California State University Chico

Unlock the FoundationDB Record Layer:

Language Flexibility and Network Freedom with a gRPC Microservice

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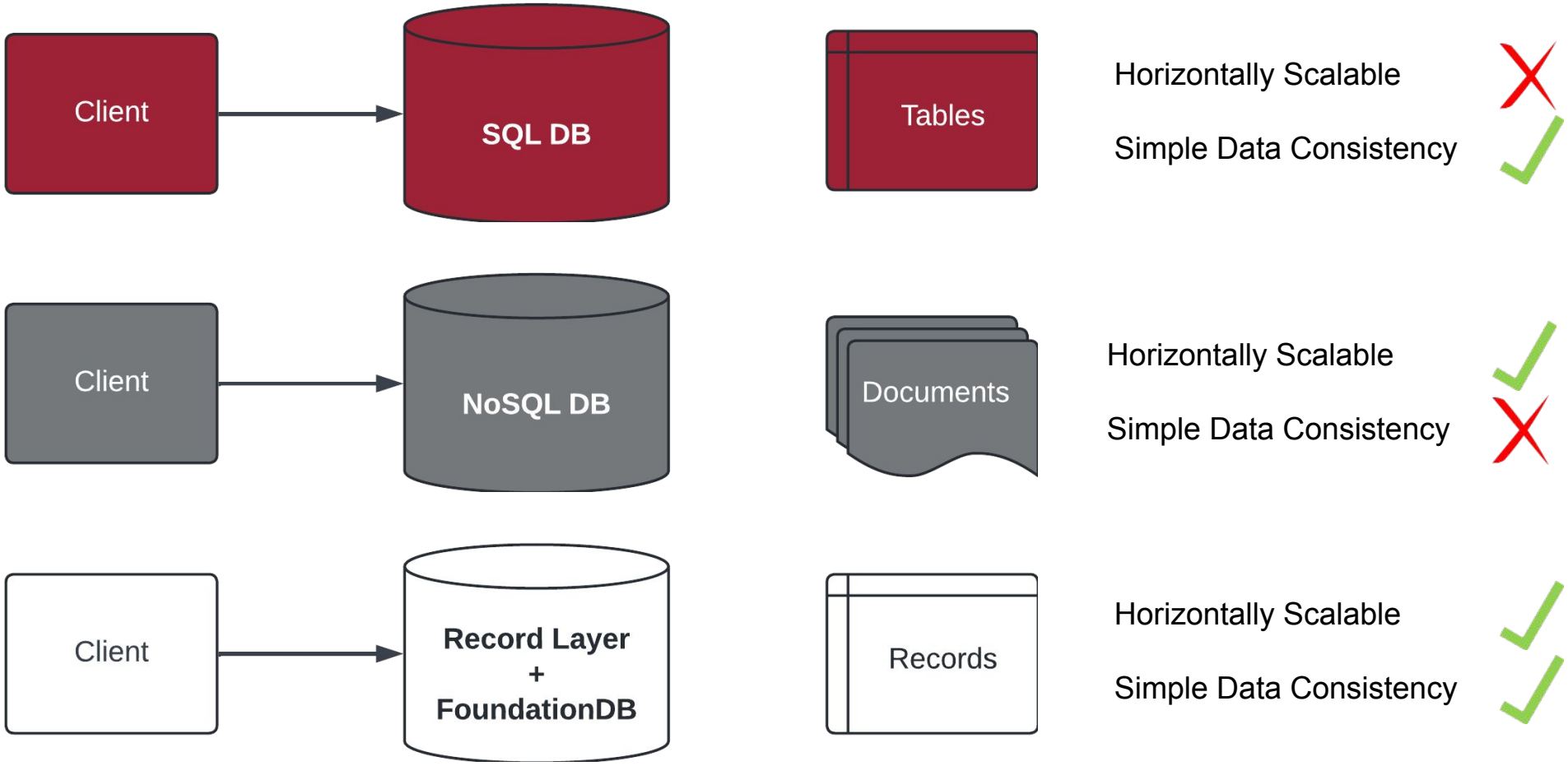
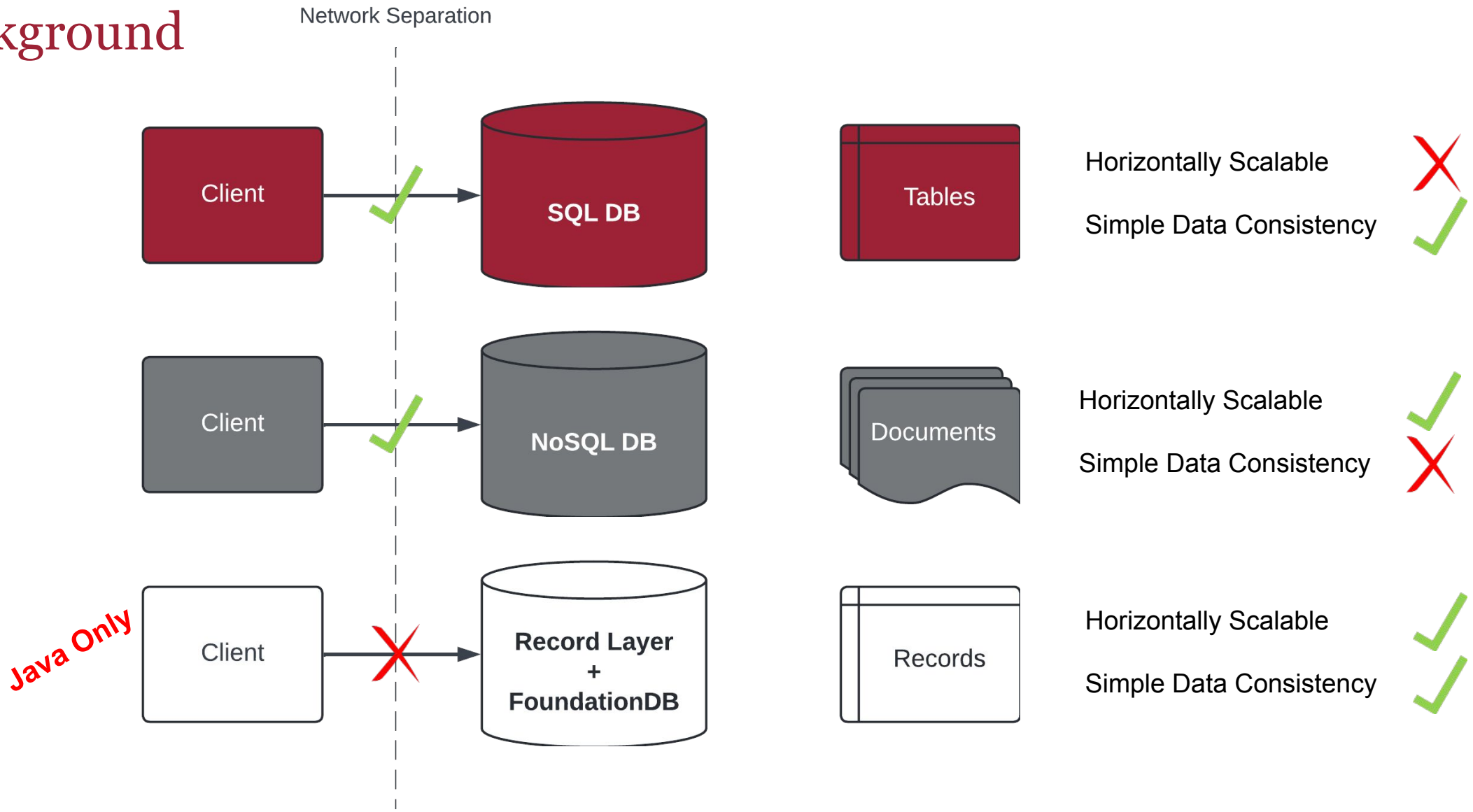
Background


Client
SQL DB
Tables
Horizontally Scalable
Simple Data Consistency
Client
NoSQL DB
Documents
Horizontally Scalable
Simple Data Consistency
Client
Record Layer
+
FoundationDB
Records
Horizontally Scalable
Simple Data Consistency

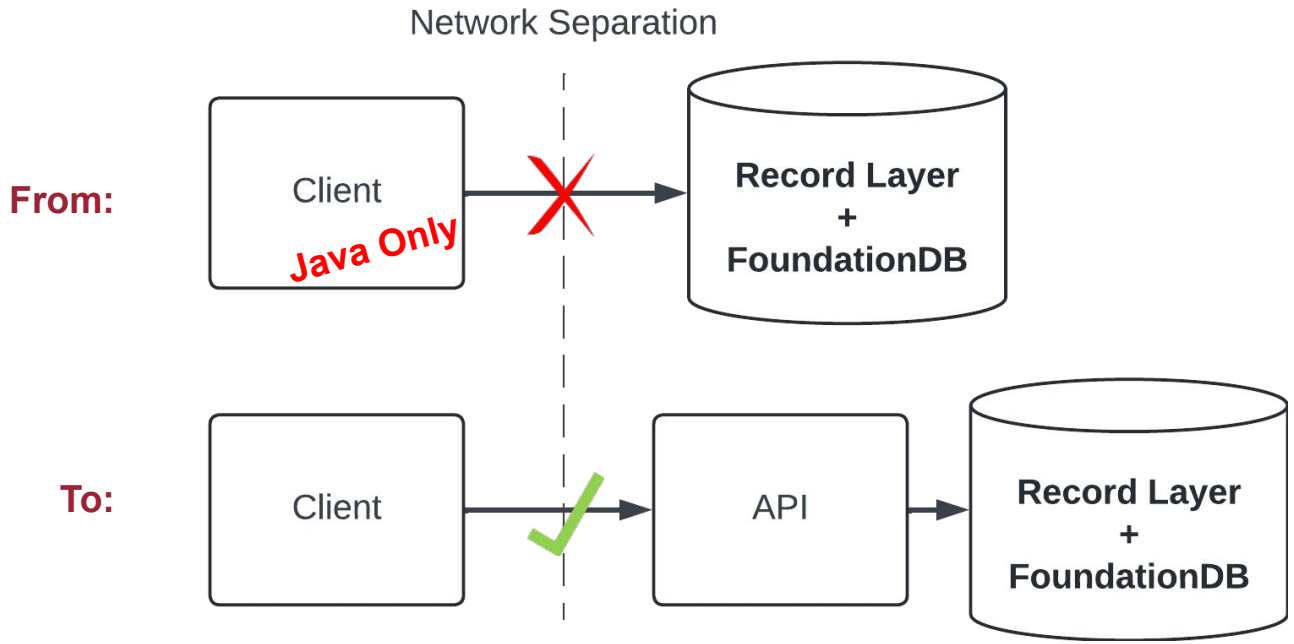
Background


Network Separation
Client
SQL DB
Tables
Horizontally Scalable
Simple Data Consistency
Client
NoSQL DB
Documents
Horizontally Scalable
Simple Data Consistency
Java Only
Client
Record Layer
+
FoundationDB
Records
Horizontally Scalable
Simple Data Consistency

Problem Statement

"Unlocking" the FoundationDB Record Layer

This research works to show that encapsulating the Record Layer within a microservice could enhance its accessibility and deployment flexibility, without compromising performance.



Research Methodology

Development:

- Created a benchmark application directly utilizing the FoundationDB Record Layer.
- Developed a functionally equivalent application interacting with the Record Layer via a gRPC microservice.

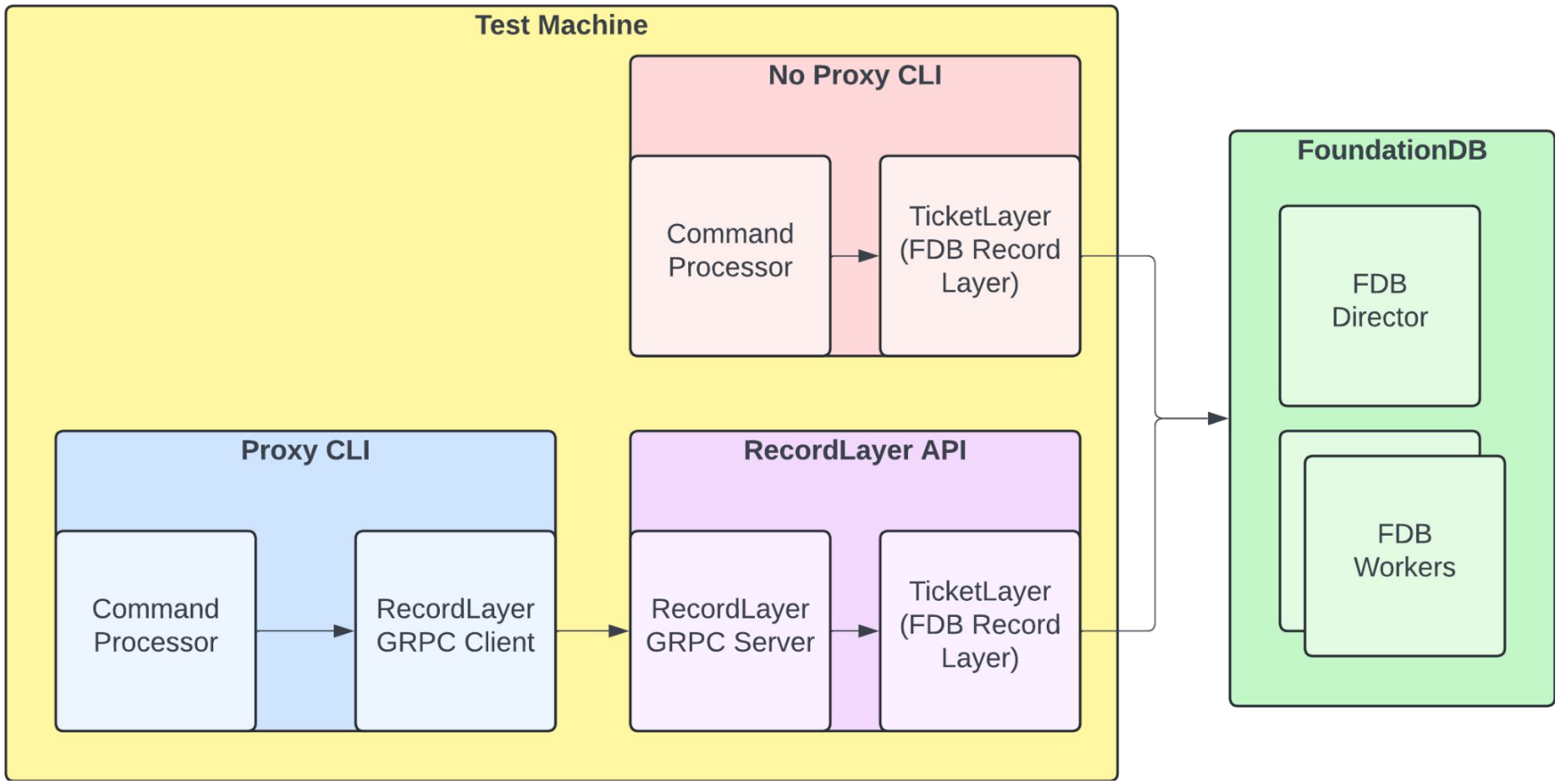
Experiment Design:

- Defined a suite of read and write operations with varying data sizes.
- Established performance metrics (latency).

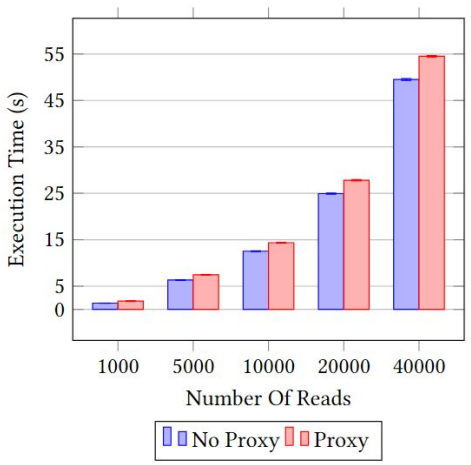
Evaluation:

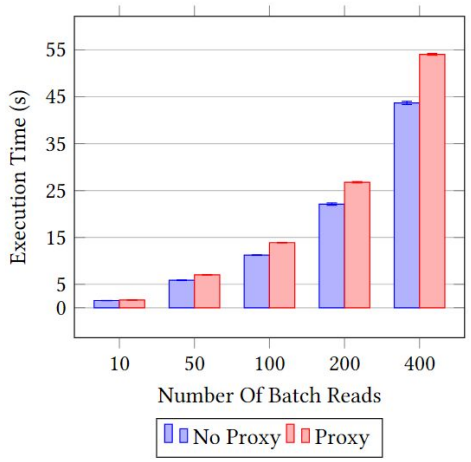
- Executed the benchmark applications against a FoundationDB cluster, measuring performance metrics for both the direct Record Layer and gRPC-based approaches.
- Analyzed results to quantify the overhead introduced by the gRPC microservice layer across different workloads.

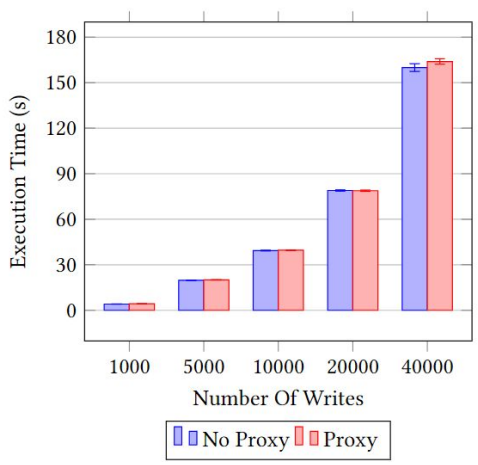
Research Methodology - System Design

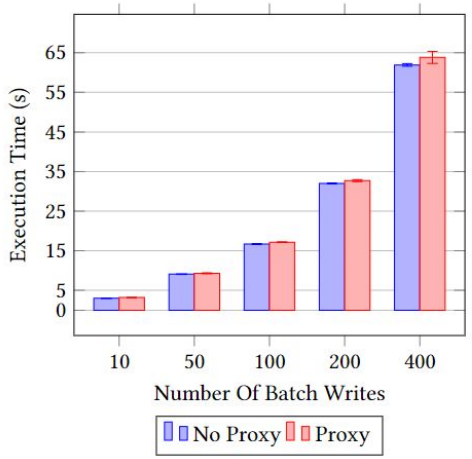


Results and Findings









N	NoProxy (ms)	Proxy (ms)	% Inc
1,000	1,335.40 +/- 15.48	1,782.35 +/- 80.91	33.47%
5,000	6,319.50 +/- 60.42	7,447.65 +/- 72.04	17.85%
10,000	12,525.05 +/- 81.47	14,354.10 +/- 87.04	14.60%
20,000	24,936.70 +/- 119.98	27,815.0 +/- 143.04	11.54%
40,000	49,522.80 +/- 199.89	54,526.0 +/- 173.46	10.10%

^ Single Random Reads

N	NoProxy (ms)	Proxy (ms)	% Inc
1,000	4,113.50 +/- 70.66	4,305.95 +/- 49.32	4.68%
5,000	19,791.80 +/- 90.93	20,045.70 +/- 126.23	1.28%
10,000	39,358.35 +/- 238.27	39,577.40 +/- 185.76	0.56%
20,000	78,946.55 +/- 420.61	78,803.85 +/- 433.98	-0.18%
40,000	159,947.95 +/- 2,544.05	163,947.50 +/- 1,787.43	2.50%

< Single Writes

Large Batch Reads >

N	NoProxy (ms)	Proxy (ms)	% Inc
10	1,526.35 +/- 15.84	1,642.05 +/- 18.47	7.58%
50	5,855.75 +/- 66.25	7,023.70 +/- 51.00	19.95%
100	11,220.40 +/- 63.00	13,883.55 +/- 54.98	23.73%
200	22,105.75 +/- 250.38	26,766.95 +/- 142.92	21.09%
400	43,695.85 +/- 348.24	54,060.25 +/- 199.79	23.72%

v Large Batch Writes

N	NoProxy (ms)	Proxy (ms)	% Inc
10	3,005.15 +/- 42.41	3,185.90 +/- 29.57	6.0%
50	9,091.70 +/- 70.42	9,317.05 +/- 114.41	2.5%
100	16,699.30 +/- 122.69	17,182.35 +/- 73.59	2.9%
200	32,001.25 +/- 132.21	32,699.90 +/- 248.54	2.2%
400	61,929.30 +/- 327.98	63,828.75 +/- 1,523.45	3.1%

Summary and Conclusions

This research demonstrates that a gRPC microservice wrapper for the FoundationDB Record Layer introduces likely acceptable performance overheads.

This gRPC approach addresses language limitations with minimal impact, particularly in write-heavy scenarios (1-6% latency increase).

Furthermore, by handling direct FoundationDB connections within a horizontally scalable microservice, this approach overcomes network co-location restrictions. This empowers organizations to adopt FoundationDB's open-source NewSQL capabilities within modern security-conscious architectures, making the Record Layer a more compelling data storage solution across a wider range of applications.

Any Questions?

Thank You