

# ST AS Number Normalization Management Guide

## MTAS

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### USER GUIDE

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# 1 Introduction

This document describes the SIP Trunking Application Server (ST AS) Number Normalization function and how it uses the Number Normalization Common Component to provide Number Normalization.

## 1.1 Prerequisites

It is assumed that the user of this document is familiar with the Operation and Maintenance (O&M) area, in general.

### 1.1.1 Documents

Before starting any procedure in this document, ensure that the following documents are available:

- *Ericsson Command-Line Interface User Guide*
- *Managed Object Model (MOM)*

### 1.1.2 Conditions

The following condition must apply:

- An Ericsson Command-Line Interface (ECLI) session in Exec mode is in progress.





## 2 Overview

The ST Number Normalization function uses the Number Normalization Common Component to provide normalization (conversion to E.164) of a SIP or tel URI as received in the SIP message, for service logic procedures, and routing.

The ST Number Normalization Managed Object (MO) is defined by the *MtasStNumNorm* MO, and its attributes, *mtasStNumNormPcContent*, and *mtasStNumNormPcRemoval*. These attributes control what information is passed to the Number Normalization Common Component for normalizing the URI. The parameters passed to the Number Normalization Common Component are a URI and a context.

The following sections describe URIs, the different context types, normalization data, and how terminals address sent numbers.







## 3 URIs

This section details tel and SIP URIs.

### 3.1 Tel URI

A tel URI is either in a global number format or a local number format.

#### 3.1.1 Global Tel URI

The tel URI for global numbers takes the following form:

`tel:+<global-number-digits>; [;uri-Parameters]`, where `<global-number-digits>` is the telephone subscriber.

Globally unique numbers are unambiguous everywhere in the world and identified by a leading “+” character. The global number digits are composed of the Country Code (CC) and the National Significant Number (NSN). In a global tel URI, globally unique numbers are identified by the leading “+” character.

For example:

`tel:+12015550123`

#### 3.1.2 Local Tel URI

The format of the local tel URI takes the following form:

`tel:<local-number-digits>;<phone-context> [;uri-Parameters] [headers] ;`, where the `<local-number-digits>;<phone-context>` uniquely identifies the telephone-subscriber.

Other attributes not used are left out for clarity.

Local numbers are unique only within a certain geographical area or a certain part of the telephone network and thus the URI always includes a `<phone-context>` parameter that uniquely identifies the scope of their validity. A context consisting of the initial digits of a global number does not imply that adding these to the local number generates a valid E.164.

For example: `tel:3568046;phone-context=+44121`  
This URI points to a phone number in Birmingham in the UK.

## 3.2 SIP URIs

The general form of a SIP URI is as follows:

`sip:<user:password>@<host:port>;[;uri-parameters] [headers],`  
where `<user:password>` is referred to as user-info.

The following is a description of a SIP URI:

- `user`: The identifier of a particular resource at the host being addressed.
- `password`: A password associated with the user. While the SIP and the SIP URI syntax allow this field to be present, it is rarely used because of security issues.
- `host`: The host part contains either a fully qualified domain name or a numeric IPv4 or IPv6 address.
- `port`: The port number where the request is to be sent.
- `Uri-parameters`: Parameters affecting a request constructed from the URI. `Uri-parameters` are added after the port component. The URI parameter of particular interest to the Number Normalization is the URI parameter `user=phone`.
- `headers`: Not used.

### 3.2.1 Dialed Digits and User-Info

A User Agent (UA) programmed with a dialing plan and an appropriate digit map can produce the following SIP URI when 5551234 is dialed:

```
sip:5551234@example.net; user=phone
```

Some legacy terminals omit the mandatory `user=phone` parameter. The normalization function can be configured to execute a correction by setting the `numNormProfileUserEqPhoneEr` and including the domain of SIP URIs to be corrected in `numNormProfileDomNameEr`.

### 3.2.2 Embedded Tel URI

The format of the embedded tel URI takes the following form:

```
sip:<embedded tel URI>@<host:port>;[;uri-Parameters] [headers]
```

A UA can produce a SIP URI with the `<global-number-digits>` or `<local-number-digits>;<phone-context>` parts of a tel URI being embedded into the user-info part of the SIP URI, between the “sip:” and the “@”.



When a UA produces such a SIP URI, the entire telephone subscriber of the tel URI, including any parameters, is placed in the user-info part of the SIP URI, and a parameter `user=phone` or `user=dialstring` is added. Absence of the `user=phone` parameter is handled as described in the following section, see Section 5.4 on page 16.

Embedded tel URIs are shown in the following examples:

- `tel:+12125551234` can be embedded into the following SIP URI:

```
sip:+12125551234@example.net;user=phone
```

- `tel:5551234;phone-context=nyc1.example.net` can be embedded into the following SIP URI:

```
sip:5551234;phone-context=nyc1.example.net@example.net;user=phone
```

- `tel:5551234;phone-context=+1212` can be embedded into the following SIP URI:

```
sip:5551234;phone-context=+1212@example.net;user=phone
```





## 4 UA and Produced URIs

The SIP and tel URIs generated by the UA depend on if the UA has digit map capabilities and if a local dial plan has been configured.

### 4.1 Local, National, and International SIP and Tel URIs

This section describes local, national, and international SIP and tel URIs.

#### 4.1.1 Local Number

A local number is a number belonging to the same local area.

The following shows an example of basic data for a local dial plan:

Data	Dial plan (context)
International Country Code (CC)	+44 (UK)
Area Code (AC)	121 (Birmingham)
UA with Address Of Record (AOR)	+441215551235 resides in the operator.co.uk domain or service provider. The UA has a context of Birmingham, defined by the birmingham.operator.co.uk URL.
AOR	+441215551235

When a local number and a Subscriber Number (SN) 5551234 is dialed, any of the following URIs can be produced:

- `tel:+441215551234`
- `sip:+441215551234@operator.co.uk;user=phone`
- `sip:5551234@operator.co.uk;user=phone`
- `tel:5551234;phone-context=birmingham.operator.co.uk`
- `sip:5551234;phone-`
- `context=birmingham.operator.co.uk@operator.co.uk;user=phone`
- `tel:5551234;phone-context=+44121`
- `sip:5551234;phone-context=+44121@operator.co.uk;user=phone`



All these tel URIs are normalized to the following:

```
sip:+441215551234@operator.co.uk;user=phone
```

#### 4.1.2 National Number

A national number is a number within the same country.

The following shows an example of basic data for a national dial plan:

Data	Dial plan (context)
International CC	+44 (UK)
AC	121 (Birmingham)
UA with AOR	+441215551235 resides in the operator.co.uk domain or service provider. The UA has a context of Birmingham, defined by the birmingham.operator.co.uk URL.
AOR	+441215551235

Any of the following URIs can be produced when the national number 02412340461 is dialed:

- tel:+442412340461
- sip:+442412340461@ope.co.uk;user=phone
- sip:02412340461@operator.co.uk;user=phone
- tel:02412340461;phone-context=birmingham.operator.co.uk
- sip:02412340461;phone-context=
- birmingham.operator.co.uk@operator.co.uk;user=phone
- tel:02412340461;phone-context=+44121
- sip:02412340461;phone-
- context=+44121@operator.co.uk;user=phone

All these tel URIs are normalized by the ST Number Normalization function to the following:

```
tel:+442412340461
```

All these SIP URIs are normalized by the ST Number Normalization function to the following:

```
sip:+442412340461@operator.co.uk;user=phone
```



### 4.1.3 International Number

An international number is a number that resides outside the current country.

The following shows an example of basic data for an international dial plan:

Data	Dial plan (context)
International CC	+44 (UK)
AC	121 (Birmingham)
UA with AOR	The user dials an AOR +46812345678 of a user in Stockholm, with AC = 8, Sweden CC = 46 by dialing 0046812345678.
AOR	+441215551235

Any of the following URIs could be produced when the international number +46812345678 is dialed:

- `tel:+46812345678`
- `sip:+46812345678@operator.co.uk;user=phone`
- `sip:0046812345678@operator.co.uk;user=phone`
- `tel:0046812345678;phone-context=birmingham.operator.co.uk`
- `sip:0046812345678;phone-context= birmingham.operator.co.uk@operator.co.uk;user=phone`
- `tel:0046812345678;phone-context=+44121`
- `sip:0046812345678;phone-context=+44121@operator.co.uk;user=phone`

All these tel URIs are normalized by the ST Number Normalization function to the following:

`tel:+46812345678`

All these tel URIs are normalized by the ST Number Normalization function to the following:

`sip:+46812345678@operator.co.uk;user=phone`

### 4.1.4 National Significant Number

The NSN is a number that is only significant within a country.



The Number Normalization function returns the URI with a *<phone-context>* equal to a CC.

The following shows an example of basic data for an NSN dial plan:

Data	Dial plan (context)
International CC	+44 (UK)
AC	121 (Birmingham)
UA with AOR	+441215551235 resides in the operator.co.uk domain or service provider. The UA has a context of Birmingham, defined by the birmingham.operator.co.uk URL.
AOR	+441215551235

Any of the following URIs could be produced when the NSN number 100 is dialed:

- `tel:+44100 sip:+44100@operator.co.uk;user=phone`
- `sip:0044100@operator.co.uk;user=phone`
- `tel:0044100;phone-context=birmingham.operator.co.uk`
- `tel:100`
- `sip:100@operator.co.uk`
- `tel:100;phone-context=birmingham.operator.co.uk`
- `sip:100; phone-context=birmingham.operator.co.uk@operator.co.uk;user=phone`
- `tel:100;phone-context=+44121`
- `sip:100;phone-context=+44121@operator.co.uk;user=phone`
- `tel:100; phone-context=+44`
- `sip:100; phone-context=+44@operator.co.uk;user=phone`
- `tel:100; phone-context=co.uk`
- `sip:100; phone-context=co.uk@operator.co.uk;user=phone`

All these tel URIs are normalized by the ST Number Normalization function to the following:

`tel:+44100` or





`tel:100; phone-context=+CC` or NSN domain, for example, `tel:100; phone-context=+44`

All these SIP URIs are normalized by the ST Number Normalization function to the following:

`sip:+44100@operator.co.uk;user=phone` or

`sip:100;phone-context=+CC` or NSN domain@operator.co.uk;user=phone, for example, `sip:100; phone-context=+44@operator.co.uk;user=phone`

### 4.1.5 Operator Service Number

The Operator Service Number (OSN) is a number with significance within an operator network. The Number Normalization function returns the URI with a *<phone-context>* equal to the OSN context. The OSN context can be set to an OSN domain name or a CC. If a digit map and a local dial plan are supported, the UA is configurable to generate any of the following URIs when the OSN number 133 is dialed.

The following shows an example of basic data for an OSN dial plan:

Data	Dial plan (context)
International CC	+44 (UK)
AC	121 (Birmingham)
UA with AOR	+441215551235 resides in the operator.co.uk domain or service provider. The UA has a context of Birmingham, defined by the birmingham.operator.co.uk URL.
AOR	+441215551235

Any of the following URIs could be produced when the OSN number 133 is dialed:

- `tel:+44133 sip:+44133@operator.co.uk;user=phone`
- `sip:0044133@operator.co.uk;user=phone`
- `tel:0044133;phone-context=birmingham.operator.co.uk`
- `tel:133`
- `sip:133@operator.co.uk;user=phone`
- `tel:133;phone-context=birmingham.operator.co.uk`
- `sip:133;phone-`

- `context=birmingham.operator.co.uk@operator.co.uk;user=phone`
- `tel:133;phone-context=+44121`
- `sip:133;phone-context=+44121@operator.co.uk;user=phone`
- `tel:133; phone-context=+44`
- `sip:133; phone-context=+44@operator.co.uk;user=phone`
- `tel:133; phone-context=co.uk`
- `sip:133; phone-context=co.uk@operator.co.uk;user=phone`

All these tel URIs are normalized by the ST Number Normalization function to the following:

`tel:+44133` or `tel:133;phone-context= OSN domain name`, for example, `tel:133;phone-context=operator.co.uk`

All these SIP URIs are normalized by the ST Number Normalization function to the following:

`sip:+44133@operator.co.uk;user=phone` or `sip:133;phone-context=OSN domain name@operator.co.uk;user=phone`, for example, `sip:133;phone-context=operator.co.uk@operator.co.uk;user=phone`



## 5 Contexts

When a non-international number is dialed, there is always some context in which that number is to be interpreted. The following three types of contexts are supported:

- Domain name contexts
- Global number context
- Asserted-identity context

### 5.1 Domain Name Context

A domain name context can provide a hierarchical structure of contexts. The domain name does not necessarily resolve to a host address.

Geographical domain name context examples are as follows:

- stockholm.se
- dallas.tx.us

Other domain name context examples are as follows:

- ericsson.com
- mainoffice.company.com

### 5.2 Global Number Phone Context

A global number context can be the leading part of a full international number.

Global phone number context examples are as follows:

- +468 (partial number = Stockholm)
- +1 (partial number = USA)

The “+” is mandatory for a global phone context. If the “+” is not present, then the context is treated as a domain name context.

## 5.3 Asserted-Identity Context

User phone context can be derived from the following Asserted-Identities:

- Asserted-Identity = P-Asserted-Identity:

The SIP Asserted Identity P-Asserted-Identity header field. The Number Normalization function uses the P-Asserted-Identity context if input URI context is not present in the input URI passed to the Number Normalization.

- Asserted-Identity = <userIdentity>:

The CAI3G input arrives at XDMS CAI3G Agent with a <userIdentity> element on CAI3G.

## 5.4 Context based User=phone Error Correction

During the input validation, the host part of the SIP URI is checked against a list of domain names configured by the `numNormProfileDomNameEr` parameter. User equals phone error correction is done against these domain names, that is, the Number Normalization function inserts a missing `user=phone` parameter in the `Input-URI` when all conditions are fulfilled:

- The user part of the `Input-URI` contains a number.
- The error correction feature is enabled in the `numNormProfileUserEqPhoneEr` parameter.
- The host part of the `Input-URI` matches an entry in the `numNormProfileDomNameEr` parameter.

With this correction applied, the determination of the URI changes from name to number.

## 5.5 Context

The context is used for the following purposes in the Number Normalization:

- `user=phone` error correction:

Finding the context entry to apply `user=phone` error correction.

- Profile resolution:

Finding context entry to decide which profile to use.

- Normalize context resolution:

Finding a context entry to normalize the URI. When a phone context is found, a corresponding configured context must be found to determine how the number is normalized. Because each type of context has a different hierarchical structure, the context resolution procedure is different for each type of context.

### 5.5.1 User=Phone Error Correction Context

The context is used to check the contexts configured for known originating sources that have `user=phone` missing in the SIP URI. This is done to correct the `user=phone` missing parameter, see Table 1.

*Table 1 User=Phone Error Correction Context Configuration*

Configured <code>user=phone</code> Error Contexts
<code>operator.stockholm.se</code>
<code>+468</code>
<code>someplace.somewhere.com</code>

URI `sip:02412340461;phone-context=+468@operator.stockholm.se`

*Example 1 User=Phone Error Configuration*

When the `user=phone` parameter is missing, the received URI context `operator.stockholm.se` is checked against the preconfigured contexts shown in Table 1. For the URI `operator.stockholm.se` context, the output SIP URI has the missing `user=phone` parameter added to it.

### 5.5.2 Profile Resolution

The Top-Level Domain Country Code (TLDcc) or the CC of the context is used to check the contexts configured against a profile, as shown in Table 2, Table 3, Example 2, Example 3, Example 4, and Example 5. This is done to select the correct profile.

*Table 2 Profile 1 Context Configuration*

Configured Profile 1 Context
<code>se</code>
<code>+46</code>
<code>com</code>

*Table 3 Profile 2 Context Configuration*

Configured Profile 2 Context
uk
+44

Received URI context birmingham.co.uk  
Profile selected: 2

*Example 2 Profile Configuration*

Received URI context +448  
Profile selected: 2

*Example 3 Profile Configuration*

Received URI context users.operatorX.com  
Profile selected: 1

*Example 4 Profile Configuration*

Received URI context +42  
Profile selected: none

*Example 5 Profile Configuration*

### 5.5.3 Normalize Context Resolution

To normalize context resolution:

1. If the domain is present in a list of configured contexts, that context is used and the resolution stops.
2. If there is a subdomain present, it is deleted, and step 1 is repeated.
3. If there is no subdomain present, the resolution stops.

In the following examples, the contexts shown in Table 4 are configured.

*Table 4 Domain Name Context*

Configured Domain Name Context
se
stockholm.se
operatorX.com



```
'Domain Name Context = proxy.stockholm.se';
'Context selected = stockholm.se'
```

#### *Example 6 Domain Name Configuration*

```
'Domain Name Context = operatorY.com';
'Context selected = none'
```

#### *Example 7 Domain Name Configuration*

```
'Domain Name Context = users.operatorX.com';
'Context selected = operatorX.com'
```

#### *Example 8 Domain Name Configuration*

### 5.5.4 Reduce Context Resolution

To reduce context resolution:

1. Delete all visual separators.
2. If the context is in the list of configured contexts, use that context and resolution stops.
3. Delete the most significant left part of the domain name context.
4. If the resulting context is in the list of configured contexts, use that context and resolution stops.
5. Repeat step 4, deleting the most significant left part of the domain name context until either a context is found, or there are no digits left in the context.

In Example 9, the context shown in Table 5 is configured.

*Table 5 Global Phone Context*

Configured Phone Context
operator.stockholm.se

```
'Global Phone Context = host1.operator.stockholm.se' ;
'Context selected = operator.stockholm.se'
```

#### *Example 9 Global Phone Configuration*

## 5.6 Initial URI Error Correction

This correction is performed at the very beginning of URI processing and may be enabled independently of Context based User=phone Error Correction

(see Section 5.4 Context based User=phone Error Correction on page 16 and Section 5.5.1 User=Phone Error Correction Context on page 17) and Context based Number Normalization. If URI error correction is enabled by the `mtasStNumNormApplyUriCorrection` attribute set to 1, the following corrections are applied:

- “user=phone” parameter is added if it is missing in the SIP embedded Tel URI and the user part of the Input-URI contains a number.
- “phone-context” parameter is added if it is missing in the SIP embedded Tel URI or Tel URI that contains a local number. Value of inserted “phone-context” parameter is controlled by `mtasStNumNormPcContent` attribute. If set to 0, the domain name associated with the default IMPU of the served user is used. If set to 1, the user provisioned country code and area code is used.
- superfluous “phone-context” parameter is removed if URI contains a global number.

Initial URI error correction is executed before Context based user=phone Error Correction and thus it renders the latter ineffective or unnecessary if executed.





## 6 Normalization Data

When all the Number Normalization data is set, the table sync parameter must be set to `TRUE`. The cached data is then updated and the table sync set to `FALSE`.

It is not allowed to set the table sync parameter to `TRUE` more frequently than every 15 seconds.

### 6.1 Configured Profile

The data that is configured for profile “sweden” is shown in Table 6.

*Table 6 Configured Profile Data for Profile = sweden*

<b>Profile Name:</b> numNormProfileName	<b>Profile Context:</b> numNormProfileContext
sweden	se
	+46

The data that is configured for profile "United Kingdom" is shown in Table 7.

*Table 7 Configured Profile Data for Profile = United Kingdom*

<b>Profile Name:</b> numNormProfileName	<b>Profile Context:</b> numNormProfileContext
United Kingdom	uk
	+44

#### 6.1.1 Profile User=Phone Configured Data

The data that is configured for profile “sweden” is shown in Table 8.

*Table 8 User=Phone Contexts for Profile = Sweden*

<b>User=Phone Error:</b> numNormProfileUserEqPhoneEr	<b>Configured User=Phone Error Contexts:</b> numNormProfileDomNameEr	<b>numNormProfileWarningText</b>
1 (TRUE)	0:operator.stockholm.se	Number input not valid.
	1:+468	
	2:somewhere.somewhere.se	

The data that is configured for profile "United Kingdom" is shown in Table 9.

*Table 9 Configured Profile Data for Profile = United Kingdom*

<b>User=Phone Error:</b> numNormProfileUse rEqPhoneEr	<b>Configured User=Phone Error Contexts:</b> numNormPr ofileDomNameEr	numNormProfileWar ningText
1 (TRUE)	0:redding.operator.co.u k	Number input not valid.
	1:+44141	
	2:someplace.somewher e.co.uk	

## 6.2 Algorithm Data

Each configured context used for normalizing the URI has the following data associated with it:

- Set of substitution regular expressions
- Set of OSN numbers
- Set of NSN numbers

The substitution regular expressions, set of OSN numbers, and set of NSN numbers are associated with the context through indexing. The data associated with the contexts used for normalizing a URI is detailed in Table 10 and Table 11. The Substitution data is detailed in Table 12 and Table 13. The OSN and NSN data is detailed in Table 14 and Table 15.

*Table 10 Contexts and Algorithm Data for Profile = sweden*

Configured Context: numNormC ontextRule	OSN Data Index: numN ormContext OsnIndex	NSN Data Index: numN ormContext NsnIndex	AC: numNor mContextSu bAreaCode	Substitution Expression Index: numN ormContext SubRulesIn dex
+46	osn_operator	nsn_Sweden	8	Sub_Index2
+468	osn_operator	nsn_Sweden	8	Sub_Index2
stockholm.se	osn_operator	nsn_Sweden	8	Sub_Index2
operator.stoc kholm.se	osn_operator	nsn_Sweden	8	Sub_Index2



gothenburg.se	osn_operator	nsn_Sweden	3	Sub_Index2
se	osn_operator	nsn_Sweden	8	Sub_Index2

Table 11 Contexts and Algorithm Data for Profile = United Kingdom

<b>Configured Context:</b> numNormContextRule	<b>OSN Data Index:</b> numNormContextOsnIndex	<b>NSN Data Index:</b> numNormContextNsnIndex	<b>AC:</b> numNormContextSubAreaCode	<b>Substitution Expression Index:</b> numNormContextSubRulesIndex
+44	osn__UK_operator	nsn_UK		Sub_Index1
+44121	osn__UK_operator	nsn_UK	121	Sub_Index1
co.uk	osn__UK_operator	nsn_UK		Sub_Index1
birmingham.operator.co.uk	osn__UK_operator	nsn_UK	121	Sub_Index1
coventry.operator.co.uk	osn__UK_operator	nsn_UK	24	Sub_Index1

Table 12 Substitution Data Sub\_Index1

<b>Index:</b> numNormSubstitutionRuleIndex	<b>Order</b>	<b>Substitution Expression</b>
Sub_Index1	0	0:/^00(.*)\$/+1/:TRUE
	1	1:/^0(.*)\$/+44\1/:TRUE
	2	2:/^(.*)\$/+44\$AC\1/:TRUE

Table 13 Substitution Data Sub\_Index2

<b>Index:</b> numNormSubstitutionRuleIndex	<b>Order</b>	<b>Substitution Expression</b>
Sub_Index2	0	0:/^00(.*)\$/+1/:TRUE
	1	1:/^0(.*)\$/+46\1/:TRUE
	2	2:/^(.*)\$/+46\$AC\1/:TRUE



Table 14 OSN Data

<b>OSN Index: numNormOsnDataIndex</b>	<b>OSN Context 0: numNormOsnDataContextAndNumbers</b>	<b>OSN Number 1: numNormOsnDataContextAndNumbers</b>	<b>OSN Number 2: numNormOsnDataContextAndNumbers</b>	<b>OSN Number 3: numNormOsnDataContextAndNumbers</b>	<b>OSN Number 4: numNormOsnDataContextAndNumbers</b>
osn_operator	0:operator.se	1:124	2:125	3:\+46124	4:/^0046124\$/+46124/
osn_operator	0:operator.co.uk	1:152	2:153	-	-

Table 15 NSN Data

<b>NSN Index: numNormNsnDataIndex</b>	<b>NSN Context 0: numNormNsnDataNumbers</b>	<b>NSN Number 1: numNormNsnDataNumbers</b>	<b>NSN Number 2: numNormNsnDataNumbers</b>
nsn_Sweden	0:+46	1:192	2:133
nsn_UK	0:+44	1:156	2:157

## 6.3 Configuration Examples

This section shows examples on how to configure local, national, and international SIP and tel URIs.

### 6.3.1 Tel URI Local Number

This section shows an example on configuration using a local number, for more information see

Table 16 Local Stockholm Number

Incoming Request URI: tel:7195523;phone-context=stockholm.se
After Normalization: tel:+4687195523

Profile selected = sweden  
Configured context = stockholm.se  
Substitution expression = Sub\_Index2  
OSN data index = osn\_operator  
NSN data index = nsn\_Sweden



The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.
- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits do not match 00.
- Leading digits do not match 0.
- Match found. +46\$AC is prepended to the local number.

### 6.3.2

#### Tel URI National Number

This section shows an example on a configuration using a national number, see Table 17.

*Table 17 User in Stockholm Dials Gothenburg Number*

Incoming Request URI: tel:0317195523;phone-context=stockholm.se
After Normalization: tel:+46317195523

Profile selected = sweden  
 Configured context = stockholm.se  
 Substitution expression = Sub\_Index2  
 OSN data index = osn\_operator  
 NSN data index = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.



- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits do not match 00.
- Leading digits match 0, replace 0 with “+46”.

### 6.3.3 Tel URI International Number

This section shows an example on a configuration using an international number, see Table 18.

*Table 18 User in Stockholm Dials a UK Number*

Incoming Request URI: tel:0044121123456878;phone-context=stockholm.se
After Normalization: tel:+4412112345678

Profile selected = sweden  
Configured context = stockholm.se  
Substitution expression = Sub\_Index2  
OSN data index = osn\_operator  
NSN data index = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.
- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits match 00, replace 00 with “+”.

### 6.3.4 SIP URI Embedded tel, Local Number

This section shows an example on a configuration using a local number, see Table 19.



*Table 19 SIP URI Embedded tel, Local Number*

Incoming Request URI: sip:7195523;phone-context=stockholm.se@stockholm.se
After Normalization: tel:+4687195523@stockholm.se;user=phone

Profile selected = sweden  
 Configured context = stockholm.se  
 Substitution expression = Sub\_Index2  
 OSN data index = osn\_operator  
 NSN data index = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.
- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits do not match 00, go to next rule.
- Leading digits do not match 0, go to next rule.
- Match found. +46\$AC is prepended to the local number.

### 6.3.5

#### **SIP URI Embedded tel, National Number**

This section shows an example on a configuration using a national number, see Table 20.

*Table 20 SIP URI Embedded tel, National Number*

Incoming Request URI: sip:087195523;phone-context=gothenburg.se@gothenburg.se
After Normalization: sip:+4687195523@stockholm.se;user=phone

Profile selected = sweden  
 Configured context = gothenburg.se  
 Substitution expression = Sub\_Index2  
 OSN data index = osn\_operator



NSN data index = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “gothenburg.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.
- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits do not match 00, go to next rule.
- Match found, replace 0 with “+46”.

### 6.3.6

#### SIP URI Embedded tel, International Number

This section shows an example of a configuration using an international number, see Table 21.

*Table 21 User in Stockholm Dials UK Number*

Incoming Request URI: sip:004412112345678;phone-context=stockholm.se@stockholm.se
After Normalization: sip:+4412112345678@stockholm.se;user=phone

Profile selected = sweden  
Configured context = stockholm.se  
Substitution expression = Sub\_Index2  
OSN data index = osn\_operator  
NSN data index = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.



- Substitution rules “Sub\_Index2” used to normalize, see Table 13.
- Leading digits match 00, replace 00 with “+”.

6.3.7

OSN Number tel, Local Number

This section shows an example on a configuration using an operator OSN number 124, see Table 22.

Table 22    *User Dials Operator OSN Number 124*

Incoming Request URI: tel:124;phone-context=stockholm.se tel:124;phone-context=operator.stockholm.se tel:124;phone-context=.se tel:124;phone-context=gothenburg.se tel:124;phone-context=+46 tel:124;phone-context=+468
After Normalization: tel:124;phone-context=operator.se

Profile selected = sweden  
Configured context = stockholm.se  
Substitution expression = Sub\_Index2  
OSN data index = numNormOsnDataIndex = osn\_operator  
NSN data index = numNormNsnDataIndex = nsn\_Sweden  
Context OSN data index = numNormContextOsnIndex = osn\_operator  
Context NSN data index = numNormContextNsnIndex = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request digits match the OSN number 124.
- Context “operator.se” applied to output normalized URI.

6.3.8

OSN Number tel, International Number

This section shows an example on a configuration using an operator OSN number 124, see Table 23.

**Table 23** *User Dials Operator OSN Number 124*

Incoming Request URI: tel:+46124;phone-context=stockholm.se tel:0046124;phone-context=operator.stockholm.se
After Normalization: tel:+46124;phone-context=operator.se

Profile selected = sweden

Configured context = stockholm.se

Substitution expression = Sub\_Index2

OSN data index = numNormOsnDataIndex = osn\_operator

NSN data index = numNormNsnDataIndex = nsn\_Sweden

Context OSN data index = numNormContextOsnIndex = osn\_operator

Context NSN data index = numNormContextNsnIndex = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request digits match the OSN number rules +46124 or 0046124, see Table 14.
- Context “operator.se” applied to output normalized URI.

### 6.3.9 NSN Number tel, Local URI

This section shows an example on a configuration using an operator NSN number 133, see Table 24.

**Table 24** *User Dials Operator NSN Number 133*

Incoming Request URI: tel:133;phone-context=+46 tel:133;phone-context=+468 tel:133;phone-context=operator.stockholm.se
After Normalization: tel:133;phone-context=+46

Profile selected = sweden

Configured context = stockholm.se

Substitution expression = Sub\_Index2

OSN data index = numNormOsnDataIndex = osn\_operator

NSN data index = numNormNsnDataIndex = nsn\_Sweden

Context OSN data index = numNormContextOsnIndex = osn\_operator

Context NSN data index = numNormContextNsnIndex = nsn\_Sweden



The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any OSN numbers configured, see Table 14.
- The incoming request digits match the NSN number 133.
- Context “+46” is applied to output normalized URI.

### 6.3.10

### NSN Number SIP URI

This section shows an example on a configuration using an operator NSN number 133, see Table 25.

*Table 25 User Dials Operator NSN Number 133*

<b>Incoming Request URI:</b> tel:133;phone-context=stockholm.se tel:133;phone-context=operator.stockholm.se tel:133;ph one-context=.se tel:133;phone-context=gothenburg.se tel:133;phone-context=+46 tel:133;phone-context=+468
<b>After Normalization:</b> tel:133;phone-context=operator.se

Profile selected = sweden

Configured context = stockholm.se

Substitution expression = Sub\_Index2

OSN data index = numNormOsnDataIndex = osn\_operator

NSN data index = numNormNsnDataIndex = nsn\_Sweden

Context OSN data index = numNormContextOsnIndex = osn\_operator

Context NSN data index = numNormContextNsnIndex = nsn\_Sweden

The following events occur:

- The incoming request context matches profile “sweden”, see Table 6.
- The incoming request context matches context “stockholm.se”, see Table 10.
- The incoming request leading digits do not match any NSN numbers configured, see Table 15.
- The incoming request digits match the NSN number 133.



- Context “+46” is applied to output normalized URI.



## 7 Example Logic for Parameters Passed to Number Normalization Common Component from ST AS

This section details the behavior of the Number Normalization Common Component based on what the ST AS passes to it. The following attributes are described:

- `mtasStNumNormPcRemoval`
- `mtasStNumNormPcContent`

The `mtasNumNormPcRemoval` attribute controls if the `<phone-context>` present in the Request URI is to be deleted or. If it is not deleted, the Request URI context is considered as a higher priority for normalization of the Request URI.

The `mtasStNumNormPcContent` attribute controls which context that is to be used to normalize the URI if set to 0, the context associated with the Main PBX Identity is used. If set to 1, the provisioned +CC-AC context of the subscriber is used to normalize the URI.

The following examples are described:

- Using `<phone-context>` in URI to Behavior
- Using Context of P-Asserted-Identity or Main PBX Identity to Normalize
- Using `<phone-context>` in Request URI, context = CC-AC also Provided
- Using CC-AC Provided to Normalize

When the ST AS is unable to normalize the number because the `numNormProfileContext` does not exist, it does not reject the call with 400 bad request. Other nodes in the network are able to normalize the number even if ST AS has failed.

The Number Normalization Common Component must be appropriately configured for the various examples, see Section 7.1 on page 33 through Section 7.4 on page 35.

For more information about the Number Normalization Common Component parameters, refer to *Managed Object Model (MOM)*.



## 7.1 Phone-Context in URI to Behavior Use

The Number Normalization Common Component normalizes the Request URI using the `<phone-context>` present in the Request URI. The Number Normalization Common Component must have the context configured.

If the `mtasStNumNormPcRemoval` attribute is set to 0, the context present in the URI is not deleted. The R-URI is passed to the Number Normalization Common Component, the context is used by the Number Normalization to normalize the URI.

If the `mtasNumNormPcContent` attribute is set to 0, the P-Asserted-Identity (if the P-Asserted-Identity is SIP URI) or the Main PBX Identity (if the P-Asserted-Identity is not SIP URI) is passed to the Number Normalization Common Component. If no context is available in the Request URI, then the domain name in the P-Asserted-Identity or in the Main PBX Identity is used by Number Normalization to normalize the request.

## 7.2 Context of P-Asserted-Identity or Main PBX Identity to Normalize Use

The Number Normalization Common Component normalizes the Request URI using the context of the P-Asserted-Identity or Main PBX Identity passed to it. The Number Normalization Common Component must have the context configured in the P-Asserted-Identity or in the Main PBX identity.

If the `mtasNumNormPcRemoval` attribute is set to 1, the context present in the Request URI is deleted. The Request URI without the context is passed to Number Normalization Common Component.

If the `mtasNumNormPcContent` attribute is set to 0, the P-Asserted-Identity (if it is a SIP URI) or the Main PBX Identity (if the P-Asserted-Identity is not a SIP URI) is passed to the Number Normalization Common Component. The domain name in the P-Asserted-Identity or in the Main PBX Identity is used by Number Normalization to normalize the Request.

## 7.3 Phone-Context in Request URI, Context = CC-AC Also Provided Use

The Number Normalization Common Component normalizes the Request URI using the `<phone-context>` present in the URI. The Number Normalization Common Component must have the context configured.

If the `mtasNumNormPcRemoval` attribute is set to 0, the context present in the Request URI is not deleted in the Request URI. The context is used by Number Normalization to normalize the request URI.



If the `mtasNumNormPcContent` attribute is set to 1, the CC and AC (CC-AC) that was retrieved from the Home Subscriber Server (HSS) is passed to Number Normalization. If no context is available in Request URI, then the CC-AC is used to normalize the Request URI.

## 7.4 CC-AC Provided to Normalize Use

The Number Normalization Common Component normalizes the URI using the CC-AC. The Number Normalization Common Component must have the CC-AC context configured.

If the `mtasNumNormPcRemoval` attribute is set to 1, the context present in the Request URI is deleted in the Request URI. The Request URI without the context is passed to the Number Normalization to be normalized.

If the `mtasNumNormPcContent` attribute is set to 1, the CC-AC that was retrieved from the HSS (Get Data) is passed to the Number Normalization. The CC-AC is used to normalize the Request URI.