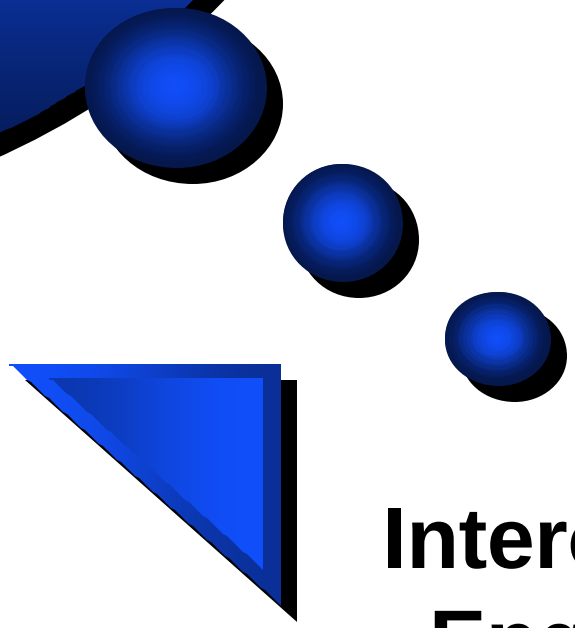

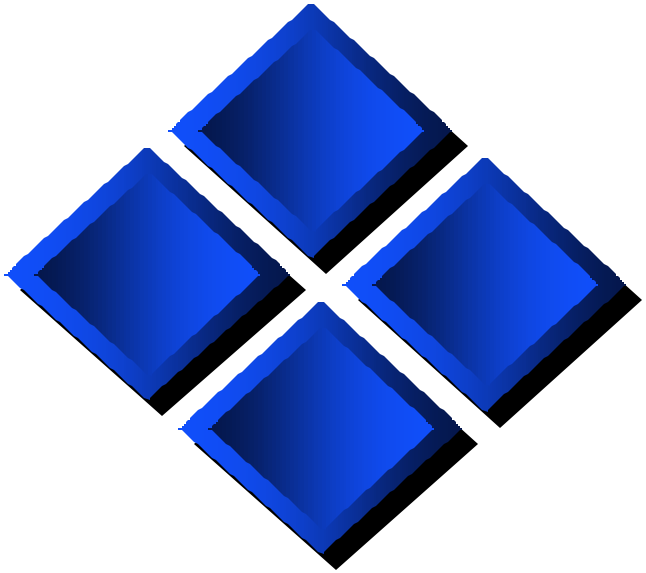

Interoperability of Systems Engineering Standards – Harmonizing World and National Perspectives

Paul R. Croll

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Topics

- The Interoperability Problem
- Harmonization Goals
- The Source Standards and Their Relationships
- Two Harmonization Paths
- The Recommendations for Harmonization
- Questions

The Interoperability Problem

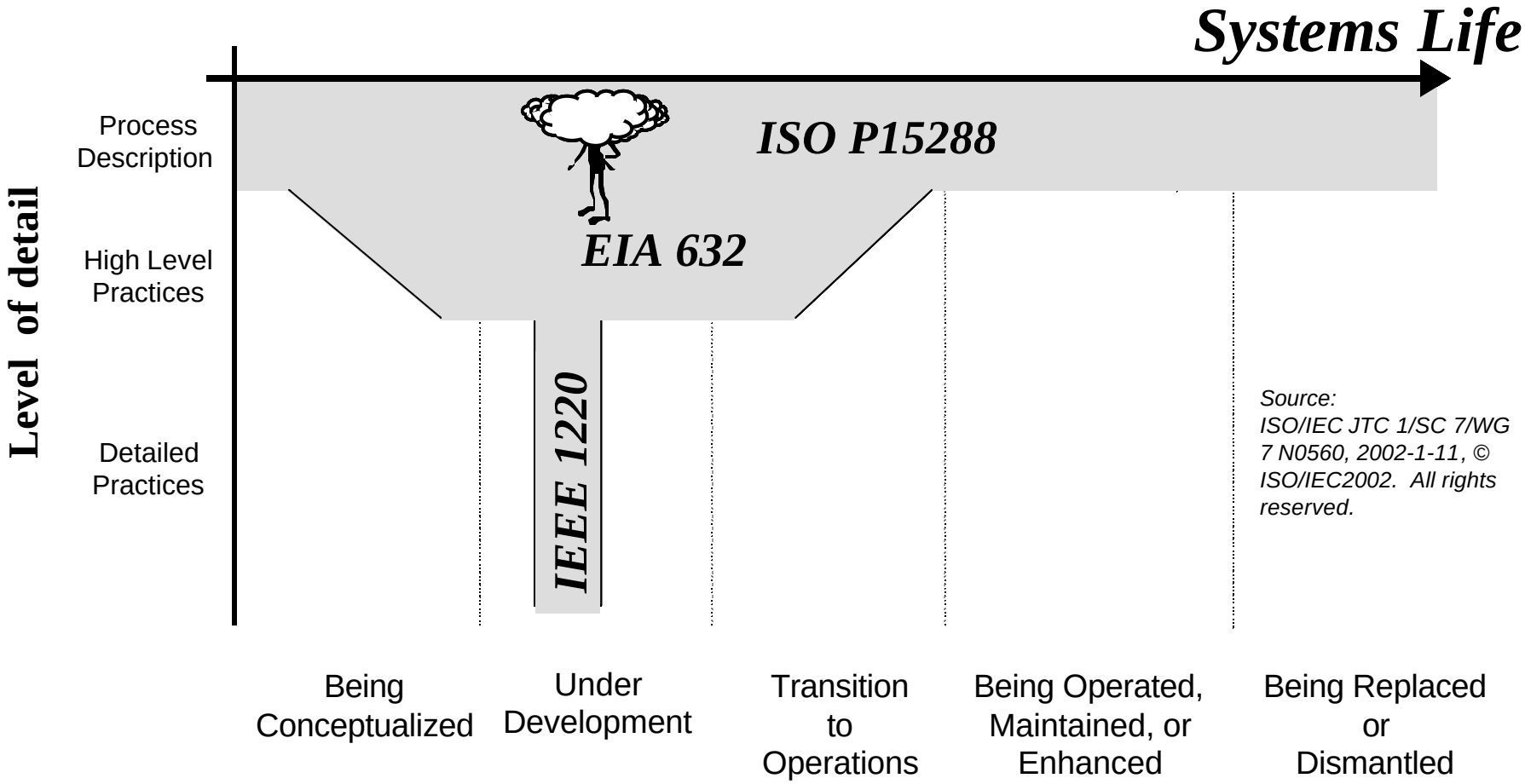
The Standards Interoperability Problem

- Stovepipe standards that are often:
  - Overlapping
  - Incomplete
  - Discipline-centric
  - Cannot easily interoperate to provide a consistent set of best practices for the engineering of systems

Three Different Systems Engineering Perspectives . . .

- ISO/IEC 15288, System Life Cycle Processes
  - Processes that an organization is likely to establish in order to build complete and efficient life cycle models.
- EIA 632, Processes for Engineering a System
  - An integrated set of fundamental processes for engineering a system.
- IEEE 1220, Standard for Application and Management of the Systems Engineering Process
  - Detailed description of the system development tasks and activities

. . . Provide an Incomplete and Sometimes Confusing Picture



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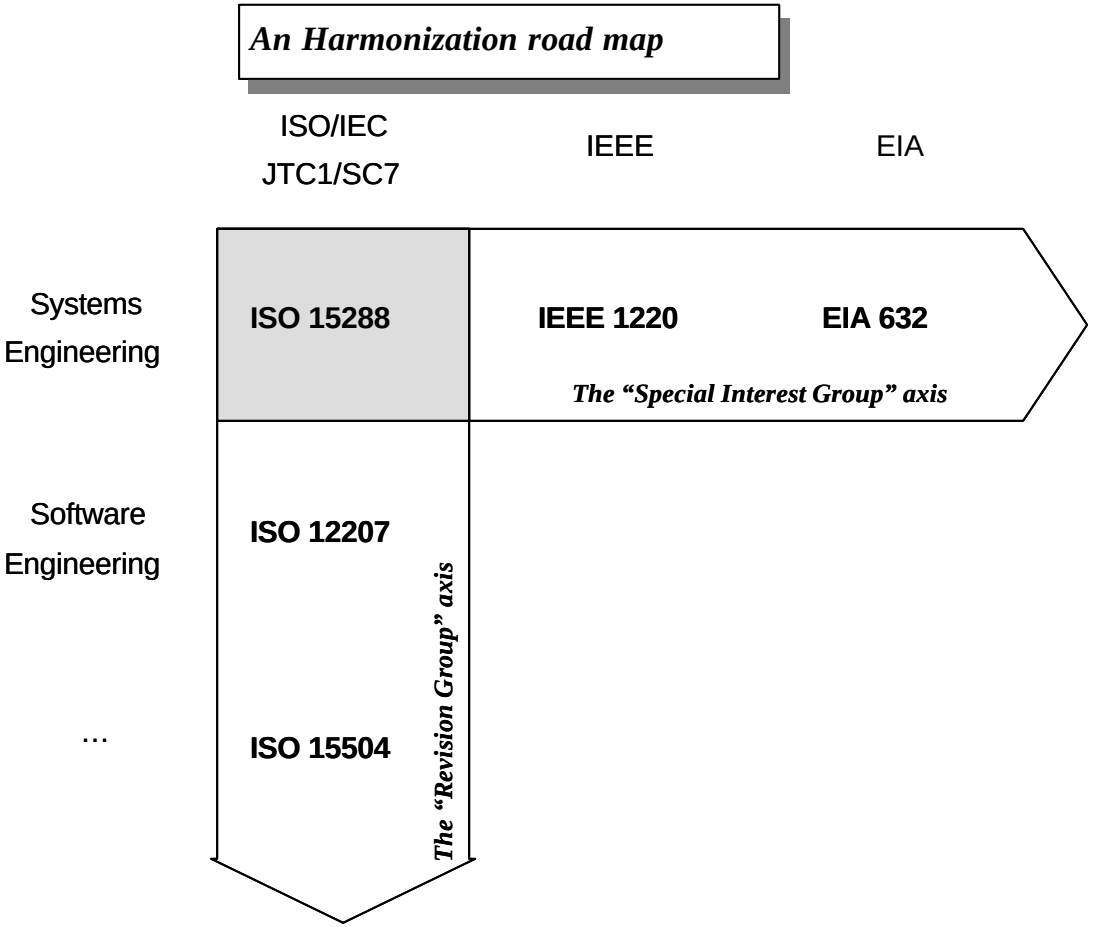
Harmonization Goals

Consistency Goals

- Concepts
- Terminology
- Readability
- Level of detail
- Processes
- Document structure
- Normative references
- Common interfacing mechanism with the ISO 9000 family of standards
- Conformance with requirements from ISO/IEC 15504 as applicable

Two Harmonization Paths



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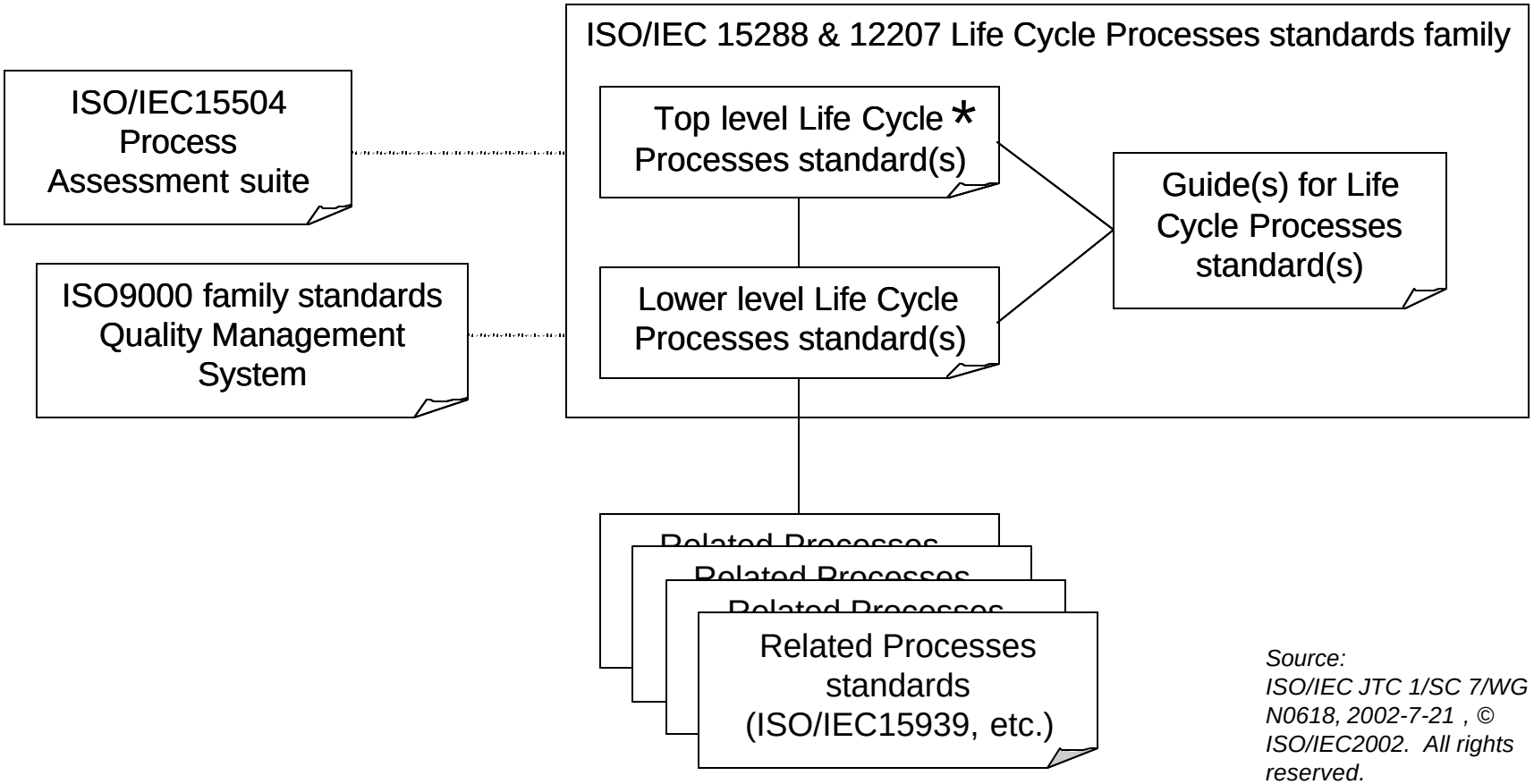
Expected relationships among ISO/IEC JTC1/SC7 documents



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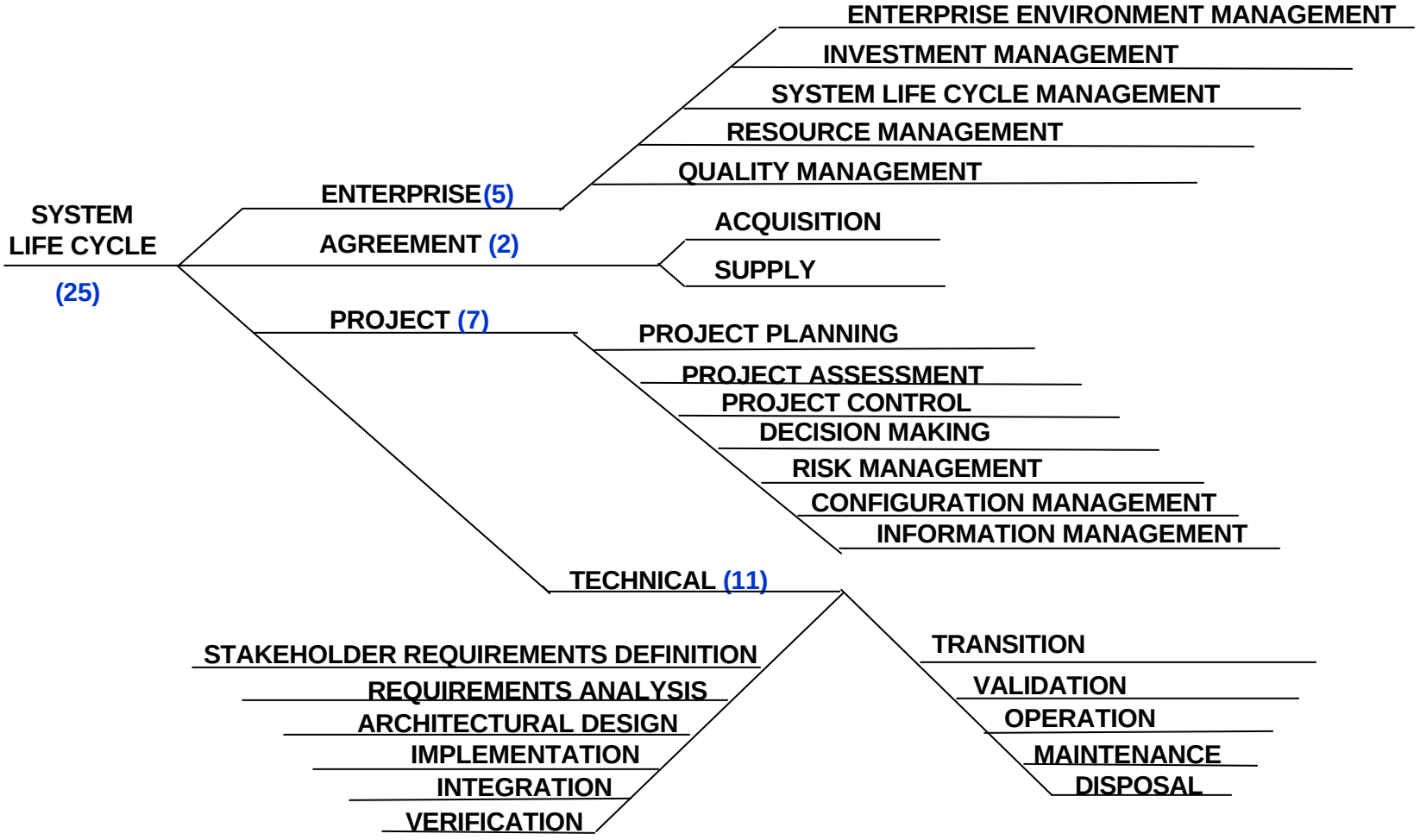
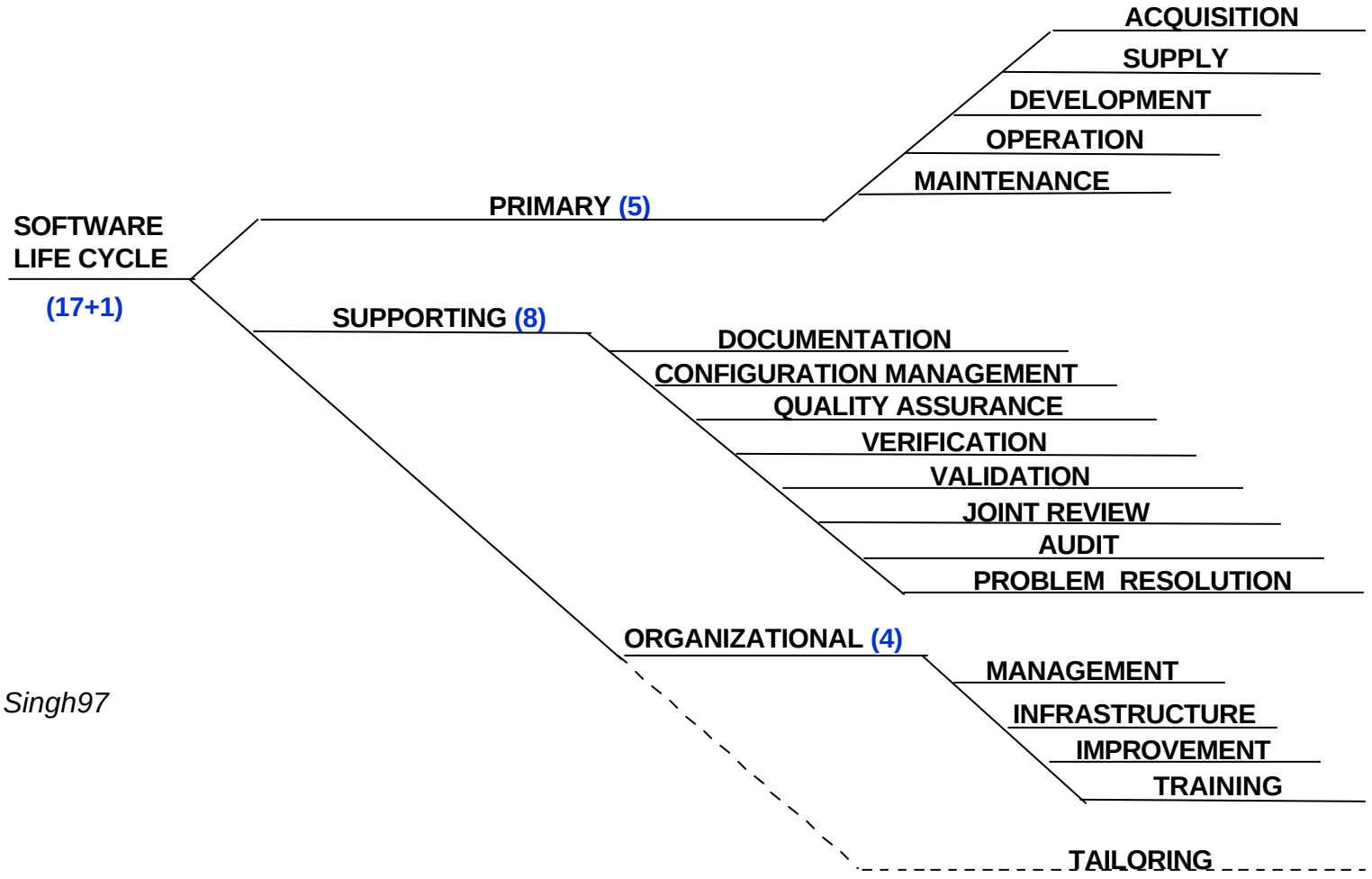
The Source Standards and Their Relationships

The ISO/IEC 15288 Systems Life Cycle Process Framework

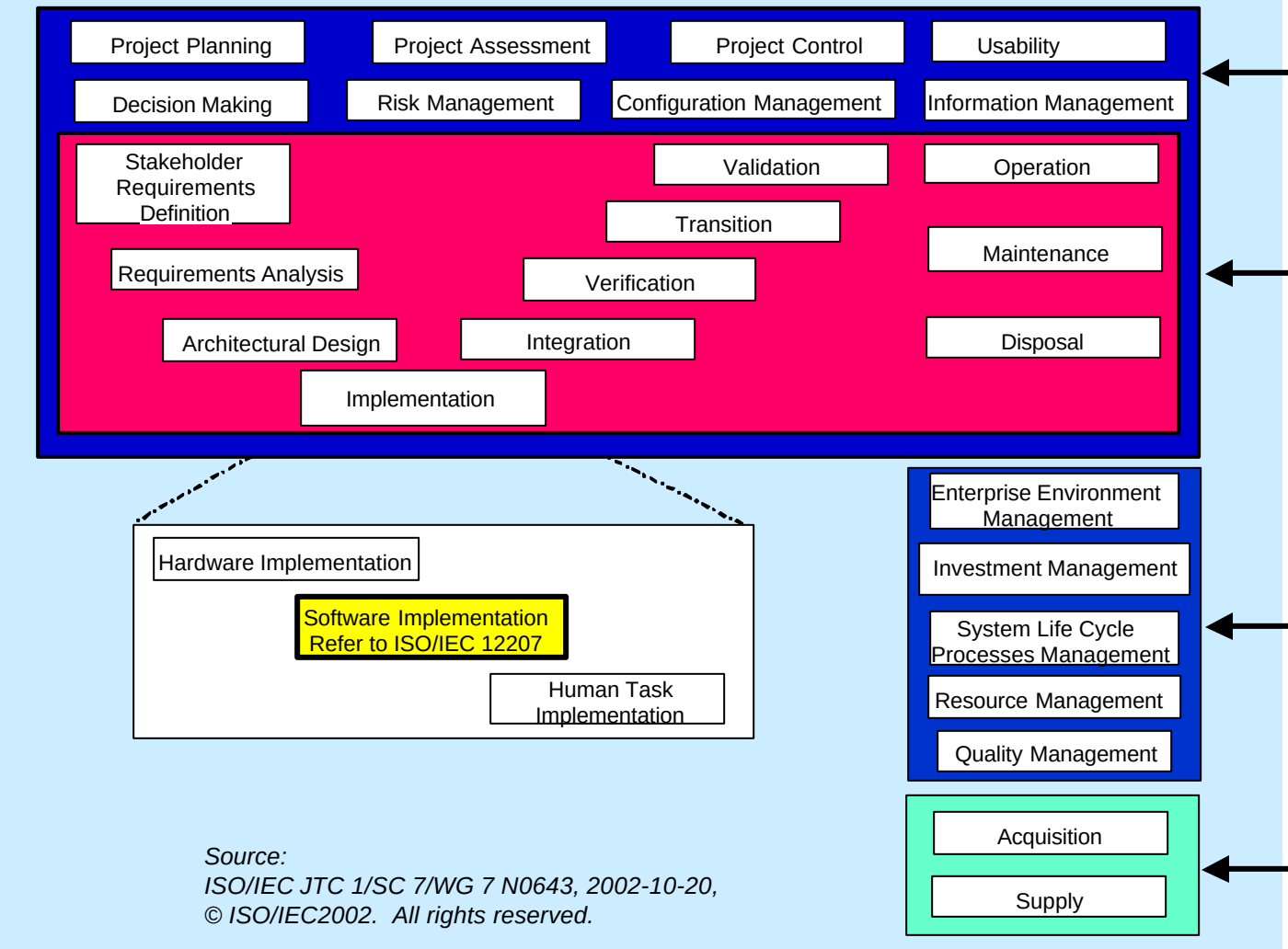


The IEEE/EIA 12207 Software Life Cycle Process Framework



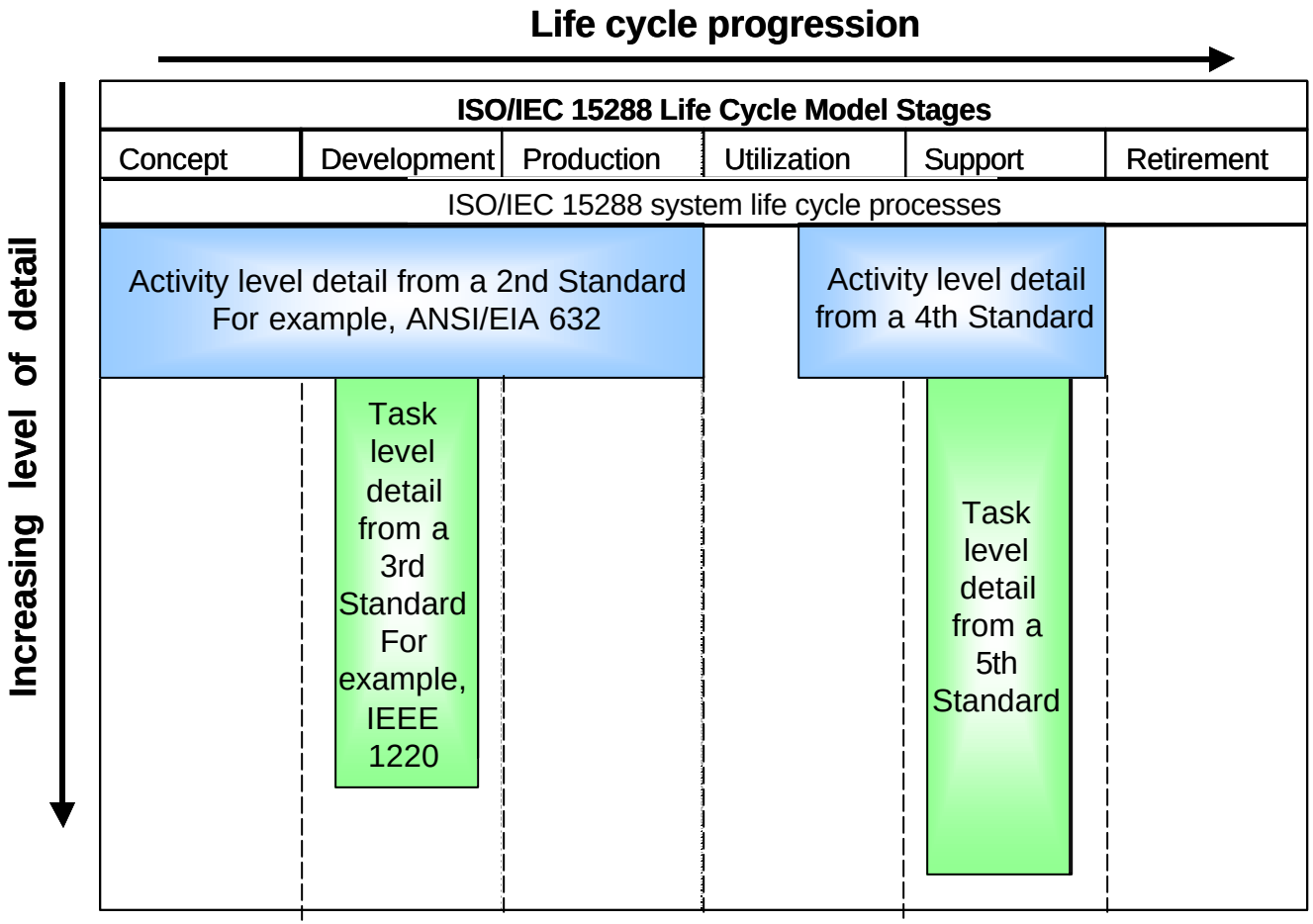
Source: Singh97

Relationship between ISO/IEC 15288 and ISO/IEC 12207



Source:
ISO/IEC JTC 1/SC 7/WG 7 N0643, 2002-10-20,

Best Practice Support for the System Life Cycle Framework



A1. ISO/IEC 15288 and other engineering standards

Source: Guide for ISO/IEC 15288 (System Life Cycle Processes), PDTR, © ISO/IEC2002. All rights reserved.

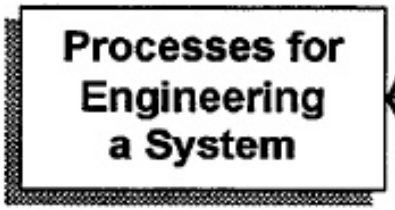
Best Practice Support for the Software Life Cycle Framework

Table 1—Information item matrix

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
Acceptance strategy and conditions record	5.1.1.9	Record (5.4)	—	IEEE 1062
Acquisition plan	5.1.1.8	Plan	6.1	ASTM E731, E1206, IEEE 1062
Acquisition requirements record	5.1.2.1	Record (5.4)	—	IEEE 1062, 1220
Audit agenda record	6.7.1.4	Record (5.4)	—	—
Audit procedure	6.7.1.4	Procedure (5.3)	—	—
Change request	5.4.4, 5.5.1, 6.2.3	Request	6.2	—
Concept of operations description	5.1.1.1	Description	6.3	IEEE 1362, EIA/IEEE J-STD-016 F.2.1. Also see ISO 5806, 5807, 8631, 8790, and 11411 for guidance on use of notations.
Concept/need determination record	5.1.1.1	Record (5.4)	—	IEEE 1062, 1220
Database design description	5.3.5.3, 5.3.6.3, 5.3.7.1	Description	6.4	IEEE 1016, EIA/IEEE J-STD-016 G.2.3
Detailed design evaluation record	5.3.6.7	Record	6.6	—
Development process plan	5.3.1.4	Plan	6.5	ASTM E622, E1340, EIA/IEEE J-STD-016 E.2.1, IEEE 1074, 1074.1

Source: IEEE/EIA 12207.1-1997,

EIA 632 Fundamental Processes for Engineering a System



(13 processes
+ 33 requirements)

Acquisition and Supply *(Subclause 4.1)*
- Supply Process
- Acquisition Process

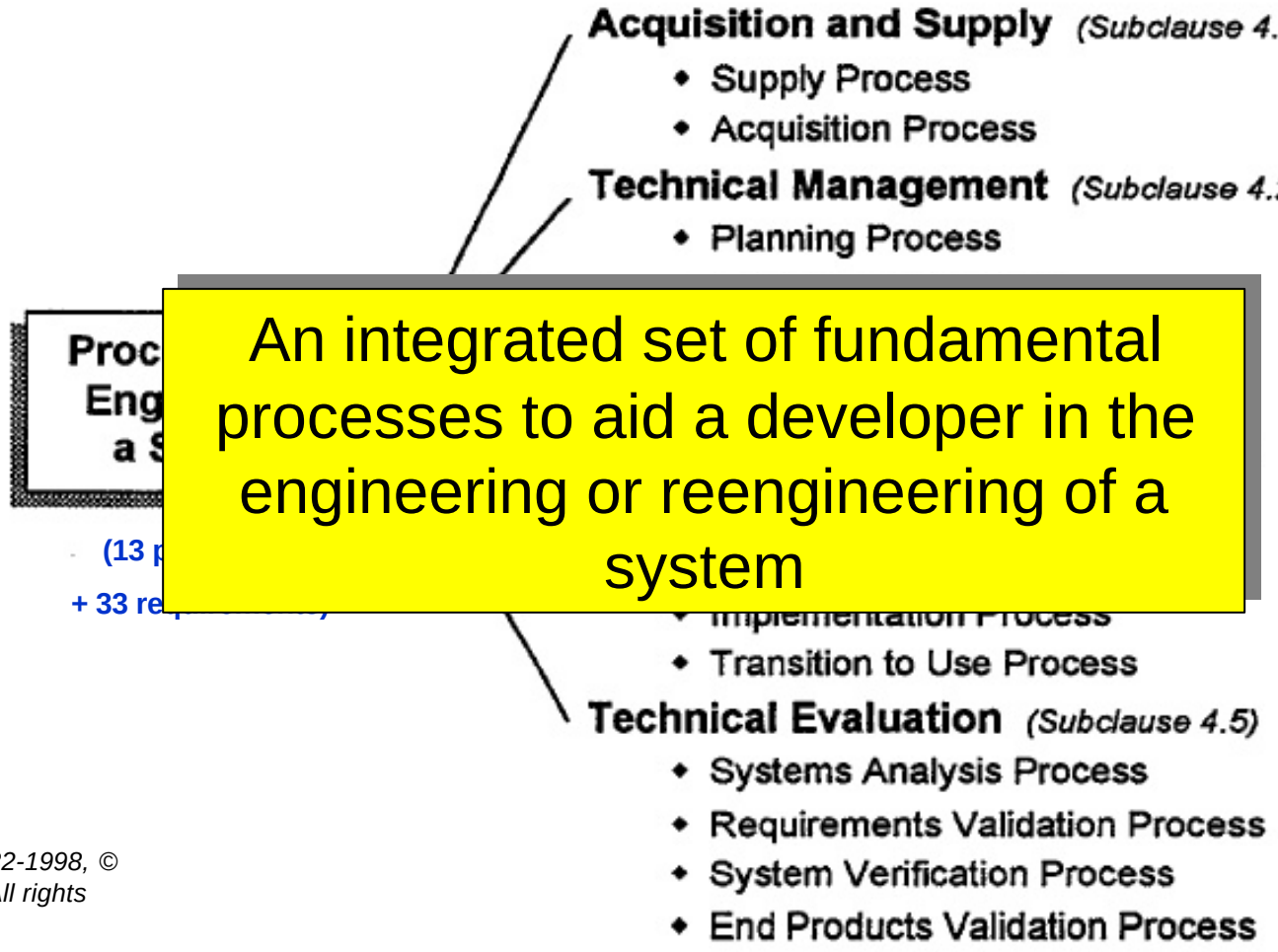
Technical Management *(Subclause 4.2)*
- Planning Process
- Assessment Process
- Control Process

System Design *(Subclause 4.3)*
- Requirements Definition Process
- Solution Definition Process

Product Realization *(Subclause 4.4)*
- Implementation Process
- Transition to Use Process

Technical Evaluation *(Subclause 4.5)*
- Systems Analysis Process
- Requirements Validation Process
- System Verification Process
- End Products Validation Process

EIA 632 Fundamental Processes for Engineering a System

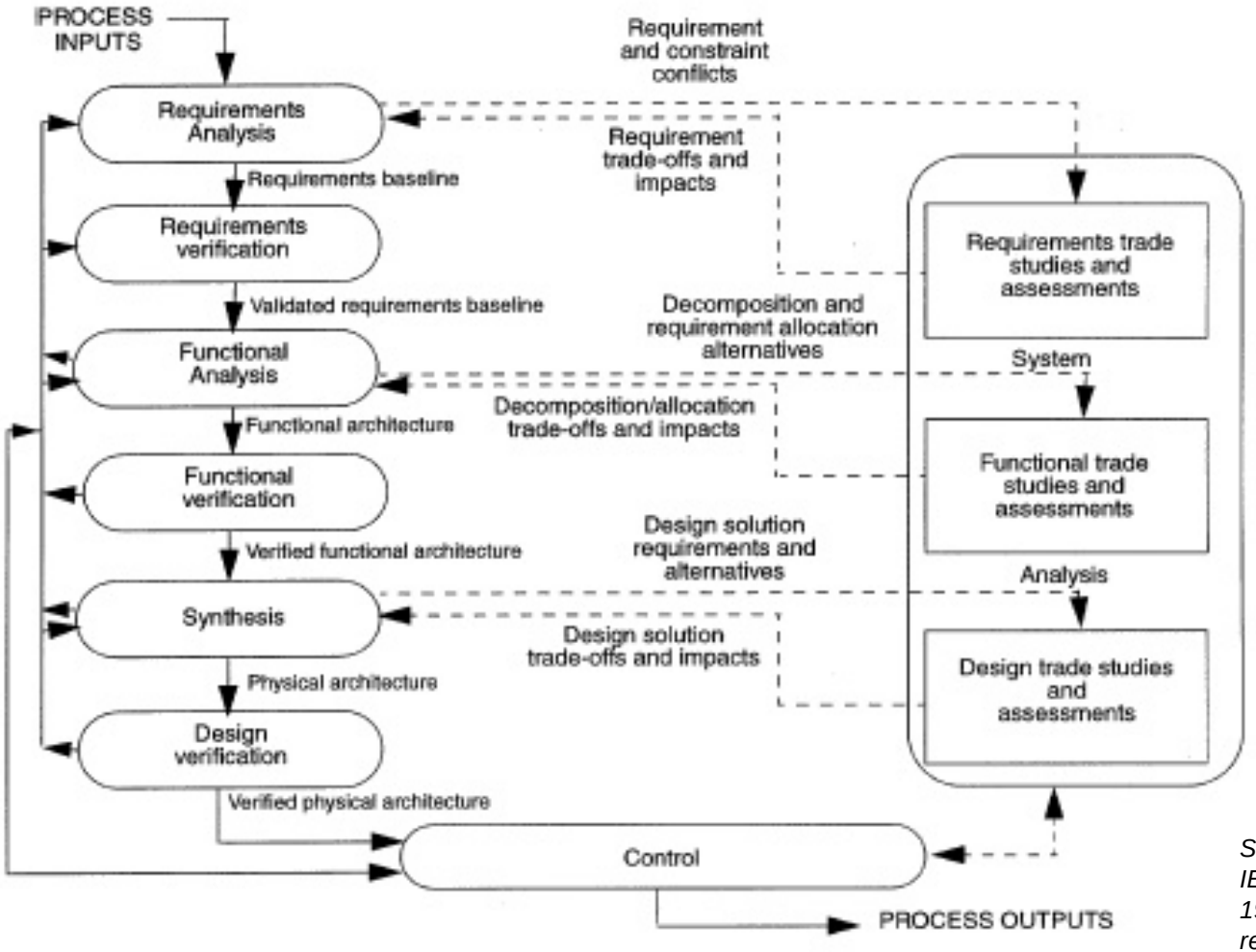


An integrated set of fundamental processes to aid a developer in the engineering or reengineering of a system

Source:
ANSI/EIA 632-1998, © EIA 1998. All rights reserved.

IEEE 1220 Systems Engineering Process

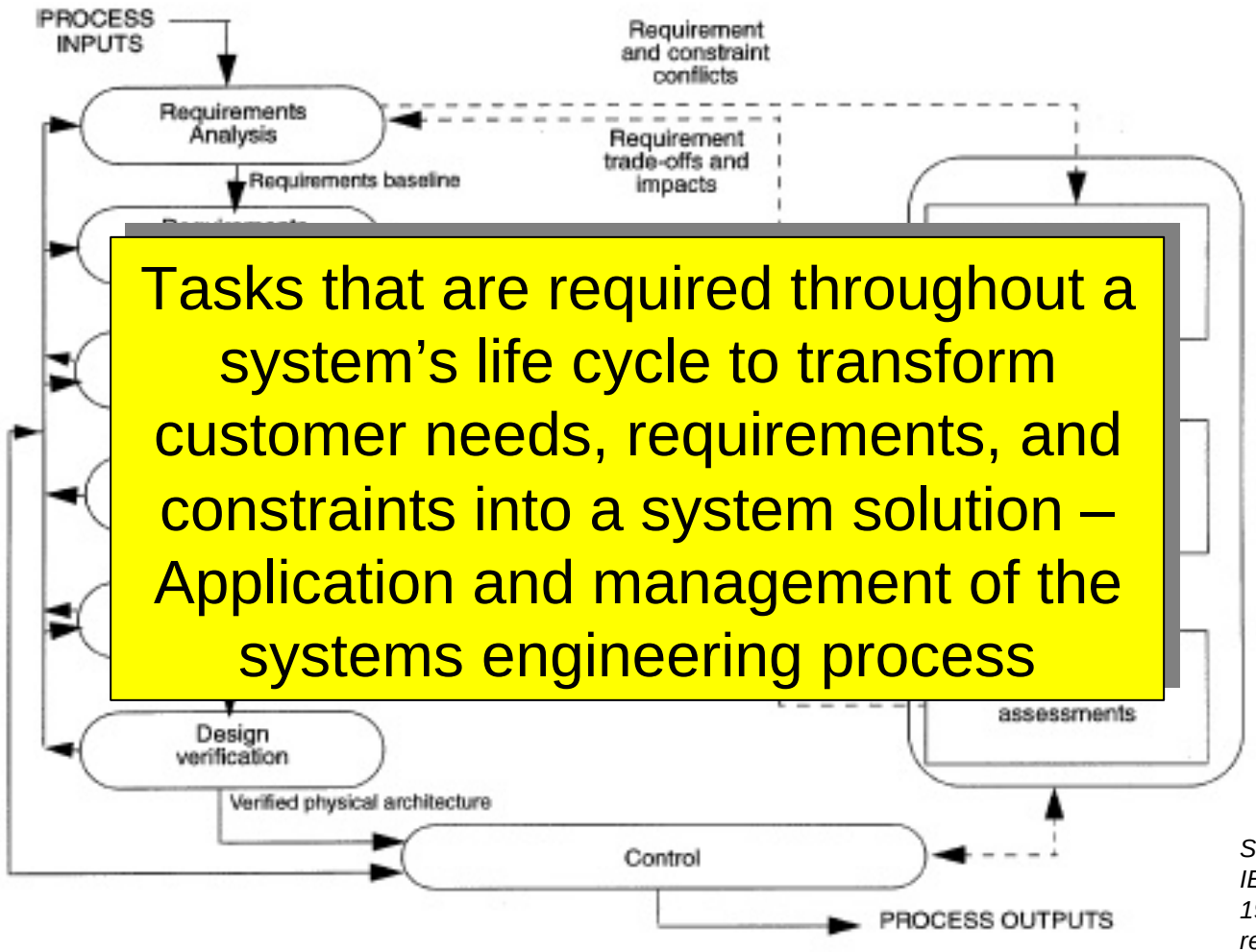
(8 subprocesses + 75 tasks)



Source: IEEE1220-1998, © IEEE 1998. All rights reserved.

IEEE 1220 Systems Engineering Process

(8 subprocesses
+ 75 tasks)



Tasks that are required throughout a system's life cycle to transform customer needs, requirements, and constraints into a system solution – Application and management of the systems engineering process

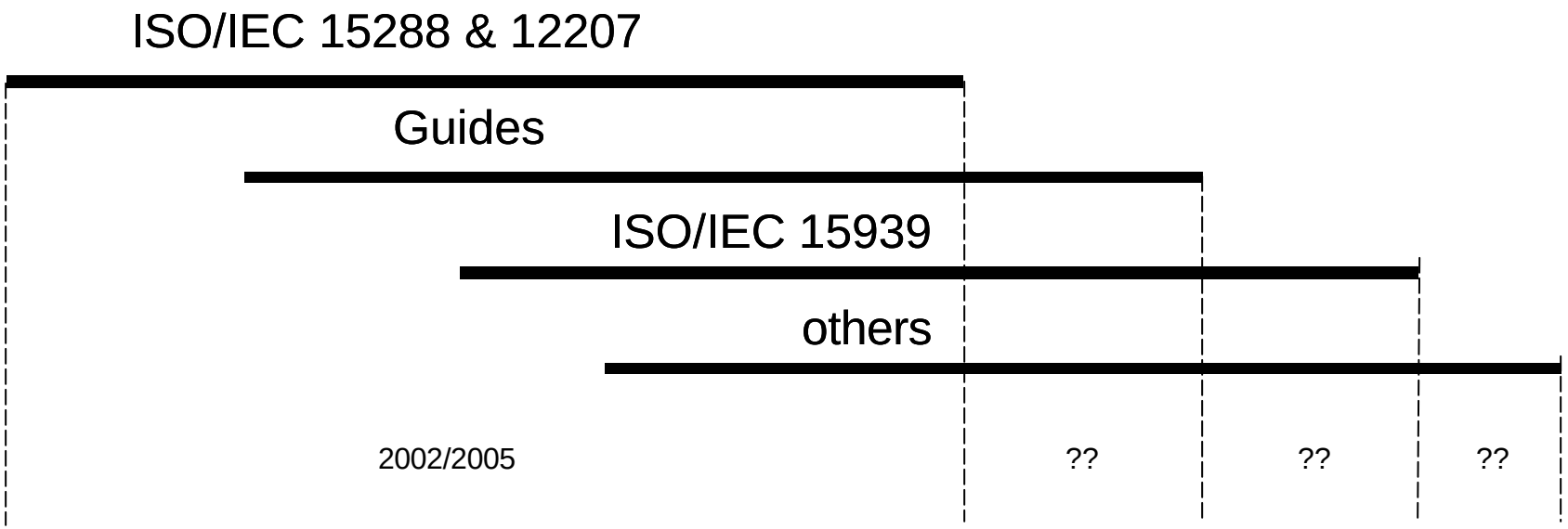
Source: IEEE1220-1998, © IEEE 1998. All rights reserved.

The Recommendations for Harmonization

Life Cycle Standards Harmonization

- Apply the principles of ISO/IEC 15288 to the effort
- Priority of work
  - Primary
    - ISO/IEC 15288
    - ISO/IEC 12207
  - Secondary
    - ISO/IEC 15939 - Software measurement process
    - ISO/IEC TR 15271 Guide for 12207
    - ISO/IEC TR 19760 Guide for 15288
    - ISO/IEC TR 15504 - parts 5 and "6"
  - Possible Additional
    - ISO/IEC 14764 Software maintenance
    - ISO/IEC TR 16326 Project management
    - ISO/IEC 18019 Documentation process
    - ISO/IEC TR 15846 Configuration management

Life Cycle Standards Harmonization Phasing



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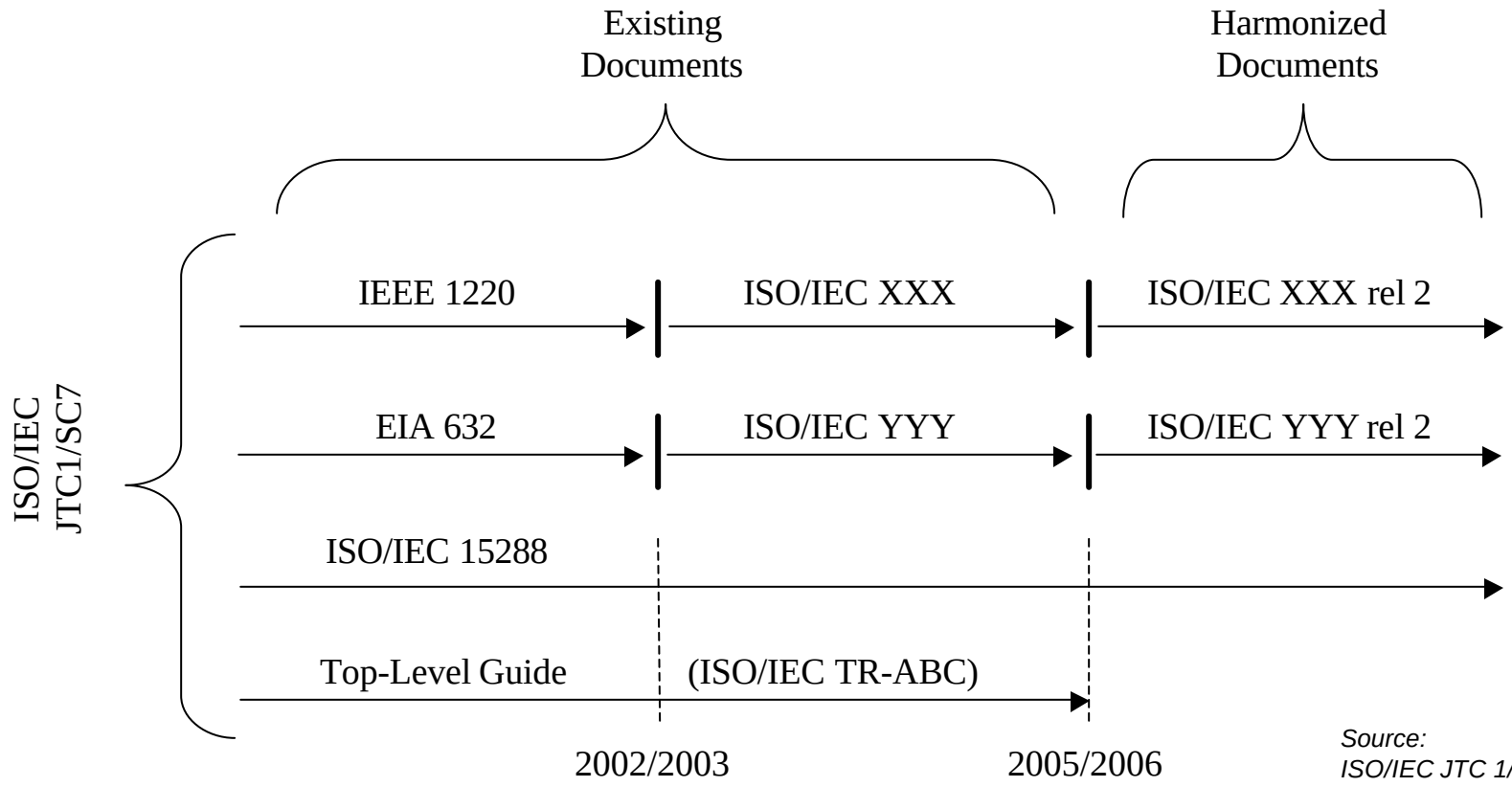
Systems Engineering Standards Harmonization

- Fast-track IEEE 1220 and EIA 632 as Technical Reports
- Create a Harmonization Group that would control revisions of these documents
  - Harmonization requirements for a set of revised documents
- Revisions done by the originating organizations
  - IEEE
  - EIA
  - ISO/IEC
- Revised and harmonized documents fast-tracked as ISO/IEC standards

Systems Engineering Standards Harmonization Timetable



Source:
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For more information . . .

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For EIA Standards:

http://www.geia.org

For IEEE Standards:

http://computer.org/standards/sesc/standards/sesc/

http://computer.org/cspress/CATALOG/st01110.htm

For ISO/IEC Standards:

http://saturne.info.uqam.ca/Labo_Recherche/Lrgl/sc7/

Questions?

References

ANSI/EIA 632-1998, *Processes for Engineering a System*, Electronic Industries Alliance, 1999.

Guide for ISO/IEC 15288 (System Life Cycle Processes), PDTR, ISO/IEC JTC1/SC7, 2002.

IEEE Standard 1220-1998, *Application and Management of the Systems Engineering Process*, Institute of Electrical and Electronics Engineers, Inc. New York, NY, 1999.

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IEEE/EIA Standard 12207.1-1997, *Industry Implementation of International Standard ISO/IEC12207:1995 — (ISO/IEC 12207) Standard for Information Technology —Software life cycle processes - Implementation Considerations*, Institute of Electrical and Electronics Engineers, Inc. New York, NY, 1998.

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