

## 5G and its Role in Facilitating the Adoption of Emerging Technologies

### 5G 及其協助推動新興技術的角色



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Over the past three decades, the evolution of mobile technology from 2G to 3G and then to 4G has shifted the communication demand from voice to data and further to mobile broadband. As Hong Kong's premier telecommunications provider and a leading technology innovator, HKT has witnessed the rapid growth in communication needs and played an important part in meeting those needs.

HKT rolled out its 5G network in April this year. Characterized by ultra-high speed, ultra-low latency and massive connectivity, 5G offers new opportunities for enterprises and vertical industries including automation, machine-to-machine communications and Industry 4.0. At the same time, 5G brings consumers a uniquely different mobile experience with new and exciting applications. Ms. Susanna Hui, Group Managing Director of HKT, believes that 5G will drive growth for the company and the continued development of Hong Kong into a smart city.

According to Ms. Hui, with a robust and extensive fiber-backed network infrastructure, as well as a substantial amount of 5G spectrum, HKT is ideally positioned to support the adoption of 5G by consumers and enterprises. HKT is actively exploring with the public sector and various industries the deployment of 5G and other emerging technologies to improve efficiencies and business insights.

#### 5G enterprise applications

Capitalizing on its decades of experience in system integration and the wealth of expertise among its technical talents, HKT has been driving digital transformation with emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT) and robotics for different vertical industries. Today, taking advantage of 5G's features of high bandwidth, low latency, and massive connectivity, the company works with global startups and technology partners to develop innovative solutions for various sectors such as connected healthcare, smart construction and PropTech. These solutions will support the sustainable development of local enterprises and the Hong Kong Government's vision of transforming Hong Kong into a smart city.

在過去 30 年，隨著 2G、3G 及 4G 的流動通訊技術演進，通訊需求已由語音轉至數據再轉變到流動寬頻。作為香港首屈一指的電訊服務供應商及領先的創新企業，香港電訊見證了通訊需求的急速增長，並在滿足這方面的需求扮演重要的角色。

香港電訊已於今年 4 月啟動其 5G 網絡。5G 具有超高速、超低延遲傳輸及大量連接的特性，為企業及垂直行業創造更多新機遇，包括自動化、機器對機器通訊及工業 4.0。同時，5G 創新及精彩的應用為消費者帶來獨特與別不同的流動體驗。香港電訊集團董事總經理許漢卿女士相信 5G 可為公司帶來增長動力，及協助香港持續發展成為智慧城市。

許女士表示，憑藉擁有強大而廣泛的光纖網絡基建及數量可觀的 5G 頻譜，香港電訊具備最佳條件，協助推動消費者及企業採用 5G。香港電訊現正積極與公營機構及不同行業合作，探索如何透過 5G 及其他新興技術提高效率及掌握商機。

#### 5G 企業應用方案

憑藉數十年的系統整合的經驗與人才，香港電訊正運用新興技術如人工智能 (AI)、物聯網 (IoT)、機器人 (Robotics) 科技，協助不同垂直行業進行數碼轉型。香港電訊將繼續與全球初創及科技夥伴緊密合作，開拓適合各種行業應用的創新方案，包括互聯醫療、智慧建築及地產科技，以推動本地企業的持續發展，並與政府共同打造香港成為智慧城市。

## Construction and PropTech

In the construction industry, 5G can support the high-speed download and update of construction blueprints to ensure satisfactory building progress. 5G can also enable massive deployment of IoT sensors to monitor construction sites and assets, and ensure the safety of construction workers. Indeed, HKT has empowered an enterprise customer to perform real-time, high-definition site monitoring through video analytics and an array of sensors at a construction site. Should an incident occur, these sensors would instantly set off an alarm at the central monitoring center and simultaneously alert designated site staff. Engineers can also remotely monitor the construction site in real time using their 5G mobile phones.

Separately, HKT has partnered with one of the largest property management companies in the world to install more than 4,000 IoT sensors in over 200 properties in Hong Kong. The project represents the largest IoT-powered PropTech deployment in Hong Kong and enables the customer to centrally monitor these connected buildings, optimize operations and enhance occupant experience.

## Connected Healthcare

5G can support 4K ultra high-definition video collaboration in real time. By putting on a pair of smart glasses to communicate ultrasound and other imaging data, medical practitioners can provide remote consultation (including doctor-to-doctor and doctor-to-patient consultation). New tools assisted by augmented reality (AR) and virtual reality (VR) can be developed and deployed for remote clinical training and remote mentoring in smart hospitals, clinics and universities. The Internet of Medical Things empowers remote patient monitoring, drug storage conditions monitoring and healthcare asset management. Connected healthcare has the potential to effectively alleviate the constant strain on the limited healthcare resources worldwide. HKT is fully capable of applying the enabling technologies of 5G, the IoT and AI to big data analytics to promote medical research, disease prevention and diagnosis. The company is also examining opportunities in health risk assessment, chronic diseases management and even digital smart hospitals.

## 建築及地產科技

在建築行業方面，5G 可支援建築平面圖的高速下載及更新，以確保建築進度更加理想。5G 亦可支援大規模 IoT 感應器的部署，以監測地盤、監控資產及保障地盤工人的安全。實際上，香港電訊已為一位企業客戶的建築地盤利用視頻分析及一系列的感應器，進行實時的高清監控。如有特別事故時，會發出即時警報通知中央監控中心及指定地盤人員。工程人員更可隨時透過 5G 手機，遙距實時掌握工地情況。

此外，香港電訊與全球最大規模的物業管理公司之一攜手合作，在逾 200 個遍及香港的管理物業內，安裝超過 4,000 個 IoT 感應器，是全港最大的 IoT 地產科技項目，讓客戶可集中監控這些已連接的大廈、優化管理及提升租戶的體驗。

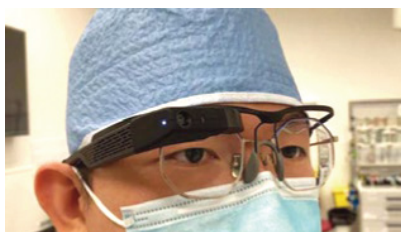
## 互聯醫療保健

5G 能支援實時 4K 超高清視像協作平台，配合智能眼鏡，連接超聲波及其他放射造影檢查數據，醫生便可提供遙距諮詢服務（包括醫生對醫生、以及醫生對病人的諮詢服務）。透過開發擴增實境（AR）及虛擬實境（VR）輔助的新工具，應用於智能醫院、診所及大學，可進行遙距臨床培訓及遙距督導。IoT 醫療可實現遙距監測病人情況、藥物存儲狀況監控及醫療物資管理。互聯醫療保健能有效舒緩全球醫療的資源問題。香港電訊能自如地運用 5G、IoT 及 AI 的技術應用於大數據分析，以促進醫學研究、疾病預防及診斷。該公司亦一直探索健康風險評估、慢性病管理及數碼化智能醫院方面的機遇。

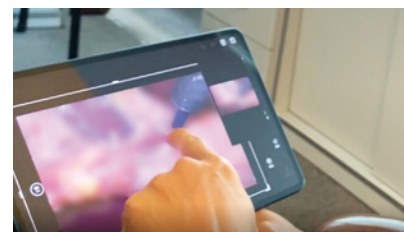
## 5G Smart Hospital: Remote Mentoring



1/ Surgical team conducts minimally invasive surgery with endoscope



2/ Smart glasses worn by surgeon provide first-person view to consultant remotely



3/ While watching the live surgical scene, consultant interacts with surgical team and provides expert advice

Photos taken during a surgery at TKO Hospital

Together with different enterprises and organizations, HKT has been developing new technologies and products to achieve its 5G vision. For example, the HKT-ASTRI Smart City Joint Laboratory was founded in 2018 to explore smart city infrastructure, electronic road pricing and connected vehicle-related technologies. Microsoft 5G IoT Makerspace is a partnership with Microsoft Hong Kong and Hong Kong Cyberport to inspire the local start-up community to test their IoT solutions using a combination of HKT's 5G network and Microsoft's technologies. Ms. Hui also welcomes the Hong Kong Government's Subsidy Scheme for Encouraging Early Deployment of 5G, which is expected to contribute to enhancing the city's overall competitiveness.

In Hong Kong, many mobile users have become early adopters of 5G. Different categories of consumer applications are expected to fuel further growth, and in the short time since the launch of its 5G network, HKT has already come up with a host of 5G applications to whet consumers' appetite.

## 5G consumer applications

Taking advantage of 5G's high bandwidth and by moving the computationally intensive video processing to the cloud, a new generation of entertainment can be introduced, such as 4K cloud gaming, 360° VR video and AR applications. HKT offers differentiated audio-visual entertainment services and exclusive AR/VR applications through its 5G network.

### VR entertainment

VR can allow us to immerse in an entirely new reality, yet the technology failed to gain traction in the consumer market in the beginning because of the heavy headset and tedious installation. To overcome these issues, HKT has sourced a highly portable VR headset which, when used together with the csl. 5G VR app, enables users to watch K-pop music shows shot in 4K VR format in their own private virtual theater, as well as to play many popular VR e-sports games.

HKT's 5G network also promises an enhanced audio journey for music lovers. Coinciding with the launch of the HKT 5G network, MOOV introduced Hong Kong's first 24-bit FLAC lossless music streaming service. The service makes available to users more than 20,000 24-bit songs in unrivaled richness and detail.

The transfer of Now TV to HKT makes the latter the only true quadruple-play services provider in Hong Kong and is anticipated to greatly enrich the company's content offerings via its 5G network.

### AR applications

In the retail industry, Ms. Hui notes that many Hong Kong brands and retailers are keen to exploit 5G to improve their customer experience. To meet their need for increased customer engagement, HKT quickly responded with the launch of the AR-based csl. 5G Lens app. By opening the app and then pointing their smartphone cameras at participating shops, consumers can instantly receive discounts and offers from these shops. The app offers an all new and fun shopping experience. Ms. Hui sees great potential for AR to enhance interactions

香港電訊一直在技術及產品開發方面與不同的機構及公司積極合作，以推進其對 5G 的願景。例如，香港電訊 - 應科院智慧城市聯合實驗室於 2018 年成立，致力智慧城市基礎設施、電子道路收費及車聯網相關技術。Microsoft 5G IoT Makerspace 是香港電訊、Microsoft 香港聯同香港數碼港的合作，旨在激發本地初創企業，運用結合香港電訊的 5G 網絡及 Microsoft 技術探索及試驗 IoT 解決方案。許女士亦對香港政府的 5G 技術項目資助計劃表示歡迎，預期將有助提升香港的整體競爭力。

在香港，許多流動通訊用戶已成為首批 5G 使用者。預期不同類別的消費者應用程式將推動進一步增長，而香港電訊自啟動其 5G 網絡以來，在短時間內亦已推出一系列的 5G 應用程式以切合消費者的需要。

## 5G 消費者市場應用

憑藉 5G 的高頻寬的優勢，將計算密集的視頻工作移至雲端以實現新世代娛樂，如 4K 雲端遊戲、360° VR 視頻及 AR 應用。香港電訊透過其 5G 網絡，提供與別不同的視聽娛樂服務及獨家精彩 AR / VR 應用。

### VR 娛樂

VR 可讓人們沉浸在一個全新的實境。從前 VR 難以普及是因為頭戴裝置比較重及安裝繁瑣。為克服這些問題，香港電訊已引入非常輕便的 VR 頭戴裝置，連同 csl. 5G VR 應用程式，讓用戶可在家擁有一個私人虛擬影院，觀看以 4K VR 拍攝的 K-pop 音樂節目，以及大玩很多大熱 VR 電競遊戲。

香港電訊的 5G 網絡亦為樂迷提供一個更佳的音乐旅程。配合香港電訊 5G 網絡啟動，MOOV 推出香港首創 24 bit FLAC 無損串流音樂服務，為用戶提供超過 20,000 首錄音室原音音樂的 24 bit 音樂服務。

Now TV 成為香港電訊的一分子後，將會令香港電訊成為全港唯一真正的「四網合一」服務供應商，並期望透過 5G 網絡帶來更豐富精彩的內容。



### AR 應用

在零售業方面，許女士深明香港有很多品牌及零售商都希望藉著 5G 提升客戶體驗。為滿足他們與客戶互動的需求日益增加，香港電訊迅速推出了以 AR 為基礎的 csl. 5G Lens 應用程式。客戶只需開啟應用程式，點擊手機相機鏡頭畫面上參與商戶的商標，便可即時取得該商戶的折扣及優惠，感受全新及有趣的購物體驗。

between consumers and retailers in smart shopping malls and shopping districts, which should boost consumer spending both during and after COVID-19.

## HealthTech

At the height of the COVID-19 pandemic in Hong Kong, HKT launched DrGo—a mobile app platform that provides comprehensive end-to-end telemedicine services to users at home or on the go. The platform sets a new benchmark for digital transformation in the healthcare sector. Remote consultation is already popular in regions like Singapore, the US and mainland China, and DrGo was conceived to serve a growing demand for telemedicine in the local community. The company is continuously expanding the DrGo network with more hospitals, clinic chains and doctors, with the long-term goal of extending remote healthcare services to patients suffering from chronic illnesses, those living in elderly care facilities, as well as users of the public healthcare system.

## 5G opportunities in the Greater Bay Area

HKT has not lost sight of opportunities for the adoption and use of its 5G technology in the Greater Bay Area. In recent years, an increasing number of Hong Kong senior citizens have been moving to the Greater Bay Area for their retirement, yet many still return to Hong Kong for their medical consultations and health checks. Ms. Hui believes that a healthcare collaboration platform enabled by 5G can meet the need for cross-border healthcare services. Such a platform can facilitate doctors in Hong Kong to conduct remote consultation and diagnosis via 4K ultra-high-definition video calls. They can also remotely view and assess high-definition x-ray or ultrasound images in real time. HKT is eager for the Greater Bay Area to open up its 5G market, so that the company can explore these opportunities and further expand its business scope through leveraging its cross-border infrastructure and ICT platform.

## Future 5G Enhancements

HKT's 5G network is built on top of its extensive 4G network in non-standalone mode (NSA) to provide a powerful mobile broadband service. The company is now building a next-generation 5G core (5GC) network to support evolution into standalone mode of operation, enabling network orchestration and slicing to unleash the full potential of 5G.

HKT is committed to providing comprehensive 5G coverage across the entire city. The company has been progressively improving coverage at key indoor locations such as transportation hubs and shopping malls. Ms. Hui believes that the ecosystem of 5G applications and smartphones will continue to grow and will accelerate the adoption of 5G technologies provided that the economy remains steady.

According to Ms. Hui, the company's investment in 5G would break even more quickly than that in 4G, partly because the 5G spectrum cost less than the 4G spectrum did, and partly because HKT has already invested in a robust and extensive optical fiber network infrastructure over the years, making 5G investment mostly incremental.

In closing, the potential of 5G is limited only by imagination. Ms. Hui has pledged that HKT will work tirelessly to devise 5G technology solutions suitable for various industries including medical, transportation, logistics, construction and retail as well as boosting its 5G offerings for consumers. From this standpoint, the future of 5G certainly looks bright. ●

許女士認為 AR 在智能購物商場及購物區可發揮巨大潛力，增強消費者與零售商之間的互動，這將刺激消費者在新冠狀病毒疫情期間及往後的購物消費。

## 健康科技

在新冠狀病毒疫情高峰期時，香港電訊推出 DrGo 應用程式平台，為用戶在家居或外出提供最全面的一站式遙距醫療服務，並為醫療保健業定下新指標及促進行業的數碼轉型。遙距醫療諮詢在多個地方已相當普及，例如新加坡、美國及中國內地，而 DrGo 能滿足本地社會對遙距醫療不斷增長的需求。該公司將繼續夥拍更多醫院、聯營診所及醫生擴大 DrGo 的醫生網絡，並擴展服務範圍至照顧長期疾病病患者、安老院舍院友、以及公共醫療保健系統的使用者。

## 大灣區 5G 機遇

香港電訊一直探索在大灣區採用及使用 5G 技術的機會。隨著近年居住在大灣區的香港長者數目不斷增加，他們大多需要回港睇醫生及進行定期健康檢查。許女士相信 5G 互聯醫療保健協作平台能滿足跨境醫療保健服務的迫切需求。香港的醫生除了透過 4K 超高清視像通話進行遙距醫療諮詢及診斷外，亦可遙距實時查看及評估高清晰 X 光檢查及超聲波影像。憑藉香港電訊的跨境基礎設施及 ICT 平台，祈望大灣區開放 5G 市場，讓香港電訊在大灣區開拓新機遇及擴展業務範疇。

## 5G 的未來發展

香港電訊的 5G 網絡是以非獨立模式 (non-standalone mode)，在其 4G 網絡上建設 5G 來提供更強的流動寬頻。該公司正在建立下一代 5G 核心網絡 (5G core) 來啟動 5G 獨立模式 (standalone mode)，以實現網絡編排及網絡切片等 5G 進階能力。

香港電訊致力提供最全面的 5G 網絡覆蓋至全港各區，並已逐步改善主要室內地點的網絡覆蓋，例如交通樞紐及購物商場。許女士相信 5G 應用及智能電話的生態圈將會持續增長，假如經濟保持穩健，採用 5G 技術的步伐將會加快。

許女士表示由於 5G 頻譜的成本相對較 4G 頻譜的成本低，另香港電訊於早期已作出投資，現時已擁有強大而廣泛的光纖網絡基建，因此建設 5G 網絡的投資有限，相信 5G 收支平衡會較 4G 快。

總括而言，5G 有著無限潛力。許女士承諾香港電訊將努力不懈，開拓適合各種行業應用的 5G 智能科技方案，包括醫療、交通、物流、建築及零售，並為消費者提供更多 5G 服務。由此可見，5G 的未來是一片光明。 ●