LOGISTICS+TECH SUMMIT

organized by hypertrack

Building Scalable and Secure Infrastructure for Logistics API Platform

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Thomas Raffetseder - Software Architect

Alex Kishinevsky - VP Engineering

Why does HyperTrack Exist?

```
import UIKit
import MapKit
import CoreLocation

class ViewController: UIViewController, CLLocationManagerDelegate {

    let locationManager = CLLocationManager()

    override func viewDidLoad() {
        super.viewDidLoad()
        locationManager.requestAlwaysAuthorization()
        if CLLocationManager.locationServicesEnabled() {
            locationManager.delegate = self
            locationManager.desiredAccuracy =
kCLLocationAccuracyNearestTenMeters
            locationManager.startUpdatingLocation()
        }
    }

    func locationManager(  manager: CLLocationManager, didUpdateLocations
locations: [CLLocation]) {
        guard let locValue: CLLocationCoordinate2D =
manager.location?.coordinate else { return }
        print("locations = \(locValue.latitude) \(locValue.longitude)")
    }
}
```

Mobile operating system's have APIs that provide you your device's GPS location and with a public cloud provider's managed services that can be integrated and implemented in minutes - why do you need experienced teams for this?

Quote from customer:

> "***At first we thought: OS gives you GPS location, and maps give you everything else. Why do we need HyperTrack?! And now after 8 months of using HyperTrack, I wonder how we ever thought of doing it ourselves.***" — *Android developer for a gig economy app in San Francisco"*

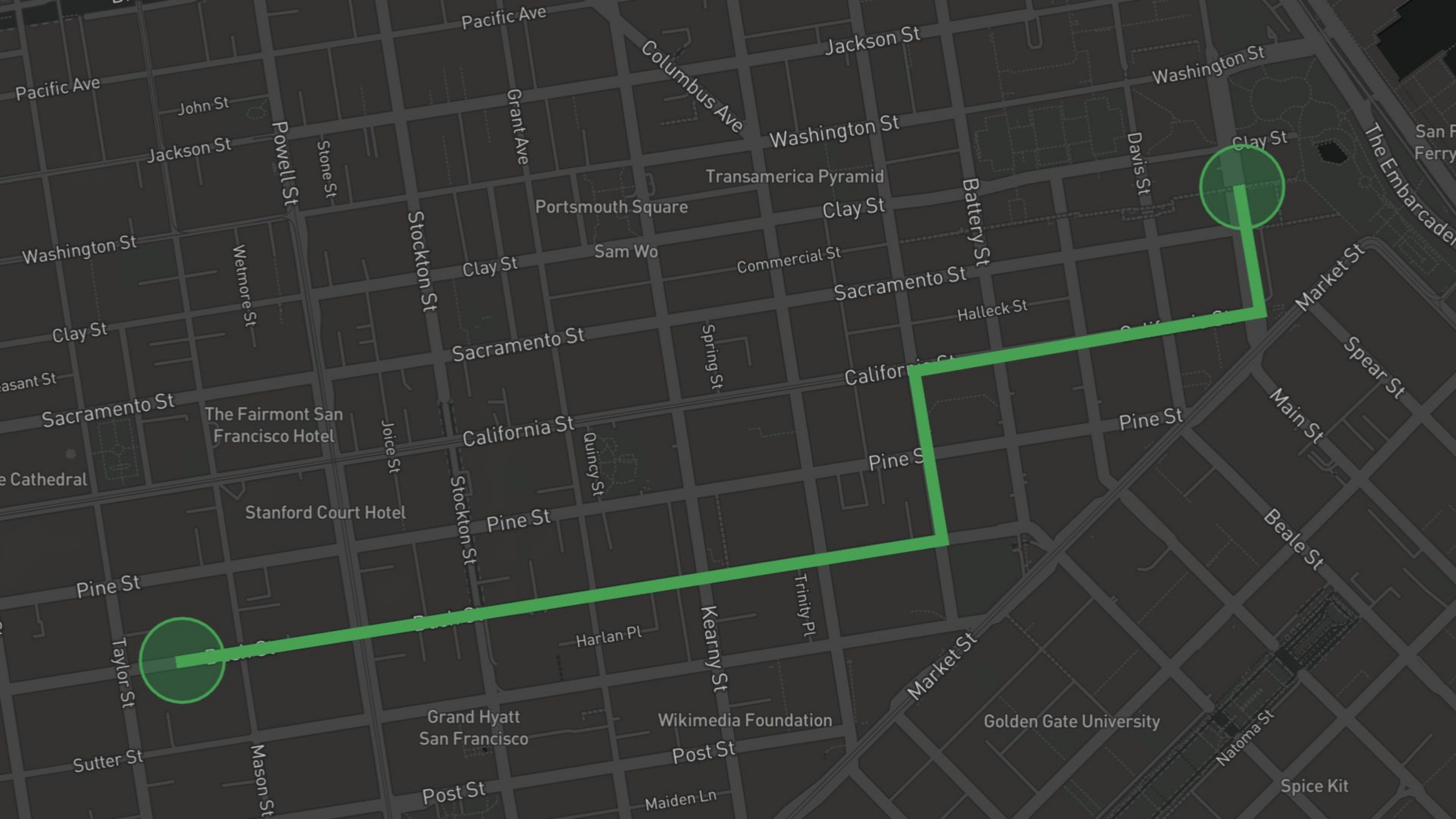
Use Cases

- **Live Order Tracking for Customers**
- **Dispatch Orders to Nearby Drivers**
- **Order Assignment and Route Optimization**
- **Productivity of Visits and Routes**
- **Pay Fairly Based on Ground Truth**
- **Enable Visibility to Ops Teams**

HyperTrack Platform

Mobile SDK	Battery efficient, real-time, accurate, fraud resilient, and secure location data generation and communication with the cloud platform
Cloud Platform	Secure, scalable, reliable, fault-tolerant, intelligent and real time location data processing to provide up to date driver location information, operations dashboard with maps and actionable insights
Data stores	Highly scalable, NoSQL stores for real-time updates and event processing, SQL stores for aggregate data, columnar databases for raw data, data science, and business intelligence analytics
Security	Secure access to public APIs and operations dashboards data; data encrypted at rest and in transit; data retention is limited to up to 90 days.

Accurately Capturing Driver Movement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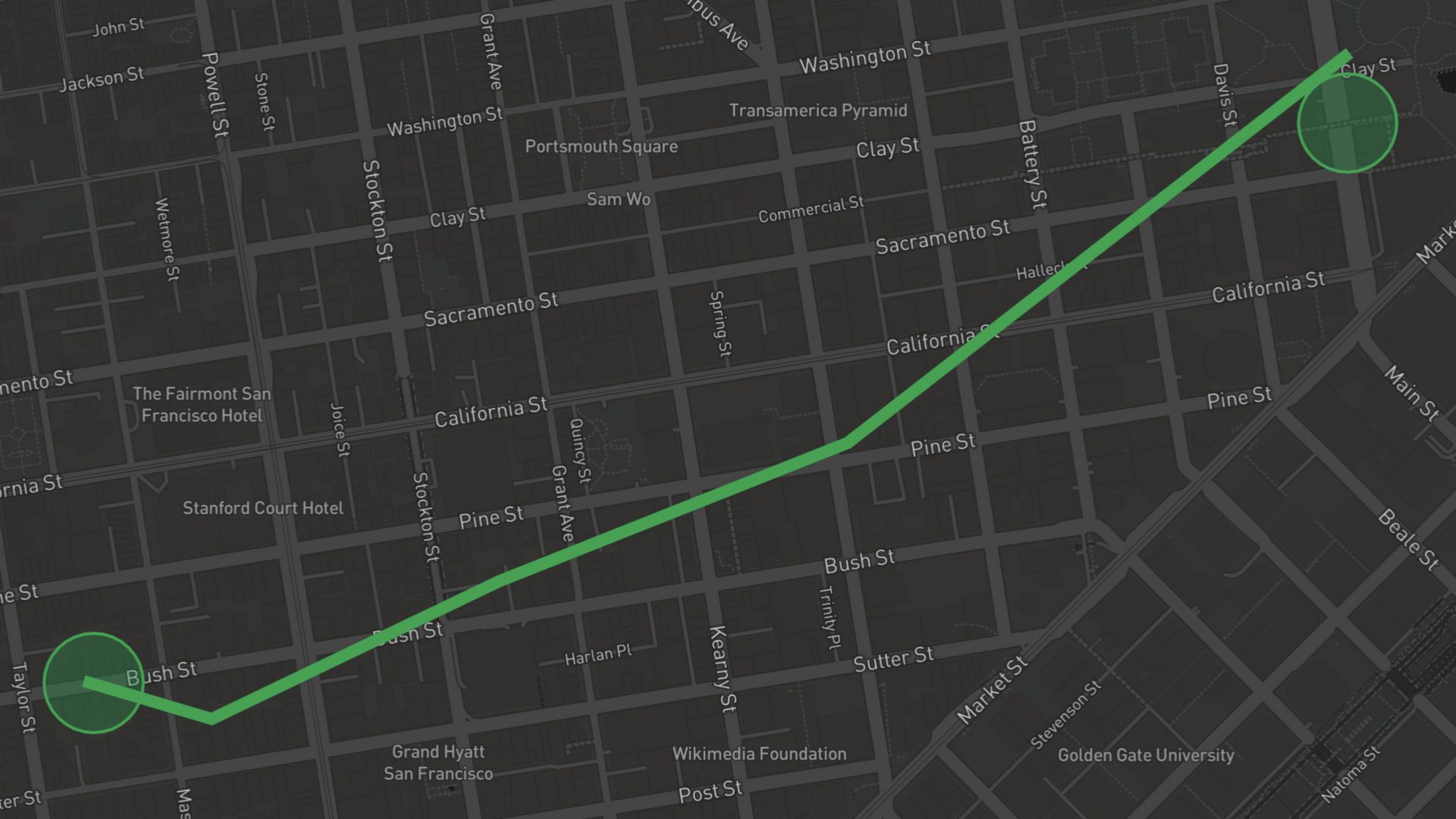
Spice Kit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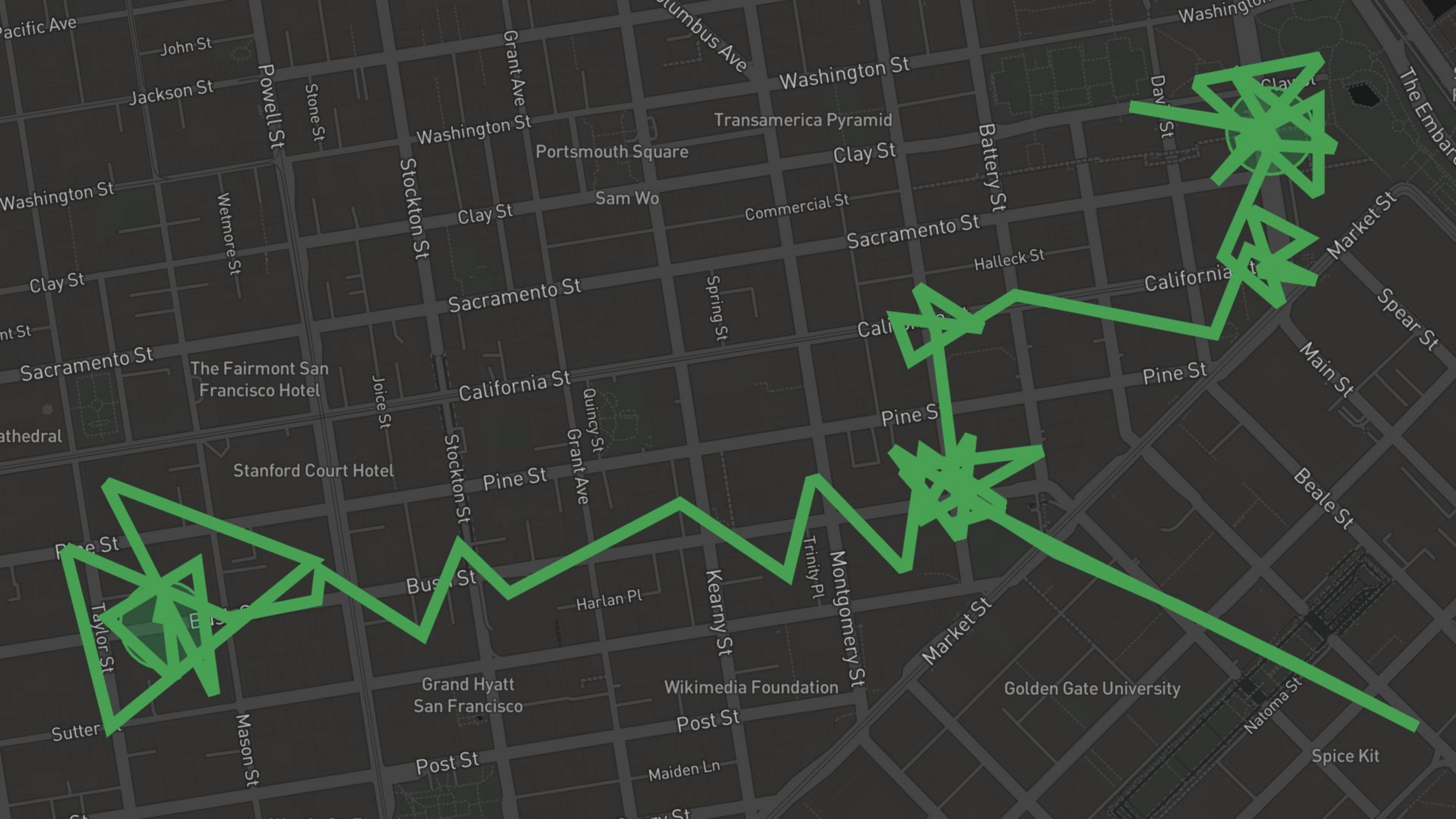
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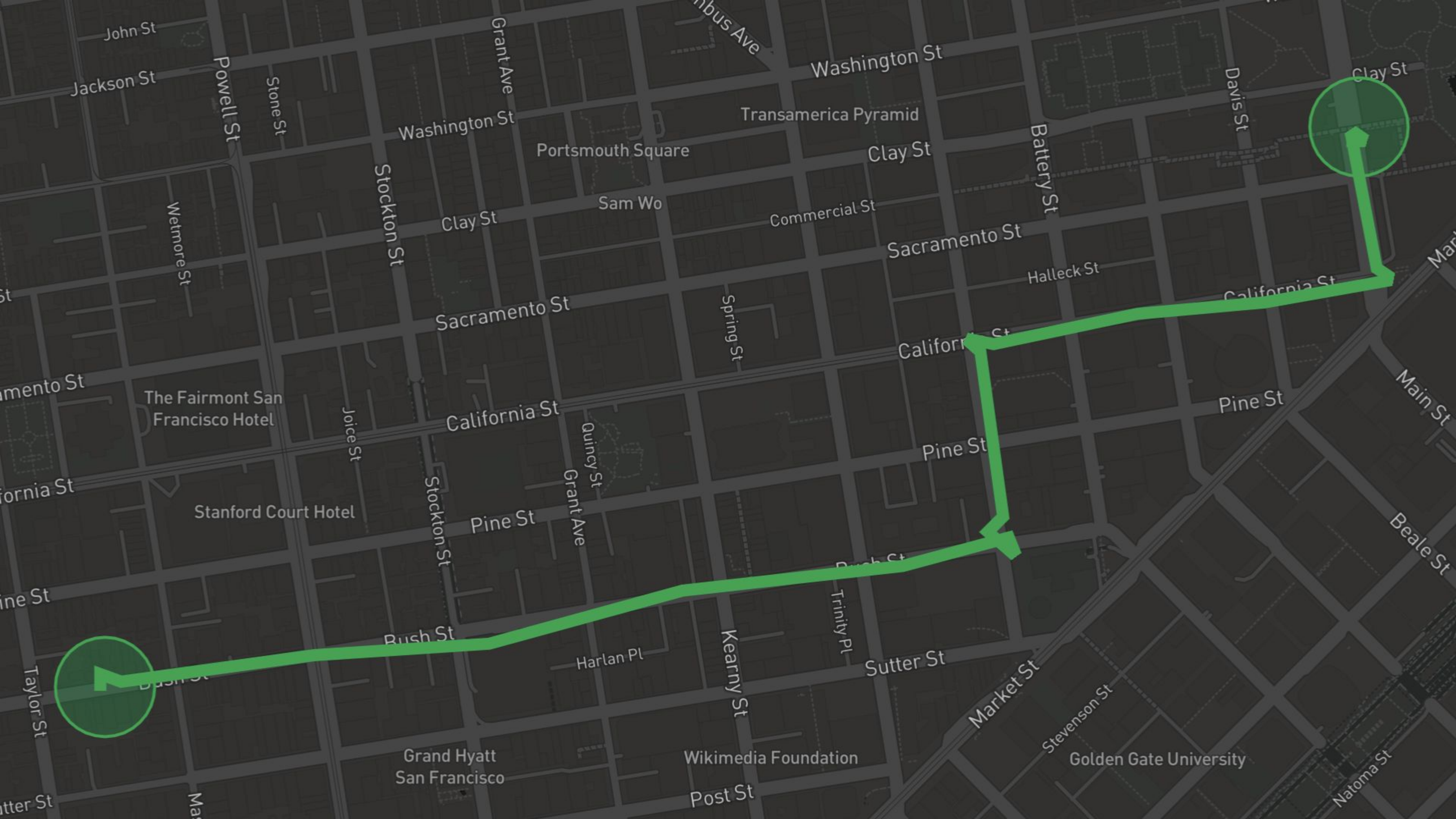
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- **Sending data in real-time**
  - **Battery life vs. real timeness**
  - **Use movement patterns to solve both battery and disconnection detection**

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  - Allow working offline
  - Use local geofences and silent notifications

App + Driver = One Team

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  - Use simulation detection APIs from OS
  - Use heuristics for older OSes

Bulletproof Logistics

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- **Solutions**

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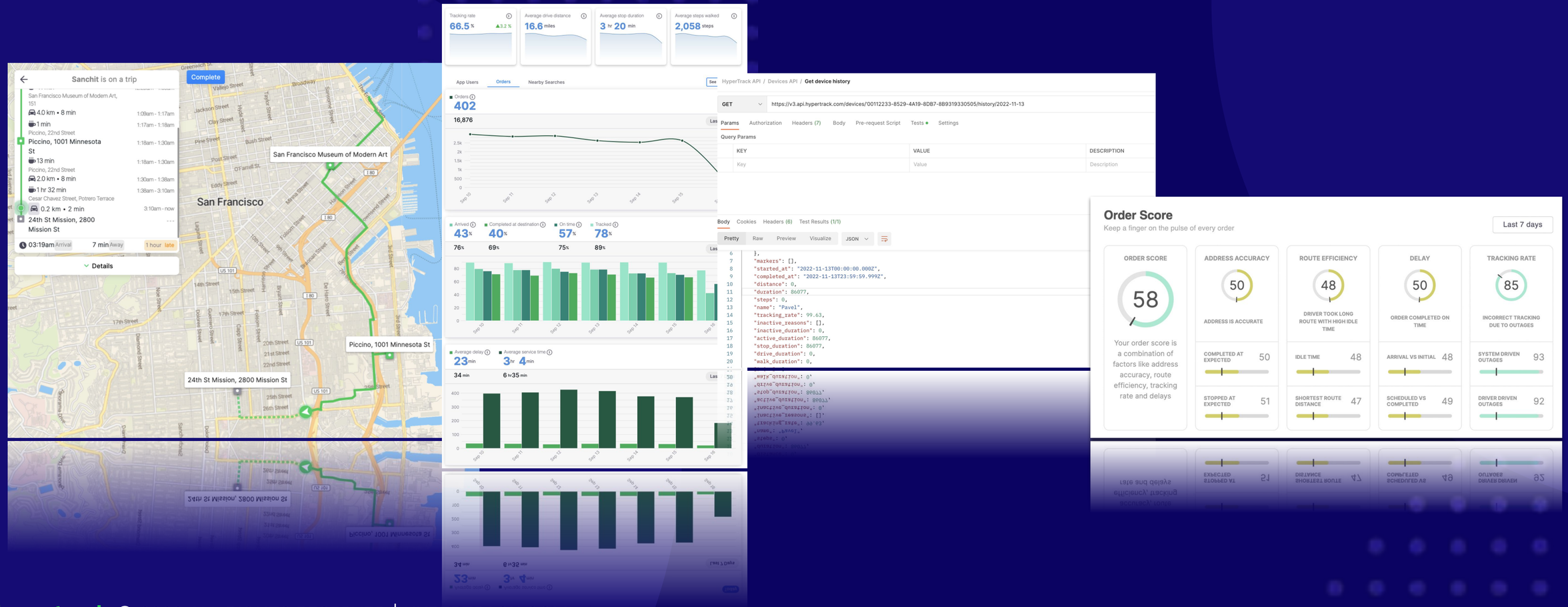
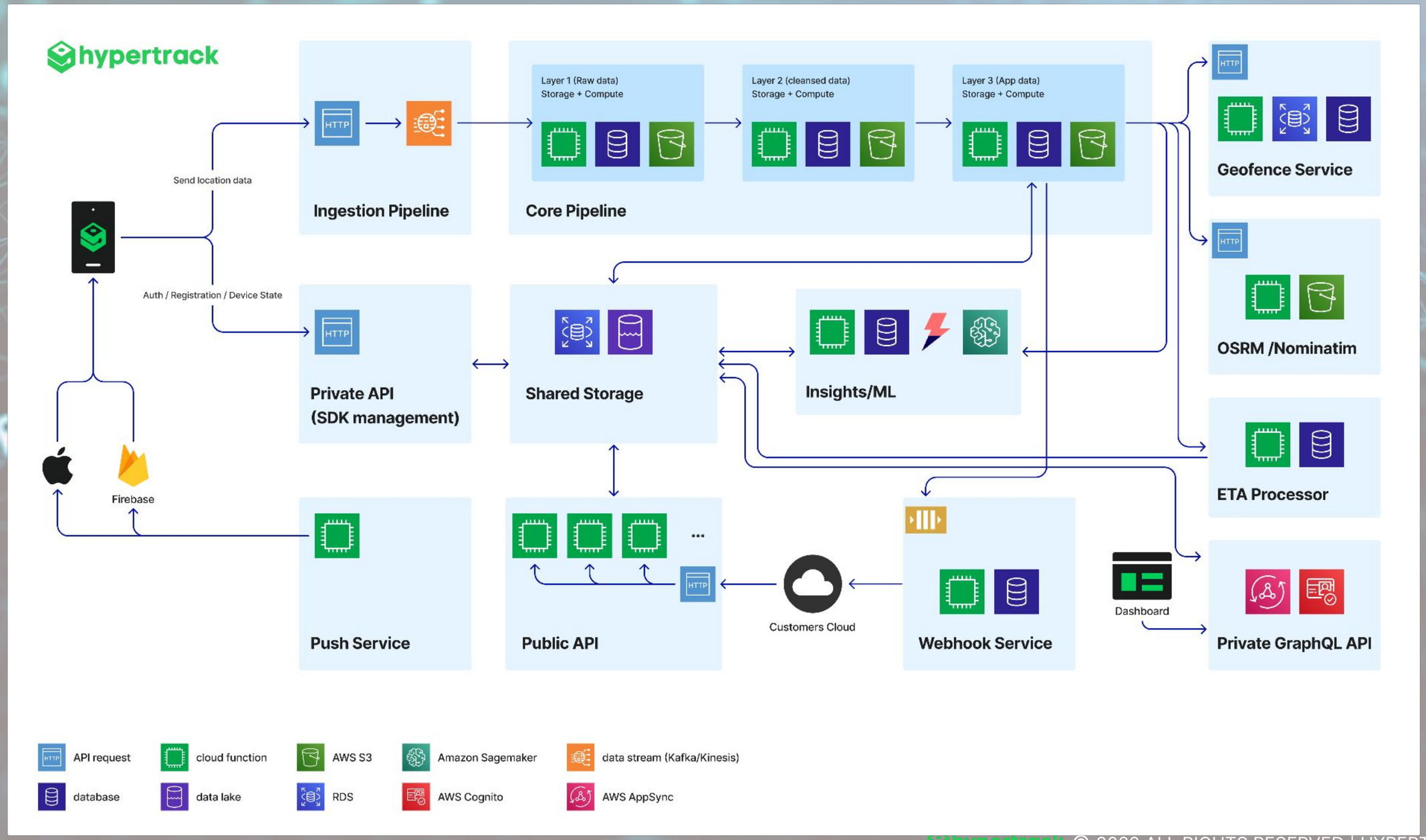
  - Cross-platform logic
  - Property based testing
  - Propagating state using CRDTs

From Raw Data to Insights


```
{
"device_id": "00112233-3883-4FD9-A33E-074845EE5DCC",
"recorded_at": "2022-11-04T03:05:35.753Z",
"account_id": "00112233-3883-4FD9-A33E-074845EE5DCC",
"arrived_at": "2022-11-04T03:05:35.762Z",
"created_at": "2022-11-04T03:05:35.762Z",
"data": "{\"location\": {\"coordinates\": [-122.3938916314764, 37.79734517847494], \"type\": \"Point\"}, \"speed\": 0.2, \"altitude\": 610, \"bearing\": 90, \"location_accuracy\": 665.02}",
"expiry_time": 1670555135,
"id": "23a2a5df-4a63-4edd-ad91-3b65ce027097",
"type": "location"
}
```

HyperTrack Architecture

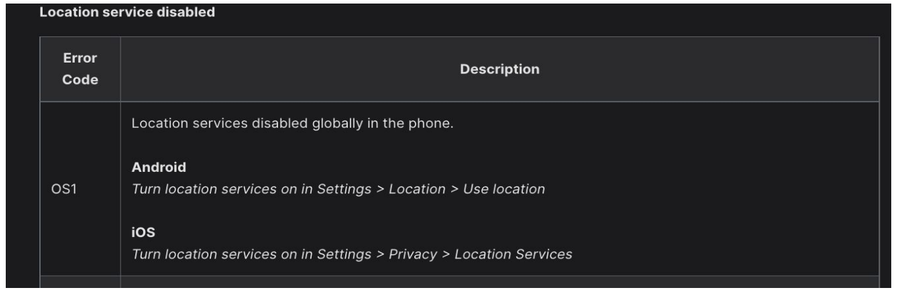


Realtime On-Demand Logistics API platform

- Realtime processing
  - Updates from SDK and API calls are handled in real time
  - Event-Driven architecture
  - Events are applied to existing state and historic movements
- Highly elastic platform to scale with our customers
  - Serverless platform that scale automatically
  - Strong observability and auto scaling automation

Handling Unreliable Mobile Clients

- Outages
  - We can distinguish dozens of different outages. Ranging from permission issues to network/GPS connectivity issues and present actionable fixes.
- Device connectivity
  - SDK data caching
  - Waking up disconnected devices remotely
- Location and movement accuracy in real time
  - Cleaning locations in real time
  - Detecting activity and movement based on SDK events in real time
    - Accurate activities and locations required for visit detection, ETA processing, Insights, ...
  - Mock location detection to protect against driver fraudulent activity
    - Developer at a leading flex work company: “wow - great that HyperTrack is able to tell us that, thanks!”

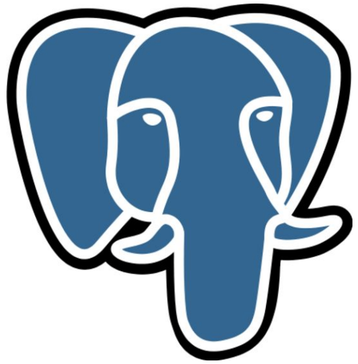


Location service disabled

Error Code	Description
OS1	Location services disabled globally in the phone. **Android** *Turn location services on in Settings > Location > Use location* **iOS** *Turn location services on in Settings > Privacy > Location Services*

Data for Logistics

- What datastores are used for what cases?
  - NoSQL store for real time updates
    - Great for some use cases, not that great for others
  - Postgres for aggregate data
    - Dashboard and API data
    - Select date_trunc('day', created_at) from hypertrack.orders;!
  - DW (columnar store) for raw data and later analysis
    - BI team
    - Data science team
    - Source data for aggregations
  - Elasticsearch for search/filtering of your fleet data and history
- PostGIS to query geospatial data on scale
- Reliable jobs to aggregate
  - To trust the data, jobs needs to be transparent and reproducible
  - Apache Airflow for job scheduling
- Openstreetmap / OSRM / Nominatim



Apache Airflow

Security At HyperTrack

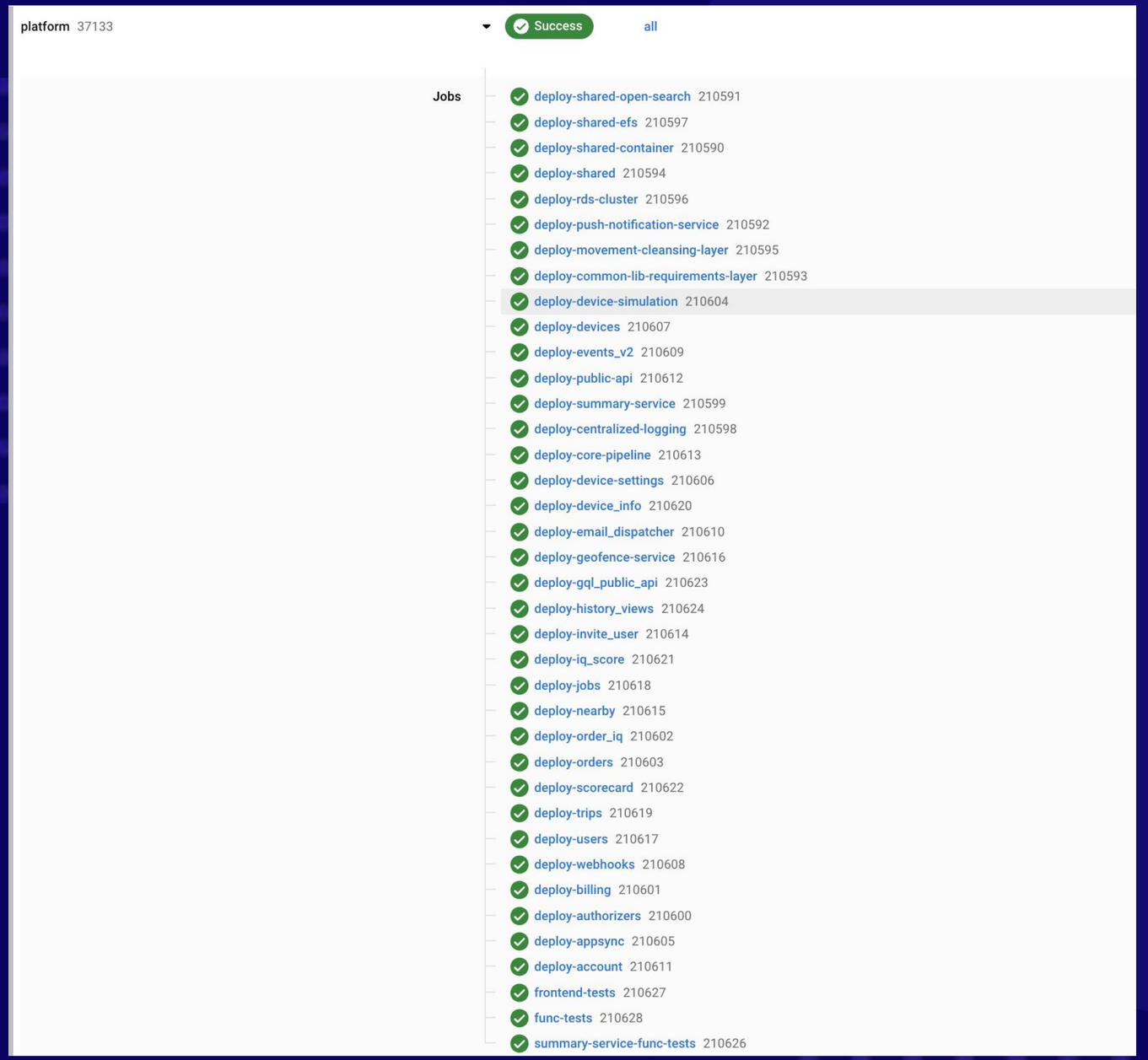
- SDK
  - Unique, per account based, key initiated in the SDKs
- Cloud
  - Multi-tenant data stores isolated for each customer account
  - IAM roles and policies implemented across the entire cloud platform components
- APIs
  - OAuth2 for REST APIs and embeddable dashboards
- Integrations
  - Each webhook payload is uniquely authenticated
- Location data is PII (personally identifiable information)!
  - Storage encrypted (data at rest)
  - Data Encrypted during transfers
  - Limit access to data via strong AWS controls and audit logs
  - Support for deleting data
  - Storage of raw data limited up to 90 days
- Credentials
  - Passed security checks and validation by Intuit, Salesforce, and AWS FTR (Foundational Technical Review)
  - Passed select customers' VAPT checks

Scale at HyperTrack

- SDK event stream
  - Billions of events per month sent from drivers' devices to HyperTrack platform
- AWS lambdas for compute
  - Hundreds of millions of daily invocations
- API calls
  - Tens of millions of daily API calls
- Hundreds of thousands of orders/day
- TBs of data storage in different data storages
  - Data retention limited to maximum a three month period

Production Lifecycle: From conception to release

- No infra setup is done manually, everything is automated
- This drives speed to production (quality-speed flywheel)
- IaC
  - Terraform for shared, stable setup like networking, VPC, data warehouses
  - Serverless Framework used for resource definition, management, and business logic with AWS Lambda
  - Lots of yml files that define our infra (allows us to carefully review changes and manage changes)
  - Allows us to provision in new regions quickly to support redundancy and quick failovers
- CI/CD
  - Fully automated deployment pipelines
  - Unit, functional, and front-end tests are executed in each individual development environment, staging, and in production post deployment
  - Live production deployments take place dozens of times each day of the week



Team expertise and experience

- Distributed across North America, India, and Europe
- Mobile engineering
  - Decades of cumulative experience in mobile platform development on iOS and Android with expertise in background service based location tracking, efficient battery management, and functional programming
- Cloud infrastructure
  - Multiple decades of cumulative production experience in building scalable, resilient, and performant cloud services ranging from enterprise SaaS, data pipelines to large scale gaming servers

Customer quote:

- Director of Engineering at a Benchmark Capital funded company - one of the largest gig economy companies) : “***your engineers operate as an extension of our team***”

Deeply differentiated customer support:

- Deeply differentiated support from the engineering team to get customers integrated with HyperTrack platform; It became possible because the platform designed from the ground up to support logistics use cases, easier to understand and integrate than solutions from Google and AWS.

What’s in store for our next release

- Based on Rust programming language
  - Small binary size and battery efficiency
- Battery efficiency improvements
  - Instrumentation and observability
- Ease and speed of SDK integration
  - Simple integration APIs
  - Proactively notify developers of integration issues
  - Significant binary size reduction
- Next generation core runtime
- More features
  - Improved tracking logic and policy support
  - Whitelisting
  - Motion permissions are optional for availability tracking
  - Add imprecise permissions outage in Android SDK

Thank you for attending!

HyperTrack helps you build apps that feel like the future in the world that is going on demand and making it mainstream.

HyperTrack engineering works very hard so that your logistics technology can do everything to support your logistics automation use cases while you can focus on your core business needs.

“HyperTrack is a really intelligent location based platform. It was really easy for us to set up and get going in a day. We have seen improved customer satisfaction.” - Pragya Jaiswal CTO

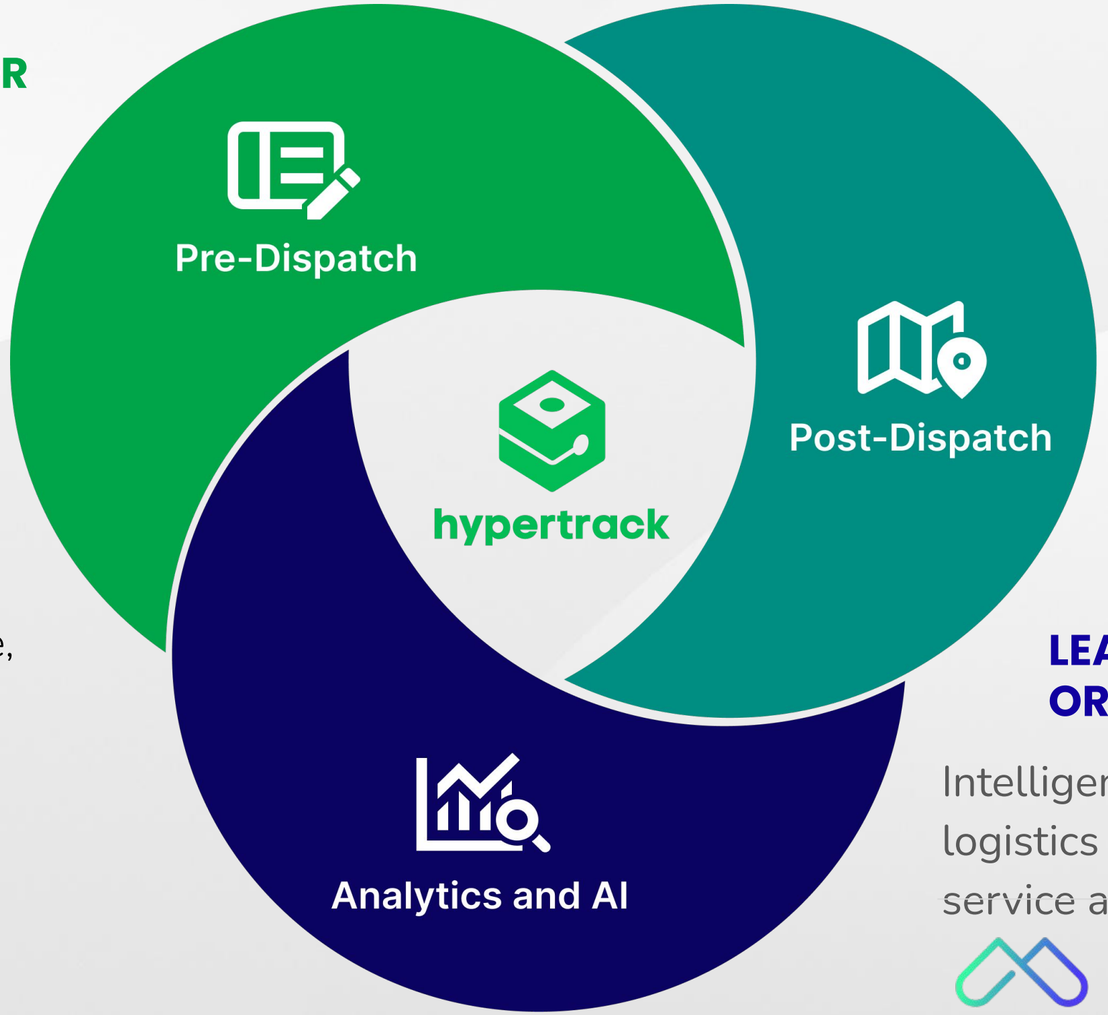
Plan, Assign and Track Orders for Last Mile Logistics

PLAN AND ASSIGN ORDERS FOR EFFICIENT OPERATIONS

Build custom business logic & workflows for on-time delivery with higher capacity utilization and predictable per order cost

JOBOX

Assign and track nearby, eligible, and available home service professionals improving the job completion rate



TRACK ORDERS FOR ON TIME FULFILLMENT WITH LOWEST COST

Live location tracking with driver and consumer apps, ops dashboards for continuous real-time visibility

SPIRITZONE

Delight customers with live tracking of liquor delivery orders

LEARN AND IMPROVE END-TO-END ORDER FULFILLMENT LIFECYCLE

Intelligence built on ground truth of your logistics operations including addresses, service and route times

magaloop

Deliver streamlined order fulfillment for independent retailers across Europe

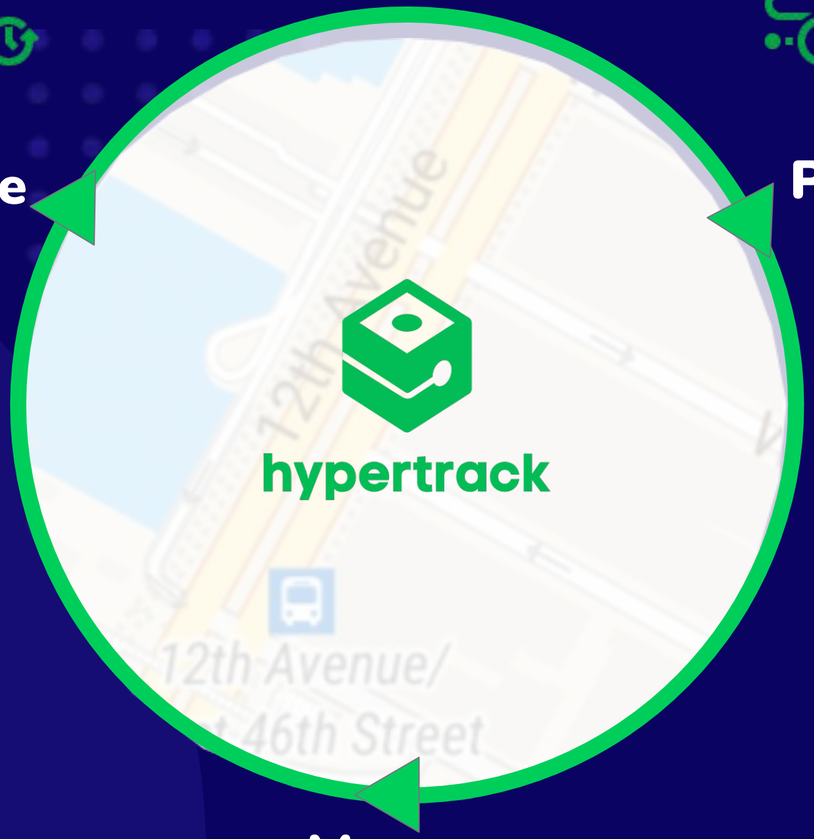
Last Mile Logistics with HyperTrack

Optimize Future Orders
Service Times
Route Actual vs Plan
Address Accuracy

Route Optimization
Deliver more orders
Minimize resources
Meet your Time Windows

Improve

Plan



Rich Data Access APIs
Webhooks
Order History
Distance + Activities
Export API with S3 access

Nearby Search
Intelligently Assign Nearby drivers on demand using live location and traffic based ETAs

Operations Dashboards
Orders at Risk
Live driver tracking
Analytic Drilldown
Driver Activity Timelines

Live Order Tracking
Accurate location and status
Real Time Traffic based ETAs
Consumer Shareable URLS

Measure

Hypertrack mobile SDK
Industry leading Accuracy
Optimized for battery and network
Outage resilient

Destination Geofencing
Measure Service times
Real Time Arrival Notifications
Included with Order Tracking at no additional cost

HyperTrack is Trusted by Logistics Tech Builders

SUPR DAILY

"Near real time visibility into the activities being done by the delivery executives had an immediate impact on the business. Distance capture is a problem with a lot of nuances that we worked together with HyperTrack to continuously improve and eventually lead to a real impact on the business as well."

Siddardha Garimella
Engineering Manager

4B+
Location Events Processed

7M+
Orders Tracked

4M+
Geofence Visits

3K+
Logistics App Built

Last mile delivery

Indiabulls PHARMACEUTICALS · SUPR DAILY · LOADSHARE NETWORKS · a&b COURIER · GOLOG

Gig work

Instawork · JOBOX · Gigable · Neebal Technologies · 100 FEET

Field service

seven lakes TECHNOLOGIES · ippify · LEAD SCHOOL Assured, Excellent Learning For Every Child · Groundworks · Spinny

Delivering Last Mile Logistics Technology - 3 Options

	1st Generation - Do-it-yourself from scratch with mobile, cloud, and maps	2nd Generation - Last Mile Logistics App Suite (Locus, OnFleet, ShipSy)	3rd generation - Last Mile Logistics API Platform (HyperTrack)
Implementation Timeframe	✗ 9-12 months	~ 3 – 6 months	✓ 15-30 days
Custom Business Logic	✓ Supported	✗ Not supported	✓ Supported
Custom Workflows	✓ Supported	✗ Not supported	✓ Supported
Battery Consumption	✗ High	~ High-Medium	✓ Low
Webhooks for Location Data & Outages	✓ Supported	✗ Not Supported	✓ Supported
Tracking Accuracy	✗ Poor	✗ Poor	✓ High
Predictable Order Cost	✗ No	✓ Yes	✓ Yes
Pre-built Analytics - Order, Route, Driver	✗ No	✗ No	✓ Yes

Case study

Spiritzone delights customers with live tracking of liquor delivery orders

SPIRITZONE

Last mile delivery | Grocery

"HyperTrack is a really intelligent location based platform. It was really easy for us to set up and get going in a day. We have seen improved customer satisfaction."

Pragya Jaiswal

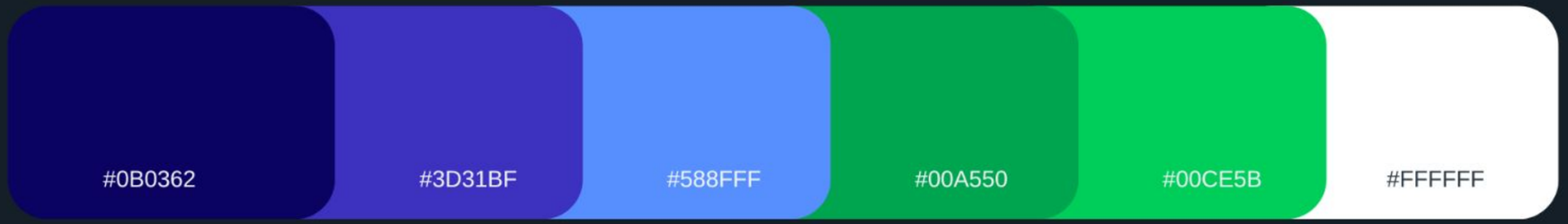
CTO

Read the Case Study

Use case	Provide consumers with accurate live tracking of their liquor delivery orders
Buyer	**CTO**
Trigger	Customer unable to see the live location of their orders - repeated calls to customer service resulting in poor experience
Business Need	**Deliver** accurate location tracking of customer orders **Eliminate** the need to call customer service for order tracking
Solution	**Live accurate location tracking** of delivery agents for customers **Service time measurement** for liquor pick-up from stores by delivery agents **Real-time visibility** of delivery agents near the liquor stores for pick-up and on-time delivery **Implement incentives and penalties** based on data to facilitate on-time delivery for customer orders

LOGISTICS + TECH SUMMIT BRAND ASSETS

COLOR PALETTE



FONTS IN USE

Code Pro Bold LC Regular

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 !@#$%^&*()

Code Pro

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 !@#$%^&*()

Montserrat Classic

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 !@#$%^&*()

Inter

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 !@#$%^&*()

Montserrat Extra Bold

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 !@#$%^&*()