Turning a Super Tanker: Process Improvement Change at NSA

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The National Security Agency was established by the Secretary of Defense on November 4, 1952.

NSA is part of the US Department of Defense
- The Director of NSA (DIRNSA) is always a general officer of grade O–9 (occasionally higher) from any military service.
- The Deputy Director of NSA (D–DIR) is always a DoD civilian employee.

NSA’s core missions are to protect U.S. national security systems and to produce foreign signals intelligence information:
- Information Assurance
- Signals Intelligence
- Network Warfare
Three Key Missions

- The **Information Assurance** mission confronts the formidable challenge of preventing foreign adversaries from gaining access to sensitive or classified national security information.

- The **Signals Intelligence** mission collects, processes, and disseminates intelligence information from foreign signals for intelligence and counterintelligence purposes and to support military operations.

- NSA enables **Network Warfare** operations to defeat terrorists and their organizations at home and abroad.
The Information Assurance, Signals Intelligence, and Network Warfare missions are highly technical.

- Systems development and integration—particularly software intensive systems—are a key enabler in fulfilling these missions.

NSA has many software development projects, ranging from both the very large (100s of developers) to the very small (1–3 developers).
NSA Process Improvement History

- Early 1990’s – early 2000’s:
  - JACKPOT and Software Engineering Knowledge Base Center

- 2003 – 2008:
  - LIONSSHARE
    - One (small) organization achieved CMMI® ML 2 and recently CL 3 in selected Process Areas
  - Six Sigma (and Lean Six Sigma)

- 2008 – Present:
  - NSA Way
What is the “NSA Way”?

“The NSA Way is a unified framework for building large, complex, primarily software systems that meet the diverse needs of NSA missions. It is lightweight, intuitive, and independent of project size and development methodology.”

It is:
- Based on a Customer/Supplier theme
- Focused on outputs over processes
- About continuous improvement
- Applicable in Agile, Iterative, and Waterfall LCMs
- Independent of team size
How does NSA Way Fit in NSA?

- NSA Way defines core expectations for how systems and software development are done.
- NSA Way deploys ‘coaches’ into NSA systems and software development organizations to provide implementation guidance and to assess progress.
- NSA Way is implemented through:
  - **Gates** (Life cycle control–milestones)
  - **Processes** (currently there are 7)
  - **Metrics** (Quality related)
- Driving cultural and behavioral change first, process maturity second
## Contrast Between NSA Way and past NSA PI Initiatives

<table>
<thead>
<tr>
<th>Senior Management Support</th>
<th>Examples from Past Initiatives</th>
<th>NSA Way</th>
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<td>Supported by a ‘junior’ senior leader who could not influence other key stakeholders. No clear champion other than the sponsor</td>
<td>• Supported at the highest level • Championed by senior personnel both within key offices and across the organization.</td>
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| Participation by respected technical leaders | Limited or none | Developed and supported by some of the organization’s technical leads. |
| Based on CMMI (or other model) | Explicitly | Implicitly |
| Appraisals/Assessments | Participating programs went through an initial SCAMPI class A appraisal as an entry condition for participating. | Monthly assessments directly connected to limited areas where technical leads agree there is positive return-on-investment. |
• Suppliers and customers at each gate
• Gate Criteria represents what the customer needs to be successful
‘Establish and maintain …’
◦ Coding Standards
◦ Configuration Management Processes
◦ Internal and External Interface Specifications
◦ Verification processes
  • Conduct code reviews
  • Implement software unit testing
◦ Defect Tracking and Reporting System

Regularly review and improve development and test methodologies
Metrics

- Philosophy:
  - NSA Way established a set of four focus areas based on key business objectives
    - Time to Field
    - Capabilities Throughput
    - Quality
    - Efficiency

- Projects define their own criteria and measurements to support these goals
  - Gate Pass/Fail data (Time to Field, Throughput, etc.)
  - Code Inspection Data/Unit Test Data (Quality)
  - Customer Satisfaction Survey (Quality)
  - Defect Data (Quality)
  - Program Management Data (Efficiency)
One Year Later...

- Accomplishments
  - We had plenty
- Challenges
  - OMG!
- Lessons Learned
  - You bet
- Initial Analysis
  - The Good, the Bad and the Ugly
Accomplishments

- Overall acceptance of the framework
  - Achieved buy-in at all levels: Most senior level to grassroots
  - More than double the number of projects on the framework
  - CMMI-like processes infused without using the ‘C’ word

- Creation of a common language
  - Lifecycle reference points for managers and developers
  - Expectation of common processes – implementations differ
  - Improves cross-project comparisons and mobility

- Importance of the ‘coaching’ model
  - Coaching model becoming a tool for solving other types of Agency problems
  - Less “business oriented” than a Mentor, broader in scope than a Guru and supported by a coaching network and infrastructure

- Acceptance of key processes and gates
Challenges

- Getting good data and getting projects to use it.
- Small project teams challenged by ‘overhead’
- Our success is hindering us – too many projects; too few coaches
- Balance of standardization vs. project’s flexibility to tailor implementations
- Middle management acceptance
- Project turnover
‘Handling required’
Specialized training had to be created
Customer-facing infrastructure is important
Practice what we preach
Patience goes a long way
  ◦ Pressure leads to Passive–Aggressive behavior
Tendency to never report failures
  ◦ If it ain’t good, don’t report it
Analysis of Data

- Assessment results
- Defect analysis
  - Cumulative Open–Closed DRs over Spins
- Gate statistics
  - Number of defects by gate over time
## Initial Assessment Summary
### April 2009

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## Final Assessment Summary
### June 2010

### NSA Way Product Status

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Legend:
- Green: Complete
- Yellow: Partial Complete
- Red: Not Completed

Notes:
- Document & Execute Defect Tracking and Reporting
- Review & Improve Development and Test Methodologies
- Gate Operations
- Quality Metrics
Defect Analysis

Open–Closed Rate by Months in Release

Number of DRs

Months in a Release
Gate Statistics

Gate 3 Defects - 2010

Most Occurring Defects at Initial Review

Most Occurring Defects at Final Review
Future NSA Way Directions

- Complete rollout across the Technology Directorate and begin expansion beyond
- Encourage teams to go beyond minimum expected behaviors
- Improve data collection
  - Customer satisfaction
  - Lots of other directions we can go…
    - Advanced requirements and defect metrics
    - Time to Market
- NSA Way 2.0 (‘Raising the bar’)
  - “Depth and Breadth”
  - Integration with other initiatives
  - Learn from ‘our’ customers and continue to engage the community
Contact Information

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