

Implementing a top-interface for the SenseHat LED on a Raspberry Pi 3B

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Abstract

Monitoring computer systems is an important task for admins and users alike. A common tool to display cpu information on UNIX-systems is top. This work will present an example implementation of a similar interface for the SenseHat LED system, which is installed onto the Raspberry Pi 3. We will argue that this display is not well suited for this task by comparing it to a web-based solution.

I. INTRODUCTION

First we will explain how an UNIX-system (here: Debian) can provide the necessary interfaces to access the relevant information required. Then we will talk about the way top displays this information and how we can utilize the given 8×8 grid of the LED. Finally we will compare this implementation with a (theoretical) web-based solution and discuss further improvements.

II. KERNEL INTERFACE

Representing (kernel) data is not a new idea. The *proc* filesystem mentioned by Killian[Killian, 1984] was used to map address space to files so that processes could access their own image. This was also used to improve debugging techniques as this was a major problem before. Today's systems expand this idea and also introduce other subfilesystems[*proc(5)*]. We will focus on the *stat*-filesystem, which displays kernel/system statistics.

As everything under UNIX is a file, so is the *proc*-filesystem. To access the data we can use any available fileoperations. When the file */proc/stat* is read the kernel updates the file. This means whenever we want to read the new

state, we will have to reopen the file. An example output can be seen on figure 1.

III. THE TOP INTERFACE

Top presents the user with both an overview of the system's resources and a list of running processes with their associated values for cputime, memory usage et cetera. This is done dynamically so changes made to the system can be observed in real time. While this is helpful, the manpage describes it as a limited interactive interface for process manipulation.

We also want to mention that there are many more implementations, **htop** to name one, which provide similar functionality with a slightly different user interface.

IV. SENSEHAT LED

Our hardware consist of a Raspberry Pi 3B with a connected SenseHat LED 8×8 grid and a joystick. We decided to simplify the output to a general overview of the systems cpu state. As we have 4 cores, we can read all relevant information for each cpu and their sum from */proc/stat*. We decided to utilize one row of the LED for each batch of data, with the first representing the sum of all cpus, the second row the first cpu and so on.

Table 1: *Example table*

Name		
First name	Last Name	Grade
John	Doe	7.5
Richard	Miles	2

$$e = mc^2 \quad (1)$$

V. DISCUSSION

- i. Subsection One
- ii. Subsection Two

REFERENCES

[Killian, 1984] T. J. Killian (1984). Processes as Files *USENIX Association, Summer Conference*.

[proc(5)] Linux man pages