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TECHNICAL INFORMATION BULLETIN 99-5

ITU-T GII STANDARDIZATION INITIATIVE

JUNE 1999

OFFICE OF THE MANAGER
NATIONAL COMMUNICATIONS SYSTEM
701 SOUTH COURT HOUSE ROAD
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FOREWORD

Among the responsibilities assigned to the Office of the Manager, National Communications System, is the management of the Federal Telecommunications Standards Program. Under this program, the NCS, with the assistance of the Federal Telecommunications Standards Committee identifies, develops, and coordinates proposed Federal Standards which either contribute to the interoperability of functionally similar Federal telecommunications systems or to the achievement of a compatible and efficient interface between computer and telecommunications systems. In developing and coordinating these standards, a considerable amount of effort is expended in initiating and pursuing joint standards development efforts with appropriate technical committees of the International Organization for Standardization, the International Telecommunication Union-Telecommunications Standardization Sector, and the American National Standards Institute. This Technical Information Bulletin presents an overview of the major initiative being taken by the International Telecommunication Union (ITU) to develop a single, integrated Global Information Infrastructure (GII) to meet the needs of the global community as it enters the 21st century; and to describe the associated GII standardization program as it relates to NCS interests. It has been prepared to inform interested Federal and industry activities. Any comments, inputs or statements of requirements which could assist in the advancement of this work are welcome and should be addressed to:

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PREFACE

This Technical Information Bulletin was prepared by ARTEL, Inc. for the National Communications System (NCS), Technology and Standards Division, under contract DCA100-97-C-0069. The purpose of this Bulletin is twofold: First to describe a major initiative on the part of the International Telecommunication Union (ITU) to facilitate the development of a global information infrastructure (GII). In this regard, the Figures contained in Section 2 have been extracted from the relevant ITU documentation with permission from the Deputy Director, ITU Telecommunication Standardization Bureau (TSB).

The second purpose of this Bulletin is to provide an independent assessment of the significance of the GII Program Initiative for achieving national security and emergency preparedness standardization objectives. It will be pointed out that the basic framework concepts that have been developed under the ITU program initiative, and published in the "Y-series" of ITU-T Recommendations, provide the essential core foundation upon which all future developmental efforts will depend.

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

The National Communications System (NCS) was established to ensure that a survivable telecommunication infrastructure exists to support the National Security and Emergency Preparedness (NS/EP) requirements of the Federal Government; and to serve as the focal point for joint Industry-Government NS/EP telecommunications planning. As part of this mission, the Office of the Manager, National Communications System (OMNCS) has been charged with management responsibility for the Federal Telecommunication Standards Program (FTSP); and directed to ensure that, whenever feasible, industry standards are used as the basis for developing Federal Telecommunication Standards.

The OMNCS, recognizing that industry standards development is a market driven process dominated by equipment vendors and service providers whose primary interests are guided by profit potential, has elected to play an active role in the industry process to ensure that NS/EP needs are fully met. To this end, personnel from the OMNCS Technology and Standards Division participate in a number of national, regional, and international standards bodies; and other knowledgeable NCS members are encouraged to do the same.

In recent years, the development and use of international standards has been spurred by the growth of the global economy and its increasing dependence on telecommunications. This has had the effect of drastically increasing both the number and complexity of telecommunication standards. In order to promote the understanding and use of these standards, NCS members require concise reference resources that highlight those having a particular NS/EP implication. In response to this need, the OMNCS Division of Standards and Technology is developing a series of standards reference resources, in the form of Technical Information Bulletins (TIBs), which address key areas of emerging standardization. These Bulletins provide:

- An overview of the importance of the focus area for NS/EP interests;
- A brief tutorial of the relevant technologies;
- An introduction to the principal standards bodies involved;
- A summary of the pertinent standards, organized for easy reference;
- An assessment of standards activity impacting NS/EP standardization objectives with respect to the focus area.

The purpose of this TIB is to provide an overview of the major initiative being undertaken by the International Telecommunication Union (ITU) to develop a single, integrated Global Information Infrastructure (GII) to meet the needs of the global community as it enters the 21st Century; and to describe the associated GII standardization program as it relates to NCS interests.

SECTION 2

OVERVIEW OF THE ITU-T PROGRAM FOR GII STANDARDIZATION

2.0 INTRODUCTION

The ITU has embarked on a major initiative to ensure that a global infrastructure is established which will "facilitate the development, implementation and interoperability of existing and future information services and applications within and across the telecommunications, information technology, consumer electronics, and content provision industries."[1] It is envisioned that this infrastructure will consist of interactive, broadcast and other multimedia delivery mechanisms coupled with the capability for individuals to securely share, use, and manage information, anytime and anywhere, with security and privacy protection at an acceptable level of quality and cost. The target of this effort is referred to as the "Global Information Infrastructure" or "GII" for short.

The principal goal of the ITU regarding the GII is to play a catalytic role in facilitating the development of a truly global information "superhighway". There are four fundamental ways in which this can be accomplished[2]: 1) by developing international standards that will enable the different networks that are likely to make up the GII to interoperate; 2) by allocating spectrum for innovative services, such as the Global Mobile Personal Communications Satellite (GMPCS) program, and helping manage their use; 3) by providing policy and technical assistance to developing countries in partnership with the private sector and other international organizations; and 4) by providing a forum where government and industry can discuss policies and strategies for making the vision of the GII a reality. These initiatives come respectively under the responsibility of the ITU Telecommunication Standardization Sector (ITU-T), the ITU Radiocommunication Sector (ITU-R), the ITU Telecommunication Development Sector (ITU-D), and the ITU Telecommunication Policy Forum. This Report focuses on the GII standardization activities of the ITU-T.

2.1 GII CONCEPTS AND OBJECTIVES

In defining the Global Information Infrastructure, the ITU has placed particular importance on the term "Global" in the belief that it is neither desirable nor logical to speak of more than one global infrastructure since, by definition, the term is all inclusive. Thus, the GII is expected to provide interoperability between a multiplicity of applications and different transport networks. This is to be accomplished through a seamless federation of interconnected computers and communications capabilities of varying complexity up to, and including, national and special purpose infrastructures such as the National Information Infrastructure (NII) and Defense Information Infrastructure (DII). These transport networks will incorporate both wire-line (e.g., copper pair, fiber, and coax) and wireless (e.g., satellite and fixed or mobile terrestrial radio) technologies in a variety of connectionless or connection oriented topologies which are expected to serve an increasing variety of

[1] ITU-T Recommendation Y.100 – GII Overview;
[2] B. Moore, "The ITU's Role in the Standardization of the GII"; IEEE Communications Magazine, Sep. 1998

user applications. In attempting this challenge, the ITU is particularly cognizant of the following considerations which must be taken into account if the GII initiative is to fulfill its desired goals.

2.1.1 The Emerging Telecommunications Environment

The environment in which the GII is being developed is much different from that of the past. This is due primarily to: 1) the convergence of the telecommunications, computer equipment, and consumer electronics sectors of the global economy through the application of digital technology; and 2) the emergence of new business opportunities created by the deregulation of the telecommunications industry and other competitive market pressures.

Digitalization - Traditionally, telecommunications networks have been designed with specific payloads in mind, such as voice, video or data. With the application of digital technology, all forms of information are now simply reduced to a stream of bits which can be transferred over any general purpose digital network. Moreover, with the application of digital technology, the interconnection between different types of networks is also simplified. This situation presents a real opportunity for decoupling the transport network from its intended information payload.

New Business Opportunities - Deregulation is creating many new business opportunities which were either not available in the closely regulated environment of the past, or considered outside the scope of the ITU. In the new competitive telecommunications and information provision environment, every added-value link in the chain from user-to-user, or user-to-content provider, must be taken into consideration in developing the GII.

2.1.2 The Demands of Global Economic Growth

The GII is seen by the ITU as a means to economic growth, competitiveness and socio-cultural development in much the same way as the development of the interstate highway system fostered these activities in rural America after World War II. Accordingly, in developing the GII, the ITU recognizes that successful collaboration between all concerned parties, not just the standards development activities, is essential if the goal of the GII is to be fully realized. At a minimum, this collaboration should be mindful of the following considerations.

Global Collaboration - In order to foster the collaborative atmosphere essential for achieving GII objectives, a set of common documents must be established that outline the areas requiring collaboration; describe the principles, frameworks and architectures within which the collaborating organizations are to operate; and specify a common set of terms and definitions to foster mutual understanding.

Accommodation of Applications - The GII standards must provide for interoperability and interconnection (both connectionless and connection-oriented) between a multiplicity of applications and platforms (both software and hardware) that include entertainment as well as business and other types of applications. The degree of interoperability and interconnectivity will depend on the type of application, and different types of applications will generally have significantly different Quality of Service (QoS) requirements.

Integration and Convergence - The GII must provide an evolutionary approach that allows the integration of current networks and technologies into a compatible overall infrastructure, as well

as providing a direction for future network evolution. Services supported by these networks will include interactive broadcast and multimedia capabilities incorporating both wire-based and radio-based technologies such as copper pair, fiber, coax, satellite and terrestrial (fixed and mobile) radio.

2.1.3 Future Trends and Directions

The ITU, in considering the future direction of the GII, is faced with a number of fundamental questions such as whether ATM or IP will emerge as the basic enabling technology; and whether SONET and dense wave division multiplexing (DWDM) will remain as necessary layers in the GII framework or will new optical switches allow transmission of IP or ATM directly over the optical layer. Connection-oriented networks currently provide voice and data services worldwide over a number of different network technologies with a high level of reliability and defined QoS. Interworking between these networks, and their extension to include broadband capabilities, is being facilitated through the use of ATM technology. This technology is now being enhanced to meet the requirements of connectionless network applications as well.

Connectionless networks, based on Internet protocols, provide a highly flexible platform for allowing users connected to significantly different network infrastructures to share a common set of applications. Currently, IP-networks do not provide a guaranteed QoS. However, a combined effort between the IETF and ITU-T is now being made to adapt the IP protocol suite to meet the needs of voice, data, and video applications requiring a defined QoS. In addition, terrestrial radio, cable, and satellite networks, which have traditionally provided local broadcast entertainment, are also evolving to provide interactive voice, data and video services as well. Figure 2.1-1 illustrates these directions of network convergence.

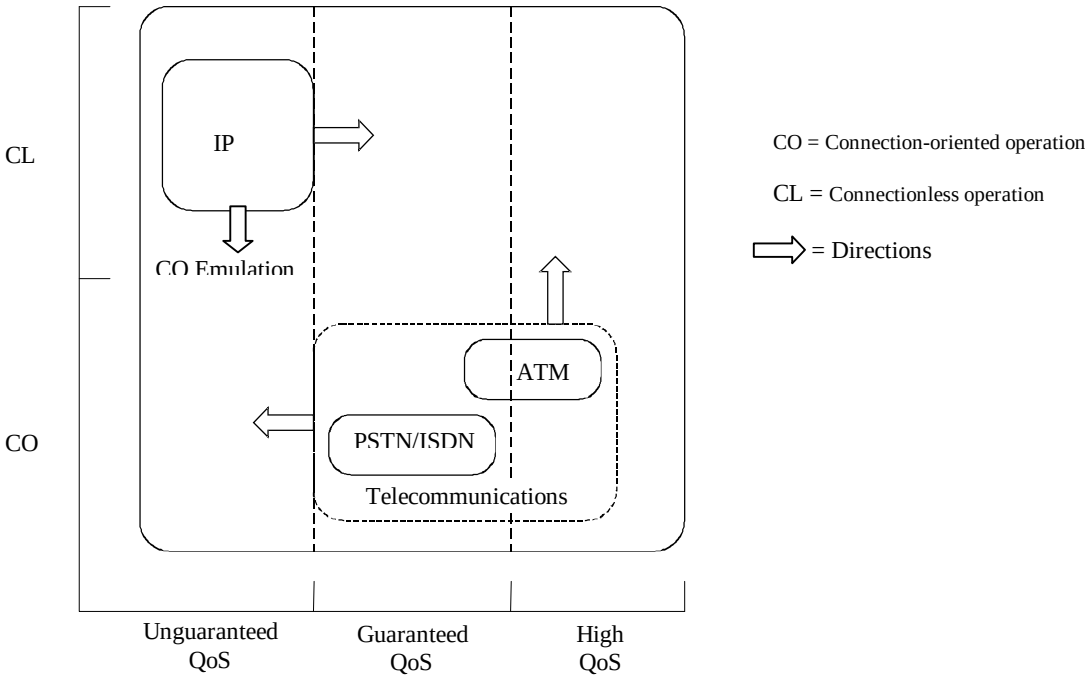


Figure 2.1–1 Networking Convergence Trends

2.2 GII PRINCIPLES AND FRAMEWORK ARCHITECTURE

The GII is at the center of convergence between the telecommunications, computing/information technology, and entertainment/consumer electronics industries; and is rapidly expanding as the implications of this merger are translated into a variety of new applications and services.
While convergence of these three industries is a prerequisite for the GII to emerge, the essence of the information society which it will support is considered by many[1] to be the mixing of what heretofore have been separate types of information (e.g., audio, video, text, and graphics) in to totally new forms. In addition, the ITU intends that access to the benefits of the information society be made available to all citizens of the global community, irrespective of location, in order to encourage economic growth, competitiveness, and socio-cultural development on a global scale. In order for all of this to occur, a common conceptual framework must be established which addresses everyone's needs and can be understood by all. The basic elements of such a framework are illustrated below.

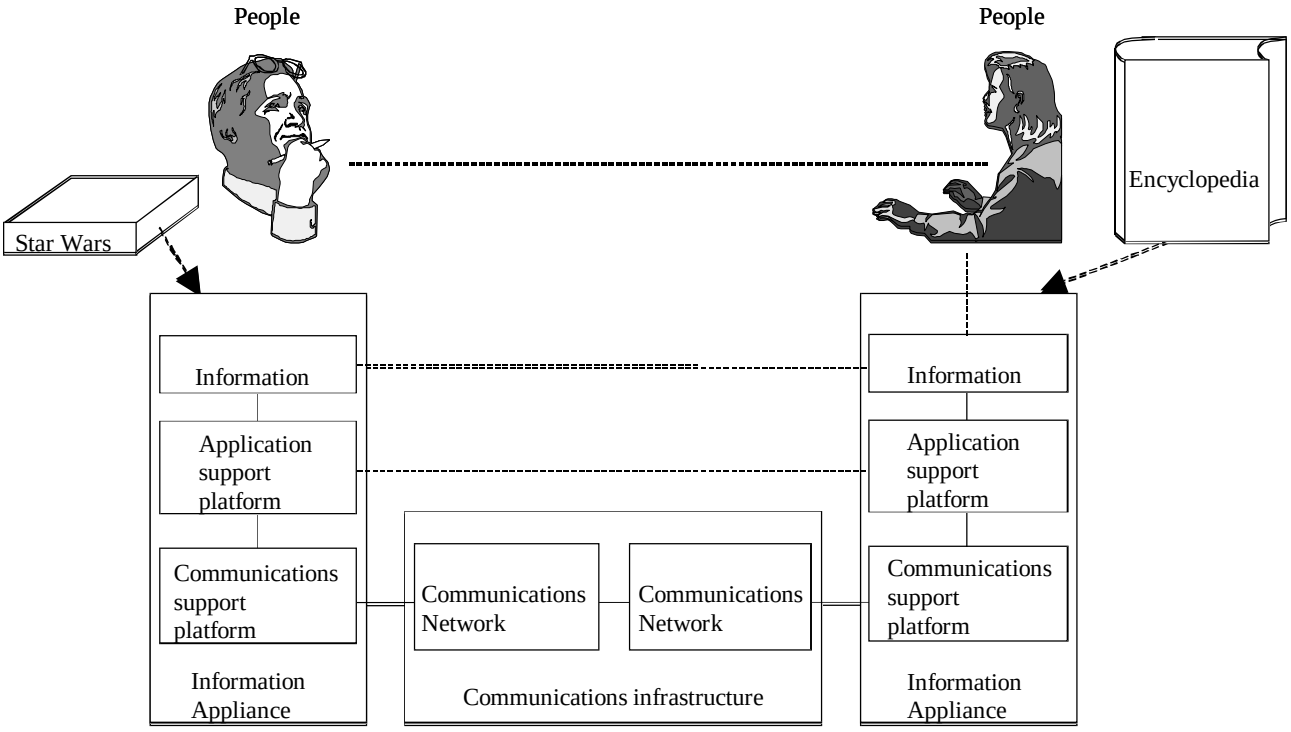


Figure 2.2-1 Conceptual Overview of the GII

Four core elements can be identified which are to be found in any application, no matter how complex, that is expected to be supported by the GII:

- the information, including application software, which may be converted from an existing medium into electronic form for use by GII users;
- the people that create, produce, use and operate on information;

[1] B. Moore, "The ITU's Role in the Standardization of the GII"; IEEE Communications Magazine, Sep. 1998

- the information appliances that are used to store, process, and allow access to information;
- the communications infrastructure used to transport information between geographically separated information appliances.

There are many groups having an interested in the GII, a sampling of which are shown in Figure 2.2-2. Each group tends to view the GII and its core elements from differing perspectives depending on the group's individual needs and concerns. These perspectives can vary from that of an end-user who may be interested only in establishing an interaction with another end-user without regard for the services or underlying networks supporting the interaction; to that of a particular vendor or service provider concerned only with the provision of a single GII product or service.

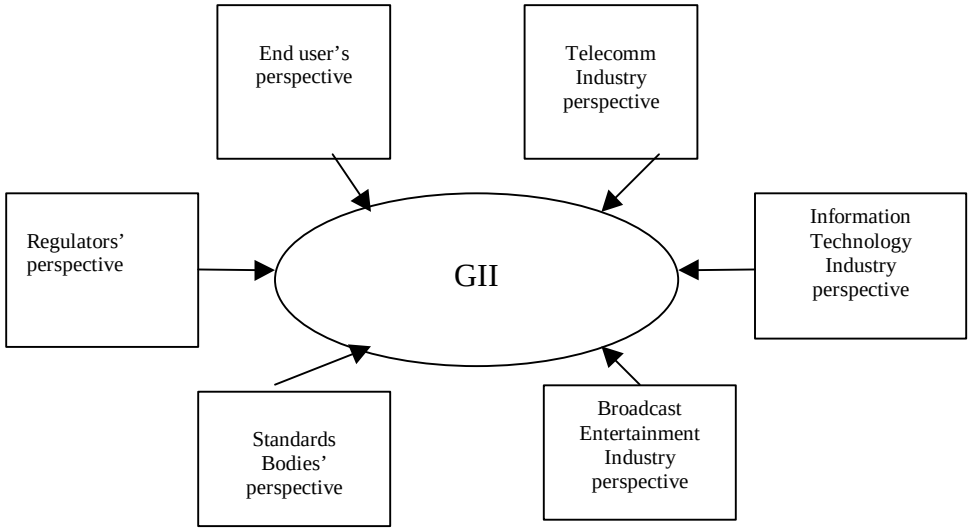


Figure 2.2-2 Example Perspectives of the GII

By examining the GII from each of these different perspectives, ITU-T believes that a more complete understanding of the essential characteristics of the GII can be obtained then would otherwise be available from a "standards" perceptive alone. To accomplish this, ITU Recommendation Y.110 provides a methodology that can be used by each participating group to express their perspective of the GII, while, at the same time, is easily translatable to the perspective of the other participants as well. This methodology is based on the introduction of four separate models of the GII conceptual overview, each tailored to the specific point-of-view of a key GII focus group. These are:

- the Enterprise Model (a business or user's point-of-view);
- the Structural Model (a service or application provider's point-of-view);
- the Functional Model (a standards developer's point-of-view); and
- the Implementional Model (an implementor's point-of-view).

These Models are introduced in the following sections, followed by a discussion of the means for translating between the various models in order to facilitate a common understanding of GII concepts and requirements among the different participants.

2.2.1 The GII Enterprise Model (a Business or User's Point-of-View)

The principal utility of the Enterprise Model is that it provides a method of definition that allows a clear translation from business activity to the relationships which may be a subject for standardization. The basic elements of the Enterprise Model are the individual roles that describe a particular business activity and the description of their interaction. Each role can be thought of as adding value to the inputs received from suppliers, passing on this added value to the next role entity in a "value chain" that ultimately supplies a final good or service to an end-user. When several players choose the same or similar role, it becomes a competitive activity which allows a competitive marketplace to emerge. This concept is illustrated in Figure 2.2-3.

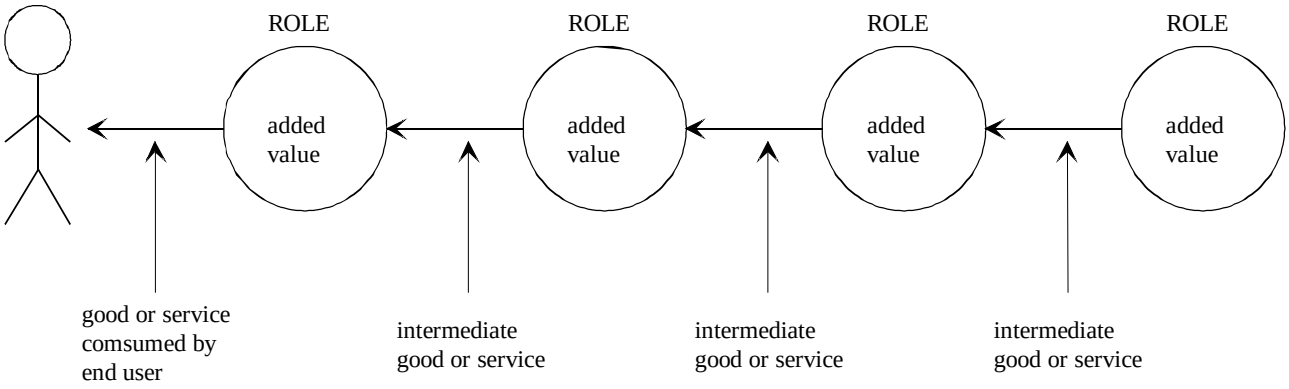


Figure 2.2-3 A Simple Enterprise Model

In applying the Enterprise Model to the GII, the ITU has further defined the concept of roles and relationships to include the following refinements:

Value Chain – a "tree" of roles that are connected together to make a finished good or service to be consumed by an end-user. The total set of roles involved in producing an end good or service, together with the manner in which they pass intermediate goods or services between the roles, is called a "**complete value chain**." Those roles which makeup the principle activity of a generally recognized industry producing end goods or services constitute the "**primary value chain**." All other roles in the complete value chain provide a supporting role.

Role – a business activity that fits into a value chain and is unlikely to be subdivided between more than one player, or reduced beyond the scale of the smallest business activity that would typically exist in a given industry. Roles are identified as being of two types:

- **Structural Role** – a role in the primary value chain of an industry. The output of a structural role is usually directed only to the next structural role in that Value Chain.

- **Infrastructural Role** – a role that is not in the Primary Value Chain, but supplies one or more Structural Roles that are. The business activity of an infrastructural role can be directed towards a variety of other roles, not necessarily belonging to the same Primary Value Chain; and may itself have a Structural Role in a Primary Value Chain in its own industry.

Player - an individual or organization which undertakes one or more roles. A player can be a commercial company, a government agency, a non-profit organization, or any other entity that takes a role in a Value Chain.

Role Relationships - a particular relationship exists when intermediate goods or services are passed from one role to the next in a value chain. This relationship implies that a marketplace exists that can match players who undertake the role on one side of the relationship with players who undertake the role on the other side. Some players may choose to undertake both roles, in which case the relationship is said to be within the player's "**domain.**" In addition to goods and services, the relationship also includes the contractual and legal obligations and other information pertinent to the interaction.

- **Horizontal Relationship** - a relationship between two adjacent roles which are in the same primary value chain, and thus belong to the same industry. This relationship is also referred to as a "**structural relationship.**"

- **Vertical Relationship** - a relationship between two roles which are not in the same Primary Value Chain. One role will supply goods and services in order to provide some of the infrastructure required by the structural role.

Segment - a role can be thought of as being made up of a number of segments for the purpose of providing linkage to the other GII models.

2.2.1.1 Structural Roles in the Information Society

Information is the key element of the Information Society. Thus, the Information Industry can be considered as the principal industry in a primary value chain that provides and manipulates this information for the benefit of end-users. The ITU has identified the following structural roles which comprise this information value chain:

Information ownership role (IOR) - there is frequently value in owning the source of information, which can then be sold as the raw material for initiating the value chain;

Provision of information and related content role (PICR) - this role takes the raw information from the owner and organizes it into a form more amenable for inclusion in a information or information-based service (e.g., a library of photographs that could be used by travel agents in describing their services);

Provision of information-based services role (PISR) - this role takes the information supplied by the content provider and builds an information or information-based service that is then made available to end-users. This role includes both activities (applications) for which information is the principal part of the service (e.g., the yellow pages) and activities for which information is only a supporting part of the service, such as home-shopping.

End-user role (EUR) - the end-user can be either a private individual or a "role" in another industry, (primary value chain) requiring information-based services.

The structural roles, as well as the relationships between them, require support services which are supplied by infrastructural roles provided by the GII. These roles are illustrated in Figure 2.2-4.

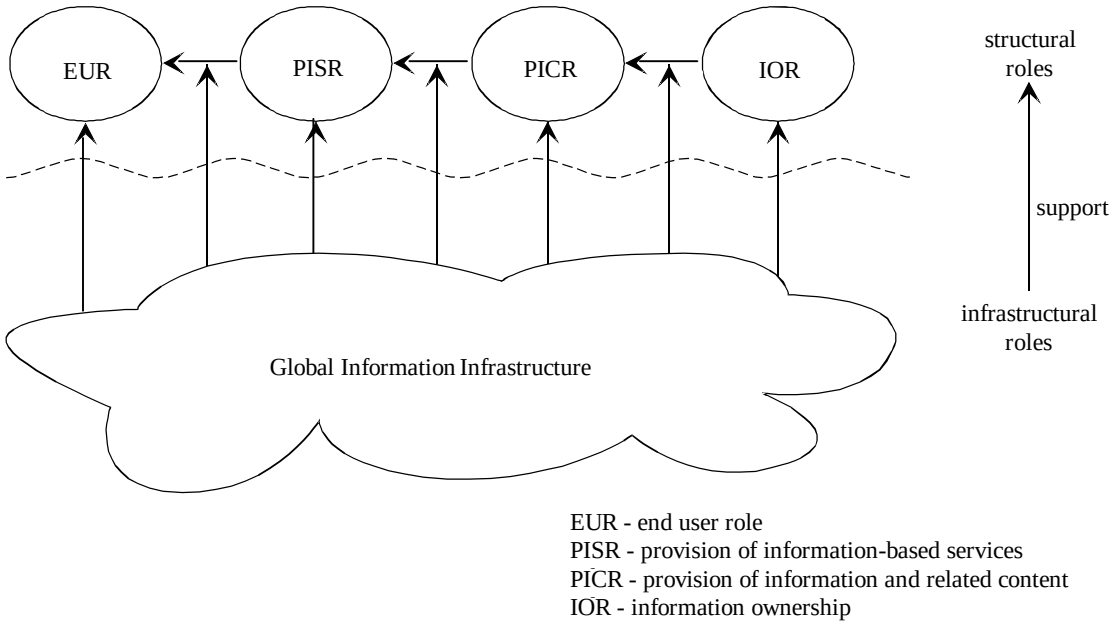


Figure 2.2-4 Structural Roles as the Users of the GII

2.2.1.2 Infrastructural Roles Provided by the GII

The GII can be defined in terms of the set of infrastructural roles that supply support services to the primary value chain of the Information Industry. In other words, the structural roles of the Information Industry are the principal users of the GII. While these structural roles are concerned only with the business activities directly associated with information content and its presentation to the End-user, the infrastructural roles provided by the GII are concerned with the full range of support services required by the primary information value chain. The following infrastructural roles have been defined by ITU-T for the GII

Communication and networking of information - This role provides a general, distributed platform on which information applications and services can be supported without being aware of the nature of the distribution. This includes invoking the application when requests are received, supporting messaging to and from the application and between components of the application, and the provision of other support capabilities such as directory services, navigation, security, payments, and browsing/searching.

Distributed information processing and storage service provision – This role provides a platform for processing applications and for storing data. This role will involve the use of an information appliance.

Generic communications service provision - This role provides basic telecommunication services for the transport of data, voice and video.

Service and application creation support - This role supplies features which facilitate the production of services and applications that use communication and information networking.

Terminal equipment supply - This role supplies information appliances to end-users; and forms an integral part of the distributed platform operated by the communication and networking role.

While these are considered supporting roles from the perspective of the information industry, they are viewed as primary roles from the perspective of the Telecommunications Industry. However, in the context of the GII, these infrastructural roles can be viewed as supplying the telecommunication service components and associated systems required to support GII User applications. Figure 2.2-5 illustrates some of the more commonly recognized services and systems as they relate to the scope of the GII.

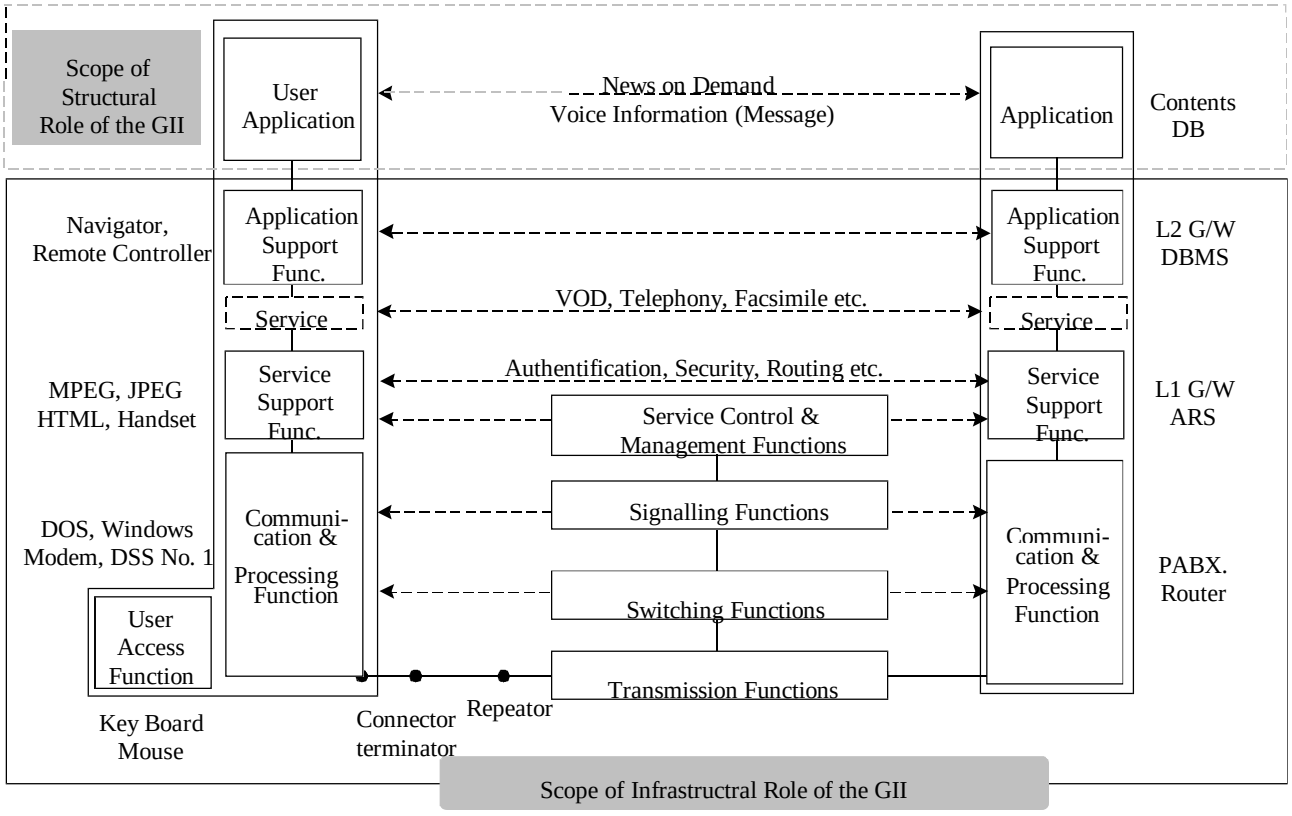


Figure 2.2-5 Example Configuration of Infrastructural Roles in the GII

2.2.2 The GII Structural Model (a Service or Application Provider's Point-of-View)

The Structural Model identifies the services or applications supplied to end-users of the GII by the infrastructural roles of the GII, and the way in which these roles can be organized to offer services and supply applications. This model is concerned with GII services and the way these services are supplied to GII users, and should not be confused with the structural roles of GII users as described in the Enterprise Model.

In order to offer a service or supply an application, a role must bring together a number of resources and package them into a form desired by end-users. Each resource utilized may be supplied by another role, in which case that resource is the output service of the supplying role. As a role adds value by packaging together services or applications received from other roles, it can either provide a bundled version of these inputs, or create entirely new services or applications. The concept of the GII Structural Model is illustrated in Figure 2.2-6.

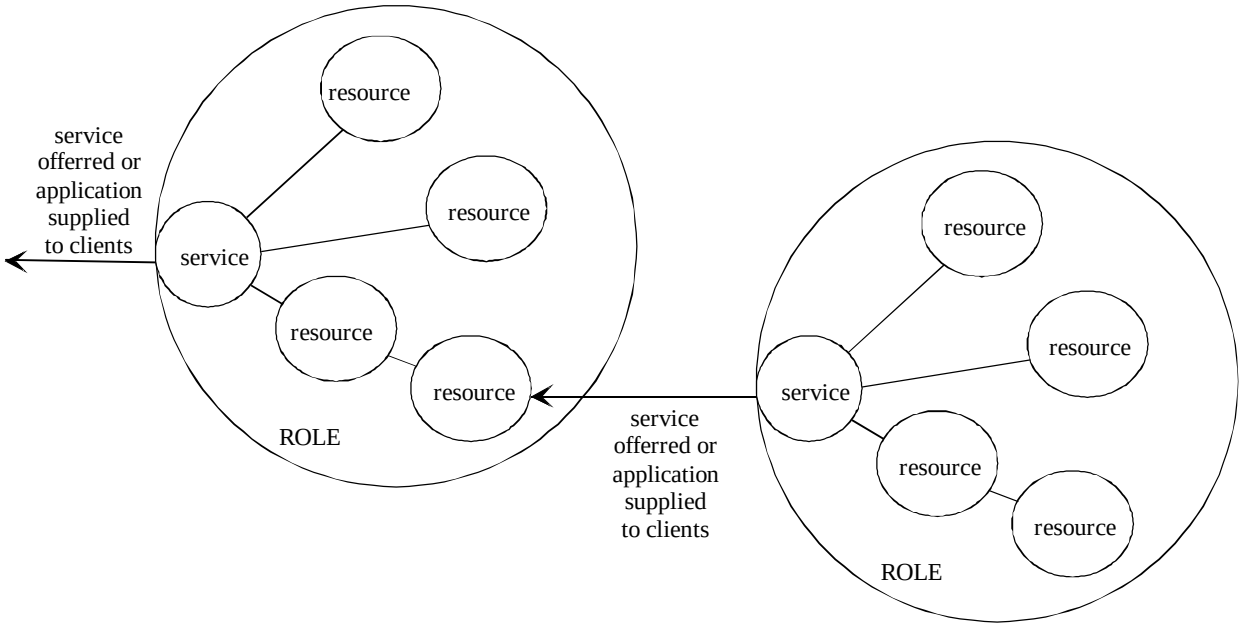


Figure 2.2-6 The GII Structural Model

ITU-T has specified the following definitions for terms used in the GII Structural Model:

Service - In order to pass value up a value chain, a client role requests and invokes services from one or more supplying roles. A service is characterized by the transactions which take place between these roles, with the client generally requesting a specific service for each item of value required. Where a service is offered between roles undertaken by different players, the service will be offered in the context of a contract which must contain sufficient features to ensure that the contract can be fulfilled and verified.

Contract - When two related roles are undertaken by different players, a contract is agreed which establishes the framework for interaction between the two players. If the two players are commercial organizations, then the agreement will be a commercial contract.

Application[3] - An application is similar to a service, but with the distinction that the client generally buys full rights to the application which can then be reused many times. With this definition, the supply and support of an application is undertaken as an infrastructual role of the GII, while the operation of an application becomes a structural role that is part of the user's domain. A distinction can also be made by noting that the Telecommunications Industry has traditionally offered "services", whereas the principal products of the IT Industry are normally referred to as "applications."

Application Component - When an application is distributed across several geographically separated information appliances, the application will be formed into a number of components. These components will interact with each other using the services of the GII. On the other hand, an application may be divided into application components in order to simplify the application design. In this event, more than one component of a particular application may reside in the same information appliance.

Segment - a part of a role, owned and operated by one player. A segment is comprised of a well defined set of functions and is the entity which is common to enterprise, structural, and functional modeling.

Domain - a collection of segments which are owned and operated by a single player, including those from more than one role. The extent of a domain is defined by a useful context and one player can have more than one domain. However, a domain should not include more than one service provisioning platform.

Service Provisioning Platform - Many services, particularly those requiring network resources, may require resources owned and operated by several players. A service provisioning platform is the collection of all federated resources required to offer a service, and can be formed by combining a number of segments as required to offer the service. These segments can be drawn from any number of supplying roles belonging to different, but cooperating domains.

Service Interface - the means by which a service is used by a player. The service interface will have several aspects, such as the inter-role relationship, information and computational aspects, implementational aspects, and contract aspects if the interface is between players. If the service involves the delivery of physical goods, this also must be included in the description of the service interface.

Service Components - a service interface can be complex and made up from a number of service components. Some of these components may be optional in the service interface.

2.2.2.1 Structure of GII Services and Applications

The services and applications supplied by the GII are built up in the form of service and application components or building blocks. These components are then packaged together in order to create the final service or application delivered to the user, as illustrated in Figure 2.2-7.

[3]It is noted in ITU-T Recommendation Y.110 that there are many definitions of the term "application" used in the various ITU-T Study Groups and other standards bodies. As a result this definition may not fully align with other uses of the term.

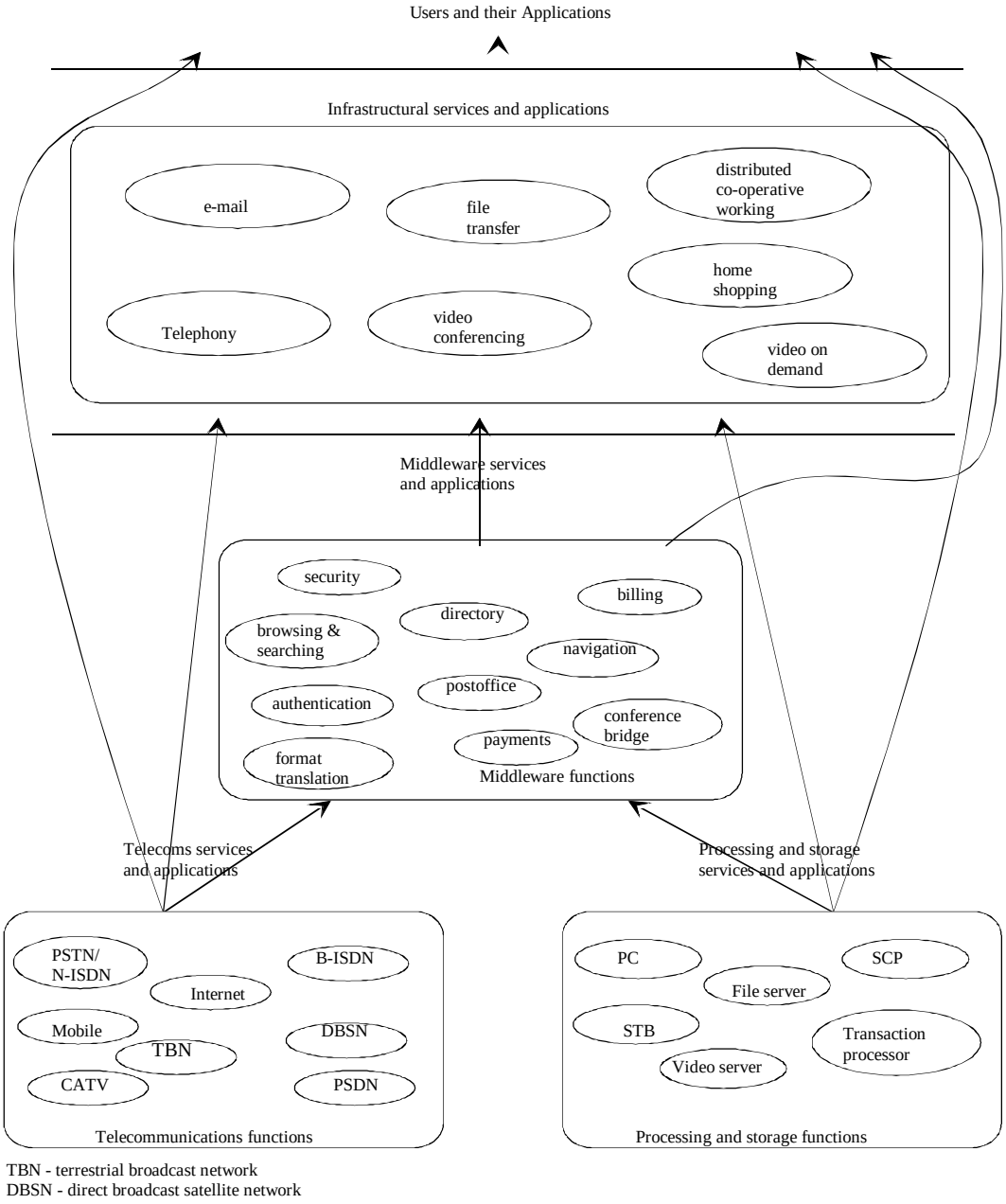


Figure 2.2-7 Service and Application Components in the GII

The supply of infrastructural services will depend on the level of sophistication of the infrastructional roles. In the early days of the GII, services are likely to be relatively simple. Users of the GII will most likely desire application components even for basic requirements. However, as the GII develops, these requirements, together with many new features, will be available as services from the increasingly more sophisticated communication and networking role of the GII. In so doing the application components associated with these features will become middleware resources, developing into a general trend in this direction over time as illustrated in Figure 2.2-8.

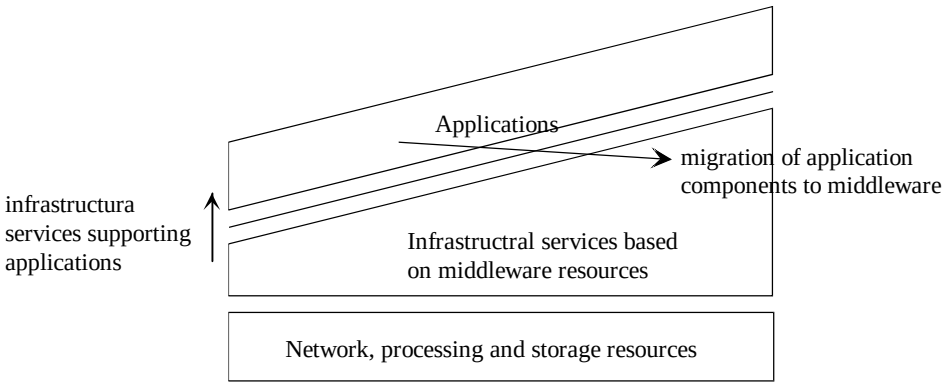


Figure 2.2-8 Migration of GII Application Components to Middleware

2.2.2.2 Infrastructural Service Components

The range of infrastructural services to be offered to users of the GII will be quite large and will vary dynamically as available resources are combined in many different ways. It is therefore appropriate to characterize these services in terms of the service components, or building blocks, from which they are constructed. Service components can be referred to as either baseware or middleware.

Baseware Service Components

Baseware service components provide the basic service features required to support the higher level service components offered in the middleware service category; and are categorized into three groups. The first group is concerned with basic transport functions, the second with basic processing and storage functions, and the third with control and management of the first two. In defining baseware service components, it is assumed that a service requiring interconnection of the same network types across different domains is a baseware service; while a service that requires interworking between different network types is a middleware service.

Category B1 - Transport of Information Service Components: The GII requires global telecommunications service components that can transport data, voice and video over any network. To a certain extent, these are available today for a variety of existing networks. However, they can support only a part of the overall requirements for integrated data, voice and video transport. It is anticipated that the next generation of telecommunications networks, based on ATM, will be able to offer a more complete set of transport service components. Category B1 service components include:

- transport of data between interfaces
- transport of messaging required to support category B3 functions.

Category B2 - Processing and Storage Service Components: These service components are normally made available through an application programming interface (API). The detailed specification of the API, and the service component it offers, is normally very complex which makes

standardization through the traditional consensus process very difficult. This has resulted in a tendency to adopt publicly available *de facto* standards whenever feasible. Category B2 service components include:

- mounting, invoking and handling an application component such that it can react
- and respond to messages from other application components;
- processing of threads of execution on a processor;
- storage of data in a memory device.

Category B3 – Control and Management of Functions Supporting Categories B1/B2

These service components include:

- control of threads of execution on an information appliance;
- file storage and retrieval operations;
- connection, call and session control service components;
- management related to basic transport, processing and storage service components.

Middleware Service Components

The middleware part of the GII includes all capabilities used to combine baseware service components and to add the additional functionality required to provide the full range of infrastructural services to be desired by users of the GII. The description of functionality for each service component will specify the ways in which it can be acquired, the means by which its usage is defined and monitored, and the mechanism for guaranteeing the required level of performance. Middleware service components are divided into four categories:

Category M1 - GII Service Packaging and Cooperation Service Components: These service components provide the features required to package basic service components into infrastructural services desired by the end-user; and principally support cooperation between different systems.

Category M2 - Middleware Support Components: These service components provide the functions required by the infrastructure role of "communication and network of information" in order to supply general GII services such as human-computer interface, registration, authentication, security, directory, navigation, accounting and billing, service management, etc.

Category M3 - Application/Service Creation Support: These service components enable users to compile and construct applications or services. Category M3 service components are normally specific to the platform on which the application or service will operate.

Category M4 - GII Interworking Service Components: These service components are dedicated to internetworking and to the support of distributed applications between information appliances supporting different baseware service components. This category also includes the many translation service components, such as the CORBA common interface definition language, which can be used to translate messages and files created in one format into another.

2.2.3 The GII Functional Model (a Standards Developer's Point-of-View)

The GII Functional Model is an abstract description of a system developed in such a way as to be independent of any particular implementation. The purpose of the functional model is:

- to allow freedom in methods of implementation without affecting the operation of the overall system;
- to allow large scale functional integration inside one equipment or software module while retaining a manageable and scaleable description of the module; and
- to allow the dynamic creation of services which can be tailored to the needs of clients.

Examples of the practical application of a functional modeling methodology include the ODP reference model, the layered description of the SDH interface and use of functional blocks in the SDH equipment specifications, and the extensive use of layered APIs in software support and operating system architectures. Figure 2.2-9 illustrates the general features of the GII functional modeling concept.

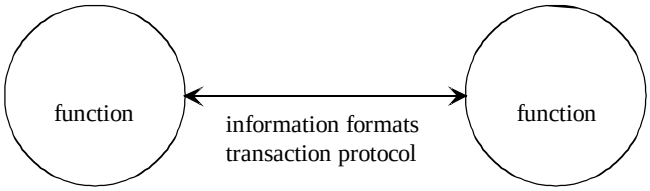


Figure 2.2-9 A Generic GII Functional Model

ITU-T has specified the following general definitions for terms relating to the GII Functional Model:

Function – a logical entity which carries out a defined task by generating a specified output in response to a set of specified inputs. The definition of a function does not imply a particular implementation, nor grouping of functions in an implementation, even if there may be few alternatives in actual practice.

Object – a term synonymous with "Function", but generally in a software context. Whereas Functions are commonly identified in the telecommunications environment where they are often implemented directly in hardware, Objects are more commonly identified with the computer environment where they are often implemented in the software. The two terms are generally used in a GII context to reflect this practical distinction.

Logical Interface – the full specification of the interaction required between two functions. This includes identification of the format used to pass information between the two functions and the computational aspects required to respond to the information at the responding end.

Information Format – a description of the manner in which messages and other data is encoded in a protocol. This can include information interface definition languages such as CORBA IDL, Internet protocol formats such as hypertext markup language (HTML), signaling messages, voice and video coding schemes, and multiplexing schemes such as ATM and SDH.

Computation – describes the way in which one function reacts to information passed to it by another. The computation mechanism records the internal state of the function so that when a piece of information is received, a predictable response can be specified. An example of computation specifications in a telecommunications context, is signaling SDL diagrams.

Protocol and Functional Reference Points – These two terms have evolved individually in association with transactional messaging and network topologies, respectively. In a GII context, both are considered to represent a Logical Interface reflecting multiple functions (objects).

Object Interface – is a logical interface that is similar to a protocol or functional reference point, but applicable only to a single object (or function). In this way, the interface for the object in question needs to be specified only once, and can then be publicly declared for use in the design of other objects (functions) needing to interact with it.

Application Type – within the context of the GII, it is useful to define two types of applications: those that function entirely within a single information appliance and do not require any communications services (referred to as "locally bounded applications"); and those that have several components residing on different information appliances that need to intercommunicate (referred to as "distributed applications"). These applications are made up of application components which, in turn, are collections of application functions.

Segment – a collection of functions belonging to one role, one service provisioning platform and one domain, and would normally (but not always) be implemented together. In the Functional Model, application functions are thought of as being collected into segments of the following types:

- segments of a locally bounded application;
- local segments of a distributed application;
- remote segments of a distributed application.

Thus a segment in the Functional Model can be seen to be an application component that is locally bound, or the local or remote portion of an application component that is distributed between different platforms. The relationship of segments to Middleware functionality can be viewed in the same manner.

2.2.3.1 Types of Functions and Logical Interfaces

In order to produce a description that is independent of implementation, it is necessary to describe the functional entities to be found in the GII and the logical interfaces that exist between them. The following basic types of functions have been identified by ITU-T for the GII:

Application Function (AF) – the logical entities of applications (these are usually implemented in software and are normally called "application objects"). In the course of time, an application function may become reusable by other new applications and can thus be migrated to middleware. It is this migration that supports the evolution of infrastructural services in the GII.

Middleware Function (MF) – the logical entities of middleware (these also are usually implemented in software and are normally called "middleware objects"). Middleware functions are divided into:

- **Service Control Functions (SCF)** – middleware functions that allow the building of services from service components and their associated resources, and control of the user's interaction with these services (these functions are sometimes associated with session control as in the case of the DAVIC architecture);

- **Management Functions (ManF)** – middleware functions which are the logical entities that manage all other functions.

Baseware Function (BF) – the logical entities which allow Application and Middleware Functions to execute, intercommunicate via an interface with the network functions, and interface with the user (these functions are normally associated with an operating system or virtual machine such as that associated with JAVA). Baseware functions are divided into:

- **Network Functions (NF)** – the baseware functions which support communications between separated locations in the GII. Two subclasses are differentiated for transport functions (TF) and control functions (CF);

- **Processing and Storage Functions (P&SF)** – the baseware functions which execute middleware and application components, and store information;

- **Human-Computer Interfacing Functions (HCIF)** – the baseware functions which allow application components to present information to, and receive information from, a human user.

The following logical interfaces describe the different types of interaction between the various functions:

Application Programming Interface (API) – a logical interface between application and middleware functions that support the application functions (baseware functions may also be transparently mapped from the BPI to be available to the API);

Basic Programming Interface (BPI) – a logical interface between middleware and baseware functions that support the middleware functions (a BPI is often referred to as an API, thus reflecting the evolution and growth of middleware functionality);

Human-Computer Interface (HCI) – typically, the logical interface between the human user and the baseware functions, however, it can also include the logical interface with middleware and application functions when appropriate;

Telecommunications Reference Point (TRP) – the logical interface between baseware and network functions, or between network functions only;

Application Protocol (AP) – a logical interface between application functions;

Middleware Protocol (MP) – a logical interface between middleware functions;

An illustration of the use of GII Functions and Logical Interfaces is given in Figure 2.2-10.

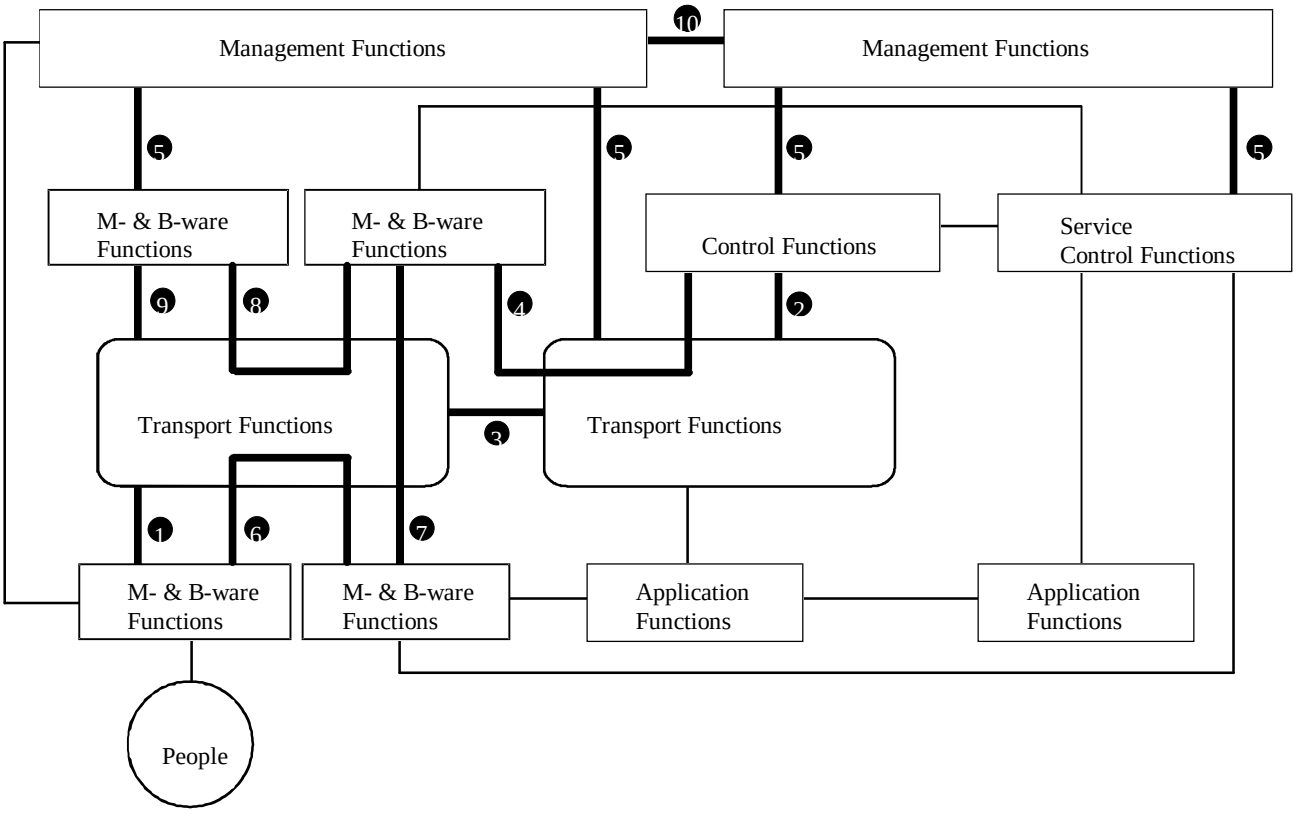


Figure 2.2-10 An Illustration of GII Functions and Logical Interfaces

The highlighted logical interfaces have the following properties:

1, 9 transport telecommunications reference points that can transparently support other logical interfaces (including application and middleware protocols) and the control protocol between the base functions and the network control functions;

2 a transport telecommunications reference point that enables the network control functions to communicate with baseware functions, service functions, or other network control functions;

3 a transport telecommunications reference point between transport network functions that supports all types of protocols transparently;

4 a network control reference point between baseware and network control functions that enables other communications services to be established. This is carried transparently by the underlying transport functions;

5 management reference points of which there are a number of examples. In those cases where there is geographical separation between the two sides of the interface, the reference point is carried transparently by the transport functions;

6, 7, 8 middleware protocols that are carried transparently by the network functions;

10 the management protocol for communications between management functions.

Transparency between middleware protocols and the supporting network functions is enabled by the basic programming interface, while transparency of application protocols is enabled by the applications programming interface. This transparency is an essential feature of the GII and allows middleware and applications to be developed independent from the supporting infrastructure.

2.2.3.2 Relationship between Functions and Roles

The relationship between functions of the Functional Model and the structural roles of the Enterprise Model which they support, is determined by the needs of each role. For example, a "Communications and Networking of Information" role will require many middleware functions in order to offer the range of service components associated with this role. In a specific application, this may also include additional middleware functions in order to provide a slightly wider range of services. In this way, the description of each role has some flexibility and there may be overlap in the functionality between different roles. Figure 2.2-11 illustrates the basic types of functions and logical interfaces within the GII and their likely relationship to the infrastructural roles of the Enterprise Model.

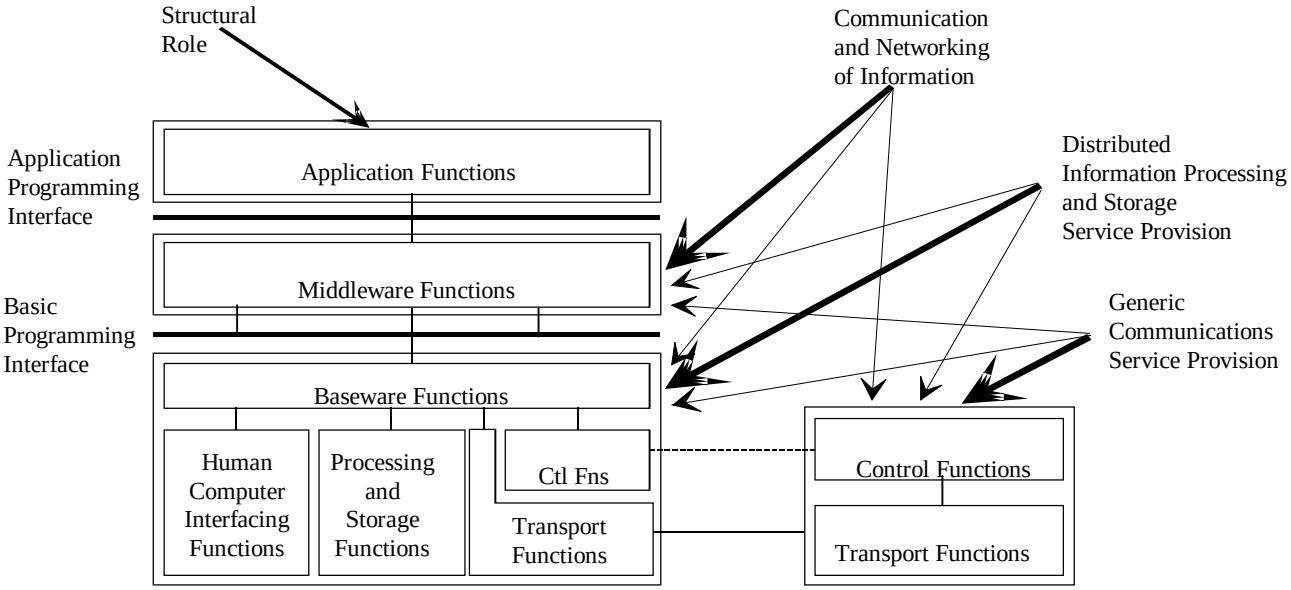


Figure 2.2-11 Relationship between Functions and Structural Roles

Figure 2.2-12 shows an example of the functions and their associated logical interfaces for a distributed application over the GII.

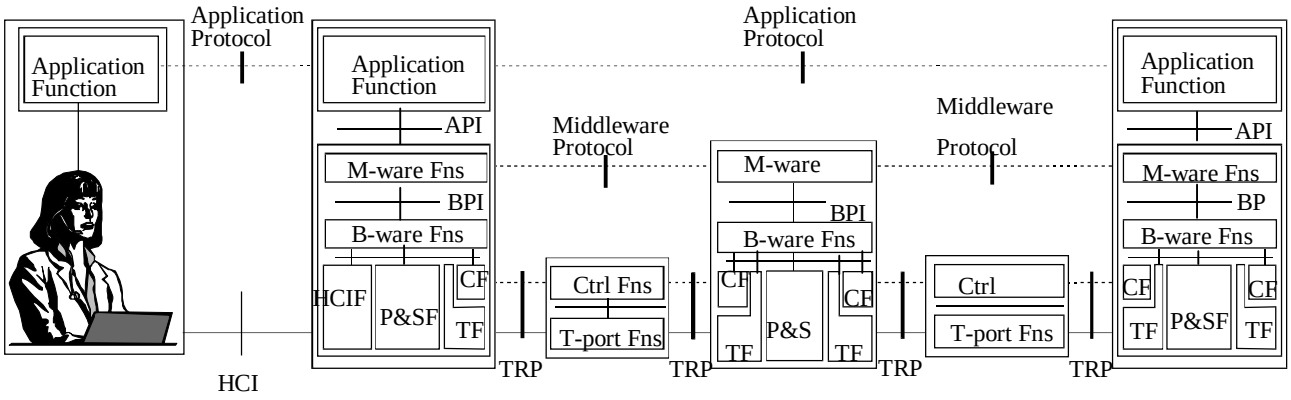


Figure 2.2-12 Example of Distributed Functions and Logical Interfaces

2.2.3.3 An Example Functional Model of a Network Operator Domain

A telecommunications network will employ transport, control, and management functions in order to provide basic telecommunications services. The network can also have additional features to support enhanced services such as those associated with Intelligent Network (IN) capabilities. A network operator's domain is therefore likely to contain:

- **Transport Functions** (TF) – entities enabling information to be successfully routed between distant locations;
- **Control Functions** (CF) – entities enabling information to be successfully routed between the desired end points, as well as base service control functions;
- **Enhanced Service Provisioning Functions** (E-SCF) – entities enabling enhanced services, such as those associated with IN, to be provided and controlled;
- **Management Functions** (ManF) – entities required to manage the other functions in the network operator's domain.

An illustration of communications between two sets of application supporting functions through two cooperating network operator domains is shown in Figure 2.2-13. The logical interfaces or reference points between functions are also illustrated.

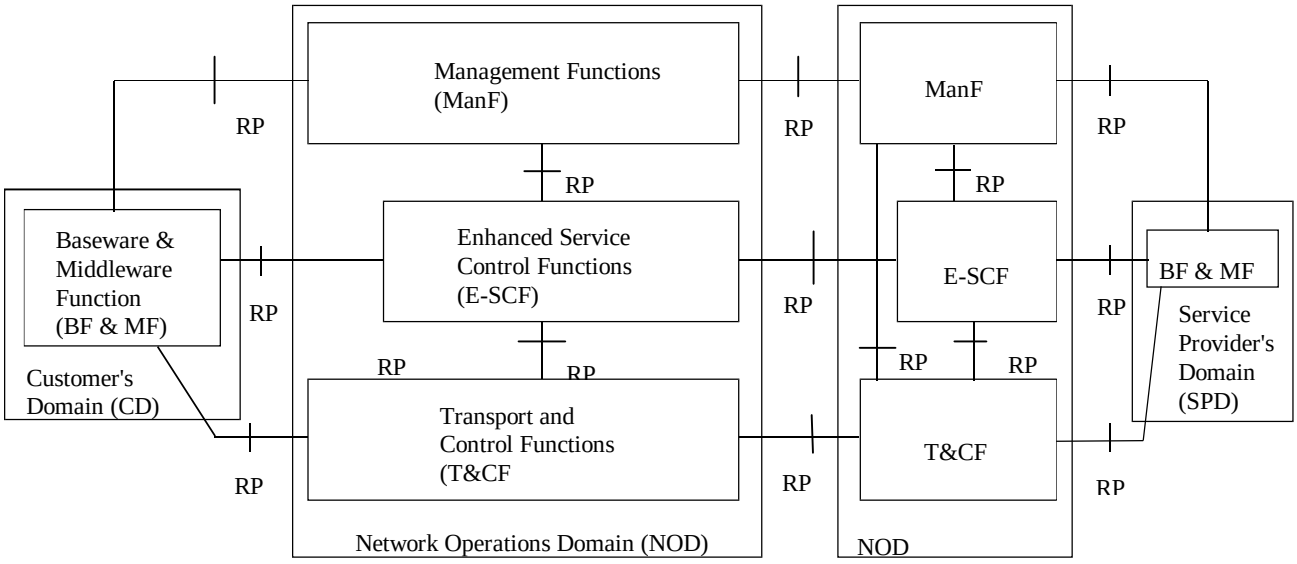


Figure 2.2-13 Example Functional Model from the Viewpoint of a Network Operator

These functions can be further subdivided into segments in order to provide a link between the Functional and Implementational Models. Standardization of reference points between segments, especially segments in different operator domains, will have a high priority since they are critical to achieving interoperability in the GII. However, since functions within a segment are normally implemented together, standardization of the associated reference points at the segment level will generally be given a lower priority.

2.2.4 The GII Implementation Model (an Implementor Point-of-View)

Formal standardization will usually end with the application of a functional model, as this is generally sufficient to guarantee interoperability between network/service operators and equipment/software vendors. There are, however, occasions when it is desirable to develop an implementational model to describe how the functions of the GII Functional Model are to be implemented in equipment or shared between different operators. Reasons for developing an implementation model include the need to:

- differentiate and characterize those interfaces which are important for standardization;
- develop a set of examples to illustrate how system performance can be affected by implementation.

An implementational model indicates which functions are implemented in which equipment, and identifies the protocols passing across the interface between equipment as shown in Figure 2.2-14.

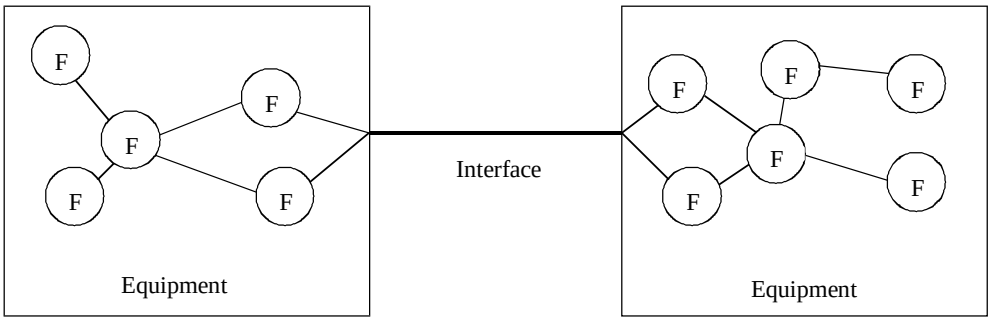


Figure 2.2-14 GII Implementational Model

ITU-T has specified the following definitions for terms used in the GII Implementational Model:

Equipment – an implementation of one or more functions in a single physical container. Equipment will have at least one function implemented in hardware and one or more physical interfaces through which it can be connected to other equipment. Equipment may be designed in a modular way so that the exact composition of functions implemented can be customized. There may also be some functions implemented is software which can be changed during the lifetime of the equipment.

Information Appliance – an equipment that allows users access to the GII or acts as host for an information resource such as a database or video library. Other examples include PCs, Set Top Boxes (STBs), mini and mainframe computers, transaction processors, telephones, and TVs.

Software Module – an implementation of one or more functions exclusively by software. A software module must reside in a piece of equipment and interfaces with that equipment across an application programming interface. In the Implementation Model, software modules are classified as either middleware or application software depending on which type of functions are implemented.

Application Programming Interface (API) – an interface between an equipment and a software module. This interface does not have a physical realization in the implementation model since it is internal to the equipment.

Physical Interface – an implementational interface between equipment requiring a physical medium to transport information.

Implementational Interface – is an interface between components in an implementation (i.e. between equipment or between an equipment and a software module). While it is possible to also consider an implementation interface between software modules, a good implementation should not require any further specification of this interface than that provided by the protocol specification of the functional module and the API definitions. All aspects relating to the way in which the protocol is carried is masked by the API.

System – a collection of equipment and/or software modules that normally work together as a single entity.

Segment – one or more systems that perform the functions identified for a specific segment of the GII Functional Model.

2.2.4.1 Telecommunications Network Segments

The general structure of the Implementational Model depicted in Figure 2.2-14 ignores the complexity of the interface between equipment. In a distributed application, the interconnection of equipment will be via the intervening telecommunications network structure of the GII. This interconnection is quite complex and can be viewed as a series of telecommunications network segments which allow middleware and application functions, residing in the interconnected information appliances, to communicate with each other as illustrated in Figure 2.2-15. In this Figure, the customer network segments, access network segments, core network segments, and international network segments can each be operated by different players. In addition, each segment is technology and implementation dependent. However, the delivery of a particular service will require a certain set of common GII functions to be implemented in each segment.

In the Figure, the interfaces between information appliance and the network access segments, and between the network access and core segments, are physical interfaces requiring both a physical and functional specification. The other interfaces are either programming interfaces internal to the information appliance or protocols that are transparent across the telecommunications network. Since these implementational interfaces are not physical in nature, their specification can be derived directly from the logical interfaces in the GII Functional Model independent of the physical network.

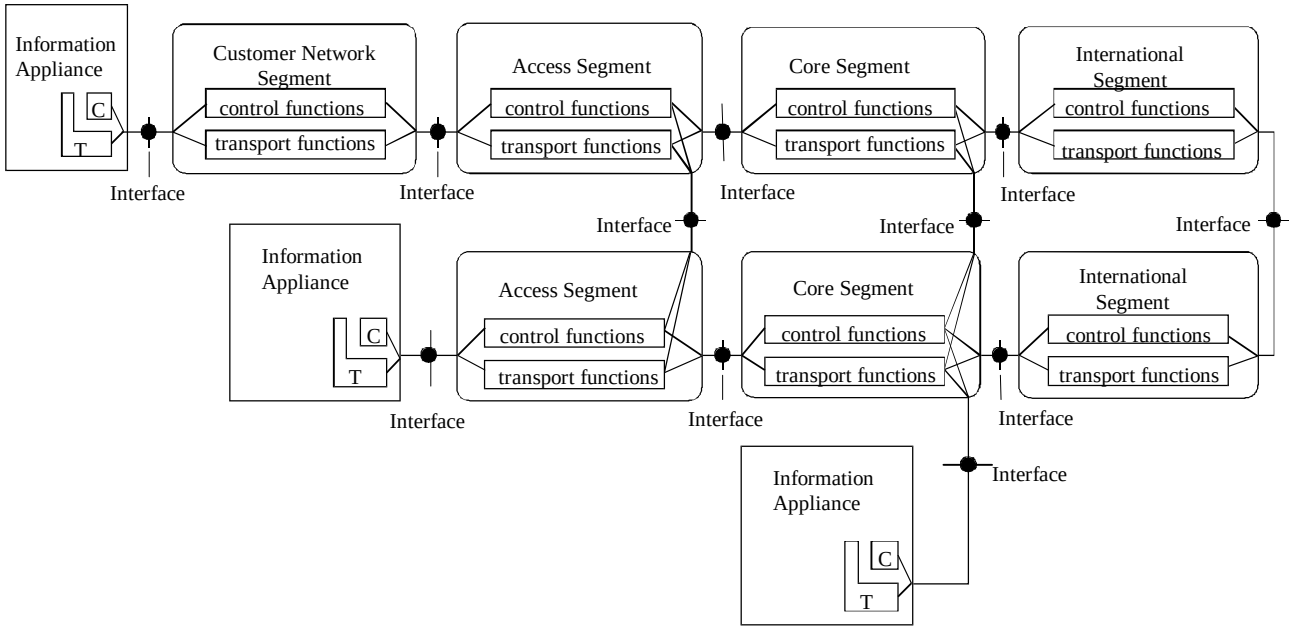


Figure 2.2-15 Telecommunications Network Segments

This framework of telecommunications network segments is in common with the scenario methodology described in Section 2.3. The scenario methodology describes a "bottom-up" approach for specifying the need for a specific type of telecommunications network segment; whereas the Implementational Model allows the segments described by the scenario method to be linked to the Enterprise, Structural, and Functional Models.

2.2.4.2 Example Component Configurations

The following examples illustrate how implementation configurations can be constructed by using the concepts of the GII Implementation Model:

A. Information Appliance Configurations

The configurations shown in Figure 2.2-16 depict information appliances for an end-user in a residential environment. These configurations represent a combination of fixed analog telephones, cordless telephones, Fax machines, PCs, TVs and set-top boxes (STB). The application is assumed to require GII service support for voice telephony, data transport, and interactive multimedia capabilities.

The two solutions illustrate how an end-user might configure an information appliance for connection to a network access segment terminated by a network terminating unit (NTU). In the first example, all information appliances are connected to the access segment through the STB. In the second example, there are separate interfaces for the PC, TV/STB, and Fax/Phone combinations.

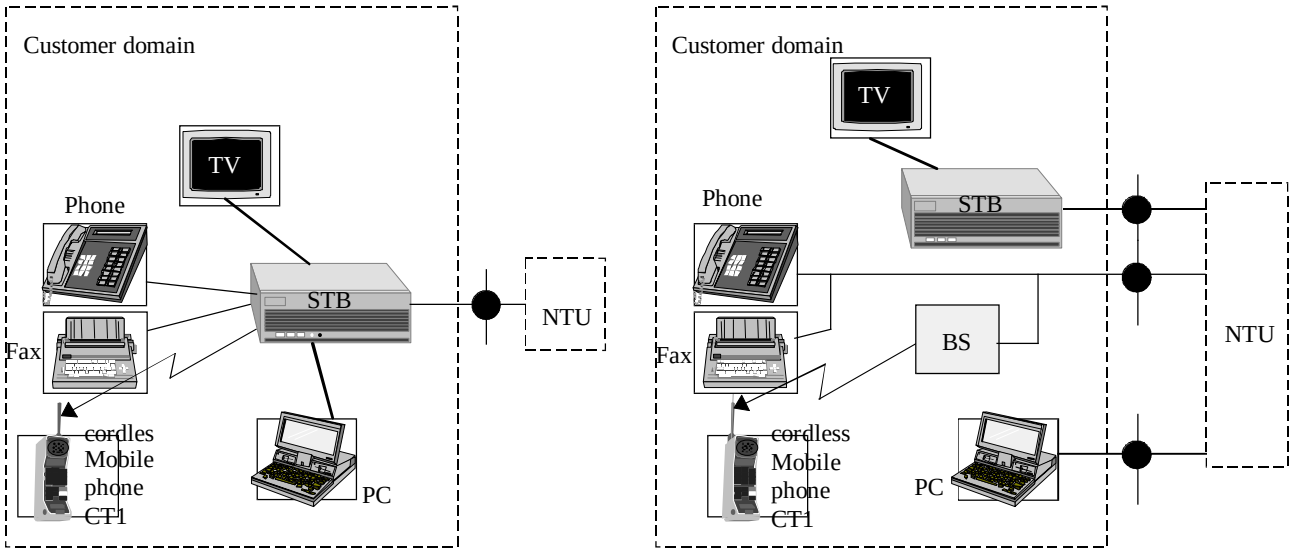


Figure 2.2-16 Examples of End-User Information Appliance Configurations

The NTU is part of the access segment and, depending on the network implementation, the end-user information appliances can be supported by more than one access segment (e.g., PSTN copper wire, cable TV, satellite, etc.).

B. Access Segment Configurations

Traditionally, the network access segment has been based on copper pairs. However, a combination of copper pairs and fiber or radio in the access loop, is becoming more prevalent. The configuration of such an access segment is illustrated in Figure 2.2-17.

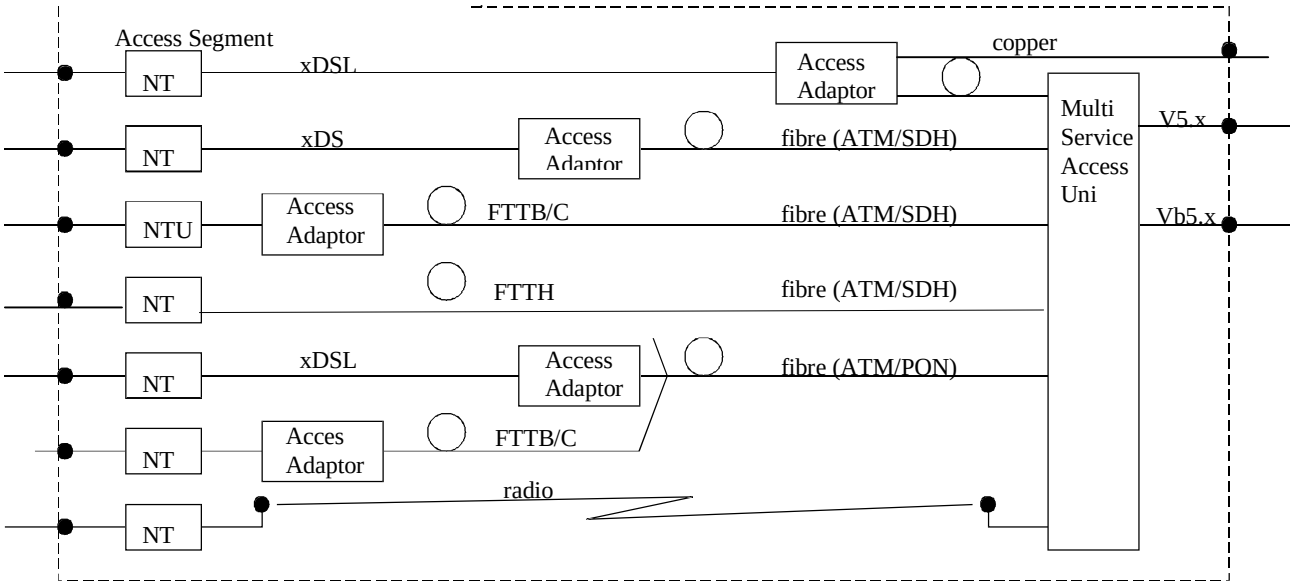


Figure 2.2-17 Examples of Fixed Network Access Configurations

2.2.5 Translation Between Models

Segments are the basic units that appear in each of the four GII models and can be used as a path from one model, or viewpoint, to another. However, each Model reflects a different aspect of the use of segments.

- the Enterprise Model defines the purpose of the segment in the value chain;
- the Structural Model defines the service components supplied by the segment which can contribute to services;
- the Functional Model defines the functions within a segment;
- the Implementational Model defines the external interfaces to the segment.

In each model, a segment will belong to only one domain and form a part of a single service provisioning platform (SPP). The relationship between segments, domains, players, and service provisioning platforms is illustrated in Figure 2.2-18. The Figure indicates that a domain can be part of only one SPP and owned and operated by only one Player. However, a domain can contain more than one segment. A SPP, on the other hand, will normally contain several domains, often owned and operated by different players.

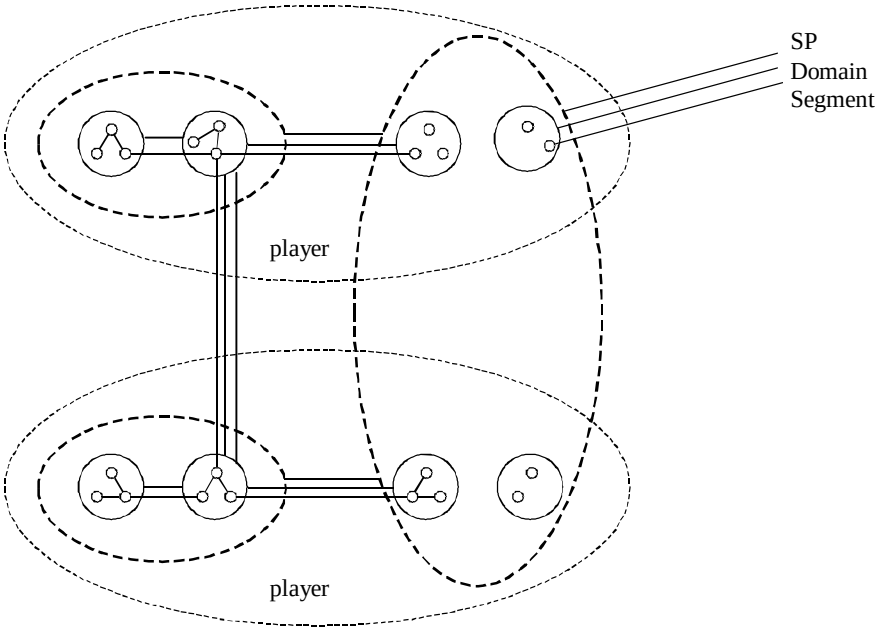


Figure 2.2-18 Relationship between Segment, Domain and Service Provisioning Platform

2.3 GII SCENARIO METHODOLOGY

The GII will be comprised of components from a number of different industry sectors (i.e., telecommunications, information technology, and consumer electronics/entertainment). Accordingly, the boundaries for service provision are no longer distinct and, as the convergence between the different Sectors increases, more diverse service delivery technologies are expected to emerge. This situation poses a significant system integration problem for the developers of the GII which is compounded by the fact that participants from each sector differ considerably in their frames-of-reference and use of the terminology. Thus, a methodology is required that can be used to graphically illustrate the wide variety of application and networking configurations that will be encountered in the GII. In particular, this methodology is needed to:

- facilitate the development of common solutions for generic GII support requirements;
- provide a means for checking the completeness of a proposed solution and aid in the comparison with other alternatives;
- facilitate investigation of the inter-relationships between elements of a given solution;
- provide a catalog of standardized solutions to avoid unnecessary re-invention and help identify gaps in the existing standards repertoire;
- identify potential issues of joint interest to other Standards Development Organizations (SDOs) for which collaboration is required.

ITU-T has developed such a methodology in Recommendation Y.120, and adopted the term "scenario" to denote the combined graphical and textural representation of the results. It is envisioned that the use of scenarios will facilitate collaboration between the various parties involved and act as a repository for mutually agreed solutions.

2.3.1 Primary Functions: The use of a scenario enables specific arrangements of GII components to be illustrated. Interesting cases occur particularly when technologies from different industries come together, and where services traditionally offered by particular providers using conventional technologies are offered by non-traditional providers utilizing new technologies. Examples of this are telephone service over cable-TV networks and Video services over the local copper-wire telephone access network. Thus, the primary function of the scenario is to identify:

- the points that form key interconnection, access and appliance interfaces in a configuration of services, networks, and appliances;
- the set of standards that could be applied at each key interface point;
- the key Standards Development Organizations and Industry Fora/Consortia that might wish to be involved in solving the standards related system integration issues.

The GII Scenario development process also provides the means to facilitate the classification of services and interfaces by type; the identification of the services that can be carried across the various interfaces and the end points for service delivery; the profiling of the protocols involved (either directly or indirectly) at a given interface; and the documentation of other related issues.

2.3.2 Principles of Description: ITU-T Recommendation Y.120 defines a set of principles to be used in the development of a GII related scenario. These principles are summarized in the following discussion and are intended as a means to achieve consistency among scenario developers without overburdening them with an unduly formal descriptive requirement. A pattern scenario configuration is shown in Figure 2.3-1. In an actual application, the title of the scenario will designate the service or services being provided.

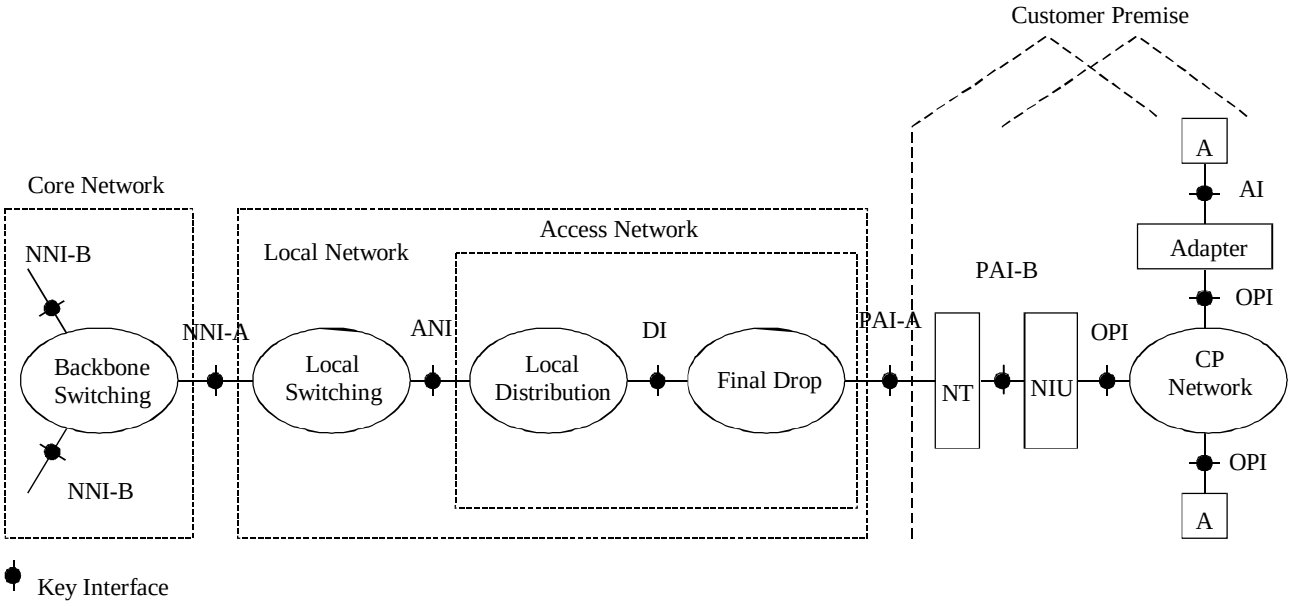


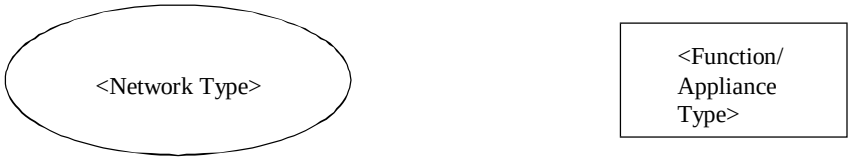
Figure 2.3-1: An Example Configuration of Generic Elements

A GII scenario is a reference configuration of generic elements whose interconnection is denoted by a set of interface and/or reference points. Each interface or reference point is identified as to Type and associated set of protocol descriptors or qualifiers.

2.3.2.1 Generic Elements: A generic element can be either a network, an appliance or some other functional unit essential to the description of a GII support requirement. It is envisioned that, as a minimum, a typical scenario will involve the following generic elements:

- a backbone switching network;
- a local switching network;
- a local distribution network;
- a final distribution or drop network;
- a premise network or equipment; and
- an appliance.

A network element is represented by a graphical ellipse, as shown in Figure 2.3-2a. Appliance and other Functional Units are represented by a rectangle, as shown in Figure 2.3-2b. In the case of an appliance, suitable appliance-like icons may also be used.



a) Network Element b) Appliance/Functional Element

Figure 2.3-2 Generic Element Symbols

The following types of Functional Units are described in Recommendation Y.120:

- **Appliance:** A generic term used to describe the terminal device employed by the service application. Examples are telephones, TV sets, personal computers, etc.;
- **Adaptation Unit (AU):** The unit, or function, that converts from the native OPI (see next page) to another interface which is more suitable for the given appliance;

2.3.2.2 Interfaces and Reference Points: The interface symbol, shown in Figure 2.3-3, is used to denote an interface or reference points between two generic elements.

Figure 2.3-3: Interface or Reference Point Representation

The following Interfaces are described in Recommendation Y.120:

- **Network-to-Network Interface Type A (NNI-A):** The interface between a long distance backbone switching network and a local switching network;
- **Network-to-Network Interface Type B (NNI-B):** The interface between a long distance backbone switching network and a peer switching network;
- **Access-Network Interface (ANI):** An interface between a local switching network and an access network;
- **Drop-Distribution Interface (DI):** The interface between a local distribution network and the final drop network to the customer premise;

- **Premise-Attachment Interface (PAI):** An interface between the external network and the internal customer premise network or equipment;

- **On-Premise Interface (OPI):** The interface between the on-premise network or equipment and the appliance;

- **Adaptation Interface (AI):** The interface between the Adaptation Unit and an Appliance;

2.3.2.3 Qualifiers: Each interface specified in a scenario is identified by its basic Type and a Qualifier or set of Qualifiers representing the protocols that are applicable across the interface. Provision is also made for the expansion of the basic Type into a Sub-Type, or possibly Sub-Sub-Types if required. The Interface Symbol annotated with a Type and Qualifier specification is shown in Figure 2.3-4.

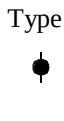


Figure 2.3-4 Interface Symbol with Type and Qualifier

Where space permits, identification of the interface Type and associated Qualifiers are positioned with the symbol, otherwise, a reference is indicated drawing attention to the appropriate footnote or other source. In the case of a distinctive interface Type for which the associated protocols are obvious, the Qualifier notation is not required. In all other cases, the Qualifier is denoted by a simple linear list representing the applicable layers of protocols in a top-down fashion. It is intended that the requirements for interface classification and identification be met using the existing taxonomies of the particular organizations concerned. The only requirement added by Recommendation Y.120 is that the interface/protocol designation be prefaced with an unambiguous identification of the responsible organization. For example, ITU: Q.931, IETF: 793/791, and ISO: 8073 would represent ISDN, TCP/IP, and OSI Transport standards respectively.

2.3.2.4 Service Aspects: Each scenario has two aspects, one relating to the physical components and the other relating to the services being provided. Thus, each scenario will illustrate not only a particular combination of physical networks and appliances, but also the interface aspects as they relate to the service, or set of services, being provided. A scenario might, for example, depict the delivery of broadcast video and a PSTN-type switched voice-band service over an interconnection of traditional telecommunication networks and cable-TV technologies. Accordingly, it may be necessary to replicate a given scenario in order to show the same physical arrangement being used for the delivery of different services. In this case, the service delivery aspects will generally require a higher level depiction of the networking interface and reference points, with their associated service or protocol standards, than would otherwise be required.

2.3.2.5 Indirect Connections and Associations: In more complicated cases, it may be necessary to separate the protocol(s) directly related to the operation of the interface from those that

are passed through transparently for operation by other elements. In this case, Y.120 requires that the directly related protocol be indicated for the interface and those that are passed through transparently be shown by a "logical" connection (association) between the elements which are directly involved. This logical connection is depicted by a dashed line as illustrated in Figure 2.3-5.

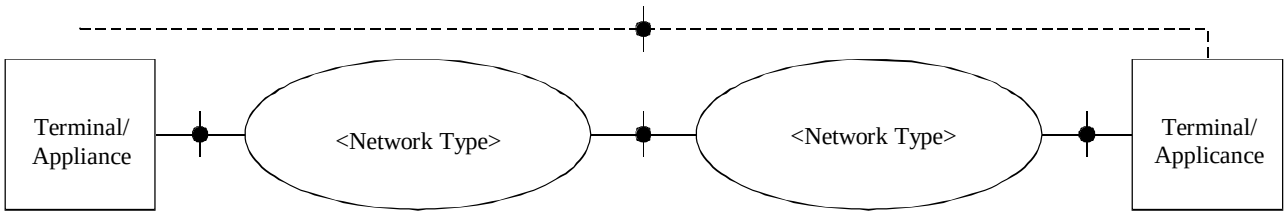


Figure 2.3-5 Representation of a Logical Connection or Association

In a given scenario, there may be a variety of dependencies requiring the depiction of a number of logical connections. As an example, a telephone call might be used to make the request for a particular movie to be down loaded or viewed in real-time over a separate delivery network. Thus the control and management planes may be entirely different from the data delivery plane, and it may be necessary to depict a given scenario more than once to show the interplay of components in the different planes of operation. To cover these cases, Recommendation Y.120 specifies that scenarios should be annotated appropriately, and sufficient explanatory text provided, to fully illustrate the interplay between all elements of the scenario.

2.3.2.6 Identification of Information Flow: Within a given scenario, there may be a number of possible paths for information flow. Some paths may be legitimate for certain types of information and not for others. In order to fully understand the scenario, it is essential that these flows be adequately described. Recommendation Y.120 provides the following guidance for addressing this situation:

- Each scenario shall be accompanied by explanatory text that details the particular paths to be taken by each type of information flow, noting any paths that are prohibited to a certain type of information;

- The text accompanying a scenario shall be explicit enough to prevent ambiguity.

- The path of information flow shall be described by enumerating the starting point, the end point(s), and all designated intermediate points traversed (e.g., a particular scenario might have a data flow from A to C through B, a management information flow from A to D through E, and a video flow from F to A through C);

2.3.3 Methods of Application: Given the scope of the GII, participants of any industry sector, standards development organization, or users group may identify a need for the development of a

scenario depicting a new GII support requirement. The extent to which this development may involve other interest groups will depend on the nature of the requirement in question. With this in mind, Recommendation Y.120 prescribes the following five step process for GII scenario development:

Step 1 – Initial Scenario Need Identification: The need for a new GII Scenario, which is not adequately supported by existing GII service capabilities, is identified by the particular participant or organization having that need.

Step 2 – Initial Scenario Development: A preliminary scenario is produced by the identifying source using the basic techniques specified in Recommendation Y.120 as summarized above in Section 2.3.3. The degree of completeness of scenarios at this stage may vary depending on the level of expertise available and/or the need to involve other organizations in a full scenario development effort. However, it is expected that the basic scenario elements and their inter-dependencies are outlined at this stage in order to adequately evaluate the need for collaboration with other user organizations or standards development groups.

Step 3 - Scenario Socialization: The initial version of the scenario, produced in Step 2, is distributed to other organizations identified as having a possible interest. Interested organizations are expected to respond to the initiating organization with an indication of the level of interest and commitment to participate in a further elaboration of the scenario.

Step 4 – Collaboration Among Organizations: Based on the response to Step 3, a meeting of all interested parties will be called to discuss the scenario and, if necessary, to organize any further development activity that may be required.

Step 5 – Iteration: One or more of the above steps may be repeated, as appropriate, until the scenario is completed to the satisfaction of all parties involved.

An example of the application of the GII scenario methodology to an integrated voice/data/video service requirement is given in Figure 2.3-6. Additional examples can be found in Annex 1 of Recommendation Y.120.

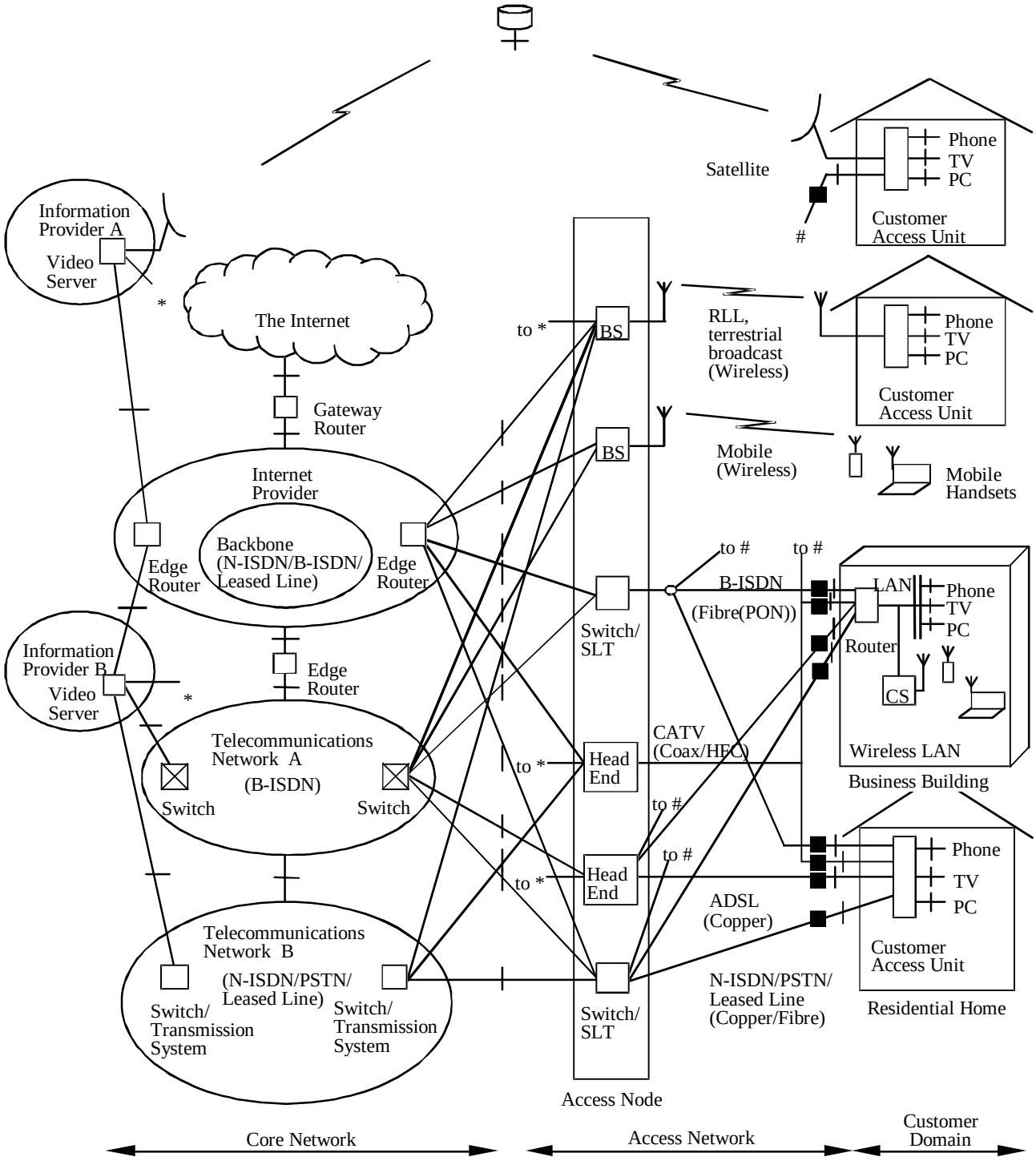


Figure 2.3-6 An Example Application of the GII Scenario Methodology

SECTION 3

GII STANDARDS ACTIVITY

3.0 OVERVIEW

The principal goal of the ITU with respect to the GII is to play a catalytic role in facilitating the development of a truly global information superhighway. As mentioned in Section 2, there are four principal ways in which this is to be accomplished: 1) by the development of standards that will enable the different networks that are likely to make up the GII to interoperate; 2) by allocating spectrum for innovative services such as Global Mobile Personal Communications Satellite (GMPCS) services and helping manage their use; 3) by providing policy and technical assistance to developing countries in partnership with the private sector and other international organizations; and 4) by providing a forum where government and industry can discuss policies and strategies for making the vision of the GII a reality.

Focusing on standardization, ITU-T has traditionally been oriented towards the development of technical standards and tariff arrangements for the operation of international telecommunications networks between countries, without particular regard for what happened within a national boundary. This approach has failed to provide universal access to basic telecommunications for the citizens of all but the most industrialized nations. However, in undertaking the new standardization initiative, the ITU views the GII as a means for every citizen to access and be part of the emerging Information Society. The ITU now sees it's standardization role in a much broader context, encompassing concerns relating to economic growth, competitiveness, and socio-cultural development in addition to the traditional technical concerns of interoperability, service flexibility and performance. This broadened view is reflected in the scope of the GII Standardization Program.

3.1 GII STANDARDIZATION OBJECTIVES

In establishing the GII Standardization Program, the ITU recognized that there are real and very significant standardization challenges posed by each of the three component terms encompassed by the GII.

GLOBAL – global standards are required for the information and infrastructure components of the GII. The globalization of business, the ease of information access, and personal mobility, require removal of restrictive national or regional ways of doing business.

INFORMATION – the purpose of a global infrastructure is to enable users to globally manage the creation, storage, delivery and use of information. Adequate global standards for the representation, exchange, and secure context-specific access to information, independent of the

location of the information provider and information user, are needed to realize the benefits of the GII.

INFRASTRUCTURE – the technological convergence and interconnection of telecommunications equipment, computers and much of consumer electronics has lead to new demands on the communications infrastructure by information providers and information users.

In order to meet these challenges, it has been generally accepted that global standards must address market needs; must not impair or restrict the creativity of equipment manufacturers and information or service providers; must provide a realistic and stable base for the envisioned information infrastructure; must achieve application-application, application-user, and user-user interoperability; must address the needs generated by new technologies and the impact of new operating paradigms (such as increased "nomadicity" and teleworking); and must meet market requirements for cost effectiveness, service quality and support for cultural diversity.

In addition to the ITU-T standardization initiative, it is recognized that global development efforts are already underway in a number of consortia and industry fora relating to the GII, and that various national and regional organizations are also concentrating on the development of their own particular national and regional information infrastructures. While these efforts may be localized in particular geographic areas, it is evident that all regions and consortia/fora need and want global standards. Thus the ultimate challenge for the international standards community is to develop the essential standards, in a timely manner, while recognizing and building on existing efforts. These considerations have lead ITU-T to establish the following set of sub-objectives for the GII standardization program:

- **Business Coupling:** To ensure that ITU-T, in conjunction with other Standards Development Organizations (SDOs), will develop the standards necessary to meet or match a value chain model consistent with business requirements. Approaches to ensuring this match include the use of scenario analysis and business value chain modeling.

- **Seamless Operation:** To facilitate a seamless linkage between telecommunications, information technology, and entertainment (consumer electronics) through joint agreements on use of appropriate standards (or their development as necessary).

- **Partnerships:** To ensure that ITU-T has sufficient working links to other SDOs who will be partners in the value chain.

- **Joint Work:** To develop procedures to enable joint meetings, joint text, deferred ownership, etc., among a set of collaborating SDOs for areas of joint interest.

- **Cross-Industry Interfaces:** To identify critical cross-industry interfaces at all levels as a vital aspect of the convergence process.

- **Common GII Models:** To establish, jointly with appropriate partners, a common set of models to be used as a framework for the progression of GII related activities.

3.2 GII STANDARDIZATION PROJECTS

A number of major topics have been identified for detailed study within the overall GII Standardization Program. These topics form the basis for the technical projects which makeup the GII work plan. These Projects are assigned to one of five categories depending on whether they address framework aspects (F-Projects), Internet-related aspects (I-Projects), general network aspects (N-Projects), middleware aspects (M-Projects), or application aspects (A-Projects).

For each project, a particular "Lead Body" is assigned as the project leader to coordinate the work effort. The Lead Body is also responsible for developing a detailed “Project Description” which specifies the project objective, description of the work to be performed, a list of relevant existing standards/Recommendations, the proposed list of deliverables and associated work schedule, and the identity of other standards groups collaborating in the work effort. These collaborating bodies may include other ITU-T or ITU-R Study Groups, other standards bodies (such as ISO/IEC JTC1), regional standards organizations, and industry consortia and fora. Table 3.1 is a list of the current GII Projects, together with the associated Lead Body responsible for providing the Project Leader.

Table 3.1: List of GII Standardization Projects

Proj. No.	Project Name	Lead Body
F.1	Principles and Framework for GII	SG 13
F.2	Scenarios and Key Interfaces for GII	SG 13
F.3	Information Appliance	SG 16
F.4	End-to-End Interoperability	SG 16
I.1	IP and Telecommunications Networks Interrelationships	SG 13
I.2	Multimedia over IP	SG 16
N.1	Architecture and Layer 1 Aspects of Narrowband/Broadband Access Infrastructures for GII	SG 15
N.2.1	Signaling and Control Aspects of Wideband/Broadband Access Interfaces for GII	SG 11
N.2.2	Signaling and Control Aspects of Wideband/Broadband Network Element-to-Network Element Interfaces for GII	SG 11
N.3	Network Interworking for the GII	SG 13
N.5.1	“Intelligent Mobility” for the GII: IMT-2000	SG 11
N.5.2	“Intelligent Mobility” for the GII: Global Mobility	SG 13
N.6	Harmonization of B-ISDN Signaling Protocols and their Interfaces to Public Broadband Networks	SG 11
N.7	Enhanced Network Intelligence for the GII	SG 11
N.8	Quality of Service and Network Performance	SG 13
N.9	Addressing for the GII	SG 2
N.10	Conditional Access Methods	SG 9
N.11	Interactive Television and Sound Programming	SG 9
M.1	Network-Oriented Middleware and Network Operating Systems	SG 13

Proj. No.	Project Name	Lead Body
M.2	APIs Harmonized with Network Capabilities	SG 8
M.3	Technical Framework for Electronic Commerce	SG 16
M.4	Middleware for Multimedia	SG 16
M.5.1	Service, Network and System Management for GII: TMN	SG 4
M.5.2	Service, Network and System Management for GII: ODM	SG 4
M.6.1	Security (End-to-End)	SG 7
M.6.2	Network Security	TBD
M.7	High-Level Naming	SG 7
M.8	Object-Oriented Environments	SG 10
M.9	Advanced HCIs for Telecommunications Management	SG 10
M.10	Software Architectures for Advanced HCIs	SG 10
M.11	Network Capabilities for Charging and Billing in GII	TBD
A.1	Medical Informatics	SG 2[1]
A.2	Libraries	SG 2[1]
A.3	Electronic Museums	SG 2[1]
A.4	Road Transport Informatics	SG 2[1]
A.5	Electronic Purse	SG 2[1]
A.6	Industrial Multimedia Communication	SG 2[1]
A.7	Ergonomics	SG 2[1]
A.8	Character Set	SG 2[1]
A.9	Geographic Information Systems	SG 2[1]

3.3 ROLE OF THE ITU-T STUDY GROUPS

ITU-T is organized into a number of Study Groups (SGs), each responsible for a general area of technical study. Study Group 13, the ITU-T Lead Study Group for developing B-ISDN, is responsible for coordinating the overall GII Standardization Program and for establishing the broad concepts and principles which will guide the individual work efforts. To assist SG 13, a number of other Study Groups have been assigned as "Lead Body" (Project Leader) for one or more of the individual GII Projects. In turn, the Project Leader is generally supported by other Study Groups having a particular expertise in the area being addressed. The following Study Groups act either as the Project Leader for one or more GII Standardization Projects, or as a major technical consultant to another Study Group in accomplishing their project leadership. A more detailed accounting of the collaboration between Study Groups for each project is outlined in the GII Project summaries provided in Annex B of this report.

Study Group 2 - Network and Service Operation

This Study Group is responsible for studies relating to the general aspects of telecommunication service definitions, to include: the principles of their interworking, network operations and

[1] Study Group 2 has declined acceptance of Projects A1 through A9 as being outside their scope of interest. However, the Projects are being retained in the GII Work Program for the time being since they are of interest to other GII participants (e.g., ISO/IEC/JTC1).

management; human factors; and the service and operational aspects of fraud prevention. In particular, SG 2 is concerned with matters pertaining to network operations in the GII. This includes network management; service quality and traffic characterization; traffic related network performance, traffic control and measurements; and numbering, addressing and routing. SG 2 is the Project Leader for GII Project N.9 (Addressing for the GII).

Study Group 3 - Tariff and Accounting Principles, including Telecommunications Economic and Policy Issues

This Study Group is responsible for studies relating to tariff and accounting principals for international telecommunication services and related telecommunication economic and policy issues, as well as policy issues related to carriage and content. In particular, SG 3 is concerned with the development of principles for tariffs, charging and accounting for combinations of services and applications (such as multimedia) arising in the context of the GII. While SG 3 does not have leadership responsibility for a GII Project, it plays a significant role as a consultant to the GII project leaders on matters relating to telecommunication tariffs, accounting principals and economic and policy issues.

Study Group 4 - TMN and Network Maintenance

This Study Group is responsible for telecommunication management network (TMN) studies and studies relating to maintenance of networks, including their constituent parts. In particular, SG 4 is concerned with the development of principles for applying TMN to the management needs of the GII. This includes the associated management information model and the identification of information to be exchanged; requirements for interfaces, management functions, and services; interworking relationships among existing management networks; and enhancements to provide for new GII applications and the integration of their management operations. SG 4 is Project Leader for GII Projects M.5.1 (Service, Network and System Management for GII: TMN) and M.5.2 (Service, Network and System Management for GII: ODM).

Study Group 7 - Data Networks and Open System Communications

This Study Group is responsible for studies relating to data communication networks and the development and application of open system communications. In particular, SG 7 is concerned with the development of distributed information processing and storage infrastructures for integrated services across both the telecommunication and information technology components of the GII; and the review of protocol architectures in conjunction with other ITU-T Study Groups and external standards bodies. This includes both high level and low level protocols and interfaces; multimedia application and service aspects; interworking between data network infrastructures; and provision for security and authentication, directory systems, and the interworking with message handling services and systems. SG 7 is the Project Leader for GII Projects M.6.1 (End-to-End Security) and M.7 (High-Level Naming).

Study Group 8 - Characteristics of Telematic Systems

This Study Group is responsible for studies relating to telematic terminal characteristics and related service aspects. In particular, SG 8 is concerned with the terminal aspects of multimedia services on the GII, taking into account existing services and interworking. This includes character set evolution, still pictures, and animation video; Video Text and audiographic/ audiovisual teleconferencing applications; and the interoperability aspects related to the exchange of terminal and application information within a conference. SG 8 is Project Leader for GII Project M.2 (APIs Harmonized with Network Capabilities).

Study Group 9 - Television and Sound Transmission

This Study Group is responsible for studies of the specifications to be satisfied by telecommunication systems used for the contribution, primary distribution, and secondary distribution of video, audio, and associated data signals used for television, sound-program and associated services, both delayed and interactive. In particular, SG 9 is concerned with the network capabilities for conventional and high definition television distribution via the GII. This includes the multi-program aspects for television, sound and data services; enhanced television signals; and the performance aspects of broadcast services. SG 9 is the Project Leader for GII Projects N.10 (Conditional Access Methods) and N.11 (Interactive Television and Sound Programming).

Study Group 10 - Languages & General Software Aspects for Telecommunication Systems

This Study Group is responsible for technical languages, the methods for their usage and other issues related to the software aspects of telecommunication systems. In particular, SG 10 is concerned with software languages for telecommunications specification and control in the GII. These include the use of description languages in the specification of interoperability requirements for multi-service/multimedia applications; sequence charts, software quality assurance guidelines and application interchange characteristics; behavior specifications contained in the Guidelines for the Definition of Managed Objects (GDMO) and the associated graphics; human-machine interface specification techniques; and formal specifications for testing and verification. SG 10 is the Project Leader for GII Projects M.8 (Object-Oriented Environments), M.9 (Advanced Human-Computer Interfaces for Telecommunications Management) and M.10 (Software Architectures for Advanced Human-Computer Interfaces).

Study Group 11 - Signaling Requirements and Protocols

This Study Group is responsible for studies relating to signaling requirements and protocols for telephone, N-ISDN and B-ISDN, UPT, mobile and multimedia communications. In particular, SG 11 is concerned with the alignment of signaling methods used by the different elements or components of the GII. These include control and signaling methods to accommodate new

applications and services, signaling interface definitions, interworking of signaling systems, and functional modeling of network control entities and entity interactions. SG 11 is the Project Leader for GII Projects N.2.1 (Signaling and Control Aspects of Wideband/Broadband Access Interfaces for GII), N.2.2 (Signaling and Control Aspects of Wideband/Broadband Network Element-to Network Element Interfaces for GII), N.5.1 ("Intelligent Mobility" for the GII: IMT-2000), N.6 (Harmonization of B-ISDN Signaling Protocols and their Interfaces to Public Broadband Networks), and N.7 (Enhanced Network Intelligence for the GII).

Study Group 12 - End-to-end Transmission Performance of Networks and Terminals

This Study Group is responsible for studies concerning the end-to-end transmission performance of networks and terminals in relation to the perceived quality and acceptance of text, speech and image signals by the users; and the related transmission implications. In particular, SG 12 is concerned with the transmission performance and quality aspects of both the service and application needs of the GII. These include the flexibility required to meet changing service needs and the associated wide range of quality criteria; transmission performance of networks using ATM technology; and transmission planning and interconnection of networks having different transmission characteristics. While SG 12 does not have leadership responsibility for a GII Project, it plays a significant role in supporting SG 13's efforts with respect to GII Project N.8 (Quality of Service and Network Performance).

Study Group 13 - General Network Aspects

This Study Group is responsible for studies relating to general network aspects and the initial studies of the impact of new system concepts and innovative technologies on telecommunication networks with far-reaching consequences, including B-ISDN and the GII. In this regard, SG 13 is responsible for the definition of the GII and development of the associated architectural models. This includes identification of the relevant enterprise, administrative, and technical interfaces that relate, respectively, to the commercial/regulatory conditions, administrative requirements and implementation needs of systems and equipment comprising the GII. SG 13 is also responsible for the overall coordination of the GII Standardization Program and is the Project Leader for GII Projects F.1 (Principles and Framework for GII), F.2 (Scenarios and Key Interfaces for GII), I.1 (IP and Telecommunications Networks Interrelationships), N.3 (Network Interworking for the GII), N.5.2 ("Intelligent Mobility" for the GII: Global Mobility), N.8 (Quality of Service and Network Performance), and M.1 (Network-Oriented Middleware and Network Operating Systems for GII)

Study Group 15 - Transport Networks, Systems and Equipment

This Study Group is responsible for studies relating to transport networks, switching, and transmission systems and equipment. In particular, SG 15 is concerned with reviewing existing specifications and Recommendations for transmission systems and equipment in order to

determine what additional functionality and applications are required to support the GII, to include additional interfaces that may be required to existing systems and network transport capabilities for future networks. SG 15 is Project Leader for GII Project N.1 (Architecture and Layer 1 Aspects of Narrowband/Broadband Access Infrastructures for GII).

Study Group 16 - Multimedia Services and Systems

This Study Group is responsible for studies relating to multimedia service definition and multimedia systems, including the associated terminals, modems, protocols and signal processing. In particular, SG 16 is concerned with all aspects of multimedia services and systems operating in the GII. SG 16 is Project Leader for GII Projects F.3 (Information Appliance), F.4 (End-to-End Interoperability), I.2 (Multimedia over IP), M.3 (Technical Framework for Electronic Commerce), and M.4 (Middleware for Multimedia).

3.4 FRAMEWORK FOR GII RECOMMENDATIONS

In recognition of the magnitude of the GII initiative, a new series of ITU-T Recommendations (the Y-series) has been reserved for matters that relate primarily to this subject area. Within the Y-series, new Recommendation numbers are to be allocated in accordance with the following functional arrangement:

- Y.1xx – GII General;
- Y.2xx – GII Services, Applications and Middleware;
- Y.3xx – GII Network Aspects;
- Y.4xx – GII Interfaces and Protocols;
- Y.5xx – GII Numbering, Addressing and Naming
- Y.6xx – GII Operation, Administration and Maintenance;
- Y.7xx – GII Security.

Currently, the following Y-series Recommendations have either been approved (A) or are under development (D). The date of approval or expected approval is also indicated.

Table 3.2 Status of Y-series Recommendations

Number	Title	Status	Date
Y.100	GII Overview	A	1998
Y.110	GII Principles and Framework Architecture	A	1998
Y.120	GII Scenario Methodology	A	1998
Y.120 A1	Annex 1 to Y.120: GII Examples	D	(1999)
Y.1XX	GII Terms and Definitions	D	(1999)
Y.1YY	GII Performance	D	(1999)
Y.POIF	GII Point of Interconnection	D	(1999)

In addition to Recommendations being developed for publication in the Y-series, many existing and future Recommendations in other series will also form a part of the overall set of GII documentation. Study Group 13 intends to prepare a set of "roadmaps" showing how these additional Recommendations fit together and relate to the overall GII architecture and set of service capabilities. The more important of these are summarized in Table 3.3:

Table 3.3: Other Recommendations of Particular Relevance

Number	Title	Status	Date
E.164	International public telecommunications numbering plan	A	1997
G.774	SDH mgt. information model-network element view	A	1996
G.784	Synchronous digital hierarchy (SDH) management	A	1994
G.850 series	Management of the transport network	A	1996
H.242	System for establishing communications between AV terminals using digital channels up to 2 Mbit/s	D	(1999)
H.310	Broadband AV communication systems and terminals	A	1996
H.320	Narrow-Band visual telephone systems and terminals	A	1997
H.321	Adaptation of H.320 terminals to B-ISDN environments	A	1998
H.322	Visual telephone systems and equipment for LANs with a guarantied quality of service	A	1996
H.323 series	Packet based multimedia communications systems	A	1998
H.324	Terminal for low bit rate multimedia communications	A	1998
H.331	Broadcasting type AV multipoint systems and terminals	A	1993
H.332	Multimedia terminal for Internet-based H.323 conferencing.	A	1998
H.341	MIB for Multimedia communications protocols	D	(1999)
I.350	General aspects of QoS and network performance in digital networks.	A	1993
I.751	ATM management of the network element view	A	1996
J.91	Technical methods to ensure privacy in long-distance international television transmission	A	1994
J.111	Network independent protocols for interactive systems	A	1996
J.112	Transmission systems for interactive cable TV services	A	1996
J.113	Digital video broadcasting interaction channel through the PSTN/ISDN	A	1996
M.3100	Generic network information model	A	1995
M.3110	TMN service level information models	D	(1999)
M.3200	TMN management services and telecommunications managed areas: overview	A	1997
M.3208.1	TMN management services for dedicated and reconfigurable circuits network	A	1997
M.3400	TMN management functions	A	1997
M.3610	Principles for applying the TMN concept to the	A	1996

Number	Title	Status	Date
	management of B-ISDN		
Q.751series	Network element management information models	A	1997
Q.811	Lower layer protocol profiles for Q3 and X interfaces	A	1997
Q.812	Upper layer protocol profiles for Q3 and X interfaces	A	1997
Q.820	TMN application information models	A	1998
Q.18xx	Intelligent network management information model	D	(1999)
T.120 series	Data protocols for multimedia conferencing	A	1996
X.121	International numbering plan for public data networks	A	1996
X.122	Numbering plan interworking for E.164 and X.121	A	1996
X.123	Mapping between escape codes and TOA/NPI for E.164/X.121 interworking during the transition period	A	1996
X.160	Architecture for customer network management service for public data networks	A	1996
X.680 series	Abstract syntax notation one (ASN.1)	A	1997
X.703	Information technology – open distributed management architecture	A	1997
Z.100 series	Specification and Description Language (SDL)	A	1996
Z.105	SDL combined with ASN.1	A	1995
Z.110	Criteria for use of formal description techniques by the ITU-T	A	1996
Z.120 series	Message sequence chart	A	1996
Z.400	Structure and format of quality manuals for telecommunications software	A	1993
Z.500	Framework on formal methods in conformance testing	A	1997

3.5 RELATIONSHIP TO NON-ITU STANDARDS ACTIVITIES

There have been a number of activities on GII related standardization issues since the GII was first advocated in 1994. The most important of these was the ISO/IEC/ITU Joint Seminar on GII held in January, 1996, following the first meeting of the ITU-T Joint Rapporteur's Group on GII (JRG-GII). This seminar focused on the need to encourage the three standardization organizations to cooperate in developing GII related standards. Since then, there has been close collaboration between the major "players", not only at the international level, but at the regional and national levels as well. The more important of these "players" are the ISO/IEC Joint Technical Committee on Information Technology (JTC-1), the Internet Engineering Task Force (IETF), the International Multimedia Teleconferencing Consortium (IMTC), the ATM Forum, the Digital Audio Visual Council (DAVIC), the Telecommunication Information Networking Architecture Consortium (TINA-C), and the regional standards bodies that make up the Global Standards Collaboration (GSC) group.

SECTION 4

GII STANDARDS ASSESSMENT

4.1 NCS STANDARDIZATION OBJECTIVES

NS/EP telecommunications are required to maintain Government services through all types of conditions and hazards. In performing these critical services, NCS users place more stringent requirements on the telecommunication networks than do most other users. NCS programs supporting these special NS/EP needs exhibit the following functional requirements:

- Priority information exchange;
- Priority service provisioning and restoration procedures;
- Emergency broadcast capability;
- Sustainable coordinating mechanisms;
- Interoperable services;
- Protected information support;
- Assured and reliable service;
- Network security.

In providing NS/EP telecommunication support, the NCS utilizes commercial networks and services whenever possible. To insure that commercial telecommunications are up to the task of supporting critical NS/EP needs, the OMNCS actively participates in the commercial standards development process which drives the evolution of commercial network capabilities. This participation focuses on achieving the following standardization objectives:

Interoperability (I) - the ability of heterogeneous devices to effectively communicate and process information. Devices are taken to refer both to customer devices and network devices such as switches. In network terms, this translates into the ability to provide access to a range of devices and services between differing networks in a seamless manner.

Network Management (M) - the ability of the network operator to manage internal network operations, such as monitoring, control, reliability, restoration, and support for evolving capabilities. By supporting a Telecommunications Management Network (TMN) concept, this goal also supports the ability of network operators to manage inter-networked services (network-to-network interfaces) and address end-user concerns (user-to-network interfaces).

Applications/Services (A) - the description and development of functionalities for network services such as telephony (both wireless and wireline), facsimile, HF radio, high speed communication (B-ISDN, ATM, and SONET), multimedia (video teleconferencing and imagery), and emergency broadcast services. Most of these services may support interactivity.

Performance (P) - the provision of service availability and quality of service over a broad range of network operating conditions, especially connectivity during periods of stress and congestion.

Security (S) - the development of telecommunications networks and services which provide for both information security as a service and the physical security of the underlying network infrastructure.

4.2 NS/EP IMPLICATIONS

The principal benefit of the ITU-T program initiative for GII standardization is the establishment of a common framework and description methodology that can be used by the various players involved in the global information revolution to communicate and harmonize their individual activities and requirements. This "Umbrella" effort was developed under GII Projects F.1 and F.2, and the results are contained in the Y-series of ITU-T Recommendations. In particular, the scenario methodology[1], reviewed in Section 2.3 of this Report, provides the NCS with an excellent vehicle for conveying NS/EP user needs to the GII development community. Such an effort could serve to clarify NS/EP requirements and associated GII support needs in a manner understandable to all players in the GII process, regardless of their particular backgrounds or areas of vested interest.

The remaining 38 GII projects that make up the ITU-T program initiative provide the framework for developing the technical standards required to achieve the GII vision. Active NCS participation in those Projects having the greatest potential for impacting NS/EP standardization objectives could provide a significant opportunity for enhancing the NS/EP posture. Table 4.1 identifies those GII projects whose assigned study areas embraces one or more NS/EP standardization objectives. It should be pointed out, however, that the overall effectiveness of these projects have received mixed review. The efforts of the IP-related projects (I1 and I2) have been highly successful, leading to the establishment of a new ITU-T Program Initiative which is expected to be the primary focus of ITU-T efforts during the next 4-year study period (2000 – 2004). On the other hand, a number of projects have either not been initiated due to the lack of a volunteering Lead Study Group, or have not received the participation required to satisfactorily progress the work. For the remaining projects, many participants have expressed the belief that the same ends would have been achieved without GII project status under the established mandate of the responsible Study Group.

[1] ITU-T Recommendation Y.120 – GII Scenario Methodology, 1998

Table 4.1 NS/EP Related GII Project Activity

Proj.	Title	SG	I	M	A	P	S
F.1	Principles and Framework for GII	13	X	X	X	X	X
F.2	Scenarios and Key Interfaces for GII	13	X		X		
F.3	Information Appliance	16			X		
F.4	End-to-End Interoperability	16	X				
I.1	IP and Telecommunications Network Interrelationships	13	X	X	X		
I.2	Multimedia over IP	16	X			X	X
N.2.1	Signaling/Control Aspects of Wideband/Broadband Access Interfaces for GII	11			X		
N.2.2	Signaling and Control Aspects of Wideband/Broadband Network Element-to-Network Element Interfaces for GII	11			X		
N.3	Network Interworking for the GII	13	X				
N.5.1	Intelligent Mobility for the GII: IMT-2000	11	X		X		
N.5.2	Intelligent Mobility for the GII: Global Mobility	13		X	X		
N.6	Harmonization of B-ISDN Signaling Protocols and their Interfaces to Public Broadband Networks	11			X		
N.7	Enhanced Network Intelligence for the GII	11		X			
N.8	Quality of Service and Network Performance	13				X	
N.10	Conditional Access Methods	9			X		
N.11	Interactive Television and Sound Programming	9			X		
M.1	Network-Oriented Middleware and Network Operating Systems for GII	13			X		
M.4	Middleware for Multimedia	16			X		
M.5.1	Service, Network and System Management for GII: TMN	4		X			
M.5.2	Service, Network and System Management for GII: ODM	4		X			
M.6.1	Security (End-to-End)	7					X
M.6.2	Network Security	TBD					X

Bearing in mind the comments on GII project effectiveness, the projects having the greatest potential for impacting NCS interests are the **IP-related Projects I.1 and I.2**, which are expected to transition into the new ITU-T IP program initiative. **Projects F.4**, dealing with end-to-end interoperability, and **N.11**, dealing with standards to support the implementation of interactive services, are also Projects that could significantly impact NS/EP standardization interests. In addition, the following projects could also be of benefit to the NCS in those cases were the current mandate of the Lead Study Group is not considered adequate for dealing with the NS/EP issues of concern:

Project N.3: Provides a systematic investigation of the interworking requirements for supporting emerging telecommunications services over the multitude of core and access area networks operated by a variety of network operators.

Projects N.5.1 and N.5.2: Identify the standards required to support global mobility management and flexible service control of telecommunication networks that will allow anywhere, anytime user communications over any medium. Project N.5.1 focuses on harmonizing the GII and IMT-2000 network architectures, while Project N.5.2 deals with those mobility areas not covered by IMT-2000.

Project N.8: Identifies and defines the key standards concerned with Quality of Service (QoS) and Network Performance for the GII, with reference to the different techniques likely to be employed for different network segments, as well as to the requirements of the different services and application.

Projects M.5.1 and M.5.2: Develops the telecommunications management network (TMN) concepts and framework required to manage public telecommunications networks and services (M.5.1), and the open distribution management (ODM) architecture and associated standards needed to support TMN in the distributed processing environment of the GII (M.5.2)

Project M.6.1: Develops the standards and implementation guidance required to provide end-to-end security in the GII. (Project M.6.2 is also identified in the GII Project Framework to address Network Security issues. However, this project has not been activated due to the lack of a volunteer for Project Leader).

ANNEX A

LIST OF ACRONYMS

ACTS	Advanced Communications Technologies and Services
ADSL	Asynchronous Digital Subscriber Line
AF	Application Function
AI	Adaptation Interface
ANI	Access-Network Interface
AP	Application Protocol
API	Application Programming Interface
ARS	Automatic Route Selection
ASN.1	Abstract Syntax Notation One
ATM	Asynchronous Transfer Mode
AU	Adaptation Unit
AV	Audiovisual
BF	Baseware Function
B-ISDN	Broadband - ISDN
BPI	Baseware Programming Interface
CATV	Cable Television (also Community Antenna Television)
CD	Customer's Domain
CF	Control Function
CL	Connectionless
CO	Connection Oriented
CORBA	Common Object Request Broker Architecture
CT	Cordless Telephone
DAVIC	Digital Audio Visual Council
DB	Database
DBMS	Database Management System
DBSN	Direct Broadcast Satellite Network
DI	Drop Distribution Interface
DII	Defense Information Infrastructure
DOD	Department of Defense (also DoD)
DPE	Distributed Processing Environment
DSS1	Digital Signaling System No. 1
DWDM	Dense Wave Division Multiplexing
E-SCF	Enhanced Service Control Function
ETSI	European Telecommunications Standards Institute
EUR	End-User Role
F	Function
FAX	Facsimile
FTSP	Federal Telecommunication Standards Program
FTTB	Fiber-to-the-Business
FTTC	Fiber-to-the-Curb

FTTH	Fiber-to-the-Home
GDMO	Guidelines for the Definition of Managed Objects
GII	Global Information Infrastructure
GMPCS	Global Mobile Personal Communications Satellite
G/W	Gateway
HCI	Human-Computer Interface
HCIF	Human-Computer Interfacing Function
HTML	Hypertext Mark-up Language
IDL	Interface Definition Language
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IMT-2000	International Mobile Telecommunications in the year 2000
IMTC	International Multimedia Teleconferencing Consortium
IN	Intelligent Network
IOR	Information Ownership Role
IP	Internet Protocol
ISDN	Integrated Services Digital Architecture
ISO	International Standards Organization (also International Organization for Standardization)
IT	Information Technology
ITU	International Telecommunication Union
ITU-D	ITU – Telecommunication Development Sector
ITU-R	ITU – Radiocommunication Sector
ITU-T	ITU – Telecommunication Standardization Sector
JAVA™	A programming language for World Wide Wed applications
JPEG	Joint Photographic Experts Group
JTC 1	Joint Technical Committee 1 (for Information Technology)
LAN	Local Area Network
L1	Level 1
L2	Level 2
MAC	Media Access Control
ManF	Management Function
MCU	Multipoint Control Unit
MF	Middleware Function
MIB	Management Information Base
MP	Middleware Protocol
MPEG	Motion Picture Experts Group
MSC	Mobile Switching Center
NCS	National Communications System
NF	Network Function
NII	National Information Infrastructure
N-ISDN	Narrow band - ISDN
NIU	Network Interface Unit
NM	Network Management
NNI-A	Network-to-Network Interface Type A

NNI-B	Network-to-Network Interface Type B
NOD	Network Operations Domain
NP	Network Performance
NPI	Numbering Plan Identifier
NS/EP	National Security/Emergency Preparedness
NT	same as NTU
NTU	Network Terminating Unit
ODM	Open Distributed Management
ODMA	Open Distributed Management Architecture
ODP	Open Distributed Processing
OMG	Object Management Group
OMNCS	Office of the Manager, National Communications System
OPI	On-Premise Interface
OSI	Open Systems Interconnection
PABX	Private Automated Branch Exchange
PAI	Premise-Attachment Interface
P&SF	Processing and Storage Function
PC	Personal Computer
PDN	Public Digital Network
PICR	Provision of Information and Related Content Role
PISR	Provision of Information-Based Service Role
PON	Passive Optical Network
PSDN	Public Switched Digital Network
PSTN	Public Switched Telephone Network
QOS	Quality of Service (also QoS)
RP	Reference Point
SCF	Service Control Function
SCP	Service Control Point
SCTE	Society of Cable Telecommunications Engineers
SDH	Synchronous Digital Hierarchy
SDL	Specification and Description Language
SDO	Standards Development Organization
SG	Study Group
SONET	Synchronous Optical Network
SPD	Service Provider’s Domain
SPP	Service Provisioning Platform
STB	Set-Top Box
SWG	Special Working Group
TBN	Terrestrial Broadcast Network
T&CF	Transport and Control Functions
TCP	Transmission Control Protocol
TF	Transport Function
TINA	Telecommunications Information Networking Architecture
TINA-C	Telecommunications Information Networking Architecture Consortium
TIPHON	Telecommunications and Internet Protocol Harmonization Over Networks
TMN	Telecommunication Management Network

TOA	Type of Address
TRP	Telecommunications Reference Point
TV	Television
UNI	User-to-Network Interface
UPT	Universal Personal Telecommunications
VOD	Video on Demand
WATM	Wireless ATM
W3C	World Wide Web Consortium
WP	Working Party
xDSL	a collective term for the various Digital Subscriber Line technologies

ANNEX B

GII PROJECT SUMMARIES

FRAMEWORK ASPECTS ("F" Projects)

F.1 Principles and Framework for GII

Project Objectives: To establish a set of fundamental concepts for GII to enable cross-industry and cross-standards organization understanding of the inter-relationships of respective standards-based technologies; and to position the ITU-T role in relation to other organizations and the market place.
Project Description: This project will develop the basic principles and models necessary to reflect the nature of the GII. A high level overview will be provided, together with a more detailed abstract representation. The latter will analyze the GII from a number of different perspectives and identify the fundamental principles and characteristics. Attention will also be paid to creating a set of terms and definitions for the GII and relating/equating them to other existing terms and definitions where appropriate.
Project Leader: SG 13
Principal Collaborating Bodies:

- ISO/IEC JTC1 Special Working Group on GII (SWG-GII)

F.2 Scenarios and Key Interfaces for GII

Project Objectives: To establish graphical techniques for illustrating the interconnection of GII networks and technologies in a consistent fashion; and to illustrate a number of critical interconnections and identify key interface points.
Project Description: This project considers the convergence of telecommunications, information technology, and entertainment/consumer electronic networks and related technologies. Various interconnection/convergence configurations will be considered, graphically illustrated and analyzed.
Project Leader: SG 13
Principal Collaborating Bodies:

- ITU-T SG 9 (Q24)
- ISO/IEC JTC1 Special Working Group on GII (SWG-GII)

F.3 Information Appliances

Project Objectives: To define functional requirements applicable to information appliances; to define the interfaces between networks and information appliances; to develop the protocols used by information appliances; and to keep the appliances independent from the network above the transport layer.

Project Description: "Information appliance" is a generic term for all terminals and servers connected to the network, including such end systems as MCUs, computers, set-top boxes and TV sets. This project addresses the mechanisms required for information appliances to answer correctly the calls directed to them through their access network; to initiate and terminate calls necessary for normal use; and to offer the functions required (at a sufficient quality of service) for the services they support. Project development will keep in mind that information appliances exchange information via the network and often contain a large part of the intelligence necessary for offering the service.

Project Leader: SG 16

Principal Collaborating Bodies:

- ITU-T SG 8 (Q1, 3, 4) and 9 (Q17, 19, 20, 24, 25, 27, 28)
- DAVIC
- IEC Technical Committee 100 (TC 100)
- ISO/IEC JTC1

F.4 End-to-End Interoperability

Project Objectives: To serve as a focal point for monitoring and coordinating the evolution of specifications applicable to the GII in order to ensure that interoperability at the application, service and network level is guaranteed; and to promote the development of profiles which will guarantee interoperability across a number of identified networks for selected key applications and services.

Project Description: This project will identify all areas relevant to the achievement of interoperability; establish a liaison with bodies working in the relevant areas; identify applications and services with high market expectations; and promote the development of interoperability profiles and conformance and interoperability test specifications. Adherence to the following principals will be of particular concern:

- Protocols and coding algorithms should, to the extent practical, be the same for different networks, or be easily converted from one type to another;
- Gateways between networks should allow (with reasonable complexity) the same services and supplementary services to be offered on both sides, with the highest functionality and quality of service common to both networks;
- Transcoding and conversions of protocols or signaling should be avoided as much as possible, but when required, should be easy to implement.

Project Leader: SG 16

Principal Collaborating Bodies:

- ITU-T SG 8 (Q4, 6, 7, 9), SG 9 (Q19, 24, 29), and SG 12 (Q16, 18, 21)
- DAVIC
- IEC Technical Committee 100 (TC 100)
- ISO/IEC JTC1
- European Commission ACTS Program Task AC126 (Interactive multimedia services interoperability)

INTERNET–RELATED ASPECTS ("I" Projects)

I.1 IP and Telecommunications Networks Interrelationships[1]

Project Objectives: To identify the issues relative to Internet Protocol (IP) and telecommunications interoperability, utilizing the features of both for mutual advantage in the support of business needs; and to identify the areas of work germane to the ITU (areas where the ITU can provide substantial added value, working in close cooperation with other key industry and standards organizations, such as the IETF).
Project Description: This project will address access to IP-based networks and interworking between IP and connection oriented telecommunication networks; determine approaches for sharing network resources for the mutual benefit of IP and telecommunication networks and their users; investigate interworking between IP and telecommunication applications and services, to include middleware, charging, and voice over IP; and identify new network concepts and architectural approaches to meet future needs for data, video and voice multimedia applications. The Internet Protocol suite developed by the IETF will be used as the basis for this project effort.
Project Leader: SG 13
Principal Collaborating Bodies:

- ITU-T SG 2, 3, 7, 9, 10, 11, 12, 15, and 16
- IETF
- World Wide Web Consortium (W3C)
- ISO/IEC JTC1
- ATM Forum
- ETSI – TIPHON Project

I.2 Multimedia over IP

Project Objectives: To support the growing market for real-time multimedia communications over IP-based networks, and its extension over the PSTN/ISDN, through coordination of ITU-T activities; and to ensure interoperation for a variety of scenarios.
Project Description: This project addresses interoperability requirements between IP networks and the PSTN/ISDN to include service definitions and requirements for service interoperability; reference configurations and functional models; multimedia coding; call control procedures, information flows and protocols; numbering and addressing; charging and billing; security; and end-to-end quality of service aspects. The initial benchmark service to be supported is interworking between voice over IP-based networks and the PSTN/ISDN.
Project Leader: SG 16
Principal Collaborating Bodies:

- ITU-T SG 2, 3, 7, 8, 9, 10, 11, 12 (Q16, 18, 21), 13, and 15
- IETF
- IMTC
- ISO/IEC JTC1
- DAVIC
- ETSI – TIPHON Project

[1] The present project I.1 is a merger of former Projects I.1, I.3, N.4.1 and N.4.2.

NETWORK ASPECTS ("N" Projects)

N.1 Architecture and Layer 1 Aspects of Narrowband/Broadband Access Infrastructures for GII

Project Objectives: To define the transport architecture for access networks supporting narrowband and broadband services in residential environments, focusing on those aspects of transmission systems which are essential for low-cost solutions; and to develop the required standards for upgrading the existing subscriber access infrastructure (e.g. twisted copper pair using ADSL, hybrid fiber/coax and passive optical networks, microwave, etc.) and the use of ATM on these access types.
Project Description: This project addresses the transport aspects of access networks for narrowband and broadband services in residential environments. In this context, the "access network" is considered to go from the terminal equipment up to the local network node. The project considers both wired and wireless technologies, and includes the capabilities required for the maintenance of the access network. The control aspects, particularly for mobility, are dealt with in a separate project.
Project Leader: SG 15
Principal Collaborating Bodies:

- ITU-T SG 9 (Q15, 18, 19, 20, and 26) and 13 (Q11, 12 and 26)
- DAVIC
- ATM Forum

N.2.1 Signalling and Control Aspects of Wideband/Broadband Access Interfaces for GII

Project Objectives: To specify the interface needed for users to gain access to telecommunication networks (such as CATV, PSTN, N-ISDN/B-ISDN, fixed and mobile telecommunications) in a common approach for both current and emerging services.
Project Description: This project will define the User-to-Network Interface (UNI) control plane, interface and protocols needed for the physical and media access control (MAC) layer; specify the signaling protocol required between the network termination point and different service networks; identify the control functions (apart from layer 1) to be provided in the different functional groupings; and specify the functions and functional transport architecture for access networks and the required interfaces between access network and the network nodes providing the services.
Project Leader: SG 11
Principal Collaborating Bodies:

- ITU-T SG 2, SG 13(Q12) and 16(1, 12)
- ISO/IEC JTC1
- DAVIC
- IEEE Project 802
- ATM Forum
- IETF

N.2.2 Signalling and Control Aspects for Wideband/Broadband Network Element-to-Network Element Interfaces for GII

Project Objectives: To specify the interface needed between network elements within one network or between two networks based on a common approach for both current and emerging services including Internet, PSTN, PSDN, N-ISDN and B-ISDN, fixed and mobile telecommunications services.
Project Description: This project will define the node-to-node interface, control plane functions and protocol requirements; identify the telecommunication control functions, functional groupings and distribution needed to support interactive, distributive and retrieval multimedia applications and services; specify signaling control protocols between the network elements within or between administrative domains to support signaling capability sets as perceived by users; and provide a common set of interworking procedures and rules between signaling protocols used in existing networks and those implemented using the GII principles and framework.
Project Leader: SG 11
Principal Collaborating Bodies:

- ITU-T SG 2 and 13 (Q12)
- DAVIC
- ATM Forum
- IETF

N.3 Network Interworking for the GII

Project Objectives: To provide a systematic investigation of the interworking requirements for supporting emerging telecommunications services over the multitude of core and access networks operated by a variety of network operators under various technical conditions. ATM-based B-ISDN is seen as the most appropriate, cost-effective technology for supporting the requirements of the information market and as a means for allowing interworking between these diverse existing networks, and will be taken as a prerequisite in considering interworking for new applications and services.
Project Description: This project will emphasize the definition of standards for the interconnection of ISDN, CATV, X.25 and mobile networks, with a particular focus on the use of ATM as a backbone for Internet type, higher layer transport capabilities. Interworking is to be considered in the context of interactive speech, real-time image transfer and multipoint retrieval, electronic mail, multimedia document retrieval, video on demand, interactive video services, computer cooperative working, broadcast TV/radio/data contribution and distribution, and distributed processing. Addressing aspects of interworking are treated in Project N.9, while interworking with the Internet is covered in Project N.4.
Project Leader: SG 13
Principal Collaborating Bodies:

- ITU-T SG 2, SG 7 (Q1, 6, 8, 9), SG 10 (Q6, 7), and SG 12 (Q16, 18, 21);
- ISO/IEC JTC 1
- ATM Forum
- Frame Relay Forum

N.5.1 "Intelligent Mobility" for the GII, IMT-2000

Project Objectives: To achieve a Unified Network Architecture for fixed and mobile multimedia services through the harmonization of the GII and IMT-2000 Network Architectures, thereby supporting terminal and personal mobility for GII users while continuing to provide multimedia services.
Project Description: Based on the IMT-2000 development effort, this project will identify intelligent functional entities within the GII Network Architecture using the IMT-2000 Intelligent Network framework; identify Protocol Reference Points and protocol stacks between these functional Entities; identify radio access requirements and criteria (including satellite components) for selecting the appropriate radio transmission technology; specify the functions and protocol stacks for the radio access interface; and identify interworking functions between the GII Network Elements and the old generation of fixed and mobile Network Elements.
Project Leader: SG 11
Principal Collaborating Bodies:

- ITU-T SG 2 (Q13) and 13 (Q1, 23, 27, 29)
- ITU-R TG 8/1
- ATM Forum (WATM)
- IETF mobile IP

N.5.2 "Intelligent Mobility" for the GII, Global Mobility

Project Objective: To identify the standards required to support global mobility management and flexible service control of telecommunication networks that will allow anywhere, anytime user communications in any medium.
Project Description: This project is complementary to project N.5.1 by addressing those mobility areas not covered by IMT-2000 and by emphasizing the global and intelligent aspects. This includes service control, service management, service creation, and an overall service architecture for a global mobile environment. In view of the convergence of the computing and telecommunications industries, the project will favor approaches leveraging advances in computing technology as well as in the intelligent network. Project N.5.2 is closely related to Project N.7 (Enhanced Network Intelligence for the GII) and Project M.1 (Network-Oriented Middleware for the GII).
Project Leader: SG 13
Principal Coordinating Bodies:

- ITU-T SG 11 (Q5,7)
- ITU-R TG 8/1
- TINA-C

N.6 Harmonization of B-ISDN Signalling Protocols and their Interfaces to Public Broadband Networks

Project Objective: To provide a common set of generic applications for enabling terminal equipment connected to a GII access interface to build multimedia services to the users; identify a common set of signaling capabilities which can be used to support generic applications for a

large variety of multimedia services; and provide a common set of interworking procedures and rules for use between the GII access signaling protocol and existing signaling systems.
Project Description: This project will identify functional entities and describe the functional groupings and protocol stacks required at the signaling protocol reference points between GII terminal equipment and private/public networks, and between private and public networks; identify generic signaling capabilities, grouped into coherent capability sets, which will allow GII users to build interactive, distributive and retrieval multimedia applications and services; describe API interfaces between applications and signaling capabilities; specify the required signaling protocols; describe interworking procedures between these protocols and existing access signaling protocols; and identify commonalties/differences between the various broadband access signaling protocols for the purpose of promoting the possible migration towards a common access broadband signaling protocol for multimedia applications and services.
Project Leader: SG 11
Principal Coordinating Bodies:

- ITU-T SG 13 (Q8)
- ATM Forum
- ISO/IEC JTC 1 (SC 6/WG 6)

N.7 Enhanced Network Intelligence for the GII

Project Objective: To identify, describe and possibly revise existing standards to support flexible service control and management of telecommunication networks, both for connection-oriented and for connectionless communications (e.g. Internet, virtual ATM LAN, etc.), thereby providing both service providers and users with a powerful and flexible means to optimize and customize their service.
Project Description: This project will apply existing IN and TMN standards to the needs of service control and management of GII services with a view to identifying and specifying any new interfaces, protocols, or other enhancements that may be required. Major topics to be treated are service control that depends on network resources which are not visible via standard user-network signaling (e.g. UNI, DSS 1, DSS 2, etc.); centralizing service control in order to simplify customization and operation, administration and maintenance; service management of optional features; and other management issues, such as routing and charging management, and the X-interface aspects of the same service routed over different networks.
Project Leader: SG 11 (with support from SG 4 for the TMN aspects)
Principal Collaborating Bodies:

- ITU-T SG 4 (Q 13-17, 19-21) and 13 (Q23, 29)

N.8 Quality of Service and Network Performance

Project Objective: to identify and define the key standards concerning Quality of Service and Network Performance for the GII, with reference to the different techniques likely to be employed for different segments and layers as well as to the requirements of the different services and applications.

Project Description: The framework and parameters already defined for Quality of Service (QoS) and Network Performance (NP) in PSTN/ISDN and ATM-based networks cover a part of the overall communication scenario for the GII. However, there is a need for a broader view of standardization in this area. Accordingly, this project will reevaluate existing QoS and NP concepts in light of newly emerging networking technologies to identify any new QoS/NP requirements; apportion them to the various network segments; and specify the relevant parameters and associated procedure for measuring them. In addition, the trends for longer term global networking (such as the impact of mobility, IP/ATM integration, support of voice over IP and ATM, and the emergence of an Integrated Services Internet) will also be investigated for the purpose of identifying general performance concepts so that a common understanding can be reached between the different actors involved; and the detailed characterization of associated methods for performance and QoS specification, allocation and measurement.
Project Leader: SG 13
Principal Collaborating Bodies:

- ITU-T SG 2 (Q3, 6, 8), SG 7 (Q2), SG 9, and SG 12 (Q16, 18, 21)
- ATM Forum
- IETF

N.9 Addressing for the GII

Project Objective: To develop a GII addressing scheme that has a sufficiently large capacity to enable all potential information appliances to be addressed, while being compatible with existing addressing schemes to the extent possible.
Project Description: This project will study and analyze existing naming and addressing structures and numbering systems; identify/develop mechanisms that permit interworking between the various schemes; or, if this is not possible, identify/develop a universal naming and/or addressing scheme that encompasses these schemes and allows easy interworking between different addressing domains, while taking human factors into consideration. The project will also set guidelines for the development of new address structures such that, at a minimum, the unrestricted transport of existing addresses in new structures is guaranteed.
Project Leader: SG 2
Principal Coordinating Bodies:

- ITU-T SG 7 (Q3, 21) and 13 (Q2)
- ISO/IEC JTC1
- ATM Forum
- IETF

N.10 Conditional Access Methods

Project Objective: To identify standards to support conditional access in the secondary distribution of GII audiovisual services for those users who have correct entitlement.
Project Description: This project will review the reference models for conditional access which are contained in ITU-T Recommendations; identify any other existing models or models under development which can be applied in the secondary distribution of audiovisual services; and develop any additional standards which may be required to achieve the project objective. The

rapid increase in electronic commerce on the GII will be taken into account to ensure that user authentication and non-repudiation are fully considered in the project work effort.
Project Leader: SG 9
Principal Coordinating Bodies:

- ITU-R SG 11
- ETSI

N.11 Interactive Television and Sound Programming

Project Objective: To establish processes and protocols that avoid a proliferation of incompatible hardware and software for interactive services delivered by secondary distribution.
Project Description: This project will identify standards to support the implementation of interactive services; and establish a generic Recommendation to be used as an umbrella under which subsequent Recommendations for interactive services associated with specific media or applications can be developed.
Project Leader: SG 9
Principal Coordinating Bodies:

- ITU-R SG 11
- ETSI
- SCTE (Society of Cable Telecommunications Engineers)

MIDDLEWARE ASPECTS ("M" Projects)

M.1 Network-Oriented Middleware and Operating Systems for GII

Project Objectives: To create the necessary concepts and standards for a new generation of GII applications and service offerings that are capable of interworking with network control and management functions of the network infrastructure.
Project Description: This project will develop a consolidated view of the overall concept, framework and principals involved in the development of network-oriented middleware and network operating systems that are tailored to the needs of the GII, Internet, and Multimedia. This is to be followed by the identification of the associated key interfaces and protocols; evaluation of client-server techniques; incorporation of the Internet protocols; identification of the multimedia and management aspects; and consideration of the required call, session, and connection control mechanisms.
Project Leader: SG 13 (initially)
Principal Coordinating Bodies:

- ITU-T SG 10 (Q1, 3) and 11
- IETF
- ATM Forum
- DAVIC
- OMG

M.2 APIs Harmonized with Network Capabilities[2]

Project Objective: {see footnote}
Project Description: {see footnote}
Project Leader: SG 8
Principal Coordinating Bodies:

- ITU-T SG 16(Q2)
- ATM Forum

M.3 Technical Framework for Electronic Commerce

Project Objective: To examine the possible contribution which ITU-T can make to the development of a technical framework for Electronic Commerce.
Project Description: This project will characterize the functional aspects of electronic commerce; review the existing work which has been accomplished outside the ITU on this subject; identify the applicable telecommunication support requirements; define the appropriate interfaces between networks and information appliances; and develop the protocols required for the support of electronic commerce.

[2] The Project Objective and Description has not yet been submitted by the Project Leader

Project Leader: SG 16
Principal Coordinating Bodies:

- ITU-T SG 3, 7 and 13
- IETF
- DAVIC

M.4 Middleware for Multimedia

Project Objective: To develop the concepts required to render multimedia applications independent of the underlying networks or operating systems for real-time operations.
Project Description: This project will identify results in *de jure* and *de facto* standards for middleware (e.g. CORBA and TINA-C's DPE) that may be applicable; determine what requirements multimedia applications place with respect to delay tolerance, real-time capabilities etc., together with the type of scalability required; identify which functions are needed; identify any concepts missing in available standards and devise a plan to provide the add-ons for multimedia; and complete the specification for middleware for multimedia including the management of the underlying services and network connections.
Project Leader: SG 16
Principal Collaborating Bodies:

- ITU-T SG 7 (Q24) and 10
- OMG
- TINA-C
- DAVIC

M.5.1 Service, Network and System Management for GII (TMN)

Project Objective: To develop the telecommunication management network (TMN) concepts and framework required to manage public telecommunications networks and services which will provide the backbone for the GII.
Project Description: This project will address the TMN architecture, functional requirements, information models, protocols, and conformance testing required to specify the interfaces between TMN operation systems and the relevant wideband/broadband networks and systems, and between operations systems providing element, network, and service management.
Project Leader: SG 4
Principal Coordinating Bodies:

- ITU-T SG 7, 11 and 15
- ATM Forum
- Network Management Forum (NM Forum)

M.5.2 Service, Network and System Management for GII (ODM)

Project Objective: To develop an open distributed management (ODM) architecture and the associated standards needed to support TMN in the GII distributed processing environment.
Project Description: Service, network, and systems management is inherently a distributed process, and performance of the TMN depends on appropriate support from a distributed

processing architecture. This project will define the Open Distribution Management Architecture (ODMA) for the GII; the associated ODMA OSI management and CORBA support; and ODMA functions for notifications selection and dispatch, viewpoint notations for system specification, and inter-domain federation transposition.
Project Leader: Jointly between ITU-T SG 4 and ISO/IEC JTC1 SC 33
Principal Collaborating Bodies:

- ITU-T SG 7 and 10
- OMG
- NM Forum

M.6.1 Security (End-to-End)

Project Objective: To develop the standards and implementation guidance required to provide end-to-end security in the GII.
Project Description: This project will assess the security threat to the GII and develop the required security policy; assess the risk to be taken in implementing this policy and develop a statement of security needs; identify the security services required to meet these needs and select appropriate security mechanisms for their realization; review relevant existing standards and determine where security gaps may exist; and develop standards and the associated implementation guidance required for their resolution.
Project Leader: SG 7
Principal Collaborating Bodies:

- ITU-T SG 11 (Q3)
- ITU-R TG 8/1
- ISO/IEC JTC1 SC 6, 21, and 27
- IETF

M.6.2 Network Security[3]

Project Objective: {see footnote 3}
Project Description: {see footnote 3}
Project Leader: to be determined
Principal Coordinating Bodies: to be determined

M.7 High-level Naming[4]

Project Objective: {see footnote 4}
Project Description: {see footnote 4}
Project Leader: SG 7
Principal Coordinating Bodies:

- IETF

[3] Development of the Project Objective and Description is pending assignment of a Project Leader
[4] The Project Objective and Description has not yet been submitted by the Project Leader

M.8 Object-oriented Environments

Project Objective: To provide sound technologies for describing objects in GII reference descriptions so that these objects can be specialized and reused.
Project Description: This project will enhance the planned work for extending SDL and MSC to ensure that any special object features required by the GII are included; enhance the SDL+ framework methodology (Supplement 1 to Z.100) to support emerging GII requirements and to provide an example of the use of this methodology for a specific GII element; outline the requirements for associated tools, to include, if possible, a demonstration of feasibility; and develop guidelines for the use of techniques to ensure that the GII descriptions can be validated as being of good quality (enabled by the use of formal techniques) and extendable to the generation of formal test cases.
Project Leader: SG 10
Principal Coordinating Bodies:

- DAVIC
- IETF
- OMG
- SDL Forum

M.9 Advanced HCIs for Telecommunications Management

Project Objective: To identify aspects of future Human-Computer Interfaces (HCIs), and associated tool interfaces for the management of telecommunications, which are candidate for standardization.
Project Description: It can be expect that a GII of 1 billion customers will require in excess of 10^{15} bytes of information for its management. This presents an unprecedented challenge for the design of human-computer interfaces which are capable of managing this tremendous amount of data. This project will explore ways for meeting this challenge, to include addressing such issues as how to correlate and present worldwide signaling to identify unauthorized use of the GII; analyze and present traffic losses to competitors; overview, unbundle and manipulate extremely large graphs and automatically aggregate and generically manipulate their parts; convert various user interfaces automatically to multiple natural languages; use speech/sound user interfaces, three-dimensional graphics, animation and new human-computer metaphors and tools for the management of the GII; create software automatically for service execution from non-programming management interfaces; etc.
Project Leader: SG 10
Principal Coordinating Bodies:

- ITU-T SG 2 and 4
- {others to be determined}

M.10 Software Architectures for Advanced HCIs

Project Objective: To provide a framework for identifying candidate human-computer interfaces (HCIs) between software components for standardization.

Project Description: Current software frameworks, such as ODP and TMN, lack a sufficient focus on the HCI aspects of the software architecture. This project will develop a systematic approach for specifying architectures for HCIs; establish the distinction between the usage, creation and life-cycle dimensions of the software and its integration; develop techniques and principles for deriving data flow interfaces from the specifications contained in the reference model; and identify and define the distinction between interchange formats for communication protocols and software interfaces (APIs) at each end of the communication channel.
Project Leader: SG 10
Principal Coordinating bodies: {to be determined}

M.11 Network Capabilities for Charging and Billing in GII[5]

Project Objective: {see footnote 5}
Project Description: {see footnote 5}
Project Leader: to be determined
Principal Coordinating Bodies: to be determined

APPLICATION ASPECTS ("A" Projects)[6]

A.1 Medical Informatics

A.2 Libraries

A.3 Electronic Museums

A.4 Road Transport Informatics

A.5 Electronic Purse

A.6 Industrial Multimedia Communication

A.7 Ergonomics

A.8 Character Set

A.9 Geographic Information Systems

[5] Development of the Project Objective and Description is pending assignment of a Project Leader

[6] ITU-T Study Group 2 was asked to assume Project Leadership for the "A" Projects. However, this was declined because the topics to be addressed were considered to be outside SG 2's area of interest. Since these projects are also of interest to other GII participants (e.g. ISO/IEC/JTC1), they are being retained in the GII Work Program with the expectation that volunteers for Project Leader will be forthcoming.