

IEEE Guide for Information Technology—System Definition— Concept of Operations (ConOps) Document

Sponsor
**Software Engineering Standards Committee
of the
IEEE Computer Society**

Approved 19 March 1998
Reaffirmed 5 December 2007

IEEE-SA Standards Board

Abstract: The format and contents of a concept of operations (ConOps) document are described. A ConOps is a user-oriented document that describes system characteristics for a proposed system from the users' viewpoint. The ConOps document is used to communicate overall quantitative and qualitative system characteristics to the user, buyer, developer, and other organizational elements (for example, training, facilities, staffing, and maintenance). It is used to describe the user organization(s), mission(s), and organizational objectives from an integrated systems point of view.

Keywords: buver. characteristics. concept of operation. concepts of operations document. ConOps,

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

Copyright © 1998 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 31 December 1998. Printed in the United States of America.

Print: ISBN 0-7381-0185-2 SH94615
PDF: ISBN 0-7381-1407-3 SS94615

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Board. Members of the committees serve voluntarily and without compensation. They are not necessarily members of the Institute. The standards developed within IEEE represent a consensus of the broad expertise on the subject within the Institute as well as those activities outside of IEEE that have expressed an interest in participating in the development of the standard.

Use of an IEEE Standard is wholly voluntary. The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of all concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE Standards Board
445 Hoes Lane P.O. Box 1331
Piscataway, NJ 08855-1331
USA

Note: Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE shall not be responsible for identifying patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Authorization to photocopy portions of any individual standard for internal or personal use is granted by the Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; (508) 750-8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Introduction

[This introduction is not a part of IEEE Std 1362-1998, IEEE Guide for Information Technology—System Definition—Concept of Operations (ConOps) Document.]

Purpose

This guide presents format and contents of a concept of operations (ConOps) document to be used when developing or modifying a software-intensive system. A software-intensive system is a system for which software is a major technical challenge and is perhaps the major factor that affects system schedule, cost, and risk. In the most general case, a software-intensive system is comprised of hardware, software, people, and manual procedures. To make this guide more readable, the term “system” will be used to mean a software-intensive system that includes elements to be developed or modified, in addition to software. The term “software system” will be used to mean a software-intensive system in which software is the only component to be developed or modified.

This guide does not specify the exact techniques to be used in developing the ConOps document, but it does provide approaches that might be used. Each organization that uses this guide should develop a set of practices and procedures to provide detailed guidance for preparing and updating ConOps documents. These detailed practices and procedures should take into account the environmental, organizational, and political factors that influence application of the guide.

The heart of the ConOps described in this guide is contained in Clauses 3 through 5.

- Clause 3 describes the existing system (manual or automated) that the user wants to replace;
- Clause 4 provides justification for a new or modified system and any restrictions on that system; and
- Clause 5 describes the proposed system.

The outlines for Clause 3 and Clause 5 are almost identical. This is not to say that the contents of the finished ConOps document will be identical. On the contrary, the contents should be very different. The outlines are the same to remind developers of the items that should be included and the actions to be taken.

Not all software projects are concerned with development of source code for a new software product. Some software projects consist of a feasibility study and definition of product requirements. Other projects terminate upon completion of product design or are only concerned with modifications to existing software products. Applicability of this guide is not limited to projects that develop operational versions of new products, nor is it limited by project size or scope. Small projects may require less formality than large projects, but all components of this guide should be addressed by every software project.

The ConOps approach provides an analysis activity and a document that bridges the gap between the user’s needs and visions and the developer’s technical specifications. In addition, the ConOps document provides the following:

- A means of describing a user’s operational needs without becoming bogged down in detailed technical issues that shall be addressed during the systems analysis activity.
- A mechanism for documenting a system’s characteristics and the user’s operational needs in a manner that can be verified by the user without requiring any technical knowledge beyond that required to perform normal job functions.
- A place for users to state their desires, visions, and expectations without requiring the provision of quantified, testable specifications. For example, the users could express their need for a “highly reliable” system, and their reasons for that need, without having to produce a testable reliability requirement. [In this case, the user’s need for “high reliability” might be stated in quantitative terms by the buyer prior to issuing a request for proposal (RFP), or it might be quantified by the developer during requirements analysis. In any case, it is the job of the buyer and/or the developer to quantify users’ needs.]

- A mechanism for users and buyer(s) to express thoughts and concerns on possible solution strategies. In some cases, design constraints dictate particular approaches. In other cases, there may be a variety of acceptable solution strategies. The ConOps document allows users and buyer(s) to record design constraints, the rationale for those constraints, and to indicate the range of acceptable solution strategies.

Intended uses

This guide is intended for use in a variety of situations by a variety of users including the following:

- Acquirers using ISO/IEC 12207:1995, Information technology—Software life cycle processes, will find the current guide suitable for satisfying the requirements of 5.1.1.1:
“The acquirer begins the acquisition process by describing a concept or a need to acquire, develop, or enhance a system, software product or software service.”
- Users who formerly applied MIL-STD-498, Software Development and Documentation, and related standards will find that the ConOps document described in this guide is very similar to the operational concept description (OCD) included in MIL-STD-498.
- Users of EIA/IEEE J-STD-016-1995, EIA/IEEE Interim Trial-Use Standard for Information Technology Software Life Cycle Processes Software Development Acquirer—Supplier Agreement will find that the ConOps document described in this guide is substantively identical to the OCD included in EIA/IEEE J-STD-016-1995.
- Other users will find this guide useful in facilitating communication among the various stakeholders in a project.

Software as part of a larger system

Software projects are sometimes parts of larger projects. In these cases, the software ConOps document may be a separate document or it may be merged into the system level ConOps document.

Overview

This guide contains four clauses. Clause 1 defines the scope of this guide. Clause 2 provides references to other IEEE standards that should be followed when applying this guide. Clause 3 provides definitions of terms that are used throughout the guide. Clause 4 contains an overview and a detailed specification of the ConOps document, including required components that should be included, and optional components that may be included in project plans based on this guide.

Responsible organization

Ideally, the ConOps document should be written by representatives of the user community. In practice, other individuals or organizations may write the ConOps (e.g., the buyer, a third party consultant, and/or the software developer). In these cases, it is essential that user representatives be involved in reviewing, revising, and approving the ConOps document. The primary goal for a ConOps document is to capture user needs, and to express those needs in the user’s terminology.

Audience

This guide is intended for users and buyers of software systems, software developers, and other personnel who prepare and update operational requirements for software-intensive systems and monitor adherence to those requirements.

Evolution of plans

Developing the initial version of the ConOps document should be one of the first activities completed on a software project. As the project evolves, the nature of the work to be done and details of the work will be better understood. The ConOps document should be updated periodically to reflect the evolving situation. Thus, each version of the document should be placed under configuration control.

Terminology

This guide follows the 1996 edition of the IEEE Standards Style Manual. The terms *should*, *may*, *might*, and *suggest* are used to indicate actions that should be used to develop a good ConOps document but that are not mandatory. However, the authors of a ConOps document should consider using all aspects of this guide to insure a complete and effective document.

The ConOps document is sometimes called an operational concept document (OCD).

History

Use of a ConOps document was first documented in Lano, R. J., "A Structured Approach for Operational Concept Formulation," TRW SS-80-02, TRW Defense and Space Systems Group, Redondo Beach, CA, 1980. In 1992 the Software Systems Technical Committee of the American Institute of Aeronautics and Astronautics (AIAA), developed a standard for an OCD.

This ConOps guide originated in October 1993, as a Master of Science thesis at California State University, Sacramento, and was supported by the U.S. Office of Research and Development. It was accepted as MIL-STD-498, Data Item Description (DID), by the DoD-Std-2167A Harmonizing Working Group with few changes. MIL-STD-498-1995 became IEEE Std 1498-1995, which was redesignated J-STD-016-1995.

The IEEE Standards Board approved the project authorization request (PAR) for development of this guide in June 1993. The first draft was submitted to the Software Engineering Standards Committee (SESC) on 8 August 1995; it was returned on 1 November 1995 with a request that the guide be harmonized with certain other specified software engineering standards. The second draft was submitted to the SESC on 28 February 1996. This draft was balloted on 21 August 1996.

Participants

This guide was written by the IEEE Guide for a Concept of Operations Document Working Group, which is part of the IEEE Computer Society. The following three individuals are the authors of this guide:

Richard H. Thayer
Richard E. Fairley
Per Bjorke

Other individuals who supported the development of this guide are:

Jed Bartlett
Boris I. Cogan

Merlin Dorfman
Rajko Milovanovic

Randy Paul
Jane Radatz

The following persons were on the balloting committee:

Mikhail Auguston
Robert E. Barry
Mordechai Ben-Menachem

Peter A. Berggren
H. Ronald Berlack
Audrey C. Brewer

Alan L. Bridges
Kathleen L. Briggs
Thomas G. Callaghan

Stuart Ross Campbell
Leslie Chambers
Keith Chan
John P. Chihorek
S. V. Chiyarath
Antonio M. Cicu
Theo Clarke
Darrell Cooksey
W. W. Geoff Cozens
Gregory T. Daich
Hillary Davidson
Neil Davis
Bostjan K. Derganc
Michael P. DeWalt
Dave Dikel
Charles Droz
John W. Fendrich
Julian Forster
Eva Freund
Juan Garbajosa-Sopena
Julio Gonzalez-Sanz
L. M. Gunther
John Harauz
Rob Harker
William Hefley
Manfred Hein
Mark Heinrich
Mark Henley

Umesh P. Hiriyannaiah
Fabrizio Imelio
George Jackelen
Vladan V. Javonovic
Frank V. Jorgensen
William S. Junk
George X. Kambic
David W. Kane
Judith S. Kerner
Robert J. Kierzyk
Motti Y. Klein
Dwayne L. Knirk
Shaye Koenig
Thomas M. Kurihara
J. Dennis Lawrence
Michael Lines
Dieter Look
David Maibor
Philip P. Mak
Tomoo Matsubara
Scott D. Matthews
Patrick McCray
Bret Michael
Alan Miller
Millard Allen Mobley
James W. Moore
Kartik C. Mujamdar

Mike Ottewill
Donald J. Pfeiffer
John G. Phippen
Peter T. Poon
Margaretha W. Price
Kenneth R. Ptack
Andrew P. Sage
Stephen R. Schach
Norman F. Schneidewind
Gregory D. Schumacher
Robert W. Shillato
Richard S. Sky
Alfred R. Sorkowitz
Donald W. Sova
Fred J. Strauss
Michael Surratt
Douglas H. Thiele
Booker Thomas
Patricia Trelle
Richard D. Tucker
Theodore J. Urbanowicz
Glenn D. Venables
Camille S. White-Partain
Charles D. Wilson
Paul R. Work
Weider D. Yu
Janusz Zalewski
Peter F. Zoll

The following individuals were part of the Life Cycle Data Harmonization working group for IEEE Std 1362a-1998:

Leonard L. Tripp, *Chair*

Edward Byrne
Paul R. Croll
Perry DeWeese
Robin Fralick
Marilyn Ginsberg-Finner
John Harauz
Mark Henley

Dennis Lawrence
David Maibor
Ray Milovanovic
James Moore
Timothy Niesen
Dennis Rilling

Terry Rout
Richard Schmidt
Norman F. Schneidewind
David Schultz
Basil Sherlund
Peter Voldner
Ronald Wade

The following persons were on the balloting committee for IEEE Std 1362a-1998:

Eduardo W. Bergamini
H. Ronald Berlack
Richard E. Biehl
Juris Borzovs
David W. Burnett
Michael Caldwell
Antonio M. Cicu
Francois Coallier
Virgil Lee Cooper
W. W. Geoff Cozens
Paul R. Croll

Geoffrey Darnton
Taz Daughtrey
Bostjan K. Derganc
Perry R. DeWeese
Leo Egan
Jonathan H. Fairclough
Richard E. Fairley
John W. Fendrich
Jay Forster
Kirby Fortenberry
Eva Freund

Roger U. Fujii
Marilyn Ginsberg-Finner
Julio Gonzalez-Sanz
Lewis Gray
L. M. Gunther
David A. Gustafson
John Harauz
Rob Harker
William Hefley
Debra Herrmann
Umesh P. Hiriyannaiah

David Johnson
Frank V. Jorgensen
William S. Junk
Ron S. Kenett
Judith S. Kerner
Robert J. Kierzyk
Thomas M. Kurihara
John B. Lane
J. Dennis Lawrence
Mary Leatherman
William M. Lively
Stan Magee
David Maibor
Robert A. Martin
Patrick D. McCray
James W. Moore
Pavol Navrat

Donald J. Ostrom
Lalit M. Patnaik
Mark Paulk
John G. Phippen
Alex Polack
Peter T. Poon
Kenneth R. Ptack
Larry K. Reed
Ann E. Reedy
Donald J. Reifer
Annette D. Reilly
Andrew P. Sage
Helmut Sandmayr
Stephen R. Schach
Norman F. Schneidewind
David J. Schultz
Robert W. Shillato
David M. Siefert

Lynn J. Simms
Carl A. Singer
Fred J. Strauss
Toru Takeshita
Richard H. Thayer
Douglas H. Thiele
Booker Thomas
Patricia Trelle
Glenn D. Venables
John W. Walz
Camille S. White-Partain
Scott A. Whitmire
P. A. Wolfgang
Paul R. Work
Janusz Zalewski
Geraldine Zimmerman
Peter F. Zoll

When the IEEE-SA Standards Board approved this standard on 19 March 1998, it had the following membership:

Richard J. Holleman, *Chair*
Donald N. Heirman, *Vice Chair*
Judith Gorman, *Secretary*

Satish K. Aggarwal
Clyde R. Camp
James T. Carlo
Gary R. Engmann
Harold E. Epstein
Jay Forster*
Thomas F. Garrity
Ruben D. Garzon

James H. Gurney
Jim D. Isaak
Lowell G. Johnson
Robert Kennelly
E. G. "Al" Kiener
Joseph L. Koepfinger*
Stephen R. Lambert
Jim Logothetis
Donald C. Loughry

L. Bruce McClung
Louis-François Pau
Ronald C. Petersen
Gerald H. Peterson
John B. Posey
Gary S. Robinson
Hans E. Weinrich
Donald W. Zipse

*Member Emeritus

Kim Breitfelder
IEEE Standards Project Editor

Contents

1.	Scope	1
2.	References	1
3.	Definitions.....	2
4.	Elements of a ConOps document.....	4
4.1	Scope (Clause 1 of the ConOps document)	5
4.2	Referenced documents (Clause 2 of the ConOps document).....	6
4.3	Current system or situation (Clause 3 of the ConOps document).....	7
4.4	Justification for and nature of changes (Clause 4 of the ConOps document).....	9
4.5	Concepts for the proposed system (Clause 5 of the ConOps document).....	11
4.6	Operational scenarios (Clause 6 of the ConOps document)	14
4.7	Summary of impacts (Clause 7 of the ConOps document).....	15
4.8	Analysis of the proposed system (Clause 8 of the ConOps document)	16
4.9	Notes (Clause 9 on the ConOps document)	16
4.10	Appendices (Appendices of the ConOps document)	16
4.11	Glossary (Glossary of the ConOps document).....	16
	Annex A (Informative) IEEE/EIA 12207.1-1997 Compliance Statement.....	17

IEEE Guide for Information Technology— System Definition—Concept of Operations (ConOps) Document

1. Scope

This guide prescribes the format and contents of the concept of operations (ConOps) document. A ConOps is a user-oriented document that describes system characteristics of the to-be-delivered system from the user's viewpoint. The ConOps document is used to communicate overall quantitative and qualitative system characteristics to the user, buyer, developer, and other organizational elements (e.g., training, facilities, staffing, and maintenance). It describes the user organization(s), mission(s), and organizational objectives from an integrated systems point of view.

This guide may be applied to all types of software-intensive systems: software-only or software/hardware/people systems. The concepts embodied in this guide could also be used for hardware-only systems, but this mode of use is not addressed herein. The size, scope, complexity, or criticality of the software product does not restrict use of this guide. This guide is applicable to systems that will be implemented in all forms of product media, including firmware, embedded systems code, programmable logic arrays, and software-in-silicon. This guide can be applied to any and all segments of a system life cycle.

This guide identifies the minimal set of elements that should appear in all ConOps documents. However, users of this guide may incorporate other elements by appending additional clauses or subclauses to their ConOps documents. In any case, the numbering scheme of the required clauses and subclauses should adhere to the format specified in this guide. Various clauses and subclauses of a ConOps document may be included by direct incorporation or by reference to other supporting documents.

2. References

This guide shall be used in conjunction with the following publications. In particular, the standards on requirements and plans should be consulted in preparing the ConOps. When the following standards are superseded by an approved revision, the revision shall apply.

IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology.¹

¹IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08855-1331, USA.