An Overview of IEEE Software Engineering Standards and Knowledge Products

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Objectives

- Provide an introduction to The IEEE Software Engineering Standards Committee (SESC)
- Provide an overview of the current state and future direction of IEEE Software Engineering Standards and knowledge products
  - IEEE Software Engineering Standards Collection
  - Software Engineering Competency Recognition Program
  - Standards-Based Training
- Discuss how you can participate in software engineering standardization efforts
The IEEE Software Engineering Standards Committee (SESC)

http://computer.org/standard/sesc/
The SESC Vision

- The leading supplier and promoter of a family of software engineering standards and related products and services.
Software Engineering: An Object View

Source: [SESC95]
SESC in the IEEE Structure

IEEE

IEEE Computer Society

IEEE Standards Board

Software Engineering Standards Committee

Executive Committee & Management Board

Working Group

Study Group

Planning Group

Conferences
SESC Strategic Program Model

ISO and IEC Standards

Terminology

Quality Management

Software Engineering

System Disciplines

IEEE SESC Standards Program

Terminology

Overall Guide

Principles or Policies

Element Standards

Application Guides

“Toolbox” of Technique Standards

Source: [SESC95]

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The IEEE Software Engineering Standards Collection

http://standards.ieee.org/catalog/softwareset.html
The 2000 Software Engineering Standards Collection

- Forty-six Standards
  - Customer & Terminology
  - Process
  - Product
  - Resource & Technique
- Overall guide
  - Several “views”
    - Context
    - Object
    - Normative intent
    - Provider and subject
  - Relationships among standards

Source: [Moore97]
IEEE/EIA 12207: The Life Cycle Process Framework

- IEEE/EIA 12207, Standard for Information Technology – Software Life Cycle Processes
  - Addresses the complete software engineering life cycle, from acquisition and supply, through development, to operations and maintenance
  - Provides a process framework upon which an organization can build its enterprise-level life cycle processes
  - These enterprise-level processes are then tailored into projects, in order to meet specific project-level requirements.
IEEE/EIA 12207 Process Tree

LIFE CYCLE

PRIMARY

SUPPORTING

DOCUMENTATION
CONFIGURATION MANAGEMENT
QUALITY ASSURANCE
VERIFICATION
VALIDATION
JOINT REVIEW
AUDIT
PROBLEM RESOLUTION

ORGANIZATIONAL

MANAGEMENT
INFRASTRUCTURE
IMPROVEMENT
TRAINING

TAILORING

Source: [Singh97]
12207 Process Flow

Source: [Singh97]

F - FEEDBACK. M - MANAGE. P - PARTICIPATE. T - TASK. U - USE
E:N - EXECUTE THE PROCESS NUMBERED N
Primary Process Flow

Source: [Singh97]
Supporting Process Flow

Source: [Singh97]
Organizational Process Flow

PRIMARY PROCESS

SUPPORTING PROCESS

MANAGEMENT PROCESS

INFRASTRUCTURE PROCESS

IMPROVEMENT PROCESS

TRAINING PROCESS

Source: [Singh97]
12207 Process Roles

Source: [Singh97]
Role Definitions

- **Acquirer:**
  - an organization that acquires or procures a system, software product or software service from a supplier

- **Supplier:**
  - an organization that enters into a contract with the acquirer for the supply of a system, software product or software service under the terms of the contract

- **Operator:**
  - an organization that operates the system
Role Definitions - 2

- Developer:
  - an organization that performs development activities (including requirements analysis, design, testing through acceptance) during the software life cycle process

- Maintainer:
  - an organization that performs maintenance activities

- Supporting Process Performer and Manager are undefined
IEEE/EIA 12207 Document Structure

- IEEE/EIA 12207.0-1996, Software Life Cycle Processes
  - Industry adoption of ISO/IEC 12207-1995
- IEEE/EIA 12207.1-1997, Life Cycle Data
  - Industry guide to life cycle data
- IEEE/EIA 12207.2-1997, Implementation Considerations
  - Industry guide to implementation of the life cycle processes contained in 12207.0
IEEE/EIA 12207.0
Document Structure

- Foreword to IEEE/EIA 12207.0-1996
- ISO/IEC 12207-1995
  - Introduction
  - Foreword
  - Clause 1 - Scope
  - Clause 2 - Normative references
  - Clause 3 - Definitions
  - Clause 4 - Application of this International Standard
  - Clause 5 - Primary life cycle processes
  - Clause 6 - Supporting processes
  - Clause 7 - Organizational life cycle processes
IEEE/EIA 12207.0 Annexes

- ISO/IEC 12207-1995 Annexes
  - A - Tailoring process
  - B - Guidance on tailoring
  - C - Guidance on processes and organizations
  - D - Bibliography
- Additional IEEE/EIA 12207.0 Annexes
  - E - Basic concepts of ISO/IEC 12207
  - F - Compliance
  - G - Life cycle processes objectives
  - H - Life cycle data objectives
  - I - Relationships
  - J - Errata
IEEE/EIA 12207.1
Document Structure

- Introduction
- Clause 1 - Scope
- Clause 2 - Normative references
- Clause 3 - Definitions
- Clause 4 - Life cycle data
  - Clause 4.1 Overview
  - Clause 4.2 Life cycle data objectives
  - Clause 4.3 Information item matrix
  - Clause 4.4 Compliance
- Clause 5 - Generic information item content guidelines
- Clause 6 - Specific information item content guidelines
- Annex A - References
IEEE/EIA 12207.2
Document Structure

- Foreword
- Introduction
- Clause 1 - Scope
- Clause 2 - Normative references
- Clause 3 - Definitions
- Clause 4 - Application
- Clause 5 - Primary life cycle processes
- Clause 6 - Supporting processes
- Clause 7 - Organizational life cycle processes
IEEE/EIA 12207.2 Annexes

- IEEE/EIA 12207 Annexes
  - A - IEEE/EIA 12207.0 Annex A - Tailoring process
  - B - IEEE/EIA 12207.0 Annex F - Compliance
  - C - IEEE/EIA 12207.0 Annex G - Life cycle processes objectives
  - D - IEEE/EIA 12207.0 Annex H - Life cycle data objectives
  - E - IEEE/EIA 12207.0 Annex J - Errata
IEEE/EIA 12207.2 Annexes - 2

- Additional IEEE/EIA 12207.2 Annexes
  - F - Use of reusable software products
  - G - Candidate joint management reviews
  - H - Software measurement categories
  - I - Guidance on development strategies and build planning
  - J - Category and priority classifications for problem reporting
  - K - Software product evaluations
  - L - Risk management
  - M - Life cycle processes references
Supporting Standards for High Integrity Software

- IEEE/EIA 12207 relies upon other standards to fill in the details regarding the activities supporting life cycle processes.
- In the case of high integrity software, several additional software engineering standards are of interest.
Customer and Terminology

- 610.12, Standard Glossary of Software Engineering Terminology
- 1062, Recommended Practice for Software Acquisition
- 1220, Standard for Application and Management of the Systems Engineering Process
- 1228, Standard for Software Safety Plans
- 1233, Guide for Developing System Requirements Specifications
- 1362, Guide for Concept of Operations Document
- 12207, Software Life Cycle Processes
- 12207.1, Guide to Software Life Cycle Processes—Life Cycle Data
- 12207.2, Guide to Software Life Cycle Processes—Implementation Considerations

= High Integrity Systems Related
Process

- 730, Standard for Software Quality Assurance Plans
- 730.1, Guide for Software Quality Assurance Planning
- 828, Standard for Software Configuration Management Plans
- 1008, Standard for Software Unit Testing
- 1012, Standard for Software Verification and Validation
- 1012a, Software Verification and Validation Content Map to IEEE/EIA 12207.1
- 1028, Standard for Software Reviews
- 1042, Guide to Software Configuration Management
- 1045, Standard for Software Productivity Metrics
- 1058, Standard for Software Project Management Plans
- 1059, Guide for Software Verification and Validation Plans
- 1074, Standard for Developing Software Life Cycle Processes
- 1219, Standard for Software Maintenance
- 1490, A Guide to the Program Management Body of Knowledge

= High Integrity Systems Related


= High Integrity Systems Related
Product

- 982.1, Standard Dictionary of Measures to Produce Reliable Software
- 982.2, Guide for the Use of Standard Dictionary of Measures to Produce Reliable Software
- 1061, Standard for a Software Quality Metrics Methodology
- 1063, Standard for Software User Documentation

= High Integrity Systems Related
Resource and Technique

- 829, Standard for Software Test Documentation
- 830, Recommended Practice for Software Requirements Specifications
- 1016, Recommended Practice for Software Design Descriptions
- 1044, Standard Classification for Software Anomalies
- 1044.1, Guide to Classification for Software Anomalies
- 1320.1, Syntax and Semantics for IDEF0
- 1320.2, Syntax and Semantics for IDEF1X97 (IDEFObject)
- 1348, Recommended Practice for the Adoption of CASE Tool
- 1420.1, Software Reuse—Data Model for Reuse Library Interoperability: Basic Interoperability Data Model
- 1420.1a, Software Reuse—Data Model for Reuse Library Interoperability: Asset Certification Framework

= High Integrity Systems Related
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Resource and Technique - 2

- 1430, Guide for Software Reuse - Concept of Operations for Interoperating Reuse Libraries
- 1462, Guide for the Evaluation and Selection of CASE Tools
- P1471, Recommended Practice For Architectural Description of Software Intensive Systems

■ = High Integrity Systems Related

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IEEE 1540: Software Risk Management - Process Model

1. Technical and Management Processes
2. Plan and Implement Risk Management
3. Manage the Project Risk Profile
4. Perform Risk Analysis
5. Perform Risk Treatment
6. Perform Risk Monitoring
7. Evaluate the Risk Management Process

Information Needs → Management Decisions → Feedback

Project Risk Profile and Risk Action Requests → Perform Risk Treatment → Manage the Project Risk Profile → Perform Risk Analysis → Perform Risk Monitoring → Evaluate the Risk Management Process → Improvement Actions

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IEEE 1471: Recommended Practice for Architectural Description of Software-Intensive Systems - Conceptual Model
Software Engineering Competency: Professionalizing Software Engineering
The Three Components of Engineering Competency

- A defined Body of Knowledge
- A Code of Practice
- Competency recognition
Guide to the Software Engineering Body of Knowledge

- Objectives
  - Better characterize the discipline of Software Engineering
  - Provide a consistent view Software Engineering as an engineering discipline

http://www.swebok.org
IEEE Software Engineering Competency Recognition Program

- **Goals**
  - Identify qualified professionals
  - Ensure recognition of expertise
  - Assist in professional development
  - Establish professional practice standards
  - Protect public
  - Enable professionals to stay current

*Source: [IEEE99]*
Roles

- software engineering practitioner
- software project manager
- software systems architect
- supporter (e.g. CM, QA, etc.)
Standards-Based Training

- Skills training in the “Code of Practice”
  - tailorable course outlines
  - completion certificates
- Pilot training program
  - State of California
  - New York City Transit Authority
  - Delta Airlines
- Twenty-three courses were delivered last year to 500 attendees
- Five universities contracted to teach courses
IEEE
Software Engineering Standards Committee

Our Future and Yours
SESC objectives for the New Millennium

- A consistent collection of Software Engineering Standards to support process definition and product development, that improve the quality of delivered software and software-intensive systems
- Development and delivery of Standards-based training to improve skills
- Feedback mechanisms to capture experience in standards usage
- A conformance program for the organizational implementation of SESC standards
How You Can Participate

- Join the IEEE Computer Society
  (at http://www.computer.org)
- Join the IEEE Software Engineering Standards Committee (at http://www.tcse.org)
  - Lead or participate in Working Groups developing or revising Standards
  - Lead or participate in Study Groups investigating new areas for standardization
  - Participate in SESC special projects
  - Become part of the SESC balloting pool (IEEE Standards Association membership required)
Questions
For more information . . .

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References


