



## IMT 543 – Group 5

### Final ERD and Description

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#### Description:

We further improve our ERD based on Greg's feedback. Going through Greg's advice, we did many group meetings and combined both Greg's suggestions and our creative thoughts together to solve the real-life Park and Ride cases.

First, we did some normalizations, for example, we made the ParkRide entity more succinct. In the rough ERD we made, there are too many rows in the ParkRide entity such as ParkRideUsageID, capacityID, OccupancyID, and etc. We made new entities and divided the redundant data into them, so we can also access them by writing queries and that is one of the examples of how we reduce the redundant data in our old ERD.

Second, we add more components in the final ERD.

- 1) We added more tables about employee and maintenance in the final ERD. They include 3 tables, PR\_EMP\_MAINT, MAINTENANCETYPE, EMPLOYEE.
- 2) We add more tables about park and ride usage as well, such as PR\_USAGE\_DETAIL and USAGE\_DETAIL.
- 3) We consider that the utilization data (which reflects the occupancy rate of each park and ride) is received through the IOT\_GATEWAY. (i.e., a device connecting the sensors in a Park and Ride facility). When recognizing the source of utilization data, we decided to add additional entities to reflect this idea. We created an entity, called IOT\_GATEWAY. This entity is about information (ID and Description) of all the IoT gateways of all the Park and Ride facilities.
- 4) We also add another entity, as PARKRIDE\_GATEWAY. This is a highly transactional table, connecting the entity of IOT\_GATEWAY and the entity of PARKRIDE. In the entity of IOT\_GATEWAY, it has fields to record for each park and ride facility, in a certain time, how many occupied spaces are there.

In the exploration of solving this issue through ERD, we learn how to solve the use case of streaming data being populated to the relational database. Streaming data is gained through IoT gateway to reflect real-time parking availability data. We believe our ERD and the relational database would contribute to addressing the real-life issue of building a data pipeline for users and traffic agencies to access real-time parking availability information of each park and ride facility. We are excited to make efforts to build solutions for the smart city.

Note: The utilization data is one type of USAGE\_DETAIL recorded in the usage detail table.