Introduction to replication

- What happens if a node's hard drive fails? 💥
- Hardware can fail at any time, so we need to handle that somehow
- Elasticsearch supports replication for fault tolerance
- Replication is supported natively and enabled by default 🎉
- With many databases, setting up replication can be a pain 🤯
- Replication is *extremely* easy with Elasticsearch ❤️

How does replication work?

- Replication is configured at the index level
- Replication works by creating copies of shards, referred to as *replica shards*
- A shard that has been replicated, is called a *primary shard*
- A primary shard and its replica shards are referred to as a *replication group*
- Replica shards are a complete copy of a shard
- A replica shard can serve search requests, exactly like its primary shard
- The number of replicas can be configured at index creation

Choosing the number of replica shards

- How many replica shards are ideal, depends on the use case
- E.g. is the data stored elsewhere, such as in a RDBMS?
- Is it OK for data to be unavailable while you restore it?
- For mission critical systems, downtime is not acceptable
- Replicate shards *once* if data loss is not a disaster
- For critical systems, data should be replicated *at least* twice

Snapshots

- Elasticsearch supports taking snapshots as backups
- Snapshots can be used to restore to a given point in time
- Snapshots can be taken at the index level, or for the entire cluster
- Use snapshots for backups, and replication for high availability (and performance)

Increasing query throughput with replication

- Replica shards of a replication group can serve different search requests simultaneously
    - This increases the number of requests that can be handled at the same time
- Elasticsearch intelligently routes requests to the *best* shard (more on that later)
- CPU parallelization improves performance if multiple replica shards are stored on the same node

Lecture summary

- Replication is used to ensure high availability for indices
- A side benefit is increased query throughput
- Replication works by copying a given shard's data
- A replica shard is **never** stored on the same node as its primary shard
- Replicate shards once if your system isn't critical; replicate at least twice if your system is mission critical
- Snapshots can be taken as backups of specific indices, or the whole cluster