SLOVENSKI STANDARD
SIST-TP TR 101 338 V1.1.6:2004

01-april-2004

Harmonizacija telekomunikacij in internetnega protokola prek omrežij (TIPHON) - Analiza obstoječih tehnik sledenja, ki so uporabne za mobilne storitve TIPHON

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Analysis of existing roaming techniques applicable to TIPHON mobility services

Ta slovenski standard je istoveten z: TR 101 338 Version 1.1.6

ICS:

33.020	Telekomunikacije na splošno	Telecommunications in general
33.070.01	Mobilni servisi na splošno	Mobile services in general

SIST-TP TR 101 338 V1.1.6:2004 **en**

ETSI TR 101 338 V1.1.6 (2000-07)

Technical Report

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Analysis of existing roaming techniques applicable to TIPHON mobility services

Reference
DTR/TIPHON-07001

Keywords
internet, network, protocol, roaming, telephony

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Sous-Préfecture de Grasse (06) N° 7803/88

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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 focuses on basic services as defined in TR 101 306 [10].

It provides a definition of TIPHON mobility, concentrating on the roaming service, and contains an examination of the different roaming technologies, e.g. Global System for Mobile communications (GSM), Universal Mobile Telecommunications System (UMTS), Internet Protocol (IP) and recommends the adoption of a roaming technology for TIPHON mobility.

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 (1997): "The international public telecommunication numbering plan".

[2] ETSI TR 101 307: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Requirements for service interoperability; Phase 2".

[3] ITU-T Recommendation Q.1701: "Framework for IMT-2000 networks".

[4] IETF RFC 1771: "A Border Gateway Protocol 4 (BGP-4)" - Y. Rekhter, T. Li, T.J. Watson Research Center, IBM Corp., Cisco Systems Editors - March 1995.

[5] UMTS 22.05: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Mobile Station Application Execution Environment (MExE); Service description; Stage 1 (3G TS 22.057 version 3.0.1 Release 1999)".

[6] 3G TR 23.920: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Evolution of the GSM platform towards UMTS".

[7] GSM 02.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR); Service definition (Stage 1)".

[8] GSM 03.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR); Technical realization".

[9] ITU-T Recommendation Q.1711 (1998): "Network functional model for IMT-2000".

[10] ETSI TR 101 306 (V1.2.3): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Requirements for service interoperability; Scenario 1".

[11] ETSI TR 101 308: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Requirements for service interoperability; Scenario 3".

[12] ETSI ETS 300 392: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D)".

[13] ETSI ETS 300 393: "Terrestrial Trunked Radio (TETRA); Packet Data Optimized (PDO)".

[14] ETSI ETS 300 396: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO)".

[15] IETF RFC 2002: "IP Mobility Support - C. Perkins, IBM - October 1996".

[16] IETF RFC 2003: "IP Encapsulation within IP - C. Perkins, IBM - October 1996".

[17] IETF RFC 2004: "Minimal Encapsulation within IP - C. Perkins, IBM - October 1996".

[18] IETF RFC 1701: "Generic Routing Encapsulation (GRE) - S. Hanks, T. Li, D. Farinacci, P. Traina, Netsmiths, Ltd., Cisco Systems - October 1994".

[19] IETF RFC 2290: "Mobile-IPv4 Configuration Option for PPP IPCP - J. Solomon, S. Glass, Motorola, FTP Software - February 1998".

[20] IETF RFC 2486: "The Network Access Identifier - B. Aboba, M. Beadles, Microsoft, WorldCom Advanced Networks - January 1999".

[21] ETSI TR 101 300: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Description of technical issues".

[22] ITU-T Recommendation Q.700: "Introduction to CCITT Signalling System No.7".

[23] ETSI ETS 300 008-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Message Transfer Part (MTP) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.701 (1993), Q.702 (1988), Q.703 to Q.706 (1993), modified]".

[24] ETSI ETS 300 009-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) (connectionless and connection-oriented class 2) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993), modified]".

[25] ETSI ETS 300 287-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]".

[26] SR 001 687: "Global Multimedia Mobility (GMM); Seamless service offering".

[27] SR 001 677: "Seamless service offering; Giving users consistent access to application/service portfolios idenpendent of access network and core network; Companion document".

[28] ITU-T Recommendation H.323 (1999): "Packet-based multimedia communications systems".

[29] IETF RFC 2543: "SIP: Session Initiation Protocol".

[30] ETSI TS 101 337: "Telecommunications and Internet Protocol Harmonization over Networks (TIPHON); Mobility and Access to Wireless Systems; Extensions to Requirements, Architecture and Protocols".

[31] ANSI TIA/EIA-41: "Cellular Radio Telecommunications Intersystem Operations".

[32] 3G TS 23.101: "Universal Mobile Telecommunications System (UMTS); General UMTS Architecture".

3 Definitions and abbreviations

3.1 Definitions

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

access network: comprises of the functional elements that enables communication between a terminal and the core network.

base station: land-based interface point for a wireless communications system. Many wireless systems require base stations to enable remote wireless devices to communicate with a land-based transmission network.

NOTE 1: In cordless telephony, this term is used for the device that provides the transparent connectivity between the handset and the Plain Old Telephone Service (POTS).

NOTE 2: In radio telephony such as cellular or Personal Communications Service (PCS), this term is used for the system serving cell phones in a metropolitan area or a Private Integrated Services eXchange (PINX) that serves cordless phones within a building.

border router: entity that resides at the edge of the network and provides connectivity between the access network and the backbone network.

business role: see TR 101 306, V1.2.3 [10], clause 5.

care-of address: termination point of a tunnel toward a mobile node (see IETF RFC 2004 [17]).

clearinghouse: company that collects and processes roaming and billing information from a number of carriers. It then transfers the compiled data to the proper carrier for credits and billing.

core network: architectural term relating to the part of a network which is independent of the connection technology of the terminal (e.g. radio, wired).

correspondent node: network exchanging datagrams with a mobile node (see IETF RFC 2004 [17]).

Domain Name Server (DNS): distributed server hierarchy that resolves a known symbolic Internet address to its 32-bit equivalent.

fixed access: property indicating that a user's equipment is physically connected to the network.

foreign agent: router handling visiting mobile nodes (see IETF RFC 2004 [17]).

foreign network: network other than the home network that is acting as host to a mobile node (see IETF RFC 2004 [17]).

H.323 gatekeeper: gatekeeper is an H.323 entity on the network, which provides address translation, and controls access to the network for H.323 terminals, Gateways, and MCUs. The Gatekeeper may also provide other services to the terminals, Gateways, and MCUs such as bandwidth management and Gateway location.

H.323 gateway: H.323 GW is an endpoint on a network which provides for real-time, two-way communications between H.323 Terminals on an IP based network and other terminals on a switched circuit network.

home agent: router forwarding packets to mobile nodes registered in foreign networks (see IETF RFC 2004 [17]).

home environment: responsible for enabling a user to obtain services in a consistent manner, regardless of the user's location or terminal used (within the limitations of the serving network and current terminal).

home network: network that contains the users service profile.

IP application point of attachment: entity (e.g. an H.323 Gatekeeper) with which the IP application (e.g. H.323 terminal) is registered.

IP service provider: company or organization, which provides access to IP services which, could be either access to a private IP network (Intranet) or to the Internet.

Message Transfer Part (MTP): Signalling System Number 7 (SS7) protocol [23] responsible for the reliable transport of signalling messages across the SS7 network.

mobile IP: mobility for Internet hosts IETF RFC 2004 [17].

mobile node: mobile IP host or router IETF RFC 2004 [17].

mobile subscriber: person or entity that has a subscription for mobile service with a service provider. An entity may take responsibility for payment of charges incurred by one or more users.

network: generic term used by voice service providers and data service providers to refer to the infrastructure that provides for the transport of user information.

(network) operator: maintains and runs the physical infrastructure over which runs user applications. A service provider may be also be an operator and vice versa.

network point of attachment: point where one IP network is connected to another IP network. IP addresses are topologically significant and unique only within a routing realm. For example, a network point of attachment maybe a Gateway, border router, or an Internet service provider.

Public land mobile network (PLMN): telecommunications network providing services to mobile users.

roaming: use of a network other than the home network. This requires registration in the visited network.

routing: process of selecting a path through a network(s) over which information is passed. The selection is based on a knowledge of the network topology, the network addressing scheme (e.g. telephone numbers. IP addresses) and (in some cases) the network traffic levels.

NOTE 3: In connection-oriented environments, the path is selected at the time of connection establishment and it is used for passing of information for the duration of the connection.

NOTE 4: In connectionless environments, the path is selected each time there is information to forward (for example, datagrams). The forwarding entity may have knowledge of how to forward the information to its ultimate destination, or may forward the information to another entity that will perform routing based on its knowledge.

service provider: provides a subscriber with services, billing and customer care. A service provider may be also be an operator and vice versa.

serving network: network to which the subscriber is attached. This may be a home network or a visited network.

Signalling Common Transport Protocol (SCTP): protocol being developed by the IETF (see RFC 2486 [20]). This protocol is specifically designed to transport signalling protocols, which require a telecom carrier-grade Quality of Service (QoS), over IP networks. It supports traditional telephony services and the new multimedia services.

Signalling Connection and Control Part (SCCP): SS7 protocol that enhances MTP routing functionality for efficient use of the network to transport non-circuit control related information (see [24]). Interfaces to the SCCP are consistent with the OSI Network Layer.

Signalling System Number 7 (SS7): internationally standardized common channel signalling system (see [22]). [22] defines the architecture, network elements, interfaces, protocols and the management procedures for a network which transports control information between network switches and between switches and databases.

NOTE 5: There are regional differences in SS7, e.g. there is a North American Version and also a European version.

terminal: device which is capable of providing access to services to users. Note the type of terminal is defined by the context (e.g. H.323 terminal, GSM terminal, etc).

TIPHON compliant system: system that complies with the mandatory requirements identified in the TIPHON requirements documents together with compliance to the parts of the TIPHON specifications in which these requirements are embodied:

- TR 101 306 [10] (for compliance with TIPHON phase 1);
- TR 101 307 [2] (for compliance with TIPHON phase 2); and
- TR 101 308 [11] (for compliance with TIPHON phase 3.

Transaction Capabilities Application Part (TCAP): SS7 application layer protocol used for the exchange of non-circuit control related information between application processes operating in different network nodes, for example, Switch-to-Switch and Switch-to-SCP (see [25]). [25] defines the messages, formats and procedures to establish and maintain a dialogue between communicating applications processes.

tunnelling protocol: protocol that enables another protocol to be carried transparently within it.

value added service provider: provides services other than basic telecommunications service for which additional charges may be incurred.

Virtual Home Environment (VHE): concept for portability of personal service environment (a combination of services, profiles and personalization information) across network boundaries and between terminals.

visited network: network other than the home network that is acting as host to a mobile user.

wireline access: see fixed access.

3.2 Abbreviations

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

3GPP	Third Generation Partnership Project
ADSL	Asymmetric Digital Subscriber Line
AMPS	Advanced Mobile Phone Service
ANSI	American National Standards Institute
BS	Base Station
BSC	Base Station Controller
GSM-BSS	Global System for Mobile communications - Base Station System
CAMEL	Customized Applications for Mobile Network Enhanced Logic
CDMA	Code Division Multiple Access
CN	Core Network
DECT	Digital Enhanced Cordless Telecommunications
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Server
GGSN	Serving GPRS Support Node
GII	Global Information Infrastructure
GMM	Global Multimedia Report
GMSC	Gateway Mobile Switching Center
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GSN	GPRS Support Node
HDB	Home DataBase
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
IMEI	International Mobile Station Identity
IMSI	International Mobile Subscriber Identity
IMT-2000	International Mobile Telecommunications - 2000
IMUI	International Mobile User Identity
IMUN	International Mobile User Number
IN	Intelligent Network
IP	Internet Protocol
IPCP	IP Control Protocol

ISDN	Integrated Services Digital Network
LAI	Location Area Identifier
LAN	Locale Access Network
MAP	Mobile Application Part
MD-BS	Mobile Data Base Station
MD-IS	Mobile Data Intermediate System
M-ES	Mobile End System
MIN	Mobile Identification Number
MM	Mobility Management
MS	Mobile Subscriber
MSISDN	Mobile Subscriber ISDN
MSC	Mobile Switching Center
MSRN	Mobile Station Roaming Number
MT	Mobile Terminal
MTP	Message Transfer Part
NAI	Network Access Identifier
NANP	North American Numbering Plan
NNI	Network to Network Interface
NPA	Numbering Plan Area (Area Code) used in the North America Dialling Plan
NSS	Network Sub System
PAMR	Public Access Mobile Radio
PCCH	Paging Control Channel
PDN	Public Data Network
PDP	Packet Data Protocol
PINX	Private Integrates services Network eXchange
PLMN	Public Land Mobile Network
PMR	Private Mobile Radio
POTS	Plain Old Telephony Service
PPP	Point to Point Protocol
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RADIUS	Remote Authentication Dial In User Service
RAN	Radio Access Network
RNC	Radio Network Control
RTP	Real-time Transport Protocol
SCCP	Signalling Connection and Control Part
SCN	Switched Circuit Networks
SCP	Service Control Point
SGSN	Serving GPRS Support Node
SIM	Subscriber Identification Module
SMS	Short Message Service
SS	Supplementary Service
SS7	Signalling System number 7
SwMI	Switching and Management Infrastructure
TCAP	Transaction Capabilities Application Part
TD-CDMA	Time Division Code Division Multiple Access
TDMA	Time Division Multiple Access
TE	Terminal Equipment
TEI	Terminal Equipment Identity
TETRA	Terrestrial Trunked Radio
TSI	TETRA Subscriber Identity
UDP	User Datagram Protocol
UIM	User Identity Module
UMTS	Universal Mobile Telecommunications System
UPT	Universal Personal Telecommunications
USIM	Universal Subscriber Information Module
UTRAN	UMTS Terrestrial Radio Access Network
VDB	Visitor DataBase
VHE	Virtual Home Environment
VLR	Visitor Location Register