

ARMAMENT SOFTWARE ENGINEERING CENTER



U.S. Army Research, Development and Engineering Command



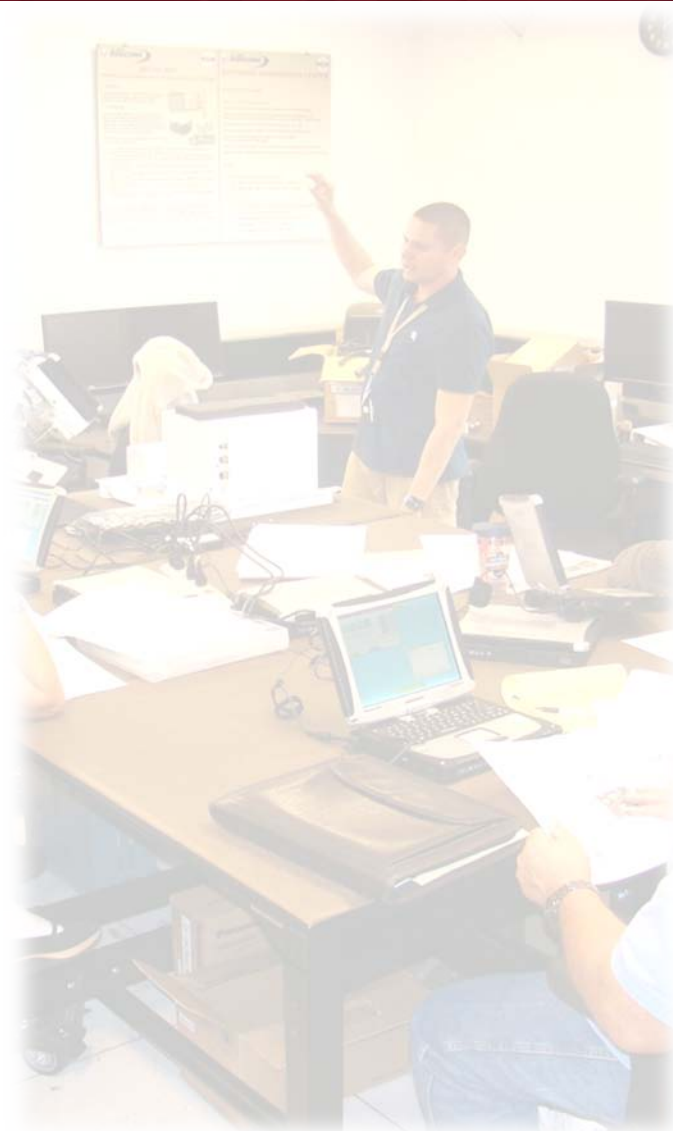
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Implementation of Process Improvement in a Multi-Model/Standard Government Environment

16 November 2011

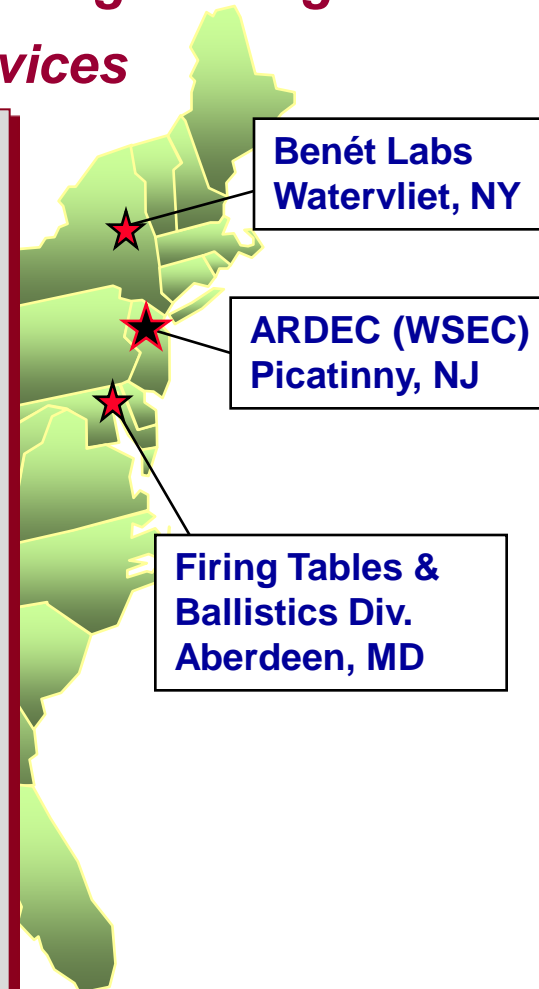
*Nathaniel Becker
US ARMY ARDEC
Armament Software Engineering Center (Armament SEC)*

Provide RDECOM, Joint Munitions & Lethality Life Cycle Management Command, TACOM Life Cycle Management Command, resident PEO/PMs and other customers a Center of Excellence for Software Engineering and Software Acquisition support services for Army Weapon Systems, Trainers, and Combat Support Systems throughout the entire system life



Serve as a Center of Excellence for Software Engineering & Software Acquisition Support Services

- ✓ **AMC Chartered Life Cycle Software Engr Center**
- ✓ **Customer Focus – Exceptional Life Cycle Mission Execution; Flexible, Agile, Innovative Workforce**
- ✓ **Technology Innovation Leader – Winner 2004, 2006 & 2007 DoD Top 5 Program of the Year**
- ✓ **State-of-the-Art Facilities, Equipment, Tools**
- ✓ **CMMI Level 5 – 2006 First in DoD for SE, SW & SS**
- ✓ **CMMI Level 5 – 2010 Sole Gov Organization to achieve; only Gov Org to successfully re-appraise**
- ✓ **Resident, Agent of the Certification Authority (ACA)**
- ✓ **A 30+year legacy of developing & sustaining SW-intensive systems to our warfighters...**



Is there anything beyond CMMI?



Growing & Sustaining a High Maturity Organization . . .

- **Establish an Enterprise Performance Improvement Framework (PIF) that ...**
 - *Harmonizes operations in a multi-model environment*
 - *Migrates to an organizational set of standard processes that leverages the successes of individual organizational achievements*
 - *Facilitates sharing of best practices, organizational processes and process assets*
 - *Reduces investment redundancies*
- **Results-based and linked to improved program performance !**



- **Currently pursuing:**

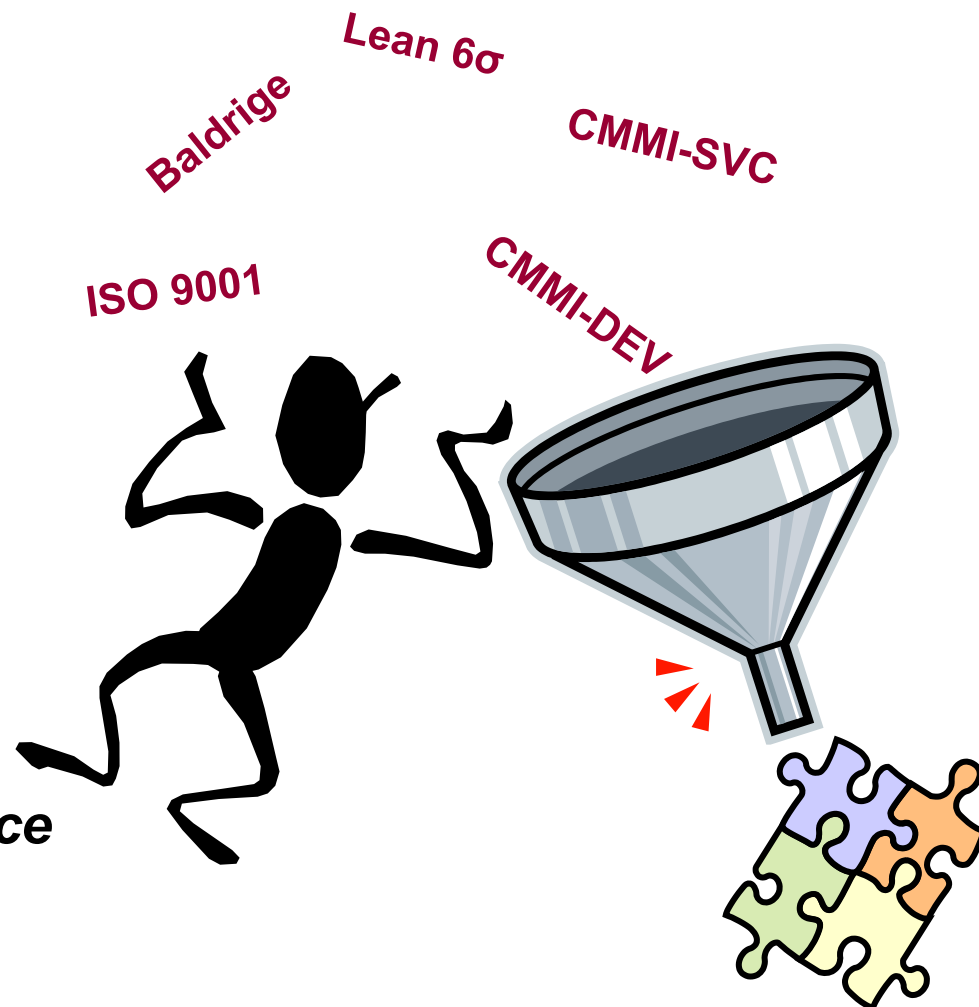
- **Baldrige**
- **CMMI - DEV**
- **CMMI - SVC**
- **ISO 9001**
- **Lean 6σ**
- **DO - 178B**

- **Under consideration:**

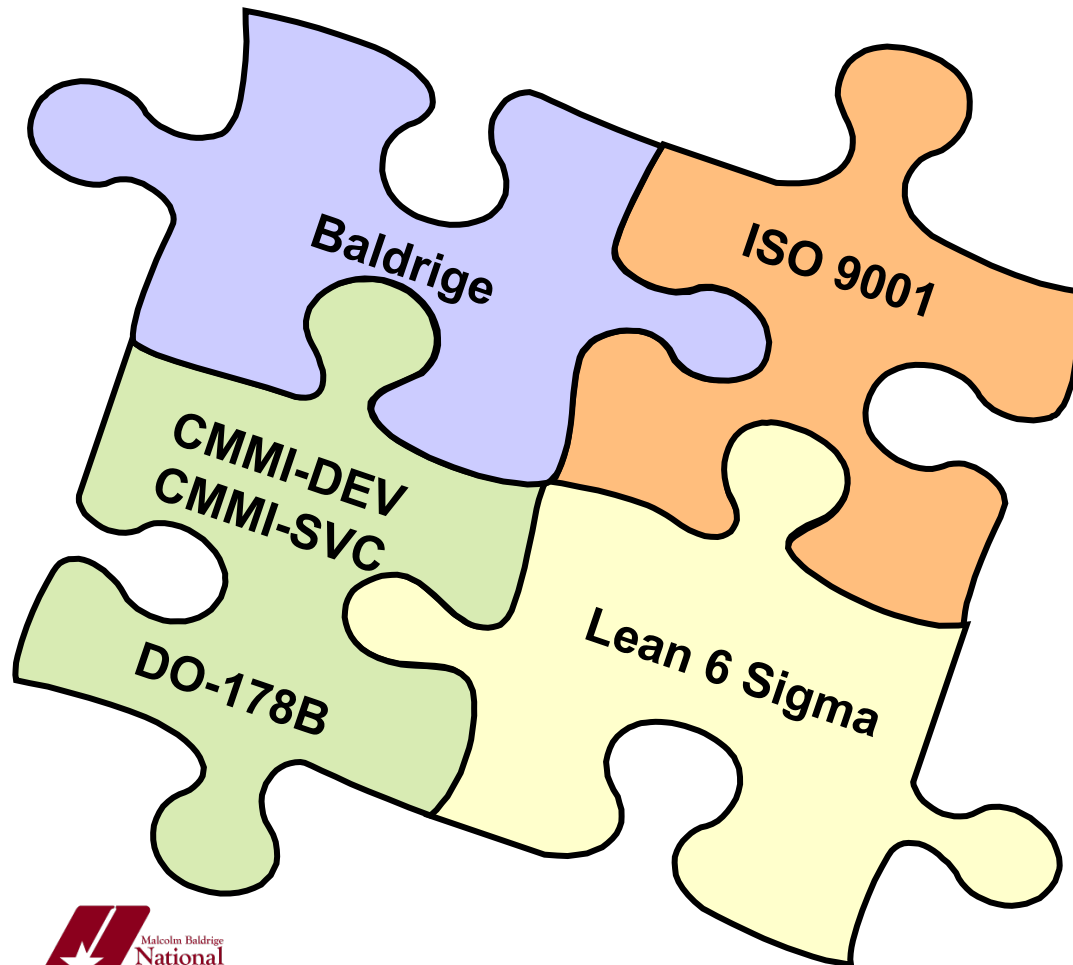
- **CMMI - ACQ**

- **Audit & Appraisals:**

- **ISO 9001 Audit Compliance**
- **SCAMPI CMMI - DEV**



Performance Improvement Framework



Performance Objectives

- **Improve Predictability, Consistency & Quality of Service**
- **Increase Productivity & Reduce Cycle Time**
- **Maintain & Enhance our Core Competencies**
- **Improve Customer Satisfaction**
- **Retain & Improve our Competitive Advantage**

| Business Objective | Process Improvement Objective |
|---|---|
| Reduce the redundancies in the processes deployed across organization | Increase efficiency and effectiveness of improvement program |
| Reduce rework and quality issues | Re enforce training and develop new skills and capabilities Reduce the number of costly “false-starts” |
| Enable achievement of growth | Targeted at facilitating high value activities: <ul style="list-style-type: none"> • key start-up decisions • appraisal program management • ongoing expert process improvement advice |
| Consolidate audits and process compliance reporting | Implement standard processes Increase portability of resources Transfer lessons learned Leverage best practices |

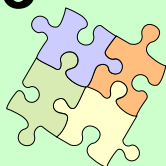
Enterprise Alignment Strategy

Strategic Intent

- Vision & Mission
 - Strategic considerations
 - Align mission needs
 - Align business goals
 - Select improvement tools & techniques

**Enterprise
Capstone
Document**

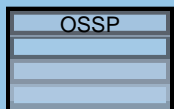
Architecture & Design



- Organizational Processes
 - Comprised of elements from underlying models, standards, quality frameworks
 - Dynamic process architecture
 - Robust organizational processes

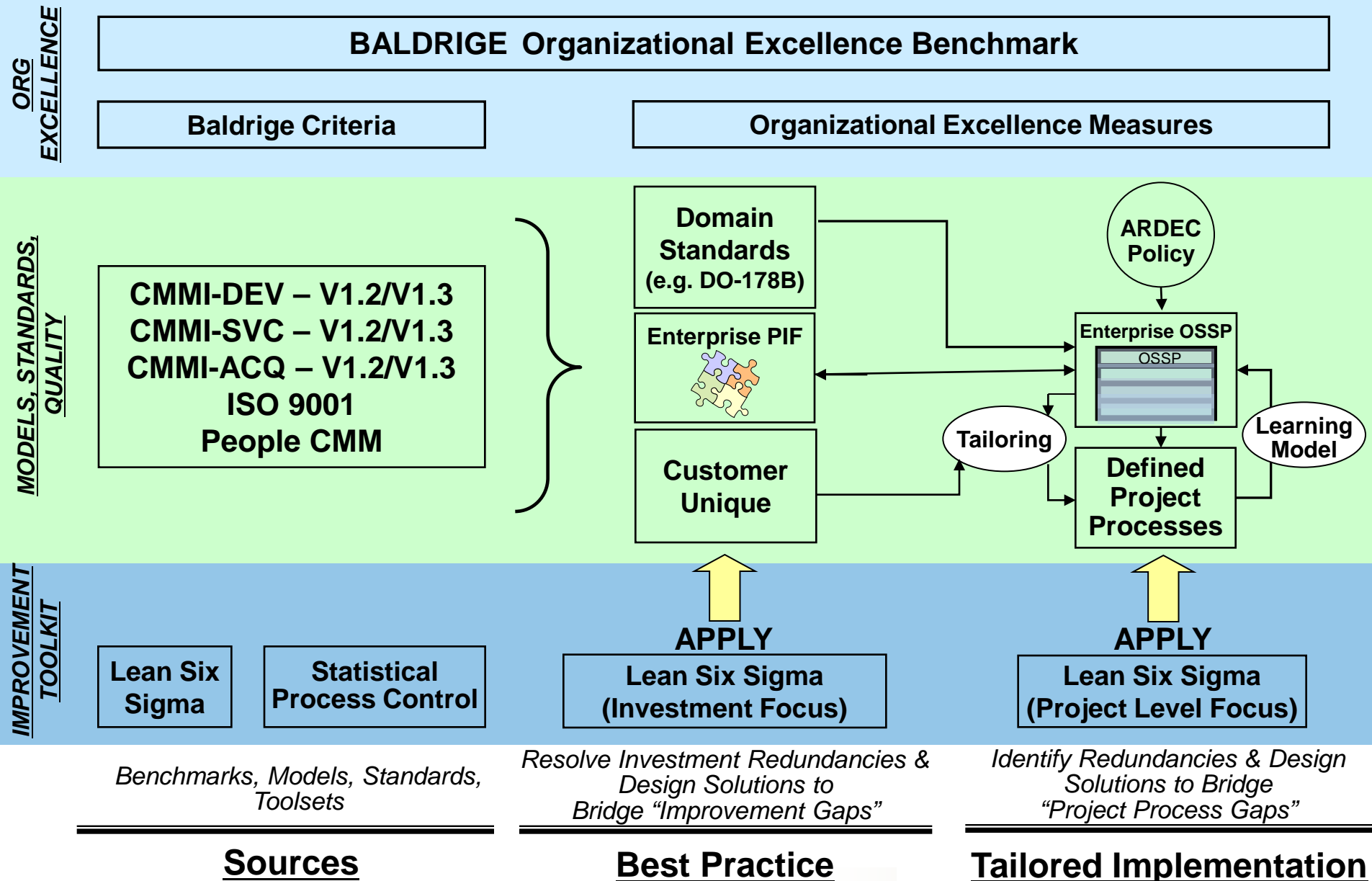
**Enterprise
Performance
Improvement
Framework**

Implementation

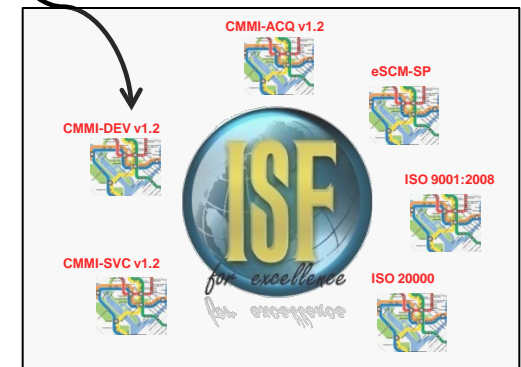


- Implementation
 - Efficient & effective performance improvement infrastructure
 - Process asset library & measurement repository
 - Benchmarking appraisals
 - Compliance audits

**Enterprise
Organizational
Set of
Standard
Processes**



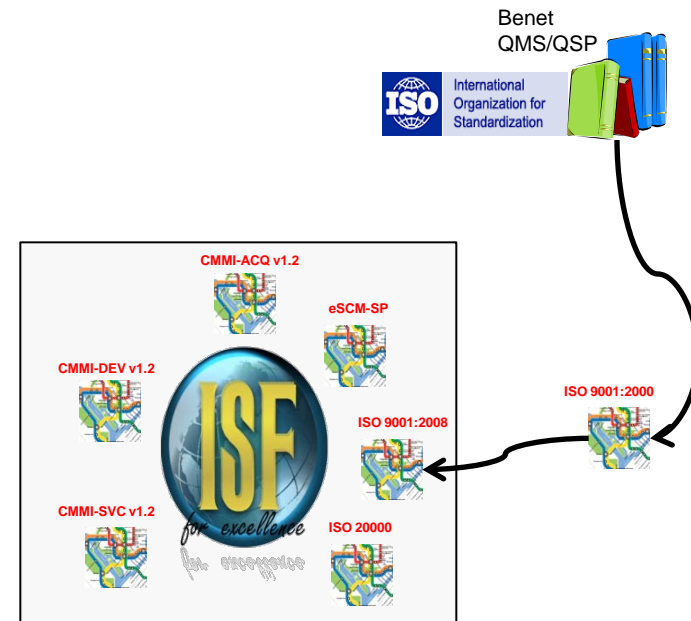
- ◆ Created the Armament SEC OSP in Model Wizard (policies, project procedures and organization procedures)
- ◆ Built a model map between CMMI-DEV v1.2 and Armament SEC OSP
- ◆ Validated the above mapping CMMI-DEV v1.2 to Armament SEC mapping
- ◆ Created a model using the existing PA Audit Checklist
- ◆ Created an appraisal instance within the tool using the CMMI-DEV v1.2, Armament SEC OSP, ISO 9001-2000, ISF (Integrated System Framework)
- ◆ Established an approach to record audits using Appraisal Wizard with the above models and model maps



Model and Mapping Steps Completed



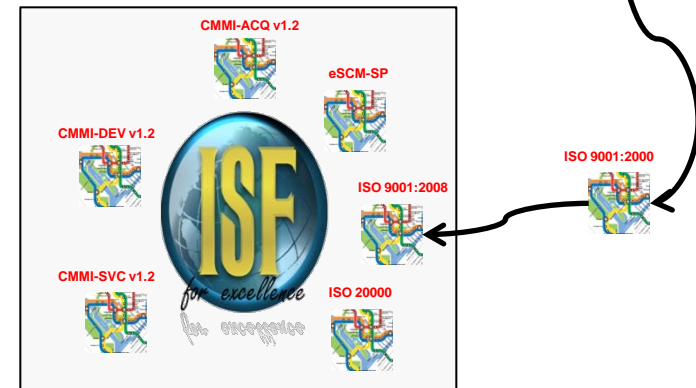
- ◆ Created the Benet Process model in Model Wizard using the Benet QMS
- ◆ Created a model map between the Benet QMS and ISO 9001-2000
- ◆ Using an appraisal instance with Armament SEC OSP, Benet Process model, CMMI-DEV v1.2, ISF and ISO 9001-2000 extrapolated a map between the Armament SEC OSP and Benet QMS
- ◆ Added the Benet QSPs into the Benet Process model



Model and Mapping Steps Completed (continued)



- ◆ Added the Quality System Procedures into the Quality Management System model in Model Wizard for Benet Labs implementation
 - ◆ Split up the Benet QSPs and entered them into MS Excel
 - ◆ Imported these into the existing QMS/QSP Model
- ◆ Included the QSPs in the existing ISO 9001-2000 map
 - ◆ Began mapping the relationships between the QSPs and ISO 9001:2000, focusing only on the strong relationships versus all relationships.
 - ◆ Need to validate this mapping with the Benet QSP author team.



Map Elements (MM007) - CMMI v1.2 ==> Armament SEC OSP v081104

Tree View Find Map

- CMMI-DEV, V1.2 Staged
 - Maturity Level 2
 - Requirements Management
 - REQM SG 1
 - REQM SP 1.1
 - REQM SP 1.2
 - REQM SP 1.3
 - REQM SP 1.4
 - REQM SP 1.5
 - REQM GG 2
 - REQM GP 2.1
 - REQM GP 2.2
 - REQM GP 2.3
 - REQM GP 2.4
 - REQM GP 2.5
 - REQM GP 2.6
 - REQM GP 2.7
 - REQM GP 2.8
 - REQM GP 2.9
 - REQM GP 2.10
 - REQM GG 3
 - REQM GP 3.1
 - REQM GP 3.2
 - Project Planning
 - PP SG 1
 - PP SP 1.1
 - PP SP 1.2
 - PP SP 1.3
 - PP SP 1.4
 - PP SG 2
 - PP SP 2.1
 - PP SP 2.2
 - PP SP 2.3
 - PP SP 2.4

| Model Element | Certainty | Comments |
|--|-----------|----------|
| <input type="checkbox"/> Policy PM-06-5 | | |
| <input type="checkbox"/> Policy PM-06-6a | | |
| <input type="checkbox"/> Policy PM-06-6b | | |
| <input type="checkbox"/> Policy PM-06-6c | | |
| <input type="checkbox"/> Policy PM-06-6d | | |
| <input type="checkbox"/> Policy PM-06-6e | | |
| <input type="checkbox"/> Policy PM-06-6f | | |
| <input type="checkbox"/> Policy PM-06-6g | | |
| <input type="checkbox"/> Policy PM-06-6h | | |
| <input type="checkbox"/> Policy PM-06-6i | | |
| <input type="checkbox"/> Policy PM-06-6j | | |
| <input type="checkbox"/> Policy PM-06-6k | | |
| <input type="checkbox"/> Policy PM-06-6l | | |
| <input type="checkbox"/> Policy PM-06-7 | | |
| <input type="checkbox"/> Policy PM-06-Appendix A | | |
| <input type="checkbox"/> Policy RM-05, Requirements Management | | |
| <input type="checkbox"/> Policy RM-05-5 | | |
| <input checked="" type="checkbox"/> Policy RM-05-6a | 0 | |
| <input checked="" type="checkbox"/> Policy RM-05-6b | 0 | |
| <input type="checkbox"/> Policy RM-05-6c | | |
| <input type="checkbox"/> Policy RM-05-6d | | |
| <input type="checkbox"/> Policy RM-05-6e | | |
| <input type="checkbox"/> Policy RM-05-6f | | |
| <input type="checkbox"/> Policy RM-05-6g | | |
| <input type="checkbox"/> Policy RM-05-6h | | |
| <input checked="" type="checkbox"/> Policy RM-05-6i | 0 | |
| <input type="checkbox"/> Policy RM-05-6j | | |
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| <input type="checkbox"/> Policy RM-05-6l | | |
| <input type="checkbox"/> Policy RM-05-6m | | |
| <input type="checkbox"/> Policy RM-05-6n | | |
| <input type="checkbox"/> Policy RM-05-7 | | |
| <input type="checkbox"/> Policy RM-05-Appendix A | | |

SP 1.1 Obtain an Understanding of Requirements

Develop an understanding with the requirements providers on the meaning of the requirements.

As the project matures and requirements are derived, all activities or disciplines will receive requirements. To avoid requirements creep, criteria are established to designate appropriate channels, or official sources, from which to receive requirements. The receiving activities conduct analyses of the requirements with the requirements provider to ensure that a compatible, shared understanding is reached on the meaning of the requirements. The result

Element Text Mapped Elements for REQM SP 1.1

a. All projects will have their requirements (technical and non-technical) documented in a RSL (or equivalent), understood, analyzed, accepted, and baselined.

Save

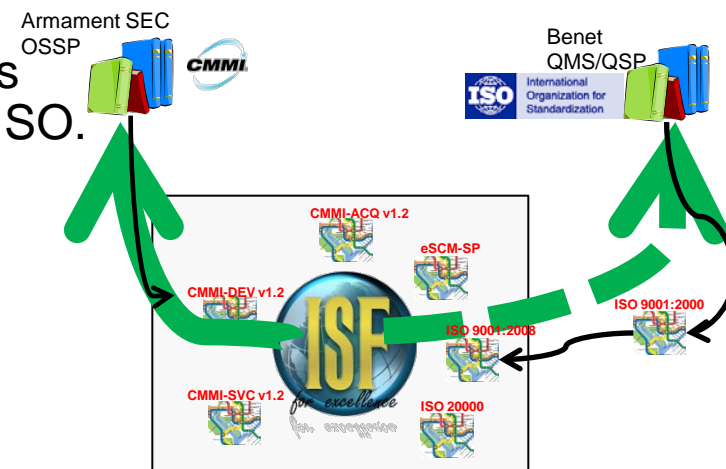
Cancel

Close

Reporting Steps Completed



- ◆ Built QMS to OSP report
 - ◆ Used the ISF as the mechanism to resolve how the QMS/QSP related to Armament SEC OSP.
 - ◆ Created the QMS/QSP to OSP map by extrapolating a map using ISF.
 - ◆ A report was completed from the set of maps we created using ISF as the connector between ISO and CMMI.
 - ◆ Initial observation gave an indication that we could potentially have problem with the CMMI generic practices due to the way they are accounted for within ISF.
 - ◆ We later discovered that if the specific practices are connected to the appropriate CPP objectives then the necessary connections will still be made between the CMMI and ISO.

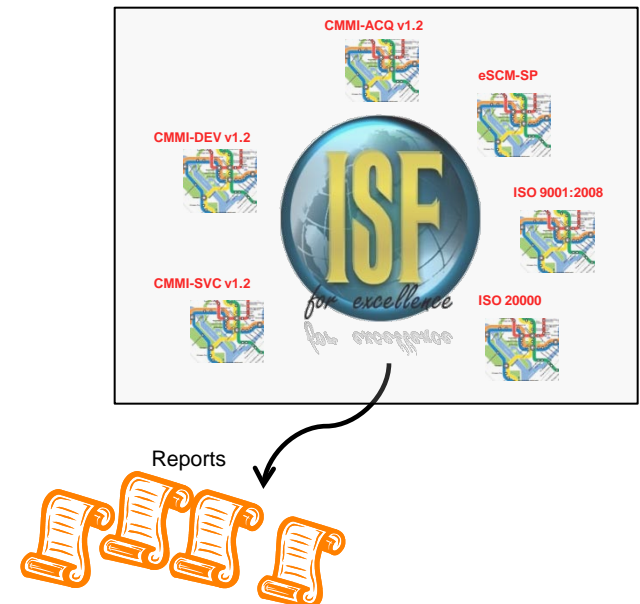


*CPP = Critical Process Performance

Reporting Steps Completed (continued)



- ◆ Built OSP to QMS report
- ◆ Built OSP to ISO 9001-2000 report
- ◆ Built QMS/QSP to CMMI-DEV report



- ◆ Areas of the Armament SEC Organizational Standard Software Process not explicitly addressed or emphasized sufficiently in Benet Quality Management System or Quality System Procedures
 - ◆ CP002,CP003 – Specific aspects of peer review related to policy and process related work products
 - ◆ CP005 - Lessons Learned
 - ◆ CP006 – Identify and Obtain Project Specific Training
 - ◆ CP CM002 - Processing and Handling of PCRs
 - ◆ CP103 – Risk Management
 - ◆ CP108 – Formal decision making process (DAR)
 - ◆ CP110 – Requirements Development – operational concepts and scenarios, requirements baselines
 - ◆ CP114 – Document/assess/control interfaces
 - ◆ CP115 – Make/Buy/Reuse Specified Products
 - ◆ CP116 – Product Integration
 - ◆ CP118 – Capture of validation work products
 - ◆ CP119 – Transition and sustainment of products

- ◆ Areas of the Benet Quality Management System or Quality System Procedures not explicitly addressed or emphasized sufficiently in Armament SEC Organizational Standard Software Process
 - ◆ QSP 4.2-1 – Preparation & Control of Quality Management System
 - ◆ QSP 4.2-2 – Control of External Documents and Data
 - ◆ QSP 4.2-3 – Control of Product Drawings
 - ◆ QSP 4.2-4 – Backup Restoration Procedure for Electronic Data Files
 - ◆ QSP 4.2-5 – Record Maintenance
 - ◆ QSP 4.2-6 – Quality Management System Manual Distribution & Amendment
 - ◆ QSP 6.2-1 – Competence Awareness & Training
 - ◆ QSP 7.1-1 – Product Realization Planning
 - ◆ QSP 7.2-1 – Review of Customer Requirements & Estimates Proposals
 - ◆ QSP 7.2-2 – Customer Communication & Satisfaction
 - ◆ QSP 7.5-1 – Process Control

Preliminary Conclusions (continued)



- ◆ Areas of the Benet Quality Management System or Quality System Procedures not explicitly addressed or emphasized sufficiently in Armament SEC Organizational Standard Software Process
 - ◆ QSP 7.5-2 – Preventive Maintenance
 - ◆ QSP 7.5-3 – Product Identification and Traceability
 - ◆ QSP 7.5-4 – Verification and Control of Customer Supplied Product
 - ◆ QSP 7.5-5 – Handling Storage Packaging Preservation Distribution and Delivery of Products and Materials
 - ◆ QSP 7.6-1 – Control of Monitoring and Measuring Devices

- ◆ Looking at the following ISO and CMMI best practice implementations
 - ◆ QSP 8.1-1 – Measurement Analysis & Improvement
 - ◆ QSP 8.2-1 – Internal Audits
 - ◆ QSP 8.2-2 – Monitoring & Measurement of Product
 - ◆ QSP 8.3-1 – Nonconforming Product Review and Disposition
 - ◆ QSP 8.5-1 – Corrective Action
 - ◆ QSP 8.5-2 – Customer Complaint
 - ◆ QSP 8.5-3 – Preventive Action

- ◆ *Ensure management buy-in*
- ◆ *Potential for multi-model appraisals*
- ◆ *Incorporate strengths of multiple models and standards*
- ◆ *Continuous feedback and Lessons Learned to organization throughout steps*



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