Total Asset Visibility (TAV™)

Version 2.8

Product Description

msi ™

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1. INTRODUCTION

Management Software, Inc. (**msi**$_{TM}$) offers a line of software system products known as:

*Total Asset Visibility (*TAV$_{TM}$*)*

Total Asset Visibility (TAV$_{TM}$) consists of the following **Management Software, Inc.** (**msi**$_{TM}$) software offerings:

Receiving & Internal Distribution

Arrival Management System (AMS$_{TM}$)

Inventory & Order Fulfillment

Warehouse Management System (WMS$_{TM}$)

Document Processing & Control

Document Control System (DCS$_{TM}$)

Shipping & External Distribution

Material Distribution System (MDS$_{TM}$)
Controlled Distribution System (CDS$_{TM}$)

Activity & Access Control

Activity Control System (ACS$_{TM}$)

Activity Archive

Distribution Archive System (DAS$_{TM}$)

All of the above software products are available in three license suites; the **Enterprise Suite**, the **Workgroup Suite**, and **Single System Software (S^3)**. The **Enterprise Suite** is applicable for high capacity server implementations and is the only **msi**$_{TM}$ offering with which "Box" licensing is available.

The **Workgroup Suite** is applicable for low to medium capacity server implementations (e.g., PC based server hardware running MS Windows).

Single System Software (S^3) licensing is applicable for single user, standalone implementations (e.g., PC hardware running MS Windows).

All **msi**$_{TM}$ offerings share a common Data Base and so are inter-operable. One **msi**$_{TM}$ offering from each category are installed together.

WEB Software System Products

The above **Management Software, Inc.** (**msi**$_{TM}$) software offerings are available in two forms, standard "Fat Client" and WEB based "Thin Client". In Fat Client mode (Oracle 6i Forms & Reports), the product software applications execute natively on the local client workstation. In Thin Client mode, the product software applications execute via Oracle's 11g Internet Application Server and are interacted with using a JAVA enabled WEB Browser.

Deployment of the Oracle's 11g Internet Application Server with the above **Management Software, Inc.** (**msi**$_{TM}$) software system products yields:

Receiving & Internal Distribution

Arrival Management System WEB (AMS WEB$_{TM}$)

Inventory & Order Fulfillment

Warehouse Management System WEB (WMS WEB$_{TM}$)

Document Processing & Control

Document Control System WEB (DCS WEB$_{TM}$)

Shipping & External Distribution

Material Distribution System WEB (MDS WEB$_{TM}$)
Controlled Distribution System WEB (CDS WEB$_{TM}$)

Activity & Access Control

Activity Control System WEB (ACS WEB$_{TM}$)

Activity Archive

Distribution Archive System WEB (DAS WEB$_{TM}$)

SECURE Total Asset Visibility (SECURE TAV$_{TM}$)

Total Asset Visibility (TAV$_{TM}$) is also available in two forms, "regular" **TAV$_{TM}$** and **SECURE TAV$_{TM}$**. Both **TAV$_{TM}$** and **SECURE TAV$_{TM}$** use the same Data Base.

SECURE TAV$_{TM}$ enables authorized users to only manipulate/view information with classification equal to those assigned to that user. This requires all **SECURE TAV$_{TM}$** Data Base users be identified in the Account Table of the **TAV$_{TM}$** Data Base, and that the corresponding Account Table entry has at least one valid classification assigned. If a user logs onto the System but is not found in the Account Table, or does not have any classification assigned, that user will be immediately logged out of the **SECURE TAV$_{TM}$** system.

Once successfully logged on, the user has full access to all authorized applications via the main menu. When executing any of those applications, only information classified equal to the accreditation assigned to the user will be available for manipulation or viewing.

TAV™ also offers the **For Your Eyes Only (FYEO)** option. This option further restricts certain data to specific users. An example of this is the **TAV**™ View Digital Mail application, which only displays mail images where the recipient is the current user.

The following **Management Software, Inc.** (**msi**™) system software products are available in the **SECURE TAV**™ line offering:

Receiving & Internal Distribution

SECURE Arrival Management System (SECURE AMS™ or SECURE AMS WEB™)

Inventory & Order Fulfillment

SECURE Warehouse Management System (SECURE WMS™ or SECURE WMS WEB™)

Document Processing & Control

SECURE Document Control System (SECURE DCS™ or SECURE DCS WEB™)

Shipping & External Distribution

SECURE Material Distribution System (SECURE MDS™ or SECURE MDS WEB™)
SECURE Controlled Distribution System (SECURE CDS™ or SECURE CDS WEB™)

Activity & Access Control

SECURE Activity Control System (SECURE ACS™ or SECURE ACS WEB™)

Activity Archive

SECURE Distribution Archive System (SECURE DAS™ or SECURE DAS WEB™)

TAV™ Common Software Modules

The following **TAV™** modules are available for use with any form of **TAV™** component.

TAV™ OCR and Scanner Control Module
Provides Software Interfaces and Operational Control for most industry standard Image Scanners (e.g., Flatbed, Sheet, Single, Duplex, etc.) for a **TAV™** enterprise or workgroup deployment. Image interpretations include:

- Optical Character Recognition (OCR)
- Optical Character Recognition (OCR) + PDF
- Optical Mark Recognition (OMR)
- Intelligent Character Recognition (ICR)
- Handprint Recognition (HNR)
- 1 Dimensional Bar Code Recognition (1DBC)
- 2 Dimensional Bar Code Recognition (2DBC)

TAV™ OCR and Scanner Single System Control Module
Provides Software Interfaces and Operational Control for most industry standard Image Scanners (e.g., Flatbed, Sheet, Single, Duplex, etc.) for a **TAV™** single system deployment. Image interpretations include those listed above.

AMS™ Carrier Communications Module (**AMS CCM™**)
Communicates with Carriers (commercial and otherwise) to secure inbound material shipment and in-transit information.

MDS™ Carrier Communications Module (**MDS CCM™**)
Communicates with Carriers (commercial and otherwise) to secure outbound material shipment and in-transit information.

CDS™ Carrier Communications Module (**CDS CCM™**)
Communicates with Carriers (commercial and otherwise) to secure outbound material shipment and in-transit information.

AMS™ Data Collection Device (DCD) Option
Provides an electronic mobile consignment platform for loading dock logging and courier route execution that does not require wireless communications (batch operation). Complete with electronic signature capture and multiple batch update capability. Licensed per Data Collection Device (DCD).

WMS™ Data Collection Device (DCD) Option
Provides an electronic mobile consignment platform for pick/put operations that does not require wireless communications (batch operation). Complete with electronic signature capture and multiple batch update capability. Licensed per Data Collection Device (DCD).

ACS™ Data Collection Device (DCD) Option
Provides an electronic mobile platform for patrol route execution that does not require wireless communications (batch operation). Complete with electronic photographic and signature capture as well as multiple batch update capability. Licensed per Data Collection Device (DCD).

TAV™ Mail Management Interface(**TAV MMI™**)
Interfaces the **TAV™** Data Base with one or more AccuTrac HT Mail Management System from Pitney Bowes, Inc., for data collection and integration.

2. APPLICABILITY

Total Asset Visibility (TAV$_{TM}$) is constructed to provide immediate, up to the minute, answers to these quintessential logistics questions:

Who - entered a location, exited a location, departed a location, deserves access, received the material, has/had the material, deserves the material, did they come to see, escorted them, sponsored them, etc.

What - is in the container, is the condition, is the damage, is the disposal method, is the container, is the vehicle/vessel, is the status, is the priority, etc.

When - did they enter, did they exit, did they depart, did it arrive, was it shipped, did you know, is/was it expected, to try again, it will be started, it will be done, they were escorted, it was locked/unlocked, etc.

Where - it is from, is it now, is it going next, is it going finally, they entered, they exited, they can go, it will be done, they are, they reside, etc.

How - to ship, it was shipped, to handle, it was handled, they are accredited, heavy, long, wide, tall, large, strong, it is accredited, it is/was packaged, it is propelled, much it can hold, it can be stacked, time was spent, etc.

Total Asset Visibility (TAV$_{TM}$):

1. Accounts for incoming material controlled to Purchase Orders (POs), Return Material Authorizations (RMAs), inventory locations, individuals and/or groups.

2. Accounts for incoming and outgoing individuals and/or groups controlled to sponsors, hosts, escorts, and locations.

3. Re-distributes incoming material to internal locations (e.g., inventory), groups and/or individuals according to assigned classifications.

4. Controls access to documents and/or internal locations by groups and/or individuals according to assigned classifications.

5. Distributes material to locations, groups and/or individuals according to assigned classifications.

6. Enforces and accounts for personnel escorts to locations for groups and/or individuals according to assigned classifications.

7. Documents individual re-distributions according to configurable document/material classification assignment.

8. Documents personnel matriculation according to configurable classification assignment.

9. Documents distributions according to courier/driver/vehicle route/location assignments.

10. Distributes controlled document/material to groups and/or individuals according to assigned classifications.

11. Documents individual distributions according to configurable carrier/courier service classification assignment.

12. Tracks document/material to recipients and accounts for consignment via bar coded receipting and automated tracer dispatch per individually aged consignments.

13. Tracks personnel to locations and accounts for escort consignment via coded badging.

14. Is accessible to all participating personnel through virtually all industry standard Local Area Networks (LANs) and/or Wide Area Networks (WANs).

15. Is available for most common computers running all popular operating systems using both character based and Graphical User Interfaces (GUI).

16. Is accessible to all participating personnel through virtually all industry standard JAVA enabled HTML based WEB Browsers (**TAV WEB**™).

TAV™ provides enterprise wide access to the tools and information pertinent to personnel and material movement throughout your enterprise. Any authorized person, from virtually anywhere (either from within the enterprise (e.g. Intranet or enterprise network) or from outside the enterprise (e.g. through the Internet)) can "see" where a given person is, who they came to see, who escorted them, when they arrived/departed, where a given document/material is, who the last person to touch it was, its condition, and its disposition.

Any authorized enterprise participant can initiate and track documents, personnel or material movement via a variety of methods:

1. exclusively though document control methods (e.g., document services) (**DCS**™)

2. exclusively though access control methods (e.g., security services) (**ACS**™)

3. exclusively though internal distribution methods (e.g., internal distribution services) (**AMS**™)

4. exclusively though external distribution methods (e.g., commercial carrier services) (**MDS/CDS**™)

5. complimentary though both internal and external distribution methods e.g.:

    A. internal distribution services to the local shipping room then external carrier services to the end recipient

    B. internal distribution services to the local shipping room then external carrier services to the next enterprise receiving location where internal distribution services delivers to the internal end recipient

Enterprise participant initiation of personnel and material movement puts the burden of data entry on the movement initiator, thereby freeing internal security, distribution, and shipping services personnel to focus on their work.

Enterprise wide access to personnel and material movement information further relieves security, distribution, and shipping services personnel from procuring said information on behalf of questioning enterprise participants. Enterprise participants can easily get his or her own information without encumbering anyone else in the process.

Carrier Communications can be effected via a scheduled Electronic Data Interchange (EDI) interface (the Carrier Communications Module (**CCM**$_{TM}$). Shipment information (e.g., airbill, manifest, etc.) is supplied to each participating Carrier using this interface, with each transmission indicating a request for subsequent shipment status. Thereafter, each time the Carrier Communications Module (**CCM**$_{TM}$) contacts that carrier, that carrier will provide all information resulting from each time any parcel within that shipment was scanned by carrier personnel. As a result, enterprise participants can "see" their material move through the carrier's infrastructure to the end recipient. In the case where a material doesn't arrive as scheduled, carrier tracing can begin at the material's last known location, thus saving time by focusing the carrier's search.

Automation of routing relieves distribution services personnel from determining the "next stop" for a given material in transit.

Automation of routing enables the "re-routing" of material in transit; again without explicit intervention of distribution services personnel.

1. Each time a material is "received" at an internal location, its next destination location is derived using the current location and the end recipient destination location.

2. When a material's end destination is changed while that material is in transit, the next time that material is "received" at a location, its next destination location will be derived using the current location and the "new" end recipient destination location, effectively re-routing the material in transit.

Since any system on the enterprise network (Intranet or Internet) is capable of material movement operations via real-time communications with the Data Base Server, portable Data Collection Devices (DCDs) are not always required.

Networked PCs equipped with Keyboard Wedge Bar Code/OCR Scanners inexpensively extend Bar Code/OCR operations to the enterprise.

Networked PCs equipped with a stylus/pad pointing device instead of a conventional mouse inexpensively extend signature capture operations to the enterprise.

When mobility is required, portable Data Collection Devices (DCDs) can be incorporated in material movement operations. Portable data collection devices are available in multiple manifestations depending upon application and ergonomic preference. These manifestations can be generally classified as CARRYABLE DCDs and WEARABLE DCDs. Within each of these general classifications there are two further categories based on modes of operation, **Real-Time** (the default) and **Batch**.

CARRYABLE Data Collection Devices include the likes of Intermec's Portable Computing Platform family. Since this equipment is meant to be "carried" in-hand or by shoulder strap, it is also expected to be dropped (usually onto hard concrete floors). As such ALL "carryable" DCDs supported are "ruggedized" and expect harsh treatment (including a little moisture).

WEARABLE Data Collection Devices are best represented by Xybernaut's Mobile Assistant V Wearable Computing Platform. Since this equipment is meant to be "worn" as a vest or accessory belt, it is NOT expected to be dropped and as such is not as rugged as a CARRYABLE Data Collection Device. It is plenty rugged enough to be worn (e.g. knocked and bumped), just not dropped harshly or immersed into moisture.

1. Batch data uploading and downloading means data processed by a given DCD is available to the enterprise only after that data is uploaded from the DCD to the Data Base Server. DCD uploading and downloading can be performed via:

    A. Local serial data interfaces available on Enterprise networked PCs

    B. Dial-up modem connections to a DCD Interface Client (dedicated PC(s) connected to the Enterprise network) using either:

        I. Public Telephone Networks
        II. Private Telephone Networks
        III. INMARSAT.

2. Real-Time communications for DCDs is available using a variety of Radio Frequency (RF) mediums dependent upon coverage areas e.g.:

    A. IEEE 802.11 Wireless LANs for building to campus coverage or

    B. High Frequency (HF) Packet Radio for national coverage.

    C. INMARSAT satellite communications for world wide coverage.

When used for material movement operations, portable DCDs with real-time communications to the Data Base Server provide a very flexible means by which up-to-the-minute information is provided to the rest of the enterprise.

2.1. Typical TAV™ Deployments

2.1.1. A TAV™ AMS™ Usage Scenario

The following is a narrative description of how the **TAV**™ Data Base with **AMS**™ Software been applied to counter-terrorism receiving operations. The narrative is a single thread usage description of the following:

1. Automated Expected Arrival Creation for Accountable Material
2. Ad-Hoc Expected Arrival Creation for Accountable Material
3. Ad-Hoc Unexpected Arrival Creation for Accountable Material
4. Arrival Processing of Accountable Material
5. Ad-Hoc Arrival Processing for Non-Accountable Material
6. Integrated Material Imaging
7. Unexpected Arrival Authentication for Accountable Material
8. Quarantine Chamber Administration and Management
9. Test Chamber Administration and Management
10. Hazard Test Management and Execution
11. Hazard Test Results Management
12. Disposal Management
13. Automated Material Tracer Actions
14. Trans-Shipment Container Consolidation for Non-Accountable Inbound Material
15. Trans-Shipment Container Consolidation for Accountable Inbound Material
16. Courier Route Administration
17. Courier Route Assignment and Load Management
18. Courier Route Execution Management

The deployment covers a receiving/mail handling facility and dozens of large office buildings in a city. A fleet of trucks move mail and material from the receiving/mail handling facility to all buildings.

A pre-existing Purchasing Order (PO) System kept on another Oracle RDBMS Server permits data access to a group of tables containing committed funds purchase order data. A scheduled Oracle PL/SQL procedure (Job) accesses these tables from the **TAV**™ Data Base Server using a Data Base Link to populate and maintain the Expected Arrival data in the **TAV**™ Data Base. New PO entries result in **Expected Arrival** postings. Canceled PO 's result in canceled **Expected Arrivals**. **Material** received against a PO by **TAV**™ is posted to the PO Data Base with table updates to reflect a current PO status, i.e. Open or Closed.

All 30,000 members and staff have access to a **SECURE TAV WEB**$_{TM}$ site where everyone with an account can post an **Expected Arrival**. Posting an **Expected Arrival** entry BEFORE the arrival of the material indicates that the incoming material truly is expected and so will be forwarded to its recipient as soon as it is successfully released from **Quarantine**.

Inbound processing of non-accountable material, i.e. mail, is accomplished by placing pieces of mail into uniquely identified trays. The tray identifications are used to track the migration of the contained mail. Migration goes from placement in a **Test Chamber**, the application of contamination tests on Mail Tray contents, movement to a **Quarantine Chamber** and the eventual removal from a **Quarantine Chamber** upon "GOOD" test results postings. The tray identifications are also used to enforce quarantine handling upon "BAD" test results postings for one or more Trays.

Inbound processing of accountable material consists of using **TAV**$_{TM}$ to find the **Expected Arrival** entry applicable to that material/parcel. Selection is made against recipient information (name, organization, address, etc.) and/or parcel information (carrier, control number, P.O. Number, RMA number, etc.). Once a match is found in the system, **TAV**$_{TM}$ applies the handling selected and processes the material accordingly.

Receiving operators post **Unexpected Arrival** entries whenever an incoming material CAN NOT BE FOUND among the **Expected Arrival** entries in **TAV**$_{TM}$. Posting an Arrival entry AFTER the arrival of the material indicates that the incoming material truly is unexpected and should be held in a staging area after Quarantine until its disposition is known. Unexpected inbound material is not available for pickup or delivery until the recipient authenticates its arrival.

Receiving operators use a hand held 2D Barcode Scanner/Imager to take pictures of the material as it is received. The image is kept in the **TAV**$_{TM}$ Data Base as part of an evidentiary audit trail and is also included in Recipient notification emails. In the case of an **Unexpected Arrival Notification**, the recipient has access to the **SECURE TAV WEB**$_{TM}$ site where everyone with an account can post an **Unexpected Arrival Authorization**. **Unexpected Arrival Notification** emails contain a link to the site, referencing the application, the recipient, and the parcel.

After **Quarantine**, unexpected material has its handling set to "HOLD FOR FORWARD" and is temporarily stored in a staging area in the receiving facility. The handling setting is not changed until the identified recipient authenticates the arrival's validity to **TAV**$_{TM}$. Once the **Unexpected Arrival's** validity is acknowledged, **TAV**$_{TM}$ changes the parcel's handling setting to the selection originally made by the receiving operator (e.g. "FORWARD INTERNALLY", "HOLD FOR PICKUP", etc.) thereby making it available for further internal processing. It is always hoped that the recipient of an **Unexpected Arrival** will authorize it before the parcel comes out of **Quarantine**.

In the event the **Unexpected Arrival** recipient forgets to authorize it, an e-mail is sent every day to remind them. After a week of email reminders, a telephone campaign is begun until the situation is rectified.

In the event an **Expected Arrival** becomes overdue, an email is sent every three days to the intended recipient and the shipper. It is up to the intended recipient to determine and post the **Expected Arrival's** disposition; i.e. update the expected arrival time or cancel it. After two weeks of email reminders, a telephone campaign is begun until the situation is rectified.

All material, mail or parcels, is tested for hazardous contamination, inside and out. Testing consists of sampling the exterior and interior of every mail piece and parcel, associating the parcel or tray with the uniquely identified sample, and testing the sample for contamination. Sample testing includes culturing which requires incubation time. All tested material is placed into a **Quarantine Chamber**, which is closed and locked until test results posting.

Once test operations are completed and the corresponding results have been determined, the results are posted in **TAV**™. If all test results are "GOOD", the **Quarantine Chamber** is opened and unloaded, with the unloaded material's placement directed by **TAV**™. If any test results are "BAD", the **Quarantine Chamber** may only be opened by a **Chamber Administrator**, and then only material with "GOOD" test results may be removed from the **Quarantine Chamber** for further internal processing. At this juncture the **Quarantine Chamber** is closed and locked until released from evidence by federal law enforcement. Only then is the **Quarantine Chamber** re-opened. Contaminated parcels or trays containing contaminated mail pieces are containerized and moved to the Disposal Area, thereby clearing the **Quarantine Chamber** and making it available for decontamination. After successful decontamination, the **Quarantine Chamber** is re-opened ready for use.

Moving the containers containing the contaminated parcels and/or mail pieces consists of shipping them to an incineration site. In this case, the consignment of the containers to the incineration group closes the disposal process.

At the receiving location, mail coming out of **Quarantine** is sorted and bundled by recipient, e.g. Mail Stop or Office, within courier/route and placed into the appropriate mail cart. The loaded mail cart is then forwarded to the building (as a shipment container) where its route begins.

Accountable material coming out of **Quarantine** initially destined for a given building is placed into a single container for transport. When one or more **Quarantine Chambers** are opened, a **Trans-Shipment Container** instance is created for every building to be serviced, and made available for loading. The **TAV**™ Trans-Shipment Container Load software application lists all material eligible for placement into a given container and enables the operator to only load the eligible material via bar code scanning. Once loaded, the **Trans-Shipment Container** is closed and "shipped" to its designated Building. Upon arrival, the **Trans-Shipment Container** is opened and unloaded, with each material removed and scanned, which routes it to its next/end destination.

Many buildings are quite large with many floors. As such, each building has a dozen or more courier routes by which mail and parcels are delivered. Each route consists of dozens of member offices, committee rooms and hearing rooms. Each route is executed twice a day by a courier equipped with a portable batch bar code scanner. Each time the courier starts the route at the first stop by picking up the parcels assigned to the route and placing them into the delivery cart assigned (which already contains the mail requiring delivery). Once loaded, the courier departs the first stop on the route for the next route stop. Once the courier arrives, mail and parcels are dropped off with electronic signature capture made for the consignment of accountable material, mail and parcels to go out are picked up, and the courier departs the stop. This is repeated at every stop until the route is completed. After arriving at the last stop, out-going parcels are scanned, which routes them to their end destination, the shipping room. Outgoing mail is left in the delivery cart and the cart is scanned, which routes it back to the mail room (where its route ends).

To abbreviate the identification of couriers in the **TAV**™ Data Base, we are using Bar Coding for each courier so that their identity can be quickly entered via a Bar Code scan. A pull down list of couriers is available in the event of forgotten IDs.

2.1.2. Typical TAV™ WMS™ with AMS™ Usage Scenario

The following is a narrative description of how the **TAV**™ Data Base with **WMS**™ and **AMS**™ Software can be applied to repair operations. The narrative is a single thread usage description of the following:

1. Bill of Material/Statement of Work (BOM/SOW) creation
2. Customer Order activation and work order emission
3. Work order assignment to repair technician
4. Tool acquisition by the repair technician
5. Material acquisition by the repair technician
6. Tool return by the repair technician
7. Material return by the repair technician
8. Organization Material Management (Forecast Orders by Organization)
9. Item Management (Purchase Requisitions by Material)
10. Purchase Order Approval (Purchase Orders by Vendor)
11. Expected Arrival Management (Receiving and Purchase Order Fulfillment)
12. Material Movement by Repair Parts Petty Officers (RPPOs)
13. Customer order creation and execution by Repair personnel on behalf of external customers
14. Internal customer order creation and execution by Repair personnel on behalf of internal customers; e.g. for inventory replenishment
15. Work order disposition posting by Repair personnel

A complete scenario could require a Repair Technician to report to more than one "Tool/Material Depot" in the execution of a repair (e.g. Electrical depot, Electronics depot, etc.). It makes for a longer day, but each depot stop will entail the same steps:

Prior to Repair Activities at each Tool/Material Depot

Tool and Material acquisition by the Repair Technician

After Repair Activities at each Tool/Material Depot

Tool and Material return by the Repair Technician

Repair **Packages** are created in the **TAV**™ Data Base as **Bills of Material/Statements of Work (BOM/SOW)** from data posted by "Work Planning" or by Item/Depot Managers.

Each of these repair **Packages** contain a list of all the **Material**, drawing references, and tools (**BOM**) required for the repair, as well as one or more **Tasks** (**Activities**) (**SOW**) to be performed at a given location (Vessel) to execute the repair order **Package**.

Projects (Jobs) are created in the **TAV**™ Data Base by "Work Planning" or by Item/Depot Managers. These specify the end customer (Vessel) and one or more **Packages (BOM/SOWs)** needed by that customer. When a **Project** (Job) is "Issued", the **TAV**™ Customer Order Entry application emits the work orders (in sequence) required to fulfill all of the work **Activities (Tasks)** specified by the repair **Packages (BOM/SOWs)** in that **Project** (Job), including the movement of required **Material**. The **TAV**™ Customer Order Entry user application also determines if sufficient quantities exist on hand to fulfill the **Project** (Order). For every **Material** with insufficient quantities on hand, the application user is presented with an option to either BUY that **Material** or (in the case where there is a **BOM/SOW** for the **Material** in question) BUILD it. Invocation of the BUY option results in the creation of a **Purchase Requisition** for that **Material** in the **TAV**™ Data Base.

In the case of Repair's modus operandi, **Material** is "picked up" by the person (Repair Technician) assigned to execute the repair at a tool/material depot counter.

A Repair Technician may be assigned to one or more **Tasks (Work Orders)** associated with one or more repair **Packages (BOM/SOWs)** in an issued **Project** (Job). A Repair Technician is assigned work by his or her association with one or more **Job (Project)**, **Task (Work Order)** combinations. Work assignments are made by "Work Planning" or by Item/Depot Managers posting Repair Technician data to **TAV**™ Work Orders by **Job (Project)** and **Task (Work Order)** in the **TAV**™ Data Base.

The Repair Technician next goes to a tool/material depot.

The depot counter operator will open the **TAV**™ Technician Material Counter Pick-Up application and perform a "Draw". The repair technician will be identified in the **TAV**™ Data Base via an ID Bar Code scan. The application will then require the selection of a **Job (Project)** assigned. Further granularity requires selection of one or more **Task (Work Order)** assigned.

This will generate a list of all the tools and material required by the Repair Technician for the **Job (Project)** and **Tasks (Work Orders)** selected.

At this juncture, the depot operator has the option to either down-load the list of all the required tools and material to a batch Bar Code scanner, or begin scanning at the counter using the attached USB/HID 2D Bar Code Scanner.

The depot operator goes to each bin containing a required tool or material and scans the Bar Code at that bin, identifying the tool or material and either entering the quantity or just scanning the Bar Code to indicate a quantity of one per scan. Tools or material not on the down-loaded list may be added at the discretion of the depot counter operator.

In the case of using a batch Bar Code scanner, once all tools and material have been collected, the hand held portable batch Bar Code scanner is up-loaded to the **TAV**™ Data Base.

At this point the tools and material scanned are consigned to the Repair Technician. It is at this juncture that all material "MOVE" **Work Orders** associated with this pick up are updated to reflect that the consigned material was "picked up" for delivery to the end destination; i.e. the Vessel. This consignment also closes the associated **Work Orders** in **TAV**™ designated to be performed on the Vessel. This excludes all other associated "down stream" **Work Orders** outstanding in **TAV**™ (e.g. MOVE, Refurbish, Calibrate, etc.).

At the end of the work day, the Repair Technician returns to the tool/material depot. The depot operator will open the **TAV**™ Technician Material Counter Drop-Off program and the repair technician will be identified in the **TAV**™ Data Base either via selection from a "Drop-Down List" of technicians or by an ID Bar Code scan. The application will then require the selection of a **Job (Project)** assigned (from Jobs already assigned and picked up). Further granularity requires selection of one or more **Tasks (Work Orders)** assigned.

This will generate a list of all the tools and material issued to the Repair Technician for the **Job (Project)** and **Tasks (Work Orders)** selected.

At this juncture, the depot operator has the option to either down-load the list of all the tools and material issued to a batch Bar Code scanner, or begin scanning at the counter using the attached USB/HID 2D Bar Code Scanner.

The depot operator goes to each "Bin" containing a returned tool and scans the Bar Code at that "Bin" thereby identifying the tool or material and entering the quantity (or just scanning the Bar Code to indicate a quantity of one per scan) as the tools and/or material are returned.

In the case of using a batch Bar Code scanner, once all tools have been placed, the hand held portable batch Bar Code scanner is up-loaded to the **TAV**™ Data Base.

At this time any damaged or missing tools or material are identified. Damaged tools or material require the application of an appropriate condition code, damage code, disposal code, and handling code (e.g. Forward for Disposal (disposal) or Forward for Outship (repair)). Tools or material so identified do not have their respective on-hand quantities adjusted, but do have an appropriate **Physical Inventory** entry made followed by the creation of a **Purchase Requisition** for replacement.

At this point the "Material/Tool Drop Off" is closed with the identification of the Repair Technician returning the tools achieved via an ID Bar Code scan. This step allows tools to be returned by another Repair Technician (proxy) on behalf of the Repair Technician originally consigned. If so configured, a "Tracer Action" can be scheduled for processing the next morning.

At this point the undamaged tools and material scanned are consigned to the depot and corresponding on hand quantities are updated. It is at this juncture all material "MOVE" **Work Orders** associated with this drop off are updated to reflect that the consigned material was "dropped of" at the end destination; i.e. the depot. This excludes all other associated "down stream" **Work Orders** outstanding in **TAV**™ (e.g. MOVE, Refurbish, Calibrate, etc.).

Tool/Material depot managers need to be able to account for spent, lost and damaged tools or material as well as replenish stocks, either from **Vendor** orders or kit construction or both.

In the **TAV**™ Data Base, depot managers are designated as "Organization Material Managers", each with their own collection of tools and/or material to divide up the management work. **Organization Material Managers** regularly create an inventory replenishment forecast (suggested order). Once created to satisfaction, the **Organization Material Manager** "dispatches" it for approval.

If the **Organization Material Manager** is within a chain of command, the dispatched inventory replenishment **Forecast Order** is forwarded up that chain for further approval and consolidation. The next person up the chain is notified by email whenever a subordinate inventory replenishment **Forecast Order** is dispatched.

If the **Organization Material Manager** is at the top of a chain of command, the dispatched inventory replenishment **Forecast Order** is converted into **Purchase Requisitions** by material and forwarded to the designated **Item Managers**. All affected **Item Managers** are notified by email whenever a command inventory replenishment **Forecast Order** is dispatched.

All inventory replenishment **Forecast Order** dispatches require the entry of an electronic signature by the dispatcher.

Item Managers are responsible for the replenishment of specific **Material** assigned. This activity is performed by consolidating material **Purchase Requisitions** and approving their procurement. The approval of a **Purchase Requisition** causes **TAV**™ to issue corresponding vendor **Purchase Orders**. **Purchase Requisition** approval also results in the email notification of all **Purchase Order** approvers and requires the entry of an electronic signature by the **Purchase Requisition** approver.

Purchase Order approvers are designated in the **TAV**™ Data Base. The approval of a **Purchase Order** requires the entry of an electronic signature by the approver and causes **TAV**™ to post a corresponding **Expected Arrival** for the ordered material.

As purchased **Material** is received, its' arrival is recorded in the **TAV**™ Data Base and incoming inspection is performed. If the **Material** is accepted, its' quantity is reconciled against the associated **Purchase Order** and is scheduled for pick up and delivery to it's' inventory location.

Fully received **Purchase Orders** are closed and made eligible for payment.

RPPOs perform **Material** MOVEs by doing the pick-ups and drop-offs using **TAV**™ Pick-Up and Drop-Off applications.

Depot operators use the **TAV**™ Customer Order Entry application to create and execute **Projects** (Jobs) on behalf of Customers (external and internal). This application is used when a Customer brings in **Material** for work or when a kit build for inventory replenishment is required.

Once a **Project** (Order) is constructed in **TAV**™, the **TAV**™ Customer Order Entry application determines if sufficient quantities exist on hand to fulfill that **Project** (Order). For every **Material** with insufficient quantities on hand, the application user is presented with an option to either BUY that **Material** or (in the case where there is a **BOM/SOW** for the **Material** in question) BUILD it. The lack of any elemental component in the **Inventory** will result in a BUY option. Invocation of the BUY option results in the creation of a **Purchase Requisition** in the **TAV**™ Data Base.

In the case where a Customer brings in **Material** for work, the depot operator creates a **Project** (Order) using the **TAV**™ Customer Order Entry application. In this application the depot operator identifies the customer, identifies the **Material**, captures or creates the serial number (if appropriate), and then specifies the charge activities to be performed upon on it. Once the **Project** (Order) is "Issued", the software emits the **Work Orders** (in sequence) required to fulfill all of the work activities specified in that **Customer Order**, including the movement of required material. Repair Parts Petty Officers (RPPOs) perform the Pick-Ups and Drop-Offs required to get **Material** to and from Work Areas (Activity Locations). Technicians use the **TAV**™ Process Work Orders to post the execution of work, which triggers subsequent Pick-Ups and Drop-Offs upon activity completion.

In the case of kit build for inventory replenishment, the depot operator creates a **Project** (Order) using the **TAV**$_{TM}$ Customer Order Entry application identifying the internal customer and the inventory location to be replenished. In this application the depot operator also identifies the **Material (BOM/SOW)** as an Order line item. Once the **Project** (Order) is "Issued", the software emits the **Work Orders** (in sequence) required to fulfill all of the work activities specified in that **Customer Order**, including the movement of required **Material**. Repair Parts Petty Officers (RPPOs) perform the Pick-Ups and Drop-Offs required to get **Material** to and from Work Areas (Activity Locations). Repair personnel also use the **TAV**$_{TM}$ Process Work Orders to post the execution of work, which triggers subsequent Pick-Ups and Drop-Offs upon activity completion.

Activity accounting (**Work Order** selection and execution) is be accounted for in **TAV**$_{TM}$ via the Process Work Orders application by Repair personnel.

To abbreviate the identification of Repair Technicians in the **TAV**$_{TM}$ Data Base, we are using Bar Coding for each Repair Technician so that their identity can be quickly entered via a Bar Code scan. This necessitates the use of an HID/USB Wired Bar Code scanner at the depot's PC. A pull down list of Repair Technicians is available in the event of proxy returns or forgotten IDs.

2.1.3. A TAV™ CDS™ with DCS™ Usage Scenario

The following is a narrative description of how the **TAV**™ Data Base with **CDS**™ and **DCS**™ Software has been applied to dissemination fulfillment operations. The narrative is a single thread usage description of the following:

1. Multiple Carriers
2. Accreditation Based
3. Location Based
4. Multiple Shipping Accounts
5. Multiple Shipping Locations (Origins)
6. Address Security
7. Address Multiplicity
8. Single Piece Wrap, Label, and Ship
9. Batch Dissemination Processing
10. Single or Double Wrapping of Parcels
11. Accreditation Based Entity Relationship Modeling
12. Centralized Rate Management
13. Automated Advanced Shipment Notification
14. Automated Receipt Tracer Actions
15. Batch Document Image Processing
16. Batch Document OCR Processing
17. Updates Data Base from Scanned Forms
18. Disposal Management

The deployment provides material dissemination services for one of the largest printing plants in the world. Dissemination is performed using a multitude of carriers and couriers, commercial and governmental, each with their own unique methods of marking, labeling and recording.

All material, every carrier service, all workstations, and all locations have an assigned accreditation. **TAV**™ ensures that material is only handled by authorized services and/or personnel and only goes where and how it is allowed (everything must be equally accredited). **TAV**™ selects the carrier/service to be used based on the material accreditation and recipient address availability.

Various organizations utilize the printing facilities and so want the dissemination of their material to reflect who they are and where they are from. **TAV**™ allows dissemination fulfillment to be performed on behalf of an organization, regardless of who or where they are, while maintaining full accountability. A dissemination request differentiates between, and accounts for, who is paying versus what appears in the return address.

TAV™ supports two types of material disseminations, single piece and batch.

In single piece dissemination, the operator creates a **Distribution Job** for the requesting account, identifies the return-to account, and then identifies a recipient. With a recipient identified, the operator next specifies the material(s) to be sent. The operator wraps the material and applies the appropriate labels and then weighs it. If the accreditation/carrier/service combination requires, the material may be wrapped again (double-wrapped), also with the application of appropriate labels and weighing.

In batch dissemination, the customer specifies the material, each recipient, and the quantity of the material to be shipped to that recipient. The dissemination manager then creates a **Distribution List** of recipients (with individual quantities) for each material. The dissemination manager next creates a **Distribution Job** specifying the return-to, requestor, the material(s), and the distribution list. If too large, **Distribution Jobs** can be divided into smaller jobs, but most often multiple **Distribution Jobs** are combined to achieve an optimum economy of scale. When a **Distribution Job** is "dispatched", **TAV**™ determines how each shipping parcel is to be constructed based on weight and volume. Once all job parcel constructions have been computed, packaging and shipping is performed.

Shipping operators use the **TAV**™ Process CDS Distribution Jobs software application to document, receipt, wrap, label, weigh, and ship the correct number of each material to each recipient using the correct method for that accreditation. The software application directs the shipping operator's activities to ensure correct execution for each parcel.

Some recipients do not always have the necessary security infrastructure to receive and hold some material (e.g., military intelligence unit deployed in a combat zone). In that event, the recipient will have a guardian appointed to receive that material and hold it until the recipient can handle it. The relationship is **Protecting Account** and **Protected Account** for a given accreditation. When **TAV**™ is used to ship to a recipient, it checks to see if the recipient is protected. If so, the material is wrapped and labeled for that recipient and then wrapped and labeled again for shipment to the protecting account. If the protecting account is also having material shipped in this dissemination job, the protected account's parcel is put aside until the protecting account is processed. Then the protected account's parcel will be scanned (Bar Coded Control ID) and included as a line item in the protecting account's parcel. A protecting account may have an indefinite number of protected accounts and a protected account may also be a protecting account.

Given the "origin" account, which specifies from where the shipment is to be made, and the parcel's weight, dimensions, and destination; **TAV**™ correctly calculates the shipping fees. Depending on the carrier/courier used, **TAV**™ also communicates with the appropriate Automated Information System (AIS) to post shipment and customs information; e.g. Federal Express Shipping Servers, etc.

Regardless of dissemination method, when a parcel is "shipped", attachments are issued, if so configured. A shipping attachment may include an email notification to the recipient, ergo an Advanced Shipping Notice (ASN).

If the parcel is receipted, **TAV**™ begins a preconfigured wait for the return of that receipt for that material. If the signed receipt is not returned in time, **TAV**™ issues a **Tracer Action** (warning letter and receipted transmittal) to the recipient. If the next wait period is exceeded, **TAV**™ issues another **Tracer Action** (urgent warning letter and receipted transmittal) to the recipient. This cycle continues until a signed receipt is received or the exhaustion of the preconfigured maximum number of **Tracer Actions** allowed. Once all **Tracer Action** attempts are exhausted, the issue is escalated to the **Office of Particular Interest (OPI)** responsible for the security of the material in question. The **OPI** is informed through an **OPI Notice Action** (documents sent to both **OPI** and errant recipient) and **TAV**™ resumes another wait period. If the executed **OPI Notice** is not received within the given period, another **OPI Notice Action** is issued, but this time with the inclusion of a Security Officer.

Documents resulting from daily operations like material receipt or parcel consignment to couriers and/or carrier representatives, are scanned, OCRed and stored in the **TAV**$_{TM}$ Data Base for quick and easy retrieval. Signed receipts and executed **OPI** documents are also scanned, OCRed and stored in the **TAV**$_{TM}$ Data Base, but the resulting information is also used to close the associated open shipment.

In all cases, the shipping operator retrieves the document configuration for the document at hand, places the paper documents into the sheet feeder of the document scanner, and commences operation from the workstation. Once this hands off operation completes (all paper documents have been scanned), the shipping operator closes the **TAV**$_{TM}$ software application and resumes other duties. In all cases, the DoD directive to reduce paper work is achieved.

Upon completion of a material's dissemination, excess material may remain. If the originator of the material does not want the excess shipped to them, then **TAV**$_{TM}$ is used to record the disposal. A **Disposal Job** is created in **TAV**$_{TM}$, identifying the excess material to be disposed, the method, the disposal personnel, and any witnesses, if required. The excess material is placed into the incinerator and a time stamp is posted in **TAV**$_{TM}$. Upon disposal completion, if required, disposal personnel and witness signatures are electronically captured and stored in the **TAV**$_{TM}$ Data Base, and the **Disposal Job** is closed.

3. SCOPE

Total Asset Visibility (TAV$_{TM}$**)** is a turnkey system composed of integrated and configured products drawn from commercially available, off-the-shelf (COTS) components.

TAV$_{TM}$ is comprised of hardware and software. Typically a Server computer, Client workstations, scanners, printers, network interface adapter cards, cables, and connectors constitute the hardware component with the software component represented by the **TAV**$_{TM}$ Software and Data Base (Oracle RDBMS based), and optionally the Oracle Application Server software.

1. A computer with Oracle Relational Data Base Management System and the **TAV**$_{TM}$ software acts as the Data Base Server and Command and Control Point for distribution operations; i.e. **TAV**$_{TM}$ Server.

2. One or more Client work stations (**TAV**$_{TM}$ Workstations), each optionally equipped with a Scale, Bar Code Reader, Image Scanner, Laser Printer, Label Printer(s), Postage Meter, Shipping Register, Conveyor Interface, Digital Camera, Badge Printer, Badge Reader(s), Electric Lock(s), and Egress Turnstiles support receiving, access control, order entry, distribution, fulfillment, transportation, warehousing, production control, manufacturing, shipping, and receipt processing operations.

3. Workstation/Server Interaction occurs over an IP connection (typically via the TCP/IP (Transport Control Protocol/ Internet Protocol) protocol suite).

4. TAV™ COMPONENTS

TAV™ Base License

All **msi**™ products share a data base and a set of common software applications; e.g., Accounts and Addresses, Vendor Maintenance, Manufacturer Maintenance, Customer Maintenance, Carrier Maintenance, Country Province Maintenance, Province Postal Code Maintenance, etc.

As such, each **msi**™ product is provided in two parts, a Base License (for the data base and those software applications consistent across **msi**™ system products) and a Product Specific License (for those software applications specific to a given **msi**™ product).

By separating the licensing of the data base and software applications consistent across **msi**™ products, customers can acquire multiple **msi**™ products for a server without paying for the common software applications more than once.

There are no per user fees associated with the Base License, so it is never sold without the accompaniment of at least one Product Specific Module License.

When procuring multiple **msi**™ products for co-installation on a single server, a customer would order one Base License and one each of the Product Specific Module Licenses required.

End user licenses are only required for additional users beyond the number provided in each of the Product Specific Module Licenses.

TAV™ Configurability

All **msi**™ products behave according to the configuration data stored in the **TAV**™ Data Base. This information includes locations (e.g., work, inventory, office, etc.), carriers, couriers, personnel, equipment (e.g., vehicles, processing machines, rate servers, etc.), classifications, chambers, and activities (e.g., painting, assembly, collation, printing, etc.). Each of these information items in turn may be associated with specific accreditation, activities, charge units, rates, locations, etc.

Comprehensive configuration information makes each installation applicable to the specific operations of that enterprise. **TAV**™ implementations can be configured so that the same software can be applicable to any operation expressed in the data base.

TAV™ enables its users to define their operations using terms meaningful to their business. A marina would have “haulage”, “storage”, and “launch” activities where a manufacturer would have “assemble”, “paint”, and “fabricate” activities. Each “activity” in turn would have attributes specific to that deployment; e.g., charge units, unit rates, location, equipment, times of operation, etc.

Initial installation usually includes the importation of “account” and “material” information from legacy data sources. Oracle tools make this job straight-forward and often reduces, if not eliminates, the need for special importation software to be written. Oracle inter-connectivity makes the exchange of operations data with other systems less of a concern, particularly when communicating with networked RDBMS’s.

TAV’s customer order processing is a good representation of how configuration data drives the software’s operation. Utilizing customer data, material product data, bill of material and operations data, inventory data, transportation data, and vendor data; the movement of material and the work activities required to fulfill a customer order are defined, sequenced and scheduled. In the event of an inventory shortage, the operator is presented with “buy” and/or “build” options which precipitates the emission of either vendor requisition(s) or the material movement and work orders necessary for sub-assembly

production. The time requirements derived from either option's data are included in the compilation of Time to Fulfillment.

Applying accreditation to material, products, locations, and transportation services guarantees the proper handling and processing of material and product. Accreditations have three categories, User defined, Department of Transportation (DoT) defined (i.e. Export Classifications), and Department of Commerce (DoC) defined (i.e. Harmony Codes). User defined accreditation assignment enables an enterprise to accommodate a broad diversity of material handling and associated work activities. The use of Export Classifications facilitates U.S. Customs compliance in international operations. The use of Harmony Codes also facilitates U.S. Customs compliance as well as hazardous material handling.

4.1. Receiving & Internal Distribution

Any material inbound into the enterprise must be received and (most times) forwarded to an end recipient (person, organization or location). This generalization reflects the breadth of applicability encompassed by this **TAV**™ product component.

The scope of receiving activities include everything from a spouse dropping off lunch for an employee, to courier delivery of business data, to the arrival of vehicle loads of goods (truck, aircraft, vessel, etc.) hazardous or otherwise.

Enforcing the correct handling of the material within each arrival context requires a sophisticated level of configurability.

"Internal Distribution" is a bit of a misnomer in that it invokes the quaint image of a clerk distributing office mail from a metal pushcart.

All aspects of contemporary transportation as they pertain to material movement are thoroughly addressed. This includes everything from a clerk distributing office mail out of a metal push cart, to campus couriers moving material among buildings, to piece/bulk material movements to regional/national/international destinations, to operating any type of consignment carrier operation, commercial or otherwise.

"Internal Distribution" also represents all activities and information associated with shipment movement and accounting for delivery receipt. This spans the times from courier consignment, to courier route execution, to recipient receipt, to return receipt acquisition, and from expected arrival to actual arrival. The resulting time/information matrix yields the "In Transit Visibility" customers expect and accountability finance demands.

"Package Routing" is performed by the system every time a parcel is handled by "Internal Distribution" personnel. In this manner, material handlers and couriers move parcels according to system direction, thereby ensuring accuracy and consistency. Without the system, parcel handlers and couriers would have to determine material placement based on a personal knowledge of distribution routes, their stops, and the services available. Automation of package routing relieves distribution services personnel from determining the "next stop" for a given material in transit.

Automated tracer processing resulting from outstanding consignment and/or arrival aging minimizes the cost of full accountability. Full accountability satisfies customer, financial, regulatory and legal interests. Automated aging and tracer processing are available for expected arrivals, distributed parcels and return receipts.

4.2. Inventory & Order Fulfillment

Any material inbound to or outbound from the enterprise that must be temporarily stored, staged, manufactured, and/or repaired and whose movement must be documented represents the breadth of applicability encompassed by this **TAV**$_{TM}$ product component.

The scope of inventory and order disbursement activities includes everything from simple order fulfillment, build to order fulfillment, to product inventory manufacturing runs. This encompasses everything from product construction definitions, manufacturing requirements planning, suggested inventory ordering, historical demand analysis, to automatic work order emission and execution tracking.

Enforcing the correct handling of the material within each fulfillment context requires a sophisticated level of configurability.

"Inventory" represents the collective reporting of all accountable assets with regard to quantity, packaging, location, condition, and disposition. This spans the times from inbound asset placement, staging, consolidation, repackaging, to outbound asset placement.

"Order Disbursement" represents all activities and information associated with accounting for order fulfillment. This spans the times from customer inquiry, customer quotation, customer order entry, customer order dispatch (which automatically yields material movement and material value added work order generation and scheduling), work order execution, to goods and/or services delivery. The resulting time/information matrix yields the "In Process Visibility" customers expect and accountability finance demands.

When used in conjunction with **AMS**$_{TM}$, inbound material movement to inventory is seamless with order reconciliation implicitly performed as a result of **TAV**$_{TM}$ component integration.

When used in conjunction with **MDS**$_{TM}$ or **CDS**$_{TM}$, outbound material movement to fulfill customer orders is seamless with end delivery packing and shipping implicitly performed as a result of **TAV**$_{TM}$ component integration.

4.3. Document Processing & Control

Hard or soft documents requiring digitization, content recognition, automated reference generation, content searching, accreditation and caveat control, material association, rule based ID generation, as well as reproduction identification and control, represent the breadth of applicability encompassed by this **TAV**$_{TM}$ product component.

The scope of document processing and control includes everything from digitization and/or image importation, optical character recognition, automated content based indexing, image presentation, batch exception handling, and full text searching.

Interfaces and controls virtually all industry standard image capture devices (e.g., Document Scanners, Cameras, etc.) and provides multiple symbol recognition engines. Recognition engines include One Dimensional Bar Code, Two Dimensional Bar Code, Three Omni-font Engine Voting, Two Omni-font Engine Voting, Hand Print, OMR, and Braille.

When used in conjunction with **WMS**$_{TM}$, document movement to and within inventory is seamless and implicitly performed as a result of **TAV**$_{TM}$ component integration.

4.4. Shipping & External Distribution

Any material outbound from the enterprise that must be shipped via an accountable carrier/courier or whose movement must be documented represents the breadth of applicability encompassed by this **TAV**™ product component.

The scope of shipping activities includes everything from a customer pick-up, to business mailings, parcel packing and labeling for commercial carrier/courier consignment, container loading, truck loading, postage calculation, carrier/courier shipment rating, LTL shipping, and bulk freight contract shipping.

Enforcing the correct handling of the material within each shipping context requires a sophisticated level of configurability.

"External Distribution" represents all activities and information associated with accounting for delivery receipt. This spans the times from carrier/courier consignment to recipient receipt to return receipt acquisition. The resulting time/information matrix yields the "In Transit Visibility" customers expect and accountability finance demands.

Automated tracer processing resulting from outstanding consignment aging minimizes the cost of full accountability. Full accountability satisfies customer, financial, regulatory and legal interests. Automated aging and tracer processing are available for both parcels and/or return receipts.

TAV™ **Shipping & External Distribution Software** is available in two models, nearly identical to each other with the only difference being in how they handle addressing and carrier/service selection.

4.2.1. Material Distribution System (MDS™)

MDS™ lets the owner make up his or her own address types, e.g. HOME, OFFICE, PLANT, SHIP, MAIL, etc. Each address type may in turn be associated with one or more carriers. This means that every account in the system may have multiple addresses, and that each address is appropriate to the type applied to a given carrier. The most common use of this civilian feature is the creation of two address types, SHIP and MAIL. The MAIL address type indicates that an address of this type may contain PO Boxes (mail-able address), and is assigned to those carriers that deliver to those addresses, e.g., USPS. The SHIP address type indicates that an address of this type must reference a street address and may NOT contain PO Boxes (ship-able address), and is assigned to those carriers that deliver to those addresses, e.g., UPS, FedEx, etc.

4.2.2. Controlled Distribution System (CDS™)

CDS™ has an address type for every carrier/courier configured in the system. Again, an account in the system may have multiple addresses, but each address is appropriate to a specific carrier/courier. This means that an account could have a USPS address, a DCS address, a UPS Address and/or a FedEx address to name a few. This is a Department of Defense feature specific to the handling of non-collateral material.

4.5. Activity & Access Control

Any location within the enterprise and/or any individual inbound to, within, or outbound from the enterprise that requires access control and/or presence accountability and/or activity accountability represent the breadth of applicability encompassed by this **TAV**$_{TM}$ product component.

The scope of activity and access control includes everything from simple employee project task time accounting, ID Card activated premises control, fingerprint and/or retina scan access control, to real time personnel location tracking and reporting. Interfaces include surveillance imaging control and storage integration as well as interfaces/controls for egress detection equipment both passive; e.g. RF-ID with motion detection, periphery seals, or thermal detection, etc and active e.g., Card Readers, Bio-Metric Readers, etc.

Enforcing the correct access of individuals across facilities and accounting for personnel activities within multiple work and security contexts requires a sophisticated level of configurability.

"Activity" represents the collection and reporting of all accountable personnel time with regard to project, task, time quantity, location, and disposition. This spans the time from task initiation, suspension, resumption, to completion.

"Access Control" represents all activities and information associated with accounting for all locations requiring restricted egress, permitting personnel egress, providing personnel identification, accounting for personnel egress, accounting for and enforcing personnel escorts, to securing legal agreement from personnel prior to permitting egress. The resulting time/information matrix yields the "In Transit Visibility" customers expect and accountability security demands.

4.6. Activity Archive

All pertinent information produced by any or all of the **TAV**$_{TM}$ software products is automatically acquired, stored, and made available via inquiry and reporting.

All data acquisition takes place on the **TAV**$_{TM}$ Data Base Server via background processes. The data acquired succinctly represents all activity posted to the system.

History data produced by **TAV**$_{TM}$ software products is detailed and may (via Administrator configuration) have a limited system retention life. Data produced by **TAV**$_{TM}$ Distribution Archive is compact, has an indefinite shelf life, and can only be removed by the **TAV**$_{TM}$ Data Base Owner.

Long term historical detail information about: any material and/or person that came into the enterprise, and/or was forwarded, all end recipients, all recipient quantities, all address changes, all classification changes, all distribution lists, all list changes, or any material and/or person whose departure from the enterprise was recorded is what this **TAV**$_{TM}$ product component accommodates.

5. TAV™ FEATURES

5.1. Arrival Management System (AMS™) Features

Automated Expected Arrival Creation
Ad-Hoc Expected Arrival Creation
Ad-Hoc Unexpected Arrival Creation
Arrival Processing
Automated Arrival Recipient Notification
Accreditation Based
Integrated Material Imaging
Address Multiplicity
Unexpected Arrival Authentication
Location Based
Quarantine Chamber Administration & Management
Digitized Mail
Test Chamber Administration & Management
Hazard Test Management & Execution
Hazard Test Results Management
Disposal Management
Trans-Shipment Container Consolidation
Courier Route Administration
Courier Route Assignment & Load Management
Courier Route Execution Management
Automated Advanced Shipment Notification
Automatic Routing
Automated Material Tracer Actions
Adaptive Routing
Automated Receipt Tracer Actions
Address Security
Accreditation Based Entity Relationship Modeling

Automated Expected Arrival Creation – Accountable Material

Data sources outside of **TAV**™ can be used to create Expected Arrival entries in the **TAV**™ Data Base. The most common are interfaces with customers' Purchase Order systems, whereby Purchase Order information is read and used to create and/or update Expected Arrival entries, against which the ordered material will be received and appropriately handled. Material inspection and line item Purchase Order reconciliation are available in **AMS**™. Non-acceptable material may be seamlessly "Returned To Sender" via **TAV**™ External Shipping operations available in **MDS**™ or **CDS**™.

Ad-Hoc Expected Arrival Creation – Accountable Material

Authorized individuals with access to **TAV**™ may post Expected Arrival entries via user applications available in both "Fat" and "Thin" client configurations. Posting an Expected Arrival entry BEFORE the arrival of the material indicates that the incoming material truly was expected and should be handled as a matter of course.

Ad-Hoc Unexpected Arrival Creation – Accountable Material

Receiving operators may post Unexpected Arrival entries whenever an incoming material CAN NOT BE FOUND among the Expected Arrival entries in **TAV**™. Posting an Expected Arrival entry AFTER the arrival of the material indicates that the incoming material truly was unexpected and should be handled differently. Unexpected inbound material may not be made available for pickup or delivery until the recipient authenticates its arrival.

Ad-Hoc Arrival Processing – Non-Accountable Material

Inbound processing of non-accountable material such as mail can be accomplished in a variety of ways. Mail trays (tote, container, etc.) can be identified as they are received, with those tray identifications used to track the migration of the contained material. Migration can include placement in a Test Chamber, the application of contamination tests, and the removal from a Test Chamber upon "GOOD" test results postings. These tray identifications would also be used to enforce quarantine handling upon "BAD" test results postings.

Arrival Processing – Accountable Material

Inbound processing of accountable material consists of using **TAV**™ to find the Expected Arrival entry applicable to that material. Selection can be made against recipient information (name, organization, address, etc.) or parcel information (carrier, control number, P.O. Number, RMA number, etc.), or any combination thereof. Once a match is found and so indicated to the system, **TAV**™ will apply the handling selected and process the material accordingly.

Integrated Material Imaging

If so configured, **TAV**™ can collect pictures of a material as it is received to be kept as part of an evidentiary trail and optionally used in Recipient notification.

Automated Arrival Recipient Notification

If so configured, **TAV**™ can notify the recipient of the material's arrival and disposition via mail, e-mail, or fax.

Accreditation Based

All user defined material/parcel handling, routing and processing events are applied according to classification assignment.

Unexpected Arrival Authentication – Accountable Material

If **TAV**™ Unexpected Arrival handling is in force, unexpected material will have its handling set to "HOLD FOR FORWARD", and will be temporarily stored at the receiving location. This handling setting will not be changed until the identified recipient acknowledges the arrival's validity to **TAV**™. Once the Unexpected arrival's validity has been acknowledged, **TAV**™ will change its handling setting to the selection originally made by the receiving operator (e.g. "FORWARD INTERNALLY", "HOLD FOR PICKUP", etc.) thereby making it available for further internal processing.

Quarantine Chamber Administration & Management

TAV™ enables it users to create and administer Quarantine Areas/Chambers. Once created these chamber instances may be opened, loaded, unloaded, closed, manifested, and locked. Material may not be removed from Quarantine until all test results have been posted and that all results where hazard negative.

Test Chamber Administration & Management

TAV™ enables it users to create and administer Test Chambers. Once created these chamber instances may be opened, loaded, unloaded, closed, manifested, and locked. Once inside a Test Chamber, material is tested for hazard exposure and the potential for contamination. Material may not be removed from Test Chambers until all test results have been posted and that all results where hazard negative.

Hazard Test Management and Execution

Testing inbound material for hazard exposure and contamination potential is customer configurable so that any variety of tests may be applied in any order required. **TAV**™ will acquire data about the test process and test objects.

Hazard Test Results Management

Once test operations are completed and the corresponding results have been determined, the results must be posted in **TAV**™. If all test results are "GOOD" then the Quarantine Area or Test Chamber may be opened and unloaded, with the unloaded material's placement directed by **TAV**™. If any test results are "BAD", the Quarantine Area or Test Chamber may only be opened by a Chamber Administrator, and then only material with "GOOD" test results may be removed from the Quarantine Area or Test Chamber.

Disposal Management

Inbound material with any "BAD" test results may be removed from a Quarantine Area or Test Chamber for appropriate disposal. **TAV**™ supports any type of disposal method from incineration to biocide emulsification. Whatever the method(s) employed, **TAV**™ will acquire data about the disposal process and disposal objects.

Location Based

TAV™ supports the definition of an indefinite number of activity locations.

Trans-Shipment Container Consolidation - Non-Accountable Inbound Material

Inbound non-accountable material such as mail, is typically broken down and sorted according to the methods best suited to a given customer's operations. Some deployments perform multi-phase sortation; at the receiving location the mail is sorted by its "next destination" such as a building, where upon its arrival at the building, the mail is sorted by its "next destination" such as a floor, where upon its arrival at the floor, the mail is sorted by recipient, e.g. Mail Stop or Office, after which it is delivered. Other deployments perform single phase sortation; at the receiving location the mail is sorted by recipient within courier/route and loaded onto the appropriate mail cart. The loaded mail cart is then forwarded to its first route stop. Deployments utilizing **TAV**™ Inbound Imaging perform single phase sortation; at the receiving location the mail is sorted by recipient with each recipient "batch" forwarded to a Scanning Station. In all scenarios, **TAV**™ enables its users to create and load "non-accountable" content containers (trays, totes, bags, etc.) and forward them to their next destination.

Digitized Mail

Deployments utilizing **TAV**™ Inbound Imaging are equipped with Scanning Workstations. Each of these **TAV**™ workstations are connected to a Document Image Scanner by which inbound mail is digitized, placed into the **TAV**™ Data Base, and made available for electronic viewing. As each tote containing the mail for a given recipient is received at a **TAV**™ Scanning Workstation, its bar code is scanned and the contents are placed in the hopper of the Document Image Scanner. From the workstation screen the operator initiates the digitization process where all documents in the hopper are scanned with their images placed into the **TAV**™ Data Base. Once all material from a given container is digitized, the operator indicates batch completion on the screen, which causes **TAV**™ to dispatch an email to the recipient informing them of mail image availability for viewing. Upon digitization completion, the corresponding container may be forwarded to a holding area, and staged for eventual disposal.

Trans-Shipment Container Consolidation - Accountable Inbound Material

Inbound accountable material is typically forwarded to its end recipient via internal distribution services managed by **TAV**™. To expedite truck loading and unloading, it is sometimes desirable to consolidate all material destined for a given location into a single container for transport. **TAV**™ enables its users to "create" a Trans-Shipment container instance, identify that container's "next destination" and then make the container available for loading. The Trans-Shipment container load software lists all material eligible for placement into that container and enables the operator to only load the eligible material via bar code scanning. Once loaded, the Trans-Shipment container is "shipped" to its designated destination via internal distribution services. Upon arrival, the Trans-Shipment container is opened and unloaded, with each material removed and scanned so that **TAV**™ may route it to its end destination. Once empty, the Trans-Shipment container may be re-destined to another location, with the process repeating itself until done.

Courier Route Administration

TAV™ enables its users to create and maintain a variety of distribution routes, any of which may intersect as often as necessary. A given route may be applied to multiple courier/services just as a given courier/service may utilize multiple routes. A route is given a user definable designation and is comprised of two or more stop locations. A route may be defined to be available for service by pick up and/or drop off within any given day of the week. Any time two or more routes share a stop location, an intersection occurs, thereby allowing an infinite number of interconnects. Once a given route is activated, **TAV**™ will use that route information in its material routing operations.

Courier Route Assignment and Load Management

As material is shipped, **TAV**™ will determine the quickest means by which to effect end delivery. As material is routed, appropriate pick-ups and drop-offs are posted to applicable route stops. At any time, authorized personnel may view all route stop material assignments. Before a given route may be started by a courier, it must first be dispatched, which gives the operator the opportunity to assign the entire route to a given courier, or split the route among more than one courier. Once the route stop allocations for a given route are selected, that route instance is then dispatched, thereby making it eligible for delivery.

Courier Route Execution Management

Once a route is dispatched, it becomes eligible for execution, which is initiated by the designated courier's "starting" the route. Once started, the courier proceeds to the first route stop location, arrives, drops off any indicated material by scanning it (and acquiring signatures as required), picks up any indicated material by scanning it, and then departs that location. For each subsequent route stop location, the courier will arrive, drop off material, pick up material, and depart. Upon completion of the above steps at the last route stop location, the courier will indicate route completion to **TAV**™.

Automatic Routing

All material/parcels shipped using a **TAV**™ Routed carrier/service are automatically assigned to the pick-ups and drop-offs required to achieve end destination delivery.

Adaptive Routing

As material/parcels are handled, the end destination route is re-evaluated to accommodate location changes and/or route outages.

Automated Advanced Shipment Notification

If so configured, **TAV**™ can notify the recipient of a parcel's shipment via mail, e-mail, or fax.

Automated Material Tracer Actions

If so configured, **TAV**™ can notify the requestor, originator, carrier and/or recipient of a parcel's overdue delivery via mail, e-mail, or fax.

Automated Receipt Tracer Actions

If so configured, **TAV**™ can notify the requestor, originator, carrier and/or recipient of a parcel's overdue return receipt via mail, e-mail, or fax.

Accreditation Based Entity Relationship Modeling

TAV™ provides for the establishment and maintenance of Accreditation Entity Relationships and does NOT permit incestuous relationships. No Entity may be related to itself, regardless of the applied classification. A single class entity relationship "family" is well represented by an organizational chart. When used in material dissemination, material destined for subordinates are packaged first; i.e. hierarchically from the bottom up. Material for a given subordinate is collected, wrapped and labeled for that subordinate. All subordinates in the hierarchy (same tier) are so processed. The superior of this tier gets a package containing his material and all of his subordinates' packages, all wrapped and labeled for that superior. Dissemination processing continues in this manner until the over all superior is reached and processed.

Address Security

The least amount of address validation available consists of matching country/province/postal code combinations. Address hygiene can be extended to include validation and verification using the National Address Data Base maintained by the U.S. Postal Service, or some other source of data. Every address in turn may be individually accredited.

Address Multiplicity

TAV™ supports unlimited address types thereby allowing a given account to have as many addresses as there are "types". A typical application of address typing is that of carrier/courier association in support of shipping. A more comprehensive application of address typing is that of address consolidation from multiple sources.

5.2. Warehouse Management System (WMS™) Features

Fulfillment Scheduling	**Production Scheduling**
Tool/Material Counter Pick-Up & Drop-Off	**Work Execution Management**
Organization Material Management	**Material Item Management**
Bills of Material/Statements of Work	**Automated Suggested Order Generation**
Automated Customer Order Purchase Requisitioning	**Pick/Put Route Administration**
Pick/Put Route Assignment and Load Management	**Automatic Routing**
Pick/Put Route Execution Management	**Adaptive Routing**
Accreditation Based Entity Relationship Modeling	**Disposal Management**
Accreditation Based	**Location Based**

Fulfillment Scheduling

The **TAV**™ Customer Order Entry process sequences and schedules all activities associated with a given order thereby deriving an accurate completion time. An Order "Trial" sequences and schedules all activities associated with a given order but does not dispatch those activities for execution thereby giving an "if you ordered now it would be ready by" time estimation. An Order "Issue" sequences and schedules all activities associated with a given order and dispatches all initial activities for execution with the resulting time reflecting the current work load and material availability. All subsequent activity scheduling (actual or estimated) will be based upon all issued order work activities.

Production Scheduling

The **TAV**™ Customer Order Entry process sequences and schedules all activities associated with a given order thereby deriving an accurate completion time. An Order "Issue" sequences and schedules all activities associated with a given order and dispatches all initial activities for execution with the resulting time reflecting the current work load and material availability.

Work Execution Management

As Customer Orders are issued, work orders are created and scheduled. Personnel responsible for work order fulfillment use **TAV**™ to direct their activities. Personnel start, suspend, restart, and complete work orders which posts their activities to the **TAV**™ Data Base accordingly.

Tool/Material Counter Pick-Up & Drop-Off

Personnel responsible for work order fulfillment to be performed "elsewhere", utilize this **TAV**™ feature to acquire material and/or tools for (prior to) work performance. After work ends, this **TAV**™ feature is used to return material and/or tools previously pick-up. Material and/or tools not returned are accounted for with replenishment purchase requisitions automatically created and variances posted as a physical inventory activity (negative variance).

Organization Material Management

Any given organization may be assigned a selection of Material for which Forecast Orders may be issued. Once a selection of Material has been assigned to a given Organization, Material Forecasters for that Organization may only request Material found in the selection assigned. Once a Material Forecaster submits a given Forecast Order, it is made available to their superior as defined in **TAV's** Accreditation Entity Relationships. If the Material Forecaster is at the top of the relationship chain, submitted Forecast Orders are broken down by material and issued to the assigned Material Item Managers as Purchase Requisitions.

Material Item Management

Any given material may be assigned to one Item Manager who thereafter is responsible for the requisitioning of that Material. Assignments may be made by Material and/or Material/Unit (e.g. all soap powder or just 1 lb boxes of soap powder). Approved Forecast Orders are issued as Purchase Requisitions to the appropriate Item Manager(s). Purchase Requisitions approved by Item Managers are issued as uncommitted Purchase Orders.

Bills of Material/Statements of Work

A Bill Of Material (BOM) is a sequence and quantity of materials required to produce, fabricate or assemble a Material unit (e.g. Part, Module, Assembly, Sub-Assembly, etc.) A Statement Of Work (SOW) is a sequence of Charges (Activities) required to produce, fabricate or assemble a Material unit using the above Bill Of Material (BOM). Bills Of Material (BOMs) and Statements Of Work (SOWs) can be nested indefinitely; e.g. Assembly, Sub-Assembly, Sub-sub-assembly, etc. Without an associated Statement Of Work (SOW), a Bill Of Material (BOM) is just a list of Material, much like the contents of a tool bag.

Automated Suggested Order Generation

The **TAV**™ Suggested Order feature evaluates historical material demand against current stocking levels and delivery lead times and suggests material order quantities for inventory replenishment. The Suggested Order feature is found in the Submit Material Requisition Forecast application.

Automated Customer Order Purchase Requisitioning

The **TAV**™ Customer Order Entry process sequences and schedules all activities associated with a given order. As the Customer Order Entry process evaluates all components of an order, it determines the availability of associated material. The operator may be presented with "build" or "buy" decisions regarding insufficient referenced material, and when the "buy" option is selected, the **TAV**™ Customer Order Entry process will emit the required Purchase Requisition information to effect procurement. Purchase Requisition emission only occurs upon order issue.

Accreditation Based Entity Relationship Modeling

TAV™ provides for the establishment and maintenance of Accreditation Entity Relationships and does NOT permit incestuous relationships. No Entity may be related to itself, regardless of the applied classification. A single class entity relationship "family" is well represented by an organizational chart. In the case of Material Forecasters, organizational reporting relationships are defined and utilized in the material forecast process. Once a Material Forecaster submits a given forecast, it is made available to their superior as defined in **TAV's** Accreditation Entity Relationships. If the Material Forecaster is at the top of the relationship chain, submitted material forecasts are broken down by material and issued to the assigned Material Item Managers as Purchase Requisitions.

Pick/Put Route Administration

TAV™ enables its users to create and maintain a variety of distribution routes, any of which may intersect as often as necessary. A given route may be applied to multiple courier/services just as a given courier/service may utilize multiple routes. A route is given a user definable designation and is comprised of two or more stop locations (e.g., inventory locations, etc.). A route may be defined to be available for service by pick up and/or drop off within any given day of the week. In warehouse environments, routes are used to manage inventory placement and picking.

Pick/Put Route Assignment and Load Management

As material is moved, **TAV**™ will determine the quickest means by which to effect end delivery. As material is routed, appropriate pick-ups and drop-offs are posted to applicable route stops. At any time, authorized personnel may view all route stop material assignments. Before a given route may be started by a warehouse worker, it must first be dispatched, which gives the warehouse manager the opportunity to assign the entire route to a given worker, or split the route among more than one worker. Once the route stop allocations for a given route are selected, that route instance is then dispatched, thereby making it eligible for processing.

Pick/Put Route Execution Management

Once a route is dispatched, it becomes eligible for execution, which is initiated by the designated warehouse worker's "starting" the route. Once started, the worker proceeds to the first route stop location, arrives, drops off any indicated material by scanning it, picks up any indicated material by scanning it, and then departs that location. For each subsequent route stop location, the warehouse worker will arrive, drop off material, pick up material, and depart. Upon completion of the above steps at the last route stop location, the worker will indicate route completion to **TAV**™.

Automatic Routing

All material/parcels shipped using a **TAV**™ Routed carrier/service are automatically assigned to the pick-ups and drop-offs required to achieve end destination delivery.

Adaptive Routing

As material/parcels are handled, the end destination route is re-evaluated to accommodate location changes and/or route outages.

Disposal Management

TAV™ supports any type of disposal method from incineration to biocide emulsification. Whatever the method(s) employed, **TAV**™ will acquire data about the disposal process and disposal objects.

Accreditation Based

All user defined material/parcel handling, routing and processing events are applied according to classification assignment.

Location Based

TAV™ supports the definition of an indefinite number of activity locations.

5.3. Document Control System (DCS™) Features

Accepts Document Images from Multiple Sources **Batch Document Image Processing**

Performs Batch Document OCR Processing **Full Textual Content Searching**

Rule Based Document ID Generation **Type, Accreditation and Caveat Based**

Automatically Linked To Tracking **Updates Data Base from Scanned Forms**

Accepts Document Images from Multiple Sources

Controls virtually all industry standard Image Scanners and Cameras. Also accepts document images in virtually all industry standard Image File formats.

Performs Batch Document Image Processing

Bulk document Digitization is available with automated image pre-processing (e.g., de-speckling, color drop out, rendering inversion, etc.) and exception handling. Easily supports both single page and multi-page documents with User or Content Based IDs.

Performs Batch Document OCR Processing

Bulk document OCR (Optical Character Recognition) is also available and provides Recognition Zoning along with a collection of Recognition Engines, which include Three Engine Voting, Two Engine Voting, One Dimensional Bar Codes, Two Dimensional Bar Codes, Omnifont, OCR-A, OCR-B, Hand Written, OMR, and Braille. Virtually all western languages and character sets are supported. Asian languages and character set support is optionally available.

Full Textual Content Searching

Text resulting from OCRed (Optically Character Recognized) documents may be retained in the **TAV**™ Data Base. Retained document text is stored on a per page basis (approximately 32,000 characters per page max.) so that text searches on a document (or the entire document data base) are available without the use of special software. The standard “Query Enter”, “Query Execute” mechanism (with wild cards) applies.

Rule Based Document ID Generation

Individual publications of a given document may require unique Identification. The construction of these Unique Document Instance IDs may include multiple components such as Sources Document ID, Parent ID Pool, Child ID Pool, Date, Sequence, and Original Owner.

Document Type, Accreditation and Caveat Based

All document processing, access and search events are applied according to user defined document type, classification, and/or caveat assignment.

Automatically Linked To Tracking

Documents can either be a distribution material source or an attachment to a given entity or activity. In the case where a Document is the source for a given material, the Document ID and Document Type are directly linked with the corresponding Material ID. When a document is an attachment to an entity or activity (e.g., user manual, test endorsements, driver document, personnel information, etc.) the Document ID is directly linked to an entity (Account ID) or activity.

Updates Data Base from Scanned Forms

Information can be extracted from Scanned Documents and used to update the **TAV**™ Data Base. Returned signed receipts can be Imaged and OCRed, with the resulting OCR data used to post the image and close the open receipt. Signed overdue notices can also be Imaged and OCRed, with the resulting OCR data used to post the document image and close the Tracer Action.

5.4. Material Distribution System (MDS™)/Controlled Distribution System (CDS™) Features

Trans-Shipment Container Consolidation
Multiple Carriers
Multiple Shipping Accounts
Multiple Shipping Locations (Origins)
Centralized Rate Management
Sophisticated Rate Shopping
Accreditation Based
Location Based
Automated Advanced Shipment Notification
In-Transit Visibility
Single or Double Wrapping of Parcels
Batch Dissemination Processing
Automated Material Tracer Actions
Automated Receipt Tracer Actions
Address Security
Address Multiplicity
Accreditation Based Entity Relationship Modeling

Trans-Shipment Container Consolidation - Accountable Outbound Material

Outbound accountable material is typically forwarded to its end recipient via external distribution services managed by **TAV**™. To expedite truck loading and unloading and to achieve a better economy of tariff scale, it is sometimes desirable to consolidate all material destined for a given recipient into a single container for transport. **TAV**™ enables its users to "create" a Trans-Shipment container instance, identify that container's "destination location" and then make the container available for loading. The Trans-Shipment container load process then lists all material eligible for placement into that container and enables the operator to only load the eligible material via bar code scanning. Once loaded, the Trans-Shipment container is "shipped" to its designated destination via external distribution services.

Multiple Carriers

TAV™ supports an unlimited number of carriers and carrier/services. Carrier maintenance can be provided by **msi**™ or performed by the user or both. All carriers and services are user definable and maintainable.

Multiple Shipping Accounts

TAV™ supports an unlimited number of "Shipper" accounts. One **TAV**™ deployment can support every carrier shipper account used by an enterprise, especially distribution centers and fulfillment houses. This support extends to electronic pickup books, carrier server deployments and postage equipment.

Multiple Shipping Locations (Origins)

TAV™ supports an unlimited number of shipping origins thereby enabling shipment operations from virtually anywhere. This support extends to multiple carrier server deployments and postage equipment.

Centralized Rate Management

All carrier service rate information is contained in the **TAV**™ Data Base. Any authorized user may maintain carrier service rate information on a given Data Base Server from any connected workstation. A **TAV**™ Data Base may reside on a single server or may span multiple Data Base Servers. Using Oracle's Distributed Replication facility, those multiple interconnected **TAV**™ Data Bases will appear as one logical Data Base implementation.

Sophisticated Rate Shopping

TAV™ enables its customers to group carrier/services into pseudo carriers and services. Whenever a parcel is shipped using a pseudo carrier/service, all underlying carrier/services are evaluated and the best combination is selected by the system. "Best" is a combination of seven (7) configurable weighted selection criteria; Transit Time, Cost, Loss, Missed Pickups, Missed Deliveries, Bad Billings, and Complaints.

Accreditation Based

All user defined material/parcel handling, routing and processing events are applied according to classification assignment.

Location Based

TAV™ supports the definition of an indefinite number of activity locations.

In-Transit Visibility

Delivery data electronically provided by any carrier or courier can be easily incorporated in the **TAV**™ Data Base. Whether the data is provided in ASCII Text on a diskette, via inter-net FTP, or via our EDI interface, there is a place for it in the **TAV**™ Data Base. Once in the **TAV**™ Data Base, it is visible to any authorized user on the enterprise network.

Single or Double Wrapping of Parcels

Depending on accreditation and/or carrier/courier configuration, **TAV**™ can direct packaging operations to either wrap the shipping material once or twice. Each wrap may have its own labeling independent of the other. This is particularly useful in the dissemination of classified material.

Batch Dissemination Processing

In batch dissemination, a Distribution Job represents the material, each recipient, and the quantity of the material to be shipped to that recipient. The dissemination manager creates a Distribution List of recipients (with individual quantities) for each material. The dissemination manager next creates a Distribution Job specifying the return-to, requestor, the material(s), and the distribution list(s). If too large, Distribution Jobs can be divided into smaller jobs, but most often multiple Distribution Jobs are combined to achieve an optimum economy of scale. When a Distribution Job is "dispatched", **TAV**™ determines how each shipping parcel is to be constructed based on weight and volume. Once all job parcel constructions have been computed, packaging and shipping is performed. Shipping operators use the **TAV**™ to document, receipt, wrap, label, weigh, and ship the correct number of each material to each recipient using the correct method for that accreditation. **TAV**™ directs the shipping operator's activities to ensure correct execution for each parcel.

Automated Advanced Shipment Notification

If so configured, **TAV**™ can notify the recipient of a parcel's external shipment via mail, e-mail, or fax.

Automated Material Tracer Actions

If so configured, **TAV**™ can notify the requestor, originator, carrier and/or recipient of a parcel's overdue external delivery via mail, e-mail, or fax.

Automated Receipt Tracer Actions

If so configured, **TAV**™ can notify the requestor, originator, carrier and/or recipient of a parcel's overdue external shipment receipt via mail, e-mail, or fax.

Accreditation Based Entity Relationship Modeling

TAV™ provides for the establishment and maintenance of Accreditation Entity Relationships and does NOT permit incestuous relationships. No Entity may be related to itself, regardless of the applied classification. A single class entity relationship "family" is well represented by an organizational chart. When used in material dissemination, material destined for subordinates are packaged first; i.e. hierarchically from the bottom up. Material for a given subordinate is collected, wrapped and labeled for that subordinate. All subordinates in the hierarchy (same tier) are so processed. The superior of this tier gets a package containing his material and all of his subordinates' packages, all wrapped and labeled for that superior. Dissemination processing continues in this manner until the over all superior is reached and processed.

Address Security

The least amount of address validation available consists of matching country/province/postal code combinations. Address hygiene can be extended to include validation and verification using the National Address Data Base maintained by the U.S. Postal Service, or some other source of data. Every address in turn may be individually accredited.

Address Multiplicity

TAV™ supports unlimited address types thereby allowing a given account to have as many addresses as there are "types". A typical application of address typing is that of carrier/courier association in support of shipping. A more comprehensive application of address typing is that of address consolidation from multiple sources.

5.5. Access Control System (ACS™) Features

Accreditation Based
Configurable Security Paradigms
Bio-Metric Identification
Automated Visitor Arrival Notification
Test Administration & Management
Disposal Management
Patrol Route Administration
Patrol Route Execution Management
Location Based
Full Visitor Accountability
Centralized Image Verification
Quarantine Administration & Management
Hazard Test Results Management
Entity Relationship Modeling
Patrol Route Assignment and Management

Accreditation Based

All egress, locations, routing and processing events are applied according to user defined classification assignment.

Location Based

TAV™ supports the definition of an indefinite number of locations.

Configurable Security Paradigms

Easily supports egress control policies ranging from simple lobby registration to adversarial counter-infiltration operations. Deployment configurations can accommodate virtually any collection of Identification Devices (e.g. Bar Code, Magnetic Strip, RFID, Bio-Metric, etc.) as well as electromechanical locks, motion detectors and periphery detection/surveillance devices.

Full Visitor Accountability

Collect and retain egress identification detail beyond name, address and/or organization, such as sponsor, host and escort details. Egress can be a condition of electronic legal agreement execution as well as personnel/location accreditation. Associated personal/legal documents (e.g. drivers license, vehicle insurance form, etc.) may also be captured and kept in the **TAV**™ Data Base.

Bio-Metric Identification

Bio-metric details can be collected maintained in the **TAV**™ Data Base for every participating individual. Bio-metric details include Left and Right Eye Retinal Images, Finger Prints, and Hand Prints.

Centralized Image Verification

Personnel image detail can be collected and maintained in the **TAV**™ Data Base for every participating individual, with no limitation on number. Personnel images stored in the **TAV**™ Data Base are used to detect forged access documentation and validate personnel identification.

Automated Visitor Arrival Notification

If so configured, **TAV**™ can notify personnel of a visitor's arrival via e-mail or fax.

Quarantine Chamber Administration & Management

TAV™ enables it users to create and administer Quarantine Areas/Chambers. Once created these chamber instances may be opened, loaded, unloaded, closed, manifested, and locked. Material may not be removed from Quarantine until all test results have been posted and that all results where hazard negative.

Test Chamber Administration & Management

TAV™ enables it users to create and administer Test Chambers. Once created these chamber instances may be opened, loaded, unloaded, closed, manifested, and locked. Once inside a Test Chamber, material is tested for hazard exposure and the potential for contamination. Material may not be removed from Test Chambers until all test results have been posted and that all results where hazard negative.

Hazard Test Management and Execution

Testing inbound material for hazard exposure and contamination potential is customer configurable so that any variety of tests may be applied in any order required. **TAV**™ will acquire data about the test process and test objects.

Hazard Test Results Management

Once test operations are completed and the corresponding results have been determined, the results must be posted in **TAV**™. If all test results are "GOOD" then the Quarantine Area or Test Chamber may be opened and unloaded, with the unloaded material's placement directed by **TAV**™. If any test results are "BAD", the Quarantine Area or Test Chamber may only be opened by a Chamber Administrator, and then only material with "GOOD" test results may be removed from the Quarantine Area or Test Chamber.

Disposal Management

Inbound material with any "BAD" test results may be removed from a Quarantine Area or Test Chamber for appropriate disposal. **TAV**™ supports any type of disposal method from Incineration to biocide emulsification. Whatever the method(s) employed, **TAV**™ will acquire data about the disposal process and disposal objects.

Accreditation Based Entity Relationship Modeling

TAV™ provides for the establishment and maintenance of Accreditation Entity Relationships and does NOT permit incestuous relationships. No Entity may be related to itself, regardless of the applied classification. A single class entity relationship "family" is well represented by an organizational chart. A multiple class entity relationship "family" may represent a multi-dimensional "Mudds" and "Ludds" intelligence repository; e.g. telecommunications interactions, familial relations, financial relations, etc.

Patrol Route Administration

TAV™ enables its users to create and maintain a variety of security routes, any of which may intersect as often as necessary. A route is given a user definable designation and is comprised of two or more stop locations. A route may be defined to be available for service within any given day of the week.

Patrol Route Assignment and Management

Before a given route may be started by a security officer, it must first be dispatched, which gives the operator the opportunity to assign the entire route to a given officer, or split the route among more than one officer. Once the route stop allocations for a given route are selected, that route instance is then dispatched, thereby making it eligible for execution.

Patrol Route Execution Management

Once a route is dispatched, it becomes eligible for execution, which is initiated by the designated officer's "starting" the route. Once started, the officer proceeds to the first route stop location, arrives, by scanning a location ID, and then departs that location. For each subsequent route stop location, the officer will arrive and depart. Upon completion of the above steps at the last route stop location, the officer will indicate route completion to **TAV**™.

5.6. Distribution Archive System (DAS™) Features

Activity Audit Trail

The **TAV**™ Activity Archive feature records activity and state information identifying the object, user and time of each transaction. This feature collects and warehouses all **TAV**™ data transactions automatically in the background of operations. The only human interface to DAS is through dozens of inquiry applications. Since only "change" data is warehoused, the resulting data footprint is quite small and includes all:

Account Activity

Address Activity

Accreditation, Caveat and Instruction Activity

Dissemination List Activity

OPI Configuration Activity

Item Manager Activity

Organization Material Manager Activity

Recipient Activity

Material Activity

Dissemination Activity

Tracer Action Activity

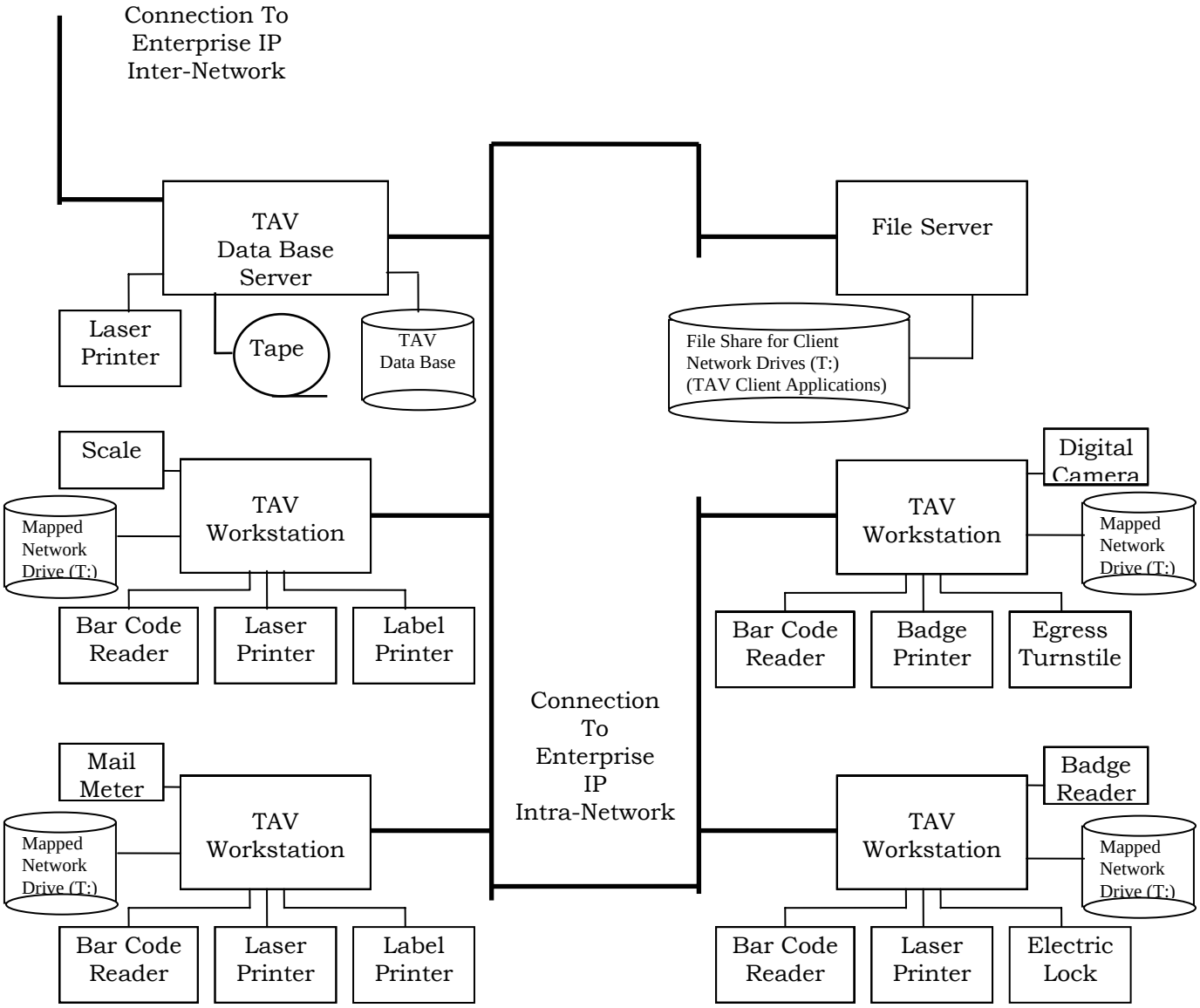
Disposal Activity

Dissemination Exception Activity

6. CONFIGURATION

TAV$_{TM}$ is a Relational Data Base Client/Server implementation utilizing Oracle TNS (Transparent Network Substrate) communications over a TCP/IP Network. Windows (X, Motif, Microsoft, etc.) and Internet Protocol (TCP/IP) facilities are available as a result of the Operating System software. Relational Data Base Management Services are provided by an Oracle RDBMS. Oracle 6i Forms and Reports provide the user application runtime environment.

6.1. TAV$_{TM}$ Deployment Configuration



An Oracle Relational Data Base Software (RDBMS) release (i.e. 10g) installed onto a Microsoft Windows server platform, followed by the creation of the **TAV**™ Data Base, yields a **TAV**™ Data Base Server.

A Microsoft Windows network file server is typically used to host the **TAV**™ Client Application Software so that the same **TAV**™ software will be used by all **TAV**™ Client Workstations. This provides a single point from which application release control is maintained. A file share (shared Windows Folder) is created and all Oracle/TAV Client Software is copied into it (**TAV**™ Client Application Distribution CD). All **TAV**™ Client Workstations then mount the **TAV**™ Share as a local network drive (e.g. "T:") and execute from that "local" network drive.

TAV™ Client Workstations communicate with the Oracle based **TAV**™ Data Base using Oracle's Transparent Network Substrate (TNS) over TCP/IP. TNS is used to establish Data Base Sessions (log on), transfer data between the Data Base and Client Workstations, as well as take down Data Base Sessions (log off). The files that control Transparent Network Substrate (TNS) operation are: SQLNET.ORA, TNSNAMES.ORA, and LISTENER.ORA.

The SQLNET.ORA file is used by both Client Workstations and the Data Base Server to encrypt/decrypt exchanged data, define authentication methods, and enable/disable TNS features. This file's settings must be common to both the Client Workstations and the Data Base Server.

The TNSNAMES.ORA file is used by Client Applications to translate a Data Base ID into a network connection to the Data Base on the Server associated with that ID. This file's settings must be consistent with the settings of the Data Base Server found in the LISTENER.ORA file.

The LISTENER.ORA file is used to tell the Data Base Server software where to listen for client requests (IP Address), what kinds of requests to listen for (TCP/IP, Named Pipes, IPC, etc.) and how to respond when a Data Base request is made (SID). This file's settings must be consistent with the settings of the Client Workstations' found in their TNSNAMES.ORA file.

7. ACCESSING

Access to the **TAV**™ Data Base and Client Software functionality is accomplished by:

1. Using "Windows" based Client/Server Software that runs on PC workstations using MS Windows 2K/XP.

2. Using a JAVA Enabled Web Browser.

Users accessing **TAV**™ via a Graphical User Interface or GUI, whether it be from the Server console, MS Windows based client, or JAVA enabled Web Browser, will all interact with **TAV**™ in the same manner.

In all cases, after **TAV**™ invocation but before Main Menu display, the **TAV**™ Data Base login screen is presented. The user is prompted for entry of his or her **TAV**™ user id, password and data base id. Upon access validation, the user is presented with the **TAV**™ Main Menu. Three unsuccessful **TAV**™ Data Base Login attempts result in GUI users being left in the GUI environment but not connected to TAV. A successful login is followed by the presentation of the **TAV**™ Main Menu. All Main Menu Items are displayed regardless of user privilege. Only sub-menu and user application items are displayed to the user based upon assigned privilege (Role).

8. SECURITY

8.1. User Security

Access to the software applications requires user identification. When a Data Base user account is created, the associated User ID is granted one or more sets of privileges or Roles. Users only see those software applications and data base tables as prescribed by the Role(s) assigned to their data base user account.

TAV™ supports well over one hundred Roles which, for the most part, can be classified into three categories:

1. Select/Insert/Update/Delete Roles

2. Select/Update Roles

3. Select Roles

A Role such as TAVSHIPMNGR (**TAV**™ Shipping Manager) has THREE manifestations:

TAVSHIPMNGR	(Select/Insert/Update/Delete)
TAVSHIPMNGRU	(Select/Update)
TAVSHIPMNGRQ	(Select)

There are just a few Roles for which only a Select/Insert/Update/Delete privilege set exists (e.g., TAVSHIPOPER (**TAV**™ Shipping Operator)).

8.2. Communications Security

TAV™ Client Workstations communicate with the Oracle based **TAV**™ Data Base using Oracle's Transparent Network Substrate (TNS) (a.k.a. SQLnet) over TCP/IP. TNS is used to establish Data Base Sessions (log-on), transfer data between the Data Base and Client Workstations, as well as take down Data Base Sessions (log-off).

Oracle's TNS supports a variety of authentication methods, including: Cybersafe, Kerberos, RADIUS, and Secure Sockets Layer (SSL). Several data encryption and decryption methods may be selected from (40 bit, 56 bit, 112 bit, 168 bit DES; 40 bit, 56 bit, 128 bit, 256 bit rc4) as well as SSL PKI so that all client/server data exchanges are encrypted, including session establishment.

8.3. Workstation Security

Any **TAV**$_{TM}$ Workstation to be used in the movement and/or disposition of material must be uniquely identified. This is done by the creation of a TAVCONFG folder on the C: drive of the Workstation and placing a "WKSTNCFG.TXT" file into it. The first line of this text file is used to identify the Workstation to the **TAV**$_{TM}$ Data Base. In the **TAV**$_{TM}$ Data Base, an entry for this Workstation is made, giving it the assigned Workstation ID, a location in the enterprise, and one or more accreditations. These accreditations determine what material will be presented for processing/handling at this Workstation regardless of the accreditations assigned to the operator. If a material movement/disposition attempt is made from this kind of Workstation, but with an incorrect Workstation ID, the attempt will be programmatically aborted (denied). Only Workstations to be used in the movement and/or disposition of material require this.

9. LICENSING

All **msi**$_{TM}$ software products are available in three (3) license suites; the **Enterprise Suite**, the **Workgroup Suite**, and **Single System Software (S^3**$_{TM}$**)**.

The **Enterprise Suite** is applicable for high capacity server implementations and is the only **msi**$_{TM}$ offering type with which "Box" licensing is available. End user licenses are only required for additional users beyond the number provided in each of the **Enterprise Suite** Product Specific Module Licenses. A **TAV**$_{TM}$ **Enterprise Suite** component acquisition resulting in thirty two (32) users yields an unlimited user-ship for that component.

The **Workgroup Suite** is applicable for low to medium capacity server implementations (e.g., PC based server hardware running MS Windows). End user licenses are only required for additional users beyond the number provided in each of the **Workgroup Suite** Product Specific Module Licenses. A **TAV**$_{TM}$ **Workgroup Suite** component acquisition requires user licenses for every user of that component, regardless of number. Acquisition of any **msi**$_{TM}$ **Workgroup Suite** software product requires ownership of at least an Oracle Standard Server Relational Data Base Management System (RDBMS).

Single System Software (S^3$_{TM}$**)** licensing is applicable for single user, standalone implementations (i.e., single PC hardware running MS Windows).

All **msi**$_{TM}$ products share a common Data Base so they are inter-operable when used on the same Server. This means that one **msi**$_{TM}$ product from each product category may be installed on the same Server.

All **msi**$_{TM}$ products share a set of common software applications; e.g., Accounts and Addresses, Vendor Maintenance, Manufacturer Maintenance, Customer Maintenance, Carrier Maintenance, Country Province Maintenance, Province Postal Code Maintenance, etc.

As such, each **msi**$_{TM}$ product is provided in two parts, a Base License (for the Data Base and those software applications consistent across **msi**$_{TM}$ system products) and a Product Specific License (for those software applications specific to a given **msi**$_{TM}$ product).

By separating the licensing of the Data Base and software applications consistent across **msi**$_{TM}$ products, customers can acquire multiple **msi**$_{TM}$ products for a server without paying for the common software applications more than once.

There are no per user fees associated with the Base License, so it is never sold without the accompaniment of at least one Product Specific Module License.

When procuring multiple **msi**™ products for co-installation on a single server, a customer would order one Base License and one each of the Product Specific Module Licenses required.

Product Specific Module Licenses do have per user fees associated with them. A **TAV**™ **Workgroup** Product Specific Module License also represents or includes five (5) users. A **TAV**™ **Enterprise** Product Specific Module License also represents or includes eight (8) users. When additional users are required, additional per user licenses are required; **TAV**™ **Workgroup** User Licenses or **TAV**™ **Enterprise** User Licenses.

So a **TAV WMS**™ and **AMS**™ fat client workgroup deployment supporting forty (40) users would require procurement of One (1) **TAV**™ **Base** License, One (1) **TAV AMS**™ **Workgroup** License (includes 5 Users), One (1) **TAV WMS**™ **Workgroup** License (includes 5 Users), and thirty (30) **TAV**™ **Workgroup User** Licenses.

Procurement of user licenses for Oracle's Standard or Enterprise editions of Relational Data Base Management System (RDBMS) software would also be required.

10. INSTALLATION

The **TAV**™ Data Base and Client Software installation is performed in two parts, Server Side Installation and Client Side installation.

10.1. Server Side Installation

Server Side Installation consists of Oracle RDBMS installation on the Server hardware platform, followed by the creation of the **TAV**™ Data Base under the Oracle RDBMS using **TAV**™ SQL scripts. Once the **TAV**™ Data Base instance is created, it is populated by importing a provided export file.

10.2. Client Side Installation

Client Side Installation has two possible forms, NMCI workstation push or File Server file sharing.

NMCI Client Side Installation requires the execution of a MAC (Move, Add, Change) Request. Within 30 days of MAC Request receipt, a software image push will be performed for every NMCI Seat (PC Workstation) specified in the request. Once loaded, all **TAV**™ Client Side software will be installed by executing a NMCI supplied script. Under NMCI, every workstation will have its own copy of the application software and runtime environment thereby off loading the **TAV**™ Server.

In a non-NMCI Client Side environment, installation begins with creating a File Share (shared folder) on the File Server and then installing the **TAV**™ Client Side onto it.

In either case, if a **TAV**™ Workstation is to be used in the movement and/or disposition of material (e.g. Disposal), it must be uniquely identified via a "WKSTNCFG.TXT" in the "\TAVCONFG" folder on the "C:" drive. Using Windows Explorer, create the \TAVCONFG folder on the C: drive of the Workstation. Copy the file "WKSTNCFG.TXT" into the "C:\TAVCONFG" folder. Open the "WKSTNCFG.TXT" file found at "C:\TAVCONFG" with MS WordPad. Change the Workstation Name "`WRKSTN01`" in the "`WRKSTNID = WRKSTN01`" expression to the unique ID assigned to this **TAV**™ Workstation (this Workstation ID must also be posted in the **TAV**™ Data Base using the Workstation Maintenance application).

If a Workstation is to have a Scale attached, the serial port to which the Scale is connected must be identified in the second line of the "WKSTNCFG.TXT" file using the "`SCALEPORT =`" expression (e.g. "`SCALEPORT = 3`" for COM Port 3). The third line of the "WKSTNCFG.TXT" file, the "`SCALEMEAS =`" expression (e.g. "`SCALEMEAS = LB`" for Pounds) specifies the scale's unit of measure. The fourth line of the "WKSTNCFG.TXT" file, the "`SCALEDLAY =`" expression (e.g. "`SCALEDLAY = 25000`" for 25000 cpu cycles) specifies the scale's serial port interface delay. The fifth line of the "WKSTNCFG.TXT" file, the "`SCALETYPE =`" expression (e.g. "`SCALETYPE = PS60`" for Mettler/Toledo PS-60 scale) specifies the scale's model id and so its communications protocol.

If a Workstation is to have an RFID Reader attached, the serial port to which the RFID Reader is connected must be identified in the sixth line of the "WKSTNCFG.TXT" file using the "`RFIDPORT =`" expression (e.g. "`RFIDPORT = 4`" for COM Port 4).

Once created and populated, the "WKSTNCFG.TXT" file should be write protected under the ownership of the Administrator account.

If this Workstation is to have a Label Printer attached, a Generic/Text Only printer named TAVLABEL must be created with a communication port selected to which the Label Printer will be connected.

If this Workstation is to have a Laser Printer attached, a printer named LASER must be created with a communication port selected to which the Laser Printer will be connected.

If this Workstation is to have a Post Script Printer attached, a printer named PSLASER must be created with a communication port selected to which the Post Script Printer will be connected.

Once the above actions have been performed on every participating **TAV**™ Workstation in the enterprise, Client Side Installation is complete.

11. CONFIGURATION

System Configuration consists of creating **TAV**™ software packages, creating and scheduling **TAV**™ Daily/Weekly Process executions, followed by the creation of Security Roles. With that complete, its time to use Oracle's Enterprise Manager (Console Mode) to create the system's users.

The creation of **TAV**™ software packages in the Data Base as well as the creation and scheduling of **TAV**™ Daily/Weekly Process executions are accomplished through the execution of one **TAV**™ SQL script. Execution of this script is performed at a **TAV**™ Workstation using SQLplus logged on as the user TAV.

The creation of **TAV**™ Security Roles is accomplished through the execution of one **TAV**™ SQL script. Execution of this script is performed at a **TAV**™ Workstation using SQLplus logged on as the user TAV.

With the above complete, its time to use Oracle's Enterprise Manager (Console Mode), on the **TAV**™ Data Base Server, to create the system's users and start using the system.

11.1. Client Side Configuration

The client application software folder (e.g. C:\Program Files\Tavcode) contains several collections of text files, which can be classified into two categories; Label Printer Label Layouts and Notice Letter Content.

For Label Printer Label Layouts, **TAV**™ supports three (3) label printer manufacturer control languages; DataMax, Zebra, and Monarch. Each printer control language yields a collection of text files, with file name commonality across control languages. As such, only one Label Printer type (e.g. Zebra) can be supported in a given client configuration. Label content and format is customized via modification of these text files using a text editor (i.e. WordPad). No software modification is required.

For Notice Letter Content, **TAV**™ provides several collections of "notice" letters; e.g. Arrival Notices, Receipt/Material Notices, Event Notices, etc. Each type of "notice" typically requires at least nine (9) different "notice" contents for escalated non-compliance statements and consequences. Notice content and format is customized via modification of these text files using a text editor (i.e. WordPad). No software modification is required.