

URLs for Telephone Calls
<[draft-antti-telephony-url-10.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 For example, "/" (used in URLs to separate parts in a hierarchical URL [[RFC2396](#)]) has been replaced by ";".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

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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 ":"

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```

    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 /
    base-phone-number = future-extension)
                        1*phonedigit
    local-phone-number = 1*(phonedigit / dtmf-digit /
                        pause-character) [isdn-subaddress]
                        [post-dial] *(area-specifier / service-
provider /
    isdn-subaddress = future-extension)
                    ";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 /
                    %x45-4F / %x51-56 / %x58-60 / %x65-6F /
%x71-76 /
                    %x78-7E) *(%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

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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 numbering area within which this number is valid. The <area-specifier> can take three forms: <global-network-prefix>, <local-network-prefix> or <private-prefix>. The interpretation of this field is as follows:

the

number is valid in the user-agent's numbering area if the user-agent's own number starts with one of the given prefixes. For example, if <global-network-prefix> is "+358", the given number is valid only within Finland (even if it is a <global-phone-number>).

If

<local-network-prefix> is "80", the number is valid in an environment

where the user-agent's own number starts with "80" - possibly a company internal phone number.

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

The interpretation of <private-prefix> is left for future specification within IETF PINT working group and shall be documented in an RFC. <private-prefix> SHOULD start with a token which identifies its syntax.

If <area-specifier> is present, the user agent MUST NOT call out if the user agent is not located within that numbering area. Also, if <area-specifier> is present, <global-network-prefix> SHOULD be used whenever possible.

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

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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. 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 for telephone number notation.

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>

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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.

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").

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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 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.foo.ext=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.foo.ext", which has the value "foo". The meaning of this extension is application-specific. Note that the order of these parameters (phone-context and vnd.foo.ext) 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 usability of this URL (to the humans).

[2.7.2](#) Why "tel" is "tel"?

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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: +358-555-1234567

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

Telephone: (0555) 1234567

or even

For more info, call [1-555-IETF-RULZ-OK](tel:+15554383785965).

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 [1234](tel:1234) (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.

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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 communications. If you want to receive the newest version of this specification electronically, send mail to the address above.

This document expires on the 24th of February, 2000, or when a new version is released.

8. Full Copyright Statement

To be added to the final RFC.