

Design and Implementation of the Cloud File Management Service System Based on LAN

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Abstract. The number of digital files is growing up in the age of information. Effective management of file becomes increasingly important. This paper proposes a cloud file management service based on local area network. It solves the problems of traditional file transmission and file storage in local area network. It solves the security issue and multi-user management. This cloud file management service is also scalable and easy to use. Based on this service, many network applications can be developed furtherly, including office automation, teaching system, experiment platform, graduation milestone project or thesis management system, and email system.

1. Introduction

For the advances of information technology, the storage, transmission and management of data are becoming increasingly important in modern society [1]. Generally speaking, personal or official data are stored as files and proceed in the same form. In order to archive the goal of office automation [2], teaching or training resources management [3], and personal files management [4], many cooperation and universities need to build their file server with specific characteristics to meet their needs. Although there are many kinds of network software with the functionality of file transmission, not all of them have the functionalities of file and user management, and they cannot provide good performance on safety, security, usability and scalability.

In order to solve these problems, a novel network file service system based on local area network is designed. Our network file management service is called Fly cloud file service system. Our cloud files management service is based on Windows File Explorer. They have similar user interface and operation methods. Fly cloud file management service has functionalities of operating on files and folders in the client, the server, and between the client and the server, including creating, renaming, deleting, moving and copying. It also supports multi-user management. Users can also register this service and the administrator in the server side checks the validity of users. The registered users use different folders. Their operations will not interfere with each other.

The structure of this paper is organized as follows. In Section 2, related work is introduced. In Section 3, the models, functionalities, and characteristics are introduced. In Section 4, we propose the design and implementation of our cloud file management service. Finally, we draw a conclusion in Section 5.

2. Related Work

There are mainly three types of file transmission.

- 1) Windows built-in folders sharing service. It can help users to share folders and transmit files between two personal computers in local area network. It is easy to use and is feasible for



temporary file transmission and sharing. But as a basic built-in feature in Windows operation system, it only provides limited functionalities.

2)FTP file server [5]. FTP is the abbreviation for File Transfer Protocol [6]. FTP file servers can manage users and be used by most companies.

3)Network software such as network disk. It is used to store files in the cloud server.

These methods have some limitations. First, the security issue. For the Windows built-in folders sharing service, all users share the same folders in the server and have the same read or write permission. If everyone can read and write the shared folders, it cannot make files secure. Files may be deleted by mistake. And user's personal storage space is not independent and at the risk of privacy violating. For FTP file server and network software, it is hard to make files stored securely, unless companies build their own file servers.

Second, the user setting issue. If there are only several users, all of those three methods above are feasible. But when the number of users grows up, those methods become unfeasible because different users need to set different kinds of permission in different folders. For the Windows built-in folders sharing service, it is tedious to create different users and folders in the server. For the FTP file server, it need to create users and folders and set permission for them.

Third, the issue of scalability. Those three methods cannot be applied in network applications such as the office automation, the teaching system, the online experiments system and milestone project management system for file transmission and management. It is impossible to extend functionality based on them, especially the FTP file server and the network software. Inspired by the philosophy of the Windows built-in file sharing service, we designed an improved file management service based on local area network to solve these issues.

3. Application Models, Functionalities and Characteristics

3.1. Application Models

There are two architectures of network applications, i.e., client-server(C/S) [7] model and browser-server(B/S) model [8]. They have both advantages and disadvantages. Developers only need to design and maintain the server in B/S model. Users use the browser as the client in this model. Its operation is simple and popular. But it also has some disadvantages. First, all computation will be carried out in the server. The server is likely to have heavy load. Second, friendly user interface is hard to design. Third, when browser and server have complicated communication of different tasks, B/S model is hard to handle message communication. As to C/S model, it has the client installed in users' personal computer. Although the design and maintenance of client software is complicated, the users can download, install it, and benefit from it once it is hosted in the internet after developed. Many network applications use C/S model. C/S model can solve the problems in the B/S model.

The transmission and operations of files in our Fly cloud file management service are performed in both the client side and the server side. And tasks in both sides have equivalent loads. The interaction between server and client is also complicated and frequent. Therefore, it adopts the C/S model. There is also another important reason. The client is designed as the principle of Windows File Explorer, including the user interface and operations. In order to provide an easy way for users, we use the C/S model and design the client.

3.2. Functionalities

From the viewpoint of users, our Fly file management service is very simple, which is to meet our design philosophy – to let users feel easy. Our file management service has three main functionalities as follows.

- 1) File transmission. The local client and the server will transmit files or folders, i.e., download and upload.
- 2) Operations on files and folders. The operations in the local client and the server include creating, renaming, deleting, moving and copying.

- 3) User management. Individuals can use the client to register our file management service. After checking the validity of user name and the approval of the administrator, the individual applicants become registered users.

3.3. Characteristics

Our Fly file management service solves the problems of Windows built-in file sharing service and FTP file server. The client of our Fly file management service is very easy to learn. It is based on the Windows file sharing service and Windows File Explorer. Its functionalities, user interface and operation methods are quite similar to Windows File Explorer. Users do not need further learning. Also, it has the functionality of user management. Users can register our service flexibly and securely with user authentication. Different users in the server side have different folders and permissions, which make their personal file separate and well-organized. Last but not least, it is scalable. More complex features can be developed based on it.

4. Design and Implementations

4.1. Session mechanism

The server need to establish session with multiple users and process data from them. Our Fly cloud file management service is developed using WinSock [9] widget of Visual Basic [9] to connect and communicate. It applies TCP to establish reliable connection between the client and server. WinSock is like a telephone in the listening state. When there is a phone call sending a request to establish connection, it accepts it and connection is established. After the session is finished, it closes the connection.

The server uses dynamic array called wsWinsock in WinSock widget to establish connection between different users. These connections are independent and do not interfere each other. The zeroth element in the array, i.e. wsWinsock(0), is always in the listening state to listen potential request from different clients. When the client is sending request to connect, it searches the free elements or creates new elements in the existing wsWinsock array. When client message arrives, an event is triggered to process the message string.

Table 1. Codes for event processing after message arrived in the client in Visual Basic style.

Codes for event processing in Visual Basic style
Private Sub wsWinsock_DataArrival(Index As Integer, ByVal bytesTotal As Long)
wsWinsock(Index).GetData xx, vbString
‘other operations here
End Sub

4.2. Data buffer

In order to transmit files safely, our cloud file management service applies the data buffer techniques. It creates a data buffer in the client side in the form of sharing folder, named as sharing, for uploading and downloading of files and folders. It is a unique sharing folder created in the client. No sharing folders are created in the server side. Invalid users have no files and folders to read or write in the server side. In this way, the security of files and folders in the server can be made sure. In addition, only when the client is uploading or downloading files or folders, the sharing folder for data buffer is in usage. It will be empty in other situation to avoid security risk.

Table 2. Codes for downloading file or folder from the server in Visual Basic style.

Codes for downloading file or folder from server in Visual Basic style.
fso.CopyFolder server_path, "\\" & wsWinsock(Index).RemoteHostIP & "\\sharing\" & server_file_name
fso.CopyFile server_path, "\\" & wsWinsock(Index).RemoteHostIP & "\\sharing\" & server_folder_name

When the downloading is finished, the client moves the files or folders to the target folder to finish the entire download mission.

Table 3. Codes for Uploading files or folders to server in Visual Basic style.

Codes for Uploading files or folders to server in Visual Basic style
fso.CopyFolder "\\" & wsWinsock(Index).RemoteHostIP & "\\sharing\" & client_folder, server_path & client_folder_name
fso.CopyFile "\\" & wsWinsock(Index).RemoteHostIP & "\\sharing\" & client_file_name, server_path & client_file_name

Of course, the client side must copy (or move) the uploading files or folders to the sharing buffer.

4.3. Multi-user management

Generally speaking, network application should have the functionality of user management to make sure only valid users have access to the resources in the server. In our cloud file management service, users' folders are created and users' information are inserted into database if users are valid. When users log in their account, their operations is under their personal folders.

New users use the client to register. The client can check the integrity of users' information, and the server checks the validity of user name. The interface of registration is shown in Fig. 1. Users' information will be inserted into database if these two phases of checking pass. The verification of new users is designed to avoid fake registration and invalid users. After the authentication of administrators, the users then can log in their account. The authentication window is shown in Fig. 2. The operation of authentication is also simple. The administrators only need to click on the check boxes of potential users, then click the 'Agree' button. The procedure of authentication is implemented with methods in Table 4.

Table 4. Codes for new user authentication in Visual Basic style

Codes for new user authentication in Visual Basic style
Private Sub cmdReview_Click() For i = 1 To lvUsers.ListItems.Count If lvUsers.ListItems(i).Checked Then adoUsers.RecordSource = "select * from users where username=" & lvUsers.ListItems(i).Text & "" adoUsers.Refresh adoUsers.Recordset.Fields("sh").Value = "T" adoUsers.Recordset.Update If Not fso.FolderExists("E:\user_files\" & lvUsers.ListItems(i).Text) Then Set fd = fso.CreateFolder("E:\user_files\" & lvUsers.ListItems(i).Text) End If Next i End Sub

Create your Fly account:

User name: *

Password: *

Password confirmation: *

Real name: *

Gender: ☐ Male ☒ Female *

Address:

TelePhone:

Mobile phone: *

E-mail: *

Institution:

Remarks:

Figure 1. Window for new user registration.

The procedures of registration and authentication are both simple. The problem of users' setting is solved.

View Range: ☐ All Users ☐ Online Users ☒ Unchecked Users

Users list: Number of current online users: 0

UserName	Name	Gender	Institution	Address	Telephone	Mobile Phone	E-mail	Status	Channel
<input type="checkbox"/> pf	XXX	M	dfg kxjfh dkfn ldxkmm	sjsid kdf griu dsfdg	0851-8361...	13823874293	pf@163.com	Unchecked	
<input type="checkbox"/> Danni	Yan...	F	Guizhou Minzu University	Guizhou Minzu University	0851-8361...	13885230505	ycr1988@163.com	Unchecked	
<input type="checkbox"/> LiouTao	Lio...	M	fthgh tyj rfthr rtyr	dx fghft fghjgyfj fg	0851-8360...	13500868954	gzzy1234@163.com	Unchecked	

Figure 2. Window for new user authentication.

5. Conclusion

In the paper, we propose the Fly cloud file management service and its design principle. It provides safe, extensibility, and easy-to-use services. The client software is designed and developed with user-friendly interface and simple operation.

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7. References

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