Module-2 Group Task -2

Big Data Process Mapping – Google Maps (Real-World Example)

For our group task, we have selected **Google Maps** as a real-world Big Data system. Everyday millions of people use Google Maps for directions, traffic updates, and finding nearby places. Behind this simple app, a huge amount of data is collected, stored, processed, and converted into useful information.

To understand this, we must map the entire data flow into **four stages**:

1. Data Sources
2. Data Storage
3. Data Processing
4. Output (Results to Users)

1. Data Sources (Where data comes from)

The first step in Big Data is collecting information from multiple sources. Google Maps collects data from many places at the same time.

Main Data Sources

a) Smartphone GPS

When people turn on location services, their phone continuously sends:

- Current location
- Speed of movement
- Direction of travel

Example:

If many phones move slowly on the same road, Google understands there is traffic.

b) Users' Search and Navigation

Whenever we:

- Search for a place
- Start navigation
- Check nearby shops

Google collects this data to understand travel patterns.

c) Road Sensors & Cameras

In some cities, traffic cameras and sensors provide:

- Vehicle count
- Traffic signals timing
- Accident alerts

d) User Contributions

Users can report:

- Accidents
- Road closures
- Speed checks
- Construction work

So, data is coming from **millions of devices and systems simultaneously.**

2. Data Storage (Where data is kept)

The data collected is extremely huge and cannot be stored in a normal database.

Google stores this data using **cloud and distributed storage systems**.

Why distributed storage?

- Data comes from the whole world
- It must be available 24/7

- It must be stored safely even if one server fails

Example:

Traffic data from India, USA, and Europe is stored across multiple servers so it can be accessed quickly anytime.

This stage ensures that **huge data is safely stored for future use and analysis.**

3. Data Processing (How data becomes useful)

Raw data is messy and cannot be used directly. So, Google processes it using **Big Data analytics and algorithms**.

Main Processing Steps

a) Data Cleaning

Remove wrong or duplicate data.

Example: If the GPS signal is weak and shows the wrong location, it gets corrected.

b) Traffic Analysis

Algorithms analyze:

- Speed of vehicles
- Number of vehicles
- Road conditions

If cars move slowly → traffic detected.

c) Route Optimization

Google compares:

- Multiple routes
- Distance
- Traffic conditions

- Estimated time

Then it calculates the **fastest route**.

d) Prediction

Google also predicts:

- Future traffic
- Busy hours
- Travel time

Example:

Even before traffic starts, Google may show “Heavy traffic is expected”.

This stage converts raw data into **meaningful insights**.

4. Output (What users see)

Finally, processed data is shown to users in an easy way.

Results shown in Google Maps

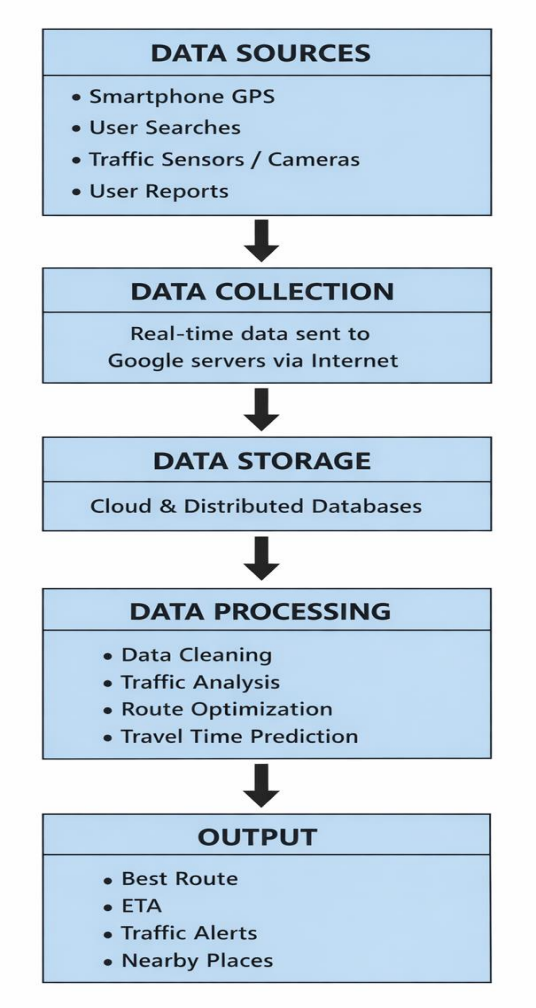
- Best route to destination
- Estimated arrival time (ETA)
- Traffic colors (Green, Orange, Red)
- Accident alerts
- Road closure notifications
- Nearby restaurants, petrol pumps, hospitals

Example:

When we start navigation, Google instantly shows the fastest route and warns if traffic appears ahead.

This is the final stage where **Big Data becomes useful for people.**

Complete Data Flow Summary



This entire pipeline happens **within seconds** every time we open Google Maps.

Conclusion:

Google Maps is a perfect example of Big Data Process Mapping. It collects massive real-time data from millions of users, stores it in cloud systems, processes it using powerful algorithms, and finally provides useful navigation and traffic updates.

This shows how Big Data moves from **raw information → smart decisions → real-world benefits**.