**Technical Documentation for Enhanced Taxi Geolocation Simulator**

**1. Introduction**

This document describes a Python script that simulates the generation and periodic retrieval of taxi geolocations within a specified city. The script incorporates improvements over the previous version to provide a more realistic and user-friendly experience.

**2. Dependencies**

The script relies on the following Python libraries:

* random: Used for generating random numbers.
* time: Used for getting the current time and sleep functionality.
* geopy: A third-party library used for geocoding (converting addresses to coordinates).

**3. Functionality**

The script offers the following functionalities:

* **Generate Random Geolocation:** The generate\_random\_geolocation function retrieves the geographical coordinates (latitude and longitude) for a given city using the geopy library. It then generates a random offset within a plausible range around the city center using the random library. This creates a more realistic distribution of taxi locations compared to a purely random approach.
* **Get Taxi Geolocations:** The get\_taxi\_geolocations function generates a list of dictionaries containing the geolocations for a specified number of taxis in a chosen city. Each dictionary includes:
  + taxi\_id: A unique identifier for the taxi (starting from 1).
  + latitude: The randomly generated latitude value within the city boundaries.
  + longitude: The randomly generated longitude value within the city boundaries.
* **Main Loop:** The main function allows users to enter the desired city name and number of taxis. It then enters an infinite loop that performs the following actions:
  + Opens a log file (taxi\_locations.log) in append mode for storing the generated data.
  + Calls the get\_taxi\_geolocations function to generate taxi locations.
  + Prints the current date and time with the chosen city name to the log file.
  + Iterates through the list of taxi locations and prints each taxi's ID, latitude, and longitude to the log file.
  + Prints a message indicating the next update time (90 seconds) to the log file.
  + Sleeps for 90 seconds using time.sleep before repeating the process.

**4. Usage**

1. Save the script as a Python file (e.g., enhanced\_taxi\_simulator.py).
2. Run the script from the command line using python enhanced\_taxi\_simulator.py.

The script will prompt you to enter the city name (default: New York) and the number of taxis (default: 5). It will then continuously generate and log taxi geolocations every 90 seconds.

**5. Improvements**

* **More Realistic Location Distribution:** The script utilizes the geopy library to generate locations centered around a chosen city, providing a more realistic distribution compared to purely random coordinates.
* **User Input:** The script allows users to specify the city name and number of taxis, enhancing its flexibility and customization.
* **Logging Enhancements:** The script writes the generated data to a log file for later analysis or visualization. It also includes timestamps and city information within the log entries.

**6. Conclusion**

This enhanced Python script offers a more realistic and user-friendly experience for simulating taxi geolocations. It allows customization of city and taxi count, and provides a log file for data persistence. You can further extend the script to include additional features, such as:

* Specifying a custom time interval for updates.
* Visualizing the generated locations on a map.
* Implementing a mechanism to stop the simulation after a specific duration.

**Results of code execution:**

