Zeitschrift: Comtec : Informations- und Telekommunikationstechnologie = information and telecommunication technology

Herausgeber: Swisscom

Band: 78 (2000)

Heft: 1

Artikel: Guidelines for interworking and interoperability in broadband networks

Autor: Potts, Martin / Rao, Sathya

DOI: https://doi.org/10.5169/seals-876417

Guidelines for Interworking and Interoperability in Broadband Networks

Appropriate policies and actions for the development of Europe's telecommunications infrastructure are critical for the implementation of an information society capable of keeping its high position in the global market.

MARTIN POTTS AND SATHYA RAO

This paper explains the concept of "Chains" within the ACTS Programme, and the philosophy behind the production of so called "Guidelines". It then provides an introduction to the Guidelines relating especially to aspects of network interworking and interoperability, ranging from the lowest layer of physical interconnectivity to the interoperability of the various management Systems.

What are Guidelines?

It is important to clarify the interpretation of the somewhat controversial term of "Guidelines". Guidelines, in the context of the ACTS Programme, are not a compulsory set of rules but rather a kind of roadmaps for the introduction of advanced communication technologies and services. The validity and authority of the roadmaps is achieved through the expertise of the contributing persons, the consensus of the many projects, and external reviews, as shown in figure 1.

Guidelines are short, concise documents that address themes, rather than specific technical issues. This helps avoid any tendency to be vendor-specific. The added-value of Guidelines is achieved through the validation of the recommendations through trials in ACTS projects, and the endorsement procedure (including exposure to selected qualified audiences) which leads up to the publication.

Whilst the Guidelines themselves are intended to be concise and easy-to-read documents, they are backed up by substantial experience, project experiments and measurements.

Guidelines are aimed at audiences (mainly) outside of the ACTS community, in the telecommunications business. For example:

- Terminal and switching equipment manufacturers
- Network operators, implementating heterogeneous and pan European networks
- Service providers, benefiting from the visibility they will have of the quality of service they are providing to users (e.g. through performance/QoS issues)
- Users representing both business and residential environments, as their requirements on network issues (including accounting) have to be taken into account
- External but related initiatives, such as Eurescom, NM Forum, TINA-C, ATM-MoU, UMTS Forum, DECT operators forum, ATM Forum, ETSI (e g. SMG5, NA6), ITU-T (e g. SG1, SG3, SG11, SG13)
- Application developers
- G7 "pilot projects" on Global Interoperability for Broadband Networks (GIBN)
- ACTS projects with a need to interoperate across regions, throughout Europe, or around the world.

Each Guideline is directed specifically at one or more of these target groups, as specified in the text. Guidelines are mainly concerned with technical issues, and include outside considerations, such as potential roadblocks, standards activities and ongoing work in specification forums. However, they also consider technoeconomic aspects, policy recommendations, social aspects and regulatory issues.

How are Guidelines Produced?

An important factor in the production of Guidelines is cons ensus (fig 1). If consensus can be found between a number of (often competing) manufacturers and network operators, then it is likely that the resultant recommendations on ways to realise advanced communications in Europe are reasonable, feasible and accurate. The recommendations are then tested, through trials, and external reviews by the broader constituencies of common interest: users, content owners, new service providers, manufacturers and operators (e g. through exposure at conferences), and feedback is incorporated, before the documents are issued.

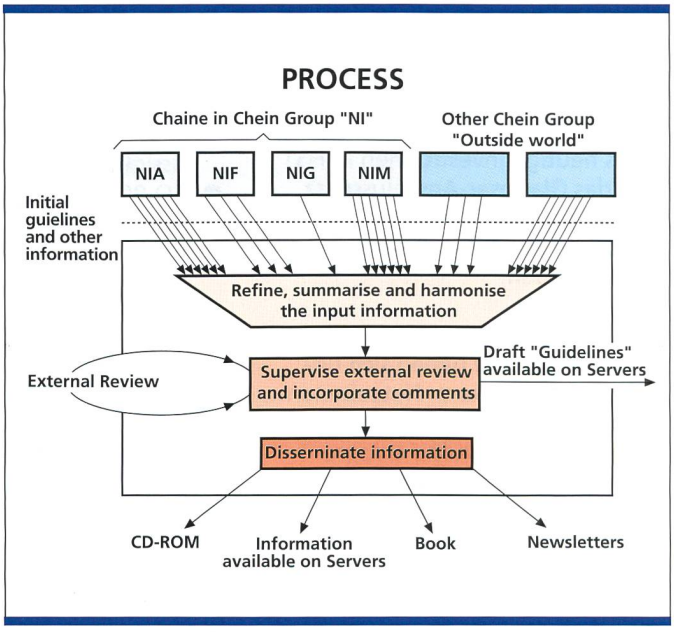

Fig. 1. The Guideline Production Process.

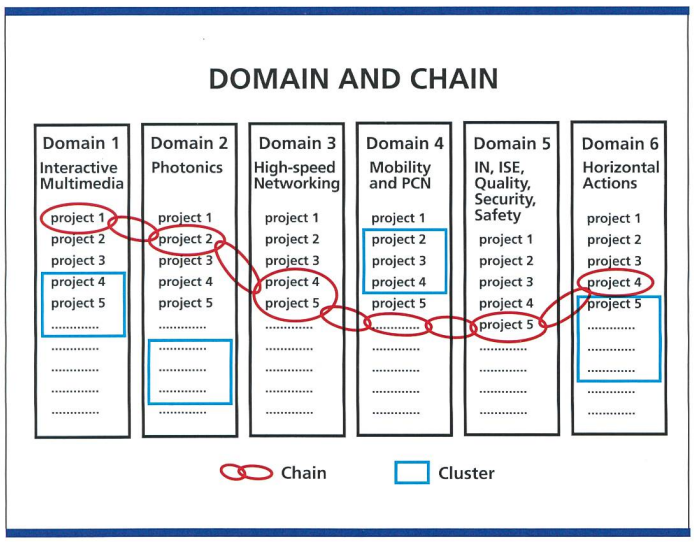

Fig. 2. Domains (Clusters) and Chains.

Concensus is achieved within the ACTS Programme by organising projects into a matrix structure of "Domains" and "Chains" (fig. 2):

Domains

Six Domains have been established:
Interactive Multimedia
Photonics
Highspeed Networking
Mobile and PCN
IN, ISE, Quality, Security, Safety
"Horizontal" Actions
Each of the 200 projects in the ACTS Programme is allocated to a Domain according to its technical orientation. Domains therefore support concertation between projects working within a defined technical area and provide a natural forum for reviews of progress by peers as well as co-operation between projects working on similar problems. Even more specific technical details may be discussed in Sub-Domain groups, called "Clusters".

Chains

Chains, on the other hand, are the means of realising concertation on broader objectives, which encompass a range of technologies.
Chains address objectives which have a strategic importance outside of the Programme itself. Each link in the chain provides one step in a continuous delivery path from the enabling technology to the end application/social impact (or indeed, in the other direction). It is Chains that produce the Guidelines. Chains tend to be driven by external events and milestones. Chains can therefore be created and expire within the timeframe of the ACTS Programme, as appropriate topics arise.
Chains offer the greatest potential for adding value to individual ACTS results.
Five Chain Groups are currently operational:

BA: Broadband Access Networks – Economics and Evolution
GA: Generic Access to Applications – the user perspective
NI: Network Level Interoperability and Management
SI: Global Service Integration
XB: Broadening of Awareness – Programme Level

The Positioning of the Network Interoperability Chain Group

The BA Group is concerned with issues at the lower layers (physical and networking), the SI Group with the intermediate layers (services) and the GA Group with the top layers (applications; see fig. 3).
The XB Group is a nontechnical group dealing only with dissemination of results (e.g. participation in major conferences).
As seen from figure 3, due to the overall impact of network interoperability issues, aspects of the NI Group relate to all the other Chain Groups.
For example, the combined results of NI and BA lead to a global telecommunications network structure. On top of this network, the SI Group installs its services, and the whole structure is offered to the GA Group to run its applications.
Guidelines in this session concern specifically issues related to network interoperability and management (the NI Chain Group). This Chain Group focuses primarily on issues of Interoperability between different types of networks and encompasses the following aspects of Interworking:

- physical level (e g. Opto-electric-radio)
- network level (e g. signalling and control functions in homogeneous and heterogeneous networks; interoperability between fixed and mobile networks, optical and electrical networks; interfacing with service-provider networks)
- application level (e.g. interfacing with content providers; user QoS)
- management aspects (e.g. interoperability between network management systems, ATM accounting schemes; guarantee and preservation of QoS).

Members of the NI Chain Group are often involved with demonstrations of various aspects of Interoperability (e g. the regular series of IDC Conferences on Network Interoperability, which in 1997 was held in Madeira, and was linked to the Global Networking '97 conference in Calgary). Such events and experiences serve also to verify the technical recommendations in the Guidelines.
A book [I] containing the first tranche of Guidelines is available through the Commission or the GINA project.
The NI group is in its third year of activities and is about to release a second tranche of Guidelines in october.

The Scope of the Network of the Interoperability Guidelines

Currently, four Chains are active within the NI Chain Group (fig. 4):

NIA: Accounting Schemes for ATM
NIF: Fixed/Mobile Interoperability (incl. Satellites)
NIG: Global Network Interoperability
NIM: Network Management Interoperability

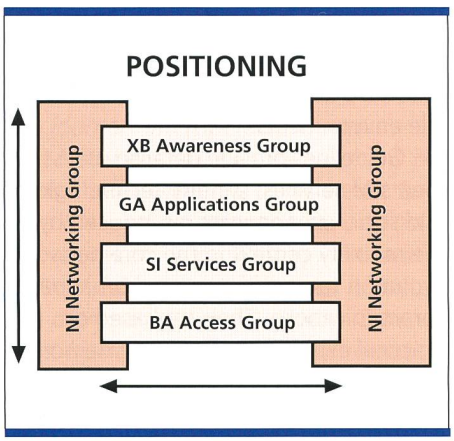

Fig. 3. NI positioning among the ACTS Chain Groups.

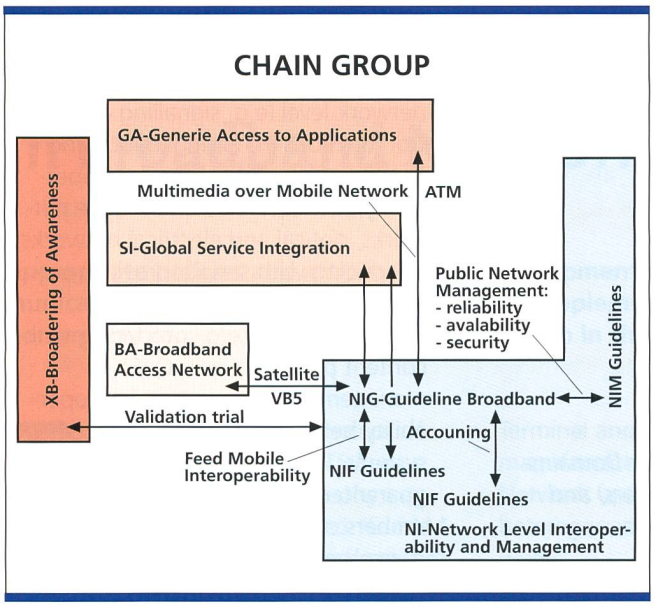

Fig. 4. The Set of Chain Groups and their Interrelationships.

Some examples of themes being worked on by these Chains are:

NIA

Large customers require predictable bills. Small customers require bills that they can easily understand. Network operators want flexibility in the charging scheme, to allow them to gain a competitive advantage and to use charges as a mechanism to control the usage of their network resources. Any accounting scheme has to be able to take different QoS factors into account, be capable of being monitored, yet be realistic to implement and maintain.
All these requirements together are difficult to satisfy with one single approach, but the NIA Chain members have documented charging models for ATM services, and their expected effects.

NIF

The objective of the NIF Chain is to support the seamless provision of basic and advanced services across fixed and mobile environments.
NIF Guidelines provide detailed assessments of services, system, technological and socio-economic issues induced by the mobility context in the core network evolution towards integrated broadband communications. They are based on practical experiences gained in demonstration systems and field trials.
Aspects covered are short-, medium- and longterm scenarios for fixed and mobile network Interworking. These provide guidance for the definition and structuring of the appropriate interfaces, migration paths from existing networks towards a common structure for easy interworking (including the consequences for service integration and interworking), and scenarios where fixed networks comprising B-ISDN and IN provide a possible solution for mobility in fixed networks.
The integration of fixed/mobile systems strongly requires the re-use of existing resources, components, protocols and services as far as possible.

NIG

Broadband capability is being deployed on a massive scale across Europe. This is being fuelled by demand for Internet services, and satisfied by the entry of new operators into the market. However, there are few signs of networks converging to a single technology in the LAN, access and backbone environments. Instead, supporters of each technology claim that their's can be used as the future single multiservice broadband network; i.e. as the capacity of the individual networks increase, they become able to carry a multiplicity of services. On all networks we are therefore beginning to find services that were traditionally carried on other types of network (e g. IP telephony) while, at the same time, we have seen a divergence of the network technologies which support these services. This has greatly increased the degree of interoperability which is needed between services, networks, and between the underlying network technologies and their management systems.

NIM

The objective of the NIM Chain is to recommend solutions for the interoperability of network (and service) management systems. This means a consistent management platform covering the management requirements of different heterogeneous networks, which when

Zusammenfassung

Richtlinien für die Kompatibilität und das Zusammenwirken von Breitbandnetzen

Geeignete Strategien und Aktionen zur Weiterentwicklung der europäischen Telekommunikationsinfrastruktur sind entscheidend für die Realisierung einer Informationsgesellschaft, welche fähig ist, ihre führende Stellung im Weltmarkt zu verteidigen. Der vorliegende Beitrag erläutert das Konzept «Chains» innerhalb des Programmes ACTS sowie die Philosophie, die der Schaffung sogenannter «Richtlinien» (Guidelines) zugrunde liegt. Des Weiteren bietet er eine Einführung in die Richtlinien, welche sich insbesondere mit den Aspekten des Zusammenwirkens der verschiedenen Netze – von der untersten Schicht (physische Vernetzung) bis hinauf zu den verschiedenen Managementsystemen – befassen.

interconnected will be able to provide end-to-end service.
The Chain opens the work to management topics which have been so far less extensively studied than traditional fixed network, e g. access management and WDM photonic networks, also creating synergy between ACTS projects directly addressing the management issues and those addressing it only as a secondary activity.
Specific aspects covered are methodologies for the design of service management service systems capable of co-operating across different administrations, organisations and technologies, a generic information model for describing an access system in a technology-independent way (and compliant with standardised functional specifications for B-ISDN equipment and TMN management architectures), and architectural issues for migration, coexistence strategies, and inter-operation concepts between the TMN OSI environment, and the TINA architecture.
New NI Guidelines to look forward to in the near future include:
- a Summary of ATM Charging Strategies
- Requirements of the Interface to UMTS between Access and Core Networks
- Internet and ATM Coexistence (first version)
- Towards Resilient Networks and Services
- Satellite and Terrestrial Network Interoperability
- Security of Multi-Domain Management Systems
- a Generic Management Information Model for Optical WDM Networks

Conclusions

Europe has an historic strength in advanced information and communication infrastructure, technical competence, a large home market comprising sophisticated users, competent service providers, and equipment manufacturers competitive on a worldwide level. However, it still suffers from traditional activity and market fragmentation across the different countries. Without a rationalisation of effort in this area, Europe risks losing its position in the global competition arena and the related jobs.
ACTS Guidelines are intended to be concise documents describing all aspects of broadband deployment aimed at specific audiences, including equipment manufacturers, network operators, users and policy makers. These Guidelines will promote network access, interconnection and interoperability through the description of technical solutions and standards supported by the documentation of trials in real environments.
Guidelines represent consensus opinions from the ACTS programme, and the contents of some of the new ones to be released soon will now be presented as part of the endorsement and consensus building process. 9.4

Acknowledgements
The NI Chain Group Guidelines are the product of numerous contributions from ACTS project members and also of the careful editing by the authors. It is a very difficult challenge to produce documents which are readable by a wide audience, yet contain sufficient technical detail to be useful as recommendations. All the contributors and editors are therefore acknowledged here for their work. The NI Chain Group receives valuable administrative and organisational assistance from the GINA project and from members of the EU Commission. The quality of the Guidelines has been significantly enhanced with their support.

References

[1] Guidelines for the Interoperability of Broadband Networks.

Martin Potts *obtained a B. Sc. degree from Salford University (UK) in 1971. He has worked previously for Plessey (now part of the Siemens group), British Telecom and Ascom. He is now the owner of Martel GmbH based in Berne, which specializes in the management of international telecommunication projects. He is also currently the manager of the EU/ACTS EXPERT project in Basel, which operates one of the largest broadband testbeds in Europe. This testbed is used in joint experiments and demonstrations with other such platforms throughout Europe and in Canada and Japan. The platform works closely with the Communications Research Center in Ottawa on tele-educational "Virtual Classroom" events within the framework of a G8/GIBN project.*
He is the chair of the ACTSProgram consensus-building "Chain Group": Network Level Interoperability and Management, and of the "Chain": Global Network Interoperability. Martin Potts also chairs the group of new ACTS projects investigating innovative solutions for providing QoS over the Internet.

Dr. Sathya Rao *has degrees in electrical communication engineering from Bangalore University and the Indian Institute of Science. He moved to Switzerland in 1980, where he gained his doctoral degree from Neuchâtel University. In 1986, he joined Ascom, where he led much of the work on ISDN systems and broadband communications. He was one of the core members of the team responsible for defining the European research framework on advanced communications, i. e. RACE and ACTS. In 1995, he founded Telscom, providing consultancy services and support to advanced communication research work. Telscom has grown ever since into a company which is involved in ATM system development and internet and ATM solutions for business needs. Sathya has published 3 books on broadband networking issues as an editor and is an editor-in-chief of the journal "Interoperable Communication Networks (ICON)". He has many patents and publications to his credit. Sathya Rao and his company have an established record in organising international and European conferences. Under the patronage of the European Commission, he has organised many international workshops, and distributed seminars using the ATM networks and applications across European centres.*