

REPRINTED FROM:

COMPUTER STANDARDS & INTERFACES

The International Journal
on the Development and Application
of Standards for Computers, Data Communications and Interfaces

Computer Standards & Interfaces 15 (1993) 515-521

From Interfaces for Application Portability (IAP) to Open System Environment profiles (OSE)

Luigi Bertuzzi ^{a,*}, Jean-Michel Cornu ^b

^a *Open Systems Consultant, Via Trento Trieste 19, 32020 Voltago (BL), Italy*

^b *CORNU Consultant, 69 rue de Seine, 91130 Ris Orangis, France*



north-holland
amsterdam · london · new york · tokyo

COMPUTER STANDARDS & INTERFACES

Editors-in-chief

John. L. Berg, *FutureTech, Inc., P.O. Box 298, Long Lake, MN 55356, USA, Tel.: 612 476 6314, Fax: 1 703 305 9361*

Harald Schumny, *Physikalisch-Technische Bundesanstalt, Fürstenwalder Damm 388, 12587 Berlin-Friedrichshagen, Germany, Tel.: +372 6441 587, Fax: +372 6441 586*

Advisory editorial board

J.H. Burrows, *Computer Systems Lab., Technology Building, Room B160, National Institute of Standards & Technology, Gaithersburg, MD 20899, USA*

J.W. van den Beld, *European Computer Manufacturers Assoc. (ECMA), Rue du Rhône 114, CH-1204 Geneva, Switzerland*

Correspondent

Shirley M. Radack, *Manager Program Coordination & Support, Computer Systems Lab., National Institute of Standards & Technology, B151, Gaithersburg, MD 20899, USA*

Editorial board

J.C. Adams, *Nat. Center for Atmospheric Res., Comp. Support, Scient. Comp. Div., P.O. Box 3000, Boulder, CO 80307, USA*

W. Attwenger, *OEFZS GmbH, Austrian Res. Center Seibersdorf, A-2444 Seibersdorf, Austria*

Cheng Hu, *Academia Sinica, Inst. of Software, P.O. Box 8718, 100080 Beijing, P.R. China*

G. Chroust, *Johannes Kepler Univ., Inst. for Syst. Sci., Altenbergerstr. 69, A-4040 Linz, Austria*

J. Garfunkel, *Micro Focus Ltd., 105 Old Mill Rd., Manhasset, NY 11030, USA*

J. Iorio, *IEEE Standards, 945 Burnt Mills Road, Bedminster, NJ 07921, USA*

M. Kato, *Fuji Xerox Co. Ltd., 3-5 Akasaka 3-chome, Minato-ku, 107 Tokyo, Musashino-Shi, Japan*

H. Kilov, *BellCore, 444 Hoes Lane, RRC-1A111, Piscataway, NJ 08854, USA*

F.H. Lang, *Margaretenstr. 3 / 4, A-1040 Wien, Austria*

J. Lukacs, *MSZKI, P.O. Box 49, H-1525 Budapest, Hungary*

B.L. Meek, *King's College London, Computing Centre, Strand, London, WC2R 2LS, UK*

R. Mori, *Univ. of Tsukuba, 1-24-12 Hakusan, Bunkyo 113, Tokyo, Japan*

T.W. Olle, *T.W. Olle Assoc. Ltd., 2 Ashley Park Rd., Walton-on-Thames, Surrey KT12 1JU, UK*

L.J. Rankine, *Rankine Assoc., 231 Bayberry Lane, Westport, CT 06880, USA*

D. Richter, *PTB 10.3, Basics of Metrological IT, Fürstenwalder Damm 388, D-12578 Berlin, Germany*

M. Scott, *Graham & James, 725 South Figueroa Str., 34th Floor, Los Angeles, CA 90017-5434, USA*

M.B. Spring, *Univ. of Pittsburgh, Dept. of Information Sci., Lis Bldg., Pittsburgh, PA 15260, USA*

F. von Sydow, *GMD-F1 Normungsbüro, Schloss Birlinghoven, Postfach 1240, D-5205 St. Augustin 1, Germany*

F.J.W. Symons, *Switching & Signal Res., 762-772 Blackburn Rd., Clayton North / Melbourne, Victoria 3168, Australia*

C. Thanos, *IEI-CNR, Via S. Maria 46, I-56100 Pisa, Italy*

B. Thuraishingham, *Mitre Corp., K-329, Burlington Rd., Bedford, MA 01730, USA*

F. Wagner, *CENSOR AG, FL-9490 Vaduz, Liechtenstein*

H.J. Will, *Univ. of Victoria, School of Public Admin., Box 1700, Victoria, B.C., V8W 2Y2 Canada*

Please note: The affiliations shown on this page are for information only, and the individuals listed express their personal views which do not necessarily represent the views of their organizations.



ELSEVIER

Computer Standards & Interfaces 15 (1993) 515-521

COMPUTER STANDARDS
& INTERFACES

From Interfaces for Application Portability (IAP) to Open System Environment profiles (OSE)

Luigi Bertuzzi ^{a,*}, Jean-Michel Cornu ^b

^a *Open Systems Consultant, Via Trento Trieste 19, 32020 Voltago (BL), Italy*

^b *CORNU Consultant, 69 rue de Seine, 91130 Ris Orangis, France*

Abstract

The ISO/IEC JTC 1 Technical Study Group 1's report on Interfaces for Application Portability has initiated a worldwide attempt at specifying a Reference Model for Open System Environments. This article provides a concise but comprehensive view of the current State of the Art and emphasizes the interaction with the 'user' of such a Reference Model.

Key words: Interfaces; Interoperability; ISO; JTC 1; Open Systems Environment; Portability; Profiles; TSG-1

1. Introduction

Information technology, an important asset of human enterprises, requires growing investments for the development and maintenance of organizationally vital application software. Changes, forced by technological advancements, often place extraordinary financial and organizational burdens on enterprises for the porting and/or rewriting of applications and retraining personnel.

The international organization which publishes Information Technology Standards is a Joint Technical Committee (JTC 1) between the International Organization for Standardization (ISO) and the International Electrotechnical Commit-

tee (IEC), fully identified by the acronym ISO/IEC JTC 1.

Portability was first presented to JTC 1 as a candidate subject for standardization by one of its 'Special Working Groups' (SWG), namely the SWG on Strategic Planning (SWG-SP).

Achieving portability of application software through standardization of interfaces was recognized as an important objective by a JTC 1 plenary meeting, and a resolution was adopted to establish a Technical Study Group (TSG-1) tasked with the production of a report aimed at the identification of standards required by portability.

Experts representing the ISO/IEC JTC 1 National Bodies were invited to contribute to the work of the ISO/IEC JTC 1/TSG-1 on Interfaces for Application Portability (IAP). The Japanese National Body offered the convenorship of the meeting and the Danish Standards Association offered the Project Manager. Both were accepted.

* Corresponding author.

2. Failure of a simple list of standards and need for profiles

The expectation that the achievement of portability would have been allowed by the identification of a set of 'base standards', such as those published by ISO, IEC and CCITT, was not satisfied.

The available number of base standards turned out to be insufficient. The 'missing standards' (or 'gaps') issue brought up a debate about the nature of such shortage and about the approach which would be needed to make their identification and development possible.

Additionally, richness of optionality available in multi-purpose base standards, and the need to integrate several of such standards whenever they would be required to assemble high-level chunks of functionality, indicated that portability could only be achieved through the development of International Standardized Profiles (ISP). ISPs are already published by ISO/IEC JTC 1 to provide a standard specification of the protocols and the services which are needed to achieve Open Systems Interconnection (OSI).

The TSG-1 report recommended that the standardization of Interfaces for Application Portability (IAP) be achieved through the specification of an Open System Environment (OSE) framework for profiling concepts and procedures, hereinafter called 'OSE standardization'.

3. Regional workshops (prototyping the OSE standardization process)

International harmonization activities for draft OSI (Open Systems Interconnection) profiles are carried out by three Regional Workshops, viz. the European Workshop for Open Systems (EWOS); the OSI (now OSE) Implementors Workshop (OIW), in North-America; and the Asia and Oceania Workshop (AOW), in Japan.

An EWOS Expert Group, which was originally formed as a result of an abortive attempt to create European Standards out of the X/Open Common Application Environment Specification, spearheaded EWOS into resolving to extend the

concept of profiling for the wider scope of the 'Open System Environment' (OSE). Its ideas have been submitted to the JTC 1 Special Group for Functional Standardization (SGFS), which (like EWOS) is extending its scope from the original OSI-orientation. The North-American workshop (OIW) has also extended its scope. The basic ideas for these activities are similar to those put forward by the JTC 1 study into application portability (TSG-1) and by the work of IEEE P1003.0 on POSIX Application Environment Profiles.

4. The difference of OSE standardization

The TSG-1 report identified a fundamental difference of this type of standardization, i.e. as opposed to base standards, and OSI profiling, OSE requires a top-down approach. Such difference should first be seen as a need to take two broad views of OSE standardization: (1) the technical view, and (2) the presentation view.

Additional evidence that both views are equally important is provided by the resolutions adopted by JTC 1 as a consequence of the TSG-1 report.

A proper form of interaction needs to be established between such views in order for the technical view to cater to the technical details of OSE and for the presentation view to acquire the user requirements which would grant the correctness of the first view. To achieve this effect, it may be a good idea to identify three *types of organizations*:

- Vendor user (VUO), i.e. 'vendors use standards',
- Buyer user (BUO),
- Standard developer (SDO).

It should then be recommended that an 'OSI-like' layered reference model is transposed into the regional workshop social context. A proposed breakdown of such a context into aspects (layers) of social communication, could be as follows (top to bottom):

- (6) Enterprise
- (5) Political
- (4) Cultural
- (3) Organization

(2) Functional

(1) Technical.

This approach should provide a hopefully well understood reference model for the interaction between the technical and the presentation views of OSE profiling which supports the specification of an OSE reference model. But this approach also raises some questions about OSE and the users:

- (a) Can we say that, unless peer-to-peer communication is established between any two of the three types of user organizations listed above, the quality of the technical contents of the connection between the end-systems (enterprises) is suitable for OSE profiles?
- (b) Can a BUO and an SDO, or a BUO and a VUO, achieve peer-to-peer communication for the sake of OSE profiling *without* a presentation gateway or without limiting such communication to a context provided by their being members of a consortium?
- (c) Can we assume that, without such a gateway function, it will be possible to achieve timeliness of OSE profiling and the single international framework required by the OSE concepts?
- (d) If a presentation gateway is deemed as necessary, shouldn't the three regional workshops and/or a well identified number of user associations provide such service?
- (e) How are these services provided, if the process of deciding which profiles are needed must meet requirements gathered from widely differing sources?
- (f) By what means, what tools, and from where come the resources?

5. Guidelines for answers to any such questions

The Technical Report ISO/IEC/TR 10000, prepared and maintained by the Special Group on Functional Standardization (SGFS) of ISO/IEC JTC 1, contains the following wording (see Part 1, version 3, clause 5):

('Purpose of Profiles')... "an objective of ISO/IEC JTC 1 is to create *the climate* for the production of harmonized profiles, where a *wide* mea-

sure of agreement is reached *before* proposals are submitted to ISO/IEC JTC 1."

However, the OSE work can be delayed in regional workshops "waiting for a stable base standard or stable International Standardized Profile (ISP)" if this type of standardization is not synchronized with the ISO/IEC JTC 1 procedures and work program.

6. OSE concepts

The TSG-1 report has introduced the concept of AEP (Application Environment Profile). While profiles defined in the OSI world are built with a bottom-up approach (one or more available standards with a choice of options), the OSE concepts lead to a top-down approach (defining a profile from the business requirements). Such requirements based on user-oriented functionality are first acquired and *then* processed to identify suitable base standards. The result at the end is still a set of standards with a selection of options, but the top-down approach has two main consequences:

- (1) An Application Environment Profile defines a complete environment for a specific use (e.g. desktop environment; supercomputing environment; transaction processing; ...) rather than a specific technical function inside the environment (such as: transport services; database management; user interface; ...). A complete set of standards is a key point for application portability, e.g. software portability would not be allowed if two platforms have the same operating system interface and the same API to transport services but two different user interface toolkits.
- (2) Defining an environment from the user requirements may lead to identify some services which are not yet supported by standards; these 'gaps' are used to identify areas where standardization work is needed; the top-down approach introduces a 'pro-active' view of standardization, rather than a 're-active' one; up to now, standards have been capturing technology aspects, when mature enough for interested parties to embark in the necessary activities.

OSE profiles can be seen as an extension of the OSI profile concept, adding other domains to the communication service domain. Examples of additional domains are: User domain; System/process domain; Information access domain.

7. Different aspects of portability

As a further extension to the OSI profile concept, the TSG-1 report has identified four different aspects of portability, supported by different 'points of stability' which are, in themselves, potential candidates for standardization:

- (1) Program portability (supported by Application Programming Interfaces, or API);
- (2) Data portability (supported by Formats);
- (3) People portability (supported by Look and Feel);
- (4) Systems interoperability (supported by Protocols).

Several new areas would then be identified by the above aspects of portability, such as: protocols for user interfaces, or APIs for communication services. Each of the above mentioned 'aspects of portability' may need to be seen from the 'point of view' of e.g. security, administration, localization (cultural and/or national 'transposition'), ... There could be an unlimited number of combinations, for 'service domains', 'aspects of portability' and 'points of view', but, by taking a top-down approach, a small set of environments could be defined, supporting just the standards which are needed.

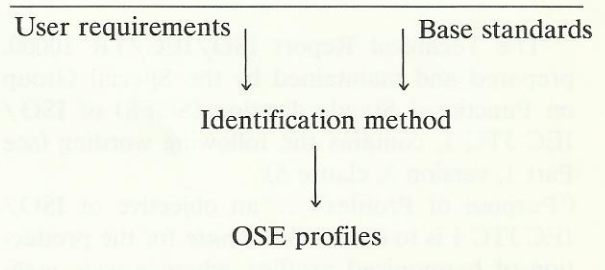
The concept of OSE profiles proposed by EWOS, as a follow-up to the TSG-1 report, focusses on three major extensions: a top-down approach starting from user requirements to define a small set of environments, the addition of user, system/process and information domains to the communication domain, and the addition of program, data and people portability to interoperability (using APIs, Formats and 'Look and Feel' as a complement to Protocols).

8. Tools for OSE profiles

While the development of OSI standards has been supported from the very beginning by the

seven-layer OSI Reference Model (OSI RM), no such a roadmap exists for OSE. It has been observed that, before a suitable OSE RM (or Framework) can be specified, several tools should be developed to support a (prototype) OSE profiling activity. The following have been tentatively identified:

- (a) A process to capture user requirements and to identify a set of user-oriented functions, to be provided by the application platform;
- (b) An information base for standards, to be used as a repository from which selected standards for a specific environment can be retrieved; such an information base should obviously contain 'de jure' standards, but also some Publicly Available Specifications (PAS) which might be needed on a temporary basis to fill some gaps in the profile (e.g. X-Window);
- (c) A method for selection and registration of PAS;
- (d) A model for the structure of the info base (preliminary ideas were offered by the TSG-1 report, in a chapter on Framework and model);
- (e) A methodology for the identification of the base standards matching with the user requirements; a proposal presented by an EWOS Technical Guide (ETG 012) has been submitted to the Special Group on Functional Standards (ISO/IEC JTC 1/SGFS);
- (f) A taxonomy for classification of environments, such as desktop environment or database server environment;
- (g) A taxonomy of functional profiles defining the building blocks used by environments. (An OSI taxonomy exists, but others are needed such as DBMS, Operating System, User Interface.)



9. Method for developing OSE profiles

A process to develop OSE profiles based on user requirements has been tentatively defined by an EWOS Expert Group, as follows:

- (1) Selection of an entry point in the taxonomy which shall be the title of the profile and the definition of a clear objective for which the profile is used. For example, a simple desktop environment;
- (2) Identification of user requirements in terms of:
 - user functionality (following our example: text processing, spreadsheet, simple graphics and mail)
 - attributes (e.g. security and/or administration tools)
 - additional constraints (e.g. degree of distribution, visibility of certain internal interfaces, preference for certain standards or paradigms);
- (3) Description of profile architecture in terms of building blocks and interfaces;
- (4) Profile specification, including identification of base standards and selected options for the environments; missing standards (gaps) may also be identified at this stage.

10. Continuing the work initiated by TSG-1

Since TSG-1 delivered its report to JTC 1 in 1991, several organizations have been endorsing the need to continue the work in the area of profiles for application portability:

- EWOS EG-OSE is now continuing the work of the former EG-CAE in defining the method for developing OSE profiles, a taxonomy of environments, and a catalogue of building blocks;
- OIW OSE-TC is working on OSE concepts with special focus on the Publicly Available Specifications;
- X/OPEN is developing profiles and components (the building blocks) and its work is based on a 'user requirement' study (XTRA);
- ISO/IEC JTC 1/SGFS has extended its scope from OSI to OSE and is preparing an extended version of the Technical Report known as "TR

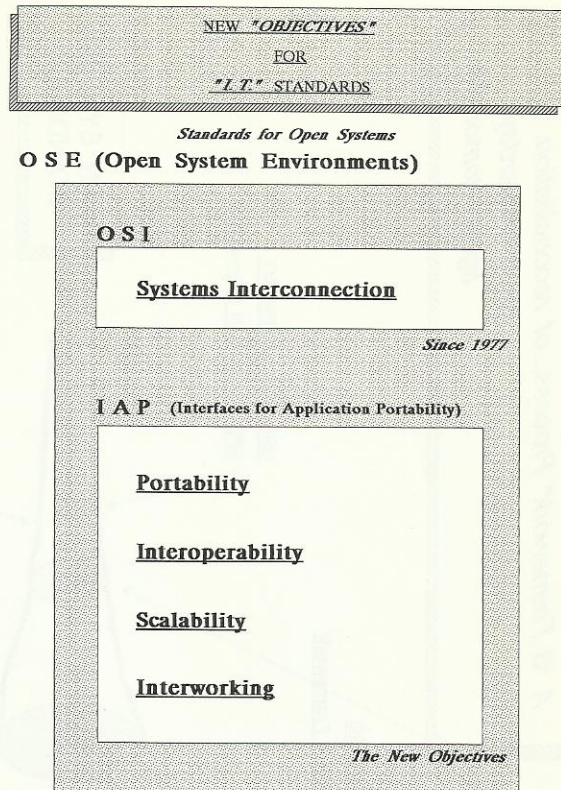


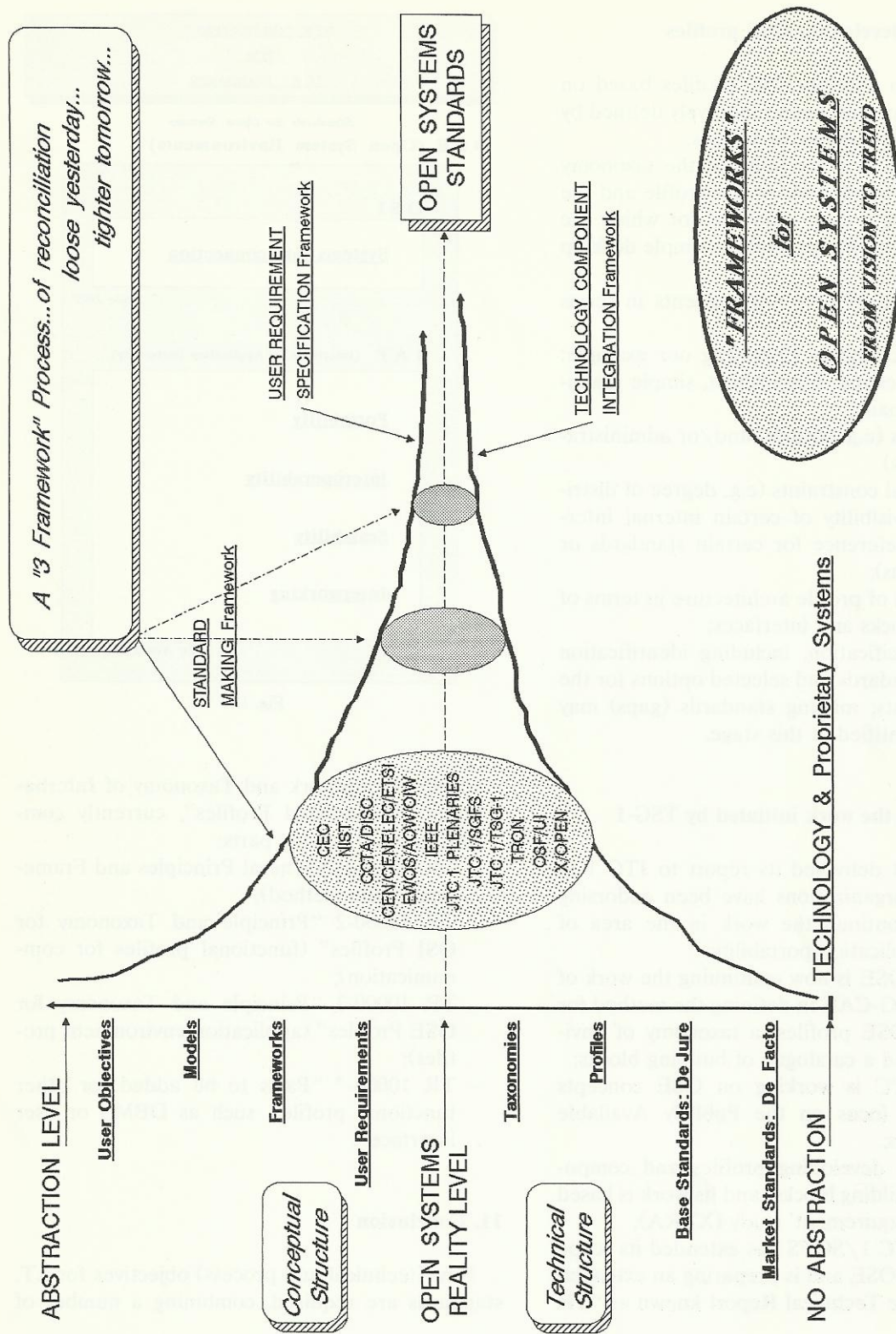
Fig. 1.

10000—Framework and Taxonomy of International Standardized Profiles", currently comprising the following parts:

- TR 10000-1 "General Principles and Framework" (the method);
- TR 10000-2 "Principle and Taxonomy for OSI Profiles" (functional profiles for communication);
- TR 10000-3 "Principle and Taxonomy for OSE Profiles" (application environment profiles);
- TR 10000-* "Parts to be added for other functional profiles, such as DBMS or user interface".

11. Conclusion

New (technical and process) objectives for I.T. standards are required, combining a number of



DISC, EWOS P04 Report; EWOS EG CAE Work; JTC 1/TSG-1 Report; NIST; IEEE

Fig. 2.

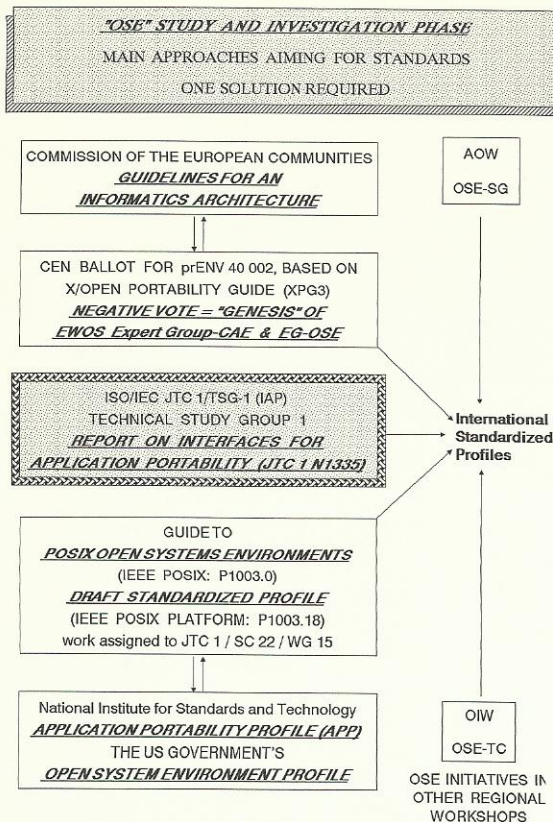


Fig. 3.

building. At the time of writing, EWOS in Europe, OIW in North-America and AOW in Asia-Oceania each host one group of experts addressing OSE profiles (an Expert Group in EWOS, a Technical Committee in OIW and a Special Group in AOW) (see Fig. 3). From now on the stepping stones beyond the TSG-1 Report on IAP, necessary to keep moving toward OSE profiles and the new I.T. objectives, will be identified by the harmonized activities promoted and supported by the regional workshops, in coordination with ISO/IEC JTC 1. Many architectural issues to be resolved have already been identified and many more will be raised, with special emphasis on the organizational and cultural aspects which allow Open System Standards to be generated and maintained.



Luigi Bertuzzi, a physics graduate of Bologna University, participated from 1969 to 1983 in large heterogeneous distributed systems at the Bologna Regional Computer Center (CINECA), the European Center for Nuclear Research (CERN), and the European Center for Medium Range Weather Forecasts (ECMWF). While with a major information technology company from 1983 to 1989 he worked for the IT industry, served as Software Purchasing Manager, Product Planning Manager, and a Corporate International Standards Manager. An independent consultant since 1990, he has chaired the Expert Group on Open System Environment developing an initial OSE profile framework and methodology for the European Workshop for Open Systems (EWOS).



Jean-Michel Cornu served as technical director for a startup company designing 32 bit workstations until 1985. As an independent consultant in the area of open systems he focussed on standard bodies and user organizations. His active participation in several standardization committees provides him a strategic global watch. He helps manufacturers and large users define their open system strategy and works on procurement policy for the French Government public agency (CCM) and the Commission of European Communities (CEC DG XII).

dynamic goals (portability, interoperability, scalability and interworking), in relation to application software, data and people. The need to reconcile enterprise (or demand) and technology (or supply) is the ultimate motivation for the pursuit of such objectives (see Fig. 1).

However, a conceptual framework for the development of Open Systems Standards cannot be provided by a single technical reference model. Reconciliation of I.T. demand and supply must be perceived as a multi-framework process (see Fig. 2). TSG-1 laid down the foundations on which the current regional workshop activities are

COMPUTER STANDARDS & INTERFACES

Aims and scope

Standards and well-defined interfaces are essential for building and exploiting complex computing and communications systems. They simplify the design and construction of individual hardware and software components and help to ensure satisfactory interworking. *Computer Standards & Interfaces* is an international journal dealing specifically with these topics. It will:

- provide information about activities and progress on the definition of computer standards and interfaces at national and international levels
- disseminate users' experiences and case studies in the application and exploitation of established or emerging standards and interfaces
- offer a forum for discussions on standards and interfaces by recognized experts
- stimulate relevant research by providing a specialized refereed medium.

Journal audience

The journal serves:

- those sponsoring or participating in activities to define and gain official ratification of computer standards and interfaces
- those designing and implementing computing systems comprising multiple hardware and software components
- managers, professionals and senior executives of commercial and industrial organisations as well as academic institutions using computers in any form, who would be affected or influenced by developments in computer standards.

Subject coverage

The journal is concerned with the specification and application of standards in such areas as: process control, CAD/CAM, industrial electronics, real-time systems, data communications, local and wide area networks, open systems interconnection, distributed computing, office automation, personal computers, microprocessors, bus architectures, hardware interfaces, languages, databases, documentation, operating systems, graphics, man-machine interfaces, robotics, encryption, storage and interchange media.

It also covers general topics concerning the standardization process such as political aspects of standards, their impact on the marketplace, cost-benefit analyses, legislative issues, and relationships among national and international standards bodies.

Types of contribution considered

The journal has a number of categories:

Refereed papers may consist of

- technical reviews of particular standards
- practical experiences in the application of existing, emerging or *de facto* standards
- recommendations for new standards activities or improvements to existing standards
- general issues such as the economic impact of standards.

Commentaries contain authoritative evaluations of standards developments and standardization processes.

Standardization activities consists of news reports on progress within various standards bodies and on relevant meetings and conferences.

The journal also publishes book reviews, calendars of forthcoming events and lists of standards publications.

Author's benefits

1. 30% discount on all book publications of North-Holland.
2. 50 reprints are provided free of charge to the principal author of each paper published.

Subscription information

Computer Standards & Interfaces (ISSN 0920-5489) is published in 1 volume (6 issues) a year. The subscription price for 1993 (Vol. 15) is SFr 580.00 + SFr 60.00 p.h. = SFr 640.00 (US\$520.00). The Swiss Francs price is definitive. The US dollar price is subject to exchange-rate fluctuations and is given only as a guide.

Subscriptions are accepted on a prepaid basis only, unless different terms have been previously agreed upon.

Subscription orders can be entered only by calendar year (Jan.-Dec) and should be sent to Elsevier Sequoia S.A., Journal Department, P.O. Box 564, CH-1001 Lausanne 1, Switzerland, tel. 41.21.207381, fax 41.21.235444, or to your usual subscription agent.

Postage & handling charges include surface delivery except to the following countries where air delivery via SAL (Surface Air Lift) mail is ensured: Argentina, Australia, Brazil, Canada, Hong Kong, India, Israel, Malaysia, Mexico, New Zealand, Pakistan, PR China, Singapore, South Africa, South Korea, Taiwan, Thailand, USA.

For Japan air delivery (SAL) requires 25% additional charge of the normal postage and handling charge. For all other countries airmail rates are available upon request.

Claims for missing issues must be made within six months of our publication (mailing) date, otherwise such claims cannot be honoured free of charge.

Authors: Please mention your email address and / or fax number on the first page of your manuscript

© 1993, Elsevier Science Publishers B.V. All rights reserved

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publisher, Elsevier Science Publishers B.V., Copyright and Permissions Department, P.O. Box 521, 1000 AM Amsterdam, Netherlands.

Special regulations for authors—Upon acceptance of an article by the journal, the author(s) will be asked to transfer copyright of the article to the publisher. This transfer will ensure the widest possible dissemination of information.

Special regulations for readers in the USA—This journal has been registered with the Copyright Clearance Center, Inc. Consent is given for copying of articles for personal or internal use, or for the personal use of specific clients. This consent is given on the condition that the copier pays through the Center the per-copy fee stated in the code on the first page of each article for copying beyond that permitted by Sections 107 or 108 of the US Copyright Law. The appropriate fee should be forwarded with a copy of the first page of the article to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, MA 01970, USA. If no code appears in an article, the author has not given broad consent to copy and permission to copy must be obtained directly from the author. All articles published prior to 1981 may be copied for a per-copy fee of US \$2.25, also payable through the Center. This consent does not extend to other kinds of copying such as for general distribution, resale, advertising and promotion purposes, or for creating new collective works. Special written permission must be obtained from the publisher for such copying.

No responsibility is assumed by the Publisher for any injury and / or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. Although all advertising material is expected to conform to ethical standards, inclusion in this publication does not constitute a guarantee or endorsement of the quality or value of such product or of the claims made of it by its manufacturer.