X/Open Snapshot

Comparison Study of OSI Profiles

X/Open Company, Ltd.

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COMPARISON STUDY OF OSI PROFILES

Preface

X/Open

X/Open is an independent, worldwide, open systems organisation supported by most of the world's largest information systems suppliers, user organisations and software companies. Its mission is to bring greater value to users through the practical implementation of open systems.

X/Open's strategy for achieving this goal is to combine existing and emerging standards into a comprehensive, integrated, high-value and usable system environment, called the *Common Applications Environment (CAE)*. This environment covers all the standards, above the hardware level, that are needed to support open systems. It ensures portability and connectivity of applications, and allows users to move between systems without retraining.

The interfaces identified as components of the Common Applications Environment are defined in the *X/Open Portability Guide*. This guide contains an evolving portfolio of practical applications programming interface standards (APIs), which significantly enhance portability of application programs at the source code level. The interfaces defined in the X/Open Portability Guide are supported by an extensive set of conformance tests and a distinct trademark - the X/Open brand - that is carried only on products that comply with the X/Open definitions.

X/Open is thus primarily concerned with standards selection and adoption. The policy is to use formal approved *de jure* standards, where they exist, and to adopt widely supported *de facto* standards in other cases.

Where formal standards do not exist, it is X/Open policy to work closely with standards development organizations to encourage the creation of formal standards covering the needed functionalities, and to make its own work freely available to such organizations. Additionally, X/Open has a commitment to align its definitions with formal approved standards.

The X/Open Product Family - XPG

There is a single family of X/Open products, which has the generic name ''XPG''.

XPG Versions

There are different numbered versions of XPG within the XPG family (XPG1, XPG2, XPG3). Each XPG version is an integrated set of elements supporting the development, procurement and implementation of open systems products, and each comprises its own:

- XPG Specifications
- XPG Verification Suite
- XPG descriptive guides

- XPG trademark licensing materials

The XPG trademark (or ''brand'') licensed by X/Open always contains a particular XPG version number (e.g., ''XPG3'') and, when associated with a vendor's system, communicates clearly and unambiguously to a procurer that the software bearing the trademark correctly implements the corresponding XPG specifications. Users specifying particular XPG versions in their procurements are therefore certain as to the XPG specifications to which vendors' systems conform.

XPG Specifications

There are four types of XPG specification:

- **XPG*n* Formal Specifications**

  These are the long-life XPG specifications that form the basis for conformant/branded X/Open systems, and are the only type of XPG specification released with an XPG version number (e.g., ''XPG3''). They are intended to be used widely within the industry for product development and procurement purposes. Currently, all XPG Formal Specifications are included in Issue 3 of the X/Open Portability Guide.

  Individual XPG specifications are released as Formal Specifications only as part of the formal release of the complete XPG version to which they belong. However, prior to the launch of that XPG version, they may be made available as:

- **XPG Developers' Specifications**

  These are specifically designed to allow developers to create X/Open-compliant products and applications in advance of the formal launch of a future version of the XPG.

  Developers' Specifications may be relied on by product developers as the final, base specification that will appear in a future XPG. They are made available beforehand in order to meet the need of product developers for advance notification of the contents of XPG Formal Specifications, to assist in their product planning and development activities.

  By providing such advance notification, X/Open makes it possible for products conforming to future XPG Formal Specifications to be developed as soon as practicable, enhancing the value of XPG itself as a procurement aid to users.

- **XPG Preliminary Specifications**

  These are XPG specifications, usually addressing an emerging area of technology, and consequently not yet supported by a base of conformant product implementations, that are released in a controlled manner for validation purposes. A Preliminary Specification is not a ''draft'' specification. Indeed, it is as stable as X/Open can make it, and on publication will have gone through the same rigorous X/Open development and review procedures as XPG Formal and Developers' Specifications.

  Preliminary Specifications are analogous with the ''trial-use'' standards issued by formal standards organizations, and product development teams are intended to develop product on the basis of them. Because of the nature of the technology they are addressing, they are untried in practice, and they may therefore change before being published as an XPG Formal or Developers' Specification.

- **Snapshot Specifications**

  These are ‘‘draft’’ documents, that provide a mechanism for X/Open to disseminate information on its current direction and thinking to a limited audience, in advance of formal publication, with a view to soliciting feedback and comment.

This Document

This document is a snapshot specification (see above), presenting a comparison study of OSI profiles. OSI profiles specify the OSI standards, and options within those standards, necessary to accomplish specific tasks. They are being defined by governments, major manufacturers and user groups. Their importance is growing because increasingly government and private sector procurements are using particular profiles as mandatory parts of their specifications of requirements.

The emergence of a number of different profiles will cause problems to manufacturers who wish to sell in different markets. They have to comply with different profiles, each defining an unambiguous but not identical vertical slice through the OSI stack. This has been recognised by ISO as an obstacle to the widespread use of OSI and it has consequently started its own standardisation process for profiles.

The aim of this specification is to compare and contrast the rationale, main features and philosophy of the most important OSI profiles and to investigate how and when convergence between them will occur. It consists of:

- **Chapter 1**, **OSI Profiles**
- **Chapter 2**, **Profile Descriptions**
- **Chapter 3**, **Profile Comparison**
- **Chapter 4**, **Conclusions**
- **Appendix A**, **Basis of the Comparison**

Chapter 1, **OSI Profiles** contains an account of how and why profiles have developed, their nature and their importance. It introduces the profiles and the organisations concerned with their production, it describes the need for convergence, and outlines the harmonisation process being carried out in the regional workshops and in ISO. It is largely tutorial in nature and may be omitted by those already familiar with work on OSI base standards and functional standards.

Chapter 2, **Profile Descriptions** contains a description of the profiles of NIST, MAP, TOP, US GOSIP, SPAG, CEN/CENELEC, EWOS, UK GOSIP, French GOSIP, Swedish GOSIP, POSI/INTAP and ISO. These descriptions address the main elements of each body of profile work, including aims, approach, scope, format, methodology and convergence issues.

Chapter 3, **Profile Comparison** compares the main features of the profiles described in **Chapter 2**, **Profile Descriptions**. The functional requirements supported are identified, with particular reference to:

- Structured Document Interchange
- File Transfer, Access and Management (FTAM)

- Message Handling Services (MHS)
- Virtual Terminal
- Presentation and Session Layers
- Lower (physical to transport inclusive) layers for local area networks (LANs)
- Lower (physical to transport inclusive) layers for wide area networks (WANs)
- Connection Oriented and Connectionless approaches in the lower layers

Chapter 4, **Conclusions** contains a discussion of current issues and trends, and the conclusions to be drawn from them, focusing on the future work plans of the profiling organisations and the prospects and likely timescales for harmonisation.

In addition to covering the main elements, the descriptions of the SPAG, CEN / CENELEC, EWOS and ISO profiles in **Chapter 2**, **Profile Descriptions** describe their profile classification schemes in some detail. These schemes - particularly that of ISO - are used in **Chapter 3**, **Profile Comparison** as a basis for the comparison of the profiles.

The descriptions and comparison have been produced on the basis of the documents listed in **Referenced Documents**. The ground rules for the comparison are described in **Appendix A**, **Basis of the Comparison**.

The subject of this specification - OSI Profiles - is one in which there is continual change and progress. The information on which the specification is based is current at the time of writing, March 1990.

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Chapter 1

OSI Profiles

1.1 THE OSI MOVEMENT

The OSI movement began at the end of the 1970s with the creation of the now well known seven layer reference model for Open Systems Interconnection. The decade since then has seen the refinement of that model, the fitting of previously defined standards into its framework and, where suitable standards did not already exist, the definition of new ones within each layer.

From the start, there were many participants in the movement; computer and communications equipment manufacturers, telecommunications administrations, governments, academic and research institutions, information technology users; and each had reasons for supporting it.

Computer and communications equipment manufacturers were faced with the need to harness a rapidly developing technology. Performance and price of equipment was improving dramatically which made it possible for users to employ more and more computers and to connect them together. The large computer manufacturers who tried to make this possible within their own ranges of models met with considerable problems. It was clear that these problems had to be solved, and interworking had to be provided between different manufacturers' ranges of models, as well as within each range.

For the smaller manufacturers, OSI meant they no longer had to support their own proprietary communications architectures or use architectures developed by other manufacturers. A common standard communications architecture also meant more market opportunities, though with greater competition.

Most computer manufacturers therefore became committed to OSI, though with some reservations. These were often put down to a desire to protect commercial interests, but a more important reason was the need to keep promises made to users about forwards compatibility of existing models and to integrate with existing network architectures.

Communications equipment manufacturers had fewer reservations. For them, OSI meant the ability to develop standard products for a larger market. It also promised greater freedom from the influence of computer manufacturers in their market. They therefore supported the movement although, in practice, their influence on it has been less than that of the computer manufacturers.

The telecommunications administrations were directly concerned because they provided the means of interconnection between computers on different sites. Their standards body - the CCITT - had already defined the X.25 protocol for connecting computers to packet switched networks. Use of such protocols for computer communications would allow them to provide higher value services, as compared with circuit switched connections or leased private circuits. They therefore supported the OSI movement in general. In particular, they promoted the inclusion of the X.25 standard within OSI.

Governments were concerned for several reasons. In the first place, they wished to encourage the growth of information technology (IT) in their countries in order to increase the competitiveness of their industry and the prosperity of their people. In the second place, IT manufacturing is in its own right an important part of the industrial base of most developed countries. In the third place, governments are substantial users of IT and they saw OSI standardisation as a way of giving them freedom of choice and lessening their dependence on suppliers. For all these reasons, governments have strongly supported OSI from the beginning.

Academic and research institutions use communications in their work, which is often heavily dependent on computing power. Increasingly, it is carried out by groups of institutions cooperating together. These institutions are also often concerned with the study of communications for its own sake. There are non-trivial problems involved which make it an interesting research topic. Governments have therefore used research institution networks as a means of developing communications technology. Notable examples of this are the funding of ARPANET by the U.S. Department of Defense and the development in the U.K. of the academic network JANET. Academic and research institutions have always been keenly interested in OSI and have contributed to its development.

IT users have most to gain from OSI. It will provide them with more choice of product (and hence better products at lower cost) plus the ability to use different products working together. However, it was clear from the start that the development of OSI would take a long time. In the uncertain world of IT development a product promised ‘‘within a year’’ will, if it ever does materialise, probably take two. Users have to make decisions on the basis of what is actually available.

IT users have given general support to OSI. A few of them have taken a sufficiently long term view to invest in the development of OSI. Decisions to purchase OSI products have, however, in general been approached with caution. The desired open market in OSI products has been slow to develop.

1.2 OSI STANDARDS

The overall controlling body for OSI standardisation is the International Standards Organisation (ISO). Indeed, the initials OSI were chosen partly because they are a permutation of ISO.

The reference model defined by ISO was based on the experience of those computer manufacturers who had developed communications architectures for their products. These were all based on a layered approach. This was in line with good practice for modular software development. It enabled the problem to be split up into manageable sized portions in a way that avoided duplication of effort in their solution.

ISO did not take on the work of developing all the standards itself; it left the definition of standards at the network layer and below to other bodies. These standards govern the interfaces between computers and networking equipment. They were eventually adopted with minor changes (with the agreement of the original producers) as ISO standards. ISO concentrated on the definition of higher layer standards governing the interaction between computers across the networks.

For lower level standards, the work of the United States Institution of Electrical and Electronics Engineers (IEEE) was adopted for local area networks (LANs). The IEEE defined standards for CSMA/CD LANs (such as Ethernet) and for token passing LANs based on ring or bus topologies. The CCITT X.25 packet switching standard was adopted for wide area networks (WANs).

The ideas on which these standards were based evolved before the seven layer model was formulated. The standards therefore had to be fitted into the framework of the model retrospectively. This was done before the nature of the network layer was fully worked out and understood. Moreover, differences in approach between WAN and LAN standards made it impossible to incorporate them in the same way.

The differences centred around the fact that the LAN suppliers (who were mostly computer and communications equipment companies) favoured a ‘‘connectionless’’ approach to protocols at the network layer, with each packet of information addressed and transmitted independently. The WAN suppliers (who were mostly the Public Telecommunications Operators) favoured a ‘‘connection-oriented’’ approach, with a concept of logical connections between communicating systems and many packets of information being transmitted across each logical connection.

Both LAN and WAN suppliers favoured the connection-oriented approach at the transport layer, but use of connectionless network service meant use of a more sophisticated transport protocol (ISO Transport Class 4) than was required over the connection-oriented network service (for example ISO Transport Class 0 or 2). However, the transport protocol should be ‘‘end to end’’ giving rise to the question of what is to be done where one end is connected to a LAN and the other end to a WAN, with LAN and WAN connected via a relay.

There was intense discussion over how to proceed. No approach could be found that was acceptable to both the connection-oriented and the connectionless schools of thought. The end result was an agreement to differ rather than a compromise. The effect of this can still be seen in the ISO classification scheme for OSI profiles.

Work on the transport and session layer standards proceeded under the leadership of ISO. It was carried out by ISO and CCITT through joint working party meetings. It resulted in standards that were issued (with different numbers) by both bodies. The work on the transport layer standards in particular has since proved its value, as these standards have been widely applicable while having relatively few different cases and special options.

Progress on the presentation layer was slow. In the absence of ISO standards, the CCITT committee working on electronic messaging defined a standard presentation transfer syntax (X.409). This was issued with the other X.400 series recommendations in 1984. It was later substantially adopted by ISO as ASN.1 though with some revisions (made in cooperation with CCITT). The CCITT specification of presentation services and protocols was combined with specifications of common applications layer services (in X.410). This area was significantly changed after 1984. Joint ISO / CCITT standards were created for presentation service and protocol. These differed technically from X.410, though incorporating an ''X.410 mode'' for backwards compatibility.

It was found that the applications layer was more complex than had at first been thought, with a need to define certain common basic functions used by many applications. For example, remote operations (where an application in one end system requests an application in another end system to perform an operation for it) are required by a number of applications and can be performed by each application in the same way. Such functions - which later came to be known as Applications Service Elements (ASEs) - were defined separately in joint ISO / CCITT standards.

With regard to particular applications, work on file transfer and management (FTAM) progressed within ISO. The CCITT took the lead in developing electronic messaging standards. CCITT interest in this area was natural since most CCITT members were responsible for their countries' postal services as well as for telecommunications. They saw electronic messaging as a natural extension of their functions and they needed the standards to allow them to operate international electronic messaging services.

1.3 IMPLEMENTORS FORUMS

By 1983, work was sufficiently advanced for it to be possible to build systems using OSI protocols (although this would often mean working from drafts of the standards rather than final versions). These systems would use either the IEEE LAN protocols or X.25 at the lower layers. At transport and session layers, joint ISO / CCITT protocols would be used. The applications would be ISO FTAM or CCITT X.400.

When this point was reached, manufacturers decided to cooperate in multi-vendor OSI product demonstrations. These would show that OSI systems could be built and that products developed by different manufacturers would work together. It was hoped that this would give users sufficient confidence to demand conformance to OSI standards when buying IT products, or at least to plan to migrate to OSI in the longer term.

In order for this to happen, it was necessary for the manufacturers' technical experts to meet to agree technical details. The idea of an implementors' forum or workshop was not a new one. Similar meetings of experts had been found useful for the implementation of other complex technical standards, for example the CCITT high level programming language CHILL. The scale of complexity of OSI was, however, far greater than anything previously attempted.

Two implementors' forums for OSI were set up in 1983: the working parties of the Standards Promotion and Applications Group (SPAG) in Europe and the OSI implementors' workshop of the National Bureau of Standards (NBS) in the U.S.. The NBS subsequently became known as the National Institute of Standards and Technology (NIST).

SPAG was formed by a group of European IT companies in 1983, partly at the instigation of the Commission of the European Communities (CEC). The group now has twelve members. Its working parties have consisted mainly of experts from the member companies but with some involvement by outside experts. They produced the **Guide to the Use of Standards (GUS)** as a record of the agreements between SPAG members on which OSI profiles should be implemented.

The NIST Implementors Workshop was open to all interested parties. Hosted by a U.S. government department, it was attended by experts from IT manufacturers, users, universities and other countries' governments. In particular, user involvement was strengthened by involving the workshop in work on two user requirements: factory automation and communications in the technical office.

Work on factory automation was pursued under the leadership of General Motors who had been working on a procurement specification for communications for factory automation since 1980. It resulted in the Manufacturing Automation Protocol (MAP). This was produced through working parties of the MAP Users Group, some of whose meetings were held jointly with the NIST Workshop. It was issued by General Motors as a separate profile but based on the NIST Implementors Workshop agreements.

The technical office communications requirement is different to that of factory automation (though related to it). The Boeing company took the lead in this work, which resulted in the Technical and Office Protocol (TOP). It was produced by the TOP Users Group which also had joint meetings with the NIST Implementors Workshop. It was kept very much in line with MAP, and the MAP and TOP Users Groups coexist under a common MAP / TOP steering committee.

1.4 PROFILES

The experts' meetings at SPAG and NIST highlighted a fundamental problem; it was clearly not possible to simply build products conforming to the standards, connect them together and expect them to interwork. For one thing, the standards were at that stage incomplete, many being only in draft form. But even if they had been complete, they would still not guarantee interworking.

The model provides for seven layers of communications service, each implemented by its own layer of protocol. At each layer, there are service alternatives and protocol options. There are thus many choices to be made in specifying how to interconnect two open systems.

Some of these choices depend on the application (for example, FTAM requires the duplex functional unit at the session layer while electronic messaging requires the half-duplex functional unit). Others depend on the type of network used (for example, CSMA/CD LANs require conformance to ISO 8802-3 while token ring LANs require conformance to 8802-5). Yet others depend neither on the application nor on the type of network. However these choices must be made in the same way by both systems wishing to communicate (for example, the network layer service may be connection-oriented or connectionless).

The user would thus be faced with having to make a multiplicity of choices. Not only is this burdensome and prone to error, but if he chooses differently from his communications partners he may fail to communicate with them. And what if he has several communications partners each of which has chosen differently from the others? This is hardly what OSI was meant to achieve!

The concept of the profile was evolved to solve this problem. Given an application and a type of network, a profile specifies a particular set of choices at all levels of the model which:

- completely defines the communications,
- supports the application, and
- works over the type of network.

Thus the user need only select the profile corresponding to his application and networking requirements in order to guarantee interworking between all his equipment and also to guarantee interworking with all his communications partners, provided they have selected the same profile.

This is the basic idea behind the concept of an OSI profile. It is in fact a little more complicated than this, and has been extended slightly to cover the format of data exchanged by applications (for example, office documents) and the repertoires of characters used by those applications (for example, the Latin alphabet, Greek alphabet and so on). In some definitions it has been extended even further to include a specification of the interface between the applications program (for example, accounting) and the communications application (for example, file transfer). This definition may even include programming language bindings.

There are some wider aspects of networking that must be considered when connecting equipment from different IT manufacturers or in different IT user organisations. They were considered in the implementors' forums and addressed in some of the profile documents. They include:

- security,
- routing, and
- naming and addressing.

1.5 EARLY PROFILE WORK

The work by SPAG and NIST resulted in a number of profiles being defined. These consisted of the SPAG Guide to the Use of Standards, the NIST Implementors Workshop agreements, and the related profiles for MAP and TOP. They were the basis of a number of multi-vendor demonstrations such as that at the Las Vegas National Computer Conference in 1984, at Autofact in 1985 and for several years at the Hannover Fair.

The two groups did not work in isolation from each other; there has been a large degree of contact and cooperation between them. A number of SPAG experts also attended the NIST Workshop and efforts were made on both sides to keep the profiles similar to each other. However, for various reasons, it was not possible to keep them completely in step.

Events at the NIST X.400 Special Interest Group meeting at the Implementors Workshop in June 1984 may serve as an example to illustrate the factors involved.

At that time, work on X.400 profiles was in a more advanced state in SPAG than at the NIST Workshop. The discussion largely consisted of a SPAG expert explaining what had been done in Europe, and the group agreeing to do likewise, with only the occasional question or change.

However, when the group presented to the main workshop, the choice of options at the transport layer became a serious issue, with the X.400 group's choice of Transport Class 0 over X.25 (as per normal European practice) conflicting with the NIST desire to standardise on Class 4 for all applications (in line with U.S. usage in other areas, such as MAP and TOP). Debate became very heated.

In the end, a compromise had to be reached. Using Transport Class 4 for X.400 would have meant changing existing implementations, which could have affected forthcoming multi-vendor demonstrations. Hence NIST had to accept Class 0 as an option (under some circumstances, at least) in the Workshop agreements. However, the TOP group still excluded Transport Class 0 from their profiles, even for support of electronic messaging.

This example illustrates the general desire to cooperate and get things done, the willingness to accept work done in other bodies, the conflicting desire to leave as few options as possible in each profile, the need to compromise in order to keep the profiling programme viable, and the fact that divergences between profiles cannot always be avoided.

1.6 CONFORMANCE

Because the OSI standards and profiles are so complex, the meaning of ''conformance'' has always been an issue. A simple statement like ''The product conforms to the profile...'' is considered insufficient unless backed up by some more detailed explanation or demonstration. Profiles therefore generally include definitions of what it means to conform to them and of how that conformance should be demonstrated.

Demonstrations of conformance may take several forms, and different sets of profiles require conformance to be demonstrated in different ways. The main ones are conformance testing, interoperability testing and implementation conformance statements.

Conformance testing is performed by testing a product in a standard test environment. A number of test systems have been developed to provide such environments for OSI standards, notably by:

- the Conformance Testing Services (CTS) programme and the Communications Network for Manufacturing Applications (CNMA) ESPRIT project partially funded by the European Commission,
- the National Computer Centre in the U.K., and
- the Corporation for Open Systems (COS) in the U.S..

SPAG has adopted much of the work of CTS, CNMA, NCC and COS. Various other organisations are active in this area in different countries around the world.

Interoperability testing consists of testing products by operating them in conjunction with other products that are known to conform. This can be achieved, for example, through participation in multi-vendor demonstrations. In Europe, the EUROSINET organisation (a group of IT manufacturers from Europe and elsewhere, with support from the European Community) has established a permanent network of OSI products which can be used for interoperability testing.

A conformance statement consists of a detailed statement of options selected. For a standard defining a protocol, such a statement is called a Protocol Implementation Conformance Statement (PICS). Typically, it is made on a proforma designed to ensure that all choices made are described. It is intended that the ISO protocol standards will all eventually include PICS proformas.

A similar concept - the Profile Implementation Conformance Statement - applies to profiles. Many profiles, for example most UK GOSIP profiles, include proformas. It is intended that the ISO profiles will refer to the appropriate sections of the PICS proformas for the relevant protocol standards and indicate where particular entries have to be made in particular ways. A conformance statement for the profile is then a set of PICS proformas completed in accordance with the ISO profile definition.

In some cases, it is not possible - or even desirable - to completely eliminate all options from the profiles. For example, the range of packet and window sizes supported is an option of the X.25 standard and is left as an option in many profiles. The fact that different choices may be made for different products does not necessarily prevent interworking. The conformance statement, in conjunction with the profile definition, provides a complete specification of the communications in such cases.

1.7 FUNCTIONAL STANDARDS

SPAG and NIST considered their profiles as IT suppliers' agreements for common implementation specifications. MAP and TOP considered their profiles as IT users' agreements for common procurement specifications. None of them laid any claim to producing new standards, just agreements on common approaches to the OSI standards defined by ISO.

Nevertheless, there was increasing support for the view that profiles should be formally standardised by recognised standards bodies. The term ''functional standard'' was coined to refer to standards that defined profiles of other standards, these other standards being ''base standards''. (Thus, in the context of OSI, the protocol and service standards - X.25, IEEE 802, ISO Transport, etc. - are base standards.)

Following a submission by SPAG to the European Commission in 1984, the European standards body CEN, and electro-technical standards body CENELEC, and the European telecommunications administrations' organisation CEPT, undertook a programme of defining OSI functional standards. A number of functional standards were produced by CEN/CENELEC as European Pre-Standards (ENVs) in the ENV 41000 series. CEPT produced draft standards that were principally concerned with communication over public telecommunications networks or with defining interfaces between public telecommunications networks and private systems.

ISO itself has always accepted the need to produce functional standards. Its programme for defining International Standardised Profiles (ISPs) is now under way. The first proposed draft ISPs have been submitted for approval. If all goes well, they could become full ISPs in 1990.

1.8 GOVERNMENT PROCUREMENT PROFILES

Governments everywhere are substantial users of IT and there are many advantages in using standard procurement specifications for IT purchases by their departments. The main ones are cost savings, interoperability of equipment and vendor independence.

In several countries, OSI profiles are seen as a way of achieving standard procurement specifications. Government OSI profiles (GOSIPs) have been, or are being, produced in the U.S., the U.K., Sweden, France, Australia and Canada. US GOSIP was produced by NIST and is a subset of the NIST Implementors Workshop agreements. All existing profiles were taken as input to UK GOSIP which is probably closest to the CEN / CENELEC ENVs. Development of Swedish, French and Australian GOSIPs has been heavily influenced by UK GOSIP. Australian GOSIP is particularly close to the U.K. version. Swedish GOSIP is also influenced by NIST.

While it has not produced a specific OSI profile, the Commission of the European Communities (CEC) has issued a directive that public sector procurements in Europe must be based on ISO standards, European standards (ENs) or European pre-standards (ENVs). (This is Directive EC / 87 / 95 which has been in force since February 1988 and applies to most large procurements.)

There is a project to define a European Procurement Handbook for Open Systems (EPHOS) based on UK GOSIP. The plan is for France, Germany and the U.K. to produce a document to be published by the CEC. Its intended scope is to cover MHS, FTAM and WANs.

There is also a project to develop a Nordic OSI Profile for use in Denmark, Finland, Norway and Sweden. Because this group includes Denmark, which is a member of the EC, it has to take the other European work into account.

The International Public Sector Information Technology Group (IPSIT) was formed in October 1988 to harmonise different national purchasing profiles. It has members from Australia, Canada, the European Community, West Germany, Japan, Sweden, the U.K. and the U.S..

The production of procurement profiles by governments is likely to lead to the development of products to satisfy those profiles.

An example of this is provided by JANET (Joint Academic NETwork), the X.25 network connecting all U.K. universities and the larger government non-military research establishments. There are similar networks in other countries, notably the West German research institutions' network DFN, and the U.S. Defense Advanced Projects Research Agency network ARPANET.

While no single institution participating in JANET was big enough to justify the development of special products, taken together they formed a reasonable sized market. Because they used a common procurement specification, development of products to meet specific JANET requirements was worthwhile and several such products appeared from competing suppliers.

The amount of equipment required for JANET is small, compared with the requirements of a government. The power of a government procurement specification to influence product development by suppliers is therefore greater.

Governments are well aware of this issue. It is an explicit purpose of many government procurement profiles to stimulate the development of products to meet their particular requirements. In the U.K., the department responsible for UK GOSIP keeps (and publishes) a register of conformant products.

Government decisions to require OSI profiles are significant for two reasons. The first is that because of the rigid nature of the government procurement process in most countries, the profiles are more likely to be strictly applied than in more commercial environments. The second is that the government typically accounts for a substantial part of the IT market in its own right and indirectly influences a still larger part. As more organisations obtain telecommunications connections to government departments (for example for tax, import/export or social security purposes) this influence is likely to increase.

1.9 REGIONAL DEVELOPMENTS

There have been significant changes in the last three years in the European standards profiling organisations with the formation of the European Workshop on Open Systems (EWOS) and the foundation of the European Technical Telecommunications Standards Institute (ETSI).

EWOS was created in December 1987 as an open forum for the development of OSI profiles and the definition of conformance test specifications. Nominally a part of CEN / CENELEC, it is administratively separate. It was set up by CEN / CENELEC in conjunction with SPAG, the European Computer Manufacturers' Association (ECMA), the European MAP and TOP Users Groups, and the associations for European academic and research institution networks RARE and COSINE. Its Technical Assembly includes representation from a wide range of European and American IT companies. The profiles it produces are input to CEN / CENELEC and / or ISO for adoption as European or international standards.

ETSI is taking on and extending much of the work previously carried out by CEPT of defining the interfaces between public networks and private equipment. Its creation is an important element of CEC policy for the creation of a European market for telecommunications goods and services. It provides a means of approving equipment for connection to public networks which is independent of the national telecommunications administrations.

The technical work on profiles which had been performed by CEN / CENELEC and CEPT is now being performed by EWOS and ETSI. They intend to keep to the original CEN / CENELEC / CEPT schedule as far as possible.

Work on functional standardisation is also under way in Japan. At the end of 1985, two organisations concerned with OSI standards were created; POSI and INTAP.

The Promoting Conference for OSI (POSI) was formed by Oki, Toshiba, NEC, Hitachi, Fujitsu, Mitsubishi and NTT. Its purpose is to work for interconnection and interoperation between different types of computer. It does this by information exchange between its members, by international cooperation, by commercialisation and by promoting the establishment of OSI standards.

The Interoperability Technology Association for Information Processing (INTAP), is sponsored by the government Ministry for International Trade and Industry (MITI). It is committed to the development of implementation specifications (which effectively means defining OSI profiles). It also maintains a conformance test centre which provides conformance test services.

POSI has been active in the formation of the Asian and Oceanian OSI Workshop (AOW), which plays a similar role in Asia / Oceania to that played by EWOS in Europe. INTAP acts as host to and secretariat for AOW which started its activities in March 1988. There has been participation from Australia, Hong Kong, India, Korea, the Republic of China, Singapore and Thailand, as well as from Japan.

In the U.S., the former National Bureau of Standards (NBS) was renamed the National Institute of Standards and Technology (NIST). This has not affected its implementors' workshops.

1.10 HARMONISATION AND CONVERGENCE

The fact that a number of groups have been working on profiles in similar areas but sometimes with different recommendations has been a cause for concern. As has been described above, each group has made efforts to remain compatible with the others. Experts working in more than one group have provided cross-fertilisation; they have tried to make the profiles the same. Failing that, they have tried to define them so that interworking is possible. Failing even that, they have tried to at least document the differences. And there have been differences, both minor and major.

It is hoped that the work of ISO will result in functional standards which everyone can accept. This work got under way in 1987. A taxonomy for classifying profiles has been worked out and a rapid procedure for producing ISPs has been agreed.

The original intention was that proposals would be fed to ISO by SPAG, COS, POSI, MAP and TOP. A Feeders Forum was established for these groups to agree their proposals before submitting them to ISO.

This has now changed. AOW, EWOS and NIST are the new submitting organisations. For each ISP, a proposal will be prepared by one of these groups. These proposals will be discussed in the Regional Workshop Coordinating Committee (RW-CC) so that they can be agreed by all before they are submitted to ISO. (This process is known as profile harmonisation.)

In addition to liaison through the coordinating committee, the work of the three regional workshops is kept in step by representatives of each group participating in the discussions of the other two.

The RW-CC was established in March 1989. However, all proposals for ISPs submitted to date, or about to be submitted, have come from members of the Feeders Forum. The Feeders Forum is still active and is expected to wind down its work gradually as the RW-CC activity builds up.

1.11 CHANGES IN SCOPE

It should not be forgotten that throughout the development of the profiles, the base standards to which they refer have been changing too. This has been due to several reasons; the need to make corrections and improvements, the completion of incomplete standards, the need for new standards to cater for technological advance, and the identification of new areas for standardisation.

Several standards have undergone corrections and improvements since their first issue. The main instances are the session layer standards and the CCITT X.400 series recommendations. With X.400, the structure of the standards, as well as some of the content, has changed between the 1984 and 1988 versions. This has been dealt with in some profiling organisations by keeping the 1984 X.400 message handling profiles and adding new ones for X.400 1988, rather than by amending the existing profiles. The session layer changes have had less impact on profiles.

Other standards, such as those for Virtual Terminal, were incomplete when profiling activities started. As the base standards have become complete and stable, work has started on profiles for them.

The development of new technologies has resulted in the issue of new base standards. ISDN is becoming mature and is already the subject of profiling work. FDDI is less mature but profiling work has started.

New areas have been identified as appropriate for standardisation. These include applications such as remote data base access and network management.

As the scope of the base standards has extended, for all of these reasons, the scope of the profiles has been extended to match.

1.12 CURRENT STATUS AND ISSUES

Work on OSI profiles has now been in progress for at least six years. Many organisations have been involved, producing a number of profiles which fall into three main sets. These are:

- the NIST Workshop agreements plus the MAP, TOP and US GOSIP profiles, which are based on them,
- the SPAG profiles from which the CEN / CENELEC / CEPT functional standards are derived, with the profiles of UK GOSIP being broadly similar, and
- the more recent work done in Japan by INTAP and POSI.

There are differences between some of these profiles. The most substantial differences are those relating to the use of connection-oriented or connectionless network service. Work is in progress within ISO to produce a single set of harmonised International Standardised Profiles. This is being done through regional workshops, two of which (NIST and EWOS) represent the main historic sets of profiles, while the third (AOW) represents the newer Japanese work. As will be described in subsequent chapters, this will resolve some of the differences. The difference between the connection-oriented and connectionless approach will not be resolved but will at least be formalised and documented.

A mechanism is thus in place which will provide convergence of the OSI profiles to a single set. This is all very well in theory but it raises three very practical questions:

- How long will it take?
- What should product developers do in the mean time?
- What problems will remain even after harmonisation is complete?

To answer these questions, it is necessary to look at what the differences between the profiles actually are and to consider the ISO programme in the light of these differences. The differences between the profiles are examined in **Chapter 3**, **Profile Comparison** and the impact on the ISO programme is considered in **Chapter 4**, **Conclusions**.

Chapter 2

Profile Descriptions

2.1 GENERAL

This chapter reviews the profiles of NIST, MAP, TOP, US GOSIP, SPAG, CEN / CENELEC, EWOS, UK GOSIP, French GOSIP, Swedish GOSIP, COS, POSI / INTAP and ISO. For each set of profiles, the producing organisation, aims, approach, scope, methodology, conformance and convergence considerations are described.

2.2 NIST IMPLEMENTORS WORKSHOP AGREEMENTS

2.2.1 Producing Organisation

The National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS), is a part of the Department of Commerce of the U.S. government. In February 1983 it organised a workshop for implementors of OSI to bring together future users and potential suppliers of OSI protocols. That workshop continues to meet regularly. It has produced the document **Stable Implementation Agreements for Open System Interconnection Protocols** which records agreements that have been formally approved by the workshop and that are based on stable OSI standards.

The workshop is an open public forum. It is attended by technical experts from a wide range of organisations including IT manufacturers, IT users, government, universities and research institutions. The MAP and TOP users' groups work closely with the workshop and use its agreements as a basis for their profiles. The NIST organises, administers and makes technical contributions to the workshop but bears no other relation to it.

2.2.2 Aims

The purpose of the workshop is to produce stable agreements that can be used in product and test suite development and as a basis for procurement of OSI products. The agreements document is thus intended to be read by IT manufacturers' product specification and development staff, and by IT users' product procurement staff in particular. More generally, it is intended for all those who are interested in stable implementation agreements for OSI products.

2.2.3 Approach

Structure and Classification of Profiles

The Stable Agreements document defines option selections and parameter values for each layer of the OSI reference model, for applications within layer 7 and for applications data interchange formats. It applies primarily to end-systems interfacing to each other across public and private communications networks, but has application also to network layer relays.

The approach adopted for layers 1 to 6 is to describe options and parameters by layer rather than by application, or by telecommunications medium. However, within layer 7, each application is considered separately.

First, layers physical (1), data link (2), and part of network (3) are described for various subnetworks. Then the rest of the network layer (3) is described, indicating how different subnetworks can be interconnected. There is a section on the transport layer (4). Session (5), presentation (6) and Application Service Elements (ASEs) from the application layer (7) are taken together as ''Upper Layers''. There is a section on object identification and registration. There are sections for each application or data interchange format. (In some cases, an application has more than one section, for example, there are two Message Handling sections covering the 1984 and 1988 versions of the CCITT X.400 series standards.) There is also a section on security (which applies to several layers of the reference model).

The NIST Implementors Workshop does not use a formal taxonomy in the same way as SPAG, CEN / CENELEC, EWOS and ISO.

Conformance

Different approaches to conformance are adopted in different sections. There is no overall conformance philosophy. There is generally a definition of the basis on which a claim of conformance can be made. In addition, some sections refer to conformance statements or to conformance or interoperability testing.

2.2.4 Scope

The following topics are the subject of agreements which are stable at present or are expected to become stable in the future.

Subnetworks

- LANs (CSMA / CD, token ring, token bus and FDDI)
- Packet Switching
- ISDN

Applications and Data Interchange Formats

- Message Handling
- FTAM
- Directory Services
- Virtual Terminal
- Transaction Processing
- Office Document Architecture and Interchange Format
- Network Management
- Remote Data Base Access
- Manufacturing Messaging

The Stable Agreements document contains substantial material on most of these. The main exceptions (still awaiting stable agreements) are FDDI, Transaction Processing, Network Management, Remote Data Base Access and Manufacturing Messaging.

2.2.5 Methodology

The workshop comprises a set of special interest groups which do the detailed technical work, plus a plenary assembly which formally approves the agreements and conducts general workshop business. It meets four times a year at NIST headquarters in Gaithersburg, Maryland, U.S.. In addition, special interest groups may hold meetings at other locations around the world.

As agreements are reached, they are recorded in a Working Agreements document. After a review period, provided they are based on stable OSI standards (that is: ISO-IS, ISO-DIS or CCITT recommendations, with no significant changes expected), they are transferred to the Stable Agreements document. The two documents are aligned, with dummy sections in the Stable Agreements document for Working Agreements that are not yet stable but are expected to become stable.

2.2.6 Format

In principle each section contains the following:

- Introduction
- Scope and Field of Application
- Status
- Errata
- Protocol and Service Agreements
- Conformance
- Appendices

This structure is adhered to fairly loosely in practice, but most of the material is present in some form in agreements which are reasonably mature.

The format of the material produced to date differs significantly from the format required for ISO ISPs. The document is structured by ‘‘horizontal layer’’ rather than ‘‘vertical slice’’. More particularly, the sections do not include detailed conformance statement proformas. It is currently intended that new material will be produced in ISP format. It is possible that some of the existing material will be converted to ISP format, or at least that detailed conformance statements will be added. However, given the desirability of keeping the material stable, and the amount of effort that would be required to do the conversion, it seems unlikely that it will be done for all the existing material.

2.2.7 Convergence

The NIST Implementors Workshop has served as the means of convergence of the MAP, TOP and US GOSIP profiles, which are based on its agreements. In addition, experts from other groups have participated in it. This has led to some convergence with the SPAG, CEN / CENELEC and UK GOSIP profiles. It is now one of the three regional workshops producing harmonised proposals for input to ISO as International Standardised Profiles (ISPs).

2.3 MANUFACTURING AUTOMATION PROTOCOL (MAP)

2.3.1 Producing Organisation

The work of producing the MAP specification versions up to and including MAP 3.0 was carried out by technical committees reporting ultimately to General Motors' Manufacturing Automation Protocol Task Force. Responsibility for subsequent issues was transferred in 1988 to the North American MAP/TOP Users Group, which was formed by combining the previous U.S. and Canadian groups.

A not-for-profit corporation, the Information Technology Requirements Council (ITRC), was formed as a ‘‘transition executive’’ but has now taken on a permanent role providing long term policy guidance, permanent staff support and funding for the North American MAP/TOP Users Group. Technical coordination is provided by a steering committee.

The copyrights of the MAP and TOP specifications have now been assigned to ITRC by General Motors and Boeing.

There are MAP and TOP Users Groups in other parts of the world outside North America (such as the European MAP Users Group - EMUG). They and the North American group are coordinated by the World Federation of MAP/TOP Users Groups. All these groups feed technical input to the process of developing the MAP specifications.

2.3.2 Aims

The original purpose of the profiles was to provide a procurement specification for the communications part of General Motors' factory automation programme. It quickly broadened so that the profile became a standard to which equipment suppliers could implement and which other users could use when buying factory automation equipment. A particular function of the profiles was to provide an interface definition which was used at a series of multi-vendor equipment demonstrations; these became prestige ‘‘shop window’’ events for the whole OSI movement.

The MAP profiles were originally intended for factory automation equipment suppliers, to serve as a basis for product development. They were also aimed at procurement executives in user organisations. Their influence has been wide throughout the IT industry and the authors have no doubt often considered this wider audience as well as the narrower one specifically concerned with factory automation.

2.3.3 Approach

The MAP profile is relevant to end-systems (in particular, computers and process control equipment used in factories), to local area networking equipment (including routers and bridges) and to gateways to wide area networks.

Structure and Classification of Profiles

MAP profiles define options at all 7 layers of the OSI reference model. Two stacks are defined; the full stack and the Extended Performance Architecture (EPA) stack. Each of these stacks is ‘‘narrow’’, which means that it allows few options.

As with the NIST Workshop Agreements, the options and selections for the full stack are described by layer rather than by application or by telecommunications method. The EPA stack is then described separately and as a whole. In addition, introductory sections describe conformance requirements and give a general description of the MAP architecture.

At the lower layers in both stacks, a particular type of LAN is specified. There are two possible choices of physical medium, but choices at data link, network and transport layers are all defined by the profile.

The EPA stack is designed for time critical use; it has null network, transport, session and presentation layers, and can support Manufacturing Messaging, Directory Service and Program-to-Program communication.

The full stack profile has non-null protocols at all layers. It can support any of the MAP applications listed under ‘‘Scope’’ below.

Conformance

Conformance is dealt with in general terms in an introductory section. In addition, many sections contain subsections giving detailed conformance requirements. The approach adopted is to define what conformance means rather than to specify conformance statement proformas, or conformance or interoperability tests.

2.3.4 Scope

The scope of the MAP profiles covers applications relevant to factory automation:

- Manufacturing Messaging
- File Transfer, Access and Management (FTAM)
- Network Management
- Directory Service
- Virtual Terminal Service
- Program-to-Program Communication

As regards networking and communications, the MAP profile describes a single medium - the token bus LAN - but with some guidance on gateways to other types of network (such as packet switched networks).

Fairly complete specifications exist for all of these areas except for Virtual Terminal services.

2.3.5 Methodology

The MAP specification is regarded as an ‘‘open’’ document and proposals may be submitted by any interested organisation. However, most of the work is done by the various MAP, TOP and joint MAP/TOP subcommittees.

2.3.6 Format

The full stack and EPA stack are specified separately. The protocols required and choices made at each layer are given. In addition, the interface to the application layer is defined in detail with C language interface definitions for FTAM, Program-to-Program Communication and application layer support functions.

2.3.7 Convergence

Work on the MAP profiles has always been coordinated with that on TOP. MAP and TOP can almost be regarded as a single set of profiles, since they complement each other, and duplication and conflict between them has been avoided. Indeed, they are now issued as a single set of documents - the MAP/TOP Specification.

Much of the work on the MAP and TOP profiles was done in conjunction with the NIST Implementors Forum, and the MAP specification refers throughout to NIST Workshop agreements providing implementation decisions. The MAP profile is thus aligned with those of TOP, NIST and US GOSIP.

2.4 TECHNICAL AND OFFICE PROTOCOLS (TOP)

2.4.1 Producing Organisation

The Technical and Office Protocols were originally produced by the TOP Users Group. This group was set up in 1985 as a result of an initiative by the Boeing Corporation. The original MAP Steering Committee was later expanded to become the Joint MAP/TOP Steering Committee, and the MAP and TOP Users Groups in the U.S. then coalesced to form the MAP/TOP Users Group. As described in the section on MAP, this merged with the Canadian Users Group to form the North American MAP/TOP Users Group which operates under the administrative direction of the ITRC.

It is the North American MAP/TOP Users Group which now has the technical responsibility for the TOP specification, with input from other members of the World Federation of MAP/TOP Users Groups.

2.4.2 Aims

The TOP profiles are intended as the vehicle by which user requirements for communications in the engineering and general office are conveyed to IT system vendors. They should thus form a basis for product definitions by IT manufacturers and for procurement specifications by user organisations. Their scope does not include the factory, but they are intended to be used in conjunction with MAP profiles where factory operations are linked with office applications.

They are intended for product definition and development groups within IT manufacturers, and for those responsible for procurement of IT systems in user organisations.

2.4.3 Approach

The profiles are relevant to end-systems (in particular, to computing equipment used in the office), to networking equipment (CSMA/CD, token ring and token bus LANs, and packet switched networks) and to network layer relays providing LAN/LAN and LAN/WAN interworking.

Structure and Classification of Profiles

The approach to profile definition adopted for TOP is to define a number of building blocks which are combined to make a complete profile. This approach is broadly similar to that adopted by SPAG, CEN/CENELEC and UK GOSIP, but goes further in specifying application interfaces (i.e., the interfaces between the communications subsystem and other system components) as well as communications components and applications interchange data formats.

Conformance

Conformance requirements are specified individually in most sections. In addition, there is reference to conformance testing.

2.4.4 Scope

There are building blocks covering applications interfaces for:

- FTAM
- Computer Graphics

Applications data interchange format building blocks cover:

- Office Documents
- Product Definitions
- Computer Graphics

There are applications layer building blocks for:

- Message Handling
- FTAM
- Virtual Terminal
- Directory Services
- Network Management

Each has supporting protocols at presentation and session layers.

There are transport service blocks incorporating specifications at the physical, data link, network and transport layers for:

- LANs (CSMA / CD, token ring and token bus)
- Packet Switched Networks

Finally, there are intermediate system building blocks for network relays to support LAN / LAN and LAN / WAN interworking; these include specifications at the physical, data link and network layers.

2.4.5 Methodology

The TOP Users Group established a number of technical subcommittees to develop the TOP specifications. Each concentrates on a particular functional area. Their members include experts from IT user and IT manufacturer organisations. Their work is conducted in an open forum.

The subcommittees study user requirements and specify protocol solutions to meet the requirements. Their proposals are subjected to a public review and approval process prior to formal incorporation in the TOP specifications.

2.4.6 Format

The profiles are defined by specifying:

- the building blocks, in terms of the functionality and protocols in each block,
- options to be selected at each layer of the ISO reference model, with a description of which options are appropriate to which building blocks,
- operations considerations (network management and directory services), and
- considerations relevant to applications data formats (for computer graphics, product information and office documents) and to applications interfaces (FTAM and computer graphics).

The application interface specifications include programming language bindings.

2.4.7 Convergence

From the beginning, the TOP work has been carried out in conjunction with the MAP work and partly through the NIST Implementors Workshop. The TOP profiles are thus aligned with those of MAP, NIST and US GOSIP.

2.5 U.S. GOVERNMENT OSI PROFILE (US GOSIP)

2.5.1 Producing Organisation

US GOSIP is produced by the National Institute of Standards and Technology (NIST), part of the Department of Commerce of the U.S. government. It is published as a Federal Information Processing Standard Publication (FIPS PUB 146).

It is produced with input from other U.S. government departments and is based on the work of the NIST Implementors Workshop, whose participants include technical experts from a wide range of organisations including IT system manufacturers, IT system users, government departments, universities and other agencies of higher education and research.

2.5.2 Aims

The purpose of US GOSIP is to be a procurement standard for U.S. federal government agencies, to achieve interworking of multi-vendor equipment, to reduce costs by increasing choice of supplier, to facilitate use of advanced technology and to stimulate the development of products conforming to OSI standards.

It is therefore aimed at procurement officers in U.S. government departments and also at product definition and development staff in IT equipment manufacturing organisations.

US GOSIP applies to all Federal government agencies and is effective from February 15th 1989. Agencies are currently encouraged to use it. They will be required to do so from August 1990.

2.5.3 Approach

The profiles apply to end-systems and to network relays which provide LAN/LAN and LAN/WAN interworking.

Structure and Classification of Profiles

Rather than defining separate profiles, US GOSIP specifies selection of a narrow set of options at each layer of the OSI reference model. Some guidance is given in situations where options in several layers are interdependent.

Conformance

The approach adopted to conformance is that of conformance and interoperability testing.

2.5.4 Scope

Applications considered within the sphere of interest of US GOSIP include:

- FTAM
- Message Handling
- Virtual Terminal Service
- Office Document Interchange
- Network Management
- Directory Services
- Computer Graphics Interchange
- Transaction Processing
- Remote Data Base Access
- Electronic Data Interchange

FTAM and Message Handling applications are currently specified, with supporting presentation session and transport services and protocols.

Lower layer options provide for use of CSMA / CD, token ring or token bus LANs or X.25 packet switching.

Future versions may include virtual terminal, office document interchange, network management, directory services, computer graphics interchange, transaction processing, remote data base access and EDI at the applications layers. Future lower layer specifications may cover ISDN and FDDI.

2.5.5 Methodology

US GOSIP is produced by NIST, taking the Implementors Workshop agreements as the primary source but using other, secondary, sources where the workshop agreements do not provide completeness. These sources include:

- International Standards and Recommendations
- Draft International Standards
- Draft Proposed International Standards
- Working Papers within international standards bodies

Where even these sources do not provide completeness, tertiary sources such as the U.S. Department of Defense specifications may be used. The use of such sources, which are not international standards, is regarded by US GOSIP as undesirable.

2.5.6 Format

The US GOSIP Document includes an introduction, a section on conformance, a section on architecture and protocols, protocol specifications, addressing requirements and a section on security.

The profile specifications define the protocols to be used and the options to be chosen at each layer of the OSI reference model. The specification generally consists of a statement that the NIST Implementors Workshop agreement shall be used, with a note of any variations.

2.5.7 Convergence

US GOSIP is based on the NIST Implementors Workshop agreements. It is thus closely aligned with the MAP, TOP and NIST profiles.

2.6 SPAG GUIDE TO THE USE OF STANDARDS

2.6.1 Producing Organisation

The Standards Promotion and Application Group (SPAG) is a consortium of European Information Technology companies. It was founded by AEG, Bull, CGE, GEC, ICL, Nixdorf, Olivetti, Philips, Plessey, Siemens, STET and Thomson. In 1986 the consortium set up a separate company registered in Belgium - Standards Promotion and Application Group Services SA. Only eight of the twelve founder companies became shareholders and one of them (Thomson) subsequently sold its shares to Alcatel. Another four companies joined the consortium and the members are now Alcatel, British Telecom, Bull, DEC, Hewlett-Packard, IBM, ICL, Nixdorf, Olivetti, Philips, Siemens and STET.

2.6.2 Aims

SPAG has produced a set of profiles, which are described in its document **Guide to the Use of Standards (GUS)**. Their purpose is to define, within the context of OSI, common product interfaces, so as to create a multi-vendor market. SPAG also wishes to influence standards bodies in order to promote convergence between its work and emerging standards.

The profiles are primarily intended for product designers within IT companies and for network and computer installation designers within user organisations.

Although SPAG continues to update the Guide to the Use of Standards, its activities are now directed more towards conformance testing than the development of profiles. Its role as the profile development workshop for Europe has effectively been taken over by EWOS.

2.6.3 Approach

The SPAG profiles are principally concerned with end-systems. They specify the interfaces between pairs of end-systems, and the interfaces between end systems and telecommunications services. They also cover some terminal interfaces and certain types of communications relays.

Structure and Classification of Profiles

The profiles are classified in relation to the OSI reference model. The classifications are:

- Telecommunications Functions (T)
- Relay Functions (R)
- Application Functions (A)
- Application Extension Functions (Q)
- Character Repertoire Specifications (S)
- Other Functions (Y)

Telecommunications functions (T-profiles) comprise service and protocol selections and parameter values at the transport layer and below. It is considered that because the transport service provided by all T-functions is the same (only the connection-oriented transport service is considered), it will be possible in principle to use any T-function in conjunction with any higher layer profile. In practice, there are some constraints. Some guidance is given on how applications and telecommunications profiles can be combined to give complete 7-layer profiles, though the possible combinations are not completely defined.

Relay functions (R-profiles) define what are in effect OSI protocol converters. Three types of relay are envisaged by SPAG: network relays, distributed system gateways and application relays. Network relays provide protocol conversion at the network layer and are used when subnetworks operating different protocols (for example, LANs and X.25 WANs) are connected together. Distributed system gateways are used when an end-system incorporates a LAN. Their function is to interface that LAN to another network - either local or wide area. In order to do this, they may provide protocol conversion within the transport layer. Applications relays provide protocol conversion at layer 7. No specific applications relays have yet been defined by SPAG.

Applications functions (A-profiles) define service and protocol selections and parameter values at the session, presentation and applications layers. A communications interface is thus (in theory) completely specified at all seven layers by a choice of one A-profile plus one T-profile.

Application Extension functions (Q-profiles) define data interchange formats. They specify interfaces between system components, such as word processors, which are not within the scope of the reference model since their main function is not communications.

Character Repertoire Specifications (S-profiles) are also concerned with interfaces between non-communications components of systems. They extend the Q-profile specifications by defining the ranges and encodings of the character sets used (for example, Latin, Greek, Cyrillic).

Other functions (Y-profiles) include anything not already covered elsewhere and, in particular, communications functions falling outside the OSI framework. To date, SPAG profiles in this category have been concerned with terminal interfaces.

A numbering scheme has been developed, based on the above classification. Within each class, there is a hierarchical scheme of sub-classification. Each of the profile areas is numbered within its class, so that, for example, ISDN is T/1 and Telematic Services is A/2. Sub-areas are identified within the main areas. For example, connection-oriented network service over ISDN bearer services are T/11, those using the B-channel are T/111 and these in turn split into permanent circuits (T/1111) and switched circuits (T/1112). Similar subdivisions apply in each area so that each individual profile is identified by a letter plus (typically) two, three or four digits.

Conformance

The approach to conformance is to include in each section a definition of what conformance to the profile means. This does not generally include a conformance statement proforma. The issue of conformance is also addressed through the inclusion of conformance test specifications in a separate ‘‘Testing Information’’ section (it should be noted that SPAG has been active in the development of conformance test systems and specifications).

2.6.4 Scope

The Guide to the Use of Standards (Revision 4.0) identifies the following areas as being appropriate for profiles:

T-profiles

- ISDN
- Permanent and Switched Analogue Telephone Circuits
- Packet Switching Services
- Permanent and Switched Digital Circuits
- LANs

R-profiles

- Network Layer Relays
- Distributed System Gateways

A-profiles

- FTAM
- Telematic Services
- Message Handling
- Open Systems Management
- Remote Data Base Access
- Directory Services
- Transaction Processing

Q-Profiles

- Office Document Architecture (ODA)
- Stream Oriented Formats (telex, teletex and videotex compatible)
- Directory Applications

S-Profiles

- Graphic Character Repertoires
- Control Functions

Y-Profiles

- Character Mode Terminals on PAD
- Character Mode Terminals on ISDN

While much of this has been achieved, there is still work identified that remains to be done, perhaps more than has been done already. Within the above areas, 84 specific topics for profiles are identified. Of these, 29 have profiles that are mature and frozen, another 12 have stable profiles, 7 have draft profiles, and there are working papers on another 18 topics. This leaves 18 topics on which there are not yet even working papers, and some of them will require several profile documents.

Topics for which the profiles are considered stable are:

T-Profiles

- Analogue Circuits: T/231 and T/232, telephone circuit without network service
- Packet Switching: T3xxx
- Digital Data Circuits: T4xxx
- LANs: T6xxx, CSMA/CD and token ring but not token bus

R-Profiles

- Distributed System Gateways: R3x

A-Profiles

- FTAM: A/111, simple file transfer unstructured; A/112, positional file transfer, flat; A/122, positional file access, flat; A/13, filestore management
- Message Handling: A/311, private system access to public service; A/3211, private system access to private system

Q-Profiles

- Office Document Architecture: Q/111, processable and formatted documents, basic character content; Q/112, processable and formatted documents, extended mixed mode; Q/121, processable and simple layout documents, simple messaging profile

S-Profiles

- Graphic Character Repertoires: S/1x

Y-Profiles

- PAD Access: Y/1x

Areas for which there is practically nothing in the latest version of GUS are:

- Open Systems Management (A / 5)
- Remote Data Base Access (A / 6)
- Transaction Processing (A / 8)
- Stream Oriented Formats (Q / 2)
- Control Functions (S / 2)

2.6.5 Methodology

Profiles may pass through the following stages in the course of their definition:

- Empty (E)
  The title is agreed but no text has been drafted.
- Working Paper (W)
  A skeleton has been written for the profile contents but there is no detail.
- Draft (D)
  A draft of the full profile text has been written.
- Stable (S)
  SPAG technical experts believe it to be complete and not subject to modification.
- Ratified (R)
  The profile has been formally approved by CEN / CENELEC, ETSI or ISO.
- Obsolete (O)

This classification of stages reflects SPAG's general method of producing working agreements for its member companies which it then puts up for adoption as European - or international - standards.

2.6.6 Format

The Guide to the Use of Standards contains five main parts:

- Introduction
- Telecommunications and Relay Profiles (including T-profiles, R-profiles and Y-profiles)
- Application Profiles (including A-profiles, Q-profiles and S-profiles)
- Common Issues (Addressing, Administration, Routing and Directory)
- Reference Information

The profile descriptions are contained in the second and third of these. The intention is that each profile description should include the elements required by ISO for its profiles:

- scope,
- illustrative scenario,
- base standards reference,

- application of base standards, and
- conformance requirements.

In addition, they may include recommendations for resolving ambiguities and conflicts in the base standards, plus testing considerations.

In practice, most profiles are organised under some or all of the following headings:

- Preface
- Scope and Field of Application
- Conformity
- Document References
- Scenario Description
- Testing Information

plus additional sections describing selections and parameter values of the base standards.

Where an ISO, EWOS or CEN / CENELEC profile exists for a topic, the SPAG profile will just contain a reference to it plus appropriate supplementary material (generally under the headings of Preface, Scope and Field of Application, Scenario Description, and Testing Information).

2.6.7 Convergence

SPAG is actively trying to promote convergence between its work and that of other profiles.

Most SPAG profiles are either based on other European or international profile definitions or are proposed by SPAG as the basis for such profiles. In the Guide to the Use of Standards these profiles are distinguished as ‘‘purple’’ profiles as opposed to the others which are known as ‘‘gold’’ profiles.

Currently, SPAG considers that of its 84 identified topics, 34 are covered by existing draft European functional standards and 40 will be covered by currently projected International Standardised Profiles (12 of these overlap).

SPAG has in fact committed to adopting the European functional standards issued by CEN / CENELEC (and now to be largely defined by EWOS) as they appear, in place of corresponding SPAG profiles. Since the European functional standards have to date largely been based upon SPAG input, this has not so far led to major changes of content.

SPAG has participated in regular meetings with MAP / TOP, COS and POSI to produce harmonised proposals for International Standardised Profiles for input to ISO. As a member of EWOS, SPAG can now be expected to promote profile convergence through the mechanism for harmonisation by the three regional workshops.

2.7 CEN/CENELEC FUNCTIONAL STANDARDS

2.7.1 Producing Organisation

CEN is the European Committee for Standardisation. Its members are the national standards bodies of Austria, Belgium, Denmark, Eire, the Federal Republic of Germany, Finland, France, Greece, Iceland, Italy, the Netherlands, Luxembourg, Norway, Portugal, Spain, Sweden, Switzerland and the U.K.. CENELEC is the European Committee for Electrotechnical Standardisation. Its members are the electrotechnical standards bodies (in some cases these are not separate from the national standards bodies in CEN) of the same countries. CEN and CENELEC have a joint secretariat, based in Brussels, and are generally referred to jointly as CEN / CENELEC.

CEPT is the Conference of European Posts and Telecommunications. Its members are the European telecommunications administrations.

CEN / CENELEC and CEPT formed a joint Information Technology Steering Committee (ITSTC) which controlled a joint Information Technology Ad-hoc Expert Group on Standardisation. This produced two Technical Memoranda. The first, M-IT-01, sets out the concept and structure of functional standards for Information Technology and Telecommunications. The second, M-IT-02, together with its supplement, lists the functional standards to be produced, and gives a programme of work for producing them.

With the formation of EWOS and ETSI, the technical responsibility for this work has been transferred to the new bodies. In general, EWOS has taken over the work that had been done by the CEN / CENELEC technical committees and ETSI has taken over the work that had been done by CEPT (the exact division of work is detailed in **Chapter 3**, **Profile Comparison**).

The joint work has so far resulted in a number of European pre-standards (ENVs) in the ENV 41000 series, issued by CEN / CENELEC. Although ETSI has the authority to issue ENs / ENVs, CEN / CENELEC will continue (at least for the present) to issue the European standards (ENs) and pre-standards (ENVs) that result from this programme of work.

(European Pre-Standards - ENVs - are provisionally valid for a trial period, after which the members of CEN / CENELEC vote on whether to make them full European Standards (ENs). National standards bodies may keep conflicting national standards in force until the ENV becomes an EN.)

Because CEN / CENELEC is the issuing authority for these functional standards they will, for convenience, be referred to in this specification as the ‘‘CEN / CENELEC functional standards’’, even though some of them have actually been produced by CEPT, ETSI and EWOS.

2.7.2 Aims

The aim is to produce European functional standards which will provide unambiguous specifications for IT product interfaces and control the anarchy that would otherwise arise from uncontrolled selection of subsets, options and parameters from the OSI standards.

2.7.3 Approach

Structure and Classification of Profiles

CEN/CENELEC adopted the same approach to classifying the profiles as that used by SPAG, with substantially the same numbering scheme. There are some differences in the ranges of profiles covered within the SPAG classes (compare the **Scope** section below with the SPAG Scope) plus three new classes not used by SPAG.

The first two new classes distinguish functions providing or using the connection-oriented transport service from those providing or using the connectionless transport service (this distinction is not made by SPAG, but all SPAG profiles provide or use the connection-oriented transport service). CEN/CENELEC T-profiles are for telecommunications functions providing the connection-oriented transport service. The new class of U-profiles is for telecommunications functions providing the connectionless transport service. Similarly, CEN/CENELEC A-profiles are for applications using the connection-oriented transport service, and the new class of B-profiles is for applications using the connectionless transport service. This distinction is similar to that made by the ISO classification scheme (described in a later section).

The third new class is that of Combined Functions (C) which are specific combinations of functions from the other classes, usually Telecommunications (T) plus Application (A), possibly plus Application Extension (Q). They are used by CEN/CENELEC within the context of access to telematic services provided by telecommunications administrations.

Conformance

Conformance requirements include a definition of a conformance statement to be made by implementors of products claiming to conform to the functional standard.

2.7.4 Scope

Memorandum M-IT-02 Issue 4, May 89, calls for functional standards to be produced in the following areas:

Application Functions Requiring the Connection Mode Transport Service (A)

- FTAM
- Telematic Services
- Message Handling
- Terminal Support (VT)
- OSI Management
- Remote Data Base Access
- Directory
- Transaction Processing

Combined Functions (C)

- PTT Telematic Services

Application Extension Functions (Q)

- ODA Document Application Profile
- Data Stream Formats
- Virtual Terminal Control Objects
- Directory Application Profile

Relay Functions (R)

- Relaying the Connection Oriented Network Service Relays
- Relaying the Connectionless Network Service
- Relaying the X.25 Packet Layer Protocol
- Relaying the MAC Service

Graphic and Control Character Repertoires (S)

- Graphic Character Repertoires
- Control Functions
- Code Structures

Telecommunications Functions using Connection Mode Transport Service (T)

- ISDN
- Permanent and Switched Analogue Telephone Circuits
- Packet Switching Services
- Permanent and Switched Digital Circuits
- LANs

Other Functions (Y)

- Character Mode Terminals on PAD

In addition, the following categories are identified but no specific areas within them have yet been defined:

- Application Functions Requiring the Connectionless Mode Transport Service (B)
- Telecommunications Functions using the Connectionless Mode Transport Service (U)

In all, some 123 topics are identified as appropriate for functional standards. Of these, 37 are covered in European pre-standards (ENVs) that have already been produced, and another 49 have summary definitions given in M-IT-02 Issue 4.

Topics which are covered in European pre-standards are as follows:

Applications (A)

- FTAM: A/111, simple file transfer, unstructured (ENV 41204); A/112, positional file transfer (flat) (ENV 41206); A/122, positional file access (flat) (ENV 41207); A/13, file management (ENV 41205)
- Message Handling: A/311, access to public messaging services (1984 version) using P2 and P1 (ENV 41202); A/3211, access to private messaging services (1984 version) using P2 and P1 (ENV 41201)
- Virtual Terminal: A/4121 Basic Class S-Mode, Forms (ENV 41208); Common Control Objects (ENV 41209)

Applications Data Formats (Q)

- Office Document Architecture (ODA): Q/111, Basic Character Content (Draft ENV 41509); Q/112, Extended Mixed Mode (Draft ENV 41 510) and Q/121, Simple Messaging (Draft ENV 41511)

Graphic and Control Character Repertoires (S)

- Graphic Character Repertoires: S/11, Telex repertoire (ENV 41504); S/13, S/141, S/142, S/16, S/191 and S/192, European Latin, Greek and Cyrillic repertoires (ENV 41503); S/15, teletex repertoire (ENV 41502); S/17, videotex repertoire (ENV 41501)

Telecommunications Functions using Connection Mode Transport Service (T)

- Packet Switching: T/311 and T/312, permanent access (ENV 41104) and T/3211 and T/3212, switched access (ENV 41105)
- Digital Circuit: T/41, T.70 case (ENV 41106) and T/421 and T/422, connection oriented network service case (ENV 41107)
- LANs: T/611, connection-oriented network service over CSMA/CD (ENV 41103); LANs: T/613, connection-oriented network service over token ring (ENV 41108); T/6211, connectionless network service CSMA/CD single LAN environment (ENV 41101); T/6212, connectionless network service CSMA/CD multiple LAN environment (ENV 41102); T/6231, connectionless network service token ring single LAN environment (ENV 41109); T/6232, connectionless network service CSMA/CD multiple LAN environment (ENV 41110)

Other functions (Y)

- Character Mode Terminals on PAD: Y/11, X.29 over X.25 and Y/12, X.28 (ENV 41901)

In addition, there are draft ENVs for:

Applications Data Formats (Q)

- Data Stream Formats, Character Coded Text: Q/111, Telex compatible (Draft ENV 41504); Q/111, Teletex compatible (Draft ENV 41506); Q/217, Videotex compatible (Draft ENV 41507)

Telecommunications Functions using Connection Mode Transport Service (T)

- ISDN: Provision of Connection Oriented Transport Service over Connection Oriented Network Service, Circuit Mode, B-Channel, Permanent case (Draft ENV 41111) and Demand Case (Draft ENV 41112)

Major areas where there is not even a summary in M-IT-02 Issue 4 are:

- OSI Management (A / 5)
- Remote Data Base Access (A / 6)
- Transaction Processing (A / 8)
- Application Functions Requiring the Connectionless Transport Service (B / x)
- Code Structures (S / 3)
- Telecommunications Functions Using the Connectionless Transport Service (U / x)

2.7.5 Methodology

The functional standards to be produced, and the programme of work for producing them, were defined in memoranda M-IT-01 and M-IT-02 (with supplement). M-IT-02 contains outline definitions of some of the standards. These were to be developed by the working groups into European pre-standards (ENVs). Ultimately, these ENVs could be raised to the status of full European standards (ENs).

The functional standards to be produced refer as far as possible to base standards which are stable. It is intended that the criterion for stability of base standards (or, failing this, prior harmonisation of base standards within CEN / CENELEC) should apply to proposed additions to the set of functional standards to be produced.

In the programme of work defined in the supplement to M-IT-02, the standards are to be defined in phases. The first 5 phases run through into 1990, and a further two (possibly overlapping phases are currently envisaged.

2.7.6 Format

The CEN / CENELEC functional standards are a series of (at present) European pre-standards (ENVs). Each ENV is a separately issued document which covers a single function or a small group of closely related functions.

In M-IT-01 it is envisaged that each functional standard should include:

- a simple definition of the function,
- an illustration of the scenario within which the function is applicable,
- references to base standards,
- specifications of choices, parameter values, etc., for application of the base standards,
- where necessary, recommendations on resolution of ambiguities and correction of errors within the base standards, and
- conformance requirements.

2.7.7 Convergence

The CEN / CENELEC functional standards are themselves a result of a certain degree of harmonisation. The fact that EWOS is now a primary source of input to the ISO profile standardisation process ensures that the work by CEN / CENELEC, CEPT and ETSI will be taken into account in the definition of future ISO International Standard Profiles.

2.8 EWOS DOCUMENTS

2.8.1 Producing Organisation

The European Workshop for Open Systems (EWOS) was created in December 1987 by a number of European IT manufacturer and user organisations in conjunction with CEN / CENELEC. It is formally a part of CEN / CENELEC, but is a separate body as regards its administration and technical work.

In addition to CEN / CENELEC, the founding organisations were:

- COSINE (Cooperation for Open Systems Interconnection Networking in Europe, a federation of national academic and research network organisations aiming, in conjunction with RARE, to produce a uniform OSI based communications infrastructure for the European scientific and research community)
- ECMA (the European Computer Manufacturers' Association)
- EMUG (the European MAP Users Group)
- OSITOP (Open Systems Interconnection Technical and Office Protocols)
- RARE (Réseaux Associés pour la Recherche Européene, association of European research networks)
- SPAG (the Standards Promotion and Applications Group)

The Commission of the European Communities (CEC) has supported EWOS from the outset and is now a member of the EWOS steering committee. Its financial commitment has been substantial and is expected to increase, so that the CEC will soon be providing more than half of the funding for EWOS.

The workshop participants include technical experts from IT manufacturers, IT users, national governments, standards institutions, universities and research institutions.

Work within EWOS is coordinated with work in the European Telecommunications Standards Institute (ETSI) and with the other two regional workshops, NIST and AOW.

The workshop produces EWOS Documents (EDs). These are input proposals to CEN / CENELEC for European pre-standards (ENVs). They may also be input to ISO as proposals for draft International Standardised Profiles (ISPs). In addition to profiles, EDs may be proposals for converting pre-standards (ENVs) to full standards (ENs), for statements for liaison with ISPs, or for profile conformance test specifications. The workshop also produces EWOS Technical Guides (ETGs) which supply background material and are not intended as proposals for standards.

EWOS is increasingly becoming involved with conformance testing. It is not expected to take over the role of commercial conformance testing organisations, but it will devise a framework for future practical work and will review the results of conformance testing programmes such as CTS.

2.8.2 Aims

The objectives of EWOS are to serve as a truly open European platform for the development of OSI profiles and for the definition of corresponding conformance test specifications.

EWOS contributions should speed up the availability of functional standards, which are vital for achieving compatibility and interoperability between different vendors' equipment.

2.8.3 Approach

Structure and Classification of Profiles

EWOS has adopted the CEN / CENELEC classification and numbering scheme for profiles. This is described **Section 2.7**, **CEN/CENELEC Functional Standards**.

Conformance

The approach adopted for conformance is that each functional standard should include a conformance statement proforma, which EWOS calls a Functional Standard Conformance Statement Proforma. In addition, the importance of conformance testing is stressed; the development of conformance test specifications for profiles is one of the EWOS objectives.

2.8.4 Scope

EWOS has taken on the CEN / CENELEC part of the programme defined in M-IT-02 and its supplement. Work currently planned or envisaged within EWOS includes

- ODA
- Directory Data Formats
- File Transfer, Access and Management (FTAM)
- Message Handling Services
- Virtual Terminal
- Directory Services
- Manufacturing Messaging Service
- LANs (CSMA.CD, Token Bus, Token Ring and FDDI)
- Relays

To date, EWOS has produced EDs for:

- FTAM: A / 111, Simple File Transfer Unstructured (revision of ENV 41204); A / 112, Positional File Transfer; A / 122, Positional File Access; A / 13, File Management (ENV 41205)
- VT: A / 4121, Basic Class, S-Mode, Forms (ENV 41208); Q / 411-422, Control Objects (ENV 41209)
- ODA Document Application Profiles: Q / 111, Processable and Formatted Documents Basic Character Content (ENV 41509); Q / 112, Processable and Formatted Documents Extended Mixed Mode (ENV 41510) and Q / 121, Processable and Layout Independent Documents Simple Messaging Profile (ENV 41511)
- LANs: T / 6212, CSMA / CD, Multiple LAN Environment (Draft EN 41102)

2.8.5 Methodology

The technical activities of EWOS are managed by a technical assembly. Membership is open to any organisation prepared to contribute.

The development process is carried out by specialist expert groups. Each expert group is supported by a national standards institute, which supplies a technical secretariat. The expert groups are controlled by the technical assembly, and their output requires approval by the technical assembly before being issued as EWOS Documents.

2.8.6 Format

Each EWOS document is self contained and specifies a single profile, or group of related profiles, in a form suitable for adoption as a European Standard (EN).

2.8.7 Convergence

As a regional workshop preparing input to ISO, EWOS liaises with NIST and AOW in order to ensure that its proposed International Standardised Profiles (ISPs) are agreed by the other two bodies.

In addition, EWOS has started a study on the alignment of M-IT-01 / 02 and ISO TR-10000.

2.9 UK GOSIP

2.9.1 Producing Organisation

The United Kingdom Government OSI Profile - UK GOSIP - is produced by the U.K. Central Communications and Telecommunications Authority (CCTA). The CCTA is a part of the Treasury department of the British government. Its function is to advise other government departments on the purchase of IT systems.

UK GOSIP was produced by the CCTA following a programme of consultation with U.K. IT manufacturers and other interested parties.

2.9.2 Aims

UK GOSIP is intended as an aid to government departments. The idea is that when a department is buying a system, it can use the appropriate parts of GOSIP in its procurement specifications. Since government forms an important segment of the U.K. market for IT systems, the CCTA expects GOSIP to influence the development of products by IT manufacturers. Further, the CCTA would like non-government organisations to use GOSIP and hence makes copies freely available outside government.

The intended audience is therefore:

- U.K. government departments' procurement officers and technical advisors,
- IT manufacturers' product specification and development departments, and
- anyone buying or producing IT systems.

2.9.3 Approach

Structure and Classification of Profiles

UK GOSIP has a broadly similar approach to that of SPAG and CEN / CENELEC, although without the detailed numbering scheme.

It is divided into ''sub-profiles'' which are grouped as follows:

GOSIP-C	character repertoires (equivalent to SPAG / CEN / CENELEC S-profiles)
GOSIP-F	interchange formats (equivalent to Q-profiles)
GOSIP-A	applications (equivalent to A-profiles)
GOSIP-T	transport (equivalent to T-profiles)
GOSIP-S	miscellaneous or generic aspects that affect profiles of on or more of the other groups

It is considered that, in principle, any GOSIP-A profile can be used in conjunction with any GOSIP-T profile.

Relay functions are covered within GOSIP-T rather than forming a separate group (as in the SPAG / CEN / CENELEC R-profiles). UK GOSIP does not cover ''other'' functions such as terminal interfaces (Y-profiles).

Conformance

The specification of conformance includes a conformance statement to be made by implementors. Ideally, GOSIP should include a conformance statement proforma for each profile. (Some of these are missing in the current version (3.1). The main reason for this is the desire to align with emerging ISPs and regional profiles; UK GOSIP is waiting for their conformance requirements to become stable.)

In addition, it is considered that for a specification to be contractually enforceable it must be testable; hence conformance and interoperability testing are important. Testing is seen as a part of the development process rather than the procurement process, however. UK GOSIP suggests that, in the longer term, purchasing departments should require a claim of conformance to be supported by reference to a conformance test report from a recognised conformance testing laboratory. It also suggests that they could ask for evidence of interoperability testing.

2.9.4 Scope

The UK GOSIP profiles are concerned with end-systems and communications equipment (such as private packet switches or LANs) that may be purchased by government departments.

The current version of GOSIP (version 3.0) identifies the following:

GOSIP-C

- Graphic Characters
- Control Functions

GOSIP-F

- Document Architecture and Interchange Formats (ODA)
- Electronic Data Interchange (EDI)

GOSIP-A

- FTAM
- Message Handling
- Virtual Terminal
- Directory Services

GOSIP-T

- Packet Switching Services (across switched data networks or point-to-point links)
- LANs (CSMA / CD, Token Ring and FDDI)

GOSIP-S

- Naming and Addressing
- Security Services
- Management

Currently, there are reasonably complete profiles for:

- Character Repertoires
- Office Document Architecture (ODA)
- EDI (using FTAM or MHS but not the emerging MHS EDI protocol)
- FTAM
- Message Handling
- Virtual Terminal
- Directory Services
- Packet Switching Services
- LANs
- Naming and Addressing (for the Network layer)

2.9.5 Methodology

UK GOSIP is developed by the U.K. government department known as the CCTA. While there has been consultation with other bodies, it is the CCTA that has taken the decisions on what areas to cover and what options and parameter values to specify.

2.9.6 Format

UK GOSIP comprises four major components: Introduction, Specification, Supplement and Procurement Handbook. Each is issued as a separate volume.

The Introduction gives a general overview.

The Specification contains the profile definitions. It is claimed that, apart from some presentational issues, their content and structure are broadly based on the approach adopted for regional profiles (the profiles of AOW, EWOS and NIST) and for ISPs. This means only that there is a rough correspondence; it does not mean that precisely similar sections and sub-sections can be found in the UK GOSIP specification and in Draft ISPs. Its most clear-cut manifestation is that the classification used for UK GOSIP PICS (M[andatory], O[ptional], etc.) is precisely related to (but is not the same as) that of ISO TR-10000.

In principle (though there are variations in practice) each profile description should include:

- status,
- functional description,

- scenario definition,
- architectural model,
- compatibility,
- technical specification,
- conformance,
- testing, and
- future commitment and migration.

The Supplement covers miscellaneous topics not suitable for inclusion in the specification. Such topics may be of a general nature or may refer to base standards which are not yet stable.

The current version of the supplement contains material on:

- EDI (using the emerging EDI addition to the 1988 Message Handling standards)
- ODA simple messaging profile
- document publishing using SGML, DSSSL or SPDL
- FDDI LANs
- CSMA / CD 10baseT (unshielded twisted pair) LANs
- cabling strategy

Other topics that could be covered in the future include:

- Naming and Addressing (for the upper OSI layers)
- Management Services
- Security Services (the outline guidance currently given could be expanded)

The Procurement Handbook gives specific guidance to procurement officers and contains text for inclusion in Operational Requirements (documents issued by U.K. government departments to suppliers, describing the systems they wish to buy).

2.9.7 Convergence

UK GOSIP was developed with the intention of achieving as much commonality as possible with other profiles, and specifically with:

- CEN / CENELEC and CEPT functional standards
- The British Telecom Open Network Architecture (ONA)
- The NIST Implementors Forum
- MAP
- TOP
- The COS testing protocol stacks
- US GOSIP
- Anticipated development of ISPs in ISO

Many of the UK GOSIP profiles are in fact aligned to some degree with one or more other profiles. The relationship is closest in the lower layers (GOSIP-T) and with the CEN-CENELEC profiles. In the upper layers - particularly for the virtual terminal profile - there is greater divergence. It is a stated intention that UK GOSIP will ultimately converge with ISO ISPs. The latest version (GOSIP 3.1) shows evidence of this intention, in particular in the reference to ISO TR-10000 in the definition of the PICS classification.

2.10 FRENCH GOSIP

2.10.1 Producing Organisation

French GOSIP is produced by the Commission Centrale des Marchés (CCM). (Central Procurement Commission). This is a department of the Ministry of Economics and Finance. Its function is to advise other central government departments on Information Technology procurement.

2.10.2 Aims

The principle aim of French GOSIP is to assist government departments in applying the CEN/CENELEC functional standards to IT procurements. There is, however, another important purpose. This is to assist European industry to produce products to meet government requirements.

2.10.3 Approach

The approach taken is based on the principle that EC directive 87/95 means that public procurements must use the CEN/CENELEC ENVs. Hence there is a need to say how the CEN/CENELEC ENVs apply to French government procurements, and possibly to introduce restrictions on the ENVs that may be used and the options within them that may be selected. French GOSIP is designed to meet this need.

Structure and Classification

French GOSIP makes the same distinction as UK GOSIP between telecommunications profiles (profils T), applications profiles (profils A), data format profiles (profils F) and character code profiles (profils C). However, the current version does not cover data formats or character codes (see **Scope**, below). It assumes the SPAG/CEN/CENELEC/EWOS profile numbering scheme.

Conformance

French GOSIP gives specific clauses to be included in requirements documents when systems are being procured. These clauses generally state that the systems must conform to certain specified ENVs. Recommendations are given on conformance testing, generally calling for application of the CTS conformance tests where these are available, and advising interoperability tests in some cases.

2.10.4 Scope

French GOSIP is mandatory for central government procurements. The current version covers:

Applications Profiles (Profils A)

- File Transfer, Access and Management (FTAM)
- Message Handling Services (MHS)

Telecommunications Profiles (Profils T)

- Wide Area Networking
- Local Area Networking using CSMA / CD or Token Ring

In addition, advice is given on interworking between subnetworks of different types. This covers interworking between two connection-oriented subnetworks, interworking between two connectionless subnetworks, and interworking between a connection-oriented subnetwork and a connectionless subnetwork.

2.10.5 Methodology

In producing their GOSIP, the CCM has taken UK GOSIP as a starting point, translating parts of it into French. However, while UK GOSIP reads as an authoritative document in its own right, French GOSIP makes it clear that the authoritative documents are the CEN / CENELEC ENVs.

2.10.6 Format

The main document, **Normes Fonctionelles Européennes des Technologies de l'Information - Guide d'Application à la Commande Publique**, consists of an Introduction, a section on Applications Profiles and a section on Telecommunications Profiles. The last two sections include the profile descriptions for FTAM, MHS, WAN and LAN. For each of these, there is:

- a description of the relevant CEN / CENELEC profiles,
- a statement of the stability of the standards, the availability of products and the availability of conformance testing,
- guidance on procuring systems, including text for insertion in the requirement specifications, and
- technical material (which can be skipped by procurement officers) including functional descriptions and operational considerations.

Interworking between different types of network is described, together with the LAN and WAN profiles, in the section on Telecommunications Profiles.

A second document, **La Communication Informatique - Guide de l'Achat Public Conformément aux Normes Européennes**, has also been produced. This does not contain detailed technical material but describes the issues in a manner that can be understood by someone who is not an IT specialist. It also gives the text that is to be inserted in the requirement specifications when equipment is purchased.

2.10.7 Convergence

French GOSIP references the CEN / CENELEC profiles and is based on UK GOSIP. It does not, however, attempt to achieve compatibility with other profiles. In particular, it does not appear to take account of the ISO harmonisation work.

2.11 SWEDISH GOSIP (SOSIP)

2.11.1 Producing Organisation

SOSIP is produced by Statskontoret, a Swedish government department whose title in English is the Swedish Agency for Administrative Development (SAFAD). It carries out a staff function for the Civil department (the Swedish government department responsible for police, churches, etc.). Its function includes advising all Central government departments on the procurement of computer systems.

2.11.2 Aims

SAFAD's aim in producing SOSIP is to make possible supplier-independent communication between different types of computer system used in government departments, in accordance with OSI.

It applies not only to the purchase of new systems but also to enhancements to existing systems. It includes guidance on migration to OSI from SAFAD's interim standard, TCP/IP. It is currently in force and must be used for procurement of all systems. The first major procurement based on SOSIP is now well advanced.

SOSIP is intended to be used by:

- purchasing authorities, since it provides rules for purchasing IT systems
- suppliers, since it tells them the requirements of the Swedish government for computer systems communications.

2.11.3 Approach

Structure and Classification of Profiles

SOSIP identifies subprofiles for:

- Transport (T-profiles)
- Relays (R-profiles)
- Applications (A-profiles)
- Data Interchange Formats and Character Codes (F-profiles)

Like that of UK GOSIP, this approach is similar to that of SPAG and CEN/CENELEC/CEPT but does not include the detailed numbering scheme. Unlike UK GOSIP, SOSIP considers relay profiles (R-profiles) separately from other transport profiles (T-profiles). However, SOSIP considers character repertoires (UK GOSIP-C, SPAG S-profiles) together with data interchange formats (UK GOSIP-F, SPAG Q-profiles) as SOSIP F-profiles. SOSIP does not cover the SPAG ‘‘other’’ functions such as terminal interfaces (SPAG Y-profiles).

Conformance

The policy of SAFAD is to require testing by recognised conformance testing organisations.

2.11.4 Scope

SOSIP contains recommendations in the following areas:

T-Profiles

- Local Area Networks - Connectionless Network Service, CSMA / CD and Token Ring and, as a lower priority, token bus
- Wide Area Networks - Connection-oriented Network Service over X.25 and X.21

R-Profiles

- Relays to link two LANs over an X.25 WAN, using connectionless network service
- Relays to link two LANs directly, using connectionless network service
- Relays to link WAN and LAN with connectionless network service on both sides
- Relays to link connectionless network service over LAN with connection-oriented network service over WAN

A-Profiles

- FTAM
- Message Handling
- Virtual Terminal
- OSI Management

F-Profiles

- Office Document Architecture / Interchange Format (ODA / ODIF)
- Character Codes

The material in all these areas is reasonably complete, although that for OSI Management consists largely of interim recommendations (as it must do, given the current state of development of the base standards). FTAM and ODA / ODIF are regarded as lower priority than X.400.

The need for future work is identified in the following areas:

- Extension of T-Profiles to cover FDDI and ISDN
- Directory Service
- Security
- EDI
- Remote Data Base Access (RDA)
- Distributed Transaction Processing

It is intended to update the Network Management material when conditions permit.

The current version of SOSIP (version 1.0) is expected to remain stable for the whole of 1990.

Extension of the T-Profiles to include connection-oriented network service over LANs (as in UK GOSIP) was considered, but has been rejected.

2.11.5 Methodology

The intention of SAFAD is to specify which base standards or functional standards should apply, rather than to define new ones. SOSIP is therefore largely based on other profiles and functional standards, including:

- The CEN / CENELEC functional standards
- UK GOSIP
- The NIST Implementors Forum agreements
- US GOSIP
- MAP
- TOP

In general, SOSIP quotes the CEN / CENELEC / CEPT profiles and functional standards as the main reference in most areas, with NIST also being quoted as a main reference for FTAM and Virtual Terminal. Reference is also made, largely for comparison purposes, to UK GOSIP, MAP and TOP.

2.11.6 Format

SOSIP consists of an introduction and two main parts; the definition of the profiles and background material. The second part (background material) is not included in the current issue (Issue Circulated for Comment, December 1988).

The first part (the definition) does in fact include a rationale and other background material. It also covers:

- the situations where SOSIP is applicable,
- compatibility with other profiles,
- organisation into subprofiles,
- the definition of each subprofile,
- future developments,
- naming and addressing, and
- migration from TCP / IP.

The subprofile definitions state what base standards are to be used and give selections for the major options within the base standards. They also reference other profiles (chiefly CEN / CENELEC ones). They do not specify conformance conditions or include detailed advice on the writing of requirements specifications.

2.11.7 Convergence

SOSIP is based to a large extent on other functional standards. In most areas, it is compatible with the relevant CEN / CENELEC profile. For Virtual Terminal, and some FTAM file types, it is compatible with NIST. It is often well aligned with UK GOSIP and sometimes with MAP and / or TOP.

2.12 COS STACK SPECIFICATIONS

2.12.1 Producing Organisation

The Corporation for Open Systems (COS) was founded by 17 American IT companies in 1985 to accelerate the introduction of OSI products, and has pursued this aim mainly through the development of test systems. It has since acquired about 70 members including some from outside the U.S..

COS has developed a number of COS Stack Specifications. These constitute detailed descriptions of profiles. In addition, it has produced some detailed profile descriptions for submission to ISO as proposals for International Standardised Profiles. However, it is likely that this aspect of its work will cease now that harmonisation is the responsibility of the regional workshops. It has also produced a large number of outline profile descriptions as a basis for its proposed future work plan.

2.12.2 Aims

The COS Stack Specifications are intended to standardise the use of options and other variations in the base standards, and to provide a basis for the development of uniform, internationally recognised system tests.

2.12.3 Approach

The technical content of the COS profiles is based on the work of the NIST Implementors Forum, while the format is aligned with that of the International Standardised Profiles prescribed by ISO. COS has adopted the ISO classification scheme for its stack specifications and for its outline profile descriptions.

2.12.4 Scope

The outline profile descriptions, which correspond to possible future work items, cover:

Transport Profiles

- Packet Switched Networks
- Digital Data Circuits
- Analogue Telephone Circuits
- ISDN
- LANs

Relay Profiles

- Relays between various types of WAN and LAN using the connectionless network service.

Application Profiles

- FTAM
- Message Handling
- Virtual Terminal
- Directory

Interchange Format Profiles

- Office Document Format

Stack specifications have been produced for:

- LANs (CSMA / CD and Token Bus)
- Message Handling

Proposed ISPs have been produced for:

- CSMA / CD LANs
- Packet Switching

2.12.5 Convergence

The COS profiles are derived from the work of the NIST Implementors Forum and are compatible with the NIST Implementation Agreements. COS has been responsible for casting some of this material into ISP format and submitting it to ISO, and has thus made a significant contribution to the harmonisation process.

2.13 INTAP IMPLEMENTATION SPECIFICATIONS

2.13.1 Producing Organisation

INTAP, the Interoperability Technology Association for Information Processing, Japan, is sponsored by the Japanese government Ministry of International Trade and Industry (MITI). As well as producing the Implementation Specifications, INTAP provides conformance testing services, carries out information dissemination activities (symposiums, seminars and so on) and manages research and development for the Japanese government's Interoperable Database System project. It also hosts the Asian and Oceanian Workshop for Implementors of OSI (AOW).

Associated with INTAP is POSI, the Promoting Conference for OSI. POSI is an association of Japanese Information Technology companies. It was founded in November, 1985 by Oki, Toshiba, NEC, Hitachi, Fujitsu, Mitsubishi and NTT in response to the Japanese government's policy of international cooperation and of promoting OSI. It has established relationships with other international bodies, notably with COS, MAP, TOP and SPAG, and it participates in the ISO Profile Harmonisation Feeders Forum. From its international contacts, POSI feeds information back into its member companies and to INTAP and assists them in developing their policy for OSI and for OSI profiling work.

POSI has technical expert groups and has produced proposed draft harmonised profiles for adoption by ISO as ISPs. However, the Implementation Specifications are produced not by POSI but by INTAP.

These Implementation Specifications were the basis of the OSI interworking demonstrations at the Tokyo Interoperable Networking Event (INE '88). At that stage they were not yet in their final form. Stable versions have now been developed and used for Datashow '89 at Tokyo Harumi in October.

2.13.2 Aims

The purpose of the Implementation Specifications is to make interoperability possible between the information processing systems and equipment of different vendors.

2.13.3 Scope

The implementation specifications cover:

- Naming and Addressing
- FTAM
- Message Handling
- Virtual Terminal
- Remote Database Access
- Office Document Architecture / Interchange Format (ODA / ODIF)
- Character Repertoires and Encodings
- Transaction Processing

- OSI Management
- Directory Service
- LAN (Connectionless Network Service over CSMA / CD, Token Bus, Token Ring and FDDI)
- WAN (Connection-Oriented Network Service over: packet switched networks; digital or analogue switched circuits and leased lines; ISDN)
- Relays

Of these, the following currently are at ‘‘Version 1 complete’’ status:

- Naming and Addressing
- FTAM (File transfer, simple unstructured)
- Message Handling
- Office Document Architecture / Interchange Format (ODA / ODIF)
- Character Repertoires and Encodings
- Directory Service
- LAN (Connectionless Network Service over CSMA / CD, Token Bus and Token Ring)
- WAN (Connection-Oriented Network Service over packet switched networks and digital or analogue switched circuits and leased lines)
- Relays

2.13.4 Convergence

POSI and INTAP are very much committed to the harmonisation process for International Standardised Profiles. The AOW regional workshop was formed at the suggestion of POSI and is hosted by INTAP. POSI participates in the Feeders Forum and is submitting some harmonised proposals for ISPs to ISO.

2.14 INTERNATIONAL STANDARDISED PROFILES (ISPs)

2.14.1 Producing Organisation

The International Standards Organisation (ISO) is an association of national standards organisations. It is not a U.N. agency but its members are mostly governmental or quasi-governmental standards institutions. It has a permanent central secretariat at Geneva, an elected council, and a triennial General Assembly. It works through its Technical Committees (TCs). There are over 160 of these, covering many areas; about 5 of them are relevant to Information Technology.

ISO has been the principal forum for the OSI movement as a whole. It has produced many of the base standards. Other base standards, originally produced by IEEE or CCITT, have been adopted as ISO standards also.

The International Electrotechnical Commission (IEC) is an organisation based on the voluntary participation of scientists and engineers from over 40 countries, organised as national committees. It is concerned with standards to promote safety, reliability, interchangeability and compatibility in electrical and electronic equipment.

The framework for the production of International Standardised Profiles is the joint responsibility of ISO and IEC. It is being developed through their joint technical committee ISO/IEC JTC1 and is described in ISO/IEC JTC1 Technical Report TR-10000. The work itself was at first carried out by the Feeders Forum members (COS, MAP/TOP, POSI and SPAG) but has now been taken over by the three regional workshops (AOW, EWOS and NIST). It is coordinated by the Regional Workshop Co-ordinating committee. For convenience, however, these profiles are referred to throughout this specification simply as the ISO profiles.

2.14.2 Aims

The ISPs are intended to form a set of OSI profiles which will meet the various needs of organisations for OSI profiles and which will be internationally standard.

As well as meeting the needs of profile users (IT manufacturers, IT procurement departments, etc.) the ISPs are also intended to form a basis for the development of conformance test suites (by organisations other than ISO).

2.14.3 Approach

Structure and Classification of Profiles

ISO has adopted a classification of profiles which is similar in many respects to those of TOP, SPAG, CEN/CENELEC and EWOS (hereafter called, for convenience, the European scheme) and of UK GOSIP. There are, however, some important differences with each of these schemes. ISO has also adopted a numbering scheme based on the classification. This is somewhat similar to the European scheme but, again, with important differences.

As with the other classifications, the ISO classification distinguishes between telecommunications (or transport) functions, relay functions, applications functions and applications data formats. It does not include classes for applications interfaces (as in TOP) or character repertoires (as in the European scheme or UK GOSIP).

ISO distinguishes two classes of telecommunications (or transport) function depending on the type of transport service they provide. ISO class T transport profiles provide the connection-oriented service, while class U transport profiles provide the connectionless service.

The T-profiles are classified further according to the class of transport protocol used and the type of network service used. Group TA profiles use connectionless network service and class 4 transport protocol. The other groups use connection-oriented network service and require support for various classes of transport protocol, as follows:

- TB: classes 0, 2, 4
- TC: classes 0,2
- TD: class 0
- TE: class 2

Class U contains two groups:

- UA: connectionless transport service over connectionless network service
- UB: connectionless transport service over connection-oriented network service

Thus the scope of the ISO T-profiles is similar to that of the European T-profiles and UK GOSIP-T. The scope of the ISO U-profiles is similar to that of the European U-profiles.

Within each group, transport profiles are classified according to the type of subnetwork they use. This classification uses a hierarchical numbering scheme. The first digit distinguishes subnetworks as follows:

1. packet switched data network
2. digital data circuit
3. analogue telephone circuit
4. ISDN
5. LAN

Subsequent digits make further distinctions, so that, for example, 11 indicates permanent access to a packet switched network, 12 indicates switched access, 121 indicates switched access via the telephone network and so on. The scheme is somewhat like the European numbering scheme but is more systematic and results in the profiles being numbered differently.

Examples of complete ISO profile identifiers are:

TA 51: connection-oriented transport service, class 4 transport protocol, connectionless network service, CSMA / CD LAN.

TD 51: connection-oriented transport service, class 0 transport protocol, connection-oriented network service, CSMA / CD LAN.

UA 52: connectionless transport service, connectionless network service, token bus LAN.

ISO relay profiles (R-profiles) correspond to European R-profiles. Each ISO R-profile has an identifier of form Rtp.q where:

- t identifies the layer at which the relay operates, the service mode supported and the type of relay. The following values of t are currently defined:

  A: connectionless network service relays
  B: connection-oriented network service relays
  C: X.25 protocol relays
  D: LAN MAC service relays using transparent bridging
  E: LAN MAC service relays using source routing
  Z: connection-oriented /connectionless interworking (this type of relay, and its final position within the taxonomy, requires further study)

- p and q are each subnetwork identifiers as used in the classification of transport profiles and indicate the types of subnetwork connected by the relay.

The division of the transport profiles into two classes is paralleled by a similar division of the applications profiles. In the ISO classification, A-profiles are applications profiles requiring the connection-oriented transport service (provided by T-profiles), while B-profiles are applications profiles requiring connectionless transport service (provided by U-profiles).

Thus the scope of the ISO A-profiles is similar to that of the European A-profiles and UK GOSIP-A. The scope of the ISO B-profiles is similar to that of the European B-Profiles (no organisation has yet published any B-profiles however).

The scope of the ISO Interchange Format and Representation profiles (F-profiles) is similar to that of European Q-profiles and UK GOSIP-F.

ISO A and F profiles are further identified by two-letter codes indicating the application or data format. Within each application or data format classification there is a further hierarchical numbering scheme to indicate sub-classifications. Thus, for example, FT indicates the file transfer application and AFT 11 identifies the simple (unstructured) file transfer applications profile. Again, this is similar, but not identical, to the sub-classification method of the European scheme.

Conformance

The approach currently adopted by ISO to the question of conformance is that the supplier of a system implementing a profile should provide an ISP Implementation Conformance Statement (ISPICS) which will show the base standard options and parameter values adopted by the system.

Each ISP will contain an ISPICS Requirements List (IPRL) which will define what an ISPICS for that ISP must contain. The IPRL will include, for each relevant base standard, a section expressing the constraints upon allowable answers in the base standard PICS proforma. The ISPICS consists of a set of base standard PICS which satisfy these constraints.

The ISPICS is thus a claim of conformance to the profile and a complete definition of the communications protocols used and options selected.

2.14.4 Scope

The classification of TR-10000 covers the following areas:

Transport Profiles (T and U)

- Packet Switched Networks
- Digital Data Circuits
- Analogue Telephone Circuits
- ISDN
- LANs

Relay Profiles (R)

- Connectionless Network Service Relays
- Connection-oriented Network Service Relays
- X.25 Protocol Relays
- LAN MAC Service Relays using Transparent Bridging
- LAN MAC Service Relays using Source Routing
- Connection-oriented / Connectionless Interworking

Application Profiles (A)

- FTAM
- Message Handling
- Virtual Terminal
- Transaction Processing
- Remote Data Base Access
- OSI Management
- Directory

Interchange Format and Representation Profiles (F)

- Office Document Format
- Computer Graphics Metafile Interchange Format
- SGML Document Interchange Format
- Directory Data Definitions

The following proposals for draft ISPs have been submitted to ISO:

- Permanent access to packet switched networks with connection-oriented transport service over connectionless network service, TA 11x1 (by COS),

- CSMA/CD LAN with connection-oriented transport service over connectionless network service, TA 51 (by COS),
- Permanent access to packet switched network SVCs with connection-oriented transport service over connection-oriented network service using various combinations of transport protocol classes, TB 11x1, TC 11x1, TD 11x1 and TE 11x1 (by POSI), and
- Simple File Transfer, Unstructured, AFT 11 (by SPAG).

The COS proposals include general material covering sub-network independent requirements that apply to all TA profiles. Similarly, the POSI proposals cover sub-network independent requirements for all TB, TC, TD and TE profiles. The SPAG proposals contain material on the upper ISO layers and document types that is common to all FTAM profiles.

2.14.5 Methodology

It is required that the proposals input to ISO for ISPs will already have been harmonised by the three regional workshops. They should therefore be free from error and agreed by all concerned. There is therefore no reason for a lengthy approvals procedure by ISO. An accelerated procedure has been defined which should take less than 9 months for each ISP.

Under this procedure, the submitting organisation submits a proposal, known as a Proposed Draft ISP (PDISP). This is reviewed by a review team (within two months). If it is satisfactory, it becomes a Draft ISP (DISP) and is sent out for a one-shot ballot by ISO members (this should take at most 6 months). If approved by the ballot, it then becomes an ISP.

The review of PDISP AFT 11 is now (March 1990) complete and the reviews of the other PDISPS are nearly complete. These reviews have generated substantial numbers of comments which are mostly of an editorial nature, rather than technical. PDISP AFT 11 has been revised in the light of the comments and should shortly be distributed by ISO for ballot.

2.14.6 Format

The format of an ISP is defined in TR-10000, as follows.

Each single part ISP will contain the following sections:

- Foreword (background information such as producing organisation, other documents replaced, and technical changes from previous edition)
- Introduction (describing the drafting and harmonisation processes undergone by the ISP)
- Scope (including a statement of the position of the profile within the taxonomy and a scenario description)
- Normative References (to base standards and to TR-10000)
- Definitions (present only as required)

- Abbreviations (present only as required)
- Requirements (these are the profile definitions, given in one or more sections whose structure will depend on the nature of the profiles being defined)
- IPRL (as the first Annex)
- Further Annexes (explanatory or tutorial material)

Multi-part ISPs may be produced where close relationships exist between two or more profiles, to allow use of common text. For example, the multi-part mechanism is used in the current proposed draft ISPs for the definition of groups of transport profiles. Each part of a multi-part standard should follow the single part format, with appropriate variations.

2.14.7 Convergence

ISO now provides the primary mechanism for the convergence of profiles, via harmonisation of its input between the regional workshops. It remains to be seen, however, how easy it will be to resolve the differences between the existing profiles produced by other organisations, and how long this process will take.

Chapter 3

Profile Comparison

3.1 GENERAL

This chapter compares the main features of the profiles produced by NIST, MAP, TOP, US GOSIP, SPAG, CEN / CENELEC, ETSI, EWOS, UK GOSIP, French GOSIP, Swedish GOSIP, COS, POSI and INTAP.

The ISO classification scheme is used as the basis of the comparison. This scheme is defined in ISO TR-10000 parts 1 and 2 and summarised in **Chapter 2**, **Profile Descriptions**. Anyone not familiar with the ISO scheme should read the summary in **Section 2.14**, **International Standardised Profiles (ISPs)** before reading this chapter.

The comparison is divided into four sections: transport profiles, applications profiles, applications data format profiles and other profiles. These sections are all organised slightly differently. For the first three sections, there is a common basic approach. (The fourth section just contains a note on some profiles that do not fit into the OSI scheme and are not true OSI profiles. They are mentioned because they have been produced by OSI profiling organisations.)

The main features of the approach used in the first three sections are that for each group of profiles defined in the ISO classification:

- the group is described in terms of functionality (for applications profiles or applications data format profiles) or type of network (for transport profiles),
- the base standards are described, with particular reference to their state of stability,
- the currently existing profiles are described,
- the use of ASEs, presentation layer and session layer by applications profiles is summarised,
- compatibility between the different profiles is discussed, and
- the context in which applications profiles could be used by applications programs is outlined.

The main part of the comparison consists of the description of the existing profiles (including the use by applications profiles of ASEs, presentation layer and session layer) and the discussion of compatibility between them.

For each ISO group, the description of existing profiles contains a table that shows the areas covered by existing profiling work. For each profile of the ISO classification, the table indicates which existing profiles contain relevant material and whether that material is stable (S), in draft form (D) or merely identified as being required (I). This enables the reader to see the main similarities and differences between the profiles at a glance.

In the tables, the following abbreviations are used for the various profiling organisations.

NST : NIST
EWO : EWOS
MAP : MAP
TOP : TOP
SPG : SPAG
COS : COS
FFP : Feeders Forum, edited by POSI
USG : US GOSIP
C / C : CEN / CENELEC
ETS : ETSI
UKG : UK GOSIP
FRG : French GOSIP
SOS : Swedish GOSIP (SOSIP)
INT : INTAP

To prevent the tables from becoming unmanageably large, each table shows only the organisations that have at least identified a requirement for relevant profiles. If an ISO profile description has no entry for a particular organisation then that organisation has not so far done work in that area.

Even so, it has been necessary to split some of the tables into two. This has been done by showing the profiles of the Regional Workshop and Feeders Forum Members (NIST, EWOS, MAP, TOP, COS, SPAG and FFP) in one table, and the profiles of the other organisations (US GOSIP, CEN / CENELEC, ETSI, UK GOSIP, French GOSIP, Swedish GOSIP (SOSIP) and INTAP) in a separate one.

Note that just because an organisation has an entry for an ISO profile description does not mean that it has defined a specific profile covering exactly the area described by ISO. What it does mean is that one of the organisation's profiles overlaps the ISO subject area.

Remember also that ISO has not yet issued any profiles. The ISO profiles are currently being created by harmonisation of the existing profiles in each area.

The existing profiles were mostly produced before the ISO classification scheme was worked out, and their structure does not follow the scheme. In fact, each set of profiles has a different structure. The ISO scheme is a useful basis of comparison, but it has been necessary to make judgements as to how the existing profiles map onto it. The basis for these judgements and for the discussions of compatibility are described in **Appendix A**, **Basis of the Comparison**.

3.2 TRANSPORT PROFILES

Transport Profiles provide a transport service for use by Applications Profiles. At present, that service is usually the Connection Oriented Transport Service (COTS) defined in ISO 8072. Work is in progress to define profiles to provide the Connectionless Transport Service (CLTS) defined in ISO 8072/ADD 1. The NIST Implementors Workshop CLTS material is now stable.

The connection oriented service is provided over various types of telecommunications network, including local area networks (LANs), X.25 Packet Switched Data Networks (PSDNs), Public Switched Telephone Networks (PSTNs), Circuit Switched Data Networks (CSDNs), Integrated Services Digital Networks (ISDNs) and analogue or digital point-to-point links. A pair of end systems may be connected by a simple network of one of these types or by a composite network including subnetworks of different types.

Different Transport Profiles are required because of the different types of network or subnetwork to which an end-system can be connected. However, the situation is complicated by the fact that different profiles are also required because of different approaches to providing the Connection Oriented Transport Service. These differences are all taken into account by the ISO classification scheme for Transport Profiles which is described in **Section 2.14**, **International Standardised Profiles (ISPs)**.

The first subsection of this section discusses the differences between the connection oriented and connectionless approaches to providing the connection oriented transport service. Further subsections cover LAN profiles, WAN profiles and relay profiles providing the connection-oriented transport service. A final subsection discusses profiles providing the connectionless transport service.

3.2.1 Connection Oriented and Connectionless Approaches for COTS

There are two approaches to providing the Connection Oriented Transport Service: by connection oriented and by connectionless network service.

The connection oriented approach uses the Connection Oriented Network Service (CONS) defined in ISO 8348, provided by the X.25 packet level protocol (ISO 8208), as described in ISO 8878. This protocol is used in packet switched data networks and can also be operated over LANs, PSTNs, CSDNs, ISDNs and point-to-point links. In a composite network, it can enable the various different subnetworks to interwork.

Interworking between different subnetworks relies on certain features of the X.25 packet level protocol that were added by the CCITT in 1984 specifically to enable it to provide the ISO network service. In practice, many PSDNs still use earlier versions of X.25 that do not incorporate these features. Some profiles have options that allow connection to such networks.

Because the X.25 packet level protocol provides error detection/correction and also multiplexing, these features are not required to be provided by the transport layer protocol. Connection oriented approach profiles therefore often only require class 0 or classes 0 and 2 of transport protocol ISO 8073 to be provided.

The connectionless approach uses the Connectionless Network Service (CLNS) defined in ISO 8348/ADD 1.

At the network layer, the CLNS profiles mostly specify the Connectionless Internet Protocol (ISO 8473) to provide interworking between different subnetworks. This protocol can be used over X.25 in PSDNs or ISDNs and over the connectionless logical link control protocol LLC-1 of ISO 8802/2 in LANs.

Some LAN profiles specify the ‘‘inactive subset’’ of ISO 8473 at the network layer. These profiles do not provide the full OSI network service and will not allow working over composite networks. They are not allocated numbers in the ISO classification.

Connectionless approach profiles do not include network layer protocols providing error detection/correction or multiplexing. They therefore require class 4 of transport protocol ISO 8073.

SPAG, CEN/CENELEC and UK GOSIP have favoured the connection oriented approach. They have not specified use of the connectionless network service except over LANs, where it is an alternative to the connection oriented service. SPAG and UK GOSIP do however specify LAN/WAN gateways (SPAG Distributed Systems Gateway, UK GOSIP Inter-Working Unit) that provide protocol conversion between the connection oriented approach (over WANs) and the connectionless approach (over WANs), including conversion at the transport layer between class 4 and class 0 or 2 of the ISO transport protocol.

NIST, MAP, TOP and US GOSIP have favoured the connectionless approach. NIST covers the provision of the connection oriented network service over both LANs and WANs as an option. US GOSIP allows CONS over WANS as an option but only for use in certain restricted circumstances. The draft issue 2 of US GOSIP is slightly more liberal.

French GOSIP and INTAP require use of the connection-oriented approach over WANs and the connectionless approach over LANs. They allow interworking between WAN and LAN to be provided by a gateway that performs protocol conversion at the transport layer.

Swedish GOSIP requires use of the connectionless approach over LANs. Where two end-systems are connected across a WAN, the connection-oriented approach is required. Where one end-system is connected to a LAN and the other is connected to a LAN, the connectionless approach may be used over both LAN and WAN. Alternatively, the connectionless approach may be used over the LAN and the connection-oriented approach used over the WAN, with a LAN/WAN gateway (Inter-Working Unit, as in UK GOSIP) providing transport layer protocol conversion.

3.2.2 LAN Profiles

Network Types

There are three main types of LAN covered by OSI profiles at present; CSMA/CD, Token Bus and Token Ring. There are several stable profiles for each of these. In addition, there has been some work done on FDDI by several profiling organisations. MAP has identified the need for fibre optic LANs but will probably not base its work on FDDI.

Base Standards

The ISO 8802 standards - 8802/1 through 8802/5 - describe the physical and data link layers for CSMA/CD, Token Bus and Token Ring LANs. They are based on (and almost identical to) the earlier IEEE standards 802.1 through 802.5. They are stable and they cover the following areas:

- 8802 / 1 - General and Network Management
- 8802 / 2 - Logical Link Control
- 8802 / 3 - CSMA / CD
- 8802 / 4 - Token Bus
- 8802 / 5 - Token Ring

FDDI is covered by ISO 9314. This contains some stable material but is not yet completely stable. In particular, there are still major disagreements on network management. It is expected that ISO 8802 / 2 Logical Link Control will be used over FDDI LANs.

Existing Profiles

Tables 1 and 2 show the areas currently covered by work on LAN profiles.

	ISP nr.	NST	EWO	MAP	TOP	SPG	COS	FFP
Tr. Cl. 4 and CLNS								
CSMA / CD	TA 51	S	S		S	S	S	
Token Bus	TA 52	S	D	S	S		S	
Token Ring	TA 53	S	I		S	S	D	
FDDI	TA 54	D	D				D	
Other fibre optic				I				
Tr. Cl. 4 and inactive internet								
CSMA / CD	N / A		S			S		
Token Ring	N / A					S		
EPA	N / A			S				
Tr. Cl. 0,2,4 and CONS								
CSMA / CD	TB 51	S						D
Token Bus	TB 52	S						D
Token Ring	TB 53	S						D
FDDI	TB 54	D						D
Tr. Cl. 0,2 and CONS								
CSMA / CD	TC 51	S	D			S		D
Token Bus	TC 52	S				I		D
Token Ring	TC 53	S	D			S		D
FDDI	TC 54	D	D					D
Tr. Cl. 0 and CONS								
CSMA / CD	TD 51	S						D
Token Bus	TD 52	S						D
Token Ring	TD 53	S						D
FDDI	TD 54	D						D
Tr. Cl. 2 and CONS								
CSMA / CD	TE 51							D
Token Bus	TE 52							D
Token Ring	TE 53							D
FDDI	TE 54							D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 1: LAN Profiling Activity: Feeders Forum Members
and Regional Workshops

	ISP nr.	USG	C / C	UKG	FRG	SOS	INT
Tr. Cl. 4 and CLNS							
CSMA / CD	TA 51	S	S	S	S	S	S
Token Bus	TA 52	S	I			S	S
Token Ring	TA 53	S	S	S	S	S	S
FDDI	TA 54	I	I	D		I	D
Other fibre optic							
Tr. Cl. 4 and inactive internet							
CSMA / CD	N / A		S		S		
Token Ring	N / A		S		S		
EPA	N / A						
Tr. Cl. 0,2,4 and CONS							
CSMA / CD	TB 51						
Token Bus	TB 52						
Token Ring	TB 53						
FDDI	TB 54						
Tr. Cl. 0,2 and CONS							
CSMA / CD	TC 51		S	S	S		
Token Bus	TC 52			I			
Token Ring	TC 53		S	S	S		
FDDI	TC 54			D			
Tr. Cl. 0 and CONS							
CSMA / CD	TD 51			S			
Token Bus	TD 52						
Token Ring	TD 53			S			
FDDI	TD 54						

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 2: LAN Profiling Activity: Other

The NIST implementation agreements cover all types of LAN, and both the connection oriented and connectionless approach. The connectionless approach requires the full ISO Network Service of ISO 8348 - it does not use the inactive subset of the ISO Internet Protocol (ISO 8473). For the connection oriented approach, NIST endorses use of the following classes of the ISO transport protocol (0), (0,2) or (0,2,4).

MAP supports only Token Bus. The full MAP protocol stack requires connectionless network service (no use of inactive internet protocol subset) and transport protocol class 4. TOP and US GOSIP support a similar stack, over CSMA / CD and Token Ring as well as over Token Bus.

MAP also defines an Enhanced Performance Architecture (EPA) stack, with null network, transport, session and presentation layer protocols. This is intended for use by simple devices in a factory environment. It does not support the OSI network or transport services and is not allocated a number in the ISO profile classification. It is specifically excluded by EWOS.

SPAG has defined profiles for both the connection oriented and the connectionless approach. Within the connectionless approach, both the full network service and use of the inactive subset of the Internet Protocol are covered. Within the connection oriented approach, the (0,2) combination of transport classes is recommended. There are stable profiles for CSMA / CD and Token Ring.

CEN / CENELEC has adopted the stable SPAG profiles and EWOS has taken on the task of updating them. It has produced a new draft issue of EN 41102 (which covers TA 51 functionality). EWOS is also working on MAP compatible profiles for Token Bus and on FDDI profiles.

UK GOSIP allows either the connection oriented approach or the connectionless approach. It does not use the Internet Protocol inactive subset for connectionless working. In the connection oriented approach, it endorses transport protocol class combinations (0) and (0,2). It covers CSMA / CD and Token Ring but not Token Bus.

French GOSIP allows either the connection oriented approach or the connectionless approach and references the CEN / CENELEC functional standards. It allows both the full internet protocol and the inactive subset.

SOSIP recommends the connectionless approach and references the CEN / CENELEC functional standards. It does not allow the inactive subset.

INTAP Implementation Specifications require the connectionless approach.

Working from the NIST agreements, COS has produced a profile for Transport Class 4 and connectionless network service over CSMA / CD LANs. In addition to the part specific to TA 51, there is a general part that applies to all TA profiles. It has been harmonised with MAP, TOP and POSI in the ISO Feeders Forum and is hopefully soon to be submitted to ISO as a draft ISP.

As part of its definition of the TB / TC / TD / TE 11x1 profiles, POSI has produced a general part that applies to all TB, TC, TD and TE profiles. It has been harmonised with MAP, TOP and COS in the ISO Feeders Forum and submitted to ISO as a draft ISP.

Compatibility

The MAP, TOP and US GOSIP profiles are based on the NIST profiles. All these profiles are therefore largely compatible. Interworking should be possible, via network layer relays where the LAN technologies differ. Except for NIST, they all cover only the ISO TA group functionality - Transport Class 4 and Connectionless Network Service. (This raises the question of whether connection-oriented working over LANs is really of strategic importance for NIST).

The CEN / CENELEC profiles were originated by SPAG. The SPAG profiles now reference them for technical content. EWOS is continuing this work. The SPAG, CEN / CENELEC and EWOS profiles can thus be regarded as a single set. French GOSIP and SOSIP reference them. The UK GOSIP profiles are based on them but with some additional specifications and qualifications.

For connectionless operation, the SPAG profiles (plus CEN / CENELEC, EWOS, UK GOSIP, French GOSIP and SOSIP) are largely compatible with those of NIST (plus MAP, TOP and US GOSIP). Interworking is possible under certain conditions.

MAP EPA is intended for one specific purpose and is not compatible with any other profile.

As regards the connection oriented approach profiles, the main difference that arises concerns the type of logical link control used. The base standard (ISO 8802 / 2) defines both a connectionless version of logical link control (LLC type 1) and a connection oriented version (LLC type 2). NIST requires LLC type 1. SPAG and CEN / CENELEC make LLC type 2 mandatory but allow LLC type 1 to be supported as well, as an option. UK GOSIP requires LLC type 2. This means that the NIST profile is compatible with SPAG and CEN / CENELEC to a limited extent, but is not compatible with UK GOSIP.

Apart from this area of using LLC to support CONS, there is thus a reasonable degree of compatibility between the various profiles within the functionality of each ISO group (TA, TB, TC, TD and TE).

Looking across the ISO group boundaries, however, there is less compatibility, even between profiles defined by the same organisation.

The connectionless profiles (both full internet and inactive subset internet) are incompatible with the connection oriented ones. They specify different protocols at the data link, network and transport layers. They cannot interwork.

The inactive internet connectionless profiles use the same protocols as the full internet ones at data link and transport layers. The SPAG, CEN / CENELEC, EWOS and French GOSIP full internet profiles allow use of the inactive subset as an option. (In the new draft EN 41102 produced by EWOS, it is stipulated that any implementation that supports this option shall be capable of being configured not to use it.) They are therefore compatible with the SPAG, CEN / CENELEC and French GOSIP inactive internet profiles and allow some interworking. The other full internet profiles (NIST, MAP, TOP, US GOSIP, UK GOSIP and SOSIP) do not use the inactive subset, are not compatible with the inactive internet profiles, and will not allow interworking.

Apart from the draft ISPs produced by COS and POSI, the profiling organisations have not yet defined separate TB, TC, TD and TE profiles. They simply allow the protocol class combinations (0,2,4), (0,2), (0) and (2) as options within their profiles. There is some compatibility between these options since a system supporting (0,2,4) also supports (0,2), and so on.

3.2.3 WAN Profiles

Network Types

The types of network covered are:

- packet switched data network (PSDN),
- analogue circuit, either switched (PSTN) or leased line,
- digital circuit, either switched (CSDN) or leased line, and
- integrated services digital network (ISDN).

PSDNs may be directly connected to the end-systems or may be accessed via PSTN, CSDN or ISDN.

There are several different types of ISDN connection. They may be semi-permanent, circuit switched or packet switched. Packet switched connections may use a B channel (switched semi-permanently or on demand) or a D channel.

Base Standards

Packet switched networks are covered by the CCITT X.25 standards with ISO equivalents ISO 8208 (for the network layer protocol) and ISO 7776 (for the data link layer). At the physical layer, X.25 references CCITT standards X.21 and X.21 bis. These standards are all stable.

The interfaces to analogue and digital leased lines, to the PSTN and to CSDNs are also covered by stable CCITT recommendations (V-series and X-series).

While the CCITT recommendations covering ISDN (I-series) are issued, and therefore nominally stable, this is a new technology and substantial revisions and additions are possible.

Existing Profiles

Tables 3 through 15 show the current state of WAN profiling work.

	ISP nr.	NST	TOP	USG	COS	SOS
PSDN						
Permanent Access						
PSTN Leased Line						
SVC	TA 1111	S	S	S	S	S
PVC	TA 1112	S	S	S	D	S
Digital Data Cct. / CSDN Leased Line						
SVC	TA 1121	S	S	S	S	S
PVC	TA 1122	S	S	S	D	S
ISDN B-Channel, Semi-Permanent						
SVC	TA 1131	S	D	S	D	
PVC	TA 1132	S	D	S	D	
Switched Access						
Via PSTN						
SVC	TA 1211				D	I
Via CSDN						
SVC	TA 1221				D	I
Via ISDN						
SVC	TA 1231	S		D	D	I
Digital Data Circuit						
Leased Line	TA 21	S	S	S	D	
Dial-Up (CSDN)	TA 22				D	
Analogue Telephone Circuit						
Leased Line	TA 31	S	S	S	D	
Dial-Up (PSTN)	TA 32				D	

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 3: WAN Profiling Activity: CLNS and Transport Class 4
over PSDN, Digital Circuit or Analogue Circuit

	ISP nr.	NST	TOP	USG	COS
Semi-Permanent Service					
B-Channel					
X.25 DTE-DTE	TA 4111	S	I	D	D
Circuit Mode Service					
B-Channel					
X.25 DTE-DTE	TA 4211	S	I	D	D
Packet Mode Service					
D-Channel					
VC	TA 4311	S	I	D	D
PVC	TA 4312	S	I	D	
B-Channel					
Semi-Perm.					
VC	TA 4321	S	I	D	D
PVC	TA 4322	S	I	D	
B-Channel					
Demand Access					
VC	TA 4331	S	I	D	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 4: WAN Profiling Activity: CLNS and Transport Class 4 over ISDN

	ISP nr.	NST	COS	FFP
PSDN				
Permanent Access				
PSTN Leased Line				
SVC	TB 1111	S	I	S
PVC	TB 1112			D
Digital Data Cct. / CSDN Leased Line				
SVC	TB 1121	S	I	S
PVC	TB 1122			D
ISDN B-Channel, Semi-Permanent				
SVC	TB 1131	S	I	D
PVC	TB 1132			D
Switched Access				
Via PSTN				
SVC	TB 1211			D
Via CSDN				
SVC	TB 1221			D
Via ISDN				
SVC	TB 1231	S	I	D
Digital Data Circuit				
Leased Line	TB 21	S	I	D
Dial-Up (CSDN)	TB 22			D
Analogue Telephone Circuit				
Leased Line	TB 31	S	I	D
Dial-Up (PSTN)	TB 32			D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 5: WAN Profiling Activity: CONS and Transport Classes (0,2,4) over PSDN, Digital Circuit or Analogue Circuit

	ISP nr.	NST	COS	FFP
Semi-Permanent Service				
B-Channel				
X.25 DTE-DTE	TB 4111	S	I	D
Circuit Mode Service				
B-Channel				
X.25 DTE-DTE	TB 4211	S	I	D
Packet Mode Service				
D-Channel				
VC	TB 4311	S	I	D
PVC	TB 4312	S		D
B-Channel				
Semi-Perm.				
VC	TB 4321	S	I	D
PVC	TB 4322	S		D
B-Channel				
Demand Access				
VC	TB 4331	S	I	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 6: WAN Profiling Activity: CONS and Transport Classes (0,2,4) over ISDN

	ISP nr.	NST	SPG	FFP
PSDN				
Permanent Access				
PSTN Leased Line				
SVC	TC 1111	S	S	S
PVC	TC 1112		S	D
Digital Data Cct. / CSDN Leased Line				
SVC	TC 1121	S	S	S
PVC	TC 1122		S	D
ISDN B-Channel, Semi-Permanent				
SVC	TC 1131	S		D
PVC	TC 1132			D
Switched Access				
Via PSTN				
SVC	TC 1211		S	D
Via CSDN				
SVC	TC 1221		S	D
Via ISDN				
SVC	TC 1231	S	I	D
Digital Data Circuit				
Leased Line	TC 21	S	S	D
Dial-Up (CSDN)	TC 22		S	D
Analogue Telephone Circuit				
Leased Line	TC 31	S	D	D
Dial-Up (PSTN)	TC 32		D	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 7: WAN Profiling Activity: CONS and Transport Classes (0,2) over PSDN, Digital Circuit or Analogue Circuit: Regional Workshops and Feeders Forum Members

	ISP nr.	C / C	ETS	UKG	FRG	SOS	INT
PSDN							
Permanent Access							
PSTN Leased Line							
SVC	TC 1111	S	S	S	S	S	S
PVC	TC 1112	S	S	S	S	S	
Digital Data Cct. / CSDN Leased Line							
SVC	TC 1121	S	S	S	S	S	S
PVC	TC 1122	S	S	S	S	S	
ISDN B-Channel, Semi-Permanent							
SVC	TC 1131	I	I				
PVC	TC 1132	I	I				
Switched Access							
Via PSTN							
SVC	TC 1211	S	S	I	S	I	
Via CSDN							
SVC	TC 1221	S	S	I	S	I	
Via ISDN							
SVC	TC 1231	I	I	I		I	
Digital Data Circuit							
Leased Line	TC 21	S	S	S	S		S
Dial-Up (CSDN)	TC 22	S	S		S	S	S
Analogue Telephone Circuit							
Leased Line	TC 31	I	D	S	S		S
Dial-Up (PSTN)	TC 32	I	D		S		S

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 8: WAN Profiling Activity: CONS and Transport Classes (0,2) over PSDN, Digital Circuit or Analogue Circuit: Others

	ISP nr.	NST	SPG	C / C	ETS	UKG	FFP
Semi-Permanent Service							
B-Channel							
X.25 DTE-DTE	TC 4111	S	I	D	S	I	D
Circuit Mode Service							
B-Channel							
X.25 DTE-DTE	TC 4211	S	D	D	S	I	D
Packet Mode Service							
D-Channel							
VC	TC 4311	S	I	I	I	I	D
PVC	TC 4312	S	I	I	I	I	D
B-Channel							
Semi-Perm.							
VC	TC 4321	S	I	I	I	I	D
PVC	TC 4322	S	I	I	I	I	D
B-Channel							
Demand Access							
VC	TC 4331	S	I	I	I	I	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 9: WAN Profiling Activity: CONS and Transport Classes (0,2) over ISDN

	ISP nr.	NST	SPG	COS	FFP
PSDN					
Permanent Access					
PSTN Leased Line					
SVC	TD 1111	S	S	I	S
PVC	TD 1112		S		D
Digital Data Cct. / CSDN Leased Line					
SVC	TD 1121	S	S	I	S
PVC	TD 1122		S		D
ISDN B-Channel, Semi-Permanent					
SVC	TD 1131	S		I	D
PVC	TD 1132				D
Switched Access					
Via PSTN					
SVC	TD 1211		S		D
Via CSDN					
SVC	TD 1221		S		D
Via ISDN					
SVC	TD 1231	S	I	I	D
Digital Data Circuit					
Leased Line	TD 21	S	S	I	D
Dial-Up (CSDN)	TD 22		S		D
Analogue Telephone Circuit					
Leased Line	TD 31	S	D	I	D
Dial-Up (PSTN)	TD 32		D		D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 10: WAN Profiling Activity: CONS and Transport Classes (0) over PSDN, Digital Circuit or Analogue Circuit: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C/C	ETS	UKG	FRG	INT
PSDN							
Permanent Access							
PSTN Leased Line							
SVC	TD 1111	S	S	S	S	S	S
PVC	TD 1112		S	S	S	S	
Digital Data Cct. / CSDN Leased Line							
SVC	TD 1121	S	S	S	S	S	S
PVC	TD 1122		S	S	S	S	
ISDN B-Channel, Semi-Permanent							
SVC	TD 1131	S	I	I			
PVC	TD 1132		I	I			
Switched Access							
Via PSTN							
SVC	TD 1211		S	S		S	
Via CSDN							
SVC	TD 1221		S	S		S	
Via ISDN							
SVC	TD 1231	D	I	I			
Digital Data Circuit							
Leased Line	TD 21	S	S	S	S	S	S
Dial-Up (CSDN)	TD 22		S	S		S	S
Analogue Telephone Circuit							
Leased Line	TD 31	S	I	D	S	S	S
Dial-Up (PSTN)	TD 32		I	D		S	S

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 11: WAN Profiling Activity: CONS and Transport Classes (0) over PSDN, Digital Circuit or Analogue Circuit: Others

	ISP nr.	NST	USG	SPG	C / C	ETS	UKG	COS	FFP
Semi-Permanent Service									
B-Channel									
X.25 DTE-DTE	TD 4111	S	D	I	D	S	I	I	D
Circuit Mode Service									
B-Channel									
X.25 DTE-DTE	TD 4211	S	D	D	D	S	I	I	D
Packet Mode Service									
D-Channel									
VC	TD 4311	S	D	I	I	I	I	I	D
PVC	TD 4312	S	D	I	I	I	I		D
B-Channel									
Semi-Perm.									
VC	TD 4321	S	D	I	I	I	I	I	D
PVC	TD 4322	S	D	I	I	I	I		D
B-Channel									
Demand Access									
VC	TD 4331	S	D	I	I	I	I	I	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 12: WAN Profiling Activity: CONS and Transport Classes (0) over ISDN

	ISP nr.	FFP
PSDN		
Permanent Access		
PSTN Leased Line		
SVC	TE 1111	S
PVC	TE 1112	D
Digital Data Cct. / CSDN Leased Line		
SVC	TE 1121	S
PVC	TE 1122	D
ISDN B-Channel, Semi-Permanent		
SVC	TE 1131	D
PVC	TE 1132	D
Switched Access		
Via PSTN		
SVC	TE 1211	D
Via CSDN		
SVC	TE 1221	D
Via ISDN		
SVC	TE 1231	D
Digital Data Circuit		
Leased Line	TE 21	D
Dial-Up (CSDN)	TE 22	D
Analogue Telephone Circuit		
Leased Line	TE 31	D
Dial-Up (PSTN)	TE 32	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 13: WAN Profiling Activity: CONS and Transport Classes (2) over PSDN, Digital Circuit or Analogue Circuit

	ISP nr.	FFP
Semi-Permanent Service		
B-Channel		
X.25 DTE-DTE	TE 4111	D
Circuit Mode Service		
B-Channel		
X.25 DTE-DTE	TE 4211	D
Packet Mode Service		
D-Channel		
VC	TE 4311	D
PVC	TE 4312	D
B-Channel		
Semi-Perm.		
VC	TE 4321	D
PVC	TE 4322	D
B-Channel		
Demand Access		
VC	TE 4331	D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 14: WAN Profiling Activity: CONS and Transport Classes (2) over ISDN

	ISP nr.	SPG	C/C	ETS	SOS
PSDN					
Permanent Access					
SVC	N/A	S	S	S	
PVC	N/A	S	S	S	
Switched Access					
Via PSTN					
SVC	N/A	S	S	S	
Via CSDN					
SVC	N/A	S	S	S	
Digital Data Circuit					
Leased Line	N/A	S	S	S	
Dial-Up (CSDN)	N/A	S	S	S	S
Analogue Telephone Circuit					
Leased Line	N/A	D	I	D	
Dial-Up (PSTN)	N/A	D	I	D	

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 15: WAN Profiling Activity: T.70

The NIST Implementors Workshop agreements cover the connection oriented approach as well as the connectionless approach. Over the Connection Oriented Network Service they allow any of the following combinations of transport protocol classes: (0), (0,2), (0,2,4). Support of the 1980 version of X.25 is covered in addition to the recommended use of the 1984 version. For ISDN, NIST specifically permits connection at the U reference point as well as at the S/T reference points.

TOP and US GOSIP recommend use of the Connectionless Network Service only. However, US GOSIP also allows the Connection Oriented Network Service plus Transport Class 0 as an option, purely for use in accessing public message handling services. US GOSIP is considering support for transport class 2 in future versions, for interworking with European systems.

MAP is not concerned with wide area networking and does not have a WAN profile (although it gives guidance on interfacing to X.25 wide area networks).

INTAP specifies Transport Classes 0 and 2 over packet switched networks and switched or permanent analogue and digital point-to-point links. In addition, it is working on specifications for ISDN.

SPAG, CEN/CENELEC, ETSI, UK GOSIP and French GOSIP support the connection oriented approach only, with transport protocol class combinations (0,2) and, in some cases, (0). They also cover use of the 1980 version of X.25 in addition to the preferred use of the 1984 version. ISDN profiles are beginning to emerge, with the creation of draft ENVs 41101 (covering TC/TD 4111 functionality) and 41102 (covering TC/TD 4211 functionality).

SOSIP supports the connection oriented approach with Transport Classes (0,2). It also includes use of the connectionless approach by two end-systems where one is connected to a LAN and the other to a WAN (the connection-oriented approach is to be used where both end-systems are connected to a WAN).

SPAG has defined a number of profiles providing the Connection Oriented Transport Service over the Connection Oriented Network Service in accordance with CCITT standard T.70. This standard defines a subset of the ISO transport protocol (class 0) and its use of the X.25 network layer protocol. It is intended for use by telematic services. CEN / CENELEC has issued most of these profiles as ENVs, and ETSI has responsibility for them. SOSIP covers use of T.70 over X.21 CSDNs. (See table 15). French GOSIP mentions the requirement to use T.70 but says that systems must conform to the requirements of the particular telematic services to which they are connected: French GOSIP therefore does not specify T.70 profiles.

In addition to the profiles shown in table 7, SPAG also defines ‘‘lightweight’’ profiles for operation over permanent and switched analogue and digital circuits. These provide the Connection Oriented Transport Service using transport protocol classes (0,2) but over a simplified stack of lower layer protocols that do not provide the ISO network service. These profiles are stable. They are not proposed by SPAG as European or international standards and have not been taken up by other profiling bodies.

The types of network covered by each set of profiles are shown in tables 3 to 15.

COS has produced a profile (working from the NIST Implementors Forum agreements) for Transport Class 4 and connectionless network service over packet switched networks.

It was submitted before the latest changes to the ISO taxonomy as TA 111. The profiles it covers in the new taxonomy are TA 1111 and TA 1121. In addition to the part that is specific to TA 11x1, there is a general part applicable to all TA profiles.

As part of its Feeders Forum activities, POSI has edited profiles for connection-oriented network service over packet switched networks, and submitted them to ISO as PDISPs.

They were submitted before the latest changes to the ISO taxonomy as TB 111, TC 111, TD 111 and TE 111. The profiles they cover in the new taxonomy are TB 1111, TB 1121, TC 1111, TC 1121, TD 1111, TD 1121, TE 1111 and TE 1121. Again, there are general parts applicable to all TB, TC, TD and TE profiles in addition to the parts specific to individual profiles.

These COS and POSI profiles have been harmonised in the ISO Feeders Forum and submitted to ISO. A large number of comments have been received at review - largely concerned with editorial rather than technical aspects. It is yet to be determined how much revision will be required before they can be submitted to ballot.

Compatibility

The MAP, TOP and US GOSIP profiles are based on NIST. They are compatible with the NIST CLNS profiles and interworking should be possible.

The SPAG, CEN / CENELEC and ETSI profiles can be regarded as a single set. The UK GOSIP profile is based on the CEN / CENELEC standards and is largely compatible with them. French GOSIP and SOSIP reference them.

The NIST and US GOSIP connection-oriented approach profiles appear to be broadly compatible with those of SPAG, CEN / CENELEC and UK GOSIP. Interworking should be possible since the connection oriented approach is permitted by US GOSIP specifically to allow interworking with public MHS systems (which can be expected to be CEN / CENELEC compliant). However, the method chosen by NIST to support CONS over X.25 1980 is not compatible with that chosen by CEN / CENELEC and UK GOSIP.

None of the CONS profiles are compatible with any of the CLNS profiles.

Other than for the Feeders Forum profiles edited by POSI, the profiling organisations have not yet defined separate profiles for the ISO groups TB, TC and TD. They simply allow the protocol class combinations (0,2,4), (0,2) and (0) as options within their profiles. There is some compatibility between these options (since a system supporting (0,2,4) also supports (0,2) and so on).

3.2.4 Relays

Relays enable different types of network to be connected together by providing protocol conversion at the data link, network and possibly transport layers. Whether transport layer protocol conversion can ever be validly performed within the framework of the OSI model has long been, and still is, a subject of debate.

Relays are not concerned with the operation of end-systems. They are outside the main scope of this specification and will therefore not be discussed in detail.

Tables 16 and 17 show the main areas covered by current relay profiling work.

	ISP nr.	NST	MAP	TOP	SPG	EWO	COS
Tr. Cl. 4 and CLNS							
on both sides							
(CLNS Relay)						I	
PSDN connected to PSDN	RA1.1	S					I
PSDN connected to LAN	RA1.5	S		S			I
ISDN connected to PSDN,							
LAN or ISDN	RA4.x	S					I
LAN connected to LAN	RA5.5	S	S	S	D		I
Tr. Cl. 4 carried between							
two CLNS LANs							
over a CONS WAN					D		
Tr. Cl. 0,2 and CONS							
on both sides							
(CONS Relay)							
PSDN connected to PSDN	RB1.1						
PSDN connected to LAN	RB1.5						
ISDN connected to PSDN,							
LAN or ISDN	RB4.x						
LAN connected to LAN	RB5.5						
Tr. Cl. 0,2 and CONS							
on both sides							
(X.25 Relay)						I	
PSDN connected to PSDN	RC1.1	S					
PSDN connected to LAN	RC1.5	S					
ISDN connected to PSDN,							
LAN or ISDN	RC4.x	S					
LAN connected to LAN	RC5.5	S					
Tr. Cl. 4 and CLNS							
connected to							
Tr. Cl. 0,2 and CONS	RZ						
PSDN connected to PSDN							
CLNS PSDN + CONS LAN							
CLNS LAN + CONS PSDN					S		
LAN connected to LAN							

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 16: Relay Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C/C	UKG	FRG	SOS	INT
Tr. Cl. 4 and CLNS on both sides (CLNS Relay)							
PSDN connected to PSDN	RA1.1	S	I				
PSDN connected to LAN	RA1.5	S	I	S		S	
ISDN connected to PSDN, LAN or ISDN	RA4.x						
LAN connected to LAN	RA5.5	S	I	S		S	
Tr. Cl. 4 carried between two CLNS LANs over a CONS WAN			I			S	S
Tr. Cl. 0,2 and CONS on both sides (CONS Relay)							
PSDN connected to PSDN	RB1.1		I	S	S		
PSDN connected to LAN	RB1.5		I	S			
ISDN connected to PSDN, LAN or ISDN	RB4.x						
LAN connected to LAN	RB5.5		I	S			
Tr. Cl. 0,2 and CONS on both sides (X.25 Relay)							
PSDN connected to PSDN	RC1.1		I	S	S		
PSDN connected to LAN	RC1.5		I	S			
ISDN connected to PSDN, LAN or ISDN	RC4.x						
LAN connected to LAN	RC5.5		I	S			
Tr. Cl. 4 and CLNS connected to Tr. Cl. 0,2 and CONS	RZ						
PSDN connected to PSDN				S			
CLNS PSDN + CONS LAN				S			
CLNS LAN + CONS PSDN				S	S	S	S
LAN connected to LAN				S	S		

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 17: Relay Profiling Activity: Other

Several profiling organisations (for example, TOP and UK GOSIP) also mention the possibility of using LAN bridges (which include MAC Layer Relays - RD/RE 5x.5x). In general, these appear transparent to the end-systems and are not discussed in the profile documents in any detail.

For each profiling organisation, the protocols and options supported on each side of a relay are generally similar to those supported over the same type of network by the organisation's LAN or WAN profiles. The exceptions are the ''Tr. Cl. 4 carried between two CLNS LANs over a CONS WAN'' profiles of SPAG, CEN / CENELEC, SOSIP and INTAP and the PSDN side of the ''Tr. Cl. 4 and CLNS on both sides, PSDN connected to LAN'' profile of SOSIP. With these exceptions, compatibility considerations for relays are thus the same as those for the LAN and WAN profiles.

3.2.5 Connectionless Transport Service Profiles

Both the ISO and the CEN / CENELEC classifications include categories for telecommunications profiles providing the connectionless transport service (U-profiles in both schemes). They also distinguish between profiles which use the connectionless network service (UA-profiles) and profiles which use the connection-oriented network service (UB-profiles).

The NIST Implementors Forum has produced some stable material covering provision of the connectionless transport service using the connectionless network service (UA-profiles). This material could be used in conjunction with the Implementors Forum agreements for the network, and lower layers covering a wide range of network types, as shown in the tables in previous subsections of this section. Thus there are now stable NIST profiles for connectionless transport service and the connectionless network service over the following:

- UA 51 - CSMA / CD LANs
- UA 52 - Token Bus LANs
- UA 53 - Token Ring LANs
- UA 111 - PSDN, permanent access, SVC
- UA 112 - PSDN, permanent access, PVC
- UA 1231 - PSDN, switched access via ISDN
- UA 21 - Digital Data Circuit (leased line)
- UA 31 - Analogue Telephone Circuit (leased line)
- UA 4xxx - ISDN basic access, semi-permanent, circuit switched or packet switched

The draft version 2.0 of US GOSIP makes provision of the connectionless transport service an option and refers to the NIST implementation agreements.

EWOS has identified a possible need to produce connectionless transport service profiles also.

3.3 APPLICATIONS PROFILES

This section compares OSI applications profiles.

These are the profiles that include functionality in ISO groups Axx (applications profiles requiring Connection Oriented Transport Service) and Bxx (applications requiring Connectionless Transport Service). However, there is as yet no stable material for any Bxx profile, so the comparison covers only applications that require connection oriented transport.

The specification concentrates on FTAM, MHS, VT and associated presentation and session layers. There is a subsection for each of FTAM, MHS and VT. Other applications profiles are summarised in a fourth subsection. The fifth and final subsection summarises use of ASEs, presentation services and session services.

3.3.1 File Transfer, Access and Management (FTAM)

Functionality

FTAM enables an application on one end-system to:

- transfer all or part of a file to or from another end-system (file transfer),
- inspect, modify, replace or erase part of the contents of a file resident on another end-system (file access), and
- create or delete a file and read or modify the attributes of a file resident on another end-system (file management).

The file may be regarded as:

- unstructured - a single unit of data which can only be manipulated as a whole,
- flat - a set of data units which can be manipulated individually but each of which can only be manipulated as a whole, or
- hierarchical - a set of data units, each of which can be further decomposed into smaller units, possibly with many levels of decomposition, such that each unit at any level can be manipulated individually.

Note that this is a simplification of the ISO definitions; refer to ISO 8571 for full details.

These three types do not correspond exactly to all the file types encountered in real computer systems. FTAM has a concept of Virtual Filestore which is an abstract model that can be used to describe real filestores and actions performed on them. Each implementor of FTAM must map the characteristics of his real filestore onto those of the FTAM virtual filestore in order to define what the FTAM operations will do in his implementation.

In addition, a number of standard document types are defined. They include types such as ‘‘unstructured text’’ and ‘‘sequential binary’’. They consist of pre-defined formal descriptions of virtual filestore members corresponding to commonly encountered or particularly useful types of real file. It is intended that the set of document types may be expanded as further common or useful types are identified.

Base Standards

FTAM is covered by ISO 8751. The first four parts of this are stable (at IS status) and cover:

- General Introduction
- Virtual Filestore
- File Service Definition
- File Protocol Specification

There is a fifth part - PICS proforma - at DIS stage.

ISO Profile Classification

The ISO classification is similar to earlier classifications by SPAG, NIST and INTAP. Table 18 shows the ISO classification and the correspondence between ISO, SPAG, NIST and INTAP profile identifiers. (The SPAG profile identifiers are also used by CEN / CENELEC and EWOS. The NIST identifiers are also used by MAP, TOP and US GOSIP).

	ISO	SPAG	NIST	INTAP
File Transfer Service				
Simple				
(unstructured files)	AFT 11	A / 111	T1	AP.111
Positional				
(flat files)	AFT 12	A / 112	T2	AP.112
Full				
(hierarchical files)	AFT 13	A / 113	T3	
File Access Service				
Simple				
(flat files)	AFT 22	A / 122	A1	AP.122
Full				
(hierarchical files)	AFT 23	A / 123	A2	
File Management Service	AFT 3	A / 13	M1	AP.13

Table 18: FTAM Profile Classifications

Existing Profiles

Tables 19 and 20 show the areas covered by current profiling activity.

	ISP nr.	NST	MAP	TOP	SPG	EWO	COS
File Transfer Service							
Simple (Unstructured)	AFT 11	S	S	S	S	S	I
Positional (Flat)	AFT 12	S	S	S	S	S	
Full (Hierarchical)	AFT 13	S	S	S	D		
File Access Service							
Positional (Flat)	AFT 22	S	S	S	S	S	
Full (Hierarchical)	AFT 23	S	S	S	D		
File Management Service	AFT 3	S	S	S	S	S	I

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 19: FTAM Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C/C	UKG	FRG	SOS	INT
File Transfer Service							
Simple (Unstructured)	AFT 11	S	S	S	S	S	S
Positional (Flat)	AFT 12	S	S	S			D
Full (Hierarchical)	AFT 13	S	I				
File Access Service							
Positional (Flat)	AFT 22	S	S	S		S	D
Full (Hierarchical)	AFT 23	S	I				
File Management Service	AFT 3	S	S	S			D

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 20: FTAM Profiling Activity: Others

The NIST Implementors Workshop has produced stable material covering the whole of the FTAM functionality of the ISO profile classification. This is used, with certain individual qualifications and restrictions, by the MAP, TOP and US GOSIP profiles.

In fact, NIST has produced three versions of the profiles: phase 1, phase 2 and phase 3. The phase 2 and phase 3 versions are based on the FTAM International Standard (IS). The previous (phase 1) version was based on a draft proposal for the standard (dated April 1985). This version is not compatible with the other two versions and is no longer current.

The phase 3 profiles are enhancements of the phase 2 ones. They are largely upwards compatible; the main exception is that the phase 2 file access profiles (A1 and A2) require file transfer functionality to be included, but the corresponding phase 3 profiles do not. Interworking between phase 2 and phase 3 profiles should be possible provided that the additional features of the phase 3 profiles are not used.

It should be noted that:

- the NIST phase 2 file access profiles include the file transfer functionality,
- the file transfer and file access profiles optionally include limited file management, and
- NIST defines a number of specific document types.

SPAG has produced stable profiles covering all ISP groups except full file transfer and access (AFT 13 and AFT 23). One of these (simple file transfer) has been adopted, with minor changes, by CEN / CENELEC as an ENV. After harmonisation among AOW, EWOS and NIST it has now been submitted to ISO as proposed draft ISP AFT 11. The others have been revised by EWOS, have become stable EWOS documents and are being submitted to CEN / CENELEC for adoption as ENVs. EWOS has also revised the simple file transfer ENV and is submitting the revision to CEN / CENELEC and ISO.

It should be noted that most of the SPAG, CEN / CENELEC and EWOS profiles include more than the bare functionality implied by their titles. The file transfer profiles also include as options the ability to create and delete files and to read file attributes. The file access profiles also include all the functionality of the file transfer profiles.

UK GOSIP has defined a profile that includes simple file transfer, positional file transfer, positional file access and file management. It is broadly compatible with (but not identical to) EWOS profiles A / 111, A / 112, A / 122 and A / 13.

French GOSIP requires only simple file transfer (as in ENV 41204). It recommends that limited file management should be included.

SOSIP requires Simple File Transfer and Positional File Access in accordance with the CEN / CENELEC profiles, but also requires support for the NIST implementation agreements and specifically for the relevant NIST document types.

ASEs, Presentation Layer and Session Layer

The FTAM protocol base standard (ISO 8571 / 4) specifies use of:

- ACSE - Associate, Release and Abort,
- presentation - kernel and duplex plus optionally resynchronise, sync-minor, context management and typed data functional units, and
- session - kernel and duplex plus optionally resynchronise, sync-minor and typed data functional units.

This specification is fairly detailed but does leave some scope for variations in different implementations.

The profiles all require the presentation kernel functional unit, and session kernel and duplex functional units. Minor synchronise and re-synchronise session functional units are also required if FTAM recovery or restart is supported. There are however some differences of detail between the requirements of different profiles (for example, NIST allows only the ‘‘abandon’’ re-synchronise type value but SPAG allows ‘‘abandon’’ or ‘‘restart’’).

Compatibility

The FTAM profiles are all largely compatible. Interworking between them should be possible to some extent. This applies both:

- between profiles produced by different organisations, and
- between different profiles of the same organisation.

Compatibility between profiles of different organisations is due to the efforts which those organisations have made to make their profiles compatible. There are, however, some differences. These include both differences of functionality and of implementation.

An example of a functional difference is that UK GOSIP simple file transfer requires support of file creation and deletion, but support for these is optional in the SPAG profile. An example of an implementation difference is that SPAG allows session resynchronise (restart) but NIST does not.

These differences should not prevent interworking.

Compatibility between different profiles of the same organisation comes about because of the following facts:

- An ‘‘unstructured’’ file is a particular case of a ‘‘flat’’ file, which in turn is a particular case of a ‘‘hierarchical’’ file. Hence AFT 11 is a subset of AFT 12, which in turn is a subset of AFT 13. AFT 22 is a subset of AFT 23.
- Transfer, access and management are three different functions. They do not conflict in their use of ASEs or of presentation services. Hence, all three can coexist in the same implementation.

Note that a harmonised profile AFT 11 has now been created and submitted to ISO as described above.

Use by Applications

File manipulation is essential to most applications. FTAM provides a means by which files can be manipulated in a distributed environment. It does so within the context of the OSI model and is recognised by the OSI movement. Use of FTAM will therefore be required by many applications that reside in distributed environments within the OSI framework.

3.3.2 Message Handling Services (MHS)

Functionality

The Message Handling standards are concerned with the protocols to be used between end-systems for electronic messaging. They also deal with access for messaging to other communications services - telex, teletex and the ordinary non-electronic mail.

At present, the type of messaging covered by standards that have been ratified by CCITT and ISO is inter-personal messaging (IPM). This is electronic mail exchanged between the human users of computer systems. Work is proceeding on the extension of the base standards to include Electronic Data Interchange (EDI), in particular for interchange of Trade Data (orders, delivery advices, invoices, etc.). Some profiling organisations have done work on interim profiles for EDI Messaging (EDIM) for use until the base standards are mature.

Inter-personal and EDI messaging involves information interchange between the following types of conceptual object (each object could be realised in a separate end-system or several objects could be realised within the same end system).

- User Agent (UA) - allows users to input messages and delivers messages to users, can be an IPM UA or an EDI UA.
- Message Store (MS) - holds incoming messages for users and allows users to retrieve them selectively.
- Message Transfer Agent (MTA) - provides the Message Transfer Service (MTS), accepting messages from UAs, storing them and forwarding them to their destination UAs, MSs or to other MTAs.

The protocols defined to enable these objects to exchange information are:

- P1 - for information transfer between MTAs,
- P3 - for information transfer between MTAs and UAs or MTAs and MSs,
- P7 - for information transfer between MSs and UAs,
- P2 - carried within P1, P3 and P7, P2 allows IPM UAs to exchange information, and
- PEDI - carried within P1, P3 and P7, PEDI allows EDI UAs to exchange information.

Base Standards

The Message Handling base standards are the CCITT X.400 series of recommendations and the ISO MOTIS standards (DIS 10021).

The X.400 recommendations were first issued in 1984. They were followed by MOTIS standards that were based on them. However, in 1987 ISO decided to stop progressing these documents and to work on standards harmonised with new CCITT work instead. This resulted in the 1988 versions of X.400 and MOTIS, produced together by cooperation between CCITT and ISO.

The 1988 versions of X.400 and MOTIS are almost identical. The most important difference is that the X.400 recommendations are intended to apply to public message handling services (and their interconnection to private systems) while MOTIS covers interconnection between private message handling systems as well. However, there are unfortunately some substantial differences between the 1984 version of the X.400 recommendations (and the early version of MOTIS) and the 1988 joint X.400 / MOTIS standards.

The 1988 revision of X.400 included addition of the Message Store and P7, which were not present in the 1984 version. It also included changes in the use of Application Service

Elements and in the use of session and presentation layers.

ISO Profile Classification

In the ISO classification of ISPs, profiles are identified for:

- Common Facilities
- Inter-Personal Messaging Service
- EDI Messaging Service

The ‘‘Common Facilities’’ profiles (AMH 1x) cover:

- MTA and MTS,
- UA to MS (P7), and
- UA or MS to MTA (P3).

It is intended that they should be referenced by the other profiles. So, for example, profile AMH 21 (IPM End System to IPM End System - P2 over P1) should reference profile AMH 11 (MTA and MTS).

All profiles, except one, use 1988 versions of the base standards. The exception is AMH 24 - IPM End System to IPM End System, P2(1984) over P1 (1984) - which uses the 1984 versions.

The 1988 revision of the standards did not include definition of the PEDI protocol. Those profiles that cover EDI generally specify interim solutions using P1, and possibly also P2, rather than PEDI.

In addition to information interchange between end-systems, there are profiles defined by some organisations for information interchange between end-systems and messaging communications services (telex, etc.). These are not covered by the ISP classification.

Existing Profiles

Tables 21 and 22 show the areas covered by work on message handling profiles within the various profiling organisations.

	ISP nr.	NST	TOP	SPG	EWO	COS
Common Facilities						
MTA and MTS	AMH 11	S	I	I	D	
UA to MS (P7)	AMH 12	S			D	
UA or MS to MTA (P3)	AMH 13	S				
Inter-Personal Messaging Service						
IPM ES to IPM ES (P2 over P1)	AMH 21	S	I	I		
IPM UA to IPM MS (P2 over P7)	AMH 22	S		D		
IPM UA or MS to MTA (P2 over P3)	AMH 23	S				
IPM ES to IPM ES (P2 (1984) over P1 (1984)	AMH 24	S	S	S		S
EDI Messaging Service						
EDIM ES to EDIM ES (PEDI over P1)	AMH 31					
EDIM UA to EDIM MS (PEDI over P7)	AMH 32					
EDIM UA or MS to MTA (PEDI over P3)	AMH 33					
Not using PEDI	N/A	S	I			
Telex Access	N/A			I		
Teletex Access	N/A			D		

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 21: MHS Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C / C	ETS	UKG	FRG	SOS	INT
Common Facilities								
MTA and MTS	AMH 11	I	I	I	D		I	S
UA to MS (P7)	AMH 12	I	I	I	D			D
UA or MS to MTA (P3)	AMH 13		I	I	D			
Inter-Personal Messaging Service								
IPM ES to IPM ES (P2 over P1)	AMH 21	I	I		D		I	S
IPM UA to IPM MS (P2 over P7)	AMH 22	I	I	I	D			D
IPM UA or MS to MTA (P2 over P3)	AMH 23		I	I	D			
IPM ES to IPM ES (P2 (1984) over P1 (1984)	AMH 24	S	S	S	S	S	S	S
EDI Messaging Service								
EDIM ES to EDIM ES (PEDI over P1)	AMH 31		I	I	I		I	
EDIM UA to EDIM MS (PEDI over P7)	AMH 32		I		I			
EDIM UA or MS to MTA (PEDI over P3)	AMH 33		I		I			
Not using PEDI	N / A				S			
Telex Access	N / A			I				
Teletex Access	N / A		I	I				
Physical Delivery System Access	N / A			I				

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 22: MHS Profiling Activity: Others

There are stable profiles from most organisations for communication between MTAs using the 1984 versions of the standards. Separate profiles are being produced using the 1988 versions, but only the NIST and INTAP ones are currently stable. (The UK GOSIP 1988 MHS material is extensive and detailed, but is regarded as provisional because of the possible future need to align with other profiles that are still being developed.) There is also work going on with profiles for MTS access, for MS access and for access to the telex and teletex services.

NIST has defined an EDI Message Handling profile which is an extension of the NIST Message Handling profile, using either the 1984 version or the 1988 version of the base standards. UK GOSIP indicates two alternative methods of handling EDI messaging. One of these is similar to the NIST profile in its use of X.400 standards, but uses different standards for the EDI data formats (EDIFACT instead of ANSI X.12). Both the NIST and the UK GOSIP EDI messaging profiles must be considered as interim solutions only, to be superseded when EDI Messaging base standards appear.

ASEs, Presentation Layer and Session Layer

This is an area where there is considerable difference between the 1984 and 1988 base standards.

The CCITT 1984 standards include X.410, Remote Operations and Reliable Transfer Server, which defines a set of ASEs and the use of the session layer. In doing so, it implicitly defines a minimal presentation service. All message handling profiles based on X.400 1984 conform to this standard.

The CCITT 1988 standards use the Association Control Service Elements (ACSE - X.217), Reliable Transfer Service Elements (RTSE - X.218), Remote Operations Service Elements (ROSE - X.219) and the OSI presentation service (X.216). These are not compatible with X.410 (1984) but include an ''X.410 1984 mode'' which allows interworking with X.410 (1984) compliant systems.

The 1984 versions of the ''P1 + P2'' profiles (AMH 24) use the Reliable Transfer Server of X.410. The 1988 versions of the ''MTA and MTS'' profiles (AMH 11) will use ACSE and RTSE. The other ''Common Facilities'' 1988 profiles (AMH 12 and AMH 13) will also use ROSE. The ISO AMH 11 and AMH 12 profiles may include use of both X.410 1984 mode and normal mode.

At the session layer, the kernel, half duplex, minor synchronise, exceptions and activity management session functional units are used.

CCITT recommendation X.410 (1984) specifies constraints at the transport layer. In particular, it requires support of transport protocol class 0. In recognition of this, the ISO definition of AMH 24 allows it to include constraints at the transport layer. (This is an exception to the rule that applications profiles specify constraints at session, presentation and application layers only.)

Compatibility

The TOP and US GOSIP profiles do not themselves contain technical content, but reference the NIST profile. Certain areas have been expanded in the TOP profile so that TOP provides a slightly tighter specification than NIST does.

The SPAG profiles do not contain technical content, but reference the CEN / CENELEC profiles. There are two of these: ENV 41201 which covers interworking between private messaging systems, and ENV 41202 which applies where at least one of the systems is a public messaging service. They are not the same as the NIST profiles, but they are sufficiently similar that interworking between NIST and CEN / CENELEC compliant systems is possible under certain constraints (they are listed in the SPAG GUS).

The UK GOSIP 1984 MHS profile is primarily based on the NIST profile. In general, it requires support of more services than either NIST or CEN / CENELEC. GOSIP compliant systems should be capable of interworking to some extent with either NIST or CEN / CENELEC compliant systems.

French GOSIP and SOSIP reference the CEN / CENELEC profiles.

There is thus a reasonable degree of compatibility between these profiles. Detailed comparisons can be found in the NIST Stable Implementation agreements and in UK GOSIP.

A compatibility problem does, however, exist between AMH 11 / AMH 21 and AMH 24. These profiles cover similar functionality but provide it in different ways, using different standards and options for Application Service Elements and at the presentation and session layers. Indeed, the differences go deeper. AMH 24 has implications at the transport layer, but the class of transport protocol is not constrained in AMH 11.

Use by Applications

AMH 24 or AMH 21 profiles could be used for communications between applications programs. There are some instances of use of AMH 24, notably for trade data interchange, as in the NIST and UK GOSIP EDI Messaging profiles. However, once the EDI Messaging base standards appear, they will be more appropriate for program-to-program messaging than will the 1984 or 1988 versions of X.400. Hence, profiles based on these future standards will be more appropriate for program-to-program messaging than profiles within the currently defined ISO categories.

The AMH 23 profile - or even AMH 22 - could be used to enable applications programs to interface to X.400 Message Handling systems. Such use would, from the point of view of most applications developers, be a more restrictive alternative to use of AMH 21. However, there are some applications for which this alternative would be desirable. Word processing and Office Automation applications, in particular, might require use of AMH 22 or AMH 23.

Use of the telex or teletex access profiles by applications is possible, but it is hard to see why a developer would write an application to simulate a telex or teletex terminal when other interfaces, such as those covered by AMH 21, AMH 22 or AMH 23, are available.

3.3.3 Virtual Terminal (VT)

Functionality

The Virtual Terminal standards cover the communications between two end systems when terminals attached to one end-system access applications running on the other (a situation similar to that obtained using rlogin in some versions of the UNIX[1] operating systems and their derivatives). These communications use the Virtual Terminal Protocol (VTP).

A part of the Virtual Terminal concept is that it should be possible to write applications in a way that does not assume a particular type of terminal.

This means that either the application must be written using the Virtual Terminal Service or the features of the terminal assumed by the application must be mapped onto the

1. UNIX is a registered trademark of AT&T.

Virtual Terminal Service. The ISO Virtual Terminal Service is very general and such a mapping is possible with most types of terminal, other than (at present) specialist graphics terminals.

It also means that the Virtual Terminal Service must be mapped in the terminal end-system onto the characteristics of the physical terminal. This is only feasible within limits, for example it is clearly not very practical to map cursor screen movements onto a teletype.

Base Standards

The OSI Virtual Terminal base standards are:

- ISO 9040 (Virtual Terminal Service), and
- ISO 9041 (Virtual Terminal Protocol).

The content of these standards has now been agreed by the technical committees but the text has not yet been published as DISs.

It was originally intended to define several classes of virtual terminal, including a basic class and a forms class. The standards currently cover the basic class. A forms capability has been incorporated in the basic class and is included. Other types of terminal (such as graphics) are not yet covered.

The Virtual Terminal standards specify the interface in terms of updates to abstract objects. For example, there is a display object which represents the screen on a real terminal. Each of these objects can be configured in various different ways (for example, the screen display object could have one, two or three dimensions). Configuring different objects in different ways allows different types of real terminal to be catered for. (A glass teletype would have a one-dimensional screen, while a terminal with a paged display would have a three-dimensional screen, for example.)

Two modes of virtual terminal service are defined: asynchronous and synchronous. (These have nothing to do with the distinction between asynchronous and synchronous modem communications.) In asynchronous mode, there are two display objects (input and output) which are updated independently. In this mode, the Virtual Terminal Service can be mapped easily onto terminals like the DEC VT-100. In synchronous mode there is only a single display object. In this mode, the Virtual Terminal Service can be mapped easily onto terminals like the IBM 3270.

Because the base standard has all these options, for procurement purposes it will be necessary to specify a particular profile in order to indicate the required functionality. If just ‘‘ISO 9040/9041’’ were specified then, for example, a user with IBM 3270 terminals might end up with a system which worked only in asynchronous mode.

Note that the term ‘‘profile’’ has a particular meaning in the context of Virtual Terminal standards. However, it is not used with that meaning here. It has the same meaning here as elsewhere in this specification.

ISO Profile Classification

The ISO classification distinguishes first of all between basic class asynchronous mode profiles (AVT 1x) and basic class synchronous mode profiles (AVT 2x). This clearly leaves room for other terminal classes, such as graphics, to be added.

The basic class asynchronous mode profiles are:

- Default
- Telnet (provides DARPA Telnet terminal functionality)
- Line Scroll
- Paged
- CCITT X.3 PAD Interworking
- Transparent (this profile supports the exchange of uninterpreted sequences of characters)
- Enhanced Line Scroll
- Enhanced Paged

The synchronous mode profiles are:

- Default
- Forms
- Paged
- Enhanced Forms
- Enhanced Paged

Both modes have a default profile. However, an implementation will generally support at least one other profile in addition to the default.

The ‘‘enhanced’’ entries are place holders for the addition of facilities (including ‘‘ripple’’ editing functions) to be specified in future addenda to the ISO Virtual Terminal base standards.

Existing Profiles

Tables 23 and 24 show the areas covered by work on virtual terminal profiles within the various profiling organisations.

	ISP nr.	NST	MAP	TOP	EWO	COS
Basic Class (A-Mode)						
A-Mode default	AVT 11	S	I	S	D	I
Telnet	AVT 12	S		S	I	I
Line Scroll	AVT 13	D			D	
Paged	AVT 14	I				
CCITT X.3 PAD compatible	AVT 15	S			D	
Transparent	AVT 16	S		S		
Enhanced Line Scroll	AVT 17					
Enhanced Paged	AVT 18					
Basic Class (S-Mode)						
S-Mode default	AVT 21	S	I		S	
Forms	AVT 22	S	I		S	
Paged	AVT 23	I			D	
Enhanced Forms	AVT 24					
Enhanced Paged	AVT 25					
Graphics	N/A		I			

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 23: Virtual Terminal Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C / C	UKG	SOS	INT
Basic Class (A-Mode)						
A-Mode default	AVT 11	D	I		S	D
Telnet	AVT 12	D			S	D
Line Scroll	AVT 13		I			
Paged	AVT 14	I	I			
CCITT X.3 PAD compatible	AVT 15		I			
Transparent	AVT 16	I	I			
Enhanced Line Scroll	AVT 17		I			
Enhanced Paged	AVT 18		I			
Basic Class (S-Mode)						
S-Mode default	AVT 21	D	S	S		D
Forms	AVT 22	D	S	S		D
Paged	AVT 23	I	I			
Enhanced Forms	AVT 24		I			
Enhanced Paged	AVT 25		I			
Graphics	N / A		I	I		

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 24: Virtual Terminal Profiling Activity: Others

NIST has defined Telnet, Transparent, Forms and CCITT X.3 PAD Compatible profiles.

The TOP profile references these, making support of Telnet mandatory and support of Transparent optional.

MAP identifies needs for various types of virtual terminal, but does not currently specify any profiles.

The current version of US GOSIP (FIPS Pub 146, August 24 1988) identifies a need for Telnet, Page and Scroll mode terminal profiles, and possibly for a Forms mode profile. The April 1989 draft for version 2 of US GOSIP references the NIST profiles for Telnet and Forms profiles, and indicates an intention to specify Page and Scroll mode profiles in version 3.

EWOS has defined an (S-Mode) Forms profile and is working on an S-Mode Paged profile, an A-Mode Paged, Line Scrolled and X.3 PAD Compatible profiles.

UK GOSIP has defined a Forms profile. It is aligned with the NIST and EWOS Forms VT profiles, and references the EWOS Forms VT PICS.

SOSIP references the NIST Telnet profile.

INTAP is also working on Telnet and Forms profiles.

ASEs, Presentation Layer and Session Layer

Both the NIST and the UK GOSIP VT profiles require ACSE, the kernel presentation functional unit, and various session functional units. In both cases, use of ACSE is as required by the ISO VT standards. However, where the profiles incorporate different VT functionality, their uses of ACSE and Presentation Service may differ.

There are also some differences at the session layer, partly due to differences in VT functionality provided. For Telnet and Transparent VT profiles, NIST requires the kernel, duplex, expedited data, major synchronisation, re-synchronisation and typed data functional units; for Forms, NIST requires the half-duplex functional unit also. UK GOSIP requires kernel, half duplex, expedited data, major synchronisation, re-synchronisation, typed data and negotiated release.

Compatibility

TOP and US GOSIP reference the NIST profiles. The NIST, EWOS and UK GOSIP Forms profiles are stable, provide similar functionality, and are well aligned in most areas.

Use by Applications

The Virtual Terminal service could be used by any applications program that requires terminal interaction.

3.3.4 Other Applications

Tables 25 and 26 show the areas covered by work on other applications profiles within the various profiling organisations.

	ISP nr.	NST	MAP	TOP	SPG	COS	EWO
Transaction Processing	ATP	D			I		
Remote Data Base Access	ARD	I		I	I		
OSI Management	AOM	D	S	S	I		
Directory	ADI						
Access to Centralised or distributed directory	ADI 1	S	S	S	I	I	D
DSP	ADI 2	S	S		I	I	D
Specification of the dynamic behaviour of DSAs in respect of distributed operations		S	S	S		I	D
Specification of the dynamic behaviour of DUAs in respect of the referral mode of the DAP		S	S	S		I	D
Manufacturing Messaging		D	S				I
Public Telematic Services							
Teletex					I		
Facsimile					I		
Mixed Mode					I		
Videotex					I		

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 25: Other Applications Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C / C	ETS	UKG	SOS	INT
Transaction Processing	ATP	I	I			I	D
Remote Data Base Access	ARD		I			I	D
OSI Management	AOM	I	I		I	D	D
Directory	ADI			I		I	
Access to Centralised or distributed directory	ADI 1	I	I		D		S
DSP	ADI 2		I		D		D
Specification of the dynamic behaviour of DSAs in respect of distributed operations			I		D		D
Specification of the dynamic behaviour of DUAs in respect of the referral mode of the DAP			I		D		S
Access to Distributed DIT							
Manufacturing Messaging							
Public Telematic Services							
Teletex			D	D			
Facsimile				I			
Mixed Mode				I			
Videotex				I			

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 26: Other Applications Profiling Activity: Other

Transaction Processing and Remote Data Base Access are identified as areas requiring profiles by several organisations.

Network management could be regarded more as an integral part of the communications architecture than as an application in its own right. This is certainly the approach adopted by MAP and TOP, and the reason why their profiles already contain stable network management material. However, now that OSI network management standards are appearing, there is a need for new profiles specifically to govern their use. Several organisations are defining such profiles or intend to define them. Two organisations not otherwise considered in this specification - the OSI Network Management Forum and the ESPRIT CNMA consortium - have been active in this area. The OSI Network Management Forum, in particular, is currently regarded by many as being at the leading edge of work on OSI network management.

Directory services are covered by the CCITT X.500 base standards, issued in 1988. Directory services are required for electronic mail, for factory and office automation and for other purposes. Work on directory service profiles is fairly advanced, with stable material produced by NIST, MAP and TOP. ETSI has identified a need to work on Directory profiles as part of its programme for 1990-1992.

Manufacturing messaging is central to the MAP requirement and the MAP profile accordingly covers it. The European MAP Users Group is a founder member of EWOS and EWOS has established an MMS expert group which is investigating the taxonomy of, and will investigate the development of, MMS profiles based on MAP.

Profiles for public telematic services have historically been more the concern of telecommunications administrations than of computer suppliers. They are, however, relevant to computer suppliers, since a computer may function as a telematic services terminal, in which case it must conform to the profiles. The SPAG classification identifies several telematic service profiles. These are being defined by ETSI. One (teletex) has been issued by CEN / CENELEC as a draft ENV.

3.3.5 Summary of ASEs, Presentation Layer and Session Layer

A detailed point by point comparison of the profiles is outside the scope of this specification. There certainly are differences in detail at the upper layers, even where profiles are the same in outline. There are also differences in the amount of detail specified.

For example, the CEN / CENELEC simple file transfer (unstructured) profile ENV 41204 requires that the presentation context definition results list parameter of the connect presentation reject PPDU (presentation protocol data unit) shall always be present, but the NIST, MAP and UK GOSIP profiles make it optional under certain circumstances.

Such differences do not necessarily prevent the profiles being compatible or preclude interworking. In the above example, an implementation that always supplied the parameter would conform (in this respect) to all the profiles. Such an implementation could also be made to interwork with an implementation that did not always supply the parameter.

As a general indication of the level of detail in each profile:

- NIST provides specifications that describe the functional units selected and main protocol options selected,
- US GOSIP references NIST and adds one minor change,
- TOP references NIST and adds some qualifications plus more detail,
- MAP references NIST, repeats much of NIST and adds considerable detail,

- SPAG, CEN / CENELEC and EWOS go to a similar level of detail to MAP,
- UK GOSIP describes the main features of its use of these layers but goes to less detail than NIST,
- French GOSIP simply references CEN / CENELEC, and
- SOSIP simply lists the standards applicable at each layer.

While there are differences in detail, the ASEs and presentation and session services required for FTAM and MHS are the same in outline for all profiling organisations.

FTAM requires ACSE, presentation kernel and version 2 session service with kernel and duplex session functional units. The context management presentation functional unit is optional. Its use requires the typed data session functional unit. Minor synchronise and resynchronise presentation and session functional units are optional.

MHS (P1 + P2, 1984 version) requires X.410 reliable transfer server and version 1 session service with kernel, half duplex, minor synchronise, exceptions and activity management session functional units.

All VT profiles require ACSE, presentation kernel and version 2 session service with major synchronise, resynchronise and typed data session functional units. There are differences as regards other session functional units, however. NIST requires duplex (plus, for Forms, half duplex) and expedited data. TOP requires duplex and strongly encourages use of expedited data. UK GOSIP requires half duplex and for certain VT options, also requires negotiated release, expedited data and resynchronise.

Hence there are differences in the upper layer options required to support VT, even at the outline level.

3.4 APPLICATIONS DATA FORMATS

Each of the layers of the OSI reference model is concerned with provision of a service to the next layer above. The topmost layer - applications - provides services for use by applications programs. The transport, relay and applications profiles are concerned with specifying precisely what services will be provided and how they should be provided.

Applications Data Format profiles are different. They are concerned with the data that is carried by communications services rather than with the services themselves.

The applications data formats that have received most attention from OSI profiling organisations are those covered by ISO Office Document Architecture (ODA). These are described in the first subsection.

The second subsection discusses character repertoires. Although these have no place in the ISO classification, they are specified by several existing profiles.

The third and final subsection describes the work that has been done on other applications data formats.

3.4.1 Office Document Architecture and Interchange Formats (ODA/ODIF)

Functionality

The purpose of ODA / ODIF is to enable documents to be exchanged between document processing packages of different types.

This is achieved by defining a standard interchange format for the documents (ODIF). The files used by each document processor can then be converted to or from ODIF files.

Office Document Architecture (ODA) provides a standard method of describing documents. It enables the process of conversion to and from ODIF to be specified.

ODA covers both the logical structure of a document (sections, paragraphs, etc.) and its physical layout (what goes where on each page). Giving the logical structure enables the document to be modified on the receiving system. Giving the layout information enables it to be presented (displayed, printed and so on), and giving both enables the document to be modified and presented.

The documents can contain text, raster graphics and / or geometric graphics. For text, the profiles specify the character repertoires that can be used. Raster graphics are encoded according to CCITT recommendations T.4 (group 3 facsimile) and T.6 (group 4 facsimile). Geometric graphics are encoded in Computer Graphics Metafile format (ISO 8632).

Base Standards

The applicable base standard is ISO 8613 - Office Document Architecture (ODA) and Interchange Format. It has parts covering:

- Introduction and General Principles
- Document Structures
- Document Profile

- Office Document Interchange Format (ODIF)
- Character Content Architectures
- Raster Graphics
- Geometric Graphics

CCITT has issued equivalent standards in the T.400 series.

These standards are all stable.

ISO Profile Classification

The ISO classification of ODA Profiles results from work by the Profile Alignment Group on ODA (PAGODA). It has two levels; at the first level, the distinction is drawn between document structures of varying complexity and functionality:

1 simple document structure (intended to address the requirements of current word processing applications)

2 enhanced document structure (intended to address the general requirements of emerging word processing applications)

3 extended document structure (intended to address the general requirements of emerging personal publishing document processing applications)

Note that the words ''enhanced'' and ''extended'' are here used in the opposite sense to that of their previous use by SPAG, CEN / CENELEC and EWOS.

At the second level, the distinction is drawn between different content architectures:

1 character content architecture only

2 raster graphics content architecture only

3 geometric graphics content architecture only

4 character and raster graphics architecture

5 character and geometric graphics architecture

6 character, raster and geometric graphics architecture

Currently, the classifications defined by ISO are:

FOD 11 simple document structure; character content architecture only

FOD 26 enhanced document structure; character, raster graphics and geometric graphics content architecture

FOD 36 extended document structure; character, raster graphics and geometric graphics content architecture

Existing Profiles

Tables 27 and 28 show the areas covered by current profiling activity.

	ISP nr.	NST	TOP	SPG	EWO	COS
	FOD					
Processable and Formatted Documents						
Basic Character Content	FOD 11	I		S	S	
Enhanced Mixed Mode	FOD 26	D		S	S	
Extended Mixed Mode	FOD 36	S	S	D	D	I
Advanced Mixed Mode				I		
Processable and Layout-Independent Documents						
Simple Messaging				S	S	
Telex / Teletex Compatible Documents						

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 27: ODA Profiling Activity: Regional Workshops and Feeders Forum Members

	ISP nr.	USG	C / C	UKG	SOS	INT
	FOD					
Processable and Formatted Documents						
Basic Character Content	FOD 11		S	S	S	S
Basic Function Set, Advanced Functionality						S
Enhanced Mixed Mode	FOD 26		S	S	S	S
Extended Mixed Mode	FOD 36	D	I	I	S	
Advanced Mixed Mode						
Processable and Layout-Independent Documents						
Simple Messaging			S	D		
Telex / Teletex Compatible Documents			I			

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 28: ODA Profiling Activity: Others

NIST, TOP, SPAG, EWOS and UK GOSIP have produced stable ODA profiles. In addition, a profile is defined by CCITT in recommendation T.502.

The SPAG / CEN / CENELEC / EWOS profiles form the most comprehensive set. There are summary descriptions in SPAG GUS and in CEN / CENELEC M-IT-02. The work of defining the profiles is being done by EWOS.

SPAG identifies four profiles for processable and formatted documents (logical structure information is provided so that they can be processed and layout information is provided so that they can be presented). These profiles are as follows:

- Q / 111 - basic character content. This profile provides for character text only and is designed to be suitable for use between generally available word processing packages. It is identical to processable mode 1 of CCITT T.502.
- Q / 112 - extended mixed mode. (Note that this is the same as ISO enhanced mixed mode.) This provides for raster and geometric graphics as well as text. It is designed to be suitable for use between generally available integrated office systems. It is a superset of Q / 111 and provides for more complex logical structure (for example, sections and passages in addition to paragraphs) and more complex layout structure (for example, multi-column layout).
- Q / 113 - enhanced mixed mode. (Note that this is the same as ISO extended mixed mode.) This provides for text, raster graphics and geometric graphics, and is designed to be suitable for use between desktop publishing systems. It is a superset of Q / 112 and provides for more complex geometric graphics, more complex logical structure (for example, indefinite nesting of numbering schemes) and more complex layout information (for example, fonts and proportional spacing).
- Q / 114 - advanced mixed mode. This is not yet fully defined. It is intended to be suitable for use between document processors based on ODA (such products are not yet generally available). It will support almost all functions of the ODA base standard.

In addition to these, SPAG has identified a format for processable and layout independent documents. (Logical structure but not layout information is provided. The document must be formatted by the recipient but does not require any special hardware for printing.) This profile is:

- Q / 121 - simple messaging. This is intended to be suitable for use between message handling systems. It supports simple character only documents. Basic logical structure information (sequence of paragraphs) is provided.

EWOS is now doing the work on these profiles and SPAG GUS references the EWOS documents for technical content. EWOS has produced stable versions of Q / 111, Q / 112 and Q / 121 (as EWOS Documents) and aims to produce an EWOS Document for Q / 113 early in 1991.

SOSIP requires profile Q / 111 and states that Q / 113 is desirable, with Q / 112 being acceptable until products conforming to Q / 113 are available.

UK GOSIP has defined two profiles:

- GDAP1 - which is similar in functionality to Q / 111, and

- GDAP2 - which is similar in functionality to Q / 112.

In addition the supplement to UK GOSIP contains a description of a simple messaging profile which is functionally equivalent to EWOS Q / 121.

NIST has defined a profile which is similar in functionality to Q / 113. This profile is referenced by TOP and by the draft version 2 (April 1989) of US GOSIP. In addition, NIST has a working implementation agreement for a profile which is similar in functionality to Q / 112. NIST has announced its intention that these profiles will be superseded by the equivalent harmonised profiles when they are submitted for processing as ISPs.

INTAP has completed the following Implementation Specifications:

- AE.1111 - small function set, character text only
- AE.1116 - small function set, different content types
- AE.1126 - medium function set, different content types

A liaison group has been set up in which the ODA expert groups of AOW, EWOS and NIST cooperate to produce ‘‘core’’ profiles based on the ODA profiles of the three regional workshops. This group is known as PAGODA (Profile Alignment Group on ODA). It has a classification scheme similar to that of INTAP. It has produced drafts for three profiles:

- CORE 11 - simple document structure and character content, similar in scope to EWOS Q / 111
- CORE 26 - more complex document structure and advanced character content plus raster and geometric graphics, similar in scope to EWOS Q / 112
- CORE 36 - advanced document structure and character content plus raster and geometric graphics, similar in scope to EWOS Q / 113

It is hoped to have these ready for submission to ISO as draft ISPs in the second half of 1990.

Use Within OSI Layer 7

Documents in ODIF format can be contained in files that are transferred, accessed or managed using FTAM or in messages transmitted using MHS.

Compatibility

The TOP and draft US GOSIP profiles reference NIST for technical content. It is also intended that SPAG / CEN / CENELEC / EWOS Q / 113 will be aligned with the NIST profile.

SOSIP references the SPAG / CEN / CENELEC / EWOS work. UK GOSIP is intended to be fully conformant with the SPAG / CEN / CENELEC / EWOS Q / 111 and Q / 112 profiles although there are some differences (UK GOSIP states them).

Q / 111 is a subset of Q / 112 which is in turn a subset of Q / 113. It is probable that Q / 113 will in turn be a subset of Q / 114 (when Q / 114 is defined). Q / 121 is not compatible with any of the others, however.

As noted above, harmonised profiles are being prepared by PAGODA. It is hoped that these will become ISPs.

Use by Applications

ODA / ODIF are intended for use by document processing applications - word processors, desk top publishers and other office automation tools. They could also be used by any application that creates human-readable documents.

The issue of how applications data is mapped into layer 7 services is crucial for inter-working. There could therefore soon be a need for guidance in this area from X / Open.

3.4.2 Character Repertoires

For systems and programs that handle text, it is necessary to specify the range of characters that can be handled and how those characters are encoded in order to achieve fully meaningful interworking. Failure to use the same character repertoires leads to the sort of problems that arise when, for example, a document written in Danish is transferred to an English computer system that does not support the three letters that are in the Danish alphabet but not the English alphabet.

Office Document Interchange is one of the the main areas in which agreement on character repertoires is required. The ODA / ODIF profiles all include character repertoire specifications. However, because there are other areas, character repertoires are specified separately by SPAG, CEN / CENELEC, UK GOSIP and INTAP.

Table 29 shows the separately specified repertoires covered by current profiling activity.

	SPG	C / C	UKG	SOS	INT
Graphic Characters					
Telex	S	S			
Initial European Latin	S	S	S		S
Basic European Latin					
Western Europe	S	S	S	S	S
Eastern Europe	S	S	S		
Teletex	S	S		S	
Full European Latin	S	S			
Videotex	S	S			
Line Drawing	S		I		
Non Latin					
Greek	S	S			
Cyrillic	S	S			
Japanese					S
Katakana-Romaji					S
Control Functions	I		D		S

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 29: Separately Specified Character Repertoires

The SPAG profiles reference the CEN / CENELEC ENVs for technical content.

UK GOSIP is fully aligned with the corresponding parts of CEN / CENELEC ENV 41503 (European Graphic Repertoires and their coding).

SOSIP references CEN / CENELEC ENVs 41502 and 41503. It also allows a Swedish national standard code as an interim solution.

In addition to being required in conjunction with ODA profiles, character repertoire specifications could also be used in conjunction with any applications profile when the system being specified handles character information.

3.4.3 Other Applications Data Formats

Table 30 shows the other applications data formats covered by current profiling activity.

	ISP nr.	TOP	USG	SPG	C / C	EWO	ETS	UKG
CGM Interchange Format	FCG	S	I					
SGML Interchange Format	FSG							D
DSSSL / SPDL Interchange Format								I
IGES Interchange Format		S						
Product Data Exchange (EDIF and PDES / STEP)		I						
Directory Structure				I	I	D	I	D
Stream Oriented Formats								
Character-coded Text								
Telex compatible				I	D			
Teletex compatible				I	D			
Videotex compatible				I	D			
VT Control Objects					D	S		

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 30: Profiling Activity on Other Applications Data Formats

TOP has stable material covering Computer Graphics Metafile (CGM - ISO 8632), as a means of transferring data created by means of the Graphical Kernel System (GKS - ISO 7492). It also defines a profile for use of the Initial Graphics Exchange Specification (IGES - ANSI Y14.26M) to transfer product data, and envisages future additional product data exchange profiles using Electronic Design Interchange Format (EDIF) and Product Data

Exchange Specification / Standard for the Exchange of Product Model Data (PDES / STEP) when the standards for these are mature.

SPAG identifies a need for agreement on certain aspects of the structure of data held in OSI directories. Work in this area is being undertaken by EWOS.

CEN / CENELEC profiles include several stream oriented character formats relevant to the telematic services. These are included in the SPAG classification.

The Directory profile in UK GOSIP includes schema for the objects contained in the directory. The supplement to UK GOSIP contains guidance on using SGML and discusses the use of Document Style Semantics and Specification Language (DSSSL), and Standard Page Description Language (SPDL). DSSSL and SPDL are being worked on within ISO.

EDI is of course an area where standardisation of data formats is required. This standardisation is being carried out, most notably under EDIFACT. OSI profiling work in this area is mainly concerned with defining how this data can be carried by MHS (and, to a lesser extent, by FTAM) rather than with selecting options within the EDI standards themselves. MHS EDI profiling activity is dealt with in this specification under the heading of MHS.

3.5 OTHER PROFILES

SPAG and CEN / CENELEC have a category of ''Y-Profiles'' which do not fit naturally into their classification and are therefore listed separately. The Y-profiles which have been defined to date cover terminal access rather than communication between end-systems and are hence not true OSI profiles.

They are listed in table 31 for the sake of completeness.

	ISP nr.	SPG	C / C
Character Mode Terminal on PAD			
X.29 over X.25	N / A	S	S
X.28	N / A	S	S
X.29 over Transport Service and LAN	N / A	S	
Character Mode Terminals on ISDN Using Rate Adaption	N / A	I	

S = Stable, D = Draft, I = Identified
(See **Appendix A**, **Basis of the Comparison**)

Table 31: Other Profiling Activity

Chapter 4

Conclusions

4.1 STATE OF EXISTING PROFILES

The present situation of OSI profiles is described in detail in previous sections of this specification. A number of different profiles exist. These profiles are not all compatible and do not necessarily even allow interworking. Even where they appear to be superficially compatible, differences of approach and format make it impossible to be sure that they are in fact compatible in detail. However, there is a process of harmonisation initiated by ISO and implemented through the regional workshops that should eventually result in International Standardised Profiles in all areas.

Currently, there are stable profiles from a relatively large number of profiling organisations for Connection Oriented Transport (over LAN and WAN), FTAM, MHS, VT and ODA / ODIF. A smaller number of organisations have produced, or soon will produce, stable profiles for Connectionless Transport and Directory Services. Work is in progress on profiles for OSI Management, Transaction Processing and Remote Data Base Access but no stable profiles have yet appeared in these areas.

4.2 INCREASING IMPORTANCE OF GOSIPS

Government OSI Profiles (GOSIPs) are increasing in importance. U.S. government agencies have been encouraged to use US GOSIP since February 1989 and will be required to use it from August 1990. Conformance to UK GOSIP is now usually mandatory in U.K. government procurements. GOSIPs are being, or have been, produced in Australia, Canada, France and Sweden. EC directive EC / 87 / 95, in force since February 1988, could be interpreted as meaning that the CEN / CENELEC functional standards and the ISO ISPs are a European GOSIP; they are increasingly likely to be treated as such, reinforced by the forthcoming European Procurement Handbook for Open Systems (EPHOS).

Government procurements account for a significant part of the IT Systems market in most developed countries. The fact that such a large sector requires a particular profile, and that no other large sector has conflicting requirements, is bound to have a major influence on the whole of the market.

4.3 INCREASING SCOPE OF GOSIPS

Government departments are increasingly addressing the need to procure not only complete systems, but also separate software components. This is leading them to take an interest in APIs. The definition of APIs, either within GOSIPs or in associated specifications, is being considered by both NIST and the U.K. CCTA.

4.4 PROSPECTS FOR PROFILE HARMONISATION

The ISO taxonomy allows for a number of harmonised profiles to be created. Each of them will cover ground where there are profiles already in existence. Generally, the existing profiles conflict with each other to some extent, but in no case does the conflict appear to be so great as to prevent harmonisation. In cases where the conflicts are more serious, ISO calls for separate profiles to be produced.

This means that there are certain things which harmonisation can achieve and others which it cannot.

What it cannot achieve is a situation where there is only one profile for each application and type of network. There will still be choices to be made in defining communications functionality. In particular, there will still be the choice between connection-oriented and connectionless network service. What harmonisation can achieve is to reduce and classify those choices. How this can be done is described in ISO TR 10000.

Harmonisation has only just started, with the submission of the first proposals for ISPs in summer/autumn 1989. While prospects are good, success is not guaranteed. There are some who regard harmonisation as being still on trial. They will watch the progress of the recently submitted proposed draft ISPs with interest.

4.5 TIMESCALES FOR PROFILE HARMONISATION

The harmonisation programme is not yet completely defined. The timescale for harmonising each profile is not yet known. The following forecasts are based on the current situation and on the results of the recent Regional Workshop Co-ordinating Committee meeting (September 1989).

As described in **Chapter 1**, **OSI Profiles**, proposals for ISPs TA 11x1, TA 51, TB / TC / TD / TE 11x1 and AFT 11 have been submitted to ISO.

The review of PDISP AFT 11 by ISO / IEC JTC1 review team is now complete. The PDISP is being revised and could soon be submitted as a draft ISP. If the one-shot ballot of that draft by ISO members is favourable, there could be an approved ISP AFT 11 this summer (1990).

The other PDISPs could become DISPs in Spring 1990 and ISPs in Summer 1990 at the earliest.

Since the ISP approval procedure is being used for the first time, there could of course be delays to this timetable.

It is understood that the next PDISPs to be prepared are likely to be in the following areas:

- FTAM (File transfer and access for flat files and file management - AFT 12, AFT 22 and AFT 3)
- MHS (Common Transfer Facilities, MTA to MTA (P1) and UA to MS (P7), using the 1988 base standards)
- ODA (Simple structure character content, enhanced structure mixed content, extended structure mixed content - FOD 11, FOD 26 and FOD 36)
- LANs (CLNS profiles for Token Bus and Token Ring - TA 52 and TA 53)
- ISDN (CONS, circuit and packet switched services)
- Relays (CSMA / CD and Token Ring LAN MAC layer relays - RD 51.51 and RD 51.53)

It seems unlikely that harmonised proposals in any of these areas can be ready before the end of 1990, and most will probably not appear until much later than that. Assuming a PDISP were to be ready then, it might be approved as an ISP in 1991.

Further topics for harmonisation will not be identified until the next Regional Workshop Co-ordinating Committee meeting in March 1990. Topics identified then might result in proposals appearing around the end of 1990, with ISPs approved towards the end of 1991.

The procedure for creating ISPs is a new one and is still on trial. The submission of further proposals for ISPs in future will depend, to some extent at least, on how well the procedure works for the proposals currently submitted.

4.6 EFFECT OF HARMONISATION ON EXISTING PROFILES

The appearance of harmonised profiles will have an impact on the existing profiles. Their producers have invested considerable effort in producing their profiles and in encouraging others to use them. Naturally, those producers have some concerns about the appearance of ISO profiles which may supersede their work. The more their profiles become established with IT System users and suppliers, the greater those concerns will be.

NIST will participate in the harmonisation work through the RW-CC and intends to use the ISP format for new profiles. Existing profiles may be re-written in ISP format, depending on whether the effort to do it is available. There is no specific commitment to re-write them and no intention to modify the technical content of the Implementation Agreements to agree with new harmonised profiles.

US GOSIP is expected to remain stable, and hence looks unlikely to be modified to align with harmonised ISPs. Since there will be a legal requirement for government procurement agencies to use US GOSIP, it seems likely that the current version of the NIST agreements will continue to be important for the U.S. market. Because of the importance of the U.S. market in world terms, the NIST agreements will continue to be influential in other countries aswell. (Of course, in many cases the technical content of the NIST agreements will be similar to that of the ISPs.)

MAP and TOP also have a commitment to stability. They will therefore not change the technical content of their profiles but will try to ensure that the harmonised profiles are compatible with them.

A very substantial body of profiles has been created as European pre-standards (ENVs) under the CEN / CENELEC programme. It is not clear what will happen to these as the new ISPs appear. There is currently a study under way in EWOS on behalf of ITSTC to consider possibilities for the alignment of the European Functional Standards programme with the ISO / IEC JTC1 activities.

The situation in the U.K. is particularly complicated. As far as there is any legal requirement to use profiles, it comes from the EC Directive which requires use of international and European standards in public sector procurements. In practice, the influence of the CCTA is great, and the profiles used are those of UK GOSIP. It is argued that these are largely compatible with the CEN / CENELEC ENVs and provide, in general, a more restrictive specification. UK GOSIP is committed to adopt the harmonised ISO profiles when they appear. Work is in progress in some areas on converging UK GOSIP with existing ENVs. However, the CCTA currently considers that ISPs should take precedence where there are ISPs and EN / ENVs covering the same areas.

France and Sweden also have GOSIPs. As a member of the EC, France is bound by the Directive in the same way as the U.K.. Its GOSIP is however less extensive and much less well established than UK GOSIP; in any case it references the CEN / CENELEC ENVs directly so there can be no conflict. Sweden is not a member of the EC and can decide independently what profiles to use for public procurements. However, its profile is substantially based on the CEN / CENELEC work.

4.7 DEVELOPMENT OF NEW PROFILES

US GOSIP is based on the NIST profiles. French and Swedish GOSIPs are based on the CEN / CENELEC profiles which are being defined by EWOS and ETSI. UK GOSIP will be under increasing pressure to converge with CEN / CENELEC. MAP and TOP have largely achieved their original programmes and will in future be more concerned with promoting their existing profiles than with defining new ones. SPAG will support the work of EWOS rather than undertake work in parallel.

It therefore looks as though much of the new profiling work will be originated by the three regional workshops and ETSI, and possibly also INTAP. The GOSIPs will no doubt base any new profiles on this work, with UK GOSIP perhaps continuing to put forward a more individual point of view.

At present, it looks likely that the ISP format will be used by all the regional workshops for the production of new profiles and that these profiles will be harmonised as they appear. The situation for new areas may thus be much simpler than for those where profiles currently exist. Harmonised profile development in these new areas may therefore possibly catch up - or even overtake - development of harmonised versions of existing profiles.

4.8 IMPLICATIONS FOR SUPPLIERS

As has been described above, the ISO harmonisation programme will not result in any ISPs being approved before the second quarter of 1990. ISPs may appear in substantial numbers during 1991.

Meanwhile, conformance to GOSIPs will increasingly be required for public procurements. Suppliers will therefore be under increasing pressure to produce implementations that conform, or at least claim to conform, to the existing GOSIPs (and, in Europe, to the CEN / CENELEC ENVs).

The harmonisation process will in any case not prevent different transport profiles being required in different countries. Harmonised profiles are being developed both for connection-oriented network service and for connectionless network service over WANs. The connection-oriented ones will be required in Europe and the connectionless ones will be required in the U.S., for example.

If this was the only difference, the number of different variations required to be implemented would be quite manageable. However, for each type of profile, the requirements are currently slightly different in the U.S., the U.K., the rest of Europe and in Japan. (Even if they are not actually different, they are stated differently). There is a danger that these different requirements could become established before the ISPs are agreed. This would mean that implementors must produce a different version of each product for each market, or must produce a version which satisfies all the different requirements.

Many government procurement agencies believe that there will be no problem because the harmonised ISPs will be completely compatible with their particular profiles. In fact, while they will probably be compatible in outline, it is highly unlikely that they will all be compatible in every detail. Moreover, differences which do not affect interoperability (the procurement agencies' main concern) will still require changes to software (a source of problems for suppliers).

At present, questions of detail may not always matter. The use of GOSIPs is still new and procurement agencies are displaying a certain amount of flexibility. They do not yet require proper conformance testing and may not insist on preparation of conformance statements in full detail.

This will change; everyone accepts that rigorous proofs of conformance are necessary if the full benefits of OSI are to be realised.

Conformance testing is not an easy process. It takes time and it can be easy to fail the tests. Experience with telecommunications approvals procedures indicates that mandatory testing of this nature can mean significant delays in bringing products to market. If an implementation were to require lengthy, complex and expensive tests against several different specifications (even if the differences appear slight), there would be enormous problems for product developers. Even the need to make several different detailed conformance statements could cause difficulties.

Harmonisation can provide the basis for a single universal set of conformance criteria. It is thus in the interests of suppliers who wish to compete in world markets. Ultimately, it must also be in the best interests of their government customers, by creating truly open markets for open systems.

Appendix A

Basis of the Comparison

A.1 GENERAL

This appendix describes the criteria for including entries in the comparison tables in **Chapter 3**, **Profile Comparison** and gives the basis for the discussions on compatibility.

A.2 ENTRY CRITERIA

An existing profile is regarded as containing material relevant to a profile in the ISO classification if it:

- allows the functionality described by the ISO profile, and
- says something about how that functionality should be provided (or, at least, identifies a need to say something).

So, for example, UK GOSIP contains material relevant to TC 51 (connection-oriented transport service, Transport Classes (0,2), connection-oriented network service, CSMA / CD LAN) but US GOSIP does not because it does not allow this combination of protocols and services. TOP contains material relevant to AVT 12 (Virtual Terminal, Telnet) but SPAG does not because although SPAG allows Telnet virtual terminal operation to be provided, it says nothing about how this should or should not be done (the SPAG profile classification does not include Virtual Terminal).

It has also been necessary to make judgements about the state of stability, or otherwise, of the various profiles. This has been done as follows.

A.2.1 NIST

For NIST, material is regarded as:

- stable if it is contained in the Stable Implementation Agreements document,
- draft if it is contained in the Working Implementation Agreements document, and
- identified if either the stable agreements document or the working agreements document contains a dummy section for it or otherwise states a need for it.

A.2.2 MAP

For MAP, material is regarded as:

- stable if it is contained in one of the chapters of the MAP specification or in an attachment to a chapter,
- draft if it is contained in one of the appendices, and
- identified if any part of the MAP specification identifies a need for it.

A.2.3 TOP

For TOP, the same principles are applied as for MAP.

A.2.4 US GOSIP

For US GOSIP, material is regarded as:

- stable if it appears in the current version of the US GOSIP specification, FIPS-PUB 146,
- draft if it appears in US GOSIP draft version 2 (April 1989), and
- identified if either of those documents states a need for it.

A.2.5 SPAG

For SPAG, material is regarded as:

- stable if SPAG classes it as ‘‘stable’’ or ‘‘ratified’’,
- draft if SPAG classes it as ‘‘draft’’, and
- identified if SPAG classes it as ‘‘working paper’’ or ‘‘empty’’.

A.2.6 CEN/CENELEC

For CEN / CENELEC, material is regarded as:

- stable if it appears in a European Standard (EN) or Pre-standard (ENV),
- draft if it appears in a draft European Pre-standard, and
- identified if it is identified in CEN / CENELEC memorandum M-IT-02.

A.2.7 EWOS

For EWOS, material is regarded as:

- stable if it appears in an EWOS Document (ED),
- draft if the EWOS / TA Schedule for deliverables (revision 7, January 1990) indicates that the material has been under consideration for a substantial period of time, and
- identified if it is shown in the EWOS / TA Schedule for deliverables (revision 7, January 1990).

A.2.8 ETSI

For ETSI, material is regarded as:

- stable if the ETSI Programme of Work identifies a published ENV for which ETSI is responsible,
- draft if the SPAG GUS states that an ETSI draft exists, and
- identified if it appears in the ETSI Programme of Work for 1989-90 or 1990-92.

A.2.9 UK GOSIP

For UK GOSIP, material is regarded as:

- stable if it appears in the current UK GOSIP specification (version 3.1, January 1990), unless that document states that it is not yet stable,
- draft if it appears in the current UK GOSIP specification and is stated not to be stable or if it appears in the current UK GOSIP supplement, and
- identified if the UK GOSIP specification or supplement states an intention to include it in future versions.

A.2.10 French GOSIP

For French GOSIP, material is regarded as:

- stable if it appears in the Guide d'Application à la Commande Publique des Normes Fonctionelles Europeénes des Technologies de l'Information (Guide to the Application to Public Sector Procurement of European Functional Standards for Information Technology), and
- identified if the Guide d'Application à la Commande Publique des Normes Fonctionelles Europeénes des Technologies de l'Information indicates a need for it.

A.2.11 SOSIP

For SOSIP, material is regarded as:

- stable if it appears in SOSIP version 1.0 Draft for Comments, December 1988 (there are a few changes to that draft that have been discussed with Statskontoret and taken into account in this specification. They can be seen in the document **Comparison between UK GOSIP version 3.0 and SOSIP version 1.0 - Update 1989-03-28** issued by Statskontoret,
- draft if SOSIP version 1.0 Draft for Comments, December 1988 indicates that it is not yet stable, and
- identified if SOSIP version 1.0 Draft for Comments, December 1988 indicates a future need.

A.2.12 COS

For COS, material is regarded as:

- stable if it is covered by the COS PDISP (TA 51 and TA 11x1 are covered by PDISP TA nnn parts 1, 2 and 5) or by a COS stack specification,
- draft if it is partially covered by the COS PDISP (for example, TA 53 is partially covered by PDISP TA nnn part 1), and
- identified if it is identified in the document **COS Profile Selection 1989-1990**.

A.2.13 Feeders Forum, Edited by POSI

For FFP, material is regarded as:

- stable if it is covered by the PDISP (for example, TB 11x1 is covered by the PDISP parts 1, 5 and 9), and
- draft if it is partially covered by the POSI PDISP (for example, TB 51 is partially covered by the PDISP part 1).

A.2.14 INTAP

For INTAP, the state of the material is determined as indicated in a private communication.

A.2.15 Notes

Note that the stability of material is judged by the producing organisation, and that the same material could be regarded as stable by one organisation but as draft by another. It seemed better to use the individual producing organisations' assessments than to attempt to re-assess all the material in terms of some absolute criteria that would be the same for all organisations. This would have involved a large number of subjective judgements and would have required a substantial amount of effort and time.

The main differences of which the reader should be aware are as follows:

- NIST includes material in the Stable Agreements document as it becomes stable. For a particular area, there may be some material that is stable and some that is not. That area will be classed as ''S'' in the comparison. On the other hand, for CEN / CENELEC to issue a standard, the whole of the material should be stable. Hence NIST (and, to a lesser extent, MAP, TOP and US GOSIP) stable material may be less complete than SPAG, CEN / CENELEC and EWOS draft material.
- Material developed by SPAG and EWOS is input to CEN / CENELEC for ratification. This means that the same document may be considered stable by SPAG or EWOS but only as draft by CEN / CENELEC. Also, EWOS is revising some ENVs which may thus be regarded as stable by CEN / CENELEC but only draft by EWOS.

A.3 COMPATIBILITY

''Compatibility'' can mean quite different things to different people and in different contexts. Hence it is necessary to say how the term is used in this specification.

Two (or more) profiles are described as being compatible in this specification if a system could be built which conforms to both (or all) of them.

In terms of Applications Program Interfaces, this means that a single API could be defined with a subset for each profile. If a part of the API was used by two profiles then its use would have similar results in systems conforming to both.

For example, the UK GOSIP profile for connection-oriented transport and network services over a CSMA / CD LAN is compatible with the CEN / CENELEC profile. An API could be defined containing, for example, a function make_transport_connection which would cause a transport connection request to be output proposing Transport Class 2 as the preferred class. The TOP LAN profile is not compatible with them, even though it provides the same functionality. So although the same API could be used, use of make_transport_connection would have a different result in that it would cause a transport connection request proposing class 4 to be output.

In fact, categorical statements about compatibility are rarely, if ever, made in the specification. Many of the profiles are very complex and are described by different organisations in different ways. The task of correctly establishing compatibility can be compared to that of writing a bug-free program. Profiles are thus described in terms such as ''apparently'' or ''broadly'' compatible, meaning that the inconsistencies have not come to light or are only minor ones. Whether an inconsistency is major or minor is, of course, somewhat subjective.

The only reliable indication of compatibility is where one profile directly references another. The main examples of this are US GOSIP, which frequently references NIST, and French GOSIP, which references the CEN / CENELEC functional standards. The differences are then stated in the form of qualifications or additional restrictions.

The profiling organisations have done considerable work on the question of interworking. Two profiles allow interworking if systems complying with them can interwork, to some minimum level, using network layer relays if necessary.

This definition is the basis of the ISO classification of transport profiles. The ISO Tx and Ux groups are defined such that profiles in the same group allow interworking, but profiles in different groups do not.

The words ''to some minimum level'' are important. There may be options of the profiles that prevent interworking, or conformant systems may only interwork satisfactorily provided certain features are not used or in particular circumstances. This does not prevent them from being described as ''allowing interworking''. There is an element of subjectivity in the decision on how restricted the circumstances for interworking have to be before it is regarded as ''not possible''.

Interworking is not the same as compatibility. Systems conforming to compatible profiles will usually interwork (this is because the protocols concerned are generally symmetric - note for example that strictly speaking two X.25 DTEs will not interwork, even though they conform to the same profile). Profiles that allow interworking are, however, often not compatible (in particular, they may use different networking technologies).

Nevertheless, the ability to interwork does give some indication of compatibility; hence statements about interworking have been included in the discussions of compatibility.