THE UNIVERSITY OF SYDNEY

School of Information Technologies
A/Prof Uwe Röhm

INFO2120: Database Systems **1.Sem./2014**

DB Project Assignment 1: Conceptual Database Design

Group Assignment (10%)
(INFO2120) **18.03.2014**

Introduction and Objectives

The objectives of this assignment are to gain practical experience in conceptual database modelling and to experience group-based design work. This is a group assignment for **teams of up-to 3 members** that is **due on Tuesday of week 6** (April 8th). Your solution will be marked for correctness of the database design and completeness of the data model with regard to the grading scheme as described on the last page.

Please note: Teams will be formed via team sign-up sheets in eLearning. The mark awarded for your assignment is conditional on *any team member* being able to explain details of your designs to your tutor or the subject coordinator if asked. Late submissions will attract a 20% penalty per day late.

Design Brief: Online Car Sharing Database

In this assignment, your team shall model a database for the online booking system of a car sharing organisation with at least the information as specified below. Your task is to create a conceptual schema **(E-R diagram (lecture notation))** for the given scenario.

The basic idea of car sharing is short-term, on-demand car rental from dedicated parking spots in the close neighbourhood with a 'pay-as-you-go' payment model: A car share organisation has several cars that are parked at dedicated locations around a city. These cars are shared by all subscribed members of the car-sharing organisation: An online system allows a member to book one of the available cars for a certain time period. Using their personal swipe card, members can then open the booked car which is parked at a dedicated parking space, drive it, and finally return the car to the same location.

For further information, feel free to check examples for car share organisations world-wide, such as ZipCar in the US (zipcar.com) or Mobility in Europe (www.mobility.ch/en/pub/). Here in Australia, at least four companies offer a car-sharing service: Go Get (goget.com.au), Flexicar (flexicar.com.au), GreenCarShare (www.greensharecar.com.au), and Hertz 24/7 (hertz247.com.au).

Car Fleet Management
Your database needs to keep track of basic information about the organisation's car fleet: Each car has an unique registration number, a make and model, and a year it was built, and either has manual or automatic transmission. For ease of use, every car also gets a unique memorisable name – such as 'Jennifer the Yaris'. We further classify cars by passenger capacity and category (e.g. *economy*, *compact*, *ute*, *van*).

Every car has a dedicated parking space (a so-called 'pod') somewhere in the city. You need to keep track of each car pod with regard to its exact address, its GPS position (longitude and latitude) and some description of how to get there. We also want to give each location a short, memorisable unique name (such as 'Sydney Uni Footbridge'). At each pod, at least one car is parked, but some locations can be large enough to park more than one car.

Membership Management
Your database needs to keep track of some general information about each member of the car sharing organisation, such as their full name, birthdate (optional), gender and address. In order to be able to use our system, every car sharing member gets assigned an unique membership number, as well as a password with which they can later login to our online booking system. For legal reasons we also need to know the driver's license number of each member, and until when it is valid.

Individual members can also choose one 'home pod', which would be one of the available car locations where they normally make their bookings.

Each member is associated with exactly one membership account which s/he might share with up-to five (5) members. The idea is to allow families or companies to have a common membership account with the car sharing organisation that gets charged for all their individual usages together. Each membership account has a unique account number and a name, and you also should keep track of the date when the account was opened. You also need to record billing information per membership account, such as a bank account, credit card (with corresponding details), or Paypal.

There are several membership plans which define the costs for each car rental, and each memberships account must be on exactly one plan. A car sharing plan has typically at least two components: A monthly membership fee and a usage fee, which in turn typically consists of a per-hour booking rate and a per-kilometer charge. There are further refinements possible, such as variable insurance excess rates or daily rates. Feel free to do some background research and come up with your own payment model.

A Credit-level or above model should further distinguish between private membership accounts and business accounts. Private membership accounts shall keep track of the address of the account (assuming a single 'family' address), what the 'walk-score' that address has (cf. www.walkscore.com), and the category of the account (such as for VIPs or veteran members). Business membership accounts require an ABN number and a flag whether the company is exempt from GST.

Bookings
Members can make bookings for cars for a certain time period. Your booking system must keep track of when bookings have been made by members, for which exact time, and for how long. For simplicity reasons, we only allow bookings for a length of multiple hours, starting at a full hour. The system shall also store the distance travelled with a car for each booking. Each booking has a status and bookings get referred to with a unique id.

User Reviews and Ratings
Finally, a Credit level and above model should allow members to review individual cars. This should include full-text comments by members about a previously booked car together with a rating on a scale of 1 (don't like) to 5 (like very much). Other members shall further be able to 'like' reviews and rate them on how useful they found them. For each rating, review or 'usefulness-rating' , the database shall keep track of who issued those reviews and when.

Extensions

Students who strive for Distinction or High Distinction grades should extend the model in some non-trivial way. Describe your extensions in an additional brief (`Discussion.txt`) as part of your assignment, and model the extension properly. You will be assessed on how closely your model matches the brief, as well as appropriate use of EER elements such as aggregation, ISA hierarchies, etc. Possible extensions include:

1. More generic views on what can be booked beyond cars (such as electrical cars, bicycles or segways) with appropriate attributes and relationships. This must include to capture the charging requirements for electrical vehicles.

2. Inclusion of privately-owned cars – or even car pods – which can be booked as part of the car-fleet during a specific time period for some fee.
   (some of the cars are owned by an external person who let their private car out via the car-sharing organisation during a pre-defined time for a certain fee)

3. On-Board Computer Logs that keep track of all trips done with any car with exact start and end times and all details to invoice the member later.
   (Every car of a car-sharing fleet has an on-board computer that controls who is allowed to open a car, as well as keeps track of the length and duration of the individual trips. Note that a user can open and close a car multiple times during the period that s/he has booked a car.)

4. ... *insert your idea here ;)*
   (the car-sharing presentation in Week 3 by GoGet's CTO gave some hints)

In order to achieve a Distinction or High Distinction grade, you should include at least one own extension that makes sense for the car-sharing scenario. Which extension is up-to you.

Submission Details

Submit your solution **in the 'Assignment' section of eLearning** by the deadline in week 6:

- an **E-R diagram (lecture notation)** of the conceptual database model as PDF;
- a **Discussion.txt** file containing a (brief) discussion of any design problems and how your team resolved them, as well as any further comments. Clearly indicate when you added ideas and extensions beyond the scenario description, and how you modelled those.
- a filled-in **assignment cover sheet** that the work is original and not plagiarised from others.

Assessment Criteria

Your team's final grade will depend on how sophisticated and correct your solution is. You can find the detailed marking rubric in eLearning.

Grade Descriptors

High Distinction 85 – 100%	The solution demonstrates an outstanding understanding of conceptual database design, including some original ideas ('extensions') and some discussion of design problems; the submission is a complete solution of the whole scenario including integrity constraints, and any additional modelling task with excellent quality of all deliverables; evidence of some further research into the topic
Distinction 75 – 84%	Thorough understanding of conceptual database design; medium level of original thinking and critical discussion of at least one design problem; the submission is a complete solution of the all modelling tasks including all integrity constraints and an approach to one extension to the described task with accomplished quality of the deliverables
Credit 65 – 74%	Good understanding of conceptual database design with E-R; adequate level of original thinking; complete solution of most of the scenario including the capture of any parts classified as 'Credit-level' and including most integrity constraints ; average quality of deliverables.
Pass 50 – 64%	The submitted E-R diagram captures the fundamental entity and relationship types, namely the *car fleet*, the *memberships* and the *bookings*.
Fail below 50%	Falls short of the basic requirements for a Pass.

Academic Honesty

IMPORTANT: Policy relating to Academic Dishonesty and Plagiarism.
All teams must declare that the work is original and not plagiarised from the work of others. In assessing a piece of submitted work, the School of IT may reproduce it entirely, may provide a copy to another member of faculty, and/or communicate a copy of this assignment to a plagiarism checking service or in-house computer program. A copy of the assignment may be maintained by the service or the School of IT for the purpose of future plagiarism checking.