PROBLEM STATEMENT : LEO Satellite Network Topology & Latency Optimization
TEAM NAME : NETWORK CARE
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Problem Description

Low Earth Orbit (LEO) satellite constellations are highly dynamic — their fast orbital motion constantly changes link availability between satellites and ground stations. This creates routing instability, congestion, and unpredictable latency in communication networks. Understanding and modeling these topological changes accurately is essential before implementing optimization techniques.

Solution Proposed

The team developed a **satellite tracking and topology modeling system** that predicts satellite positions using reduce latency and constructs a dynamic connectivity graph between satellites and ground stations. This allows real-time visualization of available inter-satellite links (ISLs) and communication paths. The model serves as the foundation for future AI-based routing and latency optimization.

Optimization Proposed by the Team

1. **Efficient Orbit Prediction:** Reduced computational overhead by updating positions only every 5–10 seconds using interpolation between edge.
2. **Modular Framework:** Designed the code to integrate easily with the upcoming AI routing .

Solution Architecture and Design

Architecture Flow:

Input: Model Satellites as Nodes

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Generate User Requests

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Serve Requests from Cache

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Pre-Processing

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Dynamic Topology Output

Timeline of Delivery

Task
Collect and parse pre-process data for chosen LEO constellation
Implement in Python
Build dynamic graph structure for satellites + ISLs
Visualize satellite network topology (Matplotlib / latency-aware caching algorithm).

References

1. Ground control ACLS group company(edge to reduce latency)
2. Starlink Constellation TLE Data – Celestrak.org
3. Driven data labs.