Joao Decastro
CS205 Fall 2020

LOAD_GO

- *A database project*

- *Database project simulating a dumpster company*
- *Emphasis on real day-to-day challenges and companies' necessity*

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THE PROJECT

Topic assignment

Topic assignment: Dumpster company

09/19/2020

It came to our attention that a small company needs a data base system to help them keep track of costumers, products, orders etc. This company started the business in the CT and NY area, and it is focused on the rental of construction dumpsters. As the company grows the problem of keeping track of all data without a software is almost impossible. They want our team of engineers to develop a data base system where they can have information about the customers and the dumpsters status. Things such as client ID, client address, phone number, dumpster ID, availability etc. Also, they want to be able to access all this data as well as enter new clients with new drop of date and pick up due date. Keep track of payments is also an important implementation which would help the company to know whether an order is paid or not. The system should also show all pick up due dates for current dumpsters and locations, so if a customer calls in, they should know if there is one available of when one would be available to drop off.

In addition, an important thing is to calculate the actual price for the order, it has a fixed price for a certain amount of weight. If it passes the allowable weight the costumer would be charged by the tons. This information should be shown at the end of the order when the dumpster is pickup. Lastly an implementation that we should consider is a way to notify their client the pickup date and a notification of the order status after paid for example.

For a new order, they want to log in with their credentials and be able to add a new client. The new client would have a name, an address, phone number and an email. The delivery address could be different from the client address. Each dumpster would have an identification number, size, capacity and availability status. Then, they would search for the next available dumpster and the system would show if there is an available or when the next dumpster would be available. They would have to set a drop off date and a pickup date with the customer as well as the estimate cost for the service. The system would also need to notify the employee with a date for pick up. The system would generate a report so they could use this information to send an invoice to the costumer.

I hope we can find a solution for this problem; I am personally excited to work on this project.

The concept

I started to work on this project right away, I enjoy work with real-life hands-on project in the university. After creating a brain storming file (provided at page 5), I decided to put some ideas in paper to start to think about the concept and put some steps to get where I wanted as a final result. Receiving some insights and feedback from professor I was able to think through some other things that could benefit my project.

The Idea

Doing some research, I decided to contact some dumpster company in order to understand more about the business and their

real needs. I emailed some of them as well as contacted from cellphone, they were mostly receptive (page 3). In fact, one of the people that I talked was also a WCSU student. I explained my research and my project and asked for some inputs such as business rules, information they need to keep for the company etc.

DATA RESEARCH

In order to understand and to inspire new ideas, I contacted some **companies with question**. I am including some of this information here in this section things such as business rules, customer information needed and dumpster capacities.

Data

From the data gathered I was able to get some useful information for our project:

.....

- **Customer INFO**

"We usually ask a client basic information, such as name, contact information, physical address and billing address".

- **Types of materials**

"We also ask what kind of items they are putting in the dumpster such as household items, appliances, furniture etc".

- **Dumpster placement**

"We also go over dumpster placement on the property".

"We get a time frame of how long they will need the dumpster as well".

- **Some business RULES**

"We inform clients of the weight limits on each dumpster size, our pricing on each size and making sure the dumpster is level with the top and not overloaded".

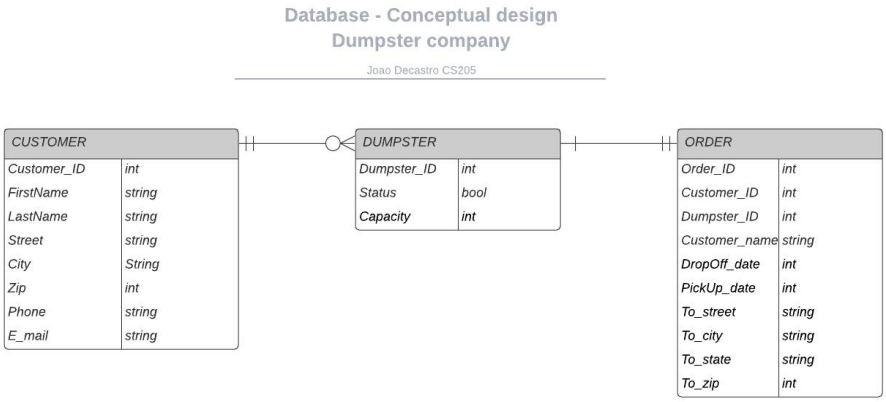
"As far as what cannot go in the dumpster, we base our information on what the transfer station does not allow".

Thank you for your interest, I hope this information is helpful

LoStocco Refuse Service LLC

ER DIAGRAM/CONCEPTUAL DESIGN

First conceptual design



Implemented ER diagram

File included

<

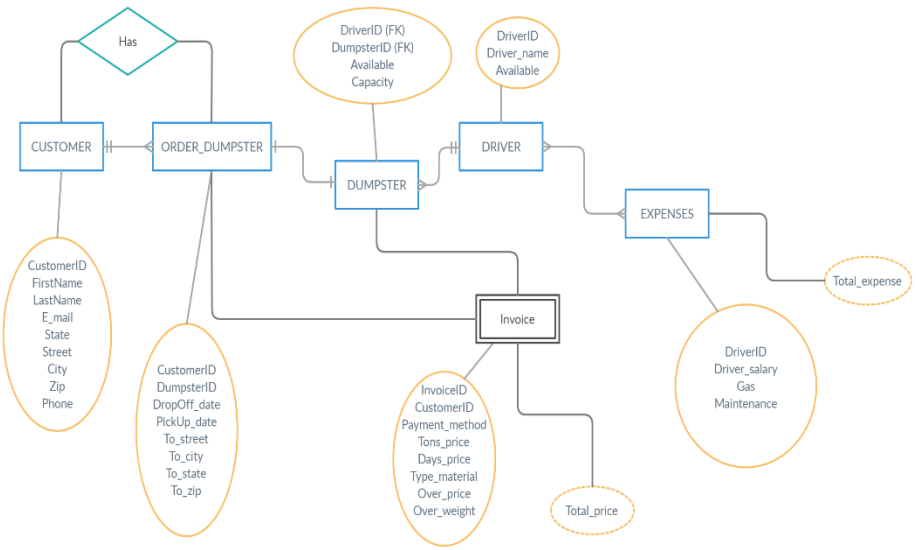


TABLE CONCEPT

Tables were created following the company needs

1. *CUSTOMER*
2. *DRIVER*
3. *DUMPSTER*
4. *INVOICE*
5. *ORDER_DUMPSTER*
6. *EXPENSES*

DATA DICTIONARY

- *Customer*
    - ***CustomerId int primary key,***
        - *Primary key in customer table*
    - ***FirstName varchar(32),***
        - *Customer first name*
    - ***LastName varchar(32),***
        - *Customer last name*
    - ***E_mail varchar(100),***
        - *Customer email*
    - ***State varchar(100),***
        - *Customer address*
    - ***Street varchar(100),***
    - ***City varchar(32)***
    - ***Zip varchar(32),***
    - ***Phone varchar(32)***
        - *Customer phone number*

- *Driver*
    - ***DriverId int primary key,***
        - *Driver primary key, used to differentiate drivers*
    - ***Driver_name varchar(100),***

- ***Available char(1) DEFAULT 'Y' CHECK ((Available = 'Y') OR (Available = 'N'))***
    - *To check if a driver is available for a new order, or pick up*

- *Dumpster*
    - ***DriverId int references DRIVER(DriverId),***
        - *To constrain a driver to a dumpster*
    - ***DumpsterId int primary key,***
        - *Each dumpster has a key and is related to a driver*
    - ***Available char(1) DEFAULT 'Y' CHECK((Available='Y')OR(Available='N')),***
        - *To check if a dumpster is available for a new order*
    - ***Capacity int***
        - *Dumpster capacity (3000lbs was used)*

- *Invoice*
    - ***InvoiceId int primary key,***
        - *Invoice number*
    - ***CustomerId int references CUSTOMER(CustomerId),***
        - *To relate a customer to an invoice*
    - ***Payment_method varchar(100),***
        - *To save customer payment method*
    - ***Tons_price numeric,***
        - *Price per ton*
    - ***Days_price numeric,***

        - *If any price is charged after limit of days (price charged by days*
    - ***Type_material varchar(100),***
        - *Part of business rules, customer needs to specify material types*
    - ***Over_price numeric,***
        - *For every ton overweight $94 dollars is charged*
    - ***Over_weight numeric,***
        - *A multiplicand for over_price (1 tons, 2 tons, 3 tons etc)*
    - ***Total_price numeric GENERATED ALWAYS AS (Tons_price + Days_price + (Over_weight*Over_price)) stored***
        - *Derived attribute to calculate total price*

- *Order_dumpster*
    - ***CustomerId int references CUSTOMER(CustomerId),***
        - *Customer is related to a dumpster*
    - ***DumpsterId int references DUMPSTER(DumpsterId),***
        - *to know which dumpster is used*
    - ***DropOff_date date,***
        - *date of dumpster placement*
    - ***PickUp_date date,***
        - *Date for pick up due date*
    - ***To_street varchar(100),***

        - *Address where dumpster is going*
    - ***To_city varchar(100),***
    - ***To_state varchar(100),***
    - ***To_zip varchar(32***
- *Expenses*
    - ***DriverId int references DRIVER(DriverId),***
        - *Driver is related to the expenses*
    - ***Driver_salary numeric,***
        - *Driver salaty*
    - ***Gas numeric,***
        - *Gas expenses*
    - ***Maintenance numeric,***
        - *Maintenance for trucks, etc*
    - ***Total_expense numeric GENERATED ALWAYS AS (Driver_salary + Gas + Maintenance) stored***
        - *Total monthly expenses*

IMAGES

Some images of queries examples and test

SQL working

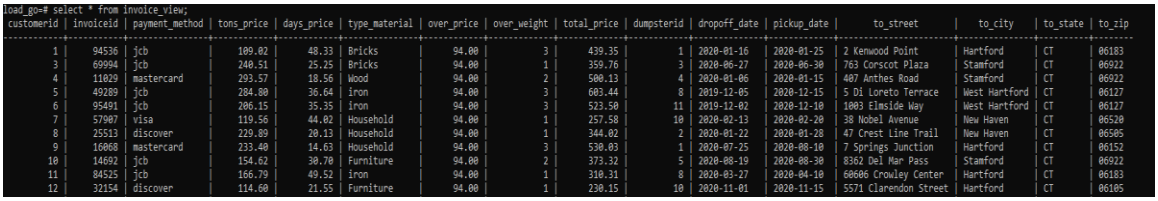
- *Showing customer info view*

```
load_go=# select * from CUSTOMER_INFO;
 customerid | firstname |  lastname  |            e_mail             | state |         street          |     city     |  zip  |    phone
------------+-----------+------------+-------------------------------+-------+-------------------------+--------------+-------+-------------
          1 | Sarena    | Akenhead   | sakenhead0@apple.com          | CT    | 6 Warner Lane           | Norwalk      | 06859 | 203-612-7709
          2 | Chalmers  | Petruskevich | cpetruskevich1@tumblr.com   | CT    | 13451 Crescent Oaks Alley | Norwalk    | 06854 | 203-925-7212
          3 | Scot      | Bohlin     | sbohlin2@51.la                | CT    | 54 Ludington Pass       | Hartford     | 06160 | 860-497-1424
          4 | Wainwright | Cowan     | wcowan3@hugedomains.com       | CT    | 9 Fieldstone Center     | Stamford     | 06912 | 203-249-9398
          5 | Augustina | Spensly    | aspensly4@census.gov          | CT    | 5373 Bultman Way        | Bridgeport   | 06673 | 203-888-0284
          6 | Sadella   | Briddle    | sbriddle5@google.de           | CT    | 974 Maple Point         | Hartford     | 06145 | 860-896-8770
          7 | Lesly     | Kurtis     | lkurtis6@odnoklassniki.ru     | CT    | 473 Thierer Park        | Stamford     | 06905 | 203-102-0923
          8 | Elvera    | Litherland | elitherland7@archive.org      | CT    | 02 Kennedy Street       | Norwalk      | 06859 | 203-319-0830
          9 | Abram     | Scothorne  | ascothorne8@dmoz.org          | CT    | 90231 Derek Avenue      | Danbury      | 06816 | 203-604-3164
         10 | Gan       | Yukhtin    | gyukhtin9@parallels.com       | CT    | 88 Florence Road        | Norwalk      | 06859 | 203-725-2811
         11 | Morgan    | Bamb       | mbamba@ucoz.ru                | CT    | 5704 Texas Drive        | Danbury      | 06816 | 203-873-0157
         12 | Gerik     | Diamond    | gdiamondb@dagondesign.com     | CT    | 4316 Cardinal Crossing  | Norwalk      | 06859 | 203-736-2856
         13 | Aloisia   | Kempton    | akemptonc@posterous.com       | CT    | 4 Buena Vista Crossing  | Waterbury    | 06726 | 203-990-1665
         14 | Ange      | Chaundy    | achaundyd@cbsnews.com         | CT    | 145 7th Street          | Norwalk      | 06854 | 203-956-7102
         15 | Garland   | Cianelli   | gcianellie@example.com        | CT    | 750 Loeprich Crossing   | New Haven    | 06520 | 203-364-0081
         16 | Maryanna  | Cherryman  | mcherrymanf@mashable.com      | CT    | 556 Becker Hill         | Hartford     | 06105 | 860-288-7149
         17 | Lezley    | Caltun     | lcaltung@myspace.com          | CT    | 9 Vidon Court           | Bridgeport   | 06673 | 203-501-7748
         18 | Allx      | Eat        | aeath@hc360.com               | CT    | 65483 Sugar Hill        | Stamford     | 06912 | 203-257-9639
         19 | Brynna    | Meeks      | bmeeksi@aboutads.info         | CT    | 9499 Corry Plaza        | New Haven    | 06538 | 203-455-1935
         20 | Cristobal | Lathom     | clathomj@nba.com              | CT    | 55343 Ryan Hill         | New Haven    | 06510 | 203-624-5476
         21 | Erastus   | Guillotin  | eguillotink@free.fr           | CT    | 36579 Annamark Parkway  | Hartford     | 06140 | 860-823-7563
         22 | Deirdre   | Willerton  | dwillerton1@lulu.com          | CT    | 413 Moland Parkway      | New Haven    | 06533 | 203-216-1348
         23 | Bryana    | Roloff     | broloffm@godaddy.com          | CT    | 1774 School Trail       | West Hartford | 06127 | 860-871-4915
         24 | Bernice   | Bernardotte | bbernardotten@slashdot.org   | CT    | 9899 Jay Drive          | Hartford     | 06145 | 860-540-8018
         25 | Byrom     | Jacson     | bjacsono@nymag.com            | CT    | 538 Hooker Plaza        | West Hartford | 06127 | 860-103-8198
         26 | Cesare    | Tivnan     | ctivnanp@lrs.gov              | CT    | 3983 Porter Terrace     | Bridgeport   | 06673 | 203-841-6888
         27 | Pennie    | Purton     | ppurtonq@netlog.com           | CT    | 59537 Browning Lane     | West Hartford | 06127 | 860-862-2101
         28 | Rhea      | Pococke    | rpococker@apache.org          | CT    | 01 Melody Trail         | New Haven    | 06520 | 203-686-3320
         29 | Glenine   | Sommer     | gsommers@weebly.com           | CT    | 2 Cambridge Park        | Waterbury    | 06721 | 203-661-9196
         30 | Ami       | Littleton  | alittletont@fotki.com         | CT    | 33 John Wall Drive      | New Haven    | 06510 | 203-883-8810
         31 | Ingrim    | Simoni     | isimoniu@umn.edu              | CT    | 1493 Eagan Park         | Norwalk      | 06854 | 203-441-9477
         32 | Lief      | Fancet     | lfancetv@bloomberg.com        | CT    | 058 Ilene Park          | New Haven    | 06538 | 203-138-4527
         33 | Caldwell  | Howgego    | chowgegow@ehow.com            | CT    | 7 Grasskamp Point       | Hartford     | 06152 | 860-634-3152
         34 | Creighton | Gittus     | cgittusx@ask.com              | CT    | 00 Armistice Way        | New Haven    | 06533 | 203-451-9649
         35 | Elsa      | Tolson     | etolsony@networksolutions.com | CT    | 84 Artisan Crossing     | Hartford     | 06160 | 860-980-9165
         36 | Ardene    | Drew-Clifton | adrewcliftonz@census.gov    | CT    | 264 Logan Street        | Stamford     | 06905 | 203-570-9363
         37 | Gloria    | Steutly    | gsteutly10@prlog.org          | CT    | 2280 Corscot Circle     | Hartford     | 06145 | 860-743-4867
         38 | Korrie    | Stooders   | kstooders11@illinois.edu      | CT    | 547 Holy Cross Lane     | Fairfield    | 06825 | 203-835-1763
         39 | Franklin  | Jozef      | fjozef12@squidoo.com          | CT    | 877 Shoshone Road       | Hartford     | 06140 | 860-658-8506
         40 | Odette    | Cranny     | ocranny13@biglobe.ne.jp       | CT    | 7 Badeau Place          | Waterbury    | 06726 | 203-204-3764
         41 | Ken       | Mulcaster  | kmulcaster14@i2i.jp           | CT    | 56 Morrow Lane          | Stamford     | 06905 | 203-844-5362
         42 | Ambur     | Ibbison    | aibbison15@europa.eu          | CT    | 7751 Clove Alley        | Hartford     | 06105 | 860-279-3381
         43 | Vincenty  | Paish      | vpaish16@istockphoto.com      | CT    | 5 Harbort Plaza         | Bridgeport   | 06606 | 203-991-0427
         44 | Jefferson | Lindenberg | jlindenberg17@shinystat.com   | CT    | 05 Sloan Terrace        | Stamford     | 06905 | 203-374-2852
         45 | Cosetta   | Roman      | croman18@weibo.com            | CT    | 0088 Loomis Lane        | Hartford     | 06152 | 860-767-6165
         46 | Robinson  | Ovens      | rovens19@apache.org           | CT    | 3471 Annamark Circle    | Norwalk      | 06859 | 203-159-1900
         47 | Norry     | Grebbin    | ngrebbin1a@si.edu             | CT    | 308 Spenser Terrace     | Hartford     | 06183 | 860-190-8003
         48 | Mohammed  | Ossenna    | mossenna1b@cdbaby.com         | CT    | 373 Forest Dale Trail   | Stamford     | 06912 | 203-966-9976
         49 | Marco     | Eynaud     | meynaud1c@infoseek.co.jp      | CT    | 17908 Kennedy Drive     | Norwalk      | 06854 | 203-839-5924
         50 | Catriona  | Enrich     | cenrich1d@sourceforge.net     | CT    | 40 Homewood Pass        | Waterbury    | 06726 | 203-597-2476
         51 | Myrta     | Oag        | moag1e@ucoz.ru                | CT    | 76 Sloan Avenue         | Hartford     | 06120 | 860-423-4353
```

- *Showing customer_order view*
    - *Derived from 3 different tables (queries included in file)*

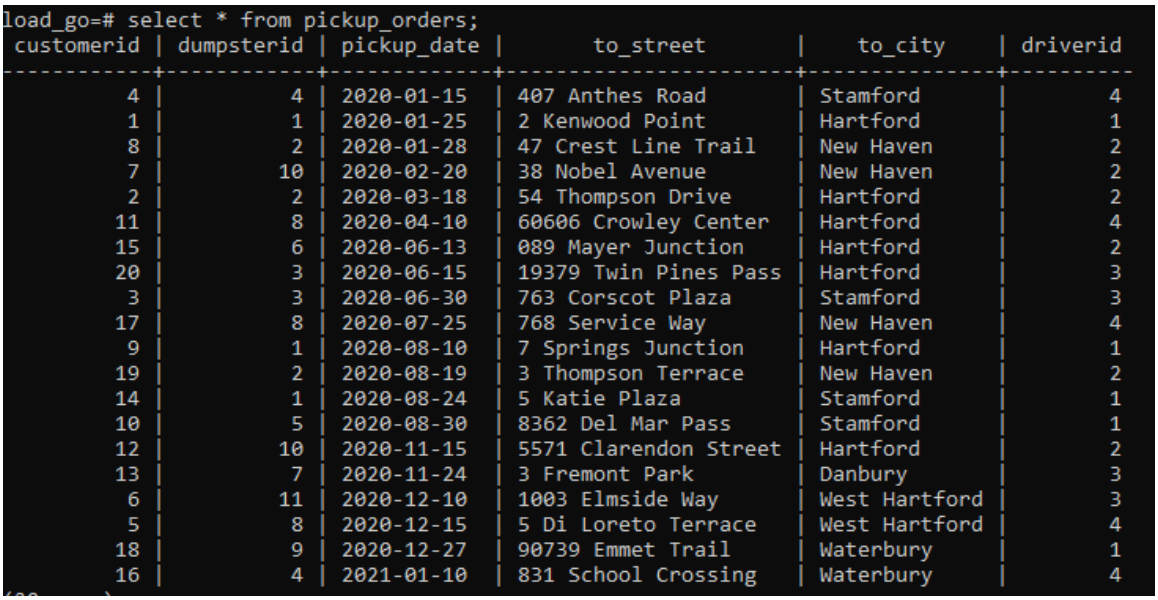
```
load_go=# select * from customer_order;
 customerid | firstname |  lastname  | pickup_date | dropoff_date | dumpsterid | total_price
------------+-----------+------------+-------------+--------------+------------+-------------
          1 | Sarena    | Akenhead   | 2020-01-25  | 2020-01-16   |          1 |      439.35
          3 | Scot      | Bohlin     | 2020-06-30  | 2020-06-27   |          3 |      359.76
          4 | Wainwright | Cowan     | 2020-01-15  | 2020-01-06   |          4 |      500.13
          5 | Augustina | Spensly    | 2020-12-15  | 2019-12-05   |          8 |      603.44
          6 | Sadella   | Briddle    | 2020-12-10  | 2019-12-02   |         11 |      523.50
          7 | Lesly     | Kurtis     | 2020-02-20  | 2020-02-13   |         10 |      257.58
          8 | Elvera    | Litherland | 2020-01-28  | 2020-01-22   |          2 |      344.02
          9 | Abram     | Scothorne  | 2020-08-10  | 2020-07-25   |          1 |      530.03
         10 | Gan       | Yukhtin    | 2020-08-30  | 2020-08-19   |          5 |      373.32
         11 | Morgan    | Bamb       | 2020-04-10  | 2020-03-27   |          8 |      310.31
         12 | Gerik     | Diamond    | 2020-11-15  | 2020-11-01   |         10 |      230.15
         13 | Aloisia   | Kempton    | 2020-11-24  | 2020-11-12   |          7 |      601.41
         14 | Ange      | Chaundy    | 2020-08-24  | 2020-08-18   |          1 |      594.97
         15 | Garland   | Cianelli   | 2020-06-13  | 2020-06-01   |          6 |      333.38
         16 | Maryanna  | Cherryman  | 2021-01-10  | 2020-12-12   |          4 |      264.73
         17 | Lezley    | Caltun     | 2020-07-25  | 2020-07-13   |          8 |      487.00
         18 | Allx      | Eat        | 2020-12-27  | 2019-12-16   |          9 |      576.66
         19 | Brynna    | Meeks      | 2020-08-19  | 2020-08-04   |          2 |      290.66
         20 | Cristobal | Lathom     | 2020-06-15  | 2020-06-05   |          3 |      390.17
```

- *Showing invoice_view*



```
load_go=# select * from invoice_view;
 customerid | invoiceid | payment_method | tons_price | days_price | type_material | over_price | over_weight | total_price | dumpsterid | dropoff_date | pickup_date |      to_street      |   to_city    | to_state | to_zip
------------+-----------+----------------+------------+------------+---------------+------------+-------------+-------------+------------+--------------+-------------+---------------------+--------------+----------+--------
          1 |     94536 | jcb            |     109.02 |      48.33 | Bricks        |      94.00 |           3 |      439.35 |          1 | 2020-01-16   | 2020-01-25  | 2 Kenwood Point     | Hartford     | CT       | 06183
          3 |     69994 | jcb            |     240.51 |      25.25 | Bricks        |      94.00 |           1 |      359.76 |          3 | 2020-06-27   | 2020-06-30  | 763 Corscot Plaza   | Stamford     | CT       | 06922
          4 |     11029 | mastercard     |     293.57 |      18.56 | Wood          |      94.00 |           2 |      500.13 |          4 | 2020-01-06   | 2020-01-15  | 407 Anthes Road     | Stamford     | CT       | 06922
          5 |     49289 | jcb            |     284.80 |      36.64 | Iron          |      94.00 |           3 |      603.44 |          8 | 2019-12-05   | 2020-12-15  | 5 Di Loreto Terrace | West Hartford | CT       | 06127
          6 |     95491 | jcb            |     206.15 |      35.35 | Iron          |      94.00 |           3 |      523.50 |         11 | 2019-12-02   | 2020-12-10  | 1003 Elmside Way    | West Hartford | CT       | 06127
          7 |     57907 | visa           |     119.56 |      44.02 | Household     |      94.00 |           1 |      257.58 |         10 | 2020-02-13   | 2020-02-20  | 38 Nobel Avenue     | New Haven    | CT       | 06520
          8 |     25513 | discover       |     229.89 |      20.13 | Household     |      94.00 |           1 |      344.02 |          2 | 2020-01-22   | 2020-01-28  | 47 Crest Line Trail | New Haven    | CT       | 06505
          9 |     16068 | mastercard     |     233.40 |      14.63 | Household     |      94.00 |           3 |      530.03 |          1 | 2020-07-25   | 2020-08-10  | 7 Springs Junction  | Hartford     | CT       | 06152
         10 |     14692 | jcb            |     154.62 |      30.70 | Furniture     |      94.00 |           2 |      373.32 |          5 | 2020-08-19   | 2020-08-30  | 8362 Del Mar Pass   | Stamford     | CT       | 06922
         11 |     84525 | jcb            |     166.79 |      49.52 | Iron          |      94.00 |           1 |      310.31 |          8 | 2020-03-27   | 2020-04-10  | 60606 Crowley Center | Hartford     | CT       | 06183
         12 |     32154 | discover       |     114.60 |      21.55 | Furniture     |      94.00 |           1 |      230.15 |         10 | 2020-11-01   | 2020-11-15  | 5571 Clarendon Street | Hartford     | CT       | 06105
```

- *Showing pickup_orders view*
    - *It is ordered by date, to see when is the next pickup date*



```
load_go=# select * from pickup_orders;
 customerid | dumpsterid | pickup_date |       to_street       |    to_city    | driverid
------------+------------+-------------+-----------------------+---------------+----------
          4 |          4 | 2020-01-15  | 407 Anthes Road       | Stamford      |        4
          1 |          1 | 2020-01-25  | 2 Kenwood Point       | Hartford      |        1
          8 |          2 | 2020-01-28  | 47 Crest Line Trail   | New Haven     |        2
          7 |         10 | 2020-02-20  | 38 Nobel Avenue       | New Haven     |        2
          2 |          2 | 2020-03-18  | 54 Thompson Drive     | Hartford      |        2
         11 |          8 | 2020-04-10  | 60606 Crowley Center  | Hartford      |        4
         15 |          6 | 2020-06-13  | 089 Mayer Junction    | Hartford      |        2
         20 |          3 | 2020-06-15  | 19379 Twin Pines Pass | Hartford      |        3
          3 |          3 | 2020-06-30  | 763 Corscot Plaza     | Stamford      |        3
         17 |          8 | 2020-07-25  | 768 Service Way       | New Haven     |        4
          9 |          1 | 2020-08-10  | 7 Springs Junction    | Hartford      |        1
         19 |          2 | 2020-08-19  | 3 Thompson Terrace    | New Haven     |        2
         14 |          1 | 2020-08-24  | 5 Katie Plaza         | Stamford      |        1
         10 |          5 | 2020-08-30  | 8362 Del Mar Pass     | Stamford      |        1
         12 |         10 | 2020-11-15  | 5571 Clarendon Street | Hartford      |        2
         13 |          7 | 2020-11-24  | 3 Fremont Park        | Danbury       |        3
          6 |         11 | 2020-12-10  | 1003 Elmside Way      | West Hartford |        3
          5 |          8 | 2020-12-15  | 5 Di Loreto Terrace   | West Hartford |        4
         18 |          9 | 2020-12-27  | 90739 Emmet Trail     | Waterbury     |        1
         16 |          4 | 2021-01-10  | 831 School Crossing   | Waterbury     |        4
```

FILES

- *Setup.sql*
    - *Notes:*
        - *Considering 4 drivers, 12 dumpsters 100 customers, 20 orders*
- *Drop.sql*

- *ImplementationQueries*
    - *Views*
        - *Included in "setup.sql"*
- *Test.sql*
    - *Create test queries to demonstrate tables*
    - *Client queries*
    - *Comments*
- *Spool*
    - *spoolCreate*
    - *spoolImplementation*
        - *obs: it is included in "spoolCreate"*
    - *spoolTesting*
    - *spoolDrop*

PHYSICAL DESIGN

Calculation

We are going to have around 500 customer, 10 driver, 20 dumpsters

- *customerid* | *firstname* | *lastname* | *e_mail* | *state* | *street* | *city* | *zip* | *phone*

-------3 + 4--+-----32----+--------32----+----20-+-----5---+--100----+-32-+--32--+-20-----

(3 + 4 + 32 + 32 + 20 + 5 + 100 + 32 + 32 + 20) * 100 = 28, 000

- driverid | driver_name | available

----3+4------+-------100---+---1--------

(3 + 4 + 100)* 4 = 428

- driverid | dumpsterid | available | capacity

------3+4----+----3+4--------+----1-------+----4------

(3 + 4 + 3 + 4 + 1 + 4) * 20 = 380

- customerid | dumpsterid | dropoff_date | pickup_date | to_street | to_city | to_state | to_zip

------3+4------+------3+4------+-------3-------+------3-------+----100-------+----100-----+----2------+----32----

(3 + 4 + 4 + 3 + 3 + 100 + 100 + 2 + 32)* 500 = 125, 500

- invoiceid | customerid | payment_method | tons_price | distance_price | days_price | type_material | over_price | over_weight | total_price

------3+4-----+-----3+4-------+------100----------+------10------+----
---10---------+-------10-----+-------20--------+----10--------+------10-
------+------10-------

(3 + 4 + 3 + 4 + 100 + 10 + 10 + 10 + 20 + 10 + 10 + 10) * 500 =
97,000

- driverid | driver_salary | gas | maintenance | total_expense

-----3+4-----+------10------+---10----+------10-------+------10--------
-

(3 + 4 + 10 + 10 + 10 + 10) * 10 = 470

Grand total = 251,778

Growth factor 20 % = 50, 355