

Software Development Company

Robert Freeman

SFID: 920588263

GitHub: RobertAldenFreeman

Milestone/Version	Date
M1V1	10/6/2020
M2V1	11/5/2020

Robert Freeman

SOFTWARE DEVELOPMENT COMPANY

Table of Contents

Section I: Project Description.....	2
Section II: Use Cases	3
Section III: Database Requirements (Business Rules)	5
Section IV: Detailed List of Main Entities, Attributes and Keys	9
Section V: Entity Relationship Diagram	12
Section VI: Testing Table	13
Section VII: Database Model/EER	15
Section VIII: Forward Engineering.....	18
Section IX: Inserting Data.....	19
Section X: Testing.....	20
Section XI: Testing Table	21






Section I: Project Description

Motivation

The motivation for this project is to solve the problems of which relate to databases and the points of design that lay within. The topics that will be addressed in this document will include concepts relating to the database of this Software Company which include but are not limited to the conceptual database model, architecture, implementation, divvying of responsibilities in relations, defining referenced constraints clearly and the components thereof which are listed under Sections II-VI in the Table of Contents.

Goals

Problems that are involved with the design and implementation of a database can be broken down into the departments of a Software Development company in general. The departments of which will be addressed here are

-  Research and Development
-  Accounts and Finance
-  Sales and Marketing
-  IT Services
-  Human Resources

These departments have a need for databases which will often require employees from several different departments to interact with one another and access relevant data. For example, IT Services will have access to relevant information on part of the client. If the company chooses to expand their requirements to enable affiliates to sell or facilitate their product, this feature should be met with streamlined expandability and modularity. Definition of actors and identification of use cases will be derived from the requirements of the system.

Section II: Use Cases

Actors will be defined as employees and clients. Of the employees and supervisors there will be software developers, company administrators, accountants, salespeople, members of the marketing team, IT support and members of human resources.

Use Case Title:	Add multiple addresses, many users with same addresses
Actors:	Registered users, Clients, Employees
Description:	The problems addressed here include user data in a modular way which will not break. If a client Jessica wants to add existing addresses besides her main address, she may. If she is a registered user, she may have one or multiple addresses. These addresses should all be unique from each other. Sally has worked at the company for many years and has a vacation home she stays at part of the year. Sally can input many addresses (shipping or billing). Many clients or employees may have the same address. Suppose Sally lives with her coworker, Liam. Both Sally and Liam may have the same address.

Use Case Title:	Authenticate registered user, non-registered user
Actors:	Registered users, Person, Client
Description:	1. Suppose a person, client or employee wants to sign into their account. 2. If they don't have an account, they shall be prompted to either make an account or checkout as a guest (if they are a client). 3. The user will be prompted to login with a username and password. If their password is incorrect, they will be asked for it again. They may make as many attempts as they like, however after 10 attempts a timer of 5 minutes will initiate barring any more attempts until it has finished.

Use Case Title:	Posting an Ad
Actors:	Employees in Sales and Marketing
Description:	This use case starts when an employee working on an ad has finished the ad and wants to post it to a website. For this to happen the user must be authenticated and a valid session must be in order. If the employee cannot authenticate themselves posting of an ad should not be possible. The employee must know the Web ID, the page he/she would want for the ad to display (i.e. homepage or product page or both). If the website does not exist, it is not possible to post an ad there and an error occurs and displays a 404 Not Found message. Upon submission of the ad a confirmation number is given to the employee.

Use Case Title:	Purchases over \$250 must be made with an existing account
Actors:	Clients
Description:	This use case begins if a client is adding items to their cart and want to check out. If the amount on the balance of the cart post-tax is greater than or equal to \$250 USD guest checkout is not allowed and they must register as a user. If the amount in checkout is greater than or equal to \$250 USD the system will check if the user is using guest checkout, if they are not and they are a registered user then they may proceed to checkout as normal. Should the user not be logged into an account upon incurring a balance of greater than or equal to \$250 at time of checkout they an error message will appear and let them know they must register as a user or to reduce the amount they spending. They will then be prompted to create an account and proceed with the purchase.

Use Case Title:	Update product versions
Actors:	Employees in the Department of Research and Development
Description:	Suppose a developer wants to update information regarding the latest version of their product. Their product may not already exist, and the product may only have one current version. If the product does not exist a new product will be created with a current starting version. The product may have many versions. The person who can edit the version numbers shall be in the Research and Development department.

Section III: Database Requirements (Business Rules)

1. Registered user
 - a. Is a person
 - b. Shall be an employee
 - c. Shall be a Client
 - d. Shall have an address
 - e. A registered user shall create only one account using a unique email
 - f. A registered user shall have at least one password and username and an ID
 - g. A registered user shall have zero or many addresses
 - h. Shall be able to make purchases over \$250
 - i. Shall be prompted to login
 - j. Shall wait five minutes after ten incorrect password attempts before being allowed ten more attempts
2. Client
 - a.
 - b. Shall be a registered user
 - c. Shall have purchases and receipts
 - d. Shall have the ability to have the same address as other registered users
 - e. If the client's balance in their account is over \$250, they shall be a registered user
 - f. Shall have zero or many complaints
 - g. Shall have receipts, purchases and a Client ID
3. Employee
 - a. Shall have zero or many computers at an office
 - b. Shall be a registered user
 - c. Shall be able to supervise other employees
 - d. Shall have zero or many departments
 - e. Shall have zero or many benefits
 - f. Shall have zero or many bonuses
 - g. Shall have zero or many payments
 - h. Shall be employed or unemployed
 - i. Shall have a uniform
 - j. Shall be able to have the same address as other registered users
 - k. An Employee in the Sales and Marketing department shall have the ability to post ads to a website
 - l. An Employee in the Sales and Marketing department shall be authenticated before being able to post an ad
 - m. An employee in the Sales and Marketing Department shall be able to know the Web ID of the website they need to post to
 - n. A developer shall be able to update a version of their software product
4. Address
 - a. Shall have zero or many registered users
 - b. Shall have a shipping address
 - c. Shall have a billing address
 - d. Shall be unique individually

- e. Many registered users, employees and clients shall have the ability to have the same address
- f. Shall have zero or many registered users
- 5. Person
 - a. Shall have one and only one account
 - b. Shall be a registered user if they are not a guest
 - c. Shall have a computed age
 - d. Shall be able to sign in as a guest if they are a client
 - e. Shall be prompted to make an account
 - f. Shall have a name, first and last
 - g. Shall have an SSN and date of birth
 - h. Shall not exceed a balance of \$250
- 6. Website
 - a. Shall host zero or many ads
 - b. Shall belong to one account
 - c. Shall have a homepage
 - d. Shall have a product page
 - e. A website shall be visible to an employee in the Sales and Marketing Department
 - f. A website shall be able to host ads
 - g. A website shall have the ability to host zero or multiple ads
- 7. Ad
 - h. Is for zero or many products
 - i. Shall be able to appear on zero or many websites
 - j. Shall have expenditure
 - k. Shall have a title
- 8. Account
 - a. Shall have zero or many websites
 - b. Shall belong to one and only one person
 - c. Shall have an email
 - d. Shall have a balance
 - e. If the balance is over \$250, guest checkout shall not be allowed
 - f. If the balance is under \$250, guest checkout shall be allowed
 - g. A client or guest may shall only have one account
- 9. Tax
 - a. Shall have zero or many products
 - b. Shall be applied to zero or many supplies
 - c. Shall be a property tax
 - d. Shall be a sales tax
 - e. Shall be an employment tax
 - f. If the account balance post-tax is over \$250, guest checkout shall not be allowed
- 10. Product
 - a. Shall have zero or many ads
 - b. Shall have zero or many taxes
 - c. Shall have zero or many sales
 - d. Shall have a list of past versions

- e. Shall have a current version
 - f. If the product does not exist, the product shall be created
 - g. If the product already exists, it shall be updated to the version of the developer's choosing
 - h. The older product shall not be overwritten, rather be stored as an older version
 - i. Only employees in the department of Research and Development shall be able to edit product versions
 - j. There may be many versions
 - k. The current version shall be derived from the most up-to-date version
11. Computer
- a. Shall be at one and only one office
 - b. Shall have a client
 - c. Shall have a company
 - d. Shall be personal or not
12. Office
- a. Shall have zero or many computers
 - b. Shall have rent
 - c. Shall have utilities
 - d. Shall have maintenance
13. Software as Service
- a. Shall have zero or many sales
 - b. Shall have a reissue date
 - c. Shall have an expiration date which is derived from the reissue date
14. Sale
- a. Shall have zero or many IT service orders
 - b. Shall have zero or many departments it may be made within
 - c. Shall have zero or many products
 - d. Shall have zero or many software as a service subscriptions
 - e. Shall have a time
 - i. The time shall have a 24-hour time
 - ii. The time shall have a date
15. Supplies
- a. May be applied to one or many taxes
 - b. Shall have the ability to be in an office
 - c. May be furnishings or not furnishings
16. IT service order
- a. Shall have zero or many sales
 - b. Shall have notes
 - c. Shall have a total
17. Department
- a. Shall belong to one or many employees
 - b. Shall have five departments: Research and Development, Accounts and Finance, Sales and Marketing, IT Services, Human Resources
 - c. Shall have zero or many sales
 - d. Sales and Marketing Department

- e. Shall have the ability to have employees which may be in other departments
- f. Shall have access to Web IDs
- g. Shall know that a website exists where they want to post an ad

18. Pay

- a. Shall belong to one and only one employee
- b. Shall be in hours
- c. Shall be in Salary
- d. Shall have wages

19. Bonus

- a. Shall belong to one and only one Employee
- b. Shall be holiday
- c. Shall be signing

20. Benefits

- a. Shall be dental
- b. Shall be medical
- c. Shall belong to one and only one employee

21. Complaint

- a. Shall belong to one and only one client
- b. Shall be resolved or unresolved
- c. Shall have a description

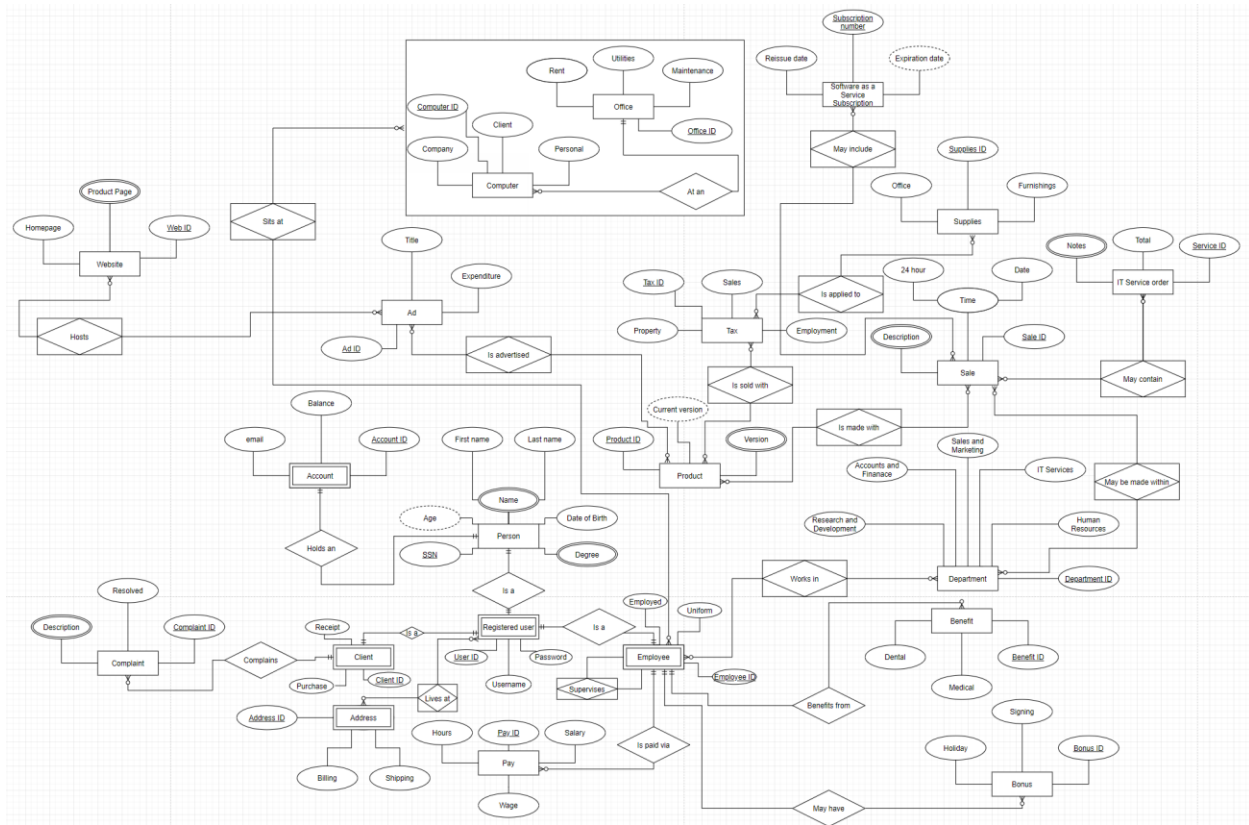
Section IV: Detailed List of Main Entities, Attributes and Keys

- 1) Registered user (Weak)
 - a) User ID: key, numeric
 - b) Username: alphanumeric, multivalued
 - c) Password: alphanumeric
- 2) Client (Weak)
 - a) Client ID: key, alphanumeric
 - b) Purchase: alphanumeric
 - c) Receipt: alphanumeric
- 3) Employee (Weak)
 - a) Employee ID: key, numeric
 - b) Uniform: alphanumeric
 - c) Employed: boolean
- 4) Person (Strong)
 - a) SSN: key, numeric
 - b) Age: derived, numeric
 - c) Name: alphanumeric, composite
 - i) First name: alphanumeric
 - ii) Last name: alphanumeric
 - d) Date of Birth: alphanumeric
 - e) Degree: alphanumeric, multivalued
- 5) Account (Strong)
 - a) Account ID: key, numeric
 - b) Email: alphanumeric
 - c) Balance: numeric
- 6) Address (Weak)
 - a) Address ID: key, numeric
 - b) Billing: alphanumeric
 - c) Shipping: alphanumeric
- 7) Complaint (Strong)
 - a) Complaint ID: key, numeric
 - b) Description: multivalued, alphanumeric
 - c) Resolved: boolean
- 8) Ad (Strong)
 - a) Title: alphanumeric
 - b) Expenditure: numeric
 - c) Ad ID: key, numeric
- 9) Computer (Strong)
 - a) Company: alphanumeric
 - b) Client: alphanumeric
 - c) Personal: boolean
 - d) Computer ID: key, numeric

- 10) Office (Strong)
 - a) Rent: numeric
 - b) Utilities: numeric
 - c) Maintenance: numeric
 - d) Office ID: key, numeric
- 11) Software as a Service (Strong)
 - a) Reissue date: alphanumeric
 - b) Subscription number: numeric, key
 - c) Expiration date: alphanumeric, derived
- 12) Sale (Strong)
 - a) Description: alphanumeric, multivalue
 - b) Time: composite, alphanumeric
 - i) 24 hours: numeric
 - ii) Date: alphanumeric
 - c) Sale ID: numeric, key
- 13) Supplies (Strong)
 - a) Office: alphanumeric
 - b) Supplies ID: numeric, key
 - c) Furnishings: alphanumeric
- 14) IT service order (Strong)
 - a) Notes: multivalue, alphanumeric
 - b) Total: numeric
 - c) Service ID: key, numeric
- 15) Tax (Strong)
 - a) Property: numeric
 - b) Sales: numeric
 - c) Employment: numeric
 - d) Tax ID: key, numeric
- 16) Product (Strong)
 - a) Product ID: key, numeric
 - b) Current version: derived, alphanumeric
 - c) Version: numeric, multivalue
- 17) Department (Strong)
 - a) Department ID: key, numeric
 - b) Research and Development: boolean
 - c) Accounts and Finance: boolean
 - d) Sales and Marketing: boolean
 - e) IT Services: boolean
 - f) Human Resources: boolean

- 18) Pay (Strong)
 - a) Hours: numeric
 - b) Salary: numeric
 - c) Wage: numeric
 - d) Pay ID: key, numeric
- 19) Bonus (Strong)
 - a) Bonus ID: key, numeric
 - b) Signing: numeric
 - c) Holiday: numeric
- 20) Benefits (Strong)
 - a) Benefit ID: key, numeric
 - b) Medical: numeric
 - c) Dental: numeric
- 21) Website (Strong)
 - a) Web ID: key, numeric
 - b) Product Page: alphanumeric, multivalued
 - c) Homepage: alphanumeric

Section V: Entity Relationship Diagram

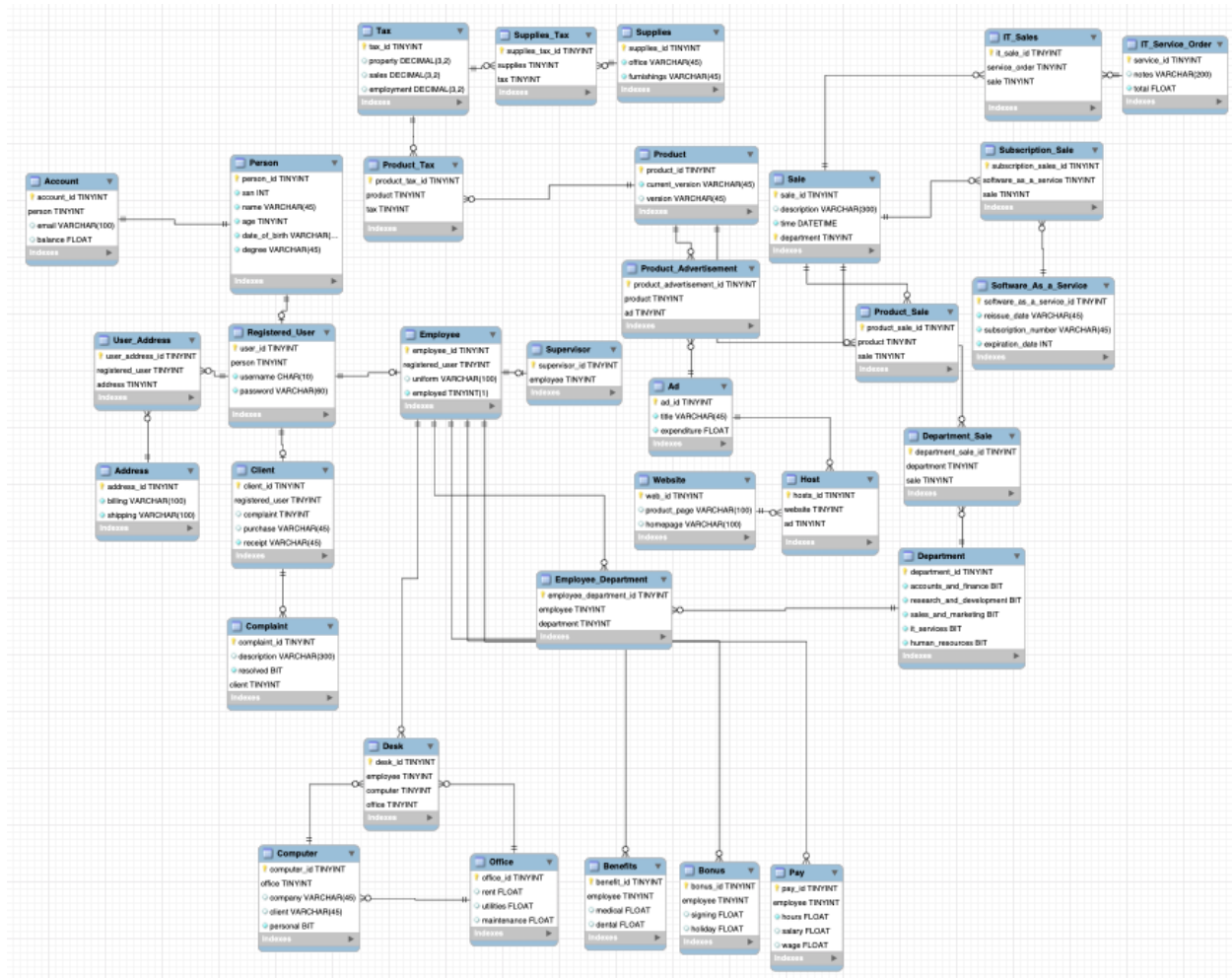


Section VI: Testing Table

Rule	Entity A	Relation	Entity B	Cardinality	Pass/Fail	Error Description
1	Account	Has a	Website	1-to-M	Pass	None
2	Client	Has a	Complaint	1-to-M	Pass	None
3	Registered User	Is a	Client	1-to-1	Pass	None
4	Registered User	Has a	Address	1-to-M	Fail	Multiple users may have the same address
5	Person	Has a	Account	1-to-1	Pass	None
6	Registered User	Is a	Employee	1-to-1	Pass	None
7	Person	Is a	Registered User	1-to-1	Pass	None
8	Employee	Supervises	Employee	Recursive	Pass	None
9	Employee	Has a	Computer at an office	Aggregation, M-to-M	Pass	None
10	Computer	At an	Office	M-to-1	Pass	None
11	Employee	Has a	Department	M-to-M	Pass	None
12	Employee	Has a	Bonus	M-to-M	Fail	A bonus may belong to only one employee, not many
13	Employee	Has a	Benefit	M-to-M	Fail	A benefit may only belong to one employee, not many
14	Employee	Has a	Pay	M-to-M	Fail	An employee may have many payments, but a payment cannot be made out to more than one employee
15	Sale	May be made within	Department	M-to-1	Pass	None: A sale does not necessarily need a department (i.e. miscellaneous sale)
16	IT Service Order	Has a	Sale	M-to-M	Pass	None
17	Sale	Has a	Software as a Service Subscription	M-to-M	Pass	None
18	Sale	Has a	Product	M-to-M	Pass	None
19	Product	Has a	Tax	M-to-M	Pass	None
20	Website	Hosts an	Ad	M-to-M	Pass	None

21	Supplies	Is applied to	Tax	M-to-1	Fail	Taxes may be applied to supplies and supplies may have taxes (Strong entity fix)
22	Product	Has a	Ad	M-to-M	Pass	None

Section VII: Database Model/EER

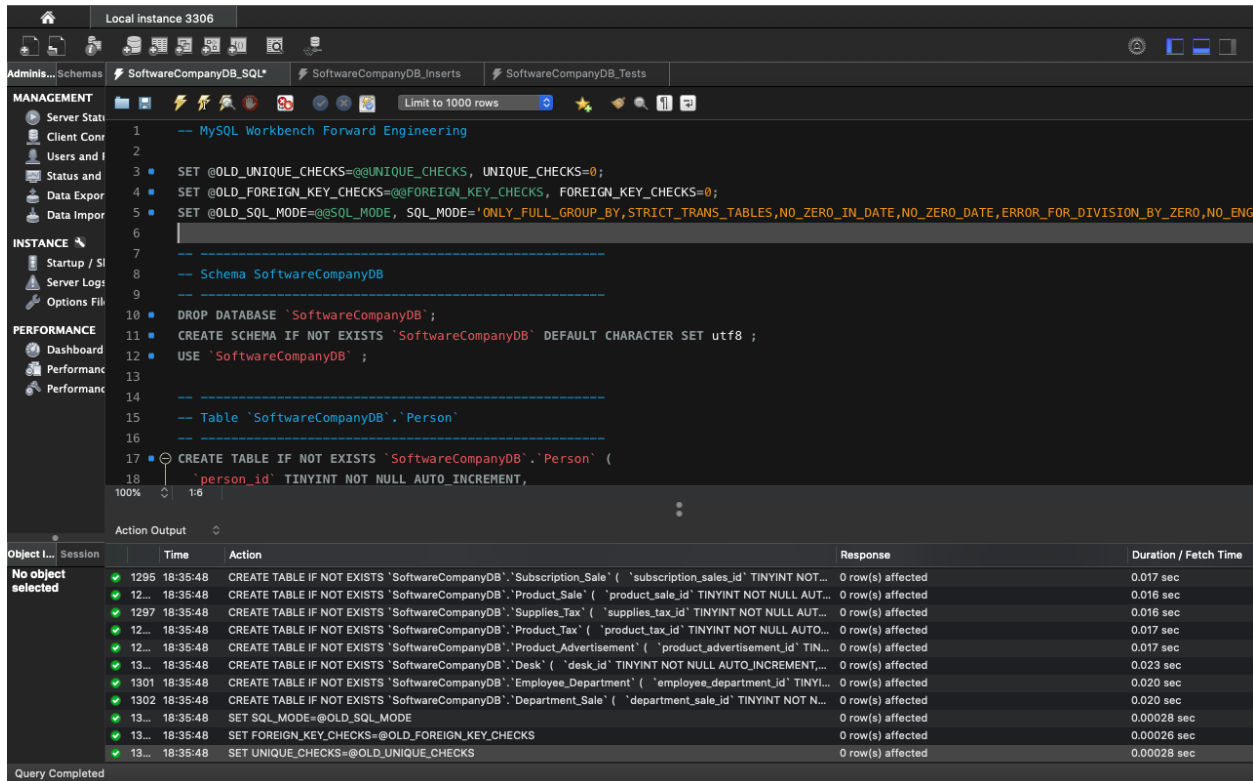


Entity	On Delete	On Update	Description
Account	Cascade	Cascade	A person has one and only one account. If the person is deleted or updated the information here should reflect this.
Registered_User	Cascade	Restrict	A person may be one or zero registered users. The information here should be deleted if the person is deleted, however the update should be restricted because we don't want to update their password without their knowledge
User_Address	Cascade	Cascade	Information here should be deleted and updated if the registered user is changed so that we may verify their address is correct at any given time
Client	Restrict	Cascade	A client is a registered user, therefore we should update their information. We want to keep customer information in case we want to analyze it in the future. Data is gold!
Complaint	No action	No action	No action will be taken either way for a complaint. They are 'single-use' data and will be saved once. If a client wants to make a new complaint they can.
Employee	Cascade	Cascade	An employee is a registered user and we want all data to cascade. When an employee leaves the company we want to delete their information to save space in the database.
Computer	Cascade	Cascade	We want all data to be updated and deleted if a computer gets old and must be retired, or if we want to add information about an existing machine etc.
Desk	Cascade	Cascade	In order to maintain consistency, cascade is used in every instance in this table.
Benefits	Restrict	Restrict	We want to save information about an employee's benefits and don't want to accidentally overwrite it
Bonus	Restrict	Restrict	We want to save information about an employee's bonus and don't want to accidentally overwrite it
Pay	Restrict	Restrict	We want to save information about an employee's pay and don't want to accidentally overwrite it
Supplies_Tax	Cascade	Cascade	For consistency, everything here will be deleted and updated on cascade. Taxes are subject to change as well as supply costs.
Host	No action	No action	While a website may host an ad, we don't want to have any actions here.
Product_Advertisement	Restrict	Cascade	We do not want to delete this information as it is valuable, however upon updating we want current information to reflect the ad.

Product_Tax	Restrict	Cascade	We do not want to delete this information as it is valuable, however upon updating we want current information to reflect the product tax.
Product_Sale	Restrict	Cascade	We do not want to delete this information as it is valuable, however upon updating we want current information to reflect the sale.
IT_Sales	Restrict	Cascade	Deleting potentially valuable information is a huge mistake. However we want to update this information so it is current
Subscription_sale	Restrict	Cascade	We want to keep all information about subscription sales as it is key for the accounts and finance and marketing departments to make predictions about the future.
Department_Sale	Cascade	Cascade	This data reflects sales made within a department. I should probably change on delete to restrict on second thought.

Section VIII: Forward Engineering

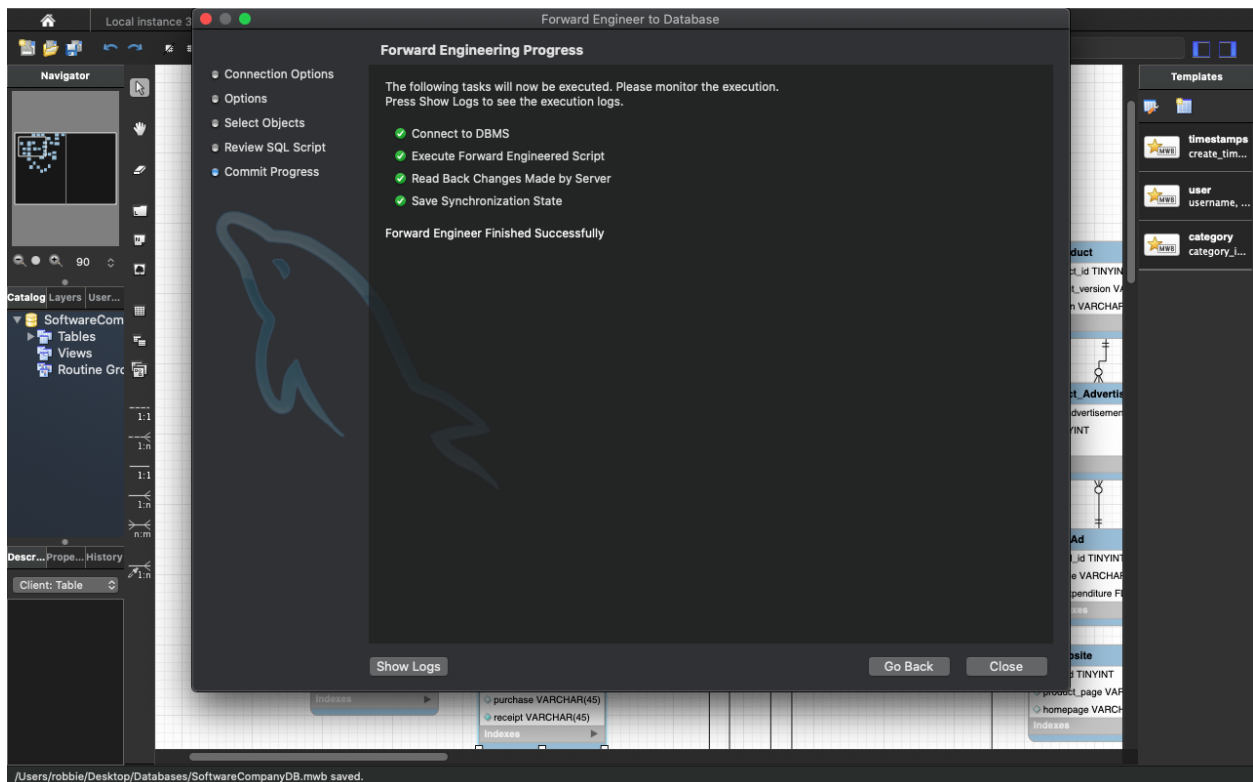
SoftwareCompanyDB



The screenshot shows the MySQL Workbench Forward Engineering progress window. The window is titled "Forward Engineering Progress" and displays a list of tasks being executed. The tasks are as follows:

Object	Session	Time	Action	Response	Duration / Fetch Time
No object selected	1295	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Subscription_Sale' ('subscription_sales_id' TINYINT NOT...	0 row(s) affected	0.017 sec
	12...	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Product_Sale' ('product_sale_id' TINYINT NOT NULL AUT...	0 row(s) affected	0.016 sec
	1297	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Supplies_Tax' ('supplies_tax_id' TINYINT NOT NULL AUT...	0 row(s) affected	0.016 sec
	12...	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Product_Tax' ('product_tax_id' TINYINT NOT NULL AUT...	0 row(s) affected	0.017 sec
	12...	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Product_Advertisement' ('product_advertisement_id' TIN...	0 row(s) affected	0.017 sec
	13...	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Desk' ('desk_id' TINYINT NOT NULL AUTO_INCREMENT...	0 row(s) affected	0.023 sec
	1301	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Employee_Department' ('employee_department_id' TINYI...	0 row(s) affected	0.020 sec
	1302	18:35:48	CREATE TABLE IF NOT EXISTS 'SoftwareCompanyDB'. 'Department_Sale' ('department_sale_id' TINYINT NOT N...	0 row(s) affected	0.020 sec
	13...	18:35:48	SET SQL_MODE=@OLD_SQL_MODE	0 row(s) affected	0.00028 sec
	13...	18:35:48	SET FOREIGN_KEY_CHECKS=@OLD_FOREIGN_KEY_CHECKS	0 row(s) affected	0.00026 sec
	13...	18:35:48	SET UNIQUE_CHECKS=@OLD_UNIQUE_CHECKS	0 row(s) affected	0.00028 sec

The window also shows a list of objects in the database, including 'Subscription_Sale', 'Product_Sale', 'Supplies_Tax', 'Product_Tax', 'Product_Advertisement', 'Desk', 'Employee_Department', and 'Department_Sale'. The progress bar indicates that the forward engineering process is 100% complete.



The screenshot shows the MySQL Workbench Forward Engineering progress window. The window is titled "Forward Engineering Progress" and displays a list of tasks being executed. The tasks are as follows:

- Connect to DBMS
- Execute Forward Engineered Script
- Read Back Changes Made by Server
- Save Synchronization State

Forward Engineer Finished Successfully

The window also shows a list of objects in the database, including 'Subscription_Sale', 'Product_Sale', 'Supplies_Tax', 'Product_Tax', 'Product_Advertisement', 'Desk', 'Employee_Department', and 'Department_Sale'. The progress bar indicates that the forward engineering process is 100% complete.

Section IX: Inserting Data

Local instance 3306

Administration Schemas SoftwareCompanyDB_SQL* SoftwareCompanyDB_Inserts SoftwareCompanyDB_Tests

MANAGEMENT

- Server Status
- Client Configuration
- Users and Groups
- Status Explorer
- Data Export
- Data Import

INSTANCE

- Startup / Shutdown
- Server Logs
- Options File

PERFORMANCE

- Dashboard
- Performance
- Performance

```
1 USE 'SoftwareCompanyDB';
2
3
4
5 INSERT INTO Person (ssn, name, age, date_of_birth, degree) VALUES (20, "Robert Freeman", 23, "06/17/1997", "Applied Mathematics, AA"), (89, "
6 INSERT INTO Account (person, email, balance) VALUES (1, "rob@example.com", 100.97), (2, "bob@thisexample.com", 98.7), (3, "user@example.com",
7 INSERT INTO Registered_User (person, username, password) VALUES (1, "sgsa", "dafa"), (2, "sfaa", "agf"), (3, "AVD", "Ac");
8 INSERT INTO Address (billing, shipping) VALUES ("BS", "SG"), ("sdg", "sg"), ("Sg", "sgedg");
9 INSERT INTO User_Address (registered_user, address) VALUES (1, 1), (2, 2), (3, 3);
10 INSERT INTO Client (registered_user, complaint, purchase, receipt) VALUES (1, 1, "p", "r"), (2, 2, "p", "r"), (3, 3, "p", "r");
11 INSERT INTO Complaint (description, resolved, client) VALUES ("sdgfs", 0, 1), ("sdgfs", 0, 2), ("sdgfs", 0, 3);
12 INSERT INTO Employee (registered_user, uniform, employed) VALUES (1, "heal", 1), (2, "fs", 0), (3, "sb", 1);
13 INSERT INTO Office (rent, utilities, maintenance) VALUES (45.8, 7.7, .6), (45.8, 7.7, .6), (45.8, 7.7, .6);
14 INSERT INTO Computer (office, company, client, personal) VALUES (1, "rg", "gf", 0), (2, "rg", "gf", 0), (3, "rg", "gf", 0);
15 INSERT INTO Desk (employee, computer, office) VALUES (1, 1, 1), (2, 2, 2), (3, 3, 3);
16 INSERT INTO Benefits (employee, medical, dental) VALUES (1, 42.0, 34.5), (2, 445, 3), (3, 22, 4);
17 INSERT INTO Bonus (employee, signing, holiday) VALUES (1, 42.0, 34.5), (2, 445, 3), (3, 22, 4);
18 INSERT INTO Pay (employee, hours, salary, wage) VALUES (1, 42.0, 34.5, 45), (2, 445, 3, 76), (3, 22, 4, 390);
```

100% 1:1

Action Output

Object Name	Session	Time	Action	Response	Duration / Fetch Time
No object selected		1130 18:32:47	INSERT INTO Host (website, ad) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0024 sec
		1131 18:32:47	INSERT INTO Product_Advertisement (product, ad) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0025 sec
		1132 18:32:47	INSERT INTO Product_Tax (product, tax) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0026 sec
		1133 18:32:47	INSERT INTO Sale (description, time, department) VALUES ("A", "20100301", 1), ("A", "20100301", 2), ("A", "20100301", 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0023 sec
		1134 18:32:47	INSERT INTO Product_Sale (product, sale) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0027 sec
		1135 18:32:47	INSERT INTO IT_Service_Order (notes, total) VALUES ("Note", 40.6), ("Note", 0.0), ("Note", 87.0)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0023 sec
		1136 18:32:47	INSERT INTO IT_Sales (service_order, sale) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0025 sec
		1137 18:32:47	INSERT INTO Software_As_a_Service (reissue_date, subscription_number, expiration_date) VALUES ("2114", "s5rb", 5...)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0023 sec
		1138 18:32:47	INSERT INTO Subscription_Sale (software_as_a_service, sale) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0024 sec
		1139 18:32:47	INSERT INTO Department (accounts_and_finance, research_and_development, sales_and_marketing, it_services, hu...)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0024 sec
		1140 18:32:47	INSERT INTO Department_Sale (department, sale) VALUES (1, 1), (2, 2), (3, 3)	3 row(s) affected Records: 3 Duplicates: 0 Warnings...	0.0023 sec

Query Completed

Section X: Testing

The screenshot displays the SQL Server Enterprise Manager interface for a local instance named '3306'. The left sidebar shows the 'MANAGEMENT' tree with 'Server Status' selected. The main pane shows a query execution plan for a query that tests various tables. The query is as follows:

```
-- 28. Testing Software_As_a_Service table
UPDATE Software_As_a_Service SET reissue_date = '1' WHERE software_as_a_service_id = 1;
-- Query: DELETE FROM Software_As_a_Service WHERE software_as_a_service_id = 1;
-- Error: Cannot delete or update a parent row

-- 29. Testing Subscription_Sale
UPDATE Subscription_Sale SET software_as_a_service = 1 WHERE subscription_sales_id = 1;
DELETE FROM Subscription_Sale WHERE subscription_sales_id = 1;

-- 30. Testing Department table
UPDATE Department SET accounts_and_finance = 1 WHERE department_id = 1;
DELETE FROM Department WHERE department_id = 1;

-- 31. Testing Department_Sale table
UPDATE Department_Sale SET department = 1 WHERE department_sale_id = 1;
DELETE FROM Department_Sale WHERE department_sale_id = 1;
```

The 'Action Output' pane shows the results of the query execution. The table below summarizes the data:

Object ID	Session	Time	Action	Response	Duration / Fetch Time
1253	18:33:26	DELETE FROM Product_Sale WHERE product_sale_id = 1	1 row(s) affected	0.0010 sec	
1254	18:33:26	UPDATE IT_Service_Order SET notes = 'note' WHERE service_id = 1	1 row(s) affected Rows matched: 1 Changed: 1 Warn...	0.0012 sec	
1255	18:33:26	UPDATE IT_Sales SET service_order = 1 WHERE it_sale_id = 1	0 row(s) affected Rows matched: 1 Changed: 0 Warn...	0.00053 sec	
1256	18:33:26	DELETE FROM IT_Sales WHERE it_sale_id = 1	1 row(s) affected	0.00098 sec	
1257	18:33:26	UPDATE Software_As_a_Service SET reissue_date = '1' WHERE software_as_a_service_id = 1	1 row(s) affected Rows matched: 1 Changed: 1 Warn...	0.0011 sec	
1258	18:33:26	UPDATE Subscription_Sale SET software_as_a_service = 1 WHERE subscription_sales_id = 1	0 row(s) affected Rows matched: 1 Changed: 0 Warn...	0.00046 sec	
1259	18:33:26	DELETE FROM Subscription_Sale WHERE subscription_sales_id = 1	1 row(s) affected	0.0017 sec	
1260	18:33:26	UPDATE Department SET accounts_and_finance = 1 WHERE department_id = 1	0 row(s) affected Rows matched: 1 Changed: 0 Warn...	0.00054 sec	
1261	18:33:26	DELETE FROM Department WHERE department_id = 1	1 row(s) affected	0.0014 sec	
1262	18:33:26	UPDATE Department_Sale SET department = 1 WHERE department_sale_id = 1	0 row(s) affected Rows matched: 0 Changed: 0 War...	0.00044 sec	
1263	18:33:26	DELETE FROM Department_Sale WHERE department_sale_id = 1	0 row(s) affected	0.00052 sec	

The status bar at the bottom indicates 'Query Completed'.

Section XI: Testing Table

Entity	SQLQuery	OK/Failed	Error Description	Possible Solution
Person	Delete	Failed	User_id cannot find referenced value in parent table	Test with different data
Person	Update	Failed	User_id cannot find referenced value in parent table	Test with different data
Account	Delete	OK	None	None
Account	Update	OK	None	None
Registered_User	Update	OK	None	None
Registered_User	Delete	Failed	Cannot delete parent row	Change condition to delete
Address	Delete	Failed	Cannot delete values in parent table	Change conditions for deletion in test
Address	Update	OK	None	None
User_Address	Delete	Failed	Cannot delete a child row	Change deletion conditions in test
User_Address	Update	OK	None	None
Client	Delete	Failed	Cannot delete a parent	Change condition for complaint
Client	Update	OK	None	None
Complaint	Delete	OK	None	None
Complaint	Update	OK	None	None
Employee	Delete	Failed	Cannot delete a parent	Change condition for testing to accurately reflect inserted data
Employee	Update	OK	None	None
Office	Delete	OK	None	None
Office	Update	OK	None	None
Computer	Delete	OK	None	None
Computer	Update	OK	None	None
Desk	Delete	OK	None	None
Desk	Update	OK	None	None
Benefits	Delete	OK	None	None
Benefits	Update	OK	None	None

Bonus	Delete	OK	None	None
Bonus	Update	OK	None	None
Pay	Delete	OK	None	None
Pay	Update	OK	None	None
Tax	Delete	Failed	Cannot delete a parent	Not sure
Tax	Update	OK	None	None
Supplies	Delete	OK	None	None
Supplies	Update	OK	None	None
Supplies_Tax	Delete	OK	None	None
Supplies_Tax	Update	OK	None	None
Product	Update	OK	None	None
Product	Delete	Failed	Parent row cannot be updated	Not sure
Ad	Update	OK	None	None
Ad	Delete	Failed	Parent row cannot be deleted	Fix parent
Website	Update	OK	None	None
Website	Delete	Failed	Cannot delete parent row	Fix parent
Host	Update	OK	None	None
Host	Delete	OK	None	None
Product_Advertisement	Update	OK	None	None
Product_Advertisement	Delete	OK	None	None
Product_Tax	Update	Failed	Child row cannot be updated	Not sure
Product_Tax	Delete	OK	None	None
Sale	Update	OK	None	None
Sale	Delete	Failed	Parent row cannot be deleted	Change test
Product_Sale	Update	OK	None	None
Product_Sale	Delete	OK	None	None
IT_Service_Order	Update	OK	None	None
IT_Service_Order	Delete	Failed	Cannot delete parent row	Change test
IT_Sales	Update	OK	None	None
IT_Sales	Delete	OK	None	None
Software_As_a_Service	Update	OK	None	None
Software_As_a_Service	Delete	Failed	Cannot delete parent row	Not sure
Subscription_Sale	Update	OK	None	None
Subscription_sale	Delete	OK	None	None
Department	Update	OK	None	None

Department	Delete	OK	None	None
Department_Sale	Update	OK	None	None
Department_Sale	Delete	OK	None	None