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

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

CMMI Technology Conference

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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 Directotorate acquisition Initiatives
- To briefly address one key process activity ï 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.

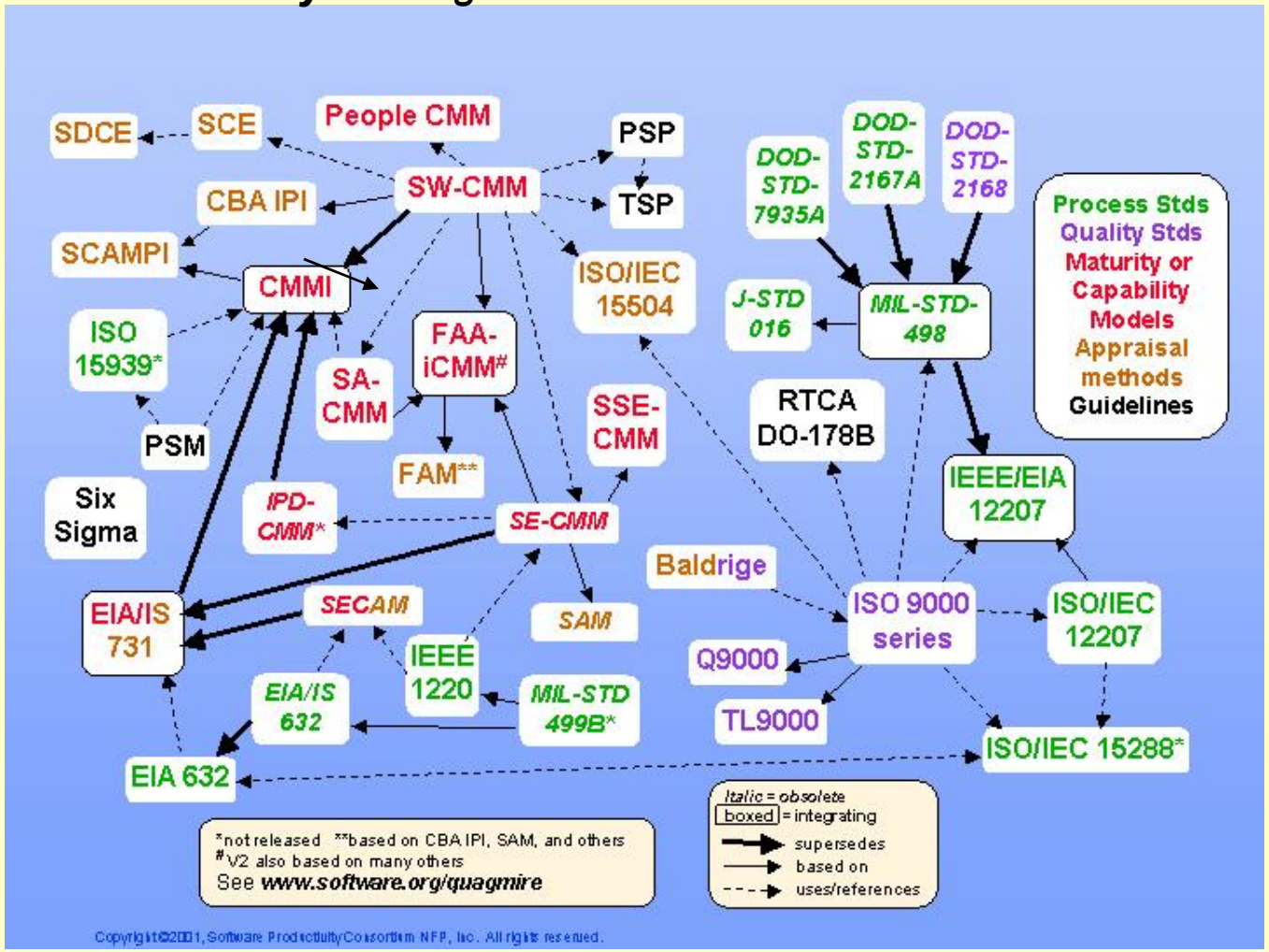
Agenda

- Introduction
- Systems Engineering Standards and Models
  - Evolution of Standards & Models
  - Summary of Standards & Models
    - ISO/IEC 15288: **System life Cycle Processes**
    - ANSI/EIA ï 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

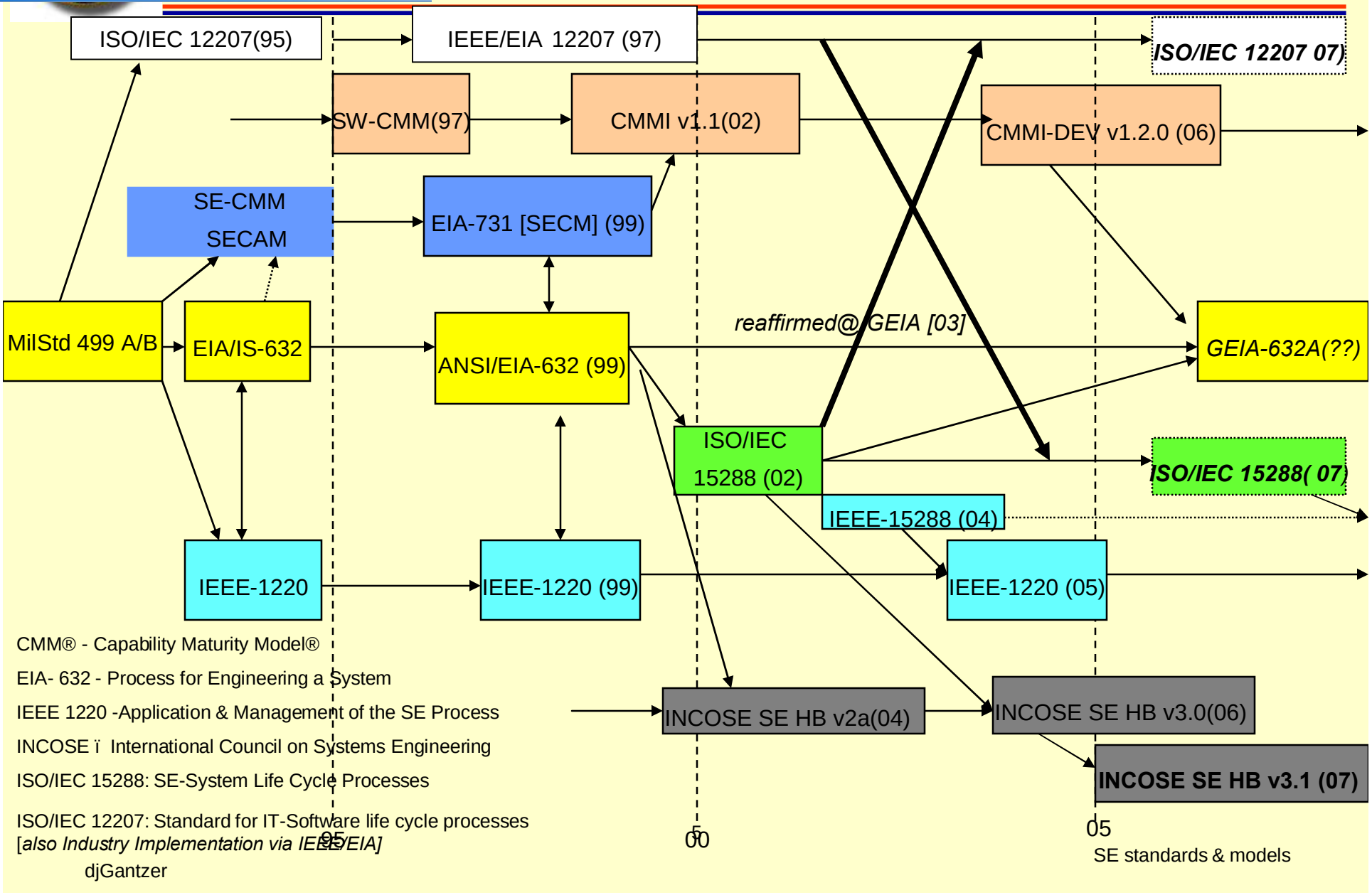
...cess Standards / Models Quagmire"

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



Source: Systems and Software Consortium [SSCI]

tandards and Models Trends



CMM® - Capability Maturity Model®

EIA- 632 - Process for Engineering a System

IEEE 1220 -Application & Management of the SE Process

INCOSE ï 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]*

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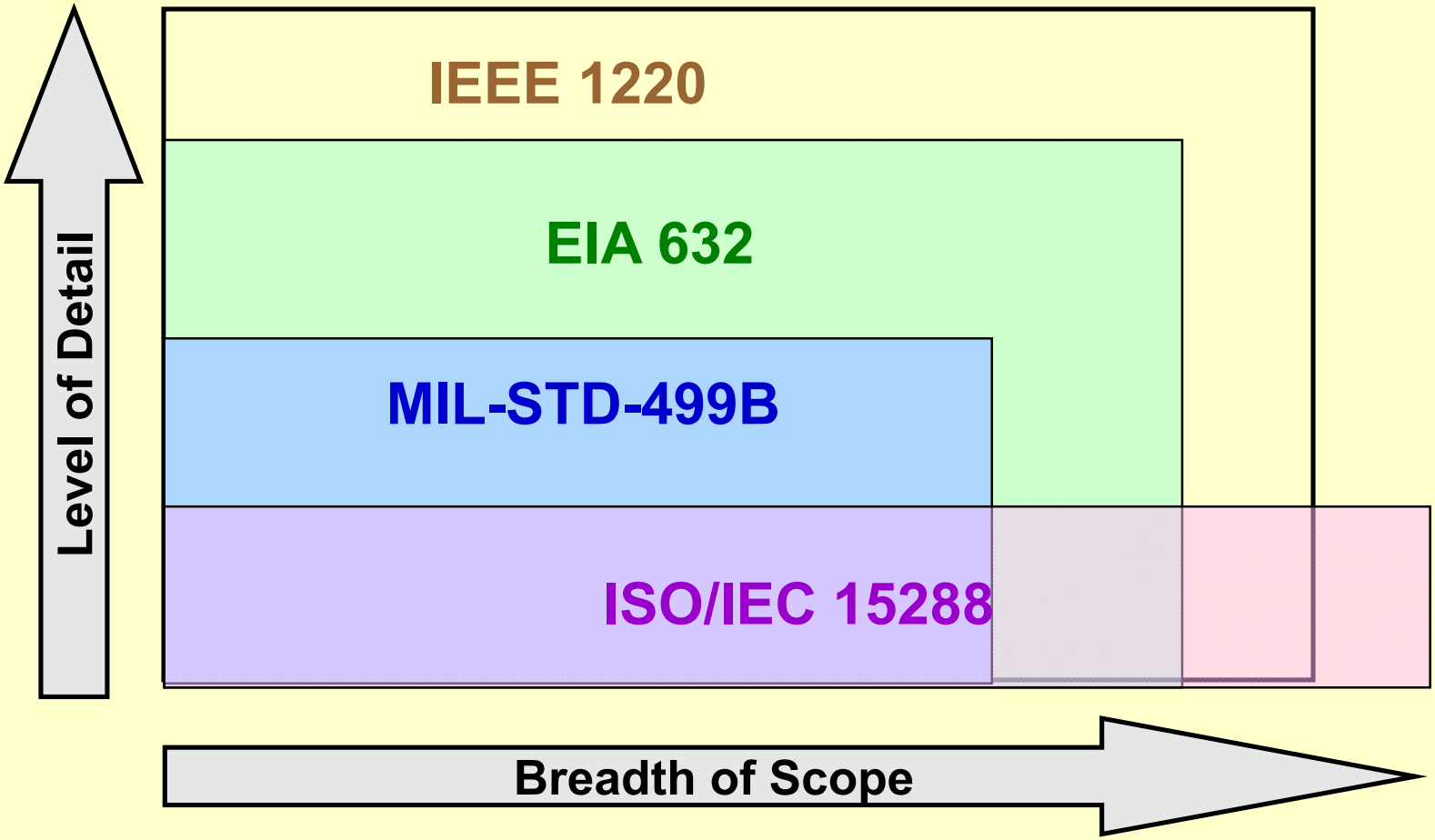
ew of SE related Standards

Standards / items	ISO/IEC 15288	EIA - 632	IEEE 1220	CMMI®-DEV
Purpose	Establish a common framework for describing the life cycle of systemsò	Provide an integrated set of fundamental processes to aid a developer in the engineering or re-engineering of a systemò	Defines the requirements for an enterpriseôs 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.

lards & Models Life Cycle Phases

ISO/IEC 15288	EIA - 632	IEEE 1220	CMMI®-DEV* **inferred*	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

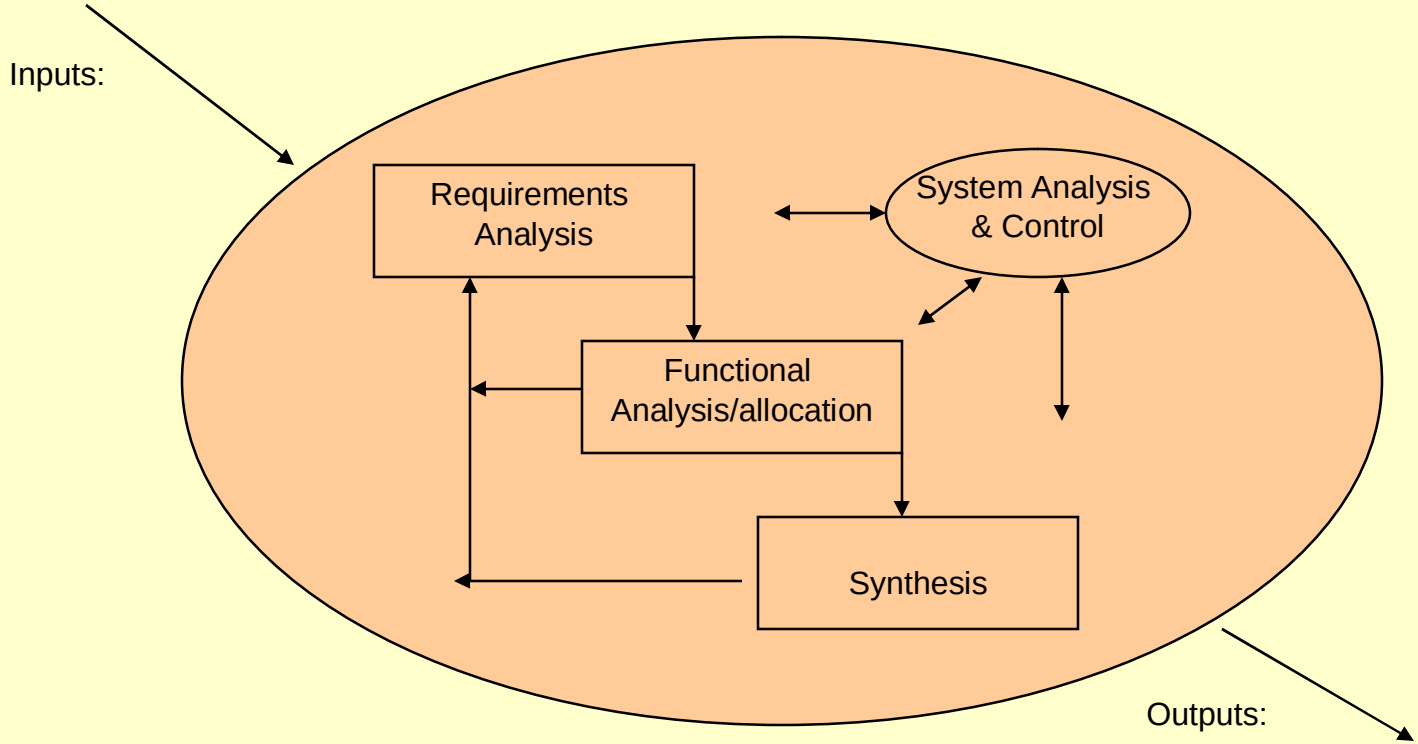
# of SE Standards



Source: S. Sheard, SPC and J. Lake, SMi; 2004

mple 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

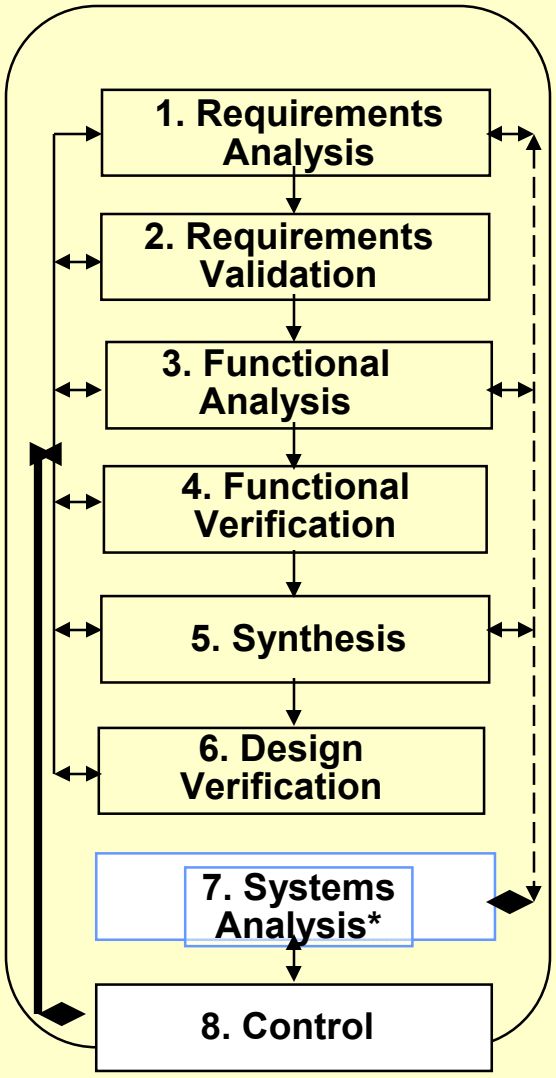
IEEE 1220: SE Process – 2005

Clause 4 - General Requirements

1. SE process
2. Polices & 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



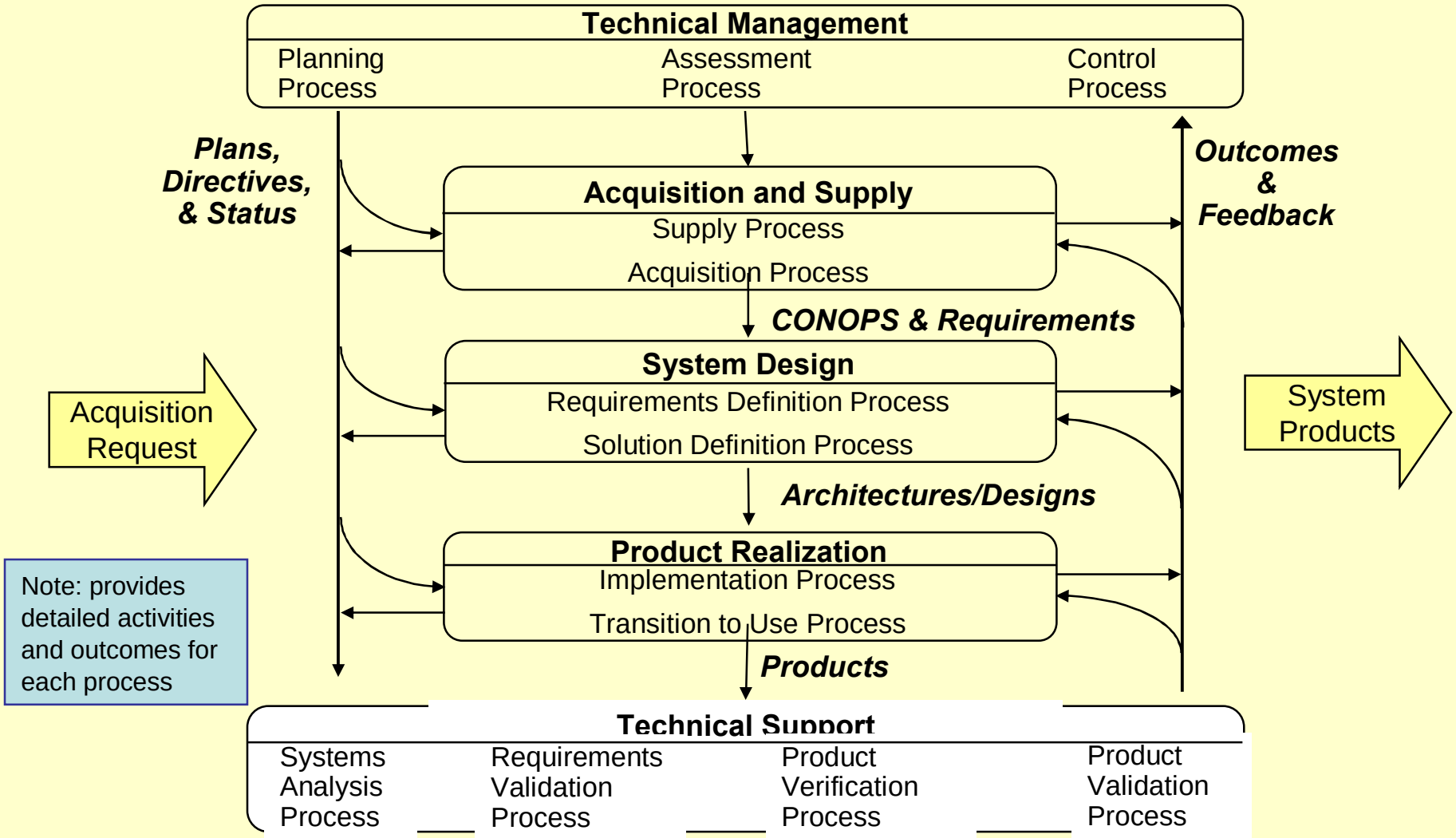
* Require-ments/ Functional /Design trade studies & assess-ments

Sources: SSCI + mods from IEEE 1220 - 1998

rocesses for Engineering a System

(1999; reaffirmed 2003)

(Source: INCOSE SE Handbook v2)



5288: System Life-Cycle Processes (2002)

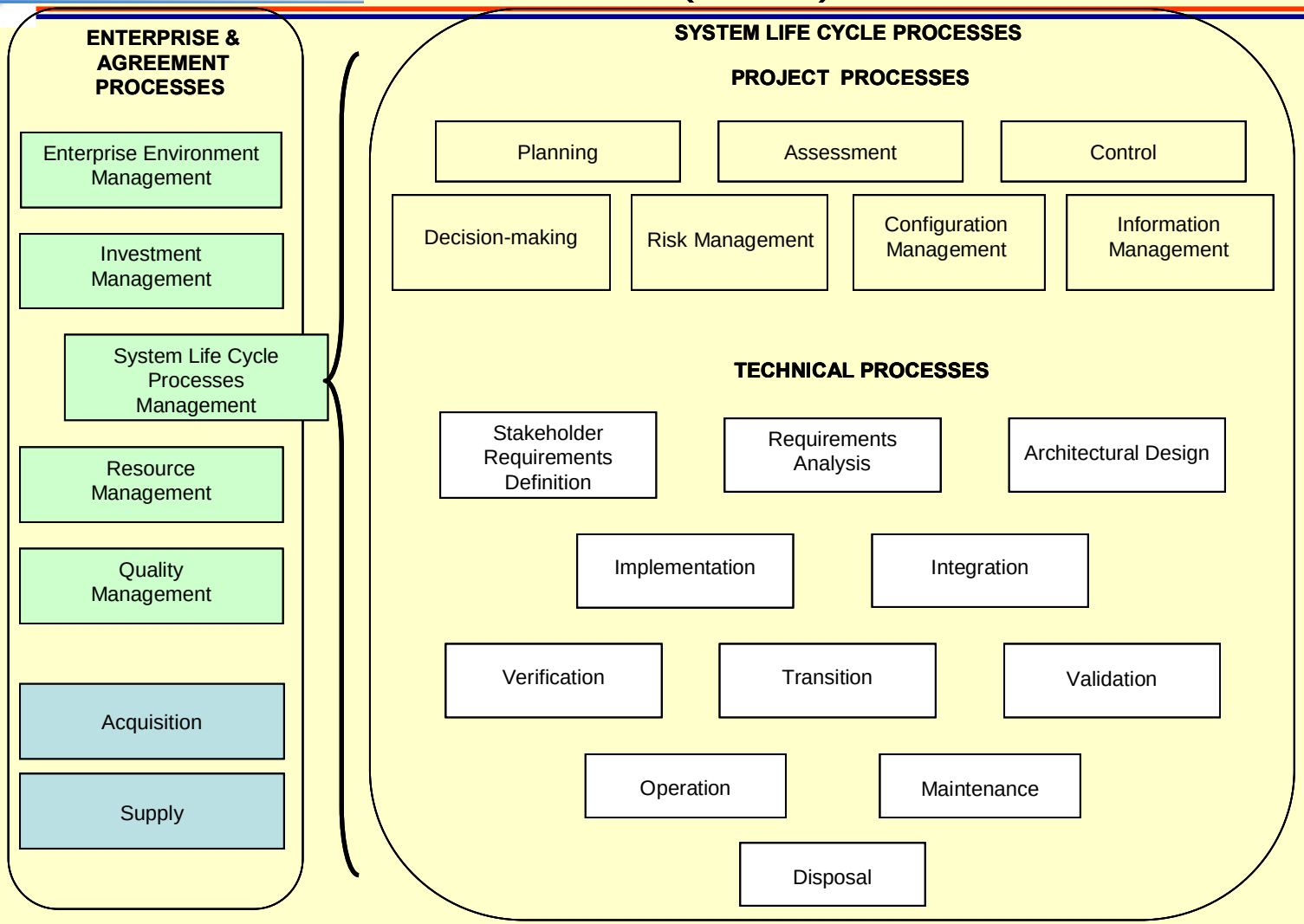


Figure1-1 System Life Cycle Process Overview per ISO/IEC 15288

Note: Each process has purpose, outcomes, and activities

Source: INCOSE SE Handbook, v3.0

DEV v1.2 Process Areas - 2006

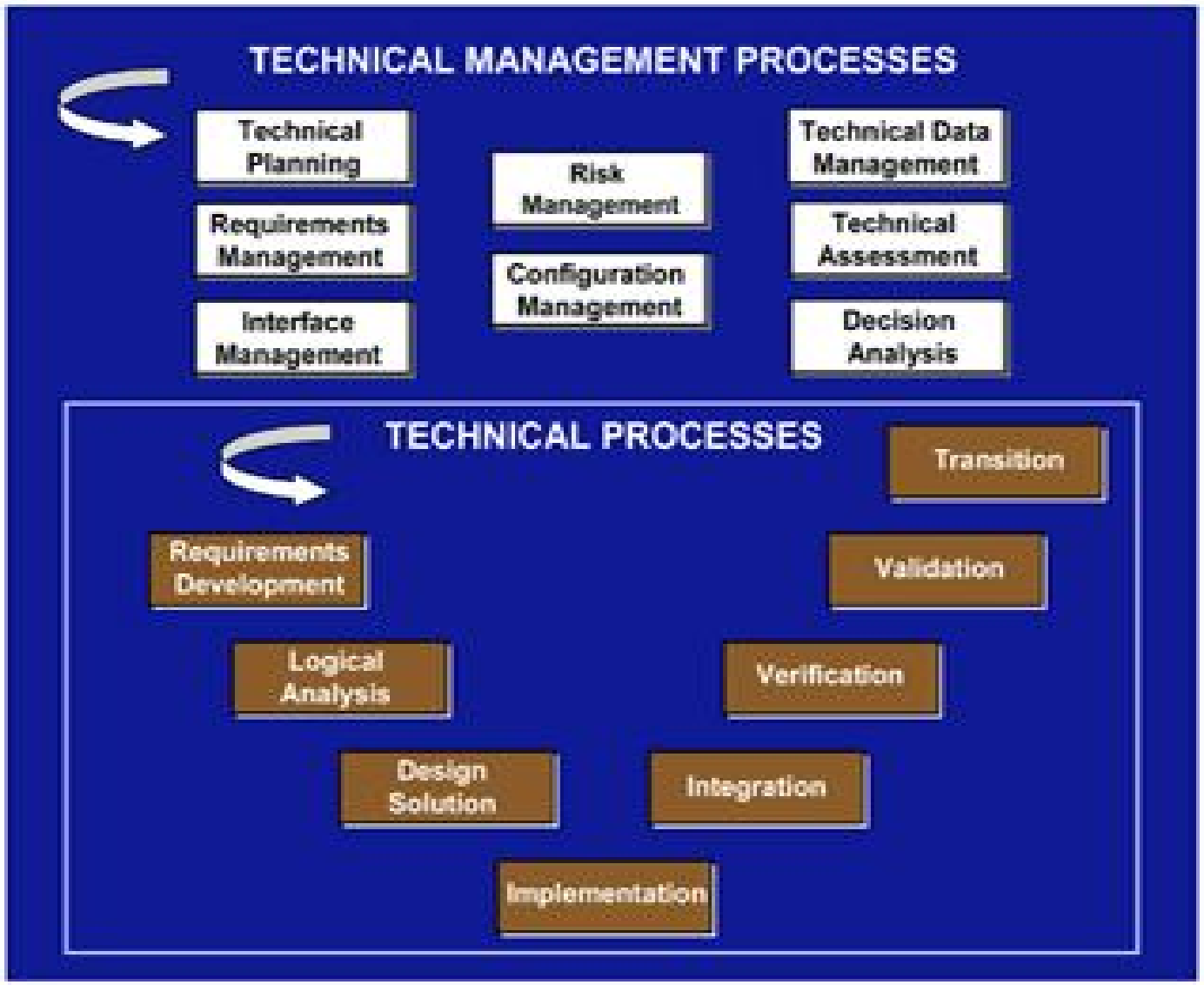
l 3 only; grouped per Continuous model)

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

nse 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]

s/Models Example Mapping - Management

ISO/IEC 15288	EIA 632	IEEE 1220	CMMI®-DEV	*DAG/SE*
Project Planning	Planning	Planning tech effort; Integration of SE effort; Development strategies	Project Planning; Integrated PM; Product QA	Technical Planning; *Technical Data Mngt.*
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; *Requirements Management*	CM; Requirements Mngt.; Interface Mngt.
Information Management	*info dissemination*	*Integrated DB/pkg.*	*Project Planning*	Technical Data Management
Agreement: Acquisition & Supply	Acquisition & Supply		Supplier Agreement Management [see also **CMMI-ACQ**]	*see other DAG chapters [e.g., Affordability & LC Resource Estimates]*
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	*see other DAG Chapters [e.g., life cycle logistics]*

ard/Models Example Mapping - Technical

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

Imminent Changes

- Following is a quick overview of anticipated changes iné

  - 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

e Cycle Processes
7

**Changes are highlighted*

Agreement Processes

- Acquisition Process (Clause 6.1.1)
- Supply Process (Clause 6.1.2)

Project-Enabling Processes

- Life Cycle Model Management Process (Clause 6.2.1)
- Infrastructure Management Process (Clause 6.2.2)
- Project Portfolio Management Process (Clause 6.2.3)
- Human Resource Management Process (Clause 6.2.4)
- Quality Management Process (Clause 6.2.5)

Project Processes

- Project Planning Process (Clause 6.3.1)
- Project Assessment and Control Process (Clause 6.3.2)
- Decision Management Process (Clause 6.3.3)
- Risk Management Process (Clause 6.3.4)
- Configuration Management Process (Clause 6.3.5)
- Information Management Process (Clause 6.3.6)
- Measurement Process (Clause 6.3.7)

Technical Processes

- Stakeholder Requirements Definition Process (Clause 6.4.1)
- Requirements Analysis Process (Clause 6.4.2)
- Architectural Design Process (Clause 6.4.3)
- Implementation Process (Clause 6.4.4)
- Integration Process (Clause 6.4.5)
- Verification Process (Clause 6.4.6)
- Transition Process (Clause 6.4.7)
- Validation Process (Clause 6.4.8)
- Operation Process (Clause 6.4.9)
- Maintenance Process (Clause 6.4.10)
- Disposal Process (Clause 6.4.11)

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

07:1995]

System Context Activities:

** Maps to ISO/IEC 15288:2007 Technical processes*

- System Requirements Analysis*
- System Architectural Design*

→

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

Software [SW] Activities:

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

Note: SW Reuse processes added:

- Domain Engineering
- Reuse Asset Management
- Reuse Program Management

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***

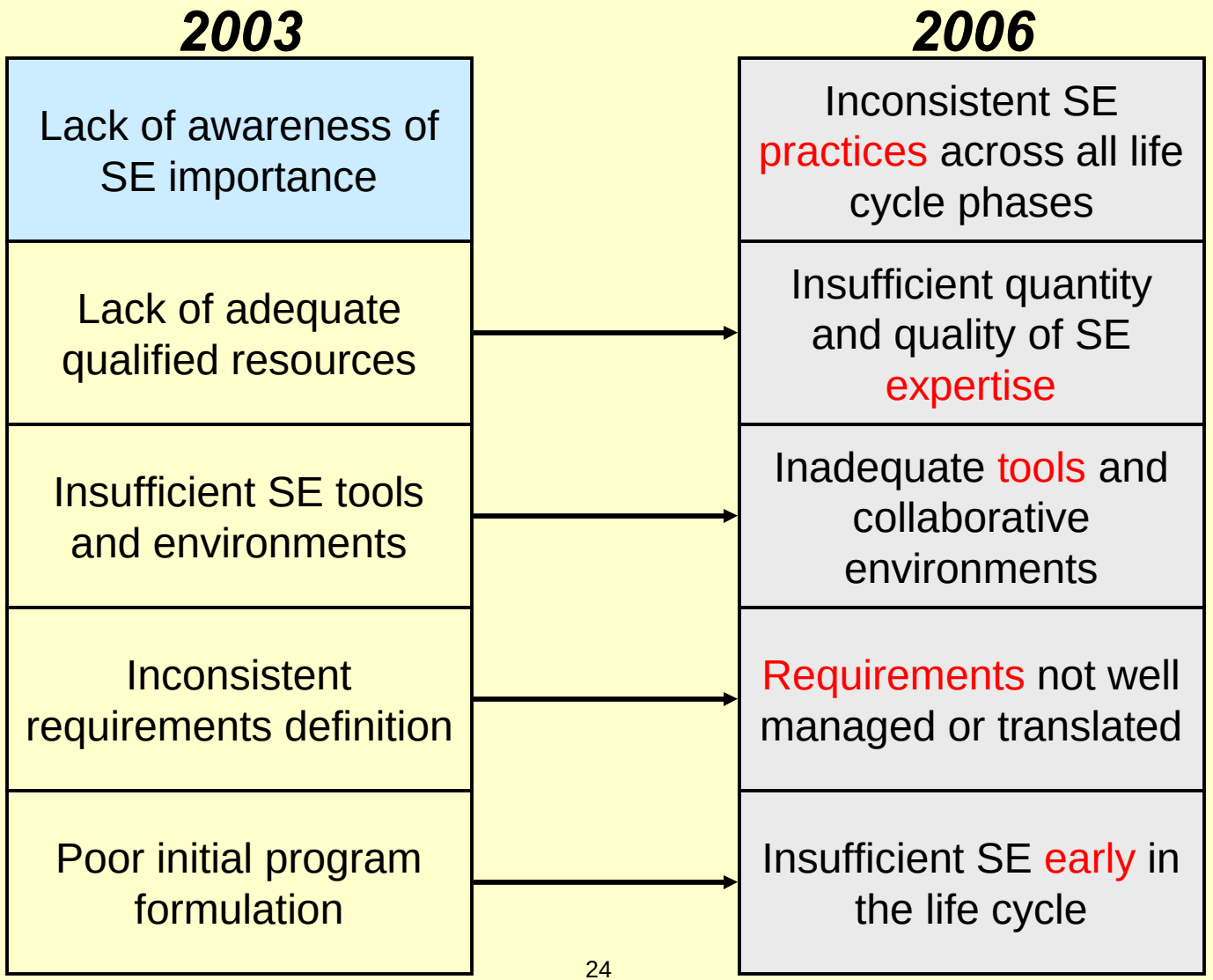
ODUSD(A&T) Systems & Software g (SSE) Directorate Related Activities

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



A-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	Å IPT roles, responsibilities, authority, poor communication Å Inexperienced staff, lack of technical expertise
2. Requirements	Å Creep/stability Å Tangible, measurable, testable
3. Systems Engineering	Å Lack of a rigorous approach, technical expertise Å Process compliance
4. Staffing	Å Inadequate Government program office staff
5. Reliability	Å Ambitious growth curves, unrealistic requirements Å Inadequate ñtest timeòfor statistical calculations
6. Acquisition Strategy	Å Competing budget priorities, schedule-driven Å Contracting issues, poor technical assumptions
7. Schedule	Å Realism, compression
8. Test Planning	Å Breadth, depth, resources
9. Software	Å Architecture, design/development discipline Å Staffing/skill levels, organizational competency (process)
10. Maintainability/Logistics	Å Sustainment costs not fully considered (short-sighted) Å 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 Supplierôs 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 ôadoptionôof latest ISO/IEC 15288, 12207]
- ISO/IEC 24748 - Life Cycle Management Process Standard
- Further ôHarmonizationôof ISO/IEC 15288 and12207
- CMMI®-DEV v2?

y

- **ISO/IEC 15288 is becoming a SE process 'reference' model**
  - **IEEE – 1220; 2005** updated per ISO/IEC 15288**;** IEEE ó adoptedô 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 ó harmonizedô 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 ï Acquisition and Technology [@ODUSD]
- ANSI ï American National Standards Institute
- DAU ï Defense Acquisition University
- DoD ï U.S. Department of Defense
- DoDI ï DoD Instruction
- EIA ï Electronic Industries Alliance
- GEIA ï Government Electronics and Information Technology Association
- IEC ï International Electrotechnical Commission
- IEEE ï Institute for Electrical and Electronics Engineers
- INCOSE ï International Council on Systems Engineering
- ISO ï International Standards Organization
- IT ï Information Technology
- NDIA ï National Defense Industries Association [SE division]
- PMI ï Project Management Institute
- SE ï Systems Engineering
- SEI ï Software Engineering Institute [@Carnegie Mellon U.]
- SEMP ï SE Management Plan
- SEP ï Systems Engineering Plan
- SSCI ï Systems and Software Consortium
- SSA ï Software Engineering and Systems Assurance
- SSE ï Systems & Software Engineering Directorate [ODUSD (A&T]
- SWE ï Software [SW] Engineering

Related Process References

- **ISO/IEC 15288**: **2002** System Engineering ï 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**ï Capability Maturity Model Integration® for Development v**1.2** (*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:

- ñ*SE Standards & Models Compared*ò, J. Lake (SMi) and S. Sheard (SPC), INCOSE 2004
- ñ*Evolution of a Standard EIA-632*ò, R. Harwell, INCOSE 2006
- ñ*Special Feature: Standards in Systems Engineering*ò, **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
- ñ*Harmonization of Systems and Software Engineering Processes*ò, 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 ï 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**

Source: ISO /IEC 15288

32 – 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**

Source: EIA-632

20 - 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, …*

Source: CMMI®-DEV

V: 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

Source: CMMI®-DEV

SE Handbook - Planning Process

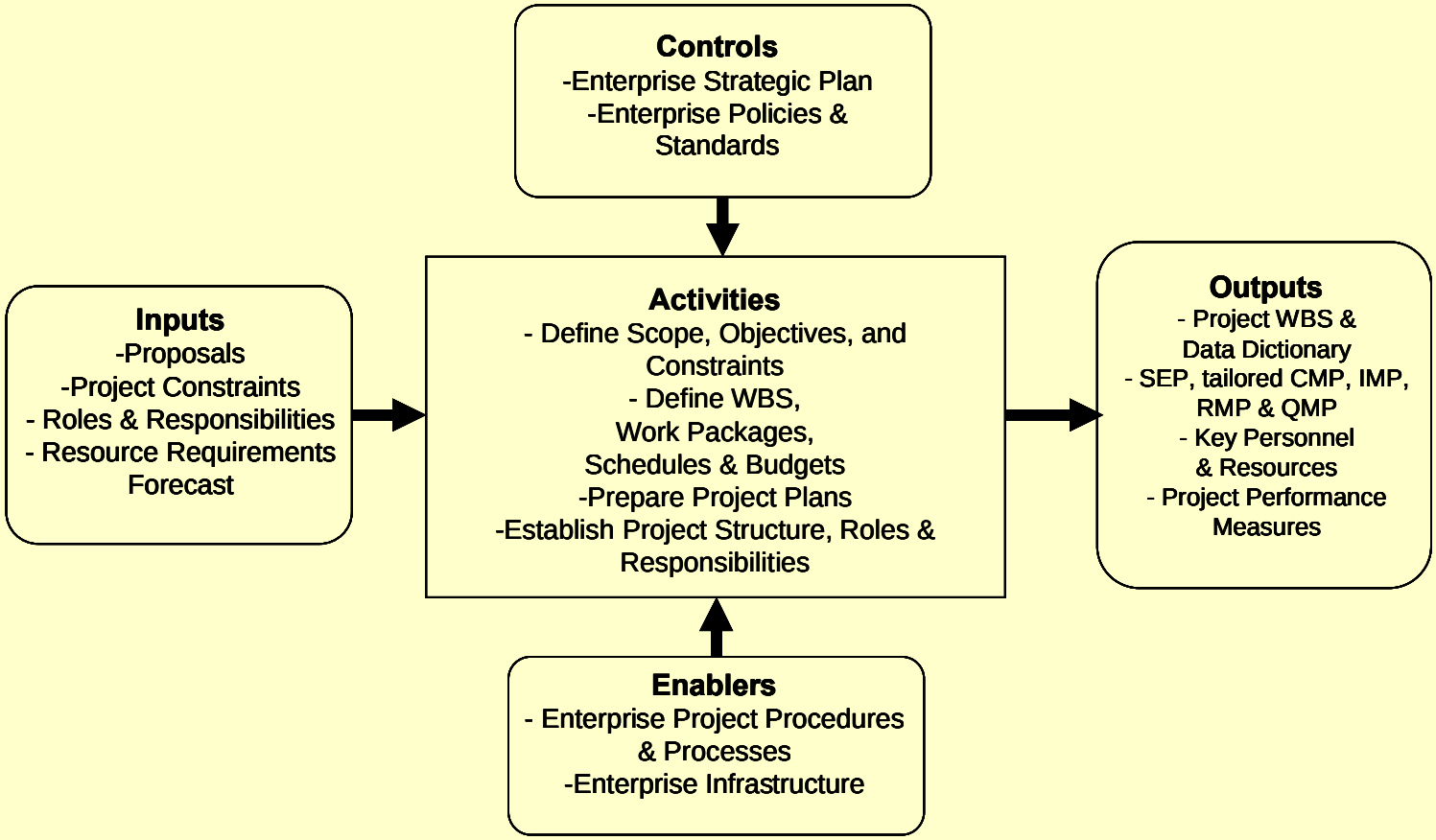


Figure 5-2 Context Diagram for the Project Planning Process

Source: INCOSE SE Handbook v3.1

agement – Book of Knowledge (PMBOK)

agement 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

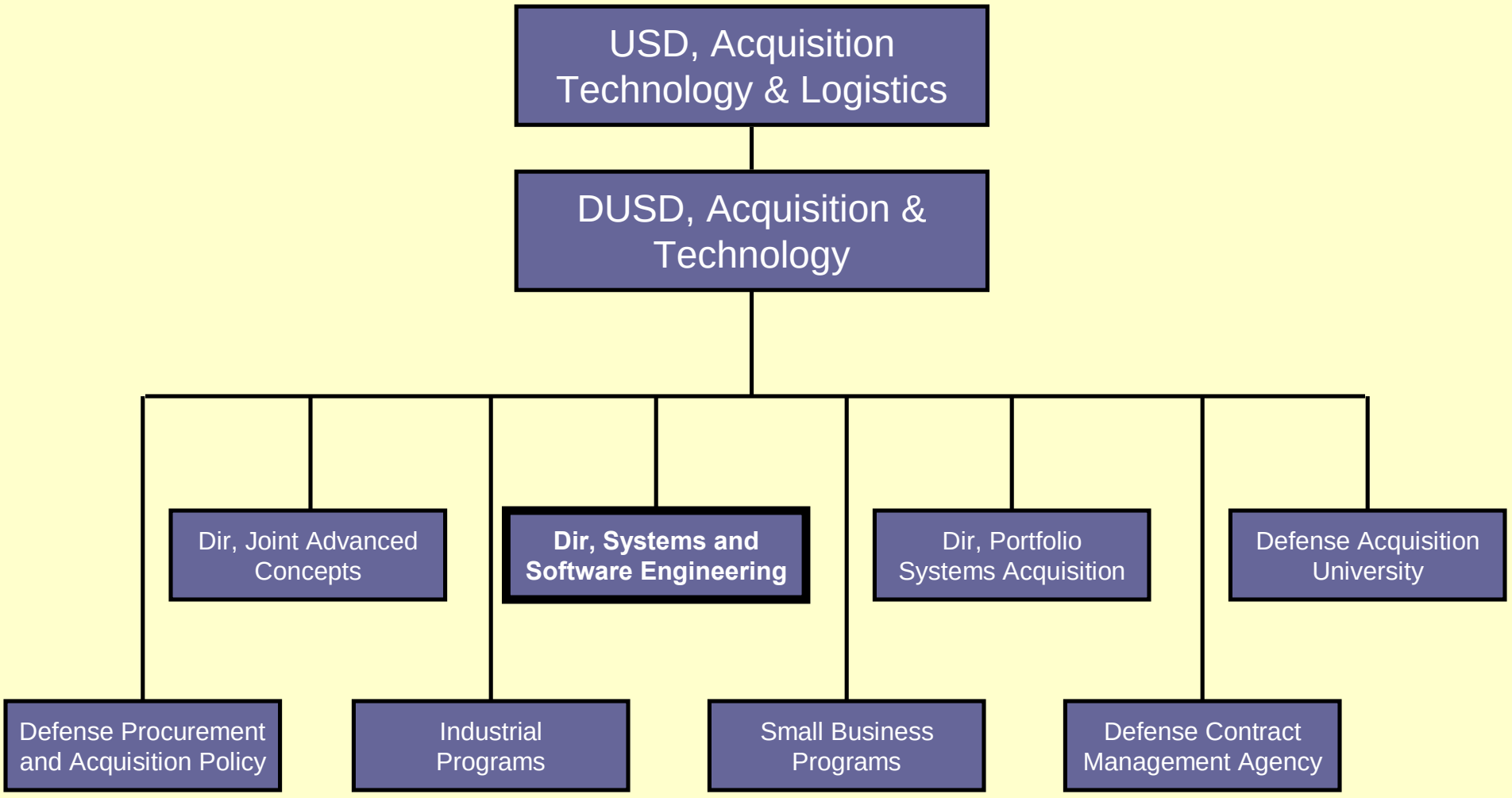
&T) SSE - Technical Planning Emphasis

- 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

USD (AT&L) Organization

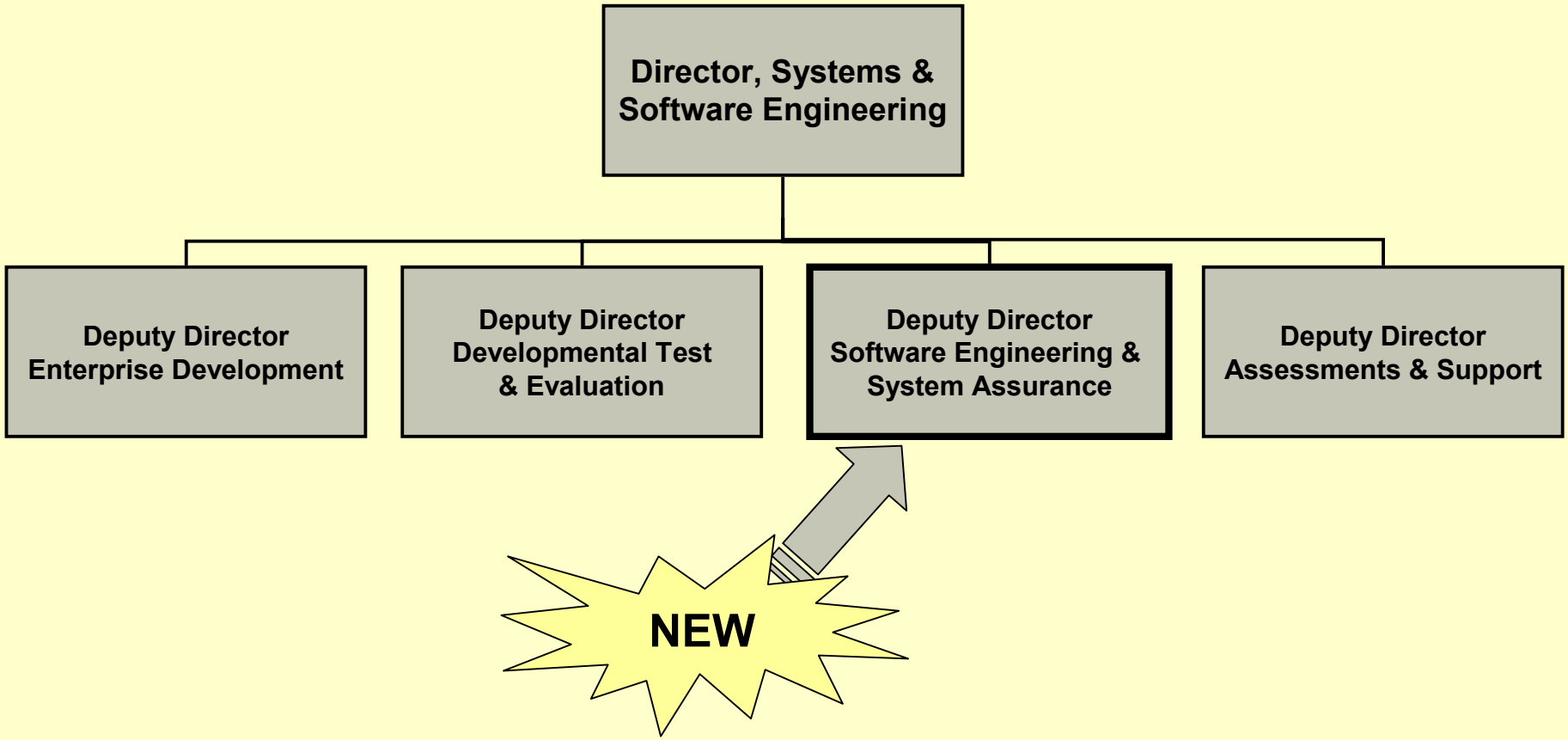


Flatter, Leaner, Empowered!

djGantzer

s and Software Engineering

An Organizational Construct



Management Visibility – Best Practices – Acquisition Excellence

) Systems and Software ring 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