International Journal of Creative and Open Research in Engineering and Management
ISSN: **3108-1754 (Online)**
Volume 02 Issue 04 April-2026 | Impact Factor: 3.5

Blockchain-Based Participation Verification for Event Engagement Platforms: A Study Based on the NOMAD Framework

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ABSTRACT

Live events such as conferences, hackathons, and festivals increasingly rely on digital platforms to enhance engagement and participation. However, most existing systems depend on centralized databases for recording attendance, achievements, and participation records, which introduces issues related to trust, data manipulation, and long-term verification. Blockchain technology offers an alternative approach by enabling tamper-resistant and publicly verifiable records. This paper explores the integration of blockchain-based participation verification within an event engagement platform called NOMAD. The proposed approach utilizes decentralized records to issue permanent participation badges that confirm event attendance and engagement. Unlike traditional reward systems that rely entirely on centralized infrastructures, the proposed system records key participation proofs on-chain while maintaining operational flexibility through off-chain data storage. This hybrid architecture reduces transaction overhead while preserving the benefits of immutability and transparency. The study discusses the motivation behind using blockchain in event ecosystems, examines the design considerations of participation verification, and evaluates the potential impact on user trust, event analytics, and long-term engagement. The findings suggest that selective blockchain integration can provide durable proof of participation while maintaining scalability for large-scale events.

Keywords:
blockchain verification, event engagement platforms, decentralized identity, participation badges, hybrid blockchain architecture, digital event systems.

1. INTRODUCTION

Live events have evolved significantly with the introduction of digital platforms that facilitate participant interaction, networking, and activity tracking. Modern event environments such as technology conferences, hackathons, and academic symposiums often incorporate digital systems to manage attendee participation and engagement. These systems typically track metrics such as session attendance, mission completion, networking interactions, and reward redemption. While such platforms enhance the event experience, they remain fundamentally centralized, meaning that all records of participation are stored and controlled by a single organization.

Centralized systems present several limitations. First, they create a dependency on the platform provider for data persistence. If the platform is discontinued or altered, historical participation records may become inaccessible. Second, centralized databases can be vulnerable to unauthorized modifications or data loss. Third, participants often lack a portable identity that reflects their engagement across multiple events or communities.

Blockchain technology introduces a new paradigm for storing digital records. Instead of relying on a single controlling entity, blockchain networks maintain distributed ledgers where records are collectively verified and preserved across multiple nodes. This property makes blockchain particularly suitable for applications that require tamper-resistant and transparent verification.

In the context of event platforms, blockchain can be used to record key milestones such as verified participation or achievement recognition. By issuing blockchain-based participation badges, event systems can provide attendees with permanent and independently verifiable proof of involvement. Such records can remain accessible even if the original platform changes or ceases operation.

The NOMAD platform explores this concept by combining traditional event engagement mechanisms with selective blockchain integration. The objective is not to place all event interactions on-chain but rather to use blockchain strategically for participation verification. Through this approach, the system maintains performance efficiency while ensuring that key achievements remain permanent and verifiable.

This paper explores the integration of blockchain-based participation verification within an event engagement platform called NOMAD. The proposed approach utilizes decentralized records to issue permanent participation badges that confirm event attendance and engagement. Unlike traditional reward systems that rely entirely on centralized infrastructures, the proposed system records key participation proofs on-chain while maintaining operational flexibility through off-chain data storage.

2. BLOCKCHAIN IN EVENT ENGAGEMENT SYSTEMS

2.1 Limitations of Traditional Event Participation Systems

Fil Event management platforms typically rely on centralized architectures where all participant data is stored within proprietary databases. These systems track attendance, issue rewards, and maintain leaderboards based on user activity during the event. While effective for short-term engagement, such systems lack durability beyond the lifespan of the platform itself.

One major limitation is the absence of verifiable ownership over participation records. Attendees may receive digital certificates or badges, but these assets remain under the control of the platform provider. If the service is discontinued or modified, the records may no longer be accessible or trustworthy. Additionally, centralized systems require users to trust that organizers maintain accurate records of participation.

Another issue arises when individuals attend multiple events across different organizations. Without a shared identity framework, participation histories remain fragmented across separate systems. As a result, participants cannot easily demonstrate long-term involvement in event communities or professional ecosystems.

These limitations highlight the need for a more reliable mechanism for recording event participation.

TABLE I: KEY ATTRIBUTES COMPARISON

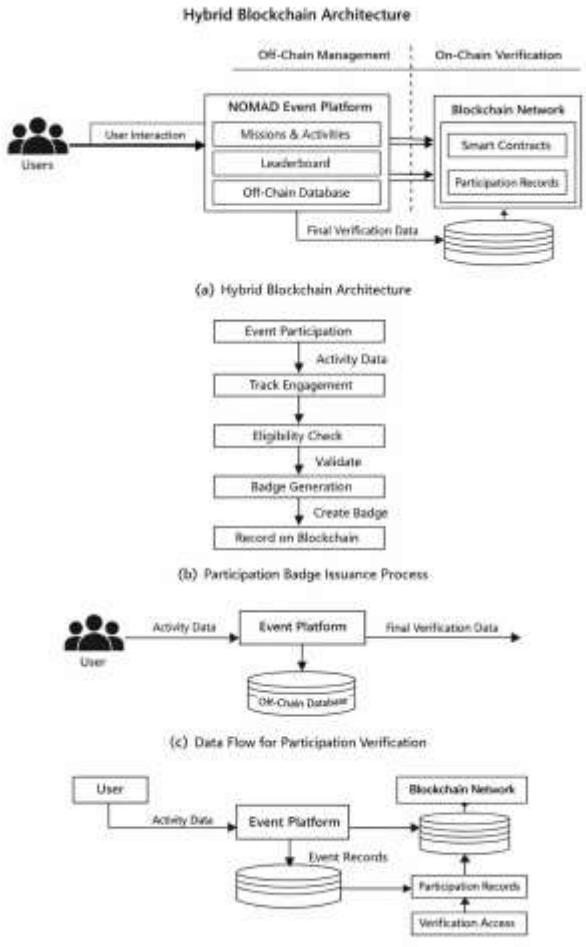
Attribute	Centralized Systems	NOMAD Hybrid Blockchain Architecture
Trust Level	Low (Trust in a Single Entity)	High (Decentralized Trust)
Verification Process	Opaque, Controlled by Central Authority	Transparent, Distributed Verification
Scalability	Scalable but Often at the Cost of Trust	High Scalability via Off-Chain Processing
Data Security	More Vulnerable (Single Point of Failure)	Enhanced Security (Decentralized Nodes)
Data Storage	Centralized Storage	Hybrid Storage (Off-Chain for Main Data, On-Chain for Validation)
Transparency	Low Transparency	High Transparency (Public Ledger for Verification)
Cost Efficiency	Lower Initial Cost	Higher Cost for On-Chain Operations (Off-Chain More Cost Effective)

TABLE I: KEY ATTRIBUTES COMPARISON

2.2 Blockchain as a Verification Infrastructure

Blockchain technology addresses many of the trust issues associated with centralized systems. A blockchain ledger stores data in blocks that are cryptographically linked to previous blocks. Once information is recorded and validated by the network, it becomes extremely difficult to alter without consensus from multiple participants in the system.

In the context of event platforms, blockchain can serve as a verification infrastructure that records participation proofs. When an attendee completes an event or fulfills predefined participation conditions, the platform can generate a digital badge linked to that individual. This badge can then be recorded on the blockchain as a unique asset associated with the participant's digital identity.



Such an approach ensures that the record of participation remains permanent and independently verifiable. Even if the original event platform becomes unavailable, the blockchain entry continues to exist as proof of involvement.

However, recording every event interaction on-chain would be inefficient and costly. Therefore, most practical systems adopt a hybrid architecture where operational data remains off-chain while key verification records are stored on-chain.

2.3 Hybrid Blockchain Architecture

The NOMAD platform adopts a hybrid architecture that separates operational event data from blockchain verification records. Routine activities such as mission completion, token balances, and leaderboard calculations are managed through conventional data systems. This ensures responsiveness and scalability during large events with thousands of participants.

Blockchain is reserved specifically for participation verification. Once an event concludes and participant eligibility is determined, the system issues a blockchain-based participation badge. This badge acts as a durable confirmation that the individual attended and engaged in the event.

The hybrid model offers several advantages:

1. **Reduced computational overhead** – Only final participation outcomes are recorded on-chain.
2. **Improved scalability** – Large volumes of real-time interactions remain off-chain.
3. **Permanent verification** – Participation records remain accessible indefinitely.
4. **User ownership** – Participants maintain independent proof of their achievements.

Through this architecture, blockchain functions as a verification layer rather than a full operational database.

3. BLOCKCHAIN PARTICIPATION BADGES IN NOMAD

3.1 Concept of Participation Badges

Participation badges are digital credentials that confirm an individual's involvement in a specific event. In the NOMAD system, these badges represent verified attendance and engagement rather than simple check-ins. A badge may be issued when a participant completes a minimum level of activity within the event ecosystem.

The badge contains information such as:

- Event name
- Event date
- Participation confirmation
- Unique verification reference

By storing this badge on the blockchain, the system ensures that the record cannot be altered or duplicated..

3.2 Issuance Process

The issuance of participation badges occurs only after an event concludes. At this stage, the system evaluates the participation records of all attendees and determines eligibility criteria. Once confirmed, a blockchain entry is created representing the badge associated with the participant's identity.

This process typically involves three stages:

1. **Eligibility verification** – The platform evaluates whether a participant meets the required engagement threshold.
2. **Badge generation** – A digital credential is created representing the verified participation.
3. **Blockchain recording** – The credential is permanently recorded as a blockchain asset.

Participants can later view their badges within the platform interface while also having the ability to verify the record independently through blockchain explorers.

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3.3 Benefits for Event Ecosystem

Integrating blockchain-based participation badges. provides multiple benefits for event ecosystems.

First, it enhances trust between participants and event organizers. Because participation records cannot be retroactively modified, attendees can rely on the authenticity of their achievements.

Second, it allows participants to build a persistent engagement portfolio. Over time, individuals may accumulate badges from multiple events, creating a transparent record of their involvement in conferences, hackathons, or professional communities.

Third, organizers benefit from improved credibility. When participation records are verifiable beyond the platform itself, event organizers demonstrate greater transparency and reliability.

Finally, such systems support long-term community development. Verified participation histories can strengthen professional networks by allowing individuals to showcase their contributions to various events.

4. DISCUSSION

While blockchain provides valuable benefits for participation verification, it must be implemented carefully to avoid unnecessary complexity. Recording every interaction during an event would introduce performance challenges and transaction overhead. Therefore, selective blockchain usage is crucial.

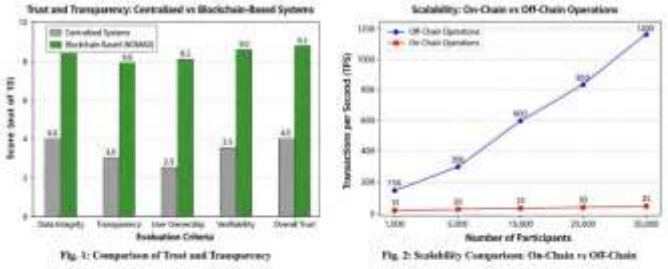

Fig. 1: Comparison of Trust and Transparency

Fig. 2: Scalability Comparison: On-Chain vs Off-Chain

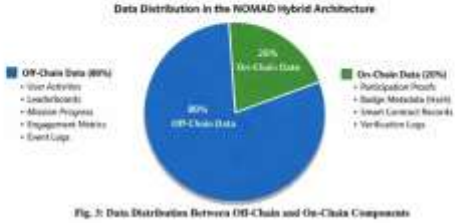

Fig. 3: Data Distribution Between Off-Chain and On-Chain Components

The hybrid model adopted in NOMAD illustrates how blockchain can complement traditional architectures rather than replace them entirely. By restricting blockchain operations to final participation verification, the system maintains both scalability and trust.

Future developments may explore additional forms of decentralized identity integration, enabling participants to maintain unified engagement profiles across multiple platforms and communities.

5. CONCLUSION

This study examined the role of blockchain in enhancing event engagement platforms through verifiable participation records. Traditional event systems rely heavily on centralized data storage, which limits long-term reliability and user ownership. Blockchain technology introduces a decentralized alternative that enables permanent and transparent verification of key achievements.

The NOMAD platform demonstrates a practical implementation of this concept through a hybrid architecture. Operational event data remains off-chain for efficiency, while participation confirmation badges are stored on the blockchain to ensure permanence and authenticity. This approach preserves scalability while leveraging the strengths of decentralized verification.

As digital event ecosystems continue to expand, the integration of blockchain-based verification systems may become increasingly valuable for establishing trust, transparency, and persistent engagement histories.

ACKNOWLEDGMENT

The authors would like to acknowledge the contributions of the research community working on decentralized identity systems and blockchain-based verification frameworks, whose foundational work has informed the ideas discussed in this study.

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