

**ATML Demo Phase II**  
**Executive & Technical Summary**  
**February 2010**

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## 1 Executive Summary

This report provides an Executive Summary of the findings and recommendations made as a result of performing the ATML Phase II demonstration with a full presentation at AutoTestCon 2009. The Executive Summary is followed by a Technical Summary and Technical presentation, providing more detailed description of the ATML Demonstration.

The purpose of the demonstrations was to validate the performance of the collection of ATML standards while providing key evidence showing how the ATML family of standards can advance the DoDs ATS Framework objectives:

- Faster technology insertion
- Improve TPS rehost and interoperability
- Use model based programming techniques
- Modernize test programming environment
- Greater use of commercial products
- Define interfaces to support integrated diagnostics

This demonstration builds on the previous ATML Phase I Core demonstration and provides a show case for existing COTS tools. It includes new detailed implementations of the standards, revealing areas where enhancements should be made to the standards in order to facilitate their adoption on actual programs. As a direct result of this demonstration, the following activities have been supported and the following benefits have been achieved:

- As the IEEE Std. 1671 is being updated to a full use standard, the ATML files created for the demonstration are being incorporated as a complete worked example.
- Changes have been made to ATML component standards based on the lessons learned from the demonstrations. These changes will be incorporated in the standards during their next review and transition to full use.
- Provided a complete set of working files to the user community, as an example of how to use ATML in a working system <http://grouper.ieee.org/groups/scc20/tii>
- Advanced and demonstrated the availability of COTS ATML tools.
- Raised the profile of the ATS Framework working group and the benefits of using standards within the test & measurement domain.

The ATML demonstration is one of several efforts that prove the maturity of IEEE standards and benefits of the DoD ATS Framework.

The goals of the ATML Phase II demonstration has been to build on the experience and lessons learnt in last year's demonstration (while adding digital and bus testing), and to show a more comprehensive range of industry led solutions. These not only show how ATML standards can be used as a technical solution, but also how they can provide real benefits to the test and ATE community, helping cut life cycle costs and improve test information exchange.

## ATML Demo Phase II - Executive & Technical Summary

The DoD ATS Framework Working Group has established six high priority key areas on which to focus, based on input from various potential users. The demonstration focuses on the following key areas:

- Test Diagram Generation
- ATML Test Description supporting TPS life cycle
- Modular Instrument Description within an ATS description
- Use of Test Configuration at test station runtime
- Interfacing with Test Results archiving databases
- ATML Capability for a UUT with digital and bus testing

The demonstration achieved each of its objectives and showed what can be achieved through common goals and industry/government partnerships.

- Show innovation and ***Faster Technology Insertion*** through deployed use of ATML information and tools, such as Test Requirements Traceability, Test Strategy reports, Test Diagram Generation
- ***Improved TPS Rehost and Interoperability*** by using ATML within different Test Program Environments that support ATML Test Description for runtime and Test Requirement configuration control.
- Incorporate the ATML format into existing Test Station system software so that ATML files provide all the test information, allowing ***Greater Use of Commercial Products***. Extend the use of ATML Instrument Description in the demonstration, for example to map ATML Test Description to instrument based test programs.
- Introduce additional aspects of using ATML files, dependent on the responses received from industry after Phase I, to ***Modernize Test Programming Environments***.
- Utilize the ATML Test Results exchange format to archive information, enabling the demonstration of ***Interfaces that Support Integrated Diagnostics***
- Align ATML Demonstration Phase II with current program needs, to show how an example solution could be used, with continued development, to support existing projects.
- The participation and interest is reflected both in the number of active companies (17) involved in the demonstration, and the number of ATML demonstrations available around AutoTestCon 2009 hall associated with different company products.

## 2 Conclusions & Recommendations

The Technical Summary describes the integration of ATML tools used during Phase II to demonstrate the extended end-to-end integration of the ATML standards between all (17) participating companies. The demonstration took 4 months to put together to achieve the transformation of an ATML Test Description into a test program running on multiple ATS platforms. A major benefit demonstrated was the ATML standards allowed the individual participants to integrate the modular components into the whole solution.

The main aspect of these demonstrations was the ability of each contributor to obtain the test information from the common ATML files, sharing the same test information across their tools.

One of the remaining key challenges is how to advance the ATML standards for practical use; the goal being for ATML standards to be used and provide benefits to fielded solution. Paramount to achieving this is having tools (COTS or custom) that create and consume ATML information that is used to tackle real problems associated with today's working practices. The Phase II demonstration addressed this area, targeting the use of ATML standards in support of specific practices and processes.

A solution to this challenge inherently required ownership, buy-in, co-operation and interaction from various DoD organizations and programs, and the feasibility of using test information conforming to the ATML standards. By demonstrating the feasibility on existing DoD and commercial systems, this also helps overcome the initial hurdle of getting commercial products to interchange ATML files, because this creates an opportunity to have ATML files delivered and used.

Phase II showed innovation and faster technology insertion through the use of ATML tools for existing projects and processes. It targeted selected applications and shows how ATML can be used to improve the current processes, while adding or enhancing commercial tool support.

The ATML Phase II Demonstration has helped facilitate the use of ATML tools from various participating companies and shown how these could be applied to specific customer's key development areas.

As a consequence of participating in this demonstration, companies from the test and measurement industry can show established and new software tools and products that all use and exchange test information using the ATML standard formats.

Because there is demonstrably widespread acceptance of the ATML standards in these commercial tools, major ATE users, such as DoD and MoD, have required the use of ATML formats in future programs through their Policies and acquisition systems.

### **2.1 Recommendation #1**

The ATS Framework Working Group should identify potential DoD users and programs that are suitable as process owners and would benefit from ATML information exchange. The ATS Framework Group should encourage the ATE industry to demonstrate the feasibility of using ATML-enabled tools.

### **2.2 Recommendation #2**

The ATS Framework Working Group should continue to address key goals (e.g. supporting TPS life cycle and TPS rehost) using ATML targeted to projects identified by interested users.

### **2.3 Recommendation #3**

Provide expertise into new programs using ATML standards. The project team membership should include DoD stakeholders, various IPT representation e.g. NxTest & TPS IPTs , ATS Framework members, and key commercial organizations who have shown a commitment to the success of ATML.

### **3 DoD ATS Framework Achieved Objectives**

The following activities and goals were achieved in support of the DoD ATS Framework Objectives:

#### **Faster technology insertion**

- Information reuse allows new resources to be added
- Common information format allows existing test technologies to be adapted and used as part of an integrated solution
- XML tools accelerate adoption of technologies

#### **Improve TPS rehost and interoperability**

- Information reuse during TPS rehost
- Support for multiple test execution environments

#### **Use model based programming techniques**

- ATML used to model ATE hardware and connectivity
- Modeling and simulation based on Signal Models

#### **Modernize test programming environment**

- Access to modern test executives and development environments through XML support

#### **Greater use of commercial products**

- Information exchange allows integration of commercial tools
- Common information format allows access to commercial products
- XML helps overcome drawbacks of propriety information formats

#### **Define interfaces to support integrated diagnostics**

- Information flow provides required infrastructure
- Information format provides for common exchange

### **4 DoD DISR Standards**

- IEEE Std 1671 Automatic Test Markup Language (ATML)
- IEEE Std 1671.1 ATML Test Description
- IEEE Std 1671.2 ATML Instrument Description
- IEEE Std 1671.3 ATML UUT Description
- IEEE Std 1671.4 ATML Test Configuration
- IEEE Std 1671.5 ATML Test Adaptor
- IEEE Std 1671.6 ATML Test Station
- IEEE Std 1636.1 SIMICA Test Results & Session Information
- IEEE Std 1641 Signal & Test Definition

## 5 Participants

The demonstration has helped facilitate the development and use of ATML tools from participating companies and has shown how they could be applied to customers' key development areas.

The following companies participated in this demonstration:

- Agilent
- Boeing
- EADS
- Fox Software Limited
- Geotest
- Indra
- Lockheed Martin
- MAC Panel
- National Instruments
- Northrop Grumman
- PIDESO
- Rohde & Schwarz
- Summit Test Solutions
- Teradyne
- TYX
- Vektrex
- Virginia Panel Corporation

## 6 Lessons Learned

### 6.1 ATML Standards

- *Transition to ATML Full-Use*
  - Added Wirelist.xsd to support Test Diagram Generation use case
  - Proposal to add Capability attributes (Capabilities.xsd)
  - Created extensive example for Test Description (IEEE 1671.1-2009)
  - Test Description recommendations during trial use period
  - Clarifying use of ATML Extension mechanism
  - Transition all ATML standards to common baseline schemas
- **ATML does help facilitate the use of COTS tools**
  - Significant reuse of ATML information and that used by the COTS tools used in the demonstration
    - TPS Support
    - Test Program Generation
    - Resource Selection
    - Diagnostics and Test results Archiving
    - Test Diagram Generation
    - Test Configuration checks
  - Users able to use standards with minimal outside assistance
- **ATML is ready for full use**

### 6.2 ATS Framework

- There is a need to have a basic level of ‘standards adherence’ on ATS platforms.
- Adherence to standards need to be verified. e.g.
  - IVI Conformance
  - ATML File Validation (format and possibly data contents)
- Validate that systems contain a ‘minimum’ amount of information conforming to the ATS Framework Standards.
- Provide series of methods and processes that can verify correct use of standards
- As not all interfaces can be standardized, ATS acquisition should also specify, evaluate, and verify ATS software architectures which are critical for TPS development and long-term maintainability.

## 7 Technical Summary

The following provides the technical summary of the Phase II demonstration. An additional “Step by Step Guide” is provided in the accompanying PowerPoint presentation titled “ATML Demo Technical Description”, which details all the steps the team went through to achieve the demonstration. As part of the technical summary, an outline of the lessons learned and a breakdown of possible Phase II ATML applications is provided.

### 7.1 Overview

One of the remaining key challenges is how to further advance the ATML standards for practical use, the goal being for ATML standards to be used and provide benefits to current and future programs. Paramount to achieving this is having software tools that create and consume ATML information to tackle real problems associated with today’s working practices.

To this end, the ATML demo defined and used core components (see Fig. 1) identified by the ATML demo team. These various core components ran on several test systems that use diverse instrument control buses, switching topologies, receiver layouts, and run time software, culminating in being reused across all the different ATML demo systems.

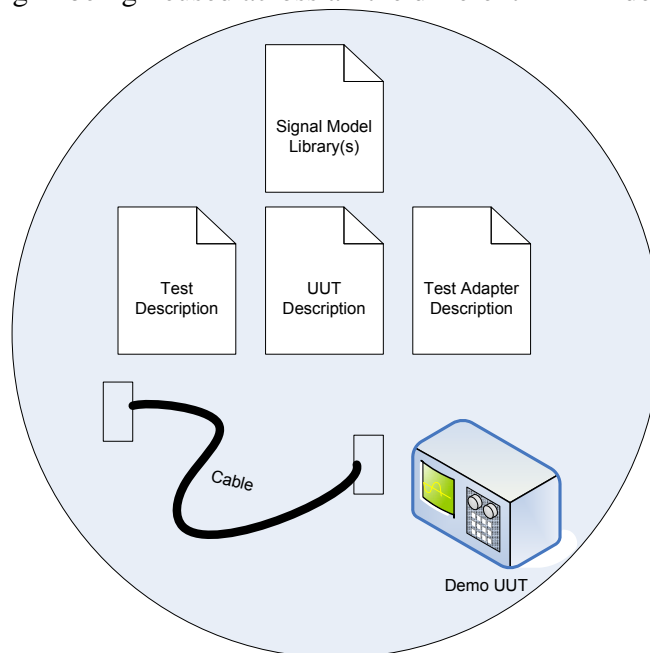


Figure 1. ATML Demo Phase2 Core Components

The specific demonstration areas that have been considered in Phase II are described below and shown in Fig. 2. The demonstration was based on an upgraded version of last years ATML Demo and UUT, which resulted in two distinct UUT builds, and where the overall TPS demonstration was the amalgamation of all of these on the updated UUT.

## ATML Demo Phase II - Technical Summary

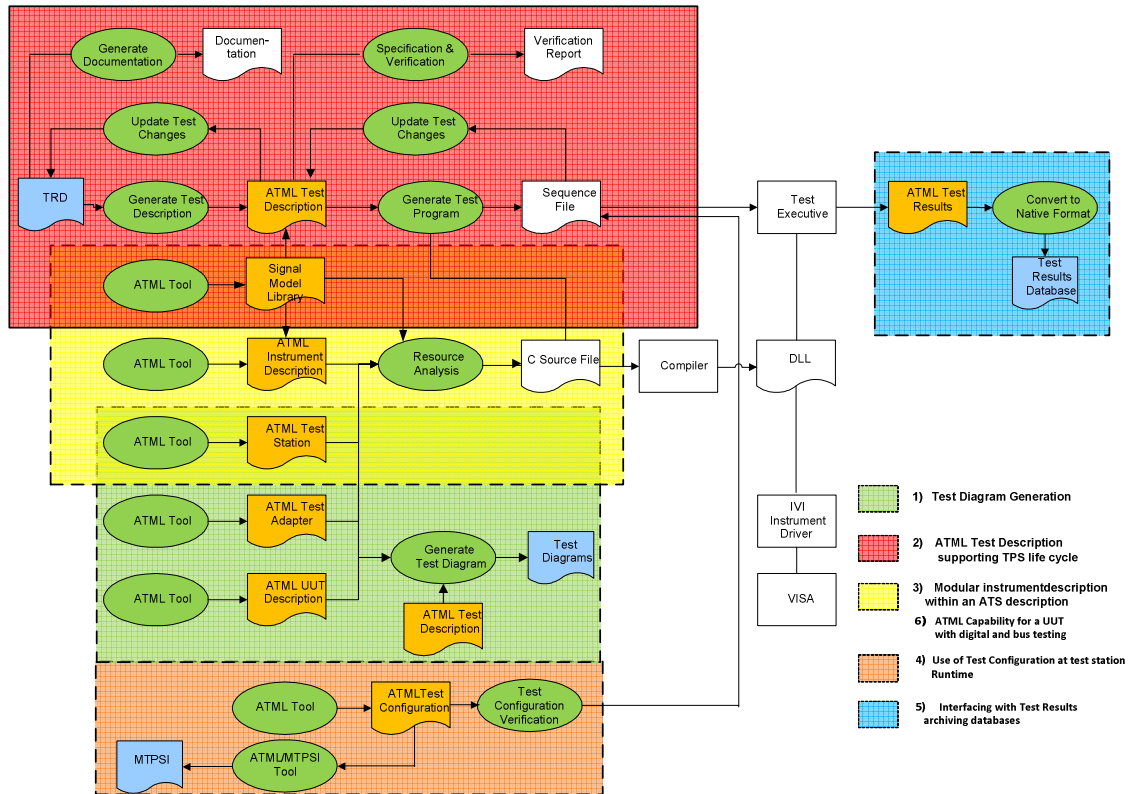


Figure 2. ATML Test Environment – Complete Demonstration

### 7.2 Test Diagram Generation

Develop a process to take Test Station Description, Test Adapter Description, UUT Description and WireLists ATML instance documents and using the applicable elements from these files to automatically generate test diagrams representing the signal paths for particular tests from an ATML Test Description file (see Fig. 3).

Industry currently has differing tools to support this process, each typically targeted to one test platform, however there is no standard format that allows these tools to share information. ATML should be that common format, such that the information could be shared across different tools and programs. A key phase of this task is the modification of the Navy Test Oriented Wire List (TOWL) process to utilize ATML data. TOWL generation is a function of the Navy CASSGRAF tool which was designed to support Test Program Sets (TPSs) for the Navy Consolidated Automated Support System (CASS) station. With the ATML enhancements made as part of this demonstration, the tool set will support any test platform, as long as the appropriate ATML files are available.

To support this effort, new ATML tools have been developed by participating companies to produce ATML Test Station instance files, which were used to generate TOWL test diagrams.

## ATML Demo Phase II - Technical Summary

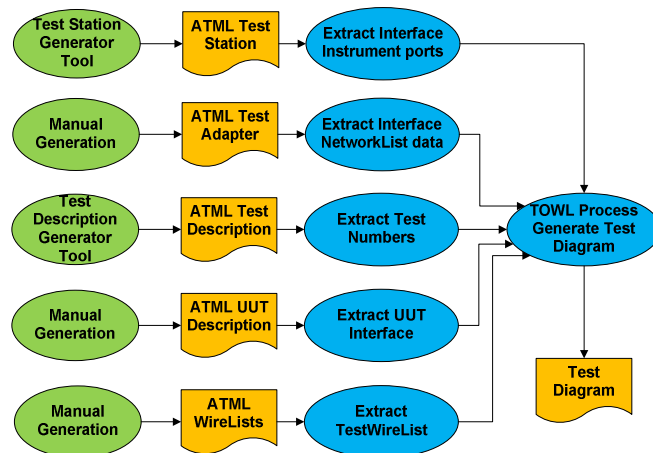


Figure 3. Test Diagram Generation Process

### 7.3 ATML Test Description supporting TPS life cycle

The objective of this demonstration topic is to show that ATML supports test requirements management throughout the TPS lifecycle. The main use cases, namely Test Requirements Specification and Verification, Test Requirements Documentation, and Test Requirements Traceability, are illustrated in Fig. 4.

The implementation relies on commercial software products that support conversion of Test Requirements Document (TRD) formats into ATML Test Description and generation of Test Program source code from ATML Test Description instance documents.

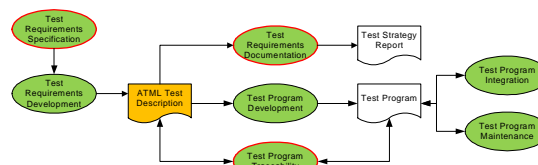


Figure 4. ATML Test Description supporting TPS life cycle

**Test Requirements Specification** enables customers (DoD and Industry) to formally specify and automatically enforce the information content of Test Requirements Documents for various milestones in the TPS development processes (ex. PDR, CDR, ATP).

The **Test Requirements Documentation** feature shows the ability to create human readable Test Requirements Documentation (e.g., Test Strategy Reports) from ATML Test Description instance documents.

**Test Requirements Traceability** allows organizations to maintain consistency between test requirements and test program implementation as test program changes during TPS integration and maintenance. The demonstration showcased the ability to update the ATML Test Description document when the Test Program changes and to regenerate the TRD from the updated Test Description document.

### 7.4 Modular Instrument Description within an ATS description

A modular process has been developed for describing ATS Capabilities, using ATML Instrument Description (see Fig. 5). This builds on the Phase I tools, but rather than using the Test Station to completely describe Test Station capability, derives Test Station capability from the individual ATML Instrument Descriptions. This ATS Capability could then be used to compare test requirements against available test platform types. A derivative of this would facilitate test program rehost analysis, comparing test program requirements to test station instrument capabilities.

This general approach has been used in three major areas:

- Updating last year's process using the ATML 2009 baseline.
- New Instrument Descriptions supporting both ARGCS ATS2 and the PXI test system to support complete UUT test programs
- Extracting Individual (subset) descriptions to support specific TPS tests to be performed on individual instruments (e.g. Gain 1 dB Compression Point)

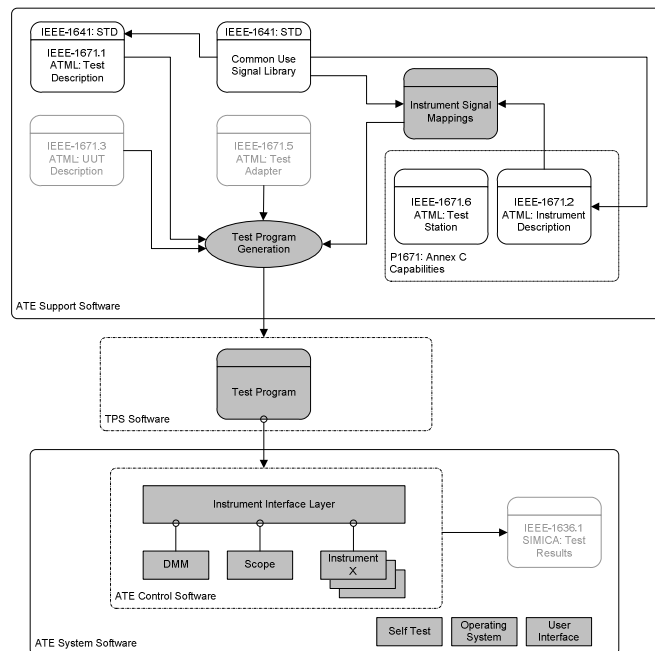


Figure 5. Using Instrument 'Capability' Descriptions

### 7.5 Use of Test Configuration at Test Station runtime and tool support for the generation of instance files

This includes the utilization of ATML Test Configuration instance files by a test station at runtime. As part of this demonstration, the test station read data from the Test Configuration files, such as the required instruments and interface hardware. The station is then queried for the required instruments to ensure they are present and functioning. Messages are also provided to the operator regarding interface hardware required by the Test Configuration file.

## ATML Demo Phase II - Technical Summary

In addition, the capability to automatically generate ATML Test Configuration files from existing test system configuration processes was addressed. A Navy tool was modified as part of this demonstration to generate a Navy Master Test Program Set Index (MTPSI) file from an ATML test Configuration instance file. This will promote the alignment of the DoD's current internal processes with the standard ATML information format.

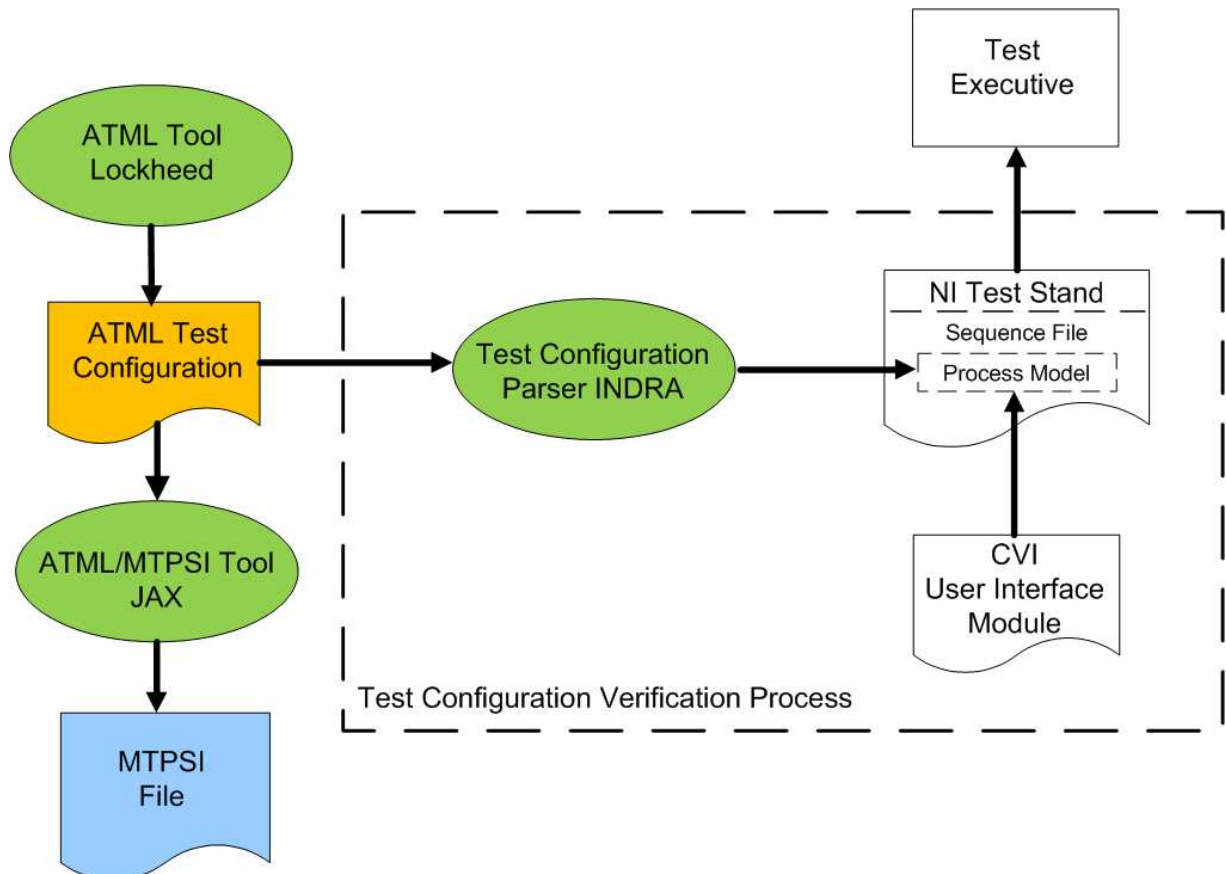


Figure 6. Use of Test Configuration Information

### 7.6 Interfacing with Test Results archiving databases

Adapt a Test Results archiving system to consume Test Results in the ATML format and map them into the native format of that system. With this approach, ATML Test Results can become part of the current formal process, regardless of which system they originated from.

There were two sets of services planned, showing how heterogeneous client systems can share information:

- The diagnostic repair services collect ATML Test Results as part of a work tasking service and are able to learn from past repairs and provide suggestions for the most probable cause of failure and repair action, based on the test results.
- A notification service shows how, through services, new technologies can be incorporated within a Net Centric environment.

### ***7.7 ATML Support for Digital and Bus Testing***

The main objective of this topic is to demonstrate the applicability of an ATML-based end-to-end solution for a UUT that requires digital and bus testing. This addressed concerns expressed during Phase I and the IEEE balloting process with respect to ATML's ability to describe digital and bus tests.

The implementation required upgrading last year's demonstration UUT with digital control capabilities, creating new ATML Instrument Descriptions for digital and bus instruments, and upgrading the ATML Test Description document with digital and bus tests and test operations.

## **8 Participating Demonstrations**

The following companies also provided ATML demonstrations during AutotestCon 2009 showing use of ATML and their products.

### **8.1 Agilent / Vektrex**

Agilent supported ATML with Instrument Description Instances by Vektrex. ATML Usability demonstration for creating ATML Instrument Description instances. ATML Usability demonstration. ATML Instrument Description Usability. ATML Demonstrated on Agilent instruments. Agilent Instrument Specifications presented/available in industry standard ATML format. Software Application outputs instrument data in industry-standard ATML format.

### **8.2 Boeing**

The Boeing Company showcased their latest Net-Centric technologies using the IEEE 1636 Software Interface for Maintenance Information Collection and Analysis (SIMICA) and the IEEE 1671 Automatic Test Markup Language (ATML) standards. Three separate demonstrations were presented:

- 1.) The use of IEEE 1671 standards for Test Description, Instrument Description, Test Configuration, Test Adapter, and Test Station demonstrated on a Navy RTCASS test station.
- 2.) Model based diagnostic reasoning using the IEEE 1636 standards for Test Results and Maintenance Action Information demonstrated on an Air Force CTMA Test Station.
- 3.) A web service implementing the IEEE 1636 standards for Test Results and Maintenance Action Information demonstrated the interchange of data from multiple systems.

### **8.3 EADS**

EADS TES has teamed up with Rohde & Schwarz and the UK MoD to produce a demonstration of ATML Test Description for gain & 1 dB compression point tests, using EADS's newWaveX to provide IEEE 1641 signal capabilities. This demonstration was shown at the Rohde & Schwarz booth.

newWaveX provides signal library modelling for use in ATML Test Description & Instrument Description; demonstrations of which were seen at the EADS booth.

EADS NA demonstrated IEEE 1671 ATML Test Description using the TYX TRD Product. ATML Test Results and Test Diagram generation demonstration using the TYX PAWS Product. TYX SigBase demonstration highlighting IEEE 1671 ATML Test Description and IEEE 1641 Signals.

### **8.4 Geotest**

As part of Geotest's involvement with the ATML Demo Phase II, a demonstration program was developed that employed the "standard" ATML demo board. Geotest constructed a pcb version of this demo board, with the UUT program hosted on the PXI-

based GBATS (Geotest Basic Automated Test) platform. Program development included the importing / converting of the XML demo files via Geotest's ATEasy program environment. ATEasy, which offers a complete test development and test executive software environment, also provides tools for importing and converting ATML files to ATEasy tests. The ATML Demo Test Description file was automatically converted to an ATEasy Program file by means of an XSL script with ATML actions converted to ATEasy tests. The program was then successfully executed with the resulting test log data exported to an ATML TestResults file, using ATEasy's ATML test log driver.

### **8.5 Lockheed Martin**

Lockheed Martin demonstrated the use of ATML within a test and diagnostic session. An AI-ESTATE compliant diagnostic reasoner consumes Test Results and Maintenance Action Information (MAI – IEEE 1636.2) to provide improved test and callout recommendations during the session. Additionally editors showing ATML Test Configuration, Test Station, and Test Description were demonstrated.

### **8.6 National Instruments**

Attendees learnt how adopting ATML can be simplified by automatically translating ATML Test Description (TD) documents using NI TestStand, a commercial test executive, into a partial Test Program Set (TPS) and automatically generating ATML Test Results (TR) reports. Attendees also learnt how the new NI TestStand ATML Toolkit 1.0 can automatically translate the latest version of ATML TD documents into TestStand sequence files, LabVIEW, and LabWindows/CVI code modules. Finally, attendees learnt how TestStand can automatically generate ATML TR reports.

### **8.7 Rohde & Schwarz**

Rohde & Schwarz showed ATML Test Description for 1 dB compression point & gain tests of a mobile RF communications device. IEEE 1641 is used to define TSF stimulus & measurement signals; IEEE ATML Capabilities are used to allocate test resources, supplemented with XML to describe a translation to IVI driver code for two independent sets of test resources. The implementation platform consists of Rohde & Schwarz's Vector Signal Generator, Spectrum Analyzer, and Vector Network Analyzer.

### **8.8 Virginia Panel Corporation**

Virginia Panel Corporation demonstrated the Interconnect Designer that will allow a Test Engineer to easily configure a cable assembly during the design of a test station. The Interconnect Designer will use ATML descriptions of Test Instruments and the Unit Under Test (UUT) as input in this simple configuration process. This tool demonstrates that VPC is committed to supporting and adopting standards such as ATML to simplify the design process and therefore reduce the overall cost to the end user.