Transition to the Systems Engineering Standards for Defense Programs

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Agenda

- Why we do Systems Engineering (SE)
- Drivers for SE Standards
- Objectives and Focus with Respect to Proposals and Programs
- Partnering with Industry (Process, Collaboration, Teamwork)
- Overview of the standards & supporting guidance
- Alignment with other SE resources
- Adoption, Access, and Use on Contract (with Example Implementation)

Drivers for Systems Engineering and Standardization

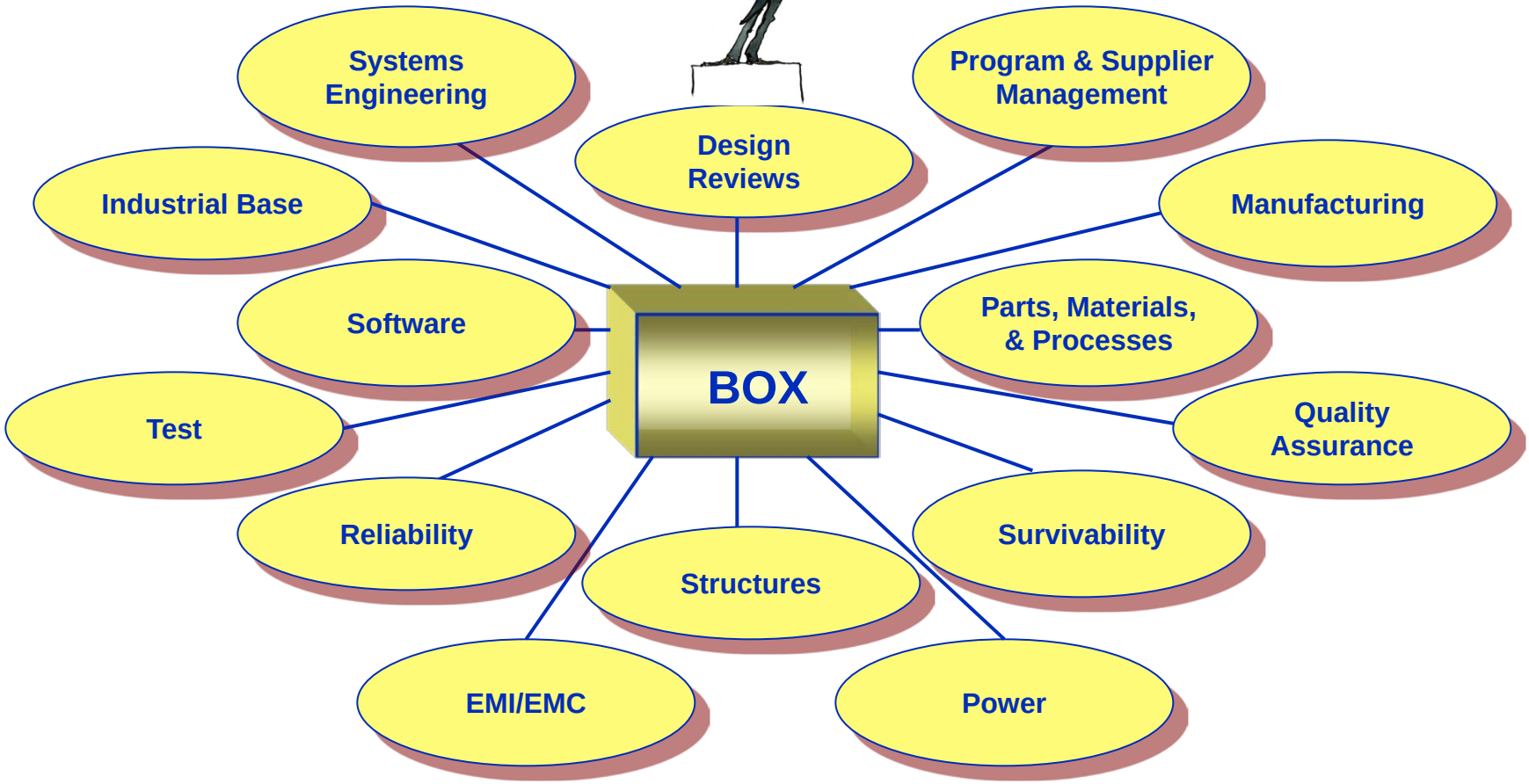
Why We do Systems Engineering

- **Build Effective Systems: Product versus Process**
  - **We engineer and build products, and they need to work... bottom line**
  - **We use process to do that, but process-only approaches didn't work well**
  - **We need to ensure that the process used leads to the right product**
  - **Some industry focusses "exclusively" on DOORS – requirement management**

- **Implementing Standards**
  - **Must know what is in the standards**
  - **Must implement the intent of the standards**
  - **Must manage product development using the standards**

- **Balanced Systems Engineering Engagement**
  - **Systems and product engineers – Doing the job right**
  - **Program and contract management – Keeping the program on budget and schedule**
  - **Acquirer – balancing both to ensure the product meets the need**

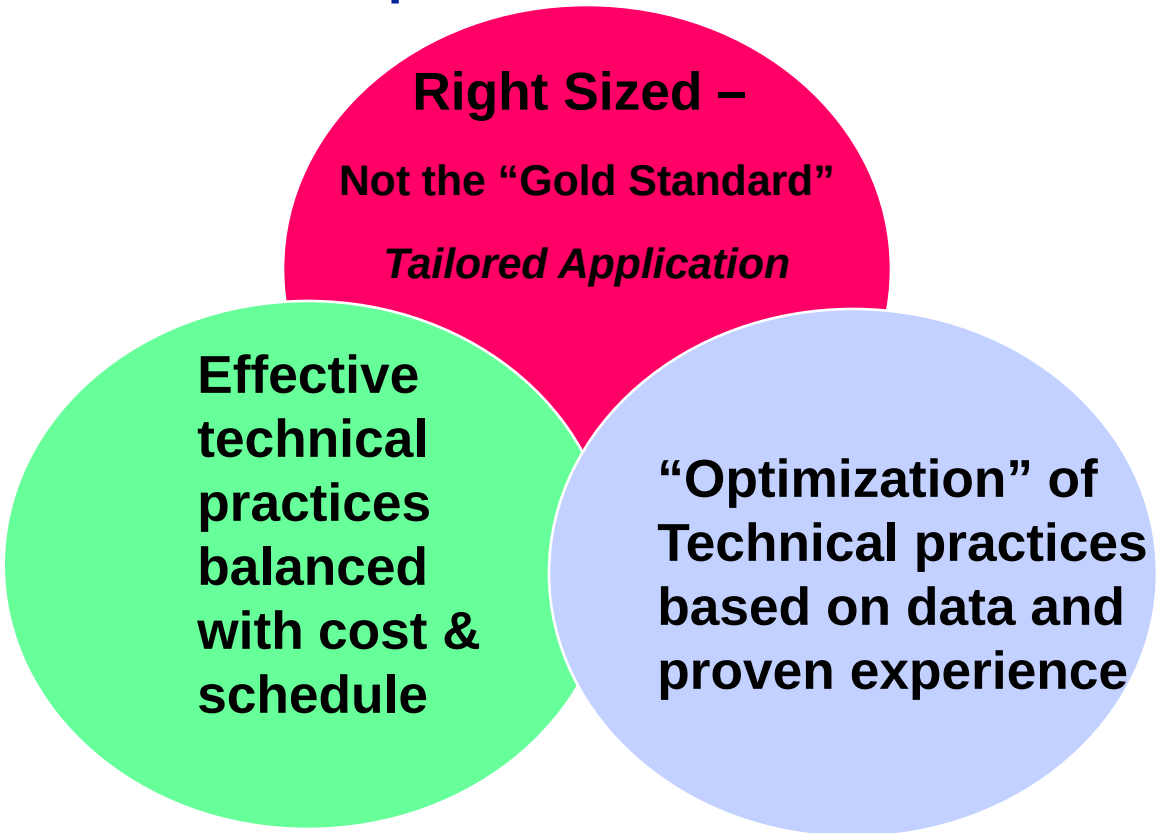
Systems Engineering / Specialty Engineering



DoD Systems are Complex

Balanced Technical Practices
Proven <--> Standardized

Specs & Standards

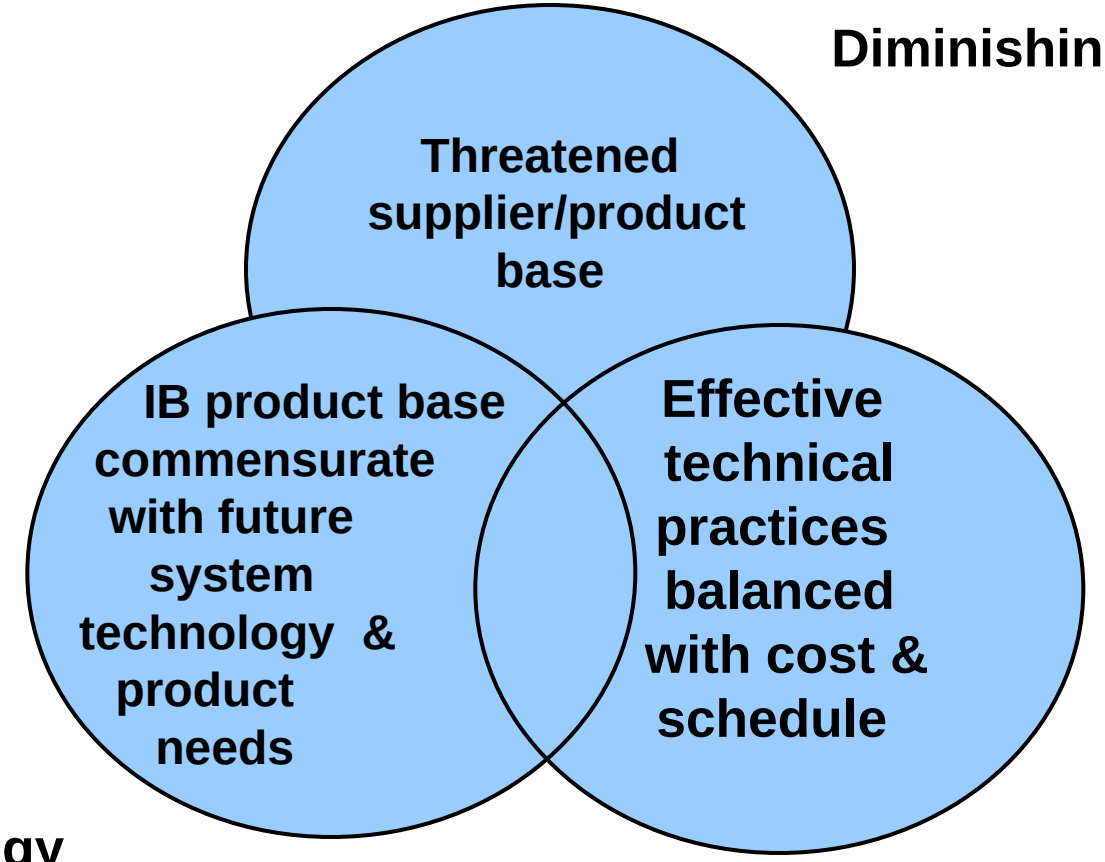


Reliable Products & Supply Base

Decision Analysis/Risk Mgmt

Include commercial data/practices where available and applicable

Industrial Base Scope



Assure Critical Industrial Supply Capability (Technologies/Products) Necessary to Support Current and Future USG Space Programs

Implementation at USAF SMC

Our Standards ARE our Technical Practices

Government — **Contract** — **Prime Contractor**

A&AS

clear expectations for technical and management activities

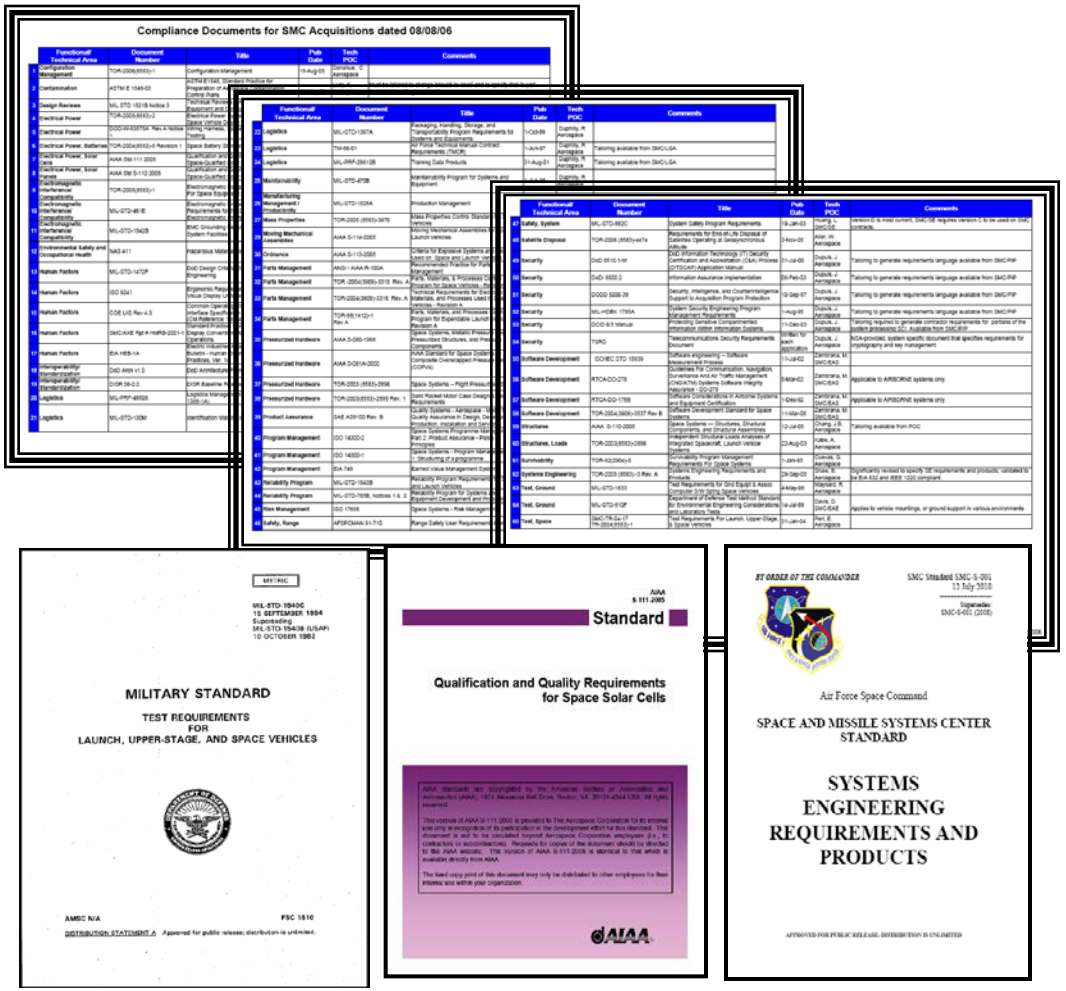
Sub-Ktrs

SEP ⟵ *Engineering Interaction* ⟶ SEMP

Technical practices in standards represent fifty-plus years of lessons learned

SMC Compliance Standards List

- SMC Technical Baseline
  - 69 documents
- Includes all four space system segments
  - Military (MIL-STD)
  - International (ISO)
  - Industry (AIAA)
  - SMC Standards
- Reflects current best practices
- Updated periodically
- SMC Instruction 63-106, issued 2011
- Applies to all new development, acquisition and sustainment contracts
- Contractual compliance through the supplier chain, as appropriate



Why We Need Standard Practices

- Launch is a “one-strike-and-you’re-out” business
- Spacecraft must work by remote control for 15 years
  - Hostile environment
  - “Small” failures can cripple or end mission

No “Flight Testing” and No Service Calls in Space Mandates Unique, High-Confidence Mission Assurance Culture

Partnering with Industry

Goal of DoD Standardization Initiative

- "Provide DoD and DoD contractors with a structured, uniform approach" in the areas identified as gaps
  - Improve communication
  - Ensure common expectations
  - Add realism to bids

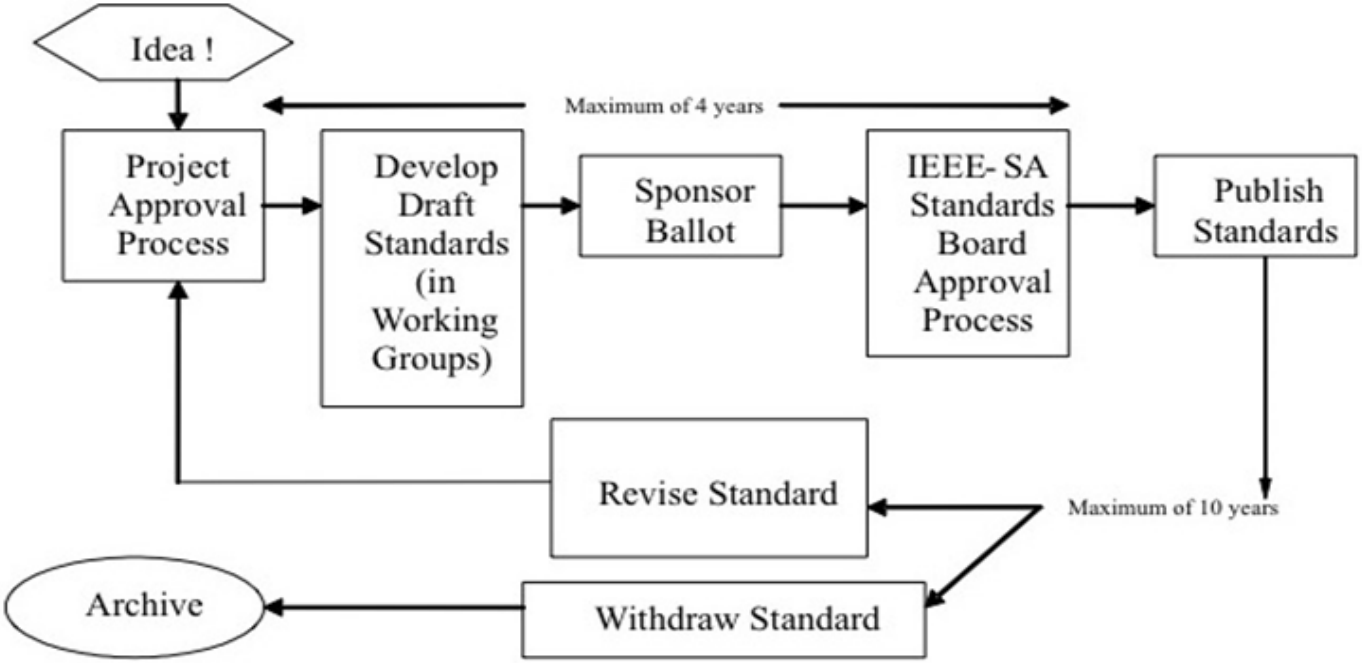
Government-Industry Partnership Required to Meet the Goal

Standardization Objectives

- Mutual-benefit stipulations:
  - Must meet *both party's needs and objectives*
  - Potential teaming partners must have existing experience with subject matter of document and existing infrastructure for publishing standards
  - Content of documents must be consistent with government needs
- Ensure right kind of standard is developed
  - Clear statement of requirements that speaks *"common language"*
  - Specific enough to support realistic bidding and resourcing
  - Proper contractual language – SHALL and should
- Ensure right amount of the right standards are included
  - *Tailorable* for different domains and contracting environments
  - *Consistent* with DOD approach
  - *Conform* to established, over-arching industry process standards

Process used to develop the standards

- Developed Joint IEEE/DoD Joint SE Working Group
  - Ensure broad span of representation from Industry, Defense Agencies, Academia and other Associations
  - Included industry chair and DoD vice chair
- Followed IEEE standards development process



Broad Span of Working Group Membership

Industry

- Aerospace Corp
- BAE Systems
- Ball Aerospace
- Boeing
- General Dynamics
- Harris Corp
- Ingalls Shipbuilding
- L-3 Com
- Leidos
- Lockheed Martin
- MITRE
- Northrop Grumman
- Parsons
- Raytheon
- SAIC
- TASC
- United Technologies

Associations

- AIA
- IEEE-CS/SA
- INCOSE
- ISO/IEC
- NDIA
- SAE Intl

Academia

- AF Institute of Tech
- Johns Hopkins University
- Naval Postgraduate School
- Stevens Institute of Technology
- University of Florida
- University of Southern California

Defense

- Air Force (Multi-parts)
- Army
- Navy (Multi-parts)
- OSD – DASD (SE)
- DAU
- DCMA
- DSPO
- Australian DMO

Leadership Team

- Chair, Garry Roedler, Lockheed Martin/IEEE
- Vice-chair, Dave Davis, USAF SMC
- Secretary, Brian Shaw, The Aerospace Corp.
- Technical Editor, Bill Bearden, INCOSE (SE)
- Technical Editor, Mark Henley, L-3 Com (TR&A)

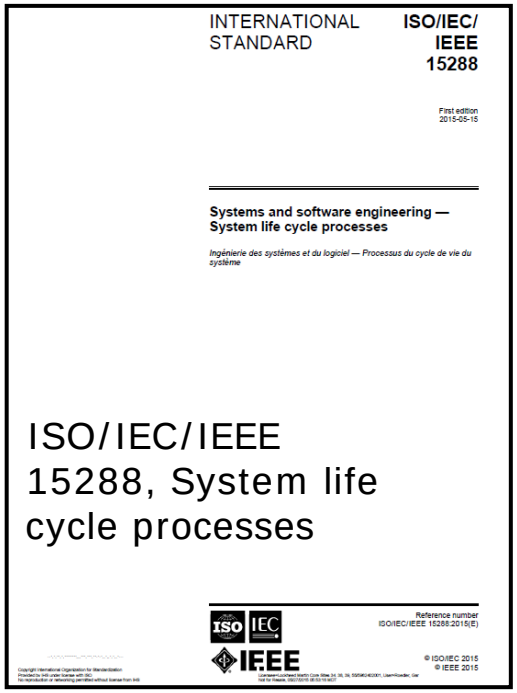
Collaboration

- With other DoD Standardization projects
  - Collaboration to ensure consistency with:
    - Configuration Management (EIA 649-1)
    - Manufacturing Management (AS6500)
  - Included liaison members in working group
- With other Standards Organizations and Industry Associations
  - ISO/IEC
  - SAE International
  - International Council on Systems Engineering (INCOSE)
  - National Defense Industrial Association (NDIA) SE Division (SED)
  - Aerospace Industries Association (AIA)
- Included alignment with several key SE resources to provide a more complete and consistent SE landscape
  - Aligned content and revision cycles
  - Consistency achieved at publication

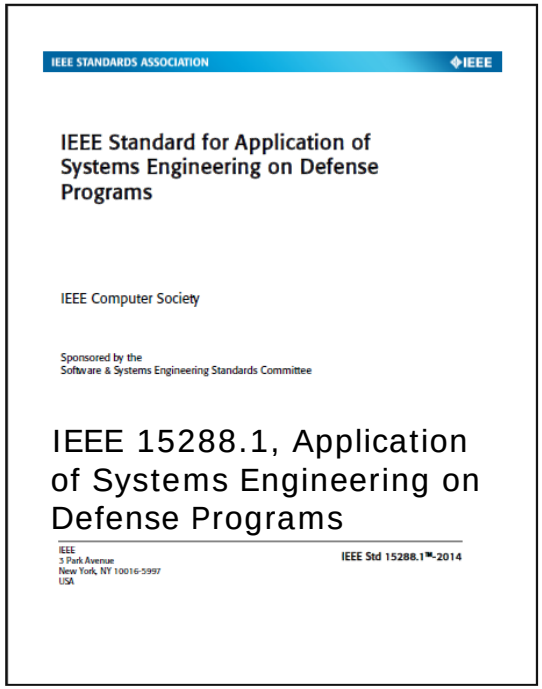
Successful teamwork during entire project from Day 1

Overview of the Standards and Supporting Guidance

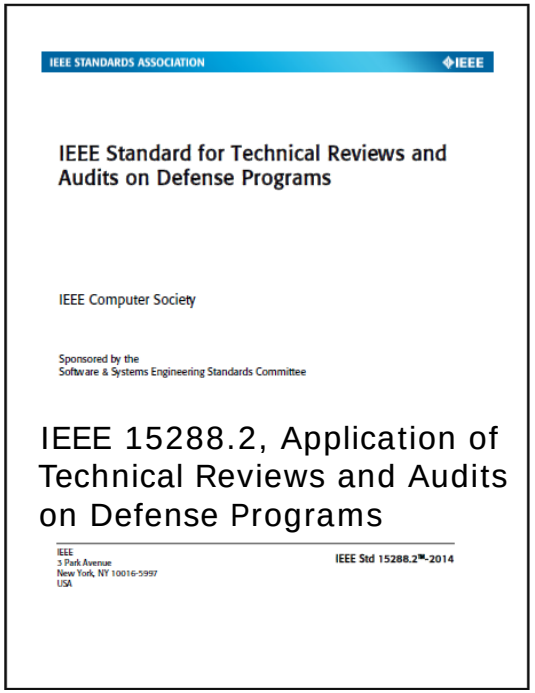
IEEE 15288 Standards Set



ISO/IEC/IEEE 15288, System life cycle processes



IEEE 15288.1, Application of Systems Engineering on Defense Programs



IEEE 15288.2, Application of Technical Reviews and Audits on Defense Programs

- Publication of standards coordinated - published May 2015
- ISO/IEC/IEEE 15288:2015, Systems and software engineering – System life cycle processes
- ISO/IEC/IEEE 15288.1 -2014, Standard for the Application of Systems Engineering on Defense Programs (Addendum to ISO/IEC/IEEE 15288:2015)
- ISO/IEC/IEEE 15288.2 -2014, Standard for the Application of Technical Reviews and Audits on Defense Programs (Links to ISO/IEC/IEEE 15288:2015)
- Availability discussed on later chart

Example: SE Addendum (15288.1)

Baseline: ISO/IEC/IEEE 15288:2015 (FDIS)	Tailoring Needed for Defense Programs - Input
6.3.1 Project planning process	**6.3.1 Project Planning Process**
6.3.1.1 Purpose The purpose of the Project Planning Process is to produce and coordinate effective and workable plans. This process determines the scope of the project management and technical activities, identifies process outputs, tasks and deliverables, establishes schedules for task conduct, including achievement criteria, and required resources to accomplish tasks. This is an on-going process that continues throughout a project, with regular revisions to plans.	**6.3.1.1 Purpose** ISO/IEC/IEEE 15288:201x 6.3.1.1 "Purpose" applies as stated.
6.3.1.2 Outcomes An implementation of the Project Planning Process shall achieve the following outcomes: a) Objectives and plans are defined and recorded. b) Roles, responsibilities, accountabilities, authorities are defined. c) Resources and services necessary to achieve the objectives are formally requested and committed. d) Plans for the execution of the project are activated and maintained.	**6.3.1.2 Outcomes** ISO/IEC/IEEE 15288:201x 6.3.1.2 "Outcomes" shall apply in accordance with the acquirer-supplier agreement:
6.3.1.3 Activities and tasks The project shall implement the following activities and tasks in accordance with applicable organization policies and procedures with respect to the Project Planning Process. a) **Define the project.** This activity consists of the following tasks: 1) Identify the project objectives and constraints. 2) Define the project scope as established in the agreement. 3) Define and maintain a life cycle model that is comprised of stages Establish a work breakdown structure based on the evolving system architecture. 4) Define and maintain the processes that will be applied on the project.	**6.3.1.3 Activities and Tasks** ISO/IEC/IEEE 15288:201x 6.3.1.3 "Activities and Tasks" shall apply: Add: The supplier shall plan, execute, and control the engineering efforts. In addition, the supplier **shall** ensure appropriate flowdown of requirements and technical management of subcontractors and vendors.

- **Purpose**
- **Outcomes**
- **Activities and Tasks**

- **Identifies Applicable Information of 15288**
- **Defines any deltas**
- **Outputs (added)**

Resulting IEEE Standard - DoD Addendum: IEEE 15288.1 - Standard for Application of SE on Defense Programs

6.3.1.4 Project Planning Process Outputs

The following Technical Process outputs shall be provided in accordance with the acquirer-supplier agreement.

a) Systems Engineering Management Plan (SEMP) with the following attributes:

1) Identifies the technical assessment and control of the project, including required technical reviews and audits and their completion criteria, technical measurement, quality assurance, baseline management, and change control.

2) Provides a description, or reference to, the life cycle model and systems engineering processes or process model description for the technical effort, including an overview of the methods, tools and techniques which are applicable across the project.

3) Identifies any specific infrastructure needs to support the technical effort.

4) Describes or points to the Work Breakdown Structure (WBS), project schedule, and project budget.

5) Identifies any project constraints that may limit or restrict the project or system solution.

6) Identifies supporting plans.

b) Contract Work Breakdown Structure (CWBS)

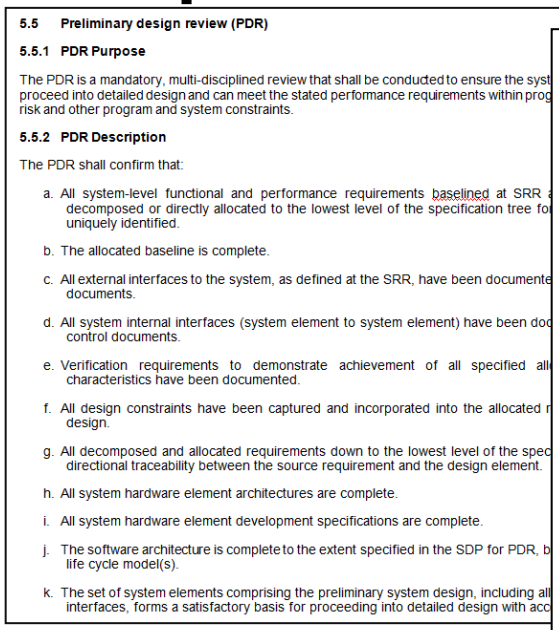
1) Is consistent with the evolving physical hierarchy and is maintained and applied to plan and monitor all work carried out under the project.

c) The systems engineering accomplishments, accomplishment criteria, and narrative in the integrated master plan (IMP); tasks in the integrated master schedule (IMS); and work packages in the earned value management system (EVMS) and other specific plans (such as tradeoff plans) as

Tailorable

* Document structure is aligned with ISO/IEC/IEEE 15288 and INCOSE SE Handbook

Example: Technical Reviews and Audits (15288.2)



5.5 Preliminary design review (PDR)

5.5.1 PDR Purpose

The PDR is a mandatory, multi-disciplined review that shall be conducted to ensure the syst
proceed into detailed design and can meet the stated performance requirements within prog
risk and other program and system constraints.

5.5.2 PDR Description

The PDR shall confirm that:

a. All system-level functional and performance requirements baselined at SRR a
decomposed or directly allocated to the lowest level of the specification tree fo
uniquely identified.

b. The allocated baseline is complete.

c. All external interfaces to the system, as defined at the SRR, have been documente
documents.

d. All system internal interfaces (system element to system element) have been doc
control documents.

e. Verification requirements to demonstrate achievement of all specified all
characteristics have been documented.

f. All design constraints have been captured and incorporated into the allocated r
design.

g. All decomposed and allocated requirements down to the lowest level of the spec
directional traceability between the source requirement and the design element.

h. All system hardware element architectures are complete.

i. All system hardware element development specifications are complete.

j. The software architecture is complete to the extent specified in the SDP for PDR, b
life cycle model(s).

k. The set of system elements comprising the preliminary system design, including all
interfaces, forms a satisfactory basis for proceeding into detailed design with acc

5. Requirements

- .1 Purpose
- .2 Description
- .3 Timing
- .4 Entry Criteria
- .5 Content
- .5.1 Product
- .5.2 Conduct
- .5.3 Outputs
- .6 Exit Criteria

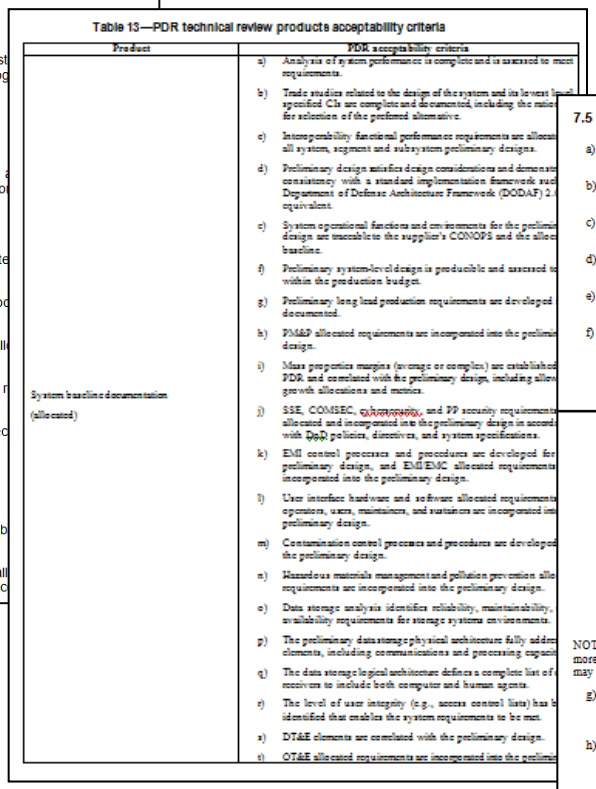
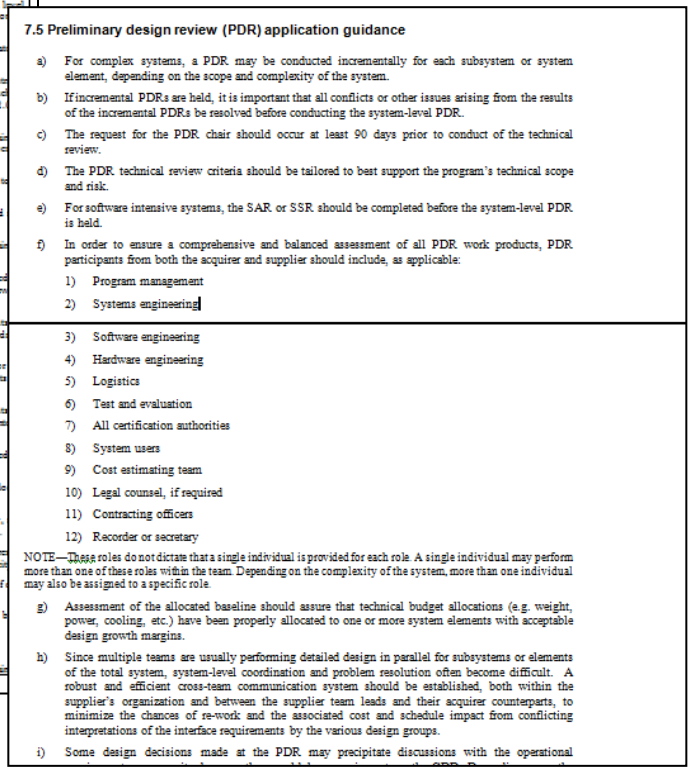


Table 13—PDR technical review products acceptability criteria

Product	PDR acceptability criteria
System baseline documentation (allocated)	a) Analysis of system performance is complete and is assessed to meet requirements. b) Trade studies related to the design of the system and its lowest level specified CIs are complete and documented, including the rationale for selection of the preferred alternative. c) Interoperability functional performance requirements are allocated all system, segment and subsystem preliminary designs. d) Preliminary design satisfies design considerations and demonstrates consistency with a standard implementation framework such Department of Defense Architecture Framework (DODAF) 2. equivalent. e) System operational functions and environments for the preliminar design are traceable to the supplier's CONOPS and the allocat baseline. f) Preliminary system-level design is producible and assessed to within the production budget. g) Preliminary long lead production requirements are developed documented. h) PM&P allocated requirements are incorporated into the preliminar design. i) Mass properties margins (average or complex) are established PDR and correlated with the preliminary design, including allow growth allocations and metrics. j) SSE, COMSEC, cybersecurity, and PP security requirements allocated and incorporated into the preliminary design in accord with DoD policies, directives, and system specifications. k) EMI control processes and procedures are developed for preliminary design, and EMI/EMC allocated requirements incorporated into the preliminary design. l) User interface hardware and software allocated requirements operators, users, maintainers, and sustainers are incorporated int preliminary design. m) Contamination control processes and procedures are developed the preliminary design. n) Hazardous materials management and pollution prevention allo requirements are incorporated into the preliminary design. o) Data storage analysis identifies reliability, maintainability, availability requirements for storage systems environments. p) The preliminary data storage physical architecture fully addres elements, including communications and processing capabi q) The data storage logical architecture defines a complete list of receivers to include both computer and human agents. r) The level of user integrity (e.g., access control lists) has b identified that enables the system requirements to be met. s) DT&E elements are correlated with the preliminary design. t) OT&E allocated requirements are incorporated into the preliminar

6. Detailed Criteria

- .1 Products Acceptability Criteria
- .2 Preparation
- .3 Conduct
- .4 Closure



7.5 Preliminary design review (PDR) application guidance

a) For complex systems, a PDR may be conducted incrementally for each subsystem or system element, depending on the scope and complexity of the system.

b) If incremental PDRs are held, it is important that all conflicts or other issues arising from the results of the incremental PDRs be resolved before conducting the system-level PDR.

c) The request for the PDR chair should occur at least 90 days prior to conduct of the technical review.

d) The PDR technical review criteria should be tailored to best support the program's technical scope and risk.

e) For software intensive systems, the SAR or SSR should be completed before the system-level PDR is held.

f) In order to ensure a comprehensive and balanced assessment of all PDR work products, PDR participants from both the acquirer and supplier should include, as applicable:

1) Program management
2) Systems engineering
3) Software engineering
4) Hardware engineering
5) Logistics
6) Test and evaluation
7) All certification authorities
8) System users
9) Cost estimating team
10) Legal counsel, if required
11) Contracting officers
12) Recorder or secretary

NOTE—These roles do not dictate that a single individual is provided for each role. A single individual may perform more than one of these roles within the team. Depending on the complexity of the system, more than one individual may also be assigned to a specific role.

g) Assessment of the allocated baseline should assure that technical budget allocations (e.g. weight, power, cooling, etc.) have been properly allocated to one or more system elements with acceptable design growth margins.

h) Since multiple teams are usually performing detailed design in parallel for subsystems or elements of the total system, system-level coordination and problem resolution often become difficult. A robust and efficient cross-team communication system should be established, both within the supplier's organization and between the supplier team leads and their acquirer counterparts, to minimize the chances of re-work and the associated cost and schedule impact from conflicting interpretations of the interface requirements by the various design groups.

i) Some design decisions made at the PDR may precipitate discussions with the operational

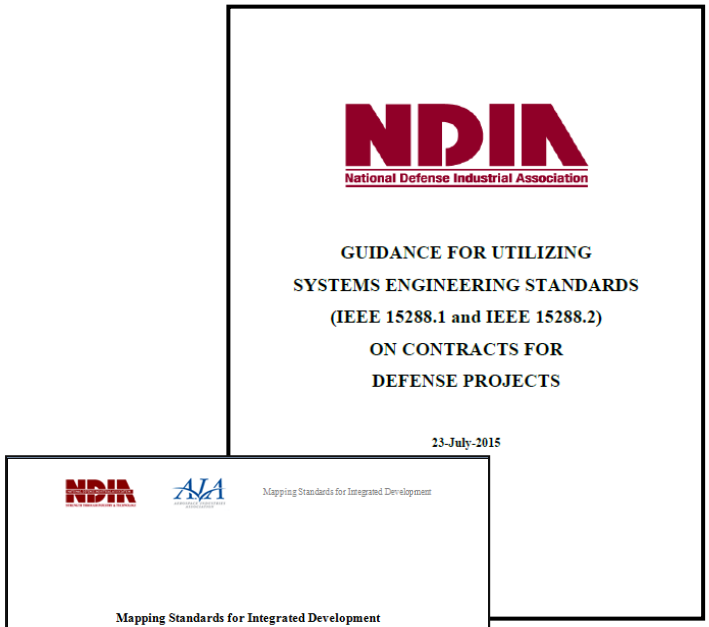
7. Application Guidance

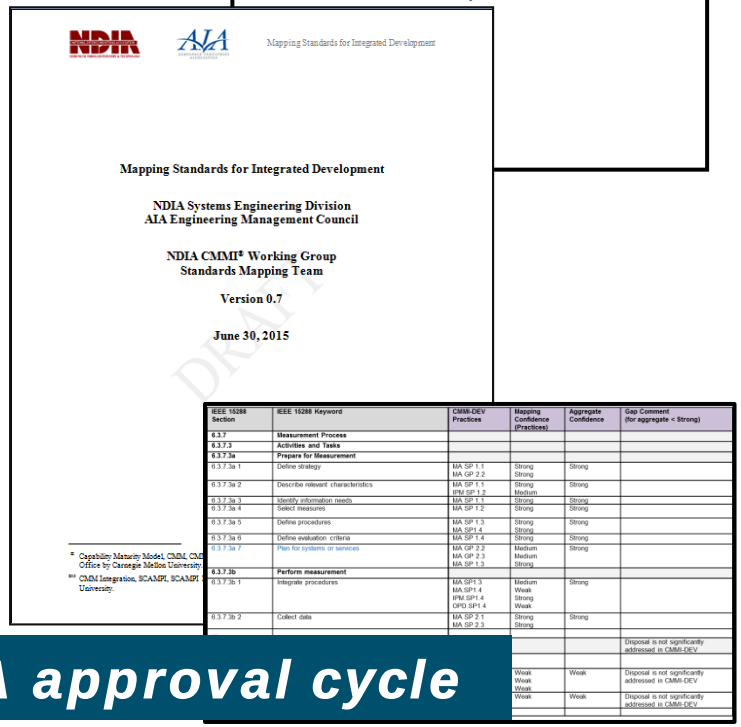
Tailorable

Normative Reviews/Audits (10): ASR; SRR; SFR; PDR; CDR; TRR; FCA; SVR; PRR; PCA
Example domain-specific reviews in annexes that "may find useful" (4): SAR; SSR; IRR; FRR

15288.X Transition Guidance

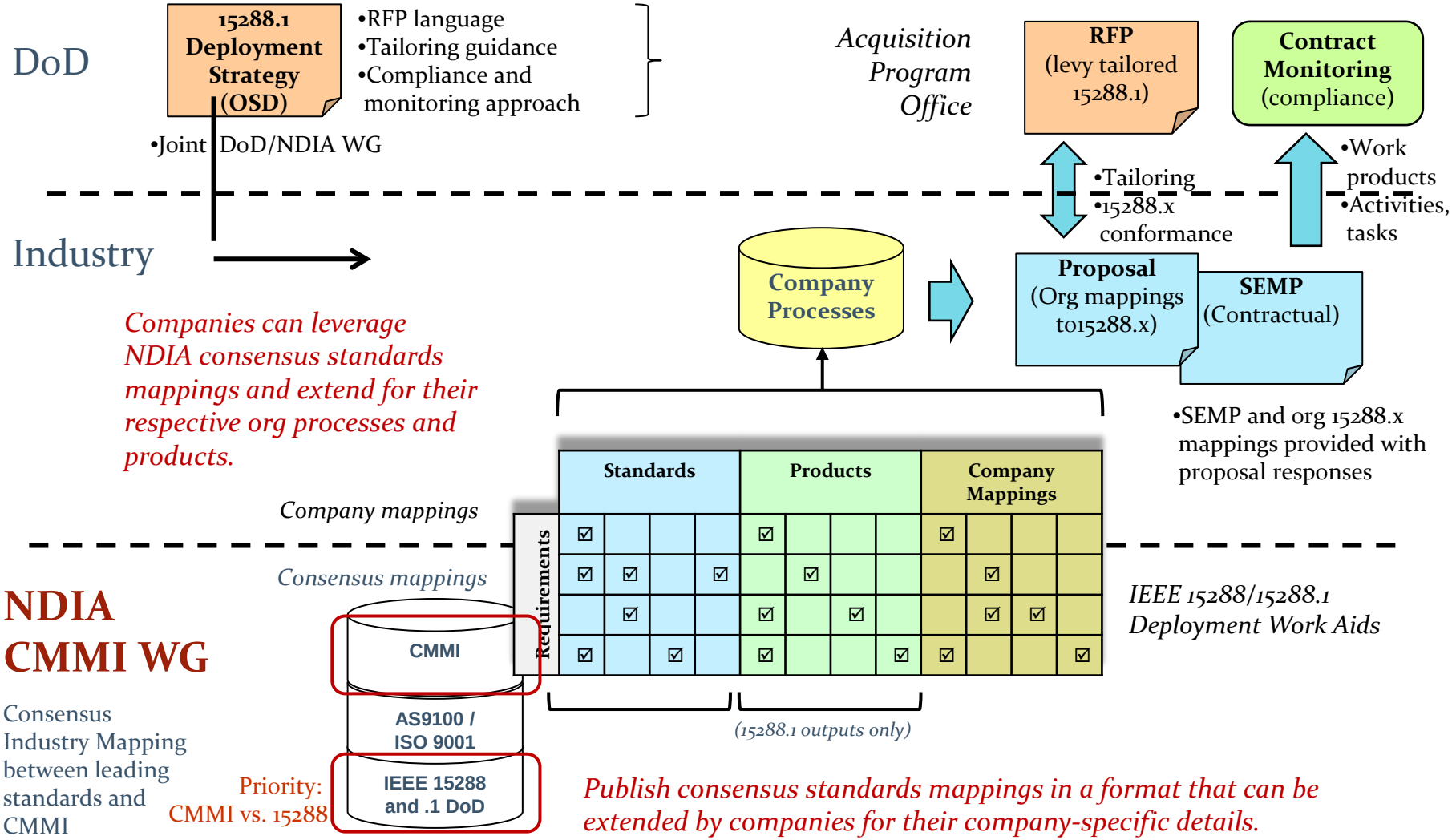
- Deployment strategy from DoD/NDIA IEEE 15288 working group
  - Provides key transition insight and guidance
  - Recommended RFP language
  - Tailoring guidance
  - Insight for interpreting compliance
- NDIA/AIA consensus mappings
  - Will help facilitate company migration to IEEE 15288.x
  - Translates currently implemented company standards and process mappings to 15288
  - NDIA mappings developed by consensus of subject matter experts





Both documents are in NDIA approval cycle

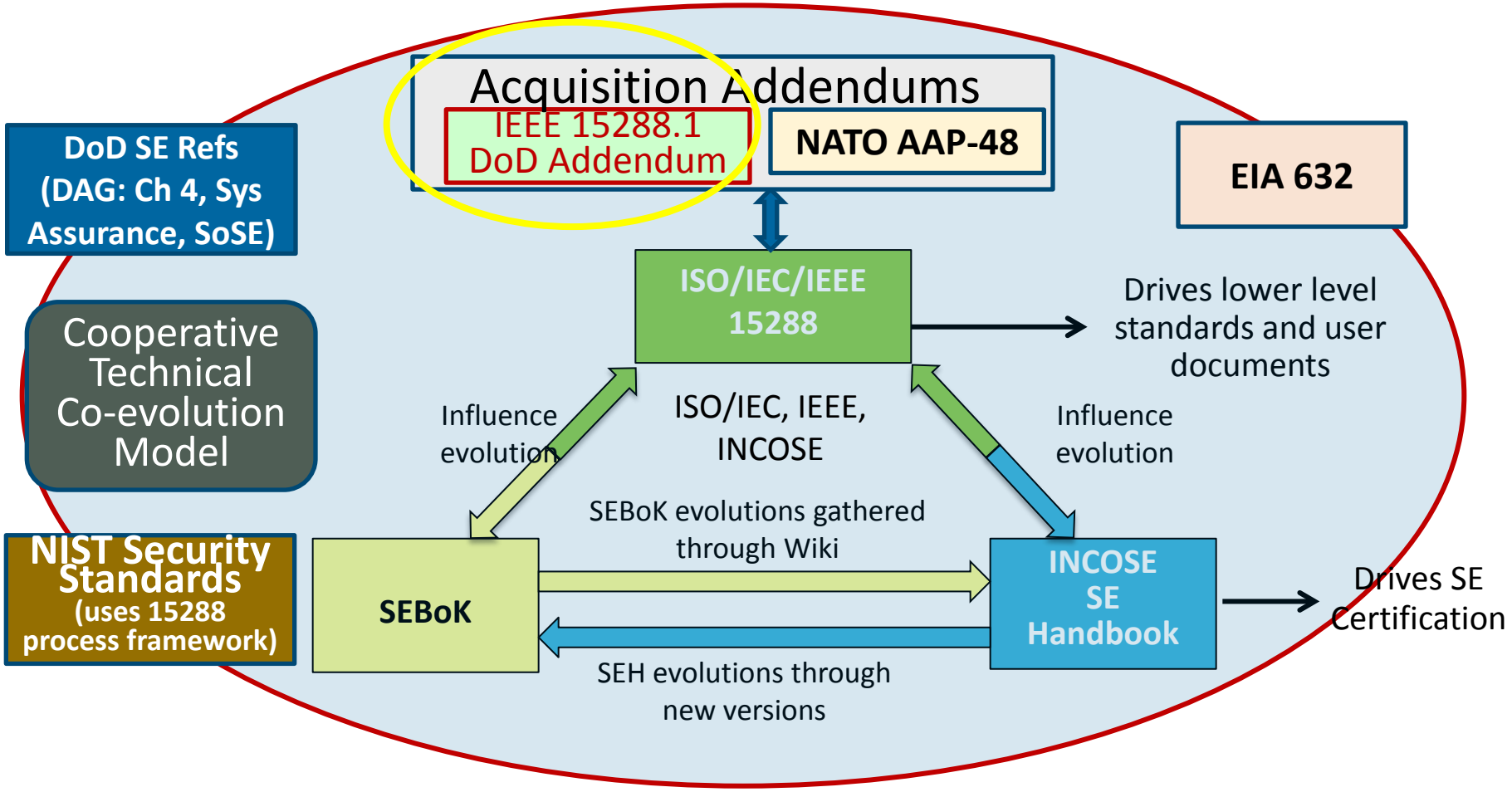
Conops – IEEE 15288.1 Deployment Strategy and Integrated Standards Mappings in Acquisition



Deployment Assets Developed to Support Transition and Implementation

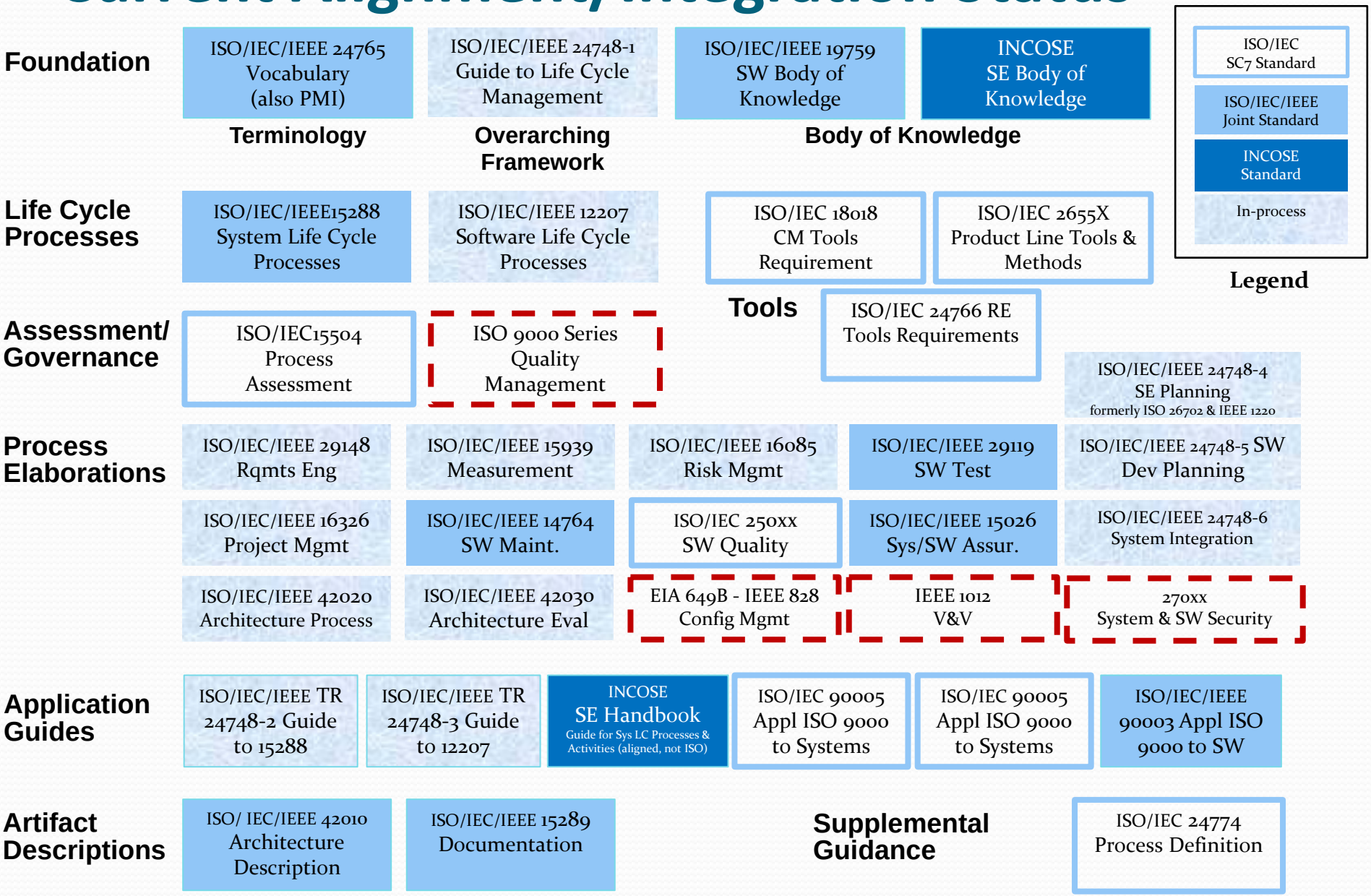
Alignment with Other Key SE Resources

Alignment of Key SE&A Resources



Significant Collaboration in this Co-evolution

Current Alignment/Integration Status

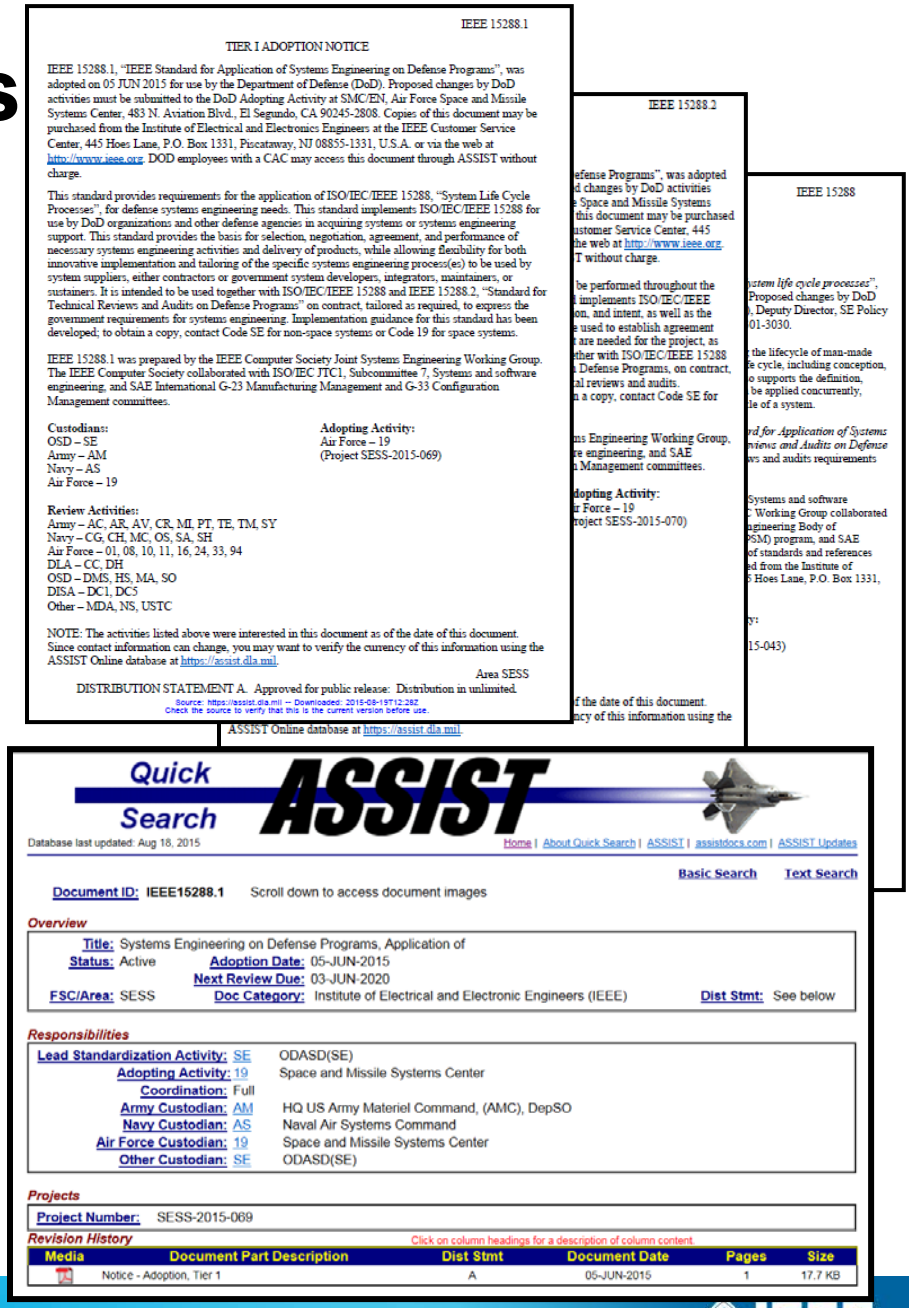


Status as of 11 Aug 2015

Adoption, Access, and Use On Contract

Adoption and Access

- The standards have been adopted by DoD
- Access
  - DoD – can access through ASSIST with CAC login
    - URL = http://quicksearch.dla.mil/
    - Working on access by DoD SETA support
  - Industry – need to purchase through IEEE or access through subscription services, such as:
    - IEEE xPlore
    - IHS



Implementation at USAF SMC

- Institutionalized in SMC Compliance Standards list
  - Replaces related SMC/MIL standards in place since 2003
- Being applied to new contracts as part of the acquirer-supplier agreement
  - Tailored by SPOs as part of acquisition strategy and RFP development
  - Facilitated by SMC/PI Acquisition Center of Excellence and SMC/EN

	~~Program~~ ~~1.2~~ **Execution;** ~~Systems Engineering~~	~~SMC Standard SMC-S-001~~	~~Systems Engineering~~	~~2010~~	
	~~Program~~ ~~1.2~~ **Execution;** ~~Systems Engineering~~	~~SMC Standard SMC-S-001 include SMC tailoring: SMC-T-005 (2014)~~	~~Systems Engineering~~	~~2013~~	~~SMC-S-001 revised IAW periodic update and stakeholder review process. SMC-T-005 added per direction of SMC/EN and SMC risk management consultant. Previously announced as interim updates to Feb 2013 SMC compliance standards list.~~
	Program 1.2 **Execution;** Systems Engineering	ISO EIA 15288 and	Systems and software engineering — System life cycle processes	2015	Updated IAW nongovernmental standards developer process with industry participation. DOD adopted. Required for use with IEEE 15288.1 standard for defense systems engineering. Released as interim update to SMC 2013 list.
7	**Program** 1.2 **Execution;** Systems Engineering	IEEE 15288.1 and SMC tailoring	Application of Systems Engineering on Defense Programs	2014	Developed within a nongovernmental standards development process by joint government-industry working group at the direction of the Defense Standardization Council to reinstitue selected cancelled standards. Released as interim update to SMC 2013 list.
	Program 1.2 **Execution;** Systems Engineering	SMC-T-006	Specialty Engineering Supplement to IEEE 15288.1	2015	Added to transfer specialty engineering planning requirements from SMC-S-001 to IEEE 15288.1 to maintain the baseline of effective practices for high-reliability space. Released as interim update to SMC 2013 list.
	Program 1.2 **Execution;** Systems Engineering	SMC-T-005	SMC Risk Management Supplement to IEEE 15288.1	2015	Added to transfer risk management requirements from SMC-T-005 in SMC-S-001 to IEEE 15288.1 to maintain the baseline of effective practices for risk management at SMC. Released as interim update to SMC 2013 list.

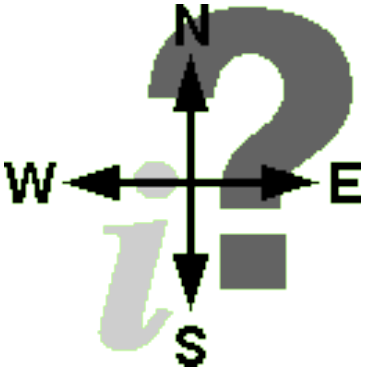
	~~1.1~~ ~~Program Execution; Program Management~~	~~SMC Standard SMC-S-021, Vol 1~~	~~Technical Reviews & Audits for Systems, Equipment and Computer Software~~	~~2009~~	
2	**Program Execution;** 1.1 Program Management	IEEE 15288.2	Technical Reviews and Audits on Defense Programs	2014	Developed within a nongovernmental standards development process by joint government-industry working group at the direction of the Defense Standardization Council to reinstitue selected cancelled standards. Released as interim update to SMC 2013 list.
	~~1.1~~ ~~Program Execution; Program Management~~	~~SMC Standard SMC-S-002~~	~~Configuration Management~~	~~2008~~	
3	**Program Execution;** 1.1 Program Management	SAE 649-1 and SMC tailoring	Configuration Management Requirements For Defense Contracts	2014	Developed within a nongovernmental standards development process by joint government-industry working group at the direction of the Defense Standardization Council to reinstitue selected cancelled standards. Released as interim update to SMC 2013 list.
	Program Execution; 1.1 Program Management	SMC Standard SMC-T-007	SMC Tailoring of EIA 649-1 - ECP change classes	2015	Added to resolve issue with definition of Major (Class I) ECPs that were not included in the standard. Released as interim update to SMC 2013 list.
	~~1.1~~ ~~Program Execution; Program Management~~	~~MIL-STD-1528A without Notice 1~~	~~Manufacturing Management~~	~~1986~~	
~~4~~	**Program Execution;** 1.1 Program Management	SAE AS6500	Manufacturing Management Program	2014	Developed within a nongoverntal standards development process by joint government-industry working group to replace cancelled MIL-STD-1528A. DOD adopted. Previously announced as interim updates to Feb 2013 SMC compliance standards list.

Summary

- Collaboration and co-evolution have driven these standards projects to a successful completion that:
  - Meets the needs of both Acquirers and Suppliers
  - Fully aligns with other key SE resources
  - Is consistent with other new DoD standards
- Collaboration from Day 1 helped build buy-in and ensure a result that is useful
- Development of the deployment assets will help transition
- We now need to continue the collaboration to change the culture

"We cannot change anything if we cannot change our thinking" (Kalwar)
"It cannot be changed without changing our thinking" (Einstein)

Questions?



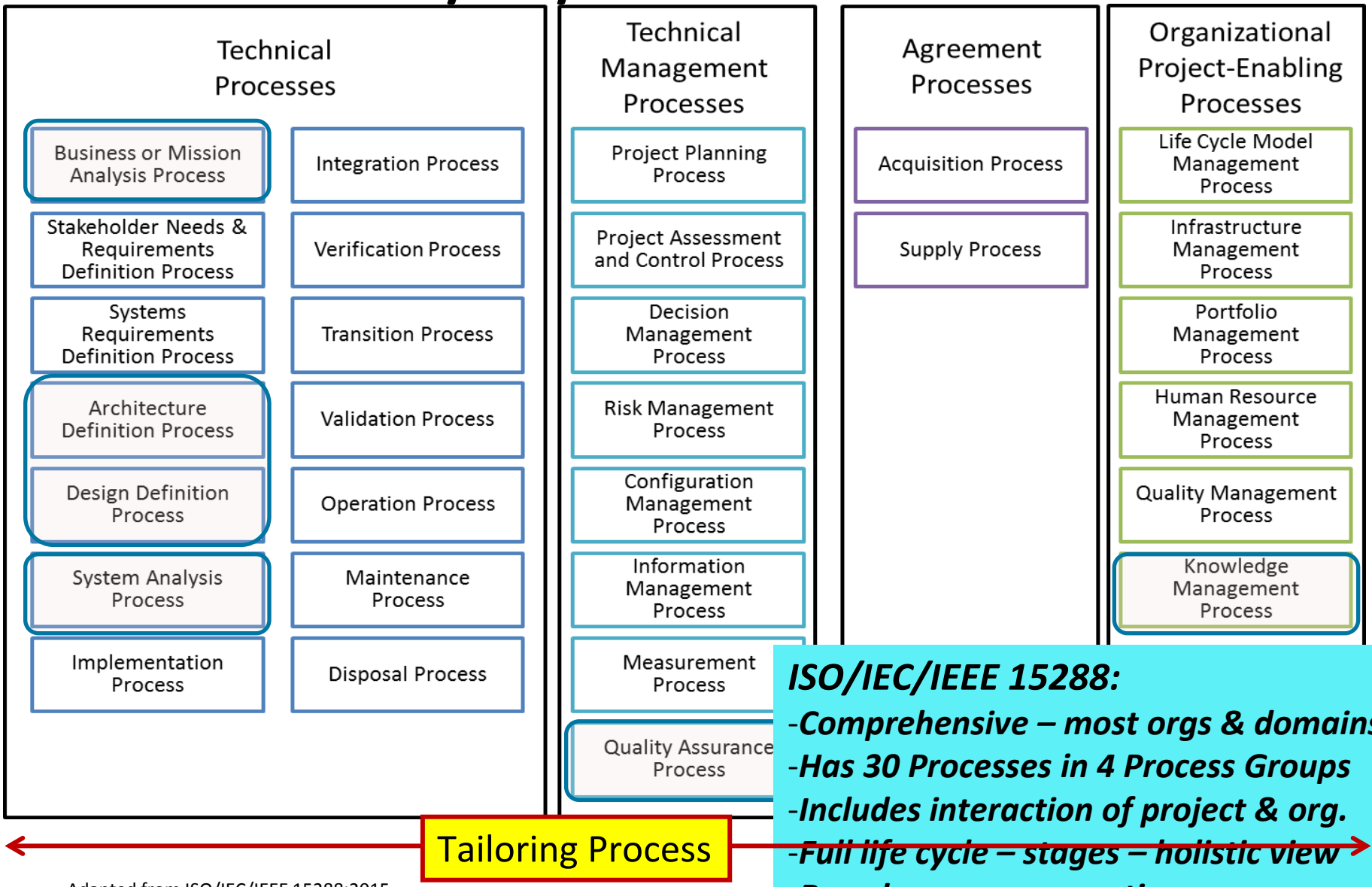
Back-up Charts

ISO/IEC/IEEE 15288 scope and focus

- Provides a common, comprehensive & integrated framework for describing and managing the full life cycle of systems for:
  - Small, medium and large organizations
  - Internal self-imposed use, as well as providing a basis for contractual arrangements (i.e., any agreement)
  - Applicable to most domains
  - Applicable to any life cycle model
- Defines a set of processes, concepts, and associated terminology
  - Can be applied at any level in the hierarchy of a system across its life cycle
  - Not sequential or one-way to apply
  - Allows for concurrent process application and concurrent stages
- Applies to man-made systems configured with one or more of the following:
  - Hardware, software, humans, or processes
- Focuses on “what”, not “how”
- Includes tailoring process
- Includes guidance for application to System of Systems (SoS)

Source: Adapted from ISO/IEC JTCI/SC7/WG7 presentation on ISO/IEC 15288.

Processes in ISO/IEC/IEEE 15288:2015



Adapted from ISO/IEC/IEEE 15288:2015

ISO/IEC/IEEE 15288:

-Comprehensive – most orgs & domains

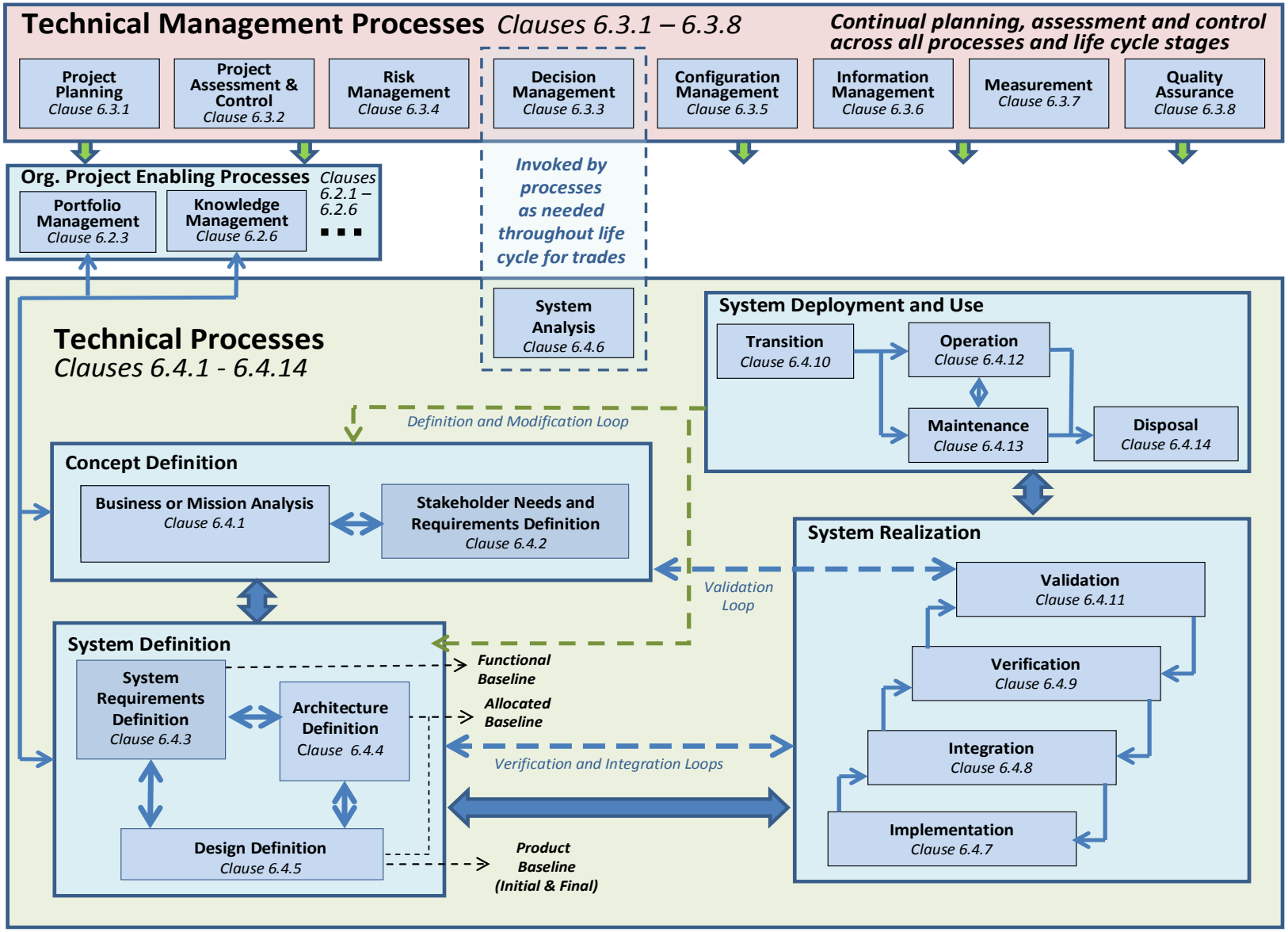
-Has 30 Processes in 4 Process Groups

-Includes interaction of project & org.

-Full life cycle – stages – holistic view

-Based on proven practices

Relationship of the Life Cycle Processes



Source: IEEE P15288.1

Example Mapping

IEEE 15288 Section	IEEE 15288 Keyword	CMMI-DEV Practices	Mapping Confidence (Practices)	Aggregate Confidence	Gap Comment (for aggregate < Strong)
6.3.7	**Measurement Process**				
6.3.7.3	**Activities and Tasks**				
6.3.7.3a	**Prepare for Measurement**				
6.3.7.3a 1	Define strategy	MA SP 1.1 MA GP 2.2	Strong Strong	Strong	
6.3.7.3a 2	Describe relevant characteristics	MA SP 1.1 IPM SP 1.2	Strong Medium	Strong	
6.3.7.3a 3	Identify information needs	MA SP 1.1	Strong	Strong	
6.3.7.3a 4	Select measures	MA SP 1.2	Strong	Strong	
6.3.7.3a 5	Define procedures	MA SP 1.3 MA SP1.4	Strong Strong	Strong	
6.3.7.3a 6	Define evaluation criteria	MA SP 1.4	Strong	Strong	
6.3.7.3a 7	Plan for systems or services	MA GP 2.2 MA GP 2.3 MA SP 1.3	Medium Medium Strong	Strong	
6.3.7.3b	**Perform measurement**				
6.3.7.3b 1	Integrate procedures	MA.SP1.3 MA.SP1.4 IPM.SP1.4 OPD.SP1.4	Medium Weak Strong Weak	Strong	
6.3.7.3b 2	Collect data	MA SP 2.1 MA SP 2.3	Strong Strong	Strong	
…					
6.4.14	**Disposal Process**				Disposal is not significantly addressed in CMMI-DEV
6.4.14.3	**Activities and Tasks**				
6.4.14.3a 1	Define disposal strategy	PP SP 1.3 RD SP 3.1 TS SP 2.2	Weak Weak Weak	Weak	Disposal is not significantly addressed in CMMI-DEV
6.4.14.3a 2	Identify constraints	RD SP 2.1	Weak	Weak	Disposal is not significantly addressed in CMMI-DEV
…					

Source Products

- **Source Products for SE Standard**
  - *ISO/IEC/IEEE 15288 (CD.2), 2013*
  - *ISO/IEC/IEEE 15289, Content of life-cycle information products (documentation), 2011*
  - *SMC-S-001, Systems Engineering Requirements and Products, July 2013*
  - *DoDI 5000.02*
  - *NATO AAP-48, NATO System Life Cycle Processes, July 2012 (Addendum Standard to 15288; focused on NATO Armament Systems)*
  - *Defense Acquisition Guide (DAG), Chapter 4, Systems Engineering, 2013*
  - *INCOSE SE Handbook V3.2 /V4.0 Draft*
  - *SEBoK*
  - *EIA 632, Engineering of a System*
  - *ISO/IEC/IEEE 24748-4*
  - *NAVSEA Instruction & Policy 5000-009 for Systems Engineering Technical Reviews*

- **Source Products for TR&A Standard**
  - *ISO/IEC/IEEE 15288 (CD.2), 2013*
  - *DoDI 5000.02*
  - *SMC-S-021, Technical Reviews and Audits for Systems, Equipment and Computer Software, Volume 1, September 2009*
  - *NAVSEAINST 5009.9, Naval Systems Engineering Technical Review Handbook, July 2009*
  - *NAVAIRINST 4355.19E, Systems Engineering Technical Review Process*
  - *NAVAIR Systems Engineering Technical Review Process Handbook, initial release*
  - *Defense Acquisition Guidebook, Chapter 4.*

Source Products include a combination of Industry and DoD resources

Source Products Usage

- Approach for Use of Source Products
  - *Use as body of knowledge for defense programs*
  - *Identify relevant information that should be considered*
    - *Identify differences or additional tasks that need to be considered*
    - *Identify key outputs and their attributes*
    - *Identify essential guidance needed to provide common understanding*
  - *Assimilate key information at level that applies to most defense programs*
    - *State in terms of "what", not "how"*