Applying the New IEEE Systems Engineering Standards to DoD Programs

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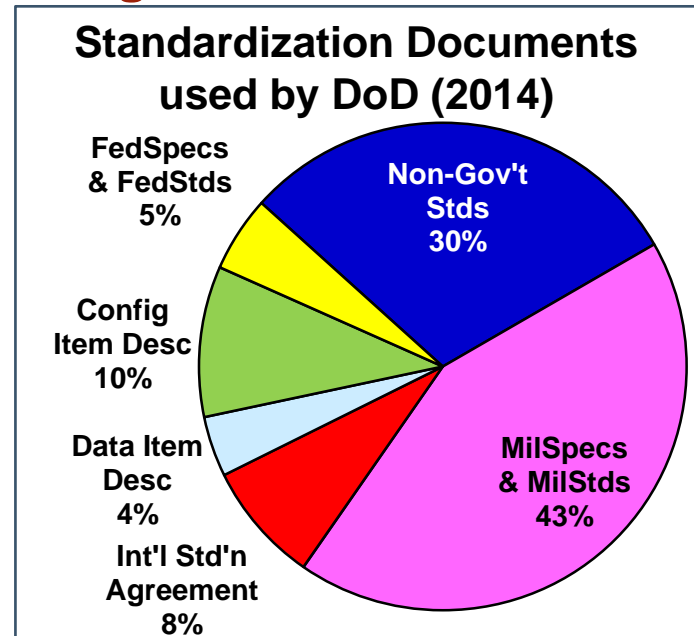Vice Chair
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Background

DoD approach to standards has changed

- Acquisition Reform efforts cancelled tens of thousands of MilSpecs & MilStds

- Partially replaced with Non-Government Standards (NGS)

- DoD continues strong support of NGS, however
  - NGS must be contractually enforceable
  - NGS may not capture DoD req'ts

Standardization Documents used by DoD (2014)

- FedSpecs & FedStds 5%
- Config Item Desc 10%
- Data Item Desc 4%
- Int'l Std'n Agreement 8%
- Non-Gov't Stds 30%
- MilSpecs & MilStds 43%

A Sedmak; "DoD SE and Acquisition Update" 08-Jul-2014

The significant industry investments made in various process methodologies (CMMI, AS9100, etc) must be leveraged to ease migration to new NGS

ISO/IEC/IEEE-15288:2015: System and software engineering – system life cycle processes

Establishes common framework of process descriptions for describing the life cycle of systems

- Facilitates communication among acquirers, suppliers and other stakeholders
- Defines Purpose, Outcomes, and Activities and Tasks for each process

ISO/IEC/IEEE 15288:2015 Processes

Agreement processes
- Acquisition
- Supply

Organizational project-enabling processes
- Life cycle model mg't
- Infrastructure mg't
- Portfolio management
- Human resource mg't
- Quality management
- Knowledge management

Technical management processes
- Project planning
- Project assessment and control
- Decision management
- Risk management
- Configuration management
- Information management
- Measurement
- Quality assurance

Technical processes
- Business or mission analysis
- Stakeholder needs and requirements definition
- System req'ts definition
- Architecture definition
- Design definition
- System analysis
- Implementation
- Integration
- Verification
- Transition
- Validation
- Operation
- Maintenance
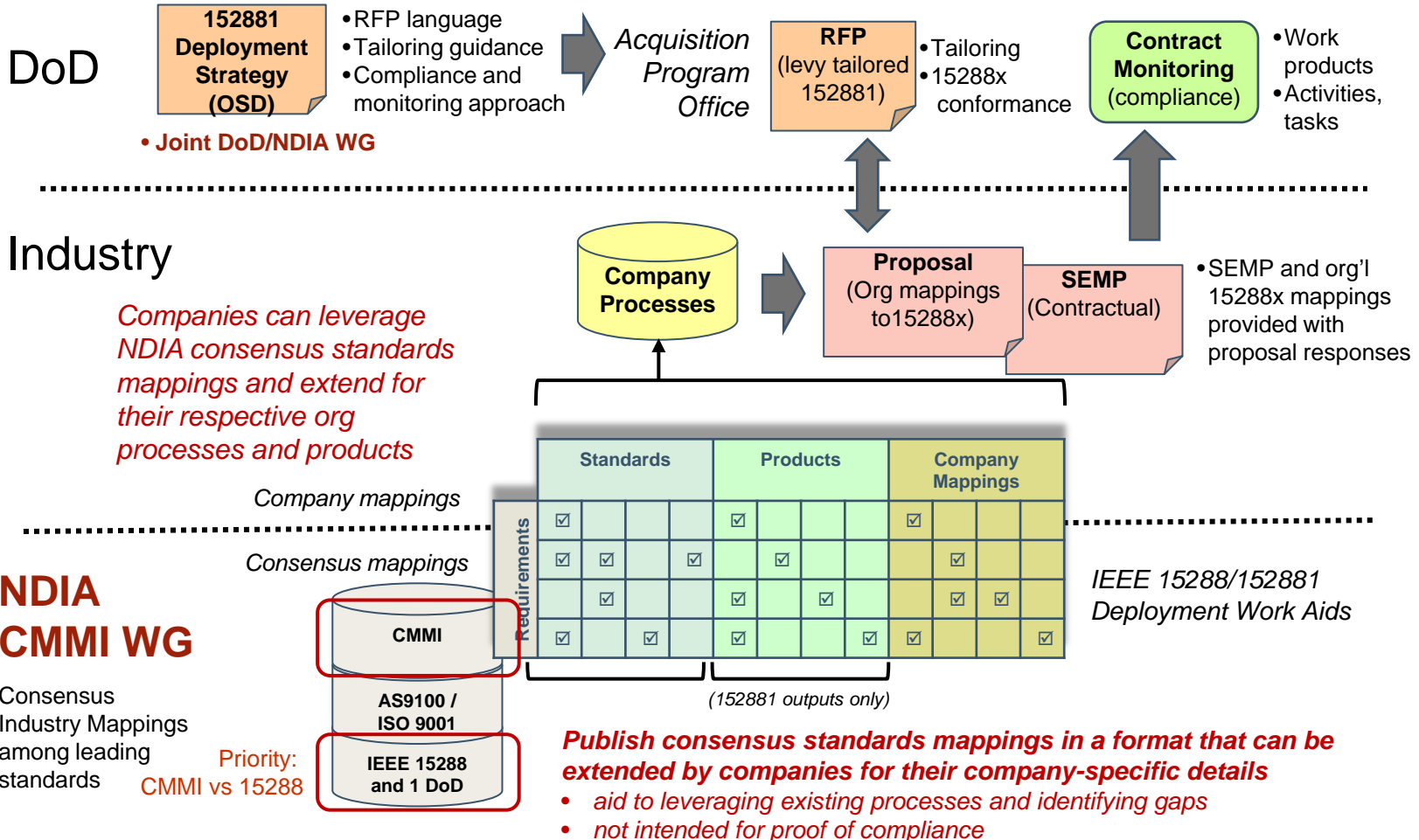- Disposal

15288 & DoD Acquisition

IEEE Std 152881-2015 - Standard for Application of Systems Engineering on Defense Programs

- Defines requirements for the application of ISO/IEC/IEEE 15288 to projects of the US DoD, including definition of "outputs" for each process

IEEE Std 152882-2015 - Standard for Technical Reviews and Audits on Defense Programs

- Elaborates the technical review and audit clause of ISO/IEC/IEEE 15288 to establish requirements for technical reviews and audits US DoD
  - Includes definition, description, and intent, as well as the entry, exit and success criteria, for each technical review and audit
    - System Req'ts Review (SRR)
    - System Functional Review (SFR)
    - Preliminary Design Review (PDR)
    - Critical Design Review (CDR)
    - Test Readiness Review (TRR)
    - Functional Config Audit (FCA)
    - System Verification Review (SVR)
    - Production Readiness Review (PRR)
    - Physical Configuration Audit (PCA)
    - Software Req'ts and Arch Review (SAR)
    - Software Specification Review (SSR)
    - Integration Readiness Review (IRR)
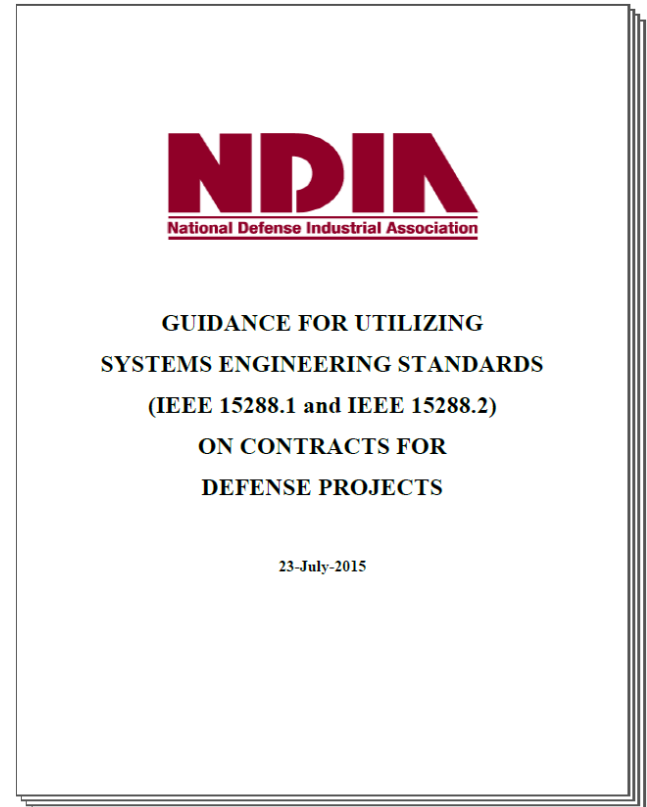   - Flight Readiness Review (FRR)

Conops – IEEE Std 152881 Deployment Strategy & Integrated Standards Mappings in Acquisition

DoD

152881 Deployment Strategy (OSD)
- RFP language
- Tailoring guidance
- Compliance and monitoring approach

Acquisition Program Office

RFP (levy tailored 152881)
- Tailoring
- 15288x conformance

Contract Monitoring (compliance)
- Work products
- Activities, tasks

• **Joint DoD/NDIA WG**

Industry

Companies can leverage NDIA consensus standards mappings and extend for their respective org processes and products

Company Processes

Proposal (Org mappings to15288x)

SEMP (Contractual)

- SEMP and org'l 15288x mappings provided with proposal responses

Company mappings

Consensus mappings

	Standards			Products			Company Mappings		
Requirements	☑			☑			☑		
	☑	☑	☑		☑			☑	
		☑		☑		☑		☑	☑
	☑		☑	☑		☑	☑		☑

(152881 outputs only)

IEEE 15288/152881 Deployment Work Aids

NDIA CMMI WG

Consensus Industry Mappings among leading standards

CMMI

AS9100 / ISO 9001

IEEE 15288 and 1 DoD

Priority: CMMI vs 15288

Publish consensus standards mappings in a format that can be extended by companies for their company-specific details
- *aid to leveraging existing processes and identifying gaps*
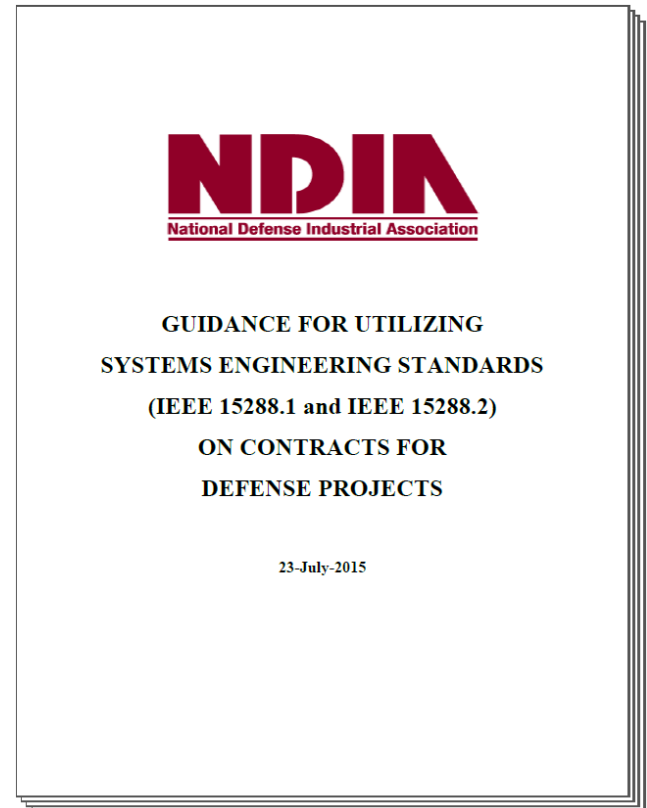- *not intended for proof of compliance*

Guidance for 15288 [1]

Developed by NDIA and AIA

- **Provided as recommendations to DoD**

- **Committee members include government, industry, and academia**

- **Available at:
 http://wwwndiaorg/Divisions/Divisions/SystemsEngineering/Documents/NDIA_IEEE_15288_Guidance_2015pdf**

NDIA
National Defense Industrial Association

GUIDANCE FOR UTILIZING
SYSTEMS ENGINEERING STANDARDS
(IEEE 15288.1 and IEEE 15288.2)
ON CONTRACTS FOR
DEFENSE PROJECTS

23-July-2015

NDIA Guidance for 15288 1

Purpose

- **To provide guidance for acquirers**
  - Tailoring 15288 standards to meet project needs
  - Invoking the standards via the RFP
  - Evaluating offeror's commitment/ ability to comply with requirements
  - Monitoring and enforcing a supplier's compliance

- **To provide guidance for offerors**
  - Developing proposals to leverage existing organizational processes to support RFP requirements and comply with the standards as tailored

GUIDANCE FOR UTILIZING
SYSTEMS ENGINEERING STANDARDS
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Contents

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3.   **Tailoring ISO/IEC/IEEE 15288, IEEE15288.1 and IEEE 15288.2 to meet project needs**

4.   **Acquirer tailoring prior to the issuance of the RFP**

5.   **Requiring conformance to the 15288 standards in the RFP**

6.   **Offeror tailoring during the proposal effort**

7.   **Evaluating and contracting for conformance to IEEE 15288.1 and 15288.2**

8.   **Monitoring for compliance**

App A. **Factors Driving Tailoring of the 15288 Standards**

App B. **Work aid for definition of outputs to be supplied**

15288 Utilization Process
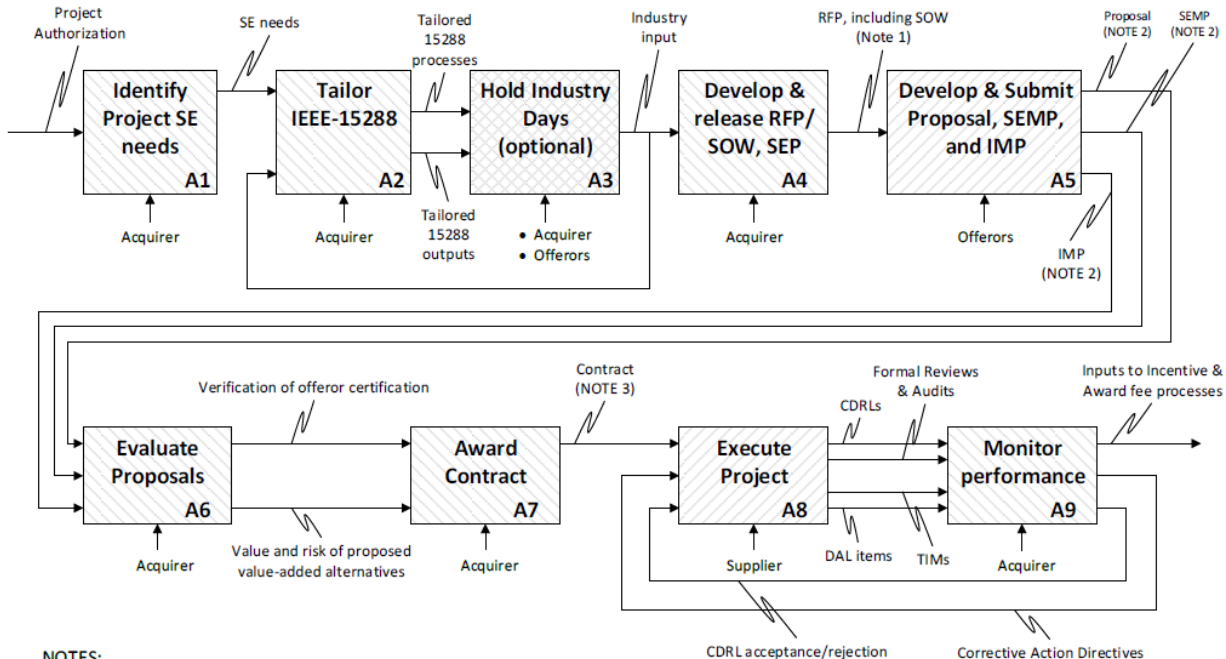
NOTES:
1) Includes requirement for offerors to define and perform SE conformant with IEEE-15288 processes.
   Includes requirement for offerors to provide outputs conformant with IEEE-15288 outputs.

2) Includes mapping of offeror's tailored processes to acquirer-tailored IEEE-15288 processes.
   Includes mapping of offeror's outputs to acquirer-tailored IEEE-15288 outputs.
   Includes certification that offeror's proposed processes and outputs satisfy acquirer's requirements for same
   Includes value-added alternatives to IEEE-15288 processes and outputs

3) Includes requirement to execute SE processes as proposed.
   Includes requirement to provide SE outputs via CDRLS or DAL, as proposed.
   Includes offeror's certification that proposed processes and outputs conform to acquirer-tailored 15288 standards
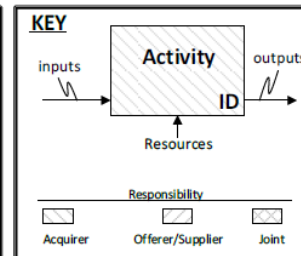
Acquirer Tailoring

Done by acquirer prior to issuance of RFP

Based on specific business/mission needs and project constraints

- e.g., projects that do not cover the full acquisition life cycle

May affect the scale or rigor of application for a specific process rather than its inclusion or exclusion

Establishes the acquirer's SE expectations and provides a baseline against which offerors should bid.

The value of standards is not in their rote implementation, but in the thought processes and resulting outcomes that enable better decisions

Offeror Tailoring

Done by offeror during the proposal effort

Responds to RFP requirements

May demonstrate alignment of organizations established processes with those of the acquirer-tailored standard, via

- Adapting existing organizational processes to conform to the standards
- Proposing alternative tailoring of the 15288 standards in a manner that preserves the acquirer's intent but aligns with the established organizational processes.

Some Tailoring Drivers 1

Life cycle considerations	• Acquisition life cycle phases covered • Government / industry division of effort • Duration of development effort • Total cost of ownership • Development life cycle (e.g., rapid) • Known or assumed funding profile
Mission application	• Domain • Mission criticality ('-ilities' required; domain regulations) • Number of usage scenarios • Number of deployment sites / environments • Design for reusability
Organizational complexity	• Number of development organizations • Diversity of organizational viewpoints, for example based on corporate legacy • Commonality and integration of standard processes or toolsets • Reuse of existing components or intellectual property • Staff experience, capability, and skills needed

Some Tailoring Drivers 2

Technical complexity	• Number of requirements • Number of system external interfaces • Number of user classes • Number of system elements / internal interfaces /architectural levels • Number of KPPs • Total development cost
Risk	• System precedence / technology availability • Technology obsolescence • Integration of the technology • Programmatic / external risk • Sustainment / disposal risk • Manufacturing / supply chain risk • Prior acquisition / system failures or past performance history
Technical understanding	• Requirements understanding • Architecture understanding • Emergence likelihood

Invoking 15288, 15288.1, and 15288.2

Invoked via RFP clauses

Suggested language provided for

- RFP Section C - Statement of Work (SOW)
- RFP Section L   - Instructions to Bidders
- RFP Section M - Evaluation criteria

Section C Examples

(SOWxx1) The Contractor shall define and implement systems engineering processes in conformance with IEEE 15288.1-2014 {as tailored by [Ref tailoring document]}. Conformance shall be measured via the outcomes and outputs specified by 15288.1-2014{as tailored by [Ref tailoring document]}.

(SOWxx2) The Contractor shall define and conduct technical reviews and audits in conformance with IEEE 15288.2-2014 {as tailored by [Ref tailoring document]}. Conformance shall be measured via outputs and criteria specified by 15288.2-2014.

Proposing compliance

Objective is to provide most efficient and effective means of achieving conformance to RFP requirements

- Often best achieved through the use of existing organizational processes
  - Offeror must show that existing processes satisfy acquirer's requirements
- May include proposals for alternatives to 15288 standards
  - Should address the value added by the alternative, as well as the associated risks and opportunities

A place to start is by mapping organizational processes and outputs to 15288 processes and 15288.1 outputs

- Identify process and output gaps
- NDIA has performed a mapping between the CMMI processes and work products and the 15288 process and 15288.1 outputs

Proposal content

Identify the organizational processes that will be performed

- Certify that those processes meet the stated requirements

Identify the work products produced from these processes

- Certify that those work products meet the stated requirements

Identify the review activities to be performed

- Certify that those review activities meet the stated requirements

Contracting for compliance

Evaluate offeror's proposal to verify that it:

- Clearly addresses the activities, outputs, reviews and audits that are incorporated into the project;

- Ensures that these conform to the 15288 standards; and

- Demonstrates the ability and commitment to:
  - Successfully execute the required SE activities
  - Produce the required outcomes and outputs
  - Conduct the required technical reviews and audits

The negotiated contract defines the activities and outputs of the supplier, and forms baseline to assess supplier compliance

- Ensure that it defines the resulting level of conformance to the standards to be provided by the supplier

Monitoring for compliance

Monitor process compliance through engagements such as TIMs, design reviews, etc.

- Observe the processes being performed
- Observe evidence of the process performance (i.e. artifacts)

Monitor negotiated provision of outputs obtained as CDRL items or via the DAL

- Assess compliance with requirements
- Assess as an indicator of the technical maturity, feasibility, technical risk, and expected performance of the end product

Monitor performance of specified technical reviews & audits

- Address technical review process and entry/exit/success criteria
- Use to evaluate product maturity, assess technical feasibility and risk, and monitor technical performance measures and test results

Summary

Provides guidance for the use of 15288, 15288.1 and 15288.2 on DoD programs, addressing

- Tailoring
- Invoking via RFP language
- Proposal compliance
- Contracting for compliance
- Monitoring compliance

Leverages industry best practices

Committee Members

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Allen Chin	Office of the Deputy Assistant Secretary of Defense (SE)
David Davis	USAF Space and Missile Systems Center
Geoff Draper	Harris Corporation
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Thank You