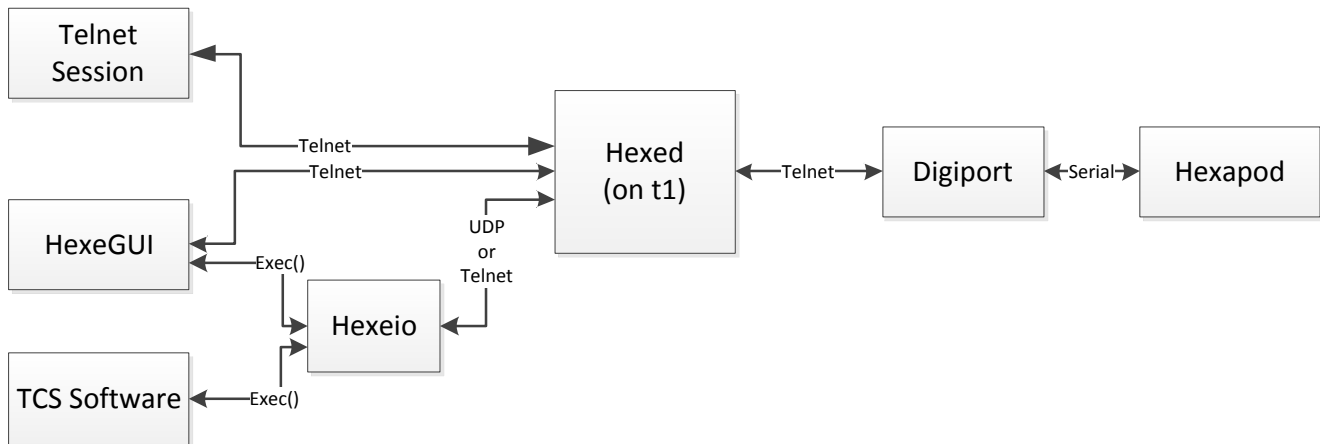


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1. What is the Hexed, HexeIO, and HexeGUI?

The following diagram illustrates the communication options provide by the Hexe programs.



The hexapod located at the telescope's secondary has a RS-232 serial port for IO. A digiport located in the MIM provide network (telnet) access to the serial port.

A Hexed (Hexe Deamon) process executing on T1 acts as a telnet and UDP server. It multiplexes various communication requests to the sole digiport session. As a telnet server it can support multiple telnet session.

The HexeIO program is a simple text-based utility to handle 1 command/response sequence to the hexapod via the Hexed. It can connect to the Hexed via it's UDP or Telnet interface. The default is UDP. HexeIO is intended to support user application or scripts that need hexapod support, for example the TCS software.

The HexeGUI is a user Graphical User Interface application providing communication to the hexapod. HexeGUI is intended to be used by the IRTF Daycrew and staff. HexeGUI is an X Windows application written in GTK+.

Application or Users can communicate with the Hexpod using HexeIO, socket (telnet) or UDP.

2. HexeD – The Hexapod Deamon.

The HexeD is the Hexapod Deamon. It runs on the TCS computer T1, and acts as a network server to the digiport port connect to the hexapod's serial port. It support some internal command, but it primary is used to pass command and response to the Hexapod.

2.1 Starting and Stopping HexeD

Hexed is automatically started whenthe T1 is booted. To stop and restart the daemon you should used the unix start/stop scripts in /etc/init.d/.

1. Become root on T1

2. Kill the hexed (if it is running)

```
% /etc/init.d/hexed stop
```

3. Start the hexed

```
% /etc/init.d/hexed start
```

2.2 Communicating with HexeD

You can communicate with the Hexapod via the Hexed using the following methods:

- 1) HexeGUI – Run the HexeGUI to communication to the HexeD .
- 2) HexeIO – used the HexeIO program for single command/reply sequences. This utility is useful for application and scripts.
- 3) Telnet. You can telnet to the hexed. Up to 5 connections are supported. To use the telnet session you must be login into one of the IRTF workstations. Telnet to T1 using port 30015. Type 'exit' when finished. Here is an example session.

```
telnet t1 30015
Trying 128.171.110.151...
Connected to tlhilo.
Escape character is '^]'.
stat n20
Commanded hexapod positions
Dimension          X          Y          Z          U          V          W
Transl. [mm]      0.0000    0.0000    0.0000          0.0000    0.0000    0.0000
Rotation [rad]          0.0000    0.0000    0.0000          0.0000    0.0000    0.0000
OK 0 -HD.EOC
exit
```

```
closing connection.
Connection closed by foreign host.
```

2.3 HexeD built-in commands

Normally the hexed just passes commands to the hexapod. There are a few internal hexed commands. These commands are described here:

die – Kills hexed.

Syntax `die`

exit – closes the telnet session used by the current client.

Syntax `exit`

focus – Set the focus value by setting the Z value on the hexapod.

Syntax `Focus z`

Range `z` – Value for Z. Limit to -8.0 to 8.0.

getfocus – prints the current Z values. Z indicated the focus value..

Syntax `GetFocus`

help – prints a summary of all the internal hexed commands.

Syntax `help`

hexe – passes a string to the hexed.

Syntax `Hexe string`

Range `string` – Any legal Hexapod Command.

IncFocus – Changes the focus value by incrementing the Z value on the hexapod by N.

Syntax `IncFocus n`

Range `n` – A value between -2.0 to 2.0. Note the resulting Z value is limited to -8.0 to 8.0.

log – Make the hexed writes a string to stdout.

Syntax `log string`

Range `string` – Any string.

show.GV – Prints out some hexed application variables.

Syntax `Show.GV`

verbose – Set the level of debug output printed by the deamon.

Syntax `verbose v`

Range `0 to 2` – The Lowest is 0 (default). Higher the value the more debug output.

version – Prints out the name and version number for hexed.

Syntax `version`

sim – Set the simulation flag. In simulation mode, no data is set to the digiport. Any HEXAPOD string are just reversed and returned to the caller.

Syntax `sim { off | on }`

Range `off` – disable simulation (default).

`on` – enables simulation..

Z – Set the focus value by setting the Z value on the hexapod. (same as Focus).

Syntax `Z z`

Range `z` – Value for Z. Limit to -4.0 to 4.0.

3. HexeIO – simple IO to hexed.

hexeio performs a single command/reply sequence to the hexepod daemon. This hexeio is install on all IRTF workstation and is intend to be used by other applications that need to communicate with hexed. Rather than building in the hexed socket or UDP protocol into your application, you can issue a system command to hexeio.

Synopsis:

```
Hexeio [-h hostname] [-v] [-s] [-u]
```

-h hostname	Computer hosting the hexed.
-v	Verbose. Default is off
-s	Use socket interface to hexed
-u	Use UDP interface to hexed (default)

Example:

```
hexeio stat n20
Commanded hexapod positions
Dimension           X           Y           Z           U           V           W
Transl. [mm]       0.0000     0.0000     0.0000
Rotation [rad]                    0.0000     0.0000     0.0000
OK 0 -HD.EOC

Completed. nchar=240 elapes_sec=0.446
```

4. HexeGUI – The Hexapod GUI.

The HexeGUI is a simple GUI for hexapod communication. This application is installed on the TCS workstation and the IRTF linux workstation.

To start the HexeGUI, type `hexegui` at your shell prompt. For example:

```
% hexegui
```

Figure 1 shows an example hexegui window. The major GUI widgets are labeled, and the output of the “stat n20” command is display in the feedback text area.

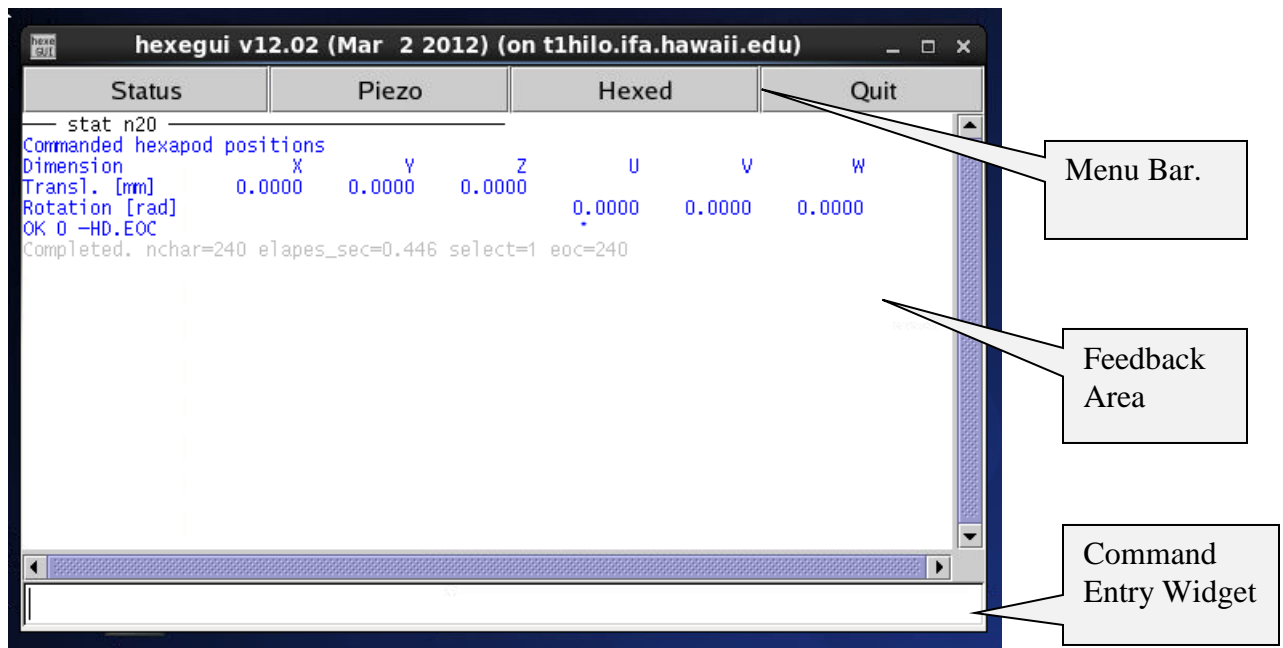


Figure 1 – HexeGUI

Type commands in the Command Entry Widet. Command should be legal HEXAPOD command or Hexed commands.

The feedback window will display the result of the command:

- Text in black show what was sent to hexed
- Text in blue, is what was returned by hexed.
- Gray text is information printed by hexegui.

Clicking on the status, piezo, and hexed button, brings up various pop up menu. Select a menu entry will issues the associated command to the hexed.

- The status menu contains HEXEAPOD “stat” commands.
- The piezo menu contains other HEXEAPOD query commands.
- The hexed menu contains some internal hexed commands.

```

stat n0 - MPIC system status
stat n1 - HEXC system status
stat n2 - Voltage of the power supplies and amplifier outputs
stat n10 - HEXC system values
stat n20 - Commanded HEXAPOD position
stat n21 - Commanded pivot point
stat n22 - Computed leg position
stat n23 - Computed leg velocity
stat n24 - Commanded HEXAPOD velocity
stat n30 - All motor controller status
stat n31 - Real position of all axis
stat n32 - Reference readout of all axis
stat n33 - Current velocity of all axis
stat n34 - Current acceleration of all axis
stat n35 - Status flags of all axis

```

Figure 2 – The status menu.

```

setf - MPIC System Control Flags
mpos - Report Piezo mirror positions (rad)
mssr - Mirror Slew Rate [rad/s]
mpid - Mirror PID Filter Parameters
mcmp - Mirror Compensation Values
mchp - Mirror Chop Angles and Timing
msin - Mirror Sine Amplitude and Frequency

```

```

getfocus - hexed getfocus value (z)
verson - show hexed version
show.gv - show internal hexed variables

```

Figure 2 and 3 – The piezo and hexe menu.

To quit the application, click the quit button.

4.1. HexeGUI built-in commands

Normally the HexeGUI just passes commands the hexed. There are a few internal hexegui commands. These commands are described here:

do – execute a command file.

Syntax `do filename`

`Rangefilename` – a text file of hexegui commands.

echo – Prints text to the command feedback window.

Syntax `echo text`

Range `text - any text`

hexe – passes a string to the hexed.

SyntaxHexe `string`

Range`string` – Any legal Hexapod Command.

init – execute the command in the `init_defaults` file. The `init` file is `/home/tcs3/data/hexapod_init`.

Syntax `init`

quit – Exits the application.

Syntax `quit`

wait – Pauses execute for `n` seconds.

Syntax `wait n`

Range `n` – Time in seconds. 1 to 300. .

Appendix A – Digi Port and Serial Note.

MPIC has a DB9 interface.

To connect the MPIC to a PC with DB9, a standard NULL Modem Cable, DB9F to DB9F is needed.

To connect the MPIC to a digiport, a RJ-45-socket-to-db9F adapter is need. Wiring for this is:

8-pin RJ45 Socket (10 pin socket, but 2 output pins ignored)	DB9F
2 (rts)	8 (cts)
4 (tx)	2 (rx)
5 (rx)	3 (tx)
6 (sgnd)	5 (sgnd)
7 (cts)	7 (rts)

2012-Mar – hexapod was tested in hilo using Portserver TS16 hilodigi port 2016. The configuration of the port is:

```
set line range=16 parity=N csize=8 error=ignore
set line range=16 baud=9600 stopb=1 break=ignore inpck=off istryp=off onlcr=off otab=off
set flow range=16 ixon=off aixon=off ixoff=off ixany=off itoss=off altpin=off forcedcd=off
set flow range=16 dtr=off cts=on dcd=off dsr=off
set flow range=16 ri=off
set flow range=16 pre-delay=0 post-delay=0
set flow range=16 rts=on

set port range=16 dev=prn sess=4 termttype="host" edelay=1 auto=off bin=off
set port range=16 uid=none group=none dport=none
set port range=16 dest=none
set port range=16 scriptname=none
set port range=16 keepalive=off flushstchar=default autoservice=default
set port range=16 autodrain=off
set port range=16 reducepkts=off
```

On Nov 14, 2002 the serial port was moved from digicass to digimim (a portserver II) port 2016. The digimin configuration for port #16 is

```
set line range=16 parity=N csize=8 error=null
set line range=16 baud=9600 stopb=1 break=ignore inpck=off istryp=off onlcr=off otab=off
set flow range=16 ixon=off aixon=off ixoff=off ixany=off itoss=off altpin=off
set flow range=16 rts=on dtr=off cts=on dcd=off dsr=off ri=off
set keys range=16 xon=^Q xoff=^S xona=^Q xoffa=^S
set keys range=16 eof=^D erase=^H intr=^C kill=^U tesc=^]
set port range=16 dev=prn sess=4 termttype=host uid=0 edelay=1 auto=off bin=off group=0
set port range=16 dest=0.0.0.0 dport=0
```

The Hexapod was original connect to digicass. Digicass configuration for port #4 is:

```
set ports range=4 termttype="host" dev=prn sess=4 uid=0 edelay=1^M
set ports range=4 auto=off bin=off group=0 dport=0 dest=255.255.255.255^M
set line range=4 baud=9600 csize=8 parity=N stopb=1 break=ignore^M
set line range=4 error=null inpck=off istryp=off onlcr=off otab=off^M
```

```
set flow range=4 ixon=off aixon=off ixoff=off ixany=off itoss=off altpin=off^M
set flow range=4 rts=on dtr=off cts=on dcd=off dsr=off ri=off^M
set keys range=4 eof=^D erase=^H flush=^@ intr=^C kill=^E lnxt=^V^M
set keys range=4 tesc=^] xon=^S xoff=^Q xona=^S xoffa=^Q^M
set logins range=4 cmdprompt="digi>" logprompt="login:"^M
set logins range=4 passprompt="passwd:"^M
set logins range=4 write=off login=on passwd=on verbose=off^M
```