

Analyze the “Bank” database model (see below). Perform the following tasks:

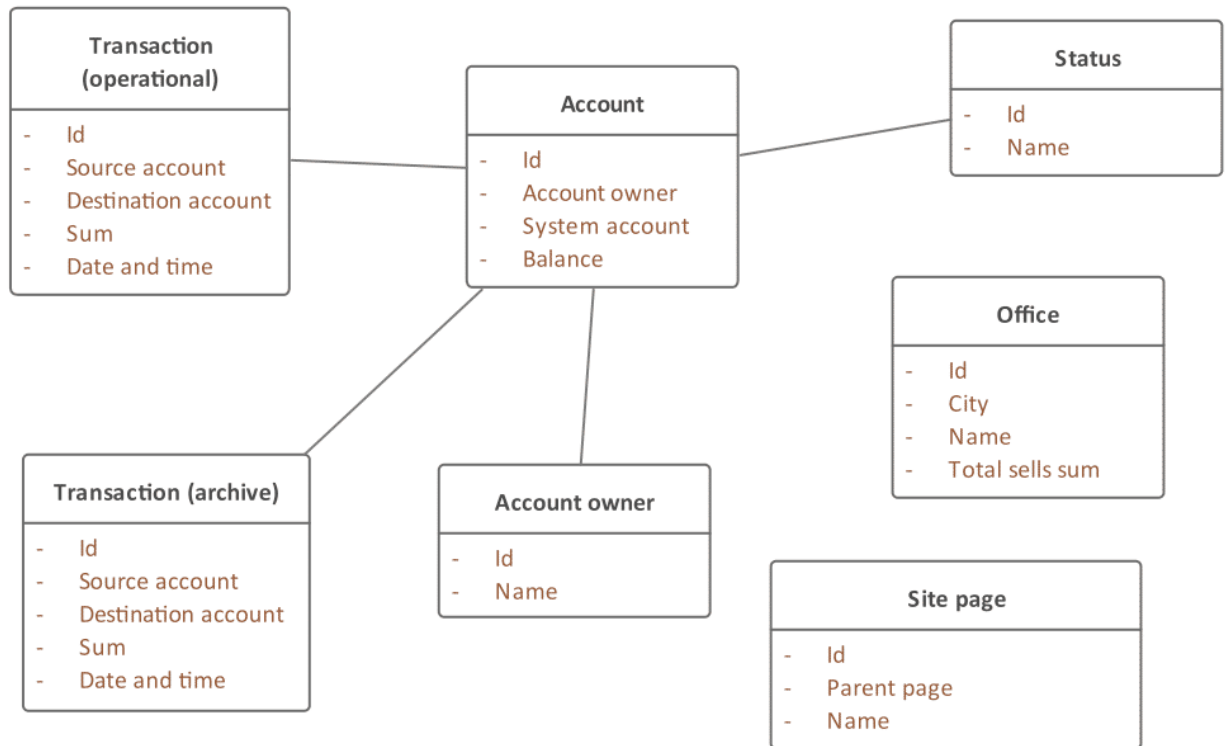
1. Do you see any possibility for insert, update, delete data operation anomalies? Make the list of such cases and correct the schema to avoid such anomalies.
  2. Can we use “star” or “snowflake” schemas with this database to avoid some data operation anomalies? Rework the schema, compare the new one to the original one and make the list of the data operation anomalies that were eliminated and introduced.
  3. Make the list of all functional dependencies in the database.
  4. Are there relations having multi-values dependencies? If “yes”, how can we rework the schema to avoid such dependencies?
  5. Does the schema violate any “normalization requirement”? If “yes”, rework the schema to avoid such violations.
  6. Can you name some potential performance issues with the database? Make the list.
  7. For each relation in the database detect what normal form it is in. Make the list.
  8. Are there relations in the higher normal form possible? Make the list.
  9. Are there relations with possible yet unnecessary further normalization? Make the list.
  10. Can we achieve some performance improvement with denormalization of the schema? Prove your opinion.
  11. Can we achieve some performance improvement by adding caching relations to the schema? Prove your opinion.
  12. Add any missing comments to the database.
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This is an extremely simplified database model for some imaginary bank. It contains only basic elements. There are some intentionally made mistakes, so it is your task to find and correct them.

The database represents the following entities and attributes (see Picture A or “Conceptual Model” in “CTECH DB 03 - Normalization and Normal Forms - task.eap”):

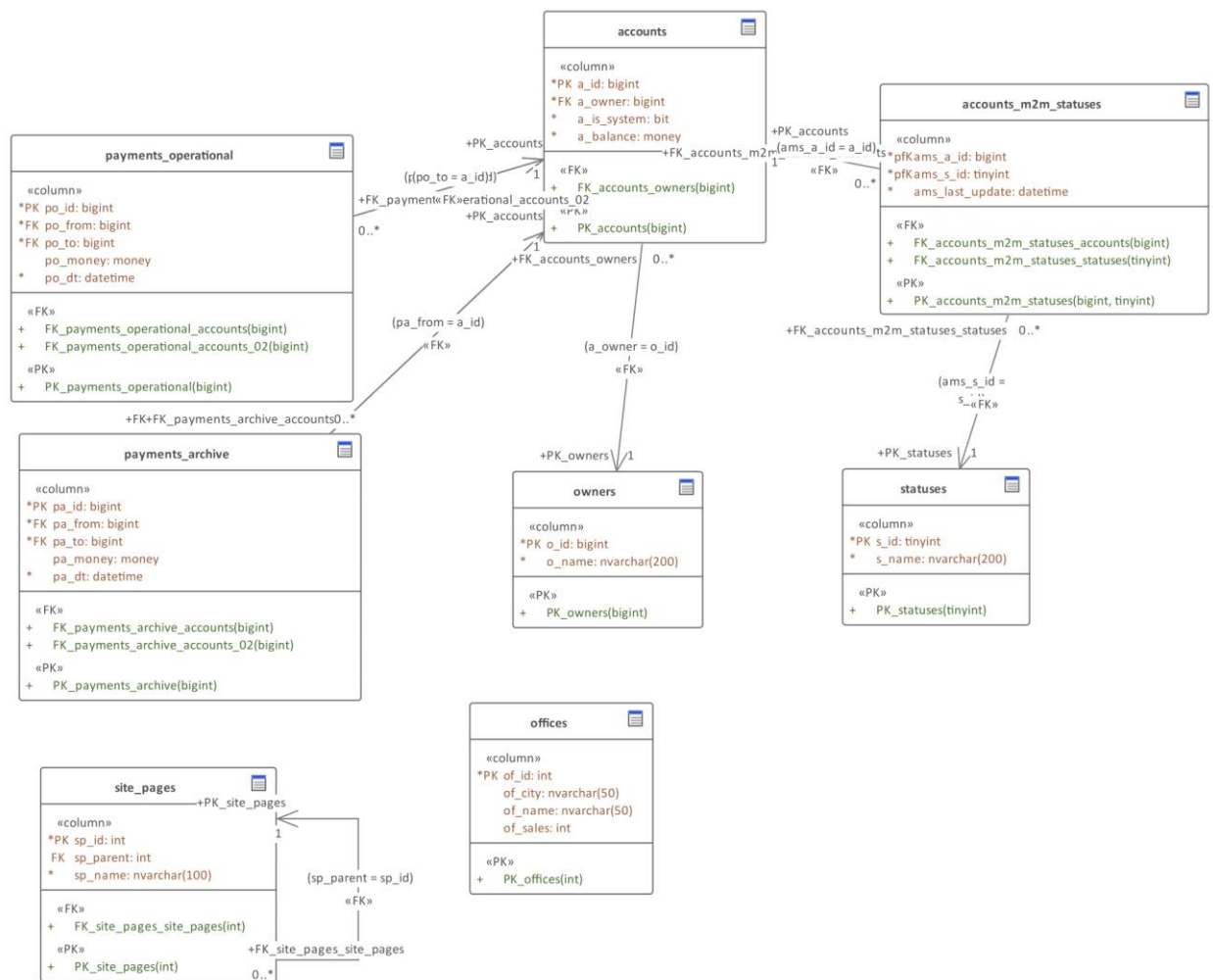
- Account (describes an account):
  - id (account id);
  - balance (account balance, MONEY data type);
  - account owner (FK);
  - system account (a flag representing that this account does not belong to a human).
- Status (account status, e.g., «Active», «Locked» и т.д.):
  - id (status id);
  - name (status name).
- Transaction operational (for transactions in the current month):
  - id (transaction id);
  - source account (FK);
  - destination account (FK);
  - date and time (transaction datetime);
  - sum (transaction total sum).
- Transaction archive (for transactions before the current month):
  - id (transaction id);
  - source account (FK);
  - destination account (FK);
  - date and time (transaction datetime);
  - sum (transaction total sum).
- Account owner (bank client):
  - id (account owner id);
  - name (account owner name).
- Site page (bank website page):
  - id (page id);
  - parent page (rFK);

- name (page name).
- Office (bank office):
  - id (office id);
  - city (office location);
  - name (office name);
  - total sells sum (MONEY datatype, sum of profit by the office).



Picture A – “Conceptual Model”

The datalogical level of the database looks like this (see Picture B and Picture C or “Datalogical Model” in “CTECH DB 03 - Normalization and Normal Forms - task.eap”):



Picture B – “Datological Model” for MS SQL Server

