The Sugar-free Chocolate of **Databases**

Matt Butrovich Carnegie Mellon University #1 Ranked CMU-DB PhD Student

Eating Smarter

Food labels in the US are wild.



Staring at DBMS Traces

Length Info 28 47/27/DV/72 28 47/27/DV/72 213 47/8/DVE/5 134 41/21/nC/1/21/n/C/1/21/
340 +PRIDIE/S 725 +PRIDIE/S/BIDIE/S 725 +PRIDIE/S/BIDIE/P/BIDIE/P/BIDIE/P/BIDIE/P/BIDIE/P/BIDIE/P/BIDIE/P/BIDIE/S 726 +VI2/VI2/VI2/VI2/VI2/VI2/VI2/VI2/VI2/VI2/
762 4.1/2/T0P/C/Z 225 >PR/B/D/E/PR/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/S 2951 >P/B/D/E/P 2052 >P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/S 302 >P/B/D/E/S 313 >P/B/D/E/S 314
2275 >>P/B/D/E/P/B/D/E/S 134 -4/2/n/C/1/2/n/C/2 2951 >P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/P/B/D/E/S 302 -4/2/n/C/1/2/n/C/2 39 -P/B/D/E/S 30 -4/2/T/D/C/Z 30 -P/B/D/E/S 30 -4/2/T/D/C/Z 30 -P/B/D/E/S 30 -4/2/T/D/C/Z 30 -4/2/T/D
134 4.1/2/n/C/12/n/C/1/2/n/C/1
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362 41/2/n/C/1/n/C/1/2/n/C/2/n/C/1/2/n/C/1/2/n/C/1/2/n/C/1/2/n/C/1/2/n/C/1/2/n/C/1/2/n
118 $> p/3/n/E/S$ 142 $< 1/2/T/D(C/Z)$ 199 $> n/n/E/S$ 94 $< 1/2/C/Z$ 244 $> n/n/E/P/N/D/E/S$ 159 $< 1/2/C/1/2/T/D/C/Z$ 329 $> n/n/n/E/S$ 146 $< 1/2/T/D/C/Z$ 139 $> n/n/n/E/S$ 142 $< 1/2/T/D/C/Z$ 139 $> n/n/E/S$ 94 $< 1/2/C/I/2/T/D/C/Z$ 139 $> n/n/E/S$ 140 $< 1/2/T/D/C/Z$ 159 $> p/n/E/S$ 141 $< 1/2/T/D/C/Z$ 152 $> p/n/n/E/S$ 152 $< 1/2/T/D/C/Z$ 153 $< 1/2/T/D/C/Z$ 154 $> n/n/n/E/S$ 153 $< 1/2/T/D/C/Z$ 154 $> n/n/n/E/S$ 154 $< 1/2/T/D/C/Z$ 155 $> n/n/L/S$ 165 $< 1/2/T/D/C/Z$ 175 $> n/n/D/E/S$ 163 $< 1/2/n/C/Z$ 176 $> n/n/D/E/S$ 177 $< 1/2/T/D/C/Z$ 177 $> n/n/C/Z$ 177 $> n/n/C/Z$ 178 $> n/n/L/S$ 179 $> n/n/L/S$ 170 $< 1/2/T/D/C/Z$ 170 $> n/n/L/S$ 170 $< 1/2/T/D/C/Z$ 170 $> n/n/L/S$ 170 $< 1/2/T/D/C/Z$ 170 $> n/n/L/S$ 170 $< 1/2/T/D/C/Z$ 170 $> n/n/L/S$ 170 $< 1/2/T/D/C/Z$
142 $< 4.1/2/T/D/C/Z$ 149 $>P/B/E/F/S$ 244 $>P/B/E/P/B/D/E/S$ 159 $< 1.2/C/1/2/T/D/C/Z$ 322 $>P/B/D/E/S$ 146 $< 1.2/T/D/C/Z$ 138 $>P/B/D/E/S$ 142 $< 1.2/T/D/C/Z$ 149 $>P/B/E/S$ 243 $< 1.2/C/C/Z$ 253 $>P/B/E/P/B/D/E/S$ 243 $< 1.2/C/C/Z$ 169 $>P/B/D/E/S$ 144 $< 1.2/T/D/C/Z$ 252 $>P/B/D/E/S$ 182 $< 1.2/Z/D/C/Z$ 263 $>D/B/D/E/S$ 183 $< 1.2/T/D/C/Z$ 273 $>P/B/D/E/S$ 184 $< 1.2/T/D/C/Z$ 273 $>P/B/D/E/S$ 185 $< 1.2/Z/T/D/C/Z$ 273 $>P/B/D/E/S$ 183 $< 1.2/T/D/C/Z$ 273 $>P/B/D/E/S$ 183 $< 1.2/T/D/C/Z$ 273 $>P/B/D/E/S$ 183 $< 1.2/T/D/C/Z$ 273 $>P/B/D/E/S$ 273 $>P/B/D/E/S$ 274 $>P/B/D/E/S$ 275 $>P$
109 \$P/B/F/5 94 <1/2/C/2 244 \$P/B/F/P/B/D/F/5 109 <1/2/C/1/2/T/D/C/Z 329 \$P/B/D/F/5 146 <1/2/T/D/C/Z 118 \$P/B/D/F/5 142 <1/2/T/D/C/Z 199 \$P/B/F/5 34 <1/2/C/1/2/T/D/C/Z 199 \$P/B/D/F/5 143 <1/2/C/1/2/T/D/C/Z 125 \$P/B/D/F/5 182 <1/2/T/D/C/Z 225 \$P/B/D/F/5 183 <1/2/N/C/Z 233 \$P/B/D/F/5 184 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 183 <1/2/N/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 235 \$P/B/D/F/5 235 <1/2/T/D/C/Z 236 \$P/B/D/F/5 236 \$P/B/D/F/5 237 <1/2/T/D/C/Z 236 \$P/B/D/F/5 237 <1/2/T/D/C/Z 236 \$P/B/D/F/5 238 \$P/B/D/F/5 239 \$P/B/D/F/5 230 \$P/B/D/F/5 230 \$P/B/D/F/5 230 \$P/B/F/5 230 \$P/B
9 4 1/2/C/2 24 + P/B/E/P/B/D/E/S 169 <1/2/C/1/2/T/D/C/Z 322 *P/B/D/E/S 146 <1/2/T/D/C/Z 139 *P/B/E/S 142 <1/2/T/D/C/Z 293 *P/B/E/P/B/D/E/S 243 <1/2/C/2 295 *P/B/D/E/S 144 <1/2/T/D/C/Z 212 *P/B/D/E/S 182 <1/2/T/D/C/Z 212 *P/B/D/E/S 183 <1/2/N/C/Z 213 *P/B/D/E/S 184 <1/2/T/D/C/Z 213 *P/B/D/E/S 183 <1/2/N/C/Z 213 *P/B/D/E/S 183 <1/2/N/C/Z 213 *P/B/D/E/S 183 <1/2/N/C/Z 213 *P/B/D/E/S 213 *P/B/D/E/S 213 *P/B/D/E/S 213 *P/B/D/E/S 213 *P/B/D/E/S 213 *P/B/D/E/S
244 >P/B/E/P/B/D/E/S 169 <1/2/C/1/2/T/D/C/Z 392 >P/B/D/E/S 146 <1/2/T/D/C/Z 189 >P/B/D/E/S 142 <1/2/T/D/C/Z 293 >P/B/E/P/B/D/E/S 243 <1/2/C/1/2/T/D/C/Z 169 >P/B/D/E/S 124 <1/2/T/D/C/Z 225 >P/B/D/E/S 126 <1/2/T/D/C/Z 225 >P/B/D/E/S 121 <1/2/T/D/C/Z 225 >P/B/D/E/S 123 <1/2/T/D/C/Z 225 >P/B/D/E/S 124 <1/2/T/D/C/Z 225 >P/B/D/E/S 125 <1/2/T/D/C/Z 225 >P/B/D/E/S 126 <1/2/T/D/C/Z 227 >P/B/D/E/S 228 <1/2/T/D/C/Z 229 >P/B/D/E/S 233 >P/B/D/E/S 243 <1/2/T/D/C/Z 243 >P/B/D/E/S
169 4/2/(7/2/T/D/C/Z 392 P/B/D/E/S 146 4/2/T/D/C/Z 118 *P/B/D/E/S 149 4/2/2/C/Z 233 *P/B/E/P/B/D/E/S 243 4/2/C/12/T/D/C/Z 159 *P/B/D/E/S 164 4/2/T/D/C/Z 222 *P/B/D/E/S 182 4/2/T/D/C/Z 225 *P/B/D/E/S 183 4/2/n/C/Z 233 *P/B/D/E/S 183 4/2/n/C/Z 233 *P/B/D/E/S 183 4/2/n/C/Z 233 *P/B/D/E/S 183 4/2/n/C/Z 233 *P/B/D/E/S 233 *P/B/D/E/S 233 *P/B/D/E/S 233 *P/B/D/E/S 233 *P/B/D/E/S
322 >>P/B/D/E/S 146 <\2/17/D/C/Z 118 >>P/B/D/E/S 142 <\2/27/D/C/Z 293 >>P/B/D/E/S 243 <\1/2/C/1/27/D/C/Z 253 >>P/B/D/E/S 144 <\1/2/T/D/C/Z 222 >>P/B/D/E/S 122 <>P/B/D/E/S 123 <<1/2/T/D/C/Z 223 >>P/B/D/E/S 134 <\1/2/T/D/C/Z 234 >>P/B/D/E/S 135 <<1/2/T/D/C/Z 235 >>P/B/D/E/S 136 <\1/2/T/D/C/Z 233 >>P/B/D/E/S 138 <\1/2/T/D/C/Z 233 >>P/B/D/E/S 138 <\1/2/T/D/C/Z 138 >>P/B/D/E/S 139 <\1/2/T/D/C/Z 139 >>P/B/D/E/S 130 <\1/2/T/D/C/Z 139 >>P/B/D/E/S 131 <\1/2/T/D/C/Z 133 +>P/B/D/E/S 133 <\1/2/T/D/C/Z 134 >>P/B/D/E/S
146 4/2/T/D/C/Z 118 >P/B/D/E/S 142 4/2/T/D/C/Z 199 >P/B/E/P/B/D/E/S 243 4/2/C/12/T/D/C/Z 159 >P/B/D/E/S 144 4/2/T/D/C/Z 222 >P/B/D/E/S 182 4/2/T/D/C/Z 235 >P/B/D/E/S 181 41/2/n/C/Z 349 >P/B/D/E/S 183 41/2/n/C/Z 233 >P/B/D/E/S 183 41/2/n/C/Z 233 >P/B/D/E/S 183 41/2/n/C/Z 233 >P/B/D/E/S 233 41/2/n/C/Z 233 +P/B/D/E/S 233 41/2/n/C/Z 233 +P/B/D/E/S 233 41/2/n/C/Z
118 $\Rightarrow P(B/D)E/S$ 142 $< 1/2/T/D(C/Z)$ 169 $\Rightarrow P(B/E/S)$ 33 $\Rightarrow P(B/E/P/B/D)E/S$ 243 $< 1/2/C/1/2/T/D/C/Z$ 169 $\Rightarrow P(B/D)E/S$ 144 $< 1/2/T/D/C/Z$ 222 $\Rightarrow P(B/D)E/S$ 182 $< 1/2/T/D/C/Z$ 225 $\Rightarrow P(B/D)E/S$ 181 $< 1/2/n/C/Z$ 249 $\Rightarrow P(B/D)E/S$ 183 $< 1/2/n/C/Z$ 249 $\Rightarrow P(B/D)E/S$ 163 $< 1/2/n/C/Z$ 249 $\Rightarrow P(B/D)E/S$ 253 $< 1/2/T/D/C/Z$ 264 $\Rightarrow P(B/D)E/S$ 265 $< 1/2/T/D/C/Z$
142 $41/2/T/0/C/Z$ 199 $P/B/E/S$ 293 $P/B/E/P/B/D/E/S$ 293 $P/B/E/P/B/D/E/S$ 293 $P/B/D/E/S$ 199 $P/B/D/E/S$ 194 $41/2/T/D/C/Z$ 202 $P/B/D/E/S$ 192 $41/2/T/D/C/Z$ 203 $P/B/D/E/S$ 193 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 193 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 193 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 193 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 203 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 203 $41/2/n/C/Z$ 203 $P/B/D/E/S$ 203 $41/2/n/C/Z$ 204 $41/2/n/C/Z$ 205 $P/B/D/E/S$ 205 $41/2/T/D/C/Z$ 206 $41/2/n/C/Z$
109 >>/B/E/F/S 94 <1/2/C/Z 233 >P/B/E/P/B/D/E/S 243 <1/2/C/1/2/T/D/C/Z 169 >>/B/D/E/S 144 <1/2/T/D/C/Z 222 >>/B/D/E/S 182 <1/2/T/D/C/Z 253 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 263 <1/2/T/D/C/Z 273 >>/B/D/E/S 263 <1/2/T/D/C/Z
94 <1/2/C/Z 293 >P/B/E/P/B/D/E/S 243 <1/2/C/1/2/T/D/C/Z 169 >P/B/D/E/S 144 <1/2/T/D/C/Z 222 >P/B/D/E/S 182 <1/2/T/D/C/Z 225 >P/B/D/E/S 101 <1/2/n/C/Z 233 >P/B/D/E/S 183 <1/2/n/C/Z 233 >P/B/D/E/S 183 >C1/2/n/C/Z 233 >P/B/D/E/S 183 >C1/2/n/C/Z 233 >P/B/D/E/S 183 >C1/2/T/D/C/Z 243 >0 >P/B/D/E/S 263 <1/2/T/D/C/Z
233 >>//0/E/P/3/0/E/S 243 <1/2/C/1/2/T/D/C/Z 169 >P/B/D/E/S 144 <1/2/T/D/C/Z 222 >>/B/D/E/S 182 <1/2/T/D/C/Z 253 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 183 <1/2/n/C/Z 233 >>/B/D/E/S 183 <1/2/n/C/Z 349 >>/B/D/E/S 263 <1/2/T/D/C/Z 349 >>/B/D/E/S
243 41/2/(71/2/T/0/C/Z 169 >P/B/D/E/S 144 <1/2/T/D/C/Z 222 >P/B/D/E/S 182 <1/2/T/D/C/Z 215 >P/B/D/E/S 101 <1/2/n/C/Z 223 >P/B/D/E/S 103 <1/2/n/C/Z 233 >P/B/D/E/S 103 <1/2/n/C/Z 103 >01/2/n/C/Z 103 >01/2/n/C/Z 103 >01/2/T/D/C/Z 103 >01/2/T/D/C/Z 105 >01/2/T/D/C/Z 105 >01/2/T/D/C/Z
169 >>/8/0/E/S 144 <1/2/T/D/C/Z 222 >>/8/D/E/S 162 <1/2/T/D/C/Z 225 >>/8/D/E/S 101 <1/2/n/C/Z 103 <1/2/n/C/Z 103 <1/2/n/C/Z 103 <1/2/n/C/Z 103 <1/2/n/C/Z 103 >>/8/D/E/S 103 <1/2/T/D/C/Z 103 >>/8/D/E/S 103 <1/2/T/D/C/Z 103 >>/8/D/E/S 103 <1/2/T/D/C/Z
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225 >P/B/D/E/S 101 <1/2/n/C/Z 349 >P/B/D/E/S 103 <1/2/n/C/Z 223 >P/B/D/E/S 103 <1/2/n/C/Z 103 >P/B/D/E/S 263 <1/2/T/D/C/Z 340 >P/B/D/E/S 767 <1/2/T/D/C/Z
101 <1/2/n/C/Z 349 >>/B/0/E/S 103 <1/2/n/C/Z 223 >>/B/0/E/S 103 <1/2/n/C/Z 103 >>/B/0/E/S 263 <1/2/T/0/C/Z 340 >>/B/0/E/S 767 <1/2/T/0/C/Z
349 >P/B/D/E/S 103 <1/2/n/C/Z 223 >P/B/D/E/S 103 <1/2/n/C/Z 103 >P/B/D/E/S 263 <1/2/T/D/C/Z 340 >P/B/D/E/S 767 <1/2/T/D/C/Z
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263 <1/2/T/D/C/Z 340 >P/B/D/E/S 767 <1/2/T/D/C/Z
340 >P/B/D/E/S 767 <1/2/T/D/C/Z
767 <1/2/T/D/C/Z
105 #/15/07/27 270 <1/2/17/07/27 340 >P/B/07/E/5 764 <1/27/07/27 118 bytes captured (944 bits) 0000 1c 69 7a 60 7b e4 d4 5d df 1a 23 04 08 00 45 00 ·12`{··]·#···E·

Zero Calorie Queries

- 1,462,909 queries from various workloads...
- CMDBAC data set shows that they are 27% of all queries!



Look in your SQL logs and you'll see these queries over and over again!

File Edit View Bookmarks Plugins Settings Help
2022-10-09T05:02:55.618041Z 1906268 Query SELECT `core_system`.`id`, `core_system`.`slug`, `core_system`.`name`, `core_system`.`created`, `core_system`.`id`,
.`modified`, `core_system`.`secret_key`, `core_system`.`view_count`, `core_system`.`ver` FROM `core_system` WHERE `core_system`.`id` = 277 LIMIT 21
2022-10-09T05:02:55.618834Z 1906268 Query SELECT core_systemvisit`.`id`, `core_systemvisit`.`system_id`, `core_systemvisit`.`ip_address`, `core_system
visit`.`user_agent`, `core_systemvisit`.`created` FROM `core_systemvisit` WHERE (`core_systemvisit`.`ip_address` = '122.165.124.50' AND `core_systemvisit`.`u
ser_agent` = 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/76.0.3809.132 Safari/537.36')
2022-10-09T05:02:55.679771Z 1907203 Connect peloton_user@localhost on using Socket
2022-10-09T05:02:55.679936Z 1907203 Query SET NAMES utf8mb4
2022-10-09T05:02:55.680196Z 1907203 Query ST NAMES 'utf8mb4' COLLATE 'utf8mb4_unicode_520_ci'
2022-10-09105:02:55.680251Z 1907203 Query SELECT @@SESSION.sql_mode
2022-10-09T05:02:55.680347Z 1907203 Query SI SESSION sql_mode='NO_ZERO_IN_DATE,ERROR_FOR_DIVISION_BY_ZERO,NO_AUTO_CREATE_USER,NO_ENGINE_SUBSTITUTION'
2022-10-09105:02:55.680405Z 1907203 Init DB peloton
2022-10-09705:02:55.6809552 1907203 Query SELECT option_name, option value FROM wp_options WHERE autoload = 'yes'
2022-10-09T05:02:55.685831Z 1907203 Query SELECT option_value FROM wp_options WHERE option_name = 'gzipcompression' LIMIT 1
Come loash Come loash Papers: bash X

DBMS Proxies to the Rescue

- PgBouncer, RDS Proxy, ProxySQL
- Features:
 - Connection pooling
 - Query rewriting
 - Sharding
 - Query caching

What I Do

- **Tigger** is a proxy that pushes Application Layer (i.e., L7) DBMS protocol logic into kernel-space via eBPF.
- Perform things like transaction pooling and workload replication without ever going to user-space. **User-bypass**.



I am graduating in early 2024. I will be expensive to hire.

https://mattbutrovi.ch