Using Tracing to Analyze Hard Disk Performance

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December 10, 2015

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Agenda

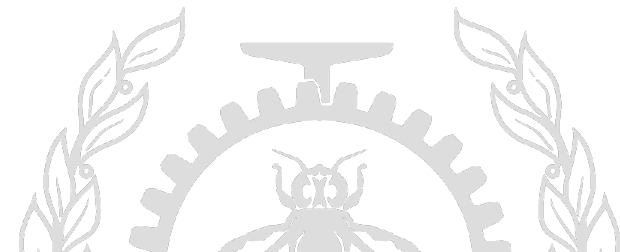Introduction and objectives

Implementation

- Block Layer Structure

- Relevant Tracepoints

- State History Tree

Developed Views

Use Cases – Demo

- Writeback Algorithm

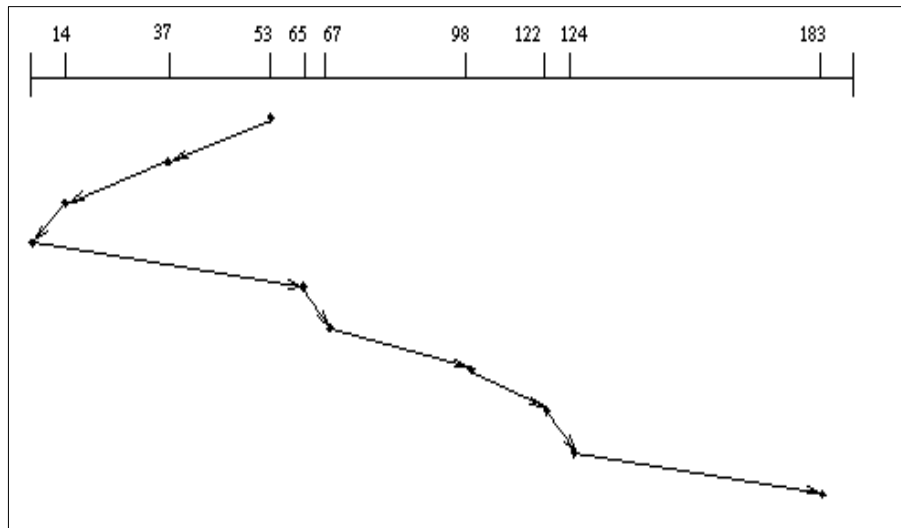- Lttng I/O Behavior

- Flush requests

Introduction

The performance of block devices has a big impact on overall system performance
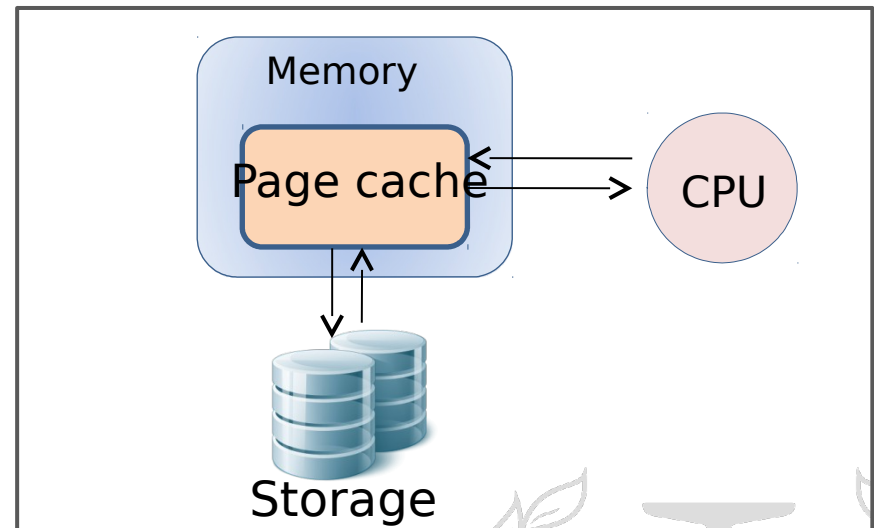
Many optimization techniques have been developed

Scheduling
- Request sorting
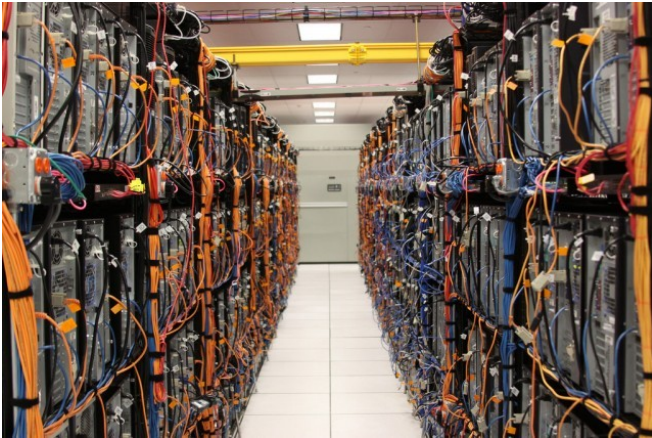- Request merging

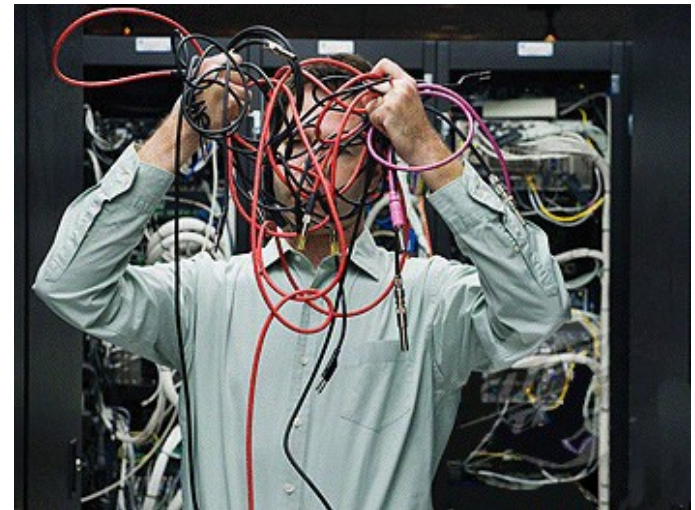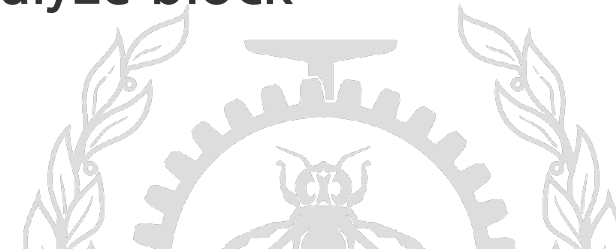## Caching
- Page cache
- Writeback

Introduction

The Block Layer is very complex

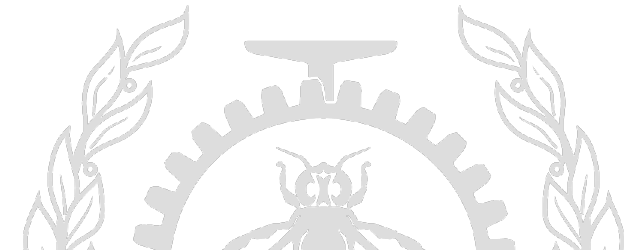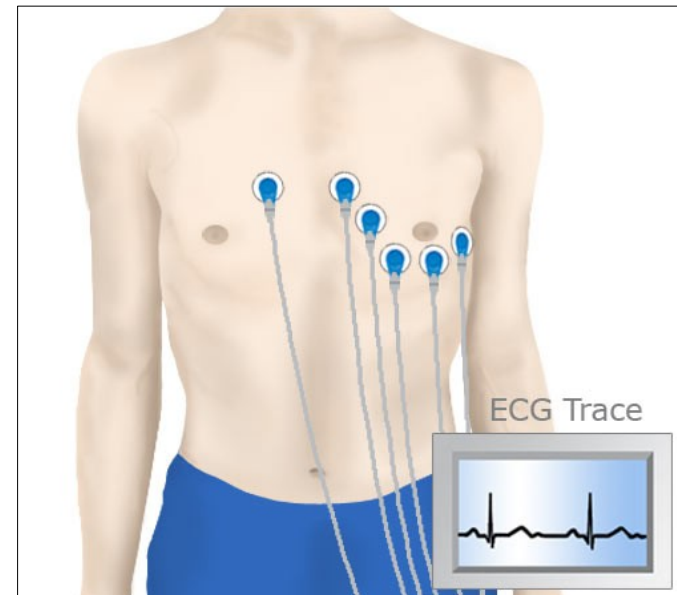It is difficult to detect disk I/O problems

The need to develop an efficient tool to analyze block layer behavior

Introduction and Objectives

Use tracing to Analyse Hard Disk Performance

- Insert Tracepoints in the block device layer
- Create views to visualize important metrics

ECG Trace
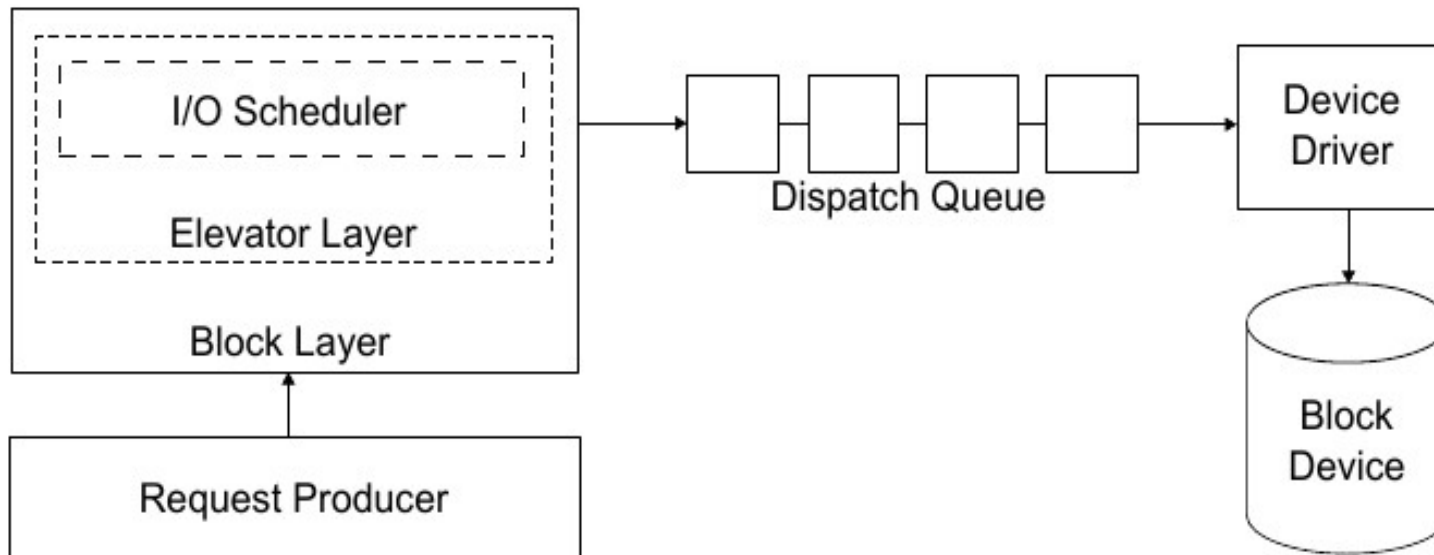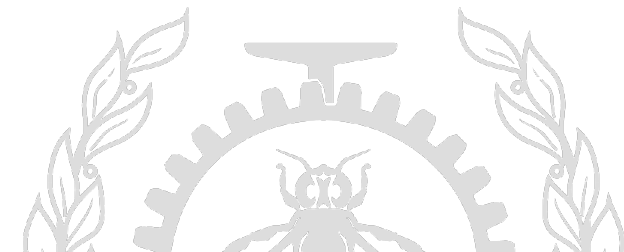
Implementation
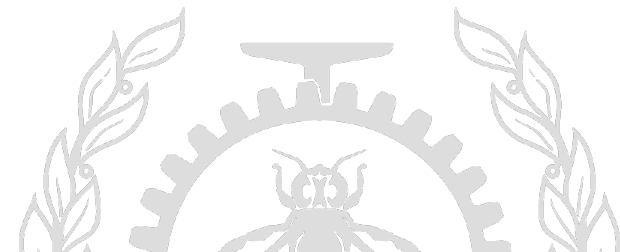
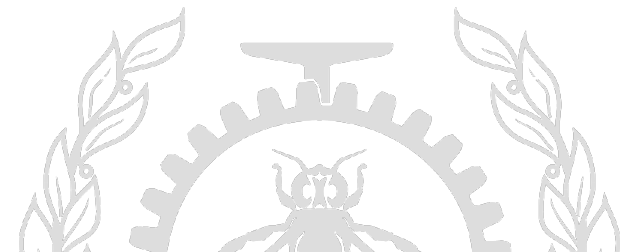## Block Layer Structure
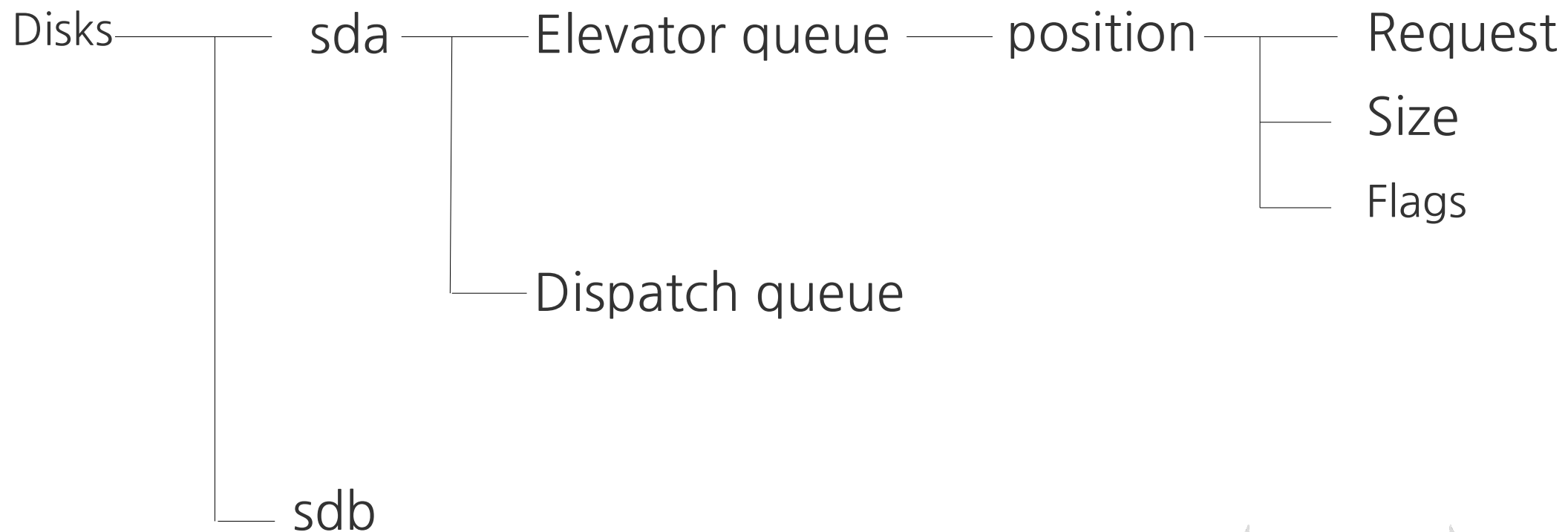

Figure 1: Linux block layer structure

Implementation

Relevant tracepoints

- **lttng_statedump_block_device**
- block_rq_insert
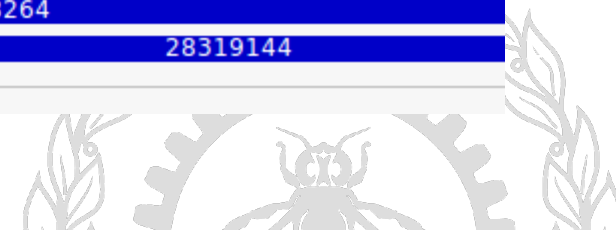- **block_rq_merge**
- block_rq_issue
- block_rq_complete

Implementation
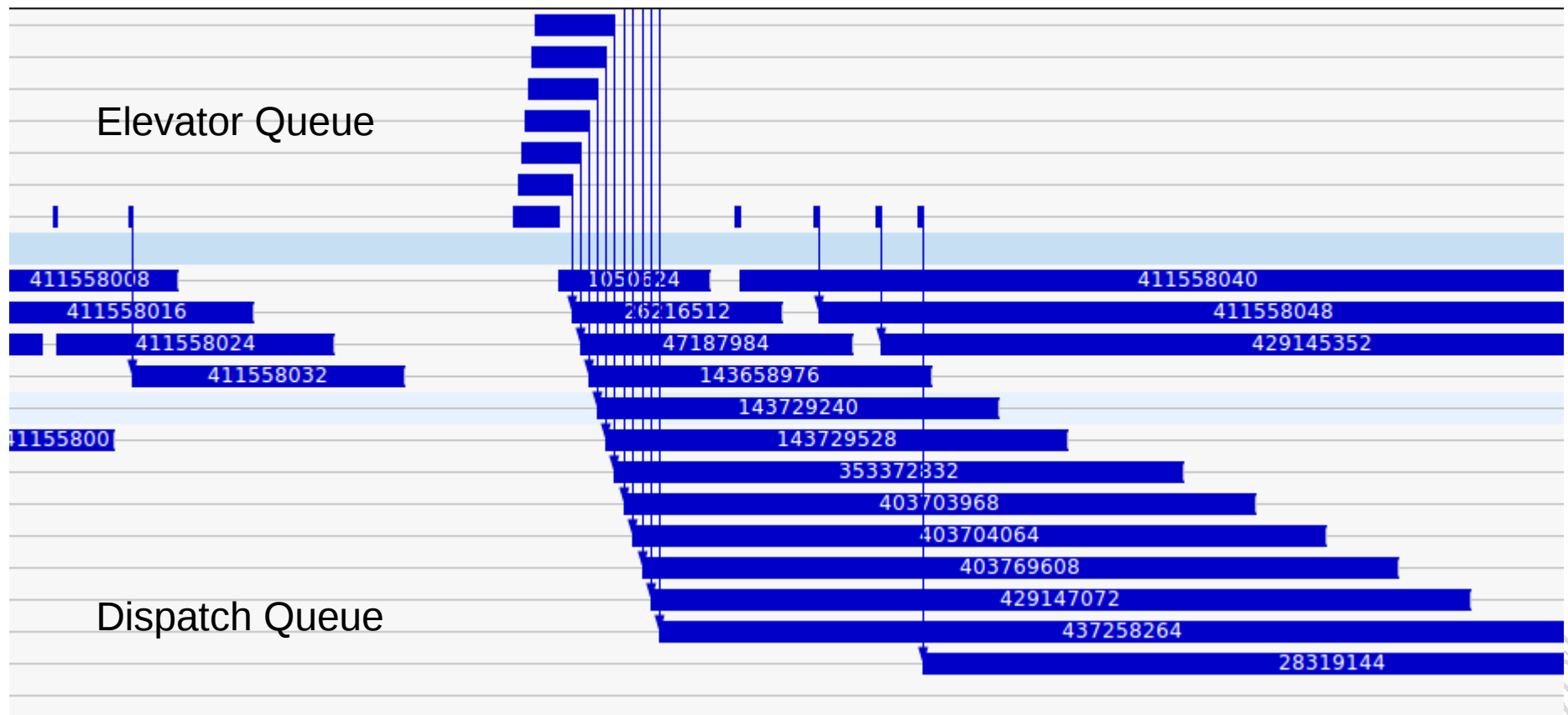
State History Tree

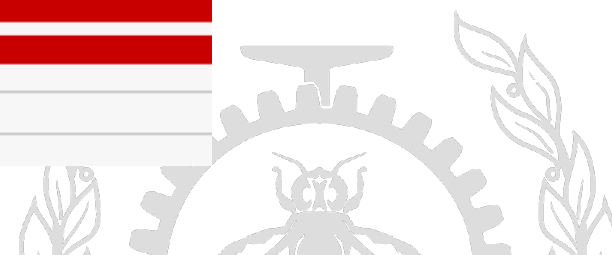Disks ─── sda ─── Elevator queue ─── position ─── Request
                                                   Size
                                                   Flags
              └── Dispatch queue
       └── sdb

Developed Views

Waiting Queues

Write

Read

Elevator Queue

Dispatch Queue

411558008
411558016
411558024
411558032
41155800

1050624
26216512
47187984
143658976
143729240
143729528
353372832
403703968
403704064
403769608
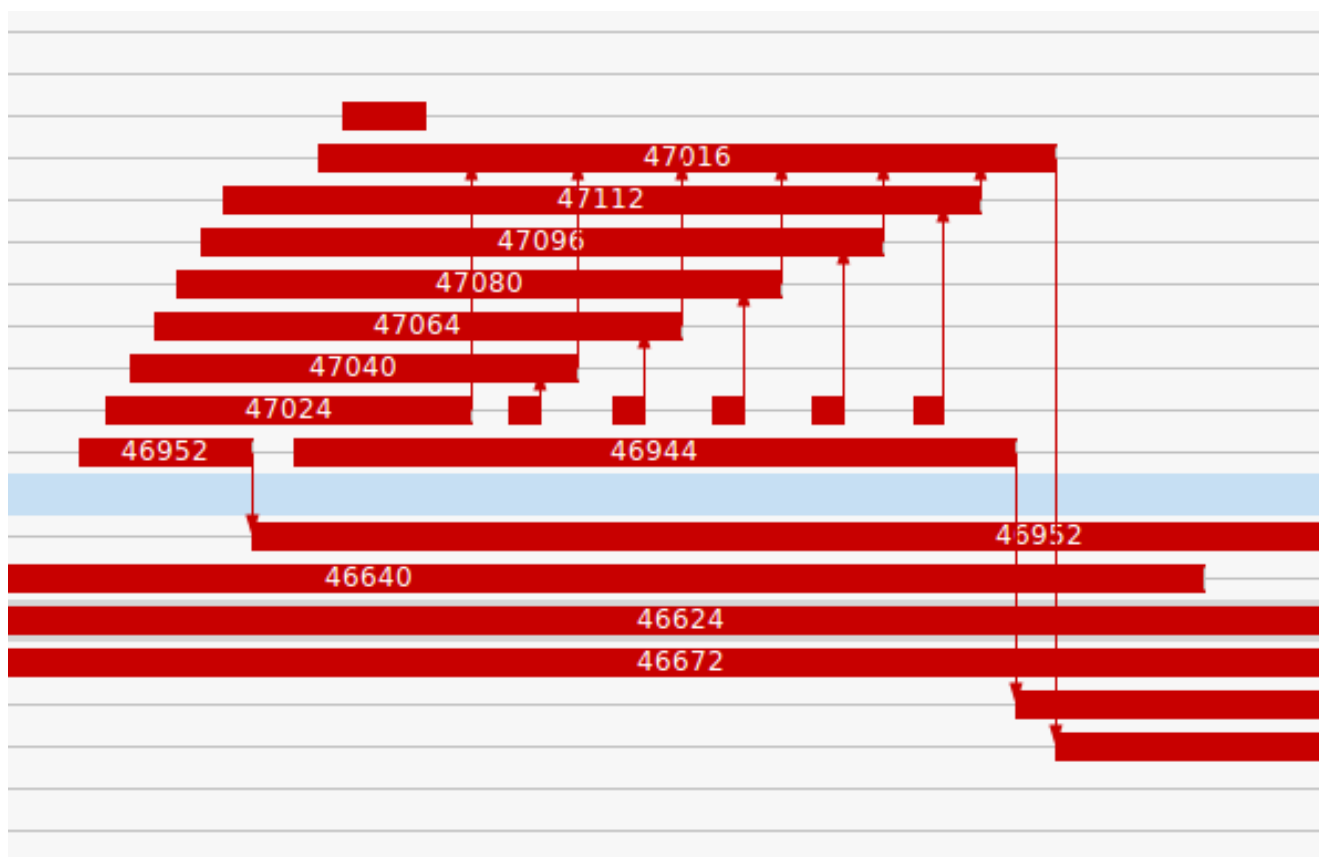429147072
437258264
28319144

411558040
411558048
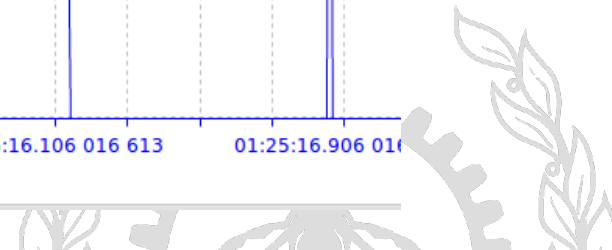429145352
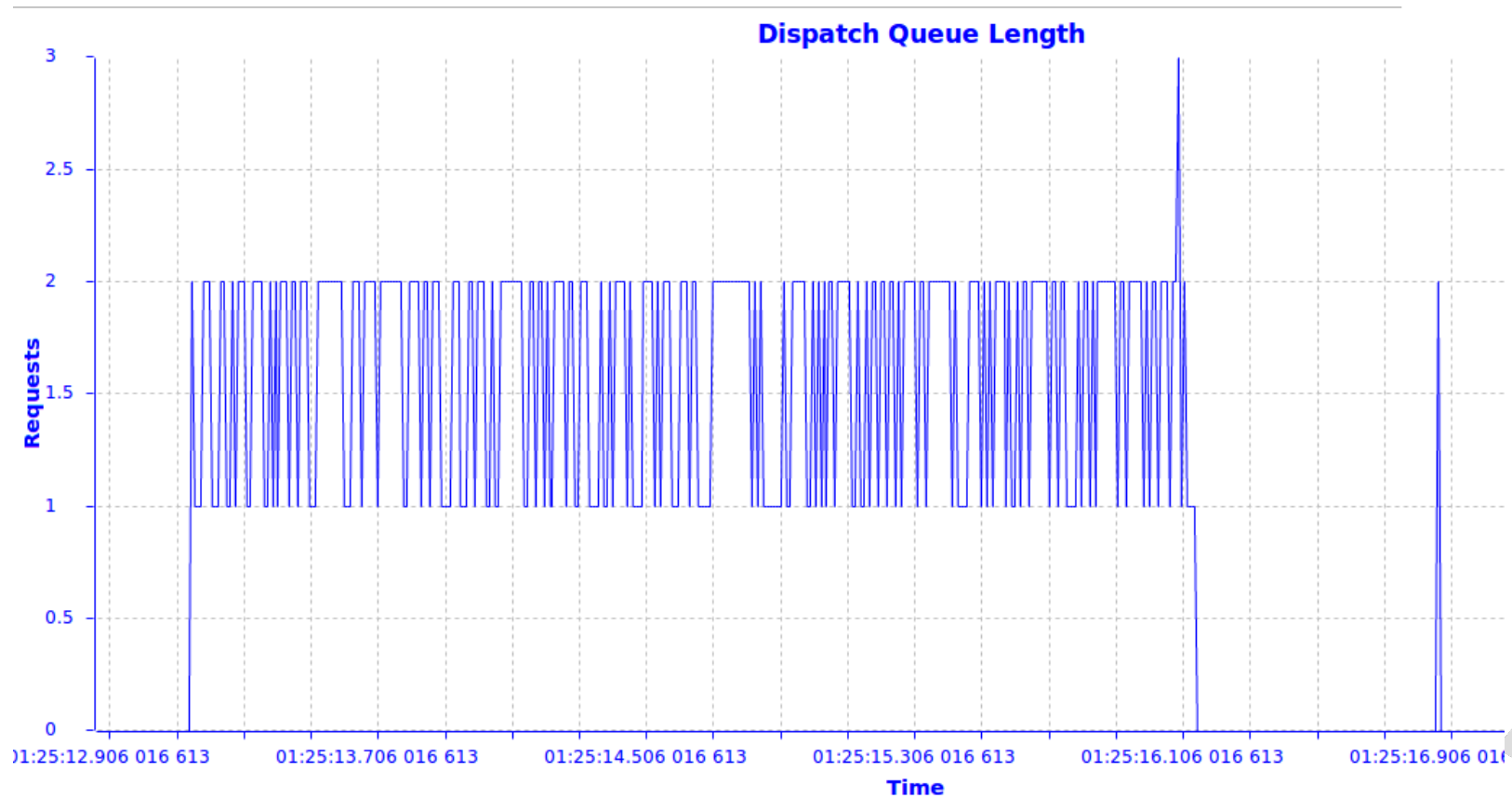
Developed Views

Waiting Queues

Merging

Developed Views
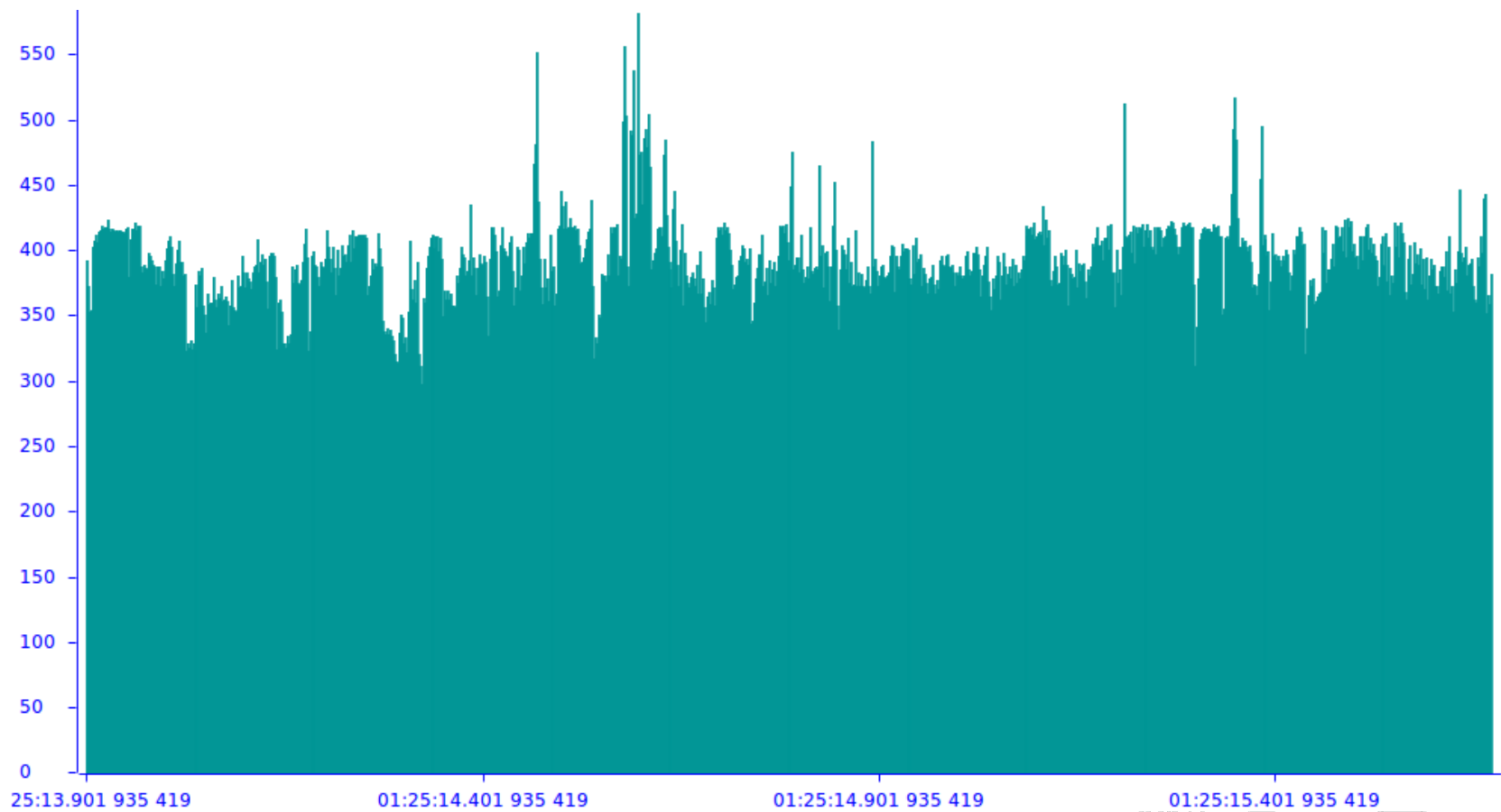
Waiting Queues

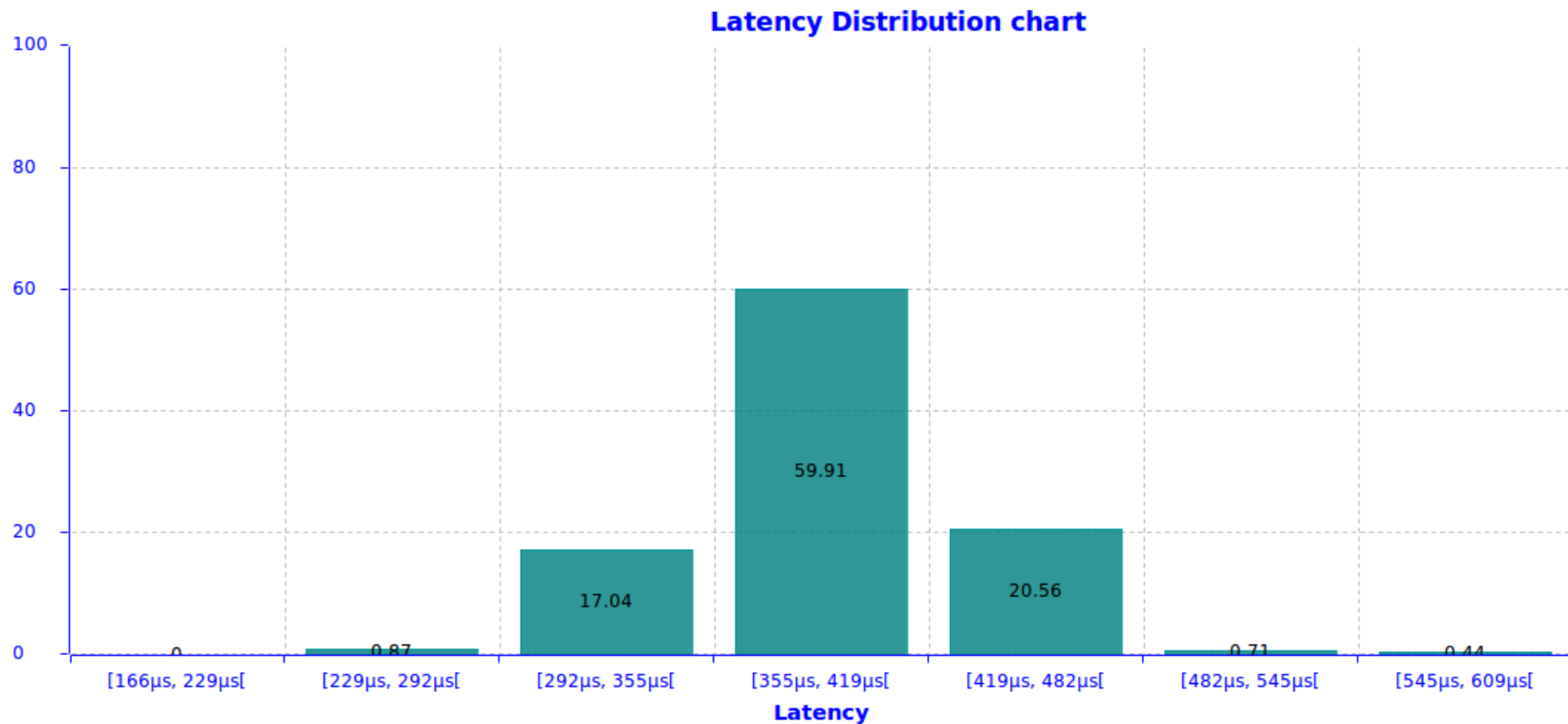Queue Length

Developed Views

Request Latencies

Latency Average
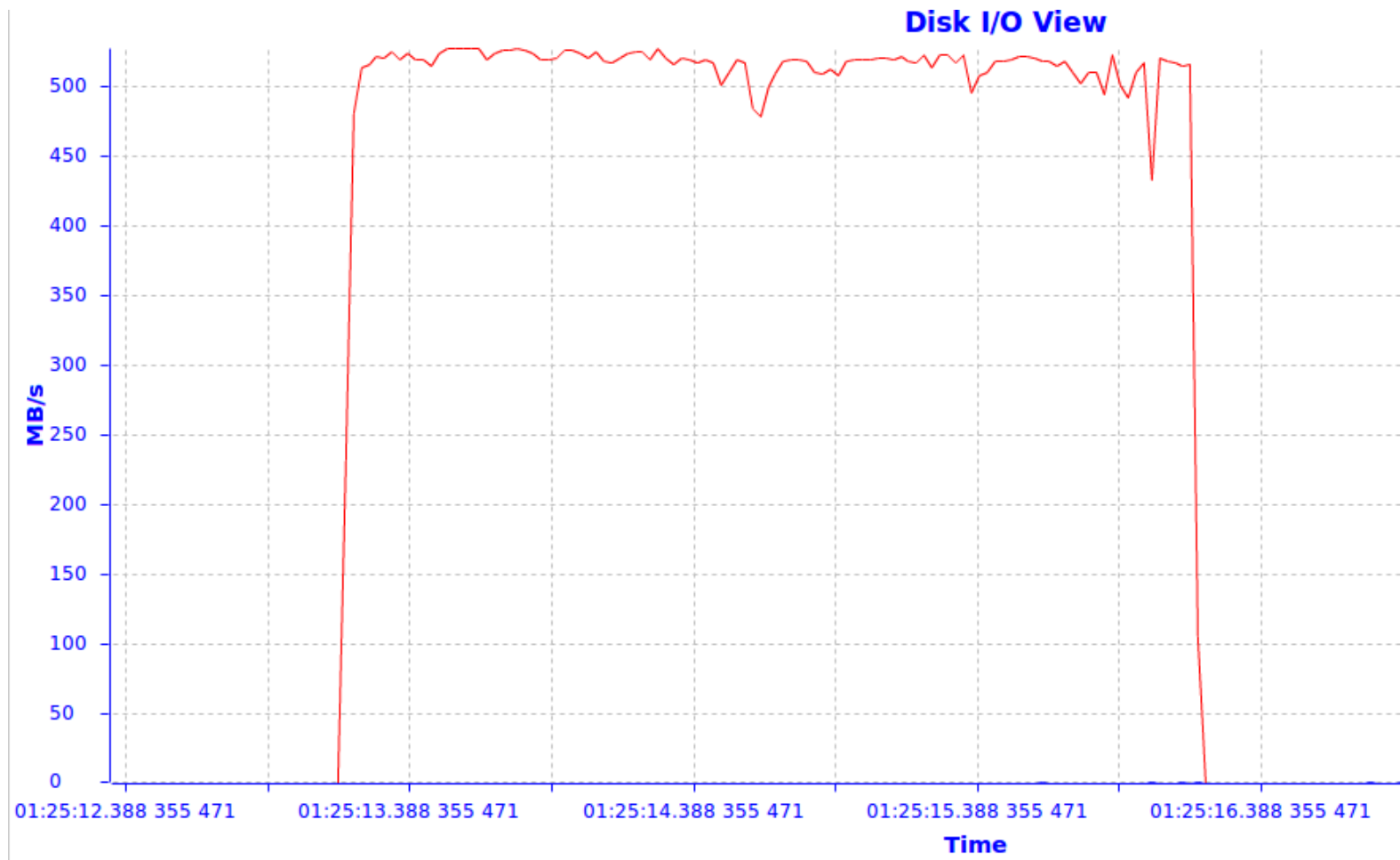
Developed Views

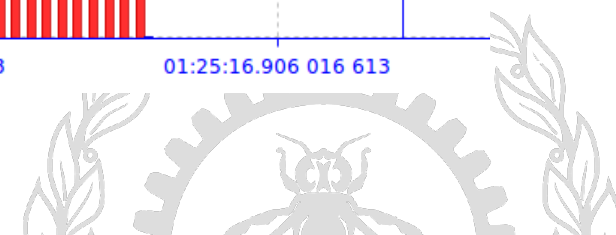## Request Latencies

Latency Distribution

Developed Views

Disk throughput

Developed Views

I/O Activity of Processes

DEMO

- Flush requests
- Writeback Algorithm
- Lttng I/O Behavior

Thank You !