Joint Working Group for DoD Systems Engineering Standardization

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NDIA SE Division POC

4/11/14

With material from Joint DoD/IEEE/Industry Standardization Working Group, Garry Roedler
<table>
<thead>
<tr>
<th>Standard Focus</th>
<th>Responsible SDO</th>
<th>Approach</th>
<th>Expected Publication</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems Engineering</td>
<td>IEEE-CS</td>
<td>ISO/IEC/IEEE 15288 (System Life Cycle Processes) will be used as basis for Systems Engineering needs. Project is expected to produce an addendum to 15288 – “Standard for Application of Systems Engineering on Defense Programs&quot;.</td>
<td>End of 2014</td>
<td>Full draft available for review in mid-2014</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increments under review now as drafted.</td>
</tr>
<tr>
<td>Technical Reviews and Audits</td>
<td>IEEE-CS</td>
<td>No acceptable industry standard to use as base. New full standard to be developed - “Standard for Application of Technical Reviews and Audits on Defense Programs&quot;.</td>
<td>End of 2014</td>
<td>Full draft available for review in mid-2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increments under review now as drafted.</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>SAE Intl</td>
<td>Configuration Mgt needs. Project is expected to produce an addendum to EIA 649B.</td>
<td>Mid 2015</td>
<td>Intended to document best manufacturing practices aimed at promoting the timely development, production, modification, fielding, and sustainment of affordable products</td>
</tr>
<tr>
<td>Manufacturing Management</td>
<td>SAE Intl</td>
<td>Recent selection - team is forming - approach to be announced.</td>
<td>TBD</td>
<td></td>
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<tr>
<td>Logistics Support</td>
<td>SAE Intl</td>
<td>Revision of MIL-HDBK-502A, which provides application guidance to the TechAmerica Standard 0017</td>
<td>Adopted by DoD in June 2013</td>
<td></td>
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<tr>
<td>Reliability</td>
<td>TBD</td>
<td>Still under review</td>
<td>TBD</td>
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</table>

*Each standard is intended to be put on future system contracts*
SE Standards

Systems Engineering:
• Tailored DoD-specific addendum to IEEE 15288 (15288.1)

Technical Reviews and Audits:
• New standard from legacy technical review descriptions (15288.2)

Status:
• Both standards have been developed incrementally and reviewed by the joint WG stakeholder groups
• NDIA: 13 representatives on email distribution/review list
• Completed drafts of the integrated standards will be available mid-April for holistic review (3-week review period)

Interested in reviewing the integrated draft standards?
Contact Geoff Draper (gdraper@harris.com)
**Membership of Working Group Has Broad Span**

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

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

### Academia
- AF Institute of Tech (TBR)
- Johns Hopkins Univ
- Naval Postgraduate School (SERC)
- Stevens Institute (SERC)
- University of Florida
- University of Southern California
- Florida Gulf Coast Univ.

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

### Leadership Team
- Chair, Garry Roedler, Lockheed Martin
- 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)
Revised ISO/IEC/IEEE 15288 Processes and Structure

ISO/IEC/IEEE 15288:
- Comprehensive – most orgs & domains
- Has 26 Processes in 4 Process Groups
- Includes interaction of project & org.
- Full life cycle – stages – holistic view
- Based on proven practices

Example SE Addendum (15288.1)

Baseline: IEEE 15288 (2013)  DoD Addendum tailoring (15288.1)

### 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. To perform the steps of this process, identifies project outcomes, tasks and deliverables, establishes schedules for each task, including achievement criteria, and required resources to accomplish tasks. This is an on-going process that continues throughout the project, with regular reviews to plan.

#### 6.3.1.2 Outcomes

An implementation of the Project Planning Process shall achieve the following outcomes:

- a) Objectives 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.

#### 6.3.1.3 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.

### 6.3.4 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 may be...

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**Document structure is aligned with IEEE15288 and INCOSE SE Handbook**

IEEE/DoD Joint WG for SE Standardization
NDIA SE Division – 4/9/14
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 system under review can proceed into detailed design and meet the stated performance requirements within program cost, schedule, risk and other program and system constraints.

5.5.2 PDR Description

The PDR shall confirm that:

- All system-level functional and performance requirements are decomposed or directly allocated to the lowest level of the specified requirements and are uniquely identified.
- The allocated baseline is complete.
- All external interfaces to the system, as defined at the SRR, have been defined and documented.
- All system internal interfaces (system element to system element) are controlled.
- Verification requirements to demonstrate achievement of all specified characteristics have been documented.
- All design constraints have been captured and incorporated into design.
- All decomposed and allocated requirements down to the lowest level of the specified functional requirement are directional traceability between the source requirement and the decomposed requirements.
- All system hardware element development specifications are complete.
- The software architecture is complete to the extent specified in the architecture, including architectural interface, and life cycle models.
- The set of system elements comprising the preliminary system design and interfaces, forms a satisfactory basis for proceeding into detailed design.

• Purpose
• Description
• Timing
• Entry Criteria
• Products
• Conduct
• Outputs
• Exit Criteria

6.5 Preliminary Design Review (PDR) application guidance

a. For complex systems, a PDR may be conducted incrementally for each subsystem or system element.

b. If incremental PDRs are held, it is important that all conflict in the mandatory incremental PDRs be resolved before conducting the subsequent PDRs.

c. The request for the PDR Chair should occur at least 90 days before the planned start date.

d. The PDR review should be tailored to best support the needs of the system.

• In order to ensure a comprehensive and balanced assessment of the candidate, the program manager and other stakeholders should include, at a minimum:
  1. Program management,
  2. Systems engineering,
  3. Software engineering,
  4. Logistics,
  5. Test and evaluation,
  6. All certification authorities,
  7. System users,
  8. Cost estimating team,
  9. Legal counsel, if required,
  10. Contracting officers.

Annex D – Preliminary design review (PDR) checklist (Normative when tailored)

D-1 PDR review products acceptance criteria

The following items and associated acceptability criteria should be considered in preparation for the PDR. Specific items shall be tailored out, modified or additional items added as necessary to support a given program.

Table D-1: PDR review products acceptability criteria

<table>
<thead>
<tr>
<th>Product</th>
<th>PDR acceptability criteria</th>
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<tbody>
<tr>
<td>System baseline documentation (allocated)</td>
<td>• Analysis of system performance is complete and assessed to meet requirements</td>
</tr>
<tr>
<td></td>
<td>• Preliminary design satisfies design considerations</td>
</tr>
<tr>
<td></td>
<td>• Preliminary design satisfies design considerations</td>
</tr>
<tr>
<td></td>
<td>• Preliminary design is complete</td>
</tr>
<tr>
<td></td>
<td>• Preliminary design is complete</td>
</tr>
<tr>
<td></td>
<td>• Preliminary design is complete</td>
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<tr>
<td></td>
<td>• Assessment of the technical effort and design indicates potential for operational test and evaluation success (operational effectiveness and suitability)</td>
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<tr>
<td></td>
<td>• All Critical Safety Items (CSIs) and Critical Application Items (CAIs) are identified</td>
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<tr>
<td></td>
<td>• Functional failure mode, effects, and criticality analysis (FMECA) is completed</td>
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<tr>
<td></td>
<td>• Estimate of system reliability and maintainability updated based on engineering analyses, mission test results, or other sources of demonstrated reliability and maintainability</td>
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<tr>
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<td>• Computer system and software architecture designs have been established, all Computer Software Configuration Items (SWCIs), Computer Software Components (CSCs), and Computer Software Units (CSUs) have been defined</td>
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<tr>
<td></td>
<td>• Software Requirements Specifications (SRRs) and Interface Requirement Specifications (IRSs) including verification plans, are complete and baselined for all CSUs and satisfy the system functional requirements</td>
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<tr>
<td></td>
<td>• Interface control documents trace all software interface requirements to the SWCIs and CSUs</td>
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<tr>
<td></td>
<td>• Preliminary software design has been defined and captured</td>
</tr>
<tr>
<td></td>
<td>• All required software-related documents are baselined and captured</td>
</tr>
</tbody>
</table>

Normative Reviews/Audits (11): ASR; SRR; SFR; PDR; CDR; TRR; FCA; SVR; PRR; PCA; ISR

Example domain-specific reviews in annexes that “may find useful” (4): SAR; SSR; IRR; FRR
Working Schedule (Draft)

- IEEE/DoD Standardization WG schedule milestones:
  - Final set of processes were released in this cycle
  - Front Matter - release in March - discussion on April 3
  - Final clean-up of full working draft in April for final holistic review
  - Working drafts
    - Distribute 1\textsuperscript{st} full working draft for both standards 4/10/14
    - Comments due on 4/28/14
    - Discuss in meeting on 5/1/14
    - Distribute 2\textsuperscript{nd} full working draft for both standards 5/15/14
    - Comments due 5/23/14
    - Discuss in meeting 5/29/14
    - Initiate MEC and Ballot Invitation on 5/15/14
    - Draft ready for ballot and Establish Ballot Resolution Group on 6/5/14
    - Start Ballot on 6/12/14; Ballot close no later than 7/17/14
    - Allows for 4 recirculation ballots prior to approval submission deadline

- Note: WG to be active until full working draft is ready for ballot (end of May)

18 day review period
- Focus on adequate comment resolution

IEEE Balloting (members)