Telephony Tones Using MIDI in SIP
draft-bryan-sipping-midi-01

Status of this Memo

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Abstract

This document describes conventions for using MIDI to generate tones
on SIP UAs. This does not define any changes to SIP but describes
how to use the existing Alert-Info header to play tones that can be
used to indicate specialized PSTN tones such as the ringback tones
from various countries. The tones are described using MIDI which
results in a compact representation that is simple for a UA to
generate and easy to render into audio.

This work is being discussed on the sipping@ietf.org mailing list.
This draft was revived at request of a few people so it could be
discussed. Parts of it need to be updated since it was written in
2003.

Table of Contents

[1](#). **Conventions**

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in [RFC-2119](#) [[1](#)].

[2](#). **Introduction**

   Countries and regions within countries use different tones to
   represent information related to the state and progress of telephone
   calls. Different tones are generated to alert the user the phone is
   ready to make a call, is attempting to ring a remote party, that the
   remote party is busy, etc.. When placing a call to a remote party
   with the PSTN, the tones of the destination country are usually
   heard. Most work at the IETF today is intended to make sure the user
   interface experience of users is localized to the form they
   understand and prefer to use. This work is just the opposite, it
   provides a way to replicate the PSTN experience of phoning a foreign
   country and hearing tones you may not have heard before and have no
   way to understand.

   SIP telephones have traditionally generated these tones locally, and
   the tones heard are the same no matter where the called resides.
   While many people feel that this localized and familiar behavior is
   the correct behavior, there have been discussions of situations where
   it is desirable to maintain the behavior of the PSTN and reproduce
   the local tones of the destination.

   Additionally, there has been no standard way to encode the tones used
   in a particular country. As the reach of SIP endpoints increases,
   localization of these devices such that they exhibit correct behavior
   for the region in which they are installed has become increasingly
   important.

   This document presents a method to represent these tones using an
   existing standard, and presents a method for conveying this
   information using SIP.

[3](#). **Discussion**

   The basic mechanism is for the UAS to indicate in a response the tone
   that it wants to have played by including the MIDI tone in the
   response message. The MIDI tone description is carried in the body
   of the SIP message and the Alert-Info header contains a cid URL that
   points at the body.

The UAS can indicate in a SIP response, such as a 180, that it wishes
a tone to be played by including a body with a MIDI tone and setting
the Alert-Info header to have a cid URL that points at the body.
This would typically be used in a 180 to indicate the ringtone to
play but it could also be sent in a response like a 486 to indicate
what sort of busy tone to play. It could also be used in an UPDATE
message.

4. MIDI Background

MIDI (Musical Instrument Digital Interface) is a protocol defined by
the MIDI Manufacturers Association for use by computerized musical
instruments such as synthesizers and keyboards and to represent
musical instrument scores on computer systems. MIDI is a very
complete and expressive protocol, capable of representing virtually
everything required for a complete performance on an instrument or
instruments. MIDI has also been used to convey other signaling
information related to musical performances, such as control of
lighting and changing settings on sound effect and public address
equipment. MIDI has been used extensively for many years (since
1983) and is a stable and well established protocol.

MIDI is currently used in telephony for representation of ringtones
for mobile phones. While the level of expressiveness available is
far richer than needed, the protocol can also be used to represent
the various tones that are generated by phones in each country.

MIDI is an event based system. Events are presented in sequential
order and interpreted by the playback device in that order. For
example, one MIDI event might indicate that a note should begin to
play, and the following event could indicate that that note should be
released and stop playing. Each event is prefixed by a delta time,
which is used to indicate the time that should elapse before that
event occurs. If the note mentioned above is to be sounded for 1
second, the release note event would be prefixed by a delta time of 1
second, indicating that the note should be allowed to play for one
second before being released.

MIDI, as a language for musicians, is oriented towards notes and
beats, rather than the frequencies and times more common in the
telecommunications and networking worlds. MIDI does, however,
support using absolute times in place of beats, as discussed on the
Open Issues section of this draft. Delta times, discussed above, are
typically represented as counts and beats, and notes are represented
as integers representing a particular musical note in the chromatic
(western) scale, and not a given frequency.

In addition to defining the events that can be generated, MIDI
defines a format for files to store songs as sequences of such
events. The regular MIDI protocol is often used exclusive of this
file format, for example to allow one musical instrument to control
another on the fly, but we will use the file format as we wish to
represent a pre-defined sequence of musical events.

The General MIDI standard was added in 1991 to further standardize
some features that were not fully specified in the original MIDI
spec. Among the things that General MIDI addresses is a numbering
scheme for patches, or types of musical instrument sounds that should
be used (Grand Piano is sound 1, Sawtooth wave is 82, etc.).
Unfortunately for telecommunications, no sine wave tone is specified.
General MIDI also suggests default values for most parameters in
MIDI. We take advantage of these suggested defaults in this
document, as they are widely used in the industry.

5. MIDI to Represent Tones

MIDI offers considerably greater expressiveness that is required for
the generation of simple tones, but a number of MIDI events are
required to properly reproduce the tones generated by a typical
endpoint.

MIDI represents start and stop events for particular musical notes,
but the tones used in telephony signaling are often not whole musical
notes, but rather tones of arbitrary frequency. To properly
represent these arbitrary pitches, one must precede the event
representing the start of the tone with a bend event that alters the
frequency of the note away from the chromatic musical pitch to an
arbitrary frequency prior to it being "struck". This is commonly
done in MIDI to represent bends as well as to represent musical notes
for non-western music, in which the frequencies may not correspond to
the chromatic musical notes.

MIDI pitch bends (also called pitch wheel events) represent the
degree that the note is changed as a 14 bit integer (0-16383), where
the midpoint (8192) represents no pitch bend, and either extreme
represents the maximum or minimum possible bend for a particular MIDI
device. While the range of pitch bend these correspond to is not
enforced by the protocol, a range of two half steps up and two half
steps down (four half steps total range) is recommended by the
General MIDI specification and used by most devices.

A half step represents a change from one MIDI note to the next, so
any arbitrary pitch can be obtained by bending up or down by less
than one half step from some note. The 14 bits are represented in a

16 bit integer in MIDI files where the bytes 0 to 6 in the first half
of the 16 bit integer represent bits 0 to 6 of the 14 bit values, and
bits 9 to 15 in the second half of the 16 bit integer represent bits
7 to 13 of the 14 bit value. As such, the 16 bit representation of
the midpoint is defined in hex as 0x0040, and a bend of one half step
up or down are represented by 0x0060 and 0x0020 respectively. We
show a worked example of calculating the pitch events needed to
generate the arbitrary tones in a later section.

MIDI can represent times either using beats, or using absolute times.
While absolute times might seem to be the better choice for a
technology driven application, the beat type system is more common in
MIDI files. We will discuss the beat-based mechanism here, and leave
discussion of the merits of one system or the other to the open
issues section.

The header for MIDI files includes data that specifies the time to be
used. Two bytes in this header represent (in Big Endian) how many
clocks there are in a quarter note of music. Later, one can specify
time signature (such as 4/4 or 3/4) and speed, in beats per minute
(bpm). General MIDI specifies that, unless modified, a signature of
4/4 and a speed of 120 bpm are to be assumed. This means that 120
quarter notes occur in a minute, or that a quarter note lasts for
half a second. If a value of 500 clocks is assigned to one quarter
note in the header, each clock used in the delta times in our file
will thus represent 1ms of clock time, a convenient time unit for
recreating telephony tones.

With the time specified in the header, we can represent delta times
elapsed between events as milliseconds, but we need to understand how
MIDI represents delta times in the file. Delta times are represented
as a Variable Length Quantity. This is a mechanism to allow numbers
of arbitrary size to be represented with the length of the
representation in the file increasing as the size of the number
represented increases. The first seven bits (right justified) of a
byte represent data, while the last bit is 0 if no more bytes of
information are needed, and 1 if another byte is needed to represent
the number. Numbers from 1-127 (2^7) can thus be represented using
one byte, adding a second byte will allow numbers as large as 2^14,
adding a third byte allows numbers as large as 2^21, etc. We show a
worked example of calculating delta times as Variable Length
Quantities in the Constructing Telephone Tones section.

The tones we wish to generate are also composed of pure sinusoidal
tones, whereas most music is generated using samples of actual
musical instruments based on more complex wave forms. General MIDI
offers pre-defined patches for some of the most common musical
instruments, as well as sawtooth and square waves, but fails to offer

a pre-defined patch for a sine wave. We discuss this further in the
open issues section. Our recommendation is that sound 125 (0x7D),
mapped to "Telephone Ring" in general MIDI, be interpreted as a sine
wave.

While developing tone files on a conventional synthesizer, one may
wish to use sound 82 (0x52), mapped to "Sawtooth Wave" in general
MIDI, since this sound most closely resembles a sine wave, and leads
to tones that sound very close when playing back with a general MIDI
sequencer.

MIDI files consist of a header, providing basic information about the
file (including the time information discussed above) and one or more
tracks containing MIDI events. In our examples, we use only one
track, and recommend this for users creating files.

There is no standard mechanism defined in MIDI files to specify that
the file should played repeatedly. For most tones representing phone
sounds, the pattern is an infinitely repeating pattern, or should be
played for a certain amount of time before switching to a different
tone (for example from dialtone to off hook). Information about
whether to repeat a file over and over, for a certain time, etc. is
conveyed with attached signaling information, as specified in the
Signaling to Play Tones section of this draft. If possible, users
should attempt to create tone files that can be looped easily and are
as short as possible.

6. Examples

6.1. Signaling to Play Tones

The following section shows an example of the signaling for a typical
ringback tone use. Alice calls a PSTN GW which sends back a 180
ringing response with a ringback tone description using MIDI.

```
   Alice                      Bob
      |(1) INVITE              |
      |---------------------->|
      |                        |
      |(2) 180                 |
      |<----------------------|
```

Message 1 from Alice to Bob is:

```
INVITE sip:bob@b.example.com SIP/2.0
Via: SIP/2.0/UDP a.example.com;branch=z9hG4bKnashds8
To: Bob <bob@b.example.com>
From: Alice <alice@a.example.com>;tag=1928301774
Call-ID: a84b4c76e66710
CSeq: 314159 INVITE
Max-Forwards: 70
Date: Thu, 21 Feb 2002 13:02:03 GMT
Contact: <sip:alice@a.example.com>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 example.com
s=Session SDP
c=IN IP4 a.example.com
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

If message 2 does not contain any bodies other than the MIDI body,
then message from Bob to Alice is:

```
SIP/2.0 180 Ringing
Alert-Info: <cid:foo@bar>
Via: SIP/2.0/UDP a.example.com;branch=z9hG4bKnashds8
To: Bob <sip:bob@b.example.com>;tag=a6c85cf
From: Alice <sip:alice@a.example.com>;tag=1928301774
Call-ID: a84b4c76e66710
Contact: <sip:bob@b.example.com>
CSeq: 314159 INVITE
Content-Type: audio/midi
Content-Disposition: render;handling=optional
Content-Length: XXX
Content-ID: <foo@bar>

***********************
* BINARY BLOB of MIDI *
***********************
```

If message 2 contains the MIDI body and SDP, then message 2 from Bob
to Alice uses multipart mime and looks like:

```
SIP/2.0 180 Ringing
Alert-Info: <cid:foo@bar>
Via: SIP/2.0/UDP a.example.com;branch=z9hG4bKnashds8
To: Bob <sip:bob@b.example.com>;tag=a6c85cf
From: Alice <sip:alice@a.example.com>;tag=1928301774
Call-ID: a84b4c76e66710
Contact: <sip:bob@b.example.com>
CSeq: 314159 INVITE
Content-Type: multipart/mixed;boundary=bound42
Content-Length: xxx

--bound42

Content-Type: audio/midi
Content-Disposition: render;handling=optional
Content-Length: yyy
Content-Transfer-Encoding: binary
Content-ID: <foo@bar>

**********************
* BINARY BLOB of MIDI *
**********************
--bound42
Content-Type: application/sdp
Content-Disposition: session;handling=required
Content-Length: zzz

v=0
o=UserB 2890844526 2890844526 IN IP4 example.com
s=Session SDP
c=IN IP4 b.example.com
t=0 0
m=audio 47172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
--bound42
```

6.2. US and ITU Tones

For detailed examples of how to construct a tone file, and exactly
what each line in a MIDI file represents, see the section
"Constructing Telephone Tones" later in this document.

The following MIDI represents the standard US and ITU tones.

U.S. Dialtone Signal - continuous 350 and 440Hz tones. (5 second
duration used for example)

```
+-----------------+-----------------------------------------------+
| 4D 54 68 64     | The text MThd is the magic word indicating    |
|                 | this is a MIDI header.                         |
| 00 00 00 06     | The length of the header data to follow is six |
|                 | bytes.                                         |
| 00 00           | MIDI format 0.                                 |
| 00 01           | The file contains 1 Track.                     |
| 01 F4           | 500 (0x01F4) clocks for a quarter note.        |
| 4D 54 72 6B     | The text MTrk is the magic word indicating    |
|                 | this is a MIDI track.                          |
| 00 00 00 1E     | The length of the track data.                  |
| 00 C0 7E        | Change channel 0 (C1) patch to "Telephone     |
|                 | Ringing" at delta time zero.                   |
| 00 C1 7D        | Change channel 1 (C1) patch to "Telephone     |
|                 | Ringing" at delta time zero.                   |
| 00 E1 5E 3E     | Set the pitch bend for channel 1 at delta time |
|                 | zero.                                          |
| 00 90 45 40     | Sound the first tone on channel 0.             |
| 00 91 41 40     | Sound the second tone on channel 1.            |
| A7 08 80 45 7F  | After a delta time of 5.0 seconds, silence the |
|                 | first tone.                                    |
| 00 91 41 7F     | Silence the second tone.                       |
| 00 FF 2F 00     | End of Track magic word, after a delay of zero |
+-----------------+-----------------------------------------------+
```

U.S. Ringing Signal - 440 and 480Hz tones, on for 2.0 seconds, off
for 4.0 seconds.

```
+-----------------+-----------------------------------------------+
| 4D 54 68 64     | The text MThd is the magic word indicating    |
|                 | this is a MIDI header.                         |
| 00 00 00 06     | The length of the header data to follow is six |
|                 | bytes.                                         |
| 00 00           | MIDI format 0.                                 |
| 00 01           | The file contains 1 Track.                     |
| 01 F4           | 500 (0x01F4) clocks for a quarter note.        |
| 4D 54 72 6B     | The text MTrk is the magic word indicating    |
|                 | this is a MIDI track.                          |
| 00 00 00 20     | The length of the track data.                  |
| 00 C0 7D        | Change channel 0 (C1) patch to "Telephone     |
|                 | Ringing" at delta time zero.                   |
| 00 C1 7D        | Change channel 1 (C1) patch to "Telephone     |
|                 | Ringing" at delta time zero.                   |
| 00 E0 7C 4F     | Set the pitch bend for channel 0 at delta time |
|                 | zero.                                          |
| 00 90 46 40     | Sound the first tone on channel 0.             |
| 00 91 45 40     | Sound the second tone on channel 1.            |
```

```
   | 8F 50 80 46 7F    | After a delta time of 2.0 seconds silence the  |
   |                   | first tone.                                    |
   | 00 81 45 7F       | Silence the second tone.                       |
   | 9F A0 FF 2F 00    | Wait 4 seconds, then send end of Track magic   |
   |                   | word                                           |
   +-------------------+------------------------------------------------+
```

U.S. Busy Signal - 480 and 620Hz tones, on for 0.5 seconds, off for
0.5 seconds.

```
   +-------------------+------------------------------------------------+
   | 4D 54 68 64       | The text MThd is the magic word indicating     |
   |                   | this is a MIDI header.                         |
   | 00 00 00 06       | The length of the header data to follow is six |
   |                   | bytes.                                         |
   | 00 00             | MIDI format 0.                                 |
   | 00 01             | The file contains 1 Track.                     |
   | 01 F4             | 500 (0x01F4) clocks for a quarter note.        |
   | 4D 54 72 6B       | The text MTrk is the magic word indicating     |
   |                   | this is a MIDI track.                          |
   | 00 00 00 24       | The length of the track data.                  |
   | 00 C0 7D          | Change channel 0 (C1) patch to "Telephone      |
   |                   | Ringing" at delta time zero.                   |
   | 00 C1 7D          | Change channel 1 (C1) patch to "Telephone      |
   |                   | Ringing" at delta time zero.                   |
   | 00 E0 7C 4F       | Set the pitch bend for channel 0 at delta time |
   |                   | zero.                                          |
   | 00 E1 78 3D       | Set the pitch bend for channel 1 at delta time |
   |                   | zero.                                          |
   | 00 90 46 40       | Sound the first tone on channel 0.             |
   | 00 91 4B 40       | Sound the second tone on channel 1.            |
   | 83 74 80 46 7F    | After a delta time of 0.5 seconds, silence the |
   |                   | first tone.                                    |
   | 00 81 4B 7F       | Silence the second tone.                       |
   | 83 74 FF 2F 00    | Wait 0.5 seconds and send end of Track magic   |
   |                   | word                                           |
   +-------------------+------------------------------------------------+
```

ITU Dialtone and Busy Signal - continuous 425Hz tone. (5 second
duration used for example)

```
+-----------------+---------------------------------------------+
| 4D 54 68 64     | The text MThd is the magic word indicating  |
|                 | this is a MIDI header.                       |
| 00 00 00 06     | The length of the header data to follow is six |
|                 | bytes.                                       |
| 00 00           | MIDI format 0.                               |
| 00 01           | The file contains 1 Track.                   |
| 01 F4           | 500 (0x01F4) clocks for a quarter note.      |
| 4D 54 72 6B     | The text MTrk is the magic word indicating   |
|                 | this is a MIDI track.                        |
| 00 00 00 14     | The length of the track data.                |
| 00 C0 7D        | Change channel 0 (C1) patch to "Telephone    |
|                 | Ringing" at delta time zero.                 |
| 00 E0 38 33     | Set the pitch bend for channel 0 at delta time |
|                 | zero.                                        |
| 00 90 44 40     | Sound the first tone on channel 0.           |
| A7 08 80 44 7F  | After a delta time of 5.0 seconds, silence the |
|                 | tone.                                        |
| 00 FF 2F 00     | End of Track magic word                      |
+-----------------+---------------------------------------------+
```

ITU Busy Signal - 425Hz tone, on for 0.67-1.5 seconds, off for 3-5
seconds (varies by location, 1.5 and 5 used in example)

```
+-----------------+---------------------------------------------+
| 4D 54 68 64     | The text MThd is the magic word indicating  |
|                 | this is a MIDI header.                       |
| 00 00 00 06     | The length of the header data to follow is six |
|                 | bytes.                                       |
| 00 00           | MIDI format 0.                               |
| 00 01           | The file contains 1 Track.                   |
| 01 F4           | 500 (0x01F4) clocks for a quarter note.      |
| 4D 54 72 6B     | The text MTrk is the magic word indicating   |
|                 | this is a MIDI track.                        |
| 00 00 00 15     | The length of the track data.                |
| 00 C0 7D        | Change channel 0 (C1) patch to "Telephone    |
|                 | Ringing" at delta time zero.                 |
| 00 E0 38 33     | Set the pitch bend for channel 0 at delta time |
|                 | zero.                                        |
| 00 90 44 40     | Sound the first tone on channel 0.           |
| 8b 5c 80 44 7F  | After a delta time of 1.5 seconds, silence the |
|                 | tone.                                        |
| A7 08 FF 2F 00  | After 5 seconds, send end of Track magic word |
+-----------------+---------------------------------------------+
```

7. **UA behavior**

   A SIP UAC that can play MIDI tones SHOULD indicate that it supports
   the MIDI media type in the Accept header.

8. **Required MIDI support**

   As specified by MIDI, endpoints MUST assume 4/4 time and 120 bpm if
   no other time is specified. Users generating ring files MUST NOT
   specify an alternate time signature or tempo. Devices interpreting
   these files MAY correctly interpret time signature and tempo change
   events, but should reasonably expect that these events will not
   appear in files sent to them. Users creating files MAY specify a
   number of clocks per beat other than 500, and devices interpreting
   these files MUST correctly interpret the clocks per beat
   specification in the MIDI header file.

   A device interpreting a MIDI file to generate telephone tones MUST
   interpret the range of the pitch wheel to be four half-steps total
   (two half-steps up and two half-steps down).

   A device interpreting a MIDI file MUST interpret general MIDI sample
   number 125 ("Telephone Ringing Effect") to be a pure sinusoidal wave.

   A device interpreting a MIDI file MUST be able to interpret a format
   0 MIDI file. It MAY interpret other MIDI types. Users generating
   tone files MUST use MIDI format 0.

   A device interpreting a MIDI file MUST be able to handle 1 track of
   data. It MAY accept more than one track. Users generating tone
   files MUST use a single track of data.

   Users generating tones SHOULD use a velocity of 0x40 (medium
   velocity) unless they require one tone to be louder than another.
   TODO They should use velocity 0xXX to represent XX db less, 0xXX to
   represent XX db less, and 0xXX to represent XX db less.

   Users generating tones should terminate them with velocity 0x7F
   (silence as quickly as possible) unless there is a reason to fade the
   note.

   Users generating tones MUST encode them so that they can be looped,
   if the tone is designed to be repeated infinitely. Users SHOULD make
   the sample as small as possible (for example, an alternating on-off
   pattern should only specify one each of on and off) to minimize the
   size of the file. Users SHOULD make the sample 5 seconds long in the
   event that the file is a continuous tone.

9. **Constructing Telephone Tones**

   We present as an example a file to represent the US Busy signal. The
   US busy signal consists of 480Hz and 620Hz tones. These two tones
   are played simultaneously in a repeated pattern of 0.5 seconds of
   tone, followed by 0.5 seconds of silence.

   Since neither 480Hz nor 620Hz correspond to a standard musical pitch,
   both need to be pitch bent from a nearby musical tone to reach the
   appropriate frequency.

   To produce 480Hz, we bend up from note 70 (0x46), an A-sharp at
   approximately 466.164Hz, toward note 71, a B at approximately
   493.883Hz. A MIDI pitch bend is represented by a 14bit integer, with
   values ranging from 0 to 16383. The midpoint of this range, 8192,
   represents that the note receives no pitch bend from the musical
   note. Assuming the suggested standard where a value of 0 represents
   a bend of 2 half-steps down, and a value of 16383 represents a bend
   up of 2 half-steps up, we calculate our pitch value by linear
   interpolation.

   The difference between the two notes is one half-step and 27.719Hz.
   One half- step is 4096 "units" of pitch bend, so each unit
   corresponds to 0.00677Hz. 480Hz requires us to bend up 13.836Hz from
   note 70 at 466.164Hz, or 2044 units. Since 8192 represents the
   center of our pitch bend (half of a 14 bit value), we add 2044 to
   this to bend up. Our pitch bend thus needs to send a value of 10236.
   In binary, this is 10011111111100. We map this to a 16 bit integer
   by placing the first 7 bits in the first half of the 16 bit integer,
   padded with a 0, and the last 7 bits in the second half of the 16 bit
   integer, padded with a 0, as shown below:

   10011111111100 => 1001111 1111100 => 01001111 01111100

   We reverse these to get the proper order for the MIDI message format,
   and we have:

   01111100 01001111 => 0x7C4F

   Similarly, we can calculate a pitch of 620Hz. Note 74 is 587.330Hz,
   and note 75 is 622.254. We bend down 2.254Hz from note 75. The
   difference between the notes is 34.924Hz, so each unit of pitch bend
   corresponds to 0.00853Hz. We thus need to bend down 264 units from
   note 75 (0x4B). With 8192 being center, we need a pitch value of
   7928. Calculating as the 16 bit value as above, this returns 0x783D
   as the pitch bend required.

   We now know the notes and pitch bends we need, but need to calculate

the time required. We have set up the file as defined above to use
500 clocks to represent a quarter note, and assume 4/4 time with 120
bpm. This means a quarter note is one beat, and there are 120 beats
per minute. Thus, there are 120 quarter notes in a minute, and each
is 500 clocks long. We thus have 60000 clocks in a minute, or 1000
clocks per second. Each clock is thus 1ms. Since a busy signal
alternates 0.5 seconds on and 0.5 seconds off, we need to use 500
clocks between turning the notes on and turning them off again.

We need to represent 500 as a Variable Length Quantity. One can find
utilities to convert this online, but we will convert this by hand.:

500 can be represented in binary as 111110100. Breaking this into 7
bit chunks, and padding with leading zeros, we have 0000011 1110100.
We will need two bytes to represent this value. The first will begin
with a 1, indicating that a second byte follows, and the second will
begin with a 0, indicating that no more bytes follow. Thus, we have
the following two bytes:

10000011 01110100 => 0x83 0x74. This will be used as our delta time
before we silence the notes.

With these values calculated, we can look at the complete MIDI file
for a US dialtone.

The file begins with a MIDI header: 4D 54 68 64 00 00 00 06 00 01 00
01 01 F4

The header can be broken down as follows

```
+------------------+-----------------------------------------------+
| 4D 54 68 64      | The text MThd is the magic word indicating    |
|                  | this is a MIDI header.                         |
| 00 00 00 06      | The length of the data to follow the header is |
|                  | 6 bytes.                                       |
| 00 00            | MIDI format.  We use MIDI format 0.           |
| 00 01            | Number of tracks.  We use only 1.             |
| 01 F4            | Number of clocks for a quarter note.  We use  |
|                  | 500 (0x01F4) as discussed above.              |
+------------------+-----------------------------------------------+
```

The file then contains the MIDI data needed to represent the events:

```
+------------------+-----------------------------------------------+
| 4D 54 72 6B      | The text MTrk is the magic word indicating    |
|                  | this is a MIDI track                          |
| 00 00 00 24      | The length of the track data. 0x24 is 36 bytes|
| 00 C0 7D         | The first byte is a time offset from the last |
|                  | event, in this case, the start of the file or |
|                  | time zero.  This event occurs immediately.  C0|
|                  | is the code for the MIDI event changing the   |
|                  | sound for MIDI channel 0.  We change to sound  |
|                  | 0x7D, or 125, which is the Telephone Ringing  |
|                  | effect.                                       |
| 00 C1 7D         | Change channel 1 (C1) to the Telephone Ring as|
|                  | well.                                         |
| 00 E0 7C 4F      | Again, the first byte is a time offset of     |
|                  | zero.  Event E0 is a pitch bend event on      |
|                  | channel 0.  We bend by 0x7C4F, as calculated  |
|                  | above.                                        |
| 00 E1 78 3D      | Set the bend for channel 1 to be 0x783D, as   |
|                  | calculated above.                             |
| 00 90 46 40      | Time delta of zero, event 90 is a start note  |
|                  | for channel 0, 0x46 is note 70, as calculated |
|                  | above.  The final byte, 0x40, indicates how   |
|                  | hard we strike the note. 0x40 represents a    |
|                  | middle velocity or volume note.               |
| 00 91 4B 40      | Start the second note on channel 1.  We now   |
|                  | have both tones sounding.                     |
| 83 74 80 46 7F   | Wait 0x83 0x74 time units (0.5 seconds), then |
|                  | signal event 80. 80 turns off a note on       |
|                  | channel 0.  The note to be turned off is note |
|                  | 46, which we turned on, then silenced with two|
|                  | instances of event 90 above.  The final byte, |
|                  | 7f, represents the speed to stop the note. 7f |
|                  | means turn the note off immediately, with no  |
|                  | fade.                                         |
| 00 81 4B 7F      | After an additional 0 seconds (in other words,|
|                  | at the same time as the event above), silence |
|                  | the other note.  Event 81 turns off a note on |
|                  | channel 1, the note to turn off is the 4B we  |
|                  | created with the 91 event, and we turn it off |
|                  | as quickly as possible.                       |
| 83 74 FF 2F 00   | Wait another 0x83 0x74 time units (0.5        |
|                  | seconds), then signal end of track.  This     |
|                  | gives us a 0.5 second pause at the end of the |
|                  | file. 0xFF 0x2F 0x00 is the End of Track Magic|
|                  | word.                                         |
+------------------+-----------------------------------------------+
```

10. Security Considerations

   This section still needs work.

   A UA needs to be very careful on who it accepts tones from because
   the user attributes particular meaning to the tones, which, if the
   tone is wrong, may not correspond to what is really happening.

11. Open Issues

   Someone should get IANA to register audio/midi

   Get someone with a frequency counter or oscilloscope to check the
   math and make sure the frequencies calculated are correct - just
   because they sound right doesn't mean 100% they are..

   No Sine Wave, so we use 125 for Telephone Ringing. Are there
   problems with this?

   Timing note style (more common) vs. absolute (more "techie" and less
   musician). Should we use the style more common in MIDI or more
   familiar to telephony/network people?

   Measure and determine velocity values to produce sounds that are so
   many db more or less than others. This is likely to be inexact since
   different synthesizers may play the files differently. Endpoints
   should be calibrated to make them correct.

   Verify there is no standard way of representing looping and discuss
   what we want to do to allow for it in the absence of a standard way
   to represent.

   Explain how the modulated form works that is used in some countries,
   and determine if there is a way to reproduce this in a standard way
   in MIDI.

   Write security section

12. Acknowledgements

   This reused work from the earlier drafts by Adam Roach [6] and Rohan
   Mahy[5].

13. Appendix A: Country Reference

   This appendix lists tones that might be used in various countries as
   an aid to developers. It is not known to be correct and is not
   normative in any way.

   The frequency is in Hz and + means to play both tones simultaneously
   while * means modulate one tone with the other. A / indicates the
   first tone is played then the second tone is played. Duration is the
   on time followed by the off time in seconds.

   <country name="ALBANIA">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.3-0.3" />
     <tone type="congestion_tone" freq="425" duration="0.15-0.15" />
   </country>

   <country name="ALGERIA">
     <tone type="ringing_tone" freq="25 or 50" duration="1.5-3.5" />
     <tone type="busy_tone" freq="450" duration="0.5-0.5" />
   </country>

<country name="ANGOLA">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="ringing_tone" freq="25" duration="1.0-5.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.5-0.5" />
  <tone type="number_unobtainable_tone" freq="400" duration="0.2-0.2" />
  <tone type="waiting_tone" freq="400" duration="1.0-5.0" />
</country>

```
   <country name="ANGUILLA">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="recall_dial_tone" freq="350+440"
           duration="3*(0.1-0.1)-continuous" />
     <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
     <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.33-1.0" />
     <tone type="warning_operator_intervening_tone" freq="450"
           duration="0.2-0.2-0.65-0.2" />
     <tone type="number_unobtainable_tone" freq="480+620"
           duration="0.25-0.25" />
     <tone type="waiting_tone" freq="440" duration="1*(0.5-10.0-0.5)" />
     <tone type="payphone_recognition_tone" freq="1600/1143"
           duration="0.2-0.2-0.2-2.0" />
   </country>

  <country name="ANTIGUA AND BARBUDA">
    <tone type="dial_tone" freq="350/440" duration="continuous" />
    <tone type="second_dial_tone" freq="350/440" duration="continuous" />
    <tone type="recall_dial_tone" freq="350/440" duration="continuous" />
    <tone type="ringing_tone" freq="440/480" duration="2.0-4.0" />
    <tone type="busy_tone" freq="480/620" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="480/620" duration="0.25-0.25" />
    <tone type="number_unobtainable_tone" freq="recorded"
          duration="announcement" />
    <tone type="waiting_tone" freq="480"
          duration="0.5-10.0-0.5 (once only)" />
    <tone type="test_number_tone" freq="1004" duration="continuous" />
  </country>

  <country name="ARGENTINA">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="0.3-0.2" />
    <tone type="congestion_tone" freq="425" duration="0.3-0.4" />
    <tone type="warning_operator_intervening_tone" freq="1400"
          duration="5*0.1-1.9" />
    <tone type="waiting_tone" freq="425" duration="0.4-0.2-0.4-4.0" />
    <tone type="call_waiting_tone" freq="425" duration="0.3-10.0" />
    <tone type="end_three_party_service_tone" freq="950/1400/1800"
          duration="3*0.33 (single burst)" />
    <tone type="service_activated_tone" freq="425" duration="1.0-0.25" />
  </country>
```

```
  <country name="ARUBA">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
    <tone type="number_unobtainable_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
    <tone type="waiting_tone" freq="425" duration="0.2-0.2-0.2-4.4" />
  </country>

  <country name="ASCENSION">
    <tone type="dial_tone" freq="350/440" duration="continuous" />
    <tone type="ringing_tone" freq="440/480" duration="1.0-3.0" />
    <tone type="busy_tone" freq="480/620" duration="0.5-0.5" />
    <tone type="warning_operator_intervening_tone" freq="440"
          duration="0.8-6.0-0.2-6.0-0.2" />
    <tone type="number_unobtainable_tone" freq="480/620"
          duration="0.25-0.25" />
  </country>

<country name="AUSTRALIA">
  <tone type="dial_tone" freq="425*25" duration="continuous" />
  <tone type="dial_pabx_tone" freq="154" duration="continuous" />
  <tone type="ringing_tone" freq="400*17" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400" duration="0.375-0.375" />
  <tone type="warning_operator_intervening_tone" freq="425 or 525"
        duration="1.0-15.0-0.36-15.0" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425/525" duration="0.1-0.1-0.1-4.7" />
  <tone type="record_tone" freq="1400" duration="0.425-14.525" />
  <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
        duration="0.075-0.15-0.075-2.7" />
  <tone type="facilities_tone" freq="425" duration="continuous" />
  <tone type="offering_tone" freq="525" duration="0.1-0.1" />
</country>
```

```
<country name="AUSTRIA">
  <tone type="dial_tone" freq="420 or 450" duration="continuous" />
  <tone type="special_dial_tone" freq="380+420" duration="continuous" />
  <tone type="recall_dial_tone" freq="420" duration="continuous" />
  <tone type="ringing_tone" freq="420 or 450" duration="1.0-5.0" />
  <tone type="busy_1_tone" freq="420" duration="0.4-0.4" />
  <tone type="busy_2_tone" freq="450" duration="0.3-0.3" />
  <tone type="congestion_1_tone" freq="420" duration="0.2-0.2" />
  <tone type="congestion_2_tone" freq="450" duration="0.3-0.3" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.33-1.0" />
  <tone type="warning_operator_intervening_tone" freq="420 or 450"
        duration="0.15-0.15-0.15-1.95" />
  <tone type="number_unobtainable_tone" freq="950/1400/1800"
        duration="3*0.33-1.0" />
  <tone type="waiting_tone" freq="420"
        duration="0.04-1.95" />
  <tone type="payphone_recognition_tone" freq="1336/1633"
        duration="0.2-0.2-0.2-2.0" />
  <tone type="positive_indication_tone" freq="380+420"
        duration="1.0-5.0" />
  <tone type="negative_indication_tone" freq="380+420"
        duration="0.4-0.4" />
</country>

<country name="BAHAMAS">
  <tone type="ringing_tone" freq="440/480 or 420/20 or 400"
        duration="2.0-4.0" />
  <tone type="busy_tone" freq="480/620/420 or 400" duration="0.5-0.5" />
</country>

<country name="BAHRAIN">
  <tone type="dial_tone" freq="330*440" duration="continuous" />
  <tone type="ringing_tone" freq="440 or 450" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_1_tone" freq="400"

        duration="0.4-0.35-0.225-0.525" />
  <tone type="congestion_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
  <tone type="intercept_tone" freq="450 or 425+475" duration="0.05-0.05" />
  <tone type="route_tone" freq="425" duration="0.06-0.06" />
  <tone type="payphone_recognition_tone" freq="816/1209"
        duration="0.125-1.5" />
</country>
```

```
   <country name="BARBADOS">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="second_dial_tone" freq="350+440"
           duration="2*(1.0-1.0)-continuous" />
     <tone type="recall_dial_tone" freq="350+440"
           duration="3*(0.1-0.1)-continuous" />
     <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
     <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
   </country>

   <country name="BELARUS">
     <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
     <tone type="busy_tone" freq="425" duration="0.4-0.4" />
   </country>

<country name="BELGIUM">
  <tone type="dial_tone" freq="425 or 450" duration="continuous" />
  <tone type="second_dial_tone" freq="900/1020/1140" duration="3*0.333" />
  <tone type="ringing_tone" freq="425 or 450" duration="1.0-3.0" />
  <tone type="busy_tone" freq="425 or 450" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425 or 450" duration="0.167-0.167" />
  <tone type="special_information_tone" freq="900/1380/1860"
        duration="3*0.333-1.0" />
</country>

   <country name="BENIN">
     <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
     <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
           duration="0.2-0.2-0.2-2.0" />
   </country>

   <country name="BERMUDA">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
     <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />

     <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
     <tone type="number_unobtainable_tone" freq="200 or 400"
           duration="0.5 (for six seconds)" />
     <tone type="waiting_tone" freq="440"
           duration="(two bursts, ten seconds apart)" />
   </country>
```

```
 <country name="BHUTAN">
   <tone type="dial_tone" freq="400+25" duration="continuous" />
   <tone type="ringing_tone" freq="400+25" duration="0.4-0.2-0.4-2.6" />
   <tone type="busy_tone" freq="400" duration="0.6-0.6" />
   <tone type="number_unobtainable_tone" freq="400"
         duration="continuous" />
   <tone type="waiting_tone" freq="400" duration="0.5-0.25" />
   <tone type="offering_tone" freq="450" duration="0.2-0.2-0.2-0.6" />
 </country>

<country name="BOTSWANA">
  <tone type="dial_tone" freq="350+450" duration="continuous" />
  <tone type="ringing_tone" freq="400 or 450" duration="0.4-0.2-0.4-2.0" />

  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="warning_operator_intervening_tone" freq="425"
        duration="0.16-2.0" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
  <tone type="waiting_tone" freq="425" duration="0.2-1.0" />
  <tone type="payphone_recognition_tone" freq="1600"
        duration="0.07-2.0" />
</country>

<country name="BRAZIL">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="dial_pabx_tone" freq="425" duration="0.975-0.05" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="425"
        duration="0.75-0.25-0.25-0.25" />
  <tone type="waiting_tone" freq="425" duration="0.05-1.0" />
  <tone type="executive_override_tone" freq="750" duration="0.02-1.0" />
  <tone type="function_acknowledge_tone" freq="425"
        duration="0.1-0.1-0.1-2.0" />
  <tone type="pay_tone" freq="300" duration="0.75" />
</country>
```

```
   <country name="BRITISH VIRGIN ISLANDS">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="recall_dial_tone" freq="350+440"
           duration="3*(0.1-0.1)-continuous" />
     <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
     <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.33-1.0" />
     <tone type="warning_operator_intervening_tone" freq="450"
           duration="0.2-0.2-0.65-0.2" />
     <tone type="number_unobtainable_tone" freq="480+620"
           duration="0.25-0.25" />
     <tone type="waiting_tone" freq="440" duration="1*(0.5-10.0-0.5)" />
     <tone type="payphone_recognition_tone" freq="1600/1143"
           duration="0.2-0.2-0.2-2.0" />
   </country>

<country name="BRUNEI DARUSSALAM">
  <tone type="dial_tone" freq="400*50" duration="continuous" />
  <tone type="special_dial_transmission_tone" freq="1000"
        duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.4-0.3-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400" duration="0.375-0.375" />
  <tone type="warning_operator_intervening_tone" freq="400"
        duration="0.25-2.0" />
  <tone type="warning_end_of_period_tone" freq="400"
        duration="0.624-4.376" />
  <tone type="warning_pip_tone_tone" freq="900" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
  <tone type="waiting_tone" freq="400*24" duration="0.5" />
  <tone type="confirmation_tone" freq="400*24"
        duration="0.1-0.1-0.3-0.3" />
  <tone type="holding_tone" freq="400*24" duration="0.5-2.5" />
</country>
```

```
  <country name="BULGARIA">
    <tone type="dial_1_tone" freq="425" duration="0.25-0.3-0.7-0.8" />
    <tone type="dial_2_tone" freq="425" duration="0.25-0.75-0.75-1.0" />
    <tone type="ringing_1_tone" freq="425" duration="1.0-9.0" />
    <tone type="ringing_2_tone" freq="425" duration="1.0-4.0" />
    <tone type="ringing_3_tone" freq="425" duration="1.83-3.0" />
    <tone type="busy_1_tone" freq="425" duration="0.25-0.25" />
    <tone type="busy_2_tone" freq="425" duration="0.5-0.5" />
    <tone type="busy_3_tone" freq="425" duration="0.2-0.5" />
    <tone type="congestion_1_tone" freq="425" duration="0.25-0.25" />
    <tone type="congestion_2_tone" freq="425" duration="0.5-0.5" />
    <tone type="congestion_3_tone" freq="425" duration="0.2-0.5" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
    <tone type="warning_operator_intervening_1_tone" freq="425"
          duration="0.15-0.25-0.15-1.15" />
    <tone type="warning_operator_intervening_2_tone" freq="425"
          duration="0.2-0.3-0.2-1.5" />
    <tone type="number_unobtainable_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
  </country>

  <country name="BURKINA FASO">
    <tone type="dial_1_tone" freq="425" duration="continuous" />
    <tone type="dial_2_tone" freq="350/440" duration="continuous" />
    <tone type="ringing_1_tone" freq="425" duration="1.0-4.0" />
    <tone type="ringing_2_tone" freq="440/480" duration="0.2-0.2" />
    <tone type="busy_1_tone" freq="425" duration="0.5-0.5" />
    <tone type="busy_2_tone" freq="480/620" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="480/620" duration="2.4-2.4" />
    <tone type="route_1_tone" freq="425" duration="0.05-0.05" />
    <tone type="route_2_tone" freq="425" duration="0.04-0.04" />
  </country>

  <country name="BURUNDI">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.7-3.3" />
    <tone type="busy_tone" freq="450" duration="0.25-0.25" />
    <tone type="special_information_tone" freq="150/450"
          duration="0.5-0.5" />
    <tone type="route_tone" freq="425" duration="0.5-0.5" />
  </country>
```

```
  <country name="CAMEROON">
    <tone type="dial_tone" freq="440" duration="continuous" />
    <tone type="second_dial_tone" freq="330 or 440"
          duration="continuous" />
    <tone type="ringing_tone" freq="440" duration="1.7-3.3" />
    <tone type="busy_tone" freq="440" duration="0.5-0.5" />
    <tone type="route_tone" freq="440" duration="0.05-0.05" />
  </country>

  <country name="CANADA">
    <tone type="dial_tone" freq="600*120 or 350+440"
          duration="continuous" />
    <tone type="dial_pabx_tone" freq="350+440"
          duration="continuous" />
    <tone type="recall_dial_pabx_tone" freq="350+440"
          duration="0.1-0.1" />
    <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
    <tone type="ringing_pabx_tone" freq="440+480"
          duration="1.0-3.0" />
    <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="480+620"
          duration="0.25-0.25" />
    <tone type="executive_override_pabx_tone" freq="440"
          duration="3.0" />
    <tone type="intercept_pabx_tone" freq="440/620"
          duration="0.25-0.25" />
    <tone type="confirmation_pabx_tone" freq="350+440"
          duration="3*0.1-2*0.1" />
  </country>

<country name="CAYMAN ISLANDS">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.25-0.25" />
</country>

<country name="CENTRAL AFRICAN REP.">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425+330" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.7-3.3" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.5-0.5" />

  <tone type="number_unobtainable_tone" freq="425" duration="0.5-0.5" />
  <tone type="route_tone" freq="425" duration="0.05-0.05" />
  <tone type="pay_tone" freq="12000" duration="0.15-0.15" />
```

```
</country>

<country name="CHANNEL ISLANDS: JERSEY">
  <tone type="dial_tone" freq="350+450" duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />

  <tone type="congestion_tone" freq="400"
        duration="0.4-0.35-0.225-0.525" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
  <tone type="waiting_tone" freq="400" duration="0.1-2.5-0.1" />
  <tone type="pay_tone" freq="400" duration="0.125-0.125" />
</country>

 <country name="CHILE">
   <tone type="dial_tone" freq="400" duration="continuous" />
   <tone type="second_dial_tone" freq="330+440" duration="continuous" />
   <tone type="ringing_tone" freq="400" duration="1.0-3.0" />
   <tone type="busy_tone" freq="400" duration="0.5-0.5" />
   <tone type="congestion_tone" freq="400" duration="0.2-0.2" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="3*0.333-1.0" />
   <tone type="warning_operator_intervening_tone" freq="1400"
         duration="0.5-15.0" />
   <tone type="waiting_tone" freq="900+1300" duration="0.5-0.5" />
   <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
         duration="0.2-0.2-0.2-2.0" />
   <tone type="identification_tone" freq="800/1200"
         duration="0.6-2.0-0.6-2.0" />
   <tone type="warning_end_of_period_tone" freq="800" duration="2.0" />
 </country>

  <country name="CHINA">
    <tone type="dial_tone" freq="450" duration="continuous" />
    <tone type="second_dial_tone" freq="450" duration="continuous" />
    <tone type="ringing_tone" freq="450" duration="1.0-4.0" />
    <tone type="busy_tone" freq="450" duration="0.35-0.35" />
    <tone type="congestion_tone" freq="450" duration="0.7-0.7" />
    <tone type="intrusion_tone" freq="450" duration="0.2-0.2-0.2-0.6" />
    <tone type="special_information_1_tone" freq="450"
          duration="0.4-0.04" />
    <tone type="special_information_2_tone" freq="950"
          duration="0.4-10.0" />
    <tone type="number_unobtainable_tone" freq="450"
          duration="3*(0.1-0.1)-0.4-0.4" />
    <tone type="waiting_tone" freq="450" duration="0.4-4.0" />
  </country>
```

```
   <country name="COMOROS">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="second_dial_tone" freq="850" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.71-3.31" />
     <tone type="busy_tone" freq="425" duration="0.5-0.5" />
     <tone type="route_tone" freq="425" duration="0.05-0.05" />
   </country>

   <country name="COSTA RICA">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.2-4.6" />
     <tone type="busy_tone" freq="425" duration="0.3-0.3" />
   </country>

 <country name="COTE D IVOIRE">
   <tone type="dial_tone" freq="425" duration="continuous" />
   <tone type="ringing_tone" freq="50 or 425*50" duration="1.66-3.33" />
   <tone type="busy_tone" freq="425" duration="0.5-0.5" />
   <tone type="route_tone" freq="425" duration="0.05-0.05" />
 </country>

<country name="CROATIA">
 <tone type="dial_tone" freq="425" duration="0.2-0.3-0.7-0.8" />
 <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
 <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
 <tone type="busy_tone" freq="425" duration="0.5-0.5" />
 <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
 <tone type="special_information_tone" freq="950/1400/1800"
       duration="3*0.333-1.0" />
 <tone type="warning_operator_intervening_tone" freq="425"
       duration="0.2-0.3-0.7-0.8" />
 <tone type="number_unobtainable_tone" freq="950/1400/1800"
       duration="3*0.333-1.0" />
 <tone type="waiting_tone" freq="425"
       duration="0.3-8.0" />
 <tone type="payphone_recognition_tone" freq="1206/850"
       duration="0.2-0.2-0.2-2.0 (four cycles)" />
 <tone type="positive_indication_tone" freq="425"
       duration="continuous" />
 <tone type="negative_indication_tone" freq="425" duration="0.25-0.25" />
</country>
```

```
<country name="CUBA">
  <tone type="dial_1_tone" freq="600*120 or 425" duration="continuous" />
  <tone type="dial_2_tone" freq="425" duration="0.75-0.75-0.25-0.25" />
  <tone type="second_dial_1_tone" freq="425+330" duration="continuous" />
  <tone type="second_dial_2_tone" freq="1050" duration="continuous" />
  <tone type="ringing_1_tone" freq="440+480 or 440+620 or 480+620"
        duration="2.0-4.0" />
  <tone type="ringing_2_tone" freq="425" duration="1.0-4.0" />
  <tone type="ringing_3_tone" freq="420*40" duration="1.0-2.0" />
  <tone type="busy_tone" freq="600*120 or 620+480 or 425"
        duration="0.5-0.5" />
  <tone type="congestion_tone" freq="600*120" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="(3*0.33-2*0.03)-1.0" />
  <tone type="number_unobtainable_tone" freq="520"

        duration="0.4-0.12-2*(0.12-0.12)" />
</country>

<country name="CYPRUS">
  <tone type="dial_tone" freq="350+450" duration="continuous" />
  <tone type="ringing_1_tone" freq="425" duration="1.5-3.0" />
  <tone type="ringing_2_tone" freq="400*25" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="warning_operator_intervening_tone" freq="1400"
        duration="0.5-14.0" />
  <tone type="number_unobtainable_tone" freq="425" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.6" />
  <tone type="payphone_recognition_tone" freq="1638/1206/943"
        duration="3*(0.068-0.068)" />
</country>

<country name="CZECH Rep.">
  <tone type="dial_1_tone" freq="425" duration="continuous" />
  <tone type="dial_2_tone" freq="425" duration="0.33-0.33-0.66-0.66" />
  <tone type="dial_3_tone" freq="425"
        duration="0.165-0.165-0.660-0.660" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_1_tone" freq="425" duration="0.333-0.333" />
  <tone type="busy_2_tone" freq="425" duration="0.167-0.167" />
  <tone type="busy_3_tone" freq="425"
        duration="0.165-0.165-0.165-0.330" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="(3*0.33-2*0.03)-1.0" />
  <tone type="waiting_tone" freq="425" duration="0.33-5.0" />
  <tone type="connection_tone" freq="425" duration="0.05-0.05" />
  <tone type="offering_tone" freq="425" duration="0.33-0.33-0.33-1.5" />
```

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</country>

   <country name="DENMARK">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.25-0.25" />
     <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
     <tone type="warning_operator_intervening_tone" freq="150"
           duration="0.05-0.5" />
     <tone type="number_unobtainable_tone" freq="950/1400/1800"
           duration="3*0.33-1.0" />
     <tone type="pay_tone" freq="950/1400/1800" duration="3*0.22-1.0" />
     <tone type="payphone_recognition_tone" freq="1477+941/1400+950"
           duration="0.2-0.2-0.2-2.0" />
   </country>

   <country name="DIEGO GARCIA">
     <tone type="dial_tone" freq="350/440" duration="continuous" />
     <tone type="busy_tone" freq="480/620"
           duration="interrupted at 60 ipm" />
     <tone type="ringing_tone" freq="440/480" duration="1.0-3.0" />
     <tone type="number_unobtainable_tone" freq="480/620"
           duration="interrupted at 120 ipm" />
   </country>

   <country name="DJIBOUTI">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.5-3.5" />
     <tone type="busy_tone" freq="425" duration="0.5-0.5" />
     <tone type="route_tone" freq="425" duration="0.05-0.05" />
   </country>
```

```
    <country name="DOMINICA (Commonwealth of)">
      <tone type="dial_tone" freq="350+440" duration="continuous" />
      <tone type="recall_dial_tone" freq="350+440"
            duration="3*(0.1-0.1)-continuous" />
      <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
      <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
      <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
      <tone type="special_information_tone" freq="950/1400/1800"
            duration="3*0.33-1.0" />
      <tone type="warning_operator_intervening_tone" freq="450"
            duration="0.2-0.2-0.65-0.2" />
      <tone type="number_unobtainable_tone" freq="480+620"
            duration="0.25-0.25" />
      <tone type="waiting_tone" freq="440" duration="1*(0.5-10.0-0.5)" />
      <tone type="payphone_recognition_tone" freq="1600/1143"
            duration="0.2-0.2-0.2-2.0" />
    </country>

<country name="DOMINICAN Rep.">
  <tone type="dial_1_tone" freq="50" duration="continuous" />
  <tone type="dial_2_tone" freq="33" duration="0.0166-0.0166" />
  <tone type="ringing_tone" freq="400 or 450" duration="0.4-0.2-0.4-2.2" />
  <tone type="busy_1_tone" freq="400" duration="0.8-0.8" />
  <tone type="busy_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_1_tone" freq="400" duration="0.8-0.8" />
  <tone type="congestion_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
</country>

    <country name="ECUADOR">
      <tone type="dial_tone" freq="425" duration="15.0" />
      <tone type="ringing_tone" freq="425" duration="1.2-4.65" />
      <tone type="busy_tone" freq="425" duration="0.33-0.33" />
      <tone type="congestion_tone" freq="425" duration="0.33-0.33" />
      <tone type="waiting_tone" freq="425" duration="0.2-0.6" />
    </country>

    <country name="EGYPT">
      <tone type="ringing_tone" freq="425*50" duration="2.0-1.0" />
      <tone type="busy_tone" freq="425*50" duration="1.0-4.0" />
      <tone type="congestion_tone" freq="450" duration="0.5-0.5" />
      <tone type="special_information_tone" freq="950/1400/1800"
            duration="0.33-0.33-0.33-0.33-0.33-0.33" />
      <tone type="intrusion_tone" freq="450" duration="0.5-0.5" />
      <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
            duration="0.2-0.2-0.2-2.0" />
    </country>
```

```
   <country name="EL SALVADOR">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.2-5.0" />
     <tone type="busy_tone" freq="425" duration="0.333-0.333" />

   </country>

<country name="ESTONIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.3-0.3" />
  <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.33-1.0" />
  <tone type="warning_operator_intervening_tone" freq="425"
        duration="0.2-0.3-0.2-1.3" />
  <tone type="waiting_tone" freq="950/1400/1800" duration="3*0.33-0.3" />
</country>

   <country name="ETHIOPIA">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.4-0.4" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
     <tone type="intrusion_tone" freq="425" duration="0.5-0.2" />
     <tone type="waiting_tone" freq="425" duration="0.2-0.6" />
   </country>

   <country name="FALKLAND ISLANDS">
     <tone type="dial_tone" freq="350+450" duration="continuous" />
     <tone type="ringing_tone" freq="400+450" duration="0.4-0.2" />
     <tone type="busy_tone" freq="400" duration="0.375-0.375" />
     <tone type="congestion_tone" freq="400"
           duration="0.4-0.35-0.255-0.525" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.33-1.0" />
     <tone type="warning_operator_intervening_tone" freq="1000"
           duration="0.1-0.1" />
     <tone type="number_unobtainable_tone" freq="400"
           duration="continuous" />
   </country>
```

```
  <country name="FAROE ISLANDS">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="0.25-0.25" />
    <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
    <tone type="number_unobtainable_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
  </country>

<country name="FIJI">
  <tone type="dial_tone" freq="33 or 50" duration="continuous" />
  <tone type="dial_pabx_tone" freq="33" duration="1/3 continuous" />
  <tone type="ringing_tone" freq="133*16"
        duration="2/3 or 400*25 0.4-0.2-0.4-2.0" />

  <tone type="ringing_pabx_tone" freq="400*16"
        duration="2/3 0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_pabx_tone" freq="400" duration="0.375-0.375" />
  <tone type="warning_operator_intervening_tone" freq="400"
        duration="0.5-0.17-0.17-0.17" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
  <tone type="number_unobtainable_pabx_tone" freq="400"
        duration="2.5-0.5" />
</country>

<country name="FINLAND">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="dial_pabx_tone" freq="425" duration="2*(0.2-0.3)-0.2-0.8" />
  <tone type="special_dial_tone" freq="425" duration="0.65-0.025" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.3-0.3" />
  <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.333-1.0" />
  <tone type="warning_operator_intervening_tone" freq="425"
        duration="0.2-0.3-0.2-1.3" />
  <tone type="queue_tone" freq="950/950/1400"
        duration="0.65-0.325-0.325-1.3-2.6" />
  <tone type="waiting_tone" freq="425" duration="0.15-0.15-0.15-8.0" />
</country>
```

```
 <country name="FRANCE">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

 <country name="FRENCH POLYNESIA">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />

   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

   <country name="GABON">
     <tone type="dial_1_tone" freq="440" duration="15.0" />
     <tone type="dial_2_tone" freq="425" duration="continuous" />
     <tone type="second_dial_tone" freq="440+330" duration="7.0" />
     <tone type="ringing_1_tone" freq="440" duration="1.5-3.0" />
     <tone type="ringing_2_tone" freq="425" duration="1.5-3.5" />
     <tone type="busy_1_tone" freq="440" duration="0.5-0.5" />
     <tone type="busy_2_tone" freq="425" duration="0.5-0.5" />
     <tone type="special_information_tone" freq="900/1380/1860"
           duration="0.35-0.30-0.35-1.0" />
     <tone type="route_1_tone" freq="440" duration="0.05-0.05" />
     <tone type="route_2_tone" freq="425" duration="0.05-0.05" />
   </country>

   <country name="GAMBIA">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.5-0.5" />
   </country>
```

```
<country name="GERMANY">
  <tone type="dial_tone" freq="425 or 450" duration="continuous" />
  <tone type="special_dial_tone" freq="425+400" duration="continuous" />
  <tone type="ringing_1_tone" freq="425 or 450"
        duration="0.25-4.0-1.0-4.0-1.0-4.0" />
  <tone type="ringing_2_tone" freq="425 or 450"
        duration="0.5-4.0-1.0-4.0-1.0-4.0" />
  <tone type="ringing_3_tone" freq="425 or 450" duration="1.0-5.0" />
  <tone type="ringing_4_tone" freq="450" duration="1.0-9.0" />
  <tone type="busy_1_tone" freq="425" duration="0.48-0.48" />
  <tone type="busy_2_tone" freq="425 or 450" duration="0.15-0.475" />
  <tone type="congestion_1_tone" freq="425" duration="0.24-0.24" />
  <tone type="congestion_2_tone" freq="425 or 450" duration="0.15-0.475" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.33-1.0" />
  <tone type="warning_operator_intervening_tone" freq="425 or 450"
        duration="0.24-0.24-0.24-1.28" />
  <tone type="waiting_tone" freq="425"
        duration="0.2-0.2-0.2-5.0" />
  <tone type="payphone_recognition_1_tone" freq="1633/1336"
        duration="0.2-0.2-0.2-2.0 (five cycles)" />
  <tone type="payphone_recognition_2_tone" freq="1366/1024"
        duration="0.2-0.2-0.2-2.2 (five cycles)" />
  <tone type="payphone_recognition_3_tone" freq="1336/1024"
        duration="2.2-0.2-0.2-0.2 (six cycles)" />
  <tone type="payphone_recognition_4_tone" freq="1645+857/1215+935"
        duration="0.2-0.2-0.2-2.0 (five cycles)" />
</country>

  <country name="GHANA">
    <tone type="dial_tone" freq="400" duration="continuous" />
    <tone type="ringing_tone" freq="400" duration="1.0-4.0" />
    <tone type="busy_tone" freq="400" duration="0.25-0.25" />
    <tone type="congestion_tone" freq="400" duration="0.5-0.5" />
    <tone type="number_unobtainable_tone" freq="400"
          duration="0.075-0.1-0.075-0.1-0.075-0.4" />
    <tone type="waiting_tone" freq="400"
          duration="0.5-0.3-0.2-0.3-0.2-3.0" />
    <tone type="holding_tone" freq="400" duration="0.5-0.5-0.5-0.25" />
  </country>
```

```
<country name="GIBRALTAR">
  <tone type="dial_tone" freq="350+400" duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400"
        duration="0.4-0.35-0.225-0.525" />
  <tone type="number_unobtainable_tone" freq="400"
        duration="continuous" />
  <tone type="waiting_tone" freq="400" duration="0.1-3.0" />
</country>

<country name="GREECE">
  <tone type="dial_tone" freq="425 or 450" duration="0.2-0.3-0.7-0.8" />
  <tone type="special_dial_special_tone" freq="400/425 or 425/450"
        duration="0.2-0.3-0.7-0.8" />
  <tone type="ringing_tone" freq="425 or 450"
        duration="1.0-4.0" />
  <tone type="busy_tone" freq="425 or 450" duration="0.3-0.3" />
  <tone type="congestion_special_tone" freq="425" duration="0.15-0.15" />
  <tone type="special_information_special_tone" freq="950/1450/1800"
        duration="3*0.33-1.0" />

  <tone type="waiting_special_tone" freq="425"
        duration="0.3-10.0-0.3-10.0" />
  <tone type="intrusion_tone" freq="425 or 450"
        duration="0.15-0.25-0.15-1.45" />
  <tone type="holding_special_tone" freq="900"
        duration="0.5-0.5" />
  <tone type="valid_radio_paging_tone" freq="450"
        duration="0.1-0.1-0.1-0.7" />
  <tone type="number_unobtainable_radio_paging_tone" freq="450"
        duration="continuous" />
</country>

<country name="GREENLAND">
  <tone type="dial_tone" freq="445 or 425" duration="continuous" />
  <tone type="second_dial_tone" freq="445 or 425" duration="continuous" />
  <tone type="ringing_tone" freq="445 or 425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="445 or 425" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="445 or 425" duration="0.25-0.25" />
  <tone type="number_unobtainable_1_tone" freq="950/1400/1800"
        duration="3*0.33-1.0" />
  <tone type="number_unobtainable_2_tone" freq="425"
        duration="0.25-0.25" />
  <tone type="pay_tone" freq="950/1400/1800" duration="3*0.22-1.0" />
</country>
```

```
<country name="GRENADA">
  <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
  <tone type="busy_tone" freq="460+620" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="recorded" duration="announcement" />
</country>

 <country name="GUADELOUPE (French Dep.)">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

 <country name="GUIANA (French Dep.)">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

   <country name="GUINEA">
     <tone type="ringing_tone" freq="450" duration="0.4-0.2" />
     <tone type="busy_tone" freq="450" duration="0.2-0.2" />
   </country>

   <country name="GUYANA">
     <tone type="dial_tone" freq="360/400" duration="1.3-0.3-0.2-0.5" />
     <tone type="ringing_tone" freq="425" duration="1.75-3.25" />
     <tone type="busy_tone" freq="425" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="425" duration="0.5-0.5" />
     <tone type="waiting_tone" freq="480" duration="0.5-18.0" />
   </country>

   <country name="HONDURAS">
     <tone type="dial_tone" freq="440" duration="continuous" />
     <tone type="second_dial_tone" freq="440" duration="0.135-0.135" />
     <tone type="ringing_tone" freq="440" duration="0.5-4.0-2.0-4.0" />
     <tone type="busy_tone" freq="440" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="440" duration="0.25-0.25" />
     <tone type="waiting_tone" freq="440" duration="0.5-0.5-0.2-2.7" />
   </country>
```

```
<country name="HONGKONG">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="recall_dial_tone" freq="350+440"
        duration="3*(0.1-0.1)+continuous" />
  <tone type="ringing_tone" freq="440+480" duration="0.4-0.2-0.4-3.0" />
  <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="480+620"
        duration="continuous" />
  <tone type="waiting_tone" freq="440" duration="3*(0.5-0.5)-8.0" />
</country>

  <country name="HUNGARY">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="second_dial_tone" freq="425" duration="continuous" />
    <tone type="special_dial_tone" freq="350+375+400"
          duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.2-3.7" />
    <tone type="busy_tone" freq="425" duration="0.3-0.3" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="3*0.333-1.0" />
    <tone type="warning_operator_intervening_tone" freq="425"
          duration="0.3-0.3-0.3-1.5" />
    <tone type="waiting_tone" freq="425+450"
          duration="0.3-0.3" />
    <tone type="payphone_recognition_tone" freq="1100/750"
          duration="0.2-0.2-0.2-2.0" />
    <tone type="positive_indication_tone" freq="300+420"
          duration="1.0-0.2 + announcement" />
    <tone type="negative_indication_tone" freq="300+420"
          duration="0.2-0.2 + announcement" />
    <tone type="offering_tone" freq="425" duration="0.3-0.3-0.3-1.5" />
  </country>

  <country name="ICELAND">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
    <tone type="ringing_tone" freq="425" duration="1.2-4.7" />
    <tone type="busy_tone" freq="425" duration="0.25-0.25" />
    <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
    <tone type="number_unobtainable_tone" freq="recorded"
          duration="announcement" />
    <tone type="waiting_tone" freq="425" duration="0.2-0.6-0.2-5.0" />
    <tone type="payphone_recognition_tone" freq="1633/1209"
          duration="0.2-0.2-0.2-2.0" />
  </country>
```

```
<country name="INDIA">
  <tone type="dial_tone" freq="33 or 50 or 400*25" duration="continuous" />
  <tone type="ringing_1_tone" freq="400*25" duration="0.4-0.2-0.4-2.6" />
  <tone type="ringing_2_tone" freq="133 or 400*25" duration="0.4-0.2-0.4-2.0" /
>
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="400" duration="0.6-0.6" />
  <tone type="number_unobtainable_1_tone" freq="400" duration="continuous" />
  <tone type="number_unobtainable_2_tone" freq="400" duration="2.5-0.5" />
</country>

<country name="INDONESIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="(3*0.33-2*0.03)-1.0" />
  <tone type="number_unobtainable_tone" freq="425" duration="2.0-0.5" />
  <tone type="payphone_recognition_tone" freq="1200/800"
        duration="0.2-0.2-0.2-2.0" />
  <tone type="offering_tone" freq="425" duration="0.5-0.5-0.5-1.0" />
</country>

<country name="IRAN">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="400/425" duration="continuous" />
  <tone type="recall_dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
duration="3*0.33-1.0"
/>
  <tone type="waiting_tone" freq="425" duration="0.2-0.2-0.2-10.0" />
  <tone type="holding_tone" freq="950/950/1400" duration="0.65-0.325-0.325-1.3-
2.6" />
  <tone type="offering_tone" freq="425" duration="0.15-0.25-0.15-1.45" />
  <tone type="preemption_tone" freq="1400" duration="0.1-0.1 (three bursts)" />
  <tone type="permanent_signal_tone" freq="1400" duration="continuous" />
</country>

<country name="IRAQ">
  <tone type="recall_dial_tone" freq="133" duration="0.4-0.2-0.4-1.5" />
  <tone type="ringing_tone" freq="400" duration="continuous" />
  <tone type="busy_tone" freq="400" duration="1.0-1.0" />
</country>
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   <country name="IRELAND">
     <tone type="dial_tone" freq="400/425/450" duration="continuous" />
     <tone type="ringing_tone" freq="400 or 450 or 425*25"
           duration="0.4-0.2-0.4-2.0" />
     <tone type="busy_tone" freq="425"
           duration="0.5-0.5" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
     <tone type="number_unobtainable_tone" freq="400 or 425"
           duration="6.0-1.0" />
     <tone type="route_tone" freq="425"
           duration="0.06-0.06" />
     <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
           duration="0.2-0.2-0.2-2.0" />
   </country>

<country name="ISRAEL">
  <tone type="dial_tone" freq="400 or 425 or 440" duration="continuous" />
  <tone type="second_dial_tone" freq="400 or 440"
        duration="3*(0.1-0.1)+continuous" />
  <tone type="recall_dial_tone" freq="400 or 440"
        duration="3*(0.1-0.1)+continuous" />
  <tone type="special_dial_tone" freq="400" duration="1.0-0.25" />
  <tone type="ringing_tone" freq="400 or 425 or 440" duration="1.0-3.0" />
  <tone type="busy_tone" freq="400 or 425 or 440" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="975/1400/1800"
        duration="3*0.333-1.0 + announcement" />
  <tone type="number_unobtainable_tone" freq="975/1400/1800"
        duration="3*0.333-1.0 + announcement" />
  <tone type="waiting_tone" freq="400 or 440"
        duration="0.15-10.0-0.15 (only once)" />
  <tone type="caller_waiting_tone" freq="400 or 440"
        duration="2*(0.1-0.1)-0.6-3.0" />
  <tone type="confirmation_1_tone" freq="400 or 440"
        duration="0.15-0.15-0.3 (only once)" />
  <tone type="confirmation_2_tone" freq="400" duration="0.04-0.04" />
  <tone type="payphone_recognition_tone" freq="1209/452"
        duration="0.2-0.2-0.2-2.0" />
  <tone type="search_tone" freq="1004" duration="0.01-1.0" />
  <tone type="holding_tone" freq="400" duration="0.05-2.0" />
</country>

   <country name="ITALY">
     <tone type="dial_tone" freq="425" duration="0.6-1.0-0.2-0.2" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.2-0.2" />
   </country>
```

```
<country name="JAMAICA">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="ringing_1_tone" freq="440*480" duration="2.0-4.0" />
  <tone type="ringing_2_tone" freq="440+480" duration="1.5-4.5" />
  <tone type="ringing_3_tone" freq="440+480" duration="1.0-4.0" />
  <tone type="ringing_4_tone" freq="400 or 133"
        duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="480+620" duration="0.5-0.5" />
  <tone type="congestion_1_tone" freq="480+620" duration="0.3-0.2" />
  <tone type="congestion_2_tone" freq="480+620" duration="0.2-0.3" />
  <tone type="number_unobtainable_tone" freq="400" duration="3.0-0.5" />
  <tone type="record_tone" freq="480+620" duration="0.25-0.25" />
</country>

<country name="JAPAN">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="dial_pabx_tone" freq="400" duration="0.25-0.25" />
  <tone type="second_dial_1_tone" freq="400" duration="0.125-0.125" />
  <tone type="second_dial_2_tone" freq="440" duration="0.125-0.125" />
  <tone type="second_dial_3_tone" freq="400" duration="0.15-0.15" />
  <tone type="recall_dial_tone" freq="350+440" duration="continuous" />
  <tone type="ringing_tone" freq="400*16" duration="1.0-2.0" />
  <tone type="ringing_pabx_tone" freq="400*20" duration="1.0-2.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="400" duration="0.1-0.1" />
  <tone type="waiting_1_tone" freq="440" duration="0.1-0.1-0.1-1.0" />
  <tone type="waiting_2_tone" freq="400*16/400"
        duration="0.5-0.5-0.5-2.5" />
  <tone type="call_waiting_tone" freq="400*16/400"
        duration="0.5-0.0~4.0-0.05-0.45-0.05-3.45-0.05-0.45-0.05-3.45" />
  <tone type="pay_1_tone" freq="250" duration="1.0" />
  <tone type="pay_2_tone" freq="250" duration="0.5" />
  <tone type="positive_indication_tone" freq="400"
        duration="0.125-0.125-0.125-0.625" />
</country>
```

```
<country name="JORDAN">
  <tone type="dial_tone" freq="420*40 or 400+440" duration="continuous" />
  <tone type="ringing_1_tone" freq="420*40 or 440+400" duration="1.2-4.8" />
  <tone type="ringing_2_tone" freq="400+16" duration="2/3 0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="420*40 or 440+400" duration="0.5-0.5" />
  <tone type="congestion_1_tone" freq="420*40" duration="0.5-0.5" />
  <tone type="congestion_2_tone" freq="400+440" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="600*120 or 540+660"
duration="2.5-
0.5" />
  <tone type="waiting_tone" freq="420*40 or 400+440" duration="0.5-2*(0.3-0.2)-
3.0" />
  <tone type="confirmation_tone" freq="400" duration="20*(0.125-0.125)-
continuous"
/>
  <tone type="holding_tone" freq="420*40 or 400+440"
duration="0.5-0.5-0.5-0.25"
/>
</country>

<country name="KENYA">
  <tone type="dial_tone" freq="425 or 50" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="1.0-0.2-0.75-0.75" />
  <tone type="ringing_tone" freq="425"
duration="1.0-4.0-1.0-2.0-1.0-5.0-0.4-0.2"
/>
  <tone type="busy_tone" freq="425" duration="0.5-0.5-0.4-0.2" />
  <tone type="congestion_tone" freq="425"
duration="0.2-0.2-0.4-0.35-0.225-0.525"
/>
  <tone type="warning_operator_intervening_tone" freq="425"
duration="0.2-0.2-0.2-
1.4" />
  <tone type="number_unobtainable_1_tone" freq="950/1400/1800"
duration="3*0.33-
1.0" />
  <tone type="number_unobtainable_2_tone" freq="400" duration="continuous" />
  <tone type="waiting_tone" freq="425" duration="continuous" />
</country>

<country name="KIRIBATI">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.5-0.5" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.25-0.25" />
  <tone type="waiting_tone" freq="425" duration="0.4-0.2-0.4-2.0" />
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</country>
```

```
<country name="KOREA (Rep. of)">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="recall_dial_1_tone" freq="400 or 450" duration="1.0-4.0" />
  <tone type="recall_dial_2_tone" freq="400 or 450" duration="1.0-2.0" />
  <tone type="ringing_tone" freq="440+480" duration="1.0-2.0" />
  <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="480+620" duration="0.3-0.2" />
  <tone type="warning_operator_intervening_tone" freq="392/494/587"
duration="2*(0.5-0.5-1.5)" />
  <tone type="number_unobtainable_tone" freq="450" duration="0.2-0.1-0.2-1.5" /
>
  <tone type="waiting_tone" freq="350+440" duration="0.25-0.25-0.25-3.25" />
  <tone type="intercept_tone" freq="350+440" duration="0.125-0.25-0.125-1.5" />
</country>

<country name="KUWAIT">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
  <tone type="ringing_1_tone" freq="425" duration="1.0-4.0" />
  <tone type="ringing_2_tone" freq="400" duration="1.0-3.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.5-0.5" />
  <tone type="warning_operator_intervening_tone" freq="425"
duration="1.0-1.5-0.4-
1.5" />
  <tone type="intrusion_tone" freq="425" duration="0.5-0.2-0.2-0.2" />
  <tone type="number_unobtainable_tone" freq="400" duration="continuous" />
  <tone type="intercept_tone" freq="950/1400/1800" duration="3*0.333-1.0" />
  <tone type="line_lockout_tone" freq="425" duration="0.5-0.5" />
  <tone type="refusal_tone" freq="425" duration="0.6-0.6" />
  <tone type="acceptance_tone" freq="425" duration="continuous" />
</country>

<country name="KYRGYZSTAN">
  <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
  <tone type="busy_tone" freq="425" duration="0.4-0.4" />
  <tone type="congestion_tone" freq="425" duration="0.4-0.4" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.4-0.4" />
</country>

<country name="LAO P.D.R.">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="1.0-1.0" />
  <tone type="congestion_tone" freq="425" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="425" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425" duration="0.4-0.4" />
```

```
   <tone type="confirmation_tone" freq="950" duration="continuous" />
</country>
```

```
   <country name="LEBANON">
     <tone type="ringing_tone" freq="435" duration="1.2-4.4" />
     <tone type="busy_tone" freq="435" duration="0.4-0.2" />
   </country>

<country name="LIBERIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425 or 450" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="number_unobtainable_tone" freq="425"
duration="0.6-0.2-3*(0.2-0.2)"
/>
</country>

<country name="LITHUANIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
  <tone type="busy_tone" freq="425" duration="0.4-0.4" />
  <tone type="waiting_tone" freq="950/1400/1800" duration="3*0.333-1.0" />
</country>

<country name="LUXEMBOURG">
  <tone type="dial_tone" freq="425 or 450" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425 or 450" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425 or 450" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="3*0.333-
1.0" />
  <tone type="warning_operator_intervening_tone" freq="425 or 450"
duration="0.25-
0.25-0.25-1.25" />
  <tone type="intercept_tone" freq="1190/1280" duration="0.25-0.25" />
  <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
duration="0.2-
0.2-0.2-2.0" />
</country>

<country name="MACAU">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="1.8-0.2" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.6" />
  <tone type="intercept_tone" freq="950/1400/1800" duration="3*0.333-1.0" />
  <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
duration="0.2-
0.2-0.2-2.0" />
```

```
</country>
```

```
  <country name="MADAGASCAR">
    <tone type="ringing_tone" freq="25" duration="1.66-3.33" />
    <tone type="busy_tone" freq="450" duration="0.5-0.5" />
    <tone type="waiting_tone" freq="450" duration="0.125-0.125" />
  </country>

<country name="MALAWI">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_1_tone" freq="425" duration="1.0-4.0" />
  <tone type="ringing_2_tone" freq="400 or 133" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="525" duration="0.5-0.5" />
  <tone type="busy_3_tone" freq="400" duration="0.4-0.333" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
</country>

<country name="MALAYSIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425"
duration="0.25-0.25-0.25-0.25-2.0" />
  <tone type="ringing_tone" freq="425" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="900/1400/1800"
duration="3*1.0-1.0"
/>
  <tone type="warning_operator_intervening_tone" freq="425"
duration="0.5-0.2-0.2-
0.2" />
  <tone type="warning_end_of_period_tone" freq="900"
duration="0.1-0.1-0.1-0.1-0.1
(only once)" />
  <tone type="number_unobtainable_tone" freq="425" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425"
duration="1.0-10.0-0.5-0.25-0.5-10.0-0.5-
0.25" />
  <tone type="line_lockout_tone" freq="425" duration="0.5-0.5" />
</country>

<country name="MALDIVES">
  <tone type="dial_tone" freq="400/50" duration="continuous" />
  <tone type="ringing_tone" freq="400" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="400" duration="continuous" />
  <tone type="waiting_tone" freq="400" duration="1.0-10.0" />
</country>
```

```
<country name="MALI">
  <tone type="dial_tone" freq="425" duration="continuous" />

  <tone type="second_dial_tone" freq="425+330" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="0.40-0.04" />
  <tone type="ringing_tone" freq="425" duration="1.7-3.3" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="900/1400/1800" duration="3*0.33-
0.05-0.03)-1.0" />
  <tone type="route_tone" freq="425" duration="0.05-0.04" />
  <tone type="acceptance_tone" freq="950" duration="continuous" />
</country>

<country name="MALTA">
  <tone type="ringing_tone" freq="400+450 or 400*25 or 400*16" duration="2/3
0.4-
0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400" duration="0.4-0.35-0.225-0.525" />
  <tone type="number_unobtainable_tone" freq="400" duration="continuous" />
  <tone type="pay_tone" freq="400" duration="0.15-0.15" />
</country>

<country name="MARTINIQUE (French Dep.)">
  <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
  <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
  <tone type="busy_tone" freq="440" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="(3*0.3-
2*0.03)-1.0" />
  <tone type="route_tone" freq="440" duration="0.05-0.05" />
</country>

  <country name="MAURITANIA">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.5-3.5" />
    <tone type="busy_tone" freq="425" duration="0.5-0.5" />
    <tone type="route_tone" freq="425" duration="0.05-0.05" />
  </country>

  <country name="MAURITIUS">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="0.75-0.75" />
    <tone type="route_tone" freq="425" duration="0.05-0.05" />
  </country>
```

```
<country name="MAYOTTE">
  <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
  <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
  <tone type="busy_tone" freq="440" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="(3*0.3-
2*0.03)-1.0" />
  <tone type="route_tone" freq="440" duration="0.05-0.05" />
</country>

<country name="MEXICO">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="warning_operator_intervening_tone" freq="425" duration="0.5-0.17-
0.17-0.17" />
</country>

  <country name="MOLDOVA">
    <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
    <tone type="busy_tone" freq="425" duration="0.4-0.4" />
    <tone type="congestion_tone" freq="425" duration="0.4-0.4" />
  </country>

  <country name="MONTSERRAT">
    <tone type="dial_tone" freq="350+440" duration="continuous" />
    <tone type="recall_dial_tone" freq="350+440"
          duration="3*(0.1-0.1)-continuous" />
    <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
    <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
    <tone type="warning_operator_intervening_tone" freq="450"
          duration="0.2-0.2-0.65-0.2" />
    <tone type="number_unobtainable_tone" freq="480+620"
          duration="0.25-0.25" />
    <tone type="waiting_tone" freq="440" duration="1*(0.5-10.0-0.5)" />
    <tone type="payphone_recognition_tone" freq="1600/1143"
          duration="0.2-0.2-0.2-2.0" />
  </country>
```

```
<country name="MOROCCO">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="660/440/590/740"
duration="0.5-0.5-0.5-0.3-
0.2" />
  <tone type="ringing_tone" freq="425" duration="1.66-3.33" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="route_tone" freq="425" duration="0.05-0.05" />
</country>

<country name="MOZAMBIQUE">
  <tone type="ringing_tone" freq="400" duration="1.0-5.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="number_unobtainable_tone" freq="400" duration="0.2-0.2" />
</country>

<country name="NAMIBIA">
  <tone type="dial_tone" freq="440*33" duration="continuous" />
  <tone type="ringing_tone" freq="400*33" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="400" duration="0.5-0.5" />
  <tone type="busy_3_tone" freq="400" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="400" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
  <tone type="payphone_recognition_tone" freq="770/1209" duration="0.125-1.5" /
>
  <tone type="pay_tone" freq="400" duration="0.125-0.125" />
</country>

<country name="NAURU">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="dial_pabx_tone" freq="33" duration="continuous" />
  <tone type="recall_dial_pabx_tone" freq="33" duration="continuous" />
  <tone type="ringing_tone" freq="400" duration="1.0-4.0" />
  <tone type="ringing_pabx_tone" freq="425*25" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="busy_pabx_tone" freq="425" duration="0.375-0.375" />
  <tone type="congestion_pabx_tone" freq="425" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="400"
duration="0.75-0.25-0.25-0.25"
/>
</country>

<country name="NEPAL">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.1-3.1" />
  <tone type="busy_tone" freq="425" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="425" duration="0.175-0.175" />
```

```
  <tone type="number_unobtainable_tone" freq="425" duration="0.25-0.5" />
</country>
```

```
<country name="NETHERLANDS">
  <tone type="dial_tone" freq="425 or 450" duration="continuous" />
  <tone type="special_dial_tone" freq="425 or 450" duration="0.5-0.05" />
  <tone type="ringing_tone" freq="425 or 450" duration="1.0-4.0" />
  <tone type="busy_1_tone" freq="425 or 450" duration="0.5-0.5" />
  <tone type="busy_2_tone" freq="425 or 450" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="425 or 450" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="3*0.333-
1.0" />
  <tone type="waiting_tone" freq="425 or 450" duration="0.5-9.5" />
  <tone type="pay_tone" freq="770 or 850 or 950" duration="1" />
  <tone type="positive_indication_tone" freq="425 or 450"
duration="continuous" />
  <tone type="negative_indication_tone" freq="425 or 450"
duration="0.0625-0.0625"
/>
</country>

<country name="NEW CALEDONIA">
  <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
  <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
  <tone type="busy_tone" freq="440" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="(3*0.3-
2*0.03)-1.0" />
  <tone type="route_tone" freq="440" duration="0.05-0.05" />
</country>

<country name="NEW ZEALAND">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_1_tone" freq="900" duration="0.5-0.5" />
  <tone type="congestion_2_tone" freq="400" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="400" duration="3*(0.75-0.1)-0.75-
0.4" />
  <tone type="waiting_1_tone" freq="400+450" duration="0.5" />
  <tone type="waiting_2_tone" freq="400" duration="0.25-0.25-0.25-3.25" />
  <tone type="waiting_3_tone" freq="523/659" duration="3*(0.2-3.0)-0.2" />
  <tone type="function_acknowledge_tone" freq="440+450"
duration="2.0-0.4-0.2-0.4"
/>
  <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
duration="0.2-
0.2-0.2-2.0" />
  <tone type="holding_tone" freq="400/400+450" duration="0.5-0.5-0.5-0.25" />
</country>
```

```
<country name="NIGER">
  <tone type="dial_tone" freq="440" duration="continuous" />
  <tone type="second_dial_tone" freq="330 or 440" duration="continuous" />
  <tone type="ringing_tone" freq="440" duration="1.7-3.3" />
  <tone type="busy_tone" freq="440" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="440" duration="0.5-0.5" />
  <tone type="route_tone" freq="440" duration="0.05-0.05" />
</country>

<country name="NIGERIA">
  <tone type="dial_tone" freq="400 or 425 or 450" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="recall_dial_tone" freq="400 or 425" duration="continuous" />
  <tone type="ringing_tone" freq="400 or 425 or 450" duration="2.0-4.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="400 or 33" duration="0.2-1.5" />
  <tone type="waiting_operator_intervening_tone" freq="400"
duration="0.15-0.25-
0.15-1.45" />
  <tone type="number_unobtainable_tone" freq="450" duration="5.5-0.5" />
  <tone type="waiting_tone" freq="425" duration="2.0-4.0" />
  <tone type="holding_tone" freq="950/950/1400" duration="0.65-0.325-0.325-1.3-
2.6" />
</country>

<country name="NORWAY">
  <tone type="ringing_1_tone" freq="425" duration="1.0-4.0" />
  <tone type="ringing_2_tone" freq="400 or 450" duration="1.0-3.0" />
  <tone type="busy_1_tone" freq="425" duration="0.5-0.5" />
  <tone type="busy_2_tone" freq="400 or 450" duration="0.2-0.4" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="3*0.333-
1.0" />
  <tone type="payphone_recognition_tone" freq="1477/941"
duration="0.2-0.2-0.2-2.0
(four cycles)" />
</country>

<country name="OMAN">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.5-0.5" />
  <tone type="warning_operator_intervening_tone" freq="425" duration="0.5-0.17-
0.17-0.17" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.2-0.3" />
```

```
<tone type="waiting_tone" freq="425" duration="0.3-1.0" />
<tone type="line_lockout_tone" freq="425" duration="0.48-0.48" />
```

```
</country>

<country name="PAKISTAN">
  <tone type="ringing_1_tone" freq="450" duration="1.0-4.0" />
  <tone type="ringing_2_tone" freq="400+16" duration="2/3 0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="450" duration="0.4-0.675-0.13-0.17" />
</country>

<country name="PANAMA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.20-4.65" />
  <tone type="busy_tone" freq="425" duration="0.32-4.65" />
  <tone type="congestion_tone" freq="425" duration="0.32-4.65" />
  <tone type="special_information_tone" freq="425" duration="0.4-0.04" />
  <tone type="warning_operator_intervening_tone" freq="425"
duration="0.18-0.18-
0.5-0.18" />
  <tone type="number_unobtainable_tone" freq="-" duration="- " />
</country>

<country name="PAPUA NEW GUINEA">
  <tone type="dial_tone" freq="425 or 400*25 or 350+440"
        duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
  <tone type="ringing_tone"
        freq="425 or 400*25 or 400*16+2/3 or 400+450 or 410*20"
        duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425 or 400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="425 or 400" duration="0.375-0.375" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.33-1.01" />
  <tone type="warning_operator_intervening_tone" freq="1400"
        duration="0.5-11.5" />
  <tone type="number_unobtainable_tone" freq="425 or 400"
        duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425"
        duration="0.04-10.0-0.04-20.0-0.04-20.0" />
  <tone type="payphone_recognition_1_tone" freq="1209/852"
        duration="0.2-0.2-0.2-2.0 (four cycles)" />
  <tone type="payphone_recognition_2_tone" freq="1336/941"
        duration="0.2-0.2-0.2-2.0 (two cycles)" />
  <tone type="payphone_recognition_3_tone" freq="900"
        duration="0.075-0.15-0.075-2.7 (two cycles)" />
</country>
```

```
  <country name="PARAGUAY">
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="1.0-1.0" />
    <tone type="warning_operator_intervening_tone" freq="425"
          duration="0.15-0.25-0.15-1.45" />
    <tone type="number_unobtainable_tone" freq="425"
          duration="2.0-0.5" />
    <tone type="waiting_tone" freq="950/950/1400"
          duration="0.65-0.325-0.125-1.3-2.6" />
    <tone type="positive_indication_tone" freq="950/1400/1800"
          duration="3*0.333-1.0" />
  </country>

<country name="PHILIPPINES">
  <tone type="dial_1_tone" freq="600*120 or 425" duration="continuous" />
  <tone type="dial_2_tone" freq="400" duration="0.2-0.2" />
  <tone type="special_dial_tone" freq="400+425" duration="continuous" />
  <tone type="ringing_1_tone" freq="450" duration="1.0-10.0" />
  <tone type="ringing_2_tone" freq="425+480" duration="1.0-4.0" />
  <tone type="busy_1_tone" freq="600*120 or 425" duration="0.5-0.5" />
  <tone type="busy_2_tone" freq="450" duration="0.4-0.2" />
  <tone type="congestion_tone" freq="600*120 or 480+620" duration="0.25-0.25" /
>
  <tone type="number_unobtainable_tone" freq="600*120" duration="0.25-0.25" />
</country>

<country name="POLAND">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425+350" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.5-0.5" />
  <tone type="special_information_tone" freq="950/1400/1800"
duration="3*0.33-1.0"
/>
  <tone type="waiting_tone" freq="425" duration="0.15-0.15-0.15-4.0" />
  <tone type="route_tone" freq="425" duration="0.05-0.05" />
</country>

<country name="PORTUGAL">
  <tone type="dial_tone" freq="400 or 425" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="1.0-0.2" />
  <tone type="ringing_tone" freq="400 or 425" duration="1.0-5.0" />
  <tone type="busy_tone" freq="400 or 425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
  <tone type="number_unobtainable_tone" freq="400 or 425" duration="0.2-0.2" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.2-0.2-5.0" />
  <tone type="payphone_recognition_tone" freq="1477/941" duration="0.2-0.2-0.2-
```

```
2.0" />
</country>
```

```
   <country name="PUERTO RICO">
     <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
           duration="0.2-0.2-0.2-2.0" />
   </country>

<country name="QATAR">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="ringing_1_tone" freq="400+450" duration="0.4-0.2-0.4-2.2" />
  <tone type="ringing_2_tone" freq="400+450" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_1_tone" freq="400 or 450" duration="0.8-0.8" />
  <tone type="busy_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400" duration="0.4-0.35-0.225-0.525" />
  <tone type="number_unobtainable_tone" freq="400" duration="continuous" />
</country>

 <country name="REUNION (French Dep.)">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

<country name="ROMANIA">
  <tone type="dial_tone" freq="400 or 450" duration="continuous" />
  <tone type="ringing_tone" freq="400*16 or 450*25" duration="2.0-4.0" />
  <tone type="busy_tone" freq="133 or 450" duration="0.15-0.20" />
  <tone type="number_unobtainable_tone" freq="400 or 450"
        duration="6*(0.033-0.03)-0.1-0.03" />
</country>

<country name="RUSSIA">
  <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
  <tone type="busy_tone" freq="425" duration="0.4-0.4" />
  <tone type="waiting_tone" freq="950/1400/1800" duration="3*0.333-1.0" />
</country>

   <country name="RWANDA">
     <tone type="dial_tone" freq="440" duration="continuous" />
     <tone type="second_dial_tone" freq="340" duration="continuous" />
     <tone type="ringing_tone" freq="440" duration="1.7-3.3" />
     <tone type="busy_tone" freq="440" duration="0.5-0.5" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
     <tone type="route_tone" freq="440" duration="0.05-0.05" />
   </country>
```

```
  <country name="S. HELENA">
    <tone type="dial_tone" freq="350+400" duration="continuous" />
    <tone type="ringing_tone" freq="400+450" duration="0.4-0.2" />
    <tone type="busy_tone" freq="400" duration="0.375-0.375" />
    <tone type="congestion_tone" freq="400" duration="0.4-0.35" />
    <tone type="number_unobtainable_tone" freq="400"
          duration="continuous" />
    <tone type="pay_tone" freq="400" duration="0.125-0.125" />
  </country>

<country name="S. KITTS AND NEVIS">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="recall_dial_tone" freq="350+440"
        duration="3*(0.1-0.1)-continuous" />
  <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
  <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
duration="3*0.33-1.0"
/>
  <tone type="warning_operator_intervening_tone" freq="450" duration="0.2-0.2-
0.65-0.2" />
  <tone type="number_unobtainable_tone" freq="480+620" duration="0.25-0.25" />
  <tone type="waiting_tone" freq="440" duration="1*(0.5-10.0-0.5)" />
  <tone type="payphone_recognition_tone" freq="1600/1143"
duration="0.2-0.2-0.2-
2.0" />
</country>

<country name="S. LUCIA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="0.375-0.25-0.375-2.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="425+330" duration="continuous" />
  <tone type="warning_operator_intervening_tone" freq="425"
duration="0.1-4.9" />
  <tone type="number_unobtainable_tone" freq="recorded"
duration="announcement" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.2" />
  <tone type="route_tone" freq="425" duration="0.05-0.05" />
</country>

<country name="S. PIERRE AND MIQUELON">
  <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
  <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
  <tone type="busy_tone" freq="440" duration="0.5-0.5" />
```

```
  <tone type="special_information_tone" freq="950/1400/1800" duration="(3*0.3-
2*0.03)-1.0" />
  <tone type="route_tone" freq="440" duration="0.05-0.05" />
</country>
```

```
<country name="S. VINCENT AND THE GRENADINES">
  <tone type="dial_tone" freq="350+450" duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.2-0.4" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="400" duration="0.4-0.35-0.255-0.525" />
</country>

  <country name="SAN MARINO">
    <tone type="dial_tone" freq="425" duration="0.6-1.0-0.2-0.2" />
    <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
    <tone type="busy_tone" freq="425" duration="0.2-0.2" />
  </country>

<country name="SAO TOME AND PRINCIPE">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="1.0-5.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.2-0.2" />
  <tone type="pay_tone" freq="12000" duration="continuous" />
</country>

  <country name="SAUDI ARABIA">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="recall_dial_tone" freq="425" duration="continuous" />
    <tone type="ringing_tone" freq="425" duration="1.2-4.6" />
    <tone type="busy_tone" freq="425" duration="0.5-0.5" />
    <tone type="intrusion_tone" freq="425" duration="0.5-0.2-0.2-0.2" />
    <tone type="waiting_tone" freq="425" duration="0.2-0.6-0.2-4.0" />
    <tone type="payphone_recognition_tone" freq="1600/1200"
          duration="0.2-0.2-0.2-2.0" />
    <tone type="refusal_tone" freq="425" duration="0.6-0.6" />
    <tone type="acceptance_tone" freq="425" duration="continuous" />
  </country>

 <country name="SENEGAL">
   <tone type="dial_tone" freq="440" duration="continuous" />
   <tone type="second_dial_tone" freq="440+330" duration="continuous" />
   <tone type="ringing_tone" freq="400" duration="1.7-3.3" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

<country name="SEYCHELLES">
  <tone type="dial_tone" freq="350+440" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.375-0.375" />
  <tone type="congestion_tone" freq="425" duration="0.4-0.35-0.225-0.525" />
  <tone type="number_unobtainable_tone" freq="425" duration="continuous" />
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</country>

   <country name="SIERRA LEONE">
     <tone type="dial_tone" freq="425 or 450" duration="continuous" />
     <tone type="ringing_tone" freq="425 or 450" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425 or 450" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
     <tone type="number_unobtainable_tone" freq="950 or 450/150"
           duration="0.33-0.03" />
     <tone type="waiting_tone" freq="425" duration="1.0 (one burst)" />
   </country>

<country name="SINGAPORE">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425*24" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="425" duration="0.75-0.75" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="warning_operator_intervening_tone" freq="425"
        duration="0.125-0.125" />
  <tone type="number_unobtainable_tone" freq="425" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="425" duration="0.3-0.2-0.3-3.2" />
  <tone type="intercept_tone" freq="425" duration="0.25-2.0" />
  <tone type="payphone_recognition_tone" freq="1206/832"
        duration="0.2-0.2-0.2-2.0" />
</country>

<country name="SLOVAKIA">
  <tone type="dial_1_tone" freq="425" duration="0.33-0.33-0.66-0.66" />
  <tone type="dial_2_centrex_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425"
duration="3*(0.165-0.165)-0.660-0.660"
/>
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.33-0.33" />
  <tone type="congestion_tone" freq="425" duration="0.165-0.165" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="(3*0.33-
2*0.03)-1.0" />
  <tone type="waiting_tone" freq="425" duration="0.33-9.0" />
  <tone type="caller_waiting_tone" freq="425" duration="1.0-0.17-0.33-3.5" />
  <tone type="connection_tone" freq="1400" duration="0.05-0.05" />
  <tone type="offering_tone" freq="425" duration="0.33-0.33-0.33-1.5" />
  <tone type="conference_tone" freq="425" duration="0.66" />
</country>
```

```
<country name="SLOVENIA">
  <tone type="dial_tone" freq="425" duration="0.7-0.8-0.2-0.3" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
  <tone type="special_information_tone" freq="950/1400/1600" duration="3*0.333-
1.0" />
</country>

<country name="SOLOMON">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="ringing_tone" freq="400+450" duration="0.4-0.2" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.1-0.1" />
  <tone type="number_unobtainable_tone" freq="400" duration="0.075-0.1" />
  <tone type="waiting_tone" freq="400+450/400" duration="0.5-0.5" />
  <tone type="pay_tone" freq="852" duration="0.2-2.0" />
</country>

<country name="SOUTH AFRICA">
  <tone type="dial_tone" freq="400*33" duration="continuous" />
  <tone type="special_dial_tone" freq="400*33"
        duration="1/3 4*(0.25-0.25)-continuous" />
  <tone type="ringing_tone" freq="400*33" duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="400" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.333-1.0" />
  <tone type="warning_operator_intervening_tone" freq="400"
        duration="0.15-0.25-0.15-1.45" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="400*33"
        duration="1/3 3*(0.25-0.25)-0.25-7.25" />
  <tone type="pay_tone" freq="900" duration="0.2-1.8" />
  <tone type="payphone_recognition_tone" freq="770/1209"
        duration="0.125-1.5" />
  <tone type="positive_indication_tone" freq="700/1100"
        duration="0.25-0.25-0.25-0.25" />
  <tone type="comfort_tone" freq="950/950/1400"
        duration="0.65-0.325-0.325-1.3-2.6" />
  <tone type="notify_tone" freq="900" duration="3*0.2-2*0.2" />
</country>
```

```
  <country name="SPAIN">
    <tone type="dial_tone" freq="425" duration="continuous" />
    <tone type="dial_tone" freq="600" duration="continuous" />
    <tone type="special_dial_tone" freq="425" duration="1.0-0.1" />
    <tone type="ringing_tone" freq="425" duration="1.5-3.0" />
    <tone type="busy_tone" freq="425" duration="0.2-0.2" />
    <tone type="congestion_tone" freq="425"
          duration="2*(0.2-0.2)-0.2-0.6" />
    <tone type="special_information_1_tone" freq="950/1400/1800"
          duration="3*0.333-1.0" />
    <tone type="special_information_2_tone" freq="950/1400/1800"
          duration="(3*0.33-2*0.03)-1.0" />
    <tone type="warning_operator_intervening_tone" freq="1400"
          duration="0.4-5.0" />
    <tone type="number_unobtainable_tone" freq="425"
          duration="0.2-0.2-0.2-0.6" />
    <tone type="waiting_1_tone" freq="425"
          duration="0.2-0.6" />
    <tone type="waiting_2_tone" freq="425"
          duration="0.175-0.175-0.175-3.5" />
    <tone type="payphone_recognition_1_tone" freq="1600"
          duration="0.05-1.28" />
    <tone type="payphone_recognition_2_tone" freq="1600"
          duration="0.05-0.05-0.05-1.55" />
    <tone type="payphone_recognition_3_tone" freq="1600"
          duration="0.05-0.05-0.05-0.05-0.05-1.5" />
  </country>

<country name="SRI LANKA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="0.65-0.03" />
  <tone type="ringing_tone" freq="425" duration="0.4-0.2" />
  <tone type="busy_tone" freq="425" duration="0.75-0.75" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="number_unobtainable_tone" freq="400" duration="continuous" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.2-0.2-4.5" />
  <tone type="route_tone" freq="425" duration="0.05-0.05" />
</country>

<country name="SURINAME">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425" duration="15.0-0.5" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
duration="3*0.33-1.0"
/>
</country>
```

```
<country name="SWAZILAND">
  <tone type="dial_tone" freq="50" duration="continuous" />
  <tone type="ringing_tone" freq="400" duration="0.4-0.2-0.4-4.0" />

  <tone type="busy_1_tone" freq="400" duration="0.5-0.5" />
  <tone type="busy_2_tone" freq="400" duration="0.4-0.4" />
  <tone type="number_unobtainable_tone" freq="400" duration="4.8-0.2" />
  <tone type="payphone_recognition_1_tone" freq="1430/943" duration="2.0-2.0" /
>
  <tone type="payphone_recognition_2_tone" freq="1100+1750/750+1450"
duration="0.2-0.2-0.2-2.0" />
  <tone type="pay_tone" freq="900" duration="0.25-0.25" />
</country>

<country name="SWEDEN">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="special_dial_tone" freq="425" duration="0.32-0.01" />
  <tone type="ringing_1_tone" freq="425" duration="1.0-5.0" />
  <tone type="ringing_2_tone" freq="400" duration="1.0-9.0" />
  <tone type="busy_tone" freq="425" duration="0.25-0.25" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.75" />
  <tone type="special_information_1_tone" freq="950/1400/1800"
duration="3*0.333-
1.0 + announcement" />
  <tone type="special_information_2_tone" freq="400"
duration="3*(0.05-0.2)-0.6"
/>
  <tone type="warning_operator_intervening_tone" freq="1400"
duration="0.1-1.5" />
  <tone type="warning_1_tone" freq="1400" duration="0.35-15.0" />
  <tone type="warning_2_tone" freq="425" duration="2.0-5.0-continuous" />
  <tone type="number_unobtainable_tone" freq="950/1400/1800"
duration="3*0.333-1.0
+ announcement" />

  <tone type="waiting_tone" freq="425" duration="0.2-0.5-0.2 (only once)" />
  <tone type="payphone_recognition_tone" freq="1633/1336"
duration="0.2-0.2-0.2-
4.0 (seven cycles)" />
  <tone type="pay_tone" freq="941" duration="0.2-0.2-0.2-3.6 (two cycles)" />
</country>
```

```
<country name="SWITZERLAND">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="dial_pabx_tone" freq="500" duration="continuous" />
  <tone type="ringing_tone" freq="425 or 500" duration="1.0-4.0" />
  <tone type="busy_1_tone" freq="425" duration="0.5-0.5" />
  <tone type="busy_2_tone" freq="425" duration="0.25-0.25" />
  <tone type="busy_pabx_tone" freq="500" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.2-0.2" />
  <tone type="special_information_tone" freq="950/1400/1800" duration="3*0.333-
1.0" />
  <tone type="record_tone" freq="1400" duration="0.45-15.0" />
  <tone type="payphone_recognition_1_tone" freq="800/1200"
duration="0.2-0.2-0.2-
2.0" />
  <tone type="payphone_recognition_2_tone" freq="1100+1750/750+1450"
duration="0.2-0.2-0.2-2.0" />
</country>

  <country name="SYRIA">
    <tone type="dial_tone" freq="450" duration="continuous" />
    <tone type="recall_dial_tone" freq="450" duration="continuous" />
    <tone type="ringing_1_tone" freq="425 or 475" duration="1.0-4.0" />
    <tone type="ringing_2_tone" freq="450 or 50" duration="1.0-3.0" />
    <tone type="busy_1_tone" freq="450" duration="0.5-0.5" />
    <tone type="busy_2_tone" freq="450" duration="0.44-0.49" />
    <tone type="congestion_tone" freq="450"
          duration="2*(0.2-0.23)-0.2-0.92" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="(3*0.33-2*0.03)-1.0" />
    <tone type="number_unobtainable_tone" freq="450"
          duration="0.9-0.2-2*(0.25-0.2)" />
  </country>

  <country name="TAJIKISTAN">
    <tone type="ringing_tone" freq="425" duration="0.8-3.2" />
    <tone type="busy_tone" freq="425" duration="0.4-0.4" />
    <tone type="waiting_tone" freq="950/1400/1800"
          duration="3*0.333-1.0" />
  </country>

<country name="TANZANIA">
  <tone type="dial_tone" freq="50" duration="continuous" />
  <tone type="ringing_1_tone" freq="400" duration="continuous" />
  <tone type="ringing_2_tone" freq="400" duration="1.0-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
</country>
```

```
  <country name="THAILAND">
    <tone type="dial_tone" freq="400*50 or 400" duration="continuous" />
    <tone type="ringing_tone" freq="400" duration="1.0-4.0" />
    <tone type="busy_1_tone" freq="400" duration="0.5-0.5" />
    <tone type="busy_2_tone" freq="450" duration="0.333-0.333" />

    <tone type="warning_operator_intervening_tone" freq="800"
          duration="1.0" />
    <tone type="number_unobtainable_tone" freq="400"
          duration="6*(0.1-0.9)-0.3-0.7" />
    <tone type="offering_tone" freq="400"
          duration="2*(0.17-0.83)-0.51-0.49" />
  </country>

   <country name="TRINIDAD AND TOBAGO">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
     <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
     <tone type="waiting_tone" freq="440" duration="0.3-10.0" />
     <tone type="reorder_1_tone" freq="480+620" duration="0.3-0.2" />
     <tone type="reorder_2_tone" freq="480+620" duration="0.2-0.3" />
   </country>

<country name="TUNISIA">
  <tone type="dial_1_tone" freq="425" duration="continuous" />
  <tone type="dial_2_tone" freq="425" duration="0.4-0.04" />
  <tone type="ringing_tone" freq="425" duration="1.2-4.6" />
  <tone type="busy_1_tone" freq="425" duration="0.25-0.25" />
  <tone type="busy_2_tone" freq="(special)" duration="950 continuous" />
  <tone type="congestion_tone" freq="425" duration="0.167-0.167" />
</country>
```

```
<country name="TURKEY">
  <tone type="dial_tone" freq="450" duration="continuous" />
  <tone type="second_dial_tone" freq="350+450" duration="continuous" />
  <tone type="special_dial_tone" freq="450" duration="1.0-0.25" />
  <tone type="ringing_tone" freq="450" duration="2.0-4.0" />
  <tone type="busy_tone" freq="450" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="450"
        duration="3*(0.2-0.2)-0.6-0.2" />

  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.3-1.0" />
  <tone type="warning_operator_intervening_tone" freq="450"
        duration="0.2-0.2-0.6-0.2" />
  <tone type="number_unobtainable_tone" freq="450" duration="0.2-0.2" />
  <tone type="waiting_tone" freq="350+450/450" duration="0.5-0.5-2.5" />
  <tone type="payphone_recognition_tone" freq="1000/1200 or 1000/1330"
        duration="0.25-0.25-0.25-2.0" />
  <tone type="confirmation_tone" freq="450" duration="0.04-0.04" />
</country>

<country name="TURKMENISTAN">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="second_dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="25" duration="0.4-4.0" />
  <tone type="busy_tone" freq="425" duration="0.4-0.4" />
  <tone type="congestion_tone" freq="425" duration="0.4-0.4" />
  <tone type="number_unobtainable_tone" freq="425" duration="0.8-4.0" />
  <tone type="route_tone" freq="25" duration="0.4-0.4" />
</country>

  <country name="TURKS AND CAICOS ISLANDS">
    <tone type="dial_tone" freq="350+440" duration="continuous" />
    <tone type="recall_dial_tone" freq="350+440"
          duration="3*(0.1-0.1)-continuous" />
    <tone type="ringing_tone" freq="440+480" duration="2.0-4.0" />
    <tone type="busy_tone" freq="480+620" duration="0.5-0.5" />
    <tone type="congestion_tone" freq="480+620" duration="0.25-0.25" />
    <tone type="special_information_tone" freq="950/1400/1800"
          duration="3*0.33-1.0" />
    <tone type="warning_operator_intervening_tone" freq="450"
          duration="0.2-0.2-0.65-0.2" />
    <tone type="number_unobtainable_tone" freq="480+620"
          duration="0.25-0.25" />
    <tone type="waiting_tone" freq="440"
          duration="1*(0.5-10.0-0.5)" />
    <tone type="payphone_recognition_tone" freq="1600/1143"
          duration="0.2-0.2-0.2-2.0" />
  </country>
```

```
<country name="UGANDA">
  <tone type="dial_tone" freq="33 or 50" duration="continuous" />
  <tone type="ringing_tone" freq="133+17 or 400+17 or 400+450"
        duration="0.25-0.5-0.25-2.0" />
  <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
  <tone type="busy_2_tone" freq="400" duration="0.375-0.375" />
  <tone type="number_unobtainable_1_tone" freq="400"
        duration="continuous" />
  <tone type="number_unobtainable_2_tone" freq="400" duration="2.5-0.5" />
</country>

   <country name="UNITED ARAB EMIRATES">
     <tone type="dial_tone" freq="350+440" duration="continuous" />
     <tone type="ringing_tone" freq="400+450 or 425"
           duration="0.4-0.2-0.4-2.0" />
     <tone type="busy_tone" freq="400 or 425"
           duration="0.375-0.375" />
     <tone type="congestion_tone" freq="400 or 425"
           duration="0.4-0.35-0.225-0.525" />
     <tone type="number_unobtainable_tone" freq="400 or 425"
           duration="continuous" />
   </country>

  <country name="UNITED KINGDOM">
    <tone type="dial_tone" freq="50 or 350+440" duration="continuous" />
    <tone type="ringing_tone" freq="400+450 or 400*25 or 400*16"
          duration="2/3 0.4-0.2-0.4-2.0" />
    <tone type="busy_tone" freq="400" duration="0.375-0.375" />
    <tone type="congestion_tone" freq="400"
          duration="0.4-0.35-0.225-0.525" />
    <tone type="number_unobtainable_tone" freq="400"
          duration="continuous" />
    <tone type="payphone_recognition_tone" freq="1200/800"
          duration="0.2-0.2-0.2-2.0" />
    <tone type="pay_tone" freq="400" duration="0.125-0.125" />
  </country>
```

```
<country name="UNITED STATES">
  <tone type="dial_tone" freq="600*120 or 350+440" duration="continuous" />
  <tone type="recall_dial_tone" freq="350+440"
        duration="3*(0.1-0.1)-continuous" />
  <tone type="ringing_tone" freq="420*40 or 440+480" duration="2.0-4.0" />
  <tone type="ringing_pabx_tone" freq="440+480" duration="1.0-3.0" />
  <tone type="busy_tone" freq="600*120 or 480+620" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="600*120 or 480+620"
        duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.33" />
  <tone type="warning_operator_intervening_tone" freq="440"
        duration="2.0-10.0-0.5-10.0" />
  <tone type="warning_operator_intervening_pabx_tone" freq="440"
        duration="1.5-8.0-0.5-8.0" />
  <tone type="waiting_pabx_tone" freq="440" duration="0.3-10.0" />
  <tone type="record_tone" freq="1400" duration="0.5-15.0" />
  <tone type="executive_override_pabx_tone" freq="440" duration="3.0" />

  <tone type="intercept_pabx_tone" freq="440/620" duration="0.25-0.25" />
  <tone type="confirmation_pabx_tone" freq="350+440"
        duration="3*0.1-2*0.1" />
</country>

<country name="URUGUAY">
  <tone type="dial_1_tone" freq="425" duration="continuous" />
  <tone type="dial_2_tone" freq="450" duration="0.7-0.8-0.2-0.3" />
  <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
  <tone type="busy_tone" freq="425" duration="0.5-0.5" />
  <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
  <tone type="special_information_tone" freq="950/1400/1800"
        duration="3*0.333-1.0" />
  <tone type="warning_operator_intervening_tone" freq="425"

        duration="0.15-0.25-0.15-1.45" />
  <tone type="waiting_tone" freq="425" duration="0.2-0.2-0.2-4.4" />
  <tone type="positive_indication_tone" freq="425"
        duration="2*(0.1-0.2)-0.1-1.3" />
  <tone type="negative_indication_tone" freq="425" duration="0.5-0.5" />

</country>
```

```
   <country name="VANUATU">
     <tone type="dial_tone" freq="425" duration="continuous" />
     <tone type="special_dial_tone" freq="425" duration="0.4-0.04" />
     <tone type="ringing_1_tone" freq="425" duration="1.0-4.0" />
     <tone type="ringing_2_tone" freq="400*450 or 133*16"
           duration="2/3 0.4-0.2-0.4-2.0" />
     <tone type="busy_1_tone" freq="400" duration="0.75-0.75" />
     <tone type="busy_2_tone" freq="425" duration="0.5-0.5" />
     <tone type="busy_3_tone" freq="400" duration="0.375-0.375" />
     <tone type="special_information_tone" freq="950 or 1400 or 1800"
           duration="0.33-0.03" />
     <tone type="number_unobtainable_tone" freq="400"
           duration="continuous" />
     <tone type="waiting_tone" freq="425" duration="0.3-10.0" />
     <tone type="route_tone" freq="425" duration="0.05-0.05" />
     <tone type="acceptance_tone" freq="950" duration="continuous" />
   </country>

 <country name="WALLIS AND FUTUNA">
   <tone type="dial_tone" freq="440 or 330+440" duration="continuous" />
   <tone type="ringing_tone" freq="440" duration="1.5-3.5" />
   <tone type="busy_tone" freq="440" duration="0.5-0.5" />
   <tone type="special_information_tone" freq="950/1400/1800"
         duration="(3*0.3-2*0.03)-1.0" />
   <tone type="route_tone" freq="440" duration="0.05-0.05" />
 </country>

<country name="WESTERN SAMOA">
  <tone type="dial_tone" freq="425" duration="continuous" />
  <tone type="ringing_tone" freq="425*25"
        duration="0.375-0.25-0.375-2.0" />
  <tone type="congestion_tone" freq="recorded" duration="announcement" />
  <tone type="number_unobtainable_tone" freq="recorded"
        duration="announcement" />
</country>

   <country name="YUGOSLAVIA">
     <tone type="dial_tone" freq="425" duration="0.7-0.8-0.2-0.3" />
     <tone type="ringing_1_tone" freq="450*25" duration="1.0-9.0" />
     <tone type="ringing_2_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_1_tone" freq="425" duration="0.5-0.5" />
     <tone type="busy_2_tone" freq="425" duration="0.2-0.4" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
   </country>
```

```
   <country name="ZAMBIA">
     <tone type="dial_tone" freq="425 or 50" duration="continuous" />
     <tone type="ringing_tone" freq="425" duration="1.0-4.0" />
     <tone type="busy_tone" freq="425" duration="0.5-0.5" />
     <tone type="congestion_tone" freq="425" duration="0.25-0.25" />
     <tone type="special_information_tone" freq="950/1400/1800"
           duration="3*0.333-1.0" />
     <tone type="intrusion_tone" freq="425" duration="0.1-4.9" />
     <tone type="number_unobtainable_tone" freq="950/1400/1800"
           duration="3*0.33-1.0" />
     <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
           duration="0.2-0.2-0.2-2.0" />
   </country>

<country name="ZIMBABWE">
  <tone type="dial_tone" freq="400" duration="continuous" />
  <tone type="second_dial_tone" freq="400*450 or 400*33"
        duration="continuous" />
  <tone type="ringing_tone" freq="400*450 or 400*33"
        duration="0.4-0.2-0.4-2.0" />
  <tone type="busy_tone" freq="400" duration="0.375-0.375" />
  <tone type="number_unobtainable_tone" freq="400" duration="2.5-0.5" />
  <tone type="waiting_tone" freq="523/659" duration="1.5-1.5" />
  <tone type="payphone_recognition_tone" freq="1100+1750/750+1450"
        duration="0.2-0.2-0.2-2.0" />
</country>
```

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14.1. Normative References

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