

Turning a Super Tanker: Process Improvement Change at NSA

Steve Tobin, NSA Way Program Manager, DRC
Michael Mangieri, NSA Way Project Coach, BTI
Sue LaFortune, Government Lead, NSA





Who is NSA?

- ▶ 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.



NSA's Mission and Systems Development



- ▶ 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:
 - LIONSHARE
 - 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

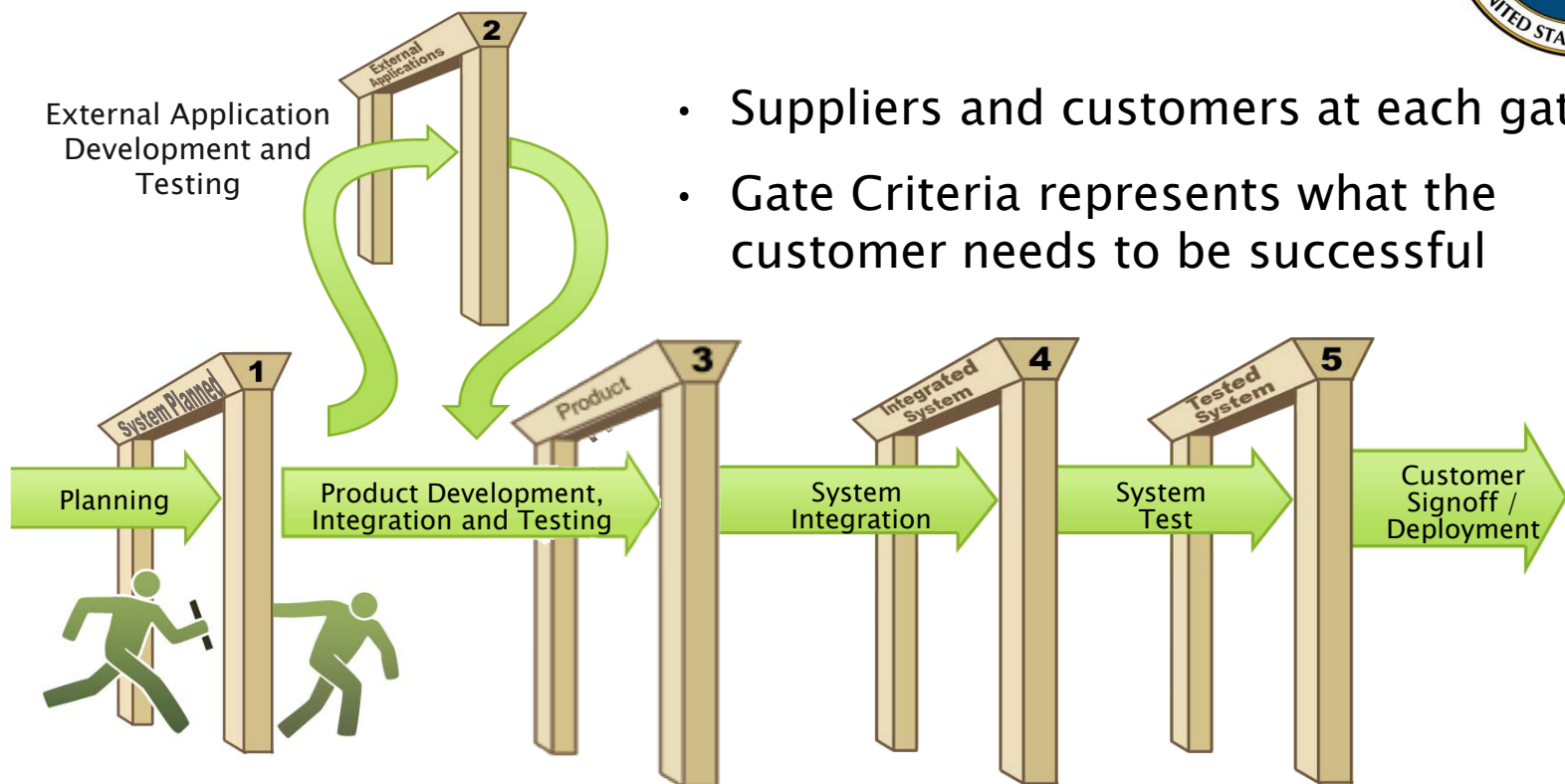
Contrast Between NSA Way and past NSA PI Initiatives



	Examples from Past Initiatives	NSA Way
Senior Management Support	Supported by a 'junior' senior leader who could not influence other key stakeholders. No clear champion other than the sponsor	<ul style="list-style-type: none"> Supported at the highest level Championed by senior personnel both within key offices and across the organization.
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.



Gates



Unit Testing

Code Reviews

Coding Standards

Requirements Management

Configuration Management

Defect Management

Lessons Learned



NSA Way Required Activities

- ▶ ‘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



Lessons Learned

- ▶ '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

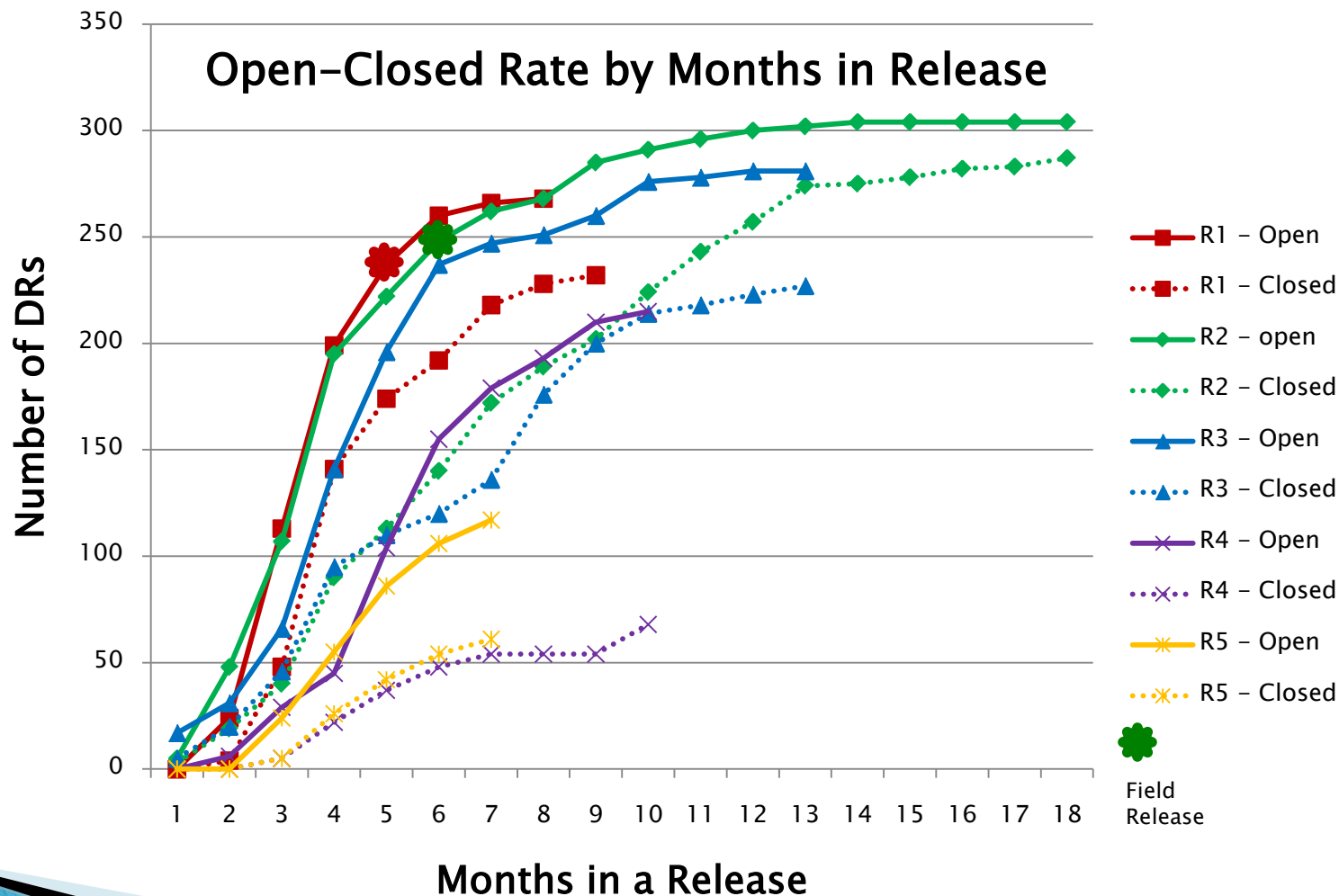


NSA Way Product Status								
Document External Interfaces	Documented Coding Standards	Hold Code Reviews	Implement Unit Testing	Documented CM Processes	Document & Execute Defect Tracking and Reporting	Review & Improve Development and Test Methodologies	Gate Operations	Quality Metrics

The seal of the National Security Agency (NSA) is a circular emblem. It features a bald eagle with its wings spread, perched on a shield with vertical stripes. The eagle is set against a blue background. The words "NATIONAL SECURITY AGENCY" are written in a circle around the top, and "UNITED STATES OF AMERICA" around the bottom, separated by two stars.

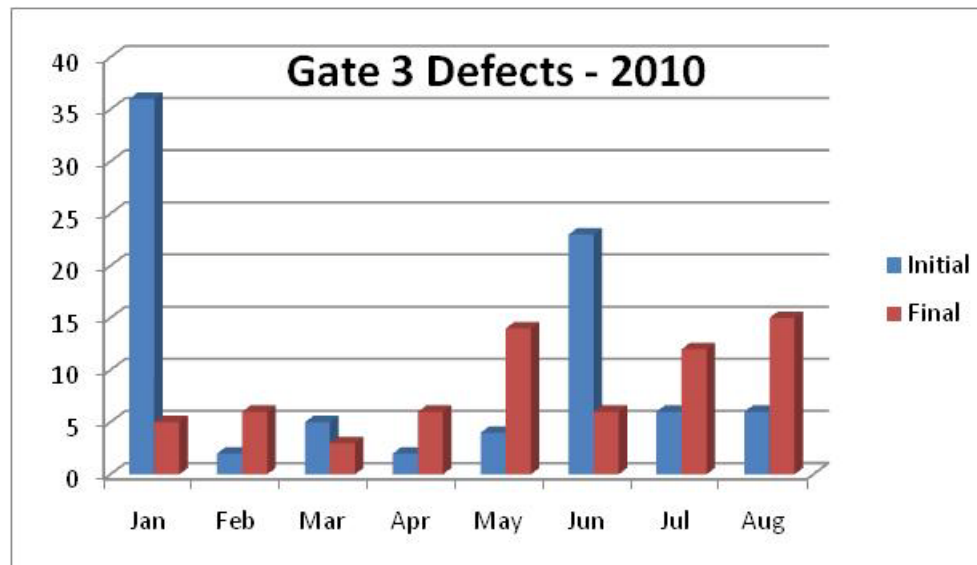
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Defect Analysis

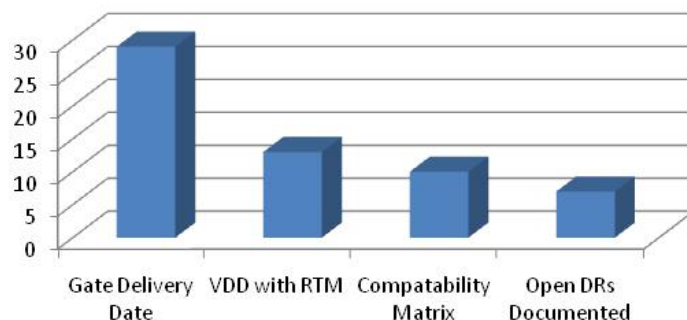




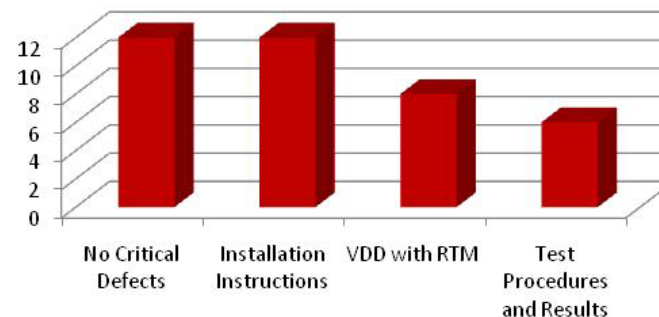
Gate Statistics



Most Occuring Defects at Initial Review



Most Occuring 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

- ▶ Steve Tobin, Dynamics Research Corporation
 - Email: stobin@drc.com
- ▶ Michael Mangieri, Business Transformation Institute, Inc.
 - Email: mmangieri@biztransform.net