Transactions and Isolation Levels

.NET CORE

*Transactions specify an **isolation level** that defines the degree to which one transaction must be isolated from a resource or from the data modifications of other transactions. **Isolation levels** indicate which concurrency side effects are allowed.*

https://docs.microsoft.com/en-us/sql/connect/jdbc/understanding-isolation-levels?view=sql-server-ver15

Isolation Level and Read Errors

https://www.geeksforgeeks.org/transaction-isolation-levels-dbms/#:~:text=

Isolation levels define the degree to which a transaction must be isolated from other data modifications made by any other transaction.

A ***transaction isolation level*** is determined by its permissiveness of:

- ***Dirty Read*** – When a transaction reads new, uncommitted data of another transaction.
- ***Non-Repeatable read*** – When a transaction reads the same row twice and gets a different value each time.
- ***Phantom Read*** – When two identical queries are executed but the rows retrieved by the two are different.

Isolation Levels

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Transaction Isolation Levels control:

1. If ***locks*** (and what type of locks) are enacted when data is read.
2. How long ***read-locks*** are held.
3. If a read operation references rows modified by another ***transaction***:
   - Block until the exclusive lock on the row is freed.
   - Retrieve the committed version of the row that existed at the time the statement or ***transaction*** started.
   - Read the uncommitted data modification.

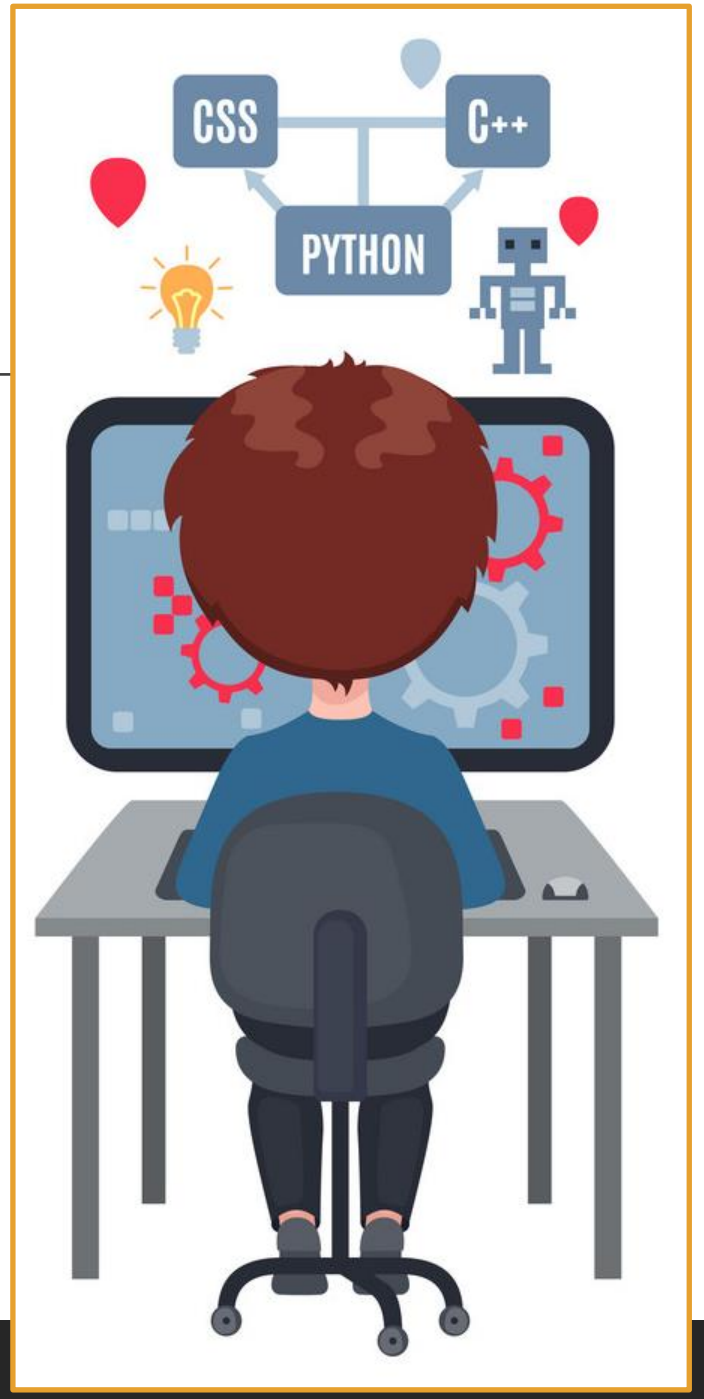
Regardless of Isolation Level, a ***transaction*** always gets an exclusive lock on any data it modifies until the ***transaction*** completes. ***Transaction isolation levels*** primarily define the level of protection from the effects of modifications made by other transactions.

Isolation Levels – Serializable

https://sqlperformance.com/2015/04/t-sql-queries/the-read-uncommitted-isolation-level

The only ***Transaction Isolation Level*** that provides complete isolation from ***concurrency*** effects is ***Serializable***. A ***transaction*** will see the latest committed data. The set of data encountered under ***serializable isolation*** is guaranteed not to change before the ***transaction*** ends.

Isolation Level	Dirty Read	Non Repeatable Read	Phantom
Serializable	No	No	No

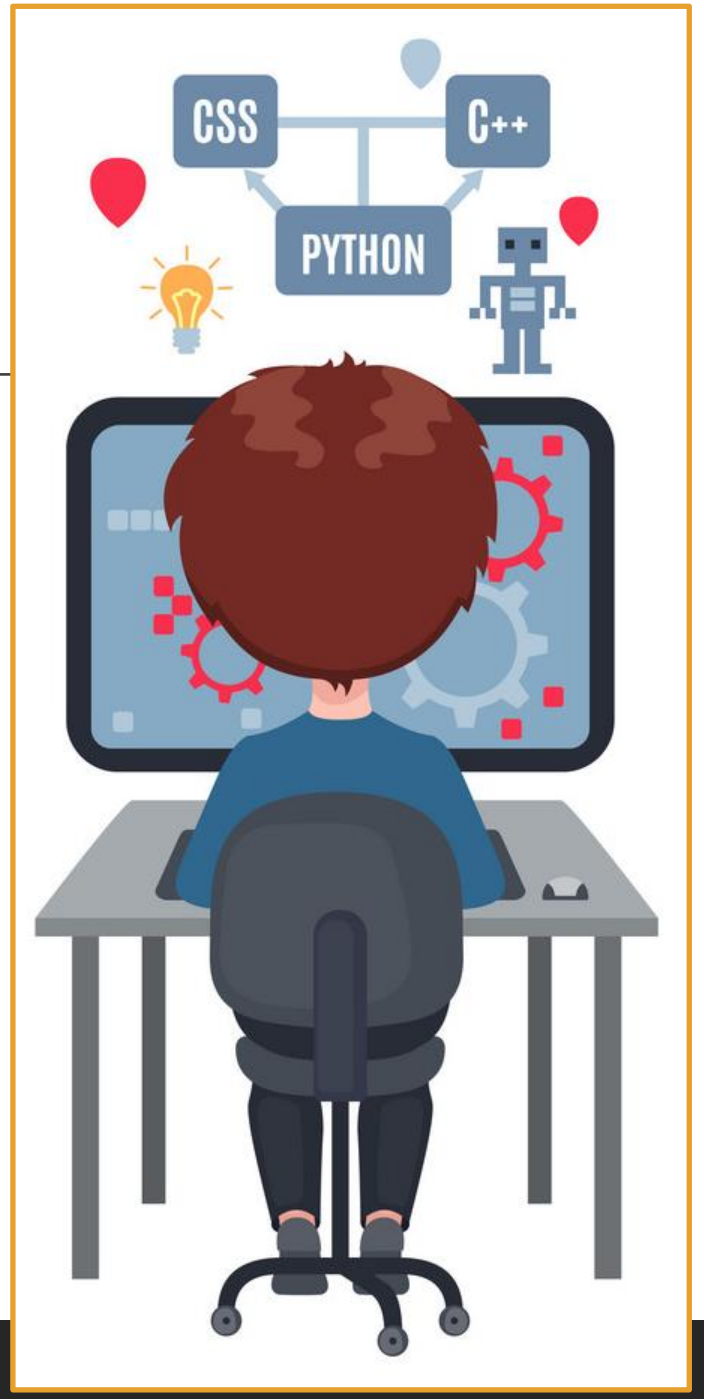


Isolation Levels – Repeatable-Read

https://sqlperformance.com/2015/04/t-sql-queries/the-read-uncommitted-isolation-level

The ***Repeatable Read*** isolation level is guaranteed to read only committed data. If two identical queries are enacted simultaneously, they may return different results.

Isolation Level	Dirty Read	Non Repeatable Read	Phantom
Repeatable read	No	No	Yes

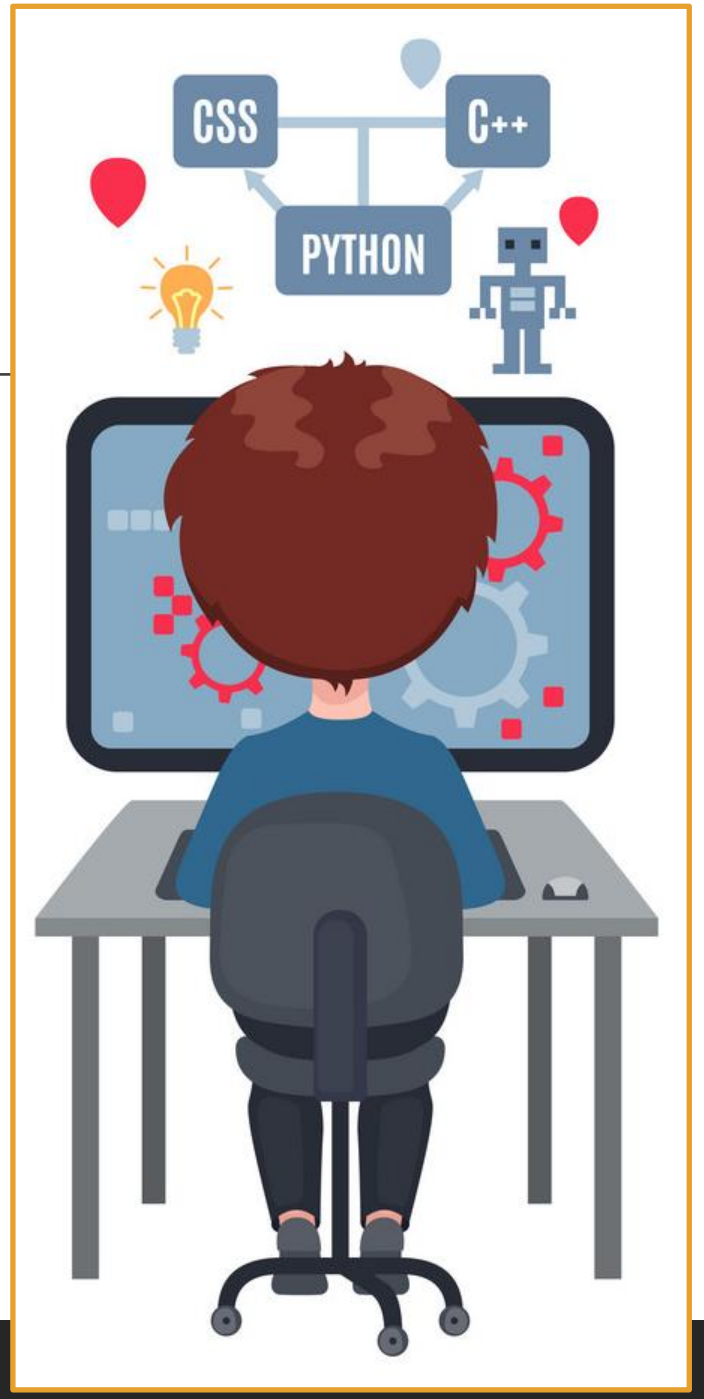


Isolation Levels – Read-Committed

https://sqlperformance.com/2015/04/t-sql-queries/the-read-uncommitted-isolation-level

Read committed can see committed data from different points in time – even for a single row if the query plan uses techniques like index intersection.

Isolation Level	Dirty Read	Non Repeatable Read	Phantom
Read committed	No	Yes	Yes

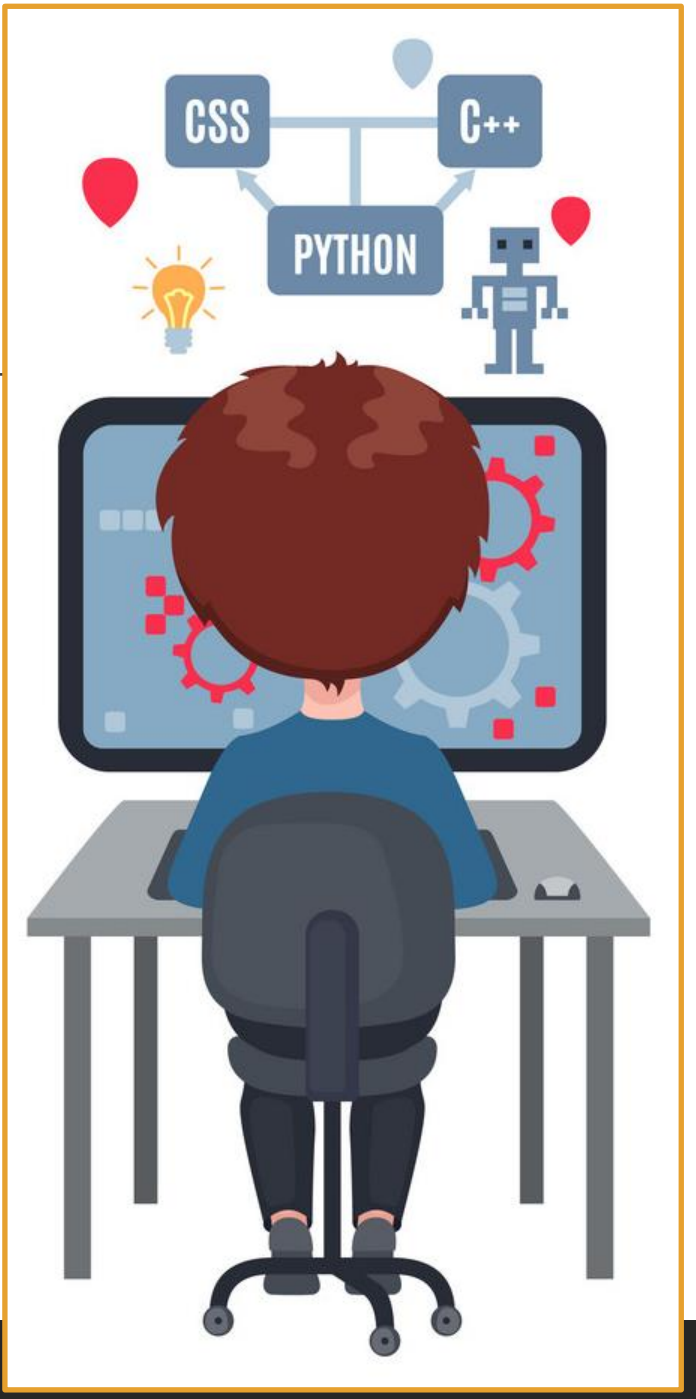


Isolation Levels – Read-Uncommitted

https://sqlperformance.com/2015/04/t-sql-queries/the-read-uncommitted-isolation-level

Read uncommitted is the weakest of the four ***transaction isolation levels***. It allows all three "concurrency phenomena“; ***dirty reads***, ***non-repeatable reads***, and ***phantom reads***. There's no read locking or versioning, so overhead is minimized.

Isolation Level	Dirty Read	Non Repeatable Read	Phantom
Read uncommitted	Yes	Yes	Yes



Isolation Levels – In context

https://docs.microsoft.com/en-us/sql/connect/jdbc/understanding-isolation-levels?view=sql-server-ver15#remarks

The following table shows the concurrency side effects allowed by the different isolation levels.

Isolation Level	Dirty Read	Non Repeatable Read	Phantom
Read uncommitted	Yes	Yes	Yes
Read committed	No	Yes	Yes
Repeatable read	No	No	Yes
Snapshot	No	No	No
Serializable	No	No	No

Transactions – Commit/Rollback/Savepoint

https://www.techopedia.com/definition/16/commit#:~:text=

- ***Commit*** - Refers to the saving of data permanently after a set of tentative changes.
- ***Rollback*** - An operation which returns the database to some previous state.
- ***Savepoint*** - A way of implementing nested ***transactions*** within a RDBMS by indicating a point within a ***transaction*** that can be "rolled back to" without affecting any work done in the ***transaction*** before the ***Savepoint*** was created. Multiple ***Savepoints*** can exist within a single ***transaction***.