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XIBO DIGITAL SIGNAGE

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ABSTRACT: Digital signage has become an essential tool for delivering dynamic visual content across various industries, including education, retail, hospitality, and corporate environments. It allows for centralized control of displays, ensuring real-time content updates and effective communication. The Xibo Digital Signage system is an open-source solution that provides a powerful and flexible platform for managing digital displays. In Phase 1 of this project, the focus was on setting up the backend infrastructure and establishing seamless connectivity between the Xibo CMS and display devices.

This involved deploying the Xibo CMS using Docker, a containerization platform that simplifies the installation and management of services. The CMS was hosted via Docker Compose for better scalability and ease of configuration. To display content, the Xibo Player was installed on a Smart TV through an Android box, and securely linked to the CMS using a CMS key. Additionally, WebSocket communication was configured to enable real-time updates and reliable data exchange between the server and display.

Xibo Digital Signage is an open-source content management system designed to manage and deliver multimedia content to remote display screens. It enables users to schedule, control, and monitor digital content across a network of screens from a centralized platform. In this project, the goal was to set up and configure the Xibo CMS using Docker, and connect it to display devices via Xibo Player to create a seamless and scalable digital signage solution.

I. INTRODUCTION

Digital signage is an innovative communication solution that replaces traditional printed posters and notice boards with dynamic electronic displays. It allows organizations to deliver multimedia content such as videos, images, scrolling text, social media feeds, and real-time updates to audiences in a visually engaging way. This technology offers flexibility, as the displayed content can be instantly updated, scheduled in advance, or customized for different locations — all without physical printing costs.

Xibo is a widely used open-source Digital Signage Content Management System (CMS) that enables centralized control over multiple displays through a web-based interface. Administrators can design layouts, schedule campaigns, integrate live data feeds, and manage content for all connected players from a single dashboard. Xibo supports various platforms such as Android, Windows, Linux, and Raspberry Pi, making it adaptable to different hardware setups.

In our project, Xibo CMS has been deployed using **Docker** for ease of installation, management, and scalability. Display devices, such as Android TV boxes and Raspberry Pi units, act as **Xibo Players** to present the content created and scheduled on the CMS. This setup is ideal for real-time communication in educational institutions, corporate offices, event centers, and public spaces.

II. LITERATURE SURVEY

Studies and industry reports show digital signage improves visibility and engagement versus static signage, increases recall and can influence buyer behaviour (e.g., price promotions). Digital signage is especially effective when content is dynamic, well-designed and contextually relevant. Xibo is a mature open-source CMS used in healthcare, retail and corporate deployments; official case studies document real deployments and benefits of centralised content management. Its architecture (CMS + players) supports scheduling, multiple player types and remote device management.

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Research and practical guides emphasise that Docker containerization improves reproducibility, simplifies deployments, and isolates service dependencies (web, DB, XMR). Container orchestration (even at small scale via Docker Compose) reduces "works on my machine" problems.

Technical comparisons and modern best practices indicate WebSocket (persistent, full-duplex) is superior to HTTP polling/long-polling for low-latency, bidirectional updates (fewer handshakes, lower overhead). Xibo's XMR (WebSocket-based) is therefore recommended for timely content pushes and player status updates.
Practical guides and vendor articles show Android TV boxes (and emulators like MEmu) are cost-effective players — easy to deploy Xibo's Android APK. Raspberry Pi is a popular low-cost alternative but requires attention to performance (video decoding, GPU acceleration). Many deployments choose Android hardware for simpler app support; Pi is useful where tight cost/power constraints exist.

Apache Kafka is a robust, distributed event streaming platform suited for large-scale real-time event pipelines (activity tracking, metrics, inter-service messaging). For a small to medium Xibo deployment Kafka is often overkill; but it becomes valuable if you plan to ingest many event streams, centralise logs/metrics, or build complex real-time workflows across many displays.

EXISTING SYSTEM
The existing systems for this digital signage project primarily rely on traditional methods of content display, such as printed posters, static banners, and manually updated notice boards, which are time-consuming, lack interactivity, and cannot deliver real-time updates. Some organizations have adopted basic digital signage solutions, but these often require manual content updates, have limited scheduling capabilities, and do not support advanced integrations like live streaming or API-based content management.

Additionally, many existing systems are dependent on single-display setups, restricting the ability to manage and synchronize content across multiple locations. In contrast, modern platforms like Xibo CMS offer centralized control, automated scheduling, multi-device support, and the ability to integrate external sources like YouTube live streams, making them more dynamic, efficient, and scalable compared to older systems. This project builds upon such modern capabilities to overcome the limitations of existing solutions and enhance content delivery for varied use cases.

PROPOSED SYSTEM
The proposed system for this project is a centralized, network-based digital signage solution using **Xibo CMS** that enables efficient, real-time management of multimedia content across multiple displays.

Unlike traditional and semi-digital systems, this solution allows administrators to schedule, update, and control content remotely from a single dashboard, eliminating the need for manual intervention at each display location. The system will support various content types, including images, videos, text tickers, and live streaming (such as YouTube feeds), ensuring dynamic and engaging communication. It will also feature automated scheduling for time-specific messages, reducing operational overhead and ensuring timely delivery of information.

By integrating Android-based display players, Raspberry Pi, or other compatible hardware, the system becomes highly scalable and cost-effective, making it suitable for use in educational institutions, corporate environments, public service areas, and commercial spaces. This approach enhances flexibility, interactivity, and audience engagement, addressing the shortcomings of existing systems while providing a robust and future-ready platform.

III. SYSTEM ARCHITECTURE

The system architecture of the Xibo Digital Signage project is designed to ensure seamless content management, distribution, and display across multiple screens. At its core, the architecture consists of three main components: the Xibo CMS (Content Management System), the Player devices, and the network infrastructure that connects them. The CMS, hosted using Docker, acts as the central hub where administrators create, upload, and schedule content. This content is stored in the CMS database and media library, from where it is distributed to Player devices such as Android Boxes, Raspberry Pi units, or Windows-based systems.

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The Players are responsible for rendering the scheduled layouts and media on the connected display screens. Communication between the CMS and the Players occurs over a secure network, ensuring timely content updates and playback synchronization. This architecture provides flexibility, as the CMS can manage Players across multiple locations, scalability to handle an increasing number of displays, and reliability through continuous connectivity and automated updates, making it ideal for real-time, dynamic digital signage operations.

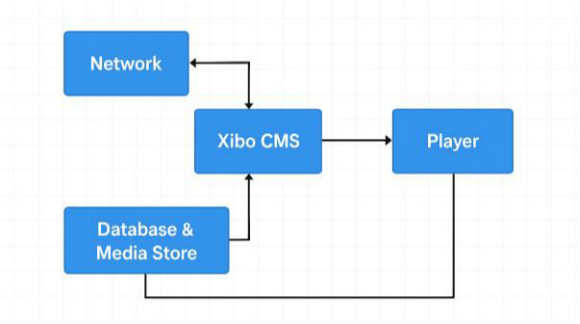

fig 3.1 System Architecture

IV. METHODOLOGY

The project follows a structured approach, beginning with the analysis of requirements for real-time agricultural monitoring, automated actions, and secure blockchain-based record-keeping. The system is designed with integrated modules for motion detection (PIR sensor), image capture (ESP32-CAM), mechanical actuation (servo motor), and Ethereum blockchain connectivity via a smart contract.

The hardware is assembled and connected for synchronized operation, while software development involves coding the IoT control logic and implementing the blockchain contract using Solidity and Web3.py in Python. The final stage integrates these components into a unified workflow, enabling motion-triggered actions and secure transaction logging on the blockchain.

The hardware and software are then developed according to the design, followed by integration to ensure all modules work seamlessly together. Testing is conducted to verify functionality and performance. Finally, the system is deployed for real-world use, and maintenance activities are carried out to ensure continued reliability and efficiency.

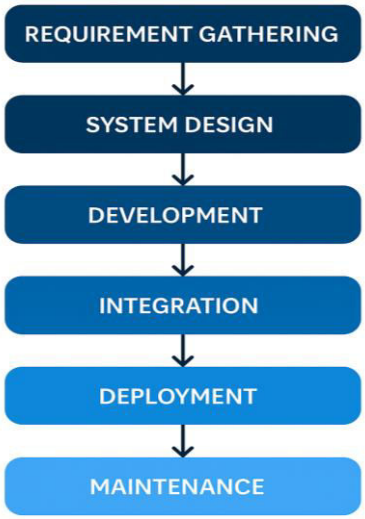

Fig 4.1 Methodology

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V. DESIGN AND IMPLEMENTATION

The design of this project centers on implementing Xibo Digital Signage as a centralized content management and display system. The architecture consists of a Xibo CMS server (Docker-based) for uploading, scheduling, and managing media content, and Xibo Players installed on client devices such as Android boxes connected to display screens. The CMS communicates with the Players over a network, ensuring that all scheduled layouts, images, videos, and text are synchronized in real time.

The implementation involves setting up the CMS in a stable server environment, configuring display profiles, connecting each Player device via its display ID, and testing content delivery to ensure smooth playback. Network configuration is optimized for uninterrupted communication, and user roles within the CMS are defined for efficient management. This setup enables dynamic, remotely managed content updates, making it ideal for information broadcasting, event announcements, and visual engagement in public or organizational spaces.

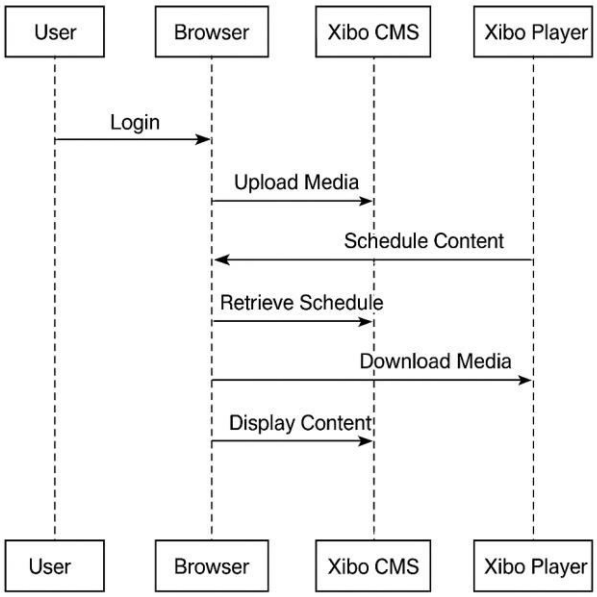

Fig 5.1 Sequential diagram

The flowchart illustrates the complete process of setting up and running the Xibo Digital Signage system. It begins with installing and configuring the Xibo CMS, where administrators set layouts, schedules, and permissions. The Xibo Player is then installed on display devices and registered with the CMS. Content such as images, videos, and text is uploaded, arranged into layouts, and scheduled for display.

The player downloads the scheduled content from the CMS and shows it on the connected screens. This process operates in a continuous loop, with administrators monitoring performance and updating content as needed. The players then automatically download the assigned layouts from the CMS, cache the media, and render it on the screens according to the set schedule, even if temporarily offline.

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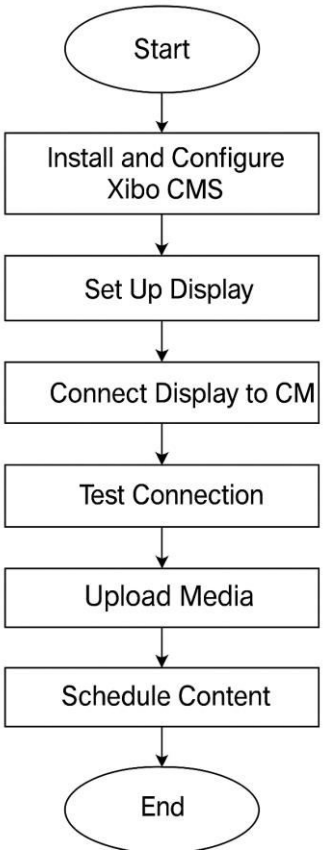

Fig 5.2 Flowchart of Signage

VI. OUTCOMES OF RESEARCH

The research on Xibo Digital Signage demonstrates that an open-source, CMS-driven signage platform can offer a cost-effective, scalable, and centralized solution for managing dynamic content across multiple displays. The study confirms that Docker-based deployment simplifies installation and maintenance, while device flexibility allows integration with Android boxes, Raspberry Pi, and PCs.

he content scheduling and layout design features enable targeted, time-based communication that enhances audience engagement. Additionally, the system's offline playback capability ensures uninterrupted operation, even during network outages. Monitoring tools within the CMS provide insights for performance evaluation, ensuring quick troubleshooting and continuous improvement. Overall, the research validates Xibo as a reliable and adaptable platform for real-world digital signage applications.

The content scheduling and playlist management features allowed precise control over when and where content was displayed, enabling more personalized and relevant communication for different audience groups. Layout customization supported a wide range of media formats, ensuring visually appealing presentations that could be updated remotely without requiring manual intervention at the display location.

Network-based central management streamlined administrative tasks, while offline playback features guaranteed uninterrupted content delivery during connectivity issues. The integration with monitoring tools provided administrators with valuable performance metrics, error reports, and uptime data, supporting proactive maintenance and reducing downtime.

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VII. RESULTS AND DISCUSSION

The results demonstrate that Xibo Digital Signage is a reliable, scalable, and cost-effective solution for dynamic content distribution. The Docker-based installation greatly simplified the setup process, making it accessible even for administrators with limited technical expertise.

Remote management features significantly reduced operational overhead, especially for distributed signage networks. This capability is particularly beneficial in large campuses, organizations with multiple branches, and public display networks.

The ability to run smoothly on low-cost devices like Raspberry Pi makes Xibo an affordable choice for organizations with budget constraints. Moreover, the offline playback feature enhances the system's resilience, ensuring content delivery is not disrupted by short-term connectivity problems.

However, certain challenges were observed:

- Initial configuration for display scaling and resolution required manual adjustments.
- Network bandwidth management became important when pushing large video files to multiple players simultaneously.

Despite these minor limitations, the overall performance and feature set of Xibo CMS make it a highly effective solution for a wide range of use cases, from corporate communications to public information systems.

VIII. CONCLUSION

The Xibo Digital Signage project successfully demonstrates the effectiveness of a centralized, CMS-driven approach to content management and display. By integrating the Xibo CMS with connected display players, the system enables seamless scheduling, distribution, and real-time updating of multimedia content across multiple screens. This implementation not only improves the efficiency of content delivery but also ensures consistency in messaging and branding.

The results highlight that the signage system is reliable, user-friendly, and scalable, making it suitable for a wide range of applications such as educational institutions, corporate environments, public information systems, and retail marketing. Overall, the project proves that digital signage using Xibo offers a cost-effective, flexible, and impactful solution for modern communication needs, providing significant value over traditional static displays.

- **Scalability** was achieved, allowing easy addition of new displays without major reconfiguration.
- Real-time updates and scheduling make it suitable for **time-sensitive information** in sectors like education, corporate communication, and public announcements.

REFERENCES

[1]Xibo Documentation Xibo Open Source Digital Signage – Official Documentation https://xibosignage.com/docs/setup/xibo-for-docker

[2] Docker Documentation Docker: Develop, Ship, and Run Applications https://www.docker.com/products/docker-desktop/

[3] Flow Diagrams Templates and Flow Design https://www.canva.com/design/

[4] Android Box Box purchased from Amazon https://www.amazon.in/s?k=android+box&crid=1ZYRNSFQY1VW9&sprefix=android+box%2Caps%2C547&ref=nb_sb_noss_2

[5] WebSocket Configuration https://community.xibo.org.uk/t/websockets-configuration-in-4-2/34358

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