

# NShare

## A-Level Computer Science Project

### Noah Torrance

---

Candidate number: 5307

Centre number: 61805

# Contents

Computational Approach.....	3	Web Server.....	9
Stakeholders.....	4	File Servers.....	9
Research.....	5	Operating System.....	9
MEGA.....	5	Success Criteria.....	10
MediaFire.....	5	Decomposition.....	11
Essential Features.....	6	Structure.....	12
File Management.....	6	Solution.....	13
Sharing.....	6	Usability Features.....	14
Encryption.....	6	Data Structures.....	15
Moderation.....	6	Database.....	15
Email Confirmation.....	6	users.....	15
Other Features.....	7	reports.....	15
Previewing and Editing.....	7	files.....	15
Limitations.....	8	Test Data.....	17
Requirements.....	9	Test Results.....	18

## Computational Approach

---

## Stakeholders

---

# Research

---

## MEGA

MEGA is a web-based cloud storage and file hosting service. It features end-to-end AES encryption to keep files secure. Even MEGA themselves do not have the encryption keys needed to decrypt them.

## MediaFire

MediaFire is a web-based file synchronisation and cloud storage service. It provides a convenient way to share files by generating a link to the file which anyone can use to download it.

# Essential Features

---

## File Management

The primary component of NShare is the file manager, where the user views and interacts with their files. There will be a priority on making this as convenient as possible. For example, the user will be able to select multiple files and change their attributes in one go.

## Sharing

Using a search tool, the user can find other users and friend them. The user can grant their friends access to some or all of their files, and vice versa, allowing for convenient file sharing between users. The user can also create a link to a file with an optional expiry date. The link can be set to expire immediately after the first use for more secure files.

## Encryption

Without encryption, anyone with access to the server would be able to view the name and contents of every file from every user. For security and privacy reasons, it is important to encrypt the files such that it can only be decrypted by the owner and those the owner has shared the files with.

## Moderation

There are numerous ways a bad actor could use file sharing services. Whether they upload illegal content or steal other user's data, it is important to have an administration system where users who abuse the service can be reported and banned by a moderator if need be.

If a user shares illegal content to another person, that person can choose to report the file and it will be investigated by a moderator. The moderator can do one of three things: delete the file, ban the account that uploaded the file, or ignore the report.

## Email Confirmation

To ensure that accounts are created with a legitimate email address a confirmation email is sent to the user on signup.

Disposable email addresses are used to create multiple accounts under one person for online services that require an email address. In the case of NShare, disposable email addresses could be used to abuse the free storage given to new accounts.

Before the email is sent the server will check if the address is from a disposable email provider. Once the email address has been validated a confirmation email is sent to the user. They must enter the code from the email into the signup form to confirm their account.

## Other Features

---

### Previewing and Editing

While NShare is primarily a file hosting service, files can be previewed before downloading them. It is even possible to edit and save text files to make quick edits.

## Limitations

---



# Requirements

---

## Web Server

NShare is a cloud service which is accessed through a website which should be hosted on a web server, ideally one that runs Apache because it uses the special `.htaccess` file to handle redirects and errors. The files themselves should be kept on separate servers that are either owned by the company or rented at a data centre.

## File Servers

Many users will be uploading and sharing their files on the service which means a massive amount of storage space would be required. If the company decided to buy their own servers then they should use magnetic storage to host the user's files. This is because magnetic storage is cheaper than solid state.

In most cases hard disk drives are less reliable than solid state drives, but that downside is made up for the fact that most users will not be using NShare as frequently as they would their own local storage. An operating system on secondary storage constantly reads and writes to the drive, whereas the server's drives would only be in use when the users are modifying files.

If the amount of data is too large to fit on the company's servers or the storage cost is too high, servers rented at a data centre could be used instead. One downside is the lessened control the company has over the user's data. Additionally, the company would have less or no control over resource allocation, user data, and network speed which could negatively affect the user experience.

## Operating System

The servers that host the system should be secure and stable. They should be running a distribution that can meet those criteria such as Debian, CentOS, or RHEL.

## Success Criteria

---

## Decomposition

---

## Structure

---

## Solution

---

## Usability Features

---

# Data Structures

---

## Database

The `nshare` database is made up of five tables. Each table has a primary key that gives each row a unique number so that it can be referenced in other tables. A primary key in another table is called a foreign key. The main table is `users` which has a foreign key in `bans`, `friends`, and `files`. Lastly, `files` has a foreign key in `links`.

I will explain some of the columns in these tables, most of them are self-explanatory so I won't explain those.

### users

The `role` column represents the user's access level. `0` is for everyone, the default for new accounts. Everyone has access to the file manager and account explorer. `1` is for moderators. They can view account reports/appeals and ban/unban accounts. `2` is for administrators. They can view and edit the database directly.

The `visibility` column represents how visible the user's account is. `0` is private. The user's account will not show up in the account explorer. `1` is public, the default for new accounts. The user's account will show up in the account explorer. This means that other users can find, view, and send a friend request to them.

### reports

The `action` column represents what the user is requesting to do. `0` is a ban request. The user has found an illegal file and has chosen to report it. The file and the account that uploaded it will be investigated by a moderator. `1` is an unban request. The user's account has been banned but they believe that the ban was undeserved.

### files

The `visibility` column represents how visible the file is. `0` is private, the default for new files. Only the file's owner can view it, unless someone follows an active link to it. `1` is public. Everyone can view the file.

## users

Column	Type
user_id	int(11) <i>Auto Increment</i>
email	varchar(255)
username	varchar(50)
password	varchar(255)
role	tinyint(1)
visibility	tinyint(1)
signup_date	datetime

## files

Column	Type
file_id	int(11) <i>Auto Increment</i>
user_id	int(11)
filename	varchar(255)
size	bigint(15)
visibility	tinyint(1)
upload_date	datetime

## friends

Column	Type
friend_id	int(11) <i>Auto Increment</i>
user_id	int(11)
friends	varchar(1023)

## links

Column	Type
link_id	int(11) <i>Auto Increment</i>
file_id	int(11)
link	varchar(255)
creation_date	datetime
expiration_date	datetime

## reports

Column	Type
report_id	int(11) <i>Auto Increment</i>
user_id	int(11)
file_id	int(11)
reporter_id	int(11)
action	tinyint(1)
reason	varchar(255)
report_date	datetime
banner_id	int(11) <i>NULL</i>
ban_date	datetime <i>NULL</i>



## Test Data

---

## Test Results

ID	Commit	Type	Expected Results	Actual Results	Clip	Date
30	<a href="#">87ee748</a>	NA	The new notifications are used.	Got expected results.	<a href="#">MP4</a>	2022/10/05
29	<a href="#">07665bc</a>	Valid	The account is created without needing to complete a CAPTCHA.	Got expected results.	<a href="#">MP4</a>	2022/10/05
28	<a href="#">dd9d97b</a>	Valid	The account is created without needing to complete a CAPTCHA.	The account is not created because create.php expects a CAPTCHA response.	<a href="#">MP4</a>	2022/10/05
27	<a href="#">f1651a1</a>	Valid	When the user changes their username their user directory should also change.	Got expected results.	<a href="#">MP4</a>	2022/07/20
26	<a href="#">e1ad6c8</a>	Valid	The friend's account ID is added once to the user's friend list and vice versa.	Got expected results.	<a href="#">MP4</a>	2022/07/15
25	<a href="#">f45e3c8</a>	Valid	The friend's account ID is added once to the user's friend list and vice versa.	The account ID's are added but they can be added multiple times.	<a href="#">MP4</a>	2022/07/15
24	<a href="#">001e9d2</a>	Valid	Friends are shown in the friends list and they can be removed.	Got expected results.	<a href="#">MP4</a>	2022/07/15
23	<a href="#">efe2abd</a>	Valid	The delete button is disabled when no files are selected.	Got expected results.	<a href="#">MP4</a>	2022/07/15
22	<a href="#">b6ba7a2</a>	NA	The new file manager layout is used.	Got expected results.	<a href="#">PNG</a>	2022/07/15
21	<a href="#">9277884</a>	Valid	All files are selected when the master checkbox is checked.	Got expected results.	<a href="#">MP4</a>	2022/07/15
20	<a href="#">bcbd428</a>	Valid	The selected files are deleted when the delete button is pressed.	Got expected results.	<a href="#">MP4</a>	2022/07/15
19	<a href="#">16e60ea</a>	NA	The new file manager layout is used which shows the upload time.	Got expected results.	<a href="#">PNG</a>	2022/07/15
18	<a href="#">89ad2f9</a>	Invalid	The account is not created when the email address is disposable.	Got expected results.	<a href="#">MP4</a>	2022/07/14

ID	Commit	Type	Expected Results	Actual Results	Clip	Date
17	<a href="#">f45e3c8</a>	Valid	The friend's account ID is added to the user's friend list and vice versa.	Got expected results.	<a href="#">MP4</a>	2022/07/14
16	<a href="#">1871866</a>	Valid	A row is added to the friends table when an account is created.	Got expected results.	<a href="#">MP4</a>	2022/07/14
15	<a href="#">b08fecb</a>	Valid	A row is added to the friends table when an account is created.	The row is not created in the friends table because the program expected an array but got a string.	<a href="#">MP4</a>	2022/07/14
14	<a href="#">b08fecb</a>	Valid	The friend's account ID is added to the user's friend list.	Got expected results.	<a href="#">MP4</a>	2022/07/14
13	<a href="#">b7adf6b</a>	NA	The new user explorer is used.	Got expected results.	<a href="#">PNG</a>	2022/07/13
12	<a href="#">a042324</a>	Invalid	The email is not changed if the email address is disposable.	The email is changed because the disposable email address domain was not on the blacklist.	<a href="#">MP4</a>	2022/07/13
11	<a href="#">a042324</a>	Invalid	The email is not changed if the email address is disposable.	Got expected results.	<a href="#">MP4</a>	2022/07/13
10	<a href="#">5dd35cb</a>	Valid	The page file extension is hidden by default.	Got expected results.	<a href="#">MP4</a>	2022/07/13
9	<a href="#">09eab34</a>	NA	The new file manager layout is used.	Got expected results.	<a href="#">PNG</a>	2022/07/13
8	<a href="#">8956c60</a>	Valid	The page uses a dark or light theme as specified by the browser.	Got expected results.	<a href="#">MP4</a>	2022/07/13
7	<a href="#">5a31196</a>	Valid	The previous page is opened when the back button is clicked.	Got expected results.	<a href="#">MP4</a>	
6	<a href="#">c1f9324</a>	Valid	The files are uploaded as soon as they are opened.	Got expected results.	<a href="#">MP4</a>	
5	<a href="#">34e874b</a>	Valid	The current page is highlighted.	Got expected results.	<a href="#">MP4</a>	
4	<a href="#">85b8d69</a>	Valid	The privacy of the file is toggled when the privacy button is clicked.	Got expected results.	<a href="#">MP4</a>	
3	<a href="#">525ce67</a>	Valid	The profile page is opened when the user link is clicked.	Got expected results.	<a href="#">MP4</a>	

ID	Commit	Type	Expected Results	Actual Results	Clip	Date
2	<a href="#">1b2e6ab</a>	Valid	The account is unbanned when the unban button is clicked.	Got expected results.	<a href="#">MP4</a>	
1	<a href="#">07f30fe</a>	Invalid	The account is not banned when the user is already banned.	Got expected results.	<a href="#">MP4</a>	