

ISP4ME

by

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Submitted to
the Faculty of the School of Information Technology
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

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University of Cincinnati
College of
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April 2020

ISP4ME

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ACRONYMS AND ABBREVIATIONS

API	Application Programming Interface
AWS	Amazon Web Service
ISP	Internet Service Provider
IoT	Internet of Things
DDOS	Distributed Denial-of-Service
SO/HO	Small Office/Home Office
LAMP	Linux, Apache, MySQL, PHP

ABSTRACT

How would you like to save \$120 a year? By opting to purchase your router, rather than renting one from your Internet Service Provider (ISP), not only will you save money, but you will also get the best security and performance out of your broadband connection. ISP4ME is a web application that aims to be an all-in-one solution for consumers that will allow them to effortlessly make this transition, regardless of their technical background. Using a concise and intuitive user evaluation, ISP4ME will determine the most suitable broadband speed for the user's specific situation. It will then recommend a compatible and budget-friendly router that is optimal for their network needs. ISP4ME will provide users with the information necessary to make financially wise decisions when selecting a broadband package and networking equipment, as well as everything they need to know to implement the best network security configurations for their equipment.

INTRODUCTION

PROBLEM

According to a 2014 Forbes article, consumers were spending between \$275 million and \$300 million per quarter on renting cable modems from Comcast alone. Since then, rental fees have increased, in some cases by more than 33%. We've also seen the combined markets of the Internet of Things (IoT) grow to about triple what it was in 2014. With this increase in the number of IoT devices, there has also been an increased number of instances in which DDoS attacks were carried out using the combined resources of unsecured IoT devices. These facts might not seem related, but together they shed light on issues that cannot be ignored.

The first issue is that most consumers are unaware of the benefits of purchasing their router, instead of renting one from their ISP (Internet Service Provider). According to a 2017 CNET article, many users can save upward of \$10 per month (~\$120 annually) by purchasing their router. There are also many other benefits to be gained by purchasing a router and modem separately from each other, instead of using the combined units that many ISPs provide.

The second issue is that home networking equipment is often set-up with default security and networking configurations, leaving home networks unoptimized and vulnerable to intruders. Considering the fact that in April 2019 there were over 2 million vulnerable IoT devices (a number that is expected to increase substantially over the next year), there is an immediate need to implement the best security practices in all home and small business networks, not only to protect the consumer but to prevent the ever-growing number of IoT devices from being compromised.

There are many sites and tools that provide users with information and recommendations related to these topics. However, there is not a solution that provides a comprehensive source of information to help solve these issues, especially not one that is consumer friendly.

SOLUTION

ISP4ME will provide consumers with a web application that will assist them in selecting a broadband package that is appropriate for them. It will then help them determine what networking technology (router/modem) is best suited for their household needs (number of devices, most common internet activities, etc.) and the broadband package they selected. ISP4ME will also provide users with all of the information that is necessary for them to configure their home networks (more specifically, the exact networking equipment that they have selected) with optimal security and networking configurations, all with the need for little technical know-how.

ISP4ME has a target audience in all households and small businesses. The focus and intent of ISP4ME are to provide all consumers, no matter their technical background, with the information necessary to make financially wise decisions when selecting a broadband package and networking equipment, and also to help encourage the average consumer to take the time to implement the proper network security configurations for their situation.

PROJECT GOALS

Develop a cross-platform web application that will provide any consumer with the ability to accurately determine what broadband speed and networking equipment are most suitable for their situation. ISP4ME will encourage the implementation of best security practices by

providing users with guides, walkthroughs, and tutorials (all of which will either be created or sourced in compliance with fair use doctrine) in a manner that will allow them to effortlessly configure the equipment they have selected with the optimal settings for high security and performance.

OVERVIEW

The remainder of this final report outlines in detail how the project was completed. The report includes the following sections: project concept, design objectives, technical approach, test plan, problems encountered, and future recommendations.

DISCUSSION

PROJECT CONCEPT

ISP4ME was an afterthought when brainstorming ideas for our project. The idea came when we were discussing ISPs and renting equipment. Both of us were paying a monthly rental fee for outdated equipment. After some research, we settled on wanting to help people get the most out of their ISP connection. The next steps involved brainstorming ISP4ME's feature set.

USER PROFILE

Table 1: User Profile illustrates the user profile for the ISP4ME application. End users will be the only users interacting with the web application. ISP4ME is for users who hope to save money and get the most out of their home networking equipment and internet service.

User Profile
<p>PROJECT TITLE: ISP4ME - All-In-One Home Network Upgrade Guide Tool</p>
<p>POTENTIAL USERS:</p> <ul style="list-style-type: none"> • Anyone with an interest in saving money on their monthly internet bill. • Anyone looking for updated reliable information on configuring SOHO. • Anyone looking for a broadband package recommendation.
<p>SOFTWARE, INTERFACE, AND RELATED EXPERIENCE: This project will be designed with the latest user experience principles in mind. ISP4ME's objective is to be user-friendly for the most novice tech users while not putting off skilled or knowledgeable users. Users are expected to understand how to navigate and use a web browser on a mobile device or computer.</p>
<p>EXPERIENCE WITH SIMILAR APPLICATIONS:</p> <ul style="list-style-type: none"> • Speedtest by Ookla or any comparable experience with online broadband speed tests • PickMyRouter.com • PickMyModem.com • HighSpeedInternet.com • Online Questionnaires
<p>TASK EXPERIENCE: Once loaded to the ISP4ME home page, users are greeted to a welcome screen with navigation options to take them directly to any of the website's functions. Users can enter the Network Questionnaire if they wish to view recommended broadband packages or networking equipment. Users can also select to view extensive organized information regarding the benefits of buying their own networking equipment, as opposed to renting from their ISP. Users can also view documentation and walkthroughs on setting up their home network equipment with the best security practices in mind.</p>
<p>FREQUENCY OF USE: Users may not return often to the site as once they set up their network, they shouldn't have a reason to return. Users who are not knowledgeable in networking may return when they need to upgrade equipment, move to a new house, switch ISPs.</p>
<p>KEY PROJECT DESIGN REQUIREMENTS THAT THE PROFILE SUGGESTS:</p> <ul style="list-style-type: none"> • Easy User Experience & Quick navigation • Follows UX Design Principles (3-Click Rule, F-Pattern, etc) • Accessibility for any size screen (Mobile, Tablet, Computer)

Table 1: User Profile

USE CASE DIAGRAM

Figure 1: Use Case Diagram presents the use case diagram. The items in this diagram represent the minimum requirements for the ISP4ME web application. The diagram indicates that the End User will have the ability to complete all of the listed tasks with the application.

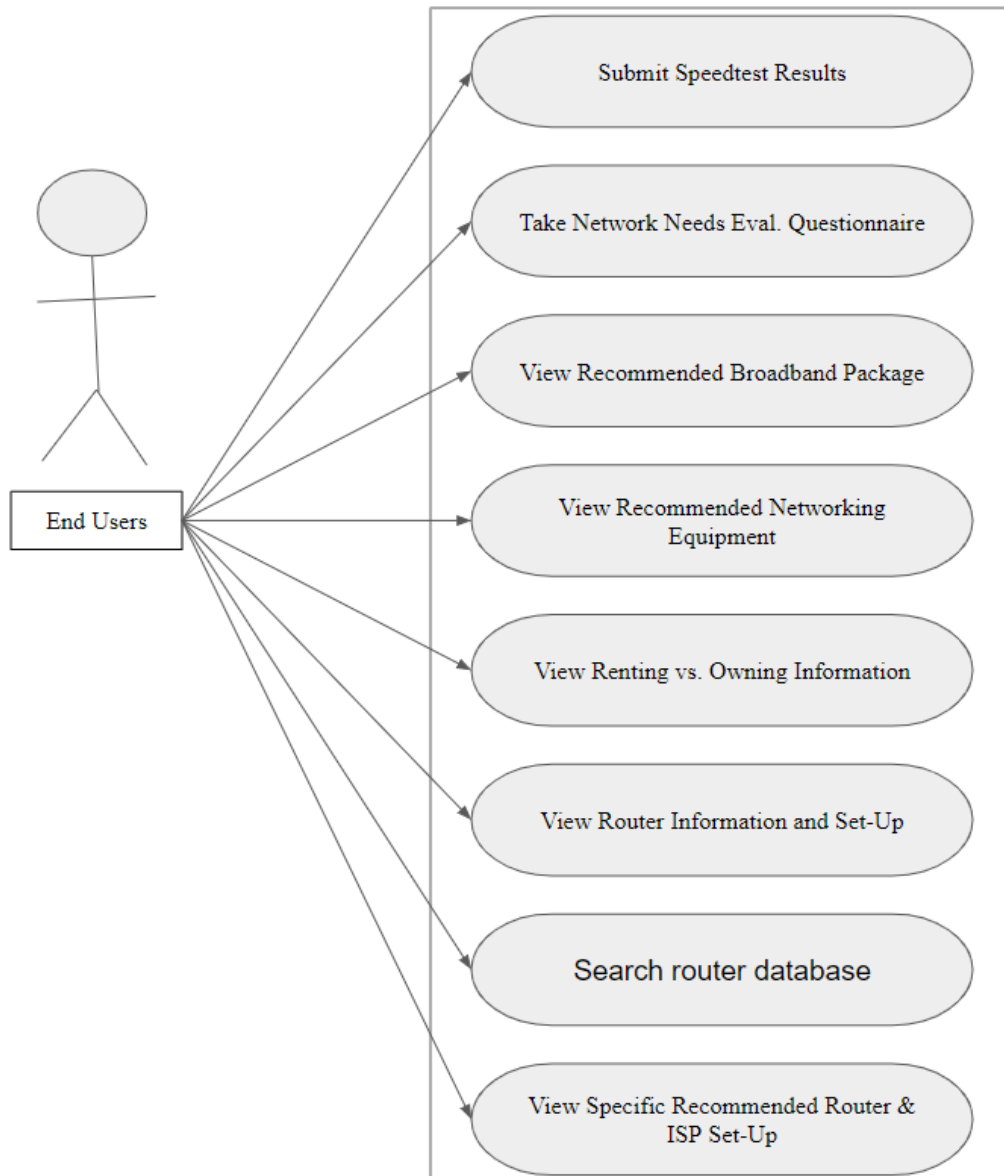


Figure 1: Use Case Diagram

DESIGN OBJECTIVES

BUDGET

Table 2: *Project Budget* illustrates the projected real-world cost of the development of the ISP4ME application.

CATEGORY	ITEM	DESCRIPTION	EXPECTED COST	ACTUAL COST
Materials	Hardware	Computer servers and devices used to create, test, run, and deploy the application (ex. AWS)	\$0	\$25.47 (as of 4/3/2020)
	Software	Frameworks and development tools used to develop the application.	\$0	\$0
Labor	Conference & Meetings	Funding for employee collaboration, learning events, and meetings.	\$0	\$0
	Actual Wage Costs	The actual wages that will be distributed for the development of the project.	\$0	\$0
	Simulated Wage Costs*	The predicted wages that would be distributed if the project was completed in the current market. We will assume 2 developers making \$25 USD / hour for 360 hours each (23 weeks, ~15hrs/wk).	\$18,000	TBD
TOTALS			\$0	\$25.47
*Simulated Wage Costs are not included in the cost totals.				

Table 2: Project Budget

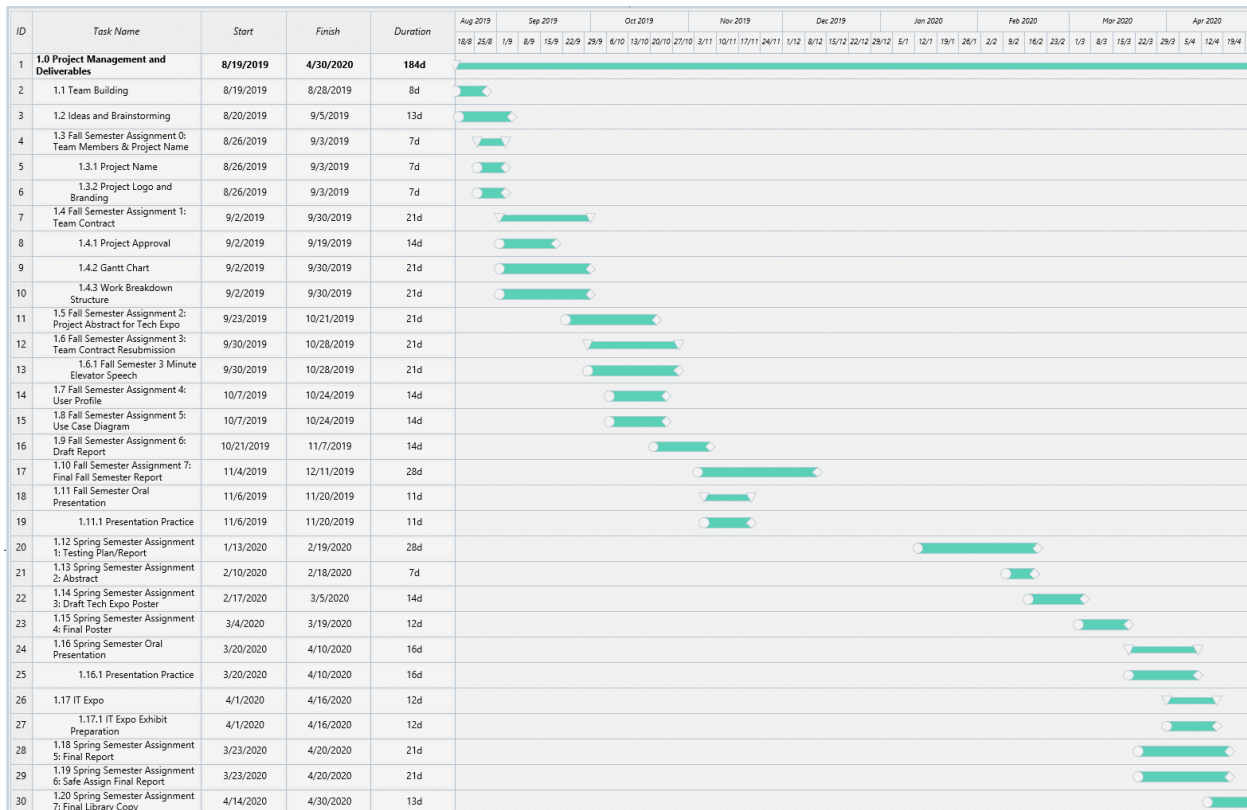
OBJECTIVES/DELIVERABLES

Major Project Milestones (Deliverables)			
Fall of 2019 Milestones			
User Questionnaire Milestone	11/27/2019	Setup LAMP Stack Milestone	11/20/2019
Design Draft Website Milestone	11/10/2019	Implement Speed Test Milestone	12/8/2019
Spring of 2020 Milestones			
UX Testing Milestone	3/2/2020	Final Web Development Milestone	1/25/2020
Security Testing Milestone	3/9/2020	Completed MySQL Milestone	2/1/2020

Figure 2: Major Project Milestones

PROJECT SCHEDULE

Figure 3: Fall Semester 2019 – Spring Semester 2020 Gantt Chart is our project schedule with the major milestones listed.



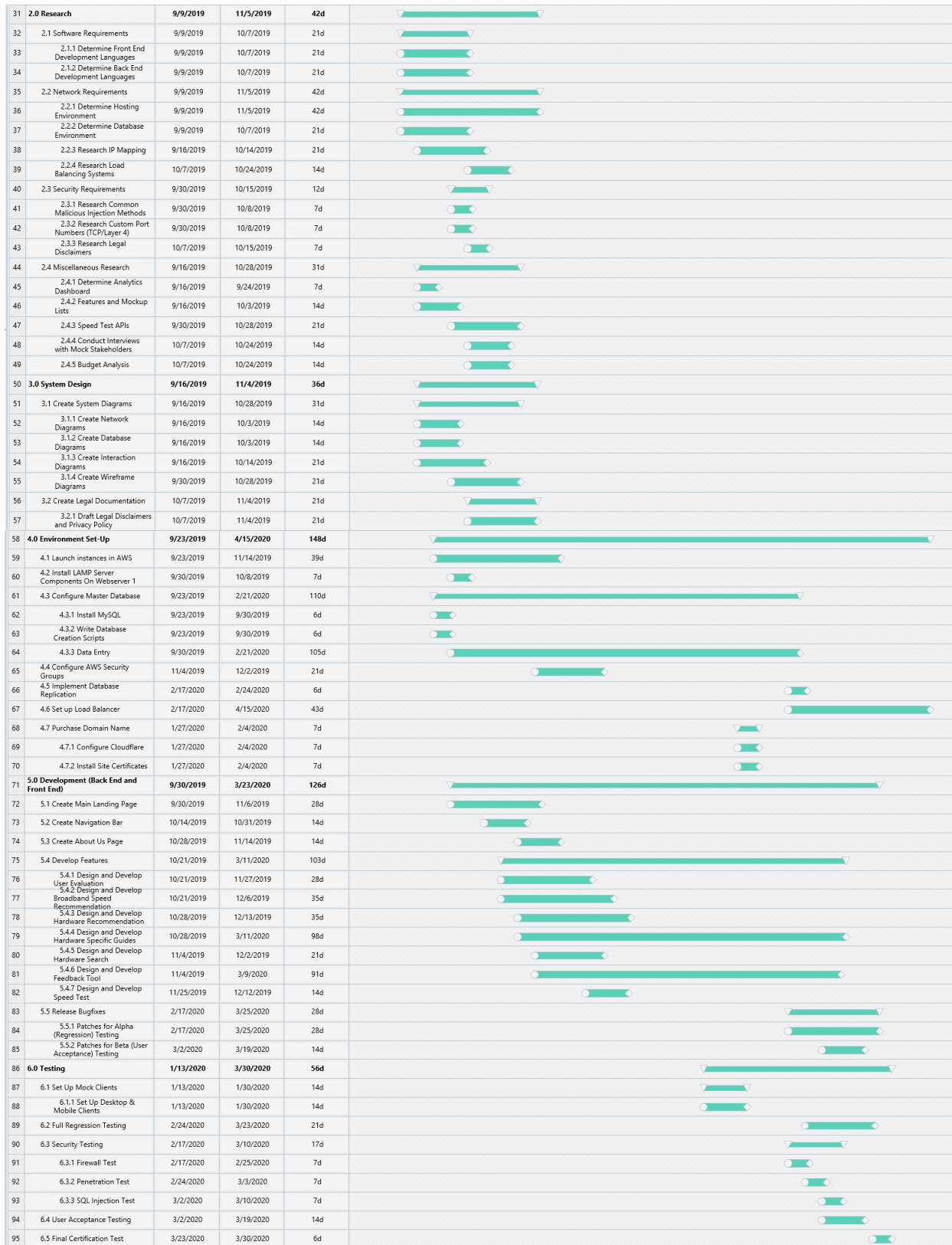


Figure 3: Fall Semester 2019 – Spring Semester 2020 Gantt Chart

TECHNICAL APPROACH

ISP4ME is an all in one tool for selecting and setting up the best SO/HO network. We needed our tools to be lightweight, responsive, and fast. With these three factors in mind, we brainstormed our technical approach. This led us to pick a LAMP stack server.

NETWORK

ISP4ME needs a reliable, responsive and easily accessible website. We choose to have ISP4ME hosted on Amazon Web Services for its ease of use, scalability, and relatively low operating expenses. Using AWS will allow users of ISP4ME fast and reliable access to our site and tools. AWS will host our web server and MySQL database.

APPLICATION

Our web application will not be using a backend framework instead, we plan on utilizing PHP, HTML, and SASS to create a fast, responsive website. We plan on using MySQL as the database that feeds our website information. PHP and MySQL work seamlessly together so we hope it allows our site to be very responsive. We aim to create the best possible user experience to encourage user engagement.

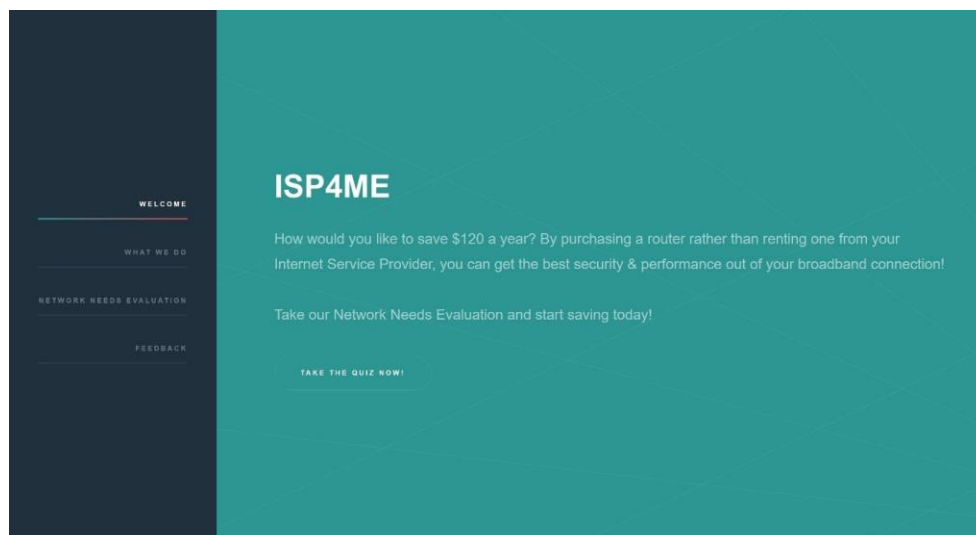


Figure 4. Landing Page

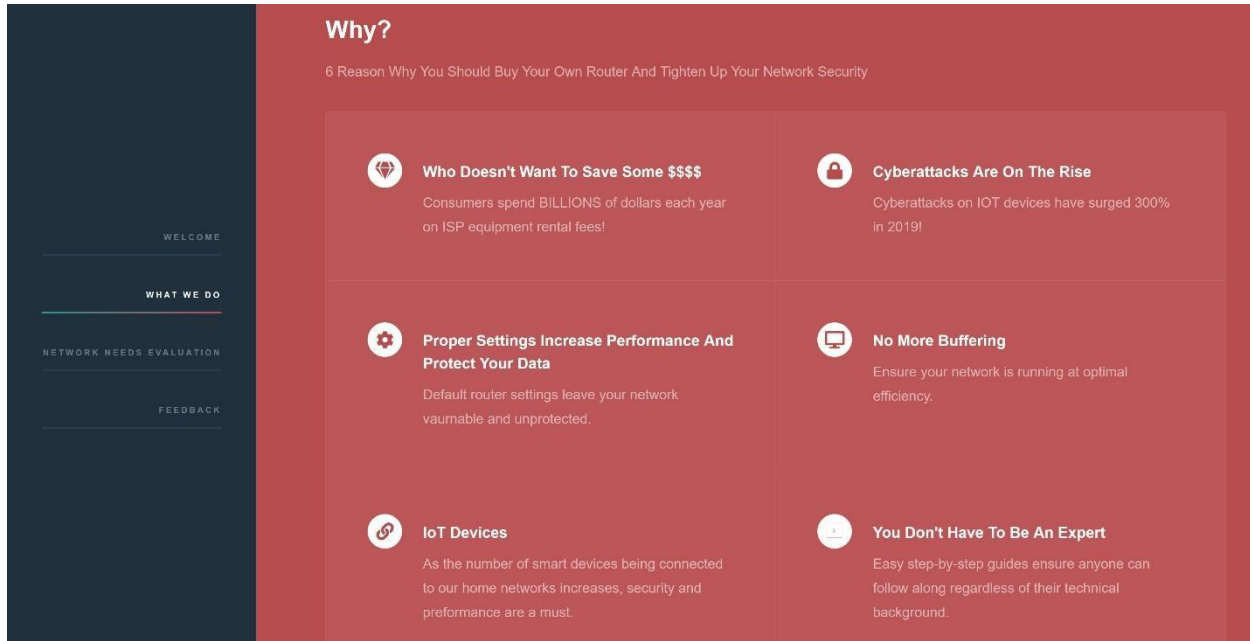


Figure 5. Why Should You Use ISP4ME

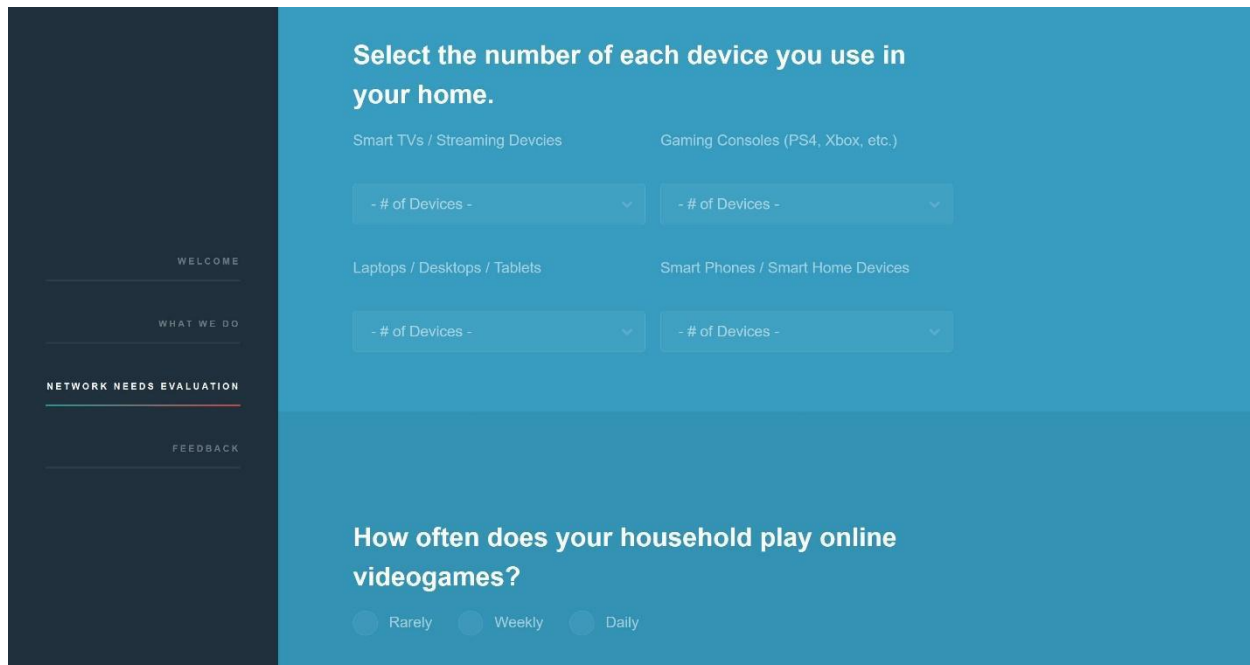


Figure 6. Network Needs Evaluation

SECURITY

ISP4ME aims to have a secure website and because users are not required to sign in there is less information we need to protect. DDoS attacks will be the biggest threat to our systems, followed by injection attacks. To mitigate these concerns, we implemented Cloudflare protection for the ISP4ME domain. This provides end-to-end encryption, caching, DNS management, and more.

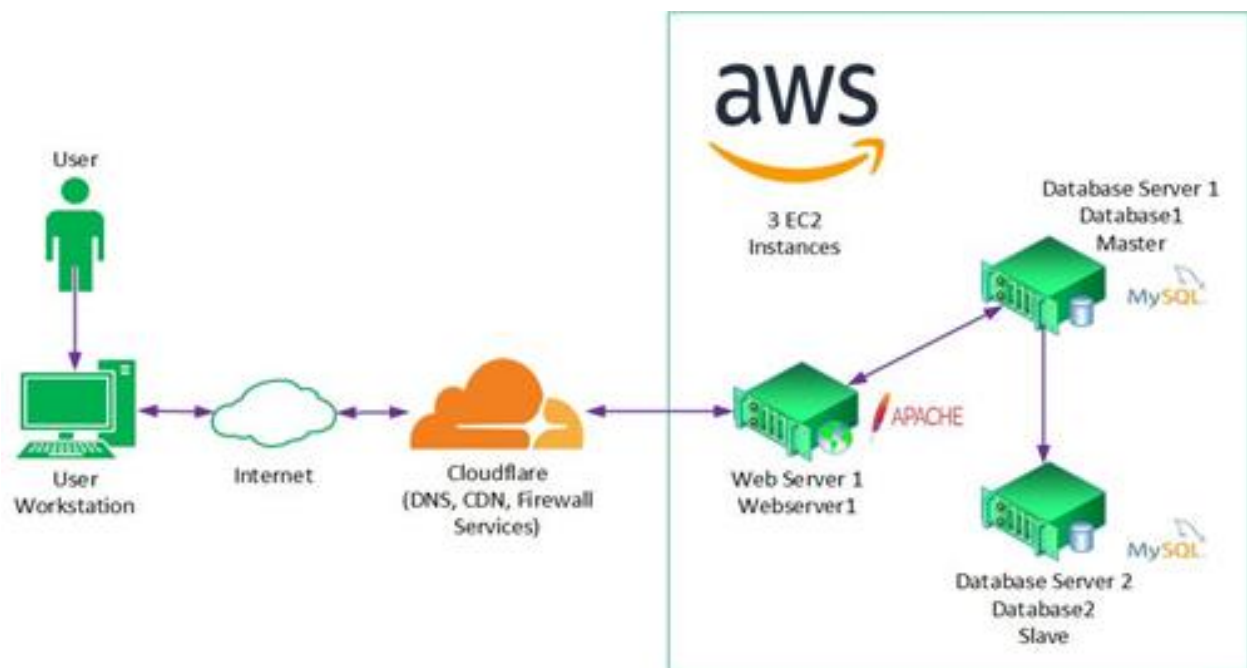


Figure 7. Technical Architecture Diagram

TEST PLAN

OVERVIEW

This section includes information on the processes and methodologies that were used in the testing of the ISP4ME site. The following groups/individuals can use this section as a guide:

- Developers
- Project Managers
- Testers
- Q/A Personnel
- Team Members

SCOPE

The scope of this testing covers all interactive elements of the ISP4ME web application to ensure the full functionality of the website and backend servers on supported web browsers. The testing will be done during the development cycle and after the coding is completely based on the requirements for the application.

OBJECTIVES

The objective of testing the ISP4ME is to verify that each part of the web application works as expected. The tests were designed to find bugs during and after the development cycle. If bugs are found during testing, testers will document and notify the developers. Depending on the severity of the bug, the developers prioritize them as they arise. By the end of our development cycle, we aim to have the testing started so it is completed well before presenting.

- All features of ISP4ME must have Q/A tests completed
- User-Role walkthrough tests completed for each user type
- Found Bugs must be documented and addressed before IT EXPO

TEST APPROACH

Before testing can begin it is important to select relevant tests for the application as well as setting pass/fail conditions and creating tables to display the test results.

Tests being Performed:

1. System Testing
 - a. Ensured all backend systems are running and connected
 - b. Ensure tables accept the proper data types
 - c. Complete all Security Tests
2. Quality and Assurance Testing
 - a. Users should be able to navigate to every page on the site
 - b. Users should never have trouble with links
 - c. A successful test would mean there were no dead links or broken pages
 - d. Users should not encounter any formatting issues or typos
3. User Acceptance Testing
 - a. Users should be able to complete and submit the Network Needs Evaluation
 - b. User should be able to access Evaluation results and navigate through router config steps
 - c. Users should be able to fill out the feedback form and submit it
 - d. User should be able to navigate to the SpeedTest tool and take a broadband speed test

PASS/FAIL CONDITIONS

It was expected that ISP4ME would pass all categories of testing. The goal for ISP4ME is to be a bug-free application. If ISP4ME failed a test, the tester documented the issue and escalated it to the developer.

SCHEDULE OF TEAM MEMBER TESTING

Due to the team's conflicting schedules throughout the course of this project and the COVID-19 pandemic near the end, testing of ISP4ME was done very informally. We distributed the URL and worked remotely with testers to gather their feedback and test results.

TEST CASES

System Test Cases

Table 3: System Testing Test Cases & Results displays the individual that tested each item, the expected outcome, and the actual outcome.

Tester Category	Item	Expectation	Actual	Pass/Fail	Bug
Developer	Browser Tests	Web app is fully functional in all web browsers	Application ran in environment without an issue	Pass	N/A
Developer	Database connection and processes	DB connects and is able to execute queries	Application ran in environment without an issue	Pass	N/A
Developer	Database Replication	Database replication should not be interrupted when the servers are rebooted	Application ran in environment without an issue	Pass	N/A

Table 3: System Testing Test Cases & Results

Quality & Assurance Test Cases

Table 4: Quality and Assurance Test Cases & Results displays the individual that tested each item, the expected outcome, and the actual outcome.

Tester Category	Item	Expectation	Actual	Pass/Fail	Bug
Developer	Typos	User should be able to navigate the site without being distracted or misled by spelling or grammatical errors	Site is free of blocking or misleading mistakes	Pass	N/A
Developer	Loads on all devices	The website should load and be fully functionally on any size display	Application ran in environment without an issue	Pass	N/A
Developer	Navigation Links	User should be able to navigate to every page on the site	All pages accessed successfully without error	Pass	N/A
Developer	External Links	All links to external locations should be functional	All external links were proven functional by test	Pass	N/A

Table 4: Quality and Assurance Test Cases & Results

User Acceptance Test Cases

Table 5: System User Acceptance Test Cases & Results displays the individual that tested each item, the expected outcome, and the actual outcome.

Tester Category	Item	Expectation	Actual	Pass/Fail	Bug
User	Evaluation Submission	User should be able to fill out the evaluation and submit the form	All UI tests passed without an error	Pass	N/A
User	Evaluation Result Output	User should receive the result of their evaluation and be able to interact with each piece of it	All UI tests passed without an error	Pass	N/A
User	Speedtest	User should be able to take a speed test and view their results	All UI tests passed without an error	Pass	N/A
User	Feedback Submission	User should be able to submit feedback without error	All UI tests passed without an error	Pass	N/A

Table 5: User Acceptance Test Cases & Results

PROBLEMS ENCOUNTERED

One of the largest problems encountered while in the planning phase of ISP4ME was picking our frameworks. With no software developers in the group, our knowledge of web development and frameworks was minimal. We spent weeks bouncing between different frameworks before we settled on using no backend framework and Vue.js with PHP for the frontend. Once we settled in on frameworks, we were able to piece together a prototype of our web application.

After piecing together a prototype we determined Vue.js was unnecessary for our needs, so we had to rethink our design approach a bit. A lot of the problems we encountered following this were small minor things. We ran into an issue with the home page having a blank space

between the body and footer, the fix was a simple CSS change. Another problem encountered was when trying to pull information from the database based on the user's input from the network needs evaluation. The fix for this was not as simple as we had to gain a deeper understanding of PHP and MySQL.

Another issue that we discovered was with our site not loading on Apple devices after implementing HTTPS. Several hours worth of fruitless troubleshooting led to us replacing all of our site files with older versions of themselves. After doing this the site loaded on Apple devices without error. We then replaced the old files with the current versions and Apple devices have been able to access the site ever since. We believe the issue was something with the permissions on the files and that it was resolved when the files received different permissions upon being moved from a different directory. If not, the only other explanation we can think of would be that it was caused by Cloudflare caching.

RECOMMENDATIONS

Learning from experience is the best way to gain knowledge and if we could go back in time and do this project again, we would want to do a few things differently. The biggest change would be selecting a group larger than two people so we can have an expanded scope. In our feedback from the fall semester presentations, a lot of other groups suggested we add more features and with a bigger team we definitely could have accomplished more ambitious goals. Another thing we would change is the amount of time that was spent researching different design methods and frontend frameworks. Although neither of us are software developers, we know enough and are savvy enough that the amount of time that we spent deciding on these things really wasn't justified. If we could do it over, we would choose PHP from the beginning and not

waste weeks researching frameworks that we now know were never good options for developers of our skill level.

Ideally, we would like to be able to generate enough ad revenue to keep ISP4ME.xyz up as a free and easy to use tool. Realistically, ISP4ME will live on only in our memories.

CONCLUSION

FALL SEMESTER 2019

This semester we spent the majority of our time researching different programming languages, frameworks, and other various topics relating to web design and application development. As novice developers, we made sure not to be rash in our decision making. Our biggest fear was that we would select a framework or language that would prove to be unnecessarily complex or cumbersome. Our goal was to select tools that would allow us to iterate rapidly over the course of the project. Hence our decision to use a LAMP Stack.

Due to the significant amount of time that it took us to finalize our decisions on such matters, we found ourselves behind schedule on delivering features and meeting certain milestones. Despite those pitfalls, we managed to lay the groundwork for exactly what we wanted ISP4ME to be.

SPRING SEMESTER 2020

This semester we split our time working on the frontend and backend. We started the semester working in Visual Studio to build an intuitive and user-friendly interface that now is ISP4ME.xyz. We also finalized our database design in the early part of the semester which allowed us to begin the chore of filling the DB with ISP information, routers, router guides, recommendations, video links, and other information. This also allowed us to make the connection from the database to the webserver and start testing the storing and receiving of information. This enabled the completion of the feedback feature and led to the implementation of the speedtest feature. It also marked the beginning of the transition from working on the questionnaire to working on the output of the results page. While our programmer worked on the

results page, the network architect worked on purchasing the domain, adding the site to Cloudflare, and implementing database replication. Upon completing these tasks, we collectively moved on to our final testing phase.

It took us a significant amount of time to complete the User Needs Evaluation and fill the database with accurate, up-to-date information, but despite those delays we managed to remain on schedule with the Gantt chart to complete user testing on time.

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APPENDIX A. IT Expo Poster

Figure 7: IT Expo Poster displays the poster that we designed for the Expo.

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Technical Advisor: Ryan Moore

ISP4ME

ISP4ME IS HERE FOR YOU
www.isp4me.xyz

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 Technology

The Problem

- Many consumers spend upwards of \$120 annually on renting their router from their Internet Service Provider (ISP).
- Home networking equipment is often used with default security and networking configurations, leaving home networks unoptimized and vulnerable to intruders.
- There is no consumer-friendly solution available that provides a comprehensive source of information to help solve these issues.

Who Doesn't Want To Save Some Money
 Consumers spend BILLIONS of dollars each year on ISP equipment rental fees!

Better Hardware Increases Performance
 Newer and better hardware can help you get the most from your broadband connection!

You Don't Have To Be An Expert
 Easy step-by-step guides ensure anyone can follow along regardless of their technical background.

Cyberattacks Are On The Rise
 Cyberattacks on IoT devices have surged 300% in the last year!

Configuring Router Settings
 Entering your routers settings from intruders. Default router settings leave your network vulnerable and unprotected.

Speedtests Are Easy to Use Network Tools
 Easily check your broadband speed to make sure you are receiving and taking full advantage of what you are paying for!

TAKE THE SPEEDTEST NOW!

Our Solution

A web application designed to be an all-in-one solution for consumers that allows them to effortlessly make the transition to owning their own router and securing their home network, regardless of their technical background.

Key Features

- Network Needs Evaluation
- Router and Broadband Speed Recommendations
- Streamlined Configuration Guides
- Broadband Speed Test
- Customer Feedback and Support System

Technology & Design

ISP4ME is Concise, Intuitive, Accessible, Responsive, Lightweight, and Secure.

powered by **aws**