Service Oriented Manufacturing
Supporting NCM and MBE

Status Report for NDIA Manufacturing Division
October 28, 2010

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Topics

• Background and updated thoughts on SOM

• Actions since last meeting (12 Aug)
  – Service Oriented Manufacturing (SOM) session at Defense Manufacturing Conference (DMC)

• Beginnings of an implementation strategy
  – Possible next steps
To review the bidding …

**Trial Balloon discussed by Mike McGrath and Jack White**
(Feb 2010 Meeting of NDIA Manufacturing Division)

- If we think of manufacturing as a set of services, then the processes, information and business linkages within and among members of a supply chain can employ:
  1. Service Oriented Architecture (SOA) concepts, and
  2. The best practices of the services sector

- We call the combination of these two Service Oriented Manufacturing (SOM)

- NDIA advocacy for SOM could catalyze change and innovation in US manufacturing, and stimulate DoD investment in areas where R&D is needed.
Still Calibrating the Idea
Technology Committee and Supply Chain Committee

• Identify Use Cases
  – Examples where service orientation has made or could make a difference
  – Assess benefits and technology gaps to inform government R&D planning

• Relevant trends and information sources:
  – Commercial IT vendors
  – CAD/CAE vendors
  – Manufacturing Service Companies
  – Supply chain management services
  – DoD NetCentric Warfare

• NIST Workshop, 5 Aug 2010

• DMC, 29 Nov – 2 Dec 2010
Example from NetCentric Warfare C2

High Level Operational Concept (OV-1)
Desired Attributes of a Multi-Service C2 Support System

Robustness: maintains effectiveness in supporting decision makers across all information producers, consumers, information types, supporting infrastructure –

Resilience: recovers from or adjusts to degraded infrastructure, lost or unavailable participants and lost, unavailable or degraded information products

Responsiveness: reacts to a change in the operational environment, ensuring the C2 System will keep pace with the desired OPTEMPO of all Enterprise decision makers

Flexibility: employs multiple ways to effectively use, share, transform and protect information, regardless of the operating environment or C2 System.

Innovation: enables decision makers to interact with the C2 System in ways that were not anticipated upon initial development and employment

Adaptability: supports rapidly changing work processes through adapting workflows and the ability to change the organization through reassignment of roles and responsibilities

Trustworthiness: ensures trust in its operation and delivery of information for all decision makers and that critical information is predictable and appropriately handled
Further Thoughts on Service Oriented Manufacturing

5 Aug NIST Workshop and Subsequent Discussions

• Ends, Means, and Scope
  – SOM is a means: enabler for MBE and SOM

• Technical and business dimensions
  – Technical architecture (SOA) for internal and external interoperability
  – Business practices to provide return on investment

• Different use cases appeal to different stakeholders
  – M2 .50 Cal Machine Gun spare part
  – Interoperability and supply chain sharing of MBE models
  – Factory floor networks and scheduling
  – DARPA META, iFab and Vehicle Forge scenarios

• Reference Architecture and Standards are needed
  – But services will be built from the bottom up
# GCMA “Round Trip Matrix”
(Global Collaborative Manufacturing Architecture Study, 2009)

## Applications
<table>
<thead>
<tr>
<th>Programs/Lines of Business</th>
<th>Aerospace</th>
<th>Ground</th>
<th>Ship</th>
<th>Space</th>
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<td>Communication Systems</td>
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## Resources

<table>
<thead>
<tr>
<th>Providers/Systems (Capability Providers)</th>
<th>University Research</th>
<th>Environmental</th>
<th>Services R&amp;D</th>
<th>Congressional</th>
<th>CALCE or IR&amp;D</th>
<th>ManTech</th>
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## Manufacturing Capabilities

### Requirements
- Processes to re-ball grid arrays
- Development of a "whisker tough" coating
- Reliability characterization for new solders
- Fundamentals of whisker growth and formation
- Mixed alloys ball grid array reprocessing
- Components reprocessing
- Mixed solder evaluation
- Modeling for system effectiveness

### Costs

### Activities

### Decision Support Services

- Assess
- Plan
- Invest
- Execute

### Providers/Systems (Capability Providers)

<table>
<thead>
<tr>
<th>Green = Some funding in place</th>
<th>Yellow = Potential for funding</th>
<th>Red = No funding</th>
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Green = Strong Interest
Yellow = Moderate Interest
Red = Little Interest
Mapping to a Reference Architecture
This is a **Big** Job

- Not appropriate or feasible for NDIA to build the architectures and services
- Possible for NDIA to be an advocate and catalyst for change
- The trick will be to find the right things to advocate
  - Some may be industry funded
  - Some may be standards bodies activities
  - Some may be government R&D and implementation programs
- Suggest we revisit this in January, based on discussions at DMC
AME Agenda for DMC 2010  
(Session Organizers)

• **November 29:** AME Track from 1:30 – 5:00  
  – Session 1: AME Goals and Strategies (Boden)  
  – Session 2: Service Oriented Manufacturing Initiative (McGrath, Gordon)

• **November 30:** AME Track from 1:30 – 5:00  
  – Session 3: Model Based Enterprise Initiative (Harris, McGinnis)  
  – Session 4: Network Centric Manufacturing Initiative (Luckowski, Peters)

• **December 1:** AME Track from 1:30 – 5:00  
  – Session 5: Discuss AME Gaps (Patterson, Kessler)  
  – Session 6: The Way Forward on AME (Boden, sub panel)

• **December 2:** AME Track from 1:30 – 5:00  
  – Session 7: Model-based Methods and Tech Data issues

Each Session:  
**Structure:** 1 hour of presentations and 30 min Panel  
**Intent:** Define topic with examples and position within the AME strategy
Planning for the SOM Session

Technology Committee

• Actions since 12 Aug NDIA Mfg Div Meeting
  ▪ 16 Sep -- phone conference on candidate use cases
  ▪ 15 Oct -- abstracts sent to Track Chair (Brench Boden)
  ▪ 18 Oct -- 3 abstracts selected, 2 held for future action

• Agenda for AME Session 2 (29 Nov)
  3:30 – 5:00 Panel on Service Oriented Manufacturing
    Mike McGrath – Moderator
    Speaker TBD (Oshkosh) – MATV Example
    Jack White (Jacobs Technology) – Business Case for SOM
    Charlie Stirk (CostVision) – Roadmap for SOM Technologies
    Moderated Q&A with audience
Backup Charts
Implementation Strategy

Goal: Sufficient infrastructure (standards and mediation) to support a market for manufacturing services that will enable benefits in defense industrial base.

Next Steps

• Develop use cases and reference architecture
• Analyze gaps and build roadmap for services
• Select/enhance standards and SOA design patterns
• In parallel work with DoD to:
  – Initiate demos and pilot programs with available standards
  – Develop a SOM research agenda

Need a few initial focus areas
Possible Focus Areas

• Product development, engineering, prototyping, and testing.
  – SOA infrastructure for MBE and additional SOM services to support prototyping, tooling, and testing.

• Fast, agile production.
  – DARPA innovations like META, FAB and Vehicle Forge.

• Supply chain operations and collaboration
  – SOA infrastructure for NCM, with services for trust management, visibility, risk management, collaboration, material management, scheduling.

• Product support and sustainment.
  – Services necessary to manage performance-based logistics service networks.
Proposed Next Steps

• Revisit in January based on discussions at DMC
• Plan a workshop (possibly with AFEI and/or NIST) to:
  – Hear from experts and practitioners
  – Map concepts and lessons to one or more SOM focus areas
  – Identify the points of leverage for NDIA to advocate and support
Example of Services for Engineering
VIVACE European Aerospace Consortium

Figure 9: WP3.6 work methodology: Example only, 3.6.2 is specifying a set of generic Web Services