Logistic Company - Database Design

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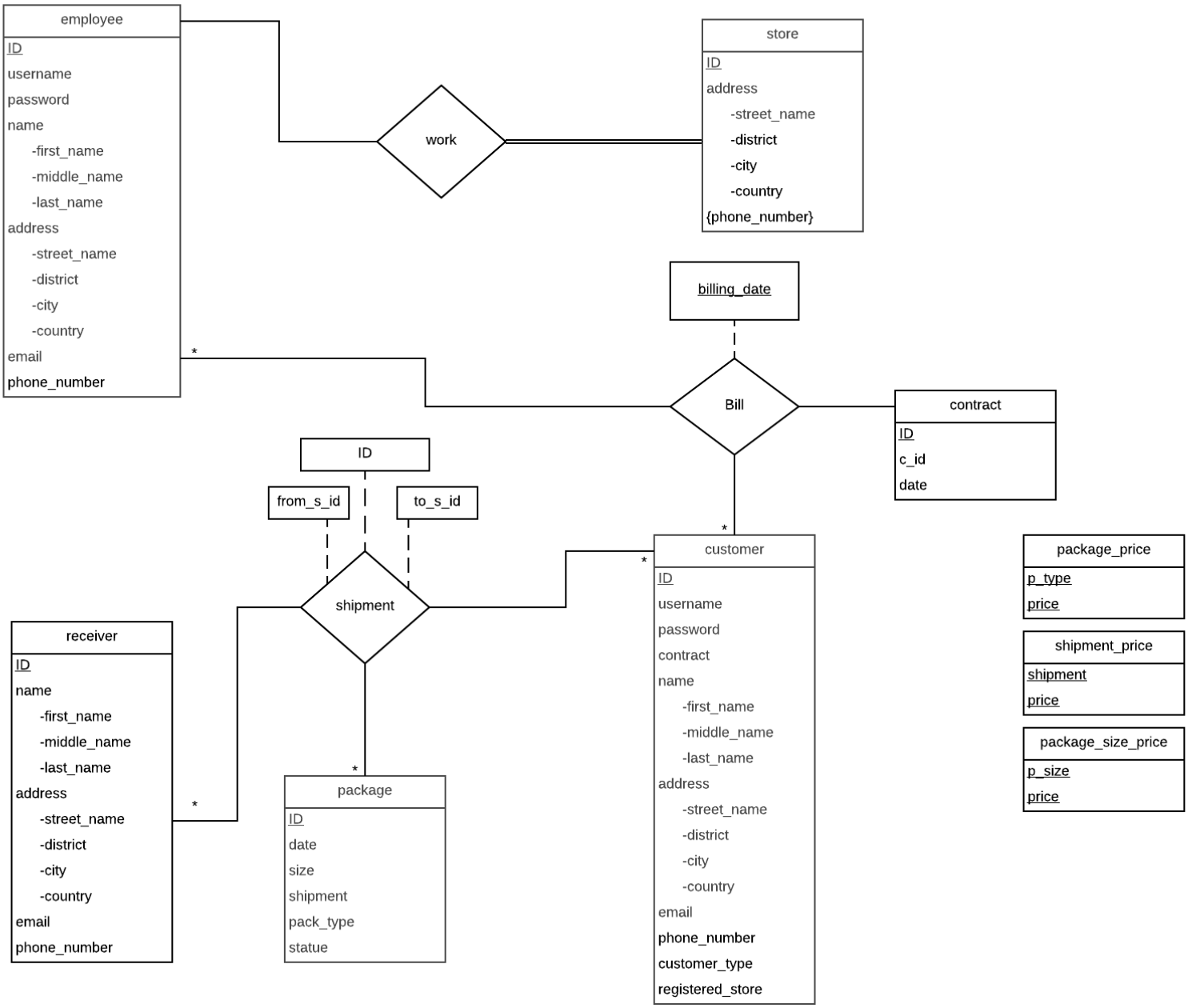
ER - DIAGRAM



Database - Queries

```
-- phpMyAdmin SQL Dump
-- version 4.5.4.1deb2ubuntu2
-- http://www.phpmyadmin.net
--
-- Host: localhost
-- Generation Time: Apr 27, 2017 at 04:20 PM
-- Server version: 5.7.17-0ubuntu0.16.04.2
-- PHP Version: 7.0.15-0ubuntu0.16.04.4

SET SQL_MODE = "NO_AUTO_VALUE_ON_ZERO";
SET time_zone = "+00:00";


/*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
/*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
/*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
/*!40101 SET NAMES utf8mb4 */;

--
-- Database: `group5`
--

-- --------------------------------------------------------

--
-- Table structure for table `bill`
--

CREATE TABLE `bill` (
  `c_id` int(11) NOT NULL,
  `e_id` int(11) NOT NULL,
  `billing_date` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `contract`
--

CREATE TABLE `contract` (
  `ID` int(11) NOT NULL,
  `date` varchar(10) NOT NULL,
  `c_id` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `customer`
--
```

```
CREATE TABLE `customer` (
  `ID` int(11) NOT NULL,
  `username` varchar(10) NOT NULL,
  `password` varchar(10) NOT NULL,
  `email` varchar(10) NOT NULL,
  `phone_number` int(11) NOT NULL,
  `customer_type` varchar(10) NOT NULL,
  `registered_store_id` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `customer_address`
--

CREATE TABLE `customer_address` (
  `ID` int(11) NOT NULL,
  `street_name` varchar(10) NOT NULL,
  `district` varchar(10) NOT NULL,
  `city` varchar(10) NOT NULL,
  `country` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `customer_name`
--

CREATE TABLE `customer_name` (
  `ID` int(11) NOT NULL,
  `first_name` varchar(10) NOT NULL,
  `mid_name` varchar(10) NOT NULL,
  `last_name` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `employee`
--

CREATE TABLE `employee` (
  `ID` int(11) NOT NULL,
  `password` varchar(10) NOT NULL,
  `username` varchar(10) NOT NULL,
  `email` varchar(10) NOT NULL,
  `phone_number` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `employee_address`
```

```
--

CREATE TABLE `employee_address` (
  `ID` int(11) NOT NULL,
  `street_name` varchar(10) NOT NULL,
  `district` varchar(10) NOT NULL,
  `city` varchar(10) NOT NULL,
  `country` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `employee_name`
--

CREATE TABLE `employee_name` (
  `ID` int(11) NOT NULL,
  `first_name` varchar(10) NOT NULL,
  `middle_name` varchar(10) NOT NULL,
  `last_name` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `package`
--

CREATE TABLE `package` (
  `ID` int(11) NOT NULL,
  `date` varchar(10) NOT NULL,
  `size` varchar(10) NOT NULL,
  `shipment_id` varchar(10) NOT NULL,
  `pack_type` varchar(10) NOT NULL,
  `statue` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `package_price`
--

CREATE TABLE `package_price` (
  `p_type` varchar(10) NOT NULL,
  `price` int(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `package_size_price`
--

CREATE TABLE `package_size_price` (
```

```
  `p_size` varchar(10) NOT NULL,
  `price` int(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `receiver`
--

CREATE TABLE `receiver` (
  `ID` int(11) NOT NULL,
  `name` varchar(10) NOT NULL,
  `address` varchar(10) NOT NULL,
  `email` varchar(10) NOT NULL,
  `phone_number` int(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `receiver_address`
--

CREATE TABLE `receiver_address` (
  `ID` int(11) NOT NULL,
  `street_name` varchar(10) NOT NULL,
  `district` varchar(10) NOT NULL,
  `city` varchar(10) NOT NULL,
  `country` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `receiver_name`
--

CREATE TABLE `receiver_name` (
  `ID` int(11) NOT NULL,
  `first_name` varchar(10) NOT NULL,
  `middle_name` varchar(10) NOT NULL,
  `last_name` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `shipment`
--

CREATE TABLE `shipment` (
  `ID` int(11) NOT NULL,
  `from_s_id` int(11) NOT NULL,
  `to_s_id` int(11) NOT NULL,
  `p_id` int(11) NOT NULL,
```

```
  `r_id` int(11) NOT NULL,
  `c_id` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `shipment_price`
--

CREATE TABLE `shipment_price` (
  `shipment` varchar(10) NOT NULL,
  `price` int(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `store`
--

CREATE TABLE `store` (
  `ID` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `store_address`
--

CREATE TABLE `store_address` (
  `ID` int(11) NOT NULL,
  `street_name` varchar(10) NOT NULL,
  `district` varchar(10) NOT NULL,
  `city` varchar(10) NOT NULL,
  `country` varchar(10) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `store_phone`
--

CREATE TABLE `store_phone` (
  `ID` int(11) NOT NULL,
  `phone_number` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

-- --------------------------------------------------------

--
-- Table structure for table `work`
--
```

```
CREATE TABLE `work` (
  `s_id` int(11) NOT NULL,
  `e_id` int(11) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Indexes for dumped tables
--

--
-- Indexes for table `bill`
--
ALTER TABLE `bill`
  ADD PRIMARY KEY (`c_id`,`e_id`),
  ADD UNIQUE KEY `c_id` (`c_id`),
  ADD UNIQUE KEY `e_id` (`e_id`);

--
-- Indexes for table `contract`
--
ALTER TABLE `contract`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `c_id` (`c_id`);

--
-- Indexes for table `customer`
--
ALTER TABLE `customer`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `username` (`username`),
  ADD UNIQUE KEY `email` (`email`),
  ADD KEY `ID` (`ID`);

--
-- Indexes for table `customer_address`
--
ALTER TABLE `customer_address`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`);

--
-- Indexes for table `customer_name`
--
ALTER TABLE `customer_name`
  ADD PRIMARY KEY (`ID`);

--
-- Indexes for table `employee`
--
ALTER TABLE `employee`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `username` (`username`,`email`),
  ADD UNIQUE KEY `ID` (`ID`);

--
-- Indexes for table `employee_address`
```

```
--
ALTER TABLE `employee_address`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`),
  ADD KEY `ID_2` (`ID`);

--
-- Indexes for table `employee_name`
--
ALTER TABLE `employee_name`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`),
  ADD KEY `ID_2` (`ID`);

--
-- Indexes for table `package`
--
ALTER TABLE `package`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`),
  ADD KEY `ID_2` (`ID`);

--
-- Indexes for table `receiver`
--
ALTER TABLE `receiver`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`);

--
-- Indexes for table `receiver_address`
--
ALTER TABLE `receiver_address`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`);

--
-- Indexes for table `receiver_name`
--
ALTER TABLE `receiver_name`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`);

--
-- Indexes for table `shipment`
--
ALTER TABLE `shipment`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `from_s_id` (`from_s_id`,`to_s_id`,`p_id`,`r_id`,`c_id`),
  ADD KEY `to_s_id` (`to_s_id`),
  ADD KEY `p_id` (`p_id`),
  ADD KEY `r_id` (`r_id`),
  ADD KEY `c_id` (`c_id`);

--
-- Indexes for table `store`
```

```
--
ALTER TABLE `store`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`),
  ADD KEY `ID_2` (`ID`);

--
-- Indexes for table `store_address`
--
ALTER TABLE `store_address`
  ADD PRIMARY KEY (`ID`),
  ADD UNIQUE KEY `ID` (`ID`),
  ADD KEY `ID_2` (`ID`);

--
-- Indexes for table `work`
--
ALTER TABLE `work`
  ADD UNIQUE KEY `s_id` (`s_id`),
  ADD UNIQUE KEY `e_id` (`e_id`);

--
-- AUTO_INCREMENT for dumped tables
--

--
-- AUTO_INCREMENT for table `employee`
--
ALTER TABLE `employee`
  MODIFY `ID` int(11) NOT NULL AUTO_INCREMENT;
--
-- Constraints for dumped tables
--

--
-- Constraints for table `bill`
--
ALTER TABLE `bill`
  ADD CONSTRAINT `bill_ibfk_1` FOREIGN KEY (`c_id`) REFERENCES `customer` (`ID`),
  ADD CONSTRAINT `bill_ibfk_2` FOREIGN KEY (`e_id`) REFERENCES `employee` (`ID`);

--
-- Constraints for table `contract`
--
ALTER TABLE `contract`
  ADD CONSTRAINT `contract_ibfk_1` FOREIGN KEY (`c_id`) REFERENCES `customer` (`ID`);

--
-- Constraints for table `customer_address`
--
ALTER TABLE `customer_address`
  ADD CONSTRAINT `c_id` FOREIGN KEY (`ID`) REFERENCES `customer` (`ID`);

--
-- Constraints for table `customer_name`
--
```

```
ALTER TABLE `customer_name`
  ADD CONSTRAINT `customer_name_ibfk_1` FOREIGN KEY (`ID`) REFERENCES `customer`
(`ID`);

--
-- Constraints for table `employee_address`
--
ALTER TABLE `employee_address`
  ADD CONSTRAINT `employee_address_ibfk_1` FOREIGN KEY (`ID`) REFERENCES
`employee` (`ID`);

--
-- Constraints for table `employee_name`
--
ALTER TABLE `employee_name`
  ADD CONSTRAINT `employee_name_ibfk_1` FOREIGN KEY (`ID`) REFERENCES `employee`
(`ID`);

--
-- Constraints for table `receiver_address`
--
ALTER TABLE `receiver_address`
  ADD CONSTRAINT `receiver_address_ibfk_1` FOREIGN KEY (`ID`) REFERENCES `receiver`
(`ID`);

--
-- Constraints for table `receiver_name`
--
ALTER TABLE `receiver_name`
  ADD CONSTRAINT `receiver_name_ibfk_1` FOREIGN KEY (`ID`) REFERENCES `receiver`
(`ID`);

--
-- Constraints for table `shipment`
--
ALTER TABLE `shipment`
  ADD CONSTRAINT `shipment_ibfk_1` FOREIGN KEY (`from_s_id`) REFERENCES `store`
(`ID`),
  ADD CONSTRAINT `shipment_ibfk_2` FOREIGN KEY (`to_s_id`) REFERENCES `store` (`ID`),
  ADD CONSTRAINT `shipment_ibfk_3` FOREIGN KEY (`p_id`) REFERENCES `package` (`ID`),
  ADD CONSTRAINT `shipment_ibfk_4` FOREIGN KEY (`r_id`) REFERENCES `receiver` (`ID`),
  ADD CONSTRAINT `shipment_ibfk_5` FOREIGN KEY (`c_id`) REFERENCES `customer` (`ID`);

/*!40101 SET CHARACTER_SET_CLIENT=@OLD_CHARACTER_SET_CLIENT */;
/*!40101 SET CHARACTER_SET_RESULTS=@OLD_CHARACTER_SET_RESULTS */;
/*!40101 SET COLLATION_CONNECTION=@OLD_COLLATION_CONNECTION */;
```

DISCUSSION

In our design, there are three relations named as “work”, “shipment”, and “bill”. Work relation is a binary relation between employee and store. Participation of store to this relation is total whereas the participation of employee is partial. Shipment is a ternary relation among customer, package, and receiver. They all have many-to-many connections. Shipment also includes from and to attributes related with store. Bill relation is also ternary -if customer is a frequent user- among contract, customer, and employee. Connection between contract and employee is one-to-many. If customer does not have contract, then relation is binary between employee and customer and there is many-to-many connection. Name and address attributes of customer, store, receiver, and employee are composite. Therefore, we design name and address tables which have first_name, middle_name, last_name, and street_name, district, city, country attributes respectively. Furthermore, store has a multi-valued attribute named as phone_number. Hence, we design phone_number table. All attributes of all tables are atomic. Thus, they are all in first normal form. We normalize package table in order to eliminate repetition of information about package price, based on size and content/type, and shipment price and package table becomes in third normal form. Also, we use Boyce-Codd normal form for bill table. It only has c_id attribute to reach customer. With this attribute, we can reach all customer related information, the corresponding package, and package related information.