

Output from Any Source To Any Destination

Executive Overview

Many organizations have discovered that, as they have grown, they have accumulated a mix of incompatible platforms—computing platforms, printing platforms, and networking protocols. They have found that data on some systems simply cannot be sent to the most appropriate printer or other output device because of those incompatibilities.

Finding a way around this output gridlock requires a global view of the organization's computing environment combined with an assessment of where information resides and where it needs to go. It requires asking, "Where does our output come from and where do we need to send it?" Searching for the answer to that question will help create an enterprise-wide output management strategy with the flexibility to accommodate unpredictable future technologies.

The Enterprise Output Management (EOM) strategy from Levi, Ray & Shoup, Inc. (LRS), focuses on software-based solutions that support industry standards. The strategy's goal is a system that enables your organization to direct output from any source to any destination.

Today's Environment

Today's typical corporate computing environment is a mix of OS/390 hosts, UNIX hosts, SNA, TCP/IP, LANs, PCs, and multiple types of printers, including hundreds or even thousands of PCL laser printers.

There are two ways to view this type of environment:

- A collection of different proprietary systems in which the hosts are connected by networks to specific printers
- A global system in which every networked printer has the potential to print output created by any source on the network

Taking the "collection of different systems" view leads to more of the same kind of thinking that created the mixed environment. That kind of thinking in turn leads to more proprietary systems, more networks and more printing schemes that are incompatible with each other.

Taking the "global system" view, on the other hand, prompts an intriguing question: "Where does our output come from and where do we need to send it?" Searching for an answer to that question can help you develop an overall strategy for making the parts of a computing environment work together across the enterprise, which can help you avoid the problems caused by implementing incompatible systems.

Develop a Strategy

Once you begin searching, you're on the way to developing a strategy for managing your output across your enterprise. You're beginning to formulate an Enterprise Output Management (EOM) strategy.

At LRS, we've been developing tools for managing output across the enterprise since 1981. During that time, we've worked with thousands of companies to help them direct output efficiently from its source to its best destination. Based on that experience, we think the best strategy for managing output is to move away from a collection of proprietary solutions and move toward a global system that incorporates standards.

The goal: A system that lets your organization direct output from any source to any destination.

Our core product, VPS (VTAM Printer Support), illustrates our philosophy of Enterprise Output Management. VPS runs on the OS/390 host (itself a standard) and, using a variety of extension products, routes host output to devices that would otherwise be completely incompatible with the host. A popular VPS extension, for example, sends host output directly to printers via TCP/IP, which has become the standard networking protocol in business today.

The OS/390 host plays a key role in our Enterprise Output Management philosophy. Why? Less than a decade after being dismissed as a dinosaur, the OS/390 host is now being viewed as the ultimate server in many organizations. After all, it offers stability, scalability, and security. If only because of its capacity for handling large volumes of work, the OS/390 host can be your *enterprise server*.

Enterprise Output Management Strategy

Using the host as your enterprise server is one of the four elements of our Enterprise Output Management strategy:

- *Use your OS/390 host as an enterprise-wide server*
It can be an integral part of the network just like any Windows NT, Novell, or any other LAN server, but the mainframe functions as an *enterprise server* because it can handle vastly larger volumes of work—and do it reliably.
- *Use the JES spool as your central point of control for all output*
The JES spool is simply the most stable and reliable spooler ever written. Using the JES spool as the central point of control for your output extends that reliability throughout the enterprise.
- *Implement standards: TCP/IP network protocol; PCL output data stream; Web browser-based viewing*
TCP/IP has become a standard protocol that is supported by most LAN operating systems as well as most printers. PCL is supported by practically every LAN printer. Web browsers have become standard software on desktop PCs. By taking advantage of these standards, you can minimize problems that are often caused by trying to route output across different platforms.
- *Choose software solutions over hardware*
Changes in software generally occur less frequently than changes in hardware, so software solutions mean less work to keep your system up to date. A centralized software solution,

especially one that resides on the OS/390 host, is easier to maintain and upgrade than a collection of hardware or software solutions distributed throughout your organization because you only have to maintain the software in one place.

Those four elements of effective output management obviously cast the OS/390 host in a new role: Enterprise Output Server.

How do you actually implement a strategy that transforms the OS/390 host into the Enterprise Output Server? The best course is to find an integrated suite of applications, like Enterprise Output Management products from LRS, which supports the key elements of the strategy.

Take another look at VPS and see how our products support the elements of an Enterprise Output Management strategy. VPS:

- directs output from the JES spool to the most appropriate device anywhere on the network, making the OS/390 host truly the Enterprise *Output* Server
- offers an interface for output monitoring and control
- offers extensions that can send output over TCP/IP, convert data streams to PCL, and deliver output to Web browsers or email addresses for desktop viewing
- provides software solutions in a centralized location, the OS/390 host

Critical Challenges

The elements of an effective Enterprise Output Management strategy provide you with the resources to address these four critical challenges:

Output Distribution

Data Stream Conversion

Monitoring and Control

Viewing and Archiving

Output Distribution

At one time, *output distribution* meant a CICS application initiated a session with an SNA printer and printed a report.

Although it worked well enough then, today it's simply not feasible for each application on each host to be responsible for sending output directly to all of the printers and other output devices in your enterprise. The challenge in implementing Enterprise Output Management today is breaking the connection between the application and the responsibility for delivering output.

The key? *Use the JES spool as your central point of control for all output.* Make sure output from all of your host-based applications can get to the JES spool. Once output is on the spool, JES takes over responsibility and the online application continues processing.

Output Capture

How can you get all output to the JES spool? Begin by *capturing* output using LRS' Dynamic Report System (DRS). DRS creates a virtual VTAM printer on the OS/390 host so CICS applications and others can print to it; that virtual printer simply takes the output and places it on the JES spool.

With its extensions, DRS can capture output from UNIX hosts, LAN applications, and legacy applications on your OS/390 host—including applications written in Software AG's Natural—and place it on the JES spool.

In addition, DRS enables legacy applications to print electronic forms without any application changes. The DRS Smart Tag Interface (DRS/STI), a component of DRS/TCPIP, reads a "smart tag" appended to the front of a print job and assigns necessary attributes from the DRS/STI database before sending the job to JES. Format, printer, and other attributes can be stored in the DRS/STI database and assigned to a print job via DRS/STI.

Sending Output from JES

Once output is captured and placed on the JES spool, VPS is the Enterprise Output Management tool for distributing it wherever it needs to go. Remember that intriguing question—"Where does our output come from and where do we need to send it?" Wherever you need to send output that's on the JES spool, VPS and its extension products can get it there.

VPS can send output directly to any VTAM-addressable device. It supports an unlimited number of output devices in a single address space and allows you to add devices without IPLs, JES definitions, or restarting VPS. Since scheduling a "window" of downtime is not required, VPS makes it easy to add resources whenever they are needed.

With several available extension products, VPS can route mainframe output almost anywhere. Consider the possibilities offered by just two of those extensions, VPS/TCPIP and VPS/Email:

- VPS/TCPIP allows you to send output to any location or device that is connected to the host via TCP/IP, which can help you migrate away from SNA. VPS/TCPIP routes reports from the JES spool directly to TCP/IP-connected printers equipped with network interface adapters that support TCP/IP. Its exclusive BIP (Bi-directional Internet Printing) support gives VPS/TCPIP SNA-equivalent control and error recovery. BIP support enables the VPS/TCPIP user to automatically restart printing after an error at the appropriate page in a print job; display printer status information on the OS/390 console; and stop printing a job and delete it from the JES spool simply by pressing the output device's CANCEL key.
- VPS/Email can send OS/390 line-mode reports as email attachments to any email address, so your organization can easily send reports to employees working in remote offices or spending most of their time on the road. VPS/Email enables your employees to read mainframe reports using Microsoft Word, Excel, their favorite Web browser, or Adobe Acrobat.

Along with its extensions, VPS offers flexibility unmatched by any other output management product. Over the years we've helped thousands of companies direct output efficiently from its source to its best destination using VPS. As we've helped our customers, we've added customization options so that today's VPS can be easily tailored to meet the needs encountered by nearly any company seeking to manage mainframe output.

VPS is the heart of a system that lets your organization direct output from any source to any destination.

Host-to-LAN Option

We strongly advocate using the JES spool as the point of control for all output, but we recognize that some organizations oppose the idea of sending output from distributed hosts to the OS/390 host. Many of these organizations need a way to route distributed host output directly to LAN queues.

The LRS option for directing output from distributed hosts to multiple LAN destinations is AnyQueue. Unique in its multithreaded design, AnyQueue can connect to multiple VPS systems via both SNA and TCP/IP as well as multiple distributed hosts via TCP/IP. AnyQueue supports an LPD connection, so it can receive output from virtually any host that can send an LPR command, including AS/400s, VM and VSE systems, UNIX systems, and any Windows-based systems that have LPR capabilities.

AnyQueue has the power to route output from those hosts to multiple LAN destinations such as files, email systems, print queues, and printers. The product can also hand off the report to extension products, such as AnyQueue/PageSorter, for additional processing based on report content.

AnyQueue/PageSorter can divide reports into smaller sections for individual users. It can also create multiple copies of a report for broadcasting to a distribution list. Once it completes its processing, AnyQueue/PageSorter can send the results back to AnyQueue for routing to multiple locations.

No matter how *output distribution* was defined yesterday, today it means getting output from any source on a network to any destination, whether it's a printer, some other output device, or some type of file on a LAN.

Data Stream Conversion

The Enterprise Output Management philosophy separates applications from responsibility for delivering output. If your applications aren't responsible for delivering output, they shouldn't be responsible for converting data streams either.

The topic of data stream conversion can encompass any number of translations, including EBCDIC to ASCII and SCS to PCL. At LRS, the most common conversion we hear about is AFP to PCL. That's not surprising, because both data streams are standards.

AFP has become the standard for incorporating text and graphics into host-generated documents; PCL is the standard language of common laser printers. Implementing AFP if you have a large number of PCL5-based laser printers presents a challenge; it appears to require the purchase of expensive IPDS printers or the installation of IPDS emulation cards in your existing laser printers to enable them to receive the AFP data stream. Choosing either of those options moves you toward proprietary hardware, though, and the Enterprise Output Management strategy encourages a centralized software solution.

VPS/PCL, a VPS extension product, is a centralized software solution to the AFP-PCL conversion challenge. VPS/PCL runs on the OS/390 host and converts host-based AFP resources

into PCL data streams that can be printed on PCL-compatible devices on any network. In other words, VPS/PCL is a centralized software solution that supports standards.

Many companies also have legacy applications on their mainframes that generate yet another data stream—XES. Since only XES printers can understand XES commands, how does this data stream fit in the Enterprise Output Management strategy? Our solution is to convert the XES data stream to AFP using VPS/XES to AFP and then use VPS/PCL to convert it to PCL. This two-step process works seamlessly because both steps use VPS extensions that run on the OS/390 host. Once parameters are defined, the XES-AFP-PCL conversion is completed automatically without operator intervention.

Monitoring and Control

Really managing output throughout the enterprise means tracking and controlling print jobs. Our VPS Monitor and Control Facility (VMCF) is a full-screen, menu-driven interface for monitoring all VPS-controlled output devices.

VMCF/TSO, VMCF/CICS, and VMCF/VTAM utilize a scrollable printer list to provide easy access to printer functions. Security is assured with external or built-in security features you can use to define what each user can control. Users can control a single printer, a group of printers, or all printers, depending on their authorization.

VMCF Client for Windows enables users to control VPS printers from any Windows workstation, without 3270 emulation hardware or software.

Viewing and Archiving

As you develop an EOM strategy for your organization, at some point you have to ask whether it makes sense to print any output on paper. After all, any strategy that favors software solutions over hardware should also favor electronic distribution of access to reports over physical distribution of printed paper reports. In many organizations, the reduction in paper cost alone justifies implementing an enterprise-wide online viewing solution.

Because the LRS Enterprise Output Management strategy favors standards over proprietary solutions, our viewing software supports standards such as the two most popular Web browsers as well as the World Wide Web itself. Web browsers have become a standard simply by being pre-installed on nearly every PC sold today. Implementing Web-based viewing of mainframe reports means you don't have to install proprietary viewing software on your PCs to reduce printing. What's more, Web access to mainframe reports provides the added benefit of increasing the payoff from your investment in Internet/intranet technologies.

PageCenter Web Access allows users to view host reports—AFP documents as well as line-mode reports—over the Web using a standard Web browser. It also addresses speed and security, two common concerns about Web viewing of mainframe data.

Speed is everything to users viewing reports. Users who have to wait to see a page display on their screens begin to miss the good old days of thumbing through thick piles of paper reports.

PageCenter runs on the OS/390 host, where it handles intensive routines such as text searches and paging up and down. The Web Access software runs on the Web server and interacts with

PageCenter on the mainframe. When a user goes to the next page or selects a specific page of a report, PageCenter transmits just a page or small group of pages to the Web server instead of sending the entire report. For the end user, each page appears quickly, even over dialup Web access.

Since PageCenter stores AFP print resources in an archive separate from the data, we can cache common resources at the Web server and download only the data for each document from PageCenter on the host. That enables PageCenter to display the first page of an AFP document almost instantaneously and allow users to page through a document quickly, even if they go directly from the first page to the last page.

Security is a concern whenever the topic is Web access to mainframe data. PageCenter handles security on the mainframe, offering its own security facility as well as an interface to external mainframe-based security applications. With PageCenter, organizations can make sure their host-based reports are viewable only by users who should see the data.

LAN-based Viewing

Our years of work with our customers tells us that departments and work groups often have a specialized need for information that can best be met with a LAN-based viewing solution.

The LRS solution for LAN-based viewing and archiving, PageCenter Plus, runs on a LAN server and automatically receives and processes reports sent from VPS on the host. PageCenter Plus processes the reports and makes them available immediately to authorized users on the LAN.

Along with report viewing, PageCenter Plus enables users to search for, analyze, and extract specific views of report data. Users can create summary reports with PageCenter Plus and selectively print, fax, or email the information. PageCenter Plus can also export information to other PC applications like spreadsheets and databases for additional analysis.

Conclusion

If your computing environment has the typical mix of platforms, your organization is probably dealing with problems that were caused by the limitations of computing, networking, and printing technology implemented in the past. In many cases, software and hardware implemented to fix specific problems were later found to be incompatible with technologies that evolved over time.

Although technology will continue to change in ways we can't predict, an effective Enterprise Output Management strategy that accounts for global—that is, enterprise-wide—concerns will help you maintain flexibility so you can accommodate new technology in the future.

At LRS, we believe the best way to develop and implement an effective Enterprise Output Management strategy is to implement a software suite that uses the OS/390 host as your Enterprise Output Server and supports standards. Our family of products, including DRS to place output on the JES spool and VPS to send output from the JES spool to a variety of output devices, is designed to help you reach a key goal: A system that lets your organization direct output from any source to any destination.

About LRS

Levi, Ray & Shoup, Inc., is the industry leader in Enterprise Output Management products—our software runs on more than 5,000 mainframes worldwide. Founded in 1979 as a computer software consulting firm with a staff of three, LRS is now an information technology firm of 500 employees offering a variety of products and services. We developed the first software that enabled the mainframe to distribute output to printers outside the data center, and today our Enterprise Output Management family of software products provides output distribution, data stream conversion, monitoring/control, and viewing/archiving throughout an enterprise.

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LRS Products

VPS—VPS streamlines printing in the OS/390 environment by efficiently sending output from the JES2/JES3 spool to the most appropriate printer or output device. Printers can be quickly and easily added to the VPS system without the need for IPLs, JES definitions, or re-starting the VPS system.

VPS/TCPIP—VPS/TCPIP takes output from the JES spool and dynamically sends it directly to an IP printer with a network interface adapter that supports TCP/IP. PJI-based BIP (Bi-directional Internet Printing) support provides SNA-equivalent control and page-level error recovery capability.

VPS/PCL—VPS/PCL is a VPS AFP extension product that enables you to send AFP output to your PCL5 compatible printers, without the need for expensive IPDS data stream conversion cards or other cumbersome solutions.

VPS/Secure™—VPS/Secure retrieves output from the JES spool, encrypts it, and routes it via TCP/IP to a printer equipped with the necessary decryption hardware, AnyQueue/Secure, or DRS/Secure. VPS/Secure enables the user to specify the decryption key and key length.

VPS/XES to AFP—VPS/XES to AFP converts documents containing Xerox 3700, 2700, and 404x escape sequences into standard AFP documents which can be printed on standard laser printers using VPS/PCL or archived and viewed using VPS PageCenter or PageCenter Plus. The combination of VPS/XES to AFP and VPS/PCL enables XES documents to be printed on existing or new devices without installing conversion hardware or re-writing existing applications.

VPS/LCDS—VPS/LCDS routes LCDS print jobs directly from the JES spool on the OS/390 host to Xerox or Xerox-emulated printers and servers over TCP/IP networks. No changes to mainframe applications are necessary; no SNA hardware is necessary for mainframe-to-printer communication. VPS/LCDS maintains the integrity of LCDS output, ensuring print jobs arrive at the printer with LCDS commands intact.

VPS/Email—VPS/Email routes print datasets from the JES spool to email addresses using Simple Mail Transfer Protocol (SMTP) and the TCP/IP network. VPS/Email can send short line-mode reports as text in an email message and longer reports as PDF, HTML, or RTF email attachments. End users can receive host output wherever they can get email messages, view output online and print pages locally as needed.

VMCF—VPS Monitor and Control Facility (VMCF) is a single point of control for network printing, giving you the ability to monitor all VPS-controlled output devices and fix any problems that occur. CICS, TSO, and VTAM versions are available.

VMCF Client for Windows—The Windows client takes full advantage of the Windows interface, enabling users to control VPS printers from any Windows workstation, without 3270 emulation hardware or software.

VPS/Report Browse—VPS Report Browse provides a secure and convenient method for quickly viewing output on the JES spool, utilizing VMCF or VMCF Client for Windows.

AnyQueue—Running on a single server with links to VPS on the OS/390 mainframe, along with links to UNIX or other host platforms, AnyQueue can send output from multiple hosts to multiple LAN destinations such as files, email systems, print queues, and printers. AnyQueue can also direct the report to extension products such as AnyQueue/PageSorter for additional processing.

AnyQueue/PageSorter—AnyQueue/PageSorter can divide reports into smaller sections for individual users. It can also create multiple copies of a report for broadcasting to a distribution list. Once it completes processing, AnyQueue/PageSorter can send the results back to AnyQueue for routing to multiple locations.

AnyQueue/WebTRAC—AnyQueue/WebTRAC adds a short-term repository where AnyQueue can store output for a user-specified interval. Print jobs in the repository can be routed, printed and viewed by authorized users with a standard web browser.

AnyQueue/Secure —AnyQueue/Secure decrypts output received from VPS/Secure via TCP/IP before routing that output to the appropriate LAN destination. The combination of VPS/Secure and AnyQueue/Secure maintains host-to-LAN security without installing decryption hardware on every network printer. AnyQueue/Secure can also encrypt print jobs and route them to a printer equipped with the necessary decryption hardware or DRS/Secure on an OS/390 host.

AnyQueue/Text to PDF—AnyQueue/Text to PDF automatically converts text output to Portable Document Format (PDF) files, compresses the result by 50 to 60 percent, and passes the files to AnyQueue for routing to various LAN destinations. Keywords for PDF processing enable the operator to specify fonts, page sizes, and such document information as Title, Subject, and Author.

PageCenter Plus—A LAN-based solution that provides departments or remote offices with an archive of reports, PageCenter Plus gives PC users desktop access to host-generated line reports and AFP documents. Robust data analysis features enable users to search for, analyze, and extract specific views of report data. PageCenter Plus lets users create summary reports and then selectively print or forward information to others. Users can also export PageCenter Plus data to other PC applications like spreadsheets and databases for additional analysis. Note that PageCenter Plus is not a VPS extension product.

PageCenter—PageCenter provides dynamic viewing and printing of OS/390 host reports anywhere in the enterprise. PageCenter receives information directly from VPS, eliminating the need to schedule batch jobs to process and import reports into the archive. Using a variety of client interfaces, users view documents electronically and, if necessary, print only the pages they need.

PageCenter Web Access—PageCenter Web Access allows users to access and view reports in the PageCenter archive using either Microsoft or Netscape Web browsers.

DRS—DRS lets you dynamically send output created by your online applications to the JES spool. From the JES spool, VPS can direct print jobs to any printer in your enterprise-wide network, including TCP/IP printers, VTAM printers, and LAN printers.

DRS/TCPIP—DRS/TCPIP receives print files from remote TCP/IP hosts and places those print files on the JES spool. A DRS/TCPIP component, DRS/STI, assigns form and printer information to print jobs as they are allocated to the JES spool. DRS/STI can minimize the number of DRS virtual printer definitions needed on the mainframe and merge line-mode output with AFP resources to create attractive, easy-to-read reports.

DRS/Secure™ —DRS/Secure runs on the OS/390 mainframe, where it receives and decrypts encrypted output sent via TCP/IP from VPS/Secure or AnyQueue/Secure and writes the output to the JES spool.

DRS/Natural—Created in conjunction with Software AG, DRS/Natural enables Natural applications to write output directly to the JES spool without changing existing Natural applications. Once the output is on the JES spool, VPS and its extensions can route it anywhere it needs to go on the enterprise network.

DRS/OutputManager™—DRS/OutputManager offers SAP Certified Integration by working with the SAP R/3 BC-XOM interface to route SAP-generated reports to the JES spool. VPS and its extension products can route the reports from the JES spool to the most appropriate output device. SAP R/3 users continue to monitor the status of their reports using the SAP R/3 graphical interface they know.