The U.S. Department of Defense moves toward more standardization

DoD Revamps Testing Organization

The U.S. Department of Defense (DoD) has emphasized automatic testing since the early 1990s, when the DoD inspector general (IG) conducted a series of audits on the “Development and Acquisition of DoD Maintenance and Diagnostic Systems” in each of the Armed Services. The findings were tailored to each Service, but included such statements as:

- develop and implement an effective internal control management system
- monitor the development, acquisition, and distribution of test, measurement, and diagnostic equipment
- assign clear management oversight responsibilities
- maximize the reuse of the Navy’s Consolidated Automated Support System (CASS) stations used initially for test program set (TPS) development
- improve its overall planning procedures for transitioning to new automatic test equipment (ATE)
- approve development of new ATE only if the Army’s integrated family of testers (IFTE) and CASS prove not to be cost effective.

Essentially, the DoD IG recommended that each of the Services develop management systems to monitor the development and acquisition of ATE. Subsequently, the Office of the Secretary of Defense (OSD) issued a memo initiating a study to define the DoD’s investment strategy options for automatic test systems (ATSs) to include the standardization of ATS hardware and software components. It created a flag/senior executive Service level steering group to direct this effort, with technical representatives organized to report to the steering group. Another DoD IG audit in 1992 recommended that the DoD issue ATS acquisition policy and guidance and establish oversight of ATE. Congressional language in FY1993 directed the secretary of defense to develop a DoD-wide policy requiring ATE commonality among the Services, along with an oversight system to ensure compliance. The DoD was directed to provide a report that addressed: 1) the results of the DoD’s ATE investment strategy study, 2) its potential savings, and 3) a plan for the implementation of the strategy.
In November 1992, OSD issued the required report titled “DoD Automatic Test System (ATS) Investment Strategy Study: Summary Report.” This report recommended that DoD components should meet their needs for ATSs by selecting from designated standard ATS families. It also recommended that a funded DoD-wide R&D program should be established to provide resources for ongoing modernization of designated ATS families and to rapidly converge the designated ATS families toward common hardware and software standards at critical ATS interfaces.

A study by the Institute for Defense Analyses documented that US$50 billion had been spent on ATSs and their support from 1980–1992. This study was forwarded to the U.S. Congress in May 1993. Language in the FY1994 Appropriations Bill recommended that the secretary of defense direct a DoD ATS acquisition policy and establish a formal implementation mechanism to ensure strategy compliance.

A 1994 memorandum from the under secretary of defense [acquisition and technology (A&T)] established the initial DoD ATS policy. The Army’s IFTE and the Navy’s CASS were designated as the initial DoD ATS families, and commercial off-the-shelf (COTS) testers and components were permitted for use at depot and factory levels of maintenance. This memorandum also appointed the Navy as the DoD executive agent (EA) for ATS. NAVAIR PMA260 was then appointed to serve as the ATS executive agent office (EAO) responsible for the following:

1) definition and management of DoD ATS standards
2) guidance of ATS family product engineering
3) establishment of ATS R&D requirements
4) review of ATS specifications and procurements
5) maintenance of a waiver process for the Office of the Undersecretary of Defense (OUSD) (A&T)
6) service as ATS lead standardization activity.

To implement the DoD’s ATS policy, the ATS EAO established two goals: 1) to reduce the total acquisition and support costs of DoD ATS and 2) to improve the inter- and intra-operability of the Services’ ATS functions.

Initial ATS EAO activities involved developing an effective interservice organization structure and working out organizational relationships and responsibilities. To this end, the EAO organized an ATS Management Board (AMB) at the O-6 level, which consisted of the ATS principals from each of the Services (Army TMDE, USAF ATS PGM, Navy PMA260, USMC TMDE, and USSOOM SOAL).

A number of integrated product teams (IPTs) were established under the EAO and AMB to carry out the main technical functions of the EA. All IPTs are truly Joint Service with membership from each Service.

The Next Generation (NxTest) IPT’s mission is to define, develop, demonstrate, and plan implementation of emerging test technologies into the DoD maintenance test environment. The generic ATS open system architecture must support new test needs and permit flexible insertion of updates and new technology with minimum impact on existing ATS components. The NxTest IPT is the Joint Services ATS Technology Team, and it has two important responsibilities: 1) to cooperatively leverage each Service’s nonrecurring ATS development investments and 2) to develop cooperative opportunities with industry, leveraging industry’s testing technology R&D investments.

The ATS Research and Development IPT (ARI) developed the ATS Architecture Framework. It focuses on developing an open systems architecture that supports ATS convergence, TPS transportability, and elimination of the requirement for Service-unique ATS. The open systems approach being pursued is an integrated technical and business strategy that achieves the benefits of flexible architecture by defining critical hardware and software elements for ATS using commonly accepted specifications or standards that may be defined by industry consensus and that are utilized by many suppliers. The ARI has defined elements as hardware and software components, interfaces between components, information models for required data entities and data relationships, and rules and processes for describing how components, interfaces, and information models must interact. In 2002, the ARI was merged into the NxTest IPT.

The ATS TPS Standardization IPT is chartered to review TPS acquisition procedures. It developed a TPS performance specification, MIL-PERF-32070, which is currently in use across all the Services.

The ATS Processes IPT is responsible for developing ATS acquisition processes and procedures. It develops and updates the ATS Master Plan and the ATS Selection Process Guide.

The OSD ATS acquisition policy was formalized in DoD Regulation 5000.2-R in 1996, which stated that “DoD ATS families or commercial components that satisfy defined ATS capabilities are to be used to meet all acquisition needs for ATE hardware and software. Critical hardware and software interfaces will serve to define the required ATS capabilities and the use of unique types of ATS in field, depot, and manufacturing operations is to be minimized.”

In 1997, the Services formally agreed via a joint memorandum of agreement (MOA) on the various policies, procedures, and organizational responsibilities to be implemented. This joint MOA described the ATS selection process, the policy deviation request process to be used when a nonpolicy-compliant ATS selection is recommended, and the commercial tester acquisition validation request used to certify that a proposed COTS ATS meets the requirements for being truly COTS.

In 1997, the ATS EAO first published the DoD ATS Master Plan and the DoD ATS Selection Process Guide. The ATS Master Plan summarizes DoD ATS policy, presents the management organization and procedures to implement the policy, and introduces the EA’s R&D plan designed to achieve the long-term objectives. The ATS Selection Process Guide presents the processes and procedures to be used by program managers throughout DoD to...
select the appropriate ATS solution for their testing requirements. It includes software models to assist in the cost benefit analyses, and it describes the waiver process to be followed when use of a DoD family member is not the optimal solution.

In October 1997, DoD 5000.2-R was changed to require that ATS selection decisions consider life cycle cost to DoD, not just to the program or Service.

Business Case Results

By 1993, 30% of DoD ATS acquisitions were from standard families and 70% were still unique ATS solutions. With the publication of the DoD ATS policy in 1994, standardization on the two major DoD ATS families, CASS and IFTE, became a reality. Both U.S. Navy and U.S. Army internal policy prohibited development of new design testers other than CASS and IFTE, respectively. Later the U.S. Marine Corps’ Third Echelon Test Set (TETS) and the Joint USAF/Navy Joint Services Electronic Countermeasures System Tester (JSECST) were designated as DoD ATS families.

By 1996, commercial ATS approaches using COTS were becoming more common. Approval of the initial set of critical interface specifications by the ATS EAO in 1997 spurred industry to increase the pace of development of commercial testers based on the approved specifications. The Marine Corps’ TETS contract was awarded to a commercial company for a transportable ATS designed around COTS components that implemented the approved specifications.

By 1998, 33% of ATS acquisitions were from DoD ATS families, 44% were policy-compliant COTS solutions, and 22% were unique tester solutions. In just five years, the number of unique ATS solutions dropped by two-thirds, and COTS became the predominant testing solution.

A 1998 business case analysis showed that the EA’s activities had resulted in significant cost savings to the DoD. Examples included several cases in which the DoD avoided costs of US$284 million by implementing the ATS policy, as well as an example where the Army and Navy jointly developed electro-optics test capability for a savings in nonrecurrence of US$80 million. Other cases showed the benefits of the approach to ATS acquisition being implemented by the EA.

Since 1998, COTS has become predominant among DoD tester acquisitions. By 2003, almost 80% of new DoD ATS requirements were satisfied by COTS solutions and all but one of the remaining requirements were satisfied by using a DoD ATS family.

General Accounting Office Audit of DoD ATE

On 31 March 2003, the General Accounting Office (GAO) submitted a report titled “DOD Needs to Better Manage Automatic Test Equipment Modernization,” which recommended that the secretary of defense:

- Reemphasize the policy that common ATE be developed to the maximum extent possible.
- Reconsider whether placing its ATS EA in a single Service is the most effective way to implement policy.

- Give the EA the authority and resources to include representatives from all of the Services, with a scope to include the oversight of automatic test equipment acquisition and modifications for all weapon systems.
- Give the EA the authority and resources to establish a mechanism to insure that all ATE acquisitions and modernizations are identified in an early enough stage so as to be able to provide a comprehensive look at commonality and interoperability and to ensure a coordinated effort among Service entities.
- Give the EA the authority and resources to direct the Services to draw up modernization plans for its review so it can identify opportunities to maximize commonality and technology sharing between and within the Services.
- Give the EA the authority and resources to continue efforts to research technical issues dealing with tester commonality, such as the development of open system architecture and other joint Service applications.
- OSD Acquisition, Technology, and Logistics (AT&L) responded to the GAO Report by stating that it would consider the recommendations. OSD then directed the Navy, in coordination with the Army and Air Force, to perform an assessment of whether any Service should be assigned as an EA for ATS under the guidelines of DoD Directive 5101.1. A Joint Service IPT was chartered to define alternative approaches to executing the ATS EA role and to provide an ATS EA Assessment Report that contained a summary of findings and recommended course of action.

Alternatives assessed by the IPT were to continue “business as usual,” to establish an enhanced MOA among service acquisition executives (SAEs) to set forth ATS acquisition policies and procedures, and to establish a formal DoD ATS EA in accordance with DoD Instruction 5101.1.

The EA Assessment Team’s final report contained the following summary findings and conclusions:
- Currently, all Services have an ATS acquisition policy in place that supports common ATS, and under the leadership of the AMB, the Services have proven that they can successfully work together to drive toward ATS commonality. However, Services continue to have program offices that independently manage their own ATS programs. While the Navy, Army, and Marine Ground Forces have realized significant life-cycle cost savings due to the implementation of common ATS families, the USAF has an extremely difficult time enforcing their ATS acquisition policy due to the lack of a common Air Force ATS solution and the independent decision-making authority given to system program directors.
- While establishing a formal EA would provide the authority and resources to enforce ATS acquisition policy across the Services, this organization could be perceived as a threat by those program offices that are already successfully working together toward common DoD ATS solutions. It would require an annual investment on the part of DoD to sustain this organization.
If properly structured, an enhanced MOA among the SAEs would provide the AMB with the authority and resources to enforce ATS acquisition policy across the Services, while allowing the AMB and established Joint-Service IPTs to continue progress with little additional investment cost. Establishing a common Air Force ATS family managed by a central ATS acquisition office would allow the Air Force to begin realizing the savings that the other Services have attained through their common ATS families. A formal DoD ATS acquisition policy letter would validate the AMB’s authority and could steer the USAF toward centralized acquisition of ATS.

The ATS EA Assessment Team’s final report was accepted by the OSD in December 2003.

Current DoD ATS Policy

A greatly downsized DoD 5000.2-R was issued on 12 May 2003 and cancelled all previous versions of DoD 5000.2-R. The new 5000.2 established a simplified and flexible management framework for translating mission needs and technology opportunities (based on approved mission needs and requirements) into stable, affordable, and well-managed acquisition programs that include weapon systems and automated information systems (AISs). In streamlining the DoD’s instructions on operation of the Defense Acquisition System, the ATS policy statements were eliminated from the 5000.2-R. However, in July 2004, OSD (AT&L) issued a policy letter which states that:

To minimize the life cycle cost of providing automatic test systems for weapon systems support at DoD field, depot, and manufacturing operations, and to promote joint service automatic test systems interoperability, program managers shall use approved DoD ATS Families as the preferred choice to satisfy automatic testing support requirements. Commercial-off-the-shelf (COTS) solutions that comply with the DoD ATS Technical Architecture should only be used if the Milestone Decision Authority concurs that an approved DoD ATS Family will not satisfy the requirement. Automatic Test System selection shall be based on a cost and benefit analysis over the system life cycle.

The policy letter includes an appendix which lists the approved DoD ATS families (CASS, IFTE, TETS, and JSE CST). The ATS policy will be included in the next issuance of DoD 5000.2.

While this policy is essentially the same as previously contained in the 5000.2 instructions, it does feature increased emphasis on satisfying requirements through approved DoD ATS families and less focus on COTS solutions. A lesson learned over the last ten years is that, while COTS solutions are far better than unique tester solutions, different COTS systems (even in the same supplier’s “family”) may have different software development environments and logistics requirements and are therefore more difficult and costly to support than DoD family testers.

DoD ATS Architecture Framework requirements are detailed in the Defense Information Technology Standards and Profile Registry (DISR), which is replacing the Joint Technical Architecture.

New DoD ATS Organization and Joint MOA

An OSD letter in January 2004 formally cancelled the Navy’s ATS EA tasking but continued the role and mission by creating an ATS Executive Directorate (ED) led by the Navy. The ATS ED has the same role filled by the ATS EA in the past, and, as it did as the ATS EAO, NAVAIR PMA260 discharges this requirement for the Navy.

The OSD policy letter of July 2004 also cancelled the ATS EA role previously assigned to the Navy and restated that an AMB led by the Navy and comprised of the each Service’s designated lead ATS offices will coordinate Service ATS matters. The OSD letter directed the AMB to develop a joint MOA for signature by the SAEs to detail the processes and procedures that the Services will follow in satisfying ATS requirements.

This new JMOA, signed in September 2004 by the Army, Navy, and Air Force SAEs, defines the DoD ATS organizational structure and details responsibilities and procedures to be followed throughout the DoD for ATS acquisition and modernization.

The AMB is defined as a Joint-Service board comprised of ATS leadership from the Army [SFAE-CSS-ME-T (PM TMDE)], Air Force (WRALC/542ATS G), Marine Corps [MARCORSYSCOM PMM161 (PM-TMDE)], and Navy (NAV AIR PMA260). The AMB is chaired by the ED, NAVAIR PMA260, and reports to OSD (AT&L) through Navy [ASN(RDA)]. The AMB’s mission is to jointly coordinate ATS R&D, acquisitions, and modernizations. This organization structure is shown in Figure 1.

The September 2004 joint MOA differs from the 1997 joint MOA in the following areas:

- The SAEs acknowledge their responsibility to provide appropriate R&D resources to support joint Service test and diagnostics technology R&D efforts.
- The ATS ED is required to publish a coherent DoD-wide R&D program plan that integrates Service ATS R&D efforts.
- The ATS ED and AMB will inform milestone decision authorities and SAEs in cases when PMs select a non-policy-compliant ATS solution.
- Each Service shall establish an ATS Leadership Office (ALO) charged with primary responsibility for ATS coordination. These offices are Army PM-TMDE, Air Force WRALC/542ATSG, Marine Corps MARCORSYSCOM PMM161 (PM-TMDE), and Navy NAVAIR PMA260. The ALO has the lead for coordinating Joint Service projects and is represented on the various ATS IPTs and working groups. The office ensures that ATS policy and related procedures are promulgated throughout its Service, provides assistance to weapon system PMs and IPTs in ATS matters, and monitors acquisition and modernization planning for
policy compliance. The ALO processes ATS policy deviation requests and forwards them to the AMB.

Proposed acquisitions of COTS testers must be validated as policy-compliant by the AMB. However, the use of designated DoD ATS families is encouraged to the greatest extent possible to reduce ATS proliferation and life-cycle operations and support costs. When a COTS solution is planned, the acquiring Service should develop a strategy for standardizing on the planned COTS tester.

Future of DoD ATS Policy

Work on completing the specifications of the DoD ATS Architecture Framework continues. Recent activity under the Agile Rapid Global Combat Support System (ARGCS) Advance Concept Technology Demonstration project has been the catalyst for progress in completing the next set of critical interface specifications.

We have seen that the DoD’s emphasis on designated family testers is paying off, and it is expected that the use of family ATS solutions will increase as illustrated in Figure 2. While COTS testers are an acceptable solution, they are no longer the preferred testing solution, and it is anticipated that their use will decline in the future.

At some point, DoD ATS policy may migrate from a family/COTS basis to an Architecture Framework basis. In June 2000, the ATS EAO requested the National Defense Industrial Association’s Automatic Testing Committee (NDIA ATC) to provide recommendations concerning the implementation of a shift in ATS acquisition policy from a hardware-based approach to an architecture basis. The NDIA ATC convened a workshop in September 2002 to address ATS policy issues. The ATC validated the ATS Architecture Framework and recommended that the DoD retain the architecture-based ATS policy as a long-term goal. As the ATS Architecture Framework matures, the ATS ED will pursue shifting the policy forward.

Summary

As a result of a GAO audit, the DoD has designated the Navy as DoD’s ATS ED, and a new Joint ATS MOA among the SAEs is in process. The DoD’s policy for ATS acquisitions has remained fairly constant since its inception in 1994. However, emphasis has shifted to acquiring standard DoD ATS family testers as the preferred acquisition choice.

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