# The Sonic SVM Attention Capital Market: An HSSN Architecture for Programmatic Value and Ecosystem Growth

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**Abstract** :

The Sonic SVM protocol represents a groundbreaking advancement in tokenomics by establishing the world's first functioning attention capital market. By tokenizing and creating a liquid market for human attention—arguably the most valuable resource in the information age—we've designed a system that fundamentally redefines on-chain value exchange. Our HSSN-powered infrastructure systematically captures, quantifies, and redistributes attention as a programmable asset through: an innovative Attention Capital Funnel that transforms off-chain awareness into on-chain value; a PageRank-inspired Authority Score system fostering ecosystem-wide synergy; precise Programmatic Attention Metrics tracked over defined epochs; and a sophisticated Incentive Mechanism driving a perpetual Attention Flywheel. This represents more than technological infrastructure—it launches a new economic paradigm where attention becomes a first-class asset class, empowering developers and users alike in a truly meritocratic digital economy.

**Keywords:** Attention Capital, Sonic SVM, HSSN, On-chain Attention Metrics, Incentive Mechanism, PageRank, dApp Ecosystem, Blockchain.

## 1 Introduction and Motivation

In an era where billions of data vying for human focus daily, it's becoming increasingly clear that attention - manifested through views, clicks and engagements - is the truly scarce and valuable asset. It's not just a metric - it's a form of labor, and perhaps the most overlooked form of capital in crypto.

As the crypto space accelerates the tokenization of everything valuable, we believe attention is the next frontier. This is already unfolding around us - from the memecoin phenomenon and the ascent of AI agents to the launch and traction of applications like Sonic X and pioneering InfoFi platforms such as Kaito. Yet despite this momentum, a structured attention capital market has yet to materialize.

With this whitepaper, we're excited to share our latest research and development toward that vision. Our goal is no longer just designing for attention, we now aim to build an attention-driven rewarding market - a foundational infrastructure that captures, quantifies, and redistributes attention as a native, liquid, and programmable asset across the open web.

### *1.1 The Genesis of Attention Capital in the Attention Economy*

"In an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes." - Simon, 1971

What information consumes is attention—and attention, in turn, is what drives users to take action. Once we accept that attention is scarce, it becomes clear that it must be treated as more than a fleeting engagement metric. We introduce the concept of Attention Capital, inspired by the idea of Internet Capital as articulated and actively embraced within the Solana ecosystem. CoinShares, 2025

In the framework of Internet Capital, capital refers to any asset or mechanism that enables internet-connected individuals to transform participation—through data, labor, or attention—into ownership. This form of capital is liquid, composable, and globally accessible through blockchain infrastructure.

Viewed through this lens, attention capital is not a metaphor—it's an asset class. Any behavior that captures or concentrates attention can be measured, priced, and further transformed into capital.

### *1.2 From Off-Chain Awareness to On-Chain Value: The Attention Capital Funnel*

Attention capital doesn't arrive fully formed. It must be created and transformed through a multi-stage funnel. In this framework, we focus on two critical layers: **off-chain attention** and **on-chain attention**.

- **Off-chain attention** refers to awareness-driven actions aimed at capturing cognitive focus through fragmented and abundant information channels—Twitter threads, TikTok clips, Galxe quests, Kaito leaderboards, and more.
- **On-chain attention** encompasses conscious, verifiable user actions that signal protocol-level engagement, such as signing, invoking, staking, depositing, or minting.

From the perspective of dApps, two key insights emerge:

1. **To transform attention into capital, off-chain attention**

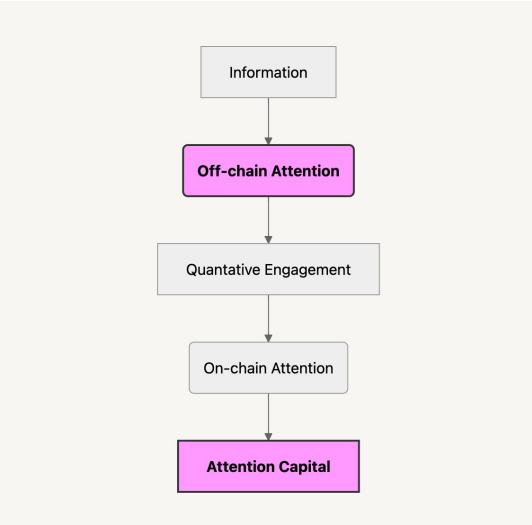


**Figure 1.** The Attention Capital Funnel

**must ultimately flow on-chain.** Whether it's token speculation, DAO participation, or product usage, social momentum must manifest as concrete on-chain outcomes. By treating on-chain attention as the definitive endpoint, dApps can reverse-engineer growth strategies around measurable results—rather than optimizing blindly for top-of-funnel impressions.

2. **Both off-chain and on-chain attention remain fragmented and insufficiently measured.** While Kaito introduced primitives like "Yaps" and "Mindshare" to quantify off-chain activity, the state of on-chain attention measurement remains rudimentary. A unified and granular measurement system is now essential. Not only does it provide clarity to builders, it also lays the foundation for more intelligent incentive design.

While capturing on-chain attention is critical, it's equally important for dApps to turn on-chain attention to capital. Existing methods—such as launching tokens, securing primary investments, or relying on ad hoc monetization—offer some pricing mechanisms, but they are often fragmented and inconsistent.

As an infrastructure, we believe a more systematic, ecosystem-native approach is needed—one that recognizes and enprices on-chain attention through an attention-driven incentive system. Ultimately, our expectation for dApps is not only to manage the attention capital funnel but to close the loop, which means the seamlessly integration of both off-chain and on-chain attention into a self-reinforcing loop can unlock a far more sustainable dApp growth model: attention drives rewards, and rewards amplify attention.

### *1.3 Attention Capital as Programmable Infrastructure on Sonic SVM*

To enable dApps to strategically manage the attention capital funnel, and ultimately close the loop, we at Sonic SVM are building a **systematic, infrastructure-native solution** designed to validate and distribute rewards based on verifiable on-chain attention inputs.

Sonic SVM is more than a fast execution layer. Powered by the **HSSN network**, Sonic SVM serves as a **programmable attention settlement layer**. It offers:

- **Consensus-level validation** of attention-related transactions and behaviors
- **Granular, on-chain access** to user activity across dApps and protocols
- **Composable, reusable primitives** that eliminate the need for each project to build bespoke attention infrastructure

By leveraging the security and consensus of the Solana base layer, Sonic SVM is not required to rely on the validator-driven economy, allowing it to redirect network incentives toward ecosystem dApps - specifically those that capture and activate on-chain attention in meaningful ways. This makes Sonic natively aligned with attention-aware incentive distribution, with no need for redundant consensus overhead.

By anchoring this reward mechanism at the infrastructure layer, Sonic enables a shared and open foundation for an **attention capital market** - one where any project, creator, or user can directly capture value for the attention they generate. No intermediaries, no gatekeepers—just composable, measurable attention that flows like capital.

## 2 A PageRank-Inspired Network Model for the Sonic SVM Attention Economy

Inspired by the foundational principles of Google's Page Rank Brin et al., 1998 algorithm, which revolutionized web search by evaluating the quality and quantity of links between pages, we conceptualize the Sonic SVM program landscape not as a collection of isolated entities vying for attention in a zero-sum game, but as an interconnected, mesh-like ecosystem.

The classic PageRank formula, which fundamentally transformed how we assess importance in interconnected systems, is defined as:

$$PR(p_i) = \frac{1-d}{N} + d \sum_{p_j \in M(p_i)} \frac{PR(p_j)}{L(p_j)} \tag{1}$$

Where:

- $PR(p_i)$ is the PageRank of page $i$
- $d$ is a damping factor (typically 0.85)
- $N$ is the total number of pages
- $M(p_i)$ is the set of pages that link to page $i$
- $L(p_j)$ is the number of outbound links from page $j$

This elegant formula encapsulates a profound insight: a node's importance depends not only on how many other nodes point to it, but also on the importance of those pointing nodes. It is this recursive, reputation-propagating principle that we adapt for the Sonic SVM.

Within this ecosystem, attention capital is dynamic, flowing between programs and allowing for mutual reinforcement based on credibility and integration. Much like PageRank assesses webpage importance through interlinking, our model evaluates program significance and distributes attention based on verifiable on-chain interactions and integrations.

### *2.1 Mutual Growth through Interdependence*

This network model fosters a synergistic environment where programs can mutually enhance their attention standing:

1. **Inter-Program Integrations as Trust Signals:** Programs within Sonic SVM can reference, integrate, or build upon the functionalities of other programs. These on-chain connections serve as more than just functional links; they act as powerful **trust and relevance signals** within the Attention Capital Market, akin to high-quality backlinks in the traditional web. A program integrating with another implicitly vouches for its utility or reliability.
2. **"Authority Transfer": Boosting Scores Through Association:** When a developing program (Program B) strategically integrates with or references a program that has already established a high attention score and reputation (Program A – an "authority" program), Program B benefits directly. This integration acts as an endorsement, providing Program B with a quantifiable boost to its foundational attention score or ranking (the methodology for calculating and classifying these scores will be elaborated upon in a subsequent section). This mechanism incentivizes the discovery and utilization of high-quality, proven programs, fostering a collaborative environment where developers leverage trusted components, thereby enhancing Program B's initial visibility and credibility within the ecosystem.
3. **"Reputation Enhancement": Strengthening Network Standing via Cross-Program Invocations:** Conversely, the established program (Program A) also gains significant advantages from being integrated with or **invoked by** other programs (like Program B). Each such quality integration or received invocation serves as a positive testament to Program A's value and reliability within the ecosystem. This positive feedback contributes directly to Program A's key performance indicators, potentially captured within a `Cross-Program Invocations Received (CPI)` (CPI) score (a core activity metric, as will be detailed in a subsequent section). An improving CPI score signifies growing relevance, network trust, and utility, further solidifying Program A's high attention score and its authoritative position within the market.

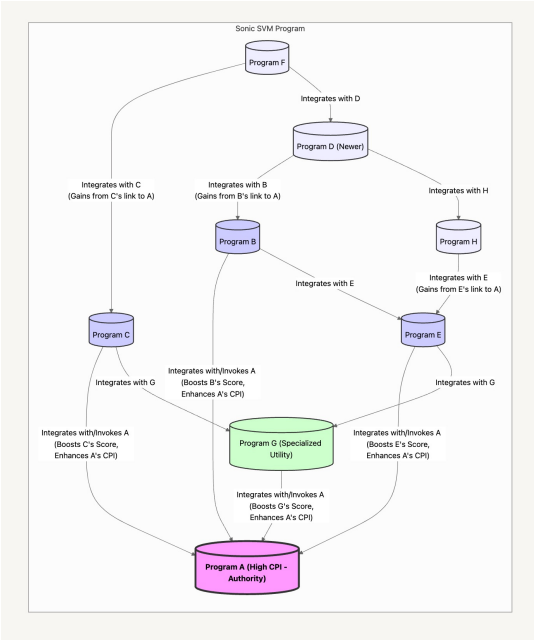


**Figure 2.** Mutual Growth through Interdependence

This interdependent dynamic cultivates a powerful positive feedback loop. High-attention, high-quality programs become network hubs, lending credibility and visibility to associated programs while simultaneously enhancing their own prestige and market value through these endorsements. This structure ensures the entire network becomes more robust, discoverable, and efficient, channeling attention towards proven utility and innovation. Consequently, the Sonic SVM ecosystem evolves into a rich tapestry of mutually reinforcing dApps, where collective interaction and integration amplify individual program value and drive overall network growth.

### *2.2 The Sonic SVM Attention Graph: Modeling Network Value Flow*

Building upon the principle of interdependent growth, Sonic SVM introduces a novel architectural approach to evaluate and quantify program interactions. We model the entire ecosystem of participating programs as a dynamic, weighted, and directed graph, which we term the Sonic SVM Attention Graph. This model serves as the foundational data structure for understanding and scoring the flow of attention and value throughout the network.

This Attention Graph extends the core concepts of web-of-trust models, such as Google's PageRank, by deeply integrating blockchain-specific economic principles and verifiable on-chain activities. In this system, the significance of each inter-program connection is not merely a count of links but is dynamically

weighted to reflect its contribution to overall ecosystem value, as evidenced by on-chain metrics. The architecture aims to create a self-reinforcing cycle: high-quality, high-attention programs inherently elevate the perceived value of those they interact with, while all programs are incentivized to forge strategic and meaningful on-chain connections.

#### 2.2.1 Sonic SVM Attention Graph Model Representation

Program relationships are structured as a **directed weighted graph**:

- **Nodes:** Each **node** in the graph represents an individual, registered program (dApp) operating within the Sonic SVM ecosystem.
- **Edges:** Each **directed edge** between two nodes (e.g., from Program B to Program A) signifies an interaction, such as Program B invoking a function in Program A.
  - **Directionality:** The direction of the edge indicates the flow of interaction or dependency (e.g., an invocation from a calling program to a called program). This is crucial for metrics like Cross-Program Invocations Received (CPI).
  - **Weighting:** Edges are assigned **weights** that reflect the quality, intensity, or economic significance of the interactions they represent. These weights can be derived from a combination of the Programmatic Attention Metrics (detailed in Section 3), such as the volume of invocations, the value transacted through such interactions, or the compute units consumed.

This graph-based architecture transforms the inherent open connectivity of blockchain programs into a reputation-aware framework. Within this framework, a program's influence and its calculated attention score emerge directly from verifiable on-chain participation and its position within the network of inter-program relationships. By systematically modeling these interactions, the Sonic SVM Attention Graph provides a transparent and quantifiable basis for the attention scoring mechanisms and subsequent reward distributions detailed in the following sections.

## 3 The Attention Epoch & Programmatic Attention Metrics

To effectively manage and incentivize the Attention Capital Market within the Sonic SVM ecosystem, a structured framework for measurement and evaluation is essential. This section introduces a novel temporal concept, the Attention Epoch, and delineates the core Programmatic Attention Metrics used to objectively track and quantify on-chain engagement during these periods. Understanding these elements is crucial for comprehending how attention is valued and rewarded within the network.

### *3.1 The Attention Epoch: Defining Measurement Cycles*

The **Attention Epoch** represents a discrete, predetermined time interval during which the on-chain attention directed towards all participating programs on the Sonic SVM is systematically measured and aggregated. The purpose of segmenting measurement into Epochs is multifaceted:

1. **Regularized Evaluation:**It provides regular cadences for assessing program performance and market dynamics, preventing static rankings and allowing new or improved programs to gain visibility.
2. **Timely Incentive Distribution:**Epochs establish clear start and end points for calculating and potentially distributing rewards or allocating resources based on measured attention capital.
3. **Dynamic Market Reflection:**It allows the attention metrics and subsequent rankings to reflect the current state of user engagement, rather than being skewed by historical data alone.

The duration of an Attention Epoch would be a critical system parameter, potentially configurable or governed by the HSSN, balancing responsiveness with computational overhead. At the conclusion of each Epoch, the attention metrics for all programs are finalized, leading to updated rankings and informing the next cycle of incentive allocation.

### *3.2 Programmatic Attention Metrics: Quantifying On-Chain Engagement*

To objectively quantify on-chain engagement and the attention capital accrued by programs, the Sonic SVM ecosystem will track a defined set of programmatic attention metrics. These metrics are categorized into Activity Metrics, reflecting core engagement, and Economic Attention Metrics, reflecting capital commitment. All raw metrics are subject to normalization and scaling as defined by governance to ensure fair comparison and weighting.

HSSN Validators tracks and verifies the following metric categories for each **registered program** during an epoch:

#### 3.2.1 Activity Metrics (Core Engagement)

These metrics focus on the direct interaction and systemic relevance of programs within the network:

1. `Direct User Interactions (I)`
   - **Definition:** $I_P$ - Total count of user-signed instructions targeting the program $P$ during an Attention Epoch.
   - **Logic:** This metric is a fundamental measure of the frequency of direct user choice and active engagement with a specific program.

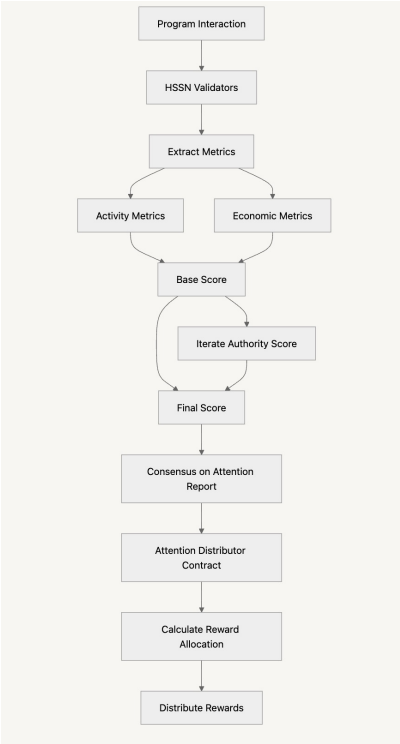


**Figure 3.** Quantifying On-Chain Engagement

2. `Unique Interacting Wallets (U)`
    - **Definition:** $U_P$ - Count of distinct user signer public keys interacting with the program $P$ within the Attention Epoch.
    - **Logic:** This metric aims to measure the breadth of a program's adoption and its overall reach within the user base.
3. `Cross-Program Invocations Received (CPI)`
    - **Definition:** $CPI_P$ - Total invocations of program $P$ received from other programs during the Epoch.
    - **Logic:** This metric is crucial to assess the systemic importance, utility, and composability of a program within the broader ecosystem.
4. `Attributed Compute Unit (CU) Consumption (G)`
    - **Definition:** $G_P$ - Total CUs consumed within the program $P$'s context during the Attention Epoch.
    - **Logic:** CU consumption acts as a proxy for the intensity, complexity, and computational cost of interactions with a program. It can be seen as a "costly proof-of-work" for attention, as more complex or heavily utilized programs will naturally consume more CUs.

#### 3.2.2 Economic Attention Metrics (Capital Commitment)

These metrics assess the economic activity and capital allocation associated with programs, reflecting deeper financial engagement and trust:

| Symbol | Description | Rationale |
|---|---|---|
| $I_P$ | Direct user instructions | Frequency |
| $U_P$ | Distinct signing wallets | Reach, breadth of adoption |
| $CPI_P$ | CPI calls received | Composability, systemic importance |
| $G_P$ | Compute units consumed | Costly proof of work |

**Table 1**
Activity Metrics

1. `Transaction Value Flow (V)`
    - **Definition**: $V_P$ - The total value flow associated with the program within the attention epoch, calculated by monitoring standard token transfer instructions (e.g., `Spl-token::transfer`involving program-controlled accounts) and/or standardized value transfer events emitted by the program (e.g., `DepositValue`, `WithdrawValue`). This tracking applies only to user-initiated transactions involving governance-approved assets (e.g., SONIC, SOL, USDC, USDT). Typically calculated as the sum of absolute values of inflows and outflows, denominated in a common unit (e.g., USDC or SONIC).
    - **Logic**: This metric measures the program's role and significance in facilitating active economic throughput across various use cases such as DeFi, payments, gaming, and more.
2. `Native SONIC Staking Volume (S)`
    - **Definition:** $S_P$ - For registered staking-type programs, the total amount of native SONIC tokens staked within program $P$ controlled accounts. This can be measured as an average value over the Epoch or an end-of-epoch snapshot.
    - **Logic:** This metric signifies a direct capital commitment and inherent trust in the program's function and stability, specifically using the network's core asset.

| Symbol | Description | Rationale |
|---|---|---|
| $V_P$ | Value-flow through entry-points (swap, lend, bridge) | Economic throughput |
| $S_P$ | Avg. native SONIC staked in program vaults | Long-term capital commitment |

**Table 2**
Economic Attention Metrics

#### 3.2.3 Metric Normalization and Scaling

To ensure fair comparison across diverse programs and to prevent any single raw metric from disproportionately influencing attention rankings, all collected raw metrics ($M_P$) will undergo a scaling or normalization transformation.

Let $M_P$ represent any raw metric collected for program $P$ during an epoch. The corresponding scaled metric $M'_P$ is obtained by applying a scaling function $f_i$:

$$M'_P = f_i(M_P) \tag{2}$$

Where $f\_i$ typically takes forms:

$$f_i(x) = \log(x + 1) \tag{3}$$


**Figure 4.** Metric Normalization and Scaling

## 4 Incentive Mechanism: Rewarding Attention Capital

The successful cultivation of a vibrant Attention Capital Market within the Sonic SVM ecosystem hinges on a robust and transparent Incentive Mechanism. This mechanism is designed to systematically reward programs that demonstrably capture and sustain meaningful user engagement, as measured by the programmatic attention metrics detailed previously (Section 3.2). The core objective is to create a direct economic linkage between the generation of verifiable on-chain attention and tangible value accrual for program developers and stakeholders, thereby fostering an environment that propels innovation and network growth.

### *4.1 Principles of Attention-Based Rewards*

The incentive mechanism operates on several key principles:

1. **Proportionality:** Rewards allocated to programs should be broadly proportional to the verified attention capital they have accrued during a given Attention Epoch. Programs commanding higher engagement and contributing more significantly to network activity should receive a correspondingly larger share of the incentive pool.
2. **Sustainability:** The incentive pool and its distribution methods need to be designed for long-term viability, ensuring that the system can continuously reward valuable contributions without depleting resources or creating adverse economic conditions.
3. **Network Alignment:** The incentive structure should encourage behaviors that benefit the overall health and growth of the Sonic SVM ecosystem, such as quality dApp development, positive user experiences, and inter-program composability.

### *4.2 Funding Source for Program Incentives and Program Attention Flywheel*

The incentives for the Attention Capital Market are funded by a strategically allocated portion of the total network rewards. This ensures that program success is directly tied to the overall health and activity of the Sonic SVM network.

The **Program Incentive Pool ($R_E$)** is the dedicated source of rewards for registered programs, distributed based on their measured attention scores.

#### 4.2.1 The Program Attention Flywheel: Leveraging Rewards for Sustained Growth

A key design principle of the Attention Capital Market is to empower programs to create a self-reinforcing cycle of growth and user engagement—an **Attention Flywheel**. Once a program receives its share of rewards from the **Program Incentive Pool ($R_E$)**, it has the strategic opportunity to reinvest a portion of these earnings back into its own ecosystem.

This reinvestment can take various forms, such as:

- **Direct User Incentives:** Rewarding users with tokens or other benefits for specific interactions, continued engagement, or contributions to the program's community.
- **Enhanced Features & Development:** Funding further development to improve the dApp's utility, user experience, or introduce new, engaging functionalities.
- **Community Building & Marketing:** Supporting initiatives that grow the user base and increase awareness.

By strategically allocating earned rewards to incentivize users, programs can stimulate increased on-chain interaction, foster greater user loyalty and retention, and attract new participants. This heightened activity, in turn, is measured by the HSSN, contributing to potentially higher attention scores for the program in subsequent epochs. Higher scores can then lead to a larger share of the $R_E$ pool, providing more resources to further fuel the flywheel. This creates a virtuous cycle where successful engagement begets more resources, which can then be used to drive even deeper and broader engagement.

The following diagram illustrates this Program Attention Flywheel:

### *4.3 Program Registration and Lifecycle Management*

To ensure a fair and transparent Attention Capital Market, programs must be formally registered to become eligible for attention metric tracking and reward distribution. This process also facilitates the collection of essential metadata and incorporates basic spam prevention measures.

**4.3.1 Purpose** The Program Registry system serves to:

- Formally identify and enumerate programs eligible to participate in the Attention Capital Market.
- Gather necessary metadata for identification, categorization, and reward distribution.
- Implement foundational mechanisms to deter the registra-

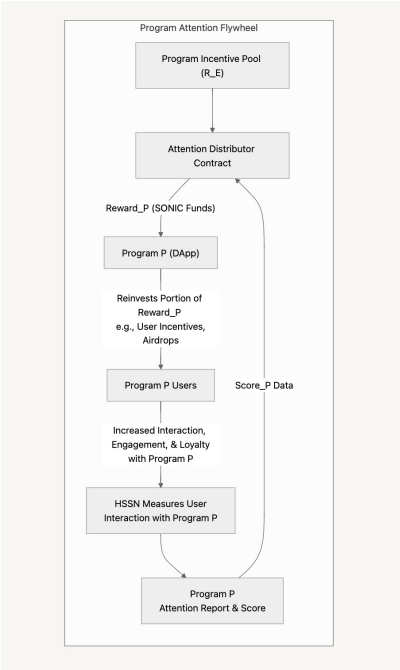


**Figure 5.** Program Attention Flywheel

tion of inactive, malicious, or low-quality programs.

Only programs successfully registered through this on-chain process will have their metrics included in the HSSN Attention Reports and subsequently qualify for rewards from the Attention Distributor contract.

#### 4.3.2 Conceptual Registration Process

1. **On-Chain Registry:** A dedicated on-chain mechanism, such as a smart contract (the "Program Registry"), would serve as the central point for managing program registrations.
2. **Developer-Initiated Registration:** Program developers or their authorized representatives would interact with this on-chain registry to submit their program for participation.
3. **Essential Information Framework:** The registration process would be designed to capture key pieces of information, typically including:
    - **Unique Program Identifier:** To link on-chain activity to the correct registered entity (e.g., the program's public key).
    - **Reward Beneficiary Information:** A designated on-chain address for the secure and transparent distribution of earned rewards.
    - **Program Categorization Data:** Information to help classify the program's primary function, which can aid in nuanced metric analysis and fair reward distribution across diverse dApp types. Examples of such categories could span DeFi, Gaming, NFTs, Infrastructure, Social applications, AI, and others.
    - **(Optional) Supplementary Metadata:** A method for linking to additional descriptive information (e.g., project name, icon, website), useful for ecosystem explorers and dashboards.
4. **Authority Verification:** The system would incorporate measures to reasonably verify that the entity registering a program has the appropriate authority or control over that on-chain program.
5. **Market Integrity Mechanisms:** To promote a healthy market and discourage the registration of inactive or potentially harmful programs, the registration process could incorporate deterrents. These might involve nominal economic commitments (e.g., a small fee or a refundable deposit in SONIC tokens), with the specifics and amounts determined by network governance to balance accessibility with spam prevention.

#### 4.3.3 Lifecycle Management Capabilities

The registry system would also need to support the ongoing management of registered programs throughout their lifecycle. Key capabilities would include:

- **Information Updates:** Mechanisms allowing authorized representatives of a program to update mutable information, such as the reward beneficiary address or supplementary metadata, as needed.
- **Voluntary De-registration:** A clear process for program representatives to voluntarily withdraw their program from active participation in the Attention Capital Market.
- **Integrity Assurance and Disqualification:** A transparent process would be necessary to address situations where programs might engage in activities detrimental to the market's fairness or security (e.g., significant metric manipulation, illicit activities). This process could lead to temporary or permanent suspension of reward eligibility.

This framework for program registration and lifecycle management aims to be robust yet adaptable, providing the necessary structure for the Attention Capital Market while allowing for future evolution as the Sonic SVM ecosystem matures.

### *4.4 Score Calculation (Post-Epoch)*

Following the conclusion of each Attention Epoch, the "Attention Distributor" smart contract plays a crucial role. It retrieves the comprehensive HSSN Attention Report, which contains the scaled attention metrics for all registered and eligible programs. These scaled metrics, derived from the raw data as described in Section 3.2.3, form the basis for calculating the Activity Score, Economic Score, and ultimately, the Final Attention Score for each program.

#### 4.4.1 Activity Score

Let $M'_P$ denote the scaled metric $M$ for program $P$ in the epoch(e.g., $I'_P$, $U'_P$,...). The Activity Score for program $P$ is calculated as:

$$\text{Score}_{\text{Activity},P} = w_I \cdot I'_P + w_U \cdot U'_P + w_{CPI} \cdot \text{CPI}'_P + w_G \cdot G'_P \quad (4)$$

Where:

- $w_I, w_U, w_{CPI}, w_G$ are pre-defined, non-negative weights
- Sum of all weights equals 1

#### 4.4.2 Economic Score

The Economic Score is calculated as:

$$\text{Score}_{\text{Economic},P} = w_V \cdot V'_P + w_S \cdot S'_P \quad (5)$$

*(Initially, these economic weights might be uniform across relevant categories).*

#### 4.4.3 Program Base Attention Score

The Base Attention Score for a program $P$ combines its Activity Score and Economic Score. However, to ensure that economic size doesn't disproportionately reward inactive programs ("zombie capital"), a minimum activity threshold, $T_{Activity_{min}}$ is introduced. This category-specific threshold ensures programs demonstrate a baseline level of genuine usage relevant to their stated function before their economic metrics significantly influence their rewards.

This mechanism prevents programs from earning substantial rewards solely by holding or attracting passive capital without fostering actual user interaction or utility.

- **Minimum Threshold**: The system establishes a qualifying threshold based on relative Activity performance within each program category during the calculation cycle. Programs below this threshold will receive rewards based solely on Activity performance.
- **Below Threshold:** If Activity falls below minimum threshold, the Base Score equals $(1 - w_{EconBoost}) \cdot S_{Activity,P}$. Economic metrics are disregarded for reward calculation.
- **Above Threshold:** If activity meets or exceeds the minimum, the Base Score becomes a weighted blend of both Activity and Economic scores, with the *w_EconBoost* parameter determining the balance. This acknowledges both dimensions of contribution for demonstrably active programs.

$$S_{\text{Base},P} = \begin{cases} (1 - w_{\text{E}})S_{\text{A},P} & S_{\text{A},P} < T_{\min} \\ (1 - w_{\text{E}})S_{\text{A},P} + w_{\text{E}}S_{\text{Econ},P} & S_{\text{A},P} \geq T_{\min} \end{cases} \quad (6)$$

#### 4.4.4 Authority Score

The **Authority Score** quantifies **network influence** using adapted PageRank mechanics. To enable **mutual authority propagation** (both in-degree and out-degree influence) while maintaining Sybil resistance, we propose an extended formula with **direction-specific weights** and **economic constraints**

The Authority Score is calculated as:

$$\begin{aligned} \text{AuthScore}^{(k+1)}(P) = {} & \lambda \cdot S_{\text{Base}}(P) \\ & + (1 - \lambda)\Bigg[\mu \sum_{Q \in \text{Call}(P)} \frac{\text{AuthScore}^{(k)}(Q) w_{Q \to P}}{\text{OutDeg}(Q)} \\ & + \eta \sum_{R \in \text{Callee}(P)} \frac{\text{AuthScore}^{(k)}(R) w_{P \to R}}{\text{InDeg}(R)}\Bigg] \end{aligned} \quad (7)$$

Where:

- $\mu$: in-degree weight, reward programs being called
- $\eta$: out-degree weight, reward programs for calling high-value programs
- $w_X ß_Y$: edge weight, a CPI value-based weight
- $\lambda$: decay factor

Authority Score essentially computes eigenvector centrality where a program's importance depends on both its own quality and the quality of programs calling it. Value-scaled CPI edges create an attestation graph that high-weight edges signal strong economic relationships rather than arbitrary connections. The Authority Score algorithm requires iterations because programs' scores are interdependent—each program's score depends on the scores of programs it interacts with (callers and callees). These mutual dependencies create a feedback loop, necessitating repeated updates to refine scores until they stabilize.

#### 4.4.5 Final Attention Score

The Final Score for Program $P$ synthesizes its Base Score (comprising Activity and Economic metrics) with Network Influence (derived from Authority Score dynamics), creating a holistic assessment that balances direct performance with ecosystem-wide collaboration. Program rankings are determined through this dynamic equilibrium of individual merit and propagated influence.

$$\text{FinalScore} = \gamma S_{\text{Base}} + (1 - \gamma)\text{AuthScore} \quad (8)$$

Where:

- $\gamma$ : **Final Score Ratio, c**ontrols the weighting between Base Score and Authority Score

### *4.5 Reward Distribution*

Once the Final Attention Scores for all eligible programs are calculated, the Attention Distributor contract proceeds with the allocation of rewards from the Program Incentive Pool.

#### 4.5.1 Per-Category Allocation

To ensure a balanced distribution across different sectors of the dApp ecosystem, the total program reward pool ($R_E$) is first divided equally among all recognized program categories. Each Category C receives: $R_{E,C} = R_E/|C|$, where $|C|$ = total number of categories.

The final reward distribution for program P in category C is calculated as:

$$\text{Reward}_{P,C} = R_{E,C} \times \frac{S_{\text{Final},P,C}}{\sum_{Q \in \boldsymbol{Q}_{\text{eligible},C}} S_{\text{Final},Q,C}} \tag{9}$$

Where:

- $R_{E,C}$ = Total reward pool allocated for category $\boldsymbol{c}$
- $S_{Final,P,C}$ = Final score of program P in category $\boldsymbol{c}$
- $\sum_{Q \in \boldsymbol{Q}\text{eligible,C}} S_{\text{Final},Q,C}$ = Sum of Final Attention Scores of all programs $Q$ in category $\boldsymbol{c}$ in current epoch. This set $\boldsymbol{Q}$eligible *includes all programs that are registered and not disqualified in the current epoch. The total score serves as the normalization factor to determine the proportional share for program P.*

All calculated rewards are then sent to the Address registered for each respective program. This systematic and transparent process ensures that incentives are directed towards programs genuinely contributing to the vibrancy and utility of the Sonic SVM Attention Capital Market.

## 5 Technical Architecture

### *5.1 Hypergrid Network Nodes*

The Hypergrid Network is composed of three types of nodes: Relay, HSSN, and Grid. The Relay Node serves as the gateway for applications to interact with the Hypergrid Network via Remote Procedure Call (RPC). The HSSN Node serves as a distributed persistency layer for high-availability state across the Hypergrid Network. The Grid Node serves as the sequencer responsible for transaction processing, account persistency, and program-level distributions. All Hypergrid Network nodes communicate on a single network plane to maximize network fault tolerance via peer-to-peer networking.

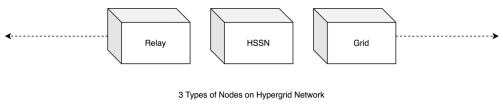


**Figure 6.** 3 Types of Nodes on HyperGrid Network

### *5.2 The Grid Node*

The Grid Node serves as the main sequencing unit of the Hypergrid Network hosting account state and key distribution-related programs in its local AccountsDB and Ledger.

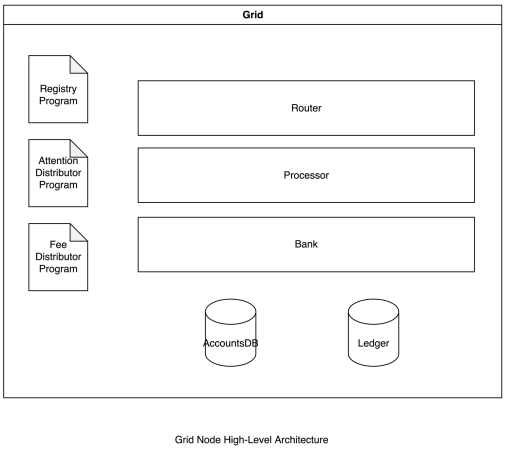


**Figure 7.** Grid Node High-Level Architecture

### *5.3 Grid Core Distribution Programs*

Registry Programs holds information regarding recognized programs in the programmatic Attention Economy of the Hypergrid Network. This serves as a gating mechanism for the Attention Distributor Program. The Attention Distributor Program houses the Incentive Bill tally calculated by HSSN and used as a reference point for Incentive Disbursal in the Hypergrid Network. The Fee Distributor Program houses the Fee Bill tally calculated by the HSSN and used as a reference point for Fee Disbursal in the Hypergrid Network.

### *5.4 The HSSN Node*

The HSSN Node is responsible for keeping track of key financial driving mechanisms of the Hypergrid Network ensuring high availability, fault tolerance, and community stake in the future of the Hypergrid Network.

### *5.5 HSSN Replicated State*

Grid Metadata contains data about the Grids recognized as official Grids of the Hypergrid Network. Incentive Bill accounts for the incentives distribution on each Grid by accounting for both Activity and Economic Attention metrics serving as the core of Hypergrid Network's Programmatic Attention Economy. Fee Bill accounts for the fee structure on each Grid by accounting for the Fee Charges of the Hypergrid Network.

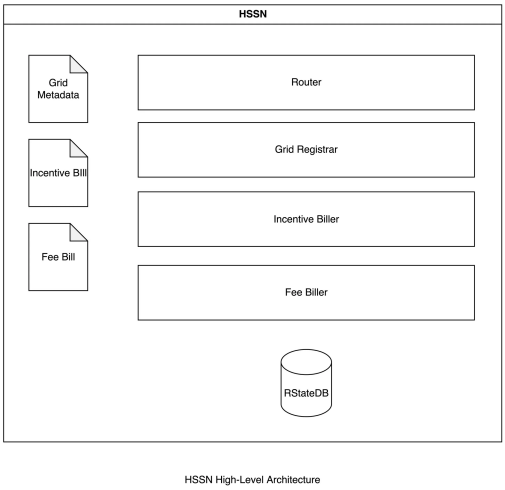


**Figure 8.** HSSN High-Level Architecture

## 6 Data Availability and Transparency

In light of high-availability and fault-tolerance of critical state, such as Incentive and Fee Billing state, the Hypergrid Shared State Network (HSSN) persists data in the Replicated State Database (RSDB). The Relay Node exposes these data through HSSN endpoints that allow any user to fetch Grid Metadata, Incentive Bill History, and Fee Bill History from the nearest HSSN node.

## 7 Thought Experiment: The "Cosmic Clash" Game Growth Cycle

To illustrate the practical application and power of the Sonic SVM Attention Capital Market, let us consider a hypothetical decentralized game, "Cosmic Clash", an innovative play-to-earn space strategy game.

**The Challenge for Cosmic Clash:** Despite having solid gameplay and unique NFTs, Cosmic Clash faces the typical new game struggle – attracting players and building community with limited resources. The team has some initial marketing budget and wants to leverage the Attention Capital Market to create sustainable growth.

**Leveraging the Attention Capital Framework:**

1. **Phase 1: Initial Off-Chain Awareness & On-Chain Conversion (Bootstrapping Attention)**
    - **Off-Chain Strategy:** The Cosmic Clash team allocates their initial budget to targeted digital advertising campaigns (e.g., ads on gaming news sites, YouTube influencer promotions targeting strategy game enthusiasts, and social media campaigns on platforms like X/Twitter and Discord). These ads showcase exciting gameplay footage and offer a small, exclusive in-game NFT (e.g., a unique starter spaceship skin) for new players who register, connect their wallet, and complete their first in-game tutorial mission (an on-chain verifiable event).
    - **Bridging to On-Chain:** Each ad directs potential players to a landing page with a clear call-to-action: download the game, connect their wallet, and claim their starter NFT by completing the initial on-chain mission. This first mission completion is a verifiable Direct User Interaction and registers a Unique Interacting Wallet.
2. **Phase 2: Measuring On-Chain Attention & Accruing Initial Rewards**
    - **HSSN Measurement:** Throughout the first Attention Epoch, the HSSN tracks Cosmic Clash's on-chain metrics: the number of new players completing the tutorial mission, the growth in unique player wallets, the CUs consumed by these initial gameplay interactions, and potentially any value flow if the starter NFT has a nominal marketplace value or if early players make small in-game purchases.
    - **Achieving Key Metrics:** The targeted ad campaign, combined with compelling gameplay and an attractive onboarding incentive, successfully converts off-chain interest into tangible on-chain player activity. Cosmic Clash achieves promising initial scores in the "Gaming" category.
    - **Receiving Rewards:** At the end of the epoch, based on its Final Attention Score, Cosmic Clash receives a distribution of SONIC tokens from the Program Incentive Pool. This reward is directly proportional to the on-chain attention (player engagement) it demonstrably captured.
3. **Phase 3: Fueling the Flywheel – Reinvesting for Growth**
    - **Strategic Reinvestment:** The Cosmic Clash team now possesses a new stream of capital – the rewards earned through the Attention Capital Market. They decide to reinvest a significant portion of these SONIC tokens back into player acquisition and retention.
    - **Scaling Off-Chain Efforts & Enhancing On-Chain Loops:** They use these rewards to:
        - Expand their digital advertising campaigns, targeting wider gaming demographics or new geographic regions.
        - Sponsor eSports tournaments or community events centered around Cosmic Clash, generating further off-chain buzz and on-chain participation.
        - Offer larger or more diverse in-game NFT rewards for completing specific on-chain quests or achieving certain milestones within Cosmic Clash, directly funded by their earned rewards.
        - Fund the development of new game modes or content updates that encourage more frequent or deeper on-chain interactions from the existing player base.

4. **Phase 4: The Amplified Growth Cycle**
    - **Increased Player Base & Engagement:** The expanded and diversified off-chain campaigns, now partly self-funded through protocol rewards, drive a larger influx of new players to Cosmic Clash. The enhanced in-game rewards and new content also boost existing player activity.
    - **Higher Attention Scores:** In subsequent Attention Epochs, Cosmic Clash's on-chain metrics show substantial growth.
    - **Larger Rewards:** Consequently, Cosmic Clash earns an even larger share of the pool, providing more resources to reinvest in the flywheel.
    - **Emerging Network Effects:** A thriving in-game economy might attract third-party tool builders or content creators, further enriching the Cosmic Clash ecosystem and driving organic attention.

**Outcome of the Thought Experiment**

Cosmic Clash demonstrates the perfect attention flywheel. Starting with just some initial marketing budget, they convert off-chain interest into on-chain engagement, earn protocol rewards, and reinvest those rewards to generate even more attention. This creates a self-sustaining growth cycle that aligns the game's success with real player engagement.

This exemplifies the Attention Flywheel facilitated by the Sonic SVM Attention Capital Market. It allows promising games and other dApps to bootstrap and scale their growth in a sustainable manner, directly aligning their financial success with their ability to attract, engage and retain an active on-chain player base. This moves beyond reliance on continuous external venture funding or transient speculative hype, offering a clear, measurable, and incentive-aligned path for developers to transform initial marketing efforts into a self-propelling engine of growth and long-term value.

## 8 Conclusion

The paradigm of Attention Capital offers a transformative approach to valuing user engagement in the digital age. This white paper has detailed the vision and architecture for the **Sonic SVM Attention Capital Market**, a pioneering initiative to establish attention as a first-class, programmable asset. We have laid out how Sonic SVM, underpinned by the **HSSN infrastructure**, transcends its role as a mere execution layer to become a sophisticated **attention settlement layer**.

Our core contributions include:

1. Defining **Attention Capital** and the **Attention Capital Funnel**, clarifying the pathway from off-chain awareness to tangible on-chain value.
2. Proposing a **PageRank-inspired network model** that encourages synergistic growth and value co-creation among dApps within the Sonic SVM ecosystem.
3. Establishing a comprehensive system of **Programmatic Attention Metrics** and **Attention Epochs** for the objective and transparent quantification of on-chain engagement.
4. Detailing a multi-faceted **Incentive Mechanism**, which calculates a **Program Base Attention Score** and combines it with the network-aware **Authority Score** to produce a holistic **Final Attention Score**. This score directly fuels the **Program Attention Flywheel**, enabling sustainable, reward-driven growth.
5. Outlining the **Program Registration and Lifecycle Management** processes crucial for market integrity and fair participation.
6. Briefly touching upon the **Technical Architecture** that makes this system feasible, including the roles of different node types and the HSSN's function in data persistence and availability for critical billing states.

The implementation of the Sonic SVM Attention Capital Market holds profound implications. For dApp developers, it offers a direct and meritocratic pathway to monetize user engagement and bootstrap growth. For users, it promises a richer ecosystem where their attention contributes to the value they can receive. For the Sonic SVM network, it unlocks a powerful engine for ecosystem expansion, attracting high-quality applications and fostering deep user loyalty.

By embedding these mechanisms at the infrastructure level, Sonic SVM is not just facilitating transactions; it is cultivating a new economy—an economy where attention is explicitly valued, transparently measured, and programmatically rewarded. This endeavor represents a significant step towards a more equitable and efficient digital landscape where developers and users alike can rightfully capture the value of their engagement.

We believe the Sonic SVM Attention Capital Market will serve as a foundational pillar for the next generation of decentralized applications and usher in a new era of attention-driven value creation on the open web. We invite developers, researchers, and visionaries to join us in building this exciting future.

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