Project Report - 2

Project Report-1

HBPR Based QoS Routing in LEO Satellites

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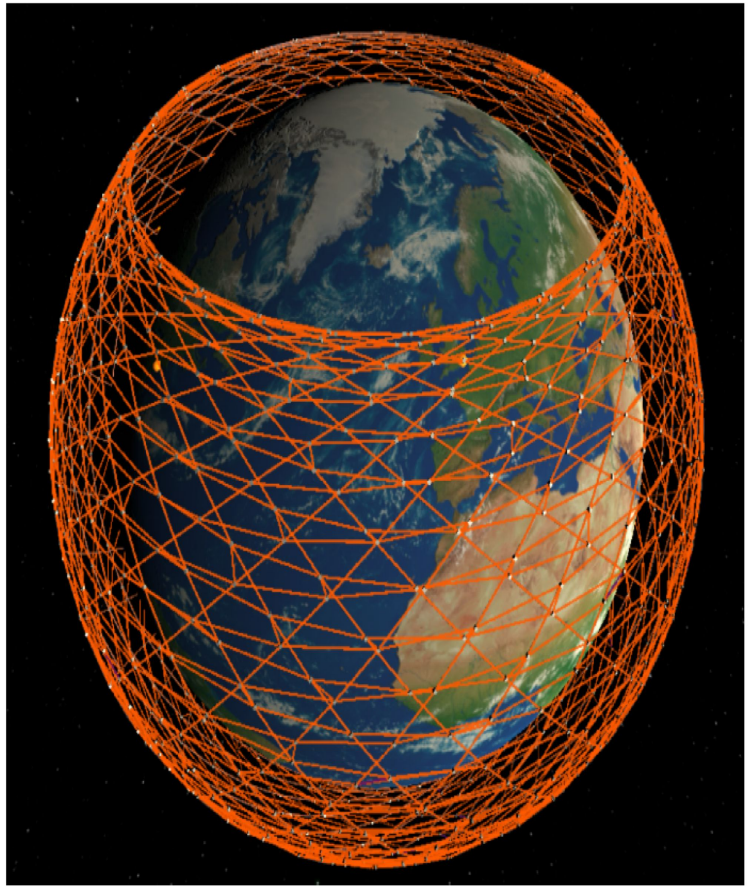
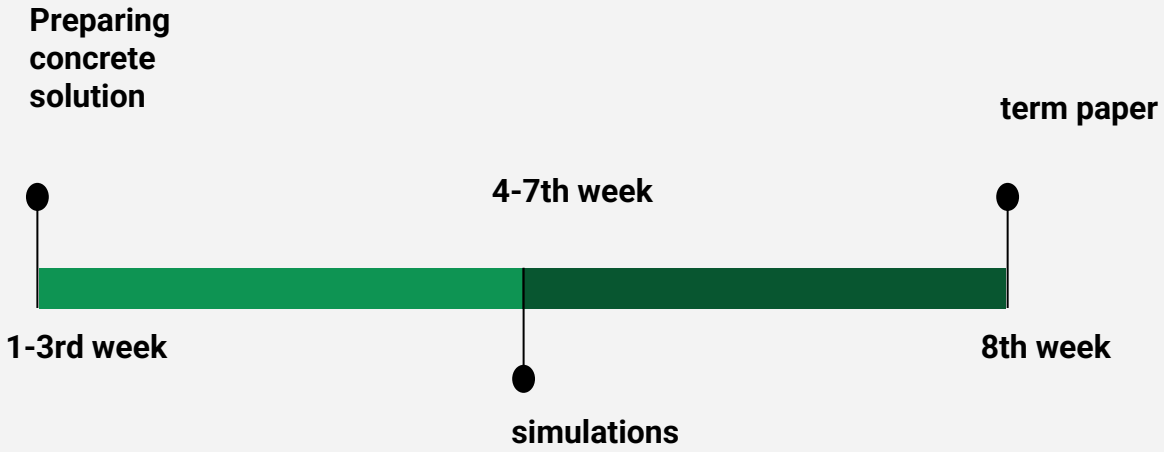


Timeline of our project



Agenda Overview

- Clustering
- Arima module
- Arima parameters
- Other Methods
- Dataset parameters
- BB frame structure
- What’s next

Clustering

- Remote area
- No global routing
- Using existing terrestrial network
- Instead of routing packets across the global through satellites only intra-clustering routing will be done via satellites.
- Instead of this we will use inter-clustering routing will be done by ground stations (terrestrial network).
- We will form 5*4 rectangular clusters centered around ground stations.
- Each cluster includes satellite that provides coverage to a certain geographical region.
- All clusters will cover the entire globe
- This ensures global coverage using multiple independent satellite clusters.

ARIMA(Autoregressive Integrated Moving Average) Module

- It is an weighted moving algorithm to predict next queue length.
- This predicted queue length from arima will feed into our HBPR mechanism which allows about taking smarting decisions about which node-to-node paths to choose based on anticipated congestion.

Why we have chosen arima?

- Leo satellites are expected to handle periodic bursts of data due to their rapid orbital movements and the nature of ground communication requests.
- These traffic patterns can be forecasted with historical queue length data,making ARIMA a viable candidate.
- It requires small data preprocessing and can be implemented using python's **statsmodel** python library.

Arima Parameters

What parameters will be given to predict the next queue lengths?

- RTT
- Queue length
- Input data entering into cluster

Our Initial Ideas

→ Formulation
→ heuristic method
→ model based on existing data set

Dataset parameters

- Here we have used lens dataset.
- The dataset comprises of latency measurements collected using two primary tools:
  - IRTT(internet round trip time)
  - Ping
- Here the conversation is between the ground stations and satellites.
- In IRTT they have converted the raw data into csv format and they have taken the 4 parameters. Those are:
  - Timestamps
  - RTT
  - Uplink
  - Downlink
- In ping also they have converted the raw data into csv format and they have taken the 2 parameters. Those are:
  - Timestamps
  - RTT

Dataset parameters

- How they have converted the raw data(.json format) into csv file(.csv format) parameters(RTT, Uplink, Downlink):
  - Uplink = server.receive - client.send
  - Downlink = client.receive - server.send
  - Processing delay = server.send - server.receive
  - RTT = Uplink + Processing + Downlink

- Sometimes there will be **packet loss** happens in the transmission.

Lost status	Meaning	RTT	Uplink	Downlink
false	success	RTT value	Uplink value	Downlink value
true	Full packet loss	-1	0	0
true_up	Lost on uplink	0	-1	0
true_down	Lost on downlink	0	0	-1

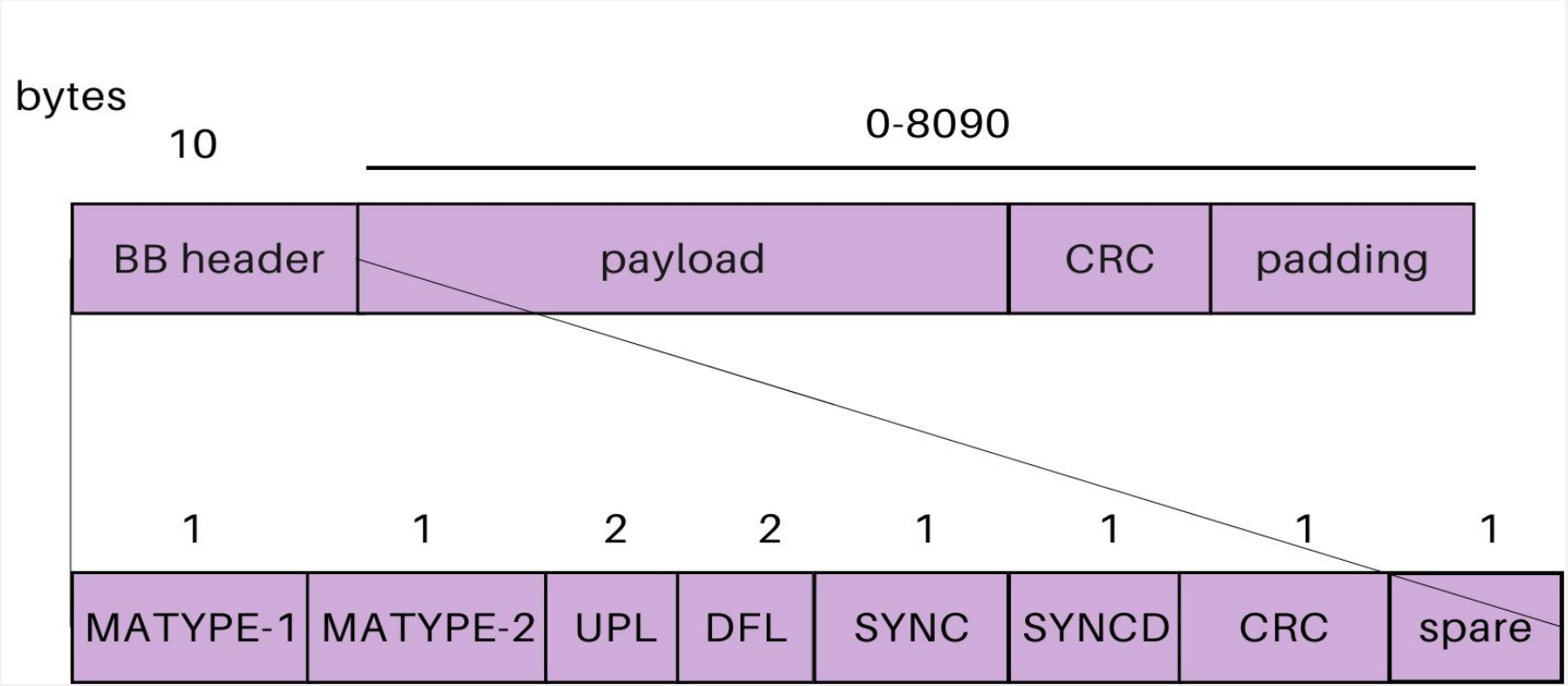
BaseBand(BB) Frame structure

What is BB frame?

- It is a structured unit of data in digital satellite communication systems, especially defined in DVB-S2,DVB-S2X and DVB-RCS2 standards.

- It’s used before modulation and channel coding, and is essential for encapsulating user data and preparing it for error correction and transmission over satellites.

BB Frame structure



What’s Next?

→ writing the codes and setting up full setup
→ using python,ns3,sns3.
→ we are using python to get arima predictions.
→ we are using sns3 to use broadcast(BB) frame of satellite which was already setted up in it.