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FileWave

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ABSTRACT :

The swift expansion of cross-platform ecosystems and the rise in mobile device use have led to a notable need for efficient and secure file-sharing options that function without internet access. Current technologies typically depend on complicated pairing methods, external servers, or the installation of extra software, which can be inconvenient and unsuitable for fast, local file exchanges. FileWave seeks to overcome these challenges by offering a lightweight, offline file-sharing app designed for Android devices, utilizing NanoHTTPD as a local HTTP server. In contrast to conventional sharing applications, FileWave creates a random port number for each session, boosting security without requiring PIN codes or manual port settings. Users can access the shared files from any device with a web browser, ensuring genuine cross-platform compatibility with Windows, Linux, macOS, and various mobile devices. To further streamline the connection process, the app includes optional QR code generation, enabling users to easily connect by scanning the code with a compatible device. This paper covers the architectural design, phases of implementation, and potential enhancements, such as UI improvements and encryption for secure file transfers. FileWave is committed to providing a straightforward, secure, and user-friendly solution for local file sharing with strong privacy controls.

Keywords: File sharing, Offline transfer, HTTP server, NanoHTTPD, Cross-platform, QR code

1. Introduction :

As technology continues to evolve and connect us, the ability to transfer files smoothly between different operating systems remains essential for both casual and professional users. Many traditional methods of file sharing often depend on an internet connection or require specific software installations, which can limit ease of access and convenience. These methods may be vulnerable to security issues, rely on external servers, or involve complicated pairing procedures, making them inefficient for local and private data exchanges. Additionally, numerous existing tools depend on fixed port numbers or PIN codes that can be easily hacked, which diminishes their overall security.

FileWave tackles these issues by offering a simple, cross-platform file-sharing solution that focuses on offline functionality. Utilizing NanoHTTPD, a lightweight and efficient HTTP server, FileWave can turn any Android device into a secure local server that shares files using a changing port. This approach removes the need for fixed port settings or manual setups, enhancing both security and user convenience. Unlike conventional file-sharing techniques, FileWave enables any device with a web browser—including those running Windows, Linux, macOS, and various mobile systems—to access shared files by simply entering the device's IP address along with a randomly generated port number.

2. Methodology :

2.1. System Architecture

FileWave's architecture is centered around a local HTTP server running on an Android device. This server allows for file sharing over a Wi-Fi connection without needing internet access. The primary components consist of:

- **HTTP Server Module**: Utilizing NanoHTTPD, this lightweight server manages incoming HTTP requests and serves files to connected devices.
- **Security Mechanism**: A random port number is generated for each session, minimizing the chances of unauthorized access.

2.2. Wi-Fi Connectivity Check

Prior to launching the server, the application checks the device's Wi-Fi status. This step is vital to confirm that devices can interact within the local network. If a connection is not found, the application prompts the user to turn on Wi-Fi.

2.3. File Selection and Serving

The key feature of FileWave involves browsing and choosing files saved on the device.

- **File Picker Integration**: Users can navigate the file system using Android's built-in file picker**.**
- **File Hosting**: After selecting a file, it becomes accessible via the local HTTP server.

2.4. IP Address and Port Display

The IP address of the server and the randomly generated port number are presented in an easy-to-understand format.

- **IP Address Retrieval**: The application collects the device's local IP address.
- **Dynamic Port Allocation**: To enhance security, a secure, randomly assigned port is utilized instead of fixed numbers

2.5. Cross-Platform Accessibility

Devices connected to the local network can access shared files through any standard web browser.

- Browser-based Access: Users enter the server's IP address and port in their browser to download files without needing extra software.

2.6. QR Code Generation

To make connection setup easier, a QR code containing the server address will be generated using ZXing or a similar library.

- **QR Code Encoding**: The IP address and port are encoded into a scannable QR code for quick access.

2.7. User Interface Design

The UI follows a minimalist, dark-theme design with a focus on usability:

- *Buttons for Core Actions*: Including starting the server and selecting files.
- *TextView for Connection Information*: Displaying IP and port data in a clear, readable format.

3. Objective :

The FileWave project aims to transform local file-sharing with the creation of lightweight, secure, and cross-platform Android application not dependent on the availability of an internet connection. Core objectives are as follows:

3.1. Cross-Platform File Sharing

This application allows users to share files between various devices with different OS like Windows, Linux, macOS, and Android, using a standard web browser and without additional software installation or any specific pairing method..

3.2. Local Network Connectivity

To work entirely locally, relying on the device's local Wi-Fi network to communicate, rather than data privacy issues associated with cloud-based or internet-dependent systems.

3.3. Dynamic and Secure HTTP Hosting

NanoHTTPD is utilized as a small HTTP server on an Android device in order to securely serve files; it does so by creating a random port for each session, which dynamically generates a port that is harder for unauthorized access when compared to systems that have a fixed port..

3.4. Simplified Connection Setup

This would provide an optional QR code generation feature to encode the IP address and port so that users can easily connect by scanning the code with a compatible device, thereby avoiding errors from manual entry.

3.5. User-Centric Design

A simple and intuitive user interface with the dark theme support by focusing on ease of use through clearly labeled buttons for core actions (such as choosing files, starting the server) and being able to show real-time connection information along with IP address and port.

3.6. Efficiency and Resource Optimization

The app should be lightweight and fully performance-driven by reducing the usage of resources so that the app remains absolutely smooth on the majority of Android devices.

3.7. Future-Proofing and Security Enhancements

To discuss further security measures, such as optional encryption of file transfers, ensuring robust privacy protection for sensitive data.

4. Result :

This project has reached major milestones, achieving the primary goal of providing a simple, secure, and efficient offline file-sharing system for cross-platform use. The following is a comprehensive overview of the results, emphasizing the application's functionality and ease of use:

System Functionality.
FileWave was designed to automate and simplify the process of sharing files securely between devices over a local network without requiring internet connectivity. A clear understanding of the workflow is provided by the system architecture diagram, demonstrating how the platform processes user actions—from file selection to dynamic port allocation and secure file hosting—ensuring a seamless sharing experience.

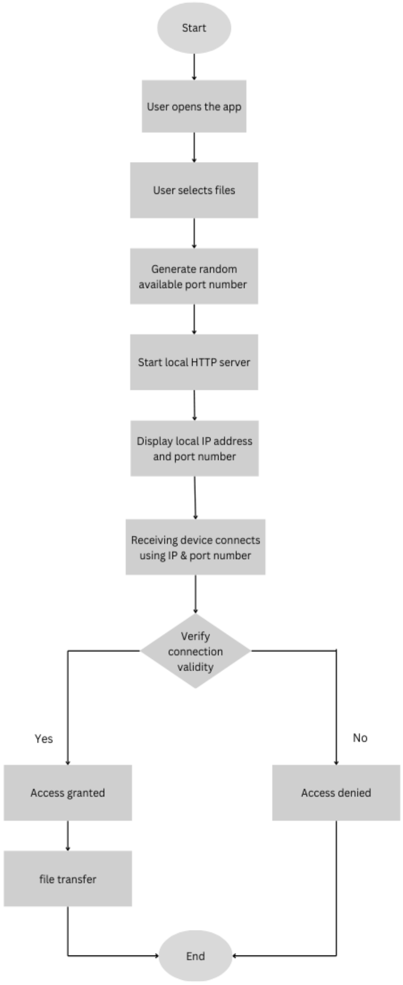
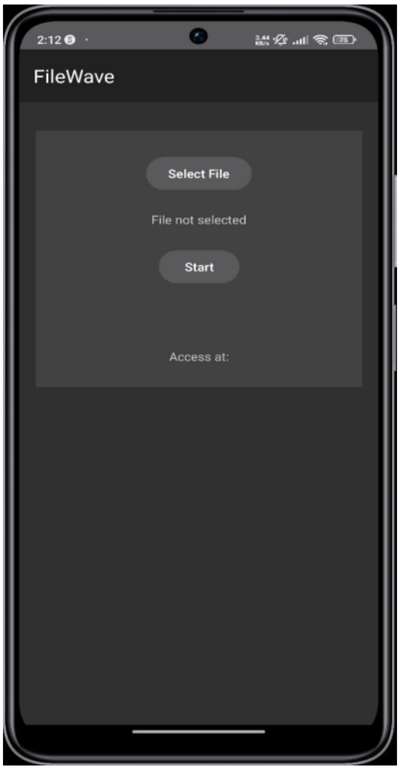

Start
User opens the app
User selects files
Generate random available port number
Start local HTTP server
Display local IP address and port number
Receiving device connects using IP & port number
Verify connection validity
Yes
No
Access granted
Access denied
file transfer
End

Fig 1. System architecture

A structured system architecture ensures that file selection, hosting, and secure sharing are handled efficiently with minimal manual intervention. The dynamic port allocation system automates security enhancements, reducing the need for user configuration and improving overall efficiency and accuracy. An appealing, user-friendly interface is the crux of the design of FileWave. The application has a simple homepage, with buttons for selecting files and starting the server, along with real-time displays of connection information. In the future, it will support QR code generation to make the connectivity process easier. Below are screenshots that represent core interface elements and features.



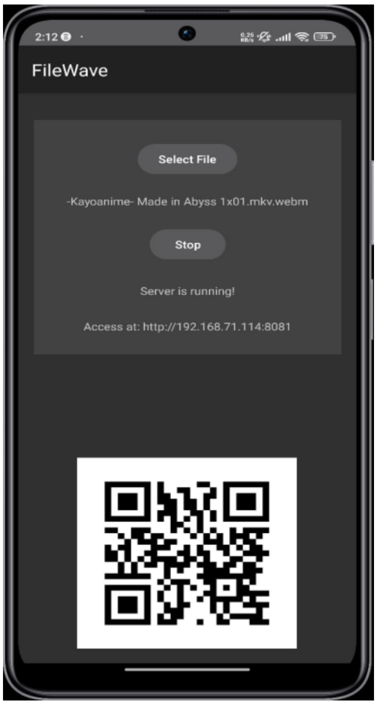
File not selected

Access at:

Fig 2. Home Page

A sleek and minimalistic design is used in the FileWave interface, which focuses on ease of use and accessibility. The homepage offers clear and separate buttons to select files and start local servers, so the user can easily navigate to core actions.

Once the server is started and the Wi-Fi connected, a QR code is self-generated to enable the connection on the receiver's device without the manual entry of IP addresses and ports. This intuitive design boosts user experience but remains to be simple and efficient.



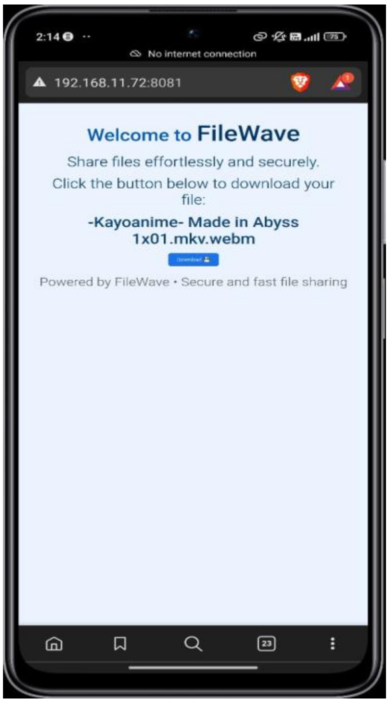
-Kayoanime- Made in Abyss 1x01.mkv.webm

Server is running!

Access at: http://192.168.71.114:8081

Fig 3. Server Started

Another feature that the QR code generation adds to user experience is not having to type in the IP address and port number of the server. All users need to do is scan the QR code generated, which will immediately take them to a specific FileWave-hosted webpage using any QR code reader on a compatible device. This webpage offers a direct download link to the selected file, thus providing a fast, seamless, and error-free connection setup for efficient file sharing across platforms.



Welcome to FileWave

Share files effortlessly and securely.

Click the button below to download your file:

-Kayoanime- Made in Abyss 1x01.mkv.webm

Powered by FileWave • Secure and fast file sharing

Fig 4. File Download Redirection

5. Conclusion :

FileWave is a proposed project that would create a cross-platform, offline file-sharing solution that bridges the gap between devices and operating systems, streamlining file transfers without relying on internet connectivity. Seamlessness and security in file sharing are key aspects of improving the efficiency of data exchange, yet most tools create problems in terms of network dependency, limited compatibility, and security vulnerabilities. FileWave addresses these challenges by providing a lightweight, browser-accessible platform powered by a local HTTP server, offering enhanced security through dynamic port generation and user-friendly connectivity options.

It allows dynamic port assignments for secure hosting of files; cross-platform accessibility through browsers is also supported with planned QR-code-based connection settings. The purpose of this approach was to make processes related to sharing files as convenient as possible. The application, built on Java on the Android platform, made use of such modern libraries like NanoHTTPD, and, therefore, provides efficiency, security, and usability.

FileWave has undergone intensive testing that confirms the base functionality, from checking dependency with Wi-Fi, file hosting, and display dynamic IP-port for ensuring efficient execution with less utilization of resources. This project reflects the possible power of local file-sharing solutions regarding increased privacy, security, and simplicity to handle all matters while staying free from third-party dependency.

This model is proposed to reduce file transfer complexities and associated security issues with the process, hence making it much more accessible and efficient. Future enhancements of this platform include encrypting files, AI-powered file search, and integration with further platforms. Technology can be effective in transforming off-line file-sharing experiences, opening its way to larger applications in the secure, local data exchange among different ecosystems..

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