

Өгөгдлийн сангийн систем /trigger/

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Trigger хийж сурахын тулд эхлээд test trigger хийсэн. Түүний талаар тайлбарлав.



```
SQLQuery1.sql - D:\MCTVAFF\Acer (53)) *  SQLQuery1.sql - not connected*  book insert values.sql - not connected  library db.sql - not connected*
1 use test
2 create table Student1 (
3   id int primary key,
4   fname varchar(50),
5   lname varchar(50),
6   dateOfBirth date,
7 );
8
9 create table studentLogs(
10  student_id int,
11  status varchar(30)
12 );
13 go
14 create trigger testStudent_insert on Student1
15 after insert
16 as
17 begin
18   set nocount on
19   declare @studentID int
20   select @studentID = INSERTED.id
21   from INSERTED
22   INSERT INTO studentLogs
23   values(@studentID, 'Inserted')
24 end
25
26 select * from studentLogs
27 insert into Student1 values(100, 'Bat', 'Bold', '2003-Mar-18')
28 go
29
30 create trigger testStudent_delete on Student1
31 after delete
32 as
```

91 %

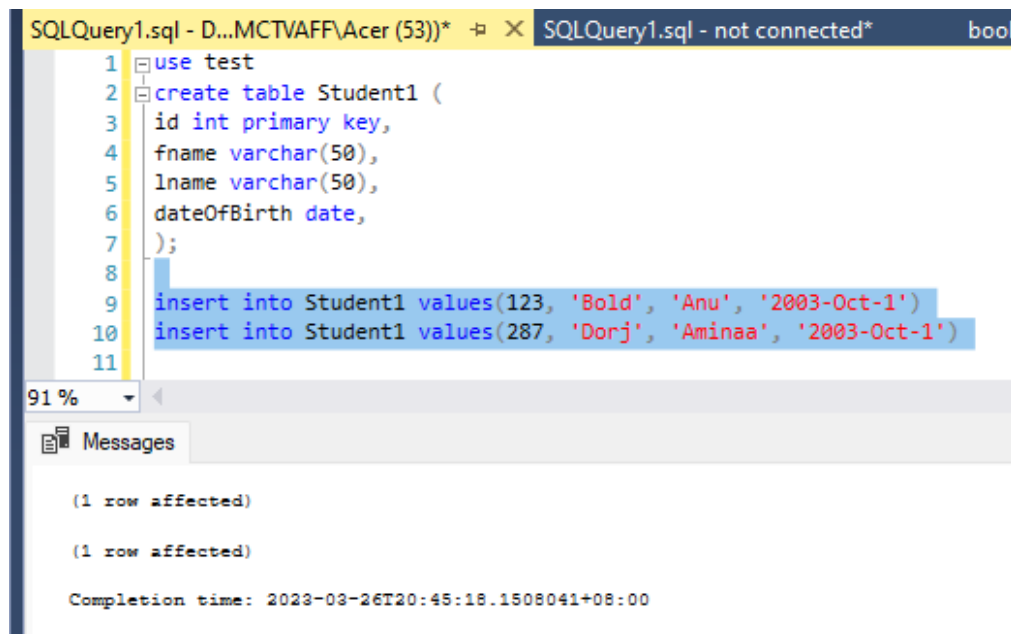
Results Messages

Query executed successfully. DESKTOP-MCTVAFF\SQLEXPRESS ... DESKTOP-MCTVAFF\Acer (53) | master | 00:00:00 | 3 rows

Test нэртэй өгөгдлийн сан дээр Student1 гэсэн хүснэгт үүсгэн үүн дээр insert, delete, update 3 – н өөр нэртэй trigger үүсгэсэн.

1. Эхнийх нь insert trigger

Эхлээд ямар ч trigger үүсгээгүй байхад хүснэгт рүү 2 мөр утга оруулсан.



```
SQLQuery1.sql - D:\MCTVAFF\Acer (53)) *  SQLQuery1.sql - not connected*  book
1 use test
2 create table Student1 (
3   id int primary key,
4   fname varchar(50),
5   lname varchar(50),
6   dateOfBirth date,
7 );
8
9 insert into Student1 values(123, 'Bold', 'Anu', '2003-Oct-1')
10 insert into Student1 values(287, 'Dorj', 'Aminaa', '2003-Oct-1')
11
```

91 %

Messages

(1 row affected)

(1 row affected)

Completion time: 2023-03-26T20:45:18.1508041+08:00

Мөн trigger хэрхэн ажиллаж байгааг шалгаж байхын тулд шинэ хүснэгт үүсгэн үүнд өөрчлөлт болгоныг хадгалсан. Учир нь ганц хүснэгт дээр өөрчлөлт хийж байгаа болохоор бусдаар trigger ажилласан эсэхийг мэдэх боломжгүй гэж бодсон.

```
11
12 create table studentLogs(
13     student_id int,
14     status varchar(30)
15 );
16
```

91 %

Messages

Commands completed successfully.

Completion time: 2023-03-26T20:47:17.9413355+08:00

Дараагаар **insert trigger** бичсэн.

```
SQLQuery1.sql - D...MCTVAFF\Acer (53))* X SQLQuery1.sql - not connected*
16
17 go
18 create trigger testStudent_insert on Student1
19     after insert
20 as
21 begin
22     set nocount on
23     declare @studentID int
24     select @studentID = INSERTED.id
25     from INSERTED
26     INSERT INTO studentLogs
27     values(@studentID, 'Inserted')
28 end
29
30 select * from studentLogs
31 insert into Student1 values(100, 'Bat', 'Sara', '2003-Mar-18')
32
33 go
34 create trigger testStudent_delete on Student1
35     after delete
36 as
37 begin
38     set nocount on
39
```

91 %

Messages

Commands completed successfully.

Completion time: 2023-03-26T20:49:46.9223233+08:00

insert trigger- бичсэний дараа Student1 хүснэгт рүү 1 мөр утга оруулаад trigger ажилласан эсэхийг мэдэхийн тулд шинээр үүсгэсэн хүснэгтээ select хийсэн.

```
31 insert into Student1 values(100, 'Bat', 'Sara', '2003-Mar-18')
32
33 go
```

91 %

Messages

(1 row affected)

Completion time: 2023-03-26T20:52:57.8469576+08:00

```

30 select * from studentLogs
31 insert into Student1 values(100, 'Bat', 'Sara', '2003-Mar-18')
32
33 go

```

91 %

	student_id	status
1	100	Inserted

```

32 select * from Student1
33 go

```

91 %

	id	fname	lname	dateOfBirth
1	100	Bat	Sara	2003-03-18
2	123	Bold	Anu	2003-10-01
3	287	Dorj	Aminaa	2003-10-01

2. Дээрхийн адилаар delete, update trigger – бичсэн болно. Зөвхөн зургийн оруулав.

Delete trigger :

```

34 go
35 create trigger testStudent_delete on Student1
36 after delete
37 as
38 begin
39 set nocount on
40 declare @studentID int
41 select @studentID = DELETED.id
42 from DELETED
43 INSERT INTO studentLogs
44 values(@studentID, 'deleted')
45 end
46
47 delete from Student1 where id = 123
48 select * from studentLogs

```

91 %

Messages

Commands completed successfully.

Completion time: 2023-03-26T20:57:46.9110574+08:00

```

46
47 delete from Student1 where id = 123
48 select * from studentLogs
49
50 select * from Student1
51

```

91 %

Messages

(1 row affected)

Completion time: 2023-03-26T20:58:04.8162840+08:00

```

47 delete from Student1 where id =
48 select * from studentLogs
49
50 select * from Student1
51

```

91 %

	student_id	status
1	100	Inserted
2	123	deleted

```

49
50 select * from Student1
51
52 go
53 create trigger testStudent_update on Student1
54 after update
55 as
56 begin
57 set nocount on

```

91 %

	id	fname	lname	dateOfBirth
1	100	Bat	Sara	2003-03-18
2	287	Dorj	Aminaa	2003-10-01

Update trigger :

```

52 go
53 create trigger testStudent_update on Student1
54 after update
55 as
56 begin
57 set nocount on
58 declare @studentID int
59 declare @action varchar(50)
60
61 select @studentID = Inserted.id
62 from inserted
63
64 if UPDATE(id)
65 set @action = 'Updated ID'
66 if UPDATE(fname)
67 set @action = 'Updated first name'
68 if UPDATE(lname)
69 set @action = 'Updated last name'
70 INSERT INTO studentLogs
71 values(@studentID, @action)
72 end
73

```

91 %

Messages

Commands completed successfully.

Completion time: 2023-03-26T21:04:28.8855789+08:00

```

73
74 update Student1 set id = 105 where id = 100;
75 select * from studentLogs
76

```

91 %

Messages

(1 row affected)

Completion time: 2023-03-26T21:05:19.1410512+08:00

```

74 update Student1 set id = 105 where id = 100;
75 select * from studentLogs
76 /*

```

student_id	status
100	Inserted
123	deleted
105	Updated ID

```

76
77 select * from Student1
78
79 /*
80 create table Student_audits (
81 change_id int primary key,
82 id int,

```

id	fname	lname	dateOfBirth
105	Bat	Sara	2003-03-18
287	Dorj	Aminaa	2003-10-01

Сонгон авсан системийнхээ өгөгдлийн санд хийсэн trigger

Үүний өмнөх лабораторийн ажил дээр сургуулийн номын сангийн системийг сонгосон байгаа. Энэхүү системийн өгөгдлийн сангийн хүснэгтүүд дээр trigger үйлдэл хийлээ. Энэ нь books, catalogs, staff, student, take_books_home, take_books_library, Reading_rooms гэсэн хүснэгтүүдтэй.

```

library db.sql - DE...-MCTVAFF\Acer (53) trigger library.sql...-MCTVAF
10
11 select * from books
12 select * from catalogs
13 select * from staff
14 select * from student
15 select * from take_books_home
16 select * from take_books_library
17 select * from Reading_rooms

```

id	author	publish	published_date	name	catalog_id	quantity
id	name					
id	fname	lname	role	tel_no	address	
id	Sisi_id	first_name	last_name	Major	tel_no	
id	avsan_ognoo	student_id	staff_id	book_id	due_date	
id	student_id	staff_id	book_id	reading_room		
id	name	NumberOfseats				

Хүснэгтэд ямар нэгэн утга оруулаагүй байна.

```

2
3 insert into books values (12001, 'gauss_jordan', 'MUIS_Press', '2010-Feb-15', 'Elimination', 25, 30);
4 insert into catalogs values (25, 'baigaliin_uhaan');
5 insert into staff values (123, 'Bat', 'Bold', 'Nomiin_sanch', 99887766, 'BZD, 18-r horoo');
6 insert into student values (10, '21binum1182', 'Gausan', 'Amangyeldi', 'CS', 80421092);
7 insert into [take_books_home] values (1, '2023-Mar-28', 10, 123, 12001, '2023-Mar-31');
8 insert into take_books_library values (1, 10, 123, 12001, 1001);
9 insert into Reading_rooms values (1001, 'Baigaliin_uhaanii_unshlaga', 25);

```

Хүснэгтэд утга оруулсан.

```

10
11 select * from books
12 select * from catalogs
13 select * from staff
14 select * from student
15 select * from take_books_home
16 select* from take_books_library
17 select * from Reading_rooms
18

```

82 %

Results Messages

	id	author	publish	published_date	name	catalog_id	quantity
1	12001	gauss_Jordan	MUIS_Press	2010-02-15	Elimination	25	30

	id	name
1	25	baigalin_uhaan

	id	fname	lname	role	tel_no	address
1	123	Bat	Bold	Nomin_sanch	99887766	BZD, 18-r horoo

	id	Sisi_id	first_name	last_name	Major	tel_no
1	10	21b1num1182	Gausar	Amangyeldi	CS	80421092

	id	avsan_ognoo	student_id	staff_id	book_id	due_date
1	1	2023-03-28 00:00:00.000	10	123	12001	2023-03-31 00:00:00.000

	id	student_id	staff_id	book_id	reading_room
1	1	10	123	12001	1001

	id	name	NumberOfSeats
1	1001	Baigalin_uhaanii_unshlaga	25

Insert, delete, update trigger

```

31 FROM INSERTED
32 INSERT INTO bookLogs
33 VALUES(@bookID, 'Inserted')
34 END*/
35 GO
36 CREATE TRIGGER update_book_quantity ON take_books_home
37 AFTER INSERT, DELETE
38 AS
39 BEGIN
40 DECLARE @book_id INT
41 SELECT @book_id = book_id FROM inserted
42 UPDATE books
43 SET quantity = quantity - (SELECT COUNT(*) FROM take_books_home WHERE book_id = @book_id)
44 WHERE id = @book_id
45 END
46 -----
47 GO
48 CREATE TRIGGER delete_take_books_home ON take_books_home

```

82 %

Messages

Commands completed successfully.

Completion time: 2023-03-27T11:28:33.8512592+08:00

Ном уншлагад
гарахад түүний
байгаа тоо
уншлагад гарсан
хэмжээгээр
хасагдах ёстой.

```

SQLQuery1.sql - D:\MCTVAF\Acer (56)) library db.sql - DE...-MCTVAF
43 SET quantity = quantity - (SELECT COUNT(*) FROM take_books_ho
44 WHERE id = @book_id
45 END
46 -----
47 GO
48 CREATE TRIGGER delete_take_books_home ON take_books_home
49 AFTER DELETE
50 AS
51 BEGIN
52 DECLARE @book_id INT
53 SELECT @book_id = book_id FROM deleted
54 UPDATE books
55 SET quantity = quantity + 1
56 WHERE id = @book_id
57 END
58 -----
59 GO
60 CREATE TRIGGER insert_take_books_home ON take_books_home
61 AFTER INSERT
62 AS
63 BEGIN

```

82 %

Messages

Commands completed successfully.

Completion time: 2023-03-27T11:29:34.7521222+08:00

Уншлагаас ирсэн
номын тоо буцаж
номын тоонд
нэмэгдэх
хэрэгтэй.

```

SQLQuery1.sql - D:\MCTVAFF\Acer (56))* library db.sql - DE...\MCTVAFF\Acer (53)) trigger library.sql...\MCTVAFF\Acer (54))*
58 -----
59 GO
60 CREATE TRIGGER insert_take_books_home ON take_books_home
61 AFTER INSERT
62 AS
63 BEGIN
64 DECLARE @student_id INT, @staff_id INT, @book_id INT
65 SELECT @student_id = student_id, @staff_id = staff_id, @book_id = book_id
66 FROM inserted
67 IF EXISTS(SELECT * FROM take_books_home WHERE book_id = @book_id AND (student_id = @student_id OR staff_id = @staff_id))
68 BEGIN
69 RAISERROR('This student or staff member has already taken out this book.', 16, 1)
70 ROLLBACK TRANSACTION
71 END
72 END
73 GO
74
75
76 GO
77 CREATE TRIGGER take_books_library_trigger ON take_books_library
78 AFTER INSERT, UPDATE

```

82 %

Messages

Commands completed successfully.

Completion time: 2023-03-27T11:31:36.3667067+08:00

Нэг оюутан
эсвэл ажилчин
уг номыг
өмнө авсан
байвал дахиж
олгохгүй байх
үүднээс insert
хийгдэх үед
энэ триггер
ажиллана.

```

SQLQuery1.sql - D:\MCTVAFF\Acer (56))* library db.sql - DE...\MCTVAFF\Acer (53)) trigger libra
76 GO
77 CREATE TRIGGER take_books_library_trigger ON take_books_library
78 AFTER INSERT, UPDATE
79 AS
80 BEGIN
81 DECLARE @book_id INT;
82 DECLARE @reading_room_id INT;
83 SELECT @book_id = inserted.book_id, @reading_room_id = inserted.reading_room
84 FROM inserted;
85
86 UPDATE books
87 SET quantity = quantity - 1
88 WHERE id = @book_id;
89
90 UPDATE reading_rooms
91 SET NumberOfSeats = NumberOfSeats - 1
92 WHERE id = @reading_room_id;
93 END
94
95 GO
96 CREATE TRIGGER update_books_trigger ON books

```

82 %

Messages

Commands completed successfully.

Completion time: 2023-03-27T11:32:26.3072779+08:00

Дээрх жишээтэй төстэй
уншлагад оюутан орох үед
ном абвал номын тоо мөн
уншлагад сууж болох
суудлын тоо нэгээр
хасагдана.

```

Graph tables
  dbo.books
    Columns
    Keys
    Constraints
    Triggers
      update_books_trigger
    Indexes
    Statistics
  dbo.catalogs
  dbo.reading_rooms
  dbo.staff
  dbo.Stay_library
  dbo.student
    Columns
    Keys
    Constraints
    Triggers
      update_student_books_trigger
  Indexes

```

```

94 -----
95 GO
96 CREATE TRIGGER update_books_trigger ON books
97 AFTER INSERT, UPDATE, DELETE
98 AS
99 BEGIN
100 DECLARE @book_id INT;
101 IF EXISTS(SELECT * FROM inserted)
102 BEGIN
103 SELECT @book_id = inserted.id
104 FROM inserted;
105 END
106 ELSE
107 BEGIN
108 SELECT @book_id = deleted.id
109 FROM deleted;
110 END
111 EXEC update_student_books_trigger;
112 END
113
114 -----
115 /*GO
116 CREATE TRIGGER update_catalog_books_trigger ON catalogs

```

82 %

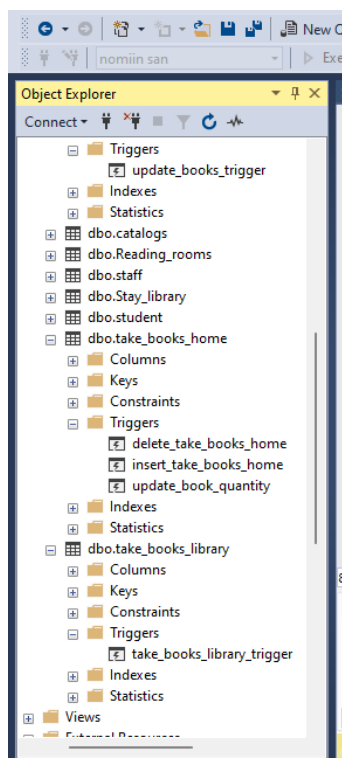
2 хүснэгт дамнасан
буюу sub trigger
бичсэн нь
Update_books_trigger
болно.

```

127 INNER JOIN catalogs ON books.catalog_id = catalogs.id
128 WHERE catalogs.id = @catalog_id;
129 END*/
130
131 GO
132 CREATE TRIGGER update_student_books_trigger ON student
133 AFTER INSERT, UPDATE, DELETE
134 AS
135 BEGIN
136 DECLARE @student_id INT;
137 IF EXISTS(SELECT * FROM inserted)
138 BEGIN
139 SELECT @student_id = inserted.id
140 FROM inserted;
141 END
142 ELSE
143 BEGIN
144 SELECT @student_id = deleted.id
145 FROM deleted;
146 END
147
148 UPDATE take_books_home
149 SET student_id = @student_id
150 WHERE student_id IN (SELECT id FROM inserted) OR student_id IN (SELECT id FROM deleted);
151
152 UPDATE take_books_library
153 SET student_id = @student_id
154 WHERE student_id IN (SELECT id FROM inserted) OR student_id IN (SELECT id FROM deleted);
155
156 UPDATE stay_library
157 SET student_id = @student_id
158 WHERE student_id IN (SELECT id FROM inserted) OR student_id IN (SELECT id FROM deleted);
159 END
160

```

Энэхүү дэд триггер нь books хүснэгтэд өөрчлөлт орвол үүнийг дагаж тухайн номыг авсан оюутан болон тэр номтой холбогдож болох бүх хүснэгтэд өөрчлөлт орж байна.



Үүсгэсэн trigger – үүд энд харагдаж байна.

Дүгнэлт:

Триггер нь өгөгдлийн санд зохицуулга хийж өгч байна. Хэрвээ триггер байхгүй бол нэг хүснэгтэд гарсан өөрчлөлтийн улмаас бүх өгөгдлийн санд өөрчлөлтийг гараар оруулах шаардлагатай болох байсан гэж ойлголоо. Харин триггер бичиж өгсөнөөр нэг хүснэгт өөрчлөгдөхөд өгөгдлийн сан дээр бүх өөрчлөлт тооцоо хийгдэх учраас 1-рт аюулгүй. Учир нь дээрхээс бусад тохиолдолд жишээлбэл юмны үнийг тооцоолох байсан бол backend -дээр буруу тооцоо хийгдэж болох юм.