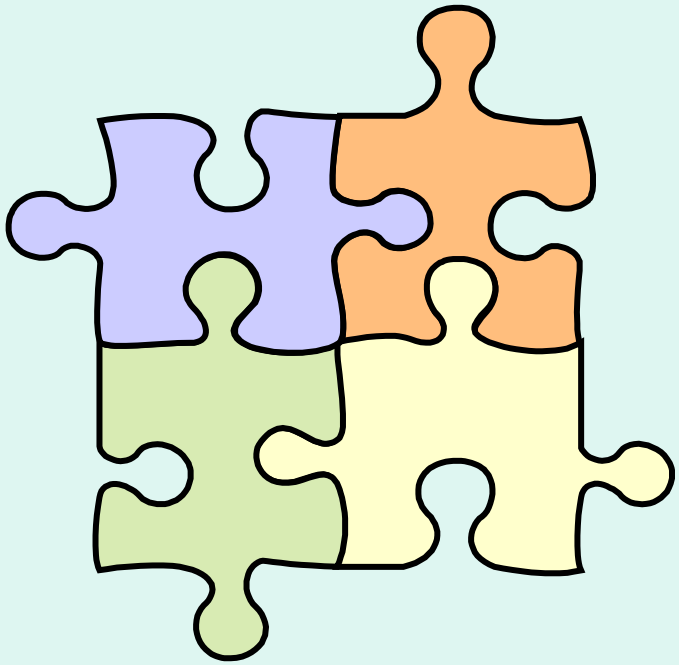

Towards Integrated Systems and Software Engineering Standards

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October 26, 2011

Note: This presentation is being given from the perspective of the industry association roles held by the presenter.

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

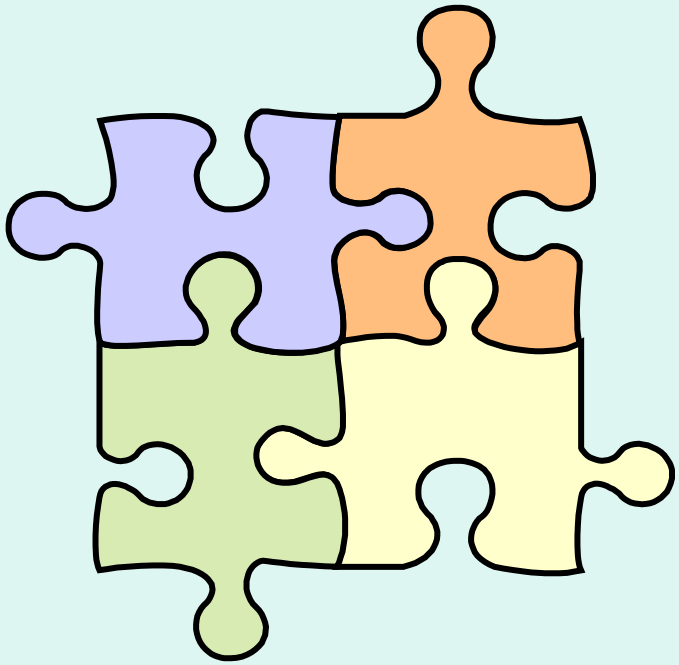
- **Less effective/efficient processes**
  - Not focused on leveraging commonalities – causes redundancy
  - Has resulted in incompatibilities, inconsistencies
- **Less effective solutions**
  - Not focused on a common approach to solve a problem/need
- **Obstacle for:**
  - Communicating (at all levels – 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

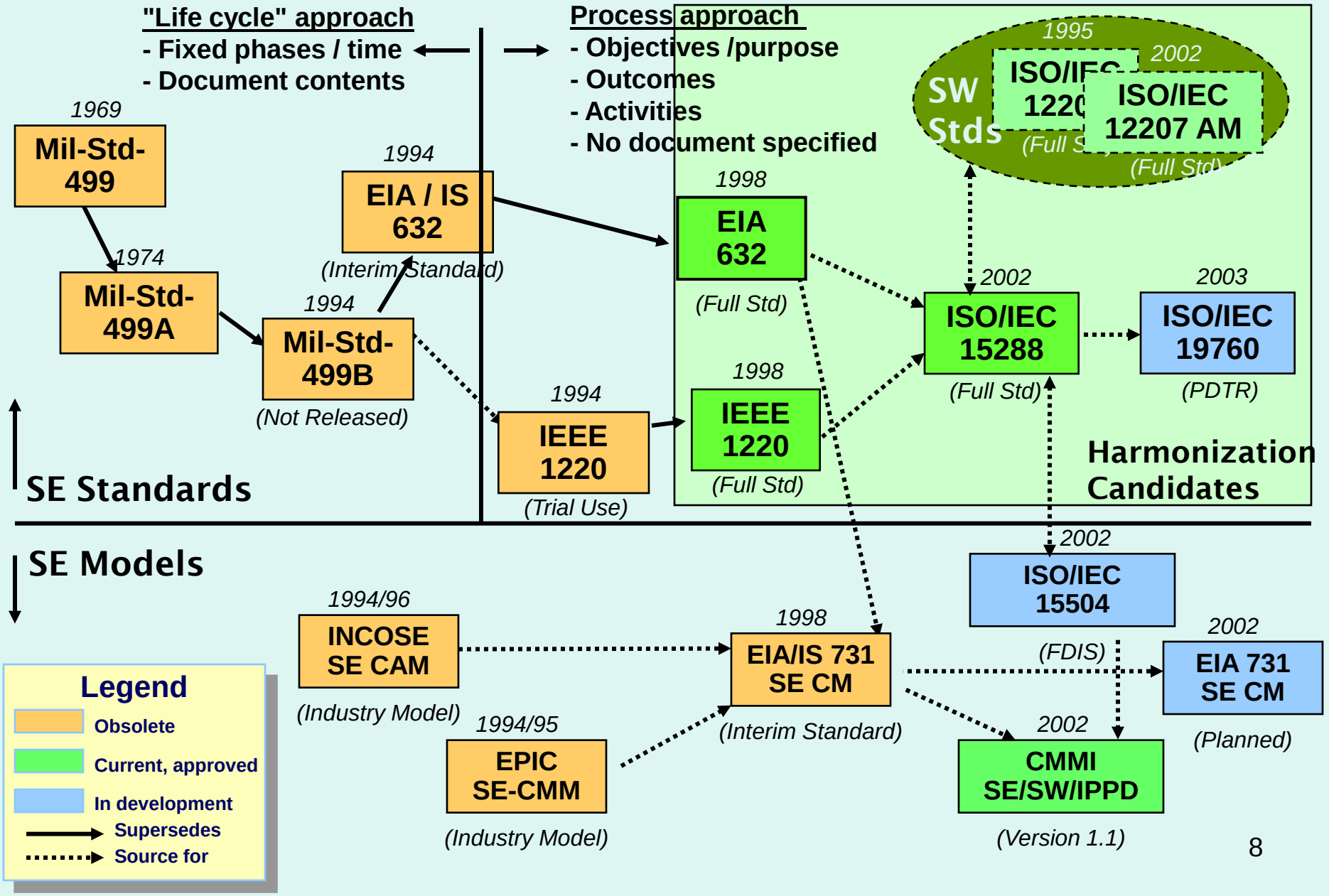
Work to a common vision, agreements, and general process concepts

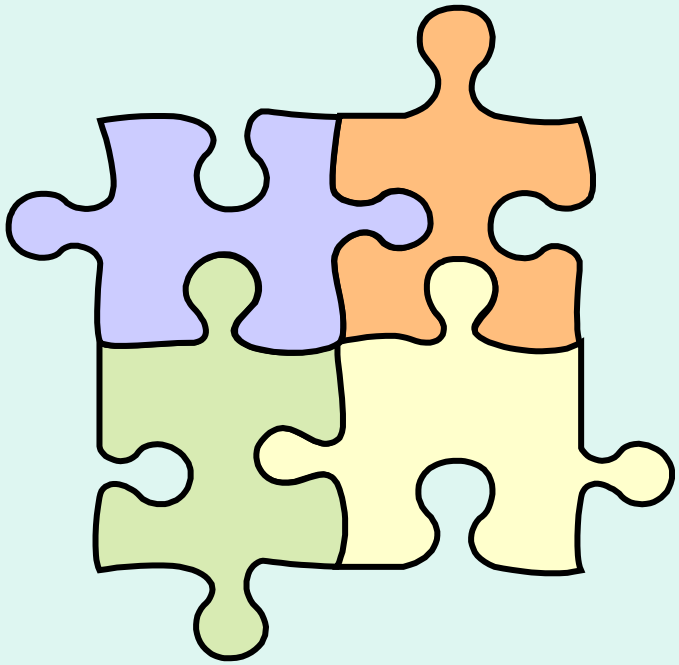


Looking Back

Framing the Situation

Heritage of SE Standards & Models as of 2002





Example of Steps Taken Towards the Objectives

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

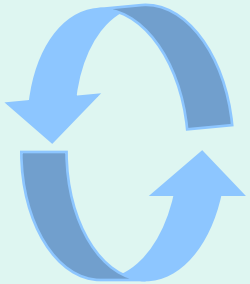
Intended Relationships of Key System & Software Engineering Process Standards After Alignment

24748-1: Guide to Life Cycle Management

Other standards providing details of selected SW processes

Revised 12207: Life cycle processes for SW

(And associated guide 24748-3)



Revised 15289: Documentation

Revised 16326: Project Mgmt

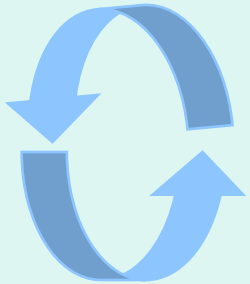
Revised 15939: Measurement

Revised 16085: Risk Mgmt

Interoperation

Revised 15288: Life cycle processes for systems

(And associated guide 24748-2)

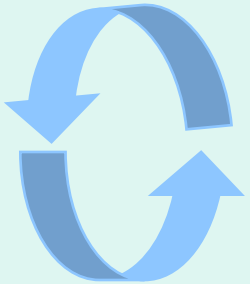


Other standards providing details of selected system processes

+

Other standards providing specific practices for specific purposes

(e.g., 15026, System/SW Assurance)



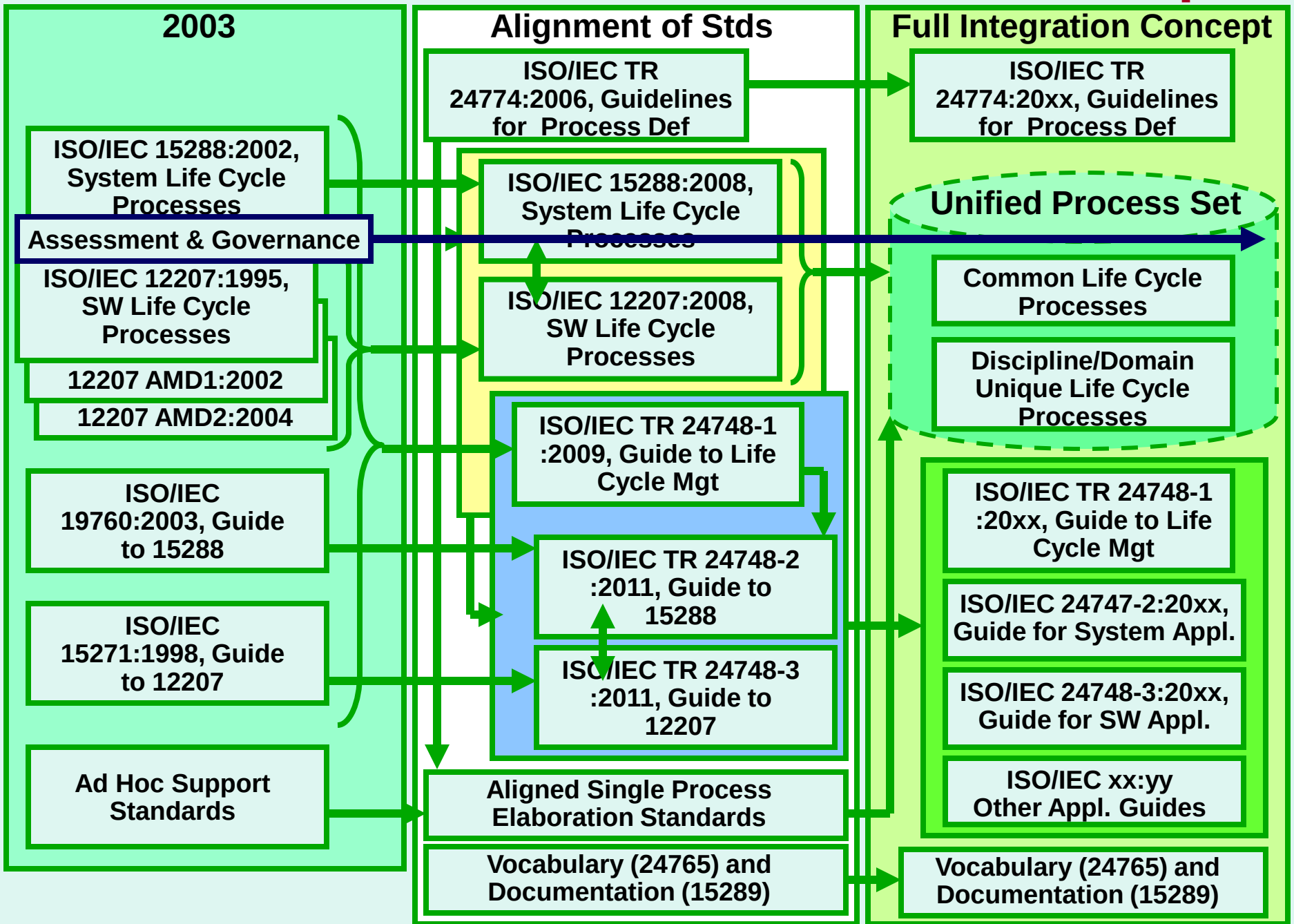
Common vocabulary, process architecture, and process description conventions

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

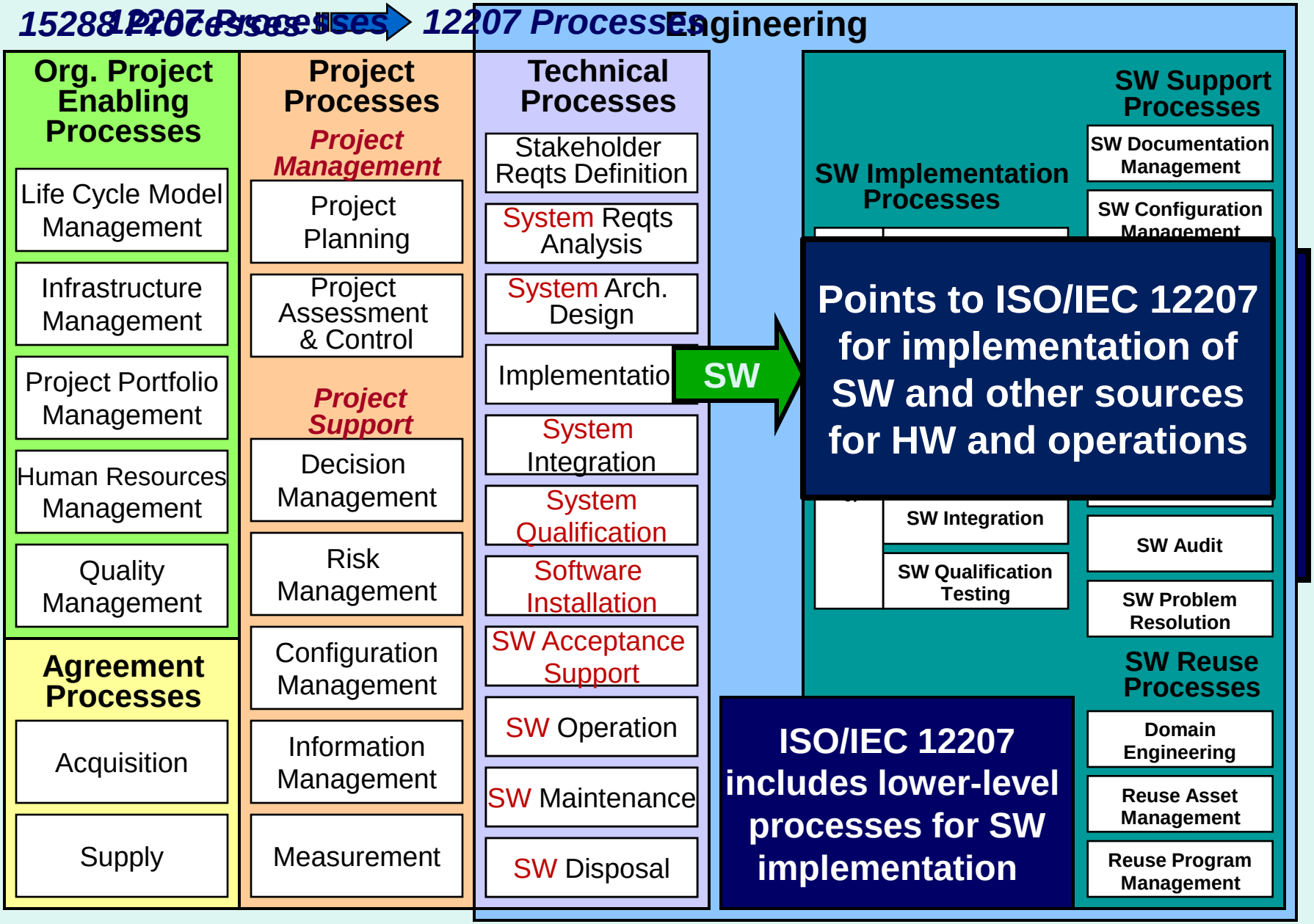
Source: Adapted from chart of James Moore, MITRE Corp. by Garry Roedler, Lockheed Martin. Used with permission from James Moore.

MITRE

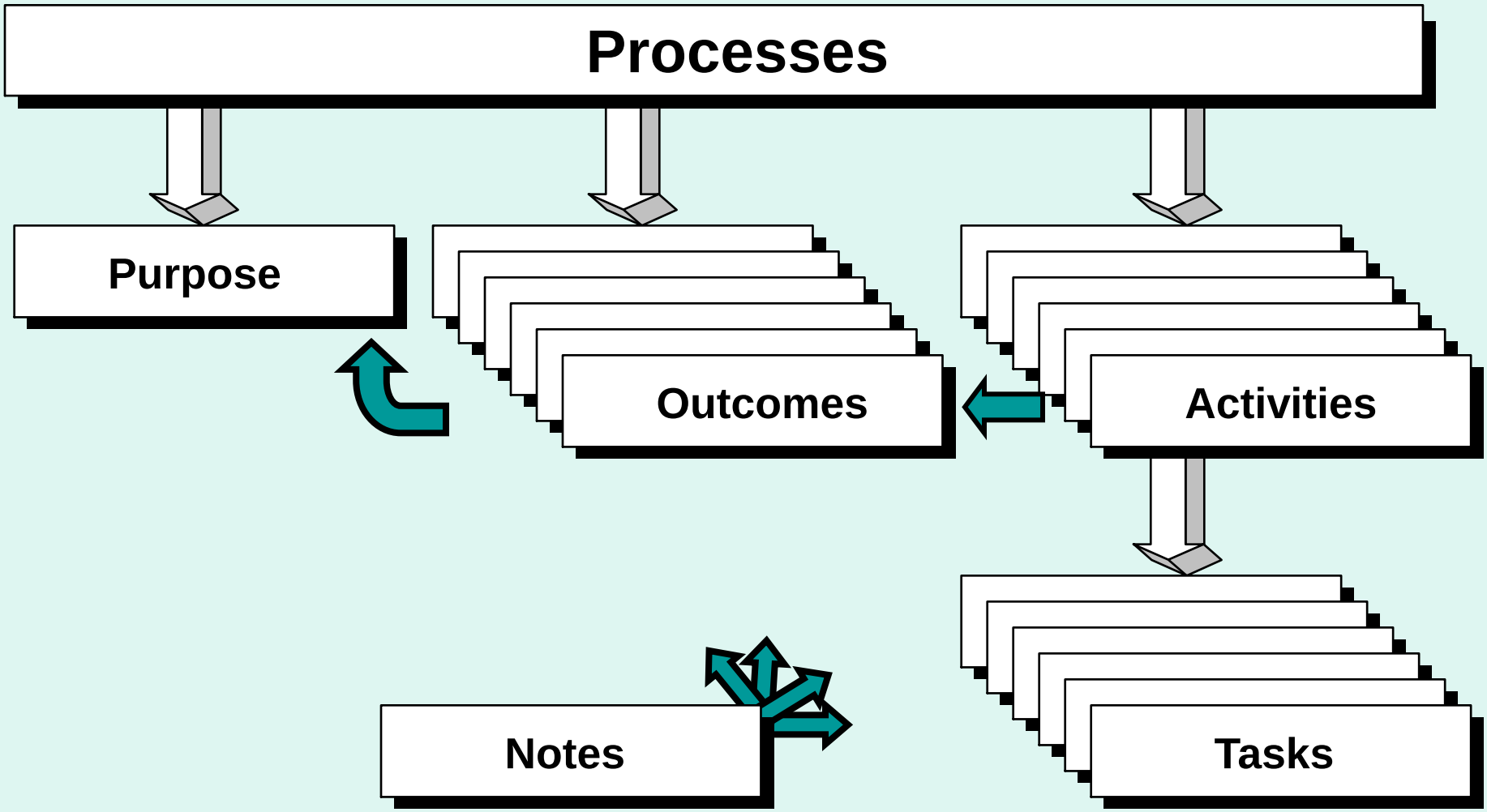
ISO/IEC JTC1/SC7 Harmonization Concept



Aligned Process Models for ISO/IEC 15288 & 12207



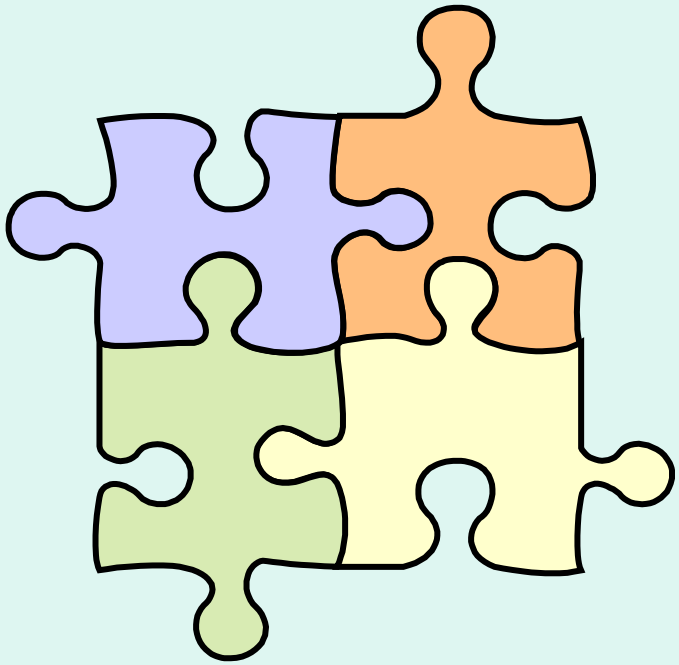
ISO/IEC/IEEE 15288 Process Structure



Purposes and Outcomes are Normative

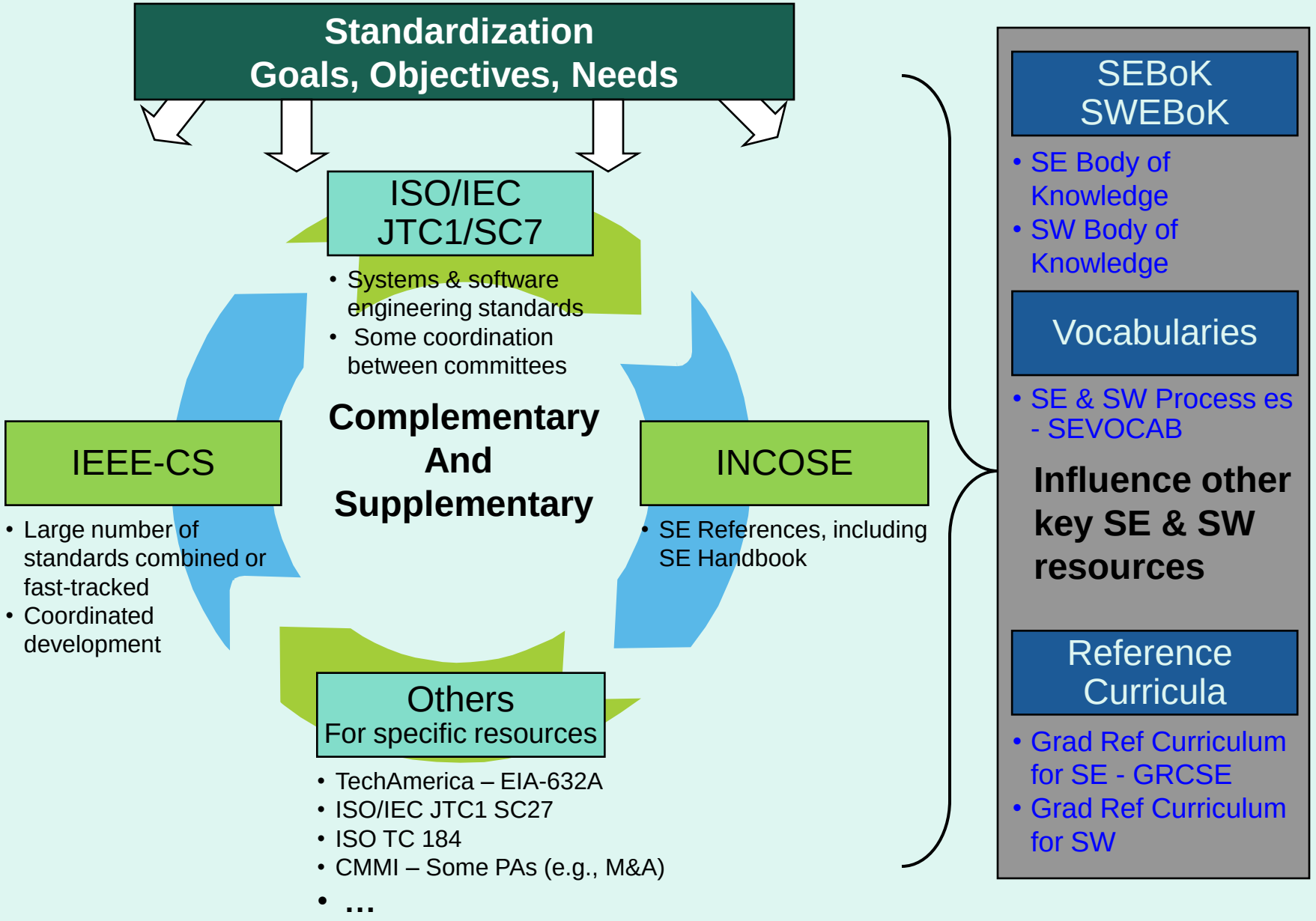
Usage Guidance for 15288 and 12207

- **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

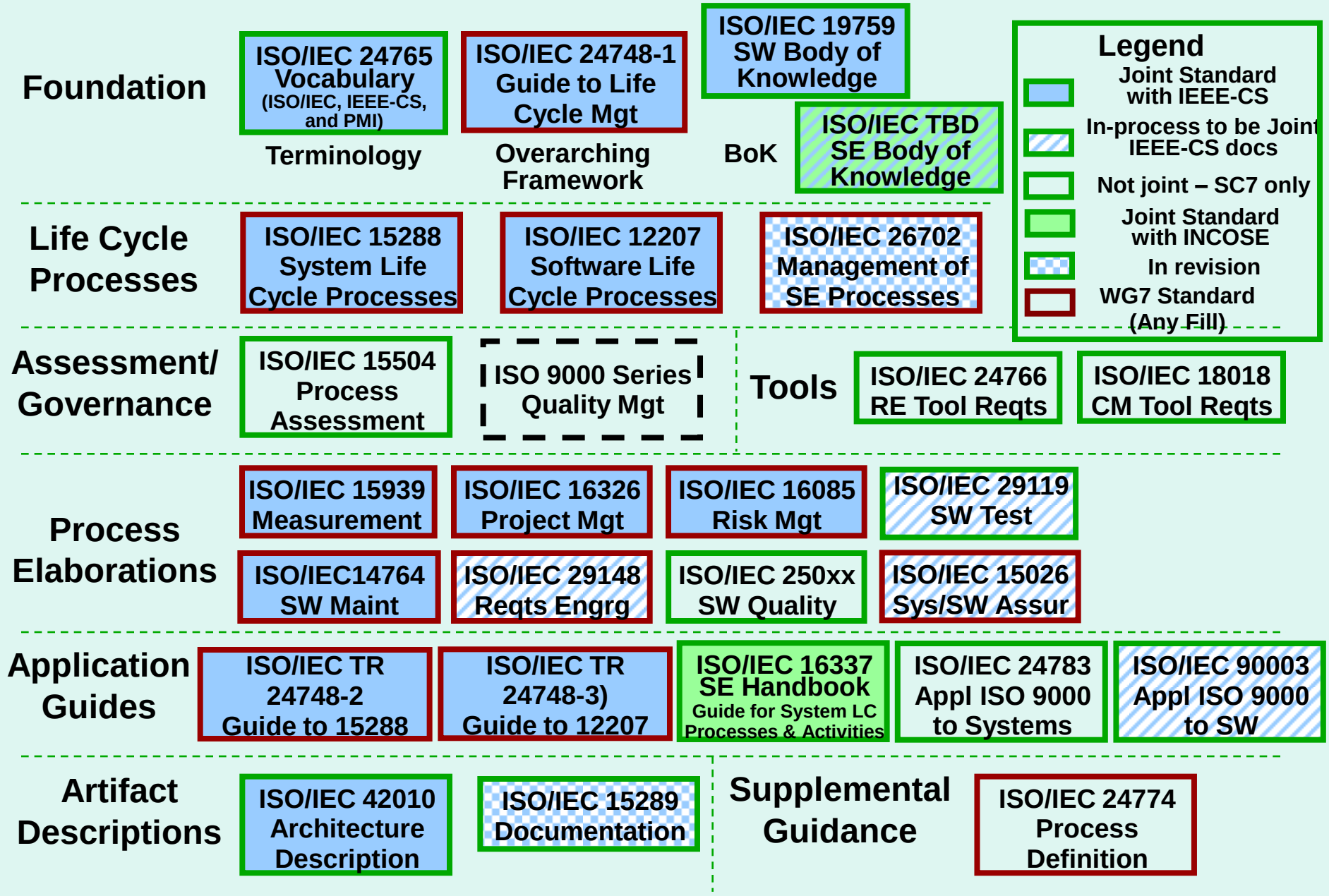


Assessment of Success

Growing Industry Collaboration



Current Alignment/Integration Status



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

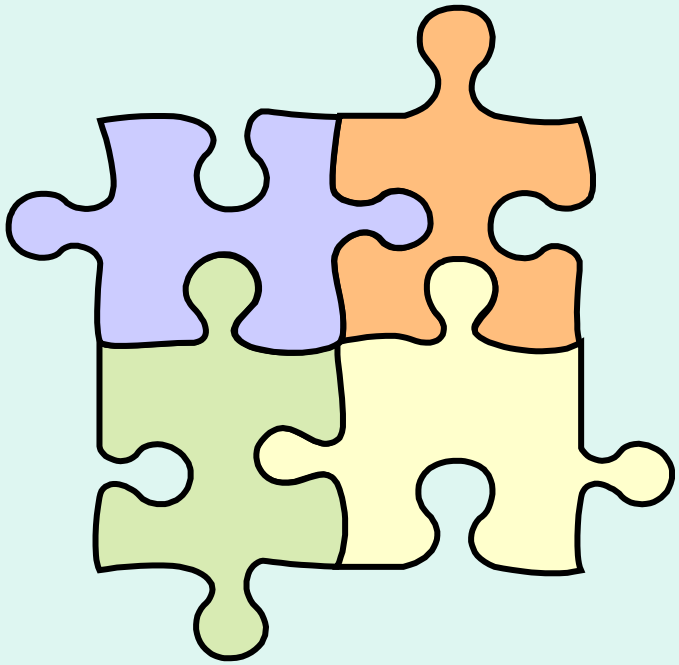
- **Study Group established**
  - Investigate scope and content of Integration Phase
  - Objective to achieve a fully harmonized view of the system and software life cycle processes
- **Integration to consider:**
  - Common purpose and outcomes
  - Architecture of the standards
  - Level of prescription 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?

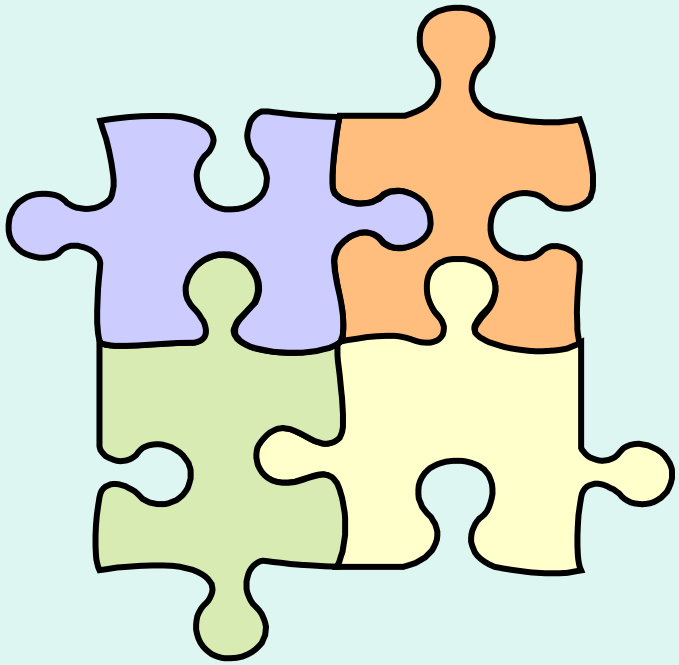
Better Understand Usage of Standards

- **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

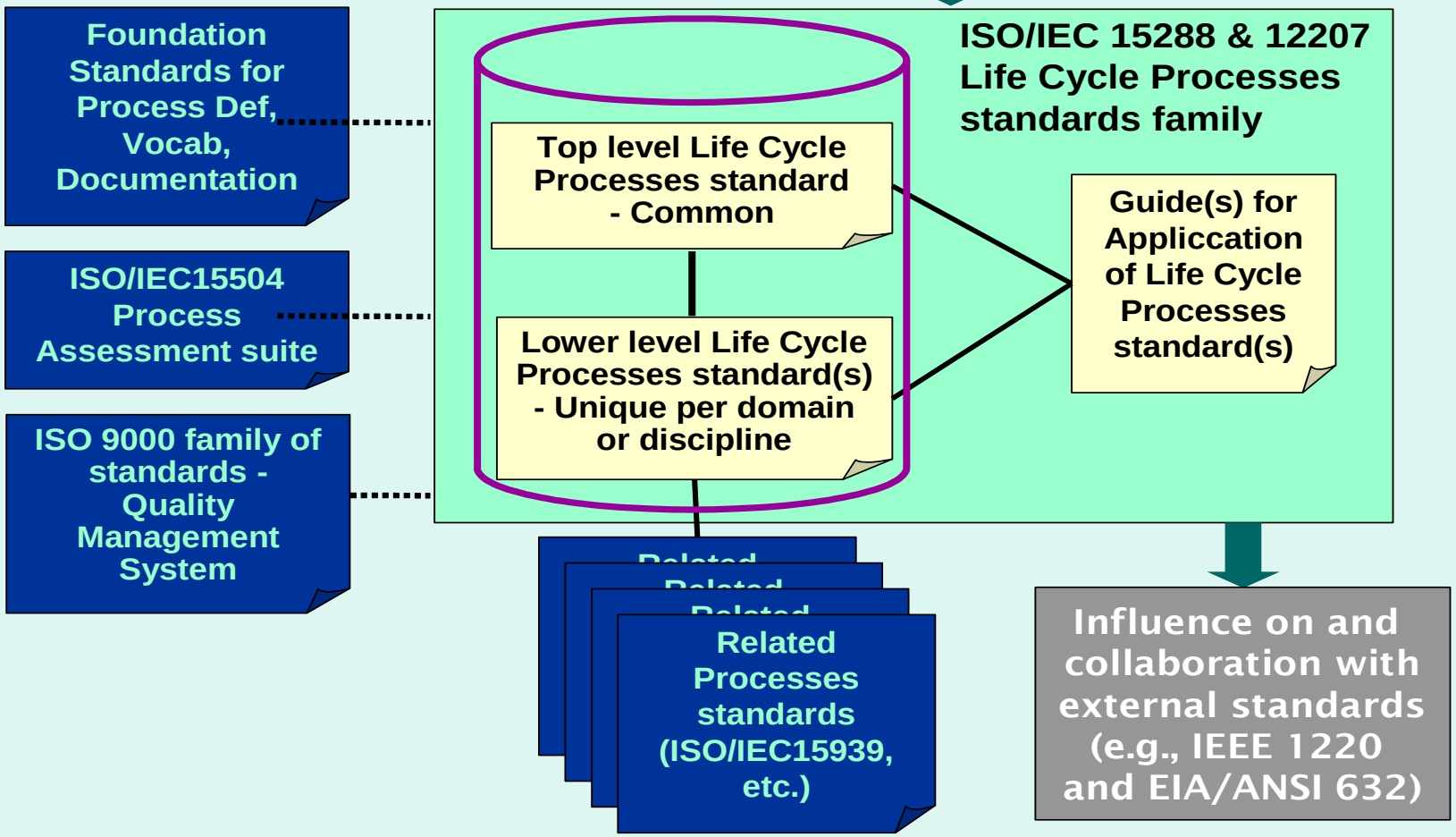
- **ISO/IEC TR 24748-1, Guide to Life Cycle Management**
  - Common guidance and definitions for life cycle management concepts
  - Includes:
    - Stages
    - Definitions
    - Life Cycle Models
  - ***Freely available!***
- **ISO/IEC TR 24748-2, Guide to ISO/IEC 15288, System Life Cycle Processes**
  - 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

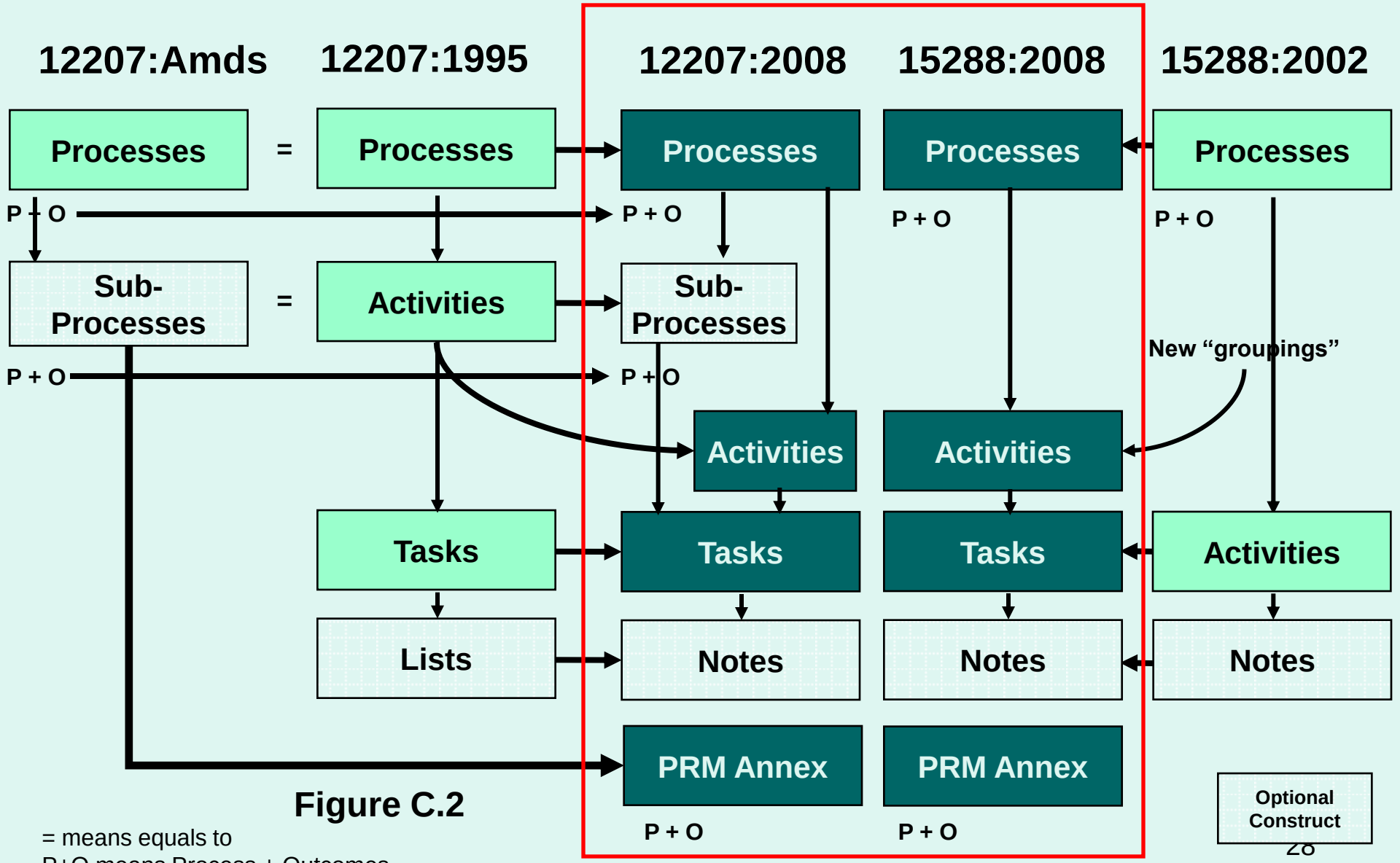
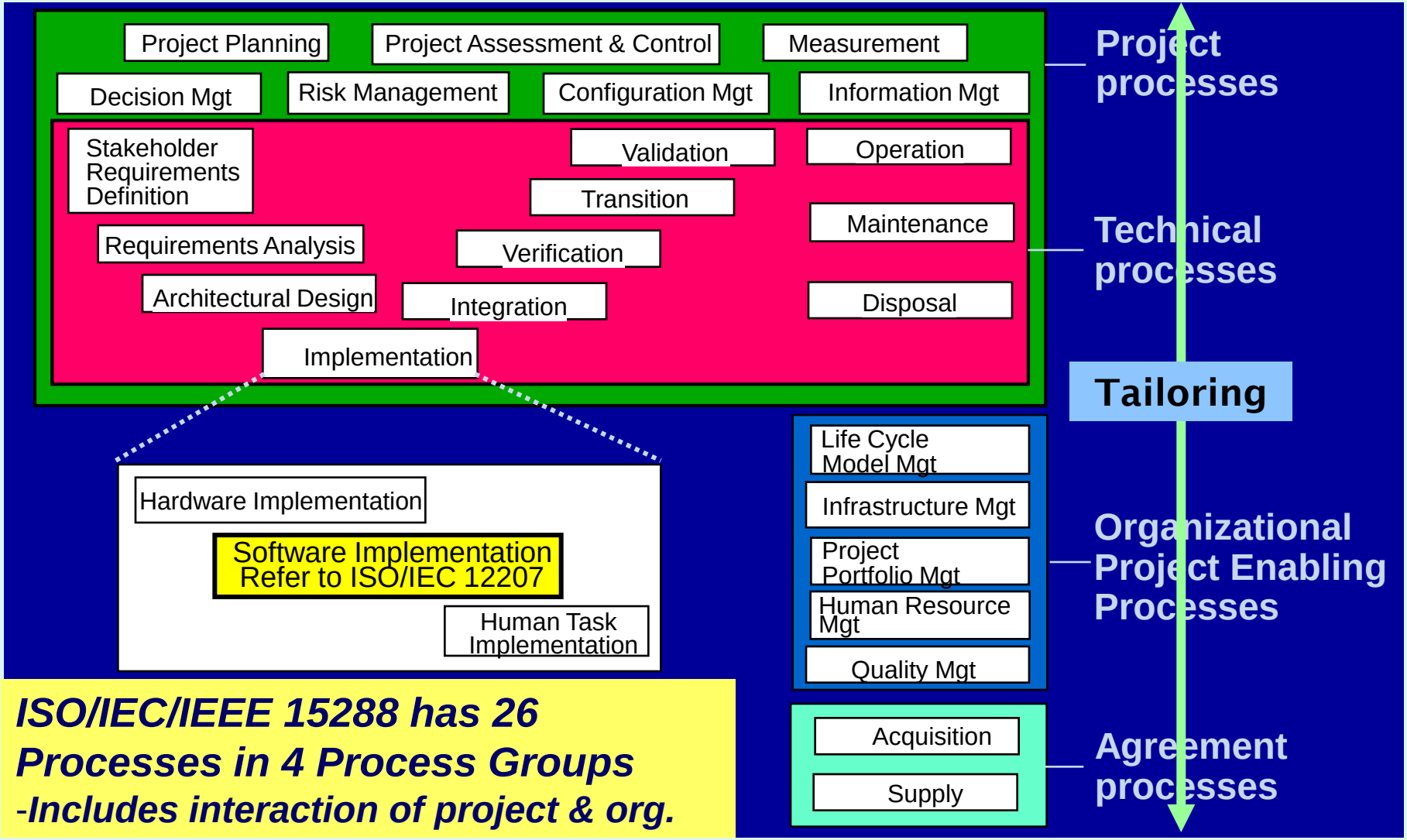


Figure C.2

= means equals to
P+O means Process + Outcomes

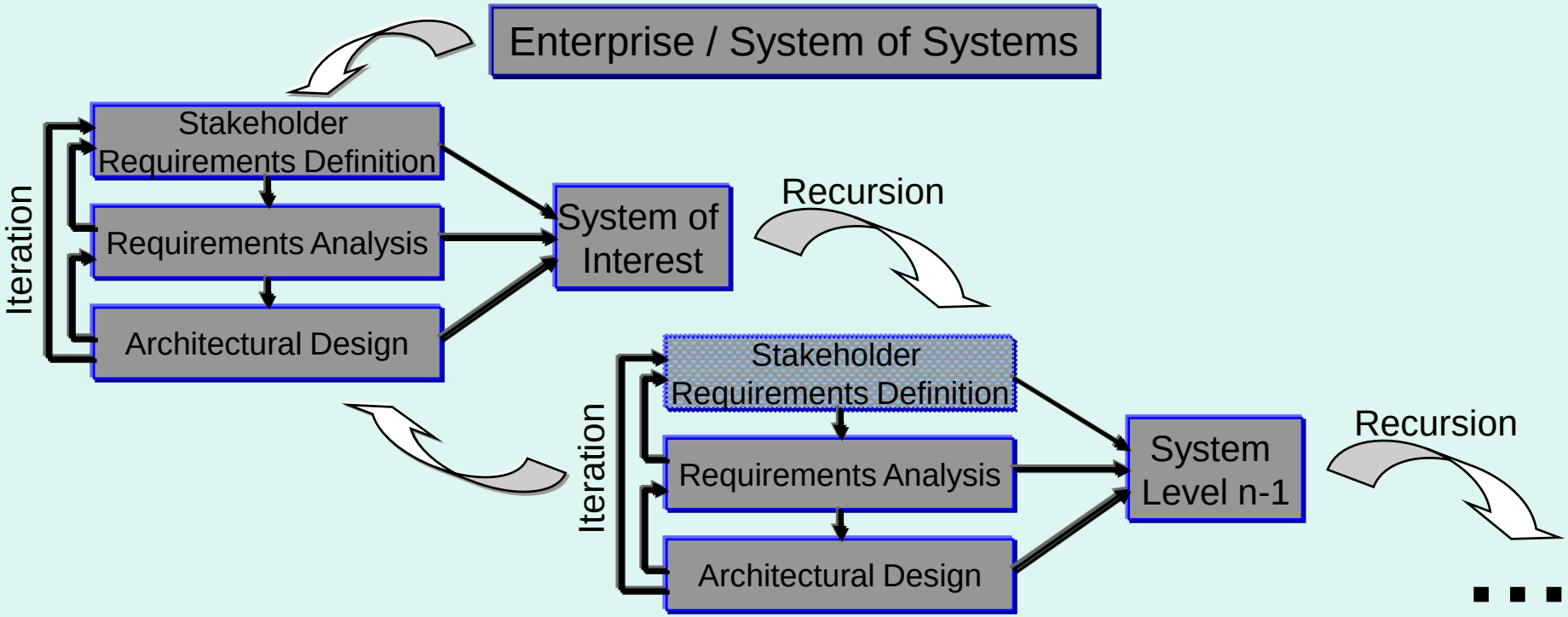
Source: Anatol Kark, National Research Council, Canada

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



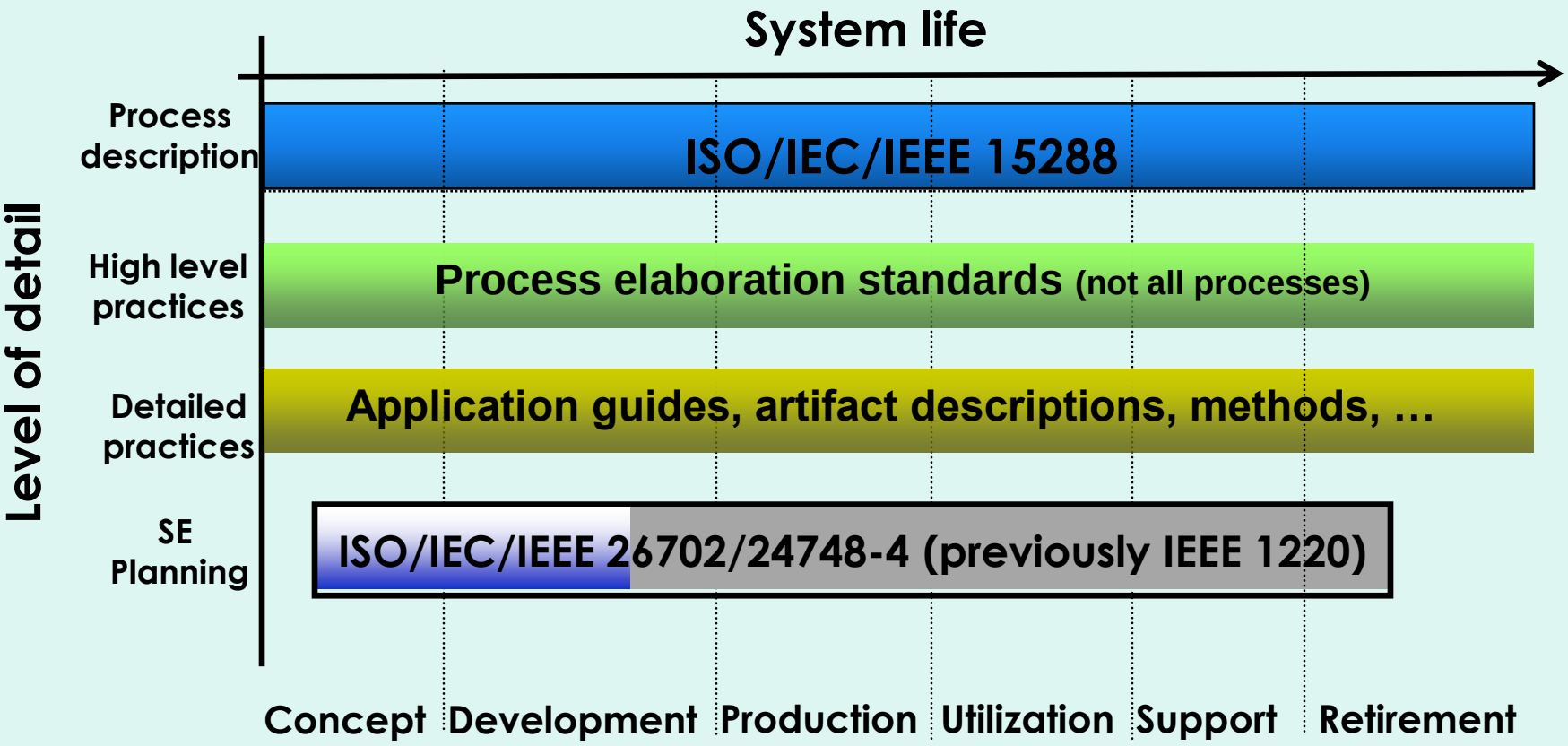
ISO/IEC/IEEE 15288 has 26 Processes in 4 Process Groups
-Includes interaction of project & org.

Source: Adapted from ISO/IEC JTCI/SC7/WG7 presentation on ISO/IEC 15288.



- **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