Engineering
Process
Improvement

Lean Advancement Initiative

Enhancing Systems Engineering Competencies in the Enterprise

29 October 2009

LOCKHEED MARTIN

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Objective of Presentation

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

Vision

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

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

Corporate Technical Learning Council

Role

- Integrates the efforts of all Business Areas and Corporate Organizations involved with technical learning

Function

- Communication and coordination forum
- Promotes teamwork and cooperation

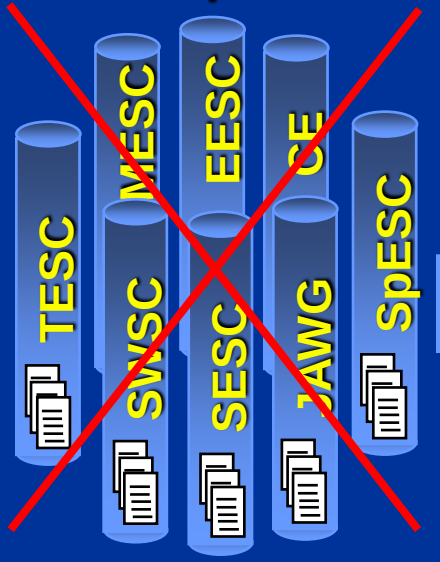
Goals

- Reach more of the workforce
- Improve learning effectiveness
- More effective and motivated workforce
- Higher retention levels
- Greater recruiting discriminators

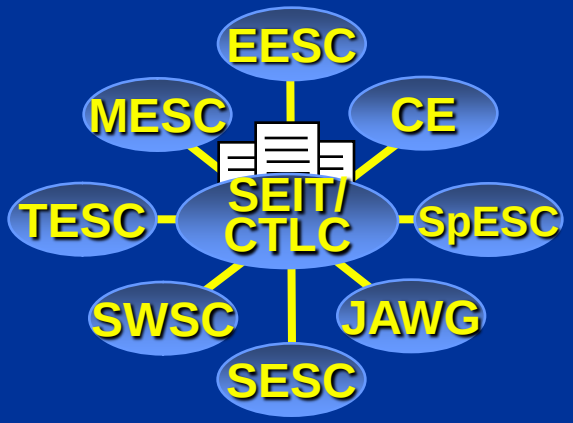
The CTLC integrates multiple corporate entities previously operating independently on technical learning initiatives

Integration Drivers

- CTLC identified needs and set vision for Engineering Professional Development
  - Need to address eroding technical base and preserve knowledge
- EPD VSM focused on overall strategy for Engineering 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

Innovative Learning Team

Recommended delivery method(s) for courses

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

Curriculum Development

- **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**

BA/BU Needs & Requirements
Product & Implementation Plans

BA/BU Interface Team

Career Path Development

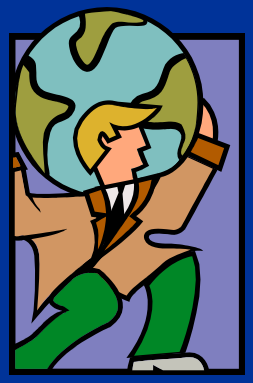
Engineering Development and Qualification Program (EDQP)

- Framework to develop, verify and recognize the knowledge, experience and capabilities of practicing engineers
  - 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

Key EDQP Concepts

Define Role

Identify L&D Direction



Encourage Individual Responsibility for Development

Create a Tailorable Framework

Provide Enabling Resources

Aligning Individual Career Goals with Business Needs

Key EDQP Elements

Skills Portfolio (Competencies)

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

BA/BUs Implement Tailored Program

Sustainment

Qualification Stage Criteria per Role

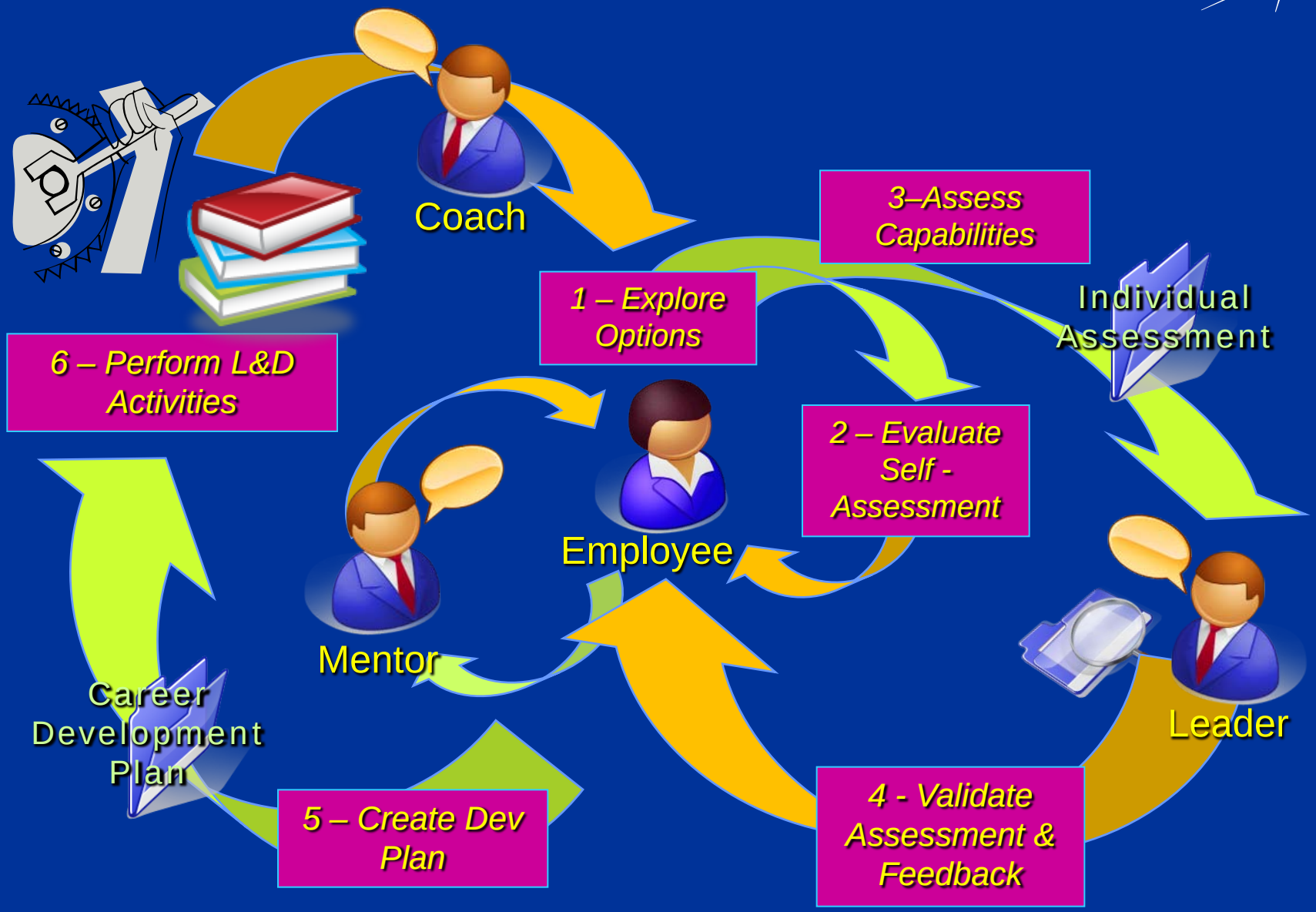
Assessment

Con-Ops & Review Board

Acknowledgement of Qualification Rating

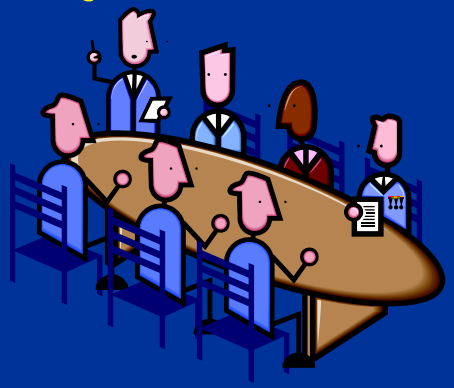
A Systematic Personnel Development Approach

EDQP Development Con-ops



EDQP Qualification Con-ops

xxDQP Review Board



8 – Reports

Talent Managers

7 – Assess Stage & Feedback

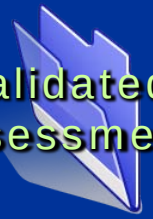
3– Assess Capabilities

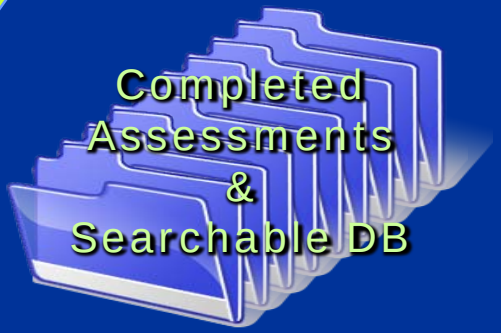
Employee

Individual Assessment

Leader

Validated Assessment





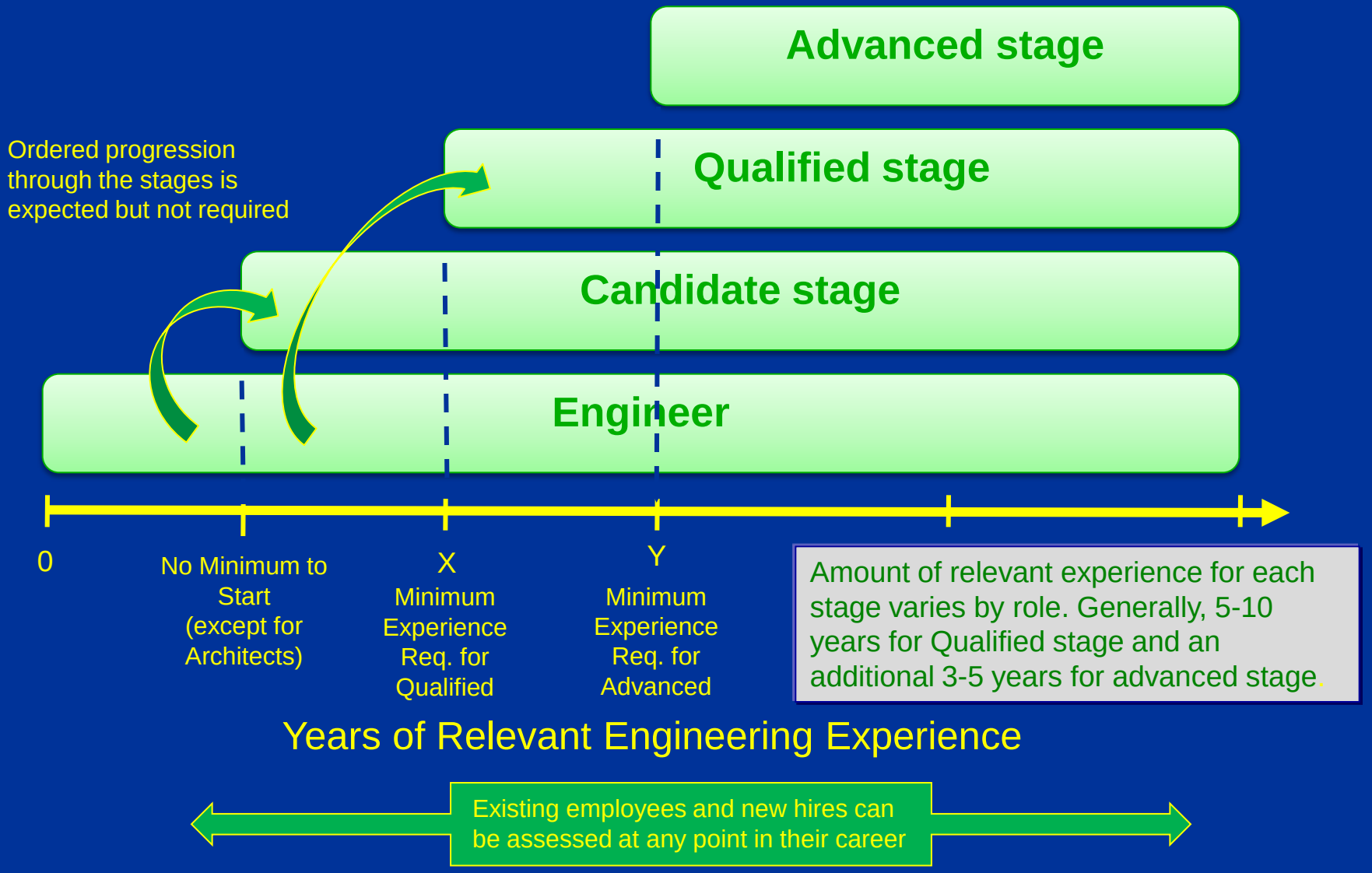
Completed Assessments & Searchable DB

4 - Validate Assessment & Feedback

EDQP Stages of Acknowledgement

- **Candidate**
  - Interest in career in the subject discipline, but experience or skill level requirements for 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



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
- Personal Development
  - Common set established by CTLC 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
  building the skills
  - Skills→Learning Requirements→Cour
    iterations)
  - Maintain a mapping of skills t
    adequate coverage and su
- Courses included in the c
  course
  - Defines what
    requirem
  - "Noti

Strong emphasis on e-learning/self-paced to provide common training to larger audiences in a consistent, yet flexible manner while leveraging technology

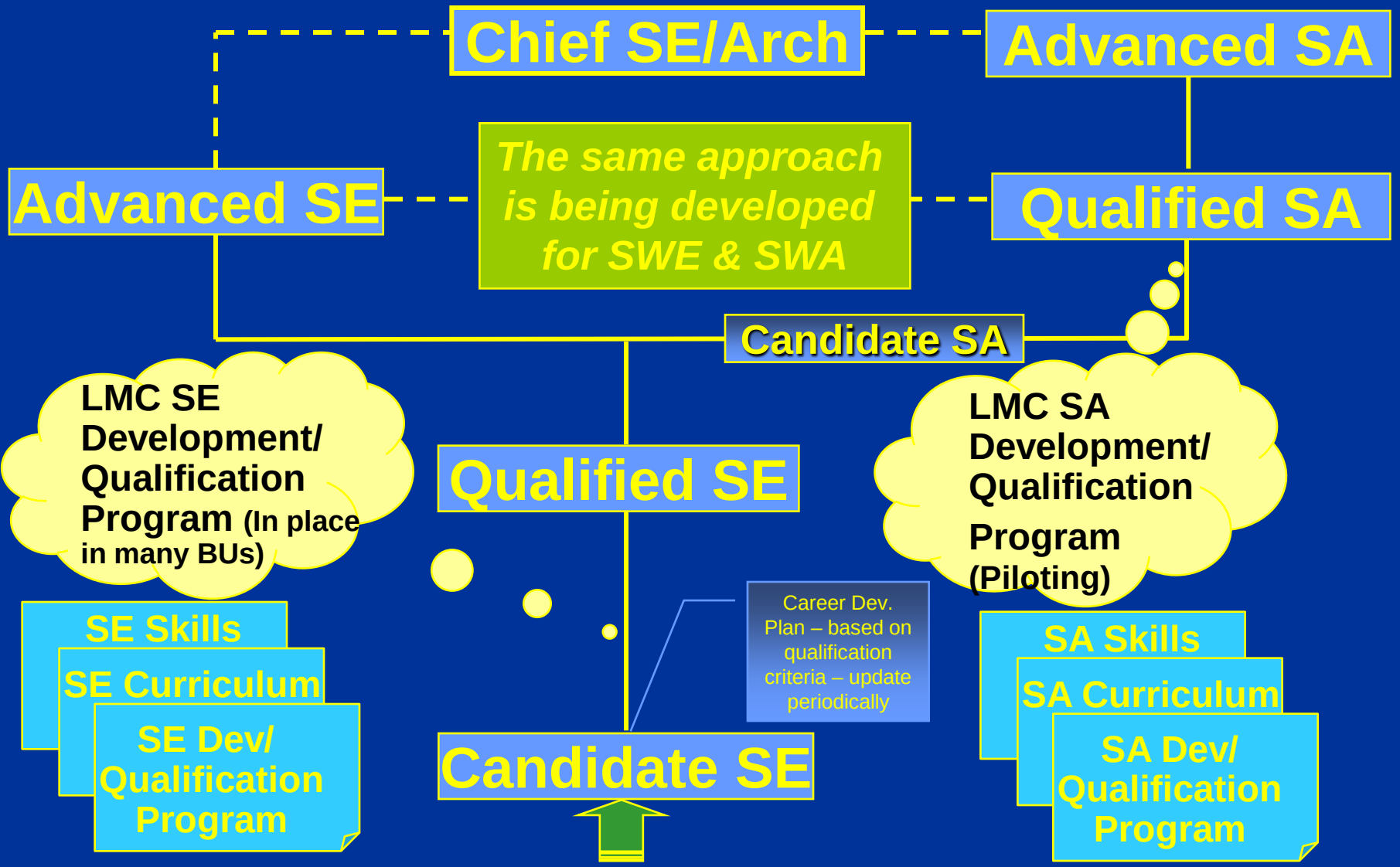
ses to ensure
nalysis
ndent of any existing
e to meet the LMC skill
sed to:
ourses (internal and external)
irements for development of new courses

**ulum is based on defined skills;
dependent 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



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

QUESTIONS?