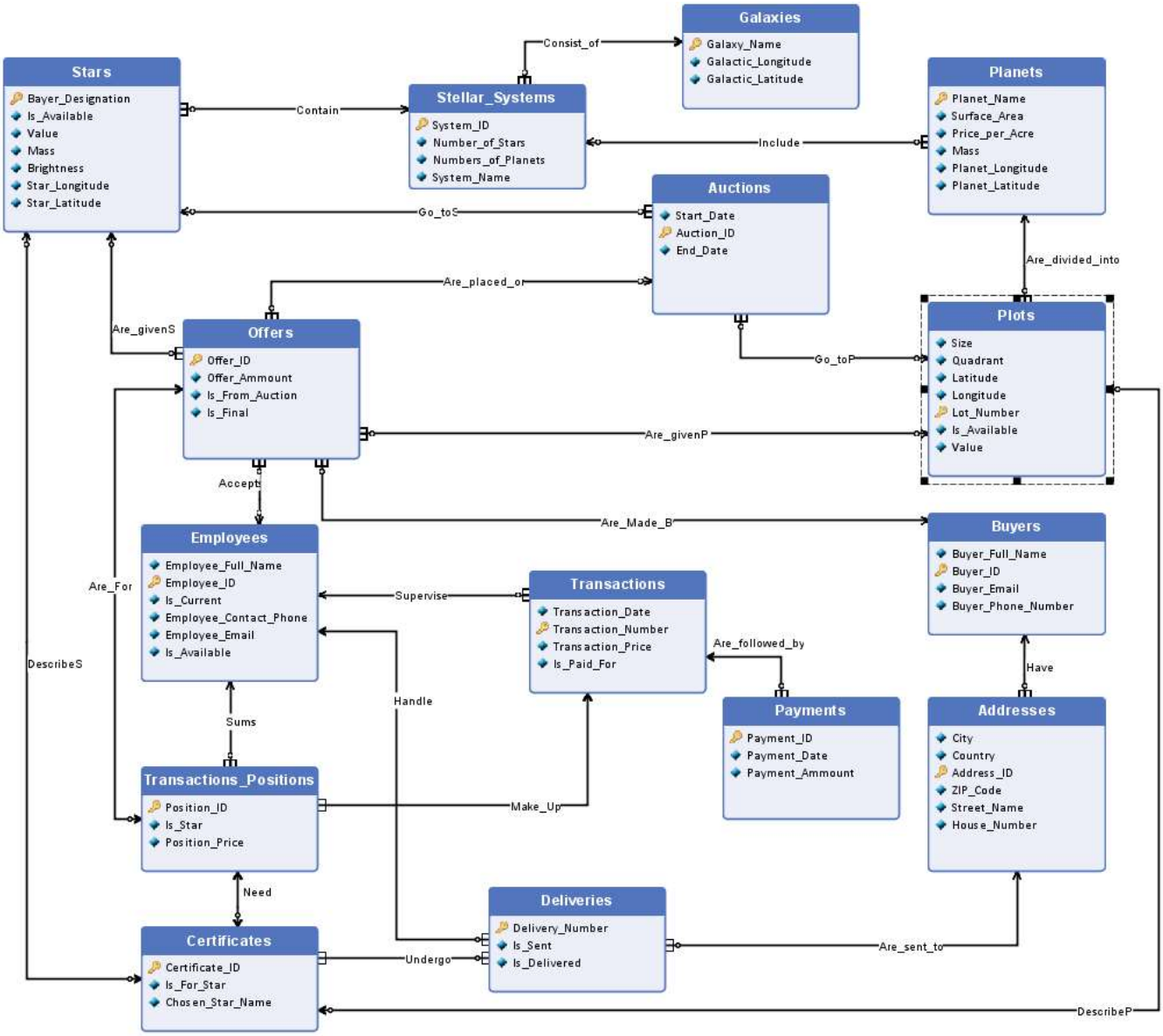
Name and surname: Michał Jakielaszek

Project topic:

Astronomy: stars, planets, galaxies, constellations etc.

Detailed project description:

1. Customer – a service selling noble titles of ownership of stars (with possibility to choose name when purchasing) and plots of land on different planets.
2. Users – company employees and clients.
3. Purpose – systematizing all the inventory, buyer's offer on and off auctions and their data, keeping track of chosen employees' responsibilities.
4. Goal – providing an effective solution for handling all the necessary data.
5. The scenarios of use include:
    - Selling product and systematizing the deliveries.
    - Systematizing the datas of all the existing clients.
    - Systematizing browsing of the available inventory.
    - Making auctions for certain items from the inventory.
    - Checking positions within the transaction.
    - Checking which employee shipped out given package.
    - Searching through all the past sales.
    - Searching through all the customers' offers.
    - Searching through all the customers' addresses.
6. Example inquiries:
    - Find all the offers made by a specific client.
    - Find all the transactions made from offers from auctions.
    - Find all the delivery addresses used by a single client.
    - Find all the deliveries sent by a given employee.
    - Find all the addresses registered by a certain buyer.
    - Find all the certificates for stars.
    - Find all the transactions positions from a given transaction.
    - Find all the offers made within a specific period of time.
7. Assumptions and limitations:
   Database doesn't handle maintenance breaks or external connections. Assumed that no returns are available, as most services of such kind do not offer them. Employees can access the entirety of the database. Buyers will only access a webpage based on it, with acccess to available inventory (and positions' details), possibility of making offers, participating in auctions, browsing their accounts and their past sales.


Galaxies
Galaxy_Name
Galactic_Longitude
Galactic_Latitude
Consist_of
Stars
Bayer_Designation
Is_Available
Value
Mass
Brightness
Star_Longitude
Star_Latitude
Contain
Stellar_Systems
System_ID
Number_of_Stars
Numbers_of_Planets
System_Name
Include
Planets
Planet_Name
Surface_Area
Price_per_Acre
Mass
Planet_Longitude
Planet_Latitude
Go_toS
Auctions
Start_Date
Auction_ID
End_Date
Are_divided_into
Are_placed_or
Are_givenS
Offers
Offer_ID
Offer_Ammount
Is_From_Auction
Is_Final
Go_toP
Plots
Size
Quadrant
Latitude
Longitude
Lot_Number
Is_Available
Value
Are_givenP
Accepts
Are_Made_B
Buyers
Buyer_Full_Name
Buyer_ID
Buyer_Email
Buyer_Phone_Number
Employees
Employee_Full_Name
Employee_ID
Is_Current
Employee_Contact_Phone
Employee_Email
Is_Available
Are_For
Supervise
Transactions
Transaction_Date
Transaction_Number
Transaction_Price
Is_Paid_For
Are_followed_by
Have
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Payments
Payment_ID
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Position_ID
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Deliveries
Delivery_Number
Is_Sent
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Certificates
Certificate_ID
Is_For_Star
Chosen_Star_Name
Undergo
DescribeP

Entity sets descriptions:

Entity set: Galaxies
Set of all galaxies available within the system.Added when there is an intention to add plots or stars from planets from certain galaxy. Records can be manually deleted.
Estimated size: 10 records

Galaxy_Name: varchar, up to 30 characters – unique and not null
Name of the given galaxy.

Galactic_Longitude: float in range <0, 360>
Galactic longitude is the angular distance around Galactic equator from the galactic centre. It describes where to find an object on the sky.

Galactic_Latitude: float in range <-90, 90>
Galactic latitude is measured in degrees north or south of the Galaxies fundamental plane of symmetry. It describes where to find an object on the sky.

Entity set: **Stellar_Systems**
The stellar systems found in the system. Added when there is an intention to add to inventory stars or plots from planets within it.Records can be manually deleted by employees.
Estimated size: 150 records

System_ID: int, up to 5 numbers in length – unique and not null
There is no unique indentifier for stellar systems, so an ID must be introduced. Generated when adding.

Number_of_Stars: int in range <0, 10> - not null
Number of stars in the system within the stellar system, should be counted by checking how many stars are assigned to it.

System_Name: varchar – up to 30 characters
Name of the system.

Numbers_of_Planets: int in range <0, 100> - not null
Number of planets in the system within the stellar system, should be counted by checking how many planets are assigned to it.

Entity set: **Planets**
A set of all planets found in the system.Added when there is an intention to sell plots from it. Records can be manually deleted by employees.
Estimated size: 1000 records

Planet_Name: varchar up to 16 characters – unique and not null
Unique name of each planet.

Surface_Area: float, greater than 0
Surface area of a planet measured in relation to Earth's surface area.

Price_per_Acre: int in range <0, 50 000>
Average price per acre of all plots on a given planet.

Mass: float, greater than 0
Mass of planet in relation to Earth's mass.

Planet_Longitude: float in range <0, 360>
Planet's longitude is the angular distance around Galactic equator from the galactic centre. It describes

where to find an object on the sky.

Planet_Latitude: float in range <-90, 90>
Planet's latitude is measured in degrees north or south of the Galaxies fundamental plane of symmetry. It describes where to find an object on the sky.

Entity set: **Stars**
A set of all stars found in the system. Added when they are added as positions for sale.Records can be manually deleted by employees, unless they've been sold. In that case they can be deleted after a year.
Estimated size: 400 records

Bayer_Designation: varchar, up to 30 characters – unique and not null
It's a unique string of letters and numbers assigned to each discovered star.

Is_Available: binary – default = 1
A marker whether a Star is available to sell (1) or has already been sold (0).

Value: int <0, 50 000>
Rough estimate of the star's sell value in USD.

Mass: float, greater than 0
Mass of the star in relation to Sun's mass.

Brightness: float in range <-100, 100>
Apparent magnitude of the star. Describes the brightness in the night sky.

Star_Longitude: float in range <0, 360>
Star's longitude is the angular distance around Galactic equator from the galactic centre. It describes where to find an object on the sky.

Star_Latitude: float in range <-90, 90>
Star's latitude is measured in degrees north or south of the Galaxies fundamental plane of symmetry. It describes where to find an object on the sky.

Entity set: **Plots**
All the plots found in the system. Added when they are added as positions for sale.Records can be manually deleted by employees, unless they've been sold. In that case they can be deleted after a year.
Estimated size: 15 000 records

Size: int, in range (0, 1000> - not null
Size of plot expressed in acres.

Quadrant: varchar, up to 4 characters
Estimate of location. Quadrant within which the plot is located.

Latitude: float, in range <-90, 90>
The latitude in degrees of the middle of the plot on the planet.

Longitude: float in range <-180, 180>
The longitude in degrees of the middle of the plot on the planet.

Lot_Number: varchar, up to 20 characters – unique and not null
A unique combination of letters and numbers. Generated when a plot is added to the system.

Is_Available: binary – default = 1
Shows whether the plot is available (1) or has it already been sold (0).

Value: int (0, 50 000>
Estimated sell value of a given plot in USD.

Entity set: **Transactions** Set of all transactions. Added when a transaction is made. Recordsare never deleted.
Estimated size: 7 000 records

Transaction_Date: date (DAY-MONTH-YEAR) – not null
Date of the transaction.

Transaction_Number: int, up to 6 numbers in length – unique and not null
Unique number of each transaction. Generated whenan offer is accepted by an employee and turns into a transaction.

Transaction_Price: int, greater than 0 – not null
Price of the transaction in USD.

Is_Paid_For: binary – default = 0
Shows whether the payment for a transaction has already been made (1) or not (0). Can be checked by checking if there is a Payment entity assigned.

Entity set: **Buyers** Set of all the registered clients.Added when a buyer registers their account.Records are never deleted.
Estimated size: 5 000 records

Buyer_Full_Name: varchar, up to 30 characters – all have to be letters or space, not null
Full name of a specific client.

Buyer_ID: int,up to 6 numbers in length – unique and not null
Unique buyer ID generated randomly and assigned when they register.

Buyer_Email: varchar, up to 30 characters – must contain “@” symbol, not null
E-mail address of a specific buyer. Chosen by them when registering an account.

Buyer_Phone_Number: bigint, 4 to 13 numbers – not null
Phone number of a specific buyer. Chosen by them when registering an account.

Entity set: **Addresses** All the addresses assigned to buyers. Added when a buyer adds an address to his account.Records are never deleted.
Estimated size: 7 000 records

City: varchar, up to 50 characters – only letters and spaces, not null
The City of the delivery address, given by the customer.

Country: varchar, up to 20 characters – only letters and spaces, not null
The country of the delivery address, given by the customer.

Address_ID: int, up to 6 numbers in length – unique and not null
A unique ID number of each address, generated when adding.

ZIP_Code: varchar, up to 8 characters – numbers, letters and a “-” signare allowed, not null
Zip code of the delivery address, given by the customer.

Street_Name:varchar, up to 15 characters – only letters, not null
Name of the street of the delivery address, given by the customer.

House_Number: varchar, up to 3 numbers followed by not more than 1 letter (in case it’s a block of flats), not null
House number of the delivery address, given by the customer.

Is_Default: binary – default = 0
Shows whether the address is default (1) – meaning it’s the one necessary for the latest delivery – or not (0).

Entity set: **Certificates** Set of purchase certificates generated after completing a transaction.Added when a certificate for a transaction position is generated. Records are never deleted.
Estimated size: 5 000 records

Certificate_ID: int,up to 6 numbers in length – unique and not null
Unique ID for each certificate generated when generating a certificate.

Is_For_Star: binary – default = 0
Shows whether the certificate concerns a star (1) or a plot (0).

Chosen_Star_Name: varchar, up to 20 characters in length
If a certificate is for a star (Is_For_Star = 1), this column contains the star name chosen by the client during transaction. If certificate is for a plot (Is_For_Star = 0), the column remains empty.

Entity set: **Deliveries** The set of certificate deliveries.Added right after generating the shipping label. Records are deleted after a year.
Estimated size: 5 000 records

Delivery_Number: varchar, up to 40 characters (depending on the delivery method) – unique and not null
The shipment number generated by the shipping company. Can be used for tracking the package.

Is_Sent: binary – default = 0
Shows whether the package has already been shipped out (1) or not (0).

Is_Delivered: binary – default = 0
Shows whether the delivery has been successfully completed (1) or not (0).

Entity set: **Offers** Set of buyers’ offers for certain stars or plots. Added when an offer is made by a buyer. Records are never deleted.
Estimated size: 10 000 records

Offer_ID: int, up to 8 characters in length – unique and not null
Unique ID number generated whenthe buyer places an offer.

Offer_Ammount: int in range (0, 50 000> in USD – not null
The amount that has been offered for a given position.

Is_From_Auction: binary – default = 0
Shows whether a specific offer is from auction (1) or not (0). Should be evaluated by checking if there is a "Auctions" entity assigned.

Is_Final: binary – default = 0
Shows whether a particular offer has been accepted (1) by an employye or not (0).

Entity set: **Auctions**
Set of auctions for planets or plots.Added when there is an intent to make an auction. Records are deleted after a year.
Estimated size: 1 000 records

Start_Date: timestamp (YYYY-MM-DD hh:mm:ss) – not null
Date and hour of the start of the auction.

Auction_ID: int, up to 5 numbers in length – unique and not null
Unique ID of each auction, generated when adding.

End_Date: timestamp (YYYY-MM-DD hh:mm:ss)
Date and hour of the end of the auction. Doesn't have to be specified right after making the record.

Entity set: **Transactions_Positions**
Set of all individual positions within transactions.Added when a transaction is placed. Records are never deleted.
Estimated size: 5 000 records

Position_ID: int – unique and not null
Unique ID number of each position within a transaction. Generated when an offer is accepted and turns into a transaction.

Is_Star: binary – default = 0
Shows whether a position is a star (1) or not (0).

Position_Price: int, in range (0, 50 000> in USD – not null
Unit price of a position.

Entity set: **Payments**
Set of all completed payments for orders.Added right after transaction with empty attributes, which are filled after completion of the payment. Records are never deleted.
Estimated size: 5 000 records

Payment_ID: int, up to 6 numbers in length – unique and not null
Unique ID number of each payment, generated randomly.

Payment_Date: timestamp (YYYY-MM-DD hh:mm:ss) – not null
Date and hour of the payment.

Payment_Ammount: int, greater than 0– not null
Ammount transferred in USD.

Entity set: **Employees**
Set of all employees of the client. Added when a person is employed.Records are never deleted.
Estimated size: 200 records

Employee_Full_Name: varchar, up to 30 characters – letters and spaces – not null

Name(s) and surname of the employee.

Employee_ID: int,up to 4 numbers in length – unique and not null
Unique ID of the employee, generated when a person gets employed.

Is_Current: binary – default = 1
Shows whether an employee is currently employed (1) or not (0).

Employee_Contact_Phone: bigint, 4 to 13 numbers – not null
Phone number of an employee, assigned when a person is employed, chosen by them.

Employee_Email: varchar, must contain an "@" symbol, no white spaces – up to 30 characters in length – not null
E-mail address of a specific employee, assigned when a person is employed, chosen by them.

Is_Available: binary – default = 1
Shows whether an employee is available to take on more responsibilities (1) or not (0).

Relationships descriptions:

Consist_of:Stellar_Systems– Galaxies (0..n – 1)
Stellar_Systems lay within Galaxies. One galaxy can have up to multiple stellar systems or none – if it was just added. Stellar system must be assigned to a galaxy.

Contain:Stellar_Systems – Stars (1 – 0..n)
Stellar systems can contain multiple stars or none if the were just added. A star must be assigned to a stellar system.

Include:Planets – Stellar_Systems (0..n – 0..1)
Stellar systems can include multiple or none planets. A planet can be assigned to 1 or 0 stellar systems in case it is rogue.

Are_divided_into: Plots – Planets (0..n – 1)
Planets surface is divided into plots. On a planet there can be many plots or none if it was just added. A single plot has to be assigned to exactly one planet.

Have:Buyers – Addresses (1 – 0..n)
Buyers can have many different addresses assigned to their account after making it. A single buyer has to be assigned to exactly one buyer.

Are_givenP: Plots – Offers (0..1 – 0..n)
Many offers can be given for a plot. Some offers can be for stars, so no plots should be assigned.

Are_givenS: Stars – Offers (0..1 – 0..n)
Many offers can be given for a star. Some offers can be for plots, so no stars should be assigned.

Need: Certificates – Transactions_Positions (0..1 – 1)
Each transaction position needs up to one certificate to follow through with the transaction's delivery. A position may not always have a certificate, for example right after purchase.

Are_followed_by: Transactions – Payments (1 – 0..n)
One payment regards exactly one transaction. A transaction can not have a payment, for example right after placing it. If a customer by mistake transfers a wrong ammount, they can send another payment to

transfer the full sum.

Handle: Employees - Deliveries (1 – 0..n)
A single employee can handle multiple or none deliveries in their history of work. One delivery is always handled by one employee.

Are_Made_By: Offers – Buyers (0..n – 1)
A buyer can have a registered account without placing any offers. An offer must be placed by a specific buyer.

Sums: Transactions_Positions - Employees (0..n – 1)
An employee can be responsible for multiple or none transactions positions. For no transaction position are more than 1 employees responsible.

Supervise: Employees – Transactions (1 – 0..n)
Employees supervise transactions to make sure they are completed successfully.

Accepts: Offers – Employees (0..n –1)
A single employee can accept many or none different offers. A single offer has to be reviewed by exactly one employee.

Go_toP: Plots – Auctions (0..1 – 0..n)
Plots can go to auctions multiple or none times – in case they are not sold on one of them. A single auction regards one plot.

Go_toS: Stars – Auctions (0..1 – 0..n)
Stars can go to auctions multiple or none times – in case they are not sold on one of them. A single auction regards one star.

Are_For: Transactions_Positions – Offers (0..1 – 1)
Transction position regards one offer for one of the available items from the available inventory. An offer doesn't have to be followed with a transaction, hence the optionality.

DescribeS: Stars – Certificates (0..1 – 0..1)
Certificates are for a specific star. A certificate can be for a plot, hence the optionality.

DescribeP: Certificates – Plots (0..1 – 0..1)
Certificates are for a specific plot. A certificate can be for a star, hence the optionality.

Undergo: Certificates – Deliveries (1..n – 0..n)
Certificates should be delivered, but right after generation no delivery invoice is generated, hence the optionality. There can be multiple certificates in a single delivery if purchased in the same transaction. If package is lost/damaged or simply does not complete the delivery, new copy of the same certificate(s) is sent.

Make_Up: Transactions_Positions – Transactions (1..n – 1)
Transactions are made up off at least one transaction position. One transaction position must be on exactly one transaction.

Are_placed_on: Auctions – Offers (0..1 – 0..n)
Multiple or none offers can be placed on the same auction. An offer can be placed on one auction or outside of an auction.

Are_sent_to: Deliveries – Addresses (0..n – 1)
Every delivery is sent to exactly one address. There can be multiple deliveries made to a single address throughout its' history.

Relational Database Schema:

Galaxies (Galaxy_Name, Galactic_Longitude, Galactic_Latitude)

Stellar_Systems (System_ID, Number_of_Stars, Number_of_Planets, Galaxy_Name REF

Galaxies)

Planets (Planet_Name, Surface_Area, Price_per_Acre, Mass, Planet_Longitude, Planet_Latitude, System_ID REF Stellar_Systems)

Plots(Size, Quadrant, Latitude, Longitude, Lot_Number, Is_Available, Value, Planet_Name REF Planets)

Stars(Bayer_Designation, Is_Available, Value, Mass, Brightness, Star_Longitude, Star_Latitude, System_ID REF Stellar_Systems)

Auctions (Start_Date, Auction_ID, End_Date)

Offers (Offer_ID, Offer_Ammount, Is_From_Auction, Is_Final, Bayer_Designation REF Stars, Lot_Number REF Plot, Buyer_ID REF Buyers, Employee_ID REF Employees, Auction_ID REF Auctions)

Addresses (City, Country, Address_ID, ZIP_Code, Street_Name, House_Number, Is_Default, Buyer_ID REF Buyers)

Buyers (Buyer_Full_Name, Buyer_ID, Buyer_Email, Buyer_Phone_Number)

Payments (Payment_ID, Payment_Date, Payment_Ammount, Transaction_Number REF Transactions)

Transactions_Positions (Position_ID, Is_Star, Position_Price, Transaction_Number REF Transactions, Offer_ID REF Offers, Employee_ID REF Employees)

Certificates (Certificate_ID, Is_For_Star, Chosen_Star_Name, Position_ID REFTransactions_Positions)

Deliveries (Delivery_Number, Is_Sent, Is_Delivered, Employee_ID REF Employees, Address_ID REF Addresses)

Transactions (Transaction_Date, Transaction_Number, Transaction_Price, Is_Paid_For, Employee_ID REF Employees)

Employees (Employee_Full_Name, Employee_ID, Is_Current, Employee_Contact_Phone, Employee_Email, Is_Available)

Go_toS (Auction_ID REF Auctions, Bayer_Designation REF Stars)

Go_toP (Auction_ID REF Auctions, Lot_Number REF Plots)

DescribeS (Certificate_ID REF Certificates, Bayer_Designation REF Stars)

DescribeP (Certificate_ID REF Certificates, Lot_Number REF Plots)

Undergo (Certificate_ID REF Certificates, Delivery_Number REF Deliveries)

Are_Placed_On (Auction ID REF Auctions, Offer_ID REF Offers)