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Designing File Storage and Sharing System

Ameer Sameer Hamood Mohammed Ali *

1University of Babylon TOEFL Center, University of Babylon, pre225.ameer.sameir@uobabylon.edu.iq, Hilla, Babylon, Iraq.

***Corresponding author email:** ameersameer.it@gmail.com

; mobile: 07802428372

تصميم نظام لخزن ومشاركة الملفات

أمير سمير حمود محمدعلي

1جامعة بابل مركز التوفل، جامعة بابل ، 51002 pre225.ameer.sameir@uobabylon.edu.iq ، بابل، العراق

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ABSTRACT

Background:

Files stored on a network are anticipated to be exchanged securely and efficiently. An internet-based file management platform that enables users to securely create, save, organize, collaborate, and share files. Sharing is a recently developed service idea that is frequently sought after by researchers and students. The suggested work offers many forms of data files, including documents and multimedia files. File storage has been a widely used storage method for many years.

Materials and Methods:

The proposed method used to build the website is Visual Studio 2015 with SQL server Database to provide file storage with different data type storage and it provides a service as an IT repository file storage system to help student and teachers to communicate with each other in academic way for publishing files in easy and in a flexible manner.

Results:

The proposed system results showed that the website can provide file upload with supported files are ".doc", ".docx", ".pptx", ".pdf", ".zip", ".rar", ".mp4", ".flv", ".avi", ".PDF", ".DOCX" and ".DOC". Results showed that the system uploaded file size 5M, 10 and 25 M smoothly.

Conclusion:

The work provides a flexible way to store and sharing files for different fields and we use it for education purposes. The results showed that the proposed system is very flexible in the process of uploading various files at a very high speed, due to the ease of uploading files to the server and accessing them by various students in the college.

Key words: File Storage; Sharing System;Web; ASP.NET; IT repository.

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INTRODUCTION

File sharing refers to the act of exchanging computer data or space in a network, whether publicly or privately, with different levels of access privilege. Although files can be transferred outside a network by physically transferring them, the word "file sharing" often refers to the act of exchanging files within a network, such as a local area network [1]. File sharing enables many individuals to access and manipulate a file, including reading, viewing, modifying, copying, or printing it. Usually, a file sharing system is managed by one or more administrators. Users may possess either identical or varying levels of access privilege. File sharing may also refer to the provision of a specific quantity of personal file storage within a shared file system [2].

File sharing has long been a characteristic of mainframe and multi-user computer systems. The Internet has popularized a file transmission mechanism known as the File Transmission Protocol (FTP) [3]. FTP is a protocol that allows users to view and perhaps modify files that are shared among a certain group of users. To obtain access to these files, users need a password and must connect to an FTP server site. Several FTP services have the option for public file sharing, allowing users to browse or download files by using a well-known password, which is "anonymous" [4]. The majority of web well-known utilize FTP to transfer new or modified web files to a web server. In fact, the World Wide Web may be seen as a vast system of file sharing, where requested pages or files are continually being downloaded or transferred to the web user.

Typically, file sharing refers to a system where users have the ability to both write to and read files, or where individuals are given a specific amount of space on a shared server to store their own files, which may be accessed by other users as desired. File sharing of this nature is prevalent in educational institutions such as schools and universities. File sharing is considered a component of file systems and their administration [6].

All multi-user operating systems include a means of sharing files. One of the most well-known network file systems is the Network File System (NFS). Originally created by Sun Microsystems for their UNIX-based systems, this technology allows users to access and, if authorized, modify files that may be shared as if they were stored on their own personal computer [7]. Files can also be shared in distributed file systems among several nodes in a network. File sharing is a component of groupware and several other types of applications [8].

File storage, also known as file-level or file-based storage, is a hierarchical storage approach used to arrange and store data on a computer hard drive or a network-attached storage (NAS) device. File storage involves the storing of data in files, which are then arranged into folders. These folders, in turn, are structured inside a hierarchical structure of directories and subdirectories. In order to find a file, you or your computer system only require the path, which includes the sequence of directories, subdirectories, folders, and the file itself [9].

Hierarchical file storage is effective for efficiently managing large quantities of well-organized structured data. However, when the quantity of information increases, the procedure of retrieving files might become burdensome and time-consuming. Scaling necessitates the addition of more hardware devices or the ongoing replacement of current devices with higher-capacity ones, both of which can be costly [10].

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Cloud-based file storage services can somewhat alleviate these scale and performance difficulties. These services let numerous users to view and share the same file data that is stored in remote data centers, commonly referred to as the cloud [11]. To utilize cloud storage, you just need to pay a recurring cost on a monthly basis. This allows you to store your file data in the cloud and conveniently increase storage space as needed. Additionally, you have the ability to define specific requirements for data performance and protection. Additionally, you may save the cost of keeping your own hardware on-site since the cloud service provider (CSP) takes care of managing and maintaining the equipment in their data center. Infrastructure-as-a-Service (IaaS) is another term used to refer to this.

File sharing is the process of transferring data and files, including texts, graphics, audio, video, and photographs, from one computer to another computer over a network or the Internet [13]. There are two primary methods for accomplishing this task: peer-to-peer transmission, which involves sending data from one computer to another over a network, and file sync and file sharing devices, which involve transmitting data through websites, applications, Bluetooth connectivity, and other means. A file-sharing application is a software program that enables the sharing and transfer of files, as well as collaboration among users. File-sharing software enable users to submit files to a communal storage area and specify the individuals who are authorized to view the contents. Workplace file sharing programs may be categorized into two main groups: consumer and corporate grade. Cloud-based consumer programs, like Dropbox and Google Drive, provide fundamental collaboration features such as file synchronization, storage, and sharing. These apps are primarily intended for personal use by consumers. They are usually affordable (some are even free) and have user-friendly interfaces. However, they generally lack the controls, security, and supervision features found in enterprise applications. Business file-sharing software often include a greater range of enterprise content management (ECM) capabilities to ensure security and compliance, including automated workflows.Tracking documents and implementing access limits depending on their content [14].

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Figure (1): The Benefits of File Sharing for Enterprises [14].

The advantages of file sharing for enterprises are as follows::

- Convenience: File sharing facilitates the process of accessing the needed information by making it effortless, convenient, and immediate [15]. This minimizes the level of exertion, duration, and vitality that is subsequently allocated to the execution of additional organizational responsibilities [16].
- Cost Reduction: By eliminating the need for companies to own and manage the infrastructure for storing, sharing, and maintaining data, the expenses associated with setting up and managing this infrastructure are completely eliminated. Consequently, the organization's operational expenditures are decreased [17].
- Enhances Efficiency: File sharing minimizes the time required for manual searching and retrieval of necessary information, resulting in time savings. This time might be utilized for other duties that are as important in achieving the company objectives. [18].
- The implementation of this technology decreases the storage capacity needed by an organization to fulfil its file requirements. These benefits include the requirement for fewer office space, less company expenditures, and the elimination of additional overhead expenses [19].
- Enhanced Data Integrity: Utilizing a file sharing infrastructure, with proper security measures in place, enhances the integrity of the obtained data. This is because such data is less susceptible to loss, tampering, and other forms of interference that could compromise its accuracy and reliability. As a result, any following judgments, interpretations, and conclusions that are made based on them are more reliable [20].
- Enhanced vulnerability: File sharing exposes the company's papers and data to potential security breaches. These sorts of cyber threats include illegal access (hacking), worms, viruses, and phishing, among others. Regrettably, this circumstance severely undermines the trust that the business's clients had in the data, so compromising the overall integrity of the firm [21].

- Plagiarism, or the violation of copyright laws, refers to the act of appropriating someone else's original ideas and presenting them as one's own. This gives rise to several issues, including, but not limited to, financial losses resulting from the sale of plagiarized content, fines imposed by applicable regulatory bodies on individuals who are caught, and a decrease in overall trust from the organization's clients [22].
- Loss of Privacy: Sharing files results in a heightened loss of privacy for people or corporations as it enables easy access to sensitive information by other parties. These bits of information may subsequently be utilized to the detriment of the firm [23].
- Call for Action: It is crucial to acknowledge that the advantages and hazards of file sharing mentioned above are not comprehensive, since there were limitations in discussing all of them owing to space limits. To fully capitalize on these advantages and adequately mitigate the possible hazards, it is imperative to contract the services of a proficient, expert, and seasoned online video conferencing supplier [24].

The major contributions of this article are represented by providing File sharing and file storage for centralizing and sharing files on a Local Area Network (LAN) in internal organization for example in university of Babylon colleges to share lectures and store them in one website like a repository. Besides, improving collaboration among student. Collaboration gets much easier when you have a dedicated spot website for sharing lectures in college for a wide variety of data needs, also it provides cost-effectively archive files to meet user requirements for data operations.

RELATED WORKS

The most related works in term of design file storage and sharing system have been discussed and overviewed as follow:

In [25] they examined a safe method for exchanging files in the cloud using the disintegration protocol (DIP). The research also presents a novel approach to enable seamless file sharing among multiple clouds without the need to provide an encryption key.

In [26], a novel approach is presented to address the shortcomings of current systems, such as file encryption, access rights, and key management, in order to establish a safe method for storing and retrieving files. Asymmetric key cryptography is employed to safeguard data and facilitate its recovery with limited access privileges. Observations: The privacy of mobile users is safeguarded against harmful insiders, ensuring the confidentiality and integrity of the accessible files. The suggested technique was used to compare several public key infrastructure methods in terms of key calculation, encryption, decryption, and resource use. The performance of each algorithm was evaluated for different file sizes. Purpose/Enhancement: The suggested system offers user access control, key management, and encryption and decryption of files through a trusted third party to provide data security in a mobile cloud environment.

In [27], an attempt was made to create a secure Electric Health Record (EHR) system that would satisfy all the above criteria for delegating and revoking access permissions. Our network engineering solution facilitates data exchange across healthcare providers while ensuring the privacy of patients' health data through the use of an Electronic Health Record (EHR) system.

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In [28] they discussed the design and implementation of Content Espresso, a distributed system for sharing huge files in digital content development. The system utilizes DRIP and includes performance assessments. The researchers established an experimental setup consisting of 79 physical computers, which included 72 low-cost storage servers. They assessed the performance of file metadata access, file storage and retrieval, forward error correction (FEC) block size, and system availability by simulating worldwide settings. The results validate that Content Espresso possesses the capacity to handle 15,000 requests per second, achieves a throughput of 1 Gbps for file storage, and achieves a throughput of over 3 Gbps for file retrieval. The network circumstances have minimal impact on the performance of file storage and retrieval.

In [29], a client architecture called Cloud4NetOrg is shown. This architecture is designed for cloud file storage and multisite repository synchronization. We have developed prototypes of this architecture that interface with two widely used cloud file services (DropBox and OneDrive). The experimental findings demonstrate a favorable potential for implementation in collaborative scenarios involving several Local Area Networks (LANs). Cloud4NetOrg reduces synchronization time and data transmission across cloud repositories by utilizing the organization repositories as a hierarchical caching mechanism. Cloud4NetOrg is designed for geographically dispersed organizations consisting of fluid and transient collaborative teams. The employees' contact relies on the exchange of files. Typically, websites are connected by a private network and include an internal repository for storing data.

In [30] they introduced an innovative network storage model that combines methods in compression, encryption, and information retrieval. It efficiently addresses the need for both security and sharing. The performance is also showcased through trials conducted on a prototype system.

In [31] they introduced a method designed to facilitate file sharing between family members using mobile phones and PCs at home, regardless of whether the mobile phone user is within or outside the home setting. In our system, the IMS network is implemented to cater to mobile phone users who are outside their home area. Additionally, a Storage Server is deployed to facilitate the forwarding of data when the PC user is not connected. The family members are instructed to utilize Wi-Fi and FTP protocol for file sharing when both the mobile phone user and the PC user are present within the home setting. In this paper, a design file sharing and repository system has been proposed. It is totally presented as follows: 1. Introduction, 2. Method, 3. Results and Discussion, and 5. Conclusion.

MATERIALS AND METHODS

There are many steps for building the used website and we will summarize the main points and the then explained the used code for these steps as: Building the design with ASP.NET C# programming language with CSS for building style and SQL data base for building data sources. Creating data base tables for admin management with four features as (insert to add to database, select to select something from database, update to update last login information, delete to delete request from admin side). Providing the login privileges for admins as two level administrations. Building view toolbox to show the insertion data and all these building point in all website pages as in code behind code.

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Figure (1) showed the site management credentails. When user enter username and password as input information which is matched with the stored information in database to verify from the correctenace of information if correct then user is authorized and directed into management pages otherwise it blocked and exit login page with notification messages as the entered information not correct.

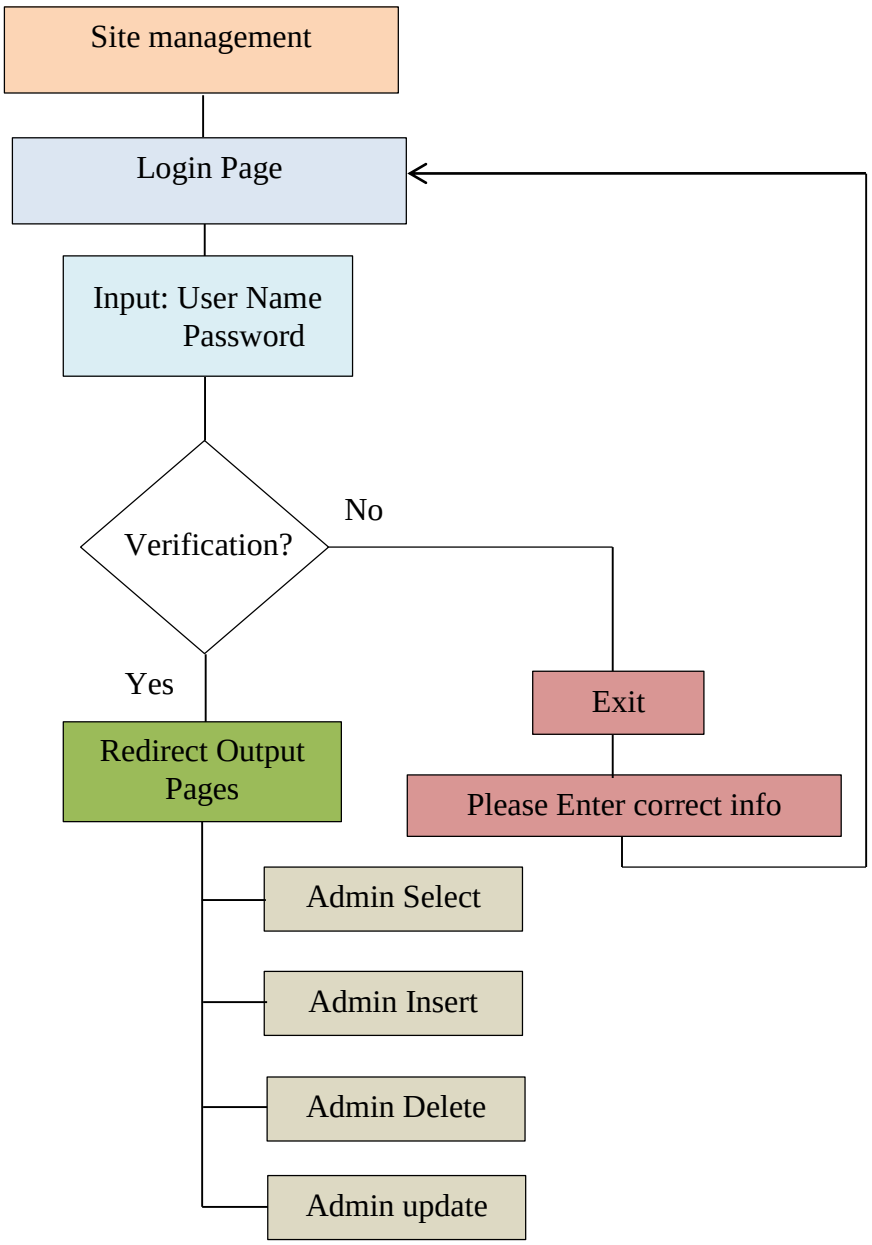

Figure (1): The site management diagram.

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Besides, the proposed system design showed in Figure 2. It contains on the main tabs to click and open different pages on the system such as main page home, student lab tab, contact with admin system or with the multi-media creator. It is also explained the site tree and general overview of the website and rating the system services to provide a general review about feedback of the visitors.

Figure (2): The main design in the current study.

The proposed system depended on a set of standard specifications to work optimally and obtain the desired results, as shown in the Table 1.

Table-1: Environmental requirements in the current study.

Operating Systems	*Windows 10 pro, 64-Bit*
CPU	*Core (TM) I7*
RAM	*8.00 GB*
Implementation Tools	*Visual Studio 2015*

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RESULTS AND DISCUSSION

This section showed the implementation of the used website for file storage and sharing system based on C# programming language with design pages to show the design pages for all website pages as general links and management links and the code behind .
The used system consists of these pages as (HomePage, StudentsLabs, About, Contact, Login)

A-Home page

It contains on the general information about the website and the used link and page as in Figure (4):

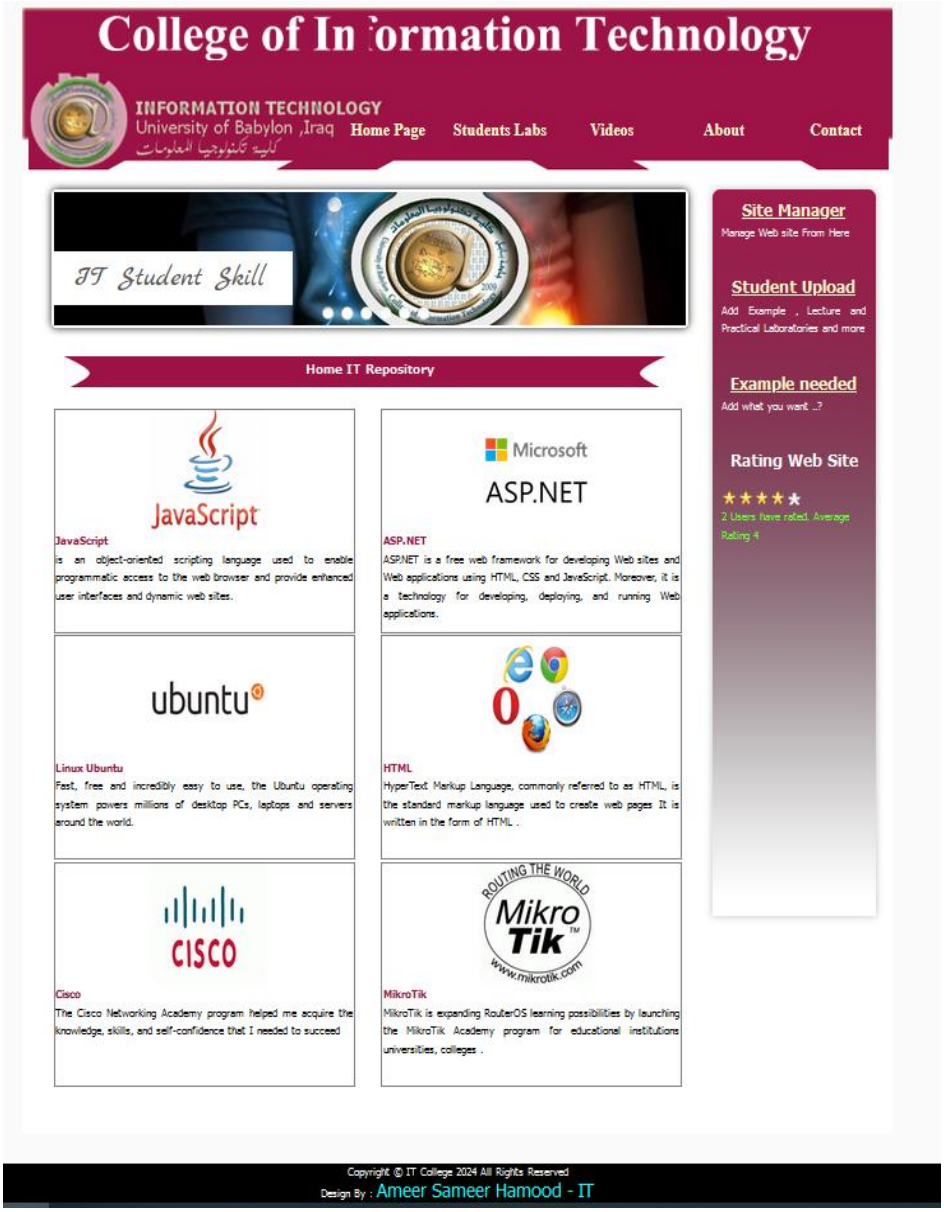

Figure (3): The main page home page component in the current study.

B- Student Lab Page

It contains on the all files shared with students and the main information posted with each file as (the name of file creator, the subject of file , the stage of education, description about file and the link of uploaded file and the way of communication with the teacher or file creator), it showed in Figure (4).

Figure (4): The student lab page in the current study.

C-About page

While this page in Figure (5) contains on the general information about file storage and sharing system.

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Figure (5): The about page in the current study.

D-Contact Page

Figure (6) showed the contact information with the website administrator

Figure (6): the contact page in the current study.

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E- Site Management pages

They are the main pages for administration accounts to manage, create, delete, share files with others and all these privileges after pass the login page, as it showed in Figure (7).

Figure (7): The credential login information in the current study.

While if login information is not correct the user con not login to the website with message error as it showed in Figure (8):

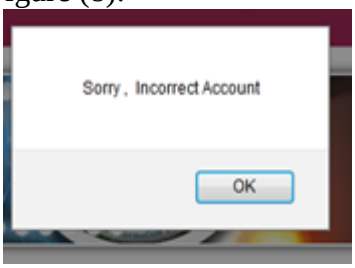

Figure (8): login failed in the current study.

While site manager contains on the Username account information and last login date and user can logout and view request from others to get required files in addition to the admin insertion files for publish in website for student lab as it showed in Figure (9):

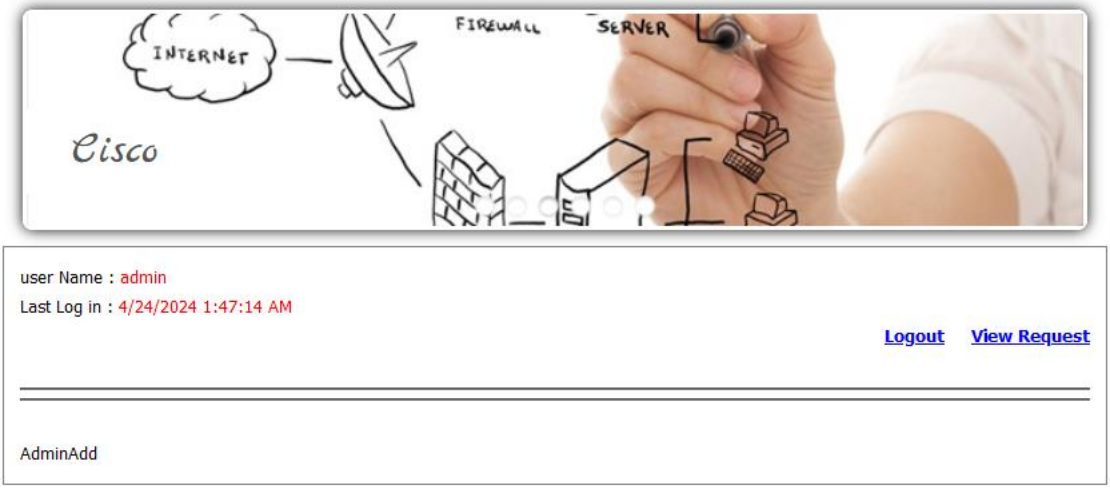

Figure (9): site manager services in the current study.

While website administrator can view requests by students as what they needed(lectures) from teacher, and just site admin can delete request while level two administrator just can see the request without deleting feature, as it showed in Figure (10).

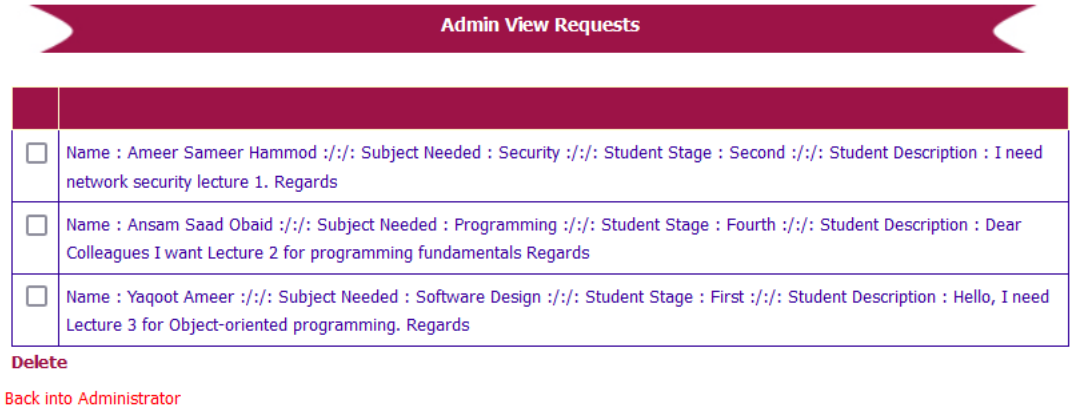

Figure (10): Admin view request in the current study.

While level two admin can see such features in Figure (11) without delete privilege:

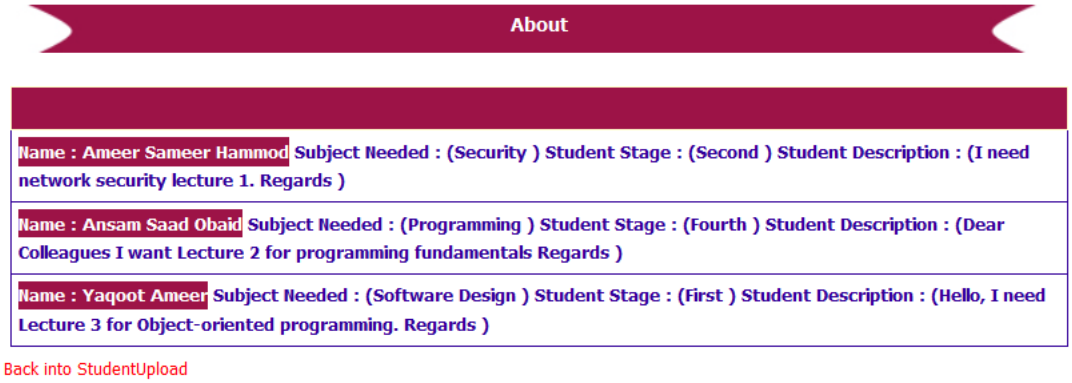

Figure (11): Admin level two Permission in the current study.

F- Add admin

It contains on the information for file uploaded with these features as it showed in Figure (12) :

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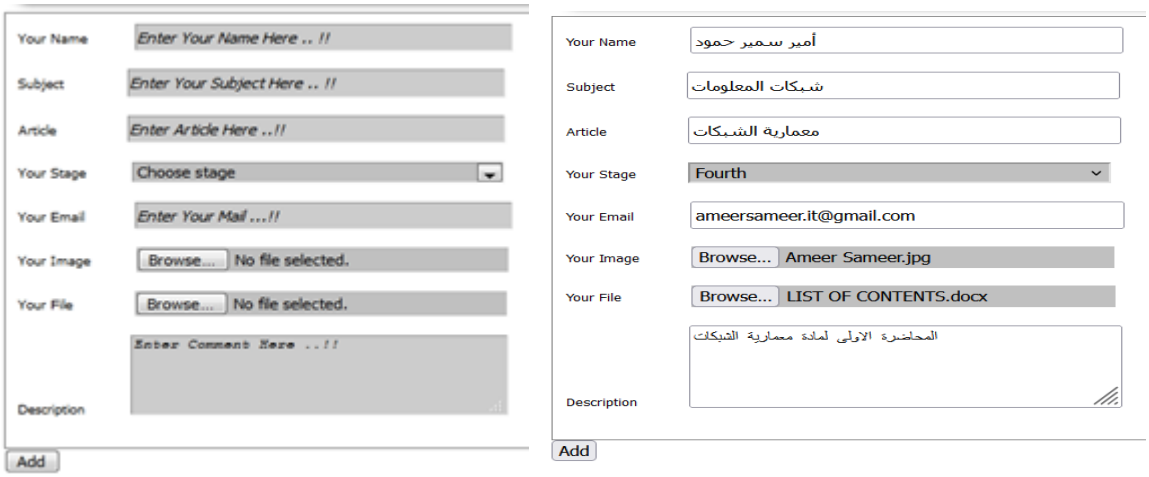

Figure (12): Admin add service in the current study.

When admin click on add button it will be publish file to the student lab page which it will appear to the student to downloaded them from student lab page as it shows in figure (13) bellow:

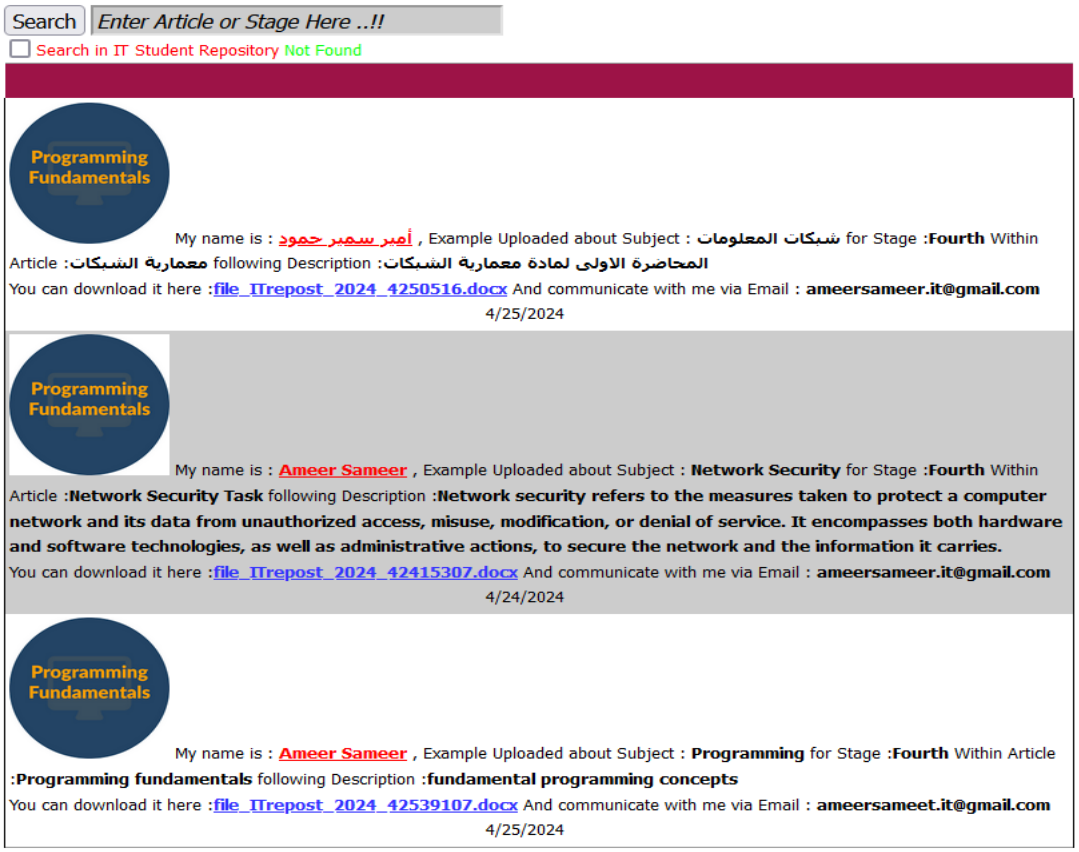

Figure (13): Uploaded Files in Student Lab in the current study.

In addition, student can request some lectures from teacher and website administrator as it shows with these input textbox and send request button, as it showed in Figure (14).

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Figure (14): Example needed view in the current study.

Besides, website administrator can see the request as it showed in Figure (15).

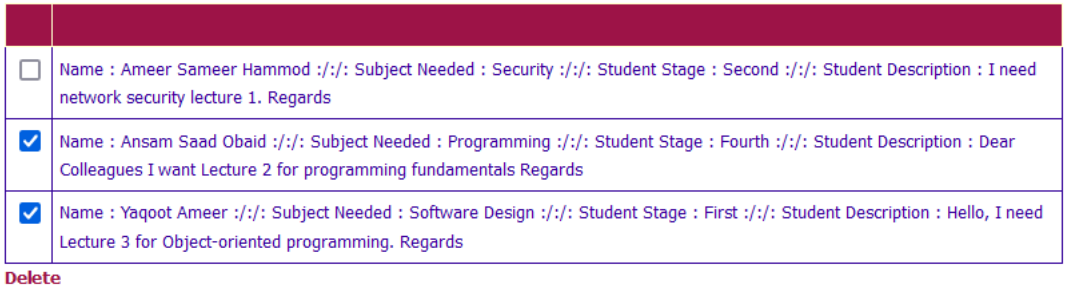

Figure (15): Website admin request view in the current study.

While, the admin level two can see as it showed in Figure (16).

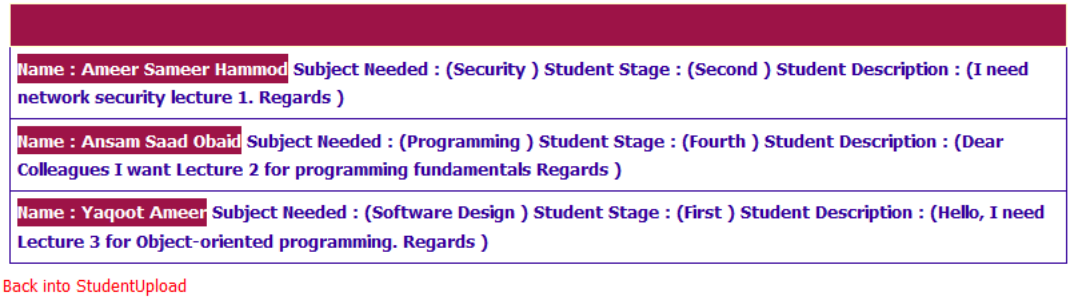

Figure (16): Admin level two request view in the current study.

We will explain the component for each data base table in asp.net c# SQL data base as follow:

1- Admin login table :

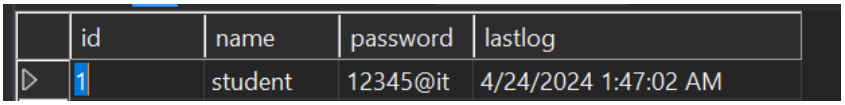

Figure (17): SQL server database table of Admin login in the current study.

2- Level two admin login table:

	id	name	password	lastlog
▷	1	student	12345@it	4/25/2024 11:48:02 AM
	2	student2	Student...	4/25/2024 11:52:55 AM

Figure (18) : SQL server database table of Level two admin login in the current study.

3- Admin add table:

	id	name	subject	article	stage	email	image	filmedia	des	uplodate
▷	20	أمير سمير حمود	شبكات المعلومات	معمارية الشبكات	Fourth	ameersa...	img_ITre...	file_ITrep...	المحاضرة ...	4/25/2024
	19	Ameer Sameer	Network Security	Network Securi...	Fourth	ameersa...	img_ITre...	file_ITrep...	Network ...	4/24/2024
	21	Ameer Sameer	Programming	Programming f...	Fourth	ameersa...	img_ITre...	file_ITrep...	fundame...	4/25/2024

Figure (19) : SQL server database table of admin add list in the current study.

4- Example needed or requested file table:

	id	name	subject	stage	des
▷	5	Ameer Sameer Hammod	Security	Second	I need network...
	6	Ansam Saad Obaid	Programming	Fourth	Dear Colleague...
	7	Yaqoot Ameer	Software Design	First	Hello, I need Le...
✪	*NULL*	*NULL*	*NULL*	*NULL*	*NULL*

Figure (20): Database Tables in the current study.

Besides, sample results of the uploaded files with different size and file types as shown in the Table 2.

Table-2: File size and File types in the web system in the current study.

File Types	File Sizes	Waiting Time
Text	30 KB	125 ms
doc	800 KB	650 ms
PDF	3 MB	1612 ms
Image	5 MB	2578 ms
pptx	7 MB	4898 ms
docx	10 MB	7472 ms

Figure (21) showed the waiting time required to upload different files to SQL database.

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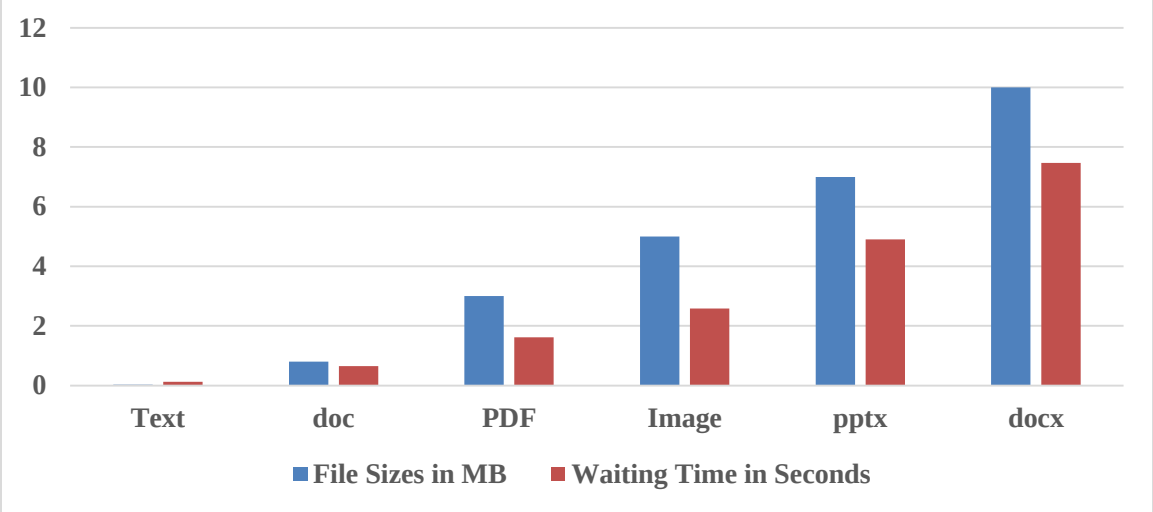

Figure (21): File size and required waiting time in the current study.

CONCLUSION

The current work offers a versatile method for storing and distributing data across many domains, specifically for educational applications. Several recommendations have been made for future endeavors, one of which involves developing a mobile application. Implementing the functionality to add comments and tags to uploaded files, including metrics such as the number of views and downloads, as well as the file size.

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Conflict of interests

There are non-conflicts of interest

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الخلاصة

المقدمة:

أدى التقدم السريع في تكنولوجيا الشبكات إلى استخدام الشبكات كوسيلة لتخزين الملفات وتبادلها. نظام أساسي لإدارة الملفات على الإنترنت يمكّن المستخدمين من إنشاء الملفات وحفظها وتنظيمها والتعاون فيها ومشاركتها بشكل آمن. تعد المشاركة فكرة خدمية تم تطويرها مؤخرًا ويسعى إليها الباحثون والطلاب بشكل متكرر. يقدم العمل المقترح العديد من أشكال ملفات البيانات، بما في ذلك المستندات وملفات الوسائط المتعددة. لقد كان تخزين الملفات طريقة تخزين مستخدمة على نطاق واسع لسنوات عديدة.

طرق العمل:

الطريقة المقترحة المستخدمة لبناء الموقع هي Visual Studio 2015 مع قاعدة بيانات خادم SQL لتوفير تخزين الملفات مع تخزين أنواع مختلفة من البيانات ويوفر خدمة كنظام تخزين ملفات مستودع تكنولوجيا المعلومات لمساعدة الطلاب والمدرسين على التواصل مع بعضهم البعض بطريقة أكاديمية لنشر الملفات بطريقة سهلة ومرنة.

الاستنتاجات:

ا أظهرت نتائج النظام المقترح أن الموقع يمكنه توفير تحميل الملفات مع الملفات المدعومة وهي ".doc"، ".docx"، ".pptx"، ".pdf"، ".zip"، ".rar"، ".mp4"". و".flv"، و".avi"، و".PDF"، و".DOCX"، و".DOC". أظهرت النتائج أن النظام قام بتحميل ملفات بأحجام 5ميكا بايت و10 و25 ميكا بايت بسلاسة. اوضحت النتائج ان النظام المقترح مرن جدا في عمليه رفع الملفات المختلفه وبسرعه فائقه وذلك لسهوله رفع الملفات على الخادم والوصول اليها من قبل مختلف الطلبة في الكلية.

الكلمات المفتاحية:

تخزين الملفات، نظام المشاركة، الويب، ASP.NET، مستودع تكنولوجيا المعلومات.