



## YottaDB Update

*Continued Progress*

# Outline

- Business
- YottaDB
- Octo
- DevOps, CI/CD
- Ecosystem
- Roadmap

Business



# Business Model

- Software is free
  - *100% Free / Open Source Software (FOSS)*
  - All work at <https://gitlab.com/YottaDB>
- People are not free
  - Support services with SLAs on commercial terms
  - Support options and tiers
- Support contracts fund software development

# Company Status



- YottaDB LLC founded in 2017
- Customers in North America, Europe, Asia
- Using multiple languages including Go, Lua, M and Node.js, as well as Octo
- Revenue plowed back into software development

# YottaDB



- A mature, high performance, hierarchical key-value, *language-agnostic*, NoSQL database whose code base scales up to mission-critical applications like large real-time core-banking and electronic health records, and also *scales down* to run on platforms like the Raspberry Pi Zero, as well as *everything in-between*.
- *Rock Solid. Lightning Fast. Secure. Pick any three.*

YottaDB is a registered trademark of YottaDB LLC

## r1.34 – February 2022

- Faster stringpool garbage collection
- HOME and END keys work in direct mode for READ
- Multiple improvements to `ydbinstall` / `ydbinstall.sh`
- Improved `ydb_env_set`
  - Performance
  - Compatibility with existing environments
- Enhancements and fixes from GT.M V6.3-011



# Lua Wrapper

```
local ydb = require('yottadb')  
ydb.set('^hello', {'Lua'}, 'Hallo Wereld')
```

- Thank you, University of Antwerp Library

# Hello world – Python

```
import yottadb

if __name__ == "__main__":
    yottadb.set("^hello", ("Python",), value="नमस्ते दुनिया")
```

The image shows a web browser window with the address bar displaying `docs.yottadb.com/MultiLangProgGuide/MultiLangProgGuide.html`. The page features a dark purple sidebar on the left with the YottaDB logo and a search bar. The main content area has a breadcrumb trail `» Multi-Language Programmer's Guide` and navigation buttons for `Previous` and `Next`. The title `Multi-Language Programmer's Guide` is prominently displayed. Below the title is a `Contents` section with a bulleted list of topics.

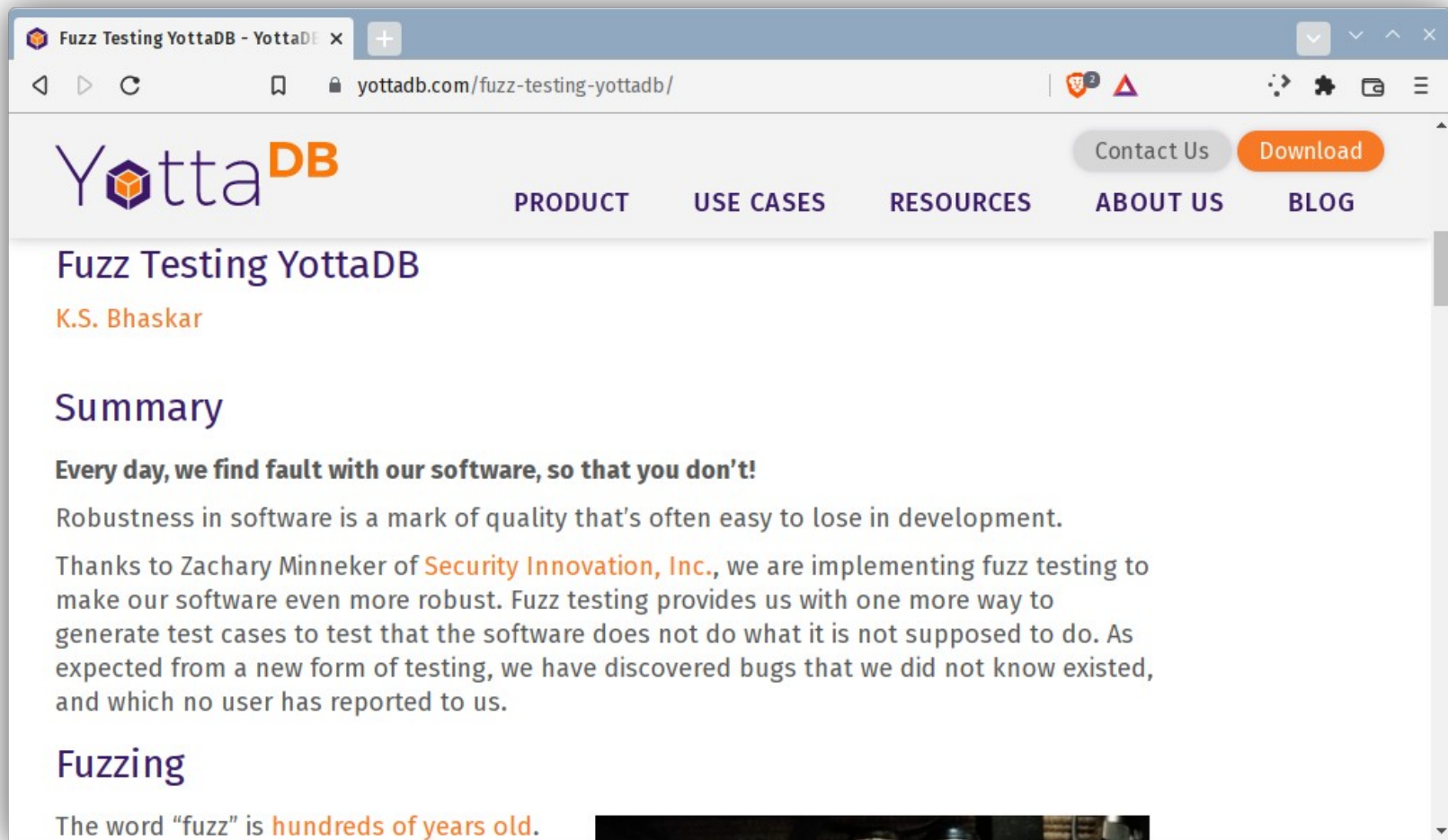
Multi-Language Programmer's Guide

Previous Next

## Multi-Language Programmer's Guide

### Contents

- [Multi-Language Programmer's Guide](#)
  - [Overview](#)
  - [Quick Start](#)
    - [Local Installation](#)
    - [Docker Container](#)
  - [Concepts](#)
    - [Keys, Values, Nodes, Variables, and Subscripts](#)
      - [Variables vs. Subscripts vs. Values](#)
    - [Local and Global Variables](#)
    - [Global Directories](#)
      - [Client/Server Operation](#)
    - [Intrinsic Special Variables](#)
      - [\\$tlevel](#)
      - [\\$trestart](#)



The screenshot shows a web browser window with the address bar displaying 'yottadb.com/fuzz-testing-yottadb/'. The page header features the YottaDB logo on the left and navigation links for 'PRODUCT', 'USE CASES', 'RESOURCES', 'ABOUT US', and 'BLOG' in the center. On the right side of the header, there are two buttons: 'Contact Us' and 'Download'. The main content area has a title 'Fuzz Testing YottaDB' and an author name 'K.S. Bhaskar'. Below the title is a section header 'Summary' followed by a bolded sub-header 'Every day, we find fault with our software, so that you don't!'. The text under the sub-header discusses the importance of robustness in software and mentions Zachary Minneker of Security Innovation, Inc. The section 'Fuzzing' begins with the sentence 'The word "fuzz" is hundreds of years old.'

Fuzz Testing YottaDB

K.S. Bhaskar

## Summary

**Every day, we find fault with our software, so that you don't!**

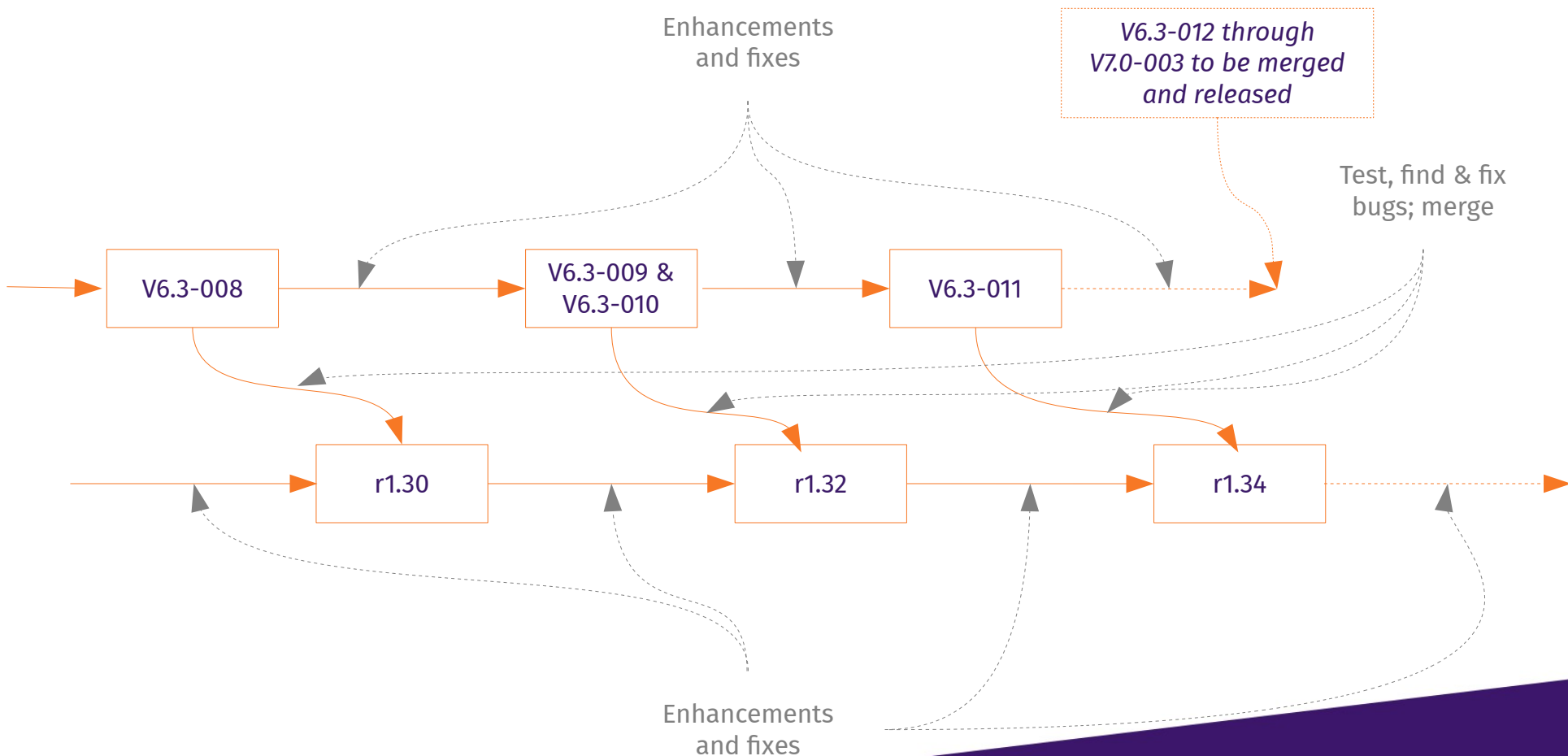
Robustness in software is a mark of quality that's often easy to lose in development.

Thanks to Zachary Minneker of [Security Innovation, Inc.](#), we are implementing fuzz testing to make our software even more robust. Fuzz testing provides us with one more way to generate test cases to test that the software does not do what it is not supposed to do. As expected from a new form of testing, we have discovered bugs that we did not know existed, and which no user has reported to us.

## Fuzzing

The word "fuzz" is [hundreds of years old](#).

# Compatibility with Upstream



Issues · YottaDB / DB / YDB · GitLab

gitlab.com/YottaDB/DB/YDB/-/issues/?sort=updated\_desc&state=closed&label\_name%5B%5D=upstream...

Menu Search GitLab 30 2 43

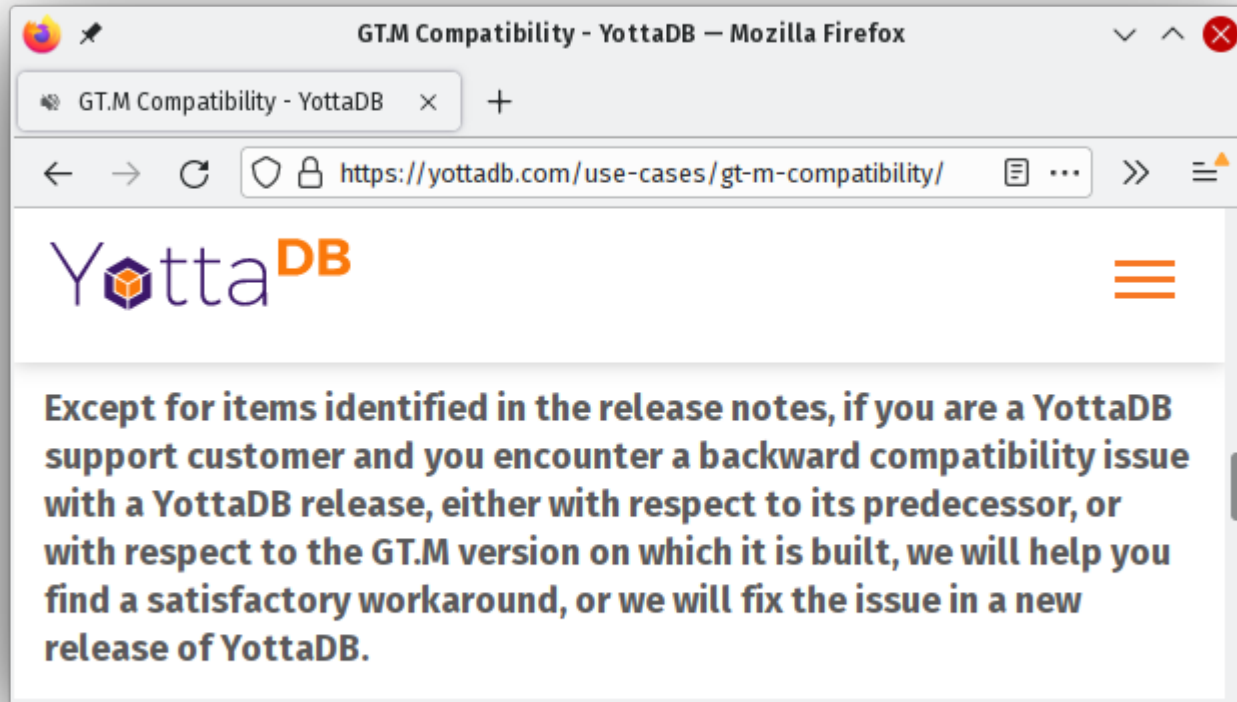
YottaDB > DB > YDB > Issues

Open 20 Closed 144 All 164

Label = ~upstream issue X Updated date

- [#886] Make \$ZSTRPLIM size check ALWAYS happen, no longer add in minimum, just set to minimum if new value is lesser** CLOSED 3  
#886 · created Jul 1, 2022, 4:44 PM by Steven Estes r1.36 bug documentation upstream issue closed Aug 11, 2022, 4:24 PM
- Code containing NEW or BREAK commands compiled with -noline\_entry runs correctly** CLOSED 6  
#901 · created Jul 28, 2022, 6:16 PM by Sam Habel r1.36 bug upstream issue closed Aug 2, 2022, 1:32 PM
- \$(Z)TRANSLATE() correctly reports error when second and third arguments are undefined** CLOSED 1  
#511 · created Dec 18, 2019, 12:04 PM by Brad Westhafer r1.30 bug upstream issue closed Dec 20, 2019, 11:37 AM
- UTF-8 mode \$TRANSLATE() with multi-byte string literals as the second or third parameter works correctly when executed from shared library** CLOSED 15  
#492 · created Oct 25, 2019, 3:01 PM by Tomas Morstein r1.30 bug upstream issue closed May 22, 2020, 1:05 PM
- GTMASSERT2 and database damage if disk IO during ONLINE BACKUP takes more than 200 seconds** CLOSED 3  
#895 · created Jul 15, 2022, 12:22 PM by Narayanan Iyer r1.36 misfeature upstream issue closed Jul 26, 2022, 2:41 PM
- TSTART with parenthesized list of local variables specified by indirection results in VAREXPECTED** CLOSED 2  
#20 · created Aug 9, 2017, 2:49 PM by K.S. Bhaskar upstream issue wontfix closed Oct 26, 2018, 8:52 AM

# Upward Compatibility Guarantee



# Octo

*Sam Habel's Octo presentation at 12pm, Sat, Oct 1*

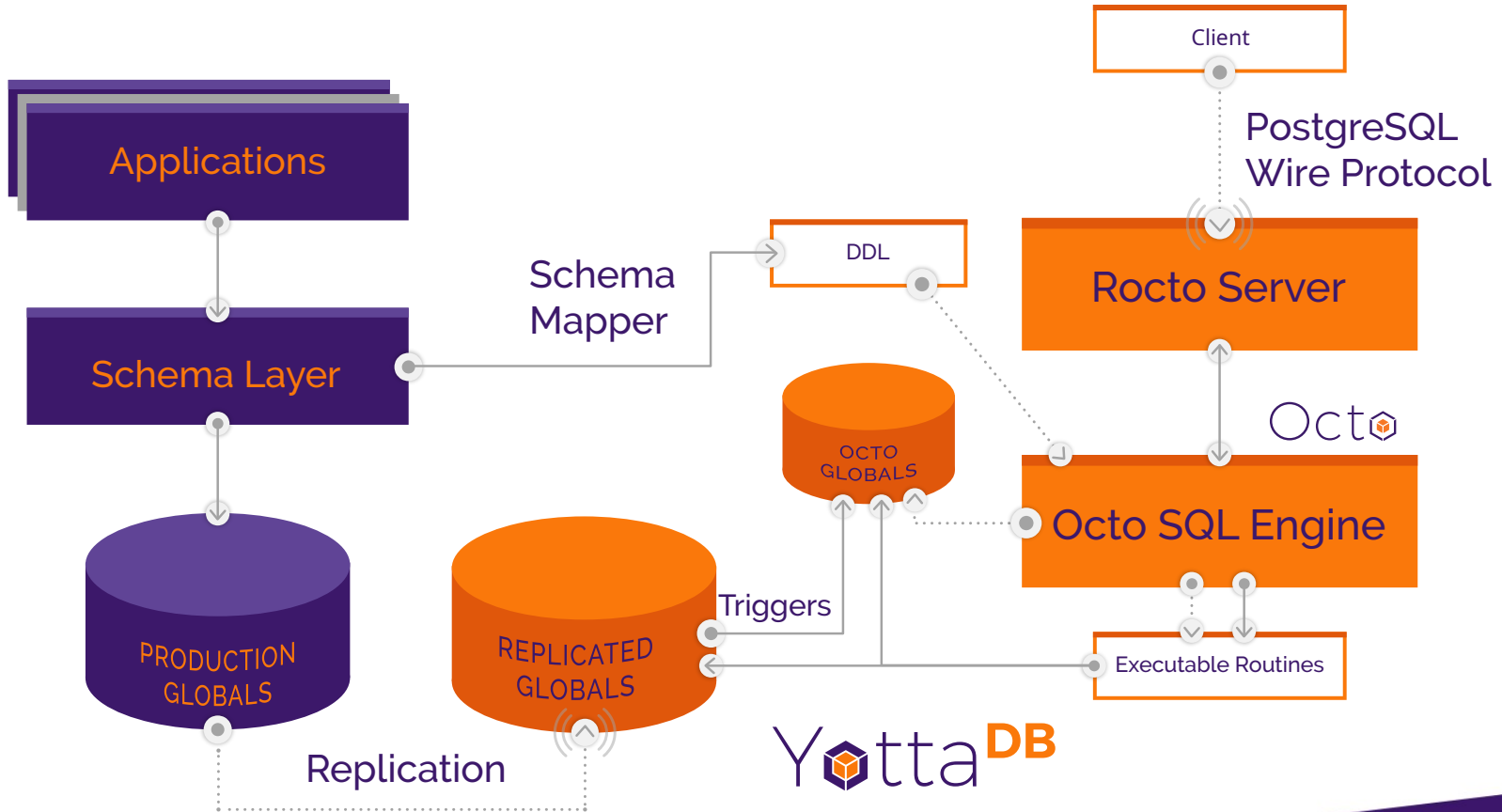




- Octo is a SQL database engine whose tables are mapped to global variables
- Octo is a YottaDB application, not a GT.M application
  - Requires functionality in YottaDB and not available in GT.M
  - Runs on SI replication instance from GT.M or YottaDB

Octo is a registered trademark of YottaDB LLC

# Octo Production Configuration



# SQL Query of VeHU Vista

Squirrel SQL Client Version 3.9.1

Connect to: Mnementh Active Session: 1 - Mnementh (dummy) as...

SQL

```
select NEW_PERSON_ID, NAME, ACCESS_CODE, DATE_ACC_CODE_LAST_CHANGED from ...
```

Limit Rows: 100

```
select NEW_PERSON_ID, NAME, ACCESS_CODE, DATE_ACC_CODE_LAST_CHANGED from NEW_PERSON WHERE AUTH_TO_WRITE_MED_ORD IS NOT NULL;
```

Rows 33; select NEW\_PERSON\_ID, NAME, ACCESS\_CODE, DATE\_ACC\_CODE\_LAST\_CHANGED from N Selected Rows: 1, Cols: 0

NEW_PERSON_ID	NAME	ACCESS_CODE	DATE_ACC_CODE_LAST_CHANGED
9	DOCTOR,VERY PRIVILEGED	498365838673847335	3170514
11	DOCTOR,ONE	49796768798482	49796768798482
12	NURSE,ONE	<null>	
15	DOCTOR,TWO	50796768798482	50796768798482
16	DOCTOR,THREE	5267YSQ	5267YSQ
17	DOCTOR,FOUR	52796768798482	52796768798482
18	DOCTOR,FIVE	53796768798482	53796768798482
19	DOCTOR,SIX	54796768798482	54796768798482
20	DOCTOR,SEVEN	55796768798482	55796768798482
21	DOCTOR,EIGHT	56796768798482	56796768798482
22	DOCTOR,NINE	57796768798482	57796768798482
23	DOCTOR,TEN	LPWG531	LPWG531
24	DOCTOR,ELEVEN	4730WQD	4730WQD
26	DOCTOR,TWELVE	6565KQL	6565KQL
27	NURSE,TWO	UOMO251	UOMO251
28	NURSE,THREE	3986ICX	3986ICX
29	NURSE,FOUR	KHVG351	KHVG351
30	NURSE,FIVE	SOKH491	SOKH491
31	NURSE,SIX	9521GRK	9521GRK
32	NURSE,SEVEN	1649WEN	1649WEN
33	NURSE,EIGHT	0053HQG	0053HQG
34	NURSE,NINE	GTQC759	GTQC759
35	NURSE,TEN	1252UND	1252UND
36	NURSE,ELEVEN	5176AOR	5176AOR
37	NURSE,TWELVE	9977HOD	9977HOD
38	NURSE,THIRTEEN	...	...

SQLState: XX000  
ErrorCode: 0  
Query 1 of 1, Rows read: 33, Elapsed time (seconds) - Total: 0.028, SQL query: 0.024, Reading results: 0.004

Logs: Errors 27, Warnings 9, Infos 11 40 of 363 MB 1:46:30 PM EDT

# Status & Road Map

- Initial release – SQL-92; read-only
  - VistA Fileman to DDL mapping tool
  - Limited ODBC/JDBC client support
- Current status – INSERT, UPDATE, DELETE usable
  - Constraints under development
- Coming: More SQL functionality (Views, Schemas, ...); more client support (e.g., PowerBI, R)

# GUI

*Sam Habel's GUI presentation at 12:30pm, Fri, Sep 29*



# Administration & Operations GUI

- Functionality
  - Database configuration
  - Administration and Operations
  - View routines
- Status
  - Under active development
  - Currently in field-test

YottaDB Management Console | localhost:8089/index.html?test=84

YottaDB r1.34 (YDBGUI v0.2.0)

Dashboard System info... System Administration Development Documentation

Database: **Healthy**      Journaling: **Healthy**      Replication: **Disabled**

**Storage Usage:** 7%

- DEFAULT: /data/r1.34\_x86\_64/g/yottadb.dat
- DEFAULT: /data/r1.34\_x86\_64/g/yottadb.mjl
- YDBAIM: /data/r1.34\_x86\_64/g/%ydbaim.dat
- YDBOCTO: /data/r1.34\_x86\_64/g/%ydbocto.dat
- YDBOCTO: /data/r1.34\_x86\_64/g/%ydbocto.mjl

**Regions:**

	Name	Database path	Database	Journaling
	DEFAULT	/data/r1.34_x86_64/g/yottadb.dat	<b>Healthy</b>	<b>BeforeImage</b>
	YDBAIM	/data/r1.34_x86_64/g/%ydbaim.dat	<b>Healthy</b>	Disabled
	YDBOCTO	/data/r1.34_x86_64/g/%ydbocto.dat	<b>Healthy</b>	<b>BeforeImage</b>

YottaDB Management Console | Dashboard | System info... | System Administration | Development | Documentation

Region view: DEFAULT

Region | Journal | Names | Stats | Locks |  Show Advanced Parameters | Refresh

Status: **Healthy** | Used space: **49.9 %** | User sessions: **0**

Storage Usage:

Regions:

### Database file

Param	Value
File Name:	/data/r1.34_x86_64/g/yottadb.dat
Current Size:	19.57 Mib
Extension Available:	19.52 Mib
Maximum Size:	39.09 Mib
Access Method:	BG
Global Buffer Count:	1,000 blocks
Lock space:	220 blocks
Async IO:	Off

Create Database file... | Extend database...

### Database access

Param	Value
Record size:	3.98 Kib
Key size:	255 Bytes
Auto DB:	No

Close



YottaDB Management Console | 4. Global Directory Editor — Adm... | 6. YottaDB Journaling — Admini... | B Forms - Bootstrap v4.6

localhost:8089/index.html?test=51

YottaDB r1.34 (YDBGUI v0.2.0) | Dashboard | System info... | System Administration | Development | Documentation

Database: **Healthy** | Journaling: **Issues**

Storage Usage: **7%**

- DEFAULT: /data/r1.34\_x86\_64/g/yottadb.dat
- DEFAULT: /data/r1.34\_x86\_64/g/yottadb.mjl
- YDBAIM: /data/r1.34\_x86\_64/g/%ydbaim.dat
- YDBOCTO: /data/r1.34\_x86\_64/g/%ydbocto.dat
- YDBOCTO: /data/r1.34\_x86\_64/g/%ydbocto.mjl

Regions:

	Name	Database path	Database	Journaling
	DEFAULT	/data/r1.34_x86_64/g/yottadb.dat	<b>Healthy</b>	Enabled/Off
	YDBAIM	/data/r1.34_x86_64/g/%ydbaim.dat	<b>Healthy</b>	Disabled
	YDBOCTO	/data/r1.34_x86_64/g/%ydbocto.dat	<b>Healthy</b>	BeforeImage

localhost:8089/index.html?test=51#

- Regions
  - View...
  - Backup...
  - Restore...
  - Integrity check...
  - Defrag / Compact...
  - Replication
- Add...
- Edit...
- Delete...
- Create Database file...
- Extend database...
- Journaling Start / Stop...

# DevOps, CI/CD

*Sam Habel's VeHU Docker image presentation at 3pm, Sat, Oct 1*



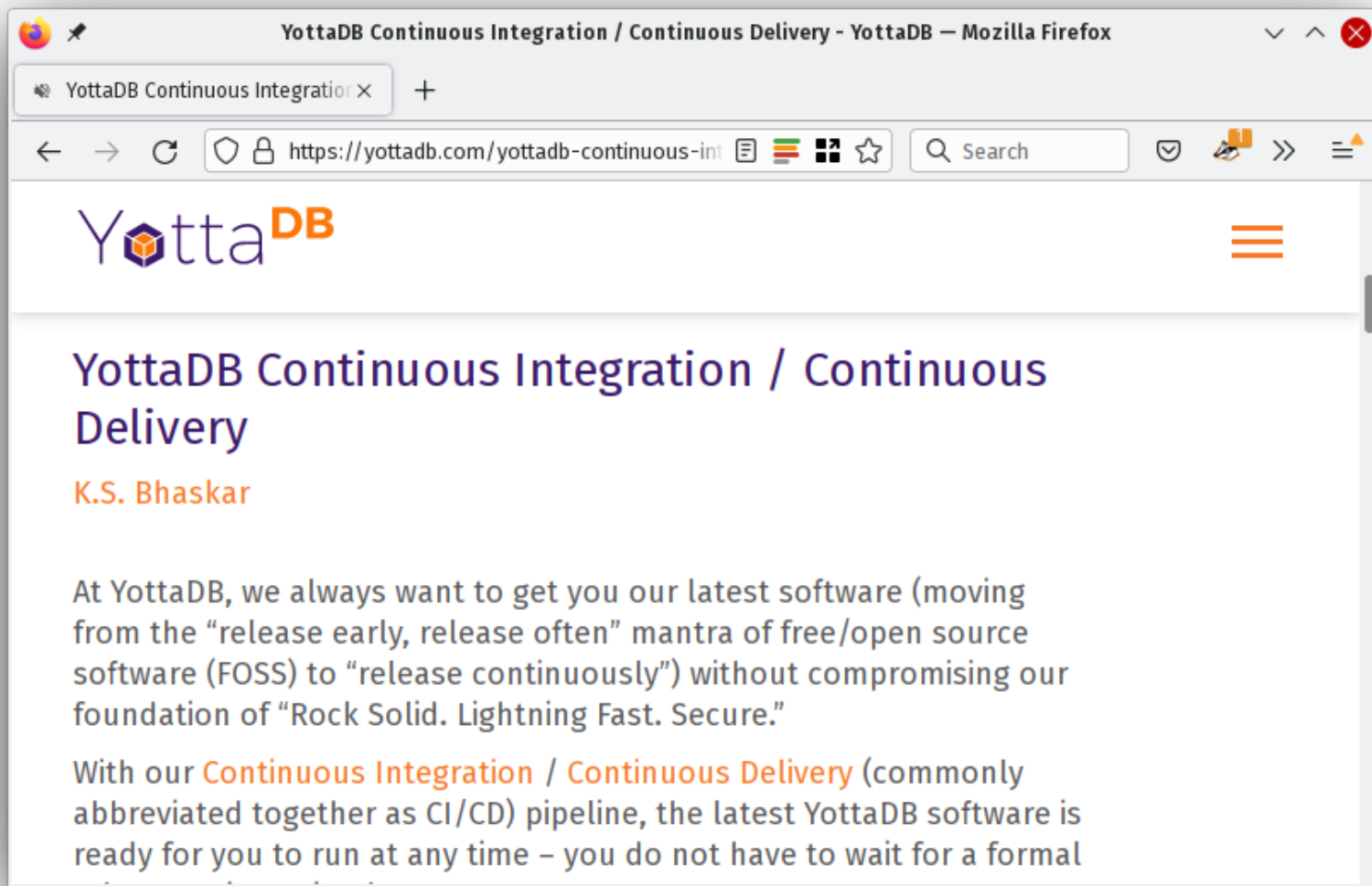
# DevOps, CI/CD

- Containers & Kubernetes: Yes, e.g.,

```
docker run -it --rm -v $(pwd)/ydb-data:/data yottadb/yottadb-debian:latest-master
```

- CI/CD: Yes

# Continuous Release



The screenshot shows a Mozilla Firefox browser window with the title "YottaDB Continuous Integration / Continuous Delivery - YottaDB". The address bar shows the URL "https://yottadb.com/yottadb-continuous-int". The page content includes the YottaDB logo, a navigation menu icon, and the main heading "YottaDB Continuous Integration / Continuous Delivery" by "K.S. Bhaskar". The text describes the company's commitment to continuous releases, moving from a "release early, release often" mantra to "release continuously" while maintaining their core values of "Rock Solid. Lightning Fast. Secure." It also mentions their CI/CD pipeline.

YottaDB Continuous Integration / Continuous Delivery

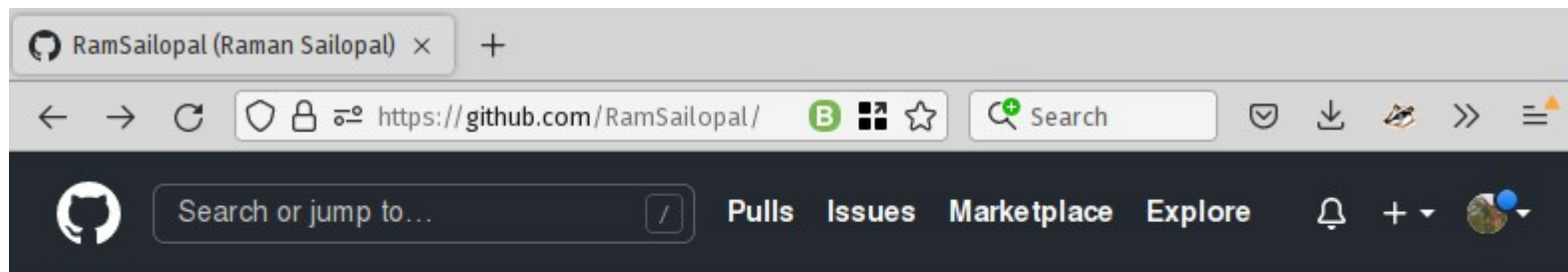
K.S. Bhaskar

At YottaDB, we always want to get you our latest software (moving from the “release early, release often” mantra of free/open source software (FOSS) to “release continuously”) without compromising our foundation of “Rock Solid. Lightning Fast. Secure.”

With our **Continuous Integration / Continuous Delivery** (commonly abbreviated together as CI/CD) pipeline, the latest YottaDB software is ready for you to run at any time – you do not have to wait for a formal

# Ecosystem Examples





**Raman Sailopal**  
RamSailopal

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[Overview](#) [Repositories](#) 74 [Projects](#)

RamSailopal / README.md

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### What's my story?

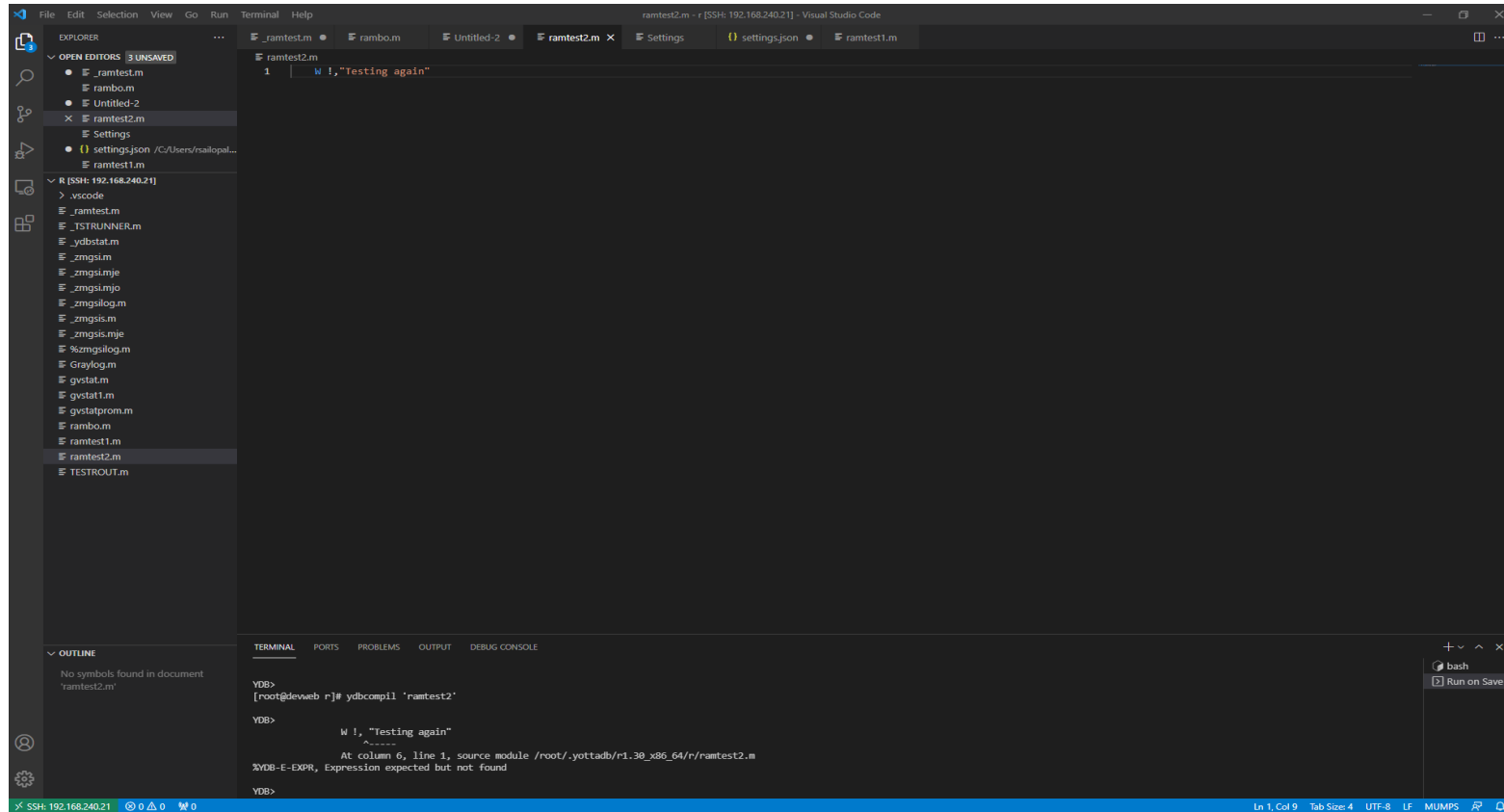
My journey with I.T. began in the late 1990's writing web pages in HTML and Javascript. Dreamweaver was around then but I always thought it was cheating to not code.

I studied Economics at uni in order to "itch a scratch" I had for further knowledge in finance, but was soon back with I.T with my

# Grafana Dashboard



# Editing in Visual Studio



The screenshot shows the Visual Studio Code interface with a file named `ramtest2.m` open. The file content is:

```
1 | W 1, "Testing again"
```

The terminal output shows the following commands and error:

```
YDB> [root@devweb r]# ydbcompil 'ramtest2'  
YDB> W 1, "Testing again"  
      ^-----  
      At column 6, line 1, source module /root/.yottadb/r1.38_x86_64/r/ramtest2.m  
%YDB-E-EXPR, Expression expected but not found  
YDB>
```

The status bar at the bottom indicates the current cursor position: `Ln 1, Col 9`.



# YottaDB vs RocksDB

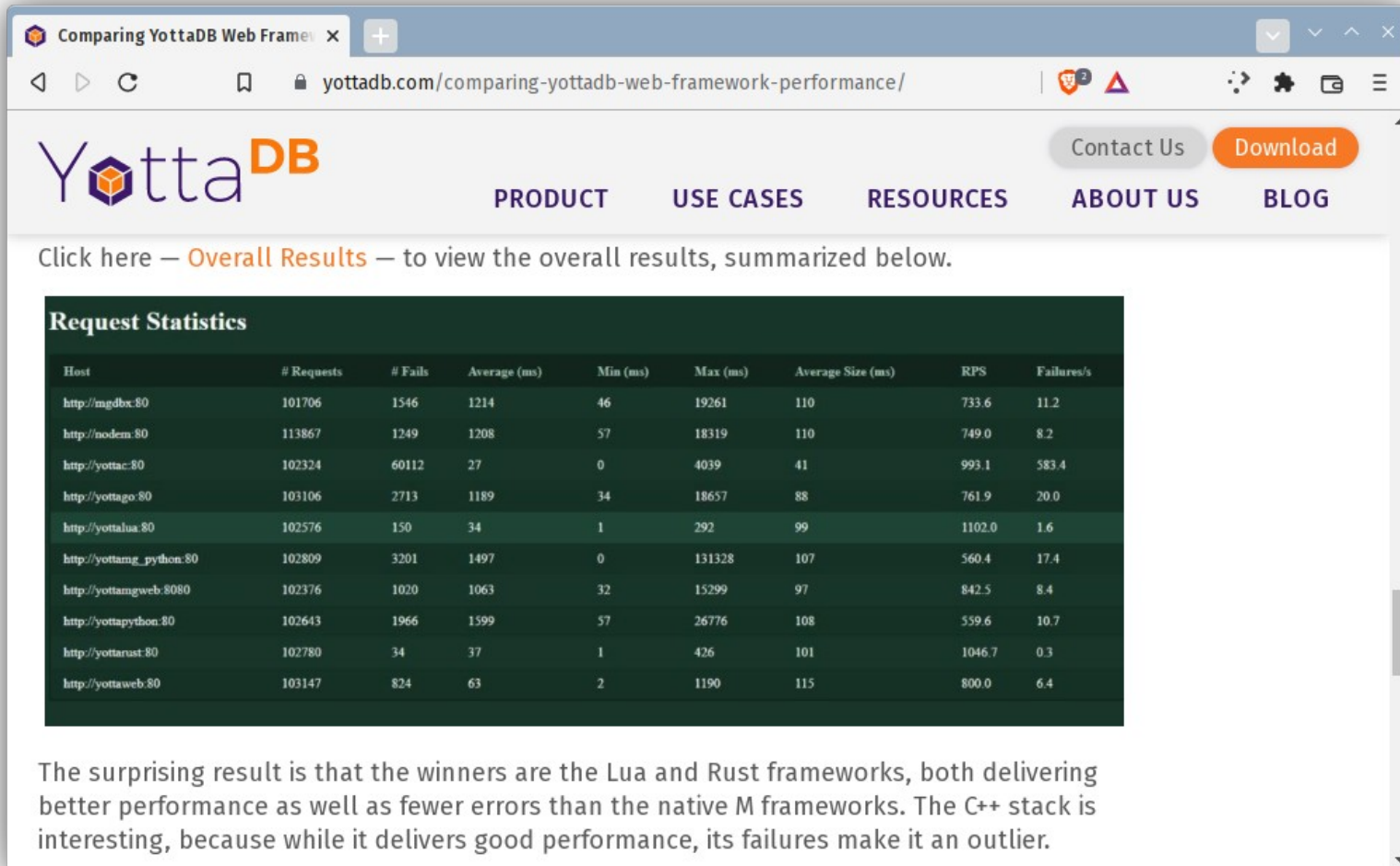


<https://github.com/RamSailopal/YottaDBvsRocksDB>

A screenshot of a web browser window displaying a performance comparison table. The browser's address bar shows the URL `https://htmlpreview.github.io/`. The table compares the performance of RocksDB and YottaDB across four different test scenarios: sequential set test, sequential get test, random get test (1000 shots), and random set test (1000 shots). The metrics measured are real time, user time, and system time (sys).

Stat	RocksDB	YottaDB
<b>Database sequential set test</b>		
real	0m1.312s	0m0.749s
user	0m0.779s	0m0.565s
sys	0m0.521s	0m0.067s
<b>Database sequential get test</b>		
real	0m1.375s	0m0.437s
user	0m0.539s	0m0.382s
sys	0m0.825s	0m0.048s
<b>Database random get test (1000 shots)</b>		
real	0m0.025s	0m0.008s
user	0m0.005s	0m0.000s
sys	0m0.011s	0m0.007s
<b>Database random set test (1000 shots)</b>		
real	0m0.013s	0m0.017s
user	0m0.006s	0m0.003s
sys	0m0.006s	0m0.008s

# YottaDB Web Framework Performance



Click here – [Overall Results](#) – to view the overall results, summarized below.

### Request Statistics

Host	# Requests	# Fails	Average (ms)	Min (ms)	Max (ms)	Average Size (ms)	RPS	Failures/s
http://mgdbx:80	101706	1546	1214	46	19261	110	733.6	11.2
http://nodem:80	113867	1249	1208	57	18319	110	749.0	8.2
http://yottac:80	102324	60112	27	0	4039	41	993.1	583.4
http://yottago:80	103106	2713	1189	34	18657	88	761.9	20.0
http://yottalua:80	102576	150	34	1	292	99	1102.0	1.6
http://yottamg_python:80	102809	3201	1497	0	131328	107	560.4	17.4
http://yottamgweb:8080	102376	1020	1063	32	15299	97	842.5	8.4
http://yottapython:80	102643	1966	1599	57	26776	108	559.6	10.7
http://yottarust:80	102780	34	37	1	426	101	1046.7	0.3
http://yottaweb:80	103147	824	63	2	1190	115	800.0	6.4

The surprising result is that the winners are the Lua and Rust frameworks, both delivering better performance as well as fewer errors than the native M frameworks. The C++ stack is interesting, because while it delivers good performance, its failures make it an outlier.

- JsonHIVES – JSON document store
  - Like MongoDB or Couchbase
  - (Still in development)

json  
HIVES

# jsonHIVES vs. MongoDB\* ... 1

- Caveats
  - jsonHIVES is still in development
  - Both were compared “out of the box” with no tuning or optimization

\* courtesy Stefano Lalli

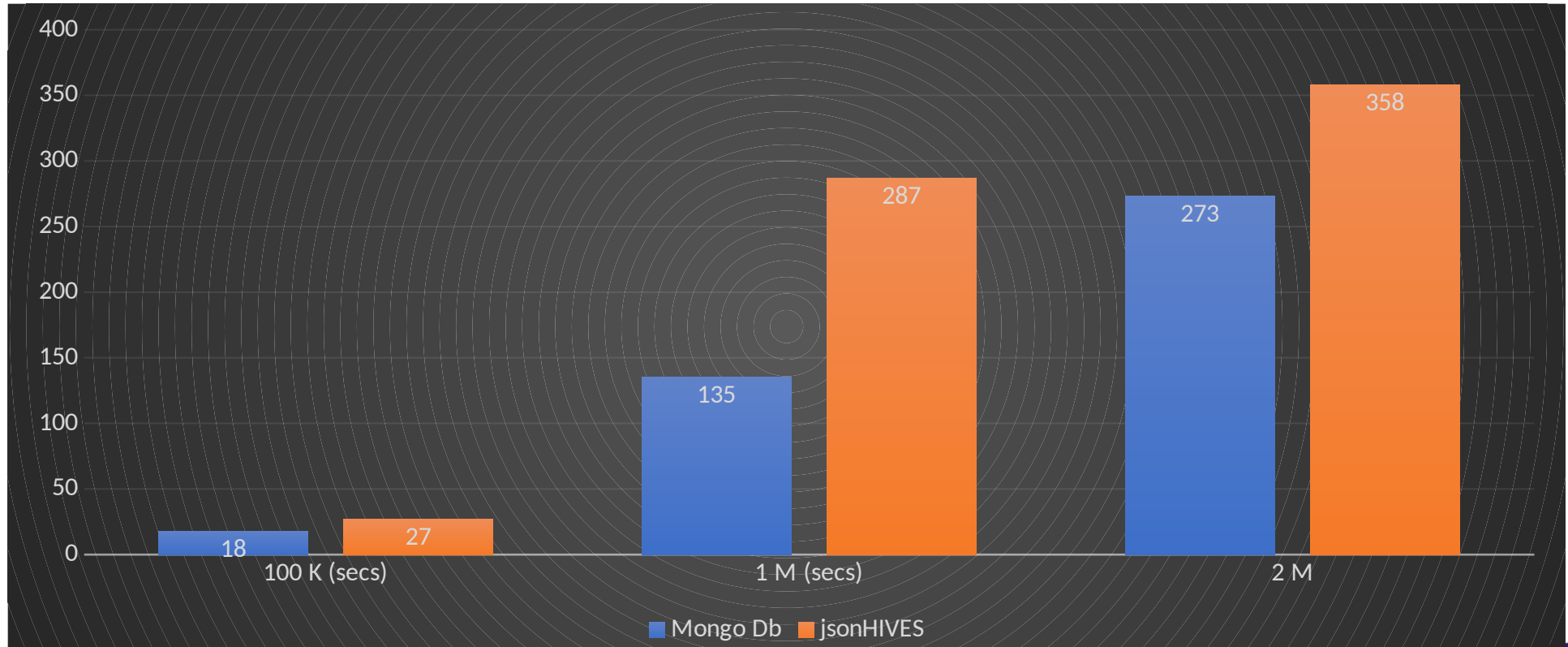
## jsonHIVES vs. MongoDB ... 2

- Identical data
  - 100 million identical records
  - Each record contains 15 nodes, i.e., 1.5 billion nodes
  - Indexes on searched fields
- Docker containers had same number of CPUs & RAM

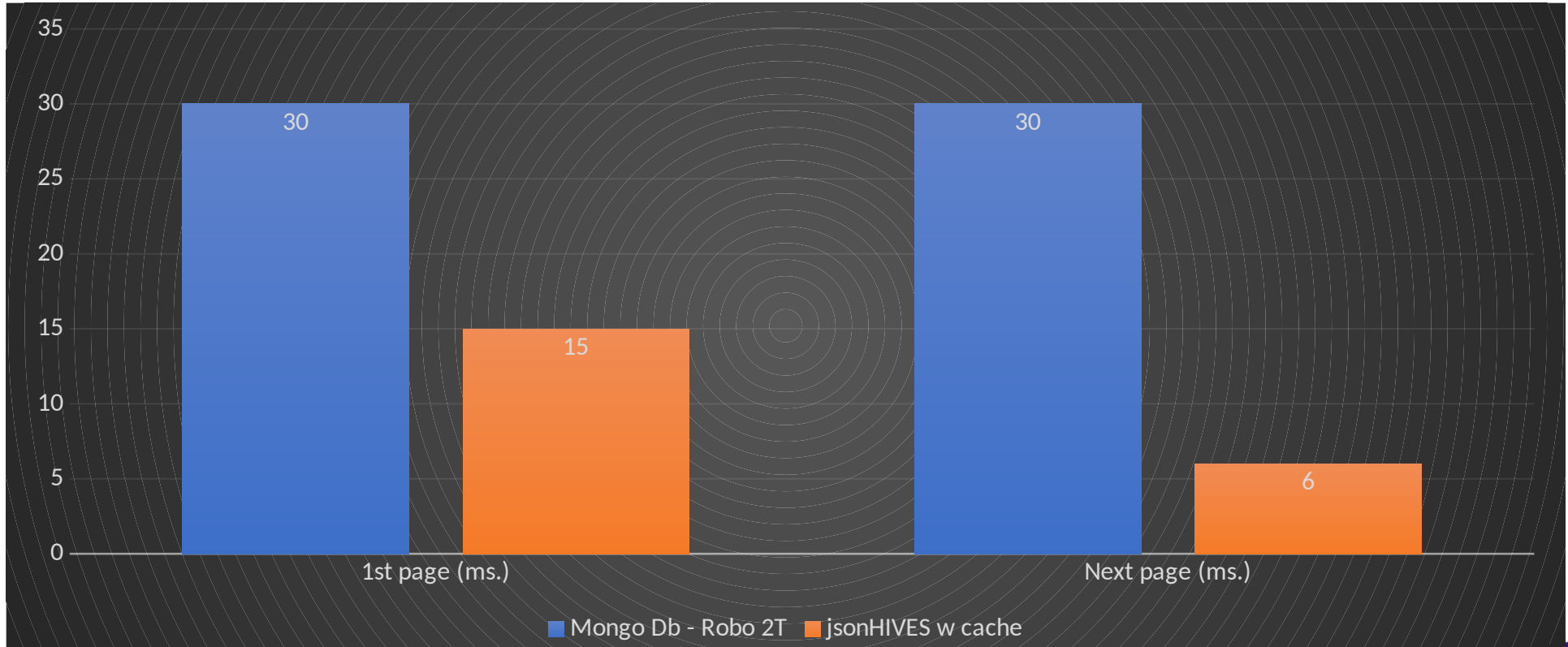
## jsonHIVES vs. MongoDB ... 3

- Clients
  - JsonHIVES – node.js driver
  - MongoDB – Robo2T (now called bongo)
- Page fetches with 50 records (750 nodes)

# Bulk Insert Records

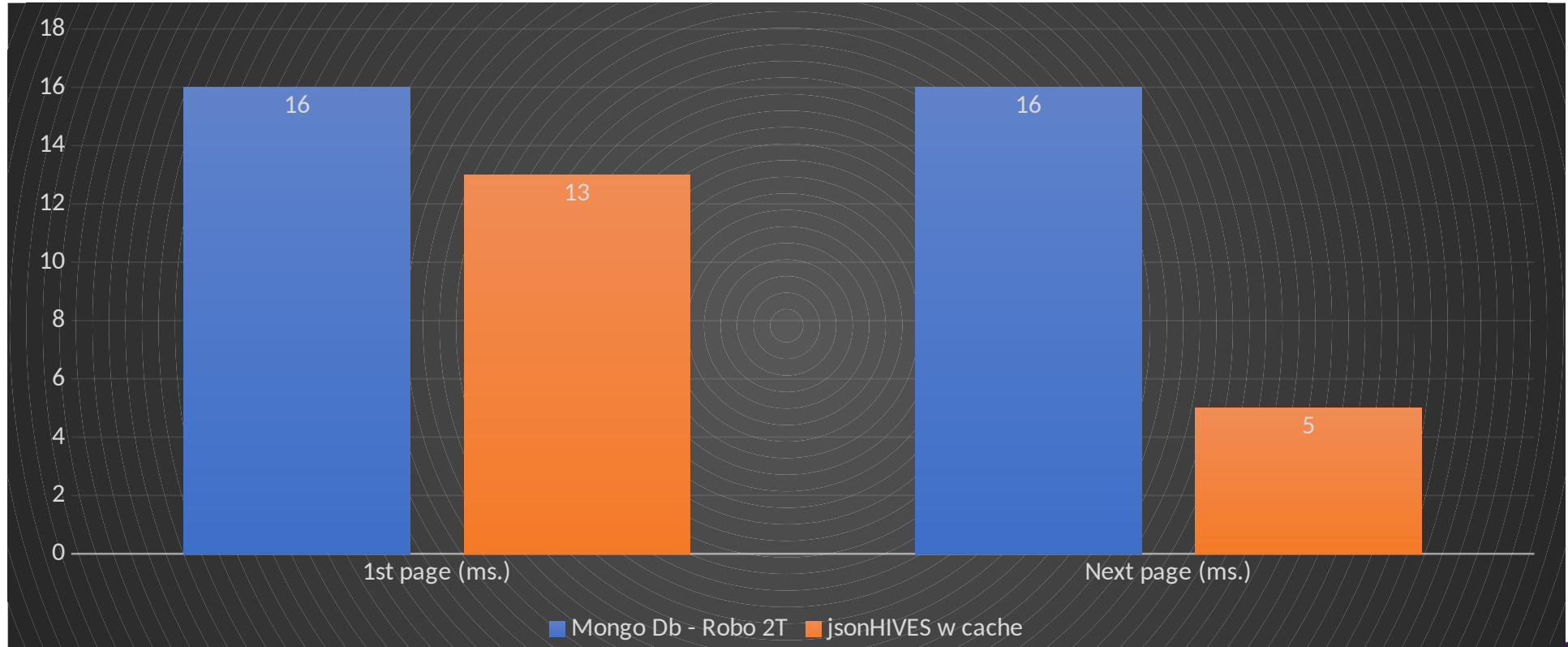


SELECT \* WHERE name.last = "RAMOS"

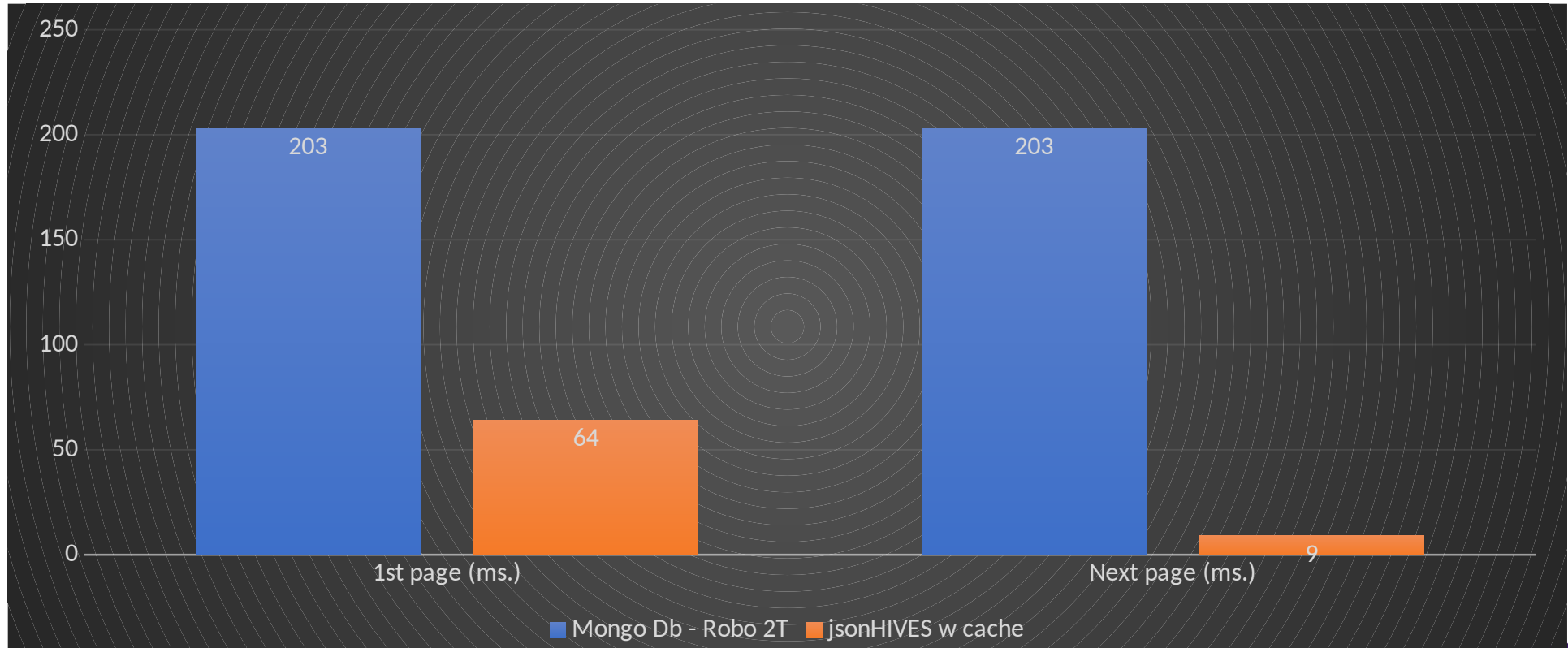




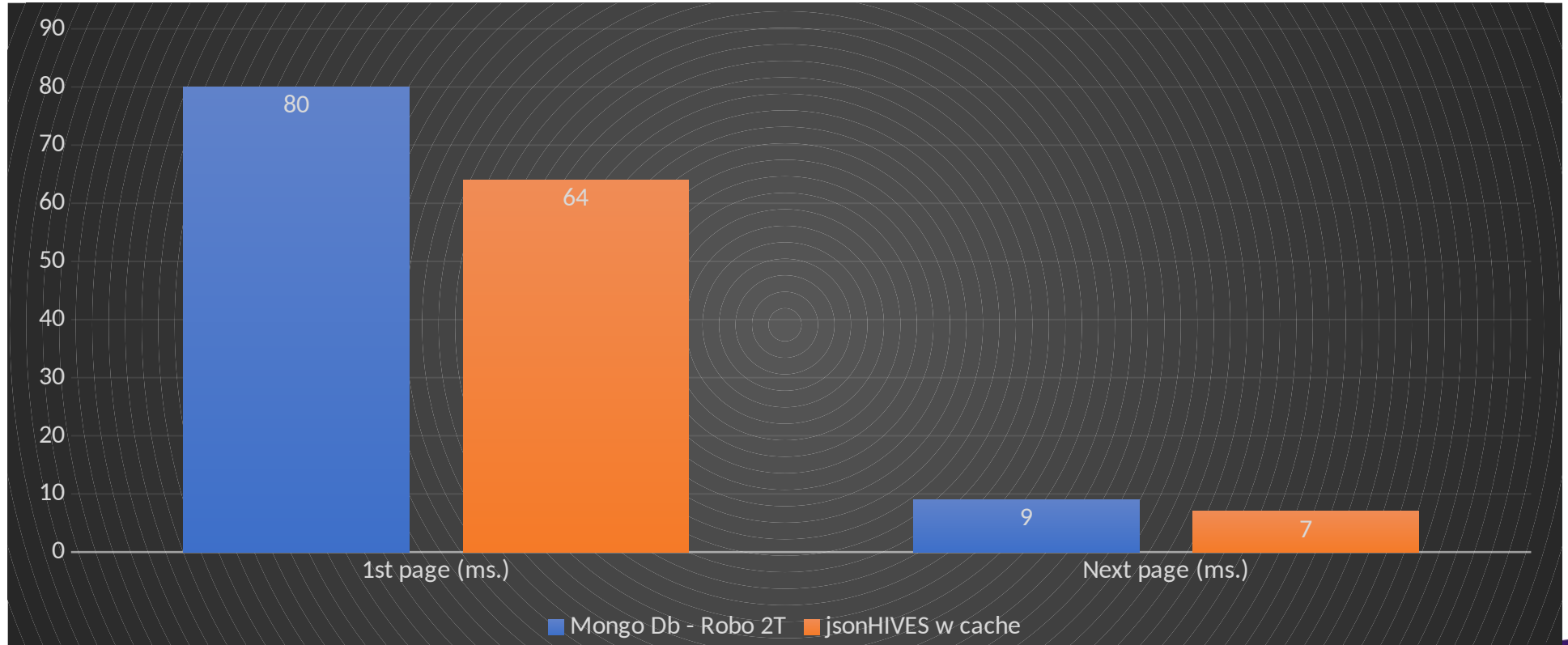
# SELECT \* WHERE zip = 90210



SELECT \* WHERE city = "San Francisco" AND state = "California"



SELECT \* WHERE state LIKE "%as" ( /as\$/ )



# Licensing

- MongoDB – not FOSS
  - <https://opensource.org/sspl-not-open-source>
- YottaDB – 100% FOSS (AGPL v3)
- jsonHIVES – to be released as FOSS (AGPL v3)

The screenshot shows a web browser window displaying the GitHub profile of user 'robtweed'. The browser's address bar shows 'github.com/robtweed'. The GitHub navigation bar includes a search box, 'Pulls', 'Issues', 'Marketplace', and 'Explore'. The profile header shows 'robtweed' with a 'Follow' button and '118 followers · 1 following'. The 'Overview' tab is selected, showing a grid of 'Popular repositories':

- qewd** (Public): Quick and Easy Web Development. JavaScript, 113 stars, 12 forks.
- DPP** (Public): Deep Persistent Proxy Objects for JavaScript. JavaScript, 65 stars, 2 forks.
- node-mdb** (Public): Node.js Implementation of SimpleDB Clone (MDB). Objective-C, 43 stars, 5 forks.
- qewd-transform-json** (Public): Transforms JavaScript Objects using a Template Object. JavaScript, 34 stars, 16 forks.

	YottaDB	IRIS	Redis	Berkeley DB	LMDB
Set	1.23	1.16	194.19	1.70	3,672.02
Get	0.78	0.87	49.71	1.45	1.13
XML parse	3.22	3.70	27.34	3.69	161.45
XML output	0.74	0.82	4.06	0.93	0.73

All times in seconds

#### XML parse:

- 3,471 DOM nodes
- 287,604 API calls

# Roadmap



# Foundations To Build On

- Successes to build on
  - Largest VistA system (Hakeem)
  - Large banking systems (tens of millions of accounts)
  - Paying customers for multiple language & SQL access
- Waiting for success
  - IoT applications – good technical fit, but looking for first adopter



# More Attention Needed

- Recruiting – continuing challenge to find talent
- Marketing
  - Paused for pandemic; slowly resuming
  - May need to find partner(s)



YottaDB

*Thank You!*

K.S. Bhaskar  
bhaskar@yottadb.com

yottadb.com