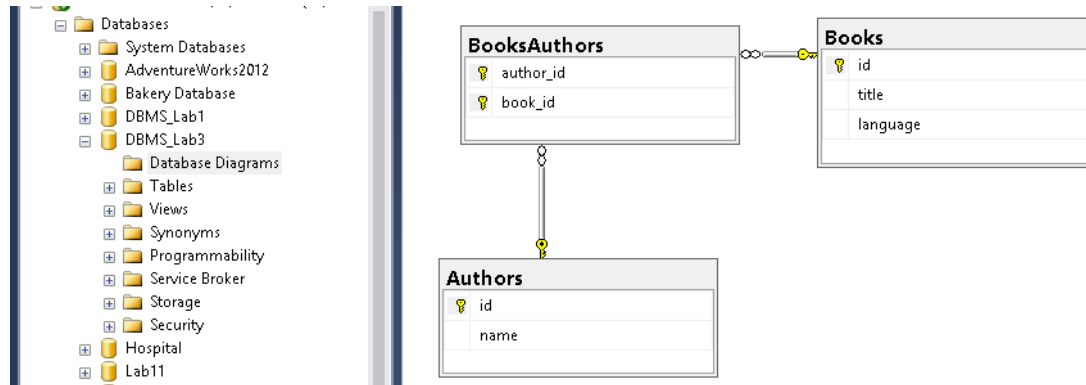


Create database



```
CREATE TABLE Books
(id INT PRIMARY KEY IDENTITY,
title varchar(100),
language varchar(100)
)
```

```
CREATE TABLE Authors
(id INT PRIMARY KEY IDENTITY,
name varchar(100))
```

```
CREATE TABLE BooksAuthors
(author_id INT FOREIGN KEY REFERENCES Authors(id),
book_id INT FOREIGN KEY REFERENCES Books(id),
CONSTRAINT pk_BooksAuthors PRIMARY KEY (author_id, book_id))
```

In table Books we have

	id	title	language
1	4	Panda	English
2	7	Codul lui Davinci	English
3	9	Harry Potter and The Chamber of Secrets	English
4	10	Insomnii	English

For what follows: **T1=Transaction 1 starts first. T2=Transaction start immediately after T1.**

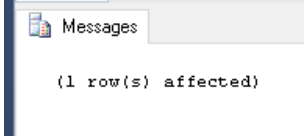
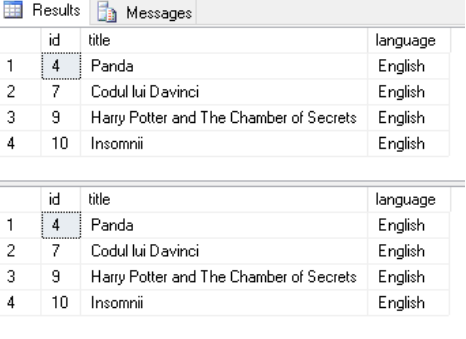
The first execution is

```
-- Optimistic Isolation Level
ALTER DATABASE DBMS_Lab3
SET ALLOW_SNAPSHOT_ISOLATION ON
```

```
ALTER DATABASE DBMS_Lab3
SET READ_COMMITTED_SNAPSHOT ON
```

1. **DIRTY READS** – T1: 1 update + delay + rollback, T2: select + delay + select -> we see the same values

Isolation level: Read Uncommitted / Read Committed (solution)

<pre>--Dirty Reads Part 1 BEGIN TRANSACTION UPDATE Books SET language='Romanian' WHERE id = 7 WAITFOR DELAY '00:00:10' ROLLBACK TRANSACTION</pre>	<pre>-- Optimistic Isolation Level ALTER DATABASE DBMS_Lab3 SET ALLOW_SNAPSHOT_ISOLATION ON ALTER DATABASE DBMS_Lab3 SET READ_COMMITTED_SNAPSHOT ON BEGIN TRAN SELECT * FROM Books WAITFOR DELAY '00:00:15' SELECT * FROM Books COMMIT TRAN -- go back ALTER DATABASE DBMS_Lab3 SET ALLOW_SNAPSHOT_ISOLATION OFF ALTER DATABASE DBMS_Lab3 SET READ_COMMITTED_SNAPSHOT OFF</pre>
	 <p>Query executed successfully. DESKTOP-ATJN5FL\</p>

2. **NON-REPEATABLE READS** – T1: insert + delay + update + commit, T2: select + delay + select -> see the result in both of the select's

Isolation level: Read Committed / Repeatable Read (solution)

<pre>INSERT INTO Books(title, language) VALUES ('Peter Pan', 'Romana') BEGIN TRAN WAITFOR DELAY '00:00:05' UPDATE Books SET language='English' WHERE title = 'Peter Pan' COMMIT TRAN</pre>	<pre>-- Optimistic Isolation Level ALTER DATABASE DBMS_Lab3 SET ALLOW_SNAPSHOT_ISOLATION ON ALTER DATABASE DBMS_Lab3 SET READ_COMMITTED_SNAPSHOT ON BEGIN TRAN SELECT * FROM Books WAITFOR DELAY '00:00:05' SELECT * FROM Books COMMIT TRAN -- go back ALTER DATABASE DBMS_Lab3 SET ALLOW_SNAPSHOT_ISOLATION OFF ALTER DATABASE DBMS_Lab3</pre>
--	---

Messages

```
(1 row(s) affected)
(1 row(s) affected)|
```

SET READ_COMMITTED_SNAPSHOT OFF

Results Messages

	id	title	language
5	13	transaction 2	English
6	20	La cirese transaction 2	Romanian
7	21	test	test
8	27	Sub dom	French
9	32	Baltagul	Chineza
10	33	Bambi	French
11	34	Copii Capitanului Grant	English
12	1024	Peter Pan	Romana

	id	title	language
1	4	Panda	English
2	7	Codul lui Davinci	English
3	9	Harry Potter an...	English
4	10	Insomnii	English
5	13	transaction 2	English
6	20	La cirese trans...	Romani...
7	21	test	test
8	27	Sub dom	French
9	32	Baltagul	Chineza
10	33	Bambi	French
11	34	Copii Capitanul...	English
12	1024	Peter Pan	English

Query executed successfully. | DESKTOP

3. **PHANTOM READS** – T1: delay + insert + commit, T2: select + delay + select -> see the inserted value
Isolation level: Repeatable Read / Serializable (solution)

```
use DBMS_Lab3
--Phantom Reads Part 1
--DELETE FROM Books
BEGIN TRAN
WAITFOR DELAY '00:00:04'
INSERT INTO Books(title,language)
VALUES ('Inferno','English')
COMMIT TRAN
```

```
--Phantom Reads Part 2
-- Optimistic Isolation Level
ALTER DATABASE DBMS_Lab3
SET ALLOW_SNAPSHOT_ISOLATION ON

ALTER DATABASE DBMS_Lab3
SET READ_COMMITTED_SNAPSHOT ON

BEGIN TRAN
SELECT * FROM Books
WAITFOR DELAY '00:00:05'
SELECT * FROM Books
COMMIT TRAN

-- go back
ALTER DATABASE DBMS_Lab3
SET ALLOW_SNAPSHOT_ISOLATION OFF

ALTER DATABASE DBMS_Lab3
SET READ_COMMITTED_SNAPSHOT OFF
```

3

Messages	Results	Messages																																				
(1 row(s) affected)																																						
		<table> <tr> <th>id</th><th>title</th><th>language</th></tr> <tr><td>6</td><td>20</td><td>La cirese transaction 2</td></tr> <tr><td>7</td><td>21</td><td>test</td></tr> <tr><td>8</td><td>27</td><td>Sub dom</td></tr> <tr><td>9</td><td>32</td><td>Baltagul</td></tr> <tr><td>10</td><td>33</td><td>Bambi</td></tr> <tr><td>11</td><td>34</td><td>Copii Capitanului Grant</td></tr> <tr><td>12</td><td>1...</td><td>Peter Pan</td></tr> <tr><td>13</td><td>1...</td><td>Peter Pan</td></tr> </table>	id	title	language	6	20	La cirese transaction 2	7	21	test	8	27	Sub dom	9	32	Baltagul	10	33	Bambi	11	34	Copii Capitanului Grant	12	1...	Peter Pan	13	1...	Peter Pan									
id	title	language																																				
6	20	La cirese transaction 2																																				
7	21	test																																				
8	27	Sub dom																																				
9	32	Baltagul																																				
10	33	Bambi																																				
11	34	Copii Capitanului Grant																																				
12	1...	Peter Pan																																				
13	1...	Peter Pan																																				
		<table> <tr> <th>id</th><th>title</th><th>language</th></tr> <tr><td>4</td><td>10</td><td>Insomnii</td></tr> <tr><td>5</td><td>13</td><td>transaction 2</td></tr> <tr><td>6</td><td>20</td><td>La cirese trans...</td></tr> <tr><td>7</td><td>21</td><td>test</td></tr> <tr><td>8</td><td>27</td><td>Sub dom</td></tr> <tr><td>9</td><td>32</td><td>Baltagul</td></tr> <tr><td>10</td><td>33</td><td>Bambi</td></tr> <tr><td>11</td><td>34</td><td>Copii Capitanul...</td></tr> <tr><td>12</td><td>1024</td><td>Peter Pan</td></tr> <tr><td>13</td><td>1025</td><td>Peter Pan</td></tr> <tr><td>14</td><td>1026</td><td>Inferno</td></tr> </table>	id	title	language	4	10	Insomnii	5	13	transaction 2	6	20	La cirese trans...	7	21	test	8	27	Sub dom	9	32	Baltagul	10	33	Bambi	11	34	Copii Capitanul...	12	1024	Peter Pan	13	1025	Peter Pan	14	1026	Inferno
id	title	language																																				
4	10	Insomnii																																				
5	13	transaction 2																																				
6	20	La cirese trans...																																				
7	21	test																																				
8	27	Sub dom																																				
9	32	Baltagul																																				
10	33	Bambi																																				
11	34	Copii Capitanul...																																				
12	1024	Peter Pan																																				
13	1025	Peter Pan																																				
14	1026	Inferno																																				
		Query executed successfully.																																				

4. **DEADLOCK** – T1: update on table A + delay + update on table B, T2: update on table B + delay + update on table A

Here we consider 2 tables: Books (A), Authors (B).

Books

Results

Messages

	id	title	language
1	4	Panda	English
2	7	Codul lui Davinci	English
3	9	Harry Potter and The Chamber of Secrets	English
4	10	Insomnii	English
5	11	Sub dom	English
6	13	Sub dom	English
7	19	Morometii	Romanian
8	20	Morometii	Romanian

Authors

Results	Messages
id	name
1	4
2	5
3	6

<pre>-- transaction 1 begin tran update Books set title='La cirese transaction 1' where id=20 -- this transaction has exclusively lock on table Books waitfor delay '00:00:10' update Authors set name='Petre Ispirescu transaction 1' where id=6 -- this transaction will be blocked because transaction 2 has already blocked our lock on table Authors -- so, transaction 1 is blocked on an exclusively block on table Authors commit tran -- transaction 2 --SET DEADLOCK_PRIORITY HIGH -- Optimistic Isolation Level</pre>	<div>Messages</div> <div>(1 row(s) affected)</div> <div>(1 row(s) affected)</div>
---	---

```

ALTER DATABASE DBMS_Lab3
SET ALLOW_SNAPSHOT_ISOLATION ON

ALTER DATABASE DBMS_Lab3
SET READ_COMMITTED_SNAPSHOT ON

begin tran
update Authors set name='Petre Ispirescu transaction 2' where id=6
-- this transaction has exclusively lock on table Authors
waitfor delay '00:00:10'

update Books set title='La cirese transaction 2' where id=20
commit tran

-- this transaction has the higher priority level from here (set to HIGH)
-- transaction 1 finish with an error, and ans results are the ones from this transaction
(transaction 2)

-- go back
ALTER DATABASE DBMS_Lab3
SET ALLOW_SNAPSHOT_ISOLATION OFF

ALTER DATABASE DBMS_Lab3
SET READ_COMMITTED_SNAPSHOT OFF

```

Messages

(1 row(s) affected)
 Msg 1205, Level 13, State 51, Line 7
 Transaction (Process ID 56) was deadlocked on lock resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

100 %

Query completed with errors. | DESKTOP-ATIN5FL\SQLEXPRESS... | DESKTOP-ATIN5FL\Emi (56) | DBMS_Lab3 | 00:00:12 | 0 rows

	id	title	language
1	4	Panda	English
2	7	Codul lui Davinci	English
3	9	Harry Potter and The Chamber of Secrets	English
4	10	Insomnii	English
5	11	Sub dom	English
6	13	Sub dom	English
7	19	Morometii	Romanian
8	20	La cirese transaction 1	Romanian

	id	name
1	4	J.K. Rowling
2	5	Irina Binder
3	6	Petre Ispirescu transaction 1