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Supplement 1
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SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

Operation, numbering, routing and mobile services – International operation – Numbering plan of the international telephone service

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Alternatives for carrier selection and network identification

ITU-T Recommendation E.164 – Supplement 1

(Previously CCITT Recommendation)

ITU-T E-SERIES RECOMMENDATIONS

OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

OPERATION, NUMBERING, ROUTING AND MOBILE SERVICES	
INTERNATIONAL OPERATION	
Definitions	E.100–E.103
General provisions concerning Administrations	E.104–E.119
General provisions concerning users	E.120–E.139
Operation of international telephone services	E.140–E.159
Numbering plan of the international telephone service	**E.160–E.169**
International routing plan	E.170–E.179
Tones in national signalling systems	E.180–E.199
Maritime mobile service and public land mobile service	E.200–E.229
OPERATIONAL PROVISIONS RELATING TO CHARGING AND ACCOUNTING IN THE INTERNATIONAL TELEPHONE SERVICE	
Charging in the international telephone service	E.230–E.249
Measuring and recording call durations for accounting purposes	E.260–E.269
UTILIZATION OF THE INTERNATIONAL TELEPHONE NETWORK FOR NON-TELEPHONY APPLICATIONS	
General	E.300–E.319
Phototelegraphy	E.320–E.329
ISDN PROVISIONS CONCERNING USERS	E.330–E.399
QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING	
NETWORK MANAGEMENT	
International service statistics	E.400–E.409
International network management	E.410–E.419
Checking the quality of the international telephone service	E.420–E.489
TRAFFIC ENGINEERING	
Measurement and recording of traffic	E.490–E.505
Forecasting of traffic	E.506–E.509
Determination of the number of circuits in manual operation	E.510–E.519
Determination of the number of circuits in automatic and semi-automatic operation	E.520–E.539
Grade of service	E.540–E.599
Definitions	E.600–E.699
ISDN traffic engineering	E.700–E.749
Mobile network traffic engineering	E.750–E.799
QUALITY OF TELECOMMUNICATION SERVICES: CONCEPTS, MODELS, OBJECTIVES AND DEPENDABILITY PLANNING	
Terms and definitions related to the quality of telecommunication services	E.800–E.809
Models for telecommunication services	E.810–E.844
Objectives for quality of service and related concepts of telecommunication services	E.845–E.859
Use of quality of service objectives for planning of telecommunication networks	E.860–E.879
Field data collection and evaluation on the performance of equipment, networks and services	E.880–E.899

For further details, please refer to ITU-T List of Recommendations.

SUPPLEMENT 1 TO ITU-T RECOMMENDATION E.164

ALTERNATIVES FOR CARRIER SELECTION AND NETWORK IDENTIFICATION

Source

Supplement 1 to ITU-T Recommendation E.164, was prepared by ITU-T Study Group 2 (1997-2000) and was approved under the WTSC Resolution No. 5 procedure on the 9th of March 1998.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Supplement 1 to Recommendation E.164

ALTERNATIVES FOR CARRIER SELECTION AND NETWORK IDENTIFICATION

(Geneva, 1998)

1 Introduction

The changing telecommunications environment has enhanced the importance of being able to choose the service providers which perform functions on a call. This ability to designate a specific service provider for a specific portion of a call may be achieved through the use of a prefix, presubscription, signalling, database analysis, or embedding the identification in the number itself. At each hand-off point of a call, the current provider must determine the next provider to which to route the call (provider determination).

2 Scope

This supplement presents a summary of the potential methods for Carrier / Service provider selection and network identification on the public network. The guidance provided may be utilized for both international and national implementations.

This supplement does not specifically address the class of provider determination methods based on contractual agreements, bilateral negotiations, transit routes, or previous traffic (proportional routing). These methods are used by individual providers in determining the next provider to which to route the call.

3 Assumptions

The following is a list of basic assumptions used in generating this supplement.

In considering Carrier Selection and Network Identification techniques methodologies that use information within the signalling should be considered.

Information within this supplement is based on current needs and technologies but not at the expense of future needs and technology.

Where a competitive environment is not present, normal call set-up should not be impacted by Carrier Selection techniques.

4 References

– ITU-T Recommendation E.164 (1997), The international public telecommunication numbering plan.

5 Definitions

The term **carrier selection** is used when the decision is controlled by the **calling party**, and the term **network identification** is used when the decision is controlled by the **called party.** This supplement uses a functional model of network services to provide a framework for examples of both carrier selection and network identification.

The word "Carrier" in this supplement included both "Access Provider" and "Transport Provider".

6 Acronyms

This supplement uses the following acronyms.

ISP Intermediate Service Provider(s)

ITP Intermediate Transport Provider(s)

OAP Originating Access Provider(s)

OASP Originating Access Service Provider(s)

OSP Originating Service Provider(s)

OTP Originating Transport Providers(s)

TAP Terminating Access Provider(s)

TASP Terminating Access Service Provider(s)

TSP Terminating Service Provider(s)

TTP Terminating Transport Provider(s)

7 Functional models

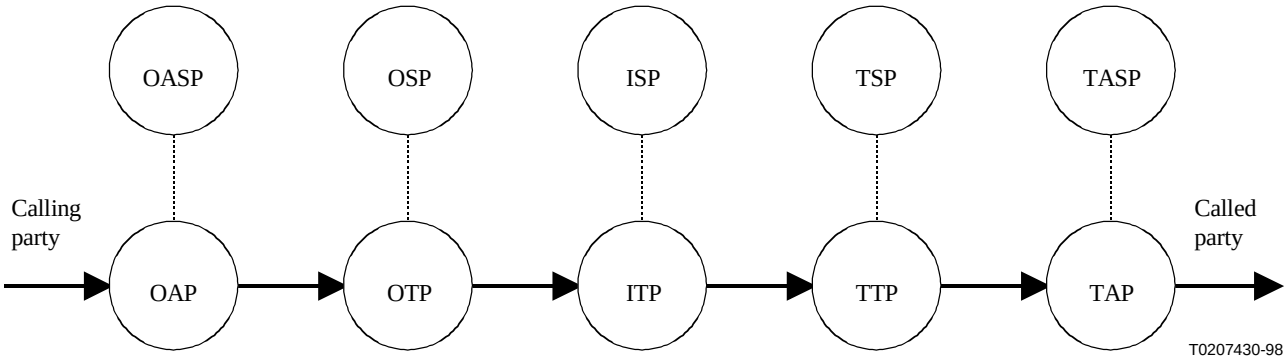

Figure 1 – Functional model

In discussing issues related to carrier selection/network identification, it is useful to address them in the context of a general model. The model shown (see Figure 1) illustrates the entities and relationships involved in a call. This is a functional model and hence the entities shown are not necessarily distinct companies.

The functions provided in network service are: connection to/from the network, transport through the network, and service features. These functions are provided to the calling party (originating) and the called party (terminating). Each provider offering connection or transport may provide service features or access to an entity providing service features.

For a call, the calling party connects to the network through the Originating Access Provider (OAP). The OAP determines the Originating Transport Provider (OTP) to carry the call forward via voice path or signalling. The OTP progresses the call to the Terminating Transport Provider (TTP) which could be done via an Intermediate Service Provider (ISP), (e.g. who may provide transit transport services). The TTP routes the call to the called party through the Terminating Access Provider

(TAP). Any one or all of these connection providers could provide access to a service provider offering features to the calling or called parties.

It is important to re-emphasize that these are functional entities. One carrier could function as multiple entities on a given call. There could be multiple instances of one entity on a given call.

8 Alternatives

8.1 General options for Carrier Selection and Network Identification in relation to E.164 numbers

For Carriers and Networks, it may be necessary to identify the Carrier/Network which is providing a specific service. There are three basic methods that can be used to identify Carriers/Networks in relation to E.164 numbers. These options are:

a) the implementation of Carrier Selection and Network Identification external to the E.164 number;

b) the implementation of Network Identification internal to the E.164 Number;

c) the implementation of the complete E.164 Number as a means of identification of the Carrier/Network.

8.1.1 General considerations for Network Identification in relation to the E.164 number

The choice of implementation of one of the above methods should be done on the basis of evaluating each individual service. It will be selected based on service and operational requirements for each service application. In some applications, specific recommendations should be made for a preferred method of Carrier Selection and Network Identification using particular numbering resources. In other cases, specific recommendations on the Carrier Selection and Network Identification method should be left as a national matter.

The following is a list of general issues to be evaluated when considering all three Carrier Selection and Network Identification methodologies.

a) *Timing and equipment availability*

The choice of a particular Carrier Selection and Network Identification approach can be impacted by the time frame (i.e. the requested date) when the service for which the numbering resources are required. This is because the availability of hardware and software to support the specific Carrier Selection and Network Identification scheme can have an impact on the Carrier Selection and Network Identification method that is selected.

b) *Impact on network interconnections and interworking*

In choosing a Carrier Selection and Network Identification methodology, the issues of network interconnection and interworking between networks and carriers should be considered. For example, should a subscriber dial an E.164 number destined to a Carrier or Network other than the network or carrier from which the call originates, then certain interworking arrangements must be in place for the call to be routed and billed. The apportionment of international traffic between Carriers/Networks may also be impacted once Carrier Selection and Network Identification is associated with an E.164 number.

The transport of Carrier Selection and Network identification information between networks may also be necessary.

c) *Impact on retaining or discarding Carrier Selection and Network Identification information*

Carrier Selection and Network Identification information is necessary to determine the routing and settlement arrangements for international calls. The nature of a given call type (e.g. calling or called party paid) will determine the need to retain or discard the Carrier Selection and Network Identification information as an international call is routed to its destination address.

8.1.2 Considerations for Carrier Selection/Network Identification options

The following subclauses contain specific considerations applying to each of the above three Carrier Selection and Network Identification options.

8.1.2.1 Considerations for applying the Carrier Selection and Network Identification external to the E.164 number

It may be possible to use either prefixes or suffixes in dialling E.164 Numbers. The Carrier Selection and Network Identification may also take place in the call related signalling information external to the number. Presubscription to a carrier may be one method. Another method may be to allow a subscriber to change their presubscription by dialling a short code (on a semi-permanent basis).

Some ramifications of this approach are:

a) No portion of the numbering space is used for Carrier Selection and Network Identification, and therefore the carrier selection and network identification does not impact the quantity, format or makeup of the numbers.

b) Additional digits may be dialled (e.g. a prefix or suffix).

c) All digit combinations (used for the prefix or suffix) are available unless they are already assigned or apportioned for other uses.

d) Service Provider Portability of Numbers is feasible under this Carrier Selection and Network Identification option.

e) Modifications to existing signalling protocol may be required to transmit the Carrier Selection and Network Identification identifiers. This may be achieved by using the transit network selection parameter in existing signalling Recommendations.

f) The calling party must dial the correct information in addition to the E.164 number.

8.1.2.2 Considerations for applying Network Identification internal to the E.164 number

When identifying the Carrier Selection and Network Identification internal to the E.164 number for particular applications, the following implications should be considered:

a) Impact on efficient use of the quantity of available numbers:

If a portion of the E.164 number is used for Network Identification, then the numbering space is divided into some finite quantity of carrier or network identification groupings. Under each such grouping, a block of numbers is then assigned to individual networks. The efficient use of these E.164 number allocations is dependent on the utilization of the numbers under each network Identification allocation. Should some networks not assign many numbers, the overall efficiency in utilizing these resources may be low. This may lead to premature exhaust of the specific E.164 numbering resource.

b) Trade off between Network Identifiers and quantity of subscriber numbers per Network:

The designation for Network Identification purposes of some quantity of digits in the E.164 number reduces the number of available digits for subscriber numbers and limits the quantity of numbers that any one Network has available for assignment to its particular customer

base. The quantity of Network specific numbers is inversely proportional to the number of networks that can be identified within the number.

c) Service provider portability is precluded:

When an E.164 number contains Network specific identification, the flexibility to change service providers and maintain the same number is lost.

d) Routing to the appropriate network is facilitated in an efficient fashion.

e) No additional digits are required when an E.164 number is dialled.

f) From a subscriber's perspective, no additional signalling information is required from the calling user for Network Identification beyond the E.164 number. From a network perspective, no additional signalling information is required for Network Identification beyond the E.164 number if every network node involved in the call correctly interprets the internal E.164 field designated for network identification.

g) No additional knowledge is required by the calling party beyond the number itself to convey Network Identification information.

8.1.2.3 Use of the complete E.164 number as a means to achieve Carrier Selection and Network Identification

Recommendations E.164 and E.162 require networks to do analysis on seven (7) digits for international calls. Using the complete E.164 number as a means of achieving Carrier Selection and Network Identification requires that the originating network have the ability to analyze the entire Number (up to 15 digits) to determine the particular Carrier Selection and Network Identification. This may require a database lookup capability for E.164 numbers of up to 15 digits in length.

a) No portion of the numbering space is used for Carrier Selection and Network Identification, and therefore the Carrier Selection and Network Identification does not impact the quantity, format or makeup of the numbers.

b) All the E.164 numbers can be used and mapped for Carrier Selection and Network Identification unless they are already assigned to some other application.

c) Service Provider Portability of Numbers is feasible under this Carrier Selection and Network Identification option.

d) Modifications to existing signalling protocol may be required to transmit the Carrier Selection and Network Identification information.

e) Routing to the appropriate carrier/network may need database lookup.

f) No additional digits are required when an E.164 number is dialled.

g) No additional knowledge is required by the calling party beyond the number itself to obtain Carrier Selection or Network Identification information.

8.2 Selection by calling party

8.2.1 Functional description

The following diagrams utilize the functional model, showing implementations to clarify carrier selection. Each of the cases discussed shows only a voice-path between entities. Some applications may use signalling paths between entities, but these are determined by the same carrier selection methods shown here. We have shown only selection of the connection carriers for simplicity, it is assumed the service providers at each stage are either the same as the connection carrier or are determined by the connection carrier based on the selection information received.

Table 1 summarizes various methods of selecting the different carriers shown in the functional model.

Table 1 – Carrier selection methods

Selection of	Based on	Identification in	Controlled by
Originating Transport Provider (OTP)	Presubscription (Figure 2) Prefix (Figure 3) Number Analysis By OAP (Figure 4)	Subscriber Info Prefix, Signalling Number	Calling party Calling party Calling party

8.2.1.1 External to the number

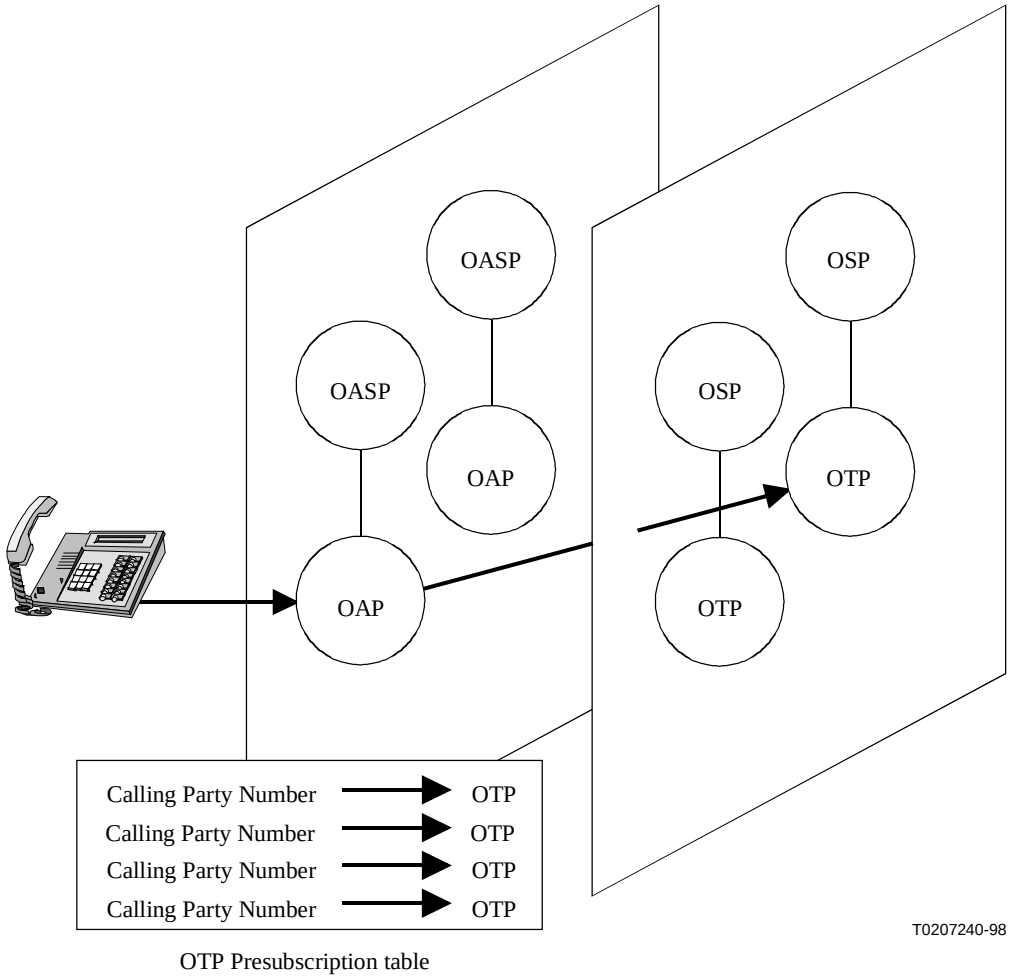

Figure 2 – Selection of OTP – Presubscription

In Figure 2, the OAP performs the function of carrier selection through means of a provisioned presubscription table using the calling party number as the key. The data in this table is provisioned prior to the call being made on a line basis in the carrier providing the OAP function and is used to determine the default carrier providing the OTP function for a call.

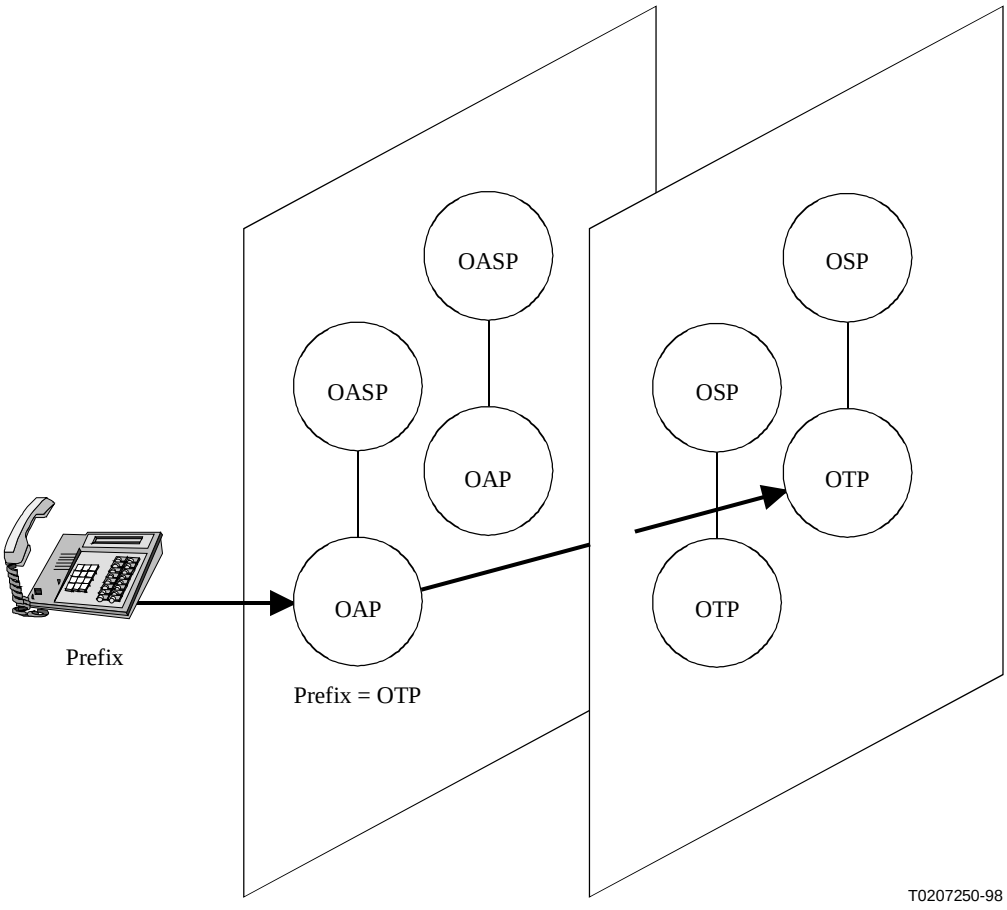

Figure 3 – Selection of OTP – Prefix

In Figure 3, the OAP performs the function of carrier selection through means of a dialled prefix. In addition to being dialled, the carrier selection information could also be populated in the call set-up message by the calling party's equipment. The OAP translates this information to determine the requested OTP.

8.2.1.2 The complete number

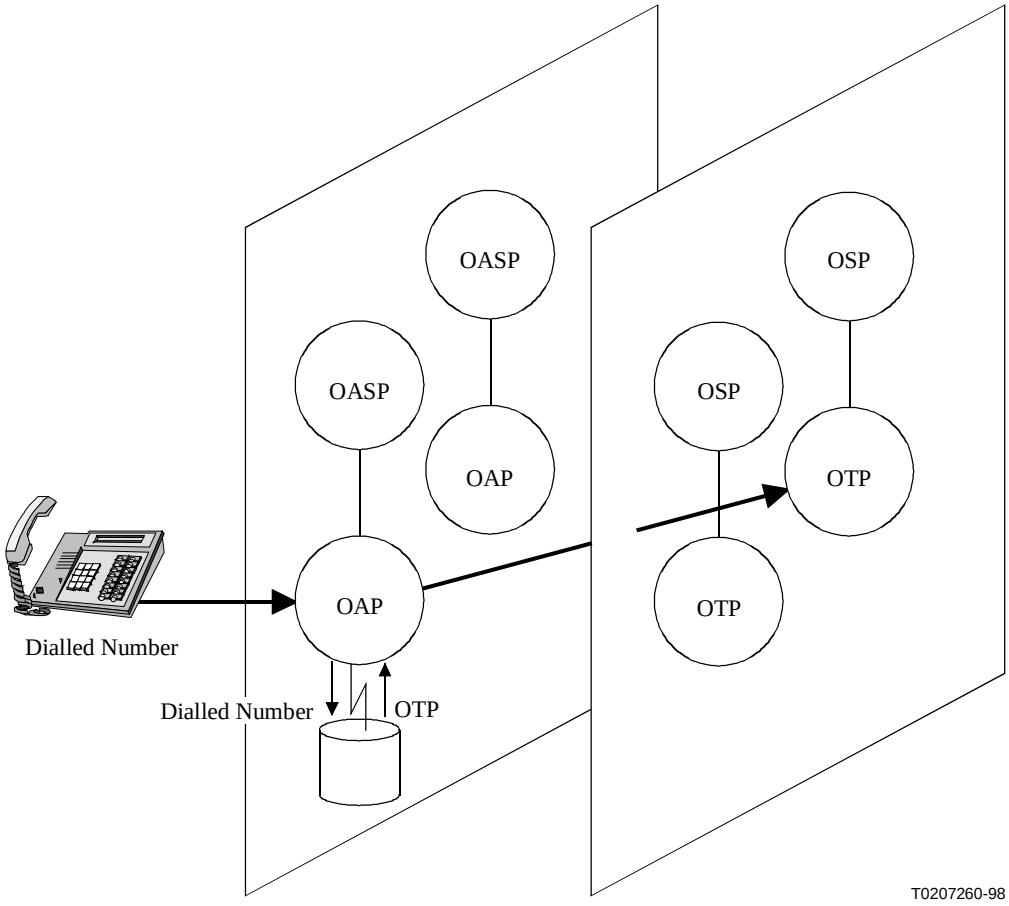

Figure 4 – Selection of OTP – Number analysis by OAP

In Figure 4, the OAP performs the function of carrier selection through means of analysis of the dialled number to determine the requested OTP.

8.3 Selection by the Called Party

8.3.1 Functional description

The following diagrams utilize the functional model, showing implementations to clarify network identification. Each of the cases discussed shows only a voice-path between entities. Some applications may use signalling paths between entities, but these are determined by the same network identification methods shown here. We have shown only identification of the connection networks for simplicity – it is assumed the service providers at each stage are either the same as the connection network or are determined by the connection network based on the identification information received.

Table 2 summarizes various methods of network identification.

Table 2 – Network identification methods

Selection of	Based on	Identification in	Controlled by
Terminating Transport Provider (TTP)	Number Analysis By OTP (Figure 6)	Number	Called Party choice of service provider
	Destination Number By OTP (Figure 5)	Number	Called Party choice of service provider

8.3.1.1 Internal to the number

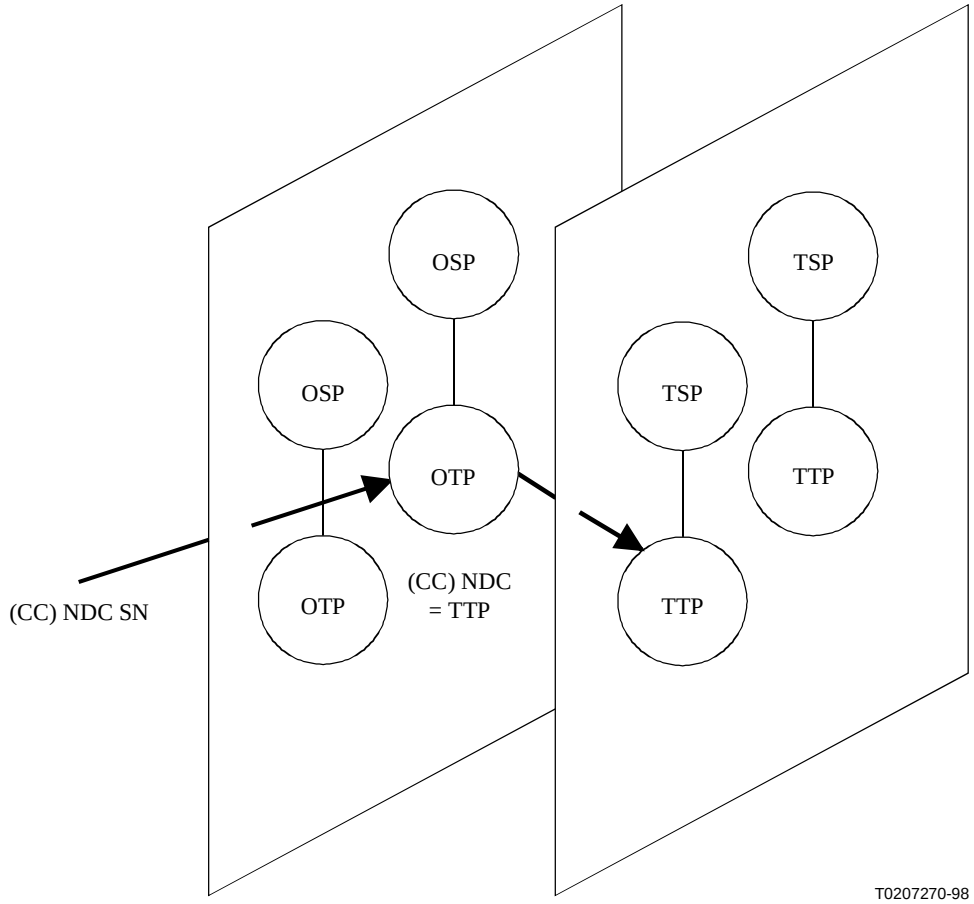

Figure 5 – Identification of TTP – Destination number by OTP

In Figure 5, the OTP performs the function of network identification through means of digit analysis of the destination number. The destination number contains a field which explicitly identifies the TTP. The OTP must recognize that the destination number contains explicit network identification, identify the field within the number containing that identification, and translate the value of the field to the appropriate TTP.

8.3.1.2 The complete number

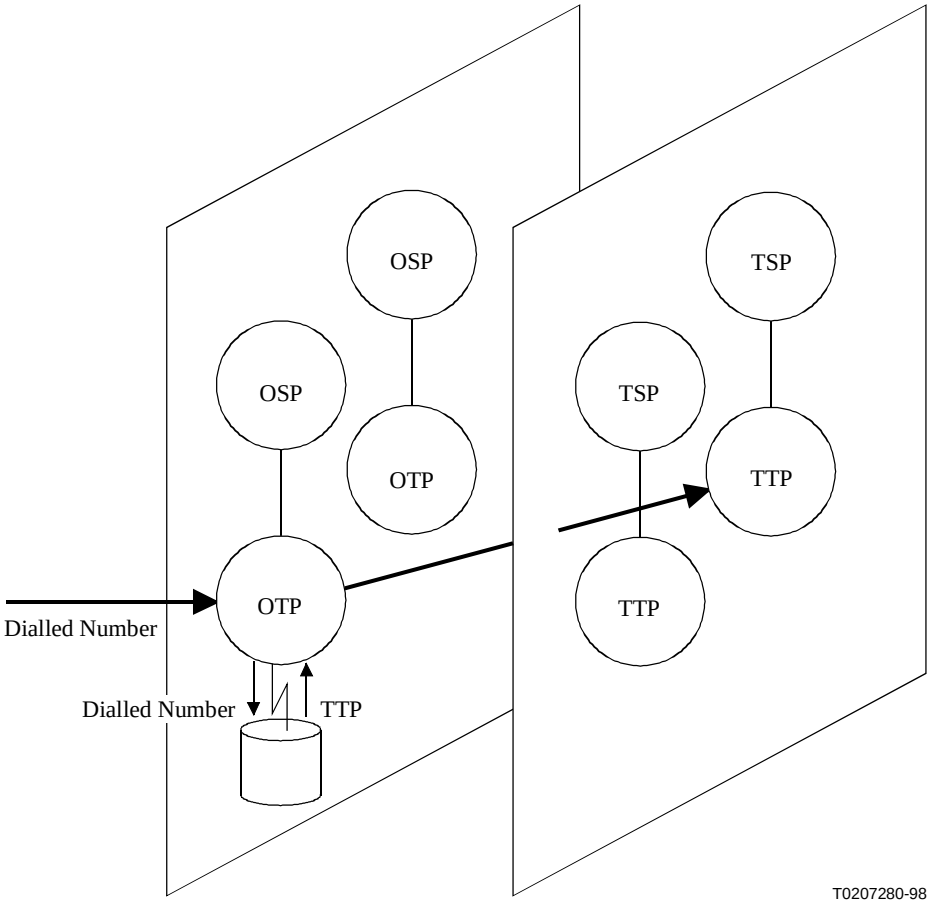

Figure 6 – Identification of TTP – Number analysis by OTP

In Figure 6, the OTP performs the function of network identification through means of analysis of the entire dialled number. The OTP must recognize that the destination number must be analyzed to determine the appropriate TTP, and perform analysis on the entire number.

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Series A	Organization of the work of the ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	**Overall network operation, telephone service, service operation and human factors**
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communication
Series Y	Global information infrastructure
Series Z	Programming languages