DEVOXX TM

NoSQL Means No Security?

Philipp Krenn
Elastic

elastic

DEVELOPER 

343 systems in ranking, June 2018

Rank Jun 2018	Rank May 2018	Rank Jun 2017	DBMS	Database Model	Score Jun 2018	Score May 2018	Score Jun 2017
1.	1.	1.	Oracle	Relational DBMS	1311.25	+20.84	-40.51
2.	2.	2.	MySQL	Relational DBMS	1233.69	+10.35	-111.62
3.	3.	3.	Microsoft SQL Server	Relational DBMS	1087.73	+1.89	-111.23
4.	4.	4.	PostgreSQL	Relational DBMS	410.67	+9.77	+42.13
5.	5.	5.	MongoDB	Document store	343.79	+1.67	+8.79
6.	6.	6.	DB2	Relational DBMS	185.74	+0.01	-1.86
7.	7.	9.	Redis	Key-value store	136.30	+0.23	+17.42
8.	9.	11.	Elasticsearch	Search engine	131.04	+0.60	+19.48
9.	8.	7.	Microsoft Access	Relational DBMS	130.99	-2.12	+4.44
10.	10.	8.	Cassandra	Wide column store	119.21	+1.38	-4.91
11.	11.	10.	SQLite	Relational DBMS	114.26	-1.19	-2.44
12.	12.	12.	Teradata	Relational DBMS	75.77	+1.36	-1.55
13.	14.	18.	MariaDB	Relational DBMS	65.85	+0.85	+12.95
14.	13.	16.	Splunk	Search engine	65.78	+0.68	+8.26
15.	15.	14.	Solr	Search engine	62.06	+0.55	-1.55

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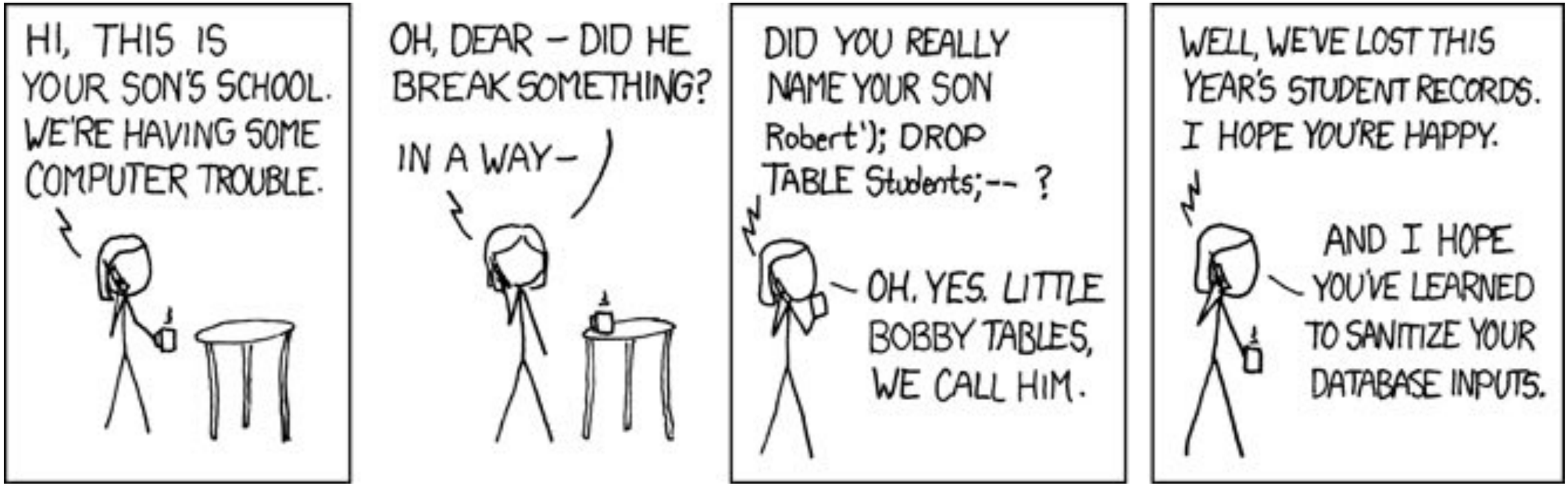
Q: https://sli.do/xeraa

A: https://twitter.com/xeraa


HI, THIS IS YOUR SON'S SCHOOL. WE'RE HAVING SOME COMPUTER TROUBLE.
OH, DEAR - DID HE BREAK SOMETHING?
IN A WAY-
DID YOU REALLY NAME YOUR SON Robert'); DROP TABLE Students;-- ?
OH. YES. LITTLE BOBBY TABLES, WE CALL HIM.
WELL, WE'VE LOST THIS YEAR'S STUDENT RECORDS. I HOPE YOU'RE HAPPY.
AND I HOPE YOU'VE LEARNED TO SANITIZE YOUR DATABASE INPUTS.

Marcus Fulbright
@MarcusFulbright

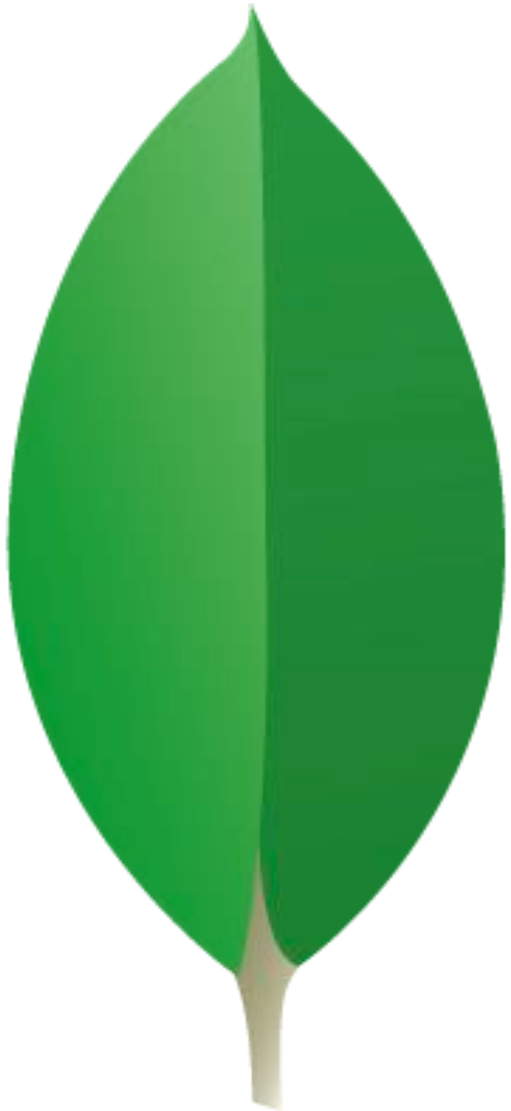
Follow

Best argument for NoSQL: You can't have SQL injection attacks if you don't have SQL.

1:32 AM - 27 Oct 2017

8 Retweets **16** Likes

4 8 16



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Adam Kent
@akent

Follow

MongoDB IPO? Now you can lose your data AND your money!

2:49 AM - 22 Sep 2017

18 Retweets **15** Likes

1 18 15

Injections

JavaScript Injection

HTTP://WWW.KALZUMEUS.COM/2010/09/22/SECURITY-LESSONS-LEARNED-FROM-THE-DIASPORA-LAUNCH/

```
def self.search(query)
  Person.all('$where' => "function() {
    return this.diaspora_handle.match(/^#{query}/i) ||
           this.profile.first_name.match(/^#{query}/i) ||
           this.profile.last_name.match(/^#{query}/i);
  }")
end
```

Problem JS Evaluation

```
$where

db.eval()

db.runCommand( { mapReduce:

db.collection.group()
```

Solution JS Evaluation

`--noscripting` **OR** `security.javascriptEnabled: false`

Saarbrücker Cybersicherheits-Studenten entdecken bis zu 40.000 ungesicherte Datenbanken im Internet

– http://www.uni-saarland.de/nc/aktuelles/artikel/nr/12173.html, Feb 2015

Massive ransomware attack takes out 27,000 MongoDB servers

– http://www.techrepublic.com/article/massive-ransomware-attack-takes-out-27000-mongodb-servers/, Jan 2017

Bound to all interfaces by default?

MongoDB 3.6 comes hardened against database ransomware by default

by MATTHEW HUGHES — 28 days ago in SECURITY

Authentication enabled by default?

Authentication & Authorization

Enable

```
auth=true
```

<3.0

MONGODB CHALLENGE RESPONSE

(MONGODB-CR)

>=3.0

IETF RFC 5802 (SCRAM-SHA-1)

>=4.0 SCRAM-SHA-256

SCRAM-SHA-1

CONFIGURABLE `iterationCount`

SALT PER USER INSTEAD OF SERVER

SHA-1 INSTEAD OF MD5

SERVER AUTHENTICATES AGAINST THE CLIENT AS WELL

Predefined Roles

`read` / `readAnyDatabase`

`readWrite` / `readWriteAnyDatabase`

`dbAdmin` / `dbAdminAnyDatabase`

`userAdmin` / `userAdminAnyDatabase`

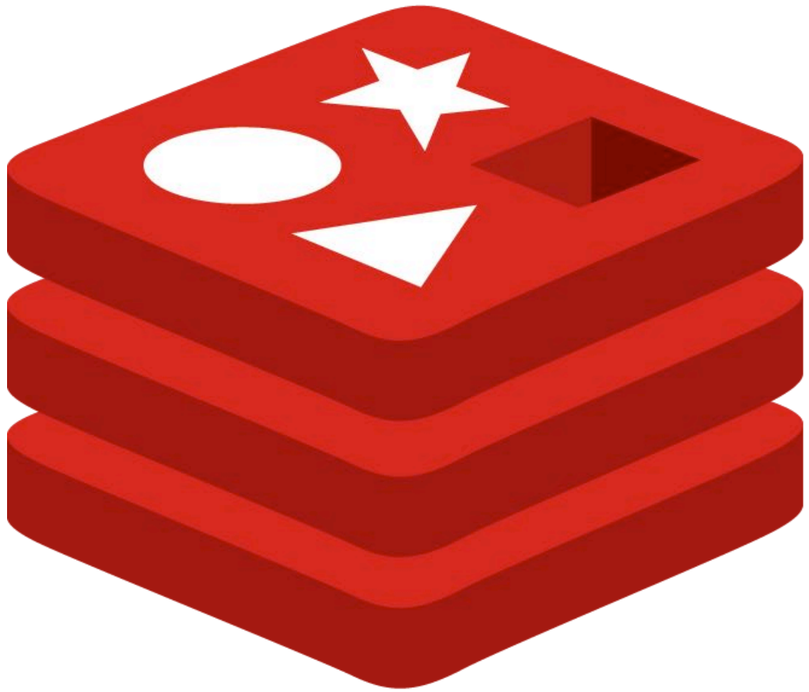
`dbOwner`

BACKUP, RESTORE, CLUSTER MANAGEMENT,...

>=3.0

SSL INCLUDED

(ALMOST) EVERYWHERE



redis

Research shows 75% of 'open' Redis servers infected

– https://www.incapsula.com/blog/report-75-of-open-redis-servers-are-infected.html, May 2018

Let's crack Redis for fun and no profit at all given I'm the developer of this thing

– http://antirez.com/news/96, Nov 2015

Bound to all interfaces by default?

Protected Mode

>=3.2.0

ANSWER LOCAL QUERIES
RESPOND WITH AN ERROR FOR REMOTE

Authentication & ~~Authorization~~

a tiny layer of authentication

– http://redis.io/topics/security

AUTH <password> COMMAND

PLAIN-TEXT PASSWORD IN REDIS.CONF

NO (BUILT-IN) SSL OR RATE LIMITS

Hiding Commands

SET IN REDIS.CONF

RESET AFTER RESTART

```
rename-command CONFIG
mysecretconfigname
```

```
rename-command CONFIG ""
```

PS: Don't Pass in Random Lua Scripts

Redis EVAL command allows execution of Lua scripts, and such feature should be allowed by default since is a fundamental Redis feature.

– http://antirez.com/news/118, Jun 2018

Redis Lua scripting: several security vulnerabilities fixed

– http://antirez.com/news/119, Jun 2018

Future

REDIS 6

ACL & TLS

HTTP://ANTIREZ.COM/NEWS/118, JUN 2018

elasticsearch

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Bound to all interfaces by default?

Broadcasting on the local subnet?

Running as root?

Scripting

ELASTICSEARCH

HTTPS://WWW.ELASTIC.CO/COMMUNITY/SECURITY

CVE-2014-3120 (6.8): Dynamic scripting
CVE-2014-6439 (4.3): CORS misconfiguration
CVE-2015-1427 (6.8): Groovy sandbox escape
CVE-2015-3337 (4.3): Directory traversal
CVE-2015-4165 (3.3): File modifications
CVE-2015-5377 (5.1): RCE related to Groovy
CVE-2015-5531 (5.0): Directory traversal

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Painless

HIRED DEVELOPER

1 YEAR DEVELOPMENT

Why build a brand new language when there are already so many to choose from?

– https://www.elastic.co/blog/painless-a-new-scripting-language

Goal

SECURE & PERFORMANT

```
POST posts/doc/1/_update
{
  "script": {
    "lang": "painless",
    "source": """
if(ctx._source.details.containsKey("plus_ones")) {
  ctx._source.details.plus_ones++;
} else {
  ctx._source.details.plus_ones = 1;
}
"""
  }
}
```

Painless DEFAULT

GROOVY, PYTHON, JAVASCRIPT REMOVED IN 6.X

Authentication & Authorization

TOTAL RESULTS

15,356

TOP COUNTRIES

United States	3,968
China	2,908
France	1,023
Germany	721
Netherlands	632

TOP ORGANIZATIONS

Amazon.com	1,669
Hangzhou Alibaba Advertisin...	1,191
Microsoft Azure	675
OVH SAS	663
Digital Ocean	568

TOP OPERATING SYSTEMS

Linux 3.x	14
Windows 7 or 8	1

TOP PRODUCTS

Elastic	9,137
Elasticsearch	118

Welcome to Badoo!

31.222.67.197
u98.badoo.com
Greysom Limited
Added on 2017-12-06 16:20:41 GMT
United Kingdom
Details

```
HTTP/1.1 200 OK
Server: nginx
Date: Wed, 06 Dec 2017 16:20:41 GMT
Content-Type: text/html
Content-Length: 344
Last-Modified: Wed, 28 Sep 2016 15:37:33 GMT
Connection: keep-alive
ETag: "57ebe3bd-158"
Expires: Thu, 06 Dec 2018 16:20:41 GMT
Cache-Control: max-age=31536000
Cache-Control: no...
```

广发证券（香港）预约开户

59.41.16.181
China Telecom Guangdong
Added on 2017-12-06 16:18:52 GMT
China, Guangzhou
Details

```
HTTP/1.1 200 OK
Vary: Accept-Encoding
Last-Modified: Mon, 13 Nov 2017 06:06:57 GMT
Content-Length: 775
Cache-Control: max-age=0
Content-Type: text/html; charset=utf-8
ETag: W/"307-15fb3fce7e8"
X-Response-Time: 6ms
Date: Wed, 06 Dec 2017 16:52:09 GMT
Connection: keep-alive
```

5.79.76.116

LeaseWeb Netherlands B.V.
Added on 2017-12-06 16:17:23 GMT
Netherlands
Details

4.0 kB | 1 Nodes

```
HTTP/1.1 200 OK
Content-Type: application/json; charset=UTF-8
Content-Length: 341
```

```
$ curl -XGET 'http://67.205.153.88:9200/_cat/indices'
yellow open goal12       5 1 9397 0   27mb   27mb
yellow open please_read 5 1    1 0  4.9kb  4.9kb
yellow open un-webhose  5 1 2294 1 25.4mb 25.4mb
yellow open goal11       5 1 4828 0 13.3mb 13.3mb
```

```
$ curl -XGET 'http://67.205.153.88:9200/please_read/_search?pretty'
{
  "took" : 1,
  "timed_out" : false,
  "_shards" : {
    "total" : 5,
    "successful" : 5,
    "failed" : 0
  },
  "hits" : {
    "total" : 1,
    "max_score" : 1.0,
    "hits" : [ {
      "_index" : "please_read",
      "_type" : "info",
      "_id" : "AVm3qmXeus_FduwRD54v",
      "_score" : 1.0,
      "_source" : {
        "Info" : "Your DB is Backed up at our servers, to restore send 0.5 BTC
                  to the Bitcoin Address then send an email with your server ip",
        "Bitcoin Address" : "12JNfaS2Gzic2vqzGMvDEo38MQSX1kDQrx",
        "Email" : "elasticsearch@mail2tor.com"
      }
    } ]
  }
}
```

1 Bitcoin equals

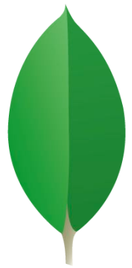
7.987,51 Euro

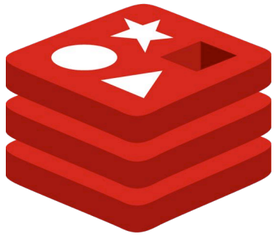
1	Bitcoin
7987,51	Euro


elastic

On 03 Feb 14:12, reports@reports.cert-bund.de wrote:

> Dear Sir or Madam,
>
> Elasticsearch is a popular search engine based on Apache Lucene, often used with web applications.
>
> If an Elasticsearch server is openly accessible from the Internet and not protected by any forms of authentification, anyone who can connect to the server has unrestricted access to the data stored with it. This allows attackers to modify or delete any data or potentially steal sensitive information. In addition, prior to versions 1.2.x an attacker can use dynamic scripting to perform arbitrary code execution on the machine that Elasticsearch is hosted on.
>
> Affected systems on your network:
>
> Format: ASN | IP | Timestamp (UTC) | Elasticsearch version | Instance name
> 24940 | [redacted].176 | 2018-02-02 04:14:47 | 6.2.0 | docker-test-node-1





redis

elasticsearch

Conclusion

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Injections Are Still a Thing

Enable Security by Default

Be Creative — Or Not

Custom Scripting Can Make Sense

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Security Takes Time

Thanks!

QUESTIONS?

Philipp Krenn @xeraa

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