Empowering the Mobility Fleet of Tomorrow

Developing innovative, meaningful, and long-lasting mobility solutions through technology.
The adoption of smart and resilient cities, infrastructure, and transportation will lead to the democratization of technology outside of the usual tech hubs. To reach this future, we will also see a ramp up in technology investments, from the Edge (AI) to the (5G) network to the cloud. Technology will be a key driver in ensuring progress and adoption of new business models, leading to economic growth.

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Overview

The internet of things plays a key role in the future of urban mobility. As cities grow in size and complexity, transportation solutions require a more strategic approach. Increasingly, public transportation companies, as well as freight/cargo companies and operators of heavy equipment fleets, are looking for IoT technology systems to produce actionable insights from vehicle data. Companies need to provide their fleets with new capabilities that will transform the transportation experience—and that is just the start of mobility’s evolution.

Growing demand in urban mobility and mass transit—which includes freight/cargo transportation, public transit, and heavy equipment—is driving the need for innovative approaches to operations. Every day, millions of connected things within smart cities generate large amounts of data. Making sense of that data in an economical way to transform municipalities and the many segments that operate within them. These analytics-based insights enable organizations to make better decisions in near real-time that deliver more value for customers and employees.

Urban mobility includes a broad scope of road vehicles—trucks, buses, and cars, as well as heavy equipment—each of which plays an integral role in personal and commercial transportation. In this context, road vehicles are crucial in areas such as last-mile transport and delivery, the reduction of infrastructure costs, and minimizing environmental impact. Here, the concept of urban mobility deals with both public transit as well as commercial applications, from global logistics to heavy equipment in fields like agriculture, construction, and mining.

The growth in population of metropolitan areas, especially larger ones, continues unabated and will ultimately influence mobility’s evolution. Large metropolitan areas that feature populations of 1 million-plus inhabitants have increased by over 400 million since 2000, with the most rapid growth seen in metropolitan areas with populations above 5 million.

Smaller metropolitan areas have also seen unprecedented growth. Additionally, the number of urban areas with more than 5 million inhabitants has doubled in just 25 years. According to the UN World Urbanization Prospects, urban shares globally are projected to increase in the coming decades. By 2050, as much as 68 percent of the global population will call an urban area home, up from 54 percent as recently as 2016.

The resulting global demand for passenger mobility in urban areas is expected to double by 2050. Transport operators continue to face increasing challenges with their existing systems in e-commerce, ticketing, route planning logistics, as well as overseeing vehicle and internal bus maintenance purposes. New complications such as evolving public health measures, non-traditional traveling schedules, and other accessibility needs present even more challenges.

The Evolving Transportation Experience

What’s driving growth and the need for innovative technological solutions?

<table>
<thead>
<tr>
<th>Heavy equipment</th>
<th>Cargo</th>
<th>Public transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing investment in construction around the globe due to population shifts</td>
<td>Significant growth in commercial transport as buying habits shift to e-commerce</td>
<td>Global demand for passenger mobility in urban areas expected to double by 2050</td>
</tr>
</tbody>
</table>
The number of daily individual journeys continues its historic growth, further increasing pressure on urban mobility systems, where requisite upgrades and expansion often fail to keep pace. Cities like Jakarta, Indonesia support as many as 200 million passengers each year with the world’s largest bus system. New York City remains the largest bus system in the U.S., and expects to be all-electric by 2040, a plan that keeps pace with California’s statewide goal for public transit to be zero-emissions by that same year.

China—the global leader in the adoption of electric buses—is home to cities like Shenzen, which hosts and operates the world’s largest electric fleet. Adoption of electric vehicles in the mass transit systems of Europe has been dramatically rising as well, with 2019 seeing a tripling of the number of e-buses in Western Europe, compared to an already significant 48% increase the previous year.

The Organisation for Economic Co-operation and Development (OECD)’s 2019–2020 report on the environment outlines ways that environmental concerns can be folded into transport policies. These include moving toward zero-emissions road passenger transport, autonomous car development, mitigating non-exhaust elements from road transport, and promoting more sustainable mobility patterns in passenger transport. Customer demand for convenient, fast, reliable, and individualized mobility solutions are increasing, a trend that will continue. Globally, the resulting on-demand public transportation market is expected to see growth from USD 86,497.92 million in 2019 to USD 172,066.68 million by the end of 2025 at a CAGR of 12.14 percent.

Compounding matters further, goods mobility and commercial transport is facing even larger growth, as consumers shift their buying habits, e-commerce skyrockets, and last-mile delivery demand booms. The global Transportation Management System market size is projected to reach USD 6.6 billion by 2026, from USD 2.8 billion in 2020, at a CAGR of 15.1 percent during 2021-2026. The global commercial vehicles market size, previously valued at USD 1.32 trillion in 2017, is expected to grow to a CAGR of 7.1 percent from 2018 to 2025.

Improvements in production techniques, evolving consumer demand, the rise of e-commerce, and more are all putting pressure on businesses and governments alike to continue transforming through digital adoption and innovation. Meaningful and lasting change in mobility solutions and within the global supply chain requires all parties involved to adopt and deploy digital technologies in an effective way, with visibility, intelligence, and efficiency guiding the process.

The total number of public buses in operation in the U.S. alone amount to nearly 900,000, including commercial and school vehicles. With China and India leading the way in terms of projected growth on the horizon for public transportation vehicles, nearly every region around the globe is predicted to increase their

### Commercial Vehicle Sales Demand by Country 2019

<table>
<thead>
<tr>
<th>Country</th>
<th>Sales/Demand 2019</th>
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</thead>
<tbody>
<tr>
<td>USA</td>
<td>12,764,999</td>
</tr>
<tr>
<td>China</td>
<td>4,324,497</td>
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<td>Canada</td>
<td>1,479,252</td>
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<td>Japan</td>
<td>894,125</td>
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<tr>
<td>India</td>
<td>854,839</td>
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<tr>
<td>Mexico</td>
<td>597,951</td>
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<td>Thailand</td>
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<tr>
<td>Brazil</td>
<td>525,781</td>
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<tr>
<td>France</td>
<td>479,698</td>
</tr>
<tr>
<td>Germany</td>
<td>409,801</td>
</tr>
</tbody>
</table>

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**Note:** The numbers represent the sales/demand for commercial vehicles in 2019. These figures are indicative of the market size or demand for commercial vehicles in that year.
fleet size of heavy-duty transit buses in the coming years. Further, it should come as no surprise that with this expected growth in fleets around the world, a significant portion of all new buses purchased will either be running on electricity or some alternative form of hybrid technology.¹⁴

In the heavy equipment vehicle market (agriculture, construction, and mining), growth of global fleets is also on the rise. For example, the farm equipment market reported steady growth in 2019, and experts note that the trend will likely continue in the coming years, supported by government subsidies and the push to promote farm mechanization. The global farm equipment market is projected to reach USD 113 billion by 2025, up from USD 92.2 billion in 2020, at a CAGR of 4.2%.¹⁵

One key trend driving projected growth is related to the expected increase in demand for autonomous tractors, which will likely hold significant market share in the next few years. Developments in the autonomous tractor market, including sensors, more safety, productivity, and fuel efficiency, are expected to boost demand in the coming years. Among the many reasons supporting this growth, favorable government schemes and policies play a central role in countries around the world.

Several factors impacting the heavy equipment, construction vehicle market is supporting projected growth. These factors include rapid urbanization, increasing investment in construction around the globe, rising demand for infrastructure development in developing economies, population increase, and the resulting increase in spending.

Here, earthmoving equipment is projected to remain the largest segment into the near future.¹⁶ In the heavy equipment sector, heavy construction vehicles includes earthmoving, material-handling, heavy construction, and mining vehicles. The construction and manufacturing segment, which includes oil & gas, public rails and roads, mining, and more, holds the largest market share in the heavy construction equipment market, with growth in the coming years projected as high as 8.3% CAGR.¹⁷

Commercial telematics system revenue within the trucking fleet management sector alone is projected to grow at a rate of CAGR 5.7%, with revenue expected to reach as high as USD 16.7 billion by 2025.¹⁸ According to market research, the global IoT Fleet Management Market is also expected to grow from an estimated USD 4.8 billion in 2018, to as high as USD 18.9 billion by 2025, at CAGR of 21.6% from 2019 to 2026°.¹⁹

Today, many logistic providers rely on disaggregated data platforms and independent point solutions for their fleet management systems, making it difficult to manage large fleets without expending significant time and resources. New fleet solutions can provide a smoother transportation experience, actionable insights from mass data, and greater value for customers and employees with improved efficiency and manageability—regardless of the industry within which they are operating.
Challenges

Ongoing developments in the increasing sophistication of consumers, continued obstacles in the wake of the global pandemic, and growing populations in the world’s urban centers will continue to pose significant and meaningful challenges for operators across several industries. Infrastructure modernization, yet another challenge currently unfolding in cities across the globe, is connected to the need for smarter fleet solutions. Part of this transformation requires legacy infrastructure to be modernized, which in turn can bring additional costs to already strained budgets.

Increased demand for mass transit

In many countries around the world, government investment is inextricably linked with public transit development and modernization. Customers want their goods delivered faster, consumers are demanding greater sustainability, and citizens desire improvements in public infrastructure, urban mobility, and mass transit, using technology implemented by governments. To keep pace with citizen demand, many governments are setting new goals for improving mass transportation. This will help accelerate the delivery of goods, mitigate congestion, and increase environmental sustainability efforts.

Operational performance oversight

To focus on one specific example, within public transportation, fleet managers face many challenges with their current systems when it comes to organizing fleets, overseeing vehicles for performance, maintenance, and route planning. Many logistics providers today rely on disaggregated data platforms and independent point solutions for their fleet management systems. Disaggregated systems have significant disadvantages compared to a single, connected system, such as decreased efficiency and performance of fleet operations. This results in major competitive disadvantages for a customer's first choice of fleet delivery. Fleet operators with disaggregated systems are left to manually track each vehicle's systems separately, making it difficult to manage large fleets and expending lots of time and resources.

Inability to adapt quickly to near real-time data

Fleet operators need greater flexibility to meet the changing demands of customers and to adapt in near real-time to weather conditions, traffic disruptions, and other events. For fleet managers, using technology, connecting devices, and harnessing the power of captured data in an economical way, can transform the business. Information based in near real-time analytics allows organizations to make better decisions, delivering greater value for passengers, customers, and employees.

Smarter solutions needed

COVID-19’s impact on consumer behavior and the global supply chain cannot be underestimated, resulting in greater demand for technology to solve budgetary and growth issues. For example, the global market for Mass Transit Smart Solutions, estimated at USD 38.3 billion in 2020, is projected to reach USD 63.4 billion by 2027, growing at a CAGR of 7.5% over the analysis period 2020–2027.
Opportunity

Globally, public transport is rapidly being adopted by consumers as the preferred mode of transportation. Governments all over the world are continuing to invest in roads, rail, and forms of mass transit, in part because public mobility systems offer both short and long-distance solutions, while reducing congestion, transport expenses, and environmental pollution. In recent years, the U.S. government began issuing tens of millions of dollars in federal grant money to states, in order to support the development of zero-emissions technology in public transportation fleets, to name just one example.

Recent initiatives in India, where as many as 200 million new urban residents are expected to populate major cities there by 2030, involve international agencies working with the support of government stakeholders at the national, state, and city levels. These initiatives would include increasing high quality rapid transit, as well as improvements to infrastructure and urban development patterns. Technology will continue to play a substantial role in how municipal governments provide services for citizens, as evidenced by fleet management applications such as smart navigation, that allows comprehensive asset allocation for snowplows, road salting, and tree removals after heavy storms. Digital twin ecosystem development will likely see greater adoption by municipalities around the globe, offering near real-time 3D city modeling and the ability to simulate the impact of natural disasters and new development while optimizing sustainability efforts and saving costs.

Trends that will impact the increased need for heavy duty machinery include large-scale efforts toward urbanization in countries like China, India, and elsewhere. Due to ongoing consumption of base and precious metals in Mexico and Canada, the mining equipment market alone is projected to grow to USD 284.93 billion by 2025. To improve safety, mining companies worldwide are swiftly using investments in human resources, equipment, and technology. Intelligent automation is providing significant benefits, such as lowering costs, driving productivity, and increasing safety. Driverless vehicles, automatic power crusher technology, and auto-tunable robotic tactile loading (ARTL) sensors represent just a few more of the innovations driving growth in the industry.

Within the agriculture industry, increased demand for more sustainability, interest in regional produce, and the resultant growth in equipment sales are driving the need for new technology and safety. Machine learning-enabled solutions, for example, are being adopted by agricultural organizations and farmers worldwide to enhance their productivity and to gain a competitive edge in business operations.

In the coming years, the application of machine learning in various agricultural practices is expected to rise exponentially. Robotic devices that can perform under adverse conditions, common data sharing initiatives, and autonomous workforce and other remote solutions are among the many other tech innovations being adopted by agricultural companies.

Another trend worth noting is the commercial trucking industry’s growth. In 2019 alone, nearly 27 million commercial vehicles were sold globally, with the U.S. representing the largest market for commercial vehicles. In this market, increases in efficiency of methods employed for cargo and commercial delivery have led to faster delivery times, resulting in more widespread adoption of e-commerce as a primary way of acquiring goods.

This growth is expected to continue, as e-commerce further becomes the preferred mode of consumers around the globe in the wake of the pandemic—a trend that most experts expect to become more permanent in the future. Concerned consumers have turned to shopping online in a massive wave, with e-commerce sales in the U.S. during a single week in March of 2020 showing a 58% increase year-over-year.

In the construction industry, increased building of megastructures and high-quality infrastructure has highlighted the need for connected construction technology to counter the shortage of skilled labor that exists in many markets. Predictive data can enable preemptive maintenance that allows components to be replaced before they malfunction or fail. These solutions can also track information such as idle time and fuel consumption, enabling managers of building sites and public-works projects to make better decisions about the use of their fleets. These machines can carry out much of their work automatically, while an operator can be dedicated to higher value, decision-making tasks. Operators will also be able to better coordinate groups of machines and facilitate scheduling and fueling, potentially speeding up each project phase.

Demand for commercial vehicles will be driven by digitization, along with increasing infrastructure spending. A few important factors currently driving growth in the commercial vehicles market include an increase in integration of telematics services, a rise in consumer demand for individualized transport solutions, and the growth of fleet sharing.
Another byproduct of the global pandemic has been the dramatic rise in consumer awareness of the necessity to reduce food waste. Concurrently, the need for investment in the cold chain has been bolstered by pharmaceutical delivery for worldwide administration of vaccines to combat the spread of COVID-19. To cite a recent pertinent example, billions of lives depend on the reliability of something like cold chain integrity and pharmaceutical asset management, a topic that few people likely consider when receiving vaccination shots. Here, IoT and technology solutions allow for careful, ongoing monitoring and protection of perishable assets at every stage of transport, ensuring temperature and handling issues don’t jeopardize successful delivery. Governments around the world have increased infrastructure investment of the cold chain as a result, with a projected value in the cold chain market size estimated to reach USD 340.3 billion by 2025, with a CAGR of 7.8 percent.

Government leaders at all levels, together with private and public companies, are aware of the growing need for smarter, safer, and more ably managed urban mobility systems that provide dramatic and much-needed improvements for both commerce and citizens everywhere. With the world’s population rapidly shifting to urban areas—expected to grow from the current figure, 51%, to as much as 70% by 2050—massive investment will be required to meet the challenges that cities and leaders face. Providing a way for passengers to navigate urban environments with convenience, speed, and safety while minimizing the impact on the environment, for example, is one key example of the opportunity that lies ahead.

Technology development is poised to make a significant impact on the overall growth in mobility systems, with the Mass Transit Smart Solutions market in the U.S. alone estimated at USD 11.3 billion in the year 2020. China, the world’s second largest economy, is forecast to reach a projected market size of USD 11.1 billion by the year 2027 trailing a CAGR of 7% over the analysis period 2020–2027. Among the other noteworthy geographic markets are Japan and Canada, each forecast to grow at 7% and 6% respectively over the 2020–2027 period. Within Europe, Germany is forecast to grow at approximately 6.1% CAGR.

The connection between the health of e-commerce, as aided by the ongoing development and use of innovative technological solutions in many sectors, and overall economic health is clear. Growth in e-commerce rates has the potential to impact wage growth, increase standards of living, generate market expansion, increase sales, improve exports, and expand overall production for countries all over the world.

The opportunities to increase overall efficiency and performance are abundant and include improvements in fuel efficiency via the enabling of automated and optimized routing, braking, acceleration, and on/off (instead of idling). The value of predictive maintenance cannot be understated, as innovative maintenance technologies allow for the integration of diverse sets of equipment, systems, and platforms, with behavioral indicators being sent from each vehicle or asset to be analyzed at the edge, thereby helping improve operational efficiency.

### Global Parcel Shipping Volume (in million parcels)

<table>
<thead>
<tr>
<th>Country</th>
<th>Shipping Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>63,500</td>
</tr>
<tr>
<td>USA</td>
<td>14,700</td>
</tr>
<tr>
<td>Japan</td>
<td>9,000</td>
</tr>
<tr>
<td>UK</td>
<td>3,800</td>
</tr>
<tr>
<td>Germany</td>
<td>3,700</td>
</tr>
<tr>
<td>India</td>
<td>2,800</td>
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<tr>
<td>France</td>
<td>1,300</td>
</tr>
<tr>
<td>Canada</td>
<td>1,100</td>
</tr>
<tr>
<td>Italy</td>
<td>990</td>
</tr>
<tr>
<td>Australia</td>
<td>934</td>
</tr>
<tr>
<td>Brazil</td>
<td>850</td>
</tr>
</tbody>
</table>

*2019 Global Parcel Shipping Volume (in million parcels) via Statista*
Use Cases

This section focuses on use cases within three major categories: heavy equipment, cargo, and public transit. While much of the information featured below showcases solutions that allow for great complexity in terms of features, it is important to note that these solutions are also exceedingly flexible in terms of usability. Because of this, they can often be implemented within other municipal or city vehicles (i.e., taxis, police cars), and use cases (i.e., public asset management, which is often a point of data collection onboard buses).

Fleet managers can help improve operations, connectivity, security, efficiency, and management while keeping costs low with Intel-powered fleet management solutions, designed and built by ecosystem partners.

Fleet management telematics solutions collect, store, and analyze vehicle data, allowing fleet managers to access analytics and mass fleet data in one location remotely through the cloud.

Fleet management solutions create a greater experience for stakeholders

The Fleet ecosystem requires consideration of multiple user experiences to drive efficiency, scalability, and cost-effectiveness

Bus Company Administrators
Route logistics Coaching opportunities

Fleet Manager
Route logistics Managerial opportunities Cargo management

Passenger
Convenience Connected ticketing system

Service Shops
Maintenance predictions Vehicle health

Heavy Equipment
Waste reduction Predictive maintenance

Driver Insights View of surroundings

Insurance Policy handling Evidence

Advertisers
Integrated digital marketing Sponsored-travel opportunities

Shippers
Space optimization Cargo management

The Fleet ecosystem requires consideration of multiple user experiences to drive efficiency, scalability, and cost-effectiveness

Value to fleet managers

Improved operations
- 40% accident reduction
- 25% decrease in theft

Increased efficiency
- 25% idle time reduction
- 45% downtime reduction

Cost savings
- Up to USD 26M savings for a 1000 vehicle fleet
- 60% insurance claim reduction

Greater manageability
- Near real-time visibility and insights
- After market solution for mixed fleet
- Easier to maintain / update

Source: ABI Research ROI of Advanced Telematics Q1 2020
Heavy Equipment Fleet Management Solutions

Heavy equipment, including yellow iron, utility vehicles, agriculture, and mining, can leverage increased safety and value through state-of-the-art automation technologies. Customers can take advantage of high-performance computing platforms for the processing power to capture, monitor, and use data from technology-equipped machines for greater insight into equipment operations. Customers can manage their operations from a single, remote location, translating into even larger productivity gains and return on investment (ROI).

Smart equipment can help provide a safer environment to conduct remote operations, leading to improved equipment availability, operational consistency, and lower overall costs. Operators can also use sophisticated onboard intelligence to achieve continuous improvement and innovation.

Organizations can count on sturdy, dependable heavy mobile equipment solutions that are designed for flexibility and durability. Powerful modules, available in different sizes, provide flexibility for any embedded device, while system platform architecture is designed for maximum flexibility to meet today’s demands and future needs for in-vehicle AI, deep learning, and High-Performance Edge Computing.

Ruggedized, industrial-grade devices perform well under challenging conditions, including shock, vibration, and thermal extremes. Built-in artificial intelligence (AI) and machine learning (ML) help them capture and analyze relevant data and develop new processes. Predictive maintenance can increase uptime and diminish potential outages.

Because many solutions are compatible with a manufacturer’s existing systems, organizations will be able to retrofit connected machinery. Customers can take advantage of cloud services to enable machine-to-cloud and machine-to-machine communications. They can synchronize workflow among machinery using the cloud. Predictable costs, such as fuel and insurance, give greater control over expenses and can improve total cost of ownership (TCO). With greater efficiency in place, organizations can free operators to focus on higher-value tasks and put their insights and judgment to uses beyond basic equipment operations. Mechanical data analysis enables customers to reduce fuel consumption.

For more improved operator safety, our solution delivers increased automation in compliance with safety regulations. Kontron and Intel offer a safety mezzanine option, collaborating with manufacturers to implement functional safety to ISO specifications.
Cargo Fleet Management Solutions

Cargo Fleet Management includes everything from tractor trailers to delivery vans and vehicles. IoT technology in cargo fleets is playing a pivotal role in helping transform business operations. Cargo fleet vehicles are a major driving force behind commerce and play a key role in the supply chain. As the number of commercial vehicles grows worldwide, the management of larger fleets becomes more complex and costly, raising a need for IoT technology to help manage them.

These insights enable managers to optimize vehicle maintenance schedules by predicting and spotting maintenance needs that allow vehicle performance and runtime to be maximized. Additionally, metadata helps managers plan routes and schedules to increase delivery efficiency. Further, artificial intelligence (AI) and vision technologies monitor cargo and empower drivers with insights for a more secure delivery experience. Advanced Telematics drives near real-time analyses and valuable insights to help businesses make key decisions in improving their fleet operations.

The latest telematics solutions powered by Intel® technologies support a range of use cases to meet the needs of all fleet managers helping instill confidence by providing deeper insights on how their fleet is performing and operating.
Empowering the Mobility Fleet of Tomorrow

Public Transit Fleet Solutions

As cities grow in size and complexity, public transportation solutions like buses and paratransit-type vehicles require a more strategic approach. Transport operators continue to face increasing risks with their existing systems in e-commerce, ticketing, and route planning logistics, as well as overseeing vehicle and internal bus maintenance. And new complications like evolving public health measures, non-traditional traveling schedules, and other accessibility needs present even further challenges. Increasingly, public transportation companies are looking for IoT technology systems to produce actionable insights from vehicle data to empower their fleets with new capabilities that will transform the transportation experience.43

The Internet of Things plays a key role in the future of public transportation. Many logistics providers today rely on disaggregated data platforms and independent point solutions for their fleet management systems, making it difficult to manage large fleets without expending significant time and resources. New fleet solutions can provide a smoother transportation experience, actionable insights from mass data, and greater value for customers and employees via improved efficiency and manageability.

To address their challenges, fleet organizations are looking for solutions that can:

- Improve operations with tools that allow transport operators to monitor vehicles, passengers, and driver behavior for coaching opportunities; and to monitor goods as part of cold chain quality assurance or theft protection
- Improve fleet manageability with near real-time visibility and insights of the entire fleet
- Enhance the passenger experience with streamlined ticketing systems, automated policy enforcement, back-end analysis on customer demands, and public transport infotainment
- Reduce costs with improved efficiencies and optimized maintenance scheduling for max vehicle runtime
- Increase awareness for heavy duty vehicles and operators, allowing data collection for light pole maintenance needs, pothole location and severity, or on construction sites to monitor effective use of safety equipment

Public transportation companies can help improve operations, efficiency, and manageability while keeping costs low with fleet management systems that provide a more connected and enhanced transportation experience.

Fleet systems collect, store, and analyze vehicle data providing transport operators with actionable insights that help manage their entire fleet. These insights enable transport operators to optimize vehicle maintenance schedules by predicting and spotting maintenance needs for the vehicle and passenger seating areas. Additionally, metadata can help operators with route planning to maximize transportation efficiency.

Features such as 360° view, driver management, and passenger monitoring provide key insights for drivers and transport operators that can help improve operations. To streamline onboarding, fleets can take advantage of e-ticketing systems, contactless payments, occupancy control, and automated compliance notifications. Lastly, passenger communication systems notify customers of policies, stops, transfers, and other routes to create a smoother travel experience for new and experienced customers.

The latest public transport fleet management solutions, powered by Intel® technologies, supports a range of use cases that meet the needs of all transport operators helping instill confidence with deeper insights on how their fleet is performing and operating.
### Use Cases for Fleet Management Solutions Powered by Intel® Technologies

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Heavy Equipment</th>
<th>Cargo</th>
<th>Public Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>360° View</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Cargo Location and Condition</td>
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<tr>
<td>Cargo Management (Measurement and Location)</td>
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<tr>
<td>Cargo Optimization</td>
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<tr>
<td>Cold Chain</td>
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<tr>
<td>Driver Management</td>
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<tr>
<td>E-Ticketing/Contactless Travel and Automated Fare Detection</td>
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<td>●</td>
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<tr>
<td>Event Monitoring</td>
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<td>External Video Event Recording</td>
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<td>Fuel Management</td>
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<tr>
<td>Geospatial Asset Management</td>
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<td>Idle Monitoring</td>
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<td>Internal Video Event Recording</td>
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<td>Navigation/Route Planning</td>
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<td>Passenger Communication Systems</td>
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<td>Road Asset Management and Data Collection</td>
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<td>Vehicle and Driver Monitoring</td>
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<tr>
<td>Waste Reduction, Service Efficiency, Uptime</td>
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Fleet Management Solutions Powered by Intel® Technologies

360° View
360° View cameras allow vehicles to record the external environment, detect specific events during the drive, and upload and save the videos online. Fleet owners can use the video for coaching opportunities to train drivers, as well as for evidence to potentially reduce the costs of litigation.

Cargo Location and Condition
Telematics plays a large role in supply chain and logistics. Temperature control, surveillance, and vibration sensors ensure that cargo is secure during transportation. By monitoring and keeping a vehicle's cargo hold at a set temperature, items such as food, medications, and other perishables stay fresh and consumable. With cameras and sensors surveying cargo—inside and outside of the vehicle—operators can help ensure exactly what should be on the truck, and in what order. This also confirms if any cargo is lost or stolen. Vibration sensors can ensure that fragile goods are secure and will not break during transportation. In-vehicle and edge-based solutions offer visibility inside and around the vehicle. Video feeds can be stored when needed for driver coaching or in case of an accident or litigation. Drivers are also more aware of cargo conditions during transit.

In the warehouse, 3D cameras can be used to scan barcodes quickly and measure the dimension of packages to capture the overall volume of the shipment, helping track cargo and maximize cargo capacity. Additionally, lighting tags can be used to localize packages. All data and insights generated can be accessed by fleet managers through a dashboard hosted on the cloud. The insights generated can be used to help optimize transportation and handling efficiency for a better delivery service to customers.

Cargo Management (Measurement and Location)
Sensors and cameras within the cargo compartment inform drivers of how much cargo space is utilized to maximize capacity. Additionally, they help ensure that cargo is secure and that the appropriate temperature for perishable cargo is maintained. By remaining connected to the entire fleet solution system, drivers are provided alerts that help detect when cargo is compromised.

Cargo Optimization
Telematics solutions collect, store, and analyze data that can be sent to fleet managers. This data helps fleet owners and managers evaluate vehicle maintenance, driver operation, and cargo management. IoT in fleet monitoring can help improve savings, manageability, and visibility in passenger-load and cargo vehicles. Managers can increase savings with improved route efficiency and cargo utilization management. Additionally, they can reduce fuel costs and decrease idle time when telematics is used to provide optimized routes. Managers can also see a decrease in accidents and theft, which can reduce costs associated with vehicle downtime and repairs.

Cold Chain
Enabling a supply-chain network that connects suppliers, customers, original device manufacturers (ODMs), third-party logistics (3PL) transport agents, retailers, and end-consumers: the network will enable sensors to directly and seamlessly connect with any potential partner and will drive supply-chain efficiency. Developed to offer near real-time asset tracking solutions for the logistics industry, Intel® Connected Logistics Platform (Intel® CLP) is an IoT platform that uses battery operated smart wireless sensor devices to provide greater visibility into location, condition, and security of packages. By providing this improved insight into all points of the shipping process, companies can save time and money, as well as greater control over inventory levels. Live tracking of multiple elements such as temperature, humidity, and GPS at the pallet level with the Intel® Connected Logistics Platform means that companies can make real-time adjustments when the unexpected occurs. Intel® solutions avoid unnecessary complications or disruptions to existing workflows and supply-chain processes.
Driver Management
Driver monitoring systems keep drivers and others on the road safe with driver fatigue and distraction detection. Using visual and audio alerts, drivers are notified when they exhibit unsafe behavior or driving manners to help bring their focus back on the road, helping prevent accidents. Telemetry also provides insights on driving behavior by capturing speed, acceleration habits, and more, providing opportunities for coaching.

E-Ticketing/Contactless Travel and Automated Fare Detection
Contactless ticketing options can provide customers with a streamlined onboarding experience, including paying with a card via NFC or connecting an online ticketing site to allow customers to prepay for tickets and scan during onboarding. This allows customers to skip ticket lines and allows buses to deliver transportation services efficiently, mitigating the risk of delays. For fleet operators and passengers alike, increased safety and reduced virus transmission result from delivering a contactless experience for all.

Event Monitoring
Intel® AI Builders member viso.ai helps vehicles provide a clear view of surroundings with exterior monitoring. Cameras can also record video clips that can be used in case of an accident or for driving coaching.

External Video Event Recording
Operators can apply AI to monitor the exterior of fleet vehicles to detect, record, and send events to the cloud dashboard. Heavy equipment external video monitoring allows for compliance, human object detection, proximity detection, PPE/safety equipment detection, and breach detection. Distributed edge and cloud-based Computer Vision/AI solution provides visibility in a variety of conditions.

Fuel Management
Organizations can increase fuel efficiency by enabling automated and optimized routing, braking, acceleration, and on/off, instead of idling.

Geospatial Asset Management
Intel® Geospatial fuses remote sensor data collected from satellites, planes, drones, and Mobileye-equipped vehicles together with AI-powered analytics and high-performance data processing and management. Designed to meet the unique challenges of processing, storing, and streaming multisource geovisual data, our cloud-based data management platform enables a wide range of cost-effective solutions. Through the use of Intel® Geospatial, operators can utilize onboard AI compute from their in-vehicle PC to detect PPE compliance from workers on the worksite, geo-locations of construction assets such as power generators, and more. Powerful AI-powered analytics capabilities include object detection and classification, 3D reconstruction, and spatial analysis.

Idle Monitoring
Idle monitoring helps minimize fuel waste by detecting unnecessary idling when on standby. An alert notifies the driver when the vehicle should be turned off, saving fuel and decreasing carbon emissions. Combined with GPS tracking and navigation, fleet solutions can help enhance the efficiency of the load and unload times, as well as waiting times in warehousing.

Internal Video Event Recording
Use computer vision, deep learning, and edge networking to develop a solution for managing drive behavior and alertness. Public transit security solutions provide video monitoring, centralized evident storage, GPS bus location, and prepared police response. A recent deployment with MBTA in Boston resulted in a solution that could be easily and securely transferred and addresses future need for video analytics inside and outside buses.

Navigation/Route Planning
GPS tracking and navigation not only helps drivers get to their destination, but it also helps managers oversee the entire fleet in near real-time, remotely through the cloud, as well as plan route logistics and improve both truck and hazardous cargo routing, especially in light of the fact that in some city road segments, trucks and hazardous cargo freighters are not allowed. Optimizing delivery routes can save on fuel, speed up delivery, and improve customer service for a more efficient fleet.

Passenger Communication Systems
To enhance the customer experience for new and seasoned travelers, passenger communication systems can help inform passengers of bus arrival and departure times, upcoming bus stops, transfers to their travel destination, out-of-service buses, and more. With digital displays inside and outside the bus, passengers can stay informed on details regarding their travel agenda. At the fleet management level, near real-time, fleet-wide visibility leads to increased productivity and performance, based on routes, trips, and events.

Passenger Count
Telematics helps fleet managers monitor drivers, vehicle usage, and maintenance needs. Aftermarket solutions can capture telematics data across a diverse fleet of vehicle types and models. With passenger-load vehicle fleets, managers can see a more accurate passenger count. They can also easily maintain surveillance and ticketing systems inside the vehicles.

Passenger Monitoring, Security Compliance, and Accessibility Assistance
The new normal for citizens traveling in public transportation means taking necessary measures to prevent the spread of illnesses to the driver and other passengers onboard. During onboarding, passenger monitoring systems can detect if passengers do not have a face mask and display an automated compliance message. Smart vision cameras can further detect social distancing between passengers, count the number of
passengers for occupancy control, and even help the driver detect passengers who need help with lifts, special seating, or other special accessibility needs to ensure that everyone has a great travel experience.

Passenger information systems in buses or other passenger load vehicles can provide access to Wi-Fi or deliver helpful information about routes and services. They can notify passengers if there are social distancing guidelines they must follow while aboard and if there are accommodating seats for people with disabilities. Video surveillance systems can provide statistics for bus operators about the number of riders and other protocols like social distancing and face mask usage. Touchless ticketing can connect to buses to improve the passenger experience.

**Predictive Maintenance**

In-vehicle sensors (or alternately, CAN bus or ODB2 readings) detect performance status of components across the entire vehicle, indicating to fleet managers when maintenance needs occur early so that vehicle runtime and performance can be maximized. This ensures maintenance schedules are optimized to save fleet organizations major costs in maintenance and downtime.

**Road Asset Management and Data Collection**

Intel’s ecosystem partners have developed market-ready solutions to solve challenges in fleet maintenance and road asset management. For example, by using 360° sensors and cameras that provide high-resolution streams, the solutions help vehicles avoid accidents and prevent theft by automatically recording anomalies around the vehicle. Telematics plays a large role in fleet management.

Temperature control, surveillance, and vibration sensors ensure that passengers and cargo remain secure during transportation. By monitoring and keeping a fleet vehicle’s passenger cabin and cargo hold at a set temperature, items such as food, medications, and other perishables stay fresh and consumable. With cameras and sensors surveying cargo—inside and outside of the vehicle—operators can ensure exactly what should be on the fleet vehicle. This also confirms if any cargo is lost or stolen.

**External and Driver Monitoring**

External cameras that can detect objects, pedestrians, and other vehicles provide clear views of the surrounding area. Cameras can also record video clips that can be used in case of an accident or for driving coaching. In-cabin cameras can alert drivers and recommend that they stop and rest when needed. Video data can be stored for use in case of an accident.

Driver monitoring is able to detect behaviors while using or interacting with the vehicle. The application monitors the driver’s attentiveness and alertness, and feedback can be given to improve the conditions under which a vehicle is operated. It functions using video analytics and AI models.

IEI Integration Corporation uses the Intel® Atom® processor to power driver management solutions like its ITG-100AI embedded PC, which uses computer vision to monitor drivers for drowsiness and distraction. These applications notify control center operators of a driver’s condition in near real-time.

**Waste Reduction, Service Efficiency, Uptime**

Operators can reduce waste by helping to maximize payload and identify bottlenecks, measure the volume of material cut and filled, and ensure machines move the right amount of material with every load. Standardizing common parts for equipment enables successful inventory management with much less variety.

With a single unique platform in use across a customer fleet, the team will not need specialized knowledge about multiple solutions. Service and repairs will be more consistent from vehicle to vehicle. With near real-time performance data and contextual analytics, organizations can anticipate potential outages or equipment failures and accurately measure volume or weight moved, in order to avoid downtime and reduce bottlenecks. Predictive maintenance enables customers to prevent interruptions from breakdowns, and keep equipment running reliably.
Empowering the Mobility Fleet of Tomorrow

Intel delivers power-efficient performance and intelligence optimized for transportation use cases, like fleet, cargo and warehouse management to fleet management solutions. Intel is partnering up with its ecosystem partners to support new models for intelligent, connected logistics with powerful computing, vision technology, and edge/cloud computing that cover fleet manager’s use cases of today and in the future. From the edge to the cloud, Intel helps turn data into actionable insights that help fleet managers continue providing a high-quality delivery service.

Fleet managers can help improve operations, security, efficiency, and management while keeping costs low for a more connected fleet with Intel®-powered fleet management solutions, designed and built by ecosystem partners.

Fleet management telematics solutions collect, store, and analyze vehicle data, allowing fleet managers to access analyses and mass fleet data in one location remotely through the cloud. These insights empower managers to optimize vehicle maintenance schedules by predicting and spotting maintenance needs to maximize vehicle performance and runtime. Additionally, metadata helps managers with routes and schedules to increase delivery efficiency. Further, artificial intelligence (AI) and vision technologies monitor cargo and empower drivers with insights for a more secure delivery experience. Advanced Telematics drives near real-time analyses and valuable insights to help businesses make key decisions in improving their fleet operations.

The latest telematics solutions powered by Intel® technologies supports a range of use cases to meet the needs of all fleet managers, helping instill confidence with deeper insights on how their fleet is performing and operating.

**Predictive Maintenance**
In-vehicle sensors detect performance status of components across the entire vehicle, indicating to fleet managers when maintenance needs occur early so that vehicle runtime and performance can be maximized. This ensures maintenance schedules are optimized to save fleet organizations major costs in maintenance and downtime.

**Navigation and Route Planning**
GPS tracking and navigation not only help drivers get to their destination; it also helps managers oversee the entire fleet in near real-time remotely through the cloud, as well as plan route logistics. Optimizing delivery routes can save on fuel, speed up delivery, and improve customer service for a more efficient fleet.

**Driver Management**
Driver monitoring systems identify drivers when interacting with the vehicle. Visual and audio alerts notify drivers when they are behaving in an unsafe manner, such as distracted driving or driving while drowsy, helping to prevent accidents. Telemetry also provides insights on driving behavior by capturing speed, acceleration habits, and more for coaching opportunities.

**Cargo Management**
Sensors and cameras within the cargo compartment informs drivers of how much cargo space is utilized to maximize capacity. Additionally, they help ensure that cargo is secure and that the appropriate temperature for perishable cargo is maintained. By remaining connected to the entire fleet solution system, drivers are provided alerts that help detect when cargo is compromised or infiltrated in.

**Idle Monitoring**
Idle Monitoring helps minimize fuel waste by detecting unnecessary idling when on standby. An alert notifies the driver when the vehicle should be turned off, saving fuel and decreasing carbon emissions. Combined with GPS tracking and navigation, fleet solutions can help enhance the efficiency of the load and unload times, as well as waiting times in warehousing.

**360° View**
360° View cameras allow vehicles to record the external environment, detect specific events during the drive, and upload and save the videos online. Fleet owners can use the video for coaching opportunities to train drivers, as well as for evidence to potentially reduce the costs of litigation.
Empowering the Mobility Fleet of Tomorrow

Technology Summary

Technology Solutions from Intel

For fleet management needs, Intel and partners are providing solutions that maximize performance in a singular, connected system accessible through the cloud, helping reduce infrastructure costs, simplifying integration, and making it easier to manage entire fleets.

Intel’s partner solutions can accelerate time to market with proven solutions with adaptable offerings that can help transform business operations and the overall transportation experience to help meet today’s needs, enabling fleet managers to make better decisions and create more value for end customers with Intel’s cutting-edge solutions.

Intel delivers power-efficient performance and intelligence optimized for transportation use cases, like fleet, cargo and warehouse management to fleet management solutions. Intel is partnering up with its ecosystem partners to support new models for intelligent, connected logistics with powerful computing, vision technology, and edge/cloud computing that cover fleet manager’s use cases of today and in the future. From the edge to the cloud, Intel helps turn data into actionable insights that help fleet managers continue providing a high-quality delivery service.

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Intel® Edge Software Hub

The Intel® Edge Software Hub is making it easier to optimize edge solutions, including computer vision and deep learning applications for Intel® architecture. Set your objectives and ramp up quickly—much less prework is needed. Choose the architecture type, then select Intel, third-party, or open-source software. Use containers and run multiple workloads on a single converged edge system, managing the data flow between sensors and applications. Whether building from scratch or customizing an implementation, Intel® Edge Software Hub accelerates business development. The Intel® Edge Software Hub makes it easy for developers to benefit from edge-to-cloud workflow integration, too. The Intel® Distribution of OpenVINO™ toolkit and marquee cloud service provider (CSP) offerings allow developers to extend their cloud applications to seamlessly develop and deploy solutions at the edge.
Partner Spotlights

**Passengera Infotainment solution**

Passengera offers a solution to provide passengers with access to real-time trip updates and entertainment content.

As the number of travelers rises across the world, transportation services of all kinds are struggling to keep up with customer demands and travel standards while also achieving scalable infrastructure to support new technologies. Passengera and Advantech teamed up to create an Infotainment solution to enable railways and buses with in-vehicle Wi-Fi, integrated GPS, and an onboard infotainment platform that offers:

- Travel information: interactive map, notifications, points of interest, station services
- Onboard services: e-commerce enabled food ordering, surveys, feedback
- Entertainment: movies, TV, music, games, books, magazines
- Advertising & monetization

As a result, customers have the information they need at their fingertips and have the resources they need to keep entertained creating a more positive travel experience.

**Getac**

Getac Video Solutions, located in Minneapolis, became a distinct subsidiary of Getac Technology Corporation, manufacturer of rugged computing solutions. Getac, founded in 1989, has become one of the largest manufacturers of military-grade, rugged computing solutions in the world. Starting in 2018, the newly minted Getac Video Solutions now offers robust software and rugged hardware solutions to help law enforcement and other industries acquire and manage video and other digital evidence.

Getac’s Video Mobile Edge Solution delivers a Mobile Data Terminal (MDT) and in-car video monitoring system, all-in-one. For in-vehicle placement, the VRX-20 DVR is typically mounted in the trunk or on the center console, the display and keyboard are positioned above the center console for ease-of-use, and the five-inch touch display is mounted on a visor bracket. The cameras leverage the same mount as the display (or can be fastened to the windshield), and an additional camera is typically mounted in the vehicle cab.

Getac’s all-in-one solution alleviates the need for two separate devices that may be required to operate similar systems (i.e., a laptop or tablet, as well as in-car video), leading to significant cost-savings and reduced need for ongoing IT support. Other key benefits of the Getac Video Mobile Edge Solution include LTE and FirstNet availability, blackbox recording, built-in crash sensors, a trigger box for automatic recording activation, as well as the unit’s ability to seamlessly integrate Getac Video Body Worn cameras. Through the use of a single piece of hardware powered by Intel’s i7 chip and Windows 10 software, users can run all applications on an MDT, while simultaneously operating in-vehicle video items.
Genetec/City Tech/CTA

Genetec is a provider of public safety, operations, and business intelligence solutions. Building resilient, connected solutions that help businesses protect, understand, and enhance the world around them, Genetec will integrate and analyze data to create projection models for proactive demand management for transit.

City Tech Collaborative is an urban solutions accelerator that tackles problems too big for any single sector or organization to solve alone. City Tech’s work uses IoT sensing networks, advanced analytics, and urban design to create scalable, market ready solutions. Current initiatives address mobility, healthy cities, connected construction, and emerging growth opportunities. City Tech’s unique partnership structure and proven solution development methodology enable and accelerate impact-driven innovation, allowing solutions to exceed where other collaborations fall short.

The Chicago Transit Authority (CTA) operates the U.S.’ second largest public transportation system and covers the City of Chicago and 35 surrounding suburbs. On an average weekday, approximately 1.6 million rides are taken on the CTA’s bus and rail systems.

Looking beyond the immediate threat of COVID-19, enhanced monitoring, management, and operations capabilities can improve customers’ experiences and increase transit agencies’ resilience in the face of future disruptions. Building on the Chicago Transit Authority’s (CTA’s) existing measures to keep bus and train service timely, efficient, and safe, City Tech Collaborative (City Tech), together with the Chicago Transit Authority, Genetec, Intel, and Microsoft, developed new tools to provide near real-time insights on bus occupancy across multiple vehicles. A pilot implementation on CTA’s 79th street bus line allowed CTA to proactively meet route ridership demand, reduce both passenger crowding and wait times, and provide a safe, socially distanced rider experience. More broadly, this effort demonstrates how existing assets and advanced technologies can improve short-term operations while also building a foundation for continued innovation.

Genetec/MBTA

Genetec™ is an industry leader in Internet Protocol (IP)-based security, delivering future-proof, scalable vision solutions that improve operational efficiencies for public and private fleets. To achieve this objective, Genetec™ partners with Intel®, leveraging the Intel® Distribution of OpenVINO™ Toolkit and Intel® Core™ Processors to give their AI vision solutions the ability to run complex machine algorithms and perform advanced functions efficiently on low power machines, even directly onboard moving vehicles.

Genetec’s Fleet Monitoring solution includes Security Center Omnicast™, an open, scalable IP video management solution that integrates with existing infrastructure and enables operators to rapidly respond to incidents with powerful reporting and search tools across all entities.

One recent case study tackled a problem with a major metropolitan area in the U.S., which was using proprietary video recording systems for their stations and bus depots. To review the video and other data, they had to physically go on the bus and connect to the hard-drive to download the data. Further complicating matters, collected data could only be reviewed in the proprietary system, making it difficult to analyze data across fleets efficiently. Additionally, to improve their system, they would need to change all of their recorders and cameras in all vehicles with another proprietary system.

Genetec provided an open-architecture fleet monitoring solution using most of its existing hardware by just adding Intel® Core® Processors inside the recorders. The new open-architecture system provided a superior fleet management solution that allowed the customer to transfer the data of all vehicles securely through Wi-Fi to the wayside system. The solution also included future-proof capabilities to address future objectives, using video analytics inside and outside busses to give fleet managers the ability to view live and playback data.
### Advantech, Harman (LATAM), Cittati (ISV)

HARMAN designs connected products and solutions for automobile manufacturers, consumers and businesses around the world, including connected car systems, audio and video products, business automation solutions; and internet of things support services. More than 25 million cars on the road today are equipped with HARMAN audio systems and connected cars.

Cittati is a leading provider of Intelligent Transportation Systems (ITS) in Brazil, with over 10 years of industry experience and almost 30,000 buses monitored in real time. In its offerings, it has solutions for operations of different sizes and needs, from the embedded level to software tools for managing the operation, including support and analysis services.

Cittageo embedded technology transforms the common bus into an intelligent vehicle, capturing data so that private operators and public authorities can understand and apply continuous improvements for urban mobility.

Fulfilling the SPTrans notice requirements for new connected buses, the Cittageo solution has been the choice of bus companies that want to use the data to apply continuous improvements in the efficiency of urban transport. By transforming common buses into smart vehicles, the solution’s technology connects passengers and onboard crew, improving the user experience.

With the data connection and technologies already used in large cities around the world, the passenger gains predictability through self-managed driving by the driver. In addition to more punctuality for passengers and a constant offer of buses on the line, the technology will allow internal channels for stop announcements, increasing accessibility for people with visual impairments.

Another benefit to passengers will be improved safety. According to Cittati’s Rafael Molina, monitoring by cameras and a panic button connected to a central solution will be able to provide data for actions in exceptional situations in near real time.

### Indra/Nauta: On-board equipment for control and location

Nauta offers complete management of passenger vehicles where data is collected in real-time and communicated instantly to the back office, where it informs the current situation of all services and systems and helps to decide what actions need to be taken. Information is processed (and stored) in a single database in the back-office system, providing both real-time analysis and subsequent reporting.

Designed as a solid and compact control unit with small dimensions, Nauta is specially built to respond to multiple functionalities, and was developed to meet the tough requirements of its operational environment, either on board or within fixed installations. The unit features the ability to collect data from different external systems, to store and process data, and remote control. Part of Nauta’s value comes from its combining of multiple functionalities into a single, compact unit that remains flexible enough to accommodate additional sub-systems in the future. This flexibility and scalability allows the Nauta to incorporate functionalities of CAD/AVL, PIS/PA, and communications, while also interfacing with ticketing, passenger control, traffic light priority, onboard entertainment, onboard Wi-Fi, and much more. Indra’s Nauta control unit features the Intel® Atom processor, with 1-2 cores of 1.33GHz or 1.46GHz. 2 GB RAM. 16 GB Flash.
Advantech Cold Chain

For most current cold chain solutions that are equipped with wired sensors, the installation of these sensors presents a real challenge. Drilling is often required for the cold room or fridge installation, so it is very difficult for operators and maintenance personnel to change the position or to maintain the device.

Advantech’s cold chain management solution spans temperature and humidity sensors, gateways, an Android APP for configuring the sensors, and a backend dashboard that displays the data collected along the cold chain and presents a map indicating where the temperature is poorly controlled, leaving stocks at risk of being damaged. The temperature and humidity sensors pass data to a gateway, and the gateway uploads the data to the cloud. Management can use Advantech’s cold chain management platform to monitor cold-chain logistics in different stores simultaneously in near real time.

One of the main advantages of Advantech’s temperature sensors is that they use a wireless transmission design, which is very convenient for installation and maintenance. The 24/7 uninterrupted temperature detection and recording, coupled with big data analysis, can effectively assist the owners of cold chain goods in identifying blind spots in inventory management and improving the quality of foods and medication.

The core of Advantech’s cold chain solution is TREK-120 wireless sensor that can continuously record the temperature/humidity data and send the data to the gateways by LoRa communication. And the TREK gateways paired with LoRa dongle can immediately upload the data to the cloud, delivering an uninterrupted cold chain management, from collection to sale. This means that the solution can be used in many places, such as within a factory, fleet, warehouse, hospital, clinic, pharmacy, and retail store.

The core of Advantech’s cold chain solution is TREK IoT gateway that is an open platform architecture based on Intel® CPU, which provides excellent compatibility and scalability to peripherals, including the LoRa dongle of Advantech’s cold chain solution of course. After combining TREK IoT gateway with the LoRa dongle, the system can be used in various applications.

Advantech/Vnomics

Many bus operating systems in developing countries are still being managed manually by paper and pen. In many instances, abnormal driving behavior of the bus drivers and abnormal behaviors of passengers is not being monitored. Different countries have different regulations, and management behaviors need to be modified to comply with local regulations.

By implementing Advantech TREK eBus solutions, which are equipped on all vehicles, fleet operators can provide customers with a more safe, efficient, and comfortable experience on public passenger transport. The solution includes fleet management, depot management, route management, passenger information system, fleet safety system, driver behavior management, battery management, passengers Wi-Fi service, and more. All the related features are implemented by Advantech’s TREK eBus solution that features in-vehicle edge AI computing with an external camera system, an industrial communication system, and a vehicle-grade advertisement system.

At the core of the solution is Advantech’s TREK in-vehicle computer, which can monitor vehicle power in real time and detect the vehicle status via CANbus. Drivers can use the TREK terminals to retrieve data, initiate operations, and contact the dispatch center. Digital and analog cameras installed inside and outside of the vehicle record and transmit images to the back-end control center. (These images can also be displayed on the TREK terminal.)

Also installed in the buses are two smart cameras equipped with AI technology. One AI camera is used for driver behavior monitoring, while the other camera is used to provide driving safety assistance through forward collision warnings and blind spot detection and monitoring. In terms of passenger service, the passenger information system provides an Internet hotspot, bus arrival information, and travel-related advertisements through a PoE switch.

Vnomics, a software company based in Pittsford, NY, helps companies realize potential gains in efficiency and management. Vnomics Fleet Management System is based on the Intel® IoT Gateway. The Vnomics software reads, analyzes, and displays the data collected from a vehicle’s sensors and then sends that data to the Intel® IoT Gateway, which in turn securely sends the data to the cloud. The product also provides end-to-end fleet telematics, processing power, data security, data management, and communication services. The Intel® IoT Gateway provides the reliable infrastructure, scale, data security, and onboard computing capability needed to realize the power of the internet of things (IoT) and to allow even more truck fleets to reduce costs.
Empowering the Mobility Fleet of Tomorrow

Solutions

Intel Go to Market Strategy

The deployment of IoT for fleet management can help boost efficiency, visibility, and manageability, while helping lower costs. The latest telematics solutions powered by Intel® technologies can enable predictive fleet maintenance, help improve driver operation, and monitor cargo.

Fleet vehicles are the driving force behind commerce and public mobility. Fleet managers have the important role of organizing and overseeing vehicles for performance, maintenance, and tracking purposes. Telematics solutions collect, store, and analyze data that can be sent to fleet managers. This data helps fleet owners and managers evaluate vehicle maintenance, driver operation, and cargo management. IoT is transforming fleet management with the ability to connect vehicles and capture a wide range of data about vehicle performance, route, passengers, and cargo.

Intel's go to market solution involves first working with the Fleet C&T team to define specific use cases related to the company and the industry. Second, we review MRSs/RRKs, or find an option that can be customized to meet the partner company's needs, allowing them to scale as needed. Next, we “matchmake” in order to complete the value chain, or to complete a proof of concept of pilot project. Last, we go to market and scale business through collaboration.

Intel® Partner Alliance (link)

Fleet authorities can also find optimized solutions through the Intel Partner Alliance, one of the world’s most trusted ecosystems for hardware, software, systems, and services. The Intel IoT Solutions Alliance helps providers deliver first-in-market IoT solutions. A global ecosystem of more than 800 industry leaders, the Alliance offers its members unique access to Intel technology, expertise, and go-to-market support. By accelerating the design and deployment of intelligent devices and analytics, technology providers can win greater market share. With more than 6,000 solutions, from hardware and software to systems and services, Intel helps fulfill nearly every requirement in a range of markets. Early access to Intel road maps and design support enables Alliance members to stay ahead of the competition, as well as help reduce risk and development costs.

Intel® IoT Market Ready Solutions

The Intel® IoT Market Ready Solutions program is designed to help members of our broad ecosystem of partners strengthen their delivery of solutions through unique support and scaling opportunities. These solutions give Fleet authorities scalable, repeatable, end-to-end solutions. That means less time, cost, and risk. These solutions are made up of sensors, edge hardware, software, cloud, and analytics from across the IoT ecosystem. By choosing Intel IoT Market Ready Solutions, fleet authorities get scalable, repeatable solutions designed to solve key challenges in vision technology, mobility, traffic management, and more. Intel has already vetted these solutions, so fleet authorities can move forward with the assurance of intelligent connectivity, exceptional performance, and easy manageability.

Intel® IoT RFP Ready Kits

Intel® IoT RFP Ready Kits are focused technology offerings that solve a class of market problems, have been deployed and tested in the field, and provide bundled hardware, software, and support. The technology is scalable and designed to grow with customer requirements, enabling accelerated development and time to market.
Next Steps

Come **Ride** With Us!

Work with the Fleet C&T team to define your use cases

Review MRSs/RRKs, or find option that can be customized to meet your needs so you can scale

We “matchmake” to complete the value chain, or complete a proof of concept or pilot

Go to Market and Scale Business through collaboration

Leading transportation and urban mobility organizations through strategic innovation and transformation is a continual journey. Many fleet management teams plan their intelligent initiatives across three action areas to:

1. Transform data into new insights in how their systems and fleets work with intelligence from edge to cloud.
2. Leverage proven intelligent mobility solutions to support stakeholder goals.
3. Consolidate systems at the edge for greater efficiency and value.

Initially, leaders should examine which services may have the most impactful outcomes. Stakeholder identification, participation, and clear priorities are essential foundation points for building a plan. Leveraging experience working with many governments and transportation authorities worldwide, Intel is bringing together the right stakeholder organizations and companies to deliver building blocks that transportation leaders can use to create and implement an appropriate plan. Here are the major steps to enable the fleet transformation journey:

**Identify Stakeholders**

Within the complex structure of your transportation organization, identify who the major stakeholders in any digital transformation project would be. Depending on the project, this can include government representatives, members of the transportation management or fleet management team, employee representatives, concessionaires, urban mobility IT team, transportation security team, and passenger advocates.

**Assess Current State**

Determine where your fleet system or transportation system is now, using the same key performance indicators you will use to quantify success. What works? What needs work? How can you improve satisfaction, security, safety, and success for all stakeholders?

**Create A Shared Vision**

Establish your ultimate outcomes, expressed in terms of stakeholder benefits. The vision should not be expressed solely as technical achievements but also as experiential improvements that technology can make possible. It is essential to build that vision with stakeholder involvement to achieve better and more diverse suggestions, consensus, and commitment.

**Build Blueprints**

Develop a priority list and “blueprints” for the most important projects in your technical modernization plan. Possibilities include master plans for:

- Better utilization of current mobility and urban transportation space and/or the addition of new space
- Modernization of the current technical infrastructure (communications and computing resources)
- Data collection
- Improvements to all interacting urban mobility systems

**Mark Milestones**

Identify waypoints at which you measure progress, share lessons learned, discuss course corrections, and strengthen stakeholder commitment to your shared vision.
Select KPIs
Decide on key performance indicators that quantify success and align with your vision.

Explore Financing and Partnerships
Implementing a comprehensive digitization vision requires committed funding. Committed funding is a critical component that should be thoughtfully planned. Innovative funding and financing alternatives can accelerate your projects. Exploring multiple funding sources such as regional economic development; state and federal agency funding for transportation, public safety, environment; and private developer and industry partnerships are a few examples of broadening sources. Developing partnerships to embrace industry knowledge, best practices, plus key solutions and technologies, provides insight from planning to implementation.

Defining and executing a digitization strategy is not straightforward or without risks—but the benefits can be significant. Intel believes that a successful urban transportation transformation requires certain key components: the right level of stakeholder participation, clear priorities, and methodical planning of technology infrastructure.
Empowering the Mobility Fleet of Tomorrow

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47. Intel: Tracking Perishable Goods with Blockchain Technology

Relevant Links

IoT-Based Fleet Management and Telematics (intel.com)
Accelerate your Growth with Intel® Partner Alliance
Intel® IoT Market Ready Solutions (Intel® IMRS)
Intel® IoT RFP Ready Kits

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Think big
Assess all the ways technology can facilitate meaningful change

Start small
Get going with projects and opportunities

Move fast
Learn, adjust, iterate