



**ITEM UNIQUE IDENTIFICATION (IUID)
CONCEPT OF OPERATIONS
FOR
USMC GROUND EQUIPMENT**

United States Marine Corps

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FOREWARD

Item Unique Identification (IUID) is a Department of Defense (DoD) and NATO standardized means to identify individual items. Through its encoded information on a machine readable, two-dimensional data matrix, IUID is highly integrated with Automated Identification Technology (AIT) to enable rapid, accurate identification.

Until now, methods used for serialized identification of equipment have been left to each community, information system, or local commander. This approach inadvertently compartmentalized valuable data, leaving most of it inaccessible or unusable outside of the community that collects or creates it. Although developed initially to improve financial accountability and reporting, IUID's standardized format and guaranteed global uniqueness for serialization provides the ability for common identification, and therefore unlocking of valuable item-specific data across many functional, system and organizational boundaries. IUID provides the primary data key for equipment identification that enables network centric management of equipment, which can extend into the overall network centricity of data available for operational commanders, program managers, and force planners. IUID methodology prescribes serialization, in the form of a *Unique Item Identifier* (UII), which acts as a data carrier to relate useful serialized data such as *configuration, status, current depreciated value, and warranty status* from authoritative sources to any stakeholder that manages Marine Corps equipment.

Implementation of IUID presents many challenges due to its broad applicability to pre-existing (legacy) inventory, multi-service management of equipment, the applicability across several portfolios of Automated Information Systems (AIS), and the ubiquitous nature of its potential use in process improvement and automation. This Concept of Operations (CONOPS) document addresses necessary plans to:

1. Rapidly enable a critical mass of IUID marked and registered items
2. Enact process and AIS changes to manage IUID data for marked and registered items
3. Establish an IUID Program to implement IUID for Marine Corps ground equipment
4. Execute a roadmap for integration of IUID to enable or enhance "value streams" in *Property Accountability, Intensive Item Management, and Product Lifecycle Management*¹

This CONOPS serves as a detailed description of Marine Corps plans and to define the scope of a Marine Corps IUID program, as an integral capability to AIT, leveraging the AIT Initial Capabilities Document (ICD) to support the Joint Capabilities Integrated Development System (JCIDS).

¹ Implementation of item unique identification in DoD logistics processes. Logistics IUID Task Force, June 8, 2010.

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1. EXECUTIVE SUMMARY

Item Unique Identification (IUID) improves four critical aspects of equipment management within the Marine Corps: data management, standardization, accuracy, and expediency. The Marine Corps IUID strategy is to automate item identification in all aspects of maintaining, tracking, accounting, reporting, and life-cycle management of equipment. Automation provides both precision and velocity to identifying equipment, enabling Marines to focus on their specialized tasks, vice data entry. The global uniqueness of each Unique Item Identifier (UII) and the ubiquity of the common UII data element definition across Automated Information Systems (AIS) enable network centrality of serialized equipment data with Marine, Joint, Allied and commercial stakeholders. Although UII will be the standard for permanent unique identification of items in the Department of Defense (DoD), services can continue to leverage the efficiency of relating common characteristics by referencing part numbers, National Stock Numbers (NSN), or temporary references such as requisition document numbers or Radio Frequency Identification (RFID) tags during movement. IUID complements and improves upon existing means of identification or reference, and allows permanent identification to relate all activity that occurs to a specific item over its lifecycle. IUID is the foundation for future Property Accountability (PA), Intensive Item Management (IIM), and Product Lifecycle Management (PLM) processes, as defined by the OSD Logistics Task Force².

Origin

The concept of IUID was born from the DoD-wide challenge of financial reporting and accountability for its inventory items. Commanders and taxpayers benefit from accurate knowledge of the location and status of valuable and sensitive items. IUID was developed as a means to standardize the serialization methodology used across DoD and other stakeholders' AIS in order to accurately account for each uniquely identified item at any point in its life, regardless of the current custodian. IUID couples a globally unique serialization methodology with a machine-readable two-dimensional *data matrix symbol* (see Figure 1) in order to support automation in financial management and logistics functions³, improve data quality and reduce data entry burden on Marines.

The *Data Matrix Symbol*

The simplicity of IUID is in the need to encode only the UII information on the *data matrix symbol*, and relate all data within AIS. This negates the need to replace the *data matrix symbol* when equipment transfers to a new unit, or a part number changes - only the record in applicable AIS needs to



Figure 1: Example of the IUID Data Matrix Symbol

² Implementation of item unique identification in DoD logistics processes. Logistics IUID Task Force, June 8, 2010.

³ Logistics functions are defined in Marine Corps Warfighting Publication 4-1.

be updated.

Compliance

Basic compliance for IUID is to enable an enduring capability to create and sustain IUID marks, as well as AIS that serially manage equipment by use of the UII data element for item identification, valuation and reporting. Compliance itself provides only limited benefit to the Marine Corps. True benefits are realized through leveraging IUID as a means to automate and improve business processes across acquisition, resource management, logistics, and sustainment operations.

IUID Enabling Process Automation & Improvements

In addition to the use of IUID for accountability, the Marine Corps will capitalize on the ability to capture and track life cycle events and item attributes that are important to commanders, operational planners, and program managers in order to better understand status, age, and health across the population of uniquely identified items to perform safety analyses and support investment, replacement, maintenance or operational planning decisions. Initial IUID capabilities reside in Global Combat Support System-Marine Corps (GCSS-MC), and will improve upon integration of IUID with other AIS as equipment is uniquely identified through IUID marking.

Scope

IUID impacts both tactical and garrison equipment, regardless of its use by the Command, Aviation, Ground or Logistics Combat Elements or supporting establishment. Operating environment and management of equipment across this spectrum varies, so IUID marks will be suitable for their intended operating environments, and the AIS used within each community (GCSS-MC, NALCOMIS, DPAS, etc.) will utilize IUID for automation and data sharing. Implementation timelines and levels of integration of IUID within processes will be tailored to each community and process by the cognizant authority for each process. Although IUID is relevant throughout the DoD and in managing all Marine Corps equipment, this CONOPS addresses the implementation of IUID only for Marine Corps ground equipment, specifically serially managed individual items, end items, assemblies, sub-assemblies, and components. Due to financial and operational value, in addition to commonality in management processes and AIS, initial priority of IUID implementation will be on Marine Corps serially managed items within supply classes II⁴, VII⁵, and IX⁶. Other classes of supply are not exempt from IUID

⁴ Clothing, individual equipment, tentage, organizational tool sets and tool kits, hand tools, small arms, administrative and housekeeping supplies, and equipment.

⁵ Major end items, which are the combination of end products assembled and configured in their intended form and ready for use (e.g., launchers, tanks, mobile machine shops, vehicles).

policies, and ultimately will also leverage UII for management within their specific processes and AIS.

Governance

Implementation planning for IUID resides within several organizations. Technical authority for incorporating IUID marks on equipment lies with the Program Manager or Product Group Director (PGD) responsible for Total Life Cycle Systems Management (TLCSM). Marine Corps enterprise IUID implementation planning resides within several organizations: Deputy Commandant for Installations and Logistics (I&L) Facilities and Service Division (LF) for garrison property, Naval Air Systems Command for aviation equipment, the USMC Enterprise IUID Working Group (EIWG), chartered by Headquarters USMC, I&L Department, and Commander, Marine Corps Systems Command for ground tactical equipment⁷. A designated USMC Program office for IUID will:

1. Translate USMC enterprise requirements for IUID implementation into USMC enterprise standards for USMC ground equipment and AIS.
2. Certify IUID compliance of USMC and Joint programs with USMC applicability against DoD and USMC enterprise IUID standards.
3. Execute the IUID implementation tasks that are not weapon system-specific, such as acquisition and life cycle management of IUID-capable marking equipment or software, as formal acquisition programs.
4. Provide expertise and integration support to other initiatives and Program Offices for implementing IUID-based process improvements to maximize benefits of IUID in PA, IIM, and PLM.

2. INTRODUCTION TO IUID

There are great efficiencies in management of items and their data by sets with common characteristics or in a common configuration. For example, NSN can identify any number of items that qualify the functional characteristics defined for that NSN during the *Cataloging*⁸ process. Often, to manage a specific design within an NSN, a combination of *Part Number* and the manufacturer's Commercial and Government Entity (*CAGE*) code are used within AIS. The Marine Corps also assigns Table of Authorized Materiel Control Numbers (*TAMCN*) to groups of equipment with common capabilities, or configurations.

⁶ Repair parts (less class VIII), including components, kits, assemblies, and subassemblies (reparable and nonreparable), required for maintenance support of all equipment.

⁷ Specific organizational roles and responsibilities for USMC tactical ground equipment are defined in MCO 4410.28.

⁸ Cataloging (called *Codification* in NATO) is part of the (Logistics) Supportability Analysis during the acquisition process as described in MIL-HDBK-502 Acquisition Logistics.

Serialized Management

Although the ability to manage design or aggregated data at a capability, design or configuration level is useful and economical, no two items within the managed populations are truly identical. Additionally, accounting for a population of items in aggregate will only identify how many are missing, not which ones, or who last accounted for the missing ones. Serialized management within these populations allows managers and leaders to account for specific assets, track pending maintenance and supply actions against the correct item, and identify the best candidates for deployment, retirement, upgrade, overhaul or life extension. Additionally, understanding characteristics of individual assets provides increased insight into the aggregate population such as distribution of failures, ages, and costs around the respective means (averages) that are critical in planning, prediction, design and decision support. Until IUID, no enterprise Marine Corps or single DoD standard existed for serialized management. This has led to employment of a multitude of schemas and combinations such as *Original Equipment Manufacturer (OEM) Part Number/OEM Serial Number, TAMCN/USMC Serial (or Registration) Number or Unit Identifier/Locally assigned serial number* for serialized identification of items within a program, community, unit, or AIS. These schemas are rarely interoperable for data sharing across AIS, can become outdated when a part number, TAMCN, or NSN changes, and allow duplicate assignment of an identifier to more than one unique item.

IUID serialization methodology

By defining UII as the single standard for serialized management, the DoD enables a common means of identifying serialized items across all AIS, vastly simplifying data discovery and sharing across business processes and organizations. Since success requires that each UII relates to only one item, IUID policy has two means to ensure uniqueness of each assigned UII. First, a federated system of UII generation allows vendors, government organizations and third party providers use their own identifiers such as CAGE, DoD Activity Address Code (DODAAC), or Data Universal Numbering System (DUNS⁹) number as an *Enterprise Identifier*. These *Enterprise Identifiers* are guaranteed by their generating authorities to be uniquely assigned to a single entity. These entities are to develop business processes that assign a serialized number to only one item, which will be concatenated¹⁰ with their *Enterprise Identifier*, to form the UII. Separately, UII equivalents such as Vehicle Identification Number (VIN) or Electronic Serial Number (ESN) can be used since they fit the data element field requirements for UII, and are

⁹ DUNS is used for business registration by Dun and Bradstreet.

¹⁰ Concatenation is the linking together of multiple data elements into a single data element. For UII, this is done using ISO/IEC 15434 syntax, and ISO/IEC 15418 semantics.

also guaranteed unique by their respective generating authority. The second step in ensuring uniqueness of UII is registration of each UII in the *DoD UID Registry (herein referred to as Registry)*. This Registry only allows one instance of each UII to be registered, and relates them with their respective pedigree¹¹ data. In short, IUID policy and business rules provide a flexible means to generate UII using existing organizational *Enterprise Identifiers* or UII equivalents, and require that services maintain records in the Registry for each UII or equivalent, even after disposal.

IUID Scope within Marine Corps AIS

To capture, use, and sustain UII and serialized item data, the Marine Corps requires incorporation of IUID capabilities across the *Marine Corps Enterprise Network*¹², including AIS compliance and AIT. The Marine Corps must be capable of both collecting and maintaining pedigree and mark information for each uniquely identified item in order to enable creation and sustainment of IUID marks. OSD policy and IUID business rules also require Marine Corps AIS¹³ to update the Registry when relevant life-cycle events occur. To enable speed and accuracy in life cycle processes, all AIS transactions shall use AIT for identification, and use the UII where necessary to automate data collection from Authoritative Data Sources (ADS) in lieu of manual entry¹⁴. Marine Corps processes must also be capable of fusing and synchronizing relevant data across related AIS and the Registry. IUID will be key in transacting data between AIS which track individual items, within the Marine Corps, and with Joint, allied and commercial partners.

Automated Identification Technology (AIT)

The automated capture and interpretation of the UII data in the *data matrix symbol* improves both speed and accuracy of identifying items, eliminating the need for time-consuming and error-prone manual data entry. AIT such as handheld optical scanners will be used whenever possible for identifying items, and initiating item-related transactions in lieu of manual data entry or paper-based processes. AIT increases data quality and reduces data entry time. For example, data collected from a Marine Corps use case¹⁵ showed an 86.1 percent improvement

¹¹ Pedigree data is a combination of data elements to describe an individual item, and distinguish it from all other like and unlike items, i.e. part number, USMC registration number, contract number, unit cost, etc.

¹² MCO 5231.3, dated 7 April 2009 identifies Marine Corps Enterprise Network as the USMC physical manifestation of net-centric warfare doctrine under the Global Information Grid (GIG).

¹³ This and other IUID-enabling functions are requirements within the enterprise architecture, not every AIS, or within a single AIS.

¹⁴ See "[IUID Business Process Requirements](#)" by DASN (A&LM), May 2010 for AIS business process requirements.

¹⁵ "[MCPP-N IUID Product Life Cycle Support \(PLCS\) Pilot Program: Final Report.](#)" Lockheed Martin Corporation, April 2008.

in time to identify uniquely identified items using AIT over manual entry of UII. This same study identified a reduction in data entry errors from 11% in manual data entry to zero using AIT. Once items are marked and AIT implemented, business area impacts can be achieved. In another example, AIT-enabled process improvements for initial issue generated a 97% reduction in time, an 18% improvement in accuracy, and a 15% gain in data quality during an Armory Automation lean-six sigma project¹⁶ at the Marine Corps School of Infantry-West.

Basics and Benefits of the IUID Data Matrix Symbol

In design of the IUID standards and policy, DoD planners decided that all items to be registered with UII or equivalents shall also be physically marked with an ECC-200 *data matrix symbol* (see Figure 1) to enable the benefits of AIT. This form of barcode is superior to others due to its data storage efficiency and error correction capability. IUID marks are up to a 50 character data string that can be formed into a readable *data matrix symbol* as small as 2-3 millimeters square, many times smaller than one produced with linear (code 39) barcodes used in military shipping labels. Additionally, the inherent error correction in the ECC-200 *data matrix symbol* enables data capture with up to 30% of the symbol damaged or missing. Although the ECC-200 *data matrix symbol* is used in applications other than IUID, AIT can easily discern an encoded UII from other data that may be in a second *data matrix symbol* on an item.

IUID Scope within Marine Corps Ground Equipment

The Marine Corps will comply with DoD IUID policy requiring all new items meeting the criteria in Defense Federal Acquisition Regulation Supplement (DFARS) clause 211.274-2¹⁷ to be IUID marked and registered in accordance with DFARS clause 252.211-7003. This means that all Marine Corps acquisition and equipment maintenance or modification contracts will include the DFARS clause 252.211-7003 to require the contractor to mark and register items meeting the DFARS 211.274-2 criteria before delivery to the Marine Corps. For “*legacy*” equipment, meaning that which pre-existed this contract condition, the Marine Corps has implemented marking capabilities to capture these items that meet the Marine Corps criteria for legacy marking. The criteria for legacy items differs from that of DFARS 211.274-2 for new acquisitions because the value of using the UII must be greater than the cost in marking and registering the item. Specifically, the Marine Corps will not mark legacy items purely based upon the unit acquisition cost. Items planned for legacy marking are all items that are serially managed where: a) the item group (i.e. NSN) is not near retirement from the inventory, and b) the

¹⁶ Armory Automation: Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) Analysis. Skylla Engineering. 11 September 2009.

¹⁷ See Appendix C for a direct citation of the DFARS 211.274-2 clause defining OSD IUID thresholds for new items.

application of a data plate or label is technically feasible for the physical characteristics and function of the item. The Marine Corps supports DoD plans to identify all IUID relevant items through use of a code in the Federal Logistics Information Service (FLIS) that will be assigned during the cataloging process or, for legacy items, by action of the appropriate Program Manager or Primary Inventory Control Activity (PICA). This FLIS code will provide a DoD standard information source to clearly identify whether an item should be assigned a UII.

3. PURPOSE – THE NEED FOR IUID

Challenges Addressed

The inception of IUID within OSD was intended to improve property accounting, valuation, reporting, and auditability for the \$407B¹⁸ worth of *Military Equipment*¹⁹. This basic need for enhanced property valuation and accountability requires precise identification, location and linkage to data from original acquisition contracts to disposal. In order to affect this, information from financial management, acquisition, and inventory management AIS needs to be available for each serialized item. Given the myriad of relevant AIS, and constant flux of equipment into the inventory, between units, services, to/from contractors as Government Furnished Property (GFP), and disposal – there was no existing suitable standard for common identification and information sharing on serialized items.

Beyond Accountability

With the eventual development of the IUID standard and business rules to support enhanced Property Accountability (PA), came identification of additional areas within item management and lifecycle management where IUID has value potential. After many pilot projects, OSD policies and limited operational IUID use, OSD initiated a task force to clarify ambiguities in IUID policy, refine IUID requirements and proposed value. As a result, the OSD IUID task force clarified the overall value of IUID to be within 3 value streams: *Property Accountability*, *Intensive Item Management*, and *Product Lifecycle Management*. Improved ability to serially identify and manage items in these value streams using IUID was estimated to save \$3-5 Billion annually across the DoD.²⁰

¹⁸ Source: Fiscal Year 2009 DoD Financial Statement.

¹⁹ Military Equipment is a subset of Capital Equipment, defined as weapon systems which are used directly by the U.S. Armed Forces to carry out battlefield missions.

²⁰ Source: OSD IUID Task Force Joint Logistics Board Brief v31.

Marine Corps Applicability

Within the Marine Corps, analyses to support modernization initiatives such as *Sense and Respond Logistics*, *Total Life Cycle Management*, and *Continuous Process Improvement* need greater fidelity of data than is currently available on Marine Corps ground equipment. Insight into the location, status and history of individual items is critical to understanding when actions such as replacement, upgrade, or overhaul are needed for an individual item or across a TAMCN. This becomes more profound as the Marine Corps uses equipment well past its design life, employs critical low-density assets, and maintains systems that had abbreviated Supportability Analyses because of Urgent Universal Needs Statements (UUNS) in order to expedite employment in *Overseas Contingency Operations*.

USMC IUID Value Proposition

Once a critical mass of UII exist, and the capability exists to maintain these baseline marks and the pedigree data set, it can then be leveraged to enable the IUID value streams through policy, process and AIS changes. These changes shall exploit the advantages of having additional fidelity available when “drill down” capabilities are available beyond fleet averages. New tools and processes are required to analyze and present the new data sets available to readily identify conditions that are out of tolerance from specified levels. For example, a fleet’s average reliability may be affected by a few “bad actors” that are in need of overhaul, or removal from service due to age, wear, or faulty production lots. These “bad actors” require disproportionate maintenance and supply resources and are detrimental to readiness. These conditions are often hidden when items are managed in aggregate as a Part Number or NSN. A repairable item’s use and maintenance history can be tracked within AIS to automatically flag items with high maintenance to operation ratios, signaling intervention for investigation or disposition.

4. END STATE – WHAT CAPABILITIES MUST IUID PROVIDE

Success for IUID will be when AIT and ubiquitous IUID *data matrix symbols* automate and streamline local and enterprise processes, meanwhile collecting and sharing item current and historical attributes to stakeholders. Mature processes for collecting and updating item pedigree, mark and attribute data will operate in the background, providing local generation or refresh of IUID marks at supply chain and sustainment nodes as a course of normal business. Item status and historical data will be discoverable and usable by stakeholders across acquisition, financial management, requirements, operations, logistics and sustainment functional areas. IUID will be designed into new weapon systems and their sustainment planning, with its quality verified and challenged through contractor and government audits, testing, and milestone reviews.

IUID Enhancing Property Accountability (PA)

Improvements in PA benefit the Marine Corps through improving each unit's ability to employ all assets assigned to them, as well as demonstrating reliable stewardship of valuable assets to taxpayers and their elected representatives. With IUID, modest improvements to PA can be achieved through use of the associated AIT and the serialized data collection and sharing as it is applied to PA and related life cycle management activities. To support valuation needed for new *Property, Plant and Equipment (PP&E)*, to include *Military Equipment (ME)* related *Statements of Federal Financial Accounting Standards (SFFAS)*²¹, financial transaction details for upgrades or service life extension programs can be available to adjust the value or impact depreciation schedules tied to item-specific service entry dates. As items enter or leave the service inventory, are modified, damaged, accumulate hours, rounds, miles or expend life units in any prescribed manner, IUID can be used in allocating these adjustments to individual asset values, which are then rolled-up into Marine Corps and DoD financial reports. The physical inventory process will be AIT and IUID enabled, and therefore significantly faster and more accurate. These inventory checks are augmented with each instance of scanning an IUID mark – this information will be captured and available to assist in locating an item within the inventory, even through relation to shipment documents or RFID tags for locating items in storage or in movement. For example, an item is missing during a unit “wall to wall” inventory, but is identified when a third party logistics provider scans the item within its frustrated cargo, and returns it to the unit. Financial audits for validating attestations of assets within the inventory will simply be discharged through swift, accurate, and repeatable location of items within the appropriate Accountable Property System of Record (APSR)²² by its UII. During property transfers, IUID will be the key enabler to migrate relevant data when transferring custodianship or accountability for each asset.

IUID Enabling Intensive Item Management (IIM)

The IIM value chain proposition focuses on the value of using the UII to intensively manage and control critical and sensitive items. Whereas PA requires accurate identification and tracking of items for their value, IIM leverages IUID to manage and track items that are critical to safety or are sensitive to National Security. Future state using IUID requires sensitive items to be tracked by their UII within AIS, leveraging AIT during transactions. Depending upon the sensitivity and the policies for managing the item, additional complementary technologies such as RFID,

²¹ SFFAS No. 23, Eliminated the *National Defense Property, Plant and Equipment (PP&E)* category, and reclassified ME as *General PP&E*, requiring that ME be capitalized (depreciated) on DoD's financial statements.

²² APSR is a service designated AIS authoritative source for equipment accountability. Refer to DoDI 5000.64 for requirements and details regarding APSR.

satellite tracking, Common Access Card (CAC)²³, and biometrics can be utilized when needed to link an item to its physical location, condition, or reportable custodian. This is exemplified through IUID automation of Marine Corps armory assets. Association of a weapon or optical device using IUID with the CAC or fingerprint of individual Marines not only improves the speed and accuracy of weapons issue and receipt, but also simplifies Marine Corps-wide *Crane Weapons Report* generation, daily inventory counts, and associates each item not present at the physical inventory with the Marine who has it checked out. This will preclude unnecessary measures to search for a weapon by rapidly identifying who last issued the weapon, who it was issued to, or where it was last stored in the rack. Similarly, IUID will improve IIM through enhanced management of Marine Corps critical safety items through accurate capture and relation of use, inspection, and maintenance history of items whose failure poses a serious safety risk to Marines. Safety investigations will be aided through extensive histories of each similar item to identify both the root cause of failures, and likely candidates for failures due to similar conditions such as production lot, age, overhaul cycles or maintenance having used a tool that was out of calibration tolerances. This will improve the speed and accuracy of safety investigations, as well as add precision in defining the affected population requiring remediation.

IUID Enabling Product Lifecycle Management (PLM)

Management of Marine Corps ground equipment has traditionally not had the requirement to actively manage serialized equipment to the extent of the aviation and nuclear communities within the Department of the Navy. Although the serialized management schemas employed in these communities were driven through safety and security measures, they provided a means for data collection and analysis supporting Product (equipment) Lifecycle Management (PLM). Through IUID enabled identification, life cycle event data collection and sharing, the Marine Corps will have volumes of history on each item to better understand and manage items within an NSN, TAMCN, or part number. IUID-enabled PLM links failed items to the warranty terms and claim procedures on their specific acquisition contract, without exhaustive research. For example, a failed assembly is scanned upon removal from an end item. The item was delivered under an Army contract that warranted the item for 12 months or 5,000 rounds fired. IUID-enabled Data captured indicates a delivery date 9 months prior, and that only 2,717 rounds have been fired. The AIS therefore automatically generates a shipping label using the Army contract's warranty clause, files a warranty claim and sends validated historical data to the supplier in an electronic advance shipment notification.

²³ CAC is a means of Personnel Unique Identification (PUID).

In another scenario, transmission of an item's configuration, maintenance, usage, troubleshooting, and failure history to a Maintenance Center enables the depot to reduce the inspection time upon induction, tailor the overhaul to the failure, incorporate applicable modifications, and anticipate spare parts needed - therefore reducing the cost and turn-around-time of the item. Analysis modules within AIS will evaluate equipment historical data to identify prioritized candidates for depot overhaul, removal of bad actors from service, and automatically adjust program office budget estimates. Modeling and simulation tools draw upon vast data stockpiles of equipment operating profiles as well as maintenance and supply records to identify and quantify resource impacts of competing Courses of Action for design modifications, logistics process improvements, or inputs to operational employment that improve life cycle management of the equipment inventory. Condition Based Maintenance (CBM+) is enabled and continuously improved through collection and analysis of failure data, correlation of failures with operating histories and conditions, all to make adjustments to a living Reliability Centered Maintenance (RCM)-based maintenance plan.

These same capabilities can be applied in an operational context as well. The fusion of maintenance history, on-board Embedded Platform Logistics System (EPLS) sensor data from the last mission, and current environmental conditions can be analyzed using the Commander's operational plans to recommend the platforms to insert into each planned mission. Use of this information can improve the odds of mission completion for equipment when it is needed most - before starting the mission.

The scenarios highlighted provide only a glimpse of the capabilities that can be enabled or enhanced using IUID to improve the net-centricity of item data.

5. METHOD - HOW IUID CAPABILITIES ARE TO BE IMPLEMENTED

IUID defines the UII data element and format for use in all AIS and business processes, as a standardized means of identifying serialized items. Its associated *data matrix symbol* also enables AIT for use in identification and process automation. IUID will be adopted and utilized within relevant AIS and processes to relate data collected against serialized items. These AIS will also ensure a preference for accessing data for these serialized items from the ADS²⁴ using the UII as the relational data key.

²⁴ Unless operational conditions require a disconnected mode.

IUID Solution Technical Approach

IUID is the singular identity by which all pertinent serialized data shall be collected and shared across AIS. During all life cycle events where a physical item needs to be serially identified, it shall be accomplished through scanning of the IUID *data matrix symbol* using AIT. The mechanism for storage and exchange of this data shall conform to international data exchange standards, using the ISO 10303 information and activity models, Data Exchange Sets (DEXs), and message formats.²⁵ Although IUID is not reliant upon ISO 10303 Standards for Exchange of Product (STEP) data, this coupling of IUID-enhanced data collection quality with the robust information management capabilities with the ISO 10303 STEP is the key to enabling item-level data discovery, correlation, and sharing of information between users in a net-centric environment.

USMC Organizational Approach to Legacy Equipment IUID Implementation

In breaking with the DoD IUID concept of Program Manager-centered IUID implementation, the Marine Corps opted to centralize legacy marking efforts to reduce the burden on Program Managers, realize economies of scale, and standardize marking processes and materials across the enterprise. The Marine Corps EIWG coordinates plans across organizations, and designated²⁶ Marine Corps Systems Command (SYSCOM) as the executor for the legacy marking effort. Transition of EIWG overall responsibilities initiated with the promulgation of MCO 4410.28, which delineates organizational responsibilities for IUID. Per the MCO:

- I&L responsibilities focus on IUID policy and integration of IUID into the Logistics Operational Architecture and Logistics AIS;
- LOGCOM's responsibilities support IUID marking, data management and quality assurance within equipment accountability, sustainment, supply chain processes, and Marine Corps AIS;
- SYSCOM's responsibilities include integration and standardization of IUID across Marine Corps ground systems and AIT, integration of IUID in Marine Corps AIS, and managing IUID marking and registration for legacy items.

Due to the diverse requirements placed upon SYSCOM and the continued sustainment resources to execute these tasks, the IUID end state requires a dedicated program office within SYSCOM to apply long-term resources and a life-cycle approach to sustain and enhance basic IUID capabilities. This program office will be the champion within SYSCOM for accomplishing the implementation requirements, but equipment Program Managers (PM) or Product Group Directors (PGD) retain responsibility for developing and maintaining IUID Implementation Plans

²⁵ Per DoDD 8320.03 and DoN Policy Memorandum on Digital Product/Technical Data, 23 October 2004.

²⁶ With the authority of DC, I&L, and based upon input from Commander, Marine Corps Systems Command.

to describe how IUID is to be implemented as part of each system, and exploited over the life cycle in support of TLCSM of the equipment they manage. SYSCOM PM, PGD and all USMC contracting personnel will ensure the IUID marking of new acquisitions through inclusion of relevant DFARS IUID clauses on both new and existing contracts.

IUID Program Office Responsibilities

The IUID Program office will identify and ensure compliance to the basic processes of:

1. Capturing UII pedigree data
2. Creating/refreshing IUID marks
3. Registering UII
4. Sustaining USMC records in the Registry

The IUID Program office is also responsible for defining USMC business rules and standards for:

1. IUID marking-related hardware and software*
2. USMC interfaces with the Registry*
3. Minimum IUID "Compliance" for AIS and IUID-enabled data exchanges*
4. IUID mark "verifiers" and AIT used for reading IUID data matrices
5. Training requirements for USMC personnel on IUID and IUID-specific AIS

* Approval for these business rules and standards will be by I&L

The IUID Program office will assist and identify for I&L certification all organizations' AIS²⁷ who manage USMC IUID data, for compliance to the above standards. The IUID program will also work with I&L to authorize and manage the IUID-related transactions for USMC ground equipment to the Registry or other external AIS, to avoid missing or duplicate transmission of transactions supporting IUID business rules.

Additionally, the IUID Program office will implement an integration strategy developed in conjunction with I&L for IUID into processes and the enterprise architecture through use of interim tools and long-term assistance in process and AIS re-engineering. Similarly, the IUID Program will be responsible to augment resourced AIT implementation plans with funding for unique demands that are required to enable IUID basic and value stream processes.

²⁷ This is to include USMC organizations, as well as vendors, joint and allied services that use or manage USMC IUID related items.

IUID Program Funding Approach

IUID crosses organizational and functional boundaries, and it leverages existing technologies such as AIT and AIS. Due to this, the Marine Corps should fund the IUID Program office to establish and sustain IUID marking and data management capabilities, as well as to offset the additional requirements levied upon AIT and AIS to support value stream implementation. The Program office will not “own” the AIT, AIS or processes, but provide input and identify requirements for funding to implement IUID requirements. This approach provides for commonality of equipment and economies of scale with the leveraged AIT or AIS program, without dividing the funding for IUID capabilities across multiple programs.

IUID Basic Processes

To establish a foundation for IUID-enabled value streams, there must be a critical mass of items marked and registered. The Marine Corps must be able to capture IUID-related data on items delivered with IUID marks, create and sustain IUID marks and related pedigree data at the Registry. The Marine Corps requires the capability to mark²⁸ items at sustainment nodes, namely Logistics Command (MARCORLOGCOM) maintenance centers, Blount Island Command, and joint, allied or commercial repair facilities. Additionally, to rapidly address the preponderance of legacy marking required on reparable items as well as to provide quality assurance on IUID marks during the receipt and acceptance process, the Marine Corps requires an IUID marking capability at nodes within the logistics chain, primarily, within each Marine Expeditionary Force (MEF) and at LOGCOM Fleet Support Division (FSD). Initially²⁹, the Marine Corps will employ Mobile Marking Teams (MMT) to rapidly mark and register principal end items, creating an initial IUID-compliant population in GCSS-MC to serve as the building blocks for IUID-enabled value streams. In order to mark and refresh (recreate) damaged or missing marks across the sustainment and logistics nodes, the Marine Corps must maintain a repository of *marking instructions*. This repository must be accessible to all marking activities, and contain instructions for both legacy items and those marked by the suppliers or joint service before delivery to the Marine Corps inventory. These instructions and the IUID data relative to each marked item must be managed throughout the lifecycle of the items, and provide updates to the Registry as required by OSD Policy.

In addition to capturing and sustaining marking instructions, the Marine Corps must maintain an ADS for the UII with linkages to its pedigree data, to support creation and registration of UIIs, and to maintain the data in the Registry. A phased approach will be employed to support

²⁸ Marking capability includes marking and registering of new marks, and replacement (refresh) of damaged or missing marks.

²⁹ Planned between 2009-2012.

the transition of the data currently stored in the USMC Temporary Data Storage (TDS) into a permanent Marine Corps enterprise level ADS which can support or interface with AIS that support IUID basic and IUID enabled functions. This data system will be the ADS for all USMC UIIs, to include those which were assigned by item manufacturers or suppliers.

The goal of the IUID *basic processes* is to opportunistically mark or sustain IUID marks on items during each supply, maintenance, and sustainment event, without impacting operations. The relationship of the IUID basic processes as foundational to the IUID value streams and higher order capabilities is depicted in Figure 2.

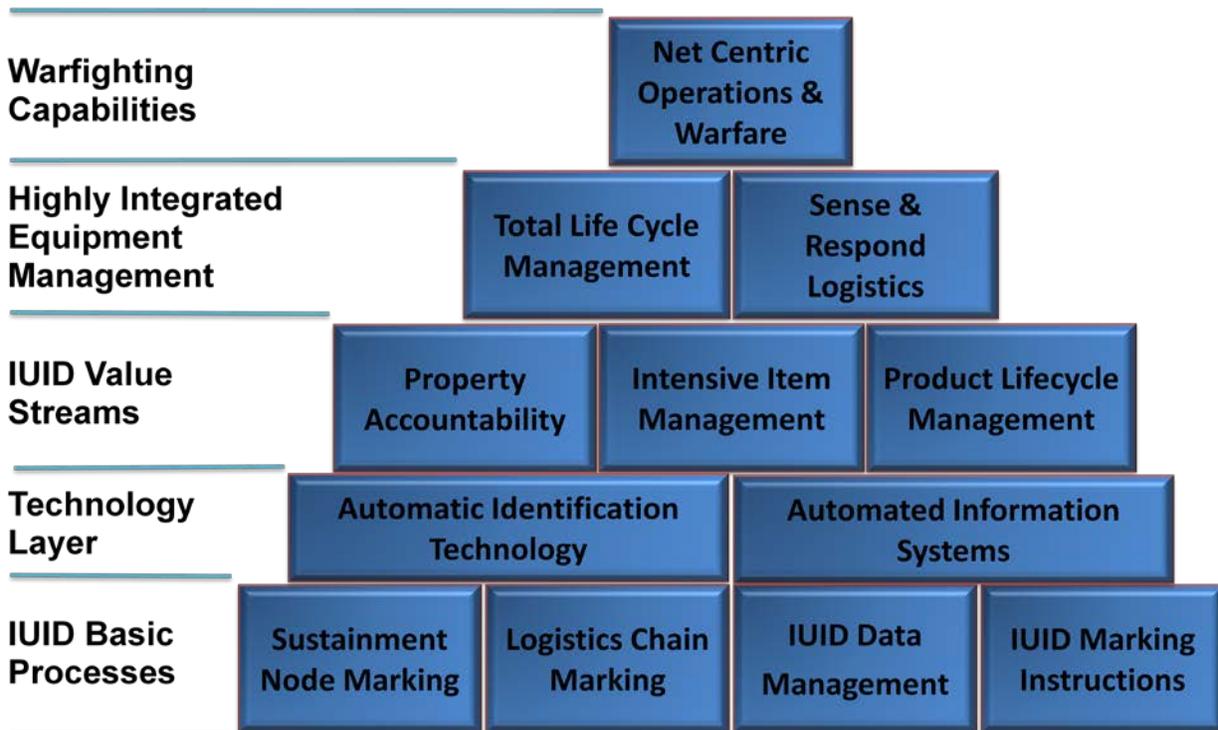


Figure 2: Relationship of IUID Basic Processes and IUID-Enabled Capabilities

IUID Program Path to Success

A phased approach is needed to address integration into Marine Corps processes and their supporting AIS. Initially, a basic IUID functionality will be established to generate IUID marks and sustain IUID pedigree and mark data. A second phase will utilize “off-the-shelf” bridge systems, middleware, edge ware and other technologies to rapidly enable IUID in processes to achieve initial IUID enabled benefits where legacy AIS are not IUID compliant. In parallel, a third phase will be initiated through modernization and formal *Software Change Requests* to wholly integrate and leverage IUID within AIS supporting value chain processes. These second and third phase efforts entail detailed consultation with process and AIS “owners” across the enterprise to collaborate on technical implementation methodologies, and lessons learned in

policy, training, and resource planning. These phases will not occur serially, but overlap in a manner to provide early capabilities where possible, and optimized solutions as early as economically possible.

Growth beyond Initial Focus Areas

As stated in Section 1 of this CONOPS, the initial priority of IUID value stream implementation is for ground tactical equipment in supply classes II, VII and IX. Once the value streams are enabled for this population, The IUID Program office will review management requirements, systems and processes for additional classes of supply for implementation of these value stream benefits.

IUID Implementation Path Within the Value Streams

True benefit is derived from IUID when the basic functionality is mature, and IUID is applied within business processes. As the original OSD driver for IUID, PA is the initial focus for implementation of IUID within the value stream processes. Although IIM and PLM value stream IUID incorporation will be worked in parallel, the primary focus will be to enable the improvements in accountability and financial reporting benefits planned through IUID. The EIWG will work with the IUID Program office to identify working groups responsible for each value stream to coordinate policy, plans and schedules with Joint services, IUID Program office, AIS and Marine Corps process “owners.” Processes, AIS transactions and data flow will be mapped for each process, with tailored solutions developed to integrate IUID within the process to ensure that the fidelity, utility, and discoverability is retained through the information “chain of custody” across legacy AIS. Near-term fixes can be employed using bridge systems, keyboard wedges, middleware, etc. that are readily available commercially or as Government “Off The Shelf” (GOTS) products. These near-term solutions will be employed to IUID-enable processes where needed to speed release of the new capability while longer-term implementation may require business process re-engineering or while awaiting planned replacement of legacy AIS. IUID implementation within new or modified systems is assisted with the mandatory IUID compliance during the Investment Review Board (IRB) process. The IUID Program office will collaborate with AIS planners during this IRB process to assist with compliance and include process improvements to leverage new capabilities which are included in AIS changes.

IUID Enabled Property Accountability

Implementation of IUID within PA requires acquisition of IUID *data matrix symbols* using AIT whenever an item is identified within Marine Corps APSRs. Additionally, IUID must enable

electronic property record management and transfers within the Marine Corps, to joint or allied services, and as GFP to contractors. The IUID Program will develop an IUID-enabled PA system view and implement changes to rapidly employ IUID in enhancing Marine Corps PA.

IUID Enabled Intensive Item Management

IUID-enabled IIM requires coordination and planning by the IUID Program office with the communities that are responsible for management of these sensitive and critical safety items. Similar to PA implementation, a focused review of policy, respective AIS and plans is required. IUID enabled process improvements, software or policy changes will be coordinated with the respective communities. Initially, the IUID Program will collaborate with small arms PMs to support IUID enabled IIM of weapons and optics through support for Armory Automation efforts.

IUID Process Improvements in Product Lifecycle Management

An extensive effort is required to implement IUID-led improvement to Marine Corps PLM processes, such as: *RCM, CBM+, Performance Based Logistics (PBL), Warranty Management, Configuration Management, Product Recall, and Counterfeit Parts Management*. The calculated benefits of IUID enabled PLM are also substantial³⁰: weapon system/equipment readiness improvements between 4% to 6%, DoD savings between \$3 billion to \$5 billion annually, and non-trivial reductions in safety mishaps and other risks. Due to the many functional areas, organizations, and processes involved in PLM, a diverse array of solutions will need to be developed, and a coordinated plan will be developed to enable IUID within the various initiatives using a phased approach. The individual process maps and AIS interfaces will be developed and reviewed by the IUID Program office to prioritize AIS and data elements to leverage IUID for sharing. This domain benefits the most from simplification of architecture using the ISO 10303 STEP standards for information model, activity model and messaging. These standards complement IUID to enhancement of PLM, through providing the framework for linking data collected in maintenance planning, contracting, budgeting, operations, logistics and sustainment chain activity in a discoverable and useful manner across the enterprise.

6. SUMMARY

IUID provides the basis for standardized life cycle identification of serialized items across the DoD. Its simplicity and permanence allows for limitless data to be acquired and related to an item over its life. Its machine readability reduces administrative burden on Marines, improves

³⁰ Implementation of item unique identification in DoD logistics processes. Logistics IUID Task Force, June 8, 2010.

data quality, and enables process automation. IUID is a simple concept that has complex implementation requirements due to its broad applicability across classes of items, operational, acquisition, sustainment, and commercial organizations and their AIS. The benefits of IUID are only limited by the scope to which it is leveraged within life cycle management or operational processes. This CONOPS describes the Marine Corps plans to deliberately introduce basic IUID capabilities and a logical path for integration of IUID within value streams that serve to benefit stakeholders across the span of equipment lifecycles, especially the Marine Commanders and Marines who depend on these items to accomplish their missions.

Appendix A: Definitions

Accountable Property System of Record (APSR): a service designated AIS authoritative source for equipment accountability. Refer to DoDI 5000.64 for requirements and details regarding APSR

Cataloging (called *Codification* in NATO): a part of the (Logistics) Supportability Analysis during the acquisition process as described in MIL-HDBK-502 Acquisition Logistics

Concatenate: Concatenation is the linking together of multiple data elements into a single data element

IUID Marked: an item that has a physical mark, has pedigree data captured in a Marine Corps designated AIS, and the item has been registered in the OSD UID Repository

Legacy Item: An item that exists in the Marine Corps inventory, which meets the IUID requirements, but was not marked before delivery to the Marine Corps.

Military Equipment: a subset of Capital Equipment, defined as weapon systems which are used directly by the U.S. Armed Forces to carry out battlefield missions

Pedigree data: a combination of data elements to describe an individual item, and distinguish it from all other like and unlike items, i.e. part number, USMC registration number, contract number, unit cost, etc.

Appendix B: Acronym List

ADS – Authoritative Data Source
AIS - Automated Information System
AIT- Automatic Identification Technology
APSR – Accountable Property System of Record
CAC – Common Access Card
CAGE – Commercial And Government Entity
CBM+ - Condition Based Maintenance
CONOPS – Concept of Operations
DEX – Data Exchange Set
DFARS – Defense Federal Acquisition Regulation Supplement
DOD – Department of Defense
DODAAC – Department of Defense Activity Address Code
DUNS – Data Universal Numbering System
EIWG – Enterprise IUID Working Group
FLIS – Federal Logistics Information System
FSD – Fleet Support Division
GCSS-MC – Global Combat Support System – Marine Corps
GFP – Government Furnished Property
I&L – Installations and Logistics
IIM – Intensive Item Management
IRB – Investment Review Board
IUID – Item Unique Identification
LOGCOM – Logistics Command
MEF – Marine Expeditionary Force
NSN – National Stock Number
OEM – Original Equipment Manufacturer
PA – Property Accountability
PBL – Performance Based Logistics
PG09 – Product Group Nine
PGD – Product Group Director
PICA – Primary Inventory Control Agency
PLM – Product Lifecycle Management
RCM – Reliability Centered Maintenance
RFID – Radio Frequency Identification
STEP – Standards for the Exchange of Product (Data)
TAMCN – Table of Authorized Material Control Number
TLCMSM – Total Life Cycle Systems Management

VIN – Vehicle Identification Number

UII – Unique Item Identifier

UUNS – Urgent Universal Needs Statement

Appendix C: Detailed Description of IUID Basic Functionality

The 4 basic functions required for IUID are:

- 1) Capturing UII Pedigree Data
- 2) Creating/Refreshing IUID Marks
- 3) Registering UII
- 4) Sustaining UII records in the Registry

1) Capturing Item Pedigree Data:

Although the intent is the same, the process and depth of pedigree data available for capture on legacy items is quite different. The need for IUID is partly driven by the current difficulty in relating serialized information from acquisition, accountability, and physical markings on items. For this reason, the incremental cost of legacy pedigree data capture is greater than that of new acquisitions. The process used to collect this information for legacy items includes collection of data available through current AIS, with validation and final population of records in AIS³¹ during the act of marking legacy items.

For newly acquired items, or IUID compliant items transferred from other military services,³² this requires electronic communication of IUID information through Wide Area Workflow (WAWF) Defense Logistics Management System (DLMS)³³ transactions when new equipment is delivered to the Marine Corps, or provided as GFP to contractors.

2) Creating/Refreshing IUID Marks:

To mark items with the IUID data matrix symbol, the Marine Corps requires the ability to generate IUID data matrix symbols that contain item-specific information, such as the original manufacturer's serial number. To enable this, data label production capability must be present at each organic and commercial sustainment or logistics chain node. Additionally, item pedigree data must be accessible to all marking activities in order to create UII, item records, or to refresh worn or missing IUID marks on items by replacing IUID marks with an identical data matrix symbol and relevant *Human Readable Information*.

3) Registering UII

In order to assure global uniqueness of UII, and provide a single repository for all IUID items, the DoD requires all UII to be registered in the Registry. Additional data elements used to uniquely identify the item; its pedigree, Warranty information, and its status as GFP are captured within the item's record in the Registry. Due to the inconsistent availability of

³¹ This AIS function is currently performed by the USMC contracted Temporary Data Store (TDS).

³² This includes both US and allied forces.

³³ WAWF DLMS messages use Extensible Markup Language (XML) in American National Standards Institute (ANSI) X12 standard formats.

information on legacy items, only a subset of these data is mandatory for registering legacy items.

4) Sustaining UII Records in the Registry

DoD policy requires that services maintain the Registry data related to the items in their custody. The Marine Corps, therefore, has a requirement to identify the life cycle events and configuration changes that trigger an update to an item's Registry record, and provide the updated information to the Registry in an OSD defined format. The Marine Corps plans for this function to be automated within GCSS-MC.

Appendix D: DFARS 211.274-2 Policy for Unique Item Identification

(a) It is DoD policy that DoD unique item identification, or a DoD recognized unique identification equivalent, is required for—

(1) All delivered items for which the Government's unit acquisition cost is \$5,000 or more;

(2) Items for which the Government's unit acquisition cost is less than \$5,000, when identified by the requiring activity as serially managed, mission essential, or controlled inventory;

(3) Items for which the Government's unit acquisition cost is less than \$5,000, when the requiring activity determines that permanent identification is required; and

(4) Regardless of value—

(i) Any DoD serially managed subassembly, component, or part embedded within a delivered item; and

(ii) The parent item (as defined in 252.211-7003(a)) that contains the embedded subassembly, component, or part.

(b) Exceptions. The Contractor will not be required to provide DoD unique item identification if—

(1) The items, as determined by the head of the agency, are to be used to support a contingency operation or to facilitate defense against or recovery from nuclear, biological, chemical, or radiological attack; or

(2) A determination and findings has been executed concluding that it is more cost effective for the Government requiring activity to assign, mark, and register the unique item identification after delivery of an item acquired from a small business concern or a commercial item acquired under FAR Part 12 or Part 8.

(i) The determination and findings shall be executed by—

(A) The Component Acquisition Executive for an acquisition category (ACAT) I program; or

(B) The head of the contracting activity for all other programs.

(ii) The DoD Unique Item Identification Program Office must receive a copy of the determination and findings required by paragraph (b)(2)(i) of this subsection. Send the copy to DPAP, SPEC ASST, 3060 Defense Pentagon, 3E1044, Washington, DC 20301-3060; or by facsimile to (703) 695-7596.