PAYSTREAM-V0

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Abstract. Paystream is a blinks based tool that lets a user create streams and accept/distribute funds on different mathematical equations based curves making it a trustless source for clients and service providers.

1. Introduction

Paystream functions as an escrow-based payment gateway that facilitates secure, time-distributed transactions between a client and a service provider via programmable streams. The client and service provider define the terms of the agreement, including the total amount, wallet addresses, and duration. Once the stream is created, the agreed amount is transferred to an escrow account and associated with a hashed Stream-ID, which serves as a unique identifier linking the transaction to the specific client-provider agreement. Based on the selected stream parameters, the escrowed funds are released periodically according to the predefined schedule. This ensures that if the service provider fails to meet the client's expectations, the client can cancel the stream, and the remaining balance will be refunded. Conversely, the service provider does not need to rely on the client's commitment to pay in full after the service is completed. This approach mathematically ensures fairness, protecting both parties from potential fraud or malicious intent.

2. Streams

Streams are on-chain Solana program constructs that incorporate time-controlled withdrawal functionality, allowing service providers to claim their payments over a predefined period. In Paystream - v0, token distribution will be supported through three distinct mathematical curves.

Those curves are:-

- **Linear**

Linear curves utilize the equation:

$y = f(x)$ for $y \neq 0, x \neq 0$

to distribute tokens at a constant rate over a specified time period. This ensures a uniform, linear distribution of tokens as a function of time, which can be expressed as:

$y(t) = m * t + b$

where:

- $y(t)$ = amount of tokens distributed at time t.
- m =constant rate of distribution (slope).
- b = initial amount of tokens (y-intercept).

- **Cliff**

The Cliff Stream utilizes the following piecewise-defined function to describe its distribution mechanism:

$y(t) = \{0, \text{ for } t \leq t_0 f(t), \text{ for } t > t_0\}$

- $y(t)$ represents the amount of funds distributed at time t.
- t_0 is the cliff duration, which marks the initial period during which no funds are distributed.During this period, the value of $y(t)$ remains zero, indicating that no payment is made to the service provider.
- $f(t)$ is the function that defines the continuous distribution of funds after the cliff period has passed.Once the time t exceeds t_0 the service provider begins to receive funds according to the function $f(t)$, which may vary based on the specific agreement or performance metrics.

This structure provides a low-risk stream for the client during the initial service phase while allowing the service provider to receive continuous compensation after the cliff duration has elapsed. The design is particularly useful in scenarios where early services may not meet client expectations, ensuring that payment is contingent upon a predefined threshold of service delivery.

- **Step-wise**

This stream represents a time period-based distribution model. It disburses funds to the service provider at regular intervals, such as weekly or monthly, on the same day and time. Clients who engage independent contractors for extended durations can utilize this model to establish a salary stream with the contractor.

Mathematically, the distribution can be represented as:

$y(t) = k.n(t)$

where:

- $y(t)$ represents the total amount distributed at time t.
- k is the fixed amount disbursed per time period (e.g., weekly or monthly salary),
- $n(t)$ is the function that counts the number of time periods that have elapsed by time t.

This equation captures the regularity of the payment structure, allowing for consistent and predictable salary distributions over the engagement period, whether on a weekly or monthly basis.

References

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