mojaloop

Performance - Coil

Time gaps and waterfalls

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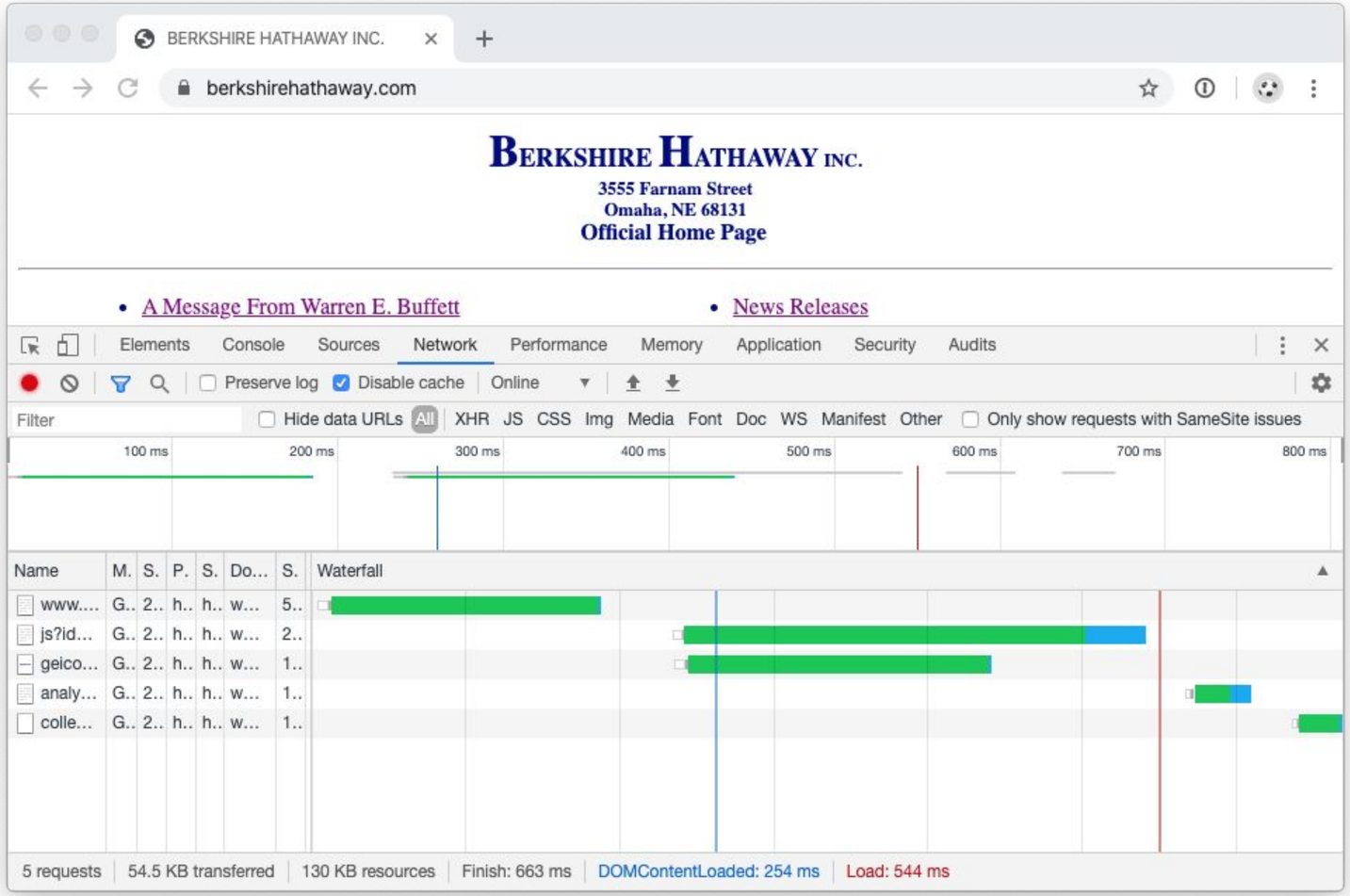
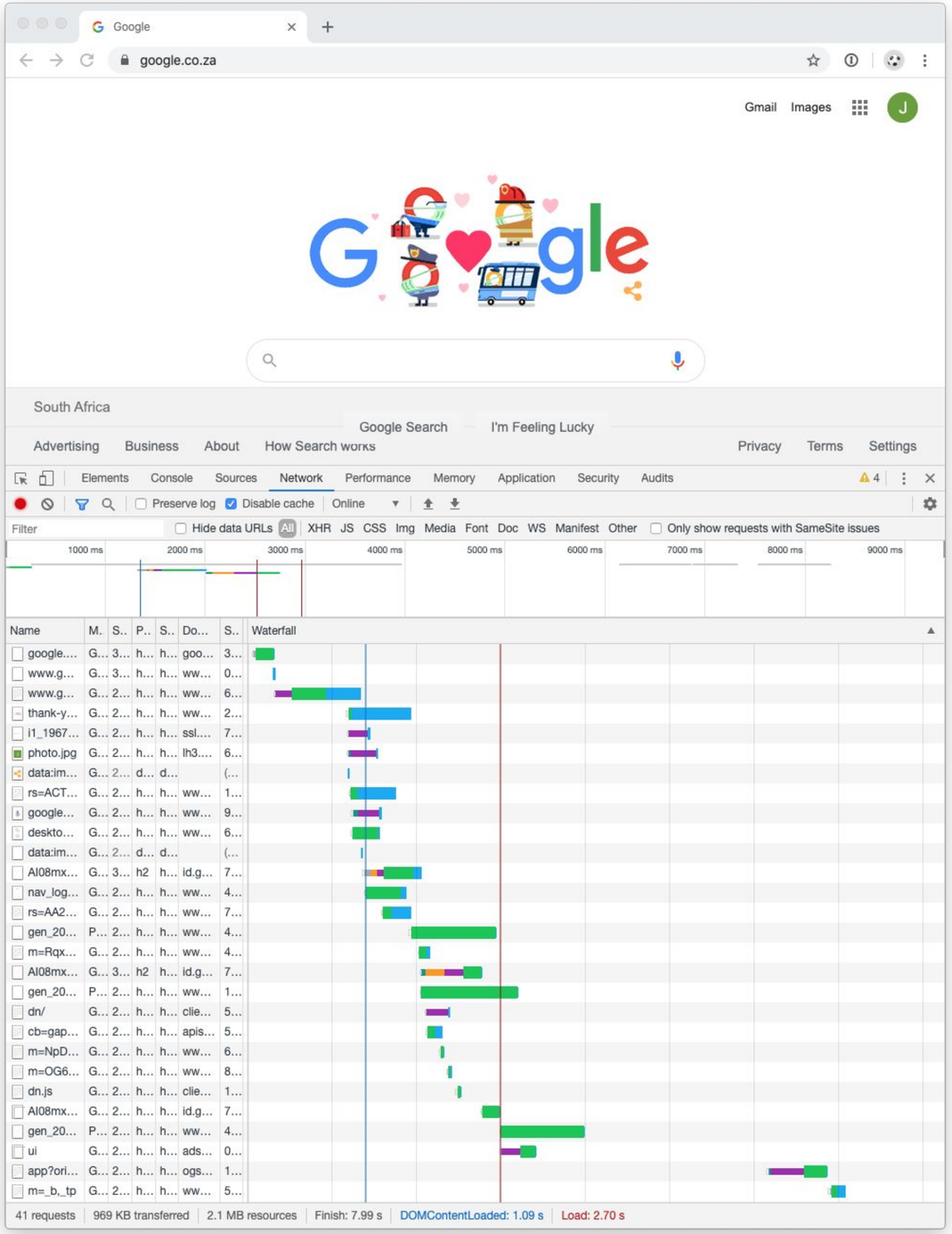
What if we thought of a Mojaloop transfer as a website?

How would we optimize it?

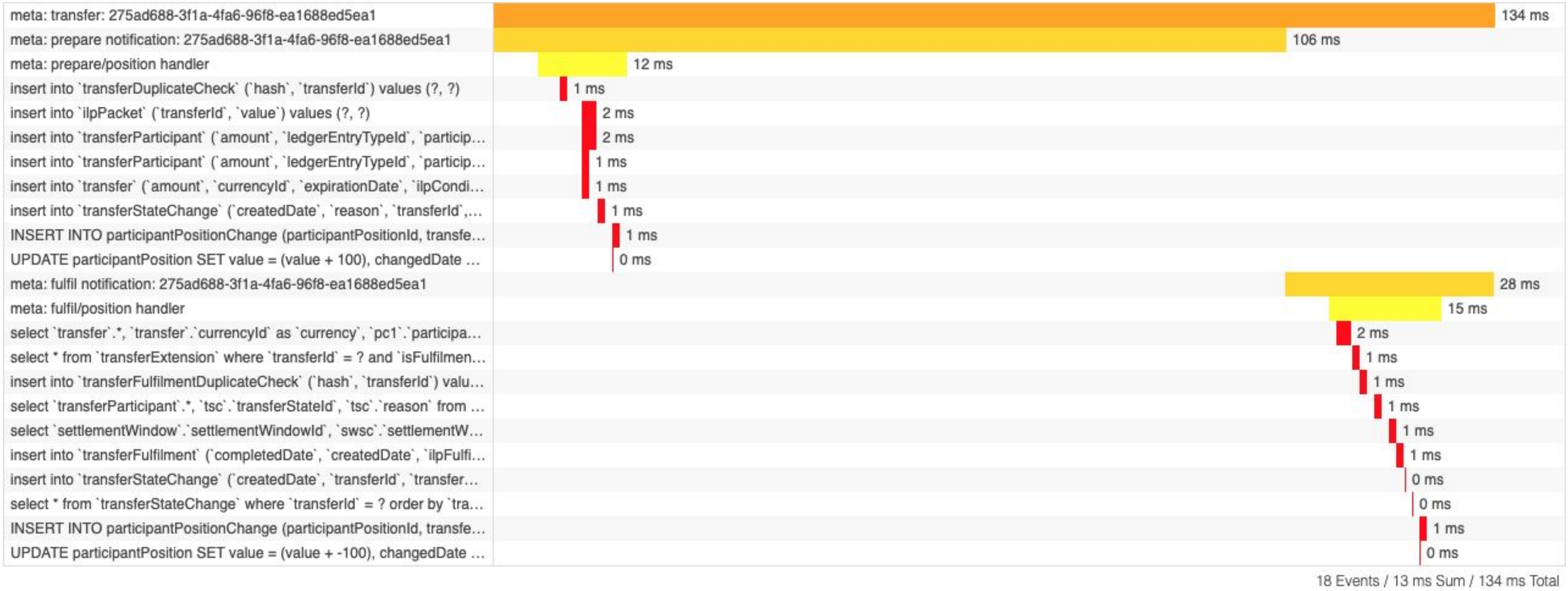
The Good...


BERKSHIRE HATHAWAY INC.
berkshirehathaway.com
BERKSHIRE HATHAWAY INC.
3555 Farnam Street
Omaha, NE 68131
Official Home Page
A Message From Warren E. Buffett
News Releases
Elements Console Sources Network Performance Memory Application Security Audits
Preserve log Disable cache Online
Filter Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other Only show requests with SameSite issues
100 ms 200 ms 300 ms 400 ms 500 ms 600 ms 700 ms 800 ms
Name M. S. P. S. Do... S. Waterfall
www.... G.. 2.. h.. h.. w... 5..
js?id... G.. 2.. h.. h.. w... 2..
geico... G.. 2.. h.. h.. w... 1..
analy... G.. 2.. h.. h.. w... 1..
colle... G.. 2.. h.. h.. w... 1..
5 requests 54.5 KB transferred 130 KB resources Finish: 663 ms DOMContentLoaded: 254 ms Load: 544 ms

The Bad...


Google
google.co.za
Gmail
Images
South Africa
Google Search
I'm Feeling Lucky
Advertising
Business
About
How Search works
Privacy
Terms
Settings
Elements
Console
Sources
Network
Performance
Memory
Application
Security
Audits
Preserve log
Disable cache
Online
Filter
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Only show requests with SameSite issues
1000 ms
2000 ms
3000 ms
4000 ms
5000 ms
6000 ms
7000 ms
8000 ms
9000 ms
Name
Waterfall
41 requests
969 KB transferred
2.1 MB resources
Finish: 7.99 s
DOMContentLoaded: 1.09 s
Load: 2.70 s

The Mojaloop...



18 SQL queries in 13ms / 134 ms total transfer time

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Catching SQL Queries

- Instrumented Knex MySQL binding for combined handlers

1 transfer = 11 inserts + 2 updates + 6 selects
= 18 SQL queries

Fsync

Tool	Rate	Latency	Notes
SAMSUNG MZ7LN512	160/s	6.3ms	Consumer grade SATA
Crucial_CT480M500SSD1	108/s	9.3ms	Consumer grade SATA
Intel 520	2031/s	0.49ms	Consumer grade SATA
SAMSUNG MZVPV512HDGL	104/s	9.6ms	Consumer grade NVMe
Samsung SSD 960 PRO	267/s	3.8ms	High-end consumer grade NVMe
Intel 750	2038/s	0.49ms	High-end consumer grade NVMe
Intel PC-3700	7380/s	0.14ms	High-end enterprise-grade NVMe

Source: https://www.percona.com/blog/2018/02/08/fsync-performance-storage-devices

Ilp-packet

```
insert into `transfer` (`amount`, `currencyId`, `expirationDate`,
`ilpCondition`, `transferId`) values (?, ?, ?, ?, ?)
```

```
insert into `ilpPacket` (`transferId`, `value`) values (?, ?)
```

Duplicate Checks

Before:

```
select * from `transferDuplicateCheck` where `transferId` = ?
```

After:

```
insert into `transferDuplicateCheck` (`hash`, `transferId`) values (?, ?)
```

Can we skip both these queries 99% of the time and still detect duplicates safely?

Duplicate Checks

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select * from `transferDuplicateCheck` where `transferId` = ?
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```
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```
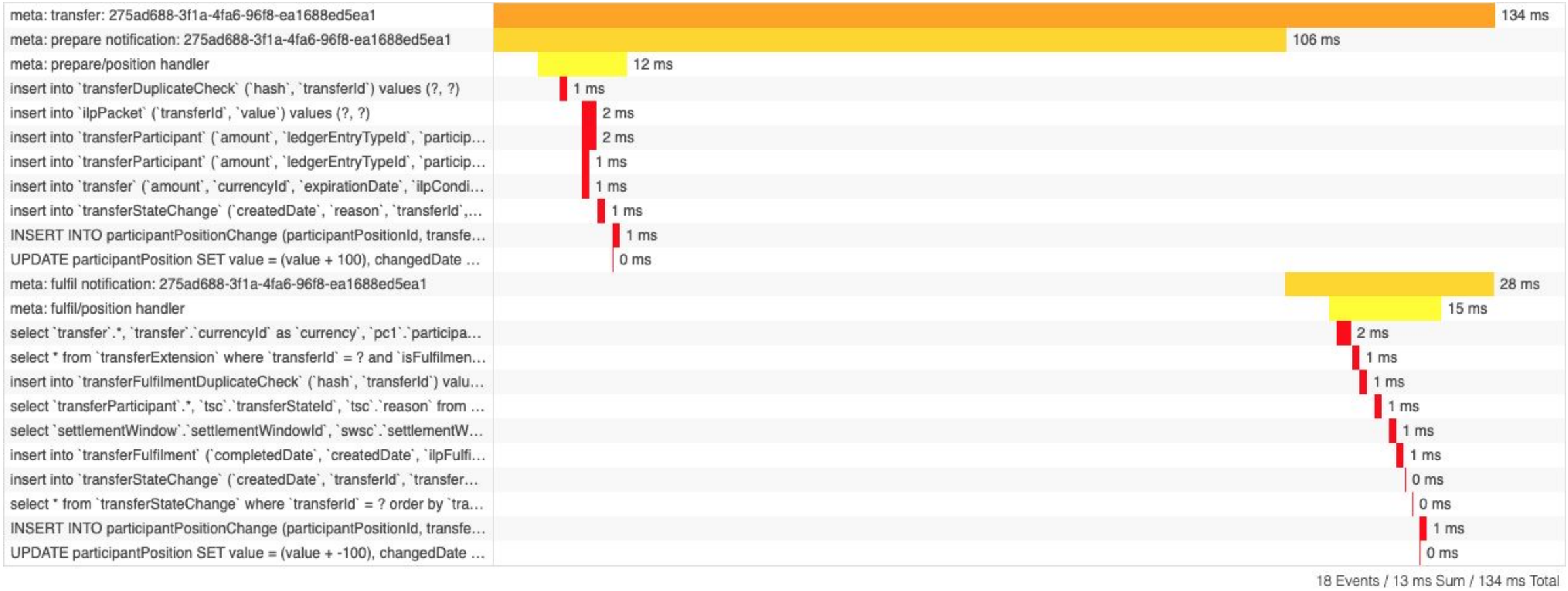

Can we skip both these queries 99% of the time and still detect duplicates safely?

Yes we can: Bloom filter

What else do you notice?



18 SQL queries in 13ms / 134 ms total transfer time

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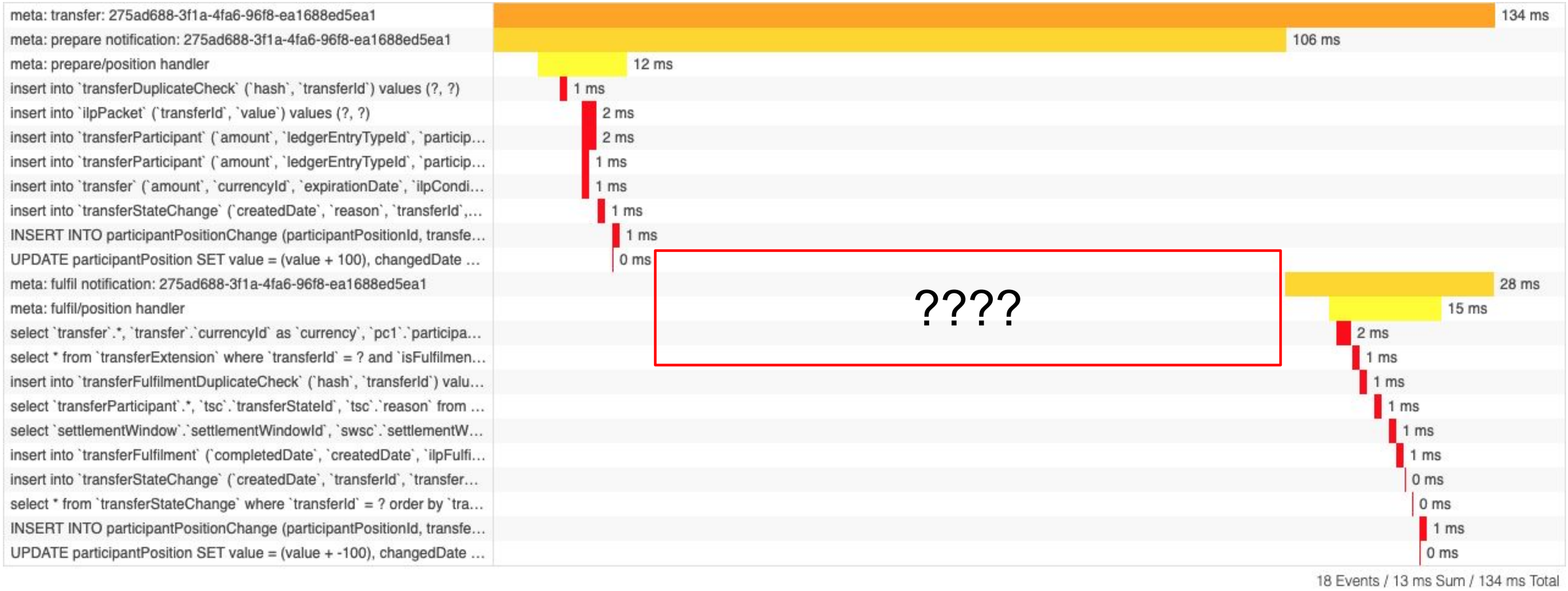
The Big Gap



18 SQL queries in 13ms / 134 ms total transfer time

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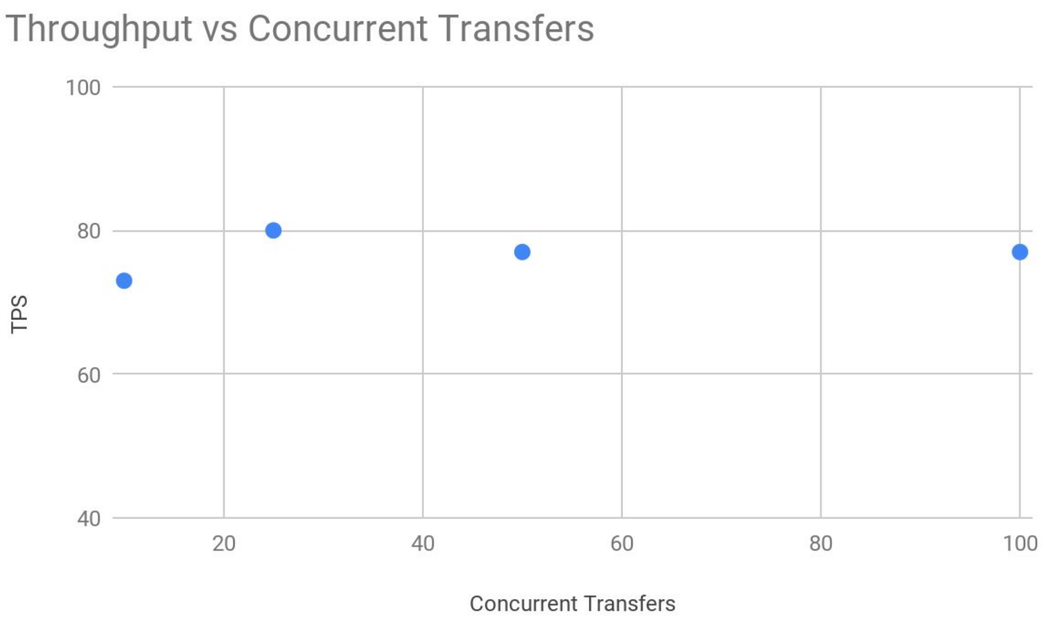
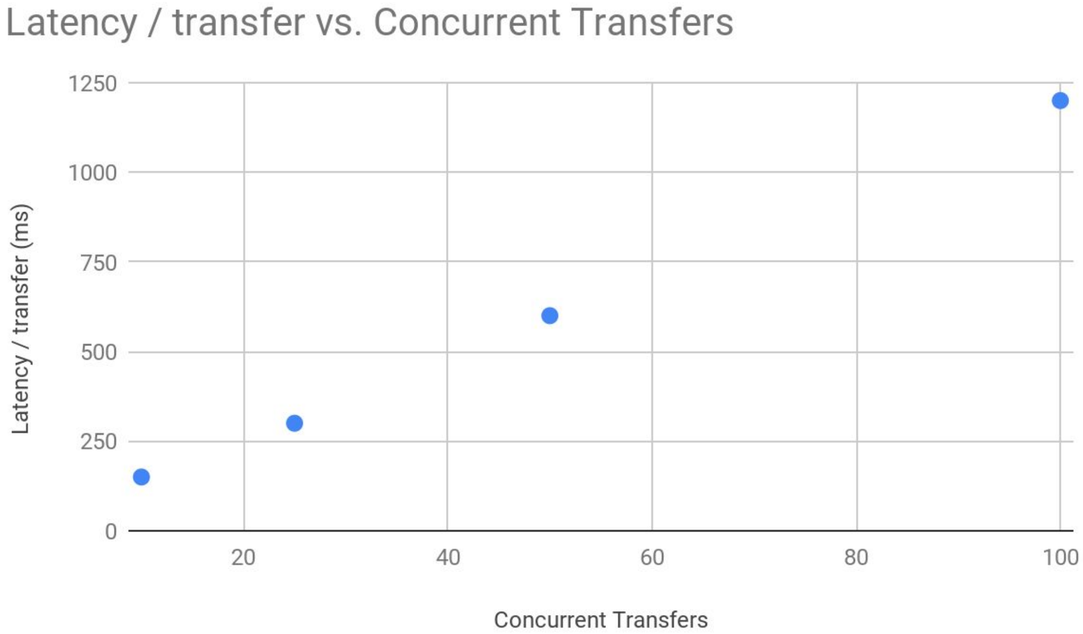
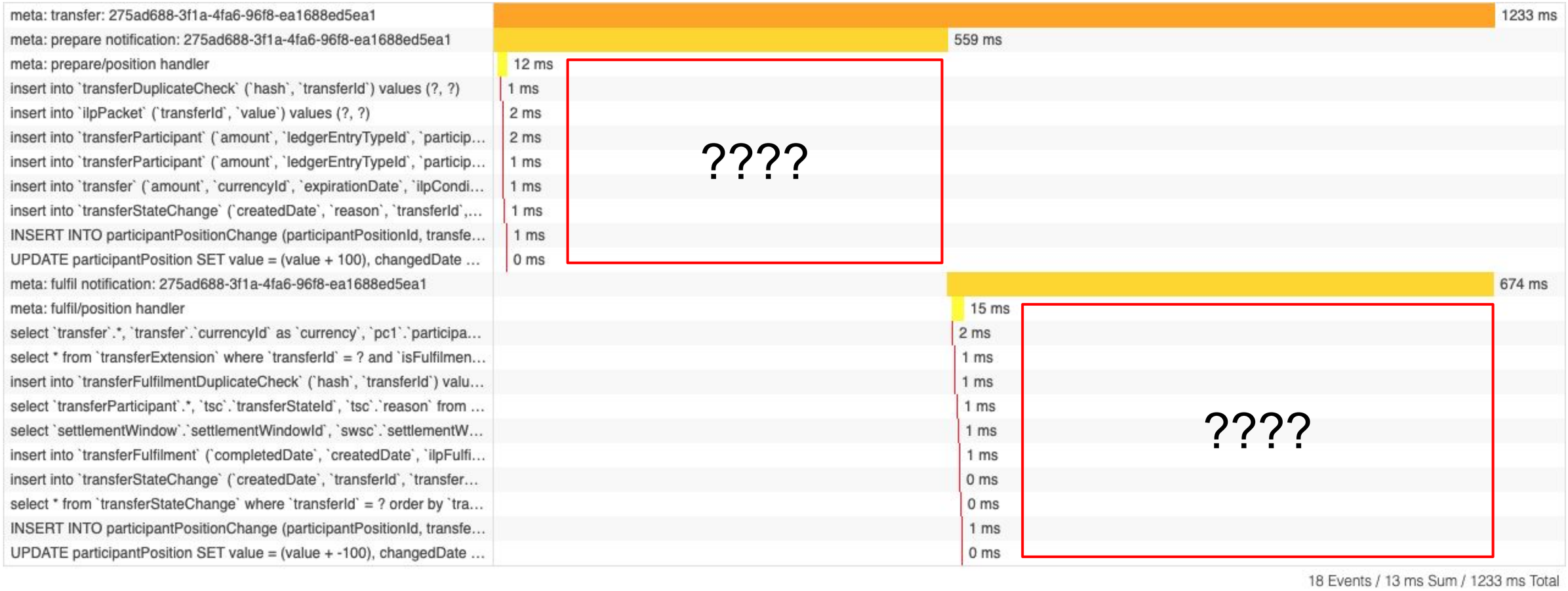
Concurrency





100 Concurrent Transfers



18 SQL queries in 13ms / 1233 ms total transfer time

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Next Steps

- Instrument the notification handler
- Instrument kafka calls to produce to and consume off the queue
- Investigate the effect of pulling multiple messages off the queue at the same time, by the handlers

DNS Lookups

Bad News

https://github.com/nodejs/node/issues/8436

- Node's dns.lookup runs in the threadpool
- Default UV_THREADPOOL_SIZE = 4

Good News

- Monkey-patched DNS lookups
- None were in the critical path

Help us solve the big gap problem!

Environment

Node type: n1-standard-4 4vCPUs 15GiB RAM

Component	Pod Scale	Dedicated Nodes	label
Kafka + ZooKeeper		3	broker
MySQL	1	1	data
ML-API-Adapter	1	1	ml_api
Prepare handler	1	1	ml_cl_prepare
Position handler	1	1	ml_cl_position
Fulfill handler	1	1	ml_cl_fulfil
Notification handler	1	1	ml_notify
Load generator	1	1	load
monitoring		1	monitor