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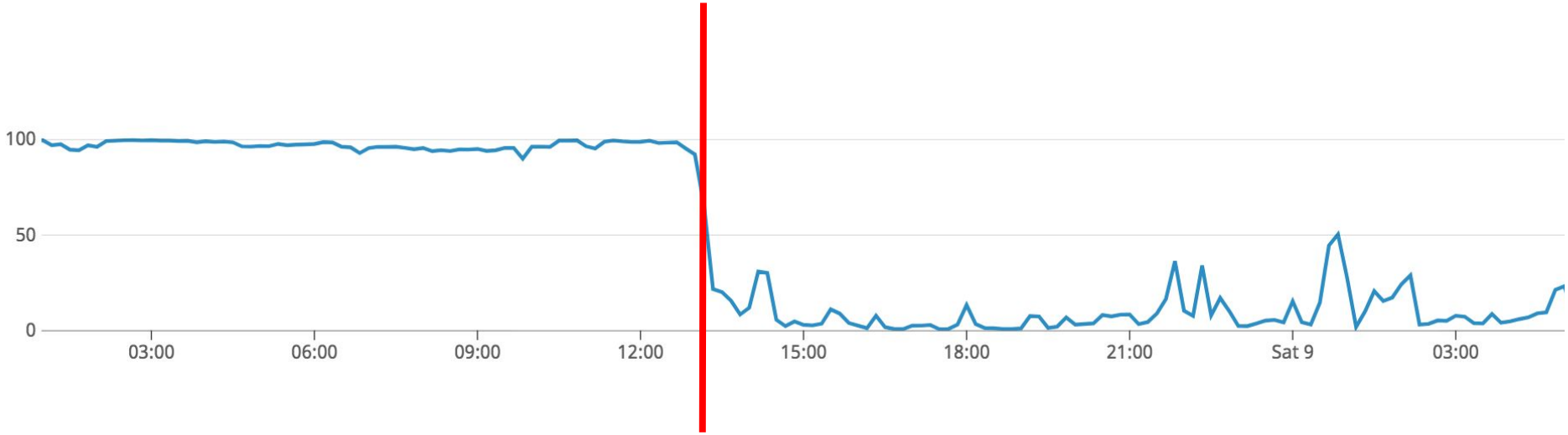
Cache is King

KENNA
Security

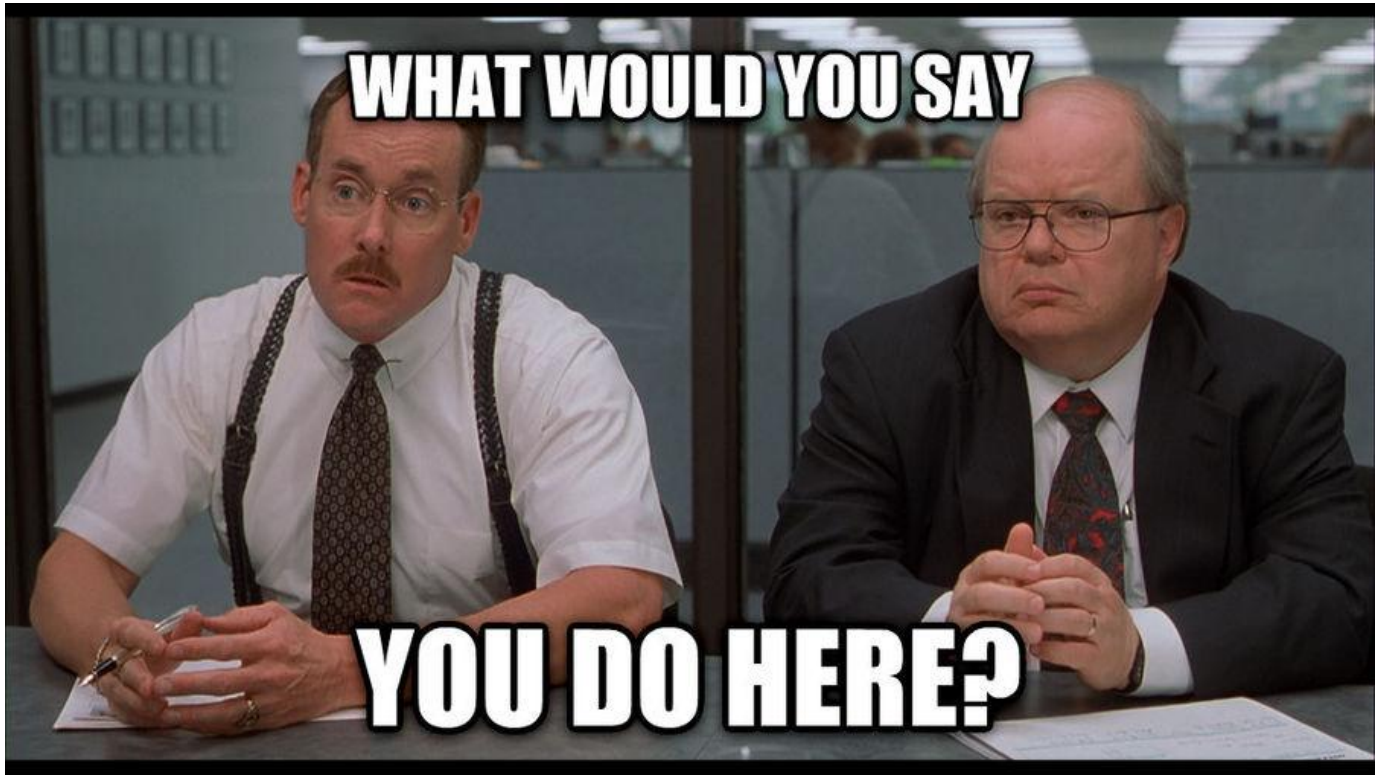


@molly_struve

KENNA
Security

@molly_struve

KENNA Security



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Cache is King

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Site Reliability Engineer

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elastic

PostgreSQL

redis

MySQL®

aws

@molly_struve

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Adding Indexes

Using SELECT statements

Batch Processing

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```
{
  "statusCode": 200,
  "took": "100ms"
}
```

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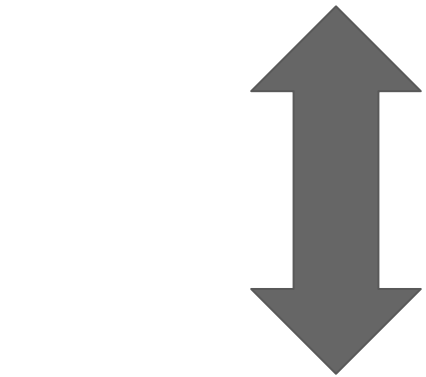
Resque




MySQL
elastic
redis

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Demo Time!

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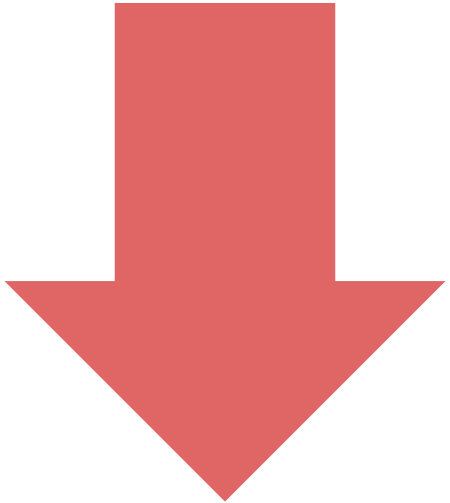
Quantity of Datastore Hits



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The average company has...

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60 thousand assets

?

24 million vulnerabilities

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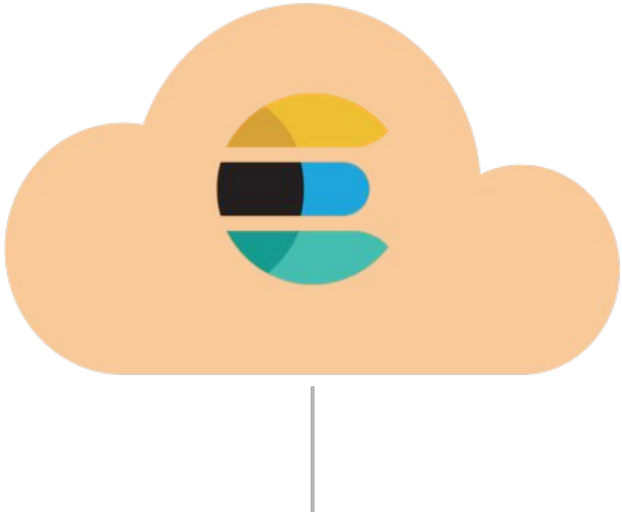
MySQL



Elasticsearch Cluster

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Serialization

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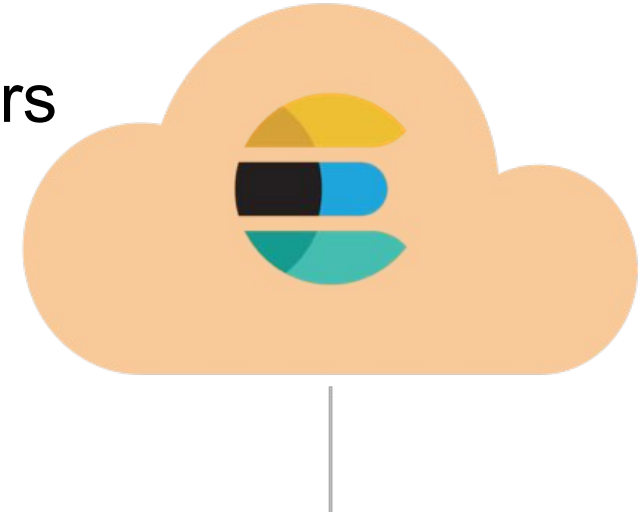
ActiveModelSerializers



MySQL

Elasticsearch Cluster

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```
class Vulnerability < ActiveModel::Serializer
    attributes :id, :client_id, :created_at, :updated_at,
               :priority, :details, :notes, :asset_id,
               :solution_id, :owner_id, :ticket_id
end
```

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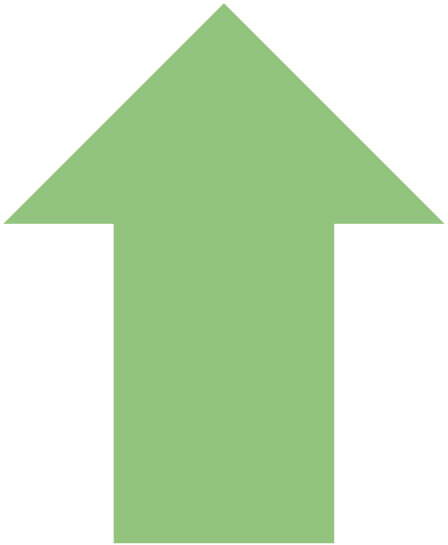

200 MILLION

11 hours and counting...

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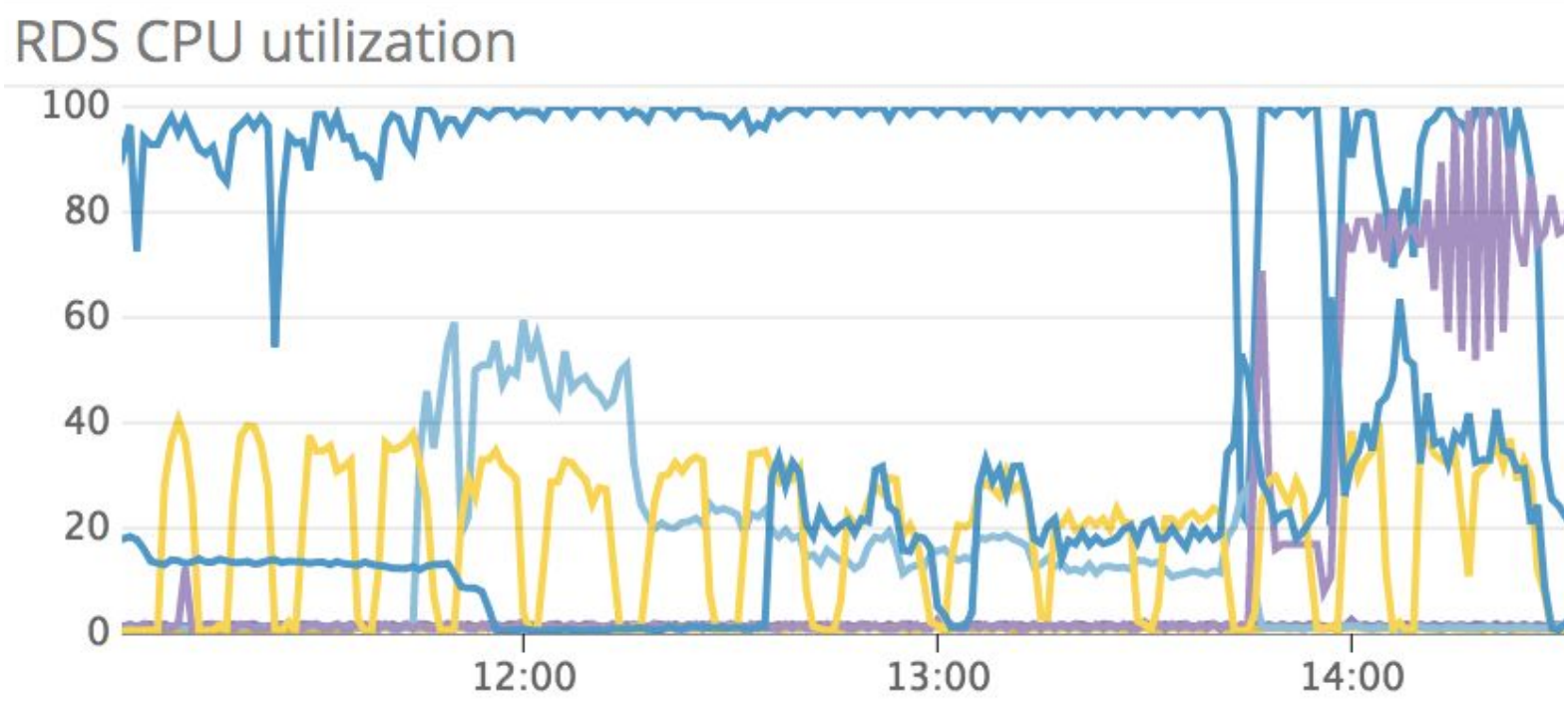

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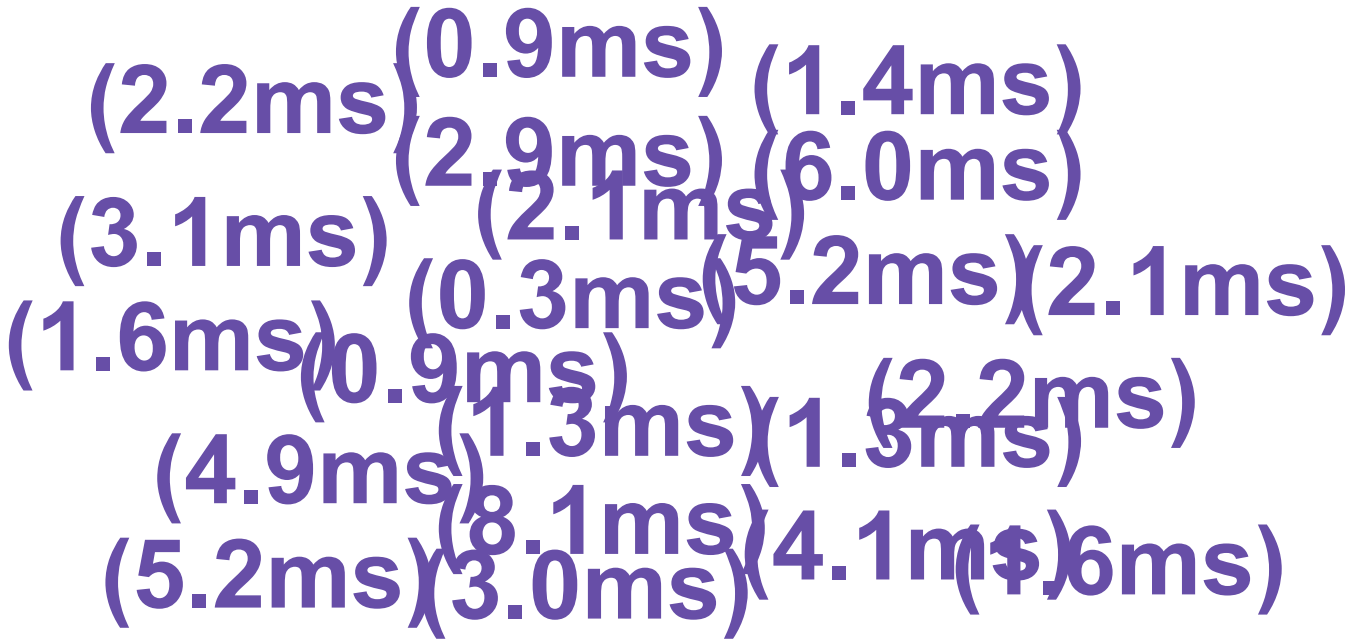

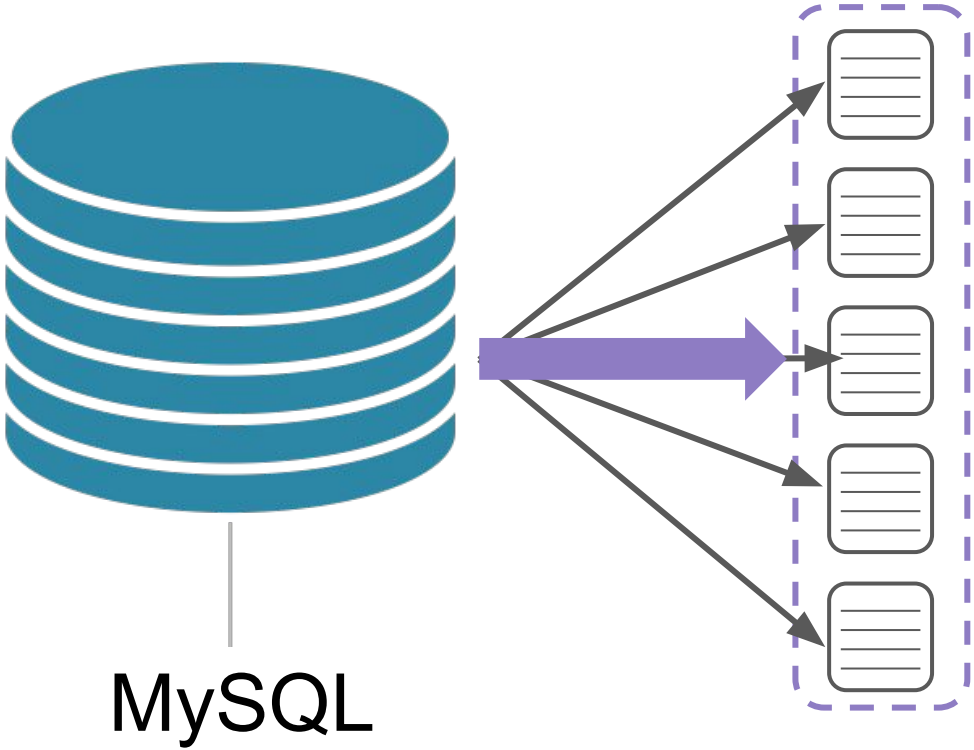
MySQL

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Bulk Serialization

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```
class BulkVulnerabilityCache
    attr_accessor :vulnerabilities, :client, :vulnerability_ids

    def initialize(vulns, client)
        self.vulnerabilities = vulns
        self.vulnerability_ids = vulns.map(&:id)
        self.client = client
    end

    # MySQL Lookups
end
```

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```
module Serializers
  class Vulnerability
    attr_accessor :vulnerability, :cache

    def initialize(vuln, bulk_cache)
      self.cache = bulk_cache
      self.vulnerability = vuln
    end
  end
end
```

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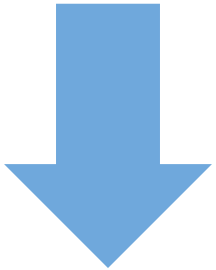
```
class Vulnerability
    has_many :custom_fields
end
```

KENNA Security

```
CustomField.where(:vulnerability_id => vuln.id)
```



```
cache.fetch('custom_fields', vuln.id)
```

The Result...

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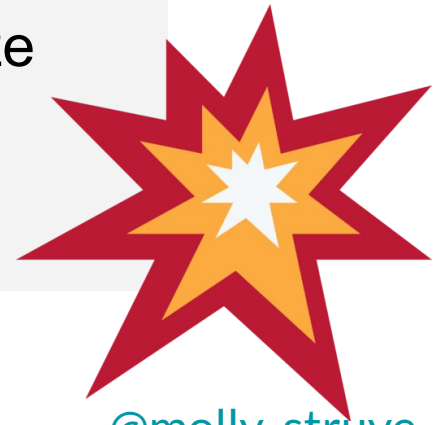
```
(pry)> vulns = Vulnerability.limit(300);
(pry)> Benchmark.realtime { vulns.each(&:serialize) }
=> 6.022452222998254

(pry)> Benchmark.realtime do
>    BulkVulnerability.new(vulns, [], client).serialize
> end
=> 0.7267019419959979
```



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Decrease in database hits

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Individual Serialization: **2,100**

Bulk Serialization: **7**

Vulnerability Batches

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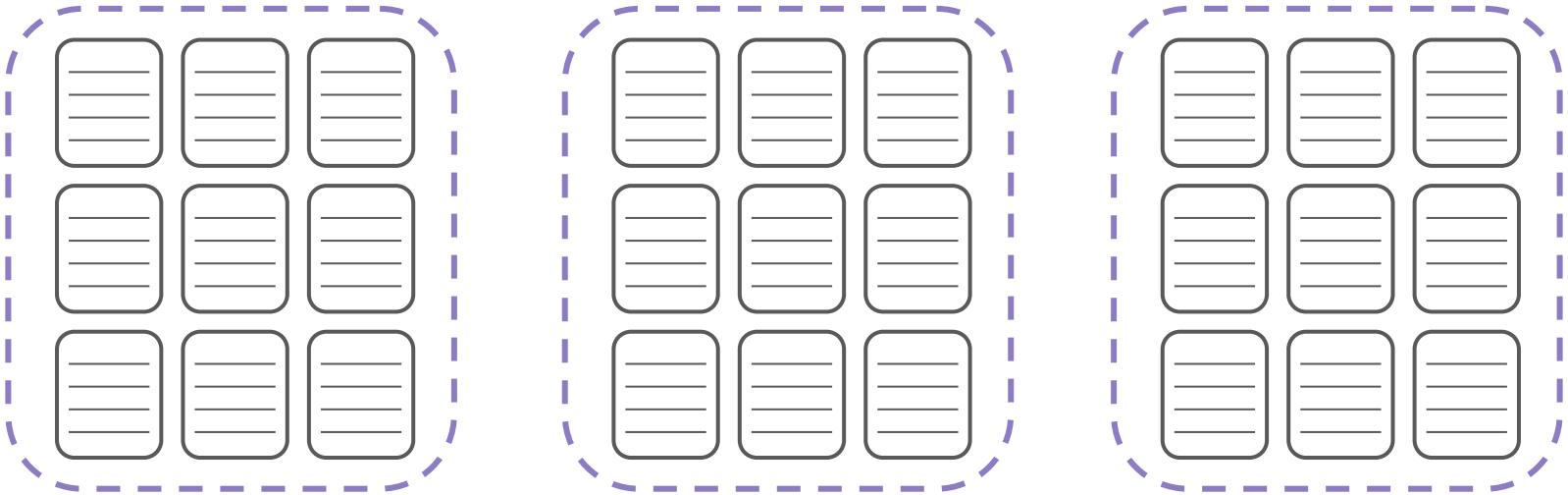

1k vulns

1k vulns

1k vulns

Vulnerability Batches

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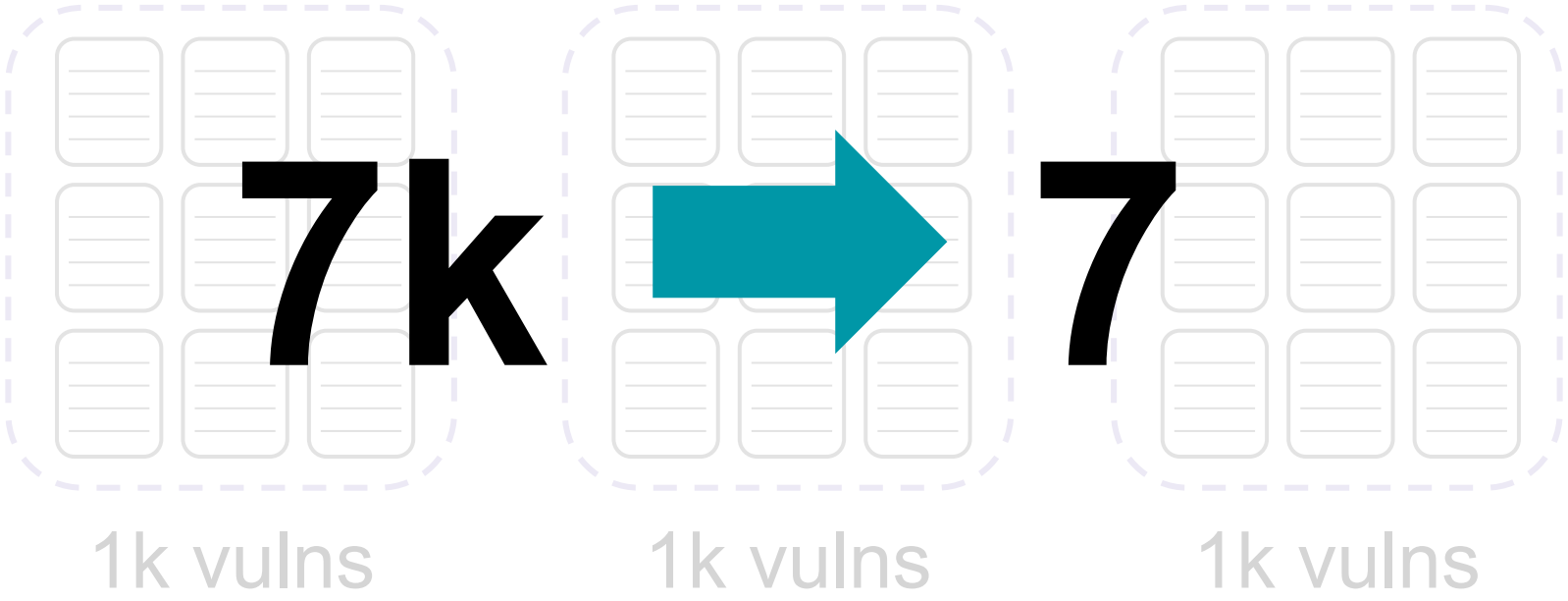

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MySQL Queries

Bulk Serialization Deployed

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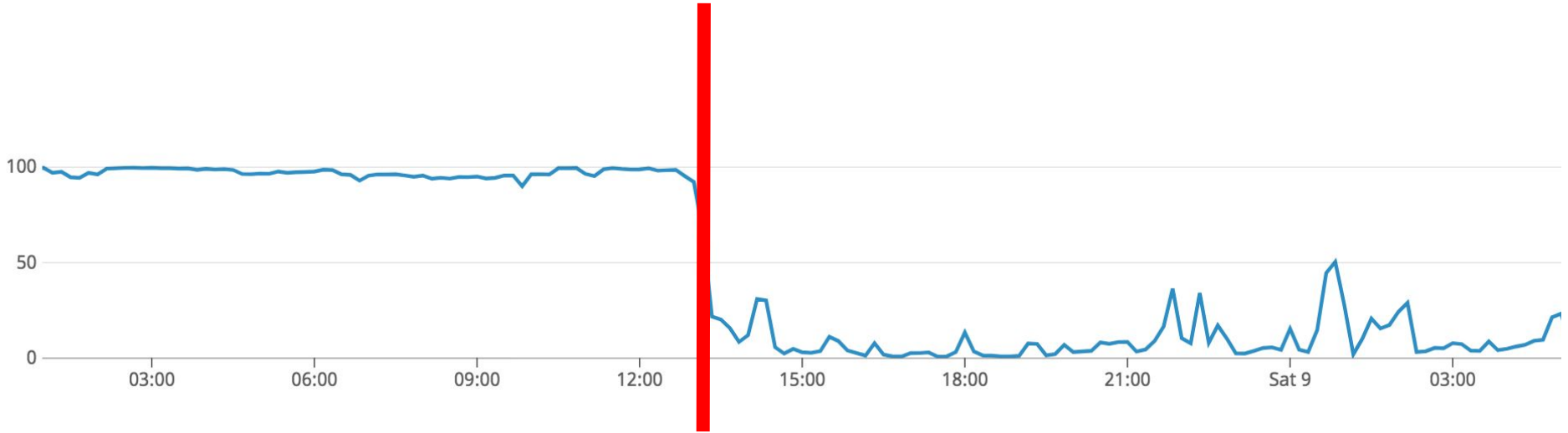
RDS CPU Utilization



Bulk Serialization Deployed

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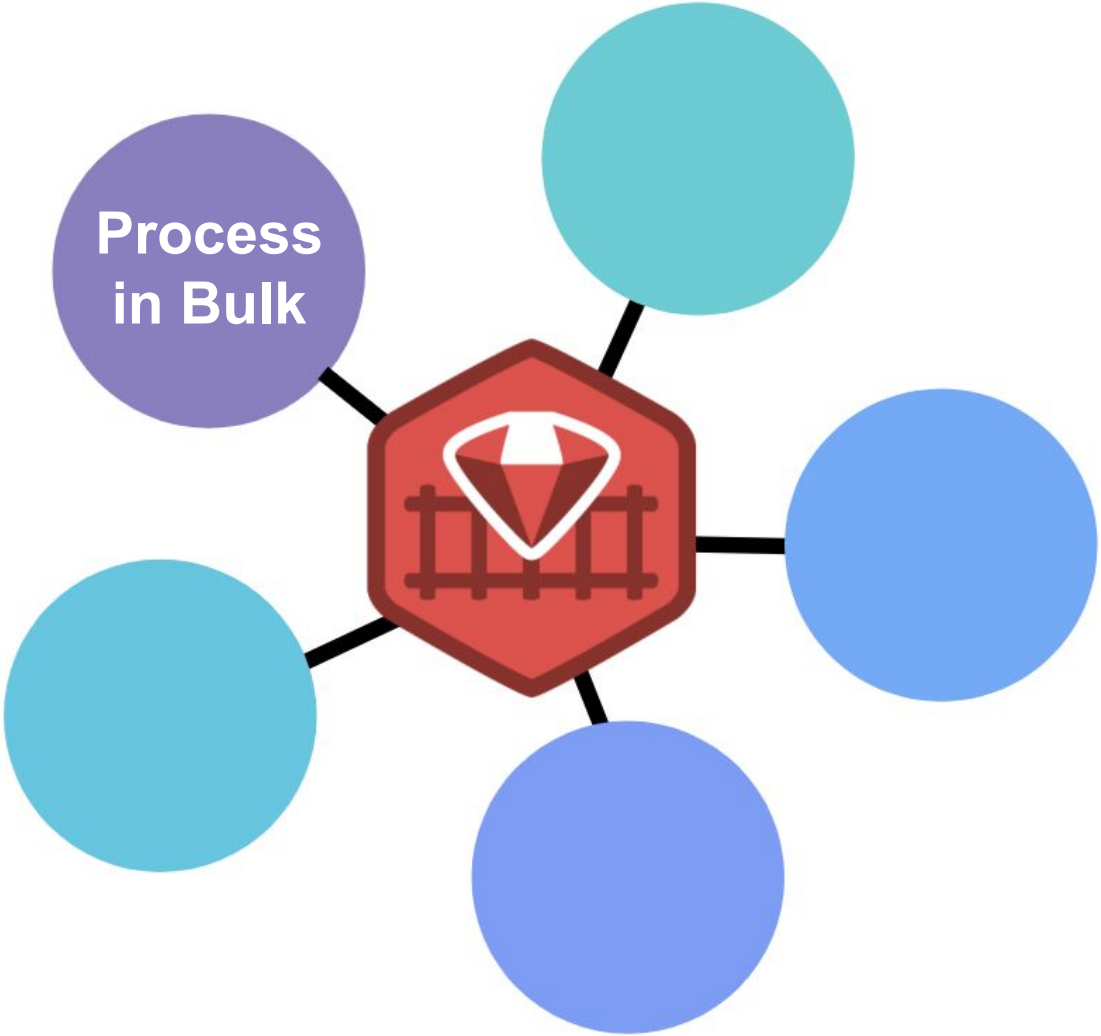


MySQL®


redis

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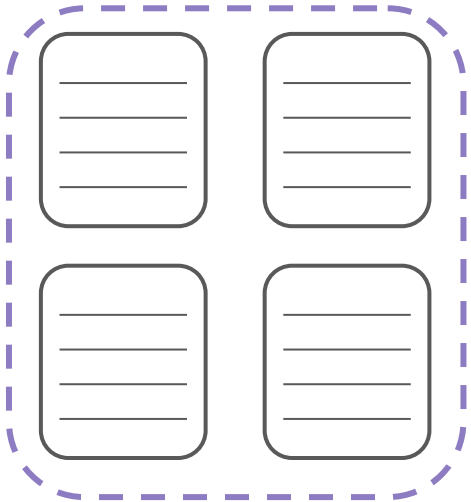
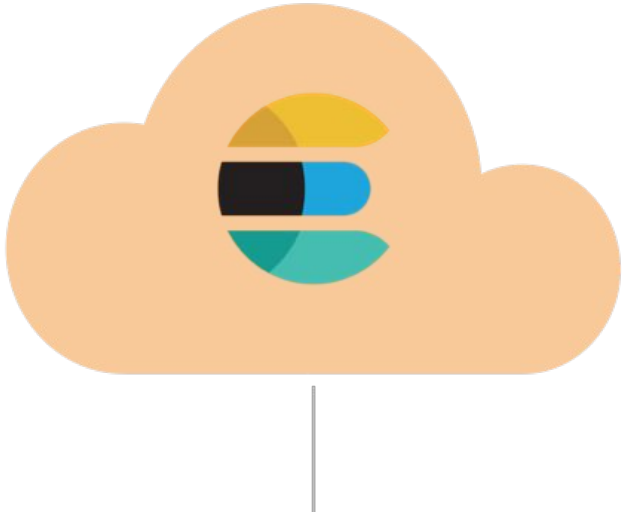


Vulnerabilities

MySQL

+

Redis



Elasticsearch Cluster

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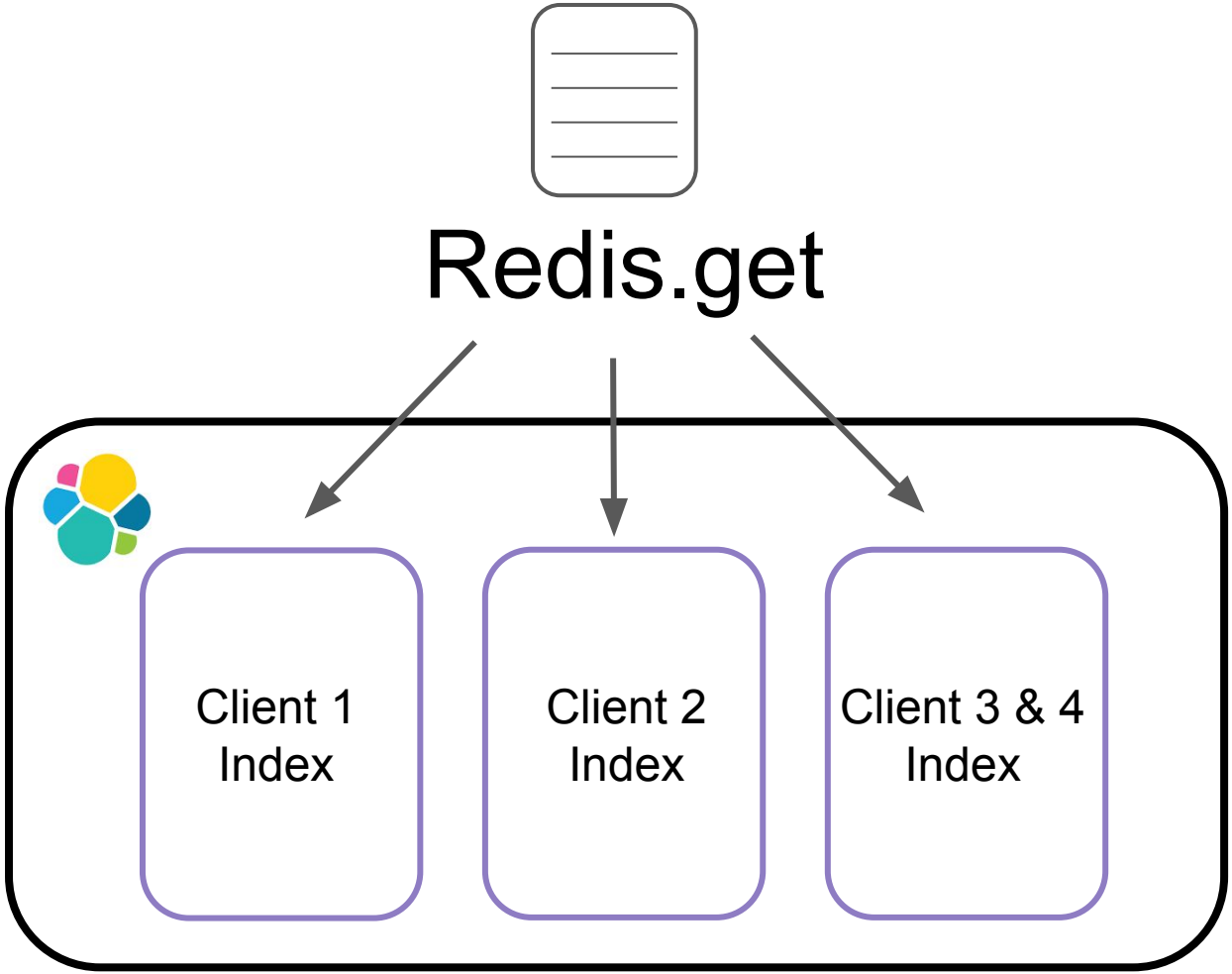

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```
indexing_hashes = vulnerability_hashes.map do |hash|
  {
    :_index => Redis.get("elasticsearch_index_#{hash[:client_id]}")
    :_type => hash[:doc_type],
    :_id => hash[:id],
    :data => hash[:data]
  }
end
```

KENNA Security

```
indexing_hashes = vulnerability_hashes.map do |hash|
  {
    :_index => Redis.get("elasticsearch_index_#{hash[:client_id]}")
    :_type => hash[:doc_type],
    :_id => hash[:id],
    :data => hash[:data]
  }
end
```

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GET

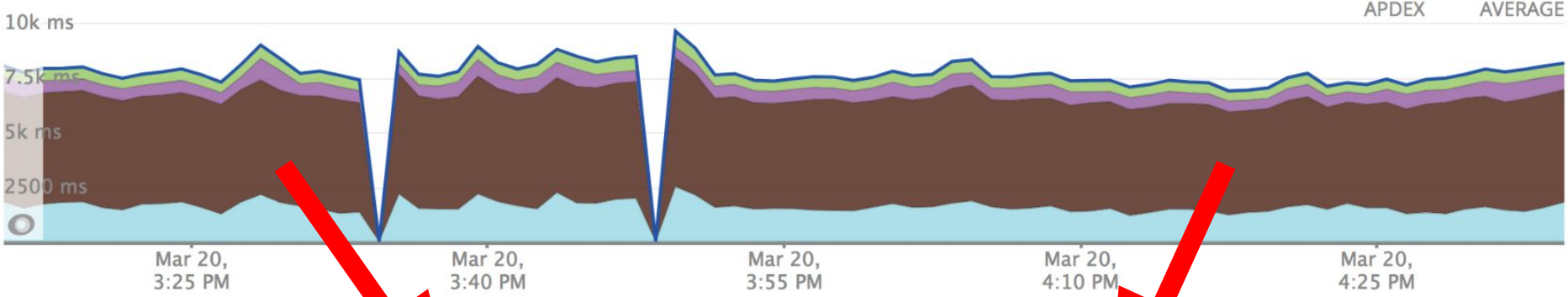
```
(pry)> index_name = Redis.get(“elasticsearch_index_#{client_id}”)
DEBUG -- : [Redis] command=GET args="elasticsearch_index_1234"
DEBUG -- : [Redis] call_time=1.07 ms
```

BulkIndexVulnFieldsWorker/perform

App performance | Map Beta

App server breakdown

N/A APDEX | 7.78 sec AVERAGE



Breakdown table

Category	Segment	% Time	Avg calls (per txn)	Avg time (ms)
Database	Redis get	64.9	4000	5,050

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```
client_indexes = Hash.new do |h, client_id|
  h[client_id] = Redis.get("elasticsearch_index_#{client_id}")
end
```

KENNA Security

```
indexing_hashes = vuln_hashes.map do |hash|
  {
    :_index => client_indexes[hash[:client_id]],
    :_type => hash[:doc_type],
    :_id => hash[:id],
    :data => hash[:data]
  }
end
```

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Client 1 Client 2 Client 3

1 + 1 + 1

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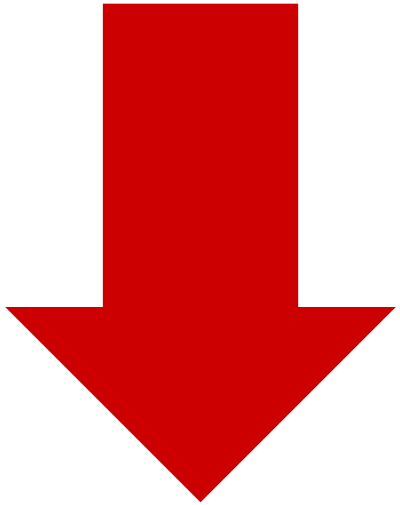

1000x

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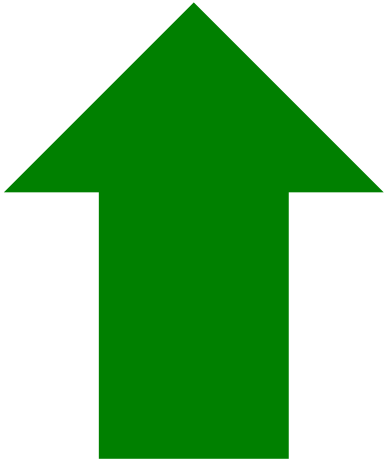

65% job speed up

Local Cache

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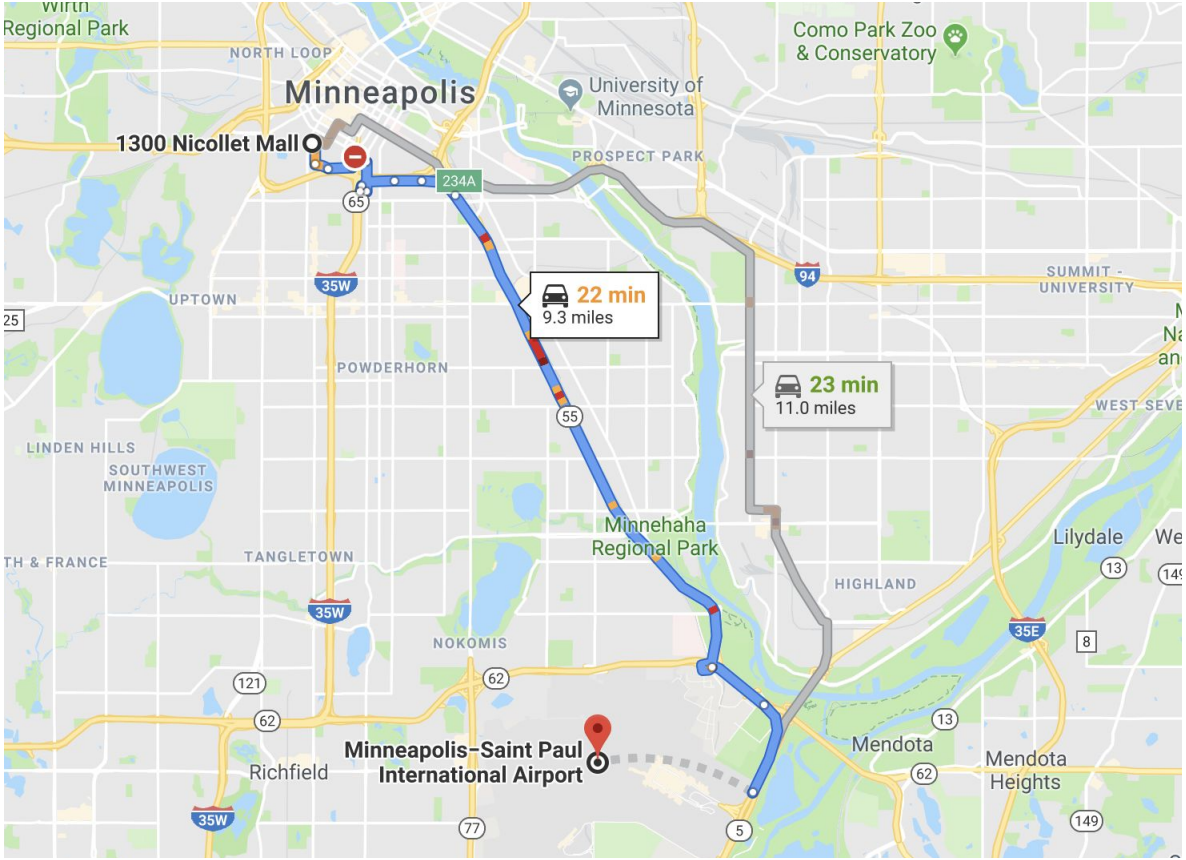

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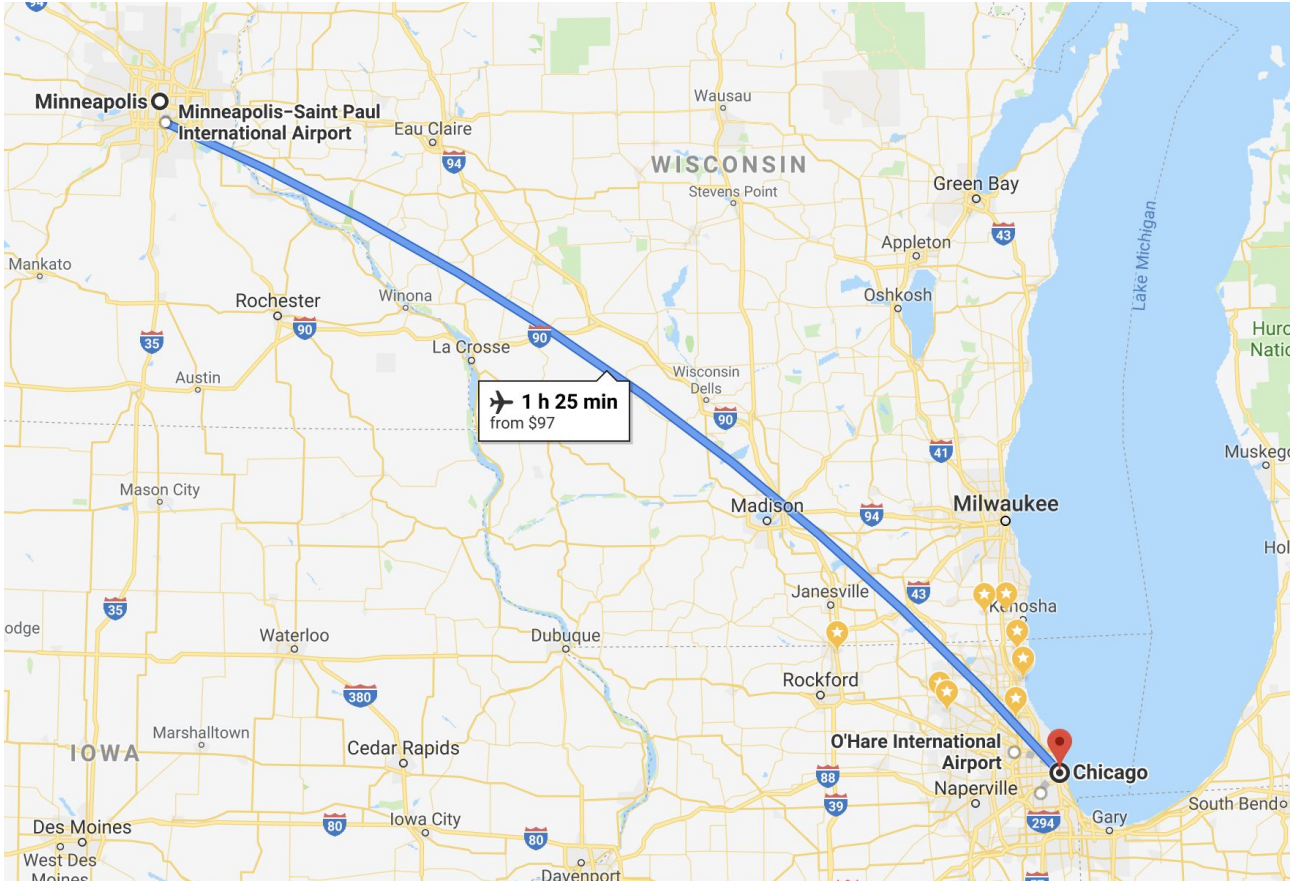
Redis

KENNA Security



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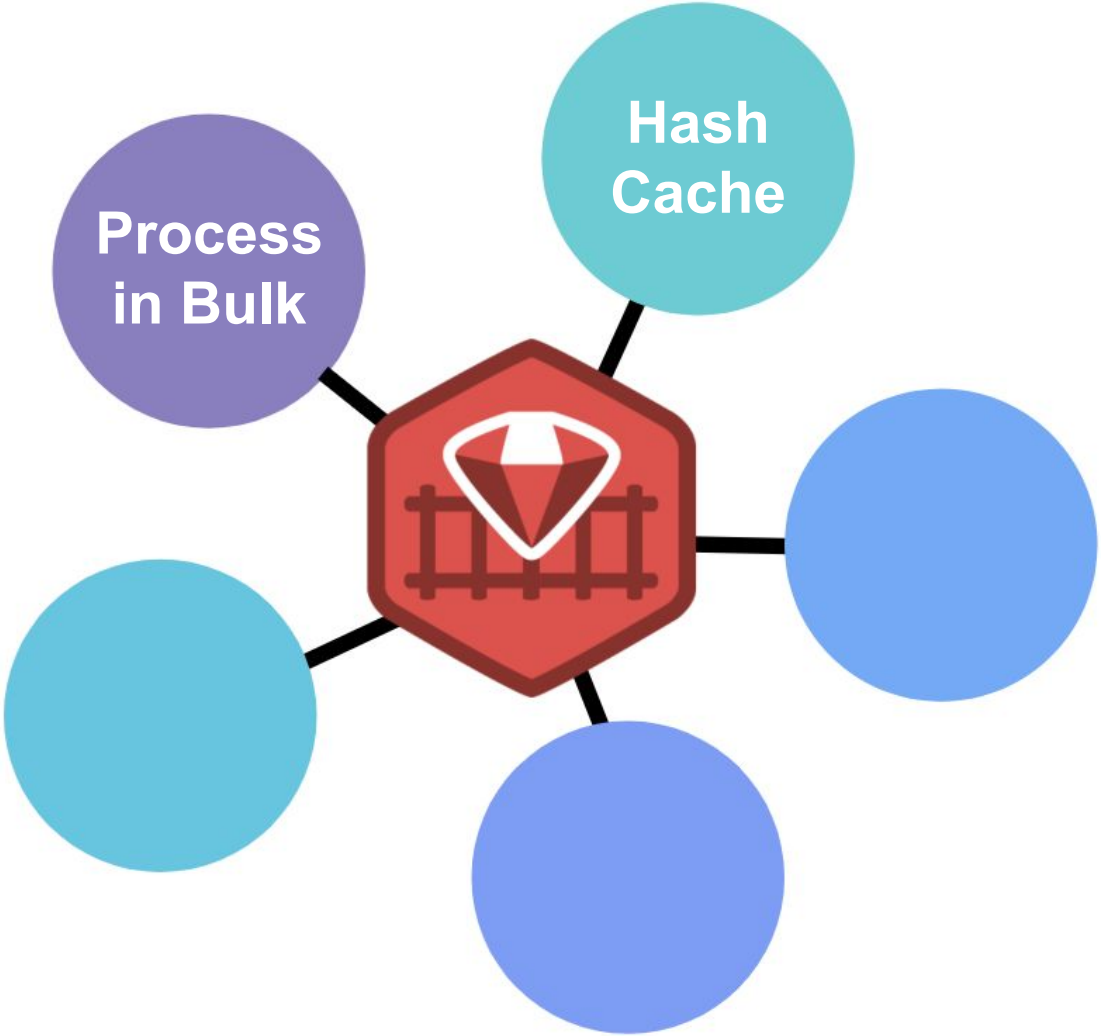
KENNA Security



Sharded Databases

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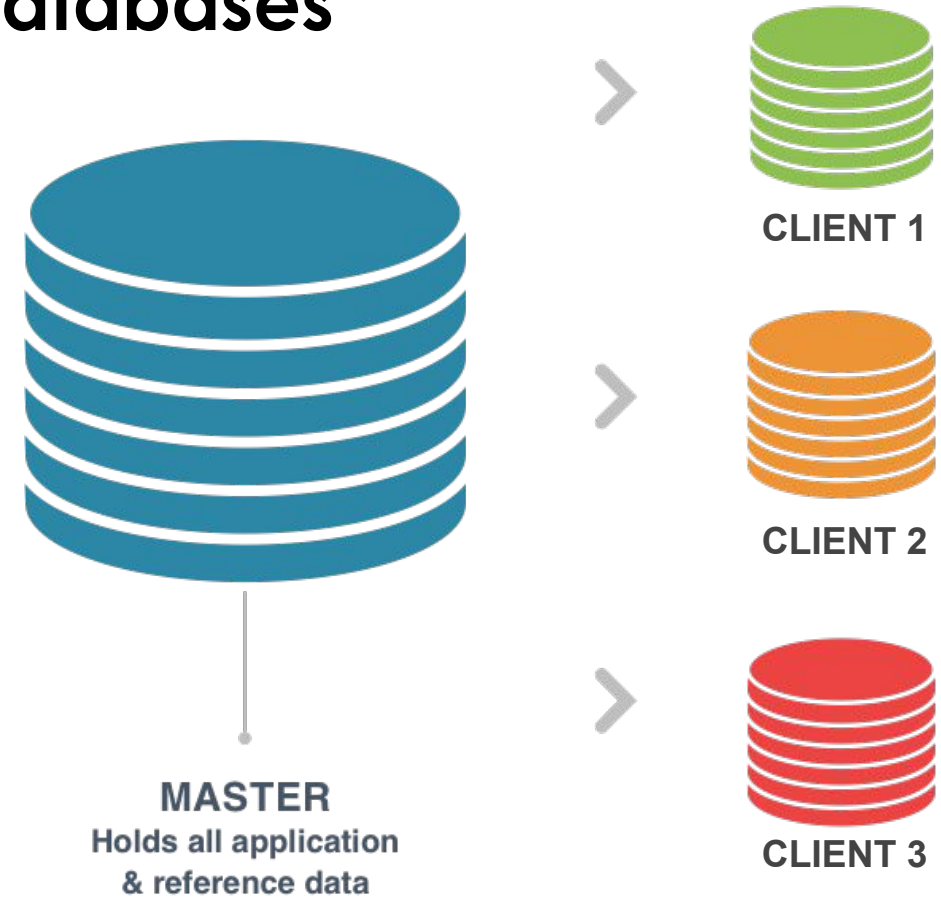

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Octopus - Easy Database Sharding for ActiveRecord

build passing CODE CLIMATE

Octopus is a better way to do Database Sharding in ActiveRecord. Sharding allows multiple databases in the same rails application. While there are several projects that implement Sharding (e.g. DbCharmer, DataFabric, MultiDb), each project has its own limitations. The main goal of octopus project is to provide a better way of doing Database Sharding.

```
Asset.using(:shard_1).find(1)
```

Sharding Configuration Hash

```
{
    'client_123' => 'shard_123',
    'client_456' => 'shard_456',
    'client_789' => 'shard_789'
}
```

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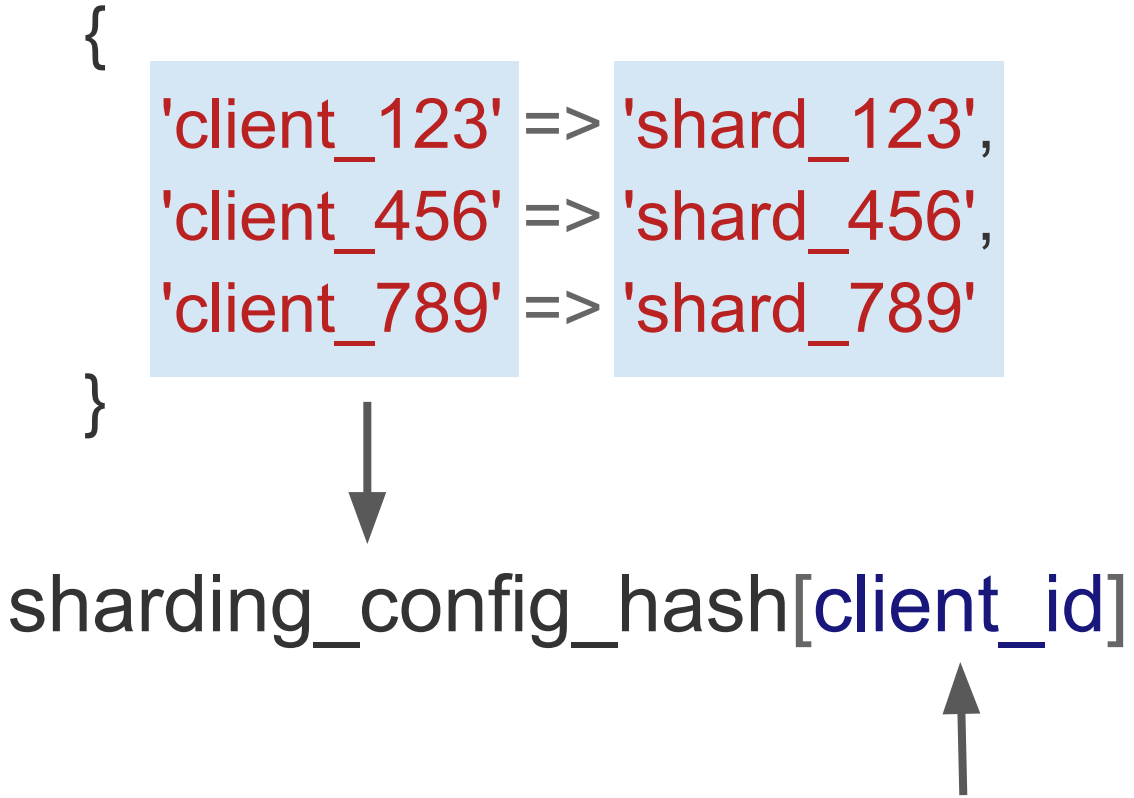
Sharding Configuration Hash

KENNA Security




redis

Sharding Configuration Size

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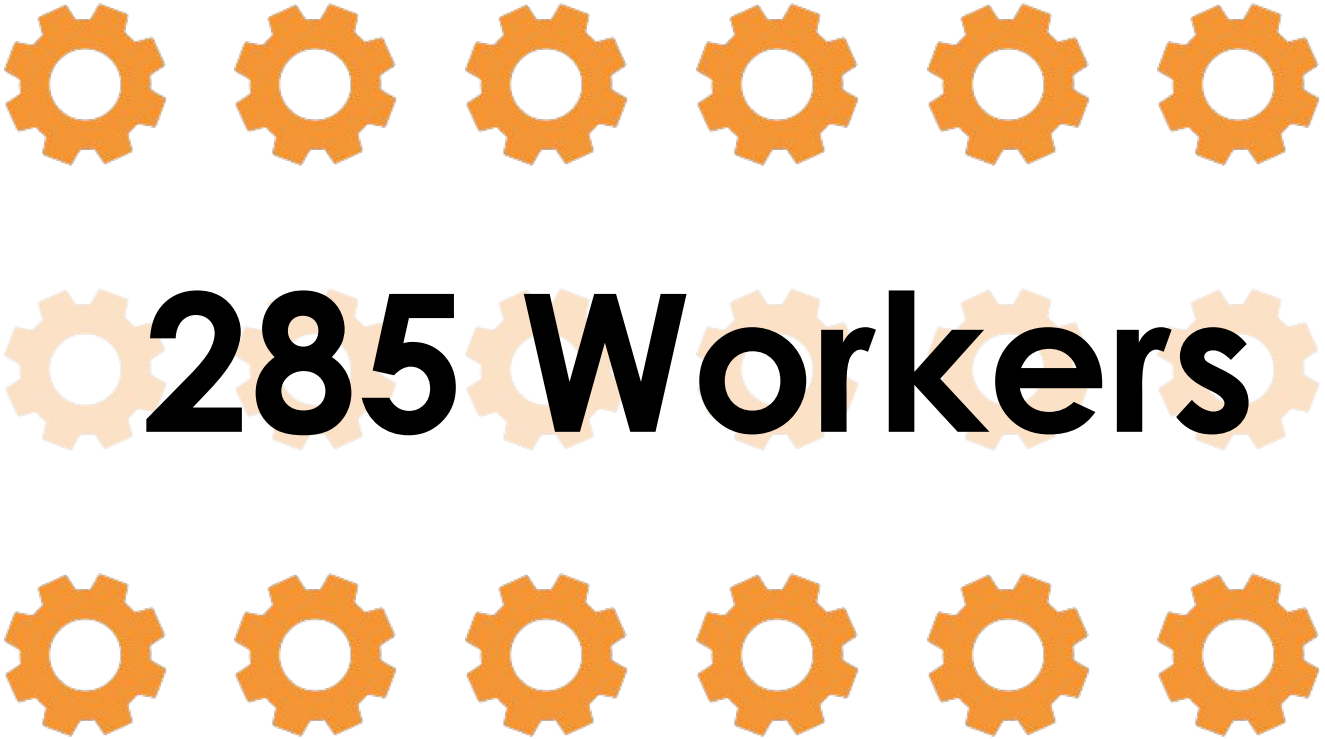
KENNA Security



285 Workers

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7.8 MB/second

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ActiveRecord::Base.connection

```
(pry)> ActiveRecord::Base.connection
  => #<Octopus::Proxy:0x000055b38c697d10
       @proxy_config= #<Octopus::ProxyConfig:0x000055b38c694ae8
```

Octopus - Easy Database Sharding for ActiveRecord

Octopus is a better way to do Database Sharding in ActiveRecord. Sharding allows multiple databases in the same rails application. While there are several projects that implement Sharding (e.g. DbCharmer, DataFabric, MultiDb), each project has its own limitations. The main goal of octopus project is to provide a better way of doing Database Sharding.

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```
module Octopus
  class Proxy
    attr_accessor :proxy_config
    delegate :current_shard, :current_shard=,
             :current_slave_group, :current_slave_group=,
             :shard_names, :shards_for_group, :shards, :sharded,
             :config, :initialize_shards, :shard_name, to: :proxy_config, prefix: false
  end
end
```

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Know your gems

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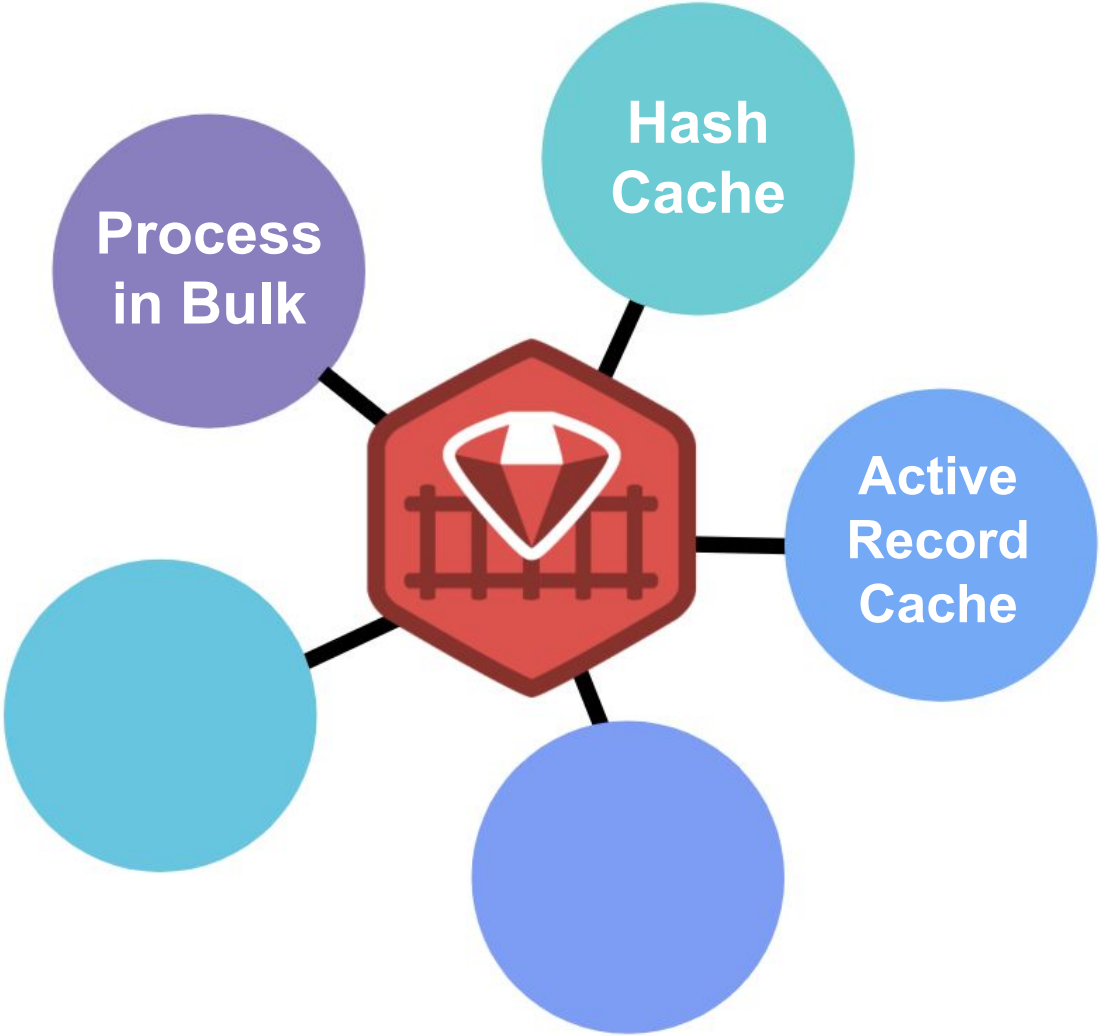

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Avoid making datastore hits you don't need

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```
User.where(:id => user_ids).each do |user|
    # Lots of user processing
end
```

KENNA Security

KENNA Security

```
(pry)> User.where(:id => [])
  User Load (1.0ms)  SELECT `users`.* FROM `users` WHERE 1=0
=> []
```

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@molly_struve

```ruby
return unless user_ids.any?
User.where(:id => user_ids).each do |user|
    # Lots of user processing
end
```

KENNA Security

```
(pry)> Benchmark.realtime do
>   10_000.times { User.where(:id => []) }
> end
=> 0.5508159045130014
(pry)> Benchmark.realtime do
>   10_000.times do
>     next unless ids.any?
>     User.where(:id => [])
>   end
> end
=> 0.0006368421018123627
```

KENNA Security

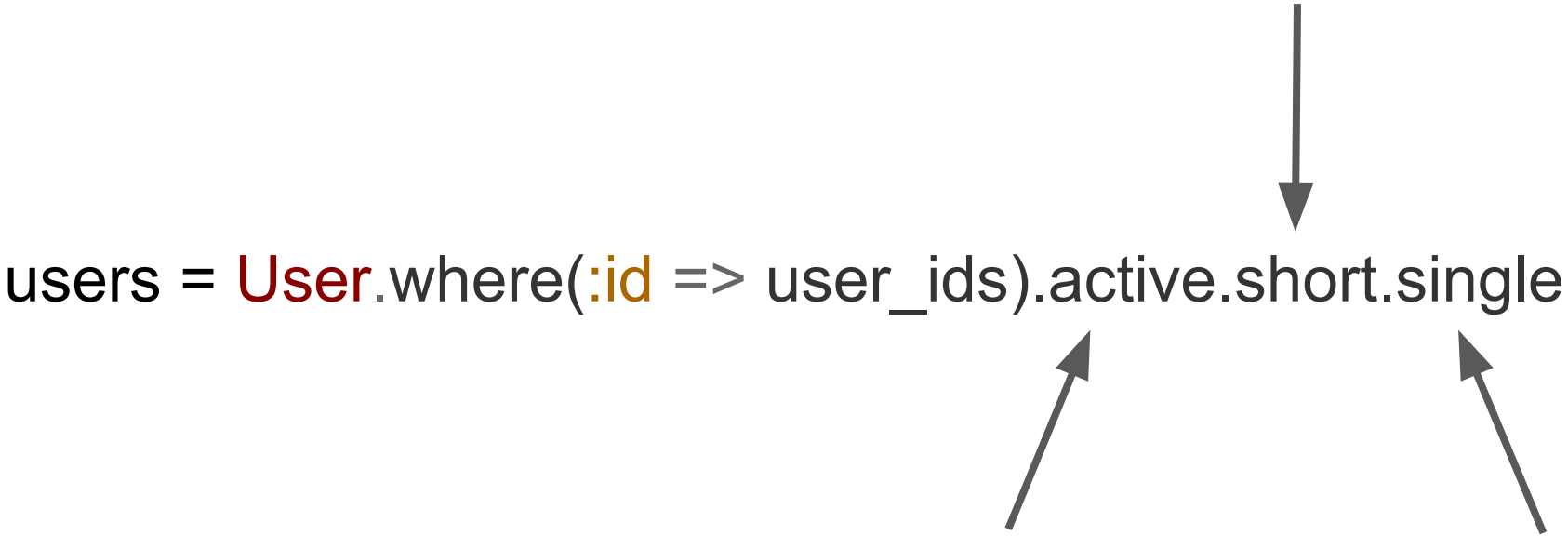
```
(pry)> Benchmark.realtime do
>   10_000.times { User.where(:id => []) }
> end
=> 0.5508159045130014
```

Hitting the database is slow!

KENNA Security

```
User.where(:id => user_ids).each do |user|
    # Lots of user processing
end
```

KENNA Security



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.none

method **none**

Ruby on Rails latest stable (v4.2.7) - 0 notes - Class: ActiveRecord::QueryMethods

1.0.0 1.1.1 1.1.6 1.2.0 1.2.6 2.0.0 2.0.3 2.1.0 2.2.1 2.3.2 2.3.8 3.0.0 3.0.5 3.0.9 3.1.0 3.2.1 3.2.3 3.2.8 3.2.13 4.0.2 4.1.8 4.2.1 **4.2.7**

none ( ) *public*

Returns a chainable relation with zero records.

The returned relation implements the Null Object pattern. It is an object with defined null behavior and always returns an empty array of records without querying the database.

.none in action...

```
(pry)> User.where(:id => []).active.tall.single
  User Load (0.7ms)  SELECT `users`.* FROM `users` WHERE 1=0 AND
`users`.`active` = 1 AND `users`.`short` = 0 AND `users`.`single` = 1
=> []

(pry)> User.none.active.tall.single
=> []
```

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@molly_struve

Gems

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

DISPLAYING GEMS **1** - **30** OF **9619** IN TOTAL

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Logging

```
pry(main)> Rails.logger.level = 0
```

```
pry(main)> Search.connection.transport.logger = Logger.new(STDOUT)
```

```
$ redis-cli monitor > commands-redis-2018-10-01.txt
```

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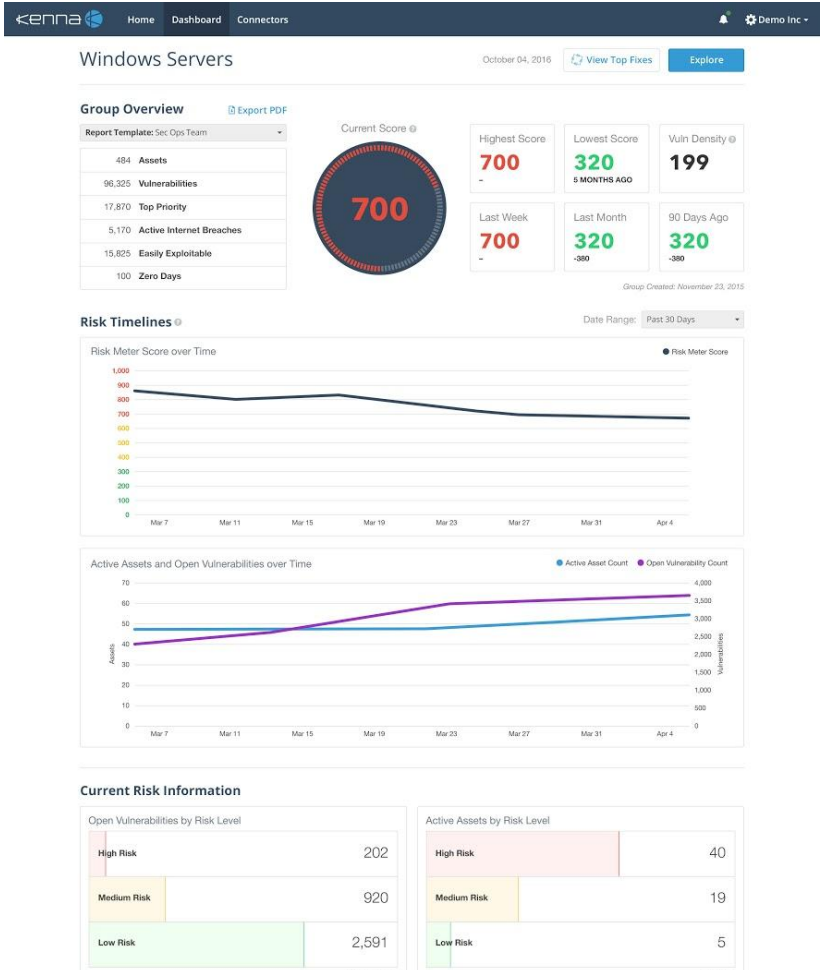
Preventing useless datastore hits

@molly_struve



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Investigating Existing Reports

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```
(pry)> Report.active.count
=> 25842
(pry)> Report.average_asset_count
=> 1657
(pry)> Report.zero_assets.count
=> 10805
```

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Security

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return if report.asset_count.zero?

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10+ hrs

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3 hrs

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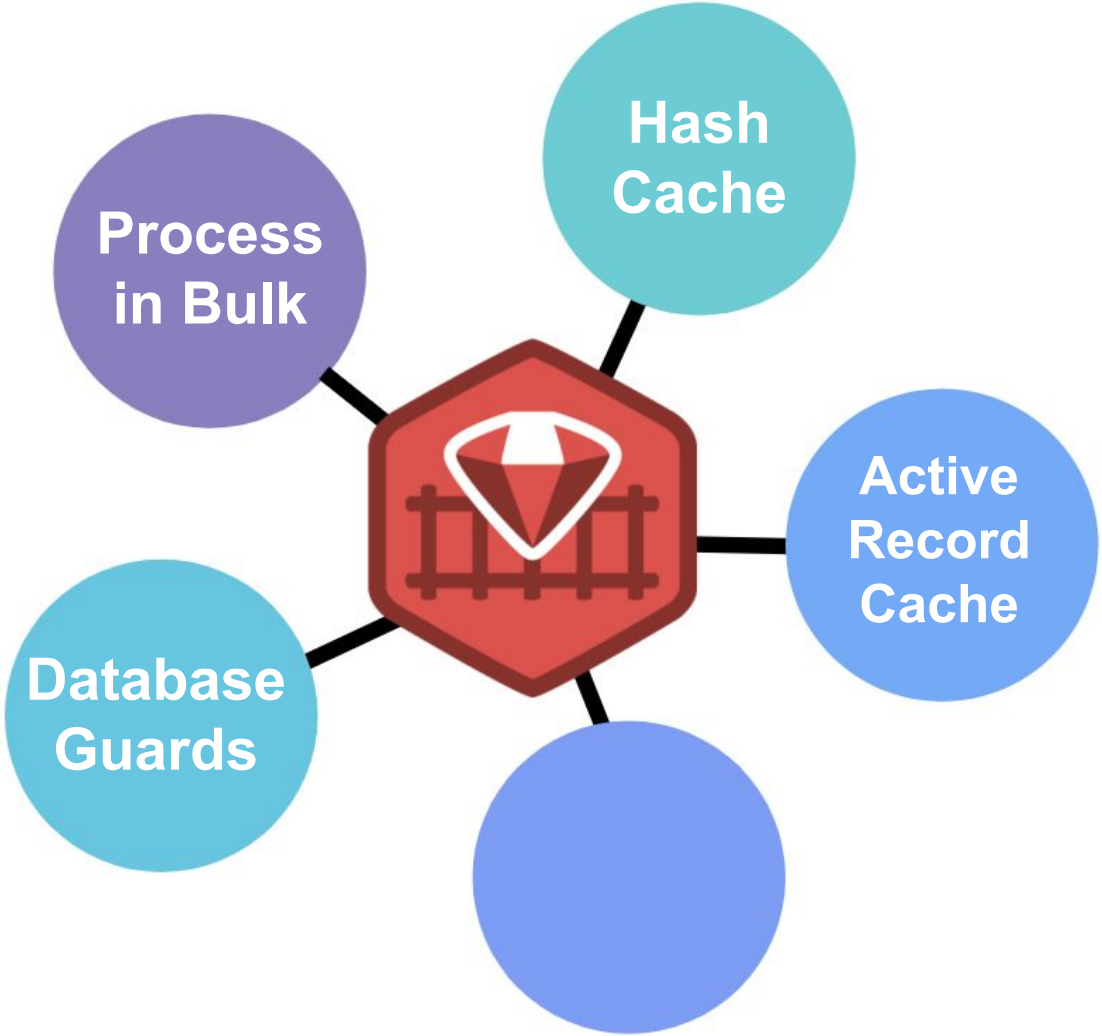

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Resque Workers

Redis

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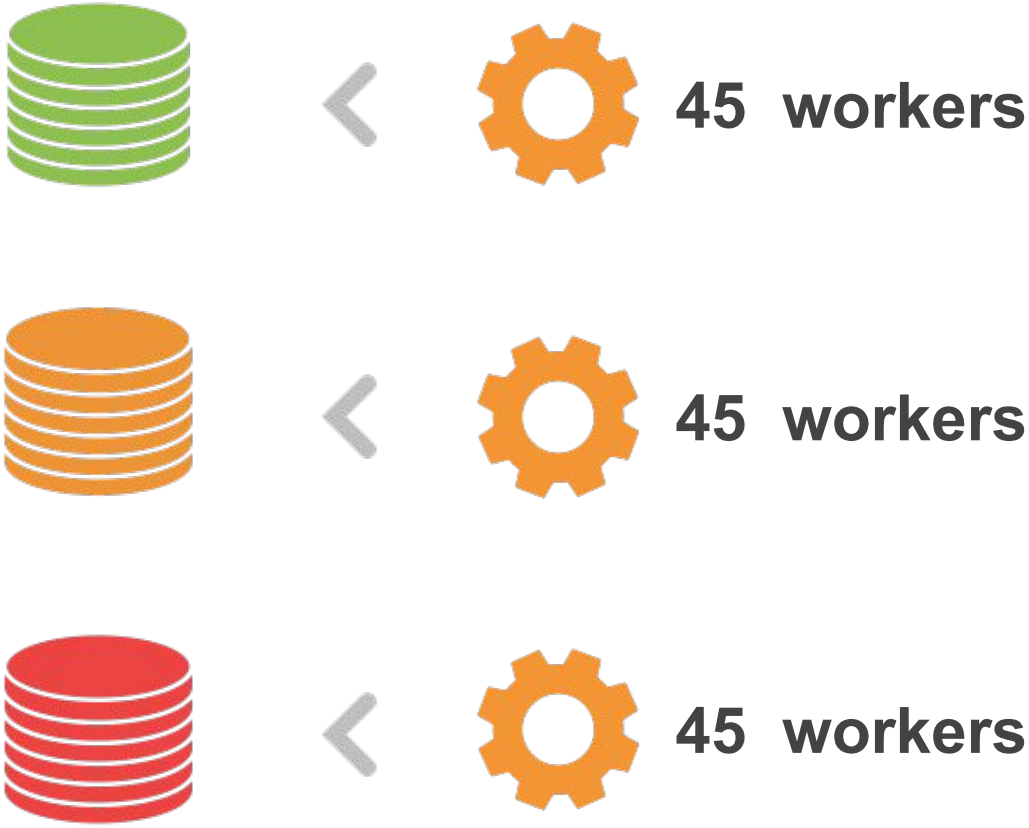
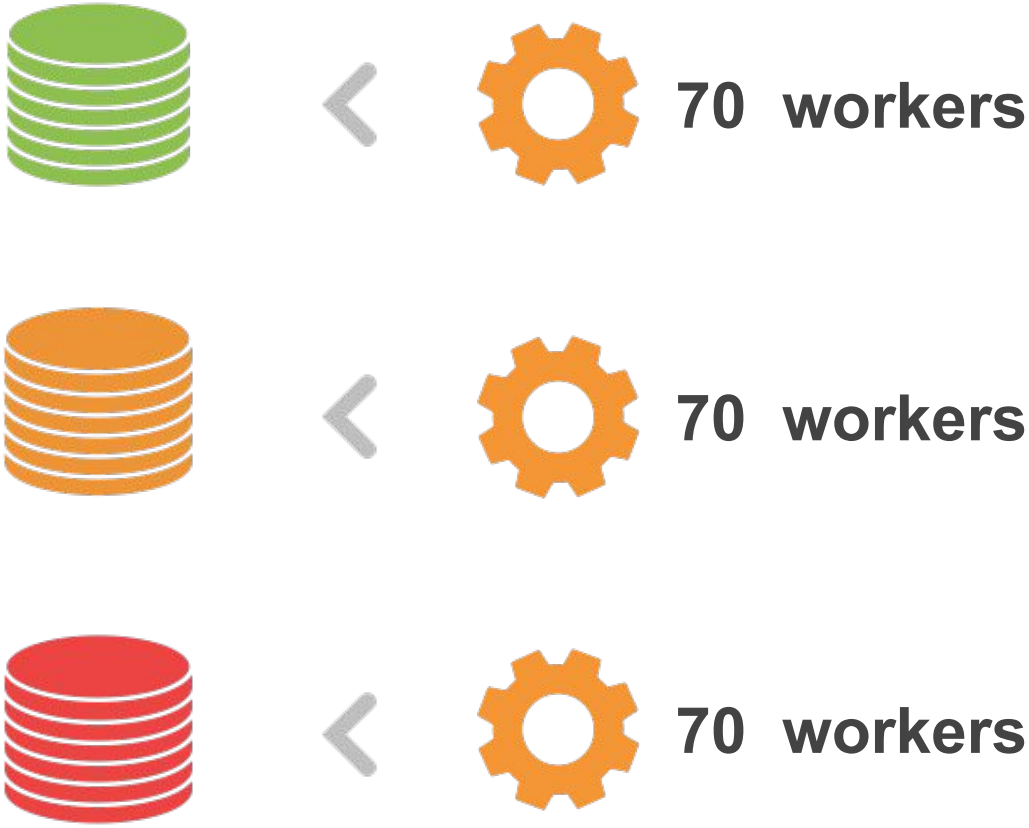
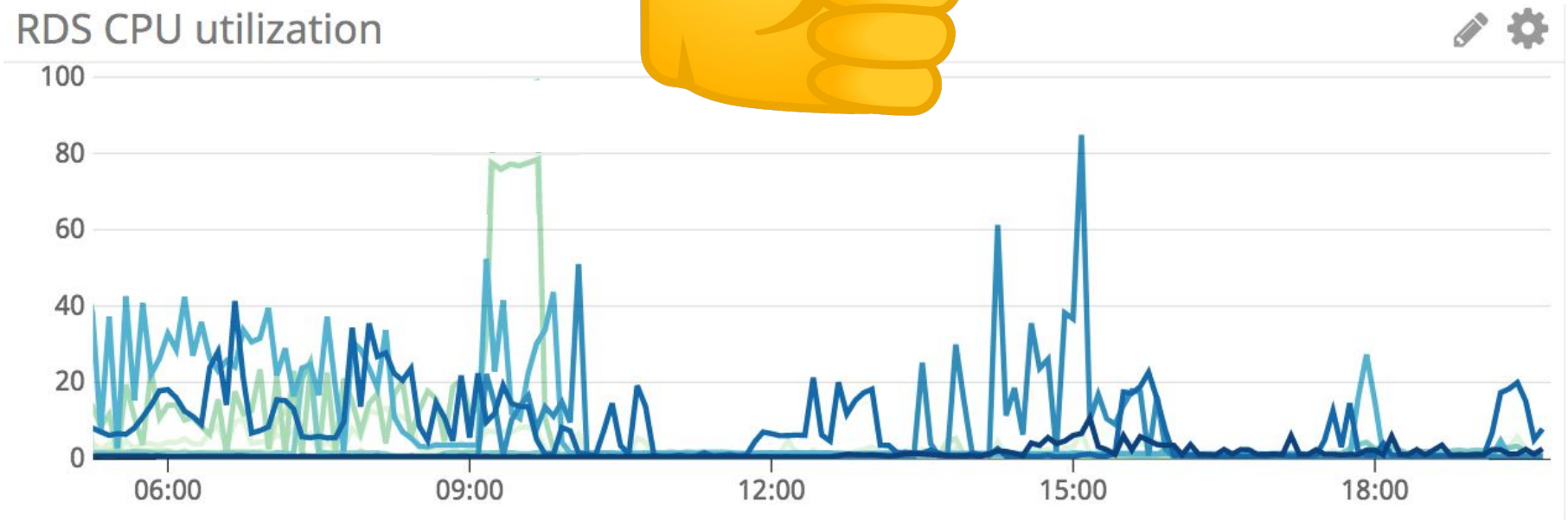


KENNA Security



KENNA Security



@molly_struve

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Security

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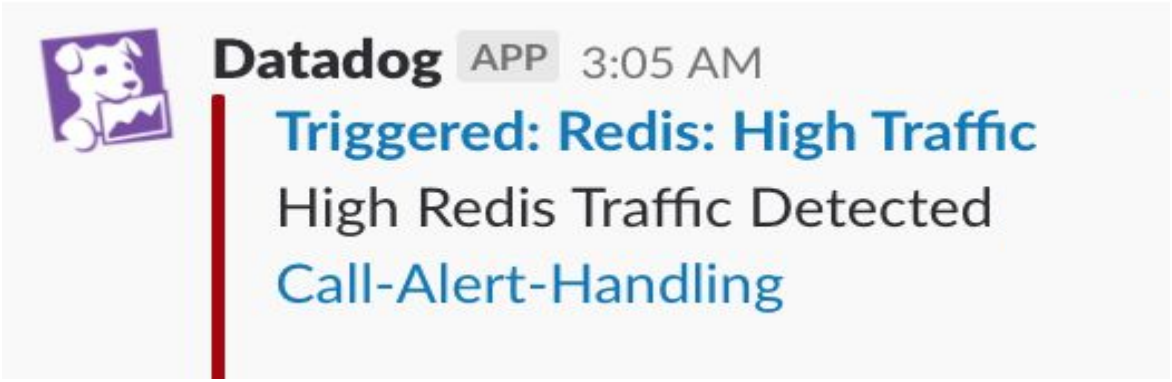

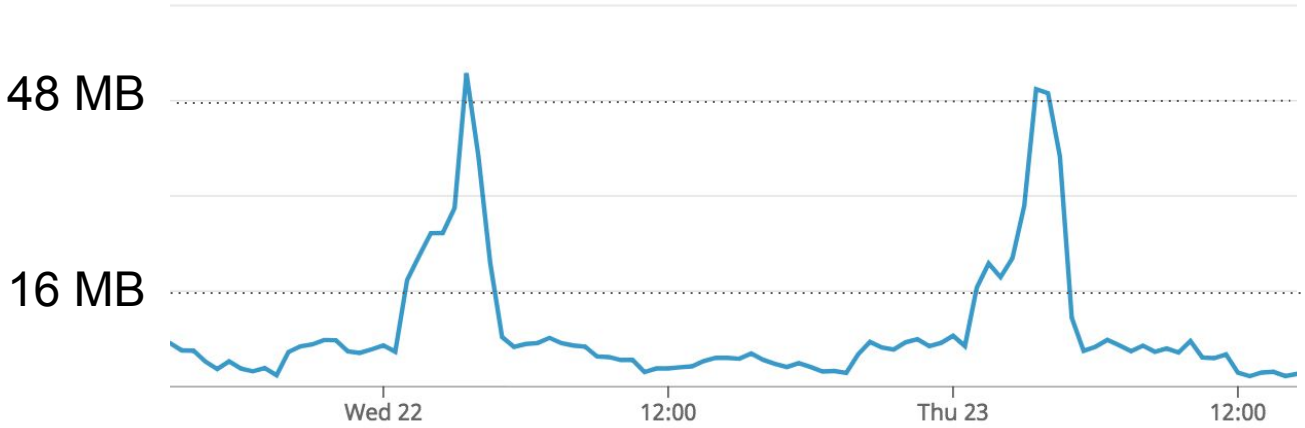

@molly_struve

Redis Requests

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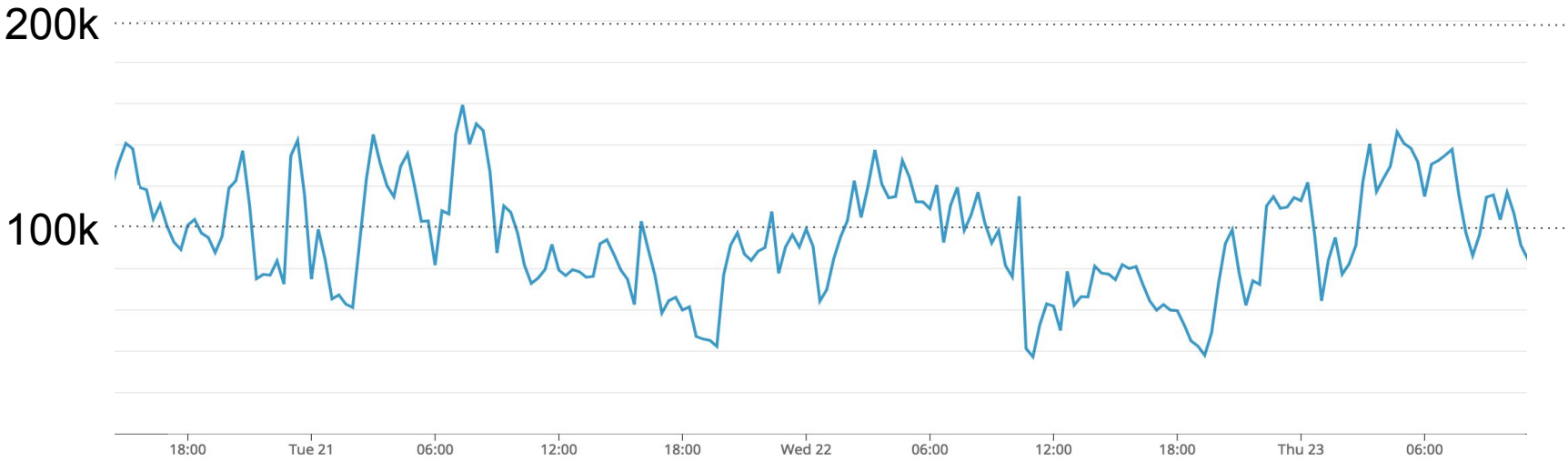

<

70 workers

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Redis::ConnectionError

A month ago - 09/05/18 @ 4:34 pm -05:00

Summary | Comments | Backtrace | Context | Params | Environment | History

Status	Unresolved — We won't alert you again until the error is resolved.
Message	`Redis::ConnectionError: Connection lost (ECONNRESET)`

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Redis Requests

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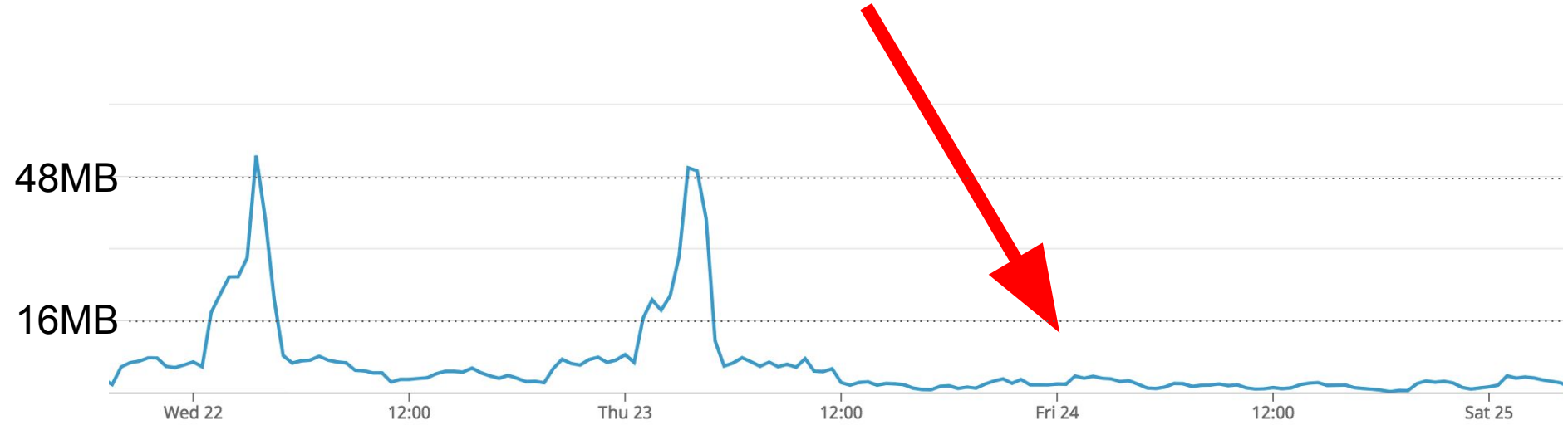
Redis Network Traffic



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Redis::ConnectionError

A month ago - 09/05/18 @ 4:34 pm -05:00

Summary | Comments | Backtrace | Context | Params | Environment | History

Status	Resolved — We won't alert you again until the error is resolved.
Message	`Redis::ConnectionError: Connection lost (ECONNRESET)`

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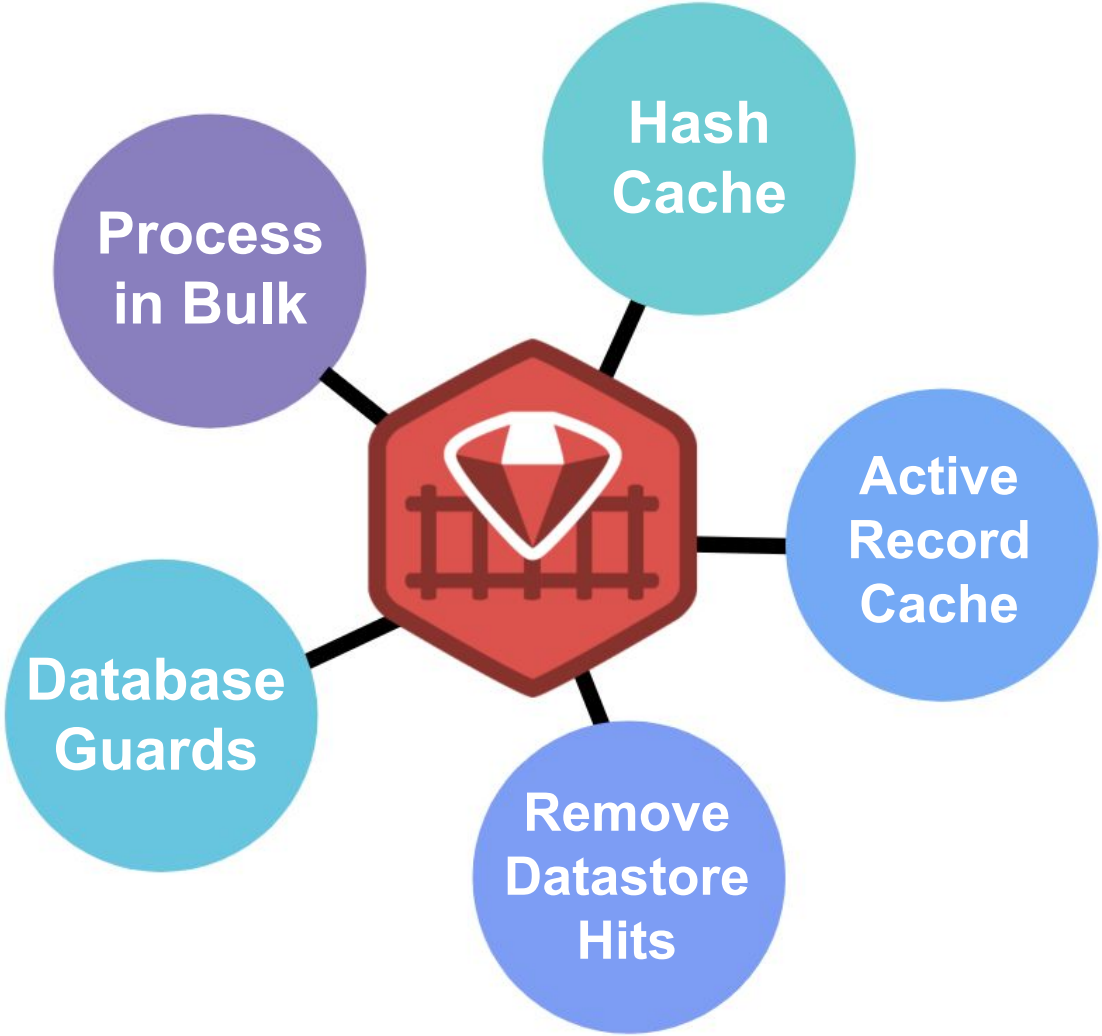

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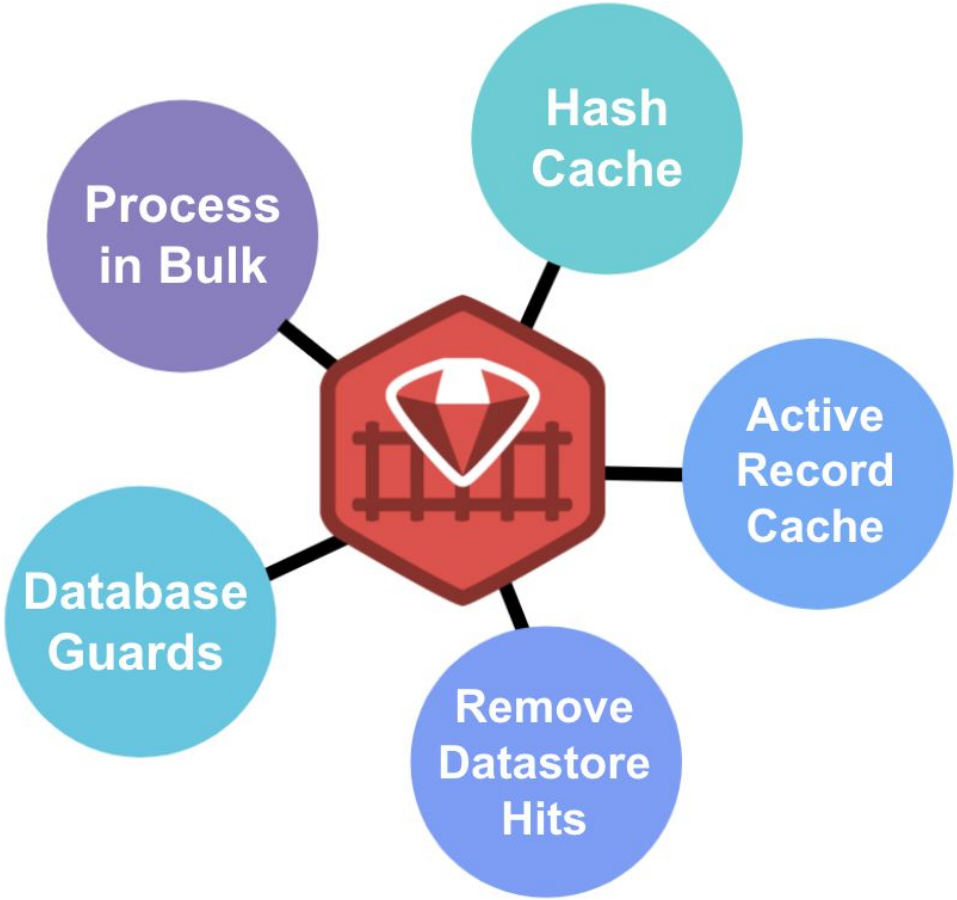

Every datastore hit COUNTS

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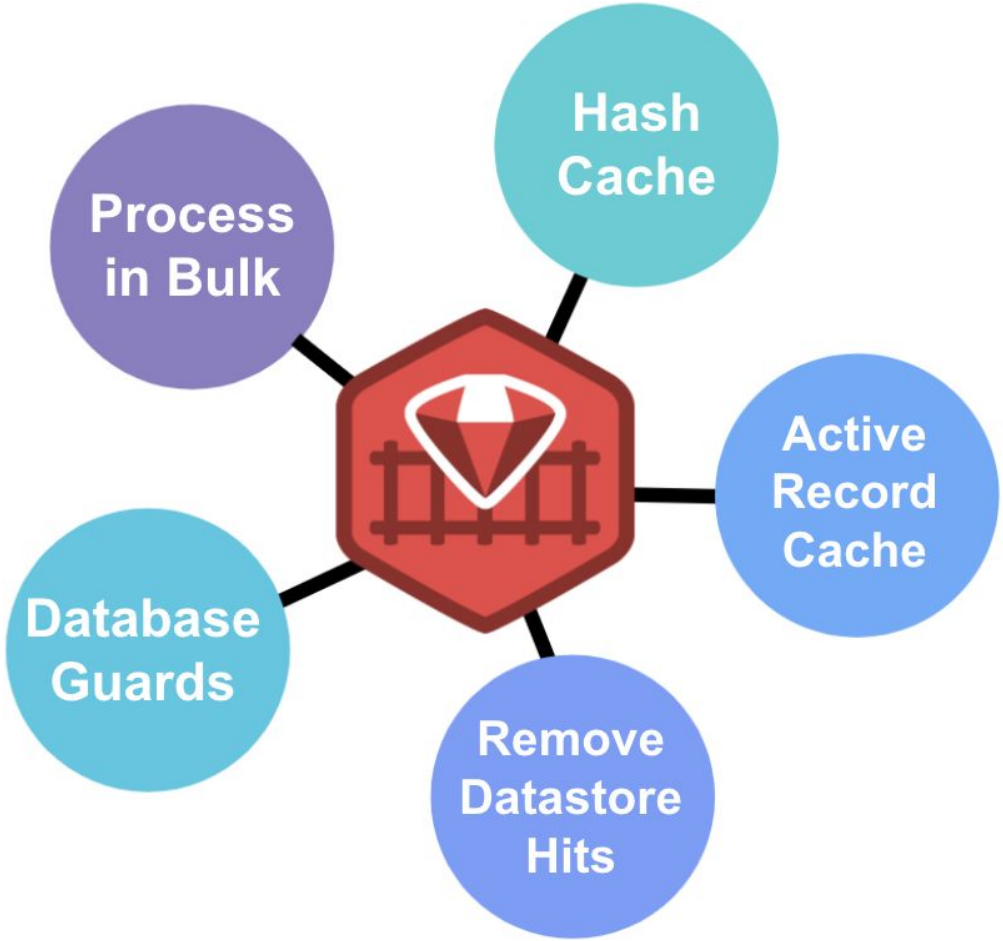

Questions

Contact

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