



*Levi, Ray & Shoup, Inc.*

ENTERPRISE OUTPUT MANAGEMENT

WHITE PAPER

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***FOCUS ON:  
APPLICATION OUTPUT  
MODERNIZATION***

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## EXECUTIVE SUMMARY

In most large organizations, enterprise applications provide the data processing functions that support core business processes. Industry analysts estimate that there are between 100 and 200 billion lines of COBOL code running in active applications. COBOL, CICS, and other legacy programs support an estimated 70 percent of all business transactions.

Faced with ever-changing business and technology environments, organizations are looking to modernize their enterprise applications and the business-critical documents they create. This report will outline the needs, challenges, and benefits of application and output modernization projects.

## MODERNIZATION NEEDS, BENEFITS, AND CHALLENGES

For decades, the largest organizations in the world have relied on their enterprise applications for the majority of their information processing needs. Running on mainframe, UNIX, or a variety of other hardware platforms, these workhorse systems have been custom-tailored over time to support the specific requirements of businesses and their customers. Individual applications can streamline core business processes; taken together, they can give organizations a decisive edge over the competition.

The benefits of these systems come at a price, however. For example, the more a given application takes advantage of hardware- or OS-specific features and facilities, the more difficult future migration becomes. In addition, the aging workers that created and supported these proven systems are beginning to enter retirement. Faced with a shortage of staff with legacy coding skills, many enterprises are looking to leverage younger workers' experience with other hardware platforms and languages.

As a result, executives and IT managers are faced with a variety of unattractive options:

- Continue running the existing systems on what are perceived to be expensive, obsolete, or non-strategic computing platforms
- Assume the time and monetary costs of custom-developing replacement systems on new, less expensive platforms
- Replace legacy systems with packaged applications that support the new platform and/or technology, in hopes that the cost savings will outweigh the training expenses and functionality loss vis-à-vis the legacy system
- Utilize modernization tools to re-host existing legacy applications on more cost-effective hardware platforms

The same issues apply when it comes to legacy printing and document archiving subsystems. Many documents used in a company's everyday operations are custom-tailored to meet specific business, legal, and/or regulatory requirements. In some instances, these valuable documents—and the systems that generated them—were originally state-of-the-art but were never updated to leverage more modern technologies. In other cases, a patchwork of documents and systems may have been implemented in reaction to individual needs, not as a part of a strategic effort.

The result of this tactical “*ready-fire-aim*” approach is a proliferation of data streams, device types, and hardware standards. In some cases, legacy systems required complex custom application code in order to insert special page formatting or data based on the document contents. This often involved adding special commands (e.g., printer escape sequences) into the data that could only be interpreted by a specific mainframe production printer or specialty output device.

Such environments present a variety of challenges for application modernization efforts. Firstly, the logic required to scan report data and customize document contents is typically quite complex. This is especially true for legacy applications that did not take advantage of Advanced Function Presentation (AFP) or other document composition technologies.

Perhaps more importantly, application modernization projects are often part of a larger platform migration effort. Output devices that were commonplace in the legacy environment (for example, high-volume Xerox or AFP mainframe printers) may not exist in the new environment. As a result, document formatting that was simple in the past may present a great challenge for modernization teams.

## THE GOLDEN RULES OF SYSTEM MODERNIZATION

A system modernization team, like any group of IT professionals, proceeds in accordance with best practices and time-tested techniques. Yet several pieces of advice from outside the world of computing can help teams achieve successes beyond their immediate project objectives.

### ***First, do no harm...***

There are two main reasons why an organization would choose to modernize an existing application instead of replace it with a packaged solution. First and foremost, the current system likely provides unique functions or benefits that are not available in packaged systems. In addition, one advantage of an existing system is that the organization’s employees, customers, and other stakeholders already know how to use it. The more similar a new system is to the one it replaces, the shorter the users’ learning curve will be.

Just as a doctor would not attempt to heal a broken wrist by removing a patient’s arm, modernization teams must ensure that a new system does not sacrifice important business functionality present in the existing system. Regarding document generation, management, and delivery, the new system should be able to produce and securely deliver all documents that are needed in critical business processes or which are required for regulatory compliance.

As previously discussed, one cannot expect a modernized system to perform every function in exactly the same manner as a legacy system. For example, an insurance agent may find that a customer quote letter formerly generated on a mainframe printer now arrives as a color PDF-formatted email attachment. Although the process is slightly different, the business need is the same, the information is the same, and the content is the same. As long as the agent has the ability to print the letter on an alternate device or send it to their customer electronically, the core business requirement can still be fulfilled.

### ***Learn from past lessons***

In the end, there is one basic reason why system modernization is necessary: application code designed for the original platform or operating system generally will not run natively in other environments. Said differently, if yesterday's applications had been written with portability in mind (following POSIX standards, for example), there would be less need to modernize them today.

But modernization projects are not just a necessary evil. In fact, they represent great opportunities to gradually increase the portability and sustainability of systems going forward. By moving away from proprietary or platform-specific technologies and embracing open standards, companies can dramatically improve both system longevity and flexibility.

When it comes to enterprise documents, there are a multitude of proprietary technology hurdles to overcome. For example, legacy applications may have been hard-coded to produce output for a specific printer, fax server, or other output device. Very old systems may rely on special pre-printed stock in order to correctly print documents. Mainframe systems in particular were often designed to send print data over IBM's proprietary VTAM (SNA) protocol instead of today's more widely-accepted TCP/IP standard.

Any output management system deployed in the course of a modernization effort should:

- Be able to run on a variety of hardware platforms and operating systems
- Provide modular conversion from nearly any incoming data stream to any target format for delivery to printers, electronic archives, email systems, etc.
- Support electronic document formatting to eliminate the need for pre-printed forms
- Enable electronic document viewing and storage to replace legacy archives
- Relieve business applications of the burden of directly managing printers and electronic document delivery

In short, modernization projects offer a rare chance to “undo” past decisions that often hampered an organization's ability to face new business and financial realities. Those who cannot learn from history are doomed to repeat it.

### ***Seize the day***

Modernization projects offer a chance to both correct past shortsightedness and to expand functionality for the future. Though major system enhancements are often outside the scope of an application modernization effort, planners should be prepared to exploit any and all “free” opportunities to improve their systems.

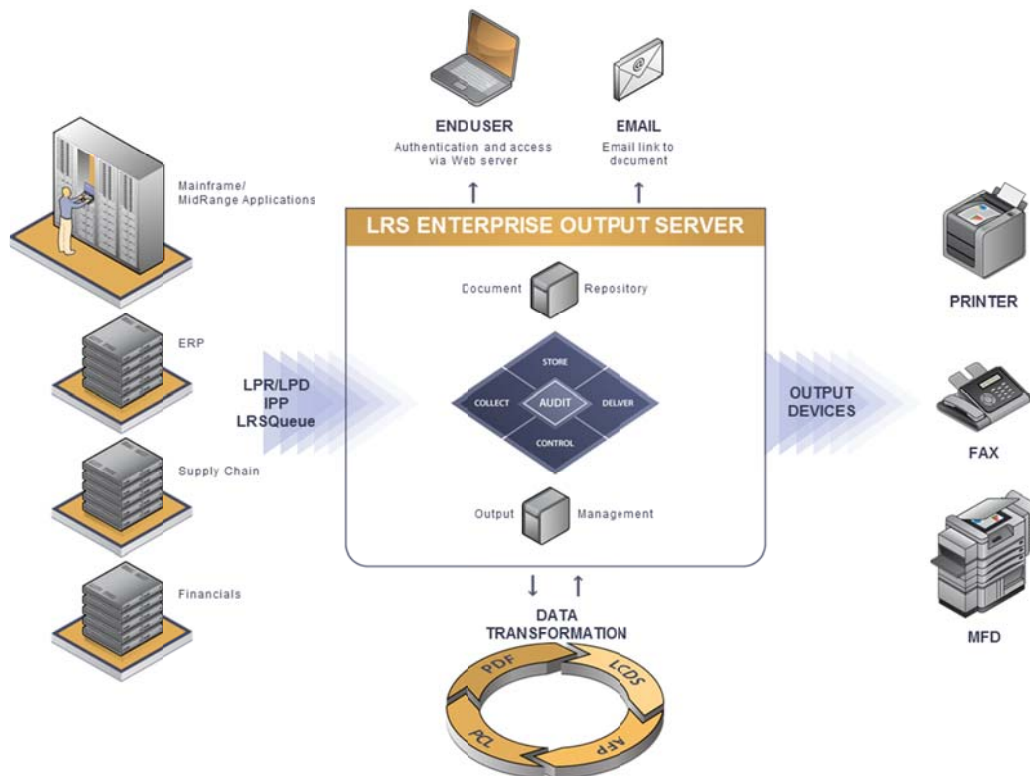
For example, organizations that include output management in their modernization plans can receive an unexpected windfall in the form of greatly increased delivery options. Unlike the purpose-built systems they replace, modern output management systems typically support email delivery, PDF document conversion, web document viewing, and other modern technologies. These options enable a modernization team to preserve and even extend the capabilities of proven legacy systems — with little or no additional effort.

## LRS<sup>®</sup> OUTPUT SERVER COMPONENTS AND CAPABILITIES

To appreciate the role of an output management server in a system modernization effort, it is important to understand the basic functions and construction of the solution. The LRS<sup>®</sup> Enterprise Output Server solution is designed to provide all applications — whether modernized, packaged, or scratch-built — with a robust central point of control for all system-generated output.

### ***Output Collection, Delivery, and Control***

LRS software provides a complete output management solution for enterprise applications. Its highly scalable architecture is designed to accommodate all POSIX-compliant environments ranging from single-department solutions to multi-server global systems. All elements of the product suite implement a single-process/multi-threaded design to ensure efficient use of system resources and enable LRS solutions to handle a very large number of input sources, output destinations, and end users as efficiently as possible.



*Figure 1 - LRS Enterprise Output Server Components*

## Output Collection

Application modernization environments can involve numerous applications developed using different technologies. The LRS solution provides multiple techniques for data collection and capture. At the most basic level is support for the LPR/LPD protocol, which enables applications to pass a limited amount of job information via the LPR control file. More advanced interfaces include the LRSQueue protocol, a JAVA J2EE IPP client, Windows IPP, Windows COM, and the LRS Port Monitor. LRS has also developed integration components with a variety of vendors specializing in tools to run COBOL applications on Windows and open systems platforms.

These methods are fast and reliable. No matter which technique is used to collect or capture print jobs, LRS software is able to dynamically determine print job attributes from the actual print data. In addition to the data stream format (PDF, PostScript, PCL5, PCL6, ZPL, AFP, LCDS, JPEG, TIFF, etc.), the software determines the page size, total number of pages, the presence of color and whether the document is printing duplex or simplex. These job attributes can be used to determine how the print request is processed.

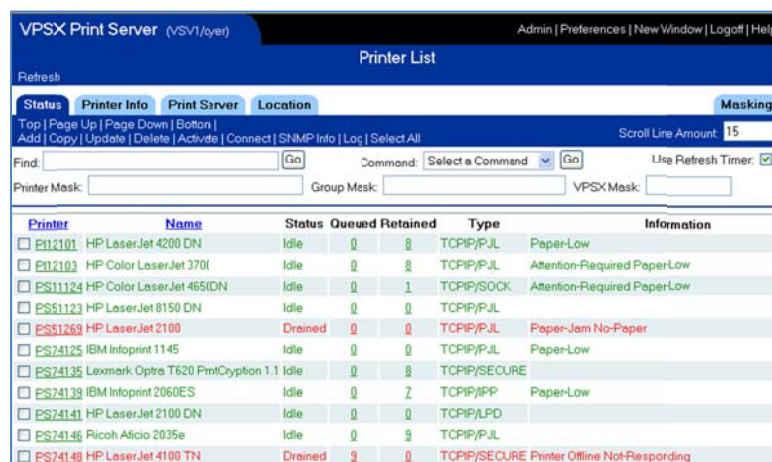
## Output Delivery

The LRS solution can deliver print data via various protocols to remote printers, high-capacity print devices and servers. Printing transmission methods range from the basic LPR protocol to more advanced protocols like Direct Sockets, Internet Print Protocol (IPP), and BIP/PJL. These advanced options provide improved performance and enhanced communication between the LRS server and the remote device. The BIP/PJL option provides guaranteed document delivery and enhanced error reporting/recovery.

In addition to delivering output to printers, the LRS server also enables output to be sent via email, viewed via a web browser interface, or converted to PDF file form.

## Administrator Control and User Access

The interface for users and administrators is a web-based tool requiring no software to be installed at remote workstations. It works with any browser and is designed for both simplicity and flexibility. Companies are able to customize the interface to reflect corporate branding, etc. Users can select various ‘tabs’ to view more detailed information.



Printer	Name	Status	Queued	Retained	Type	Information
<input type="checkbox"/>	PS12101 HP LaserJet 4200 DN	Idle	0	0	TCPIP/PJL	Paper-Low
<input type="checkbox"/>	PS12103 HP Color LaserJet 370i	Idle	0	0	TCPIP/PJL	Attention-Required PaperLow
<input type="checkbox"/>	PS11124 HP Color LaserJet 465IDN	Idle	0	1	TCPIP/SOCK	Attention-Required PaperLow
<input type="checkbox"/>	PS51123 HP LaserJet 8150 DN	Idle	0	0	TCPIP/PJL	
<input type="checkbox"/>	ES51268 HP LaserJet 2100	Drained	0	0	TCPIP/PJL	Paper-Jam No-Paper
<input type="checkbox"/>	ES74125 IBM Infoprint 1145	Idle	0	0	TCPIP/PJL	Paper-Low
<input type="checkbox"/>	PS74135 Lexmark Optra T620 PmtCryption 1.1	Idle	0	0	TCPIP/SECURE	
<input type="checkbox"/>	ES74139 IBM Infoprint 2060ES	Idle	0	2	TCPIP/IPP	Paper-Low
<input type="checkbox"/>	PS74141 HP LaserJet 2100 DN	Idle	0	0	TCPIP/LPD	
<input type="checkbox"/>	PS74146 Ricoh Aficio 2035e	Idle	0	0	TCPIP/PJL	
<input type="checkbox"/>	ES74148 HP LaserJet 4100 TN	Drained	0	0	TCPIP/SECURE	Printer Offline Not-Responding

Figure 2 – The management interface gives administrators web-based control over all output



## Data Stream Conversions

One major hurdle in any modernization effort is the challenge of printing or viewing system-generated output when legacy hardware no longer exists in the new environment. To avoid this problem, the LRS Enterprise Output Server invokes data stream conversion modules that transform legacy output formats to almost all popular modern formats. Table 1 outlines some of the typical conversions used by the LRS solution during the course of modernization projects. However, additional data stream conversions can be implemented when required to meet the needs of a specific project.

		<i>Target Data Streams (“to”)</i>				
		PCL	PostScript	TIFF	PDF	AFP
Legacy Data Streams (“from”)	Conversions					
	AFP	X	X	X	X	
	Mixed-mode data	X	X		X	
	LCDS (Xerox)	X	X		X	X
	PCL			X	X	X
	PDF	X	X		X	X
Image File Format	X	X		X	X	

*Table 1 – Select data stream conversions used during system modernization projects*

Flexible data stream conversion support eliminates the need to re-write legacy application code, even when the original devices are unsupported on the modernized platform. For example, mainframe applications may have been designed to generate LCDS, Metacode, or AFP formatted documents and transmit them to a high-volume printer via a Bus/Tag interface. The LRS solution enables this same application code to send these documents to standard TCP/IP devices. This ability to seamlessly convert data streams helps LRS Enterprise Output Server software preserve a company’s investments in proven legacy applications and the documents they create.

## Document Storage and Viewing

One of the biggest challenges when modernizing legacy environments is providing access to data stored in legacy archives. Documents stored in mainframe-based archival systems often become inaccessible once the legacy hardware is removed – a major problem for organizations that are legally required to retain electronic copies for five or more years.

The document viewing component of the LRS Enterprise Output Server provides web-based viewing of documents from a variety of legacy platforms. Powerful search functions enable users to quickly find the exact document needed to answer a customer question or comply with an auditor’s inquiry.

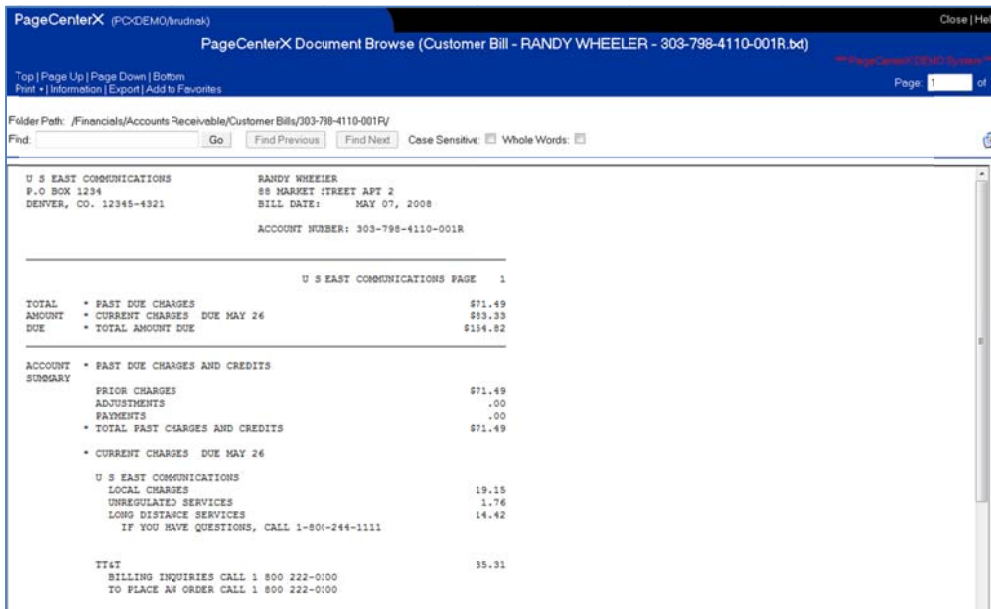


Figure 3 – Web-based document viewing interface

Depending on user and document security settings, users can print to any LRS-managed device, annotate, and export archived documents as well as forward an electronic copy via email. Many functions of the LRS Enterprise Output Server can be integrated directly into corporate portals or other systems in the modernized environment.

As explained earlier, the LRS Enterprise Output Server can seamlessly transform legacy data streams into formats that can be printed on modern devices. This same capability is useful in converting legacy archive data into PDF, text, or image formats for viewing and storing documents in the LRS solution.

## THE SUM OF THE PARTS

The LRS Enterprise Output Server is designed to form a scalable central point of control that supports a wide variety of network protocols, data streams, and hardware platforms. Since modernization projects aim to bridge the gap between legacy technologies and emerging ones, the importance of this flexibility cannot be overstated. The open standards-based approach of the LRS solution protects customers' current IT investments from becoming obsolete as future technologies emerge — thus reducing and delaying the need to modernize the same system in the future.

Just as the print management and document viewing interfaces involve multiple components, they are likewise individual elements of the larger LRS offering. The print management component provides assured document delivery while the viewing component helps companies avoid hardcopy-related costs.

Rounding out the LRS offering is the output auditing functionality of the Enterprise Output Server solution. Designed to provide detailed tracking of hardcopy and electronic document use, this powerful module generates a variety of reports that help decision-makers identify security risks and uncover opportunities for savings. This is of particular importance during application modernization and other major IT initiatives.

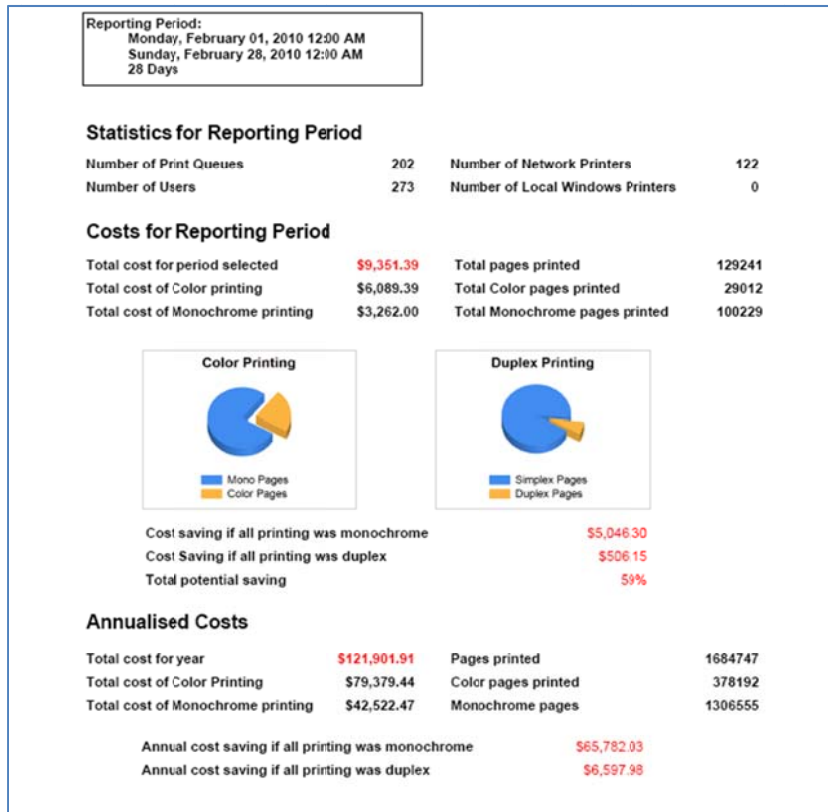


Figure 4 - Output Auditing report from the LRS Enterprise Output Server

## CONCLUSION

In today's business environment, IT managers are often asked to choose between their time-tested legacy systems and the promise of newer, more cost-effective technology platforms. By modernizing their existing applications — and the documents they create — companies are able to have the best of both worlds.

Application modernization projects give organizations the opportunity to dramatically improve both the quality and cost-effectiveness of their document systems. LRS has developed customized interfaces to help customers more quickly migrate their legacy system output to the Enterprise Output Server. This standards-based solution provides a scalable, platform-independent central point of control for all of an organization's business critical output.

