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## Caso #4 Preliminar #1: Detalle

## Unrepeatable Read

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## Error

## Fix del Lost Update

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## Unrepeatable Read

## Error

| T1  | T2   |
|---|--|
| <p>(...)</p> <p>Read_Item(SaldoActual) → 600</p> <p>SaldoInicial: SaldoActual</p> <p>(...)</p> <p>(Espera)</p><br><br><p>Read_Item(SaldoActual) → 0</p> <p>SaldoActual: SaldoActual - SaldoInicial</p> <p>Write_Item(SaldoActual) → -600</p> <p>(...)</p> | <p>(...)</p> <p>Read_Item(SaldoActual) → 600</p> <p>SaldoInicial: SaldoActual</p> <p>Read_Item(SaldoActual)</p> <p>SaldoActual: SaldoActual - SaldoInicial</p> <p>Write_Item(SaldoActual) → 0</p> <p>(...)</p> |

El saldo actual queda con  $-\text{SaldoInicial}$

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| Results |                  | Messages |            |                         |
|---------|------------------|----------|------------|-------------------------|
|         | (No column name) | saldold  | montoSaldo | (No column name)        |
| 1       | Primer read      | 1        | 600.00     | 2023-05-22 19:51:07.130 |
| 2       | Primer read      | 2        | 10000.00   | 2023-05-22 19:51:07.130 |

|   | (No column name) | saldold | montoSaldo | (No column name)        |
|---|------------------|---------|------------|-------------------------|
| 1 | Segundo read     | 1       | 0.00       | 2023-05-22 19:51:22.150 |
| 2 | Segundo read     | 2       | 10000.00   | 2023-05-22 19:51:22.150 |

|   | (No column name) | saldold | montoSaldo | (No column name)        |
|---|------------------|---------|------------|-------------------------|
| 1 | Tercer read      | 1       | -600.00    | 2023-05-22 19:51:22.157 |
| 2 | Tercer read      | 2       | 9187.2937  | 2023-05-22 19:51:22.157 |

| Results |                  | Messages |            |                         |
|---------|------------------|----------|------------|-------------------------|
|         | (No column name) | saldold  | montoSaldo | (No column name)        |
| 1       | Primer read      | 1        | 600.00     | 2023-05-22 19:51:09.473 |
| 2       | Primer read      | 2        | 10000.00   | 2023-05-22 19:51:09.473 |

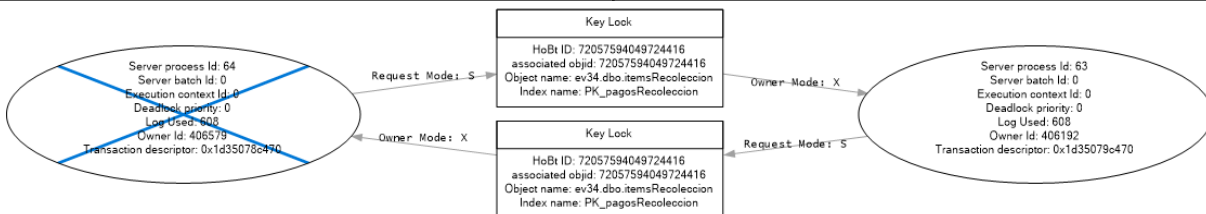
|   | (No column name) | saldold | montoSaldo | (No column name)        |
|---|------------------|---------|------------|-------------------------|
| 1 | Segundo read     | 1       | 600.00     | 2023-05-22 19:51:09.483 |
| 2 | Segundo read     | 2       | 10000.00   | 2023-05-22 19:51:09.483 |

|   | (No column name) | saldold | montoSaldo | (No column name)        |
|---|------------------|---------|------------|-------------------------|
| 1 | Tercer read      | 1       | 0.00       | 2023-05-22 19:51:09.493 |
| 2 | Tercer read      | 2       | 10000.00   | 2023-05-22 19:51:09.493 |

# Deadlock

| T1   | T2  |
|--|---|
| <pre> read_locks(...) read_lock(saldosDistribucion) write_lock(itemsRecoleccion) Read_Item(SaldoActual) → 600 SaldoInicial: SaldoActual Write_Item(itemsRecoleccion) (...) (Espera)  data_lock(itemsRecoleccion) (read) espera data_lock(saldosDistribucion) (write) DEADLOCK </pre> | <pre> (...) read_locks(...) (read) read_lock(saldosDistribucion) write_lock(itemsRecoleccion) Read_Item(SaldoActual) → 600 SaldoInicial: SaldoActual Write_Item(itemsRecoleccion)  data_lock(itemsRecoleccion) (read) espera data_lock(saldosDistribucion) (write) </pre> |



Update Lock:

<https://learn.microsoft.com/en-us/sql/relational-databases/sql-server-transaction-locking-and-row-versioning-guide?view=sql-server-ver16>

## Update locks

The Database Engine places update (U) locks as it prepares to execute an update. U locks are compatible with S locks, but only one transaction can hold a U lock at a time on a given resource. This is key - many concurrent transactions can hold S locks, but only one transaction can hold a U lock on a resource. Update (U) locks are eventually upgraded to exclusive (X) locks to update a row.

Update (U) locks can also be taken by queries that do not perform an UPDATE, when the [UPDLOCK table hint](#) is specified in the query. It is common for applications to use a "select a row, then update the row" pattern, where the read and write are explicitly separated within the transaction. In this case, if the isolation level is repeatable read or serializable, concurrent updates may likely deadlock. Instead, applications could follow a "select a row with UPDLOCK hint, then update the row" pattern.

- In a repeatable read or serializable transaction, the transaction reads data, acquiring a shared (S) lock on the resource, and then modifies the data, which requires lock conversion to an exclusive (X) lock. If two transactions acquire shared (S) locks on a resource and then attempt to update data concurrently, one transaction attempts the lock conversion to an exclusive (X) lock. The shared-to-exclusive lock conversion must wait because the exclusive lock for one transaction is not compatible with the shared (S) lock of the other transaction; a lock wait occurs. The second transaction attempts to acquire an exclusive (X) lock for its update. Because both transactions are converting to exclusive (X) locks, and they are each waiting for the other transaction to release its shared (S) lock, a deadlock occurs.
- In the default read committed isolation level, S locks are short duration, released as soon as they are used. The short duration locks are unlikely to lead to deadlocks.

## Fix de unrepeatable read

| T1   | T2  |
|--|---|
| <p>(...)</p> <p>update_lock(saldoActual)</p> <p>Read_Item(SaldoActual) → 600</p> <p>Saldolnicial: SaldoActual</p><br><p>Read_Item(SaldoActual) → 600</p> <p>SaldoActual: SaldoActual - Saldolnicial</p> <p>Write_Item(SaldoActual) → 0</p> <p>(...)</p> <p>Commit</p> <p>Unlock(saldoActual)</p> | <p>(...)</p><br><p>update_lock(saldoActual) → Debe esperar a que T1 libere el lock.</p><br><br><p>Read_Item(SaldoActual) → 0</p> <p>Saldolnicial: SaldoActual</p> <p>Read_Item(SaldoActual)</p> <p>SaldoActual: SaldoActual - Saldolnicial</p> <p>Write_Item(SaldoActual) → 0</p> <p>(...)</p> <p>Commit</p> <p>Unlock(saldoActual)</p> |

| Results Messages |                  |         |            |                         |
|------------------|------------------|---------|------------|-------------------------|
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Primer read      | 1       | 600.00     | 2023-05-22 19:56:54.050 |
| 2                | Primer read      | 2       | 10000.00   | 2023-05-22 19:56:54.050 |
|                  |                  |         |            |                         |
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Segundo read     | 1       | 600.00     | 2023-05-22 19:57:04.073 |
| 2                | Segundo read     | 2       | 10000.00   | 2023-05-22 19:57:04.073 |
|                  |                  |         |            |                         |
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Tercer read      | 1       | 0.00       | 2023-05-22 19:57:04.080 |
| 2                | Tercer read      | 2       | 9187.2937  | 2023-05-22 19:57:04.080 |

| Results Messages |                  |         |            |                         |
|------------------|------------------|---------|------------|-------------------------|
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Primer read      | 1       | 0.00       | 2023-05-22 19:57:04.083 |
| 2                | Primer read      | 2       | 9187.2937  | 2023-05-22 19:57:04.083 |
|                  |                  |         |            |                         |
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Segundo read     | 1       | 0.00       | 2023-05-22 19:57:04.100 |
| 2                | Segundo read     | 2       | 9187.2937  | 2023-05-22 19:57:04.100 |
|                  |                  |         |            |                         |
|                  | (No column name) | saldold | montoSaldo | (No column name)        |
| 1                | Tercer read      | 1       | 0.00       | 2023-05-22 19:57:04.103 |
| 2                | Tercer read      | 2       | 9187.2937  | 2023-05-22 19:57:04.103 |

# Lost Update

## Error

| T1  | T2  |
|---|---|
| <p>(...)</p> <p>Read_Item(SaldoActual) → 3000<br/>SaldoInicial: SaldoActual<br/>Read_Item(MontoTotal) → 1403<br/>if (SaldoInicial &lt; MontoTotal then<br/>    Descuento: SaldoInicial<br/>else<br/>    Descuento: MontoTotal</p> <p>SaldoActual: SaldoInicial - Descuento<br/>Write_Item(SaldoActual) → 1597<br/>    (...)</p> <p>Commit</p> | <p>(...)</p> <p>Read_Item(SaldoActual) → 3000<br/>SaldoInicial: SaldoActual<br/>Read_Item(MontoTotal) → 1280<br/>if (SaldoInicial &lt; MontoTotal then<br/>    Descuento: SaldoInicial<br/>else<br/>    Descuento: MontoTotal</p> <p>SaldoActual: SaldoInicial - Descuento<br/>Write_Item(SaldoActual) → 1720<br/>    (...)</p> <p>Commit</p> |

El saldo tenía 3000 al principio.

| Results |           | Messages   |          |            |                 |         |                |             |  |
|---------|-----------|------------|----------|------------|-----------------|---------|----------------|-------------|--|
|         | itemRecId | montoTotal | montoRec | montoTrato | montoComisionEV | viajeId | descuentoSaldo | montoAPagar |  |
| 1       | 1         | 1403.80    | 933.80   | 220.00     | 250.00          | 13      | 1403.80        | 0.00        |  |
| 2       | 2         | 1280.44    | 880.44   | 150.00     | 250.00          | 14      | 1280.44        | 0.00        |  |

| Results |         | Messages |            |
|---------|---------|----------|------------|
|         | saldold | localId  | montoSaldo |
| 1       | 1       | 1        | 1719.56    |
| 2       | 2       | 2        | 10000.00   |

Como podemos ver, solo se restó la cantidad del T2

## Fix del Lost Update

| T1  | T2   |
|---|--|
| (...)<br>Read_Item(SaldoActual) → 3000<br>Read_Item(MontoTotal) → 1403<br>if (SaldoActual < MontoTotal then<br>Descuento: SaldoActual<br>else<br>Descuento: MontoTotal<br><br>Read_Item(SaldoActual) → 3000<br>SaldoActual: SaldoActual- Descuento<br>Write_Item(SaldoActual) → 1597<br>(...)<br>Commit | (...)<br><br>Read_Item(SaldoActual) → 3000<br>Read_Item(MontoTotal) → 1280<br>if (SaldoActual < MontoTotal then<br>Descuento: SaldoActual<br>else<br>Descuento: MontoTotal<br><br><br>Read_Item(SaldoActual) → 1597<br>SaldoActual: SaldoActual- Descuento<br>Write_Item(SaldoActual) → 317<br>(...)<br>Commit |

|   |   |         |        |        |        |    |         |      |
|---|---|---------|--------|--------|--------|----|---------|------|
| 3 | 3 | 1403.80 | 933.80 | 220.00 | 250.00 | 15 | 1403.80 | 0.00 |
| 4 | 4 | 1280.44 | 880.44 | 150.00 | 250.00 | 16 | 1280.44 | 0.00 |

|   | saldold | localld | montoSaldo |
|---|---------|---------|------------|
| 1 | 1       | 1       | 315.76     |
| 2 | 2       | 2       | 10000.00   |

# Dirty Read

## Error

| T1   | T2   |
|--|--|
| <p>(...)</p> <p>Read_Item(saldoActual 600) → calcula descuento</p> <p>(...)</p> <p>Read_Item(saldoActual 600) → update saldoActual: saldoActual - descuento (556)</p> <p>Write_Item(saldoActual 44)</p> <p>(...)</p> <p>Rollback</p> | <p>(...)</p> <p>Read_Item(saldoActual 44) → calcula descuento</p> <p>(...)</p> <p>Read_Item(saldoActual 600) → update saldoActual: saldoActual - descuento (44)</p> <p>Write_Item(saldoActual 556)</p> |

Messages

(2 rows affected)

Msg 50000, Level 16, State 1, Procedure SP\_registroFacturaRecoleccionDRI, Line 182 [Batch Start Line 7]  
VIAJES NO EXISTEN - Error Number: 2001

Completion time: 2023-05-25T20:15:09.2366856-06:00

Results

|   | saldold | montoSaldo |
|---|---------|------------|
| 1 | 1       | 116.20     |
| 2 | 2       | 8774.5875  |

|   |   |         |   |        |        |        |   |                         |       |        |   |
|---|---|---------|---|--------|--------|--------|---|-------------------------|-------|--------|---|
| 5 | 1 | 906.92  | 2 | 506.92 | 150.00 | 250.00 | 7 | 2023-04-24 00:00:00.000 | 58.10 | 848.82 | 1 |
| 6 | 1 | 1000.30 | 2 | 600.30 | 150.00 | 250.00 | 8 | 2023-04-24 00:00:00.000 | 58.10 | 942.20 | 1 |



## Solución

La solución consiste en cambiar el nivel de aislamiento a Read Committed para que solo pueda leer información que ya haya llegado al commit.

```
(2 rows affected)
Msg 50000, Level 16, State 1, Procedure SP_registrarFacturaRecoleccionDRIFix, Line 184 [Batch Start Line 21]
VIAJES NO EXISTEN - Error Number: 2001

Completion time: 2023-05-25T20:28:46.8808097-06:00
```

|   | saldold | montoSaldo |
|---|---------|------------|
| 1 | 1       | 1450.00    |
| 2 | 2       | 10000.00   |

|   | saldold | montoSaldo |
|---|---------|------------|
| 1 | 1       | 0.00       |
| 2 | 2       | 10000.00   |

|   |   |         |   |        |        |        |   |                         |        |        |   |
|---|---|---------|---|--------|--------|--------|---|-------------------------|--------|--------|---|
| 1 | 1 | 906.92  | 2 | 506.92 | 150.00 | 250.00 | 7 | 2023-04-24 00:00:00.000 | 725.00 | 181.92 | 1 |
| 2 | 1 | 1000.30 | 2 | 600.30 | 150.00 | 250.00 | 8 | 2023-04-24 00:00:00.000 | 725.00 | 275.30 | 1 |

# Bibliografia

<https://learn.microsoft.com/en-us/sql/relational-databases/sql-server-transaction-locking-and-row-versioning-guide?view=sql-server-ver16>

<https://learn.microsoft.com/en-us/answers/questions/91746/how-update-lock-works>

[SET TRANSACTION ISOLATION LEVEL \(Transact-SQL\) - SQL Server | Microsoft Learn](#)