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WHITE PAPER

Enterprise Printing with BS2000/OSD

Products and Usage Models

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With its multiple developments in the domains of modern Production Printing, Remote Printing, Distributed Printing and LAN-to-Host Printing, the BS2000/OSD is the corner-stone of the Enterprise Printing.

This paper summarizes the BS2000/OSD State of the Art in all those domains and presents the usage models corresponding to those functions.

Contents

Overview

From central unit to enterprise computer network

The generation and management of the enterprise's documents is more and more treated by the computer systems. Independently of the form of those documents, the generation can be classified as follows:

Modern production printing

Today's enterprises usually need a central printing service that produces large quantities of printed output for internal or external use. The modern printers technology proposes a wide range of devices, fanfold or cut-sheet, simplex or duplex, TWO-UP/N-UP, single colour, highlight colour, full colour, with a rate of 50 to 1000 ppm. The organization of such a printing centre necessarily includes a pre- and post-processing with an increasing trend to the automation with more and more performing devices. Besides the quality of the printing (600 dpi, highlight colour, full colour, simplex/duplex, n-up, …) and the performances (up to 1000 ppm), permanent improvements concerning the availability and reliability are required.

The organization of such a print centre also requires adequate possibilities of control (graphical interfaces), with the possibility to easily modify the scheduling and the job priorities at any time while optimizing the delays and operational costs.

The customers also require easy interfaces to submit print jobs, not only from the legacy applications, but also for any instance in the enterprise, who needs large quantities of documents to be printed on economical devices in very short delays.

Desktop and department printing

Besides this central printing, the enterprises manage a large number of department and personal printers; there is a need for a seamless link between any application and any such remote printers, often outside the Intranet of the enterprise. The largest transaction application needs very often to print a report on the personal printer of a connected user, even at home or in an Internet Café.

Printing in the frame of enterprise networks

With the emergence of enterprise networks comes up the need of distributed printing services available on small, medium and large networks (LAN/WAN) and supporting multiple communication protocols (TCP/IP, ISO and NEA). Client applications may reside anywhere in a network as well as print servers.

The requirement is to provide print service to any client on the network that is as easy and secure as the one provided by a local spool system.

Several goals can be present and sometimes several of them at the same time:

optimize the investment and organization costs of the print services by sharing the resources between all the hosts of the enterprise,

replace the "print and distribute" policy by the more economical "distribute and print",

provide a high level of availability by allowing dynamic server reassignment in case of failure,

concentrate the management of the resources on a unique point.

From ‘print-and-distribute’ to ‘distribute-and-print’

Paper has long been a very comfortable medium for the distribution and communication of information for most of us. However, the today reality deals mainly with electronic distribution of information so that we will be able to select when, what, and where we print with ever increasing frequency as we move from the print-and-distribute model of communication to the distribute-and-print model.

In the 90’s a growing demand for integrated solutions covering not only the distributed printing in heterogeneous network environments but also providing alternatives to printing such as archiving or exporting to other platforms, offering integration of pre- and/or post-processing came through. Today users are demanding more advanced, more productive document printing services. Many need to print documents that are personalized as well as customized (documents contain the information their individual customers need, printed just for them). These are often compound documents, composed in industry-standard page description languages. They may combine text with special fonts and complicated graphics such as charts and graphs, line art and halftones.

The paper mountain is becoming a serious problem for many organizations, and alternatives to printing are becoming increasingly important. It is time to gauge the potential benefits of archiving and on-line information systems. In response to the demand for increased efficiency in both production and distribution, the printing and publishing industries are driving a transition from the traditional model of “print, then distribute” to the more timely and cost-effective “distribute, then print”. This allows customers to take advantage of reduced warehousing and shipping costs, faster delivery of documentation when and where it's needed. The information printed is always the latest available, eliminating documents becoming obsolete or outdated. Today’s market demands print material with less production time and more information integrity.

The modern archiving system also needs indexing features allowing to easily retrieve a given information. The indexes can be part of the document, like in AFP.

But many times one does not need the paper at all. One needs only see the information. This introduces a new concept ‘Internet and view’ where the physical printing is to be replaced by a distribution on the Web. The benefits of on-line viewing include a simple method of immediate access. It is no longer necessary to wait for the delivery of paper to see the information. It can also occur that the addressee most of the time watches the document and only prints parts or nothing.

From chain printer to high level presentation

For several years, from the beginning of the electronic printing age until recent past, most of the local printing devices offer a line-oriented addressability upon the printed page. This technology provides relative poor printing quality and limited possibilities for the preparation and presentation of information on the printed page.

New printing technology is based on the principle of free addressability of each pixel on the printed page. A page printer can print at any addressable point on a page. This All Points Addressable (APA) printing enables you to mix a variety of type sizes and styles, as well as images and electronic forms, on a single page. This technology provides almost limitless possibilities for the preparation and presentation of information on the printed page.

Page printers differ from line printers in that a page printer receives an entire page of data before printing any data, whereas a line printer receives one line of data at a time, and prints each line as it is received.

Advanced Function Printing (AFP) is a set of licensed programs, together with user applications, that use the all-points-addressable concept to print data (text, images and graphics) on a wide variety of printers. Advanced Function Printing includes creating, formatting, distributing and printing information. Advanced Function Printing has evolved into Advanced Function Presentation.

The Advanced Function Presentation Data Stream Reference (AFPDS) defines the AFP data stream used for advanced function page printing, explaining how the structured fields are interpreted in presenting composite pages of text, image, graphic and bar code data. AFP/IPDS (Intelligent Printer Data Stream) is a host-to-printer data stream that contains both data and controls defining how the data is to be presented.

The network/department/desktop printers have also followed the evolution. The current catalogues offer:

Line printers supporting the ANSI emulation together with the Epson FX and IBM Proprinter emulation.

Serial matrix printers supporting ECMA, Epson LQ and IBM Proprinter emulation.

Inkjet printers and Page printers supporting Lineprinter, Diablo 630, Reno, IBM Proprinter, Epson LQ-850, PostScript 2 and 3, HP PCL.

The PCL printer language created by HP provides an economical and efficient way for application programs to control a range of print features across a number of printing devices. The PCL printer language has evolved driven by the combination of printer technology developments, changing user needs and application software improvements, each version is a superset of the previous one.

PostScript is a page description language - a programming language - designed to do one thing: describe extremely accurately what a page looks like. Every programming language needs a processor to run or execute the code. In the case of PostScript, this processor is a combination of software and hardware, which typically lives in a printer, called a RIP - a Raster Image Processor. A RIP takes in PostScript code and renders it into dots on a page. So a PostScript printer is a device that reads and interprets PostScript programs, producing graphical information that gets imaged to paper, film, or plate.

At the same time, the printer capabilities have evolved too: growth of the printing speed, printing volume, printing quality/resolution as well as the support of a growing range of paper formats, of connection interfaces. Alternative solutions to paper waste exist from selecting duplex printing to using enhanced n-up printing (n logical pages placed anywhere on the front or reverse of a sheet of paper, with any possible rotation and in any size).

In the colour domain, some changes are coming up too. The advent of inexpensive inkjet colour printers in the SOHO (Small Office, Home Office) market, the availability of associated software and the standardization in desktop publishing made possible by PostScript have constituted essential factors in the introduction of the colour in the production printing. New Highlight Colour Printing System offers highlight colour printing, shades of one colour plus black. This feature is available in PCL and IPDS. Custom colour and full colour are features directly related to the support of PostScript.

Interoperability between systems and printers has induced the emerging of new printing protocols.

As a previous standardization effort, RFC1179 (LPD) is a ‘de-facto’ standard because of many implementations by many vendors. Unfortunately the scope of this protocol was fairly limited, essentially to line printers and mostly unstructured streams of ASCII text. But the printer technology moved on to use cut sheets and page description languages. And there were no extensions defined for RFC1179. Therefore, each vendor started implementing its own extensions up to the point where today RFC1179 can no longer be considered as a standard.

Now a new printing protocol is required. Aim of the Internet Printing Protocol (IPP) is to propose a standard to develop a platform-independent and interoperable protocol to provide distributed printing across the Internet and Intranets, based on Internet tools and technologies.

Enterprise Printing with BS2000/OSD

Application segments

The Print Services by Fujitsu provide the customer with a set of technology solutions addressing specific application segments. Those segments are certainly not exclusive. A given application can address several segments or even all at a time. The following classification can however be done:

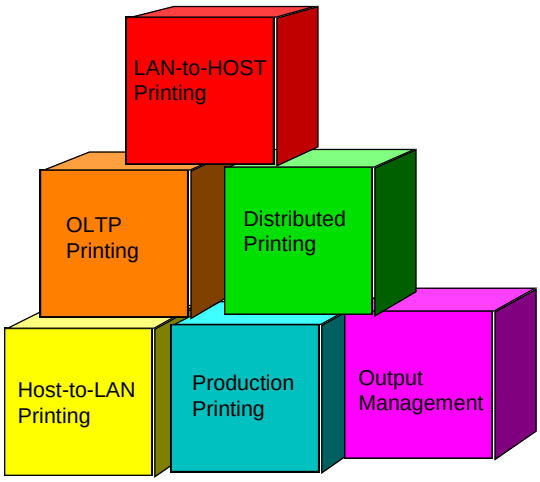

Figure 1: Application segments

Production Printing

This concerns the production of high volumes of documents concentrated on high performance devices. Pre- and post-processing operations normally complete this production, which can be done manually (distribution) or with the help of appropriate devices like folding, cutting, inserting and so on.

All production devices are now based on the APA technology providing almost limitless possibilities for the preparation and presentation of information on the printed page.

The printing devices supported range from very-high-speed, twin & fanfold printers (ca 1000 ppm) to low-speed cut-sheet printers (50 ppm). The print technologies include impact, non impact LED (light-emitting diode), SRA controller for scalability and multiple connectivity: KT2, KTS, Ethernet.

Predefined print resources including forms, page definitions, typographic fonts, and images are provided with adequate management/creation tools. The print services optimize the use of those resources.

The control of the printers is now moved to an adequate print server (Océ PRISMAproduction); the mainframe validates the print orders and determines which print jobs are to be processed by this server. The user interfaces are not affected, while the independent server can be upgradeded at any time to support most recent technologies, without affecting the mainframe.

The needed print resources can remain on the mainframe and transferred to the server,with the data to be printed, or they can be installed permanently on the server.

Host-to-LAN Printing

In a complementary way, Host-to-LAN printing enables the printout on decentralized devices across networks. The print service supports a lot of printer configurations with different attachment modes (conventional variants, RS232, Centronics, TCP/IP LAN cards, Print Server for PC's). Also additional printing systems can be reached using the open standard LPD protocol (RFC 1179).

It covers a wide spectrum of market relevant desktop printers with de facto associated printer language like PCL, PostScript™, IBM Proprinter and Epson family, and many others (ECMA, Diablo-630, RENO, ANSI, DP).

Chosen as standard printing system by openUTM, this BS2000/OSD print service completes its role of a central and universal remote output system for OLTP applications.

LAN-to-Host Printing

There are many editing programs available for document publishing. Thanks to LAN-to-Host-Printing solutions documents from Windows offices right across the company can all be channeled to a production print service. The user can take benefit from these printing system in the same manner as if directly connected. Job management includes job follow-up and cancel features in a Windows integrated Interface.

Output Management

Today's digital documents are often electronic versions of the paper documents that have filled filing cabinets. Although electronic storage can yield direct storage cost savings and accelerate document retrieval, and although printing produces faster and better mass of documents, they do little to tailor document content to immediate and specific user needs or to increase the user's ability to access and use that content.

In this context, the Fujitsu Technology Solutions product suite provides a set of processes that prepare and position you for delivering mission-critical, high-volume digital documents, using "Factory" production techniques that appropriately mechanize document production.

Distributed Printing

The distributed printing of BS2000/OSD allows to merge the printing devices and resources of a cluster of BS2000 hosts into a common service with a centralized administration. Such clusters can also communicate with other BS2000 or Xprint clusters, thus allowing an Enterprise Print service for all mainframes, UNIX, Linux and NT based systems. In addition, the BS2000 clusters can be used as Print Servers from any Windows station (Lan-to-Host printing).

The Distributed Printing service is not a separate feature, but brings an additional dimension to all other print services. The non-exclusive usage models can be classified as follows:

Optimizing the use of the resources:
The distributed printing allows any print job in the enterprise to be directed or redirected to any device at any time. When a unique Server controls all printers, the load-balancing problem simply does not exist any more.

Improving the reliability:
In case of server or printer failure, the corresponding workload can be redirected to another server, either manually (by a command or a Drag & Drop in the graphical interfaces), or automatically with HIPLEX-AF.

Reducing the administration costs:
A cluster of hosts can be administrated from a single point. Even when printers are distributed on several hosts, the administration can be concentrated at a unique location. In case of failure, the administration can be continued on another host.

Reducing the distribution costs:
The distributed printing provides a transparent "distribute and print" policy: The issuer of a job is able to determine where the print will occur, by a simple parameter of the command.

Remote and distributed applications:
The distributed print services insure the communication with the workstations of the network and are the basis for LAN-to-Host printing.

BS2000/OSD product coverage

Production Printing

	BS2000/OSD				**Unix Syst.**	**Windows**
Functions	SPOOL-GA	ROUTER	RSO	DPRINT	XPRINT	WPRINT
High Perf. Printers Support						
E-Mode	X					
L-Mode	X					
I-Mode		X				
LP	X					
Printers Technology						
Impact	X					
SRA	X	X			X	
SRA+	X	X			X	
Robustness & Reliability	X	X			X	
Administration & Accounting	X	X			X	
Print Resources Management	X	X			X	
Security & Authorisation	X	X			X	
Connectivity						
KT 2/S	X	X				
Ethernet		X			X	

Host-to-LAN Printing

	BS2000/OSD				Unix Syst.	Windows
Functions	SPOOL-GA	ROUTER	RSO	DPRINT	XPRINT	WPRINT
LAN-Printers Support						
HP LaserJet			X		X	
PostScript			X		X	
Proprinter			X		X	
EPSON-xx			X		X	
Diablo 630			X		X	
Reno			X		X	
ECMA			X		X	
Open Protocols						
bsd/lpd			X		X	
ipp			X			
OLTP Printing			X			
Administration			X		X	
Multiple Connectivity Types						
BAM			X		X	
RS232			X		X	
Centronics			X		X	
LAN TCP/IP			X		X	
PC servers			X		X	X

LAN-to-Host Printing

	BS2000/OSD				Unix Syst.	Windows
Functions	SPOOL-GA	ROUTER	RSO	DPRINT	XPRINT	WPRINT
From draft to production print.	X	X		X	X	X
From Win to high perf printing	X	X		X	X	
From Win to PCL printers			X	X	X	
PC connectivity to host	X			X	X	X
Win NT (2000)	X					X
Windows integrated interfaces	X					X

Output Management

	BS2000/OSD				Unix Syst.	Windows
Functions	SPOOL-GA	ROUTER	RSO	DPRINT	XPRINT	WPRINT
Customisation						
Virtual device	X					
Slow/fast filter					X	
Converters	X					
Open administration interf.	X		X	X		
TV CC - SNMP	X	X	X		X	

Distributed Printing

	BS2000/OSD				Unix Syst.	Windows
Functions	SPOOL-GA	ROUTER	RSO	DPRINT	XPRINT	WPRINT
Distributed topology				X	X	
Distributed functionality				X	X	

Location transparency				X	X	
Interoperability				X	X	X
Single point of administration				X	X	
Flexibility & scalability				X	X	
Security & authorization				X	X	
Reliability				X	X	
Printer sharing				X	X	X
Server selection				X	X	
Encapsulated local functions				X		
Heterogeneous interoperability				X	X	X

Core Services

SPOOL-GA as kernel

The so-called "Spool" subsystem is part of the BS2000/OSD-BC ("Basic Component"). It contains all the necessary functions and interfaces for printing on local printers (except IPDS ones), but it is also the basic component for all other activities: remote printing, distributed printing, production printing, LAN-to-host printing and output management.

All those functions use the central services provided by the kernel:

All commands and interfaces are controlled by SPOOL-GA. The other functions depend on specific parameters or parameter values that are allowed when the corresponding subsystems are loaded.

Resources management: The Spool Parameters functional unit controls all resources. This includes the parameters used by the remote and distributed printing and the output management applications.

The SPOOL-GA controls the scheduling for itself and for all other subsystems.

The technical integration of the complete print services around SPOOL-GA has multiple advantages:

The interfaces are totally homogeneous; additional functions are managed by additional parameters or values.

The resources, including the local printers are common; the same printer is used for local and for distributed printing.

The jobs management and scheduling is common: There is no local and distributed session on a device; the jobs are in the same queues.

The end user and the spool administrator aspect can be separated; with adequate parameters, the administrator can control whether a user job can be routed to a local, a remote or a distributed printer, while the end-user always enters the same, simplified command.

A flexible scheduling mechanism allows an unlimited variety of policies, optimising the number and duration of change-over on the printers, the classification for further distribution, the support of the priorities and so on. The interfaces allow a complete follow-up and control of the jobs and devices.

Management of print output services

The BS2000/OSD print output services provide a complete set of API's, commands and statements. SDF provides several operating modes, depending level of expertise of the user; the support of appropriate return codes also allows developing efficient applications in the form of SDF-P procedures controlling commands and statements.

Automated control

All important events occurring to a device or a print job can be captured by the “Spool Notifications Service” (SNS), and treated by sending an E-mail, executing an SDF-P procedure or entering a record in a file. Typical examples are: Job completed, device started or stopped, device in error, ... This allows the administrator to develop an efficient, secure and economical administration of his printing activities.

Production Printing

Print technologies now exist that allow to describe every dot on the printed page. Often referred to as All Points Addressability (APA), this technology provides almost limitless possibilities for the preparation and presentation of information on the printed page.

AFP printers

The printing devices supported by AFP range from very-high-speed, twin & fanfold printers to low-speed cut-sheet printers. The print technologies include LED (light-emitting diode), SRA controller for scalability. At the same time, those models provide the

end user with a stable, durable interface to printing by introducing an APA-print-services component into the operating system between the application and the printer.

APA print services

In BS2000/OSD, the APA print services component for AFP is the Router. Its major function is to provide a device-independent interface to printing. In this environment, the application needs only have the ability to place data on the Spool system. The Router then provides the following important functions: data stream transformations, printer resource management, communication with the Print Server.

Data stream transformation

The Router provides its users with 3 different data stream interfaces.

Currently, used system line-printer data streams (apa Generic printing format) with/without TRC are accepted by the Router and transferred to the PRISMA server for processing. In addition, the Router accepts and processes composed-page data streams in AFPDS format or mixed-mode data streams, which include system line-printer data intermixed with AFPDS control structures.

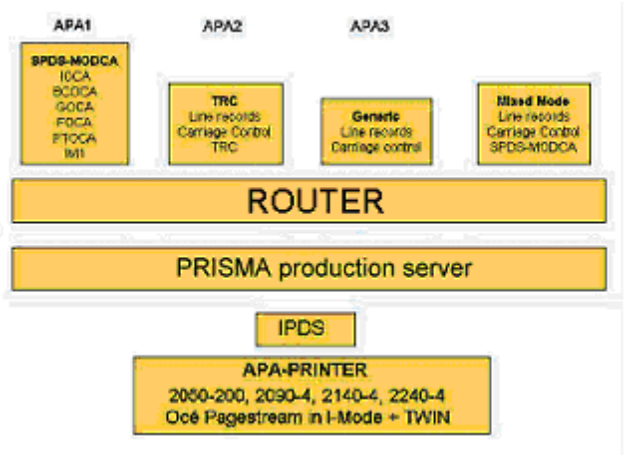

Figure 2: ROUTER data stream interfaces

APA printing applications

APA printing applications can be classified as follows :

	APA1	APA2	APA3
Printing formats	SPDS-MO:DCA	LM-TRC	LM-Generic
Document production	Printer type APA		
	User SPSlib specification		
	Form definition		
		Page definition	Page definition
	Substituted fonts list	Fonts list for TRC mapping	Substituted fonts list
	APA control mode		
Prerequisites	APA printer defined		
	APA form defined		
BS2000/OSD driver	Router		
SPOOL device type	2050-APA/2090-APA/2090-TWIN		
BS2000 attachment	LAN		
Océ printer models	VarioStream/VarioPrint in I-Mode		

Printer resource management

The Router manages resources required to print, which include forms, page definitions and form definitions.

These are used by the Router to generate the print data stream and the page segments, typographic fonts, and overlays that are sent to the printer for use during the print process. A set of predefined resources are provided with the AFP product set in different resolutions. Also more complex functions can be provided with resources that can be created with a set of Océ utility programs.

An application can reference resources in the input data stream to the Router, or these resources can be specified external to the print data when scheduling a document for printing. The Router either binds these references to an actual resource object that it has taken out of a named resource library and inserted into the output data stream, or moves the reference into the IPDS data stream when it knows that the required resource is resident at the printer (previously host downloaded).

Router device

The Router device is defined and managed like a Printer. Its role is to transfer the print jobs (optionally including print resources) to the PRISMAproduction server. For the end user, as well as for the administrator, the router devices behave exactly as physical printers.

The printing itself is processed by the server that provides a complete set of management features.

What can the Router/BS2000 do for you?

The Router system management functions create a fully integrated, automated printing system. You can use the Router for BS2000/OSD to do the following:

Receive print jobs, access resources required by the print jobs, and send print jobs to the server.

Manage resources required for the print job, such as form definitions, page definitions, fonts, page segments, and overlays.

Handle print jobs that are formatted at different resolutions and select the resource libraries with the correct resolution to print the data.

Write accounting records.

Write separator pages between print jobs or copies of print jobs.

Let installations manage resources; modify output records, separator pages, and accounting records; and inspect messages.

Host-to-LAN Printing

In a complementary way, Host-to-LAN printing enables the printout on decentralized devices across networks. The print service supports a lot of printer configurations with different attachment modes (conventional variants, RS232, Centronics, TCP/IP LAN via TACLAN or LAN cards, Print Server for PC's). Additional printing systems can also be reached using the open standard LPD protocol (RFC 1179).

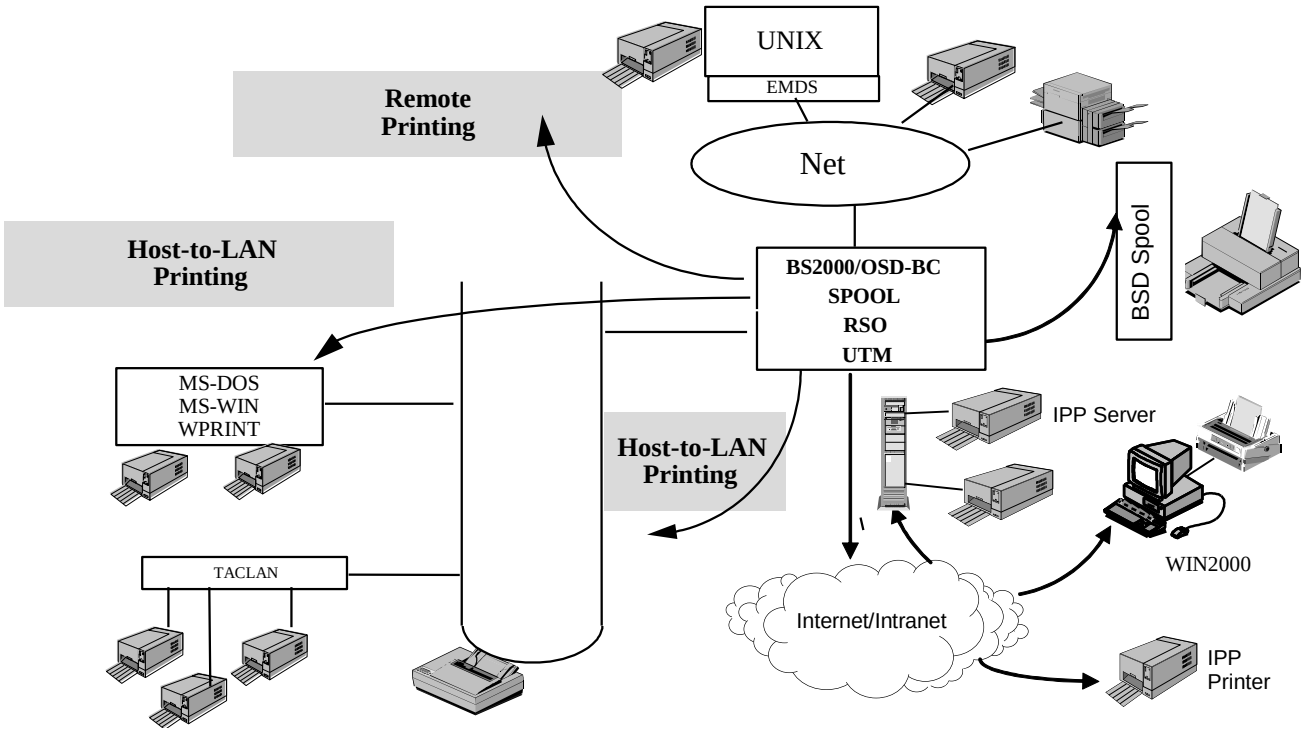

Figure 2: RSO configuration

This functionality is realized by RSO (Remote Spool Output), an optional add-on product supplementary to the central BS2000/OSD SPOOL system.

It covers a wide spectrum of market relevant desktop printers with de facto associated printer language like PCL, PostScript™, IBM-Proprinter and EPSON family (FX/LQ/SQ), and many others (ECMA, Diablo-630, RENO, ANSI, DP).

The additional support of the http based IPP (Internet Printing Protocol) protocol allows the RSO user to access IPP printers (either printer or server) through the Intranet/Internet.

Chosen as standard printing system by openUTM, RSO completes its role of a central and universal remote output system for OLTP applications.

Moving printers from reliable-but-proprietary-and-old-fashioned TRANSDATA-NEA connections to open-but-less-reliable TCP/IP LAN connections backs up the customers' feeling of reliability decrease, mainly in case of printers not supporting the polling and synchronisation capabilities.

The support of an RSO-SEH protocol improves printing reliability, overcoming anyway the major 'data loss' problem. Besides overcoming the 'data loss' problem, this new protocol also makes printer status available even over Centronics interface, allowing then quicker and easier printer problems detection.

Introducing the support of the PRESCRIBE II within RSO gives the user a more accurate information about printing troubles, and guarantees accurate printing recovery for Kyocera printer types.

By integrating the functions and user interfaces in the central spool system, uniform, simple yet functionally powerful administration/operation of the printers is assured.

Distributed Printing

Highlights

Client/server architecture

DPRINT implements a consistently symmetrical client/server architecture within homogeneous (BS2000/OSD and BS2000/OSD) and heterogeneous networks (BS2000/OSD and UNIX systems). UNIX and Windows clients can submit print jobs to be processed on BS2000/OSD high-speed printers while BS2000/OSD can submit print jobs on printers attached to Windows via RSO.

Cluster model

A set of computers and printers connected via a LAN/WAN network are combined to form an organizational cluster. The major advantages of this model:

Single point of configuration
: The cluster configuration is defined and modified centrally on the master host by the cluster administrator.

Single point of administration
: All devices and jobs may be administrated centrally from the master host.

Single system image
: Users do not even have to know how printers are distributed within the cluster. DPRINT handles automatically the server selection. In counterpart, adequate pool definitions allow the end users to address a specific printer or any printer controlled by a specific server.

Interoperability
: DPRINT is able to send print jobs to remote systems, external to the local cluster like a remote BS2000/OSD cluster, a XPRINT domain. Symmetrically DPRINT can process jobs sent by such remote systems.

Network-wide printer access

DPRINT supports all spool subsystems on the server side (including the Router). The entire range of high-performance printers, such as Model2 (HP/HP90), PCL, Twin and APA printers, is thus available to the associated client hosts.

Cost benefits

Printers and resource sharing cut costs. Similarly, the print resources in a network do not need to be duplicated.

A state-of-the-art architecture and standardized protocols ensure protection for your investment.

International standards

The print functions to be supported within heterogeneous networks are based on ISO standard 10175(-1) DPA (Document Printing Architecture). Multilevel security functions – like privileged cluster administrator rights - and access controls for using the server mean that DPRINT satisfies all the stringent requirements of BS2000/OSD.

Reliability and availability

If a printer becomes unusable, DPRINT is able to reroute print jobs to other printers in neighboring data centers. So you can always maintain quality and keep your deadlines. DPRINT allows to transparently access printers that are switched between several hosts. The processing is thus independent of the availability of a particular one. If the master host is down, DPRINT allows another host in the cluster to assume the role of master.

DPRINT in homogeneous environment

DPRINT provides the highest level of functionality in the frame of a network of BS2000/OSD systems. Schematically, all systems belonging to a site, on different hosts, or on different Virtual Machines on a host can constitute a DPRINT cluster with an integrated administration.

This is adapted to an enterprise with several BS2000/OSD servers, but also to an enterprise having a production and a development server.

For communication between distant sites, for which an integrated administration is not adequate, DPRINT provides the inter-cluster communication. This function justifies the existence of clusters containing only one systemThe main usage models are described in the following sections:

Sharing the devices over the enterprise

Concentrating the print services on a unique Print Server

High availability with a work and standby server

Integrated document distribution with DPRINT

Of course, the applications of DPRINT can merge several usage models.

Sharing the devices over the enterprise

When several BS2000/OSD systems are in use in the enterprise, DPRINT allows any printer of any type, controlled by one system, to be used by any application or end user located on another system. This allows the most appropriate printer to be chosen at any time. In addition, jobs or categories of jobs can be modified by a simple command, so as to reroute them to other printers.

The benefits are:

Easy load balancing between systems

The unavailability of a printer on a system has no consequences on the applications.

The enterprise can purchase a high capacity printer instead of several smaller ones.

The applications can run on the most appropriate system, independently of the connected devices.

An application can be moved from one system to another allowing a very high availability.

In this example, the system running on host A has no printer. The DPRINT Client is installed allowing the print jobs to be transferred to the systems on host B and C which both run the DPRINT Server. On host B, one printer is "distributed". It is known by DPRINT and hence by any Client. The other one is exclusively used by applications running on host B.

The same PRINT-DOCUMENT command is used for printing, independently of the print location. The choice is done through the Printer Pool that contains local printers or distributed printers.

Of course, printers belonging to a distributed pool can be connected to different hosts. DPRINT always searches the optimal printer: If a printer of the distributed pool is connected to the same host, and has the requested characteristics, it is selected by DPRINT. Otherwise, the job is transferred to another host with an adequate printer.

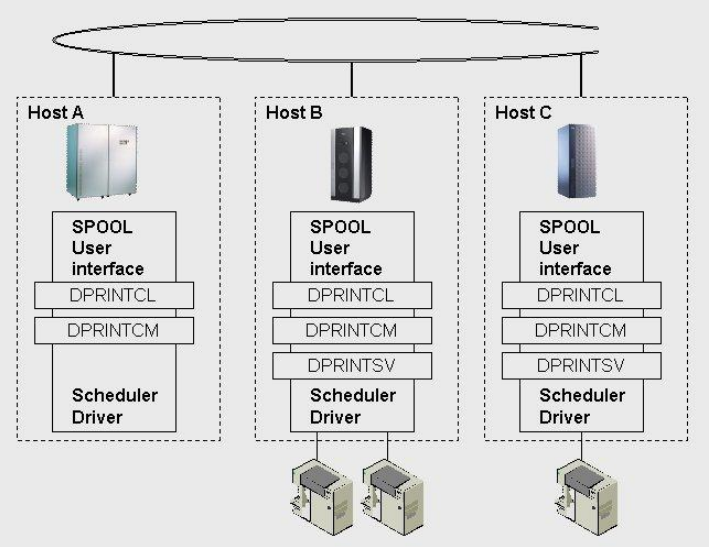

Figure 3: Printer sharing

Remarks:

A Spool option specifies the "Default Printer Pool" of the PRINT-DOC command. This allows all spool jobs without explicit destination to be submitted to DPRINT.

To select a Print Server, DPRINT also considers the job class of the print job and the Access Control Lists. This allows numerous tuning possibilities.

Concentrating the print services on a unique Print Server

This is a particular case of organization. The same host controls all printers. This host can also run other applications or it can be exclusively dedicated to the print services.

This kind of organization has also the advantage to concentrate all print activities of the enterprise in the same location with a unique point of control.

This is also the first step to the configuration described in the next section, where a pair of servers allows a very high availability.

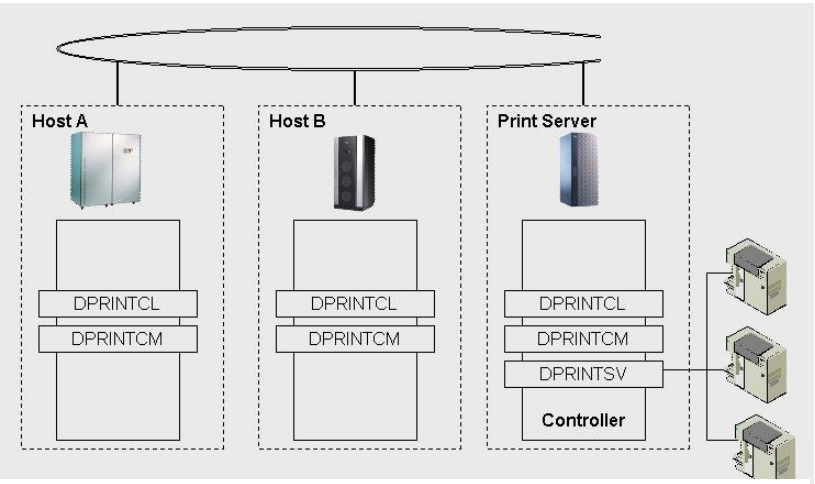

Figure 4: Central print server

High availability with a work and standby server

A printer can be switched from a host to another one. In usual configurations, this allows the printer to work successively for the different systems, and hence, applications of those systems. DPRINT as described in the preceding section provides the same possibilities without the necessity of switching a printer between hosts. However the switch-ability can be useful in the case of DPRINT to provide a very high print service availability.

Let's consider the following configuration: The printers can be switched to 2 different hosts, each one running the DPRINT server functionality. The physical printers have to be declared locally on each server, and declared twice in the DPRINT configuration (once for each Print Server system).

Of course, only one of the distributed printers is available at a time, since only one printer exists. There is however no problem in declaring both in the same distributed pool: DPRINT will never send a job to a host without active DPRINT server.

In this example, each printer is defined twice as distributed printer: once through Print Server X and once through Print Server Y. One or several distributed pools are available that contain both definitions of a given printer. The administrator starts the DPRINT server on the host that controls the printers. This does not prevent a DPRINT client to be started on the other host. By this way, the end-user does not need to know which Print Server is active. DPRINT will choose the right one in all cases.

What happens when the active server fails? In general, print jobs are already assigned to this server; some of them are even active. A DPRINT administrator intervention is necessary to transfer those jobs to the new currently active server. This is done by a single command allowing the transfer of the jobs satisfying a choice of selection parameters.

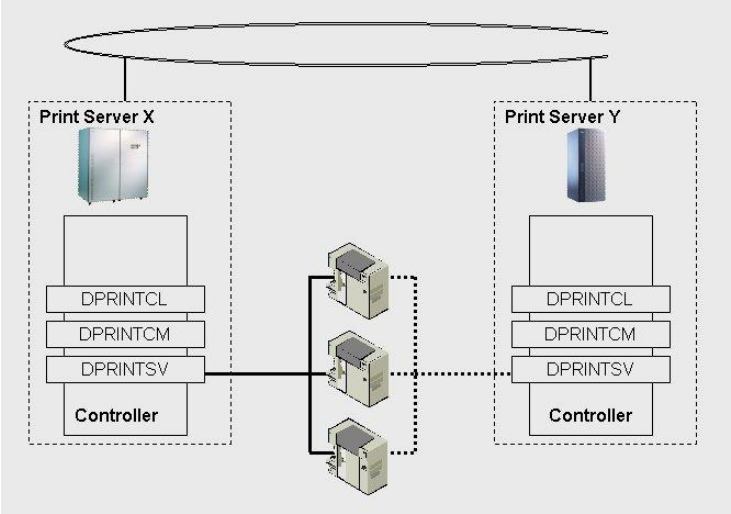

Figure 5: Work and standby server

It is very important to notice that this operation does not need any information from the failed server. Until the job completion, the complete information is kept on the client.

Windows-to-BS2000 printing

Wprint runs on Windows 95/98 and Windows NT and is able to submit print jobs to an external server via the bsd-lpd protocol. It is thus the ideal link between the MS/Windows world and the BS2000/OSD Print Services.

This feature is implemented in DPRINT and runs under POSIX. It consists of:

A Fujitsu Technology Solutions PageStream printer driver for Windows (integrated in Wprint or provided with DPRINT). It generates a device-independent data stream that will be handled later on by the gateway.

A “BSD/LPD” gateway on BS2000/OSD that resubmits the Wprint jobs to the BS2000/OSD Print Services.

A converter Fujitsu Technology Solutions PageStream / PCL, AFPDS, EXCCW or PDF (as of DPRINT V1.1).

All the RSO printers accessible from the Gateway, and all distributed printer pools are available from the Wprint client. This includes the AFP printers controlled by the Router.

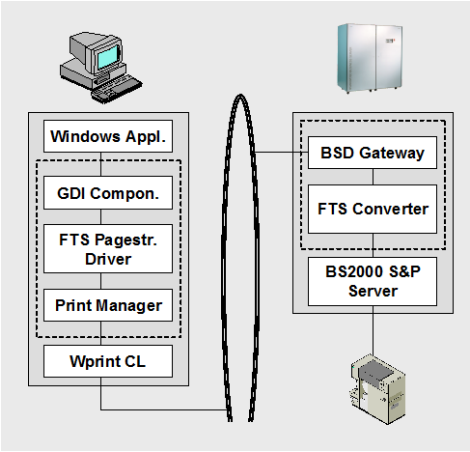

Figure 6: Dprint-Wprint coupling

Usage models

For the MS/Windows user, the Wprint/Dprint functionality is available in the "PRINT" interface of any product using the GDI interface. In particular, all MS/Office products, the Web browsers, Acrobat Reader, and so on.

In the printer names list, one or several items correspond to RSO printers or "Printer-Pool" name in a DPRINT cluster. The processing is the same as for using another printer.

A print job appears in the Window Spooler interfaces, until the job has been transferred to the host. At this time, the job can be followed up in the Wprint interface (quite similar to the interface of the Windows Spooler).

Available drivers

The driver to be used on the PC can be

an usual PCL or PostScript driver; the corresponding jobs must then be sent to corresponding RSO devices.

a Generic Text Driver (MS/Windows component) that ignores any document layout or image. This driver allows printing in line mode on any printer controlled by BS2000/OSD.

the Fujitsu Technology Solutions PageStream driver that produces a device-independent data stream that can be converted into AFP, PCL, EXCCW or PDF (as of DPRINT V1.1). In this case, all aspects of document layout and images are taken into account.

The Fujitsu Technology Solutions PageStream driver provides the widest possibilities. In the frame of DPRINT, the conversion into AFP, PCL or EXCCW is done in accordance with the specified printer pool.

Customer benefits

Wprint and Dprint build a seamless link between the MS/Windows world and the mainframe. For example, MS/Office documents can be printed on production printers, as easily as on a printer directly attached to the PC.

The Fujitsu Technology Solutions PageStream driver brings an additional flexibility.

UNIX-based system-to-BS2000 printing

Through a common protocol, Xprint and Dprint are able to exchange print jobs in both directions, to follow them up and to control them from the location where the job was created. An Xprint domain is seen from Dprint as an external Dprint cluster and vice versa.

The following usage models can be developed:

Concentrating the complete production printing on one or several BS2000/OSD servers

Giving access to all printers of the enterprise from any platform

Allowing printer-less servers by exporting the standard print jobs

Any combination of those models

In this example, all production printers are controlled by a unique BS2000/OSD host, allowing the optimal use of those devices. All jobs from any BS2000/OSD or Unix-based system host are treated by this server.

In the reverse way, the department printers controlled by the Unix-based systems are directly accessible from the BS2000/OSD hosts, allowing documents to be directly printed on the desired location.

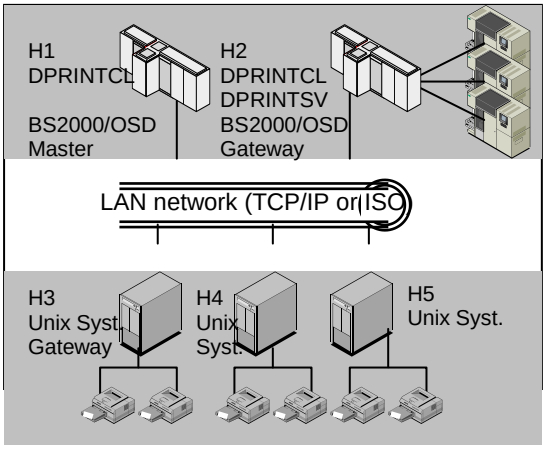

Figure 7: Dprint-Xprint coupling

DPRINT as bsd-lpd print server

DPRINT includes a bsd-lpd gateway. Any host supporting the corresponding client protocol is thus able to submit jobs to a DPRINT cluster, and control them. In the lp job submission, the device name must be a distributed Printer Pool. If such a pool does not exist, the destination is supposed to be an RSO device or pool.

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