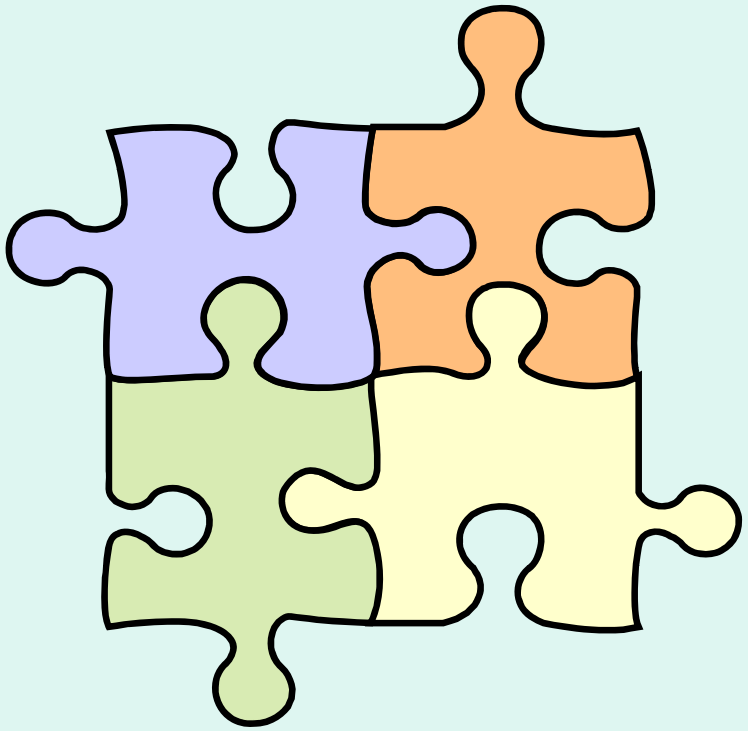


Is An Integrated Set of Systems and Software Standards Possible?

Garry Roedler

US Head of Delegation for ISO/IEC JTC1/SC7/WG7,

US TAG TG7 Lead,

Senior Program Manager, Systems Engineering

Lockheed Martin Corporation

April 29, 2008

Agenda

- **Problem, Causes, 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

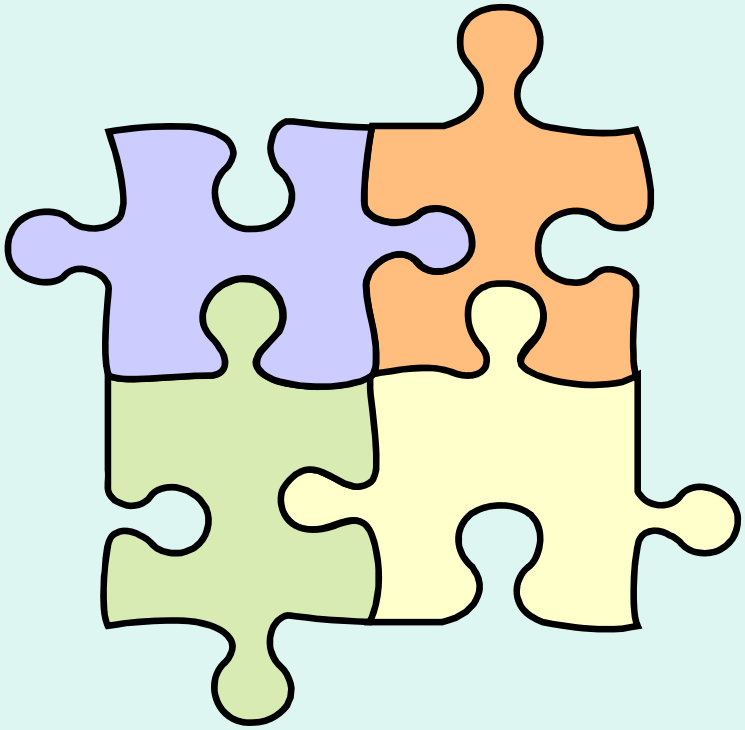
- **Less effective/efficient processes**
  - Not focused on leveraging commonalities – causes redundancy
  - Has resulted in incompatibilities, inconsistencies
- **Less effective solutions**
  - Not focused on a common approach to solve a problem/need
- **Obstacle for:**
  - Communicating (at all levels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

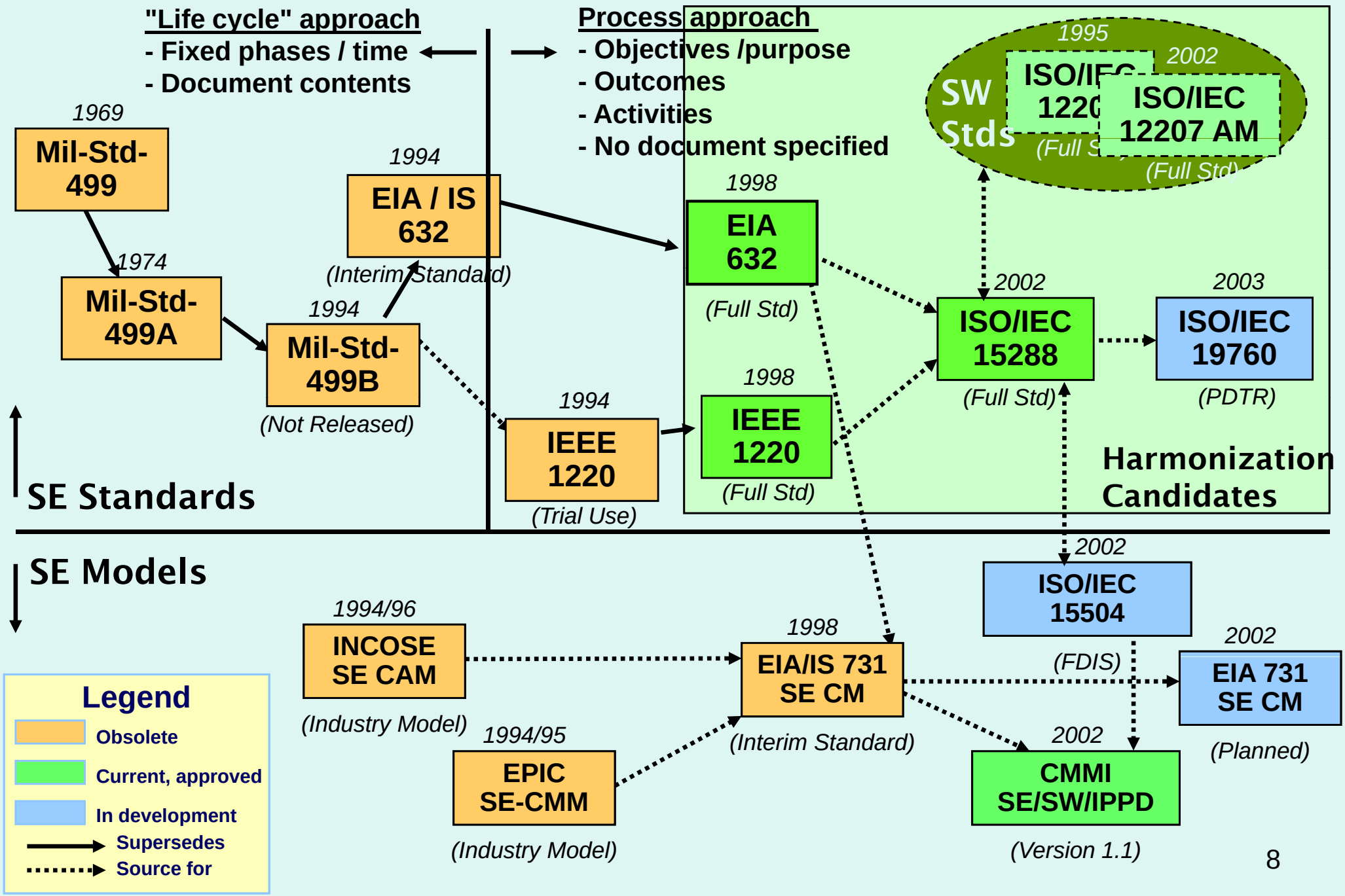
Work to a common vision, agreements, and general process concepts

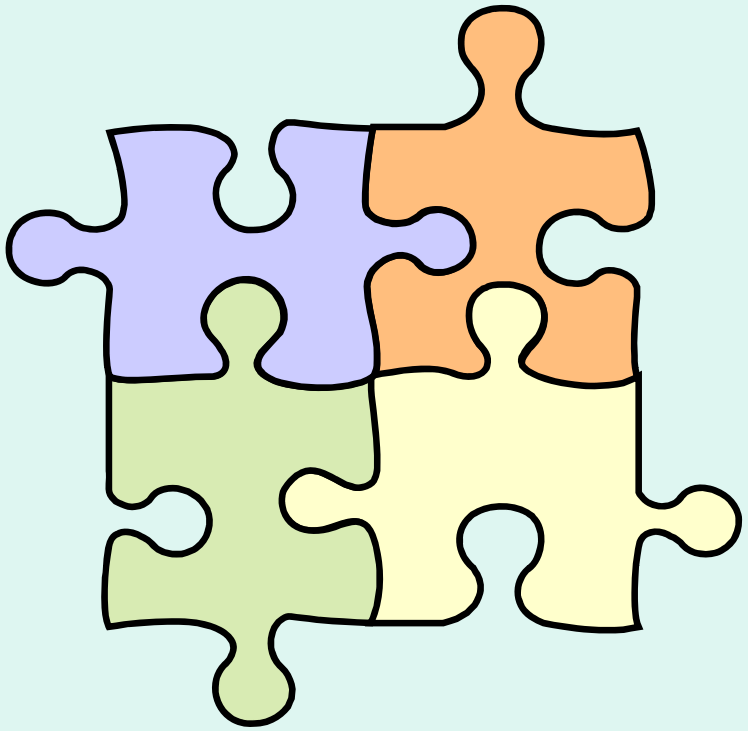


Looking Back

Framing the Situation

Heritage of SE Standards & Models as of 2002

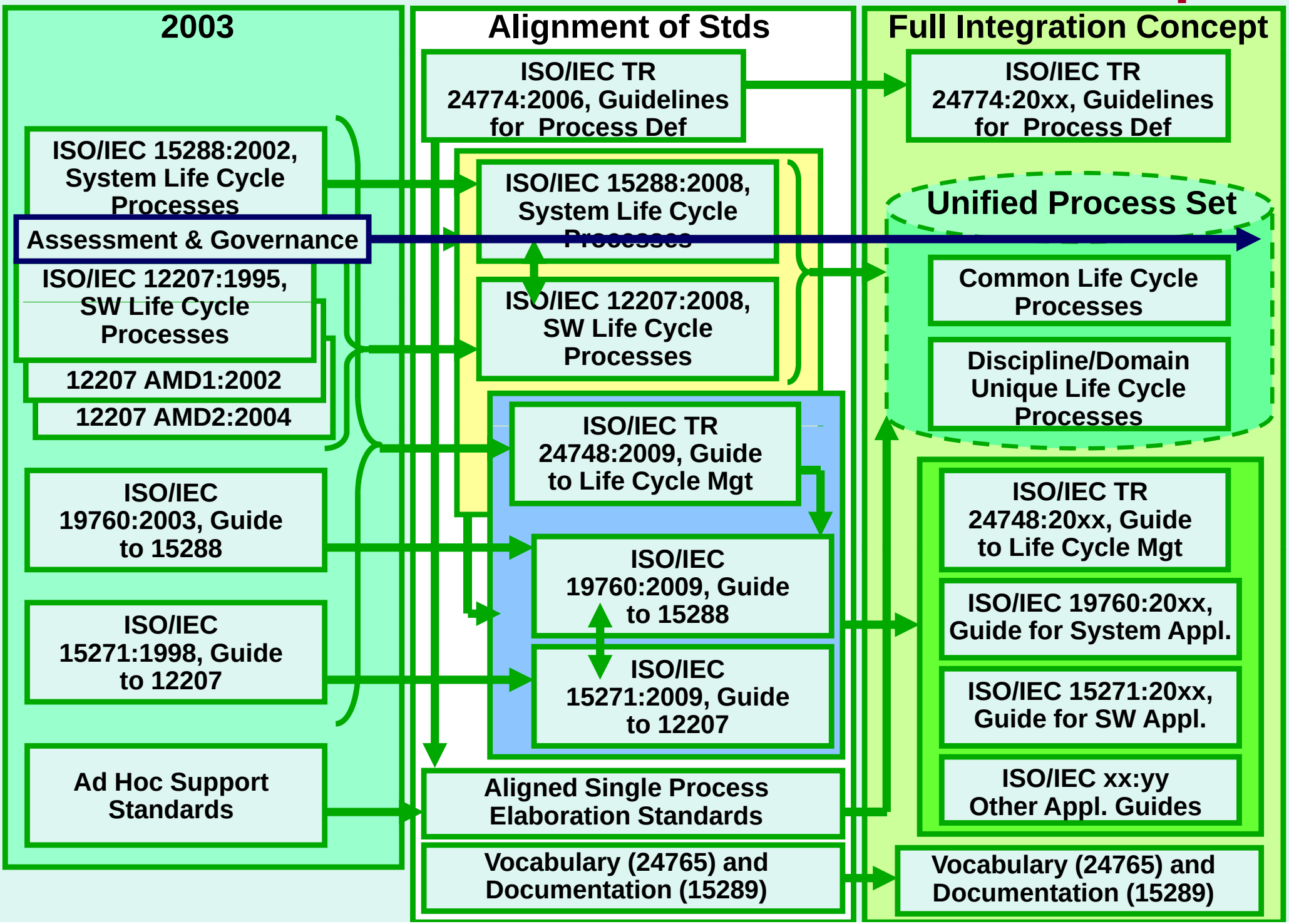




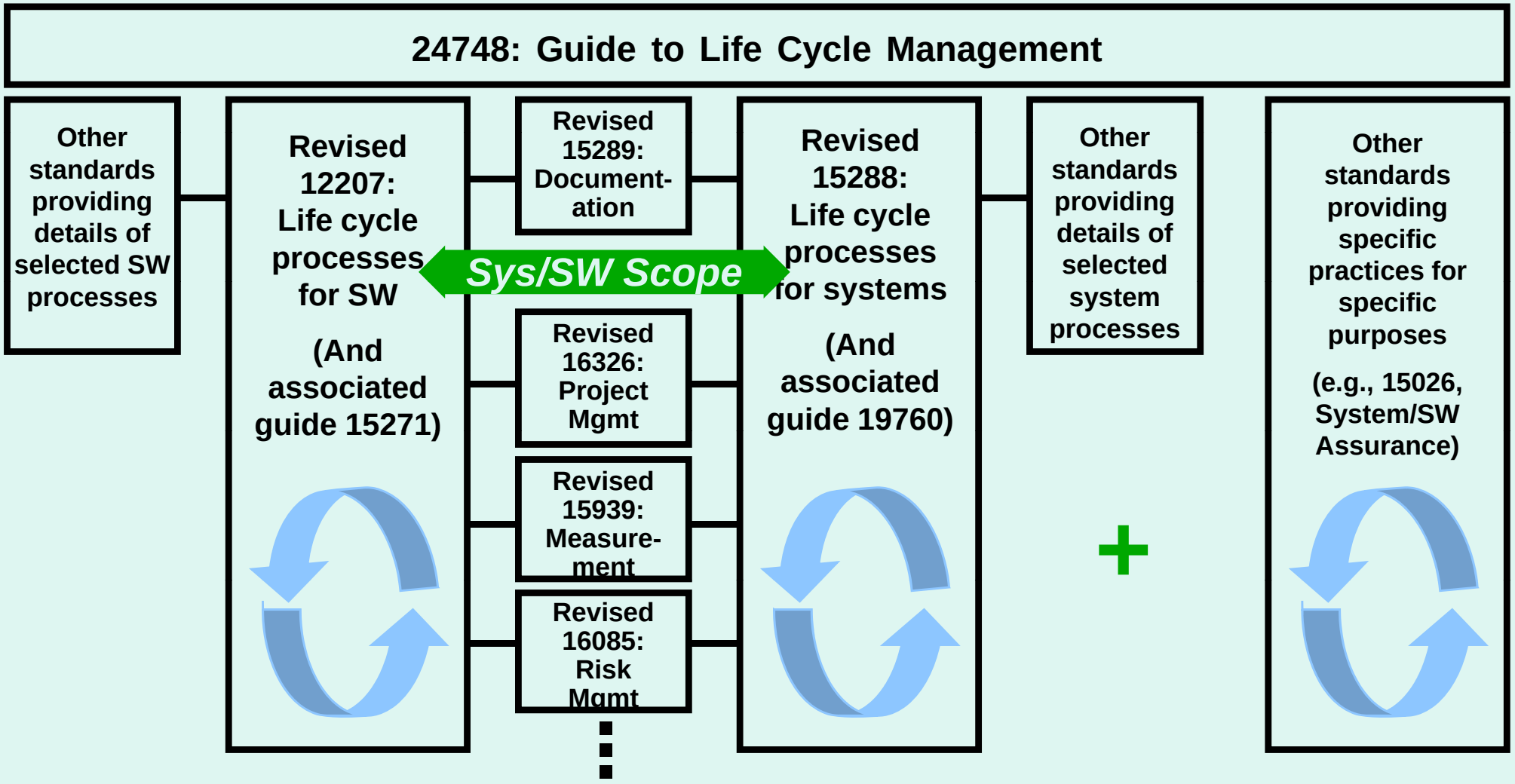
Example of Steps Taken Towards the Objectives

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

ISO/IEC JTC1/SC7 Harmonization Concept



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



Source: Adapted from chart of James Moore, MITRE.

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

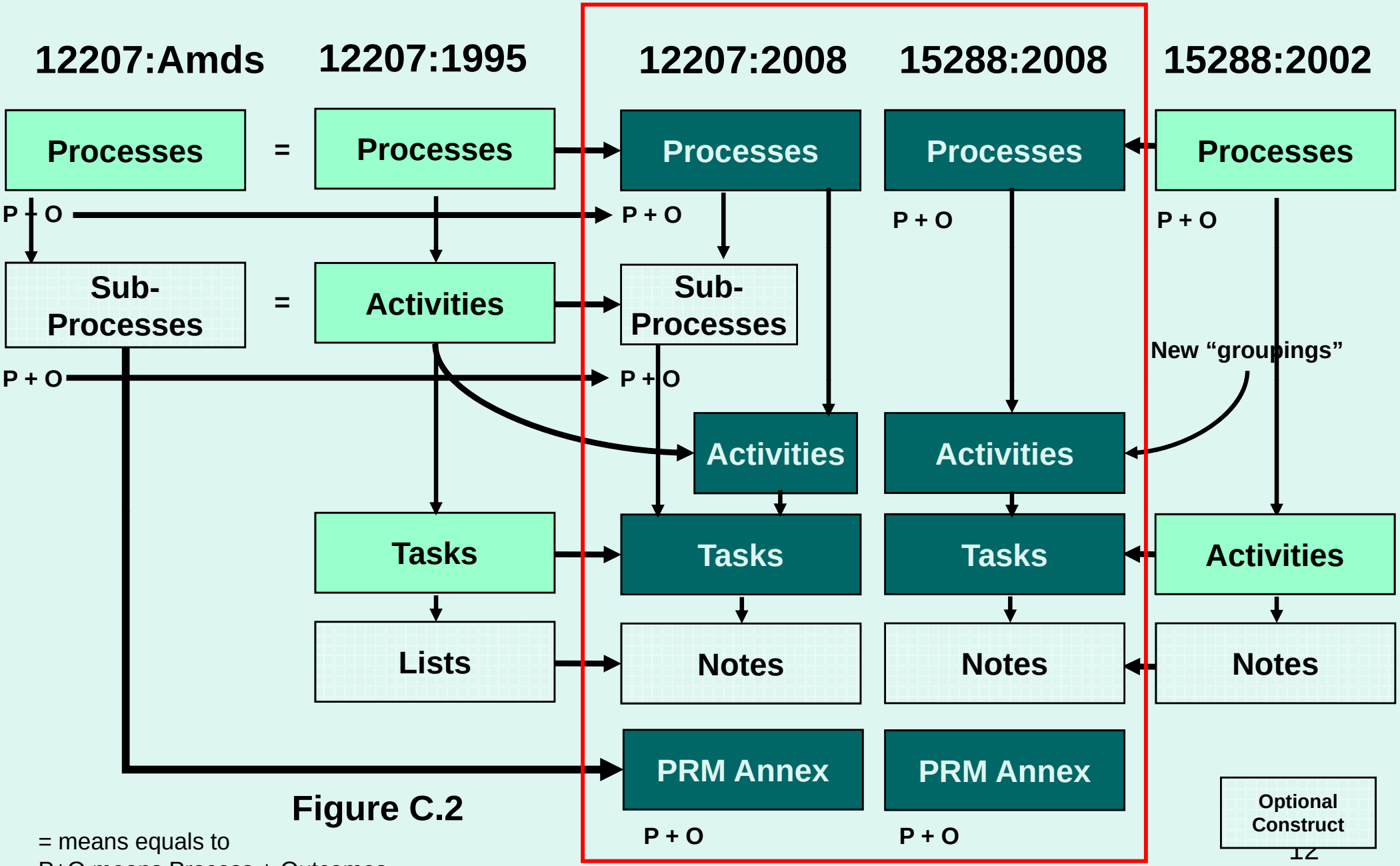
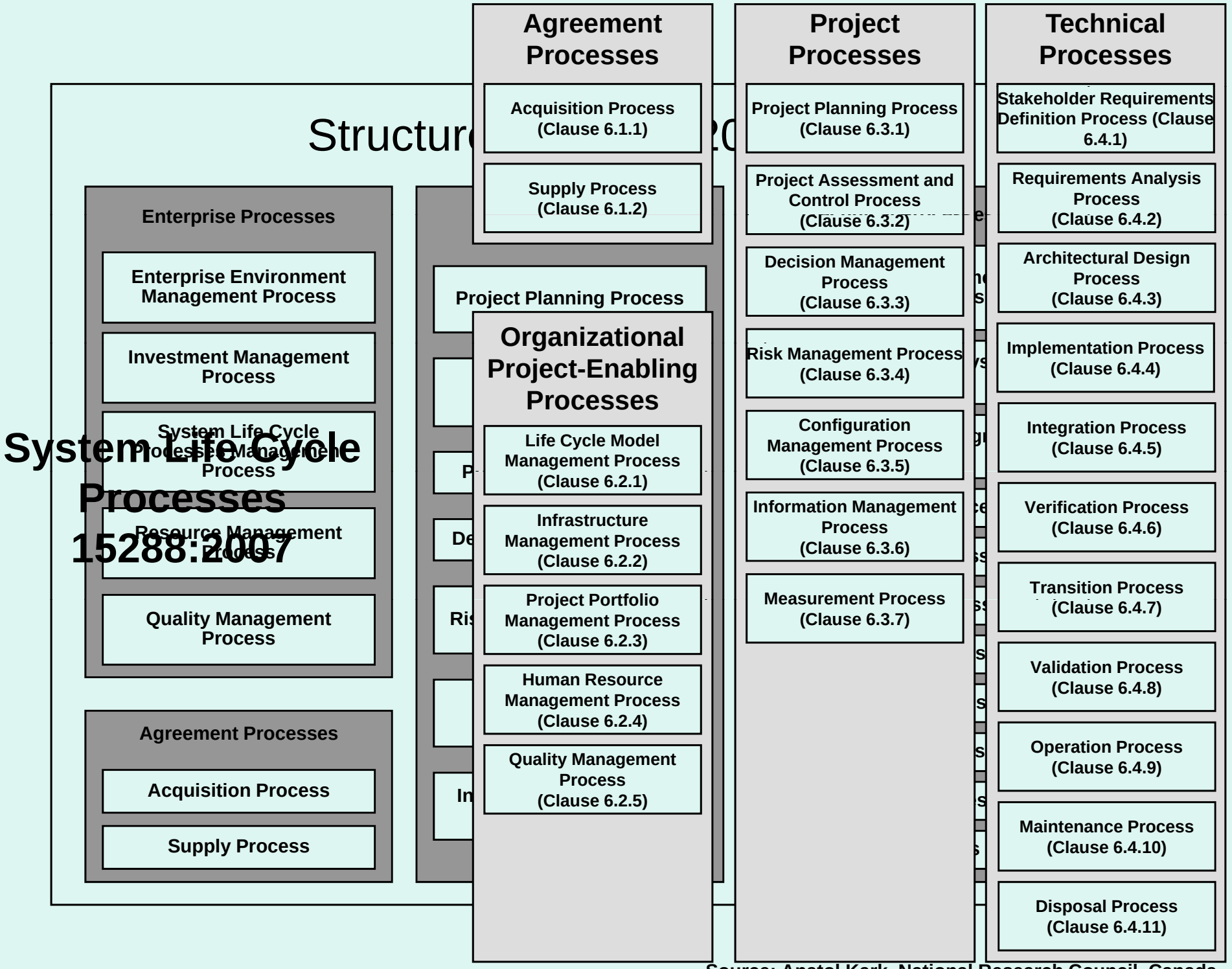


Figure C.2

= means equals to
P+O means Process + Outcomes

Source: Anatol Kark, National Research Council, Canada



Source: Anatol Kark, National Research Council, Canada

System Life Cycle Processes (12207)

Agreement Processes

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

Organizational 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)
- System Requirements Analysis Process (Clause 6.4.2)
- System Architectural Design Process (Clause 6.4.3)
- Implementation Process (Clause 6.4.4) → 7.1.1
- System Integration Process (Clause 6.4.5)
- System Qualification Testing Process (Clause 6.4.6)
- Software Installation Process (Clause 6.4.7)
- Software Acceptance Support Process (Clause 6.4.8)
- Software Operation Process (Clause 6.4.9)
- Software Maintenance Process (Clause 6.4.10)
- Software Disposal Process (Clause 6.4.11)

Software Life Cycle Processes

SW Implement-ation Processes

- Software Implementation Process (Clause 7.1.1)
- Software Requirements Analysis Process (Clause 7.1.2) ← From 5.3.1
- Software Architectural Design Process (Clause 7.1.3) ← From 5.3.4
- Software Detailed Design Process (Clause 7.1.4) ← From 5.3.5
- Software Construction Process (Clause 7.1.5) ← From 5.3.6
- Software Integration Process (Clause 7.1.6) ← From 5.3.7
- Software Qualification Testing Process (Clause 7.1.7) ← From 5.3.8

SW Support Processes

- Software Documentation Management Process (Clause 7.2.1)
- Software Configuration Management Process (Clause 7.2.2)
- Software Quality Assurance Process (Clause 7.2.3)
- Software Verification Process (Clause 7.2.4)
- Software Validation Process (Clause 7.2.5)
- Software Review Process (Clause 7.2.6)
- Software Audit Process (Clause 7.2.7)
- Software Problem Resolution Process (Clause 7.2.8)

Software Reuse Processes

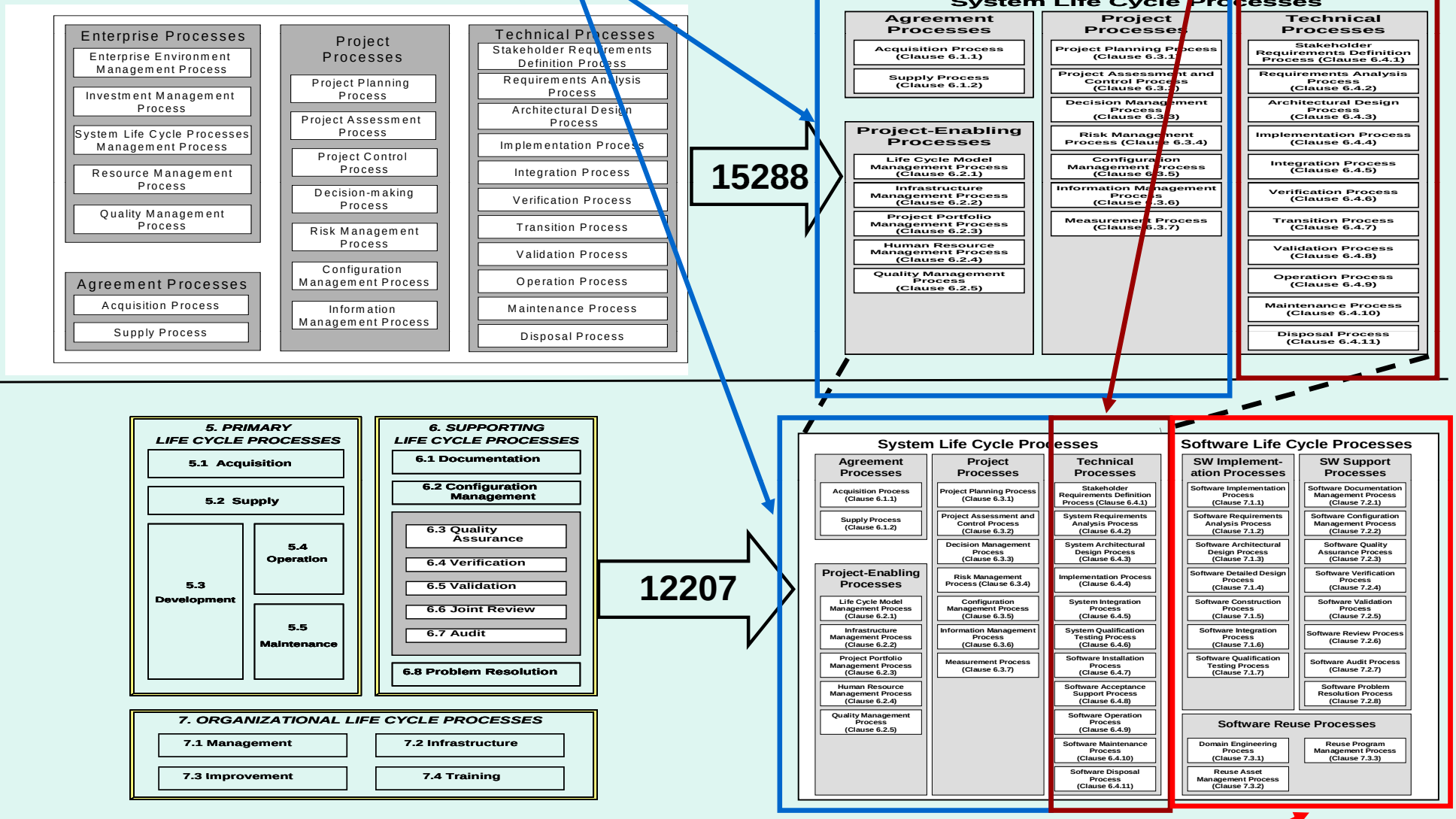
- Domain Engineering Process (Clause 7.3.1)
- Reuse Program Management Process (Clause 7.3.3)
- Reuse Asset Management Process (Clause 7.3.2)

Source: Anatol Kark, National Research Council, Canada

Another way of looking at it:

1. Processes common to both

2. Processes similar between the two



3. Processes unique to domain

Source: Integration Study Group draft content – Richard Kitterman, Northrop Grumman

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

Supporting Guidance Changes

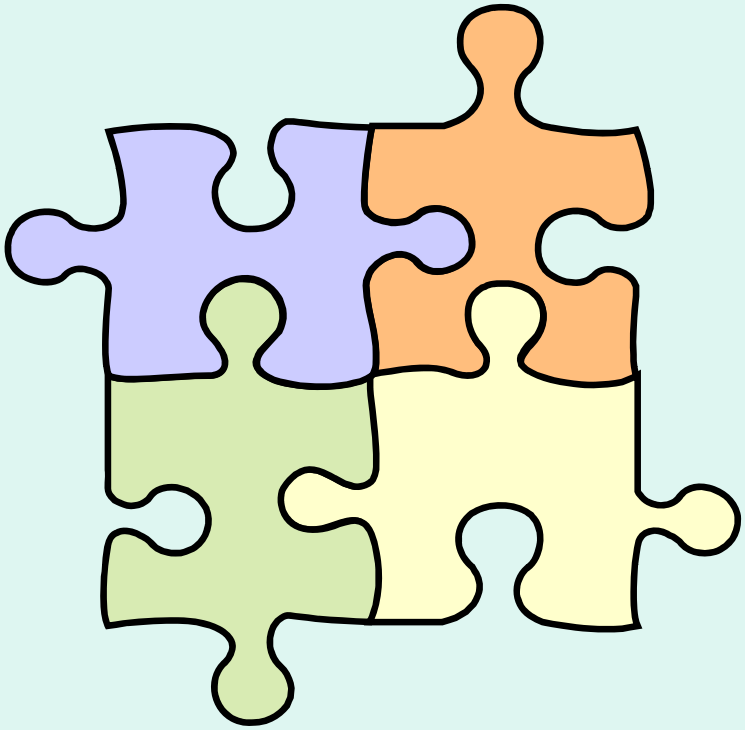
- **ISO/IEC TR 24748, Guide to Life Cycle Management**
  - Common guidance and definitions for life cycle management concepts
  - Includes
    - Stages
    - Definitions
    - Life Cycle Models
- **ISO/IEC TR 19760, Guide to ISO/IEC 15288, System Life Cycle Processes**
  - Guidance specific to application 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
- **ISO/IEC TR 15271, 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

In Work Now!

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

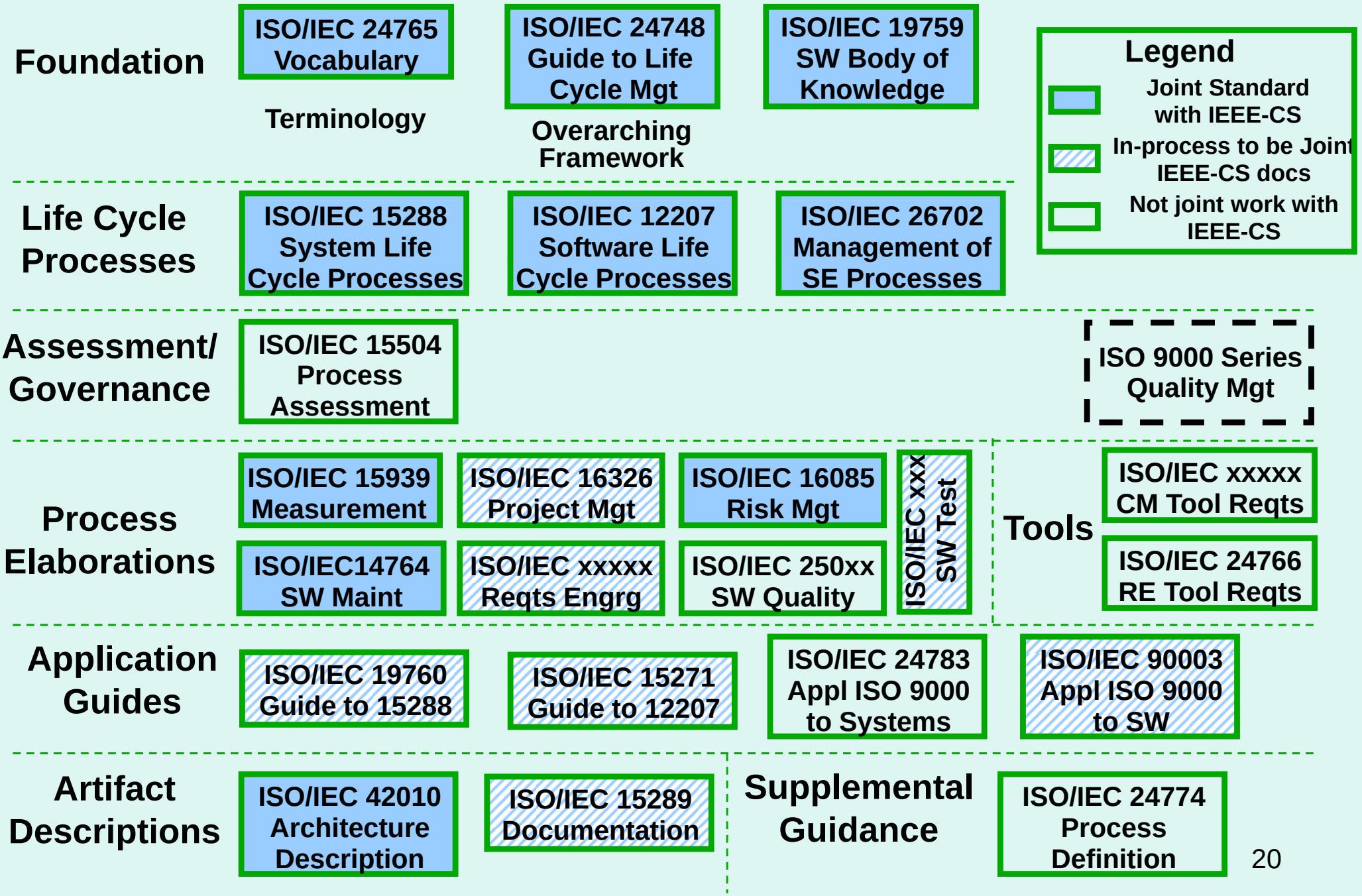
Towards Full Integration

- **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



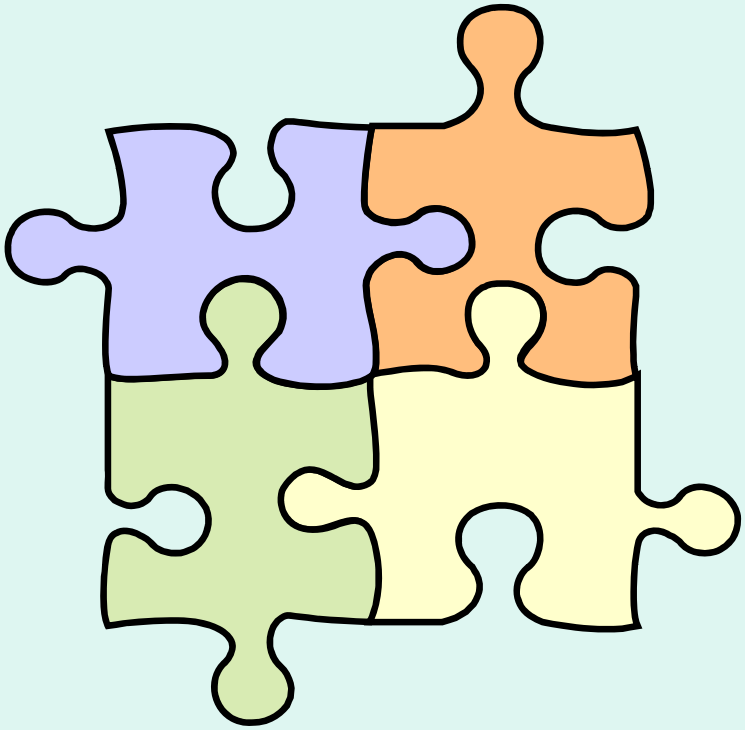
Assessment of Success

Current Alignment/Integration Status



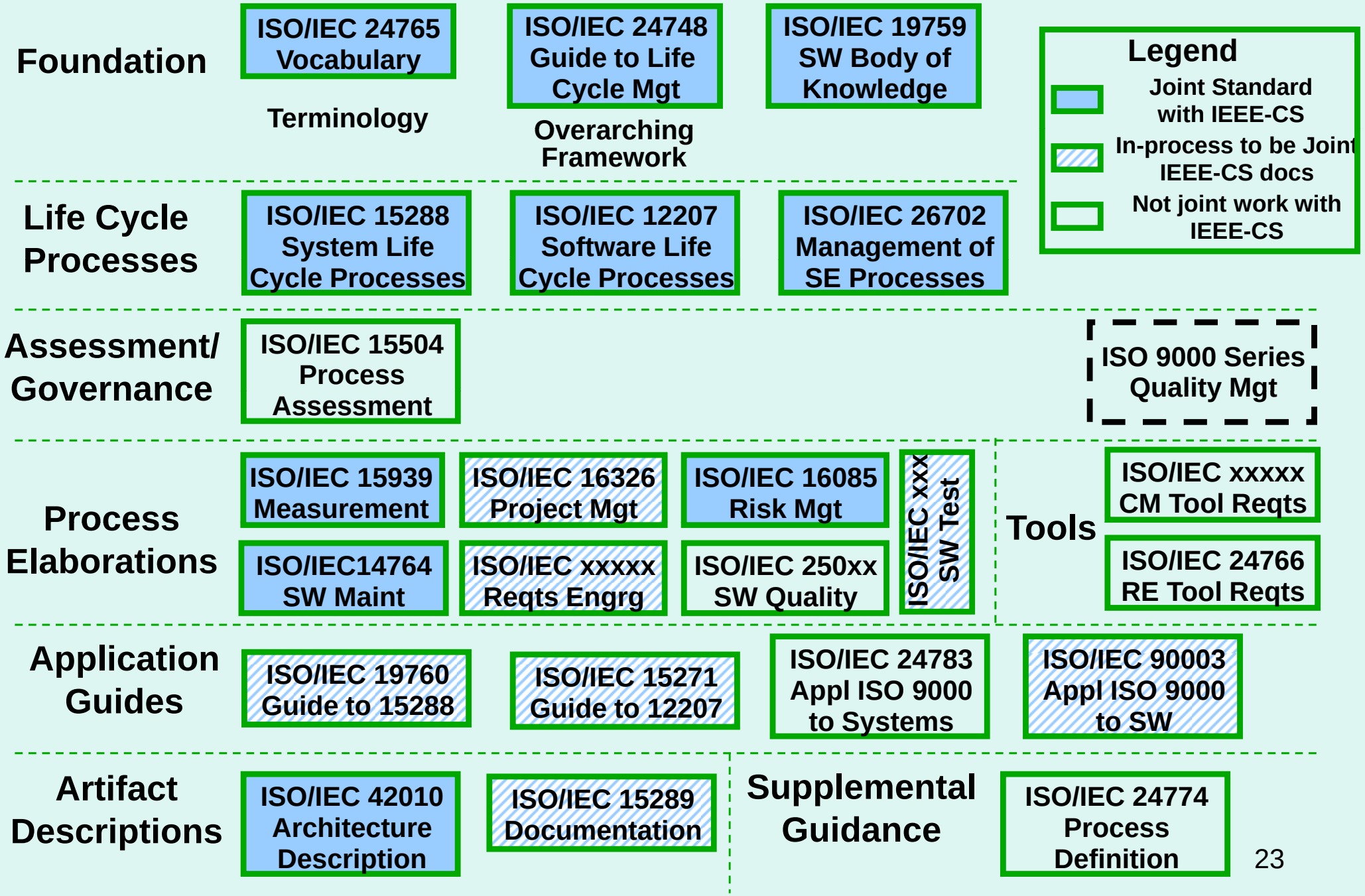
But Is This Enough?

- **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

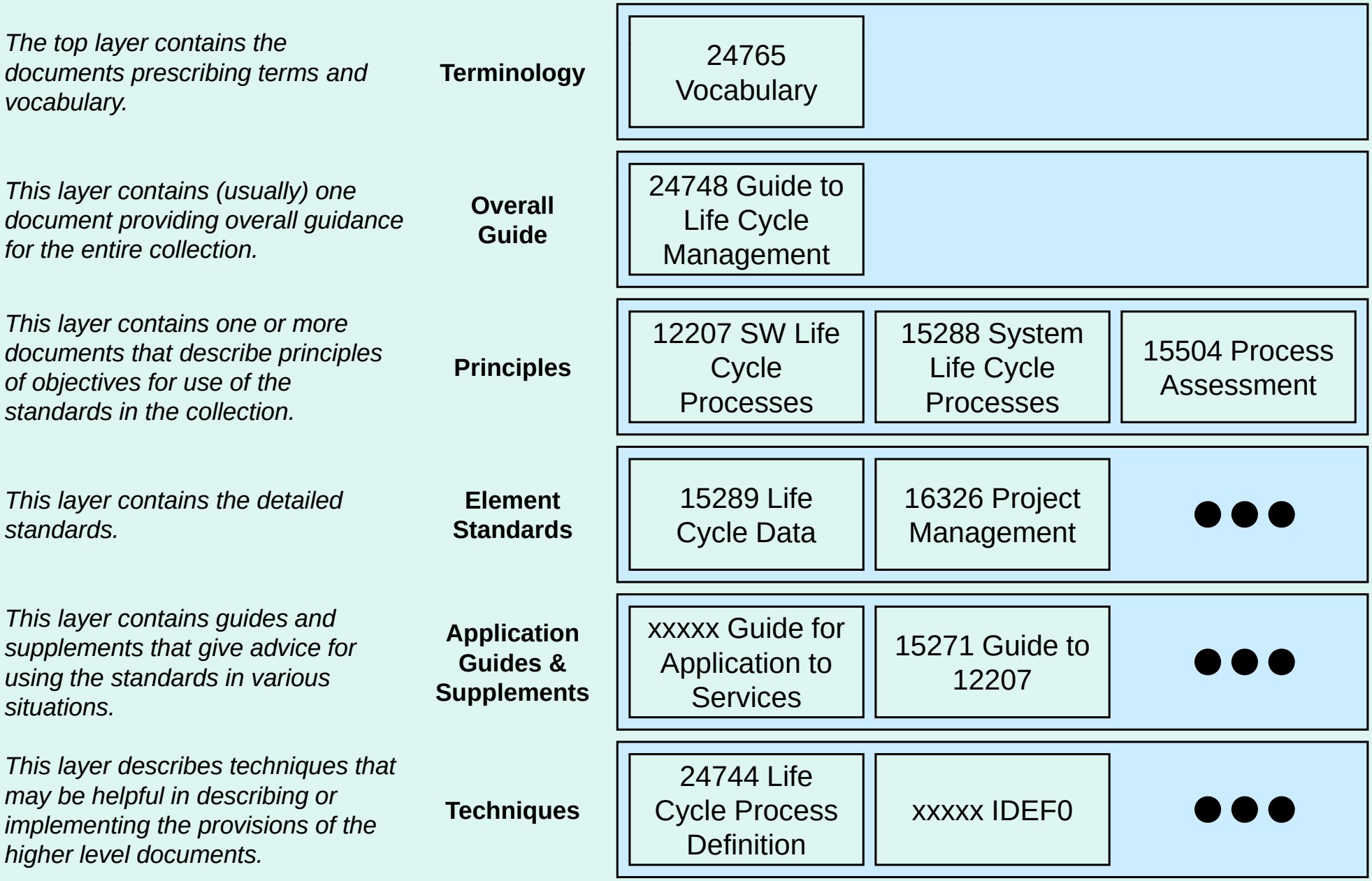


What Is Still Needed?

Need a Common Taxonomy for Process Standards – One Candidate



Need a Common Taxonomy – Another Candidate



An (incomplete) example of applying the layered approach to Life Cycle Process standards

Adapted from: James W. Moore, Software Engineering Standards: A Users Road Map, John Wiley & Sons, 1997 – Used with permission from James Moore..

Other Needs

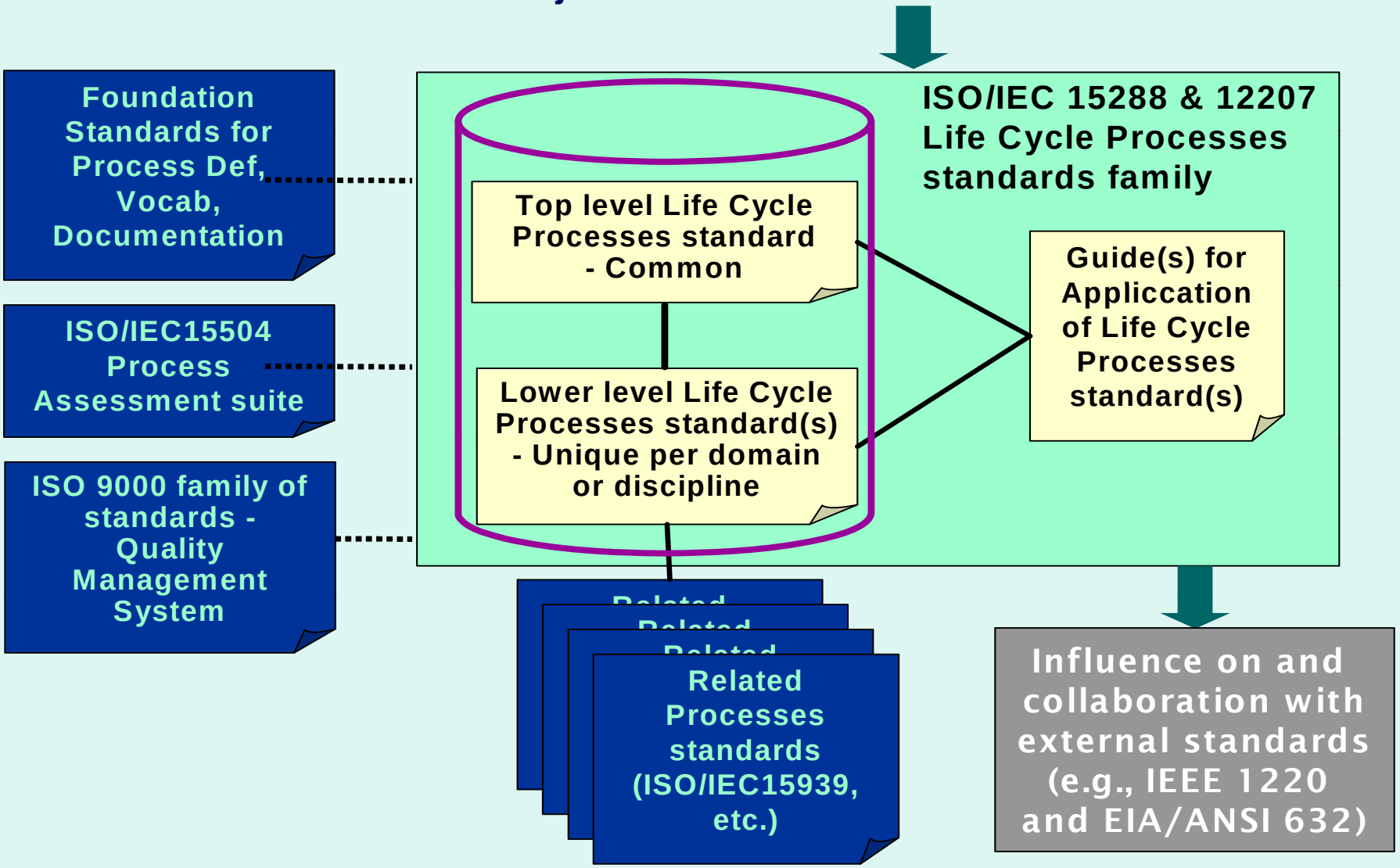
- **Identification of related standards within and between SDOs**
- **Tie more SDOs into integration efforts through joint partnering agreements**
- **Establish long-term visions and plans to accomplish integration efforts**

Communicate, Cooperate, Collaborate!

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

For More Information:

- **Doug Thiele**
  - ISO/IEC JTC1/SC7 WG7 Convener
  - doug.thiele@ieee.org
- **Garry Roedler**
  - ISO/IEC 15288 Project Editor
  - garry.j.roedler@lmco.com
- **Terry Doran**
  - ISO/IEC 12207 Project Editor
  - Terry.Doran@computer.org
- **Dick Kitterman**
  - ISO/IEC TR 24748 Project Editor
  - Richard.Kitterman@ngc.com
- **James Moore**
  - Alignment Editor
  - James.W.Moore@ieee.org
- **Cheryl Jones**
  - ISO/IEC 15288 Co-Editor
  - cheryl.jones5@us.army.mil
- **Anatol Kark**
  - ISO/IEC 12207 Co-Editor
  - anatol.kark@nrc.ca