

Towards Integrated Systems and Software Engineering Standards

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Agenda

- **Problem, Causes, Impacts, and Objectives**
- **Example of Steps Taken Towards the Objectives**
- **Assessment of Success**
- **What Is Still Needed?**

The Problem

- **In the past, Systems and Software standards have had different:**
 - Terminology
 - Process sets
 - Process structures
 - Levels of prescription
 - Audiences
- **These differences have been both between Systems and Software, and to some extent within each**
- **The problem has been exacerbated by competing standards, in whole or part**

**Lack of integration both within and across
Standards Development Organizations**

The Cause

- **Culture**
 - “We’re different”
 - “Not invented here”
- **Organizational**
 - Different teams, committees, etc.
- **Competition**
 - Many Standards Development Organizations
- **Domains**
 - Focused, narrow view often doesn’t look beyond the domain for commonality

**Many obstacles; some real, some perceived,
some self-made**

The Impact

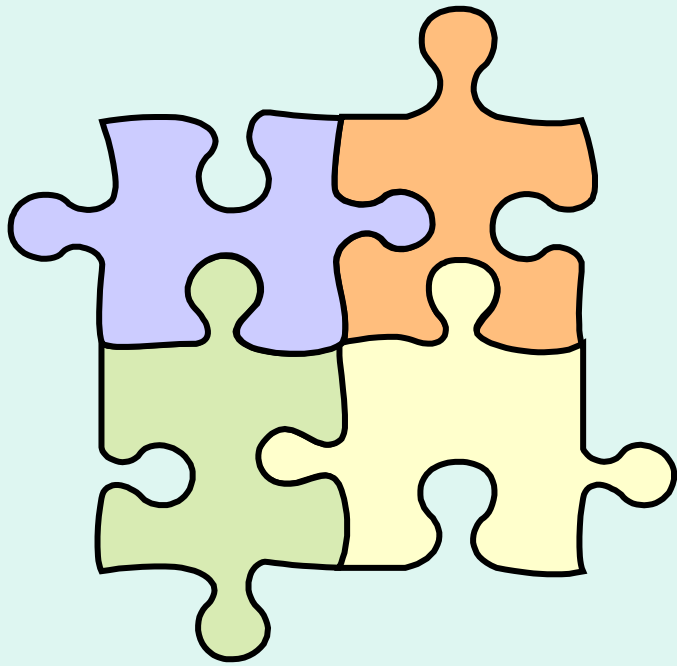
- **Less effective/efficient processes**
 - Not focused on leveraging commonalities – causes redundancy
 - Has resulted in incompatibilities, inconsistencies
- **Less effective solutions**
 - Not focused on a common approach to solve a problem/need
- **Obstacle for:**
 - Communicating (at all levels – disciplines, teams, etc.)
 - Working in integrated teams
 - Leveraging resources
- **Stove-piping due to:**
 - The incompatibilities, inconsistencies
 - Lack of leveraging commonalities

Impacts effectiveness and efficiency of the team

The Objective

- **The objective is to make the standards more usable together by achieving:**
 - Common vocabulary
 - Single, integrated process set
 - Single process structure
 - Jointly planned level of prescription
 - Suitable across the audiences
 - Accounts for considerations in wide range of domains and applications

**Work to a common vision, agreements,
and general process concepts**



Looking Back

Framing the Situation

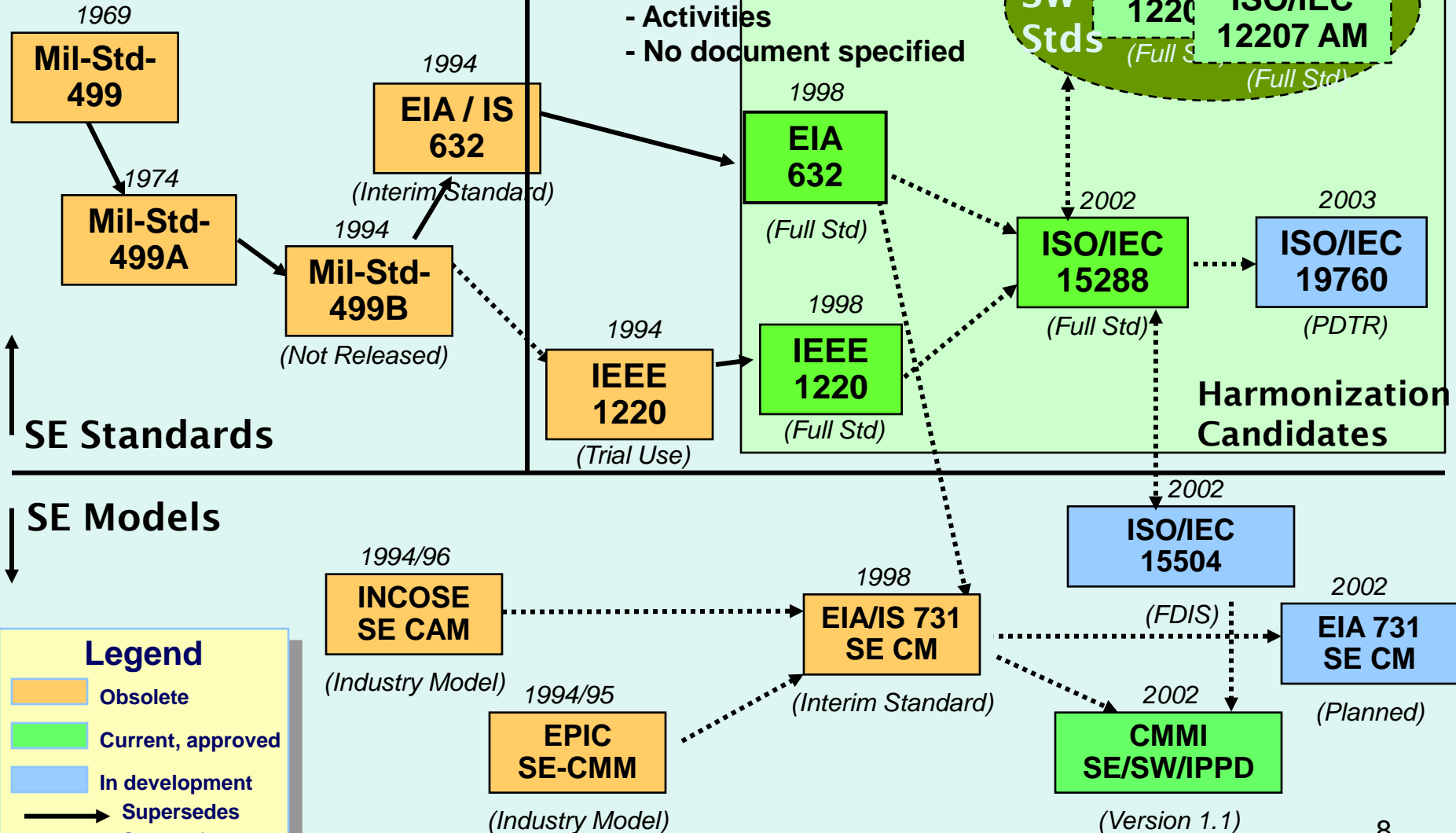
Heritage of SE Standards & Models as of 2002

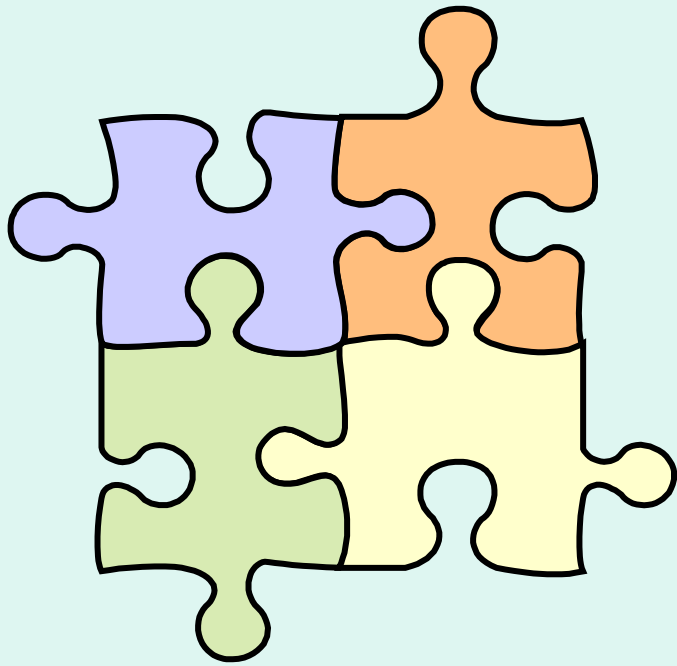
"Life cycle" approach

- Fixed phases / time
- Document contents

Process approach

- Objectives / purpose
- Outcomes
- Activities
- No document specified



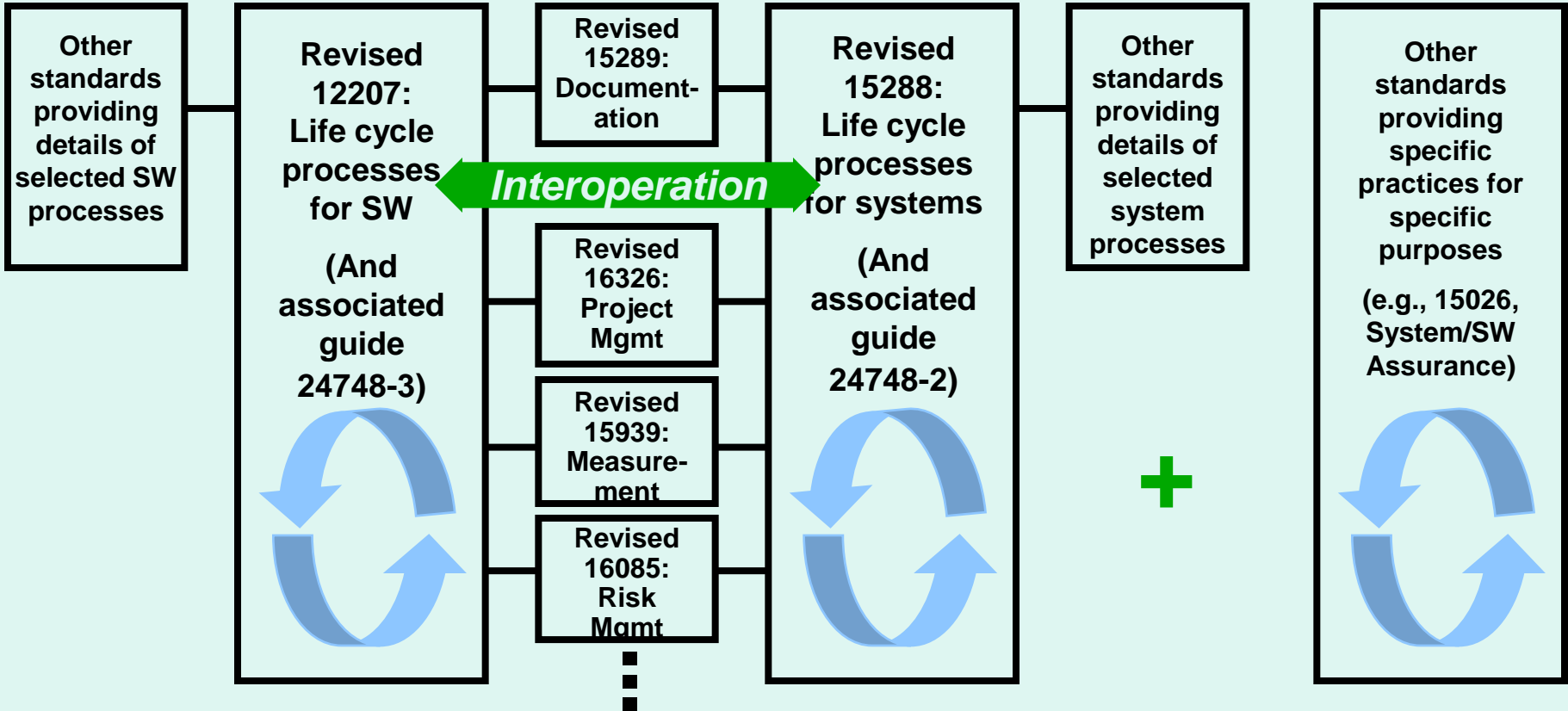


Example of Steps Taken Towards the Objectives

***A Look at the Journey
for ISO/IEC JTC1/SC7***

Intended Relationships of Key System & Software Engineering Process Standards After Alignment

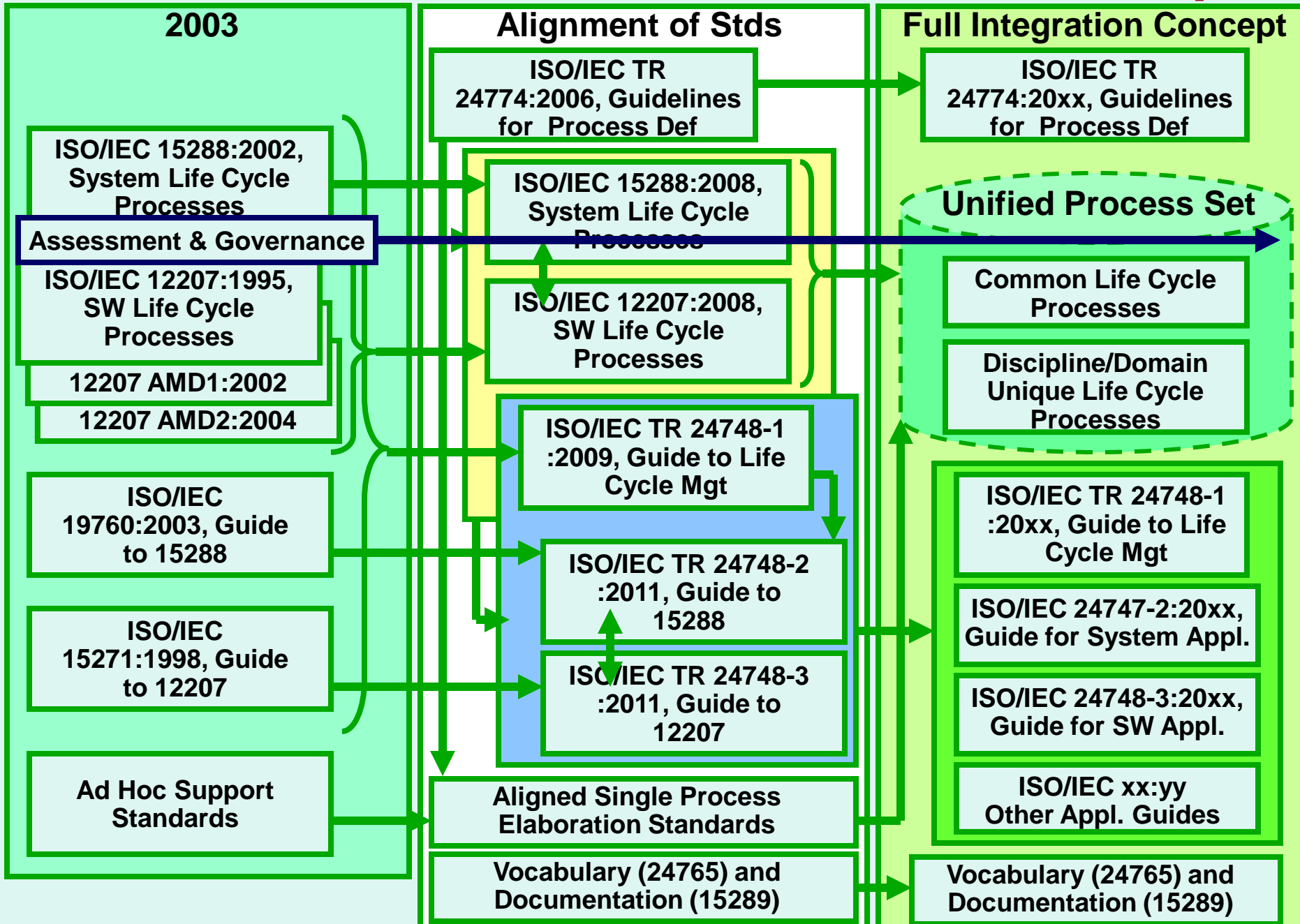
24748-1: Guide to Life Cycle Management



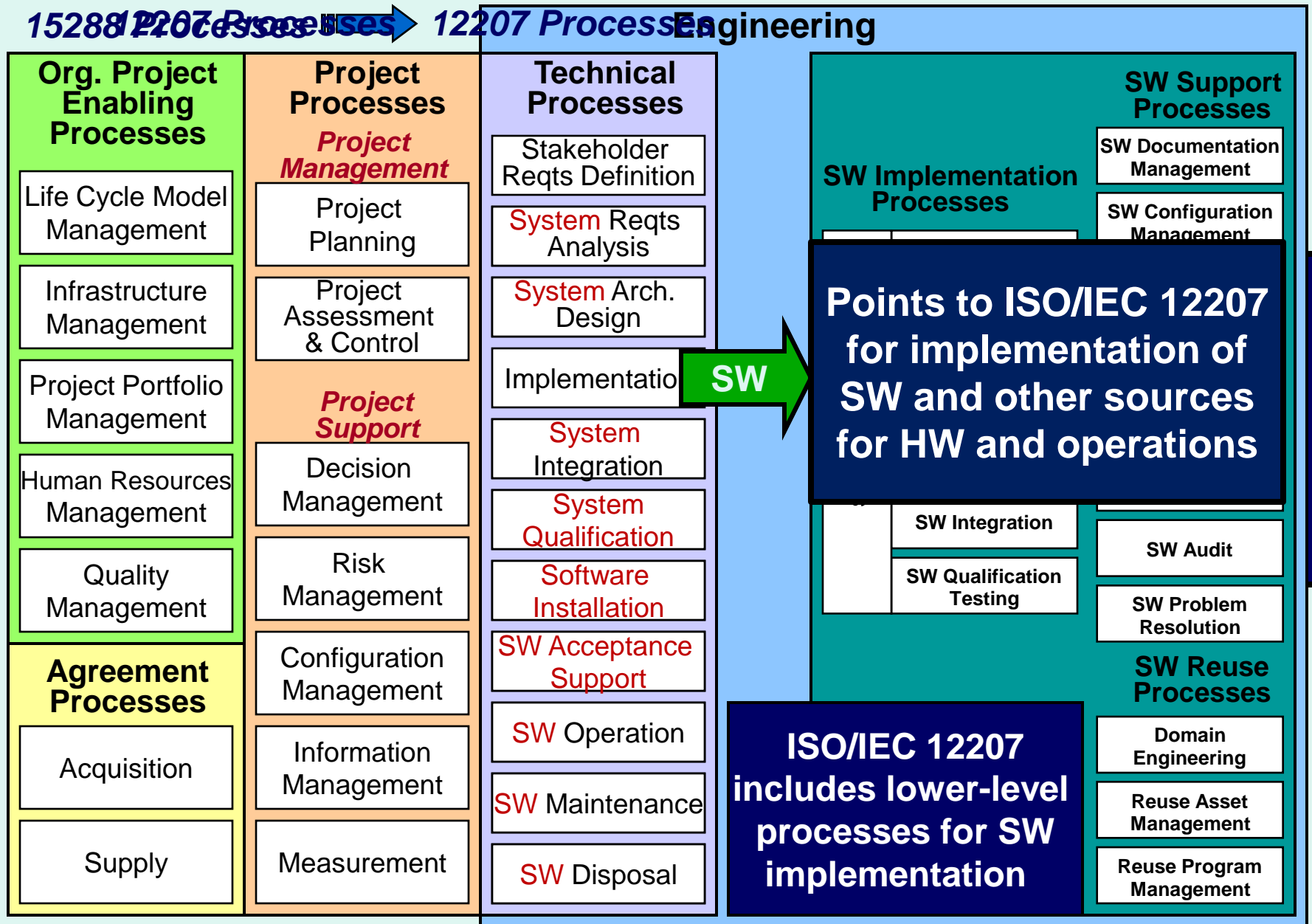
Common vocabulary, process architecture, and process description conventions

Process Assessment (ISO/IEC 15504) and Quality Mgmt (ISO 9001, ISO/IEC 90003/24783)

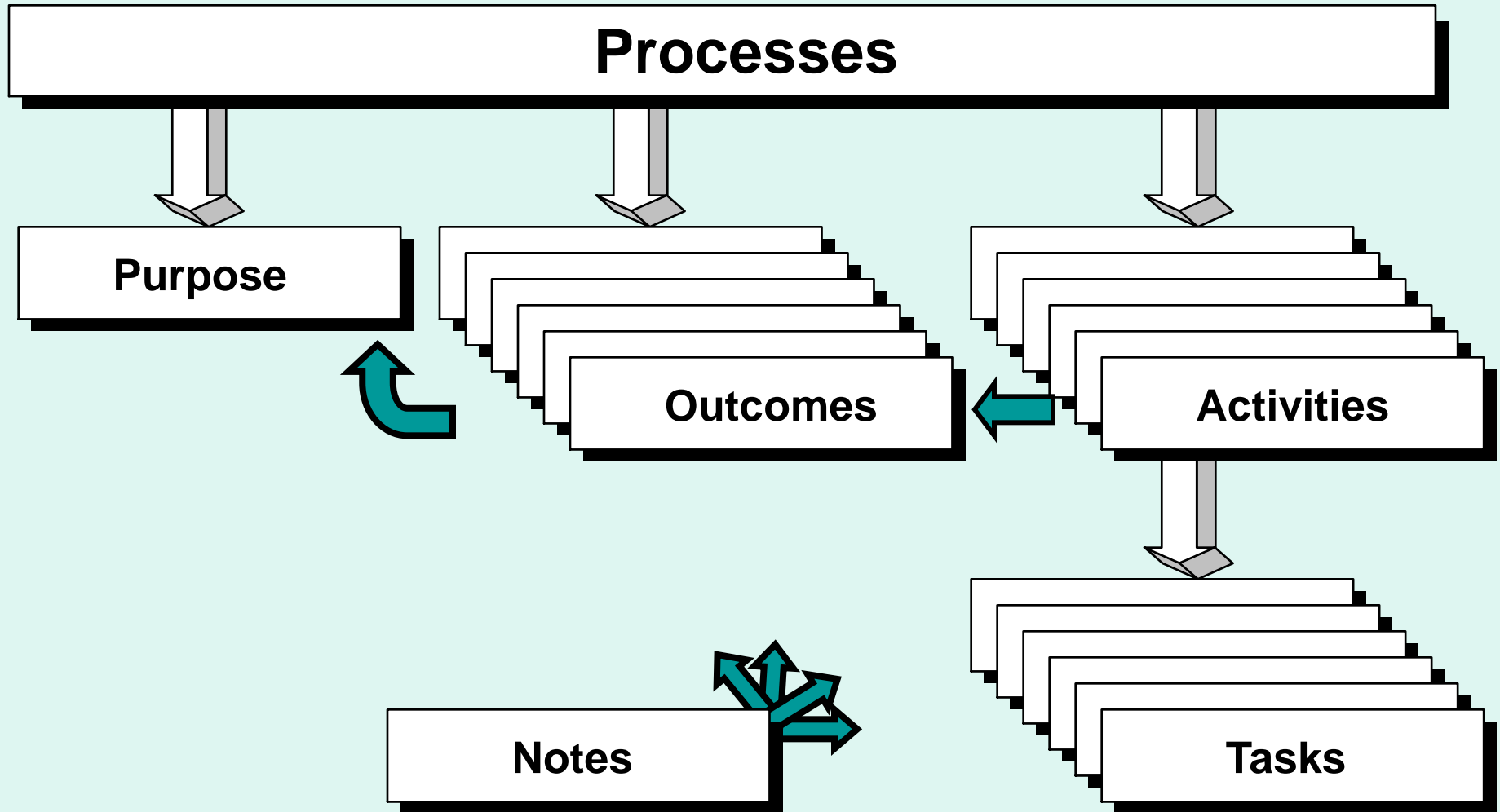
ISO/IEC JTC1/SC7 Harmonization Concept



Aligned Process Models for ISO/IEC 15288 & 12207



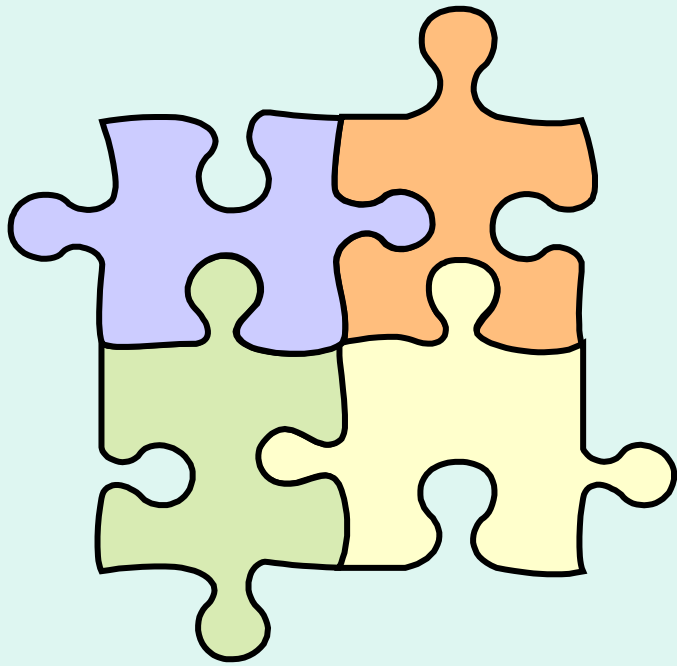
ISO/IEC/IEEE 15288 Process Structure



Purposes and Outcomes are Normative

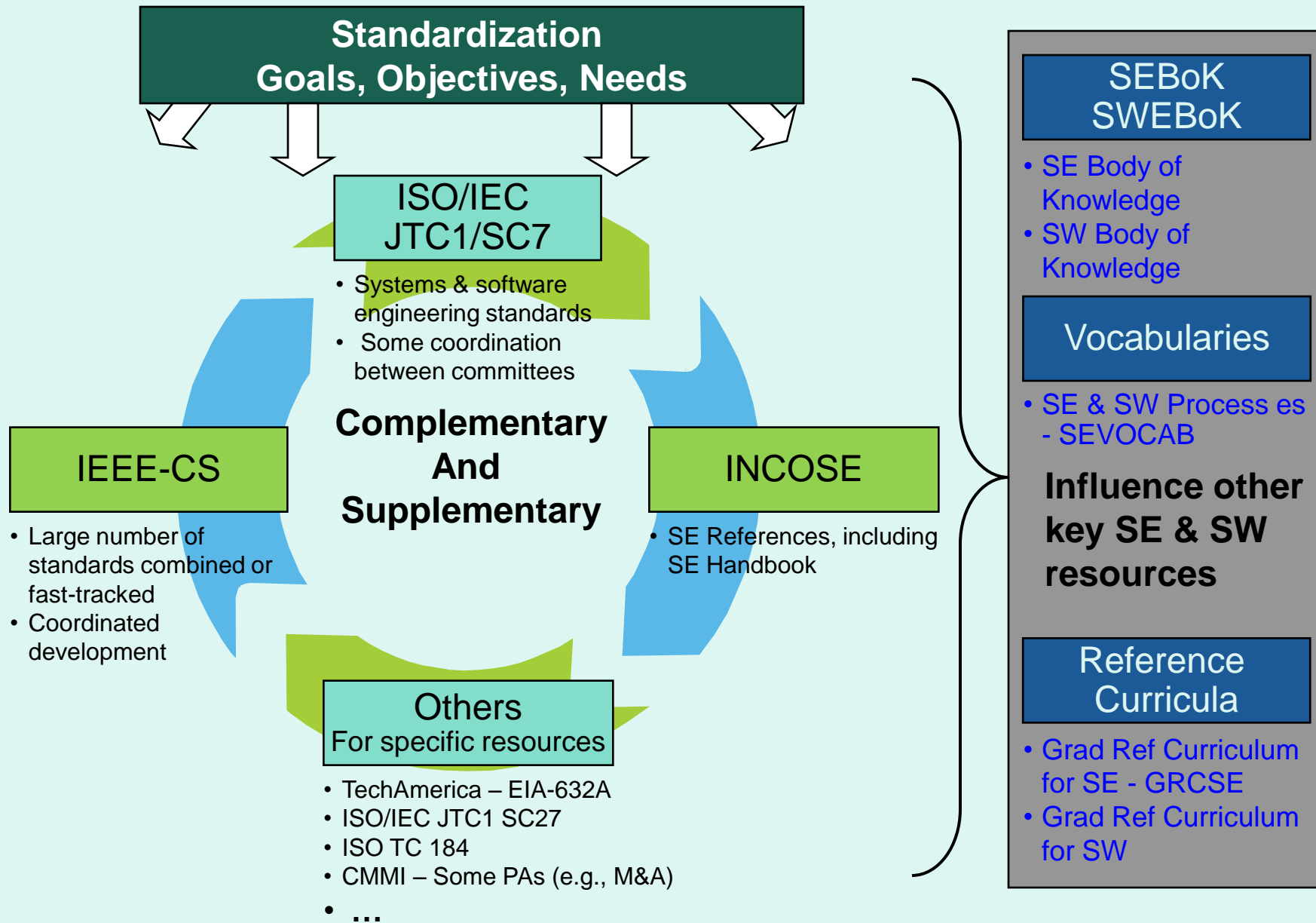
Usage Guidance for 15288 and 12207

- **Nearly the same process models**
 - 15288 describes the processes at the system level.
 - 12207 provides specializations of the same processes to software, and adds processes specific to software.
- **Usage Guidance**
 - System Focus – use 15288
 - System with SW elements – use 15288 and the SW processes of 12207
 - SW product or service focus – use 12207

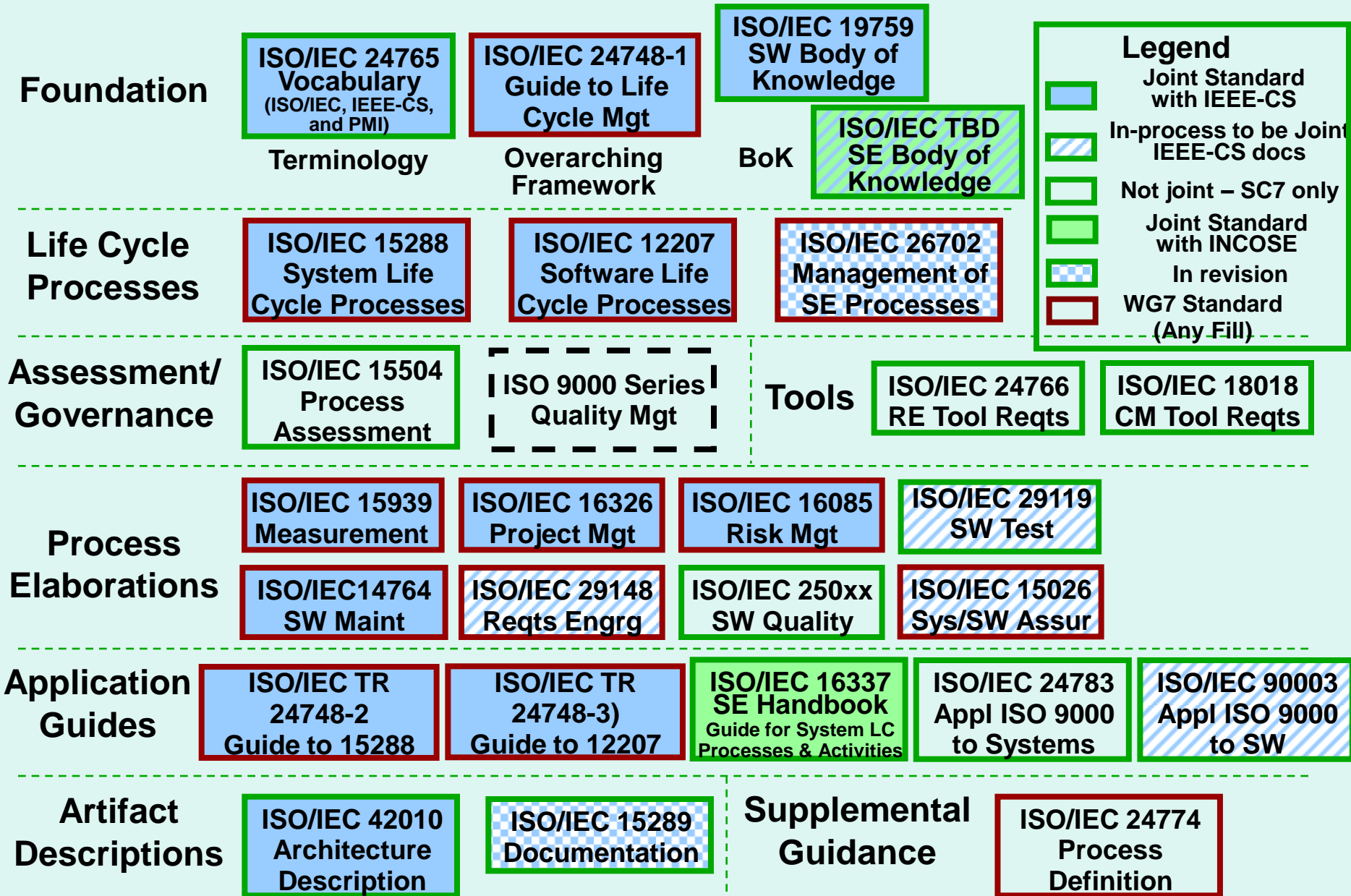


Assessment of Success

Growing Industry Collaboration



Current Alignment/Integration Status



Legend

- Joint Standard with IEEE-CS
- In-process to be Joint IEEE-CS docs
- Not joint – SC7 only
- Joint Standard with INCOSE
- In revision
- WG7 Standard (Any Fill)

But Is This Enough?

- **Advantages**

- Drives to a more consistent set of standards
- Provides for “interoperability” of these standards
- Creates a better foundation for collaboration between Standards Development Organizations (SDOs)
 - Work towards common or complementary/supplementary standards
 - Model has worked well with IEEE-CS and INCOSE

- **But some issues still remain**

- Still allows for significant redundancy
- Still need to account for specialized needs
- Alignment does not ensure an integrated set of processes that can be chosen as needed
 - Integration phase must be completed to gain this benefit
 - Significant coordination/negotiation needed to drive more industry buy-in

Towards Full Integration

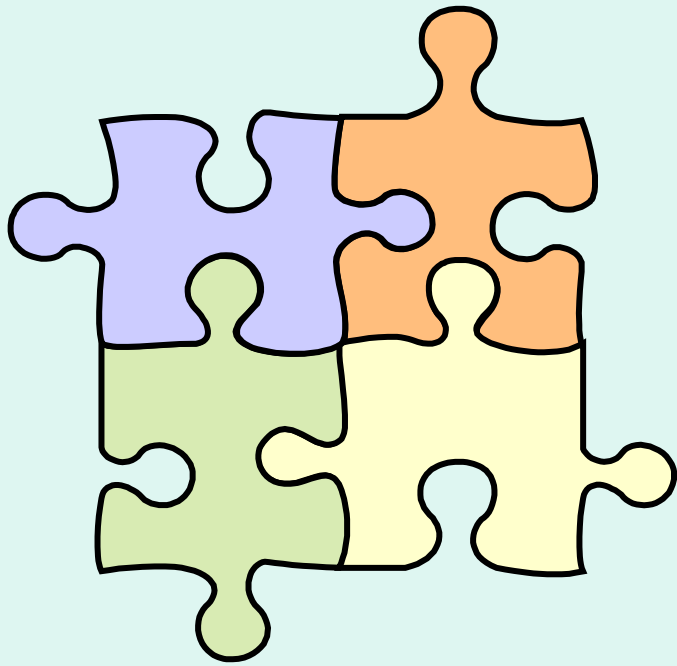
- **Study Group established**
 - Investigate scope and content of Integration Phase
 - Objective to achieve a fully harmonized view of the system and software life cycle processes
- **Integration to consider:**
 - Common purpose and outcomes
 - Architecture of the standards
 - Level of prescription of activities and tasks
 - Life cycle treatments
 - Application to services and operations
 - Common verification and validation concepts
 - Common configuration management concepts
 - Alignment with other applicable standards
 - Rationalization of application guides

Standards Management and Harmonization

- Standards Management (SWG5)
 - Manage the portfolio of SC7 standards and projects
 - Review proposals and provide counsel to JTC1/SC7 on initiatives
 - Provide counsel to JTC1/SC7 conveners and editors on standards management and relationships between standards
 - Include in its scope the IEEE Systems and software engineering standards collection
- Life Cycle Process Harmonization (LCPHAG)
 - Model standards, analyze use cases and architecture, and recommend a framework for an integrated set of process standards in software and systems domains
 - Make recommendations regarding the future content, structure and relationships of ISO/IEC 12207, ISO/IEC 15288 and their guides, as well as other related SC 7 documents
 - Includes members from SWG5, WG7, WG10, WG25, IEEE-CS, INCOSE, and other interested organizations

Harmonization Discussion with TechAmerica G47 Committee

- **Objective:**
 - Understand the driving requirements for the revision of EIA-632 and determine path for potential collaboration and alignment
- **Participating Organizations:**
 - ISO/IEC JTC1/SC7, IEEE-CS, INCOSE, TechAmerica G47
- **Key Points:**
 - Requirements for EIA-632 (defined in 2004) include alignment with ISO/IEC 15288
 - ISO/IEC JTC1/SC7 has a draft model focused on ongoing harmonization and process integrity, which could help
- **Conclusion:**
 - Recommended that EIA-632 revision be done to be complementary and supplementary to ISO/IEC 15288
 - Agreement reached in August 2011 G47 committee meeting to move towards better alignment of EIA-632A with ISO/IEC 15288



**What Is Still
Needed?**

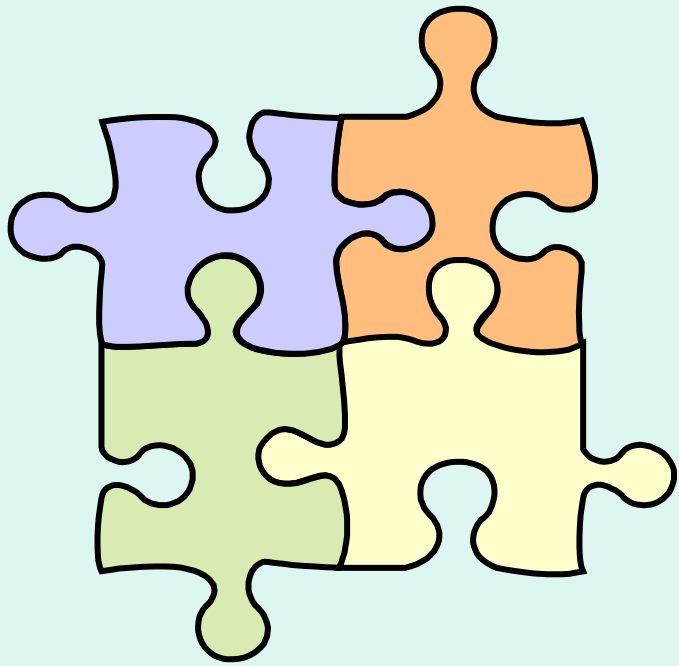
Better Understand Usage of Standards

- **Analyze how standards are used by organizations/ projects for Systems and Software**
- **Understand what standards are used concurrently**
- **Understand what tailoring needs to be supported**
- **Determine applicable domains**
- **Determine when a standard can be applied within a domain**

Other Needs

- Identification of other related standards within and between SDOs
- Tie more SDOs into integration efforts through joint partnering agreements
- Establish long-term visions and plans to accomplish integration efforts
- Eliminate duplicate redundant efforts

Communicate, Cooperate, Collaborate!



Back-up Charts

Supporting Guidance Changes

- **ISO/IEC TR 24748-1, Guide to Life Cycle Management**

- Common guidance and definitions for life cycle management concepts
- Includes:
 - Stages
 - Definitions
 - Life Cycle Models
- ***Freely available!***

- **ISO/IEC TR 24748-2, Guide to ISO/IEC 15288, System Life Cycle Processes**

- Guidance specific to application of life cycle processes for systems
- Leverages 24748 rather than repeat its information
- Common alignment of information to make it easy to use with the other guides
- Replaces 19760

- **ISO/IEC TR 24748-3, Guide to ISO/IEC 12207, Software Life Cycle Processes**

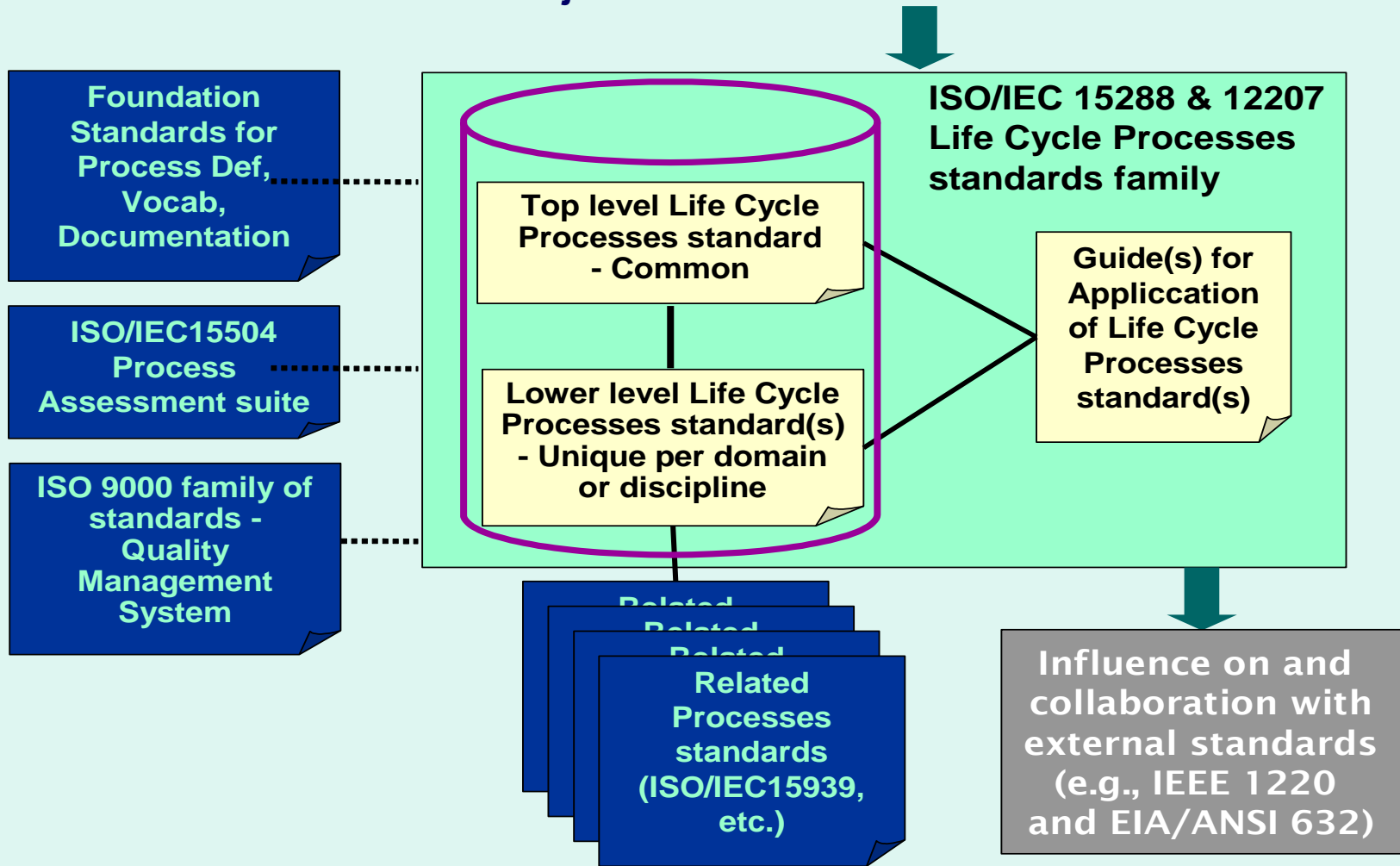
- Guidance specific to application of life cycle processes for software
- Leverages 24748 rather than repeat its information
- Common alignment of information to make it easy to use with the other guides
- Replaces 15271

These Changes Provide an Integrated Set of Guidance for the Base Standards

Looking to the Future

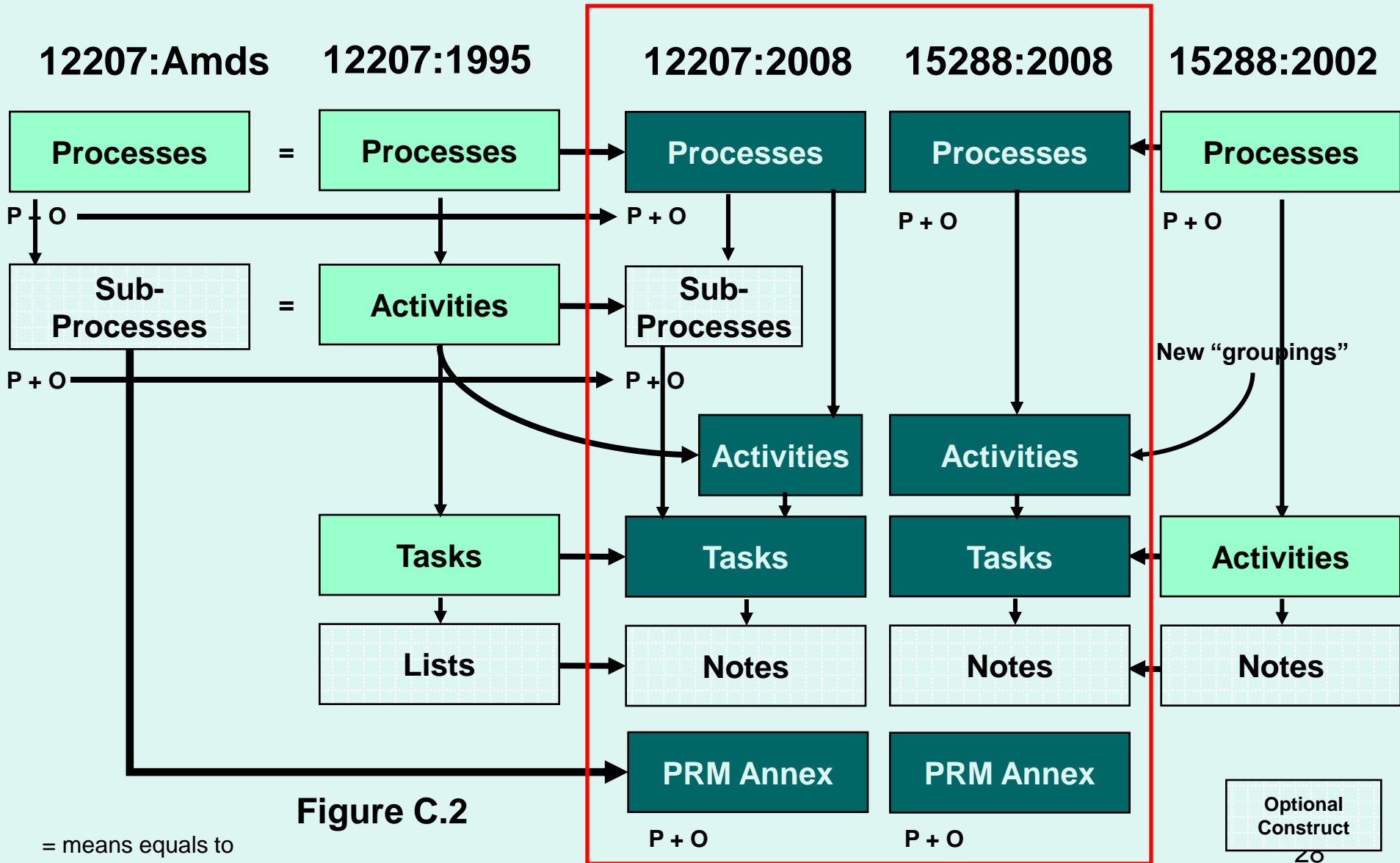
15288 & 12207 Harmonization Project

Possible structure

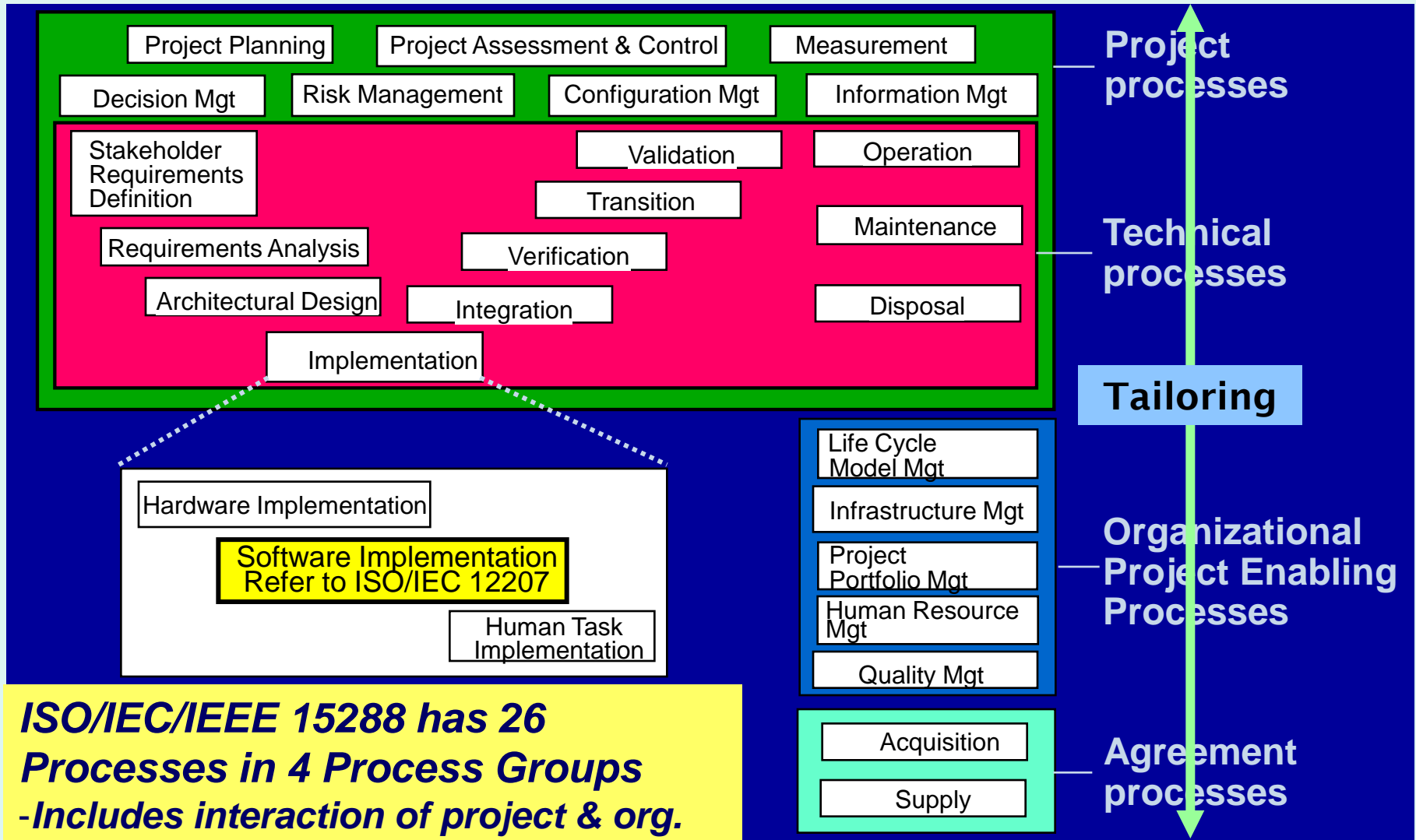


The Concept is Proven – Now More Plans for Harmonized Standards and Collaboration Between SDOs are Needed

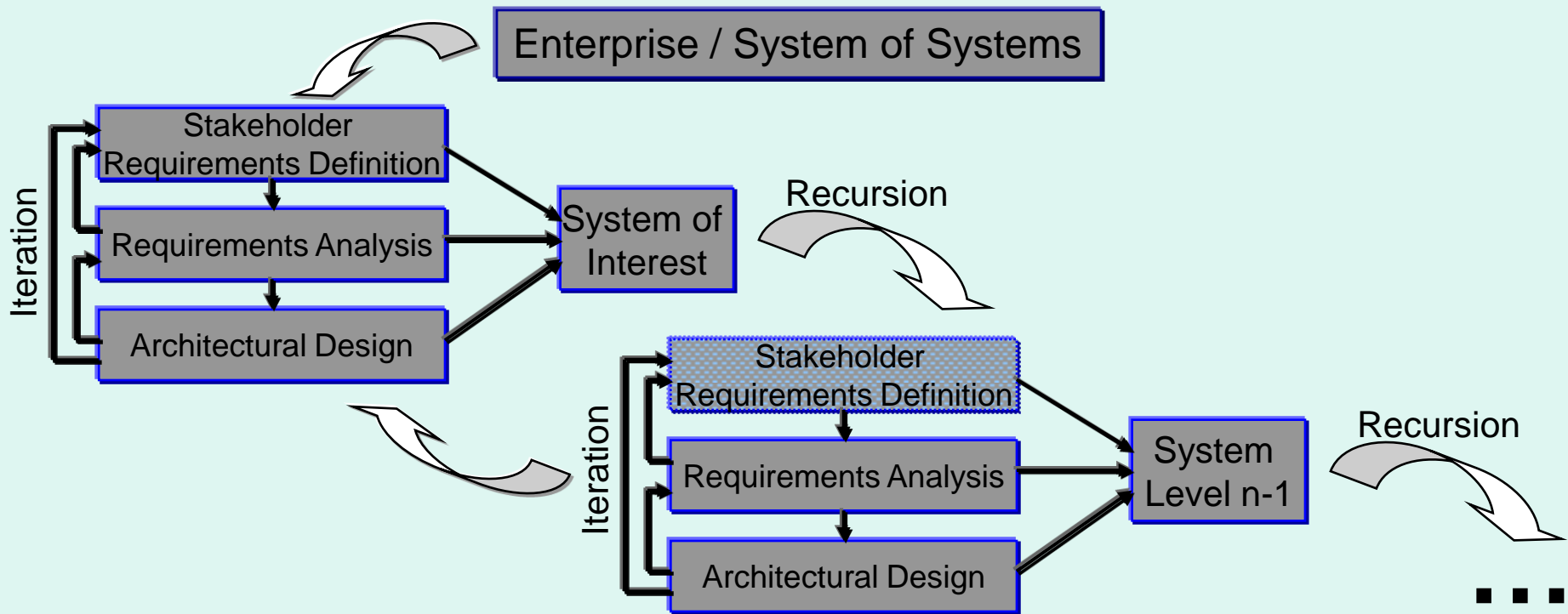
Relations of Process Constructs among ISO/IEC 12207:1995 and its Amendments, 15288:2002, 15288:2008 & 12207:2008



ISO/IEC/IEEE 15288 Processes and Relationship to ISO/IEC/IEEE 12207

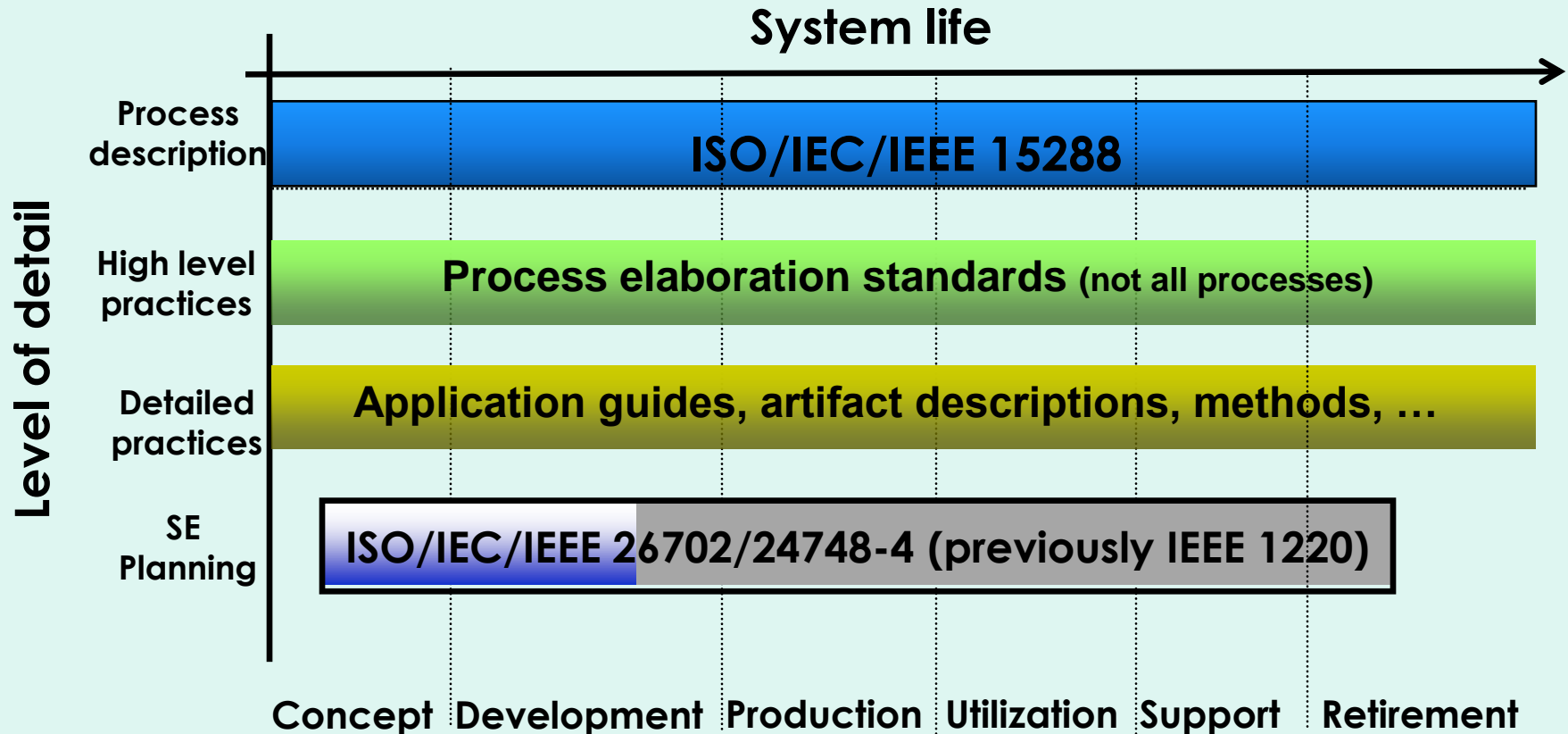


ISO/IEC/IEEE 15288 has 26 Processes in 4 Process Groups -Includes interaction of project & org.



- **Iteration needed to:**
 - Accommodate stakeholder decisions and evolving understanding
 - Account for architectural decisions/constraints
 - Resolve trades for affordability, adaptability, feasibility, resilience, etc.
- **Recursive application for each lower level of the system hierarchy**

Breadth and Depth of Key SE Standards - 2011



State of standards, guides, etc.

- Corporate adoption – general observations
 - Many corporations have adopted a few key standards, models, and frameworks for top-level process
 - Process requirements/guidance; not the process itself
 - Influence development of organizational standard processes
 - Potential for reasonable commonality, even after tailoring
 - Provides leverage of industry consensus and good practices
 - Common vocabulary, if adopted
 - Basis for desired certifications
 - Domain specific / product specific standards and specs adopted when standardization needed in supply chain
 - Lower-level documents adopted as they address needs

Potential Standards Influence of Org/Project Processes

