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E/Z MAS: AN EASY-TO-USE COMPUTERIZED MATERIALS CONTROL AND ACCOUNTABILITY SYSTEM*

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Abstract

Nuclear facilities that handle and process nuclear materials are required to track their nuclear holdings and to keep adequate records that manage and control the inventory of those holdings. The complexity of a system that does this job is directly proportional to the complexity of the facility's operations. This paper describes an approach to computerized materials protection, control, and accountability (MPC&A) that was introduced by Los Alamos National Laboratory (LANL) in the fall of 1997. This new system, E/Z MAS, is the latest addition to the LANL suite of computerized MPC&A tools, which also includes the CoreMAS system. E/Z MAS was initially designed to address the needs of those facilities that have small to modest MPC&A needs but has been expanded to provide full functionality for any facility. The system name, E/Z MAS, reflects the system's easy-to-use characteristics, which include ease of installation and ease of software maintenance. Both CoreMAS and E/Z MAS have been provided to facilities in the Former Soviet Union to assist them in implementing a computerized MPC&A system that meets their needs. In this paper we will address the functionality of CoreMAS and E/Z MAS, and an argument in favor of intranet-based material control and accountability will be advanced.

Background

This section contains the background information on the MPC&A systems developed at LANL and available to facilities in the Former Soviet Union (FSU).

CoreMAS. Several years ago, LANL developed a prototype computerized MPC&A system. The prototype system has been enhanced and improved and today exists as the CoreMAS computerized MPC&A system. CoreMAS is a network-based nuclear material accountability system that operates in a client/server mode, utilizing a local area network (LAN). The database resides on the server, while the user interface runs on the client. The client accesses the server via a network connection. CoreMAS has been made available to many facilities within the FSU and may be used as is or as the foundation for building the required MPC&A functionality. CoreMAS is specifically designed as a core application that can be customized by an individual site to meet its user interface and functional operations requirements.

E/Z MAS. The original requirements of the CoreMAS system resulted in a fully functional and robust MPC&A software system that addressed the needs of a medium-to-large nuclear facility. In 1997, utilizing new World Wide Web technologies not available when CoreMAS was developed, a streamlined, easy to install, enhance, and maintain product called E/Z MAS was developed. E/Z MAS is a Web-based, computerized MPC&A system that is unencumbered by excess functionality and complexity that may not be necessary for every facility. E/Z MAS can be run on a network or a single stand-alone computer.

CoreMAS: Client/Server LAN-Based Material Accounting

Core Material Accountability System (CoreMAS) software provides the framework for a materials accountability system. This core software was developed using commercial software whenever possible. The database management system is implemented with Microsoft SQL Server. All of the database tables reside on the server, as do the stored procedures for retrieving and modifying data. The client software is written in Microsoft Visual Basic, which provides a rapid user-interface screen-development tool. For accessing the database, clients are networked to the server by an Ethernet or telephone connection. Either connection provides the familiar Windows environment through which authorized users can easily update and query material accountability data.

CoreMAS was designed to run on computers that run the Microsoft Windows NT operating system, which provides the security features required in a nuclear materials accountability system. The core software includes universal functionality needed by all potential user sites. Individual sites can extend the software to provide site-specific functionality, thereby producing a site-specific computerized accountability system. Example screens are provided in

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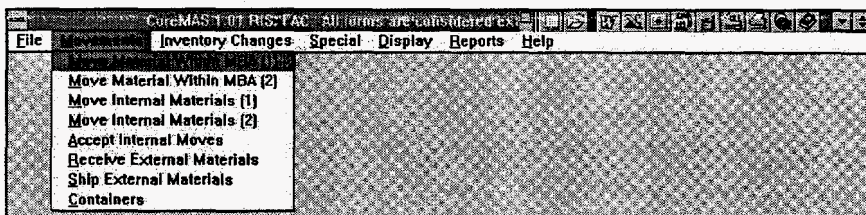
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the core software, and users may choose to use them or to create custom screens that more fully suit their needs. The final product is a custom system composed of core software and site-specific software.

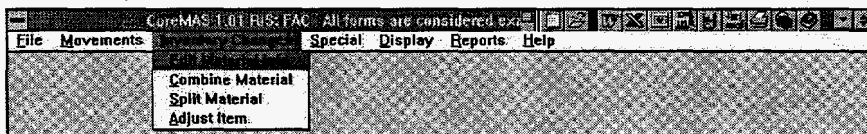
When logging in to CoreMAS, the user first sees the main CoreMAS screen, which shows the menu choices. These include *File*, *Movements*, *Inventory Changes*, *Special*, *Display*, *Reports*, and *Help* menus. The submenus and their functions are discussed below.

Movements Menu Options



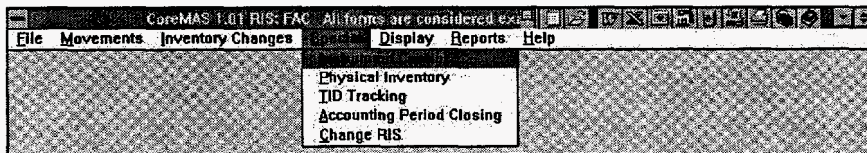
- Move Material Within MBA:** Enables the user to record movement of material within a material balance area (MBA), with the capability of searching for materials and containers by name or location.
- Move Internal Materials:** Enables the user to initiate movement of materials from one MBA to another within the same facility.
- Accept Internal Moves:** Enables the user to accept movement of materials into one MBA from another MBA within the facility.
- Receive External Materials:** Enables the user to record the receipt of materials into the facility from outside.
- Ship External Materials:** Enables the user to record shipment of materials from the facility to outside.
- Containers:** Enables the user to containerize materials and report container contents.

Inventory Changes Menu Options



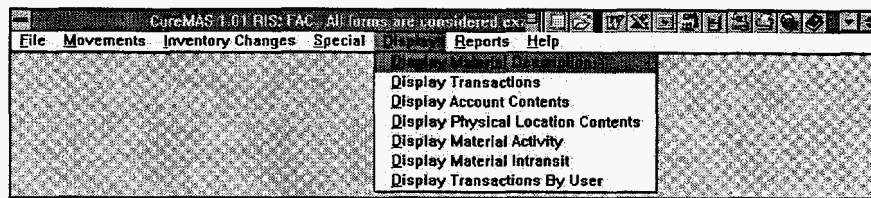
- Edit Material Info:** Enables the user to add, edit, or delete materials (elements and/or isotopes) or containers.
- Combine Material:** Enables the user to record information on combining materials.
- Split Material:** Enables the user to record information on splitting materials.
- Adjust Item:** Enables the user to enter material adjustments.

Special Menu Options



- Instrument Control:** Enables the user to enter information on instrument calibration status.
- Physical Inventory:** Enables the user to record information on physical inventories.
- TID Tracking:** Enables the user to enter information on tamper-indicating devices (TIDs) and to report on their status.
- Accounting Period Closing:** Enables the user to close an accounting period.
- Change RIS:** Enables the user to change the current reporting identification symbol (RIS) to which transactions are being applied.

Display Menu Options



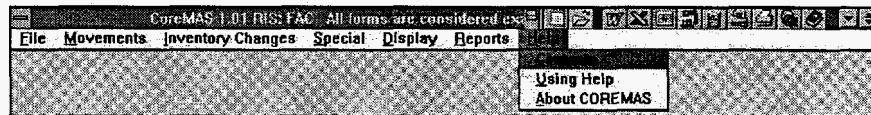
- Display Material Description:** Enables the user to view material descriptions.
- Display Transactions:** Enables the user to view all transactions during a user-specified time period and to “zoom in” on the material detail involved in a transaction.
- Display Account Contents:** Enables the user to view containers and materials in a user-specified account.
- Display Physical Location:** Enables the user to view containers and materials in a user-specified contents location.
- Display Material Activity:** Enables the user to view the transactions associated with a specified material.
- Display Material Intransit:** Enables the user to view materials that are in transit.
- Display Transactions By User:** Enables the user to view all transactions recorded by a specified individual.

Reports Menu Options



- Standard Queries:** This menu selection provides a form for individual sites to execute reports developed for their needs.

Help Menu Options



- Contents:** Enables the user to view the contents of CoreMAS Help.
- Using Help:** Provides tips on using CoreMAS Help and Help systems in the Microsoft Windows environment.
- About CoreMAS:** Provides developer information for CoreMAS.

E/Z MAS: Intranet-Based Material Accounting

The evolution from localized to distributed computing lies behind the transition from CoreMAS to E/Z MAS at LANL. Development of CoreMAS is complete. The sites that have already implemented CoreMAS will continue to be supported, however it is recommended that sites that are evaluating MPC&A systems for their facility choose E/Z MAS as their basic computerized MPC&A tool. Time already invested in evaluating CoreMAS will facilitate the implementation of E/Z MAS. The Web-based E/Z MAS exists now in two flavors.

- E/Z MAS that uses Microsoft Access for the database, and
- E/Z MAS Pro that uses SQLServer.

E/Z MAS will soon have all the functionality of CoreMAS, supplemented by additional advantages. Specifically, it is available with a Russian interface; it can generate reports proposed by the Russian Federal System; it offers two-person logins; it has a modern, familiar Web-based look and feel; no installation is required for the clients; no commercial packages are needed other than Windows NT Server and Microsoft Access or SQLServer. Overall, it is a smaller, more refined system, which is much easier for the software team at the implementing site to learn. Table 1 shows a comparison of the functions of CoreMAS and E/Z MAS. Figure 1 shows the E/Z MAS home page in English and Figure 2 shows it in Russian.

Table 1. The Functions of CoreMAS and E/Z MAS Computerized MPC&A Systems

User Functions	CoreMAS	E/Z MAS	E/Z MAS future version
Receive external shipments/materials	X	X	
Ship material to another RIS/facility	X	X	
Move material within an MBA (intra)	X	X	
Move material between MBAs (inter)	X	X	
Send material to "in transit"	X		X
Receive material from "in transit"	X		X
Material transformation: splits, combines, etc.	X	X	
Containerization	X	X	
Calculate decay	X		X
Federal reporting subsystem	NMMSS	X (1)	
Measurement instrument control	Tracking		X
Physical inventory	X	X	
Tamper Indication Device (TID)	X	X	
Russian interface	(2)	X	
Barcode interface/capability	X	X	X
Transaction/inventory reports	X	X	
Creation/Maintenance of configurable data	X (3)	X (3)	
Two-person log-in		X	
Input from scales			X
On-line help	X	X	X
Authorizations by location	X		X
Bulk processing	(2)		X
Batch processing		X	

(1) Meets the beta Russian federal reporting requirements

(2) May be developed by a Russian site.

(3) May be performed only by the database administrator. Includes data/tables such as MBA/location, users, authorization, material description, etc.

The E/Z MAS home page gives you access to the five groups of E/Z MAS functions:

Movements:

Enables the user to record the movements of containers within and between MBAs (material balance areas).

External Transfers :

Enables the user to record the transfer of containers from a source enterprise to a destination enterprise.

Inventory Changes:

Enables the user to record the transformation of an existing material, element, or isotope.

Reports:

Enables the user to generate user-printable reports.

Data Configuration:

Enables the user to maintain the tables in the database (E/Z MAS Administrator rights are necessary to access this function).

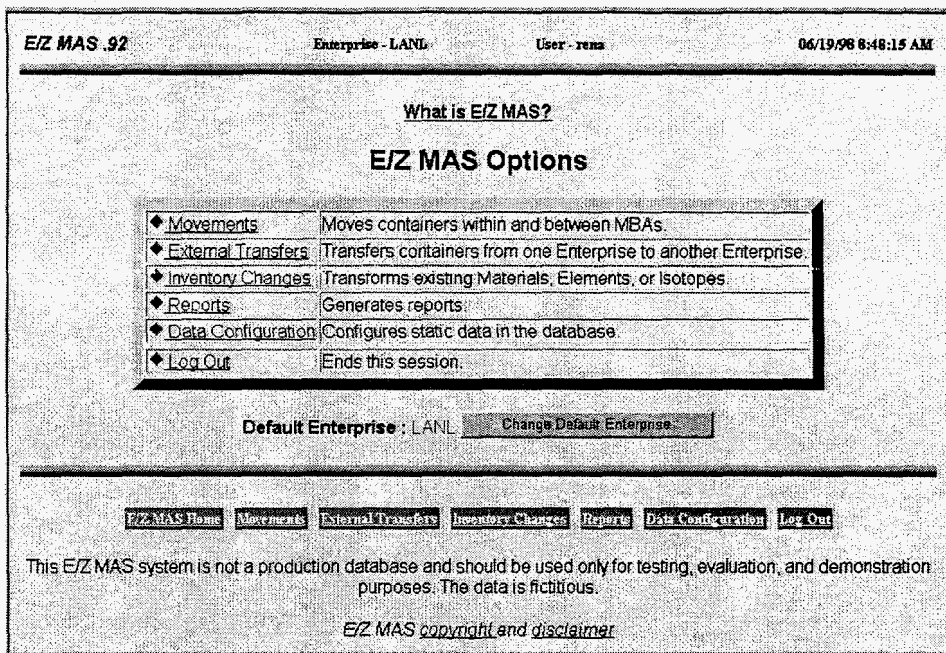


Figure 1. The E/Z MAS home page.

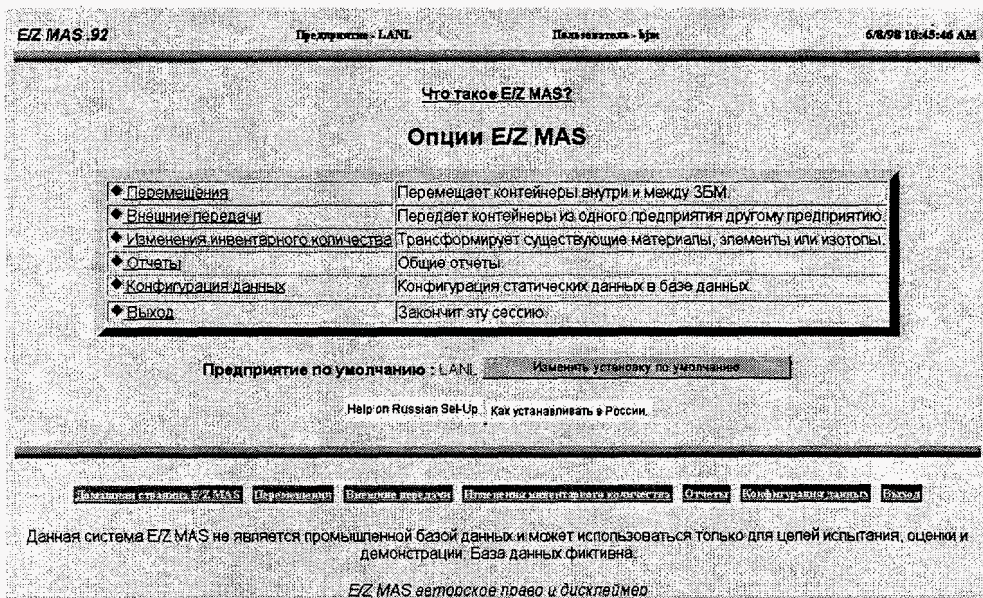


Figure 2. The E/Z MAS home page in Russian.

Whenever a transaction is made, a summary of the transaction is displayed for the user, and only after the user confirms that the information is correct is the database updated. Figure 3 shows the summary of a transaction by user *jmh*, who has chosen to move container *Con0010*, which is in the MBA named *MBA1*. He is moving it to the physical location named *Receiving*. This activity took place on 5/1/98. Figure 4 shows the same summary in the Russian version.

E/Z MAS 92 Enterprise - LANL User - jmk 05/01/98 9:29:24 AM

Container Movements Within an MBA

The following Selections have been made:

MBA: MBA1
 Number of Containers: 1
 Containers: Con0010
 Destination Physical Location: Receiving
 Activity Date: 05/01/98 9:27:14 AM
 Comment:

Submit Selections

Cancel

E/ZMAS Home Movements External Transfers Inventory Changes Reports Data Configuration Log Out

This E/Z MAS system is not a production database and should be used only for testing, evaluation, and demonstration purposes. The data is fictitious.

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Figure 3. A summary of a transaction is displayed before the database is updated.

E/Z MAS 92 Предприятие - LANL Пользователь - jmk 6/1/98 10:50:05 AM

Перемещения контейнеров внутри ЗЕМ

Было выбрано следующее:

ЗЕМ: MBA1
 Число контейнеров: 1
 Контейнеры: a1aazawww
 Физическое место назначения: Receiving
 Дата действия: 6/1/98 10:49:23 AM
 Комментарий:

Ввести выбранное

Отменить

Документы системы E/Z MAS Перемещения Внешние перевозки Изменения инвентарного учета Отчеты Конфигурация системы Польза

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Figure 4. A summary of a transaction is displayed in Russian before the database is updated.

Security

CoreMAS and E/Z MAS both utilize the security provided by the NT operating system. Both also use internal authorization procedures built by LANL to verify user access and user authorization. It is highly recommended that each E/Z MAS site disallow anonymous log-ins to their servers. Both CoreMAS and E/Z MAS should be installed on dedicated, closed intranet networks, rather than the open Internet.

Summary

Both CoreMAS and E/Z MAS are offered to facilities in the Former Soviet Union that desire to computerize their nuclear materials control and accountability functions. They are provided with all source code in addition to the necessary hardware and commercial software packages necessary for a development team. Thus each site is able and encouraged to augment the code in any way so that the final system will meet their site-specific needs. Unessential functions may be removed; remaining functions may be modified; supplementary functions may be added.

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