

Reimagine 5G with Location Intelligence: Asia Pacific

here

Shantung Street

Live

5G

Driver on the way

Who is this eBook for?

This guide explores the intersection of 5G and location intelligence. In our emerging autonomous world, 5G networks have to deliver the high levels of performance needed to enable the most demanding applications. However, getting the most out of 5G requires the use of location data and technology in everything from autonomous driving to enabling new, multi-industry enterprise and consumer use cases.

This guide is brought to you by **HERE Technologies** – the world's leading location platform, helping people, goods and organizations to move safely and efficiently for over 30 years.



Is it for me?

This guide provides insights for executives in various sectors, especially those in the telecommunications and automotive industries. This resource is particularly suited for those seeking to:

- Drive higher ROI on 5G network planning and deployment
- Realize the full benefits of low latency and high throughput applications enabled by 5G, including hyper-personalized experiences and hyper-precise real-time location awareness for people and machines on the move
- Harness 5G networks for safer, automated driving
- Enable people to manage their privacy in a 5G world

What's inside?

Introduction	4
Growth of 5G in the APAC region	6
Solving the location dilemma	7
Reinventing Telecom network planning for 5G	8
Working with Telco players for visual positioning	9
Potential of 5G for consumers and enterprises	10
Smart factory and other Industry 4.0 applications	13
5G connected cars and C-V2X	15
Conclusion: 5G technology and location intelligence are natural partners	16
The location promise	17
Gain an edge with location data	18
Case study: partnership with Verizon	20

Introduction



The importance of fast and reliable connectivity has never been more evident than in recent months. With COVID-19 confining people to their homes and bringing about social distancing, communication networks have helped them stay connected and employed. Countless businesses have also been able to access the digital infrastructure needed for them to weather the crisis.

Modern network technologies haven't just helped us move through the pandemic - they're also key to global recovery. In the post-pandemic era, nearly all industries will seek to accelerate their efforts to automate, digitize, and enhance their

capability to operate remotely. For this, the continued advancement of 5G, presently still in the early stages of a multi-year build-out, is critical.

As we shift towards an era of 5G connectivity, the ability of Telcos to maximize their network planning investments - with a focus on customer experience, loyalty, retention, and new technologies - will become ever more important. As deployment will be based on location, a greater understanding of the new generation of location data can reduce the cost and time to market associated with planning and creating 5G networks.

Webinar on Demand

Maximizing 5G & ROI: Customer experience, loyalty, retention and technology

Watch the replay

Webinar on Demand

A new resolution for 5G network planning

Watch the replay

This eBook builds on two virtual roundtable discussions hosted by HERE Technologies. The first session was held in partnership with TelecomWorld Asia on October 6, 2020, and the second session was held on November 5, 2020. These virtual events brought together various Telco industry experts from multiple countries and the product experts at HERE, to discuss the challenges and opportunities in establishing 5G network by leveraging location intelligence.



Abhijit Sengupta
Director of Sales
- South East Asia,
HERE Technologies



Norman Yeoh
Vice President, Head of Network
Commercials, Operations Assurance
& Transmission, Group Technology
Division, **Axiata**



Diego Anibaldi
Senior Product
Portfolio Manager,
HERE Technologies



Sean Bergin
President, **AP Telecom**



Harvey Wright
Head of 5G, **Optus**



Sunhwa Kim
Senior Industry Solutions Manager
- Telco, **HERE Technologies**



Mark Yao
Director of Product
Management,
HERE Technologies



Tom McDonald
Senior Product Marketing Manager,
HERE Technologies

Growth of 5G in the APAC region



Significant investments are being made in 5G. In the APAC region alone, GSMA, the mobile communications industry body, estimates that mobile network operators will invest US\$378 billion over the next four years. This will fuel an expected US\$423 billion boost to the APAC economy by 2034, with the bulk coming from advances in IoT (Internet of Things) and automation for the region's large manufacturing sector.

Recent data shows that there are now 129 global 5G deployments, compared

to just 63 recorded in March. Of those 129 deployments, 37 are in the APAC region. While there continue to be propagation challenges associated with 5G, especially in the millimeter-wave spectrum, location intelligence and the use of 3D geospatial data is proving to be invaluable in reducing operational costs. Network operators are also able to roll out services quicker. Using this technology is vital to ensuring the success of 5G deployment in APAC.

Solving the location dilemma

Building, operating, and leveraging 5G can be potentially lucrative. However, commercial success is far from assured; 5G requires high upfront investment and comes with significant risks. High-speed connectivity, cloud processing, and storage capabilities will need to be deployed close to the consumers, workers, cars, robots, and industries of tomorrow. This is where location intelligence comes in.

Location intelligence has previously played a peripheral role in enterprise

decision-making and application development. In recent years, however, it has exploded with context richness, fueled by affordable, low-powered sensors, big data analytics, and artificial intelligence. This new generation of location intelligence is at the core of the next wave of digital transformation and helping drive better real-world outcomes.

For both consumer and enterprise use cases, location intelligence will drive the way forward.

“Location plays a vital role in each use case. The deployment of 5G will vary by country because the ROI for an operator varies according to the geography of the area it covers. Each use case is defined by the country in question, the size, the demographics, and the subscriber base. These factors will determine its requirements. That’s why we work with Telco players at the deployment stage and then throughout the rollout stage - to ensure deployment can meet proper KPIs.”

- Abhijit Sengupta, Director of Sales - South East Asia, HERE Technologies



Reinventing Telecom network planning for 5G

5G network planning is challenging. Choosing where to invest is a complex set of tradeoffs between latencies and deployment costs that need to be minimized, and device connections and coverage that need to be maximized. While geographical accuracy to where human populations are located is important, other factors also require consideration prior to investment and deployment.

5G network topologies, particularly those utilizing mmWave spectrum bands or massive MIMO/beam forming technologies, are substantially more complex to plan than their 4G and LTE predecessors. Previous methods of

using 2D and 2.5D geodata sets may be insufficient when designing new networks. The critical elements now include geodata precision, scale, and fidelity, rather than a previous generation's network topologies.

Location intelligence can accelerate the network planning process by reducing the need for field surveys. Access to highly defined 3D geospatial data enables planning and design to be performed from a remote location using a desktop computer. To that end, 5G deployment costs can be reduced, cutting down operating expenditures by as much as 40%, particularly those associated with cell site real estate selection.

“With location-based technology, you’re essentially bringing the field to the desktop. Traditionally, the idea is that you must go out and acquire this information, send a truck roll to get the data needed. It is very time consuming and expensive, especially since we are going to require so many more small cells relative to macro cells, and it would be cost-prohibitive to be able to bring the field. Location intelligence can help reduce cost and bend the operations expenditure curve downwards, and new high-resolution geospatial data has proven to reduce planning cost.”

- Tom McDonald, Industry Marketing Manager, Telecommunications,
HERE Technologies

Working with Telco players for visual positioning



Terrestrial Lidar-based geodata models have successfully addressed some of the biggest challenges of selecting the sites and specific locations of 5G radio equipment. There is, however, also potential for ever greater collaboration between location providers and Telco players. One new location technology promises to further expand the possibilities for how Telco players can maximize the impact of their networks: visual positioning.

Visual positioning is an advanced technique similar to the way humans locate themselves. People analyze what they can see around them and access visual memories of places. Visual positioning compares imagery of specific

locations to a database of 3D geometric objects, created from Lidar-captured 3D pixel-point cloud maps to find accurate positioning in real time.

This means visual positioning solutions could enable near-instantaneous identification of specific locations using image capture – without a GPS signal. 3D positioning algorithms will analyze images or video for landmarks and other data that it can compare to extensive location databases through a Telco operator's network in near real time. This allows sub-meter accurate positioning without the need of a remote server, meaning it also works in urban canyons or signal deserts that GPS and other signal-based technologies can't reach.

Potential of 5G for consumers and enterprises

Once deployed, these 5G network technologies open up new horizons for consumers, businesses and governments. Location precision will redesign the exchange of value between Telco players and consumers, giving the former the ability to own the experience, monetize data, increase ARPU (average revenue per user) and enhance their position in the overall value chain.

By opening their networks to third-party developers, Telco players can also foster

an open ecosystem of services at the edge – giving application and service developers more choices than a pure cloud instantiation of their systems ever could. This allows mobile network operators (MNOs) to monetize access to various location-centric platform services, including those that take advantage of accurate positioning and geometry. Accurate, real-time positioning will become a key element in a new generation of consumer experiences.

“The great thing about 5G is it opens up a broad range of use cases across consumer and enterprise that extend beyond the smartphone. In the near term, things like fixed wireless access are going to be an important source of revenue and opportunity, as is the case here in Australia, since we launched a fixed wireless access product over a year ago. But then with applications such as augmented reality, virtual reality, enterprise use cases around manufacturing, and Industry 4.0, there’s a wide variety of different use cases. The interesting thing about monetization under those circumstances, from a Telco perspective, is making sure we place our bets in the right areas.”

- Senior leader at a leading telecommunications company in Australia

For consumers, hyper-targeted engagement will be the future. In an always-on marketplace, consumers expect frictionless experiences and real-time access to information and services. Location data helps connect the dots across foot traffic to various points of interest, illuminating patterns in movement.

Similarly, access to location technology coupled with 5G will mark the way

forward for many industries, allowing for true immersive experiences and opportunities to create value in our day-to-day living. Location technology and network technology go together in the enterprise and industrial arenas, with precise positioning supporting the advanced tracking and monitoring of personnel and mobile assets, which opens up numerous possibilities.

Examples of how location technology can apply across sectors as indicated below:



Immersive virtual collaboration

In the world of VR and virtual collaboration, spaces with complex 3D geometry and objects require a lot of heavy graphics rendering, which can prove too much for some hardware. 5G naturally reduces latency and boosts bandwidth. Offloading some of the workloads to Mobile Edge Computing (MEC) platforms – something known as split rendering – also helps enhance user experiences and eliminate drops in performance. This gives developers more flexibility in the development of immersive multi-user experiences, such as VR-based training.

The addition of location data further widens the possibilities. For example, precise positioning and location context supports spatially unrestricted experiences, where users wearing standalone HMDs (Head Mounted Displays) roam freely in a real-world environment. Location data captured from 5G networks can also help train machine learning models used in the generation of realistic virtual simulations of settings where real-world equivalents might be dangerous or inaccessible – such as research into road safety or virtual exploration of faraway places.





Gaming

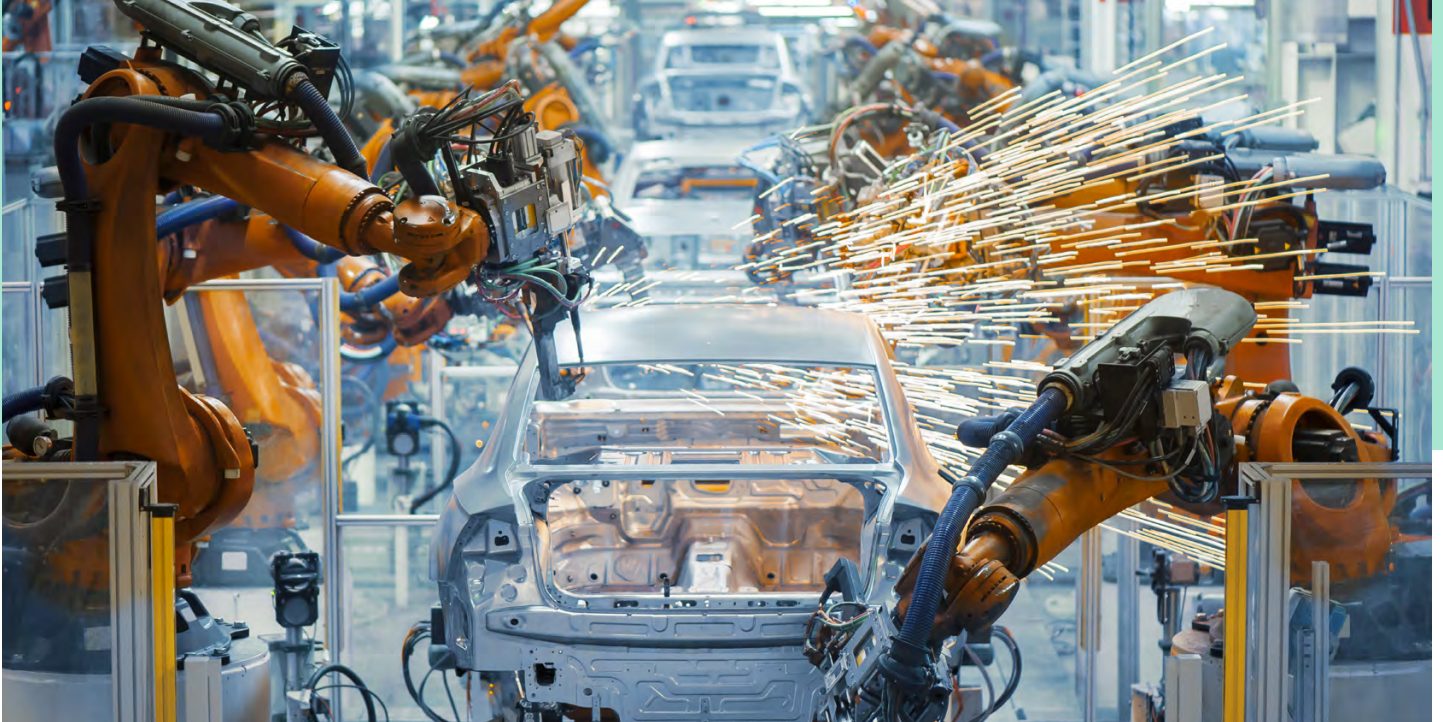
Split rendering is useful in low-latency, real-time gaming too. The use of decentralized, low-cost data centres facilitates streaming of titles in 4K at 60 frames per second, without the need to download games onto consoles or devices. Rich real-world location data can also be added to enhance the experience. By combining positioning data and a device's camera to enable players to experience fictional worlds in real-world environments, 5G raises the prospect of location-based AR gaming on steroids, with ever richer graphics, more precise and efficient real-world 3D positioning, and greater AR accuracy.



First responder edge tracking

Location technology can provide precise, real-time 3D tracking of emergency response personnel during building sweeps and rescue missions. The solution, which works in both indoor and outdoor environments, boosts safety, expedites response times and improves operational efficiency. Real world scenarios include locating mobile emergency calls for accurate indoor positioning, advising drivers to pull over upon detection of approaching emergency vehicles, communicating with traffic lights for 'green waves', and overlaying indoor maps with augmented reality graphics to show mission-critical information, such as accessibility routes, first aid kits, water hose spigots, and the location of people or animals in need of assistance. The potential for growth is also high, as we explore and leverage location-based 5G capabilities.

Smart factory and other Industry 4.0 applications



Although 4G LTE can handle the majority of industrial IoT use cases today, advanced manufacturing systems, logistics hubs and mining facilities have increasingly demanding requirements around latency, reliability, and security. Robust networks and location technology are necessary to run mission-critical operational processes as well as maintain an accurate, trusted real-time and historical record of items across

indoor and outdoor environments. To boost reliability, many businesses are building their own private 5G networks. Location technology can play a vital role in the private domain too – in terms of both realizing networks and in enabling a range of services and applications that reap the benefits of the enhanced connectivity that a private network can bring.



“Imagine if you have a moving machine and no way of knowing where it is located. It will be a disaster. This is where location-based technology is important, in order to identify where the object is and to have control over it. Before that, mapping will be first needed, as you want to know what kind of structure is available at that location, and that is very much important in terms of the planning purpose. There is a lot of future in location-based technology as a solution.”

- Senior leader at a leading regional telecommunications company

5G technology enables smart factories to achieve automation, autonomous vehicle navigation within campus and to track & trace parts. It also helps facilitates condition-based monitoring and predictive maintenance in more advanced ways. All these use cases require private map creation for visualization and analytics.

To help achieve this, HERE provides indoor/outdoor tacking & positioning, platform workspace for real-time data enrichment and geospatial analysis, along with 3D &HD maps for indoor/outdoor and yard.

5G connected cars and C-V2X



One of the most interesting uses of 5G is how it can be incorporated into improving road safety, reducing traffic congestion, cutting pollution, and enabling new vehicle-centric experiences. The vision enabled by 5G is that vehicles can be continually connected to the internet and each other, as well as to traffic lights and road infrastructure. 5G MEC meanwhile, enables large volumes of data from vehicles and infrastructure in any given area to be rapidly aggregated, analyzed and redistributed. The greater compute and network performance will accelerate vehicle-to-everything (V2X) communication, which enables vehicles to tap into their surroundings for greater situational awareness and, if all goes

to plan, facilitates the transition to full autonomy on our roads.

There are plenty of ways 5G MEC could transform the in-car experience. One example is in delivering seamless high-definition 3D views and augmented heads-up-displays of the driving environment. 3D maps tend to be highly memory intensive, restricting their storage in the car. Their size makes downloading them over a 4G network challenging. 5G MEC solves this problem, enabling rich map tiles and data layers to be cached at the edge and streamed on demand, based on a vehicle's planned route.

Conclusion: 5G technology and location intelligence are natural partners

Consumers, enterprises, and governments stand to benefit enormously as 5G capabilities deploy over the next decade. Yet, fully exploiting the transformative potential of these technologies calls for location intelligence. Making use of location intelligence in decision-making will be the key driver of ROI. As Telco players begin exploring ways to be more data-driven and efficient – from network planning to market outreach –

the importance of location intelligence and its potential for transforming and monetizing networks is undeniable.

5G technology and location intelligence are natural partners. Together, this symbiotic relationship will propel us into a hyper-precise world where effectively leveraging location data will become key to achieve the next level of productivity and efficiency.

“In the COVID environment, we have seen how the delivery of goods and optimization of the entire operation is suddenly extremely important. From the manufacturing unit, to the point of sale, to the user, the entire operation needs to be very highly optimized. The on-demand and platform economy is vital for today’s success. More industries are coming to see the on-demand and platform-based economy as another supply chain. They all need connectivity, and what better connectivity than 5G. Not only can it bring satisfaction to these industries, it will help Telco players make money through those applications.”

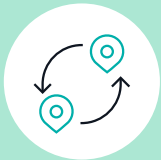
- Abhijit Sengupta, Director of Sales - South East Asia, HERE Technologies



The location promise

Digital revolutions in the Telecom and utilities sectors have led to growing demands for new and innovative technologies. However, building these technologies - such as energy-efficient smart grids, lightning-fast 5G, and connected vehicle services -

requires significant investment. The right data and insights are crucial in planning, building and managing your infrastructure. When the precise location of hardware can save time, money or lives, accurate location intelligence becomes critical.



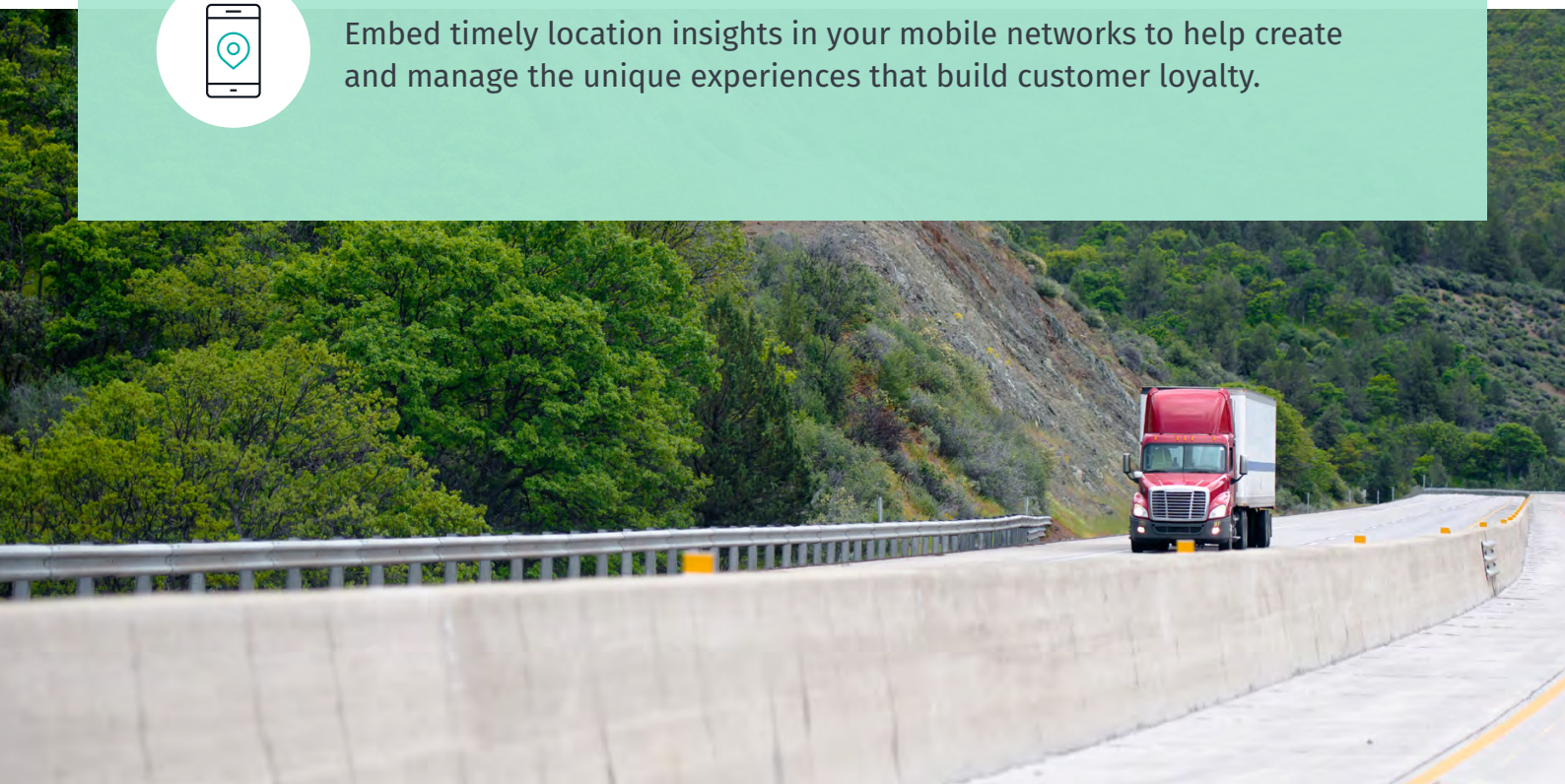
Empower each business unit of your telecommunications enterprise to apply contextually relevant location data to build new enterprise services and customer experiences.



Accelerate 5G rollouts with 3D geodata that provides hyper-precise location data at the scale and freshness necessary for mmWave spectrum and those topologies employing beamforming technologies.



Embed timely location insights in your mobile networks to help create and manage the unique experiences that build customer loyalty.



Gain an edge with location data

As a location data and technology company, HERE Technologies offers a portfolio of products that can help empower telco enterprises.



Network planning

- Location intelligence for network planning and design
- Informed site selection and digital twin capability



Enterprise, auto & public sector

Solutions for Telco enterprise, automotive and government markets (B2B/B2G)



Consumer engagement

Solutions for Telco consumer markets and advertising (B2C)



Co-Innovation

Co-developed, innovation POC driven solutions for R&D: 5G, MEC, C-V2X, IoT, autonomous driving, etc



Improve planning: Significantly reduce the cost of 5G network planning and design by using 3D geodata for the following use cases:

- Digital site survey - Remotely identify and assess prospective cell site real estate candidates and plan RF equipment deployment, reducing truck rolls and delivering faster time to service
- Line of sight (LoS) analysis - Determine optimal placement of small cell antennas for mmWAVE spectrum and beam forming deployments, reducing truck rolls and cell count while delivering faster time to service
- RF propagation modeling - Identify optimal small cell placement and maximize RF coverage, reducing truck rolls and delivering faster time to service
- Digital twin - Bring highly accurate real-world digital twin models into the network planning process, reducing truck rolls and delivering faster time to service and repair



Increase satisfaction: Use location data to help keep customers happy and connected, whether you're bringing affordable wireless broadband to underserved areas, managing your fleet more effectively, or creating new innovative experiences and services. Applications that leverage location data provide a better understanding of consumer behavior and enable AI/ML algorithms to anticipate and respond to user needs.



Engage consumers: Leverage hyper-precise location data to create engaging and relevant customer experiences, improve driver safety and progress towards autonomous driving. Combine location with 5G and Mobile Edge Compute to enable new services for the automotive, retail and media industries.

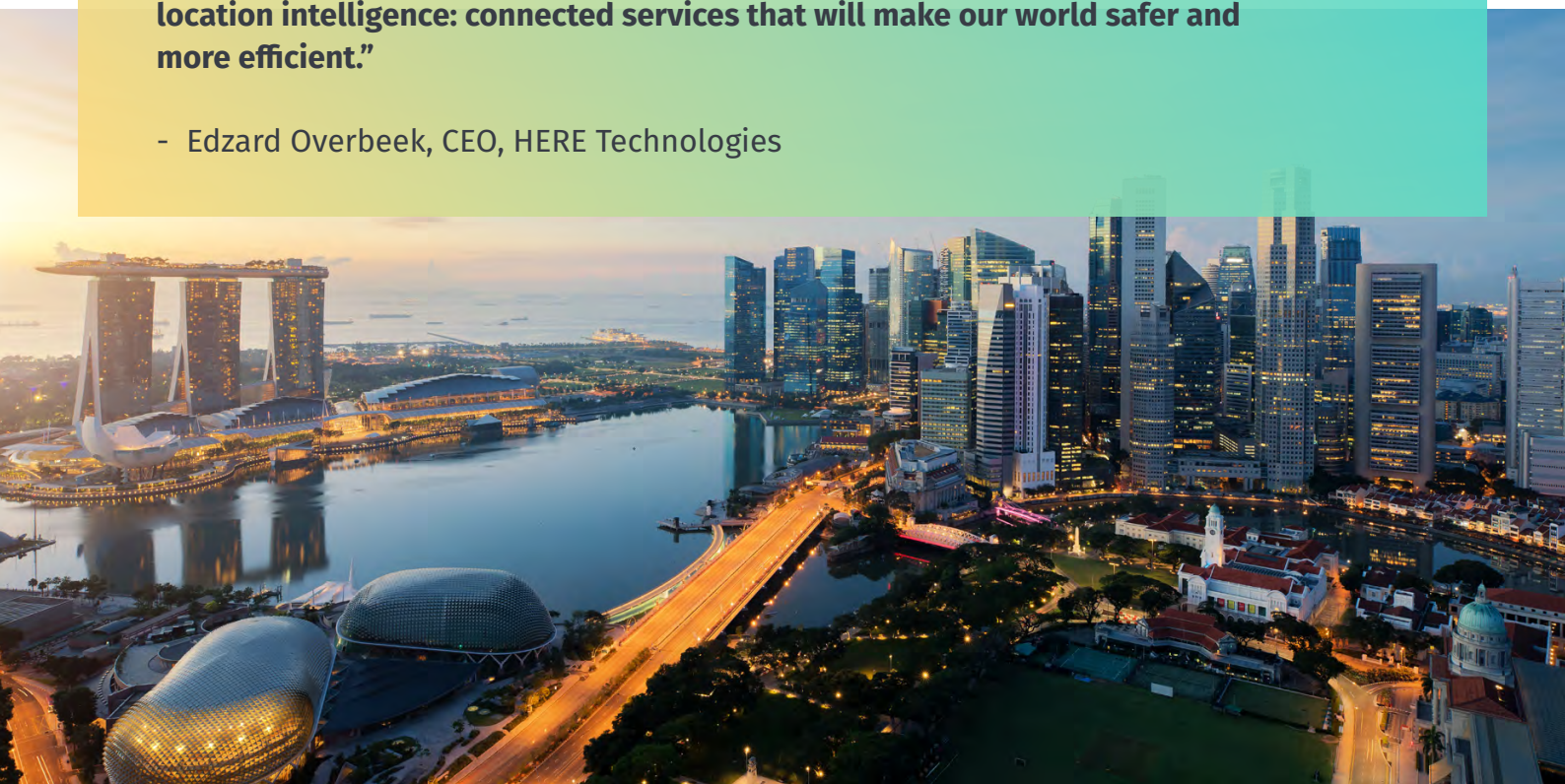
HERE and Verizon co-innovate with 5G, MEC, AI/ML and Hyper-Precise Location

In partnership with Verizon, HERE is exploring how 5G will enable new developments in location technology and autonomous vehicles. We already know that the future of driving is connected. Autonomous or not, it isn't enough for cars to collect data around them using cameras and sensors – they must have a means of communicating with each other and other road-based infrastructure.

As Verizon's valued partner in location services, HERE provides access to a wide range of location data to serve many of Verizon's business needs. The partnership is focused on co-innovation for use cases around problems that connected driving could solve. The aim is to benefit industries, from automotive and smart cities to transport and logistics.

“5G is the future, and the scale and reach of the Verizon 5G network will enable the widespread, higher-bandwidth, low-latency connectivity necessary for more precise positioning. Our partnership with Verizon not only allows us to tap into the innovation potential of 5G, but also highlights what is possible when telecommunications meet location intelligence: connected services that will make our world safer and more efficient.”

- Edzard Overbeek, CEO, HERE Technologies








Customer example



Built by Verizon for Verizon

Location Platform is a new, global, unified foundation that enables Verizon businesses to transform their solutions by harnessing the power of location

Core capability enabling wide range of verizon use cases

 Media	<ul style="list-style-type: none">• Location aware ads• Geo segmentation• Personalization	<ul style="list-style-type: none">• Along-the-way ads• Location insights
 Smart city	<ul style="list-style-type: none">• Smart intersections• Parking• Multimodal transport	<ul style="list-style-type: none">• Traffic optimization• Government solutions
 Connect	<ul style="list-style-type: none">• Navigation• Localization• Fleet optimization	<ul style="list-style-type: none">• Rich place content• Home management• Smart family
 Enterprise	<ul style="list-style-type: none">• E911• Supply chain• Visit verification• On-demand economy	<ul style="list-style-type: none">• ThingSpace• Connected ecosystems• Asset tracking
 Consumer	<ul style="list-style-type: none">• Wayfinding• Personalization• Rewards/offers	<ul style="list-style-type: none">• Emergency services• Fraud detection• Wearables
Unified Verizon Location Platform		
HERE Platform and Telco Offers		

In summary, HERE provides comprehensive and dynamic location intelligence enabling telco enterprises to create new and engaging services for enterprises and consumers.



HERE is a strategic partner who provides the location services and know-how needed by Telecom operators to innovate and create next-gen Telco solutions



HERE products and solutions are available in multiple geographies and can help Telcos reduce costs, capture synergies and create new revenue



HERE products and solutions are built with privacy and neutrality in mind, adhering to all global and regional privacy and consent regulations

Location technology from HERE helps you stay ahead of disruption and gain more functionality and flexibility. Apply our expertise in location-based analysis to build a cost-efficient 5G network or make your grid smarter. Streamline your maintenance workforce. Discover new ways to monetize your data and create products that stand out from the competition.

Turn disruption into an opportunity with the power of location.



Want to know more?

Find out more about how HERE solutions can help facilitate long-term planning for 5G deployment.

Contact Us

About HERE Technologies

HERE, a location data and technology platform, moves people, businesses and cities forward by harnessing the power of location. By leveraging our open platform, we empower our customers to achieve better outcomes – from helping a city manage its infrastructure or a business optimize its assets to guiding drivers to their destination safely. To learn more about HERE, including our new generation of cloud-based location platform services, visit <http://360.here.com> and www.here.com.