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Project Subject

5. Shipping company - sender and receiver, package. There are different transport forms, different drivers, different package formats

Project Content

Creation of database for shipping company which allows receiver to track deliveries.

Project Detailed Description

Database was created on commission for a delivery company which introduced a package tracking system for users. User here is a person using this system as a package sender. Receiver gets information of his delivery via email. Database does contain only the name, surname and email of the receiver, receiver does not have to be registered by account. The goal of this database is to create a reliable source of information about users packages, information about package history, which delivery points it was at. Company operates only in Poland.

The most important information that we had to focus on during the design was:

- Detailed information about package delivery history - how many times it was transshipped and where.
- Information about which delivery man delivers transport of packages and what car vehicle was he driving.
- Tracking message content sended to user after arriving to a delivery unit

Possible Scenarios of database use:

1. In the delivery unit the user A checks in an order containing a few packages.
2. Every package is added to a database, with the receiver address.
3. Receiver gets an email notification about package status and whereabouts.
4. Package is sorted and goes to the group of packages which form transport.
5. Transport has its driver and vehicle.
6. Package is transported to the next delivery unit and goes through the process (3, 4, 5) multiple times.
7. Package is delivered to the address assigned.

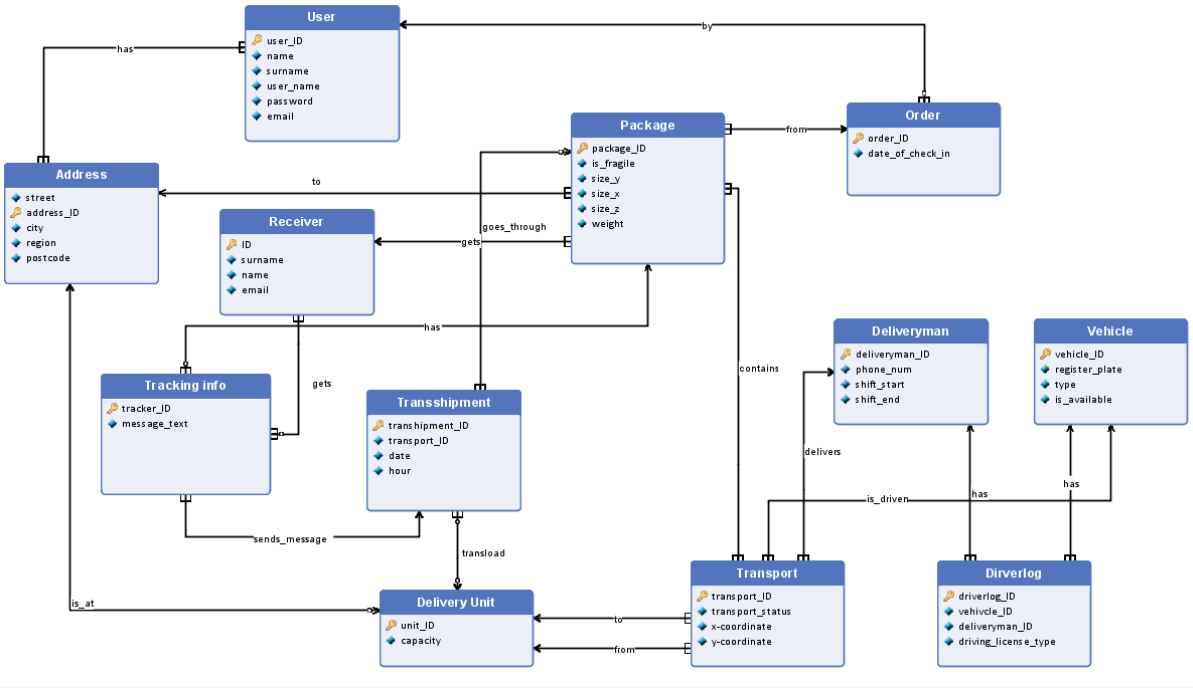
Assumptions and limitations:

Database does not contain information about package pricing (oversized, special wishes, priority, distance between destiNos, taxes, etc.). Database does not contain information if a user is in a special offer (subscriber). Database does not contain information about salaries of employees of the company. It is assumed that the order containing the package / packages is checked in the delivery unit.

Inquiries to the database:

1. Give ID of delivery men who transported package X
2. How many transshipments did package X have.
3. Give the coordinates of package X.
4. Can driver X drive vehicle Y.
5. Give the address of the delivery units that package X was transshipped at.

ERD Diagram



Definition of entities

Entity 1 : User
Description

Contains collection of users registered to the system. Every user has a unique ID number, which is the primary key. There is a new entry in the entity when a new user registers to the system. Quantity: to ~10, 000, 000 Annual growth: ~500,000. Entities are not deleted.			
Attributes			
Name	**Primary Key**	**Type/ domain**	**Description**
user_ID	Yes	Natural number from 0000001- 9999999	Unique id number of user
name	No	text up to 15 characters (special characters forbidden)	User real name
surname	No	text up to 15 characters (special characters forbidden)	User real life surname
user_name	No	text up to 20 characters	Pesel osoby. W przypadku obcokrajowca atrybut jest pusty.
password	No	text up to 20 characters Must contain min. 1 number and capital letter	Users password.
email	Yes	text max 30 characters have to contain characters: ‘@’ and ‘.’	Email that user is registered with.Used for contact, and confirmations.

Entity 2 : Address			
Description			
Quantity: ~9,000,000 Annual growth; ~480,000 Entity that contains address information.There is a new entry in the entity when a new user either registers to the system or adds a new address to his/her account or new delivery unit is added to the system or package is sended to that address. Entities are deleted after one year of package arrival or if the user decides to delete the address.			
Attributes			
Name	**Primary Key**	**Type/ domain**	**Description**
address_ID	Yes	Natural number from 0000001- 9999999	Unique id for every address.

city	No	Text max 59 characters (only letters)	Name of the city. Should start with capital, the system corrects the first letter if needed. Can be in more than one word.
street	No	Text max 40 characters	Street name.
region	No	text max 25 characters	name of the region. Voivodeship
postcode	No	6 characters two natural digits followed by '-' then 3 digits	postcode. Should be in the form 00-000. Must match the city(checked by the system)

Entity 3 : Package			
Description			
Contains information about packages. Every package has a unique primary key. New entity is added when a new package is to be delivered. Entities are deleted after a year from being created. Quantity: ~100,000,000 Annual growth :~50,000,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
Id	Yes	Set of all characters 12 characters	Unique id of every package
is_fragile	No	boolean value (true, false)	Does the package need a special approach.
size_y	No	natural number 0 to 200	size y of package in centimetres
size_x	No	natural number 0 to 200	size x of package in centimetres
szie_z	No	natural number 0 to 200	size z of package in centimetres

Entity 4 : User Address			
Description			
Associative entity linking entities User and Address. Entity is added when a user adds an address to his account, which is mandatory to register. Entities can be deleted by the user. Quantity: ~10,000,000 Annual growth: ~520,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
User_ID	Yes	Natural number from 0000001- 9999999	Unique id number of user
address_ID	Yes	Natural number from 0000001- 9999999	Unique id for every address.

Entity 5 : Order			
Description			
Entity contains information of date of check in. Users can send multiple packages that are contained in one order. Entity is deleted automatically after one year from being created. Quantity: ~7,000,000 Annual growth: ~400,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
order_ID	Yes	Natural number from 0000001- 9999999	Unique id number of order
date of check in	No	date in format dd-mm-yyyy	Day of order being added to database

Entity 6 : Transport			
Description			
Entity contains information of transports. Multiple packages create transport after being sorted. Entity is deleted automatically after one year from being created. Quantity: ~1,000,000 Annual growth: ~100,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
trasport_ID	Yes	Natural number from 0000001- 9999999	unique id of transports
tarsport_status	No	text max 10 characters only letters.	Status of the package. Is from range: ‘sorting’, ‘delivery’, ‘magazine’, ‘delivered’, ‘accepted’
x_coordinate	No	float, can be negative, 6 decimal places	x coordinate of transport current whereabouts
y_coordinate	No	float, can be negative, 6 decimal places	y coordinate of transport current whereabouts

Entity 7 : Vehicle			
Description			
Entity contains information about vehicles that transport packages. New entry when administrator registers new vehicle. Vehicle transport multiple transports. Entity is deleted automatically when the vehicle is sold. Quantity:~ 10,000 Annual growth:~ 600			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
vehicle_Id	Yes	Natural number from 0 - 99999	unique id of vehicle
register_plate	No	text max to 8 characters one blank space	Characters before blank space characterise the region where the car was registered.
Type	No	text max 10 characters	type of vehicle. Possible types: lorry, plane, motorbike, van
is_available	No	boolean value	Is vehicle available at this moment if yes value = true, if no =false

Entity 8 : Deliveryman			
Description			
Entity contains information about delivery workers that transport packages. New entry when a new deliveryman is employed. Entity is deleted after one year of contract expiration date. Quantity: ~10,000 Annual growth:~ 500			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
deliveryman_ID	Yes	Natural number from 0 - 99999	Unique id of deliveryman
phone_num	No	Natural number 9 digits. first digit cannot be 0	Telephone number to contact deliveryman directly. System automatically adds +48 at the beginning
shift_start	No	time in 24h format number from 0 - 24, two decimal places	Hour of shift beginning
shift_end	No	time in 24h format number from 0 - 24, two decimal places	Hour of shift end

Entity 9 : Driverlog			
Description			
Entity contains information about delivery workers and vehicles they drive. New entity is created when the delivery man is driving a vehicle he has never used before . Entity is deleted after one year of either delivery man contract expiration date or deleting a vehicle from the database. Quantity: ~20,000 Annual growth: ~1000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
driverlog_Id	Yes	natural number from 0 - 99999	unique id of driverlog
vehicle_Id	No	Natural number from 0 - 99999	unique id of vehicle
deliveryman_ID	No	Natural number from 0 - 99999	Unique id of delivery man
driving_licence_type	No	text up to 2 characters. Capital letter can be followed by number	Category of driving licence

Entity 10 : Transshipment			
Description			
Entity contains information about transports delivered to the delivery unit. Date and hour it happened. New entry when a new transport is being deployed to the delivery unit. Entity can be deleted after one year from arriving at the unit. Quantity: ~100,000 Annual growth: ~10,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
transshipment_ID	Yes	natural number from 0 - 999999	unique id of transshipment
unit_ID	No	natural number from 0 - 99999	unique id of delivery unit
transport_ID	No	natural number from 0 - 99999	unique id of transport
date	No	date in format dd-mm-yyyy	Day of transport scanned in delivery unit during transloading

hour	No	time in 24h format number from 0 - 24, two decimal places	Hour of transport scanned in delivery unit during transloading

Entity 11 : Sorting			
Description			
Entity contains information about delivery workers that transport packages. New entry when the package enters the process of sorting and is channelled to transport. Entities are deleted after a year from being created. Quantity: 40,000,000, Annual growth: 1,000,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
sorting_ID	No	natural number from 0 - 99999999	unique ID number of sorting process
package_ID	No	Natural number from 1- 99999999	unique id of packages
trasport_ID	No	Natural number from 1- 9999999	unique id of transports

Entity 12 : Delivery Unit			
Description			
Entity contains information about delivery units that packages are being delivered to . New entry when a new delivery unit is open. Entity is never deleted. Quantity:~ 400 Annual growth:~ 10			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
unit_ID	Yes	natural number from 0 - 999	Unique ID of delivery unit
capacity	No	natural number from 0 - 999999	Capacity of individual delivery unit

Entity 13 : Tracking info
Description

Entity contains information about delivery workers that transport packages. New entry when a new deliveryman is employed. Entity is deleted after one year of package arrival. Quantity: 80,000,000, Annual growth: 6,000,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
trackerId	Yes	natural number from 0 - 9999999	Unique tracker ID
message_text	No	text max 150 characters	Content of tracking info message

Entity 14 : Receiver			
Description			
Entity contains information about receivers. New entry when a new package is posted. Entity is deleted after one year of package arrival. Database allows him to get tracking info. Quantity: ~6,000,000 Annual growth: ~500,000			
Attributes			
Name	**Primary Key**	**Typ/ domain**	**Description**
Id	Yes	natural number from 0 - 9999999	Unique ID number of receiver
name	No	text up to 15 characters (special characters and numbers forbidden)	User real name
surname	No	text up to 15 characters (special characters and numbers forbidden)	User real life surname
email	No	text max 30 characters have to contain characters: '@' and '.'	Contact email to receiver

Relationships description:

Name relation	**Entities**		**Relation Type**	**Description**
	Entity 1	**Entity 2**		

is_driven	Transport	Vehicle	1..n : 1	One transport is driven only by one vehicle. When it is transloaded, transport always changes. One vehicle can deliver many transports
by	User	Order	1 : 0..n	Users can send many orders. Users can be registered and have no orders. Users can send many different orders. One order can be sent only by one user.
is_kept_bt	UserAddress	Address	1..n : 1	UserAddress keeps only one address. One address can have many UserAddresses
is_at	Delivery Unit	Address	1 : 1	One delivery unit can have only one address. One address can have only one unit.
goes_through	Package	Sorting	1 : 1..n	Package can go through many different sortings. It is a mandatory process for packages. Sorting is individual for every package
sends_message	Transhipment	Tracking info	1 : 1..n	Tracking info gets only one message from transhipment. Message can be sended to many trackers
gets	Receiver	Tracking info	1 : 1..n	One tracking info can be sent to only one receiver. Receiver gets multiple tracking information.
from	Package	Order	1..n : 1	Package can be only from one order. Order contains at least one package.
transload	Transshipment	Delivery Unit	0..n : 1	One transhipment goes to only one delivery unit. Delivery units can serve multiple transshipments. There is an option that the transport is transhipped directly without arriving at the delivery unit.
to	Package	Address	1..n : 1	Multiple packages can be addressed to the same destination. One package can be addressed only to one destination.
has	Delivery Man	Driverlog	1 : 1..n	One driverlog can be only to one person. One person (delivery man) can have multiple driver logs.
has	Driverlog	Vehicle	1..n : 1	One driverlog can be used on only one vehicle. Vehicles can be reported in multiple driver logs.
placed	Sorting	Transport	1 : 1..n	Packages that are placed to transport come from many sortings. Package from particular sorting is directed to only one transport
keeps	User	UserAddress	1 : 1..n	UserAddress keeps only one user. One user can have many addresses

gets	Receiver	Package	1 : 1..n	Receiver can get many packages. One package can be delivered to only one receiver

Relational Database Schema:

Address(address_ID, street, city, region ,postcode)

User(user_ID, name, surname, usern_name, password)

HasAddress(user REF Users, address ref Addresses)

Orders(order_ID, date_of_check_in, user_ID REF User)

Package(package_ID, is_fragile, size_y, size_z, size_x, address REF Addresses, order_ID REF Order, receiver REF Receivers)

PackageTransport(package ref Packages, transport REF Transports)

DeliveryUnit(unit_ID,capacity, address REF Addresses)

Transshipment(transhipment_ID, date, hour, transport REF Transports, unit_ID REF Delivery Unit)

Tracking_info(tracker_ID, message_text,transshipment REF Transshipments, packageREF REF Packages)

Receiver(receiver_ID, surname, name, email)

Tracker (tracking_info REF Tracking info, reciever_ID REF Receiver)

Vehicle(vehicle_ID, register_plate, type, is_available)

Delivery Man(deliveryman_ID, phone_num, shift_start, shift_end)

Driverlog(driverlog_ID, driving_licence_type, deliveryman REF Deliverymen, vehicle REF Vehicles)

Transport(transport_ID, transport_status, x - coordinate, y- coordinate, vehicle_ID REF Vehicle, deliveryman_ID REF Deliveryman, to_delivery REF Delivery_Unit, from_Delivery REF Delivery_Unit)