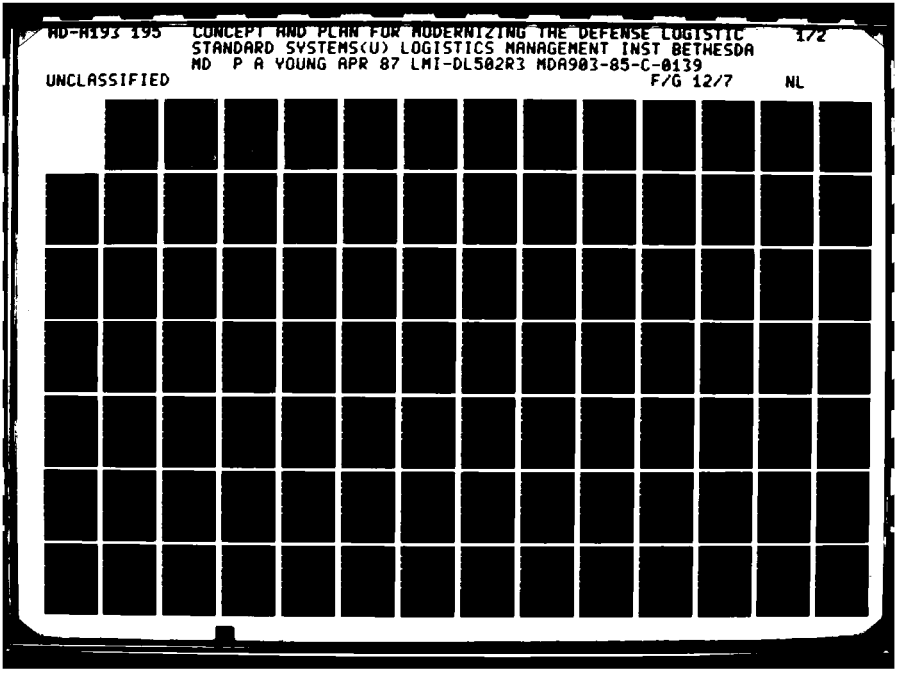
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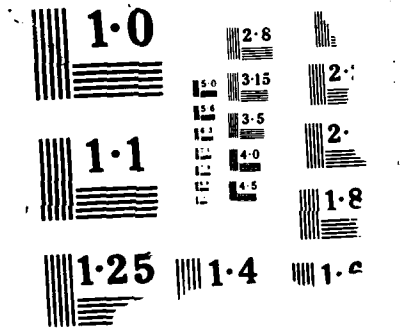
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CONCEPT AND PLAN FOR MODERNIZING THE DEFENSE LOGISTICS STANDARD SYSTEMS

Report DL502R3

AD-A193 195

April 1987

Paul A. Young

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Executive Summary

CONCEPT AND PLAN FOR MODERNIZING THE DEFENSE LOGISTICS STANDARD SYSTEMS (DLSS)

The Modernization of Defense Logistics Standard Systems (MODELS) project will increase the capacity and flexibility of DoD's logistics operations by redesigning and upgrading the Defense Logistics Standard Systems (DLSS).

To take advantage of advances in logistics information management practices, as well as telecommunications and data processing technology, the DLSS must undergo two aspects of modernization simultaneously: (1) functional, that is enhancing and expanding current procedures and transactions for communicating logistics information, and (2) technical, upgrading the capabilities of the hardware and software of the various information processes.

From the functional view, we recommend formulating revised variable-length DLSS transactions in place of the present 80-column format.

From the technical view, we recommend upgrading the DAAS to a distributed network configuration consisting of interconnected logistics gateway nodes (LGNs). LGNs pass, route, edit, and perform special processing functions for transactions entering and leaving the logistics sites they support. They offer the potential of a significant increase in its functional capability and a reduction in communication costs.

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SECTION 1

FUNCTIONAL CONCEPT FOR LOGISTICS INFORMATION FLOWS

1.1 INTRODUCTION

The Defense Logistics Standard Systems (DLSS) define the requirements for effective communication and interactions between organizations within the defense logistics community. They consist of discrete, but compatible systems of procedures and transaction formats which enable the effective interaction between and among organizations.

Administered by the Defense Logistics Standard Systems Office (DLSSO), the DLSS play a critical role in many logistics functions, including: cataloging, inventory management, contracting, contract administration, storage, distribution and redistribution of materiel, transportation and movement, maintenance, property disposal, international supply support, integrated support of weapons, and billing and collections. The DLSS also include hardware and software systems responsible for editing and routing a large percentage of all logistics communications between the Services, other Federal agencies, and outside entities including commercial contractors and foreign customers.

The DLSS have evolved over the past 20 years. During that time, and on an ongoing basis, new logistics information requirements have been identified. The DLSS must respond to this continuing need. However, effective logistics management has increasingly been impeded due to the obsolescence of some existing procedures. In addition, escalating communication demands make greater capacity a necessity.

Along with growing internal requirements, dramatic changes in telecommunications and data processing technologies have spotlighted the need to upgrade systems to meet current standards. To capitalize fully on new capabilities and meet the changing needs of the logistics community, DoD must replace, rather than modify, existing DLSS.

There is ample evidence that a change in system architecture to a distributed rather than centralized, configuration is required (see Section 3). However, before new transaction methods and procedures can be designed, the manner in which logistics-related information flows between system users must be examined in greater depth.

The first set of charts, represented in Figures 1-1 through 1-6, illustrate the work breakdown structure (WBS) defined in the second MOdernization of the DEfense Logistics Standard Systems (MODELS) report.[1] They illustrate the full scope of logistics functions that should eventually have standardized procedures and transactions. They include performance measurement (evaluation of system performance is currently not possible on a centrally aggregated basis); secondary item acquisition (including procurement and contract administration); supply (requisitioning and inventory management); transportation (tracking the movement of personnel, supplies, etc.); and reutilization and marketing (the handling of excess property).

The information flow diagrams which make up the balance of Section 1 identify the information requirements that must be incorporated into the design of a modernized DLSS. The analysis is presented in terms of subject areas. Specific data elements, or units of information will need to be developed in coordination with DLSS Administrators and Service/Agency participants based on recommended DLSS[2] transaction syntax. In addition, management or policy issues on control of the new procedures and final transaction definition are not discussed.

One new system capability is not presented here but is highly recommended: acknowledgments to a sender to confirm that a transaction was received, called transaction receipt acknowledgments, should be standardized and automatic throughout the system. Each would carry minimal information, including source and destination data in the header record and a transaction-unique identifier key with a one-character receipt acknowledgment code. The capability will provide

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[1]LMI Report DL502R1. *Defense Logistics Standard Systems Functional Requirements* Pp I-1 through I-5. Young, Paul A. Mar 1987.

[2]LMI Report DL502R1 *Defense Logistics Standard Systems Functional Requirements* Pp II-11 through II-18 Young, Paul A. Mar 1987.

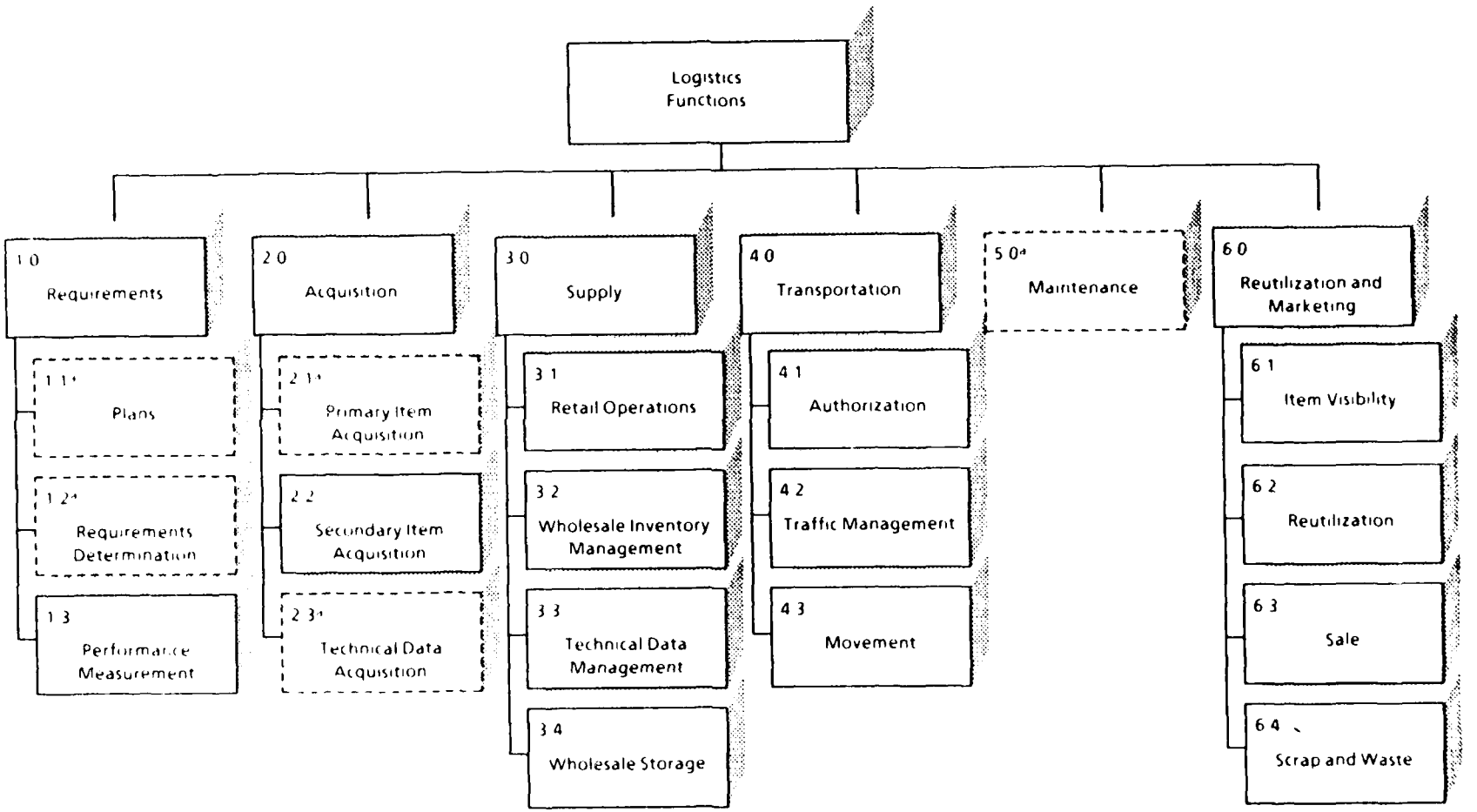
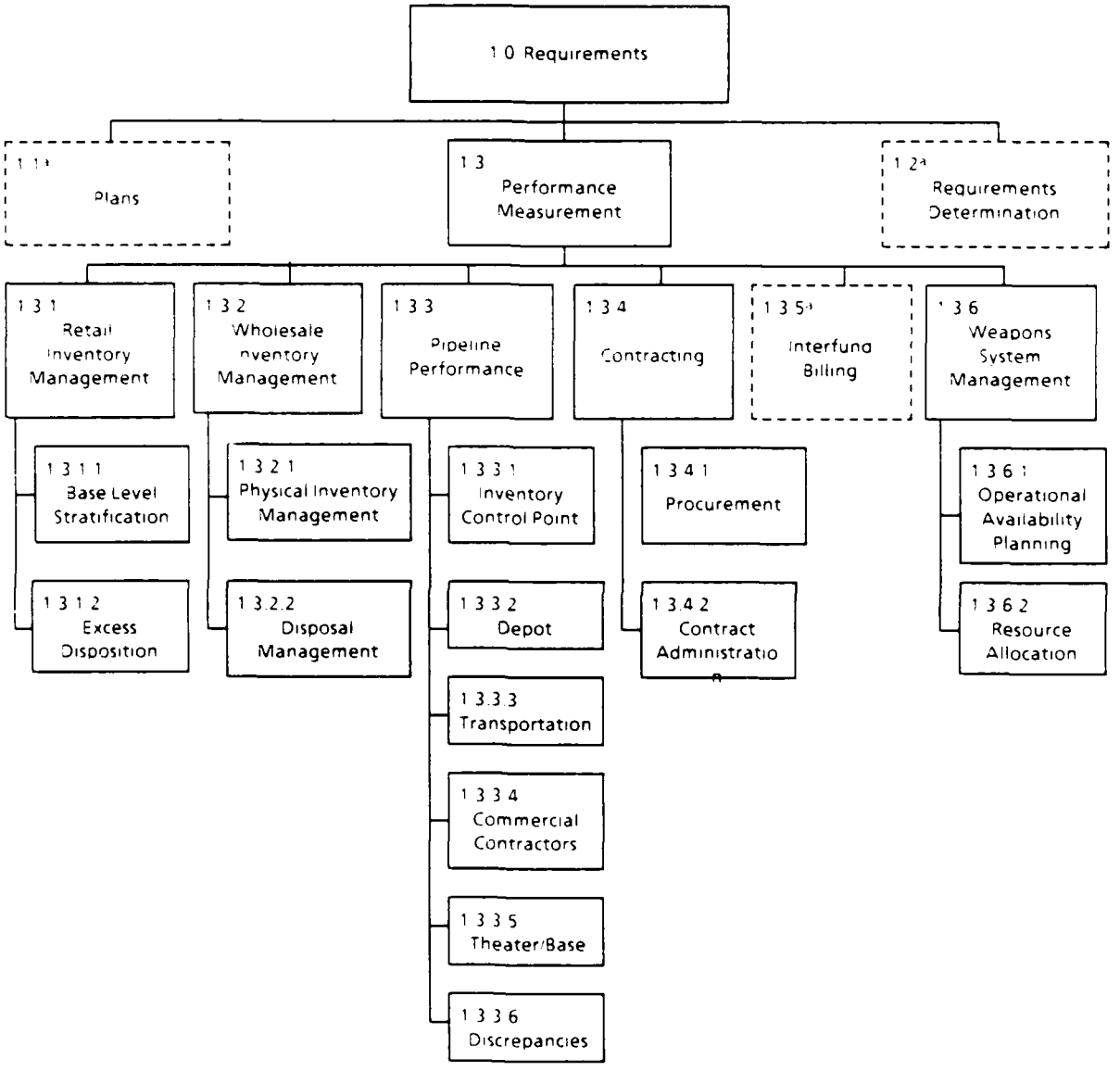
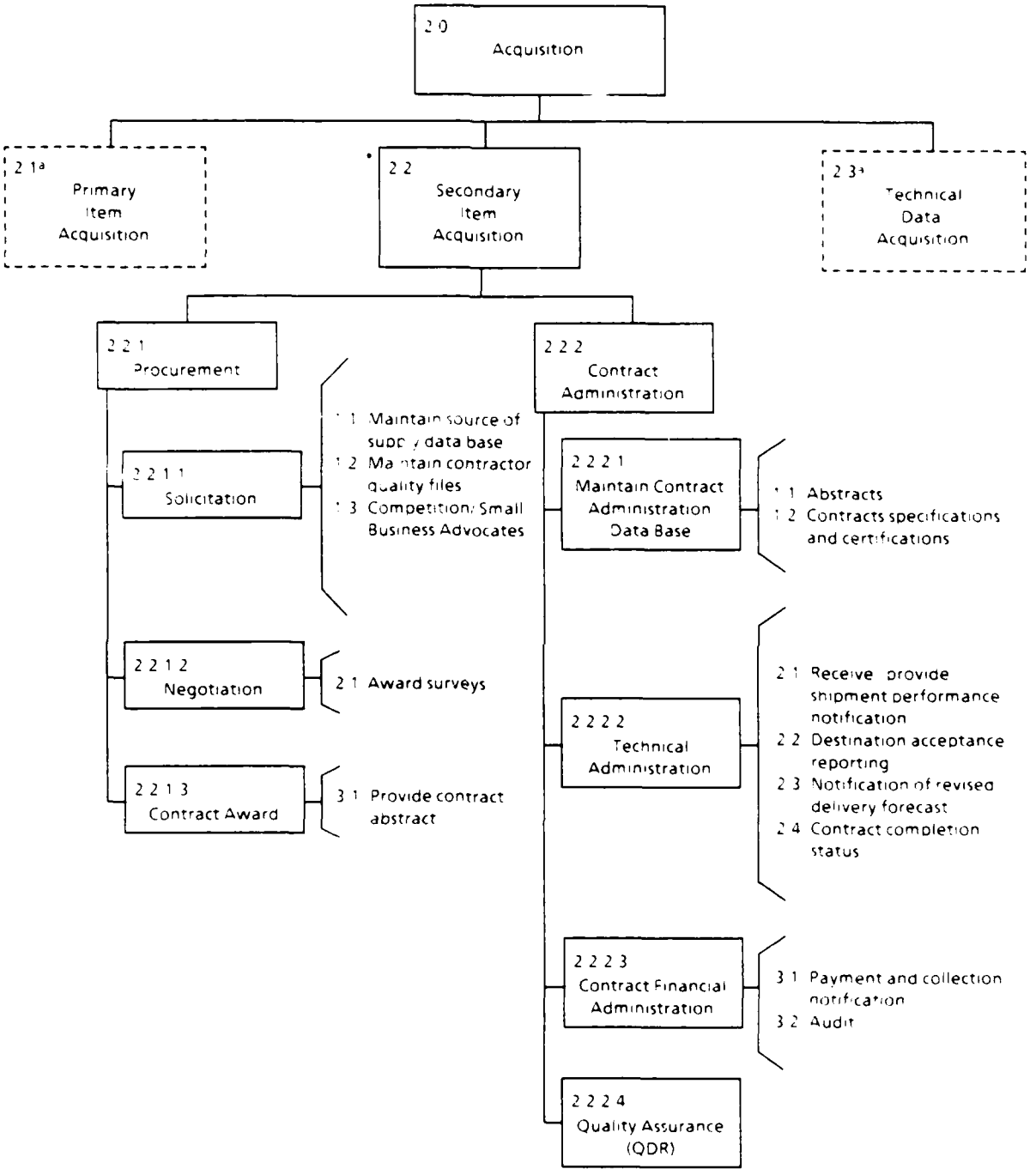


FIG. 1-1. MODELS FUNCTIONAL ACTIVITIES WORK BREAKDOWN STRUCTURE



[a] Only functional interfaces being addressed in this study

FIG. 1-2. PERFORMANCE MEASUREMENT FUNCTIONS



[a] Only functional interfaces being addressed in this study.

FIG. 1-3. SECONDARY ITEM ACQUISITION FUNCTIONS

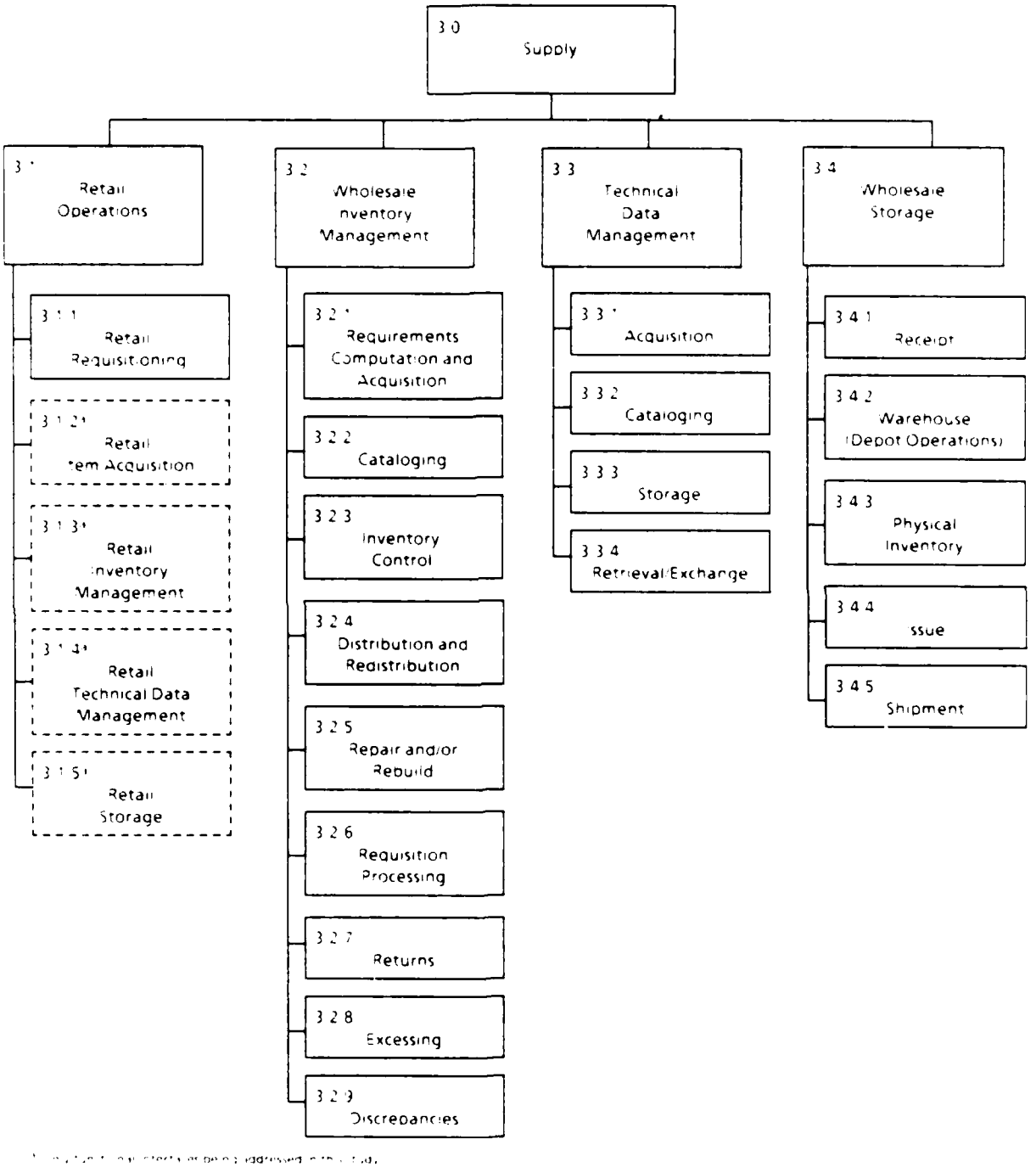


FIG. 1-4. SUPPLY FUNCTIONS

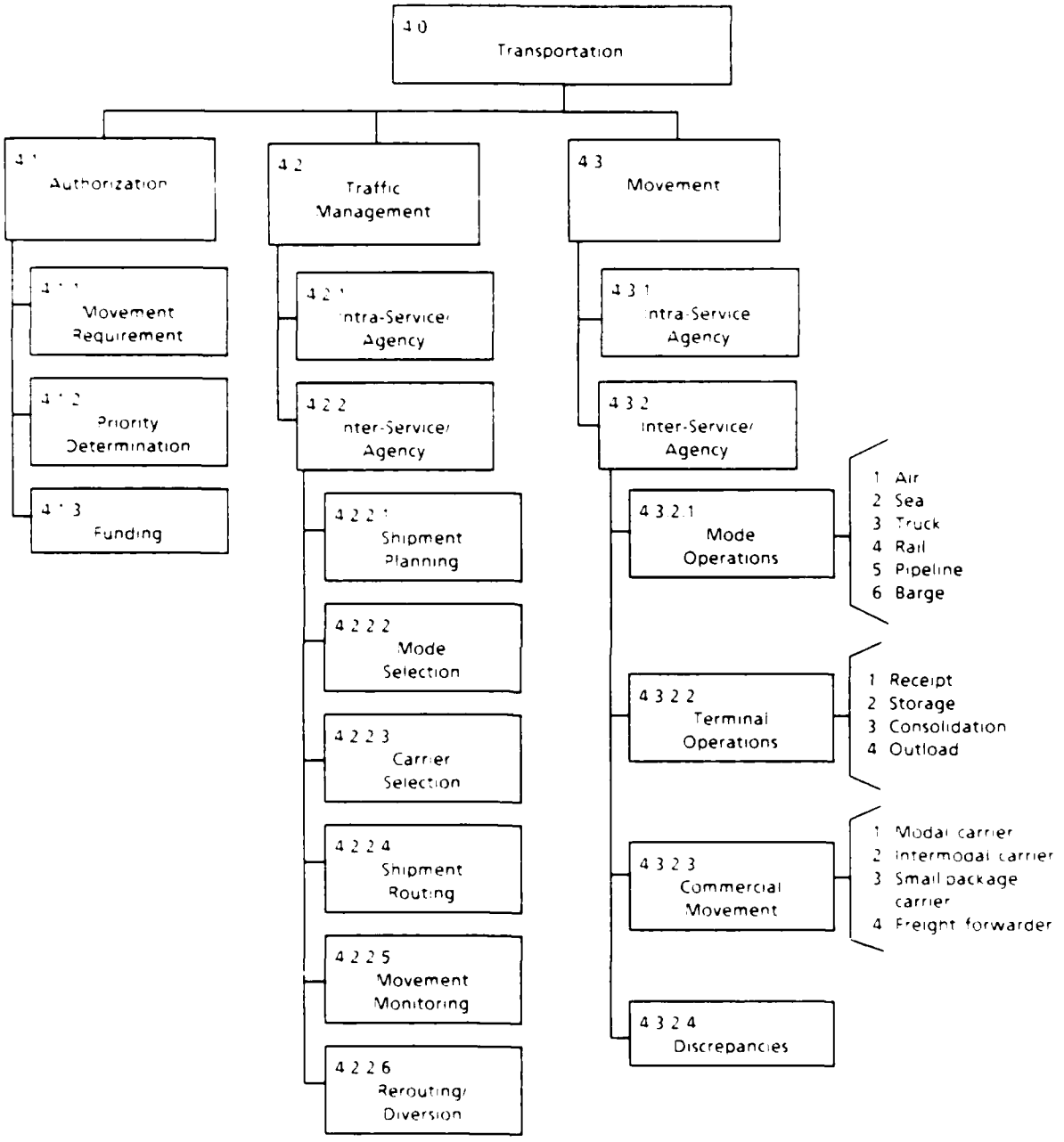


FIG. 1-5. TRANSPORTATION FUNCTIONS

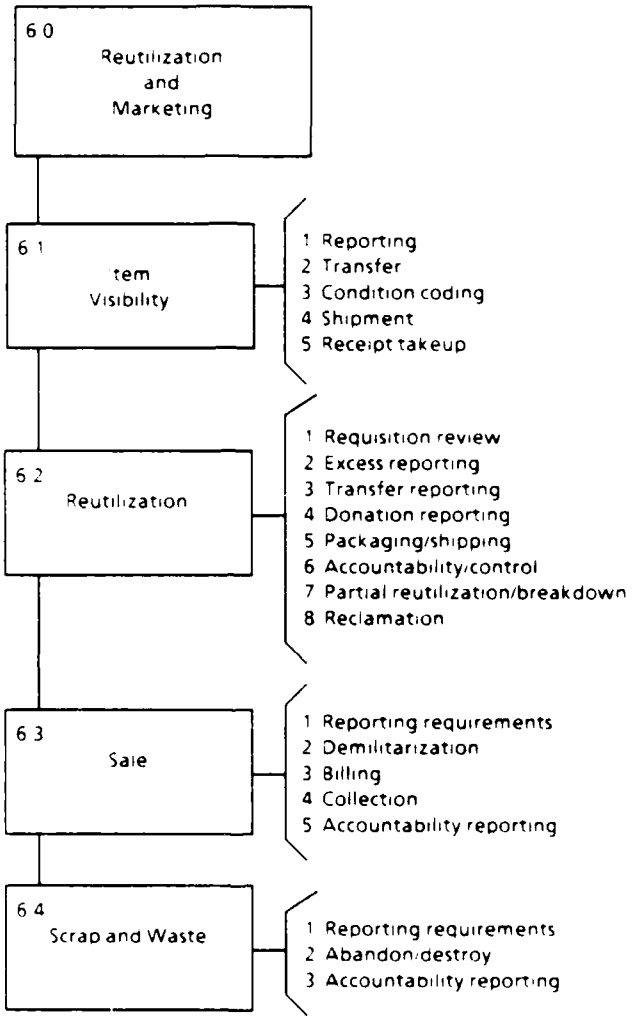


FIG. 1-6. DEFENSE REUTILIZATION AND MARKETING FUNCTIONS

compatibility with commercial systems being designed using the Electronic Data Interchange American Standards Institute X12 (EDI) concepts.[3]

1.2 DESIGN OF THE FUNCTIONAL INFORMATION FLOW DIAGRAMS

The flow diagrams in the remainder of this section start at the second-tier of the WBS. The outline of the function boxed descriptors denotes the following:

- Solid line boxes, [ ], indicate the function was addressed below the second-tier level in the MODELS functional requirements and will be addressed in the initial transactions development projects.
- Dashed line boxes, [ ], indicate the function is not part of the current DLSS and that policy decisions concerning the level of interface or integration into the DLSS set of logistics standards must be made before transaction development will commence. However, they are shown in the diagrams only because they are significant sources or receivers of logistics information standardized by DLSS policies and procedures and, therefore, may be impacted by DLSS transaction redesign.
- Double-solid line boxes, [ ], indicate that information flows to a data collector (e.g., Weapons System Manager), rather than a logical function (e.g., Discrepancy Reporting).

The conceptual flow diagrams in this section will become the basis for:

- Identifying organizational sources of and destinations for information
- Identifying logical grouping of data elements for building transaction data segments and data records
- Developing information flow models to analyze the impact of variable-length transactions on logistics communications facilities
- Policy and procedure decisions on organizational responsibility for information processing.

The information flow diagrams are presented in the remainder of this section of our report. Acronyms not defined in the figures are defined in Appendix A. Each diagram consists of inflow-function-outflow charts augmented by brief narratives covering each of the second-tier logistics functions shown in Figure 1-1. The numbering used in the diagrams relate to those in the Figure 1-1 WBS. Supporting

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[3] LMI Report DL502R1 *Defense Logistics Standard Systems Functional Requirements* Pp II-11 through II-18 Young, Paul A Mar 1987

each of the second-tier logistics functions are diagrams showing subsidiary functions.

1.2.1 Performance Measurement

Figure 1-7 depicts second-tier logistics functions for performance measurement. This function collects data to compare current performance against established mission objectives and goals. Performance measures and statistics provide data to establish future goals and objectives and to determine requirements. Figure 1-2 shows the six subfunctions of performance measurement.

- Retail inventory management collects information from both wholesale and retail organizations to provide detailed and summarized performance measures of the effectiveness of the retail materiel management activity.
- Wholesale inventory management collects information on the performance of wholesale supply inventory management activities.
- Pipeline performance collects information to measure both the movement of requirements for material and materiel.
- Contracting collects information concerning the efficiency of the contracting process from identification of procurement through completion or termination of the contract.
- Intefund billing provides for payment, between Government organizations, for supplies and services provided from the wholesale to the retail levels for consumption. This measurement system collects information concerning the timeliness and accuracy of this funds transfer process.
- Weapons system management collects information concerning the effectiveness of logistics functions in meeting the requirements of weapons system managers and special programs.

The inflows and outflows for each of these are shown in Figures 1-8 to 1-12.

1.2.2 Secondary Item Acquisition

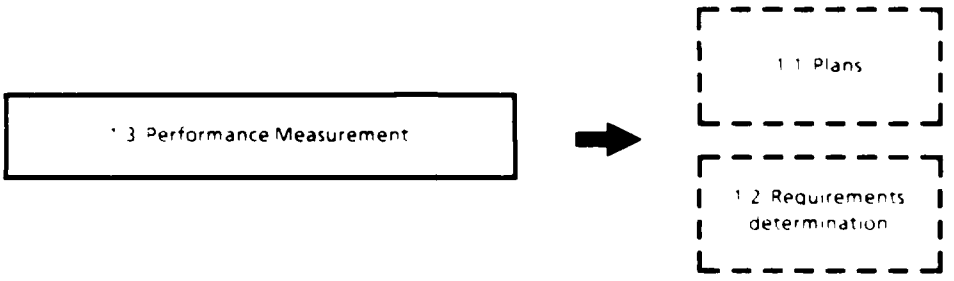
There are two major subfunctions (shown in Figure 1-3) under secondary item acquisition: procurement and contract administration. Procurement, with inflows and outflows shown in Figure 1-13, includes all the transactions related to the process of procuring equipment or supplies other than primary weapons systems or end items. Contract administration, shown in Figure 1-14, includes technical administrative transactions to the contracting administration officer.

Inflows

Data transaction inflows are described at lower WBS element levels

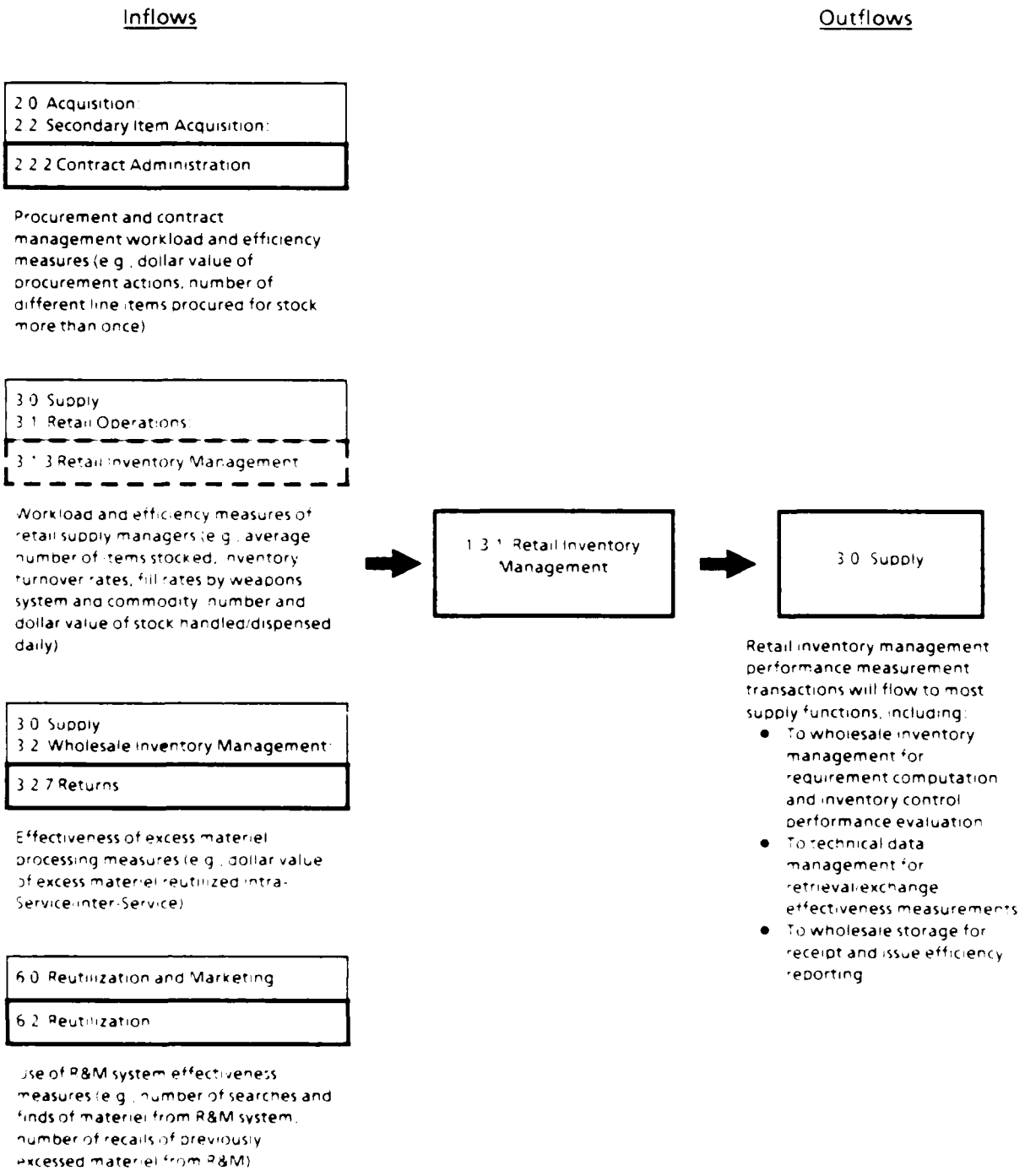
Outflows

Actual performance measures and statistics provide data to plans for establishing future goals and objectives and for determining requirements in various logistics areas (e.g., supply, transportation reutilization and marketing (R&M)).



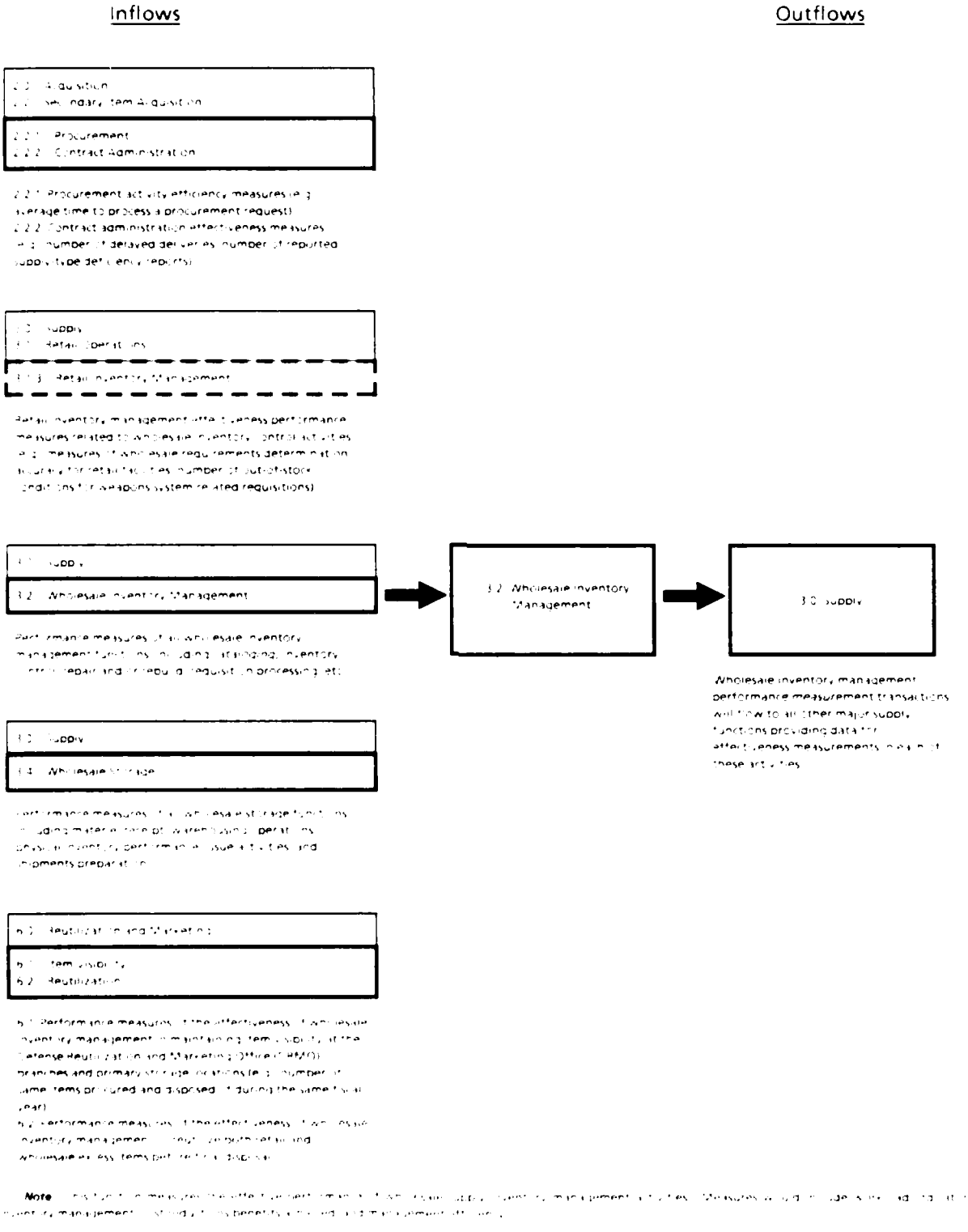
Note: [illegible]

FIG. 1-7. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – PERFORMANCE MEASUREMENT



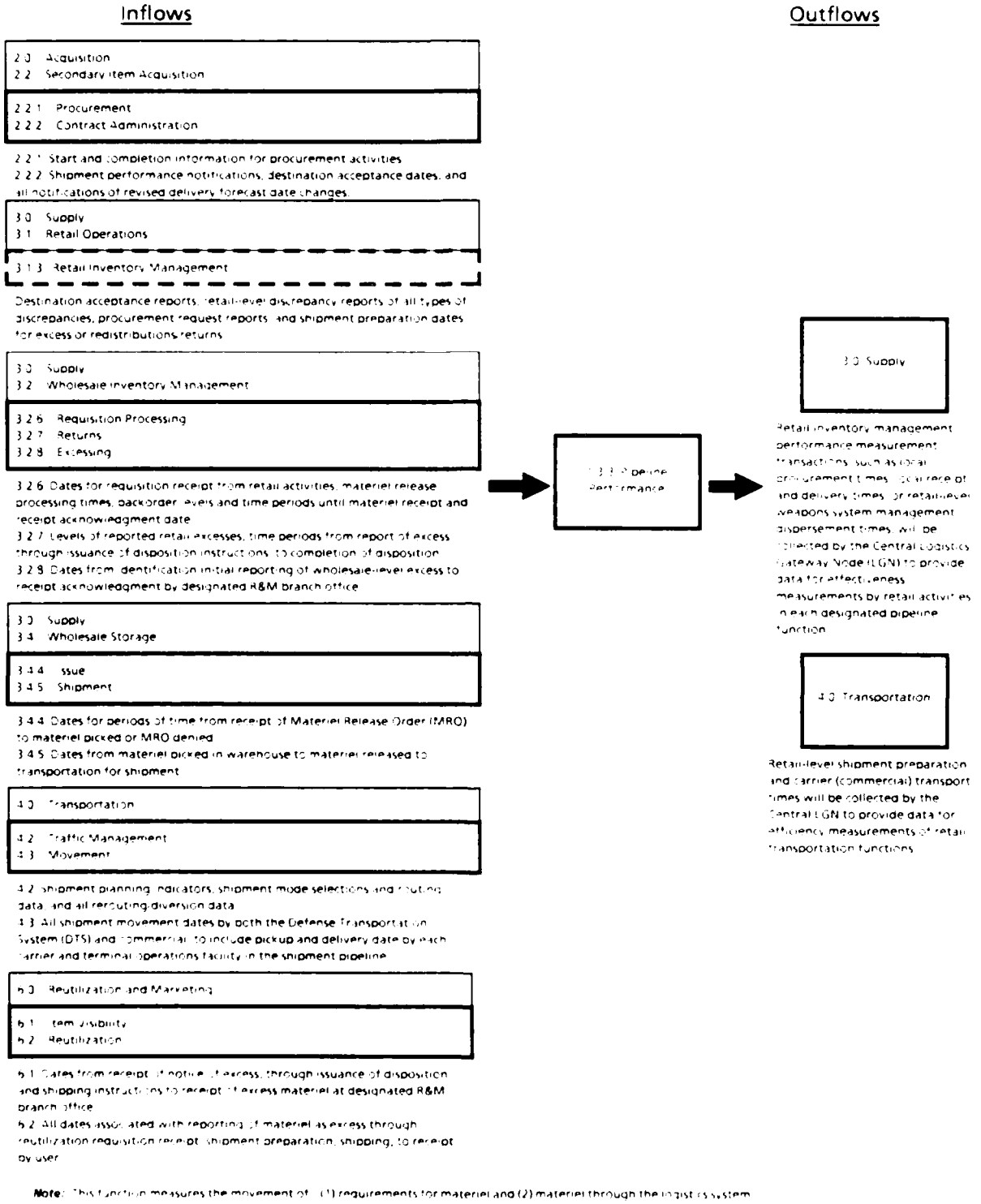
Note

FIG. 1-8. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – RETAIL INVENTORY MANAGEMENT



Note

FIG. 1-9. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – WHOLESALE INVENTORY MANAGEMENT



Note: This function measures the movement of: (1) requirements for materiel and (2) materiel through the logistics system.

FIG. 1-10. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – PIPELINE PERFORMANCE

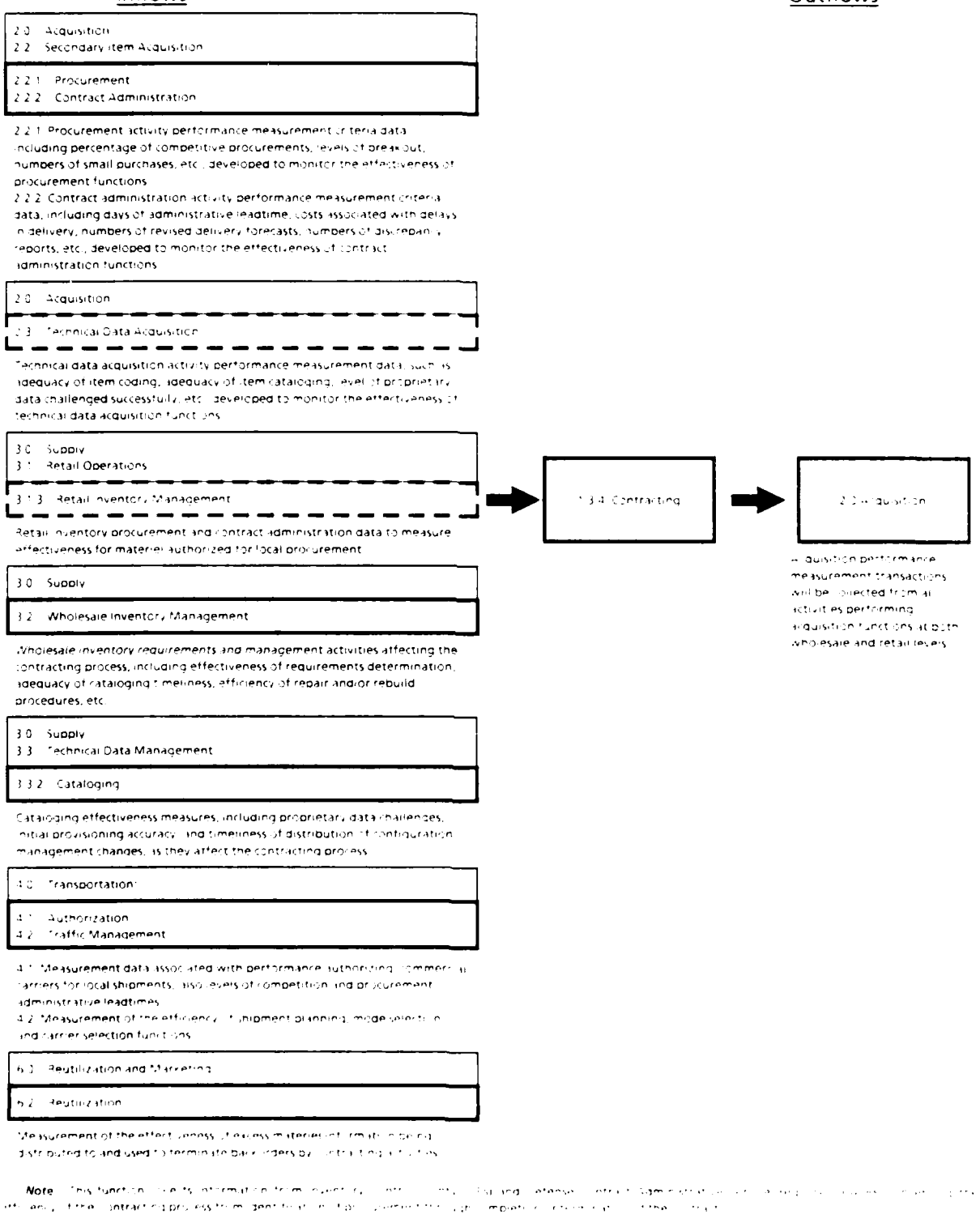
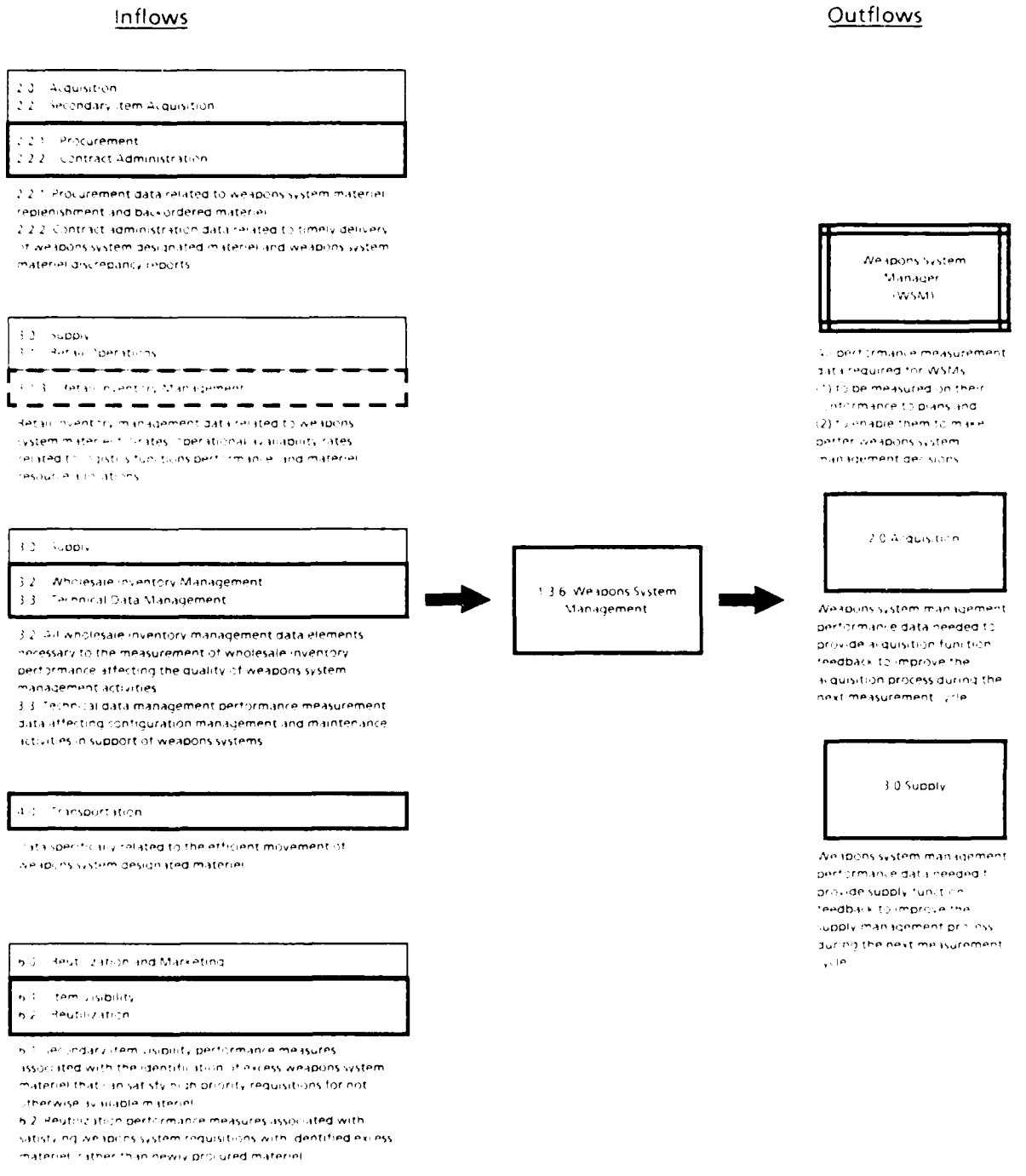
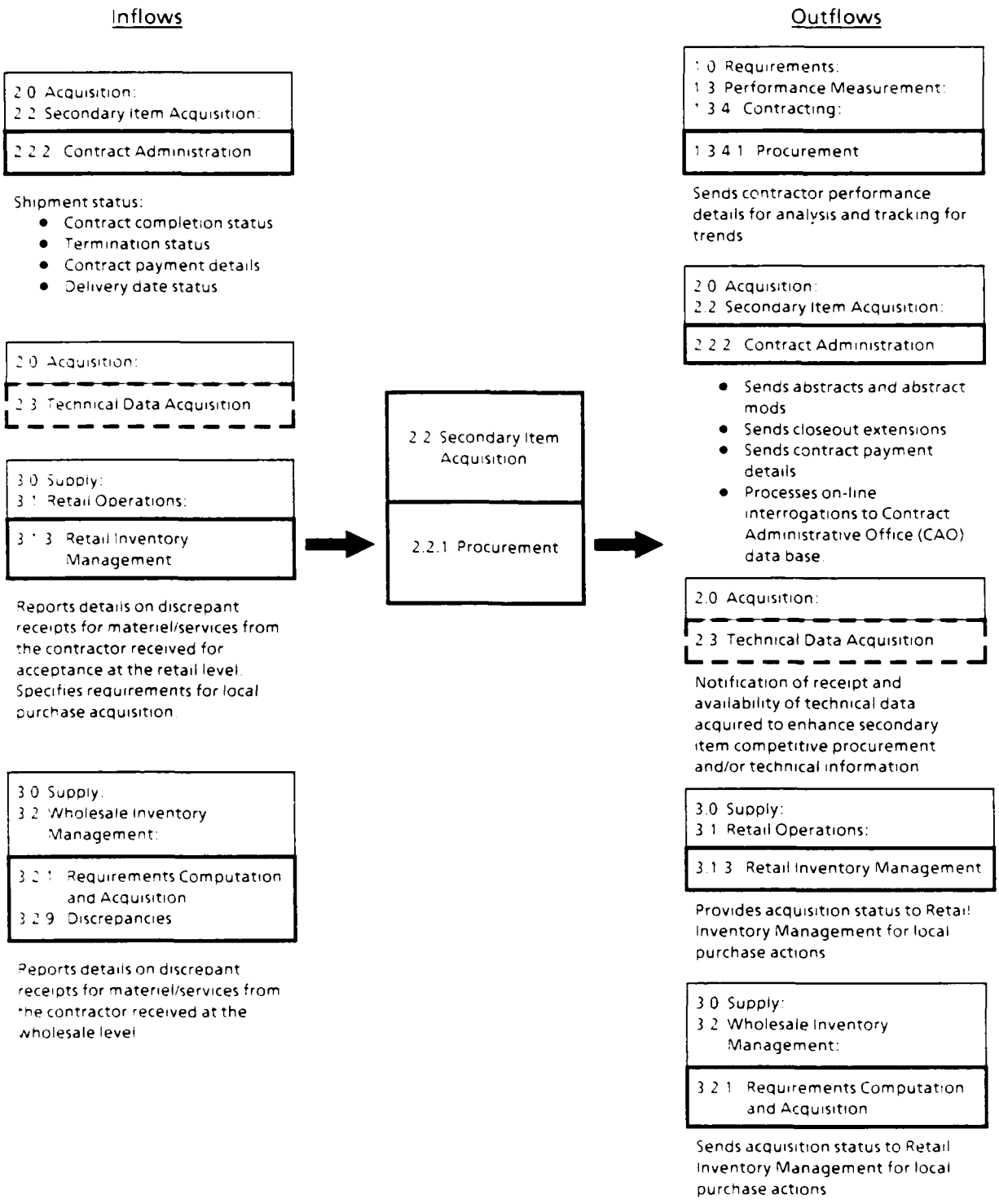


FIG. 1-11. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – CONTRACTING



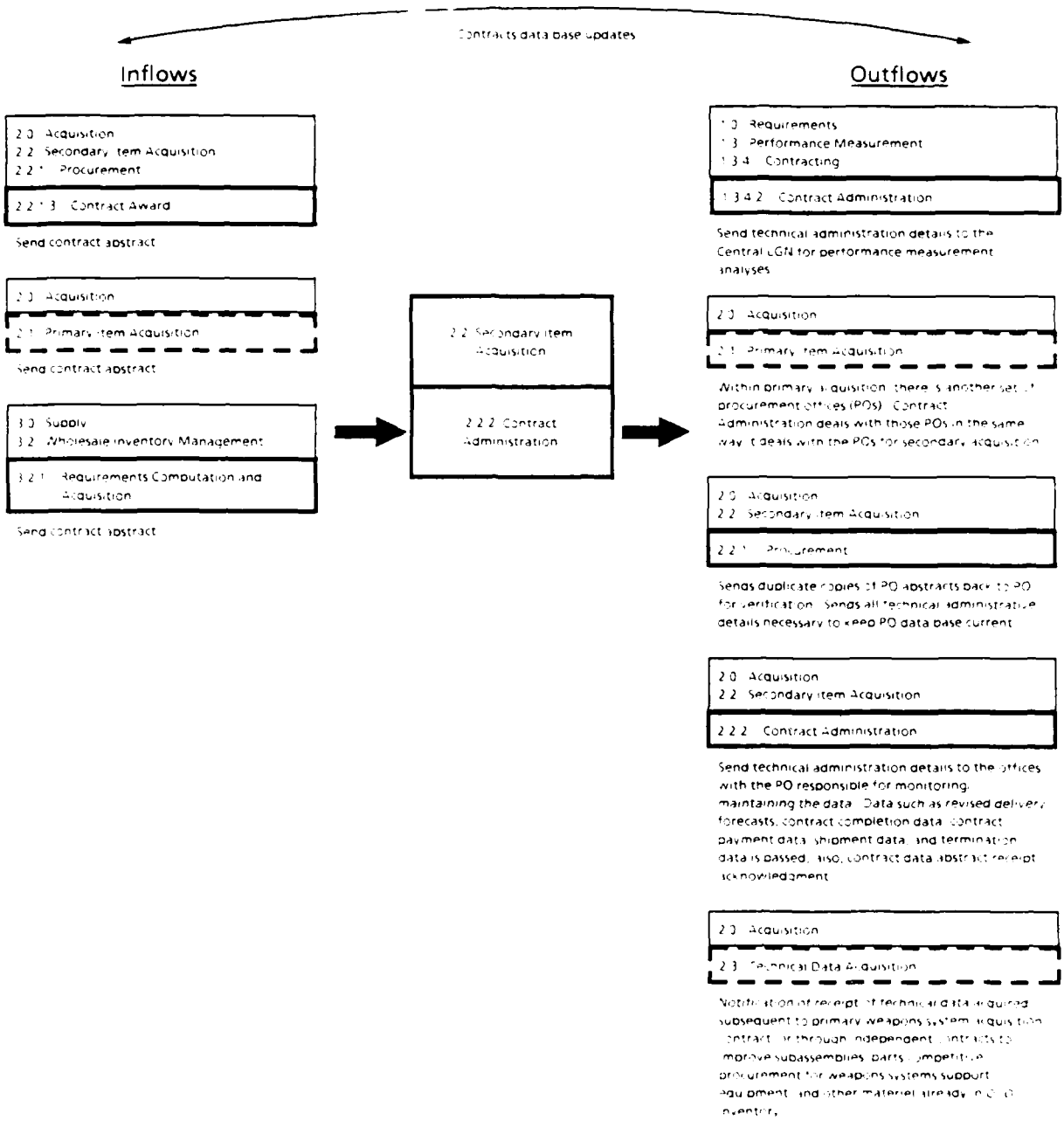
Note: This function collects information from all levels of the logistics systems concerning the effectiveness of logistics functions in meeting the requirements of weapons system managers and specific program offices.

FIG. 1-12. PERFORMANCE MEASUREMENT TRANSACTION INFLOWS AND OUTFLOWS – WEAPONS SYSTEM MANAGEMENT



Note: The process of procuring equipment or supplies, other than primary weapons systems or end items, that is received by the Procurement Contracting Officer (PCO) in the form of requirements. These requirements are processed and contracts are awarded directly from the PCO. Administrative data may be forwarded to a CAO. This process may happen at either the retail or wholesale level.

FIG. 1-13. SECONDARY ITEM ACQUISITION TRANSACTION INFLOWS AND OUTFLOWS – PROCUREMENT



Note: Sends transactions of technical administrative details to the CAO. Details include: (1) notification that materiel or service has been shipped, (2) request for acknowledgment of Government acceptance of materiel or service, (3) notification of a revised delivery forecast, (4) notification that contract is completed or that contract remains enclosed past scheduled close date, and (5) notification that contract has been terminated and reason for termination.

FIG. 1-14. SECONDARY ITEM ACQUISITION TRANSACTION INFLOWS AND OUTFLOWS – CONTRACT ADMINISTRATION

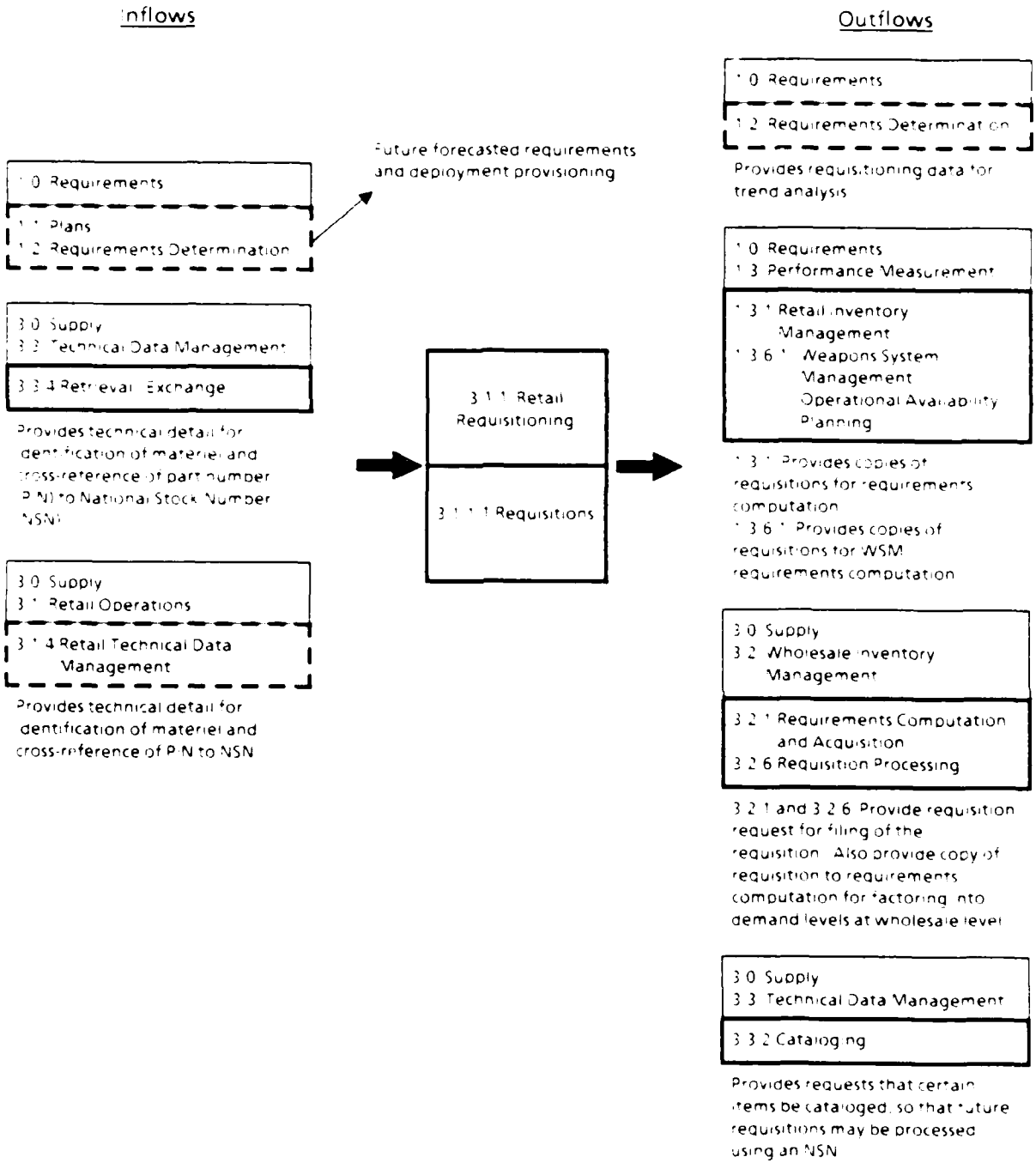
1.2.3 Retail Operations

As shown in Figure 1-4, MODELS is fully addressing only one subfunction under retail operations, retail requisitioning. This requisitioning function includes not only requisition processing as shown in Figure 1-15, but also pipeline status, receipt acknowledgment, report of discrepancy, excessing, and shipment as shown in Figures 1-16 to 1-20.

1.2.4 Wholesale Inventory Management

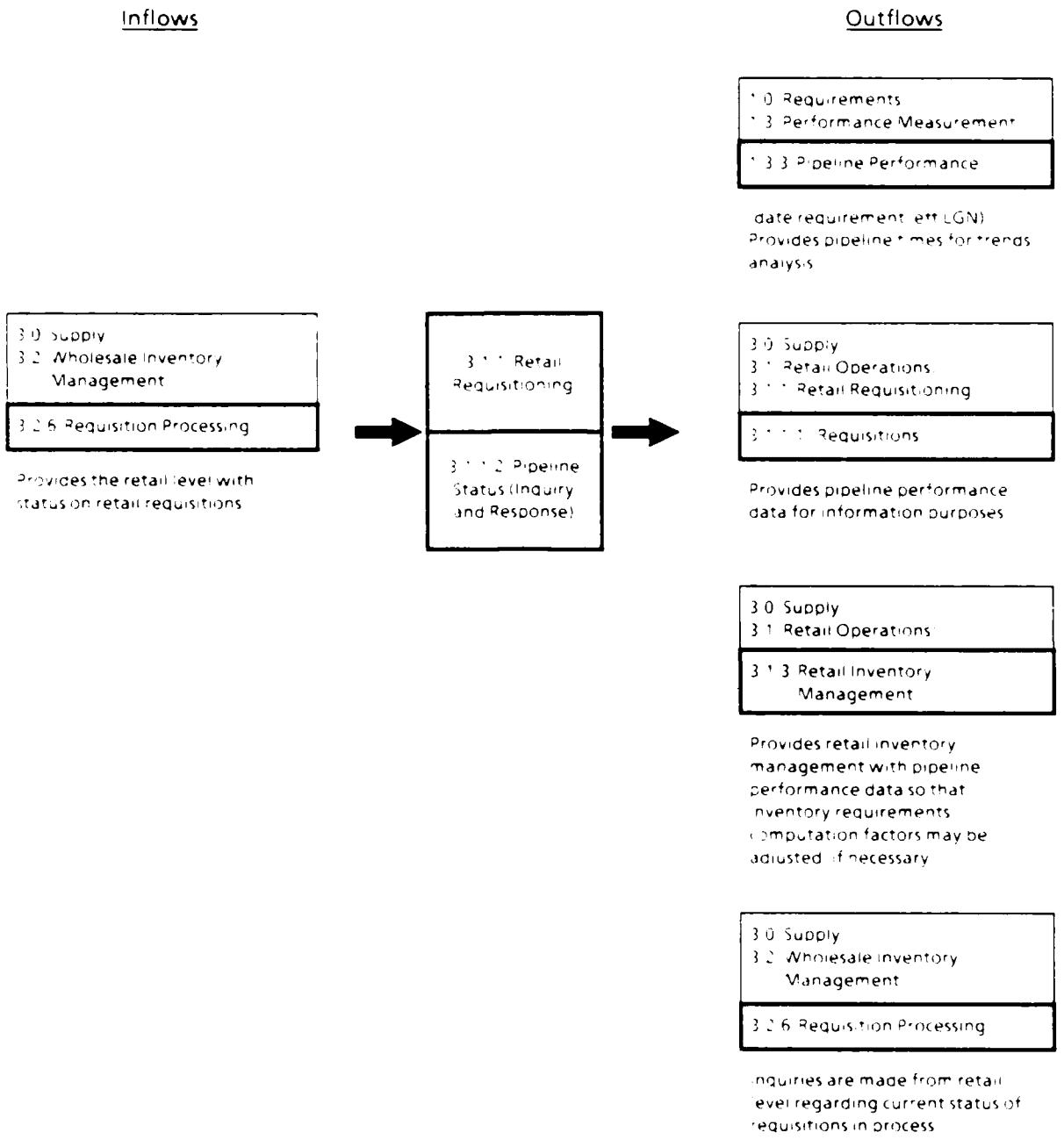
The next second-tier logistics supply function shown in Figure 1-4 is wholesale inventory management. It consists of the following:

- Requirements computation and acquisition inflows and outflows (Figure 1-21) include information flows related to the determination of wholesale requirements and the acquisition of stock to meet those requirements.
- Cataloging (Figure 1-22) supports all inventory management requirements for item identification, cataloging data reference, and retrieval.
- Inventory control inflows and outflows (Figure 1-23) cover maintenance of stock levels and replenishments, and management of accountable inventory records.
- Distribution and redistribution information flows (Figure 1-24) include those related to positioning and movement of wholesale stocks between and to wholesale sites.
- Repair and/or rebuild includes the information inflows and outflows (Figure 1-25) to support the decision to repair and/or rebuild reparable items.
- Requisition processing (Figure 1-26) includes all inventory management supply decisions necessary for requisitioning.
- Retail excess processing inflows and outflows (Figure 1-27) are those related to review, authorization, and disposition of excess materiel reported from below the wholesale level.
- Excessing (Figure 1-28) shows the inflows and outflows related to review, authorization, inventory adjustments, and disposition of excess materiel at the wholesale level.
- Discrepancies (Figure 1-29) includes information flows for the documentation and resolution of materiel and shipments.



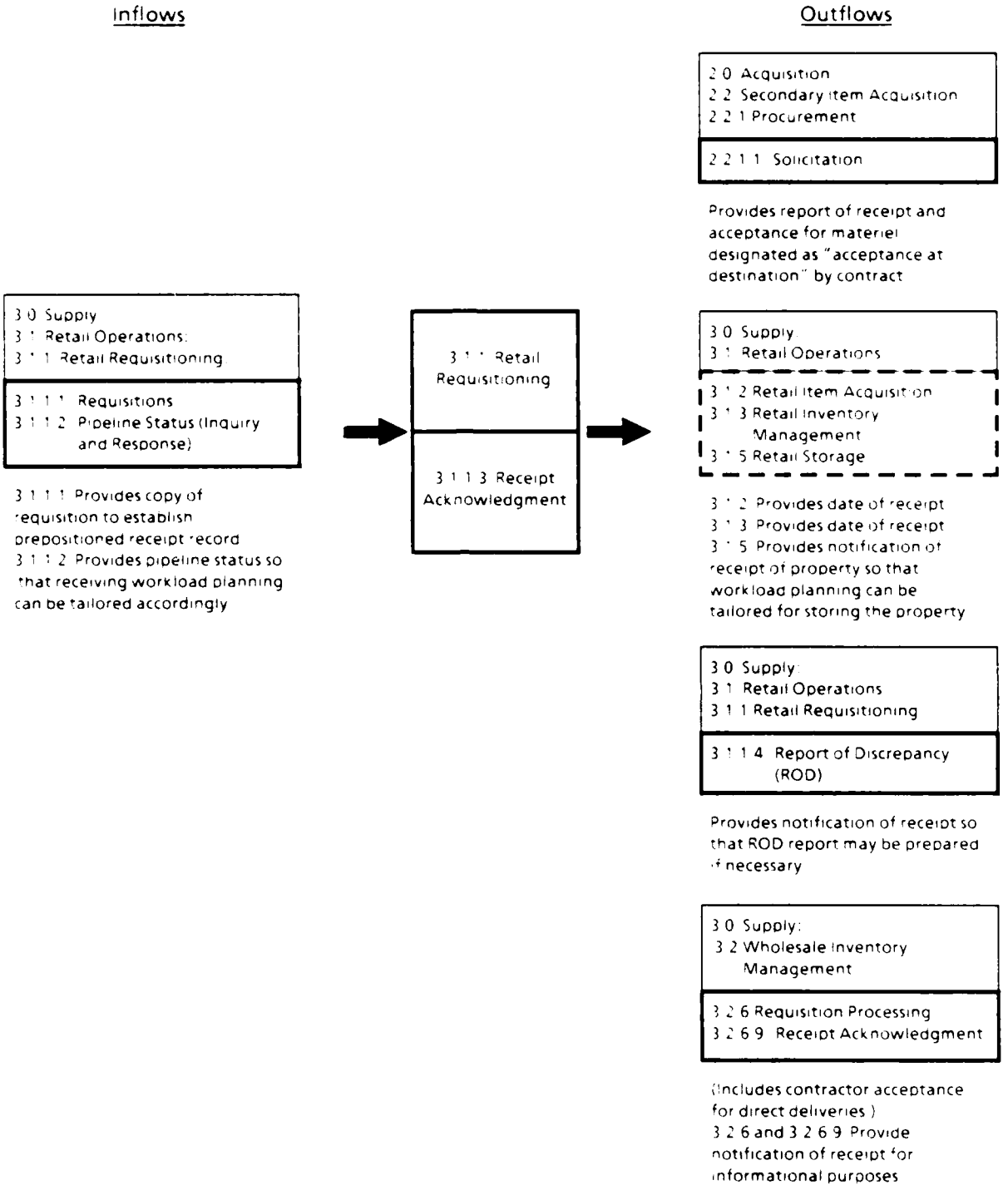
Note. Retail level requirements are determined by retail policy stockage objectives, weapons system management objectives, and wholesale inventory management objectives. Requirement data are forwarded in the requisitioning unit where source of supply (SOS) is determined and requisitioning action is initiated.

FIG. 1-15. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – REQUISITIONS



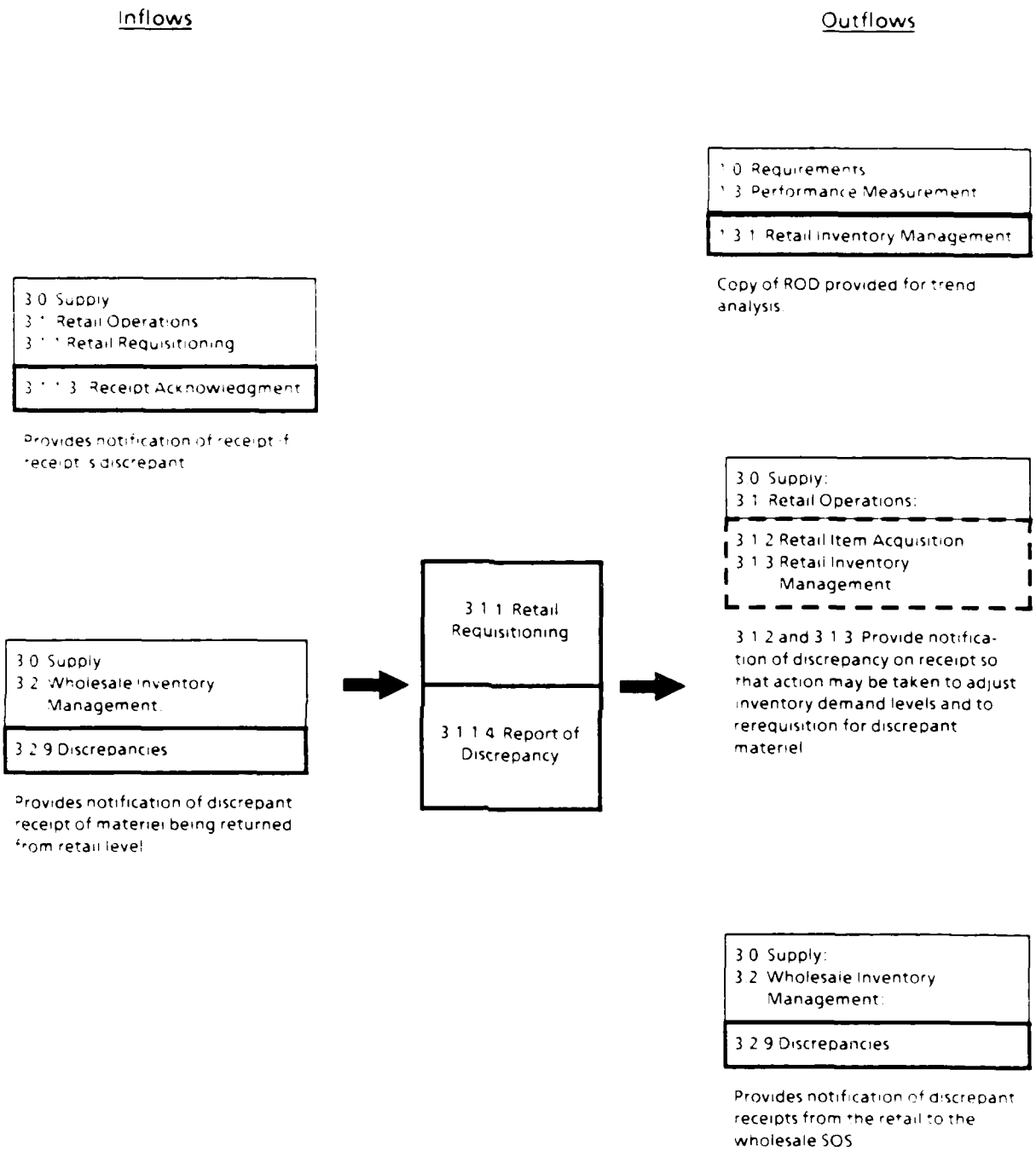
Note Pipeline status is normally provided to the requisitioner on a routine basis consistent with the priority of the requisition. In an exception basis pipeline status inquiries are generated by the retail level to the appropriate SOLs.

FIG. 1-16. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – PIPELINE STATUS (INQUIRY AND RESPONSE)



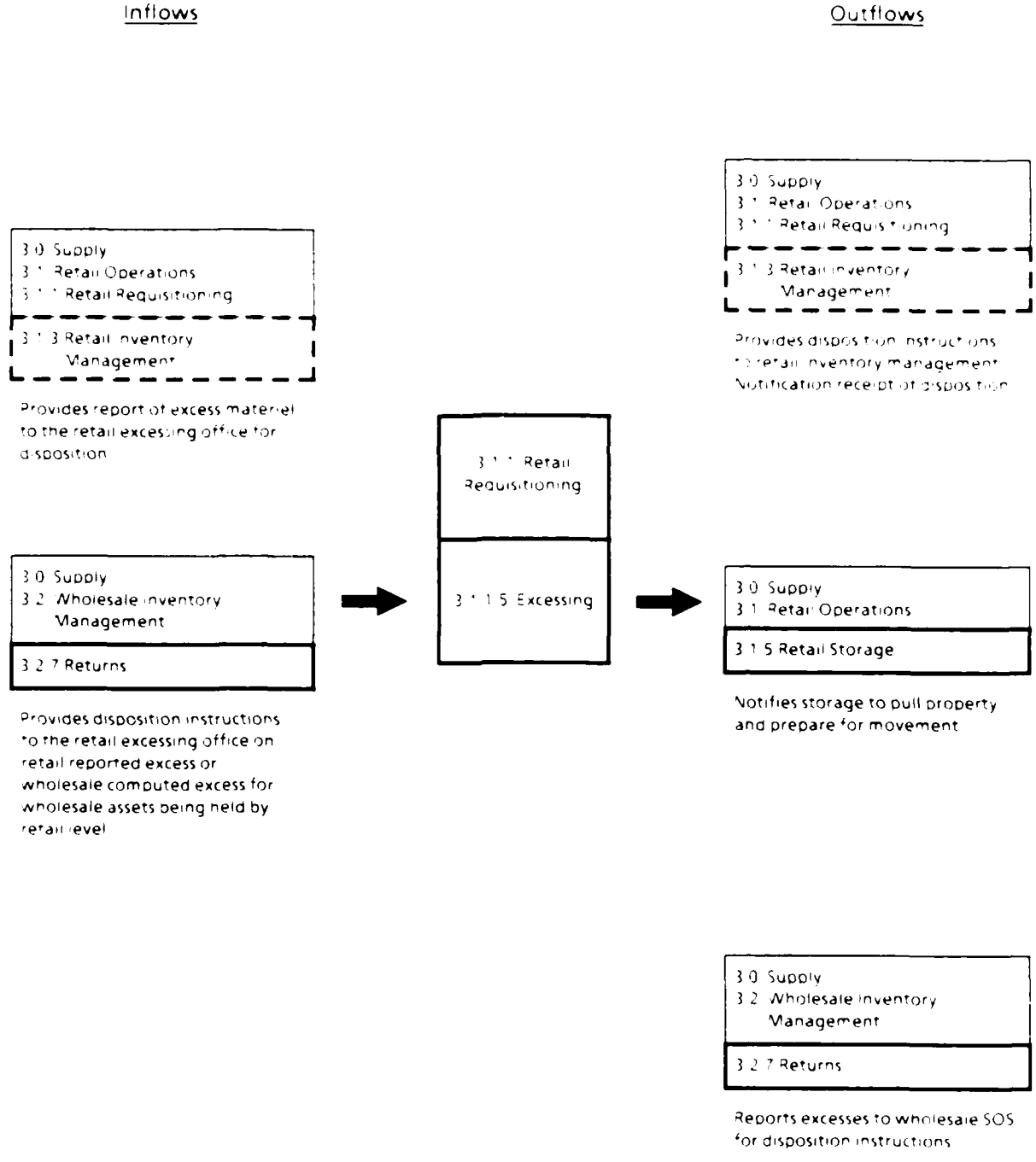
Note: The requisition issues a due-in record to be established within the prepositioned data base. Receipt acknowledgment data are recorded when property is received. Notice of receipt is then provided to the SOS.

FIG. 1-17. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – RECEIPT ACKNOWLEDGMENT



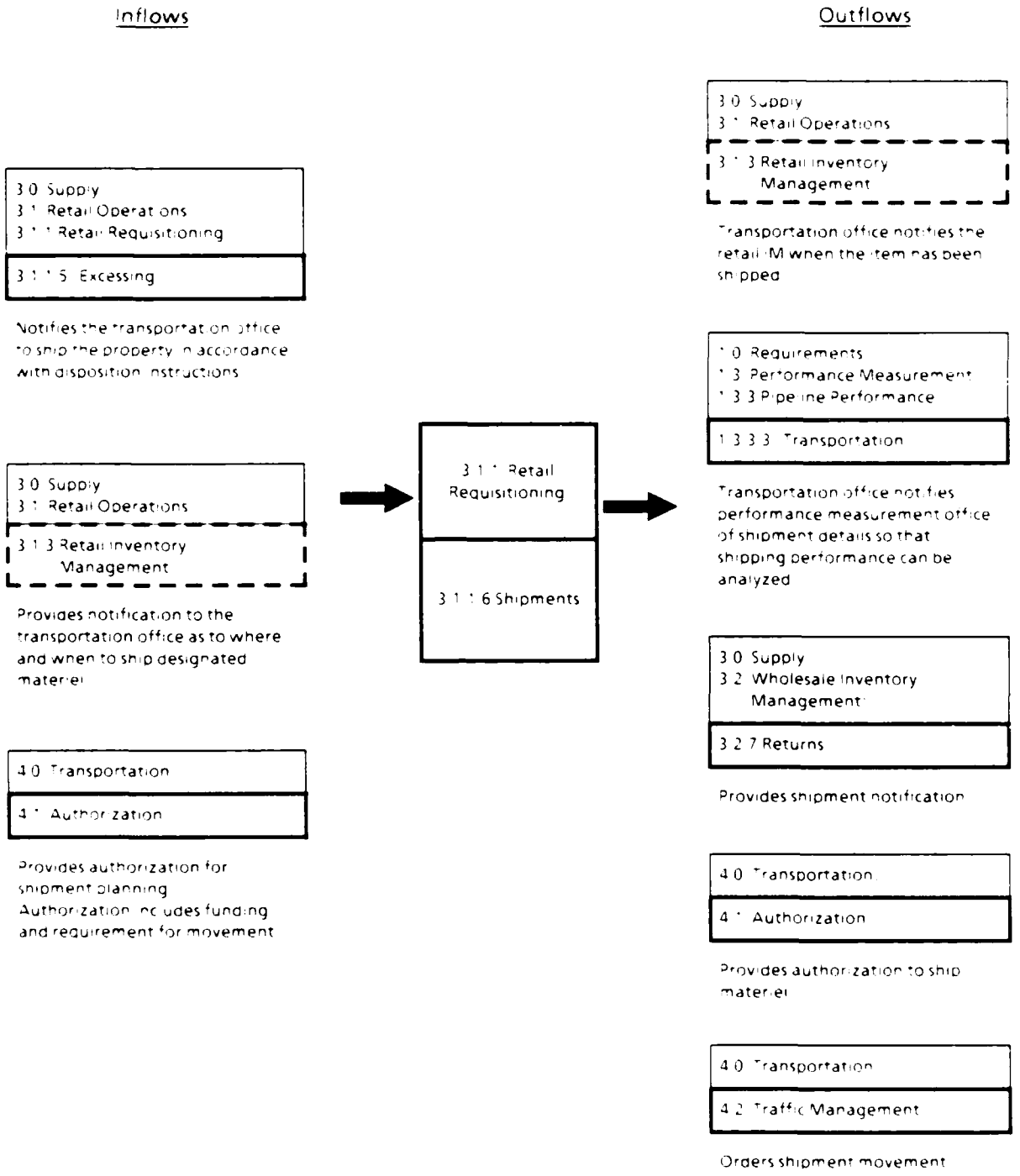
Note: Discrepant receipt data is provided to the ROD unit. RODs are then forwarded to SOS for appropriate action.

FIG. 1-18. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – REPORT OF DISCREPANCY



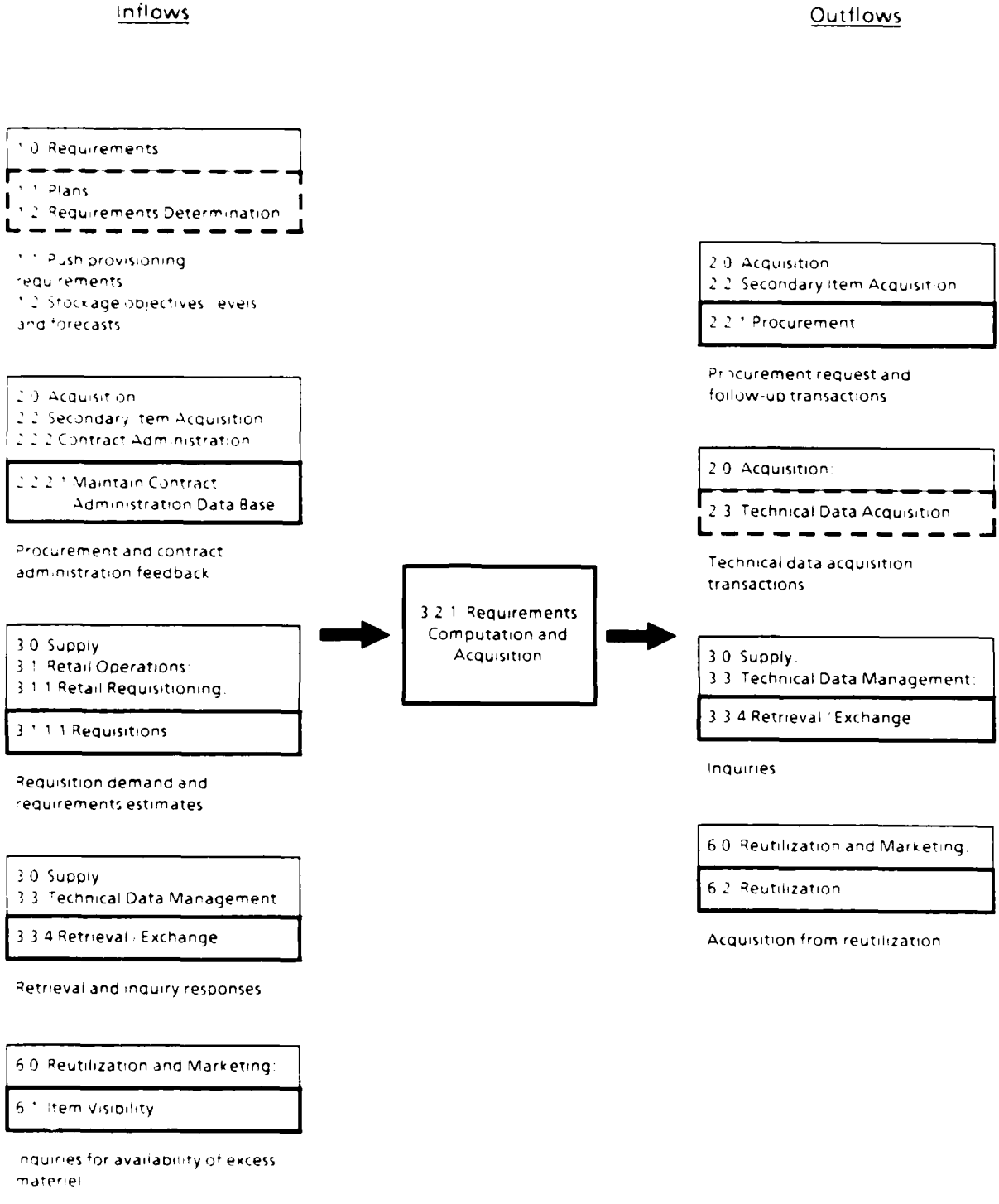
Note The excessing function notified of excesses by either the retail or wholesale inventory manager (IM). The excessing function then requests disposition from the appropriate IM. When disposition instructions are received, the excessing unit coordinates the appropriate actions.

FIG. 1-19. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – EXCESSING



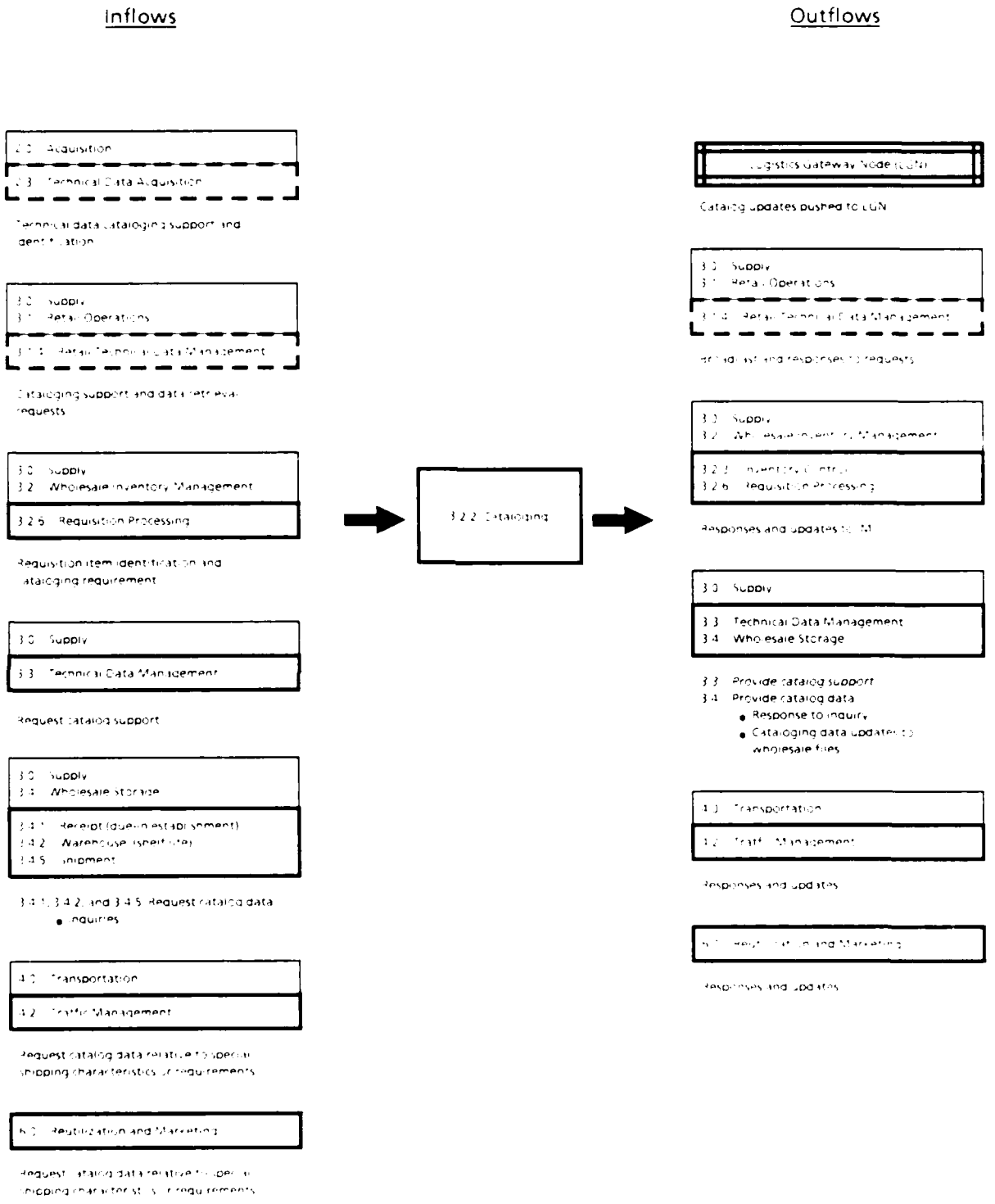
Note [illegible]

FIG. 1-20. RETAIL OPERATIONS TRANSACTION INFLOWS AND OUTFLOWS – SHIPMENTS



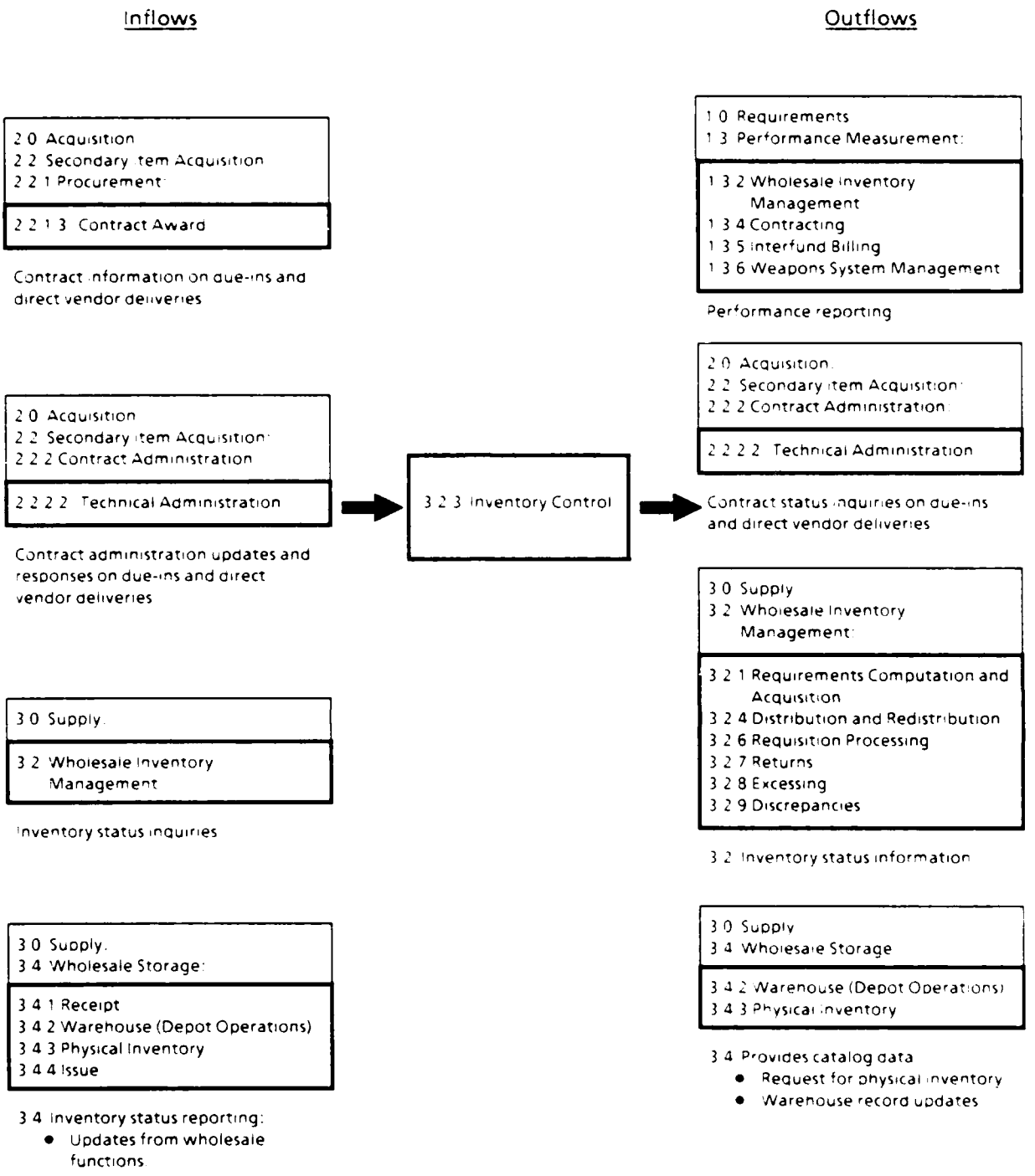
Note: This function includes two wholesale inventory management activities: the determination of wholesale requirements to meet requisition demand and stockage objectives, and the acquisition of stock to meet these requirements.

FIG. 1-21. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – REQUIREMENTS COMPUTATION AND ACQUISITION



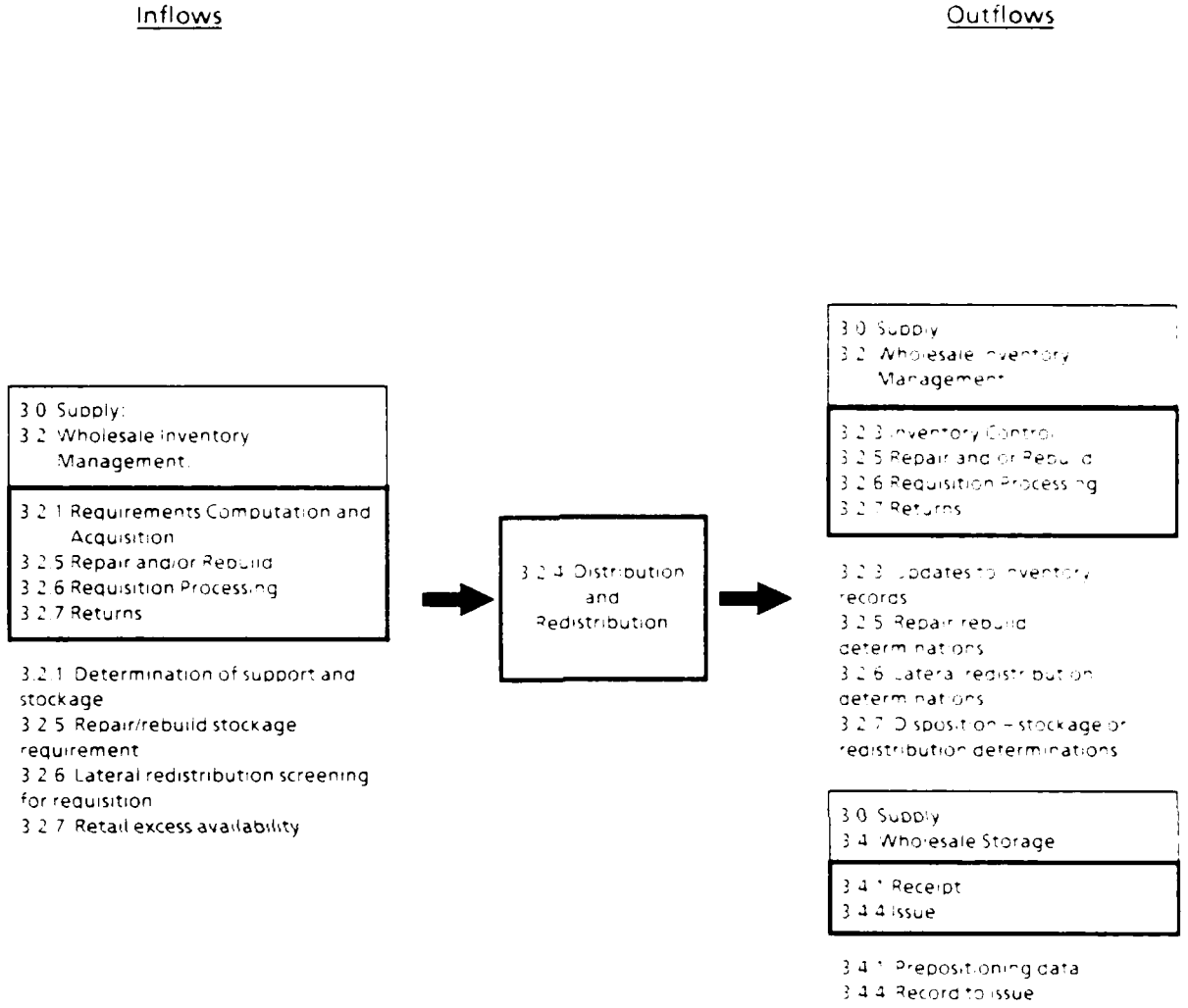
Note: This function supports all inventory management requirements for item identification, cataloging data reference, and retrieval.

FIG. 1-22. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – CATALOGING



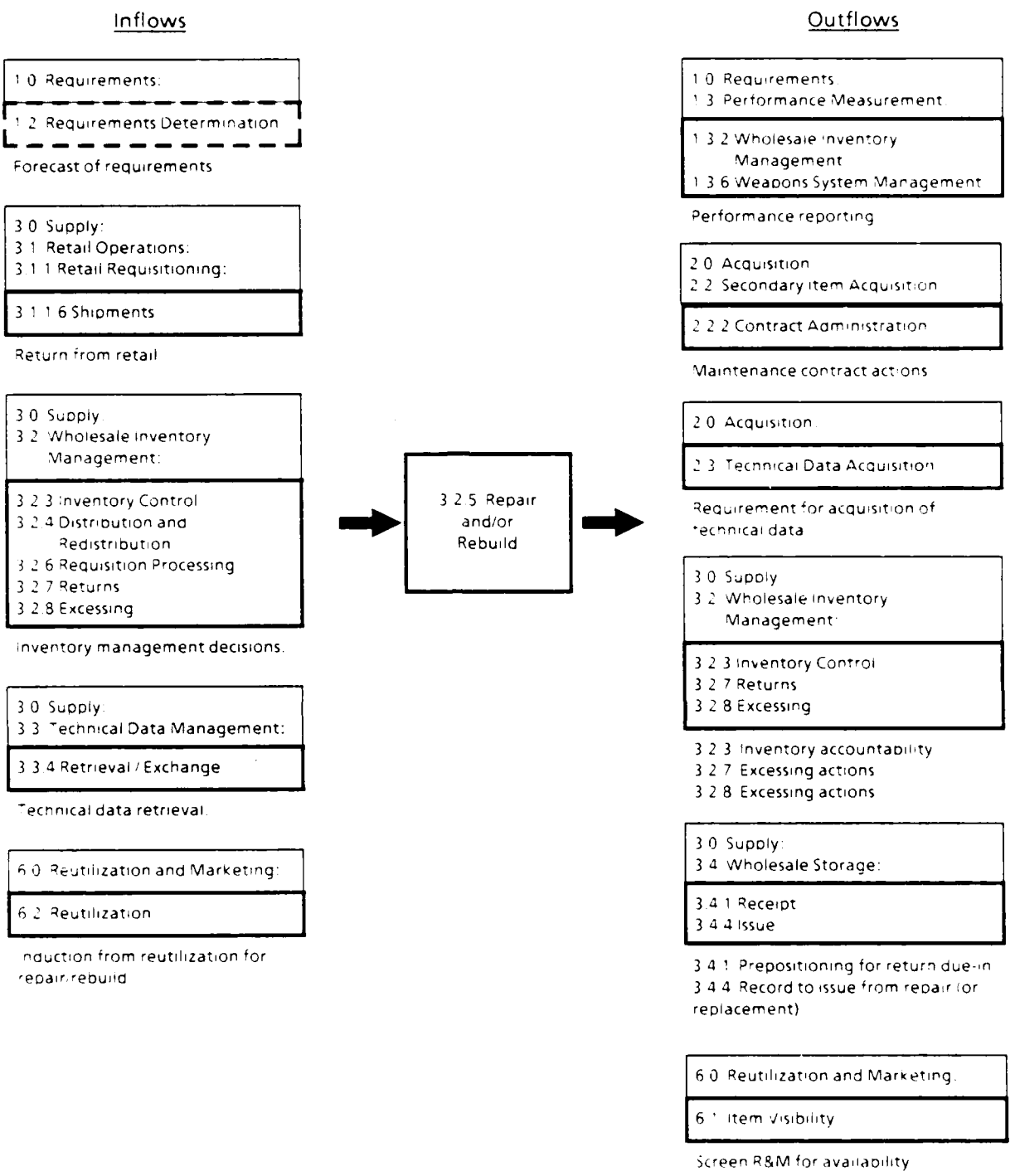
Note: This function covers maintenance of stock levels and replenishments, and management of accountable inventory records.

FIG. 1-23. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – INVENTORY CONTROL



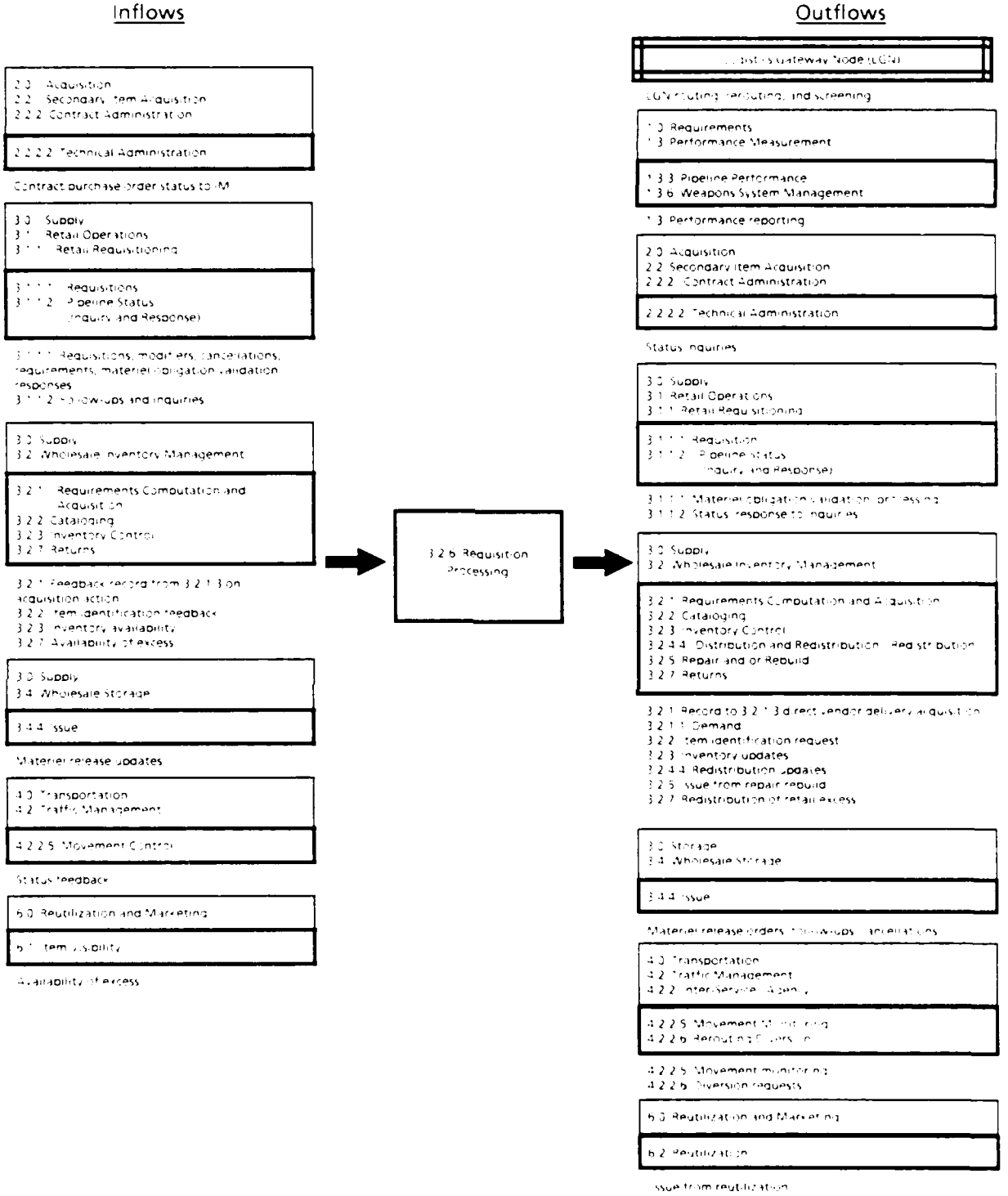
Note This function includes positioning and movement of wholesale stocks between and to wholesale sites, but does not include issue from wholesale to retail requisitioner.

FIG. 1-24. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – DISTRIBUTION AND REDISTRIBUTION



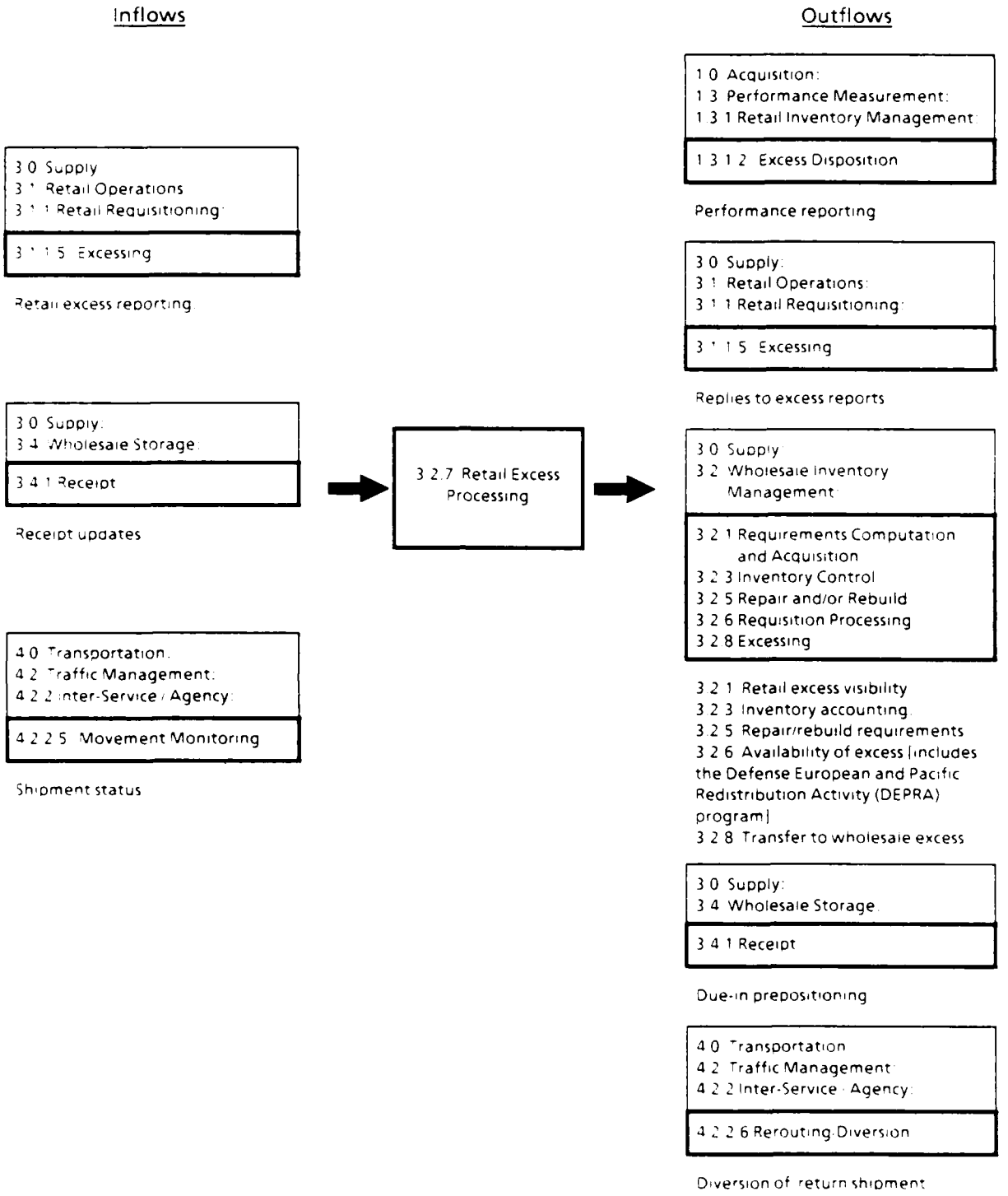
Note: This function includes decision process for determination of repair and/or rebuild of reparable items and resultant actions.

FIG. 1-25. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – REPAIR AND/OR REBUILD



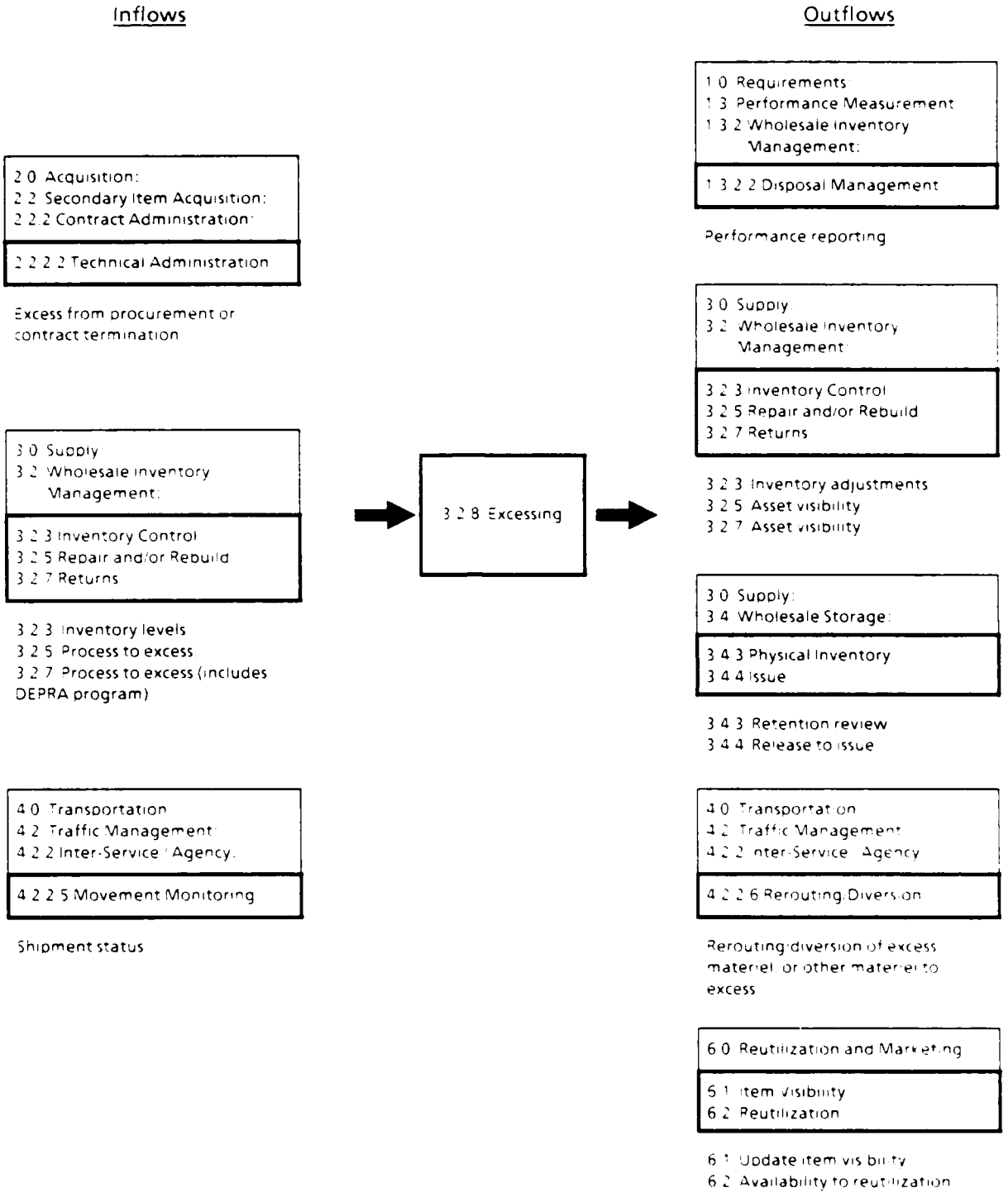
Note: This function excludes all inventory management, supply, and transportation necessary for requisition processing.

FIG. 1-26. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – REQUISITION PROCESSING



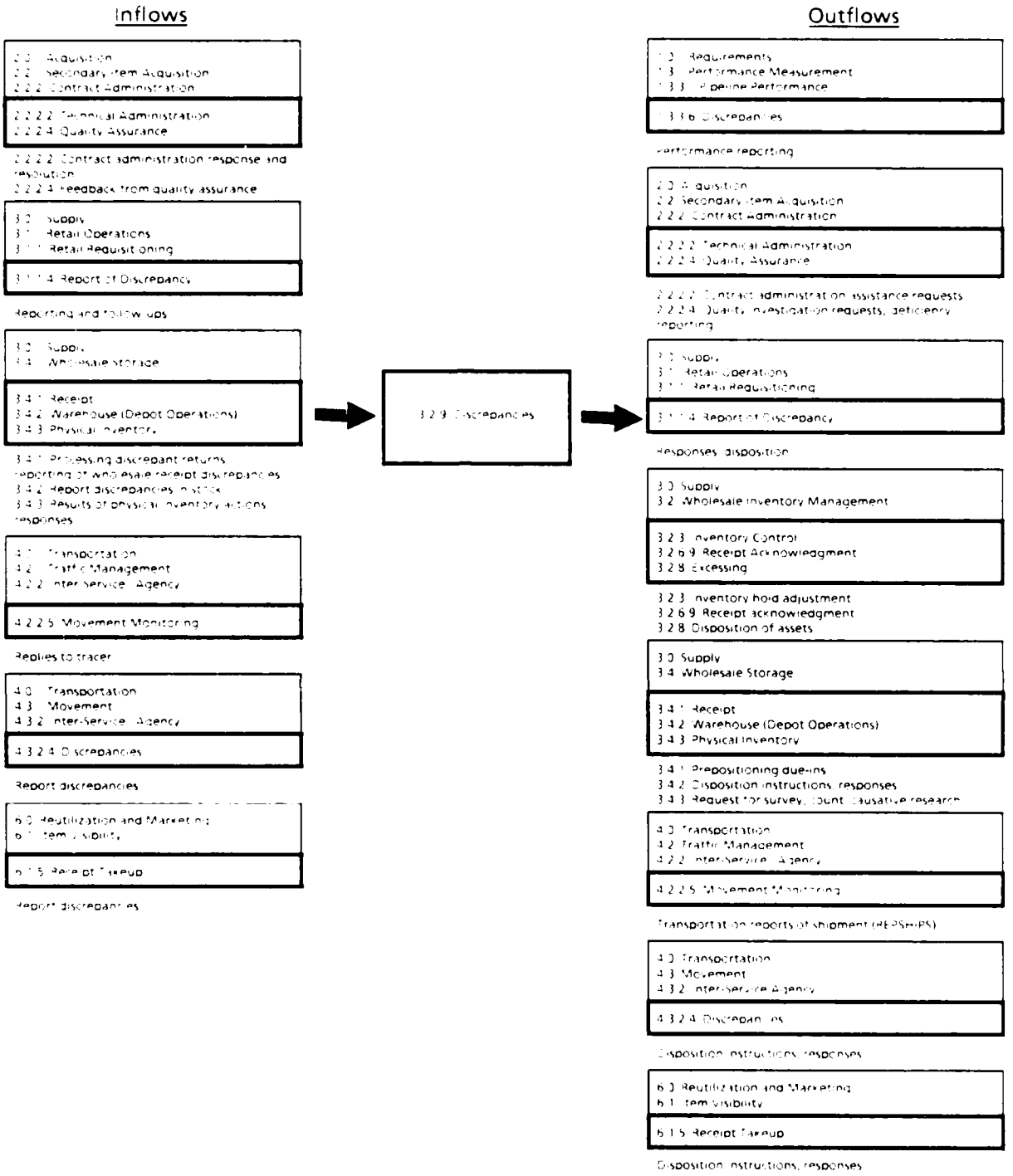
Note: These are the logistics processes related to review, authorization, and disposition of excess material reported from below the wholesale level in the redistribution systems first operate with the DEPRA program before being reported as excess for return to CONUS.

FIG. 1-27 WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – RETAIL EXCESS PROCESSING



Note: These are the logistics processes related to review, authorization, inventory adjustments, and disposition of excess materiel identified at the wholesale level.

FIG. 1-28. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – EXCESSING



Note: The logistics process of documenting and resolving discrepancies in materiel and shipments, including supply-type, quality, and transportation discrepancies.

FIG. 1-29. WHOLESALE INVENTORY MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – DISCREPANCIES

1.2.5 Technical Data Management

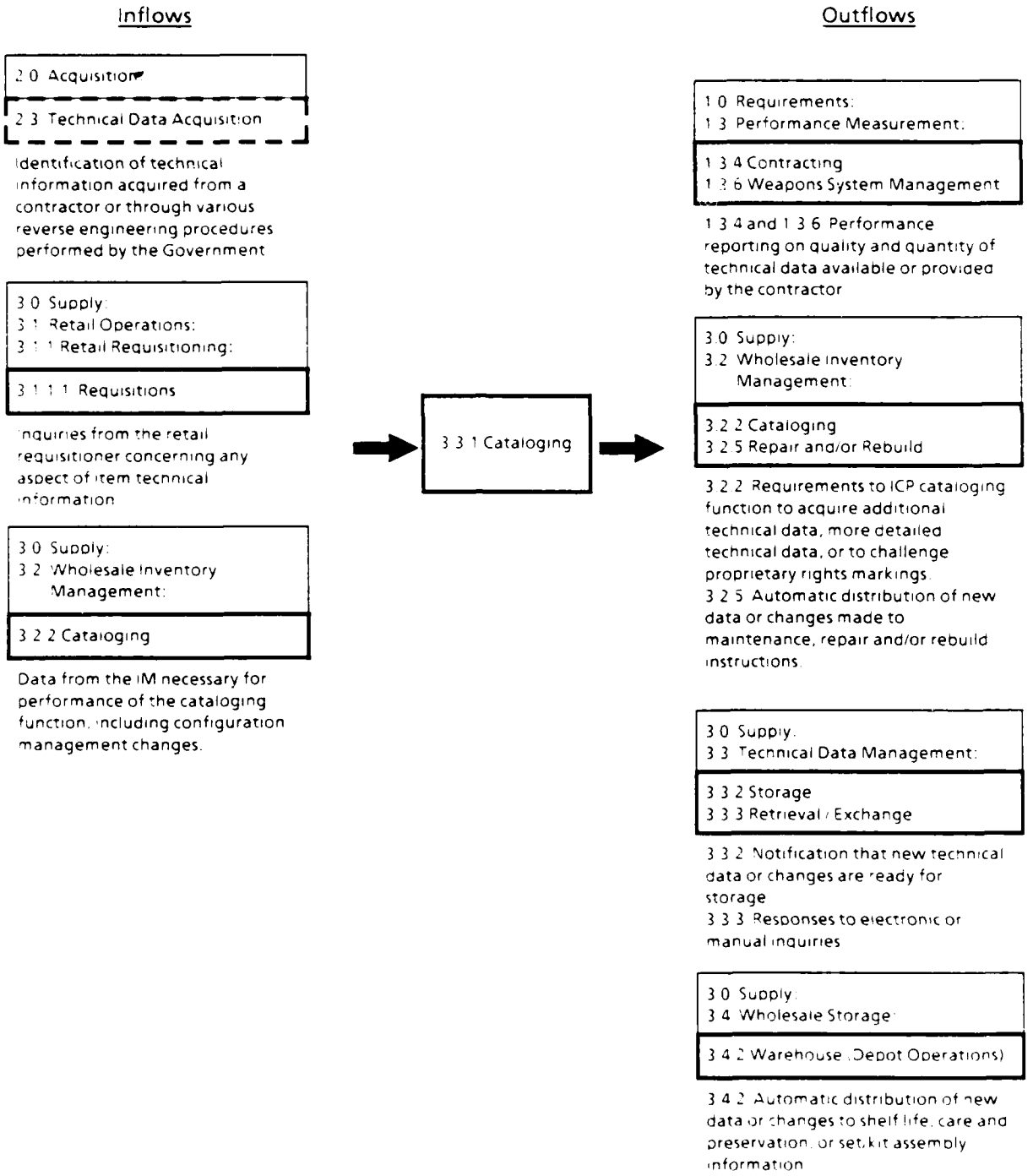
The next second-tier logistics supply function shown in Figure 1-4 is technical data management. It consists of the following:

- Cataloging includes the inflows and outflows (Figure 1-30) of information for the identification, notation, indexing, configuration management, and preparation for filing of technical specifications, drawings, pictures, etc., acquired as technical data.
- Storage inflows and outflows (Figure 1-31) include the storage of technical specifications, drawings, pictures, etc., for manual and electronic retrieval in response to inquiries.
- Retrieval/exchange (Figure 1-32) shows the process of finding, collecting, and collating technical information from contractors, etc., for dissemination and distribution to authorized users.

1.2.6 Wholesale Storage

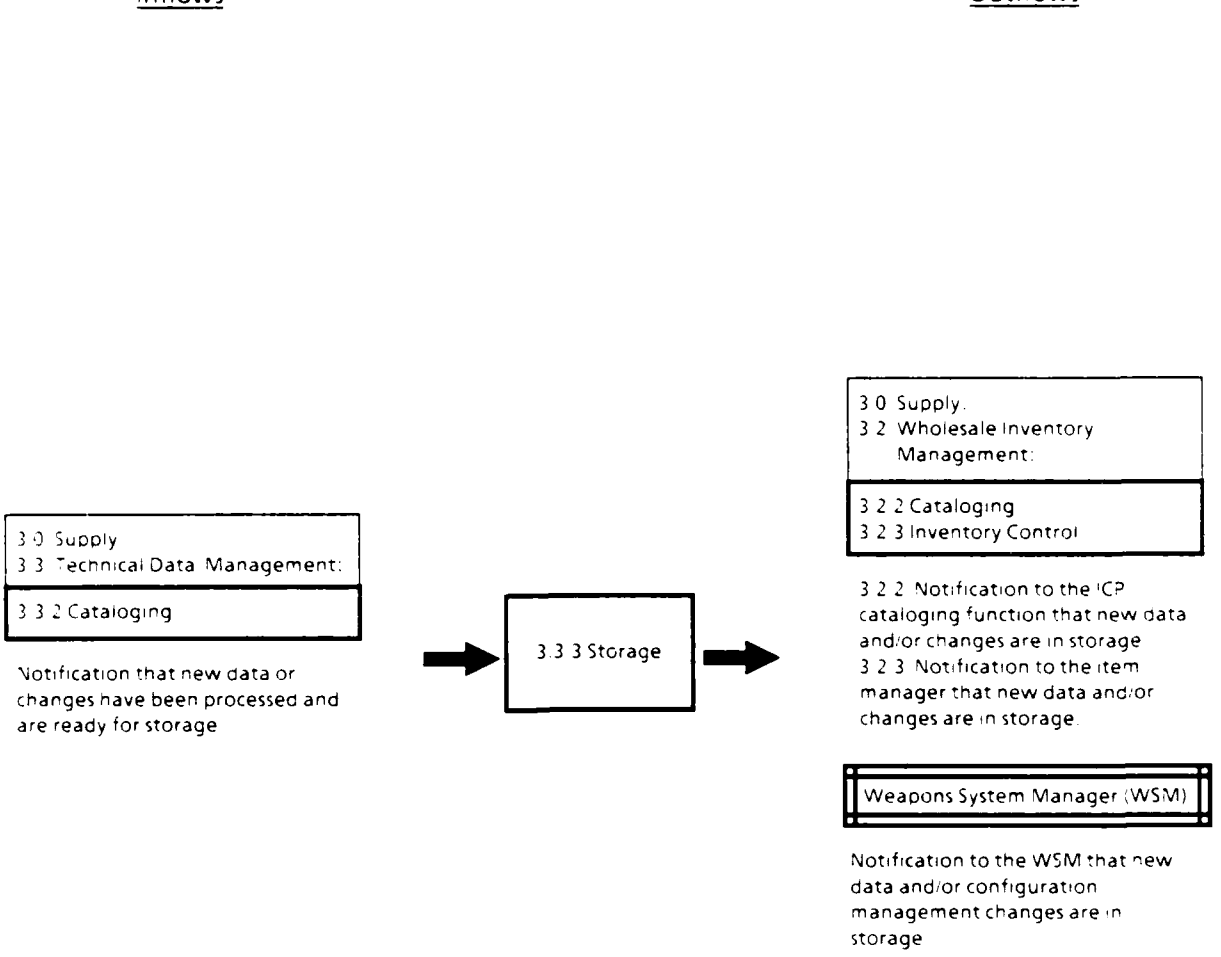
The last second-tier logistics supply function shown in Figure 1-4 is wholesale storage. It consists of the following third-tier logistics supply functions:

- Receipt inflows and outflows (Figure 1-33) include receipt processing at the wholesale level, including inspection, acceptance related actions, and update of inventory records.
- Warehouse (depot operations) information flows (Figure 1-34) concern the physical operation of warehousing, including stowage and maintenance of materiel in stockage.
- Physical inventory information inflows and outflows (Figure 1-35) account for and control stock on hand, including physical counting, reconciliation of discrepancies, location surveys, etc.
- Issue information flows (Figure 1-36) are related to processing issue requests, stock selection, confirmation/denial, and tender of materiel to the transportation functions.
- Shipment inflows and outflows (Figure 1-37) include information related to the physical preparation of materiel for shipment, depending on the mode of shipment.



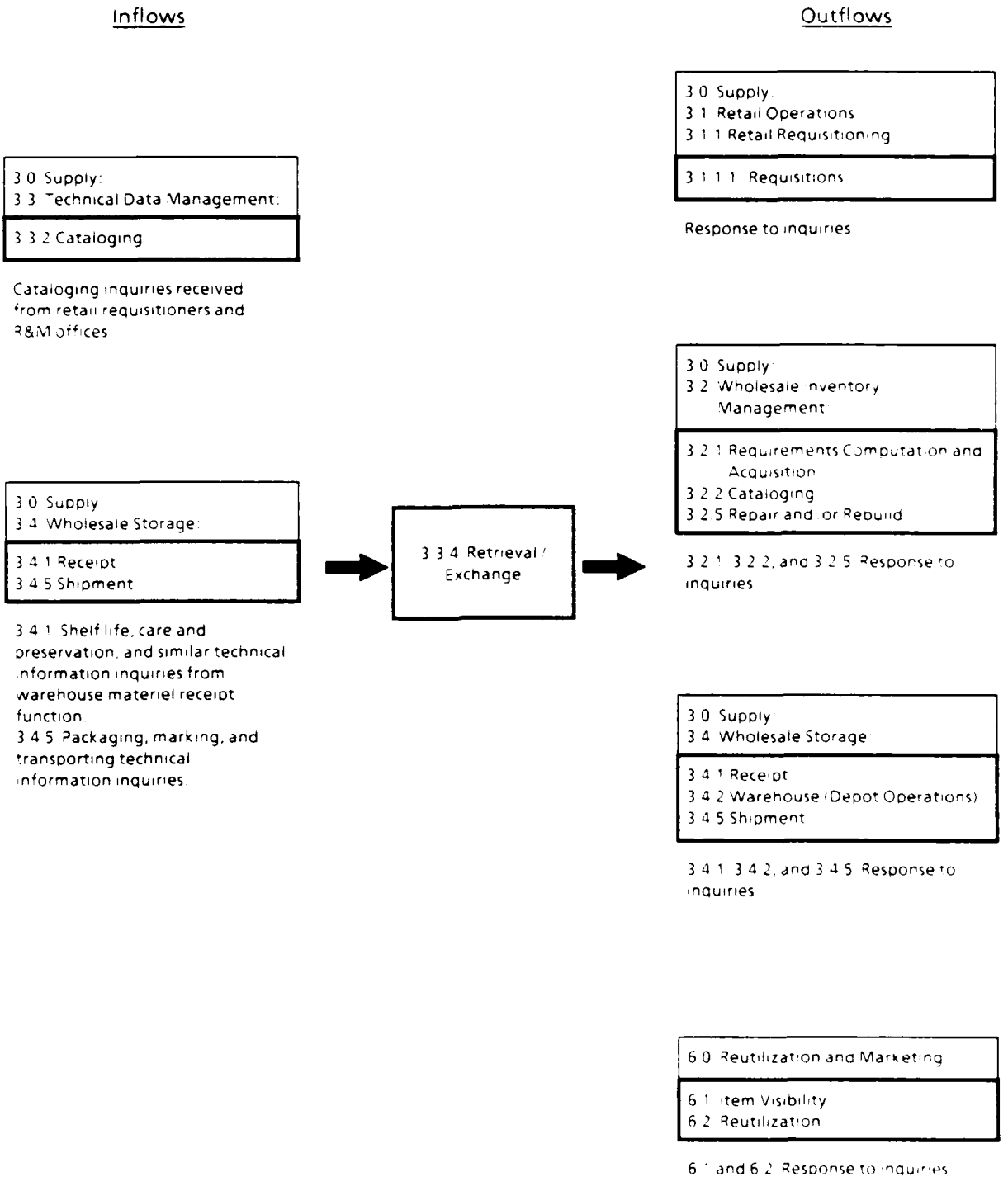
Note: This function includes the identification, notation, indexing, configuration management, and preparation for filing of technical specifications, drawings, pictures, etc., acquired as technical data.

FIG. 1-30. TECHNICAL DATA MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – CATALOGING



Note: This function includes the storage of technical specifications, drawings, pictures, etc., for manual and electronic retrieval in response to inquiries.

FIG. 1-31. TECHNICAL DATA MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – STORAGE



Note: This function includes the process of finding, collecting, and collating technical information from contractors, storage repositories, and reversion engineering centers for dissemination and distribution to authorized users.

FIG. 1-32. TECHNICAL DATA MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – RETRIEVAL/EXCHANGE

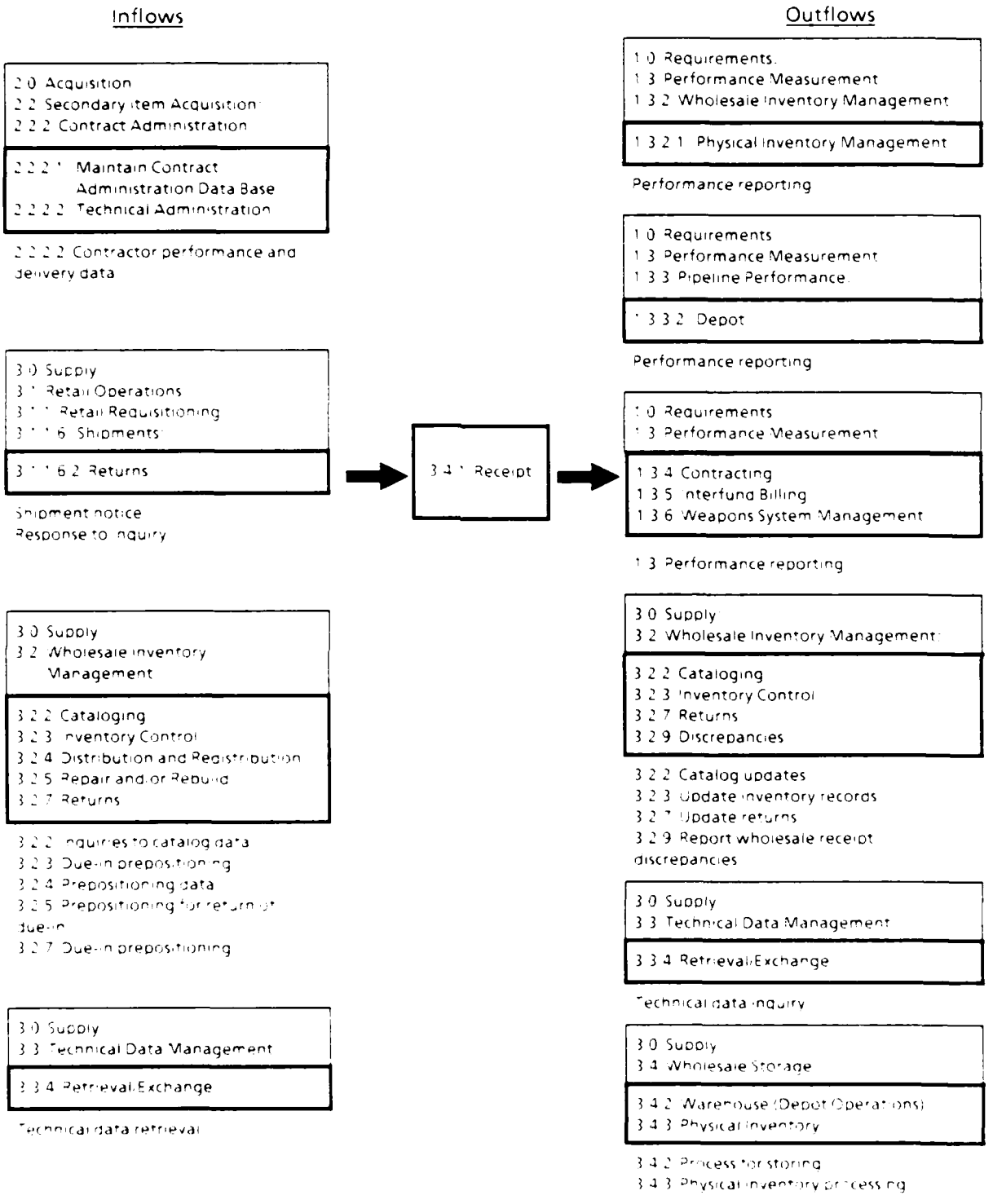
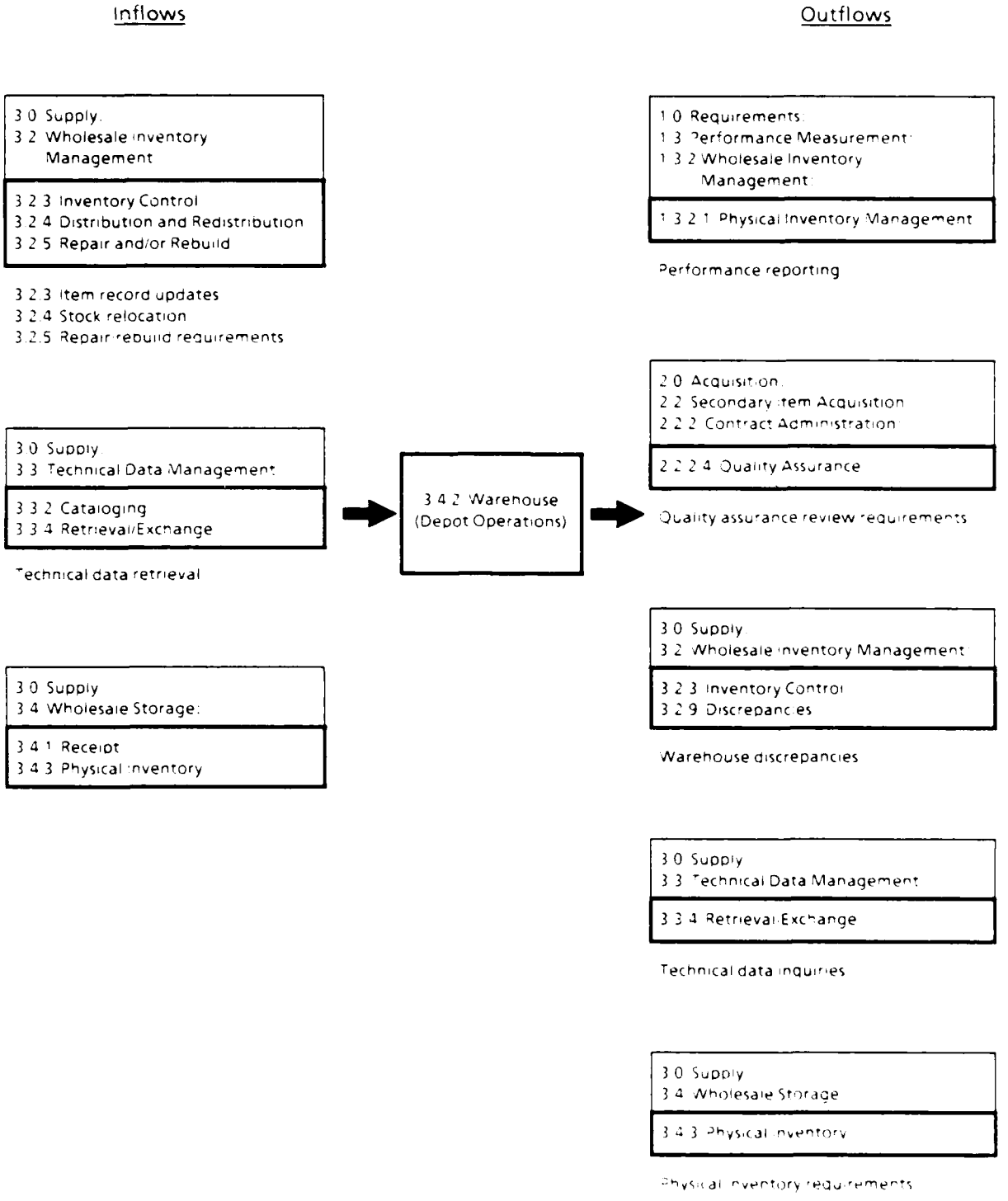
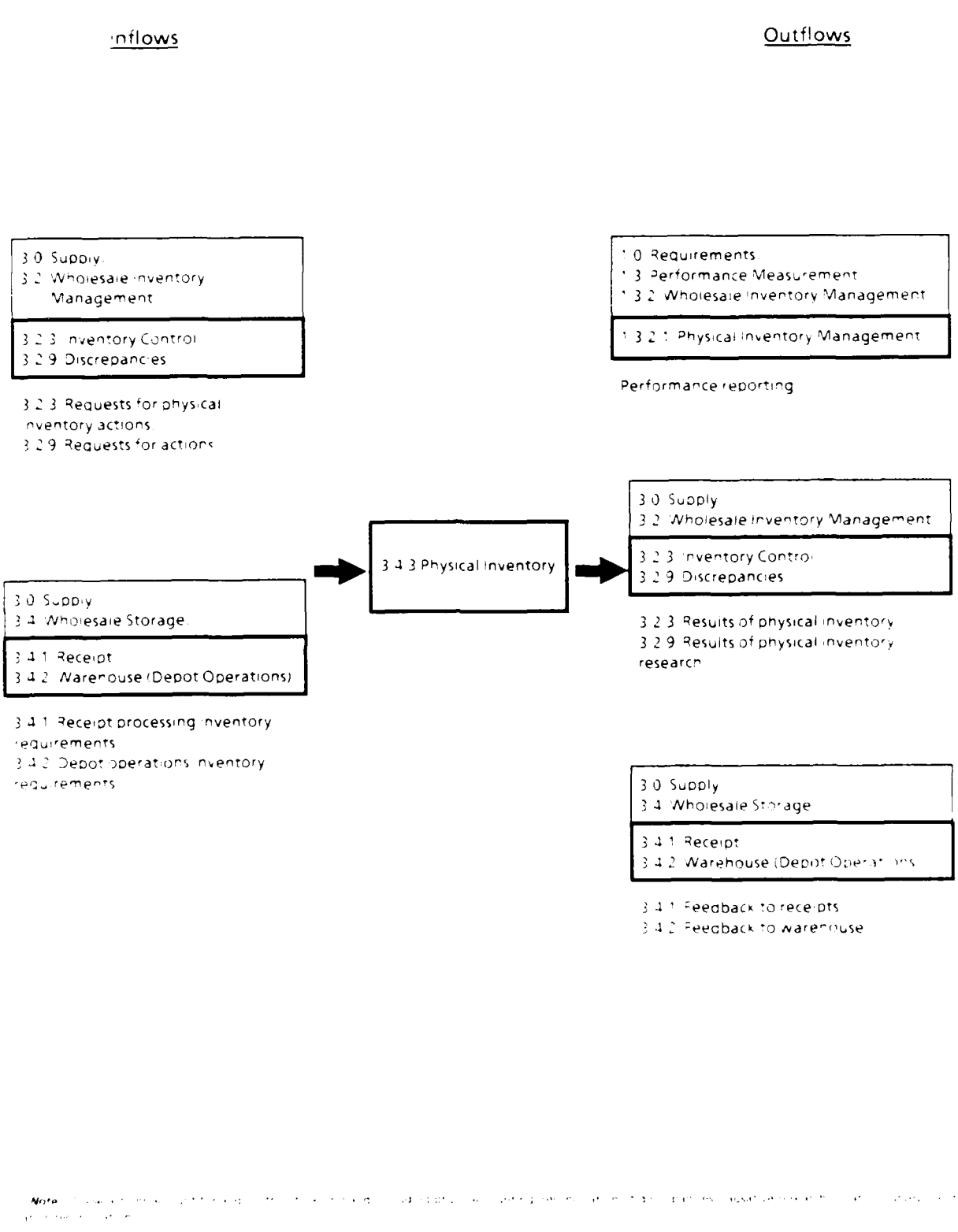


FIG. 1-33. WHOLESALE STORAGE TRANSACTION INFLOWS AND OUTFLOWS – RECEIPT



Note

FIG. 1-34. WHOLESALE STORAGE TRANSACTION INFLOWS AND OUTFLOWS – WAREHOUSE (DEPOT OPERATIONS)



Note:

FIG. 1-35. WHOLESALE STORAGE TRANSACTION INFLOWS AND OUTFLOWS – PHYSICAL INVENTORY

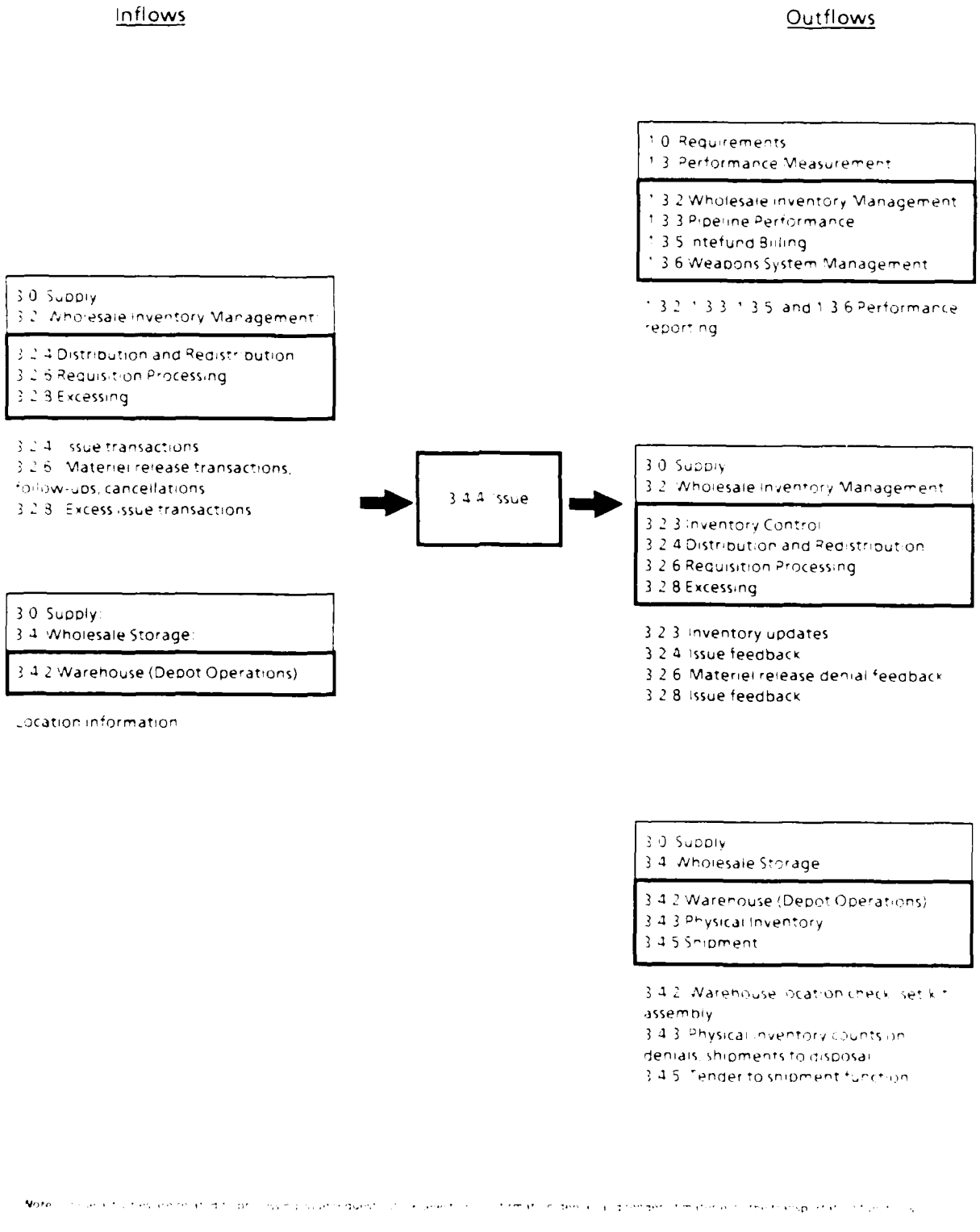
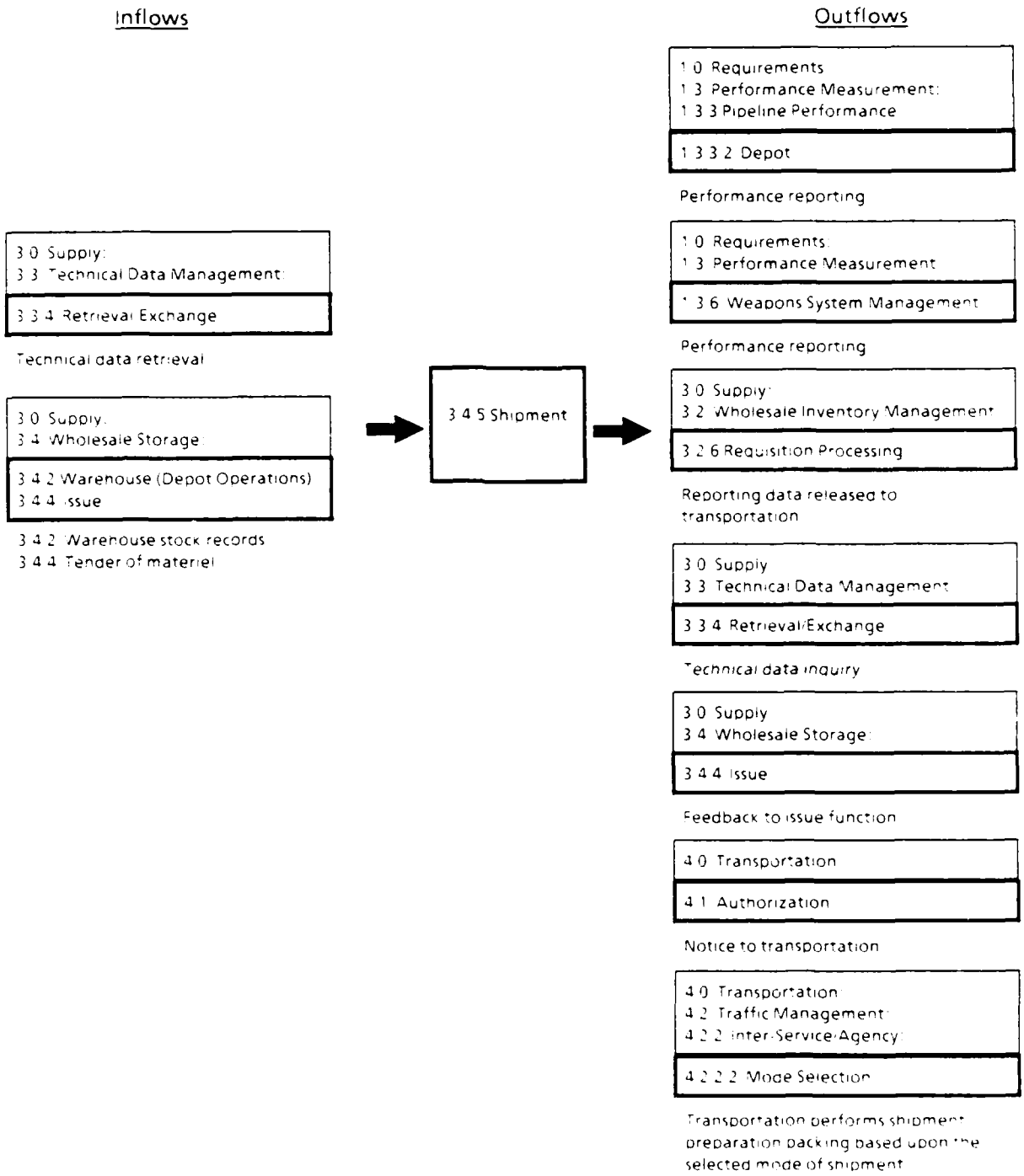


FIG. 1-36. WHOLESALE STORAGE TRANSACTION INFLOWS AND OUTFLOWS – ISSUE



Note

FIG. 1-37. WHOLESALE STORAGE TRANSACTION INFLOWS AND OUTFLOWS – SHIPMENT

1.2.7 Transportation Authorization

As shown in Figure 1-5, there are three second-tier logistics transportation functions. The transportation authorization function inflows and outflows are shown in Figure 1-38. They include the process of specifying movement requirements to the transportation provider.

1.2.8 Traffic Management

The second-tier logistics transportation function is traffic management. This function, whose inflows and outflows are shown in Figure 1-39, includes the planning, routing, scheduling, and control of materiel movements. There are diagrams for the following two traffic management subfunctions:

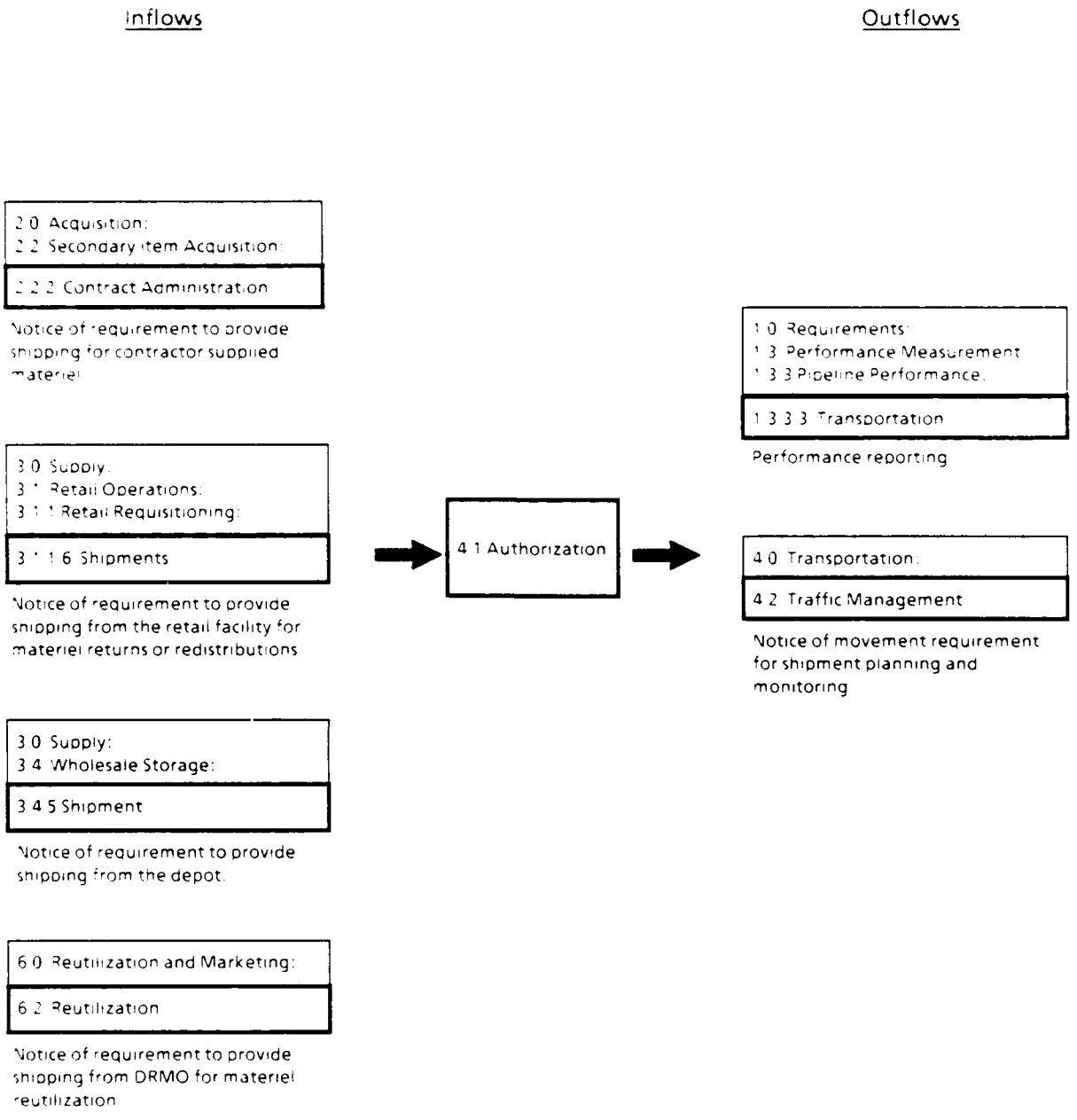
- Movement monitoring information flows (Figure 1-40) include tracking materiel from point of origin, through intermediate terminals and/or modes (different carriers) to destination.
- Rerouting/diversion information flows (Figure 1-41) include changing routing or changing the mode or carrier.

1.2.9 Movement

The last second-tier transportation function is related to the operation of transportation terminals and carriers. The inflows and outflows for this movement function are shown in Figure 1-42.

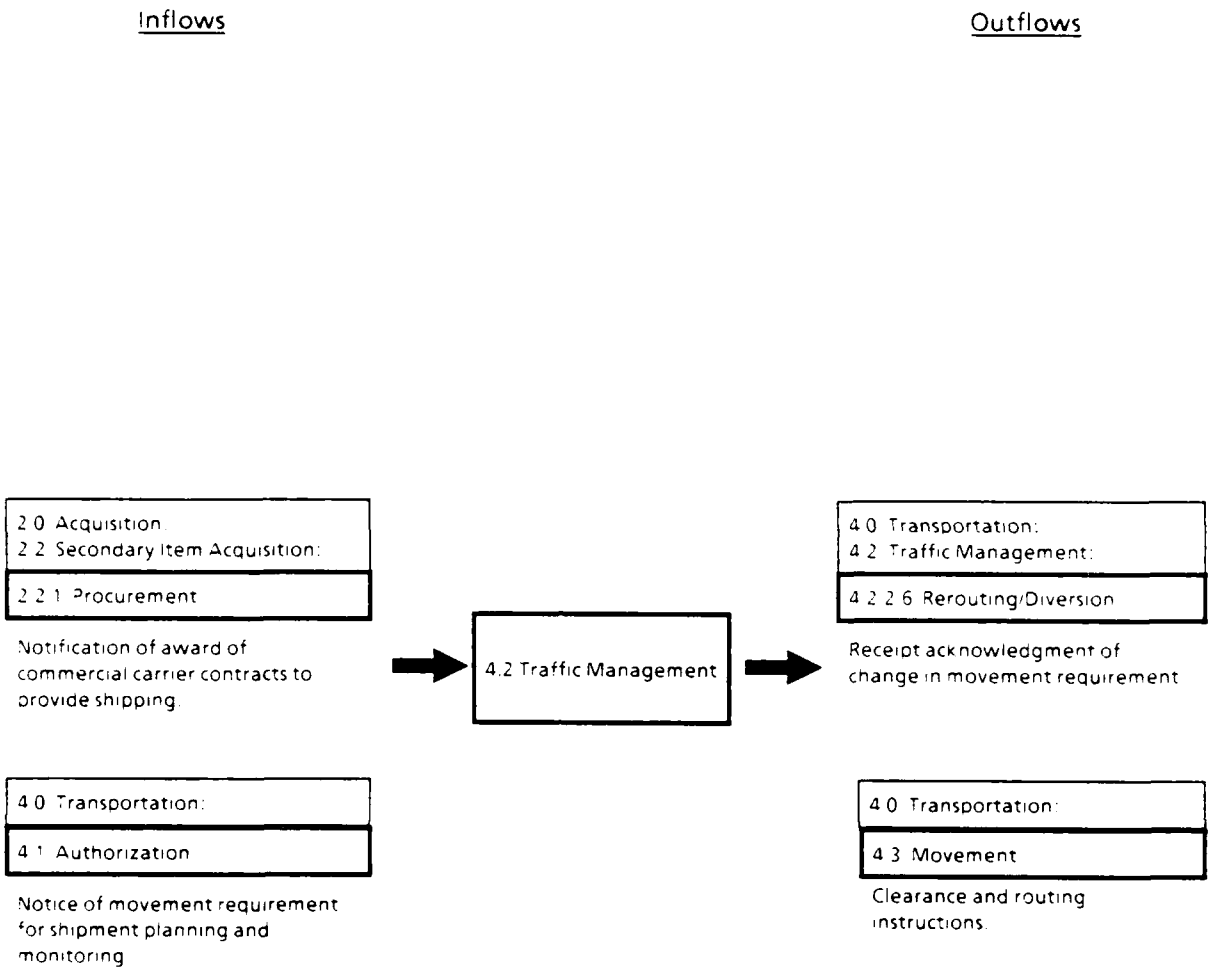
1.2.10 Reutilization and Marketing

As shown in Figure 1-6, the reutilization and marketing function has four second-tier logistics functions. The inflows and outflows for item visibility are shown in Figure 1-43. This function provides visibility of secondary item assets declared excess, including such information as quality, location, and condition. The remaining second-tier function – reutilization, sale, and scrap and waste – ensure that materiel excesses are screened and utilized to the fullest extent practical by other DoD activities or Federal agencies. The inflows and outflows for these functions are shown in Figure 1-44.



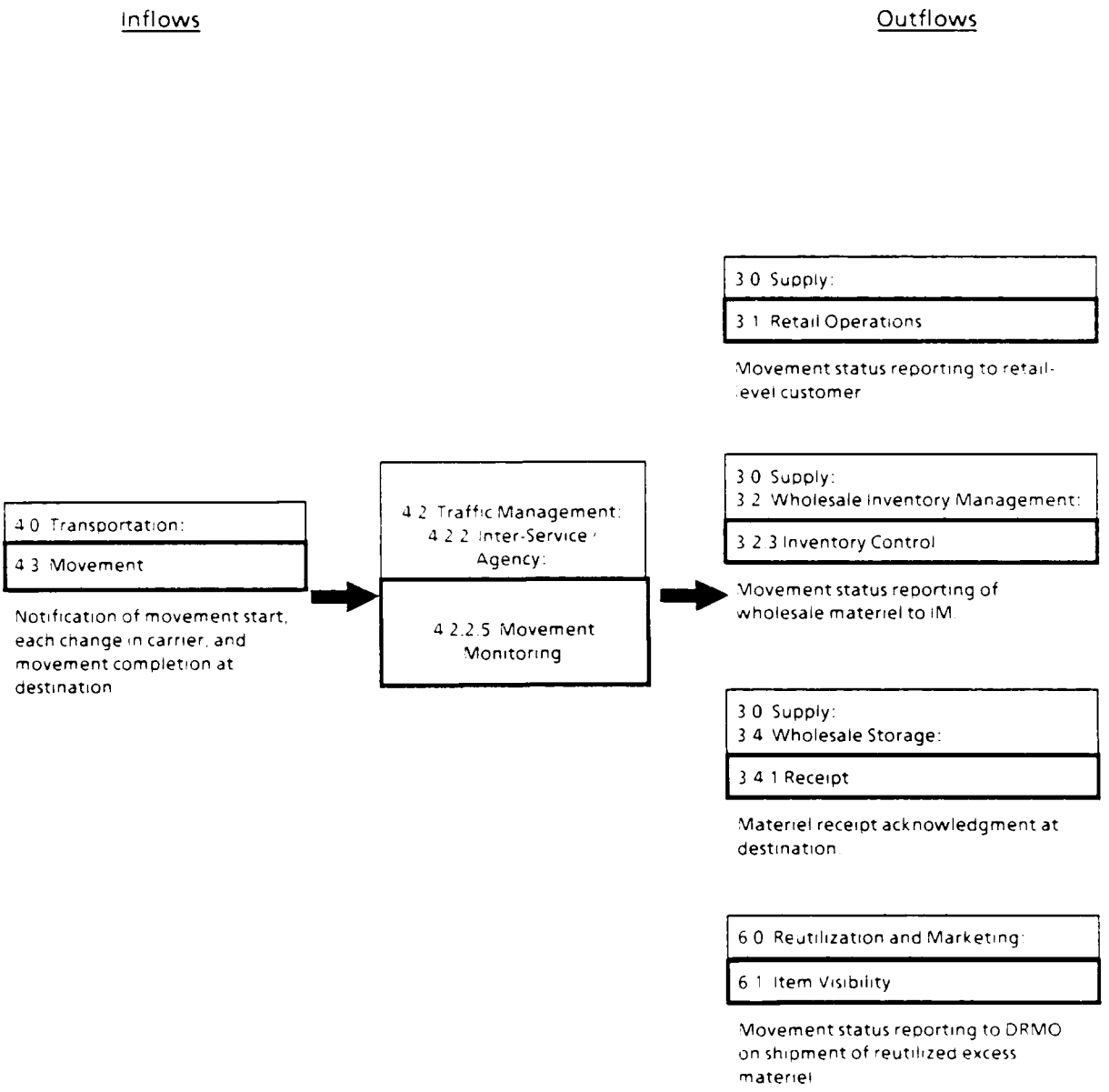
Note: This function includes the process of specifying a movement requirement to the provider of transportation, including description of what is to be moved, its origin, its destination, the movement priority, and required delivery date, and the funding authorization.

FIG. 1-38. TRANSPORTATION TRANSACTION INFLOWS AND OUTFLOWS – AUTHORIZATION



Note: This function includes the planning, routing, scheduling, and control of material movements including the procurement of commercial capacity.

FIG. 1-39. TRANSPORTATION INFLOWS AND OUTFLOWS – TRAFFIC MANAGEMENT



Note

FIG. 1-40. TRAFFIC MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – MOVEMENT MONITORING

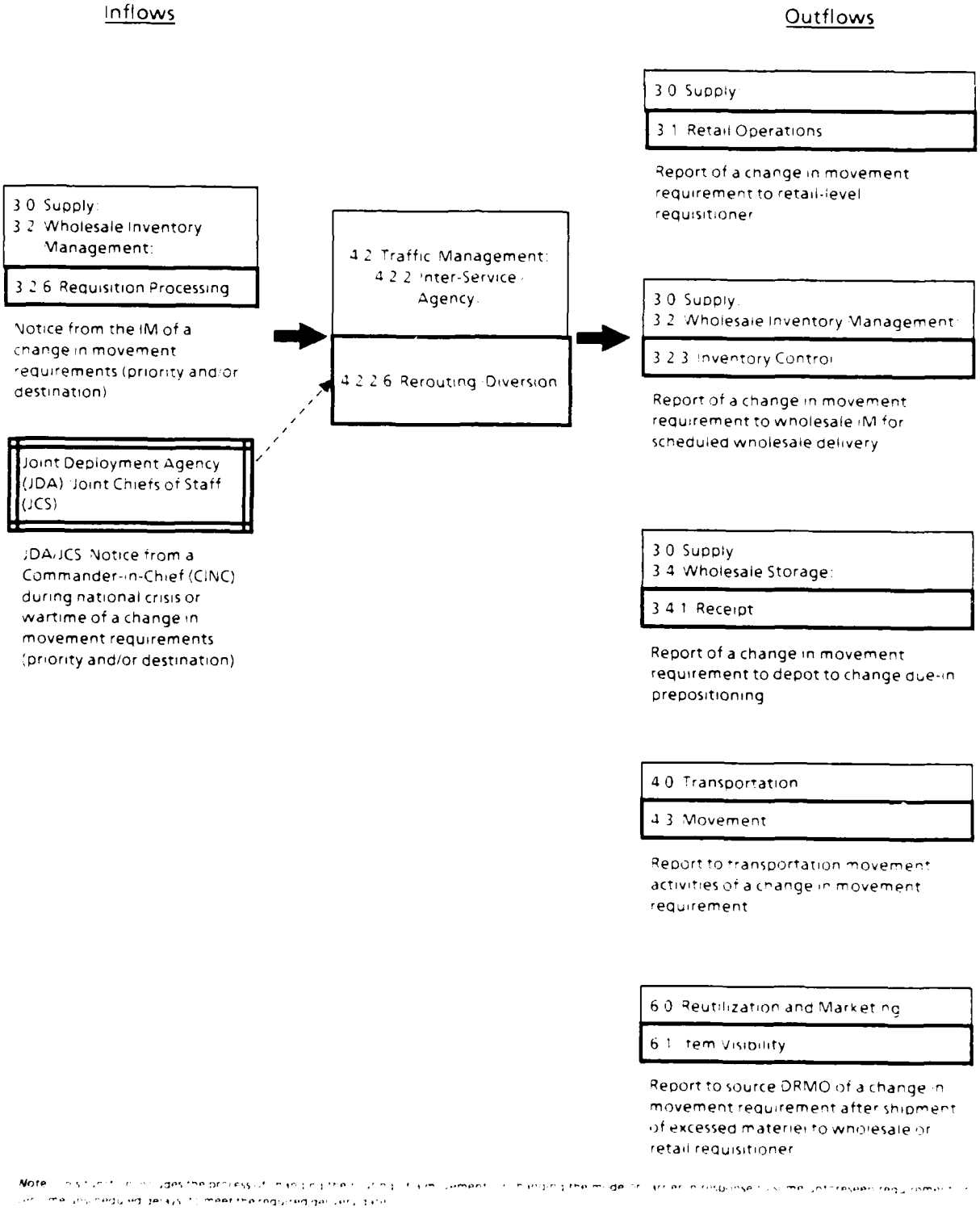
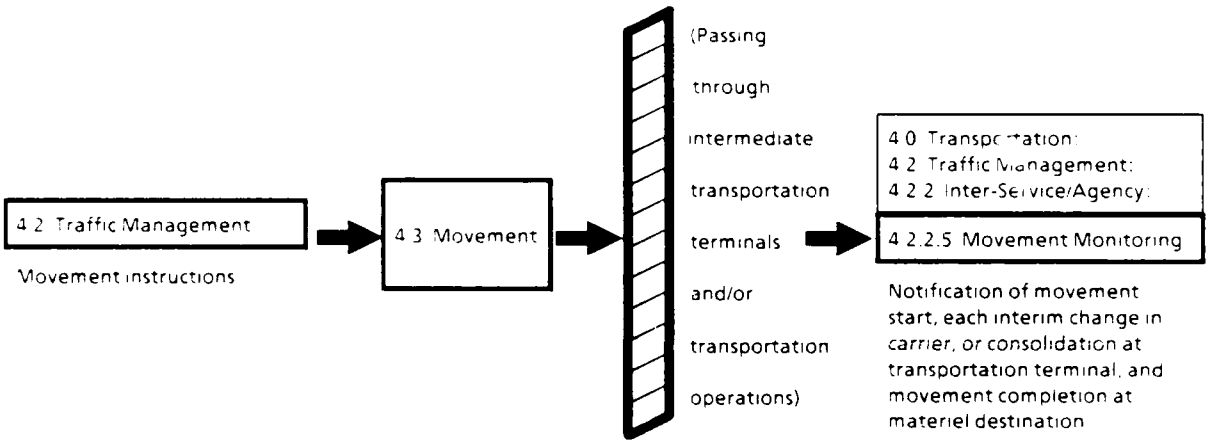


FIG. 1-41. TRAFFIC MANAGEMENT TRANSACTION INFLOWS AND OUTFLOWS – REROUTING/DIVERSION

Inflows

Outflows



Note

FIG. 1-42. TRANSPORTATION TRANSACTION INFLOWS AND OUTFLOWS – MOVEMENT

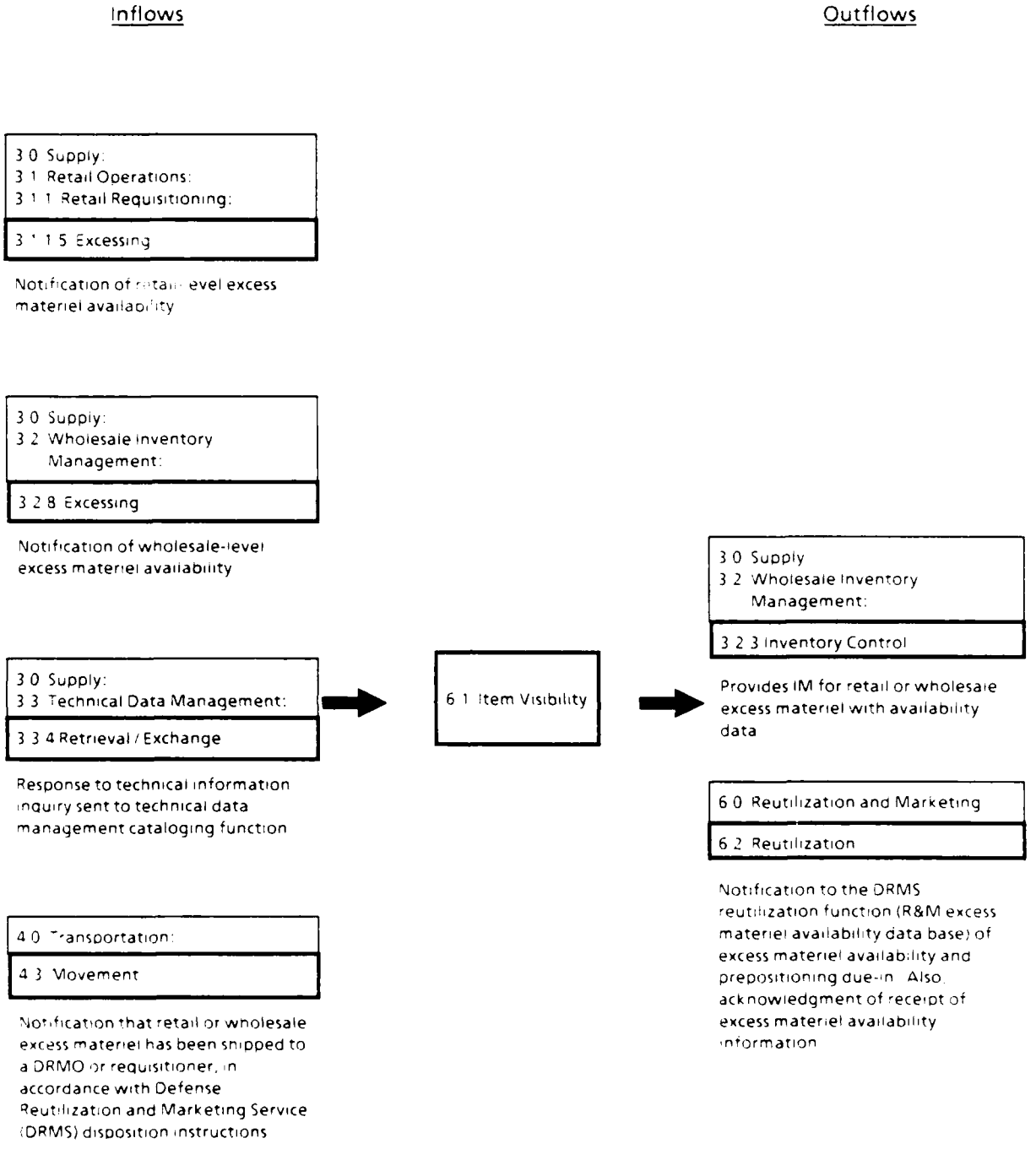
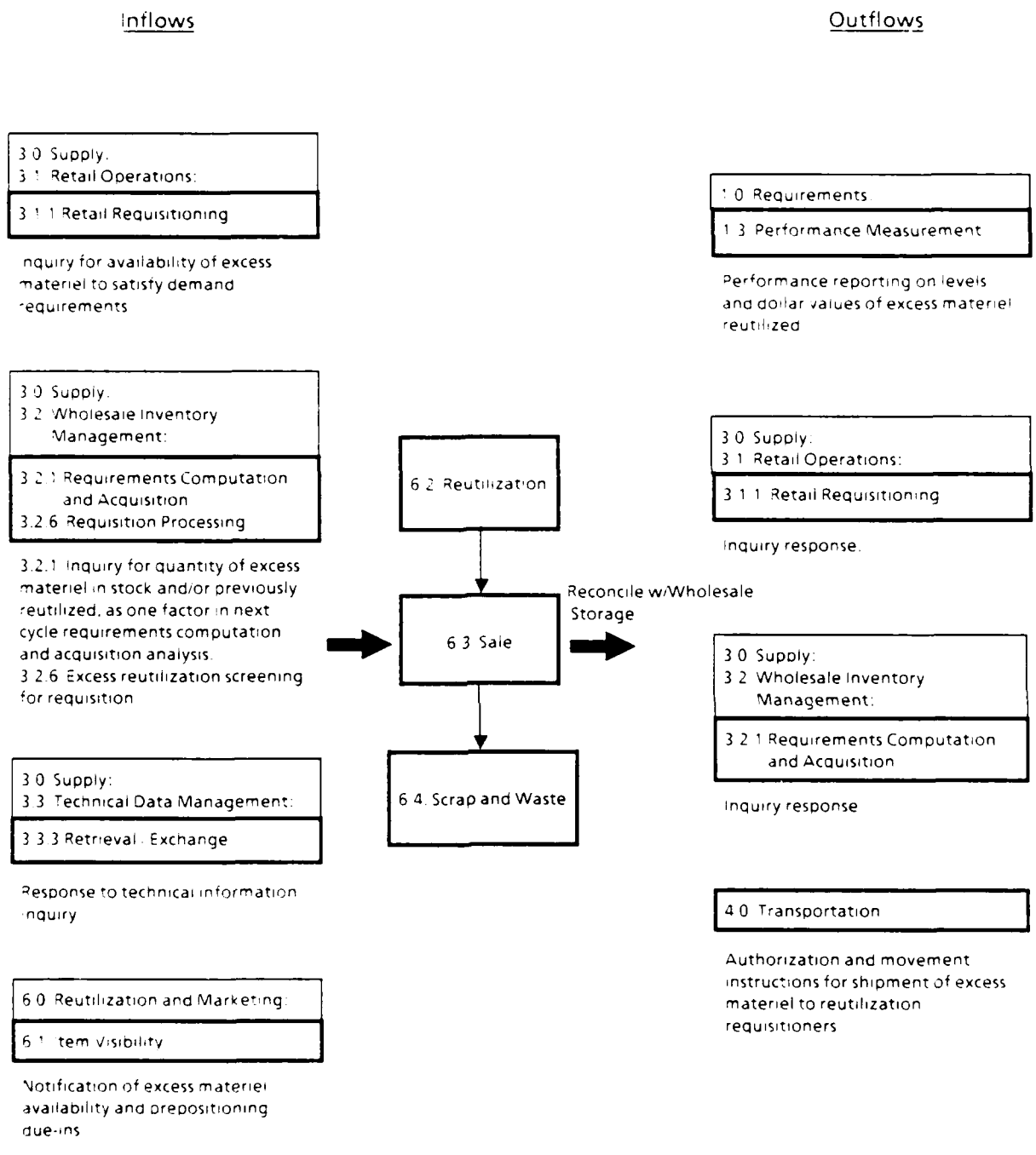


FIG. 1-43. REUTILIZATION AND MARKETING TRANSACTION INFLOWS AND OUTFLOWS – ITEM VISIBILITY



Note: The process that ensures that materiel excesses of one [illegible] component are screened and utilized to the fullest extent practical by other [illegible] federal agencies.

FIG. 1-44. REUTILIZATION AND MARKETING TRANSACTION INFLOWS AND OUTFLOWS – REUTILIZATION

SECTION 2

ANALYSIS OF ARCHITECTURES TO SUPPORT THE MODELS REQUIREMENTS

2.1 BACKGROUND

The MODELS Functional Requirements[1] describes two alternatives to the existing logistics system architecture. Those alternatives were analyzed in terms of the DoD-wide logistics system effectiveness and vulnerability. The existing system architecture against which the alternatives are compared consists of the two Defense Automatic Addressing System (DAAS) facilities that route documents, provide system interfacing, and perform value-adding functions to provide interoperability among the activities of the logistics system. The existing system and the two alternative architectures are shown in Figure 2-1.

The existing DAAS provides a broad range of services that are essential to the logistics community (see Appendix B). Those services were reviewed during the development of the alternative architectures to ensure that all the essential ones would be retained in a manner compatible with ongoing and future requirements of DoD. Additional services, not currently performed by DAAS, were also considered for incorporation into the architectural alternatives. These enhanced capabilities are defined on the basis of the recommendations of the Functional Requirements.

The first alternative is an expansion of the existing configuration to include additional nodes functioning in the same manner as the current DAAS. That alternative offers the potential for reducing system vulnerability and provides limited additional operational benefits. However, those benefits are offset by a substantial increase in system acquisition, operations, and maintenance costs.

The second alternative significantly modifies the services of the two existing DAAS sites. It augments the Dayton, Ohio site with individual processors at major logistics installations. The Dayton, Ohio DAAS site would provide the centralized

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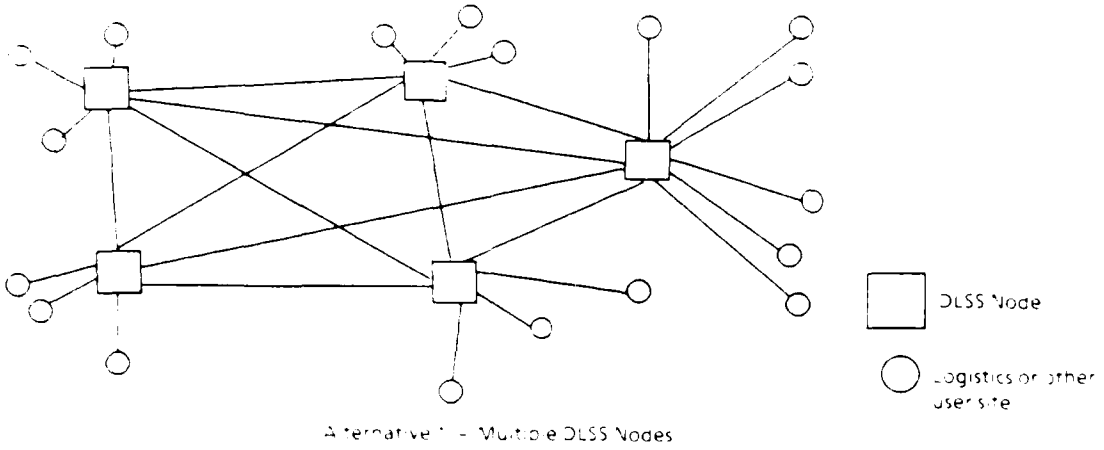
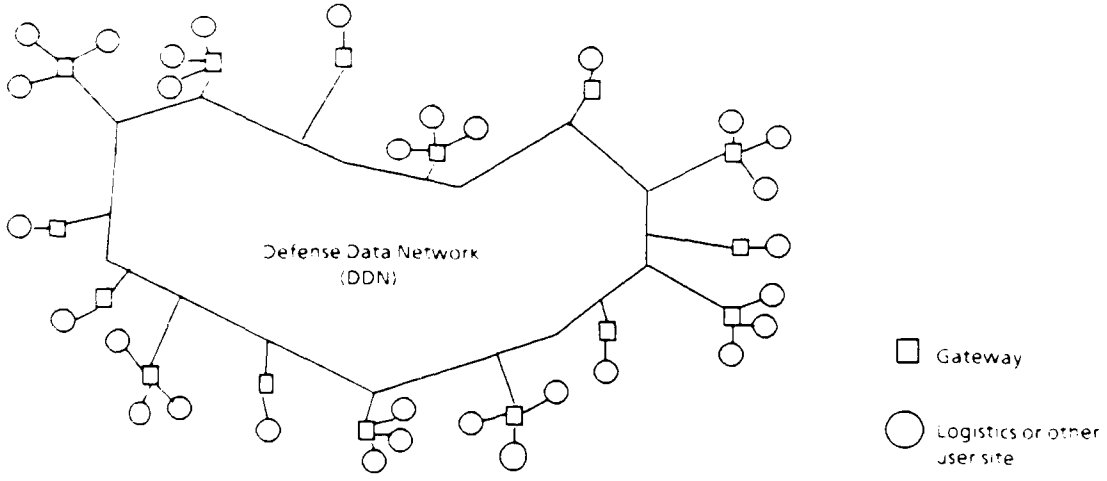
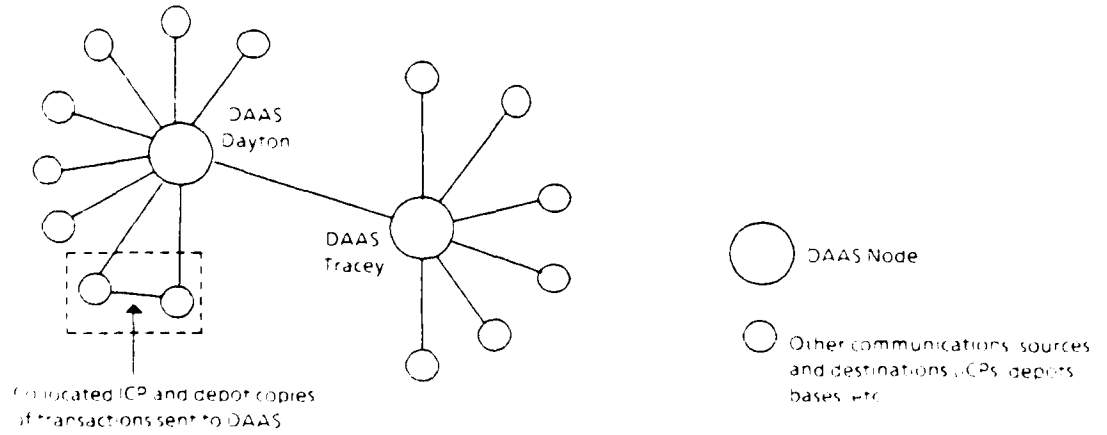
[1] LMI Report DL502R1. *Defense Logistics Standard Systems Functional Requirements*. Pp I-95 through I-107. Young, Paul A. Mar 1987.



Alternative 1 - Multiple DLSS Nodes



Alternative 2 - Multiple Gateway Processors



Existing System Architecture

FIG 2-1. TELECOMMUNICATIONS NETWORK ALTERNATIVES

services required by the logistics system. These distributed logistics installation processors [which were called gateway processors (GPs) in the Functional Requirements], are now called logistics gateway nodes (LGNs). The LGNs will perform passing, routing, editing, and special processing functions similar to those performed by DAAS. However, each LGN will perform these functions only for transactions entering and leaving the logistics site(s) it supports.

A preliminary analysis shows that the implementation of LGNs will significantly reduce system vulnerability, increase system functional capability, and reduce communications costs. Since the LGN architecture includes the installation of an interface gateway at major logistics installations, the logistics system will be distributed over many sites. As a result, system vulnerability is no greater than that of the individual site. Functional capability is improved because of the increased flexibility of the LGN architecture to accommodate changes at individual sites and the elimination of a requirement for storage of redundant centralized data bases. Communications costs are reduced by eliminating multiple transmission of messages through DAAS centralized nodes. Thus, the LGN alternative offers the potential for enhancing existing logistics system effectiveness.

The LGN architecture represents a significant change from the current "DAAS-based" architecture. Thus, while the LGN architecture appears to offer many advantages over the existing system, it must be analyzed in greater detail before reaching a final decision regarding its implementation. A preliminary functional description and cost estimate must be undertaken for the LGN architecture. Subsequent steps during a prototype test and evaluation effort should include preparation of a functional description in adequate detail to permit development of accurate estimates of LGNs.

The remainder of this section describes the LGN architecture, locations served, functions performed, and data bases used. It describes hardware and software required to support these functions and a preliminary estimate of their cost. It also provides recommendations on management and organizational issues associated with implementing the LGN architecture.

2.2 LOGISTICS GATEWAY NODE ARCHITECTURE

The following section provides an overview of the LGN architecture, gives examples of typical operations, and provides additional information on several key

points of the concept. A technical description of the concept is provided in subsequent sections.

2.2.1 Overview of Operation

The basic framework of the DLSS LGN architecture is illustrated in Figure 2-2. It provides for a network of identical communications processors, designated LGNs, linked by existing and evolving communications systems [such as Defense Data Network (DDN)]. In general, each LGN performs the same routing, passing, and error-checking functions now performed by DAAS. Each also performs the formatting and translation functions required to interface with other automatic data processing equipment (ADPE) at its user site. Each LGN would communicate with other LGNs (or the Central LGN in Dayton, Ohio) using standard DLSS formats and data. Each LGN would interface with a specific Service/Agency (S/A) set of users in formats and data unique to that set of users. For example, Army National Inventory Control Point (NICP) user interfaces may be standard but different from the Defense Logistics Agency (DLA) NICP interfaces. From a systems viewpoint it is desirable to have all LGN/user interfaces standard. However, that standardization is not currently practical. A full discussion of LGN functions is presented later in this section.

The Central LGN would interface with its Joint Command, OSD, and S/A "customers" through terminals and/or computer links. The nature of each of these interfaces requires additional definition. A more complete description of the Central LGN is also presented later in this section.

2.2.2 Illustrative Examples

The following examples illustrate the potential operation of the LGN architecture. The examples may be tracked in Figure 2-2.

2.2.2.1 Example 1: Routine Requisition and Shipment

In this example, the requisition originates in an S/A activity and is processed by S/A systems and procedures. It contains DLSS-specified data and S/A-unique data in a variable-length record. At the LGN site (the point at which the S/A interfaces with the wholesale logistics system), the data are reformatted for transmission using a DLSS format. The LGN routes the requisition to the appropriate NICP using table driven software. At the NICP, a second LGN passes the

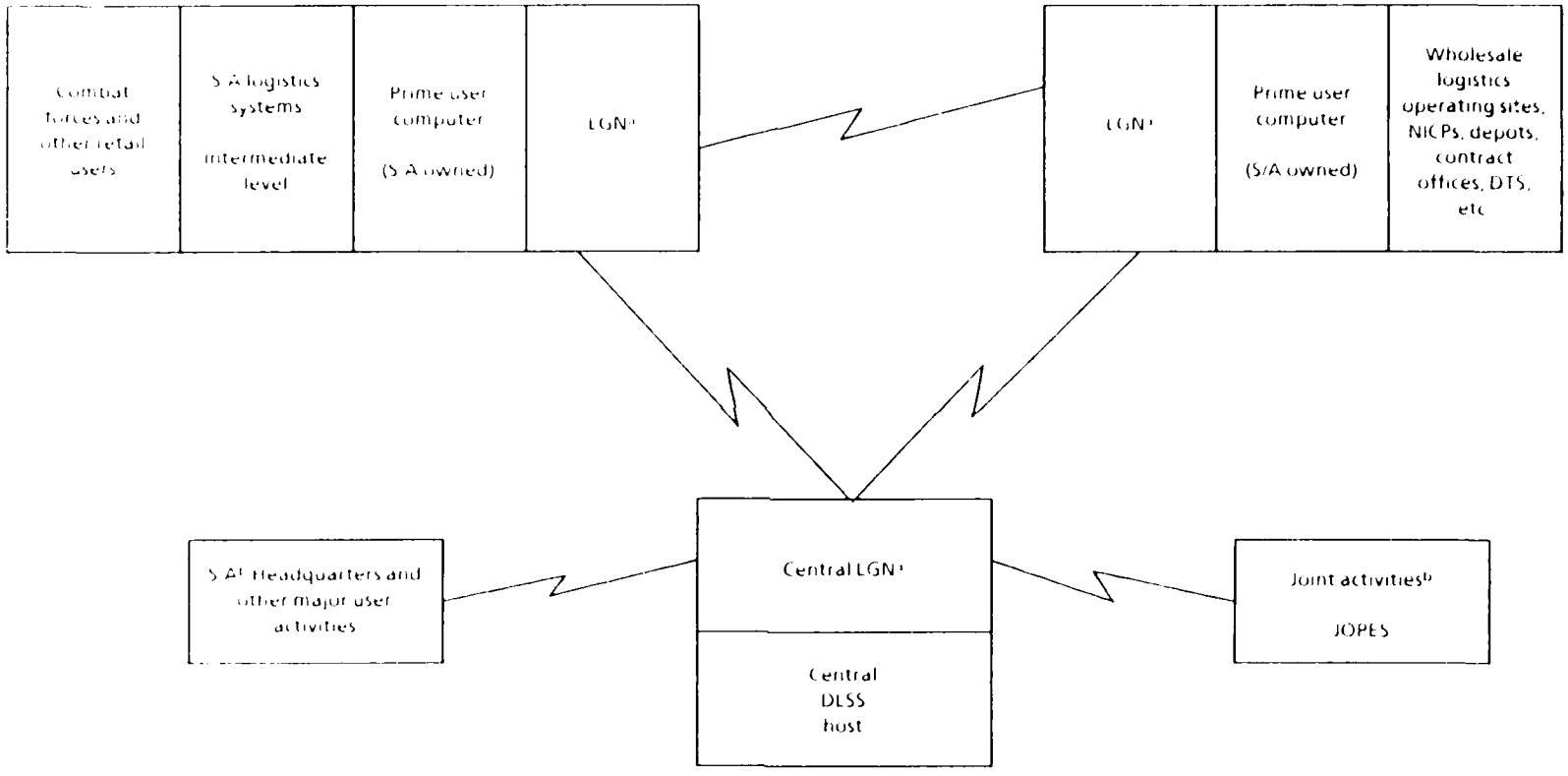


FIG. 2-2. MODELS DEFENSE LOGISTICS STANDARD SYSTEMS LOGISTICS GATEWAY NODE ARCHITECTURE

requisition to the NICP for further processing. The NICP prepares a Materiel Release Order (MRO) and transmits it to the appropriate depot. The MRO would be transmitted back through the NICP LGN to the LGN supporting the depot.

The depot notifies the appropriate transportation agency to ship the supplies, and notifies the requester that supplies are being shipped using standard DLSS formats. This notice of shipment would be directed through the depot's LGN to the appropriate LGN of the S/A.

On-line requesting will be available for designated critical items for the facilities that can utilize these advanced capabilities.

2.2.2.2 *Example 2: The Primary Source of Supply (SOS) Is Out of Stock*

In this example, the requisition cannot be filled at the primary SOS and is electronically directed to an alternative SOS. (*Note:* This capability will require some enhancements to S/A supply management systems.) The requester is not notified of the redirection unless a longer ordering/shipping time is projected. In that case the requester would be notified in a standard DLSS format routed to the appropriate LGN for transfer to the requester.

2.2.2.3 *Example 3: The Item Is Out of Stock in the Wholesale System*

If the wholesale system does not have the item, in the short term the NICP will notify the requester through the appropriate standard DLSS transactions sent to the requester's LGN. This notification will contain the DLSS-prescribed data and such other information as may be appropriate to the situation, e.g., a narrative message indicating an estimate of when the stock will be available.

In the longer term, the NICP or other designated agency would use the LGN to initiate a search of the worldwide retail inventory and reutilization and marketing (R&M) assets to determine availability of the needed supplies. The R&M search could be performed on-line.

2.2.2.4 *Example 4: The Requested Supplies Do Not Arrive Within the Expected Order and Ship Time*

In the event that the requested supplies fail to arrive within the required order/ship time, follow-up action, either computer- or human-generated must be

taken. Standard DLSS follow-up formats, augmented with S/A systems and procedures if necessary, will follow the same path as the requisition. When the requisition's status is determined, the user is notified through the appropriate LGN to the requesting S/A system. If the supplies have been shipped, the shipping supply activity notifies the initial transportation activity for continuation of the follow-up and the requester is notified (using the LGN) that the supplies have been shipped. Transportation activities continue the follow-up action and notify the requester when they determine the status. In the fully developed system and related S/A systems, this entire process will be electronic.

2.2.2.5 Example 5: The Joint Chiefs of Staff (JCS) Needs Information on the Status of a Critical Item for a Priority Decision

In this example, the appropriate Organization of the Joint Chiefs of Staff (OJCS) element would frame a global inquiry and submit it to the Central LGN using either a terminal or computer link. The Central LGN would extract the required data from LGN data bases (and from user data bases if required) and would respond to the query. Procurement, stock status (wholesale and retail), and pipeline data would be available in the fully developed network.

2.2.3 Joint Requirements

Of particular interest is the LGN's potential for providing a basis for resolution of a long-standing requirement for improvements in the S/A's capability to support Joint requirements for logistics information. These requirements stem from both the planning and execution responsibilities of the Joint community.

Many existing and evolving systems in the S/As and at the Joint level address these problems. All are hampered to some degree by the lack of firm requirements and standard data. Both of those problems are being addressed in the development of the Joint Operations, Planning, and Execution System (JOPES) and its various components, such as the Joint Deployment System (JDS), as well as by internal S/A programs.

The LGN architecture will provide a basis for development of capabilities to meet many of the known and potential Joint requirements. To provide the required capabilities, changes in traditional Joint procedures may have to be considered. For example, planners will have to project resupply requirements in terms of Federal

Supply Class (FSC) and Subclass in lieu of the classes and subclasses currently used, and critical items requirements may have to be projected in terms of National Stock Numbers (NSNs). If those changes are made, capabilities based on the LGN architecture would readily track the flow of supplies during execution of a crisis/war plan.

Most of the Joint logistics information requirements appear to stem from the supply and transportation functional areas. We suggest that priority be given to providing capabilities in those areas in the development of the Joint interfaces with MODELS. Joint requirements in other functional areas can be added later.

2.2.4 Support of Deployed Forces

The basic purpose of MODELS is to provide a framework for continued modernization of all the logistics systems in DoD. While the DLSS support all U.S. forces, the support of deployed forces is of particular concern. LGNs to support peacetime deployments are included in the list of proposed LGNs discussed later in this section.

The extension of DLSS to an undeveloped area of operations during a crisis or mobilization requires further study. Development of the capability is not expected to be technically difficult; however, it will require a great deal of coordination and may have to include various options to fit specific plans. Two alternatives provide a point of departure for consideration:

- Extension of S/A systems into undeveloped theaters. Under this concept, logistics data would enter DLSS through existing LGNs.
- Deployment of LGNs with the force. Under this concept, the deployed LGN(s) would operate in a similar manner to all other LGNs using available communications channels.

2.2.5 Operating Concept

The operations described in the preceding examples are similar to those performed by DAAS, except that the LGNs are physically located at the same facility as the primary user's computer with which they communicate. As a result, the requisition enters the primary communications system a single time, rather than being transmitted from the source to DAAS and then from DAAS to the Inventory Control Point (ICP).

If the transmitting computer has not been updated to reflect a recent change in requisition formats (such as the introduction of weapons coding data), the transmitting LGN requests the information from the user's computer and inserts it into the correct DLSS specified field before it is sent. The additional required information is inserted using either supplementary file data, direct operator input, or dummy codes. As a result, all logistics traffic would enter the data communi cations system in a common DLSS format. Similarly, if the receiving LGN is installed at a site that cannot accommodate a recent DLSS change, it would reformat the received data for compatibility with its processor, before passing it to the primary user computer.

The LGNs are also able to process single, discrete, on-line queries about supply system status, as illustrated in Figure 2-3.[2] Responses are provided through query into the LGN's data base through a transaction generated by the LGN into the data base of the supported user computer. For example, a requisitioner wishing to inquire about the status of a particular requisition would enter the query. The user's computer would forward the query to its local LGN as a standard "query" transaction using the user's format. The local LGN would search its own records to determine where the requisition had been sent and would then automatically forward a query (using a standard DLSS transaction format) to the LGN at the receiving site. The receiving LGN would search its data base to determine whether it processed any transactions related to the requisition. If it had, it would respond to the inquiring LGN. If the receiving LGN had no record of further processing of the requisition, it would return a transaction to the sending LGN to indicate it had no further updates on the requisition status.

If the receiving LGN responds with information indicating that the requisition has been passed to another site or has entered the transportation system, the inquiring LGN would have the capability to formulate additional queries for other sites to which the requisition response responsibility has been passed. In this manner, the LGN at the site of the original query can track the requisitioned materiel status throughout the logistics system through a "chained query" of other LGNs.

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[2]Complex queries or global queries involving collecting information from multiple LGNs are described in the section on Data Query Requirements

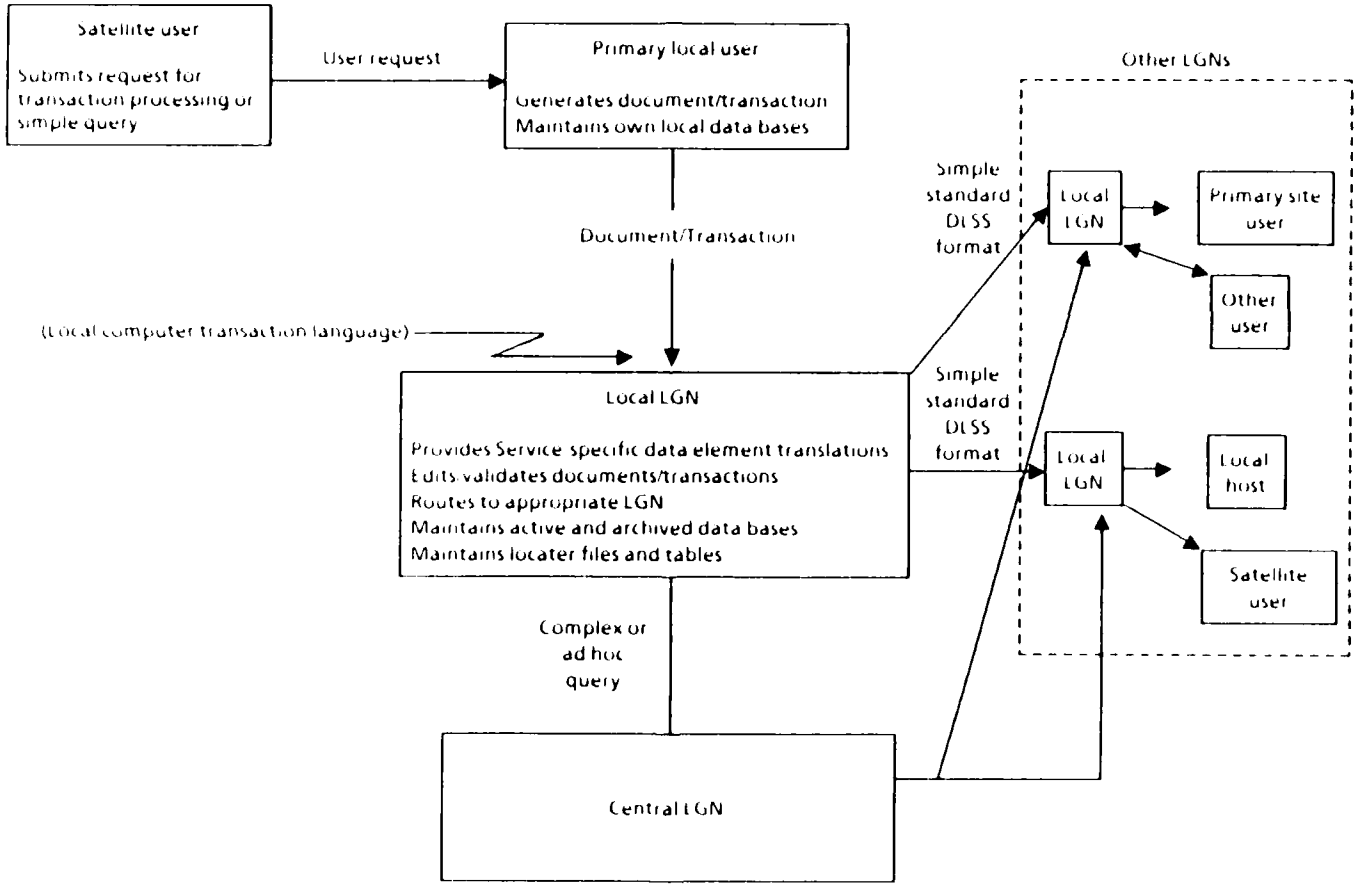

FIG. 2-3. SIMPLE VIEW OF USER QUERY FUNCTIONS

This search process, combined with the ability to formulate standard queries for the user computer's data base, offers a powerful capability for logistics customers to readily obtain up-to-date information on the status of requisitions without using multiple terminals or waiting for printed reports to be delivered. Other query capabilities related to system performance, item availability, transportation movement status, and contract status will be provided. Simple queries will be transmitted between LGNs using a common DLSS transaction format. Complex queries or nonstandard queries must be processed by the Central LGN.

2.2.6 Logistics Gateway Node Locations

The major logistics facilities that are candidates for LGN installation are identified in Table 2-1. That table also identifies the presence of a Central LGN at the existing DAAS site at Gentile Air Force Station in Dayton, Ohio. The Central LGN would provide management and updating for all tables, applications software, and data bases installed at the remote LGNs. It also would perform interfacing, reporting, and media conversion functions. Table 2-1 indicates that LGNs could be installed in CONUS, Europe, and the Pacific. Although Outside of the Continental United States (OCONUS) sites are not specifically identified, three installations could be located in the Pacific theater and three in Europe.

The facilities identified in Table 2-1 were selected on the basis of the functions they perform, the existing levels of logistics communications traffic, and geographical location. All facilities performing wholesale-level logistics functions have been included on this list without considering their existing communications traffic levels.

The number of retail facilities to be included on this list was determined on the basis of levels of logistics communications traffic levels. Those facilities are all characterized by traffic levels in excess of 1 million transactions per month.

The LGN architecture includes provision for the LGN to support nearby facilities. Security requires that communications with nearby facilities be per formed using telecommunications services that can verify the Communications Routing Identifier (COMM RI) of the source. That restriction would permit the use of the DDN, Automatic Digital Network (AUTODIN), Inter-S/A Automated Message Processing Exchange (I-S/A AMPE), Defense Logistics Telecommunications Net work (DLANET), Stock Point Logistics Integrated Communications Environment

TABLE 2-1

CANDIDATE LOGISTICS GATEWAY NODE LOCATIONS

Facility type	Organization	Number of locations
Defense Contract Administration Service Regions (DCASRs)	DLA	9
ICPs	Army	7
	Navy	3
	Air Force	6
	Marine Corps	1
	DLA	5
	General Services Administration (GSA)	1
Depots not collocated with ICPs	Army	5
	Navy	9
	Marine Corps	1
	DLA	5
Defense Reutilization and Marketing Service (DRMS)	DLA - Battle Creek, Michigan	1
Cataloging [Defense Logistics Service Center(DLSC)]	DLA	1
Defense Transportation System (DTS)	Army [Military Traffic Management Command (MTMC)]	2
	Navy [Military Sealift Command (MSC)]	3
	Air Force [Military Airlift Command (MAC)]	2
Central LGN (Dayton, Ohio)	DLA	1
Service finance centers	Army	1
	Navy	1
	Air Force	1
	Marine Corps	1
Major CONUS retail facilities (locations to be determined)	All Services	20
International Logistics Control Offices (ILCO)		Collocated with other Service facilities
European Theater	Shared facilities	3
Pacific Theater	Shared facilities	3
JOPES	OJCS	1
LGNs could also be installed at the sites of commercial organizations		To be determined

(SPLICE), Marine Corps Data Network (MCDN), etc. Leased lines could also provide this capacity. While the use of commercial dial-up telephone facilities is technically feasible, it precludes verification of the origin of the sender, a function that is required to prevent unrestricted access to the system.

2.2.7 Local Site Configuration

In a typical configuration, the LGN would act as an interface between the user's processor and a communications service such as DDN. Logistics traffic originating at the user's computer would be transmitted to the LGN using the data formats of the user's configuration. The LGN would receive the user transmission, identify the destination address(es), and translate the user's data formats into a common DLSS format before transmitting the data. In addition, the LGN would perform necessary table maintenance and accumulation of traffic statistics. The LGN at the destination facility would receive the data and translate it into the language used by the user at the destination site. The general equipment configuration to support this operation is shown in Figure 2-4.

2.2.8 Common Defense Logistics Standard Systems Formats

The processing sequence defined above permits the use of unique data formats by the user's equipment while ensuring that all logistics data are transmitted using a common DLSS format. The DLSS formats will be designed to accommodate Service-unique fields. This approach permits the use of differing user data formats that will be invisible to the overall logistics system because of the translation capability of the LGN. As a result, DLSS changes can be implemented without the delays that are currently imposed when a single Service is unable to quickly implement the required modification.

The significance of this capability should not be underestimated. In general, a DLSS change requires between 1 and 2 years for its implementation. This delay is necessary because of the need to delay system revisions until all participating organizations are able to update their user software in response to the required DLSS change. These delays are currently increasing because of Service requests that changes be delayed as long as possible to avoid disrupting ongoing moderni zation programs. However, requirements for future DLSS changes will probably occur at an increasing rate because of the introduction of new requirements and capabilities such as transmission of graphics information, on-line data base queries

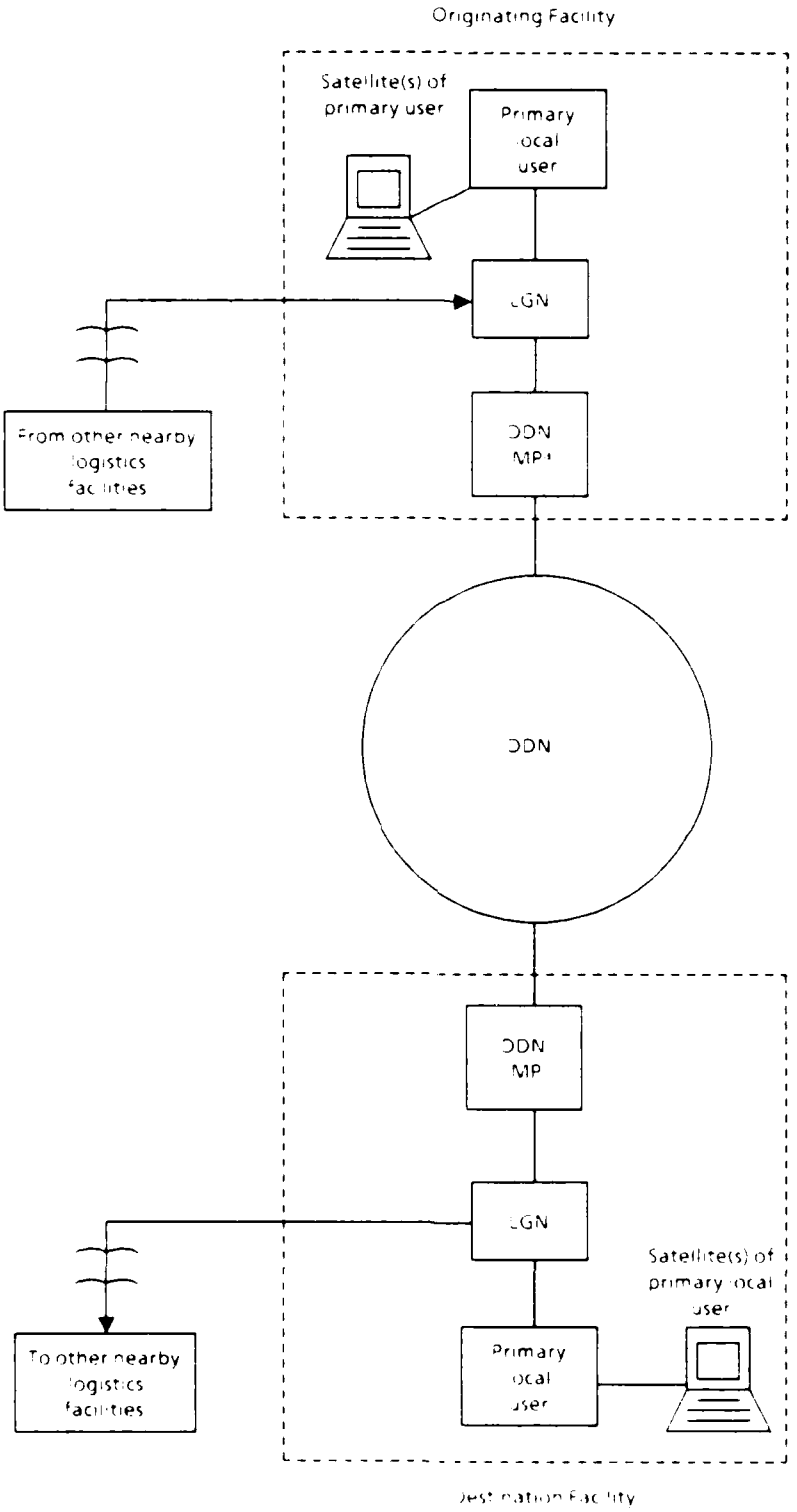

FIG. 2-4. CONCEPT OF DEFENSE LOGISTICS STANDARD SYSTEMS COMMUNICATIONS BETWEEN LOGISTICS FACILITIES

(processed as standard query transactions), and increasing mission and equipment complexity. Thus, it is important that the DoD logistics system be able to rapidly accommodate new information interchange requirements.

2.2.9 Standard Design Configurations

The widespread installation of LGNs requires that they be economical to purchase, operate, and maintain. If these nodes are permitted to become major data processing installations, the LGN architecture will not be cost effective. Thus, the viability of the concept requires that the design of the individual nodes be as simple as possible. To achieve that objective, standardized configurations tailored to the category of facilities supported have to be developed. A series of standard configurations that will satisfy the requirements of user sites is listed in Table 2-2. These standard configurations were selected on the basis of differences between their user configurations (both existing and planned). In defining these configurations, it is assumed that the Services and DLA will provide standardized systems within each functional level of their own operation (e.g., ICP, depot, retail level).

While it appears that the support of the standard configurations listed in Table 2-2 could lead to configuration management problems, it is important to recognize that the differences between these configurations is restricted to their translation of formats between the user's processor and the DLSS standard formats. The other difference will be in their ability to provide the Service-unique processing required by the Service of the user's site. Since this is a relatively small percentage of the overall processing performed by the LGN, the support of multiple configurations is significantly simplified. Further simplification can be provided using "table driven logic" to provide the necessary translation functions. Such logic will permit revision of format translation features through data base updates rather than software programming modifications.

2.2.10 Configurations

The LGN will be designed to permit transmission of tables, application software machine code, and data base updates from a central site. With that capability, all processors can be managed by a central design and programming organization and access to data collected by the LGN will be centralized. The ability to manage

TABLE 2-2

STANDARD LOGISTICS GATEWAY NODE CONFIGURATIONS

Organization	LGN configurations
Army	Wholesale Retail
Navy	Wholesale Retail
Air Force	Wholesale Retail
Marine Corps	Wholesale Retail
GSA	Single LGN
DLA	Central LGN Wholesale DCASR DLSC DRMS
Transportation Operating Agencies (MTMC, MAC, MSC)	Transportation
OJCS	Worldwide Military Command and Control System (WWMCCS) Information System (WIS)

the LGN from a central site minimizes the operations and maintenance staff required at the individual logistics site.

2.2.11 Comparison with Existing Architecture

While some of the LGN's processing is similar to that performed by the existing DAAS facilities, the following significant differences also exist between the two architectures:

- The LGNs are not identical but rather are tailored to meet the requirements of the site at which they are installed. This approach results in an LGN processing load significantly less than that experienced by the DAAS sites serving the entire logistics community.
- The LGN is designed to be responsive to the format translation requirements of the individual user's computer system served. The translation process will include such actions as adding fields, deleting fields, changing field lengths, merging data from multiple sources, etc. It would not include

translations between computer languages involving complex analysis of the data contents of a message.

- The LGN architecture ensures that all logistics data transmitted from the LGN are in common DLSS format. Use of a common transmission format eliminates the complexity of the multiple translations that would be required to provide compatibility between all combinations of transmitting and receiving systems.

- While a tariff has not yet been established for the use of the DDN, users of this system will probably be charged for data transmission services in the near future. Data communications tariff structure is typically a function of both the number of data transmissions and the amount of data transmitted. The DAAS architecture requires duplicate transmission of all data (once from the origin to DAAS and a second time from DAAS to the destination). The LGN data traffic enters the DDN a single time since it is transmitted directly from origin to the destination.

- The existing DAAS architecture is designed to function as a highly centralized system. All logistics data collected by DAAS are centrally stored. Performance reports, requests for requisition status, etc., can only be provided if they are available in the large central data base. The LGN architecture is a distributed architecture in which the data used for preparing reports and responding to queries are stored at the originating site. This architecture requires the use of a distributed data base management system (DDBMS) that formulates queries and directs them to remote sites.

2.3 DATA BASE MANAGEMENT

2.3.1 Background

The proposed LGN network will consist of computers connected by one or more communication systems and supported by a homogeneous, relational DDBMS. In a homogeneous DDBMS, each computer in the network supports the same data base management system (DBMS). Each computer, however, has DBMS and communications software. The communications software performs the data exchange function between the user, local computer, and the LGN. The DBMS manipulates the separate data bases stored in LGNs that are linked in the network. Since data distribution is transparent to the user,[3] any data in the network can be accessed without having to know where those data are stored.

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[3] A user is any authorized member of the logistics community such as requisitioners, item managers, cataloguers, etc.

Distributed data bases can increase performance since the load can be shared among processors to allow parallel operations. Data concurrency – or keeping several copies of the same data current – requires complex algorithms to synchronize data updates. In addition, a DDBMS must maintain a conceptual or overall view of the data in the network. This requires a data dictionary directory (DD D), discussed in the next section, to keep track of data locations.

The data and tables will be distributed across the network in a pattern determined by operational needs, performance requirements, and availability. The user will interact with the data base using transactions to distributed programs that will run simultaneously at multiple nodes and synchronize their processing by exchanging messages.

DDBMS software is needed to offer improved services to DLSS users. A number of files are currently maintained for the codes, tables, addresses, and other stored data elements used in routing and other functions performed by DAAS. The data files will be altered by on-line, low-volume updates and by batch large-scale updates. In the flat-file structure used today, it is necessary to keep the data in multiple file copies to support different access requirements. The use of DDBMS software will support multiple-access methods, as well as provide rapid search and retrieval of those data without requiring multiple files. A DDBMS will also provide security for key documents, addresses, and routing data. Use of a DDBMS will improve physical access to the data, consolidate update procedures, and provide standardization of data elements.

The major reporting functions provided by DAAS today will be augmented by improved ad hoc reporting and on-line information query capabilities to support user requests for data collected and maintained by the LGNs. The DDBMS software will provide for the rapid retrieval of data in response to an ad hoc query or report request. An ad hoc reporting capability must accommodate individual Service requirements.

A critical design factor will be the partitioning of functions between the central facility and the local LGNs. Distribution of data processing and data storage is characterized by the fact that some data may be maintained centrally, some remotely, and some may be common to both central and remote sites. Before a final

decision is made on the actual distribution of functions and data, a number of factors must be considered in evaluating a DDBMS, including:

- System architecture – how do the major transaction flows translate into logical functions to be performed and where will the source user functions be located?
- Technical resources – how should the DAAS logical functions be distrib uted, sourced, and implemented in terms of specific physical components?
- Management control – what techniques are needed to plan, implement, and maintain changes?
- Organization – to what extent does the redistribution of human and tech nical information resources require a redistribution of organizational responsibilities?

2.3.2 Data Query Requirements

A user views the LGN network in two ways. Most users will access the local computer and perform the usual activities, and the local computer will generate transactions to be sent to the LGN. A user may also perform a query or generate an ad hoc report. In those cases, the user will either: (1) enter a command on the local computer that submits a request to the local LGN for a pass-through to either the Central LGN or the remote LGN containing the requested data, and the query function will simply appear to be another function that is supported on the user's computer; or (2) for complex or global queries and ad hoc reports, call directly into the Central LGN. Both procedures are depicted in Figure 2-5.

When the user wants to submit a series of queries or knows that certain requests generally have a slow response time, the query may be submitted as a batch request. The user's system will inform the user when the query request has been accepted. The user may then format another query or terminate the session. The user will be notified when the response is ready, or the user may request the status of jobs either in the current session or in a later session. The user may then retrieve the jobs.

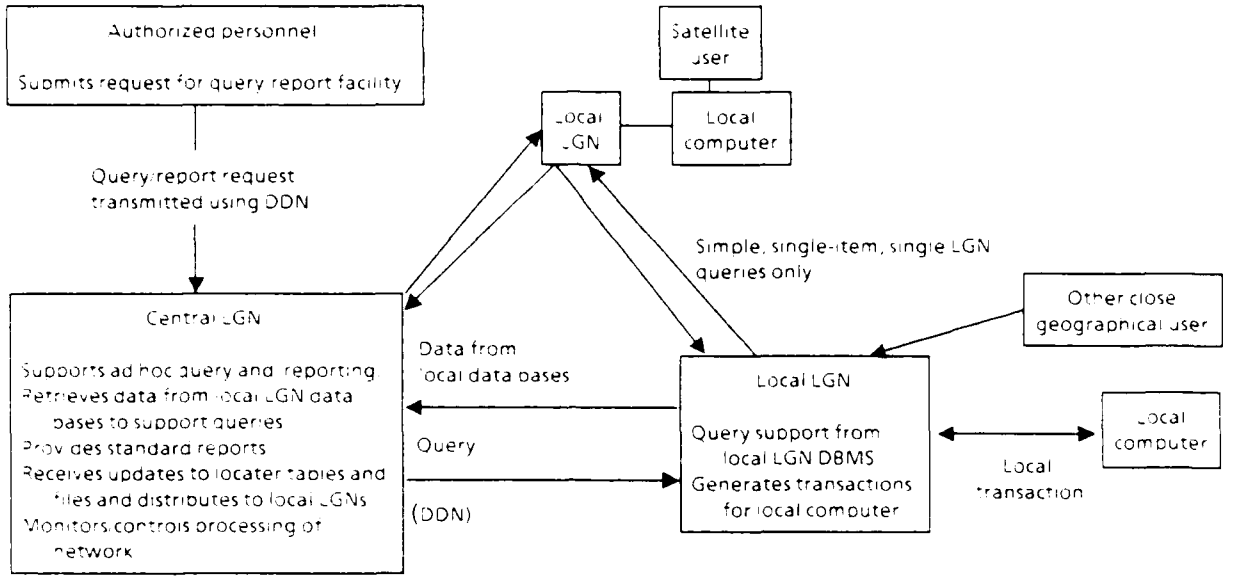

FIG. 2-5. SIMPLE VIEW OF NETWORK DATA QUERY FUNCTIONS

To allow users maximum flexibility in accessing the data base and to allow them to easily express both simple and complex data retrieval operations, an English-like query language will be provided. In addition, the query facility will be:

- Interactive
- Supportive with interactive display of the data dictionary, prompts, HELP messages, query, and modification status displays
- User-oriented, i.e., can be used by non-ADP-oriented users with a minimum of instructions
- Nonprocedural, i.e., users will only need to specify what is wanted and not how to search the data base to obtain it, nor how to display the results.

The query language will provide the capability for an on-line user to request that a query be executed on-line (interactively) with results available on-line or to be executed in batch mode with results available upon request. The DBMS capability may permit user-defined query formats and query results to be named and stored for later use.

2.3.3 Report Generator

A report generator will provide users with capabilities to produce simple or complex hierarchical reports in user-specified formats by directly accessing, through the Central LGN, the LGN data base files in which responses to queries are stored. The report generator will be compatible with the DDBMS and can access data records or query results files. It also will offer users the capability to produce reports in batch mode. Immediately after completion of processing, the results of batched reporting requests can be made available to the user's host on the LGN network.

2.3.4 Data Dictionary/Directory

The integration of data base technology into a network environment leads to the need for new functions and capabilities, as outlined in Table 2-3. Information must be supported at both the network-wide level and at the individual LGN level. Figure 2-6 depicts a possible dictionary/directory architecture for the proposed network. The network data directory provides network-wide knowledge of the node location of all the data bases in the system, specifying any partitioning of data across multiple nodes and any data replication between nodes. Complementing the network data directory is the network data dictionary, which contains information on the types and formats of the various data bases and the data elements contained in each.

Combined, and possibly residing at each node, a data dictionary/directory subsystem (DD/DS) capability may serve as the master index (analogous to a card catalog in a library) through which authorized users may be introduced to the various systems and services; the types, formats, and location of available data bases; and the procedures to be followed for gaining access to the data. The purpose of the DD/D, therefore, is simply to let users know what systems, services, and data are available at other nodes.

A directory system may be organized in several ways. A centralized directory is stored on only one system and has a conceptual view of the data entities in all the DBMSs. An extended directory maintains local information from the centralized directory. Whenever a site requests the location of data from the centralized directory, the local site copies the information into its own extended directory so it does not have to request the location again. A local directory provides only that data relating to the site's DBMS. In a distributed directory system, each computer has a

TABLE 2-3

FUNCTIONS AND CAPABILITIES TO SUPPORT A NETWORK ENVIRONMENT

At a central location	Functions
Network data directory	Maintains control information on node location of data bases and data base positions.
Network data dictionary	Contains information on types and formats of the various data bases and the data elements contained in each.
Residing at each node	
Data dictionary/directory	Serves as an index to systems, services, types, formats, and location of data bases. Contains procedures for data base access as required by users at a particular node.
Network data base management system	Services global data base requests for users at one particular node.

complete copy of the central directory. Performance tradeoff studies must be performed to determine the best approach for the proposed LGN architecture.

In conjunction with the DD/D, a DDBMS is necessary at each node to service the users' global data base requests. The DDBMS links the user, the local DBMS, the directory of data stored in the local DBMS, and the network. If we assume a DBMS only includes those functions that relate to a local data base and that it has no knowledge of any other data node, then all the other data base management functions needed in a distributed network environment have to be subsumed by the DDBMS. The DDBMS should, therefore, serve the following functions:

- Intercept a user request and determine where to send it for processing, or what nodes must be accessed to satisfy it
- Access the DD/D or at least know how to request and use the information in it
- Coordinate the processing and response to a user request if it spans nodes, that is, if the target data exists at multiple nodes

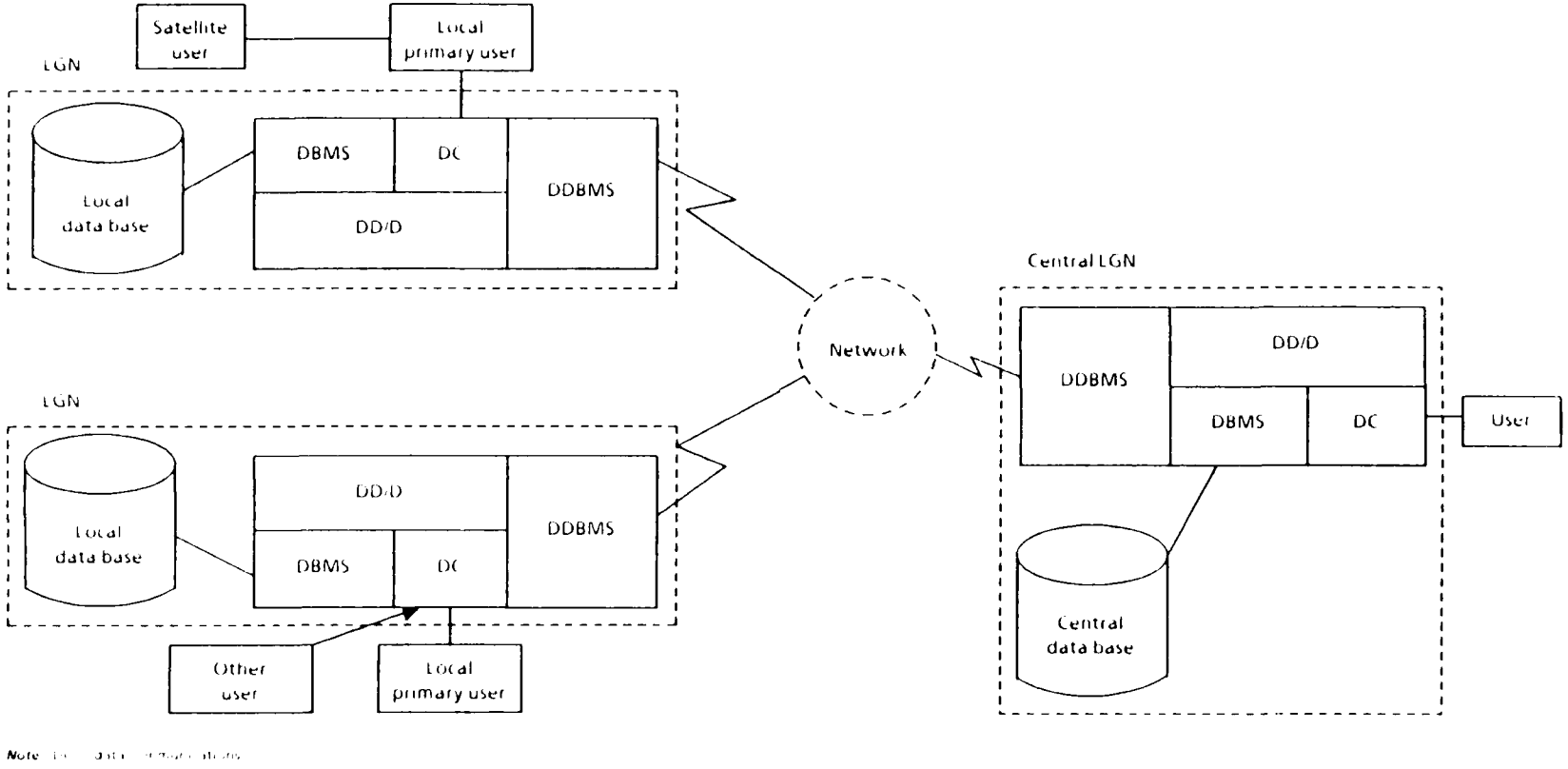

FIG. 2-6. SOFTWARE COMPONENTS OF THE LOGISTICS GATEWAY NODE ARCHITECTURE

- Function as the communications interface among the user process, the local DBMS, and DBMSs at other nodes
- Provide data and process translation support in a heterogeneous, distributed, data base environment.

Support utilities provide the Data Base Administrator (DBA) with the tools to assist in gathering the detailed information and descriptions, validating the data base entries, establishing system security information, and maintaining and testing the dictionary/directory entries required by the system.[4] The DDBMS should provide easy-to-use, easy-to-maintain, on-line access to the data base definitions (i.e., unique identifiers, physical characteristics, and textual descriptions of data elements, etc.).

The local data dictionary should have the following set of basic characteristics:

- Contain unique identifiers, physical characteristics, and textual information for each data element
- Show the relationships between elements (i.e., the model or schema relationship specification for each data element in the data base)
- Be treated by the DBMS the same as other data in the data base (e.g., capable of being queried)
- Be integrated within the DBMS
- Contain the official external name and acceptable synonyms for each data element
- Use rules or algorithms for data elements that are computed from the values of other data elements
- Use keying designations (e.g., whether the element is a unique primary key, is unkeyed, etc.)
- Use statistical information such as journalizing information describing system or environment interfaces; frequency of access, update, and archiving; usage statistics; performance statistics, log, and audit information
- Use system security information such as authority and date authorized, owner information, version of this entity, edit and validation criteria.

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[4]The DBA function is located at the Central LGN.

The National Bureau of Standards (NBS) Information Resource Dictionary System (IRDS) specifications should be considered in the procurement or development of a DD/D. The IRDS specifications are a draft proposed American National Standards Institute (ANSI) standard, a draft proposed U.S. Federal Information Processing Standard (FIPS), and a Working Document of the International Standards Organization (ISO), Subcommittee 21, Working Group 3.

2.3.5 Variable-Length Records and Service-Unique Data

Variable-length transactions, i.e., those with variable field lengths and variable fields allow a user to limit transaction lengths to the amount of information necessary without sending blank spaces. With variable field lengths, character positions are not important; the field position is the important characteristic.

A number of alternative approaches are possible for the implementation of variable-length transactions. One alternative is the position-dependent format, in which fields are identified by their sequence in the message. In that format, fields are separated by a unique character such as an asterisk and the omission of a field is designated by two adjacent asterisks. A second alternative is the use of field designators, which precede the field to identify its purpose.

The EDI standard proposed for commercial transportation activities by the Transportation Data Coordinating Committee (TDCC) in 1975 offers a hybrid approach to the implementation of variable-length transactions. This standard defines transactions using a multilayer organization made up of segments and fields.

Segments are equivalent to the contents of a line or box on a form. For example, they might include the geographic location of the originator of a requisition.

The fields that make up a segment are presented in a fixed sequence. For example, in a geographic location segment, the city name must precede the state code. The absence of a data element (e.g., the location qualifier) is designated by an adjacent asterisk (*).

The EDI standard does not define a fixed format. It represents an overall approach that can be adapted to the requirements of a specific user or industry. It is being adopted by a broad range of foreign and U.S. industries as a data exchange standard, including many of the industries with which the DoD logistics system

must interface. For these reasons, we recommend that the EDI standard be adopted in concept by DoD for the design of future DLSS transactions.

Information will be derived from the various Services' data description manuals to determine which Service-specific data elements must be translated to the DLSS standards. Data element standards include standard coding formats for enumerated sets (e.g., state names), uniform reference number assignments to lists of values, and DoD-wide standard naming conventions and codes.

A table-driven technique will generalize processing regardless of the application being handled. Data element modifications then simply require a change to a table. The DLSS standards will accommodate maximum data element lengths for all the Services. Differences between the standard length and the length expected by the receiving Service will be accommodated through table manipulation. The software will take a user's fixed format record, edit it according to the DLSS standards, and construct transactions for transmission. The receiving LGN will perform the opposite function to reformat data into the required local computer's receiving format.

2.3.6 Configuration Management

A critical factor in the LGN software and data base implementation and maintenance is control of changes to the system design. Controls must be rigorously enforced to prevent unauthorized or undocumented changes. User changes must be restricted to the Central LGN software development and maintenance team, and reconciliation of design errors discovered during the programming/coding/testing process must follow defined procedures.

Configuration management establishes the disciplined environment needed to implement these controls for maintenance, testing, and redeployment of applications software, as well as procedures for updating, testing, and redeploying the DD/D data bases. Configuration management should include procedures for:

- Positive identification and library listing of all program components (modules)
- Rapid, comprehensive, and accurate processing of proposed changes
- Complete implementation of approved changes and dissemination of corrected documentation and program changes

- Accurate records of status of all proposed changes
- Verification of change control, identification, and status accounting of the descriptive documentation and program materials.

2.3.7 Security and Data Integrity

The DBMS provides the interface between individual application software and specific data items in the data base. For that reason, it is important that DBMS security features be implemented to provide security over data base access as well as to control the addition, modification, and deletion of data. Security functions are provided for monitoring all DBMS activities. Those functions include audit trails, data base access control through user authentication, procedures for identifying violations, and logging of data base errors and failures. User authorization codes or passwords are used to control access to data items by file, record, data value, and type. Security functions also include maintenance within the DD/D of user access lists associated with the distributed data bases.

In addition, hardware and system software features should be provided to ensure data integrity in the processing and transmission of data. Three characteristics that constitute data integrity and that must be maintained at all times are completeness, validity, and consistency. They are maintained according to the specifications in the data definitions contained in the data dictionary.

A data distribution management function supports: (1) retrieval of data that is not part of a local LGN's data base but resides in data bases belonging to other LGNs and (2) distribution of updates to other nodes. Multiple copies of data kept in distributed data bases must be maintained in a consistent state without causing unacceptable delays in processing. The data dictionary contains all specifications to support the control and integrity of the distribution of data. The data distribution function is responsible for ensuring that all updates to distributed data bases are done in a proper time sequence.

2.4 LOGISTICS GATEWAY NODE FUNCTIONS

The current DAAS and the proposed LGN system architectures differ, and thus modifications to the performance of some DAAS functions are required. Furthermore, additional functions are needed to support the recommended MODELS modifications. The range of LGN functions is described in this section.

The LGN functions are grouped into five categories: (1) communications, (2) operations, (3) document routing/passing/editing, (4) file maintenance, and (5) performance monitoring.

2.4.1 Communications/Gateway Functions

Communications/gateway functions include all activities associated with the data communications process – the translation of data formats and protocols, the interface with communications systems, error checking, message transmission and delivery, security, and interface with nearby installations. The following is a list of functions in this category:

- Reformatting between variable-length DLSS format and local user formats.
- Imposing MINIMIZE restrictions on communications traffic.
- Retransmission of lost documents or documents received with errors.
- Automatic back-up generation of all files.
- Automatic transfer to back-up processor in the event of primary processor failure.
- Interface with DDN, DAAS, and host electronic mail systems.
- Receive and store messages until they are delivered.
- Monitor communications and deny all invalid requests based on COMM RI and DoD Activity Address Code (DoDAAC). Monitoring is to be performed both at the origination and destination LGNs.
- Interface with DDN, AUTODIN, I-S/A AMPE, and DLANET for DLSS communications.
- Accept inputs from remote sites using any military data communications system capable of verifying the location COMM RI of the sender or from leased lines.

To preserve the simplicity of the LGN architecture, it is desirable to restrict locations served by a given LGN to the same S/A to limit Service-unique processing and format translation requirements. Otherwise, program complexity, program and table sizes, and hardware capability and capacity could severely limit the efficiency of the LGN architecture.

To ensure that the required simplicity is retained, locations that do not have their own LGN will communicate through the nearest same S/A LGN capable of supporting their requirements. Exceptions to this rule may occur only when it is more convenient to install a large LGN capable of supporting multiple categories of facilities. An example of this situation may be OCONUS LGN installations.

2.4.1.1 Communications System Interfaces

This function includes the capability of the LGN to interface with the data communications services operated by DoD, including DDN and AUTODIN. In addition, the LGNs must communicate with existing logistics support services such as DLANET, SPLICE, and MCDN, although it is anticipated that those services will, in the future, make use of DDN for their intra-Service communications.

Transactions from nearby facilities of the same S/A nearby facilities will be processed by the LGNs in the same manner as transactions received from a collocated user's processor. However, those transactions may be transmitted to the LGN site either over intra-Service communications to the local computer or over direct leased lines.

Protocols must be converted and messages reformatted in a manner consistent with the requirements of the transmission service being used, and messages must be transmitted in the appropriate DLSS format. In terms of the OSI model described in Appendix B and shown in Figure 2-7, the combination of the communications protocol and DLSS data formats will completely define the information interchange requirements of the logistics process.

2.4.1.2 Redundancy and Back-Up

The LGNs will be designed for a high level of reliability. All equipment functions and message traffic will be continuously monitored for hardware malfunction, software errors, and data transmission errors.

Since the reliability of the local computers and communications interface equipment is outside the control of the LGN, it will be designed to ensure that failures of such equipment will not endanger the integrity of the data being returned to the user. Since data integrity is a higher consideration than performance, queries

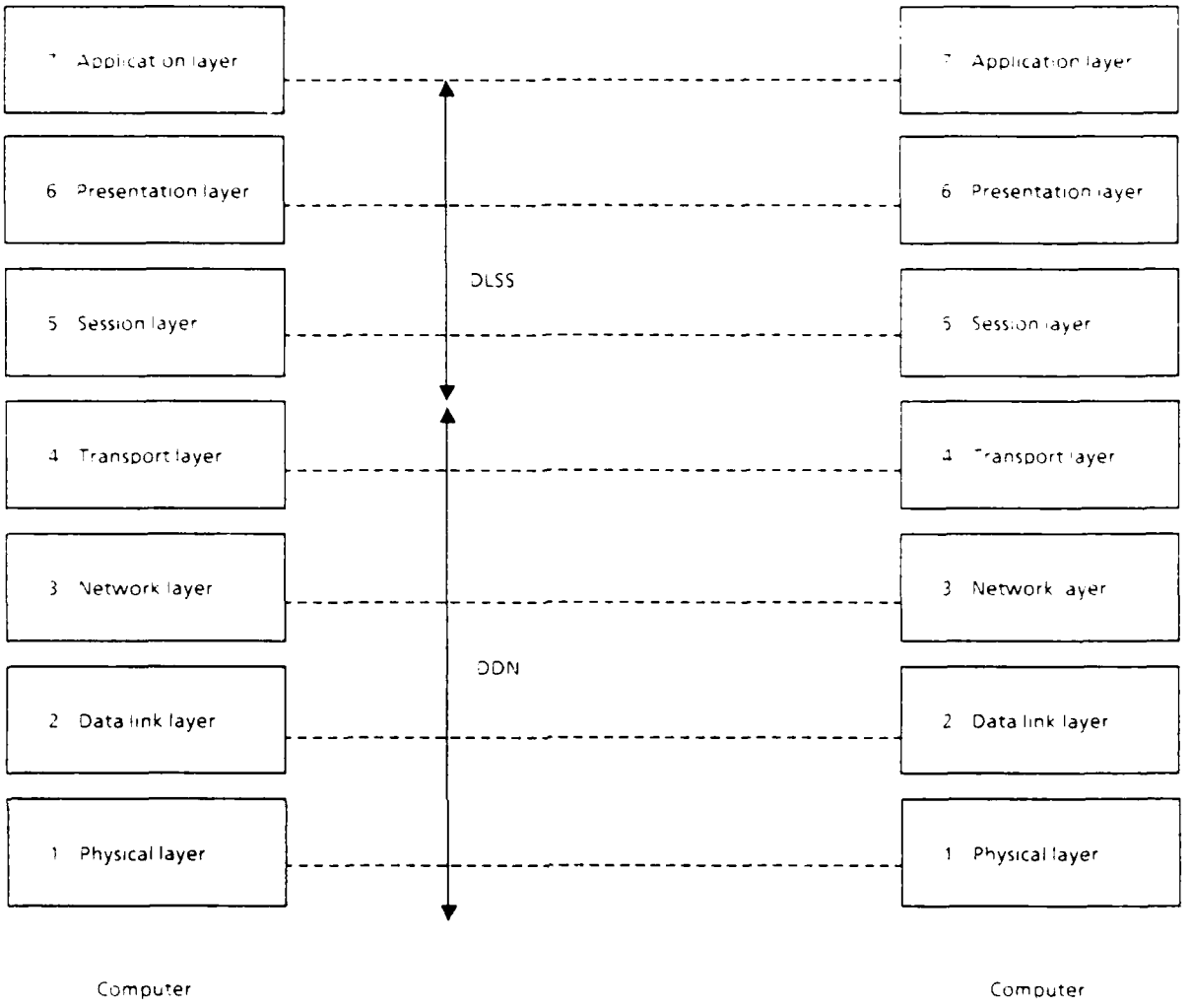

FIG. 2-7. OPEN SYSTEMS INTERFACE COMMUNICATIONS LAYER STRUCTURE

in progress during failure situations may be aborted and rerun at a later time to provide the required integrity.

A primary communications function of the LGN is the updating of a history file in which all transactions are archived. This function provides communications back-up (to permit retransmission of lost messages) and serves as a data base for performance and status reporting. The archiving functions are described in additional detail in the File Maintenance subsection.

2.4.1.3 Access Security

Access security to the LGN system is equivalent to that currently provided by DAAS. All data traffic received at the LGN will be checked to ensure that it originates from a source with a valid COMM RI and a valid DoDAAC.

The access security requirements of the system will be in full conformance with the current access protection (Class C2) provisions of the Orange Book (the 15 August 1983 or later edition of the DoD Trusted Computer System Evaluation Criteria). The C2 or Controlled Access level of protection makes users individually accountable for their actions through log-on procedures, auditing of security-relevant events, and resource isolation. Computer security functional capabilities will be provided to meet the following categories of requirements:

- Computer security program management
- Personnel security
- Physical security
- Network security
- Data security
- Data back-up and disaster recovery.

A fully developed access security requirements analysis will be completed prior to the LGN's final specification.

2.4.1.4 Data Security

Existing logistics data is communicated on unsecured, unclassified lines. The nature of individual pieces of logistics information is unclassified. However, when logistics data is accumulated and aggregated, it can result in information that is at least "sensitive" relative to national security, and in some instances may result in classified data, particularly during a national crisis or wartime.

Existing procedures require the transmission of classified data directly from its origin to its destination over secured lines, bypassing DAAS. The LGN architecture, which supports direct communication between origin and destination, could be equipped with communications facilities and lines capable of transmitting classified data. Also, because the LGN will already be incorporating translation capability,

adding encryption capability would be relatively easy if this requirement is identified early in the development stage.

2.4.1.5 Message Storage and Delivery

Since many of the recommended DLSS functions require the capability to process on-line requests for logistics data, it is important to design the LGN to provide the capability for storing responses to these on-line requests until they can be delivered to their destinations. The LGN should also be able to interface with the existing electronic mail systems of the user computer facility supported by the LGN and the electronic mail system of the DDN.

The ability to store messages is required for the following reasons:

- It may not be possible to provide an immediate response to an on-line query. For example, delays are likely to be experienced when transactions generated by these queries require data from more than one remote LGN-supported site.
- Connections between the LGN and its user computer might be interrupted by an equipment failure or the loss of communications. Thus, it is important to retain the ability to store messages until service has been restored.
- The communications and processing equipment of the logistics system will experience occasional peak loading, which will prevent the LGN from servicing requests in a timely manner. With storage capability, those messages can be distributed over an extended time period.
- Many installations within the logistics community experience heavy volumes of message traffic. The DAAS sites assemble that message traffic into batches before transmitting it to its intended destination. The store-and-forward capability of the LGN will permit batching of messages that do not require an immediate response.

2.4.2 Operational Functions

This category of functions includes all actions directly related to the logistics process – servicing queries; establishing priorities; formatting records; and routing,

passing, and editing documents. The functions included in this category are summarized below:

- Respond to inquiries for SOS and address information.
- Respond to inquiries related to requisition tracking, transportation status, and supply availability related to the site supported by an LGN.
- Communicate with one or more LGNs to obtain data required to satisfy local requests.
- Track throughout the LGN network to respond to requests listed above; e.g., if requisition has been passed to another SOS, LGN should be capable of automatically generating a second request to the new SOS.
- Create requisition priority using the Force Activity Designator (FAD) files and urgency of need; also use Required Delivery Date (RDD) for creating transportation priority.
- Accept supplementary data files (as batch input) that are to be merged when incomplete records are received from a host to create complete DLSS transaction.
- (Optional) Manually edit and merge outgoing records to add supplementary information not supplied by the user's primary transaction format.

2.4.2.1 Local Queries

The DAAS currently processes queries related to data stored at DAAS sites. It typically processes queries on SOS for specific items, cross references between part numbers (P/Ns) and NSNs, and site addresses. That capability would be incorporated into the LGNs through the definition of query transaction formats and the use of local data bases containing the information required to satisfy such requests. Local response to these requests eliminates the need for the use of a communications system to transmit requests from the customer to a central site.

2.4.2.2 Queries of Remote Data Bases

The ability to process on-line queries related to remotely stored information is a new function in MODELS. To provide this function, the LGN must be able to identify the remote site at which the required data are stored. It must also be capable of performing chained searches in which a remote site can answer a transaction query with a response that indicates that a second remote site ...

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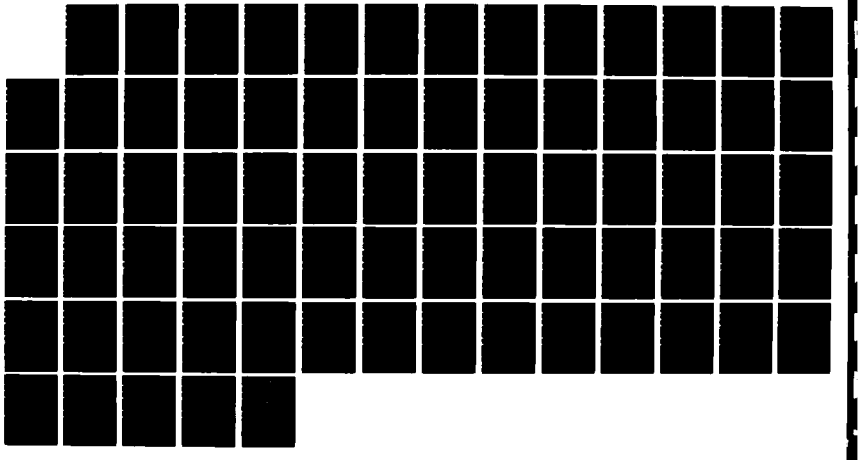

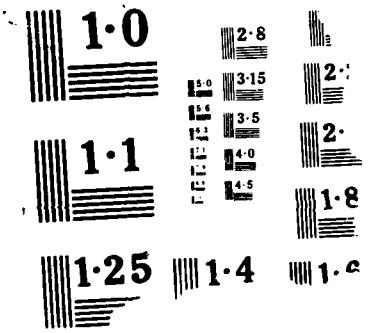
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interrogated. When this type of response is received, the LGN would then interrogate the second site.

The chained search permits response to queries related to requisition status in which a requisition has been passed to an alternative SOS or the supplies have entered the transportation system. The ability to provide searches of remote data bases is an important feature of the LGN architecture in that it minimizes the requirement for the maintenance of large central data bases that duplicate information available from other facilities. Examples of applications for the on-line query of remote data bases include:

- Requisition tracking, in which the LGN processes a request for requisition status by interrogating the SOS to which the requisition was initially transmitted. If the response indicates that the requisition has been passed to a second SOS, the LGN automatically interrogates that SOS. In its ultimate configuration, the LGN will offer the capability to track the requisition through the transportation system by transmitting sequential transaction queries to the carriers involved in the shipment of the requisitioned items. The ability to track requisitions through the transportation system will probably be initially implemented within the Defense Transportation System (DTS) since commercial implementation will require the cooperation of the individual carriers for totally successful operation.

- Requests for item availability through the transmission of a standard transaction query to the appropriate SOS. With the ability to generate chained queries, the LGN can identify alternative sources of supply in the event that the primary source cannot satisfy the anticipated requirements of the user. Such queries may be restricted to questions on the availability of specific quantities of items with a response that indicates only the availability of the desired quantity.

- Queries for catalog information. These queries could be transmitted to the site responsible for the management of the item using a standard transaction format. Queries that cannot be served by the site would be transmitted to the Defense Logistics Service Center (DLSC). Alternatively, the LGN can be programmed to automatically send all requests directly to DLSC in a format compatible with DLSC requirements.

These examples of the servicing of on-line queries are typical of the manner in which the LGN would operate. The capability for remotely accessing distributed data bases using pairs of LGNs communicating in a common DLSS transaction format results in a DDBMS architecture. DDBMS architectures represent an

alternative to the difficult and costly maintenance of large central data bases currently used as a source of information for remote queries.

The LGN architecture minimizes the complexity of accessing distributed data bases in that it will use specific DLSS transaction formats for queries. The definition of a common format reduces the complexity of the query translation to be performed by the LGN since it must only provide translation between two different query languages, the local computer language and the DLSS language. To simplify the DDBMS requirements, only a limited number of queries would be permitted.

2.4.2.3 Priorities

The existing DLSS require that requisition priorities be calculated in terms of the originator's FAD and the urgency of need. The FAD defines the maximum requisition priority that can be used based on the mission of the originating activity. In MODELS, the FAD would set the maximum requisition priority that can be assigned by an organization. The LGN architecture includes the capability for requisitions to include specification of urgency of need rather than priority. The LGN would calculate the priority using the requisitioning organization's FAD (stored in the LGN), and the requisition-supplied urgency of need.

Transportation priorities would be calculated similarly by using the RDD in addition to the FAD and the urgency of need. For example, a requisition may identify both the supply item urgency of need and its RDD window (e.g., 21 through 31 September). That window might be several days after the requisition date, or it might be several weeks later. When the requisition reaches the ICP (or depot), the appropriate supply issue processing system would evaluate both the LGN-assigned supply issue priority and the RDD-window-calculated transportation priority. If the RDD can only be met by air transportation, an air priority would be designated; if it can be met by scheduled ground transportation, a ground transportation priority would automatically be designated. (*Note:* Either or both ICP- and depot-processing systems will require programming changes and development of more sophisticated issue- and shipment-processing algorithms to accommodate this proposed logistics system operational requirement.)

The RDD should also be considered in determining issue release. If the RDD is several weeks in advance, the issue should be suspended as a tentative one. If an equal or higher priority is received with a closer RDD and both can be filled on time

through on-hand or backordered stocks, the tentative issue should be lifted and the later requisition filled. As backordered stock is received, the first requisition is again placed on tentative issue. If the first requisitioner's RDD cannot be satisfied if stock is issued to the second requisitioner, the first requisition should maintain first issue priority.

Thus, the combination of the issue priority and RDD should provide a more flexible supply system and should minimize the air challenge program requirement while providing satisfactory fill rates.

2.4.2.4 Merging Data

The LGN architecture can accommodate DLSS changes without requiring simultaneous implementation of those changes at all user sites. However, in some cases, the DLSS changes might require incorporation of information not included in the current version of the transaction format. For example, the addition of new weapons system coding requirements that cannot be provided by an existing user's system could be satisfied through entry of those data from an external source.

Thus, the LGN must have the ability to accept supplementary data files that can be merged with "partial" files received from a user's system that has not yet been programmed to satisfy the new DLSS requirement. Supplementary data files could be entered at the LGN as either batch transactions or interactive additions, and transmitted from the local computer or from a peripheral device such as a terminal or a disk.

This capability must be accompanied by the appropriate access security restrictions.

2.4.3 Document Routing/Passing/Checking Functions

Routing, passing, and checking logistics documents are the primary functions performed by the DAAS sites. Those functions are described by the Military Standard Requisitioning and Issue Procedures (MILSTRIP) and DAAS logistics standards. The LGN would perform these functions in essentially the same manner as they are currently performed by DAAS.

To eliminate duplicate processing, all editing would be performed at the originating LGN. The originating local computer would be automatically informed

of any rejected documents. Here again, communications requirements would be reduced by eliminating transmission of documents that are subsequently edited and rejected by DAAS.

The following modifications would be required to the manner in which the DAAS sites currently perform the routing/passing and editing functions:

- The LGNs must have the capability to accept and respond to mass cancellation requests including termination of foreign military sales (FMS). Mass cancellations would be broadcast from the Central LGN as described below.
- Wherever possible, all part identification number (PIN) requisitions would be converted to NSN requisitions prior to their transmission.
- Incoming FMS documents would be automatically transmitted to the International Logistics Control Offices (ILCO) through its LGN. Following ILCO processing, these documents would be routed or passed to the LGN at the appropriate logistics destination. Outgoing FMS documents would be automatically routed through the ILCO before they are transmitted to their foreign destination.
- All responses to status requests filed by the requester would be transmitted by the LGNs to their appropriate destinations. The LGN would continue to perform the error checking, passing, and routing of these documents when appropriate.

2.4.4 File Maintenance Functions

To provide the functions previously described, the LGNs must be capable of maintaining the data bases required for document routing and responding to local queries for logistics information. It will also be necessary to maintain data bases that serve as archives for the transactions processed by the LGNs.

2.4.4.1 LGN On-Line Data Bases

A number of on-line reference files have been identified to process requests for information originating from the local users. Those files include the general categories of addressing/communications directories, logistics data related to P/Ns, stock numbers and SOS, and the FAD files used for the calculation of requisition priorities. Files identified thus far that are larger than 1 megabyte (Mbyte) and that must be maintained at the LGN are shown in Table 2-4.

TABLE 2-4

MAJOR LOGISTICS GATEWAY NODE ON-LINE FILE SIZES

File name	Average file size (Megabytes)	Update volumes[a] (Kilobytes)
DoD Activity Address File (DoDAAF)	33	52
COMM RI/DoDAAC cross reference	2	3
SOS	578 - 748	558 - 722
P/N NSN cross reference	260 - 600	100 - 231
FAD by DoDAAF	2	3
Military Assistance Program Address File (MAPAF)	1	2
Zip code	3	0
Activity/Military Routing Identifier (MILRI)	5	8
Communications activity file [Logistics Information Data Service (LIDS)]	2	0
Plain Language Address Designator (PLAD)	5	8
Performance activity [Military Supply and Transportation Evaluation Procedures (MILSTEP)-expanded]	40	0
Miscellaneous files smaller than 1 Mbyte	2	10
Total file size	933 - 1,443	744 - 1,039

[a] File updates are those that are performed remotely from the Central LGN site

The files shown in Table 2-4 must be updated by the Central LGN at periodic intervals. The local LGNs will receive updates, perform the required file maintenance, and initiate back-up activities. The Central LGN would specify the time at which new data are to be used to synchronize operations of the individual LGNs.

The need for frequent file updates at multiple LGNs appears to offset many of the communications benefits derived from other LGN features; however, similar updates are currently being made by DAAS to more than 200 logistics facilities. We anticipate no increase in communications traffic as a result of LGN update requirements. The impact of the communications required for file updates can be minimized through transmission of updates during off-peak hours.

When developing this LGN architecture, we considered the possibility of maintaining these large files at a central location that would be interrogated by the individual LGN as required. However, we concluded that such an approach would result in a level of communications traffic equal to or greater than the communications traffic resulting from the file updates. In addition, the use of central files would significantly increase system vulnerability, a characteristic that is avoided by all other aspects of the LGN architecture.

2.4.4.2 Archived Data Bases

The DAAS sites maintain archived histories of all communications processed by their facilities for tracing lost transmissions, retransmitting interfund billings, and preparing reports of system performance [Military Supply and Transportation Evaluation Procedures (MILSTEP)] and communications traffic [Logistics Information Data Service (LIDS)]. The LGNs must be capable of capturing the data required to prepare equivalent reports.

The files required to perform these functions are identified in Table 2-5. The file sizes indicated in that table are based on the assumption that a 1-year history of all interfund billing documents will be stored at the originating LGN.

TABLE 2-5

MAJOR ARCHIVED FILE SIZES

File name	Average size (Megabytes)	Update volumes[a] (Kilobytes)
Transmitted document archive (30 days)	53	2
Interfund billing archive (1 year)	317	0
Received document archive (6 months)	576	0
Total archive files	946	2

[a] File updates reference the updates of files at the Central LGN site from locally archived data

A complete 6-month history of all received data, including discrepancy reports, would be retained at the receiving LGN to generate required standardized performance and communications traffic reports. The receiving LGN is designated as the basic data source for report generation to ensure that all documents included in

performance reports have been successfully transmitted through the communications system. In addition, a 30-day history file of all communications would be stored at the originating LGN for retransmission of lost documents. LGNs would not maintain files of rejected documents.

2.4.5 Performance Monitoring Functions

The LGN architecture assumes that the existing DAAS capability for the production of periodic reports related to system performance and communications traffic will be retained. In addition, MODELS requires ad hoc reports in response to the needs of senior-level personnel within the DoD. Both of these capabilities are included as LGN functions.

2.4.5.1 Periodic Reports

Periodic reports similar to the MILSTEP and LIDS reports currently produced by DAAS would be produced at monthly intervals. Those reports would be prepared at the Central LGN site using data retrieved from the LGN network archived data bases. Retrieval of these data by the Central LGN could either be performed during off-peak hours, or it could be sent on disks using the U.S. Postal Service or package express. The data transfer technique used should be determined on the basis of an analysis of costs and requirements.

The printing and distribution of these reports would be performed by the staff of the Central LGN. In the future, these capabilities could be replaced by electronic distribution of information.

The LGN concept has the potential for improving the accuracy of the MILSTEP reports because it can potentially capture all logistics data traffic (except possibly intra-Service traffic) originating at its site. The possibility that a local computer will bypass the LGN is minimized by the fact that communications with an LGN at another site requires the use of the LGN at the originating site. In addition, the features and flexibility of the LGNs should encourage their increased use.

2.4.5.2 Ad Hoc Reports

The LGN system design will include the ability to generate ad hoc reports in response to queries. The design assumes that requests for ad hoc data would be routed through the Central LGN, which would identify the sources of the data

required to generate the requested report. Access to the ad hoc reporting capability must be restricted to a limited number of DoD personnel because of the processing and communications load that can be created by large numbers of requests and because of the potential sensitivity of available data.

The unpredictable nature of ad hoc queries requires system flexibility that is provided through access to the distributed data bases of the logistics community. To provide this capability, the system must be able to access the data bases of the LGNs and, to a limited extent, the data bases of the local user computers they support. Since the LGN data bases will have a common data model standard and will use identical DBMS software, access to the data they maintain can be performed using common query and response formats.

Access to user data bases for response to ad hoc queries is significantly more difficult because of the potential sensitivity of these data and because of the lack of DBMS standards. For these reasons, access to user data bases will be restricted to data that can be obtained by the local LGN supporting that user with predefined queries established in coordination with the management of the local facility. The use of standard queries minimizes complexity and provides the user facility with the required data security.

Thus, an ad hoc report would be processed in the following sequence:

1. Senior-level DoD personnel would initiate a query from a terminal connected to the Central LGN by the DDN. The query would be transmitted using either electronic mail or on-line access.

2. The Central LGN would verify the authorization of the individual initiating the request, and after the authorization has been validated would analyze the request to determine which remote LGNs must be interrogated to acquire the required information.

3. Queries would be transmitted from the Central LGN to the remote LGNs using a common DBMS query format. The remote LGNs would verify that the Central LGN is the source of the request.

4. If the required information is available from the data base of the LGN, it would respond to the request. If the user system must be accessed to acquire the information, the LGN would verify the availability of the information and format a query for the user's data base. The retrieved information would then be returned to the central site. If the LGN cannot access the required user information because the user is not operational or

the data are not available, it would transmit a code to the central site indicating that the information cannot be provided.

5. Following receipt of the required information at the central site, a report would be formatted and returned to the requesting terminal.

2.4.6 Mobilization and Continuity of Operations Plans

Mobilization readiness requirements will be considered when determining hardware requirements, designing software, and developing mobilization contingency plans. A mobilization and surge sensitivity analysis will be performed during system specification to determine the cost and feasibility of continued processing of various critical and noncritical functions during mobilization. The system should be capable of handling substantial processing increases without imposing significant impacts on ongoing operations. Priority handling functions will be specified, and a determination will be made as to which functions are to be dropped in emergencies.

Since logistics operations are required 24 hours a day, 7 days a week, individual sites must have back-up capabilities and must be capable of providing back-up for each other. Contingency planning should include back-up procedures, emergency measures, methods for handling peak workloads, recovery procedures, procedures for returning to normal processing, and other procedures to assure rapid contingency processing.

The LGN should provide the priority scheme and processing capacity sufficient to sustain critical functions during mobilization and wartime and as soon as possible after LGN operations have been disrupted by natural disasters or other contingencies. Procedures should be specified to ensure that mobilization and wartime are considered in LGN planning and design specifications. These procedures should include:

- Plans to minimize data losses during and immediately after catastrophic events
- Plans to provide alternative support for LGN subscribers during periods, brief or protracted, when they are denied normal support because of emergencies
- Plans to reduce to a minimum the time between automatic data processing (ADP) failure because of a catastrophe and restoration of acceptable support levels.

A Continuity of Operations Plan (COOP) should be developed for each site during implementation. A current copy of each COOP should be maintained in a remote storage area (off-site). The COOP should include an evaluation of the vulnerability of sites, systems, and functions to disaster, combat, and sabotage. It should identify differences in site operations, organization, staffing, and support requirements during peacetime, mobilization, and wartime. As part of the COOP, functional information requirements should be reviewed to determine wartime-essential data, information flows, workloads, data and function priorities, and special requirements. A primary and alternate contingency manager should be identified to coordinate back-up and recovery. The COOP should describe procedures for retaining and copying master files and for reconstructing damaged or destroyed files. The COOP also describes procedures for assuring that at least one current copy of all data critical to sustained operations, including applications programs, control files, and system software, is kept at a location other than the main storage site. The COOP also contains provisions for the following:

- Back-up for all telecommunications requirements
- Capability to perform critical functions manually in emergency situations
- Personnel training and readiness
- Identification for intersite and intrasite resource sharing
- Provision for alternative administrative and system management procedures
- Reconstitution procedures and support requirements
- Computer disaster recovery, test and evaluation plan.

2.5 CENTRAL LOGISTICS GATEWAY NODE

The proposed MODELS requires a Central LGN. The LGN architecture assumes that the Central LGN will be operated at the existing DAAS site in Dayton, Ohio and will probably use its planned data processing equipment. This LGN would perform all functions required for central control of the local LGNs, such as data base updates and software configuration management. It would also be used as the entry

point to the system for ad hoc queries and for preparation of periodic reports. The specific functions performed by the Central LGN are as follows:

- Transmit software updates to remote LGNs.
- Receive inquiries, assemble data (from other LGNs), perform analysis, and prepare all ad hoc reports.
- Assemble data, prepare, print, microfilm, and distribute all periodic reports.
- Broadcast MINIMIZE condition to all local LGNs.
- Receive and broadcast all mass cancellation requests.
- Receive and distribute (to all LGNs) all data base updates [DoD Activity Address File (DoDAAF), SOS files, etc.].
- Maintain all archival data to be stored more than 1 year.
- Provide off-site back-up for all critical local LGN data.
- Provide all media conversion activities: electronic data to hard copy (including mail), punch cards to electronic data, electronic data to microfiche, etc. A back-up for the media conversion capability must be provided at a second LGN.

The Central LGN performs only functions requiring central support or functions that, if performed centrally, will reduce the cost and complexity of the individual LGN configurations. In all cases, the Central LGN functions are those that can be implemented at a single site without affecting the overall vulnerability of the system. Further reductions in vulnerability can be achieved by designating one of the other LGNs as a back-up for the Central LGN. The functions for which back-up is required are identified in the following discussion.

2.5.1 Configuration Management Operations

The successful operation of the LGN architecture requires strict management and standardization of the hardware and software at each local site. The system architecture must be designed to permit updating LGN programs and data from a central site. Transmission of all updates would be accompanied by the time and date the update is to be implemented in order to coordinate the overall system operation. This is critical. Although immediate updating of software and data bases is not critical to the logistics system operation, the absence of this capability for more than 2 weeks will seriously reduce the effectiveness of logistics operations. Thus, the

LGN architecture must incorporate the capability to provide updates from alternative LGN sites.

Data base updates would be performed to all on-line files including the SOS file, the DoDAAF, the Military Assistance Program Address File (MAPAF), DoD Routing Identifier (DoD RI) codes and distribution codes, and the activity address file including the COMM RI and DoD Activity Address Directory (DoDAAD) cross references. Data base updates will also be required for the operational tables that define the reformatting of local user-to-DLSS data formats, restrictions to access of the user data base, and definition of local user data base contents.

Although not directly related to configuration management, the Central LGN should also be considered a potential location for off-site storage of data bases. This site will automatically store all data base updates transmitted to the local LGNs, eliminating the need for redundant back-up storage at the local sites. Additional back-up can be provided automatically through the storage of data transmitted from the local LGNs to the central site for the development of the periodic reports. These two data bases include the majority of data maintained at the LGN sites. Thus, it is unlikely that extensive back-up storage will be required at the local sites.

Software updates from the Central LGN will be required for program maintenance and for responding to changes in the DLSS and user configurations that cannot be accommodated through data base modifications.

2.5.2 Reporting and Query Processing

Periodic reports will be processed using a central data base assembled from the data transmitted to the Central LGN from local LGNs. These reports would be produced using standard report formats.

Ad hoc queries would be processed by the Central LGN by transmitting data requests to the individual LGNs defining the information that is required. The data received from the remote LGNs would be assembled in a temporary data base and processed using a general-purpose DBMS. The query formats should be defined in a manner that is consistent with the requirements of the DBMS to minimize the requirement for additional translation.

The response to ad hoc queries related to supply and shipment status in support of major operations can be extremely critical. For this reason, alternate LGNs

(including those installed at foreign theaters) must offer the capability of processing ad hoc queries as back-up to the Central LGN. However, one of the benefits of using the Central LGN for the entry of ad hoc queries is the availability of a knowledgeable staff to assist the user in formulating queries. That capability will not necessarily be available at all remote LGN sites.

The Central LGN is expected to serve as the primary node for supporting Joint requirements for logistics information. As JOPES and related projects evolve and Joint requirements are more clearly defined, they will be incorporated.

2.5.3 Broadcast Operational Changes

The Central LGN would initiate all changes to system-wide operation. These changes would include initiation of the MINIMIZE mode of operation and mass cancellation requests. These operational changes must be initiated only by personnel with authorized access codes. While this capability could be provided at all LGN sites, its use should be restricted to a single site with back-up from a second LGN site to minimize the chance of unauthorized use of this feature.

2.5.4 International Logistics Communications System (ILCS) Interface

For ILCS users, the Defense Automatic Addressing System Office (DAASO) has developed message-formatting and routing schemes that are similar to AUTODIN formats. All ILCS logistics traffic is transmitted from the ILCS subscriber to the DAAS Dayton, Ohio site, where it is routed first to the ILCO and then to the appropriate logistics facility. This mode of operation would be modified by the LGN architecture; all ILCS users would have to communicate directly with the ILCO's LGN. When ILCO processing is complete, the transaction would be routed to the appropriate logistics facility.

2.5.5 Media Conversion

DAAS currently offers the capability to communicate between sites using a number of alternative media and formats. While the majority of transactions use electronic data transmission in computer-readable form, DAAS also receives narrative messages from either teletype or dial-up communications services, and hard copy messages from mail or courier. These messages are currently entered into the logistics system manually as batch transactions. This service would be retained

at the Central LGN site with the exception that data would be entered using on-line terminals or other methods of source data automation.

A second LGN site should provide the back-up media conversion capability. The Central LGN would also perform the equivalent output conversion (also performed by DAAS) from electronic data to hard copy or to narrative teletype messages.

The Central LGN should perform any media conversions required during MINIMIZE conditions. Data can be mailed or sent by courier to the central site on either disks or tape where it would be converted to hard copy output and mailed to the appropriate destination.

The Central LGN will also produce all printed output and provide all microfilming services associated with the distribution of reports. Those services would include the conversion from tape to microfilm and the distribution of the output to the appropriate recipients.

2.6 MANAGEMENT ISSUES

The LGN architecture requires a centrally managed standard configuration. The standardization requires the use of compatible, stand-alone processors capable of receiving remote updates from a central source. These constraints on system design and maintenance require the availability of a centralized staff responsible for the acquisition and maintenance of the LGN hardware, development of software, and maintenance of data bases.

The central staff responsibilities should include:

- All software development, maintenance, and enhancements.
- Receiving, reviewing, and transmitting all data base updates to the remote LGNs.
- Coordinating the requirements of the Services for LGN services including identification and support for Service-unique processing, coordination of Service user computer configuration modifications, interfaces with DoD data communications services, and coordination with all nearby facilities served by the LGNs.
- Continued support to ILCS subscribers including management of the ILCS equipment, training, media conversion, etc.

- Management of personnel required to provide operations and maintenance support of the LGNs at the remote site, including monitoring of personnel activities, training, and hiring.
- Management of all LGN equipment procurement activities, including system design, specification, contractor performance monitoring, and acceptance testing.
- Maintenance of all LGN hardware. Maintenance activities would be the responsibility of on-site personnel with diagnostic support provided from the central site. Diagnostic support would be provided through remote access and remote control of local LGN processors.

Since many of these services are currently provided by the existing DAASO staff, it is likely that DAASO would retain them and would adapt them to the requirements of the LGN architecture.

Since the expanded capabilities of the LGNs will have a greater impact on the operation of the entire defense logistics system than on the existing DAAS sites, consideration should be given to establishing a Joint management team (such as the DLSS focal point committees) to establish the requirements for LGN operations. That team would identify and define Service requirements, define surge capabilities, and identify the need for new LGN sites.

2.7 COST ESTIMATES

2.7.1 Approach

The development of a reliable cost estimate requires preparation of a detailed system functional description that can be used to estimate the lines of software code and computer resources required to support LGN operations. The surge capability and security requirements must also be defined. This document does not provide sufficient detail to develop this type of estimate. However, a preliminary estimate of system costs to determine whether the system is affordable and to compare the LGN operating costs with those of the existing DAASO system follows.

Estimates were developed by comparing the peacetime volume of document traffic to be processed by the LGNs with transaction processing functions of similar commercial and military systems. From those comparisons, we developed preliminary estimates of the hardware acquisition costs.

Software implementation costs are based on the assumption that the number of lines of software code used to provide the LGN processing functions will be equivalent to those in the current DAAS computer configuration. Available conversion factors that relate the number of lines of code to manpower requirements are used to estimate the software costs. Recurring operations and maintenance costs are estimated using similar procedures and factors.

The DAAS modernization plans [DAAS ADPE Replacement Program (DARP)] provide additional uncertainty in the development of the cost estimates. The DARP has been reviewed and appears to offer many of the features required by the Central LGN. It also includes the development of some software that may be transferable to the remote LGNs. Thus, software development cost savings that are not reflected in the following cost estimate may be possible.

When reviewing this cost estimate, it is important to recognize that many of the functions and locations served exceed the capabilities and services of the existing DAAS configuration. The following estimates are presented in terms of 1986 costs. The future effects of inflation and the possibility of future decreases in data processing equipment costs have not been considered.

2.7.2 Hardware Costs

The hardware cost estimate is based on a local LGN operational profile developed from the following sources:

- The LIDS data base was used to develop estimates of communications traffic for the 90 sites processing the greatest amount of logistics communications traffic. These sites accounted for approximately 85 percent of the traffic processed by DAAS. These data represent the existing traffic processed by DAAS; they do not include the future traffic resulting from the enhanced capabilities of the LGNs.

- Additional assumptions were made related to traffic growth using the data from the MODELS Phase 2 report. That report projected an increase of *292 percent* over that which is currently experienced by DAAS. These factors were used for the projection of traffic loading at the individual sites.

- File sizes and file update traffic were developed from the data presented in the *Defense Automatic Addressing System Office Baseline Functional Specification (DAASO-BFS)* developed for DLA by Advanced Technology, Inc., in August 1984.

- Sizes of programs and supporting data bases were also derived from data presented in the DAASO-BFS.

Data from those sources served as the basis for the processor loading projections presented in Table 2-6. The data presented in the column titled "Level" represent the average data anticipated at the LGN sites. The "Maximum level" column represents the worst case conditions anticipated at the busiest site. The variation in major on-line file storage between these two columns reflects the anticipated expansion of the SOS file to include the NSN, unit of issue, and price data. The values used in the "Maximum level" column were used to develop the cost estimates presented.

TABLE 2-6

LOCAL SITE LOGISTICS GATEWAY NODE PROJECTED PROCESSOR LOADING

Activity	Level	Maximum level
Operational incoming logistics traffic	1.0 Mbyte/hour	19 0 Mbytes/hour
Operational outgoing logistics traffic	2.0 Mbytes/hour	7.0 Mbytes/hour
Total operational logistics traffic	3.0 Mbytes/hour	19.0 Mbytes/hour
Average length of one transaction	72.0 bytes	180.0 bytes
Incoming file update traffic	74.0 Kbytes/hour	104.0 Kbytes/hour
Outgoing file update traffic	0.2 Kbytes/hour	1.2 Kbytes/nour
On-line storage for major files	933.0 Mbytes	1,650.0 Mbytes
Storage		
Back-up (off-line storage) for major files	933.0 Mbytes	1,650.0 Mbytes
Off-line storage for archive files	946.0 Mbytes	4,730.0 Mbytes
On-line storage for programs and supporting data bases	4.0 Mbytes	4.0 Mbytes
Back-up (off-line storage) for programs and supporting data bases	4.0 Mbytes	4.0 Mbytes
Total on-line storage	937.0 Mbytes	1,654 0 Mbytes
Total off-line storage	1,883.0 Mbytes	6,384.0 Mbytes

Note: Kbytes = kilobytes

These data were used to develop the following processing configuration:

- The computer processing configuration will include identical dual processors with full redundancy and back-up capabilities. The processor characteristics include a 32-bit word length, memory expansion up to 8 megabytes per processor, and a memory access time of 400 nanoseconds. The configuration consists of a fault-tolerant architecture including redundant power supplies and interprocessor communications facilities. Each of the processors is equipped with 4 megabytes of memory and 15 input/output (I/O) ports.

- Formatted disk storage of 3.3 gigabytes (Gbytes) has been included in the configuration for storage of on-line disk files. The disk storage has been sized to accommodate redundant storage of the on-line data base at its maximum level.

- Optical-disk storage of 1.0 gigabyte has been provided for on-line storage of the received document archive. That storage would be used for response to ad hoc queries related to documents received by the LGN.

- A magnetic tape drive has been provided for recording archived data including back-up data for the received document archive. The tape drive would also be used to generate off-site magnetic tape back-ups of on-line data bases and software.

- The estimate includes a medium speed (300-lines per minute) line printer for producing local listings of data bases and operating logs.

The estimated cost of this local LGN configuration using 1986 pricing data is $230,000. That cost is based on the General Services Administration (GSA) schedule prices for unit quantities of this equipment. An additional $30,000 must be added to the total cost of the LGN installation to account for minor facility modifications required to house the LGN. Thus, the cost of the LGN hardware implementation for all major logistics sites is estimated to be $26 million.

2.7.3 Software Costs

Software costs were developed using existing DAAS statistics summarized in Table 2-7. That table indicates that the DAAS software has been programmed using the Common Business Oriented Language (COBOL) compiler language and the COMPASS assembly language. The total lines of code have been converted to equivalent machine instructions using a factor of six machine instructions per line of

compiler code. The COMPASS code generates one machine instruction for each line of source code.

TABLE 2-7

SOFTWARE DEVELOPMENT REQUIREMENTS

Item	Computer source code		Assembly language source code
Existing DAAS system statistics:			
Total lines of code	180,000		183,000
Equivalent machine instructions	1,080,000		183,000
Number of programs	400		322
Average lines of code per program	450		568
Program development estimates:			
Estimated lines of code to be converted	64,000		—
Estimated lines of code to be replaced by general purpose DBMS	25,000		30,000
Estimated lines of new code	95,000		150,000
Estimated labor hours required	190,500		37,500
Total development labor		228,000 hours 110 man-years	
Total maintenance labor		22 man-years/year	

The number of lines of code to be converted was developed assuming that the DAAS routing, passing, and error-checking functions would be performed by the local LGNs in the same way they are currently performed. As a result, these programs may be convertible without significant reprogramming. It was assumed that new code would have to be developed for all other functions. However, in some cases, the new code would be replaced by the use of general-purpose DBMS software since many of the DAAS programs involve file maintenance, access, and updating.

The factors used to convert these lines of code to programming labor are as follows. New software are programmed at the rate of four object instructions per hour. Existing programs converted at the rate of 10 object instructions per hour. All estimates include definition, analysis, design, coding, testing, documentation, and

management of the software development. Annual software maintenance and support is assumed to equal 20 percent of the development labor. These estimates are from *Quantitative Management: Software Cost Estimating*, COMPSAC 77, IEEE Computer Society, Piscataway, New Jersey. That reference also served as a source for estimating the software maintenance requirements discussed in the following section.

On the basis of this analysis, we have concluded that 110 man-years will be required for the development of the software required by the LGN architecture. Assuming that 1 man-year is equivalent to $100,000 in annual contract costs (including direct labor, overhead, other direct costs, and profit), the total software development cost will be approximately $11 million. These costs do not include the cost of Government administration of contractor supplied services, since at this time the organization responsible for the software development has not been identified. This software could be developed, tested, and implemented by DAASO staff.

2.7.4 Operations and Maintenance Costs

The costs associated with the ongoing operation of the LGN system include equipment operations, hardware maintenance, and software maintenance and updating. These costs have also been developed using experience of other facilities and available conversion factors.

The following operations and maintenance costs can be anticipated:

- Operations costs assume that one system operator will be required for each shift. One of the operators will act as a supervisor for the operations personnel. Thus, a total of four operators will be required at each LGN site. Fewer operators may be necessary if personnel from the staff of the user facility can be made available to monitor the LGN operation.

- Annual equipment maintenance has been estimated from industry averages, which equal approximately 10 percent of the purchase price. Therefore, the total system-wide maintenance cost will be $2.6 million per year.

- Annual software maintenance labor is anticipated to equal 20 percent of the initial development effort. Therefore, a total software maintenance staff of 22 programmers and management personnel will be required.

2.7.5 Total Local Logistics Gateway Nodes Implementation and Operations-Maintenance Costs

The total system implementation costs (for hardware and software) are summarized in Table 2-8.

TABLE 2-8

TOTAL SYSTEM IMPLEMENTATION COSTS

Element	Cost (Millions of dollars)
Hardware	26
Software	11
Total cost	37

The required system operations and maintenance resources have been divided into categories of Government personnel and contract maintenance support. These resources include:

- Programming and management support – 22 individuals
- Site operations support – 400 individuals
- Total staff support requirements – 422 individuals
- Total contract maintenance support – $2.6 million per year.

2.7.6 Local Logistics Gateway Nodes Life-Cycle Costs

This cost estimate has been used to develop an approximate system life-cycle cost. These estimates provide the data required to assess the feasibility of the continuing development of the LGN architecture. A more precise definition of these costs must be prepared as the architecture is further defined.

The life-cycle cost estimate has been developed using the following assumptions:

- System life will be 10 years.
- Inflation has not been included in the estimate.

- The system will be implemented over a 5-year period using the following schedule:
  - First year: one-half software development.
  - Second year: one-half software development and implementation of first five sites.
  - Third year: 25 sites implemented.
  - Fourth year: 30 additional sites implemented.
  - Fifth year: 40 additional sites implemented.
- The maintenance programming staff will be established during the second year of system operation.
- The life-cycle costs include system acquisition, programming staff salaries, operations staff salaries, and maintenance costs. The costs of floor space and environmental controls for the system are not included.
- Salaries include base salaries increased by a factor of 1.26 for fringe benefits. Operations staff salaries have been increased by an additional 8 percent reflecting cost of overtime and weekend premium rates.
- The average annual base salaries used include:
  - Programmer – $35,000.
  - Operators – $25,000.

  These average salaries include team leader's salaries.

2.7.7 Central Logistics Gateway Node Implementation and Operations-Maintenance Costs

The cost estimates presented in this section assume that the equipment and software being acquired for the DARP will be compatible with the requirements of the Central LGN. For that reason, the cost of the Central LGN implementation has been assumed equal to the cost of the other LGN installations, to provide for the acquisition of a computer configuration to be used as a software development testbed. The development costs of the Central LGN software are included in the total software development costs of the preceding section.

The recurring Central LGN operations and maintenance costs are equivalent to the operations and maintenance costs of the DARP configuration at the Dayton, Ohio site. Current DARP staffing plans for that site include:

- A staff of 32 to provide technical applications support for applications, telecommunications, and operating system software.
- A staff of 10 to provide reports and support to other organizations; this staff will also provide support for the ad hoc inquiry capability of the Central LGN.
- A staff of 60 for system operations; some systems operations personnel will be reassigned to the other two activities.
- An additional staff of 48 management and clerical personnel.

It is anticipated that an equivalent staff size will be required to support the Central LGN operation in addition to the management of the LGN activities at the field locations.

Using these assumptions, life-cycle costs have been developed and are shown in Tables 2-9 through 2-11.

TABLE 2-9

ACQUISITION COSTS

Year	Number of sites installed (cumulative)	Software ($000)	Hardware ($000)	Total acquisition cost ($000)
1	0	5,500	—	5,500
2	5	5,500	1,300	6,800
3	30	0	6,500	6,500
4	60	0	7,800	7,800
5	100	0	10,400	10,400
6 – 10	100	0	0	0
Total		11,000	26,000	37,000

TABLE 2-10

OPERATION AND MAINTENANCE COSTS

Year	Number of sites installed (cumulative)	Operation ($000)	Software maintenance ($000)	Hardware maintenance ($000)	Total ($000)
1	0	0	0	0	0
2	5	680	970	130	1,780
3	30	4,082	970	780	5,832
4	60	8,165	970	1,560	10,695
5	100	13,608	970	2,600	17,178
6	100	13,608	970	2,600	17,178
7	100	13,608	970	2,600	17,178
8	100	13,608	970	2,600	17,178
9	100	13,608	970	2,600	17,178
10	100	13,608	970	2,600	17,178
Total		94,575	8,730	18,070	121,375

TABLE 2-11

TOTAL LIFE-CYCLE COSTS

Year	Number of sites installed (cumulative)	Acquisition cost ($000)	Operation and maintenance ($000)	Total ($000)
1	0	5,500	0	5,500
2	5	6,800	1,780	5,500
3	30	6,500	5,832	12,332
4	60	7,800	10,695	18,495
5	100	10,400	17,178	17,178
6	100	0	17,178	17,178
7	100	0	17,178	17,178
8	100	0	17,178	17,178
9	100	0	17,178	17,178
10	100	0	17,178	17,178
Total		37,000	121,375	158,375

2.8 REVIEW OF SYSTEM BENEFITS

The LGN architecture offers many significant benefits over the existing system. Some are unique to the LGN architecture in that they could not be provided in any other manner, while others could also be provided through a functional expansion of the DAAS configuration although in some cases not as efficiently.

2.8.1 Unique Benefits

The three benefits unique to the LGN architecture include: (1) a significant reduction in vulnerability, (2) elimination of the need for duplicate data transmission, and (3) expandability.

2.8.1.1 Reduction in Vulnerability

Vulnerability is reduced by eliminating those critical functions at a central location which, if disabled, would significantly degrade the effectiveness of the defense logistics system. The LGN design eliminates the need for a critical central facility by distributing all critical functional capabilities to each of the 100 sites. Thus, the system will remain fully operational in the event of a Central LGN failure, and the vulnerability of the LGN system is equivalent to the vulnerability of its individual sites. A high level of reliability is provided at each site through the use of redundant processors, data base back-ups, and the ability of each LGN to provide back-up support to other sites.

2.8.1.2 Reduction in Data Communications Traffic

The LGN system eliminates duplicate data communications traffic by supporting direct user/LGN site-to-user/LGN site transmissions without requiring communications with an intermediate (DAAS) site. This feature will significantly reduce DoD data communications costs because of the magnitude of present and future logistics data traffic. Significant increases in traffic are anticipated during the next 10 years as modernized logistics systems are implemented and graphics data are transmitted. The potential reduction in traffic by almost a factor of two represents a significant benefit to the defense communications community.

Additional reductions in data communications traffic would result from the fact that many inquiries that are currently forwarded to DAAS can be served by the

local LGN without requiring data transmission. Examples include billing history inquiries.

Still further reductions in data communications traffic are provided by the fact that transaction editing is performed at the originating LGN. As a result, incorrect transactions will not enter the data communications system.

While it would appear that the need to provide frequent updates of the LGN files at each major logistics site tends to offset some of this benefit, it must be recognized that the DAASO is currently transmitting data base updates to more than 200 different sites, including most, if not all, of the sites at which the LGNs are to be installed. Therefore, the need for data base updates is not expected to affect the projected communications benefits.

It might also appear that the need for communications between the satellite facilities and the remote LGNs that serve them would tend to reduce the overall communications benefits since the traffic for these sites would still require retransmission (satellite facility to originating LGN to destination LGN). However, the traffic generated by these sites is less than 15 percent of the total logistics traffic. Thus, the need for retransmission for these sites would reduce the overall benefits by a relatively small amount.

2.8.1.3 Expandability

The LGN architecture can be readily expanded to accommodate changes in logistics communications at an individual site or throughout the system. If the size of an individual site were to increase rapidly (for example, as the result of a mobilization), the LGN at that site could be expanded to meet its requirements without affecting other elements of the system. If a new site were to be created with adequate logistics traffic to justify the installation of an LGN, such capability could be rapidly provided. Thus, the LGN architecture is ideally suited to the requirements of DoD for a flexible system that can be adapted to a variety of requirements which are difficult to predict. The system could be expanded both in CONUS and OCONUS as dictated by the specific situation. This capability can be provided without requiring expensive hardware and software modifications at a major central data processing installation. Although not specifically addressed in this report, a

deployable version of the LGN could be developed. The availability of that capability further increases the flexibility of the concept.

2.8.2 Functional Expansion

The LGN architecture has been developed to take advantage of the benefits of a distributed system. These advantages include the ability to capture and store data at the point at which it is generated and the ability to tailor the LGN to the requirements of the local site. This approach has produced a number of functional capabilities including:

- The ability to modify the LGN data base to accommodate the requirements of the organization it supports. This capability reduces the need to delay DLSS changes until all user computer software packages can be updated.
- The ability to provide requisition tracking capability throughout the supply system using standard transaction formats. The tracking capability includes searching multiple LGN and user computer data bases.
- Interconnection with all elements of the logistics supply, transportation, contracting, and financial communities. This includes interface capabilities to commercial organizations.
- The ability to respond to ad hoc requests for data from senior level defense personnel. This capability includes the ability for limited interrogation of user system data bases.
- The use of a common transmission format. The complexity of the existing DAAS processing is, in part, the result of the requirement to provide compatibility between all possible combinations of originating and receiving sites. The use of a common transmission format eliminates this complexity since each LGN must only provide compatibility between its user site and a common DLSS format. This approach simplifies the data reformatting procedure and provides the opportunity for the LGN to be responsive to the unique requirements of the organization it serves.
- The capability for enhancing the priority system through automatic calculation of requisition and transportation priorities using the urgency of need, the FAD of the user organization, and the RDD.
- The ability to merge separate data bases or to enter data on-line to accommodate the requirement for data entries on new DLSS transactions that cannot be provided by the existing user system software. This process can be implemented at the local site. (It would be difficult to implement at a site remote from the source of the supplementary data.)

- The ability to process a higher percentage of logistics traffic. The installation of the LGNs at major user sites and the use of variable-length transaction formats will encourage their use for all inter-S/A logistics communications traffic. The ability to process a higher percentage of logistics traffic than is currently processed by DAAS will improve the quality of the data that are used in the preparation of logistics system performance reports.

Perhaps the most significant benefit is the availability of an architecture that can provide these enhanced functions without any loss of the existing system's functionality. In addition, these functions can be provided at a cost that is equivalent to the cost of implementing a third DAAS site, a measure that is being considered to reduce the vulnerability that exists with only two sites.

The proposed architecture has been informally reviewed with representatives of the data processing industry. They believe that the LGN architecture can be implemented using existing hardware and software technology. Thus, little risk is associated with its implementation.

However, the viability of this architecture is the result of the simplicity of the design concept that results from the use of standard transaction formats for user inquiries, and the use of a common DBMS package on all LGNs. Deviation from these concepts could significantly increase the complexity of the design.

SECTION 3

MODELS IMPLEMENTATION PLAN

3.1 DEFENSE LOGISTICS STANDARD SYSTEMS FIVE-YEAR MODERNIZATION PLAN

3.1.1 Introduction

The Military Services and DLA are modernizing their logistics operational and management information systems. They are replacing obsolete hardware and software with new data processing and telecommunications technologies. To make effective use of the capabilities of these new technology systems throughout the DoD and to maintain DoD-wide standardization of logistics information communications, OASD [Acquisition and Logistics (A&L)] directed the modernization of the DLSS, which are defined by DoD Directive 4000.25, *Administration of Defense Logistics Standard Systems.*

These DLSS, administered by the Defense Logistics Standard Systems Office (DLSSO), encompass varying degrees of the following logistics functional areas: cataloging, inventory management, contracting, contract administration, storage, distribution and redistribution of materiel, transportation and movement, maintenance, property disposal, international supply support, integrated support of weapons, and billing and collections. The DLSS also include the DAAS and the ILCS. These latter two DLSS are operational ADP hardware and software systems responsible for, among other things, editing and routing a large percentage of all logistics communications between the Services, DLA, GSA, other Federal organizations, commercial contractors, and foreign customers.

The project with responsibility for modernization of these standard systems is MODELS. Development of a 5-year modernization plan [MODELS Five-Year Plan (FYP)] for the DLSS is being performed in a series of sequential phases as follows:

1. Definition of the existing logistics system and modernization efforts in the Services and DLA
2. Analysis of functional and technological requirements

3. Development of operating concepts and a MODELS implementation strategy and plan

4. Preparation of a five-year plan for the DLSS modernization, both functional and operational.

3.1.2 Purpose

The DLSS modernization will be based on a simultaneous, two-pronged effort involving: (1) functional modernization – updating and expanding procedures and transactions used in communicating logistics information and (2) technical modernization – improving the capabilities of the hardware and software used in the various information routing processes.

3.1.3 Summary

3.1.3.1 Modernizing DLSS Procedures and Transactions

MODELS will increase the depth and breadth of logistics operational and management functions. Included are the further definition and enhancement of the DoD-wide standard logistics data element dictionary [Logistics Data Element Standard Dictionary (LOGDESD)] along with a comprehensive data source-destination directory. The functional modernization incorporates current DLSS policies, procedures, and transactions realignments, and transactions redesign to accommodate varying amounts of information. The realignment of DLSS procedures will adjust to functional lines of operation and responsibility as depicted in the information flow diagrams presented in Section 1. The transactions redesign may be based upon EDI concepts and standards incorporating variable-length fields and records.

3.1.3.2 Modernizing DLSS Communication Technologies

MODELS is based on current and evolving data management and telecommunications capabilities. The basis of the modernization is an LGN architecture with processors at major logistics sites. The LGNs can translate transactions from S/A internal system (intra-Service) formats to an EDI-based DoD DLSS standard format. The LGNs are linked through a centrally owned and managed wide-area network (DDN) that permits central updating and information management reporting. However, logistics operational information would be communicated

directly from source to destination and all critical logistics management functions reside at the LGN.

3.1.3.3 Resource Requirements

MODELS estimated resources do not specifically identify the source of the labor. The efforts must be coordinated tasks involving OSD, DLSSO, DAASO, the Services and Agencies, and commercial contractors.

3.1.3.4 Strategic Plan

The initial 5-year strategic plan for modernization of the DLSS is shown in Figure 3-1. In that figure, each circled item is a major project to be performed, the #-F projects are functional modernizations, the #-S projects are technology improvements, and the Arabic numbers associated with each project are the recommended sequence for performance. However, projects can be performed simultaneously, as depicted by the concurrent schedules. The remainder of this section describes the objectives of each major project along with the actions that should be completed during the scheduled period.

Appendix B, "Models Functional Requirements in Implementation Priority Groupings," presents the MODELS recommendations.[1]

3.2 MODERNIZING DEFENSE LOGISTICS STANDARD SYSTEMS PROCEDURES AND TRANSACTIONS

3.2.1 Objectives

The strategies for modernization of DLSS procedures and transactions have the following four objectives:

1. *Establish direct relationships between modernized DLSS procedures and operational logistics functions.* This objective includes identifying overlaps, duplication, gaps, and misalignments between DLSS procedures and functional operations.

2. *Institute variable-length transaction formats as the basis for logistics information interchange.* The concepts and methodologies developed for

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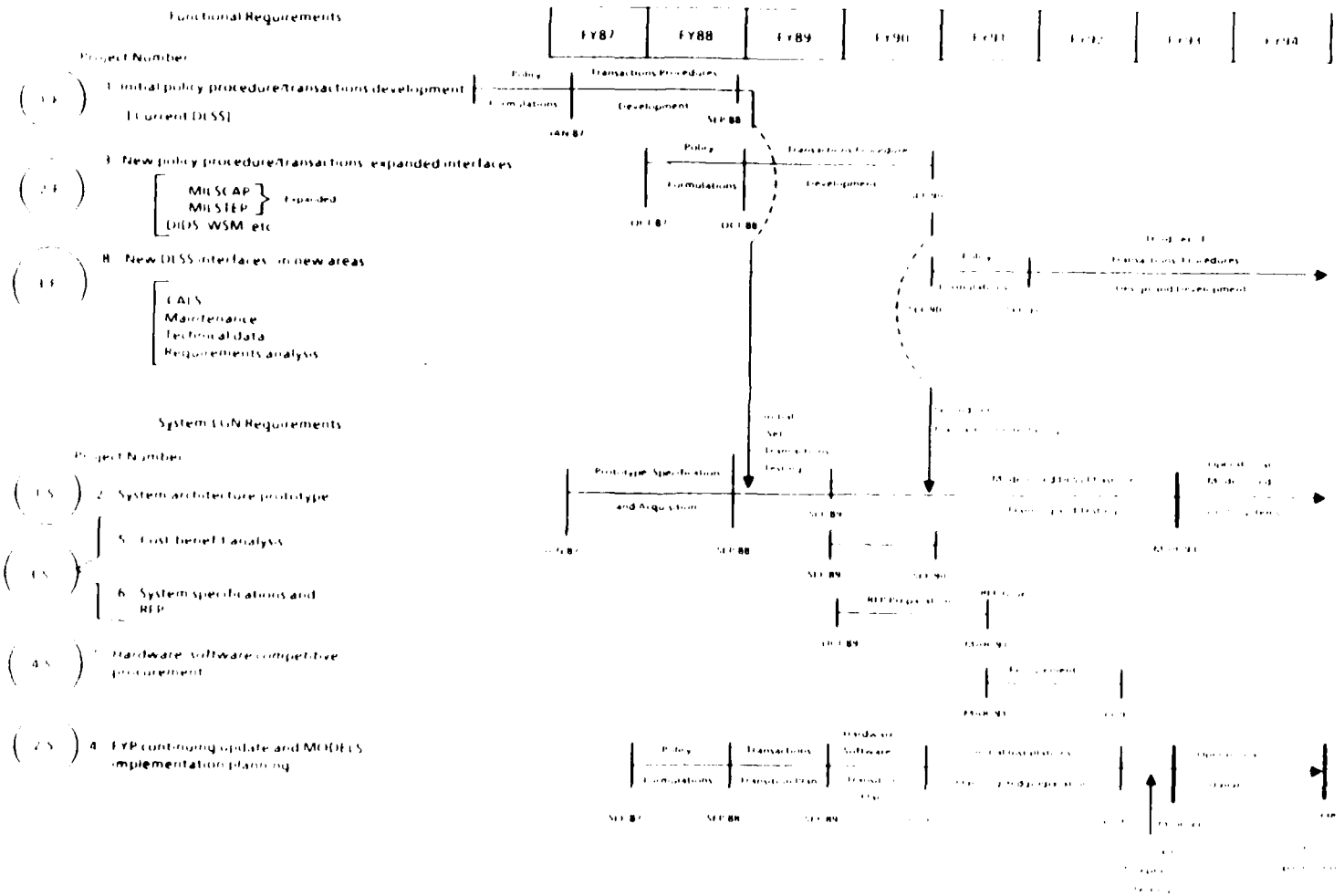
[1]LMI Report DL502R1 *Defense Logistics Standard Systems Functional Requirements* Young, Paul A. Mar 1987



Note: CALS = Computer-aided Logistics Support; DESS = Defense integrated Data System; MILSCAP = Military Standard Contract Administration Procedures; RFP = Request for Proposal; WSM = Weapons System Manager

FIG. 3-1. MODELS FIVE-YEAR PLAN PROJECTS SCHEDULE

the commercial sector EDI standards will serve as the basis for this definition.

3. *Review and revise DLSS procedures.* The modernization of DLSS operational procedures must specifically address identifying those documents that must be reassigned to a different DLSS as a result of revising the organization of, or alignment of, current procedures; revising and consolidating documents and reducing data in order to implement procedures using the capabilities of the variable-length transaction formats; and identifying opportunities for the consolidation of Service-unique documents into revised DLSS documents.

4. *Transition to modernized DLSS.* A transition plan is required to identify the manner in which the modernized DLSS should be implemented. It must define procedures for translating existing fixed-length transactions into revised variable-length transactions for organizations that will not have the capability to process the new, variable-length formats when the transactions are ready for DoD-wide adoption. It must also outline methods for smooth changeover from the old to the new DLSS procedures and transactions without mission disruption. These methods must be closely coordinated with Service and Agency functional and ADP staffs.

3.2.2 Summary of Variable-Length Concept and Electronic Data Interchange Relationship

A key limitation to the effective communication and processing of logistics information, that has been continually cited at Congressional hearings and Major Automated Information System Review Council (MAISRC) meetings, is the obsolete techniques associated with the use of the "80-column card format." Names of parts, vendor P/Ns, DoDAAC or in-the-clear organization ship-to and bill-to names and addresses, order quantities, special instructions, contractual information, transportation information, etc., all vary in length. To use fixed-length records to accommodate maximum lengths without truncation is extremely inefficient for data coding and telecommunication.

EDI standards are already developed or actively under development for many commercial business transactions such as purchase orders and acknowledgments, status inquiries and reports, shipping notices, receiving advice, invoices, requests for quotations, reply to quotations, etc. While formats for DoD EDI standards may not necessarily be identical with those of their commercial counterparts, such similar concepts as logical grouping of data elements into small discrete data segments can be used.

Within the data segment, data element lengths may vary in size. For example, a small or specialized vendor's P/N may only be three or four positions long. However, a large international parts distributor may use P/Ns of 20 to 30 positions. The data field parameters should accommodate both parts without having to be fixed to the largest possible number.

3.2.3 Implementation Strategies

The strategy for implementing recommended changes to the DLSS summarized in Appendix B of this report, is to subdivide the recommendations into three priority groupings as follows:

- Current DLSS procedures and associated transactions, [e.g., MILSTRIP, Military Standard Transaction Reporting and Accounting Procedures (MILSTRAP), existing coverage in Military Standard Contract Administration Procedures (MILSCAP) and Military Standard Transportation and Movement Procedures (MILSTAMP), etc.]

- Expanded, current DLSS procedural areas and closely associated supply operations and supply information management interfaces [e.g., expanded MILSCAP encompassing a fuller scope of acquisition and contract administration procedures, worldwide transportation procedures under MILSTAMP, Weapons System Manager (WSM) procedures, and expanded functional performance measurements, i.e., MILSTEP-type procedures]

- Expanded logistics system interfaces into functional areas not presently within the DLSS scope (e.g., supply-item technical data management, requirements planning and analysis for supply managed items, and supply-maintenance information electronic interfaces).

This subdivision of projects is shown in the MODELS Five-year Plan Projects Schedule in Figure 3-1.

3.2.4 First Procedures Modernization

The first project (1-F) under the DLSS transactions modernization program is to convert the 400-plus current DLSS transaction formats in the procedures encompassed by Department of Defense Instruction (DoDI) 4000.25 and to consolidate/reorganize them into variable-length formats.

Within this project, a series of activities must be successfully completed before the MODELS transactions can be defined and implemented. Those activities are similar for the development of variable-length transactions within each of the

priority groupings. The activities for the initial set of MODELS transactions development, described below, applies in general to all transactions.

The first task is defining and developing a DoD LOGDESD. This dictionary is based on the present DoD Logistics Data Element Standardization and Management Program (LOGDESMAP) DoDI 4000.25-13 and its Logistics Data Resource Management System (LOGDRMS). To them are added the EDI data element definitions and code list dictionary. This addition involves an examination and comparison of terms and definitions to identify and annotate matching data elements to resolve which of the competing terms is to be the standard. The merging and integration of LOGDRMS and EDI data element sets is illustrated in Figure 3-2.

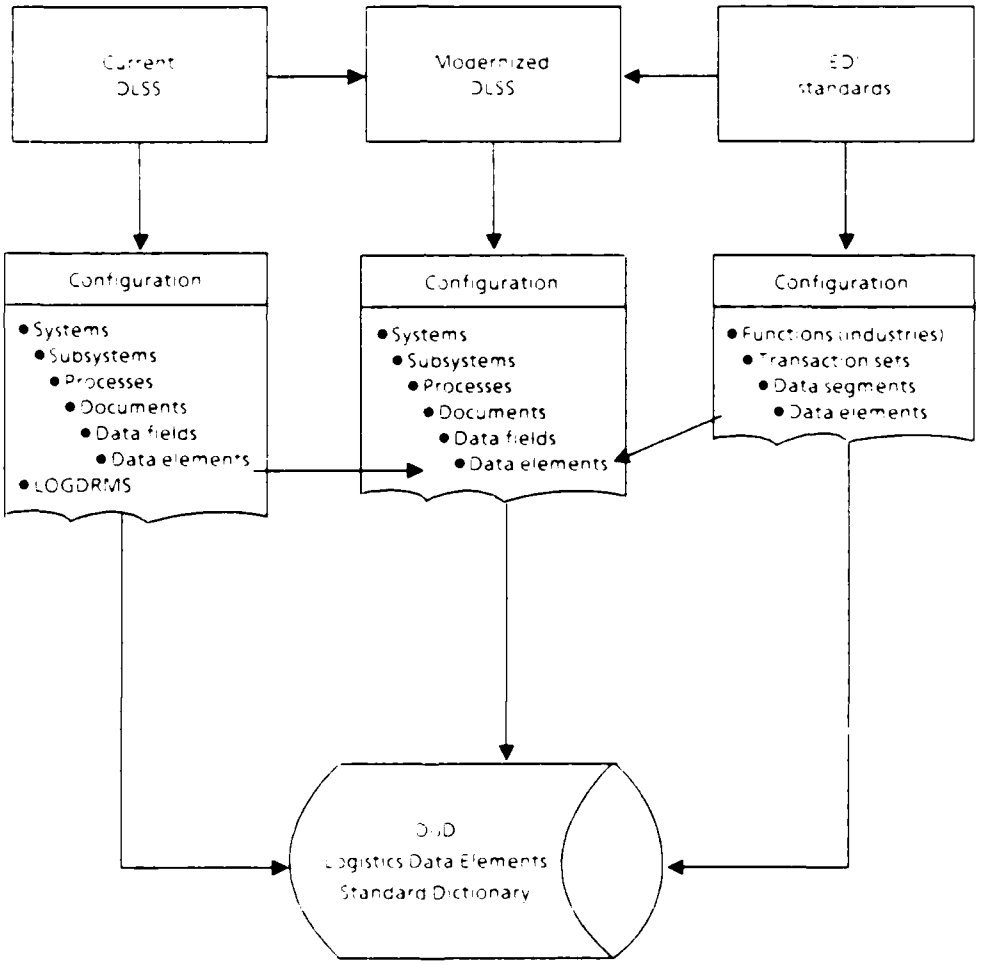


FIG. 3-2. DEVELOPMENT OF A DoD STANDARD DICTIONARY OF LOGISTICS DATA ELEMENTS

The LOGDESD will be an interactive system permitting easy access and retrieval of information. Its data base will include every data element of the existing DLSS standards, existing Service-unique transaction data elements within the prescribed DLSS functional areas, and the EDI data elements in the pertinent DLSS functional areas. The specific activities associated with the development of this data base should include:

- Analyzing LOGDRMS and EDI data base formats and data elements for applicability and adaptability to data base requirements
- Defining data base organization, data base contents, and sources of information
- Selecting computer equipment and DBMS software to support creation and use of the DoD LOGDESD data base
- Create LOGDESD.

The second task that must be conducted concurrently with the data element dictionary development is the definition and development of the modernized DLSS logistics operations model and the resolution of any issues resulting from proposed operational changes. This process is the basis for the data element data base configuration and its subsequent management.

Five activities define the modernized DLSS operational model. They consist of identifying and defining:

1. The relevant logistics functional systems and the scope of their application (e.g., inventory control between ICPs and supporting depots, shipment status between depot and customer)
2. The applicable subsystems (e.g., MRO and acknowledgment; materiel release acceptance, denial, or passing confirmation, and confirmation acknowledgment; shipment status and current location tracing)
3. The applicable logistics operations and information processes (e.g., item inventory data base inquiry, MRO preparation, hazardous material shipment instructions, contract administration award notification)
4. Transaction data requirements, both interactive and batch (e.g., inventory inquiry, item procurement inquiry, in-transit shipment location and delivery date inquiry)

5. Transaction data fields (data segments) to be included in variable-length standardized transactions (e.g., item identifiers, SOS, destination of supply, delivery priority requirements).

The third task of this project is to realign existing DLSS procedures to enhance management efficiency. The results of this task are not expected to cause major changes in the existing DLSS. Rather, they are expected to modify the scope of the existing DLSS by adding and deleting transactions.

This task requires frequent reviews with the DLSSO administrators and Service representatives to: (1) verify the accuracy and relevance of the results being produced and (2) evaluate the impact of recommended realignments on Service and Agency intraorganizational systems and procedures.

The fourth task is to define and develop transactions in the variable-length format to minimize duplicative processing and communications requirements and to maximize consistency within the new alignment of the DLSS. The variable-length formats must be compatible with the DLSS functional operations requirements, must consider transition from the existing formats, and must incorporate the unique requirements of the individual Services and DLA where appropriate. To successfully accomplish this task it is necessary to:

- Define logistics information sources and destinations, describe the flow of information between the organizations, and segregate the information into logical transaction sets.
- Develop a list of the transactions. This list will be a subset of the existing list of transactions since a single variable-length format is capable of accommodating multiple sets of existing transactions. For example, there are presently eight requisition formats (A0 series documents) that differ because of minor variations in information content. These documents could conceivably be simplified as a single variable-length requisition transaction.
- Define the overall structure of each transaction in terms of the data segments it contains and Service and DLA-unique information requirements.
- Define the data elements that make up each data segment in terms of the type (numeric, alphanumeric, etc.), ranges of values, types of values, definition of contents, and the identification and description of relationships with information in other fields.

As with the previous task, this task requires frequent reviews with the DLSSO administrators and S/A representatives to verify the accuracy and relevance of the results being produced and to evaluate the impact of recommended formats on S/A intraorganizational systems and procedures.

The fifth task of the modernized DLSS transactions development project is documentation of the revised DLSS procedures and their associated variable-length transactions. This documentation must include references to the existing DLSS procedures, describing changes and realignments that have been made and providing a map from existing formats to modernized variable-length formats. Also, existing procedures must be rewritten into a form and format for the modernized DLSS procedures and be formally issued as DoD manuals and regulations.

The sixth and final task of this project is actual testing of the modernized variable-length DLSS transactions. This will occur during the prototype testing of the LGN architecture. The new transactions will be used during a 6-month live test described in the next section.

3.2.5 Phase 2 and 3 Defense Logistics Standard Systems Transaction Development Projects

As indicated in Figure 3-1, two additional transaction development projects must be performed to address the full scope of future DLSS procedures. These projects will be conducted in a similar manner to the first implementation step just described. However, one major additional task, policy formulation, must first be taken.

Because the first implementation addresses only existing DLSS procedures, only a few policy issues need to be addressed. However, as DLSS procedures and transactions are expanded, major issues will have to be considered and resolved. These issues include the: (1) degree of and the manner of interaction with existing DoD component logistics systems, (2) responsibilities of administrative and operational organizations, (3) scope of expanded procedures, (4) availability and sources of logistics information to be included, and (5) cost-benefit of expanded information requirements. Thus, the first task of these subsequent projects is to identify, formulate, and resolve the policy issues related to the expanded scope of DLSS.

Successful accomplishment of this first task will require not only frequent and close coordination with functional and operational working groups from the Services and Agencies but also careful review and recommendations by a senior-level management board comprised of representatives from OSD, the Services, affected Agencies, and the JCS community.

3.3 STRATEGIES FOR MODERNIZING DEFENSE LOGISTICS STANDARD SYSTEMS COMMUNICATION TECHNOLOGIES

3.3.1 Objectives

In today's logistics environment, the ability of the defense logistics community to operate effectively in a changing technological environment depends on the quality of service provided by the inter-Service logistics information communication system.

The existing inter-Service and Agency logistics information communication system consists of two DAAS facilities that perform much of the routing and translation functions required to achieve interoperability among the various Service and Agency logistics processing systems.[2] This communication architecture is based upon centralized data base concepts that have inherent functional and operational vulnerability. The current DAAS hardware and software designs are obsolete and are being modernized under the DARP, but they are still based upon centralized data communications and data base storage concepts.

During the next 10 years, logistics data communications traffic is expected to grow significantly as a result of normal increases in logistics traffic, new requirements for data transmissions between facilities, expanded ADP (e.g., increasing automation of acquisition processing and monitoring activities), and increased integration of logistics functions (e.g., automated interfaces between supply and maintenance). Another significant change will be increasing pressure for interactive access to logistics information (e.g., item availability and in-transit status), as more persons become familiar with and have access to microcomputers and work stations.

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[2]Not all DLSS transactions are communicated through DAAS. Examples of transactions that are presently transmitted direct from source to destination are MILSCAP and some MILSTAMP transactions. Under the MODELS concept, all DLSS transactions would be communicated through the LGNs.

The inefficiencies in cost (i.e., double transmission cost of most logistics transactions, once from source to DAAS and a second time from DAAS to destination) and time (i.e., that needed to regroup and retransmit transactions at a centralized DAAS facility) are unacceptable in a system projected to grow by almost 300 percent in the next decade.

Thus, a new data communication method is needed. A less vulnerable, less costly, and more flexible alternative to the existing logistics communications system architecture is needed. An LGN architecture based on the use of a table-driven DDBMS within a wide-area logistics network is recommended. This architecture is described in detail in Section 2.

To demonstrate the advantages of the LGN, a working prototype should be implemented. The prototype will also identify features that must be modified, deleted, or supplemented in the conceptual design.

A second objective of the prototype test is the development of detailed estimates of the costs and benefits of implementing the LGN architecture. The cost estimate will include the hardware procurement, software purchase and/or development and associated conversion, data base conversion, and personnel associated with the LGN implementation, facilities requirements, communication physical line installation costs, and LGN operation and maintenance. The benefits estimate must reflect the expected savings in communications costs for source-to-destination data flows, time reduction savings, and increases in productivity resulting from better and faster information availability.

The third objective of the prototype test is to provide the basis for development of a detailed implementation plan to integrate hardware, software, variable-length transactions, and revised procedures into a modernized DLSS system.

3.3.2 Summary of the Logistics Gateway Node Concept

The LGN architecture replaces the two DAAS facilities with local logistics site LGNs that provide an enhanced, distributed version of most of the functions currently performed by DAAS. The LGN architecture would be implemented through the installation of front-end processors (LGNs) at the major logistics sites including wholesale logistics activities (ICPs and depots), finance centers, Defense Contract Administration Service Region (DCASR) offices, transportation

management facilities, and major intermediate retail-level activities. One LGN site (probably the Dayton, Ohio DAAS site) would be designated the Central LGN to perform summary reporting and configuration management functions that are required for overall system network operations.

The LGNs would ensure that all traffic entering the inter-S/A data communications facilities of the DoD are consistent with standardized DLSS transaction formats. Since the LGN would act as the interface between its user computer(s) and other processors of the defense logistics system, it can be tailored to the requirements of the user facility.

Sites that do not have a local LGN would communicate with the logistics system as satellite facilities through a designated user site. These satellite facilities would therefore have access to all of the LGN features available at the user site.

3.3.3 Implementation Strategies

The strategy for implementing a modernized telecommunications and information processing system to support the DLSS information flow requirements presented in Sections 1 and 2 of this report, is to:

- Develop system specifications and conduct a prototype of the system architecture at selected logistics sites
- Conduct detailed cost-benefit and economic impact analysis to prove the financial practicality of the LGN concept before planning full-scale implementation
- Prepare a full-scale implementation plan, that includes phased implementations, test plans, transition schedules, and operation and maintenance plans
- Prepare specifications for a competitive request for proposal (RFP) for the implementation of the LGN network and conduct the competitive procurement
- Install, test, and implement the modernized DLSS procedures using modernized communications and processing LGNs.

This phased development and implementation is shown in Figure 3-1 under the System LGN Requirements subsection. The actual plan extends over 12 years (to

1998) before the LGN architecture is fully implemented and operational. This is a tight schedule considering the many major activities that must be accomplished.

3.3.4 System Architecture Prototype

The first step under the LGN network implementation program is to select a few major logistics sites at which to conduct a small but comprehensive testing of hardware and software prototypes and modernized DLSS transactions and procedures. The activities to be performed during the first project include:

- Developing detailed hardware and software specifications to support the prototype tests
- Selecting the logistics sites for the prototypes
- Preparing the prototype test plans
- Acquiring prototype systems (hardware and software) and providing necessary support to, and monitoring of, their installation at each site
- Conducting a 6-month prototype test using MODELS transaction formats
- Evaluating the prototype test and developing recommendations for changes and improvements to the LGN requirements and specifications
- Preparing a final detailed functional description of the LGN concept and revised functional specifications.

3.3.4.1 Developing LGN Requirements

As a first task of this project, the hardware and software requirements for the working prototype must be defined for the overall system level and for the unique requirements of each selected site. The definition should include specifications for the processor, peripheral equipment, communications interface hardware and associated protocol requirements (e.g., standard communication interfaces), the capabilities of the DBMS package, and any special-purpose software required for the test. The requirements should also contain a description of the data bases that are required to support the system operational test and evaluation.

A functional definition of the prototype system will be prepared. That definition should provide a summary system description; operating requirements; test conduct details including inputs, processing, and outputs; a definition of the operating environments at the various sites; and estimates of the prototype

implementation and test conduct costs. This functional definition for the prototype systems and their environments should be prepared in the general form of an RFP to ensure that the commercial vendors selected to provide the various hardware and software have a specification to work with in preparing their technical and cost proposals.

The functional definition document must be a working document that can be revised as the prototype is implemented and the evaluation conducted.

3.3.4.2 Selecting Prototype Sites

The prototype test is currently planned to be conducted at three operational logistics sites and a Central LGN site (DAASO). To optimize the transaction testing activities (i.e., test the largest number of different transactions possible), the operational sites should probably include a major retail operation, an ICP, and a depot. Final decisions as to the types of functional sites, their specific locations, and related information will be based upon site selection criteria. It is important that this activity be performed early in the project because the types of sites, and therefore the DLSS transactions to be used during the prototype test, will establish priorities for the transactions design project.

3.3.4.3 Preparing the Prototype Test Plan

After the sites are identified, a test specification and plan will be developed to more fully define:

- Objectives of the test and the criteria by which the success of the test is to be determined
- Functions and processing capabilities of each test site LGN
- Specific software processing and data base requirements at each LGN to support the test
- Staffing requirements for each site, including the number, type, and source of personnel
- Schedules for installing the equipment, testing it, and evaluating the test at each site; that is, schedules to identify milestones for each responsible organization to complete their respective assignments.

Preliminary prototype test planning anticipates that the operational test scenario will be similar to the following:

- Thirty-day test of variable-length test transactions designed to provide a robust test of the full range of transaction types.
- Sixty-day test of transactions from the selected prototype sites, collected over a prior 6-month period. Transactions will be in current DLSS format and converted by the LGN to new variable-length formats for transmission.
- Ninety-day live operations from and to each of the designated prototype sites (modified DAAS storage of transactions for parallel operations) with actual DLSS logistics transactions in current formats converted to new formats by the LGN.

The portion of the test plan developed for the evaluation of prototype effectiveness must include both qualitative and quantitative assessments of the LGN's effectiveness.

The qualitative assessment should include interviews with systems and logistics personnel at both the midpoint and conclusion of the test period. The assessment must obtain their evaluation of positive and negative aspects of the LGN's operation.

The quantitative assessment must be maintained in the form of a system operating log to annotate various characteristics and problems associated with performance. One component should be before-and-after evaluations of logistics operations. The "before" case would consist of system performance measurements conducted with the existing logistics system architecture using the DAAS facilities; the "after" case would evaluate system performance during the test period while the LGN is installed and operating. The quantitative operating parameters to be collected during these two test periods would include measures such as system response times, communications message traffic volumes and message lengths, error rates, number of lost documents, number of erroneous documents, etc. Quantitative measures must also include the personnel required (i.e., number and skill level) to support each mode of logistics system operation.

The test plan will define all of the qualitative and quantitative parameters that are to be evaluated and the methods of evaluation. This test plan will be the basis for designing the actual test scenarios before conduct of the 6-month prototype test.

3.3.4.4 Acquiring Prototype Systems

Using the functional descriptions and test plans developed in the first stages of this project, the prototype systems will be acquired [e.g., Government-furnished equipment (GFE), if available, leased, or purchased, whichever is most cost-effective]. If GFE is not available, the following activities must be completed to acquire the prototype systems:

- Preparing documentation required to support and justify the acquisition
- Conducting a marketplace survey to identify possible suppliers of the prototype equipment. The marketplace survey must accompany the justification to support an R&D acquisition.
- Requesting technical and cost proposals from one or more suppliers, evaluating the responses, negotiating with the best offeror as necessary, and awarding a contract for the lease or buy of the systems.

Successful development and implementation of LGN software will require that DAASO staff actively participate in the specification, design, and development of the LGN operational applications software, data base system software selection, and software implementation acceptance testing.

3.3.4.5 Conducting a Logistics Data Flow Prototype Test

Installation of the prototype systems primarily by the selected vendor will be the first component activity. All the installation requirements must be carefully reviewed and site support provided for floor space, office space, communications facilities, and hardware utilities (heating/cooling, electricity, etc.). Support for data base conversion and LGN application software implementation will probably be provided by the staff at DAASO, which will serve as the Central LGN site, a fourth LGN test site. The Central LGN will be responsible for local site LGN configuration management, broadcasting data base updates to the local LGNs, and central data collection for activities such as aggregated performance measurement summaries.

Installation monitoring activities will include review of all installation plans; review and approval of planned system-generated reports, displays, and functional capabilities; and verification that the equipment and software (both applications and special purpose) conform with the requirements of the specifications.

The second component activity is acceptance and "dry run" testing of the installed hardware and software, prior to beginning the 6-month prototype operational test.

The third component activity is the actual conduct of the 6-month test. The following paragraphs describe briefly the planned prototype operations.

The DAAS facilities will act as both the current central routing facility for logistics information and the Central LGN configuration control during the test. As the central routing facility, DAAS will receive all transactions from the test sites not directed to another test site and route them to their appropriate destination. As the Central LGN, DAAS will receive updates to customer addresses, SOS changes, and requests for ad hoc reports. It will send changes to local site LGN data bases or collect information from LGN data bases to prepare ad hoc reports.

Each local LGN test site will prepare logistics transactions in its normal mode of operation. However, instead of being transmitted from the base communications center to DAAS, the transactions will go from the site's local computer into the local LGN. Within the LGN the transactions will be edited against the SOS data base and separated into batches, one directed to DAAS in its traditional role of central routing facility, and the others to the test sites designated as the destinations for the transactions.

In addition, each site will continue to send its entire set of logistics transactions to DAAS using existing methods. However, those transactions for another test site will have a special record identifier to advise DAAS to hold the record rather than retransmit the transactions to the intended destination. This will be the back-up parallel operation for the test site and would immediately be put into operation should difficulties arise with the LGN test. Thus, the test will have a well-defined and ready-for-operation alternative system to support the site's logistics activity requirements.

At the conclusion of the 6-month test, all the test sites will revert to their current mode of logistics communications operation.

3.3.4.6 Evaluating the Prototype Test

The LGN architecture and the MODELS variable-length transactions will be evaluated in accordance with previously developed plans and criteria established in

the test plan. The final test plan will be reviewed prior to commencing the prototype operational test, to incorporate any significant changes that occurred during the installation of the LGN.

The test plan will call for a qualitative and quantitative evaluation of performance at the three test sites and at DAAS. The evaluation will continue through the period of the test, and the collected data will be analyzed and summarized in the 6 months following the conclusion of the test. The evaluation will include a reassessment of the hardware and software functional requirements; operational requirements; implementation and operation costs; functions of the Central LGN; reliability, maintainability, and vulnerability issues; and similar implementation and operations characteristics. The evaluation will also include recommendations for any changes to the LGN architecture, implementation plans, and operational requirements.

3.3.4.7 Preparing the LGN Documentation

The last task of the prototype evaluation is preparation of documentation of the prototype test procedures, results of the evaluation, recommendations for improvements, and updates to the system functional description and specification. This documentation must be prepared in sufficient detail to permit a full understanding of the objectives, purpose, procedures, problems, findings, and recommendations of the prototype project.

3.3.5 Cost-Benefit and Economic Impact Analyses

Assuming the success of the prototype LGN test, a cost-benefit and economic impact analysis of the LGN must be conducted to:

- Prepare for MAISRC milestones, if required
- Prepare detailed out-year Program Objectives Memorandum (POM) estimates
- Substantiate implementation of a wide-area distributed logistics network.

The cost-benefit and economic impact analyses should assume that variable-length DLSS-formatted transactions will be implemented along with the LGN architecture. Thus, the analyses should consider all MODELS recommendations.

The cost-benefit analysis should identify and quantify all life-cycle costs and benefits. It should be performed on an incremental basis in which the costs and benefits are compared with the comparable costs and benefits of the existing DAAS logistics information communications system (after completion of the current DARP).

The benefits to be evaluated should include communications cost savings, improvements in logistics system effectiveness through the availability of more timely and comprehensive information, and improvements in functional operations effectiveness. These benefits must also include forecasts of the impact of future expansion and enhancements (such as transmission of graphics data, weapons system management, crisis management planning and execution, and EDI with the commercial sector) on the existing and proposed systems.

3.3.6 Full Implementation Planning

The third step in the LGN implementation process is the full implementation planning. The MODELS FYP is a preliminary plan. Detailed plans for execution should be made after the prototype test has supported the technical feasibility and practicality of the LGN, and the cost-benefit and economic impacts analysis indicates it is economically viable. This is not to say that preliminary transition plans, already being considered, should not be drafted prior to and during the test. These are necessary for resource allocation forecasting and to ensure that the MODELS program is included in POM considerations by the Services and Agencies in their outyear budgeting processes.

The full implementation plan must address implementation of the revised DLSS procedures; associated variable-length transactions; and the LGN hardware, software, and communications. Each of these components has major issues.

A primary issue in the DLSS procedures and transactions implementation planning is the schedule for transition to the new transactions. One alternative is to wait until LGNs are installed at all major logistics sites and the network is tested. The disadvantage of that approach is that it will probably take close to a decade to complete all of the necessary approvals, procurements, installations, and testing. Another alternative is to develop and implement all the features and capabilities of the LGN concept at the two DAAS sites, thereby facilitating conversion to the

modernized procedures and variable-length transactions before 1990, and then implement the remaining LGNs.

Issues associated with the LGN include identifying who will own, control, and staff the LGN sites, which will probably be collocated and housed in Service and DLA facilities. If DLSSO owns and operates the equipment, should it rent space and back-up operators from the local site organization? If the Services and DLA own the LGNs at their respective sites, does DLSSO lose the flexibility of being able to make rapid changes and updates? Also, who is responsible for maintenance and repair of hardware in either situation?

The MODELS Implementation Plan must also address phased implementation issues (e.g., should implementation be performed by the Service and Agency or by logistics organizational level); test plans (who prepares them, conducts them, approves satisfactory completion of testing); transition schedules (what is the order of conversion to modernized DLSS formats since it is impractical to expect a conversion to all new transactions on a single designated day); and operations and maintenance plans (does the Government form operations troubleshooting and maintenance teams that handle problems on site or should that service obtained under contract as part of the hardware and software procurements).

These and many similar issues must be formulated and resolved in the full implementation planning.

3.3.7 Request for Proposal Preparation and Competitive Procurement

At the conclusion of the previously described tasks, there will be an assessment of the feasibility and practicality of the new DLSS formats and the LGN accompanied by a plan to ensure effective implementation of the modifications on a DoD-wide basis. A final version of the functional description will define the required DLSS changes, identify sites at which the LGNs are to be installed, describe the connection of satellite facilities to these sites, and identify the variations required in LGN functions to meet the requirements of specific user configurations. The DDBMS or DBMS network software, directories, and dictionaries required to support the logistics network operation will also have been specified. Finally, many, if not most, of the issues similar to those described above will have been addressed and resolved.

The functional description and implementation plan will provide the basis for a competitive RFP defining hardware and software requirements, test and acceptance plans, and schedules and milestones to implement the MODELS recommendations. In addition to the formal RFP, required supplemental documentation must also be prepared to support the procurement activities. These documents include a Project Plan, Outside Sources Considerations, supporting studies, a Systems Analysis and Requirements Document (SARD), a market survey, procurement justifications, and a Systems Authorization Document (SAD). Finally, all of this documentation and the implementation plans and funding requirements must be presented and approved in the MAISRC process.

When approvals are received and documentation is in place, the actual procurement process can be started. This process will include technical and cost evaluations of all proposals received, tests of proposed hardware and software, award of one or more contracts, and acceptance testing of the proposed equipment and software. Only then can the implementation process truly begin.

3.4 RESOURCE REQUIREMENTS

Tables 3-1 and 3-2 present summary estimates of resource requirements for the MODELS program activities described in the Implementation Plan and depicted in Figure 3-1. These estimates identify resources for each of the organizations participating in this program by project and by fiscal year.

OSD participation will consist primarily of policy formulation, regular ongoing reviews of program activities and progress, and decisions on major modernization issues.

DLSSO participation will include detailed reviews of program activities; day-to-day program management – budgeting, issue formulation, FYP updates, and related activities; and participation in technical direction of the program. Technical participation will include extensive involvement in the review of the LOGDESMAP data base and design of the new DLSS data dictionary and associated directories. It will also include active participation in the design and definition of variable-length transactions and DLSS procedures modifications.

DAASO will participate in the design and definition of the variable-length transactions, including development of automated data flow diagrams and the DLSS

TABLE 3-1

SUMMARY OF FIVE-YEAR PLAN RESOURCE REQUIREMENT ESTIMATES BY PROJECT

(Labor in person-months, dollars in thousands)

Project number	Description	OSD	DLSSO	DAASO	Services and Agencies	Support contractors		Total	
		Labor	Labor	Labor	Labor	Labor	$ (000s)	Labor	$ (000s)
1	Initial policy procedure transactions development	4.0	40.0	40.0	40.0	50.0	$ 660	174.0	$ 660
2	System architecture prototype	10.0	32.0	74.0	47.0	96.0	$2,600[a]	259.0	$2,600[a]
3	New policy procedure transactions, expanded interfaces	27.0	70.0	36.0	60.0 (Services) 48.0 (DLA)	80.0	$1,000	321.0	$1,000
4	FYP continuing update and LGN network implementation planning	44.0	80.0	134.0	294.0	68.0	$ 950	620.0	$ 950
5	Cost benefit analysis	3.0	4.0	4.0	3.0	24.0	$ 320	38.0	$ 320
6	System specifications and RFP	4.0	14.0	48.0	42.0	36.0	$ 480	144.0	$ 480
7	Hardware, software competitive procurement	34.0	30.0	42.0	42.0	24.0	$ 360	172.0	$ 360
8	New DLSS interfaces, in new areas	40.0	100.0	54.0	116.0	120	$1,600	430.0	$1,600
	Total	166.0	370.0	432.0	692.0	498.0	$7,970[a]	2,158.0	$7,970[a]

[a] [illegible] and estimated equipment costs of $1,600,000

TABLE 3-2

SUMMARY OF FIVE-YEAR PLAN RESOURCE REQUIREMENT ESTIMATES BY ORGANIZATION AND FISCAL YEAR

(Labor in person-months, dollars in thousands)

Fiscal year	OSD	DLSSO	DAASO	Services and Agencies	Support contractors		Totals	
	Labor	Labor	Labor	Labor	Labor	$ (000s)	Labor	$ (000s)
FY87	4 0	20 0	26 0	31 0	62 0	$ 768	143 0	$ 768
FY88	13 0	53 0	72 0	70 0	88 0	$2,442[a]	296 0	$2,442[a]
FY89	20 0	64 5	60 0	94 0	66 0	$ 935[a]	304 5	$ 935[a]
FY90	25 0	60 5	78 0	115 0	90 0	$1,175	368 5	$1,175
FY91	14 0	40 0	79 0	122 0	54 0	$ 725	309	$ 725
FY92	56 0	84 0	93 0	174 0	78 0	$1,100	485	$1,100
FY93	34 0	48 0	24 0	86 0	60 0	$ 825	252	$ 825
	166 0	370 0	4[illegible]0	692 0	498 0	$7,970[a]	2,158	$7,970[a]

[a] Dollars include labor and estimated equipment costs of $1,600,000

data dictionary. However, it is anticipated that their most extensive involvement will be in the specification, design, and development of the LGN data base applications software.

The Services, DLA, Defense Transportation Agencies, OJCS/Joint Deployment Agency (JDA), and other interested or affected organizations should all participate in an active review and coordination capacity. They will review policy and the LGN data base design, as well as support site installations.

APPENDIX A

GLOSSARY

The following is a list of acronyms and their definitions used in this report.

ACO	Administrative Contracting Officer
ADP	Automatic Data Processing
ADPE	Automatic Data Processing Equipment
A&L	Acquisition and Logistics
ANSI	American National Standards Institute
AUTODIN	Automatic Digital Network
CALS	Computer-Aided Logistics Support
CAO	Contract Administrative Office
CDR	Contract Deficiency Report
CINC	Commander-in-Chief
COBOL	Common Business Oriented Language
COMM RI	Communications Routing Identifier
CONUS	Continental United States
COOP	Continuity of Operations Plan
DAAS	Defense Automatic Addressing System
DAASO	Defense Automatic Addressing System Office
DAASO-BFS	Defense Automatic Addressing System Office Baseline Functional Specification
DAISY	Defense Reutilization and Marketing Service Automated Information System
DARP	DAAS ADPE Replacement Program
DBA	Data Base Administrator
DBMS	Data Base Management System
DCASR	Defense Contract Administration Service Region
DDBMS	Distributed Data Base Management System

DD/D	Data Dictionary/Directory
DD/DS	Data Dictionary/Directory Subsystem
DDN	Defense Data Network
DEPRA	Defense European and Pacific Redistribution Activity
DIDS	Defense Integrated Data System
DLA	Defense Logistics Agency
DLANET	Defense Logistics Agency Telecommunications Network
DLSC	Defense Logistics Service Center
DLSS	Defense Logistics Standard Systems
DLSSO	Defense Logistics Standard Systems Office
DoD	Department of Defense
DoDAAC	Department of Defense Activity Address Code
DoDAAD	Department of Defense Activity Address Directory
DoDAAF	Department of Defense Activity Address File
DoDI	Department of Defense Instruction
DoD RI	Department of Defense Routing Identifier
DRMO	Defense Reutilization and Marketing Office
DRMS	Defense Reutilization and Marketing Service
DTS	Defense Transportation System
EDI	Electronic Data Interchange
FAD	Force Activity Designator
FIPS	Federal Information Processing Standard
FMS	Foreign Military Sales
FSC	Federal Supply Class
FYP	Five-Year Plan
Gbytes	Gigabytes
GFE	Government-Furnished Equipment
GP	Gateway Processor
GSA	General Services Administration
ICP	Inventory Control Point

ILCO	International Logistics Control Offices
ILCS	International Logistics Communications System
IM	Inventory Manager
IMM	Integrated Material Manager
IMP	Interface Message Processor
I/O	Input/Output
IRDS	Information Resource Dictionary System
I-S/A AMPE	Inter-Service/Agency Automated Message Processing Exchange
ISO	International Standards Organization
JCS	Joint Chiefs of Staff
JDA	Joint Deployment Agency
JDS	Joint Deployment System
JOPES	Joint Operations, Planning, and Execution System
Kbytes	Kilobytes
LGN	Logistics Gateway Node
LIDS	Logistics Information Data Service
LOGDESD	Logistics Data Element Standard Dictionary
LOGDESMAP	Logistics Data Element Standardization and Management Program
LOGDRMS	Logistics Data Resource Management System
MAC	Military Airlift Command
MAISRC	Major Automated Information System Review Council
MAPAF	Military Assistance Program Address File
Mbyte	Megabyte
MCDN	Marine Corps Data Network
MILRI	Military Routing Identifier
MILSCAP	Military Standard Contract Administration Procedures
MILSPETS	Military Standard Petroleum System
MILSTAMP	Military Standard Transportation and Movement Procedures

MILSTEP	Military Supply and Transportation Evaluation Procedures
MILSTRAP	Military Standard Transaction Reporting and Accounting Procedures
MILSTRIP	Military Standard Requisitioning and Issue Procedures
MODELS	Modernization of Defense Logistics Standard Systems
MRO	Materiel Release Order
MSC	Military Sealift Command
MTMC	Military Traffic Management Command
NBS	National Bureau of Standards
NDBMS	Network Data Base Management System
NICP	National Inventory Control Point
NSN	National Stock Number
OASD(A&L)	Office of the Assistant Secretary of Defense (Acquisition and Logistics)
OCONUS	Outside the Continental United States
OJCS	Organization of the Joint Chiefs of Staff
OSD	Office of the Secretary of Defense
OSI	Open Systems Interconnection
PCO	Procurement Contracting Office
PIN	Part Identification Number
PLAD	Plain Language Address Designator
P/N	Part Number
PO	Procurement Office
POM	Program Objectives Memorandum
QDR	Quality Deficiency Report
R&D	Research and Development
R&M	Reutilization and Marketing
RDD	Required Delivery Date
REPSHIPS	Reports of Shipment

RFP	Request for Proposal
ROD	Report of Discrepancy
S/A	Service/Agency
SAD	Systems Authorization Document
SARD	Systems Analysis and Requirements Document
SOS	Source of Supply
SPLICE	Stock Point Logistics Integrated Communications Environment
TDCC	Transportation Data Coordinating Committee
UMMIPS	Uniform Materiel Movement and Issue Priority System
WBS	Work Breakdown Structure
WIS	WWMCCS Information System
WSM	Weapons System Manager
WWMCCS	Worldwide Military Command and Control System

APPENDIX B

PRIORITIES FOR MODELS IMPLEMENTATION

The MOdernization of DEfense Logistics Standard Systems (MODELS) functional and technology-related requirements[1] presented in this appendix are organized by implementation priority. The priorities are organized in six classification categories in Table B-1.

PROJECT 1-F REQUIREMENTS

The first priority set of requirements[2] are for transformation of current Defense Logistics Standard Systems (DLSS) 80-column transactions and procedures to Electronic Data Interchange (EDI)-concept variable-length transactions, with changes in procedures, as required.

- The MODELS conceptual design must provide flexible transaction formats and a methodology for expedited adoption of new codes and procedures as logistics operations and management information needs change.
- Uniform Materiel Movement and Issue Priority System (UMMIPS) performance measurement standards and procedures should become part of the restructured, expanded DLSS, and must continue close coordination with the Joint Chiefs of Staff (JCS) for Force Activity Designator (FAD) and priority assignments.
- The MODELS concept must provide the capability for internal Service/Agency (S/A) unique data needs to be accommodated in DLSS inter-S/A transactions.
- MODELS transaction formats must provide flexibility to handle two-party and multi-party informational exchanges, even though not formally part of DLSS procedures.

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[1] LMI Report DL502R1 "Functional Requirements" summary from *Defense Logistics Standard Systems Functional Requirements*. Young, Paul A. Mar 1987

[2] Order of requirements does not indicate any priority within project 1-F

TABLE B-1

CLASSIFICATION CATEGORIES

Classification	Description
1-F (1986 – 1988)	Project 1-F: Transformation of current DLSS, 80-column transactions and procedures to EDI-concept variable-length transactions, with changes in procedures, as required.
2-F (1988 – 1991)	Project 2-F: The expansion of current DLSS to accommodate increased scope of coverage [e.g., Military Standard Contract Administration Procedures (MILSCAP) to include secondary item acquisition activities, Military Supply and Transportation Evaluation Procedures (MILSTEP) to include a broad range of logistics management and operations performance measures]; the incorporation of commodity specific procedures into the standard DLSS [e.g., Military Standard Petroleum System (MILSPETS) integrated into Military Standard Requisitioning and Issue Procedures (MILSTRIP), Military Standard Transaction Reporting and Accounting Procedures (MILSTRAP), etc.]; and the interfacing of external defense standard systems into the DLSS network of systems.
3-F (1991 – Later)	Project 3-F: Interfacing existing and developing defense standard systems (i.e., systems to support operations or management information across the Department and which require inter-S/A exchange of information) into the DLSS network of systems and procedures.
F =	Designation for Functional modernization projects, to change and enhance functional capabilities of DLSS procedures.
1-S (1986 – 1989)	Project 1-S: Prototype testing of the logistics gateway node (LGN) and logistics network concepts to assess feasibility and better define cost-benefit relationships.
2-S (1992 – Later)	Project 2-S: Implement the LGN and logistics network at 100 major sites and implementation of Projects 1-F and 2-F transactions throughout the defense logistics community. Includes limited interactive inquiry capability and ad hoc reporting.
3-S (1994 – Later)	Project 3-S: Enhancement of the logistics network to fully interface all defense standard systems operating within the Department, including policies and procedures external to the DLSS, but requiring inter-S/A information exchange and interaction with the commercial sector for a full range of electronic communications. Incorporation of 3-F transactions.
S =	Designation for System modernization projects, enhancing automatic data processing (ADP) and telecommunications capabilities for DLSS operations.

- The MODELS concept design should make it easy to measure the performance of a range of operations and trend indicators at the wholesale operations level.
- The MODELS concept should identify methods and procedures to collect pipeline performance measurement data at each segment of the process, as it occurs. The DLSS should standardize the definition of each pipeline segment.
- MODELS acquisition function transaction formats must be variable in length to accommodate all S/A contract data exchange requirements.
- DLSS procedures should standardize the requisitioning transaction to accommodate retail-level end user requirements.
- History retention periods, for each type of transaction, should be standardized. Visibility of referrals, backorders, depot denials, and cancellations should be enhanced.
- The use of priority codes, project codes, and weapons system codes in the requisition transaction must be defined and accommodated in the MODELS concept.
- MODELS must establish standards for methods of supply determination processes to assure responsive support of user requirements.
- MODELS must incorporate improved interface capabilities to permit timely processing of modifications and cancellations.
- Modernized DLSS should integrate DoD Manual 4140.27-M for shelf-life items and hazardous materiel procedures into an expanded wholesale storage standard.
- The MODELS concept must include automating processes to accommodate and improve the productivity of conducting physical inventory procedures.
- The expanded-DLSS procedures must provide for the identification, definition, control, and dissemination of data standards. This role should include the development of the data dictionary and related directories.
- DLSS transaction formats should be variable-length records and should conform to an electronic data exchange standard. Serious consideration should be given to using EDI standards to establish compatibility with the commercial sector. Therefore, DLSS transaction formats should be formulated and established in cooperation with the American National Standards Institute (ANSI) EDI Committee, associated subcommittees such as the Transportation Data Coordinating Committee (TDCC), and industry representatives.

- The MODELS concept should provide for modernized DLSS procedures and transaction data elements to accommodate implementation, through UMMIPS, of separate issue and transportation priority coding systems.

- Individual S/A logistics systems need to be designed with the total DoD logistics community in mind. An overall DoD logistics system modernization plan should be formally prepared and regularly updated, as part of the MODELS continuing modernization process.

PROJECT 2-F REQUIREMENTS

The second priority set of requirements are for the expansion of current DLSS to increase its scope of coverage [e.g., Military Standard Contract Administration Procedures (MILSCAP) to include secondary item acquisition activities, Military Supply and Transportation Evaluation Procedures (MILSTEP) to include a broad range of logistics management and operations performance measures]; the integration of commodity specific procedures within the standard DLSS [e.g., Military Standard Petroleum System (MILSPETS) integrated into Military Standard Requisitioning and Issue Procedures (MILSTRIP), Military Standard Transaction Reporting and Accounting Procedures (MILSTRAP), etc.]; and the interface of external defense standard systems with the DLSS network of systems [e.g., Defense Integrated Data System (DIDS), Weapons System Manager (WSM), Defense Reutilization and Marketing Service (DRMS) Automated Information System (DAISY)]. These requirements are all closely associated with the current DLSS and can be thought of as an extension of the current DLSS. These requirements will require some policy decisions prior to development of Project 2-F implementation plans. However, the policy decisions are not as broad in scope as those required prior to implementation of Project 3-F. The following are Project 2-F MODELS requirements:[3]

- The MODELS concept design should make it easy to measure the performance of a range of operations and trend indicators at the wholesale operations level.

- The MODELS concept must have the capability to electronically collect, collate, and summarize discrepancy reports from all S/A organizations worldwide as one element of performance measurement reporting. These discrepancy reporting evaluation procedures should be incorporated into DoD-wide standard performance measures.

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[3]Order of requirements does not indicate any priority within project 2-F

- Standard criteria for measuring procurement and contracting performance should be developed. The MODELS concept must include procedures for regular collection of these standardized performance measurement data as a normal process.

- Modernized DLSS procedures must define a standard weapons-system performance measurement program, including standardized weapons system identification codes. The DLSS procedures must allow for multiple weapons system coding for common-use items.

- A comprehensive set of logistics operations performance measurements should be developed and implemented through a DLSS procedural publication.

- The modernized DLSS procedures should encompass standard procurement functions and related inter-S/A information exchange requirements.

- MODELS formats for acquisition transactions must be variable in length to accommodate all S/A contract data exchange requirements.

- Contract Deficiency Reports (CDRs) should become a part of Administrative Contracting Officer/Procurement Contracting Officer data bases and should be available on-line.

- The MODELS concept should automate response and disposition instruction processing, in accordance with published standards.

- The modernized, expanded DLSS should standardize processing of materiel and equipment to Defense Reutilization and Marketing Offices (DRMOs), including all types of local turn-ins. The automated processing of materiel to reutilization and marketing (R&M) functions, even for local turn-ins, should be coordinated with MODELS implementation.

- Procedures for all shipment preparation and documentation should be incorporated into the modernized DLSS.

- The MODELS concept should review DIDS modernization requirements and plans and closely coordinate the MODELS conceptual design to accommodate future DIDS capabilities.

- All inventory management and control issues and procedures should be integrated in an expanded DLSS.

- Distribution and redistribution procedures should be consolidated under one expanded DLSS procedure for wholesale supply management.

- The use of priority codes, project codes, and weapons system codes in the requisition transaction must be defined and accommodated in the MODELS concept.

- The MODELS concept should include a method of providing denial status directly to requisitioners, either at a retail-supply point or by end users through the retail-supply point system. Standardized procedures and timeframes are needed to improve data records and delivery and receipt records for billing purposes throughout all levels of the logistics community.

- With a network-wide interactive inquiry capability there may no longer be a need for pushed follow-ups to update centralized data bases. This change would require that standardized procedures and guidelines be developed for inquiry capability.

- Modernized DLSS must include procedures and standard rules concerning the stages when changes can be made (during which segments of the pipeline process), what changes are authorized with various modes of data access (interactive versus transactional), and who is authorized to initiate interactive changes, with appropriate precautions regarding access and record-level security.

- DLSS guidelines and procedures need to be developed and implemented for processing backorder releases. A priority processing scheme, similar to that used for in-process requisitions, should be applied to backorder release processing. Partial shipments of priority materiel should be considered and rules and automated procedures developed to standardize when such shipments can be authorized and by whom.

- Procedures need improvement in Inventory Control Point (ICP) determination and processing of wholesale excess materiel.

- One procedural document should define a standard set of reporting procedures for all types of discrepancies. Methods for automated integration of deficiency reporting procedures through data base techniques and on-line, interactive information retrieval capabilities should be considered.

- Shipment preparation procedures should all be integrated in modernized DLSS. The MODELS concept must be able to accommodate the full extent of information exchange requirements. The MODELS concept must also allow for and encourage the use of bar-coding and EDI standards for improved documentation and processing efficiency.

- The MODELS concept must provide for exchange of transportation information/data with all logistics community activities and also some activities that are not included in the defense logistics operations management environment, particularly JCS, the Joint Deployment Agency (JDA), and the Commanders-in-Chief (CINCs).

- The MODELS concept must provide for a reduction of paperwork. It must improve the flow of compatible data, on a near-real-time basis in some cases, within the defense community and to and from other organizations.

including commercial carriers. Electronic data exchange concepts and standards must be incorporated.

- The DLSS-expanded functions must provide for evaluation and development of procedures and data exchange requirements in theaters of operation, compatible with the the Defense Transportation System (DTS) and CONUS-based activities that provide transportation data to the theater or require data from the theater.

- The MODELS concept must provide for exchange of data concerning transportation authorization decision process and the traffic management function.

- The MODELS concept must provide for an appropriate level of recording and reporting of transportation movement information and data.

- Modernized DLSS procedures and the MODELS information exchange technology concepts must provide standardized interfaces to unique commodity systems (e.g., ammunition, petroleum). Eventually such unique Service-to-Service and Service-to-Defense Logistics Agency (DLA) procedures and automated systems must be fully interfaced with the MODELS concept.

- The MODELS concept should provide for a working interface between Joint operations systems and the DLSS.

- Modernized DLSS must establish procedures and standards for DoD-wide logistics information inquiry.

PROJECT 3-F REQUIREMENTS

The third priority set of functional requirements are to interface existing and developing defense standard systems (i.e., systems to support operations or management information across the Department and which require inter-S/A exchange of information) with the DLSS network of systems and procedures [e.g., maintenance, requirements analysis, Computer-Aided Logistics Support (CALS) data]. The following requirements[4] are currently not closely associated with the DLSS and will require important policy decisions prior to the development of Project 3-F implementation plans:

- Informational inputs and function-to-function interfaces (for example, supply-to-transportation) should be reevaluated and redefined to overcome known inter-S/A information deficiencies not addressed by the current

[4]Order of requirements does not indicate any priority within project 3-F

DLSS and to meet the needs of new and expanding functional and management information requirements.

- Modernized DLSS must provide for standardization of retail procedures.
- The MODELS concept must coordinate with all S/A logistics modernization requirements.
- The MODELS conceptual design should accommodate all information exchanges between logistics functions and operational/management components.
- The MODELS concept should include methods for collecting and reporting data at the retail operations level to satisfy a variety of performance measurement criteria.
- The MODELS design must provide the automated capabilities to perform weapons system-oriented performance measurement of logistics operations. This must include access to wholesale and retail operational performance measurement data classified by weapons system.
- The MODELS effort should continue to closely monitor CALS developments and information exchange protocols and procedures. As standards are developed by the OSD-CALS Group for technical data acquisition and distribution procedures and communications interfaces, these standards should be published as part of the modernized DLSS technical data functions.
- Retail requisitioning should be DLSS compatible throughout the S/A logistics community.
- The expanded DLSS must develop DoD standards for analysis of demand. They must also present requirements data including initial provisioning procedures and the control and management of war reserve materiel requirements.
- The MODELS concept must provide an automated information interface for maintenance requirements. The modernized DLSS must provide for the induction and return of reparables, so that the Integrated Material Manager (IMM)/Inventory Manager (IM) (owning) has the necessary asset visibility to allow for proper control, and to take asset status into consideration when performing procurements and redistributions.
- MODELS must improve IM visibility of retail excess materiel. Also, the DLSS should identify procedures to integrate retail returns with discrepancy processing systems.
- DLSS procedures need to be developed to define standards for the use and transmission of technical data. The MODELS design must allow and promote on-line access to catalog and technical data, with full graphics

capability for transmission and display of digitized images. This capability must incorporate CALS-developed procedure and protocol standards.

- The MODELS concept should provide for standardization of procedures for the exchange of technical data between the S/As.
- The DLSS must provide for standardization of cataloging activities related to technical data, engineering drawings, and documents in accordance with the OSD-CALS Group recommendations.
- The DLSS should incorporate the findings and recommendations of the CALS project for technical data storage and retrieval standardized procedures.
- Wholesale receipt procedures for information access and exchange between the depot and ICP should be fully covered under the modernized DLSS, including use of bar-coding technology, interface requirements to other logistics functions, and performance measurement/quality control processes.
- The MODELS concept must recognize the integral role of R&M in the total logistics process and should incorporate an evolving DAISY capability for on-line visibility of excess assets. Asset visibility should be available to wholesale IMs and all retail-level supply echelons. OSD should consider the integration of R&M functional procedures into the DLSS scope of responsibility.

PROJECT 1-S REQUIREMENTS

The following are requirements[5] for prototype testing of the LGN and logistics network concepts to assess feasibility and better define cost-benefit relationships:

- MODELS will require some degree of data base and data model standardization.
- A standard DoD logistics data elements dictionary will be a requisite (and a responsibility of the DLSS), to include all data elements, terms, and definitions used in S/A logistics system interfaces and information exchanges.
- The expanded-DLSS procedures must provide for the identification, definition, control, and dissemination of data standards. This role should include the development of data dictionaries.
- The MODELS concept must provide for an electronic mail capability.

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[5] *Order of requirements does not indicate any priority within project 1-S.*

- The MODELS concept must provide for continued use of batch processing and the standardized exchange of data in batches.

- DLSS modernization should carefully review existing and developing communications standards for the Open Systems Interconnection (OSI) seven-layer reference model, to facilitate inter-operability in the logistics community among heterogeneous data networks. The Defense Logistics Standard Systems Office (DLSSO) must take an active role in ensuring adherence to DoD-wide logistics applications data management standards.

- The MODELS concept recognizes the use of modern data base management system (DBMS) technology by the S/As and must provide for procedures to standardize data element definitions in the S/As. In the interim, data dictionaries should be established to facilitate data element translations among S/As.

- The MODELS concept must be structured to take advantage of the emerging distributed data base management system (DDBMS) technology. Existing DDBMS technology should be reviewed to determine its ability to address the needs of the logistics community.

- The MODELS concept must provide for electronic exchange of large text-fields of contract-related information.

- Individual S/A logistics systems need to be designed with the total DoD logistics community in mind. An overall DoD logistics systems modernization plan should be formally prepared and regularly updated, as part of the MODELS continuing modernization process.

PROJECT 2-S REQUIREMENTS

To implement the LGN architecture at major sites and to integrate Project 1-F and 2-F transactions throughout the defense logistics community requires the following:[5]

- The MODELS concept must coordinate with all S/A logistics modernization requirements. It must also be able to satisfy logistics information requirements and fully support resupply requirements in crisis or wartime situations.

- The MODELS concept should include the capability to: (1) accumulate performance characteristic data generated as a normal process of daily operations, and (2) provide for the retrieval of performance data in a form that the intended recipient will find most useful. This capability should include collection of data, based on normally-generated operations data (not

[5]Order of requirements does not indicate any priority within project 2-S

special data collection efforts), and rapid retrieval in easily modified formats to view information from different points of interest.

- The MODELS concept should identify methods and procedures to collect pipeline performance measurement data at each segment of the process as it occurs. The DLSS should standardize the definition of each pipeline segment.

- The MODELS concept must provide access to contract data via various data elements and also establish and maintain relationships among data elements through a well-designed data architecture.

- CDRs should become a part of Administrative Contracting Officer Procurement Contracting Officer data bases and should be available on-line.

- The use of priority codes, project codes, and weapons system codes in the requisition transaction must be defined and accommodated in the MODELS concept. Requisition edits by the supply source and intervening third parties [such as the Defense Automatic Addressing System (DAAS)] need to be integrated under the DLSS.

- MODELS should provide a better approach to accessing source-of-supply (SOS) information and to resolving conflicts.

- The MODELS concept must accommodate improved automated information exchange for issue procedures between the depot and ICP as new technologies, such as bar-code readers, are introduced into depot issue processing.

- The MODELS concept should provide the capability to implement on-line user interfaces with ICPs for stock availability and requisition status inquiry for, at a minimum, Priority Group I materiel requirements.

- The MODELS concept must provide a broad base of DoD users with access (not necessarily real-time) to contracting and contract administration activities, maintaining information related to contract content and status.

- DLSS procedures must provide for meeting the growing need for inter-SA standardization of information to be collected and communicated between DoD transportation agencies and customers, and between DoD and commercial transportation activities.

- The MODELS concept should provide for a working interface between Joint operations systems and the DLSS.

- The MODELS concept must be structured to accommodate rapidly evolving advanced computer and communication technologies including voice and video communications.

- The MODELS concept requires a highly efficient and reliable system of telecommunications and gateway processors to support inter-S/A queries and transfer of various types of weapons system-related data. Any data exchange programs to support weapons systems management must be designed to accommodate classified data.
- Modernized DLSS procedures must resolve the in-transit visibility supply-transportation interface issues by providing specific-item visibility during the shipment process.
- The MODELS concept must provide for electronic exchange of large text-fields of contract-related information.

PROJECT 3-S REQUIREMENTS

This project enhances the LGN architecture to fully interface all defense standard systems operating within the Department, including policies and procedures external to the DLSS, but requiring inter-S/A information exchange and interfaces with the commercial sector for a full range of electronic communications. It includes incorporation of 3-F transactions. Its requirements[7] are:

- The MODELS conceptual design should accommodate all information exchanges between logistics functions and operational/management components.
- The MODELS concept should provide retail users with direct, on-line access to all retail supply echelons and the wholesale logistics systems for inquiries about stock availability, identification of retail-issue requisition demand and shipment actions, in a bottom-up, chain-of-supply hierarchy.
- The MODELS concept should automate all types of discrepancy/deficiency recordkeeping, possibly in accessible retail-level inventory files.
- All inventory management and control issues and procedures should be integrated in an expanded DLSS. Within this integrated environment, the MODELS design must provide the IMM the capability for semi-real-time, on-line DoD-wide asset visibility to the lowest supply echelon.
- The MODELS concept must provide for exchange of transportation information/data with all logistics community activities and also some activities that are not included in the defense logistics operations management environment, particularly JCS, JDA, and the CINCs.
- The MODELS concept must provide for a reduction of paperwork and must improve the flow of compatible data, on a near-real-time basis in some cases, within the defense transportation function and to and from other

[7]Order of requirements does not indicate any priority within project 3-S.

organizations, including commercial carriers. Electronic data exchange concepts and standards must be incorporated.

- The MODELS concept must provide for evolutionary development of a near-real-time capability to provide information and data to assist the Military Traffic Management Command (MTMC) in managing the transportation function in support of logistics activities.

- The MODELS concept must provide for a reasonable interchange of information and data between transportation activities and both nontransportation and nonlogistics activities.

- Modernized DLSS procedures and the MODELS information exchange technology concepts must provide standardized interfaces to unique commodity systems (e.g., ammunition, petroleum). Eventually such unique Service-to-Service and Service-to-DLA procedures and automated systems must be fully integrated into the MODELS concept.

- Modernized DLSS procedures must provide for improved visibility, i.e., the ability to track specific items at any point in the shipment process.

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The Modernization of Defense Logistics Standard Systems (MODELS) project will increase the capacity and flexibility of DoD's logistics operations by redesigning and upgrading the Defense Logistics Standard Systems (DLSS).

To take advantage of advances in logistics information management practices, as well as telecommunications and data processing technology, the DLSS must undergo two aspects of modernization simultaneously: (1) functional, that is enhancing and expanding current procedures and transactions for communicating logistics information, and (2) technical, upgrading the capabilities of the hardware and software of the various information processes.

From the functional view, we recommend formulating revised variable-length DLSS transactions in place of the present 80-column format.

From the technical view, we recommend upgrading the DAAS to a distributed network configuration consisting of interconnected logistics gateway nodes (LGNs). LGNs pass, route, edit, and perform data processing functions for transactions entering and leaving the logistics sites they support. They offer the potential of significant increases in DAAS capacity and flexibility and reductions in communication costs.

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