Advanced database technologies

(Sorry for the code without syntax highlighting in blocks of code. Notion does not export worksheets as PDFs with code highlighting. You can check the original page where the code is properly highlighted)

View

```
-- Make view of viewers information
-- (to add to mailing list and send notification to their account for example)
CREATE OR REPLACE VIEW viewers_info AS
    SELECT Site.email, Site.username
    FROM Person
    NATURAL JOIN Viewer
    NATURAL JOIN Site
    WHERE(Viewer.email = Person.email);
```

Index

▼ Leaderboard Index

```
-- Using this index we can fasete search results of competition by place.
CREATE INDEX IF NOT EXISTS leaderboard_place
ON Leaderboard (place);
```

- This table is big (~ 38k) and index helps us make queries faster. We should update index after every competition (after adding all results of competition)

▼ Person Index

```
-- Index to faster search biathletes/viewers/workers using his/her sex
CREATE INDEX IF NOT EXISTS person_sex
ON Person (sex)
```

- Person table is not small and its date not changing very often and we can make index of it.

Triggers

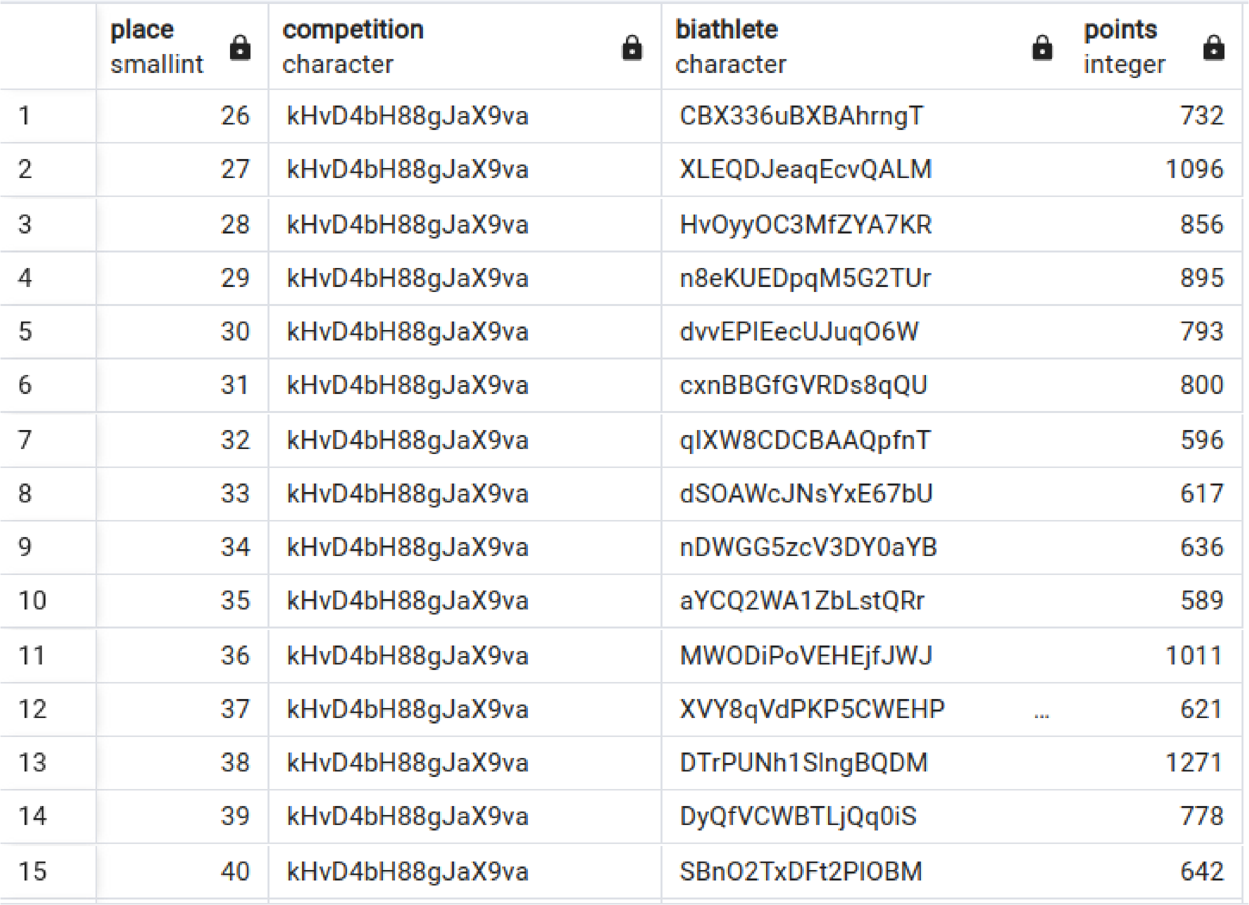
- NOTICE: I added new field to table Biathlete —> Biathlete.points. It has integer type and 0 by default. It increases depending on finish place.

```
-- This function updates (increase) points after biathlete finish
-- It depends on finish place.
CREATE OR REPLACE FUNCTION update_points()
RETURNS TRIGGER
AS
$$
DECLARE
    new_points INT := 0;
BEGIN

    IF (NEW.place > 5) AND (NEW.place < 41)  THEN
        new_points := 45 - NEW.place;
    END IF;
    IF (NEW.place < 6) THEN
        new_points := 150  - 20 * NEW.place;
    END IF;

    UPDATE Biathlete
    SET points = points + new_points
    WHERE biathleteID = NEW.biathlete;

    RETURN NEW;
END;
$$
LANGUAGE plpgsql;

-- Triggers when new row added to Leaderboard.
CREATE OR REPLACE TRIGGER update_biathlete_points_after_result
AFTER INSERT
ON Leaderboard
FOR EACH ROW
EXECUTE FUNCTION update_points();
```

Transactions

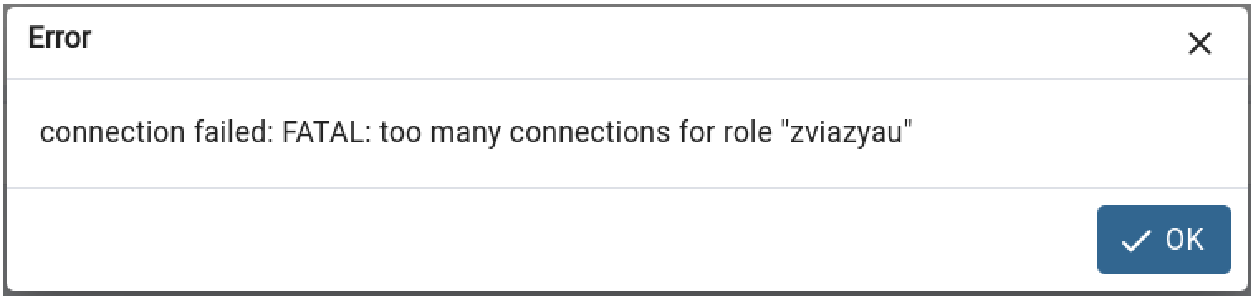
```
-- Transaction what delete biathlete competition result if he/she cheats (like doping).
-- Also it changes places of another biathletes and their porints
-- If you don't use a transaction here, we will have
-- 1. all places instead of deleted place (break after 1st query)
-- 2. wrong points, wrong places (break after 2nd query)
-- 3. right places, but no points for this places (break after 3rd query)
-- There can be write-read conflict, read-write conflict and write-write conflict.

-- Let's delete result with 28 place on competition with id "kHvD4bH88gJaX9va"


-- Function that returns points for place
CREATE OR REPLACE FUNCTION get_points_for_place(place INT)
RETURNS INT
AS
$$
DECLARE
    new_points INT := 0;
BEGIN

    IF (place > 5) AND (place < 41)  THEN
        new_points := 45 - place;
    END IF;
    IF (place < 6) THEN
        new_points := 150  - 20 * place;
    END IF;

    RETURN new_points;
END;
$$
LANGUAGE plpgsql;
```

```
BEGIN; -- Start transaction

SET TRANSACTION ISOLATION LEVEL SERIALIZABLE;

DECLARE
    cur_comp CHAR(32) := 'kHvD4bH88gJaX9va';
    cur_place INT := 28;

-- Deleting 28 place
DELETE FROM Leaderboard WHERE leaderboard.competition = cur_comp AND place = cur_place;

-- Subtract points of current place
UPDATE Biathlete
SET points = OLD.points - get_points_for_place(place)
FROM (
    SELECT biathlete, points, place
    FROM Biathlete
  NATURAL JOIN Leaderboard
) AS subquery
WHERE Biathlete.biathletedID = subquery.biathlete;

-- Update place, decrease place by 1
UPDATE Leaderboard SET place = (OLD.place - 1)
WHERE leaderboard.competition = cur_comp AND place > cur_place;

-- Increase points of current place
UPDATE Biathlete
SET points = OLD.points + get_points_for_place(place)
FROM (
    SELECT biathlete, points, place
    FROM Biathlete
  NATURAL JOIN Leaderboard
) AS subquery
WHERE Biathlete.biathletedID = subquery.biathlete;

COMMIT; -- If all operation was made

ROLLBACK; -- If an error occurs


-- Using this query we can check our db before and after transaction
SELECT place,competition,biathlete, points
FROM (
  SELECT place,competition,biathlete, points
  FROM Leaderboard
  NATURAL JOIN Biathlete
  WHERE Biathlete.biathleteID = Leaderboard.biathlete
  ) AS subquery
WHERE competition = 'kHvD4bH88gJaX9va' AND place >= 26;
```



	place smallint	competition character	biathlete character	points integer
1	26	kHvD4bH88gJaX9va	CBX336uBXBAhrngT	732
2	27	kHvD4bH88gJaX9va	XLEQDJeaqEcvQALM	1096
3	28	kHvD4bH88gJaX9va	HvOyyOC3MfZYA7KR	856
4	29	kHvD4bH88gJaX9va	n8eKUEDpqM5G2TUr	895
5	30	kHvD4bH88gJaX9va	dvvEPIEecUJuqO6W	793
6	31	kHvD4bH88gJaX9va	cxnBBGfGVRDs8qQU	800
7	32	kHvD4bH88gJaX9va	qIXW8CDCBAAQpfnT	596
8	33	kHvD4bH88gJaX9va	dSOAWcJNsYxE67bU	617
9	34	kHvD4bH88gJaX9va	nDWGG5zcV3DY0aYB	636
10	35	kHvD4bH88gJaX9va	aYCQ2WA1ZbLstQRr	589
11	36	kHvD4bH88gJaX9va	MWODiPoVEHEjfJWJ	1011
12	37	kHvD4bH88gJaX9va	XVY8qVdPKP5CWEHP …	621
13	38	kHvD4bH88gJaX9va	DTrPUNh1SlngBQDM	1271
14	39	kHvD4bH88gJaX9va	DyQfVCWBTLjQq0iS	778
15	40	kHvD4bH88gJaX9va	SBnO2TxDFt2PIOBM	642

There should be image after transaction, but



connection failed: FATAL: too many connections for role "zviazyau"