CNCMILL

A brief Introduction

Introduction

CNCMILL is a linux based experimental program for numerical control of machine tools such as milling machines. CNCMILL is a work in progress, and one that progresses when I need to add features to meet my needs. Accordingly, the documentation is spartan, particularly as to the XML extensions I have added to the G_CODE compiler. The compiler was constructed with a copy of the EIA-274-D standard for numerical controlled machines. CNCMILL uses a kernel module compliant with a Rtlinux kernel to hard schedule signaling stepper motors through the parallel port. In my prototype installation CNCMILL is connected through the parallel port to four Gecko micro-step, stepper motor controllers and my Sanko-Denki steppers motors are powered by an Allied Electronics 48V, 3A DC power supply. As of October 2002, the power supply, and Gecko's are mounted in a surplus pc tower chassis with extra cooling fans in the box and individual fans and heat sinks on each Gecko. The Linux box is a 233mhz HP Pavilion running Redhat Linux 7.2. CNCMILL is currently an open loop control system.

Installation

Before installing CNCMILL you should obtain and install the rtlinux kernal. My current version of CNCMILL is using rtlinux 3.1. For my rtlinux kernal, I first downloaded the a linux 2.4.4 sources and obtain the rtlinux 3.1 source from http://www.rtlinux.org this should be a compressed tar file named "rtlinux-3.1.tar.gz". Unpack the rtlinux files and follow the instructions to create a rtlinux kernel. Make sure you backup your current kernel, and your grub loader files. When you have a rtlinux kernel built you will have to edit the grub file to make a second operating system entry. On boot-up you should leave your regular kernel as the default boot-up and select the rtlinux when you want to run real time applications such as CNCMILL.

After you have a rtlinux kernel up and running, you are ready to install CNCMILL. Read the installation notes on the "cncmill_month_day_year.tgz" file for the latest information

on which directory to install CNCMILL in. CNCMILL typically will be installed in "/usr/src/rtlinux/rtlinux-3.1/examples/cncmill". Once the distribution is unpacked run the installation script "install.sh" to install CNCMILL.

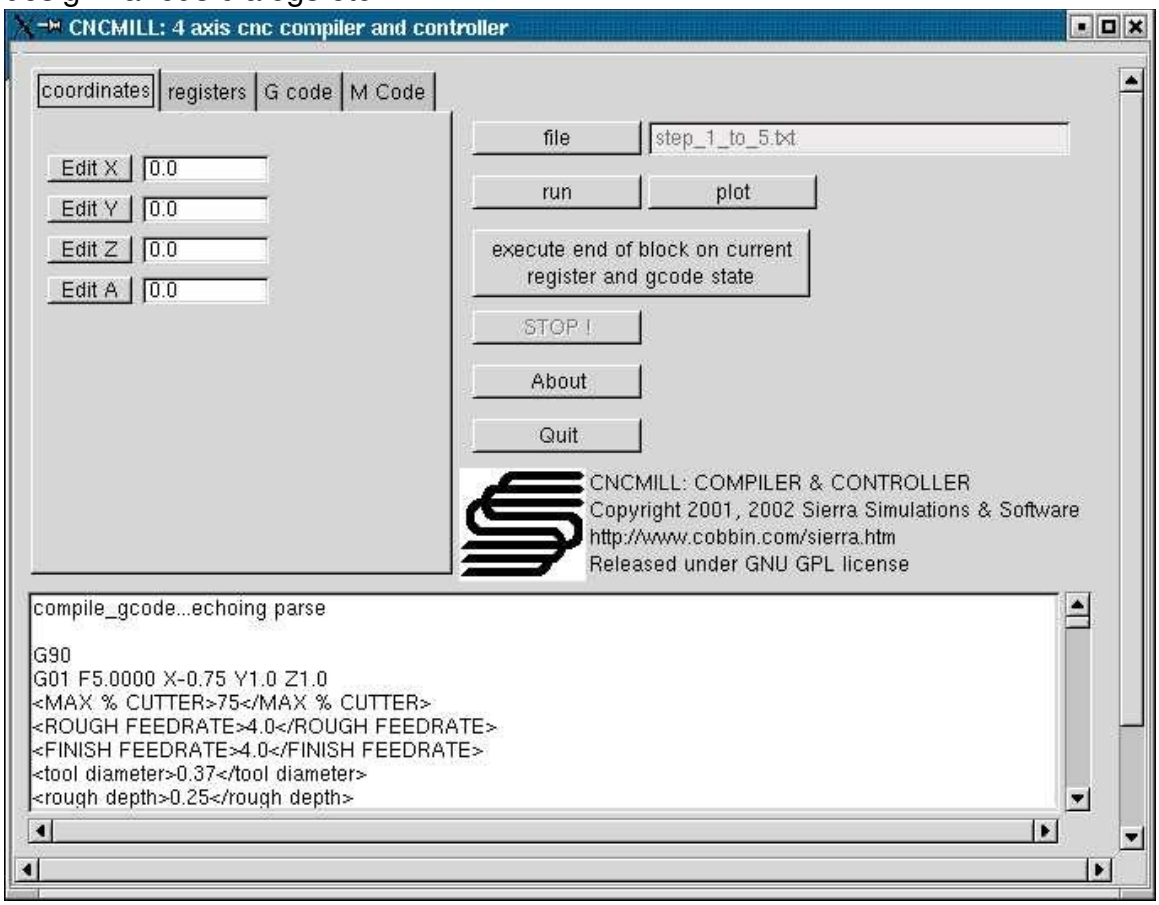
To run CNCMILL run the script:

./cnc

which will load the stepper controller into to the rtlinux kernel and start the cncmill executable.

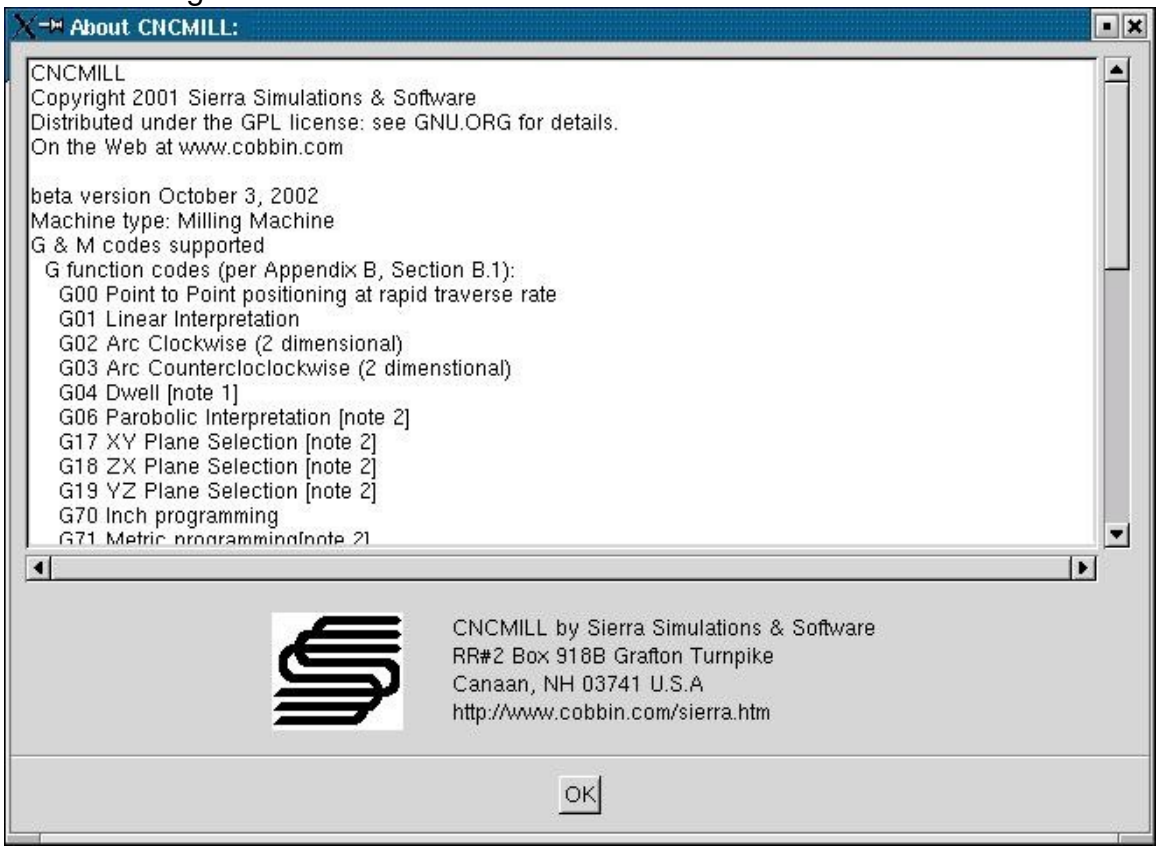
User Interface

Below is a figure of the general arrangement of the user interface which was constructed using the GTK+ widget library with the GLADE program used to design various dialogs etc.

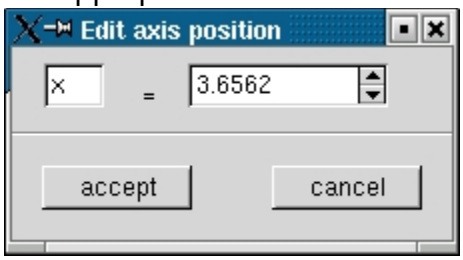


The four tabbed panes display current coordinates, status of data registers, G and M code state the machine is in. Press the "File" button to pop up a dialog to select a g_code file. A selected file is parsed for any glaring errors and if none are found, the file can be run using the "Run" button, or plotted using the "Plot" button.

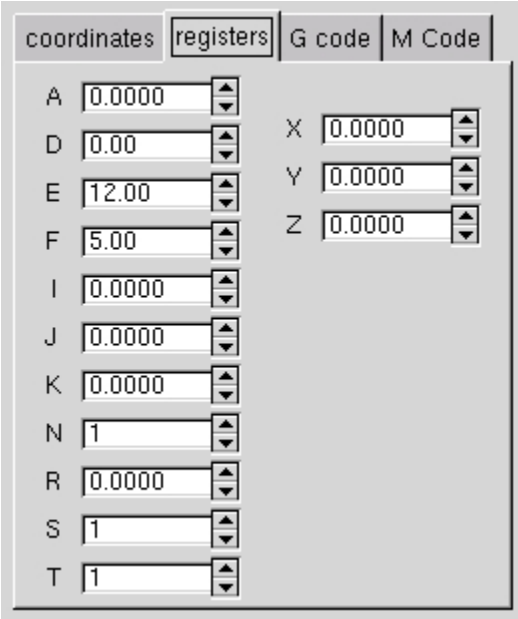
Details as to what G and M codes are supported are listed by pressing the "About" dialog button.



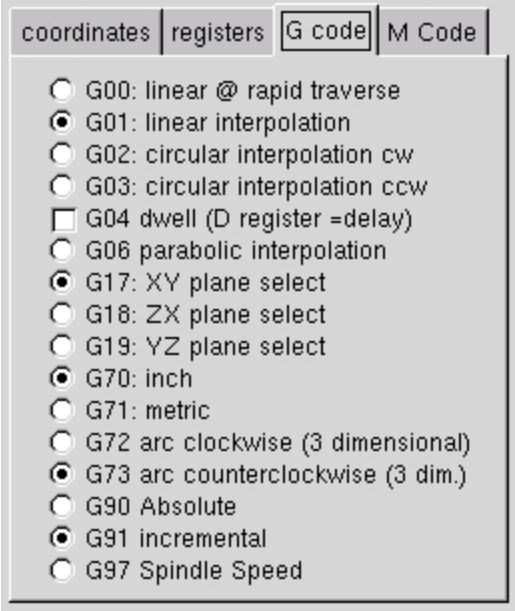
Individual axis's can be edited to reset the zero point, etc. for an axis by pushing the appropriate edit button.



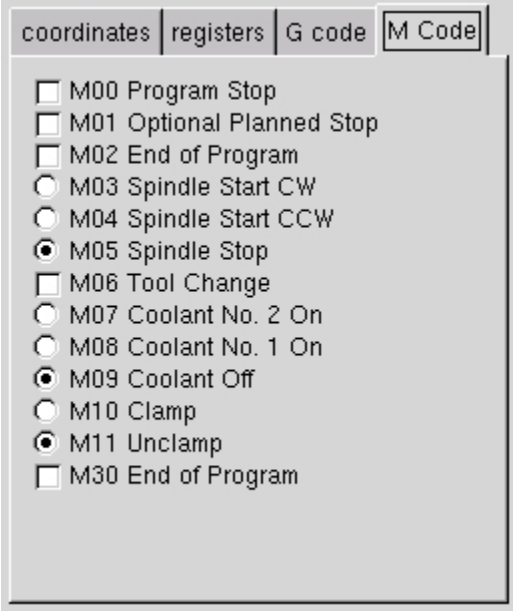
Individual data settings for registers such as X, Y, Z, I, J, R etc. can be viewed and edited with the "Registers" tab.



Likewise G_CODE and M_CODE settings can be made through the G_Code and M_Code tabs.

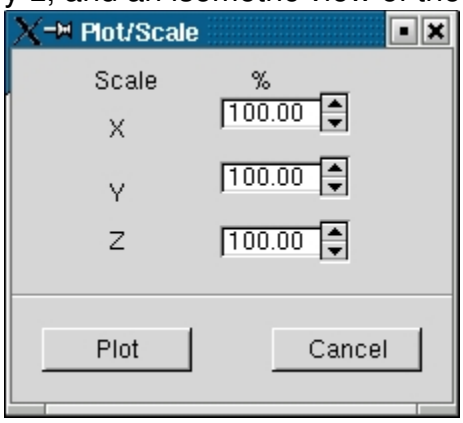


When the "Execute end of block on current register and gcode state" button is pressed the controller will run the current settings.

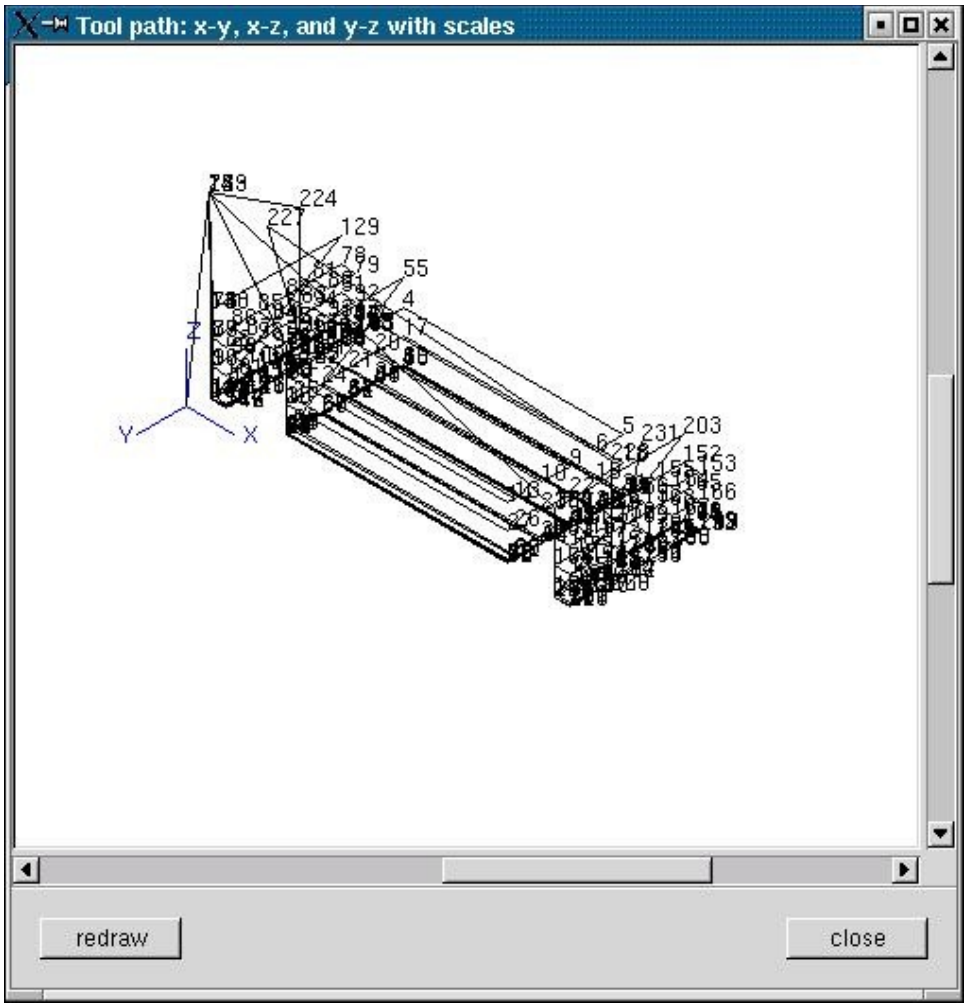


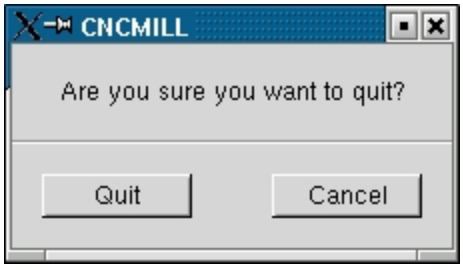
During execution of block of data entered manually, or during execution of a g_code program, pressing the "Stop" button will cause a termination of the current stepping in progress and resetting any g_code program currently being run.

Pressing the "Plot" button will pop up a plot scale dialog to allow adjustment of the plotting scale. When plotting, CNCMILL will simulate the execution of a g_code program and display a plot of the tool paths. CNCMILL plots the x-y, x-z, y-z, and an isometric view of the tool path

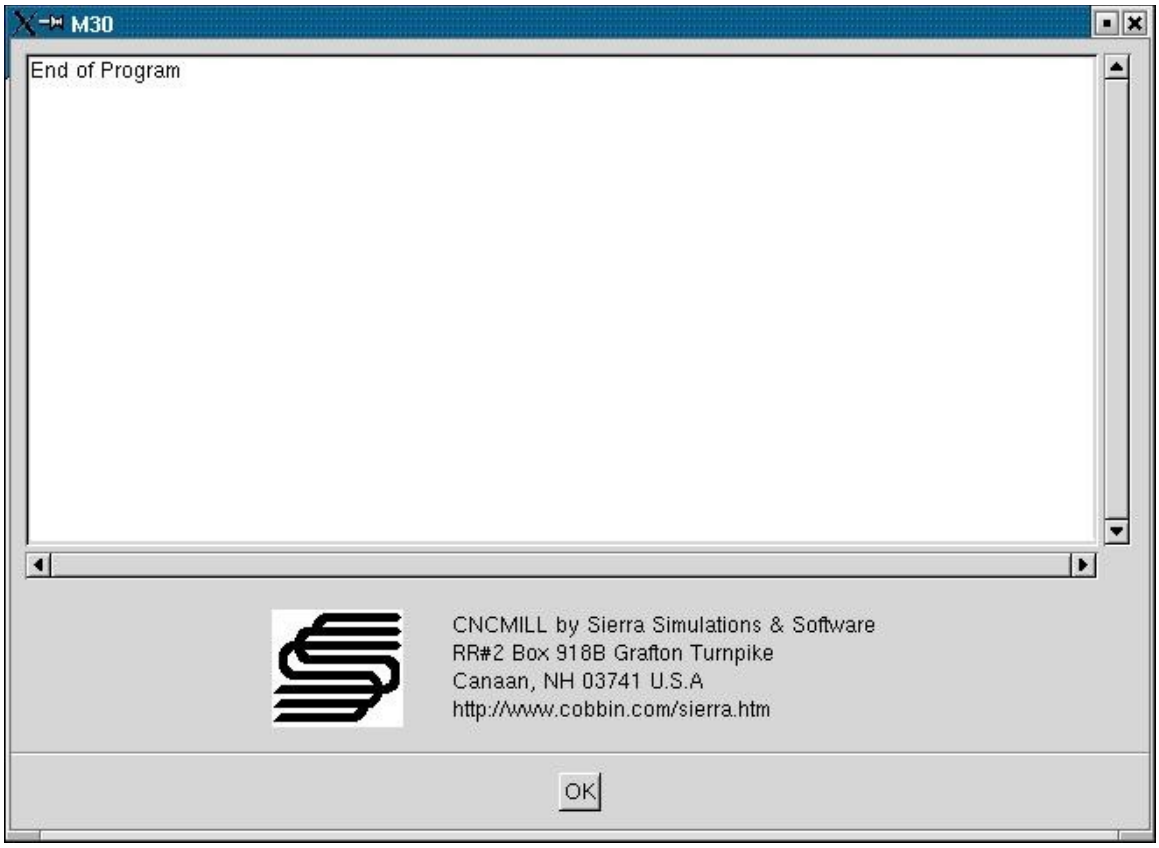


If you accidentally press the "Quit" button the software will put up a dialog for verification that you want to quit. This dialog also is displayed if you press the "X" button on the upper right of the main window.

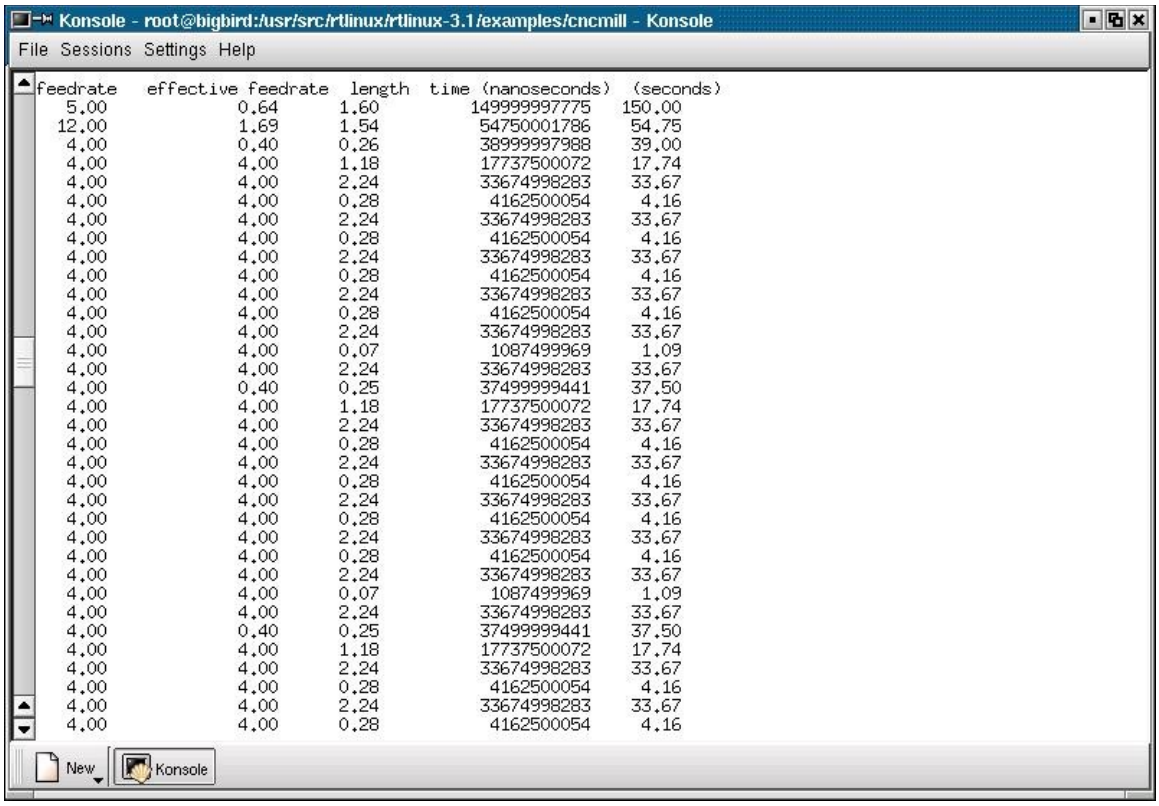




During execution of a g_code file, G04 (Dwell), M30 (End of Program) and other selected commands pop up a dialog message. The next release of CNCMILL will likely include an XML feature to allow for putting in descriptive messages and graphics for setup information etc.



CNCMILL is run by executing the "cnc" script which loads the stepper control module into the kernel and runs the cncmill program. During execution of CNCMILL the program currently rights out useful, and non-useful, information as the case may be. Currently, I have it write out information on expected move times and cumulative move times. My machine uses a worm drive on the knew of a 1957 Bridgeport milling machine, and when the dust settles it takes 60,000 steps to move the knee one inch.


Konsole - root@bigbird:/usr/src/rtlinux/rtlinux-3.1/examples/cncmill - Konsole
File Sessions Settings Help
feedrate effective feedrate length time (nanoseconds) (seconds)
5.00 0.64 1.60 149999997775 150.00
12.00 1.69 1.54 54750001786 54.75
4.00 0.40 0.26 38999997988 39.00
4.00 4.00 1.18 17737500072 17.74
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.07 1087499969 1.09
4.00 4.00 2.24 33674998283 33.67
4.00 0.40 0.25 37499999441 37.50
4.00 4.00 1.18 17737500072 17.74
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 0.07 1087499969 1.09
4.00 4.00 2.24 33674998283 33.67
4.00 0.40 0.25 37499999441 37.50
4.00 4.00 1.18 17737500072 17.74
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
4.00 4.00 2.24 33674998283 33.67
4.00 4.00 0.28 4162500054 4.16
New
Konsole