Elasticsearch as Search Engine for User System

Taras Hnativ

Lviv Polytechnic National University, Lviv, Ukraine
hnativtaras79@gmail.com

Abstract. All sites that we visit every day is a "Search" box. Blogs, wikis, shopping, social media, every website can benefit from providing search. Google, started as just a very powerful Search Engine. As developers, scientists and all who plan to implement some types of website, they all have the same need for a quality and speedy search function. In fact more recently, search has become so fast and useful that it has been used to power almost entire websites with millions of listing pages. And of course we have a lot of search engines with their pros and cons, but the most powerfull is ElasticSearch. In this article I am going give a brief outline of ElasticSearch. And also will be covered the deloying ES as cluster on AWS.

Keywords: ElasticSearch, AWS,search systems, search engines, Lucene, indexing, reindexing, sharding.

1 Introduction

Today, search engines are very popular because all for what we use the internet it is searching for information that we are interested in, searching for the goods we want to buy, searching for friends and many other things that interest us. Everyone, when searching for information, wants to get the most relevant result, get it quickly and efficiently. If we are not even sure whether we formulated the query correctly, or made a spelling error, we hope that the system will understand and return the result we expected. Also, when a user starts typing a query in the relevant search engine box, modern real-time search engines offer us the choice of continuing our query or even help us formulate it correctly. Today search engines can be found in social networks, online stores, applications. Each web-based search engine has a set of properties that they must provide:

- Speed;
- Reliability;
- Relevance of the result;
- Convenience;

Each of these properties is very important, so the owners of these systems are trying to improve them and be able to control every stage from the request to the result on the client-side.

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2 Formulation of the Problem

The problem of choosing a search system or search engine is extremely important because all areas in our informational world work with data that need to be processed. Also, there is a problem with reliable storage for data with rapid access and the ability to obtain relevant data.

3 Analysis of Last Research and Publications

Thanks to powerful algorithms, powerful advertising platforms, and the personal user experience, Google is an engine that should be taken into account and one of the most popular search engines in the world. Keep in mind that giant search engines collect users browsing history and share this information with advertisers and other members. However, if you do not want to trade privacy for convenience, there are dozens of Google alternatives - many of them propose a better search.

- Global search engine market in 2020:
- • Google 92.54%
- • Bing 2.44%
- • Yahoo! 1.64%
- • Baidu 1.08%
- • Yandex 0.54%
- • DuckDuckGo 0.45%
- • Sog 0.44%
- • Ecology 0.14%
- • Shenm 0.08%
- • Probably 0.07%

Google started a new search engine for scientific collaboration that will help make the millions of data sets available on the Internet.

The system will help scientists, journalists to find what they need for their jobs and their people - or just satisfy their intellectual curiosity.

The new search engine works like Google Scholar, a popular search engine for academic businesses and others.

4 Formulating the Purpose of the Article

To create your own search engine, you need to analyze the existing systems and choose a search engine or platform to implement the idea. Therefore, the main goal will be to evaluate the positives and negatives of the Elasticsearch search engine.

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5 Main Material

ElasticSearch is based on the full-text search engine Apache Lucene, which has in common with the main competitor Apache Solr. While Lucene provides most of the search features, ElasticSearch extends this, and most importantly, turns it into a fully distributed and automatically scaled REST API.

Elasticsearch is a real-time search and analytics system. It indexes documents on a large scale and allows you to quickly search for and perform analytics on them.

Elasticsearch can be integrated with Hadoop to provide storage, retrieval, and analysis of big data. In this post, I will give a brief overview of how it works.

ElasticSearch uses a Javascript object notation (JSON) to store data, it's also out of schema; although it is likely that you will need to determine at least a portion of the "mapping" for your index. Setting up the ElasticSearch cluster is quite simple.

In a basic full-text search engine, your query probably defines the search terms. In ElasticSearch you can also specify:

- How conditions (marker, prefix, or partial match) match
- What fields in documents are searched for
- Which fields are more relevant
- Are more recent documents more relevant
- Filters (to search only subsets of data)
- Aggregations (to return metadata for primary search results)
- and more

You do have complete control over the search, but be careful. ElasticSearch is very powerful, but I recommend doing a lot of research before you take it, if you make the wrong query, it may be difficult to understand what was returned and you can send a query that is slow.

How it works?

At its core, Elasticsearch uses Lucene. Lucene is a Java engine built to optimize text storage. It can effectively search for and retrieve text elements that closely match the search terms.

So why the need for Elasticsearch? Elasticsearch gives you a cleaner API for the lower-level Lucene engine, it is much larger and supports plugins and integration with a number of other technologies.

The key concepts can be divided into 3 main areas. The first key concept is the index. An index is simply a collection of documents. These documents should be of a similar style, such as product details and reviews or software documentation. This index is how you add, edit, and receive documents.

The second concept is types. Types are located under the index and act as the logical separation of components in documents stored in the index. For example, let's say you create an application that stores software documentation. In the program, each documentation page contains textual content, any images, and any comments. This entire page would be under the same index, but the types should be used to separate each component. This gives some logical distinction when looking for an index.

The third concept is shard. The index cannot be split, so if you want to split it across the nodes of the cluster, this can be a problem. Elastic search solves this by using several Lucene indexes, which it calls shard. So shard is just a Lucene index.

Today Elasticsearch is very widely used for text search and geospatial search, real-time BI dashboards and log analysis. Although using Elasticsearch managed cloud service instead of running your own cluster on your own machines is tempting, Amazon's Elasticsearch service is not a good choice, and that's why.

AWS has decided to create an Elasticsearch service, but they don't seem to have the important know-how and experience in the real world, because many of their decisions around the service just don't make sense.

Invalid number of master nodes. AWS ES allows you to request custom nodes for your cluster. For any non-trivial cluster that is important to have. However, in the drop-down menu to select the number of master nodes before provisioning, you will also find a completely invalid option 2 master nodes.

Multi AZ support exists, but it is not enabled by default - possibly to save on regional data transfer costs, but I recommend any real-world cluster to use this affinity feature.

No local updates. This is the biggest stop show. When you provide Elasticsearch for AWS, you get a cluster that works with a particular version of Elasticsearch without being able to upgrade to a new version. AWS ES does not support on-site version updating - this is the easiest and recommended upgrade method. If you find that you are running a version that is buggy or just needs a feature from a new version - you have to go through a long process of starting a new cluster, adding it to the list for re-indexing, re-indexing, and updating your entire system. new clusters.

You can only back up once a day. Backups at Elasticsearch are very cheap, and I usually recommend backing up twice an hour or more for critical systems. The best thing you can do with AWS ES is back up for an hour once a day, and it's a terrible default for the production system.

Security. It is too easy to leave the Elasticsearch cluster open because many security features are not applied. In addition, most X-Packs are not supported, and so there is no such flexibility for security. Most systems use Elasticsearch for sensitive data.

Various restrictions and blocking behavior. AWS has decided to interfere with the cluster in some cases, limiting your control of the cluster and turning off some APIs and behavior. For example, the Index Closing / Opening API - which is required to use the Shrink API, for example, or updating certain index settings - is disabled, and an attempt will result in an error message saying "Your request is denied by Amazon Elasticsearch". There is also a ClusterBlockException that blocks all cluster write operations when some CloudWatch warnings are triggered.

Configurations not allowed, limited support for configuration changes. Out of dozens of important configurations, only a small subset of about 5 configuration options can be modified. Therefore, such performance optimizations (such as query cache sizes, thread pool sizes), and even standard functionality are simply not usable (for example, reindex.remote.whitelist is not supported, and as such, reinstalling from

a remote cluster is simply not possible). This makes many productions in the real world simply impossible for AWS ES.

No magazines. There is absolutely no visibility for magazines, though sometimes Elasticsearch magazines are real-time savings. Complaints, warnings, slow GC logs and even bits of information are just too valuable to ignore by any production system.

No plugins. No support for installing plugins prevents you from using Elasticsearch to the full. It is not only about the X-Pack (which adds security and proper monitoring, among other things - which AWS ES is completely missing), but also the impossibility of installing analyzer plugins, receiving plugins, etc. - many of which are an important part of a fully functioning EC system in the real world the world.

Zero Visibility. AWS ES offers close monitoring and visibility of cluster metrics. CloudWatch, which is enabled by default to monitor core VMs, is far from sufficient - it only shows some common machine metrics combined by multiple high-level cluster metrics. In a real ES installation, you want to know much more about your cluster for optimization in normal operations and to be able to effectively debug when the cluster begins to tighten. This includes a better view of machine metrics, a deeper look at many cluster metrics (caches, flow pools, rates, etc.). To begin with, each ES cluster must have a Kibana Monitoring and Grafana dashboard installed, as well as a Cerebro instance for a clear view of the cluster's current status.

There are two main alternatives to running Elasticsearch on AWS:

Elastic Cloud - A decision made on AWS, managed and maintained by Elastic, the company behind Elasticsearch. This way, it always supports the latest versions as soon as it's released and provides almost all the visibility you need, as well as much of the extensibility you'll ever need - including log visibility and downloading your own plugins. Upgrading to newer ES versions without any downtime, as well as resizing clusters on the go is also supported outside the box.

Running your own Elasticsearch cluster on AWS EC2 will be a lot cheaper (about 2 times more) and give you full control, visibility, and accessibility if configured correctly. Deploying it really is easy if you do it with Terraform (see My Elasticsearch Cloud Deploy repository) and then the size and monitoring are as simple as using cloud offers. Nowadays, a proper size cluster does not require much attention if the growth is linear.

In fact, the biggest advantage of AWS ES is that it connects and seamlessly integrates with other AWS services (such as Kinesis Firehose and many others). For that matter, obviously there will be some code to write if you are going to run your own cluster or use an Elastic managed solution, but for some use cases, you may find good tools that already work.

6 Conclusions

I hope this article on using ES as a search engine and evaluating options for cluster deployment has been helpful and will allow you to start creating your own search

engine quickly enough! All it takes is a little imagination and a simple web front, and you'll be competing with Google in no time.

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