

Czech (T_EX), Phonetic Devanāgarī (देवनागरी), Phonetic Gujarātī (ગુજરાતી), and Mac OS X-like Armenian (Հայերեն) Keyboard Layouts for xkb, v. 2.0

Zdeněk Wagner

<http://icebearsoft.euweb.cz>

Improper and/or careless use of this software can damage settings of your computer so that the graphical subsystem will no longer start. The instructions written in this manual will help you to overcome all problems. Please read the manual before trying the software. You have been warned.

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1 License

These files are not considered as software. They are merely configuration files for `xkb` and thus cannot be copyrighted. The files are provided freely and can be freely used and redistributed either alone or as a part of any collection. They may become a part of Linux distribution. The files may also be a source for a derived work.

If a specific license is required, the above written text should be considered as “Public Domain”.

2 No warranty

The files are distributed AS IS in the hope that they may be useful for someone. There is no warranty for any damage of any kind. However, the installation instructions explain how to revert to the original configuration should these files cause any problems. **Do read the manual before trying the files.**

3 Preface

The development of this software started on Fedora Core 2 probably in year 2006 without use of any versioning system. The project was imported into subversion when the author installed CentOS 4 on another computer. The oldest date known from the project history is 6 January 2007. That many years ago the first Czech `xkb` layout was developed. After the first attempt, new characters were added. The keyboard served at the beginning for writing the Czech \TeX files. Later the author realized that \XeTeX allows to input all characters directly without the need to use \TeX sequences. It is therefore better to have them available on the keyboard. Moreover, in such a case the characters can be used when writing XML and HTML files.

After the success of the first Czech `xkb` layout Devanāgarī came into mind. It is possible to use a transliterated input in \XeTeX but such a file is less readable. More serious problem is that such transliterations cannot be easily used in XML and HTML files. Spell checkers are available for Hindi as well as other Indian languages but they do not accept a transliterated text. The `xkb` layout was developed by applying the same method learned during the development of the Czech layout.

Using the same scheme the Gujarātī keyboard layout was developed on 1st December 2018. It remained in the testing stage without documentation and was not released. In January 2024, the Armenian keyboard layout was developed, documentation was updated including the notes on the KDE Plasma and Wayland in Fedora 39 and the package was released as v.2.0.

You may ask why these layouts have ever come into life? Are the existing layouts not sufficient? From the author’s point of view they are not. Explanation will be given in the next section.

As written above, all layouts were developed using the very same design principles. Although the languages are unrelated, the design is analogous and the installation instructions equal. This is the reason why all layouts are distributed together in the same package. However, the package is structured in such a way that you can easily install just one of the layouts.

The layouts were verified in several Linux distributions but anything may happen and the settings of your graphical subsystem can be damaged so that it will no longer start. The manual

contains the steps needed to restore your original settings. Do read the manual before you start installation. You have been warned...

4 Introduction

In the *typewriter age* minimization of the number of keys was important in order to reduce the size of the machines. Some typewriters did not even contain digits *0* and *1*. Letters *O* and *l* were used instead. Mathematical symbols were not available at all. Layout of the keys on the Czech typewriters was prepared for easy typing the Czech texts.

In the beginning of the *computer age* the computers were used for programming and data processing only. The enhanced keyboards came with numeric keypads. Only US ASCII was supported. The programmers got accustomed to the US keyboard layout used on the punching machines.

Later on operating systems became localized. The only normalized national keyboard was the one used on old typewriters. This is the reason why this layout was implemented. However, a lot of characters are missing. They were put to other locations that could be reached usually via AltGr. However, such typing is uncomfortable. If a user types a program on a US keyboard and a text on a national keyboard, he or she easily makes mistakes. The design goal is to make the utmost of the `xkb` features and prepare a layout that contains all symbols at the very same places as on the US keyboard yet it offers easy typing of the Czech text.

In the *pre-UNICODE age* the Devanāgarī texts could not be typeset directly. Several systems [1] were developed. Frans Velthuis developed a system [2] similar to transliterations used in textbooks and dictionaries. Later the transliteration was modified probably by inspiration from ITRANS [3]. The system is phonetic so that users can easily find the characters on the US keyboard. Traditional Indian typewriters followed another scheme. This scheme is implemented in operating systems but it is not comfortable for western users.

The idea was to implement the Devanāgarī `xkb` layout that would be as close to the Velthuis transliteration as possible. A few modifications had to be accepted. Some characters were added later, for instance the Rupee (₹) sign. The same scheme was used later for the Gujarātī `xkb` layout.

All non-Latin scripts present problems for users who use a Latin-based script for their mother tongue. This applies also to Armenian. The standard phonetic layout distributed with Linux places too many characters to digits and symbols keys and thus it is difficult to remember their positions. On the contrary, Mac OS X provides a phonetic layout which suprisingly implements similar principles as the keyboard layouts mentioned above. It is thus possible to design the same layout using `xkb`. Linux and Mac OS X users will thus have almost identical layouts on both systems.

The exact layouts of the keyboards will be given in the later sections.

5 Layout principles

The original idea arised from the previous work on the Czech/Slovak keyboard for eComStation [4]. The possibility of having one dead key was originally invented by Jiří Kolafa in his unpublished keyboard driver for MS-DOS. This driver hides just one character that is not so important in Czech and Slovak \TeX files. Unfortunately it cannot be easily implemented in the `xkb` system. Closest alternative was therefore searched for.

The US keyboard makes use of one modifier key, the Shift, that is used to switch between lowercase and uppercase characters. In addition, the `xkb` system offers Level 3 modifier key. Usually it is AltGr but it may be configured. By using this feature each key may represent four characters. The number of

available characters can thus be doubled. This allows not only to type all characters easily but even to support a great many UNICODE characters.

Since the layout was intended for writing mathematical texts in \TeX , not only the backslash but also characters as #, \$, %, ^, &, _ as well as all types of braces must be easily available and preferably at the same positions as on the US keyboard. The digits on the upper row are not important because they can be entered via the numeric keypad. Later the author arrived at a conclusion that the digits may be important mainly on notebooks where the numeric keypad is not present. The digits are therefore accessible using the L3 (Level 3) modifier key. Both layouts distributed in this package keep the same standard symbols on the digit keys as the US keyboard if Shift is pressed. The layout is given in Table 1.

Table 1: Symbols on the digit keys

1	2	3	4	5	6	7	8	9	0
!	@	#	\$	%	^	&	*	()

5.1 Czech/Slovak `xkb` layout

The intention was to design the Czech/Slovak layout in such a way that the user will not have to switch to the US keyboard unless a very special demand arises. All keys have therefore the same characters with an exception of the digit keys on the upper row. Their assignment almost copies the Czech typewriter. The layout is given in Table 2. Shift-L3 in combination with the digit keys produces uppercase characters and so does their use with Caps Lock.

Table 2: Characters on the upper digit row

1	2	3	4	5	6	7	8	9	0
ů	ě	š	č	ř	ž	ý	á	í	é

The combining diacritical marks needed for Czech are accessible by L3 and Shift-L3 but should rarely be needed because all composed accented characters are directly available. The keyboard layout was prepared for Czech but other languages were taken into consideration: Slovak, German, Danish, Norwegian, Swedish, Icelandic, partially French and Polish. For characters of these languages combining diacritical marks will often be needed. Only characters such as Æ, Ø, Œ or Ł are directly accessible because they cannot be composed from a separate accent. All accented letters obey Caps Lock. Finally a few symbols were added so that it is possible to write angles as $15^{\circ}25'12''$ or dimensions as $\pm 2\mu\text{m}$. The complete layout is given in Table 3 and displayed in Figure 1.

As will be explained in sections 8.4 and 8.5, some fonts do not contain all characters, especially °C and °F may be missing. The Czech right quote entered as Shift-L3-” has to be replaced with the English left quote entered via L3->.

5.2 Phonetic Devanāgarī (देवनागरी) layout

The Devanāgarī (देवनागरी) keyboard layout is inspired by the Velthuis transliteration [2]. It is intended for users accustomed to latin scripts and tries to be as intuitive as possible. It enables to enter all Devanāgarī characters used in nowadays Hindi as well as a few special letters. The author hopes that it can also be used for Sanskrit, Marathi, Rajasthani¹, and Nepali.

¹Some linguists consider Rajasthani a language, other consider it as a dialect of Hindi. It is added here because it has ISO 639-2 and ISO 639-3 codes.

would be written as if you wrote पुस्तक. The same holds for repha. Thus प्रकर is entered as प्रकर and चर्चा is entered as चर्चा. If the font contains a ligature, it is automatically used. Therefore शक्ति will always be displayed. If you wish to use the half form, i. e. शक्ति you must follow the virama by zero-width-joiner. Using zero-width-nonjoiner forces displaying the full consonant with a virama.

As a side note it should be written that some programs allow selection of a set of conjuncts used according to the language. This is the case of Xe_{La}TeX. The polyglossia package for Xe_{La}TeX is very useful for this purpose. Firefox v. 17 (distributed e. g. with Fedora 17) can also distinguish Hindi and Sanskrit conjuncts without the need of using zero-width-joiner.

The keyboard layout follows a few rules. Short dependent vowels are entered as lowercase letters, long dependent vowels as uppercase letters, i. e. with a shift. Independent vowels are entered with L3. The only difference is lowercase *a*. Since short dependent *a* is not used in UNICODE, this key produces avagraha (ऽ). Keys R and L are used for corresponding consonants. Vocalic *r̥* (ठ) is assigned to W and vocalic *l̥* (ड) to X. Anusvara is entered as M, candrabindu as L3+m, and visarga as H. English *o* (ऑ) is assigned to L3+y and ॐ to uppercase Q.

Zero-width-joiner (ZWJ) is entered as +, zero-width-nonjoiner (ZWNJ) as =. Characters + and = are produced with L3.

Dental unaspirated consonants are represented by lowercase characters, retroflex consonants by characters with L3. Aspirated characters are entered as uppercase. There are just a few exceptions. Although ञ is not used alone in nowadays Hindi, it forms an important conjunct ञ्. It was therefore placed to an uppercase N. Letter *na* with nukta (ँ) is entered as V and its underlined variant (ॡ) as L3+v.

Eyelash repha (ँ) is produced as a half form of र according to the UNICODE standard. You will therefore type it as र followed by a virama. If you need an explicit half form of any consonant, add ZWJ after the virama.

Some punctuation characters and accents (svarita, anudatta, grave, acute, nukta) are included. Characters used for transliteration of other languages are available too but their position is not mnemonic at all. They were put to empty places.

Numbers in the upper row are used to write Devanāgarī numerals. Arabic digits are entered with L3. Combination with Shift-L3 is used for entering special characters. The assignments on the upper digit keys are summarized in Table 4.

Table 4: Devanāgarī numerals and special characters

1	2	3	4	5	6	7	8	9	0
१	२	३	४	५	६	७	८	९	०
ँ	ँ	ँ	ँ	ँ	ँ	ँ	ँ	ँ	ँ

The full Devanāgarī layout is shown in detail in Table 5. Special characters are distinguished by colour. Notice that important English characters as a question mark, exclamation mark, quotes and long dashes are also included.

The complete layout of the Devanāgarī keyboard is shown in Figure 2.

5.3 Phonetic Gujarātī (ગુજરાતી) layout

The Gujarātī keyboard layout is based upon the same principles as the Devanāgarī layout. The reason is that all scripts derived from Brāhmī follow the same scheme in Unicode. Each script has its own page and corresponding characters occupy the respective places. Not all characters are available in all scripts. In such a case the slot is left empty in order to preserve matches throughout all Indic scripts. It was

Table 5: Devanāgarī (देवनागरी) keyboard layout; combining diacritical marks (including nukta) are printed with magenta colour, glottal stop, anudatta and svarita are printed with green colour, names of symbols are printed with blue colour

Key	LC	Shift	L3	Shift+L3	Key	LC	Shift	L3	Shift+L3
a	ऽ	।	अ	आ	n	न	ञ	ण	ङ
b	ब	भ	ब		o	ो	ौ	ओ	औ
c	च	छ	अु	अु	p	प	फ		
d	द	ध	ड	ढ	q	क	ः	रु	Rs
e	'	"	ए	ऐ	r	र	रु	इ	ढ
f	फ़		'	'	s	स	श	ष	
g	ग	घ	ग़		t	त	थ	ट	ठ
h	ह	:	ह		u	ु	ू	उ	ऊ
i	ि	ी	इ	ई	v	व	वः	गु	घ
j	ज	झ			w	ॳ	ॳ	ऋ	ॠ
k	क	ख	ख	ख	x	ॴ	ॴ	ऌ	ॡ
l	ल	ळ	ळ	ळ	y	ॵ	ॵ	ॠ	ॡ
m	म	.	ॆ	ॆ	z	ज़	ज़	ञ	
~	~	~	ॆ	ॆ	::	;	:	'	"
-_	-_	-_	-_	-_	”	'	†	अ	ओ
=+	ZWNJ	ZWJ	=	+	,<	,	<	,	<
\			\	(bar)	.>	°	>	.	.
[{	[{	-	~	/?	/	?	“	”
]}]	}	-	~	□	□	□	□	.

thus possible to create the Gujarātī layout from the Devanāgarī definition file semiautomatically using the same principle.

The Gujarātī alphabet is not as rich as the complete Devanāgarī script. There are no equivalents to Devanāgarī letters with nuktas such as क़, ख़, ङ़, ढ़, फ़ etc. The additional letters used by linguists exist in Devanāgarī only, not in other Indic scripts. The digit keys on the upper row thus contain only the Gujarātī digits, symbols with the Shift, and Arabic digits with L3. There are no linguistic symbols. The layout of the upper row is shown in Table 6.

Table 6: Gujarātī numerals

1	2	3	4	5	6	7	8	9	0
૧	૨	૩	૪	૫	૬	૭	૮	૯	૦

Assignment of the letters to keys using the Shift and L3-keys follows the same logic but in comparison with the Devanāgarī keyboard several keys remain unassigned. If just one or two positions on a key remain unassigned, they are defined as *NoSymbol*. If the whole key, such as the F-key, remains empty, it is not listed in the definition file and thus inherits the values from the basic US keyboard. It may be confusing but we consider it a feature, not a bug.

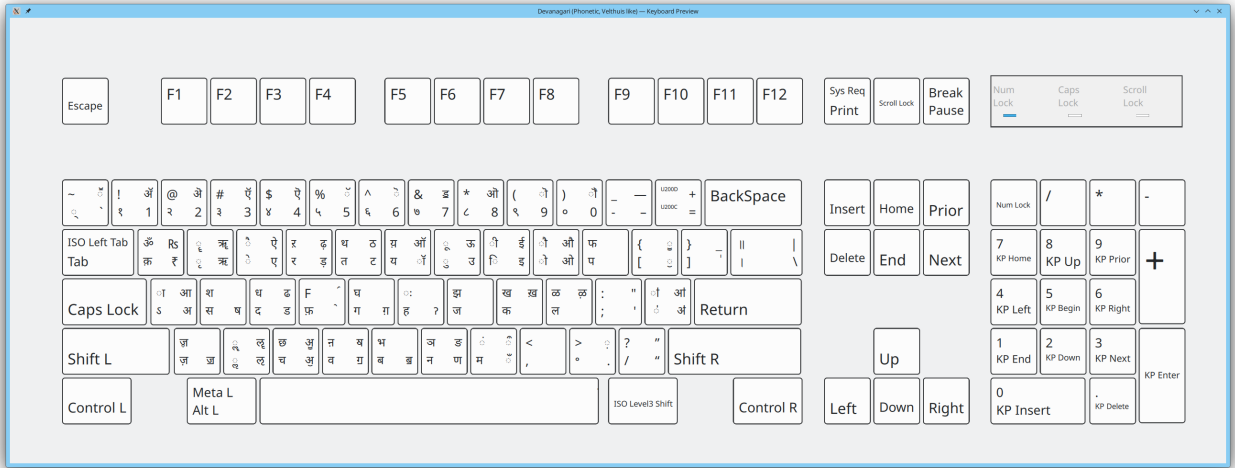


Figure 2: The layout of the Devanāgarī keyboard

The complete layout is displayed in table 7. The table shows all positions used in the Devanāgarī layout although they are empty in the Gujarātī layout. Letter ઝ is present in the Noto Sans Gujarati font but may be missing in other fonts.

Table 7: Gujarātī (ગુજરાતી) keyboard layout; names of symbols are printed with blue colour

Key	LC	Shift	L3	Shift+L3	Key	LC	Shift	L3	Shift+L3
a	ઠ	ઠ	ઠ	ઠ	n	ન	ન	ન	ઠ
b	બ	બ			o	ો	ો	ઓ	ઓ
c	ચ	છ			p	પ	ફ		
d	દ	ધ	ડ	ઢ	q	ઠ	ઠ	ઠ	Rs
e	ે	ે	એ	એ	r	ર	ર	ે	એ
f					s	સ	શ	ષ	
g	ગ	ઘ			t	ત	થ	ટ	ઠ
h	હ	ઃ			u	ુ	ુ	ઉ	ઉ
i	િ	િ	ઇ	ઈ	v	વ			
j	જ	ઝ			w	વ	ે	ઝ	ઝ
k	ક	ખ			x	ઃ	ઃ	ઃ	ઃ
l	લ	લ			y	ય	ય	ૈ	ઓ
m	મ	ં	ં		z	ઝ			
~	~	~	~		::	;	:	'	"
-	-	-	-	-	”				
=+	ZWNJ	ZWJ	=	+	,<	,	<	,	<
\			\	(bar)	.>	.	>	°	
[{	[{			/?	/	?	“	”
]}]	}			□	□	□	□	...

The layout is graphically presented in Figure 3.

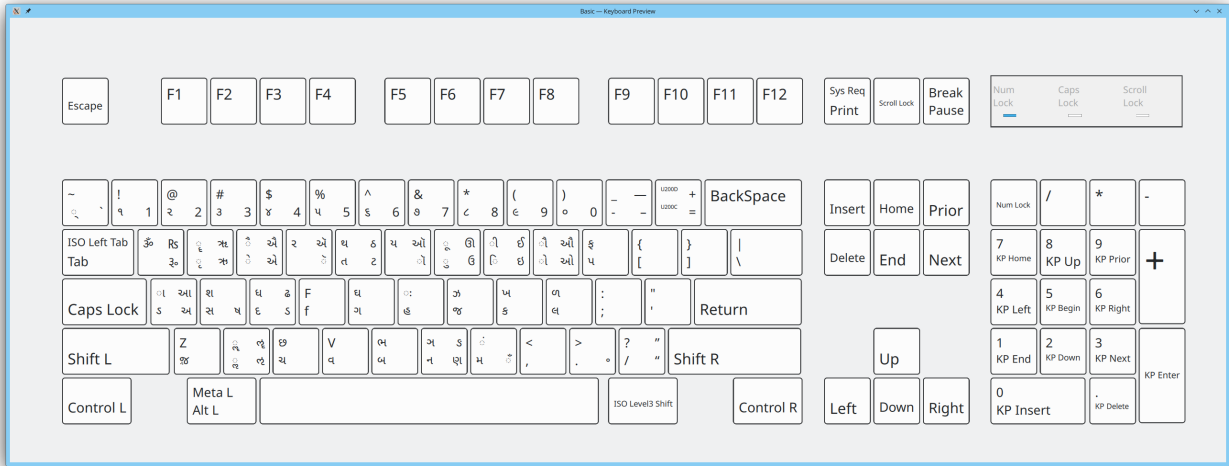


Figure 3: The layout of the Gujarati keyboard

5.4 Mac OS X-like Armenian (հայերեն) layout

This keyboard layout is intended for European users who are not accustomed to traditional mechanical Armenian typewriters. Linux offers a phonetic keyboard but too many letters are placed to numeric keys and to symbol keys. It brings two problems:

1. Users on laptops cannot access digits, they must switch to another keyboard.
2. Positions of letters assigned to digits and symbols are difficult to remember.

It is well known that Apple often goes its own way. It is thus no surprise that the phonetic Armenian keyboard makes use of a very different layout in Mac OS X. Letters are assigned to letters only but some of them require the Alt key to be accessed. Linux offers an L3-switch thus the same layout can easily be defined for the `xkb` system. In addition, positions of all characters are logical and can thus be easily remembered. No Armenian characters are assigned to the digits thus the keyboard is simply usable on laptops which do not have a numeric keypad. This even allows to create a package similar to `FarsiTEX` where macros are translated into Persian (Farsi). Thus something like hypothetical `HayerenTEX` could be created and `\հաճոյսաճալ` can be used instead of `\relax`. However, I am not sure whether people need it because US characters are needed anyway for other purposes and it is easy to switch two last layout with a single key.

The keyboard is intended for use in Armenian, therefore Shift is preferred to L3 for accessing the Armenian symbols whenever it makes sense although it is often opposite to the Mac OS X layout. Mac does not seem to have the dram symbol $\֏$. The standard Linux keyboard contains it on the same key as `u` but with the Shift key. Applying the same principle it is here accessible with Shift+L3 on the `V` key. The complete layout is presented in Table 8.

The layout is displayed graphically in Figure 4.

6 Notes on the `xkb` system

The authoritative information on the `xkb` system is not easy to find. Internet search returns quite a lot of pages most of which are very old. Since that time the `xkb` system has evolved and some configuration files are no longer used although they are still distributed. If you follow old instructions, your setting will

Table 8: Armenian (Հայերեն) keyboard layout; the dram symbol is printed with the blue colour, Armenian punctuation is printed with green colour

Key	LC	Shift	L3	Shift+L3	Key	LC	Shift	L3	Shift+L3
a	ա	Ա	բ	Բ	n	ն	Ն		
b	բ	Բ			o	ո	Ո	օ	Օ
c	ծ	Ծ	ց	Յ	p	պ	Պ	փ	Փ
d	դ	Դ			q	զ	Ճ	չ	Չ
e	ե	Ե	է	Է	r	ր	Ր	ն	Ռ
f	ֆ	Ֆ			s	ս	Ս	շ	Շ
g	գ	Գ	ղ	Ղ	t	տ	Տ	թ	Թ
h	հ	Հ			u	ւ	Ի		
i	ի	Ի			v	վ	Վ	և	Լ
j	յ	Չ	շ	Չ	w	ւ	Ի		
k	կ	Կ	ք	Ք	x	խ	Խ		
l	լ	Լ	ղ	Ղ	y	յ	Յ		
m	մ	Մ			z	զ	Ջ	ժ	Ժ
‘ ~	՝	՛	՛	~	, <	,	«	<	«
; :	;	:	:	:	. >	.	»	>	»
’ ”	՛	՛	՛	”	/ ?	/	՞	?	՞
_ -	փ	—	-	-	␣	␣	␣	␣	...

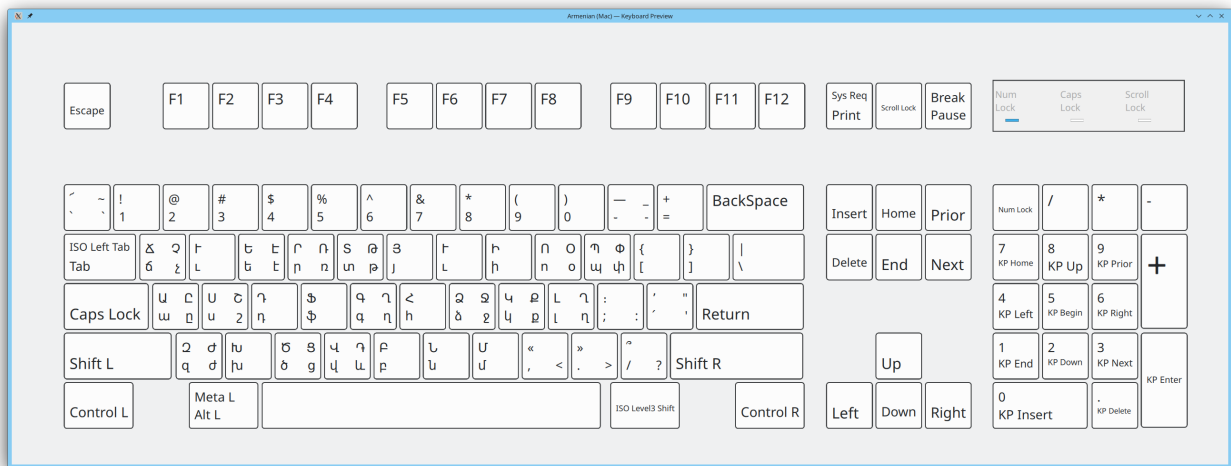


Figure 4: The layout of the Armenian keyboard

not get corrupted but your layouts will not be found by the system. At least the old layouts will continue to work. The goal of this section is to give you the brief information on the `xkb` evolution².

²Even when preparing the Armenian keyboard layout and updating this manual in January 2024, I did not manage to find better documentation of the `xkb` system. The description is thus based again on trials and errors followed by the final success.

Originally the layouts were configured in `xorg.lst` which was a plain text file. Later it was replaced by `xorg.xml` with the XML syntax. Both files were present but it seems that only `xorg.xml` was used. Afterwards the name changed, the plain text file was renamed to `base.lst` and the XML file was renamed to `base.xml` but the previous files `xorg.lst` and `xorg.xml` exist as symlinks. Recently another change has been introduced. The files are named `evdev.lst` and `evdev.xml` but the old files including the symlinks are still present.

The directory has changed too. Originally the files resided below `/etc/X11/xkb`, in Fedora 17 the files are below `/usr/share/X11/xkb`. Symlinks between files in these directories existed in some previous distributions. The location of the files may vary in different distributions.

7 Installation

This section describes the manual installation procedure. The author tried to prepare an installation script but it was found that distributions evolve and thus development of a universal installation script is near to impossible. Instead of supplying a script that will work on some computers only and may sometimes even be harmful the author finally decided to describe manual installation steps only.

It has already been noted that the settings can be damaged in such a way that the graphical subsystem will not work properly or even will not start. There are ways how to recover from that situation. Remember that you will not be able to read any instructions if your graphical subsystem does not work. You must know in advance what to do. Do read the manual before you proceed. You have been warned...

The installation requires basically two steps:

1. The files have to be copied to the system directory and configuration files have to be modified.
2. The new layouts have to be enabled in the desktop environment.

Copying the files to the system directory thus does not mean that the layouts are known by your system. It should not be harmful if you just copy the layout definition files.

7.1 Preinstallation steps

The purpose of this subsection is to explain the prerequisites needed as well as the methods of rescue after possible damage. Although the installation procedure and the keyboard layout files have been checked on several Linux distributions, anything may happen.

In order to install the layouts as well as to rescue after damage, *root* access is mandatory. Some desktop environment do not allow *root* login. It is, however, sufficient to get the *root* privileges by `su` in a terminal, `sudo` is not sufficient.

If anything wrong happens, you will have to restore several important files from copies. If the graphical subsystem runs somehow and allows you to open a terminal, you can simply type `su` to become *root*, copy the files and restart Xorg. However, things may be more difficult.

It may happen that Xorg starts but does not work properly. In such a case Linux offers four text consoles. In older distributions they were accessible via Ctrl-Alt-F1 to Ctrl-Alt-F4 and Ctrl-Alt-F5 was used to switch to the graphical desktop. In Fedora 17 Ctrl-Alt-F1 switches to the graphical desktop and Ctrl-Alt-F2 to Ctrl-Alt-F5 select these four text consoles. This was again changed, in Fedora 39 the graphical desktop is selected by Ctrl-Alt-F2 and the four text consolec by Ctrl-Alt-F3 to Ctrl-Alt-F6. You can log in as a *root* and restore the files. *Do not just read these instructions.* Try to do it now!

In a much worse case the system will boot into a bad shape where even switching to the text console will not work. Although most likely it will not happen, it is better to know in advance what to do.

You should press Ctrl-Alt-Del and boot `linux single`. In this mode you have *root* access without entering the password. The system starts in the text mode without any network. It is therefore an ideal method for rescue from many types of catastrophs. The method for booting `linux single` depends on your boot loader. In grub you wait until the boot menu is displayed and press any key to stop automatic boot. Then select your kernel and press `e` to edit it. Find the command loading the kernel and append `single` to its end. Finally press `b` to boot. Again this depends on the version of grub. Find the exact method in the documentation of your Linux distro.

Remember that the exact method may differ if you have a different version of grub or even a different boot loader. Consult your manual. **Try to do it!** Although the keyboard layouts are not dangerous, knowledge of this way may be useful. It can, for instance, be used to recover forgotten *root* password.

When you end in the single mode, you will have to reboot. Older versions use just the `reboot` command, Fedora 17 requires `systemctl reboot`.

7.2 Locating the `xkb` directory

As written in section 6, the `xkb` directory was changed during time. Before installation you should locate it in your system. If you do not manage to guess it, issue the following command:

```
find / -name xkb -type d -ls
```

This command may find several directories. We have to locate the directory containing a few sub-directories the most important of which are `rules` and `symbols`. In the next sections we will refer to this directory as `$xkb`.

7.3 Saving important files

Important files reside in the `$xkb/rules` directory. Files `xorg.lst` and `xorg.xml` should be symlinks. They will not be modified. If they are normal files, your system is very old. The keyboard layout files from this package will still work but your fonts are old too and currency symbols `€` and `₹` as well as some other characters will be unavailable. Remember that new OpenType fonts may not work with an old version of `fontconfig`. There is no way out of it, upgrade is needed.

Unless your `xkb` is too old as written above, you have to make a backup copy of `base*` and `evdev*` files. You can do it simply by:

```
cd $xkb/rules
for a in base* evdev*; do cp -pv $a saved-$a; done
```

If anything happens and you will have to restore them as described in section 7.1, you do the reverse operation simply by

```
cd $xkb/rules
for a in saved-*; do cp -pv $a ${a#saved-}; done
```

Of course, you can edit the files in any text editor and revert the changes but copying the saved files is easier.

7.4 Installing the xkb files

This package contains three directories: `manual` with this manual, `symbols` with the layout definition files, and `rules` with fragments of configuration files.

You should first decide whether you wish to install both layouts or only one of them. After decision you copy the corresponding file(s) from the package's `symbol` directory to `$xkb/symbols`. Afterwards you have to modify `base.xml` and/or `evdev.xml`. The fragments are present in these files:

- `define-cz_tex.xml`
- `define-dvng`
- `define.guj_tex.xml`
- `define.am_mac.xml`

The best place for these fragments is at the end of the `<layoutList>` element. It should better be done by means of an XML editor as shown in Figure 5.

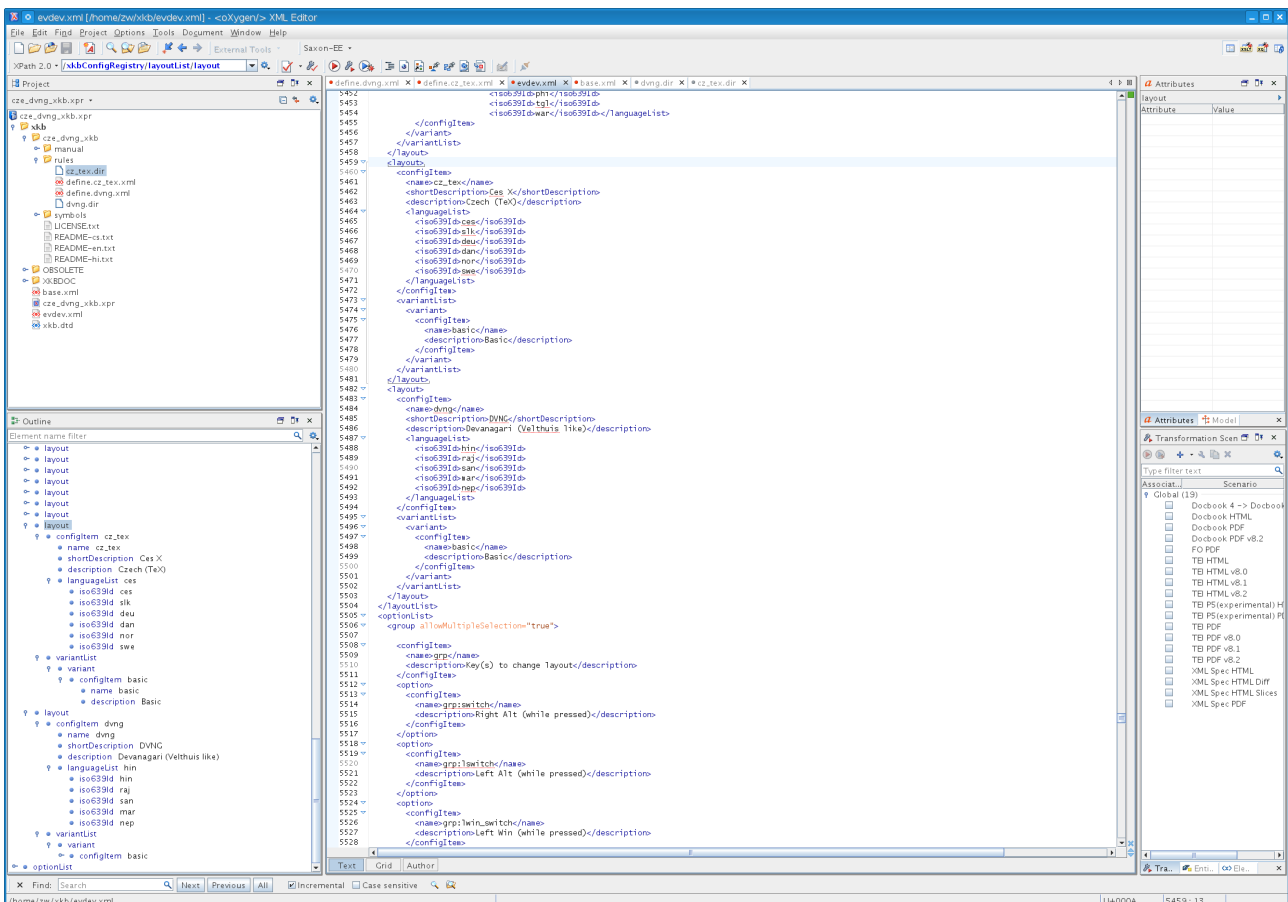


Figure 5: Editing the XML configuration files

Afterwards open the `base.lst` and `evdev.lst` files, locate the end of the `! layout` section and add the definitions of the selected layouts (one of the following lines or both):

```
cz_tex      Czech (TeX)
dvng       Devanagari (Phonetic, Velthuis like)
```

```

am_mac           Armenian (Mac)
guj_tex          Gujarati (Phonetic, Velthuis like)

```

The `$xbk` directory may contain `symbols.dir` file. It should contain the list of layout files. Inspection of the file distributed with Fedora 17 reveals that only a few files are listed in it. It is not sure whether editing the file is needed. Anyway, the fragments are prepared in the `cze_tex.dir`, `dvng.dir`, `am_mac.dir`, and `guj_tex.dir` files. Put the contents of these files to the end of the `symbols.dir` file.

In the rescue instructions we did not mention to make a copy of the `symbols.dir` file. It is quite easy to restore it by any text editor because the lines are placed at its end.

After installation the permissions of the new files has to be checked. It seems that the files need not be owned by `root` but they must be readable by everybody.

After installation of the files you have to restart Xorg which is usually done by `Ctrl-Alt-Backspace`. Remember that it kills all programs running on your desktop.

7.5 Enabling the keyboard layouts in the desktop environments

After restarting Xorg the new layouts are available for configuration but cannot yet be used. It is first necessary to configure them.

As shown in figures 6 and 7, the keyboard layouts contained several variants differing in the selection of the level 3 modifier. These variants have been removed because the level 3 modifier should be configured in the keyboard preferences dialogue. The system works without explicit support in the layout definition files. The author prefers to use any Win key as the level 3 modifier.

The screenshots for layouts configuration are very old and not updated to the current distributions. However, the appearance is very similar and you should be able to find the settings on your desktop.

The first example shows how to configure the keyboard in Gnome version 2. Open the keyboard preferences and select the layout and switching options similarly as shown on Figure 6. Gnome version 3 is quite user hostile, at least according to author's point of view. The author hopes that the keyboard preference dialogue is not very different.

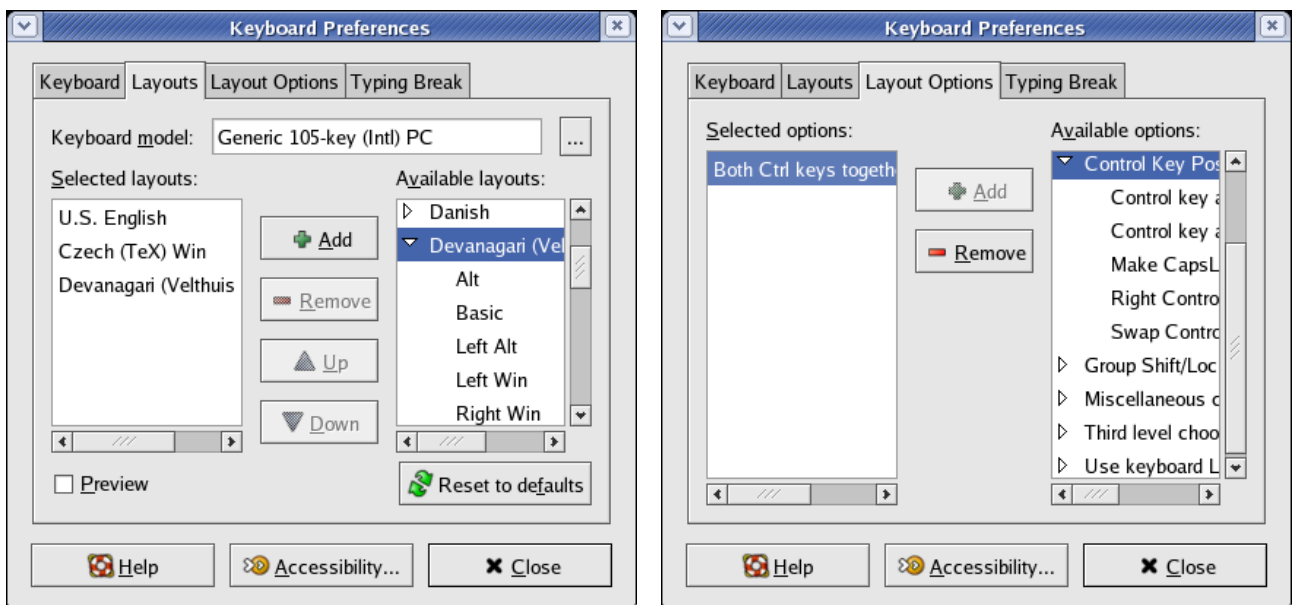


Figure 6: Enabling the keyboard in Gnome v. 2.x

Xfce alone does not contain any tool for keyboard switching. It is offered by the panel plugin `xfce4-xkb-plugin` that has to be installed separately. It most probably exists as a package for your Linux distribution. The keyboard preference dialogue is similar.

Figure 7 shows the dialogues in the KDE plasma workspace. Notice that even the key sequence for killing the X server can be configured.

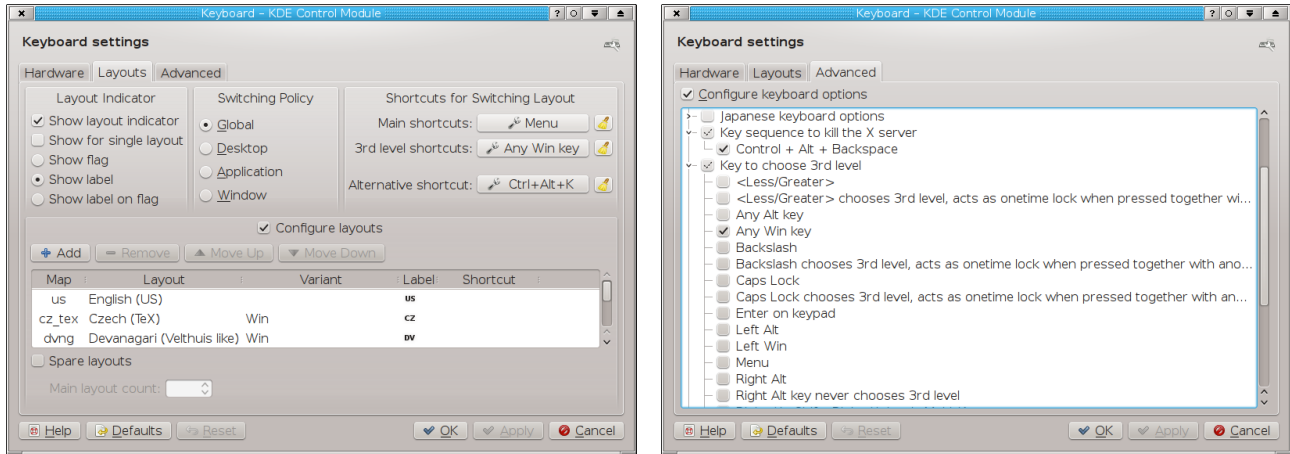


Figure 7: Enabling the keyboard in the KDE plasma session

It can happen that the layout cannot be added. It happened to the author and the reason was not understood but it was possible to solve the problem by method explained in section 8.2.

7.6 Layout switching shortcut

The layout switching shortcut is configured in the keyboard preferences dialogue. The shortcut should be simple so that the user can switch layouts quickly. However, it should be selected in such a way that the layouts could not be switched accidentally. The shortcut must not hide important keys. The following shortcuts are bad from the author's point of view:

left shift + right shift – Imagine you wish to type an abbreviation such as PS. You will type it as left shift + P and right shift + S. It may happen that you hold both shifts for a while and the layouts will be switched.

shift + control – Some applications make use of shortcuts in the form of Shift-Ctrl-key, for instance Shift-Ctrl-S is often used for *Save As*. If you select shift + control for layout switching, these application shortcuts will be unavailable.

alt + control – This is a similar case, Ctrl-Alt-key shortcuts are used in some applications and they will be hidden.

Originally the author used both control keys as a layout switching shortcut. Currently, the KDE plasma workspace offers even better possibility, the Menu key. If you wish to use two different layouts only, it may be advantageous to use the Scroll Lock key and let the keyboard status displayed by the Scroll Lock LED.

KDE Plasma (and probably other desktops as well) supports up to four keyboard layouts which can be changed cyclically. More layouts can be configured but they must be selected by other means. At the time of writing this document it seems to be better to select just two main layouts and assign shortcuts. The layout switching shortcut then switches between the first two layouts. However, when another layout is chosen using its shortcut, the the layout switching key will switch between that layout and the first

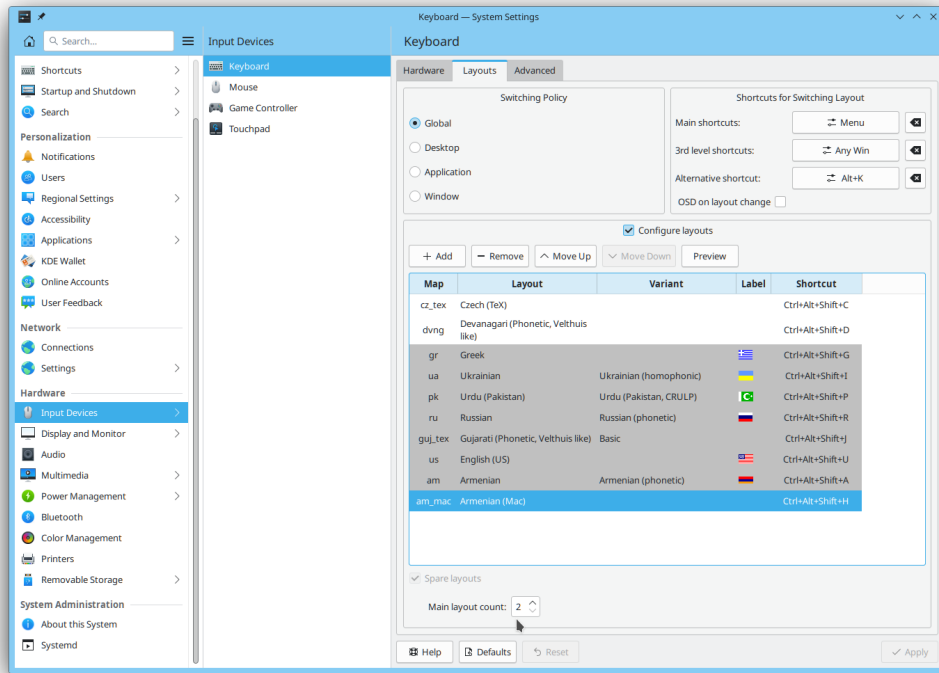


Figure 8: Keyboard layout configuration dialogue in KDE5 Plasma

layout without changing the priorities in the configuration. It is thus possible to write a \TeX document in a non-Latin script and access \TeX sequences very easily.

The layout switching almost does not work in Wayland³ if more than two layouts are used. It can cease to work in KDE Plasma after system update. Recovery is explained in section 8.2.

7.7 Upgrade from v.1.0

Version 1.0 of this package contained only the Czech/Slovak and Devanāgarī layouts. If all you need is just upgrade of these layouts, it is sufficient to replace the files in the `symbols` directory and restart Xorg. If you need to modify the XML definitions and/or add other layouts, you must follow the complete installation.

7.8 Uninstallation

As a matter of fact, uninstallation should not be needed. Once you know that the existence of the files does not break your graphical subsystem you need not care. You may wish to disable the layouts in the keyboard preference dialogue. If you really wish to uninstall them, follow these steps:

1. Remove the layouts from the keyboard preference dialogue.
2. Remove the information on the added layouts from configuration files `base.lst`, `base.xml`, `evdev.lst`, `evdev.xml`, `symbols.dir`.
3. Delete files `cze_tex`, `guj_tex`, `am_mac`, and `dvng` from the `$xkb/symbols` directory.
4. Restart Xorg.

³At the time of writing this document.

It seems that the configuration files are examined at Xorg startup only. It should not therefore be necessary to restart Xorg immediately after editing the configuration files.

8 Known problems

The layouts are routinely used by the author and were tested on several distributions, mainly CentOS and Fedora. However, some problems are known.

8.1 Disabled control keys

Both the Czech and Devanāgarī keyboards for some reason disable control keys Ctrl-1, Ctrl-2 etc. in Fedora 17. Control keys work properly if the keyboard is switched to US or any other standard layout. This problem did not appear in previous Linux distributions.

8.2 Problems with Xorg updates

During updates the files in the `rules` directory are usually replaced with the maintainers' versions and the custom layout definitions are thus lost. However, the GUI usually stores information about configured layouts in its own configuration files which means that they usually continue to work, sometimes with some limitations. Files in the `symbols` directory always persist.

Two types of problems were observed in KDE Plasma:

1. Layout switching works abnormally or does not work at all.
2. Layouts newly defined in `base.xml` and `evdev.xml` do not appear in the dialogue even after OS restart.

KDE Plasma stores its configuration in user's `~/.config` directory. Two files are important, namely `kglobalshortcutsrc` in the *[KDE Keyboard Layout Switche]* section and `kxkbrc` in the *[Layout]* section. These are plain text files and can be edited by any text editor but the changes take effect after the GUI restart. It is good to have a copy of the files before you start editing them.

It happened to me several times that after the system update `kglobalshortcutsrc` contained several copies of the same keyboard layouts with different names and conflicting shortcuts. In such a case changes in the configuration dialogue do not work but manual copying using the *trial & error* method usually leads to success.

Recently I was unable to add a new keyboard layout although it was defined in `base.xml` and `evdev.xml`. KDE Plasma has the list of layouts in `kxkbrc`. *LayoutList* contains the comma separated list of layouts which are the names of the files in the `symbols` directory. *DisplayNames* contains the comma separated list of identifiers shown on the layout indicator widget, the identifier can be empty (the widget then probably takes it from the XML file) but the number of commas must match. The best way for addition of a new layout is at the end of the list. The layouts in `kglobalshortcutsrc` are ordered alphabetically. It is necessary to add the name corresponding to that in the XML description, primary and alternative shortcut (it can be *none*), add a descriptive text. If it works after the GUI restart, the order can be safely modified in the configuration dialogue.

8.3 Preview not displayed in KDE Plasma

Figure 8 on page 16 shows the keyboard layout configuration dialogue in KDE5 Plasma. It is possible to display the preview. The preview is resizable (the layouts in this manual were created as screenshots

enlarged to the full width of the monitor) and displays even larger picture if the mouse is over a key. It seems that KDE needs the information from the XML files. If the definitions of the custom layouts disappears from the XML files in the `rules` directory, the *Preview* button does not work for them but will continue to work with the layouts which are parts of your distro. Be prepared to reinsert these definitions following the instructions in section 7.4 on page 13 if you need the layouts.

8.4 Missing characters

It may happen that a key does not type a character as defined in the layout table. This is not a problem of `xkb` but a problem of a font. The author added many characters that might be useful but some of them do not exist in all fonts. All characters were tested with GNU FreeFont release 2012-05-03 [7]. It is the font with which this manual was typeset.

8.5 Czech right quote missing

UNICODE contains separate pair of Czech (double) quotes and English quotes. The standard says that the Czech right quote is a variant of the English left quote. Some fonts contain both complete pairs, some fonts do not contain the Czech right quote and the English left quote must be used. Especially when writing a web page without supplying the font it is better to use the English left quote for compatibility.

8.6 Installation problems

A few problems occur during or after installation:

- *Wayland* works fine with two layouts but at the time of writing this manual it has fatal problems if three or more layouts are configured. Shortcuts do not work, random layouts are selected. If a layout is selected by clicking to an applet, the layout is often switched when you click to an application window. It is near to impossible to write a bug report because the behaviour is not reproducible at all and sometimes even works as expected. Layout switching works fine in *Plasma*.⁴
- Xfce `xkb` plugin loses the setting of the layout switch shortcut. It seems to be a problem of the plugin, not the layouts.
- If the Xorg configuration files are edited and new layouts added, Gnome may lose all its settings and recover them after rebooting the computer. It happened to me only once in CentOS 5.0, so maybe it was a Gnome bug that has already been fixed. Anyway, it may be better to remove the keyboard indicator from the panel, restart the X server, install the files and after restarting the X server add the keyboard indicator back to the panel.
- New layouts can be invisible in the dialogue even if the definitions are included in `base.xml` and `evdev.xml`. Solution was described in section 8.2.

Finally it should be noted that it might be better to put user's changes to files `base.extras.xml` and `evdev.extras.xml` but it was not tried.

9 Changes in v.2.0

- Icelandic letters þ, Þ, ð, Ð added to the Czech keyboard.
- IPA letter ə added to L3-f on the Czech keyboard

⁴I have currently 10 (ten) layouts enabled in KDE Plasma and switching works fine.

- Accents dot below and dot above added to L3-B of the Czech keyboard.
- Gujarātī keyboard layout added.
- Armenian keyboard layout added.
- Documentation enhanced.

10 References

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