

Massachusetts Department of Transportation (MassDOT)

Request for Information (RFI)



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Introduction

Netradyne Story

Since its inception, in 2015, Netradyne has been building a world-class team to deliver industry leading fleet safety solutions. We are an A.I. and data company at our core. From there we are applying new technologies to the commercial vehicle industry and building the future of vehicle telematics. Leaders in our company own a combined 275+ patents and we are developing new ones every year.

We're the first commercial vehicle technology provider to combine Artificial Intelligence with video to detect, reason, and determine the causality of events, and the only provider to recognize positive driving.

Netradyne Vision

The way we've been taught to improve driver performance and fleet safety is perfectly suited for a world that no longer exists. We want to provide technology for fleets to grow and be successful. This has to happen from the bottom up, it starts with the drivers.

There is a proven scientific method to statistically improve driver performance through positive reinforcement. By reinforcing good behavior and empowering drivers to improve their own performance in real-time the cascading effects are powerful. Fleets see reduced accidents, higher safety scores, lower insurance costs, improved driver retention, and better fleet performance resulting in increased profits.

Driver•i is the only solution that can positively recognize, empower and improve driver performance to make your fleet more successful...We didn't invent fleet safety, we revolutionized it.

Click here to Learn More: Netardyne Overview



Driveri[®] (Vision Based Driver Recognition Safety Platform)

Driveri® operates differently than legacy video event recorders. Legacy event recorders – record when triggered by driving maneuvers out of the ordinary such as hard braking or swerves. This model typically only produces five minutes of video per week per driver. When an event is triggered, it is off-loaded and sent to an operations center where the video is reviewed and observed and delivered back to the fleet within hours and in some cases, days. Driveri® operates differently – removing the guesswork in driver recognition and safety.

Driveri[®] captures every minute of every driving hour. The system utilizes both inertial and video-based sensors to collect and analyze every minute of operation.

How much data is collected by Driveri® during a typical day? Vehicle traveling 80,000 miles per year = roughly 400 minutes of driving each day

Driveri[®] automatically reviews each minute; observational analysis is broken down into five [5] categories:

- GreenMinutes -- Number of (compliant) driving minutes without risk
- DriverStar -- Positive driving decisions that immediately reduce risk
- Severe Alerts (e.g. Running Red Light) High Risk Driving
- Moderate Alerts -- (e.g. rolling stop sign)
- Mild Risk Driving Risk Measurement of driving environment & habits



In this example, Driveri[®] would process 400 minutes of driving/operation each day – providing the fleet with a complete profile of the driver's entire operation – including good driving minutes, exceptional driving maneuvers, driver trends & compliance measurements, and individual coaching opportunities.

Also, fleets have the option to leverage the Driveri® MobileApp – allowing drivers to view the score as it is updated every minute – as well as allowing fleet managers to curate videos that they select to share with the driver to facilitate remote praise or remote coaching.



Click Here to Review. Driveri® Hardware Configurations

In addition, to capturing and analyzing every minute -- Driveri[®] generates In-Cab notifications to the drivers - creating real-time visibility around dynamic following distance, speeding, distracted driving and sign compliance.





Speed Safety Cameras

Section Background

Section 4.2 > Develop prospective pilots for automated enforcement for red light running, speed zones, and work zones.

Automated enforcement is the use of cameras and radar technology to identify and cite vehicles for violating traffic laws such as speeding, running red lights, and bus and bicycle lane violations. Speed is a key factor in protecting all road users, including pedestrians and bicyclists. While automated enforcement is a proven tool for improving driving behaviors and reducing vehicle speeds in communities, it has not yet been utilized in Massachusetts. Currently, Massachusetts General Law does not permit the use of automated enforcement.

Twenty-three states allow for red light cameras, and 17 states allow for speed cameras, many of which grant communities the ability to opt-in. Over 400 U.S. communities use red light cameras and over 130 use cameras to enforce speed laws.

In Maryland, a study showed that the proportion of drivers traveling more than 10 mph above the speed limit declined by nearly 70% for locations with warning signs and speed camera enforcement.

With interest from communities throughout Massachusetts, the Commonwealth will work with municipal partners to develop prospective pilots to test technologies and develop recommendations for legislature approval. Importantly, it is essential that any automated enforcement pilot accounts for equity to prevent existing enforcement disparities or create new ones. Importantly, safety must remain the sole focus of any automated enforcement effort and must not be used as a source of revenue.

Netradyne Solution

Overall, Netradyne does not have solutions that traditionally meet the requirements provided by the description of 'Speed Safety Cameras'.

However, we do have a very rich data database (27 billion Analyzed Driving Minutes) where speed limits are 1) verified through posted speed object detection and 2) average vehicle speed can be provided for each identified road segment.



Netradyne Ideas / Tools / Solutions (Speed Safety Cameras)

Netradyne has deployed over 270,000 Driveri devices [Link: F<u>leet Camera Systems</u>) that measures and collect over 490 million (Refreshed) Miles per month.

The example below is a graph that provides the posted speed limits within Boston, MA. geographic area.



Example: (Massachusetts Speed Limit Map)



Where does Risk Occur?

The graphic below provides an actual data report from Netradyne that provides actual speeding events during a specified time period. Netradyne tracks two types of speeding; Speeding above fleet limit and speeding above posted speed sign.





Where are the areas to focus on?

The following (Netradyne) report provides vehicle activity over a specific time period – where not only is Speeding tracked – but, non-speeding is also tracked. This dataset provides context to how severe speeding problems are in certain designated geographic regions.



Actual Chart: Netradyne (Speeding) Risk Maps

Proposal: Ingredient Data / Risk Maps

Netradyne and MassDOT can collaborate within the opportunity of Netradyne providing <u>data road speed insights and accuracy.</u>

Expected Results - The leveraging of this data set will provide guidance on the dynamic deployment of Speed Safety Cameras that are designed to provide the greatest yield and ultimately the greatest reduction in speeding events.



Moving Telematics

Netardyne is an aftermarket Video Telematics platform that is installed in commercial and consumer vehicles; monitoring driver performance, tracking areas for safety improvement and identifying compliant driving time along with measuring proactive (positive) driving events.

Commercial fleets that have deployed Driveri[®] recognize **50%-60% reduction in Severe Driving Alerts** within the first 12 months, which equates to roughly a **25-30% reduction in Accident Frequency (APMM).**

> 50-60% Reduction of Severe Alerts within first year of deployment 25-30% Reduction in Accident frequency (APMM)

In addition to providing Video Telematics, the Driveri[®] telematics platform provide fleets with [Compliance] and [Fleet Tracking] solutions that assist in reducing fuel consumption and enable fleets to be compliant with State and FMCSA guidelines for duty-of-service.



Netradyne Driveri® D-430



In a recent study, where the Netradyne team correlated accidents and Fleet's GreenZone Score (Netradyne measurement of driver performance) over 1.3 Billion Miles with 215k drivers over 6 months. The team has developed a predictive accident model that provides the likelihood of a fleet having an accident based on their realtime GreenZone fleet/driver performance score.



The chart plots accident frequency measured by APMM (Accidents per Million Miles) against GreenZone Score.

Fleet GreenZone APMM improves 13-15% for Every 50-Point increase in GreenZone Score



Unsafe Driving Behavior

Video Telematics / Hardware Configurations

Driver·I is the most advanced vision-based driver recognition and fleet safety solution, built to reward positive driving behavior and coach areas in need of improvement. Driver·I comes in two form factors - D-215 and D-430.

The D-215, for small-to mediumsized commercial vehicles, is a dual facing dash cam featuring both inward- and outward-facing cameras. The D-430 includes four HD cameras providing a 270-degree picture: one road-facing, one driver-facing, and two side window views. Customers can optionally add up to four external cameras to provide unparalleled 360-degree visibility using our Driver·I HUBx.



Netradyne supports a wide range of privacy options that are tailored to customer needs. This includes the following:

- We offer a standalone road-facing only camera, known as the D-211.
- The inward-facing camera can be disabled entirely and covered with a lens cap.
 - This allows the flexibility to utilize the inward-facing camera in the future.
- Inward footage can be captured but disabled after being parked for three minutes.
 - This allows drivers to use sleeper berths to keep their privacy.
- Netradyne supports a sensor only approach. This allows driver behavior risks to be identified and coached through in-cab alerts. However, inward video files are not stored and thus cannot be retrieved.

All device options record continuously and analyze thousands of data points directly on the Driver-I device. Unlike legacy platforms that rely only on G-force triggers to record video, Driver-I uses advanced AI object detection to deliver the insights and results that drivers and fleets need. By default, each device stores 100 rolling hours. This can be extended by upgrading the storage capacity device up to 200 hours.

Click Here to Review. Driveri® Hardware Configurations



Alerts / Events Captured

Netradyne's solution is powered by over 27 billion minutes of analyzed drive time that leverages computer vision to visually detect high risk driving behaviors such as distraction, tailgating (following distance), stop sign violation, rolling stops, and near collisions.

The Driver-I solution analyzes every second of every driving mile. This allows Driver-I Device to analyze and index driver and external factors/behaviors to identify and warn a driver of potential risks before they impact a driver or a third-party.

Advanced AI is consistent; the same algorithm is used for the same time frame, compared to human reviews with natural error. Driver I uses the power of AI to gain full visibility into every incident; it provides actionable data to automatically coach and improve safety performance across any fleet, developing proactive drivers and futureproofing your safety program.

Our visual AI combined with advanced inertial sensors can detect U-Turns, Lane Departure, Following Distance, Forward Collision Warning, High-G events, Max and Posted Speed Limit and, traffic and stop sign violations to name a few. If the driverfacing camera is enabled, Driver-I can detect distraction, fatigue, seatbelt utilization and more. Each driver can also initiate a recording event by pushing a driver-initiated button.

When connected with our VBUS installation method, Driver I can leverage an existing

ADAS solution to provide video context for, Stability Control, and RPM/Over-Rev, and hard braking events.





Video Access

Netradyne Driver-I focuses on two performance metrics; coachable events and recognition of positive driving recognition. Coachable events include Forward Collision Warning, Following Distance, U-turns, Distracted, Seatbelt, Drowsy, Hard Braking, Speed (Max & Posted), Stop Sign Compliance, Obstructed Camera, Hard Acceleration, Traffic Lights, Hard Turns, Weaving, Collision Warning (near miss).

Positive Driving events include creating space, moving over for a vehicle on the side of the road, Consecutive Stop Signs, and calculated GreenMinutes (# of minutes of fully compliant driving). In addition, Driver I provide context into the driver's performance through individual & fleet compliance statistics (Stop Sign Compliance, Traffic Light Compliance, Speeding Compliance, Following Distance & Average Following Distance) and Distracted Driving Compliance.

The Netradyne Driver I solution allows up to 200 hours of rolling drive time to be stored on the device. This includes every second of every minute of operation between key on and key off. Users with the proper permissions can request playback footage through automated upload via a driving risk event (alert) or through Event Access which allows full visibility to all stored drive time through searching by location, vehicle number, time of day, etc.





Driver / Fleet Manager Experience

The graphic below shows an event – where the system has detected a 'severe' following distance event (following distance under 0.6s). The Driveri® system systematically detects & analyzes the driving event and provides visibility to the driver & to the fleet. Here is the breakdown of the [5] different program elements:

- Alert Determination & 2) Alert Detection, Causality and Severity Driveri[®] uses object detection versus a triggered 'severe vehicle movement' to determines detection, causality, and severity. Alerts are analyzed at the device and accessible data is available within seconds after they occur.
- 3) Driver Coaching via In-Cab Notification Driveri[®] is designed with an 'Act Now, Talk Later' approach – where an in-cab notification audio message is presented to the driver – asking them –– in this case – to "create space". Trying to resolve the condition now versus later.
- 4) **IDMS CustomerPortal visibility** Since the data is analyzed at the device alerts & events are sent through 4G LTE wireless connectivity and are made available on the CustomerPortal within minutes after occurring and being analyzed.
- 5) Fleet Manager MobileApp | Push Notifications The Driveri[®] program enables derived program data to be both provided to the CustomerPortal in addition, the same information can be provided through a 'push notification' via the Fleet Manager MobileApp.





Roadway Condition

In the example below, we took a dataset from one of our largest customers looking at their operations over the last 30 days. The fleet had 63,625 data events, where the specific 'micro-weather' for each event was identified and labeled.



What is the opportunity to harvest this data?

Netradyne has accumulated over 27 billion <u>Captured & Analyzed</u> operating minutes since the launch of the Driveri® Safety Platform. In the month of February 2024, the Driveri® generated over 1 billion operating minutes – which indicates a highfrequency for road topography data. Examples being, accuracy of posted traffic signs, relative speed around those data points, and relative speed of other vehicles within close proximity (is traffic moving faster or slower than Driveri equipped vehicle)



Traffic Signal Timing and Phasing

Netradyne and MassDOT can collaborate within the opportunity of Netradyne providing <u>data road speed insights and accuracy.</u>

Expected Results - The leveraging of this data set will provide guidance on the dynamic deployment of Speed Safety Cameras that are designed to provide the greatest yield and ultimately the greatest reduction in speeding events.





Civic Research Questions on Telematics

1. What are we able to learn about the relationship between distracted driving and land use (or other variables)?

Netardyne Observation/Response – In analyzing over 27 billion operating minutes – we have found material trends for distracted driving. The four most common environmental conditions that lend themselves towards distracted driving are as follows:

- 1) Route confusion (lost and/or running late)
- 2) Longer routes where there is a substantial amount of straight-line driving
- 3) Drivers that are not commercially certified (non-CDL drivers)
- 4) Drivers that have routes that cover multiple days.
- 2. Is there a geographic correlation between different types of poor driving behavior (speeding, distraction, harsh braking, etc.)?

Netradyne Observation/Response – Yes. Typically, distracted driving occurs on routes that are measured in hours and/or days versus minutes/hours. Speeding is more prevalent in vehicles that travel on highways and stop sign & traffic signal events occur in applications of city vehicles. Lastly, hard braking occurs equally on longer routes and within city driving.

3. How might we use telematics to inform traffic signal timing and phasing to improve safety for Vulnerable Road Users?

Netradyne Observation/Response - As stated earlier in the RFI, we believe that



there are datasets that can be harnessed by the MassDOT to create the greatest speed reduction benefit – by harvesting the data provided in Netradyne RiskMaps. Opportunistically, identifying the locations with the greatest opportunity of risk reduction.



4. How might we use telematics information, such as driver distraction or seatbelt use, to inform driver education activities and campaigns?

Netradyne Observation/Response – Netradyne telematics data can provide the location and frequency of event types (distraction / seatbelt) and help to create effective campaigns on the opportunities to reduce these occurrences.

5. Beyond aggregated and anonymized driver behaviors, can vehicle data like low tire pressure, brake wear, or wiper information be used in creative ways to improve safety?

Netradyne Observation/Response – Yes. Netardyne collects vehicle usage and funnels that information into the DriveriOne Fleet Management solution offering – where maintenance cycles can be optimized based on not only mileage – but, through aggregated vehicle usage (e.g. time driving in rain, location of vehicle, etc.)

- 6. What are the societal benefits of better pavement condition for non-motorists?
- 7. How do you envision MassDOT might use ubiquitous telematics data to supplement:
 - a) our existing (annually refreshed) pavement condition collection program that informs our resurfacing plan,
 - b) data to make spot improvements (e.g. a pothole finder),
 - c) information for snow/ice operations, or
 - d) ways to capture roadway marking quality

Netradyne Observation/Response – Netradyne currently works with selected 3rd parties that use Driveri data (Imagery data that provide visibility into road durability / condition) to generate specific DOT work orders for road maintenance / repair.



- 8. What sustainability metrics (like fuel consumption) are you able to provide insight into that could also correlate to safety improvements?
- 9. Show us something unique about your work that would provide new actionable insight for MassDOT in helping us prioritize resources.

Netradyne Observation/Response – Through the application and utilization of the Driveri generated imagery. MassDOT can quickly prioritize different video/images that provide insight into the severity and timeliness of repairs. This information is refreshed each day/week/month and creates a proactive model for road repair versus having a reactive model that reduces resource utilization.

10. How would your tool support insights in both heavily populated areas and more rural areas in Massachusetts?

Netradyne Observation/Response – Netardyne Driveri[®] customers operate on highways, boulevards, city roads and neighborhoods. The data collected from these different roads can be equally analyzed and prioritized for repair/maintenance.

11. How could your tool be leveraged to support the work of cities and towns in making their roadways safer through annual construction project planning?

Netradyne Observation/Response – Netradyne Driveri customers covered over 1 billion driving minutes in February 2023 – which just under 500 million miles captured and analyzed each month. This data can be harvested to understand where resources should be applied to create a safer infrastructure.

12. ... or bring your own research question and answer it using your data and platform to generate useful insights.



Our "challenge" to you

Please select one or more of the civic research questions above or propose an unasked question that you feel your team can uniquely answer. Provide a response that demonstrates your ability to answer that question and provide insights for MassDOT and other roadway owners in Massachusetts.

If you offer telematics services, please also answer the following questions:

 Demonstrate that you can conflate your data insights to MassDOT's road inventory file (see MassDOT Assets below) and to Open Street Map or describe in some detail the process required to do this for roadway segments and the estimated time involved to do so.

Netardyne Resources

Netradyne API Link

2. Please describe how you protect and preserve privacy with your product.

Netardyne Resources

Netradyne Privacy Policy

3. Please explain your business model or models for working with government transportation authorities.

Netradyne currently works with multiple City, County and State agencies – where the Netradyne Driveri device is installed on the vehicle and the respective commercial fleet utilizes the 'safety platform' to reduce risk (leading indicators) and reduce accident frequency (lagging indicators) – along, with leveraging the collected data to optimize/assign resources for infrastructure improvements.

4. If relevant, please share how MassDOT would be involved in developing the product or if there are any opportunities for customization.



5. Please indicate the monthly volume of drivers/vehicles reflected in your data for Massachusetts roadways and the estimated percentage of drivers out of all of those on the roadway represented in your dataset.

Over 80% of our 270k+ vehicles deployed with Netradyne Driveri operate in the Eastern Time Zone (EST). A larger portion of our 'Last Mile' and 'Longer haul' customers operate in the New England region – where there is substantial geographic coverage to determine opportunities for safety improvement and risk reduction.

6. Indicate if you have a demonstration with Massachusetts-based data that you would like to present in a workshop with MassDOT staff. Please include the topic you'd like to address and a few sentences on what you want to share.

The demonstration that we would propose to the MassDOT is to provide insight into the volume of data that is currently being collected within the state. Providing insight into real-time speeding, risk and areas of opportunity. In addition, we can provide data segments where infrastructure can be immediately addressed to improve road conditions and safer driving.



Non-Digital Tools & Ideas

Our Civic Research Questions for Your Idea

Q1. Where else has this been implemented? Or would we be the first place to try it out, to your knowledge?

Netradyne has deployed over 270,000 Driveri devices that operate roughly 1 billion minutes per month – covering just under 500 million miles. The segment that we would focus on is smaller segment of this data that is filtered by data collected from the Commonwealth of Massachusetts.

Q2. To your knowledge, does this solution require a power source? Is it batterypowered? Does it need network connectivity?

Yes. Driveri utilizes vehicle battery power.

Q3. Please describe the requirements for any space or physical assets needed for installation of equipment if you are proposing physical equipment.

The Driveri device is installed in the top / middle portion of the vehicle's windshield.

Q4. How would Massachusetts residents experience your proposed idea? What interaction would they have with it and how would they help shape it?

The residents of Massachusetts would only recognize the device installed on the vehicle. There are opportunities where pedestrians and person identifiable data – such as license plates can be blurred to equally collect data to improve safety / reduce risk – while, protecting the general privacy of the general public.

Q5. With which component(s) of the Safe System Approach does this solution correspond?



Where attention goes, Energy flows.

One argument against measuring in the negative is that it keeps our attention on what we don't want. This would mean that if we measure workplace accidents, then our attention is on injuring people rather than keeping them safe.



But really, **why can't our attention be on the shrinking gap between the current injury level and zero**, through <u>a trajectory of improvement targets</u>? Our energy, then, could flow in the direction of finding the solutions that continue to shrink that gap.



Energy flows towards the decisions we make. And performance measures exist to help us decide on the best action to get closer to the results we want.

Measures are not self-fulfilling prophecies - we will not get more workplace accidents just because we measure them. We don't measure just to monitor; we measure to learn how to reach the results we want.



Measuring Positive Driver/Fleet Performance.

Great Driving is Recognized – professional drivers are trained to identify risk and immediately react to increase the safety around their vehicles –- each DriverStar recognizes excellent driving and is counted as a bonus against their GreenZone score – providing opportunities to achieve daily, weekly and monthly goals

US Patent #10,782,654 - Netradyne's patent focused on positive driving

Click here to view (sample) DriverStar Events





Why Netradyne Driveri®?

There are [6] unique differentiators that the Netradyne Driveri[®] Vision Based Driver Recognition Safety Platform provides over other video telematics solutions.

- 1) Capture and analyzing every driving minute this lends itself to being able to identify geographic areas in terms of risk severity and DOT road maintenance
- 2) AI Accuracy As objects are identified, accuracy of identification create opportunities for effective work streams
- Timeliness data is processed at the vehicle providing drivers with immediate self-coaching opportunities – along with providing MassDOT resources insight into events/alerts as they occur
- 4) Automated Coaching as information is processed at the vehicle / device immediate correction guidance can be applied to the driver to reduce their risk
- 5) Driver Recognition as all the data is analyzed a byproduct is full visibility into compliant driving and visibility into opportunities where the drivers were proactive in removing risk around their vehicles.
- Safety Predictability there is a strong correlation between the Driveri scoring (GreenZone) and reduction of leading indicators of risk and lagging indicators of accident occurrence.