

# Enhancing Systems Engineering Workforce Development in the Enterprise

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# Objective of Presentation



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

# Vision

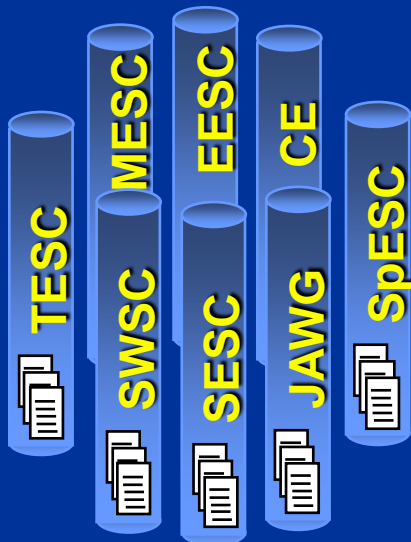


**A comprehensive set of skills and a curriculum that is integrated across disciplines to provide the foundation for engineering and architecture professional development and qualification, and enable flexible career paths for employees across Lockheed Martin.**

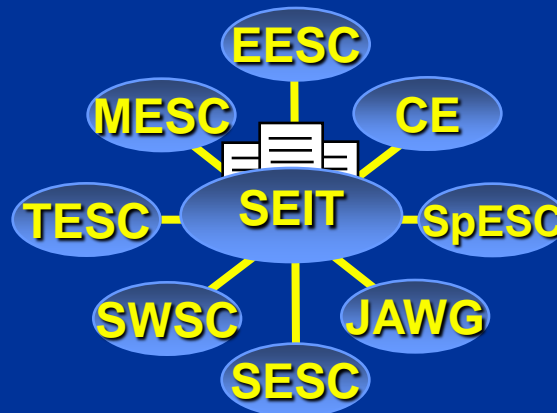
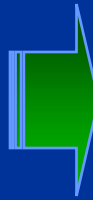
**A broad program with multiple components to affect the development of engineers – not just a set of courses**

# Integration Drivers

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



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



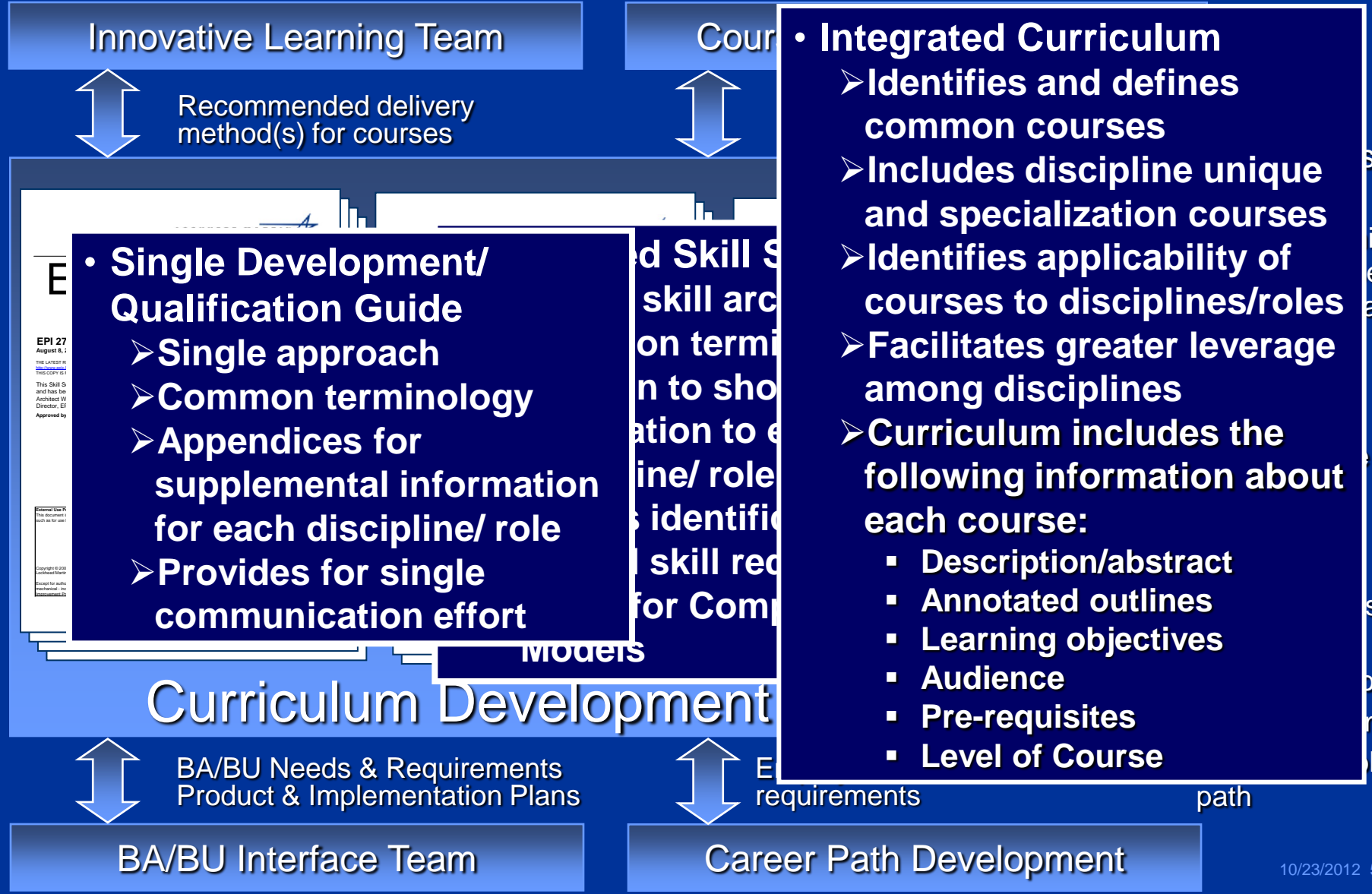
Integrated Approach Using a Common Set of Assets

## 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

**A comprehensive approach to skills integration**

# Integrated Approach to Address Skills, Training, and Career Path



**Single Development/Qualification Guide**

- Single approach
- Common terminology
- Appendices for supplemental information for each discipline/ role
- Provides for single communication effort

**Model**

**Small Text:**  
 EPI 27  
 Approved by:  
 THE LATEST IN  
 THIS CONTEXT  
 This Skill S  
 and has be  
 Authorized W  
 Director, EF  
 Approved by  
 Copyright © 200  
 Andrew Mann  
 Support to the  
 Mechanical, Inc  
 International, Inc

# 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**



**Encourage Individual  
Responsibility  
for Development**



**Provide Enabling  
Resources**



**Create a Tailorable  
Framework**

**Aligning Individual Career Goals with Business Needs**

# Key EDQP Elements



## 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*

## Skills Portfolio / Competency Model



## BA/BUs Implement Tailored Program

Sustainment

## Qualification Stage Criteria per Role

Assessment

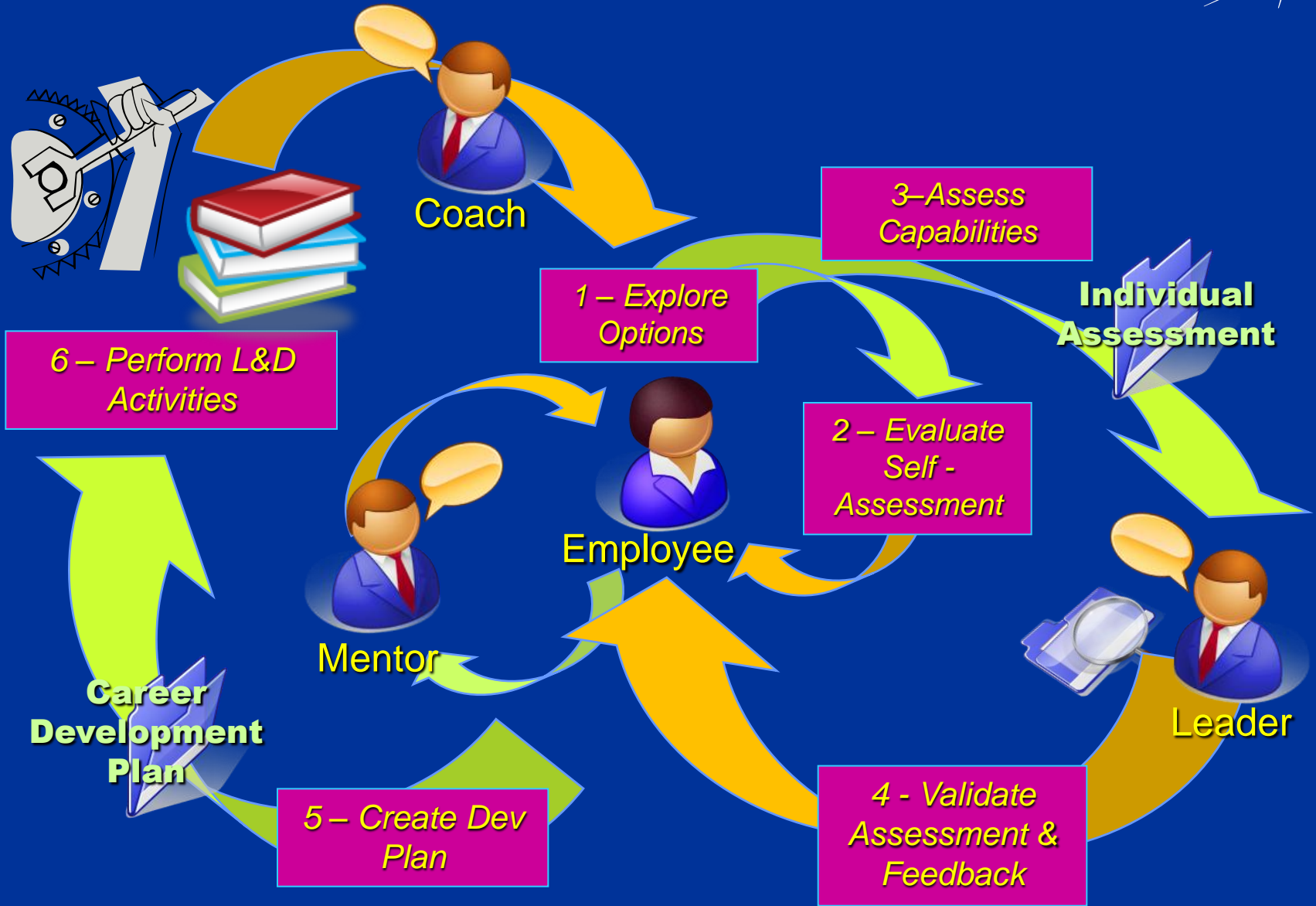
Con-Ops & Review Board

Acknowledgement of Qualification Rating

**A Systematic Personnel Development Approach**

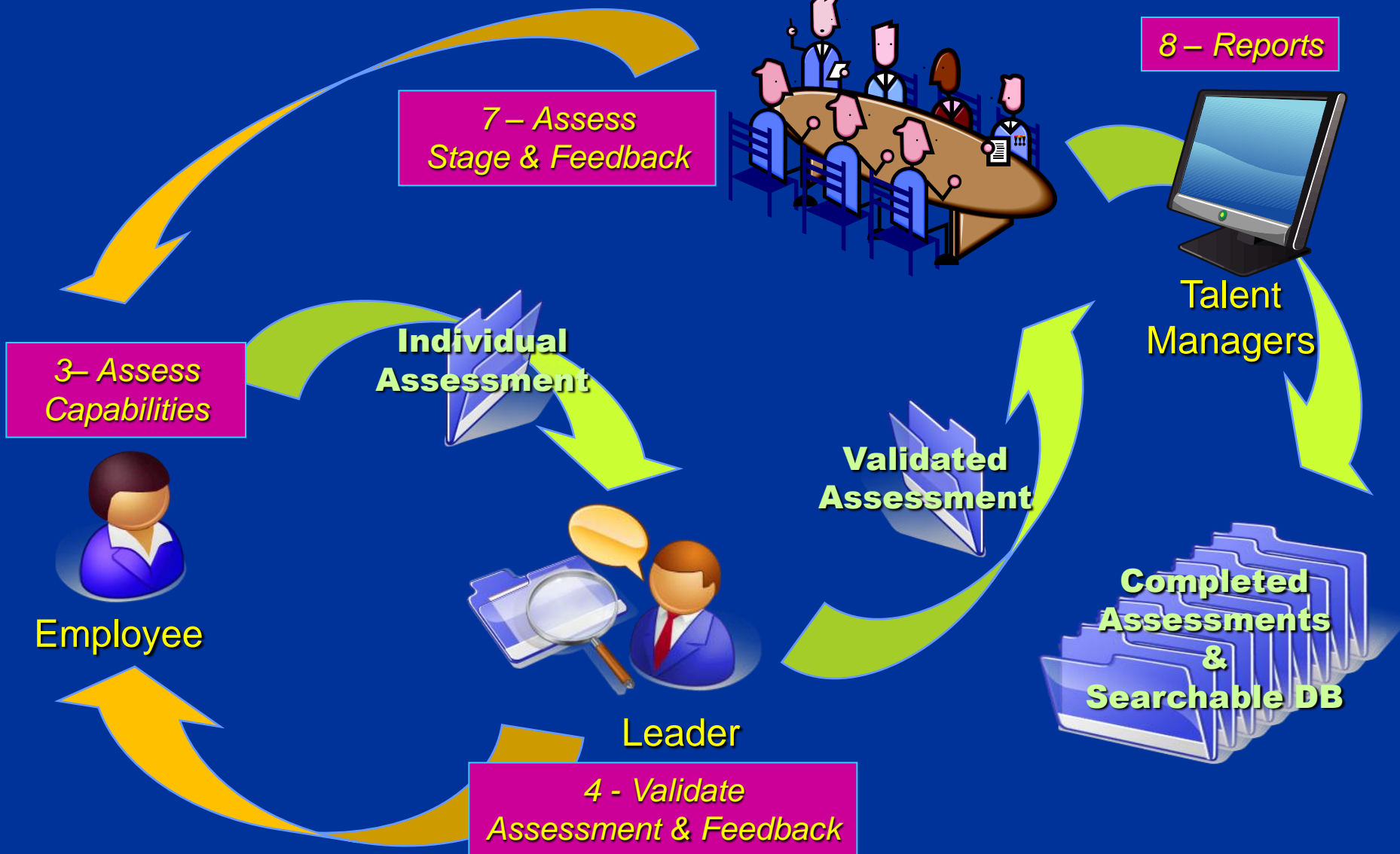


# EDQP Development Con-ops



# EDQP Qualification Con-ops

xxDQP Review Board



# 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).

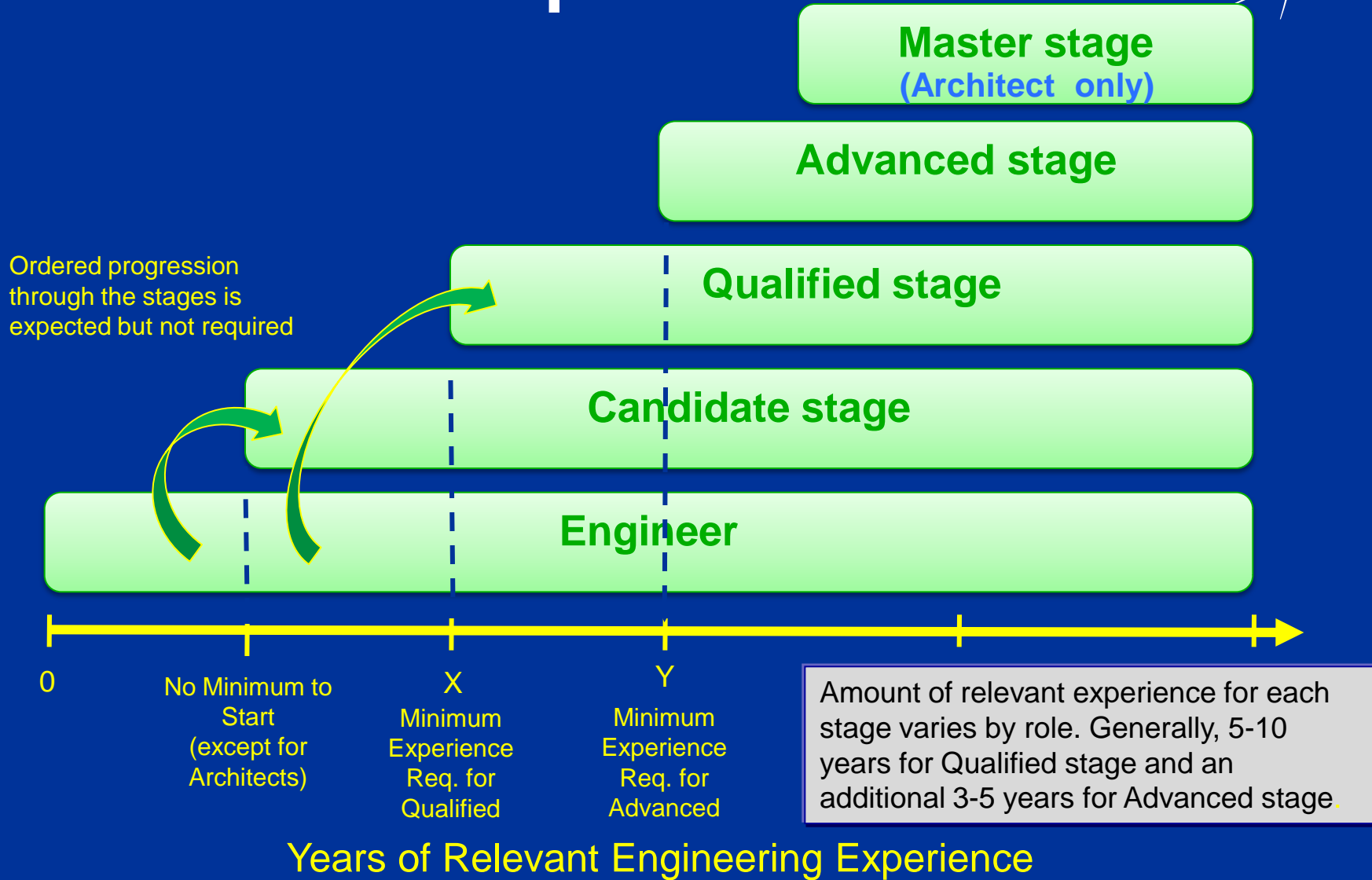
- **Qualified**

- 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.

# Notional Development Timeline



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 education building the skills
  - Skills → Learning Requirements → Courses (iterations)
  - Maintain a mapping of skill to course to ensure adequate coverage and analysis
- Courses included in the curriculum are a result of any existing course
  - Defines what is required to meet the LMC skill
  - “Must be able to”

**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**

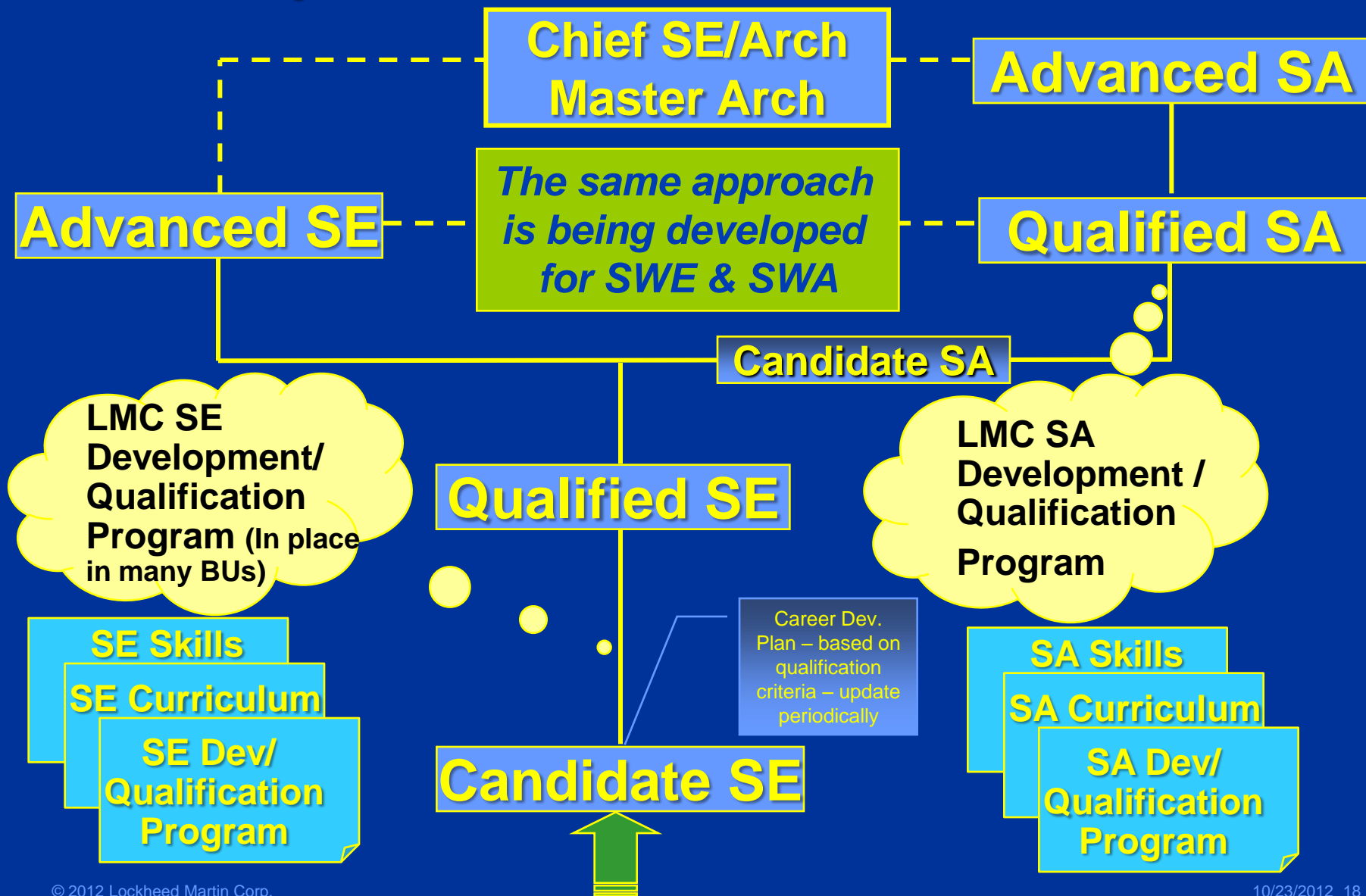


# Course Types

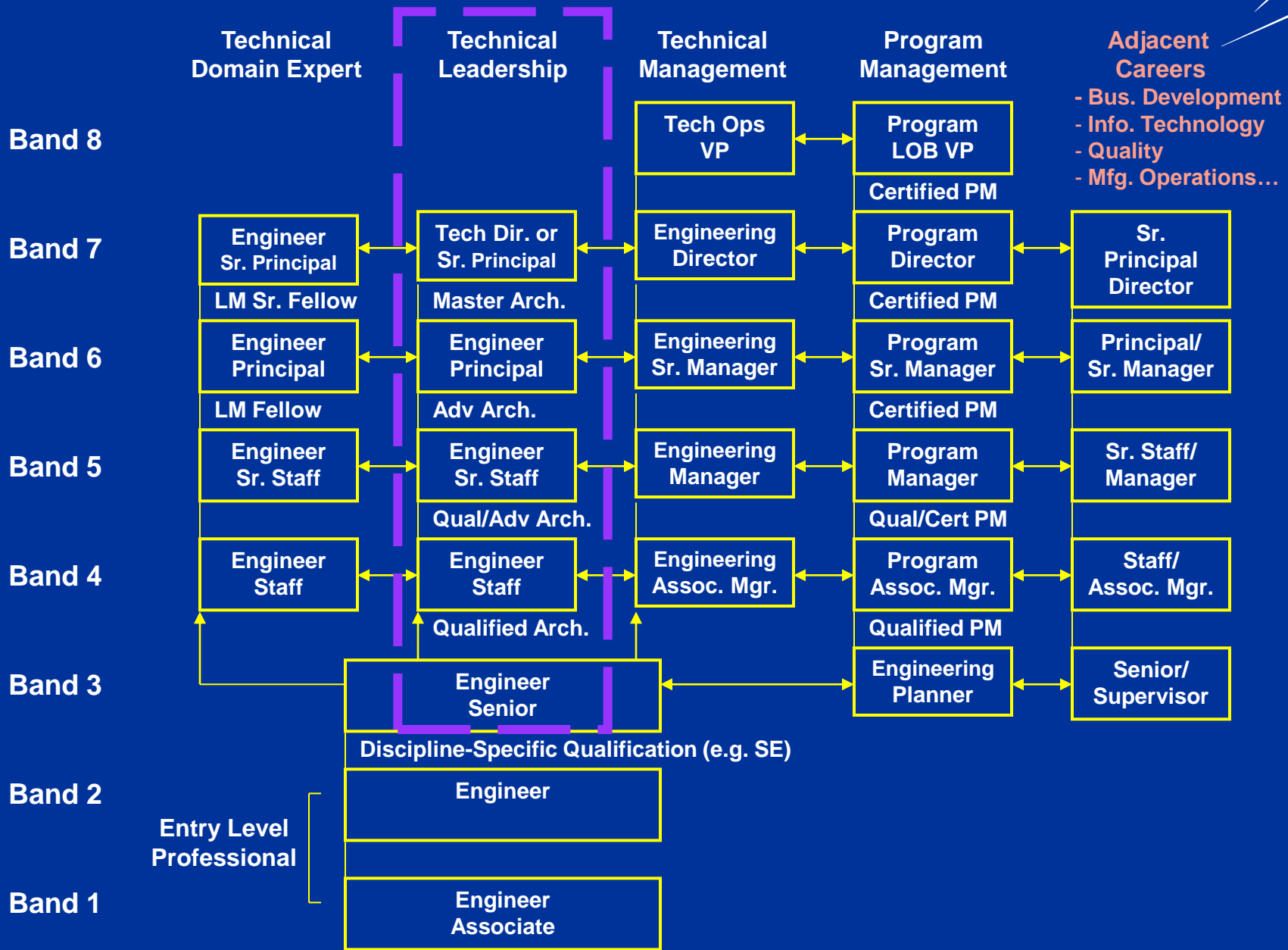


- **Essential (Foundation) courses**
  - **Technical knowledge in a discipline needed for fundamental tasks.**
- **Enhancement (Supplemental) courses**
  - **More in-depth technical knowledge needed for more advanced tasks.**
- **Specialization courses**
  - **Technical knowledge in required only for 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



# Architects/Chief Engineers Growth Path



# 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

# Lockheed Martin EDQP Products



Organization	LM ADQP	LM SEQual
<b>Specialty / Primary Family</b>	Cyber Security Information Systems System of Systems Software Enterprise Architecture	Systems Engineering
<b>Competency Levels</b>	Candidate Qualified Advanced Master	Candidate Qualified Advanced
<b>Operation</b>	Program Assist	Program Assist
<b>Domains</b>	Systems Software Lead Systems (Chief) Engineer	Systems Software
<b>Review Board</b>	Yes (BA/BU)	Yes (BA/BU)
<b>Reciprocity</b>	Yes	Yes
<b>Governance</b>	Joint Architecture Working Group and BA/BU	Exclusive within BA
<b>Renewal / Re-certification</b>	Yes	Pending
<b>Follow CE 270-XX</b>	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?

