
ROACHNEST Documentation

Release 1

Danny Price

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ROACHNEST: A browser based user interface for monitor & control of CASPER hardware

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INTRODUCTION

Roachnest is a browser based Graphical User Interface (GUI) for control of CASPER hardware. This script utilises the KATCP python libraries, the bottle web framework, and sqlite3:

- <http://casper.berkeley.edu/wiki/KATCP>
- <http://bottle.paws.de/>
- <http://docs.python.org/library/sqlite3.html>

The HTML/CSS is based on blueprint CSS web framework, and plotting is done with HTML5/javascript flot:

- <http://www.blueprintcss.org/>
- <http://code.google.com/p/flot/>

Warning: I strongly suggest that this is available only through an internal network and is not made accessible via the WWW. Use at your own risk.

SCREENSHOTS

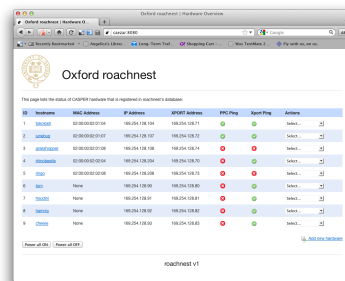


Figure 3.1: Homepage: hardware management

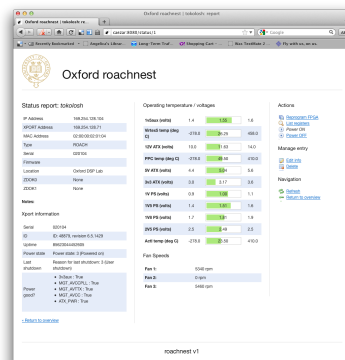


Figure 3.2: Detailed status and board control.

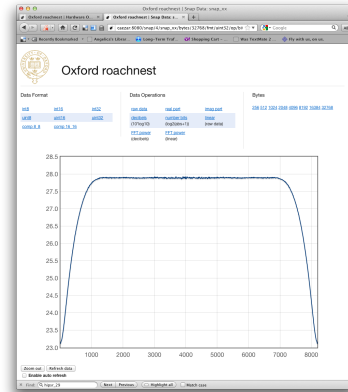


Figure 3.3: Javascript plotting of snap BRAMs.

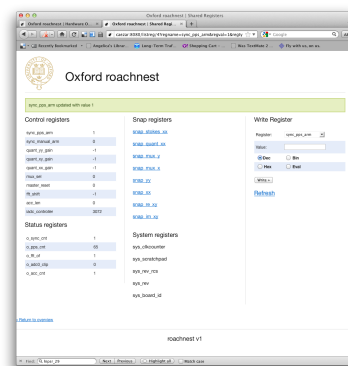


Figure 3.4: Reading and writing shared registers.

GETTING STARTED

The first thing you'll need to do is to satisfy the dependencies. You'll need:

os, sys, time, re, struct, `sqlite3`, `bottle`, `numpy`, `katcp`, `paste`, `lxml`

Note that `paste` and `lxml` are optional: `paste` improves webserver performance by using threading, and `lxml` is for parsing configuration files – although these won't appear until a future release!

After downloading the files, you should edit `lib/config.py`, and check that you're happy with the configuration. Note that you can change the page titles and the logo in this file.

Next, assuming you've got the dependencies sorted, all you should need to do is run:

```
>> python roachnest.py [options]
```

This would start up a webserver on localhost:8080. The options available are:

Options:

```
-h, --help            show this help message and exit
-p PORT, --port=PORT  Select KATCP port. Default is 7147
-i HOSTIP, --hostip=HOSTIP
                        change host IP address to run server. Default is
                        localhost (127.0.0.1)
-P HOSTPORT, --hostport=HOSTPORT
                        change host port for server. Default is 8080
```

Once the webserver is up and running, open a browser up and surf over to localhost:8080, or if you've changed the IP address and port, type these in instead (eg. 192.168.126.6:8888). If you want the page to be viewable over a network, you'll have to use the `-hostip` option and point this to the IP address of your ethernet card.

MODULE LISTING

5.1 roachnest.py

Created by Danny Price on 2011-01-12.

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Roachnest is a browser based Graphical User Interface (GUI) for control of CASPER hardware. It facilitates basic monitor and control tasks, such as turning boards on and off via the XPORT, reprogramming the FPGA, reading and writing registers, and plotting the contents of shared BRAMS (snap blocks).

Roachnest also provides basic hardware management through a small sqlite database. Users can add notes, specify IP addresses, hostnames, and other basic information necessary to keep track of hardware specifics.

License: GNU GPL: <http://www.gnu.org/copyleft/gpl.html>

Warning: I strongly suggest that this is available only through an internal network and is not made accessible via the WWW. Use at your own risk.

```
roachnest.create_db()  
    URL: /dbcreate
```

Creates a new database.

```
roachnest.download(filename)  
    URL: /download/:filename
```

Forces download of static files.

```
roachnest.hardware_add()  
    URL: /add
```

Add a new piece of kit to the database.

```
roachnest.hardware_edit(id)  
    URL: /delete/:id
```

Delete a piece of kit from the database.

```
roachnest.list_hardware()  
    URL: /
```

Index page. Lists all boards in the hardware database.

```
roachnest.listbof(id)  
    URL: /listbof
```

Lists all bitstreams. Uses KATCP ?listbof command.

`roachnest.listreg(id)`

URL: `/listreg`

Lists registers and applies basic sorting regex. Uses KATCP `?listdev` command.

`roachnest.power_off(id)`

URL: `/poweroff/:id`

Powers off a ROACH board using XPORT.

`roachnest.power_on(id)`

URL: `/poweron/:id`

Powers up a ROACH board using XPORT.

`roachnest.progdev(id, bitstream)`

URL: `/progdev/:bitstream`

Executes KATCP `?progdev` command to program FPGA.

`roachnest.server_static(path)`

URL: `/files/:path#.+`

Returns static files (eg images, css, scripts, favicons).

`roachnest.snap32(id, snap_id, bytes, fmt, op)`

URL: `ajax_snap/:snap_id/bytes/:bytes/fmt/:fmt`

AJAX request handler for /snap plotting page. Returns JSON data for the Flot javascript plotting library to plot.

`roachnest.view_hardware(id)`

URL: `/status/:id`

Provides overview of a single piece of kit.

5.2 roachnest_helpers.py

Created by Danny Price on 2011-01-12.

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Helper functions and classes for roachnest.

`roachnest_helpers.bin2dec(binary)`

return the decimal string representation of *binary*

Parameters **binary:** binary string :

binary string to reinterpret as decimal

`roachnest_helpers.dbadd(hostname, MAC_address, IP_address, location, notes, serial, firmware, atype, XPORT_address, ZDOK0, ZDOK1)`

Add a new piece of hardware to the database

Parameters **hostname:** string :

Hostname of piece of hardware

MAC_address: string :

MAC address of KATCP interface

IP_address: string :

IP address of KATCP interface.

location: string :

Physical location of the hardware (eg Oxford DSP lab)

notes: string :

Any relevant notes that you may have

serial: string :

The serial number of the hardware.

firmware: :

Firmware revision information

atype: string :

What type of hardware is it? Options are generally ROACH, ROACH2, iBOB or BEE2

XPORT_address: string :

IP address of XPORT interface.

ZDOK0: string :

Notes about what is installed in ZDOK 0.

ZDOK1: string :

Notes about what is installed in ZDOK 1.

`roachnest_helpers.dbblank()`

Returns a blank hardware dictionary.

Returns a BLANK python dictionary with the following entries: `id`, `hostname`, `MAC_address`, `IP_address`, `location`, `notes`, `serial`, `firmware`, `type`, `XPORT_address`, `ZDOK0`, `ZDOK1`, `status`, `XPORT_status`.

`roachnest_helpers.dbcreate()`

Creates a new database.

Notes

This function should only be called once, for initial database setup.

`roachnest_helpers.dbdelete(id)`

Deletes a piece of hardware from the database.

Parameters id: int :

Primary key (ID number) of record

`roachnest_helpers.dbedit(id, hostname, MAC_address, IP_address, location, notes, serial, firmware, atype, XPORT_address, ZDOK0, ZDOK1)`

Edit an existing piece of hardware in the database

Parameters id: int :

Primary key (ID number) of record

hostname: string :

Hostname of piece of hardware

MAC_address: string :

MAC address of KATCP interface

IP_address: string :

IP address of KATCP interface.

location: string :

Physical location of the hardware (eg Oxford DSP lab)

notes: string :

Any relevant notes that you may have

serial: string :

The serial number of the hardware.

firmware: :

Firmware revision information

atype: string :

What type of hardware is it? Options are generally ROACH, ROACH2, iBOB or BEE2

XPORT_address: string :

IP address of XPORT interface.

ZDOK0: string :

Notes about what is installed in ZDOK 0.

ZDOK1: string :

Notes about what is installed in ZDOK 1.

`roachnest_helpers.dbget (id)`

Retrieves a hardware record from the hardware database.

Parameters id: integer :

primary key (ID number) of database entry

Notes

Queries database and returns a python dictionary with the following entries: id, hostname, MAC_address, IP_address, location, notes, serial, firmware, type, XPORT_address, ZDOK0, ZDOK1, status, XPORT_status.

`roachnest_helpers.dbgetall ()`

Retrieves all records from the database.

Notes

Retrieves all records from the database. Returns a list of python dictionaries, with name: value pairs that correspond to database columns. Each python dictionary contains the following entries: id, hostname, MAC_address, IP_address, location, notes, serial, firmware, type, XPORT_address, ZDOK0, ZDOK1, status, XPORT_status.

`roachnest_helpers.dec2bin (decimal)`

return the binary string representation of a *decimal* Parameters ——— decimal: decimal string

decimal string to reinterpret as binary

`roachnest_helpers.dec2hex (n)`

return the hexadecimal string representation of integer *n*

Parameters n: hexadecimal string :

hexadecimal string to reinterpret as decimal

`roachnest_helpers.hex2dec(s)`

return the integer value of a hexadecimal string *s*

Parameters s: decimal string :

decimal string to reinterpret as hexadecimal

`roachnest_helpers.safe_eval(command)`

A safer version of the `eval()` command, using `ast.literal_eval` TODO: make this more functional, at the moment it's pretty useless.

Parameters command: string :

command to evaluate (e.g. `'2**10-1'`).

`roachnest_helpers.writereg(fpga, name, value, base=10)`

Writes a value to an FPGA register. Very similar to `fpga.write_int`, but you can specify the base (e.g. base 2 for binary)

Parameters fpga: katcp_wrapper.FpgaClient object :

fpga client object (which roach board to communicate with)

name: string :

register name

value: integer :

value to write to register

base: int :

base to write register. Default is 10 (decimal), but other bases may be used.

5.3 ping.py

Ping multiple hosts/ip addresses in parallel, using threading

Credits: Modified from script by Jose Porrua: <http://www.joseporrua.com/2008/12/11/multi-threaded-ping-in-python>
However, this script didn't work for me out of the box so I modified it to get it running.

`class ping.Host(ip)`

Defines a host object.

Current attributes include: name, address and status.

`ping.execute(host)`

Executes a ping command and sets the appropriate attribute.

Parameters host: ping.Host :

A host object.

Notes

This is significantly different to Jose Porrua's original script, which will not match ping requests on Mac OSX.
TODO: Test this on Windows and modify if required.

`ping.ping (hostname)`

Pings a single board

Parameters `hostname: string` :

hostname or IP address of hardware to ping

`ping.pingHosts (hosts)`

Creates and starts pinging threads.

Parameters `hosts: list []` :

A list of host objects.

`ping.printResults (hosts)`

Prints a results: address status hostname

Parameters `hosts: list []` :

A list of ping.Host objects

5.4 xport.py

Created by Danny Price, 03 October 2011.

Based on roach_monitor.py at: https://casper.berkeley.edu/wiki/Roach_monitor_and_management_subsystem

This module allows for communication with the ROACH X-port. ROACH has an onboard, fully independent management subsystem that can be accessed through the Xport. The X-port system monitors voltages and temperatures and will shut down the board if these are out of specification. A log is kept of the shutdown cause, its value and time.

class `xport.Xport (ip, port)`

Actel Fusion X-port class, for communicating with M&C

Methods

clear_crashlog ()

Reset crash log counter

close ()

Close xport socket connection

connect ()

Connect to xport socket

flush ()

Flush receive buffer

get_board_time ()

Check and retrieve board uptime. Returns board up time in seconds (int).

get_channels ()

Retrieves the voltage and temperatures of the PPC, V5, PSU, and Actel chips.

Returns a list of format: (channel name, channel state, channel min operational value, channel max operational val)

get_fan_speeds ()

Check and retrieve fan speeds. Returns a list of fan speeds

get_id()
Return board ID and revision

get_last_shutdown()
Check and retrieve reason for last shutdown. Returns reason as a string

get_power_good()
Check and retrieve power good status of voltage regulators. Returns a list of power good signals.

get_power_state()
Check and retrieve board power state. Returns power state as a string

get_serial()
Check and retrieve serial number. After first query the serial number is stored as class variable self.serial

power_down()
Power down the ROACH

power_up()
Power up the ROACH (Wake on LAN)

read(addr)
Reads a 16bit value from the Fusion part through the Xport.

toggle_config_h()
todo: Toggle PPC EEPROM boot (config H)

toggle_power_on_reset()
todo: Toggle auto power-on after hard-reset.

warm_rst()
Reset ROACH, but not Actel

write(addr, value)
Writes a 16bit value to the Fusion part through the Xport.

exception xport.XportError(msg)
A simple class for X-port error handling

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