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Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim-European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

This ETR has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunication Standards Institute (ETSI) and defines a basic architecture for providing necessary mechanism to allow flexible interworking between ISDNs and within an ISDN.

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1 Scope

This ETSI Technical Report (ETR) aims to establish a basic architecture for providing the necessary mechanisms in an ISDN to cope with interworking situations in as flexible a way as possible. To achieve this flexibility in use and to be able to cope with a potentially very large number of interworking cases without having to change the basic architecture, a modular approach has been attempted.

1.1 Introduction

This work has been initiated by actual problems concerning the interworking of teleservices. It quickly became clear that in the short term only solutions with certain limitations are feasible which need to be adapted closely to the specific service needs (e.g. terminal based solutions (multi-function terminals) have the disadvantage that only a limited number of functions can be included in a terminal and therefore they can not resolve the interworking problem in general). It became clear that such an approach would lead to a very complex situation, as soon as interworking becomes necessary in a large number of communication demands. As such a situation could no longer be transparent to the users, the growth of the traffic would be damaged.

In the process of establishing the architecture described in this ETR, several market aspects were identified, which are reproduced here as a further motivation of the work.

It is expected that also in the long term a large quantity of different incompatible applications will exist on the Integrated Services Digital Network (ISDN), most of them non-standardised (e.g. product specific communications architectures of computer manufacturers). This leads to split the ISDN market into (in many cases) small segments, each of them being a communications island. As it is in the interest of the network service providers to ease communications between as many potential partners as possible, the network service providers therefore should create an environment to allow communication between the above mentioned islands; i.e. to resolve the interworking problem. This is expected to have a multiplicative effect on the traffic. In a competitive environment however, the use of an Interworking Function (IWF) may need to be charged for.

Taking into account the expected strong segmentation of the ISDN applications (especially in the data market), it is considered as a prerequisite, that ways are found to enable also third parties (e.g. manufacturers) to provide interworking functions. (However, in this case the charging and accounting, problems still need further study).

To reach that goal, a comprehensive interworking architecture is needed, the principles of which are described in this ETR.

2 Symbols and abbreviations

The following symbols and abbreviations are used within this document.

BC	Bearer Capability
CF	Higher layer signalling channel (fast)
CFU	Call Forward Unconditional
ETR	ETSI Technical Report
HLC	Higher Layer Compatibility
IWF	Interworking Function
ISDN	Integrated Services Digital Network

IW	Interworking
LLC	Lower Layer Compatibility
MSN	Multiple Subscriber Number

3 The ISDN interworking situation

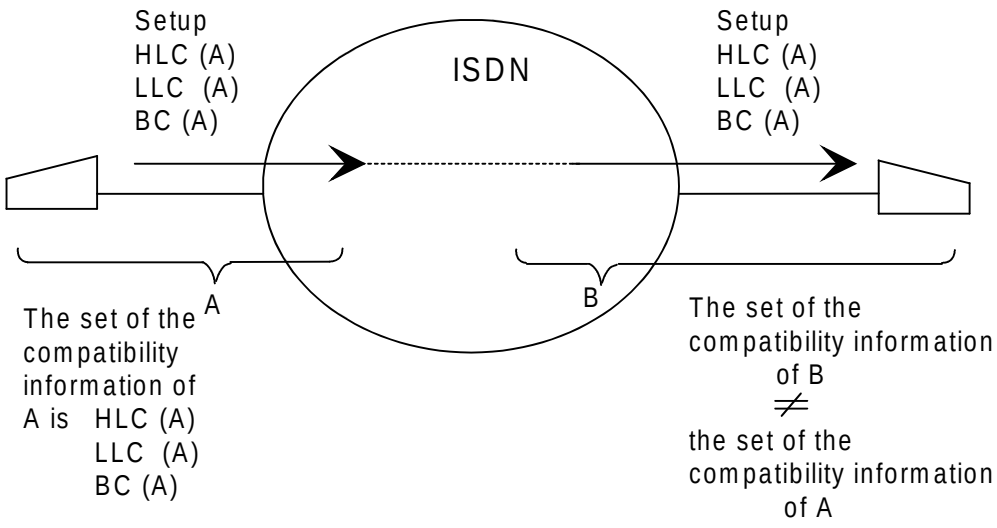

Figure 1

The term ISDN Interworking includes ISDN to ISDN and ISDN internal interworking.

An ISDN interworking situation arises in the case when the set of compatibility information of endsystem A is different from the set of compatibility information of endsystem B. In the following it is assumed, that IWFs are provided outside the endsystems and are supported by the network (i.e. adaption and fallback procedures provided inside the endsystems are not considered in this document).

The term endsystem is used either for a single terminal, for a terminal connected to a terminal adapter, or for the combined terminal functionality at an S-bus or in a complex subscriber installation.

4 The ISDN interworking problem

To resolve the ISDN interworking problem, the compatibility information of both endsystem A and endsystem B need to be known, so that the proper IWF can be selected.

In the general case the compatibility information of the called endsystem (B) is not known in advance, although customer profiles might be stored at the local exchange or might be conveyed implicitly in the Multiple Subscriber Number (MSN) (see also subclauses 5.1 and 5.3). A mechanism has therefore to be devised to get this information.

5 An architecture to resolve the ISDN interworking problem in a general manner

5.1 To get the information on the actual ISDN interworking case

Interworking in principle has to provide means to allow communication between two endsystems with different sets of compatibility information.

Endsystem A: the set of compatibility information of the calling endsystem (A) is available in the network in the SETUP message (i.e. HLC, LLC, BC).

Endsystem B: the set of compatibility information of the called endsystem (B) may or may not be available in the network; in general it will not be available in the network.

To permit the selection of the correct IWF, a mechanism must exist to provide this information to the network. The following possibilities exist:

a) the information is fetched from the called endsystem B.

   In a multi-terminal environment (e.g. an S-bus) this information may be contained in a multitude of responses (e.g. one per terminal);

b) the set(s) of compatibility information of B is(are) stored in the network in advance;

c) implicit knowledge by using specialised addresses.

Whereas possibilities a) and b) apply for the general interworking case, possibility c) does not apply in the general case as prior knowledge is necessary on the calling side.

Whereas possibility a) is workable also with a very large (virtually unlimited) number of endsystems in a network, possibility b) will, in this case, necessitate many network resources (e.g. memory space) and imply a heavy management effort to maintain the compatibility information stored in the network up to date with the real capabilities of the endsystems.

To resolve the general interworking case, possibility a) therefore appears to be the one best suited. The necessary signalling methods need further study.

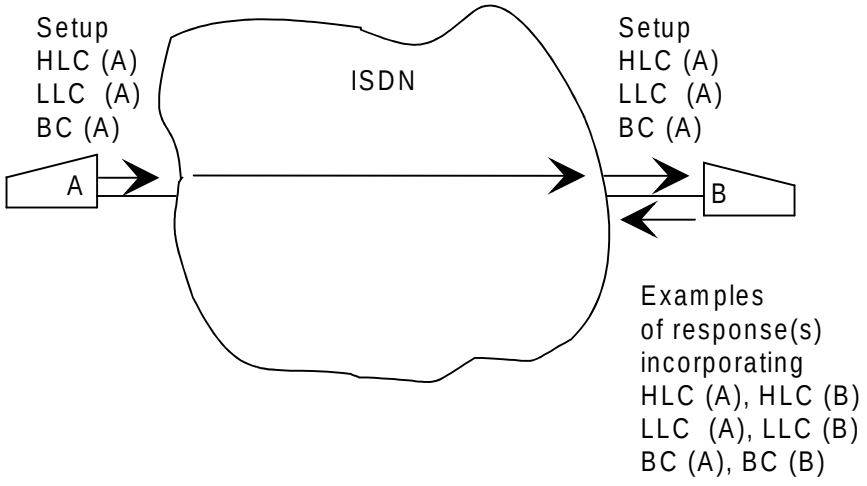

Figure 2

5.2 Routing to the interworking function: General case

Once the compatibility information of both endsystems is known to the network, the network has to provide a rerouting function to a suitable IWF. The IWF itself may, or may not be, part of the network.

As in subclause 5.1, possibility a) has been chosen for the general case, the compatibility information of the two endsystems (A) and (B) is known for the first time within the terminating exchange. Therefore the configurations in subclauses 5.2.1 and 5.2.4 may occur.

Rerouting of calls through an IWF may be dependent on the calling endsystems permission. This permission may be given on a per call basis, or on a subscription basis. Therefore a rerouting notification mechanism should be foreseen. This requires further study.

NOTE: To limit the impact on existing ISDN signalling protocols the second option may be preferable.

5.2.1 No rerouting: IWF at the terminating exchange

The interworking function is provided by the terminating exchange. In this case no rerouting is needed.

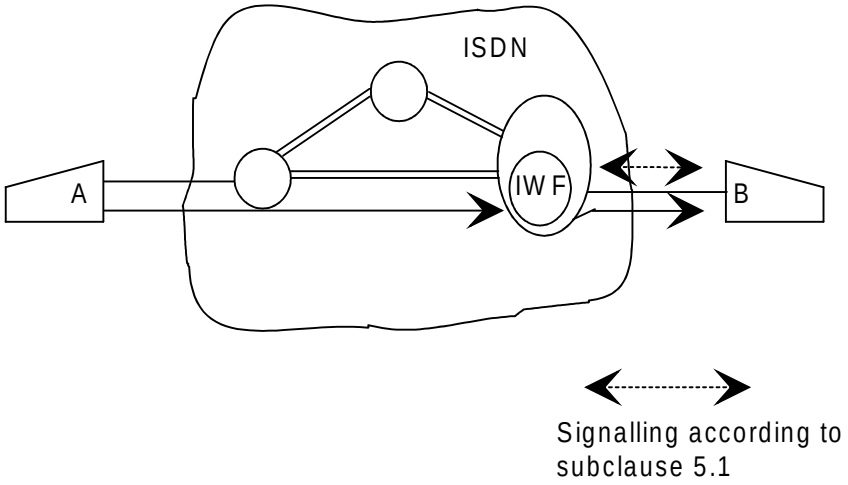

Figure 3

5.2.2 Rerouting at the terminating exchange

In this case the IWF is not performed in the terminating exchange, but somewhere else in the network or outside the network. To get to the IWF, rerouting is performed at the terminating exchange, i.e. the call is forwarded to the IWF from the terminating exchange (see figure 4).

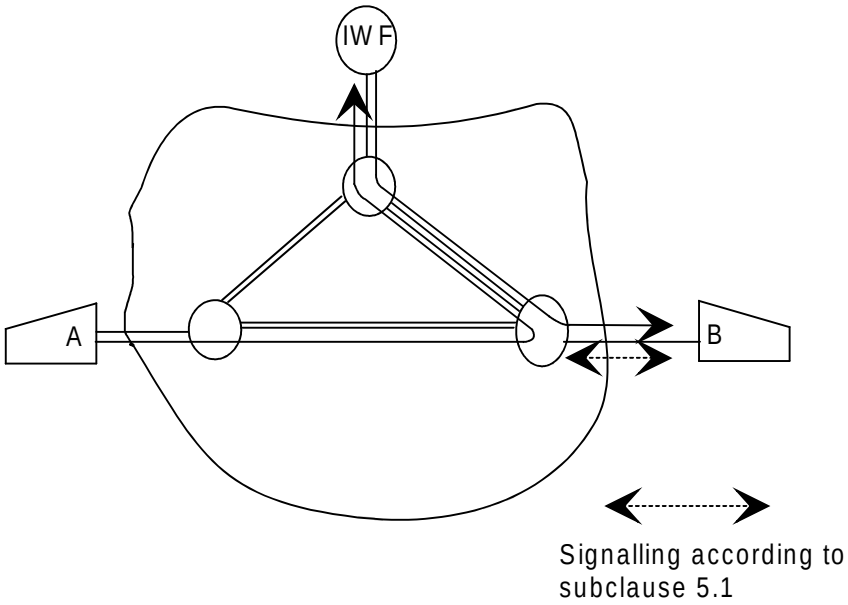

Figure 4

In this case, the position of the IWF needs firstly to be known to the terminating exchange. No new routing functionality is needed in the ISDN. The solution may have the drawback of a sub-optimal path from (A) to the IWF, to (B) which might be an important drawback in geographically large networks (e.g. the global ISDN).

5.2.3 Rerouting at the originating or at an intermediate exchange

In this case the IWF is not performed in the terminating exchange but somewhere else in the network or outside the network. To get to the IWF, rerouting is performed at the originating or at an intermediate exchange (e.g. an international gateway) thus allowing for optimal routing from (A) to the IWF, to (B) (see figure 5).

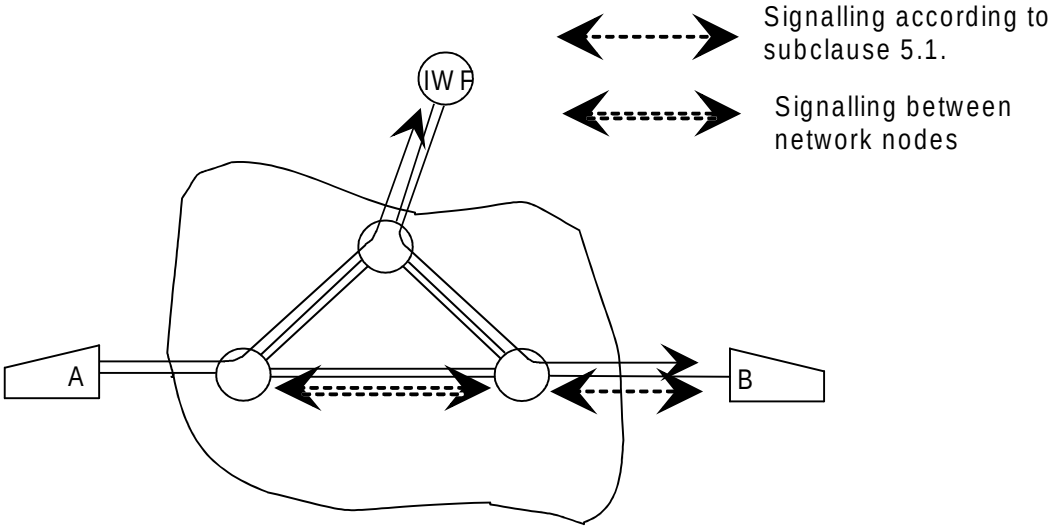

Figure 5

In this case the position of the IWF has to be known prior to the exchange responsible for the rerouting of the call. This case requires new (re)routing functionality in the ISDN. It may require new signalling mechanisms within the network.

The solution allows for optimal pathfinding, which makes it especially well suited for geographically large networks i.e. for the general case in the global ISDN.

5.2.4 Intelligent network solution

In this case the IWF is not performed in the terminating exchange but somewhere else in the network, or outside the network. To get the IWF, rerouting is performed either at the terminating exchange (according to subclause 5.2.2) or at the originating, or an intermediate, exchange (according to subclause 5.2.3). The existence and the position of the IWF in this case is not known prior to any node. It needs to be selected by an intelligent network function on the basis of the compatibility information available of the 2 sides (i.e. endsystem A and endsystem B), see figure 6.

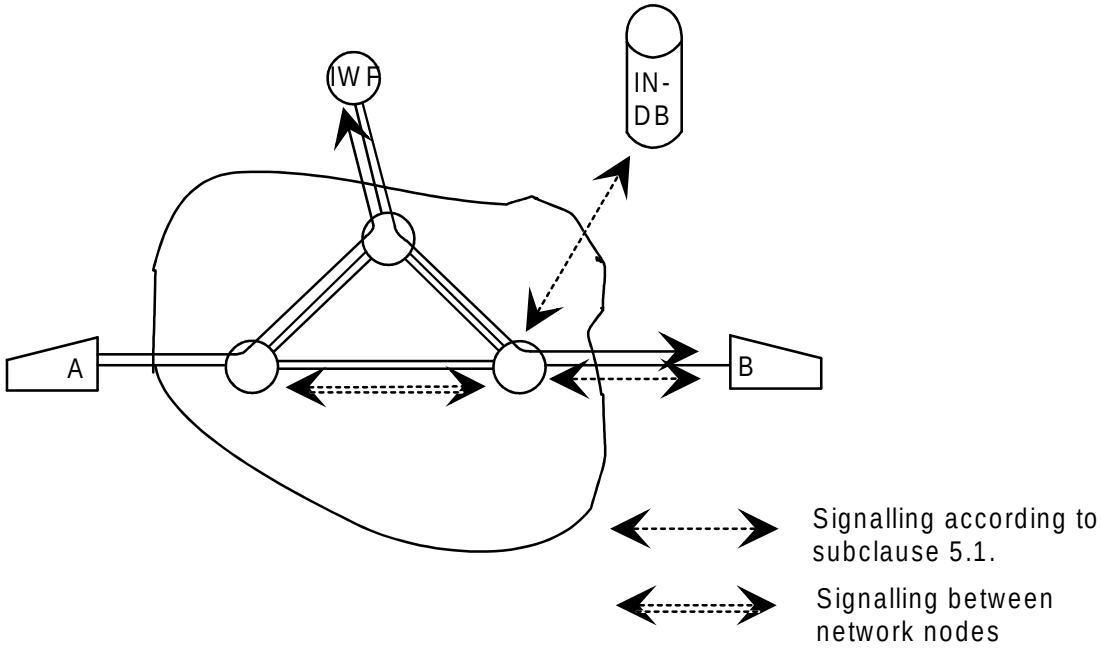

Figure 6

The IN solution for interworking is well suited for complex networks, where no prior knowledge of the existence and location of a specific interworking function may be assumed in the nodes. When combined together with rerouting at the originating or intermediate exchange (according to subclause 5.2.3) even geographically widespread networks may be covered.

The IN solution in combination with rerouting at the originating exchange represents the most general solution to the ISDN interworking problem and is well adapted to resolve the interworking problem in the global ISDN in a general manner.

5.3 Rerouting to the interworking function in the case of prior knowledge of the interworking case by the network

As shown in subclause 5.1 the network may have prior knowledge about the required set of compatibility information of B, either explicitly as pre stored information in the network (case b) of subclause 5.1, or implicitly through the address allocated to B (case c) of subclause 5.1.

The routing configurations in these cases are similar to those described in subclause 5.2, although without the need of signalling the compatibility information between the terminating exchange and the remote endsystem (B). The location where rerouting is performed is then dependent only on the location where prior knowledge of the actual interworking case is processed (in many cases this will be the terminating exchange).

The following mechanisms are already included in the ISDN standards and can be used to resolve interworking problems of the type described above:

For rerouting to the IWF: Call Forwarding (CF).

This mechanism can be used for rerouting a call to the proper IWF.

For specific addressing: Multiple Subscriber Number (MSN) in case c) of subclause 5.1.

This mechanism can be used to provide implicit information about the interworking case (i.e. a specific MSN number may be allocated to an endsystem per caller category (i.e. per set of compatibility information of the calling side). Rerouting to the proper IWF can then be performed using, for example, the Call Forward Unconditional (CFU) supplementary service.

5.4 The ISDN interworking architecture

To resolve the interworking problems in the real ISDN in a coherent way, an ISDN interworking architecture is needed, consisting of different modules, which can be used in a specific interworking case to build up an adapted solution.

The following nine functional modules could be identified.

Module No.	Description
1	A signalling mechanism to get all possible compatibility information from the called endsystem (according to subclause 5.1).
2	A register to store the compatibility information.
3	The interworking function.
4	The rerouting function at a certain node (which might be the originating, an intermediate, or the terminating exchange).
5	A signalling mechanism to invoke a rerouting function at the originating or intermediate exchange from the terminating exchange.
6	A signalling mechanism to inquire the existence and location of an IWF from an intelligent network function.
7	A register to store the information on the location of a certain IWF.
8	An IN server, or function to provide the information on the existence and location of a certain IWF.
9	Charging and/or accounting functions.

The following interworking scenarios may be drawn up with this architecture:

a) fallback set of compatibility information the called endsystem (e.g. as with Fax 4 and Fax 3 in Europe). Requires the modules: none (and is therefore not considered as an interworking solution);

b) IW at the terminating exchange (according to subclause 5.2.1) without prior knowledge of the compatibility information of the called endsystem by the terminating exchange: requires the modules: 2 3 9;

c) IW at the terminating exchange (according to subclause 5.2.1) without prior knowledge of the compatibility information of the called endsystem by the terminating exchange: Requires the modules: 1 2 3 9;

d) non-IN solution with rerouting at the terminating exchange (according to subclause 4.2.2): Requires the modules: 1 2 3 4 7 9;

e) non-IN solution with rerouting at the originating exchange (according to subclause 4.2.3): Requires the modules: 1 2 3 4 5 7 9;

f) IN solution (according to subclause 4.2.4) with rerouting at the terminating exchange: Requires the modules: 1 2 3 4 6 7 8 9;

g) IN solution (according to subclause 4.2.4) with rerouting at the originating exchange: Requires the modules: 1 2 3 4 5 6 7 8 9.

6 Prerequisites for an implementation

For the implementation of scenarios as described in this document, enhancements to the signalling in the ISDN interworking case on the access line (i.e. the DSS1) as well as the signalling inside the network (i.e. the SS No.7) needs to be defined. The present document, however, only intends to show what general solutions of the interworking problem might be feasible, and what functionalities are needed to do this.

History

Document history	
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