TRUCK PARKING TECHNOLOGIES UTILIZED FOR OPERATIONS ACROSS THE COUNTRY

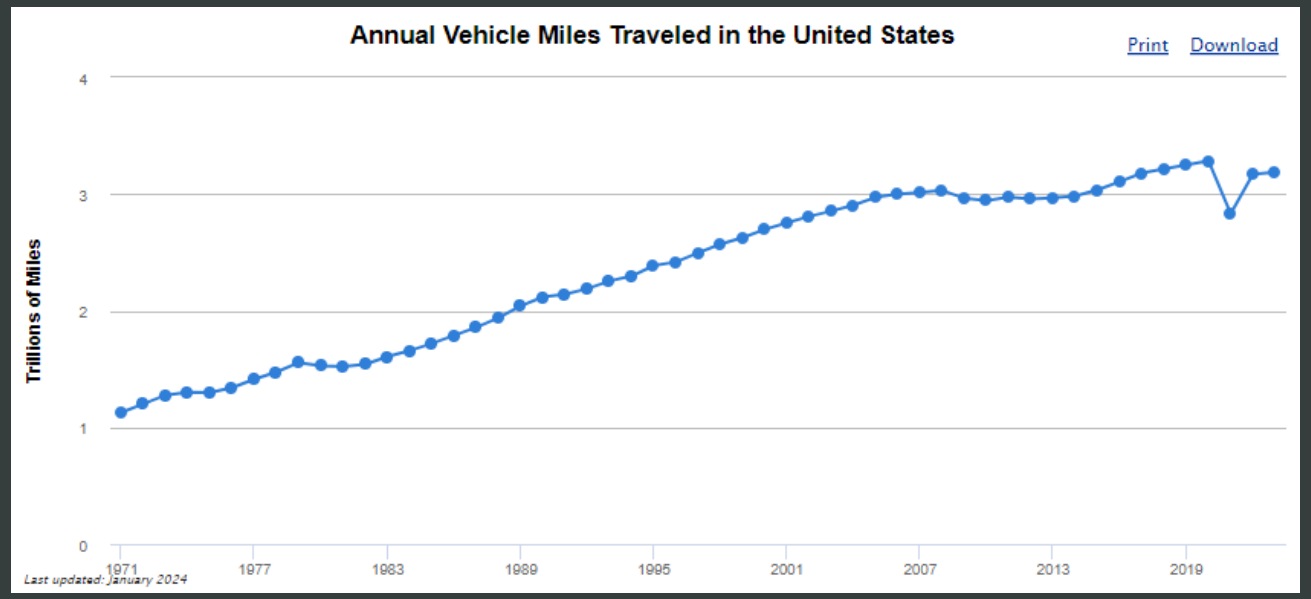
Preston Judkins, PE, PTOE, MBA; Senior Project Manager and Traffic Engineer; Parsons

AGENDA

1. Overall National Topics
2. Michigan
3. Upcoming technologies

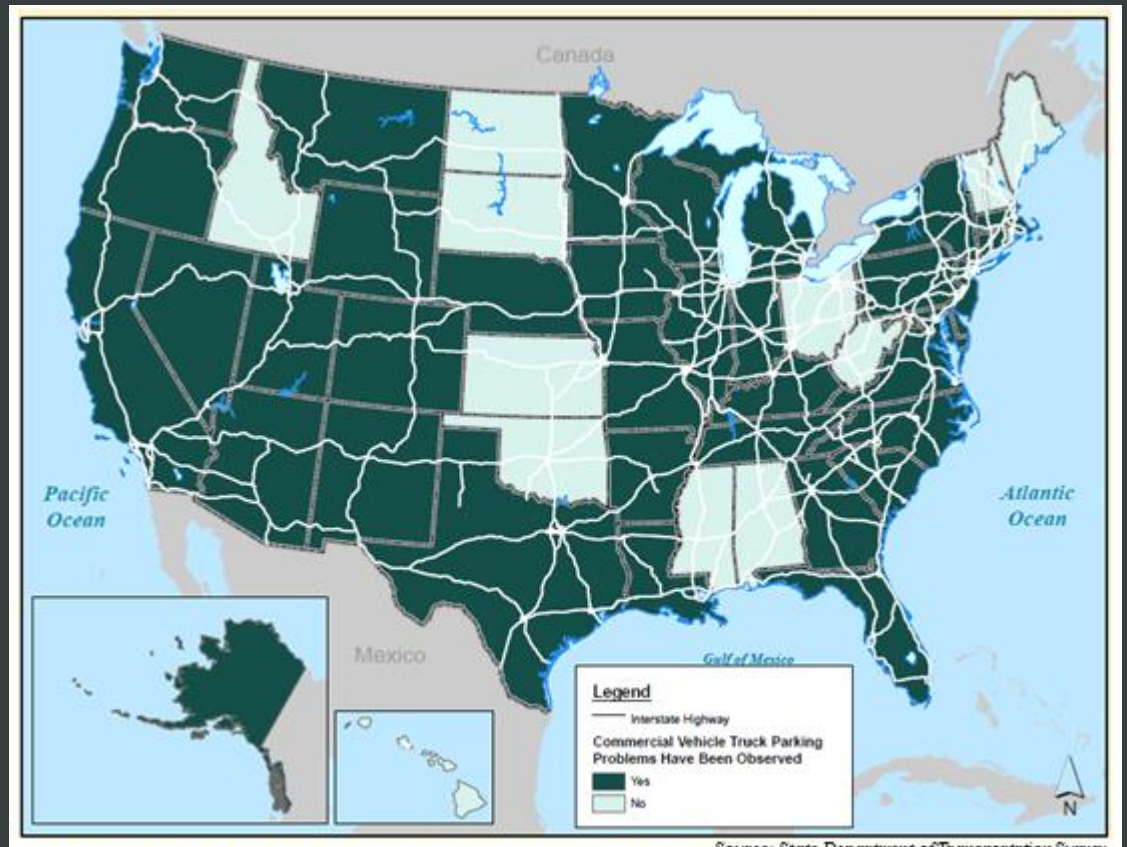
What the Truck?

- US annual freight travel is over 287 billion miles
- Growing 2 - 3% per year, compared to .5 – 1% for overall VMT
- Surge of home delivery and distribution centers have amplified freight travel



New York Specific

- In relation to all States:
  - #35 in Spaces provided per 100k Daily Truck VMT
  - #46 in Spaces provided per 100 Miles of National Highway
- In a combined survey from American Trucking Association, Commercial Vehicle Safety Alliance, and Owner Operator Drivers Association:
  - New York ranked #3 on worst Truck Parking accommodations



Source: State Department of Transportation Survey

Figure 8 - States Reporting Truck Parking Problems

OVERALL NATIONAL APPROACH

CLICK TO ADD SUBTITLE

USDOT Key Topics

- Defined in a national memo from 2018:

PARKING CAPACITY

TECHNOLOGY AND DATA

FUNDING, FINANCE, AND REGULATIONS

STATE, REGIONAL, AND LOCAL GOVERNMENT COORDINATION

Parking Capacity	• Creative Uses of the Right-of-Way (ROW) and Adjacent Areas • Involving Shippers/Receivers to Address Truck Parking Capacity • Considerations for Maintaining Low-Cost Truck Parking Facilities	• Explore contractual relationship between truck stops and fleets for fuel purchases. • Consider how to implement staging in urban and suburban zones. • Hold a peer exchange with international partners and stakeholders to discuss parking capacity.

Technology and Data	• Truck Parking App Survey Results
	• Best Practices for Truck Parking Availability Detection and Information Dissemination
	• Technology and Data Research Needs Webinar
		• Research data standards and application program interfaces (API) for smart phone applications and promote common standards.
		• Research and promote common, functional standards across information systems including:
		  ○ Apps
		  ○ Dynamic message signs (DMS) and other roadside signs mentioned in the Manual on Uniform Traffic Control Devices (MUTCD)
		  ○ In the cab
		  ○ Data transmission
		  ○ Intelligent transportation systems (ITS)

Funding, Finance and Regulations	• Public-Private Partnership (P3) Examples and Considerations • Emissions Reduction Grant Programs Fact Sheet	• Use truck parking fees as a revenue source for private and public parking. • Provide tax incentives for the private sector to build new parking capacity. • Track the amount of money being spent and types of projects being developed by States for truck parking projects.
State, Regional and Local Government Coordination	• Notable Examples for Including Truck Parking in State and Metropolitan Planning Organization (MPO) Freight Plans • How to Improve Truck Parking in Your Region Brochure • The Importance of Considering Truck Parking in Local Zoning Codes • Parking and Staging Requirements in Local Zoning • Talking Freight Webinar: Best Practices in Industry and Government Coordination for Developing Truck Parking Solutions	• Work with the American Planning Association (APA) to develop a guide for city, county, and regional governments on truck parking. Consider developing a webinar to accompany this. • Write an article for APA's *Zoning Practice* or *Planning* magazine about zoning considerations for truck parking. • Continue to develop resources regarding local zoning and land use authorities directed to city engineers and planners. • Develop zoning template language and design guidelines for truck stops and truck parking lots that includes requirements for minimum acreage, site design, lighting, setbacks/buffers, landscaping, security, and other aspects. Differentiate requirements by area type (rural vs. suburban vs. urban) or roadway type (arterial vs. collector). • Hold an interstate Peer Exchange on truck parking solutions.

Federal guidance on Truck Parking Technology

Technology and Data	• Truck Parking App Survey Results
	• Best Practices for Truck Parking Availability Detection and Information Dissemination
	• Technology and Data Research Needs Webinar
		• Research data standards and application program interfaces (API) for smart phone applications and promote common standards.
		• Research and promote common, functional standards across information systems including:
		  ○ Apps
		  ○ Dynamic message signs (DMS) and other roadside signs mentioned in the Manual on Uniform Traffic Control Devices (MUTCD)
		  ○ In the cab
		  ○ Data transmission
		  ○ Intelligent transportation systems (ITS)

Jason’s Law

- **Truck Parking Analysis**: Jason's Law requires each state in the U.S. to evaluate truck parking options along national highways. This involves assessing the availability of parking spaces, commercial motor vehicle traffic volumes, and developing a system of metrics to measure the adequacy of truck parking.
- **Addressing a National Challenge**: The lack of safe and sufficient rest areas for truck drivers is a major problem. Jason's Law aims to improve this situation by gathering data and prompting action from state governments.
- **Safety Focus**: By ensuring truck drivers have access to proper rest facilities, Jason's Law promotes road safety. Well-rested drivers are less likely to be fatigued and cause accidents.
- **Data-Driven Solutions**: The law emphasizes using data to understand the scope of the problem and identify areas where additional parking is most needed. This data-driven approach can inform targeted solutions for improving truck parking across the country.

MICHIGAN DEPLOYED SOLUTIONS

CLICK TO ADD SUBTITLE

TPIMS Project

- “I-94 Truck Parking Information and Managements System”
- Started in 2014 with these charter goals:
    1. Enhance highway safety by providing timely and reliable truck parking information
    2. Provide a sustainable and scalable truck parking solution
    3. Provide a secure solution that protects user privacy and data
    4. Maximize user acceptance of the system for truck parking decisions
- Independently reviewed and evaluated as a success by UMTRI

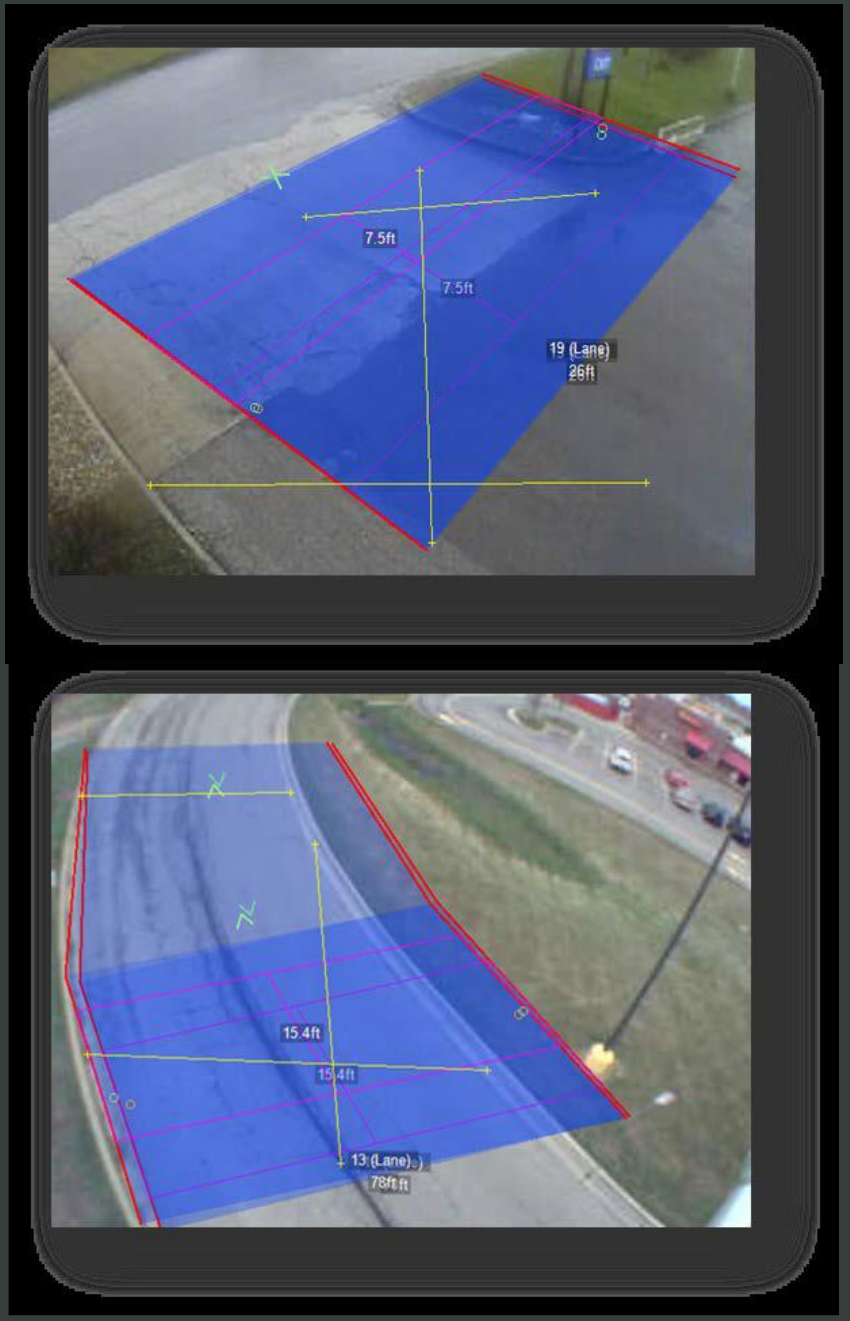
UMTRI
UNIVERSITY OF MICHIGAN
TRANSPORTATION RESEARCH INSTITUTE

Data Inputs

- Project deployed a variety of data collection techniques
  - Presence detection
  - Entrance and Exit differential counts
  - Edge Video Analytic cameras
  - Sidefire Radar
  - Magnetometers
  - Manual input

Data Challenges

- **Public vs. Private Facilities**: Combining public rest areas with private truck stops presented new challenges for a unified reporting system.
- **Expensive & Difficult Sensor Technology**: Tracking individual parking spaces with sensors was deemed too expensive, especially for large truck spaces and private facilities with features like gravel lots, uneven layouts, and poor lighting.
- **Traffic Detection Challenges**: The system relied on counting vehicles entering and exiting parking areas. However, factors like road curvature, low light at night, and the need for accurate traffic classification made camera-based detection complex.



DATA INTEGRATION

Automated System with Minimal Operator Input: MDOT's iNET® deployment was linked with cameras, sensors, and DTPS signs to automatically collect and display parking availability data. This minimized workload for operators and avoids information overload.

Central Data Repository: iNET® manages all interface connections and access to the truck parking data. This allowed MDOT to control who has access and easily add or remove access

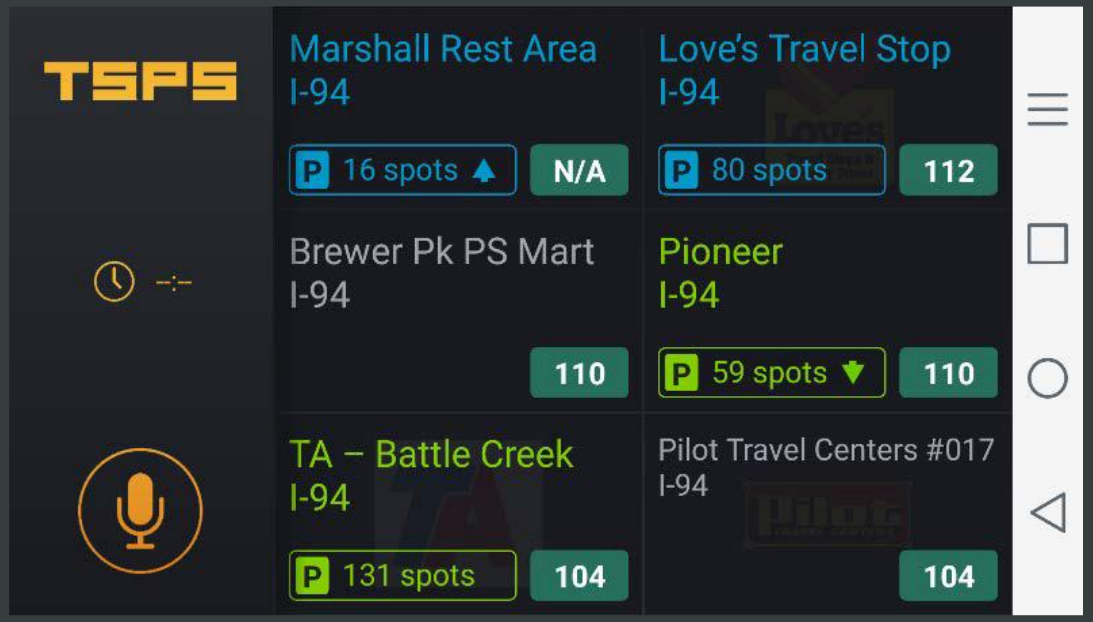
Dynamic Truck Parking Signs

- **Real-time Truck Parking Info**: Dynamic Truck Parking Signs (DTPSs) show truck drivers how many parking spaces are available at upcoming rest areas and exits with private parking facilities along I-94.
- **Strategic Placement & Dynamic Updates**: Located before exits, DTPSs give drivers time to decide where to stop. The signs update automatically to show the number of available spaces at three locations.
- **"LOW" Threshold & Multiple Parking Areas**: If there are few spaces left, the sign displays "LOW" instead of a number. For exits with multiple lots, the sign shows the total available spaces across all the lots.

Smartphone Application

Developed in partnership with Truck Smart Parking Services (TSPS)

- **Availability and Functionality**: The TSPS app displays real-time parking availability for public and private I-94 parking areas, along with details about amenities like fuel prices and showers.
- **User-Friendly Design**: The app uses GPS to show parking based on your location and travel direction. It prioritizes upcoming locations and updates as you drive. Color coding (red, blue, green) indicates parking space availability at a glance, with arrows showing filling/emptying trends.
- **Limited Awareness**: Despite being available since 2014, the app isn't well-known among truck drivers. Some confuse it with other apps offering amenity information but no real-time parking data.
- **Comparison with Other Apps**: Several commercially-affiliated apps (Love's Connect, myPilot) and independent apps (Big Truck Stops) offer amenity information, but only TruckSmart (for TA/Petro) provides limited parking availability (updated manually, not real-time).

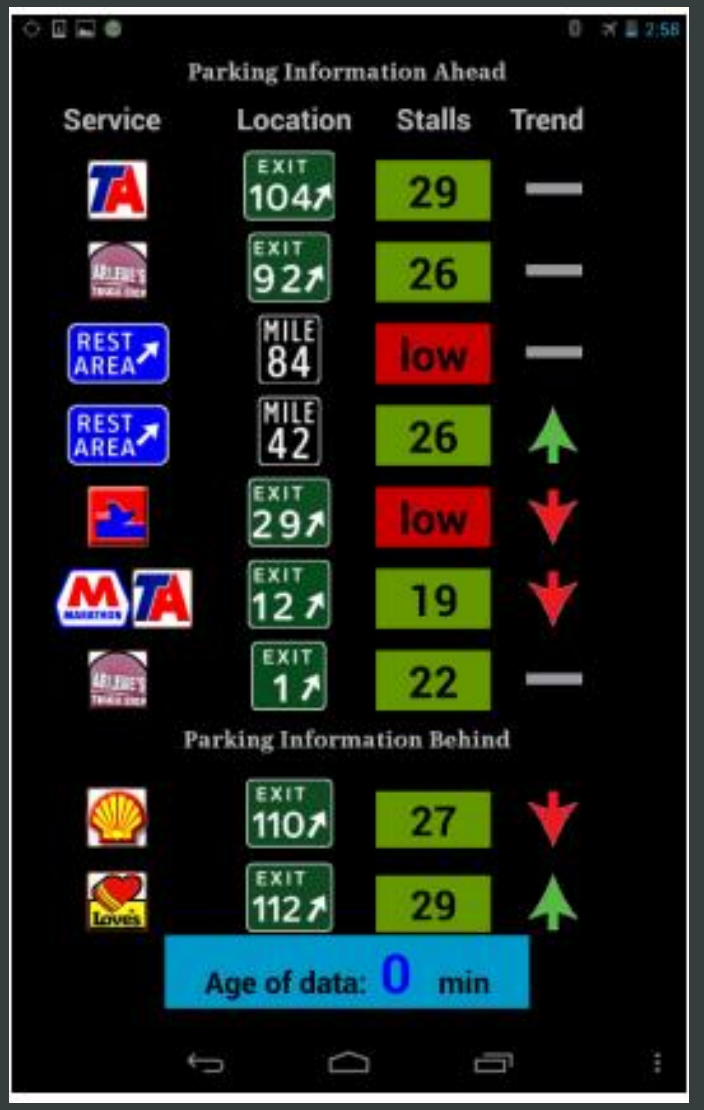


Agency Website Updates

Mi Drive (MDOT): This website shows the total and available parking spaces for any selected rest area or exit along I-94.

In Vehicle Display

- **System Setup**: Local carriers were subsidized to equip tablets and DSRC units. DSRC is still in use, with research into C-V2X. Roadside units along I-94 transmit parking data that the tablets display in the truck cabs.
- Driver Interface: The tablet shows parking information (service area, exit location, available spaces) with color-coded trends (red for low availability, green for high) and arrows indicating if spaces are increasing, steady, or decreasing.



Lessons Learned

Challenges with Vehicle Operations: Inconsistent vehicle speeds, types, and illegal parking (especially on shoulders) made it difficult to accurately track parking availability with sensors. These issues were addressed with adjustments, enforcement, signage, and regular operator calibration.

Adapting Off-the-Shelf Technology: While using existing vehicle detection technology saved costs, it wasn't perfect for slow-moving, turning trucks at private stops. The system's accuracy was improved through collaboration with the manufacturer to refine algorithms and equipment (e.g., wider detection zones, variable background resets).

Potential for Cost-Effective Solutions: This project demonstrated that "off-the-shelf" technology, integrated with existing traffic management systems, can be a sustainable and scalable approach for tracking parking.

Next Steps: In process of incorporating AI against the now very large dataset to not only give the real time conditions, but projections.

OTHER NATIONAL DEPLOYMENTS

CLICK TO ADD SUBTITLE

CALIFORNIA SMART TRUCK PARKING (STP)

Goal: Demonstrate real-time parking availability for truck stops on Interstate 5 in California. This project is funded by a federal grant and involves collaboration between multiple partners.

Methods: The project is testing various sensor technologies (video, in-ground) at truck stops in Sacramento and Stockton to track parking availability.

Information Sharing: Parking data is displayed on roadside signs and a website (americantruckparking.com) which includes public/private rest areas, fueling locations, and real-time updates for some California sites.

Tennessee

TMCSA SmartPark Program

- **Finding the Right Technology:** The program aimed to identify a reliable way to track truck parking availability. Phase I tested various sensors (magnetometers, video detection, Doppler radar) and found Doppler radar with laser scanning to be the most accurate (over 93%).
- **Phase II Demonstration:** Using the chosen technology, Phase II showcased functionalities like diverting trucks to available areas, reservation systems, and information dissemination through various channels (signs, voice recognition, website, mobile app). This took place at rest areas on I-75 in Tennessee.
- **Outcome & Challenges:** While the technology proved accurate, the system was deemed cumbersome to maintain by the Tennessee DOT and wasn't continued.

Florida

Truck Parking Availability System (TPAS)

- **System Design**: TPAS uses in-ground sensors at rest areas and welcome centers, with CCTV camera backups. Weigh stations use microwave detection and CCTV cameras.
- **Information Sharing & Expansion**: Real-time parking data is available on the FL511 website/app, roadside signs, and for third-party apps.
- **Reservations:** Rolling out an integration that allows for reservations at certain Public and Private locations

AI APPLICATIONS

CLICK TO ADD SUBTITLE

Video Analytics

Analyzes video to determine :

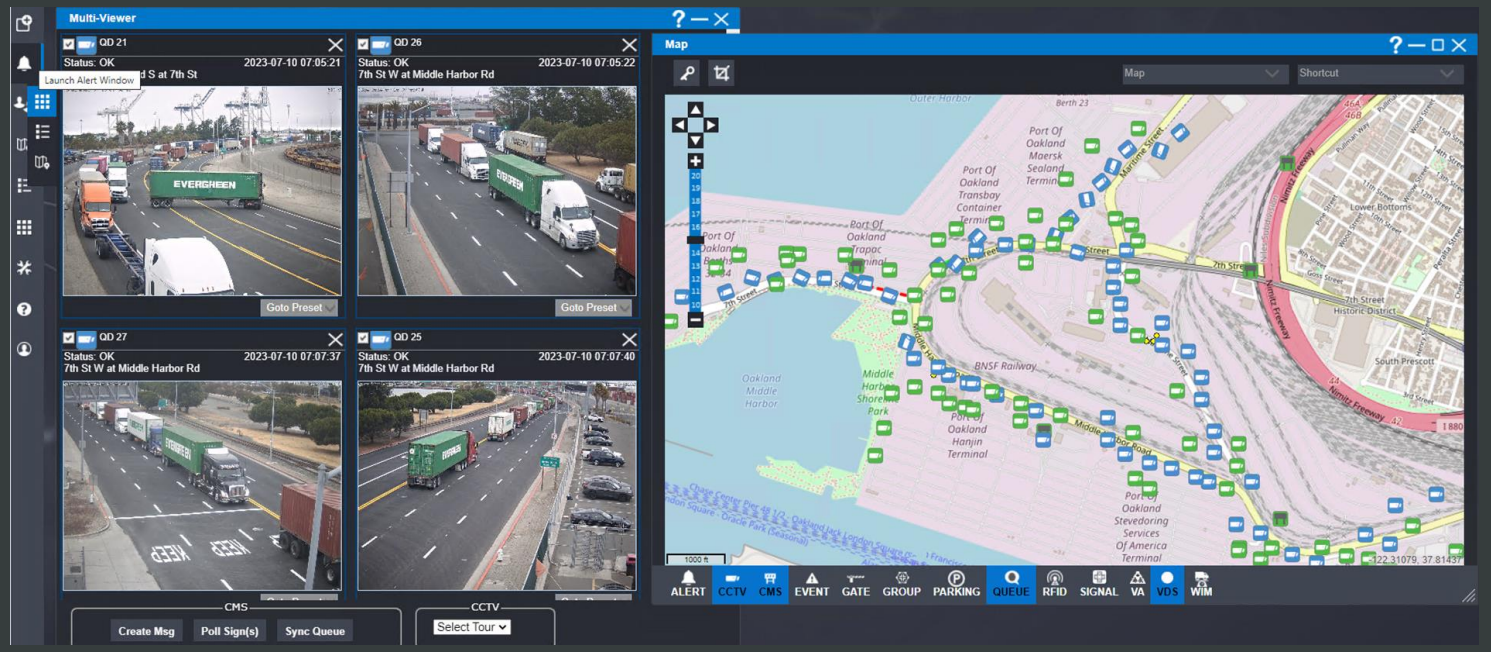
- Parking spot occupancy
- Fixed point entrance/exit counts
- Vehicle, pedestrian, bicycle counts
- Vehicle classification & speed
- Stopped or Wrong way vehicle detection
- Queuing traffic detection
- Uses AI ML & deep-learning neural networks to identify and track objects (vehicles, trucks, pedestrians, cyclists, trains)
- Works with either fixed or PTZ cameras
- Works with most streaming video sources

Future use cases:

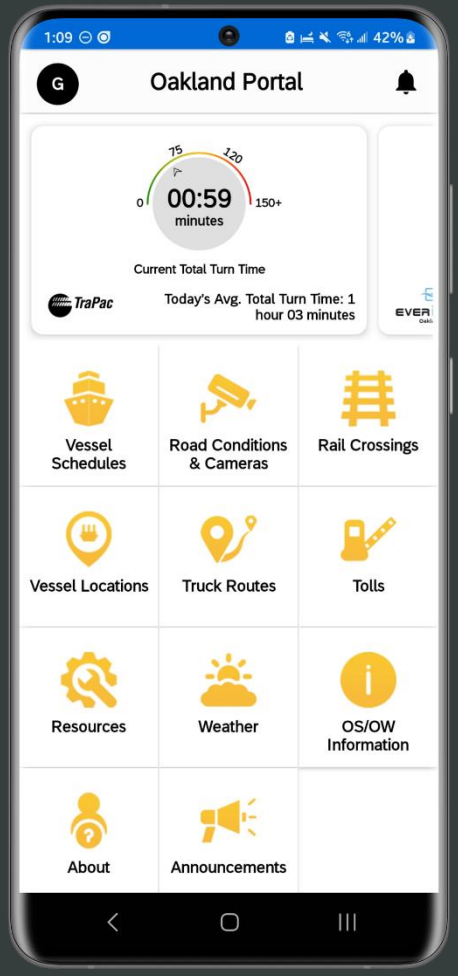
- Near-miss occurrences
- Erratic behaviors

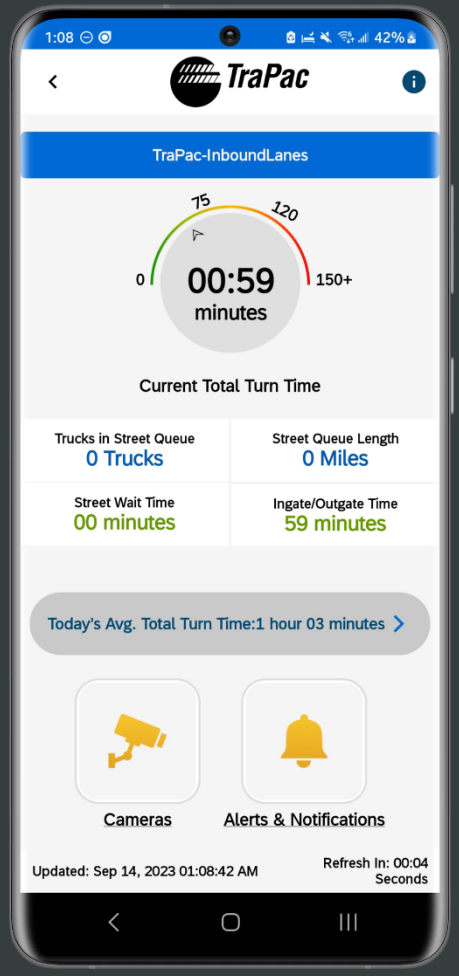
Predictive Modeling

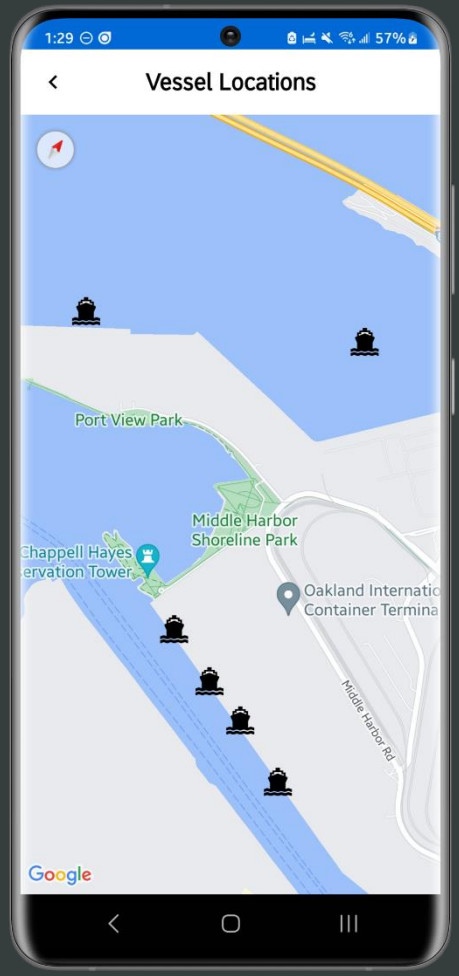
- In progress with Port of Oakland
- Combination of:
  - Historical freight use (parking and dockings)
  - Input factors (day of week, month, year; weather)
  - Real time trends (occupancy; parking demand compared to historical; CV reads)



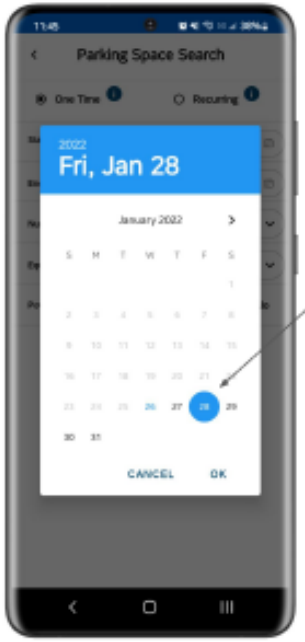
Oakland Portal







Smart Parking



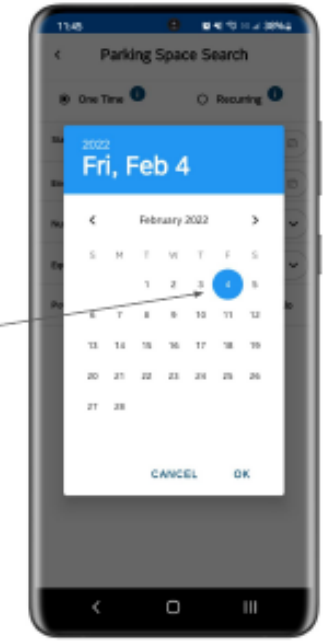
Parking Space Search

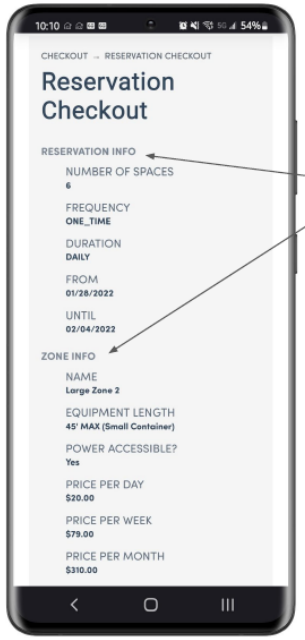
Date range selection for a One Time booking

Selecting a start date calendar pop up

Selecting an end date calendar pop up

Note: For a recurring booking, there will only be a start date pop up.





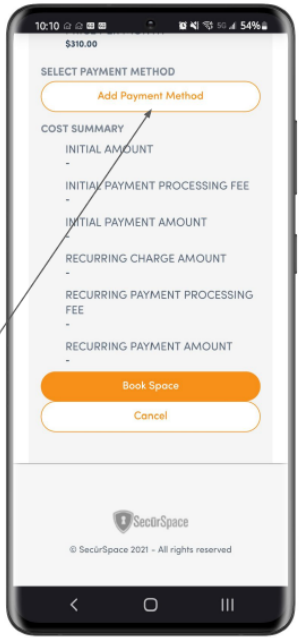
Reservation Checkout Screens

The external web browser window titled '**Reservation Checkout**' displays Reservation and Zone Info for the selected booking.

Select Payment Method

A first time user will have to select the "Add Payment Method" button to select payment preferences.

This will be required before a user can select the "Book Space" button. The Cost Summary section will not display any data until a payment method has been created by a user.



Questions?

THANK YOU FOR YOUR TIME