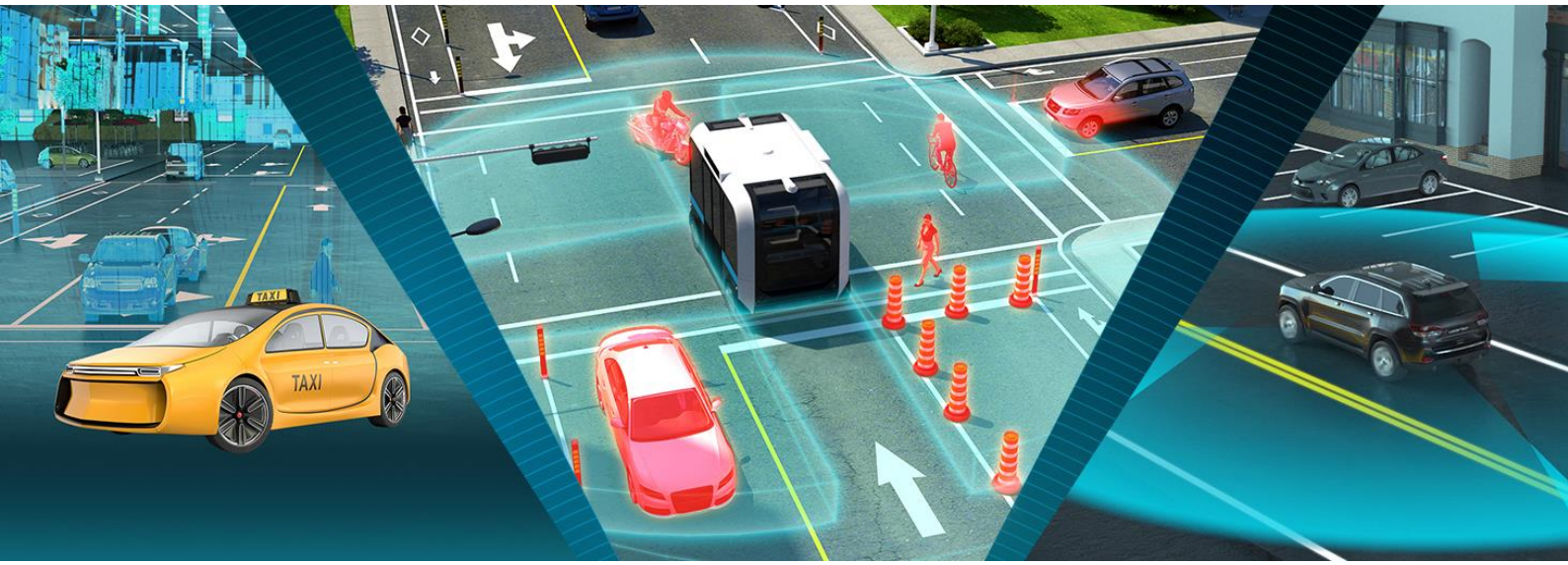
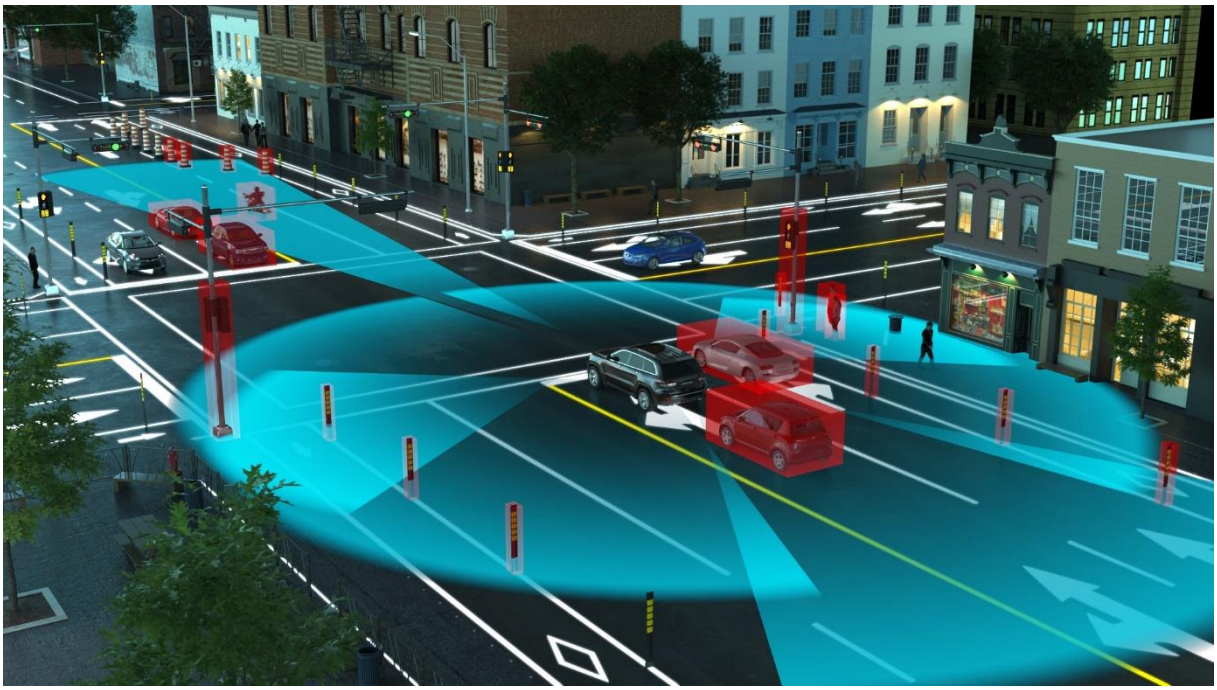
How LeddarTech is Driving Forward the Autonomous Vehicle LiDAR Solutions of Tomorrow



Over the past decade, LiDAR technology has become a highly accessible solution to enable obstacle detection, avoidance, and safe navigation through various environments in an assortment of vehicles. Its substantial impact on the future of how we interact with our environment in cities and on roadways will be known for decades to come.

This article provides an overview of the innovative, flexible, and scalable LiDAR technology developed by LeddarTech, and its deployment in automotive and mobility applications, including Advanced Driver Assistance Systems and Autonomous driving.

Light Detection and Ranging

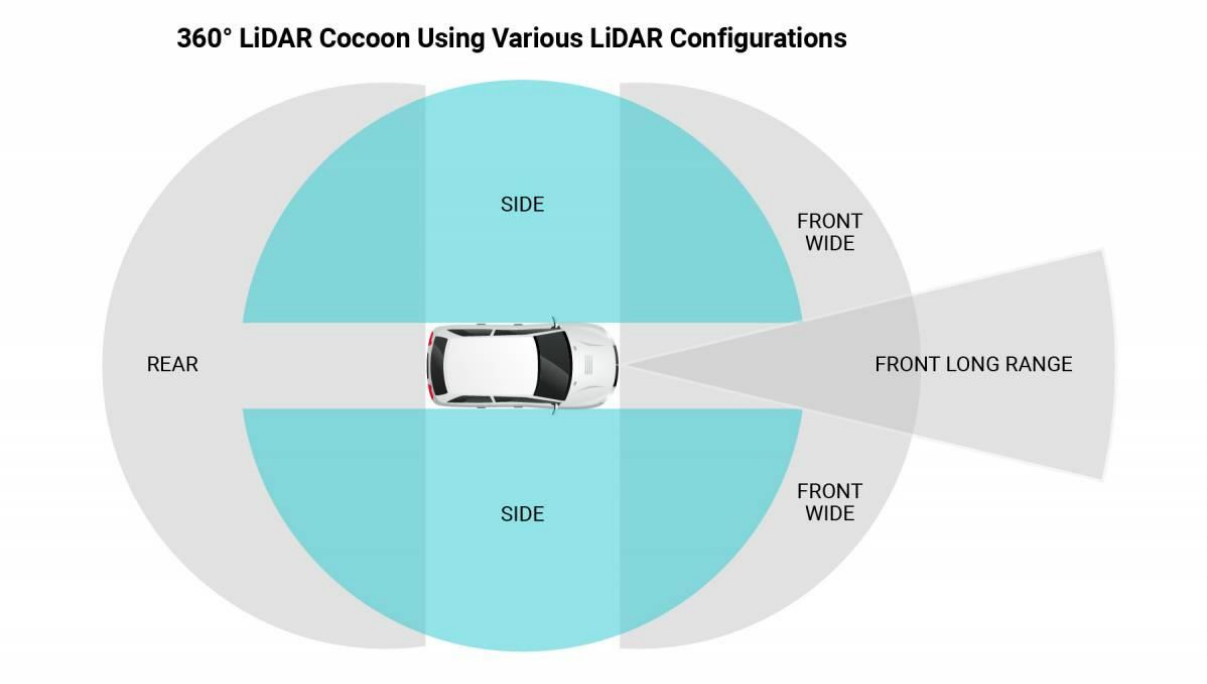


Whereas LiDAR is considered an indispensable solution that will enable technology for advanced driver-assistance systems *(ADAS)* and autonomous vehicles *(AV)*, what is yet to be determined is how, and under what format, LiDAR will be deployed in tomorrow's vehicles.

The reality is that many LiDAR systems available today are still too expensive for automakers to use. Eventually, cost-effective technologies that allow vehicle automation, from partly autonomous to fully autonomous driving, will emerge from the pack and prevail over more inefficient solutions.

Autonomy and LiDAR

For autonomy to occur, vehicles must be able to use various types of sensors to detect their environment. Technologies such as cameras, ultrasound, and radar are the current standard used in today's passenger vehicles. Whilst these sensors have their inherent benefits; there is an overwhelming consensus in the industry that all these sensors have limits — LiDAR will be a necessary addition to achieve the required level of safety in autonomous driving.



"LiDAR offers hard, computer-friendly data in the form of exact measurements. That's why every serious player in the self-driving car race believes the laser sensor is an indispensable ingredient for a fully robot car, the kind that doesn't need a steering wheel or a human hand."

Alex Davies, Wired.com

A Tale of Two LiDARs

There are two fundamental types of LiDARs available to designers wishing to integrate this technology into automotive and mobility solutions: **Mechanical Scanning LiDARs**, and **Solid-state LiDARs**.

Mechanical Scanning LiDARs can collect data over a wide area of up to 360 degrees by physically rotating a laser/receiver assembly, or by using a rotating mirror to steer a light beam. These LiDARs use powerful, collimated lasers that concentrate the return signal on the detector through highly focused optics. While they provide a detailed mapping of the environment, their high price (i.e., several-to-tens of thousands of dollars), complexity, reliability issues, and large dimensions make them an unattractive option for commercial deployments in automotive and mobility applications.

Solid-state LiDARs, built without motorized mechanical scanning, have been recognized as the best avenue for delivering mass-market automotive LiDAR solutions. Their more straightforward build with no moving mechanical parts makes them intrinsically more cost-efficient to produce, providing a path to high-volume manufacturing and commercial viability. Flash LiDARs provide complete, instantaneous scene illumination. They capture incremental insights on objects using significantly less data than point cloud methods, enabling highly efficient processing.

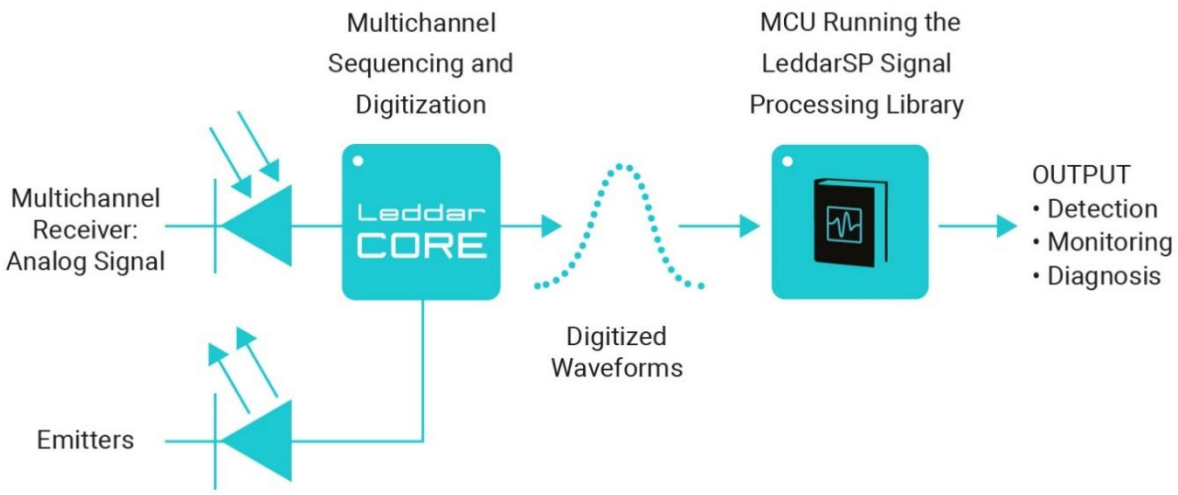
When we look to the future, for LiDAR to be a viable, sustainable sensing solution to be deployed in all automobile classes, a technology platform with the following attributes is necessary:

- Keeps costs low;
- Functions reliably; and,
- Cover the required ranges, resolutions, and fields of view.

This is where LeddarTech® comes in. LeddarTech, with its roots in the optics industry, started working towards cost-optimized LiDAR very early on when it's market potential was relatively unknown.

Solid-state LiDAR sensors from LeddarTech are already used in various mobility applications, from drones to autonomous shuttles, from traffic management to highway tolls, so the company has already been through the necessary learning curve and now provides technology that exhibits a high degree of optimization and maturity. LeddarTech's development efforts are currently focused primarily on making ADAS and autonomous driving possible in many vehicles such as cars, shuttles, robotaxis or utility vehicles.

The Anatomy of LeddarTech's® LiDAR Technology



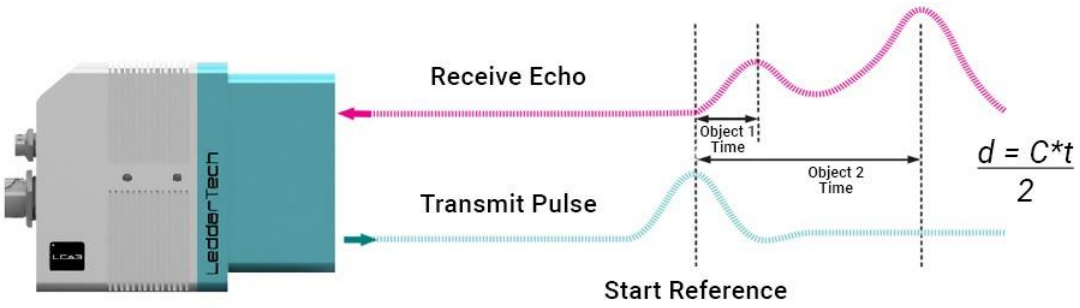
To achieve automotive autonomy, LeddarTech™ developed the **LeddarEngine™**, which consists of a highly optimized LiDAR core comprised of an exclusive line of LeddarCore™ system-on-chips *(SoCs)* and the LeddarSP™ digital signal processing software. LeddarTech's **flexible architecture addresses auto & mobility applications with optimized development, cost and performance scalability combined with a full automotive grade supply chain.** The LeddarTech's Auto and Mobility LiDAR Platform™ enables tier 1 customers to develop a LiDAR system that meets functional safety standards and the specific needs of customers.

LeddarTech uses direct time-of-flight measurement, in which a discrete pulse is emitted and the time difference between the emitted pulse and the return echo is measured, which can be converted directly into a distance. Since the speed of light changes only slightly even in extreme weather conditions and is orders of magnitude higher than the rate of the objects to measure, optical time-of-flight measurement is a very reliable option for contact-free measurement of distances from objects.

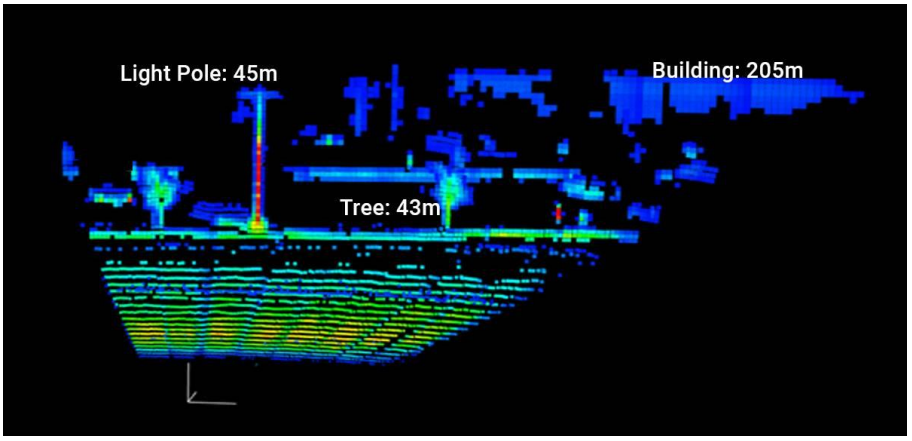
"To lower the costs of LiDAR systems, LeddarTech™ has developed its own signal processing technology, which makes it possible to use cost-effective, easily available optical components and get greater performance from a LiDAR design. This makes it possible to mass-produce LiDAR systems for a few hundred dollars instead of thousands."

Klaus Buchner, ASIC Senior Project Manager, LeddarTech™

Advantages of the proprietary LiDAR Technology from LeddarTech®



- ✓ The technology can be used in a wide variety of applications, as versatile combinations can be created with components stemming from ecosystem partners;
- ✓ The distance for any object found in the field of view can be extracted;
- ✓ Measurement methods are not implemented directly in the hardware due to flexible complex software algorithms;
- ✓ Precise distances can be calculated, even for an object with a weak echo;
- ✓ Larger detection ranges can be covered with less light power due to high range-to-power ratio;
- ✓ Targets can be detected even in challenging lighting conditions;
- ✓ A single detector element can be identified with multiple targets.



One Step Ahead

Since LiDAR has been considered important technology for highly automated driving, many semiconductor manufacturers have also developed technologies to allow such systems to be implemented cost-effectively. In the end, a crucial factor for success will be how quickly the technology can be industrialized and put into mass production.

LeddarTech® offers certain advantages here.

Besides the degree of maturity and the available software, developers on LeddarTech's Auto and Mobility LiDAR platform™ also have access to a corresponding ecosystem. This ecosystem contains other renowned manufacturers of all the other components necessary for a LiDAR system and are pre-qualified to be compatible with the LeddarEngine. Armed with the LeddarEngine and components from this ecosystem, Tier-1 suppliers and system integrators can develop their own LiDAR systems. This gives rise to win-win partnerships that take advantage of the core competencies of the respective company to reduce the time-to-market, while simultaneously reducing the overall risk, which ultimately benefits the OEMs.

Built to Last

LeddarTech's® proprietary LiDAR platform will stand tall in a time where an assortment of competing LiDAR technologies are hurriedly emerging from the shadows to join the race toward vehicle autonomy.

One way this is achieved is by investing heavily in research and development to ensure that LeddarTech can assert and expand a leading technological position and distinguishing features. The creation of new R&D centers in Toronto and Montreal in Canada, as well as Linz in Austria, and the expansion of the global presence in Europe, North America, and Asia, are also oriented towards this.

Eventually, these enhancements to the organization will result in a cost-effective, flexible, and scalable technology that will allow for the potential of LiDAR to be the driving force behind the self-driving solutions of tomorrow.

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