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GSMA 5G TRANSFORMATION HUB

The world's most innovative 5G solutions

5G

The Private 5G Network for the Oil and Gas Industry

Petroliam Nasional Berhad (PETRONAS) & Telekom Malaysia Berhad

In this rapidly innovating digital era, the implementation of advanced technological solutions for industrial processes has become a necessary paradigm shift to ensure enhanced operational efficiency, workforce safety, and environmental sustainability. This case study delves into a pioneering endeavour by PETRONAS, a global energy group: the deployment of a private 5G network infrastructure to enable transformative solutions.

These private 5G networks are not only instrumental in ensuring uninterrupted connectivity, but they also serve as a robust technological foundation that would enable the deployment of sophisticated solutions. Specifically, this case study will explore the use of inspection robots, inspection drones, and augmented reality (AR) / virtual reality (VR) goggles; all made operable by the 5G Enhanced Mobile Broadband (eMBB). These solutions not only improve the efficiency and reliability of inspection and monitoring processes, but they also minimise the risks associated with human interventions, particularly in challenging offshore environments.

PETRONAS

TM ONE

The Private 5G Network for the Oil and Gas Industry

CHALLENGE:

In advancing reliability and sustainability of energy supplies amid energy transition, PETRONAS is driving a digital transformation that encompasses, among others, digitally optimised operations and greater visibility across the value chain. Achieving notable improvements in connectivity speed, latency, stability, and security necessitates the adoption of an advanced wireless technology. In this context, 5G wireless technology emerges as the optimal choice to effectively address these requirements.

SOLUTION:

PETRONAS and Telekom Malaysia (TM) have taken up the challenge and successfully delivered the first oil & gas private 5G network deployment for PETRONAS and its group of companies, marking a significant stride forward in the region's telecommunications landscape. Implemented in December 2022, this solution highlighted several distinct attributes and advantages offered by private 5G networks compared to their public counterparts.

a) Segregation from Public 5G Networks: The private network implemented by TM is wholly segregated from public 5G networks. This distinction offers a myriad of benefits from enhanced security measures to the provision of high-availability services that cater to specific sections or areas within the deployed zone.

b) High Service Level Availability: The private 5G network guarantees an impressive 99.9% network availability per Service Level Agreement (SLA), outpacing the 'best effort' delivery of public networks, typically capped at 95%. This higher SLA translates into increased network reliability and stability, vital for critical operations such as remote operations, high-definition and live monitoring.

c) Enhanced Security and Stability: The private 5G network adds a layer of protection by including 5G as a backup Fiber Optic backbone, which was devised from an engineering partnership between PETRONAS and TM. It incorporates security features that ensure only authorized devices can connect to the network, enhancing network security against any invasions or disturbances. Furthermore, it ensures high-speed, high-availability service, which is critical for the smooth execution of numerous tasks.

d) On-Premise Solution: The design of the private 5G network is based on an on-premise solution. This arrangement provides greater control over network operations and maintenance, ensuring high service levels and moving towards becoming a critical enabler for PETRONAS's production and operational excellence.

e) Leveraging High Upload Throughput: Another key benefit of the 5G technology is its high upload throughput, which PETRONAS has leveraged in their use cases. This capability is a crucial factor in the successful implementation of high-data demand applications, such as live HD video streaming for remote monitoring.

f) Wider Coverage for Transmission: The broader coverage provided by the 5G network has been used to facilitate transmission, both point-to-point and point-to-multi-point, over water. This advantage is of particular importance in offshore operations, enhancing communication capabilities and operational efficiency.

IMPACTS AND STATISTICS:

The deployment of the private 5G network for PETRONAS and its group of companies has resulted in tangible and significant impacts on business operations and socio-economic aspects.

a) Unmanned Operations and Cost Reduction: One of the key opportunities presented by the deployment of private 5G networks is its potential to pave the way for increased utilization of autonomous operations. This new way of working not only significantly mitigates the risks linked with human involvement in such zones but could also cut costs related to workforce logistics, insurance, and potential recompense for occupational hazards.

b) Improved Machine Performance and Safety: 5G enabled devices connected through the private 5G network can perform tasks faster, more accurately, and more reliably than their human counterparts. This improvement leads to the increased of operational efficiency and productivity, and most importantly, the minimisation of errors that could lead to serious incidents in these hazardous environments.

The Private 5G Network for the Oil and Gas Industry

c) Value Generation and Return on Investment (ROI): The private 5G network, despite its upfront costs, is anticipated to generate a high benefit-over-cost ratio in the long run. By fostering an environment conducive to digital innovation and enhanced operational efficiency, the network could lead to significant savings and value generation. Additionally, the network would serve as a foundation for future technologies, further improving the ROI over time.

d) Socio-Economic Benefits: Beyond the direct operational benefits, the private 5G network implementation also has significant socio-economic advantages. By reducing the need for human intervention in hazardous environments, it contributes to workplace safety and welfare, aligning with the UN's Sustainable Development Goals. Moreover, the pioneering initiative sets a benchmark for other industries, potentially encouraging similar technological adoption and fostering a more digital, innovative, and safer industrial landscape.

WIDER IMPLICATIONS:

The successful implementation of a private 5G network by PETRONAS and its group of companies marks a notable transformation in the field of oil and gas, setting a benchmark for the industry. By shifting towards a more digitalised and connected working model, this endeavour could inspire significant improvements in operational efficiency, risk mitigation, and cost savings if replicated globally across other industries, operating in similar conditions.

A crucial milestone achieved with this implementation is the progression towards remote autonomous operations. The ability to have fully unmanned offshore operations presents a groundbreaking possibility within the industry, which could potentially extend to other sectors seeking to automate hazardous tasks. This transition could redefine numerous industries, enhancing safety and efficiency on a large scale.

Alongside the direct industry benefits, the societal implications are far-reaching. The reduction of human transportation to and from these sites due to unmanned operations substantially reduces the carbon footprint associated with these activities. In effect, it aligns with global sustainability goals, making significant strides towards combating climate change.
In essence, while the deployment of the private 5G network offers immediate operational benefits for PETRONAS, the wider implications and future opportunities are substantial. They signify the dawn of a digital revolution in the industry, heralding a future of safer, more efficient, and more sustainable operations. This transformation has the potential to greatly contribute to societal well-being and global sustainability goals, defining a promising future for industries worldwide.

STAKEHOLDERS:

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SOURCES AND FURTHER INFORMATION

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Efficiency through 5G:
The Case of PETRONAS

LEVERAGING 5G TECHNOLOGY FOR REMOTE AUTONOMOUS OPERATIONS

The implementation of 5G technology, particularly the Enhanced Mobile Broadband (eMBB) has been pivotal in achieving PETRONAS' set goals of operational efficiency and safety. This case study explores why these technologies were necessary and why they were considered the best solution for PETRONAS' specific needs.

In comparison to alternative technologies such as LTE or Wi-Fi, 5G eMBB offer superior speed, capacity, and mobility, which enable a high-quality internet access, even in challenging offshore environments.

In the near future, the roles of massive Machine Type Communications (mMTC) and Ultra-Reliable Low Latency Communications (uRLLC) are expected to become increasingly important. mMTC will enable a more extensive range of 5G native Internet of Things (IoT) devices and sensors to be deployed, further enhancing the capabilities and efficiency of remote autonomous operations.

Similarly, uRLLC, which offers low-latency solutions, will be integral to ensuring real-time communication and control for these operations. This characteristic is vital for executing tasks that require instant feedback, allowing quicker decision-making and more efficient operations.

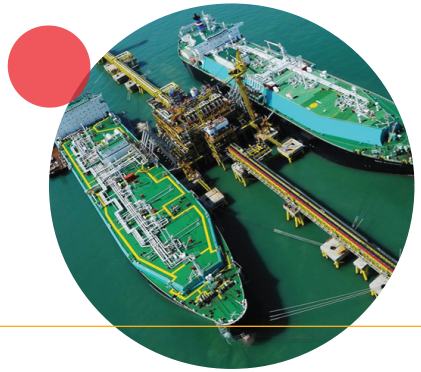
Embracing 5G: A Significant Leap in Connectivity Technologies

5G CONNECTIVITY: A NEW FRONTIER IN OPERATIONAL EFFICIENCY AND INNOVATION

5G, the latest generation of wireless communication technology, holds a distinct position within PETRONAS' digital connectivity strategies. With its faster data speeds, lower latency, and greater capacity, 5G represents a significant leap forward from previous technologies such as 2G, 3G, and 4G LTE. Moreover, as a licensed spectrum technology, 5G offers enhanced reliability and security, thereby ensuring a guaranteed quality of service.

5G is poised to play a critical role in PETRONAS' digital transformation journey. This revolutionary technology is expected to unlock an array of new and innovative applications that require high-speed and low-latency connectivity. Furthermore, it can support the burgeoning demand for mobile data services, especially in densely populated urban areas where network congestion is a considerable challenge.

However, the implementation of 5G does not signal the end for other connectivity technologies like LoRa and Wi-Fi, which continue to play important roles in certain scenarios. As such, while 5G represents a significant milestone, it is one piece of a complex connectivity ecosystem that PETRONAS continues to strategically evolve and optimise.



PETROLIAM NASIONAL BERHAD (PETRONAS) & TELEKOM MALAYSIA BERHAD

Gleaning Insights from Asia Pacific's 5G Approach

LEARNING FROM THE ASIA PACIFIC'S 5G BLUEPRINT: THE CRUCIAL ROLE OF GOVERNMENT SUPPORT

The strategic approach to 5G implementation in the Asia Pacific region provides valuable insights for other regions. A key lesson from the Asia Pacific journey is the pivotal role of government support in establishing the policy landscape for 5G deployment, catering to the needs of both consumers and enterprises.

Governments in the Asia Pacific region have actively championed the development and deployment of 5G and IoT technologies. This commitment has manifested in investment in research and development, the formulation of conducive regulatory frameworks, and the financing of essential infrastructure. These concerted efforts have facilitated a swift and efficient rollout of 5G across the region, paving the way for innovation and growth.

The lessons derived from Asia Pacific's 5G trajectory underscore the vital role of supportive governmental policies and proactive involvement in accelerating the uptake of advanced connectivity technologies. These insights can serve as a strategic blueprint for other regions seeking to build a robust 5G ecosystem and leverage the transformative potential this technology offers.

Future Plans and Expansion Opportunities

CHARTING THE PATH FORWARD: COST-EFFECTIVE EXPANSION AND INNOVATIVE OPPORTUNITIES

With the successful implementation of the private 5G network, PETRONAS is now set to explore the expansion possibilities offered by this digital platform. Recognising the importance of cost-effectiveness in scaling up, the company is committed to finding efficient design solutions to make the 5G network more accessible and advantageous, not just within their existing operations but also extending its benefits across diverse areas of business.

Plans are underway to optimise the network's reach and capacity, enhancing its performance while concurrently reducing the costs associated with its deployment and operation. In addition to this, the introduction of more features tailored to serve the specific needs of the oil and gas industry is being considered. This strategy also takes into account the potential for catering to the requirements of other industries, making the 5G network a versatile platform for a wide array of applications, from remote monitoring and autonomous operations to high-definition video streaming and real-time data analysis.

In shaping its future, PETRONAS aims to reinforce its position as a digital innovator within the oil and gas industry. The company is actively contributing to the broader adoption and development of 5G technology, with its endeavours setting the stage for a new era of industrial operations marked by efficiency, safety, and sustainability.

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.

For more information, please visit the GSMA corporate website at www.gsma.com.

Follow the GSMA on Twitter: @GSMA.

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