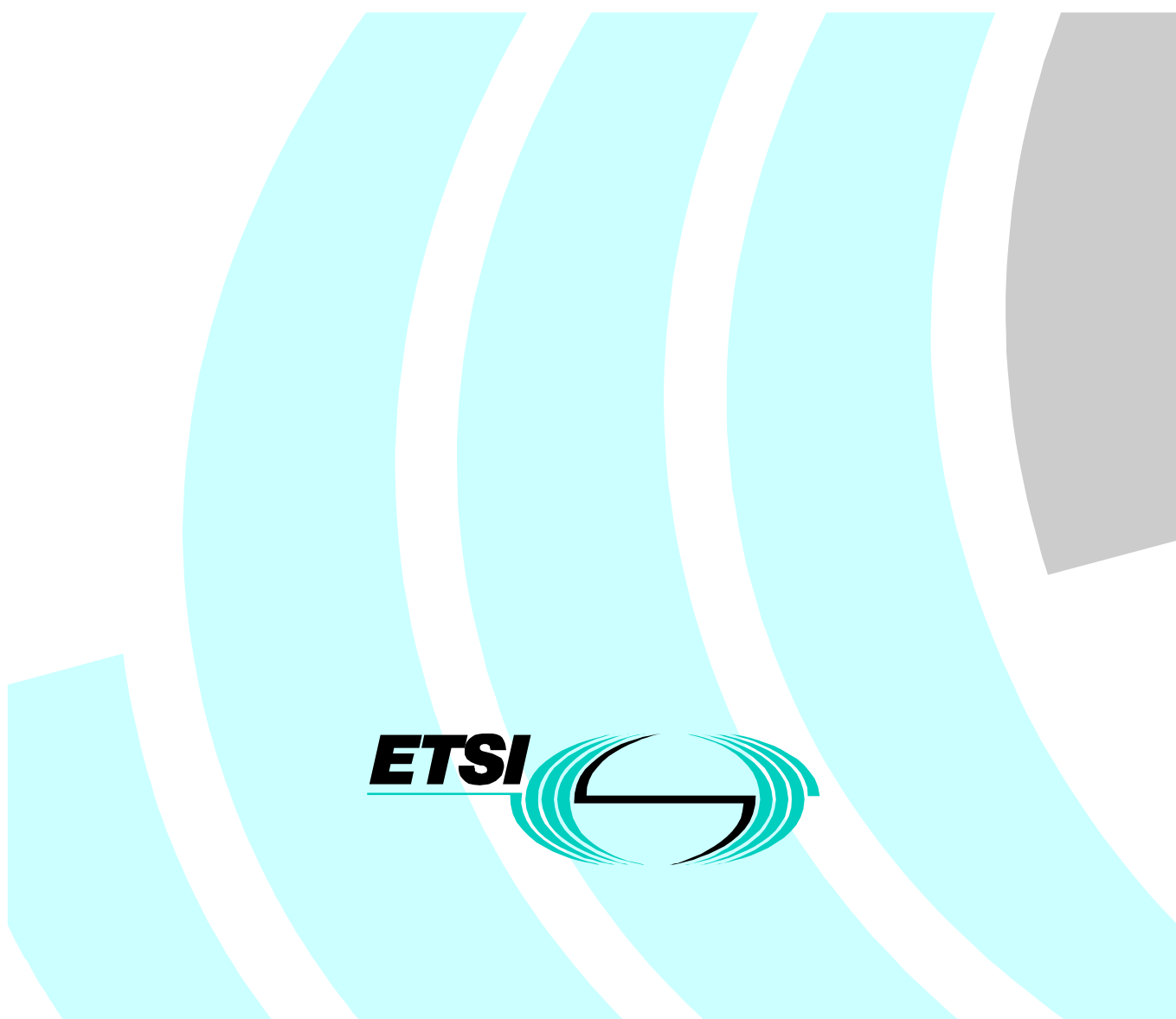# TR 101 300 V1.1.5 (1998-12)

Technical Report

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Description of technical issues

ETSI

Reference
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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 provides an overview of the different technical issues relating to the work items defined in the terms of reference of project TIPHON (see Bibliography). The present document introduces the scenarios, the business assumptions, the issues that have to be solved and summarizes the working groups' expected output. It aims at providing the means to understand TIPHON, its challenges, and also explains the structure of documents.

The present document will not provide solutions for the technical issues which are identified therein.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1]   ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

3 Definitions and abbreviations

3.1 Definitions

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

example: The text serving as an example.

Switched Circuit Network (SCN): A telecommunications network, e.g. Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN), and General System for Mobile communications (GSM), that uses circuit-switched technologies for the support of voice calls. The SCN may be a public network or a private network.

E.164 number: A number conforming to the numbering plan and structure specified in ITU-T Recommendation E.164.

H.323 terminal: An entity which provides audio and optionally video and data communications capability in point-to-point or multipoint conferences in packet-based networks.

IP number: A number conforming to the structure of addresses in IP networks.

3.2 Abbreviations

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

DECT	Digital Enhanced Cordless Telecommunications
DTMF	Dual Tone Multiple Frequency
GSM	General System for Mobile communication
GSTN	General Switched Telephone Network
IETF	Internet Engineering Task Force
IMTC	International Multimedia Telecommunication Consortium
IWF	Interworking Function
IP	Internet Protocol

ISDN	Integrated Services Digital Network
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RSVP	Resource Reservation Protocol
SCN	Switched Circuit Network

4 Overview

There is a growing market for real time voice communication and related voiceband communication over Internet Protocol (IP) - based networks. The objective of this project is to support a market that combines telecommunications and Internet technologies to enable communication over Internet Protocol (IP)-based networks to work with existing Switched Circuit Networks (SCNs) and vice versa. The focus covers interoperability between the two networks and not on the actual individual network itself.

The scope of the project is on the following scenarios:

- **Scenario 1**: communication between IP network based users and SCN based users, in which the call set-up is originated by the IP network user.

- **Scenario 2**: communication between IP network based users and SCN based users, in which the call set-up is originated by the SCN based user.

- **Scenario 3**: communication between SCN based users, using IP based networks for the connection/trunking between the involved users.

- **Scenario 4**: communication between IP network based users, using SCNs for the connection/trunking between the involved users.

The life cycle of the project should come to completion in the mid 1999 with the completion of the interoperability tests.

4.1 Working Principles

The market which is supported by this project is very rapidly evolving. Further the working principles currently widely applied in the area of telecommunications and in the area of Internet Protocols, e.g. the Internet Engineering Task Force (IETF), are quite different. In order to create an environment which is attractive to companies from both sides project TIPHON was established. The objective is to have principles that foster an atmosphere of cooperation and openness leading to high quality deliverables in the appropriate time frame.

This is supported though:

- openness to world-wide contributions from ETSI members and specific non-ETSI members, particularly those with an expertise in IP and Telecom industry;

- free availability of documents to TIPHON members via e-mail distribution lists;

- easy access to FTP, according to ETSI rules where all Temporary Documents (TDs) and Permanent Documents (PDs) are provided on-line;

- short time schedules and frequent meetings;

- verification, demonstration and implementation in parallel to standards production.

4.2 Collaborative Activities

In addition to TIPHON several organisations are working in related areas or are prepared to support TIPHON. The objective of collaboration is to avoid overlapping and assure a complete coverage of the area: technically and geographically.

Within ETSI the following technical bodies have been identified as major collaborators:

Technical Committees:

- NA (Network Aspects);

- SMG (Special Mobile Group);

- SPS (Signalling, Switching and Protocols);

- TETRA (Terrestrial Trunked Radio); and

- ECMA TC32.

ETSI Projects:

- MTA (Multimedia, Terminals and Applications);

- ATA (Analogue Terminals and Access);

- DTA (Digital Terminals and Access).

Outside ETSI the following technical bodies have been identified as major collaborators:

- ITU-T (SG-16);

- IETF;

- IMTC;

- EURESCOM;

- ISO/IEC JTC1/SC6/WG6.

4.3   Marketing Activities

The objective is to produce specifications that have a global acceptance from industry, administrators and regulators, and other standards bodies. To support this a number of marketing activities are performed including press releases, press conferences, presentations in conferences and the use of a unique logo.

5   Scenarios

The following diagrams demonstrate the possible scenarios for each of the 3 development phases.

NOTE 1: Interworking functions (IWF) can be implemented separately from or integrated into the existing SCN or IP-based network in order to provide the required interoperability.

NOTE 2: IP Network does not specifically denote the Internet but, can also mean networks such as enterprise IP intranets.

NOTE 3: SCN represents the set of networks also known as "circuit-switched" networks, General Switched Telephone Networks (GSTN), etc. does not preclude private networks.
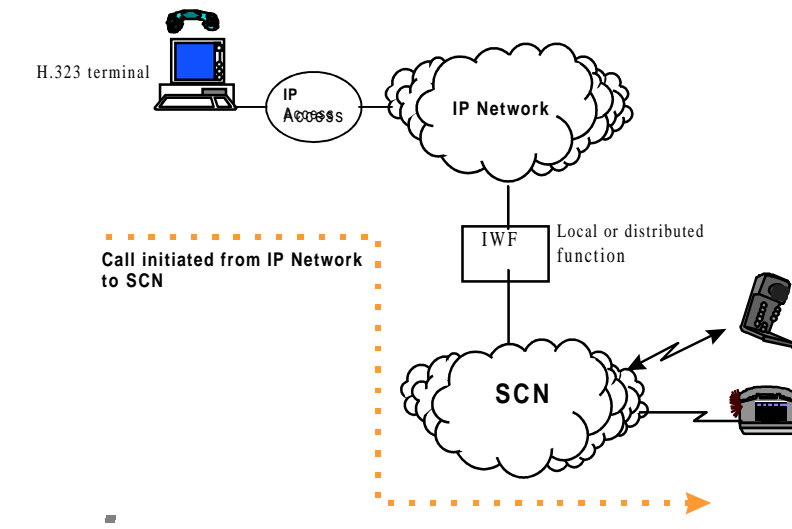
5.1   Scenario 1
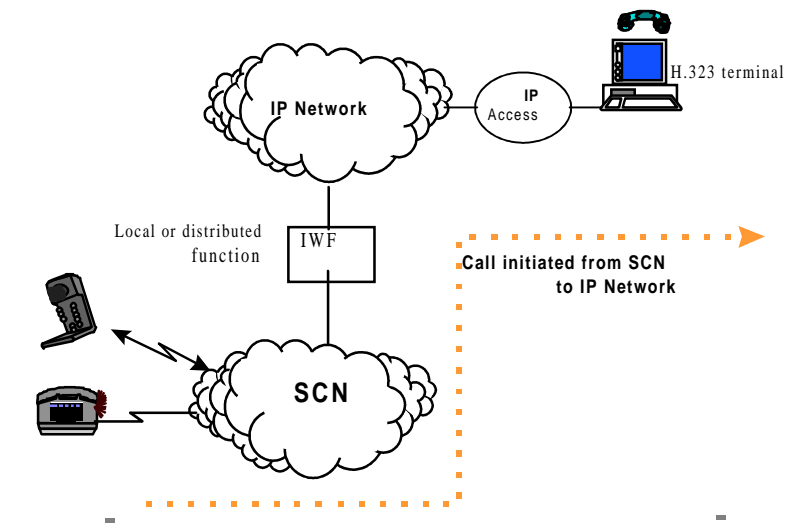

Figure 1: IP Network to SCN

5.2   Scenario 2

Figure 2: SCN to IP Network

5.3   Scenario 3
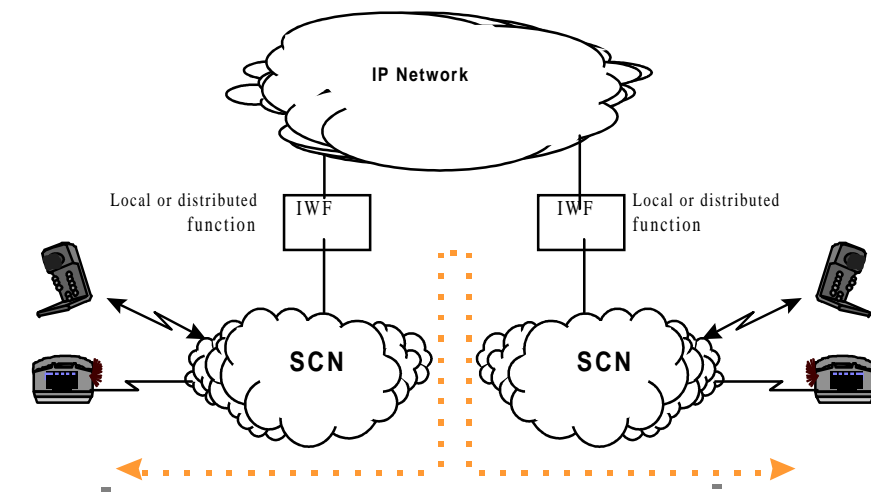

Figure 3: SCN to SCN
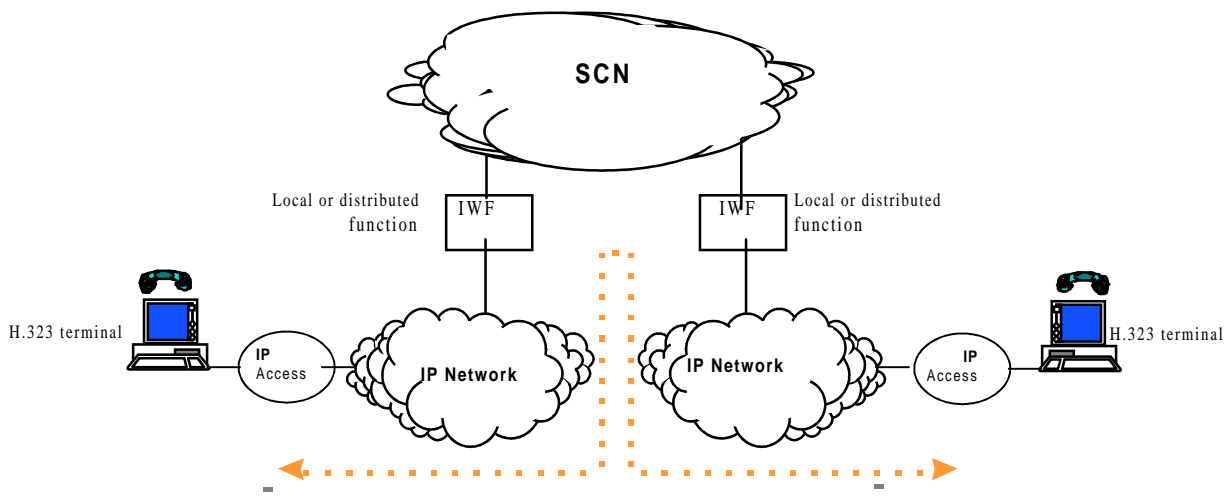
5.4   Scenario 4

Figure 4: IP Network to IP Network

6   Issues

In order to ensure an acceptable service offering a number of issues have to be solved. The following list provides an overview the technical issues that have to be solved to enable interoperability. The deliverables produced by each working group will deal with the various aspects for each issue.

requirements for service interoperability: Such as call on demand, detection of failures, appropriate tones/signalling, Quality of Service (QoS) selection, call tracing, caller id.

reference configurations and functional models, including position of gateway functions between IP based networks and SCNs and interfaces at these gateways: Models for all aspects of functionality including the use intelligence networks, gatekeepers, gateway finding functions.

call control procedures, information flows and protocols: For such things as call establishment and teardown, transport layer, gatekeeper discovery, endpoint registration, user authentication, Dual Tone Multi Frequency (DTMF) signalling.

address translation between E.164 and IPv4/v6 addresses: Since IP networks are dynamic addressing environments, it is not possible to look up users by IP address and therefore a better way needs to be developed. Perhaps a new service code similar to a country code should be developed. Issues to be considered include technology transparency and portability (move E164 number to IP number and back).

technical aspects of charging/billing: Charges have to be based on particular methods such as collect call, credit card call or basic call and on particular parameters such as time of day, type of service and duration of call.

technical aspects of security: Primarily protection of the network against accidental or malicious failures, including congestion and signalling problems. Also, authentication, authorization, encryption and privacy of calls.

end-to-end quality of service aspects, including transcoding and echo-cancellation: In telecommunication a very detailed definition of the service quality has been applied and requested by the regulators. The end-user expects Voice over IP (VoIP) to deliver a good voice quality and a high reliability. But examples like General System for Mobile communications (GSM), Digital Enhanced Cordless Telecommunications (DECT) have shown, that the end-user will tolerate a quality worse than delivered by Public Switched Telephone Networks (PSTN) or Integrated Services Digital Networks (ISDN) as long as the end-user benefits from the introduction of the new service in another way. In the case of GSM that is the mobility and in the case of VoIP it may be features like low price, integration capabilities etc. delay (framing delay, coder delay, packetization delay, transit delay), packet loss, service models (half-duplex, full-duplex), Resource Reservation Protocol (RSVP), weighted fair queuing, classes of QoS.

mobility aspects: A roaming user can access the Voice over IP service by using different technics like mobile IP and application roaming.

verification and demonstration of Tiphon based implementations: Tiphon sites for TIPHON-Net have already been decided and will be interconnected using a variety of network infrastructures.

7 Impacts of VoIP interoperability

The introduction of voice and voiceband communication over IP based networks and their interoperability introduce a number of economical challenges and opportunities to the telecoms marketplace. The interoperability provides primarily a vast new variety of integration possibilities and in addition, pricing and marketing benefits that will help to spread the acceptance of new technology. A whole set of additional business opportunities is offered to vendors and operators. The main driving forces for the introduction of this new technology are:

multimedia: Applications like video conferencing while sharing application information where the users are situated in two different countries, travel agents using voice and video over the Internet to discuss travel plans, or web merchants displaying products and taking orders.

naming, numbering and addressing: The ability to have a phone number where someone can call you at and have the call routed to either your business phone, home phone or IP phone. Or, the ability of an IP user to give an Email-like address which is then resolved to a particular number of the desired user.

integration: Integrated services such as clicking on button on a web page in order to set up a voice connection with someone in sales support.

pricing benefits: One of the big benefits of IP network and SCN interoperability is that it currently offers large cost savings to the end user since (particularly with phases 1 to 3) the communication is sent over IP networks (example: Internet) which does not have the same charges as a SCN and are usually charged with a flat rate.

nonregulated environment: currently VoIP is treated like data communication in most areas. This situation may change however as technology progresses and VoIP becomes more widespread used.

8 Deliverables

The production of deliverables will be structured in 3 project phases:

Project Phase 1: Covering all issues for scenario 1;

Project Phase 2: Covering all issues for scenarios 1 and 2 and amendments to documents of Phase 1;

Project Phase 3: Covering all issues for scenarios 1, 2, 3 and 4 and amendments to documents of Phase 1 and 2.

For all 3 phases documents will be produced covering the following items:

- Identification and definition of required service mechanisms to ensure service interoperability for TIPHON. It includes, but not limited to, technical aspects of accounting and security. The approved delivery from this work item should be needed as a common base line for TIPHON and should be used during the whole project lifecycle.

- Definition of the reference configuration, network architecture and interfaces.

- Provision of a high level description of information flows needed to handle basic calls from an H.323 terminal to a SCN-based terminal.

- Provision of a high level description of admnistrative information flows needed to support basic calls from an H.323 terminal to a SCN-based terminal involving multiple gatekeepers, gateways and domains.

- Specification of naming, numbering, and addressing mechanisms specific to calls between IP basedterminals (H.323) and SCN-based terminals (E.164). It includes the name for the SCN-based terminal (E.164) that is used by the IP based terminal (H.323) and how it maps to the address of an appropriate gateway and to the destination of the call. There will be an investigation into existing schemes that may be relevant to this problem. Requirements for an acceptable solution will be developed. After requirements are validated by the ETSI TIPHON Project, existing as well as new schemes will be evaluated with respect to the requirements and specifications will be made. The impact of carrier selection will be considered in evaluating solutions. Acceptable solutions must work with both IPv4 and IPv6.

- Discussion of quality of service for TIPHON´s current standardisation activities and specification of a minimum requirements for QoS and areas for further specification.

- Summary of the results of Verification, Demonstration and Implementation (VDI) activities and guidlines to implementors of TIPHON technology.

Annex A (informative):
Current list of deliverables planned

General Documents	Title	
DTR/TIPHON-00001	Description of technical issues	
DTR/TIPHON-00002	Vocabulary, abbreviation and definition of terms	
DTR/TIPHON-00003	General description	
Phase 1 deliverables		
DTR/TIPHON-01001	Service requirements for interoperability and technical aspects of accounting and security, Phase 1	
DTS/TIPHON-02001	Reference configuration, network architecture and interfaces, Phase 1	
DTS/TIPHON-03001	Use of GSM family of codecs within ITU-T Recommendation H.323	
DTS/TIPHON-03002	Call control flows for basic calls from an H.323 terminal to PSTN/ISDN /GSM terminal	
DTS/TIPHON-03004	Inter-domain pricing, authorisation, and usage exchange	
DTS/TIPHON-03003	Call control flows for basic calls from an H.323 terminal to PSTN/ISDN /GSM terminal involving multiple domains	
DTS/TIPHON-04001	Naming, Numbering, and Addressing; Interworking from IP Terminals to E.164 Terminals (PSTN/ISDN/GSM)	
DTR/TIPHON-05001	Review of current Quality of Service (QoS) options and identification of w ork items	
DTR/TIPHON-05002	Tiphon Quality of Service Guidelines: Minimum levels of QoS for the establishment of Tiphon-Compliant systems	
DTR/TIPHON-06001	Verificationn and Demonstration Implementation (VDI); Implementors handbook and test reports, Phase 1	
DTS/TIPHON-06004	PICS for TIPHON end to end systems; Phase 1	
Phase 2 deliverables		
DTR/TIPHON-01002	Service requirements for interoperability and technical aspects of accounting and security, Phase 2	
DTS/TIPHON-02002	Reference configuration, network architecture and interfaces, Phase 2	
DTS/TIPHON-03005	Signaling for basic calls (Scenario 2)	
DTS/TIPHON-04002	Naming, Numbering, and Addressing; Interworking from E.164 Terminals (PSTN/ISDN/GSM) to IP Terminals, Phase 2	
DTR/TIPHON-06002	Verification and Demonstration Implementation (VDI); Implementors handbook and test reports, Phase 2	
DTS/TIPHON-06005	PICS for TIPHON end to end systems, Phase 2	
Phase 3 deliverables		
DTR/TIPHON-01003	Service requirements for interoperability and technical aspects of accounting and security, Phase 3	
DTS/TIPHON-02003	Reference configuration, network architecture and interfaces, Phase 3	
DTR/TIPHON-06003	Verificationn and Demonstration Implementation (VDI); Implementors handbook and test reports, Phase 3	
DTS/TIPHON-06006	PICS for TIPHON end to end systems, Phase 3	

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History

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