

F R O S T & S U L L I V A N



2022
TECHNOLOGY
INNOVATION
LEADER

ASIA-PACIFIC
5G ENTERPRISE INDUSTRY

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Singapore Telecommunications Limited excels in many of the criteria in the Asia-Pacific 5G enterprise space.

| AWARD CRITERIA | |
|----------------------------|------------------------|
| <i>Technology Leverage</i> | <i>Business Impact</i> |
| Commitment to Innovation | Financial Performance |
| Commitment to Creativity | Customer Acquisition |
| Stage Gate Efficiency | Operational Efficiency |
| Commercialization Success | Growth Potential |
| Application Diversity | Human Capital |

Commitment to Innovation

Singapore Telecommunications Limited (Singtel), a leading communications technology group in Asia-Pacific (APAC), offers business solutions for workforce mobility, data hosting, cloud, network infrastructure, analytics, and cybersecurity. With more than 428 direct points of presence in 362 cities, Singtel’s network infrastructure and technology services cater to businesses in more than 21 countries worldwide.

Singtel has spent the year delivering on its innovation commitment with a series of firsts, defining its capabilities in the 5G enterprise space. In 2021, the company launched the first-of-its-kind portable 5G-in-a-box service, the first-of-its-kind platform for connectivity and edge cloud, and the first full campus network rollout in the region. Singtel is well positioned and recognized as the partner of choice among Singapore’s 291,600 enterprises. With the number of enterprises in Singapore growing at a compound annual growth rate (CAGR) of 3.3% from 2019 to 2021, Singtel’s potential to monetize 5G innovation in the enterprise segment is expected to become even stronger as the company continues to build its track record in 5G and show the benefits over 4G.

Singtel’s reputation extends beyond Singapore, leading the way in APAC by being the first mobile operator to launch AWS Outpost and Microsoft Azure Stack Hub Multi-access Edge Computing (MEC) and by being the third operator to deploy a platform that offers regional 4G and 5G opportunities. Moreover, the company is the second global mobile operator to launch Microsoft Azure Public MEC. In 2021, Singtel witnessed greater than 100% year-on-year (YoY) revenue growth from 5G, indicating the company’s

growth potential within the 5G enterprise space. The company's commitment to continue investing in building its core intellectual property (IP) and regional capabilities serves to strengthen its ability to tap into opportunities in the 5G enterprise space.

Commitment to Creativity

Singtel makes it easy for customers to overcome approval bottlenecks and reduce commercialization risks, thus leveraging technology advancements to drive innovation. For this purpose, Singtel created the 5G-in-a-box platform, GENIE, to send 5G and MEC capabilities directly to customers to test applications and assess if improved services with low-latency capabilities will enhance the business value proposition. After testing and with customers convinced of the benefits and value proposition of 5G, Singtel believes in delivering intelligence with flexibility and making all the necessary resources, including 5G, cloud, and edge compute, available at customers' fingertips.

With Singtel Paragon, the industry's first all-in-one orchestration platform that is accessible through a single pane of glass, Singtel makes it easy for enterprises to discover, launch, and manage next-generation applications across different infrastructure silos. With this strategy, the company lowers the barriers to 5G adoption among enterprises and expedites 5G integration in the industry.

Customer Acquisition

Singtel's customer-facing processes are based on industry best practices because they thoroughly map the customer journey, from identifying business challenges and pain points to building and managing a sustainable solution that can scale as required; therefore, Singtel adequately helps customers solve their business challenges. The team at Singtel takes a proactive approach when helping customers overcome their business challenges by leveraging both connectivity and compute power to meet or even exceed the experience expectations of enterprises. The company ensures connectivity bandwidth and quality of service (QoS) to meet the needs of enterprise applications, and it ensures compute power is as close as possible to enterprises so they can reap the benefits of 5G, with real-time analysis and decision making.

Operational Efficiency

With its digital Singtel Paragon platform, which is equipped with an application programming interface (API) library, Singtel takes operational efficiency up a notch by shortening the timeframe for customer

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Director, ICT Research**

onboarding and go to market. Manual customer support, which, for example, used to take 2 days to change a SIM profile, is reduced to 2 minutes through a self-service portal. Finding the right application on the Paragon marketplace to solve a business challenge now only takes 1 to 2 hours, whereas the traditional procurement process would slow enterprises down by at least a month because they would need to shortlist an application manually for deployment.

With local government agencies focusing on the use of drones with 5G e.g., for remote site inspections (to enhance site safety), to exacerbate decision making for rectification works with real time data transmission, etc, Singtel Paragon can fulfil the critical role of ensuring that the drones on its 5G network

can perform as required. Deploying and operating a drone application previously took 2 to 3 weeks but now takes as little as 15 minutes to deploy. Moreover, any network issues that hamper the drone's performance in flight can be resolved within less than a minute. With a simple API command, the customer can send instructions for the drone to be moved to a new slice, thereby resolving any network issues. Moreover, drones are no longer required to land pending trouble ticket resolution, which usually takes 1 to 2 days to resolve manually.

Application Diversity

As the industry advances toward Singapore's Smart City goals, 5G adoption will become more complex, with the industry looking beyond connectivity to power next-generation services and new business models. With adequate investment at the edge, artificial intelligence (AI) and MEC can bring together end-to-end (E2E) services to create an intelligent edge that can support location-based services, contextualized marketing, and network analytics capabilities. With the Singaporean government advocating the use of these emerging technologies, progress on the island state is expected to accelerate in the near future.

Singtel's 5G Paragon platform is in line to continue supporting the nation's ambition/goals and powering multiple applications in multiple environments using a single solution. The platform is especially critical for empowering mission-critical services, such as Industrial Internet of Things (IIoT), autonomous driving, and 5G broadcasting, that need the high throughput and low latency benefits of 5G to perform as required. Furthermore, Singtel's multi-cloud capability unifies near edge, far edge, and centralized compute to provide customers with the necessary E2E performance required by next-generation services.

Commercialization Success

Singtel holds the patent for the intellectual property (IP) of the Singtel Paragon platform. Out of the company's many successful 5G implementations so far, such as for AETOS, Micron, and Hyundai, the connected warehouse at Zuellig Pharma is by far the most notable because it demonstrates how 5G can help organizations realize the future of manufacturing by making warehouse operations more efficient, productive (e.g., with better throughput), accurate (e.g., with better visibility), and safe (e.g., with better

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location compliance and predictive and preventive maintenance capability) through automation and data-driven insights.

Early results show a nine-times improvement in counting speed, with 95% counting accuracy; a 30% improvement in augmented reality (AR) pick productivity, with 100% pick accuracy; and an overall increase in safety. These early success stories in Singapore will soon be replicated across APAC and worldwide because Singtel can now leverage its local track record and expertise to use its proven model through regional

associates, such as Optus in Australia, AIS in Thailand, Globe in the Philippines, Telkomsel in Indonesia, and Airtel in India, all of which have strong business relationships with leading enterprises in the region. Furthermore, with the Microsoft Azure Edge Zones integration with Singtel's 5G network in February 2022, Singtel has expanded its reach to include all existing Microsoft Azure subscribers in Singapore.

Conclusion

Singtel's commitment to innovation has led to a series of firsts that define the company's capabilities in the 5G enterprise space. With Singtel's proactive approach to helping customers overcome their business challenges by going beyond connectivity and leveraging both connectivity and compute power to meet or exceed the experience expectations of enterprises, the company's local track record and expertise can be easily leveraged and replicated worldwide. With Singtel Paragon as a single platform, Singtel makes it easy for enterprises to discover, launch, and manage next-generation applications across different infrastructure silos.

With its strong overall performance, Singapore Telecommunications Limited earns Frost & Sullivan's 2022 Asia-Pacific Technology Innovation Leadership Award in the 5G enterprise industry.

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

About Frost & Sullivan

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Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.

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Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

