

NoSQL MEANS No SECURITY?

Philipp Krenn

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elastic

DEVELOPER



347 systems in ranking, May 2019

Rank			DBMS	Database Model	Score		
May 2019	Apr 2019	May 2018			May 2019	Apr 2019	May 2018
1.	1.	1.	Oracle +	Relational, Multi-model i	1285.55	+5.61	-4.87
2.	2.	2.	MySQL +	Relational, Multi-model i	1218.96	+3.82	-4.38
3.	3.	3.	Microsoft SQL Server +	Relational, Multi-model i	1072.19	+12.23	-13.66
4.	4.	4.	PostgreSQL +	Relational, Multi-model i	871.89	+0.17	+77.99
5.	5.	5.	MongoDB +	Document	408.07	+0.10	+65.96
6.	6.	6.	IBM Db2 +	Relational, Multi-model i	174.44	-1.61	-11.17
7.	↑ 8.	↑ 9.	Elasticsearch +	Search engine, Multi-model i	148.62	+2.62	+18.18
8.	↓ 7.	↓ 7.	Redis +	Key-value, Multi-model i	148.40	+2.03	+13.06
9.	9.	↓ 8.	Microsoft Access	Relational	143.78	-0.87	+10.67
10.	↑ 11.	10.	Cassandra +	Wide column	125.72	+2.11	+7.89

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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

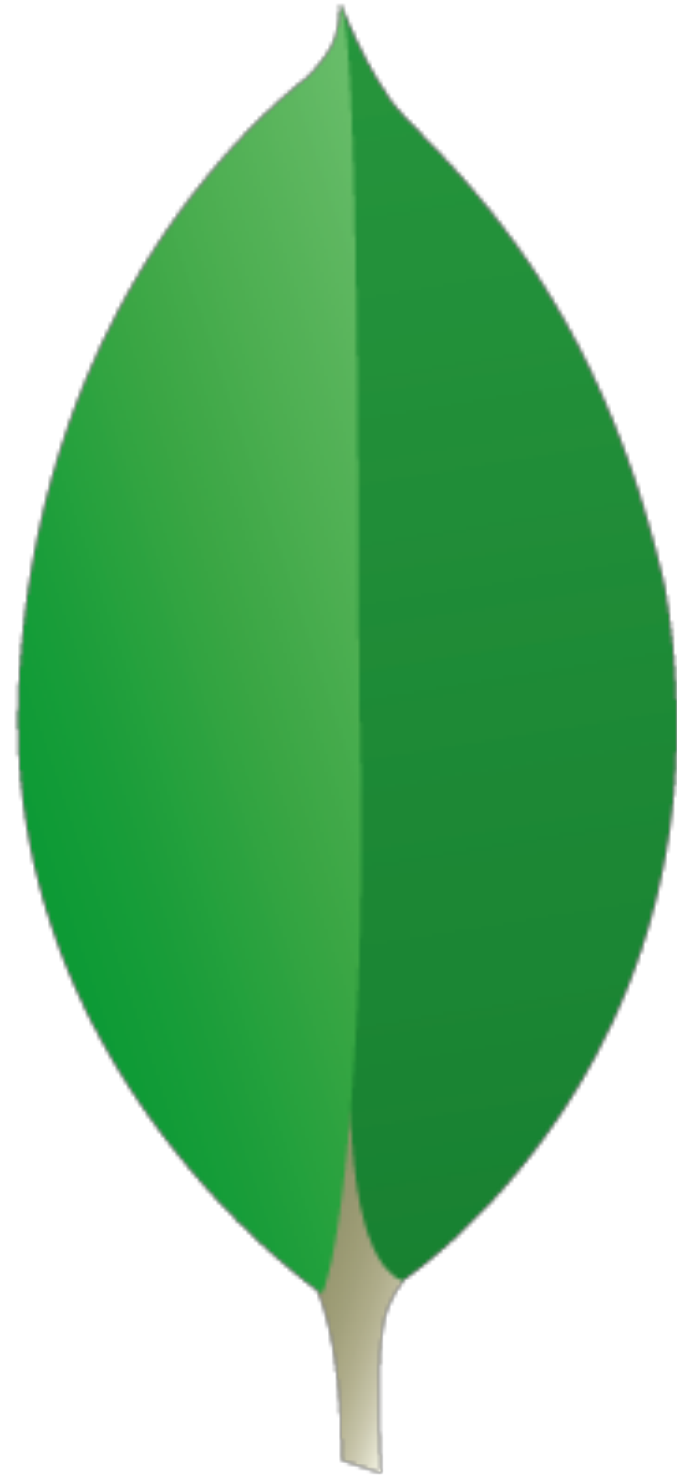


8



16







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



Injecti0ns

JavaScript Injection

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

https://twitter.com/ashu_barot/status/1129081068819058688



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,...



```
$ mongod --noauth --port 27017 --dbpath test/ --logpath testlog
```

```
$ mongo localhost/admin
```

```
> db.createUser({  
  user: "philipp",  
  pwd: "password",  
  roles: [ {  
    role: "root",  
    db: "admin"  
  } ]  
})  
> db.system.users.find()  
> exit
```

```
$ mongod --auth --port 27017 --dbpath test/ --logpath testlog
```

```
$ mongo localhost/admin
```

```
> show dbs
```

```
> exit
```

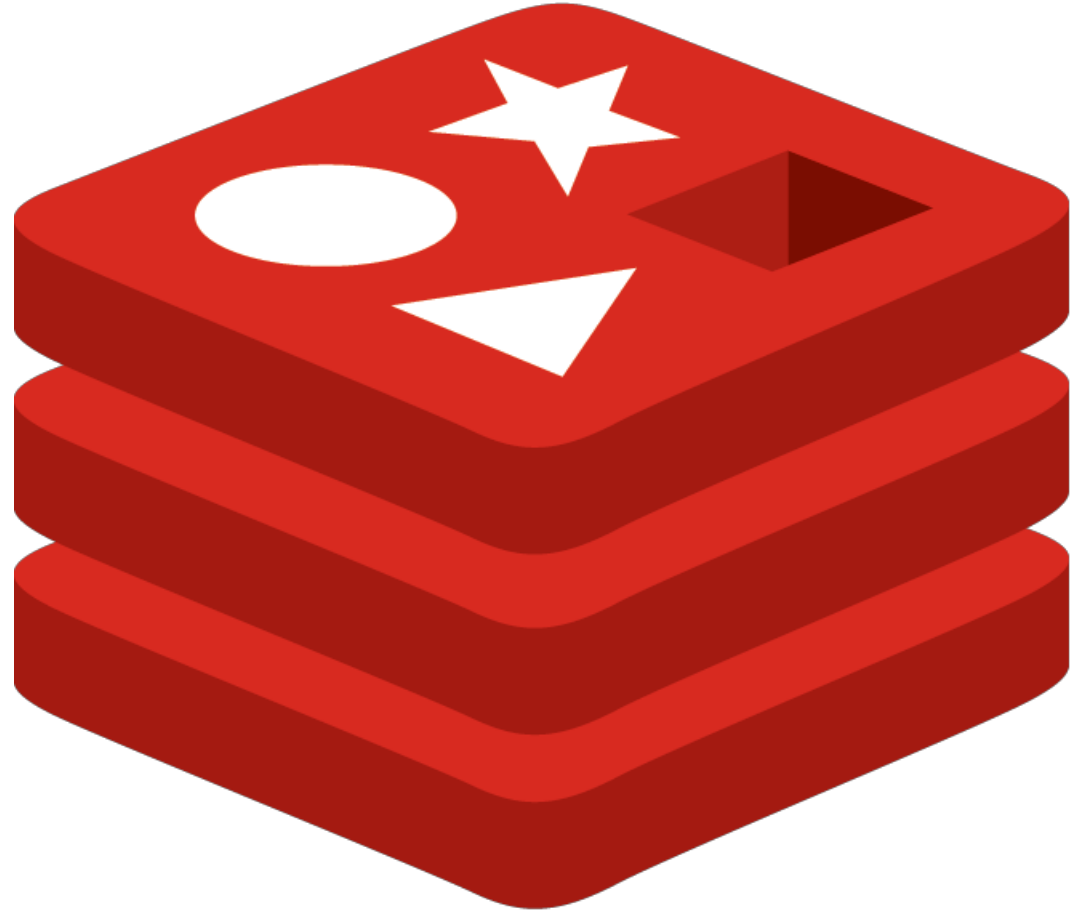
```
$ mongo localhost/admin -u philipp -p --authenticationDatabase admin
> show dbs
> db.createUser({
  user: "alice",
  pwd: "password",
  roles: [
    { role: "read", db: "testA" },
    { role: "readWrite", db: "testB" }
  ]
})
> db.system.users.find()
> exit
```

```
$ mongo localhost/testA -u alice -p --authenticationDatabase admin
> db.test.insert({ foo: "bar" })
> db.test.find()
> use testB
> db.test.insert({ foo: "bar" })
> db.test.find()
> use testC
> db.test.find()
> exit
```

>=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~~

*tiny layer of authentication that is
optionally turned on*

– <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 ""

While it would be a very strange use case, the application should avoid composing the body of the Lua script using strings obtained from untrusted sources.

- <http://redis.io/topics/security>

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](http://antirez.com/news/118), JUN 2018



elasticsearch

Bound to all interfaces by default?

Authentication enabled by default?

Broadcasting on the local subnet?

Running as root?

Scripting

ELASTICSEARCH

[HTTPS://WWW.ELASTIC.CO/COMMUNITY/SECURITY](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
CVE-2018-3826	(X.X):	Disclosure flaw

ELASTICSEARCH

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CVE-2018-3826	(X.X):	Disclosure flaw

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**

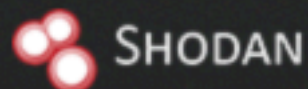
```
POST posts/doc/1/_update
```

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

Removed

GROOVY, PYTHON, JAVASCRIPT IN 6.0

Authentication & Authorization



port:"9200" 200 OK



Explore

Downloads

Reports

Enterprise Access

Contact Us

My Account

Upgrade

Exploits

Maps

Images

Share Search

Download Results

Create Report

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

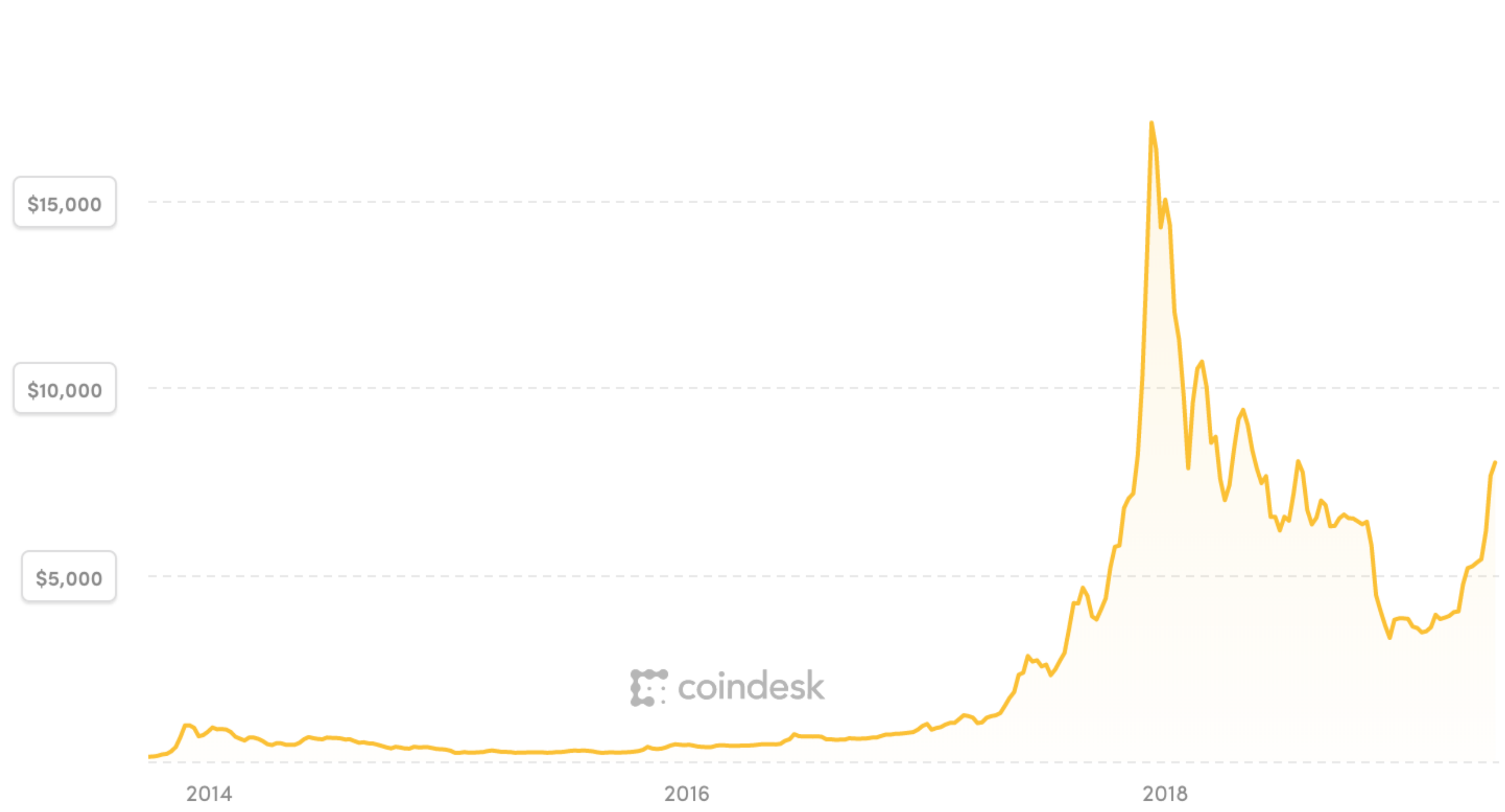
HTTP/1.1 200 OK

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"
      }
    } ]
  }
}
```



 coindesk



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

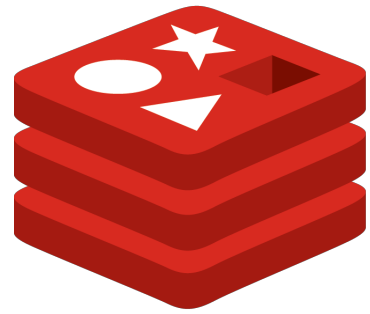
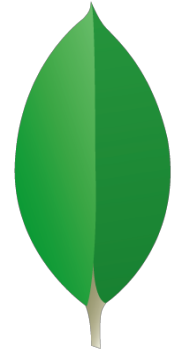
Dear Sir or Madam,

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 authentication, 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

Injectons Are Still a Thing

Enable Security by Default

Be Creative — Or Not

*Custom Scripting Can
Make Sense*

Security Takes Time

Thanks!

QUESTIONS?

Philipp Krenn

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