

1) Real-Time Radiation Data Visualization (Highest Priority)

User Story:

As a user, I want to see live radiation levels from different locations displayed on the map in real time, so that I can monitor radiation exposure dynamically.

Explanation:

The core function of your project is to **display live sensor data** on a world map. Users should be able to **see radiation levels per location** with visual indicators (color-coded markers). Initially we can try to constrict the number of data points to only 200 or 300 to avoid cluttering or map. Later we can do the windowing method by using the **TIMESTAMP** attribute provided by the kafka message que by default. Not to get confused with our payloads **TIMESTAMP**. Speed of which how the markers appear is also open for research as of now.

In short – Map with markers which are being updated constantly

2) Threshold-Based Alerts & Notifications

User Story:

As a user, I want to get alerts when radiation levels exceed a dangerous threshold, so that I am warned about hazardous conditions.

Explanation:

Users should be able to **set a critical CPM threshold** from the front-end map and based on that user can get alert notifications. I have added the functionality of pop ups on the markers itself which shows a danger points.

If radiation exceeds this threshold, the system can do these things

Send pop-up notifications or alerts via the UI and we maintain a separate queue for this where all the high cpm data points are pushed or we can also have email push notification to a dummy mail as of now for testing purpose.

- **0–20 CPM (Normal Background)**
- **20–50 CPM (Elevated)**
- **50–100 CPM (Moderate)**
- **100–300 CPM (High)**
- **300–600 CPM (Very High)**
- **600–1000 CPM (Dangerous)**
- **1000+ CPM (Extreme)**

3) Heatmaps & Color-Coded Safe/Danger Zones

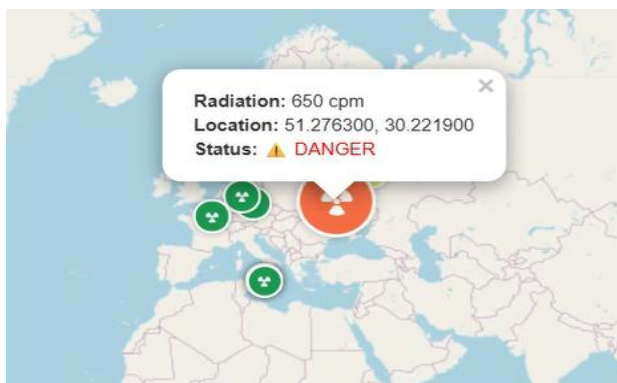
User Story:

As a user, I want the map to display radiation levels in different colours, so that I can easily identify safe and dangerous areas.

Explanation:

Instead of showing **individual data points**, use **heatmaps** to visually cluster radiation intensity. This clearly helps us to identify interesting area as mention in the Assignment. **Hybrid Approach** we can follow is to show **both markers and heatmaps** together:

- Markers **when zoomed in** for exact precise readings.
- Heatmap **when zoomed out** for big-picture trends.



Markers when zoomed in for extra details.



Heat maps when zoomed out totally

4) Configurable Geographic Filters

User Story:

As a user, I want to focus on specific locations instead of seeing all global radiation data, so that I can analyze radiation patterns within my area of interest.

Explanation:

Case 1) Allow users to **select a region/country** they want to monitor instead of loading all global data. We then have to Use **reverse geocoding** APIs (like Google Maps or OpenStreetMap) to convert lat/lon to country because our data has only latitude and longitude only.

Case 2) Could include **radius-based filtering** for example , "Show radiation levels within 50 km of Hamburg.

Case3) Let user draw a shape on the map and then only show those points inside the map. Looks complex but can be implemented if given some effort.

5) Show Average CPM. Highest CPM till now and other aggregate function results on our map i.e dash board metrics

This metrics will be changing in real time as our stream of data comes in. Imagine these numbers changing constantly depending on the speed of our data inflow.

Final expected output

