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Field Service Augmented by AR and Drone Using 5G with Edge for Reliable Performance

Hong Kong Telecommunications (HKT) Limited

Hong Kong Telecommunications (HKT) Limited, an industry leader in the telecommunications sector, embarked on an innovative initiative to revolutionise its field service operations by harnessing the power of 5G technology, augmented reality (AR), and drones. These technological advancements provide a safer and more efficient approach to the company's operational challenges, specifically in servicing areas that were difficult to access or required specialised personnel. Thus, HKT was able to streamline its field service operations significantly. The case of HKT serves as a pioneering example of how integrating 5G with advanced technology can optimise field operations, boost efficiency, improve safety, and foster effective communication in the telecommunications industry.

HKT

Field Service Augmented by AR and Drone Using 5G with Edge for Reliable Performance

CHALLENGE:

Field service operations in the telecommunications sector face several critical challenges. The inherent dangers of manual field inspections necessitate workers' physical presence in potentially hazardous environments, such as hard-to-reach areas and high-rise platforms. This may result in an potential increase in accidents. The traditional field operation model is also highly time-consuming and resource-intensive. Comprehensive manual surveys of each piece of equipment require significant time and personnel, yet often yield data records that are not sufficiently comprehensive or visualised. In the telecom industry, cell tower inspections entail tower climbing, a skilled task requiring multiple workers, which leads to high labour costs. Furthermore, junior staff unfamiliar with the site tend to expend additional time locating equipment and redoing tasks.

SOLUTION:

The proposed solution leverages drone technology to mitigate the risks associated with field operations. Drones are deployed for dangerous inspection tasks that traditionally required manual labour, reducing workers' exposure to hazardous environments. Drone-based inspection can mitigate risks of aerial works and ensure safer operation for hard-to-reach locations as well as minimise network downtime. Drone inspections, compared to manual methods, are faster, cover a larger area, require less labour, and are less disruptive. They also produce a comprehensive digital archive of precise, visual data accessible at any time. Alongside drones, the solution introduces an AR navigation mobile application that provides precautionary warnings along virtually guided field routes. These make remote expert guidance and field asset tracking possible to reduce errors, reworks, and time spent, enhancing cost-effectiveness.

The integration of 5G, AR, and edge technologies provides real-time on-site navigation and video guidance with remote expert inspection. This efficient, scalable solution allows for effective training of junior field staff while reducing operational risks. Consequently, safety concerns that deter potential industry entrants can be mitigated. Overall, the solution optimises field service operations while prioritising safety.

IMPACTS AND STATISTICS:

The introduction of edge computing with a 5G mobile core network significantly reduced transmission latency, ensuring seamless navigation. This setup demonstrated two to three times superior latency response and five to eight times higher uplink bandwidth capacity than 4G.

The deployment of a 4K ultra-high definition (UHD) camera on 5G phones enabled real-time remote expert video assistance. With the help of AR and drone technologies, an end-to-end field service solution was implemented, improving health and safety measures, reducing operational risks, and facilitating scalable training.

The solution led to a 30-40% time saving compared to using paper maps, thanks to pre-designed and optimised routes. Operational efficiency of field service visits improved by 30%. The Office of the Communications Authority (OFCA) recognised and provided funding support for this impactful project. User satisfaction was high, with the application recommended by all respondents for field operation routing.

WIDER IMPLICATIONS:

The adoption of an edge computer with a 5G mobile core network could significantly enhance user navigation, impacting various sectors such as transportation, logistics, and tourism. The implementation of a 4K UHD camera on 5G phones could improve remote assistance, affecting industries like healthcare and manufacturing. The end-to-end field service solution, if replicated globally, could enhance operational efficiency and safety across sectors like logistics, utilities, and manufacturing.

This project highlights the growing demand for accessible AR applications and sets the stage for the AR+5G+Edge solution as a ready-to-adopt, turnkey industry solution, accelerating market expansion. Moreover, HKT's initiatives have inspired wider cross-industry use cases, from interactive 3D manuals improving fieldwork safety in utilities to real-time route finding and asset tracking, enhancing stock management in warehouses and public facilities.

STAKEHOLDERS:

Mobile phone users, device manufacturers, healthcare providers, utilities, property/venue management, and field service technicians, as well as those involved with aerial works.

SOURCES AND FURTHER INFORMATION

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Why 5G and Key Technologies Are Crucial for Advanced Field Operations

The Role of 5G, AR, and Drones in Enhancing Field Service Solutions

5G's low latency, high capacity, and high bandwidth enable live 4K UHD environment streaming on its uplink, a non-lagging real-time navigation experience, and support for a significantly larger number of connected devices and users.

Key attributes for this use case include 5G, AR, and drones. 5G provides the necessary speed, low latency, high reliability, network slicing, and edge computing capabilities to support the field service solution described in the case study.

AR offers real-time visual interactive indoor navigation with virtual path guidance and location indication of selective field devices, important for field service operations where accurate and timely location information is critical.

Drones enable inspections of difficult-to-reach locations, carried out by specialists in the office, reducing the need for on-site inspections, which can be time-consuming and hazardous.

Utilising 5G/mmWave Technology for Enhanced Field Operations

The Necessity and Superiority of 5G/mmWave in Achieving Set Goals

5G can help achieve the set goal by providing faster data transfer speeds, low latency, high reliability, network slicing, and edge computing capabilities. These capabilities enable real-time applications, such as the AR mobile application used in this case, and support a significantly larger number of connected devices and users. 5G (or mmWave) is necessary and the best answer in this situation because no other technology can match its combination of speed, low latency, reliability, network slicing, and edge computing capabilities. Alternative technologies such as 4G LTE or Wi-Fi do not provide the same level of performance and reliability that 5G or mmWave offers, making them less suitable for this application.

Revolutionising Field Operations: The Impact and Importance of the Innovative Solution

The Technological Platform, Value Chain, and Resolved Challenges in Enhancing Field Service Operations

The solution significantly improves the efficiency and safety of field service operations. It enables remote inspections using drones, real-time visual interactive indoor navigation with virtual path guidance and location indication for select field devices as well as instant communication access between on-site field staff and remote experts via 4K UHD video calling.

The technological platform used involves 5G, AR, drones, edge computing, and 4K UHD video calling. The value chain integrates these technologies to create an end-to-end solution that provides a more efficient and safer approach to field service operations.

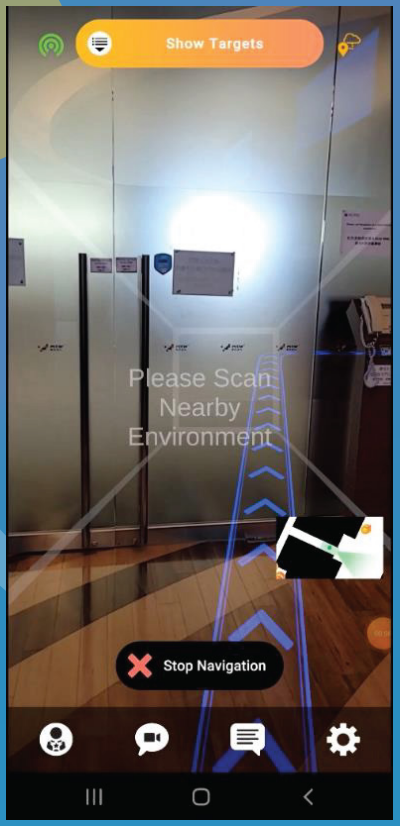
Potential technical challenges during the solution's deployment could include ensuring the safety and regulatory compliance of drone inspections and maintaining the accuracy and real-time availability of location information in the AR mobile application.

The Industry-wide Appeal of the Innovative Field Service Solution

Reasons for Broader Adoption within the Industry

Other businesses in the industry should consider utilising this solution due to the significant improvements it offers for the efficiency and safety of field service operations. It enhances accuracy and reduces the need for repeat visits, presenting a more streamlined approach.

This versatile solution can be customised to cater to specific business needs, offering features such as real-time route finding and asset tracking, interactive 3D manuals for on-site equipment repair, and hazard mapping for increased fieldwork safety. Additionally, the solution's hands-on training and skill development opportunities can aid businesses in attracting and retaining qualified staff.



Future plans

Future plans for the solution involve the integration of AI and ML capabilities for predictive maintenance and automated fault detection. It also includes more advanced sensor and analytics capabilities for comprehensive monitoring of field devices, and the broader application of the solution to industries like gas and electricity plants, manufacturing, transport, logistics, and public areas.

These enhancements can further improve the efficiency and accuracy of field service operations and provide real-time visual guidance and feedback to streamline processes and improve customer satisfaction. The solution's multifaceted benefits and adaptability make it a wise investment for businesses across diverse industries.

"The integration of 5G, AR, and edge technologies in field service operations led to a 30-40% time saving compared to using paper maps, with operational efficiency of field service visits improving by 30%. With the help of drones, dangerous inspection tasks were significantly mitigated. The case of HKT serves as a beacon for the entire industry, demonstrating how the marriage of advanced technologies can revolutionize operations, boost efficiency, and enhance safety in the telecommunications sector."

- Dr NG, Ping Chung, Senior Vice President, HKT Limited.

About the GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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GSMA 5G Transformation Hub

The GSMA 5G Transformation Hub is a source of information on some of the most innovative 5G solutions in the world. This portal contains case studies detailing design, benefits, key players, measured value and the future impact of scaling up these 5G solutions worldwide. The 5G Era is now firmly established and this family of standardised GSM technologies, including mmWave, are being rolled out successfully across the globe. The GSMA 5G Transformation Hub, launched at MWC Barcelona in 2022, provides details of how 5G is best placed to deliver real value for a range of key sectors including manufacturing, energy, transportation, media and live entertainment, smart cities and construction.. Many more case studies will be added, in the coming months, covering even more industries and the GSMA is asking Members to nominate innovative 5G case studies to add to this global digital showcase. The 5G Transformation Hub and this particular Case Study are both sponsored by Qualcomm.

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About this case study