Objective of Presentation

Communicate the elements of the Engineering Professional Development program for Systems Engineering and Systems Architecting at Lockheed Martin.
Vision

A comprehensive set of skills and a curriculum that is integrated across disciplines to provide the foundation for engineering and architecture professional development and qualification, and enable flexible career paths for employees across Lockheed Martin.

A broad program with multiple components to affect the development of engineers – not just a set of courses
Integration Drivers

EPD VSM focused on overall strategy for Engineering and Architecture Professional Development

Objectives

- Same “look and feel”
- Allow identification of common Skills and Training needs
- Promote consistent understanding of concepts, terms, etc.
- Facilitate cost-effective course development via common courses, where applicable
- Framework for common engineering needs along with discipline specific needs

From “Cylinders of Excellence” with Separate Assets to ...

Integrated Approach Using a Common Set of Assets

A comprehensive approach to skills integration
Integrated Approach to Address Skills, Training, and Career Path

• **Integrated Curriculum**
  - Identifies and defines common courses
  - Includes discipline unique and specialization courses
  - Identifies applicability of courses to disciplines/roles
  - Facilitates greater leverage among disciplines
  - Curriculum includes the following information about each course:
    - Description/abstract
    - Annotated outlines
    - Learning objectives
    - Audience
    - Pre-requisites
    - Level of Course

• **Single Development/Qualification Guide**
  - Single approach
  - Common terminology
  - Appendices for supplemental information for each discipline/role
  - Provides for single communication effort

• **Innovative Learning Team**
  - Recommended delivery method(s) for courses

**Curriculum Development**

- BA/BU Needs & Requirements
- Product & Implementation Plans

**Career Path Development**

- BA/BU Interface Team

**Course Development Team**

- Single Development/Audience
- Integrated Skill Set Matrix
- Integrated Curriculum
- Description/abstract
- Cost
- Implementation
- Annotated outlines
- Support flexible
- More flexible

**EPI 270-16 Rev. 3.0**

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**Lockheed Martin Corporation**

- Approved by: Director, EPI Program for use throughout the Lockheed Martin Corporation.
- Autodesk Architect Working Group, the SE Management Working Group, the System Definition Working Group, and the Systems Engineering Subcouncil Leader
- Bob Epps/Ed Moshinsky
- Steve Bullock/David Olmstead/Garry Roedler

**10/23/2012 5**
Engineering Development and Qualification Program (EDQP)

• Framework to develop, verify and recognize the knowledge, experience and capabilities of practicing engineers and architects
  – Establishes common expectation of the specific engineering capabilities
  – Facilitates technical development and career path planning of engineers (including those new to the discipline)
  – Defines capabilities and experiences for use by HR & leaders to develop staffing plans/execute staffing

• Builds on documented skills and curriculum
• Includes multiple stages of development
• SA is the highest level of maturity found within EDQP
Key EDQP Concepts

- Define Role
- Identify L&D Direction
- Create a Tailorable Framework
- Encourage Individual Responsibility for Development
- Provide Enabling Resources

Aligning Individual Career Goals with Business Needs
Key EDQP Elements

Skills Portfolio / Competency Model

Experience/OJT
- Discipline & domain
- Successful demonstration of skills

Training/Education
- Consistent foundation knowledge per curriculum

Coaching
- First receiving coaching
- Later providing coaching

Mentoring
- First as Mentee
- Later as Mentor

Basis of Qual Criteria

Qualification Stage Criteria per Role

Assessment

Con-Ops & Review Board

BA/BUs Implement Tailored Program

Sustainment

Acknowledgement of Qualification Rating

A Systematic Personnel Development Approach

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EDQP Development Con-ops

1 – Explore Options

2 – Evaluate Self-Assessment

3 – Assess Capabilities

4 – Validate Assessment & Feedback

5 – Create Dev Plan

6 – Perform L&D Activities

Career Development Plan

Individual Assessment

Leader

Mentor

Coach

Employee
EDQP Qualification Con-ops

1. Assess Capabilities
2. Employee
3. Leader
4. Validate Assessment & Feedback
5. Individual Assessment
6. xxDQP Review Board
7. Assess Stage & Feedback
8. Reports
9. Completed Assessments & Searchable DB

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EDQP Stages of Acknowledgement

• **Candidate**
  - Interest in career in the subject discipline, but experience or skill level requirements for Qualification not yet met.
  - Application for EDQP of the subject discipline has been accepted.
  - Formalizes career development intent and planning.
  - Pre-requisites achieved per documented requirements (in 270-17).

• **Qualified**
  - An individual who has met or exceeds the criteria specified for the Qualified Stage in the specific discipline.
  - The minimum common criteria to attain the designation of “Qualified” is documented for each discipline in the appendices of 270-17.
  - The business unit may include additional criteria (e.g., to address domain or business unit specific needs) in their implementation of the program.

• **Advanced**
  - An individual who has met or exceeds the criteria specified for the Advanced stage in the specific discipline.
  - The minimum common criteria to attain the designation of “Advanced” is documented for each discipline in the appendices of 270-17.
  - The business unit may include additional criteria (e.g., to address domain or business unit specific needs) in their implementation of the program.
Ordered progression through the stages is expected but not required. Amount of relevant experience for each stage varies by role. Generally, 5-10 years for Qualified stage and an additional 3-5 years for Advanced stage. Existing employees and new hires can be assessed at any point in their career.
Other Information in EDQP

- **EDQP Concept of Operations**
- **Eligibility**
  - Open to all, except where pre-requisites are noted
- **Successful completion of training**
  - Testing is on course-by-course basis per learning objectives
- **Request for Acceptance of Equivalent Learning or Development**
  - No blanket waivers or grandfathering
  - Provide rationale for equivalency with objective evidence
- **Reciprocity**
  - Accepted by receiving BU
  - Employee responsible to obtain domain skills per BU needs
- **Renewal**
  - Business Unit decision
  - Typically 3-5 years with additional learning and experience requirements
Skill Set Matrix

• Documents the skills required for given disciplines or roles

• Includes skill categories, skill sets, skills, sub-skills and appropriate classifications
  
  – **Skill Category** – High-level grouping of skill sets based on general focus
  
  – **Skill Set** – A set of skills that are related to a key objective.
  
  – **Skill** - Aptitude required for the performance of a process or life cycle activity.
  
  – **Sub-skill** - One of lower level multiple aptitudes required to perform a skill.

• Skill Sets, Skills, and Subskills are defined the discipline team for each skill category

Skills provide the basis for curriculum and development
Common Skill Categories

• Process
  – Common skills apply to all disciplines
  – Addresses organizational standard processes, standards, and tools

• Technical
  – Focused on the technical engineering processes through the life cycle

• Application/Domain/Environment (BU Specific)
  – Skills specific to the business unit domain areas

• Leadership

• Personal Development
  – Common set established for all disciplines
  – Focused on the interpersonal, communication, efficiency and effectiveness, and team skills

• Management
  – Focused on the project management processes through the life cycle
Curriculum Development

• Derived from the skills to provide the educational component of building the skills
  – Skills → Learning Requirements → Courses (with iterations)
  – Maintain a mapping of skills to the curriculum courses to ensure adequate coverage and analysis
• Courses included in the curriculum are independent of any existing course
  – Defines what needs to be in a course to meet the LMC skill requirements
  – “Notional” course outline used to:
    • Evaluate existing courses (internal and external)
    • Establish requirements for development of new courses
Strong emphasis on e-learning/self-paced or distance learning to provide common training to larger audiences in a consistent, yet flexible manner while leveraging technology

Curriculum is based on defined skills; independent of existing course offerings
Course Types

- **Essential (Foundation) courses**
  - Technical knowledge in a discipline needed for fundamental tasks.

- **Enhancement (Supplemental) courses**
  - More in-depth technical knowledge needed for more advanced tasks.

- **Specialization courses**
  - Technical knowledge in required only for specialized assignments in that discipline.

- **Inter-discipline courses**
  - Address skills in one discipline that are beneficial for successful performance in other disciplines.

- **Personal Development courses**
  - Address skills that enhance general professional effectiveness.

- **Domain/BU Specific courses**
  - Defined by the BU to meet unique needs.
System Engineer and Architect Development

Chief SE/Arch Master Arch

Advanced SE

The same approach is being developed for SWE & SWA

Advanced SA

Qualified SA

Candidate SE

Qualified SE

Candidate SA

LMC SE Development/Qualification Program (In place in many BUs)

LMC SA Development / Qualification Program

SE Skills
SE Curriculum
SE Dev/Qualification Program

SA Skills
SA Curriculum
SA Dev/Qualification Program

Career Dev. Plan – based on qualification criteria – update periodically

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Note: “Diagonal” Promotion Opportunities from One Career Path to Another May Also Occur
Continuous Improvement

• Alignment with SE competency models
  – Influence, learn from and align with efforts across industry (e.g., NDIA, UARC, INCOSE)

• Refine/improve over time
  – Monitor changes in technology, customer needs, and advancements in learning approaches
  – Incorporate lessons learned
<table>
<thead>
<tr>
<th>Organization</th>
<th>LM ADQP</th>
<th>LM SEQual</th>
</tr>
</thead>
</table>
| Specialty / Primary Family | Cyber Security  
Information Systems  
System of Systems  
Software  
Enterprise Architecture | Systems Engineering |
| Competency Levels | Candidate  
Qualified  
Advanced  
Master | Candidate  
Qualified  
Advanced |
| Operation | Program Assist | Program Assist |
| Domains | Systems  
Software  
Lead Systems (Chief) Engineer | Systems  
Software |
| Review Board | Yes (BA/BU) | Yes (BA/BU) |
| Reciprocity | Yes | Yes |
| Governance | Joint Architecture Working Group and BA/BU | Exclusive within BA |
| Renewal / Re-certification | Yes | Pending |
| Follow CE 270-XX | Yes | Yes |

* Credentialed recognition are based on the following experience combinations within programs:
  - Duration of performed tasks
  - Visibility/value of the programs being designed/architected
  - Technical capabilities of the architect
QUESTIONS?