P3-LOGICAL DESIGN FOR VEHICLE INCIDENT MANAGEMENT DATABASE SYSTEM

PURPOSE SERVED:

Vehicle incident management is one of the most vital aspects of the automotive industry that has consistently benefited from advancing database management technologies. Every vehicle manufacturing company which prioritizes customer experience above all metrics by which their line of products can be assessed on has a highly efficient vehicle module database management system that is dynamically tracking the behavior of a variety of IOT devices within the vehicle and remotely administering changes to better suit the behavior of its respective driver.

Our project mainly deals with the incident handling component of this vehicle module management system where data related to incidents (that can either be accidents or general roadside assistance events like a flat tire or an engine breakdown) is captured to immediately rectify and simultaneously ensure efficient insurance claims processing and legal and compliance support. The efficiency of this model has a direct impact on the brand image of a automotive company as data collected on incidents can not only imply upgrades on vehicular components that could be the cause of the incident but also the quality of service provided to rectify it that a user can expect upon buying a vehicle.

KEY CHANGES MADE TO P2:

- **LOCATION ENTITY**: a LOCATION entity that tracks the location and the timestamp of the incident as soon as it is reported is added to the model to capture the flow of data between the IOT device that contacts us via a given network provider (that the sim inside the IOT device is registered on) and the INCIDENT entity which immediately records it as an entry to be rectified with a status of INPROGRESS or RECTIFIED.

  The LOCATION entity is connected to the INCIDENTS entity by a mandatory one to optional many relationship as a single location can have multiple incidents if multiple vehicles registered with us were involved in it. However a single incident cannot have multiple locations registered under it.

  The location is sent out by the IOT Device as latitude and longitude coordinates and all entries along with the timestamp are identified by the primary key of LocationID. The foreign key DEVICEID ensures that there are no duplicate entries if in the case that two vehicles registered on our database are involved in the same incident at the same location.

- **NORMALISATION OF ALL ENTITIES TO 3NF**: The INSURANCE entity is broken down into two relations as INSURANCE and INSURANCE COMPANY in order to remove partial dependencies of Insurance provider details on InsuranceProviderID and INSURANCE details such as policyNumber and state on INSURANCE.

  The same has been done with the SERVICEHISTORY entity as well. The service provider details are separated from service history details in order to remove partial dependencies. The service history is kept

independent of the provider as details related to the history of services provided to a car can have redundant information when provided by the same service provider.

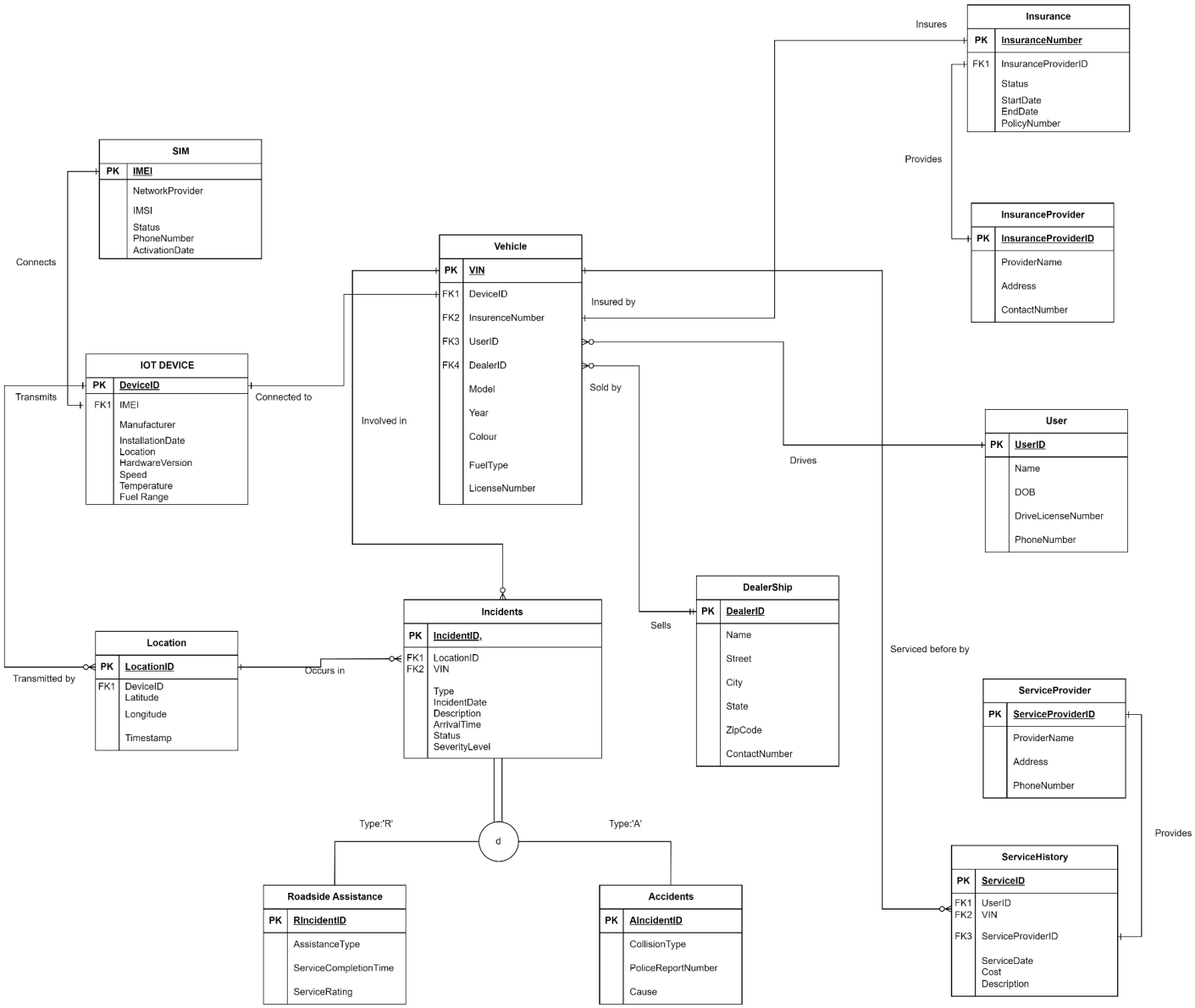
- **REMOVING COMPOSITE ATTRIBUTES**: The address attribute under INSURANCECOMPANY and SERVICEPROVIDER is broken down into multiple columns of street, city, state and zipcode. Though the zip code can have a transitive dependency on the state and the city pertaining to it, we have left it as is in order to efficiently retrieve the data at higher speeds along with other entries of SERVICEPROVIDER AND INSURANCECOMPANY.

- **REMOVING MANY-TO-MANY RELATIONSHIPS:** The USER and VEHICLE entities that were connected by an many to optional many is rectified as a mandatory one to optional many relationship where one user can have one or more number of vehicles registered under his name in our database.

- **LINKING PRIMARY AND FOREIGN KEYS:** As per the conceptual design of our model, we have linked the necessary primary keys to their respective foreign keys in relations related to it in such a way that referential integrity is ensured. The specialization of the INCIDENTS supertype into ACCIDENTS and ROADSIDE ASSISTANCE subtype entities is handled in the logical design as the subtypes having a special ID that is the combination of the INCIDENT type and IncidentID as RIncidentID and AIncidentID respectively.

- **ADDITIONAL ATTRIBUTES FOR IOT DEVICE:** Attributes for speed, temperature and fuel range have been added to the IOT device as well as they are valuable metrics that are to be recorded in the event of an accident or incident for insurance claiming and performance optimisation of the vehicle.

LOGICAL DESIGN



RELATIONAL SCHEMA