Interoperability for Multimedia services: the approach of the standards bodies – an overview based on ACTS Guideline SII Go6

PRIME

Renata Guarneri, Italtel – renata.guarneri@italtel.it
Cees J.M. Lanting, Datsa Belgium – datsa_belgium@compuserve.com

SUMMARY

In the open telecommunication market characterised by deregulation and global competition, new technology is constantly being introduced into products, systems and networks. Network providers build networks that consist of products from multiple vendors; service providers are faced with the challenge of providing services over heterogeneous computing and network environments.

Achieving interoperability, defined as the capability of two or more items to work constructively together in achieving a common goal, should therefore be the ultimate goal of technically oriented activities in communications, including co-operation, standardisation, and technical regulation.

In an open environment, interoperability brings benefits to the market, to the supply side as well as to the demand side. Interoperable products and services:

• can achieve a shorter time to market,
• help a market develop faster,
• achieve lower development, introduction, maintenance and ownership costs,
• help to sustain open competition in the market

The PRIME project in ACTS (Advanced Communication, Technologies and Services) has been set up with the key objective of contributing to interoperability initiatives in standardisation bodies and industry fora. Among others, this is resulting in increased awareness on interoperability issues in and opportunities for ACTS.

The work of the project is built around the central theme of interoperability and starts from the following assumption:

Interoperability is achieved when

• the market requires and values it (i.e., it is promoted by the market actors, including users), and/or
• it is promoted by the regulatory authorities/institutions, and
• agreed common specifications exist to be implemented as a basis.

The first two bulleted items mainly relate to the identification of requirements and to the
promotion of interoperability, while the third component relates to the means to ensure that interoperability is technically achievable.

PRIME studies all the three components, however, a specific focus will be on the standardisation activities related to the development of interoperable standards.

This chapter provides an overview of relevant developments in the standardisation activities, with particular emphasis on some of the interoperability-focused activities of ITU-T (International Telecommunications Union) and ETSI (European Telecommunications Standards Institute).

**INTRODUCTION**

The chapter is structured into two main parts:

- The first part gives an overview of the activities in relevant standards bodies, with particular attention to work in ITU-T and ETSI that is specifically addressing the issue of interoperability. A short overview of activities in other bodies is also given.
- The second part briefly describes the approach to interoperability adopted by the PRIME project. Such approach has been developed initially by the EURORIM project and is documented in draft ACTS Guideline SII-G6 “Interoperability for Multimedia services”.
- Finally some conclusions will be drawn, with some consideration on the role of standards in achieving interoperability.

**OVERVIEW OF INTEROPERABILITY FOCUSED STANDARDS ACTIVITIES**

All the consensus making bodies, including traditional standards bodies, at regional and at international level, as well as the major industry fora, are actively working on the definition of standards for the Information Society.

A few initiatives have been undertaken at both regional and world-wide level to assess the current state of the art and determine an evolutionary path towards this important goal. All the initiatives have taken a global approach looking at both the network and the service aspects.

While the different bodies and fora are taking interoperability into consideration in the development of specifications, a closer look will be taken at the activities of:

- ITU, with specific attention to the progress made within the scope of the GII (Global Information Infrastructure) Project “End-to-end Interoperability”;
- ETSI, with specific attention to the work of the ETSI Project EASI (ATM Services Interoperability).

The PRIME project is also monitoring the activities of a number of other bodies. These are also briefly introduced, stressing the aspects that are relevant to interoperability.

**GII PROJECT F4 IN ITU-T**

The requirement for a project dedicated to interoperability has been identified at an early stage in the GII activities of the ITU. A complete project description became available at the September 1997 meeting of SG 13 where the initial work identified by SG 16 (the co-
ordinating Study Group for this project) was further elaborated and released. Main points mentioned in the project description as key project objectives are:
• Interworking between all types of information appliances;
• Interworking allowing resources to be located both in the private and in the public network;
• Middleware development, as information appliances should be designed to be network independent above the transport layer.

The project will ensure that the necessary specifications to achieve interoperability allowing resources to be located either in the public or in the private network will be identified, or, wherever missing, developed.

The project will identify the areas relevant for achieving interoperability and will establish a liaison with bodies working in the identified areas. The project will identify applications and services with high market expectation and promote the development of interoperability profiles. The project will also promote the development of conformance and interoperability test specifications.

Formally SG 16 started working on this project at their meeting in January 1998. A group of interest has been set-up and a phased approach has been agreed for carrying out the required activities.

Within the scope of the project, SG16 is currently working on the development of a baseline document called “Guideline for multimedia end-to-end interoperability”. At this stage the document identifies that there are actually four possible views of interoperability which might be considered within the project. These are,
• Interoperability as an empirical characteristic of a standard under development, in the sense used in the IETF. (Specifications cannot progress there unless the existence of multiple interoperating implementations demonstrates that the specifications are written clearly and unambiguously.)
• Interoperability as the objective of a methodology for standards construction.
• Procedures for demonstrating interoperability of different implementations of an already-written standard.
• Revision of existing standards to achieve interoperability.

Further work will now concentrate on how to move forward in the project. Two possibilities are considered at present:
• Identify reference scenarios and develop interoperability profiles starting from there, or
• Work on the development of a general methodology for interoperable standards development.

The work has progressed by correspondence until the May 1999 meeting of SG16, where a new draft of the baseline document has been proposed. The new draft has not been approved and is included in the meeting report available to the ITU TIES members.
The ATM MoU and the ETSI Project EASI

Network Operators have invested considerable effort in both R&D and in preliminary trials of ATM services. However, some standards are still missing and only now is the ATM technology mature enough for full-scale application in the market. A real breakthrough in terms of concrete implementations of networks and services, for the benefit of all interested parties, is still a challenge for the near future.

Network operators need to see a demand for new broadband services best served by ATM before heavily investing in ATM network and services infrastructure. Also manufacturers of network and customer premises equipment including terminals, need to be sure of concrete requirements from their customers before investing in high volume production.

Taking into account that there might be only a limited window of opportunity to capitalise on the investments already undertaken in R&D, operators in Europe moved to break the vicious circle by setting up a Working Group to draft an MoU—the MoU on an interoperability platform for broadband telecommunication services based on Asynchronous Transfer Mode (ATM) technology. This MoU focuses on network interface and network management functions supporting interoperable European ATM services.

The MoU intended to provide a collaborative and technical framework for interoperation, urgently needed to capitalise on Europe’s investments to date in R&D on ATM technology. It intended to contribute to the world-wide discussion regarding interoperability in a liberalised, multi-provider and multi-vendor ATM environment.

A number of non-technical difficulties have however led to a suspension of the signing of the MoU. Nevertheless, there is still the technical interest in the development of specifications to achieve a high degree of interoperability. The technical work in support of the MoU both in ETSI and EURESCOM therefore continues with the support of major manufacturers and operators in Europe.

ETSI has started a project responsible for bringing together a complete specification to enable network service and management interoperability for the next generation of commercial broadband networks, initially in Europe, but with the intention of global application. The Project called EASI (ETSI project on ATM Services Interoperability) has started its activities with the objective of producing standards which allow for the interconnection of ATM networks and their management systems, to provide ATM-based services across network boundaries.

The EASI Project is considered an important actor for the realisation of the European Backbone telecommunication Network (EBTN) and the subsequent development of European and Global ATM networks and services. It is in support of market growth and business opportunities in a key areas of the telecom industry.

The initial task the EASI Project has been that of analysing the requirements prepared by ETNO (European Telecommunication Network Operators) ATM project. The approach initially taken to respond to the ATM MoU requirements was that of developing Super ICS (Implementation Conformance Statement) Proforma specifications for both the Control Plane
and the User Plane of the NNI. The concept of Super ICS has been developed within the ETSI EASI Project to define Implementation Conformance Statements that cover a full interface. The approach is derived from the principles on which PICS Proforma for specific protocols are designed, ISO/IEC 9646-1 and ISO/IEC 9646-7.

When, at the November 1998 meeting of EASI, it was officially announced that the ATM MoU would possibly not be signed, the activity concentrated in the revision of the project's Terms of Reference and workplan to take into account the changed environment. The following observations led to the decision that work in EASI should continue even with the MoU not signed:

The importance of interoperability has increased considerably, has even grown since the start of the project, and therefore the rationale behind the MoU is still valid.

There is a change in means, not in the objectives. The operators present at the meeting expressed their continued interest in the subject and stressed the importance of having formal specifications for ATM interoperability.

It was also noted that the new charter of the EASI group should reflect the current situation and the changes that have occurred in the telecom environment since the initial establishment of the project. EASI should take into account the emerging services (e.g., integration of mobility, support of IP based services).

Consensus on the position that work should continue on the specifications for interoperability was therefore established. EASI then proposed to go ahead taking the existing results from the MoU and continue the work within the open environment of ETSI.

One of the key functions of the MoU Working Group was the identification of requirements, this function is now further fulfilled by EASI and has been specifically identified within the EASI charter. The phased approach stated by the ATM MoU is now followed by EASI also at the requirements level.

The first activity of the new revised EASI project has been that of reviewing the Phase 1 MoU documents, and work on Phase 1 started immediately with a short deadline to complete the work. A first specification for the Phase 1 User and Control Planes has been completed. The activities for the Phase 2 specifications requirements and development have started. Further phases may be identified and defined as the work progresses. Phases are processed in parallel where possible.

In summary, the following briefly describes the workplan of EASI:

• EASI continues to work on ATM related interoperability.
• A phased approach is adopted; requirements are defined for the different phases.
• Phase 1 is being completed; work on Phase 2 has started.
• Phases are worked on in parallel as far as possible.

Following the revised approach, it was confirmed that EURESCOM takes the lead for the work on network management, while EASI takes the lead for the work on network (User and Control planes) and services.
The following picture shows the relation between EASI and EURESCOM Project P813, indicating also how the EASI Steering Group takes over the task of co-ordinating the overall activities and identifying the requirements that formerly was with the MoU Working Group. The picture also shows that the EASI Steering Group is responsible for co-ordinating liaison with other bodies. ETSI TC TMN has been identified as key liaison body for the activities on network management.

**Figure 52**—*EASI/EURESCOM: organisation of work*

Main tasks of EASI are:
- decide on services and applications to be supported in the different phases,
- identify the technical features required for the support of these selected services at the relevant interfaces,
- identify the relevant standards and select the relevant options.

If gaps are identified, the work to fill them should be delegated to the relevant ETSI STCs, or other external bodies, as appropriate. This in particular means that the work on S-ICS has been suspended, as the EASI has taken responsibility for “requirements identification”.

Interoperability specifications, defined as specific instances of standards applicable to User and Control plane, have been identified as the new output of EASI. Interoperability specifications will be guidelines on how to use a standard, identifying the selected options to be implements in order to achieve interoperability.
Currently the Phase 1 specification for the User and Control Plane has been finalised while further work is still required for the Management Plane. This specification is expected still in the 1999 time frame.

An overview document has also been produced, introducing the objectives of the activities, the relevant architecture and the time-scale for completion of the different specifications by EASI.

A Joint Steering Committee EASI—EURESCOM P813 has been formed. The objectives of this committee are those of overseeing the requirements for the activities (replacing in this task the ATM MoU Working Group). In addition, the Steering Committee would have the role of monitoring development and implementation activities on interoperability, promoting the application of the specifications developed by EASI.

**OTHER BODIES**

*The ATM Forum*

ATMF activity is focused mainly on aspects related to the specification of protocols for private ATM networks.

However, in ATMF there is the understanding that interworking with other networks based on other technologies is important to promote the adoption of ATMF based products.

Among the activities in this direction, the most important items currently under development are the specification of

- AINI (Interface between private and public ATM network), and of
- PNNI (Interface between private networks).

More specifically, the following are the areas in the ATM-F that PRIME is monitoring with regard to interoperability:

- Specification of AINI (ATM Internetwork Interface), this is an interface for generic interconnection of heterogeneous ATM systems;
- Internet / ATM Co-operation, including MPOA, and QoS Mapping between Internet and ATM
- “Cookbook” of ATM Solutions for Interoperability.

*DBV (Digital Video Broadcasting)*

Within the DVB project the key working group under consideration by PRIME is the MHP (Multimedia Home Platform).

Interoperability is one of the key goals, along with openness, flexibility and market-led consensus, that characterises the DVB’s philosophy/approach and the activity carried out within all the working groups that have been set up so far.

Observing the overall trend of the market pushing the Set Top Box towards convergence fostered by broadcasters and the main players of the “near-term” industry, the DVB project has created a working group called MHP. MHP is aimed at evaluating and promoting the path for the STB’s evolution and harmonisation in a context of multimedia convergence.
According to the established DVB project’s methodology, the MHP activity is carried out within two ad-hoc groups:
- the first, within the Commercial module, is responsible for the development of user/commercial requirements that will be used as constraints on the technical specification;
- the second, within the Technical module, is focused on the development of technical guidelines (not necessarily specifications) for MHP based on the requirements defined by the Commercial Module.

The approval process of a developed specification within the DVB requires that the Commercial Module support the specification before the Steering Board finally approves it. The Commercial activity of the Multimedia Home Platform working group is focused on the following topics:
- definition of the evolution path for multimedia equipment including set-top boxes, integrated TV receivers, in-home digital networks, Personal Computers, Network Computers, computer games systems, etc., taking into account the existing and near-future penetration of equipment, and the success of early services;
- preparation of Commercial Requirements on:
  - interfaces to permit software applications to be loaded and run, retaining backwards compatibility with early-market products, and permitting future extension;
  - navigation tools (programme and service selection mechanisms, tuning and decoder configuring in the widest sense);
  - user-choice of programming (via Electronic and other Programme Guide functions and services);
- development of a road map for the applications, working on the operational requirements and addressing in priority enhanced broadcast, Internet access and interactive television;
- studying the format for transmission of navigation and EPG data via DVB
- changing proposals (simplification and/or enhancements) to DVB specifications to make the Multimedia Home Platform concept practical, and elaborate guidelines where necessary;
- development of proposals for implementation profiles defined at hardware and software levels (layered approach), considering market and management issues of such a layered approach.

From a technical point of view, the approach of the MHP group is that of promoting:
- the development of hardware to demonstrate the basic requirements set out in the MHP working group; and
- the development of software interfaces that support the interoperability over different platforms whilst supporting coexistence with proprietary elements such as Operating Systems, API and/or CA (Conditional Access) solutions.
**OMG (Object Management Group)**
Among OMG objectives is the provision of vendor independent specifications, closely related to interoperability.

For the interactive multimedia market an important group is the Electronic Commerce Domain Task Force which is followed with the objective of identifying key elements for the definition of interoperability profiles for this application area. In addition, the standardisation of mobile agent system interoperability (MASIF) that takes place in the ORB and Object Services Platform Task Force is monitored.

**OIF (Optical Interconnection Forum)**
One of the aims of the OIF is “to promote nation-wide and world-wide compatibility and interoperability, encourage input to appropriate national and international standards bodies, and identify, select and augment as appropriate and publish optical internetworking specifications drawn from appropriate national and international standards”. As such this body is seen as very relevant for the project’s objectives.

This forum has recently begun its work. The compatibility and interworking activities of the OIF are closely followed.

**OPIMA (Open Platform Initiative for Multimedia Access)**
The Open Platform Initiative for Multimedia Access (OPIMA) has been set up based on the belief that the multimedia market would see faster development if a standardised technology existed that would

- allow the consumer to use and pay for services,
- without having prior knowledge of which services would be consumed,

in a simple way such as by operating a remote control device.

The actual technology required to reach this goal already exists, but OPIMA believes that some aspects of it need to be standardised, thus enabling the system to work openly and efficiently. OPIMA operates in the Industry Technical Agreement (ITA) programme of the International Electrotechnical Commission (IEC).

The OPIMA platform is targeted at providing value-chain participants the ability to acquire, supply, process and consume multi-media services on a world-wide basis in accordance with the rights associated with these services. To enable a greater selection of content to the consumer the platform should guarantee content providers’ interests through secure content management and protection. OPIMA specifically addresses intellectual property management and protection.

The activity of this group has been followed from the beginning. The forum has produced version 0.6 of the specification that is available for public comments.
The ACTS SII-G6 approach to Interoperability

This draft guideline was initially conceived in support of the Memorandum of Understanding (MoU) on Multimedia Service Interoperability. This MoU on Multimedia Interoperability had been under discussion at the time. It was concluded however, that an MoU with such a large scope was premature.

The relation with a specific MoU on the subject covered by this guideline was therefore no longer there. However, it was felt that a document specifically dealing with interoperability is very important at this stage, and this has led to the development of a more generally applicable guideline on multimedia services interoperability.

The guideline has been initially developed within the framework of the SII Chain in ACTS, with in particular the contribution of four projects, ATHOC, EURORIM, OCTALIS and SOMMIT. With the closing of the SII Chain activities, PRIME has taken over the responsibility for its further development and completion within the framework of the NI Chain Group, more specifically in the NIG (Global Network Interoperability) Chain.

The concept of interoperability developed within this guideline as illustrated hereafter will be promoted by PRIME within the relevant standards bodies.

Within the scope of the guideline, the term interoperability is understood as service interoperability, and the guideline specifically considers the issues related to:

- **“horizontal interoperability”** considering the compatibility of services peer-to-peer, across multiple networks, between (remote) end-systems;
- **“vertical interoperability”** considering the problem of service offering on top of multiple heterogeneous networks.

The following, simplified enterprise model highlights the type of interfaces at which the considerations and the issues on service interoperability developed and discussed by this guideline apply.

The model also shows that the area of applicability of this guideline is within the information service provision domain and does not cover the provision of information (content).

The logical interfaces identified by a dashed line are the interfaces at which the concept of horizontal interoperability as defined above applies. Provision of interoperability at this type of interface will allow users to connect to any information service provider or broker and to be able to run their applications independent of the specific service provider.

The logical interfaces identified by a double line, crossing the boundary between structure and infrastructure are the interface at which the concept of vertical interoperability as defined above applies. Provision of interoperability at this type of interface will allow information service providers to deploy and offer their services independent of the infrastructure available. Achievement of interoperability at this type of interface also allows users and providers to choose different infrastructures.

The guideline explores possible solutions to the problem of service interoperability, and in particular the following observations apply within the scope of this document:
**Horizontal Interoperability:**

*at the minimum level*, the user is able to access different service providers by downloading, via a standard protocol, specific applications for each service; *at the optimum level*, the user is able to address different service providers using the same application.

**Vertical Interoperability:**

information service providers can provide services, to users, via all infrastructures (independent of the underlying infrastructure).

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**Concluding remarks**

Realisation of interoperability in the market place is a key requirement for the development of the multimedia market, and of the Information Society.

Standards bodies are the natural place for the development of specifications required to achieve interoperability. Interoperability is in fact, implicitly or explicitly among the main objectives of their work. However, in few cases specifications developed explicitly deal with interoperability.

An analysis of the different approaches gives broadly three different ways in which analysed organisations with an emphasis on interoperability focus their activities:
• ‘single set of specifications’: priority is the development of a ‘single set of specifications’ for a given function or application; this approach is often taken when different standards and/or de-facto specifications compete;

• interworking/interoperability with other specifications: priority is achieving interworking/interoperability between different specifications for the same or similar applications; this approach is often taken in environments where regional differences and/or differences between ‘public’ and ‘private’ are accepted;

• formal interoperability specifications: priority is the development of actual formal interoperability specifications, that allow different implementations to be designed and tested for interoperability; this approach is taken when a single set of specifications is available, and market players demand interoperability to be practicable rather than theoretical.

ETSI project EASI, and GII Project F4 of the ITU-T, are examples of standardisation efforts where interoperability is the main objective, rather than a desired ‘side effect’.

It is important that the sector actors work together to support these and other initiatives in the relevant bodies to achieve the important goals of designing for and achieving interoperability.

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REFERENCES
SII Chain—DRAFT guideline G6 “Interoperability for Multimedia Services” – September 1999
AC370 PRIME—Deliverable D202 “Analysis of interoperability requirements and of relevant activities in standards bodies and fora” – April 1999
ETSI—Report of Project EASI meeting No. 7 – Sophia-Antipolis, 21-23 April 1999 – April 1999
ETSI—Report of Project EASI meeting No. 8 – Kjeller, 29 June—1 July 1999 – July 1999