A database for a Vehicle Insurance Company

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Team 3

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Logical Data Model(LDM)

Elements

Elements in the data model are named entities. This is any distinguishable object that presents part of the database. It can be related to any object in the real world such as: a car, a customer (person), a policy, a company, etc. with respective attributes that are relevant to the software system.

Properties of **entities** can have values:

1. Name

2. Description of the meaning and significance

3. Weather entity is dependent or non-dependent

4. List of attributes (Car entity: year, manufacturer, model, mileage, owner, licence, book of maintenance) with properties (data type, size, is it required or not). - The attributes (or attribute) are used to precisely identify an entity (primary key – PK, foreigner key – FK, …)

5. Constraints of individual or combined attributes values (e.g. date of issue of new policy can't be prior to renewal date of policy)

6. Rules to grant permission to users or user groups to access the entity

7. Expected number of entity instances and expected growth rate

Or additional:

1. List of attributes to be indexed to optimize access time

2. List of attributes to be encrypted or compressed

3. Whether entity should become a database view or a table

4. Weather entity should become a materialized view

5. List of database triggers to be implemented for that entity.

Relations

Relationship - Designates logical association between entities, with cardinality of the participant entities: one-to-one, one-to-many, or many-to-many relationships. Relationships can be identifying or non-identifying (identifying A-B; existence of B depends on existence of A).

Generalization/specialization – Indicates an "is a" relationship between entities. For example department entity is a generalization of different types of departments; at the same time vehicle insurance department or travel insurance department is specialization of department entity.

Aggregation - is an abstraction that turns relationships between entities into an aggregate entity, rarely used. Example: "customer-insurance advisor -date" can be an aggregate entity called Appointment.

Constraints

The database normalization technique is used to impose restrictions on data models that are based on dependencies between entities and their attributes. Normalization is used with the goal objective to avoid duplication of information in order to safeguard the consistency (integrity) of the data.

Data types

When we assign attributes to entities with primary keys and foreign keys do the normalization, we identify each attribute with the data type for each data management system – **MySQL Workbench** as listed below.

Table-LDM 1: t3_INCIDENT

t3_Incident_Id VARCHAR(20) NOT NULL ,

t3_Incident_Type VARCHAR(50) NULL ,

t3_Incident_Date DATE NOT NULL ,

t3_Description VARCHAR(1000) NULL ,

CONSTRAINT XPKINCIDENT_17 PRIMARY KEY (t3_Incident_Id)

Table-LDM 2: t3_CUSTOMER

t3_Cust_Id VARCHAR(15) NOT NULL ,

t3_Cust_FName VARCHAR(15) NOT NULL ,

t3_Cust_LName VARCHAR(15) NOT NULL ,

t3_Cust_DOB DATE NOT NULL ,

t3_Cust_Gender CHAR(2) NOT NULL ,

t3_Cust_Address VARCHAR(35) NOT NULL ,

t3_Cust_MOB_Number BIGINT NOT NULL ,

t3_Cust_Email VARCHAR(25) NULL ,

t3_Cust_Passport_Number VARCHAR(20) NULL ,

t3_Cust_Marital_Status CHAR(12) NULL ,

t3_Cust_PPS_Number INTEGER NULL ,

CONSTRAINT XPKCUSTOMER PRIMARY KEY (t3_Cust_Id)

Table-LDM 3: t3_INCIDENT_REPORT

Incident_Report_Id VARCHAR(20) NOT NULL ,

t3_Incident_Type CHAR(50) NULL ,

t3_Incident_Inspector VARCHAR(20) NULL ,

t3_Incident_Cost INTEGER NULL ,

t3_Incident_Report_Description VARCHAR(1000) NULL ,

t3_Incident_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKINCIDENT_REPORT_18 PRIMARY KEY

(Incident_Report_Id,t3_Incident_Id,t3_Cust_Id),

CONSTRAINT R_83 FOREIGN KEY (t3_Incident_Id) REFERENCES t3_INCIDENT (t3_Incident_Id) ON

DELETE CASCADE ON UPDATE CASCADE,

CONSTRAINT R_86 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER (t3_Cust_Id) ON

DELETE CASCADE ON UPDATE CASCADE

Table-LDM 4: t3_INSURANCE_COMPANY

t3_Company_Name VARCHAR(70) NOT NULL ,

t3_Company_Address VARCHAR(400) NULL ,

t3_Company_Contact_Number bigint NULL ,

t3_Company_Fax bigint NULL ,

t3_Company_Email VARCHAR(50) NULL ,

t3_Company_Website VARCHAR(50) NULL ,

t3_Company_Location VARCHAR(50) NULL,

t3_Company_Department_Name VARCHAR(50) NULL ,

t3_Company_Office_Name VARCHAR(50) NULL ,

CONSTRAINT XPKINSURANCE_COMPANY_15 PRIMARY KEY (t3_Company_Name)

Table-LDM 5: t3_DEPARTMENT

t3_Department_Name VARCHAR(50) NOT NULL ,

t3_Department_ID VARCHAR(50) NOT NULL ,

t3_Department_Staff VARCHAR(50) NULL ,

t3_Company_Name VARCHAR(100) NOT NULL ,

CONSTRAINT XPKDEPARTMENT PRIMARY KEY

(t3_Department_Name,t3_Department_ID,t3_Company_Name),

CONSTRAINT R_56 FOREIGN KEY (t3_Company_Name)

REFERENCES t3_INSURANCE_COMPANY (t3_Company_Name) ON DELETE CASCADE ON UPDATE

CASCADE

Table-LDM 6: t3_VEHICLE_SERVICE

t3_Department_Name VARCHAR(100) NOT NULL ,

t3_Vehicle_Service_Company_Name VARCHAR(10) NOT NULL ,

t3_Vehicle_Service_Address VARCHAR(200) NULL ,

t3_Vehicle_Service_Contact VARCHAR(200) NULL ,

t3_Vehicle_Service_Incharge VARCHAR(200) NULL ,

t3_Vehicle_Service_Type VARCHAR(200) NULL ,

t3_Department_ID VARCHAR(200) NOT NULL ,

t3_Company_Name VARCHAR(200) NOT NULL ,

CONSTRAINT XPKVEHICLE_SERVICE PRIMARY KEY

(t3_Vehicle_Service_Company_Name,t3_Department_Name),

CONSTRAINT R_50 FOREIGN KEY (t3_Department_Name, t3_Department_ID,

t3_Company_Name) REFERENCES t3_DEPARTMENT (t3_Department_Name,

t3_Department_ID, t3_Company_Name) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 7: t3_VEHICLE

t3_Vehicle_Id VARCHAR(20) NOT NULL ,

t3_Policy_Id VARCHAR(20) NULL ,

t3_Vehicle_Registration_Number VARCHAR(20) NOT NULL ,

t3_Vehicle_Value bigint NULL ,

t3_Vehicle_Type VARCHAR(20) NOT NULL ,

t3_Vehicle_Size INTEGER NULL ,

t3_Vehicle_Number_Of_Seat INTEGER NULL ,

t3_Vehicle_Manufacturer VARCHAR(20) NULL ,

t3_Vehicle_Engine_Number INTEGER NULL ,

t3_Vehicle_Chasis_Number INTEGER NULL ,

t3_Vehicle_Number INTEGER NULL ,

t3_Vehicle_Model_Number VARCHAR(20) NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKVEHICLE_6 PRIMARY KEY (t3_Vehicle_Id,t3_Cust_Id),

CONSTRAINT R_92 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER

(t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 8: t3_PREMIUM_PAYMENT

t3_Premium_Payment_Id VARCHAR(20) NOT NULL ,

t3_Policy_Number VARCHAR(20) NOT NULL ,

t3_Premium_Payment_Amount INTEGER NOT NULL ,

t3_Premium_Payment_Schedule DATE NOT NULL ,

t3_Receipt_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKPREMIUM_PAYMENT_5 PRIMARY KEY

(t3_Premium_Payment_Id,t3_Cust_Id),

CONSTRAINT R_85 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER

(t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 9: t3_RECEIPT

t3_Receipt_Id VARCHAR(20) NOT NULL ,

t3_Time DATE NOT NULL ,

t3_Cost INTEGER NOT NULL ,

t3_Premium_Payment_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKRECEIPT_21 PRIMARY KEY (t3_Receipt_Id,t3_Premium_Payment_Id,t3_Cust_Id),

CONSTRAINT R_84 FOREIGN KEY (t3_Premium_Payment_Id, t3_Cust_Id)

REFERENCES t3_PREMIUM_PAYMENT (t3_Premium_Payment_Id, t3_Cust_Id) ON DELETE

CASCADE ON UPDATE CASCADE

Table-LDM 10: t3_APPLICATION

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Vehicle_Id VARCHAR(20) NOT NULL ,

t3_Application_Status CHAR(8) NOT NULL ,

t3_Coverage VARCHAR(50) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKAPPLICATION_2 PRIMARY KEY (t3_Application_Id,t3_Cust_Id),

CONSTRAINT R_93 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER

(t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 11: t3_INSURANCE_POLICY

t3_Agreement_id VARCHAR(20) NOT NULL ,

t3_Department_Name VARCHAR(20) NULL ,

t3_Policy_Number VARCHAR(20) NULL ,

t3_Start_Date DATE NULL ,

t3_Expiry_Date DATE NULL ,

t3_Term_Condition_Description VARCHAR(400) NULL ,

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKINSURANCE_POLICY_4 PRIMARY KEY

(t3_Agreement_id,t3_Application_Id,t3_Cust_Id),

CONSTRAINT R_95 FOREIGN KEY (t3_Application_Id, t3_Cust_Id) REFERENCES t3_APPLICATION

(t3_Application_Id, t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 12: t3_POLICY_RENEWABLE

t3_Policy_Renewable_Id VARCHAR(20) NOT NULL ,

t3_Date_Of_Renewal DATE NOT NULL ,

t3_Type_Of_Renewal CHAR(15) NOT NULL ,

t3_Agreement_id VARCHAR(20) NOT NULL ,

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKPOLICY_RENEWABLE_16 PRIMARY KEY

(t3_Policy_Renewable_Id,t3_Agreement_id,t3_Application_Id,t3_Cust_Id),

CONSTRAINT R_101 FOREIGN KEY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id)

REFERENCES t3_INSURANCE_POLICY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id) ON DELETE

CASCADE ON UPDATE CASCADE

Table-LDM 13: t3_MEMBERSHIP

t3_Membership_Id VARCHAR(20) NOT NULL ,

t3_Membership_Type CHAR(15) NOT NULL ,

t3_Organisation_Contact VARCHAR(20) NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKMEMBERSHIP_12 PRIMARY KEY

(t3_Membership_Id,t3_Cust_Id),

CONSTRAINT R_91 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER

(t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 14: t3_QUOTE

t3_Quote_Id VARCHAR(20) NOT NULL ,

t3_Issue_Date DATE NOT NULL ,

t3_Valid_From_Date DATE NOT NULL ,

t3_Valid_Till_Date DATE NOT NULL ,

t3_Description VARCHAR(100) NULL ,

t3_Product_Id VARCHAR(20) NOT NULL ,

t3_Coverage_Level VARCHAR(20) NOT NULL ,

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKQUOTE_3 PRIMARY KEY

(t3_Quote_Id,t3_Application_Id,t3_Cust_Id),

CONSTRAINT R_94 FOREIGN KEY (t3_Application_Id, t3_Cust_Id) REFERENCES

t3_APPLICATION (t3_Application_Id, t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 15: t3_STAFF

t3_Staff_Id VARCHAR(200) NOT NULL ,

t3_Staff_Fname VARCHAR(100) NULL ,

t3_Staff_LName VARCHAR(100) NULL ,

t3_Staff_Address VARCHAR(200) NULL ,

t3_Staff_Contact BIGINT NULL ,

t3_Staff_Gender CHAR(2) NULL ,

t3_Staff_Marital_Status CHAR(8) NULL ,

t3_Staff_Nationality CHAR(15) NULL ,

t3_Staff_Qualification VARCHAR(20) NULL ,

t3_Staff_Allowance bigint NULL ,

t3_Staff_PPS_Number bigint NULL ,

t3_Company_Name VARCHAR(400) NOT NULL ,

CONSTRAINT XPKSTAFF_9 PRIMARY KEY (t3_Staff_Id,t3_Company_Name),

CONSTRAINT R_105 FOREIGN KEY (t3_Company_Name) REFERENCES

t3_INSURANCE_COMPANY (t3_Company_Name) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 16: t3_NOK

t3_Nok_Id VARCHAR(20) NOT NULL ,

t3_Nok_Name VARCHAR(20) NULL ,

t3_Nok_Address VARCHAR(200) NULL ,

t3_Nok_Phone_Number BIGINT NULL ,

t3_Nok_Gender CHAR(10) NULL ,

t3_Nok_Marital_Status CHAR(8) NULL ,

t3_Agreement_id VARCHAR(20) NOT NULL ,

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKNOK_14 PRIMARY KEY

(t3_Nok_Id,t3_Agreement_id,t3_Application_Id,t3_Cust_Id),

CONSTRAINT R_99 FOREIGN KEY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id)

REFERENCES t3_INSURANCE_POLICY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id) ON DELETE

CASCADE ON UPDATE CASCADE

Table-LDM 17: t3_PRODUCT

t3_Product_Number VARCHAR(200) NOT NULL ,

t3_Product_Price INTEGER NULL ,

t3_Product_Type CHAR(40) NULL ,

t3_Company_Name VARCHAR(200) NOT NULL ,

CONSTRAINT XPKPRODUCT_20 PRIMARY KEY (t3_Product_Number,t3_Company_Name),

CONSTRAINT R_107 FOREIGN KEY (t3_Company_Name) REFERENCES t3_INSURANCE_COMPANY

(t3_Company_Name) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 18: t3_OFFICE

t3_Office_Name VARCHAR(200) NOT NULL ,

t3_Office_Leader VARCHAR(200) NOT NULL ,

t3_Contact_Information VARCHAR(200) NOT NULL ,

t3_Address VARCHAR(200) NOT NULL ,

t3_Admin_Cost INTEGER NULL ,

t3_Staff VARCHAR(50) NULL ,

t3_Department_Name VARCHAR(200) NOT NULL ,

t3_Department_ID VARCHAR(200) NOT NULL,

t3_Company_Name VARCHAR(200) NOT NULL ,

CONSTRAINT XPKOFFICE_11 PRIMARY

KEY(t3_Office_Name,t3_Department_Name,t3_Company_Name),

CONSTRAINT R_104 FOREIGN KEY (t3_Department_Name,t3_Department_ID,t3_Company_Name)

REFERENCES t3_DEPARTMENT (t3_Department_Name,t3_Department_ID,t3_Company_Name) ON

DELETE CASCADE ON UPDATE CASCADE

Table-LDM 19: t3_COVERAGE

t3_Coverage_Id VARCHAR(20) NOT NULL ,

t3_Coverage_Amount INTEGER NOT NULL ,

t3_Coverage_Type CHAR(30) NOT NULL ,

t3_Coverage_Level CHAR(30) NOT NULL ,

t3_Product_Id VARCHAR(30) NOT NULL ,

t3_Coverage_Description VARCHAR(400) NULL ,

t3_Coverage_Terms VARCHAR(50) NULL ,

t3_Company_Name VARCHAR(400) NOT NULL ,

CONSTRAINT XPKCOVERAGE_19 PRIMARY KEY

(t3_Coverage_Id,t3_Company_Name),

CONSTRAINT R_102 FOREIGN KEY (t3_Company_Name) REFERENCES

t3_INSURANCE_COMPANY (t3_Company_Name) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 20: t3_INSURANCE_POLICY_COVERAGE

t3_Agreement_id VARCHAR(20) NOT NULL ,

t3_Application_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

t3_Coverage_Id VARCHAR(20) NOT NULL ,

t3_Company_Name VARCHAR(200) NOT NULL ,

CONSTRAINT XPKINSURANCE_POLICY_4_COVERAGE PRIMARY KEY

(t3_Agreement_id,t3_Application_Id,t3_Cust_Id,t3_Coverage_Id,t3_Company_Name),

CONSTRAINT R_97 FOREIGN KEY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id)

REFERENCES t3_INSURANCE_POLICY (t3_Agreement_id, t3_Application_Id, t3_Cust_Id) ON DELETE

CASCADE ON UPDATE CASCADE,

CONSTRAINT R_98 FOREIGN KEY (t3_Coverage_Id, t3_Company_Name)

REFERENCES t3_COVERAGE (t3_Coverage_Id, t3_Company_Name) ON DELETE CASCADE ON

UPDATE CASCADE

Table-LDM 21: t3_CLAIM

t3_Claim_Id VARCHAR(20) NOT NULL ,

t3_Agreement_id VARCHAR(20) NOT NULL ,

t3_Claim_Amount INTEGER NOT NULL ,

t3_Incident_Id VARCHAR(20) NOT NULL ,

t3_Damage_Type VARCHAR(20) NOT NULL ,

t3_Date_Of_Claim DATE NOT NULL ,

t3_Claim_Status CHAR(10) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKCLAIM_7 PRIMARY KEY (t3_Claim_Id,t3_Cust_Id),

CONSTRAINT R_88 FOREIGN KEY (t3_Cust_Id) REFERENCES t3_CUSTOMER

(t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Table-LDM 22: t3_CLAIM_SETTLEMENT

t3_Claim_Settlement_Id VARCHAR(20) NOT NULL ,

t3_Vehicle_Id VARCHAR(20) NOT NULL ,

t3_Date_Settled DATE NOT NULL ,

t3_Amount_Paid INTEGER NOT NULL ,

t3_Coverage_Id VARCHAR(20) NOT NULL ,

t3_Claim_Id VARCHAR(20) NOT NULL ,

t3_Cust_Id VARCHAR(20) NOT NULL ,

CONSTRAINT XPKCLAIM_SETTLEMENT_8 PRIMARY KEY

(t3_Claim_Settlement_Id,t3_Claim_Id,t3_Cust_Id),

CONSTRAINT R_90 FOREIGN KEY (t3_Claim_Id, t3_Cust_Id) REFERENCES t3_CLAIM

(t3_Claim_Id, t3_Cust_Id) ON DELETE CASCADE ON UPDATE CASCADE

Graphical presentation of LDM

The Logical Data Model (LDM) that we have designed for this part of report in graphical

Figure-LDM 1. It has all the entity types, attributes and relationships that are valid and pertinent

in designing our online vehicle insurance database system.