

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: buyer characteristics, concept of operation, concepts of operations document, ConOps,

The Institute of Electrical and Electronics Engineers, Inc.
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Print: ISBN 0-7381-0185-2 SH94615
PDF: ISBN 0-7381-1407-3 SS94615

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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 to 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.

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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.