

languageONE

Version 3

OVERVIEW

languageONE is an extensible system, that is – it is easily extended (most languages are). Because the system is basically a collection of assembler macros, a macro may be written by anyone and used as they code. Done correctly, the macro sits in the language as though it had always been there.

So what are packages ?

Packages are a collection of macros, and their underlying subroutines, written in raw languageONE code, that extends languageONE and provides the backbone for completing common tasks. This document maps out the three such package, LCURSES.PKG that extends languageONE by providing greater control over the keyboard and screen, LMENUS.PKG which assist in building common menus and MATHS.PKG that provides access to the FPU and its associated functions.

To provide access to a languageONE package, you must code an include statement. ie:-

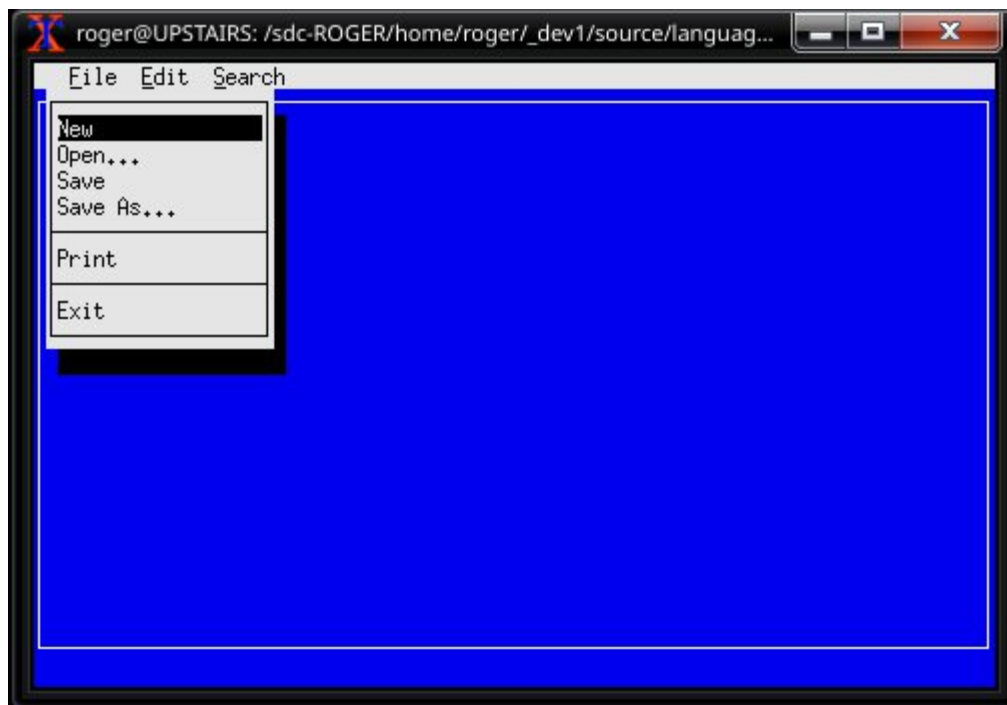
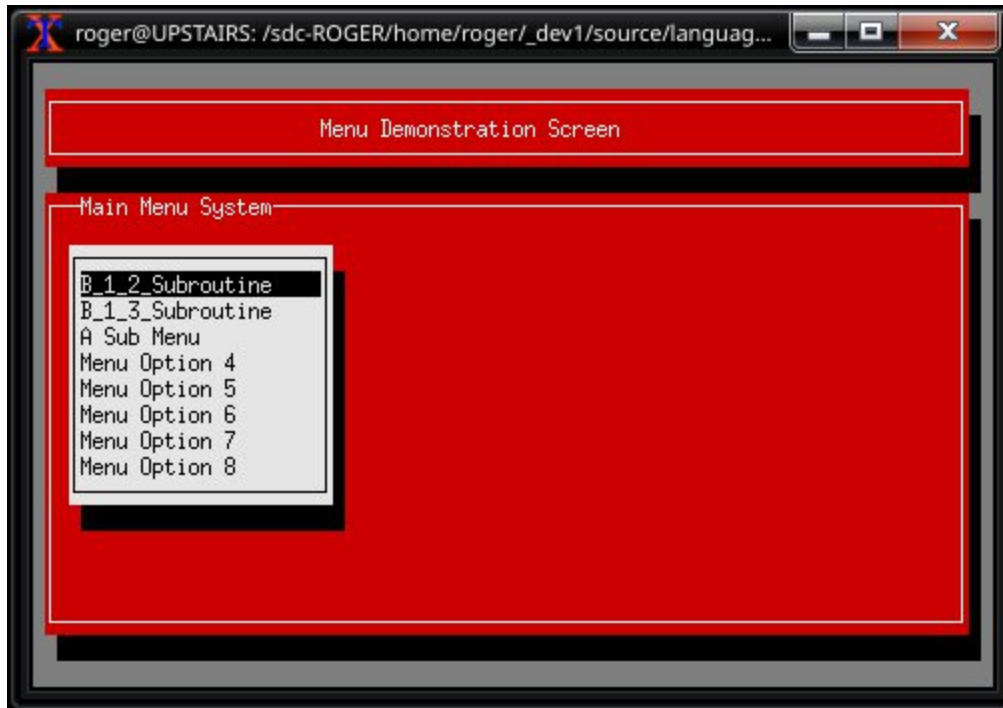
- `%include 'include/LCURSES.PKG'`
- `%include 'include/LMENUS.PKG'`
- `%include 'include/MATHS.PKG'`

NOTE:-LMENUS uses LCURSES so if you intend to use LMENUS then LCURSES must be defined along with it.

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The following screenshots offer an example of the output that is easily attained with the `lcurses` and the `lmenus` packages.



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A WORD ABOUT TERMINALS

Historically speaking a terminal is a relatively dumb electromechanical device with an input interface (like a keyboard) and an output interface (like a display). It was connected to another device (like a computer) via two logical channels, and all it does is:

- send the keystrokes down the first line
- read from the second line and display them on the screen.

escape sequences were used to control cursor location, color, font styling, and other options on video text terminals. Certain sequences of bytes, most starting with an escape and a bracket character followed by parameters, are embedded into text. The terminal interprets these sequences as commands, rather than text to display verbatim.

Almost all manufacturers of video terminals added vendor-specific escape sequences to perform operations such as placing the cursor at arbitrary positions on the screen. One example is the VT52 terminal, which allowed the cursor to be placed at an x,y location on the screen by sending the ESC character, a Y character, and then two characters represented by numerical values equal to the x,y location, plus 32 (thus starting at the ASCII space character and avoiding the control characters). The Hazeltine 1500 had a similar feature, invoked using ~, DC1 and then the X and Y positions separated with a comma. While the two terminals had identical functionality in this regard, different control sequences had to be used to invoke them.

As these sequences were different for different terminals, elaborate libraries such as termcap ("terminal capabilities") and utilities such as tput had to be created so programs could use the same API to work with any terminal. In addition, many of these terminals required sending numbers (such as row and column) as the binary values of the characters; for some programming languages, and for systems that did not use ASCII internally, it was often difficult to turn a number into the correct character.

The ANSI standard attempted to address these problems by making a command set that all terminals would use and requiring all numeric information to be transmitted as ASCII numbers. These standards were introduced in the 1970s to replace vendor-specific sequences and became widespread in the computer equipment market by the early 1980s. They were used in development, scientific, commercial text-based applications as well as bulletin board systems to offer standardized functionality.

Although hardware text terminals have become increasingly rare in the 21st century, the relevance of the ANSI standard persists because a great majority of terminal emulators and command consoles interpret at least a portion of the ANSI standard.

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A WORD ABOUT TERMINAL EMULATION

A terminal emulator is a program that emulates the functionalities of the traditional computer terminals. In simple words, unlike the classic terminal that performed functions using hardware, the terminal emulator executes the same tasks in software. Examples of Linux terminal emulators are xterm, konsole and gnome-terminal.

ncurses (new curses) is a programming library providing an application programming interface that allows the programmer to write text based user interfaces in a terminal-independent manner. It is a toolkit for developing application software that runs under a terminal emulator.

LCURSES maybe thought of as “languageONE curses” or perhaps “light curses”. It does not try to be ncurses but tries to provide enough functionality so that a fully functioning text based interface can be easily produced within a terminal emulator. It defines the most common escape codes as mnemonics and allows their transmission and receipt via the standard languageONE display and accept statement. LanguageONE has previously provided this function but the LCURSES.PKG has been developed to give far greater control than was previously possible. It also highlights the use of languageONE as a macro language and how the language itself may be extended by building on itself.

Some Assumptions Lcurses does not try to determine the type of terminal any specific emulator mimics. It assumes ANSI standard or VT52/VT100 (or combination). It has been tested with xterm, konsole and gnome-terminal and relies on the ability of these emulators to be configured to return specific escape sequence for any given key.

STDIO.LIB is the languageONE module that provides terminal access and it is there you will find the escape codes that are being used. As languageONE is delivered with all the original source code it is a simple task to modify the generic escape codes currently being used to something that may be more appropriate. Having said that, it is a more desireable path to simply configure the emulator to return that which languageONE expects.

One Last Thing. Originally a terminal was connected to the computer through serial cables plugged into a Universal Asynchronous Receiver and Transmitter (UART). A UART driver reads from the hardware device and applies the line discipline. The line discipline is in charge of converting special characters (like end of line, backspaces), and echoing what has been received back to the teletype, so that the user can see what it has been typed. It is also responsible to buffer the characters. When enter is pressed, the buffered data is passed to the foreground process for the session associated with the TTY. The whole stack as defined above is called a TTY device.

IMPORTANT:- echoing what has been received back to the teletype. It is undesirable to echo escape sequences as this will destroy any screen that we are trying to build. This should be turned off by the use of the following command LINUX:/\$ stty -echoctl To make this permanent it should be coded within your .bashrc

EXAMPLES:- languageONE/src/examples/V2.13.ONE is an example program used for the development of the lcurses and lmenu packages and can be used as a guide in developing languageONE programs that use the lcurses and lmenu facilities. In addition languageONE/src/examples/0.MENU-TEMPLATE.ONE is a template program that can be used to build menu driven applications.

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LCURSES

The LCURSES.PKG manages line drawing characters and an enhanced AcceptAt macro.

HORIZONTAL LINE

`lcurses_hline` startRow, StartColumn, EndColumn

This macro will generate a horizontal line at the specified row, starting at startColumn and finishing at EndColumn. The desired foreground and background colours need to be established prior to this call

VERTICAL LINE

`lcurses_vline` startCol, StartRow, EndRow

This macro will generate a vertical line at the specified column, starting at startRow and finishing at EndRow. The desired foreground and background colours need to be established prior to this call

BOX

`lcurses_box` startRow, startColumn, endRow, endColumn, Shadow

A box will be drawn using the supplied parameters. Shadow should be set to `c_TRUE` if a shadow is required or `c_FALSE` if a shadow is not required. The desired foreground and background colours need to be established prior to this call.

ACCEPTAT

`lcurses_AcceptAt` Row, Col, FieldName

AcceptAt enhances the Accept.At macro by acknowledging a number of function keys and returning a value by way of RETURN_CODE.

The following constants have been defined:-

FUNCTIONKEY1	FUNCTIONKEY2	FUNCTIONKEY3	FUNCTIONKEY4
FUNCTIONKEY5	FUNCTIONKEY6	FUNCTIONKEY7	FUNCTIONKEY8
FUNCTIONKEY9	FUNCTIONKEY10	FUNCTIONKEY11	FUNCTIONKEY12
RETURN	ALT	ARROWUP	ARROWDOWN
ARROWRIGHT	ARROWLEFT	END	HOME
INSERT	ENDOFFIELD	ESCAPE	BACKSPACE
NULL			

Additionally, STDIO.LIB now includes 2 more escape code driven variables. They are:-

`c_HideCursor`

`c_ShowCursor`

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LMENUS

The LMENUS.PKG will draw and manage menus based on the data supplied to it. Note that it uses the lcurses.pkg which must be included in your program if you want to use it. It functions by accessing two tables that should be defined by the calling program. They are:-

THE ALL MENUS TABLE

which defines all the menus that the calling program wishes to manipulate. The index into the table identifies the table while the table record defines the geometry of the table. The following record must be coded within the calling programs files section.

```
@begin_record c_AM_RecordLen, AM_Record
  @insertnumber AM_StartRow,    00,'99'
  @insertnumber AM_StartCol,    00,'99'
  @insertnumber AM_EndRow,      00,'99'
  @insertnumber AM_EndCol,      00,'99'
@end_record AM_Record
@insertnumber AM_Idx,           00,'99'           ; the index returned by LMENUS.PKG
```

THE MENUS TABLE

which defines the individual menu items. It is a 2 dimensional table with the 1st dimension defined by AM_Idx sourced from the all menus table. The following record must be coded within the calling programs files section.

```
@begin_record c_M_RecordLen,M_Record
  @insertword    M_Type,        01,""           ; the menu entry type
  @insertnumber  M_Target,      00,'99999999'    ; the target
  @insertword    M_Entry,       55,""           ; and the text
@end_record M_Record
@insertnumber M_Idx,           00,'99'         ; the index returned by LMENUS.PKG
```

NOTE: that c_AM_RecordLen and c_M_RecordLen must be defined before their use and ALWAYS have the following definition:-

```
c_AM_RecordLen    EQU 08
c_M_RecordLen     EQU 64
```

NOTE: that c_AM_NoOfRecords and c_M_NoOfRecords used by the lmenus program (and your own) must be established preceding the include statement. Define them as:-

```
c_AM_NoOfRecords  EQU nn
c_M_NoOfRecords   EQU nn
```

As with all tables in languageONE there must be an entry in the tables section:-

```
@inserttable AM_Table, c_AM_RecordLen*8    ; Allows for 8 menus
@inserttable M_Table, c_M_RecordLen*8*16    ; Allows for 8 menus with 16 entries
```

and they must be bound in the instructions section:-

```
@tables_bind AM_Table,AM_Record,8
@tables_bind M_Table,M_Record,8,16
```

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MENU ITEMS

`lmenus_MenusItems` `AM_Idx`, `M_Idx`, `M_Type`, `M_Target`, `M_Entry`

The Menus record may be populated and loaded manually but the `lmenus_MenusItems` has been defined to make this a little easier.

M_TYPE

- S: A Subroutine in this (or a linked) program
- M: A sub Menu
- X: An external program
- Space is end of options and must be defined to mark the end of the menu

M_TARGET

- M_Type = S: Subroutine name
- M_Type = M: Menu No
- M_Type = X: 0

M_ENTRY

The text that appears on the menu

NOTE:- That if this table is loaded manually, the target must be loaded using the following fragments of assembler code:-

If the Target is a Menu, the target must be loaded with it's number

- `mov qword[M_Target],Menu Number`

while if the target is a subroutine the address must be loaded as

- `lea rax,SubRoutineName`
- `mov qword[M_Target],rax`

MENU

`lmenus_Menu` `AM_Idx`, `c_TRUE/c_FALSE`

The menu macro will pass handling of the menu over to `lmenus` to manage. This routine simply handles the `ARROWUP` and `ARROWDOWN` keys while returning the `RETURN` and `ESCAPE` keys along with the `ARROWLEFT` and `ARROWRIGHT` keys in `RETURN_CODE`.

When the `RETURN` key has been pressed `AM_Idx` and `M_Idx` will have been set and the table record has been read.

When the second parameter is set to `c_TRUE` `lmenus` will wait for a user response. When the second parameter is set to `c_FALSE`, the menu will be displayed and `lmenus` will return control to the calling program.

CALL

`lmenus_Call` `M_Target`

This macro should be used (in place of the normal `$Call`) when a sub routine name has been returned the `lmenus.Menu`.

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MATHS

The MATHS.PKG provides access to the FPU in the form of functions

F_ADD(X,Y)

`Answer = f_Add(Number1,Number2)`

Adds Number2 to Number1 and returns the result in Answer.

F_SUB(X,Y)

`Answer = f_Sub(Number1,Number2)`

Subtracts Number2 from Number1 and returns the result in Answer.

F_MUL(X,Y)

`Answer = f_Mul(Number1,Number2)`

Multiplies Number2 and Number1 and returns the result in Answer.

F_DIV(X,Y)

`Answer = f_Div(Number1,Number2)`

Divides Number1 by Number2 and returns the result in Answer.

F_POWER(X,Y)

`Answer = f_Power(Base,Exponent)`

returns the result of the base to power of the exponent.

F_SQROOT(X)

`Answer = f_SqRoot(Number)`

returns the square root of Number.

F_SIN(X)

`Answer = f_Sin(Degrees)`

returns the sine of degrees

F_COS(X)

`Answer = f_Cos(Degrees)`

returns the cosine of degrees

F_TAN(X)

`Answer = f_Tan(Degrees)`

returns the tan of degrees

F_PI(X)

`Answer = f_PI()`

returns the value of PI

f_LogN(x)

`Answer = f_LogN(Number)`

returns the natural log of Number

F_LOG(X)

`Answer = f_Log(Number)`

returns the log of Number

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