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Connecting the future of mobility

Reimagining the role of telecommunications in the new transportation ecosystem

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Introduction: Rachel's party

Linda is excited as she prepares to head into the city for Rachel's birthday bash. At 40 miles away, it's not a short distance to cover, but she isn't concerned: Her trip has been planned out, and she can use the time to finish watching the movie she had been streaming on TV a short while earlier. She hops into a driverless taxi that shows up at her doorstep and settles in as the vehicle automatically cues up the film for her from the point where she paused it at home. The windows grow opaque and are transformed into an immersive, 360-degree surround screen, with one spot indicating the progress the vehicle is making along the route.

With a start, she belatedly remembers: the cake! She asks her voice-activated assistant—which typically lives on her phone but instantly synced with the taxi's sound system when she climbed in—for assistance and scans the options that are presented to her onscreen. She selects a delicious-looking red-velvet cake with a birthday message for Rachel, from a bakery not far from the party. The delivery is scheduled to arrive via an autonomous pod synchronized with the time of Linda's arrival at the party. Disaster averted.

The taxi pulls up at a metro train station, and Linda gets out. The taxi reconfigures its surround screen, sound system, and seating layout to the preferences of the next rider, waiting just down the block. In the meantime, Linda heads into the station and directly boards the train, scheduled to leave in a few minutes. Her phone sends her e-ticket information to the train's transponder, which records that she is on board and guides her to her seat. The screen in front of her already has her movie cued up to play from where she left off. Putting her headphones on, she sits back and enjoys the ride, even dozing off for a few minutes after the movie ends. An alert sounds in her earbuds shortly before she reaches the station, suggesting she get ready to disembark. A notification pops up on her phone: Her wallet has been charged automatically for the total trip fare, as well as for the cake. She exits the station and walks the remaining three blocks to the restaurant, guided by her phone's turn-by-turn directions. Just ahead of the restaurant, she sees the autonomous pod waiting for her—the cake is here! Linda collects the cake from the pod and heads into Rachel's party, right on time.

The future of transportation systems could promise many different, highly personalized versions of trips such as Linda's, as it would enable faster, safer, cleaner, and more efficient travel for work or play. Underpinning it all is a mesh of smart devices, network connectivity, and content and experiences delivered in ways that were previously unimaginable, from hailing a taxi to streaming Linda's favorite movie, and from ordering a cake to paying for her trip—compelling and seamless experiences enabled by fast, reliable, omnipresent connectivity. Telecom companies are likely just as integral to the evolving transportation ecosystem as any automaker, tech giant, or urban planner. They need to prepare today, not only for the surge in demand for connectivity but for the emergence of fundamentally new roles that telecom companies will likely be required to play for the future of transportation to fulfill its enormous potential.

Telecom's place in the changing mobility landscape

ROUGHLY 1.2 billion vehicles operate on this planet every day.[1] With the environmental costs of fuel usage and the approximately 1.25 million road traffic deaths every year globally,[2] the costs imposed by today's transportation industry are staggering. In the United States alone, drivers spend roughly 160 million hours every day on the road.[3]

The landscape of mobility—the way passengers and goods move from point A to point B—is changing. Converging forces—including powertrain technologies, lightweight materials, connected and autonomous vehicles, and shifting mobility preferences—seem to be reshaping the future of mobility. Emerging from the confluence of these trends will likely be a new mobility ecosystem that provides meaningful improvements to the current way people and goods move, with far-reaching implications for businesses across industries.[4] As vehicles and the infrastructure become more connected, shared, and autonomous, and transportation becomes more intelligent overall, the emerging system may not only bring cost savings—it can create new revenue potential for participants across a broad spectrum of the mobility ecosystem.

In particular, the shifting mobility landscape is expected to create a host of new challenges and opportunities for companies across the telecommunications industry value chain, including wireless and fixed-line carriers, infrastructure solution providers, and equipment vendors. Indeed, the pace at which the mobility landscape is transforming is raising questions that telecom executives will likely need to address:

- What are the opportunities for telecom companies in the future of mobility?
- What are the sources of value creation in the new mobility ecosystem? Do they involve doing more of the same but on a larger scale (more devices, more fiber infrastructure, more data traffic on the network), or do they create entirely new product/service opportunities for telecom companies?
- How large and profitable will these opportunities be? And how soon will they be realizable?
- How should telecom companies mobilize their enterprise to capitalize on the rapid emergence of this new ecosystem?

The answers to these questions will likely vary for every telecom player, depending upon in which part of the industry value chain or geography the company currently resides, and those answers also shift depending on in what part of the mobility ecosystem the telecom company intends to compete. As customer expectations become increasingly sophisticated, as transportation options improve in breadth and level of integration to support intermodal mobility experiences, and as connectivity technologies

advance, many new use cases may emerge, demanding higher speeds, better interoperability, lower latency, and ubiquity. If telecom companies develop a full range of capabilities that meet these needs, they can position themselves at the forefront in enabling the future of mobility.

There is a debate under way about whether all of the core functions of driverless vehicles are likely to be self-contained, meaning housed within the vehicles' operating systems and sensors; there is an alternative view that vehicle-to-vehicle and vehicle-to-infrastructure communications might enable greater functionality and efficiency. For example, MIT researchers have modeled a system of "slotting" autonomous vehicles through intersections, eliminating traffic lights and cutting wait times by 80 percent or more.[5] But that system requires vehicles to connect with a common traffic management system, and that, in turn, requires network latency of perhaps 1 millisecond for some applications, much lower than the current latency of 50 milliseconds offered by 4G networks.[6]

The breadth of future mobility use cases requiring connectivity is expected to generate data traffic of roughly 0.6 exabytes every month by 2020—about 9 percent of total US wireless data traffic.

Deloitte's analysis has found that the breadth of future mobility use cases requiring connectivity is expected to generate data traffic of roughly 0.6 exabytes every month by 2020—about 9 percent of total US wireless data traffic.[7] And our estimates further indicate that data traffic associated with mobility and transportation could grow to 9.4 exabytes[i] every month[8] by 2030 as autonomous vehicles become more pervasive, highlighting the exponential growth in data traffic that could exert significant pressure for higher bandwidth. These estimates vastly exceed most industry projections, which don't take into account the complexities and far-reaching implications of the future of mobility. Telecom companies need to gear up to embrace this imminent challenge.

Network security is expected to be another critical issue that needs to be addressed, as in-vehicle systems and increasingly connected and intelligent infrastructure would be more exposed to security threats as data is shared between vehicles and the network.[9] Complicating matters, manufacturers and developers have yet to settle on common operating technologies and standards for the mobility ecosystem, raising interoperability issues that should be dealt with for full system efficacy.

While the pace and nature of the changes facing the telecom industry are potentially daunting, a number of telecom companies are building or acquiring capabilities focused on providing advanced mobility experiences by combining their core communications capabilities with vehicular technologies and real-time wireless data.[10] Major wireless carriers and infrastructure solution providers have fostered partnerships with automotive OEMs, governments, and technology providers to support the development of standards for self-driving vehicles.[11] A consortium of European telecom companies associated with ETNO and ECTA, and car industry associations ACEA and CLEPA,[ii] have put forward a joint plan to help accelerate testing and launching autonomous vehicles on the roads.[12] Tier-1 telecom companies in the United States are committing billions of dollars in investments to build high-speed, next-generation broadband infrastructure, even as they work closely

i 1 exabyte = 1 million terabytes = 1 billion gigabytes
ii ETNO represents European Telecommunications Network Operators' Association; ECTA is European Competitive Telecommunications Association; ACEA is European Automobile Manufacturers' Association; and CLEPA is European Association of Automotive Suppliers.

with regulators to help accelerate the rollout of fifth-generation wireless technology (5G)[13] While these 5G investments are not necessarily being built specifically for the emerging mobility ecosystem, the resulting network can help address a part of the emerging autonomous mobility demands as well. In parallel to the transforming mobility landscape, there is an impending shift in connectivity that will likely affect businesses across a range of industries—and enable the changing mobility ecosystem.[14]

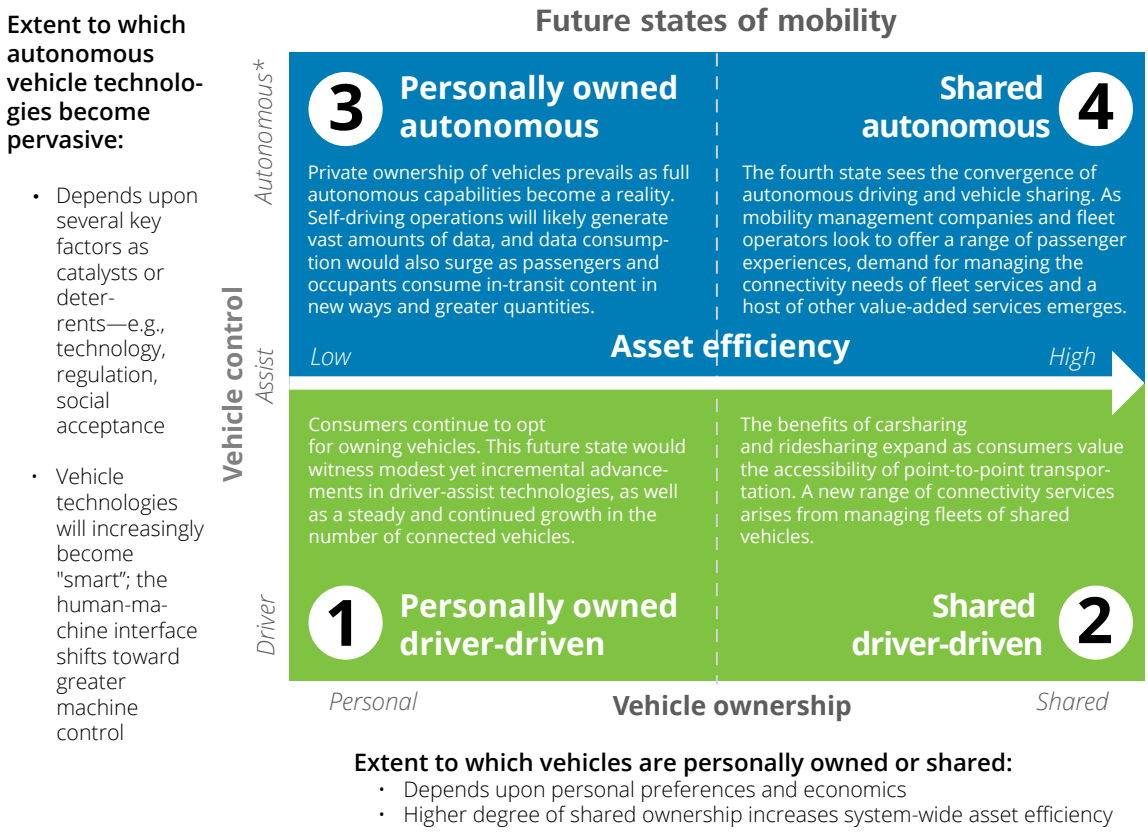
It is still early. We foresee growth opportunities emerging in network connectivity areas as well as in new digitally oriented solutions and services. In this article, we explore the intersection of the future of mobility and telecommunications, identify potential growth opportunities for telecom players, and outline some preliminary pathways and pragmatic steps that executives can consider to help attain a strong position in the new mobility ecosystem.

The future of mobility

Deloitte envisions the emergence of four states of mobility (see figure 1) that will evolve and co-exist in the future, defined by ownership of the vehicle and control of the vehicle.[15]

The emergence of these four future states catalyzes a new mobility ecosystem that is connected, seamless, efficient, and intermodal.[16] Value in this new ecosystem is derived from consumer-centric data, systems, and services-oriented business models (see figure 2).

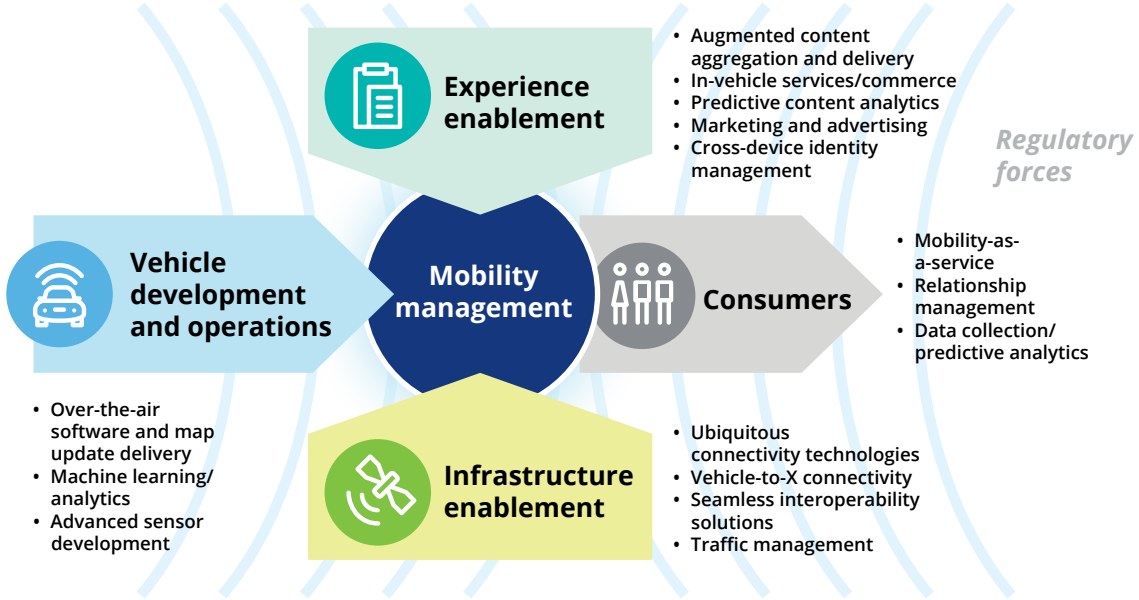
Figure 1. The future states of mobility



*Fully autonomous drive means that the vehicle's central processing unit has full responsibility for controlling its operation and is inherently different from the most advanced form of driver assist. It is demarcated in the figure above with a clear dividing line (an "equator").

Source: Deloitte analysis.

Figure 2. Future mobility value opportunity areas for telecom



Source: Deloitte analysis.

Value opportunity areas for telecom in the future mobility ecosystem

With connected cars and smart devices gaining traction and several autonomous vehicle pilots already under way, the mobility landscape is approaching a tipping point,[17] offering telecom companies the potential to help drive transformational changes that go well beyond today's core business. Within each future state and core component of the ecosystem, there is scope for telecom companies to play an integral role—but only if they accelerate their efforts to target the emerging opportunities in a concerted way.

EXPERIENCE ENABLEMENT

The on-the-road experience can encompass opportunities related to diverse types of user experiences that are delivered both in and out of the vehicle. As the number of connected, shared, and autonomous vehicles grows, in-vehicle applications such as media, Internet radio, music streaming, and information services could demand an average of 0.7 exabytes of monthly data by 2030 in the United States.[18] In the near term, passengers will likely continue to rely on wireless connectivity to stream personalized audio/video content and for web browsing using their mobile devices, the vehicles' entertainment systems, or both. Gradually, demand for personalized content and points-of-interest search[19] will likely grow further, as shared and autonomous vehicles gain widespread adoption (more than 70 percent of new vehicles sold in urban areas by 2040),[20] freeing up drivers from minding the road. Consumer demand for on-the-go content will increase not only in volume (as noted above) but also by way of content types, such as augmented reality and virtual reality.[21] As the mobility landscape evolves to encompass frictionless intermodal transportation, consumer expectations for reliable and seamless end-to-end experiences will likely propel demand for highly personalized services, such as behavior-based and mood-based advertising,[22] booking tickets for a Sunday football game, or sending instructions to the microwave to heat up dinner.

Revenue from connected car services that includes infotainment and navigation could reach about $40 billion globally in 2020,[23] for which it's essential to have a robust and ubiquitous network. Once self-driving vehicles hit the market around 2020 and beyond, those numbers could expand exponentially as humans are freed of driving responsibilities.

Implications for telecom companies: Telecom providers have an upper hand, as the smartphone becomes the hub of our increasingly digital lives, including not just our multiple interconnected and personalized smart devices but also our access to transportation.[24] Increasing consumer demand for on-the-go content would require new types of *audio/video content aggregation and delivery* methods to provide interoperability for different types of content, including voice, text, social media, video streaming, and virtual reality. Content delivery

networks can follow a multiscreen strategy to provide a seamless experience across different modes of transportation, whether a personally owned vehicle, shared autonomous vehicle, train, or city bus, and not just be restricted to homes and smartphones. Content sourcing, creation, aggregation, pricing, bundling, and distribution will likely undergo a gradual change as the mobility landscape evolves, given that the in-vehicle infotainment experience will be more immersive and engaging, delivering an augmented experience for the passenger as compared to media consumption on today's tablets and smartphones.

Telecom companies can champion the efforts toward creating an open, integrated platform that can work across different types of devices and vehicles in supporting various content formats. Moreover, they can use their large subscriber base and established customer care and billing service centers, partnering with media and infotainment content providers to enable specific in-vehicle services, such as pay-as-you-go infotainment. They can analyze the data on consumption patterns during different times of days and modes of transportation to advise content creators, networks, and advertisers about how media is being consumed, leveraging valuable data to generate insights. They can also help fleet operators track their vehicles' location and vitals and develop in-vehicle platforms for global automakers to facilitate pay-per-use billing for services such as Internet access, content streaming, and navigation support.

As shared autonomous vehicles could become mainstream, a person watching a TV show on her tablet at home could very easily prefer to continue watching the same show on a high-definition infotainment screen in the driverless cab, right from the point where she paused. Therefore, multiple devices including tablets and smartphones need to be integrated with shared autonomous vehicle systems, requiring *cross-device/vehicle identity management*. Telecom companies can play a significant role in supporting such integration across mobility solutions[25] and can monetize this value by creating an invisible handoff in which the telco carrier gets paid for each pass of the baton.

MOBILITY MANAGEMENT

Shared mobility (ridesharing and carsharing) in the United States has nearly doubled from 8.2 million users in 2014 to 15 million users in 2016,[26] and its prevalence is likely to increase, with Millennials[27] leading this trend. Deloitte analysis projects that shared mobility could account for 80 percent of total people miles traveled in the United States by 2040;[28] this likely creates a growing opportunity for trusted mobility advisers to help passengers get from place to place through customized intermodal route planning, electronic ticketing, and payments across the different modes of the transportation network. This requires having a comprehensive real-time picture of passenger demand and capacity across modes, the ability to nudge consumption choices and behavior and update routes in transit, assisting fleet operators to incorporate greater pliability into the overall system to more effectively manage journeys for transit providers and passengers. Across these use cases, telecom providers have an opportunity to play a pivotal role in serving customers' end-to-end transportation needs, making mobility offerings more personalized at every stage of every journey. They also have an opportunity to serve enterprises such as fleet operators, facility management, and governmental authorities to provide these services more efficiently.

Implications for telecom companies: Telecom companies seem well positioned to support end-to-end *intermodal mobility-as-a-service solutions*. They can play a vital role in enabling mobility services given their expertise in billing, payments, analytics for planning and optimization, and asset management services. They can help establish new models of consuming intermodal transportation—for example, buy a block of road miles or time per month just like data plans and then reconcile revenue allocation and payment to providers.

Telecom companies can also play a key role in enabling fleet management services, including automated fleet scheduling, dispatching, and tracking as well as assisting in managing the rapid anticipated growth of autonomous fleets. They can use customer profile data or biometric authentication to

manage vehicle access on behalf of fleet operators, ensuring the safety and security of both vehicles and co-passengers. For example, Vodafone in Qatar recently launched its own fleet management service in partnership with Qatar Mobility Center to help track mobile assets and manage logistics with the help of a SIM embedded in the vehicles.[29]

VEHICLE DEVELOPMENT AND OPERATIONS

As more vehicles get connected to network infrastructure (V2V, V2I, and V2P), a number of vehicle-related operations and functions can be controlled remotely. Wireless connectivity requirements for vehicle operations will expand to enable new or enhanced functionality, such as built-in navigation and over-the-air software updates to add new features. Such over-the-air updates can help lower maintenance costs, enhance the driving or riding experience, and ensure reliability and continuity of the vehicle's operation.

> To meet the demand of various mobility use cases, these connectivity solutions need to have a unique set of attributes such as high bandwidth, high reliability, low latency, and strong data security.

And while autonomous vehicle operation may be self-contained, the vehicles could generate an increasing range of valuable data that would need to be offloaded. On average, an autonomous car in 2030 could be embedded with some 30 sensors, compared with about 17 sensors in 2015,[30] generating hundreds of gigabytes of data every hour.[31] These sensors would be unique to autonomous vehicles, helping them sense their surroundings, smoothly navigate roads, and avoid obstacles and pedestrians. While not all of this data would be transmitted over cellular networks, more could be increasingly shared via Wi-Fi, some could be used for mapping the environment and machine learning/analytics to improve the autonomous vehicle's operating system. The vehicle's onboard software—including the operating system, voice assistance, and critical driving applications—could consume vast quantities of data.[32] Further, autonomous cars would depend on over-the-air updates for operating system software as well as high-definition 3D maps of their ever-changing surroundings to navigate to specific destinations with a higher degree of accuracy than rideshare passengers experience today.

Implications for telecom companies: While not traditionally considered a core telecom business, the new ecosystem will likely enable telecom companies to penetrate vehicle operations. From securely integrating basic, established functions such as remote start/stop and lock/unlock to enabling systems as complex as self-driving, telecom companies have opportunities to add entirely new revenue streams through processing and distributing data from many new types of sensors that automakers could install in autonomous vehicles. These sensors would capture vehicles' health in real time to preempt a breakdown, or to capture the environmental data for collision-free navigation. Telecom companies can provide *vehicle/infrastructure data integration* services given their existing role in gathering, storing, cleansing, and analyzing high-volume data today with their mediation platforms.

As more vehicles become connected and driverless, cybersecurity threats could rise, as the number of vulnerabilities are forecast to grow significantly.[33] This creates an additional requirement for telecom companies to provide stronger *vehicle and device security* solutions. As cyber risk escalates in the future of mobility, mobile network operators and telecom infrastructure providers can provide scalable cloud security solutions to help detect and mitigate potential threats.[34]

INFRASTRUCTURE ENABLEMENT

Frictionless intermodal travel will likely need to be built on a robust underlying infrastructure, both physical and digital. Traffic management systems, connected homes and devices, roadside sensors, roads and bridges, cybersecurity infrastructure, and a comprehensive telecommunications network seem necessary for the new mobility ecosystem to emerge. Connecting and conveying the status of critical components like charging stations, traffic movements, dynamic pricing for infrastructure usage, and parking availability would be crucial. And nearly all of the discrete opportunities discussed above depend upon the presence of ubiquitous, high-speed, reliable connectivity. Users and providers alike will likely expect telecom companies to build and maintain this backbone network infrastructure.

Implications for telecom companies: As incumbent providers of data connectivity, telecom players need to develop the higher-bandwidth 5G network to support future traffic. Carriers and equipment providers will likely see the emergence of opportunities to provide *vehicle/infrastructure connectivity* solutions, given the surge in data traffic. To meet the demand of various mobility use cases, these connectivity solutions need to have a unique set of attributes such as high bandwidth, high reliability, low latency, and strong data security. In this context, telecom companies need to build the network infrastructure to help enable effective communications between vehicles and the various physical infrastructure components—such as charging stations, bike-sharing stations, roadways, intersection points, traffic management systems and tolling/payments systems—directly leading to the increase of connectivity revenues.

Interoperability of mobility systems and platforms between the rapidly growing numbers of endpoints will likely present additional revenue opportunities for telecom companies (for example, platform onboarding and integration fees, data bridging/translation event fees, or revenue sharing with mobility managers/advisers, levied at the transaction or subscription level). Enabling seamless interoperability among a variety of connectivity technologies as well as autonomous vehicle platforms would require a unique set of capabilities that are core to telecom companies, including experience-defining technical requirements and driving standards for next-generation networks. Telecoms can offer a variety of options, including Wi-Fi, low-power wide area networks, mesh networks, and peer-to-peer communication. The need for seamless interoperability may be much higher than today, as vehicles of varied types, driver-driven cars, and multiple varieties of shared and autonomous vehicles (cars, buses, trains) will likely need to communicate with each other and with the infrastructure.

Riding the waves: New growth opportunities for the telecommunications industry

As telecom executives evaluate this range of opportunities, we anticipate that the market will continue to evolve along two dimensions: breadth and depth (see figure 3). *Breadth* encompasses the range of ecosystem components (in short, "things") that can possibly be connected—for instance, connecting the autonomous taxis with a city's traffic signal systems for better traffic management/coordination. *Depth* indicates the degree and extent to which different players in the future mobility value chain can be integrated to deliver "experiences" through solutions that blend data, platforms, and ecosystems—for example, using predictive analytics to alert vehicle diagnostics and maintenance, pre-conditioning the vehicle based on passengers' preferences, and providing recommendations for personalized infotainment content based on history and mood.

Telecom companies can use the two dimensions of breadth and depth to plot the opportunity areas that map to their core capabilities. We see three distinct categories of opportunities—"waves"—arising for telecom companies: core opportunities, adjacent opportunities, and transformational opportunities. Based on our initial estimates, we expect the annual revenue potential for telecom industry players across the four domains (in-transit vehicle experiences, mobility management, vehicle operations, and enabling infrastructure) and the three opportunity waves to be at least $50 billion in the United States by 2030.[35]

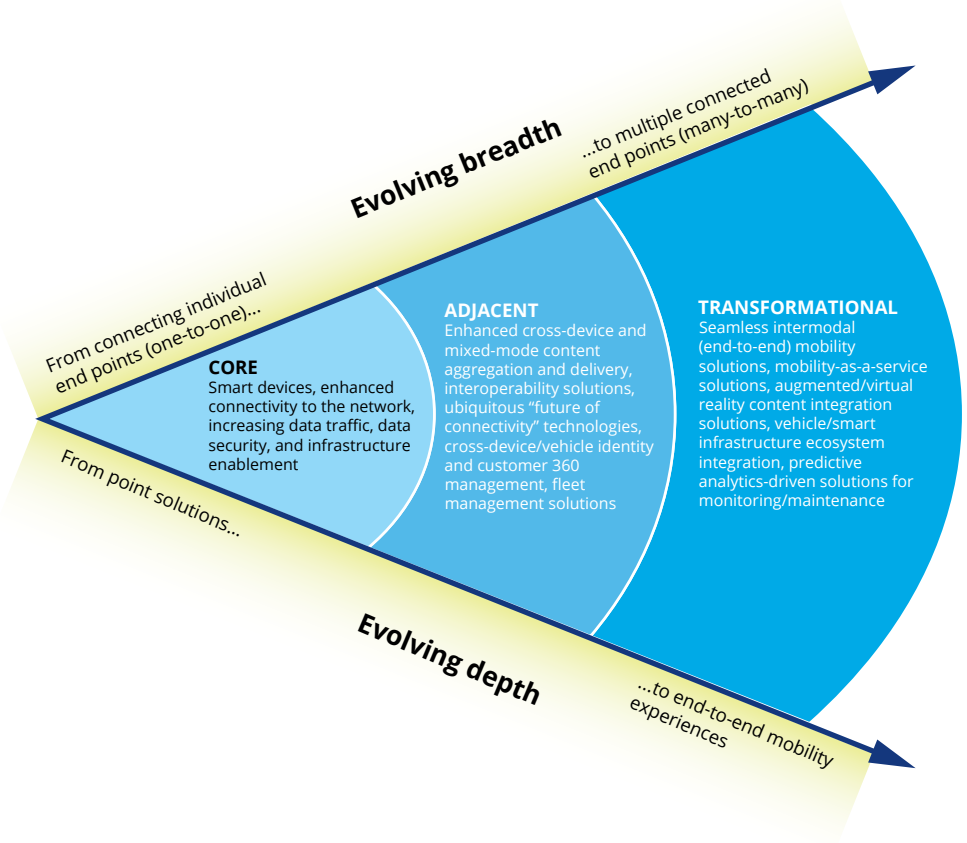
WAVE 1: CORE OPPORTUNITIES *(POTENTIAL PAYOFF IN NEXT 18 MONTHS)*

Maximizing core opportunities will likely require telecom companies to focus on optimizing and introducing new products and services that are heavily vehicle-centric, while starting to build capabilities that can serve as platforms for more intermodally oriented services. With the expected strong growth in vehicle-generated data traffic, telecom companies need to invest in upgrading the core infrastructure—not just to meet the demand for high bandwidth and low latency but to ensure high levels of safety and security that are critical for autonomous driving. This could help address the rising connectivity demand from a growing array of endpoints, including vehicles and connected devices, and also to address the emerging diverse and traffic-intensive use cases. In addition, telecom companies likely need to bolster their cybersecurity capabilities to help ensure a highly secure environment for facilitating storage, access, and delivery of data between vehicles, devices, infrastructure, systems, and people.

WAVE 2: ADJACENT OPPORTUNITIES *(POTENTIAL PAYOFF IN 18 MONTHS TO THREE YEARS)*

Adjacent opportunities likely require expanding from existing business into "new to the company" business areas. A range of adjacent opportunities including fleet management support,

Figure 3. Next "wave" opportunities for telecoms to grow in the mobility landscape



Source: Deloitte analysis.

in-transit infotainment content aggregation and delivery, cross-device/vehicle identity management, and ecosystem-level interoperability solutions could emerge, and they would demand higher levels of data and platform integration. Telecom companies pursuing adjacent market opportunities as part of their growth path may choose to help develop integration platforms and standards that facilitate data exchange between vehicles, a variety of devices, passengers/customers, and other physical objects. In turn, that can allow performing analysis across data classes to provide insights at different levels: passenger, driver, vehicle, device, and any combination thereof.

WAVE 3: TRANSFORMATIONAL OPPORTUNITIES *(POTENTIAL PAYOFF IN THREE TO FIVE YEARS)*

The third wave of opportunities would be transformational for telecom companies, demanding that they develop breakthrough solutions for markets and opportunity spaces that are either nascent or don't yet exist. To target this wave of opportunities, telecom companies need to pursue strategies that help strengthen their position as preferred business partners for mobility managers and trusted mobility advisers. Whether to support intermodal mobility-as-a-service solutions or enable vehicle/infrastructure data integration, companies need to develop capabilities to perform systems integration spanning different verticals and physical spaces (for example, retail, parking spaces, health care centers, emergency operations centers), different types of vehicles (for example, owner-driven, fleets, powertrains, buses), and a range of passenger experiences.

Conclusion: What telecom companies can do to "win" in this space

TELECOM companies should ideally not consider the waves of opportunities as either/or choices—rather, they should pursue them in parallel. That could mean leveraging their core strengths and competencies in the near term, while also putting in place the requisite strategy and lining up targeted investments to help capitalize on the adjacent and transformational opportunities. Across this evolving ecosystem, telecom companies may face stiff competition, not just from their peer companies but also from Silicon Valley giants and automotive OEMs, all of which will likely be vying for the prize of owning the customer, data, experiences, money flows, and other emerging areas of value creation. In such an environment, how can telecom companies compete effectively and "win"? These guiding principles may help telecom executives better position their companies to compete and win in the new mobility ecosystem.

Ensure alignment with the core strategy. In the transforming mobility landscape, it is likely that telecom companies might give in to the temptation to pursue an overly broad spectrum of attractive use cases and capabilities, motivated by a desire to own larger swathes of the value chain or just chase new and innovative technologies and monetization opportunities. At the same time, the transportation mobility opportunities should not be viewed merely as an extension of the Internet of Things or simply as a "higher number of connected smart devices." Rather, telecom companies should likely adopt a focused approach by aligning their targeted future of mobility investments and efforts with the broader core purpose and strategic vision that they articulate.

Prioritize capabilities. Given the capital-intensive nature of their business, telecom companies should rationalize and prioritize their investments—a key step of which will likely be to selectively lay out a multiyear strategy on what capabilities to acquire and how. Besides autonomous mobility, they may need to continue to invest in other key areas such as 5G, Internet of Things technology, network security, and digitization of content. In that context, one of the guiding tenets is to prioritize investments in developing or acquiring must-have capabilities that help to efficiently target vertically integrated opportunities and/or provide a foundation that allows them to scale and broaden the services they deliver. Telecom companies can elect to expand/acquire new capabilities either organically (in-house venture arm, incubation model, hiring talent for R&D) or inorganically (strategic partnerships, acquisitions, joint ventures).

Build smart go-to-market partnerships. In their efforts to go beyond their core businesses to capture value in adjacencies and transformational opportunities, telecom companies face significant hurdles in the level of competition they could face

with respect to segments that they don't traditionally serve or capabilities that they have not typically owned. This is where they should aggressively build out their service portfolio by pursuing go-to-market partnerships and cross-industry alliances that provide access to these opportunity areas while allowing them to bring the power of their core offerings to bear through enabling connectivity and content delivery. These partnerships may eventually translate into organically built or inorganically acquired capabilities, but at the outset they would provide a valuable foot in the door to help telecom companies build brand permission in this space. For instance, they could partner with augmented-reality providers to demonstrate the ability to deliver enhanced multimedia content experiences within the vehicle, and they could partner with fleet management service providers to provide intermodal mobility device tracking, monitoring, and interoperability.

Preserve flexibility and be nimble to change. Investments don't come easy, particularly in a world where the technologies that determine the future continue to change dramatically and traditional power structures give way under the weight of new sources of value creation. It will likely be critical for telecom companies to be adaptive to realign strategies as the external environment evolves. They should allow for adequate incubation for mobility innovations and experimentation by providing a measure of insulation from usual market pressures that call for immediate results and returns. In addition, telecom companies should continue to invest in networks and capabilities that can enable a broad set of use cases and value opportunities. However, they should identify and track potential signposts or beacons that point to the nature or speed of change, including social adoption of autonomous vehicles, technology innovations, and passage of regulation—and build in flexibility to effectively adjust their strategies to the external changes.

We seem to be at the threshold of a personal mobility revolution, one likely to change the way telecom equipment and product manufacturers, solution developers, and service providers interact with the rest of the mobility ecosystem participants, whether to provide core connectivity solutions or to enable and support expansion into new frontiers. As the various opportunities emerge at different points in time in the future across the different ecosystem areas, it could be vital that telecom companies chart out a well-defined game plan and strategy—one that allows them to grow their legacy businesses while expanding revenue streams beyond the traditional boundaries. If telecom companies are deliberate about making the right moves in terms of differentiating themselves in their scale and scope of solution offerings, they can look to capture a significant share in the ensuing new value opportunities.

This report only begins to scratch the surface of what is possible, and we intend to continue exploring the implications for telecom companies of the emergence of a seamless intermodal transportation system. With foresight and boldness, they may well become the driving forces of change and value creation in the mobility ecosystem of tomorrow.

ENDNOTES

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