### URLs for Telephone Calls
### <draft-antti-telephony-url-11.txt>

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Abstract

   This document specifies URL (Uniform Resource Locator) schemes
   terminal in the phone network and the connection types (modes of
   operation) that can be used to connect to that entity. This
   specification covers voice calls (normal phone calls, answering
   machines and voice messaging systems), facsimile (telefax) calls and
   data calls, both for POTS and digital/mobile subscribers.

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## 1. Introduction

### 1.1 New URL schemes

URLs that designate phone or fax numbers that can be dialed have been brought forward in other Internet-Drafts. However, none of these has reached the RFC status. This document tries to remedy the situation. All interested parties are invited to submit comments on this Internet-Draft. Contact information can be found at the end of this document.

See also [CONV-URL] for more discussion on conversational URLs.

This specification defines three new URL schemes: "tel", "fax" and "modem". They are intended for describing a terminal that can be contacted using the telephone network. The description includes the subscriber (telephone) number of the terminal and the necessary parameters to be able to successfully connect to that terminal.

The "tel" scheme describes a connection to a terminal that handles normal voice telephone calls, a voice mailbox or another voice messaging system or a service that can be operated using DTMF codes.

The "fax" scheme describes a connection to a terminal that can handle telefaxes (facsimiles). The name (scheme specifier) for the URL is "fax" as recommended by [E.123].

The "modem" scheme describes a connection to a terminal that can handle incoming data calls. The term "modem" refers to a device that does digital-to-analog and analog-to-digital conversions; in addition to these, a "modem" scheme can describe a fully digital connection.

The notation for phone numbers is the same which is specified in [RFC2303] and [RFC2304]. However, the syntax definition is a bit different due to the fact that this document specifies URLs whereas [RFC2303] and [RFC2304] specify electronic mail addresses. For example, "/" (used in URLs to separate parts in a hierarchical URL [RFC2396]) has been replaced by ";". In addition, this URL scheme has been synchronized with [RFC2543].

When these URLs are used, the number of parameters should be kept to minimum. This is especially important if the URL is intended to be shown to the end user, printed, or otherwise distributed so that it is visible.

### 1.2 Formal definitions

Formal definitions follow [RFC2234]. This specification uses elements
from the 'core' definitions (Appendix A of [RFC2234]).  Some elements
have been defined in previous RFCs. If this is the case, the RFC in
question has been referenced in comments.

## 1.3 Requirements

Compliant software MUST follow this specification. Requirements are
indicated by capitalized words as specified in [RFC2119].

## 2. URL schemes for telephone calls

## 2.1 Applicability

In this document, "user agent" means software that can detect and
parse one or more of these URLs and possibly place a call to the
remote terminal using hardware and software at its disposal after it
has been properly configured, or otherwise utilize the contents of
the URL.

These URL schemes are used to direct the user agent to place a call
using the telephone network, or as a method to transfer or store a
phone number plus other relevant data. The network in question may be
a landline or mobile phone network, or a combination of these. If the
phone network differentiates between (for example) voice and data
calls, or if the user agent has several different telecommunications
equipment at its disposal, it is possible to specify which kind of
call (voice/fax/data) is requested. The URL can also contain
information about the capabilities of the remote entity, so that the
connection can be established successfully.

None of the URL schemes do have a 'path' in them - they are always
absolute. The URLs are always case-insensitive, except for the
<future-extension> parameter (see below), whose case-sensitivity is
application specific.

All unsafe and reserved characters (when not used for their reserved
purpose) MUST be URL-encoded as explained in [RFC1738]. All 8-bit
characters MUST be URL-encoded.

## 2.2 "tel" URL scheme

The URL syntax is formally described as follows. For the basis of
this syntax, see [RFC2303].

```
telephone-url          = telephone-scheme ":"
```

```
                            telephone-subscriber
     telephone-scheme      = "tel"
     telephone-subscriber  = global-phone-number / local-phone-number
     global-phone-number   = "+" base-phone-number [isdn-subaddress]
                             [post-dial] *(area-specifier / service-provider /
                             future-extension)
     base-phone-number     = 1*phonedigit
     local-phone-number    = 1*(phonedigit / dtmf-digit /
                             pause-character) [isdn-subaddress]
                             [post-dial] *(area-specifier / service-provider /
                             future-extension)
     isdn-subaddress       = ";isub=" 1*phonedigit
     post-dial             = ";postd=" 1*(phonedigit /
                             dtmf-digit / pause-character)
     area-specifier        = ";" phone-context-tag "=" phone-context-ident
     phone-context-tag     = "phone-context"
     phone-context-ident   = network-prefix / private-prefix
     network-prefix        = global-network-prefix / local-network-prefix
     global-network-prefix = "+" 1*phonedigit
     local-network-prefix  = 1*(phonedigit / dtmf-digit / pause-character)
     private-prefix        = (%x21-22 / %x24-29 / %x2C-2F / %x3A /  %x3C-40 /
                              %x45-60 / %x65-7E) *(%x21-3A / %x3C-7E)
                              ; Unsafe and reserved characters must be encoded
                              ; as explained in [RFC1738]
     service-provider      = ";" provider-tag "=" provider-hostname
     provider-tag          = "tsp"
     provider-hostname     = domain ; <domain> is defined in [RFC1035]
     future-extension      = ";" 1*(token-char) ["=" ((1*(token-char)
                             ["?" 1*(token-char)]) / quoted-string )]
     token-char            = (%x21 / %x23-27 / %x2A-2B / %x2D-2E / %x30-39
                             / %x41-5A / %x5E-7A / %x7C / %x7E)
                             ; Unsafe and reserved characters must
                             ; be encoded as explained in [RFC1738]
     quoted-string         = %x22 *( "\" CHAR / (%x20-21 / %x23-7E / %80-FF )
%x22
                             ; Unsafe, reserved, and 8-bit characters must
                             ; be encoded as explained in [RFC1738]
     phonedigit            = DIGIT / visual-separator
     visual-separator      = "-" / "." / "(" / ")"
     pause-character       = one-second-pause / wait-for-dial-tone
     one-second-pause      = "p"
     wait-for-dial-tone    = "w"
     dtmf-digit            = "*" / "#" / "A" / "B" / "C" / "D"
```

## 2.3 "fax" URL scheme

   The URL syntax is formally described as follows (the definition

reuses nonterminals from the above definition). For the basis of this
syntax, see [RFC2303] and [RFC2304].

```
fax-url           = fax-scheme ":" fax-subscriber
fax-scheme        = "fax"
fax-subscriber    = fax-global-phone / fax-local-phone
fax-global-phone  = "+" base-phone-number [isdn-subaddress]
                    [t33-subaddress] [post-dial]
                    *(area-specifier / service-provider /
                    future-extension)
fax-local-phone   = 1*(phonedigit / dtmf-digit /
                    pause-character) [isdn-subaddress]
                    [t33-subaddress] [post-dial]
                    *(area-specifier / service-provider /
                    future-extension)
t33-subaddress    = ";tsub=" 1*phonedigit
```

## 2.4 "modem" URL scheme

The URL syntax is formally described as follows (the definition
reuses nonterminals from the above definitions). For the basis of
this syntax, see [RFC2303].

```
modem-url          = modem-scheme ":" remote-host
modem-scheme       = "modem"
remote-host        = telephone-subscriber *modem-params
modem-params       = ";type=" data-capabilities
data-capabilities  = accepted-modem ["?" data-bits parity
                     stop-bits]
accepted-modem     = "V21" / "V22" / "V22b" /
                     "V23" / "V26t" / "V32" /
                     "V32b" / "V34" / "V90" /
                     "V110" / "V120" / "B103" /
                     "B212" / "X75" /
                     "vnd." vendor-name "." modem-type
data-bits          = "7" / "8"
parity             = "n" / "e" / "o" / "m" / "s"
stop-bits          = "1" / "2"
vendor-name        = 1*(ALPHA / DIGIT / "-" / "+")
modem-type         = 1*(ALPHA / DIGIT / "-" / "+")
```

## 2.5 Parsing telephone, fax and modem URLs

## 2.5.1 Call type

The type of call is specified by the scheme specifier.  "Tel" means

that a voice call is opened. "Fax" indicates that the call should be
a facsimile (telefax) call. "Modem" means that it should be a data
call. Not all networks differentiate between the types of call; in
this case, the scheme specifier indicates the telecommunications
equipment type to use.

### 2.5.2 Phone numbers and their scope

<telephone-subscriber> and <fax-subscriber> indicate the phone number
to be dialed. The phone number can be written in either international
or local notation. All phone numbers SHOULD always be written in the
international form if there is no good reason to use the local form.

Not all numbers are valid within all numbering areas. An optional
parameter <area-specifier> is used to indicate the locale within
which this number is valid, or to qualify the phone number so that it
may be used unambiguously.  The <area-specifier> can take three
forms: <global-network-prefix>, <local-network-prefix> or <private-
prefix>.

If <area-specifier> is present, the user agent MUST NOT attempt to
call out using the phone number if it cannot originate the call
within the specified locale.

There can be multiple instances of <area-specifier>. In this case,
the number is valid in all of the given numbering areas.

The global prefix form is intended to act as the outermost context
for a phone number, so it will start with a "+", followed by some
part of an E.164 number. It also specifies the region in which the
phone number is valid. For example, if <global-network-prefix> is
"+358", the given number is valid only within Finland (even if it is
a <global-phone-number>).

The local prefix form is intended to act as an intermediate context
in those situations where the outermost context for a phone number is
given by another means. One example of use is where the user agent is
known to originate calls within the North American Number Plan Area,
so an "outermost" phone context can be assumed. The local context
could, for example, be used to indicate the area code within which an
associated phone number is situated. Thus "tel:456-7890;phone-
context=213" would suffice to deliver a call to the telephone number
"+1-213-456-7890".  Note that the version including the <phone-
context> implies further that the call should be originated within
the "area code 213" region.

The <private-prefix> form is intended for use in those situations
where a publically accessible phone number is not provided, or some
other context is intended in which the sender and the recipient of
the telephony URL share an understanding of the private phone context
token, but differ in the digit string that this token represents. For
example, a private network numbering plan may be indicated by the
token "X-COMPANY-NET", but the private dialling plan from the locales
of the sender of the telephony URL and the user agent are different.
The syntax of these tokens will be left for future specification.

Unless the sender is absolutely sure that they share the same private
network access digit string with the user agent, then they SHOULD NOT
use a dialling plan number (a local phone number, or one qualified by
a local context), as the result may be incorrect. Instead, they
SHOULD use a private context; if the user agent does not support
dialling into the private network indicated by that context, then the
request can be rejected. If it does, then it will use the access
digit string appropriate for its locale.

Note that the use of <area-specifier> is orthogonal to use of the
telephony service provider parameter (see 2.5.10); it qualifies the
phone number, whilst the <service-provider> parameter indicates the
carrier to be used for the call attempt.

For example, a large company may have private network
interconnections between its sites, as well as connections to the
Global Switched Telephone Network. A phone number may be given in
"public network" form, but with a <service-provider> indicating that
the call should be carried over the corporate network.

Conversely, it would be possible to represent a phone number in
private network form, with a private context to indicate this, but
indicate a public telephony service provider. This would request that
the user agent convert the private network number plan address into a
form that can be carried using the selected service provider.

Any telephone number MUST contain at least one <phonedigit> or
<dtmf-digit>, that is, subscriber numbers consisting only of pause
characters are not allowed.

International numbers MUST begin with the "+" character. Local
numbers MUST NOT contain that character. International numbers MUST
be written with the country (CC) and national (NSN) numbers as
specified in [E.123] and [E.164]. International numbers have the
property of being totally unambiguous everywhere in the world if the
user agent is properly configured.

Local numbers MAY be used if the number only works from inside a
certain geographical area or a network. Note that some numbers may
work from several networks but not from the whole world - these
SHOULD be written in international form, either with a set of
global-phone-prefixes or with a <service-provider> parameter to
specify the regions within which the numbers are valid. URLs
containing local phone numbers should only appear in an environment
where all user agents can get the call successfully set up by passing
the number to the dialing entity "as is".  An example could be a
company intranet, where all user agents are located under a the same
private telephone exchange. If local phone numbers are used, the
document in which they are present SHOULD contain an indication of
the context in which they are intended to be used, and an appropriate
<area-specifier> SHOULD be present in the URL.

In some regions, it is popular to write phone numbers using
alphabetic characters which correspond to certain numbers on the
telephone keypad.  Letters in <dtmf-digit> characters do not have
anything to do with this, nor is this method supported by these URL
schemes.

It should also be noted that implementations MUST NOT assume that
telephone numbers have a maximum, minimum or fixed length, or that
they would always begin with a certain number.  Implementors are
encouraged to familiarize themselves with the international
standards.

### 2.5.3 Separators in phone numbers

All <visual-separator> characters MUST be removed from the phone
number by the user agent before using it do dial out.  These
characters are present only to aid readability: they MUST NOT have
any other meaning. Note that although [E.123] recommends the use of
space (SP) characters as the separators, spaces MUST NOT be used in
phone numbers.

### 2.5.4 Converting the number to the local numbering scheme

After the telephone number has been extracted, it can be converted to
the local dialing convention. (For example, the "+" character might
be replaced by the international call prefix, or the international
and trunk prefixes might be removed to place a local call.) Numbers
that have been specified using <local-phone> or <fax-local-phone>
MUST be used by the user agent "as is", without any conversions.

### 2.5.5 Sending post-dial sequence after call setup

The number may contain a <post-dial> sequence, which MUST be dialled using Dual Tone Multifrequency (DTMF) in-band signalling or pulse dialing after the call setup is complete. If the user agent does not support DTMF or pulse dialing after the call has been set up, <post-dial> MUST be ignored. In that case, the user SHOULD be notified.

### 2.5.6 Pauses in dialing and post-dial sequence

A local phone number or a post-dial sequence may contain <pause-character> characters which indicate a pause while dialing ("p"), or a wait for dial tone ("w").

User agents MAY support this method of dialing, and the final interpretation of these characters is left to the user agent.  It is recommended that the length of the pause is about one second.

If it is not supported, user agents MUST ignore everything in the dial string after the first <pause-character> and the user SHOULD be notified. The user or the user agent MAY opt not to place a call if this feature is not supported and these characters are present in the URL.

Any <dtmf-digit> characters and all dial string characters after the first <pause-character> or <dtmf-digit> SHOULD be sent to line using DTMF (Dual Tone Multifrequency) in-band signaling, even if dialing is done using direct network signaling (a digital subscriber loop or a mobile phone). If the local infrastructure does not support DTMF codes, the user agent MAY opt to use pulse dialing. However, it should be noted that certain services which are controlled using DTMF tones cannot be controlled with pulse dialing. If pulse dialing is used, the user SHOULD be notified.

### 2.5.7 ISDN subaddresses

A phone number MAY also contain an <isdn-subaddress> which indicates an ISDN subaddress. User agent SHOULD support ISDN subaddresses. These addresses are sent to the network by using a method available to the user agent (typically, ISDN subscribers send the address with the call setup signalling). If ISDN subaddressing is not supported by the caller, <isdn-subaddress> MUST be ignored and the user SHOULD be notified. The user or the user agent MAY opt not to place a call if this feature is not supported.

### 2.5.8 T.33 subaddresses

A fax number MAY also contain a <t33-subaddress>, which indicates the

start of a T.33 subaddress [T.33]. User agents SHOULD support this. Otherwise <t33-subaddress> MUST be ignored and the user SHOULD be notified. The user or the user agent MAY opt not to place a call if this feature is not supported.

## 2.5.9 Data call parameters

<modem-params> indicate the minimum compliance required from the user agent to be able to connect to the remote entity. The minimum compliance is defined as being equal to or a superset of the capabilities of the listed modem type.

The user agent MUST call out using compatible hardware, or request that the network provides such a service.

For example, if the user agent only has access to a V.22bis modem and the URL indicates that the minimum acceptable connection is V.32bis, the user agent MUST NOT try to connect to the remote host since V.22bis is a subset of V.32bis. However, if the URL lists V.32 as the minimum acceptable connection, the user agent can use V.32bis to create a connection since V.32bis is a superset of V.32.

This feature is present because modem pools often have separate numbers for slow modems and fast modems, or have different numbers for analog and ISDN connections, or may use proprietary modems that are incompatible with standards. It is somewhat analogous to the connection type specifier (typecode) in FTP URLs [RFC1738]: it provides the user agent with information that can not be deduced from the scheme specifier, but is helpful for successful operation.

This also means that the number of data and stop bits and parity MUST be set according to the information given in the URL, or to default values given in this document, if the information is not present.

The capability tokens are listed below. If capabilities suggest that it is impossible to create a connection, the connection MUST NOT be created.

If new modem types are standardized by ITU-T, this list can be extended with those capability tokens. Tokens are formed by taking the number of the standard and joining together the first letter (for example, "V"), number (for example, 22) and the first letter of the postfix (for example "bis" would become "b").

Proprietary modem types MUST be specified using the 'vendor naming tree', which takes the form "vnd.x.y", in which "x" is the name of

the entity from which the specifications for the modem type can be
acquired and "y" is the type or model of the modem. Vendor names MUST
share the same name space with vendor names used in MIME types
[RFC2048]. Submitting the modem types to ietf-types list for review
is strongly recommended.

New capabilities MUST always be documented in an RFC, and they MUST
refer to this document or a newer version of it.

| Capability | Explanation |
| --- | --- |
| V21 | ITU-T V.21 |
| V22 | ITU-T V.22 |
| V22b | ITU-T V.22bis |
| V23 | ITU-T V.23 |
| V26t | ITU-T V.26ter |
| V32 | ITU-T V.32 |
| V32b | ITU-T V.32bis |
| V34 | ITU-T V.34 |
| V90 | ITU-T V.90 |
| V110 | ITU-T V.110 |
| V120 | ITU-T V.120 |
| X75 | ITU-T X.75 |
| B103 | Bell 103 |
| B212 | Bell 212 |
| Data bits: "8" or "7" | The number of data bits. If not specified, defaults to "8". |
| Parity: "n", "e", "o", "m", "s" | Parity. None, even, odd, mark or space parity, respectively. If not specified, defaults to "n". |
| Stop bits: "1" or "2" | The number of stop bits. If not specified, defaults to "1". |

### 2.5.10 Telephony service provider identification

It is possible to indicate the identity of the telephony service
provider for the given phone number. <service-provider> MAY be used
by the user-agent to place the call using this network, to enhance
the user interface, for billing estimates or to otherwise optimize
its functionality. It MAY also be ignored by the user-agent.
<service-provider> consists of a fully qualified Internet domain name
of the telephony service provider, for example
";tsp=terrifictelecom.com". The syntax of the domain name follows
Internet domain name rules and is defined in [RFC1035].

### 2.5.11 Additional parameters

In addition to T.33 and ISDN subaddresses, modem types and area
specifiers, future extensions to this URL scheme may add other
additional parameters (<future-extension> in the BNF) to these URLs.
These parameters are added to the URL after a semicolon (";").
Implementations MUST be prepared to handle additional and/or unknown
parameters gracefully. Implementations MAY opt not to use the URL if
it contains unknown parameters.

For example, <future-extension> 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.  Whenever a
<future-extension> is used in an open environment, its syntax and
usage MUST be properly documented in an RFC.

<future-extension> nonterminal a rephrased version of, and compatible
with the <other-param> as defined in [RFC2543] (which actually
borrows BNF from an earlier version of this specification).

## 2.6 Examples of Use

    tel:+358-555-1234567

This URL points to a phone number in Finland capable of receiving
voice calls. The hyphens are included to make the number more human-
readable: country and area codes have been separated from the
subscriber number.

    fax:+358.555.1234567

The above URL describes a phone number which can receive fax calls.
It uses dots instead of hyphens as separators, but they have no
effect on the functionality.

    modem:+3585551234567;type=v32b?7e1;type=v110

This phone number belongs to an entity which is able to receive data
calls. The user agent may opt to use either a ITU-T V.32bis modem (or
a faster one, which is compatible with V.32bis), using settings of 7
data bits, even parity and one stop bit, or an ISDN connection using
ITU-T V.110 protocol.

    tel:+358-555-1234567;postd=pp22

The above URL instructs the user agent to place a voice call to
+358-555-1234567, then wait for an implementation-dependent time (for
example, two seconds) and emit two DTMF dialing tones "2" on the line

(for example, to choose a particular extension number, or to invoke a particular service).

        tel:0w003585551234567

This URL places a voice call to the given number. The number format is intended for local use: the first zero opens an outside line, the "w" character waits for a second dial tone, and the number already has the international access code appended to it ("00"). This kind of phone number MUST NOT be used in an environment where all users of this URL might not be able to successfully dial out by using this number directly.  However, this might be appropriate for pages in a company intranet.

        tel:+1234567890;phone-context=+1234;vnd.company.option=foo

The URL describes a phone number which, even if it is written in its international form, is only usable within the numbering area where phone numbers start with +1234. There is also a proprietary extension "vnd.company.option", which has the value "foo". The meaning of this extension is application-specific. Note that the order of these parameters (phone-context and vnd.company.option) is irrelevant.

## 2.7 Rationale behind the syntax

### 2.7.1 Why distinguish between call types?

URLs locate resources, which in this case is some telecommunications equipment at a given phone number. However, it is not necessarily enough to know the subscriber number in order to successfully communicate with that equipment. Digital phone networks distinguish between voice, fax and data calls (and possibly other types of calls, not discussed in this specification). To be able to successfully connect to, say, a fax machine, the caller may have to specify that a fax call is being made. Otherwise the call might be routed to the voice number of the subscriber. In this sense, the call type is an integral part of the 'location' of the target resource.

The reason to have the call type in the scheme specifier is to make the URL simple to remember and use. Making it a parameter, much like the way modem parameters are handled now, will substantially reduce the human readability of this URL.

### 2.7.2 Why "tel" is "tel"?

There has been discussion on whether the scheme name "tel" is

appropriate. To summarize, these are the points made against the
other proposals.

callto      URL schemes locate a resource and do not specify
            an action to be taken.
telephone   Too long. Also, "tel" considered to be a more
            international form.
phone       Was countered on the basis that "tel" is more
            internationally acceptable.

### 2.7.3 Why to use E.164 numbering?

It should be noted that phone numbers may have 'hierarchical'
characteristics, so that one could build a 'forest' of phone numbers
with country codes as roots, area codes as branches and subscriber
numbers as leaves. However, this is not always the case. Not all
areas have area codes; some areas may have different area codes
depending on how one wants to route the call; some numbers must
always be dialled "as is", without prepending area or country codes;
and area codes can and do change.

Usually, if something has a hierarchical structure, the URL syntax
should reflect that fact. These URLs are an exception.

Phone numbers are written almost always in some form which resembles
the E.164 notation. Because of this, the syntax in this specification
is intuitively clear to most people. This is the usual way to write
phone numbers in business cards, advertisements, telephone books and
so on.

Also, when writing the phone number in the form described in this
specification, the writer does not need to know which part of the
number is the country code and which part is the area code. If a
hierarchical URL would be used (with a "/" character separating the
parts of the phone numbers), the writer of the URL would have to know
which parts are which.

Finally, when phone numbers are written in the international form as
specified here, they are unambiguous and can always be converted to
the local dialing convention, given that the user agent has the
knowledge of the local country and area codes.

### 2.7.4 Not everyone has the same equipment as you

There are several ways for the subscriber to dial a phone number:

- By pulse dialing. Typically old telephone exchanges. Usually this dialing method has only to be used to set up the call; after connecting to the remote entity, <post-dial> can be sent to the line using DTMF, because it will typically be processed by the remote entity, not the telephone network.

- By DTMF. These are the 'beeps' that you hear when you dial on most phones.

- By direct network signalling. ISDN subscribers and mobile phone users usually have this. There is no dial tone (or if there is, it is generated locally by the equipment), and the number of the called party is communicated to the telephone network using some network signalling method. After setting up the call, <post-dial> sequences are usually sent using DTMF codes.

### 2.7.5 Do not confuse global and local contexts

As an example, +123456789 will be dialled in many countries as 00123456789, where the leading "00" is a prefix for international calls. However, if a URL contains a local phone number 00123456789, the user-agent MUST NOT assume that this number is equal to a global phone number +123456789. If a user-agent received a telephony URL with a local number in it, it must make sure that it knows the context in which the local phone number is to be processed. Equally, anyone sending a telephony URL should take into consideration that the recipient may have insufficient information about the phone number's context.

### 3. Comments on usage

These are examples of the recommended usage of this URL in HTML documents.

First of all, the number SHOULD be visible to the end user, if it is conceivable that the user might not have a user agent which is able to use these URLs.

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

Second, on a public HTML page, the telehone number in the URL 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 more info, call <a href="tel:+15554383785965">1-555-IETF-RULZ-OK</a>.

Moreover, if the number is a <local-phone-number>, and the scope of the number is not clear from the context in which the URL is displayed, a human-readable explanation SHOULD be included.

> For customer service, dial <a href="tel:1234">1234</a> (only from Terrific Telecom mobile phones).

## 4. References

NOTE. References to Internet-Drafts will be removed from the final document which will be submitted to the RFC-Editor.

[CONV-URL] Conversational Multimedia URLs. 1997. Pete Cordell. An Internet-Draft (work in progress).
<URL:ftp://ftp.nordu.net/internet-drafts/ draft-cordell-sg16-conv-url-00.txt>

[RFC1035] Domain Names - Implementation and Specification. November 1987. P. Mockapetris. RFC 1035.
<URL:ftp://ftp.nordu.net/rfc/rfc1035.txt>

[RFC1738] Uniform Resource Locators (URL). December 1994. T. Berners-Lee et al. RFC 1738.
<URL:ftp://ftp.nordu.net/rfc/rfc1738.txt>

[RFC1866] Hypertext Markup Language - 2.0. November 1995. T. Berners-Lee & D. Connolly. RFC 1866.
<URL:ftp://ftp.nordu.net/rfc/rfc1866.txt>

[RFC2048] Multipurpose Internet Mail Extensions (MIME) Part Four: Registration Procedures. November 1996. N. Freed et al. RFC 2048.
<URL:ftp://ftp.nordu.net/rfc/rfc2048.txt>

[RFC2119] Key Words for Use in RFCs to Indicate Requirement Levels. March 1997. S. Bradner. RFC 2119.
<URL:ftp://ftp.nordu.net/rfc/rfc2119.txt>

[RFC2234] Augmented BNF for Syntax Specifications: ABNF. November 1997. D. Crocker et al. RFC 2234.
<URL:ftp://ftp.nordu.net/rfc/rfc2234.txt>

[RFC2303] Minimal PSTN Address Format in Internet Mail. March 1998.
C. Allocchio. RFC 2303.  <URL:ftp://ftp.nordu.net/rfc/rfc2303.txt>

[RFC2304] Minimal FAX Address Format in Internet Mail. March 1998.
C. Allocchio. RFC 2304.  <URL:ftp://ftp.nordu.net/rfc/rfc2304.txt>

[RFC2396] Uniform Resource Identifiers (URI): Generic Syntax.  August
1998. T. Berners-Lee et al. RFC 2396.
<URL:ftp://ftp.nordu.net/rfc/rfc2396.txt>

[RFC2543] SIP: Session Initiation Protocol. March 1999. M. Handley et
al. RFC 2543. <URL:ftp://ftp.nordu.net/rfc/rfc2543.txt>

[E.123] ITU-T Recommendation E.123: Telephone Network and ISDN
Operation, Numbering, Routing and Mobile Service: Notation for
National and International Telephone Numbers. 1993.  < [E.164] ITU-T
Recommendation E.164: Telephone Network and ISDN Operation,
Numbering, Routing and Mobile Service: Numbering Plan for the ISDN
Era. 1991.

[T.33] ITU-T Recommendation T.33: Facsimile Routing Utilizing the
Subaddress. 1996.

## 5. Security Considerations

It should be noted that the user agent SHOULD NOT call out without
the knowledge of the user because of associated risks, which include

   - call costs (including long calls, long distance calls,
     international calls and premium rate calls, or calls which do
     not terminate due to <post-dial> sequences that have been left
   out
     by the user agent)

   - wrong numbers inserted on web pages by malicious users

   - making the user's phone line unavailable (off-hook) for a
     malicious purpose

   - opening a data call to a remote host, thus possibly opening a
     back door to the user's computer

   - revealing the user's (possibly unlisted) phone number to the
     remote host in the caller identification data

All of these risks MUST be taken into consideration when designing

the user agent.

The user agent SHOULD have some mechanism that the user can use to
filter out unwanted numbers. The user agent SHOULD NOT use rapid
redialing of the number if it is busy to avoid the congestion of the
(signaling) network. Also, the user agent SHOULD detect if the number
is unavailable or if the call is terminated before the dialing string
has been completely processed (for example, the call is terminated
while waiting for user input) and not try to call again, unless
instructed by the user.

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All phone numbers and company names used in the examples of this
specification are fictional. Any similarities to real entities are
coincidental.

## 7. Authors' Addresses

Contact person and version control responsibility for this
specification:

    Nokia Mobile Phones
    Antti Vaha-Sipila
    P. O. Box 68
    FIN-33721 Tampere
    Finland

    Electronic mail: avs@iki.fi
                     antti.vaha-sipila@nokia.com
Please include your name and electronic mail address in all
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version is released.

**8**. **Full Copyright Statement**

   To be added to the final RFC.