

**Transitioning a Merged Organization
to CMMI and a New OSSP**

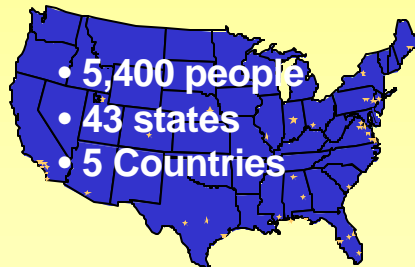
**NDIA CMMI Technology Conference
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Defense Mission Systems**

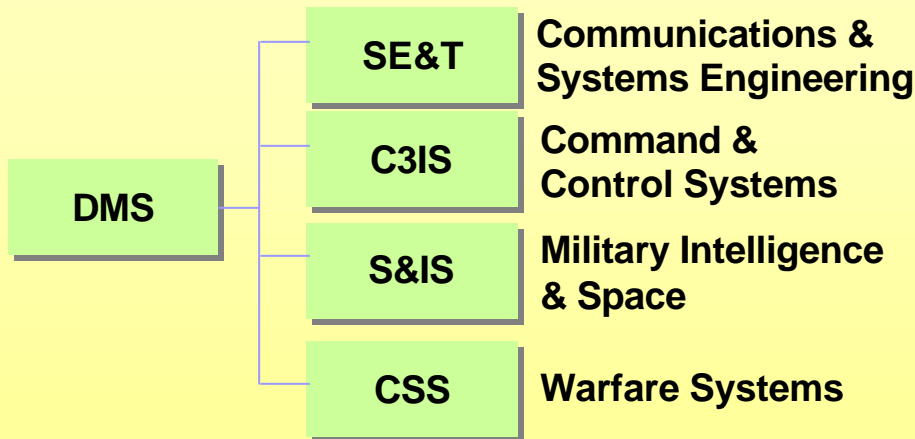
Defense Mission Systems (DMS) Profile

- Revenues: ~\$800M

- People & Locations:



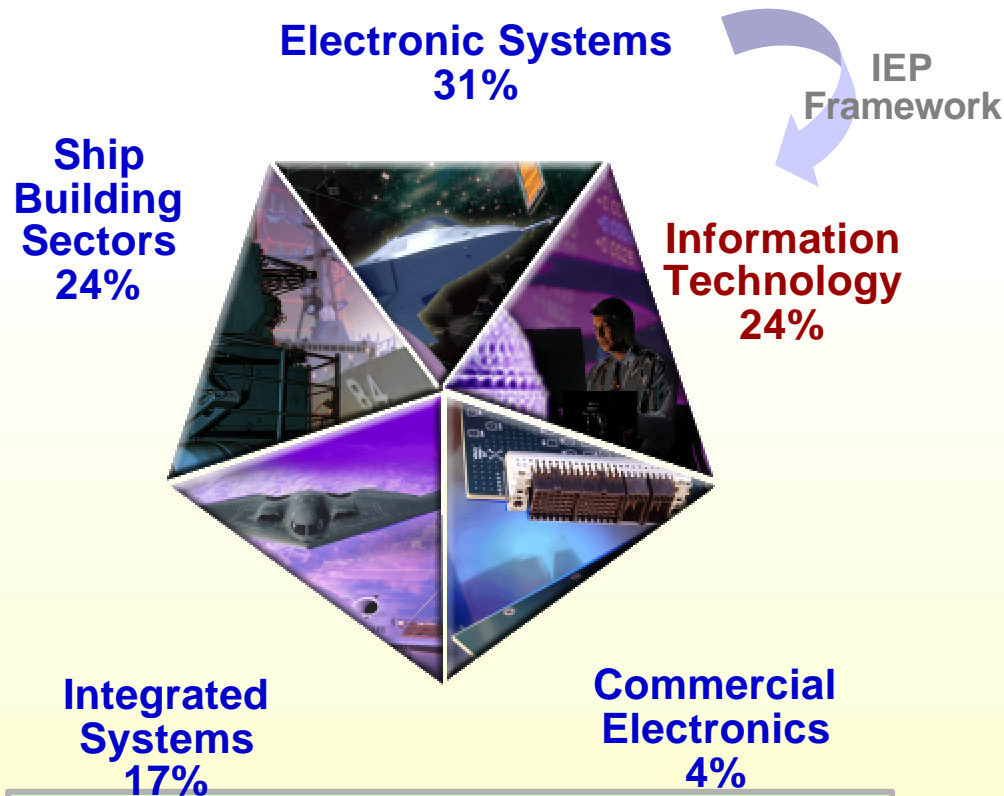
- Organization:



- Largest Business Unit within the Northrop Grumman Information Technology (NGIT) Sector
- Created out of seven separate legacy organizations as the C⁴ISR arm of NGIT
 - Realigned in June 2001
 - Formal stand up – Jan 2002
- Quickly formed into a cohesive group of interdisciplinary operating units
- Mixture of large and small programs
- Very customer mission oriented
- Process tailoring became an important accommodation

Integrated Enterprise Process (IEP)

- Process Framework derived from a sister sector



Northrop Grumman - Global aerospace and defense company with cutting-edge technologies and products

- 2002 Sales : ~\$18B
- Employees: over 100,000

- 1998
 - Electronic Systems Sector begins development of IEP
 - IEP built on foundation of 15 years of process improvement efforts
- Jun 2001 – LTS (DMS legacy component) adopts CMMI and IEP
- Jun 2001 – DMS formed
 - Adopts IEP and CMMI
 - Tailors and augments IEP
- Dec 2001
 - DMS evaluated CMM Level 3 through external SCE
 - DMS IEP Block Release and Piloting
- Jan 2001 – NGIT Adopts IEP Process Framework

Transitioning to the CMMISM and a new OSSP

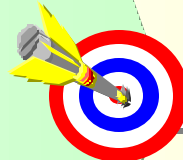
Realigned Organization DMS - June 2001

- Model: CMM
- Maturity Level: CMM Level 2-5
- OSSP: 10+ Legacy Processes

Comptek-P
FDC-P
IPDH
ENABLER
LEIB
Logicon IEP
ISS-P
O-LEIB
PRC-P
SEP

Current Organization DMS – January 2002

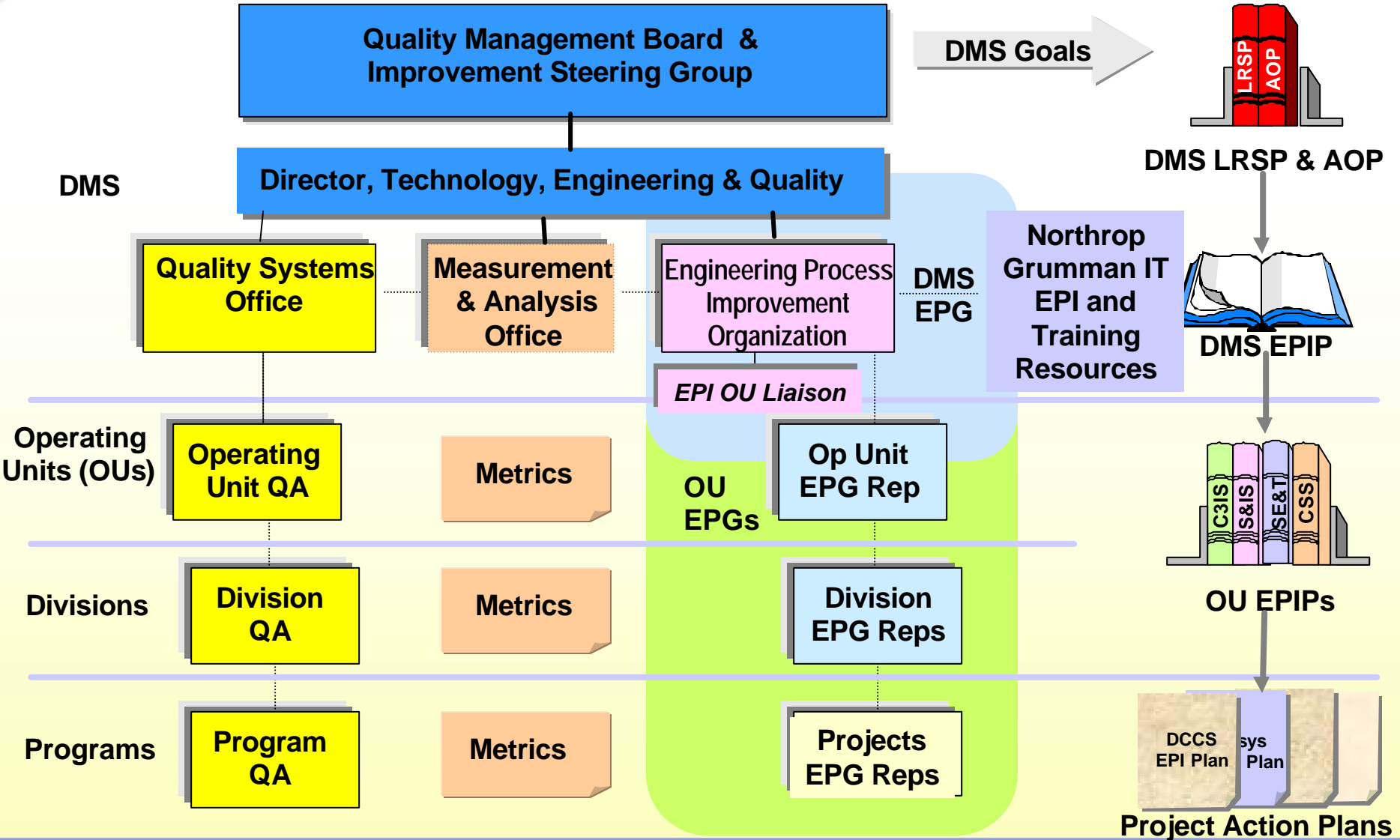
- Support the business objectives and needs of merged but larger and geographically diverse enterprise
- Establish the infrastructure to achieve the highest levels of engineering excellence, as measured by the CMMISM and ISO 9001:2000 quality frameworks
- Retain CMM Level 3 credentials



Strategic Goals

- Institutionalize a common OSSP, the DMS Integrated Enterprise Process (IEP)
- Achieve and maintain a high level of engineering maturity as measured by the CMMISM
 - DMS-wide CMMISM Level 3 (by Q2 '03)
 - Critical projects at CMMISM Level 5 (by Q4 '03)
- Support and facilitate ISO 9001 implementation and registration

Quality and Process Improvement Infrastructure



Transition

- **To CMMI**

- **Evaluate CMM to CMMI gaps**
 - What higher maturity projects would experience in performing against the CMMI
- **Generate initial transition guidance**
 - Determine if high maturity projects already are performing practices or if they need to begin
 - EPG to develop new material for all projects to use to help fill gaps
- **Provide implementation guidance**
- **Deploy internal CMMI Appraisal program**

- **To IEP**

- **Select other Business Unit OSSP for adaptation**
- **Identify CMMI gaps**
- **Adapt OSSP process set, add legacy organizations' high maturity best practices, and call it DMS IEP**
- **Generate initial Implementation guidance**
 - CMM ML3 or higher projects
 - Other existing projects
 - New projects
- **Deploy to pilot projects of each type**
- **Obtain process feedback and update DMS IEP**

Observations on Transitioning to CMMI

- **Requirements Development**

- Pilot projects are much more comfortable with the separation of RD and REQM
 - RD matches their good engineering practices
- Raises visibility in project of eliciting, understanding and balancing stakeholder needs
- More easily permits the overlap with TS of evolutionary engineering and development activities

- **Validation**

- Not necessarily a part of the standard engineering life cycle activity that all our projects are tasked to perform
- This is not an activity only in the later stages (e.g., System Testing) but occurs in the earlier stages as well (e.g., early demonstration of product usage mock-ups)

Observations on Transitioning to CMMI

- **Relevant Stakeholders Involvement**

- Solved organizationally by EPG generating a detailed template for the Stakeholder Involvement Plan for all process areas
- Output products from monitoring involvement per the plan need to be defined more carefully

- **Decision Analysis and Resolution**

- Some projects have already done this as a matter of good engineering
- Projects need to more clearly define when this process is to be invoked

Observations on Transitioning to CMMI

- **Risk Management**

- Legacy organization's best practice process for risk management is equivalent to corresponding IEP process
- Explicit CMMI visibility of this area supports our rollout of rigorous process to wider set of programs
 - Experience base, and existing tools and processes can be leveraged to accelerate deployment

- **Process and Product Quality Assurance**

- Increased CMMI visibility of process evaluations (adherence evaluations) helps support our rollout to wider set of programs
 - Experience base from high maturity projects and processes can be leveraged to accelerate deployment
 - The Quality Systems Office is the focal point for PPQA
- There is a synergy with the internal CMMI Appraisal program

Organizational Process Definition

- **As part of redefining the DMS Measurement Repository specify an essential and small common core set of metrics to be collected by projects so that**
 - Projects begin using these metrics from their project inception
 - Relatively easy to collect by standard collection templates
 - Projects can begin a well-defined evolutionary path to QPM and implementation of OPP is accelerated
- **Set up Measurement and Analysis Office to provide an organizational focus on the systematic metrics collection, analysis and use by projects and the organization**
 - Ensure there is a strong synergy with the Quality Systems Office
 - The MA Process Area lays it all out

Measurements to be Collected

Product Activity	Effort		Schedule		CPI		SPI		Size		Defects			
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Detect	Inject		
Requirements	[Redacted]				.	.	.	.
Design
Construction
Integration
Delivery
PM	.	.	[Redacted]		.	.	.	.	.	.	.	.
QA/CM	.	.			[Redacted]									
Other	.	.												

ML4 & ML5 - Implementation Tactics

- **Initiate EPG managed Process Focus Groups for**
 - **Quantitative Process Performance**
 - **Organizational Process Performance**
 - **Causal Analysis and Resolution**
 - **Organizational Innovation and Deployment**
- **Leverage the experience of projects' participation in other Business Unit working groups to address the CMM level 4 and 5 issues**
- **Use the metrics (being collected on a pilot basis) and their pilot quantitative management plans and defect prevention management plans as a basis to accelerate progress**
- **Treat Causal Analysis and Resolution as a subroutine to be invoked at all levels of maturity development**
 - **Can be performed on any process that receives feedback on its defects or failures, or when the difference between expectations and actual results is greater than some predefined threshold**

Organizational Training

- **Restabilize the training program to support new merged but geographically diverse enterprise**
 - Training records and plans for new organization
 - Currently maintained in numerous tools
 - Transition all records to a new training record database
 - Expanded delivery modes
 - Traditional classroom training
 - Expensive and difficult to deliver to multi-site large engineering organization
 - Qualification and availability of instructors
 - Web-based or CD-ROM training delivery
 - Net Meeting or other live methods of training to reach large distributed audiences
- **Institutionalize a consistent training culture based on skills and practices needed to maintain high maturity and performance**

Organizational Training

- **New or modified training to support CMMI**
 - Introduction to the CMMI
 - Introduction to the SCAMPI Process
 - REQM and RD
 - Refine existing measurement and QPM courses to accommodate quantitative control mechanisms
 - Elaborate existing courses to accommodate both system engineering and software elements
 - Courses in CAR, DAR, OID/TCM
- **New or modified training to support new OSSP**
 - Orientation course for new standard process
 - Existing process courses to reflect changes in the standard process (new documents and new requirements)
 - Basic engineering courses

Assessing Maturity against the CMMI

- **Transition Northrop Grumman IT and DMS CMM Internal Appraisal program to CMMI**
 - Projects record, and trained appraisers verify, objective evidence
 - Attempt to avoid discovery mode
 - References to evidence are input into web-based tool
 - Modes
 - Quarterly 2-day appraisals by trained evaluators
 - Interviews and sampled evidence verification
 - Asynchronously using web-based tool and e-mail
 - Highly experienced and trained staff train new appraisers
- **Assessments provide**
 - Visibility and feedback to/from projects on progress made in achieving
 - Targeted CMMI capability levels
 - Implementation of the OSSP
 - One vehicle for delivering and receiving improvement information

DMS IEP Policy

- **New projects will use the DMS IEP unless this requirement is in conflict with contract or customer requirement**
- **Projects currently using a legacy OSSP and operating at a minimum of CMM level 3 may continue using the project's legacy processes provided they**
 - Comply with the CMMI unless this requirement is in conflict with contract or customer requirements
 - Are augmented by IEP procedures to fill any gaps against the CMMI
- **All other legacy projects will transition to the IEP in accordance with the DMS IEP Transition Plan approved by senior management**

DMS IEP Structure & Tailoring Approach

Compliance Documents

NGIT &
DMS
Quality and
Engineering
Policies

DMS IEP
Procedures

- **Policy – Engineering excellence policies mandate commitment to CMMI framework and the use of the DMS IEP**
- **IEP Procedures (compliance)**
 - **Highest level documents – The basis of the integrated engineering practices and processes. Used by all projects in accordance with DMS IEP Implementation procedure**
 - **Must be waived if the project does not need to perform the activity or is contractually required to follow other processes**
 - **Waivers must be approved in advance by the DMS EPG Chair**

DMS IEP
Instructions
Forms
Guides
Checklists
Templates

- **IEP Work instructions, forms, guides, checklists and templates**
 - **Support instructions to the IEP processes**
 - **May be followed, edited, or rewritten**
 - **Must not violate procedure**

Project IEP Implementation Steps

- **Initiation**
 - Project profile
 - IEP application matrix
 - IEP Procedures' waivers (if any)
- **EPI Plan**
 - Process adaptation plan
 - Core measures
 - Process training plan
- **Execution**
 - Develop responsive comprehensive program plan
 - Develop training plan

IEP Transition Observations

- **Our adaptation of another sector's process set augmented by DMS legacy organizations' best practices**
 - Saved resources and time at generating new processes to accommodate more elements of the extended enterprise
 - Leveraged best practice experience and lessons-learned with mature processes to accelerate breadth of deployment and institutionalization
- **Critical to**
 - Validate that against the CMMI, projects operating at ML3 with their legacy process set are also performing the relevant activities from the new IEP
 - Get deployment feedback from a wide variety of projects to deepen the expanded scope of the IEP

CMM to CMMI Transition Observations

- For projects currently operating at a CMM ML3, we estimate 15-20% of the CMMI requires new or additional work on the part of the project or organization
 - Projects often already satisfy some of the new practices based on their engineering maturity
 - RSKM and MA are already being performed
- We build on, and reuse, what we have done relative to the CMM
- Critical to perform quarterly project CMMI assessments by trained EPG staff
- We are gaining experience in applying the CMMI to new and current projects with services content or significant systems content

Conclusion



A strong DMS organizational commitment and enterprise infrastructure with extensive communications was crucial to transitioning the merged, geographically-diverse organization to the CMMI and a new OSSP simultaneously.