205CDE

Developing the Modern Web

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GitHub: https://github.coventry.ac.uk/205CDE-1718JANMAY/205CDE-Course-Work.git

2018

Introduction

During this module I was asked to create a website using modern web development techniques. These include NodeJS (NodeJS 2018), HTML and CSS. I decided to create an alternative private file sharing website. This website would be different from its competitors by including additional features with a focus on the user’s privacy.

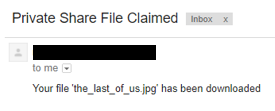
What website did I create?

I have created a website which allows users to share files over the internet. This website has a focus on the user’s privacy by enforcing the use of a password to encrypt and decrypt files. Files which are shared using my website will not hang around on the internet forever because they will be purged from the host server after a determined set of time; this means that the user has peace of mind when sharing their sensitive information. The website has a clean modern user interface which should be simple to use for first time users yet powerful enough for regular users.

Methodology

During this project I decided to play to my strengths as an engineer and focus on making an application which has a more complex backend. The front end of my website is quite minimalistic however very functional.

Feature list

* Time limit – Files on the server will only be stored for a predetermined set of time. In my website I currently have a scheduled task to delete the unclaimed downloads after an hour.
* Password protected files – When the user uploads a file to the server it will be encrypted using the user’s password. This feature means while the users files are stored on the host server they can’t be viewed by anybody. (The only detail that is preserved is the filename)
* Email receipt – After the user has shared their file using the service and the recipient has downloaded the file an optional email receipt will be formatted and sent to the user which uploaded the file. This means that the user is certain the file has been claimed. This is a feature which would be useful when sending files in a business environment.
* Garbage collection – This feature is almost mandatory when dealing with files on the server; if a user uploads a file and nobody claims the download then we are left with a file on the server permanently. This feature means that if there are any unclaimed downloads remaining from when the server was last run they will be removed automatically.
* qrcode – Once a user has uploaded a file to the server they will be sent a share page which contains a URL to the download file. There will also be a QR code on that page which will mean that the user can share files with friends who are on their phones. This simply means that the user will not have to type the URL which contains a random uuid on their phone.
* Secure handling of passwords – The web application uses the NodeJS module bcrypt (bcrypt 2018) to hash and compare passwords. ONLY the hashed versions of passwords are stored in the applications database.
* Persistent Data – Since all the relevant data is stored in the SQLite3 database the Express routes to files can be restored after a server restart. This means that all the data is not lost if the server fails and needs to be restarted. The files will still be removed properly after an hour by the Garbage Collector module.
* Minimalistic design – The website has a minimal but effective design which is easy to navigate and astatically pleasing.

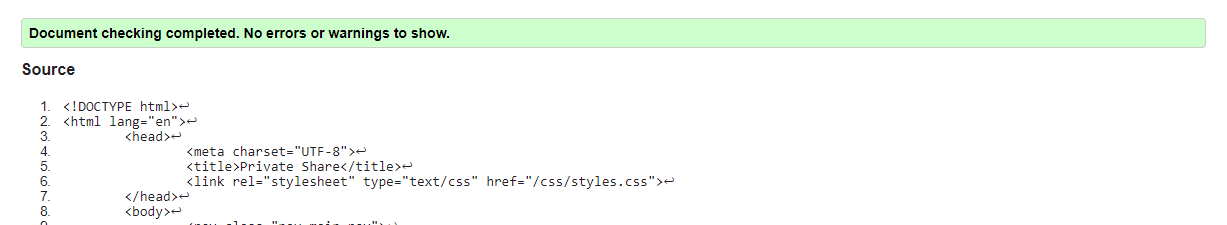
Discuss each of the technologies used in creating the website

NodeJS (NodeJS 2018) – NodeJS is the JavaScript runtime which is built on Google Chrome’s V8 engine. This is the language that I have used in conjunction with the Express framework to create my website.

Express – Express is the minimal web framework which I have used to create my website. It has allowed me to easily create and remove dynamic routes to both efficiently and privately share files.

SQLite3 (sqlite 2018) – SQLite is used in my website to store the hashed passwords used to encrypt files. I’ve used the bcrypt (bcrypt 2018) module for password hashing. When the user enters their password into the download page it will be compared to the one in the database. I have normalised the database as well. I did this by separating the database into two separate tables. I have a single table which stores the passwords along with the file paths and another table containing the user’s id and optionally their email.

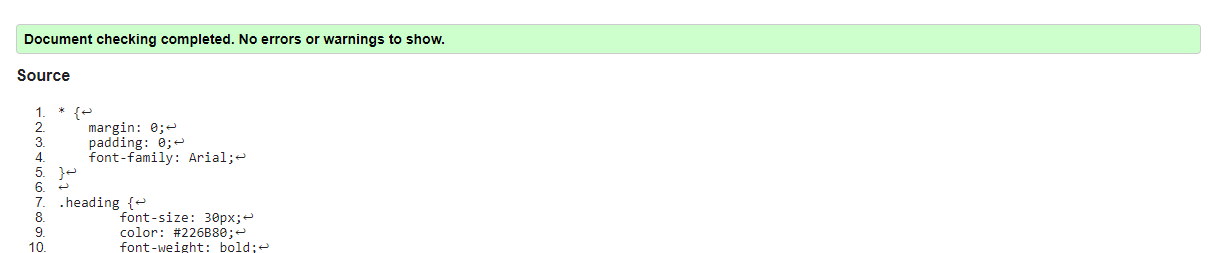
HTML – Hyper Text Mark-up Language is one of languages of the modern web. It is the structure of websites on the internet. All the HTML that I wrote passes the W3 validation.



I have also implemented the use of scheme.org as can be seen in the Google data scraper.



CSS – Cascading Style Sheet is the way that we add style to HTML. This is the tool that I have used to give my website a ‘modern’ look. All the CSS that I used to style my website passes the W3 validator.



Discuss any issues you came across when developing the website

While I was developing the website, I needed to keep concurrency in mind. This was because I would need to anticipate having more than one person using the website at a time. I would need to be able to keep track of the user’s files and make sure that when they download files they are getting the correct files which they are able to decrypt. I overcame these issues with the use of a node module called uuid (uuid 2018). This module allowed me to create a unique identifier for each separate user’s files. This neatly and quickly solved the issue of concurrency by allowing me to make sure that users actions while using the website didn’t clash.

Storing password is one issue which I needed to overcome. In the end I use a NodeJS module called bcrypt (bcrypt 2018) which allowed me to hash passwords. I could then securely compare passwords to determine if the user should have access to the file download. This was an extra layer of security as well as the file encryption.

Another issue which I came across while making my website was the dynamic download page creation and dynamic Express (Express 2018) route creation and removal. Since my web service is allowing users to share their files I needed to dynamically create URL’s which the user can then send to the recipient which allows them access to the file. I used several different Node modules and self-written modules in conjunction to solve this issue. These modules were uuid (uuid 2018), node-schedule (node-schedule 2018), express-es6-template-engine (express-es6-template-engine 2018) and route-remover. These modules together allowed me to effectively create dynamic download pages and add and remove Express routes.

* uuid – The uuid module allowed me to create a unique id which used for the actual URL. This make sure that I have don’t have conflicting URL’s.
* express-es6-template-engine – The template engine module allowed me to inject the download URL into a share page which means that the user can share the download URL easily.
* node-schedule – This was the module which allowed me to schedule the garbage collection method.
* route-remover – This is a module which I wrote which allows the complete removal of express routes. The route is removed by its path.

What have I learnt over the term?

During this module I have been able to learn about the best practices when it comes to creating modern websites. These are websites that offer dynamic content to the user. Using this technique means that the developer can reuse huge amounts of HTML and CSS by using template engines and JavaScript. An example of this dynamic page creation would be the ‘download’ and ‘share’ page for my website. Each of which changes depending on the download URL and ID of the shared file.

It has been a great insight learning about how asynchronous JavaScript works and how to write it. The simplicity allows this allows the creation of powerful websites with a very little amount of code.

Over this semester I have also learned how powerful NodeJS’s package system is. When creating the qrcode for my share page I found a Node module called qrcode (qrcode 2018) which allowed me to easily create a qrcode. The qrcode was already base64 encoded. This allowed me to simply use es6-renderer to place it on my share page.

How would I improve on my website?

* Time limit – The user could decide how long they want files to remain of the host server at the time of upload. This would be a helpful alternative to the hour time limit included in my initial implementation.
* Download limit – Instead of purging the files from the server the user could determine how many times they would like to allow the file to be accessed. The feature would be extremely useful when sharing the same file with multiple users.
* If I had more time to work on the website I would like to give it full responsive web functionality. This would allow users on mobile devices to use the file sharing service. I have not added this currently as it would require a completely new design for mobile and tablet. (Please refer to the methodology section)

Extending the website with the features listed above would be relatively simple. These features were not included in the initial implementation of the website because they would have taken slightly more time to implement and fine tune.

For both the adjustable time and download limit it would simply be a case of adding an additional column to the server’s database and interacting with that persistent value.

Conclusion

During this module I have been able to refine my skills which JavaScript, HTML and CSS. These are all skills which I will need in an industry environment. I have been able to make a website which effective and does everything that I wanted it to do; my website had a complex and interesting backend while maintaining a simple and effective user interface.

References

NodeJS is a JavaScript runtime which is based on Google Chrome’s V8 JavaScript Engine. [Online] Available at ‘https://nodejs.org/en/’.

uuid [Online] Available at ‘https://www.npmjs.com/package/uuid’

node-schedule [Online] Available at ‘https://github.com/node-schedule/node-schedule’

express-es6-template-engine [Online] Available at ‘https://www.npmjs.com/package/express-es6-template-engine’

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sqlite3 [Online] Available at ‘https://www.sqlite.org/index.html’