Raspberry Pi Information Kiosks

by

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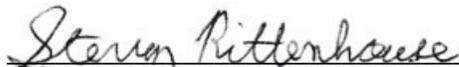
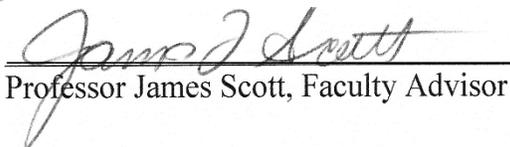|	
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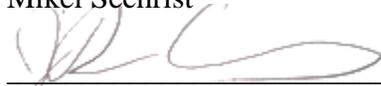
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Abstract

Digital information kiosk environments are expensive and can be difficult to manage. Raspberry Pi Information Kiosks are a new way to utilize Raspberry Pi technology to create an inexpensive and manageable digital information kiosk environment. These Pi information kiosks are used as a cost-effective alternative to standard digital information kiosks. The target clients are universities, malls, amusement parks, and other institutions that would benefit from digitally displaying information to users in an interactive way. With convenient touchscreen control, straightforward navigation, and a practical display, companies can put the information out there in an accessible and easy to read format. Raspberry Pi Information Kiosks are essential for any company looking for a digital kiosk solution that is both cost effective and manageable.

Introduction

Informational kiosks are a vital part of some companies. They are used to display maps, important dates, reminders, and other important information. Hardware costs alone are quite cumbersome in these applications, as these systems can cost anywhere from $3,000 to $10,000 depending on a number of different add-ons the business would like (1). The informational Pi kiosk will significantly lower the upfront costs of installation and hardware. Hardware alone for the Pi Kiosk will range from $300 to $450 depending on the application.

Project Description

The project involved setting up and configuring Raspberry Pi devices as digital information kiosks in a way that will simulate implementing the Raspberry Pi Information Kiosk solution at a university, which is one of the potential target clients. The Raspberry Pi devices have touch screen interfaces for easy user interaction and navigation, and a larger attached screen for easier viewing. The Raspberry Pi devices are also networked to a central server that is used to manage the Pis. The management server, running Git, is also hosting the sample information that the Pis will be pulling data from. The Pi kiosk environment includes a Raspberry Pi kiosk, a second Raspberry Pi representing a second kiosk, a management server, and any other required networking equipment such as a switch and networking cables as needed in order to simulate implementing the kiosks in a university environment. The total hardware cost ended up being around $245 for the Pi kiosk and accessories, which is significantly less expensive than the hardware costs for a commercial information kiosk, which generally range anywhere from $3000 to $10,000 (1).

Potential Problems

Some potential issues we had anticipated running into were heating issues relating to the actual kiosk enclosure, software compatibility, and display issues.

During the design process of the kiosk enclosure we attempted to design it in such a way that avoided any potential heating issues. However, Raspberry Pis themselves do not regularly have cooling issues, even when enclosed in small airtight spaces. Still, we tried to design the enclosure in such a way to mitigate any cooling issues.

We originally anticipated issues with software compatibility when trying to set up the management server replication software with the Pis. However, while this ended up not being problematic, we did end up running into driver compatibility issues between the Raspberry Pis and the second monitors. We resolved this by trying different options and researching specific adapters that were Linux-compatible, and finally choosing a compatible adapter.

User Profile

The user profile displays data that is associated with potential users of the project. The main users for the simulated university environment would be the end users (students) and IT personnel. There could potentially be non-technical administrative users as well, but their technical experience would most likely not vary much from a student. In an actual environment, where the setting may not be a university, this user profile should still be similar for the end users, and may vary somewhat for IT personnel.

User Profile
Application: Raspberry Pi Information Kiosk
Potential Users 1. End User/Student 2.Nontechnical Administration 3. IT Personnel
Software and Interface Experience: The interface will also not require much end user experience, as it will be a straightforward touch screen interface with navigation buttons. For any nontechnical administrative users, it would most likely only require being able to changing/updating text. IT Personnel will require some software experience in HTML and basic web pages for configuring and updating the interfaces as needed. They will also require basic knowledge of CentOS and be familiar with file replication groups using Git.
Experience with Similar Applications: End users could vary greatly but should have basic experience with touch screen devices due to common phone use and other kiosk use. IT personnel on the management end will likely have basic experience in HTML and basic experience with Windows Server.
Task Experience: End users will already be familiar with navigating interfaces and searching for information. Nontechnical Administrative users would most likely be familiar with editing text. IT Personnel will need to be experienced with updating HTML pages, basic server administration, and file replication in order to update the interfaces.
Frequency of Use: Daily use by end users to search for and view information. Nontechnical Administration and IT Personnel use depends on the frequency of updates and any required maintenance.
Key Interface Design Requirements that the Profile Suggests: The interface will need to be consistent with other interface standards. It will need to be straightforward and easy for end users to navigate.

Table 1: User Profile

Raspberry Pi Information Kiosks
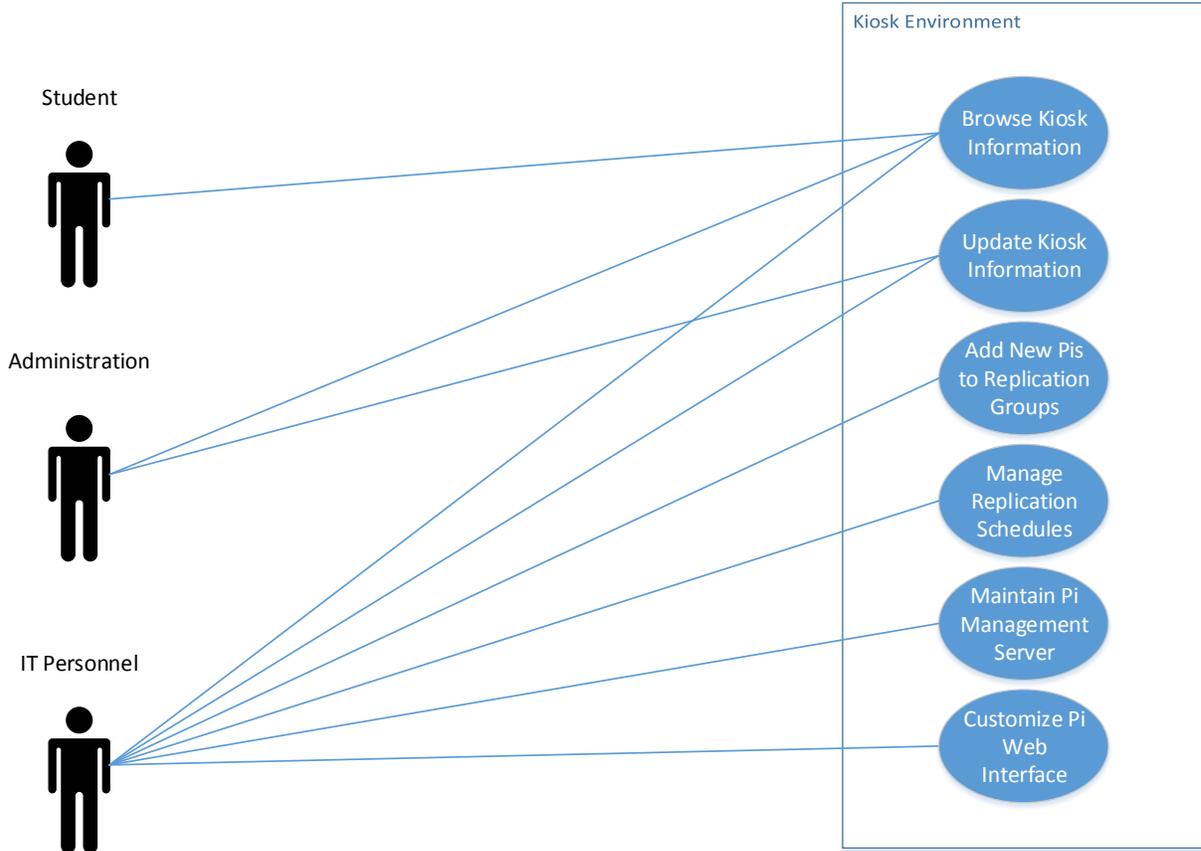
Figure 1: Use Case Diagram

Networking Setup

To simulate the Raspberry Pi Kiosk Environment network we set up two Raspberry Pis networked into a switch, representing the existing network at a university. The management server was also networked to the switch. With this setup, neither the Pis nor management server will need internet access, barring any additional needed operating system updates. If this were to be set up on an enterprise environment, the Pis and server should be on their own network segment or otherwise separated from the rest of the network for security purposes, as they should not need to communicate with other devices.

Management Server

Switch

Raspberry Pi Kiosk A

Raspberry Pi Kiosk B
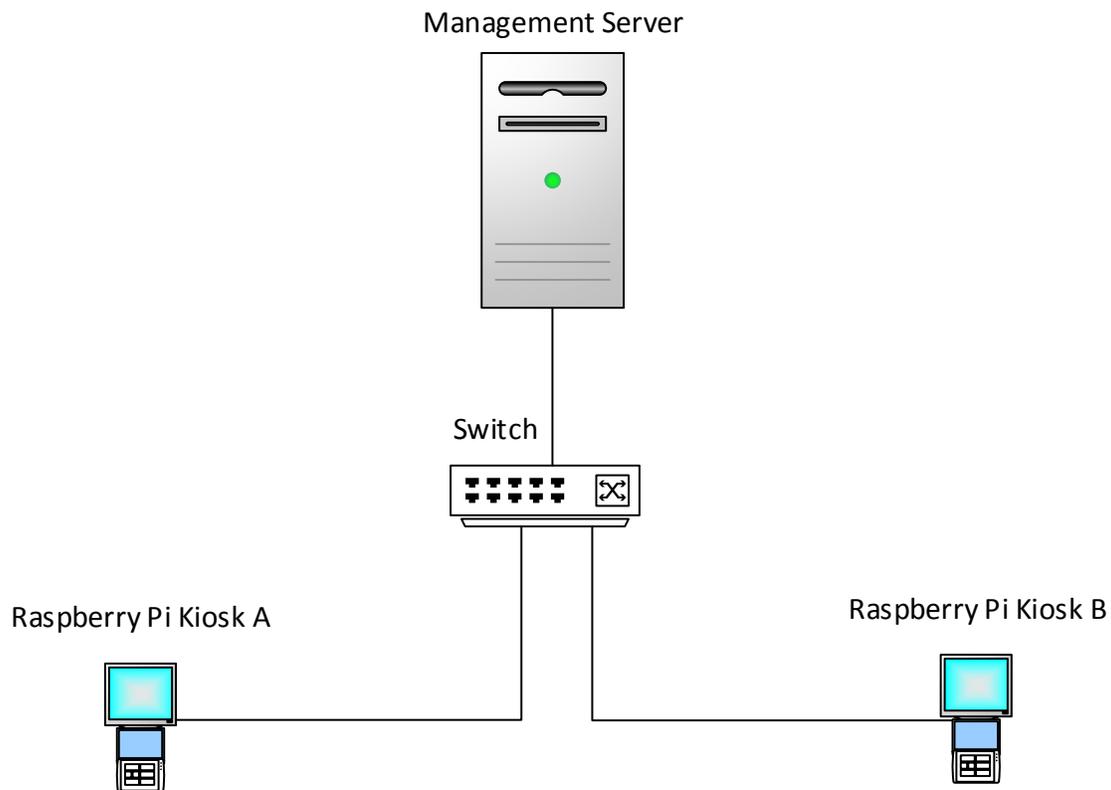
Figure 2: Network Diagram

Project Timeline

Figure 3 illustrates the predicted project timeline. As such, this timeline may not represent the exact time specific requirements were completed. It has been adjusted for potential

issues and time constraints, and was continually updated until the completion of the project. It is

divided into two main sections, which are Fall Semester and Spring Semester.

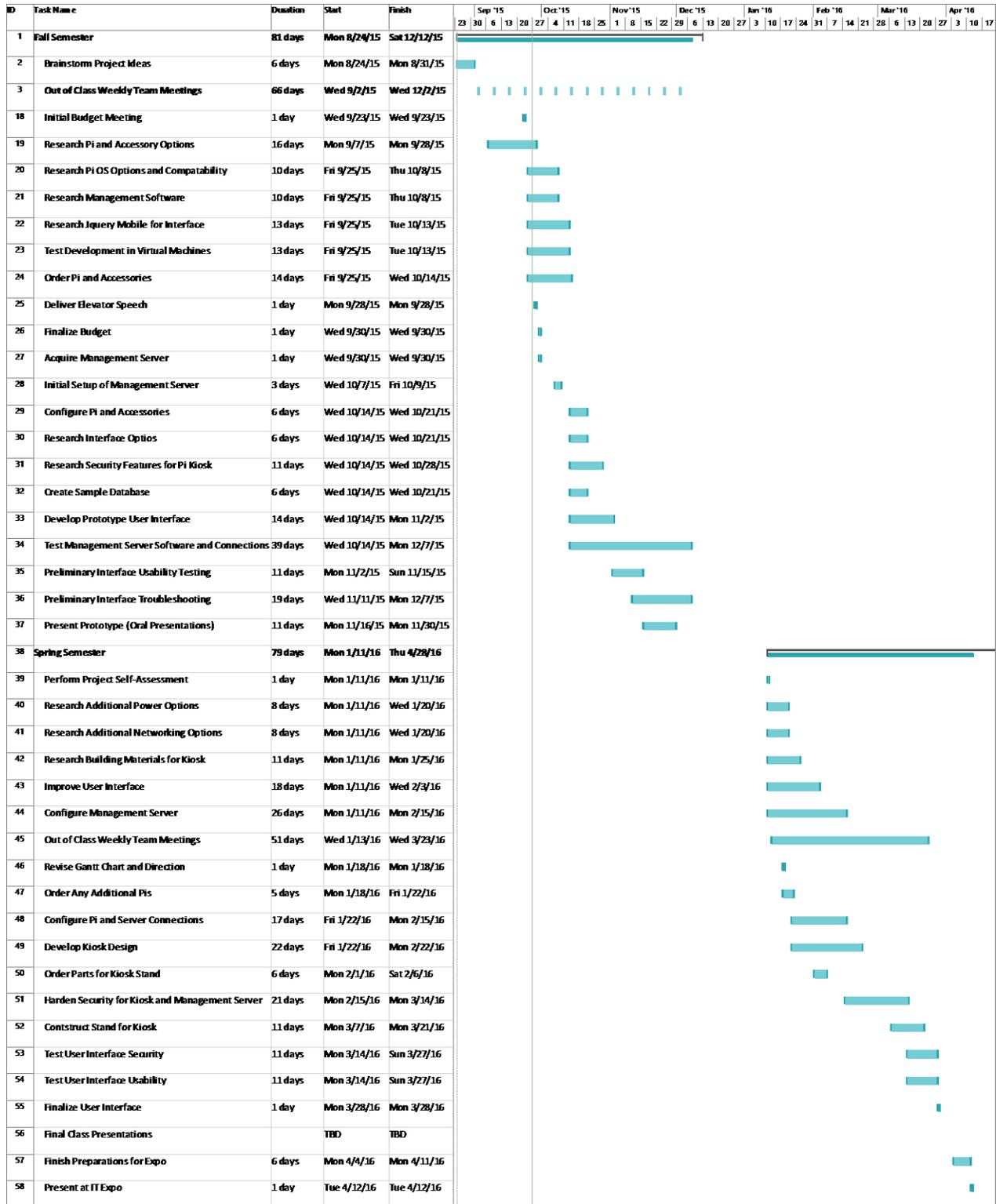| ID	Task Name	Duration	Start	Finish
1	Fall Semester	81 days	Mon 8/24/15	Sat 12/12/15
2	Brainstorm Project Ideas	6 days	Mon 8/24/15	Mon 8/31/15
3	Out of Class Weekly Team Meetings	66 days	Wed 9/2/15	Wed 12/2/15
18	Initial Budget Meeting	1 day	Wed 9/23/15	Wed 9/23/15
19	Research Pi and Accessory Options	16 days	Mon 9/7/15	Mon 9/28/15
20	Research Pi OS Options and Compatability	10 days	Fri 9/25/15	Thu 10/8/15
21	Research Management Software	10 days	Fri 9/25/15	Thu 10/8/15
22	Research Jquery Mobile for Interface	13 days	Fri 9/25/15	Tue 10/13/15
23	Test Development in Virtual Machines	13 days	Fri 9/25/15	Tue 10/13/15
24	Order Pi and Accessories	14 days	Fri 9/25/15	Wed 10/14/15
25	Deliver Elevator Speech	1 day	Mon 9/28/15	Mon 9/28/15
26	Finalize Budget	1 day	Wed 9/30/15	Wed 9/30/15
27	Acquire Management Server	1 day	Wed 9/30/15	Wed 9/30/15
28	Initial Setup of Management Server	3 days	Wed 10/7/15	Fri 10/9/15
29	Configure Pi and Accessories	6 days	Wed 10/14/15	Wed 10/21/15
30	Research Interface Optios	6 days	Wed 10/14/15	Wed 10/21/15
31	Research Security Features for Pi Kiosk	11 days	Wed 10/14/15	Wed 10/28/15
32	Create Sample Database	6 days	Wed 10/14/15	Wed 10/21/15
33	Develop Prototype User Interface	14 days	Wed 10/14/15	Mon 11/2/15
34	Test Management Server Software and Connections	39 days	Wed 10/14/15	Mon 12/7/15
35	Preliminary Interface Usability Testing	11 days	Mon 11/2/15	Sun 11/15/15
36	Preliminary Interface Troubleshooting	19 days	Wed 11/11/15	Mon 12/7/15
37	Present Prototype (Oral Presentations)	11 days	Mon 11/16/15	Mon 11/30/15
38	Spring Semester	79 days	Mon 1/11/16	Thu 4/28/16
39	Perform Project Self-Assessment	1 day	Mon 1/11/16	Mon 1/11/16
40	Research Additional Power Options	8 days	Mon 1/11/16	Wed 1/20/16
41	Research Additional Networking Options	8 days	Mon 1/11/16	Wed 1/20/16
42	Research Building Materials for Kiosk	11 days	Mon 1/11/16	Mon 1/25/16
43	Improve User Interface	18 days	Mon 1/11/16	Wed 2/3/16
44	Configure Management Server	26 days	Mon 1/11/16	Mon 2/15/16
45	Out of Class Weekly Team Meetings	51 days	Wed 1/13/16	Wed 3/23/16
46	Revise Gantt Chart and Direction	1 day	Mon 1/18/16	Mon 1/18/16
47	Order Any Additional Pis	5 days	Mon 1/18/16	Fri 1/22/16
48	Configure Pi and Server Connections	17 days	Fri 1/22/16	Mon 2/15/16
49	Develop Kiosk Design	22 days	Fri 1/22/16	Mon 2/22/16
50	Order Parts for Kiosk Stand	6 days	Mon 2/1/16	Sat 2/6/16
51	Harden Security for Kiosk and Management Server	21 days	Mon 2/15/16	Mon 3/14/16
52	Contstruct Stand for Kiosk	11 days	Mon 3/7/16	Mon 3/21/16
53	Test User Interface Security	11 days	Mon 3/14/16	Sun 3/27/16
54	Test User Interface Usability	11 days	Mon 3/14/16	Sun 3/27/16
55	Finalize User Interface	1 day	Mon 3/28/16	Mon 3/28/16
56	Final Class Presentations		TBD	TBD
57	Finish Preparations for Expo	6 days	Mon 4/4/16	Mon 4/11/16
58	Present at IT Expo	1 day	Tue 4/12/16	Tue 4/12/16

Figure 3: Project Timeline

Budget

Our initial budget was to not spend more than $450. Overall we have spent a total of $245 around $50 on the Pi, and $80 on the touchscreen. We purchased another Pi for an additional $50 for demonstrating a multi-pi environment. We are most likely going to use monitors that we already own, or use monitors available from the school. The enclosure materials cost us $30. The specific USB to VGA adapter we ended up needing cost us an additional $35. We spent an additional $30 on enclosure materials.

For the management server, we are using hardware that we already had available to us. For software, everything we are using is either free or open sourced.

Budget (Predicted)	
Item	**Cost**
Raspberry Pi (x2)	$100
Touchscreen Display	$80
Enclosure Materials	$30
USB to VGA Video Graphics Adapter	$35
Total	**$245**

Table 2: Budget

Conclusion

By utilizing Raspberry Pis as an inexpensive alternative to other kiosk hardware, along with a management server running open sourced software, we have created an inexpensive and manageable alternative to standard information kiosks in delivering information to patrons.

Bibliography

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