Interdependence of ATML & IEEE 1641, and their role in MOD Test Policy
Modern IEEE standards—supporting interoperability & longevity

- **IEEE Std. 1641™**
  - Standard for Signal & Test Definition
  - Providing unambiguous signal definitions
  - Delivering system independent test definitions

- **ATML – IEEE Std. 1671™**
  - Automatic Test Markup Language
  - A suite of XML standards
  - Supporting information interchange
Modern IEEE standards—supporting interoperability & longevity

• Why are these standards needed?
  – Provides system independent test definitions
    • Portable between compliant systems
    • Simplifies re-host when ATS reaches end-of-life
  – Facilitates information transfer
    • Common information exchange format using XML
    • Simplifies exchange of test & diagnostic information
    • Results saved in common format but may be printed or displayed in any required style.
MOD Policy and IEEE Standards

- MOD requirements for ATS and test
  - System and TPS interoperability
  - TPS portability
  - Simplified re-host
  - Upgradeable ATS
  - Reusable ATS

- MOD policy is supported by these standards
MOD Policy

- MOD Policy is defined by:
  - Acquisition Operating Framework (AOF)
    - Key Support Area (KSA-2) – Supportability Engineering
    - Governing Policy (GP2.4) – ATS and Test & Measurement Equipment
  - JSP 886 Volume 7 Part 8 – Test and Measurement Equipment
    - The Procurement and Management of Automatic Test Systems Policy
  - Def Stan 66-31 – Requirements for Electrical Test Equipment
    - Part 8 – Requirement for ATS utilising an Open System Architecture

- MOD Policy requires:
  - Sign off by Subject Matter Expert (SME)
    - DES JSC TLS-Pol-TM-ATS
MOD Policy

- JSP 886 Volume 7 Part 8.06
  - Section 2 Chapter 1 includes:
    - New requirements shall be specified in terms of an open architecture ATS and the Signal Test Definition (STD) standard shall be used.

- Def Stan 66-31 Part 8
  - Provides guidance for implementation of policy
  - Describes an Open System Architecture (OSA)
MOD Policy – Def Stan 66-31 Part 8 includes…

A model for an Open System Architecture (OSA)
MOD Policy – Def Stan 66-31 Part 8 includes…

- A table of appropriate standard groups (Table B1)

<table>
<thead>
<tr>
<th>Item</th>
<th>Data or Signals being defined</th>
<th>Standards Group</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Requirement Data</td>
<td>TPS Software standards</td>
<td>D.1</td>
</tr>
<tr>
<td>2</td>
<td>UUT Specific Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>3</td>
<td>Test Adapter Description Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>4</td>
<td>Instrument Description Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>5</td>
<td>Switch Description Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>6</td>
<td>ATS Configuration Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>7</td>
<td>Static Diagnostic Data</td>
<td>Test information interchange standards</td>
<td>D.2</td>
</tr>
<tr>
<td>16</td>
<td>Upload/Download Data</td>
<td>Data-bus standards used by UUTs</td>
<td>D.6</td>
</tr>
<tr>
<td>17</td>
<td>UUT Data</td>
<td>Data-bus standards used by UUTs</td>
<td>D.6</td>
</tr>
<tr>
<td>17</td>
<td>UUT Signals</td>
<td>ATE interfacing &amp; switching standards</td>
<td>D.5</td>
</tr>
</tbody>
</table>
MOD Policy – Def Stan 66-31 Part 8 includes…

- **Table D.1—TPS Software standards**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE Std 1232</td>
<td>IEEE Standard for Artificial Intelligence Exchange and Service Tie to All Test Environments (AI-ESTATE)</td>
</tr>
<tr>
<td>IEEE Std 1445</td>
<td>IEEE Standard for Digital Test Interchange Format (DTIF)</td>
</tr>
<tr>
<td>IEEE Std 1546</td>
<td>IEEE Guide for Digital Test Interchange Format (DTIF) Application</td>
</tr>
<tr>
<td>IEEE Std 1641</td>
<td>IEEE Standard for Signal and Test Definition</td>
</tr>
<tr>
<td>IEEE Std 1641.1</td>
<td>IEEE Guide for the Use of IEEE Std 1641, Standard for Signal and Test Definition</td>
</tr>
<tr>
<td>IEEE Std 716</td>
<td>IEEE Standard Test Language for All Systems - Common/Abbreviated Test Language for All Systems (C/ATLAS)</td>
</tr>
<tr>
<td>IEEE Std 771</td>
<td>IEEE Guide to the Use of the ATLAS Specification</td>
</tr>
</tbody>
</table>
MOD Policy – Def Stan 66-31 Part 8 includes…

- **Table D.2—Test information interchange standards**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>IEEE Std 1636</td>
<td>IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA)</td>
</tr>
<tr>
<td>IEEE Std 1636.1</td>
<td>IEEE Standard for (SIMICA): Exchanging Test Results and Session Information via the eXtensible Markup Language (XML)</td>
</tr>
<tr>
<td>IEEE Std 1636.2</td>
<td>IEEE Standard for (SIMICA): Exchanging Maintenance Action Information via the Extensible Markup Language (XML)</td>
</tr>
<tr>
<td>IEEE Std 1671</td>
<td>IEEE Standard for Automatic Test Markup Language (ATML) for Exchanging Automatic Test Equipment and Test Information via XML</td>
</tr>
<tr>
<td>IEEE Std 1671.1</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging Test Descriptions</td>
</tr>
<tr>
<td>IEEE Std 1671.2</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging Instrument Descriptions</td>
</tr>
<tr>
<td>IEEE Std 1671.3</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging UUT (Unit-Under-Test) Description Information</td>
</tr>
<tr>
<td>IEEE Std 1671.4</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging Test Configuration Information</td>
</tr>
<tr>
<td>IEEE Std 1671.5</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging Test Adapter Information</td>
</tr>
<tr>
<td>IEEE Std 1671.6</td>
<td>IEEE Standard (ATML) for Exchanging ATE and Test Information via XML: Exchanging Test Station Information</td>
</tr>
</tbody>
</table>
IEEE 1641—Standard for Signal & Test Definition

• IEEE 1641 provides:
  – Rigorously defined signal definitions
  – Rigorously defined signal interfaces
  – Standard pre-defined basic signals
  – Libraries for different technologies/environments
  – Signals that are the same in different environments
  – Fully portable test requirements
  – XML format for signals definitions (used by ATML)

• Current version is IEEE Std 1641™–2010
IEEE 1671 series—ATML suite of related standards

- A standard XML exchange format for sharing information between ATS components
  - test data
  - results data
  - resource data
  - UUT data
  - diagnostic data
  - historic data
- Supports test program, test asset and UUT interoperability
IEEE 1671 series—ATML suite of standards

- Using a common XML format:
  - Different tools and systems can exchange information
  - Heterogeneous systems may co-operate, resulting in:
    - Decreased test times
    - Reduced incidents of *Can Not Duplicate* or *No Fault Found*
    - Reduced Repair Cycle
    - Formalized capture of historic data
    - Improved closed loop diagnostic systems
Do we want to add any non-runtime benefits shared or reused test information portability/rehost etc.

Chris Gorringe, 18/07/2011
IEEE 1671 series—ATML suite of standards

• The ATML standards define:
  – XML schemas that represent ATE and test information
  – XML schemas supporting the exchange of ATE and test information between different systems
  – Examples of services that can be used for exchanging ATE and test information in a distributed net-centric environment
where did this come form because I nolonger think ATML does provide example services, or where it does (Annex D - ATML runtime Services) its very toplevel and toned down in the last release

Chris Gorringe, 18/07/2011
IEEE 1671 series—ATML suite of standards

- The ATML standards

ATML Overview and Architecture IEEE 1671-2010

<table>
<thead>
<tr>
<th>ATML Test Description</th>
<th>ATML Instrument Description</th>
<th>ATML UUT Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATML Test Station Description</td>
<td>ATML Test Adapter Description</td>
<td></td>
</tr>
<tr>
<td>IEEE 1671.6-2008</td>
<td>IEEE 1671.5-2008</td>
<td></td>
</tr>
<tr>
<td>ATML Test Configuration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEEE 1671.4-2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEEE 1636.1-2007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ATML) Common & Hardware Common schemas
Part of IEEE 1671-2010

All 1671 series XML schemas available on IEEE standards Website
IEEE 1671 ATML series and related standards

- RFI Pin Map Info
  - IEEE P1505.1.1

- SIMICA Test Results
  - IEEE 1636.1

- ATML Applications

- XML

- ATML Overview & Architecture
  - IEEE 1671

- Signal & Test Definition
  - IEEE 1641

- ATML Test Station
  - IEEE 1671.6

- ATML Instrument Desc.
  - IEEE 1671.2

- ATML Test Adapter
  - IEEE 1671.5

- ATML Test Configuration
  - IEEE 1671.4

- ATML Test Description
  - IEEE 1671.1

- ATML UUT Description
  - IEEE 1671.3

- SIMICA Test Results
  - IEEE 1636.1

- SIMICA Maintenance Info
  - IEEE 1636.2

- AI-ESTATE
  - IEEE 1232
ATML Test Description (IEEE 1671.1)

- Provides for the description of test requirements
- For exchanging information defining:
  - Test actions
  - Test conditions
  - Diagnostic requirements
  - Support equipment
- To verify proper operation of a UUT
- Supports the development of TPSs that will be used in an automatic test environment
ATML Instrument Description (IEEE 1671.2)

• Provides for the description of:
  – a test instrument model
  – specific instance of instrument,
    • e.g., instrument (serial number xyz) within a test system
• For exchanging static descriptions of test instruments
  – where an instrument is a physical device and accompanying
driver, firmware and documentation that is used to accomplish the
testing of an UUT.
• Includes All Instrument types
  – Traditional
  – Switching systems
  – Synthetic
ATML UUT Description (IEEE 1671.3)

• Provides for the description of a UUT test subject or specific instance of a UUT
  – e.g., serial number
• Provides for common hardware descriptions, plus:
  – Built In test codes (BIT)
  – Errors & Failures
  – UUT History
ATML Test Configuration Description (IEEE 1671.4)

• Provides for the description of the testing configuration
• All hardware, software and documentation that may be necessary to test & diagnose a UUT on a test station:
  – Test system assets
  – Hardware to electrically adapt or physically support the UUT
  – Test program description software
  – Test program media
  – Maintenance manuals
  – References to external schemas
ATML Test Adaptor Description (IEEE 1671.5)

- Provides for the description of an interface test adapter (ITA) and ancillary cables
- Defines the interface between the Unit Under Test and the Test Station, including:
  - Physical and electrical characteristics
  - Capabilities & performance
  - Identification & classification
• Provides for the description of a test station type or specific instance of a test station
  – e.g., Serial Number
• Defines the elements and attributes used to describe a test station:
  – Physical and electrical characteristics,
  – Components – Resources and Instruments
  – Capabilities & performance
  – Identification & classification
Test Results (IEEE 1636.1)

• Provides for the description and transfer of test results for:
  – system test
  – UUT tests
  – calibration
  – etc

• Types of results
  – qualitative (yes/no)
  – quantitative (a measured or calculated value)
  – operational observations (e.g. pilot comments)
Test Results (IEEE 1636.1)

- Provides a standard format for exchanging and storing the
  - measured values,
  - pass/fail results,
  - accompanying data, including:
    - operator information
    - station information
    - environmental conditions
- May be used as a data storage format
- Test Results may be displayed/printed in any required format by using style sheets
Signal & Test Definition (IEEE 1641)

- Mandated by MOD policy
- A complete standard in its own right
  - Defines signals for use in test
  - Defines measurements
  - Defines complete tests (using a carrier language)
- IEEE 1641 signals may referenced in:
  - ATML Test Description (1671.1)
  - ATML Capabilities
    - Instrument Description (1671.2)
    - Test Adaptor (1671.5)
    - Test Station (1671.6)
IEEE 1641 features:

- Rigorously defined signal definitions
  - Signals are supported by mathematical definitions
  - Signals built up from lower level components
- Signals may be assembled into libraries
  - Libraries for different technologies/projects/UUTs
- Signals are the same in different environments
  - Signal definitions are independent of environment
IEEE 1641 Signals:
- Signals may be expressed in different formats
  - Graphical
  - Tabular
  - XML
  - IDL
- XML is formal exchange medium
- 1641 standard provides formal XML schema
  - Downloadable from IEEE Standards website
Signal & Test Definition (IEEE 1641)

- IEEE 1641 tests comprise:
  - IEEE 1641 signal definitions
  - Test sequential information in a "carrier language"

- Carrier language may be:
  - Any compliant programming language
    - Requirements are defined in the standard
  - ATML Test Description (IEEE 1671.1)
    - Preferred due to ease of interpretation and re-host, etc.
Signal & Test Definition (IEEE 1641)

• Closing the loop!

• IEEE 1641 signals are used in:
  – ATML Test Description
  – ATML Capabilities
    • Instrument Description
    • Test Adaptor
    • Test Station

• For ATML Test Description
  – Signals may be individually expressed
  – TSF models, maintained in TSF Libraries

• For ATML Capabilities
  – Resource Capabilities described in form of Signals
  – Usually with ranges instead of specific values
ATML TPS development process using signal models
General flow of information – Traditional process

- Little scope for reuse or automatic information exchange
• Provides a format that allows common exchange of test information
Flow of information – ATML concept of operations
Summary

• Use of ATML & 1641 is MoD Policy
• Use of IEEE 1641 is mandatory or new projects
• ATML inherently uses IEEE 1641
• ATML is part of Def Stan 66-31 Pt 8 (OSA)
• ATML & 1641 support exit strategies via common information exchange
• MoD will mandate tools and systems that support Def Stan 66-31 Pt 8 (OSA)