**Content**

[1. Concepts 2](#_Toc20595802)

[1. Elasticsearch key concepts 2](#_Toc20595803)

[2. Inverted index 3](#_Toc20595804)

[3. Lucene 3](#_Toc20595805)

[4. Single-page application (SPA) 3](#_Toc20595806)

[2. How to Elasticsearch 5](#_Toc20595807)

[1. Port forwarding 5](#_Toc20595808)

[2. H 5](#_Toc20595809)

1. Concepts
   1. Elasticsearch key concepts

**Node** − It refers to a single running instance of Elasticsearch. Single physical and virtual server accommodates multiple nodes depending upon the capabilities of their physical resources like RAM, storage and processing power.

**Cluster** − It is a collection of one or more nodes. Cluster provides collective indexing and search capabilities across all the nodes for entire data.

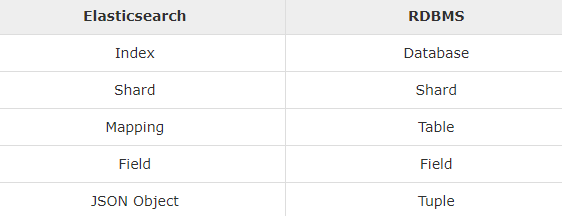
**Index** − It is a collection of different type of documents and document properties. Index also uses the concept of shards to improve the performance. For example, a set of document contains data of a social networking application.

**Type/Mapping** − It is a collection of documents sharing a set of common fields present in the same index. For example, an Index contains data of a social networking application, and then there can be a specific type for user profile data, another type for messaging data and another for comments data.

**Document** − It is a collection of fields in a specific manner defined in JSON format. Every document belongs to a type and resides inside an index. Every document is associated with a unique identifier, called the UID.

**Shard** − Indexes are horizontally subdivided into shards. This means each shard contains all the properties of document, but contains less number of JSON objects than index. The horizontal separation makes shard an independent node, which can be store in any node. Primary shard is the original horizontal part of an index and then these primary shards are replicated into replica shards.

**Replicas** − Elasticsearch allows a user to create replicas of their indexes and shards. Replication not only helps in increasing the availability of data in case of failure, but also improves the performance of searching by carrying out a parallel search operation in these replicas.

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* 1. Inverted index

Elasticsearch uses a structure called an inverted index, which is designed to allow very fast full-text searches. An inverted index consists of a list of all the unique words that appear in any document, and for each word, a list of the documents in which it appears.

* 1. Lucene

full-text search library in Java which makes it easy to add search functionality to an application or website.

* 1. Single-page application (SPA)

A single-page application (SPA) is a web application or web site that interacts with the user by dynamically rewriting the current page rather than loading entire new pages from a server. This approach avoids interruption of the user experience between successive pages, making the application behave more like a desktop application. In a SPA, either all necessary code – HTML, JavaScript, and CSS – is retrieved with a single page load,[1] or the appropriate resources are dynamically loaded and added to the page as necessary, usually in response to user actions. The page does not reload at any point in the process, nor does control transfer to another page, although the location hash or the HTML5 History API can be used to provide the perception and navigability of separate logical pages in the application.[2] Interaction with the single page application often involves dynamic communication with the web server behind the scenes.

Web browser **JavaScript frameworks**, such as AngularJS, Ember.js, ExtJS, Knockout.js, Meteor.js, React and Vue.js have adopted SPA principles.

**SPA with Ajax and Websockets :** WebSockets are typically used in applications where real time updates are required . WebSockets also enables us to multiplex data on the same connection, thus one can easily implement an 'AJAX library on top of WebSockets and still use the same WebSocket connection for bi-directional real-time data transfer.

**Server-sent events (SSEs)** is a technique whereby servers can initiate data transmission to browser clients. Once an initial connection has been established, an event stream remains open until closed by the client. SSEs are sent over traditional HTTP and have a variety of features that WebSockets lack by design such as automatic reconnection, event IDs, and the ability to send arbitrary events.

Although this method is **outdated**, asynchronous calls to the server may also be achieved using **browser plug-in technologies such as Silverlight, Flash, or Java applets.**

Requests to the server typically result in either **raw data (e.g., XML or JSON),** or new **HTML** being returned. In the case where HTML is returned by the server, JavaScript on the client updates a partial area of the DOM (Document Object Model).When raw data is returned, often a client-side JavaScript XML / (XSL) process (and in the case of JSON a template) is used to translate the raw data into HTML, which is then used to update a partial area of the DOM.

1. How to Elasticsearch

To stop elasticsearch running process on win10, run in PowerShell

Stop-Process -Id (Get-NetTCPConnection -LocalPort 9200).OwningProcess -Force

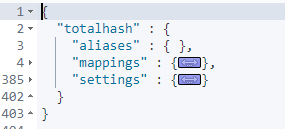
* 1. Port forwarding

In computer networking, port forwarding or port mapping is an application of network address translation (NAT) that redirects a communication request from one address and port number combination to another while the packets are traversing a network gateway, such as a router or firewall. This technique is most commonly used to make services on a host residing on a protected or masqueraded (internal) network available to hosts on the opposite side of the gateway (external network), by remapping the destination IP address and port number of the communication to an internal host

Port Forwarding allows remote computers (for example, computers on the Internet) to connect to a specific computer or service within a private local-area network (LAN).

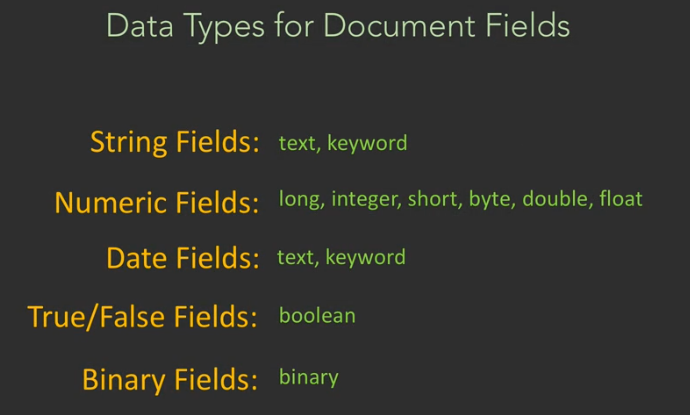
* Local
* Remote
* Dynamic port forwarding

1. ES defining an index structure



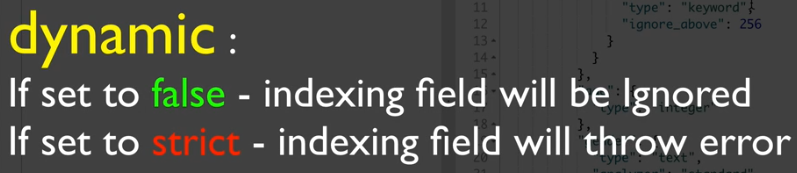
Mappings – details about fields.

Settings – higher level, how many shards, how many replicas etc….

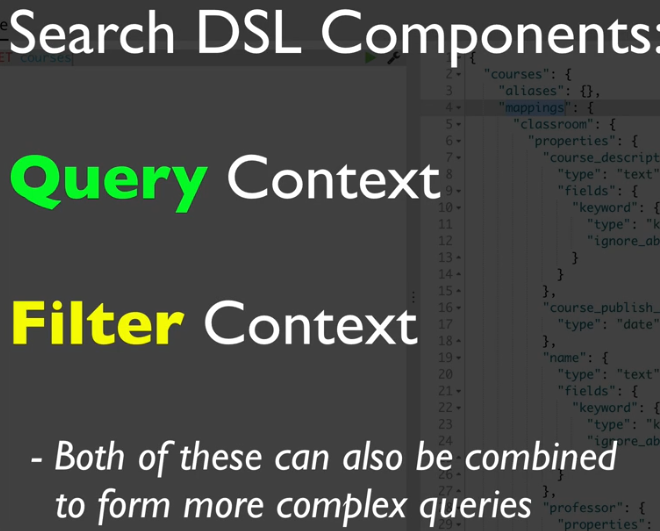


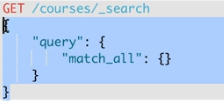
 analyzer – for text values. Standard analyzer splits on whitespace – creates tokens per split – and lowercase the text. Also punctuation is removed.

ES dynamically modifies the structure, the mapping of the index when new type of value as been arrived. To enforce strictness you need to specify during the index creation time.



1. Elasticsearch Query DSL



 - we are sending our requests to the search endpoint.

 Relevancy score; match\_all() search criteria and all will be 1.0



Wether or not the field exists.

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Everything in Elasticsearch is HTTP over Json. This is the true power of ES.

* Must
* Must\_not
* Should
* Minimum\_should\_match

