Quaderno #3 – Trigger in Oracle DB

Trigger #1 – Accensione/Spegnimento di un telefono
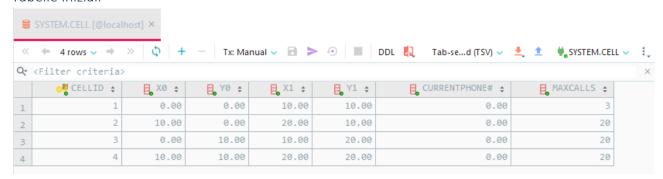
Codice
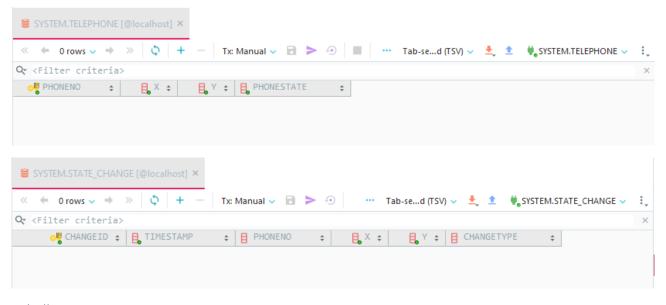
```sql
-- On/Off telephone state change

CREATE OR REPLACE TRIGGER onOff
    AFTER INSERT
    ON STATE_CHANGE
    FOR EACH ROW
    WHEN (NEW.CHANGETYPE = 'O' OR NEW.CHANGETYPE = 'F')
DECLARE
    DELTA_PHONE NUMBER;

BEGIN
    IF :NEW.CHANGETYPE = 'O' THEN
        -- TELEPHONE POWER ON => INSERT
        INSERT INTO TELEPHONE (PHONENO, X, Y, PHONESTATE) VALUES (:NEW.PHONENO, :NEW.X,
            :NEW.Y, 'ON');
        DELTA_PHONE := 1;
    ELSE
        -- TELEPHONE POWER OFF => DELETE
        DELETE FROM TELEPHONE WHERE TELEPHONE.PHONENO = :NEW.PHONENO;
        DELTA_PHONE := -1;
    end if;

    -- UPDATE PHONE# FOR THIS CELL
    UPDATE CELL
    SET CURRENTPHONE# = CURRENTPHONE# + DELTA_PHONE
    WHERE X0 <= :NEW.X
      AND :NEW.X <= X1
      AND Y0 <= :NEW.Y
      AND :NEW.Y <= Y1;
end;
/
```

Verifica

Non sono riportati gli screenshot della tabella EXCEPTION_LOG in quanto non viene modificata dal trigger e rimane vuota.

Tabelle iniziali

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	0.00	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (1, sysdate, '333000010', 3, 3, 'O');
```


Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (2, sysdate, '333000009', 15, 15, 'O');
```

SYSTEM.CELL [@localhost] ×

4 rows | Tx: Manual | DDL | Tab-se...d (TSV) | SYSTEM.CELL

<Filter criteria>

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	1	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	1	20

SYSTEM.TELEPHONE [@localhost] ×

2 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.TELEPHONE

<Filter criteria>

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ON
2	333000009	15.00	15.00	ON

SYSTEM.STATE_CHANGE [@localhost] ×

2 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.STATE_CHANGE

<Filter criteria>

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (3, sysdate, '333000009', 15, 15, 'F');
```

SYSTEM.CELL [@localhost] ×

4 rows | Tx: Manual | DDL | Tab-se...d (TSV) | SYSTEM.CELL

<Filter criteria>

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	1	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

1 row | Tx: Manual | Tab-se...d (TSV) | SYSTEM.TELEPHONE

<Filter criteria>

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ON

Trigger #2 – Inizio di una telefonata

Codice

```sql
-- Trigger Call start

CREATE OR REPLACE TRIGGER startCall
    AFTER INSERT
    ON STATE_CHANGE
    FOR EACH ROW
    WHEN ( NEW.CHANGETYPE = 'C' )
DECLARE
    CELL_ID      NUMBER;
    MAX_CALLS    NUMBER;
    ACTIVE_CALLS NUMBER;
    X_0          NUMBER;
    X_1          NUMBER;
    Y_0          NUMBER;
    Y_1          NUMBER;
    EX_ID        NUMBER;

BEGIN
    -- SELECT MAXCALLS + CELL LOCALIZATION FOR CURRENT TELEPHONE
    SELECT CELLID, MAXCALLS, X0, X1, Y0, Y1
    INTO CELL_ID, MAX_CALLS, X_0, X_1, Y_0, Y_1
    FROM CELL
    WHERE X0 <= :NEW.X
      AND :NEW.X <= X1
      AND Y0 <= :NEW.Y
      AND :NEW.Y <= Y1;

    -- SELECT ACTIVE CALLS IN CELL
    SELECT COUNT(*)
    INTO ACTIVE_CALLS
    FROM TELEPHONE
    WHERE PHONESTATE = 'ACTIVE'
      AND X_0 <= :NEW.X
      AND :NEW.X <= X_1
      AND Y_0 <= :NEW.Y
      AND :NEW.Y <= Y_1;

    IF (ACTIVE_CALLS < MAX_CALLS) THEN
        -- SET TELEPHONE ACTIVE
        UPDATE TELEPHONE SET PHONESTATE = 'ACTIVE' WHERE PHONENO = :NEW.PHONENO;
    ELSE
        -- INSERT INTO EXCEPTION_LOG 'M'
        SELECT MAX(EXID) INTO EX_ID FROM EXCEPTION_LOG WHERE CELLID = CELL_ID;
        IF (EX_ID IS NULL) THEN
            EX_ID := 0;
        end if;
        INSERT INTO EXCEPTION_LOG (EXID, CELLID, EXCEPTIONTYPE) VALUES (EX_ID + 1,
            CELL_ID, 'M');
    end if;
end;
```
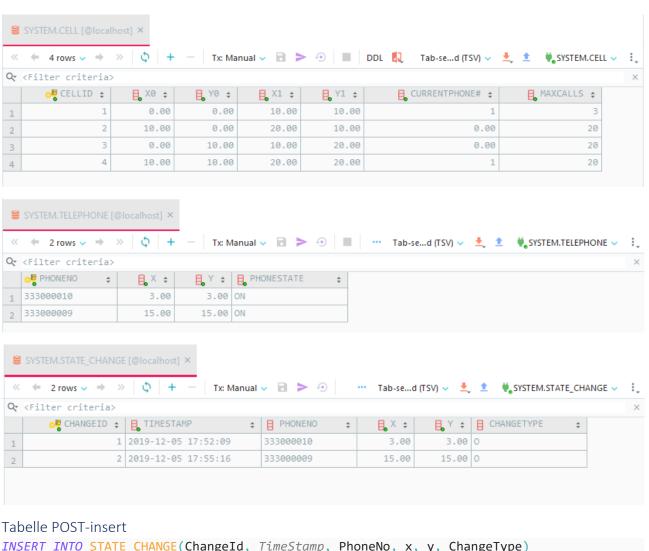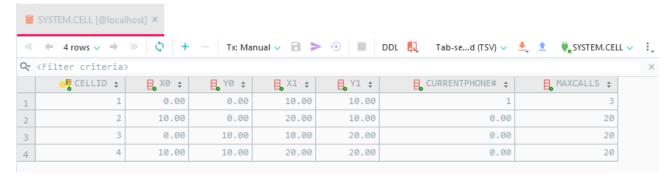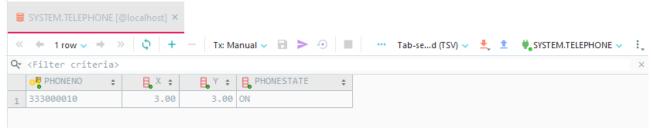
Verifica

Tabelle POST-insert
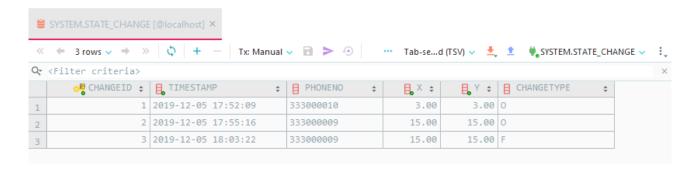
```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (4, sysdate, '333000001', 3, 3, 'O');
```

SYSTEM.CELL [@localhost] ×

« ← 4 rows ∨ → »   ↻   +   −   Tx: Manual ∨   💾 ➤ ⊙   ■   DDL 🔍   Tab-se...d (TSV) ∨   ⬇ ⬆   SYSTEM.CELL ∨   ⋮

`<Filter criteria>`

	CELLID ⇕	X0 ⇕	Y0 ⇕	X1 ⇕	Y1 ⇕	CURRENTPHONE# ⇕	MAXCALLS ⇕
1	1	0.00	0.00	10.00	10.00	2	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

« ← 2 rows ∨ → »   ↻   +   −   Tx: Manual ∨   💾 ➤ ⊙   ■   ···   Tab-se...d (TSV) ∨   ⬇ ⬆   SYSTEM.TELEPHONE ∨   ⋮

`<Filter criteria>`

	PHONENO ⇕	X ⇕	Y ⇕	PHONESTATE ⇕
1	333000010	3.00	3.00	ON
2	333000001	3.00	3.00	ON

SYSTEM.STATE_CHANGE [@localhost] ×

« ← 4 rows ∨ → »   ↻   +   −   Tx: Manual ∨   💾 ➤ ⊙   ···   Tab-se...d (TSV) ∨   ⬇ ⬆   SYSTEM.STATE_CHANGE ∨   ⋮

`<Filter criteria>`

	CHANGEID ⇕	TIMESTAMP	PHONENO ⇕	X ⇕	Y ⇕	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O

SYSTEM.EXCEPTION_LOG [@localhost] ×

« ← 0 rows ∨ → »   ↻   +   −   Tx: Manual ∨   💾 ➤ ⊙   ···   Tab-se...d (TSV) ∨   ⬇ ⬆   SYSTEM.EXCEPTION_LOG ∨   ⋮

`<Filter criteria>`

EXID ⇕	CELLID ⇕	EXCEPTIONTYPE ⇕

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (5, sysdate, '333000004', 5, 5, 'O');
```

SYSTEM.CELL [@localhost] ×

« ← 4 rows ∨ → »   ↻   +   −   Tx: Manual ∨   💾 ➤ ⊙   ■   DDL 🔍   Tab-se...d (TSV) ∨   ⬇ ⬆   SYSTEM.CELL ∨   ⋮

`<Filter criteria>`

	CELLID ⇕	X0 ⇕	Y0 ⇕	X1 ⇕	Y1 ⇕	CURRENTPHONE# ⇕	MAXCALLS ⇕
1	1	0.00	0.00	10.00	10.00	3	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ON
2	333000001	3.00	3.00	ON
3	333000004	5.00	5.00	ON

SYSTEM.STATE_CHANGE [@localhost] ×

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O

SYSTEM.EXCEPTION_LOG [@localhost] ×

	EXID	CELLID	EXCEPTIONTYPE

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (6, sysdate, '333000004', 5, 5, 'C');
```

SYSTEM.CELL [@localhost] ×

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	3	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ON
2	333000001	3.00	3.00	ON
3	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

« ← 6 rows ∨ → » | ⟳ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ⋯ Tab-se…d (TSV) ∨ ⬇ ⬆ 🔌 SYSTEM.STATE_CHANGE ∨ ⋮

🔍 <Filter criteria>   ×

	CHANGEID ⇕	TIMESTAMP ⇕	PHONENO ⇕	X ⇕	Y ⇕	CHANGETYPE ⇕
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C

SYSTEM.EXCEPTION_LOG [@localhost] ×

« ← 0 rows ∨ → » | ⟳ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ⋯ Tab-se…d (TSV) ∨ ⬇ ⬆ 🔌 SYSTEM.EXCEPTION_LOG ∨ ⋮

🔍 <Filter criteria>   ×

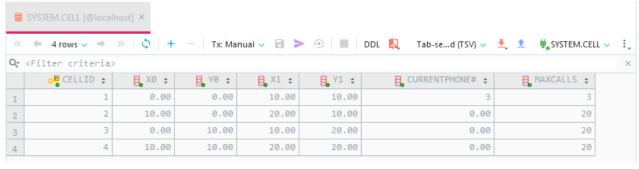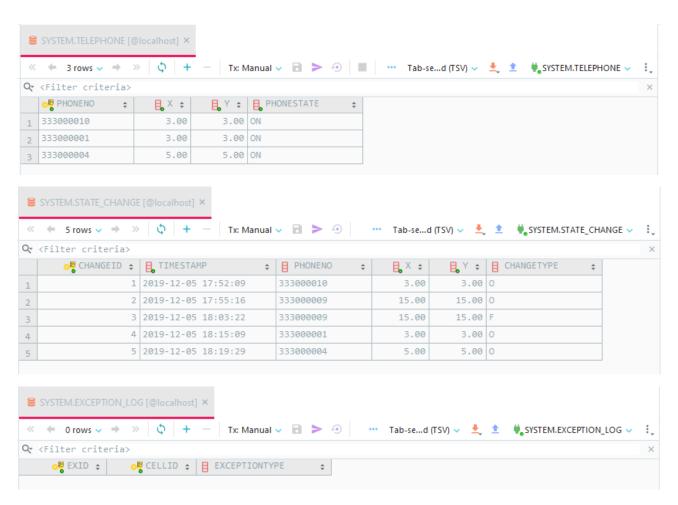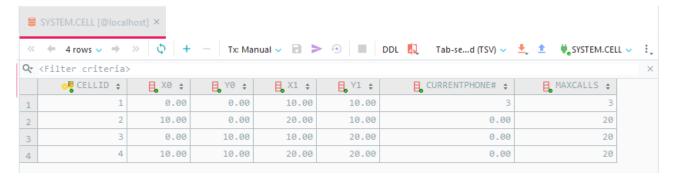| EXID ⇕	CELLID ⇕	EXCEPTIONTYPE ⇕

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (7, sysdate, '333000001', 3, 3, 'C');
```

SYSTEM.CELL [@localhost] ×

« ← 4 rows ∨ → » | ⟳ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ▪ DDL 🔖 Tab-se…d (TSV) ∨ ⬇ ⬆ 🔌 SYSTEM.CELL ∨ ⋮

🔍 <Filter criteria>   ×

	CELLID ⇕	X0 ⇕	Y0 ⇕	X1 ⇕	Y1 ⇕	CURRENTPHONE# ⇕	MAXCALLS ⇕
1	1	0.00	0.00	10.00	10.00	3	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

« ← 3 rows ∨ → » | ⟳ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ▪ ⋯ Tab-se…d (TSV) ∨ ⬇ ⬆ 🔌 SYSTEM.TELEPHONE ∨ ⋮

🔍 <Filter criteria>   ×

	PHONENO ⇕	X ⇕	Y ⇕	PHONESTATE ⇕
1	333000010	3.00	3.00	ON
2	333000001	3.00	3.00	ACTIVE
3	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

« ← 7 rows ∨ → » | ⟳ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ⋯ Tab-se…d (TSV) ∨ ⬇ ⬆ 🔌 SYSTEM.STATE_CHANGE ∨ ⋮

🔍 <Filter criteria>   ×

	CHANGEID ⇕	TIMESTAMP ⇕	PHONENO ⇕	X ⇕	Y ⇕	CHANGETYPE ⇕
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C

SYSTEM.EXCEPTION_LOG [@localhost] ×

EXID	CELLID	EXCEPTIONTYPE

Tabelle POST-insert

```
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (8, sysdate, '333000010', 3, 3, 'C');
```
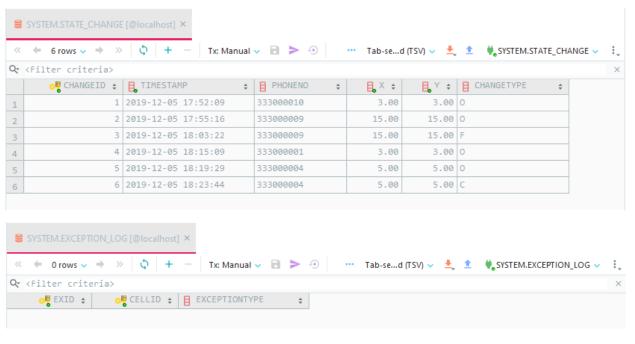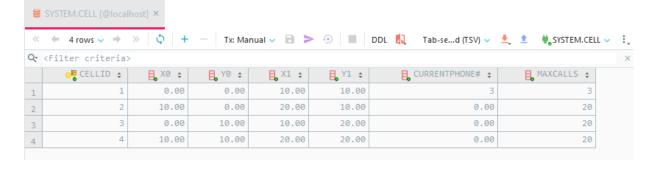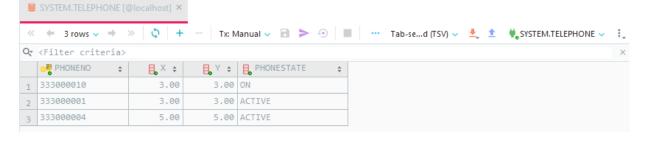
SYSTEM.CELL [@localhost] ×

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	3	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000001	3.00	3.00	ACTIVE
3	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C

SYSTEM.EXCEPTION_LOG [@localhost] ×

EXID	CELLID	EXCEPTIONTYPE

Tabelle POST-insert

```sql
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (9, sysdate, '333000020', 4, 4, 'O');
```
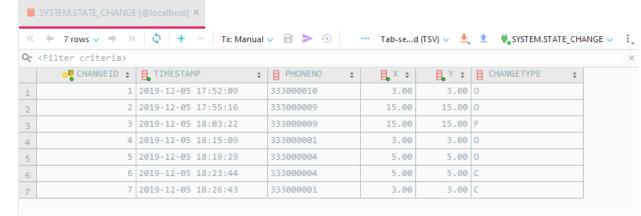
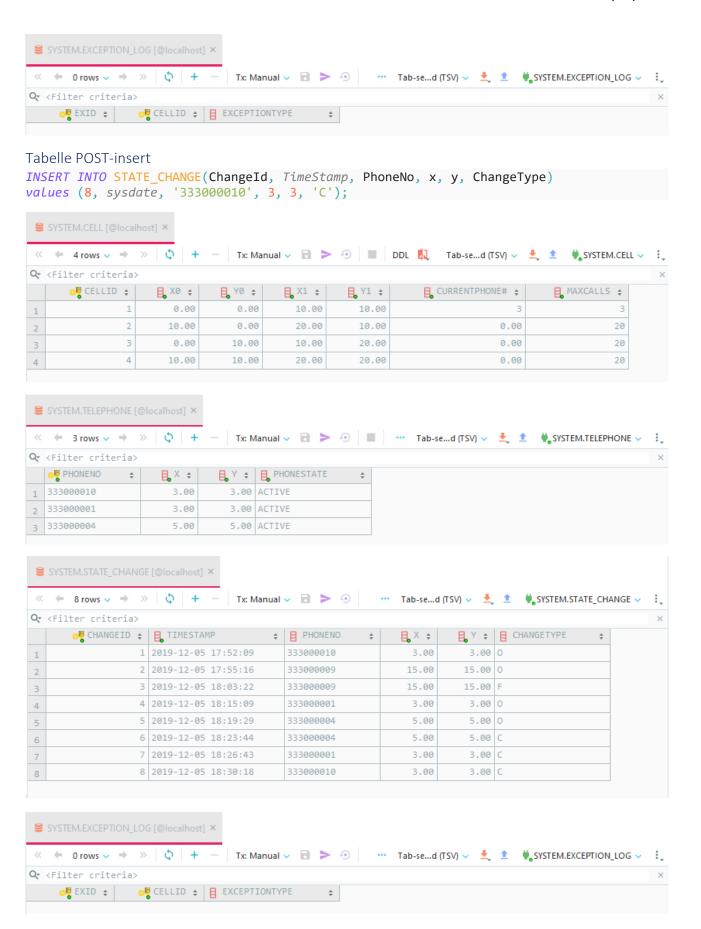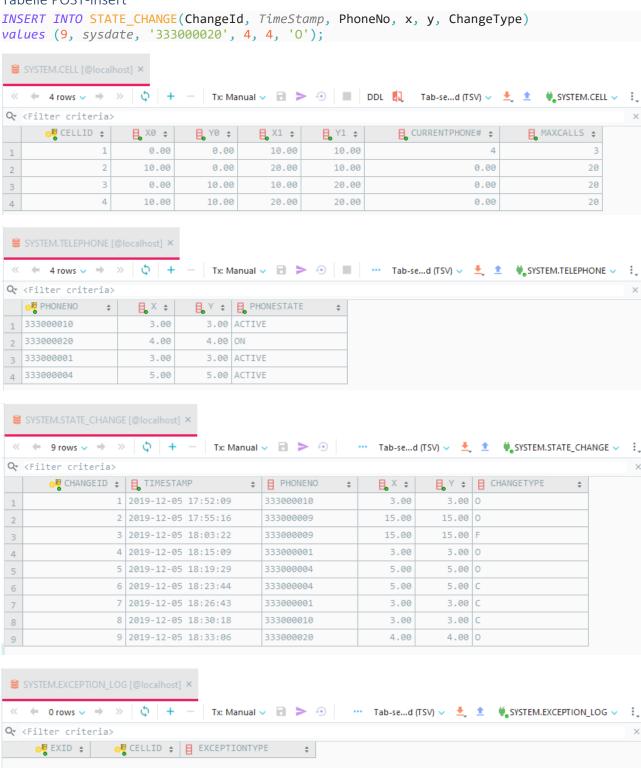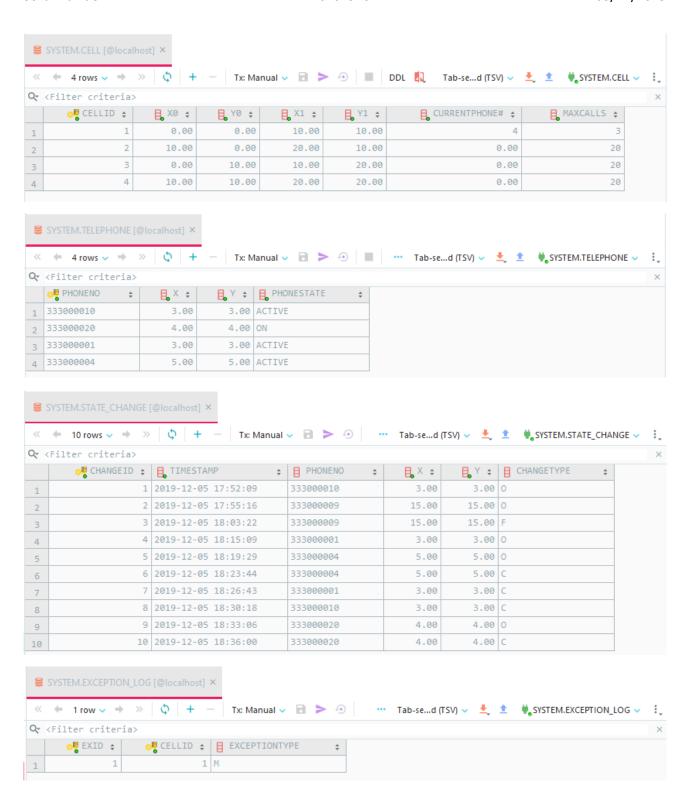**SYSTEM.CELL [@localhost]** ×

4 rows | Tx: Manual | DDL | Tab-se...d (TSV) | SYSTEM.CELL

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	4	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

4 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.TELEPHONE

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000020	4.00	4.00	ON
3	333000001	3.00	3.00	ACTIVE
4	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

9 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.STATE_CHANGE

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C
9	9	2019-12-05 18:33:06	333000020	4.00	4.00	O

SYSTEM.EXCEPTION_LOG [@localhost] ×

0 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.EXCEPTION_LOG

	EXID	CELLID	EXCEPTIONTYPE

Tabelle POST-insert

```sql
INSERT INTO STATE_CHANGE(ChangeId, TimeStamp, PhoneNo, x, y, ChangeType)
values (10, sysdate, '333000020', 4, 4, 'C');
```
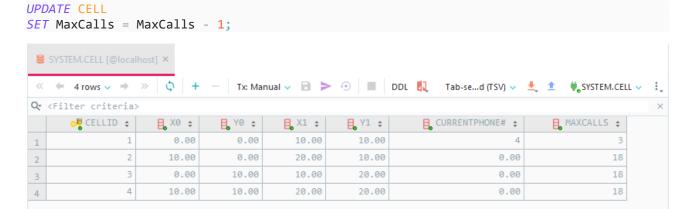
SYSTEM.CELL [@localhost] ×

4 rows | Tx: Manual | DDL | Tab-se...d (TSV) | SYSTEM.CELL

<Filter criteria>

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	4	3
2	2	10.00	0.00	20.00	10.00	0.00	20
3	3	0.00	10.00	10.00	20.00	0.00	20
4	4	10.00	10.00	20.00	20.00	0.00	20

SYSTEM.TELEPHONE [@localhost] ×

4 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.TELEPHONE

<Filter criteria>

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000020	4.00	4.00	ON
3	333000001	3.00	3.00	ACTIVE
4	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

10 rows | Tx: Manual | Tab-se...d (TSV) | SYSTEM.STATE_CHANGE

<Filter criteria>

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C
9	9	2019-12-05 18:33:06	333000020	4.00	4.00	O
10	10	2019-12-05 18:36:00	333000020	4.00	4.00	C

SYSTEM.EXCEPTION_LOG [@localhost] ×

1 row | Tx: Manual | Tab-se...d (TSV) | SYSTEM.EXCEPTION_LOG

<Filter criteria>

	EXID	CELLID	EXCEPTIONTYPE
1	1	1	M

Trigger #3 – Variazione del numero di chiamate massime delle celle
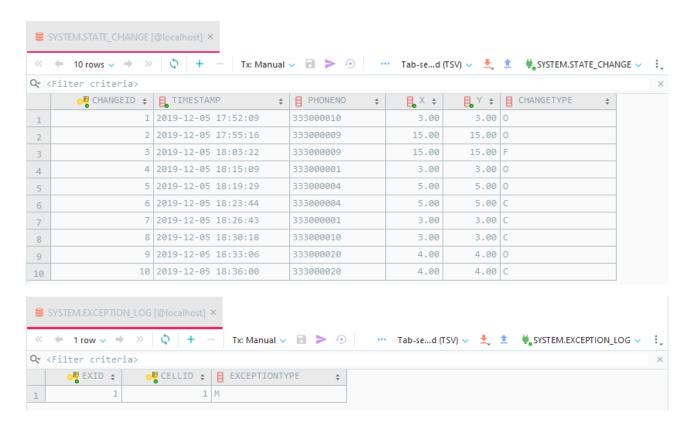
Codice

```
-- UPDATE MAX CALLS - 1

CREATE OR REPLACE TRIGGER maxCallsUpdate
    BEFORE UPDATE
    OF MAXCALLS ON CELL
    FOR EACH ROW
DECLARE
    ACTIVE_CALLS NUMBER;

BEGIN
    -- SELECT ACTIVE CALLS IN CELL
    SELECT COUNT(*)
    INTO ACTIVE_CALLS
    FROM TELEPHONE
    WHERE PHONESTATE = 'ACTIVE'
      AND :NEW.X0 <= X
      AND X <= :NEW.X1
      AND :NEW.Y0 <= Y
      AND Y <= :NEW.Y1;

    -- CHECK ACTIVE CALL <=MAX_CALLS
    IF (:NEW.MAXCALLS < ACTIVE_CALLS) THEN
        :NEW.MAXCALLS := ACTIVE_CALLS;
    end if;
end;
```

Verifica

Tabelle POST-update

```
UPDATE CELL
SET MaxCalls = MaxCalls - 1;
```

SYSTEM.CELL [@localhost] ×

« ← 4 rows ∨ → » | ↻ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ▮ | DDL 🔃 | Tab-se…d (TSV) ∨ ↧ ↥ | 🔌 SYSTEM.CELL ∨ ⋮

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	4	3
2	2	10.00	0.00	20.00	10.00	0.00	18
3	3	0.00	10.00	10.00	20.00	0.00	18
4	4	10.00	10.00	20.00	20.00	0.00	18

SYSTEM.TELEPHONE [@localhost] ×

« ← 4 rows ∨ → » | ↻ | + − | Tx: Manual ∨ 🖫 ➤ ⊙ | ▮ | ··· | Tab-se…d (TSV) ∨ ↧ ↥ | 🔌 SYSTEM.TELEPHONE ∨ ⋮

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000020	4.00	4.00	ON
3	333000001	3.00	3.00	ACTIVE
4	333000004	5.00	5.00	ACTIVE

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C
9	9	2019-12-05 18:33:06	333000020	4.00	4.00	O
10	10	2019-12-05 18:36:00	333000020	4.00	4.00	C

	EXID	CELLID	EXCEPTIONTYPE
1	1	1	M

Trigger #4 – Garanzia del servizio

Codice

```
-- UPDATE MAX CALLS - 2

CREATE OR REPLACE TRIGGER minServiceGuarantee
    AFTER UPDATE OF MAXCALLS
    ON CELL
DECLARE
    MAX_CALLS NUMBER;

BEGIN
    SELECT SUM(MAXCALLS) INTO MAX_CALLS FROM CELL;
    IF MAX_CALLS < 30 THEN
        RAISE_APPLICATION_ERROR(-20123, 'MINIMUM SERVICE GUARANTEE CONSTRAINT
            VIOLATED');
    end if;
end;
```

Verifica

Tabelle POST-update

```
UPDATE CELL
SET MaxCalls = MaxCalls - 1;
```

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	4	3
2	2	10.00	0.00	20.00	10.00	0.00	17
3	3	0.00	10.00	10.00	20.00	0.00	17
4	4	10.00	10.00	20.00	20.00	0.00	17

SYSTEM.TELEPHONE [@localhost]

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000020	4.00	4.00	ON
3	333000001	3.00	3.00	ACTIVE
4	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost]

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C
9	9	2019-12-05 18:33:06	333000020	4.00	4.00	O
10	10	2019-12-05 18:36:00	333000020	4.00	4.00	C

SYSTEM.EXCEPTION_LOG [@localhost]

	EXID	CELLID	EXCEPTIONTYPE
1	1	1	M

Verifica POST-update

```sql
UPDATE CELL
SET MaxCalls = MaxCalls - 10;
```

SYSTEM.CELL [@localhost]

	CELLID	X0	Y0	X1	Y1	CURRENTPHONE#	MAXCALLS
1	1	0.00	0.00	10.00	10.00	4	3
2	2	10.00	0.00	20.00	10.00	0.00	17
3	3	0.00	10.00	10.00	20.00	0.00	17
4	4	10.00	10.00	20.00	20.00	0.00	17

SYSTEM.TELEPHONE [@localhost] ×

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Q‧ <Filter criteria>   ×

	PHONENO	X	Y	PHONESTATE
1	333000010	3.00	3.00	ACTIVE
2	333000020	4.00	4.00	ON
3	333000001	3.00	3.00	ACTIVE
4	333000004	5.00	5.00	ACTIVE

SYSTEM.STATE_CHANGE [@localhost] ×

« ← 10 rows ∨ → » | ↻ | + − | Tx: Manual ∨ | 🖫 ➤ ⊙ | ⋯ Tab-se…d (TSV) ∨ 📥 📤 | 🔌 SYSTEM.STATE_CHANGE ∨ | ⋮

Q‧ <Filter criteria>   ×

	CHANGEID	TIMESTAMP	PHONENO	X	Y	CHANGETYPE
1	1	2019-12-05 17:52:09	333000010	3.00	3.00	O
2	2	2019-12-05 17:55:16	333000009	15.00	15.00	O
3	3	2019-12-05 18:03:22	333000009	15.00	15.00	F
4	4	2019-12-05 18:15:09	333000001	3.00	3.00	O
5	5	2019-12-05 18:19:29	333000004	5.00	5.00	O
6	6	2019-12-05 18:23:44	333000004	5.00	5.00	C
7	7	2019-12-05 18:26:43	333000001	3.00	3.00	C
8	8	2019-12-05 18:30:18	333000010	3.00	3.00	C
9	9	2019-12-05 18:33:06	333000020	4.00	4.00	O
10	10	2019-12-05 18:36:00	333000020	4.00	4.00	C

SYSTEM.EXCEPTION_LOG [@localhost] ×

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Q‧ <Filter criteria>   ×

	EXID	CELLID	EXCEPTIONTYPE
1	1	1	M

```
[2019-12-05 20:58:50] [72000][20123] ORA-20123: MINIMUM SERVICE GUARANTEE CONSTRAINT VIOLATED
[2019-12-05 20:58:50] ORA-06512: at "SYSTEM.MINSERVICEGUARANTEE", line 7
[2019-12-05 20:58:50] ORA-04088: error during execution of trigger 'SYSTEM.MINSERVICEGUARANTEE'
[2019-12-05 20:58:50] Position: 7
```

Il codice e gli screenshot del database sono stati fatti con DataGrip.