PROBLEM STATEMENT:

This data scenario takes two different data sets and performs an integration between them. The first data set contains multiple years of Space Track two-line element (TLE) data (originally obtained from Space-Track.org), and it has the following format:

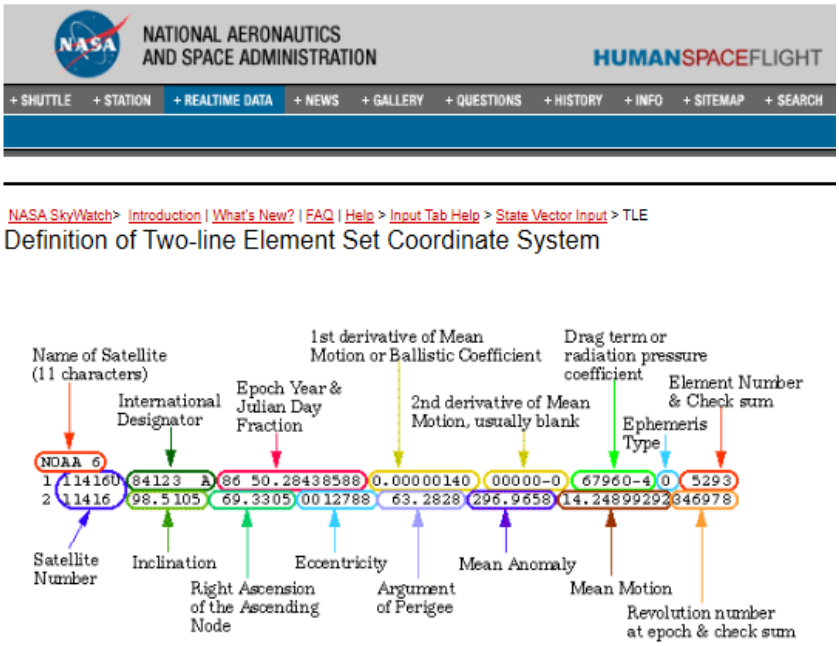

Figure Source: https://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/JavaSSOP/SSOP_Help/tle_def.html

The second data set contains multiple years of Automatic Identification System (AIS) vessel traffic data (originally obtained from the US Coast Guard), and it has the following .csv format:

Message ID	MMSI	Rx ID	Tx DTTM	Latitude	Longitude	Course over Ground (deg)	Navigational Status	Positional Accuracy	Rate of Turn (deg)	Speed over Ground (knots)	True Heading (deg)
1	000000000	r003381012	2009-10-09T19:00:14.0000000Z	38.998405	-76.38045833	19.1	Under Way using engine	Low (Autonomous Mode)	0	8.8	21
1	000000000	r003381012	2009-10-09T19:00:16.0000000Z	38.974	-76.48426	349.9	Under Way using engine	Low (Autonomous Mode)	0	0	326
1	000000000	r003381012	2009-10-09T19:00:18.0000000Z	38.97610833	-76.48319333	253.5	Under Way using engine	Low (Autonomous Mode)		0	
1	000000000	r003381012	2009-10-09T19:00:24.0000000Z	38.99880167	-76.38028	19.9	Under Way using engine	Low (Autonomous Mode)	0	8.8	21
1	000000000	r003381012	2009-10-09T19:00:26.0000000Z	38.974	-76.48426333	350.1	Under Way using engine	Low (Autonomous Mode)	0	0	326
1	000000000	r003381012	2009-10-09T19:00:27.0000000Z	38.97610833	-76.48318833	253.5	Under Way using engine	Low (Autonomous Mode)		0	
1	000000000	r003381012	2009-10-09T19:00:33.0000000Z	38.999165	-76.38010333	20.6	Under Way using engine	Low (Autonomous Mode)	0	8.8	22
1	000000000	r003381012	2009-10-09T19:00:35.0000000Z	38.973995	-76.48426833	346.5	Under Way using engine	Low (Autonomous Mode)	0	0	326
1	000000000	r003381012	2009-10-09T19:00:39.0000000Z	38.9761	-76.48316	253.5	Under Way using engine	Low (Autonomous Mode)		0	
1	000000000	r003381012	2009-10-09T19:00:43.0000000Z	38.99951833	-76.37991667	22	Under Way using engine	Low (Autonomous Mode)	0	8.8	23
3	000000000	r003381012	2009-10-09T19:01:09.0000000Z	38.97413667	-76.48380167	82.7	Moored	Low (Autonomous Mode)		0	
3	000000000	r003381012	2009-10-09T19:01:59.0000000Z	38.97672	-76.48401667	324.3	Moored	Low (Autonomous Mode)	-127	0	324
3	000000000	r003381012	2009-10-09T19:02:47.0000000Z	38.97671667	-76.48373333	226.3	At Anchor	Low (Autonomous Mode)	0	0	124
3	000000000	r003381012	2009-10-09T19:04:08.0000000Z	38.97414167	-76.48380833	344.3	Moored	Low (Autonomous Mode)		0	
3	000000000	r003381012	2009-10-09T19:05:00.0000000Z	38.97673833	-76.48404	323.8	Moored	Low (Autonomous Mode)	0	0.1	324
3	000000000	r003381012	2009-10-09T19:05:48.0000000Z	38.97671667	-76.48371667	226.3	At Anchor	Low (Autonomous Mode)	0	0	123
3	000000000	r003381012	2009-10-09T19:07:06.0000000Z	38.974125	-76.483805	11	Moored	Low (Autonomous Mode)		0	
3	000000000	r003381012	2009-10-09T19:08:00.0000000Z	38.97672	-76.48403333	282.5	Moored	Low (Autonomous Mode)	0	0	329
3	000000000	r003381012	2009-10-09T19:08:45.0000000Z	38.9767	-76.48371667	226.3	At Anchor	Low (Autonomous Mode)	0	0	123
3	000000000	r003381012	2009-10-09T19:08:53.0000000Z	39.01760333	-76.36925667	29.7	Under Way using engine	Low (Autonomous Mode)	0	9	30
3	000000000	r003381012	2009-10-09T19:09:01.0000000Z	39.01785	-76.36906333	31.2	Under Way using engine	Low (Autonomous Mode)	0	8.9	29
3	000000000	r003381012	2009-10-09T19:09:04.0000000Z	39.01796333	-76.368975	31	Under Way using engine	Low (Autonomous Mode)	0	8.9	30
3	000000000	r003381012	2009-10-09T19:09:08.0000000Z	39.01810333	-76.368865	31.5	Under Way using engine	Low (Autonomous Mode)	0	9	29
11	000000000	r003381012	2009-10-09T19:43:58.0000000Z	39.04277667	-76.38392333						
11	000000000	r003381012	2009-10-09T19:44:57.0000000Z	39.04022	-76.38277667						
11	000000000	r003381012	2009-10-09T19:59:03.0000000Z	39.00255333	-76.378835						
11	000000000	r003381012	2009-10-09T20:10:11.0000000Z	38.973995	-76.39023						
11	000000000	r003381012	2009-10-09T21:00:36.0000000Z	38.97392333	-76.48434167						
11	000000000	r003381012	2009-10-09T21:01:35.0000000Z	38.97391667	-76.48433						
11	000000000	r003381012	2009-10-09T21:04:38.0000000Z	38.97608667	-76.48316						
11	000000000	r003381012	2009-10-09T21:08:40.0000000Z	38.97340833	-76.48386167						
11	000000000	r003381012	2009-10-09T21:09:39.0000000Z	38.974715	-76.48229167						
11	000000000	r003381012	2009-10-09T21:11:40.0000000Z	38.97392167	-76.4843						
18	000000000	r003381012	2009-10-09T19:00:23.0000000Z	39.01803333	-76.378875						
18	000000000	r003381012	2009-10-09T19:00:30.0000000Z	38.98047333	-76.47552167						
18	000000000	r003381012	2009-10-09T19:00:44.0000000Z	38.97854333	-76.47771						
18	000000000	r003381012	2009-10-09T19:00:52.0000000Z	38.96531833	-76.479165						

Perform the following scenario objectives:

1) Determine the “hits” where a satellite has geodetic overlap of any vessel(s) at any point(s) in time. For simplicity, it may be assumed that a satellite has full view of half the earth (regardless of satellite type or its elevation above the earth). However, additional accuracy models with rationale is allowed.
2) Determine if any “holes” exist in the data that cause a loss of fidelity in data (e.g. missing identifiers).

Perform the following REQUIRED technical objectives:

1) Resulting code is in an open format available for use by the Government (e.g., Python, R, JavaScript, etc.).
2) Resulting files are in an open format available for use by the Government (e.g., JSON, csv, txt, xml, etc.).
3) Instructions are provided to allow the Government to implement and/or interact with the data, including software required for its use (e.g., Python environment, Jupyter Notebook, R Studio, etc.) and required configuration (e.g. Python packages, R packages, JavaScript libraries, etc.).
4) All analytical results and visualizations can be recreated from downloaded files and instructions using approved open-source software (e.g., Apache Spark, Anaconda [Jupyter Notebooks, Spyder], R Studio, NodeJS, Zeppelin Notebooks, etc.).
5) Visualizations are interactive/dynamic.

Perform the following REQUIRED administrative objectives:

1) Submission must be able to be replicated by the government data science team (e.g., Git repository, S3 bucket).
2) Submission implements open-source tools for the solution.
3) Provide the list of all tools and/or services used to support the solution.
4) Describe the statistical techniques used to implement the solution.
5) Describe the data management techniques used to implement the solution (e.g., curation, cleansing, etc.).
6) Describe the process to implement the solution.

Perform the following DESIRED technical objectives:

1) Submission is containerized and the container can be instantiated by the government data science team (e.g. Docker image, Kubernetes orchestration).
2) Submission is cloud-native (e.g. cloud templates, cloud-hosted visualizations, etc.).
3) End-to-end submission is available via a ready-to-run image.

Offerors may access the scenario data repository using the following instructions:

1) https://afdata.s3.us-gov-west-1.amazonaws.com/index.html