

## **SIP**

# **Network to Network Interface Signalling**

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## Foreword

This NICC Document (ND) has been produced by NICC SIP TG

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# 1 Scope

The present document provides the signalling requirements for interconnection of basic voice services between networks using SIP.

Annexes to the present document extend the scope to additional services where use is agreed between the interconnecting parties.

NICC is aware of UK regulatory discussions about Calling Number Identification which could require significant changes to the contents of the present document. This may result in an update to the present document which may not be backwards compatible when the outcome of UK regulatory discussions is clear.

The SIP TG work to develop specifications for signalling interworking to/from ND1035 may also result in updates to the present document.

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# 2 References

For the particular version of a document applicable to this release see ND1610 [1].

## 2.1 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ND1610 Next Generation Networks, Release Definition.
- [2] ND1647 SIP-NNI Basic Voice Architecture.
- [3] ND1016 Requirements on Communications Providers in relation to Customer Line Identification display services and other related services.
- [4] ND1704 End-to-End Network Performance Rules & Objectives for the Interconnection of NGNs.
- [5] RFC 3261 SIP: Session Initiation Protocol.
- [6] RFC 3323 A Privacy Mechanism for the Session Initiation Protocol.
- [7] RFC 3325 Private Extensions to the Session Initiation Protocol for Asserted Identity within Trusted Networks.
- [8] RFC 3362 Real-time Facsimile (T.38) - image/t38 MIME Sub-type Registration.
- [9] RFC 3966 The tel URI for Telephone Numbers.
- [10] RFC 7044 An Extension to the Session Initiation Protocol for Request History Information.
- [11] RFC 4566 SDP: Session Description Protocol.
- [12] RFC 4733 RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals.
- [13] RFC 5009 Private Header (P-Header) Extension to the Session Initiation Protocol for Authorization of Early Media.
- [14] RFC 5079 Rejecting Anonymous Requests in the Session Initiation Protocol.
- [15] ITU-T Rec. T.38 Procedures for real-time Group 3 facsimile communication over IP networks.
- [16] RFC 3264 An Offer/Answer Model with the Session Description Protocol.

- [17] RFC 4412 Communications Resource Priority for the Session Initiation Protocol.
- [18] RFC 7135 Registering a SIP Resource Priority Header Field Namespace for Local Emergency Communications

---

## 3 Abbreviations

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

CC	Country Code
CLI	Calling Line Identity
CLIP	Calling Line Identity Presentation
CLIR	Calling Line Identity Restriction
CP	Communication Provider
DTMF	Dual Tone Multi-Frequency
ITU-T	International Telecommunication Union -Telecomms
MIME	Multi-purpose Internet Mail Extension
NN	Network Number
NNI	Network to Network Interface
NSN	National Significant Number
PN	Presentation Number
RFC	Request for Comment
RTP	Real-Time Protocol
SIP	Session Initiation Protocol
SDP	Session Description Protocol
UAC	User Agent Client
UAS	User Agent Server
UK	United Kingdom
UNI	User Network Interface
URI	Uniform Resource Identifier

---

## 4 SIP Signalling

### 4.1 SIP Methods and Headers

#### 4.1.1 SIP Methods

The SIP methods required to support basic voice services between networks are specified in Table 4.1 below.

Other SIP method extensions may be used as described in the appropriate Annex.

Method	RFC
ACK	3261 [5]
BYE	3261 [5]
CANCEL	3261 [5]
INVITE	3261 [5]
OPTIONS	3261 [5]

**Table 4.1: SIP Methods**

## 4.1.2 SIP headers

### 4.1.2.1 General

Unless stated in the present document, any other SIP header /error code extensions that may be present in requests/ responses shall be handled according to the rules in RFC 3261 [5].

### 4.1.2.2 Special Behaviour

In order to support basic calls the following SIP extensions shall be supported across the NNI:

- ‘P-Asserted-Identity’ header as described in RFC 3325 [7].

The ‘P-Asserted Identity’ header is required to support the requirements of ND1016 [3] and shall be present in any request that is attempting to create a dialogue. Please refer to the CLIP/CLIR clause of the present document.

- ‘Privacy’ header as described in RFC 3323 [6].

The presence of this header in any request that is attempting to create a dialogue is dependent on whether or not anonymity has been requested by the calling user. Please refer to the CLIP/CLIR clause of the present document.

- 433 (Anonymity Disallowed) error code as described in RFC 5079 [14].

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# 5 Media Establishment

## 5.1 General

The SIP NNI shall utilise the Session Description Protocol (SDP) as described in RFC 4566 [11]. Media capabilities shall be negotiated according to RFC 3264 [16].

The media path used shall comply with ND1704 [4]. Specifically the guidance in ND1704 [4] regarding the use of G.711 A-law as the default codec for interoperability shall apply.

NOTE: RFC 3261 [5] supports sending a 488 (Not Acceptable Here) response which, if agreed bilaterally, offers an alternative to including G.711 A-law in the initial INVITE.

To support early media call scenarios (e.g. far end ringing, changed number announcement) an SDP offer should be included in the initial INVITE request.

**NOTE:** Early media call scenarios depend on a backward media path being established to the originator prior to answer (200 OK). To fulfil this requirement an SDP offer must be generated from the originating terminal (or media gateway).

Establishment of a backward media path prior to answer cannot be guaranteed unless an SDP offer is included in the initial INVITE.



## 5.2 DTMF Transport

Support for the transportation of DTMF using telephone events is optional when operating with a G.711 codec. When required, support shall be indicated in the SDP offer per RFC 4733 [12].

## 5.3 FAX

Use of a G.711 codec is recommended for transmission of fax information.

When required, support for ITU-T Rec. T.38 [15] Fax transport shall be indicated in the SDP offer per RFC 3362 [8].

**NOTE:** Calls encountering multiple T.38 hops (.e.g. due to multiple TDM<->IP interworkings) have been shown to suffer quality degradation.

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# 6 Addressing Formats

## 6.1 General

The SIP NNI shall support the sip and tel URI schemes in the req-URI, From, To and P-Asserted-Id headers contained within SIP requests and responses.

## 6.2 sip URI

The sip URI scheme is defined in RFC 3261 [5] and contains a userinfo portion and a host portion. The userinfo portion can contain either a user field or a telephone-subscriber field (see 6.4). For the purposes of the NNI the telephone-subscriber field is used. As a result the sip URI must end with the user parameter containing the descriptor 'phone' i.e. user=phone.

The host portion must comply with ND1647 [2].

## 6.3 tel URI

The tel URI scheme is defined in RFC 3966 [9] and contains a telephone-subscriber field (see 6.4).

## 6.4 telephone-subscriber field

A telephone-subscriber field can contain an address in either global-number format or a local-number format. Although RFC 3966 [9] allows the use of visual separators in both a global-number and local-number portion they should not be used across this interface unless agreed bilaterally.

The global-number portion of a sip or tel URI shall comprise at least an E.164 international number prefixed by "+".

The local-number format shall comprise at least:

- A local-number-digits portion which contains the UK specific address
- A context portion with the descriptor set to "+44"

The local-number format shall only be used in the req-URI and To header fields.

NOTE: The first digit of a UK specific address cannot be 0 and there is no mechanism in this NNI to carry UK national format numbers which must therefore be formatted as an E.164 number including the UK country code 44.

Examples of the encoding of UK specific addresses can be found in Annex D of the present document.

The following are examples of the minimum compliant URI formats:

- sip:+<CC><NDC><SN>@<domain>;user=phone
- sip:<UK specific address>;phone-context=+44@<domain>;user=phone
- tel:+<CC><NDC><SN>
- tel:<UK specific address>;phone-context=+44

Where <CC> is the country code, <NDC> is the national destination code, <SN> is the subscriber number, and <domain> is an element name compliant with ND1647 [2].

## 7 CLIP/CLIR

### 7.1 General

The following principles apply to transport of CLI within and between trusted carrier networks when using the SIP NNI protocol:

- The implementations shall conform to ND1016 [3]
- The Network Number shall be transported in the ‘P-Asserted-Identity’ header defined in RFC 3325 [7].
- The Presentation Number shall be transported in the ‘From’ header defined in RFC 3261 [5].

### 7.2 ‘From’ header

If anonymity has not been requested then the ‘From’ header shall contain either:

- A Presentation Number (PN), or
- The Network Number (NN) value included in the ‘P-Asserted-Identity’ header if a PN is not available.

If anonymity has been requested then either:

- a ‘Privacy’ header shall be present containing priv-value ‘user’, or
- the ‘From’ header shall be anonymised as described in RFC 3323 [6].

**Note:** Use of the privacy header is recommended.

No semantic meaning shall be ascribed to the contents of the optional display name of a From header field.

### 7.3 'P-Asserted-Identity' header

A 'P-Asserted-Identity' header, as described in RFC 3325 [7], shall be included in all call originations. Where a Network Number is not available from the originating interface, a 'P-Asserted-Identity' header shall be generated.

**NOTE:** The value generated for the 'P-Asserted-Identity' header shall be chosen to facilitate subsequent networks in identifying the first point at which a reliable Network Number was signalled. In the case of a UNI this will be the Network Number assigned to the interface; in the case of an NNI this will be a number from the CPs UK allocated number ranges.

Where the number is to be marked restricted the 'Privacy' header shall be present containing the priv-value 'id' as described in RFC 3323 [6] and RFC 3325 [7].

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## Annex A (normative): Emergency Calls

Support for this annex is optional and to be agreed bilaterally between connecting CPs.

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### A.1 Identification of Emergency calls

Priority for emergency calls shall be signalled by the inclusion of a Resource Priority header field defined in IETF RFC 4412 [17] containing a value from the ESNET namespace defined in IETF RFC 7135 [18]. The absence of a Resource Priority header field defined in [17] or the absence of value from the ESNET namespace shall indicate a normal call (non-priority).

Only one level of priority for emergency calls is required in the UK and for consistency of implementation it is recommended that the value “esnet.2” is used however all priority values in the ESNET namespace shall have equal precedence in the event of resource contention.

Any Resource Priority header field containing a value from the ESNET namespace and originating from an untrusted domain shall be discarded and the call shall be handled with normal priority.

IETF RFC 4412 mandates the use of TLS, the ‘sips’ URI scheme and Digest Authentication. Use of these functions in the UK shall be optional when the NNI is provided over a private IP connection.

**NOTE:** Alternative methods for signalling priority (e.g. service addressing) can be implemented by bilateral agreement.

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### A.2 Handling of Emergency Calls

Under normal conditions no specific treatment shall be applied to calls identified as having emergency priority however, when resource contention is encountered, calls identified as having emergency priority shall be afforded preferential treatment in the application of functions such as restrictive network controls, rate limiting, overload controls. This will ensure that emergency calls are given an enhanced opportunity to mature.

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## Annex B (normative): Call Divert

Support for this annex is optional and to be agreed bilaterally between connecting CPs.

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### B.1 UK NNI support of call divert.

The 'History-Info' header field defined in RFC 7044 [10] shall be used to provide information regarding the identity of the diverting party.

NOTE: The information in a 'History-Info' header field [10] may have been inserted by a user entity and cannot be used for services such as Carrier Pre-Select validation and billing which require a network asserted identity. Signalling the network asserted identity of a diverting party is for further study.

A CP may apply rules to prevent loops occurring based on the 'History-Info' header field[10]

### B.2 Dropback

Forwarded calls are routed through the diverting CP for the duration of the call so that charging and other services can be provided to the forwarding customer. Therefore 3xx responses are not used.

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## Annex C (normative): Support of P-Early-Media

Support for this annex is optional and to be agreed bilaterally between connecting CPs.

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### C.1 Introduction

This annex endorses the use of RFC 5009 [13] to support the use of in-band tones and announcements in the UK.

#### C.1.1 Exceptions

RFC 5009 [13] shall apply except for the following:

Section 3 – The User Agent Client (UAC) shall refer to the Calling CP and the User Agent Server (UAS) shall refer to the called CP.

Section 4 – Forward early media shall not be permitted.

Section 4.2 – Forward early media shall not be permitted.

Section 6 - Forward early media shall not be permitted.

Section 7 – Parallel Forking is outside the scope of this specification.

Section 8 - Forward early media shall not be permitted.

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## Annex D (informative): Examples of UK Specific Numbers

This annex provides examples of how UK Specific numbers are coded within SIP

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### D.1 Number Portability

For Number Portability the local-number format of a telephone subscriber portion would be structured as follows:

```
sip:5xxxxx01277325555;phone-context=+44@example.com;user=phone
```

```
tel:5xxxxx01277325555;phone-context=+44
```

Where 5xxxxx is the Number Portability Prefix (a six digit, fixed length prefix of 5xxxxx, in which '5' indicates Number Portability and the remaining digits the Recipient Exchange Code) followed by the called number.

---

### D.2 Indirect Access

For Indirect Access the local-number format of a telephone subscriber portion would be structured as follows:

```
sip:1xxx01277325555;phone-context=+44@example.com;user=phone
```

```
tel:1xxx01277325555;phone-context=+44
```

Where 1xxx is the Indirect Access Prefix (1xxx; a code designated for a particular operator that may be dialled by a subscriber) followed by the called number.

---

### D.3 Directory Enquiries

For Directory Enquiries the local-number format of a telephone subscriber portion would be structured as follows:

```
sip:118xxx;phone-context=+44@example.com;user=phone
```

```
tel:118xxx;phone-context=+44
```

Where xxx identifies the provider of the called Directory Enquiries service

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## History

<b>Document history</b>		
<b>&lt;Version&gt;</b>	<b>&lt;Date&gt;</b>	<b>&lt;Milestone&gt;</b>
v1.1.1	June 2013	Initial publication
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