Smart Products
Smart Manufacturing
Smart Standards

The Industry 4.0 challenge to SDOs

Greg Saunders, Director
Defense Standardization Program Office
What is Industry 4.0?

1st
Mechanization, water power, steam power

2nd
Mass production, assembly line, electricity

3rd
Computer and automation

4th
Cyber Physical Systems

AKA Smart Products

Image: https://en.wikipedia.org/wiki/Industry_4.0
The development of SMART PRODUCTS

Automated Activities

The Internet

Smart Products
Why is Manufacturing going to Industry 4.0

- 10–30% reduction in design and engineering costs
- 20–50% reduction in time-to-market
- 20–50% decrease in costs for
- 10–20% reduction in costs for quality
- 45–55% increase of productivity through automation of knowledge work

McKinsey Digital Capability Center
Aachen, Germany
Re-think the SDO product

**Industry 4.0 Imperatives**
- Interoperability between machines, products and people
- Integration of data from multiple distributed sources (sensors to soldiers)
- Technical Interaction: Help systems conduct tasks that are unpleasant, exhausting or unsafe for humans
- Decentralized Decisions: systems perform their tasks autonomously

**SDO Product Challenge**
- Is the SDO product a document or a container for data?
- What does a customer do with the product after they buy it?
- Can the product directly communicate requirements with the machines that make finished goods?
- Does it work in Internet of Things as well as the Internet of People
How is DOD Meeting this Challenge?

1. Re-thinking Documents as Data
2. Modernizing ASSIST to meet the challenges of this century.
3. Developing the Semantic Web for Interoperable Specs and Standards (SWISS)
   - Reduces engineering lead time to manage standards and their derivatives such as test plans, purchase descriptions and work instructions.
   - Open, interoperable format that integrates with the enterprise software of our customers and suppliers.
   - DoD data directly linked to industry authorities such as ASTM
The Promise of SWISS

- True Connected Documents
- Automated Configuration “Awareness”
- Multi-Enterprise Interoperability
- Tailored Derivative Works
It sounds so simple

- Example: PWB Drawing Note

“UNLESS OTHERWISE SPECIFIED PERFORM ELECTRICAL TESTS PER NG STD NUMBER 106”

The next eight slides used with permission of Northrop Grumman
NG STD 106 – “PRINTED WIRING BOARDS, RIGID, FABRICATION REQUIREMENTS”
DOCUMENT PAGE COUNT - 24

4 GOVERNMENT / NATIONALLY RECOGNIZED PUBLICATIONS

12 REFERENCED DOCUMENTS

6 INDUSTRY PUBLICATIONS (ANSI, IPC, SAE)

2 GOVERNMENT PUBLICATIONS

11 INDUSTRY PUBLICATIONS (ASTM, ANSI, IPC)

4 OTHER NGSC DOCUMENTS

2 OTHER NGSC DOCUMENTS (AS APPLICABLE)

2 GOVERNMENT PUBLICATIONS

12 INDUSTRY PUBLICATIONS (ASTM, ANSI, IPC)

4 OTHER NGSC DOCUMENTS

Represents 40+ Unique Documents
Bow & twist requirement

**Bow & Twist (Para 3.11.4)**

**Shall Meet Para 3.6.1.2**

**Requirements of IPC-6012 apply**

- **25 IPC specs**
- **2 joint industry standards**
- **3 ASTM standards**
- **1 UL standard**
- **1 NEMI standard**
- **2 AMS standards**
- **1 ASME standard**

**37 Unique Documents**
Let’s get “Smart”
Change Management is Difficult

These get updated

But these do not

- SAP
- PPT
- SOFTWARE
- SUPPLIERS
But Wait ... There's more!

Is my task affected by the change?

Version Aware

SWISS Semantic Model
Bow & twist requirement

- Bow & Twist (Para 3.11.4)
- Shall Meet Para 3.6.1.2
- Requirements of IPC-6012
- Shall Meet Para 3.6.1.2
- IPC specs
- Appropriate Document

1 Appropriate Document
Part of the Model Based Enterprise

- Part Number YYY
- PWB CAD Model
- Bill Of Material
- Printed Wiring Board
- Bow & Twist Requirement
- Schematic Model

Digitally Integrated Model definition
Maximize the Digital Thread

• Purposeful Specifications
• Version cognizance
• Linked to CAD data
• Available on Demand

SMART CONNECTED DOCUMENTS!
Derivative Works

• Custom, Appropriate, Version Aware, procurement specs, manufacturing data
• Test and inspection plans
• CAD/CAM developed from derivative Specs based on documents from multiple SDOs
Challenges

- Business Plans
- Revenue Stream
- Legacy Document Conversion

- Intellectual Property Protection
- Configuration Management
Automated Configuration Management
Rapid Technology Insertion
Real Knowledge Management linking:
  - Standards
  - Laws
  - Regulations
  - Policies
  - Guides
  - Papers
  - Lessons Learned
And, Vastly Improved Time to Knowledge