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Topics

- Significant similarities and differences between the requirements in
  - IEEE/EIA 12207 (adopted by the DoD on 27 May 98)
  - ISO/IEC 12207
  - J-STD-016, and
  - MIL-STD-498 (canceled by the DoD on 27 May 98)

Background:
The Pedigree of IEEE/EIA 12207

DOD-STD-2167A
"Defense System Software Development," Feb '88

ISO 12207
"Software Life Cycle Processes," Aug '95

DOD-STD-7935A

MIL-STD-498
"Software Development and Documentation," Dec '94

(Trial Use Std.) "Software Life Cycle Processes, Software Development" Sep '95

IEEE/EIA 12207.0-1996
"Software Life Cycle Processes" Mar '98
( Guides )
IEEE/EIA 12207.1-1997
IEEE/EIA 12207.2-1997 Apr '98

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Background: Traditions of Major Influences

◆ U.S. Military Standards
  – created by organizations within the U.S. Department of Defense
  – authored by industry contractors
  – authors guided by advisory committees consisting both of individuals and of representatives of military and industry organizations
  – reviewed by military and industry personnel
  – legally enforced on military software contractors
  – used to compensate for shortage of technically-trained government software buyers.

◆ ISO Standards
  – created by committees of national representatives
  – inspire national implementations
  – used voluntarily
  – used by businesses
  – used to simplify trade.

◆ IEEE Software Standards
  – created by committees of professional individuals
  – used voluntarily
  – used by businesses and individuals
  – used for self-improvement.
Background: All Four Standards are Most Useful...

Define Concept

Planning

Develop & Maintain

Operate

- Request for Proposal (RFP)
- Software Change Request (SCR)
- Define Concept

initial response

498, 016, both 12207s suggest processes, data

funding obtained

What: WBS (contracted tasks, data)
Who: people
When: schedule
How: tasks, data, methods, procedures, tools

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Background:
Similar Leadership Influences

The Chair of the DoD Harmonization Working Group (HWG) that developed **MIL-STD-498**, the Editor of **ISO/IEC 12207** during its development, the IEEE Co-Chair of the Joint Industry Working Group on Software Development that developed **J-STD-016-1995**, and the IEEE Co-Chair of the Joint Industrial Standard Working Group (JISWG) that developed **IEEE/EIA 12207.0-1996**

all were the same person, **Dr. Raghu Singh (SPAWAR)**, who is now with the U.S. Federal Aviation Admin. in Washington, DC.
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IEEE/EIA 12207.2-1997
Apr '98

IEEE/EIA 12207.0-1996
"Software Life Cycle Processes" Mar '98

IEEE/EIA 12207.1-1997
IEEE/EIA 12207.2-1997
Apr '98

ISO/IEC 12207
"Software Life Cycle Processes," Aug '95

IEEE Std 1498/EIA IS 640

MIL-STD-498
"Software Development and Documentation," Dec '94

IEEE EIA 12207.0-1996
"Software Life Cycle Processes" Mar '98
(Guides)
IEEE EIA 12207.1-1997
IEEE/EIA 12207.2-1997
Apr '98
[formerly IEEE P1448]
Why is There J-STD-016-1995?

- To bring MIL-STD-498’s deliberately limited (2-year) life to a close.
- SecDef Perry’s memo of 29 Jun 94 began the retirement of military software development standards.
- Despite the memo, MIL-STD-498 was adopted on 5 Dec 94 to provide a bridge to a suitable non-governmental software life cycle processes standard yet to be developed.
- That replacement standard is now called IEEE/EIA 12207. J-STD-016-1995 was the first step toward it.
Only Cosmetic Differences

If this is MIL-STD-498... ...this is J-STD-016-1995
“Bottom Line”

◆ J-STD-016 is a “demilitarized” MIL-STD-498.

◆ J-STD-016-1995 adds a general requirement for traceability similar to the traceability elements in MIL-STD-498 DIDs.

◆ For each detailed requirement in MIL-STD-498 there is one in J-STD-016-1995 with the same technical content.

◆ Two additional activities in J-STD-016-1995 update system and software requirements to match the “as-built” software.

◆ For each MIL-STD-498 DID there is a product description in J-STD-016-1995 with the same content.

◆ Every data item in J-STD-016-1995 is also in MIL-STD-498.
The Development of J-STD-016

- Dropped military references
- Adopted ISO-style clauses
- Packaged data descriptions as subclauses

Ballot in June ‘98 -
2nd ballot in Summer ‘99
- Backed away from contractual use
- Redefined Tailoring
- Assumed defined organizational software process

Two Trends
- Compatibility with ISO standards
- Influence of software process improvement goals
Should (and Will) J-STD-016 Survive?

YES, because...
- J-STD-016 product descriptions have been cited by IEEE/EIA 12207.1 but not included in whole.
- Projects that use (or prefer to adopt) MIL-STD-498 language for contracts, or have process descriptions based on it, need J-STD-016.

NO, because...
- Most of the J-STD-016 engineering requirements are already in IEEE/EIA 12207.2, and the content of J-STD-016 product descriptions could be added to IEEE/EIA 12207.1.
- IEEE/EIA 12207 is compatible with a software process description written in language from MIL-STD-498.
- Most topics in J-STD-016 are covered by other IEEE or ISO standards.

FACT...
- There is significant DoD interest in adopting J-STD-016.
The Business Tradition: IEEE/EIA 12207

DOD-STD-2167A
"Defense System Software Development," Feb '88

ISO 12207
ISO/IEC 12207
"Software Life Cycle Processes," Aug '95

IEEE Stds
IEEE/EIA 12207.0-1996
"Software Life Cycle Processes"
Mar '98
(IEEE Stds)
IEEE/EIA 12207.1-1997
IEEE/EIA 12207.2-1997
Apr '98

DOD-STD-7935A

2167A

MIL-STD-498
"Software Development and Documentation," Dec '94

498

016

J-STD-016-1995 (Trial Use Std.)
"Software Life Cycle Processes, Software Development" Sep '95

12207

[formerly IEEE Std 1498 / EIA IS 640]

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ISO/IEC 12207 & IEEE/EIA 12207
Share a Life Cycle Processes Model

Key

0 - the same points
CM - Configuration Management process
E - execute
E:n - execute supporting process n
E:ACQ - execute the Acquisition process
F - feed back (verb)
(I)V&V - (independent) Verification & Validation processes
M - manage
P - participate in
QA - Quality Assurance process
T - task (verb)
T:SUB - task a subcontractor
(T)E - task the processes if they are independent, or execute them otherwise
U - use
U:n - use supporting process n

PDCA - Plan, Do, Check, Act

PDCA: 1 DOCUMENTATION E 2 CM 3 PROBLEM RESOLUTION 4 TAILORING

O: THE SAME POINTS, ACQ: ACQUISITION, SUB: SUBCONTRACTOR

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The life cycle processes of ISO/IEC 12207...
Retail Purchase Roles: A New Car

- Buyer
- Factory
- Car Dealer
- mechanic
- User
ISO/IEC 12207 & IEEE/EIA 12207...
Generalized Primary Parties in a Software Project Life Cycle

Developer

Operator

Supplier

Maintainer

Acquirer

User
ISO/IEC 12207 & IEEE/EIA 12207...
Basic Relation Between Primary Parties: a Binding Agreement

Example contracts: acquirer - supplier (5.1.3.4 - 5.2.3.1), supplier - subcontractor (5.2.5.4)

“3.7 Contract: A binding agreement between two parties, especially enforceable by law, or a similar internal agreement wholly within an organization, for the supply of software service or for the supply, development, production, operation, or maintenance of a software product.”
ISO/IEC 12207 & IEEE/EIA 12207 are About the Software Life Cycle

A “Carnot cycle” for software development and operational use.
In Contrast...
MIL-STD-498 and J-STD-016 are About What Developers Do...

◆ Twenty five management and engineering activities: some of these must be chosen (via tailoring) and ordered into a software development process, and then carried out as planned.

◆ Twenty two descriptions of data items (DIDs / product descriptions) that represent records of the results of the chosen management and engineering activities: some of the data elements of the data items must be chosen (via tailoring) and the chosen data must be recorded during software development.
...But, a Developer is Only One of Five Primary Parties in ISO/IEC 12207 & IEEE/EIA 12207

ISO/IEC 12207 and IEEE/EIA 12207 contain management, engineering, and data requirements for

– Acquirers
– Suppliers
– Developers
– Operators, and
– Maintainers.
How Does IEEE/EIA 12207 Differ From ISO/IEC 12207?
“Bottom Line”

IEEE/EIA 12207.1 provides much more extensive guidance than ISO/IEC 12207 does on
- the possible content of key document types mentioned in ISO/IEC 12207 (for example ‘description’ and ‘plan’), and on different instances of each type (for example database design description and project management plan).

IEEE/EIA 12207.2 provides guidance on (i.e., intends to “summarize the best practices” for)
- implementing the primary, supporting, and organizational life cycle processes defined in clauses 5, 6, and 7 of ISO/IEC 12207.

Tailoring is defined differently in IEEE/EIA 12207
Compliance is defined differently in IEEE/EIA 12207
IEEE/EIA 12207 adds guidance on data and on implementing life cycle processes to the requirements in ISO/IEC 12207.
The content of ISO/IEC 12207 is preserved nearly intact in IEEE/EIA 12207 (tailoring and compliance are the major exceptions).
Because the guidance in IEEE/EIA 12207 is based on the requirements in MIL-STD-498 / J-STD-016-1995, it allows contractual language and software processes and data based on the earlier standards.
So, you can keep successful, old software processes and data requirements when adopting IEEE/EIA 12207.
How are ISO/IEC 12207 and IEEE/EIA 12207 Used?

By two “parties” ---
Possible Jointly: For legal, contractual language when one organization acquires software from another.
Possible Jointly: For “binding” guidance that establishes expectations between developers and their customers within an organization (for example, between two different projects, or between software programmers and software users).

Important Individually: As a checklist for evaluating the other party’s plans and performance.

By a single “party” ---
Most important: As a planning checklist for the party’s role!
What is the Value of IEEE/EIA 12207?

◆ Covers more of the software life cycle, more thoroughly, than any earlier software process standard.

◆ Defines relations between the primary parties in the software life cycle better than any other standard except ISO/IEC 12207.
Topics

◆ Significant similarities and differences between the requirements in
  – IEEE/EIA 12207 (adopted by the DoD on 27 May 98)
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Roles Directed by J-STD-016

◆ Acquirer
- Procures software products for itself or another organization
- Decides requirements for software products
- Tailors J-STD-016
- Confirms that software products satisfy requirements.

◆ Developer
- Establishes software process
- Defines requirements and develops software products
- Suggests tailoring of J-STD-016
- Selects characteristics of software products to satisfy requirements
- Performs other activities in J-STD-016 (that are not tailored out), develops and records data in J-STD-016 product descriptions (that are not tailored out).

◆ Maintenance Organization
- Performs the activities that ensure that software installed for operational use continues to perform as intended and fulfill its intended role in system operation.
J-STD-016 Acquirer-Developer Relation

- Begins after contract award
- Developer requirements analysts go to work to find out what the acquirer’s conditions for acceptance will be.
- Developer performs the activities in J-STD-016 that were not tailored out by the acquirer, and develops and records the data in the J-STD-016 product descriptions that were not tailored out by the acquirer.
- Periodically, developer presents status of work to acquirer.
- After reviewing developer’s qualification tests, acquirer decides whether to accept software products.
The Biggest Problems for Software Development Projects Occur Outside the Scope of J-STD-016

- Contract terms (cost and schedule)
- Requirements
IEEE/EIA 12207
Acquirer-Developer Relation

◆ Begins before contract award
◆ Acquirer’s requirements analysts decide what the requirements will be before a developer is hired.
◆ Developer performs the activities in IEEE/EIA 12207 that were not tailored out by the acquirer, and develops and records the data required by the standard that were not tailored out by the acquirer.
◆ Periodically, developer presents status of work to acquirer.
◆ After reviewing developer’s qualification tests, acquirer decides whether to accept software products.
IEEE/EIA 12207
Life Cycle Processes Model

Key

0 - the same points
CM - Configuration Management process
E - execute
E:n - execute supporting process n
E:ACQ - execute the Acquisition process
F - feedback (verb)
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O: THE SAME POINTS, ACQ: ACQUISITION, SUB: SUBCONTRACTOR
PDCA - Plan, Do, Check, Act
Related IEEE/EIA 12207.1 Acquisition References

- Concept of operations description (5.1.1.1) [2 refs] - J-STD-016 F.2.1 “Operational Concept Description”
- System requirements description (5.1.1.2) [4 refs] - J-STD-016 F.2.2 “System/Subsystem Specification”
- Software requirements description (5.1.1.4) [4 refs] - J-STD-016 F.2.3, F.2.4 “Interface Requirements Specification,” and “Software Requirements Specification”
- Acquisition Plan (5.1.1.8) [3 refs] - ASTM E731 “Guide for Selection and Acquisition of Commercially Available Computerized Systems,” IEEE Std 1062 “IEEE Recommended Practice for Software Acquisition”
Other Acquisition Process Data

- Request For Proposal (5.1.2.1)
- Contract (5.1.3.4)
IEEE/EIA 12207 Development Process

*SW life cycle model w activs from Develop proc - 5.3.1.1
*baselines for config items - 5.3.1.2 (Annex J)
*tailored stds, methods, tools, langs - 5.3.1.3
*plans for activs of Develop proc - 5.3.1.4
*(sys require’s spec - 5.3.2.1, in Acq. process)
*top-level sys architect - 5.3.3.1
*SW require’s spec - 5.3.4.1 (in Acq. process also)
*architect of SW items - 5.3.5.1
*top-level design for interfaces - 5.3.5.2
*top-level design for databases - 5.3.5.3
*prelim & updated versions of user docs - 5.3.5.4, 5.3.6.4, 5.3.7.3, 5.3.8.3
*prelim & updated test require’s and sched for SW integration - 5.3.5.5, 5.3.6.6, 5.3.7.4
*detailed design of SW comp’s - 5.3.6.1
*detailed design of interfaces - 5.3.6.2
*detailed design of databases - 5.3.6.3
*require’s & sched for testing SW units 5.3.6.5
*SW units & databases - 5.3.7.1
*SW unit test results - 5.3.7.2
*integration plan - 5.3.8.1
*sys & SW integ and test results - 5.3.8.2, 5.3.10.1
*tests, test cases & procedures for SW & sys qual testing - 5.3.8.4, 5.3.10.2
*SW & sys test results - 5.3.9.1, 5.3.11.1
*audit results - 5.3.9.4, 5.11.3
*evaln’s of products - 5.3.2.2, 5.3.3.2, 5.3.4.2, 5.3.5.6, 5.3.6.7, 5.3.7.5, 5.3.8.5, 5.3.9.3, 5.3.10.3, 5.3.11.2
*complete deliverable SW product - 5.3.11.4, 5.3.13.2
*installation plan - 5.3.12.1
*installation events & results - 5.3.12.2
*acceptance review and testing results - 5.3.13.1
Related IEEE/EIA 12207.1 Development References

- Software life cycle model description (5.3.1.1) [1 ref] - IEEE Std 1074 “IEEE Standard for Developing Software Life Cycle Processes”

- System requirements specification (5.3.2.1) [4 refs] - J-STD-016 F.2.2 “System/Subsystem Specification”

- System architecture and requirements allocation description (5.3.3.1) [4 refs] - J-STD-016 G.2.1 “System/Subsystem Design Description”

- Software requirements description (5.3.4.1) [4 refs] - J-STD-016 F.2.3, F.2.4 “Interface Requirements Specification,” and “Software Requirements Specification”
IEEE/EIA 12207 Supply Process

- Acquisition enters contract with SUPPLY
- Acquisition accords with SUPPLY
- SUPPLY performs 5.2.5.2
- Acquisition develops SW product IAW
- SUPPLY enters contract with 5.2.6.4
- SUPPLY conducts or supports Joint Review
- SUPPLY conducts or supports Audit
- SUPPLY interfaces with (I)V&V

PRODUCTS:
- *proposal - 5.2.2.1
- *recommen'd tailoring of std - 5.2.2.1
- *SW life cycle model with activs from std - 5.2.4.2
- *project management plan(s) - 5.2.4.5
- *reports of eval'ns - 5.2.6.4
- *reports of reviews - 5.2.6.4
- *reports of audits - 5.2.6.4
- *reports of testing - 5.2.6.4
- *reports of problem resolutions - 5.2.6.4
- *SW product - 5.2.7.1
Relevant Supply Process Data

◆ Proposal (5.2.2.1)
ISO/IEC 12207 & IEEE/EIA 12207...

Simple Life Cycle Activities Flow

START

Acquisition Process
- define system concept, clarify system require’s

Supply Process
- request proposal
- submit proposal

Development Process
- negotiate and sign contract
devolve, test, and install software part of system

Operation Process
- operate system

Maintenance Process
- maintain & retire software part of system

END
Back to the Biggest Problems for Software Development Projects...

- Contract terms (cost and schedule)
- Requirements
- They are within the scope of ISO/IEC 12207 and IEEE/EIA 12207.
How to Get the Standards

◆ IEEE/EIA 12207
  – Order from IEEE at 800-678-4333 (732-981-0060 outside the US and Canada) -- FAX: 908-981-9667 -- telex 833233

  – Order from IEEE, or from Global Engineering Documents at 800-854-7179 (303-397-7956 outside the US) -- FAX: 303-397-2740.

◆ MIL-STD-498
  – Download from Abelia Corporation at http://www.abelia.com/pubsmain.htm
Recommened Reading


