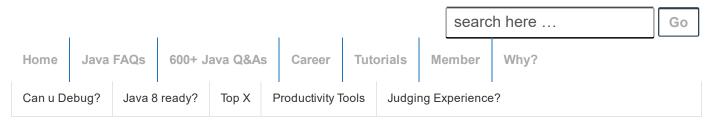
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Essentials > 6 Scaling your Java applications interview Q&As

6 Scaling your Java applications interview Q&As

Posted on September 8, 2014 by Arulkumaran Kumaraswamipillai — No Comments \



Q1. What is the difference between performance and scalability?

A1. The performance and scalability are two different things. For example, if you are in the business of transporting people in a van, the performance is all about utilizing more powerful engine to transporting your people quicker to their destination. Scalability is all about catering for increase in demand for such transportation as your business grows by either increasing the capacity of individual actors (e.g. bigger van from 8 seater to 12 seater) or adding more actors (e.g. from a single van to 3 vans).

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Q2. What are the different types of scalability?

A2. Vertical Scaling: You can increase the seating capacity of a van or use more powerful vans to reduce the time it takes to reach the destination. In a computer term, increase CPU, memory, etc to increase the capacity or tune the code/ database to reduce the time it takes to process. This means we have just increased the capacity of each actor. You can also vertically scale an application via multi-threading or using non-blocking I/O.

Horizontal Scaling: In a horizontal scaling model, instead of increasing the seating capacity of each individual actor in the system, we simply add more actors to the system. This means more vans. In terms of the computers, adding more nodes and servers.

Q3. How will you scale your data store?

A3. The scalability of database is critical because data is often a shared resource, and it becomes the main contact point for nearly every web request. The most important question you have to ask when considering the scalability of your database is, "What kind of system am I working with?" Are you working with a read-heavy or a write-heavy system?

Scaling Reads: If your website is primarily a read-centric system, vertically scale your data store with a caching strategy that uses memory cache (e.g. ehcache) or a CDN (Content Delivery Newtork). You can also add more CPU/RAM/Disk to scale vertically.

Scaling Writes: If your website is primarily a write-heavy system, you want to think about using a horizontally scalable datastore such as MongoDB (NoSQL database), Riak, Cassandra or HBase. MongoDB is a NoSQL database with great features like replication and sharding built in. This allows you to scale your database to as many servers as you would like by distributing content among them. A database shard ("sharding") is the phrase used to describe a horizontal partition in a database or search engine. The idea behind sharding is to split data among multiple machines while ensuring that the data is always accessed from the correct

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     -01b: ♦ 13 Spring
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     -03: ♥♦ Spring DI
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place. Since sharding spreads the database across multiple machines, the database programmer specifies explicit sharding rules to determine which machines any piece of data will be stored on. Sharding may also be referred to as horizontal scaling or horizontal partitioning. Oracle uses (RAC – Real Application Cluster) where small server blades are genned-in to an Oracle RAC cluster over a high-speed interconnect.

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SQL Vs NoSQL

SQL Model:

The relational model takes data and store them in many normalized interrelated tables that contain rows and columns. Tables relate with each other through foreign keys. When looking up data, the desired information needs to be collected by joining many related tables and combined before it can be provided to the application.

NoSQL Model

NoSQL databases have a very different model. NoSQL databases have been built from the ground up to be distributed, scale-out technologies and therefore fit better with the highly distributed nature of the three-tier Internet architecture. A document-oriented NoSQL database takes the data you want to store and aggregates it into documents using the JSON format. Each JSON document can be thought of as an object to be used by your application. This might relate to data agregated from 10+ tables in an SQL model.

Q4. What is BigData?

A4. Big data is the term for a collection of data sets so large and complex that becomes very difficult to work with using most relational database management systems and desktop statistics and visualization packages, requiring instead "massively parallel software running on tens, hundreds, or even thousands of servers". Apache™ Hadoop® is an open

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source software project that enables the distributed processing of large data sets across clusters of commodity servers. It is designed to scale up from a single server to thousands of machines, with a very high degree of fault tolerance.

Hadoop uses MapReduce to understand and assign work to nodes in the cluster and HDFS(Hadoop Distributed File System), which is file system that spans all the nodes in a Hadoop cluster for data storage.

Q5. What are the general scaling practices for a medium size system in Java?

A5.

- Using non-blocking IO
- Favoring lock free algorithms and concurrent collection classes like ConcurrentHashmap.
- Vertical scaling more CPU, RAM, etc.
- Caching data.
- Favor stateless idempotent methods.
- Using big JVM heaps.
- Using JMS publish/subscribe model.
- Using resource pooling e.g. database connection pooling,
 JMS connection factory pooling, thread pooling, etc.
- Using flyweight design pattern to minimize object creation.
- Tuning garbage collection to minimize pauses.

Q6. What are the general scaling practices for a large size system in Java?

A6.

- Use of RTSJ (Real Time Specification for Java) which addresses issues like
 - During garbage collection all threads are blocked and the garbage collection time can expand to minutes.
 These huge latencies effectively limit memory which limits scalability.
 - Increased garbage collection latencies make Java less useful for application that use heart beats, make

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real-time trades, etc.

- Java supports a strict priority based threading model.
- Use of Server clusters/JVM clustering (e.g. terracotta).
- Use of distributed cache.
- Use of Big Data like MongDB and NoSQL where applicable.
- Use of SEDA based architecture.
- Use of Message Oriented Middle-ware for loosely coupled and asynchronous architecture.
- Use of CDN (Content Delivery Networks) for storing web resources.
- Use proven libraries like MINA, Cameron FIX, Javalution, Trove collection, etc.

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