Image designed by TSgt James D. Smith, USAF

UID: *BUILDING THE PERMANENT FOUNDATION*

Jon Andresen

The military of the 21st century must be more efficient than the one from the last century. But without fast and accurate data, complex and expensive decisions are left to a force of personality instead of clear thinking, facts, and reality. Fast, accurate data must be considered the foundation of any future military. Data must be common, accurate, and shareable. The DoD's UID (Unique IDentifier) Policy addresses this issue by defining a common set of data for every expensive, serialized, tangible part—a social security number that will stay with that part from cradle-to-grave. It will form the foundation of all serial number tracking systems, Total Asset Visibility systems, and every DoD logistics system in the future.

Without fast and accurate data, complex and expensive decisions are left to a force of personality, not to clear thinking, facts, and reality. Eleven new Enterprise Resource Planning (ERP) modernizations programs are in process across the services, but only one has been cutover—the other imminent cutovers are postponed until the first 2003 cutover can be stabilized. What is one of the reasons for the instability? Existing data must be cleaned up before it can be loaded into the new system. But that actually begs the question concerning current and future data going into the system—will it be clean? Will it be accurate? Will it be timely? Fast, accurate data must be considered the foundation of any future military, not Congress, not personalities, and not new ERP systems, unless they address this fundamental problem: is the data common, is the data accurate, and is the data shareable?

The Department of Defense's (DoD's) UID (**U**nique **ID**entifier) Policy begins to address some of these issues by defining a common set of data for every expensive, serialized, tangible part—a social security number, if you will, that will stay with that part from cradle-to-grave, and it will form the foundation of all serial number tracking

systems, Total Asset Visibility systems, and every DoD logistics system in the future (see Figure 1).

THE BUSINESS PROBLEM

Why are we doing this UID thing? Is serial number tracking not sufficient? Frankly, no; it is not sufficient! Serial numbers are not unique within themselves (how many serial #100s are there in the world?). Serial numbers within part numbers are not unique either, because part numbers, though probably unique within one company, are not unique across all companies. Additionally, over time, many expensive parts get modified and upgraded, causing their part number to change. This change is usually small—maybe adding an alpha character or a "-3" following the old part number, or both—but our computer systems do not look at two part numbers and say, "Those are pretty close." They are either exactly the same or there is no match.

Do parts already have enough identification on them? Yes, they do, and that is another problem. They have ***too much*** identification, and it confuses all but the experts in such matters. Parts may have a part number and a serial number. They may have a systems integrator's part number or assembly number. They may have a national stock number, a contract number, a manufactured date, a warranty expired date, and many other important, but very temporary, numbers that are applied to the box, hand-written on the part, or wire-wrapped to the part to track it through field, depot, or original equipment manufacturer (OEM) maintenance operations. These constitute various nicknames for the part, but none of those numbers uniquely identify that particular part across the

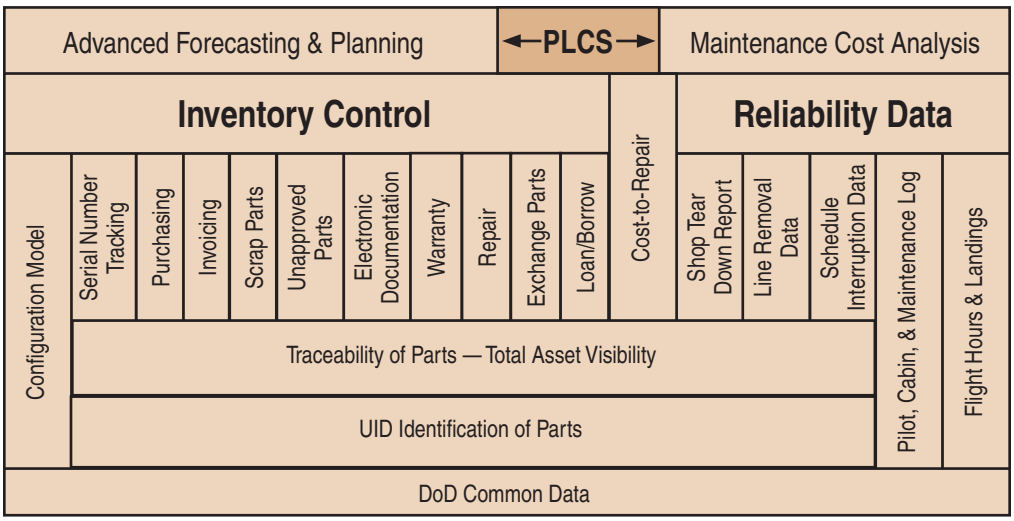

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FIGURE 1. FUNCTIONAL AND DATA ARCHITECTURE BASED ON UID DATA

supply chain. In an open-systems world we now live in with parts flowing all over the world, this is a highly "inefficient" way to do business.

The parts identification and tracking situation is equivalent to your retirement benefits going into a retirement bucket in Washington, DC based on your nickname. Your name is Robert J. Smith; or is it just Robert? or Rob? or Bobby? or Bob? or BJ? or Smitty? or… Nicknames, though endearing to those who use them, are not a good way to accurately identify something over a long period of time. We need to give the part a social security number that provides a universally unique identity for very expensive parts over their entire life. The International Standards Organization (ISO) and other industry segments have developed solutions for that. The Department of Defense's solution is called Unique Identification (UID), and it is a necessity in order to be competitive in the global economy of today's world, where better-faster-cheaper dictates core competencies, outsourcing, and the destruction of traditional ways of doing business.

THE SOLUTION

The solution that was developed creates a universally unique identification for all expensive, serialized parts coming into the DoD system. This has to be done without creating a centralized bottleneck in which an agency hands out the next unique serial number to every DoD supplier who wants one for every serialized component they make that day. The UID system was designed to allow each manufacturer or supplier of the data to follow a set of business rules to create a standardized UID on their own. This method provides the maximum flexibility for the suppliers and a minimum of business process disruption while still providing the desired result of a UID for every important component. Table 1 states what a UID is and what it is not. A proper understanding of what a UID is and is not will avoid many false starts in your own implementation efforts.

TABLE 1. WHAT IS A UID?

A UID Is:	A UID Is Not:
• A Database Data Element • A Unique Identifier for an Item • Globally Unique • Unambiguous • Permanent • Created by Concatenating Specific Data Elements	• A Medium for Communicating Data, such as Radio Frequency Identification (RFID) Tags, Contact Memory Buttons, Linear Bar Codes, or 2-D Data Matrices • A Replacement for the National Stock Number • Intelligent Data that Yield Information About the Item

HOW IS THE UID CONSTRUCTED?

The UID is a database number that uses specific data elements, like the company identifier and serial number commonly found on the data plate of a part, and the remaining UID data from a programmed lookup table. The UID is not necessarily marked on the part; it is primarily a "virtual construct" in a database, unique for each serialized item. To distinguish the UID number from the data elements that make up the UID number, the latter are called Unique Item Identifier (UII).

Basically, there are two possible constructs to create a UID. Construct 1, developed by the Air Transport Association in 1990, is the best because it is shorter, smaller, more exacting, and less confusing. Construct 1 consists of:

1. Enterprise ID, and

2. Serial number for that item that is unique within that enterprise ID.

Note that the serial number is not explicitly related to the part number. This approach begins to break the hard-wired linkage between the serial number and part number, and allows part number to change over time as modifications and upgrades are made without affecting the UID identification for that item. Approximately 1,500 companies in aerospace have made this change successfully, and it has rationalized and improved many of their internal business processes, to include the warranty, traceability, reliability, and collaborative data surrounding the part. This opens doors to continuing benefits that were previously impossible to realize.

The second method to create the UID in the database, Construct 2, requires three data elements on the part. Construct 2 consists of:

1. Enterprise ID,

2. Serial number, and

3. Original part number.

The advantage of using Construct 2 is that many companies normally serialize within the part number family so no business process changes need to occur. The downside is more data entry and data transmission are required, and businesses remain married to the old concept of interrelated serial numbers and part numbers, even though the part number may change over time and break that relationship. Also, because human-readable characters are included on the part, there may be confusion by users seeing two elements called *part number* on the part.

Table 2 provides a summary of Construct 1 and 2 approaches. Note that the *current* part number is extremely important and required on the part, but it is not used to build the UID Number. The current part number is important, but too transient to be used to build a permanent, unique identifier for the part. Parts often last for decades and can be rebuilt, modified, and upgraded a number of times to make them better. Each change

TABLE 2. SUMMARY OF CONSTRUCT 1 AND 2 APPROACHES

	UID Construct #1	UID Construct #2
Based on current enterprise configurations	If items are serialized within the Enterprise	If items are serialized within Part Number
UID is derived by concatenating the data elements IN ORDER	• Enterprise ID* • Unique Serial Number	• Enterprise ID* • Original Part Number • Serial Number
Data identified on Assets Not Part of the UID (Separate Identifier)	• Current Part Number	• Current Part Number
• The UID in the database will be prefaced by the Issuing Agency Code (IAC) representing the registration authority that issued the enterprise identifier (e.g., DLA, Dun and Bradstreet, EAN. UCC). This IAC will be derived from the data qualifier for the enterprise identifier and does not need to be marked on the item.		

will result in the current part number changing. It would be analogous to basing your Social Security Number on the company you worked for at the time; after changing your workplace numerous times over a career, correctly identifying your retirement benefits would be very difficult!

The footnote in Table 2 indicates why the data elements marked on the part are not identical to the actual UID number for that part. The Issuing Agency Code (IAC) is deduced from the Enterprise Identifier and added, by the computer system, to create the complete UID number.

PART MARKING REQUIREMENTS

Thus far, we have only discussed the UID as a computer database number, built from several data elements that are marked on the part. But how are they marked on the part? Are there DoD requirements for that? Yes; and for some companies, this is a significant and non-trivial part of their UID solution. Even though the necessary data will be shown on the data plate with human-readable characters, experience has shown that manually typing that data into a database is done with low levels of accuracy. If your social security benefits were being added to a database and they got 8 out of 9 characters correct, the entire benefit goes to some unknown person. Close is just not good enough.

The solution to getting data entered correctly is to use Automatic Identification Technology (AIT). The AIT, typically bar code technology, is at least 100,000 times more accurate than a touch typist. Accuracy is the biggest benefit, but speed and ease of use also make the end users job that much easier.

Bar codes come in two basic varieties: 1-dimensional (1D) and 2-dimensional (2D), as shown below. The 1D bar codes are the regular bar codes you are used to seeing, but the 2D format is the minimum requirement in the UID Policy. If you, your supplier, or your customer do not have 2D reading equipment, a combination data plate that has both 1D and 2D formats can be used if space allows. This would allow for easier business transitions without capitalizing a lot of new bar code imaging equipment needed to read the 2D bar codes. However, the 2D Data Matrix bar codes must be printed on data plates, permanent labels, or directly on the part.

Because human-readable text is expected with the bar coded data, the easiest thing to do on new parts would be to redesign the data plate to include the bar-coded data, along with all existing requirements for that part's data plate. Figure 2 shows one example of a UID data plate; several other versions are also possible for tagging the data. These use Data Identifiers (DIs) and Application Identifiers (AIs) instead of the Text Element Identifiers (TEIs) shown. The UID Policy and supporting guidance documents need to be read to understand other options, and the constraints of each format. These may be referenced at http://www.acq.osd.mil/dpap/uid/. All the options require the data to be formatted in a particular way in the 2D Data Matrix bar code. The MIL STD 130 or the references on the web site can provide proper guidance on these issues.

With so many different kinds of parts to be marked that live in a range of environments, and undergo varying repair and re-manufacturer processes, there are many variables to consider before permanently applying the UID-required data to the part. Without going into mind-numbing detail, a list of considerations and options are presented here that will feed into each solution set chosen:

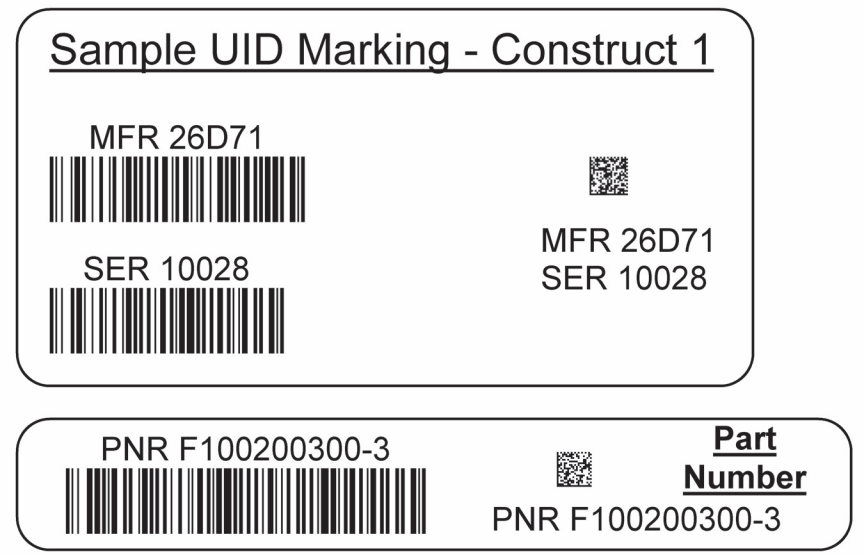

FIGURE 2. EXAMPLE OF UID PART LABEL

- Marking new parts, legacy parts, or both?
- Type of material (aluminum, steel, plastic, fabric, etc.)?
- Type of environment (office-benign to blades in a jet engine)?
- Type of processes (new manufacturing, in-service handling, repair process)?
- Using permanent label, metal data plate, or Direct Part Mark (DPM)?
- Use of appropriate DPM technology?
- Engineering involved? Information Technology (IT) involved? Manufacturing?
- Do IT systems need to be re-programmed? When? How much?
- Does IT know how to submit data to the UID Registry via Wide Area Work Flow?
- Print onsite (demand) or outsource (batch)?
- Systems available to store and transmit UID data?
- 1D bar codes used along with 2D?
- Opportunity to rationalize part or serial numbering systems?
- Opportunity to fix internal problems, reduce costs?
- Opportunity to redesign internal processes to reduce complexity?
- Repair, warranty, and reliability benefits?
- Benefit/Impact on your suppliers?
- Benefit/Impact to customers?

BENEFITS

The benefits of adopting the UID policy are huge, affecting the entire supply chain and logistics process from manufacturer to warfighter over decades of use for that part. The implementation of a DoD UID Policy creates a foundation built on common, unchanging data that will reap many other benefits that span manufacturing, procurement, logistics, operations, repair, and financial areas. Beginning in January 2004, the UID Policy applied to all new DoD solicitations and contracts, and it applies to all parts over

$5,000 in value. As of December 23, 2004, the UID Policy was extended to cover every legacy item, in inventory or operational use. The UID Policy and guidance documents spell this out in more detail, but the time to act is clearly now.

The challenge, as with any change, is to get beyond the emotion of needing to change at all, and to move on toward understanding how this can be used to benefit the long term health and viability of your operation, whether you are the supplier or the customer for these UID-marked parts. The UID Policy reflects Best Commercial Practice where such practices were established fifteen years ago in the commercial aviation world (Spec2000). The intent is that this change to UID-marked parts will benefit customers and suppliers alike. A common means of identifying valuable parts can enable electronic traceability, eBusiness, and a collaborative business environment.

You are encouraged to form a cross-functional team to study the policy itself, the possible solutions for your parts, and the benefits that might be reaped internally by this reorientation toward a better business process. Resources are available across industry and their use will help you implement this policy correctly the first time—a key factor in any successful solution.

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AUTHOR **BIOGRAPHY**