

**Telecommunications and Internet Protocol
Harmonization Over Networks (TIPHON);
Requirements Definition Study;
Scope and Requirements for a Simple call**



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Foreword

This Technical Report (TR) has been produced by ETSI Project Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON).

1 Scope

The present document defines the TIPHON framework that enables services to be developed which are able to inter-work across multiple communication network domains and diverse network technologies. The framework identifies services, service capabilities and service applications and defines the relationships between them.

The present document:

- considers how Service Capabilities can be combined to develop Service Applications;
- defines the requirements for a Simple Call Service Application.

The content of the present document does not infer any details of the implementation of any of the concepts expressed within it.

2 References

For the purposes of this Technical Report (TR), the following references apply:

- [1] ETSI TR 101 835: "Telecommunications and Internet Protocol Harmonization over Networks (TIPHON); Project method definition".
- [2] ITU-T Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [3] ITU-T Recommendation I.140: "Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [4] ITU-T Recommendation I.210: "Principles of telecommunication services supported by an ISDN and the means to describe them".
- [5] ITU-T Recommendation I.112: "Vocabulary of terms for ISDNs".
- [6] ETSI TR 101 287: "Network Aspects (NA); Terms and definitions".
- [7] ITU-T Recommendation E.105: "International telephone service".
- [8] ITU-T Recommendation E.106: "Description of an international emergency preference scheme (IEPS)".
- [9] TINA-C: "TINA Business Model and Reference Points".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

administrative domain: bounded entity within which all encompassed constituent elements are under common ownership, operation and management

domain: result of the application of specific policies to a specific network technology

International Emergency Preference Scheme (IEPS): IEPS enables authorized users to have priority access to telecommunication services and priority processing of communications in support of recovery operations during emergency events

network: telecommunications network that provides telecommunications services

network abstraction LAYER: provides a set of communications capabilities to the Transport Abstraction Layer that are derived from, but independent of, the capabilities of a specific underlying network technology

network operator: entity that is responsible for the development, provisioning and maintenance of telecommunications services and for operating the corresponding networks

public: attribute indicating that the application of an item qualified as "public" is offered to any person
This attribute does not indicate any aspects of ownership.

private: attribute indicating that the application of an item qualified as "private" is offered to a pre-determined set of users
This attribute does not indicate any aspects of ownership.

service: commercial offering to a customer
It comprises functionality - known as a service application - set in a business context. The business context is outside of the scope of TIPHON to consider as it determined by commercial or political concerns.

service abstraction layer: element of the TIPHON Application Plane that provides a modular and extensible set of Service Capabilities for use in the creation of Service Applications

service application: integrated set of one or more Service Capabilities
TIPHON will not specify service applications but may consider such groupings where this contributes to the identification and definition of specific Service Capabilities. The ability to select and combine Service Capabilities offers a structured, yet flexible, means for creating service applications that:

- are internally coherent and self consistent;
- enable the inter-operation of services between different implementations of TIPHON systems;
- enable inter-working with other systems.

service capability: indivisible and exclusive set of functionality including user and network capabilities

service independent requirement: requirement that applies without reference to currently invoked service capabilities

service provider: entity that provides services to its service subscribers on a contractual basis and who is responsible for the services offered
The same entity may act as both a network operator and a service provider.

service provider access interface: interface between a network and a service provider's equipment for enabling the service provider to access specific functionality of a network

transport abstraction layer: provides a set of domain independent capabilities derived from the underlying Network Abstraction Layer in response to the transport and connectivity requirements of the Service Abstraction Layer

user: entity using the services of a network via terminal equipment

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

GSM	Global System for Mobile communication
IEPS	International Emergency Preparedness Scheme
ISDN	Integrated Services Digital Network
RDS	Requirements Definition Study
SCD	Service Capability Definition
SP	Service Provider

4 Services and service capabilities framework

Traditional approaches to developing services offered by communications networks have largely been specific to a single network technology, such as ISDN. This has tended to create problems in enabling services to operate across multiple network technologies. An alternative approach is to derive a core set of capabilities in an abstract manner and then map these on to selected network technologies through an abstract, technology neutral, network architecture. By adopting this approach, the services developed on specific network technologies may be derived from a common core set of capabilities. This enables easier inter-working between different network technologies at the functional level.

By using a common core set of capabilities to implement services, a basic level of functional inter-working should be assured for TIPHON based networks. Furthermore, the approach enables technical inter-working problems to be identified in a structured manner.

The traditional service development approach described has also restricted the development of services to the limitations of the specific network technologies upon which they are based. The alternative adopted by TIPHON is a more flexible and extensible approach to service development because it enables services to be constructed from the aggregation of modular, re-usable components based on the concepts of service applications and service capabilities.

Service Interaction is a common problem within modern communications networks. The modular and hierarchical approach adopted by TIPHON allows easier identification and resolution of such problems by enabling them to be traced to the presence or absence of specific capabilities and the relationships between them.

4.1 The ITU ISDN approach to describing services

ITU-T Recommendations I.130 [2], I.140 [3] and I.210 [4] describe a method of describing service applications in the Integrated Services Digital Network (ISDN) by bearer and teleservice attributes. In general bearer services offer bearer attributes to teleservices and the teleservices provide service by manipulation of the bearer attributes. This approach views attributes of an overall service application in 3 parts.

Table 1: ITU ISDN 3 layer service application model

Part	Sub-part	Assigned attributes (examples)
Low layer	Information transfer	Mode Rate Structure
	Access attributes	Access channel and rate Access protocol Signalling for each of layers 1 to 3 Information protocol for each of layers 1 to 3
High layer		Type of User Information Protocol functions for each of layers 4 to 7
General		Supplementary Service provided QoS Interworking capabilities

In an environment comprising multiple network technologies, the lower layer attributes will vary between network technologies. In this approach, the information transfer and access layer attributes cannot be considered common between users.

4.2 The TIPHON environment

The TIPHON environment considers the case where multiple networks, possibly employing differing network technologies, inter-work to provide end-to-end communications services as shown in figure 1.

This model supports the different business roles found within the heterogeneous communications environment envisaged by TIPHON (see Annex A) and commonly found in modern public communications networks. The key requirements for this environment are:

- separation of service applications and transport services hence enabling users to access their call handling services irrespective of their transport connection;

- ability of service applications to work across multiple network domains thereby enabling users to access their services irrespective of the network domain they are connected to;
- ability of service applications to work across multiple network technologies thereby enabling service providers to offer services using a range of network technologies;
- ability to recursively construct network domains thereby enabling network providers to extend the reach of their networks.

By introducing a number of layers of abstraction, the TIPHON model provides a framework that is able to describe an end-to-end application capable of operating over a heterogeneous infrastructure.

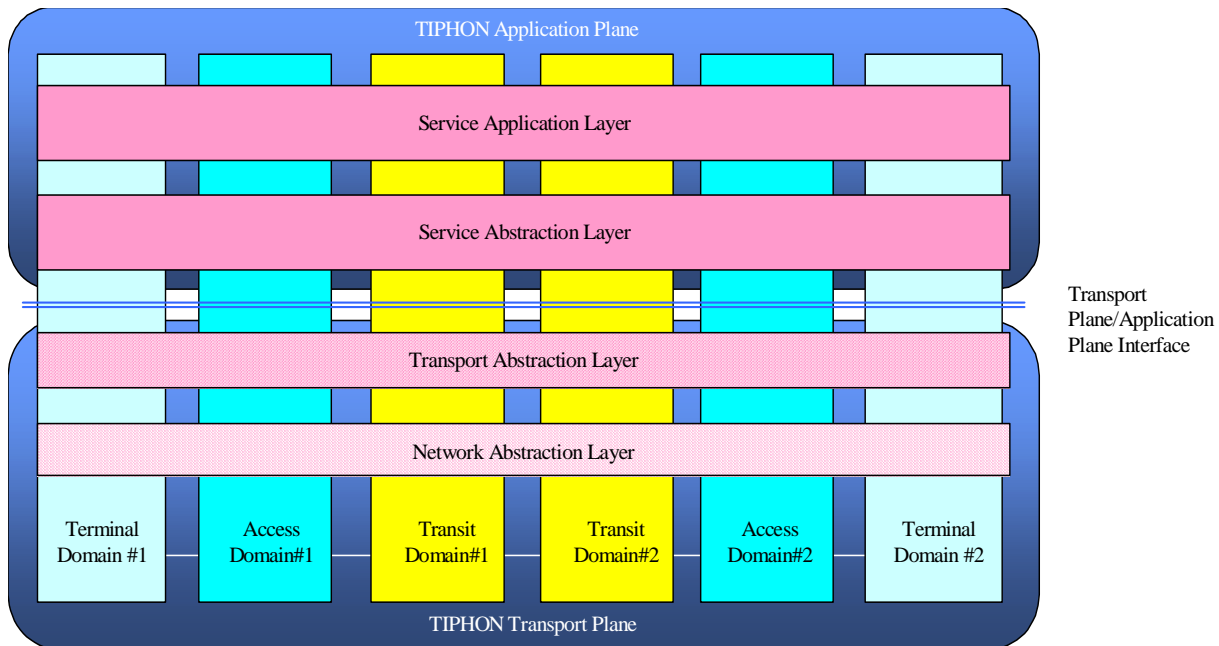


Figure 1: The TIPHON network and service environment model

TIPHON identifies the following layers within this model:

- a Service Application Layer that provides the end to end communications application;
- a Service Abstraction Layer that is defined by a modular and extensible set of Service Capabilities that place requirements on the Transport Abstraction Layer beneath it;
- a Transport Abstraction Layer that provides a set of domain independent capabilities derived from the underlying Network Abstraction Layer in response to the transport and connectivity requirements of the Service Abstraction Layer;
- a Network Abstraction Layer that provides a set of communications capabilities to the Transport Abstraction Layer that are derived from, but independent of, the capabilities of a specific underlying network technology.

The TIPHON network and service environment model is separated into two planes that exist across the various network domains encountered in the end-to-end communications path. The upper plane comprises the Service Application and Service Abstraction Layers and is termed the TIPHON Application Plane. This plane addresses the implementation of end-to-end communications applications. The lower plane includes the Transport and Network Abstraction Layers and is termed the TIPHON Transport Plane. The TIPHON Transport Plane provides domain independent communications capabilities to the TIPHON Application Plane. Requirements placed upon the TIPHON Transport Plane by the TIPHON Application Plane are expressed in Service Independent Requirements documents in accordance with the TIPHON project method [1].

The present document describes the framework for Service Capabilities in the Application Layer. The Network Abstraction Layer and Transport Abstraction Layer are defined by sets of Service Independent Requirements and are described elsewhere.

4.3 Service capability framework

TIPHON identifies a number of concepts when considering the TIPHON Application Plane. These are derived from a decomposition of a service into constituent elements. TIPHON places the following meanings on the terminology used to describe services as follows:

Service: commercial offering to a customer. It comprises functionality - known as a Service Application - set in a business context. The business context is outside of the scope of TIPHON to consider as it determined by commercial or political concerns.

As shown in figure 2, Service Applications are constructed in a modular fashion from Service Capabilities within the TIPHON Service Abstraction Layer.

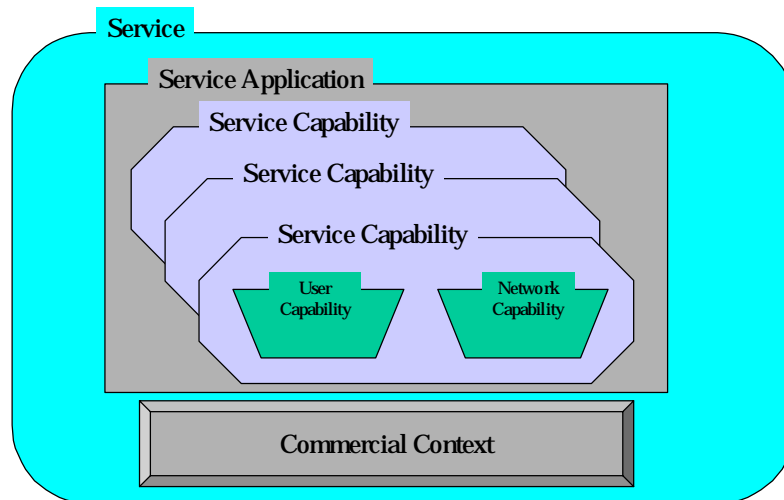


Figure 2: Services and Service Capabilities

Service Application: a Service Application is an integrated set of one or more Service Capabilities. TIPHON will not specify Service Applications other than Simple Call but may consider such groupings where this contributes to the definition of specific service capabilities. The ability to select and combine Service Capabilities offers a structured, yet flexible, means for creating service applications that:

- are internally coherent and self consistent;
- enable the inter-operation of services between different implementations of TIPHON systems;
- enable inter-working with other systems;
- enable service providers to develop differentiated services that inter-work across multiple networks and multiple network technologies.

Service Capability: an indivisible and exclusive set of functionality including the capabilities of users and networks that represent functionality required by either users of the service or for inter-service provider connection. A Service Capability does not include the definition of communication:

- types such as voice, video or text;
- formats such as specific codecs.

Since these are examples of attributes of a specific Service Application. A Service Capability must negotiate and manipulate these attributes by incorporating mechanisms, such as the ability to select a particular communication type and associate with it a specific communication format.

Every Service Capability has an Identifier that enables it to be distinguished from other Service Capabilities.

An existing Service Capability may be augmented by additional functionality, in which case a new Service Capability is created. Service Capabilities become related to each other when used to design a Service Application, as shown in figure 3. Service Capabilities do not interact other than through a Service Application.

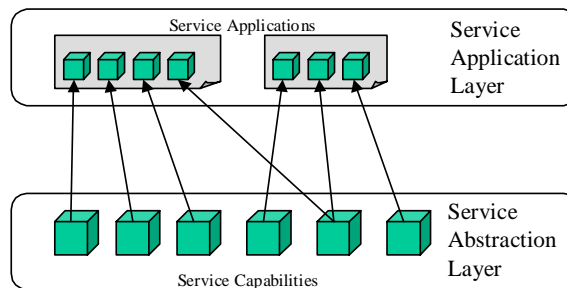


Figure 3: TIPHON Service Capability Framework

Service Capabilities are combined in the definition of Service Applications, which inherit their functionality and attributes. To be TIPHON compliant, TIPHON Service Capabilities may not be supplanted by independently defined Service Capabilities that provide the same functionality. Service Applications may also include additional functions that are not defined by TIPHON. Simple Call is an example of a Service Application. Other Service Applications may be defined using varying combinations of Service Capabilities, including those used to construct the Simple Call Service Application.

5 Building service applications

There are essentially two approaches to the development of Service Applications. One approach is to analyse the requirements of an envisaged Service Application and then decompose this to the point of identifying the constituent Service Capabilities that will be required for implementation - a "Top Down" approach. The other approach is to take an existing set of Service Capabilities and use these to construct a Service Application - a "Bottom Up" approach. Both of these approaches are equally valid, although the former approach is likely to be more common until a number of Service Capabilities are identified.

5.1 Structuring service applications

In determining which Service Capabilities will be required to construct a Service Application, or identifying whether new Service Capabilities will be required, the service designer will create a model for the service application. This will consider the:

- scope of the Service Application and the application of the design to the various domains envisaged;
- complete behaviour of the application, including under failure conditions;

- identification of inter-working through the reuse of well known or published Service Capabilities;
- reuse of existing Service Capabilities;
- identification of requirements for new Service Capabilities.

Building applications is outside the scope of the TIPHON project. However, using example service applications may be valuable in helping define the components.

5.2 Service application models

To enable Service Applications to be developed that will inter-work across the various domains within the TIPHON environment, they need to reflect an end-to-end model of this kind. To aid this process, TIPHON has identified the application environment model, shown in figure 4. In the example shown, there are three Service Capabilities, A, B and C. These are distributed across the TIPHON network and service environment model and instantiated as C_o , C_{T2} and C_T , etc.

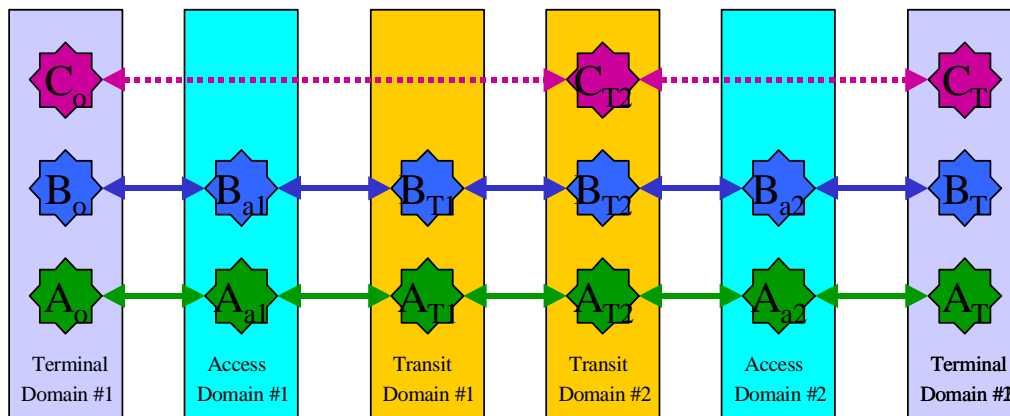


Figure 4: Service Capabilities interworking across Domains

This model encompasses the following concepts:

- communication is required between Service Capabilities to achieve inter-operable and seamless Service Application inter-working and service provision across heterogeneous network domains. This shall be achieved through the support of Service Capabilities and the associated information flows by the communications network technology mappings developed by following the TIPHON process. These are indicated by flows such as A_o to A_{a1} in figure 4, which are developed as part of steps C and D of the TIPHON project process;
- Service Applications may also contain components that need to communicate information flows other than those required to support the needs of Service Capabilities. These information flows need to be associated with the Service Application with which they are involved. Domains that provide only communications transport capabilities that are not involved with the behaviour of the particular Service Application shall pass these information flows unchanged. In such cases it must be possible to identify the entity on whose behalf the information is carried. This is indicated by flows such as C_o to C_{T2} in figure 4;
- multiple network domains may exist, including multiple transit domains, each of which may offer differing types of capabilities.

6 Deriving service capabilities

6.1 Structuring service capabilities

TIPHON identifies core Service Capabilities through the analysis of elemental Service Applications as part of a TIPHON Requirements Definition Study [1]. Service Applications, such as Simple Call that constitute the simplest form of an application that implements the functionality of a particular type of service, are examined and candidate Service Capabilities proposed. These Service Capabilities are then described in TIPHON Service Capability Definition documents that contain information listed in this clause.

In order to permit inter-operation it is important that the core capabilities and communications support for Service Capabilities remain unchanged when new Service Capabilities are derived from the core version.

A desirable feature of Service Capabilities is that they may be used without causing unwanted interactions between Capabilities. Therefore the changes made to core capabilities should not interact with the changed core capability or with other capabilities.

6.2 Service capability model

The TIPHON Service Capability Model identifies the following elements for a Service Capability Definition:

- scope;
- behaviour, including state transitions;
- Service Capability Identifier;
- failure modes.

A Service Capability Definition has to describe the above items at the points at which users and/or network domains are involved within the TIPHON Network and Service Model.

7 Simple call service application

As an example, the following clause demonstrates the use of the approach described in the present document to the provision of a call service application. The objective in this clause is to demonstrate the principles of the approach, rather than provide a normative specification - which shall be provided in the relevant Service Capability Definition for the appropriate TIPHON Release [1].

7.1 Simple call as a basic service application

The primary function of a communications network is to enable, establish and appropriately control the flow of information between the users of the network. From this core functionality, additional features may be developed to meet a range of other needs - such as behaviour when a called user is not available. For a network user to be able to establish communications with another user of the network, there are a number of functions that must be provided. For example:

- the calling user must first establish a connection and relationship as a member of the network concerned;
- they must have some means of identifying the user they wish to communicate with;
- the temporary relationship between the two users will need to be established and controlled; and
- the associated information flows will need to be established and controlled.

This functionality may be reused for applications other than a "Simple Call", from which it is concluded that the behaviour of "Simple Call" may be defined by the aggregation of these elements. This is one indication that Simple Call is therefore an example of a Service Application and that the functionalities identified above are candidates for Service Capabilities. Note that further analysis will reveal whether the examples cited above are in fact Service Capabilities as opposed to attributes or behaviours of a Service Capability.

7.1.1 Scope of the simple call service application

It is possible to consider a number of Service Applications that could be considered to be a "Simple Call". Each of these "Simple Calls" is differentiated from another by its scope of use and functionality. The differences between the various types of call arise from specific requirements, which may include behaviours required to meet social policies, for example. Whilst it is not necessary at this stage to completely specify each variation, the following serves as an illustration of differing types of call being positioned within such a taxonomy:

Simple Private Call: A Simple Call that does not pass through, or inter-connect with, a Public Network and has, for example, the following additional attributes:

- either Party Clearing;
- support for Lawful Interception in a Private Network.

Simple Hybrid Call: A Simple Call that originates from or terminates in a private network and passes through a public network and has, for example, the following attributes in addition to Simple Private Call:

- originating CLI is provided as well as the nature of address and screening information. This is provided for use in locating callers for emergency service use and for tracing malicious calls;
- support for Lawful interception in the public network;
- number Portability is supported, including both donor and recipient roles;
- carrier Selection and Pre-selection are supported in the public network;
- calls may be made to the emergency services;
- only first party clearing is supported.

Simple Public Call: A Simple Call that originates and terminates and is switched only within a Public Switched Network [7] and has, for example, the following additional attributes:

- originating Calling Line Identification and/or geographical location information is provided;
- number Portability is supported, including both donor and recipient roles;
- carrier Selection and Pre-selection are supported in the public network;
- lawful interception is supported;
- calls may be made to the emergency services;
- only first party clearing is supported;
- priority calling capabilities need to be considered [8].

While there are different types of call, each type of call must have a common root of functionality and may therefore be considered to derive from a base application. For the purposes of TIPHON, this base application shall be known as "Simple Call".

7.1.2 Behaviour of the simple call service application

The following definitions provide some insight into the behaviour of a call in a communications network:

- a call is defined by ISO as *"any temporary relationship capable of transferring a continuous stream of information between two or more users of a telecommunications system. In this context a user may be a person or a machine."*;
- in the same context a telecommunications system is defined as a system supporting telecommunication which is itself defined as *"any transfer of signs, signals, writing, images, sounds, data or intelligence of any nature transmitted in whole or in part by a wire, radio, electromagnetic, photoelectronic or photo-optical system."* This definition is endorsed by both ITU-T Recommendation I.112 [5] and TR 101 287 [6].

TIPHON considers a Simple Call to be the combination of these definitions, set in the context of the TIPHON network and service environment model.

7.1.3 Use of service capabilities

Service Capabilities required to support the Simple Call Service Application do not exist at the time of writing and therefore need to be created. If appropriate Service Capabilities were available, this clause would discuss how they would be used and identify any additional Service Capabilities that need to be defined.

7.2 Service capabilities for simple call

An initial analysis of the Simple Call Service Application shows that a number of Service Capabilities are required to provide the aggregate functionality required. These Service Capabilities are declared in the following clauses and will be developed further in their respective Service Capability Definitions [1].

7.2.1 Simple connectivity control

Scope:

- to establish a temporary logical association between a calling entity and another entity for the purpose of conveying information. This applies to TIPHON scenarios 0, 1, 2 and 3.

Attributes:

- a user shall supply a *name* corresponding to another user to whom a connection is desired;
- a *failure reason* shall be supplied by a domain that detects a failure.

Normal Behaviour:

- establishes a temporary logical association between originating and terminating users for the purpose of information transfer. The association is established across each of the domains involved;
- removes the temporary logical association between originating and terminating users upon request of either user. The association is removed from each of the domains involved.
- if an association with a terminating user cannot be established, the originating user shall be notified in an appropriate manner.
- if a failure is detected within any domain, the association shall be removed in each domain involved and any associated resources released. The domain that detects the failure shall supply a reason for failure to each other domain.

Exceptional behaviour:

- the failure mode behaviour for this capability shall be to always remove any existing association and release any associated resources.

7.2.2 Simple registration

Scope:

- to establish a temporary logical association between an entity requesting registration and an entity offering registration. This applies to TIPHON scenarios 0, 1, 2 and 3.

Attributes:

- a user shall supply *credentials* for registration;
- the things which the registering user may do are maintained as a *profile*.

Normal Behaviour:

- a domain shall determine the functionalities available to the registering user and maintain them as a *profile*;
- allows the registering user to perform those things specified in the registering user's profile.
- if registration fails, the registering user shall be notified in an appropriate manner.
- registration shall be performed by the originating network domain.
- the originating network domain may delegate a registration request to another domain;
- the domain to which a registration request is delegated shall supply an indication of functionality available to the registering user. Additionally, the originating network domain shall determine the functionality available to the registering user and maintain it as a profile. The registration attempt shall fail if the originating network domain determines that the user can do nothing.

Exceptional behaviour:

- a domain shall determine that nothing may be done by the registering user in this case. In these circumstances, such a user must not be registered.

8 Prioritized requirements

The present document has described the method of using Service Capabilities in the TIPHON environment and identified the Simple Call Service Application. TIPHON Release 3 shall develop the set of Service Capabilities required to support this Service Application and the associated register of TIPHON Service Capabilities.

These Service Capabilities will be defined in detail for TIPHON Release 3. Additional Service Capabilities, for supporting Third Party call handling functionality for example, will be deferred to a subsequent release.

Annex A: Business role model in a TIPHON environment

A.0 Introduction

TIPHON envisages the provision of communications services within the heterogeneous environment of figure 1. Recognizing that this environment will most likely be realized by a plurality of business roles, in terms of those that offer functionality and those that use functionality offered by others, TIPHON identifies the business role model shown in figure 5. The TIPHON model considers four such roles (played by *stakeholders*); the consumer, retailer, service provider and the connectivity provider. Interfaces can be defined between the roles, shown as lines and dots in figure 5. This model is based upon the TINA business model [9].

Within a TIPHON system, each telecommunication network may play **one or more** of these roles. This implies that all interfaces between roles may be subject to standardization since they may be interfaces between domains.

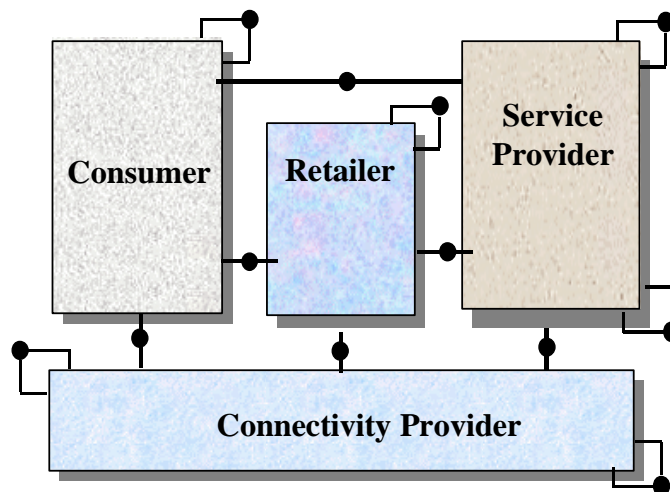


Figure 5: TIPHON business roles

The roles are defined as follows:

A.1 Consumer

This role is assumed by entities that use the services provided by other stakeholders. This is typically the end user and TINA-C defines this by stating that: "*The consumer business role is introduced through economic considerations, as it is the only business role consuming the [...] services and not trying to make money from them.*" All other types of business roles are characterized as producers or resellers.

The high-level requirements of this business role are:

- (de)registration at retailers;
- indicating availability to retailers (for receiving invitations) i.e. an on-line registration session;
- accepting invitations to join sessions (i.e. calls) from other consumers or retailers;
- accepting downloads from retailers to upgrade the interaction capability with the retailer.

A.2 Retailer

The retailer sells services to consumers that are developed and supported by a Service Provider. The retailer business role is oriented towards subscription management and adding value, while the service provider is oriented towards production and maintenance of the service.

The high-level requirements of this business role are:

- manage (de)registration to obtain various services (including person-to-person communication, if desired) by consumers;
- manage (de)registration to provide various services provided by service providers;
- authorization prior to service usage;
- maintenance of consumer service profiles and treatment policies;
- collect accounting information for the purpose of billing, in general, for each invoked service. This includes network connectivity as well as the services of the retailer.

A.3 Service provider

The aim of the stakeholder acting as a service provider is to support retailers or other service providers with services. Note that both a service provider and a retailer are a specialization of a service provider but, in contrast with a retailer, a service provider does not have a contractual relation with stakeholders in the consumer domain.

The high-level requirements for this business role are:

- obtain locations of retailers;
- (de)registration at retailers;
- indicate availability to retailers;
- provide uploads to retailers;
- establish provisioning relationships to other service providers;
- collect accounting information for the purpose of billing of service usage;
- value adding of services from other service providers.

A.4 Connectivity provider

A stakeholder in the role of connectivity provider owns and/or manages a network comprising switches, cross-connects, routes, and trunks. This network can constitute a transport network to support streamed media connections or can constitute the transport network to support connectivity for basic signalling.

The connectivity provider participates in a user/provider relation with the stakeholders that terminate a connection (i.e. consumer, retailer, and service provider). Furthermore, a connectivity provider engages in a peer-to-peer relation with other stakeholders in the connectivity provider role if an end point of a connection is situated in the connectivity domain of another connectivity provider.

The high-level requirements for this business role are:

- set up and manage bindings between network flow endpoints either with or without connections;
- add and modify these bindings (e.g. adding branches or media to a connection configuration);
- manage these binding (e.g. fault, security);

- collect accounting information for the purpose of billing for network connectivity; the billing point is associated with this information.

A.5 Relationships between domains

The interfaces between the stakeholders playing the roles are the basis of TIPHON procedures. The interfaces between the roles are defined by TIPHON specification and further refined by Service Level Agreements (SLAs).

TIPHON identifies the following interactions:

- 1) **Consumer-consumer:** inter consumer communication, (e.g. direct routed call setup);
- 2) **Consumer-Retailer:** user registration;
- 3) **Consumer-service provider:** call-setup;
- 4) **Consumer-connectivity provider:** connectivity usage (QoS);
- 5) **Retailer-Retailer:** user mobility (e.g. roaming);
- 6) **Retailer-service provider:** call authorization, user-specific call routing;
- 7) **Retailer-connectivity provider:** connectivity usage (QoS);
- 8) **Service provider- Service provider:** Inter domain call setup;
- 9) **Service provider- Service provider (3pty):** 3rd party call ;
- 10) **Service provider- connectivity provider:** transport usage (QoS) 3rd party QoS establishment;
- 11) **Connectivity provider- connectivity provider (peering):** transport usage (QoS);
- 12) **Connectivity provider- connectivity provider (federation):** transport usage (QoS).

History

Document history		
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