Block Talk: Peer-to-Peer Messaging on The Bitcoin Lightning Network
White Paper

MIT Bitcoin Expo Hackathon
April 2025

David Kazeem
Samuel Tosin
Brian Haney

Executive Summary

Digital communication is broken: users are overwhelmed by spam emails and messages, receiving no reward for their valuable attention, while advertisers, sales professionals, and business developers struggle to reach high-value individuals through the clutter. This inefficiency drains time and contributes to a $20 billion annual spam burden globally, even as the attention economy surges toward a $500 billion valuation by 2027. Block Talk addresses this imbalance head-on, offering a decentralized messaging app built on the Bitcoin Lightning Network that flips the script—users set satoshi-based price targets for incoming messages, earning income while filtering out noise, and senders gain direct access to their targets.

Problem

Everyone online is overwhelmed by a constant influx of spam emails, messages, and advertisements across various platforms, yet they receive no tangible reward for the attention they expend sifting through this noise. Despite the inherent value of their time and focus, users are left uncompensated while corporations and spammers exploit their inboxes. This imbalance creates a frustrating experience for users, who lack control over who can reach them and are unable to monetize their attention, while legitimate advertisers and professionals struggle to connect with high-value individuals amidst the clutter.

Solution

BlockTalk is a decentralized messaging app built on the Bitcoin network that empowers users to take control of their communication by monetizing their attention. With BlockTalk, users create accounts and set customizable price targets in satoshis (sats) for incoming messages based on perceived importance, ensuring that only senders willing to pay can reach them. This system filters out spam, rewards users for their time with Bitcoin payments, and provides a secure, privacy-focused platform that leverages blockchain technology to eliminate intermediaries and enhance user autonomy.[1]

Opportunity

BlockTalk presents a unique opportunity to revolutionize digital communication by aligning economic incentives with user attention, tapping into the growing Bitcoin ecosystem and the increasing demand for privacy-centric solutions. As cryptocurrency adoption rises, millions of Bitcoin users could turn to BlockTalk to earn income from their inboxes, while advertisers, sales

[1] Dai, W. (1998). B-Money. ("Wei Dai's proposal introduces a decentralized digital currency using proof-of-work and peer-to-peer coordination, prefiguring Bitcoin and offering historical context for Block Talk's blockchain-based communication approach.")

professionals, and business development leaders gain a direct, efficient channel to reach targeted, high-value individuals. By bridging the gap between attention economics and decentralized technology, BlockTalk has the potential to capture a significant share of the messaging and advertising market, offering a win-win for users and senders alike.

Technology

Block Talk builds on the foundational work of Bitcoin, Satoshi Nakamoto, and the Lightning Network by extending their principles of decentralization, security, and efficiency into a novel communication platform tailored for the Bitcoin community.[2] Satoshi's vision of a peer-to-peer electronic cash system, realized through Bitcoin, provides the trustless backbone, while the Lightning Network—developed to address Bitcoin's scalability limitations—enables Block Talk's instant, low-cost micropayments for user incentives.[3]

We layer on top a system where advertisers and business pros pay users directly to receive targeted messages, leveraging LNURL-auth and LNURL-withdraw for seamless wallet-based access and payouts, all powered by our Voltage-run Lightning Node. This fusion transforms Bitcoin's transactional capabilities[4] into a communication tool, fostering a new way for the community to engage, earn, and interact using the cryptocurrency's infrastructure as both currency and connective tissue.

Mechanisms and Models

We're crafting Block Talk with user incentive mechanisms that put rewards front and center, making it a no-brainer for people to jump in. Users earn money by receiving targeted messages from advertisers and business development pros, with payments delivered instantly to their Lightning wallets through LNURL-withdraw. It's all about micropayments—small amounts like a few cents per message—that add up quickly, giving users a tangible reason to stay engaged.

---

[2] Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. ("This foundational white paper introduces Bitcoin's decentralized peer-to-peer network, laying the groundwork for the Lightning Network and its potential use in secure communication systems like Block Talk.") *See also* Shannon, C. E. (1948). A mathematical theory of communication. ("Shannon's pioneering work establishes the theoretical framework for reliable data transmission over noisy channels, providing essential principles for designing Block Talk's peer-to-peer messaging system.")
[3] Poon, J., & Dryja, T. (2016). The Bitcoin Lightning Network: Scalable off-chain instant payments. ("This paper details the Lightning Network's off-chain scaling solution for Bitcoin, offering a fast and private transaction framework that Block Talk could adapt for peer-to-peer communication.")
[4] Antonopoulos, A. M. (2017). Mastering Bitcoin: Programming the open blockchain (2nd ed.). ("This comprehensive guide explains Bitcoin's peer-to-peer architecture and cryptography, providing technical insights critical for integrating communication protocols with the Lightning Network in Block Talk.")

We've designed this setup to create a balanced ecosystem where everyone wins. Users opt in because they're directly compensated for their attention, while advertisers and business pros get access to a focused, willing audience, driving higher engagement than traditional ads. This incentive loop keeps Block Talk lively, with users motivated by real-time earnings they can see and spend right away.

On the technical side, we're building mechanisms to ensure Block Talk scales effortlessly as our user base grows. Our back-end, powered by Node.js and Express.js, is lightweight and fast, handling a flood of requests—like generating invoices or sending messages—without breaking a sweat.[5] WebSocket steps in to deliver real-time updates, pushing new messages and payment notifications to users the moment they happen, keeping the experience fluid and instant.

To support massive scale, we're leaning on Voltage to run our Lightning Node, which processes thousands of transactions efficiently on the Lightning Network,[6] and Firebase, with its serverless architecture, to manage our database and authentication needs. Together, these tools ensure Block Talk stays responsive and reliable, whether we've got hundreds or millions of users earning from advertisers and business pros, making growth a strength, not a challenge.

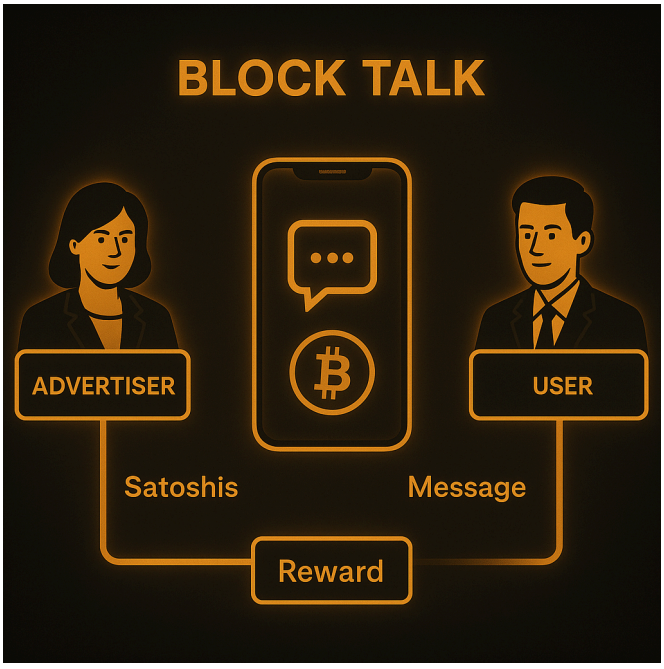

Figure 1

[5] Tilkov, S., & Vinoski, S. (2010). Node.js: Using JavaScript to build high-performance network programs. ("This article introduces Node.js as a lightweight, event-driven framework for handling high volumes of requests, supporting Block Talk's fast and scalable back-end powered by Node.js and Express.js.")
[6] Antonopoulos, A. M., & Osuntokun, O. (2021). Mastering the Lightning Network: A second layer scaling solution for Bitcoin. ("This comprehensive guide explores the Lightning Network's technical implementation, validating Block Talk's reliance on Voltage's Lightning Node for efficient transaction processing at scale.")

The "Block Talk" model leverages the power of incentive-driven engagement by rewarding users with satoshis—the smallest unit of Bitcoin—for receiving messages from advertisers. Visually represented in the sleek infographic, the flow is simple but powerful: an advertiser sends a targeted message directly to a user, who in turn receives a micro-reward in satoshis. This process is immediate and seamless, thanks to the Lightning Network and LNURL-withdraw technology, which allows users to see and withdraw their rewards in real time. By integrating messaging with micro-payments, Block Talk transforms passive attention into an active value exchange, making the user experience feel more like participation than intrusion.

What makes this model effective is its alignment of incentives across all parties. Users are no longer passive targets of ads—they're active participants being fairly compensated for their attention and time. Advertisers, on the other hand, access a high-intent, opt-in audience that is significantly more engaged than traditional ad platforms can provide. This boosts message visibility and campaign ROI while reducing wasted impressions. The real-time nature of rewards, visible right on the phone, creates a satisfying feedback loop that keeps users engaged and coming back. It's a win-win ecosystem built for scalability, transparency, and modern expectations.

Software Stack

We're crafting Block Talk with a powerful tech stack, starting with React and TypeScript for our front-end development. React is a JavaScript library that lets us build dynamic, interactive user interfaces by breaking them into reusable components, while TypeScript adds static typing to JavaScript, catching errors early and improving code clarity.[7] We chose them because they're widely adopted, speed up development with reusable code, and make our app more reliable and maintainable—great for delivering a smooth user experience. In Block Talk, React and TypeScript help us create an engaging, bug-free interface where users can easily interact with targeted messages from advertisers and business development pros, ensuring they enjoy a polished experience while earning payments.

Next, we're using Node.js paired with Express.js to power our back-end infrastructure. Node.js is a runtime that lets us run JavaScript on the server side, enabling fast, scalable applications, and Express.js is a lightweight framework that simplifies building APIs and handling requests on top of Node.js. We love this combo because it's efficient, uses a single language across our stack (JavaScript), and handles high traffic well, making it ideal for real-time apps. For Block Talk,

[7] Banks, A., & Porcello, M. (2017). Learning React: Functional web development with React and Redux. ("This book explores React's capabilities for building interactive UIs, supporting Block Talk's goal of delivering an engaging, polished front-end for users earning from targeted messages.")

Node.js and Express.js ensure our server can quickly process requests—like generating invoices or delivering messages—keeping the app responsive as advertisers pay users for their attention.

We've also integrated WebSocket and Voltage to enhance real-time functionality and payment processing. WebSocket is a protocol that enables two-way communication between the client and server over a single, persistent connection, while Voltage, as mentioned earlier, powers our Lightning Node for fast, low-cost Bitcoin transactions on the Lightning Network. We picked WebSocket for its ability to push updates instantly and Voltage for its reliable, scalable Lightning infrastructure—both perfect for apps needing speed and live interactions. In Block Talk, WebSocket keeps users updated on new messages or payments in real time, and Voltage ensures advertisers can instantly fund those payments, creating a seamless flow from message delivery to user earnings.

Finally, we're leveraging Firebase to round out our stack with robust data and authentication management. Firebase is a platform from Google that provides a real-time database, cloud functions, and user authentication tools, all managed in a scalable, serverless environment. We chose it because it simplifies backend tasks, scales effortlessly with our user base, and offers secure, out-of-the-box features like user sign-ins—saving us development time. For Block Talk, Firebase securely stores user data, tracks earnings from targeted messages, and handles authentication alongside LNURL-auth, giving us a solid foundation to grow while keeping everything fast and user-friendly for those getting paid by advertisers and business development pros.

Authentication and Security

We're building an exciting system for our app, Block Talk, and we've chosen to use LNURL for authentication as the first key component. LNURL-auth is a protocol that lets users log into services with their Lightning wallets, relying on cryptographic signatures tied to their wallet keys instead of traditional passwords. We love it because it's decentralized, secure, and incredibly user-friendly, eliminating centralized servers and enhancing privacy.[8] For Block Talk, this means we can offer our users a seamless and safe way to access the app, where they'll get paid to receive targeted messages from advertisers and business development pros, all while keeping their identity protected.

[8] Diffie, W., & Hellman, M. (1976). New directions in cryptography. ("This seminal paper introduces public-key cryptography, a cornerstone of Bitcoin's security model, which Block Talk can leverage to ensure encrypted and secure peer-to-peer messaging.") *See also* Back, A. (2002). Hashcash - A denial of service counter-measure. ("Back's introduction of proof-of-work, integral to Bitcoin, could be adapted in Block Talk to prevent spam or manage resource allocation in its communication protocol.")

Next, we're using Voltage to power our Lightning Node, which serves as the backbone of our payment infrastructure. A Lightning Node is software that connects to the Lightning Network, allowing us to process fast, low-cost Bitcoin transactions off-chain while still leveraging Bitcoin's security. We picked it because it simplifies node management, scales efficiently, and ensures reliable transaction handling—ideal for an app handling frequent micropayments. In Block Talk, Voltage keeps our node running smoothly, so advertisers can instantly pay users for receiving messages, and we can maintain a responsive system as our user base expands.

For creating invoices, we've opted for LNBits, a versatile tool that integrates with our Lightning Node.[9] LNBits is a wallet and payment management system that lets us generate invoices, track payments, and handle funds effortlessly, all while running on top of our node. We think it's a great choice because it's lightweight, customizable, and perfect for quickly creating invoices for small, frequent transactions without added complexity. In Block Talk, LNBits allows us to efficiently issue invoices to advertisers or business pros, ensuring they can pay users for each targeted message delivered, making the monetization process smooth and straightforward.

Finally, we're implementing LNURL for payment withdrawals to complete our payment flow. LNURL-withdraw is a feature that enables users to request and pull funds from our system directly to their Lightning wallets, simplifying payouts in a user-driven way. We selected it because it gives users control over their earnings, reduces friction in accessing funds, and keeps transactions fast and affordable—crucial for a payment-focused app. For Block Talk, this means our users can easily withdraw the money they've earned from receiving messages, enhancing their experience by providing instant access to funds paid by advertisers and business development professionals.

Conclusion

Block Talk represents a bold step forward in merging secure, scalable communication with the decentralized power of the Bitcoin Lightning Network, delivering a platform that's as resilient as it is innovative. By harnessing Node.js and Express.js for a lightweight back-end, WebSocket for real-time interactivity, and Voltage alongside Firebase for massive scalability, we've built a system that thrives under growth—whether serving hundreds or millions of users earning from advertisers and business pros. Block Talk not only reimagines peer-to-peer messaging but also sets a new standard for privacy, efficiency, and economic empowerment in the digital age. As blockchain and communication technologies evolve, Block Talk stands ready to scale effortlessly, turning the promise of decentralization into a practical, user-driven reality.

[9] LNBits Team. (2020). LNBits: Free open-source Bitcoin Lightning wallet accounts system. ("This documentation introduces LNBits as a lightweight, customizable tool for managing Lightning payments, supporting Block Talk's choice to use it for seamless invoice creation and payment tracking.")