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ISO/IEC JTC 1/SC 21/WG 1
OSI Architecture

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Title	:	**UK DISCUSSION PAPER RELATING TO USER REQUIREMENTS RELEVANT TO OPEN SYSTEMS ASSESSMENT METHODOLOGY**
Source	:	United Kingdom
Status	:	UK contribution to discussion for consideration at the WG 1 meeting, Yokohama, 16-24 June 1993. This paper gives further information in support of the UK proposal for a NWI on Open Systems Assessment Methodology

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1 Background

The development of OSI standards, and the associated testing methodology as described in ISO 9646, are based on the premise that OSI products should be assessed on the basis of their capability to formulate correctly structured Protocol Data Units (PDUs), and to respond appropriately to received PDUs, so as to fulfil the functionality implied by the standards. However, it has always been viewed that the internal workings of an OSI end system, and particularly the degree to which it reflects internally the 'abstract services' described in the OSI standards, is outside the scope of the standards definition and hence of assessment.

This situation has been changing over recent years, as the standardisation of more user visible functions, like File Transfer, Message Handling and Terminal Connection has taken place. Never-the-less, the approach to stating conformance requirements, and hence to applying formal conformance testing, has remained oriented towards requirements as viewed from the protocol definitions, using the concept of a Protocol Implementation Conformance Statement.

The inadequacy of this approach has been long recognised, and has led to the concept of 'interoperability testing' as a stage after conformance testing, when some form of verification takes place that the system can actually achieve some useful interoperability with similar systems from other vendors. Although not formally acknowledged as such, a significant component of interoperability testing is verifying conformance to function, rather than to the protocol definition.

2 The Need

The situation in open systems standardisation is now changing dramatically from the environment in which the early standards were conceived and developed. The work on Open Systems Environment (OSE) and Open Distributed Processing (ODP) as well as the work being undertaken to standardise APIs, has brought awareness that an OSI end system, far from being a 'black box' is a complex, multi-component entity, with many internal interfaces which have to function correctly to some defined rules, if the system as a whole is going to deliver a useful service to its users.

This awareness brings new requirements to the makers of open systems standards, that they define more precisely what functionality is <u>Required</u> of an implementation of the standard, and what functionality is described but optional to implement. Most importantly, these definitions have to accommodate requirements for behaviour as observed at points of control and observation (PCOs) other than the referenced protocol interface, for example, at a secondary (not directly related) protocol interface, or at a Human-Computer Interface (HCI).

3 Some Real Examples

To illustrate the requirement to be able to make statements of functional conformance requirements, either as a basic requirement to comply with a standard, or as a user requirement to provide some functionality allowed by a base standard, some relevant examples are considered.

3.1 Systems Management, Object Conformance

The systems management work in ISO and elsewhere, which can all be positioned within the ODP framework, is formulating managed object definitions to allow for management of OSI layer implementations in real OSI systems. The managed object definition is an abstraction of some real set of parameters which would be implemented in some concrete fashion in a real end system, and which would be capable of remote manipulation or reporting. To conform to the systems management protocol requirements, all that is required is that the protocol exchanges of management information take place correctly. However, to be useful to the end user, it is important that the actual parameter changes in the real implementation are changed under the relevant control signal. It may also be important to indicate that the real implementation is only required to support a limited range of the possible parameter values to claim compliance.

3.2 Message Handling, support of 'relay' function

The message handling standards define rules for relaying a message from one originating system to many eventual end systems. The relaying process description in the standards sets down how each of the outgoing messages should be constructed from an incoming message. However, the traditional 'PICS' approach to defining implementation requirements does not allow for this internal functionality to be itemised and hence tested. The standards also specify 'downgrading ' rules, whereby an implementation may offer conversion between the 1988 (version 2) protocol and the very different 1984 (version 1) protocol. Again, the traditional PICS is not well suited to making statements of requirement for what is essential an internal 'process' of the implementation.

3.3 Open Document Architecture

The ODA standards describe how to represent and encode a word-processed or desk-top published document between two document processing systems. The encoded document is represented by a series of 'attributes', encoded within a data stream, which are given particular values to indicate some particular characteristic of the document. In the ODA implementation support requirements, which is a tabular representation of requirements, similar to a PICS, the concept of 'Functional Units' has been introduced. These functional units are defined in user-meaningful language, drawn from the terms and functionality of the base standards and profiles, and have a defined mapping onto the attributes which comprise the data stream.

3.4 Virtual Terminal

The virtual terminal standards describe an abstract terminal model, which is mapped by an implementation to either a real terminal or a controlling application process. However, the semantics of the components of the virtual terminal have to be mapped correctly in any real implementation, if the implementation user is to get a consistent representation of information on the real terminal. In this case, the HCI in a terminal product, or the API in a host product, are valid PCOs for ensuring that an implementation conforms to requirements. However, the requirements have to be expressed in terms of functionality supported at the HCI or API, not in terms of protocol elements supported at a protocol interface.

3.5 OSI Directory

The directory standards describe processes that may be implemented in a real directory implementation, including searching, matching and filtering. These processes again call for some real functionality to be implemented, and therefore potentially tested, in a directory product. The functions are not well addresses by using a PICS table, but need a similarly structured table based on functional aspects.

4 TYPES OF IMPLEMENTATION

OSI standardisation was originally based on equality of end systems, and 'peer-to-peer' protocols. The real world is not like that, and implementations reflect the real world requirement. The real world is represented by many asymmetric relationships between end systems which have some kind of requirement or dependency on each other. This type of relationship is variously identified as 'Master/Slave' 'Client/Server' 'Manager/Agent' in different OSI standards, and there is seldom any requirement for a single system to be able to play both roles.

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This means that a conformance requirement statement has to be worded in terms of the overall functionality offered by a particular type of implementation. A storage system offering an FTAM interface would be qualified by its' capability to handle file read, write and search commands, but need not have the capability to issue such commands. A work-station product which wishes to make use of such a storage system has to be able to invoke write, search and read commands, but does not have to be able to respond to such requests from another system.

Other more complex levels of functionality can be included or excluded from an implementation, for example the capability for a directory systems agent to chain an enquiry, or for a message handling system MTA to relay messages for third parties. The mechanisms are needed such that base standards writers, profile writers or procurers can set down exactly what processes must be carried out if an implementation is to be able to claim 'conformance' to a particular function. Eventually, such requirements must be testable such that an implementation can be subjected to formal testing for conformance to function.

Attempts have been made to extend or adapt the PICS proforma to include questions relating to function, but this is distorting the original PICS purpose, and leads to problems with the semantics associated with the PICS notations.

5 Types of 'Conformance to Function'

5.1 Process Conformance, the internal behaviour of an implementation

Process conformance relates to the way that an Implementation Under Test executes defined (in standards) processes within a total system. Process conformance is measured by applying defined test conditions at a particular PCO, and observing that the outputs from the IUT at the same or at other PCOs reflect correctly the changes that are a result of application of the internal process. ('Cause and effect') An example of process conformance requirements is the behaviour that as is expected in a directory implementation for searching, matching and filtering, where the outcome of a particular operation is based on the implementation of some processes which take place with respect to information supplied with the operation request or previously. A more striking example arises when the process is influenced by parameters which, although described in standards, are set up and adjusted by processes outside the scope of the standards. This is the case for MHS use of routing tables, and directory use of 'knowledge information'.

5.2 Rendition Conformance, the representation of information to a human observer

Rendition conformance is a special case of process conformance, where at least one of the PCOs is designed for human observation, variously termed 'HCI' or 'Perceptual Interface'. Such a process is characterised by the translation between human visible representation of information and a corresponding electronic encoding. Rendition conformance particularly applies to any information interchange where the format of presentation to the (human) end user is critical to the success of the communication. It is most obviously manifested in the CCITT facsimile recommendations, where test patterns are defined for verifying satisfactory behaviour. Other examples occur in the character set, document interchange (ODA), Printing protocols (SPDL) and the graphics standards (CGM, GKS).

Scanners and OCR equipments have to conform to requirements to recognise characters whose shapes are defined with certain tolerances.

5.3 Real Effects, the externally visible, or physical behaviour of a system.

Real effects conformance applies to the situation where at least one of the PCOs is represented by an external interface to the system on which the IUT resides, for example, some mechanical action, a component whose behaviour can be physically manipulated or observed. Real effects conformance includes behavioral characteristics which are observable at some interface other than that which is being stimulated in a test situation. The other interface may be some other OSI or non-OSI communications interface, or some physical device which the implementation controls. Examples include remote sensors, bank ATM terminals and manufacturing robots, all of which have as a PCO an interface with the external environment.

6 TYPES OF POINT OF CONTROL AND OBSERVATION (PCO)

6.1 Human-Computer Interface

This includes visual displays (virtual terminal) printing devices (SPDL, CGM), scanners (OCR), keyboards (character sets) and audio-visual devices. This corresponds to the widely accepted understanding of a perceptual interface.

6.2 Communications Interface

This includes observation or stimulation of other (than the one under test) OSI interfaces, and also non-OSI 'communications' interfaces such as computer busses, relay drivers, remote control and servo systems.

6.3 Application Programming Interface

This includes standardised or non-standard APIs within an implementation, accessible only at the programmatic level.

6.4 Storage/retrieval interface

This includes the result of writing information onto a physical medium such as CD-WORM or magnetic discs, and searching and retrieval of information from physical storage media.

6.5 Other physical interfaces

This includes PCOs which require physical control or observation, to assess the behaviour of an implementation in generating or responding to OSI PDUs. Examples include atmospheric sensors and alarm systems, factory robots and bank cash dispensers. This could be regarded as a more specialised class of perceptual interface.

7 NEXT STEPS

This paper illustrates the requirements as seen by IT systems users to be able to both specify and test that an implementation will actually deliver the user functionality implied within open standards. The range of standards needs to be further qualified, and the scope which can be addressed a) within ISO/IEC JTC 1/SC 21 and b) at the JTC 1 level needs to be determined. The various requirements need to be prioritised for action so that an appropriate methodology workplan can be put in place.

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Dear Mr Bessems

UK POSITION ON EWOS DOCUMENTS

The UK has prepared its position for the 9th SGFS Plenary meeting to be held in Seoul, Korea (5-9 July 1993), with reference to the following EWOS/EG OSE documents:

EWOS/EG-OSE/93/051 (SGFS N ...)	(EWOS-1) Proposals for replacement text in both Parts on the subject of the overall aspects of OSE and the nature of OSE Profiles.
EWOS/EG-OSE/93/052 (SGFS N ...)	(EWOS-2) Itemised comments on TR 10000-1 on other topics, but including references to EWOS-1 proposals for completeness
EWOS/EG-OSE/93/053 (SGFS N ...)	(EWOS-3) Itemised comments on TR 10000-3 on other topics, but including references to EWOS-1 proposal for completeness

Yours sincerely

T N NGOSI
For the UK P-Member of ISO/IEC JTC 1/SGFS

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UK POSITION

The UK endorses the EWOS position on the revision of WDs TR 10000 Parts 1.3 (SGFS N 817) and 3.2 (SGFS N 830) and supports:

a) that the WDs should be progressed together;

b) the EWOS position on the technical direction of the work, in particular the overall aspects of OSE concepts and the nature of OSE profiles;

c) further work to define OSE concepts, in particular "building blocks" and "scenarios". These concepts should be defined as identified in WD TR 10000-3.2;

d) the position on the scope of OSE profiles and their relationship to OSI profiles.

The UK also points out that there are IEEE documents that will be useful for OSE terminology and these are:

1) P1000.0 Draft 15 - POSIX Profiles Guide

2) P1003.0 - Profiles Guide

3) P003.1 - Language Independent Specification (LIS) Draft

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