

UP BikeShare Web Server

Data Design Document

Submitted to:

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Revision Control

History Revision:

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09/29/15	Carlos Penaflorida	1.0	Initial Document.

Database Design

User Account

Account Number	Username	First Name	Middle Name	Surname	Contact Number
SMALL INT	VAR-CHAR(250)	VAR-CHAR(250)	VAR-CHAR(250)	VAR-CHAR(250)	SMALL INT
9999	X(250)	X(250)	X(250)	X(250)	9(15)

Email Address	Subscription Type	State Type	Emergency Contact Number
VARCHAR(250)		SMALL INT	SMALL INT
X(250)		9	9(15)

Account State

State Type	Status
SMAL INT	VARCHAR(10)
9	X(10)

Bike Module

Bike Number	State Type	Location
SMALL INT	SMALL INT	VARCHAR(250)
9999	9	X(250)

Bike State

State Type	Status
SMALL INT	VARCHAR(10)
9	X(10)

Reservation

Transaction Number	Account Number	Bike Number	Time-From	Time-To	Location-From	Location-To	Date
SMALL INT	SMALL INT	SMALL INT	SMALL INT	SMALL INT	VARCHAR(250)	VARCHAR(250)	SMALL INT
99999	9999	9999	99:99	99:99	X(250)	X(250)	99/99/99

Finished Share

Transaction Number	Account Number	Bike Number	Time-From	Time-To	Location-From	Location-To	Date
SMALL INT	SMALL INT	SMALL INT	SMALL INT	SMALL INT	VARCHAR(250)	VARCHAR(250)	SMALL INT
99999	9999	9999	99:99	99:99	X(250)	X(250)	99/99/99

Ongoing Share

Transaction Number	Account Number	Bike Number	Time-From	Time-Last Update	Location-From	Location-Last Update
SMALL INT	SMALL INT	SMALL INT	SMALL INT	SMALL INT	VARCHAR(250)	VARCHAR(250)
99999	9999	9999	99:99	99:99	X(250)	X(250)

Report

Report Number	Account Number	Bike Number	Date	Time	Notes
SMALL INT	SMALL INT	SMALL INT	SMALL INT	SMALL INT	VARCHAR(250)
9999	9999	9999	99/99/99	99:99	X(250)

Delinquency

Delinquency Number	Account Number	Date	Time	Delinquency Type	Notes
SMALL INT	SMALL INT	SMALL INT	SMALL INT	SMALL INT	VARCHAR(250)
9999	9999	99/99/99	99:99	99	X(250)

Delinquency Type

Delinquency Type	Delinquency Category	Notes
SMALL INT	VARCHAR(250)	VARCHAR(250)
99	X(250)	X(250)

Location – Coordinates

Location	Coordinate-X	Coordinate-Y
VARCHAR(250)	SMALL INT	SMALL INT
X(250)	999	999

Table Details:

Table Name: User Account Contains the list of user accounts	
Columns	
<i>Column</i>	<i>Description</i>
Account number	4 digit integer (subject to change) used primarily to distinguish the account in the database
Username	String most often used to distinguish the account in interfaces
First name	First name of the user
Middle name	Middle name of the user
Surname	Surname of the user
Contact Number	Number used to contact the user
Emergency Contact Number	Number used to contact someone in case an emergency happened
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
State Type	Account State
Subscription Type	Subscription Type

Table Name: Account State	
Columns	
<i>Column</i>	<i>Description</i>
State Type	Integer used to differentiate varying states of the account
Status	String stating the state of the account

Table Name: Subscription Type	
Columns	
<i>Column</i>	<i>Description</i>
Subscription Type	

Subscription	
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Table Name: Bike Module	
Columns	
<i>Column</i>	<i>Description</i>
Bike number	Integer primarily used to differentiate the bike modules in the database
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
State Type	Bike State
Location	Location - Coordinates

Table Name: Bike State	
Columns	
<i>Column</i>	<i>Description</i>
State Type	Integer used to differentiate the varying states of the bike module
Status	String stating the state of the bike module

Table Name: Reservation	
Columns	
<i>Column</i>	<i>Description</i>
Transaction Number	Integer for distinguishing the individual "transactions"
Time-To	Time a certain bike module is to be used
Time-From	Time the said bike module is to returned
Date	Date
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
Account Number	User Account
Bike Number	Bike Module

Location-From	Location – Coordinates
Location-To	Location - Coordinates

Table Name: Finished Share	
Columns	
<i>Column</i>	<i>Description</i>
Transaction Number	Integer for distinguishing the individual “transactions”
Time-From	Time a certain bike module was borrowed
Time-To	Time the said bike module was returned
Date	Date the bike share was made
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
Account Number	User Account
Bike Number	Bike Module
Location-From	Location – Coordinates
Location-To	Location – Coordinates

Table Name: Ongoing Share	
Columns	
<i>Column</i>	<i>Description</i>
Transaction Number	Integer for distinguishing the individual “transactions”
Time-From	Time a certain bike module was borrowed
Time-Last Update	Time in which the last synching with the database was made
Date	Date
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
Account Number	User Account
Bike Number	Bike Module
Location-From	Location – Coordinates

Location-Last Update	Location – Coordinates
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Table Name: Report	
Columns	
<i>Column</i>	<i>Description</i>
Report Number	Integer used to distinguish the individual report
Time	Time the report was sent
Date	Date the report was sent
Notes	String containing additional information about the report
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
Account Number	User Account
Bike Number	Bike Module

Table Name: Delinquency	
Columns	
<i>Column</i>	<i>Description</i>
Delinquency Number	Integer used to distinguish the individual delinquency report
Date	Date the delinquency was recorded
Time	Time the delinquency was recorded
Notes	String containing additional information about the delinquency
Foreign Key	
<i>Column</i>	<i>Referenced Table</i>
Account Number	User Account
Delinquency Type	Delinquency Type

Table Name: Delinquency Type	
Columns	

<i>Column</i>	<i>Description</i>
Delinquency Type	Integer used to represent the different kinds of delinquencies
Delinquency Category	String containing the name of the delinquency
Notes	String containing details about the said delinquency

Table Name: Location - Coordinates	
Columns	
<i>Column</i>	<i>Description</i>
Location	String containing the name of the location
Coordinate – X	String used to create the virtual map
Coordinate - Y	String used to create the virtual map

Referential Integrity:

1. Deletion of rows in the User Account table is not allowed when rows with same Account Number exist in the Reservation, Finished Share, Ongoing Share, Report, or Delinquency table.
2. Insertion of rows in the User Account table is allowed.
3. Deletion of rows in the Account State table is not allowed when rows with same State Type exist in User Account table.
4. Insertion of rows in the Account State table is allowed.
5. Deletion of rows in the Bike Module Table is not allowed when rows with same Bike Number exist in the Reservation, Finished Share, Ongoing Share, or Report Table.
6. Insertion of rows in the Bike Module Table is allowed.
7. Deletion of rows in the Bike State Table is not allowed when rows with same State Type exist in the Bike Module Table.
8. Insertion of rows in the Bike State Table is allowed.
9. Deletion of rows in the Reservation Table is allowed.
10. Insertion of rows in the Reservation Table is allowed if and only if:
 1. There exist a row in the User Account Table with the same Account Number
 2. There exist a row in the Bike Module with the same Bike Number and whose Status is "Ready" as given by the Bike State Table
 3. There exist a row in the Bike Module Table with the same Bike Number and Location as the row's Bike Number and Location-From to be inserted
 4. There are no rows in the referencing table with the same Bike Number overlapping with the time period and date of the row to be inserted in the Reservation and Ongoing Share tables.
 5. The time and date of the row to be inserted has not lapsed.
11. Deletion of rows in the Finished Share Table is allowed.
12. Insertion of rows in the Finished Share Table is allowed if and only if:
 1. There exist a row in the Ongoing Share Table with the same attributes as the row to be inserted
 2. The said row is to be deleted from the Ongoing Share Table
 3. The value of the Location of the row with the same Bike Number in the Bike Module is to be updated
13. Deletion of rows in the Ongoing Share Table is allowed if an insertion of rows is made in the Finished Share Table (see 12.).
14. Insertion of rows in the Ongoing Share Table is allowed if and only if:
 1. There exist a row in the User Account Table with the same Account Number as the row to be inserted
 2. There exist a row in the Bike Module Table with the same Bike Number as the row to be inserted
 3. The said row in the Bike Module Table has a State Type equal to that of the State Type whose Status is "Ready" in the Bike State Table
 4. If there exist a row in the Reservation Table with the same Account Number, Bike Number, Time-From, Date, and Location-From, delete the said row
15. Updating of values in the Ongoing Share Table is allowed.
16. Deleting rows from the Location – Coordinates Table is not allowed if there exist rows with a Location equal to that of the row to be deleted.
17. Inserting of rows in the Location – Coordinates Table is allowed if there exist no rows in the Location-Coordinates Table with the same Coordinate-X and Coordinate-Y.
18. Updating of values in the Location-Coordinates Table is allowed.

19. Deletion of rows from the Report Table is allowed.
20. Inserting of rows in the Report Table is allowed if and only if:
 1. There exist a row with the same Account Number in the User Account Table
 2. There exist a row with the same Bike Number in the Bike Module Table
21. Deletion of rows from the Delinquency Table is allowed.
22. Inserting of rows in the Delinquency Table is allowed if and only if:
 1. There exist a row in the User Account Table with the same Account Number
 2. The said row has a State Type equal to that of a State Type with a Status of "Active" in the Account State Table.
23. Deletion of rows from the Delinquency Type Table is allowed if there exist no row in the Delinquency Table with the same Delinquency Type
24. Insertion of rows in the Delinquency Type Table is allowed

Triggering Operations:

User Rule: User must be Active
Event: Inserting, Updating
Table: Reservation, Finished Share, Ongoing Share, Report, Delinquency
Condition: User is anything but Active
Action: Reject insert or update

User Rule: Bike must be Ready
Event: Inserting
Table: Reservation, Ongoing Share
Condition: Bike is anything but Ready
Action: Reject insert

User Rule: Time borrowed must happen before time returned and time updated
Event: Inserting, Updating
Table: Reservation, Finished Share, Ongoing Share
Condition: Time-From > Time-To, Time-Last Update
Action: Reject insert or update

User Rule: User must be Active
Event: Inserting, Updating
Table: Reservation, Finished Share, Ongoing Share, Report, Delinquency
Condition: User is anything but Active
Action: Reject insert or update