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The tel URI for Telephone Calls

Status of this Memo

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Contents

Abstract

This document is a revision of RFC 2806.

This document specifies the URI (Uniform Resource Identifier) scheme "tel" for specifying the address of a terminal in the phone network. The tel URI is service-independent and describes voice calls (phone calls, answering machines and voice messaging systems), facsimile (telefax) calls and data calls, for landline, ISDN and mobile subscribers.

1 Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in RFC 2119 [1] and indicate requirement levels for compliant implementations.

2 Introduction

This document defines the URI scheme "tel" that contains telephone numbers. The telephone number can refer to terminals in the telephone network or the Internet, mobile and landline devices, voice, data and fax devices. The URI can refer to originators or targets of a telephone call.

Telephone numbers as commonly understood actually comprise two related, but distinct concepts: as a canonical address-of-record and as a dial-string. We define the concepts below:

Address-of-record: The telephone number is understood here as the canonical address-of-record, as they are handled by the signaling network. Generally, this means E.164 numbers, or numbers that can be trivially converted into them. Subscribers publish a phone number as a universal means of being reached.

Dial string: "Dial strings" are the actual numbers, symbols and pauses entered by a user to place a phone call. A dial-string is consumed by one or more network entities, and understood in the context of the configuration of these entities. It is used to generate a telephone number so that a call can be routed. Dial-strings may require pre-pended digits to handle local PBXs, and they may include post-dial DTMF signaling that could control an IVR. Dial strings are beyond the scope of this document.

To reach a telephone number from a particular terminal, the user of the terminal or the terminal itself has to know how to convert that telephone number into a dial string appropriate for that terminal. The telephone number itself does not convey what needs to be done for a particular terminal. Instructions may include dialing "9" before placing a call or prefixing a "00" to reach a number in a foreign country. Telephone numbers are also the normalized way that addresses are signaled in the PSTN.

The notation for phone numbers is the same as in RFC 2303 [2] and RFC 2304 [3]. However, the syntax differs since this document describes URIs whereas RFC 2303 and RFC 2304 specify electronic mail addresses. RFC 2303 and RFC 2304 use "/" to indicate parameters (qualifiers). Since URI use the forward slash to describe path hierarchy, the URI scheme described here uses the semicolon, in keeping with SIP URI conventions [4].

There are at least two ways one can envision making a telephone connection. In the first approach, a URI contains the dial string, which is then passed to an entity that can reproduce the actions specified in the dial string, by sending DTMF digits, waiting for dial tone, pausing and generating post-dial DTMF digits after the callee picks up. Another approach has the URI specify the telephone number, which can be either globally unique or only be valid within a local context. A dialer application is aware of the local context, knowing, for example, whether special digits need to be dialed to seize an outside line, whether network, pulse or tone dialing is needed and what tones indicate call progress. The dialer then converts the telephone number into a dial string and performs the necessary signaling actions. The document below assumes the second model. The dialer does not have to be a user application as found in traditional desktop operating systems, but could well be part of an IP-to-PSTN gateway.

The approach pursued here has the disadvantage that certain services, such as extensions on a PBX (when direct inward dialing is not used) or electronic banking, cannot be specified in a URI.

The URI is used as a request URI in SIP [4] requests. The SIP specification also inherits the subscriber part of the syntax as part of the user element in the SIP URI. Other protocols may use this URI for both query-based and prefix-based applications.

A "client" is defined as software that can parse one or more of the URIs defined in this document and possibly place a call to a remote entity.

3 URI Comparisons

URI comparisons are case-sensitive except that the scheme and parameter names are case-insensitive.

4 URI Syntax

The URI is defined using the ABNF (augmented Backus-Naur form) described in RFC 2234 [5] and uses elements from the core definitions (Appendix A of RFC 2234).

The syntax definition follows RFC 2396 [6], indicating the actual characters contained in the URI. Note that the reserved characters "+", ";", "=", and "?" MUST NOT be escaped if shown in the grammar definitions below as they are delimiters for the "tel" URI scheme. These reserved characters MUST be escaped if they appear in parameter values.

Characters other than those in the "reserved" and "unsafe" sets (see RFC 2396 [6]) are equivalent to their "% HEX HEX" encoding.

The "tel" URI has the following syntax:

```
telephone-uri       =  "tel:" subscriber *param
subscriber          =  global-number / local-number
global-number       =  global-number-part [isdn-subaddress]
global-number-part  =  "+" 1*phonedigit
local-number        =  local-number-part [isdn-subaddress]
                       [context]
local-number-part   =  1*phonedigit
isdn-subaddress     =  ";isub=" 1*uric
context             =  ";phone-context=" descriptor *("," descriptor)
descriptor          =  domainname / global-number-part
domainname          =  *( domainlabel "." ) toplabel [ "." ]
domainlabel         =  alphanum
                       / alphanum *( alphanum / "-" ) alphanum
toplabel            =  ALPHA / ALPHA *( alphanum / "-" ) alphanum
param               =  ";" pname ["=" pvalue ]
pname               =  1*uric
pvalue              =  *uric
phonedigit          =  HEXDIG / visual-separator
visual-separator    =  "-" / "." / "(" / ")"
alphanum            =  ALPHA / DIGIT
```

5 Phone Numbers and Their Scope

5.1 Phone Numbers

The subscriber part of the URI indicates the number. The phone number can be represented in either global (E.164) or local notation. All phone numbers MUST use the global form unless they cannot be represented as such. Numbers from private numbering plans, emergency ("911", "112") and some directory assistance numbers (e.g., "411") and other "service codes" (numbers of the form N11 in the United States) cannot be represented in global (E.164) form, and need to be represented as a local number with a context. Local numbers MUST be tagged with a phone-context.

Implementations MUST NOT assume that telephone numbers have a maximum, minimum or fixed length, or that they always begin with a certain number.

5.1.1 Separators in Phone Numbers

Phone numbers MAY contain visual separators. Visual separators (visual-separator) merely aid readability and MUST be ignored by the client.

Even though ITU-T E.123 [7] recommends the use of space characters as visual separators in printed telephone numbers, tel URIs MUST NOT use spaces.

5.1.2 Alphabetic Characters

In some countries, it is popular to write phone numbers using alphabetic characters which correspond to certain numbers on the telephone keypad. The URI format does not support this notation since the mapping from alphabetic characters to digits is not completely uniform internationally, although there are standards [8, 9] addressing this issue.

Since called and calling terminal numbers (TNs) are encoded in BCD in ISUP, this allows for six additional values per digit, sometimes represented as the hexadecimal characters A through F. However, in accordance with E.164, they may not be included in global numbers. Their use in local numbers is not defined, but it not prohibited.

5.1.3 Global and Local Numbers

Global (international) numbers are identified by the "+" character prefix. Global numbers MUST be composed with the country (CC) and national (NSN) numbers as specified in E.123 and E.164 [7, 10]. International numbers have the property of being unambiguous everywhere in the world and are RECOMMENDED.

Local numbers only work within a certain geographical area or a certain part of the telephone network, e.g., a private branch exchange (PBX) or a particular country. URIs with local phone numbers should only appear in environments where all local entities can successfully set up the call by passing the number to the dialing software. Digits needed for accessing an outside line, for example, are not included in local numbers.

The phone-context parameter can be used to unambiguously identify the local context where the local number is valid. The parameter value is defined by the "owner" of the local number. The parameter can contain a list of contexts that enumerate all the contexts where this number is valid. It does NOT in any way indicate a prefix that turns the local number into a global (E.164) number. The phone-context provides a unique identifier that lets a client know whether it can interpret the local number or not. It has not other meaning or function.

There are two ways to label the context: via a global number prefix (e.g., "+33") and via a domain name, e.g., "houston.example.com". The choice between the two is left to the "owner" of the local number and is governed by whether there a global number prefix or domain name is a valid identifier for a particular local number.

> The two label types were chosen so that in almost all cases, a local administrator can pick an identifier that is reasonably descriptive and does not require a new assigned number. It is up to the administrator to assign an appropriate identifier and to use it consistently. In many cases, an organization can choose many different identifiers.

The domain name does not have to resolve to any actual host, but MUST be under the administrative control of the entity managing the local phone context.

For example, ";phone-context=+1,+49" indicates that the number is valid in country codes 1 (North America) and 49 (Germany). For a local number valid within a PBX, the organization can choose any number under its control to identify the context. For example, a context consisting of any of the organization's global number may be suitable, or a substring that is completely occupied by the organization. For example, +49-6151-16 would be a suitable prefix for the TU Darmstadt, as it uses all numbers starting with those digits.

The global number prefix does not imply that adding it to the number will generate a valid E.164 number. It might by coincidence, but this cannot be relied upon. (For example, "911" should be labeled with the context "+1", but "+1-911" is not a valid E.164 number.) As noted earlier, numbers can be represented as valid E.164 numbers SHOULD NOT be represented as local numbers plus phone-context.

5.2 ISDN Subaddresses

A phone number MAY also contain an isdn-subaddress parameter which indicates an ISDN subaddress. This parameter is mandatory, i.e., a client MUST reject the URI if it cannot interpret ISDN subaddresses.

ISDN subaddresses typically contain IA5 characters, but may contain any octet value.

5.3 Other Parameters

Future extensions to this URI scheme may add other parameters (param in the ABNF). Such parameters can be either mandatory or optional. Mandatory parameters start with "m-". An implementation MAY ignore optional parameters. An implementation MUST NOT use the URI if it contains unknown mandatory parameters. The "m-" prefix cannot be added to parameters that were already registered (except to create a new, logically distinct parameter). The "phone-context" parameter in this document is mandatory.

For example, param parameters can be used to store application-specific additional data about the phone number, its intended use, or any conversions that have been applied to the number.

All new parameters MUST be registered with IANA.

6 Examples

tel:+358-555-1234567 This URI points to a phone number in Finland capable of receiving voice calls. The hyphens are included to make the number more human-readable; they separate country, area codes and subscriber number.

tel:7042;phone-context=cs.columbia.edu The URI describes a local phone number valid within the context "cs.columbia.edu".

tel:863-1234;phone-context=+1-914-784 The URI describes a local phone number that is valid within a particular phone prefix. (The example approximates the IBM tie line numbering system.)

7 Rationale

7.1 Why Not Just Put Telephone Numbers in SIP URIs?

The "tel" URI describes a service, reaching a telephone number, that is independent of the means of doing so, be it via a SIP-to-PSTN gateway, a direct SIP call via ENUM translation, some other signaling protocols such as H.323 or a traditional circuit-switched call initiated on the client side via, say, TAPI. It is thus, in spirit, closer to the URN schemes that also leave the resolution to an external mechanism. The same "tel" URI may get translated to any number of other URIs in the process of setting up the call.

7.2 Why Not Distinguish Between Call Types?

Signaling protocols such as SIP allow to negotiate the call type and parameters, making the very basic indication within the URL scheme moot.

7.3 Why "tel"?

"Tel" was chosen since it is widely recognized none of the other suggestions appeared appropriate. "Callto" was discarded since URI schemes locate a resource and do not specify an action to be taken. "Telephone" and "phone" were considered too long and not as internationally recognized.

7.4 Do Not Confuse Numbers with How They Are Dialed

As an example, the E.164 number "+123456789" will be dialed in many countries as 00123456789, where the leading "00" is a prefix for international calls. (In general, "+" in E.164 indicates that an international prefix is required.) Tel URIs MUST NOT contain the local dialing prefixes in numbers such as 00123456789, as the transformation back to an international number is not guaranteed to be correct or unique.

If a client receives a "tel" URI containing a local number, it MUST make sure that it knows the context in which the local phone number is to be processed, or else the number MUST NOT be used. Equally, the originator of a "tel" URI must take into consideration that the recipient may have insufficient information about the phone number's context.

When overlap signaling is used, devices which collect dial strings MUST construct a complete phone number before constructing the tel URI and including the URI in a network request. In other words, such devices must convert from overlap dialing to en bloc signaling.

8 Usage of Telephone URIs in HTML

The number SHOULD be visible to the end user if it is conceivable that the user might not have a client which is able to use these URIs.

```
Telephone: <a href="tel:+3585551234567">+358-555-1234567</a>
```

On a public HTML page, the telephone number in the URI SHOULD always be in the international form, even if the text of the link uses some local format.

```
Telephone: <a href="tel:+3585551234567">(0555) 1234567</a>
```

or even

```
For having RFCs read aloud, call
<a href="tel:+1-555-438-3732">1-555-IETF-RFC</a>.
```

9 IANA Considerations

"Tel" URI parameters (param) MUST be registered with IANA. Any parameter that should be considered as mandatory should be prefixed by "m-" as described in Section 5.3. Mandatory parameters must be described in an informational or standards-track RFC.

10 Security Considerations

The security considerations parallel those for the mailto URL [11].

A client SHOULD NOT place calls without the consent of its owner. Placing calls automatically without appropriate user confirmation may incur a number of risks, such as those described below.

- Calls may incur costs.

- The URI may be used to place malicious or annoying calls.
- A call will take the user's phone line off-hook, thus preventing its use.
- A call may reveal the user's, possibly unlisted, phone number to the remote host in the caller identification data, and may allow the attacker to correlate the client's phone number with other information such as the e-mail or IP address.
- A call may use the same local number in different contexts, in which the number may have a different meaning.

11 Change History

11.1 Changes Since -04

- ISDN subaddresses can contain any IA5 character or even binary data; represented now as "uric".

11.2 Changes Since -03

- Clarified use of multiple contexts and how to express this, as a comma-separated list.

11.3 Changes Since -02

- Clarifications and editorial fixes.
- Now, mandatory parameters are labeled, to avoid making [12] obsolete.

11.4 Changes Since -01

The draft has been greatly simplified to reflect parts that have actually been implemented.

- Removed references to carrier selection.
- Removed dial context.
- Removed fax and modem URIs.
- Removed post-dial strings.
- Removed pause characters.

11.5 Changes Since RFC 2806

The specification is backwards-compatible with RFC 2806.

- Editorial changes and clarifications. The document has been shortened and reorganized. Most paragraphs have been rewritten to be more concise.
- Syntax now conforms to RFC 2396 [6], in particular related to escaping.

12 Acknowledgments

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