



**T**ELENOR

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# Specification of the network's handling of supplementary services, number information and profile selection

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## 1 Purpose and application area

This specification describes the networks handling of supplementary services, user facilities, profile selection and number information formats applicable at the S- and S/T-reference point for the provision of ISDN packet mode bearer services, PMBS.

Other aspects of the network implementation of the ISDN packet mode bearer services are described in the Telenor Nett Specification A43 [1].

## 2 References

- [1] Telenor Nett Specification A43: «Specification of the network side of the ISDN Virtual Circuit Service for ISDN Basic Access (BA) and Primary Rate Access (PRA)».
- [2] Telenor Nett Specification A44-3: «ETSI standardised supplementary services supported in the public ISDN of Telenor; Basic Access (BA) and Primary Rate Access (PRA)».
- [3] Telenor Nett Specification A43-1: «Specification of the bearer services provided by the B-channel of the user access - basic and primary rate».
- [4] Telenor Nett Specification A43-2: «Specification of the bearer services provided by the D-channel of the user access - basic and primary rate».

## 3 Definitions and abbreviations

### 3.1 Definitions

**User:** The DSS1 protocol entity at the user side of the user-network interface.

**Network:** The DSS1 protocol entity at the network side of the user-network interface.

**Default number:** Number provided by the network in case the combination of TON, NPI or the digits does not match the network screening.

### 3.2 Abbreviations

- CC: Country Code (E.164)
- CLIP: Calling Line Identification Presentation
- CLIR: Calling Line Identification Restriction
- DDI: Direct Dialling In
- DNIC: Data Network Identification Code (X.121)
- DSS1: Digital Subscriber Signalling System No. one
- E.164: ISDN/telephony numbering plan
- ETS: European Telecommunication Standard, issued by ETSI
- ETSI: European Telecommunication Standards Institute
- ISDN: Integrated Services Digital Network

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MAA: Multiple Address Assignment  
MSN: Multiple Subscriber Number  
NPI: Numbering Plan Identification  
NSN: National Significant Number (E.164)  
NTN: Network Terminal Number (X.121)  
PDN: Packet Data Network (X.25)  
PMBS: Packet Mode Bearer Services  
TA: Terminal Adapter  
TON: Type Of Number  
X.121: Data Numbering Plan

## 4 ISDN supplementary services and user facilities

### 4.1 ETSI standardised supplementary services

In general, only a few supplementary services are applicable for ISDN packet mode bearer services.

The supplementary services not mentioned in the following subsections are in general not applicable.

#### 4.1.1 Direct Dialling In (DDI)

Applicable.

The DDI supplementary service is described in the Telenor Nett Specification A44-3 [2]. The number shall always be sent en bloc.

#### 4.1.2 Multiple Subscriber Number (MSN)

Applicable.

The MSN supplementary service is described in the Telenor Nett Specification A44-3 [2]. The number shall always be sent en bloc.

#### 4.1.3 Calling Line Identification Presentation (CLIP)

Applicable.

The CLIP supplementary service is described in the Telenor Nett Specification A44-3 [2].

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Calling Line Identification Restriction (CLIR)

Not applicable for PMBS.

However, the S12 exchange has the possibility to override this supplementary service when used for PMBS.

#### **4.2 X.2 user facilities**

The X.2 user facilities applicable for ISDN packet mode bearer services are contained in the Telenor Nett Specifications A43-1 [3] and A43-2 [4].

#### **4.3 Non-standardised user facilities**

##### **4.3.1 Multiple Address Assignment (MAA)**

The MAA facility are available as a subscription option on all service classes offered, i.e. B-channel (both semi-permanent and switched), D-channel (both semi-permanent and PLL) and any combination of concurrent B- and D-channel subscription on the same subscriber number.

MAA allows a layer 2 entity to be associated with several layer 3 addresses. With this facility several E.164 addresses are grouped together to form an MAA group which is associated with the same physical link.

If this facility is activated, incoming calls with different X.25 called addresses (within the MAA group) will be routed to the specific link. For outgoing calls, the network will accept calls with different X.25 calling addresses (within the MAA group) on the specific link. This will effectively support interworking between the ISDN virtual circuit services and private (X.25) networks, or support several ports behind a terminal adapter (TA) by sharing the same physical link.

MAA is applicable both for incoming and outgoing virtual calls.

Several MAA groups can be defined at the same basic access or primary rate access interface.

All the numbers in an MAA group will have the same user profile defined.

The MAA facility is applicable with all packet mode services (both B- and D-channel). E.g. it is possible at the same time to subscribe to both switched and semi-permanent B-channel and one D-channel link of the same MAA subscription. In this particular case MAA can be associated with more than one physical link. This is a very powerful and flexible option as it would allow the subscriber to manipulate bandwidth on demand, as well as reduce the total communication costs.

Within an MAA group, one of the MAA group numbers has to be defined as the Master Address number for the common MAA group.

For the D-channel options, only one TEI value is defined. In the ISDN-exchange the MSN/DDI number to be associated with the TEI value is the Master Address.

For the semi-permanent B-channel option, the MSN/DDI number to be defined in the ISDN exchange is the Master Address.

For the switched B-channel there exists an option whether the Master Address is used or not.

When the Master Address is used the called address in the X.25 Incoming Call packet is mapped to the Master Address (which is common for the MAA group) and used in the DSS1

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incoming SETUP message. I.e. independent of the content of the X.25 called address field (as long as it is a member of the MAA group) the Master Address will always be used in the DSS1 incoming SETUP message when establishing the bearer channel. I.e., the MSN/DDI number to be defined in the ISDN exchange is the Master Address. This option makes it possible to exceed the limitation of eight MSN numbers on a basic access interface when DDI is not used.

When the Master Address is not used the called address in the X.25 Incoming Call packet is directly mapped and used in the DSS1 incoming SETUP message when establishing the bearer channel. I.e. depending on the content of the X.25 called address field (as long as it is a member of the MAA group) in the X.25 Incoming Call that triggers the establishment of the bearer channel, the contents of the Called party number information element of the incoming SETUP message will vary. I.e., all the numbers in the MAA group have to be defined in the ISDN exchange. For this option the maximum numbers to be defined in an MAA group are limited to the capacity of the access connection in the ISDN network. E.g., the limitation of eight MSN numbers on a basic access limit the maximum numbers to be defined in an MAA group to eight when DDI is not used.

The use of Master Address has no impact on the called- and calling numbers used in the X.25 packets. The numbers will pass the Packet Handler unchanged.

## 5 Number information

The following subsections describe the X.25 and ISDN number formats to be used when accessing ISDN packet mode bearer services.

### 5.1 X.25 number format

The following table describes the number format to be used in the X.25 packets both for incoming and outgoing calls at the originating and terminating side.

	<b>PDN is called entity</b>	<b>ISDN is called entity</b>
<b>PDN is calling entity</b>	outside scope	Cg=0+DNIC+NTN Cd=00+CC+NSN
<b>ISDN is calling entity</b>	Cg=00+CC+NSN Cd=0+DNIC+NTN	Cg=00+CC+NSN Cd=00+CC+NSN

Cg = X.25 calling address

Cd = X.25 called address

CC = country code = 47 for Norway

### 5.2 ISDN number format

ISDN numbers shall be sent en bloc for ISDN packet mode bearer services.

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## 5.2.1 Handling of calling party number

The following tables describes the number information sent by the user to the network, or sent by the network to the user in the calling party number information element.

### 5.2.1.1 Originating side

NPI	TON	NUMBER DIGITS
E.164 or unknown	National *	NSN
E.164 or unknown	Subscriber	NSN
E.164 or unknown	Unknown <small>Note 1</small>	NSN
E.164 or unknown	International	47+NSN

\* preferred coding

Note 1: Not applicable for ISPBX

*Note!* 47 is the country code for Norway

Use of any other NPI or TON value or other number digits will imply screening failure, and the network provided default number will be inserted by the ISDN and sent to the Packet Handler (PH). The network provided default number is not registered within the PH, so the default profile (not the standard- or user profile) will be selected by the PH. Dependent of the calling number sent in the X.25 Call Request message, the call may be cleared (if the X.25 calling number does not match the network provided number) or successfully connected (if the X.25 calling number matches the network provided number) with the limitations described in the default profile.

### 5.2.1.2 Terminating side

#### Incoming national ISDN call

NPI	TON	NUMBER DIGITS
E.164	National	NSN

#### Incoming international ISDN call

NPI	TON	NUMBER DIGITS
E.164	National	CC+NSN

#### Incoming PDN call

NPI	TON	NUMBER DIGITS
X.121	National	DNIC+NTN

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## 5.2.2 Handling of called party number

The following subsections describe the number information sent in the called party number information element.

### 5.2.2.1 Originating side

For the case B option, no called party number information element shall be sent.

### 5.2.2.2 Terminating side

NPI	TON	NUMBER DIGITS
E.164	National	NSN

## 6 Profile selection and load balancing/distribution and limiting

### 6.1 User profile selection

When a call is initiated, the ISDN user must be identified by the packet handler so the corresponding profile for the user can be selected. Once the user is identified, the user profile is selected.

#### User profile selection for outgoing calls

For the switched B-channel, the DSS1 calling party number is used for profile selection. If no profile is found, the default profile will be used in an attempt to connect the call. For the semi-permanent B-channel option, the X.25 calling address is used. For the D-channels options, the profile is selected based on the users DLCI value (SAPI+TEI) configured at subscription time.

If there is no calling address in the X.25 Call Request packet from the subscriber (for a non-MAA call), the proper X.25 calling address will be inserted by the PH. If the X.25 calling address is incorrect, or in case of MAA-call no X.25 calling address is sent, the call will be rejected with the diagnostic «invalid calling address».

#### User profile selection for incoming calls

The user profile is selected based on the called address field in the X.25 Incoming Call packet both for B- and D-channel services.

### 6.2 Determining the type of service

When the user profile is retrieved, it will indicate one, two or all of the following depending on the subscription time agreements:

- B-channel service, switched
- B-channel service, semi-permanent
- D-channel service, semi-permanent or PLL link

The Packet Handler (PH) provides two basic principles for service selections: D-channel has preference over B-channel, and established/permanent channels/links are used whenever



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possible. For an incoming call, the PH will apply the following selection mechanism (in the order shown) in accordance with the user's type of service and notification class subscriptions:

1. An established logical link on a D-channel will be used, up to its load limit (see section 7.3.3).
2. An established semi-permanent B-channel will be selected, using the balancing criteria defined in section 7.3.1 (when multiple semi-permanent channels exist), and the load limiting criteria defined in section 7.3.2.
3. An established switched B-channel will be selected, using the balancing criteria defined in section 7.3.1 (when multiple switched B-channels exist), and the load limiting criteria defined in section 7.3.2.
4. A PLL on a D-channel will be activated, using the load limiting criteria defined in section 7.3.3.
5. A switched B-channel will be established.

### **6.3 Load balancing/distribution and limiting**

Load balancing takes place in the PH upon the arrival of an incoming call. There are substantial differences between what occurs on a B-channel compared to what occurs on a D-channel in both balancing and limiting.

#### **6.3.1 Load balancing/distribution of VCs among established B-channels**

For incoming calls, the balancing/distribution will take place only when more than one access connection (B-channels) exist between the PH and the TE and these connections are associated with the same user number. If only one access connection exists, additional access connections to the same number will not be established for the purpose of balancing/distribution (although additional connections may be established for other reasons).

##### **6.3.1.1 Switched B-channels**

Load gathering as opposed to load balancing is implemented for switched B-channels. If two switched B-channels are established to the same user number, an effort will be made to fill up the channel with the largest number of VCs as long as the channel is within its maximum VC limit.

In the case of one switched and one semi-permanent B-channel, an effort will be made to fill up the semi-permanent B-channel until it reaches its maximum number of VCs.

##### **6.3.1.2 Semi-permanent B-channels**

The balancing/distribution between two or more semi-permanent B-channels is based on load balancing, using the specified maximum number of VCs as one of the criteria.

#### **6.3.2 Load limit on B-channels**

A parameter entered in the user's profile specifies the maximum number of VCs for the B-channel link. Once the specified maximum number of VCs is active, no additional VCs will be activated on that specific B-channel link. As a result, if the profile indicates switched B-

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channel service (and PLL service may not be used), an attempt will be made to complete the call by activating another B-channel.

### **6.3.3 Load limit on D-channel link**

A parameter entered in the user's profile specifies the maximum number of VCs for the D-channel link. Once the specified maximum number of VCs is active, no additional VC will be activated on that specific D-channel link. If the user does not subscribe to any other service, the VC will be rejected.

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## 7 HISTORY

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