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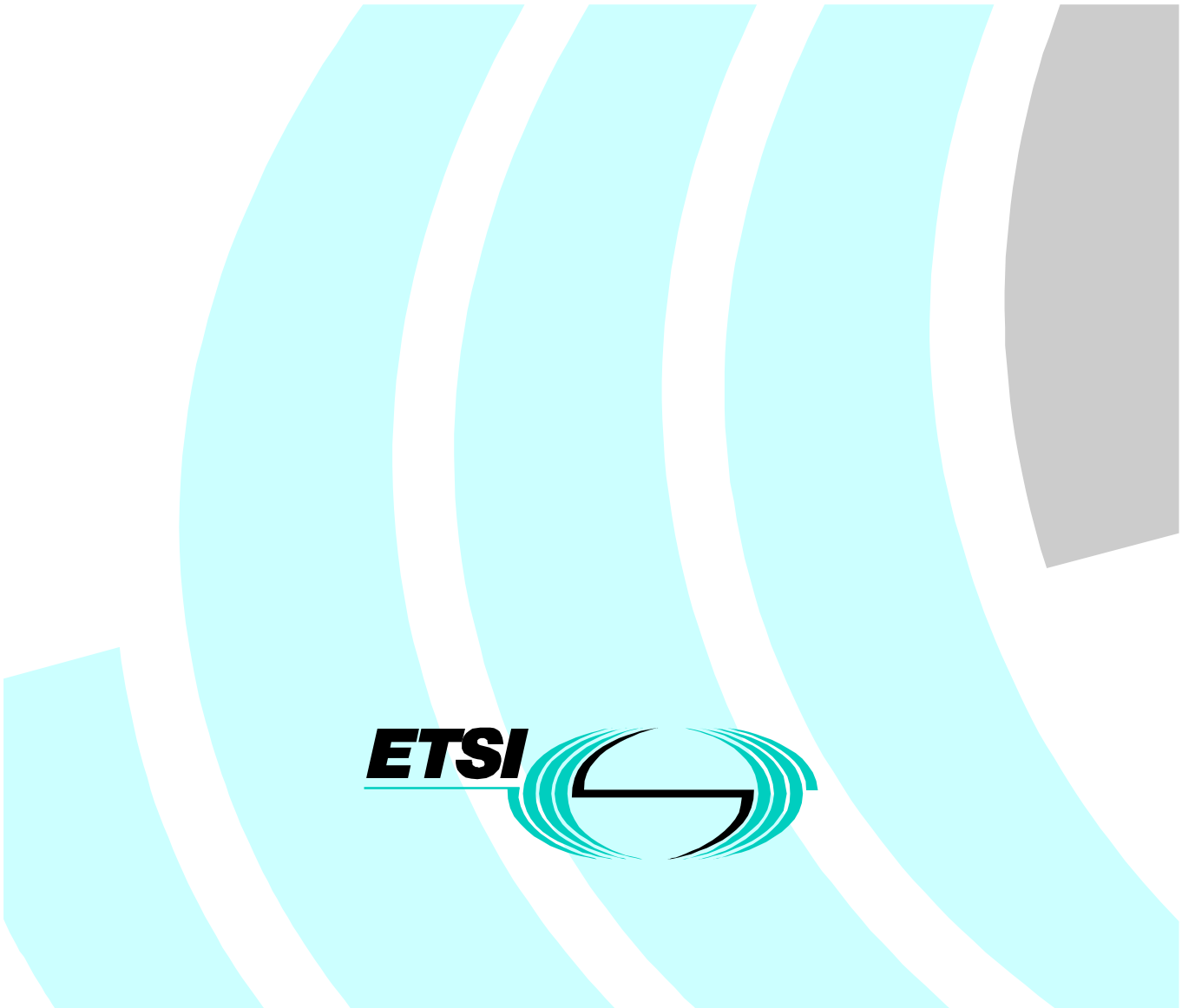
Technical Report

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; Service Independent requirements definition; Transport Plane



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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 describes the requirements for TIPHON Transport Plane capabilities as identified in [1].

2 References

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

[1] ETSI TR 101 877: "Telecommunications and Internet Protocol Requirements Definition Study; Scope and Requirements for a Simple call".

[2] ETSI TR 101 835: "Telecommunications and Internet Protocol Harmonization over Networks (TIPHON); Project method definition".

[3] ETSI TS 101 329-4: "Telecommunications and Internet protocol Harmonization Over Networks (TIPHON) Release 4; Functional Entities, Reference Points and Information Flows Definition; Part 4: Quality of Service Management".

[4] ITU-T Recommendation Y.1310: "Transport of IP over ATM in public networks".

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

signalling entity: element capable of sending signalling information

For instance terminal, router, service element.

transport domain: implementation of the transport plane functionality

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

3.2 Abbreviations

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

IP	Internet Protocol
MLPS	Multi Protocol Label Switching
QoS	Quality of Service
SCTP	Secure TRansport Control Protocol
SLA	Service Level Agreement
TCP	Transport Control Protocol
UDP	User Datagram Protocol

4 Introduction to the TIPHON transport plane

The TIPHON environment addresses 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 of [1]) and commonly found in modern public communications networks.

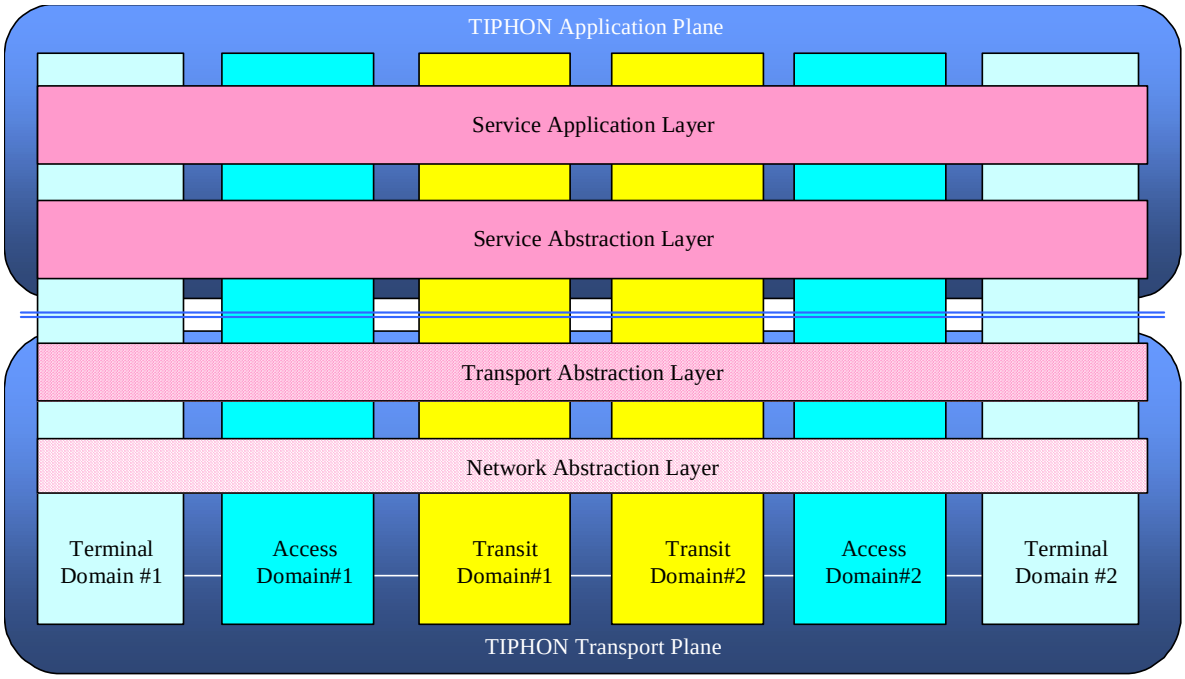

Figure 1: The TIPHON network and service environment model.

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. These two planes connect with a Management Plane, shown in figure 2, which exists outside of the TIPHON network and service environment.

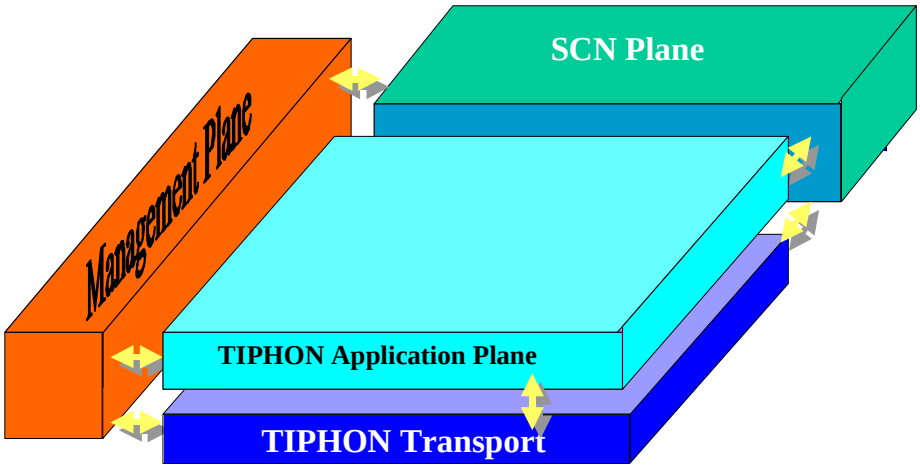

Figure 2: TIPHON planes

As shown, 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 [2].

The present document describes sets of Service Independent Requirements that specify the required behaviour of the TIPHON Transport Plane. The TIPHON Application Plane is expressed in terms of Service Applications and Service Capabilities that are described elsewhere.

4.1 Functionality in the transport plane

The TIPHON transport plane supports the TIPHON Application Plane by providing transport for signalling and media streams to multiple applications. Each type of stream has its own requirements on the transport capabilities provided by the TIPHON Transport Plane. The TIPHON Transport Plane provides generic transport functionality and hence includes protocol layers up to and including ISO Layer 4. For IP-based transport this includes protocols such as TCP, UDP and SCTP. This means that functionality such as security is also within the scope of the TIPHON Transport Plane.

The Transport Plane contains the functionality that is necessary for its own performance, like QoS and routing protocols.

4.2 Assumed business models

The TIPHON telephony application is intended for commercial deployment. The functionality in the transport plane service capability shall support the business requirements of the operators of the network equipment to meet their business and regulatory constraints. A TIPHON Transport Domain:

- may allow non-TIPHON data applications to share the same transport infrastructure;
- should provide a Quality of Service capability independently of the application requesting it;
- may serve multiple TIPHON application domains.

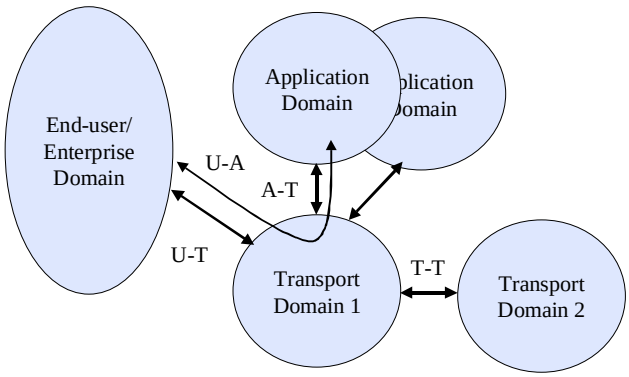

Figure 3: Transport Plane context

There are three kinds of users of the transport plane functionality, each of those impose differing requirements as follows:

- **end-users & enterprises:** will require communication with application domains to access the applications and transport domains to get the bandwidth they need;
- **application domains:** will need to communicate with users and enterprises, other application domains and transport domains to signal for their service and to establish bandwidth for signalling and media;

- **other transport domains:** need to establish bandwidth for signalling and media.

See also annex A of [1] for an analysis of the possible relationships between roles and hence domains.

5 Requirements

5.1 Transport Capabilities

The TIPHON transport plane provides functionality for 3 generic transport capabilities:

- best effort packet transport (reliable and unreliable);
- QoS-enabled packet transport for the media;
- QoS-enabled packet transport for the signalling.

5.2 Deployment specific policies

Transport domains are free to choose the way in which they provide functionality. The operator of a transport domain may choose local policies and technologies provided they fulfil the overall requirements. The TIPHON transport plane shall provide the means to support such local policies.

Examples of these local policies are:

- QoS mechanisms (There is a choice of QoS mechanisms such as static over provisioning, IntServ, DiffServ, MPLS etc which may be use on their own or in combination);
- addressing mechanisms (for example private addressing ranges or globally unique addresses;
- access control;
- admission control;
- transport mechanisms (IP version 4, IP version 6, or something else…);
- policing mechanisms (such as policy enforcement, e.g. discard policy).

5.3 Core requirements

1) The transport plane shall allow for appropriate entities to communicate for the purposes of signalling and media streams.

2) The Transport Abstraction Layer shall provide an abstraction from underlying transport network technologies and differences in policy between multiple domains. The TIPHON Transport Plane might be aware of the fact that the underlying transport mechanism is a wireless link, in that case the TIPHON Transport Plane shall hide terminal mobility from the telephony application as long as agreed communication is possible with the terminal (i.e. it stays within range).

3) There shall be no assumption that Transport Addresses are globally unique although they must be unique within the same domain.

4) A signalling transport shall provide a means of uniquely identifying the originating and terminating signalling entity (e.g. terminal, service node etc.).

5) The transport plane shall be able to provide a unique terminal ID to support access control, legal intercept and lifeline services.

6) The transport plane shall provide a reference point enabling the physical location of terminals (fixed and mobile), to support location aware services as well as lifeline/emergency calling service and legal interception requirements.

7) The transport plane shall allow multiple signalling interfaces terminating on a signalling entity.

5.4 Transport Quality

1) Transport domains shall accept, in real-time, request for flows with or without QoS control from application domains and from other transport networks.

2) The purpose of the TIPHON Transport Abstraction Layer includes mapping from transport independent QoS descriptions to transport dependent QoS descriptions.

3) Reservations (static or dynamic) may be per:

   - end-point (host);
   - end-point and port;
   - end-point and subdivisions e.g. per set of ports;
   - pair of end-points (hosts);
   - pair of end-points and pair of ports;
   - pair of endpoints and pair of sets of ports.

5) The transport plane network shall support signalling traffic with adequate low delays and reliability.

6) The transport shall be able to identify signalling units received containing errors.

7) The transport shall provide a means to detect signalling congestion on the route and if possible to notify the application using this transport service.

5.5 Media Quality of Service

The telephony application has the following media requirements:

1) **Quantitative guarantees:** The transport plane shall facilitate guaranteed (on a statistical basis) end-to-end bandwidth capacity with appropriately bounded delay, loss and jitter.

2) **Monitoring Function:** The transport plane shall enable a monitoring function to indicate whether QoS levels are being met. See TS 101 329-4 [3].

3) **Static and Dynamic Operation:** QoS preferences may be signalled on a per call basis or operate on the basis of service capability level agreements using static QoS provisioning.

5.6 Interconnection of Transport Domains

It is desirable to be able to provide Service Level Agreements (SLA) governing Inter network communications. End-to-end QoS guarantees may be covered by such Service Level Agreements.

1) Technical mechanisms are required at the interconnection of transport domains to enable the agreed transport QoS to be achieved.

NOTE: In this respect guidelines for interconnection between transport networks are provided in ITU-T Recommendation Y.1310 [4].

2) The transport plane shall allow operation of applications over a combination of separate networks domains. (Note that this does not imply that the network deployment shall be transparent!)

3) **Federation:** A particular deployment of the transport plane functionality (network) may require the services of a neighbouring network to provide its services. Providing a service area that appears to be transparent to the customer of the network.

5.7 Security

Network Operators, Network Providers and Access Providers themselves need security to safeguard their operation and business interests, to meet their obligations to customers, shareholders and to comply with regulatory requirements including lawful interception. The transport plane shall therefore provide an appropriately trusted transport facility for TIPHON applications and address the following issues:-

1) **Legal Interception:** Depending on local regulatory constraints the transport plane must provide a means for legal interception.

2) **Confidentiality of media:** Confidentiality is the avoidance of the disclosure of information without the permission of its owner except in cases of legal interception. The transport plane is required to take measures to avoid this unauthorised disclosure. This may be achieved by several means including the use of encryption or prevention of access to the transport network.

3) **Confidentiality of address/location information:** The transport plane shall allow equipment addresses (both end-user and network-user) and geographical location confidential to end-users and untrusted peer networks. This does not prevent the disclosure of such information to Emergency Call handling or publish-and-subscribe features.

4) **Integrity:** Integrity is the property that data has not been altered or destroyed in an unauthorized manner. Within the bounds of established quality of service requirements, such as best-effort transmission, the transport plane should deliver transport facilities of a known integrity.

5) **Accountability:** The transport plane shall provide accounting functionality commensurate with the purposes of maintaining system integrity and accounting for resource usage, to prevent the possibility of fraud while allowing legal investigation.

6) **Authentication:** the transport plane shall provide means of authenticating packet streams for the purposes of:

   - identifying the origin of packets for the purposes of non-repudiation, accountability and access control and to prevent masquerading;

   - authenticating the sender of the packets for access control.

7) **Denial of service:** Denial of service is the situation whereby an entity fails to perform its function or prevents other entities from performing their functions. Insofar as the attack targets functionality of the transport plane. Transport protocols and their implementations should be designed for functional operation under denial of service attacks.

8) **Access control:** Access to the network may be subject to authorization. The transport plane shall provide functionality to control the access to the network and block unauthorized usage.

9) **Packet/Service access control:** The transport plane shall provide functionality to control the access of signalling and media streams to the network.

5.8 Operational Requirements

1) **Maintainability:** The transport plane deployments shall be able to change the signalling transport in a smooth way, i.e. it shall be possible to add and delete signalling paths without interruption of the transport between two nodes.

History

Document history		
V1.1.1	June 2001	Publication