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Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Interconnection and Routing requirements related to Numbering and Naming for NGNs; NAR Interconnect

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

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1 Scope

The present document analyzes the issues concerned with interconnection and routing in NGN and their implications and requirements for numbering, naming and addressing and related resolution functionalities.

Several different interconnection scenarios are considered, based on TISPAN "NGN Functional Architecture" ([5]), although not all require the use of all architectural functions. The role of the transit network has also been considered in order to evaluate the knowledge of numbers/names served by different operators and related requirements for routing purposes.

Some scenarios may require the availability of infrastructure systems for numbering/naming resolutions, such as infrastructure ENUM, or other database based system for route resolution, and may require coordinated provision by involved operators.

The present document focuses on calls routed between subscribers identified by E.164 numbers, coded through either tel URI and SIP URI formats. It also applies only to the transfer of calls across interconnection points between the home network of the A-Party and the home network of the B-Party. It does not consider in detail interconnections needed to support roaming scenarios. A further issue of the present document will consider interconnect scenarios related to roaming.

The present document is relevant not just to IMS but to any NGN SIP-based interconnection.

2 References

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- | | |
|-----|---|
| [1] | Void. |
| [2] | ETSI TS 181 005: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Services and Capabilities Requirements". |

- [3] ETSI TS 182 012: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation Sub-system (PES); Functional architecture".
- [4] ETSI ES 282 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Functional architecture".
- [5] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture".
- [6] ETSI ES 283 018: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: H.248 Profile for controlling Border Gateway Functions (BGF) in the Resource and Admission Control Subsystem (RACS); Protocol specification".
- [7] ETSI ES 283 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 [Release 7], modified]".
- [8] ETSI TS 123 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228 version 7.5.0 Release 7)".
- [9] ITU-T Recommendation Q.3401: "NGN NNI Signalling Profile (Protocol Set 1)".
- [10] ETSI EN 383 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control (BICC) Protocol or ISDN User Part (ISUP) [ITU-T Recommendation Q.1912.5, modified]".
- [11] ETSI TS 123 228: "IP Multimedia Subsystem (IMS); Stage 2".
- [12] ETSI TS 124 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Signalling flows for the IP multimedia call control based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.228 Release 5)".
- [13] ETSI TS 124 229: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 Release 8)".
- [14] ETSI TS 129 163: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks (3GPP TS 29.163 Release 7)".
- [15] ETSI TS 184 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Identifiers (IDs) for NGN".
- [16] Void.
- [17] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
- [18] IETF RFC 3261: "SIP: Session Initiation Protocol".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] ETSI TR 180 000: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Terminology".

[i.2] ETSI TR 184 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Naming/Numbering Address Resolution (NAR)".

3 Abbreviations

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

3GPP	3rd Generation Partnership Project
BGCF	Breakout Gateway Control Function
BICC	Bearer-Independent Call Control
CP	Communication Provider
DNS	Domain Name System
ENUM	E.164 telephone NUmber Mapping
GRX	GRPS Roaming eXchange
GSMA	GSM Association
IBCF	Interconnection Border Control Function
I-CSCF	Interrogating-Call/Session Control Function
I-ENUM	Infrastructure ENUM
IETF	Internet Engineering Task Force
IMS	IP Multimedia System
IPX	IP Packet eXchange
ISUP	ISDN Signalling User Part
IWF	InterWorking Function
MGCF	Media Gateway Control Function
NAR	Naming/Numbering Addressing Resolution
NGN	Next generation Network
NNI	Network to Network Interface
OPID	Originating Party Identity
P-CSCF	Proxy-Call/Session Control Function
PES	PSTN Emulation Service
PSTN	Public Switched Telephone Network
RACS	Resource and Admission Control Subsystem
S-CSCF	Serving-Call/Session Control Function
SDP	Session Description Protocol
SIP	Session Initiation Protocol
TPID	Terminating Party Identity
UA	User Agent
URI	Uniform Resource Identifier

4 Introduction

This Technical Specification:

- Defines a Routeing Model for NGN Interconnection.
- Proposes the first set of Requirements and related CP Routeing Roles.
- Defines the resolution process for tel URI and SIP URI.
- Proposes the possible basic structure of NAR [i.2] Interconnect Framework.

5 Routing Model for NGN Interconnection

5.1 Reference scheme for interconnection

Figure 1 describes the NGN layers and the reference scheme for interconnection in NGN. The routing resolution in NGN includes both the typical IP interworking routing rules that are bounded into the transport layer and the service/control layer ones.

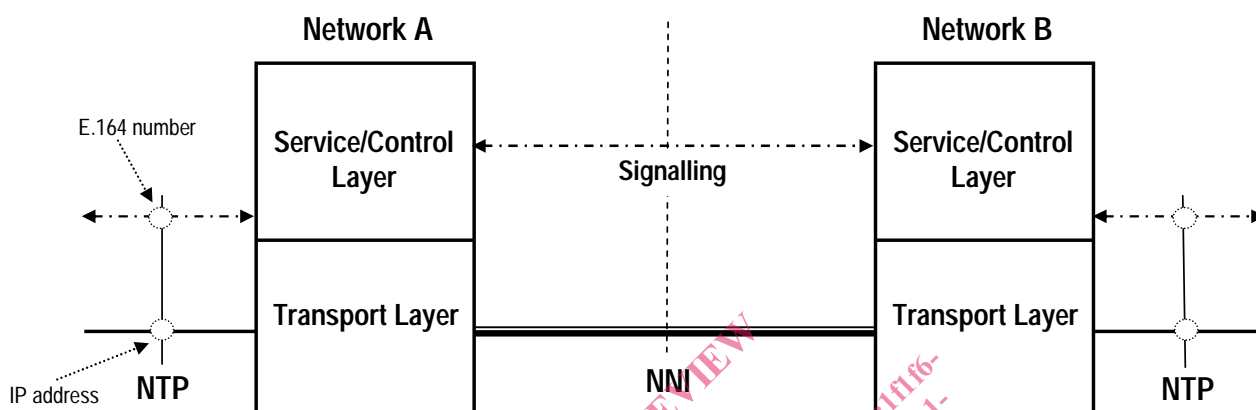


Figure 1: Reference scheme for Interconnection and routing

The call control and service control functions take into account service capabilities requirements for routing. Some applications entities (for instance redirect servers and/or location application) may also be required to define the route. For the purpose of interconnection the Call Control function has to resolve routing in order to get the next hop and reach the required destination (the transport layer has to allocate the resource required based on the services characteristics). As a consequence, the NGN routing determination process includes both service and transport functions to define the correct destination and requires an appropriate service transport resources allocation at the interconnection level.

The functionalities used for routing at the transport layer follow the existing IP intrinsic routing mechanisms, and have also to satisfy the NGN service requirements and the transport resource requirements (RACS function [4], [5]). Therefore routing resolution at transport layer is outside the scope of the present document.

The destination number/name and the type of service required are essential to identify the route for service layer routing. The ETSI standards on NGN public identity [15] state that E.164 numbering is the main customer identification scheme. However in addition domain name based identifiers can be also used.

In the case of the SIP protocol, as defined in relevant ETSI standards ([7]), such public identifiers are carried through so-called SIP URI (i.e. SIP URI: <E.164 number>@<home network domain>) and tel URI (i.e. tel URI: <E.164 number>).

Public identifiers resolution is an essential part of the routing process to determine the next hop network entity for the session setup: this entity can either be identified by an intermediate URI translated into an appropriate IP address using DNS functionality, or directly mapped to an IP address.

5.2 Interconnection and Routing

The innovative approach for NGN routing requires identifying a common routing model that guarantees interoperability between networks; besides more networks, provided by different operators, can be involved in session setup and routing process and related decisions depends on its specific role within the session setup process (i.e. originating, transit, triggering, termination or interworking).

The routing model for interconnection should take in account required type of service and existing interconnection bilateral agreements in order to resolve the route.

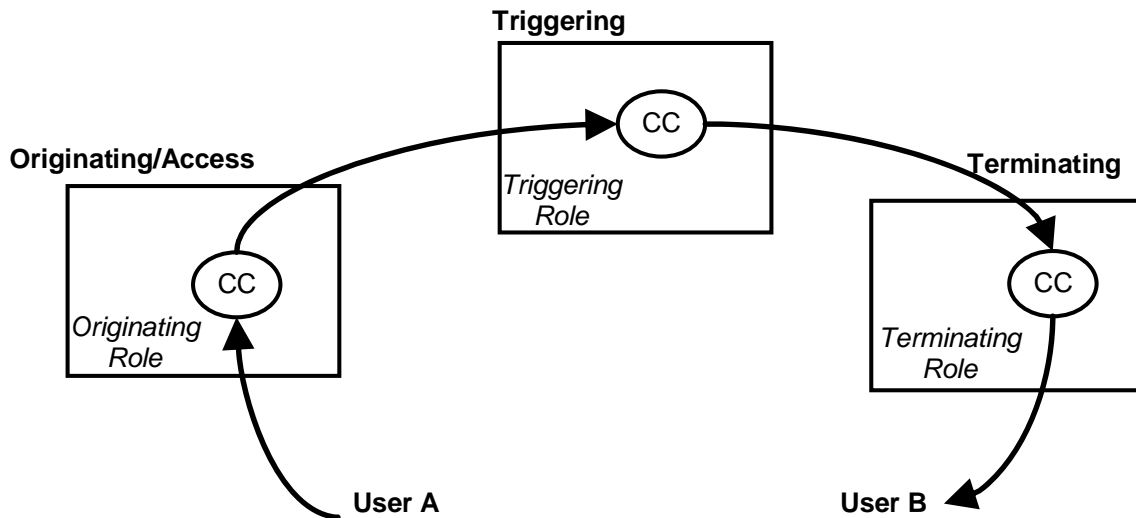


Figure 2: Functional framework for routing and CP roles

Figure 2 identifies the essential Communication Providers' (CP) routing roles for the routing process of a generic session setup established for two users. The user A sends a service request to the NGN call control of the originating CP that has the objectives of processing the request and putting through the communication to other CPs or/and the user B.

An individual CP may assume different roles on defining the route of the session for a service request and it can apply particular routing procedures related also to the knowledge of the service required and the partial or full information on the final destination to reach (i.e. external routing).

The same representation can be also adopted to include the cases where the same CP fulfils all the routing roles for an internal call/session started and terminated on the same CP's domain/domains (i.e. internal routing).

The CP can implement one or more routing roles at the same time, and can also provide these capabilities for other CPs (e.g. in the case of hosting).

A description of the basic routing roles follows:

- **Originating Role:** responsible for the communication service offered to the end customer and basic service request and related call/session handling. It is influenced by the Originating customer profile.
- **Triggering Role:** Responsible for numbering resolution, routing determination toward final destination and the choice of appropriate next hop entity (internal or external) to reach it; additionally it is in charge to identify specific interworking requirements for NGN (IMS or not IMS networks) or for PSTN/ISDN interoperability.
- The numbering resolution process implies the determination of "routable SIP URI" that includes the domain associated to operator which called user is subscribed to. In the case of terminating calls toward legacy networks (i.e. PSTN/ISDN or PLMN) the numbering resolution output can be a tel URI.
- **Terminating Role:** responsible for terminating and serving the session-oriented communication to end user.

5.3 Transit capabilities

In addition to the previous basic CPs' roles the case where one or more transit networks are involved is relevant.

- **Transit Role:** Route the session-oriented communication request to the next hop CP without any SIP URI or tel URI mapping in routable SIP URI. All the session related information is carried on to next hop transparently.

The routing process for transit is limited to transparently deliver the session setup to the appropriate next hop CP (without numbering resolution or mapping in a routable SIP URI). However the transit routing process has to guarantee appropriate transport resources allocation to preserve service requirements.

5.4 Example of complete set of CP's roles

Figure 3 points out an example of a complete set of CP's roles for SoIx Interconnection (see SoIx in the NGN Architecture [5]) that highlights different application of routing model for route determination.

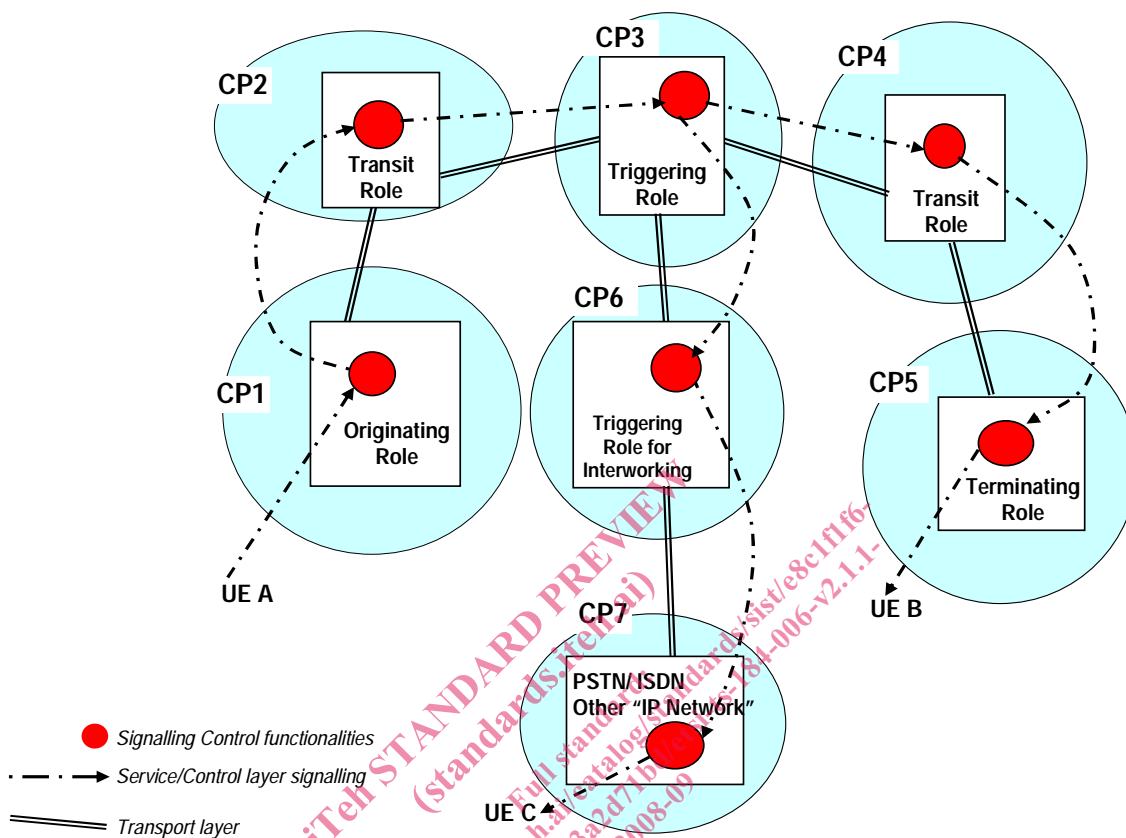


Figure 3: CPs roles for routing process for SoIx interconnection

Following is the routing process implementation among different CPs, and the description of guidelines for implementations:

- Originating role, on the basis of service required by session-based originated by Originating user, forwards the session setup request for routing analysis to the Triggering Role entity, which is provided internally or by a different CP on the basis of bilateral agreements.
- Triggering role is per definition responsible for resolving public user identities to determine the next hop outbound route towards the operator to which the destination user is subscribed.
- Transit role is assumed by a CP that, on the basis of bilateral agreements, transparently forwards the session setup request to the appropriate next hop CP.
- Terminating role is responsible for delivering communication service session setup to the destination end user; the numbering/naming analysis and related routing process is limited to internal identification of session control entity associated to end user for required service communication session setup and then to determination of the IP address associated to the user terminal equipment. Where a Routable SIP URI is used, the CP with the terminating role for a service communication session is identified through the domain part of the routable SIP URI.