

INTRODUCTION

Standard metrics

- Latency, throughput, bandwidth

Problem

- These are numbers, not stories

Missing

- How do metrics evolve over time?

Challenge

- What causes performance degradation?

Solution

- Enhanced performance measurement with temporal and structural insights

Platform: Cogita - PRO (AI-driven)

Case Study: Network-on-Chip IP

OBJECTIVES

Enhance conventional performance measurement with:

Temporal Analysis

- Number of outstanding transactions (max & time-series)
- Duration of transactions over time

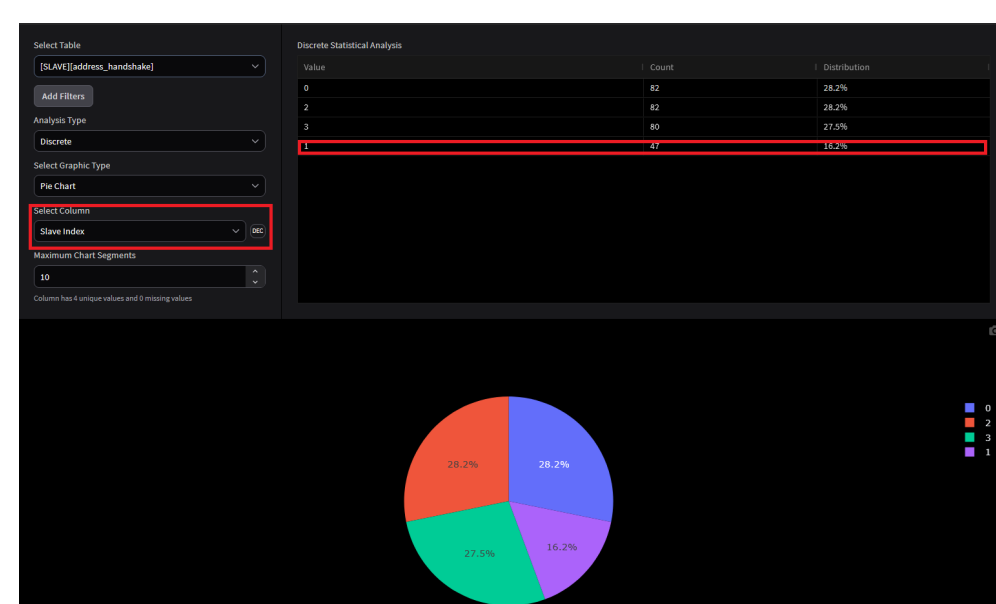
Advanced Metrics

- Normalization: Bytes/Duration per transaction
- Anomaly detection for longest transactions
- Performance window visualization

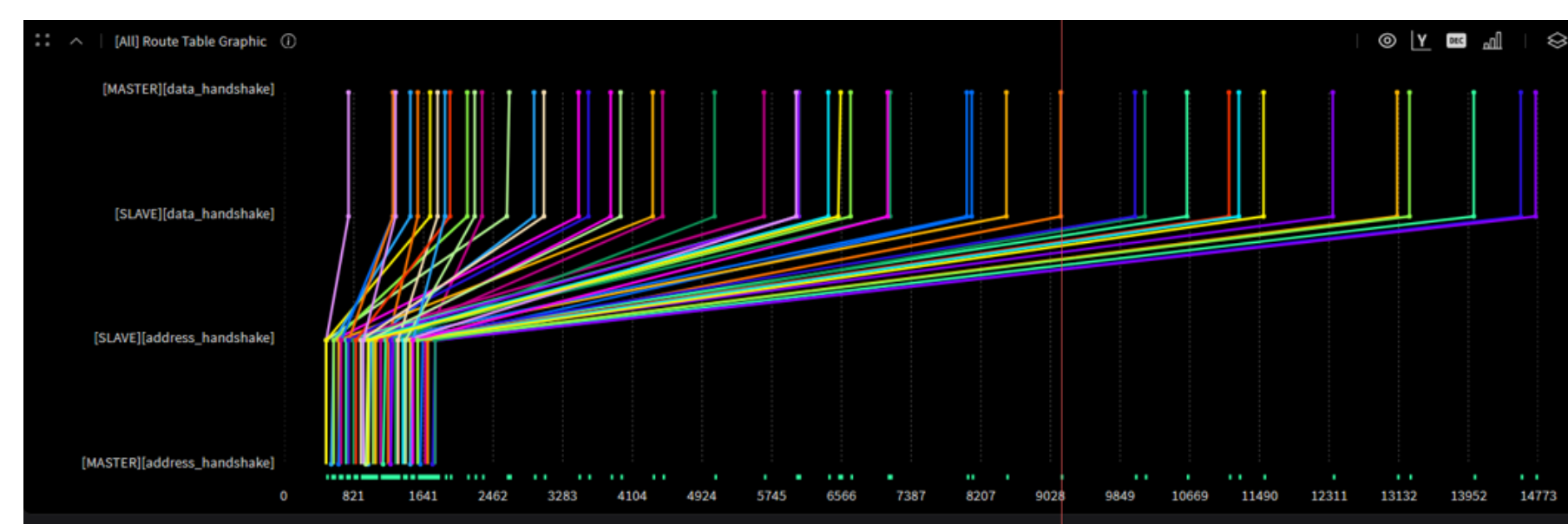
Fairness & Efficiency

- Starvation detection
- Arbitration checking
- Traffic efficiency metrics

RESULTS



Slave traffic distribution



Temporal behavior of all transactions



Temporal behavior of three masters

RESULTS

Bottleneck Detection

- Abnormal transaction durations
- Congestion and arbitration delays

Traffic Efficiency

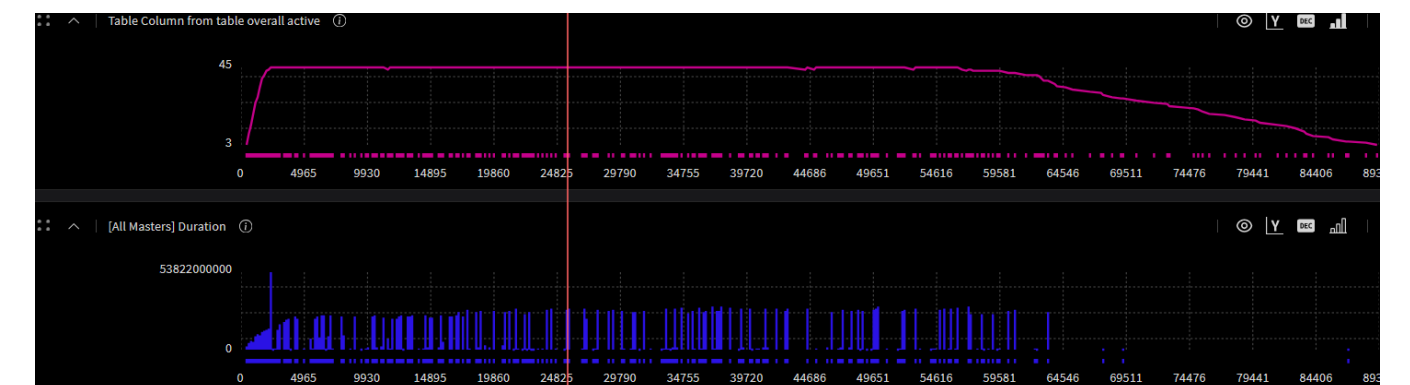
- Normalized duration/byte metric

Sliding Window Analysis

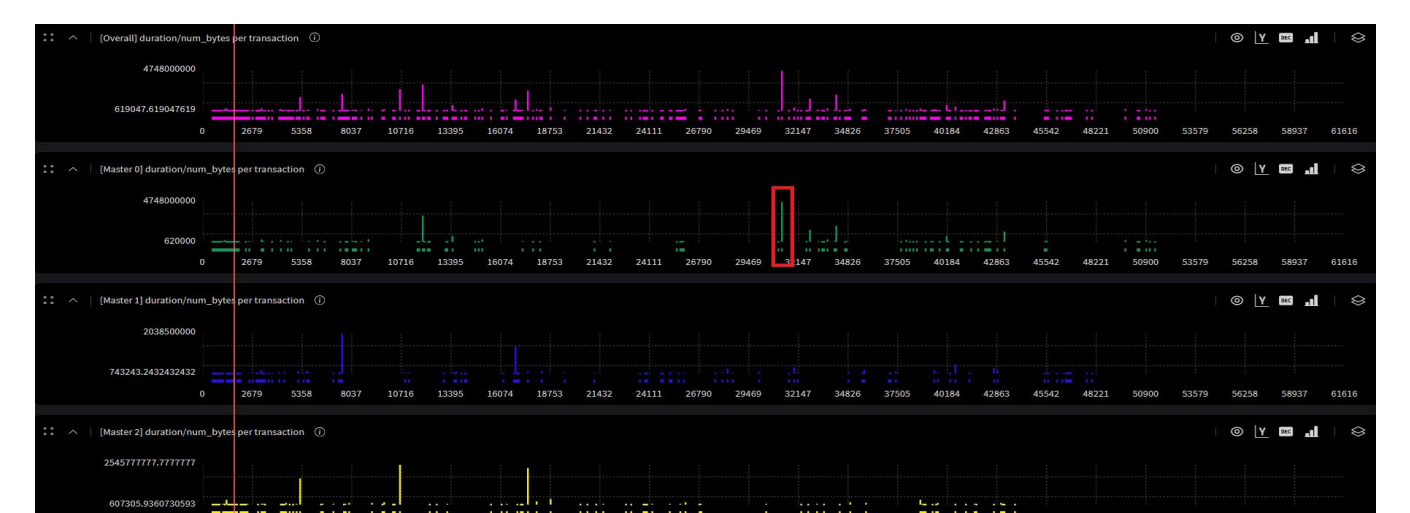
- Exposing short-lived congestion and efficiency variations



Anomaly detection



Duration of transactions



Normalized duration per byte

ACHIEVEMENTS

Time-Series Performance Metrics

- Track latency, throughput, bandwidth evolution

Outstanding Transactions Analysis

- Identify saturation points and buffer requirements

Anomaly Detection

- Automatically flag duration outliers

Traffic Quality Assurance

- Validate even distribution across interfaces

Fairness & Arbitration

- Verify round-robin and prevent starvation

Efficiency Metrics

- Bytes/duration normalization per transaction

Sliding Window

- Expose short-lived congestion patterns

CONCLUSIONS

Dynamic vs Static

- Performance is temporal behavior, not just numbers

Designer Benefits

- Focus on critical areas with data confidence

Architect Benefits

- Compare configurations systematically

Comprehensive View

- Outstanding transactions + duration + efficiency

Cogita-PRO Platform

- AI-driven extraction, correlation, visualization

NoC Case Study

- Proven on Network-on-Chip IP verification

