



# *Language Manual*

*HQ, HD, and CO Czech*

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Language Manual: HQ, HD, and CO Czech

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## 1 General

This document discusses certain aspects of text-to-speech processing for the Czech text-to-speech system, in particular the different types of input characters and text that are allowed.

This version of the document corresponds to the High Quality (HQ), Colibri (CO), and High Density (HD) Czech voices.

Please note that the *User's Guide*, mentioned several times in the manual, is called *Help* in some applications.

Note: For efficiency reasons, the processing described in this document has a different behaviour in some Acapela Group products. Those products are:

Acapela TTS for Windows Mobile

Acapela TTS for Linux Embedded

Acapela TTS for iOS

Acapela TTS for Android



For these products, the default processing of numbers, phone numbers, dates and times has been simplified for the low memory footprint (LF) voice formats. Developers have the possibility to change the default behaviour from *simplified* to *normal* preprocessing by setting corresponding parameters in the configuration file of the voice. Please see the documentation of these products for more information. In the following chapters, each simplification will be described by the indication *[not SP]* following the description of the standard behaviour. The *SP* in the indication stands for *Simplified Processing*.

## 2 *Letters in orthographic text*

Characters from **A-Z, a-z** (as well as **á, Á, ä, Ä, č, Č, ď, Ď, é, É, ě, Ě, í, Í, ě, Ě, ó, Ó, ö, Ö, ř, Ř, š, Š, ů, Ů, ú, Ú, ü, Ü, ě, Ě, ý, Ý, ž, Ž**) may constitute a word. Certain other characters are also considered as letters, notably those used as letters in other European languages, i.e. “**ł, õ, ą, ç**”. These letters are not pronounced as in their source languages, but they are pronounced as regular Czech “**l, o, a, c**” when occurring in a word.

Characters outside of these ranges, i.e. numbers, punctuation characters and other non-alphanumeric characters are not considered as letters.

### 3 *Punctuation characters*

Punctuation marks appearing in a text affect both rhythm and intonation of a sentence. The following punctuation characters are permitted in the normal input text string:

, : ; “ ” . ? ! ( ) [ ] { }

#### 3.1 *Comma, colon and semicolon*

Comma ',', colon ':' and semicolon ';' cause a brief pause to occur in a sentence, accompanied by a small rising intonation pattern just prior to the character.

#### 3.2 *Quotation marks*

Closing quotes '""' and '""' after a group of words cause a brief pause after the quoted text. Quotes surrounding a single word do not generate such pauses.

#### 3.3 *Full stop*

A full stop '.' is a sentence terminal punctuation mark which causes a falling end-of-sentence intonation pattern and is accompanied by a somewhat longer pause. A full stop may also be used as a decimal marker in a number (see chapter *Number processing*) and in abbreviations (see chapter *Abbreviations*).

#### 3.4 *Question mark*

A question mark '?' ends a sentence and causes question-intonation, first rising and then falling. Exclamation mark

#### 3.5 *Parentheses, brackets and braces*

Parenthesis '()', brackets '[]' and braces '{}' appearing around a single word or a group of words cause a brief pause before and after the bracketed text.

## 4 Other non alphanumeric characters

### 4.1 Non-punctuation characters

The characters listed below are processed as non-letter, non-punctuation characters. Some are pronounced at all times and others are only pronounced in certain contexts, which are described in the following sections of this chapter.

*Table: Non-punctuation symbols with fixed pronunciation*

| Symbol | Reading     |
|--------|-------------|
| /      | lomítko     |
| +      | plus        |
| \$     | dolar       |
| €      | euro        |
| <      | menší než   |
| >      | větší než   |
| %      | procento    |
| ^      | stříška     |
|        | svislá čára |
| ~      | vlnovka     |
| @      | zavináč     |
| =      | rovná se    |
| -      | (see below) |
| *      | (see below) |

### 4.2 Symbols with pronunciation depending on the context

#### 4.2.1 2 and 3 with metric units

The expressions with 2 and 3 are read as accordingly "čtvereční" or "krychlový". The accompanying unit measure words: such as *mm*, *cm*, *m*, *km* or *l*, are expanded in Nominative Case in number agreement with the preceding number.

| Expression         | Reading                        |
|--------------------|--------------------------------|
| 1 mm <sup>2</sup>  | jeden milimetr čtvereční       |
| 2 cm <sup>2</sup>  | dva centimetry čtvereční       |
| 5 m <sup>2</sup>   | pět metrů čtverečních          |
| 80 km <sup>2</sup> | osmdesát kilometrů čtverečních |

| Expression        | Reading                   |
|-------------------|---------------------------|
| 1 mm <sup>3</sup> | jeden milimetr krychlový  |
| 1 cm <sup>3</sup> | jeden centimetr krychlový |
| 1 m <sup>3</sup>  | jeden metr krychlový      |
| 1 km <sup>3</sup> | jeden kilometr krychlový  |

### 4.2.2 Hyphen

A hyphen < - > is pronounced “mínus” in two cases:

- a) followed by a digit and no other digit is found in front of the hyphen
- b) followed by a digit and an equals sign. If there is no equals sign, it is pronounced “*pomlčka*”.

In certain date formats, in between days or years, the hyphen is pronounced “až”.

In compounds or between words, the hyphen is not pronounced. Example: T-Mobile.

| Expression     | Reading                                           |          |
|----------------|---------------------------------------------------|----------|
| -3             | mínus tři                                         |          |
| 44-3=41        | čtyřicet čtyři mínus tři rovná se čtyřicet jedna  |          |
| 15-20 října    | patnáctého až dvacátého října                     | [not SP] |
| 6-10 listopadu | šestého až desátého listopadu                     | [not SP] |
| 1998-2004      | tisíc devětset devadesát osum až dva tisíce čtyři | [not SP] |
| 02-02-2002     | druhého února dva tisíce dva                      | [not SP] |

### 4.2.3 Asterisk

Asterisk '\*' is only pronounced as “krát” if enclosed by digits and followed by equals sign. In other cases it is pronounced as “hvězdička”.

| Expression | Reading                    |
|------------|----------------------------|
| 2*3        | dva hvězdička tři          |
| 2*3=6      | dva krát tři rovná se šest |
| *bc        | hvězdička b c              |

## 5 *Number processing*

Strings of digits that are sent to the text-to-speech converter are processed in several different ways, depending on the format of the string of digits and the immediately surrounding punctuation or non-numeric characters. To familiarize the user with the various types of formatted and non-formatted strings of digits that are recognized by the system, a brief description of the basic number processing is provided below, along with examples.

Number processing is subdivided into the following categories:

Full number pronunciation  
Leading zero  
Decimal numbers  
Currency amounts  
Ordinal numbers  
Arithmetic operators  
Mixed digits and letters  
Time of day  
Year  
Dates  
Phone numbers

### 5.1 *Full number pronunciation*

Full number pronunciation is given for the whole number part of the digit string.

#### **Example**

2425                      full number

2.425                    full number

2 425                    full number

24,25                    24 is a full number, 25 is the decimal part

Numbers denoting thousands, millions and billions (numbers larger than 999) may be grouped using space or full stop. In order to achieve the right pronunciation the grouping must be done correctly.

The rules for grouping of numbers are the following:

- Numbers are grouped in groups of three starting at the end.
- The first group in a number may consist of one, two, or three digits.
- If a group, other than the first, does not contain exactly three digits, the sequence of digits is not interpreted as a full number.
- The highest number read is 999999999999 (twelve digits). Numbers higher than this are read as separate digits.

| Number         | Reading                                                                                 |
|----------------|-----------------------------------------------------------------------------------------|
| 2580           | dva tisíce pět set osmdesát                                                             |
| 2 580          | "                                                                                       |
| 2.580          | "                                                                                       |
| 25800          | dvacet pět tisíc osm set                                                                |
| 25 800         | "                                                                                       |
| 25.800         | "                                                                                       |
| 2580350        | dva miliony pět set osmdesát tisíc tři sta padesát                                      |
| 2 580 350      | "                                                                                       |
| 2.580.350      | "                                                                                       |
| 1000000000     | jedna miliarda                                                                          |
| 1234567890123  | jedna dva tři čtyři pět šest sedm osm devět nula jedna dva tři                          |
| 23 456 789 012 | dvacet tři miliard čtyři sta padesát šest milionů sedm set osmdesát devět tisíc dvanáct |

## 5.2 Leading zero

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Numbers beginning with 0 (zero) are read out digit by digit.

| Number | Reading                |
|--------|------------------------|
| 09253  | nula devět dva pět tři |
| 020    | nula dva nula          |

## 5.3 Decimal numbers

---

Comma or full stop may be used when writing decimal numbers.

The full number part of the decimal number (the part before comma or full stop) is read according to the rules in the section *Full number pronunciation*. The decimals (the part after comma or full stop) are read as separate digits if there are more than 3 digits after the comma. When the decimals are read as a whole number, the words “desetin”, “setin”, and “tisícín” are added after the decimal, depending on the number of digits in the decimal.

Note: A number containing a period followed by exactly three digits is not read as a decimal number but as a full number, following the rules in the section *Full number pronunciation*.

| Number   | Reading                                         |
|----------|-------------------------------------------------|
| 16,234   | šestnáct celých dvě stě třicet čtyři tisíciny   |
| 3,1415   | tři celé jedna čtyři jedna pět                  |
| 1251,04  | tisíc dvě stě padesát jedna celých čtyři setiny |
| 1.251,04 | tisíc dvě stě padesát jedna celých čtyři setiny |
| 2.50     | dvě celé padesát setin                          |
| 2,50     | dvě celé padesát setin                          |
| 3.141    | tři tisíce sto čtyřicet jedna                   |

## 5.4 Currency amounts

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The following principles are followed for monetary amounts:

- Numbers with zero up to two decimal places preceded or followed by the currency markers \$, €, CZK, SKK, HUF, PLN, GBP, CAD, DKK, EUR, JPY, USD are read as monetary amounts.
- Numbers with zero or two decimal places preceded or followed by the words “dolar”, “euro”, “libra”, “lib.”, “yen”, “koruna česká”, “koruna slovenská”, “forint” or “zlotý” (singular or plural) are read as monetary amounts.
- Accepted decimal markers are comma and full stop.
- The decimal part (consisting of two digits) in monetary amounts is read as “i nn cent”.
- If the decimal part is “00” it will not be read.

| Example      | Reading                      |
|--------------|------------------------------|
| \$15.00      | patnáct dolarů               |
| 15.00 CZK    | patnáct korun českých        |
| 15.00 euro   | patnáct euro                 |
| € 200.50     | dvě stě euro a padesát centů |
| 1 000 000 \$ | jeden milion dolarů          |

There is also the possibility of writing large amounts as follows:

|             |                     |          |
|-------------|---------------------|----------|
| \$ 1 milion | jeden milion dolarů | [not SP] |
|-------------|---------------------|----------|

## 5.5 Ordinal numbers

---

Numbers are read as ordinals in the following cases:

- The number is followed by a full stop and a space, with no capital letter after the space. Examples: 1. , 12.

- The number is followed by a period, then a month name or one of the month name abbreviations and the number is smaller or equal to 31. The number may be preceded by a day or an abbreviation for a day.  
Examples: 3. ledna, 3. led., sobota 3. led.

## 5.6 Arithmetic operators

---

Numbers together with arithmetical operators are read according to the examples below.

| Expression | Reading                        |
|------------|--------------------------------|
| -12        | minus dvanáct                  |
| +12        | plus dvanáct                   |
| 2*8        | dva hvězdička osm              |
| 2*8=16     | dva krát osm rovná se šestnáct |
| 2/8        | dvě osminy                     |
| 8/2=4      | osm děleno dva rovná se čtyři  |
| 25%        | dvacet pět procent             |

## 5.7 Mixed digits and letters

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If one or more upper-case letters appear within an alphanumeric sequence, the letters are read one by one. The strings of digits are split up into numbers according to the examples below.

| Expression | Reading           |
|------------|-------------------|
| 77B184Z3   | 77 B 184 Z 3      |
| 0092B87-B  | 0 0 92 B 87 B     |
| FT2892B87Z | F T 28 92 B 87 Z  |
| TN12345L5  | T N 1 2 3 4 5 L 5 |

## 5.8 Time of day

---

The colon is used to separate hours, minutes and seconds. Possible time formats are:

- hh:mm* or *h:mm*
- hh:mm:ss* or *h:mm:ss*
- hhHmm* or *hHmm*      ex: 2H45      [not SP]

*h* = hour, *m* = minute, *s* = second.

In pattern a:

If the “*mm*”-part is equal to “00”, this part will not be read. “*Hodin(y,a)*”, is read after the hours, whether there be minutes or not. “*Minut*” or “*minuty*” is added after the “*mm*” part in agreement with the preceding number.

In pattern b:

“*Sekund*” will be added after the seconds part. If the “*ss*”-part is equal to “00”, this part will not be read.

Pattern (c) follows the rules for pattern (a).

Some examples:

| Expression | Reading                                    |
|------------|--------------------------------------------|
| 8:15       | osm hodin patnáct minut                    |
| 9:00       | devět hodin                                |
| 1:02       | jedna hodina dvě minuty                    |
| 5:20:45    | pět hodin dvacet minut čtyřiset pět sekund |
| 5:20:00    | pět hodin dvacet minut                     |

## 5.9 Dates

---

The valid date formats are:

1. *dd.mm.yyyy*, *dd-mm-yyy* and *dd/mm/yyyy*
2. *dd.mm.yy*, *dd-mm-yy* and *dd/mm/yy*

where, “*yyyy*” is a four-digit number, “*yy*” is a two-digit number, “*mm*” is a month number between 1 and 12 and “*dd*” a day number between 1 and 31. Full stop, hyphen and slash may be used as delimiters.

In all formats, one or two digits may be used in the “*mm*” and “*dd*” part. Zeros may be used in front of numbers below 10.

The following examples show valid formats and their readings:

### Type 1:

|                         |                               |
|-------------------------|-------------------------------|
| 10-02-2003 or 10-2-2003 | desátého února dva tisíce tři |
| 10.02.2003 or 10.2.2003 | “                             |
| 10/02/2003 or 10/2/2003 | “                             |

### Type 2:

|                     |                               |
|---------------------|-------------------------------|
| 10-02-03 or 10-2-03 | desátého února dva tisíce tři |
| 10.02.03 or 10.2.03 | “                             |

**Type 2:**

10/02/03 or 10/2/03

“

Ranges of days and years are also supported:

[not SP]

| Expression         | Reading                                               |
|--------------------|-------------------------------------------------------|
| 1980-1990          | tisíc devět set osmdesát až tisíc devět set devadesát |
| 1939-45            | tisíc devět set třicet devět až čtyřicet pět          |
| 14-15 dubna        | čtrnáctého až patnáctého dubna                        |
| 14 až 15 dubna     | čtrnáctého až patnáctého dubna                        |
| od 6. do 10. února | od šestého do desátého února                          |
| 6-10.1             | šestého až desátého ledna                             |

Other possible date formats include:

[not SP]

sobota, 12. srpen

sobota, 12. srpen 2000

30. leden 1980

duben 1999

[not SP] Abbreviations of months and days in date formats:

**Months:**

*led., ún., bř., břez., dub., květ., červ., červen., srp., zář., říj., list., pros.*

**Days:**

*pon., ut., stř., čtv., pát., sob., ned.*

## 5.10 Phone numbers

---

In this section the patterns of digits that are recognized as phone numbers are described. In the pronunciation of phone numbers, groups of two and three digits are read as normal numbers, groups of four digits are read out digit by digit, with a pause between the groups. [not SP]

### 5.10.1 Ordinary phone numbers

Sequences of digits in the following formats are treated as phone numbers. [not SP]

The following sequences of digits can be separated by a space, a hyphen or a full stop. The first separation can be a space, a hyphen, or a backslash:

x xxxx xxxx

x xx xx xx xx

xx xxx xxxx

xx xxxx xxx

xxx xx xx xx

xxx xxxxxx

The sequences can also all be preceded by a "0".

The sequence xxx xxx xxx is recognized as a phone format only if preceded by "*tel, mob, telefon, mobil, fax*", with optional ":" between these words and the phone number.

### 5.10.2 International phone numbers

All preceding formats can be recognised if preceded by international prefix (space is optional) [not SP]:

|        |       |
|--------|-------|
| 00 x   | + x   |
| 00 xx  | + xx  |
| 00 xxx | + xxx |

These international prefixes can be followed by an optional (0) before the phone number.

Other recognized formats, that must be preceded by "00" or "+" with optional separator:

xx xxxx xxxx

xxx xxx xxxx

xxx xxxx xxx

xxxx xx xx xx

xxx xxxx xxxx

xxxx xxx xxxx

xxxx xxxx xxx

xxxxx xx xx xx

xxxx xxxx xxxx

xxxxx xxx xxxx

XXXXX XXXX XXX

XXXXXXX XX XX XX

XXX XXX XXX XXX

## **6 *How to change the pronunciation***

Words that are not pronounced correctly by the text-to-speech converter can be entered in the user lexicon (see *User's guide*). In this lexicon, the user enters a phonetic transcription of the word (see chapter *Czech phonetic text*). Phonetic transcriptions can also be entered directly in the text, using a *PRN* tag (see *User's guide*).

## 7 Czech phonetic text

The Czech text-to-speech system uses symbols based on the SAMPA phonetic alphabet (*Speech Assessment Methods Phonetic Alphabet*). The symbols are written with a space between each phoneme.

Only SAMPA may be used in phonetic transcriptions. Symbols not listed here are not valid in phonetic transcriptions and will be ignored if included in the user lexicon or in a PRN tag.

### 7.1 Consonants

The table below lists the phonetic symbols used for the Czech consonants along with example words and their transcriptions.

*Table: Symbols for the Czech consonants*

| Symbol | Word    | Phonetic text   |
|--------|---------|-----------------|
| b      | Bota    | b o1 t a        |
| d      | Dal     | d a1 l          |
| d'     | Divadlo | d' i1 v a d l o |
| dz     | Leckdy  | l e1 dz g d l   |
| dZ     | Léčba   | l e:1 dZ b a    |
| f      | Forma   | f o1 r m a      |
| g      | Kde     | g d e           |
| H      | Had     | H a1 t          |
| j      | Jas     | j a1 s          |
| k      | Krk     | k r=1 k         |
| l      | Led     | l e1 t          |
| m      | Mák     | m a:1 k         |
| n      | Noc     | n o1 ts         |
| n'     | Nic     | n' i1 ts        |
| N      | Banka   | b a1 N k a      |
| p      | Pes     | p e1 s          |
| r      | Ret     | r e1 t          |
| r'     | Tuř     | t u1 r'         |
| s      | Sen     | s e1 n          |
| S      | Šabach  | S a1 b a x      |
| t      | Tam     | t a1 m          |
| t'     | Tati    | t a1 t' i       |
| tS     | Tavič   | t a1 v i tS     |
| ts     | Cíl     | ts i:1 l        |

| Symbol | Word         | Phonetic text |
|--------|--------------|---------------|
| v      | Vak          | v a1 k        |
| x      | Chata        | x a1 t a      |
| z      | Zub          | z u1 p        |
| Z      | Žal          | Z a1 l        |
| R      | Buřeň        | b u1 R e n'   |
| ʔ      | Glottal stop | ʔ o1 s u m=   |

## 7.2 Vowels

The table below lists the phonetic symbols used for the Czech vowels along with example words and their transcriptions.

*Table: Symbols for the Czech vowels*

| Symbol | Word     | Phonetic text  | Comment       |
|--------|----------|----------------|---------------|
| a      | Pas      | p a1 s         | Short         |
| a:     | Rád      | r a:1 t        | Long          |
| e      | Les      | l e1 s         | Short         |
| e:     | Lék      | l e:1 k        | Long          |
| i      | Myš      | m i1 S         | Short         |
| i:     | Píbl     | p i:1 b l=     | Long          |
| o      | Rok      | r o1 k         | Short         |
| o:     | Móda     | m o:1 d a      | Long          |
| u      | Kus      | k u1 s         | Short         |
| u:     | Kučův    | k u1 tS u: f   | Long          |
| ou     | Bambous  | b a1 m b ou s  | Short         |
| au     | Braum    | b r au1 m      | Short         |
| eu     | Breu     | b r eu1        | Short         |
| l=     | Bágl     | b a:1 g l=     | Syllabic l    |
| m=     | Osm      | o1 s m=        | Syllabic m    |
| r=     | Crha     | ts r=1 H a     | Syllabic r    |
| E:     | äke      | E:1 k e        | Foreign vowel |
| 2:     | Bönschův | b 2:1 n S u: f | Foreign vowel |
| y:     | Süd      | s y:1 t        | Foreign vowel |

### ***7.3 Lexical stress***

---

A lexical accent is used to indicate the level of prominence (or emphasis) of a syllable in a word. Practically all words in Czech have a lexical accent even if it does not always serve to differentiate between two different words. It is therefore important to include stress marks when writing phonetic transcriptions.

In the phonetic transcriptions, the lexical accent is indicated by the symbol “1” placed directly after (no space) the accented vowel.

### ***7.4 Pause***

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An underscore /\_ / in a phonetic transcription generates a small pause.

### ***7.5 Glottal stops***

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A glottal stop, represented by the phonetic symbol /ʔ /, is a small sound which is often used to separate two words when the second word starts with a vowel. This sound can be inserted in a transcription in order to improve the pronunciation.

## 8 Abbreviations

In the current version of the Czech text-to-speech system, the abbreviations in the table below are recognized in all contexts. These abbreviations are mostly case-insensitive, and some require punctuation such as comma or slash.

As previously mentioned, there are also abbreviations for the days of the week and the months, see chapter *Dates*.

*Table: Abbreviations and symbols*

| Abbreviation/Symbol | Reading                |
|---------------------|------------------------|
| apod.               | a podobně              |
| atd.                | a tak dále             |
| cal                 | kalorie                |
| ccm                 | centimetrů krychlových |
| cm                  | centimetrů             |
| hl.                 | hlavní                 |
| hlas.               | hlasové                |
| jedn.               | jednotka               |
| kb                  | kilobajty              |
| kg                  | kilogram               |
| kilometry/h         | kilometry za hodinu    |
| km                  | kilometrů              |
| krychl (.)          | krychlové              |
| kW                  | kilowattů              |
| kWh                 | kilovat hodin          |
| metry/s             | metry za sekundu       |
| mm                  | milimetrů              |
| míle/h              | míle za hodinu         |
| přík (.)            | příkaz                 |
| spr.                | správce                |
| stopy/s             | stopy za sekundu       |
| °C                  | stupeň Celsia          |
| °F                  | stupeň Fahrenheita     |
| °K                  | stupeň Kelvina         |
| cad                 | kanadský dolar         |
| czk                 | koruna česká           |
| dkk                 | dánská koruna          |

| Abbreviation/Symbol | Reading          |
|---------------------|------------------|
| eur                 | euro             |
| gbp                 | britská libra    |
| huf                 | maďarský forint  |
| jpy                 | jen              |
| skk                 | slovenská koruna |
| usd                 | americký dolar   |

The single-letter abbreviations, such as “*m*”, “*g*” and “*t*” are expanded only when appearing after a number, and must be in low case. Different expansions are applied in agreement with the number. Uppercase versions: “*M*”, “*G*” and “*T*” are read out as letters.

| Expression | Reading            |
|------------|--------------------|
| 25 m       | dvacet pět metrů   |
| 30 t       | třicet tunů        |
| 45 g       | čtyřicet pět gramů |
| 25 M       | dvacet pět M       |
| 30 T       | třicet T           |
| 45 G       | čtyřicet pět G     |

## 9 Web-addresses and email

Web-addresses and email-addresses are read as follows:

- “www” is read as three w’s spelled letter by letter.
- Full stops are read as “tečka”, hyphens as “pomlčka”, underscore (“\_”) as “podtržítko”, slash (“/”) as “lomeno”.
- “cz, fr” and all the other abbreviations for countries are spelled out letter by letter.
- The “@” is read “zavináč”.
- Words/strings (including “org”, “com” and “edu”) are pronounced according to the normal rules of pronunciation in the system and in accordance with the lexicon.

### String

www.acapela-group.com

http://www.acapela-group.com

novak@yahoo.cz

milos\_novak@yahoo.cz

### Reading

w w w tečka acapela pomlčka group tečka com

h t t p dvojtečka lomeno lomeno w w w tečka  
acapela pomlčka group tečka com

novak zavináč yahoo tečka c z

milos podtržítko novak zavináč yahoo tečka c z