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RealSpeak Telecom Software Development Kit

User Guide Finnish V 4.0

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Software Development Kit
User's Guide for Finnish

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Realspeak Telecom SDK

Chapter I

Finnish Text-To-Speech System

User's Guide for Finnish V4.5



Chapter I

Finnish Text-To-Speech System

Introduction

This section provides operational instructions for the Text-To-Speech system for Finnish. It reviews the functionality of the system, and describes how the user can customize the pronunciation of input texts. This part also describes issues that are particular to the Finnish Text-To-Speech system. It introduces the Finnish phonetic alphabet and discusses some language-specific features of the Finnish Text-To-Speech system.

Preparing a text for Text-To-Speech

In general, there are four ways to intervene in the pronunciation of text:

- By using control sequences
- By entering phonetic input
- By using a user dictionary or a user ruleset
- By using one of the supported API's

These mechanisms are described in the Programmer's Guide. In this part, however, the specifications for Finnish are fully described.

Native Character Set

The native character set of the Finnish TTS system is Windows-1252; it has the printable characters in the ASCII range 1-127 as a subset. Note that TTS input encoded in another supported character set is converted to the native character set for that language before it is processed internally. Consequently, input must be representable in the native character set even if it is encoded in another character set supported by the API.

Using Control Sequences

For a description of the various supported markup languages (independent from the language), refer to the **Programmer's Guide**.



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Remark: <ESC> represents the escape character “\x1B” (decimal 27) that generates the ASCII character 27 (Hex 1B).

Below, you can find a quick reference table for the RealSpeak native control sequences for Finnish. The language-specific support for the SSML markup language is described in the “SSML Preprocessor” chapter.



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Quick Reference of the RealSpeak native Control Sequences for Finnish

Sequence	Description	Range	Default	Delimiter
<code><ESC> \vol=x\ </code>	Volume (x : 0 .. 100)	0 = silence 10 = low 100 = high	80	No
<u>For example:</u> <ESC>\vol=10\ Voin puhua varsin hiljaa, <ESC>\vol=90\ mutta myös melko kovaa.				
<code><ESC> \rate=x\ </code>	Speech Rate (x : 1 .. 100)	1 = slow 100 = fast	50	No
<u>For example:</u> Voin <ESC>\rate=70\ nopeuttaa puhettani <ESC>\rate=20\ tai hidastaa sitä.				
<code><ESC> \rate_wpm=xxx\ </code>	Word per minute (xxx: 1..1000)	Voice-specific (see subsequent table)	Voice- specific	No
<u>For example:</u> Voin <ESC>\rate_wpm=350\ nopeuttaa puhettani <ESC>\rate_wpm=110\ tai hidastaa sitä.				



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Sequence	Description	Range	Default	Delimiter
<ESC>Mx	Read mode; some read modes are not supported in e-mail mode	x = 0..3: 0 = character-by-character 1 = word-by-word (not supported in e-mail mode) 2 = sentence-by-sentence 3 = line-by-line (not supported in e-mail mode)	2	Yes
	<p><u>For example:</u> <ESC>M0 Omenoita (The word "Omenoita" will be spelled.) <ESC>M1 Osta vihreitä omenoita. (This sentence will be read word by word.) <ESC>M2 Osta vihreitä omenoita. Voit ostaa myös päärynöitä. (This input will be read sentence by sentence.) <ESC>M3 Banaaneja Rasvatonta maitoa Vehnäjauhoja (This input will be read as a list, with a pause at the end of each line.)</p>			
<ESC>Wx	Wait Period	0 = no wait period 1 = 200 millisecond wait period 9 = 1800 millisecond wait period	2	Yes
	<p><u>For example:</u> <ESC>W2 Tätä virkettä seuraa lyhyt tauko. <ESC>W9 Tätä virkettä seuraa pitkä tauko. Huomasitko eron?</p>			



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Sequence	Description	Range	Default	Delimiter
<ESC> \Pause=xxx\ <u>For example:</u> Voit lisätä tekstiin taukoja ja määrittää itse <ESC>\Pause=1500\ tauon pituuden.	Long Pause	xxx is the duration of the pause in milliseconds; the supported range is 1 ..65535 msec		No
	<ESC>C	Continuation		No
<ESC>E	End-of-Message			Yes
	<ESC>/+	Phonetic Input (L&H+ phonetic alphabet)		No
<ESC>%x	Preprocessing Mode	text = standard text mode email = e-mail mode		Yes



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Sequence	Description	Range	Default	Delimiter
<ESC>\tn=x \	Guide text normalization; limited support in e-mail mode	address=address mode (not supported in e-mail mode) normal=standard mode spell=spell mode The text normalization types corresponding with the SSML <say-as> types are also supported in standard text mode (not in e-mail mode), see the "SSML Preprocessor" chapter for more details.	Normal	No
	<p><u>For example:</u> <ESC>\tn=address\ Hallitusk. 24 90700 Pertunmaa <ESC>\tn=normal\ Kirjoitetaan <ESC>\tn=spell\Pertunmaa<ESC>\tn=normal\</p>			
<ESC>F	Reset to Default			Yes
	<p><u>For example:</u> <ESC>\vol=10\ Äänenvoimakkuus on säädetty pienelle. <ESC>F Nyt se on säädetty uudelleen oletusarvon mukaiseksi. <ESC>\rate=10\ Äänenvoimakkuus on säädetty pienelle. <ESC>F Nyt se on säädetty uudelleen oletusarvon mukaiseksi.</p>			
<ESC>\voice=s\	Set the voice (if more than one voice is available)	s = string; the name of the voice		Yes
<ESC>\mrk=n\	Insert a bookmark	n = 0.. 2147483647		No
<ESC>p\	Insert a paragraph boundary			Yes
<ESC>\audio="s"\	Insert an audio document; not supported in e-mail mode	s = string; the URI of a document with an appropriate MIME type		Yes



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Speech Rates in Words per Minute for Finnish Voices

Words per minute		
Voice	Range	Default
Mikko	Min = 39 Max = 117	78

Entering phonetic input

How to proceed

To switch from orthographic to phonetic mode, insert <ESC>/+ to use the L&H+ phonetic alphabet. The phonetic input mode remains active until the command is explicitly reset by entering <ESC>/+ again.

The phonetic input string is composed of symbols of the L&H+ phonetic alphabet. Examples are given in the phonetic table below.

In addition to the phonetic symbols, it is advised to use the following characters in the phonetic input string:

Special characters		
L&H + Symbol	Meaning	As in:
' (ASCII 39, Hex 27)	primary word stress	<ESC>/+ 'p@@.pA&i.no <ESC>/+ (pääpaino)
.	syllable boundary	<ESC>/+ 'tA.vu.rA.jA <ESC>/+ (tavuraja)
#	silence (pause)	<ESC>/+ 'sA.no#vA.li.k:o <ESC>/+ (sano 'valikko')

Note that the use of punctuation marks remains useful within phonetic input to assure a correct intonation. Each punctuation mark needs to be preceded by an asterisk.



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For example:

```
<ESC>/+ 'jos_'xA.lu.At_'li.s@.ti&e.to.jA*,  
_'o.tA_'yx.te&y.t:@*. <ESC>/+  
(Jos haluat lisätietoja, ota yhteyttä.)
```

Punctuation Marks	
L&H+ Symbol	Meaning
_	Word delimiter
*.	End of declarative
*,	Comma
*!	End of exclamation
*?	End of question
*;	Semicolon
*:	Colon



Chapter 1

The Finnish L&H+ and UNIPA Phonetic Alphabets

Vowels and Diphthongs				
L&H+ Symbol	L&H+ Transcription	UNIPA Symbol	UNIPA Transcription	As in:
A	'tA.lo	A	'tA.lo	talo
e	'e.l@&in	e	'e.l@+in	eläin
i	'ki.sA	i	'ki.sA	kisa
o	'ko.lo	o	'ko.lo	kolo
u	'u.ni	u	'u.ni	uni
y	'tyx.j@	y	'tyx.j@	tyhjä
@	'n@l.k@	@	'n@l.k@	nälkä
E+	'pE+.l:E+	E=	'pE=.l:E=	pöllö
A:	'kA:.to	A:	'kA:.to	kaato
e:	'e:.vA	e:	'e:.vA	eeva
i:	'ki:.lA	i:	'ki:.lA	kiila
o:	'po:.lo	o:	'po:.lo	poolo
u:	'u:.ni	u:	'u:.ni	uuni
y:	'ty:.ny	y:	'ty:.ny	tyyny
@:	'n@:.t@	@:	'n@:.t@	näätä
E+:	'tE+:.lE+	E=:	'tE=:.lE=	töölö
A&i	'A&i.tA	a+i	'A+i.tA	aita
A&u	'A&u.to	a+u	'A+u.to	auto
e&i	'xe&i.n@	e+i	'xe+i.n@	heinä
e&u	'ke&u.lA	e+u	'ke+u.lA	keula
e&y	'e.xe&ys	e+y	'e.xe+ys	eheys
i&e	'ti&e	i+e	'ti+e	tie
i&u	'xi&u.tA.le	i+u	'xi+u.tA.le	hiutale
i&y	'ti:.vi&y.den	i+y	'ti:.vi+y.den	tiiviyden
o&i	'so&i.tA	o+i	'so+i.tA	soita
o&u	'po&u.tA	o+u	'po+u.tA	pouta
u&i	'xu&i.mA	u+i	'xu+i.mA	huima
u&o	'tu&o.li	u+o	'tu+o.li	tuoli
y&i	'xy&i.se.v@	y+i	'xy+i.se.v@	hyisevä
y&E+	'y&E+	y+E=	'y+E=	yö
@&i	'p@&i.v@	@+i	'p@+i.v@	päivä
@&y	't@&y.si	@+y	't@+y.si	täysi
E+&y	'pE+&y.t@	E+=y	'pE+=y.t@	pöytä
E+&i	'E+&i.t@	E+=i	'E+=i.t@	öitä
Consonants				
L&H+ Symbol	L&H+ Transcription	UNIPA Symbol	UNIPA Transcription	As in:
j	'jo.ki	j	'jo.ki	joki
r	'ru&o.ri	r	'ru+o.ri	ruori
p	'pA.lA	p	'pA.lA	pala



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b	'bA.nA:.ni	b	'bA.nA:.ni	banaani
t	'tu&o.li	t	'tu+o.li	tuoli
d	'sy.d@n	d	'sy.d@n	sydän
k	'kAx.vi	k	'kAx.vi	kahvi
g	'ge:.ni	g	'ge:.ni	geeni
f	'fir.mA	f	'fir.mA	firma
v	'vA:.rA	v	'vA:.rA	vaara
s	'su.ru	s	'su.ru	suru
S	'SA.ki	S	'SA.ki	shakki / šakki
x	'sA.xA	x	'sA.xA	saha
m	'mu&is.to	m	'mu+is.to	muisto
n	'ne.n@	n	'ne.n@	nenä
nK	'tunK.ki.o	nK	'tunK.ki.o	tunkio
l	'lA&u.lu	l	'lA+u.lu	laulu
j:	'le&i.j:A	j:	'le+i.j:A	leija
r:	'xu.r:A.tA	r:	'xu.r:A.tA	hurrata
p:	'kA.p:A	p:	'kA.p:A	kappa
b:	'rA.b:i	b:	'rA.b:i	rabbi
t:	'kA.t:o	t:	'kA.t:o	katto
d:	'lu.d:i:.tti	d:	'lu.d:i:.tti	luddiitti
k:	'ku.k:A	k:	'ku.k:A	kukka
g:	'mA.g:i	g:	'mA.g:i	maggi
f:	'le.f:A	f:	'le.f:A	leffa
v:	'li.v:i	v:	'li.v:i	livvi
s:	'kA.s:A	s:	'kA.s:A	kassa
x:	'xi.x:u.li	x:	'xi.x:u.li	hihhuli
m:	'kA.m:A.tA	m:	'kA.m:A.tA	kammata
n:	'me.n:@	n:	'me.n:@	mennä
nK:	'ke.nK:@t	nK:	'ke.nK:@t	kengät
l:	'pA.l:o	l:	'pA.l:o	pallo



NOTE

- Note that the L&H+ alphabet is not SSML compliant. For SSML, use the UNIPA alphabet.

Using a User Dictionary

For information on how to create and use user dictionaries, please refer to the User Configuration chapter of the RealSpeak Telecom Programmer's Guide.

Using the Microsoft SAPI5 Lexicon

Microsoft SAPI5 provides lexicons so that users and applications can specify pronunciation and part-of-speech information for particular words. As such, all SAPI compliant Text-To-Speech engines should use these lexicons to guarantee uniformity of pronunciation and part of speech information.

There are two types of lexicons in SAPI: user lexicons and application lexicons.

User Lexicons

Each user who logs in to a computer will have a User Lexicon. Initially, this lexicon is empty; words can be added either programmatically, or by using an engine's add/remove words UI component (for example, the sample application Dictation Pad provides an Add/Remove Words dialog).

Application Lexicons

Applications can create and ship their own lexicons of specialized words. These lexicons are fixed and cannot be edited.

Detailed information on how to use the MS SAPI5 lexicons can be found in the manual "Microsoft Speech SDK V5.1", chapter "ISpLexicon Interface".

The Finnish SAPI5 Phoneme List

To add entries to the lexicon, the user should use a set of language specific phonemes. The language specific phoneme list for Finnish is given below.

SAPI5 Symbols				
L&H+ Symbol	SAPI5 Symbol	As in:	SAPI5 Transcription	SAPI5 Phone ID
A	AA	talo	S1 T AA . L O	0251
e	E	eläin	S1 E . L AE + I N	0065
i	I	kisa	S1 K I . S AA	0069
o	O	kolo	S1 K O . L O	006F
u	U	uni	S1 U . N I	0075
y	Y	tyhjä	S1 T Y X . J AE	0079
@	AE	nälkä	S1 N AE L . K AE	00E6
E+	OE	pöllö	S1 P OE . L lng OE	0153
A:	AA lng	kaato	S1 K AA lng . T O	0251+02D0
e:	E lng	eeva	S1 E lng . V AA	0065+02D0
i:	I lng	kiila	S1 K I lng . L AA	0069+02D0
o:	O lng	poolo	S1 P O lng . L O	006F+02D0
u:	U lng	uuni	S1 U lng . N I	0075+02D0
y:	Y lng	tyyny	S1 T Y lng . N Y	0079+02D0
@:	AE lng	näätä	S1 N AE lng . T AE	00E6+02D0
E+:	OE lng	töölö	S1 T OE lng . L OE	0153+02D0
A&i	AA + I	aita	S1 AA + I . T AA	0251+0361+0069
A&u	AA + U	auto	S1 AA + U . T O	0251+0361+0075
e&i	E + I	heinä	S1 X E + I . N AE	0065+0361+0069
e&u	E + U	keula	S1 K E + U . L AA	0065+0361+0075
e&y	E + Y	eheys	S1 E . X E + Y S	0065+0361+0079
i&e	I + E	tie	S1 T I + E	0069+0361+0065
i&u	I + U	hiutale	S1 X I + U . T AA . L E	0069+0361+0075
i&y	I + Y	tiiviyden	S1 T I lng . V I + Y . D E N	0069+0361+0079
o&i	O + I	soita	S1 S O + I . T AA	006F+0361+0069
o&u	O + U	pouta	S1 P O + U . T AA	006F+0361+0075
u&i	U + I	huima	S1 X U + I . M AA	0075+0361+0069
u&o	U + O	tuoli	S1 T U + O . L I	0075+0361+006F
y&i	Y + I	hyisevä	S1 X Y + I . S E . V AE	0079+0361+0069
y&E+	Y + OE	yö	S1 Y + OE	0079+0361+0153
@&i	AE + I	päivä	S1 P AE + I . V AE	00E6+0361+0069
@&y	AE + Y	täysi	S1 T AE + Y . S I	00E6+0361+0079
E+&i	OE + I	öitä	S1 OE + I . T AE	0153+0361+0069
E+&y	OE + Y	pöytä	S1 P OE + Y . T AE	0153+0361+0079
j	J	joki	S1 J O . K I	006A
r	RR	ruori	S1 RR U + O . RR I	0072
p	P	pala	S1 P AA . L AA	0070
b	B	banaani	S1 B AA . N AA lng . N I	0062
t	T	tuoli	S1 T U + O . L I	0074
d	D	sydän	S1 S Y . D AE N	0064
k	K	kalvi	S1 K AA X . V I	006B
g	G	geeni	S1 G E lng . N I	0067
f	F	firma	S1 F I RR . M AA	0066
v	V	vaara	S1 V AA lng . RR AA	0076
s	S	suru	S1 S U . RR U	0073

SAPI5 Symbols				
S	SH	shakki / šakki	S1 SH AA . K lng I	0283
x	X	saha	S1 S AA . X AA	0078
m	M	muisto	S1 M U + I S . T O	006D
n	N	nenä	S1 N E . N AE	006E
nK	NG	tunkio	S1 T U N G . K I . O	014B
l	L	lauhu	S1 L AA + U . L U	006C
r:	RR lng	hurrata	S1 X U . RR lng AA . T AA	0072+02D0
p:	P lng	kappa	S1 K AA . P lng AA	0070+02D0
b:	B lng	rabbi	S1 RR AA . B lng I	0062+02D0
t:	T lng	katto	S1 K AA . T lng O	0074+02D0
d:	D lng	luddiitti	S1 L U . D lng I lng . T lng I	0064+02D0
k:	K lng	kukka	S1 K U . K lng AA	006B+02D0
g:	G lng	maggi	S1 M AA . G lng I	0067+02D0
f:	F lng	leffa	S1 L E . F lng AA	0066+02D0
s:	S lng	kassa	S1 K AA . S lng AA	0073+02D0
m:	M lng	kammata	S1 K AA . M lng AA . T AA	006D+02D0
n:	N lng	mennä	S1 M E . N lng AE	006E+02D0
l:	L lng	pallo	S1 P AA . L lng O	006C+02D0
j:	J lng	leija	S1 L EI . J lng AA	006A+02D0
x:	X lng	hihhuli	S1 X I . X lng U . L I	0078+02D0
v:	V lng	livvi	S1 L I . V lng I	0076+02D0
nK:	NG lng	kengät	S1 K E . NG lng AE T	014B+02D0

SAPI5 Symbols		
SAPI5 Symbol	Meaning or example	SAPI Phone ID
-	syllable boundary (hyphen)	002E
!	sentence terminator (exclamation mark)	0001
&	word boundary	0002
,	sentence terminator (comma)	0003
.	sentence terminator (period)	2198
?	sentence terminator (question mark)	2197
_	silence (underscore)	0004
1	primary stress	02C8

Notes on the Finnish Text-To-Speech System

The Finnish Text-To-Speech system has been designed to allow a correct pronunciation of any input written according to the rules of Finnish orthography. The following cases, however, require special attention.

Cardinal Numbers

Cardinal numbers up to 15 digits are pronounced as full numbers. Spaces and periods may be used to separate groups of digits. Digit strings consisting of more than 15 digits are pronounced digit by digit. A number starting with a zero is automatically spelled.

For example:

1234567	miljoona kaksisataakolmekymmentäneljätuhatta viisisataakuusikymmentäseitsemän
136 665	satakolmekymmentäkuusituhatta kuusisataakuusikymmentäviisi
25.500	kaksikymmentäviisituhatta viisisataa
006	nolla nolla kuusi

Decimal Numbers

Decimal numbers may consist of up to 15 digits before or after the decimal comma. Spaces or periods may be used to separate groups of digits in the digit string before the decimal point. Decimal parts consisting of up to 3 digits are read as full numbers. Decimal parts consisting of more than 3 digits are read digit by digit.

For example:

20,02	kaksikymmentä pilkku nolla kaksi
0,014	nolla pilkku nolla neljättoista
12,2976	kaksitoista pilkku kaksi yhdeksän seitsemän kuusi

Ordinal Numbers

Cardinal numbers that consists of up to 15 digits and that are followed by a period are pronounced as ordinal numbers. Spaces may be used to separate groups of digits in the digit string.

For example:

3. kolmas
22. kahdeskymmenestoinen
4 585. neljästuhannes viidessadas-
kahdeksaskymmenesviides

Fractions

Digit strings consisting of maximally 2 digits, followed by a slash, followed by a maximum of 2 digits, are pronounced as fractions.

For example:

2/3 kaksi kolmasosaa
5/19 viisi yhdeksästoistaosaa
17/60 seitsemäntoista kuudeskymmenesosaa

Telephone Numbers

National telephone and fax numbers must be preceded by an indication of a telephone or fax number (e.g. “puh.”, “puhelin”, “GSM”, “faksi”). The prefix is extended appropriately into “puhelinumero”, “matkapuhelinnumero” or “faksinumero”, and the number is read digit by digit.

Spaces may be used to separate groups of digits. Area codes and mobile operator codes may be surrounded by parentheses or separated from the rest of the number with a hyphen or a space.

For example:

p. (09) 579 405
puhelinumero nolla yhdeksän viisi
seitsemän yhdeksän neljä nolla viisi

gsm 0400 992 483
matkapuhelinnumero nolla neljä nolla
nolla yhdeksän yhdeksän kaksi neljä
kahdeksan kolme

puh. 017-1398232
puhelinumero nolla yksi seitsemän
yksi kolme yhdeksän kahdeksan kaksi
kolme kaksi

International telephone and fax numbers may be preceded by an indication of a telephone or fax number, which is extended appropriately. The country code must be preceded by a + sign, which is read as “plus”. The number itself is read digit by digit. In this format, the area code or the mobile phone code must not be

surrounded by parentheses. However, if included, the first zero of the national number may be surrounded by parentheses.

For example:

+49 228 550 381
plus neljä yhdeksän kaksi kaksi
kahdeksan viisi viisi nolla kolme
kahdeksan yksi

+30 61 997 283
plus kolme nolla kuusi yksi yhdeksän
yhdeksän seitsemän kaksi kahdeksan
kolme

puh. +34 (0)57 422 0845
puhelinumero plus kolme neljä nolla
viisi seitsemän neljä kaksi kaksi
nolla kahdeksan neljä viisi

Dates

The Finnish Text-To-Speech system supports dates in the following formats.

Day.Month.Year
Day/Month/Year
Day-Month-Year
Day.Month.

Day can have one or two digits between 1 and 31, Month can have one or two digits between 1 and 12, and Year can have two or four digits. If the year has two digits, these may be preceded by a ' or - sign. All of the formats may be preceded by a day abbreviation (ma, ti, ke, to, pe, la or su).

For example:

22.1.2005
kahdeskymmenestoinen tammikuuta
kaksituhattaviisi

08.04.'67
kahdeksas huhtikuuta
kuusikymmentäseitsemän

13/12/98
kolmastoista joulukuuta
yhdeksänkymmentäkahdeksan

24-8-1907
kahdeskymmenesneljäs elokuuta
tuhatyhdeksänsataaseitsemän

6.1.
kuudes tammikuuta

su 6.12.1975
sunnuntai kuudes joulukuuta
tuhatyhdeksänsataaseitsemänkymmentä-
viisi

Dates can also be specified in written format, with abbreviated or fully written day and month names.

For example:

To, 21. lokak. 1993
torstai, kahdeskymmenesensimmäinen
lokakuuta tuhatyhdeksänsataa-
yhdeksänkymmentäkolme

Perjantai, 13. helmikuuta '98
perjantai, kolmastoista helmikuuta
yhdeksänkymmentäkahdeksan

MA 22.9.2000
maanantai kahdeskymmenestoinen
syyskuuta kaksituhatta

Ranges and lists of dates are also supported.

For example:

6.9. - 23.10.
kuudennesta syyskuuta kahdenteen-
kymmenenteenkolmanteen lokakuuta
14.-31.5.1997
neljännestätoista kolmanteen-
kymmenenteenensimmäiseen toukokuuta
tuhatyhdeksänsataayhdeksänkymmentä-
seitsemän
2.9.2000-26.2.2002
toisesta syyskuuta kaksituhatta
kahdenteenkymmenenteenkuudenteen
helmikuuta kaksituhattakaksi
19.-30. syyskuuta 1776
yhdeksännestätoista kolmanteen-
kymmenenteen syyskuuta tuhat-
seitsemänsataaseitsemänkymmentäkuusi
Kesäkuun 1., 2. ja 4.
kesäkuun ensimmäinen, toinen ja
neljäs

Finally, dates consisting of a year indication, preceded by the word "vuosi" in different cases, and names of months followed by a year indication are supported.

For example:

vuonna 1999
vuonna tuhatyhdeksänsataayhdeksän-
kymmentäyhdeksän
vuoden 2032 tammikuussa
vuoden kaksituhattakolmekymmentä-
kaksi tammikuussa
lokakuussa 2000
lokakuussa kaksituhatta

For example:

25:34:15
kaksikymmentäviisi tuntia
kolmekymmentäneljä minuuttia
viisitoista sekuntia

345:59:12,15 h
kolmesataaneljäkymmentäviisi
minuuttia viisikymmentäyhdeksän
minuuttia kaksitoista pilkku
viisitoista sekuntia

25 h 34 min 15 s
kaksikymmentäviisi tuntia
kolmekymmentäneljä minuuttia
viisitoista sekuntia

28:16 h
kaksikymmentäkahdeksan tuntia
kuusitoista minuuttia

2545:34,1237 min
kaksituhattaviisisataaneljäkymmentä-
viisi minuuttia kolmekymmentäneljä
pilkku yksi kaksi kolme seitsemän
sekuntia

Currencies

The Finnish Text-To-Speech system correctly handles the currency symbols € (euro), \$ (dollari), £ (punta) and ¥ (jeni). The currency signs may precede or follow the numeral.

For example:

25 €
kaksikymmentäviisi euroa

\$40
neljäkymmentä dollaria

£ 200
kaksisataa puntaa

5¥
viisi jeniä

EUR 10000
kymmentuhatta euroa

20 USD
kaksikymmentä Yhdysvaltain dollaria

These currency signs can also be followed or preceded by decimal amounts. Decimal numbers up to 15 digits before and 15 digits after the decimal comma are pronounced correctly. When an amount is expressed in euros, “senttiä” is added after a decimal part that consists of one or two digits.

For example:

\$1,25 yksi pilkku kaksikymmentäviisi
dollaria
3.123,45€ kolmetuhattasatakaksikymmentäkolme
pilkku neljäkymmentäviisi puntaa
€ 2,14 kaksi euroa neljätoista senttiä

Additionally, the most common currency abbreviations from around the world are supported. These abbreviations can precede or follow the amount and are expanded.

For example:

NZD200 kaksisataa Uuden-Seelannin dollaria
1 FIM yksi Suomen markka
NOK 358,59 kolmesataaviisikymmentäkahdeksan
pilkku viisikymmentäyhdeksän Norjan
kruunua
10,50 EUR kymmenen euroa viisikymmentä senttiä

Measures

The Finnish Text-To-Speech system supports the most common measure expressions.

Integers with up to 15 digits and decimal numbers with up to 15 digits before and after the decimal comma are pronounced correctly. The only exception to this rule is temperature expressions; the numbers may be either positive or negative and contain up to three digits before and up to two digits after the decimal comma or point.

For example:

-29 °C miinus kaksikymmentäyhdeksän
Celsius-astetta
-12.6°C miinus kaksitoista piste kuusi
Celsius-astetta
36,8 ° kolmekymmentäkuusi pilkku kahdeksan
astetta
34 mm kolmekymmentäneljä millimetriä
5 Gbit/s viisi gigabittiä sekunnissa
7 kg seitsemän kilogrammaa

Credit Card Numbers

The Finnish Text-To-Speech system supports Visa/Mastercard and American Express credit card numbers.

A Visa/Mastercard number must consist of four space-separated groups of four digits. An American Express number must consist of groups of four, six, and five digits separated by spaces.

For example:

```
4352 5161 4682 8934
    neljä kolme viisi kaksi viisi yksi
    kuusi yksi neljä kuusi kahdeksan
    kaksi kahdeksan yhdeksän kolme neljä
4352 516414 84934
    neljä kolme viisi kaksi viisi yksi
    kuusi neljä yksi neljä kahdeksan
    neljä yhdeksän kolme neljä
```

ISBN Numbers

The Finnish Text-To-Speech system supports ISBN numbers.

An ISBN number must be preceded by the word "ISBN" either in upper or lower case and a space. The ISBN number itself must consist of groups of 1-2, 2-3, 3-6 and 1 digits separated by hyphens.

For example:

```
ISBN 88-453-0574-0
    ISBN kahdeksan kahdeksan neljä
    viisi kolme nolla viisi seitsemän
    neljä nolla
isbn 0-19-506511-5
    ISBN nolla yksi yhdeksän viisi
    nolla kuusi viisi yksi yksi viisi
```

Abbreviations

The Finnish Text-To-Speech system contains a dictionary with the most common abbreviations, such as: esim., jne., rva, etc.

For example:

```
esim.    esimerkiksi
jne.     ja niin edelleen
rva      rouva
```

Acronyms and Initialisms

The Finnish Text-To-Speech system contains dictionaries and rules to handle acronyms and initialisms.

Acronyms are abbreviations formed by combining the first letter(s) of a group of words. They are pronounced as words.

For example:

Nato
Unesco
Kela
ETLA
Stakes

Initialisms are abbreviations formed by combining the first letter of each part of a group of words. Initialisms are spelled.

For example:

DVD
EKP
ISBN
KKO
SKS

Notes on Text Normalization

Case Assignment beyond the Following Word

The Finnish Text-To-Speech system assigns the case for cardinal numbers and ordinal numbers based on the case of the following word. This approach results in a very high degree of accuracy.

For example:

6 kirjassa
 kuudessa kirjassa
3 pienestä talosta
 kolmesta pienestä talosta

However, this approach cannot deal with expressions in which the numeral does not agree with the word directly following it:

For example:

3 Suomen parasta muusikkoa
 kolmen Suomen parasta muusikkoa

The '3' in the above example should agree with the word 'muusikkoa'. However, the current system does not support any kind of part-of-speech tagging or syntactic parsing and, therefore, there is no way of

knowing that 'Suomen parasta musiikkia' is a noun phrase the last word of which the '3' should agree with.

In some cases, it is also possible that the system overgenerates case expansions for numerals. The ending of the illative case, for instance, is '-iin'. However, imperfect verbs in the passive form also end with '-iin'. Therefore, if it happens that a numeral is followed by an imperfect verb in the passive form (relatively infrequent), this verb will be interpreted as being a word in the illative form. Consequently, the expansion of the numeral will be inflected for the illative case.

For example:

```
20 saatiin pelastettua.  
Kahteenkymmeneen saatiin pelastettua.
```

As the system determines the case of the following word based on a simple regular expression without any part-of-speech information, the above-mentioned problem is unavoidable.

Plural Case Expansions

The Finnish Text-To-Speech system does not expand cases in the plural form because one does not expect plural forms to occur in the kinds of numerical expressions (cardinal numbers, ordinal numbers, date expressions, and expressions with currencies and measurements) that the system supports.

The only types of expressions where one might expect a numeral to occur in the plural form are expressions involving pairwise things, e.g. kolmet kengät ('three pairs of shoes'; literal translation: 'three (pl.) shoes').

However, these sort of expressions are always spelled out and do, therefore, not need to be supported by the system.

Rare Cases

The Finnish Text-To-Speech system does not support the following three rare cases: abessive, comitative and instructive.

There are three main reasons why the Finnish Text-To-Speech system does not support these cases.

1) Looking for the case endings of the abessive, the comitative and the instructive in the words following words in need of case expansion would result in the incorrect tagging of words that appear in other, very common cases (e.g. nominative, genitive, illative). For example, 'uutta' (the partitive form of the word 'new') would be tagged as appearing in the abessive case because it ends with -tta, i.e. one of the case endings for the abessive. Also, the word 'kone' (the nominative form of the word 'machine') would be tagged as appearing in the comitative case because it ends with -ne, i.e. the case ending of the comitative

2) The comitative and the instructive only appear in the plural form, and the Finnish Text-To-Speech system does not support case expansions in the plural form (see above). Furthermore, if numerals would ever be inflected for these two cases, they would be spelled out.

3) Numerals do not occur in the abessive case in actual language usage. If the meaning of the abessive case ('without sth') is to be expressed, it is likely that the word 'ilman' ('without') is used instead. For instance, '6 kirjatta' is not grammatical; 'ilman kuutta kirjaa' ('without six books') would be used instead.

Day Abbreviations

The Finnish Text-To-Speech system only expands day abbreviations in the nominative case.

For example:

```
ma 6.6.  
maanantai kuudes kesäkuuta
```

This approach results in incorrect/suboptimal case assignment in some contexts.

For example:

```
Kurssi alkaa ma 6.6.  
Kurssi alkaa maanantai kuudes  
kesäkuuta.
```

In the above example, the day abbreviation should ideally be expanded in the essive case ("maanantaina"). However, the system does not have context information that would make it possible to predict the correct case.

Realspeak Telecom SDK

Chapter II

SSML Preprocessor

User's Guide for Finnish
V4.5



Chapter II

SSML Preprocessor

Introduction

SSML (Speech Synthesizer Markup Language) is part of a set of markup specifications by the W3C for voice browsers. General information regarding the RealSpeak SSML processor can be found in the **SSML Support** chapter of the *Programmer's Guide*. The RealSpeak Telecom SDK provides a built-in preprocessor that supports a large portion of the SSML 1.0 September 2004 Recommendation (REC). Moreover, RealSpeak extends SSML with a number of Nuance specific elements/attributes. The set supported by Nuance is called “Nuance SSML” (SSML).

The section below describes language-specific SSML support included in the RealSpeak Telecom V4.5 – Finnish language version.

Finnish specific SSML markup

XML encoding types for Finnish

The encoding is specified in the XML text declaration ("`<?xml ... ?>`") by the encoding declaration which is of the form `encoding="<EncodingName>`.

E.g. `<?xml version="1.0" encoding="UTF-8"?>`

RealSpeak Telecom V4.5 – Finnish supports:

- “Windows-1252” and “ISO-8859-1” (ISO Latin1)
- The Unicode encoding “UTF-8”, “UTF-16” and “UCS-4” (Note that the alias “ISO-10646-UCS-4” is not supported)
- Any coding character set supported by the ICU component as long as the input text only contains characters that can be transcoded to the native coded character set, being “Windows-1252”. For more information about the character sets supported by ICU, take a look at the ICU website <http://www-306.ibm.com/software/globalization/icu> and <http://www.iana.org/assignments/character-sets>.

NOTE

Encoding names are parsed case-insensitive; hyphens and underscores are ignored.



Chapter II

SSML Specifics for Finnish

For reasons of compatibility with the 'standard' Finnish system, the parallel text control sequence (<esc> sequence) is listed where applicable. As such, a similar TTS behavior can be created – or combined – with non-SSML driven text input.

SSML Tags	Comment	Corresponding control sequence
High-level and document structure tags		
xml:lang	Supported 'fi-FI' for Finnish. Attribute of speak, paragraph, sentence and voice.	
Text normalization tags		
<say-as interpret-as="xxx">	Supported; limited support in e-mail mode. In e-mail mode the only supported interpret-as value is "spell".	
<say-as interpret-as="number" format="cardinal" >	Supported	<esc>\ tn=number_cardinal\
<say-as interpret-as="number" format="digits" >	Supported	<esc>\ tn=number_digits\
<say-as interpret-as="number" format="decimal" >	Supported	<esc>\ tn=number_decimal\
<say-as interpret-as="number">	Supported	<esc>\ tn=number\
<say-as interpret-as="number" format="ordinal" >	Supported	<esc>\ tn=number_ordinal\
<say-as interpret-as="number" format="telephone">	Supported	<esc>\ tn=number_telephone\



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SSML Tags	Comment	Corresponding control sequence
<say-as interpret-as="number" format="telephone" detail="punctuation">	Not supported	<esc>\ tn=number_telephone_punctuation\
<say-as interpret-as="ordinal">	Supported	<esc>\ tn=ordinal\
<say-as interpret-as="acronym">	Supported	<esc>\ tn=acronym\
<say-as interpret-as="acronym" detail="strict">	Not supported	<esc>\ tn=acronym_strict\
<say-as interpret-as="measure">	Supported	<esc>\ tn=measure\
<say-as interpret-as="letters">	Supported	<esc>\ tn=letters\
<say-as interpret-as="letters" detail="strict">	Supported	<esc>\ tn=letters_strict\
<say-as interpret-as="words">	Supported	<esc>\ tn=words\
<say-as interpret-as="date">	Supported	<esc>\ tn=date\
<say-as interpret-as="date" format="mdy">	Supported	<esc>\ tn=date_mdy\
<say-as interpret-as="date" format="dmy">	Supported	<esc>\ tn=date_dmy\
<say-as interpret-as="date" format="ymd">	Supported	<esc>\ tn=date_ymd\
<say-as interpret-as="date" format="ym">	Supported	<esc>\ tn=date_ym\
<say-as interpret-as="date" format="my">	Supported	<esc>\ tn=date_my\
<say-as interpret-as="date" format="dm">	Supported	<esc>\ tn=date_dm\
<say-as interpret-as="date" format="md">	Supported	<esc>\ tn=date_md\
<say-as interpret-as="date" format="y">	Supported	<esc>\ tn=date_y\



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SSML Tags	Comment	Corresponding control sequence
<code><say-as interpret-as="date" format="m"></code>	Supported	<code><esc>\ tn=date_m\</code>
<code><say-as interpret-as="date" format="d"></code>	Supported	<code><esc>\ tn=date_d\</code>
<code><say-as interpret-as="time"></code>	Supported	<code><esc>\ tn=time\</code>
<code><say-as interpret-as="time" format="h"></code>	Supported	<code><esc>\ tn=time_h\</code>
<code><say-as interpret-as="time" format="hm"></code>	Supported	<code><esc>\ tn=time_hm\</code>
<code><say-as interpret-as="time" format="hms"></code>	Not supported	<code><esc>\ tn=time_hms\</code>
<code><say-as interpret-as="duration" format="hms"></code>	Supported	<code><esc>\ tn=duration_hms\</code>
<code><say-as interpret-as="duration" format="hm"></code>	Supported	<code><esc>\ tn=duration_hm\</code>
<code><say-as interpret-as="duration" format="ms"></code>	Supported	<code><esc>\ tn=duration_ms\</code>
<code><say-as interpret-as="duration" format="h"></code>	Supported	<code><esc>\ tn=duration_h\</code>
<code><say-as interpret-as="duration" format="m"></code>	Supported	<code><esc>\ tn=duration_m\</code>
<code><say-as interpret-as="duration" format="s"></code>	Supported	<code><esc>\ tn=duration_s\</code>
<code><say-as interpret-as="duration"></code>	Supported	<code><esc>\ tn=duration\</code>
<code><say-as interpret-as="currency"></code>	Supported	<code><esc>\ tn=currency\</code>
<code><say-as interpret-as="telephone"></code>	Supported	<code><esc>\ tn=telephone\</code>
<code><say-as interpret-as="telephone" detail="punctuation"></code>	Supported	<code><esc>\ tn=telephone_punctuation\</code>
<code><say-as interpret-as="address"></code>	Supported	<code><esc>\ tn=address\</code>



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SSML Tags	Comment	Corresponding control sequence
<code><say-as interpret-as="spell"></code>	Supported	<code><esc>\ tn=spell\</code>
<code><say-as interpret-as="name"></code>	Not supported	<code><esc>\ tn=name\</code>
<code><say-as interpret-as="net" format="email"></code>	Supported	<code><esc>\ tn=net_email\</code>
<code><say-as interpret-as="net" format="uri"></code>	Supported	<code><esc>\ tn=net_uri\</code>
<code><say-as interpret-as="net"></code>	Supported	<code><esc>\ tn=net\</code>
Pronunciation tags		
<code><phoneme alphabet="unipa"></code>	Supported See section 'the Finnish L&H+ and UNIPA phonetic alphabets' for an overview of the alphabet.	

Realspeak Telecom SDK

Chapter III

Custom G2P Dictionaries

User's Guide for Finnish
V4.5

Custom G2P Dictionaries

Introduction

Nuance's RealSpeak system now offers support for custom G2P dictionaries. A custom G2P dictionary module is an add-on module specifically designed to improve the quality of pronunciation for specific kinds of words.

One example of a custom G2P dictionary module currently available from Nuance is the "proper names" module, which is described below. Check with Nuance for the availability of other custom G2P dictionary modules.

The custom G2P dictionaries feature is described in more detail in the *Programmer's Guide*, namely in the "Custom G2P Dictionaries" section of the "User Configuration" chapter and the "SSML Support" chapter.

Realspeak Telecom SDK

Appendices

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Appendix A

Appendices

Appendix A: Finnish voice and language strings

The RealSpeak Telecom Text-To-Speech system now supports selecting the voice and language via a string as well as a define (please see the definition for the function **TtsInitialize()** in the *Programmers Guide* and also the *Backwards Compatibility Guide* for details). The name strings for the currently supported Finnish voices are listed in the table below.

Finnish Voice Name Strings	
Voice	Name String
Mikko	“Mikko”

The string to use to set the language to Finnish is “Finnish.”