Team SAME: Package Domain

Phase 1 Report:

I. **Progress**
    As a team, we have so far read the requirements for our database and services and have:
    - broken down requirements into entities and relationships
    - created our ER diagram
    - drawn out basic UI designs
    - collected a small amount of sample data to populate our tables

II. **Description of Design**
    The Package, Customer, Trip, and Warehouse entities form the backbone of our design. The Package entity keeps data about the package itself, as well as a link to the Customer who sent it and the Customer who is receiving it. The Trip entity represents one event of some Packages being moved from one Warehouse to another Warehouse; it contains a link to each of these three things. We also have the Carrier entity, which represents a truck, plane, boat, or whatever, linked to by the Trip entity. There is also a table of Special Info attributes (such as "Flammable" and "International") that can be associated with a package by the Special Info table. A similar mechanic is used to link packages to Signatures if necessary.

III. **Design Process**
    a. Choices Made
        Reading the requirements for the Package Domain, we knew off the bat that we needed entities representing a package, customer, warehouse, and carrier. As we started figuring out data that we needed to hold and the attributes that would represent that data, we realized that it would be helpful if we also had special info, trip, and signature entities that held data about special cases for packages (hazardous, international, flammable, etc.), information about the trips that packages go through to get to the customer, and proof of signature (if a package requires one), as well as individual tables for multivalued attributes such as phone numbers and credit card numbers. Overall, this translated into a total of 11 relational tables.

    b. Issues Faced & Solutions
        There were a couple issues we faced as we were coming up with our entities and ER diagram:
        1.) how to handle addresses (originally we were trying to break up addresses into number, street, city, state/province, country, and put each into its own individual table)
        2.) unnecessary attributes in some entities
        3.) figuring how to handle multivalued attributes
        4.) how to record time stamps (for package tracking)

        Solutions:
        1.) instead of splitting up these attributes into separate tables (which would require natural joins every time we wanted to get a full address), we decided to store them in

Customer and use relational algebra to get specific entries

2.) we removed the unnecessary attributes and instead introduced foreign keys to access additional data

3.) originally we had decided on storing multivalued attributes as lists, but after realizing that wouldn't be practical, we broke them up into separate tables with foreign keys back to the original tables the multivalued attributes were part of

4.) we realized using Unix time would be the easiest way of handling time stamps since we wouldn't need to worry about recording the time stamps in a specific format and can easily convert a time stamp from Unix time into a nice, printable format

IV.   *ER Diagram*

a.   <u>Explanation of Diagram</u>

A Customer is able to send or receive multiple Packages. Some Packages require a Signature and/or contain Special Information (such as if it's international or hazardous). To get delivered, a Package takes many Trips from Warehouse to Warehouse. Carriers help transport the Packages between Warehouses and to their final delivery addresses.

b.   <u>Reduction to Tables</u>

- Package(<u>ID</u>, origin_cust_id, destination_cust_id, ship_timestamp, delivery_timestamp, size, type, weight, price, exp_delivery_date, signature_id)
- Customer(<u>ID</u>, name, email, addr_line1, city, province, country, zip_code)
- Trip(<u>ID</u>, start_timestamp, end_timestamp, fail_flag)
- Warehouse(<u>ID</u>, addr_line1, city, province, country)
- Carrier(<u>ID</u>, type)
- Signature(<u>ID</u>, image_link)
- Special_info(<u>ID</u>, info_string)
- Phone(<u>cust_id, phone_num</u>)
- Bank_account(<u>cust_id, bank_acc_num</u>)
- Credit_card(<u>cust_id, credit_card_num</u>)
- Special_case(<u>package_id, special_info_id</u>)

V.   *Description of Data We Plan to Use*

For our tables, we need customer information (such as name, email, bank account, phone, address, etc.), package information (size, type, weight, price, origin, destination, expected delivery, etc.), and a lot of uniquely identifying IDs (that will be stored as numbers). We also need time stamps for trips and delivery dates (which will be in Unix time), and warehouse locations (in address format). Most of this data will be generated randomly with online generators (such as name, address, phone, etc.) or with a small, custom program (to create unique image links, which are how signatures are stored).