An Overview of IEEE Software Engineering Standards and Knowledge Products

Paul R. Croll
Chair, IEEE SESC
Computer Sciences Corporation
pcroll@csc.com
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]
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

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

ACQUISITION → SUPPLY → MAINTENANCE → DEVELOPMENT → OPERATION

E = EXECUTE
T = TASK
U = USE

Source: [Singh97]

Plan, Do, Check & Act
Supporting Process Flow

Source: [Singh97]
Organizational Process Flow

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
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

ASQ Section 509 SSIG Meeting, 8 November 2000

Paul R. Croll - 27
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
Process - 2

- P1540, D7.0, Draft Standard for Software Life Cycle Processes - Risk Management

■ = 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
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
IEEE 1540: Software Risk Management - Process Model
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 . . .

Paul R. Croll
Computer Sciences Corporation
5166 Potomac Drive
King George, VA  22485-5824

Phone:    +1 540.663.9251
Fax:      +1 540.663.0276
e-mail:   pcroll@csc.com
References


