is that the printer specific control codes are only added to the spool file once the make and model of device the job is being released to is known. This means that the correct information is always sent to the printer and the user always gets the output they are expecting.



From the end user point of view, the uniFLOW universal driver appears as a normal printer queue that they can select from any Windows application. They just select "file, print" and select the "uniFLOW Universal Driver" from the list. On pressing the "properties" button, the user can select how they want their document to be printed. The user can select to print single or double sided, select a hole punch or a staple and if it should be printed in colour or not. The user can also select which paper type they want the job to be printed on. They do not have to select which paper tray as, for example, there is no guarantee that *tray 1* always contains headed paper.

When the user has finished their selections, the job is held on the print server waiting for them to authenticate at a device. There have been no printer specific commands added to the spool file at this point because uniFLOW does not know yet which printer make or model the user will eventually walk to.



1. User prints to "secure queue" uniFLOW Universal Driver
2. User selects paper type, duplex, staple, colour and hole punch options from the uniFLOW Universal Driver
3. Job is stored on the print server, without any printer specific codes, waiting for the user to authenticate

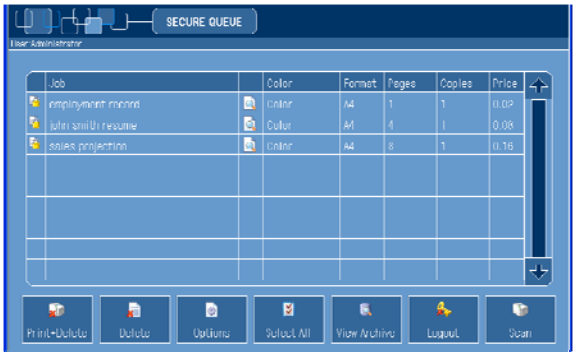
Once the user is ready, they can walk to the printer of their choice to retrieve their job. While it is possible to release the job to any make and model of printer, the user experience is best on a Canon MEAP enabled MFD.

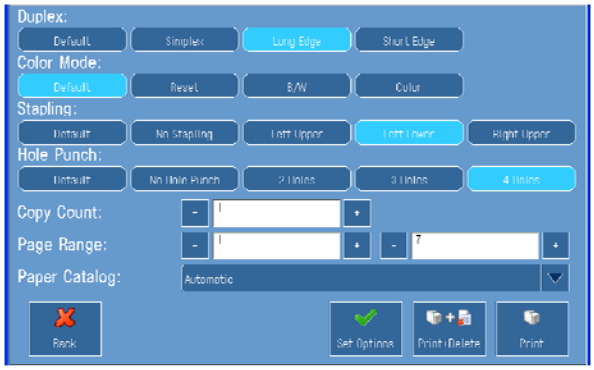
The user authenticates at the Canon MFD with a door entry card, a finger print, their username and password or a PIN number. A list of their waiting jobs is shown on the Canon MFD panel.

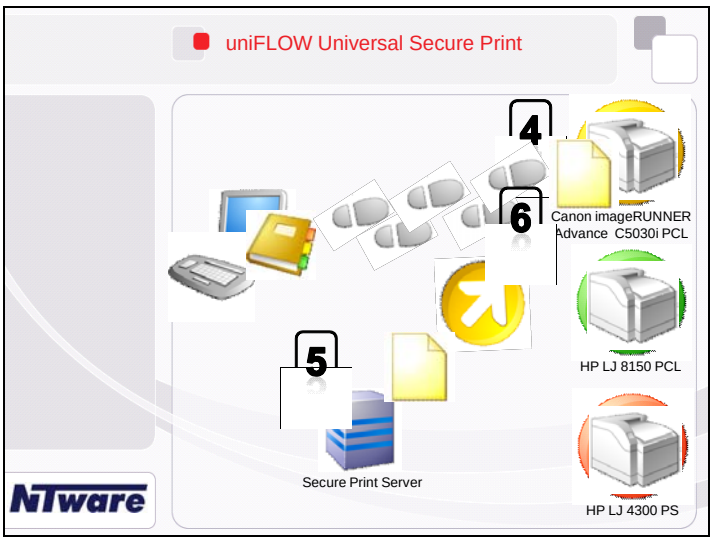
The user can view more details of the job by pressing the magnifying glass icon. This will not only show the job details and a thumbnail of the first page of the job, but also inform the user if the job cannot be printed with all the features originally requested. For example, the user may have asked for the job to be stapled but walked to an MFD without a staple option. Instead of the user finding out after the job has been printed that the device cannot perform stapling, they are informed beforehand so they can choose another device.

Finally, as no printer specific information has been added to the job yet, the user can still change how they would like the job to be printed. For example, they may have originally sent the job to the secure print queue single sided, but now want it to be double sided. Rather than having to delete the job and re-submit it, the user can simply change the finishing options on the Canon control panel.

The user can also change the hole-punch, staple, colour mode and paper type settings. Finally, the user can select to only print a range of pages from the document rather than the whole file.





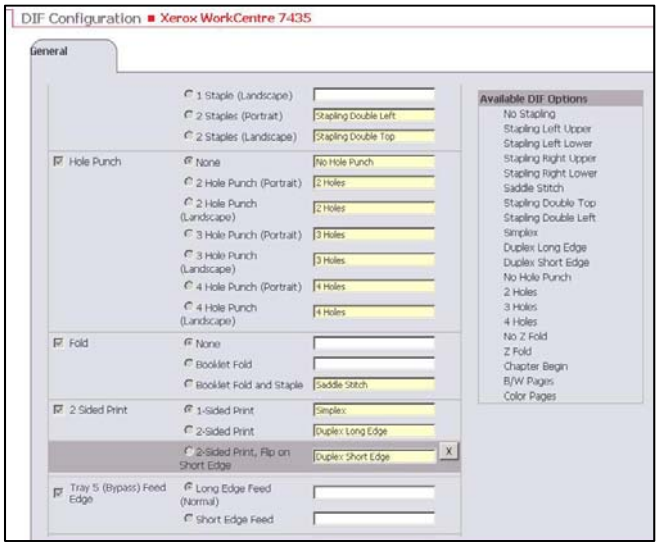


4. User walks to chosen device, authenticates, selects job to release and changes print settings

5. uniFLOW server knows which device type the user has selected to release the job, so adds Canon imageRUNNER Advance C5030i PCL printer commands to the job

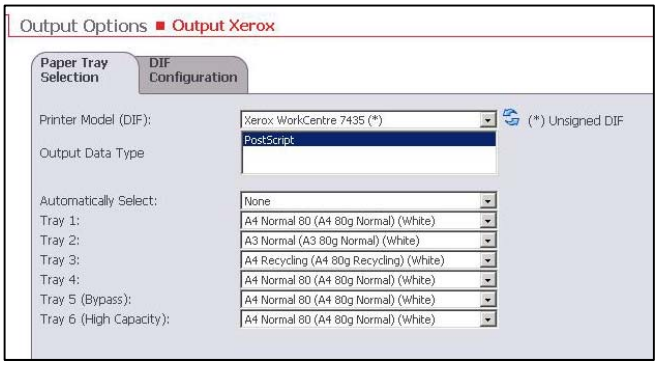
6. Job is printed exactly as the user expected

So how can uniFLOW and the universal driver control other manufacturer devices? The answer is simple. uniFLOW can import the manufactures own printer drivers and map the specific printer codes to the options available to the user in the universal driver.



For example, a user has the option to select double sided printing in the universal driver. uniFLOW has the ability to map the user's requests directly to the options available on the device. For the Xerox WorkCentre 7435, the printer command is "2-Sided print" while on another HP, it might be "Duplex Side". When the user is authenticated at the Xerox WorkCentre 7435, it uniFLOW knows to add the command "2-Sided print" to the spool file to make sure it is printed correctly. If the user authenticates on an HP printer, uniFLOW will add the command "Duplex Side" to the spool file instead. As uniFLOW knows which device type the user wants to release the job to, it can always make sure that the correct control codes are used to ensure that the output is always as the user expects. The principal is exactly the same when it comes to routing jobs from one device to another. Once the device type is known, the appropriate printer control codes are added to the spool file.

The process is similar when it comes to controlling the paper trays. uniFLOW already knows the correct commands to use to driver each paper tray from the imported driver. The administrator can then set which paper type is held in each tray. So when a user asks for "A4 Headed paper", it might be in tray 1 in a Canon imageRUNNER Advance C5030, but in tray 3 in a Xerox WorkCentre 7435. uniFLOW can take the paper the user requested from the correct tray, regardless of which make or model of device the user has chosen to release the job to.



So what impact does the uniFLOW universal driver have when secure *pull printing* or *job routing* to different devices. The answer is shown below

	Canon iR4580i	Canon iRC5880i	Canon iR2220	Xerox WorkCentre 7435	HP LaserJet 4250	HP Colour LaserJet 4600
Colour	OK	OK	(n/a)	OK	(n/a)	OK
Duplex	OK	OK	OK	OK	OK	OK
Staple	OK	OK	OK	OK	(n/a)	n/a
Tray 1	OK	OK	OK	OK	OK	OK
Tray 2	OK	OK	OK	OK	OK	OK
Tray 3	OK	OK	OK	OK	(n/a)	(n/a)
Tray 4	OK	OK	OK	OK	(n/a)	(n/a)
Manual Feed	OK	OK	OK	OK	OK	OK

The uniFLOW universal driver allows the user to have confidence that their job will be printed as expected, even when they chose a different make or model of printer.

The "utopian" marketing view and technical reality

The technical problem with moving jobs to potentially incompatible printers is well known to all output management software developers. The marketing materials, however, imply a much better outcome is possible when printing in a mixed printer make and model environment. The administrator manuals and technical information reveal the truth to be far less perfect.

Equitrac make strong claims for their multi-vendor support as they have created embedded solutions for a number of different manufacturers. The Equitrac *pull printing* and *job routing* functions suffer from the problem of incompatible printer drivers. Users can experience problems with their print jobs if multiple printer models are used, even if they are from the same manufacturer.

In their marketing materials, Equitrac say that:
"Follow-You Printing holds documents in a secure print server until users authenticate themselves at the networked printer of their choice, anywhere on your print network — across servers, departments and even geographic boundaries." [2]

and that it:
"Integrates easily into multi-vendor environments." [3]

But, the technical manual shows that this may not be the case:
"The key to creating pull groups is to ensure that all device drivers within the group are technologically compatible. If you want a print job generated for one printer to output successfully on another printer, you must ensure that the other printer can understand all of the print commands included in the datastream from the driver."[4]

While for routing documents, the marketing materials state that administrators can:
"Define rules to easily enforce color output quotas or automatically delete, hold or re-route print jobs — and direct output away from desktop printers to more efficient networked multi-function devices"[5]

But the technical documents are far more cautious, stating something very familiar:
"The key to creating routing groups is to ensure that all MFP drivers within the group are technologically compatible. If you want a print job generated for one printer to output successfully on another printer, you must ensure that the other printer can understand all of the print commands included in the datastream from the driver."[6]

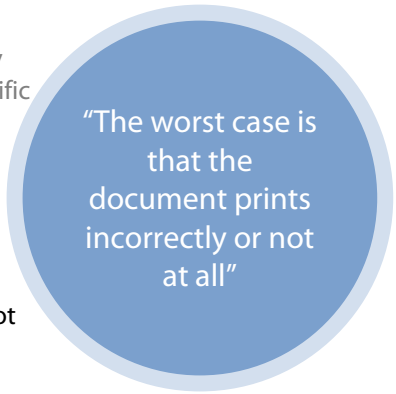
[2] Equitrac "Follow you printing brief"
[3] Equitrac "Follow you printing brief"
[4] Equitrac Office 4.1 Administration guide, page 228
[5] "Print Smarter with Equitrac Office" - LTPEQ004_0506_8_5
[6] Equitrac Office 4.1 Administration guide, page 257

Another output management system with *pull print* and *job routing* functionality is SafeCom but they too have the same problems with incompatible drivers which can lead to the user not getting the output they were expecting.

With *pull printing*, SafeCom say that users can:
"Go to any SafeCom-enabled printer whenever it is convenient"[7]

But their administrator guide clarifies the situation by stating:
"The question is: What happens if the document is subsequently collected at a different printer model? The worst case is that the document prints incorrectly or not at all."[8]

The solution, according to SafeCom is as follows:
"If you use many different printers from different manufacturers then you may have to install multiple shared SafeCom Pull Printers, each one with their specific Windows printer driver."[9]



This causes problems and frustration for the users as not only do they have multiple secure print drivers to choose from, they lose the ability to go to the most convenient device. The user is only able to release a job to exactly the same make and model as the original driver. They cannot even go to a different model from the same manufacturer as these two devices may also not be compatible.

For the *job routing* functionality, the SafeCom administrator guide is quite clear:
"SafeCom Rule Based Printing needs to modify the print data stream to control: Duplex on/off, Toner save on/off and Force job to b/w. SafeCom does NOT guarantee that these modifications will work and cannot be held responsible if they do not work as expected."[10]

Finally, PaperCut is an output management system with some basic *pull print* functionality. The technology used in PaperCut also will suffer from the same limitations with incompatible drivers when the user walks to another device type. Yet again, this can lead to the user not receiving the output they are expecting.

The PaperCut administration guide, again, is realistic to the possibilities of job re-direction:
"The ability to redirect print jobs from one print queue to another is limited by several factors. Firstly, the destination printer must be able to handle the rendered print job. This means that the source (or virtual) print queue and the target print queue must at least use drivers that produce the same print language (e.g. PostScript to PostScript or PCL5 to PCL5). However due to the differences in the way each manufacturer uses a print language, and even differences between models from the same manufacturer, compatibility can be limited to printers of the same or similar models.."[11]

The solution, according to PaperCut is as follows:
"When selecting the driver to use for a virtual (source) print queue, pick a simple lowest common denominator driver and test it for compatibility with each one of your printers"[12]

Only uniFLOW can correctly move jobs from one device type to another, either in a secure *pull printing* or *job routing* system to give the user the output they are expecting. The user has the option of changing the job finishing options before the job is released and all the accounting information can be stored in a database for later reporting.

[7] http://safecom.eu/products/device_license/pull_print
[8] SafeCom G3 Administrators manual – 60603-04, page 44
[9] SafeCom G3 Administrators manual – 60603-04, page 44
[10] SafeCom G3 Administrators manual – 60603-04, page 301
[11] PaperCut-NG Administration guide, page 178
[12] PaperCut-NG Administration guide, page 178

Summary – and questions to ask your print management supplier

Print management software should give companies the ability to control the printing process and save money. Print jobs are held in a secure print queue and only released when the user is standing next to the device, eliminating the piles of paper that are printed but never collected. Large jobs can be routed from convenient but expensive local devices to cheaper, workgroup based multi-functional devices reducing printing costs while not affecting user choice.

However, this ideal scenario promoted by the marketing materials of most print management software providers is not available when installed in real world environments.

The reason most print management software packages do not deliver is this: Different types of printer do not speak the same "language" resulting in inconsistent output, costly reprints and user frustration. Printer specific commands are added when the user submits the job which causes problems if the job is moved to a different make or model of printer. These problems arise even if the job is just sent to a different make of printer from the same manufacturer.

uniFLOW is different. The *uniFLOW Universal Driver* is different.

The *uniFLOW Universal Driver* only adds the printer specific commands once the final device type is known, resulting in the correct output. Through the *uniFLOW Universal Driver*, jobs can be routed freely between different makes, models and brands of printer with the user safe in the knowledge that their job will be printed as expected.

Before purchasing a print management solution, here are some questions to ask your solutions provider:

1. **Secure Printing: Is it possible for a user to walk to any make or model of printer on the network to release their job and have it printed correctly?**

   Answer : _____

2. **Secure Printing: How do you ensure that the user will get the output they are expecting when they may walk to a different make or model of printer?**

   Answer : _____

3. **Job Routing: Is it possible to move the users print job from one device to another if certain conditions are met?**

   Answer : _____

4. **Job Routing: How do you ensure that the user will get the output they are expecting when the job may be routed to a different make or model of printer?**

   Answer : _____

5. **Universal Driver: How is using your universal driver different from using a normal printer driver when using job routing or secure printing functionality?**

   Answer : _____