S1000D INTERMEDIATE

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Members of S1000D community
Not a law firm!
Topics

• Main Items
  – Presenter introductions
  – Background
  – High level overview
  – Deeper insight

• Rules
  – Dig Tam up about his accent
  – Ask questions any time
    • You need to get out as much as possible
  – If we park something remind us at end
  – There are no rules only guidance
Who am I (Tam)

• **Current**
  – BAE SYSTEMS Shared Services; Standards and Capability development.
    • Working on and understanding the role of technical data in the following areas;
      – S1000D
      – PLCS
      – SCORM
      – ILS/PBL/availability contracting
    – With a view to taking this knowledge back into the business to influence future and current programs.
  – Sit on S1000D Steering Committee

• **Previously**
  – Worked as a consultant on all aspect of data creation, management and delivery with IBM, Raytheon, UK MOD and various UK academic committees looking at metadata in learning.
  – Initial involvement in the S1000D, whilst working with the UKMoD covering, Publications Policy a long time ago…
    • This was on S1000D, UK internal standards, NATO committees, etc
Who am I (Ryan)

- **BOEING Integrated Defense Systems – Product Support**
  - Streamlining information flow through Product Support
    - Engineering source
    - SSA (1388-2B, S3000L, GEIA-0007)
    - Tech Pubs (MIL standards, S1000D)
    - Training (SCORM, S1000D)
  - Chair of the S1000D Electronic Publications Working Group (EPWG) – the technical branch of the S1000D Committee
  - One of the founders of the US S1000D Implementation Group (USSIG) and past Industry Chair of that group
  - Almost 20 years experience in Product Support
    - Mainly Technical Publications
    - Automated Maintenance Environments
  - Have survived (barely) 9 years of S1000D committee work with characters such as Tom Malloy
S1000D Background
S1000D

- International Specification for Technical Publications utilizing a Common Source Database.
- 20 years old
- Baseline was ATA Spec 100
- Global adoption of it, in its various versions
  - Europe
    - 1.5 - 4.0
  - USA
    - 2.0 - 4.0
  - Asia
  - Russia
  - Etc
S1000D History - Why

• The European Military/Industry problem
  – Distributed work share programs
    • Different companies / countries developing data for the same program
    • Disparate data must be integrated into a coherent publication
  – ATA Spec 100 was a good starting point, but didn’t support requirements for workshare
  – S1000D was developed from Spec 100 to place greater emphasis on **granularity** and **interchangeability** of information
• The US Military/Industry problem
  – Too many specifications, no consistency between or even within service branches
    • The services were spending an estimated $5M/year just on technical publication specification maintenance
    • Each specification requires unique knowledge base and software solutions = COST
  – S1000D provides an INTERNATIONAL solution to standardize on a common spec across the services
    • Although it started out as Air specific, S1000D now supports Land, Sea, and Air in a single specification
S1000D History - Why

- The Commercial Airline Industry problem
  - ATA tech pubs specifications are SGML based and publication based
  - Manufacturers and Industry were looking to develop an information exchange, as opposed to a publication exchange (and wanted newer technology – XML)
  - S1000D had already cracked that nut, and had the same ancestor in Spec 100
S1000D in the USA

**USSMG**
- Air Working Group
- Land Working Group
- Sea Working Group
- Business Rules Group & Acquisition Guidance Group

To get involved
https://ussmg.btas.com

Follow the instructions

**USSIG**
- Non-Linear Group
- Effectivity-Applicability Group
- Graphics and Multimedia Group
- Diagnostics Group
- Functionality/Look & Feel Group
- Information Reuse Group
- Tools & Technologies Group
- Training Group
- Wiring & Schematics Group
How is it run?
Background to S1000D

- Publications standard in common use;
  
  **Air Transport Association**

- Used by the commercial aircraft industry.

- Breaks down aircraft into systems, sub-systems equipments etc., in accordance with a pre-defined numbering scheme.
Benefits - Data

- Interoperability at data level
- Meta Data
- Data Dictionary
- Non-proprietary
- Ease of data exchange
- Can be linked with source data e.g. LSAR
- Permits the addition of extra documentation features such as Link mechanisms etc.
- International standard, ISO 8879.
- Delimits objects of information, rather than the traditional paper bound constraints.
- The AECMA S1000D data module concept can be and has been applied to legacy data
Benefits - Reduced Authoring Costs

- Re-use of data i.e. it is modular (up to 40% re-use)
- Reduction in update costs (up to 30%)
- Defined Document Structures
- Module Uniqueness (Task / Description)
- Toolkit
- Implementation Guidance
- Compliant Authoring tools available
Benefits - Viewer (IETM)

- Web Technology based
- Minimal Common GUI
- Baseline standard style sheets
- Interoperability at viewer level
- Flexibility of Output Formats
- Maintained Standard Since mid1980s
- Management Committee
- Active User community

In-Use (V-22, 117 in US, CH47, UK AH64)
Benefits - Reduced Training Costs

- Single User Interface
- Single Document Construct
  - Within projects
- Single Method of Production
  - Within projects
Benefits - Reduced Life Cycle Costs

- Reduced creation costs
- Lower document distribution costs.
- Wider access and more efficient retrieval of the documentation by the end user.
- Easy filtering of information e.g. search and retrieval by applicability
- Increased operational readiness through reduced MTTR
- Improved repair performance
- Increase in data integrity and the generation of better quality documents
S1000D High Level Concepts
Life Cycle Support of Information

- S1000D addresses the life cycle of information management, not just the exchange.
### Processes

| Planning DMRL Data Module Rqmts List | Status CSL CSDB Status List | Feedback Comment | Delivery DDN Data Dispatch Note |

### Aggregation

| Maintenance PM Publication Module | Training SCM SCORM Content Package Module |

### Data

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### Applicability

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Basic concepts (1)

- **Data module**
  - A stand alone information unit comprising descriptive, procedural, operational data for a Materiel or a component thereof
  - “the smallest self contained information unit within a technical publication”
  - Must be a standalone unit, the only external information allowed are graphic files, multimedia or PDF
  - The unit is produced in such a form that it could be stored and retrieved from a Common Source DataBase by the data module code as the identifier
  - Size is not mandated, but typically is a discrete task (remove power, open access panel, etc…)
  - Produced in SGML/XML according to specific DTDs/Schemas

- **CSDB (Common Source DataBase)**
  - A store for the data modules and publications
Basic concepts (2)

• DMC (Data Module Code)
  – A code to uniquely identify a data module and to facilitate storing and retrieving them from a CSDB
    • Minimum 17 characters
    • Maximum 41 characters

• ICN (Information Control Number)
  – A code to identify an illustration and to facilitate storing and retrieving them from a CSDB
    • Two methods: CAGE code based and Model Ident code based
    • Minimum 15 characters
    • Maximum 47 characters

• Applicability (Effectivity)
  – Defines to which version/mark/serial number of the Materiel or other condition the data module or data module portion is written
Each Data Module comprises two parts:

Identification and Status

and

Contents
Data Modules

• Data module structure
  – IDSTATUS section
    • Divided into
      – Identification metadata
      – Status metadata
    • Every DM contains the same IDSTATUS structure
  • All other objects (PM, SCM, DMRL, etc…) contain similar structure
  – CONTENT section
    • Content will differ depending on the data module type
Data Module - Identification and Status

- Provides information for:
  - Managing the Data Module within the CSDB.
  - Managing Data Module applicability.
  - Managing the Quality Assurance process.
  - Controlling the retrieval processes.
  - Automatic compilation of User information.
Data Modules – IDSTATUS

ID

• Unique identification of the DM
  – DM Code
  – Language
  – Issue number
  – Issue date
  – Title
Data Modules – IDSTATUS
Status

- Security classification
- Data restrictions (partial list)
  - Distribution statement
  - Export control statement
  - Special handling instructions
  - Destruction statement
  - Copyright
- Responsible partner company
- Originator
- Applicability (Effectivity)
- Quality assurance status
- Reason for update
- Several other data items
Data Module Code (1)

- Are unique ‘packages’ of information.
- Are associated with a particular element/item of equipment.
- Contain textual and may reference non textual information.
Data Module Code (2)

- Defines the Data Module in terms of:
  - Assembly/sub-assembly/item information, providing information about the equipment being documented.
    - Equipment.
    - Hierarchical position
    - Disassembly sequence
  - Module usage information, providing information about the Data Module.
    - Information Contents
    - Location
Data Module Code (3)

BATTLETANK1234

- AAAA - A38-21- 0301 - 04AAA - 040A - A

MI SDC SNS DC/DCV Location code
Optional MICC IC/ICV

Training covered later
Model Identification - MI

- Project can allocate and register with NAMSA to avoid duplication.
- Example
- Rules use of Zeros

BATTLETANK1234
SNS

- Identifies the physical location within the Material or Equipment
- Note
  - An element of a unique ID
- SNS breakdown is similar to ATA and to Mil-Spec -1808 for air vehicles
- Various SNS and exemplar SNS in spec
SNS Generic breakdown rules

- System
- Sub System
- Sub, sub system
- Function/LRU
Information Codes (1)

- The information codes identify the type of information contained within a data module there is a grouping structure. The primary codes are defined as:
  - 000 Function, data for plans and description
  - 100 Operation
  - 200 Servicing
  - 300 Examinations, tests and checks
  - 400 Fault report and isolation procedures
  - 500 Disconnect, remove and disassemble procedures
  - 600 Repairs and locally make procedures and data
  - 700 Assemble, install and connect procedures
  - 800 Storage procedures and data
  - 900 Miscellaneous
Information Codes (2)

• Each of these have secondary codes, examples are below;
  – 210 Fill
  – 211 Refuel
  – 212 Fill with oil
  – 213 Fill with oxygen
  – 214 Fill with nitrogen
  – 215 Fill with air
Illustrations

• Illustration Rules:
  – S1000D describes in detail how illustrations should be prepared and controlled. It covers:
    • Presentation techniques.
    • Symbols.
    • Types of Illustrations.
    • Illustration sizes, formats, line weights, typefaces etc.
    • Layout – including reference locations, call-outs etc.
    • Information Control Number (ICN).
Illustrations

• Why have them;
  – To clarify text
  – To avoid lengthy explanations
  – When information cannot be conveyed through text
  – Ease in multi-lingual situations
Illustrations

• Hot spotting. This allows linking:
  – From data module to location(s) within a graphic.
  – From data module to location(s) within several graphics.
  – From within graphic to within data modules.
  – From graphic to graphic.

• Screen tips.
  • There is meant to be an example here!
Applicability (Effectivity)

- S1000D has recently revolutionized how it deals with applicability.
- Applicability is handled within a DM and applies the content of the DM to the physical object or an operational condition.
- The term effectivity is no longer used in S1000D, the term applicability has been chosen and defined to cover the traditional terms of applicability and effectivity.
- Watch this space, we will discuss this later but has been one of the more dramatic changes within the specification.
S1000D - Outputs

- S1000D allows two forms of output
  - Paper
    - User driven based paradigm
    - Output to suit user
  - Electronic
    - Web based delivery
    - Data in SGML/XML form
    - Starting to increase functionality
Information Set/Publication?
Information Set/Publication?
Information Set/Publication?
Information Set/Publication?
Information Set/Publication

DMs → Info sets → Info sets → Info sets → Publication → Publication
Information Set/Publication?

Many to One

DMs

Info sets

One to One

Publication

Publication
Info Set/Publication/Deliverable

Final Deliverable

One or More Publications

One or more Info Sets

One or more DMS and support data
S1000D Deeper Dive
Highlights - 4.0

• **Main changes**
  – Identification and status section
  – Steps and paragraphs
  – Warnings, cautions, and notes
  – Hotspots
  – Process data module
  – Publication module
  – References
  – Information codes
  – IPD data module
  – IPD data module
  – Preliminary requirements
  – BREX data module
  – Schema cleanup
  – Technical information repository data module
  – Schedule data module
  – Checklist data module
  – Training
  – Comment schema

• **Summary**
  – Predominately changes for US ARMY
  – Issue 4.0 is a complete revision of the specification, so no change marks appear.
    • Schema construct and name changes greatest aspect and biggest impact
Guidance in S1000D

- **White paper**
- **Mapping tool**
  - Downloadable from S1000D site
S1000D Issue 4.0 main areas

- Business Rules
- Applicability
- Container alternate
- Technical Repositories
- Learning
- Process DM
Business Rules

• Next set of slides looks at high level overview of concept.
• Discuss what they are, were they come from and why.
Concept

• Original concept
  – Attempt by S1000D practitioners to input into the specification guidance on what information is required when “doing” an S1000D program.
  – Everybody using the spec needs to understand these as they are probably fundamental to good deployment.
    • Most projects use them already in some capacity
  – Projects can fail/falter if all aspects are not understood.
What is a Business Rule?

• Rule:
  “A rule is a principle or condition that customarily governs behaviour”

• Business Rule:
  “Business rules represent policies, procedures and constraints regarding how an enterprise conducts its business”

• In the past in S1000D programs business rules were deemed to only apply the author/creator of the information

• As knowledge grew within programs it was identified that there were multiple aspects that affected Business
  – Contractual
  – Organisational
  – Geographical
  – etc
Categories of Business Rules

• Within S1000D it was decided that guidance was needed to identify the various types of business rules applicable.

• These would group together “alike” rules and would cover aspects such as:
  – product definition,
  – maintenance philosophy,
  – concepts of operation,
  – security,
  – business processes,
  – data creation,
  – data exchange,

  – data integrity,
  – data output
  – Other possibilities
  – Legacy data conversion,
  – management,
  – handling
  – etc.
Example Category

- **Data Creation Business Rules**
  - These BRs give information to aid data creation. They can be for the creation of text, illustrations and multimedia.
  - The Data Creation BRs include:
    - Business Rules on creation of textual data
    - Business Rules on creation of graphics, 3D content, and multimedia.

- **Data Creation Business Rules – Text**
  - These BRs consist of writing rules (including terminology rules) and mark-up rules.
  - Writing rules give information about how the technical content is written and specify, for example, the use of dictionaries, how numbers are to be expressed, how the author is to refer to technical terms, and the establishment and use of a Terminology database.
  - Mark-up business rules provide information about which mark-up elements and attributes are to be used and how they are to be used and populated. These rules are often project specific.
  - To summarize, the Data Creation BRs for Text may include:
    - Writing rules (including terminology rules)
  - Markup rules.

- **Example:**
  - All fault data modules must have their fault codes listed in the fault code index
  - The applicability block mark-up requirements are…
  - The `<techstd>` element must not be used….
  - The `<dmsize>` element must contain …
Business rules should be layered, by that we mean there is an inherent hierarchy in their applicability within a program.
Layering examples

6-layered Defense Business Rules Model

- Layer 1: S1000D BRs
- Layer 2: National defense BRs
- Layer 3: Organization BRs
- Layer 4: Project BRs
- Layer 5: Subproject BRs

3-layered Civil Business Rules Model

- Layer 1: S1000D BRs
- Layer 2: Civil Aviation BRs
- Layer 3: Project BRs
Applicability

- Next set of slides looks at high level overview of concept.
- Discuss what should affect application of applicability.
Applicability Outline

- Common understanding of applicability concepts
- Conceptual overview of Issue 3.0 applicability
- Examples
Applicability
A New Approach

• Prior to Issue 3.0:
  – Specific structure was used to specify values to a small set of product properties (model, version, etc)
  – Inflexible
  – Suitable for paper output (no rules for computer interpretation)

• Issue 3.0 replaced with a completely new concept
  – Flexible framework where the data provider chooses the product properties and operational conditions to use for applicability
  – Computing rules are associated with the statement structure
  – A system where both the human and the computer can understand and act upon the applicability statement
  – Allows for (this is optional) IETP viewers to filter information to the end user based on applicability
Applicability Definition

Applicability provides the mechanism to identify the context for which a data module or parts of a data module is valid. This context is usually associated with the physical configuration of the Product but can include other aspects such as tool availability and environmental conditions.
First problem the Applicability Working Group had was expressing a common understanding of what is applicability.

Expectations

- This example is intended ONLY to convey a broad understanding of what Applicability is within S1000D
- This example is not intended to illustrate all use cases or all the needed functionality
Scenario

- The OEM develops a cell phone that can take 3 batteries:
  - Alkaline
  - Ni-MH
  - Lithium Ion
- The OEM sells the phone to Customer A who only offers Alkaline and Ni-MH
- The OEM also sells the phone to Customer B who only offers Alkaline and Lithium Ion
- IETP is capable of displaying a “filtered” view for a specific product / cell phone
Conventions

- Applicability is in GREEN
- Filtering criteria is in BLUE
- Applicability statements are generalized, for example:
  <applic>
    <!--Alkaline battery installed-->
  </applic>
Data Module applicability (publishing process only)

Applicability

Filtering criteria

Delivery A: 00001
- Batteries: Alkaline, Ni-MH

Delivery B: 00002
- Batteries: Alkaline, Lithium Ion

DM
DMC-MP-01-01-01-…-700A…
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...
<br><applic>
<!--Alkaline battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700B…
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<idstatus>
...
<br><applic>
<!--Ni-MH battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700C…
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...
<br><applic>
<!--Lithium Ion battery installed-->
</applic>
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</idstatus>
<content>
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DM
DMC-MP-01-01-01-…-700D…
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...
<br><applic>
<!--Alkaline battery installed-->
</applic>
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</idstatus>
<content>
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DM
DMC-MP-01-01-01-…-700E…
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<idstatus>
...
<br><applic>
<!--Ni-MH battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700F…
--------------------------------------------------------
<idstatus>
...
<br><applic>
<!--Lithium Ion battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700G…
--------------------------------------------------------
<idstatus>
...
<br><applic>
<!--Alkaline battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700H…
--------------------------------------------------------
<idstatus>
...
<br><applic>
<!--Ni-MH battery installed-->
</applic>
...
</idstatus>
<content>
...

DM
DMC-MP-01-01-01-…-700I…
--------------------------------------------------------
<idstatus>
...
<br><applic>
<!--Lithium Ion battery installed-->
</applic>
...
</idstatus>
<content>
...
In-line applicability (customization/publishing process only)

Delivery Rqmt A : 00001
----------------------
Batteries:
Alkaline
Ni-MH

Customization
Of DM / Publishing proc. (filtering)

Master DM
DMC-MP-01-01-01-…
--------------------------------------------------------
…
<step1>…</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged…</step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by…</step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by…</step1>
...

Delivery Rqmt B : 00002
----------------------
Batteries:
Alkaline
Lithium Ion

Customization
Of DM / Publishing proc. (filtering)

Customized DM
DME-OEM1-00001-MP-01-01-01-…
--------------------------------------------------------
…
<step1>…</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged…</step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by…</step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by…</step1>
...

Customized DM
DME-OEM1-00002-MP-01-01-01-…
--------------------------------------------------------
…
<step1>…</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged…</step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by…</step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by…</step1>
...

Applicability

Filtering criteria
In-line applicability (customization/publishing process and IETP)

Master DM
DMC-MP-01-01-01-...
--------------------------------------------

...<step1>...</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged...<step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by...<step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by...<step1>
<step1>...</step1>

...<step1>...</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged...<step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by...<step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by...<step1>
<step1>...</step1>

Customized DM
DME-OEM1-00002-MP-01-01-01-...
--------------------------------------------------------------------------------

...<step1>...</step1>
<step1>
<applic><!--Alkaline battery installed--></applic>
Alkaline battery cannot be charged...<step1>
<step1>
<applic><!--Ni-MH battery installed--></applic>
Recharge Ni-MH battery by...<step1>
<step1>
<applic><!--Lithium Ion battery installed--></applic>
Recharge Lithium Ion battery by...<step1>
<step1>...</step1>

Customization Of DM / Publishing proc. (filtering)

Delivery Rqmt B: 00002
-------------------------------

Batteries:
Alkaline
Lithium Ion

Phone S/N: XYZ-456
Batteries: Lithium Ion

IETP (filtering)

Applicability
Filtering criteria
In-line applicability (using <inlineapplics>)

Master DM
DMC-MP-01-01-01-…

<iestatus>
...
</iestatus>

<inlineapplics>
  <applic id="a1">!--Alkaline battery installed--></applic>
  <applic id="a2">!--Ni-MH battery installed--></applic>
  <applic id="a3">!--Lithium Ion battery installed--></applic>
</inlineapplics>

<iestatus>
...
</iestatus>

<content>
...
</content>

<step1>…</step1>
<step1 refapplic="a1">Alkaline battery cannot be charged…</step1>
<step1 refapplic="a2">Recharge Ni-MH battery by…</step1>
<step1 refapplic="a3">Recharge Lithium Ion battery by…</step1>

...

Delivery Rqmt A : 00001
--------------------------------------------------------
Batteries:
Alkaline
Ni-MH

Customization
Of DM /
Publishing proc.
(filtering)

Customized DM
DME-OEM1-00001-MP-01-01-01-…

<iestatus>
...
</iestatus>

<inlineapplics>
  <applic id="a1">!--Alkaline battery installed--></applic>
  <applic id="a2">!--Ni-MH battery installed--></applic>
  <applic id="a3">!--Lithium Ion battery installed--></applic>
</inlineapplics>

<iestatus>
...
</iestatus>

<content>
...
</content>

<step1>…</step1>
<step1 refapplic="a1">Alkaline battery cannot be charged…</step1>
<step1 refapplic="a2">Recharge Ni-MH battery by…</step1>
<step1 refapplic="a3">Recharge Lithium Ion battery by…</step1>

...

Delivery Rqmt B : 00002
--------------------------------------------------------
Batteries:
Alkaline
Lithium Ion

Customization
Of DM /
Publishing proc.
(filtering)

Customized DM
DME-OEM1-00002-MP-01-01-01-…

<iestatus>
...
</iestatus>

<inlineapplics>
  <applic id="a1">!--Alkaline battery installed--></applic>
  <applic id="a2">!--Ni-MH battery installed--></applic>
  <applic id="a3">!--Lithium Ion battery installed--></applic>
</inlineapplics>

<iestatus>
...
</iestatus>

<content>
...
</content>

<step1>…</step1>
<step1 refapplic="a1">Alkaline battery cannot be charged…</step1>
<step1 refapplic="a2">Recharge Ni-MH battery by…</step1>
<step1 refapplic="a3">Recharge Lithium Ion battery by…</step1>

...
Outline

• Common understanding of applicability concepts
• Conceptual overview of Issue 3.0 applicability
• Examples
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Author (Applic)

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

CSDB

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (**ACT**)

Conditions (**CCT**)

Author (Applic)

CSDB

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Author (Applic)

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Document Flow

Information Flow
Conceptual Overview

Product List (PCT)

Product Attribute Values

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Condition Values

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (ACT)

Product List (PCT)

Author (Applic)

CSDB

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Author (Applic)

CSDB

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Document Flow

Information Flow
Conceptual Overview

Product List (PCT)

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Document Flow

Information Flow

Author (Applic)

CSDB

IETP
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Document Flow

Information Flow
Conceptual Overview

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Document Flow

Information Flow
Applicability Outline

- Common understanding of applicability concepts
- Conceptual overview of Issue 3.0 applicability
- Examples
Example: Product Attributes

Product Definition

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Author (Applic)

CSDB

Document Flow

Information Flow
Example: Product Attributes

`<productattributes>
  <prodattr id="serialno">
    <name>Serial number</name>
    <description>Serial number</description>
  </prodattr>
  <prodattr id="model">
    <name>Model</name>
    <description>Model</description>
    <enum actvalues="BKTRK"/>
  </prodattr>
  <prodattr id="series">
    <name>Series</name>
    <description>Model series</description>
    <enum actvalues="1~3"/>
  </prodattr>
  <prodattr id="frame">
    <name>Frame type</name>
    <description>The frame material</description>
    <enum actvalues="Steel|Aluminum"/>
  </prodattr>
</productattributes>`
Example: Conditions

Product Definition

Product Attributes (ACT)

Author (Applic)

CSDB

Conditions (CCT)

Product List (PCT)

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Document Flow

Information Flow
Example: Conditions

<conditionlist>

<condition id="brakes" condtyperef="brakeType">  
  <name>Brakes</name>  
  <description>Brand of brakes installed</description>  
</condition>

<condition id="HDLT-2A" condtyperef="optEquip">  
  <name>Headlight installed</name>  
  <description>Headlight kit HDLT-2A installed</description>  
</condition>

<condition id="SB-BT-3" condtyperef="sbType">  
  <name>Chain guard (SB-BT-3)</name>  
  <description>Chain guard service bulletin embodied (SB-BT-3)</description>  
</condition>

</conditionlist>
Example: Product List

Product Definition

Author (Applic)

Product Attributes (ACT)

CSDB

Conditions (CCT)

Product List (PCT)

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Document Flow

Information Flow
Example: Product List

<pct>
<pct>
<product>
<assign actidref="serialno" actreftype="prodattr" actvalue="001"/>
<assign actidref="model" actreftype="prodattr" actvalue="BKTRK"/>
<assign actidref="series" actreftype="prodattr" actvalue="1"/>
<assign actidref="frame" actreftype="prodattr" actvalue="Aluminum"/>
<assign actidref="brakes" actreftype="condition" actvalue="Shimano"/>
<assign actidref="HDLT-2A" actreftype="condition" actvalue="False"/>
<assign actidref="SB-BT-3" actreftype="condition" actvalue="Pre"/>
</product>

<product>
<assign actidref="serialno" actreftype="prodattr" actvalue="002"/>
<assign actidref="model" actreftype="prodattr" actvalue="BKTRK"/>
<assign actidref="series" actreftype="prodattr" actvalue="2"/>
<assign actidref="frame" actreftype="prodattr" actvalue="Steel"/>
<assign actidref="brakes" actreftype="condition" actvalue="Tekro"/>
<assign actidref="HDLT-2A" actreftype="condition" actvalue="False"/>
<assign actidref="SB-BT-3" actreftype="condition" actvalue="Post"/>
</product>
</pct>
Example: Applicability Model

Product Definition

Author (Applic)

Product Attributes (ACT)

Conditions (CCT)

Product List (PCT)

CSDB

Serial: 001
Model: BKTRK
Series: 1
Frame: Aluminum
Brakes: Shimano
Headlight: False
SB-BT-3: Pre

Serial: 002
Model: BKTRK
Series: 2
Frame: Steel
Brakes: Tekro
Headlight: False
SB-BT-3: Post

Document Flow

Information Flow
Example: Applicability Model

<applc>
  <displaytext>S/N 200-350</displaytext>
  <assert actidref="serialNo" actreftype="prodatt"
        actvalues="200~350"/>
</applc>
Example: Applicability Model

<applic>
  <displaytext>Model Brook trekker-1 S/N 200-350</displaytext>
  <evaluate oper="and">
    <assert actidref="model" actreftype="prodattr"
      actvalues="BKTRK"/>
    <assert actidref="series" actreftype="prodattr"
      actvalues="1"/>
    <assert actidref="serialNo" actreftype="prodattr"
      actvalues="200~350"/>
  </evaluate>
</applic>
S/N 1-10 with Tekro brakes; S/N 1-20 with Shimano brakes

Example: Applicability Model
Container Alternate

- Next set of slides looks at high level overview of concept.
• **Original concept**
  – Methodology to ensure simpler management of links.
  – Management is the operative word was not intended to be part of output
  – However....
Concept

- A Container DM is used to group DMs together that achieve the same maintenance goal.
- Container DM references the other DMs.
- Example:

  - Procedural DM: Apply Power using APU
  - Procedural DM: Apply Power using Ground Power
  - Procedural DM: Apply Power using Portable Cart
Concept

• The Container DM can also be used to isolate referencing DMs when the references change

• Examples:
  – Taking the previous example with applying power, suppose a new power source (Apply Power DM) is added
  – Suppose a supplier adds an alternate method in the data they provide to the integrator
Principle

No container concept

- OEM DM
- RefDM
- Supplier DM

Container concept

- OEM DM
- RefDM
- Container
  - Supplier DM
Principle

No container concept

Container concept

OEM DM Iss2 → RefDM

Supplier DM alternate 1
Supplier DM alternate 2

OEM DM

Container

Supplier DM alternate 1
Supplier DM alternate 2
Container in a DM

• New concept proposed for Issue 4.1 is to do the same thing, but within the content of a DM
  – Using the container concept to capture alternate links dependent on applic for instance.
Container Alternate in DM

Remark: in case a new alternate B is created for A/C 6 in a later DM issue, there is no need to create a new alternate A.
Technical Repositories

• Next set of slides looks at high level overview of concept.
• Discuss what, where and why.
Concept

- **Original concept**
  - Support the exchange of collections of support data
    - Foster reuse – small pieces of information referenced from many places
    - Reduce redundancy – write once, use many times
  - Like containers not necessarily to be used in output
- **Introduced into the specification at Issue 2.3 as a new DM type**
Principle

Data redundancy
Principle

Data modules

Technical information repository data module
Repository Types

• Currently supported (Issue 4.0)
  – Functional item numbers
  – Circuit breakers
  – Parts
  – Zones
  – Access points
  – Organizations
  – Supplies
  – Support equipment
  – Physical / functional areas (breakdown)
  – Controls and indicators

• Proposed (Issue 4.1)
  – Warnings and cautions
  – Applicability
So What is a TIR

- A DataBase
- Data Module
- A list of spares
- All of the above!

How can you implement it
- Two main methods
  - Internal to an organisation and external as part of the deliverable
So What is a TIR

- What are your information requirements
  - Lists
  - TIR
- Deciding what it is is based on how you intend using it.
- How will you manage it
  - Coding
  - Updating
  - Configuration control of content
- Delivering it or not
Learning

• Next set of slides looks at high level overview of enhancement to training.
Concept

• Original concept
  – Originally introduced to enable training to be created in a S1000D environment

• Enhanced Learning and introduced view from conception to delivery
Learning

Learning Schema Objectives

1. Supplement SCORM with structured DM markup for technical learning content (SCORM is not a markup specification).

2. Apply XML structure to all phases of course development: lesson plans, overview content, main course content, summary content and assessment content.

3. Apply file naming and configuration to technical learning content.

4. Fold training into life cycle data management, especially ECP impact notification.
### Learning

<table>
<thead>
<tr>
<th>Function</th>
<th>S1000D</th>
<th>SCORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregation</td>
<td>PubModule, scormContentPackage</td>
<td>IMS Manifest</td>
</tr>
<tr>
<td>Sequencing</td>
<td>Process Data Module</td>
<td>IMS Simple Sequencing</td>
</tr>
<tr>
<td>“Granularization”</td>
<td>Data Modules</td>
<td>Sharable Content Objects</td>
</tr>
<tr>
<td>Meta Data</td>
<td>&lt;idStatus&gt;, &lt;pmStatus&gt;,</td>
<td>Learning Object Metadata</td>
</tr>
<tr>
<td></td>
<td>&lt;scormContentPackageStatus&gt;</td>
<td>(Institute for Electronics and Electrical Engineers, LOM)</td>
</tr>
<tr>
<td>Content</td>
<td>Learning Data Modules</td>
<td><strong>No</strong> reference to content and format</td>
</tr>
<tr>
<td>Reporting and Interfacing</td>
<td>Data and communication</td>
<td>IEEE ECMA Script API for</td>
</tr>
<tr>
<td></td>
<td>protocol <strong>not</strong> specified</td>
<td>Content-to-Runtime Services Communication</td>
</tr>
</tbody>
</table>
How learning.xsd was created

1. DITA learning subcommittee met for (approx) ten months in 2007; five groups developed five schemas for course content.
2. Created the learning.xsd structure based on the DITA work, but to S1000D schema rules.
3. Reused as much existing S1000D structure as feasible.
4. Coordinated with the DITA subcommittee on suggested changes and enhancements.
Concept

- Plan
  - TNA
- Overview
  - Synopsis
- Content
- Summary
- Assessment
<learning> Wrapper

learningElemType

- learningPlan
  - learningOverview
  - learningContent
  - learningSummary
  - learningAssessment
<learningPlanWrapper>

learningPlanElemType

attributes

- IcProject
- IcNeedsAnalysis
- IcGapAnalysis
- IcIntervention
- IcTechnical

learningPlan
</learningPlanWrapper>
<learnPlan> <IcProject>

IcProjectElemType

attributes

- title
- description
- IcClient
- IcPlanTitle
- IcCIN
- IcModDate
- IcDelivDate
- IcPlanSubject
- IcPlanDescript
- IcPlanPrereqs
<learnplan><IcNeedsAnalysis>

learningPlanElemType

attributes

IcProject

IcNeedsAnalysis

IcGapAnalysis

IcIntervention

IcTechnical

learningPlan
<learnplan><IcNeedsAnalysis>

IcNeedsAnalysisElemType

+ attributes

- IcOrganizational
- IcAudience
- IcWorkEnv
- IcTask
<lcLearnPlan> <lcGapAnalysis

learningPlanElemType

attributes

lcProject

lcNeedsAnalysis

lcGapAnalysis

lcIntervention

lcTechnical
<lcLearnPlan><lcGapAnalysis>

lcGapAnalysisElemType

attributes

+ title

+ shortDescr

lcGapItemElemType

attributes

+ title

+ shortDescr

+ lcPlanObjective

+ lcJtaltem

+ lcGapItemDelta

lcGapAnalysis
<lcLearnPlan><lcTechnical>

learningPlanElemType

attributes

IcProject

IcNeedsAnalysis

IcGapAnalysis

IcIntervention

IcTechnical

S1000D Learning Content Aggregation Model
Problem

Integrating training standards to S1000D brings up two issues:

• When reusing technical data content, it is not always possible, or useful, to have a one-to-one link between data modules and learning objects.

• How would S1000D aggregate data modules and training modules to produce a training package?
Learning Aggregation Model

SCORM Content Package

Used PM for baseline

• IDSTATUS
  • Changed “pm” prefix to “ScormContentPackage”
  • Added LOM
  • Additional training-specific elements

• Added training elements to the CONTENT
  • Description of learning content
  • Links to DM and to external references
  • Information about multimedia objects
  • LOM
Purpose of SCORM Content Package

Three purposes:

• Reusability of technical data
• Aggregation of training modules and data modules
• Manifest for LMS to use
Learn Codes to Support Human Performance Technology and Training Information in S1000D
• Human Performance Technology ("H") learn codes have been added to provide an organization with a means to define and capture requirements of an S1000D project to plan and evaluate technical and training data modules.

• Sample "H" Learn Codes:
  • 18 = Work Environment Information from Environmental Analysis
  • 31 = Performance Support Requirements
  • 53 = Summative Analysis Data on Job Transfer (Level 3)
Training ("T") learn codes have been added to the DMC to provide a more robust and instructionally coherent means of creating and identifying training data modules.

Sample “T” Learn Codes:

- 2D = Enabling Objective for Intellectual Skill of the Procedure Type
- 43 = Static Content for Concept Learning
- 57 = Learning Guidance provided as a Demonstration
Learn Codes

• Learn schema has been added to capture “H” and “T” learning content

• Contains five optional branches that accommodate common structures for learning content

• Learn Event Code was added to signify in the DMC which branch of Learn schema is used for the content

Uses the “Content Branch” of the Learn Schema
Learn Codes

S1000DBIKE-A-10-10-00-00A-520A-A-T4CB

Animation of a procedure…

…that uses the Overview Branch of the learn schema.

LearnCode 4C = Animated Content – Procedure
LearnEventCode B = Overview
Learn Codes

• Learn Codes help integrate the technical information, training and media assets that support an overall training and human performance system requirements

• Learn Codes help align the ADL SCORM and IEEE LOM with S1000D by establishing coding that supports common training requirements
Process DM
Step 1
- Logic Engine starts executing the Process DM
- dm-node (dialog) executed
- LE sends dialog fragment to IETP for display
Step 2
- User answers the dialog
- IETP sends user response to LE
- LE updates the appropriate variable in the state table

Logic Engine (Software)

<table>
<thead>
<tr>
<th>State Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var1</td>
</tr>
<tr>
<td>Var2</td>
</tr>
<tr>
<td>Etc...</td>
</tr>
</tbody>
</table>

Process Data Module

- dm-seq
- dm-if
- If
  - then-dm-seq
    - dm-node-alt
      - dm-node (refdm)
      - dm-node (step1)
  - else-dm-seq
    - dm-node (step1)

Data Module

IETP

Dialog:
What is your answer?
YES
Step 3

- Dm-if executed
- LE evaluates IF expression against variables in the state table
- LE determines path

Logic Engine (Software)

<table>
<thead>
<tr>
<th>State Table</th>
<th>Data Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var1</td>
<td>12</td>
</tr>
<tr>
<td>Var2</td>
<td>TRUE</td>
</tr>
<tr>
<td>Etc...</td>
<td></td>
</tr>
</tbody>
</table>

Process Data Module

```
process: dm-seq
  dm-if
    then-dm-seq
      dm-node-alt
        dm-node (refdm)
      dm-node (step1)
    else-dm-seq
      dm-node (step1)
```

IETP

User
Step 4

- LE takes then-dm-seq path
- Dm-node-alt executed
- Each dm-node applic in the alt is evaluated against variables in the state table
- The first dm-node with applic TRUE is executed
Process Data Module

Step 5
- Dm-node indicates refdm to display
- LE notifies IETP to display DM
- IETP locates DM and displays it

Data Module

Logic Engine (Software)

<table>
<thead>
<tr>
<th>State Table</th>
<th>Var1</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<tr>
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IETP

DM Procedure
- Gonculator Removal
- Required Conditions: Electrical power off
Step 6
• In the else-dm-seq branch
  • LE processes dm-node step content
  • LE sends step fragment to IETP for display

Logic Engine (Software)

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</table>

IETP

Process Data Module

dm-seq

dm-node (dialog)

dm-if

If

then-dm-seq

dm-node-alt

dm-node (refdm)

dm-node (step1)

else-dm-seq

dm-node (step1)

1 Remove Gonculator
  1.1 Remove 5 retaining bolts
  1.2 Remove cover
  1.2.1 Loosen gain knob
Step 7
- User activates NEXT function in IETP
- IETP notifies LE to move NEXT

Logic Engine (Software)

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</table>

IETP

Process Data Module

- dm-seq
  - dm-node (dialog)
  - dm-if
    - If
      - then-dm-seq
        - dm-node-alt
          - dm-node (refdm)
    - else-dm-seq
      - dm-node (step1)

- dm-node (refdm)

1. Remove Gonculator
   1.1 Remove 5 retaining bolts
   1.2 Remove cover
   1.2.1 Loosen gain knob
Step 6
• LE processes next dm-node step content
• LE sends step fragment to IETP for display

1. Remove Gonculator
   1.1 Remove 5 retaining bolts
   1.2 Remove cover
      1.2.1 Loosen gain knob

Check gonculator for obvious damage
2. Clean gonculator
   2.1 With a clean cloth, wipe the face of
Your needs

• What does anyone using S1000D need to understand

• Current “information framework”
  – Tools
  – Technologies
  – People

• Discussion
What does anyone using S1000D need to understand

- Understand the specification
  - Understand the tailoring applied
    - It should be tailored!
    - Business Rules
      - Levels
      - Who supplies them

- Discuss
Current information framework

- **Tools**
  - Authoring applications
  - CSDB
  - Project needs
    - BR
    - DMRL

- **Technologies**
  - SGML V XML

- **People**
  - Skills knowledge

- **Discuss**
DOD needs

- Current “information framework”
  - Tools
    - Infrastructure
      - Does it align with usage scenario?
      - IETM and/or Paper
  - Technologies
    - Do you care, depends on what you have contracted for as a deliverable
  - People
    - Knowledge of spec
    - Knowledge of application in a project
      - BR aware/project requirements aware
  - Discuss