



ARL-TN-1205 • JUNE 2024



User Interface (UI) for Setting Date–Time and Media Storage Maintenance on a Raspberry Pi

by Laurel C Sadler

DISTRIBUTION STATEMENT A. Approved for public release: distribution unlimited.

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

Destroy this report when it is no longer needed. Do not return it to the originator.



User Interface (UI) for Setting Date–Time and Media Storage Maintenance on a Raspberry Pi

Laurel C Sadler

DEVCOM Army Research Laboratory

REPORT DOCUMENTATION PAGE

1. REPORT DATE		2. REPORT TYPE		3. DATES COVERED	
June 2024		Technical Report		START DATE May 2020	END DATE September 2020
4. TITLE AND SUBTITLE User Interface (UI) for Setting Date–Time and Media Storage Maintenance on a Raspberry Pi					
5a. CONTRACT NUMBER		5b. GRANT NUMBER		5c. PROGRAM ELEMENT NUMBER	
5d. PROJECT NUMBER		5e. TASK NUMBER		5f. WORK UNIT NUMBER	
6. AUTHOR(S) Laurel C Sadler					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) DEVCOM Army Research Laboratory ATTN: FCDD-RLA-PB Adelphi, MD 20783-1138				8. PERFORMING ORGANIZATION REPORT NUMBER ARL-TN-1205	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)		11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT DISTRIBUTION STATEMENT A. Approved for public release: distribution unlimited.					
13. SUPPLEMENTARY NOTES ORCID ID: Laurel C Sadler, 0000-0001-8697-2246					
14. ABSTRACT This report describes the user interface (UI) that allows the user to edit the date, time, and time zone on a Raspberry Pi device when internet access is unavailable. The UI also allows the user to open and close the menu when not in use and to properly shut down the Raspberry Pi with the touch of a button. This UI application is independent and can be used on any Raspberry Pi. An automated feature that is customized to the data storage area of each sensor allows the user to copy files stored on the device to a USB storage device with the touch of a button. The storage capability is specific to each application (unless the same storage space is used). This report serves as a user's manual for the UI and describes its functions.					
15. SUBJECT TERMS user interface, UI, Raspberry Pi, time zone, media storage, Network, Cyber and Computational Sciences					
16. SECURITY CLASSIFICATION OF:				17. LIMITATION OF ABSTRACT	
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED	UU		17
19a. NAME OF RESPONSIBLE PERSON Laurel C Sadler				19b. PHONE NUMBER (Include area code) (301) 394-1221	

STANDARD FORM 298 (REV. 5/2020)

Prescribed by ANSI Std. Z39.18

Contents

List of Figures	iv
1. Introduction	1
1.1 UI Overview	1
1.2 UI Development Overview and Custom Widgets	1
2. Operations UI	1
2.1 Tab 1: Set Date	2
2.2 Tab 2: Set Time	2
2.3 Tab 3: Set Time Zone	3
2.4 Tab 4: Exporting Data	4
2.5 Tab 5: Exit Menu	8
2.6 Tab 6: Shut Down Menu	9
3. Conclusion	9
4. References	10
List of Symbols, Abbreviations, and Acronyms	11

List of Figures

Fig. 1	Tab 1: Set Date tab.....	2
Fig. 2	Tab 2: Set Time tab.....	3
Fig. 3	Tab 3: Set Time Zone tab.....	4
Fig. 4	Tab 4: Export Data tab.....	5
Fig. 5	Export data error: missing USB storage device.....	6
Fig. 6	Export data error: multiple USB storage devices connected	7
Fig. 7	Export data: operation complete	8
Fig. 8	Exit Menu.....	8
Fig. 9	Shut Down tab.....	9

1. Introduction

This report describes the user interface (UI) that allows the user to edit the date, time, and time zone on a Raspberry Pi device when internet access is unavailable. The UI also allows the user to properly shut down the Raspberry Pi with the touch of a button. An automated feature that is customized to the data storage area of the device allows the user to easily and quickly copy files stored on the device to a USB storage device. The storage capability is specific to each application (unless the same storage space is used). An example data structure format for the Raspberry Pi is described in this report, which serves as a user's manual for the UI and explains all the functions of the UI.

1.1 UI Overview

The Operations UI was initially developed to be used in an internet-inaccessible environment, which necessitates the system clock to be manually set. It was developed for use on a Raspberry Pi 0 with a Linux operating system, a 3- × 3-inch touch screen display for visualization, and a USB port to enable use with a storage device. However, the UI can be used with any Raspberry Pi or Linux device. Although the UI was developed for a 3- × 3-inch touch screen, the software can be used with larger screens as well.

1.2 UI Development Overview and Custom Widgets

The UI software was written in Python 3.7.3¹ using Tkinter,² a Python binding to the Tk GUI toolkit. To accommodate the small touch screen, the style of the standard widgets needed to be modified and, in several cases, it became necessary to design and develop custom widgets. The custom widgets were designed to match the general appearance and behavior of the standard widgets included in the Tkinter toolkit to provide seamless integration into the UI. The custom widgets enable the appearance of the widgets to be large enough for the user to operate them on the 3- × 3-inch screen.

2. Operations UI

The Operations UI allows the user to change the date, time, and time zone. It also allows the user to export data and cleanly shut down the system. Each of these actions requires a separate tab to accommodate the large buttons.

This section describes the Operations UI in detail and acts as a user's manual. As stated previously, each of the actions provided by the Operations UI requires a

separate tab. Figure 1 depicts the first tab of the Operations UI: Date. Notice the list of named tabs across the top of the UI in gray. Each of these tabs control an operation to be performed on the device. The “Date” tab, the first tab from the left of the UI, is highlighted, indicating that it is the active tab. The timestamp, including time zone, is highlighted in blue and is always visible at the bottom of the Operations UI. This timestamp displays the time to which the internal clock is currently set. The operations enabled by each tab are described in the following subsections.

2.1 Tab 1: Set Date

Figure 1 depicts the UI for which the “Date” tab is enabled. The user can modify the date by simply touching the downward pointing “Red Arrow” on the corresponding month, day, or year widget. When each “Red Arrow” is touched, a corresponding drop-down menu appears on the tab, allowing the user to select the desired month, day, or year. Once the desired date is shown on the corresponding widgets, the user must select “Apply” to execute the time change of the device’s internal clock. The timestamp highlighted in blue will update accordingly.



Fig. 1 Tab 1: Set Date tab

2.2 Tab 2: Set Time

Figure 2 depicts the UI for which the “Time” tab is enabled. The user can modify the time by simply touching the downward pointing “Red Arrow” on the corresponding hour, minute, or second widget. When each “Red Arrow” is touched, a corresponding drop-down menu appears on the tab, allowing the user to select the

desired hour, minute, or second. Once the correct time is shown on the corresponding widgets, the user must select “Apply” to execute the time change of the device’s internal clock. The timestamp highlighted in blue will update accordingly.



Fig. 2 Tab 2: Set Time tab

2.3 Tab 3: Set Time Zone

Figure 3 depicts the UI for which the “Time Zone” tab is enabled. The user can change the time zone by simply touching the downward pointing “Red Arrow” on the widget. When the “Red Arrow” is touched, a drop-down menu appears on the tab, allowing the user to select the desired time zone. Once the correct time zone is shown in the widget, the user must select “Apply” to execute the time zone change of the device’s internal clock. The timestamp highlighted in blue will update accordingly.

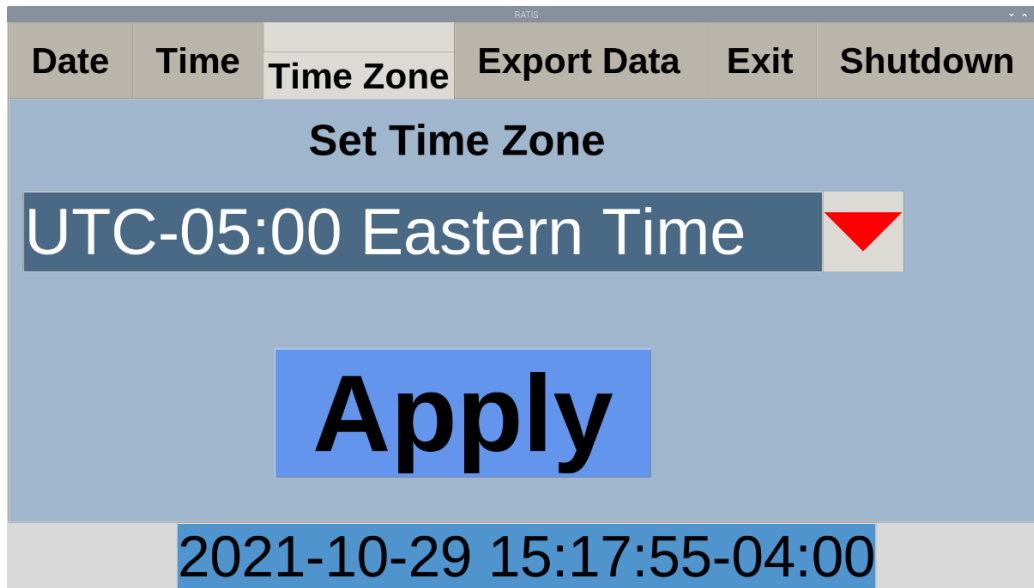


Fig. 3 Tab 3: Set Time Zone tab

2.4 Tab 4: Exporting Data

Figure 4 depicts the UI for which the “Export Data” tab is enabled. This tab enables the user to copy media from the Raspberry Pi or local computer to a USB storage device. The file folders on the local computer from which the media is copied are preset in a configuration file.

The “Export Data” capability is specific to each application unless the same media and storage locations are specified. The UI can be adapted for other applications by simply modifying the configuration file and redefining the file folder paths for `mediapath`, `imagelocation1`, and `imagelocation2`. The software itself does not require modification. `Mediapath` defines where the file path is from which the USB devices are detected. `Imagelocation1` and `imagelocation2` define the file folder paths in which the images and motion data are stored on the local computer.

For this application, the USB devices variable is preset to

`mediapath = /media/pi,`

and the image locations variables are preset to

`imagelocation1 = /home/pi/Desktop/Archive/`

`imagelocation2 = /home/pi/Desktop/motionData/.`

When the “Export Data” button is selected, the media is immediately copied to the USB storage device connected to the computer with the two caveats that 1) a USB storage device must be connected and 2) only one USB storage device can be

connected. If either of these caveats occur, an error message is generated. These error messages are described in the following.



Fig. 4 Tab 4: Export Data tab

If the “Export Data” button has been selected prior to connecting a USB device to the computer, the error message window shown in Fig. 5 will appear on the screen. Follow these instructions to correct the error:

- 1) Select “OK.” The “Error” message window will be removed from the screen.
- 2) Plug a USB storage device into the computer.
- 3) Select “Export Data” again.



Fig. 5 Export data error: missing USB storage device

If multiple USB storage devices are connected to the computer when the “Export Data” button is selected, the error message window shown in Fig. 6 will appear on the screen. Follow these instructions to correct the error:

- 1) Select “OK.” The “Error” message window will be removed from the screen.
- 2) Remove **all** USB storage devices from the computer.
- 3) Insert a USB storage device into the computer.
- 4) Select “Export Data” again.



Fig. 6 Export data error: multiple USB storage devices connected

When copying the media files to the USB storage device is complete, the pop-up window shown in Fig. 7 will appear on the screen.

- 1) It is now safe to remove the USB storage device.
- 2) Select "OK." The pop-up window will be removed from the screen.
- 3) Before selecting "Export Data" again, the USB storage device must be removed from the computer and reinserted. The software procedure to safely remove the USB storage device has been executed and the USB storage device must be reinserted for it to be automatically detected by the computer. If the device is not removed and reinserted prior to selecting "Export Data," the error message shown in Fig. 7 will appear on the screen and the corresponding instructions will need to be followed.



Fig. 7 Export data: operation complete

2.5 Tab 5: Exit Menu

Figure 8 depicts the UI for which the “Exit Menu” tab is enabled. This tab enables the user to exit the Operations UI without shutting down the computer. When the “Exit Menu” button is selected, the software will return to the initial state, after user login.

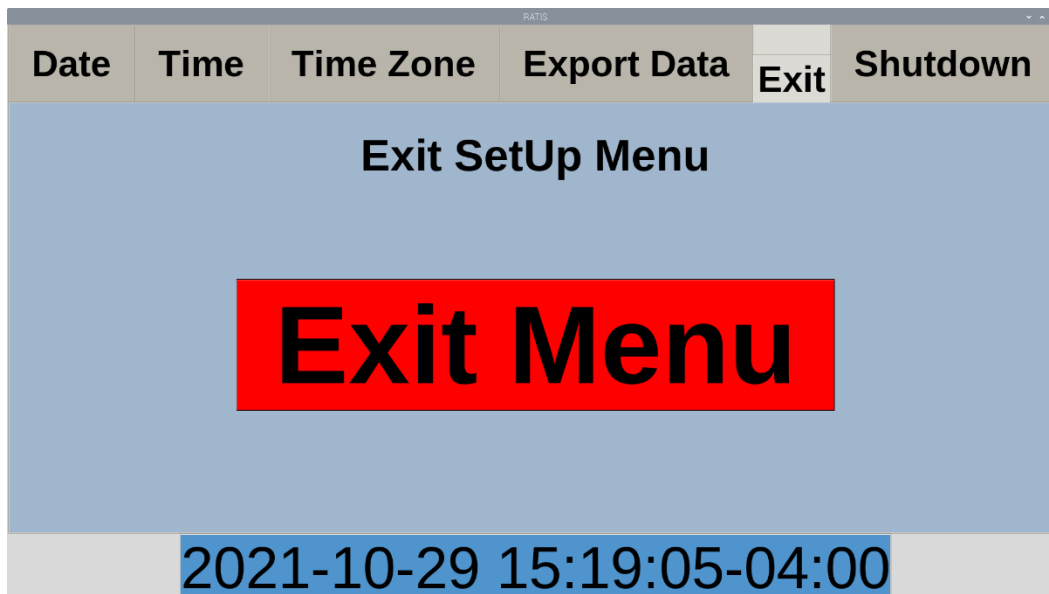


Fig. 8 Exit Menu

2.6 Tab 6: Shut Down Menu

Figure 9 depicts the UI for which the “Shut Down” Tab is enabled. This tab enables the user to exit the Operations UI as well as safely shut down the computer. When the “Shut Down” button is selected, the software will properly shut down the computer.



Fig. 9 Shut Down tab

3. Conclusion

This UI was developed specifically for use with a 3- × 3-inch touch-activated display. Custom widgets were developed for large fingers to use on a small touch screen. These widgets operate in the same manner as the universal widgets for ease of the user. Conveniently, the UI operates without the need for a keyboard or special tool such as a pen with touch screen stylus. It allows the user to modify the system clock date, time, and time zone on a Raspberry Pi when internet is unavailable. In addition, the UI allows the user to copy files stored on the device to a USB storage device with the touch of a button.

4. References

1. Python Software Foundation. Python language reference, version 3.7.3. [accessed 2024 May 15]. <https://www.python.org/>.
2. Tkinter. Wikipedia; last updated 2024 Mar 19 [accessed 2024 May 16]. <https://en.wikipedia.org/wiki/Tkinter>.

List of Symbols, Abbreviations, and Acronyms

ARL	Army Research Laboratory
DEVCOM	US Army Combat Capabilities Development Command
GUI	graphical user interface
UI	user interface
USB	Universal Serial Bus