VTML (VoiceText™ Markup Language) Tag Set

User's Guide

Software Version 3.9

NeoSpeech, Inc.

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<vtml_break>

Description
Sets the Break Indices between words.

Syntax
```
<vtml_break level="0" | "1" | "2" | "3"/>
```

Attributes

Attribute	Description
Level	It sets Break Indices. *Required* (0= read continuously, 1= read with minor break, 2= read with major break, 3=sentence separation)

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

Example
```
The arrest warrant issued in Florida<vtml_break level="0"/> links the attorney to a government probe of the Medhyin drug cartel headed up by kingpin Carlos Later<vtml_break level="2"/> who now serving a life sentence in federal prison.
```

<vtml_partofsp>

Description
Designates a word class of the word surrounded with tags.

Syntax
```
<vtml_partofsp part="unknown" | "noun" | "verb" | "modifier" | "function" |
"interjection"> text
</vtml_partofsp>
```

Attributes
Attribute	Description
part	Part of speech. *Required*

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

IMPORTANT LIMITATION
This is applicable only in VoiceText English synthesizer.
The max length of the text is 512bytes including the NULL character. Anything longer will be truncated.

Example
```
Did you <vtml_partofsp part="verb">record</vtml_partofsp> that
<vtml_partofsp part="noun">record</vtml_partofsp>?
```

<vtml_pause>

Description
Sets a pause to be inserted in the synthesized voice.

Syntax
```
<vtml_pause time="msec"/>
```

Attributes

Attribute	Description
time	Pause length. *Required* The unit is millisecond and it has the value between 0 to 65535. (Anything beyond this value will be set as minimum or maximum value. +, - symbols not usable)

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

IMPORTANT LIMITATION
Adding pause at the very end of the output is supported by placing this tag at the very end of the text. (From v3.7.2)

Example
```
The arrest warrant issued in Florida<vtml_pause time="1000"/> links the attorney to a government probe of the Medhyin drug cartel headed up<vtml_pause time="100"/> by kingpin
Carlos Later who now serving a life sentence in federal prison.
```

<vtml_phoneme>

Description
Sets the phonetic symbols of the texts surrounded with the tags.

Syntax
```
<vtml_phoneme
   ph="string"
   alphabet="ipa" | "x-cmu" | "x-pentax" | "x-sapi" | "x-sampa"
                | "x-worldbet" | "x-pinyin">
 text
</vtml_phoneme>
```

Attributes

Attribute	Description
ph	It represents the pronunciation strings. *Required*
alphabet	It sets the SPR(Symbolic Phonetic Representation) to represent pronunciation strings. *Optional* (if omitted, it will set as "ipa". For detailed information on SPR and TAG usage, please refer to Appendix A.

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

IMPORTANT LIMITATION
VoiceText English synthesizer only supports **ipa, x-worldbet, x-sampa, x-sapi, x-cmu** and **Japanese synthesizer** only supports **x-pentax** and **Chinese synthesizer** only supports **x-pinyin.**
The max length of the text is 512bytes including the NULL character. Anything longer will be truncated.
The maximum length of Japanese Synthesizer's ph value must be under **60 bytes.** For English synthesizers, the ph value must have less than or equal to **64 phonetic symbols.**
The maximum length of Chinese synthesizer's ph value must be under **240bytes.**

Example
```
<vtml_phoneme alphabet="ipa" ph="116;601;712;109;101;105;116;
111;650;">tomato</vtml_phoneme>
<vtml_phoneme alphabet="x-cmu" ph="T AH0 M EY1 T OW0">tomato
</vtml_phoneme>
<vtml_phoneme alphabet="x-pentax" ph="マルチメディアウェヘア[その他の固有
名詞]">MMW</vtml_phoneme>
<vtml_phoneme alphabet="x-pinyin" ph="da4fu1">大夫</vtml_phoneme>
```

<vtml_pitch>

Description
Among the prosody information, it sets the pitch of the text surrounded by this tags.

Syntax

```
<vtml_pitch value="pitch">
  child elements
</vtml_pitch>
```

Attributes

Attribute	Description
value	The level of pitch ranging between 50~200%. *Required* (Anything beyond this range will be set as minimum or maximum value. +, - symbols not usable)

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
<vtml_break>, <vtml_partofsp>, <vtml_pause>, <vtml_phoneme>, <vtml_pitch>, <vtml_speed>, <vtml_volume>, <vtml_sayas>, <vtml_sub>

Example

```
<vtml_pitch value="150">The arrest warrant issued in Florida links the attorney to a government probe of the Medhyin drug cartel headed up by kingpin Carlos Later who now serving a life sentence in federal prison.</vtml_pitch>
```

<vtml_sayas>

Description
Sets the format of the text.

Syntax

```
<vtml_sayas
    interpret-as="construct_type"
    format="string"
    detail="string">
  text
</vtml_sayas>
```

Attributes

Attribute	Description
interpret-as	Text type. *Required*
format	The format in accordance with the type of text. *Optional* (If omitted, please refer to interpret-as below on how it is handled.)
Detail	Additional information on reading in accordance with the format of the text *Optional*

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

IMPORTANT LIMITATION
VoiceText Engine supports <vtml_sayas> element as stated below
The length of texts is max 512bytes including the NULL character and anything longer will be truncated.

ssml:date
Syntax :
<vtml_sayas interpret-as="ssml:date" format="format">Text</vtml_sayas>
Format : mdy, dmy, ymd, md, dm, ym, my, d, m, y
Text : Only numbers, date separators (' / ', ' . ', ' - ') are allowed.
When format is specified, it checks the possible range of each numbers. Otherwise it regards it in the order of Month, Day, Year.
Example :
Input :

```
<vtml_sayas interpret-as="ssml:date" format="mdy">
    01/02/2007
</vtml_sayas>
```

Output : January 2nd 2007

Input :

<vtml_sayas interpret-as="ssml:date" format="dmy">
01/02/2007
</vtml_sayas>
Output : Feburary 1st 2007

Input :
<vtml_sayas interpret-as="ssml:date" format="ymd">
2007/01/02
</vtml_sayas>
Output : January 2nd 2007

Input :
<vtml_sayas interpret-as="ssml:date" format="md">
01/02
</vtml_sayas>
Output : January 2nd

Input :
<vtml_sayas interpret-as="ssml:date" format="dm">
01/02
</vtml_sayas>
Output : Feburary 1st

Input :
<vtml_sayas interpret-as="ssml:date" format="ym">
2007/01
</vtml_sayas>
Output : January 2007

Input :
<vtml_sayas interpret-as="ssml:date" format="my">
01/2007
</vtml_sayas>
Output : January 2007

Input : <vtml_sayas interpret-as="ssml:date" format="d">1</vtml_sayas>
Output : 1st

Input : <vtml_sayas interpret-as="ssml:date" format="m">1</vtml_sayas>
Output : January

Input : <vtml_sayas interpret-as="ssml:date" format="y">2007</vtml_sayas>
Output : 2007

Input : <vtml_sayas interpret-as="ssml:date">01/02/2007</vtml_sayas>
Output : January 2nd 2007

ssml:time
Syntax :
<vtml_sayas interpret-as="ssml:time" format="format">Text</vtml_sayas>
Format : hms24, hms12
Text :
Only numbers, time separators (' : ', ' . ', empty string), modifier separators (space,

empty string), and modifiers ("AM", "A.M.", "am", "a.m.", "A", "a", "PM", "P.M.", "pm", "p.m.", "P", "p") are allowed.
It checks the possible range of each number. When format is not specified, it regards them as hms12. Real numbers are allowed in second.

Restriction : hms12 only permits from 1 to12 for the hour values.
hms24 only permits from 0 to 23 for the hour values.

Example :

Input :

```
<vtml_sayas interpret-as="ssml:time" format="hms12">
    09:21:15
</vtml_sayas>
```

Output : nine twenty one and fifteen seconds

Input :

```
<vtml_sayas interpret-as="ssml:time" format="hms24">
    19:21:30
</vtml_sayas>
```

Output : nineteen twenty one and thirty seconds

Input :

```
<vtml_sayas interpret-as="ssml:time">
    09:21:15
</vtml_sayas>
```

Output : nine twenty one and fifteen seconds

ssml:telephone

Syntax :

```
<vtml_sayas interpret-as="ssml:telephone" format="format">
  Text
</vtml_sayas>
```

Format : country code

Text :

Only country code symbol (' + '), numbers, phone number separators (' (', ') ', ' - ', ' . ', ' / ', space, empty string), symbols ('*', '#'), English characters (except Q and Z) are allowed.

Example :

Input :

```
<vtml_sayas interpret-as="ssml:telephone" format="39">
    +39(011)777-7777
</vtml_sayas>
```

Output : 3 9 0 1 1 7 7 7 7 7 7 7

(three nine zero one one seven seven seven seven seven seven seven)

Input :

```
<vtml_sayas interpret-as="ssml:telephone" format="39">
    +1-800-EXAMPLE
</vtml_sayas>
```

Output : 1 800 3 9 2 6 7 5 3

(one eight hundred three nine two six seven five three)

ssml:characters

Syntax :

```
<vtml_sayas interpret-as="ssml:characters" format="format" detail="detail">
```

Text
</vtml_sayas>
Format : characters
Detail : The number of characters of the classified group.
(In order to distinguish groups, spaces must be used.)
The sum of characters in all groups should equal to the total number of character in the text.
Text :
Only English characters, numbers, and 31 1-Byte symbols are allowed.
When Format or Detail is not specified, it will be just spelled out.
The symbols allowed are as follows:
(' ! ', ' # ', ' $ ', ' % ', ' & ', ' ’ ', ' (', ') ', ' * ', ' + ', ' , ', ' - ', ' . ', ' / ', ' : ',
' ; ', ' < ', ' = ', ' > ', ' ? ', ' @ ', ' [', ' \ ', '] ', ' ^ ', ' _ ', ' ` ', ' { ', ' | ', ' } ',
' ~ ')
Example :
Input :
<vtml_sayas interpret-as="ssml:characters" format="characters" detail="3 1 2">
1a3BZ7
</vtml_sayas>
Output : 1a3 B Z7 (one A three B Z seven)

Input :
<vtml_sayas interpret-as="ssml:characters" format="characters">
1a3BZ7
</vtml_sayas>
Output : 1a3BZ7 (one A three B Z seven)

Input : <vtml_sayas interpret-as="ssml:characters">1a3BZ7</vtml_sayas>
Output : 1a3BZ7 (one A three B Z seven)

ssml:cardinal
Syntax :
<vtml_sayas interpret-as="ssml:cardinal" format="format" detail="detail">
Text
</vtml_sayas>
Format : a symbol
(character which distinguish integers and decimal numbers)
Detail : a symbol (character which distinguish the integers)
Text : Only sign symbols (' + ', ' - '), numbers, Format or detail symbols are allowed.
Restriction : Format and Detail must use different symbols.
The maximum length of Integer Parts is based on (Appendix B:Text preprocessing protocol, Cardinal Numbers condition.)
Example :
Input :
<vtml_sayas interpret-as="ssml:cardinal" format=".">
123.456
</vtml_sayas>
Output : 123.456 (one hundred twenty three point four five six)

Input :
<vtml_sayas interpret-as="ssml:cardinal" detail=".">
123.456

</vtml_sayas>
Output : 123 456 (one hundred twenty three, four hundred fifty six)

Input :
<vtml_sayas interpret-as="ssml:cardinal">
123
</vtml_sayas>
Output : 123 (one hundred twenty three)

ssml:ordinal
Syntax : <vtml_sayas interpret-as="ssml:ordinal">Text</vtml_sayas>
Text : Only numbers are allowed.
Restriction : The maximum length is based on (Appendix B:Text preprocessing protocol, Ordinal Numbers condition.)
Example :
Input : <vtml_sayas interpret-as="ssml:ordinal">123</vtml_sayas>
Output : 123th

vxml:boolean
Syntax : <vtml_sayas interpret-as="vxml:boolean">Text</vtml_sayas>
Text : Only true or false value are allowed.
Example :
Input : <vtml_sayas interpret-as="vxml:boolean">true</vtml_sayas>
Output : true

Input : <vtml_sayas interpret-as="vxml:boolean">false</vtml_sayas>
Output : false

vxml:date
Syntax : <vtml_sayas interpret-as="vxml:date">Text</vtml_sayas>
Text : Only yyyymmdd patterned numbers, '?'(fills non-specified dates) are allowed.
Restriction :
yyyy is four digit number representing the year, mm is two digit number representing the month and dd is two digit number representing day.
Example :
Input : <vtml_sayas interpret-as="vxml:date">20070102</vtml_sayas>
Output : January 2nd 2007

Input : <vtml_sayas interpret-as="vxml:date">????0102</vtml_sayas>
Output : January 2nd

vxml:digits
Syntax : <vtml_sayas interpret-as="vxml:digits">Text</vtml_sayas>
Text : Only numbers are allowed.
Example :
Input : <vtml_sayas interpret-as="vxml:digits">123</vtml_sayas>
Output : 1 2 3 (one two three)

vxml:currency
Syntax : <vtml_sayas interpret-as="vxml:currency">Text</vtml_sayas>
Text : Only UUUmm.nn patterned three digit monetary symbols (UUU), number and decimal point(mm.nn) are allowed.

Example :
Input : <vtml_sayas interpret-as="vxml:currency">USD30.101</vtml_sayas>
Output : 30.101 US dallors

vxml:number
Syntax : <vtml_sayas interpret-as="vxml:number">Text</vtml_sayas>
Text : Only symbols(' + ', ' - '), number, decimal are allowed.
Restriction : The maximum length of Integer Parts is based on (Appendix B:Text preprocessing protocol, Cardinal Numbers condition.)
Example :
Input : <vtml_sayas interpret-as="vxml:number">+123.45</vtml_sayas>
Output : +123.45

vxml:phone
Syntax : <vtml_sayas interpret-as="vxml:phone">Text</vtml_sayas>
Text : Only numbers, 'x'(extension's abbreviation) are allowed.
Example :
Input :
<vtml_sayas interpret-as="vxml:phone">
8005551234x789
</vtml_sayas>
Output : 8 0 0 5 5 5 1 2 3 4 extension 7 8 9
(eight zero zero five five five one two three four extension seven eight nine)

vxml:time
Syntax : <vtml_sayas interpret-as="vxml:time">Text</vtml_sayas>
Text :
Only HHMM patterned numbers, 'a'(AM), 'p'(PM), 'h'(24 hour),'?'(ambiguous time of AM/PM) are allowed.
Restriction : HH represents 2 digit hours. MM represents 2 digit minutes and X represents one of 'a', 'p', 'h', '?'. Only when it is 'h', the value from 00 to 23 is permitted as HH value.
Example :
Input : <vtml_sayas interpret-as="vxml:time">0600a</vtml_sayas>
Output : six o'clock AM

Input : <vtml_sayas interpret-as="vxml:time">0600p</vtml_sayas>
Output : six o'clock PM

Input : <vtml_sayas interpret-as="vxml:time">0600?</vtml_sayas>
Output : six o'clock

Input : <vtml_sayas interpret-as="vxml:time">2310h</vtml_sayas>
Output : twenty three ten

sapi:date
Syntax :
<vtml_sayas interpret-as="sapi:date" format="format">Text</vtml_sayas>
Format : mdy, dmy, ymd, md, dm, ym, my, y
Text : Only numbers, date separators (' / ', ' . ', ' - ') are allowed.
If format is specified, it checks the possible range of numbers.
Otherwise it regards it in the order of month, day, year.
Example :

Input :
<vtml_sayas interpret-as="sapi:date" format="mdy">
01/02/2007
</vtml_sayas>
Output : January 2nd 2007

Input :
<vtml_sayas interpret-as="sapi:date" format="dmy">
01/02/2007
</vtml_sayas>
Output : Feburary 1st 2007

Input :
<vtml_sayas interpret-as="sapi:date" format="ymd">
2007/01/02
</vtml_sayas>
Output : January 2nd 2007

Input :
<vtml_sayas interpret-as="sapi:date" format="md">
01/02
</vtml_sayas>
Output : January 2nd

Input :
<vtml_sayas interpret-as="sapi:date" format="dm">
01/02
</vtml_sayas>
Output : Feburary 1st

Input :
<vtml_sayas interpret-as="sapi:date" format="ym">
2007/01
</vtml_sayas>
Output : January 2007

Input :
<vtml_sayas interpret-as="sapi:date" format="my">
01/2007
</vtml_sayas>
Output : January 2007

Input : <vtml_sayas interpret-as="sapi:date" format="y">2007</vtml_sayas>
Output : 2007

Input : <vtml_sayas interpret-as="sapi:date">01/02/2007</vtml_sayas>
Output : January 2nd 2007

sapi:time
Syntax : <vtml_sayas interpret-as="sapi:time">Text</vtml_sayas>
Text : Only numbers, time separators (' : ', ' ’ ', ' ” ') are allowed.
It checks the possible range of numbers.
Example :

Input : <vtml_sayas interpret-as="sapi:time">09:21:15</vtml_sayas>
Output : nine twenty one and fifteen seconds

Input : <vtml_sayas interpret-as="sapi:time">1'21"</vtml_sayas>
Output : one minute and twenty one seconds

sapi:number
Syntax :
<vtml_sayas interpret-as="sapi:number" format="format">
Text
</vtml_sayas>
Format : cardinal, digit, fraction, decimal
Text : Only numbers, decimal point, fraction symbol (' / ') are allowed.
Even if Format is not specified, it will be regarded as cardinal.
Restriction : The maximum length of Integer Parts is based on (Appendix B:Text preprocessing protocol, Cardinal Numbers condition.)
Example :
Input :
<vtml_sayas interpret-as="sapi:number" format="cardinal">
3432
</vtml_sayas>
Outpt : 3432 (three thousand four hundred thirty two)

Input :
<vtml_sayas interpret-as="sapi:number" format="fraction">
3/15
</vtml_sayas>
Output : 3/15 (three fifteenth)

Input :
<vtml_sayas interpret-as="sapi:number" format="digit">
123
</vtml_sayas>
Output : 1 2 3 (one two three)

Input :
<vtml_sayas interpret-as="sapi:number" format="decimal">
123.456
</vtml_sayas>
Output : 123.456 (one hundred twenty three point four five six)

Input :
<vtml_sayas interpret-as="sapi:number">
3432
</vtml_sayas>
Outpt : 3432 (three thousand four hundred thirty two)

sapi:phone
Syntax : <vtml_sayas interpret-as="sapi:phone">Text</vtml_sayas>
Text : Only country code symbol (' + '), numbers,
phone number separator (' - ') are allowed.
Example :
Input :

<vtml_sayas interpret-as="sapi:phone">
+82-02-3016-8541
</vtml_sayas>
Output : 8 2 0 2 3 0 1 6 8 5 4 1
(eight two zero two three zero one six eight five four one)

sapi:currency
Syntax : <vtml_sayas interpret-as="sapi:currency">Text</vtml_sayas>
Text : Only currency symbols ('$', '£',…), numbers, decimal point are allowed.
Example :
Input : <vtml_sayas interpret-as="sapi:currency">$34.90</vtml_sayas>
Output : 34 dollars and 90 cents (thirty four dollars and ninety cents)

sapi:web
Syntax :
<vtml_sayas interpret-as="sapi:web" format="format">Text</vtml_sayas>
Format : url
Text : Only English characters, numbers, symbols (' : ', ' / ', ' . ', ' _ ', ' - ') are allowed.
Even if Format is not specified, it will be regarded as url.
Example :
Input :
<vtml_sayas interpret-as="sapi:web" format="url">
www.Microsoft.com
</vtml_sayas>
Output : W W W dot Microsoft dot com

Input :
<vtml_sayas interpret-as="sapi:web">
NBA.com
</vtml_sayas>
Output : N B A dot com

sapi:email
Syntax : <vtml_sayas interpret-as="sapi:email">Text</vtml_sayas>
Text : Only English characters, numbers, symbols ('@', ' _ ', ' . ') are allowed.
Example :
Input :
<vtml_sayas interpret-as="sapi:email">
someone@microsoft.com
</vtml_sayas>
Output : someone at Microsoft dot com

sapi:address
Syntax :
<vtml_sayas interpret-as="sapi:address" format="format">
Text
</vtml_sayas>
Format : postal
Text : Only English characters, numbers, symbols (' # ', ' , ', ' . ', ' - ') are allowed.
Restriction : Only USA formatted addresses are allowed.
Only Canada and USA formatted postal addresses are allowed.

Example :
Input :
<vtml_sayas interpret-as="sapi:address" format="postal">
A2C 4X5
</vtml_sayas>
Output : A 2 C 4 X 5 (A two C four X five)

Input :
<vtml_sayas interpret-as="sapi:address">
One Microsoft Way, Redmond, WA, 98052
</vtml_sayas>
Output : One Microsoft Way Redmond Washington nine eight oh five two

Example

```
<vtml_sayas interpret-as="ssml:characters" format="characters">VoiceXML
</vtml_sayas>
You still owe me <vtml_sayas interpret-as="vxml:currency">USD30.10
</vtml_sayas>
Today's date is <vtml_sayas interpret-as="ssml:date" format="mdy">01/02/2006
</vtml_sayas>
Please push the <vtml_sayas interpret-as="vxml:boolean">true</vtml_sayas>
button.
I will get there at <vtml_sayas interpret-as="ssml:time" format="hms24">
07:30:30.0PM</vtml_sayas>
```

<vtml_speed>

Description
Among the prosody information, it sets the speed of text surrounded with this tags.

Syntax

```
<vtml_speed value="speed">
  child elements
</vtml_speed>
```

Attributes

Attribute	Description
speed	It sets the utterance speed with 50~400(%) value. *Required* (Anything beyond this range will be set minimum or maximum value. +, - symbols not usable)

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
<vtml_break>, <vtml_partofsp>, <vtml_pause>, <vtml_phoneme>, <vtml_pitch>, <vtml_speed>, <vtml_volume>, <vtml_sayas>, <vtml_sub>

Example

```
<vtml_speed value="150">The arrest warrant issued in Florida links the attorney to a government probe of the Medhyin drug cartel headed up by kingpin Carlos Later who now serving a life sentence in federal prison.</vtml_speed>
```

<vtml_sub>

Description
Reads text by replacing text surrounded with tags with the alias value.

Syntax
```
<vtml_sub
    alias="string">
  text
</vtml_sub>
```

Attributes
Attribute	Description
alias	It replaces the value surrounded with tags. *Required*

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
N/A

IMPORTANT LIMITATION
The length of the texts is max 512bytes including the NULL character. Anything longer will be truncated.
The length of the alias is max 512bytes including the NULL character. Anything longer will be considered as tag error.

Example
```
<vtml_sub alias="World Wide Web Consortium">W3C</vtml_sub>
```

<vtml_volume>

Description
Sets the volume of the text's prosody information surrounded with tags.

Syntax
```
<vtml_volume value="volume">
  child elements
</vtml_volume>
```

Attributes

Attribute	Description
volume	Set the volume within 0 to 500(%) value. *Required* (Anything beyond this range will be set as minimum or maximum value. +, - symbols not usable)

Parents
<vtml_pitch>, <vtml_speed>, <vtml_volume>

Children
<vtml_break>, <vtml_partofsp>, <vtml_pause>, <vtml_phoneme>, <vtml_pitch>, <vtml_speed>, <vtml_volume>, <vtml_sayas>, <vtml_sub>

Example
```
<vtml_volume value="150">The arrest warrant issued in Florida links the attorney to a government probe of the Medhyin drug cartel headed up by kingpin Carlos Later who now serving a life sentence in federal prison.</vtml_volume>
```

Appendix A: SPR(Symbolic Phonetic Representations)

Symbolic Phonetic Representation is only supported in **VoiceText English/ Japanese/Chinese synthesizer** and the method of expressing the phonetic representation varies with each <vtml_phoneme>tag's optional alphabet.

English synthesizer supports only the below mentioned five types such as ipa, x-worldbet, x-sampa, x-sapi, x-cmu and each phonetic representation which can be used in each alphabet is a concise English version and defined in Symbolic Phonetic Table.

Japanese synthesizer supports only x-pentax and phonetic representation can only be used in KATAKANA and accent symbols such as (' ^ ', ' / '). Also, you can express the optional word class information. The word class is expressed
between ' [' and '] ' behind the phonetic representations.

Chinese synthesizer supports only x-pinyin with alphabet and only pinyin attached with tone could be used for phonetic symbols. The value of the tone should be between from 1 to 5.

ipa : It is a method of expressing International Phonetic Alphabet-defined phonetic representation as Unicode and the alphabet value **"ipa" must be small letters**. The Unicode must be put in decimal numbers and semi-colon must be put at the end of it.
ex)

```
<vtml_phoneme alphabet="ipa" ph="116;601;712;109;101;105;116;
111;650;">tomato</vtml_phoneme>
```

x-WORLDBET : It is a method of expressing World's Languages as ASCII and the prefix **"x-" must be small letter.**
ex)

```
<vtml_phoneme alphabet="x-worldbet" ph="t&'meitoU">tomato
</vtml_phoneme>
```

x-SAMPA : It is a method of expressing Speech Assessment Methods Phonetic Alphabet-defined ASCII phonetic representation and the prefix **"x-" must be small letter.**
ex)

```
<vtml_phoneme alphabet="x-sampa" ph="t@'meit@U">tomato
</vtml_phoneme>
```

x-SAPI : It's a method of expressing phonetic representation defined by SAPI Phoneme Representation and the prefix **"x-" must be small letter.**
ex)

```
<vtml_phoneme alphabet="x-sapi" ph="h eh - l ow 1">hello
</vtml_phoneme>
```

x-CMU : It's a method of expressing phonetic representation defined by Carnegie Mellon University pronunciation dictionary and the prefix **"x-" must be small letter.**
A vowel must be expressed by vowel coupled with a stress number. If expressed without the stress number, it will be regarded default 0.
In English, there are 3 kinds of stress levels; 1 for primary stress, 2 for secondary stress, and 0 for no stress.

ex)

```
<vtml_phoneme alphabet="x-cmu" ph="T AH0 M EY1 T OW0">tomato
</vtml_phoneme>
```

x-PENTAX : **Only used in Japanese synthesizer.** It's a method of expressing phonetic representation by KATAKAGA and stress symbols (' ^ ', ' / ') and the prefix **"x-" must be small letter.**

Max 10 stress phrase are allowed and one stress phrase can express at least one stress. The stress symbols used are As follows;

^ : It shows the location of the stress.

/ : It shows the boundary of the stress phrase.

ex)

オシャベリデ^ンタク　　(○ : stress phrase 1, stress 1)
オシャベリ/デ^ンタク　(○ : stress phrase 2, stress 1)
オシャ^ベリ/デ^ンタク (○ : stress phrase 2, stress 2)
オシャ^ベリデ^ンタク　(× : stress phrase 1, stress 2)
オシ^ャベリ/デンタク　(× : wrong position of the stress)

You can select one word class among 18 types such as a common noun, last name, first name, name of a place, company name, other proper noun, pronoun, verb, adjective, keiyōdōshi , adverb, symbol, rentaishi, conjunction, prefix, suffix, auxiliary word and so on.

ex)

```
<vtml_phoneme alphabet="x-pentax" ph="マルチメディアウェ^ア[その他の固
有名詞]">MMW</vtml_phoneme>
```

x-PINYIN : **It is only supported in Chinese synthesizer.** It's a method of expressing phonetic representation by pinyin and tone and the prefix **"x-" must be small letter.** The phonetic string must be expressed with "pinyin+tone" and the tone of value between 1 to 5 is used. The tone value 5 means unstressed.

ex)

```
<vtml_phoneme alphabet="x-pinyin" ph="da4fu1">大夫</vtml_phoneme>
```

Symbolic Phonetic Table

The table below is a group of phonetic representations and word examples.

	Unicode	Decimal	IPA	WORLDBET	SAMPA	SAPI	CMU	Example
Consonant	**70**	**112**	**p**	**p**	**p**	**p**	**P**	**p**en
	62	**98**	**b**	**b**	**b**	**b**	**B**	**b**ut
	74	**116**	**t**	**t**	**t**	**t**	**T**	**t**wo
	64	**100**	**d**	**d**	**d**	**d**	**D**	**d**o
	02A7	**679**	**tʃ**	**tS**	**tS**	**ch**	**CH**	**ch**air
	02A4	**676**	**dʒ**	**dZ**	**sZ**	**jh**	**JH**	**j**oy
	006B	**107**	**k**	**k**	**k**	**k**	**K**	**c**at
	67	**103**	**g**	**g**	**g**	**g**	**G**	**g**et
	66	**102**	**f**	**f**	**f**	**f**	**F**	**f**ool
	76	**118**	**v**	**v**	**v**	**v**	**V**	**v**oice
	03B8	**952**	**θ**	**T**	**T**	**th**	**TH**	**th**ink
	00F0	**240**	**ð**	**D**	**D**	**dh**	**DH**	**th**is
	73	**115**	**s**	**s**	**s**	**s**	**S**	**s**ee
	007A	**122**	**z**	**z**	**z**	**z**	**Z**	**z**oo
	283	**643**	**ʃ**	**S**	**S**	**sh**	**SH**	**sh**e
	292	**658**	**ʒ**	**Z**	**Z**	**zh**	**ZH**	plea**s**ure
	68	**104**	**h**	**h**	**h**	**h**	**HH**	**h**am
	006D	**109**	**m**	**m**	**m**	**m**	**M**	**m**an
	006E	**110**	**n**	**n**	**n**	**n**	**N**	**n**o
	014B	**331**	**ŋ**	**N**	**N**	**ng**	**NG**	ri**ng**
	006C	**108**	***l***	***l***	***l***	***l***	**L**	**l**eft
	279	**633**	**ɹ**	**9**	**r**	**r**	**R**	**r**un
	77	**119**	**w**	**w**	**w**	**w**	**W**	**w**e
	006A	**106**	**j**	**j**	**j**	**y**	**Y**	**y**es
	028D	**653**	**ʍ**	**W**	**W**		**W**	**wh**ile
	78	**120**	**x**	**x**	**x**		**K**	lo**ch**

Monophthong	**0251 02D0**	**593 720**	**ɑː**		**A:**	**aa**	**AA**	f**a**ther
	251	**593**	**ɑ**	**A**	**A:**		**AA**	b**o**b
	0069 02D0	**105 720**	**iː**	**i:**	**i:**	**iy**	**IY**	s**ee**
	026A	**618**	**ɪ**	**I**	**I**	**ih**	**IH**	c**i**ty
	025B or 0065	**603 or 101**	**ɛ or e**	**E**	**E:**	**eh**	**EH**	b**e**d

	025C 02D0 or 0259 02D0	604 720 or 601 720	ɜ: or ə:		3:		AH	bird
	025C	604	ɜ	3	@:		AH	bird
	025D	605	ɝ	3r	3r		ER	bird
	00E6 or 0061	230 or 97	æ or a	@ or a	{	ae	AE	cat
	028C	652	ʌ	^	V	ah	AH	run
	252	594	ɒ	5	Q		AA	not
	0254 02D0	596 720	ɔ:		O:	ao	AO	law
	254	596	ɔ	>	O:		AO	law
	028A	650	ʊ	U	U	uh	UH	put
	0075 02D0	117 720	u:		u:	uw	UW	soon
	75	117	u	u	u:		UW	soon
	259	601	ə	&	@	ax	AH	about
	025A	602	ɚ	&r	=r	er	ER	butter

Diphthong	0065 026A	101 618	eɪ	eI	eI	ey	EY	day
	0065 0069	101 105	ei	ei	eI		EY	day
	0061 026A or 028C 026A	97 618 or 652 618	aɪ or ʌɪ	aI	aI	ay	AY	my
	0254 026A	596 618	ɔɪ	>I	OI	oy	OY	boy
	0254 0069	596 105	ɔi	>i			OY	boy
	0259 028A	601 650	əʊ		@U		OW	no
	006F 028A	111 650	oʊ	oU	@U	ow	OW	no, show
	0061 028A	97 650	aʊ	aU	aU	aw	AW	now
	026A 0259	618 601	ɪə		I@		IY AH	near, here
	0069 0259	105 601	iə	i&	I@		IY AH	near, here
	025B 0259 or 025B 02D0	603 601 or 603 720	ɛə or ɛ:		E@		EH AH	there
	028A 0259	650 601	ʊə		U@		UW AH	tour, poor
	0075 0259	117 601	uə	u&	U@		UW AH	tour, poor
	006A 0075 02D0	106 117 720	ju:		ju:		Y UW	pupil

The table below shows Chinese pinyins.

Part 1

	final										
	a	o	e	i	u	v	er	ai	ao	ou	un

initial	-	a	o	e	-	-	-	er	ai	ao	ou	-
	b	ba	bo	-	bi	bu	-	-	bai	bao	-	-
	p	pa	po	-	pi	pu	-	-	pai	pao	pou	-
	m	ma	mo	-	mi	mu	-	-	mai	mao	mou	-
	f	fa	fo	-	-	fu	-	-	-	-	fou	-
	d	da	-	de	di	du	-	-	dai	dao	dou	dun
	t	ta	-	te	ti	tu	-	-	tai	tao	tou	tun
	n	na	-	ne	ni	nu	nv	-	nai	nao	nou	-
	l	la	-	le	li	lu	lv	-	lai	lao	lou	lun
	g	ga	-	ge	-	gu	-	-	gai	gao	gou	gun
	k	ka	-	ke	-	ku	-	-	kai	kao	kou	kun
	h	ha	-	he	-	hu	-	-	hai	hao	hou	hun
	j	-	-	-	ji	ju	-	-	-	-	-	jun
	q	-	-	-	qi	qu	-	-	-	-	-	qun
	x	-	-	-	xi	xu	-	-	-	-	-	xun
	zh	zha	-	zhe	zhi	zhu	-	-	zhai	zhao	zhou	zhun
	ch	cha	-	che	chi	chu	-	-	chai	chao	chou	chun
	sh	sha	-	she	shi	shu	-	-	shai	shao	shou	shun
	r	-	-	re	ri	ru	-	-	-	rao	rou	run
	z	za	-	ze	zi	zu	-	-	zai	zao	zou	zun
	c	ca	-	ce	ci	cu	-	-	cai	cao	cou	cun
	s	sa	-	se	si	su	-	-	sai	sao	sou	sun
	y	ya	yo	ye	yi	yu	-	-	-	yao	you	yun
	w	wa	wo	-	-	wu	-	-	wai	-	-	-

Part 2

		final										
		ei	ia	ie	iu	iao	ua	uo	ui	uai	ue	uan
initial	-	ei	-	-	-	-	-	-	-	-	-	-
	b	bei	-	bie	-	biao	-	-	-	-	-	-
	p	pei	-	pie	-	piao	-	-	-	-	-	-
	m	mei	-	mie	miu	miao	-	-	-	-	-	-
	f	fei	-	-	-	-	-	-	-	-	-	-
	d	dei	-	die	diu	diao	-	duo	dui	-	-	duan
	t	tei	-	tie	-	tiao	-	tuo	tui	-	-	tuan
	n	nei	-	nie	niu	niao	-	nuo	-	-	nue	nuan
	l	lei	lia	lie	liu	liao	-	luo	-	-	lue	luan
	g	gei	-	-	-	-	gua	guo	gui	guai	-	guan
	k	kei	-	-	-	-	kua	kuo	kui	kuai	-	kuan
	h	hei	-	-	-	-	hua	huo	hui	huai	-	huan
	j	-	jia	jie	jiu	jiao	-	-	-	-	jue	juan
	q	-	qia	qie	qiu	qiao	-	-	-	-	que	quan
	x	-	xia	xie	xiu	xiao	-	-	-	-	xue	xuan
	zh	-	-	-	-	-	zhua	zhuo	zhui	zhuai	-	zhuan
	ch	-	-	-	-	-	-	chuo	chui	chuai	-	chuan
	sh	shei	-	-	-	-	shua	shuo	shui	shuai	-	shuan

	r	-	-	-	-	-	-	ruo	rui	-	-	ruan
	z	zei	-	-	-	-	-	zuo	zui	-	-	zuan
	c	-	-	-	-	-	-	cuo	cui	-	-	cuan
	s	-	-	-	-	-	-	suo	sui	-	-	suan
	y	-	-	-	-	-	-	-	-	-	yue	yuan
	w	wei	-	-	-	-	-	-	-	-	-	-

Part 3

		final										
		an	ang	ong	en	eng	in	ing	ian	iang	iong	uang
initial	-	an	ang	-	en	-	-	-	-	-	-	-
	b	ban	bang	-	ben	beng	bin	bing	bian	-	-	-
	p	pan	pang	-	pen	peng	pin	ping	pian	-	-	-
	m	man	mang	-	men	meng	min	ming	mian	-	-	-
	f	fan	fang	-	fen	feng	-	-	-	-	-	-
	d	dan	dang	dong	-	deng	-	ding	dian	-	-	-
	t	tan	tang	tong	-	teng	-	ting	tian	-	-	-
	n	nan	nang	nong	nen	neng	nin	ning	nian	niang	-	-
	l	lan	lang	long	-	leng	lin	ling	lian	liang	-	-
	g	gan	gang	gong	gen	geng	-	-	-	-	-	guang
	k	kan	kang	kong	ken	keng	-	-	-	-	-	kuang
	h	han	hang	hong	hen	heng	-	-	-	-	-	huang
	j	-	-	-	-	-	jin	jing	jian	jiang	jiong	-
	q	-	-	-	-	-	qin	qing	qian	qiang	qiong	-
	x	-	-	-	-	-	xin	xing	xian	xiang	xiong	-
	zh	zhan	zhang	zhong	zhen	zheng	-	-	-	-	-	zhuang
	ch	chan	chang	chong	chen	cheng	-	-	-	-	-	chuang
	sh	shan	shang	-	shen	sheng	-	-	-	-	-	shuang
	r	ran	rang	rong	ren	reng	-	-	-	-	-	-
	z	zan	zang	zong	zen	zeng	-	-	-	-	-	-
	c	can	cang	cong	cen	ceng	-	-	-	-	-	-
	s	san	sang	song	sen	seng	-	-	-	-	-	-
	y	yan	yang	yong	-	-	yin	ying	-	-	-	-
	w	wan	wang	-	wen	weng	-	-	-	-	-	-

Syllable Symbols Table

Syllable symbols (syllable stress, pronunciation length mark and pause symbols) listed below can be used with phonetic representation.

	Unicode	Decimal	IPA	WORLDBET	SAMPA	SAPI	CMU	Definition
Syllable symbol							**0**	none stress
	02C8	**712**	**'**	**'**	**'**	**1**	**1**	primary stress
	02CC	**716**	**,**	**,**	**%**	**2**	**2**	secondary stress
	02D0	**720**	**ː**	**:**	**:**			length mark : long
	002E	**46**	**.**	**.**	**.**	**–**		syllable break
	23	**35**	**#**	**#**		**_**	**#**	pause
						!		Sentence terminator
						&		word boundary
						,		Sentence terminator
						.		Sentence terminator
						?		Sentence terminator

Appendix B: Text preprocessing protocol

1. Numbers

1. 1 Cardinal Numbers

Ordinary method of reading number. **However, a number with 16 digits or more and number beginning with 0 will be read by each digit.**

Example	Expansion
123	one hundred twenty three
12,345	twelve thousand three hundred forty five
12345	

1.2 Ordinal Numbers

It follows ordinal number reading. **However, a number with 16 digits or more will be read by each digit.**

Example	Expansion
123rd	one hundred twenty third
12,345th	twelve thousand three hundred forty fifth

1.3 Decimal Fractions

It separates then reads numbers of left and right of the decimal point.

Example	Expansion
1.23	one point two three
.123	point one two three

1.4 Fractions

Example	Expansion
⅔	two thirds
3 ⅔	three and two thirds

1.5 Digit Mode

It reads digit by digit regardless of cipher.

Example	Expansion
+82-2-1234-4567	plus eight two, two, one two three four, four five six seven
157-26-5734	one five seven dash two six dash five seven three four

1.6 Numbers used in product names

The way of reading varies by cipher.

Example	Expansion
LS1234	L S twelve thirty four
F-306	F three oh six

2. Date

Date is read in the order of month, day, year.

Example	Expansion
98/12/01	December first ninety eight
Sept. 11, 2004	September eleventh two thousand four
Mon, the 1st of May.	Monday, the first of May.
4-'03	April two thousand three

3. Time

Time is read in the order of hour, minute, second, and time related words.

Example	Expansion
01:12:34	one twelve and thirty four seconds
01:12:34 EST,	one twelve and thirty four seconds Eastern Standard Time
01:12:34 am., e.s.t.,	one twelve and thirty four seconds A M, Eastern Standard Time

4. Currency

Currency units are read according to singular or plural form.

Example	Expansion
$10.09	ten dollars and nine cents
$10.5	ten point five dollars
$10.12US	ten point one two U S dollars
$US10.50	ten point five zero U S dollars

5. E-Mail & URI

5.1 E-Mail

Example	Expansion
myid@my.com	myid at M Y dot com
mduerst@ifi.unizh.ch	mduerst at ifi dot U N I Z H dot C H

5.2 URI

Example	Expansion
http://www.voiceware.co.kr	H T T P W W W dot voiceware dot co dot kr
ftp://ds.internic.net/rfc/	F T P D S dot internic dot net slash R F C slash

6. Telephone Number

Telephone numbers are read in the order of nation number, regional number, telephone exchange number, subscriber number and extension number digit by digit.

Example	Expansion
1 800 260 2650	one, eight hundred, two six zero, two six five zero
02.3016.8541	zero two, three zero one six, eight five four one
02.3016.8541 Ext. 15	zero two, three zero one six, eight five four one, extension one five
Call me at 337-4291	Call me at three three seven, four two nine one

7. Social Security Number

It is read digit by digit.

Example	Expansion
157-26-5734	one five seven dash two six dash five seven three four
690823-2274321	six nine oh eight two three dash two two seven four three two one
12-1234567	one two dash one two three four five six seven

8. Mathematics Operator

The basic operators used in arithmetic are read differently according to their usages.

Example	Expansion
1 + 5 = 6	one plus five equals six
2 * 6 = 12	two times six equals twelve
1 - 90℃.	one dash ninety degrees celsius
1 - 3/5	one minus three fifths
95 mile/h	ninety five mile per hour
3 3/4	three and three quarters

9. Measure

It expands abbreviations used as measure through analyzing neighboring context.

Example	Expansion
t^4	ton to the forth

l/m²	liter per square meter
1kg + 35kg	one kilogram plus thirty five kilograms
18° ***f***	eighteen degrees Fahrenheit
The length is 10***m***.	The length is ten meters.

10. Address

Addresses are read in the order of Primary Street, Secondary Street, Post-Office Box, City, State & Zip-code.
It follows the U.S. and Canadian address reading method.

Example	Expansion
2381 Dutch Fork Rd. Chapin, SC 29036	twenty three eighty one Dutch Fork Road, Chapin, South Carolina, two nine oh three six
2005 Pan Am Cir Ste. 800 Tampa, FL 33607	twenty oh five Pan Am Circle Suite eight hundred, Tampa, Florida, three three six oh seven
Voice Response, Inc. One Corporate E. 1910 E. Kimberly Pl. Montreal , QC L7C 4P8	Voice Response, Incorporated One Corporate E. nineteen ten East Kimberly Place Montreal , Quebec L seven C four P eight

11. Title & Person Name

Abbreviated title/name expands through analyzing neighboring context.

Example	Expansion
Capt. ***Wm***. ***O***. Barnett	Captain William O Barnett
Jill ***St***. John lives on	Jill Saint John lives on
2nd Lt. ***Jas***. Keil	second Lieutenant James Keil

12. Symbols

Specific symbols' reading method is set by the neighboring context. 2 byte symbols have no ambiguities therefore they are read according to the symbols.

Example	Expansion
10 ~ 20	ten to twenty
3.5 > 2.5	three point five more than two point five
X¹	X to the first
ⅰ	one
⒜	A

13. Abbreviations

Widely used abbreviations or abbreviations without ambiguity on expansion always expand

regardless of the context.

Example	Expansion	Example	Expansion
bldg	Building	c.f	compare
corp	corporation	vs	versus