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# Guidelines for Usage of Enbloc / Overlap Signalling in UK networks

Issue 1

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**Normative Information**



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# 1 Introduction

This document provides a best practice guide to minimising the usage of overlap signalling between UK telecoms networks.

As some calls are to numbers where the number length cannot easily be determined, it has become common practice in UK networks to utilise Overlap signalling, whereby digits are sent in clusters until the terminating network acknowledges that sufficient digits have been received to process the call.

Although the signalling systems used in Next Generation Networks (NGNs) are capable of supporting such Overlap signalling, this is done in a relatively inefficient way. Therefore it is good practice to minimise such usage to where it is absolutely essential. Whilst the issues that arise are largely confined to networks migrated to NGN technology, a TDM-based originating network does not necessarily know the technology used by the terminating network, so the recommendations in this document apply to all UK networks.

Section 2 of this document explains the background to the requirement, while Section 3 provides detail of the recommended usage of Enbloc versus Overlap signalling, both for UK destinations and the most popular overseas destinations.

# 2 Background

UK telecoms networks support two mechanisms for signalling the destination number of a call;

- In Enbloc signalling, the sending node accumulates all the digits from the preceding node (or, in the case of the originating node, the customer), before passing them as a single message to the receiving node.

  Enbloc signalling is typically used where the number length is known, so the sending node is aware of how many digits to await prior to sending them to the receiving node. The number length can be known either by digit decode information in the sending node, by the application of a timer that assumes sufficient digits have been received once it expires, or by an indication from the caller that they have completed dialling (e.g. mobile handsets).

- In Overlap signalling, the sending node transmits the digits in discrete blocks of messages, sending one or more digits in each block. The receiving node indicates when it has received sufficient digits.

  Overlap signalling is typically used where the number length is not known by the sending node. Although less efficient than Enbloc signalling, Overlap is the only mechanism which is practicable where the number length isn't known by the sending node and usage of an inter-digit timer is viewed as undesirable.

C7 signalling as used for interconnection of TDM-based networks in the UK (ND1006, ND1007) is capable of support of both.

Similarly, SIP(I) signalling, as used for interconnection of NGN-based networks in the UK (ND1017) is capable of the support of both. However, usage of Overlap signalling within SIP(I) incurs significant performance penalties. In SIP(I), when a sending node transmits additional digits, it results in a second INVITE message. The second INVITE contains all of the information in the original INVITE plus the extra digits (NB the extra digits are not added

to the encapsulated C7 signalling). The receipt of the second INVITE is seen as a completely fresh call attempt, and so causes the first INVITE to be rejected and the process of call establishment to start anew; negotiation of the bearer path may also have to start anew. This re-start occurs every time extra digits have to be sent. The result is that both nodes are now performing more work and call establishment will take longer.

Clearly, extensive use of Overlap signalling within UK NGNs is undesirable because of these performance implications. Although a potential approach could be to devise a better approach to accommodating Overlap signalling within SIP(I), this would require international agreement and NICC has concluded that this would not be practicable prior to the introduction of NGN interconnection in the UK. Therefore, this document seeks to provide guidance to minimise the usage of Overlap signalling to those situations where it is absolutely essential.

# 3 Recommended usage of Enbloc versus Overlap Signalling

## *3.1 Overview*

Overlap signalling should only be used where absolutely essential, and originating CPs should make all efforts to use Enbloc signalling. It should be noted that because an originating CP can have no knowledge of the technologies used by downstream networks, this guidance applies regardless of whether the technology used by the originating CP is NGN or TDM.

In general, two mechanisms can be used to enable a call to be conveyed in Enbloc mode;

- An inter-digit timer can be employed such that, if a digit is not received from the customer within N[1] seconds, it is assumed that they have finished dialling. The call can then be sent using Enbloc signalling. The disadvantage with this approach is that post-dial delay is experienced, caused by the originating node pausing to determine whether the customer intends to dial an additional digit.

- The originating node can be configured so that the number length of each range is known, and the call is sent as Enbloc signalling once this number length is reached. This avoids the need for the introduction of post-dial delay, but it requires originating CPs to correctly manage the number length data on their network.

In some cases, a hybrid system of the above approaches can be adopted, whereby the originating node is aware of the shortest and longest number length within a given range, and inter-digit timers are used where the customer dials a number within these constraints.

**Other than where indicated within the remainder of this section it is recommended that where possible originating CPs utilise digit decode to determine the appropriate number length, defaulting to last digit timers where this isn't practicable. Where CPs are unable or unwilling to use last digit timers, they should use Overlap signalling but starting with the minimum number length so as to reduce the number of re-starts.**

It should be noted that the guidance provided in this document relates to numbers that can be publicly dialled. Nothing within this document should be taken to prevent CPs from striking bilateral agreements to route other numbers, for example routeing numbers.

[1] N is chosen by the CP, and is typically 4-6 seconds

## *3.2 UK Calls*

### 3.2.1 Geographic Numbers

**It is possible for CPs to configure their nodes to determine the number length of any UK geographic number, hence it is recommended that CPs use Enbloc signalling. Where CPs are unwilling to do this, they should determine the relevant shortest and longest number length for a given area code, and use inter-digit timers to determine when customers have completed dialling.**

UK Geographic numbers in general have 11 digits (including the leading zero). Certain number ranges are shorter than this; in a series of locations such as Whitehaven, 10 digit numbers are used. In Brampton, shorter number lengths than this are utilised.

Information about the length of numbers in each range is provided on the Ofcom website (www.ofcom.org.uk), under the "Information for Industry" heading; where there is any doubt as to the accuracy of this information the rangeholder CP should be contacted.

### 3.2.2 Mobile Numbers

All numbers in the 07 number range are of 11 digits (including the leading zero). **Therefore, it is recommended that CPs configure their networks to expect this number of digits hence use Enbloc signalling.**

### 3.2.3 Non-geographic Numbers

**It is possible for CPs to configure their nodes to determine the number length of any UK non-geographic number, hence it is recommended that CPs use Enbloc signalling. Where CPs are unwilling to do this, they should determine the relevant shortest and longest number length for a given area code, and use inter-digit timers to determine when customers have completed dialling.**

UK Non-Geographic numbers are in general of 11 digit length (including the leading zero), with the following exceptions;

- 0500 numbers are of 10 digit length (including the leading zero)
- Certain legacy 0800 numbers are of 10 digit length (including the leading zero)
- Certain isolated 08 number ranges are of 8 digit length (including the leading zero), notably 0800 1111 and 0845 46 47.

Information about the length of numbers in each range is provided on the Ofcom website (www.ofcom.org.uk), under the "Information for Industry" heading; where there is any doubt as to the accuracy of this information the rangeholder CP should be contacted.

### 3.2.4 Indirect Access

In the case of Indirect Access (IDA), the originating CP is only aware of the access code dialled by the customer, and the subsequent digits bear significance only to the IDA CP.

NICC has examined whether it would be possible to categorise IDA services into those where the following digits are an E.164 number, and those where the following digits may not be an E.164 number. In principle, for the former category, this would allow the originating CP to replicate the data tables setting out relevant number lengths for their own calls, hence allowing Enbloc signalling to be used. In practical terms, however, it has proven impossible to do this replication in a resource efficient way, so this approach has been abandoned. **Therefore, it is acknowledged that Overlap signalling is appropriate for IDA services.**

### 3.2.5 Carrier Pre-Selection

In Carrier Pre-Selection (CPS), the originating CP carries out rudimentary analysis of the dialled digits, and inserts a CPS prefix as dictated by the customer preferences. As with IDA, in principle, for CPS the originating CP could replicate the data tables setting out relevant number lengths for their own calls, hence allowing Enbloc signalling to be used. In practical terms, however, it has proven impossible to do this replication in a resource efficient way, so this approach has been abandoned. **Therefore, it is acknowledged that Overlap signalling is appropriate for CPS services.**

### 3.2.6 Targeted Transit

For Targeted Transit, the originating, transit and terminating networks agree a digit format to be used. **NICC recommends that CPs agree this structure such that where possible a fixed-length numbering scheme is used, allowing Enbloc signalling to be employed.**

### 3.2.7 0899 routeing prefix

For 0899, the originating and terminating networks (and, if applicable, transit networks) agree a digit format to be used. **NICC recommends that CPs agree this structure such that where possible a fixed-length numbering scheme is used, allowing Enbloc signalling to be employed.**

### 3.2.8 Calls to Ported Numbers

For Geographic Number Portability (GNP) and Non-Geographic Number Portability (NGNP), a fixed length prefix is appended to the destination number. As such, the same considerations as outlined in Sections 3.2.1 and 3.2.3 apply regards the number length. **However, by the time the call undergoes the onward routeing leg of the call with the NP prefix, the number length is known hence Enbloc signalling should be used.**

For Mobile Number Portability, per NICC ND1208 a fixed length Intermediate Routeing Number (IRN) is used to route calls to the recipient network. **NICC therefore recommends that this leg of the call should use Enbloc signalling.**

## *3.3 International Calls*

This section details the minimum and maximum digits to be expected on calls to popular international destinations.

**It is inherent that numbering plans change; where possible a link has been provided to sites that will provide the latest information, and this document will be periodically reviewed for accuracy. However it must be stressed that NICC accepts no liability for errors in this section.**

For countries not described in detail, the ITU provides a guide to numbering plans at http://www.itu.int/oth/Default.aspx?parent=T0202.

In all cases, the number lengths stated exclude the country code and the international access code (i.e. 00).

**NICC recommends that where possible Enbloc signalling should be used. It is acknowledged that for some destinations this is problematic so it is acknowledged that Overlap signalling may be necessary where highlighted.**

### 3.3.1 Australia, CC=61

The Australian numbering plan is predominately of fixed length. For further information about the Australian numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200000D0001MSWE.doc .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +61 0 | Variable | NICC acknowledges Overlap may be necessary |
| +61 1 | Variable | NICC acknowledges Overlap may be necessary |
| +61 2 | Fixed at 9 digits | Enbloc |
| +61 3 | Fixed at 9 digits | Enbloc |
| +61 4 | Fixed at 9 digits | Enbloc |
| +61 5 | Fixed at 9 digits | Enbloc |
| +61 6 | Not used | N/A |
| +61 7 | Fixed at 9 digits | Enbloc |
| +61 8 | Fixed at 9 digits | Enbloc |
| +61 9 | Not used | N/A |

### 3.3.2 Bangladesh, CC=880

The Bangladesh numbering plan has differing length number ranges according to the destination. For this reason it may not be practicable to implement enbloc signalling to Bangladesh destinations.

For further information about the Bangladesh numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200001200001MSWE.doc.

### 3.3.3 Belgium, CC=32

The Belgian numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Belgian numbering plan, see http://www.bipt.be/bipt_E.htm .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +32 1 (excl +32 17) | Fixed at 8 digits | Enbloc |
| +32 17 | Variable | NICC acknowledges Overlap may be necessary |
| +32 2 | Fixed at 8 digits | Enbloc |
| +32 3 | Fixed at 8 digits | Enbloc |
| +32 4 | Variable | NICC acknowledges Overlap may be necessary |
| +32 5 | Fixed at 8 digits | Enbloc |
| +32 6 | Fixed at 8 digits | Enbloc |
| +32 7 | Variable | NICC acknowledges Overlap may be necessary |
| +32 8 | Fixed at 8 digits | Enbloc |
| +32 9 | Variable | NICC acknowledges Overlap may be necessary |

### 3.3.4 China, CC=86

The China numbering plan has differing length number ranges according to the destination. For this reason it may not be practicable to implement enbloc signalling to Chinese destinations.

For further information about the Chinese numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200002B0001XLSE.xls .

**NICC acknowledges that it is appropriate to use overlap signalling to Chinese destinations.**

### 3.3.5 Denmark, CC=45

The Danish numbering plan is predominately of fixed length. For further information about the Danish numbering plan, see http://www.itst.dk/wimpdoc.asp?page=tema&objno=95024035 .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +45 1 | Variable | NICC acknowledges Overlap may be necessary |
| +45 2 | Fixed at 8 digits | Enbloc |
| +45 3 | Fixed at 8 digits | Enbloc |
| +45 4 | Fixed at 8 digits | Enbloc |
| +45 5 | Fixed at 8 digits | Enbloc |
| +45 6 | Fixed at 8 digits | Enbloc |
| +45 7 | Fixed at 8 digits | Enbloc |
| +45 8 | Fixed at 8 digits | Enbloc |
| +45 9 | Fixed at 8 digits | Enbloc |

### 3.3.6 France, CC=33

The French numbering plan is of fixed length[2], being 9 digits.

For further information on the French numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200004A0001MSWE.doc .

**NICC recommends that enbloc signalling always be used to French destinations.**

### 3.3.7 Germany, CC=49

The German numbering plan is highly variable. Additionally, support of Direct Dial Inward (DDI) in Germany is frequently implemented by the extension digits being dialled after the main number rather than as part of it. For this reason it isn't practicable to implement enbloc signalling to German destinations.

For further information about the German numbering plan, see http://www.bundesnetzagentur.de/enid/47393a59eaa098b980093f54f6b45fa1,0/1k0.html

[2] At least for numbers which are accessible overseas; while there are certain short codes, these are not generally internationally enabled.

**NICC acknowledges that it is appropriate to use overlap signalling to German destinations.**

### 3.3.8 Greece, CC=30

The Greek numbering plan consists of a mixture of fixed and variable length ranges. For this reason it may not be practicable to implement enbloc signalling to Greek destinations.

For further information about the Greek numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000550001MSWE.doc .

**NICC acknowledges that it is appropriate to use overlap signalling to Greek destinations.**

### 3.3.9 India, CC=91

The Indian numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Indian numbering plan, see <insert ref>.

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +91 1 | Fixed at 10 digits | Enbloc |
| +91 2 (excl +91 20) | Enbloc | Enbloc |
| +91 20 | Variable (9 – 10 digits) | NICC acknowledges Overlap may be necessary |
| +91 3 | Fixed at 10 digits | Enbloc |
| +91 4 | Fixed at 10 digits | Enbloc |
| +91 5 | Fixed at 10 digits | Enbloc |
| +91 6 | Fixed at 10 digits | Enbloc |
| +91 7 | Variable (8 – 11 digits) | NICC acknowledges Overlap may be necessary |
| +91 8 | Variable (8 – 11 digits) | NICC acknowledges Overlap may be necessary |
| +91 9 | Variable (10 – 12 digits) | NICC acknowledges Overlap may be necessary |

### 3.3.10 Ireland, CC=353

The Irish numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Irish numbering plan, see http://www.comreg.ie/sector/default.asp?s=4&navid=55 .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +353 1 | Fixed at 8 digits | Enbloc |
| +353 2 (excl +353 21) | Fixed at 7 digits | Enbloc |
| +353 21 | Between 6 and 9 digits | NICC acknowledges Overlap may be necessary |
| +353 4 (excl +353 40, 43, 45,47) | Between 7 and 9 digits | NICC acknowledges Overlap may be necessary |
| +353 40, 45 | Fixed at 8 digits | Enbloc |
| +353 43, 47 | Fixed at 7 digits | Enbloc |
| +353 5 (excl +353 50, 52, 54, 58, 59) | Between 7 and 9 digits | NICC acknowledges Overlap may be necessary |
| +353 50 | Fixed at 8 digits | Enbloc |
| +353 52, 54, 58 | Fixed at 7 digits | Enbloc |
| +353 59 | Fixed at 9 digits | Enbloc |
| +353 6 (excl +353 61, 65, 66, 68) | Fixed at 7 digits | Enbloc |
| +353 61 | Fixed at 8 digits | Enbloc |
| +353 65, 66, 68 | Between 7 and 9 digits | NICC acknowledges Overlap may be necessary |
| +353 7 (excl +353 71, 74, 76) | Fixed at 7 digits | Enbloc |
| +353 71, 74, 76 | Between 7 and 9 digits | NICC acknowledges Overlap may be necessary |
| +353 8 | Between 8 and 10 digits | NICC acknowledges Overlap may be necessary |
| +353 9 (excl +353 90, 91, 94) | Fixed at 7 digits | Enbloc |
| +353 90, 91, 94 | Between 7 and 9 digits | NICC acknowledges Overlap may be necessary |

### 3.3.11 Italy, CC=39

The Italian numbering plan is highly variable. For this reason it isn't practicable to implement enbloc signalling to Italian destinations.

**NICC acknowledges that it is appropriate to use overlap signalling to Italian destinations.**

### 3.3.12 Monaco, CC=377

The Monaco numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Monaco numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200008D0001MSWE.doc .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +377 4 | Variable | NICC acknowledges Overlap may be necessary |
| +377 6 | Variable | NICC acknowledges Overlap may be necessary |
| +377 7 | Fixed at 5 digits | Enbloc |
| +377 9 | Fixed at 8 digits | Enbloc |

### 3.3.13 Netherlands, CC=31

The Dutch numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Dutch numbering plan, see http://www.opta.nl/asp/en/numberingissues/ .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +31 1 | Fixed at 9 digits | Enbloc |
| +31 2 | Fixed at 9 digits | Enbloc |
| +31 3 | Fixed at 9 digits | Enbloc |
| +31 4 | Fixed at 9 digits | Enbloc |
| +31 5 | Fixed at 9 digits | Enbloc |
| +31 6 (excl +31 66) | Variable | NICC acknowledges Overlap may be necessary |
| +31 66 | Fixed at 9 digits | Enbloc |
| +31 7 | Fixed at 9 digits | Enbloc |
| +31 8 (excl +31 800) | Fixed at 9 digits | Enbloc |
| +31 800 | Variable | NICC acknowledges Overlap may be necessary |
| +31 9 | Variable | NICC acknowledges Overlap may be necessary |

### 3.3.14 Nigeria, CC=234

The Nigerian numbering plan has differing length number ranges according to the destination. For this reason it may not be practicable to implement enbloc signalling to Nigerian destinations.

For further information about the Nigerian numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T020200009C0001MSWE.doc.

### 3.3.15 North American Numbering Plan (including USA, Canada and various parts of Caribbean), CC = 1

With the exception noted below, the North American Numbering Plan (NANP) is of fixed length, at 10 digits.

For further information on the NANP, see http://www.nanpa.com

NICC is aware of one number range, +1 09x, which is used as a routeing code and has some numbers of 11 digits; it is an individual CP matter of how to treat it.

**NICC recommends that enbloc signalling always be used to NANP destinations.**

### 3.3.16 Pakistan, CC=92

The Pakistani numbering plan has differing length number ranges according to the destination. For this reason it may not be practicable to implement enbloc signalling to Pakistani destinations.

For further information about the Pakistani numbering plan, see http://www.pta.gov.pk/index.php?cur_t=vnormal.

### 3.3.17 Poland, CC=48

The Polish numbering plan consists of a mixture of fixed and variable length ranges. For this reason it isn't practicable to implement enbloc signalling to Polish destinations.

For further information about the Polish numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000A80001MSWE.doc .

**NICC acknowledges that it is appropriate to use overlap signalling to Polish destinations..**

### 3.3.18 Portugal, CC=351

The Portuguese numbering plan consists of a mixture of fixed and variable length ranges. For this reason it isn't practicable to implement enbloc signalling to Portuguese destinations.

For further information about the Portuguese numbering plan, see http://www.anacom.pt/template12.jsp?categoryId=5344 .

**NICC acknowledges that it is appropriate to use overlap signalling to Portuguese destinations.**

### 3.3.19 Russia, CC=7

The Russian numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Russian numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000AD0001MSWE.doc

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +7 0 | Fixed at 10 digits | Enbloc |
| +7 3 | Fixed at 10 digits | Enbloc |
| +7 4 | Fixed at 10 digits | Enbloc |
| +7 5 | Fixed at 10 digits | Enbloc |
| +7 8 (excl +7 800, +7 8532) | Fixed at 10 digits | Enbloc |
| +7 800, +7 8532 | Between 10 and 13 digits | NICC acknowledges Overlap may be necessary |
| +7 9 (excl +7 904, 905, 908, 915, 919, 925, 95x, 96x, 98x, 99x) | Fixed at 10 digits | Enbloc |
| + 7 904, 905, 908, 915, 919, 925, 95x, 96x, 98x, 99x | Between 10 and 13 digits | NICC acknowledges Overlap may be necessary |

### 3.3.20 South Africa, CC=37

The South African numbering plan consists of a mixture of fixed and variable length numbers. For further information about the South African numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000C10001MSWE.doc .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +27 1 | Variable | NICC acknowledges Overlap may be necessary |
| +27 2 | Fixed at 9 digits | Enbloc |
| +27 3 | Fixed at 9 digits | Enbloc |
| +27 4 | Fixed at 9 digits | Enbloc |
| +27 5 | Fixed at 9 digits | Enbloc |
| +27 6 | Not used | N/A |
| +27 7 | Variable | NICC acknowledges Overlap may be necessary |
| +27 8 | Variable | NICC acknowledges Overlap may be necessary |
| +27 9 | Not used | N/A |

### 3.3.21 Spain, CC=34

The Spanish numbering plan consists of a mixture of fixed and variable length numbers. For further information about the Spanish numbering plan, see http://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000C20001MSWE.doc .

The table below summarises NICC's recommendations;

| Range | Number Length | Recommended signalling |
|---|---|---|
| +34 6 | Between 8 and 13 digits | NICC acknowledges Overlap may be necessary |
| +34 7 | Between 8 and 12 digits | NICC acknowledges Overlap may be necessary |
| +34 8 (excl +34 800) | Fixed at 9 digits | Enbloc |
| +34 800 | Between 9 and 11 digits | NICC acknowledges Overlap may be necessary |
| +34 9 (excl +34 904) | Fixed at 9 digits | Enbloc |
| +34 904 | Between 9 and 12 digits | NICC acknowledges Overlap may be necessary |

### 3.3.22 Sweden, CC=46

The Swedish numbering plan consists of a mixture of fixed and variable length ranges. For this reason it may not be practicable to implement enbloc signalling to Swedish destinations.

For further information about the Swedish numbering plan, see http://www.pts.se/Archive/Documents/SE/Sv_nrplan_telefoni_enl_TU-T_rek_E.164.pdf .

**NICC acknowledges that it is appropriate to use overlap signalling to Swedish destinations.**

### 3.3.23 Switzerland, CC=41

The Swiss numbering plan has differing length number ranges according to the destination. For this reason it may not be practicable to implement enbloc signalling to Swiss destinations.

For further information about the Swiss numbering plan, see http://www.bakom.admin.ch/themen/telekom/00479/00604/index.html?lang=en .

**NICC acknowledges that it is appropriate to use overlap signalling to Swiss destinations.**

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