Executing a Successful CMMI® Maturity Level 3 SCAMPI™ for SPAWAR Systems Center Charleston (SSC-C)

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Improving operational effectiveness through C⁴ISR common integrated solutions

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Presentation Outline

- Background
- Road to Maturity Level 3
- Appraisal Planning/Execution
- Lessons Learned
- Beyond Maturity Level 3
Background
Where We Fit

**SPAWAR**
Space and Naval Warfare Systems Command

**Secretary of Defense**

**Other DoD**

**Secretary of the Navy**

**CNO**
Fleet Support

**ASN (RDA)**
Acquisition

**NETWARCOM**
MARCOR

**ADDU for C4I**

**NAVSEA**
Washington, DC

**NAVAIR**
Patuxent River, MD

**NAVSUP**
Washington, DC

**NAVFAC**
Washington, DC

**SYSCEN**
San Diego, CA

**SYSCEN**
New Orleans, LA

**SYSCEN**
Norfolk, VA

**SFA**
Chantilly, VA

SYSCEN
Charleston, SC

Network Centric Enterprise

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Connecting the Warfighter

Mission - We enable knowledge superiority to Naval and Joint Warfighters through the development, acquisition, and life-cycle support of effective, integrated C4ISR Information Technology, and Space capabilities.

Vision - Fully Netted in Three

We are the Principal C4I Acquisition Engineering & Integration Center on the East Coast & Principal C4ISR ISEA for the Navy

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Who We Are

A Large Systems & Software Engineering Organization

Over 70% of workforce is in an engineering or computer-related discipline

- The solutions to the global war on terror developed by SPAWAR result from good systems and software engineering
- Systems engineering is our core competency
- Total workforce of ~ 2,300 employees
Road to Maturity Level 3

Implementation of Best Practices
A Vision of World Class

When you want it done right, Who do you want working on it?

Cutting corners, undisciplined, untrained

Rigorous processes, Skilled resources

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Process Improvement and Systems Engineering Strategy - 2003

• Vision
  – Develop and maintain a World Class Systems Engineering Organization

• Approach
  – Achieve Command-wide operational consistency
  – Based on ISO 15288 – systems engineering
  – Based on ISO 12207 – software engineering
  – Measure using best practices of CMMI®

• Goals
  – CMMI Maturity Level 2 by April, 2005
  – CMMI Maturity Level 3 by April, 2007

Both Goals attained on schedule
1st SPAWAR Systems Center to Achieve ML2 and ML3
New Goal: Maturity Level 4 by 2010
## CRITICAL SUCCESS FACTORS FOR SE REVITALIZATION

<table>
<thead>
<tr>
<th>Command-wide Policy (Create vision that is urgent)</th>
<th>Assign Responsibilities (Strong Change Agents are essential)</th>
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<tbody>
<tr>
<td>Strategy and Plan (Include knowledge of why change is necessary and benefits)</td>
<td>Provide Training</td>
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<td>Senior Management Support</td>
<td>Build a Central Repository</td>
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<tr>
<td>Provide Resources and Funding (New Organizational Structure Usually Needed)</td>
<td>Measure and Communicate Progress</td>
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SSC-C SE Revitalization Plan
Aligned with DoD SE Revitalization

Elements of SSC-C SE Revitalization

Policy / Guidance
- SSC-C SE Instruction
- SSC-C SE Process Manual
- SSC-C SW-Dev Process Manual
- SSC-C SW-Maint Process Manual
- EPO Website
- ePlan Builder

Training / Education
- Intro to PI WBT
- SE 101 WBT
- SE Fundamentals
- SE for Managers
- Project & Process Workshop
- Intro to Software Engr.
- Architecture Dev. WBT
- Certification/Degrees

Assessment & Support
- CMMI® Level 2
- CMMI® Level 3
- CMMI® Level 4/5
- Project Reviews
- Balanced Scorecard
- Lean Six Sigma
- Integrated Product Teams
- IT Tools

Underway
Completed/Ongoing

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Process Improvement Infrastructure: Organization

- Business Board
- Management Steering Group (MSG)
- Enterprise Process Group (Ent PG)
- Define and Manage Standard Processes
- Tactical Implementation

Staff

- Business Board
- Management Steering Group (MSG)
- Enterprise Process Group (Ent PG)
- Define and Manage Standard Processes
- Tactical Implementation

- External Liaison
- Staff
- Mike Kutch
  SE/CMMI Champion
- Bruce Carter
  Dir. Engr. Operations

- Engineering Process Office (EPO)
- AD
- SE IPT
- PM IPT
- CM IPT
- LSS
- PPQA IPT
- LOG IPT
- Corporate Engineering Process Group (EPG)
- Comms & Netw Dept EPG
- Cmd/Ctrl Dept EPG
- ISR/IO Dept EPG
- NetCentric SE Dept EPG
- Corporate Business Process Group (BPG)
- WFO IPT
- Facility IPT
- RDT&E IPT

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Timeline 2001-2002

• Prior to 2001
  – Code 70 had experience with SW-CMM®

• 2001
  – SSC-C Process Improvement (PI) effort began
  – Code 70 developed PI Policy for SE, SW, and Security Engineering using SEI CMM® and CMMI®
  – Code 70 Engineering Process Group expanded to Command-wide
  – Engineering Process Office (EPO) Website started
  – Pilot Projects selected and evaluated
  – Some templates published

• 2002
  – Began developing and delivering training
  – Began conducting Class “C” assessments as progress checks
• 2003
  – Established and Funded Dir. of Engineering Operations position
    • Staffed Engineering Process Office (EPO)
  – Developed Organizational Standard Policies
    • Policy for each CMMI® Level 2 and 3 Process Area
  – Developed Organizational Standard Process Manuals
    • Top Level
      • Systems Engineering
      • Software Development
      • Software Maintenance
    • Supporting Processes
      • Process Manual for each CMMI® Level 2 and 3 Process Area
  – Developed plan templates
  – Coached and mentored pilot projects
  – Built tools
  – Developed and delivered training
  – Performed interim assessments
Timeline 2004-2005

• 2004
  – Conducted project-level Maturity Level (ML) 2 SCAMPI℠ Class “A” appraisals
    • 6 Projects Appraised
    • 6 Achieved ML2

• April 2005
  – Conducted Command-level ML2 SCAMPI℠ Class “A” appraisal –
    First SPAWAR Systems Center to achieve Command-level ML2
• Addressed the three Organizational Process Areas early to provide a smoother transition to ML3
  
  – **Organizational Process Focus (OPF)** - Purpose: Plan, implement, and deploy organizational process improvements based on an understanding of the current strengths and weaknesses.
    
    • Determined Process Improvement Opportunities
      – Management commitment – the PI strategy
      – Benchmarked current state, addressed identified needs/gaps
    
    • Planned and Implemented Process Improvements
      – Determined Scope, Model (CMMI-SE/SW), Approach (Staged, but appraise using Continuous)
      – Created appropriate teams to champion PI efforts
    
    • Deployed Organizational Process Assets and Incorporated Lessons Learned
      – Shared sample project plans, improvements, etc., across the organization
• Addressed the three Organizational Process Areas early to provide a smoother transition to ML3 (con’t)
  – *Organizational Process Definition (OPD)* – Purpose: Establish and maintain a usable set of organizational process assets and work environment standards.
    • Developed EPO website, which is a repository for standard process manuals, SOPs, checklists, etc. The site also contains Tailoring criteria and other useful resources such as sample plans, etc., shared with the SSC-C organization by its projects
    • Built SSC-C Organizational Measurement Repository (OMR) for projects to use for managing their projects and capturing standardized cost, schedule, and process performance measurement data
      – Defined Balanced Scorecard measures directly related to CMMI® and Process Improvement
• Addressed the three Organizational Process Areas early to provide a smoother transition to ML3 (con’t)
  
  – *Organizational Training (OT)* - Purpose: Develop the skills and knowledge of people so they can perform their roles effectively and efficiently.
    • Identified the training needed by the organization
    • Obtained and provided training to address those needs
    • Established and maintained training capability
    • Established and maintained training records
    • Assessed training effectiveness
      – Objective evaluation of OT process performed by the Process and Product Quality Integrated Product Team (PPQA IPT)
• SSC-C organization developed basic Tailoring Guidelines
• SSC-C Projects developed ML2-to-ML3 Action Plans
• Developed internal “self-assessment” process for measuring ongoing implementation of ML2 processes
• Continued enhancing ePlan Builder tool to create new plans (e.g., SEP/SEMP) that are ML3 compliant
• Updated/Improved existing plans
• Provided additional CMMI® Training
• Added Work Breakdown Structure Tool and Architecture Development Web-Based Training Course
• Continued to Measure and Communicate Progress
• Maintained Momentum and Commitment to Goals
Timeline 2005-2006

• May – Dec 2005
  – Updated Organizational processes with ML3 language
  – Built Organizational Measurement Repository (OMR) to track cost, schedule, and process performance measurement data
  – Developed Sample ML3 plans
  – Projects: Built ML2 to ML3 transition plans
    • Coaching and mentoring continued

• 2006
  – Conducted project-level Maturity Level 3 SCAMPI\textsuperscript{SM} Class “A” appraisals
    • 6 Projects Appraised between June and December
    • 5 Achieved ML3
  – Projects worked to correct consistent weaknesses in Peer Reviews, Decision Analysis and Resolution (DAR), PPQA
• January 2007
  – 1 additional project achieved ML3
  – Collected data from 30+ “non-focused” projects
    • Tailoring Guidelines
    • Project Management Plans
    • SEMP/SDPs
    • PPQA Plans
    • CM Plans
    • M&A Plans

• February 2007
  – Conducted 5-day Readiness Review
  – Collected additional artifacts needed
• April 2007
  – Conducted Command-level ML3 SCAMPI℠ Class “A” appraisal – First SPAWAR Systems Center to achieve Command-level ML3
  – 9 Projects in appraisal scope – 7 Focused, 2 Non-Focused
    • >8000 artifacts submitted, 164 interviewees
  – SEI Senior Member was Lead Appraiser (Team Leader)
  – 2 other SEI Authorized Leads on the Team
  – 1 Government person from NSA
  – 1 Government person from SSC-C
  – 3 team members with multi-appraisal experience
Success Factors of Implementation

• Carefully select Initial Projects
  – Start with interested projects
    • High Sponsor interest
    • Strong need/desire to improve

• Set Guidelines (criteria) that yield benefits, for example, SSC-C’s CMMI® Projects meet the following:
  – Systems or software engineering effort
  – Funding directly with SSC-C
  – SSC-C performs the Project Management function
  – SSC-C PM is directly responsible for product delivery
  – Multi-year effort
  – Over $2M per year
  – Not limited to level of effort for services
  – Not merely a pass-through contract
Success Factors of Implementation

• Assign a CMMI® resource to each project
  – Strong facilitator with strong CMMI® knowledge
  – Conduct regular (at least monthly) process-focused meetings to ensure steady progress
    • Include all key process area members (including contractors)
  – Review project’s plans, SOPs, work products
  – Explain process area practices to the team’s subject matter experts
    • Relates model to project
    • Helps team define typical work products
    • Helps team identify and collect direct and indirect evidence
  – Conduct mini assessments to benchmark progress
  – Share/provide organizational tools, templates
Success Factors of Implementation

• Project Team
  – Project Manager - involved and committed to success
  – Document specialist/Technical Writer role for coordinating documentation, revisions
  – Active, skilled PPQA manager is a great benefit
    • Also can serve as the Measurement Analyst
  – Useful plans are built by the key players; shelfware is built by the novice or new contractor
  – Don’t let one person wear too many hats
    • Resource the team properly
  – New technology and complex systems are NOT necessary for success

• A Customer that supports the initiative is a plus
Success Factors of Implementation

• Recognize and Publicize Early Successes
  – ‘Project-level’ SCAMPIs provided early successes due to conducting the appraisal using the “continuous representation” of the model
    • Scope of appraisal looked at all 7 ML2 PAs, then 11 ML3 PAs
    • If all the PAs were satisfied, then the project achieved ML2 and/or ML3 through equivalent staging
    • Or, Projects received Capability Level 2/3 for various PAs satisfied (e.g., CM, SAM, REQM, PP, PMC, TS, PI, DAR)
  – Led to BIG success! - SSC-C became the first SPAWAR Systems Center to achieve CMMI® Maturity Level 2 (April 2005)
  – Continued similar approach to Maturity Level 3
    • 1st Successful ML3 Program – July 2006
    • 4 more projects achieved ML3 in late 2006
  – Command CMMI® Maturity Level 3 – April, 2007
    • 1st SPAWAR Systems Center to achieve ML3
Appraisal Planning/Execution

Measuring Progress
• 7 SEI staff members were involved in the SSC-C Class “A” SCAMPIs

• Required early planning to get each SEI staff member’s commitment to appraisal dates

• Built detailed schedule for ML2 and ML3 project and organizational-level appraisals

• Obtained commitment from project team members concerning availability on appraisal dates

• Reserved conference and meeting rooms well in advance
• Pre-Readiness Reviews (PRRs) helped to ensure projects were ready and the Formal RR would lead to 90%-100% coverage

  – Used Appraisal tool to conduct PRRs
    • Provided early and easy access to the direct and indirect evidence for each process area’s specific and generic practices
    • Provided means for communicating appraisal team comments
      – Used convention to denote status of each practice
        (e.g., PRR-SG: Direct OE satisfies practice OR PRR-SG: Direct and indirect OE is too old)
    • Provided early feedback to the projects
    • Provided easy upload of new artifacts supplied by projects
• Formal RRs conducted on-site with Appraisal Team Members (ATMs)
  – SEI Lead Appraiser and ATMs worked as a team
  – Used Appraisal tool to conduct RR
    • Provided easy access to the direct and indirect evidence for each process area’s specific and generic practices
    • Provided means for communicating appraisal team comments
      – Used convention to denote status of each practice
        (e.g. RR-CS: Direct OE indicates performance of practice OR RR-CS: Direct and indirect OE is too old)
    • Provided good feedback to the projects on items still missing
    • Provided easy upload of new artifacts supplied by projects
• SCAMPI\textsuperscript{SM} Class A appraisals conducted on-site
  – Involved mostly the “Interview” process since RR ensured direct and indirect coverage was evident
  – Used Appraisal tool to conduct SCAMPI\textsuperscript{SM}
    • Affirmation section of tool allowed for easy update following each interview
    • Tool allowed primary team member to select practice compliance and secondary member to concur (or not)
    • Authorized lead appraiser (team lead) then verified each practice within the process area
    • Built-in color coding provided easy visibility to “weaknesses”
    • Facilitated voting process at Goal level and Process Area
  – Each project-level ML3 SCAMPI\textsuperscript{SM} conducted in 5 days and Command-level ML3 SCAMPI\textsuperscript{SM} conducted in 10 days
Lessons Learned

Implementation

Appraisals
Lessons Learned - Implementation

• Senior Management support is critical to success

• Training
  – Everyone needs to be engaged – “train the masses”
  – Specific training for process owners/subject matter experts

• Utilize Teams (IPTs) as champions of specific processes
  – Multi-department representation
  – Change agent mentality
  – Process-focused charters

• Resource Properly
  – Implement with projects that want to improve, can benefit from efforts, and that recognize own weaknesses
  – EPO staff provided skilled coaching, resources, support, and tools
  – Project members learned by doing and maintaining

• Goals and Publicity
  – Keep goals to sizable bites (projects)
  – Publicize successes; Share best practices
Lessons Learned – Appraisals

- Provide CMMI® mentoring and coaching for projects selected for an appraisal

- Build detailed schedules for appraisals early in planning phase to use as a roadmap

- Plan early in order to obtain project team member and appraisal team member commitment to appraisal dates
Lessons Learned – Appraisals

• Invest in an Appraisal Tool to facilitate easy collection and evaluation of appraisal data

• Perform a Pre-Readiness Review to ensure minimal coverage gaps are identified at the formal Readiness Review

• Conduct individual project appraisals to ensure successful organizational appraisals

• Document Lessons Learned from conducting appraisals to improve the appraisal process
What has success meant?

• Business Results
  – SCN: “They see us as a model and want to increase our efforts.”
  – Automation Program: “We had hundreds of sites and there was a need for a structured organization to put a ‘wrapper’ around that and control it. CMMI became the wrapper.”
  – CICS: “CMMI was key to achieving the project goal.”
  – VIDS: “The VIDS failure (2000) motivated implementing CMMI because the team needed to change course or the customer would have no confidence in system development. It was a tremendous success…”

• Others Asking for Help
  – PMS 408 – CREW program
  – SESG / NAVAIR / NAVSEA
  – Marine Corp – Quantico
  – Air Armament Center, Eglin AFB
Beyond Maturity Level 3

Plan of Action for ML4/5
• No more “Ratings for Life”
  – Ratings are now valid for only 3 years (April 2007- April 2010)
  – SSC-C will lose its CMMI® ML3 rating on 27 April 2010 if another Command-level SCAMPI® SM Class “A” appraisal is not successfully completed before then
    • Sustain the current Command-sponsored projects (representative sample)
    • Self-Assessments/Appraisals – mentoring and coaching of more projects

• Plan for and Implement
  – CMMI® V1.2 (CMMI®–DEV) New Model
  – Maturity Levels 4/5
• Take a fresh look at the entire measurement program with an eye towards managing the projects using quantitative data

• Collect and evaluate project historical data for measuring cost, schedule, and quality

• Establish a process for maintaining the appropriate data to begin managing quantitatively
  – Select at least one “main contributor” sub process per project lifecycle phase, at least one project management sub process and at least one support sub process

• Statistically manage the data
  – Using statistical methods (e.g., Statistical Process Control charts, histograms, trend charts, etc.)
• Demonstrate stable historical data for measuring cost, schedule, and quality
  – Stable data will help you answer questions like:
    • Can you predict where your next data point will fall?
    • Do you know what your baseline is for cost/schedule performance?
    • Is your product quality what you expect it to be?
    • Are you finding “enough” defects before the customer gets the product?
  – As a guideline, strive for at least 4 consecutive data points within your established control limits
• Formalize performance baselines for the project and provide baseline data to organization

• Re-establish quantitative objectives (for example):
  – Reduce cost variance to +/- 5%
  – Reduce schedule variance to +/- 10%
  – Reduce delivered defects by +/- 10%
  – Improve major saves found in peer reviews by 20%

• Use baselines and variance to predict future performance

• Keep up the ML2 and ML3 process performance!
Timeline 2007

• May – Dec 2007
  – Developed Process Improvement Plan for ML4/5
  – Developed Detailed Schedule for ML4/5
  – Developed QPM Plan Template
  – Held various ML4 Meetings with projects
  – Held SCAMPI\textsuperscript{SM} for one project using CMMI\textsuperscript{®} v1.2
    • September: Project achieved ML3
  – Increase usage of tools across departments/projects
  – Add additional plans to ePlan Builder as needed
  – Continue internal CMMI\textsuperscript{®} Level 3 mini assessments

Begin Maturity Level 4/5 implementation
May – Dec 2007 cont’d

– Enhance/Expand OMR
  • More Quality Data from Peer Reviews, Testing Phase and Defects from Production
  • More Statistical Process Control (SPC) Charts

– Command and Department Project Reviews process
  • Look at quality of plans and implementation of best practices
  • Reviews of project status by management driven by project metrics
  • More Peer Reviews to measure “saves”

– Better tailoring guidance for smaller projects

Begin Maturity Level 4/5 implementation
• 2008
  – Conduct ML3 SCAMPI\textsuperscript{SM} Class “A” appraisals for new projects
  – Conduct ML4/5 SCAMPI\textsuperscript{SM} Class “A” appraisal for one program

• 2009
  – Conduct ML3 SCAMPI\textsuperscript{SM} Class “A” appraisals on other Command projects
  – Conduct ML4/5 SCAMPI\textsuperscript{SM} Class “A” appraisals on other Command projects

• 2010
  – Conduct SSC-C Command-level ML4 SCAMPI\textsuperscript{SM} Class “A” appraisal in April 2010
Summary

- Decided on Approach – Use CMMI® for Process Improvement and Measuring Progress
- Using extensive research, determined the ‘Critical Success Factors’ for Implementing CMMI®
- Built Plan of Action/Detailed Schedule for Appraisals
- Provided Training – Systems Engineering, Processes, & CMMI®
- Advertised Early Successes
- Implemented Plan Successfully for Phase 1 – CMMI® Maturity Level 2 and Phase 2 – CMMI® Maturity Level 3
  - On schedule, on budget
- Laying groundwork for higher maturity
Any Questions?

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