TACOM-ARDEC
Software Enterprise (SWE)

CMMI Based
Process Improvement

S. Wayne Sherer
973-724-3531
wsherer@pica.Army.Mil
Agenda

• SWE overview.
• Basis for process improvement.
• Appraisal summary.
• Experience summary.
• Future plans.
• Organizational summary.
Organizational Environment

- TACOM-ARDEC Software Enterprise (SWE) consist of the software intensive weapon system elements of:
  - FSAC Fire Control & Software Engineering Division.
  - QED Systems/Software Technology, Analysis and Reliability (STAR) Team.
SWE Demographics

• Provides Post Deployment and Acquisition support for Software Intensive Weapon Systems (Combat Vehicles, Artillery, Trainers, Munitions, etc.).
• SWE has 166 Army and Contractor personnel.
• Has participated in CMMI development and testing from its start.
• Achieved CMMI Maturity Level 3.
Process Needs

• Maintain and enhance Core Competencies.
• Improve quality & consistency of services and products.
• Increase productivity & reduce cycle time.
• Improve customer satisfaction.
• Improve competitive advantage.
Business Processes

- Requirements Management (RM)
- Project Management (PM)
- Acquisition Management (AM)
- System Engineering (SE)
- Product Evaluation (PE)
- Performance Management (PFM)
- Organizational Process Management (OPM)
- Status Review (SR)
- Configuration Management (CM)
- Process Assurance (PA)
<table>
<thead>
<tr>
<th>Level</th>
<th>Focus</th>
<th>Process Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Optimizing</td>
<td>Continuous Process Improvement</td>
<td>Organizational Innovation and Deployment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Causal Analysis and Resolution</td>
</tr>
<tr>
<td>4 Quantitatively Managed</td>
<td>Quantitative Management</td>
<td>Organizational Process Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quantitative Project Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quantitative Supplier Management</td>
</tr>
<tr>
<td>3 Defined</td>
<td>Process Standardization</td>
<td>Requirements Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical Solution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Product Integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational Process Focus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational Process Definition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integrated Project Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Risk Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision Analysis and Resolution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integrated Supplier Management</td>
</tr>
<tr>
<td>2 Managed</td>
<td>Basic Project Management</td>
<td>Requirements Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Monitoring and Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supplier Selection and Monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement and Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process and Product Quality Assurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Configuration Management</td>
</tr>
<tr>
<td>1 Initial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Approach

• Map CMMI-SE/SW/A goals and practices to the business processes.
• Group the mapped goals and key practices by common requirements and threads.
Approach (cont.)

• Develop concepts, policy, processes and procedures for each Business Process that address the mapped CMMI requirements.
• Implement the Business Processes.
• Appraise SWE against CMMI-SE/SW/A.
• Act on findings.
Appraisal Summary

Five appraisals:

– March 2000, Class A, resulted in level 1
– October 2000, Class B, status check
– January 2001, Class A, resulted in level 2
– August 2001, Class B, status check
– February 2002, Class A, resulted in level 3
Appraisal Description

- Standard CMMI Appraisal Method for Process Improvement (SCAMPI) v1.0 and Software Capability Evaluation (SCE) v3.0:
  - Methods for evaluating the process capability of an organization.
  - Appraisal process can be used with the Software Engineering Institute’s SW-CMM, SA-CMM, or CMMI.
  - Outcome - Characterizations of practices (organized by KPA or PA), findings and ratings.
Lessons Learned

• Active senior management involvement is a prerequisite.
• Communication, training and coaching are all essential and must be integrated.
• CMMI and the standard processes must be supplemented.
• Start measurement effort early and keep it streamlined.
• Process group should include all project leaders.
Lessons Learned (cont.)

• CMMI does not address the quality of the framework.
• Should handle infrastructure efforts (PI, CM, QA, etc.) as individual projects.
• CMMI needs to be tailored for non-developmental projects.
• A central Process Asset Library and repository are basic and must be actively stocked and maintained.
Successful Practices

• Active integration of the quality assurance function into the process improvement effort.
  – Periodically assess project activities & artifacts.
  – Target the audits to assess compliance with CMMI.

• Extension of the standard processes through a comprehensive set of framework elements.
  – Templates, forms, checklists.
  – Training and coaching information.
CMMI Benefits (vs. SW-CMM)

• CMMI is less burdensome in the implementation phases, for example:
  – eliminating the extensive set of required procedures.
  – permitting a more tailored, economic development of standard processes and procedures.

• CMMI has an integrated acquisition discipline that provides supplier management coverage.

• CMMI can be applied to non-developmental projects, increasing the “bang for the buck.”
SWE Benefits

- Highest customer satisfaction ratings ever.
- Increase in on-time deliveries.
- Improved cost management.
- Fewer complaints to upper management.
Plans

- Streamline and improve business processes and assets.
- Maintain SWE satisfaction of CMMI level 3 requirements.
- Institutionalize business processes across the organization.
- Prepare the infrastructure for CMMI level 4.
• Expand coverage to new areas (ATE, DPOs, systems, hardware, etc.).
• Work to evolve CMMI to better meet our needs.
• Conduct appraisals to baseline new areas and measure progress.
Organizational Summary

- Senior management is proactively involved with process improvement effort.
- The organization is committed to process improvement.
- CMMI based approach has worked and benefited the organization.
Backup Slides
Timing results for Class “A”

<table>
<thead>
<tr>
<th>Appraisal</th>
<th>Projects</th>
<th>Practices</th>
<th>Time</th>
<th>Time/Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 00</td>
<td>4</td>
<td>120</td>
<td>52 hr</td>
<td>26.0 min</td>
</tr>
<tr>
<td>Jan 01</td>
<td>4</td>
<td>160</td>
<td>88.4 hr</td>
<td>33.1 min</td>
</tr>
<tr>
<td>Feb 02</td>
<td>4</td>
<td>173</td>
<td>75.7 hr</td>
<td>26.2 min</td>
</tr>
</tbody>
</table>

Mar 00 included all of CMMI-SE/SW/A level 2 & part of level 3
Jan 01 included all of CMMI-SE/SW/A levels 2 & 3
Feb 02 included all of CMMI-SE/SW levels 2, 3 & 4 + ISM
Timing results for Class “B”

<table>
<thead>
<tr>
<th>Appraisal</th>
<th>Projects</th>
<th>Practices</th>
<th>Time</th>
<th>Time/Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept 00</td>
<td>8</td>
<td>161</td>
<td>37 hr</td>
<td>13.79 min</td>
</tr>
<tr>
<td>Aug 01</td>
<td>9</td>
<td>179</td>
<td>41.2 hr</td>
<td>13.82 min</td>
</tr>
<tr>
<td>Sept 02</td>
<td>3</td>
<td>148</td>
<td>34.1 hr</td>
<td>13.82 min</td>
</tr>
</tbody>
</table>

Sept 00 included all of CMMI-SE/SW/A levels 2 & 3
Aug 01 included all of CMMI-SE/SW/A levels 2, 3, & 4
Sept 02 included all of CMMI-SE/SW/A levels 2 & 3 except OPD & OPF