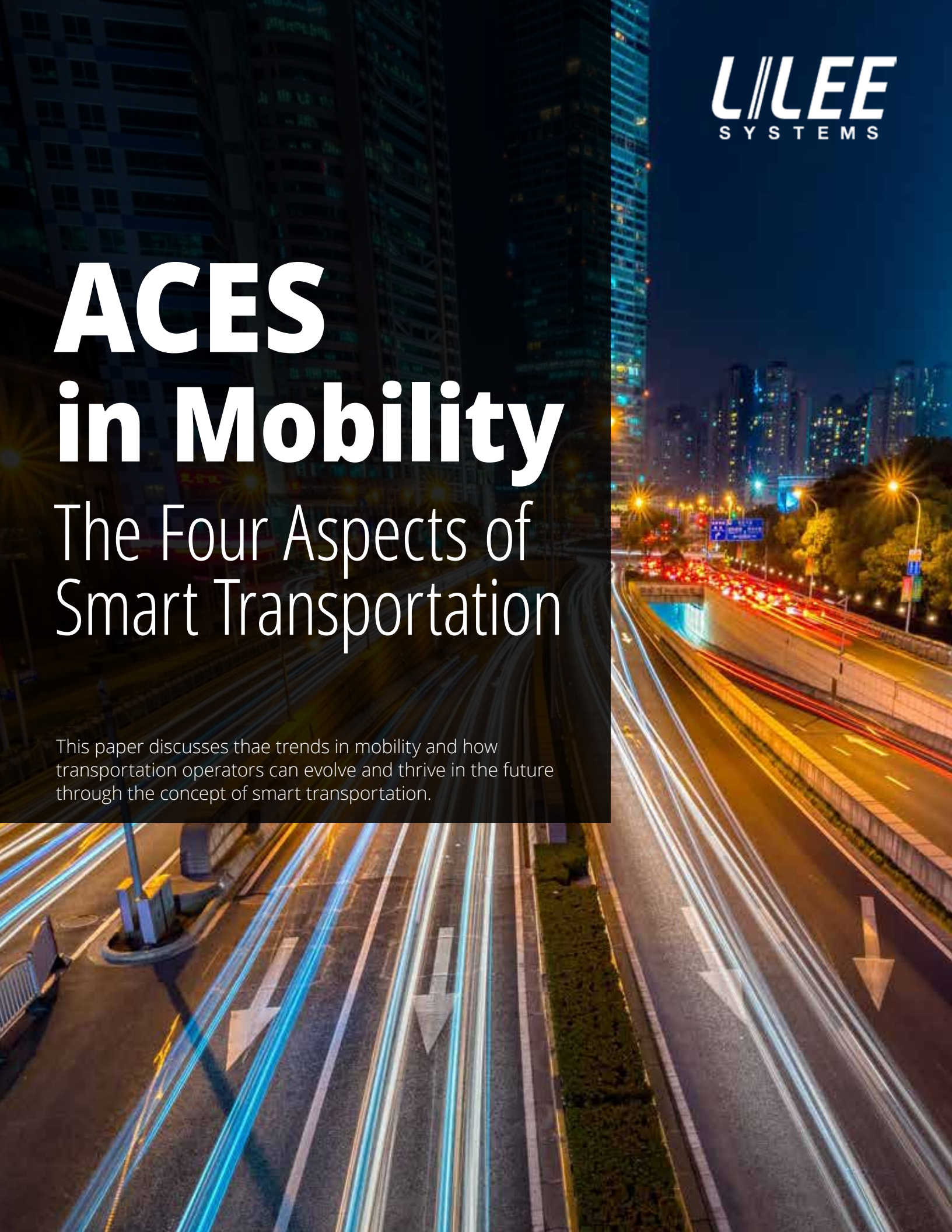
LILEE SYSTEMS

ACES in Mobility

The Four Aspects of Smart Transportation

This paper discusses thae trends in mobility and how transportation operators can evolve and thrive in the future through the concept of smart transportation.



Mobility's perfect storm

It is a perfect storm for mobility; rise of millennials, growth in sharing economy and advent of autonomous cars are shaping the future of mobility in very different ways. Today, millennials are the largest demographic[1] in the U.S. and have different consumer characteristics. They want to stay always connected and want access and not ownership of assets like automobiles[2].

The sharing economy is making it easier to put otherwise idle assets like personal vehicles for commercial use. This pressures traditional transportation businesses to remain profitable. The race to put autonomous vehicles on the roads is heating up with billions of dollars in investment and cities considering regulatory, planning, and governance implications.

All these trends are impacting buses, shuttles and other modes of transportation across the globe. Although they may sound disruptive, there is a silver lining for bus and shuttle transportation providers. There is a shift away from owning vehicles to using more public and shared transportation, especially in urban areas.

People transportation providers can capitalize on this shift in this new economy. To do that, they should evaluate and transform their fleet along four dimensions –autonomous, connected, efficient and safe. Transportation that is autonomous, connected, efficient and safe is smart transportation.

Let us look at each of the four dimensions of a smart transportation.

Autonomous

Autonomous or driverless vehicles will represent an important percentage of transportation in the future[3]. Autonomous vehicles promise fewer accidents, less congestion and higher utilization of the fleet. $80B have been invested over the last three years and several cities around the world are piloting autonomous vehicles. Safety, customer trust and regulation remain the biggest hurdles for mainstream deployment. The momentum is strong with autonomous vehicle companies and it is just a matter of time before we see fully autonomous vehicles on the road.

For bus transportation providers, there are faster ways to get to autonomous fleet. An example is driverless buses on virtual tracks. CBTC (Communications based Train Control) is a proven rail technology that can be used to transform buses and shuttles into autonomous vehicles. This is done by running autonomous buses on dedicated lanes or virtual tracks.

Unlike a fully autonomous vehicle (L4 or L5 per SAE International classification[4]), virtual track autonomous bus requires more straightforward driverless car technology with robust obstacle detection and remediation. This is a quicker way to roll out autonomous vehicles and enjoy the benefits of reduced operational costs. It is also safer because the dedicated lane lowers the risk of collisions.

Fixed route transit, first mile/last mile, theme and corporate parks can all benefit from this virtual track autonomous technology.

Connected

We live in a connected world with apps and cloud based services on every smartphone, tablet and personal computer. There is tremendous value in connecting people and things not only at fixed locations, but also while on the move, in buses and shuttles. Riders expect this. Operators can create new customer experiences and discover new ways to optimize operations. Passenger fleet operators can:

- Enable services like onboard Wi-Fi, real-time travel information updates and entertainment for superior customer experience
- Run targeted promotions and advertisements to onboard passengers' mobile devices
- Enable remote vehicle diagnostics to minimize delays and identify potential failures proactively e.g. a stuck door in bus 100 miles away analyzed from your control center
- Monitor and improve driver behavior by looking at sudden acceleration, turns, braking and over speeding for increased safety

A connected bus is defined as a bus having connectivity to Internet always with enough bandwidth and low latency for real time onboard services. Such omnipresent connectivity can be via cellular, Wi-Fi, dedicated radio and satellite. The operator can control the connected vehicle operations in real time. This aspect is covered in the next two sections under efficiency and safety. The operator can also roll out new services such as passenger Wi-Fi, entertainment and onboard commerce.

These in-transit experiences can become a key differentiator for a transportation provider. According to Deloitte, "passengers on public transportation could consume roughly 23 billion hours of additional media content by 2030[5]."

A connected vehicle also becomes part of the overall hassle-free and multi-modal transportation system which every rider wants today. Connected vehicle is the bedrock of smart transportation.

Efficient

Transportation fleet operators can improve their return on investment (ROI) by improving fleet efficiency. A connected vehicle provides ample opportunities to increase efficiency. The fleet operator can monitor vehicle health and increase utilization of remote vehicles from their control center. Advanced analytics can help predict failures.

Here are two scenarios that illustrate how.

Sarah, fleet manager, follows a schedule based maintenance program for her fleet. When a vehicle presents a problem, she deploys a technician to diagnose the problem and sends a report to the service center. With a connected vehicle, Sarah gets onboard diagnostics data in real time and information is proactively sent directly to the service center. This eliminates manual troubleshooting and sending off reports to the service center.

Frank, fleet manager, keeps track of the fuel consumption of his fleet manually. With telematics application on its connected bus, Frank can quickly review and compare fuel consumption to improve the fuel efficiency of each vehicle by correlating driver behavior, route distance and engine performance like idling. He also coaches his drivers and saves money in fuel costs.

Almost every part of the vehicle can be continuously monitored to detect failures and performance issues without the need to wait for someone to call. Faults in one vehicle can help identify issues in a different vehicle based on patterns and trends .

Safe

Safety is the foundation for smart transportation. Safety of driver, passengers and vehicle itself is a fundamental requirement for a successful fleet operation. It can lead to smoother operations, lower insurance costs and overall better business value. There are several safety tools available for a fleet operator such as onboard surveillance cameras, advanced driver-assistance system (ADAS), and distracted driver monitoring.

In railroad, Communications based Train Control (CBTC) is used to continuously monitor the location and speed of a train to ensure safety and capacity requirements. The same concept can be used for safety of autonomous vehicles on virtual tracks on roads. It also provides the flexibility to scale capacity up or down, for example to run more trains or autonomous buses per hour during high demand and lower the capacity during light demand.

Bus and shuttle operators can minimize accidents through automatic monitoring of aggressive driving behavior and increase passenger safety through in-vehicle surveillance cameras.

Driving behavior monitoring is also a great coaching tool and eliminates the need for a supervisor to physically ride alongside the driver.

Here is a safety scenario made possible when a vehicle is connected.

Robert, safety manager, is faced with a serious complaint against one of his best drivers. He uses driver behavior application to look up location, speed, acceleration and braking data along with interior and exterior video footage around the time of incident. He discovers it is not the driver's fault, defends against the false claim and exonerates the employee.

When a vehicle is connected, operators can also look at the in-vehicle live video feeds from a remote location, i.e. operations control center. Law enforcement and other emergency response personnel can access the same camera footage in real-time when needed.

Takeaway

Multiple trends such as millennials' attitude to transportation, prevalence of sharing economy and advent of autonomous vehicles are shaping the future of mobility. For people transportation operators, these "disruptions" can be taken advantage of by transforming themselves to smart transportation providers.

By investing in safety, efficiency, connected vehicle services and autonomous vehicles, operators can strategically place themselves to ride this wave of disruption. It is important to note that transitioning to smart transportation is a journey that will take longer than a simple overnight change. Operators can start the journey today along any one of the dimensions and add the others on a pace based on their needs and business goals. Many agencies are already benefitting from systems and applications that provide efficiency and safety, and the right technology can help them increase the value of those applications and systems. Achieving the vision of smart transportation is easier that it seems.

Please contact us to learn more about the four aspects of smart transportation we discussed in this white paper. Many of the solutions discussed are available from LILEE Systems. We are happy to work with you in your journey to smart transportation.

About LILEE Systems

LILEE Systems provides real-time connectivity for onboard devices in trains, buses, other mobile assets and for smart cities. We enable a variety of applications such as passenger Wi-Fi, CAD/AVL, infotainment, video- and sensor-based safety applications, and telematics. LILEE Systems edge gateways also run third-party applications and optimize connectivity through dynamic load balancing to lower cellular costs. LILEE Systems, listed as an Inc. 500 fastest-growing private company, is headquartered in Silicon Valley with offices in Taipei and Amsterdam.

For more information, please visit www.lileesystems.com.

Corporate Headquarters:

91 E. Tasman Dr.

San Jose, CA 95134, USA

+1 (408) 988-8672

sales@lileesystems.com

Endnotes

1 http://www.goldmansachs.com/our-thinking/pages/millennials

2 https://www2.deloitte.com/us/en/pages/manufacturing/articles/automotive-trends-millennials-consumer-study.html

3 https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/o6verview.html

4 https://en.wikipedia.org/wiki/Autonomous_car

5 https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/opportunities-for-media-and-entertainment-industry.htm