Connecting spring boot to dual DB:

1. In application.properties give the two datasource properties
2. Configure two Data Config, like BookDBConfig and UserDBConfig.
3. Should have different packages for both UserRepo and BookRepo and model classes as well.

@Configuration

@EnableTransactionManagement

@EnableJpaRepositories(

        entityManagerFactoryRef = "entityManagerFactory",

        basePackages = {

                "com.ashokit.user.repository"

        }

)

public class UserDBConfig {

    @Primary

    @Bean(name = "dataSource")

    @ConfigurationProperties(prefix = "spring.user.datasource")

    public DataSource dataSource() {

        return DataSourceBuilder.create().build();

    }

    @Primary

    @Bean(name = "entityManagerFactory")

    public LocalContainerEntityManagerFactoryBean entityManagerFactory(EntityManagerFactoryBuilder builder,

            @Qualifier("dataSource") DataSource dataSource) {

        HashMap<String, Object> properties = new HashMap<>();

        properties.put("hibernate.hbm2ddl.auto", "update");

        return builder.dataSource(dataSource)

                      .properties(properties)

                      .packages("com.ashokit.user.model")

                      .persistenceUnit("User")

                      .build();

    }

    @Primary

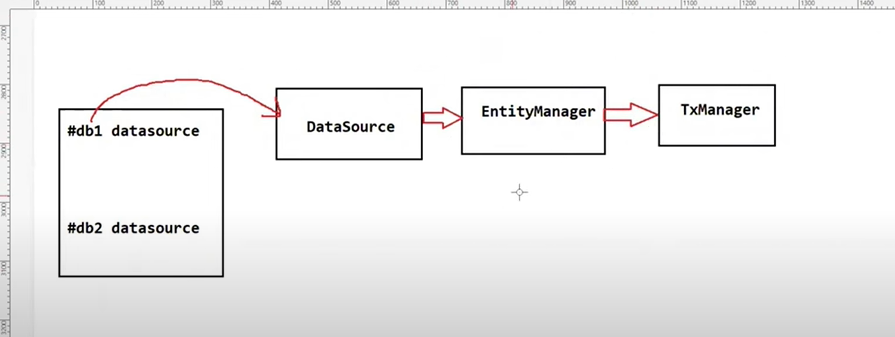
    @Bean(name = "transactionManager")

    public PlatformTransactionManager transactionManager(@Qualifier("entityManagerFactory") EntityManagerFactory entityManagerFactory) {

        return new JpaTransactionManager(entityManagerFactory);

    }

}



**Q) What is hot reloading and how does it work?\***

Hot reloading allows developers to make changes to their code, resources, or configuration files while an application is running, and see those changes immediately reflected without needing to **\*restart the application.\* using Dev Tools.**

**Handling multiple users at the same time:**

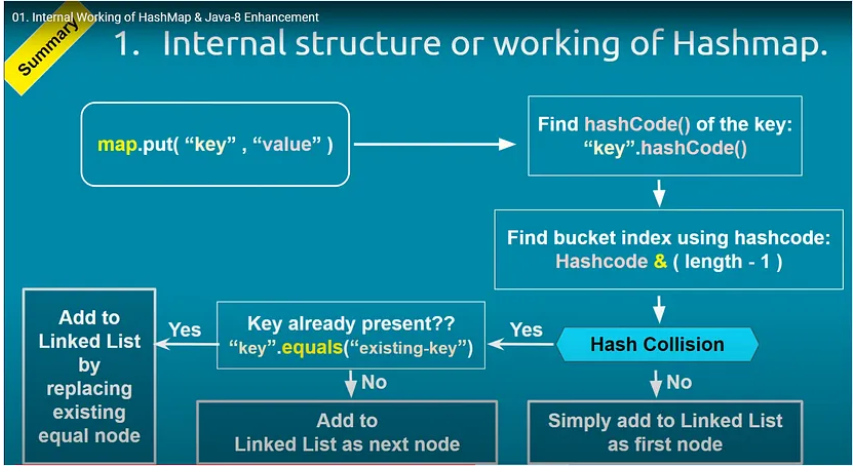
1. Thread pool and asynchronous : using @Async annotation on the method tells spring boot that it should run in a separate thread.
2. How to synchronous two java process: shared DB and share file system
3. JVM architecture: class Loader, Run time Data areas and execution engine

Class loader loads class file into JVM, Runtime Data areas keeps memory for variables and all.. And execution engine will execute the instructions.(wrie once and run anywhere)

1. Stack and heap memory: Heap is shared across threads while the stack is for each method having thread safe
2. Java makes its engine faster by using JIT compiler, byte code to native machine code..
3. Super calls the method in parent class even if we have overridden it.
4. **Private**: The access level of a private modifier is only within the class. It cannot be accessed from outside the class.
5. **Default**: The access level of a default modifier is only within the package. It cannot be accessed from outside the package. If you do not specify any access level, it will be the default.
6. **Protected**: The access level of a protected modifier is within the package and outside the package through child class. If you do not make the child class, it cannot be accessed from outside the package.
7. **Public**: The access level of a public modifier is everywhere. It can be accessed from within the class, outside the class, within the package and outside the package.

**How does polymorphism help the Java collection framework?**

Letting it treated as sameWay, list interface we can use ArrayList or LinkedList



How HashCode and Equals work together in a Collection?

The Relationship Between hashCode() and equals() in Java Collections

In Java, the hashCode() and equals() methods are used in collections to store, retrieve, and identify objects efficiently. They work hand in hand to ensure fast access and accurate results in a collection.

Understanding hashCode():

The hashCode() method is a part of the Java Object class. It returns an integer representation of the object memory address. When an object is stored in a hashed data structure like a HashMap, HashSet, or Hashtable, Java uses the hashCode() method to determine where the object should be stored.

Understanding equals():

The equals() method is used to determine the equality of two objects. If equals() returns true for two objects, this means that they are equal in terms of their defined equality criteria (which can be overridden in a custom class to suit specific needs).

Working Together:

hashCode() and equals() methods work together in the following way:

1. When an object is inserted into a hashed collection, the hashCode() method is called first to determine the correct bucket location for storing the object.
2. If a collision occurs (two objects have the same hash code), the collection calls the equals() method to check if the objects are truly equal. If they are equal, the new object replaces the existing one. If they aren't, the collection resolves the collision and stores both objects.

Ensuring Consistency:

To ensure consistency and avoid misbehavior in collections, there are two important contracts:

1. If two objects are equal (as determined by the equals() method), then calling hashCode() on each of the two objects must produce the same result.
2. If two objects are unequal (as determined by the equals() method), it's not required that calling hashCode() on each of the two objects will produce distinct results. However, producing distinct results for unequal objects may improve the performance of hash tables.

In Summary:

hashCode() and equals() methods are fundamental to the correct functioning of hash-based collections in Java. They are used to determine the storage location of objects and to avoid storing duplicate objects. These two methods should be overridden together and behave consistently with each other to avoid unexpected results in collections.

**Using mutable object as key in HashMap?**

When mutable object is inserted in hashmap, it might change and hashcode might change then its difficult to retrieve the object.

**Can we build a server without using spring framework?**

We can build that using server socket connection, accepting requests from client and write code for all network connection,listening on port

**How to deploy a servlet web application without spring?**

Need to create a war file, configure web.xml file for servlet mapping and all in the end deploy and publis to tomcat server.

**AutoConfiguration:**

Add spring starter web

**Slow in production faster in Dev:**

Check logs, blue/green deployments , optimize query

**Circular Dependency:**

spring.main.allow-circular-references=true, using @Lazy annotation

SOLID Design Principles:

<https://medium.com/@javatechie/solid-design-principle-java-ae96a48db97>

==================================================================================

In Java, the throw and throws keywords are both used in exception handling, but they serve different purposes:

1. **throw**:
   * The throw keyword is used to **explicitly throw an exception** from a method or a block of code. It is typically used when you want to manually raise an exception.
   * It is followed by an instance of the Throwable class or its subclasses (like Exception or RuntimeException).
   * Example:

java

Copy code

public void checkAge(int age) {

if (age < 18) {

throw new IllegalArgumentException("Age must be 18 or above.");

}

}

1. **throws**:
   * The throws keyword is used in a method declaration to indicate that the method **might throw one or more exceptions**. It is a way of informing the caller of the method that they should be prepared to handle the specified exceptions.
   * It is followed by a list of exception types that the method might throw.
   * Example:

java

Copy code

public void readFile(String fileName) throws IOException {

// Code that might throw an IOException

}

**Summary:**

* throw is used to actually throw an exception.
* throws is used to declare that a method might throw exceptions, which must be handled by the method caller.

The equals and hashCode contract in Java is fundamental when dealing with objects, particularly in collections like HashMap, HashSet, and Hashtable. An analogy can help clarify this concept:

**Analogy: Identifying Books in a Library**

Imagine you are in a library with thousands of books. Each book has two important identifiers:

1. **Content (Equals):** This is the actual content of the book, including its title, author, and text. Two books are considered the same if their content is identical.
2. **Barcode (HashCode):** This is a unique code printed on each book that allows the library to quickly find and catalog the book. This barcode is generated based on the book’s content.

**Equals Method (Content Check)**

The equals method is like checking the content of two books to see if they are the same. If two books have the same title, author, and text, they are considered equal, regardless of their barcode.

* **Analogy:** Imagine you are comparing two books to see if they are identical. You carefully read through each one and determine they are exactly the same, even though their barcodes might differ.
* **In Java:** When you override the equals method, you define the logic that determines when two objects are considered equal based on their content.

**HashCode Method (Barcode Check)**

The hashCode method is like the barcode on a book. The barcode is generated based on the book’s content, so two identical books should ideally have the same barcode.

* **Analogy:** In the library, if two books have the same barcode, you assume they are the same book and treat them as such.
* **In Java:** When you override the hashCode method, you provide a way to generate an integer (barcode) that represents the object’s content. This allows collections like HashMap and HashSet to quickly locate objects.

**The Contract**

The equals and hashCode contract states:

1. **Consistent Equals and HashCode:** If two objects are equal (based on equals), they must have the same hashCode. In the library, if two books have the same content, they should have the same barcode.
2. **Different HashCodes for Different Objects (Not Always Required but Ideal):** If two objects have different content, their hashCode values should ideally be different. However, different books might still end up with the same barcode by coincidence (a hash collision), but this is rare and should be minimized.

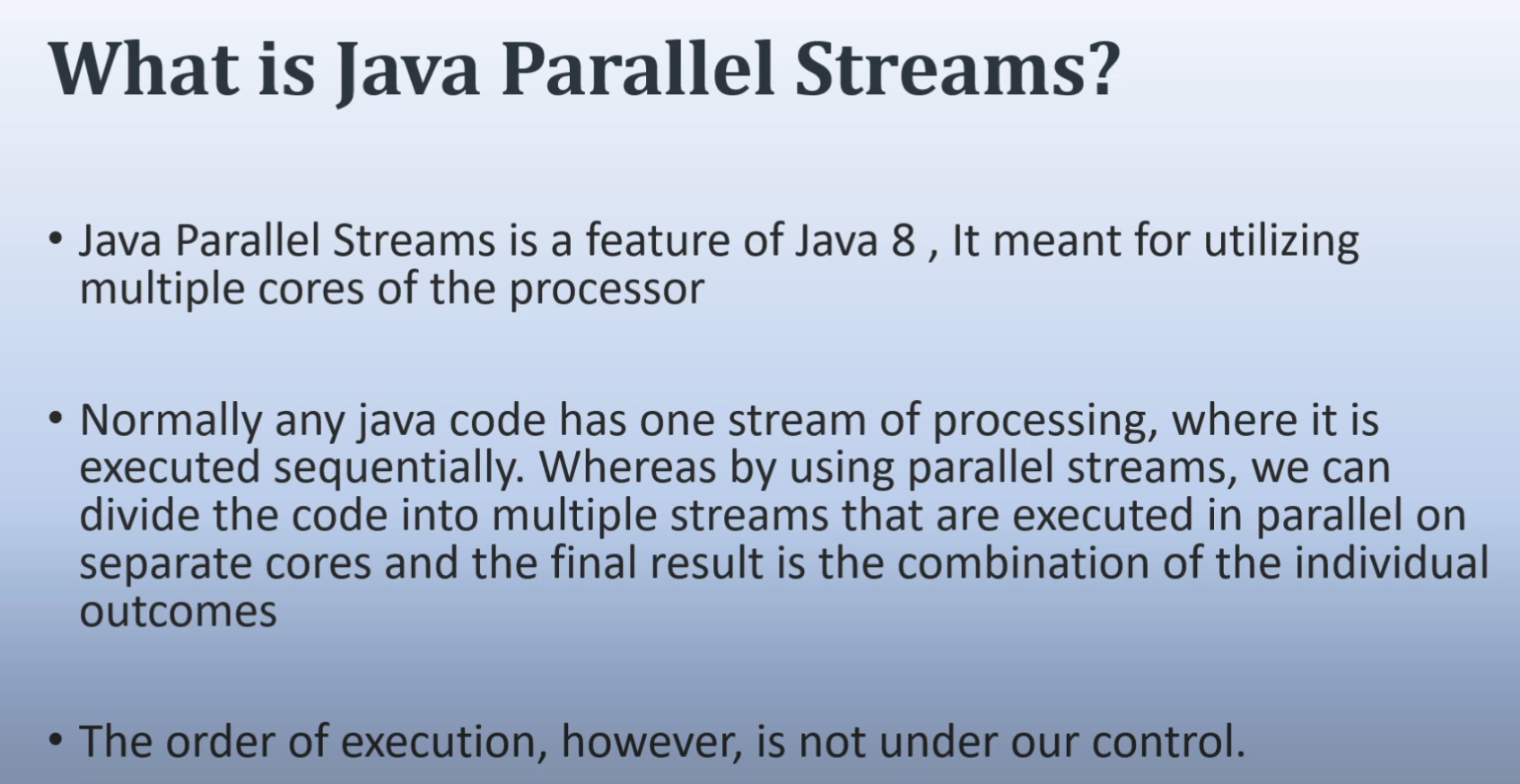
**Violation of the Contract**

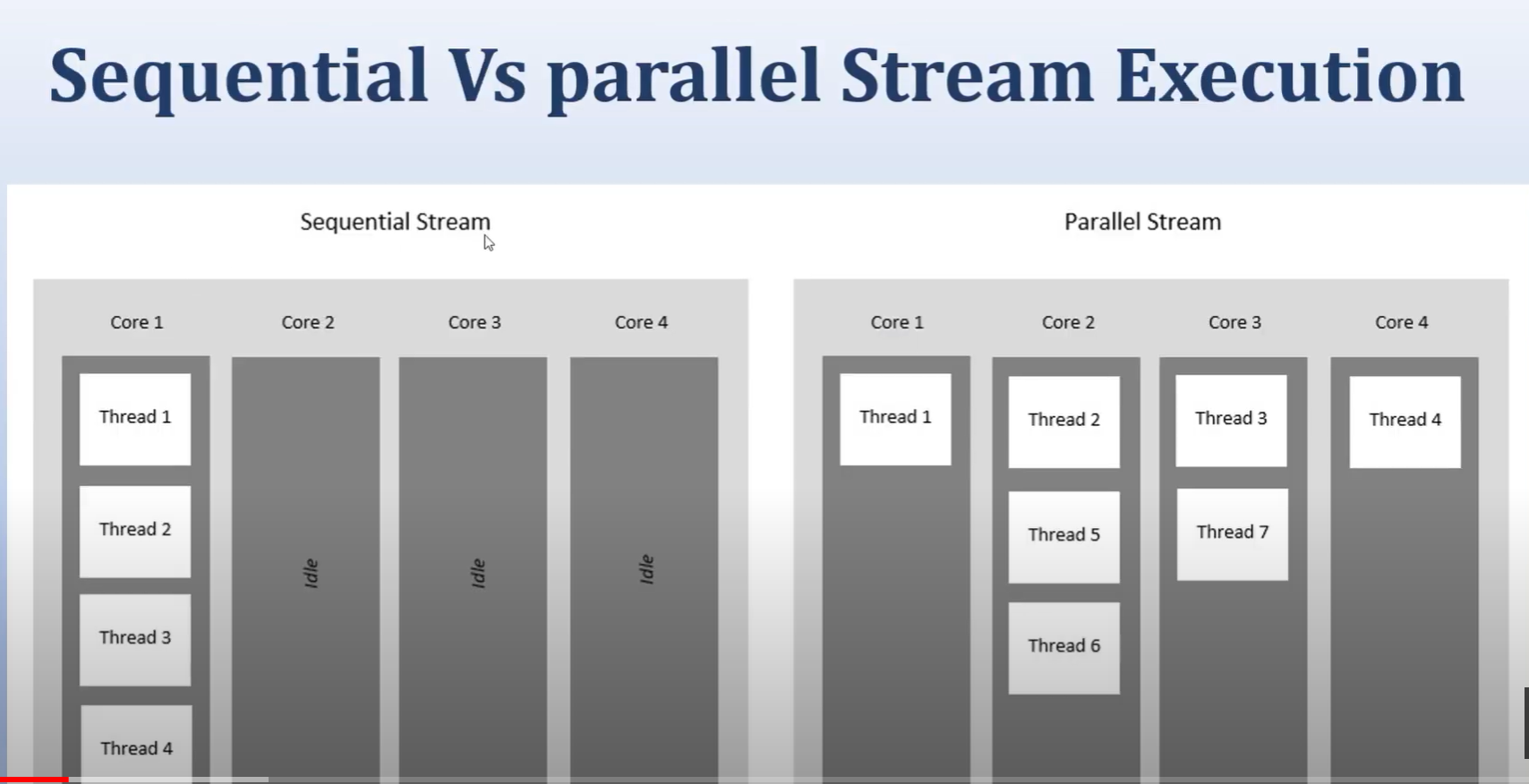
* **Same Content, Different Barcodes:** If two books have the same content but different barcodes, the library might store them in different places, causing confusion. In Java, if two equal objects have different hash codes, it can cause issues in hash-based collections like HashMap.
* **Different Content, Same Barcode:** If two different books have the same barcode, the library might mistakenly treat them as the same book. In Java, this is a hash collision, and while it’s not a violation of the contract, it can degrade performance.

**Conclusion**

In Java, following the equals and hashCode contract is crucial for ensuring that objects behave correctly in collections that rely on hashing. Just like in a library, where consistent content (equals) and barcode (hashCode) management is key to efficient operation, in Java, adhering to this contract is essential for avoiding bugs and ensuring efficient data retrieval.

**How does parallel stream work in java?**





Parallel streams in Java are part of the Stream API, introduced in Java 8. They enable parallel processing of data streams, allowing operations on the stream to be executed concurrently, leveraging multi-core processors. Here's how they work internally:

**1. Splitting the Data**

* **Spliterator:** A parallel stream internally uses a Spliterator, which is a special kind of iterator that supports parallelism. The Spliterator recursively splits the data source into smaller parts, which can be processed independently. This splitting happens until the data chunks are small enough to be processed efficiently by individual threads.

**2. Creating the ForkJoinPool**

* **ForkJoinPool:** Parallel streams use a ForkJoinPool under the hood, which is a special kind of thread pool designed for parallel decomposition and processing tasks. The default pool used is the common ForkJoinPool, which has a number of threads equal to the number of available processors (Runtime.getRuntime().availableProcessors()).

**3. Distributing the Tasks**

* Once the data is split, each chunk is assigned to a separate thread from the ForkJoinPool. The threads work on their assigned tasks concurrently. The framework uses the *work-stealing* algorithm to dynamically balance the workload. If a thread finishes its task and others are still working, it will "steal" work from them, ensuring efficient utilization of resources.

**4. Processing the Data**

* The operations defined on the stream (like map, filter, reduce, etc.) are applied to the data chunks in parallel. Intermediate operations are lazily evaluated, just like in a sequential stream, but now they are done in parallel.

**5. Merging the Results**

* After all chunks are processed, the results are merged back together. This happens automatically in the case of reduction operations, where the partial results from different threads are combined.

**6. Final Result**

* The final result of the parallel stream operation is then collected and returned as a single result, similar to how it would be in a sequential stream, but the processing is done in parallel, potentially offering significant performance benefits, especially with large datasets.

The distinct() method in Java 8's Stream API is used to filter out duplicate elements from a stream, ensuring that only unique elements are present in the resulting stream. Here's how distinct() works internally:

**1. HashSet for Uniqueness**

* Internally, distinct() uses a HashSet to track seen elements. As the stream is processed, each element is checked against this set.
* If the element is not already in the set, it is added to the set and passed on to the resulting stream.
* If the element is already in the set, it is considered a duplicate and is not included in the resulting stream.

**2. Stateful Intermediate Operation**

* distinct() is a stateful intermediate operation. This means it needs to remember the state (in this case, the elements it has already seen) across the entire processing of the stream.
* Because of this statefulness, distinct() may have some impact on performance, particularly with large streams or parallel streams, as it needs to maintain and check the HashSet during processing.

**3. Effect on Parallel Streams**

* When used in a parallel stream, distinct() still works correctly, but it may require additional synchronization to manage the shared state of the HashSet across multiple threads. This can introduce some overhead, potentially reducing the benefits of parallelism.
* The order of elements may be affected if the stream is unordered. If the stream is ordered, distinct() will preserve the order of the first occurrence of each element.

**4. Example Usage**

java

Copy code

List<String> words = Arrays.asList("apple", "banana", "apple", "orange", "banana", "grape");

List<String> distinctWords = words.stream()

.distinct()

.collect(Collectors.toList());

System.out.println(distinctWords); // Output: [apple, banana, orange, grape]

In this example, distinct() filters out the duplicate "apple" and "banana", resulting in a list of unique words.

**5. Custom Objects**

* When working with custom objects, the behavior of distinct() depends on the equals() and hashCode() methods of the objects. For distinct() to work correctly, these methods must be properly overridden to reflect what it means for two objects to be considered equal.
* If equals() and hashCode() are not overridden, distinct() may not correctly identify duplicates, as it relies on these methods to determine uniqueness.

**6. Complexity Considerations**

* The time complexity of distinct() is O(n) for a sequential stream, where n is the number of elements in the stream. This is because each element must be checked against the HashSet and possibly added to it. The space complexity is also O(n) due to the storage required for the HashSet.

**Summary**

The distinct() method in Java 8 streams provides a simple and efficient way to filter out duplicate elements by leveraging a HashSet internally. While it works well for most cases, understanding its reliance on equals() and hashCode(), especially in custom objects and parallel streams, is crucial for ensuring correct behavior and performance.

* **Multiple Inheritance:** Allows a class to inherit from multiple parent classes (not directly supported in Java for classes, but possible with interfaces).
* **Multilevel Inheritance:** Involves a chain of inheritance, where one class inherits from another, which in turn inherits from another class, creating a multi-level hierarchy.

**Concurrency** and **parallelism** are two concepts often discussed in the context of computer science and software engineering, particularly when it comes to multitasking and performance optimization. Here are the key differences between them:

**Concurrency**

1. **Definition**:
   * Concurrency is the ability of a system to handle multiple tasks or operations simultaneously by interleaving them. It doesn't necessarily mean that tasks are running at the same time, but rather that the system can switch between tasks quickly to give the appearance of simultaneous execution.
2. **Execution**:
   * In a single-core CPU, concurrent tasks are not actually running at the same time but are rapidly switched between, thanks to the operating system's scheduling.
3. **Use Case**:
   * Concurrency is useful when tasks involve waiting for external resources (e.g., I/O operations, network requests), allowing the CPU to work on other tasks during these wait times.

**Parallelism**

1. **Definition**:
   * Parallelism is the simultaneous execution of multiple tasks or operations. This can only be achieved on a multi-core or multi-processor system where different tasks run on different processors or cores at the same time.
2. **Execution**:
   * Parallel tasks are truly running at the same time on separate CPU cores, taking advantage of hardware capabilities to improve performance.
3. **Use Case**:
   * Parallelism is beneficial for computationally intensive tasks that can be broken down into smaller, independent tasks that can run simultaneously, such as large data processing or scientific computations.

**Key Differences**

* **Concurrency** involves managing multiple tasks by interleaving their execution, often used to improve responsiveness and resource utilization.
* **Parallelism** involves executing multiple tasks at the same time, leveraging multi-core processors to improve computation speed.

In summary, concurrency is about dealing with lots of things at once, while parallelism is about doing lots of things at once.

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