

What's all this 'churn' in Systems Engineering Standards and Models?

[where did they come from? and where are they going?]

CMMI Technology Conference

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Donald J. Gantzer

ODUSD(A&T) Systems and Software Engineering

donald.gantzer.ctr.osd.mil

gantzerd@syseng-so.com

703-412-3668

Objectives

- To provide an overview summary of key Systems Engineering [SE] process standards and models
- To illustrate a top level comparison of them
- To correlate with the Software Engineering Standard
- To indicate trends and usage
- To relate to ODUSD(A&T) System & Software Engineering Directorate acquisition Initiatives
- To briefly address one key process activity .
Technical Planning - as an example

Disclaimer: The views and opinions presented here are the author's and do not necessarily represent SAIC or DoD views.

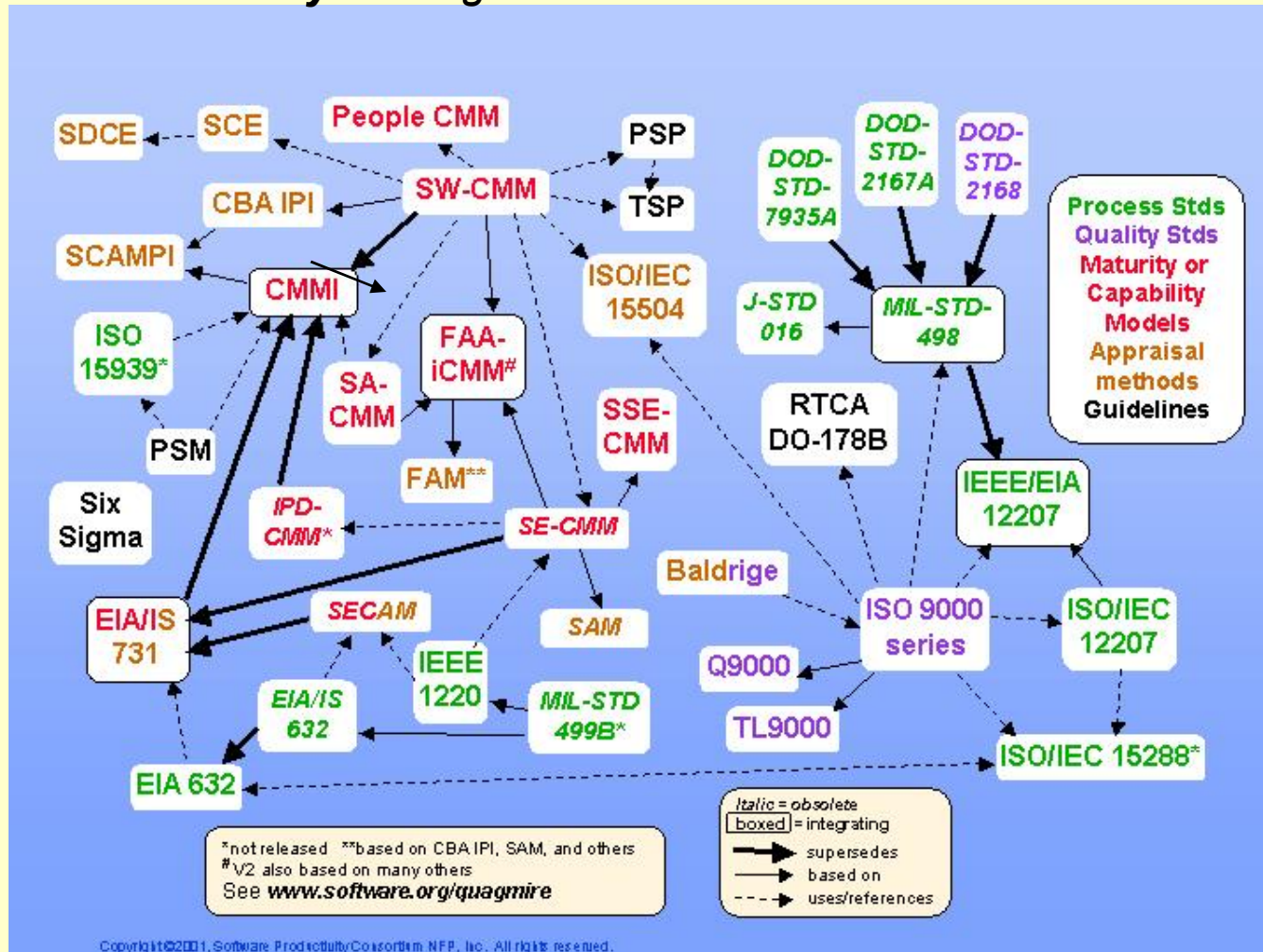
Agenda

- Introduction
- Systems Engineering Standards and Models
 - “ Evolution of Standards & Models
 - “ Summary of Standards & Models
 - ISO/IEC 15288: **System life Cycle Processes**
 - ANSI/EIA . 632: **Processes for Engineering a System**
 - IEEE 1220: **Standard for Application and Management of the System Engineering Process**
 - CMMI® - DEV: **Capability Maturity Model Integrated for Development**
 - DAG/SE; **Defense Acquisition Guide/Systems Engineering**
 - INCOSE **Systems Engineering Handbook**
 - “ A Mapping across standards and models
 - “ Harmonization of ISO/IEC 12207(Standard for Information Technology - Software Life Cycle Processes) & ISO/IEC15288
- ODUSD(A&T) Systems and Software Engineering issues in Acquisitions
- Summary
- Some Key References and Links
- Appendix: Example - Summary for Technical Planning activities

Note: Every effort is made to credit sources of material presented here

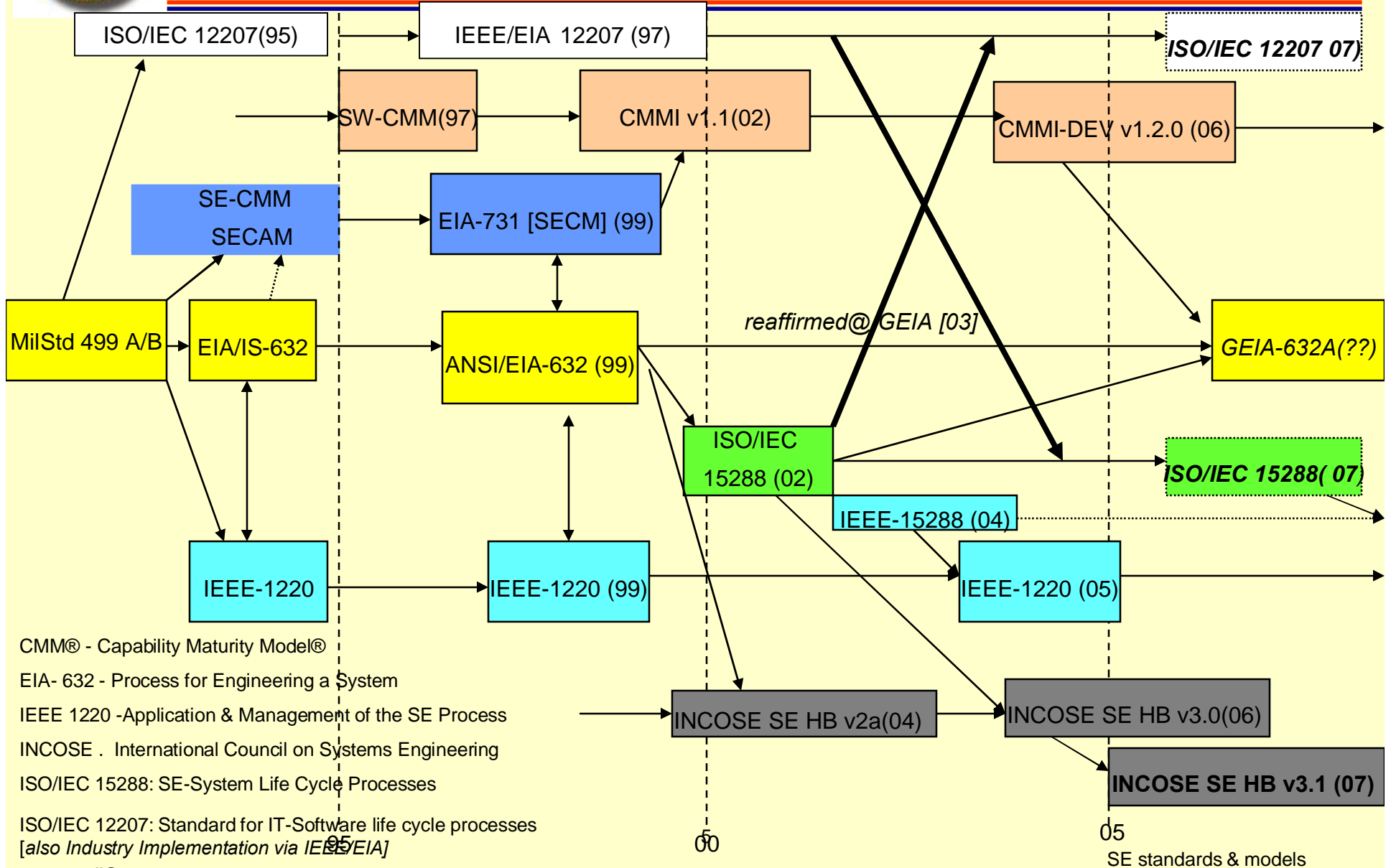
Process Standards / Models Quagmire

Remember this? ~10 years ago! – now ood!



Standards and Models Trends

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CMM® - Capability Maturity Model®

EIA- 632 - Process for Engineering a System

IEEE 1220 -Application & Management of the SE Process

INCOSE . International Council on Systems Engineering

ISO/IEC 15288: SE-System Life Cycle Processes

ISO/IEC 12207: Standard for IT-Software life cycle processes
[also Industry Implementation via IEEE/EIA]

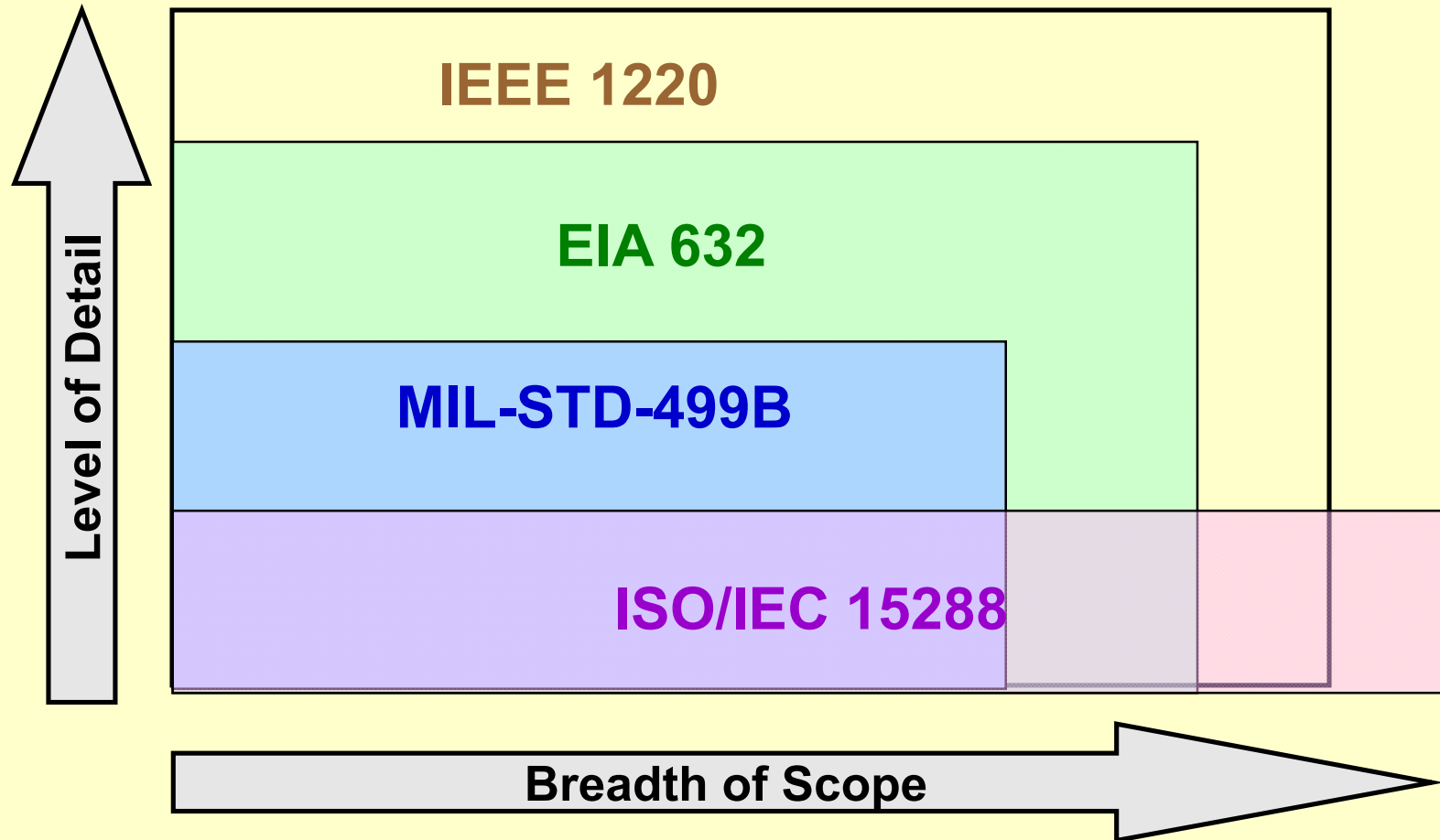
ew of SE related Standards

Standards items	ISO/IEC 15288	EIA - 632	IEEE 1220	CMMI®-DEV
Purpose	Establish a common framework for describing the life cycle of systems+	Provide an integrated set of fundamental processes to aid a developer in the engineering or re-engineering of a system+	Defines the requirements for an enterprise's total technical effort related to the development of products and processes that will provide life cycle support for the products	CMMI®) is a process improvement maturity model for the development of products and services. It consists of best practices that address development and maintenance activities.
Activities	25 processes: 7 Project 11 Technical 7 Agreement and Enterprise	33 Requirements in 5 groupings of 13 processes	28 requirements: 14 General 6 by Life Cycle Stages 8 in SE Process	27 process areas: Continuous model : 11 Project Management 6 Engineering 5 Support 5 Process Management
Other	~60 pgs [plus separate guide for application] - a hi-level framework [descriptive].	~120 pgs - in between 1220 and 15288 in scope and details.	~85 pgs - less scope but more detailed [prescriptive].	~575 pgs - focus mainly on development; much supplemental info.
djGantzer		6		SE standards & models

Standards & Models Life Cycle Phases

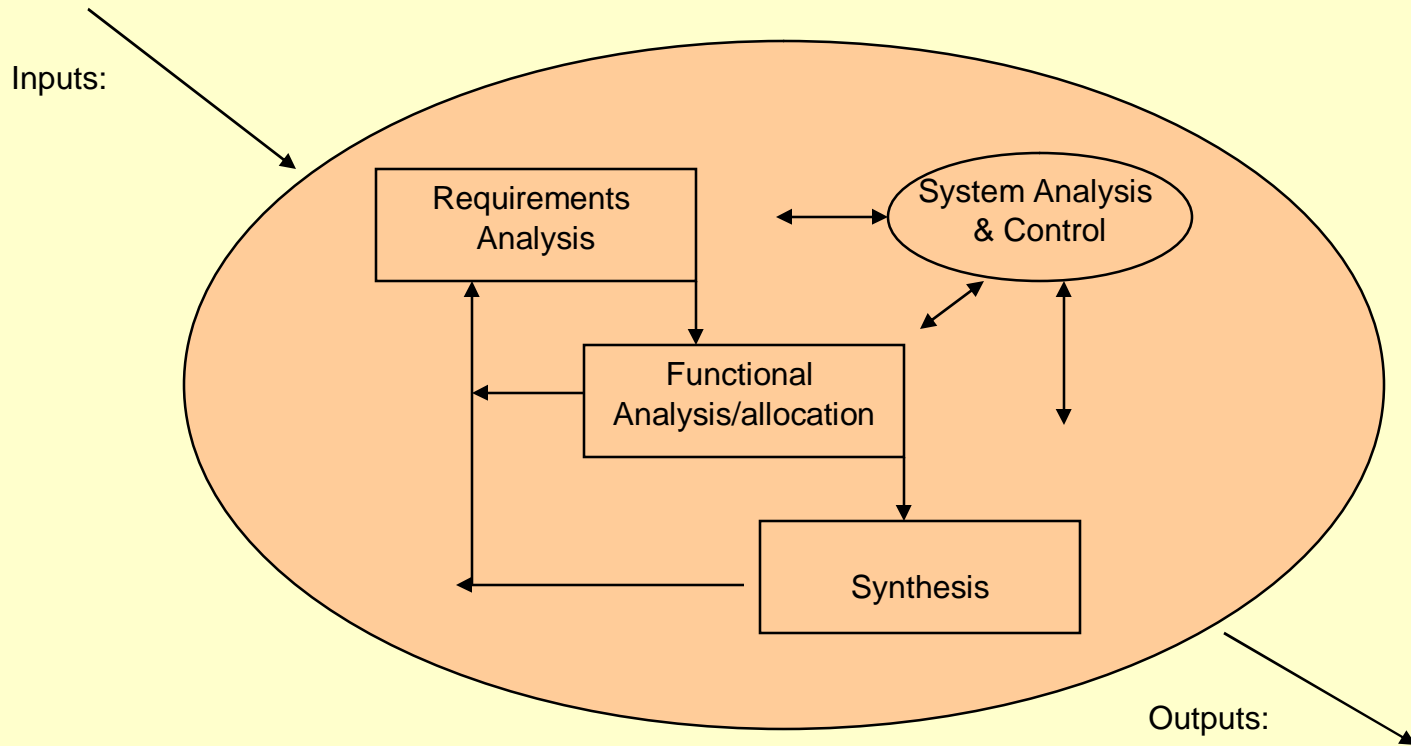
ISO/IEC 15288	EIA - 632	IEEE 1220	CMMI®-DEV* <i>*inferred</i>	DoD/DAG [& DoDI 5000.2]
Concept	Pre-system Definition	Concept	concept, exploration, vision	Concept Development
Development	System Definition, Subsystem Design, Detailed Design	System Def., Subsystem design, Detailed design; FAIT	feasibility, design, development	Technology Development; System Development; Demonstration
Production	End Product, Physical Integration, Test & Evaluation	Production	production, manufacturing, delivery	Production & Deployment: LRIP
Utilization		Utilization	operations	Operations & Support [O&S]: FRIP
Support		Support	support, maintenance, sustainment	O&S: Sustainment
Retirement		Retirement	disposal, phase out	O&S; Disposal

of SE Standards



Simple Generic SE Process

Note: Applied to Air Force IT/CSE SE Case Studies; <http://www.afit.edu/cse/>



Sources: Mil Std 499A/B and early DAU/DAG guidance

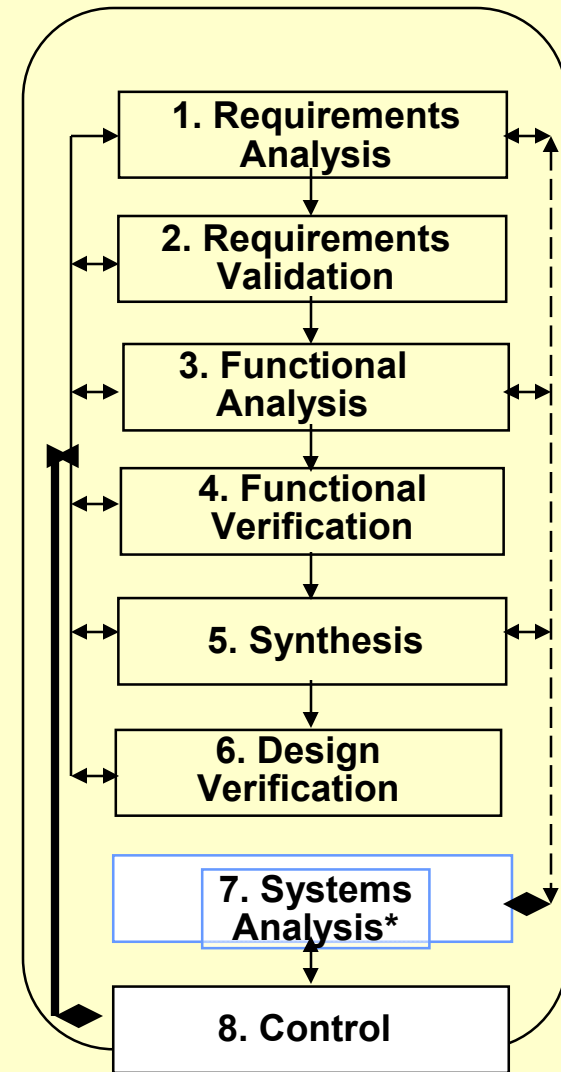
EEE 1220: SE Process – 2005

Clause 4 - General Requirements

1. SE process
2. Policies & procedures for SE
3. Planning the technical effort: Prepare/update engineering plan; schedule; tech plans.
4. Development strategies
5. Modeling & prototyping
6. Integrated repository: data, tools.
7. Integrated data package: HW, SW, LC processes, human.
8. Specification tree
9. Drawing tree
10. System breakdown structure
11. Integration of the SE effort: concurrent engr., Int. teams.
12. Technical reviews
13. Quality management
14. Product and process improvement: re-engineering, self-assessment, LL.

Note: Standard includes detailed flows for each activity; and an example SEMP table of contents

Clause 6 – The SE Process

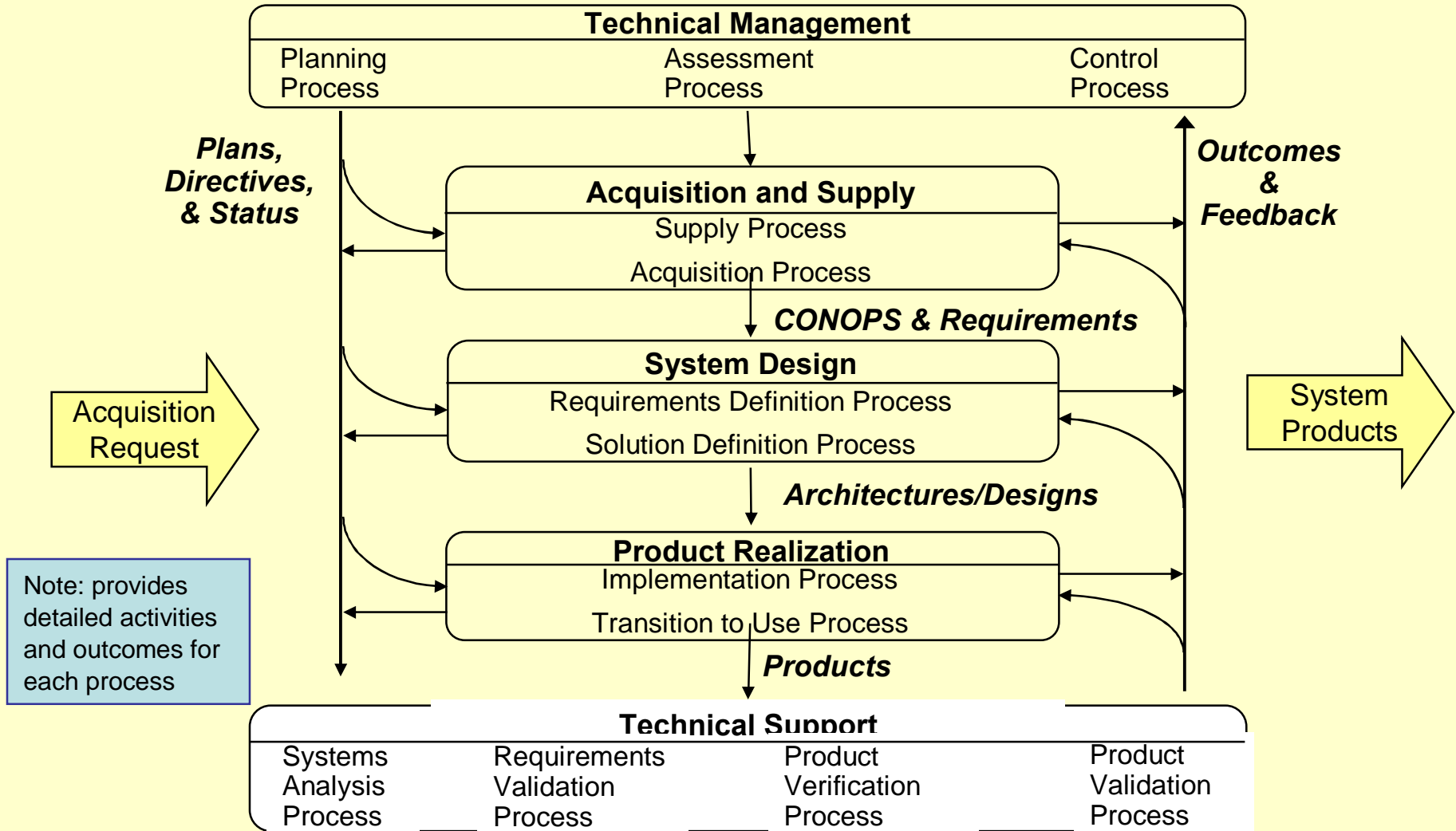


* Requirements/ Functional /Design trade studies & assessments

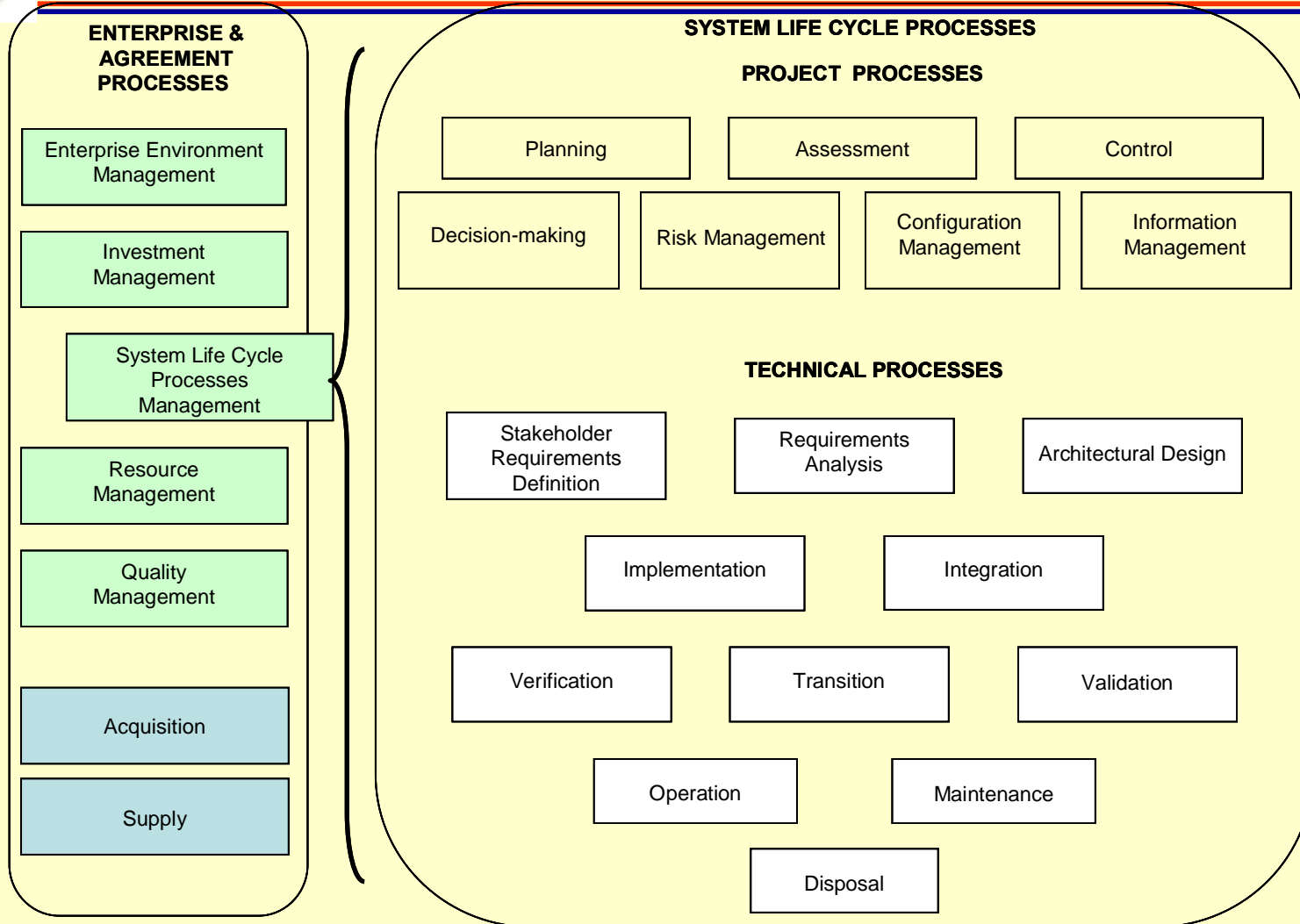
Processes for Engineering a System

(1999; reaffirmed 2003)

(Source: INCOSE SE Handbook v2)



5288: System Life-Cycle Processes (2002)



Note: Each process has purpose, outcomes, and activities

Figure1-1 System Life Cycle Process Overview per ISO/IEC 15288

DEV v1.2 Process Areas - 2006

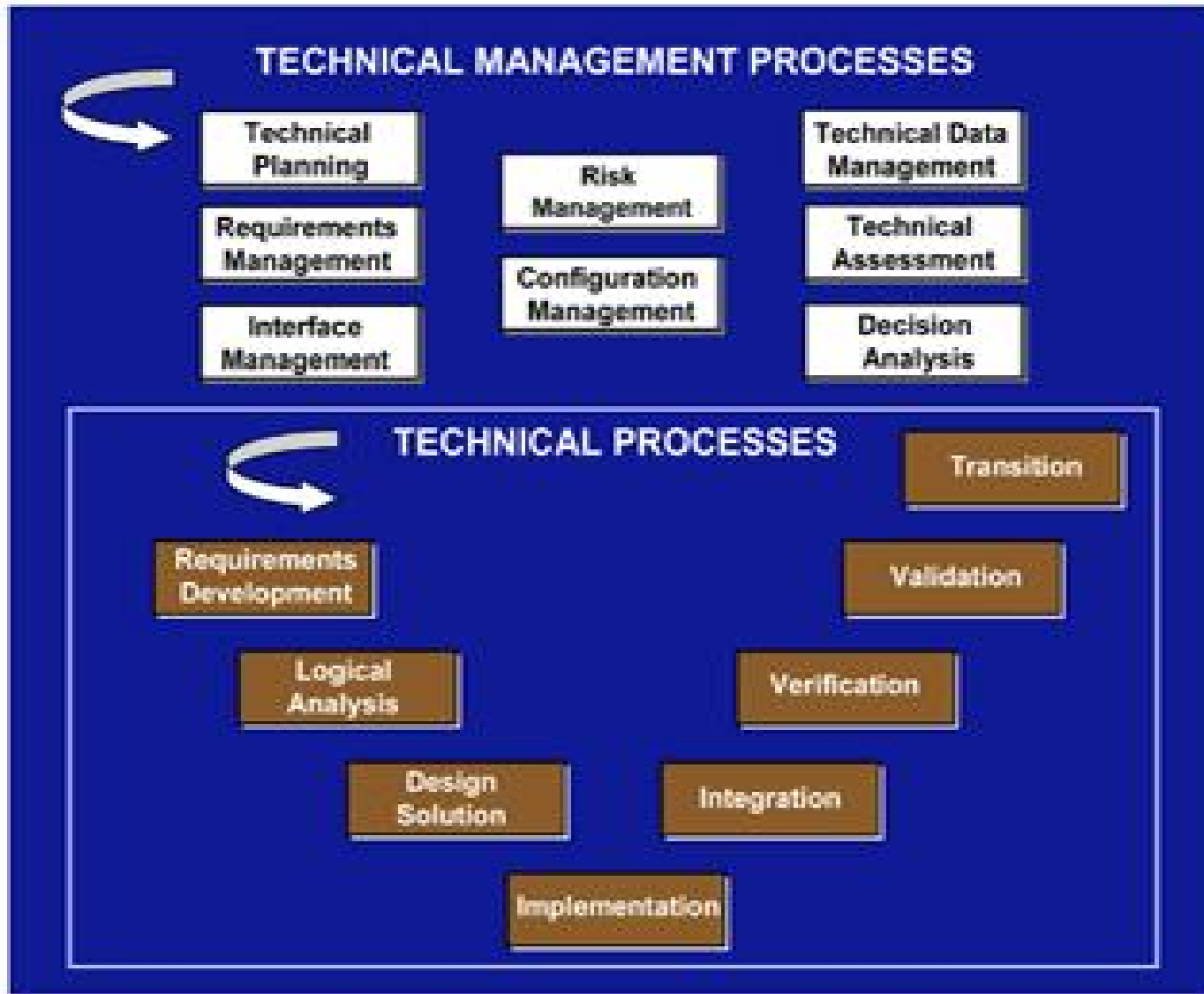
(3 only; grouped per Continuous model)

Category	Process Area
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management Risk Management
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Decision Analysis and Resolution
Engineering	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
Process Management	Organizational Process Definition Organizational Process Focus Organizational Training

Source: SEI/CMU

Design Acquisition Guide (DAG)

[Source: Chapter 4 on SE; 11/04]



[Note: DAG/SE 'derived' from ISO/IEC 15288, EIA-632, IEEE 1220, and DAU 2001 SE Handbook]

Standards/Models Example Mapping - Management

	ISO 9000:2015	IEEE 1220	CMMI®-DEV	DAG/SE
15288				
Project Planning	Planning	Planning tech effort; Integration of SE effort; Development strategies	Project Planning; Integrated PM; Product QA	Technical Planning; <i>Technical Data Mngt.</i>
Project Assessment	Assessment	Control	Measurement & Analysis [M&A]	Technical Assessment
Project Control	Control	Control; System breakdown structure	Project Monitoring & Control	Technical Assessment; CM; Interface Mngt.
Decision Making	Systems Analysis (SA)	Systems Analysis	Decision Analysis & Resolution; M&A	Decision Analysis
Risk Management	Systems Analysis	Systems Analysis	Risk Management	Risk Management
Configuration Management (CM)	CM	CM; Integrated repository and data package	CM; <i>Requirements Management</i>	CM; Requirements Mngt.; Interface Mngt.
Information Management	<i>info dissemination</i>	<i>Integrated DB/pkg.</i>	<i>Project Planning</i>	Technical Data Management
Agreement: Acquisition & Supply	Acquisition & Supply		Supplier Agreement Management [see also CMMI-ACQ]	<i>see other DAG chapters [e.g., Affordability & LC Resource Estimates]</i>
Enterprise: Environment, Life Cycle, Resource; Quality Mngt.	Environment & Enterprise Support [e.g., resource, process mngt.]	Quality Management; Product & Process Improvement	Process Management processes; Process & Product QA	<i>see other DAG Chapters [e.g., life cycle logistics]</i>

Standard/Models Example Mapping - Technical

	ISO 9000	ISO 632	IEEE 1220	CMMI®-DEV	DAG/SE
15288					
Stakeholder Requirements Definition	Requirements Definition	Requirements Analysis	Requirements Development & Management	Requirements Development & Management	Requirements Development; Logical Analysis
Requirements Analysis	Systems Analysis (SA)	Requirements and Functional Analysis; SA; Modeling	Requirements Development	Requirements Development	Logical Analysis
Architectural Design	Solution Definition	Functional Analysis; Synthesis; SA; Modeling, Specs/drawings	Technical Solution	Technical Solution	Logical Analysis; Design Solution
Implementation	Implementation; production	<i>prototyping; fabrication, assembly, production</i>	Technical Solution	Technical Solution	Implementation
Integration			Product Integration	Product Integration	Integration;
Verification	System Verification	Functional & Design Verification; Tech reviews	Verification	Verification	Verification; [+Chap 9 - IT&E]
Validation	Requirements & End Products Validation	Requirements Validation; Tech reviews	Validation	Validation	Validation; [+Chap 9 - IT&E]
Transition	Transition to Use		<i>Product Integration</i>	<i>Product Integration</i>	Transition
Operation; Maintenance; & Disposal	<i>field support</i>	<i>support stage</i>			<i>See other DAG chapters [e.g., Life Cycle Logistics]</i>

Imminent Changes

- Following is a quick overview of anticipated changes in
 - ” ISO/IEC 15288
 - ” ISO/IEC 12207
 - ” EIA-632

ation of Key Standards Underway

➤ Why?

- “ Differing concepts, structure, and audience
- “ First ~~align~~ using a common nomenclature structure for ISO/IEC 15288 & 12207
- “ Later a general life cycle process to provide a baseline; focus on interoperability and integration
- “ Goal is a single vocabulary, process set, uniform architecture, shared level of prescription, and suitable across audiences

Sources: Garry Roedler, Lockheed Martin, notes from SC7 subcommittee of ISO/IEC Joint Technical Committee; James W. Moore, Mitre; Harmonization of Systems & Software Engineering Processes; 6/07; brief to ASQ-DC [IEEE and INCOSE supporting]

12207:1995 List of Processes

Processes, Activities, and Tasks

Primary Life Cycle Processes

Acquisition Process*

Supply Process*

Development Process [to be addressed]

Operation Process*

Maintenance Process*

Organizational Life Cycle Processes

Management Process**

Infrastructure Process*

Improvement Process**

Training Process**

Supporting Life Cycle Processes

Documentation Process

Configuration Management Process*

Quality Assurance Process**

Verification Process*

Validation Process*

Review process

Audit Process

Problem Resolution Process

*Maps directly to 15288:2007

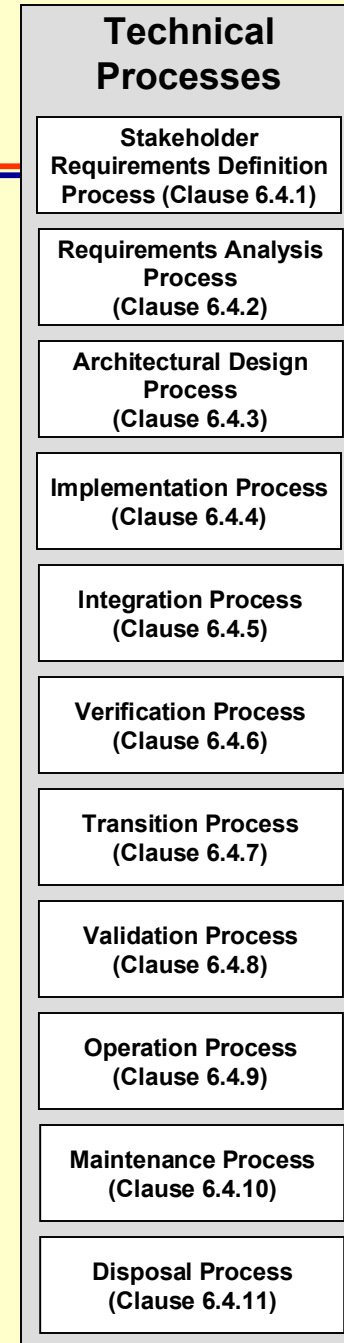
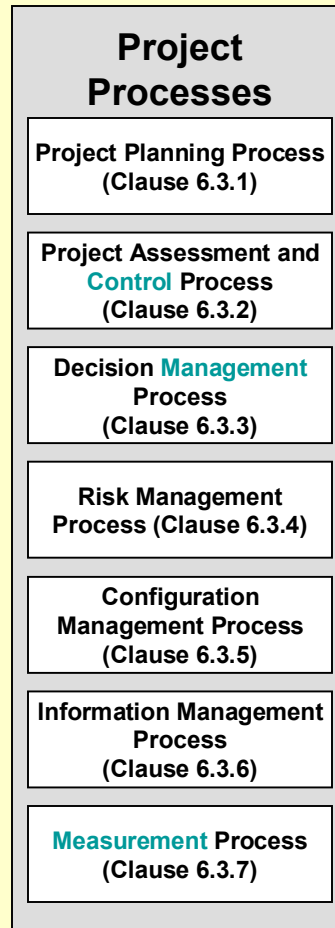
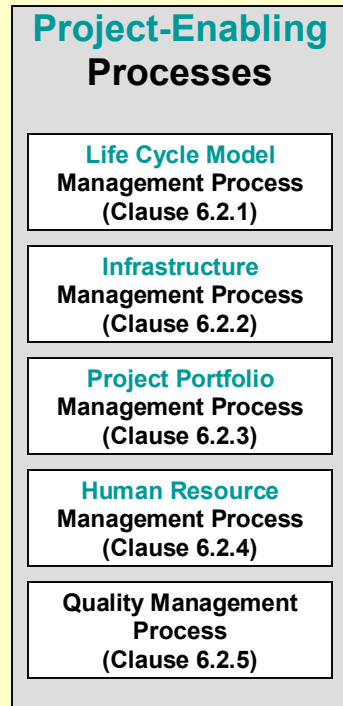
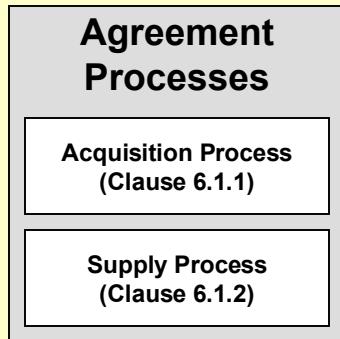
** maps indirectly to 15288:2007

Sources: Anatol Kark, Canadian National Research
Center via Karen Richter, IDA, in support of DUSD(A&T)
SSE/SSA; 10/07

Life Cycle Processes

17

**Changes are highlighted*



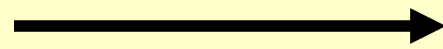
Source: Anatol Kark, Canadian National Research Center via Karen Richter, IDA, in support of DUSD(A&T) SSE/SSA; 10/07

2207: 2007 Development Process

[2207:1995]

System Context Activities:

- System Requirements Analysis*
- System Architectural Design*



- System Integration*
- System Qualification Testing
- Software Installation
- Software Acceptance Support

Note: SW Reuse processes added:

- “ Domain Engineering
- “ Reuse Asset Management
- “ Reuse Program Management

* Maps to ISO/IEC 15288:2007
Technical processes

Software [SW] Activities:

- “ SW Implementation
- “ SW Requirements Analysis
- “ SW Architecture Analysis
- “ SW Detailed Design
- “ SW Coding & Testing
- “ SW Integration
- “ SW Qualification Testing

Sources: Anatol Kark, Canadian National Research Center via Karen Richter, IDA, in support of DUSD(A&T) SSE/SSA;10/07; James W. Moore, Mitre; Harmonization of Systems & Software Engineering Processes; 6/07; brief to ASQ -DC.

Draft proposal for EIA-632A

[Source: GEIA report; R. Harwell, 11/05 – ood?]

EIA – 632 [1999]	EIA – 632A [date?]
Planning	Planning
Assessment	Progress Assessment
Control	Control
Requirements Definition	Concept Definition
Solution Definition	System Definition
Product Realization [Implementation/Transition]	System Realization
Systems Analysis	Mission & Systems Analysis
Requirements & End products Validation; System Verification	System V&V
Supply & Acquisition	Customer & Supplier Relationship Management
Enterprise Support	Resources & Infrastructure
Enterprise Support	Governance
Enterprise support	Life Cycle Portfolio Management

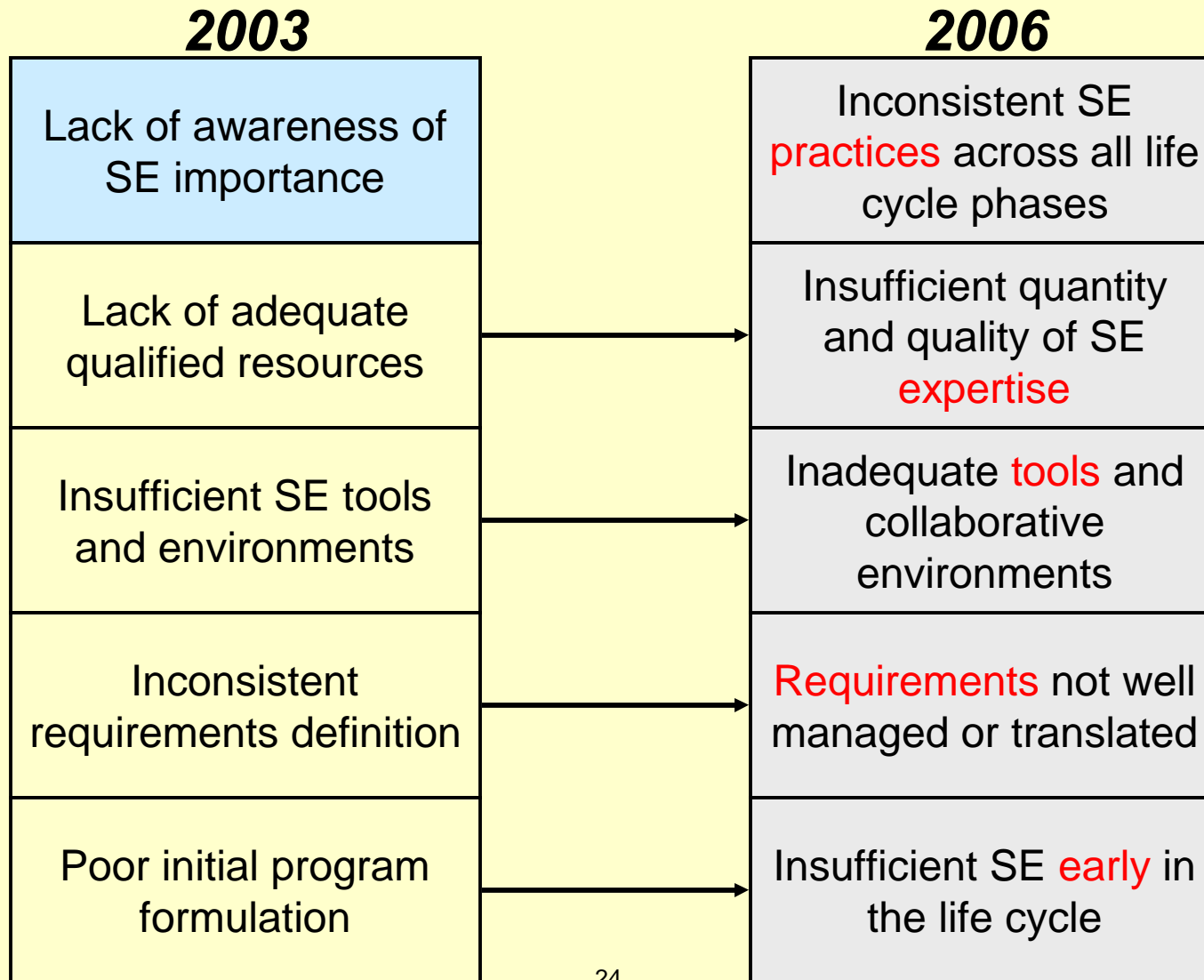
ODUSD(A&T) Systems & Software Engineering (SSE) Directorate Related Activities

Recent Issues identified as they relate to SE activities:

- ” NDIA-SE Workshop on SE issues
- ” DoD SW Engineering Workshop [via NDIA-SE]
- ” ODUSD(A&T) / SSE *Assessment & Support - Program Support Reviews* observations

SE Top 5 SE Issues

Source: NDIA SE Conference 10/06; M. Schaffer DUSD(A&T) SSE



SE Top Software Issues

1. The impact of **requirements** upon software is **not consistently quantified and managed** in development or sustainment.
2. **Fundamental system engineering decisions** are made **without full participation of software engineering**.
3. Software **life-cycle planning** and management by acquirers and suppliers is **ineffective**.
4. The quantity and quality of **software engineering expertise** is **insufficient** to meet the demands of government and the defense industry.
5. Traditional **software verification techniques** are **costly** and **ineffective** for dealing with the scale and complexity of modern systems.
6. There is a **failure to assure correct, predictable, safe, secure execution of complex software** in distributed environments.
7. **Inadequate** attention is given to total lifecycle issues for **COTS/NDI** impacts on lifecycle cost and risk.

Source: NDIA Top Software Issues Workshop
August 2006; K Baldwin, DUSD(A&T) SSE/SSA

10 Emerging Systemic Issues

[from ODUSD(A&T) SSE/AS Program Support Reviews]

1. Management
 - “ IPT roles, responsibilities, authority, poor communication
 - “ Inexperienced staff, lack of technical expertise
2. Requirements
 - “ Creep/stability
 - “ Tangible, measurable, testable
3. Systems Engineering
 - “ Lack of a rigorous approach, technical expertise
 - “ Process compliance
4. Staffing
 - “ Inadequate Government program office staff
5. Reliability
 - “ Ambitious growth curves, unrealistic requirements
 - “ Inadequate test time for statistical calculations
6. Acquisition Strategy
 - “ Competing budget priorities, schedule-driven
 - “ Contracting issues, poor technical assumptions
7. Schedule
 - “ Realism, compression
8. Test Planning
 - “ Breadth, depth, resources
9. Software
 - “ Architecture, design/development discipline
 - “ Staffing/skill levels, organizational competency (process)
10. Maintainability/Logistics
 - “ Sustainment costs not fully considered (short-sighted)
 - “ Supportability considerations traded

Source: DUSD(A&T) SSE; M Schaeffer, 8/07

Major contributors to poor program performance

2007 – What a Year!

- INCOSE SE Handbook v 3.1
- Understanding & Leveraging a Supplier's CMMI Efforts; A Guidebook for Acquirers
- CMMI for Acquisition [CMMI-ACQ]
- ISO/IEC 15288:2007
- ISO/IEC 12207:2007

...and yet to come...

- “ EIA-632?
- “ IEEE-1220? [and adoption of latest ISO/IEC 15288, 12207]
- “ ISO/IEC 24748 - Life Cycle Management Process Standard
- “ Further Harmonization of ISO/IEC 15288 and 12207
- “ CMMI®-DEV v2?

- **ISO/IEC 15288 is becoming a SE process 'reference' model**
 - " **IEEE – 1220; 2005** updated per ISO/IEC 15288; IEEE adopted the 15288 w elaboration; further updates anticipated
 - " **CMMI-DEV v1.2** uses SE standards and models as sources
 - " **ISO/IEC 12207** (SW Engineering processes) is being harmonized with 15288; additionally a **ISO/IEC 24748** Guide for LC Mngt. in draft
 - " **INCOSE SE Handbook v3.1, 2007** [applies ISO/IEC 15288; SE Certification will be based on it.
 - " Coordination also underway with the **ISO 9001**
- **DoD supported SE & SWE in Acquisition revitalization activities**
 - " **DAG/ SE & T&E** are under revision; one area of expansion is **Software Engineering**
 - " **DAU** has implemented a series of SE courses
 - " **DoD Guides:**
 - 'Integrating SE into DoD Acquisition Contracts'
 - 'System of Systems (SoS) Engineering 'Guide being piloted
 - 'SE Plan Preparation Guide' revised
 - " **NDIA-SE draft Systems Assurance Guide**

Acronyms/Definitions

- A&T . Acquisition and Technology [@ODUSD]
- ANSI . American National Standards Institute
- DAU . Defense Acquisition University
- DoD . U.S. Department of Defense
- DoDI . DoD Instruction
- EIA . Electronic Industries Alliance
- GEIA . Government Electronics and Information Technology Association
- IEC . International Electrotechnical Commission
- IEEE . Institute for Electrical and Electronics Engineers
- INCOSE . International Council on Systems Engineering
- ISO . International Standards Organization
- IT . Information Technology
- NDIA . National Defense Industries Association [SE division]
- PMI . Project Management Institute
- SE . Systems Engineering
- SEI . Software Engineering Institute [@Carnegie Mellon U.]
- SEMP . SE Management Plan
- SEP . Systems Engineering Plan
- SSCI . Systems and Software Consortium
- SSA . Software Engineering and Systems Assurance
- SSE . Systems & Software Engineering Directorate [ODUSD (A&T)]
- SWE . Software [SW] Engineering

Related Process References

- **ISO/IEC 15288: 2002** System Engineering . System Life Cycle Processes *[new version released 2007]*
- **EIA/IS - 632: 1998** - Processes for Engineering a System
- **IEEE 1220: 2005** Application and Management of the Systems Engineering Process
- **CMMI®-DEV**. Capability Maturity Model Integration® for Development v1.2 (2006) *[updating underway]*
- **Defense Acquisition Guide**, Chapter 4 - Systems Engineering; Defense Acquisition University, 2004 *[being updated]*
- **Understanding and Leveraging a Supplier's CMMI Efforts**; DUSD(A&T) SSE; 2007
- **CMMI® – ACQ**: Adapting CMMI® for Acquisition Organizations: A Preliminary Report; 2006 *[new model report released 11/07 by SEI/CMU]*
- **INCOSE** Systems Engineering Handbook, v3.1; 8/2007
- **PMBOK®** PMI's Project Management Book of Knowledge
- **IEEE/EIA 12207** [adopted ISO/IEC 12207]; 1997 *[new version released 2007]*

ces and Links

References:

- *SE Standards & Models Compared*; J. Lake (SMi) and S. Sheard (SPC), INCOSE 2004
- *Evolution of a Standard EIA-632*; R. Harwell, INCOSE 2006
- *Special Feature: Standards in Systems Engineering*; **INCOSE Insight** ; April 2007 (see particularly K. Crowder, D. Kitterman, T. Doran, R. Harwell, and S. Arnold articles)
- *CMMI – Next Steps*; Kristen Baldwin, ODUSD(A&T) SSE/SSA; CMMI technology Conference; November, 2007
- *Harmonization of Systems and Software Engineering Processes*; James W. Moore; Mitre; June, 2007, brief for ASQ-DC meeting
- *Issue on Systems Engineering*; **CROSSTALK**, STSC; October 2007

Links:

- ANSI/EIA-632: <http://www.geia.org/index.asp?bid=552>
- CMMI: <http://www.sei.cmu.edu/cmmi/>
- DAU-DAG: <http://akss.dau.mil/dag/>
- IEEE -1220: http://www.techstreet.com/cgi-bin/detail?product_id=1260785
- IEEE Standards: <http://www.ieee.org/web/standards/home/index.html>
- INCOSE . Standards site: <http://www.incose.org/practice/techactivities/standards.aspx>
- INCOSE Guide to SE BoK: <http://g2sebok.incose.org/>
- ISO: <http://www.iso.org/iso/home.htm>
- ISO/IEC 15288: <http://www.15288.com/>
- NDIA-SE: <http://www.ndia.org/Template.cfm?Section=Divisions> [then select SE]
- ODUSD (A&T) SSE: <http://www.acq.osd.mil/sse/>
- Systems & Software Consortium: <http://www.systemsandsoftware.org/>

Note: If you have problems locating references, contact me at gantzerd@saic.com

e:

Practices to *Technical Planning*

It was found very difficult to ‘map’ planning activities from the various standards & models at this level of detail – so decision was made to just summarize each for your own consideration

However, it is concluded that some very basic activities that need to be accomplished for planning are ...

– the what, why, who, when and how!

ISO/IEC 15288

EIA - 632

IEEE 1220

CMMI®-DEV

PM BoK

INCOSE SE Handbook

ODUSD(A&T) SSE Technical Planning considerations

5288 - Project Planning Activities

Purpose: to produce and communicate effective and workable project plans

- **Identify the project objectives and constraints**
- **Define the project scope as established in the agreement**
- **Establish a WBS based on evolving system architecture**
- **Define and maintain a project schedule based on project objectives and work estimates**
- **Project achievement criteria for the life cycle stage decision gates, delivery dates and major dependencies on external inputs or outputs**
- **Define the project costs and plan a budget**
- **Establish the structure of authorities and responsibilities for project work**
- **Define the infrastructure and services required by the project**
- **Plan the acquisition of materials, goods and enabling system services supplied from outside the project**
- **Generate and communicate a plan for technical mgmt. of the project, including the reviews**
- **Define the project measures to be generated and the associated data to be collected, validated and analyzed**
- **Generate a project quality plan**

62 – Technical Planning

- **Process Implementation Strategy**
 - “ **stakeholders, applicable docs, process approaches, LC phases, integration, reporting requirements, implementation**
- **Technical Effort Definition**
 - “ **Requirement types, db, risk mngt. process metrics, metrics/quality, cost objectives, TPMs, tasks, methods & tools, technology**
- **Schedule & Organization**
 - “ **Event& calendar based schedules, resources, staffing/disciplines, team/ org structure**
- **Technical Plans**
 - “ **Engineering, Risk mngt., Tech Review, V &V, other**
- **Work Directives**
 - “ **Work packages, work authorizations**

10 - Planning the Technical Effort

“Prepare and Implement the technical plans and schedules to guide the project toward accomplishment of its objectives and proper conclusion.”

- “ **Engineering Plan [example SEMP content]**
- “ **Master and Detail Schedules**
- “ **Technical Plans**
- “ **Developmental Strategies**
- “ **Modeling & Prototyping**
- “ **Integrated Repository, Data, Tools, and Integrated Data Package**
- “ **Hw, SW, Humans**
- “ **Life Cycle Processes**
- “ **Specifications and Drawing Trees; SBS**
- “ **Integration the SE Effort**
- “ **Tech Reviews**
- “ **Quality Management**
- “ **Product & Process Improvement**

Source: IEEE - 1220

– DEV - Project Planning

Purpose: to supply and maintain plans that define project activities.

➤ **Establish Estimates**

- “ **Estimate** scope
- “ **Establish Estimates** of work products/attributes
- “ **Define** life cycle
- “ **Determine** effort & cost estimates

➤ **Develop Project Plan**

- “ **Establish** budget & schedule
- “ **Identify** risks
- “ **Plan** for data management,
- “ **Plan** for resources; **Needed** knowledge & skills
- “ **Plan** stakeholder involvement
- “ **Establish** the Plan

➤ **Obtain commitment to the Plan**

- “ Review **plans that affect project**
- “ Reconcile **work & resource levels**
- “ **Obtain** commitment

■ *Other key process area relationships: – Requirements Development, Project Monitoring & Control, Supplier Agreement Mngt. , Integrated PM, Risk Mngt., Measurement & Analysis, ...*

1: Generic Practices for all process areas

- Perform the planning process
- Establish & maintain an Org **policy** for planning process
- **Plan the planning process**
- Provide **resources**
- Assign **responsibility**
- Train people
- Manage **configurations**
- Identify and involve relevant **stakeholders**
- Monitor and control the planning process
- Objectively **evaluate** adherence to the planning process
- Review status with higher level management

SE Handbook - Planning Process

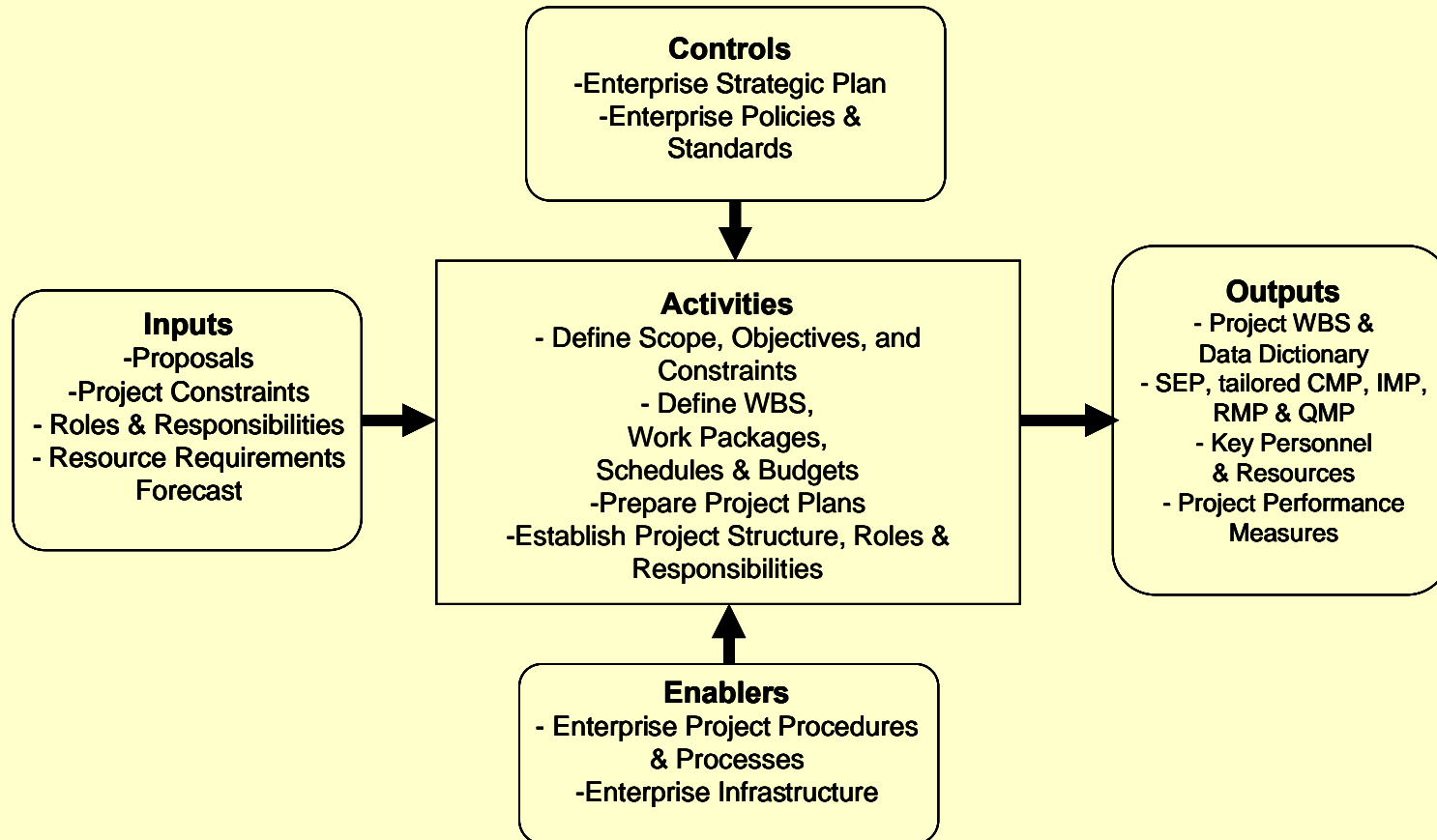


Figure 5-2 Context Diagram for the Project Planning Process

Management – Book of Knowledge (PMBOK) (Management area)

- Scope*
 - Integration
(charter, scope statement,
PMP)
 - Communication*
 - Risk*
 - Quality*
 - Human Resources*
 - Time (definition,
sequencing, estimation)
 - Cost (estimation,
budgeting)
 - Procurement (purchase,
acquisition, contracting)
- * Apply Planning, Execution &
Control to each area**

* Note: DoD PMBoK Extension (2003 also covers
SE, SW Acquisition, Logistics, T&E, Manufacturing

Source: www.PMI.org ; 3rd Edition, 2004

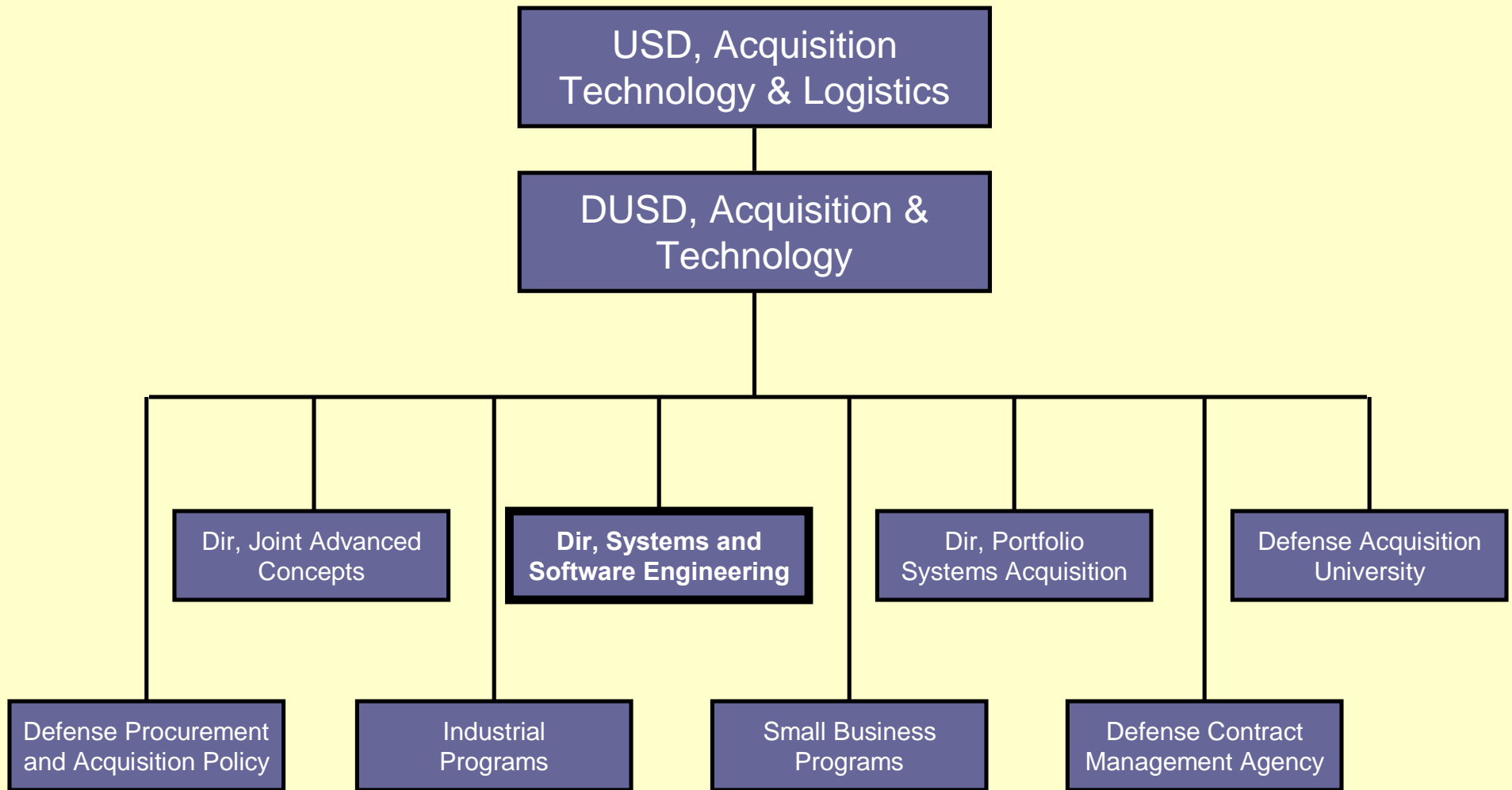
&T) SSE - Technical Planning Emphasis

- **Manage a Comprehensive Set of Requirements**
 - “ **Define project scope w key stakeholders [FoS, SoS]**
 - “ **Formulate, assess, select the preferred system concept**
 - “ **Develop explicit and testable system/project requirements**
 - “ **Develop a WBS [products & process]**
- **Resource & Staffing to the Technical Plan**
 - “ **Organize and staff the project team [PM, Lead SE, IPTs]**
 - “ **Estimate the time and resource requirements [IMS, EVMS]**
 - “ **Develop a project critical path**
 - “ **Develop a project budget**
- **Develop and Managing Technical Baselines**
 - “ **Identify, manage, and mitigate project risks [technical]**
 - “ **Manage project changes and customer expectations**
- **Managing Event-based Technical Reviews**
- **Integrating Tech Planning into overall Program Planning & Management Context [IMP/IMS, EVMS, program Risks]**

*Note: DoD is updating DAG/SE, DoDI
5000.2, and SEP Prep Guide just updated*

Source: SE Plan Preparation Guide; 1/06

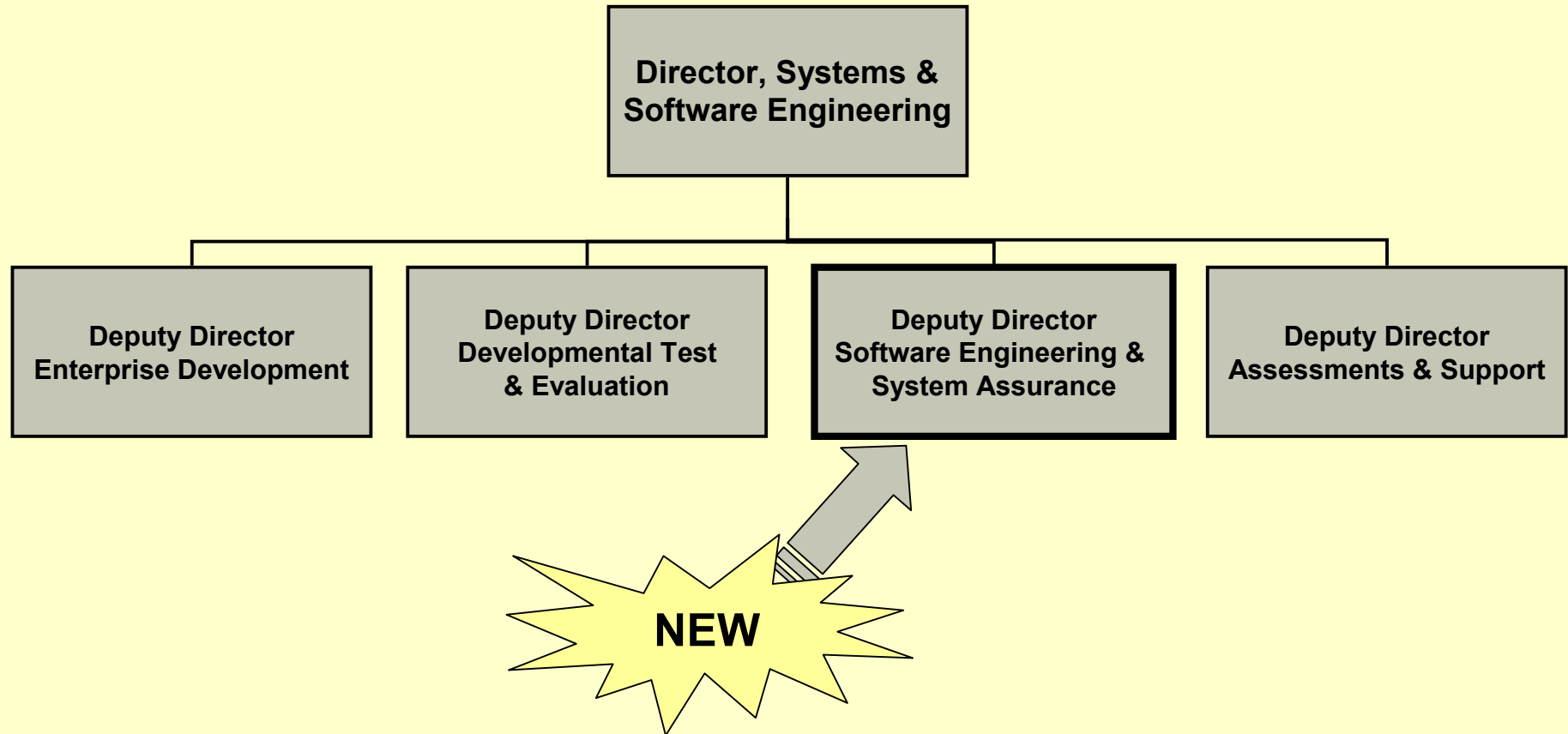
JSD (AT&L) Organization



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s and Software Engineering

An Organizational Construct



Management Visibility – Best Practices – Acquisition Excellence

) Systems and Software Engineering Mission Statement

- Shape acquisition solutions and promote early technical planning
- Promote the application of sound systems and software engineering, developmental test and evaluation, and related technical disciplines across the Department's acquisition community and programs
- Raise awareness of the importance of effective systems engineering and drive the state-of-the-practice into program planning and execution
- Establish policy, guidance, best practices, education, and training in collaboration with academia, industry, and government communities
- Provide technical insight to program managers and leadership to support decision making

Source: DOD(A&T) SSE; M Schaeffer, 8/07

We continue to evolve as the challenges change