



CHANNEL PARTNER CASE STUDY

## KAYRROS | SPECTUS

The Power of Mobility Data to Predict Fuel Consumption and Supply Chain Activity



Kayrros is a global climate tech company and a world leader in earth observation technology. Kayrros helps governments, investors and businesses make better decisions, leveraging the power of satellite imagery and artificial intelligence to provide data and insights into global energy supplies and natural resources. By bringing transparency to the environment, Kayrros gives its partners the means to understand climate and energy risks to help create a better world. Kayrros generates reliable mobility insights for their clients by powering their products with Spectus' location data.

### Use Cases

Kayrros leverages Spectus for two primary use cases:

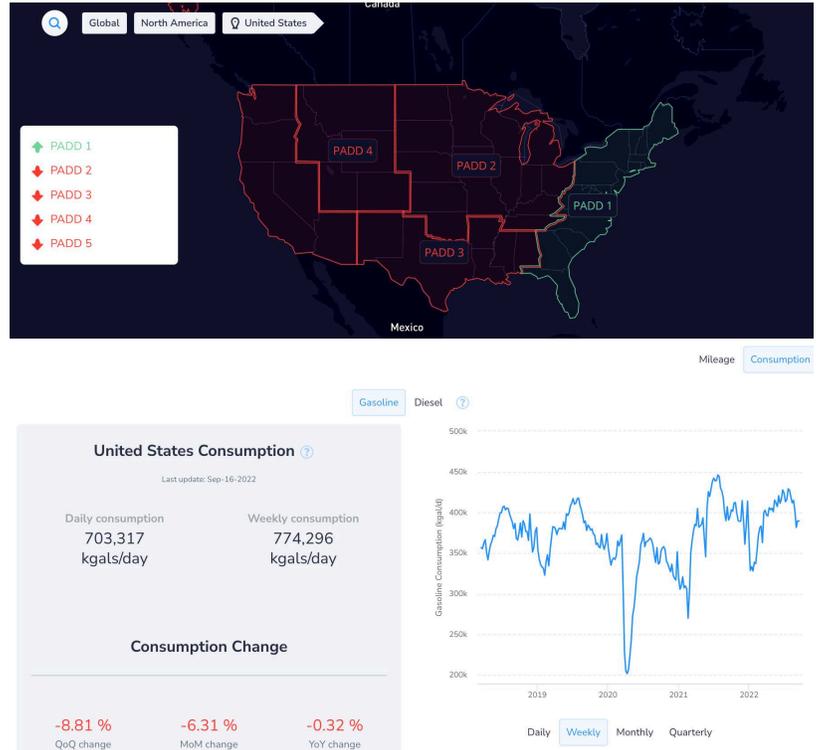
1. Predicting real-time fuel consumption and emissions
2. Monitoring supply chain activity



# Predict Real-Time Fuel Consumption and Emissions

Kayros provides clients with real-time estimates of gas and diesel consumption in the US by analyzing journeys and classifying them as passenger cars or commercial vehicles. Fuel consumption figures are then used to provide a bottom-up view of CO<sub>2</sub> emissions from ground transportation. Kayros infers fuel consumption based on the journeys made by passenger cars and commercial vehicles.

Figure 1: Kayros' dashboard showing US fuel consumption calculated from Spectus' Trajectories data.



**“Trajectory data from Spectus provides us a comprehensive view of mobility patterns across the US that enables accurate high-frequency modeling of fuel consumption before any other data source.”**

- Oliver Zhu, VP



Kayros feeds Spectus Trajectories datasets directly into their On-Road Demand product through the Data Flow Studio, which is a tool in our Data Clean Room that allows clients to compute, import, and export data. Trajectories are first filtered down to only journeys made in road vehicles, then aggregated on a daily regional basis to obtain the total mileage traveled. These daily aggregations are exported into an AWS S3 bucket where Kayros ingests the data into their own processes. A model based on historical mileage to fuel consumption conversions are applied and the data is normalized to produce a real-time view of fuel consumption that anticipates the weekly US DOE statistics.

## What is a Trajectory?

A trajectory is the path traveled between two consecutive stops in a given day. Trajectories can be used for origin-destination analyses by mapping the route, speed, and frequency of travel between points for a defined period. Trajectories are one of Spectus' many datasets that are immediately available to customers upon onboarding the platform.

# Monitor Supply Chain Activity

Spectus enables Kayrros to monitor supply chain activity and anticipate disruptions in real-time by analyzing workforce change at industrial facilities. By analyzing levels of foot traffic at industrial POIs, Kayrros can detect changes in activity that imply operational disruptions or improvements. Kayrros' clients use this information to adjust their operations so that disruptions across their supply chains can be mitigated.

Kayrros leverages Spectus' API to retrieve footfall metrics from thousands of POIs in near real-time.

**Spectus' API empowers partners to access the number of unique devices that stopped at nearly any POI over the past 3 years down to a 5<sup>2</sup> meter area in seconds.**

## Spectus' API

When clients request foot traffic data through the dashboard, Spectus is able to return the aggregate of the sum of unique devices that stopped within the given area quickly by leveraging an innovative data asset called `stoppers_h11_by_geohash`. As the name implies, `stoppers_h11_by_geohash` are based on device [Stops](#) and are aggregated by Geohash, a method used to divide the Earth into rectangular regions by encoding geographic coordinates into alphanumeric strings. The precision of a Geohash is represented by a number from 1 to 12 where higher values represent smaller rectangular regions and more precise measurements. For reference, Geohash 9 is a rectangle of approximately 5<sup>2</sup> meters. Spectus produces a [HyperLogLog](#) data asset for each Geohash from level 4 to 9 daily, and has backfilled footfall data to January 2019. HyperLogLog is a probabilistic data structure that Spectus uses to approximate the number of unique devices that stopped in a Geohash. With Spectus' API, partners and their clients can access the number of unique devices at nearly any POI – at hourly, daily, or weekly intervals – in real-time. Precise, granular footfall metrics are only a couple of clicks away.

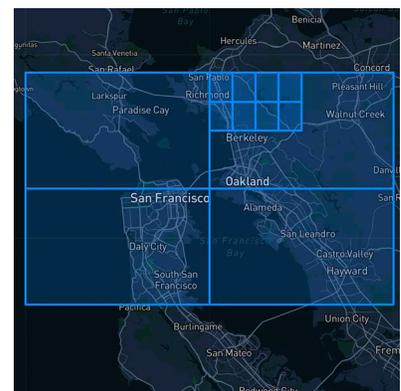


Figure 2: Geohash precision

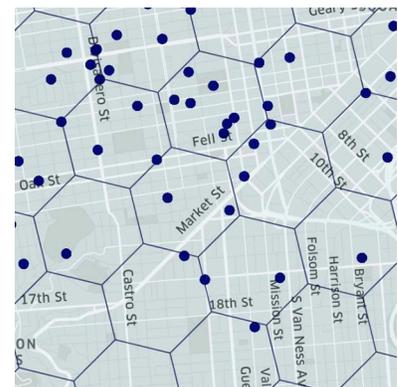


Figure 3: H3 cells

**Each grid system has a unique purpose. [Find out](#) which is best for your business.**

Spectus is equipped to spatially index areas using four distinct grid systems: Geohash, H3, S2, and Bing Tiles. Kayrros uses H3, a hexagonal grid system with 16 resolutions that's optimized to analyze large spatial datasets accurately. Kayrros indexes their data using relatively large H3 cells – resolution 6 – so their tables can be queried efficiently.

**“The API makes product building on top of Spectus data seamless and efficient. We run thousands of fully automated jobs on a daily basis.” - Oliver Zhu, VP**

## Batch Processing

When clients are interested in foot traffic metrics for predefined POIs, they can leverage Spectus' batch processing solution. Batch processing efficiently processes millions of custom polygons via Data Flow Studio. Clients can create jobs in Data Flow Studio to receive the count of distinct devices at multiple POIs by the hour, day, week, month, or year. Device counts are approximated by the same HyperLogLog data structure as the API. Clients can also request results that are processed further, such as normalized and sub-aggregate values, and compare foot traffic at multiple POIs at various times.



### Example: Monitoring Oil Field Activity

Kayrros combines Spectus location data with satellite observation data to provide an up-to-date view of the energy supply balance in the US. One example of this is the tracking of exploration and production (E&P) activity in US shale oil and gas basins. The development of new shale wells goes through multiple phases which require different equipment and workforce at the development site. Kayrros uses satellite imagery to determine what kind of equipment is being used and Spectus location data to more precisely determine the amount of time the workforce spent on site.

A combination of this information enables Kayrros' clients to anticipate how much new supply of oil and gas will go into the market and the operational efficiency of the companies developing these wells. This information then helps to inform energy market participants of the supply of oil and gas, and investors of company performance.

To do this, Kayrros uses Data Flow Studio to analyze hundreds of thousands of individual wells across the major US shale oil and gas basins. Data Flow Studio enables Kayrros to define custom queries that can be scheduled and run at scale.



## Data Clean Room

Kayrros accesses Spectus' customization tools and high-quality location data through the Data Clean Room, a secure environment with privacy-enhanced infrastructure and data assets to share aggregated data.

Data providers are becoming less comfortable with their data being sent or used in an open format due to increasing regulation and media scrutiny. The current model gives data owners less control over how their data is used and as a result, data feeds are becoming a thing of the past. The Data Clean Room is what allows us to partner with high-quality location data providers because they are comfortable with the privacy protections we have in place. With privacy-enhancing technologies like our patent-pending [Privacy Enhanced Mobility](#) and techniques like Differential Privacy, privacy has been embedded in the [design of our platform](#), which allows clients to fully leverage our mobility data and insights without privacy concerns.

**Spectus is an integral partner in bolstering product capabilities and strengthening internal analytics.**

**Learn more about how Spectus simplifies location data by contacting our Sales team.**



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