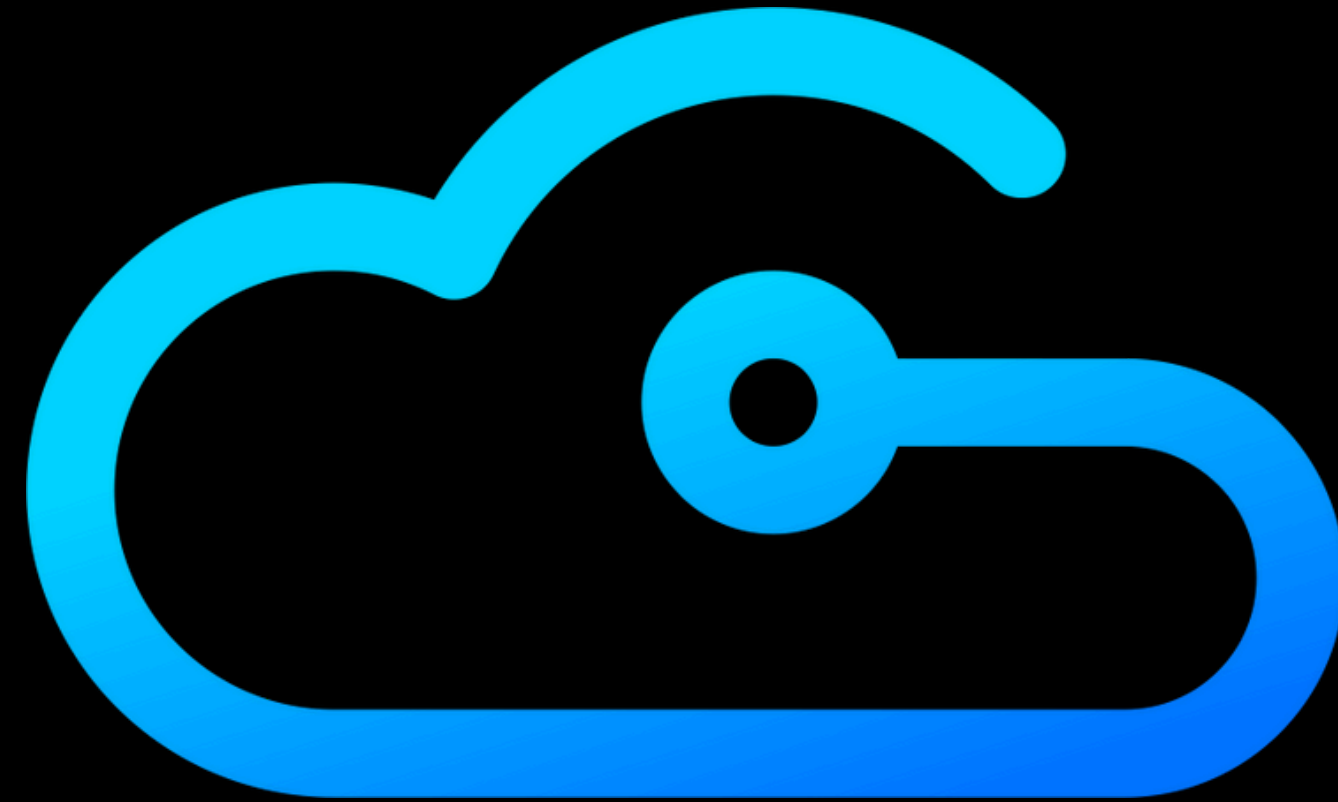


PAYMENT REORDERING AS A LIQUIDITY SAVINGS MECHANISM IN T2

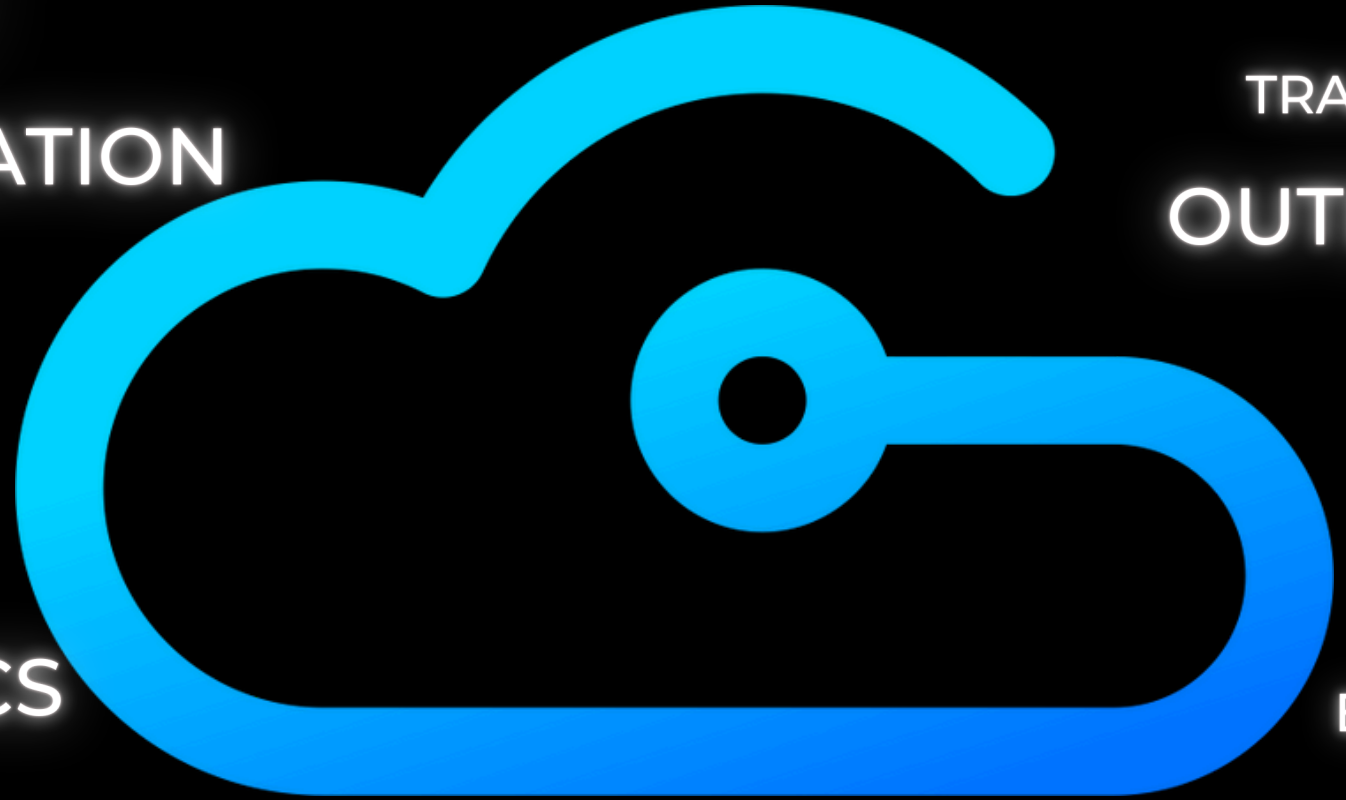
GOODLABS



INTELLIGENCE ENGINEERING

GOODLABS

SECURITY
CASH MANAGEMENT ANTI FRAUD
FINTECH
PAYMENTS OPTIMIZATION
EARLY WARNING
AUTOMATION
HEALTH
TRAINING PATIENT CARE
OUTBREAK DETECTION
DATA
SPECIALIZED ROBOTICS
A.I.
LOW-LATENCY A.G.I.
SECURITY ANNEALING
EARLY COMPUTING
QUANTUM
SENSORS ENCRYPTION



INTELLIGENCE ENGINEERING

COLLABORATION PROJECT



**IMPROVING THE EFFICIENCY OF
PAYMENTS SYSTEMS USING QUANTUM
COMPUTING**

Management Science

McMahon, 2024

<https://pubsonline.informs.org/doi/full/10.1287/mnsc.2023.00314>



RESEARCH & ENGINEERING TEAM

A.I. RESEARCH



CHRIS MCMAHON
DIRECTOR A.I & EMERGING.
PHD, QUANTUM



DONALD MCGILLIVRAY
QUANTUM+A.I.
PHD, QUANTUM

FINANCE



JEAN-PAUL LAM
ML+DL, FINANCE
PHD, ECONOMICS



AMIR MEMAR
RISK
PHD, QUANTITATIVE FINANCE

ENGINEERING



ALEX OSTROVSKY
A.I. ENGINEERING
BSC, COMPUTER SCIENCE



MYKHAILO MAROZ
A.I. ENGINEERING
BSC



JASMINE WAHRHAFTIG
A.I. ENGINEERING
BCS, COMPUTER SCIENCE

PAYMENT SYSTEMS EXPERTS



TATU LAINE
SENIOR ECONOMOST



KASPERI KORPINEN
SENIOR ECONOMOST



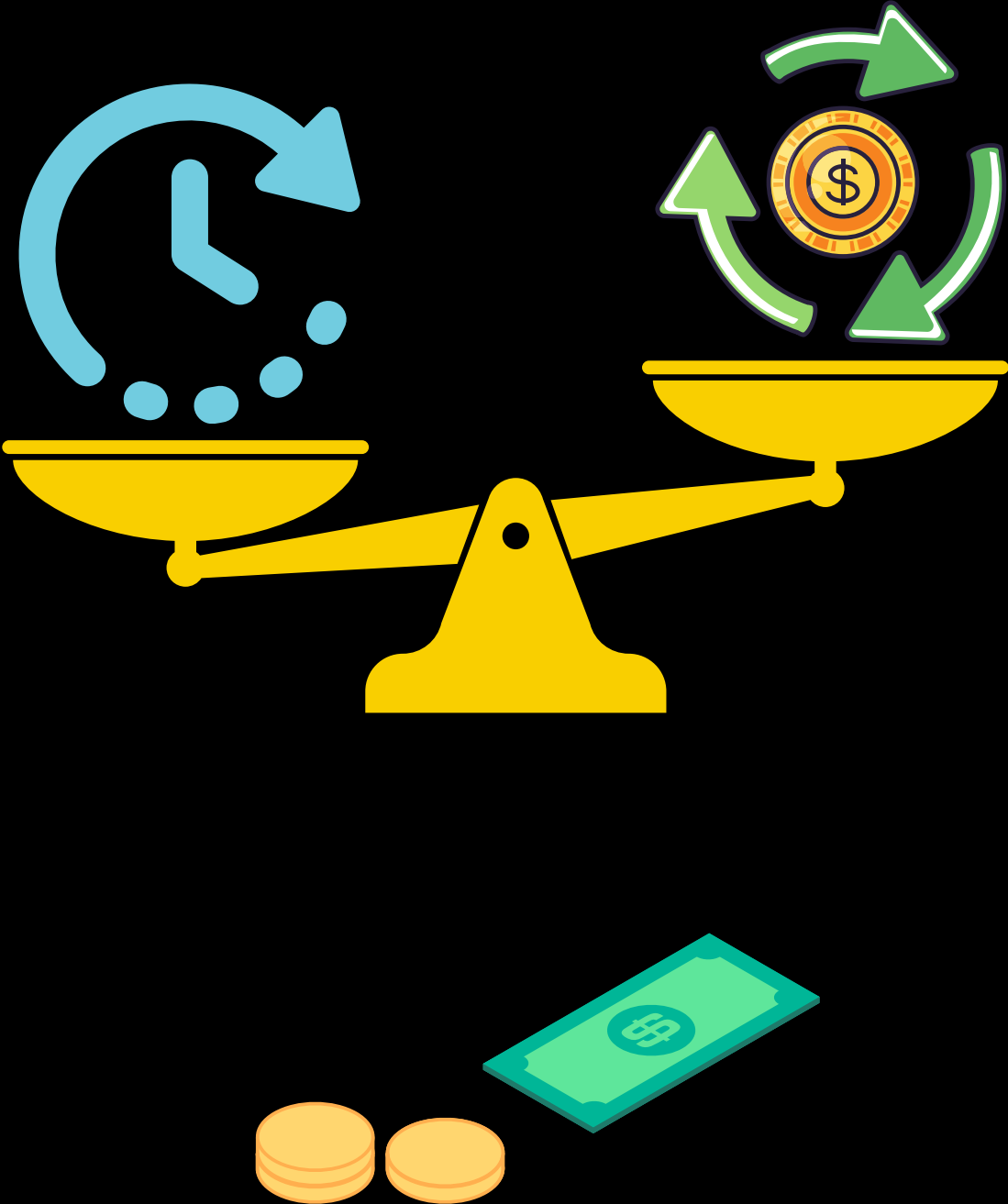
PASI JAUHIAINEN
ENGINEERING



HARRI ENGBLOM
ENGINEERING

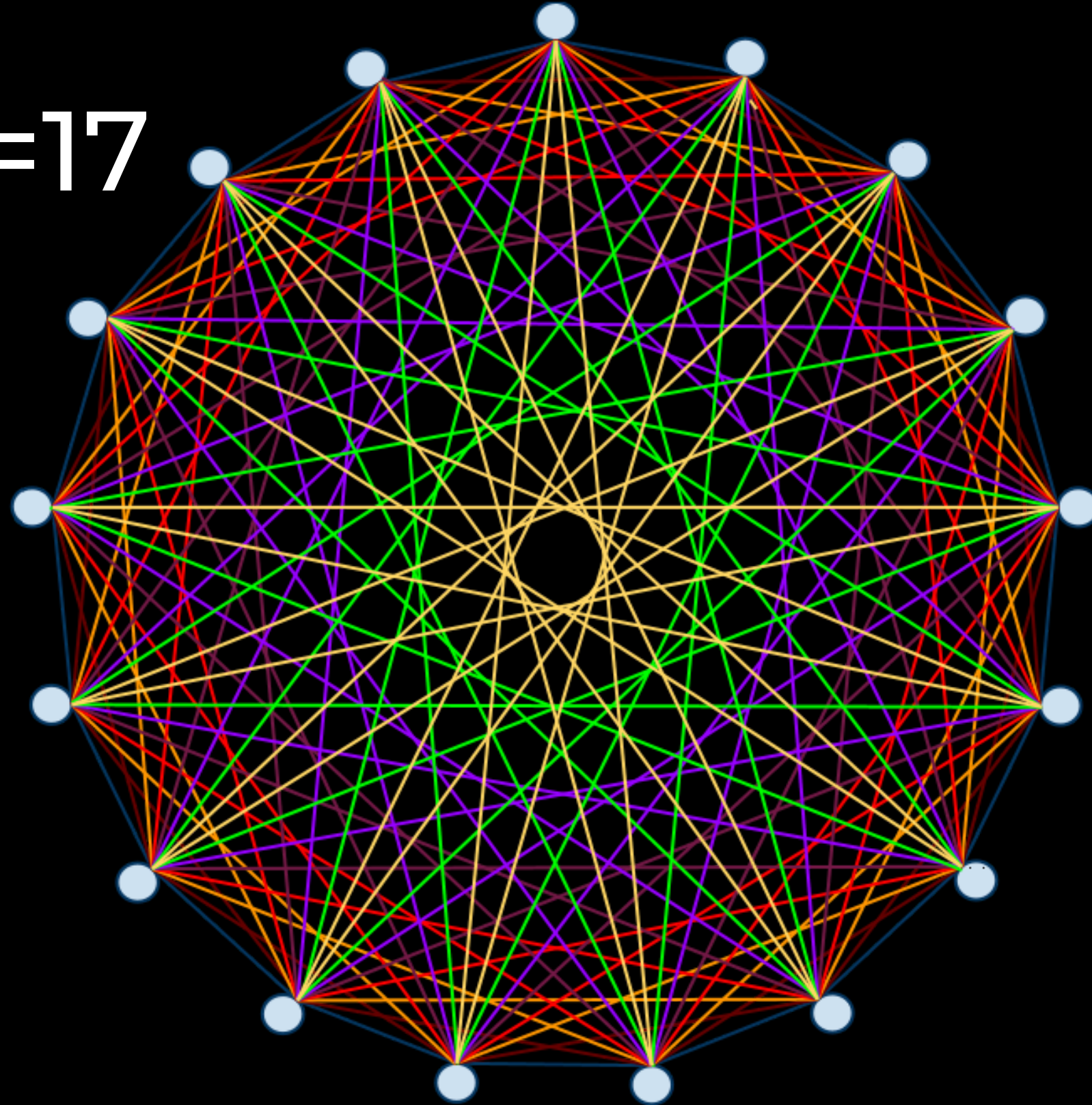
THE CHALLENGE

RTGS IS EXPENSIVE



COMBINATORIAL OPTIMIZATION

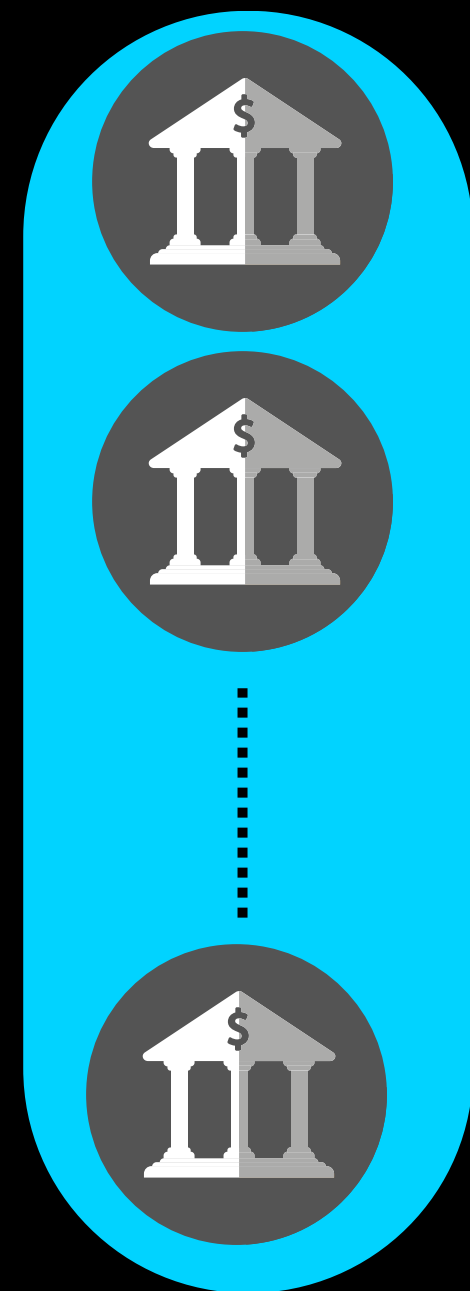
N=17



$O(N!)$

OUR SOLUTION

A PAYMENT PREPROCESSOR



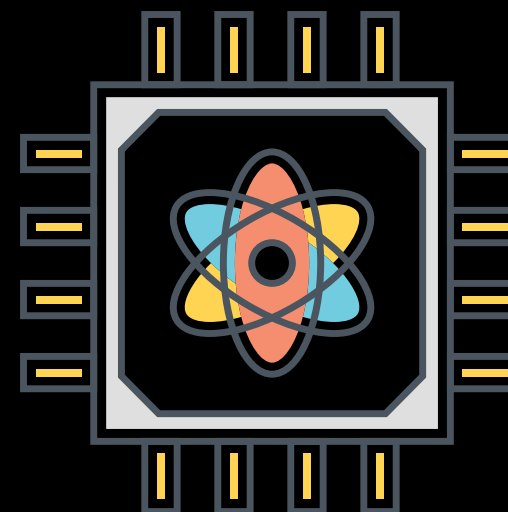
PAYMENTS
DEMAND



CENTRAL BANK

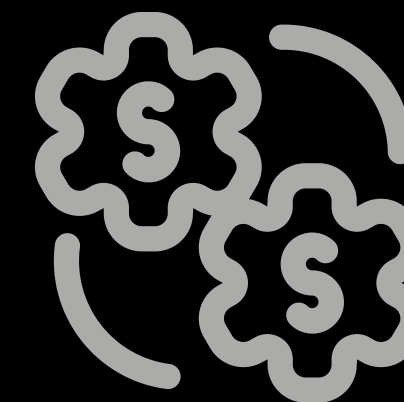
INITIAL
LIQUIDITY

PAYMENTS
ORIGINAL ORDER



PAYMENT
LIQUIDITY
OPTIMIZER

PAYMENTS
OPTIMIZED ORDER



HIGH VALUE
PAYMENTS SYSTEM

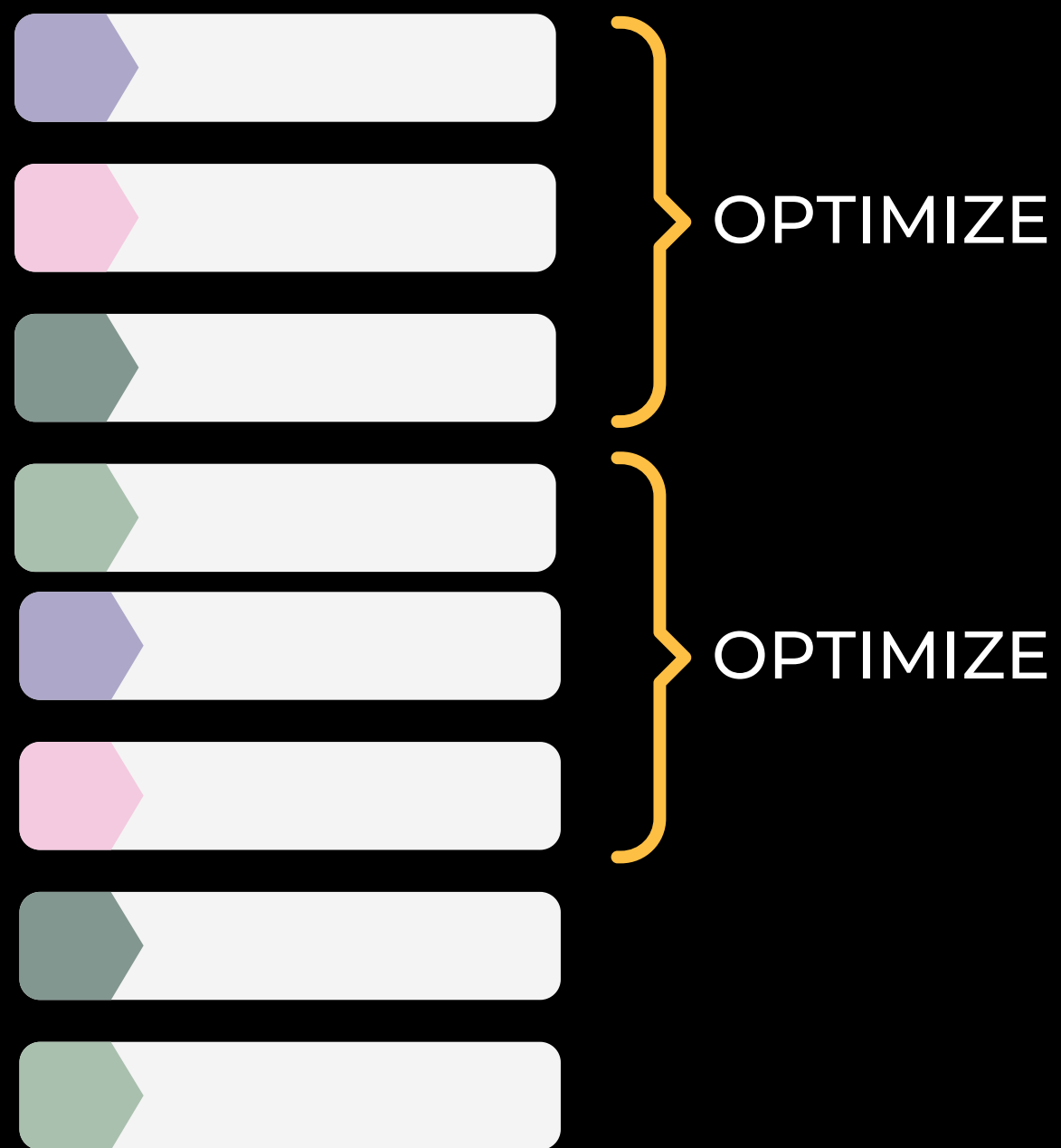
PROPOSAL



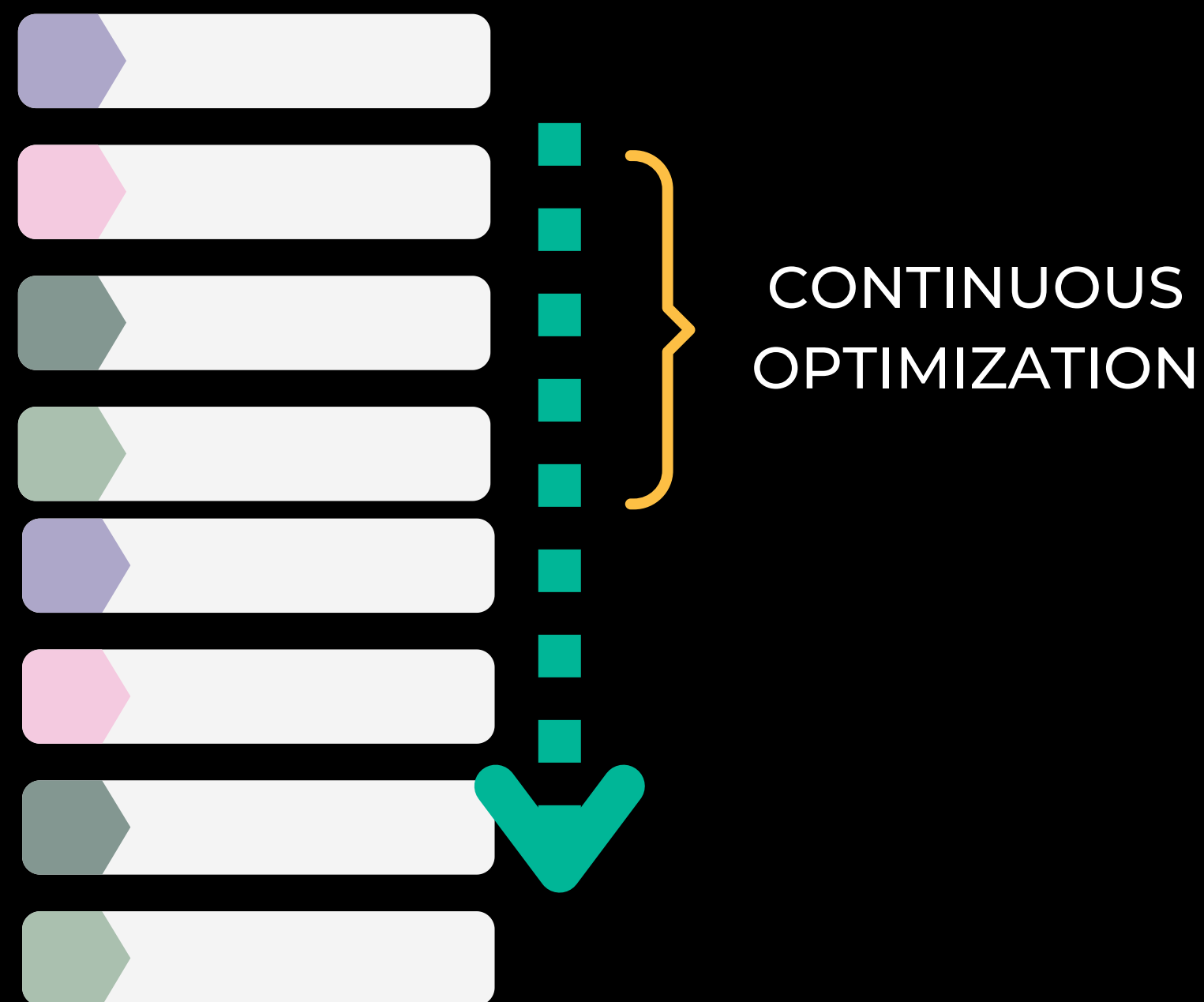
NET DEBIT
POSITIONS



WINDOW REORDERING

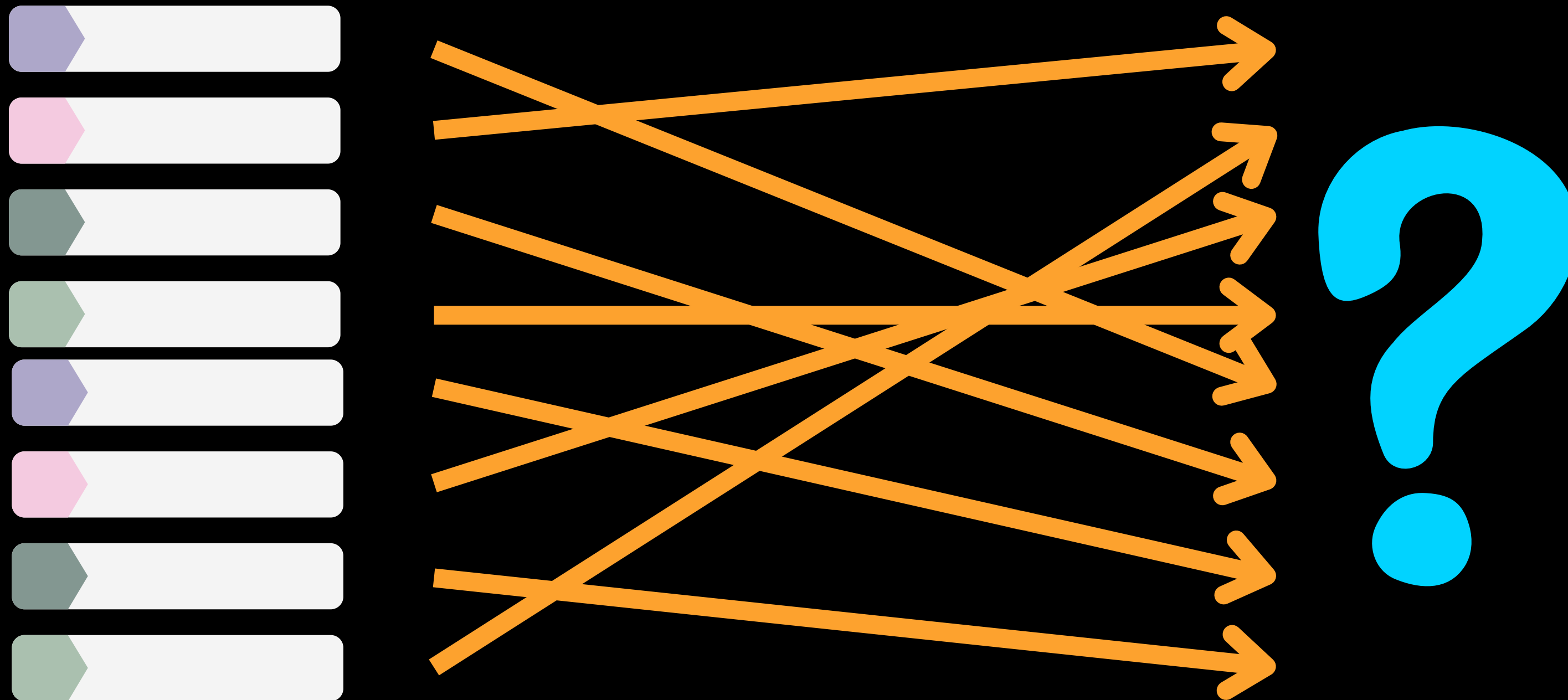


TUMBLING

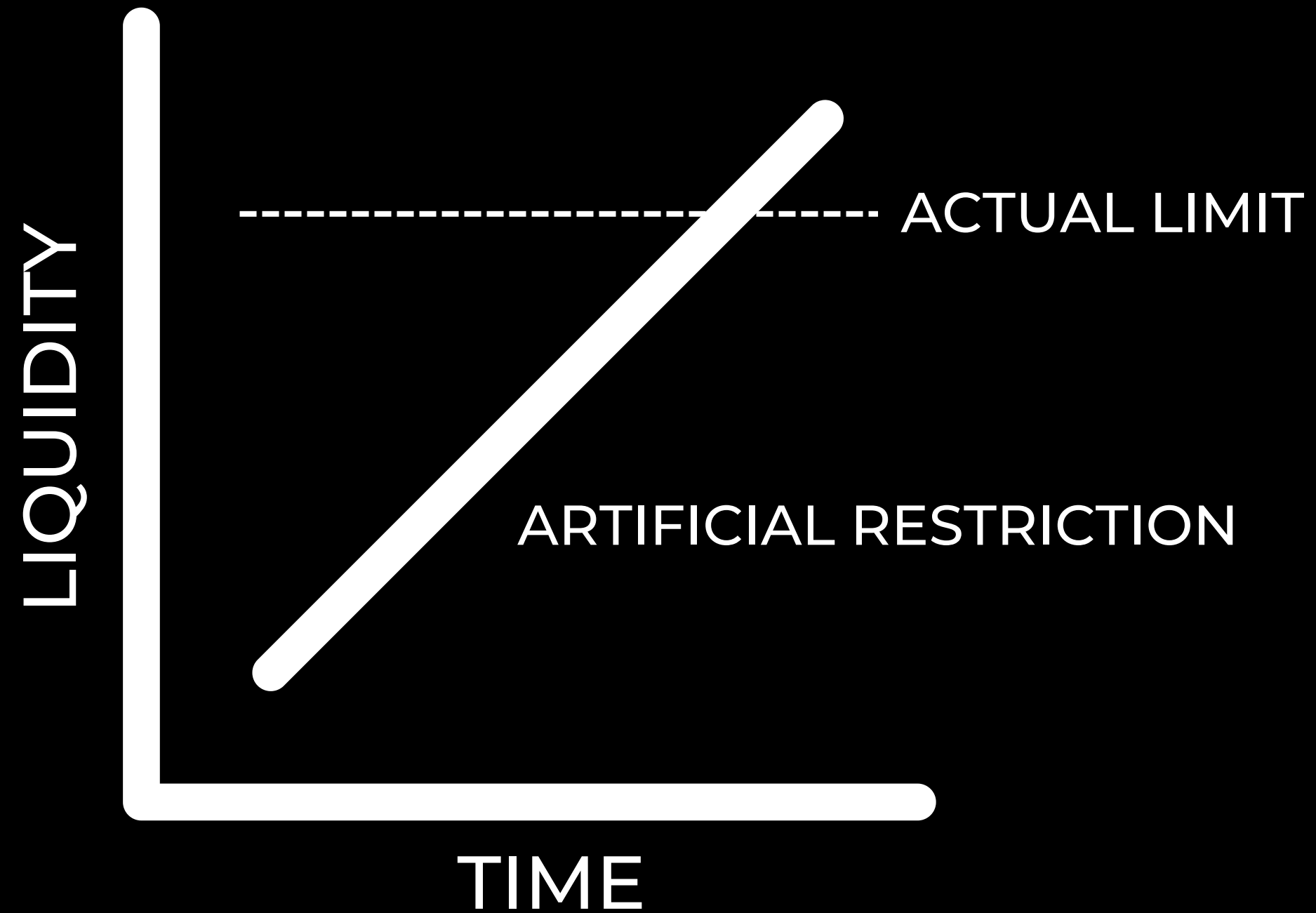


SLIDING

WINDOW REORDERING



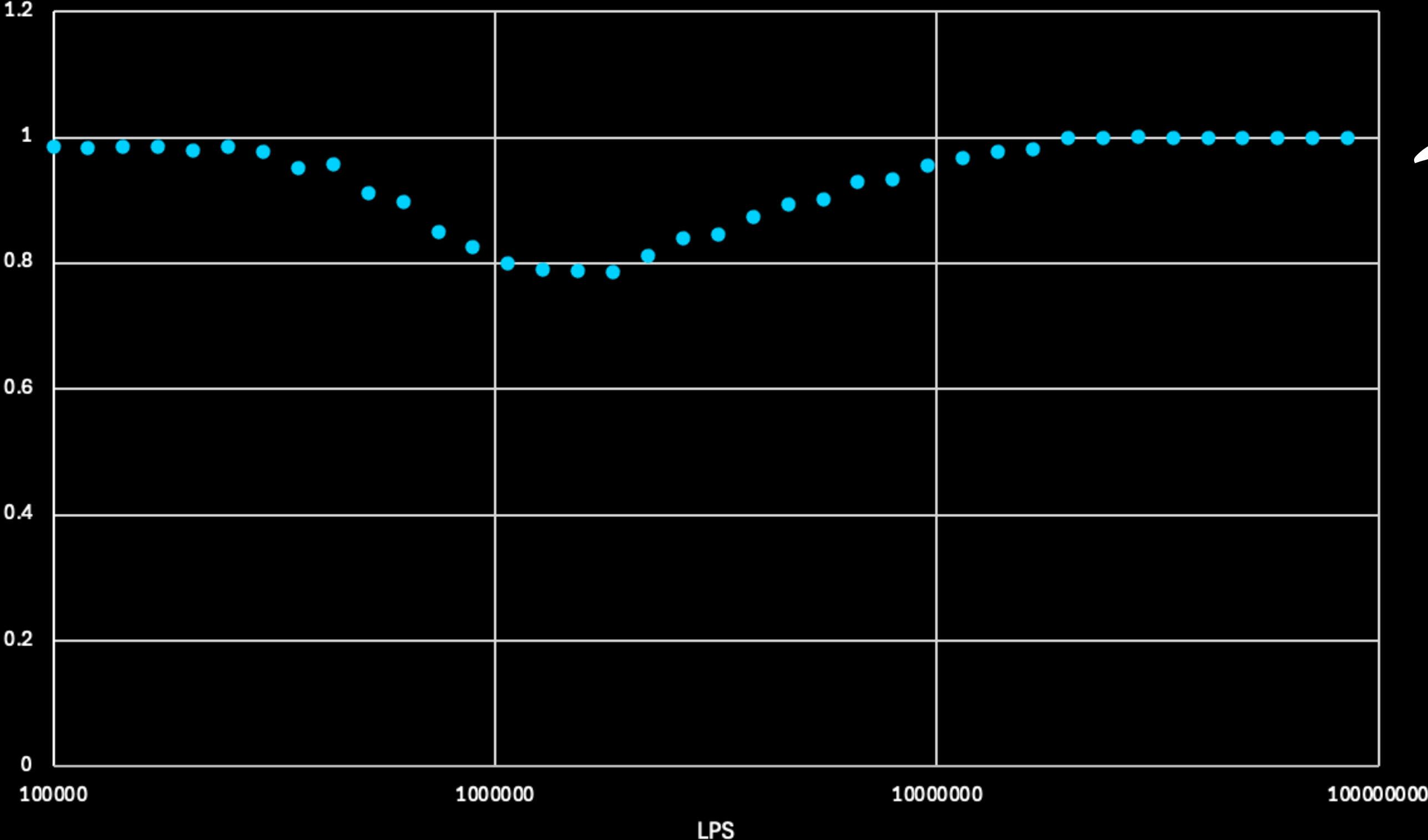
ARTIFICIALLY RESTRAINED LIQUIDITY



RESULTS: SIMULATION

SIMULATION RESULTS

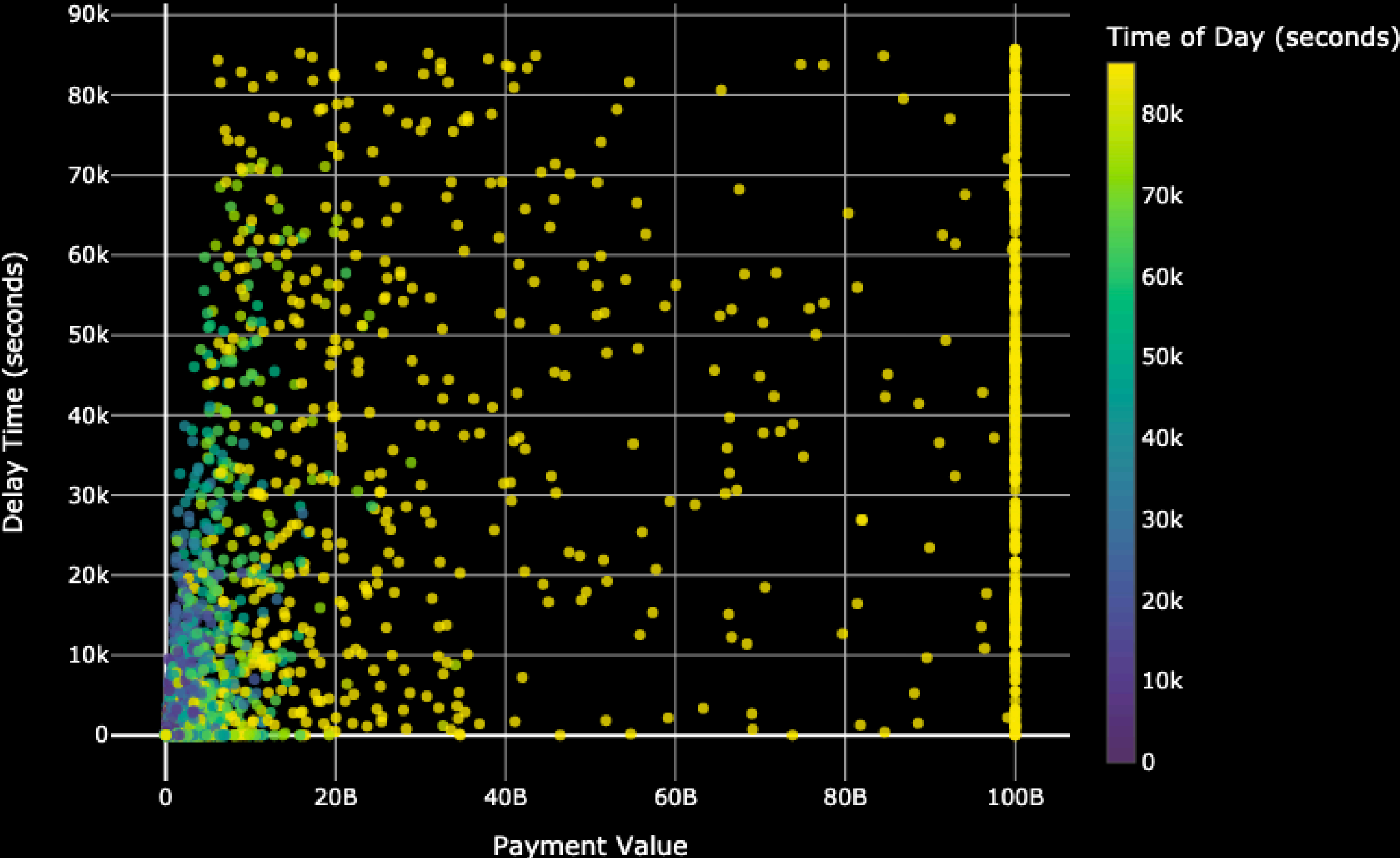
Aggregate mNDP as a Percentage of FIFO - n350000_p1700_mult1



21.4% IN LIQUIDITY SAVINGS

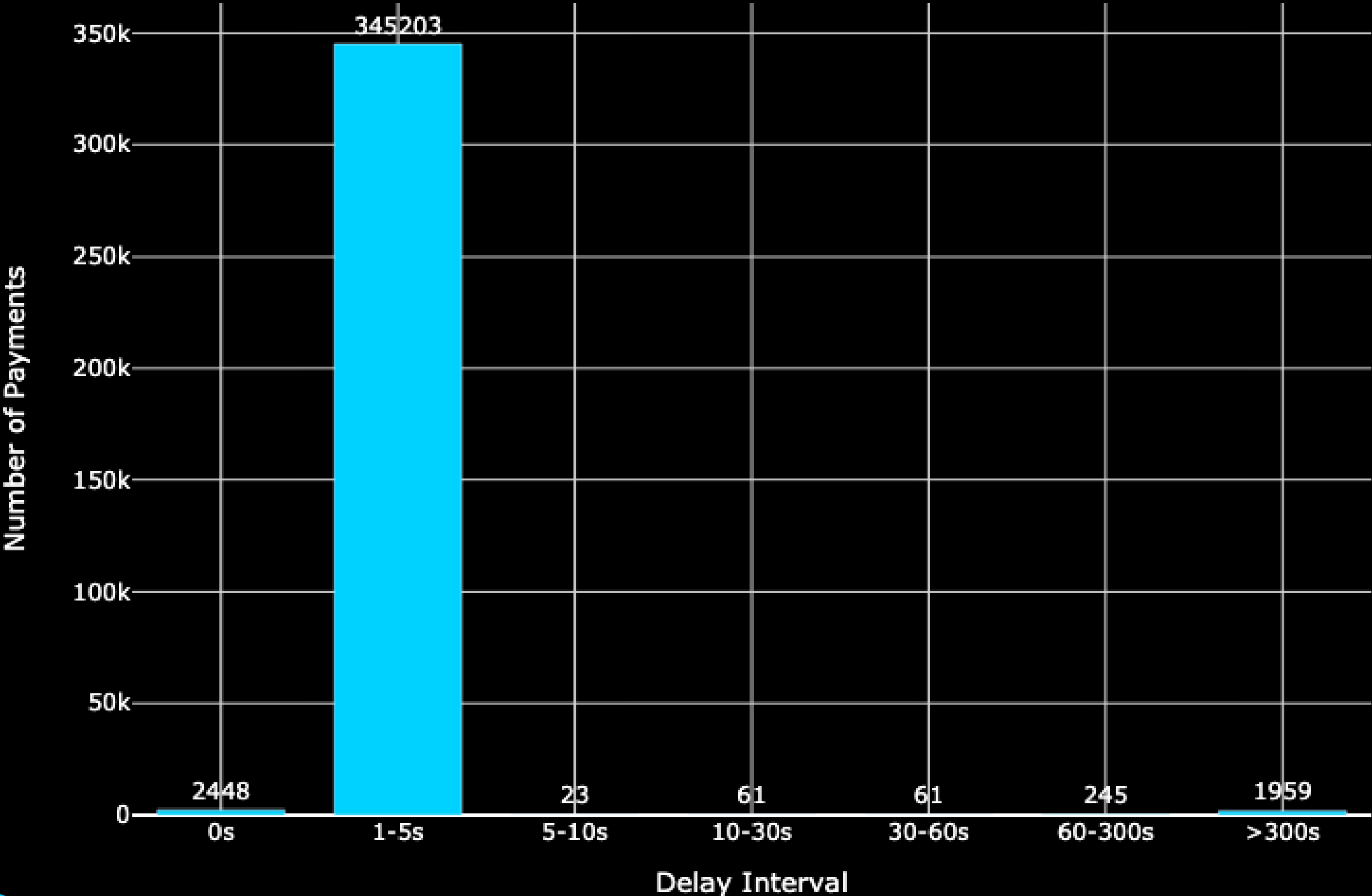
SIMULATION RESULTS

Scatter Plot of Payment Delays - n350000_p1700_mult1_ips100000.csv



SIMULATION RESULTS

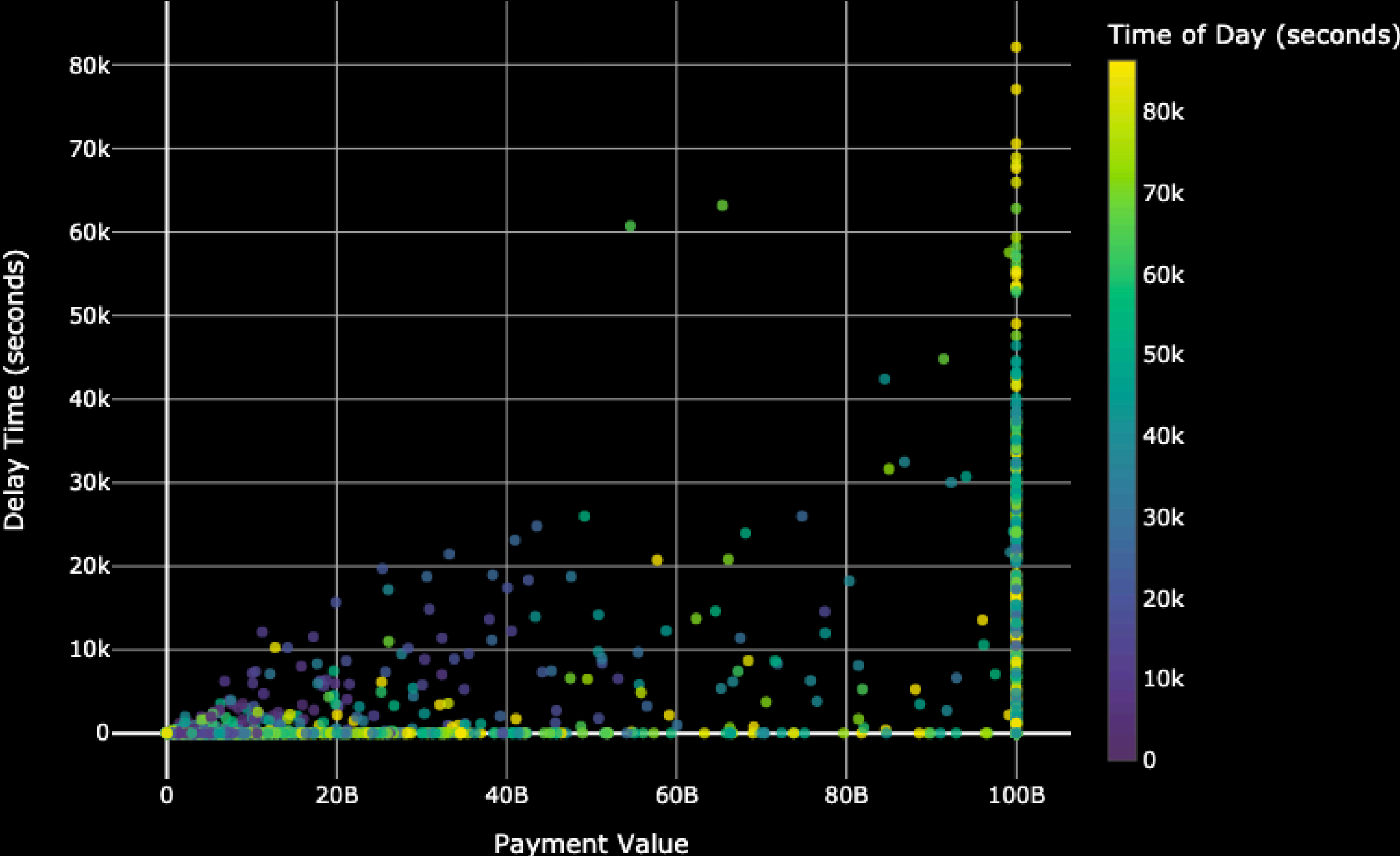
Histogram of Delays - n350000_p1700_mult1_lps100000.csv



99.3%
SETTLED
IN < 5
SECONDS

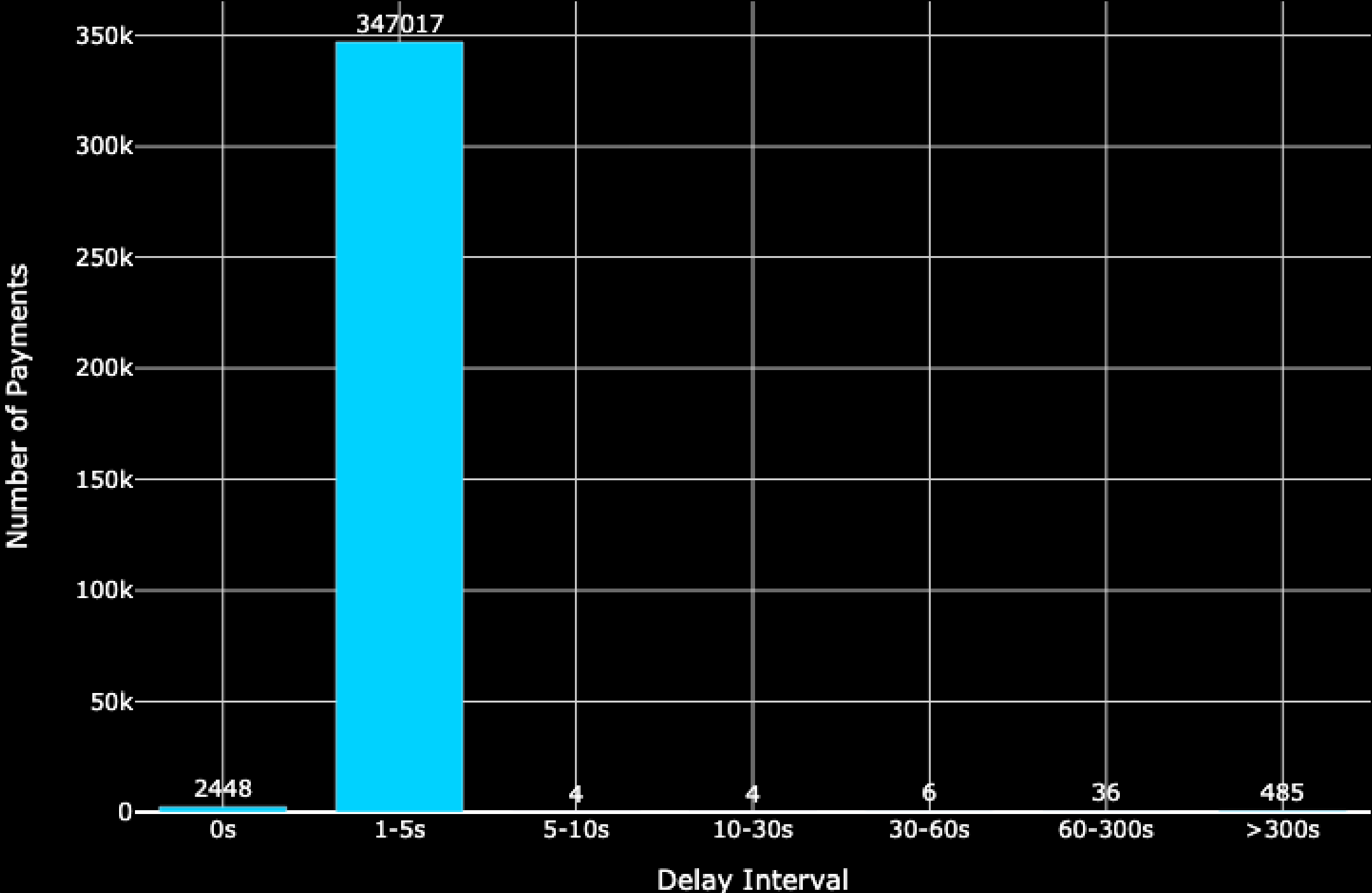
SIMULATION RESULTS

Scatter Plot of Payment Delays - n350000_p1700_mult1_ips2000000.csv



SIMULATION RESULTS

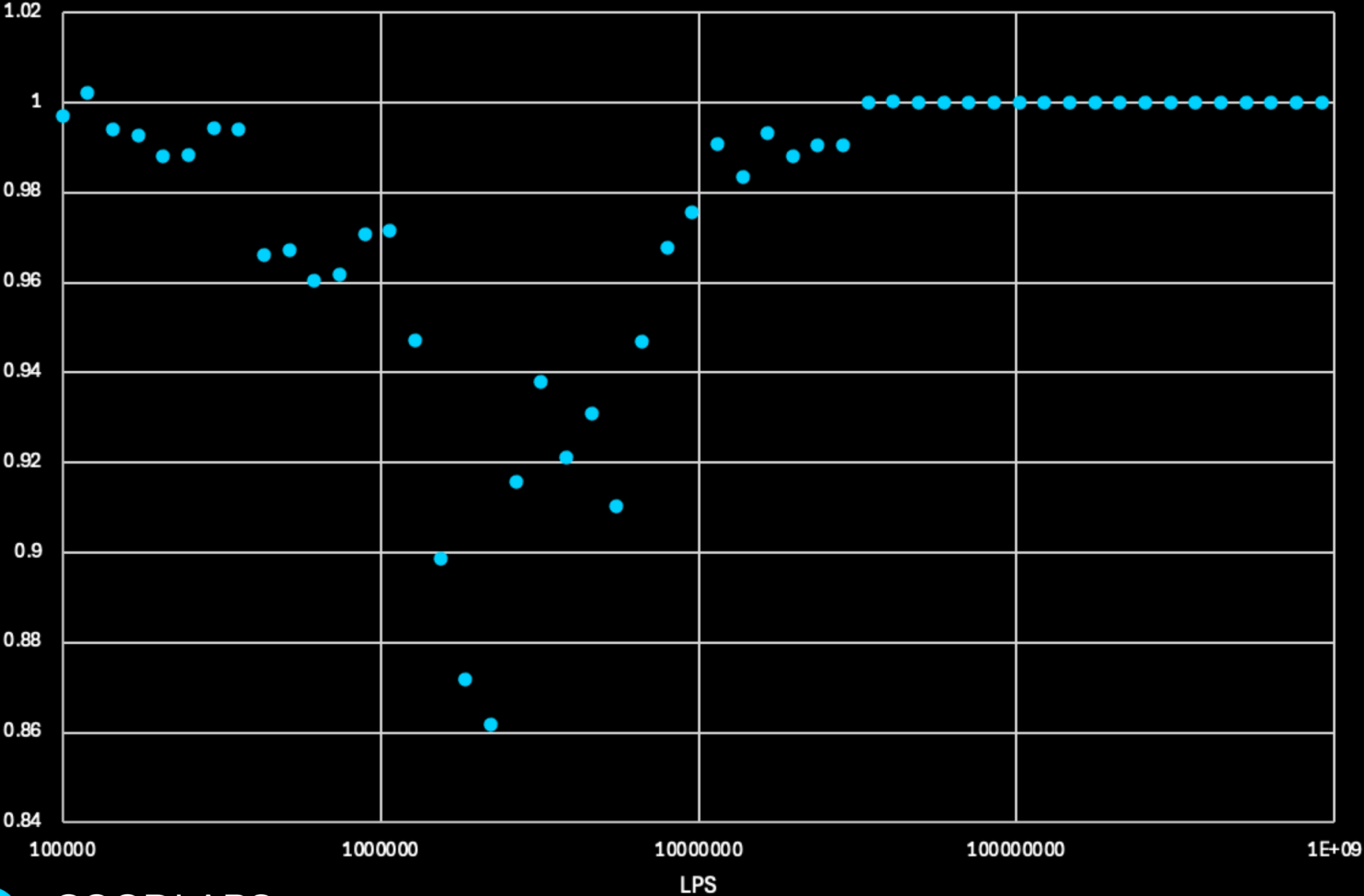
Histogram of Delays - n350000_p1700_mult1_lps2000000.csv



99.8%
SETTLED
IN < 5
SECONDS

SIMULATION RESULTS

Aggregate mNDP as a Percentage of FIFO - n100000_p1700_mult1

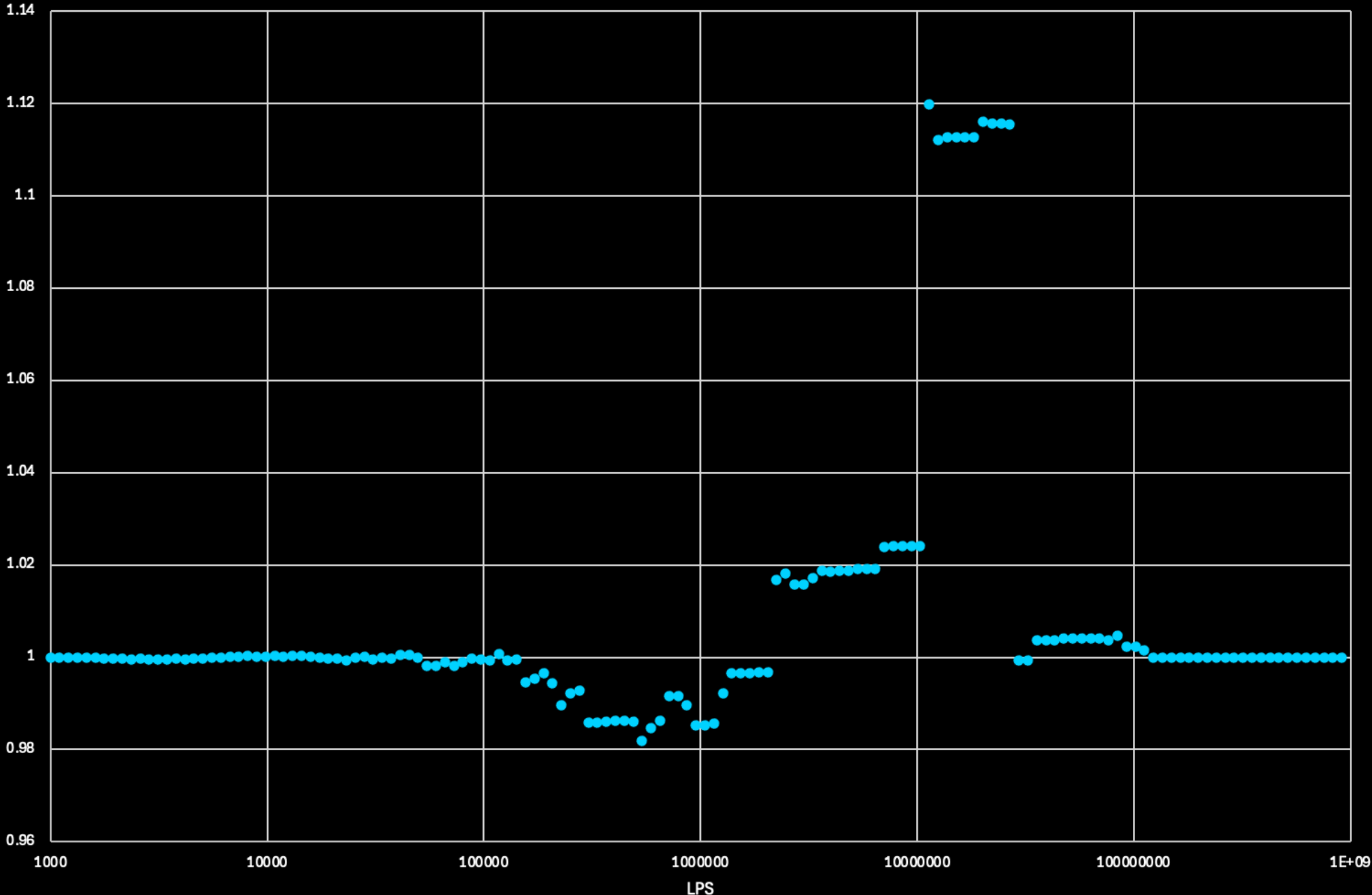


13.8% IN LIQUIDITY SAVINGS



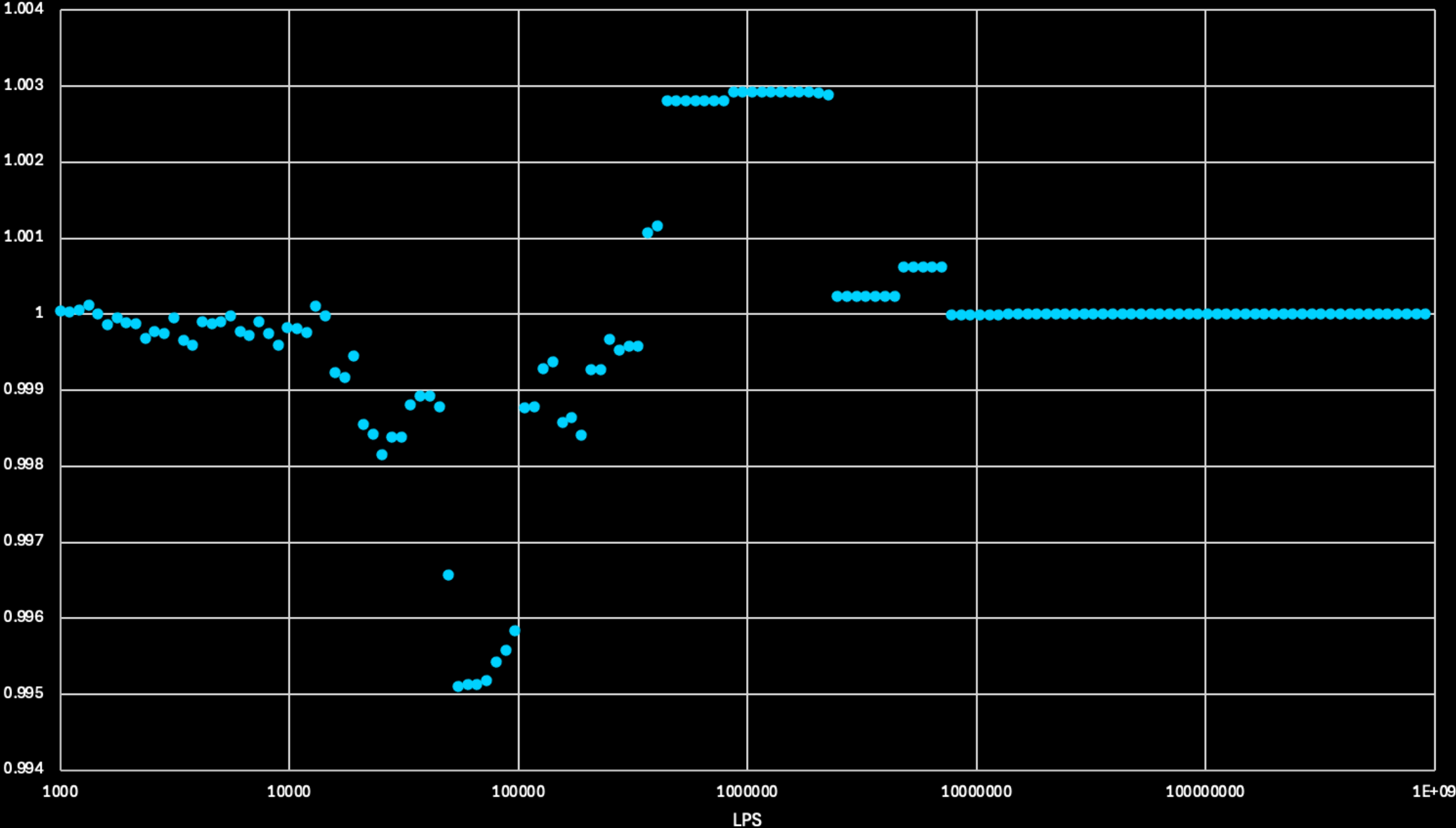
SIMULATION RESULTS

Aggregate mNDP as a Percentage of FIFO - n10000_p1700_mult1



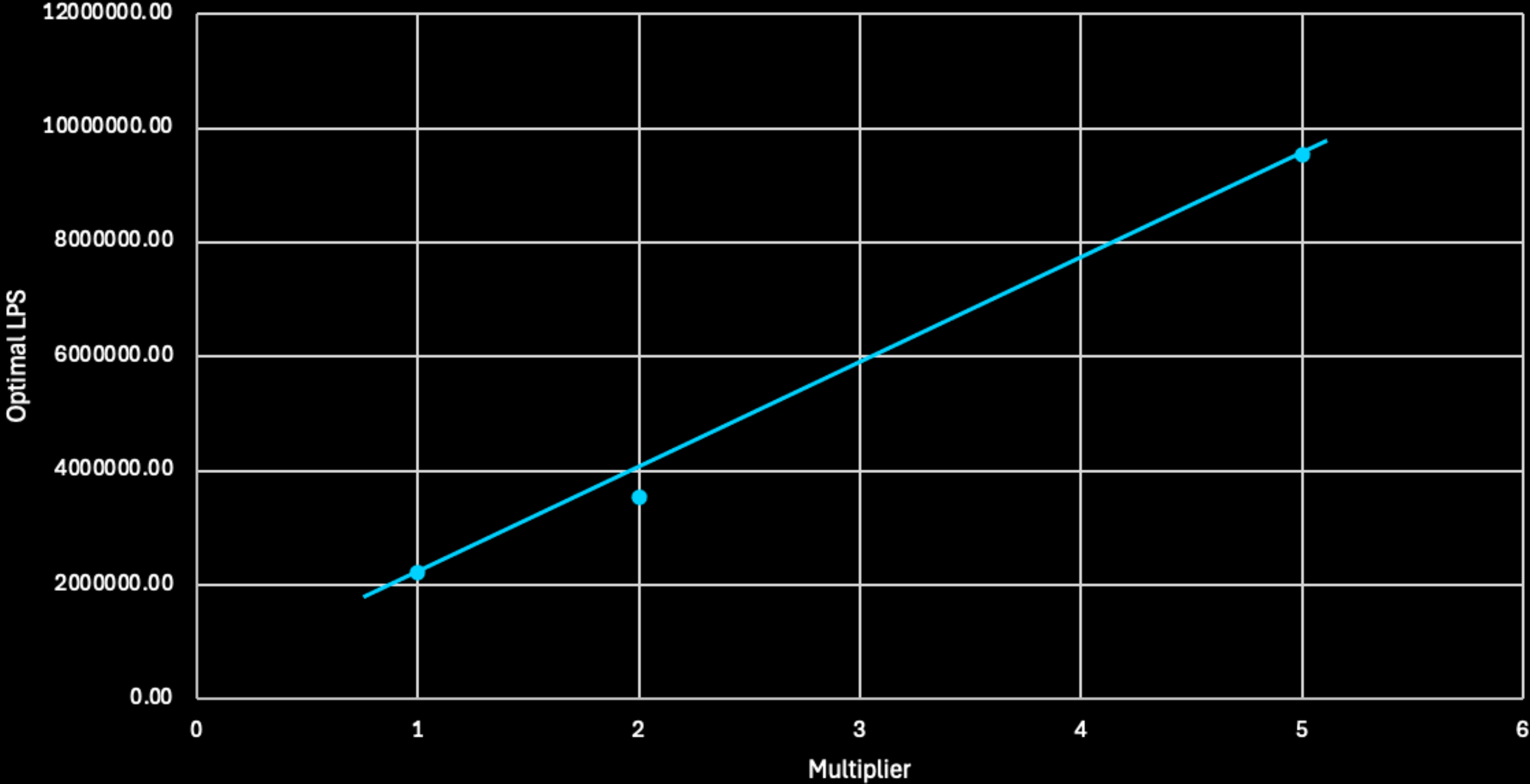
SIMULATION RESULTS

Aggregate mNDP as a Percentage of FIFO - n2000_p1700_mult1



SIMULATION RESULTS

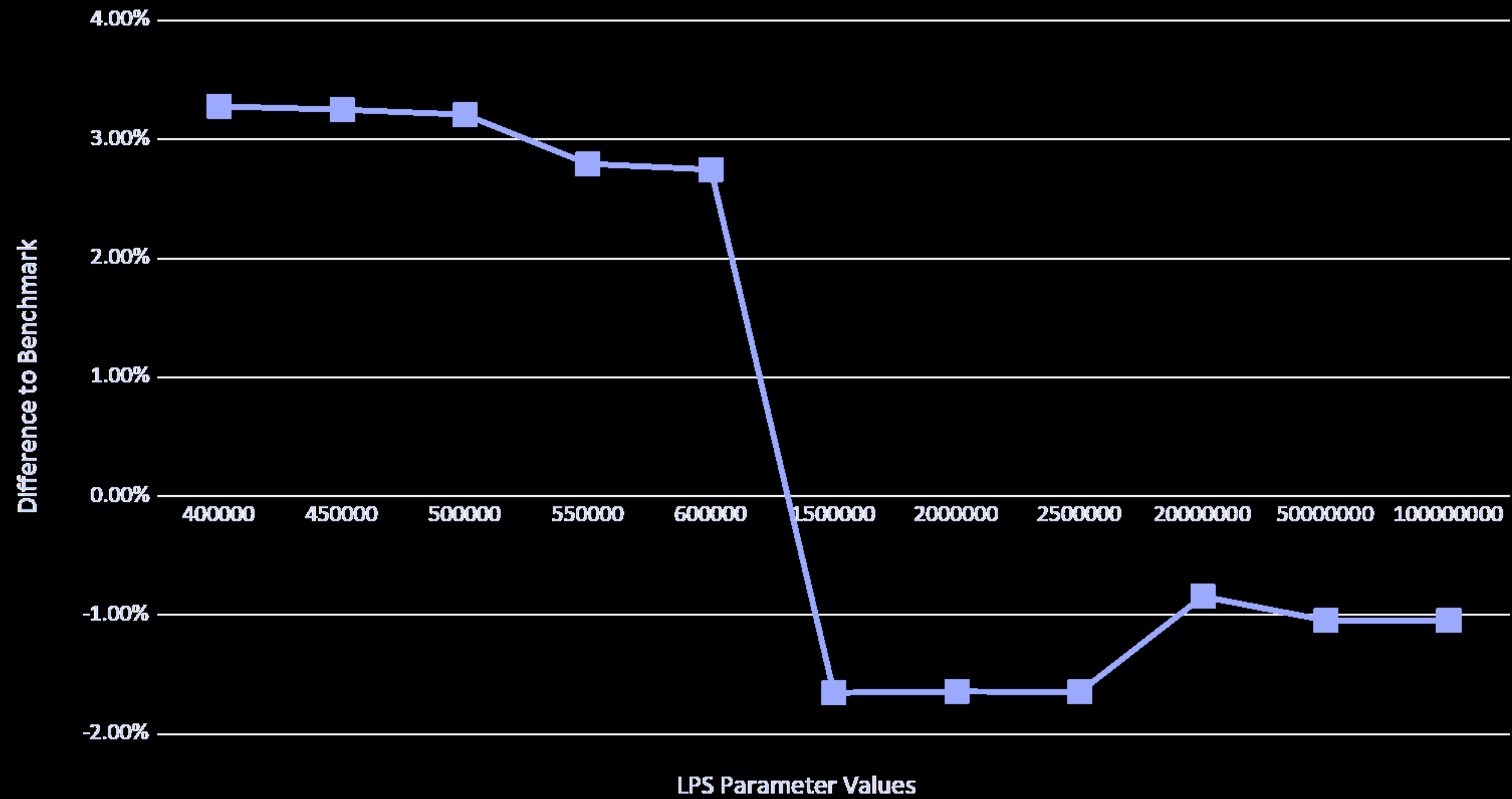
Multiplier Effects on Optimal LPS - n100000_p1700



RESULTS: EXPERIMENT

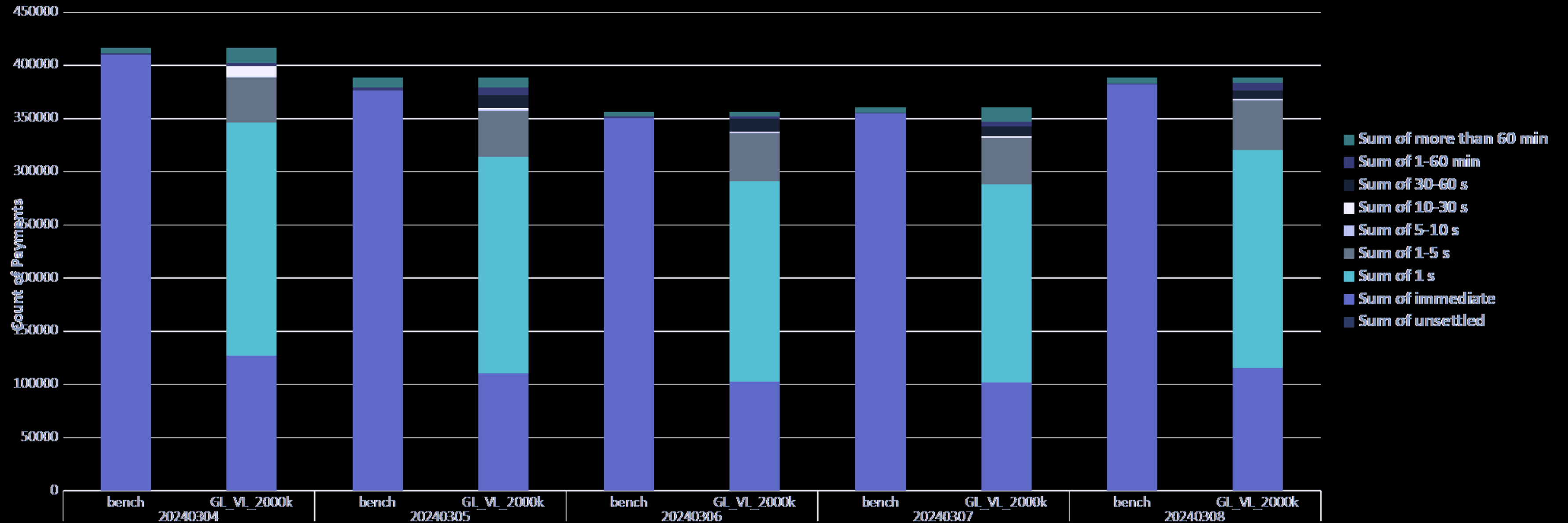
EXPERIMENT RESULTS

Average Maximum Net Debit Positions with 11 Different LPS Parameter Values.
Difference to Benchmark



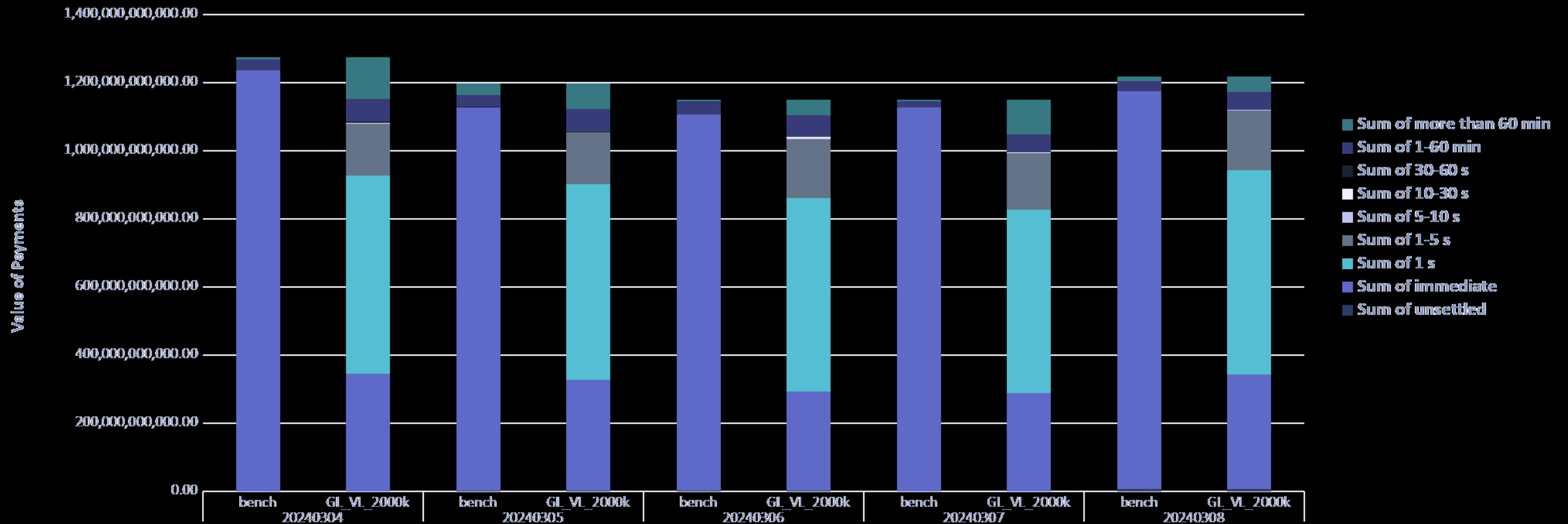
EXPERIMENT RESULTS

Count of Payment Delays in Benchmark and Virtual Liquidity Algorithm with LPS = 2000k. Observations for 5 days.



EXPERIMENT RESULTS

Count of Payment Delays in Benchmark and Virtual Liquidity Algorithm with LPS = 2000k. Observations for 5 days.



WHAT WE HAVE ACHIEVED

WHAT WE HAVE ACHIEVED

- Reduce liquidity usage (up to **30%** daily vs FIFO)
- Runs in real-time (most delay <5s)
- Payment reordering alone can provide significant liquidity reductions

WHAT'S NEXT?

- Continue our exploration
- Further optimize algorithm
- Explore "single agent" problems (eg firm cash management)

QUESTIONS & ANSWERS

meepo@goodlabs.studio

A Presentation Crafted by GoodLabs Studio

GoodLabs was founded by serial tech entrepreneurs with a singular belief:
Business first software engineering delivers exceptional digital experience.

GoodLabs Studio is an advanced software innovation studio specialized in creating best-of-breed digital products and services. Our teams of passionate product designers, architects, and software engineers bring strong domain and technical expertise to walk alongside on your digital journey.

Visit us at <https://www.goodlabs.studio>
or email us at hello@goodlabs.studio