**DBDS DataBase Design Specialists, Inc.**

“We are always 5NF”

**AAA Rentals**

**Final Report**

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**Functional dependency analysis:**

A screenshot of a cell phone

Description generated with very high confidence

A close up of a street

Description generated with high confidence

**FD’s from above analysis:**

{ApartmentID} → {Number}

{ApartmentID} → {NumberRents}

{ApartmentID} → {ComplexID}

{Number} → {NumberRents}

{RenterID} → {NumberRents}

{RenterID} → {Name}

{Name} → {NumberRents}

{Name} → {RenterID}

{StartDate} → {ComplexID}

{PaymentNumber} → {ApartmentID}

{PaymentNumber} → {Number}

{PaymentNumber} → {NumberRents}

{PaymentNumber} → {ComplexID}

{PaymentNumber} → {RenterID}

{PaymentNumber} → {Name}

{PaymentNumber} → {StartDate}

{PaymentNumber} → {Rent}

{PaymentNumber} → {DateDue}

{PaymentNumber} → {DatePaid}

{PaymentNumber} → {Amount}

{DateDue} → {StartDate}

{DateDue} → {ComplexID}

{ProspectNumber} → {ComplexID}

{ProspectNumber} → {Name}

{ProspectNumber} → {Address}

{ProspectNumber} → {Phone}

{ProspectNumber} → {StatusCode}

{ProspectNumber}->{ComplexID,Name,Address,Phone,StatusCode}

{Name} → {ComplexID}

{Name} → {ProspectNumber}

{Name} → {Address}

{Name} → {Phone}

{Name} → {StatusCode}

{Address} → {Phone}

{Phone} -> {Address}

**Functional dependencies from Enterprise statements:**

{ApartmentID, RentarID} -> {Rent}

{RenterID, ApartmentID} ->{StartDate}

{Number, ComplexID} -> {ApartmentID}

{ApartmentID} - > {Number, ComplexID}

{ApartmentID,RenterID,ProspectNumber} -> {Rent, StartDate}

{ApartmentID,ProspectNumber} -> {Rent, StartDate}

{RenterID} -> {ProspectNumber}

**Irreducible cover of FD’s:**

{ApartmentID} -> {Number}

{ApartmentID} -> {ComplexID}

{ProspectNumber} -> {Name}

{ProspectNumber} -> {Phone}

{ProspectNumber} -> {StatusCode}

{Phone} -> {Address}

{Address}->{Phone}

{RenterID} -> {Name}

{RenterID} -> {ProspectNumber}

{RenterID,ApartmentID} -> {Rent}

{RenterID,ApartmentID} -> {StartDate}

{RenterID,ApartmentID} -> {NumberRents}

{PaymentNumber} -> {RenterID}

{PaymentNumber} -> {ApartmentID}

{PaymentNumber} -> {Amount}

{PaymentNumber} -> {DateDue}

{PaymentNumber} -> {DatePaid}

**Applying union and eliminating transitive dependencies, we got below relations:**

{ApartmentID} -> {Number, ComplexID}

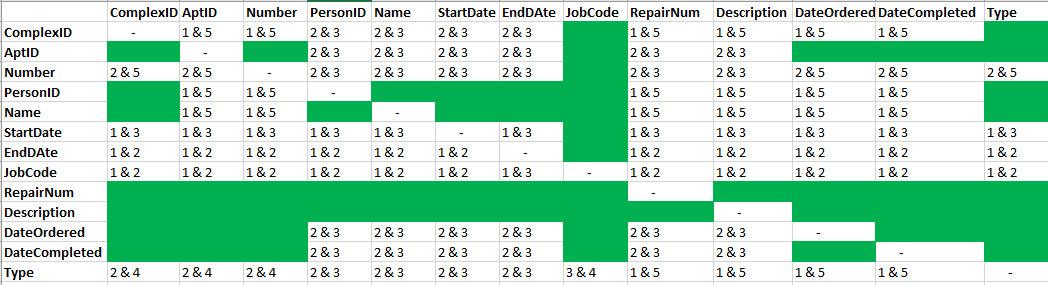
{ProspectNumber} -> {Name,Phone,StatusCode}

{Phone} -> {Address}

{RenterID} -> {Name, ProspectNumber}

{RenterID,ApartmentID} -> {Rent,StartDate, NumberRents}

{PaymentNumber} -> {RenterID,ApartmentID, Amount, DateDue, DatePaid}



{ComplexID} -> {Jobcode}

{ComplexID}->{Type}

{AptID}->{ComplexID}

{AptID}->{Number}

{AptID}->{Jobcode}

{AptID}->{DateOrdered}

{AptID}->{DateCompleted}

{AptID}->{Type}

{Number}->{Jobcode}

{PersonID}->{ComplexID}

{PersonID}->{Name}

{PersonID}->{StartDate}

{PersonID}->{EndDate}

{PersonID}->{Jobcode}

{PersonID}->{Type}

{Name}->{ComplexID}

{Name}->{PersonID}

{Name}->{StartDate}

{Name}->{EndDate}

{Name}->{Jobcode}

{Name}->{Type}

{StartDate}->{Jobcode}

{EndDate}->{Jobcode}

{RepairNum}->{ComplexID}

{RepairNum}->{AptID}

{RepairNum}->{Number}

{RepairNum}->{PersonID}

{RepairNum}->{Name}

{RepairNum}->{StartDate}

{RepairNum}->{EndDate}

{RepairNum}->{Jobcode}

{RepairNum}->{Description}

{RepairNum}->{DateOrdered}

{RepairNum}->{DateCompleted}

{RepairNum}->{Type}

{Description}->{ComplexID}

{Description}->{AptID}

{Description}->{Number}

{Description}->{PersonID}

{Description}->{Name}

{Description}->{StartDate}

{Description}->{EndDate}

{Description}->{Jobcode}

{Description}->{RepairNum}

{Description}->{DateOrdered}

{Description}->{DateCompleted}

{Description}->{Type}

{DateOrdered}->{ComplexID}

{DateOrdered}->{AptID}

{DateOrdered}->{Number}

{DateOrdered}->{DateCompleted}

{DateOrdered}->{Type}

{DateCompleted}->{ComplexID}

{DateCompleted}->{AptID}

{DateCompleted}->{Number}

{DateCompleted}->{DateOrdered}

{DateCompleted}->{Type}

**Functional dependencies from Enterprise statements:**

{PersonID} -> {NextVisit} (In case of CEO)

{PersonID}->{LastAccess} (In case of Manager)

{ComplexID}->{Description} (Description means complex name)

{Jobcode}->{Description} (Description means Job description)

{ComplexID}->{PersonID} (each complex has one manager)

{Type}->{Description} (Description means Insurance type)

**Irreducible cover of FD’s:**

{PersonID}->{ComplexID}

{PersonID}->{Name}

{PersonID}->{StartDate}

{PersonID}->{EndDate}

{PersonID}->{Jobcode}

{PersonID}->{Type}

{RepairNum}->{AptID}

{RepairNum}->{PersonID}

{RepairNum}->{Description}

{RepairNum}->{DateOrdered}

{RepairNum}->{DateCompleted}

{RepairNum}->{Type}

{PersonID} -> {NextVisit}

{PersonID}->{LastAccess}

**Applying union and eliminating transitive dependencies, we got below relations:**

{Jobcode}->{Description}

{PersonID}-> {Name, StartDate, EndDate, Jobcode}

{PersonID}->{NextVisit} (as CEO) (SubType entities)

{PersonID}->{LastAccess} (as Manager) (SubType entities)

{PersonID} (as Repairer) (SubType entities)

{Type}->{Description} (Description means Insurance type)

{RepairNum}-> {Description, DateOrdered, DateCompleted, ApartmentID, PersonID, Type} (PersonID from subtype Repairer)

{ComplexID}-> {Description, PersonID} (PersonID from subtype Manager)

**Final Logical data model:**

A screenshot of a cell phone

Description generated with very high confidence

**Procedure fallowed to get final data design:**

* I modified data model to satisfy the requirements of Bob by including lastAccess and NextVist columns to relations.

Physical Data Model

A screenshot of a computer

Description generated with very high confidence

**Prototype of RDD Generated by ERwin tool:**

use master;

create database AAA60;

use AAA60;

CREATE TABLE Jobcode

(

JobCode char(1) NOT NULL ,

Description char(10) NULL ,

PRIMARY KEY CLUSTERED (JobCode ASC)

)

go

CREATE TABLE staff

(

PersonID char(4) NOT NULL ,

Name char(20) NULL ,

StartDate date NULL ,

EndDate date NULL ,

JobCode char(1) NULL ,

PRIMARY KEY CLUSTERED (PersonID ASC),

FOREIGN KEY (JobCode) REFERENCES Jobcode(JobCode)

)

go

CREATE TABLE Managers

(

PersonID char(4) NOT NULL ,

LastAccess datetime NULL ,

PRIMARY KEY CLUSTERED (PersonID ASC),

FOREIGN KEY (PersonID) REFERENCES staff(PersonID)

)

go

CREATE TABLE Complex

(

ComplexID char(1) NOT NULL ,

Descripton char(10) NULL ,

PersonID char(4) NULL ,

PRIMARY KEY CLUSTERED (ComplexID ASC),

FOREIGN KEY (PersonID) REFERENCES Managers(PersonID)

)

go

CREATE TABLE Apartment

(

ApartmentID integer NOT NULL ,

Number char(4) NULL ,

ComplexID char(1) NULL ,

NumbeRents integer NULL ,

PRIMARY KEY CLUSTERED (ApartmentID ASC),

FOREIGN KEY (ComplexID) REFERENCES Complex(ComplexID)

)

go

CREATE TABLE Prospectors

(

ProspectNumber integer NOT NULL ,

Name char(20) NULL ,

Phone char(12) NULL ,

Address char(20) NULL ,

PRIMARY KEY CLUSTERED (ProspectNumber ASC)

)

go

CREATE TABLE Status

(

StatusCode integer NOT NULL ,

Description char(10) NULL ,

PRIMARY KEY CLUSTERED (StatusCode ASC)

)

go

CREATE TABLE Waitlist

(

ApartmentID integer NOT NULL ,

ProspectNumber integer NOT NULL ,

StatusCode integer NULL ,

PRIMARY KEY CLUSTERED (ApartmentID ASC,ProspectNumber ASC),

FOREIGN KEY (ApartmentID) REFERENCES Apartment(ApartmentID),

FOREIGN KEY (ProspectNumber) REFERENCES Prospectors(ProspectNumber),

FOREIGN KEY (StatusCode) REFERENCES Status(StatusCode)

)

go

CREATE TABLE Type

(

Type char(1) NOT NULL ,

Description char(10) NULL ,

PRIMARY KEY CLUSTERED (Type ASC)

)

go

CREATE TABLE manualLabour

(

PersonID char(4) NOT NULL ,

PRIMARY KEY CLUSTERED (PersonID ASC),

FOREIGN KEY (PersonID) REFERENCES staff(PersonID)

)

go

CREATE TABLE repair

(

RepairNum integer NOT NULL ,

Description char(10) NULL ,

DateOrdered date NULL ,

DateCompleted date NULL ,

ApartmentID integer NULL ,

Type char(1) NULL ,

PersonID char(4) NULL ,

PRIMARY KEY CLUSTERED (RepairNum ASC),

FOREIGN KEY (ApartmentID) REFERENCES Apartment(ApartmentID),

FOREIGN KEY (Type) REFERENCES Type(Type),

FOREIGN KEY (PersonID) REFERENCES manualLabour(PersonID)

)

go

CREATE TABLE Renter

(

RenterID char(5) NOT NULL ,

Name char(20) NULL ,

PRIMARY KEY CLUSTERED (RenterID ASC)

)

go

CREATE TABLE Lease

(

RenterID char(5) NOT NULL ,

ApartmentID integer NOT NULL ,

Rent money NULL ,

StartDate date NULL ,

PRIMARY KEY CLUSTERED (RenterID ASC,ApartmentID ASC),

FOREIGN KEY (RenterID) REFERENCES Renter(RenterID),

FOREIGN KEY (ApartmentID) REFERENCES Apartment(ApartmentID)

)

go

CREATE TABLE Payment

(

PaymentNumber integer NOT NULL ,

Amount money NULL ,

DateDue date NULL ,

DatePaid date NULL ,

RenterID char(5) NULL ,

ApartmentID integer NULL ,

PRIMARY KEY CLUSTERED (PaymentNumber ASC),

FOREIGN KEY (RenterID,ApartmentID) REFERENCES Lease(RenterID,ApartmentID)

)

go

CREATE TABLE CEO

(

PersonID char(4) NOT NULL ,

NextVisit date NULL ,

PRIMARY KEY CLUSTERED (PersonID ASC),

FOREIGN KEY (PersonID) REFERENCES staff(PersonID)

)

go

**DML statements for loading data into database:**

INSERT INTO Jobcode VALUES('C','CEO');

INSERT INTO Jobcode VALUES('M','Manager');

INSERT INTO Jobcode VALUES('R','Repair');

INSERT INTO staff VALUES('p00','Bob Bureaucrat',Null,Null,'C');

INSERT INTO staff VALUES('p01','Sam Supervisor',Null,Null,'M');

INSERT INTO staff VALUES('p02','Fred Foreman',Null,Null,'M');

INSERT INTO staff VALUES('p03','Mary Manager',Null,Null,'M');

INSERT INTO staff VALUES('p04','Alex Johnson','2015-10-01',Null,'R');

INSERT INTO staff VALUES('p05','Gail Steward','2015-10-01','2017-12-21','R');

INSERT INTO staff VALUES('p06','Ben Jackson','2017-12-22',Null,'R');

INSERT INTO staff VALUES('p07','Beth Redding','2017-12-22',Null,'R');

INSERT INTO Managers VALUES('P01','');

INSERT INTO Managers VALUES('P02','');

INSERT INTO Managers VALUES('P03','');

INSERT INTO Complex VALUES('L','Lakeview','P01');

INSERT INTO Complex VALUES('N','Northside','P02');

INSERT INTO Complex VALUES('P','Princeton','P03');

INSERT INTO Apartment VALUES(1,'101G','L',2);

INSERT INTO Apartment VALUES(2,'201','L',1);

INSERT INTO Apartment VALUES(5,'201','N',1);

INSERT INTO Apartment VALUES(7,'209','L',1);

INSERT INTO Apartment VALUES(8,'333','P',1);

INSERT INTO Apartment VALUES(9,'431P','P',2);

INSERT INTO Apartment VALUES(12,'310','L',Null);

INSERT INTO Apartment VALUES(14,'201','P',Null);

INSERT INTO Prospectors VALUES(55,'Jack Black','555-81-3232','73 Maple Ave');

insert into Prospectors values(60, 'Prem Chand','317-360-3645','402 w West St');

insert into Prospectors values(11, 'Kevin White','555-222-1234','234 Main St');

insert into Prospectors values(31, 'Gail Green','555-234-2525','P.O. Box 22');

insert into Prospectors values(45, 'Ed Brown','555-234-8888','12 N 1st St');

insert into Prospectors values(46, 'Ann Black','555-881-3233','73 Maple Ave');

insert into Status values(0, 'Incomplete');

insert into Status values(1, 'References');

insert into Status values(2, 'Waiting');

insert into Status values(3, 'Complete');

insert into Waitlist values(1,55,3);

insert into Waitlist values(1,60,2);

insert into Waitlist values(2,60,2);

insert into Waitlist values(5,11,1);

insert into Waitlist values(5,31,2);

insert into Waitlist values(12,45,1);

insert into Waitlist values(14,46,0);

insert into Type values('I', 'Insured');

insert into Type values('U', 'Uninsured');

insert into manualLabour VALUES('P04');

insert into manualLabour VALUES('P05');

insert into manualLabour VALUES('P07');

insert into manualLabour VALUES('P06');

insert into repair VALUES(23,'Faucet','2017-12-22','2017-12-23',1,'U','P04');

insert into repair VALUES(28,'Window','2017-12-28','2017-12-31',5,'I','P06');

insert into repair VALUES(31,'Carpet','2017-12-28','2017-12-31',5,'I','P05');

insert into repair VALUES(33,'Roof','2018-01-05','2018-02-23',8,'I',NULL);

insert into repair VALUES(35,'Lock','2018-01-10','2018-01-11',2,'U','P04');

insert into Renter values('A021','Jack Black');

insert into Renter values('C222','Fred Jones');

insert into Renter values('A025','Mike Allen');

insert into Renter values('A023','Jane Black');

insert into Renter values('B444','John Dough');

insert into Renter values('B456','Bill Smith');

insert into CEO values('P00',NULL);

insert into Lease values('A021',1,1100,'2016-12-01');

insert into Lease values('C222',1,1200,'2017-11-15');

insert into Lease values('A025',2,1100,'2016-12-01');

insert into Lease values('A023',5,1200,'2017-11-01');

insert into Lease values('A023',7,1250,'2017-11-15');

insert into Lease values('B444',8,700,'2017-12-01');

insert into Lease values('B456',9,900,'2017-12-01');

insert into Payment values(211,1100,'2017-01-01','2016-12-30','A021',1);

insert into Payment values(397,1100,'2017-02-01','2017-01-29','A021',1);

insert into Payment values(402,1200,'2017-12-15','2017-12-30','C222',1);

insert into Payment values(399,1100,'2017-01-01','2017-01-01','A025',2);

insert into Payment values(400,1200,'2017-12-01','2017-12-01','A023',5);

insert into Payment values(401,1200,'2017-12-15','2017-12-15','A023',7);

insert into Payment values(488,700,'2018-01-01','2016-12-30','B444',8);

insert into Payment values(511,500,'2018-01-01','2017-12-30','B456',9);

insert into Payment values(512,400,'2018-01-01','2017-12-31','B456',9);

select \* from Apartment;

select \* from CEO;

select \* from Complex;

select \* from Jobcode;

select \* from Lease;

select \* from Managers;

select \* from manualLabour;

select \* from Payment;

select \* from Prospectors;

select \* from Renter;

select \* from repair;

select \* from staff;

select \* from Status;

select \* from Type;

select \* from Waitlist;

**Queries in Memo:#3 and Memo:#4**

1) List information for rent payments (and when and for what apartment) that are less than the lease specifies.

select Payment.PaymentNumber,Payment.Amount,Payment.DateDue,Payment.DatePaid,Lease.RenterID,Lease.ApartmentID,Lease.Rent from Payment JOIN Lease on Lease.RenterID=Payment.RenterID and Lease.ApartmentID=Payment.ApartmentID where Lease.Rent > Payment.Amount;

2) For each apartment, list the rent payments in chronological order.

select \* from Payment JOIN Lease on Lease.RenterID=Payment.RenterID and Lease.ApartmentID=Payment.ApartmentID order by

Payment.ApartmentID,Payment.DatePaid;

3) List the name and number for prospects who are waiting for an apartment.

select Waitlist.ApartmentID,Prospectors.Name,Prospectors.ProspectNumber,status.Description from Waitlist JOIN Prospectors on Waitlist.ProspectNumber = Prospectors.ProspectNumber JOIN status on Waitlist.StatusCode=status.StatusCode where status.Description='Waiting';

4) List the top two leases based on rent.

select TOP 2 \* from Lease order by Lease.Rent DESC;

5) List Information about leases signed/started on November 1,2017 and those signed/started on December 1,2017

select \* from Lease where Lease.StartDate='2017-11-01' or Lease.StartDate = '2017-12-01';

6) List Information about the late rent payments.

select \* from Payment where Payment.DatePaid > Payment.DateDue;

7) List Apartment Rental Information by complex

select Complex.ComplexID,Complex.Descripton,Apartment.ApartmentID,Lease.RenterID,Lease.StartDate, Lease.Rent from Lease JOIN Apartment on Lease.ApartmentID=Apartment.ApartmentID JOIN Complex on Apartment.ComplexID = Complex.ComplexID order by Apartment.ComplexID;

8) who (Name and ID) manages the Princeton complex?

select staff.Name,staff.PersonID from Complex JOIN staff on Complex.PersonID=staff.PersonID where Complex.Descripton='Princeton';

9) who (Name and ID) has access to repair data for the northside complex?

select staff.Name,staff.PersonID from Complex JOIN staff on Complex.PersonID=staff.PersonID where Complex.Descripton='northside';

10) How many times has each apartment has been leased ?

select Apartment.ApartmentID,Apartment.NumbeRents from Apartment;

11) List all Insured repairs, Include the name of maintenance person if known.

select repair.RepairNum,staff.Name,repair.Description,repair.DateOrdered,repair.DateCompleted,Type.Description from repair JOIN Type on repair.Type =Type.Type LEFT OUTER JOIN staff on repair.PersonID=staff.PersonID where Type.Description='Insured';

**Appendix**

**OLD Logical data model based on Memo #1:**

**A screenshot of a social media post

Description generated with very high confidence**

**OLD Logical data model:**

**A screenshot of a social media post

Description generated with very high confidence**

**Procedure followed to get above design:**

* According to new sample data given by Design Team leader, I done FD analysis on sample data to get functional dependencies.
* I added necessary code tables to make data base more informative.
* By analyzing those functional dependencies, I came through problems with “Null” in {personID,RepairNum,AppartmentID}, where this FD describes about repair done by person in particular apartment.
* Where if we don’t know the personID, we will get Null’s in above relation which leads to violation of foreign key constraints.
* So, I came with better implementation by keeping apartmentID in Repair table, and sub categorizing the RepairNum and PersonID.
* This will solve the problem of unknow repair done at apartment.
* The same problem occurred when dealing with personID->ComplexID, to keep ComplexID in Staff table, we will get some constraint problems like, Bob is owner. he will get all complexID’s. which is violation of 1st normal form. So, I subcategorized PersonID and ComplexID. Which will solve this problem and satisfies the condition of managers and repairers.
* I choose proper and appropriate field sizes to save memory.

**OLD Physical Data model**

A screenshot of a social media post

Description generated with very high confidence