Noise Measurements using a Mobile Phone

A mobile phone App is to be developed to allow members of the general public to measure the noise levels in their local environment (in particular if they live close to an airport) and associate each measurement with a GPS position and a time-stamp (i.e. the exact time when the noise was measured). As well as the actual noise measurement, the users are also required to rate their perception of each noise measurement along four sliding scales -> love-hate, urban-rural, happy-sad, manmade-natural. They should also be able to associate as many tags as they like with each noise measurement – for example 'garden', 'inside', 'next to double-decker bus', 'outside school', 'main road' to give more context about the measurement.

All of the above information will be collected on a mobile phone and submitted to a central database for analysis. The analysis should answer the following questions:

1. How many times has each tag been used?
2. How many times has each phone taken a noise measurement?
3. Who owns the phone?
4. In which UK County was the measurement taken?
5. What is the maximum and minimum DB measurement taken by each phone?
6. What is the average DB measurement per county?

NB: The App can be downloaded by anyone owning a phone. The University research group carrying out the study will also loan out phones – i.e. one phone could be used by many people.

1. Identify and diagram the entities involved in the above system.

2. Identify and diagram the relationships between the entities.

3. Identify and diagram attributes for the entities and relationships you have drawn.

4. Identify and diagram the cardinality of the relationships you have drawn.

5. Identify and diagram the cardinality of the attributes you have identified.

6. Identify and diagram the identifying attributes of each entity.

Some thoughts:

1. A first entity is the county – you are asked ‘in which UK county …’ and a county is something that can be thought about without thinking of anything else to do with the noise

2. A second entity would be the phone itself – again, you can think of a phone as something you can pick up and move and you don’t really need to think of noise measurements at the same time

3. A third entity would be the noise measurements themselves – you can measure noise using devices that aren’t phones, and you could think of these measurements separately from the phone – i.e. you don’t really need to know what phone measured the noise to work with the actual noise readings.

    - This decision is also driven by the fact that the whole project is about noise so noise information is very important in its own right (rather than just being a property of the phone)
    - A further clue here is that **one phone** would take **many noise measurements** so in this case it is useful to separate them out.
    - We are also interested in properties of the noise measurement that aren’t properties of the phone – so you wouldn’t really have a phone with a property of “Noise Decibel Value” – that doesn’t describe the phone, it describes the noise measurement:

Things that you could have options on (ASSUMPTIONS ARE IMPORTANT!!)

1. Do you model the owner of the phone as a separate entity or not? It is normal to think of a person separately from their phone, so this could be one option. However, it would depend on what information you need to store about the person. The requirements aren’t clear (‘who’ is quite vague) so you could:
    a. **Assume** that you only need name and surname, and make this part of the phone entity **OR**

    b. **Assume** that information about the person is important to the system, and make a separate person entity with name, surname, date of birth, address and land line number

2. Do you model the perception ratings as a separate entity?   They are part of the noise measurement – you can’t say whether you love/hate the noise without actually having the noise measurement itself. So, at least conceptually, these are modelled as part of the noise.

a. **If you assume** that there will only ever be these four types of perception measurement, it is fine to keep them with the noise entity

b. **If you want a more flexible system**, where you could add other perceptions (e.g. warm/cold, indoor/outdoor) in later on, then it will be worth splitting them into a separate entity – this would be a many:many relationship – one noise measurement has many perceptions, and one perception rating is used for many noise measurements. If you do this you would need to make an **assumption** that this flexibility is required.

3. Do you model the tags as a separate entity? Intrinsically the tags are not separate from the noise – so you can't say that noise was measured 'near a bus stop' without having the noise itself, so the tags are probably part of the noise entity, at least conceptually. However ..

    a. One noise measurement would have MANY tags so it is useful to separate them out so that they can be counted more easily (relating back to the requirement to count the tags)

    b. **If you assume** that there will be a fixed list of tags that the user can choose from, this could even be a many:many relationship:

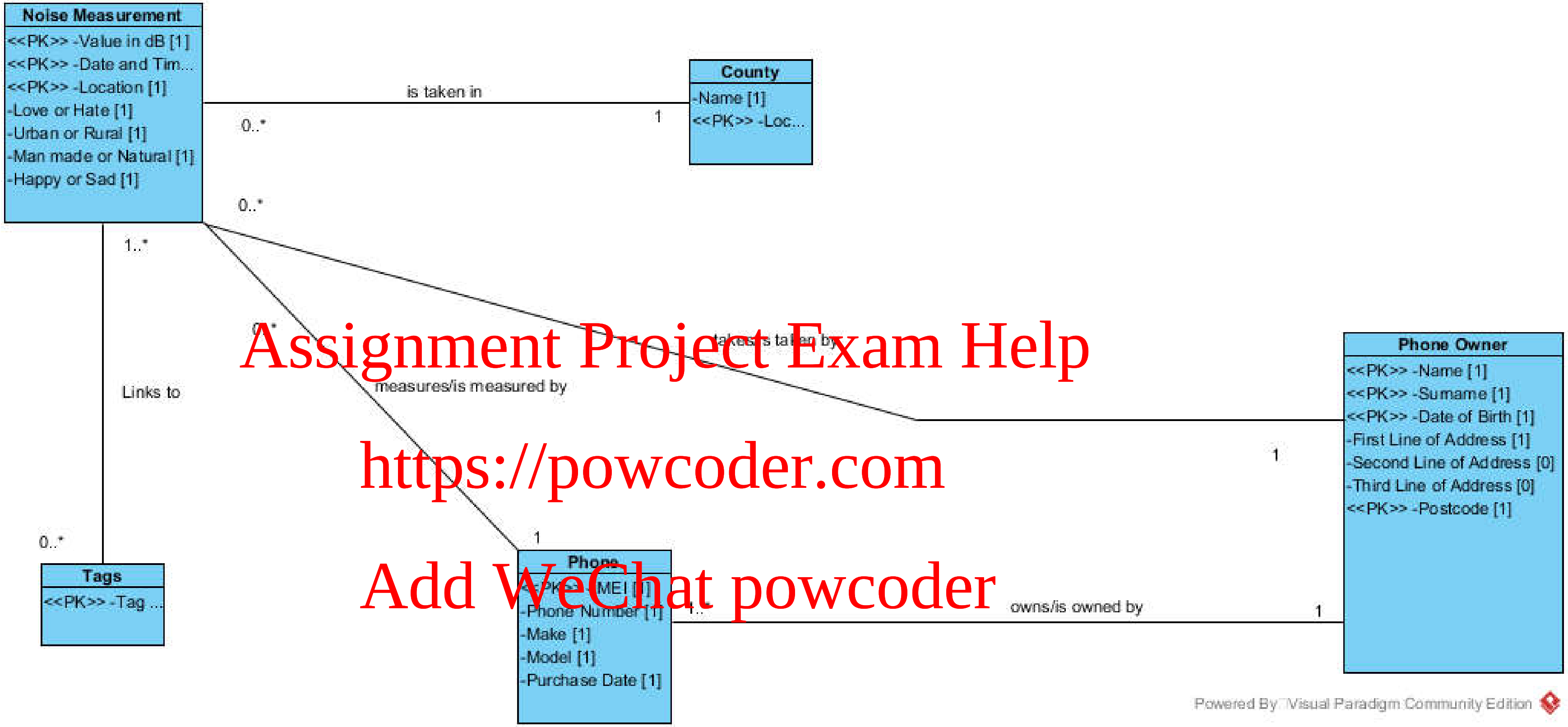
        i. 1 tag is used for many noise readings

        ii. 1 noise reading can have many tags

4. Do we link phone owner and county with a relationship? I've decided against this, as we don't really have a requirement to find out in which county the phone owner lives –so this would possibly be extra information that is not needed. You could of course **assume** that this might be extra functionality that is required of the system.

5. I have used the IMEI as the Identifier for the phone – this is really a substitute ID for a combination of make/model/manufacture date/manufacture location – but we don't have all that information (as this is held in the manufacturer's database) so have to use the substitute ID. So **the assumption here** is that the IMEI is unique in the world (which it should be).

6. We could also use the County Name as the identifier for the counties – **assuming** that there are no two counties that have the same name (which is probably a reasonable assumption).


Noise Measurement
<<PK>> -Value in dB [1]
<<PK>> -Date and Tim...
<<PK>> -Location [1]
-Love or Hate [1]
-Urban or Rural [1]
-Man made or Natural [1]
-Happy or Sad [1]
is taken in
0..*
1
County
-Name [1]
<<PK>> -Loc...
0..*
1..*
0..*
takes/is taken by
measures/is measured by
Links to
Phone Owner
<<PK>> -Name [1]
<<PK>> -Surname [1]
<<PK>> -Date of Birth [1]
-First Line of Address [1]
-Second Line of Address [0]
-Third Line of Address [0]
<<PK>> -Postcode [1]
1
0..*
1
Tags
<<PK>> -Tag ...
Phone
<<PK>> -IMEI [1]
-Phone Number [1]
-Make [1]
-Model [1]
-Purchase Date [1]
1..*
owns/is owned by
1
Powered By Visual Paradigm Community Edition