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關於香港應用科技研究院

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1 ABOUT ASTRI

Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI) was founded by the Government of the Hong Kong Special Administrative Region in 2000 with the mission of enhancing Hong Kong's competitiveness in technology-based industries through applied research.

ASTRI's core R&D competence in various areas has been organised under seven Technology Divisions: Communications Technologies, Electronics Components, Mixed Signal Systems IC, Advanced Digital Systems, Opto-electronics, Security and Data Sciences, and Intelligent Software and Systems.

In 2006, ASTRI was designated as the Research and Development Centre for Information and Communications Technologies by the Innovation and Technology Commission. In 2012, ASTRI was given approval from the State Ministry of Science and Technology (MOST) under the Chinese State Council to establish the first Hong Kong Branch of the Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System in collaboration with Southeast University (SEU) in Nanjing.

Our R&D strategic focus covers five areas of applications: Financial Technologies, Smart City, Intelligent Manufacturing, Next Generation Network and Health Technologies. These, together with the Hong Kong branch of the CNERC, form our '5+1' R&D strategy.

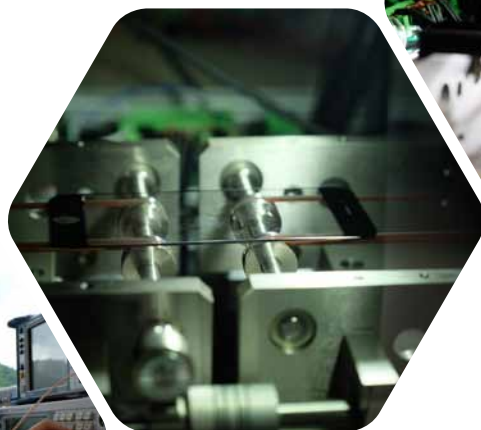
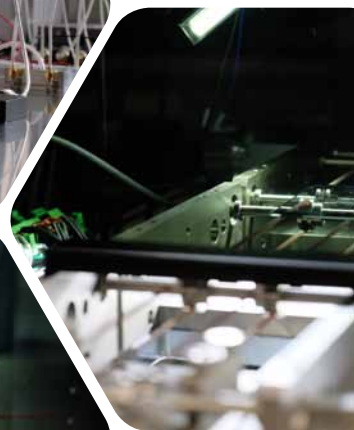
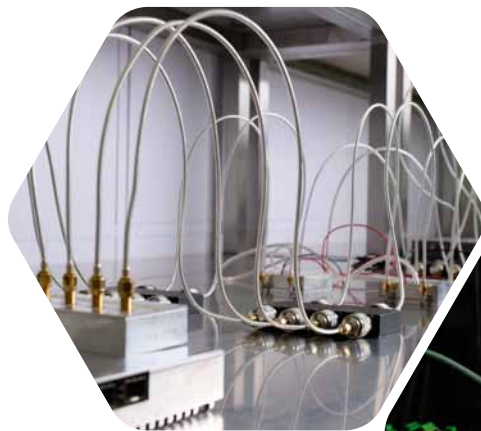
關於應科院

香港應用科技研究院有限公司（應科院）由香港特別行政區政府於2000年成立，其使命是要透過應用科技研究，協助發展以科技為基礎的產業，藉此提升香港的競爭力。

應科院的主要科技研發領域由通訊技術、電子元件、混和信號系統晶片、先進數碼系統、光電子、信息安全與數據科學及智能軟件與系統七個技術部門構成。

2006年，應科院獲創新科技署指定為「資訊及通訊技術研發中心」。2012年，應科院獲國家科學技術部批准，與南京的東南大學合作，成立本港第一所「國家專用集成電路系統工程技術研究中心香港分中心」。

應科院的研發策略主要應用在五項重點範疇：金融科技、智慧城市、智能製造、新一代通訊網絡及健康技術。同時，我們也致力拓展應科院內之國家專用集成電路系統工程技術研究中心香港分中心的工作。以上的架構和研發方向，譜成應科院的「5 + 1」發展策略。



2

VISION, MISSION, GOALS
AND VALUES願景、使命、目標、
核心價值

Our Vision

To be a world-class technology developer and enabler to enrich lives.

Our Mission

To enhance Hong Kong's competitiveness through applied research.

Our Goals

- Perform innovative R&D for greater technological applications in industries
- Nurture technology entrepreneurs and talents
- Promote collaborations among universities, R&D institutions and industries to achieve win-win results

我們的願景

引領世界創新，締造豐盛人生。

我們的使命

科技產業化，產業智能化。開創香港競爭新世代。

我們的目標

- 領航科技創新，擴大產業應用
- 培育專才，推動創業
- 促進產學研互動協作，創造共贏



CHAIRMAN'S FOREWORD

主席序言



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It is my absolute privilege to present the Annual Report of ASTRI for the fourth time since being appointed as Chairman of its Board of Directors in 2013. These past three and a half years have been a very special segment of my professional life. I have had the opportunity to witness ASTRI's growth and development from a close vantage point. Seventeen years ago, when ASTRI was established by the Hong Kong SAR Government, it had a simple yet powerful mission – to enhance the competitiveness of Hong Kong and its enterprises through innovative technologies and applications. History will be the best judge of what we have accomplished and how well we have achieved our goals. If we just look at the numbers, we can't help but feel proud of the 1,000+ patents filed (of which 700+ have been granted), the 350+ completed R&D projects and the 600+ technologies transferred to industries since ASTRI's inception.

本人十分榮幸能夠再度向大家分享應科院年報。這是本人於2013年獲委任為應科院董事局主席之後提交的第四份年報。這三年半的時間，實在是我事業生涯的一個很特別的部分。在這期間，我有幸能夠以局內人的身份，見證本院的成長與發展。十七年前，當香港特區政府成立應科院時，本院被賦予一項樸實卻目標宏遠的任務，就是透過科技研發，創新及應用，促進本港以及本港企業的競爭力。歷史將會就我們的成績以及我們為實現目標而作出的努力，給予最公正的評價。只要大家看看有關應科院的一些具體數字，便不能不為我們的成績感到自豪——應科院自成立至今共申請了超過千項專利（包括七百多項已獲授專利），完成了超過350個科研項目，並將600多項技術轉移予業界。

.....

In the last four financial years, ASTRI added 348 new patents to its portfolio. The number of R&D professionals in our team grew by around 9%, strengthening our technical expertise and abilities. Since I joined the Board, I have observed strong and capable management from the Institute's CEOs, senior executives and technology leaders. Our colleagues have also demonstrated their dauntless commitment to innovation and excellence in delivering advanced and practical technological solutions. By investing in people and infrastructure, ASTRI continues to strengthen and steer technological R&D for Hong Kong, the Mainland and the neighbouring region. On behalf of the Board of Directors, I must acknowledge the great work done by everyone in the organisation.

ASTRI innovates platforms and solutions to help transform Hong Kong into a centre of technological excellence. In the last few years, we have focused on R&D efforts in five core areas: Financial Technologies, Next Generation Network, Intelligent Manufacturing, Smart City and Health Technologies. In addition, we are authorised by the State Ministry of Science and Technology (MOST) to host the first Hong Kong Branch of the Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System. The CNERC branch, along with the five core technology areas, forms the foundation of our R&D strategy.

Our R&D in communication technologies, including advanced 4G and 5G networks and the Internet of Things, lay the groundwork for the future development of the telecommunication sector, not just in Hong Kong but throughout the region. We remain committed to pursuing innovative R&D for smart city development, in full alignment with the Government's vision to transform Hong Kong into a smart and sustainable city. ASTRI's smart city development endeavours include Connected Cars and Smart Mobility, Device-to-Device (D2D) communications, Data Analytics and Network Security.

The 'digital imperative' has penetrated national, regional and international markets, affecting all spheres of people's lives. We continue to interact, exchange and engage with the community as well as the business sectors. Our industry collaboration projects have led to many successful solutions and commercialisations that don't just help the businesses but also benefit the consumers. From Blockchain research to Cybersecurity R&D, Artificial Intelligence to Industrial Robots, 3D and UHD video conversion to sophisticated power electronics – we have made our mark across many industries and contributed to smart city technologies and intelligent manufacturing solutions. I also take heart from our socially conscious role in developing health technology solutions benefitting various segments of the society. Many of our innovations – such as the Telehealth Technology Platform, Location Tracking for vulnerable citizens, Intelligent Preventive Healthcare System, and non-invasive health screening devices –

特別在剛過去的四個財政年度裏，應科院獲授348項新的專利。我們的科研專業人員數目也增加了約百分之九，因此大幅加強我們的科技專長和能力。自加入應科院董事局以來，我一直見證著應科院歷任行政總裁、高級行政人員及科研部門主管的魄力和領導才能。我更高興看到本院的同事在科研方面秉持著堅毅不屈和勇於創新的精神，因此成功研發許多實際可行的應用方案，成績驕人。應科院向來重視在人才和基建方面的投資，而應科院的團隊亦如箭在弦、全力以赴支援香港、內地和鄰近地區的科研工作。我謹代表董事局對本院一眾全人致意，感謝大家的不懈努力和傑出工作表現。

應科院致力研發創新科技和解決方案，藉以令香港成為卓越的科技中心。過去數年間，我們以金融科技、新一代通訊網絡、智能製造、智慧城市以及健康技術這五個核心範疇為科研工作重點。此外，本院獲得國家科學技術部授權設立首個「國家專用集成電路系統工程技術研究中心香港分中心」。該中心連同以上五個核心研發方向，已成為應科院科研的基礎。

我們在通訊技術（包括先進的4G、5G網絡及物聯網）方面進行的科研工作，為香港以至區內電訊業的未來發展奠定基礎。一如既往，我們致力開展創新科研項目以推動智慧城市的發展，並全力配合特區政府的長遠願景—把香港打造為可持續發展之智慧城市。應科院研發與智慧城市相關的項目包括：車聯網通訊技術與智能交通、終端直通（D2D）通訊技術、數據分析及網絡安全等範疇。

「數碼化」在國家、地區和國際市場上已勢在必行，同時更影響到公眾生活的各方面。在這方面，我們一直與社會各方及業界人士廣泛互動交流。我們與業界合作的項目成績斐然，已成功研發出不少卓越的解決方案，並將之商業化。這些科研成果不單單惠及業界，更為消費者帶來莫大裨益。我們的科研項目涵蓋區塊鏈研究、網絡安全研究、人工智能、工業機械人、3D及超高解像度視頻轉換，以至複雜的功率電子研究等。應科院通過以上種種科研成果，在配合智慧城市和智能製造發展等方面，作出了獨特的貢獻。此外，應科院亦履行企業社會責任，投入資源，



have been adopted by hospitals, care centres and other healthcare service providers.

ASTRI remains conscious of another important element in the technology ecosystem – its people. Over the years, we have helped foster tens of thousands of technology talents, many within the organisation as its R&D team members, others through student exchanges, training schemes, workshops and other programmes. Promoting Science, Technology, Engineering and Mathematics (STEM) among the next generation has been one of our top priorities.

I feel delighted to have seen so many talented engineers, scientists and researchers join us at ASTRI, each one of whom has made a difference to the Institute's endeavours. While our workforce is primarily from Hong Kong's local talent pool, we are also blessed to have a large number of bright minds from other parts of Greater China, as well as quite a few from other parts of the world. Through their hard work and dedication, these talented individuals have helped advance innovation and technology for Hong Kong and beyond. Many of our former colleagues have gone on to become technology leaders in prominent local, regional and international enterprises. The bravest enterprising souls have even chased their dreams and started their own ventures. Much like the ancient Chinese Shaolin Monastery which was a legendary cradle of learning of martial arts, ASTRI seeks to nurture talents who aspire to master their skills and sharpen their knowledge in applied science and technology. It should not be an overstatement when I say that ASTRI has nurtured a generation of technology talents who have gone on to make greater contributions to society, and we continue to do so.

ASTRI, as the largest scientific R&D facility in Hong Kong, has a crucial role to play in promoting technology and innovation not just for the city, but also for our country. Hong Kong is currently standing at a historic crossroad. Faced with national programmes like the South China Greater Bay Area or international mega-plans like 'One Belt One Road' (OBOR), we must capitalise on what we do best – financial services, creative design, technology research, flow of information, legal and IP framework and so on. International rankings consistently place Hong Kong at the forefront of innovation; Hong Kong ranks 14th in the 2016 Global Innovation Index published by INSEAD. OBOR provides a visionary blueprint for global economic development where Hong Kong can spearhead innovation and act as a hub of technological excellence. By tapping into all of these opportunities, Hong Kong can achieve stronger prosperity for itself, strengthen

發展健康技術方面的解決方案。我們所研發的許多創新技術 - 例如遠距健康照護平台、長者追蹤和監測、智能預防醫療系統和非侵入性健康檢查設備等等，均受到醫院、護理中心和其他醫療服務供應商採用，也惠及弱勢社群，成績令人鼓舞。

應科院也一直關注著科技生態系統內的另一重要元素——人才的培育。本院至今已協助培育了數以萬計有志於科研的新一代，當中很多是本院的研究團隊成員，另外也有很多是藉著參加學生交流、訓練、工作坊以及其他培訓計劃，從而學習與科技及科研相關的知識。推動下一代學習科學、科技、工程和數學（STEM）方面的知識，一直是應科院極為重視、且是重中之重的任務。

能夠看到這麼多優秀的工程師、科學家、研究人員加入應科院隊伍，壯大本院的研究實力，實在令我感到欣慰和鼓舞。應科院的團隊除有土生土長的本地人才外，我們亦欣見有很多來自大中華地區以及少數來自世界其他地方的專才。這些研究人員孜孜不倦的投入工作，努力推動香港以至鄰近地方的創新和科技發展。不少曾受聘於應科院的同事現已於本港、區內甚至國際上一些著名的企業擔任要職。另一些具創業精神的同事更開創了個人事業，全力追求夢想。我們常把應科院比喻為鍛鍊武功的少林寺，很多年輕的人才就在這培訓場鑽研與應用科學相關的技術和知識，並發揮所長，貢獻社會。應科院不單通過其技術影響人們的生活，更加因為培養傑出的科技人員，通過他們為社會所作出的更大貢獻，使人們的生活變得更美好。

應科院作為香港規模最大的科研機構，實在肩負重任，在推動本港以至國家的科技開發和創新工作上，擔當重要角色。香港正在面對歷史的一大轉捩點。隨著國家正在規劃「粵港澳大灣區」發展以至「一帶一路」國際大型經濟商貿藍圖，我們必須清楚掌握香港在這些重大機遇中的定位和角色，從而盡展所長。香港擁有很多優勢，其中包括在金融服務、創意設計、技術研究、資訊流通、法律與知識產權架構等方面。香港在創新成就上經常獲得很高的國際評級。在歐洲工商管理學院（INSEAD）公佈的2016年全球創新指數中，香港排名第14位。「一帶一路」倡議為世界經濟發展提供一個遠景藍圖，而香港可以憑藉在創新方面的實力，在當中發揮技術提升的樞紐作用。香港利用



China's leadership in the OBOR programme and improve the lives and livelihoods of people across the region. Closer to home, we can fuel the economic and industrial growth of Greater China, particularly the Greater Bay Area, with technological solutions as well as financial and professional services. If we can bolster our existing strengths with innovative technologies, Hong Kong can boldly write the next great chapter of its growth and prosperity.

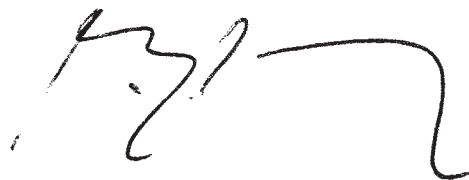
ASTRI has a team of diverse professionals who can help Hong Kong realise its aspirations. We will continue to invest in our people and infrastructure, gearing up for cutting-edge research in full alignment with local, national and regional priorities. In an era where technology shapes every aspect of people's lives, how economies craft their development strategies in the digital age needs to evolve. From tracking the most recent mega-trends to exploring emerging technologies for breakthrough innovation, ASTRI faithfully serves Hong Kong by tapping into today's opportunities while positioning ourselves for tomorrow's possibilities.

I must thank the Government's Innovation and Technology Bureau and the Innovation and Technology Commission for their continued patronage and guidance. My sincere thanks go to the members of ASTRI's Board of Directors for their collective leadership, wisdom and guidance. I also thank the senior executives, technology leaders and all staff members for their hard work, dedication and commitment. Beyond that, the support and encouragement of all our partners and well-wishers in Hong Kong, Greater China and beyond have kept us motivated to do great things throughout 2016-17. With your support and patronage, ASTRI will continue to develop, support and steer Hong Kong's journey of technological excellence.

「一帶一路」帶來的商機，不單能夠促進本身的經濟發展、加強中國在「一帶一路」倡議中的主導地位，更加有助改善「一帶一路」沿線國家人民的生活水平。我們將可以運用所研發的技術解決方案以及各種金融和專業服務，為大中華地區（尤其是粵港澳大灣區）的經濟和行業增長注入動力。如果我們能夠以創新的技術，鞏固現有實力，香港必能譜寫另一繁華傳奇。

應科院具備多方面專長、表現優秀的專業人員團隊，能夠協助香港實現以上抱負。我們將繼續投資於人才培育和基建方面，為從事新銳研究做好準備，全面配合本港、國家和區內的社會經濟發展策略。現今科技從每一角度塑造人們生活，而不同的經濟體系也在尋索如何在數碼時代制定適切自己的發展策略。從追蹤最近期的經濟大趨勢，以至探索新興技術，爭取突破性創新，應科院都在努力把握現有的各種機會，並準確地為自己定位，以求掌握明天的種種機遇，從而忠誠地為香港服務。

我謹在此向香港特區政府創新及科技局與創新科技署衷心致謝，感謝其一直以來的支持和引導；同時也感謝應科院董事局各位全人為本院提供真知灼見，引領本院持續發展。我亦衷心感謝本院各位高級行政人員、技術主管以及全體職員同事努力不懈、全情投入、獻身科研事業。同時多得本院在香港、大中華地區以至世界各地的合作夥伴以至各界人士給予我們的寶貴支持和真情鼓勵，讓我們能夠奮發精神，在2016至2017年度裏爭取到不俗的成績。憑著應科院各方持份者繼續大力襄助，我們將繼續肩負我們的使命，為香港的科技發展發揮支持、領航的作用。



Wong Ming-yam 王明鑫

Chairman of the Board 董事局主席



CORPORATE
GOVERNANCE

企業管治



Board of Directors

ASTRI is governed by a Board of Directors which has representation from the academic, industrial and commercial sectors and the HKSAR Government. Directors are appointed by the Government and have collective responsibility for ASTRI's leadership, policy and strategic directions.

To achieve good governance, the Board, with the support from ASTRI's management team, steers the Institute through changing terms and conditions of the business environment in which ASTRI operates. While ensuring exemplary corporate behaviours, the Board maintains a particular focus on the needs of the industrial sectors.

The Board and the management adhere to the four key management objectives of ASTRI: transparency, speed, user-friendliness and governance.

董事局

董事局是應科院的管治組織，成員包括來自學術界、工商界及香港特區政府的代表。董事是由特區政府委任，負責制訂應科院的發展政策和路向。

為實施良好的管治，應科院董事局在得到管理層的全力支持下，帶領應科院在不斷轉變的營商環境和條件下向前邁進。董事局在保持良好企業水準之餘，尤其關注工業界的發展需求。

董事局和管理層堅持四個主要管理原則：高透明度、高效率、切合需要和妥善管治。

1. Mr Sunny Lee Wai-kwong, JP 李惠光先生，太平紳士
2. Dr Davy Lo Kwok-wai 羅國威博士
3. Mr Wong Ming-yam, BBS, JP 王明鏗先生，銅紫荊星章，太平紳士
4. Dr Frank Tong Fuk-kay 湯復基博士
5. Mr Humphrey Choi Chor-ching, JP 蔡楚清先生，太平紳士
6. Professor Roland Chin Tai-hong, BBS, JP 錢大康教授，銅紫荊星章，太平紳士
7. Mr Tony Choi Siu-chow, JP 蔡少洲先生，太平紳士
8. Ir Dr Alan Lam Hiu-fung 林曉鋒博士，工程師
9. Ms Hera Siu Kit-wan 蕭潔雲女士
10. Mr Ha Yung-kuen, BBS 夏勇權先生，銅紫荊星章
11. Ms Cally Chan Shan-shan 陳珊珊女士
12. Mr Denis Tse Tik-yang 謝迪洋先生
13. Professor Ching Pak-chung, SBS 程伯中教授，銀紫荊星章
14. Mr Cheuk Wing-hing, JP 卓永興先生，太平紳士
15. Mr Andy Liu An-ting 劉安庭先生
16. Ms Annie Choi Suk-han, JP 蔡淑嫻女士，太平紳士
17. Mr Pindar Wong 黃平達先生
18. Ms Cammy Yung Wai-ki 容慧琪女士
19. Mr Chuck Cheng Cheuk-wing 鄭灼榮先生
20. Mr Kwong Chi-keung, JP 鄺志強先生，太平紳士
21. Dr Meikei leong 楊美基博士
22. Mr Duncan Chiu 邱達根先生



Board Composition

As of 31 March 2017, the Board comprises the Chairman, two official members and 17 members.

董事局的組成

截至2017年3月31日，董事局成員包括主席、兩位官守董事及17位董事。

Name, Company and Title	董事姓名、公司及職位
Chairman	主席
Mr Wong Ming-yam, BBS, JP Director, eSPOT Lighting Limited	王明鑫先生，銅紫荊星章，太平紳士 螢輝科技有限公司董事
Official Members	官守董事
Mr Cheuk Wing-hing, JP Permanent Secretary for Innovation and Technology, Innovation and Technology Bureau	卓永興先生，太平紳士 創新及科技局常任秘書長
Ms Annie Choi Suk-han, JP Commissioner for Innovation and Technology, Innovation and Technology Commission	蔡淑嫻女士，太平紳士 創新科技署署長
Members (in alphabetical order according to surname)	董事 (以英文姓氏順序排列)
Ms Cally Chan Shan-shan General Manager, Microsoft Hong Kong Limited*	陳珊珊女士 Microsoft 香港有限公司總經理*
Mr Chuck Cheng Cheuk-wing CEO and President, AppoTech Limited	鄭灼榮先生 卓榮集成電路科技有限公司總裁
Professor Roland Chin Tai-hong, BBS, JP President and Vice-Chancellor, Hong Kong Baptist University	錢大康教授，銅紫荊星章，太平紳士 香港浸會大學校長
Professor Ching Pak-chung, SBS [#] Choh-ming Li Professor of Electronic Engineering, Director of Shun Hing Institute of Advanced Engineering, The Chinese University of Hong Kong	程伯中教授，銀紫荊星章 [#] 香港中文大學卓敏電子工程學系講座教授， 香港中文大學信興高等工程研究所所長
Mr Duncan Chiu Chairman, Lai Yuen Company Limited	邱達根先生 荔園有限公司主席
Mr Humphrey Choi Chor-ching, JP Partner, PricewaterhouseCoopers	蔡楚清先生，太平紳士 羅兵咸永道會計師事務所合夥人
Mr Tony Choi Siu-chow, JP [^] Executive Director, Hong Kong Garment Manufacturing Co Ltd	蔡少洲先生，太平紳士 [^] 百達製衣有限公司執行董事
Mr Ha Yung-kuen, BBS	夏勇權先生，銅紫荊星章
Mr Kwong Chi-keung, JP Senior Partner, Sit, Fung, Kwong and Shum Solicitors and Notaries	鄺志強先生，太平紳士 薛馮鄺岑律師行高級合夥人
Ir Dr Alan Lam Hiu-fung Chief Executive Officer, Sengital Limited	林曉鋒博士，工程師 港科研有限公司行政總裁
Mr Sunny Lee Wai-kwong, JP Vice-President (Administration), City University of Hong Kong	李惠光先生，太平紳士 香港城市大學副校長（行政）
Dr Tiger Lin Zhen-hui [~] Executive Director and Chief Executive Officer, CITIC Telecom International Holdings Limited	林振輝博士 [~] 中信國際電訊集團有限公司執行董事及行政總裁

Mr Andy Liu An-ting
CEO, Illumi Health Limited
Vice Chairman, HKBIO

Dr Davy Lo Kwok-wai
Consultant

Ms Hera Siu Kit-wan
Chief Executive Officer, Greater China, Vice President,
Cisco Technologies (Beijing) Co Ltd⁺

Mr Denis Tse Tik-yang
Managing Principal, Asia-IO Advisors Limited

Mr Pindar Wong
Chairman, VeriFi (Hong Kong) Limited

劉安庭先生
Illumi Health Limited 行政總裁
香港生物科技協會副主席

羅國威博士
顧問

蕭潔雲女士
思科科技（北京）有限公司
大中華區首席執行官
全球副總裁⁺

謝迪洋先生
Asia-IO Advisors Limited 管理合夥人

黃平達先生
VeriFi (Hong Kong) Limited 主席

*Company and title were changed from 2 August 2017

#Awarded an SBS on 30 June 2017

^Appointed as JP on 30 June 2017

~Resigned on 9 May 2017

+Title was changed from 31 July 2017

*公司與職位於2017年8月2日起更新

#於2017年6月30日獲頒銀紫荊星章

^於2017年6月30日獲委任為太平紳士

~於2017年5月9日辭任

+職位於2017年7月31日起更新

Functional Committees

Three functional committees, namely Finance and Administration Committee (FAC), Technology Committee (TC) and Audit Committee (AC), were formed to assist the Board in managing ASTRI. FAC oversees ASTRI's financial and administrative matters, TC oversees research initiatives and AC ensures that internal and external audit processes are properly carried out.

The membership of the committees as of 31 March 2017 is as follows:

功能委員會

董事局成立了三個功能委員會，即財務與行政委員會、科技委員會及審計委員會，以協助董事局管治應科院。財務與行政委員會監察應科院財務及行政事宜；科技委員會監察應科院的研究項目；審計委員會則確保內部及外部審計程序妥善執行。

以下是截至2017年3月31日各委員會成員名單：

Finance and Administration Committee 財務與行政委員會

Board Member	董事姓名
Mr Humphrey Choi Chor-ching, JP (Chairman)	蔡楚清先生，太平紳士 (主席)
Ms Cally Chan Shan-shan	陳珊珊女士
Mr Duncan Chiu	邱達根先生
Ms Annie Choi Suk-han, JP	蔡淑嫻女士，太平紳士
Mr Ha Yung-kuen, BBS	夏勇權先生，銅紫荊星章
Mr Andy Liu An-ting	劉安庭先生
Dr Davy Lo Kwok-wai	羅國威博士
Ms Hera Siu Kit-wan	蕭潔雲女士
Mr Denis Tse Tik-yang	謝迪洋先生
Mr Pindar Wong*	黃平達先生*

*Withdrew on 10 May 2017

*於2017年5月10日退出

Technology Committee 科技委員會

Board Member	董事姓名
Mr Sunny Lee Wai-kwong, JP (Chairman)	李惠光先生，太平紳士（主席）
Ms Cally Chan Shan-shan	陳珊珊女士
Mr Chuck Cheng Cheuk-wing	鄭灼榮先生
Professor Roland Chin Tai-hong, BBS, JP	錢大康教授，銅紫荊星章，太平紳士
Professor Ching Pak-chung, SBS	程伯中教授，銀紫荊星章
Mr Duncan Chiu	邱達根先生
Mr Tony Choi Siu-chow, JP	蔡少洲先生，太平紳士
Ms Annie Choi Suk-han, JP	蔡淑嫻女士，太平紳士
Mr Ha Yung-kuen, BBS	夏勇權先生，銅紫荊星章
Ir Dr Alan Lam Hiu-fung	林曉鋒博士，工程師
Dr Tiger Lin Zhen-hui [#]	林振輝博士 [#]
Dr Davy Lo Kwok-wai	羅國威博士
Mr Wong Ming-yam, BBS, JP	王明鑫先生，銅紫荊星章，太平紳士
Mr Pindar Wong [*]	黃平達先生 [*]
[#] Resigned on 9 May 2017	[#] 於2017年5月9日辭任
[*] Withdrew on 10 May 2017	[*] 於2017年5月10日退出

Audit Committee 審計委員會

Board Member	董事姓名
Dr Davy Lo Kwok-wai (Chairman)	羅國威博士（主席）
Professor Ching Pak-chung, SBS	程伯中教授，銀紫荊星章
Ms Annie Choi Suk-han, JP	蔡淑嫻女士，太平紳士
Mr Kwong Chi-keung, JP	鄺志強先生，太平紳士
Ir Dr Alan Lam Hiu-fung	林曉鋒博士，工程師
Mr Pindar Wong [*]	黃平達先生 [*]
[*] Joined on 10 May 2017	[*] 於2017年5月10日加入

Changes in Directors

董事局成員變動

New Director 新委任董事	Date of Appointment 委任日期
Mr Duncan Chiu 邱達根先生	21 October 2016 二零一六年十月二十一日
Ms Hera Siu Kit-wan 蕭潔雲女士	21 October 2016 二零一六年十月二十一日
Mr Pindar Wong 黃平達先生	21 October 2016 二零一六年十月二十一日

Retired Director 退任董事	Date of Retirement 退任日期
Professor Andrew Chan Chi-fai, SBS, JP 陳志輝教授，銀紫荊星章，太平紳士	21 October 2016 二零一六年十月二十一日
Professor Philip Chan Ching-ho, BBS 陳正豪教授，銅紫荊星章	21 October 2016 二零一六年十月二十一日
Ms Agnes Nardi Kar-wai 李家慧女士	21 October 2016 二零一六年十月二十一日

Meeting Attendance

The attendance records of the ASTRI Board and the functional committee meetings held between 1 April 2016 and 31 March 2017 are as follows:

會議出席率

以下是應科院董事局會議及各功能委員會於2016年4月1日至2017年3月31日期間的會議出席記錄：

Board Meetings 董事局會議					
	2016-04-06	2016-07-05	2016-09-28	2016-12-15	2017-03-29
Number of directors during the period 期內董事局成員人數	20	20	20	20	20
Number of directors present at meeting 董事出席人數	17	16	18	16	17
Number of apologies 缺席人數	3	4	2	4	3
Group attendance in percentage 出席率	85%	80%	90%	80%	85%

Finance and Administration Committee Meetings 財務與行政委員會會議					
	2016-06-01	2016-08-24	2016-11-24	2017-02-09	2017-03-03
Number of directors during the period 期內董事局成員人數	8	8	10	10	10
Number of directors present at meeting 董事出席人數	6	7	7	9	7
Number of apologies 缺席人數	2	1	3	1	3
Group attendance in percentage 出席率	75%	88%	70%	90%	70%

Technology Committee Meetings 科技委員會會議

	2016-06-22	2016-09-20	2016-11-30	2017-03-15
Number of directors during the period 期內董事局成員人數	14	14	14	14
Number of directors present at meeting 董事出席人數	12	11	11	10
Number of apologies 缺席人數	2	3	3	4
Group attendance in percentage 出席率	86%	79%	79%	71%

Audit Committee Meetings 審計委員會會議

	2016-06-13	2016-09-13	2016-11-22	2017-03-14
Number of directors during the period 期內董事局成員人數	5	5	5	5
Number of directors present at meeting 董事出席人數	5	5	4	5
Number of apologies 缺席人數	0	0	1	0
Group attendance in percentage 出席率	100%	100%	80%	100%

Corporate Governance Manual

ASTRI ensures good corporate governance by adhering to a Corporate Governance Manual that has been adopted by the organisation with clear articulation of its policies and principles. The Manual supports the Board and management's efforts to operate and oversee ASTRI's business in a transparent and accountable manner.

Taking into account changes and developments required to improve ASTRI's operations, sections of the Manual are being updated, modified and strengthened. Changes in the Manual reflect the changing terms and conditions of the business environment ASTRI operates in.

企業管治手冊

應科院制定企業管治手冊，清楚列明達致優良管治的政策和原則，並恪守遵行以確保良好的企業管治水準。手冊旨在協助董事局和管理層以透明、負責之準則經營及監督應科院的業務。

應科院因應改善運作而作出相應轉變和發展，故此現正更新、修改及加強企業管治手冊中多個環節。手冊的內容變更反映應科院對所處之營運環境的轉變做出了靈活的應對及考量。



Internal Audit

To exercise effective corporate governance, an Internal Audit Department (IAD) was set up under the Audit Committee (AC) in 2003 to provide the Board with information and assurance on internal controls. Since July 2013, an Internal Audit Charter has been introduced into the Corporate Governance Manual. This Charter sets out more clearly the responsibilities, independence, authority, planning and reporting processes of the IAD.

Throughout the year, various internal audit reviews have been carried out in accordance with the Internal Audit Annual Plan approved by the AC. Despite some enhancement recommendations, the reviews found that significant controls were in place and all significant regulations and procedures were observed in all material aspects. The reports and recommendations of these reviews were submitted to the AC for consideration.

Compliance

In April 2007, the Board appointed the Head of Internal Audit as Compliance Officer to assist its governance by reporting significant non-compliance issues identified by a team of Departmental Compliance Officers. The Compliance Officer submits quarterly reports to the Audit Committee on significant compliance issues.

內部審計

為有效進行良好的企業管治，應科院於2003年成立內部審計部。內部審計部向審計委員會匯報，並向董事局提供有關內部監控的資訊及保證。應科院於2013年7月制定內部審計章程，並於同期納入企業管治手冊內，明確列出內部審計部的職責、獨立性、職權範圍、計劃及匯報流程等事項。

內部審計部按照審計委員會批准的內部審計年度計劃，於過去一年內進行了各項內部審計審查。雖然內部審計部提出了一些改善建議，相關的審查報告顯示應科院已實施重要的監控措施，並已遵守各重大規例及程序。這些審查報告及相關建議已提交審計委員會審閱。

合規

2007年4月，董事局委任內部審計部門主管擔任合規主任，協助董事局進行企業管治，就各部門之合規主任所提請的重大不合規事項作匯報。自此以後，合規主任須就重要的合規議題，向審計委員會提交季度報告。



Safeguards Against Conflicts of Interest

As a public organisation, it is important for ASTRI to have effective safeguards against conflicts of interest. ASTRI completed the review of the Code of Conduct for Employees and promulgated the updated Code of Conduct in November 2016. Suitable updates on Acceptance of Advantages, Acceptance of Sponsorship, Acceptance of Entertainment, Misconduct in Public Office, Indebtedness, Supervisory Accountability and Reporting Suspected Irregularities and Criminal Offences were incorporated in the updated Code of Conduct document.

Workplace Policy

ASTRI is committed to ensuring a workplace with zero tolerance for discrimination and harassment. To promote equal opportunities in the workplace, ASTRI regularly organises seminars on anti-discrimination regulations.

Risk Management

Under the direction and guidance of the Board via the Audit Committee, the management and the IAD conducted a company-wide Risk Profiling and Assessment exercise in 2010. Several risky areas were identified, and management took prompt action to ensure that preventive controls were in place. A Risk Register was formulated, and it is updated when necessary to enhance the effective governance of ASTRI. In addition, during the year a process was started to review and enhance the existing risk management framework.

ISO-based Quality Management System and Information Security Management System

In June 2016, ASTRI successfully passed the ISO 9001:2008 certification renewal audit, which confirmed that ASTRI's business operations fully complied with international quality management system standards.

In October 2016, ASTRI's FinTech business operations went through a surveillance audit on the ISO 27001:2013 certification. The audit confirmed that the Institute's FinTech business operations fully complied with the international information security management system standards.

防範利益衝突

作為一所公營機構，應科院需要一套有效的機制來防範利益衝突。應科院已完成了員工行為守則檢討，並於2016年11月發佈了更新版本的行為守則。新版行為守則在接受利益、接受贊助、接受款待、公職人員不當行為、債務、監察問責制及舉報涉嫌違規行為及刑事犯罪等章節內容作出適當更新。

工作環境守則

應科院致力提供一個沒有歧視和騷擾的良好工作環境。為了提倡工作環境中的平等機會，應科院定期舉行有關反歧視條例的研討會。

風險管理

管理層和內部審計部門在董事局轄下之審計委員會指導下，於2010年進行了一項全公司的風險分析與評估的工作，並確定了幾個高風險範疇，管理層也採取了迅速行動，以訂定相關的防範監控措施，以應付此類風險。「風險登記冊」已經制定，並會按需要作出更新，以進一步加強應科院的有效管治。此外，年內已開始了一項針對現有風險管理框架的程序檢討及改善程序。

以ISO為基礎的品質管理系統及資訊保安管理系統

應科院於2016年6月成功通過 ISO 9001:2008 認證更新審計，該審計確認了應科院的業務運作完全符合國際質量管理體系標準。

2016年10月，應科院金融科技業務營運項目就ISO27001：2013認證進行監督審計。經審計，確認應科院的金融科技業務營運項目完全符合國際資訊保安管理系統標準。



From left: Dr Chen-jung Tsai, Mr Yiu-kei Li, Dr Daniel Shi Xun-qing, Dr Meikei leong, Dr Franklin Tong Fuk-kay, Ms Cammy Yung Wai-ki, Mr Bill Zhang Wei-min, Dr Justin Chuang Che-i, Dr James Lei Zhi-bin
由左起：蔡振榮博士、李耀基先生、史訓清博士、楊美基博士、湯復基博士、容慧琪女士、張為民先生、莊哲義博士、雷志斌博士

Senior Management

As at 31 March 2017, the composition of ASTRI's senior management is as follows:

Headquarter Executives

Dr Franklin Tong Fuk-kay
Chief Executive Officer
(Departed on expiry of contract from 1 July 2017)

Dr Meikei leong
Chief Technology Officer

Ms Cammy Yung Wai-ki
Chief Financial Officer

Ms Elaine Wong Yan-lan
Chief Administrative Officer (Departed from 24 May 2017)

高級行政人員

截至2017年3月31日，高級行政人員包括：

總部行政人員

湯復基博士 行政總裁
(於2017年7月1日任期屆滿離任)

楊美基博士 首席科技總監

容慧琪女士 首席財務總監

黃紉蘭女士 首席行政總監
(於2017年5月24日離任)

Technology Division Heads

Dr Justin Chuang Che-i
Vice President, Next Generation Network

Dr Duncan Wong Shek-chong
Vice President, Financial Technologies
(Departed from 13 June 2017)

Mr Yiu-kei Li
Senior Director, Advanced Digital Systems

Dr Daniel Shi Xun-qing
Senior Director, Electronics Components

Mr Bill Zhang Wei-min
Senior Director, Mixed Signal Systems IC

Dr Chen-jung Tsai
Acting Director, Opto-electronics

Dr James Lei Zhi-bin
Acting Director, Intelligent Software and Systems

技術部主管

莊哲義博士 副總裁（新一代通訊網絡）

王世松博士 副總裁（金融科技）
（於2017年6月13日離任）

李耀基先生 高級總監（先進數碼系統）

史訓清博士 高級總監（電子元件）

張為民先生 高級總監（混和信號系統晶片）

蔡振榮博士 署理總監（光電子）

雷志斌博士 署理總監（智能軟件與系統）

Annual Remuneration of Senior Executives

The tables below show the remuneration of the top three tiers of senior executives of ASTRI for the period from 1 April 2016 to 31 March 2017:

高級行政人員薪酬

以下列表為應科院2016年4月1日至2017年3月31日期間排名首三職級的高級行政人員薪酬：

Post 職位	Annual Remuneration* 1 Apr 2016 – 31 Mar 2017 (HK\$) 全年薪酬* 由2016年4月1日至2017年3月31日（港元）
Chief Executive Officer 行政總裁	3,750,000
3 level one executives 三名一級行政人員	7,709,630
15 level two executives 十五名二級行政人員	21,658,870
Annual Remuneration (HK\$)* 全年薪酬（港元）*	Number of Senior Executives 高級行政人員數目
1,000,000 or below	1
1,000,001 to 1,500,000	7
1,500,001 to 2,000,000	5
2,000,001 to 2,500,000	3
2,500,001 to 3,000,000	2
3,000,001 to 3,500,000	0
3,500,001 to 4,000,000	1

* Annual Remuneration includes Base Salary, Salary Adjustment, Acting Allowance, Variable Payment and Cash Award (Inventor Award). It is rounded to the nearest HK\$10. Two senior executives joined in the course of the financial year; their annual remunerations were calculated on a prorated basis.

*全年薪酬包括基本薪資、薪資調整、署任津貼、可變薪酬、現金獎勵（創新發明獎）。四捨五入至十位數。財政年度中加入兩名高級行政人員，其全年薪酬按比例計算。

Management Structure

During the 2016-17 financial period, ASTRI has been headed by a Chief Executive Officer responsible to the Board of Directors for the overall management of the organisation. The CEO has been assisted by the Technology Division Heads and senior executives responsible for R&D, administrative, financial, commercial and other supporting functions.

To scale up our research capabilities and activities, we have strengthened our management structure to provide more room for growth and promote technology development. The management structure as at 31 March 2017 is as follows.

管理層架構

於2016-17財政年度，應科院由行政總裁領導，並向董事局負責公司的整體管理。行政總裁旗下有技術部主管及高級行政人員，負責科技研發、行政管理、財務、商務及其他支援的職責。

為了提升研發能力及擴闊研究的規模，我們優化管理架構以提供更多發展空間及提升技術拓展。下圖為截至2017年3月31日應科院的管理架構：



A Professional Team

ASTRI builds its strengths on people and talent. Over 80% of ASTRI's staff are in R&D functions, with ample expertise and experience covering a broad range of technological areas.

專業團隊

人才是應科院得以拓展的關鍵因素。而應科院整體員工中，佔八成為研發人員，他們具備科研專才和經驗，肩負不同領域的科研工作。



Headcount Status

The following is a breakdown of staff members under the respective divisions and teams as at 31 March 2017.

員工人數

以下是截至2017年3月31日有關員工所屬團隊的統計資料：

Division 部門	Number of Staff 員工數目
Headquarter 總部	80
Communications Technologies 通訊技術	98
Mixed Signal Systems IC 混和信號系統晶片	61
Advanced Digital Systems 先進數碼系統	66
Intelligent Software and Systems 智能軟件與系統	101
Security and Data Sciences 信息安全與數據科學	52
Opto-electronics 光電子	56
Electronics Components 電子元件	44
Others 其他	19
Interns 實習研究員	16

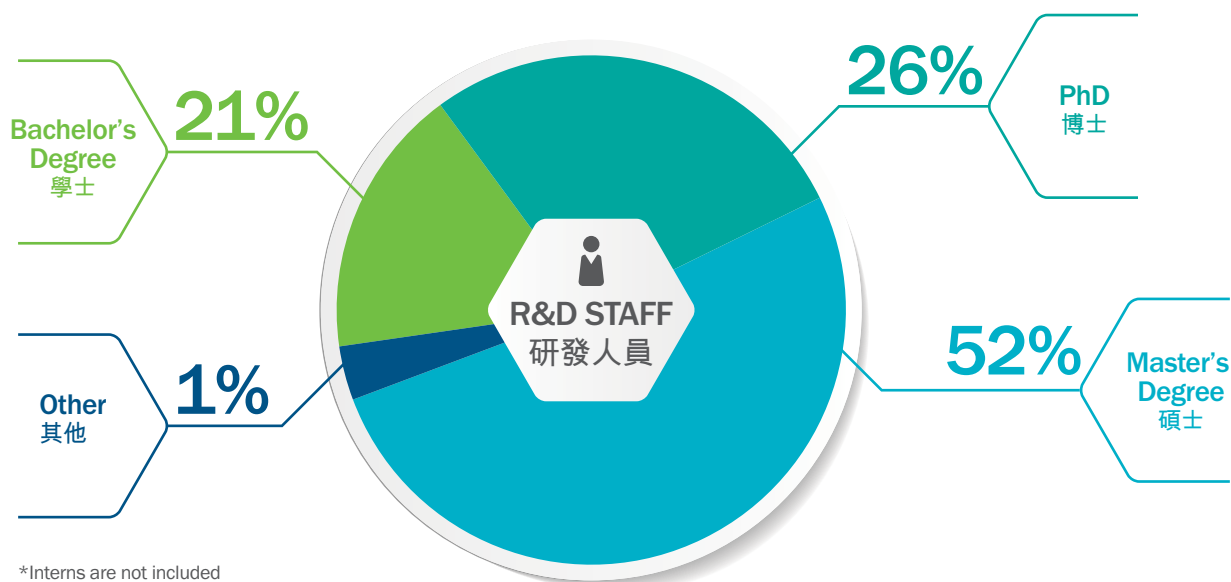
Total 總數
593

 = 5 staff 員工

Academic Qualifications of R&D Staff

研發人員學歷

Academic Attainment (as of 31 March 2017)*
學歷（截至2017年3月31日）*



6 R&D DIRECTION AND STRATEGY

研發方向及策略



ASTRI is committed to delivering world-class innovation to help develop Hong Kong into a premier technological hub. We develop technologies that can be transferred, commercialised and used across industries.

應科院致力於研究世界一流的創新技術，幫助香港發展成為首屈一指的科技中心。這些技術可以轉移、商業化並且能夠讓各行各業使用。



In 2016-17, ASTRI continued to strive for excellence based on the five cornerstones of its technology strategy developed in the previous year. In 2015-16, ASTRI embarked on a strategic exercise to enhance and consolidate its research strengths by identifying five core focus areas. Together, the Hong Kong Branch of the Chinese National Engineering Research Centre for Application Specific Integrated Circuit System (CNERC), they form the '5+1' strategic impetus. This is the direction to ensure optimal utilisation of ASTRI's R&D strengths, and to ensure a more prolific and dynamic future for the organisation.

The five strategic focus areas are: Financial Technologies (FinTech), Smart City, Next Generation Network, Intelligent Manufacturing and Health Technologies. In addition, the CNERC Hong Kong Branch is the other key element of the strategy. Having its main centre in the Southeast University in Nanjing, the CNERC Hong Kong Branch is the first of its kind to be set up in the SAR. ASTRI is well-poised to cater to a wider range of technology needs and achieve more exposure while generating significant impact on the national level.

The five strategic focus areas and the CNERC Hong Kong Branch ('5+1') are interwoven to create synergy – together, they form a strong grid of ASTRI's R&D focus and direction. R&D in these five strategic focus areas are pursued through seven technology divisions: Communications Technologies, Electronics Components, Mixed Signal Systems IC, Advanced Digital Systems, Opto-electronics, Security and Data Sciences and Intelligent Software and Systems.

2016至2017年，應科院繼續秉承上一年的技術研發策略，在五大核心基礎上努力追求卓越。在2015至2016年，應科院為更集中研究資源，制定了五個核心研發範疇及成立了國家專用集成電路系統工程技術研究中心香港分中心（工程分中心），組成「5+1」的策略，為提升和鞏固其研究優勢拉開序幕。這個定位能夠確保應科院的研發實力得到充分優化利用，未來能夠更多產和更有活力。

應科院的五個核心研發範疇為：金融科技、智慧城市、新一代通訊網絡、智能製造及健康技術。此外，國家專用集成電路系統工程技術研究中心香港分中心也是研發策略的另一個關鍵要素。國家專用集成電路系統工程技術研究中心（CNERC）的主研究中心位於南京市東南大學，香港分中心的設立堪稱首例。應科院已經做好準備，迎接更廣泛技術需要的挑戰，努力在全國範圍內研發出能夠產生重大影響的創新技術。

五個策略核心研發範疇及一個工程分中心（「5+1」）、相輔相成，形成應科院研發重點與方向的強大格局。五個策略核心研發範疇的研究與開發，都是通過七個技術部門開展：通訊技術、電子元件、混和信號系統晶片、先進數碼系統、光電子、信息安全與數據科學，以及智能軟件與系統。

COMMUNICATIONS TECHNOLOGIES

通訊技術

Overview

The Communications Technologies (CT) Division was established in 2005 to conduct focused R&D on market-ready, leading-edge communications technologies and solutions. CT delivers value-added information and communications technology (ICT) applications and services for the benefit of industries and communities.

CT researchers and engineers come from diverse geographic, academic and professional backgrounds. Many of them bring along rich experience of working in large, global corporations and research institutions. Consolidating its core technical competence in the following areas, CT provides end-to-end system solutions across a wide range of applications.

- **Networking Software (NSOFT):** CT develops large-scale and real-time software for telecom networks, Network Function Virtualisation (NFV) and orchestration, as well as Software Defined Networking (SDN). Its solutions provide agile, scalable, manageable next generation network infrastructure supporting 4G and beyond. In addition, the Division works on Cellular Vehicle-to-Everything (C-V2X) systems and management applications help realise a smart mobility system ensuring vehicular and pedestrian safety.

概覽

通訊技術 (CT) 部成立於2005年，致力於研發領先通訊技術和解決方案，並將其商用化，從而為業界及社區提供增值資訊及通訊科技 (ICT) 應用方案和服務。

此技術部的研究員與工程師來自世界各地，擁有不同地域、學術及專業背景，當中大多數都具備在跨國企業和研究機構工作的豐富經驗。技術部門致力於發展以下多項核心技術能力，並為各種應用提供端到端的系統解決方案。

- **網絡軟件 (NSOFT):** 通訊技術部為電訊網絡、網絡功能虛擬化 (NFV)、網絡編排及軟件定義網絡 (SDN) 開發大規模實時軟件，其解決方案支持4G及後4G技術，而且具備靈活、可擴展、易於管理等新一代網絡基礎設施的特質。此外，該技術部還研發了移動車聯網 (C-V2X) 系統和管理應用，幫助實現智能交通系統，保障車輛和行人安全。



- **Baseband Solutions (BSOL):** ASTRI is a pioneer in developing and testing communications technologies that support LTE and more advanced communication networks. Its R&D efforts involve baseband and upper layer protocol stacks, and next generation Centralised Radio Access Network (C-RAN) technologies to enhance overall cellular network throughput by coordinated interference management and radio resource allocations.
- **Emerging Systems (ESYS):** R&D in this domain include 5G radio access technologies, Software Defined Radio (SDR), C-V2X technology, full dimension Massive Input Massive Output (MIMO), dynamic spectrum utilisation, and enhanced broadband wireless innovation platform.
- **Mobile and IoT Platforms (MIP):** CT specialises in developing and facilitating scalable technologies and large-scale total system solutions that fully realise the potential of Internet of Things (IoT) in Smart City and other applications.

Technology Focus and Services

Networking Software (NSOFT)

The Networking Software Group focuses on developing next generation virtualised mobile core network software solutions and V2X networking systems.

The virtualised mobile core network solution includes:

- Telecom-grade virtualised mobile core network software (including Evolved Packet Core (EPC), Cellular Serving Gateway Node (C-SGN), small cell gateway, and IPSec security gateway), with focus on the performance and high availability capabilities under x86 virtualised platforms
- Network orchestrator to automate and visualise end-to-end network deployments to significantly reduce the complexity, human errors and deployment time for LTE or next generation network infrastructure
- NFV platform reference design integrating open virtualised platform components which delivers performance, stability and with deployment automations

These technologies are licensed to customers for deployment in public and private LTE networks (e.g. internal signalling network to support subway line operations). The Group collaborates with major players such as Intel on NFV technologies.

The V2X Networking System R&D focuses on using V2X low latency communications to detect potential risks to road safety, and to give immediate warnings to drivers and road users. Some examples of real-life risks and warnings include: emergency brakes, intersections, do not pass, and blind spot detection.

- **基帶解決方案 (BSOL):** 應科院是開發和測試LTE和更先進通訊網絡技術的先驅，其研發工作涉及基帶與高層協議棧以及新一代集中化無線接入網絡 (C-RAN) 技術，通過協調干擾管理和無線電資源分配，提升整體移動網絡流量。
- **新興系統 (ESYS):** 此領域的研發包括5G無線接入技術、軟件定義無線電 (SDR)、移動車聯網技術、大規模多入多出天線 (MIMO) 系統、動態頻譜使用，及增強型寬帶無線創新平台。
- **移動和物聯網平台 (MIP):** 此技術組專注於研發和推動可擴展技術與大規模全系統解決方案，充分實現物聯網在智慧城市與其他應用方面的潛力。

技術重點與服務

網絡軟件 (NSOFT)

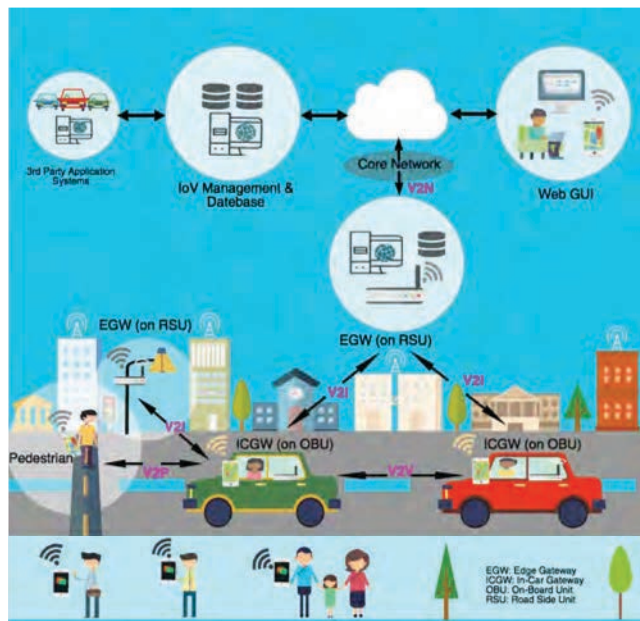
網絡軟件技術組專注於研發新一代虛擬移動核心網絡軟件解決方案及車聯網網絡系統。

虛擬移動核心網絡的解決方案包括以下數方面：

- 電訊級虛擬移動核心網絡軟件（包括核心網絡（EPC）、移動服務網關節點（C-SGN）、小基站網關和安全網關），該技術著重於在x86虛擬化平台上的性能和高可用性。
- 網絡編排器可以將端對端網絡部署自動化和形象化，從而大幅降低LTE或新一代網絡基礎設施的複雜性、人為錯誤機會和部署時間。
- 網絡功能虛擬化平台，集成了開放虛擬化平台元件的參考設計，平台具備卓越性能，穩定性強，並可進行自動化部署。

應科院已將上述技術授權給客戶，並部署於公共和專用LTE網絡（例如支援地鐵線運行的內部訊號網絡）。技術組與英特爾（Intel）等業界精英合作，開發網絡功能虛擬化技術。

車聯網系統技術組主力研究利用車聯網低延遲通訊技術，來偵測路面情況潛在的風險，並立即向司機和道路使用者發出警告。現實生活中的例子包括：緊急剎車、十字路口、禁止超車及盲點檢測等路面上可能發生的危險，車聯網系統都能發出預警通報。



End-to-end IoV and V2X management solution for road safety
端到端物聯網和車聯網管理方案以改善道路安全



ASTRI helps to build a connected car ecosystem for Hong Kong by using the Cellular-Vehicle-to-Everything (C-V2X) technology - cars may communicate with one another, pedestrians, and road side infrastructure to enhance road safety and deliver a better driving experience

應科院致力為香港建立車聯網（C-V2X）技術，汽車可以相互通訊，亦可感應到行人和路邊基礎設施，以加強道路安全，提供更好的駕駛經驗

Baseband Solutions (BSOL)

In collaboration with industry partners, the Baseband Solutions Group delivered the world's first commercial grade Frequency Division Duplex/Time Division Duplex (FDD/TDD) dual-mode LTE small cell and TD-LTE terminal baseband core reference designs. These technologies address the demand for high speed mobile data and higher quality services in both public telecom and private mobile networks.

The Group's reference designs are industry-proven and have passed inter-operability tests by infrastructure vendors and operators. With the professional support of the Group, its partners passed a leading operator's stringent bidding tests on small cells and terminals. The design ranked first in China Mobile's small cell bidding process.

The Group is developing next generation Centralised Radio Access Network (C-RAN) technologies to enhance overall cellular network throughput by coordinated interference management and radio resource allocations. The C-RAN

基帶解決方案 (BSOL)

基帶解決方案技術組與業界夥伴攜手，推出全球首個商用級頻分雙工和時分雙工（FDD/TDD）雙模制式LTE小基站及TD-LTE終端基帶核（Baseband core）參考設計。這些技術可滿足公共電訊與專用移動網絡對高速數據和更優質服務的需求。

技術組的參考設計通過了業界驗證，並通過了多家通訊設備供應商和營運商的互通測試。在我們技術組的專業支援下，合作夥伴也通過了主要營運商對小型基站和終端設施的嚴格招標測試。該設計在中國移動的小基站招標過程中排名第一。

技術組正在研發新一代集中化無線接入網絡（C-RAN）技術，通過干擾協調管理和無線資源分配，提升整體網絡流



architecture also allows general IT equipment to carry out communication-specific processing which further reduces the cost and power consumption of cellular networks.

Other ongoing R&D efforts include next generation small cell technologies, physical layer algorithms for Enhanced Mobile Broadband communication in 5G, and LTE Machine Type Communications (MTC) terminal reference design for IoT.

Emerging Systems (ESYS)

The Emerging Systems Group is undertaking projects to develop a Software Defined Radio (SDR) platform and core technologies for 5G cellular systems to increase spectrum efficiency, and to reduce both hardware cost and energy consumption. The Group is also developing LTE Device-to-Device (D2D) technologies for public safety networking and smart city applications. In addition, the Group is working on V2X technologies for connected car applications.

Working with government bodies and cellular operators, the Group trials state-of-the-art wireless technologies to enable new application solutions such as dynamic spectrum sharing technologies for TV white space and unlicensed band. It is also developing an Open Wireless Innovations Platform (WIP) by integrating technologies from ASTRI and other third parties to provide a configurable network environment for system development, integration and verification.

The Group also collaborates with leading industry partners and the academia to create IPs, contribute to academic research and publications, and strengthen 5G standardisation efforts.

Mobile and IoT Platforms

The Mobile and IoT Platforms Group focuses on developing technologies to tackle the scalability problem of IoT systems for large-scale deployment. These systems can accommodate vast amount of network traffic triggered by millions of devices and mobile users. At the same time, they can function cohesively with the cloud resources which can scale horizontally instead of vertically. In addition, the Group works on proximity, geographic information and real time telemetric-related technologies such as positioning, navigation, map rendering, sensors data processing, and smart distributed gateways, etc.

量。集中化無線接入網絡架構，也允許採用通用資訊科技設備用於通訊處理，進一步降低移動網絡的成本和功耗。

其他研發工作還包括新一代小基站技術、用於5G增強型移動寬帶通訊的物理層算法，以及用於物聯網的LTE機器類通訊 (MTC) 終端設備的參考設計。

新興系統 (ESYS)

新興系統技術組正在研發適用於5G移動系統的軟件定義無線電 (SDR) 平台和核心技術，以提升頻譜效率，減省硬件成本和降低能源消耗。技術組還為公共安全網絡和智慧城市的應用開發了LTE終端直通 (D2D) 技術。此外，技術組還致力於開發車聯網通訊技術。

技術組與政府機構和電訊運營商合作，嘗試採用最先進的無線技術，實現新的應用解決方案，如電視空白頻段和未授權頻段的動態頻譜共享技術。技術組通過採用應科院與其他第三方的技術，建立了一個開放的無線創新平台 (WIP)，為系統開發、集成和驗證提供一個可設定的網絡環境。

技術組還與業界翹楚及學術機構合作，共同創建知識產權，開發專利，為學術研究與出版物作出貢獻，並協力推動5G網絡標準化工作。

移動和物聯網平台

移動和物聯網平台技術組專注於開發技術，以解決物聯網系統在大規模應用時的可擴展性問題。倘若由數以百萬計的終端和移動用戶同時使用網絡，這些系統可以應付大規模網絡流量，同時藉著結合雲端，轉作橫向擴展，而非傳統的縱向擴展。此外，技術組還致力於定位、導航、地圖展示、傳感器數據處理及智能分佈網關等感知、地理資訊及實時遙測等相關技術的開發。

Innovation, Applications and Collaborations

The R&D efforts of the CT division have resulted in a large number of innovative solutions and applications, including:

TD-LTE Technologies

The Division has successfully developed commercial-grade TD-LTE technologies which were utilised to build a railway Communication-based Train Control (CBTC) signalling network system. The system has already been deployed at the recently opened Wuhan Metro Line 6 - the first subway signalling system in the Mainland to use LTE technologies.

Compared to the traditional Wi-Fi based railway communication network, LTE-based CBTC system reduces signal interference, enhances high and reliable mobility, provides better security, and shortens the signal communication time between trains and control centres. ASTRI's network solution has high reliability on handover, enhanced failure handling mechanisms during the train movement, and improved safety and efficiency mass railway transit operations.

The prototype of the Communication-based Train Control (CBTC) signaling system using TD-LTE technologies: the technologies are deployed at Wuhan Metro Line 6 - the first subway signaling system using LTE technologies in the Mainland

採用TD-LTE通訊技術的列車通訊控制系統(CBTC)的原型：系統應用到武漢地鐵6號線——是內地第一個使用LTE技術的地鐵訊號系統



創新、應用和合作

通訊技術部的研發工作已轉化為大量創新解決方案並應用到不同範疇，其中包括：

TD-LTE技術

該技術部成功研發了商用級TD-LTE技術，並應用於列車通訊控制系統 (CBTC)。該系統是內地首個採用LTE技術的地鐵訊號系統，最近開通的武漢地鐵6號線，正是使用此系統。

基於LTE的無線列車通訊控制系統，與傳統的WiFi技術相比，可減少訊號干擾，提高高速移動時的可靠性和安全性，以及縮短列車與控制中心之間的訊號通訊時間。在列車運行時，應科院的網絡方案能提供高的切換可靠性及增強的故障處理機制，有效提升地鐵運作的安全度、穩定性和效率。



Wuhan Metro Line 6
武漢地鐵6號線

Next Generation Mission Critical Communications

Broadband Trunking Communication (B-TrunC) can support one-to-many voice calls and one-to-many video calls by leveraging the new one-to-many transmission mechanism in its radio interface. Mission critical communication is essential for fast response time to ensure the safety and order of communities, firefighting, public health, national security and economic stability. Having recognised this serious need, the B-TrunC standard was developed to enable mission critical communication for Public Protection and Disaster Relief (PPDR) operations.

新一代應急通訊系統

寬帶集群通訊 (B-TrunC) 可透過在無線界面採用全新的一對多傳輸機制，支援一對多語音及視訊通話。在危急時刻通訊必須快速可靠，方可確保社區、消防、公共衛生、國家安全和經濟穩定等各方面安然有序。寬帶集群通訊標準支援並確保在進行公共安全與救災行動等任務時通訊能順利進行。

In this project, ASTRI has developed LTE-based Broadband Trunking Communication (B-TrunC) technology, which is the first standard from China to be accepted by the International Telecommunication Union (ITU). It was acknowledged as an international PPDR broadband trunking air interface standard. The key features are:

- Release 1 and release 2 B-TrunC standard compliant
- Emergency broadband group communication applications
- Flexible bandwidth management
- High frequency efficiency optimisation

Broadband Trunking Communication (B-TrunC) base station
寬帶集群通訊 (B-TrunC) 基站



應科院在此項目中開發了基於LTE的寬帶集群通訊 (B-TrunC) 技術。寬帶集群通訊技術作為中國首個被國際電訊聯盟 (ITU) 接納的標準，認可為國際公共安全與救災行動寬帶集群通訊空中界面標準。其主要特點包括：

- 符合版本1及版本2寬帶集群通訊標準
- 應用於應急寬帶群組通訊
- 靈活的帶寬管理
- 高度優化的頻譜效率

Next Generation LTE Small Cells

C-RAN solutions provide flexible, power-efficient, software-based, and centralised baseband pool for commercial LTE/LTE-A and 5G deployment. C-RAN's key features include joint transmission and reception, new waveform, and massive MIMO. C-RAN is versatile and suitable for private networks with application specific requirements.

In this project, ASTRI has developed a pre-5G C-RAN reference design with the following key features:

- Virtual Cell
- Flexible Centralised Unit - Distributed Unit Splitting
- Full dimension MIMO
- Joint Transmission and Joint Reception

Virtualisation for 4G and Beyond Mobile Networks

In this project, ASTRI developed disruptive network virtualisation technologies for the telecom industry, enabling flexible deployment and reconfiguration of LTE network. The researchers used general purpose x86 servers and delivered excellent throughput (40Gbps) and high reliability. ASTRI is also collaborating with Intel and a leading telecom operator for this project.

Smart Indoor and Outdoor Geographic Information System (SIOGIS)

ASTRI has realised the design of a scalable architecture for a seamless integrated indoor and outdoor Geographic Information System (GIS), capable of supporting real time data capturing and monitoring. It also features algorithms for smart navigation and efficient mesh networks for Internet of Things (IoT) telemetry data.

新一代LTE小型基站

集中化無線接入網絡 (C-RAN) 方案為商用 LTE/LTE-A 及 5G部署提供了靈活低功耗的軟件化集中式基帶池，其主要特點包括聯合傳輸與接收、新波形及大規模多入多出天線系統。集中化無線接入網絡功能全面，適用於有特殊應用需求的專用網絡。

在此項目中，應科院研發了pre-5G集中化無線接入網絡 (C-RAN) 的初步參考設計，主要特點如下：

- 虛擬小基站
- 靈活分離中央單元與分布式 (Distributed) 單元
- 全維度多入多出天線
- 聯合傳輸與聯合接收

4G及下一代移動網路虛擬化

在此項目中，應科院開發了適用於電訊級的具有突破性的網絡虛擬化技術，實現LTE網絡的靈活部署與可重配。研發團隊採用通用的x86伺服器，能實現高流量 (40Gbps) 和高可靠性。應科院正與英特爾 (Intel) 及一家電訊運營商合作研發此計劃。

智能室內與室外地理信息系統(SIOGIS)

應科院設計了一個兼備室內與室外地理信息系統(GIS)的可擴展架構，支援實時數據採集與監控。這設計更具有智能導航的演算功能及適用於物聯網遙測數據的高效網狀網絡。

The SIOGIS technologies were showcased to the general public through Energising Kowloon East Office (EKEO) and also at the First@Science Park event.

Based on the SIOGIS technologies, a Smart Parking Server went through pilot trials. The system collects real-time car parking vacancy data in the Kowloon East Smart City Pilot Area. The collected data are used by the Government including EKEO and the Transport Department in their respective mobile applications “My Kowloon East (MyKE)” and “Hong Kong eRouting”. Such data are also available for public access through www.data.gov.hk.



Interface of ASTRI Smart Parking Server
易泊車系統界面

應科院在起動九龍東辦事處 (EKEO) 及 First@SciencePark 活動中，向公眾展示智能室內與室外地理信息系統技術。

應科院以智能室內與室外地理信息系統技術為基礎，發展出易泊車系統，並通過了試驗階段。該系統收集九龍東智慧城市試點的實時汽車停泊數據。香港政府部門（發展局起動九龍東辦事處及運輸署）將收集到的數據應用到其特定移動應用程式，公眾可經 www.data.gov.hk 取閱這些數據。



EKEO MyKE mobile app
起動九龍東辦事處應用程式

Collaboration and Commercialisation of Next-Generation Network Technologies

ASTRI partnered with a large number of enterprises and institutions to try, test and implement its communication technologies. Some prominent examples include:

- LTE Virtualised Evolved Packet Core was licensed to a major telecom operator for building new application and services using LTE.
- B-TrunC base station reference design was licensed to Hebei Far East Communication, and ASTRI technology successfully passed B-TrunC certification test, ready for commercialisation.
- LTE-M base station reference design was licensed to Hebei Far East Communication. ASTRI technology successfully passed certification test and is ready for commercialisation.

新一代通訊網絡項目與業界的合作和商業化

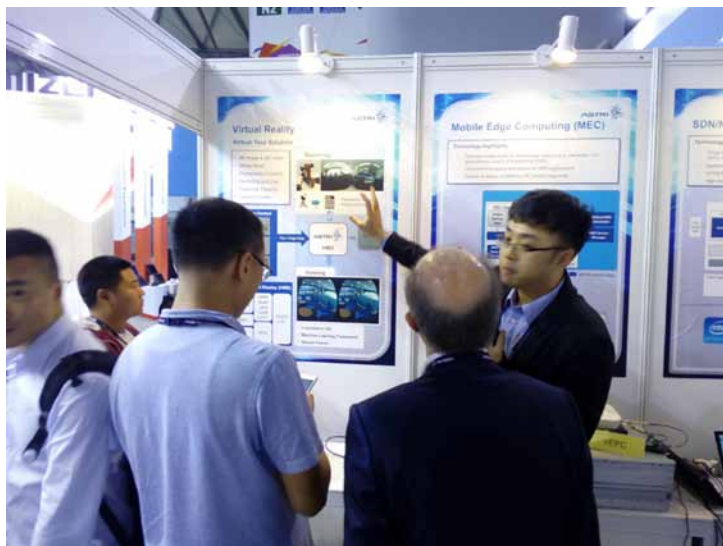
應科院與多家企業和機構測試和應用所研發的通訊技術。以下是一些重要例子：

- 把LTE虛擬化核心軟件授權予一家大型電訊營運商，用LTE技術建立新的應用程式和服務。
- 把寬帶集群通訊（B-TrunC）基站參考設計授權給河北遠東通信，應科院的技術通過寬帶集群通訊認證測試，準備商業化。
- 把LTE-M基站參考設計授權給河北遠東通信，應科院的技術通過認證測試，準備商業化。

- ASTRI showcased the technologies in leading international telecom exhibitions including Mobile World Congress Barcelona, Mobile World Congress Shanghai and PT/EXPO China in partnership with our partners (e.g. Sunnada, Comba, Artesyn, Rohde & Schwarz, Keysight, and TCL).

Showcasing ASTRI's technologies in Mobile World Congress Barcelona, Mobile World Congress Shanghai and PT/EXPO China

在世界移動通訊大會巴塞羅那、世界移動大會上海和中國國際信息通信展覽會，展示應科院的技術



- 應科院與我們的合作夥伴（例如三元達、京信通信、雅特生科技、羅德與施瓦茨、是德科技和TCL等）在國際級電訊展覽會，包括世界移動通訊大會巴塞羅那、世界移動大會上海和中國國際信息通信展覽會等，展示了我們的技術。

- Mobile Edge Computing (MEC) Proofs of Concept: (1) Vehicle-to-everything (V2X) for road safety and (2) Virtual Reality (VR) tour solution
- Internet of Vehicles (IoV) Application: Fleet Management with real-time status monitoring of mobile vehicles' dashboard, user and fleet group information, historical trip records and data, etc.
- NB-IoT core network (C-SGN)
- LTE C-RAN solutions on Artesyn MaxCore Platform
- Coordinated virtual cell Centralised Radio Access Network (C-RAN) base station for inter-cell interference mitigation and system throughput enhancement
- Coherent Joint Transmission prototype for distributed MIMO with phase synchronised active antenna units
- ASTRI's leading Open Air Interface (OAI) software defined TD-LTE UE solution supporting TD-LTE interoperability with commercial base station
- Established an LTE trial network at the Chinese University of Hong Kong for education and testing
- Designed the private LTE trial network at the Hong Kong International Airport to enhance the stability and mobility of daily operations. The trial will conduct several use cases including: mobile surveillance and video analytics through portable camera station and LTE network. The completed trial network will be ready in Q4 2017.
- Smart Indoor and Outdoor Geographic Information System (SIOGIS)

- 移動邊緣計算（MEC）的概念驗證：（1）利用車聯網（V2X）技術實現道路安全和（2）虛擬實境（VR）導賞解決方案。
- 車聯網（IoV）應用：車隊管理包括車輛儀錶板的實時狀態監控、用戶和車隊資訊、行駛記錄和數據等。
- 窄帶物聯網（NB-IoT）的核心網絡（C-SGN）。
- 基於雅特生科技MaxCore平台的LTE無線接入網絡解決方案。
- 協調無線接入網（C-RAN）虛擬小基站，用於減輕少基站間之互相干擾和增強系統吞吐量。
- 相干聯合傳輸原型，具有相位同步有源天線單元的分布式大規模多入多出天線技術。
- 應科院基於開放戶外接口（OAI）的軟件定義TD-LTE用戶終端（UE）解決方案，支持與商用基站的互通。
- 在香港中文大學設立了用作教學和測試的LTE實驗網。
- 應科院為香港國際機場設計了專屬的LTE試驗網絡，以加強日常營運的穩定性和流動性。試驗網絡的應用包括：通過便攜式攝像機和LTE網絡進行移動監控和視像分析。試驗網絡將於2017年第四季度完成。
- 智能室內與室外地理信息系統。

- ASTRI contributed the data format and interface design for collecting the Kowloon East real-time parking data through ASTRI's Smart Parking Server with 'Smart Parking' function accessible to private car park owners and operators in Kowloon East.

- 應科院為起動九龍東辦事處及運輸署的應用程式提供數據模式和界面設計，同時採用應科院的易泊車系統予九龍東的私人停車場業主和經營者發放其實時泊車資訊。



- The SIOGIS technologies were showcased to the general public through the Smart City Week (07-13 November 2016) of the EKEO and also the First@Science Park exhibition (23-24 February 2017) at Hong Kong Science and Technology Park (HKSTP).
- Public Sector Trial Scheme (PSTS) Telehealth Technology Platform: The trial with Tung Wah Group Hospitals (TWGHs) lasted for nine months and the system is currently being used in their day-to-day operations. The system intends to improve the service quality of daily operations of the 'Wong Cho Tong Day Care Centre for the Elderly', in alerting caregivers about Alzheimer's patients accidentally leaving the group during outdoor activities.

- 應科院在2016年11月7至13日於起動九龍東辦事處舉辦的智慧城市展覽週及2017年2月23至24日於香港科學園舉行的First@Science Park活動，向公眾展示智能室內與室外地理信息系統技術。
- 屬於公營機構試用計劃項目的遠距健康照護技術平台，已在東華三院轄下院舍作了為期九個月的測試，至今仍然使用中。此系統旨在進一步提升黃祖棠長者日間護理中心的日常運作服務水平，提醒護理人員隨時掌握病弱者的行蹤，如認知障礙症患者可能在外出活動時離開群體而失去聯絡，此系統便有助防止這情況發生。



Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Internet of Things (IoT) via BLE Application and System 物聯網: 低功耗藍牙應用和系統	Jan 2015 - 30 Jun 2016 2015年1月至2016年6月
Open Broadband Wireless Innovation Platform (WIP) 開放型無線寬頻創新平台	Aug 2014 - Jul 2016 2014年8月至2016年7月
In-Car Gateway Software for Internet-of-Vehicles (IoV) 用於車聯網的車內網關軟件	Jan 2016 - Sep 2016 2016年1月至2016年9月
LTE Machine Type Communications (MTC) Baseband Technologies LTE機器類型通訊基帶技術	Mar 2015 - Sep 2016 2015年3月至2016年9月
Telehealth Technology Platform 遠距健康照護技術平台	Nov 2014 - Apr 2016 2014年11月至2016年4月
Emerging System for Efficient and Dynamic Spectrum Utilization 高效及動態頻譜共享的新興系統	Mar 2016 - Dec 2016 2016年3月至2016年12月
High Efficiency RF System 高效射頻系統	Mar 2015 - Jan 2017 2015年3月至2017年1月
Virtualisation for 4G and Beyond Mobile Networks (NFV) 4G 及下一代的移動網絡功能虛擬化	Sep 2015 - Sep 2017 2015年9月至2017年9月
Smart Indoor and Outdoor Geographic Information System 智能室內室外地理信息系統	Feb 2016 - Feb 2018 2016年2月至2018年2月
Next Generation Small Cells 新一代小基站	Mar 2016 - Sep 2017 2016年3月至2017年9月
Core Network Evolution Research for NB-IoT NB-IoT的核心網演進研究	Jan 2017 - Oct 2017 2017年1月至2017年10月
Next Generation Mission Critical Communications 下一代應急通信系統	Feb 2017 - Feb 2019 2017年2月至2019年2月
Long-haul IoT and Location Service for Smart City 智慧城市:長距物聯網傳輸和具位置認知的服務	Mar 2017 - Dec 2017 2017年3月至2017年12月
LTE Vehicle-To-Vehicle (V2V) Communications Technologies LTE 車對車通訊技術	Mar 2017 - Dec 2017 2017年3月至2017年12月
5G Access Technologies for Next Generation Heterogeneous Networks 下一代異構網絡中的5G接入技術	Mar 2017 - Mar 2019 2017年3月至2019年3月
Trial: LTE Private Network for Video Delivery 試用: LTE專用網絡視頻應用	Mar 2017 - Mar 2018 2017年3月至2018年3月



ELECTRONICS COMPONENTS

電子元件

Overview

Focusing on market-driven solutions, the Electronics Components (EC) Technology Division specialises in advanced packaging technologies, materials and devices development, and module integration. Its technologies cater to applications in the electronics sector particularly in the consumer, automotive, power and energy segments.

EC transferred its technologies and products to 10 Hong Kong and Mainland-based companies through existing collaborative projects and new contracts with a total value of more than HK\$23.5 million (~41.1% industrial contribution). Besides, EC signed seven new contracts with some tier-one electronic component manufacturers and a few small to medium technology enterprises. A collaborative agreement was signed with Zhongke Laifang Energy Technology (HK) Limited [ZKLF(HK)] to establish a joint laboratory for the development on environment-friendly advanced aqueous based energy storage systems. Through these partnerships ASTRI supports the partner companies to rapidly realise their commercial products with advanced, innovative technologies.

概覽

電子元件 (EC) 技術部擅長研發先進封裝技術、材料及器件開發和模組集成等等針對市場需要的解決方案。此等技術可應用於消費電子、汽車電子、電力和能源電子多個領域。

電子元件技術部通過現有合作項目和新合約，將相關技術和產品轉讓給十家香港和內地公司，價值合計超過2,350萬港元（其中約41.1%來自業界）。此外，電子元件技術部又與多家頂尖的電子元件製造商和幾家中小型技術企業簽訂了七項新合約。去年，該技術部與中科來方能源科技（香港）有限公司（中科來方（香港））簽署了合作協議，共同成立聯合研究實驗室，開發先進環保型水系儲能系統。應科院通過建立合作關係，支持夥伴企業以先進創新技術，更快地把產品商業化。



ASTRI and Zhongke Laifang Energy Technology (HK) Ltd establish a joint laboratory to drive R&D for next generation energy storage systems which are safe, efficient, and eco-friendly

應科院夥拍中科來方（香港）共同成立聯合實驗室，推動研發安全、高效及環保的新一代儲能系統

On intellectual property development, EC has released eight new inventions in the areas of power electronics and 3D interconnection technologies. In addition, six patents were filed while eight were granted, in the US and China.

The three key core competence groups under EC - Power Devices (POWER), Packaging (PACK) and Intelligent Devices Energy (IDE) - will continue to pursue advance R&D for various technology solutions and industry applications, reinforcing EC's leading role in each of its core areas of competence.

Technology Focus and Services

EC seeks to develop leading-edge core competence in advanced value-added power electronics products with significant cost and performance improvement. Its solutions are useful for many smart city applications such as Electric Vehicles (EV)/Hybrid Electric Vehicles (HEV), data centres and new energy sources. EC's core competencies cover the following major aspects:

- Low-cost power devices based on Silicon Carbide (SiC) and Gallium Nitride (GaN)
- High-thermal and high-density substrate to achieve high power density

The technology focus of Electronics Components
電子元件技術部的技術重點

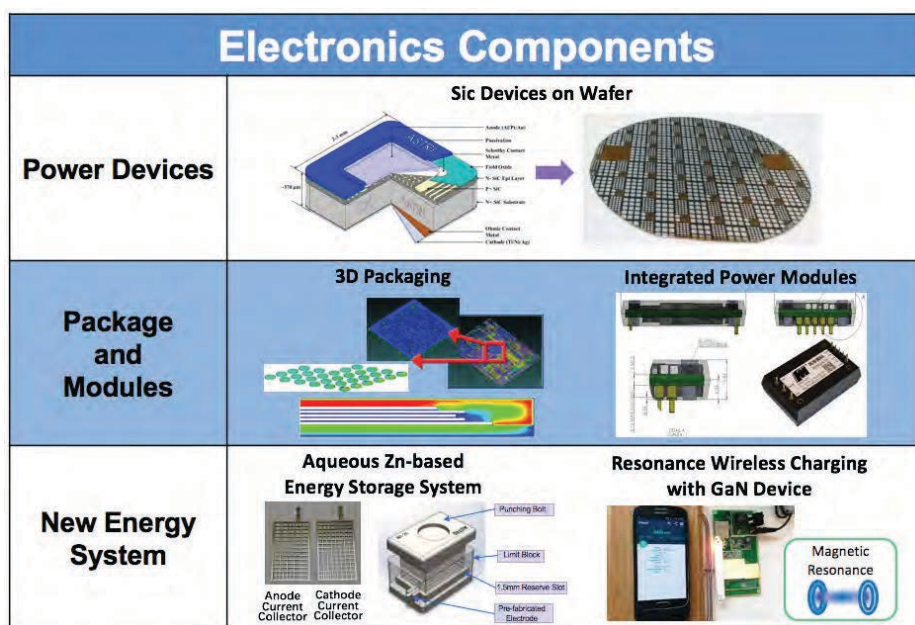
在知識產權開發方面，電子元件技術部在電力電子和3D互連技術領域共發佈了八項新發明。除此以外，在美國和中國申請了六項專利；而連同較早前申請的專利項目，此段期間榮獲的專利達到八項。

電子元件技術部轄下擁有三個主要核心技術組—功率器件 (POWER)、先進封裝 (PACK)、智能能源器件 (IDE)，將專注研發各項技術解決方案，及如何應用到業界當中，藉以鞏固電子元件技術部在其各個核心研究範疇的領導地位。

技術重點與服務

電子元件技術部致力開發高增值功率電子產品，降低成本，提升效能。該技術部所提供的技術方案可應用於多個智慧城市項目，例如電動車或混合電動車、數據中心和新能源等。電子元件的主要研發核心涵蓋下列幾方面：

- 以碳化矽 (SiC) 和氮化鎵 (GaN) 為基礎的低成本功率器件
- 能提高大功率密度的高熱能、高密度基板



- Magnetic and other key components to achieve high power conversion efficiency
- 3D packaging to integrate power electronics, microelectronics and sensors for smart control systems
- Low-cost, high-density energy storage systems with high reliability

The Power Devices Group develops advanced semiconductor power devices as well as inverters and converters. These are applied in electric vehicles, solar cell energy, wind mill energy, cloud computing data centers, air conditioners, subways, trains etc. The Group focuses on wide-bandgap (WBG) and their applications together with Si devices (ICs, IGBTs). The Group designs and fabricates power chips, and provides customised solutions from discrete level device design to fabrication. The Group also develops related circuits and topologies for inverter and converter 'control modules' which employ wide-bandgap semiconductor devices with SiC and GaN.

The Packaging Group focuses on modelling and simulation at multi-scale and multi-physics dimensions. It also specialises in high density interconnections, embedded passives and actives, high thermal solutions, key components, advanced substrate, 3D integration and so on. All these support high power and high frequency applications such as power electronics, automotive electronics, data centre, new energy, and smart city.

The Intelligent Devices Energy Group develops robust technologies for energy storage – with wide applications in smart home and smart city. The group has successfully demonstrated industry fabrication and field test of LIB cell prototypes and is currently cooperating with industry partners, such as ZKLF(HK), to develop advanced energy storage modules with green and safety advantages. It targets to strengthen its cooperation with industry partners and to explore the development of advanced energy storage systems for LEVs and other related applications.

In 2016-17, EC widened the scope of its R&D endeavours to power devices and system integration for various applications such as in smart city and electronic vehicles. All these are expected to generate substantial economic returns and social benefits for both local and overseas markets. Its strategic impetus was on ten ITF projects, five of which were successfully completed, with two on-going and three newly commenced projects.

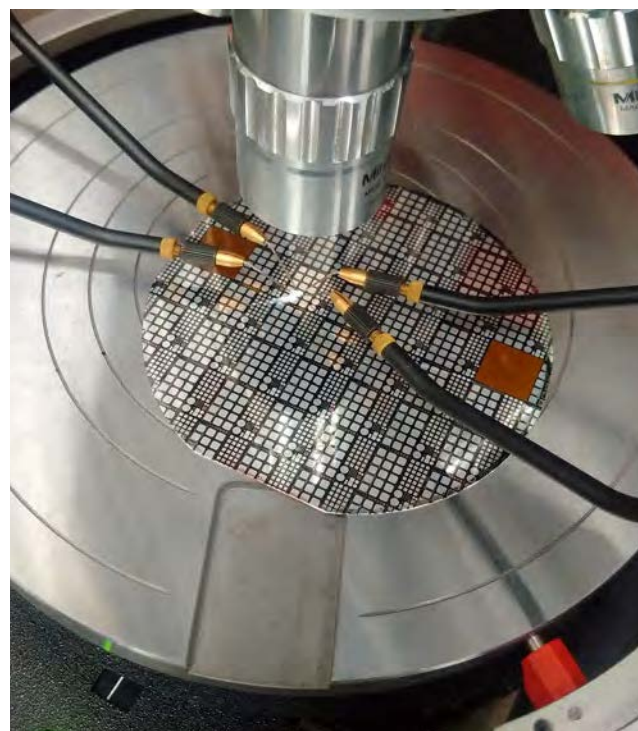
- 能提高功率變換效能的磁性元件及其他關鍵元件
- 結合了電力電子、微電子及傳感器的3D封裝，可應用於智能調控系統
- 低成本、高密度、高可靠性能源儲備系統

功率器件技術組開發先進的半導體功率器件、逆變器和轉換器，適用於電動汽車、太陽能電池、風力發電、雲端計算數據中心、空調、地鐵、火車等領域。技術組研發重點為寬帶隙 (WBG) 及其與矽器件（集成電路、絕緣柵雙極晶體管）一併使用的應用方案。技術組設計和製造能源芯片及提供針對客戶需要的技術方案，包括從器件基本概念的設計到製造。技術組亦開發相關電路和拓撲，用於控制裝設了寬帶隙半導體器件的逆變器和轉換器模塊（碳化矽和氮化鎵）。

先進封裝技術組專責研究多功能和多重物理的建模與仿真。技術組亦專注研究高密度互連、嵌入式無源和活性、高散熱性能方案、關鍵元件、先進基板和3D集成等技術。這些技術能支持大功率和高頻的應用，例如電力電子、汽車電子、數據中心、新能源及智慧城市等發展。

智能能源器件技術組主力研發在智能家居和智慧城市方面具有廣泛應用的儲能技術。技術組成功製造工業級的鋰離子電池原型，並進行實地測試。我們現正與業界夥伴如中科來方（香港）共同開發既環保又安全的先進儲能模塊。技術組旨在加強與業界夥伴的合作，並研發適用於輕型電動車的先進儲能系統及其他相關應用。

在2016至2017年期間，電子元件技術部將其研發範圍進一步擴大，包括多種功率器件與系統集成的應用，如智慧城市及電動汽車等。上述技術的研發有望為本地和海外市場帶來可觀的經濟回報與社會效益。電子元件技術部本年度致力於十個「創新及科技基金」資助項目，其中五個項目已經完成，兩個項目正在進行中，三個為新開展項目。



Research on SiC diodes
新一代碳化矽半導體的研究

Innovation, Applications and Collaborations

Leveraging its advanced infrastructure and a clearly orchestrated set of core competence, EC focuses on high-frequency and high-power applications including power electronics, energy storage, automotive electronics, etc. During the reporting period, EC expanded its research field to develop 3rd generation semiconductors, next generation SiC diodes and wide-bandgap-based intelligent power modules, etc.

Contributing to Industry Endeavours

ASTRI was elected as Chair and Co-chair respectively for the International Collaboration committee of China Advanced Semiconductor Industry Innovation Alliance (CASA), and the China and Packaging and Module subcommittee of International Technology Roadmap for Wide-bandgap Semiconductors (ITRW). Furthermore, ASTRI engages and collaborates with the Institute of Electrical and Electronics (IEEE) on Semiconductor innovation and industry standards.

ASTRI joins the launching ceremony of the 3rd Generation Semiconductor Industry Base in the South organised by Guangdong Provincial Department of Science and Technology

應科院出席由廣東省科學技術廳召開的第三代半導體產業南方基地啟動會

Integrated Power Module for Networking and Telecommunication Equipment

Power module is the core component of the power supply unit (PSU). Its main function is to convert grid electricity for various applications at different voltage and current levels. The global market of switching power supply reached USD 30 billion in 2013, and the networking and telecommunication equipment (NTE) market will grow at the fastest rate over the next five years. However, the market share of domestic products is less than 10%, and most of the telecommunication companies are still using imported products in their high-end systems. According to Moore's law, the integration density on the motherboard can double approximately every two years, which means the demand of operating power will also increase. If the overall size of the NTE is expected not to increase exponentially, the power density of the power module must be pushed up to keep pace with the progress of the motherboard.

A technology platform of integrated power module for networking and telecommunication equipment was successfully established in this project. By adopting the system-in-package technology developed in this platform which includes a few patents like adaptive auxiliary power control circuit, high power dielectric carrier structure with

創新、應用和合作

電子元件技術部以先進的基礎設施和明確的核心技術能力，專注於電力電子、能源儲備及汽車電子等高頻、高功率應用的研發。在本年度內，電子元件技術部將研發範圍拓寬至第三代半導體、新一代碳化矽半導體及採用寬帶隙的智能功率模塊等。

與業界共謀成果

應科院分別被選為第三代半導體產業技術創新戰略聯盟（CASA）國際合作委員會主席，和寬帶功率半導體國際技術路線圖（ITRW）的中國、封裝與模塊小組委員會共同主席。除此以外，應科院亦與電機電子工程師學會（IEEE）進行合作，參與訂立半導體創新和行業標準。



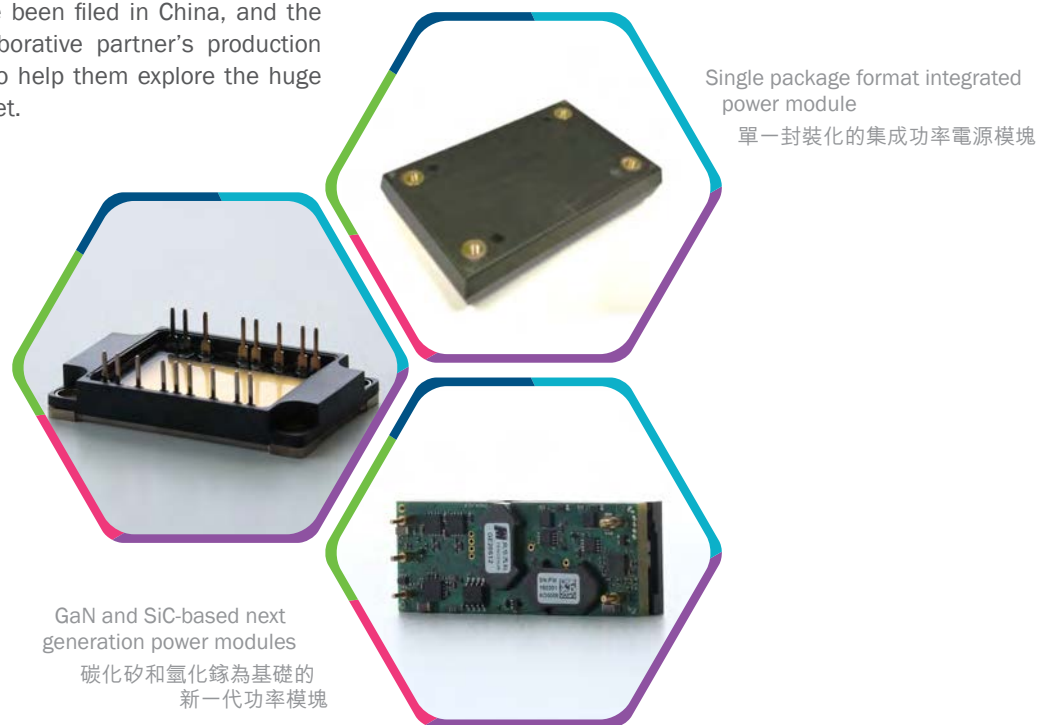
應用於網絡和通訊設備的集成功率模塊

功率模塊是開關電源（PSU）的核心組件，其主要功能是將電網供電轉換為各種實際應用所需的電壓和電流等級。2013年，全球開關電源市值已達到300億美元。預計未來五年，網絡與通訊設備（NTE）市場也將以最快的速度增長。但是，國內產品市場佔有率不足10%，大多數電訊公司的高端系統仍選用進口產品。根據摩爾定律，主機板集成密度大約每兩年便會增長一倍，這意味著主機板運行功率也將不斷增加。如未來網絡與通訊設備與器件普遍的體積不會大幅增加的話，那麼功率模塊的功率密度便必須配合主機板的發展而進一步提升。

電子元件技術部構建了一個技術研發平台，專為研發網絡與通訊設備所採用之高密度集成功率模塊而設。技術部採用了平台內的系統級封裝技術，成功建立了集成開關芯片、驅動芯片、控制反饋電路、大型磁性器件等的高密度集成功率模塊。透過採用幾項專利技術包括自適應性輔助電源控制電路、防止導熱界面分離結構、及散熱增強型集

accurate die attached layer, and integrated magnetic core with locally enhanced cooling system, a single package format power converter product has been designed and tested. It is the first successful case to achieve an integrated power density of $30\text{W}/\text{cm}^3$ and improve the thermal performance by 100% among similar products. In total, five patent applications have been filed in China, and the technology transfer at collaborative partner's production line is undergoing. We aim to help them explore the huge domestic and overseas market.

成式磁芯設等，成功開發出全新的塑封式集成功率模塊，乃是同類產品中首次將功率密度提升至 $30\text{W}/\text{cm}^3$ 、並增強散熱性能一倍以上。應科院已就該技術在中國提交五項專利申請，目前正將技術轉移到合作夥伴生產線，最終目標是協助合作夥伴開拓國內及海外市場。



New Materials and Process for Next-generation High Density Interconnects

The demand for finer line, space pattern formation of high density interconnect (HDI) substrates has become the mainstream circuitry manufacturing technology. It has shifted the focus from conventional subtractive circuit formation to semi-additive process (SAP), and modified semi-additive process (MSAP) technologies. The advancement of these technologies provides many challenges to overcome in production. The critical challenges in the MSAP technology process are copper electrodeposition for signal line formation, blind microvia and through hole filling. In addition, it is also a complex process to do flash etching to finalise circuit formation by removing the copper seed layer through differential etching.

Innovative etching additives have been developed in this project to overcome the challenges of severe undercut issues, by attaining narrower and higher aspect-ratio etch channels for ever finer circuitry. A novel molecule structure is designed for a banking agent to achieve higher efficiency on the etching inhibition at channel sidewall. An accelerator jacks up the etching rate at the channel bottom while working together with the banking agent to minimise undercuts. The

用於新一代高密度互連的新材料與工藝

高密度互連 (HDI) 基板對日益精細的線寬、圖形的需要，使半加成法 (SAP) 和改良式半加成法 (MSAP) 技術逐漸取代傳統的減成法，成為主流電路製造技術。然而，半加成法和改良式半加成法技術仍為生產線帶來了很多挑戰。其中一個挑戰是改良式半加成法技術在完成電路、移除銅籽晶層時採用的差分刻蝕工藝。



ASTRI's additive for high density substrate
應科院開發可應用於高密度基板之添加劑

etching accelerator can also act as a stabiliser to inhibit the decomposition of base etchant for sound performance, sustained over longer periods.

In addition, the new electrodeposition recipe for both blind microvia and through hole filling is developed to meet the market demand for a multitasking electrodeposition solution. The process parameters of electrodeposition are optimised for the simultaneous or separate filling of blind microvias and through holes. Formulation of a novel polymer-based leveller resulted in minimum surface deposition thickness, reducing the aspect ratio of etch channels, and thereby mitigating the undercut issue in flash etching process.

Grooming Talents for the Future

ASTRI organised or co-organised four conferences and symposiums together with IEEE, China Institute of Electronics (CIE), China Electronics Technology Group Corporation (CETC) and Hong Kong Science and Technology Parks Corporation (HKSTP). Over 300 engineers attended trainings sessions at these events.

應科院研發了一種解決上述問題的創新方法，就是利用新型蝕刻添加劑來克服精細電路中，刻蝕狹窄和高縱橫比溝道的嚴重底切問題。應科院研發了新型的分子結構，並用於製造護岸劑，可提高溝道側壁的蝕刻速率，在溝道刻蝕中加入加速劑可以加快刻蝕速度，與護岸劑一起發揮作用，減少底切現象。刻蝕加速劑也可作為穩定劑，用以抑制刻蝕液的分解，以保持穩定效能，延長使用時間。

此外，應科院還研發了新的微通孔、微盲孔電沈積配方，以迎合市場的需求，並進一步優化工藝參數，使這些配方可應用在通孔盲孔同時沈積、或單獨沈積的不同情況中。最後，應科院開發了一種新型聚合物基底整平劑，確保表面沉積厚度達到最小，降低溝道的縱橫比，從而改善閃刻工藝中的底切現象。

栽培接班人

應科院與電機電子工程師學會、中國電子學會（CIE）、中國電子科技集團公司（CETC）和香港科技園有限公司共同舉辦了四次會議和研討會，超過300多名工程師參加了這些活動的培訓班。

Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Medium-range Wireless Power Transfer (MWPT) Technology for Smart Home 應用於智能家居的中距離無線電能傳輸技術	Mar 2016 – Nov 2016 2016年3月至2016年11月
Grafted Polymer Insulator for Through-Silicon-Via (GPI-TSV) Applications 以接枝聚合物作為矽通孔絕緣材料的技術開發	Mar 2016 – Dec 2016 2016年3月至2016年12月
Robust Battery Cell for Unmanned Aerial Vehicles (RBC-UAV) 用於無人機之安全電池	Jul 2016 – Mar 2017 2016年7月至2017年3月
Miniaturised Dual-frequency RFID-reader (MDR) w/ NFC Functions for Smartphone 具有NFC功能的用於智能手機的微型化雙頻RFID讀寫器	Aug 2014 – May 2016 2014年8月至2016年5月
Lithium Rich Cathode Material for High Energy Density Advanced LIB (LRCM-F) 先進高密度鋰離子電池富鋰正極材料	Dec 2014 – Dec 2016 2014年12月至2016年12月
Integrated Power Module for Networking and Telecommunication Equipment (IPM-NTE) 應用於網絡和通訊設備的集成功率模塊	Mar 2015 – Jun 2017 2015年3月至2017年6月
New Materials & Process for Next-generation High Density Interconnects (NMP-HDI) 應用於下一代高密度互連的新材料和工藝	Mar 2016 – Sep 2017 2016年3月至2017年9月
GaN-based High Density Power Module for Next Generation Power Conversions 應用於下一代能量轉換的氮化鎵基高密度功率模塊	Mar 2017 – Nov 2017 2017年3月至2017年11月
Medium-range Wireless Power Transfer (MWPT) Technology for Smart Home 應用於智能家居的中距離無線電能傳輸技術	Mar 2017 – Sep 2018 2017年3月至2018年9月
Robust Battery Module for Light Electric-drive Vehicles (RBM-LEV) 用於輕型電動車之安全電池模組	Mar 2017 – Mar 2019 2017年3月至2019年3月



MIXED SIGNAL SYSTEMS IC

混和信號 系統晶片

Overview

Mixed Signal Systems IC (MSS) Technology Division is dedicated to developing leading-edge ICs and solutions. The Division works as a part of the Chinese National Engineering Research Centre's first ever branch outside the Mainland. The Division realises commercially viable IC applications by focusing on Internet of Things (IoT), wireless communications, and sensor signal processing, etc.

MSS offers competitive Intellectual Properties (IPs) and IC solutions in the following key technology areas:

- Wireless IoT System on Chip (SoC) Design
- Ultra Low Power IC Design
- Electrostatic Discharge (ESD) and Input/Output (I/O) Design Technology

概覽

混和信號系統晶片 (MSS) 技術部致力開發尖端集成電路和解決方案，屬國家專用集成電路系統工程技術研究中心在內地以外首個分中心的一部分。該技術部主要研究與物聯網 (IoT)、無線通訊及傳感訊號處理等領域相關的技術，專注研發可應用於商業上的集成電路項目。

混和信號系統晶片技術部在下列關鍵技術領域提供具有競爭力的知識產權 (IPs) 和集成電路解決方案：

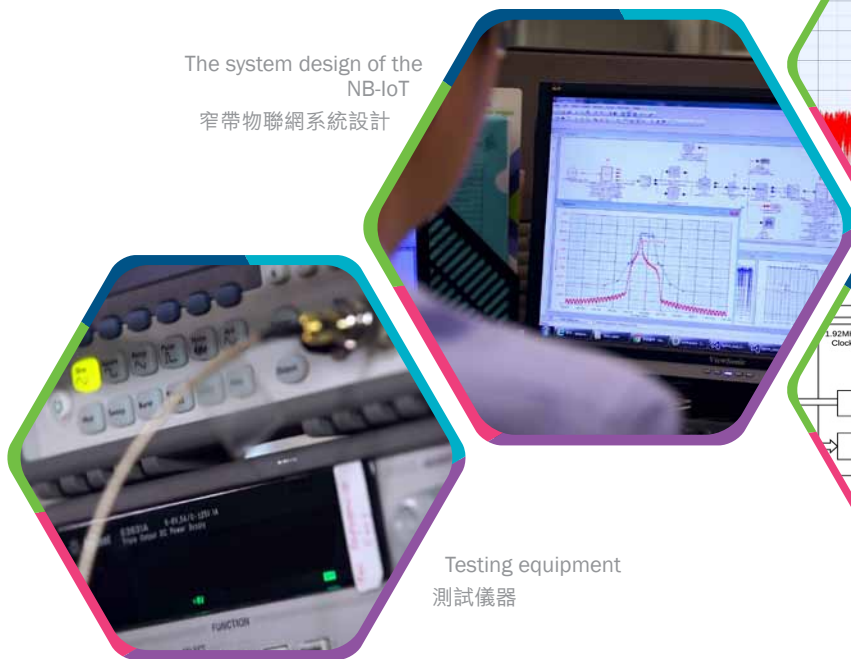
- 無線物聯網系統晶片 (SoC) 設計
- 超低功耗集成電路設計
- 靜電防護 (ESD) 和輸入/輸出 (I/O) 端口設計技術

Technology Focus and Services

RF Systems

The RF Systems Group provides wireless connectivity solutions with state-of-the-art low power integrated circuit design, which includes Narrow Band Internet of Things (NB-IoT) and latest Bluetooth Low Energy (BLE) technologies. In addition to facilitating the development of Smart City applications, NB-IoT enables wide area connectivity for personal, industrial and IoT appliances. BLE covers local and personal area connectivity for consumer electronics and IoT applications.

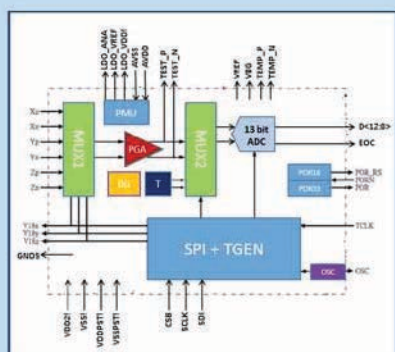
The system design of the
NB-IoT
窄帶物聯網系統設計



Testing equipment
測試儀器

Low Power Design

The Low Power Design Group has developed a full range of silicon-proven IPs for low power sensor signal processing. These IPs have been widely adopted in various applications such as Hall sensor, wireless electrocardiography, uncooled infrared micro-bolometer and G-sensor. Many of these have already been licensed to customers for mass production.

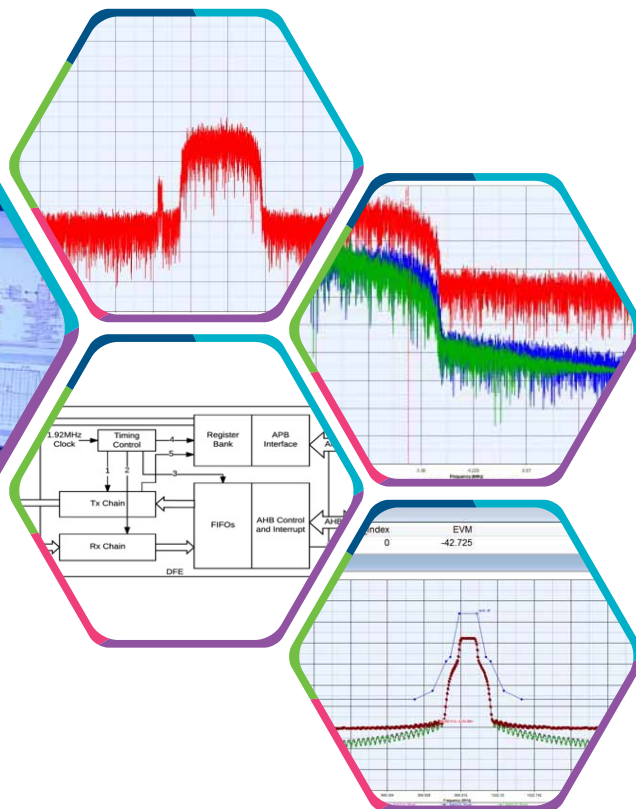


A highly integrated solution for G-sensor application - the three-channel analog front-end
三通道類比前端是用作加速傳感器應用的高集成解決方案

技術重點與服務

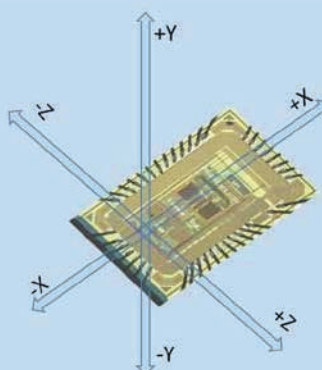
射頻系統

射頻系統技術組採用最先進的低功耗集成電路設計，提供無線連接解決方案，研發範圍涵蓋窄帶物聯網 (NB-IoT) 及最新的低功耗藍牙 (BLE) 技術。除了促進智慧城市應用的開發，窄帶物聯網更可為個人、工業以及具物聯網傳感器的裝置和系統提供廣域連接。低功耗藍牙技術則涵蓋個域與局域網絡的消費電子和物聯網應用。



低功耗設計

低功耗設計技術組為低功耗傳感訊號處理研發了一系列已進行流片驗證的IP模塊。這些IP可廣泛應用於霍爾傳感器、無線心電圖、非製冷紅外微測輻射熱計，及加速度傳感器 (G-sensor) 等應用，其中大多數已授權給客戶進行大量生產。

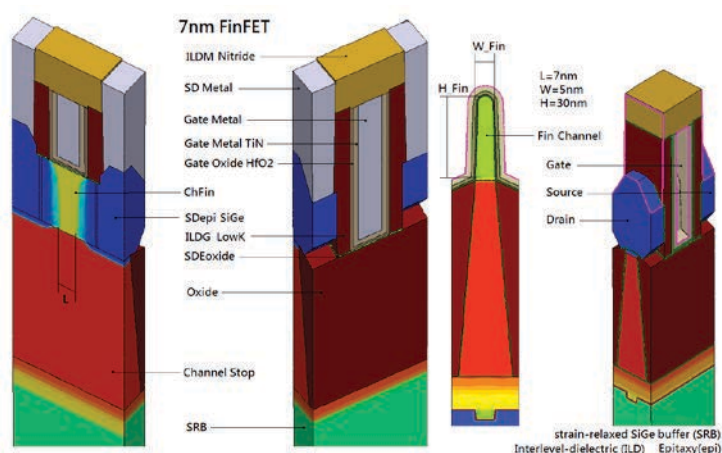


Technology Co-Design

The Technology Co-Design Group focuses on the development of advanced semiconductor devices and modelling. It provides solutions for ESD protection devices, semiconductor sensors and other novel semiconductor devices. Its core competence includes virtual fabrication technology as well as compact model extraction methodology. These technologies make it possible to virtually develop processes and devices in an optimised and efficient manner. The Group has developed comprehensive IP portfolios for device design and modelling, including area-efficient ESD structure IPs, process independent scalable I/O libraries and BSIM models.

The Technology Co-Design Group collaborates very closely with IC foundries and design houses to develop unique advanced devices and model IPs in Complementary Metal-Oxide-Semiconductor (CMOS) technologies. It has successfully delivered device and model IPs from 0.5 μ m to 16nm FinFET processes.

FinFET structure developed by ASTRI
應科院研發的鰭式場效電晶體結構



協同設計技術

協同設計技術組致力於先進半導體器件的開發與建模，為靜電防護器件、半導體傳感器及其他新型半導體器件提供解決方案，其核心技術包括虛擬製造平台和集約模型提取方法學。這些技術可以令半導體的研發過程和器件設計得以優化和達到最佳的效能。技術組已經開發了多種器件與模型IP，包括更小的靜電器件結構、與工藝無關的可擴展輸入/輸出端口數據庫及 BSIM 模型庫。

協同設計技術組與集成電路製造廠和設計公司密切合作，開發應用於互補金屬氧化物半導體 (CMOS) 技術的獨特先進器件和模型IP，成功交付了從0.5微米至16納米鰭式場效電晶體 (FinFET) 工藝器件和模型IP。

Innovation, Applications and Collaborations

NB-IoT standardisation

NB-IoT is the global standard based on public and spectrum-licensed 4G/LTE networks. It is the conduit for IoT products and application manufacturers to enter the vibrant market that is based on the NB-IoT standard and eco-system. ASTRI has actively participated in the standardisation of the 3rd Generation Partnership Project (3GPP) NB-IoT. A total of 13 proposals and way forwards were contributed. In June 2016, ASTRI co-hosted the standard meeting of 3GPP RAN4 with Huawei which was the first ever in Hong Kong. ASTRI has also promoted the NB-IoT ecosystem together with Keysight Technologies and CEVA (the leading licensor of signal processing IP).

Co-hosting the first international standard meeting
of 3GPP RAN4 with Huawei in Hong Kong
與華為合辦香港第一個3GPP RAN4國際標準
技術會議

創新、應用和合作

窄帶物聯網標準化

窄帶物聯網是建基於公共和授權頻譜的4G/LTE網絡的全球標準。當物聯網產品和應用程式能結合窄帶物聯網標準和生態系統時，將可為生產商帶來豐厚利潤。應科院積極參與第三代合作夥伴計劃 (3GPP) 窄帶物聯網的標準化工作，提交了13項提案和發展方向。2016年6月，應科院與華為一同主辦了3GPP RAN4國際標準技術會議，是香港首次舉辦同類會議。另外，我們又與是德科技 (Keysight Technologies) 和CEVA (全球首屈一指信號處理IP授權公司) 一起推動窄帶物聯網生態系統的發展。



In December 2016, Keysight Technologies collaborated with ASTRI to introduce the industry's first NB-IoT design and simulation solution. Keysight Technologies has been closely collaborating with ASTRI on the development of RF transceiver architectures. This includes defining an RF and baseband interface and evaluating system performance and functionality for a NB-IoT terminal chipset.

In February 2017, CEVA and ASTRI introduced Dragonfly NB1, a comprehensive cost and power optimised NB-IoT solution to streamline the development of LTE IoT devices. The collaboration produced a complete M2M endpoint solution offering best-in-class performance and power consumption, that is easily integrated into a SoC. Dragonfly NB1 not only reduces the time taken to get NB-IoT products certified, but also provides Low-Power Wide-Area (LPWA) SoC designers with a flexible, software-upgradeable platform with key benefits in terms of die size and power consumption.

NB-IoT is the public cellular network standard for IoT applications

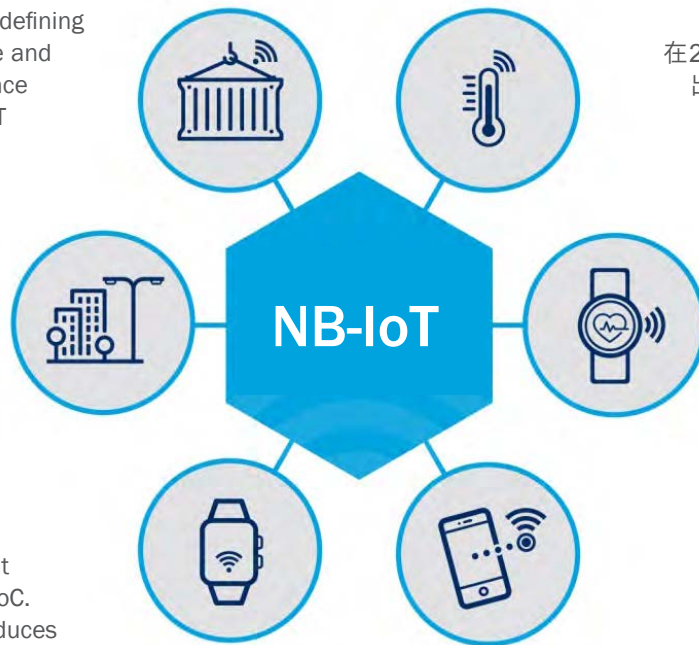
NB-IoT is easy to use and can penetrate deeply into almost all locations. It also enables terminal devices to operate for years on a small battery. In future, NB-IoT will be an ecosystem which will lead to substantial growth in the IoT market. In addition to enhancing many existing applications such as metering, remote sensing and telemetry, NB-IoT accelerates rapid development of the mass IoT market by providing reliable, low cost and accessible connectivity. Even the most low cost and low power devices such as municipal lighting, waste management, livestock breeding, irrigation, and environment monitoring can be realised using this technology. A set of NB-IoT IPs including RF transceiver and baseband are being developed by ASTRI. Set to be delivered by 2017, these IPs have already drawn the attention of several customers for IP licensing.

Bluetooth 5: a significant update to the Bluetooth Core Specifications

Bluetooth 5 delivers critical new features and benefits for Bluetooth Low Energy (BLE). With increased range, speed and broadcast messaging capacity, Bluetooth 5 unlocks a new world of possibilities, making it an ideal short-range

在2016年12月，是德科技與應科院合作，推出業界首個窄帶物聯網設計和仿真解決方案。是德科技一直與應科院緊密合作，開發射頻系統收發器架構。這包括了定義射頻和基帶接口，並評估窄帶物聯網終端芯片組的系統性能和功能。

在2017年2月，CEVA和應科院推出了Dragonfly NB1，這款成本和功耗優化的窄帶物聯網全面解決方案旨在精簡LTE物聯網終端的開發。雙方這次攜手合作提供了完整M2M終端解決方案，易於在系統晶片中使用。Dragonfly NB1不僅縮短了窄帶物聯網產品取得認證的時間，而且還為低耗廣域網(LPWA)系統晶片設計人員提供了一款在晶片尺寸和功耗方面具有極大優勢的靈活的軟件可升級的平台。



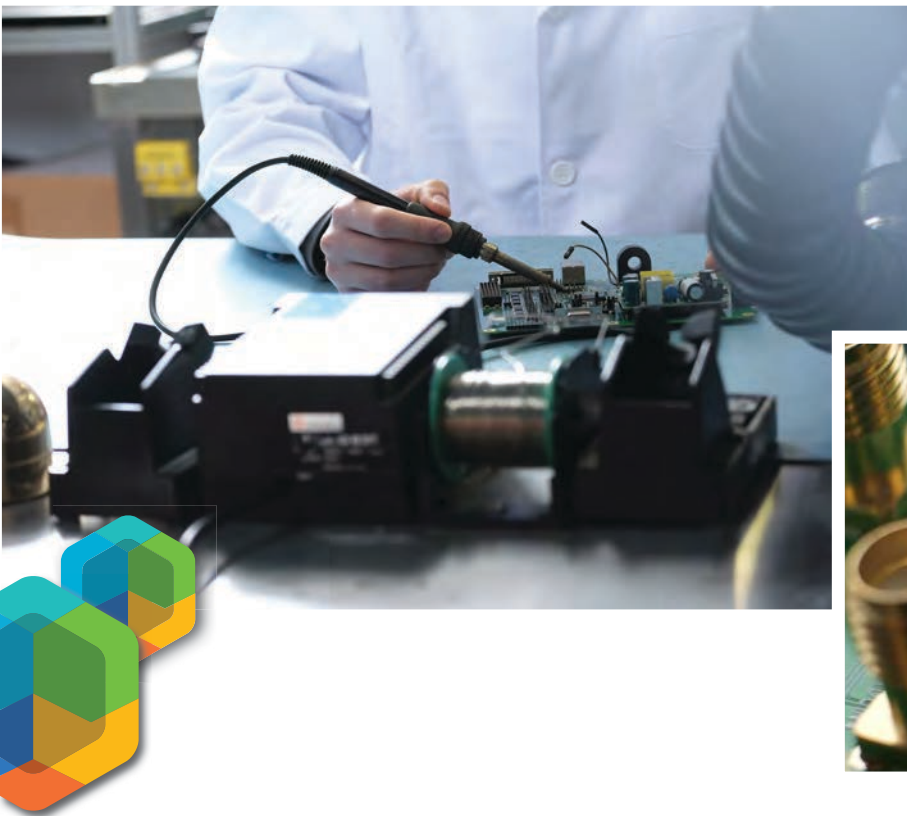
Applications of NB-IoT
窄帶物聯網的應用

窄帶物聯網是支援物聯網應用的蜂窩網絡公開標準

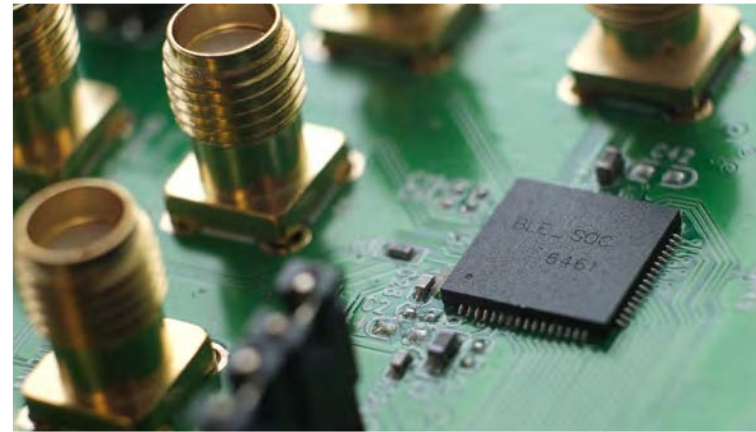
窄帶物聯網裝置使用方便，覆蓋全面，而且非常省電，僅憑一塊小型電池即可運行多年。窄帶物聯網有望在未來令物聯網市場實現大幅增長。在改進遠程抄錶、遙感及遙測等眾多現有應用的同時，窄帶物聯網還可為市政照明、廢物管理、畜牧養殖、灌溉及環境監測等應用提供成本更低廉的低功耗、可靠及覆蓋廣泛的網絡，加速廣域的物聯網市場的迅速發展。應科院正在開發一套窄帶物聯網IP，包括了射頻收發器和基帶，並將於2017年底完成。有關項目已吸引多家企業關注，商討相關IP授權事宜。

藍牙 5：藍牙核心技術的重大更新

藍牙5大幅提升低功耗藍牙 (BLE) 的性能和效益。隨著覆蓋範圍、速度以及傳播訊息容量上的提升，藍牙5成為了理想的短距離無線技術，在物聯網應用上開拓了新領域。應科院在射頻收發器、數字基帶以及其他IP的開發上採用創新關鍵技術，以滿足市場對藍牙性能的要求。我們將會



ASTRI will deliver a comprehensive set of IP portfolio and IC solution supporting the BLE 5 standard
應科院將推出全面IP系列及支援藍牙5標準的全套集成電路解決方案



wireless technology for IoT. ASTRI is developing critical and innovative technologies for RF transceiver, digital baseband as well as other IPs to meet the market's expectations. Advanced RF transceiver architecture, such as direct modulation transmitter and low-IF single conversion receiver with optimised digital baseband algorithms, will achieve optimal power, cost and performance. New features, 2Mbps PHY and low energy (LE) long range for instance, will double the speed and quadruple the range. BLE 5 System on Chip (SoC) with reference design will be produced. ASTRI will deliver a comprehensive set of IP portfolio and IC solution supporting the BLE 5 standard. Our solutions will capture the rapidly growing market with faster, smarter and more reliable connected devices based on BLE 5 technology.

Low capacitance ESD structures for RF applications

With the progress in wireless communication and network technologies, the working frequency and data transmission rate of the system have increased to GHz and Gbit. Meanwhile, the reliability concern has turned ESD/surge protection into an important issue. For RF circuit interfaces, problems of ESD-to-Circuit interactions have emerged as a major challenge. ASTRI is developing low capacitance ESD structures for RF applications based on 16nm FinFET technology. It not only aims to develop onchip low-capacitance (low-c) ESD structure for RF circuit ESD protection, but also target on-board low-c structure for ESD/surge protection in high speed data lines. The virtual

設計先進的射頻收發器架構，如直接調製發射器、低中頻單轉換接收器及優化數字基帶等，以達至理想的功耗、成本和性能。至於新功能方面，將會提升物理層數據速度兩倍、和增加低功耗長距離有效通訊距離達致四倍。應科院將推出全面IP系列及支援低功耗藍牙5標準的全套集成電路解決方案。我們的解決方案可幫助客戶通過更快速、更智能化、更可靠的低功耗藍牙技術連接裝置，把握這個增長迅速的市場機遇。

為射頻應用而研發的低電容靜電保護結構

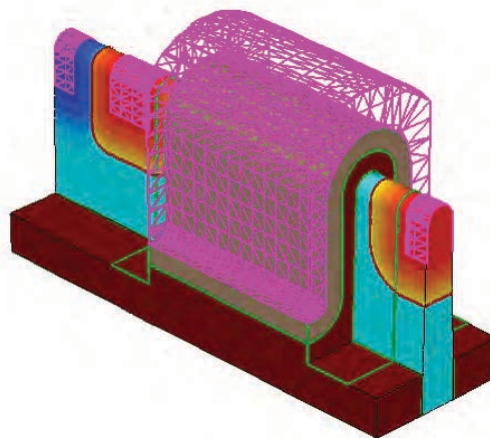
隨著無線通訊和網絡技術的進步，系統的工作頻率和數據傳輸速率已經提高到GHz和Gbit級。同時，可靠性問題使靜電脈衝保護成為重要課題。就射頻電路接口而言，靜電保護與電路的相互作用是一個主要技術挑戰。應科院在16納米鰭式場效應電晶體 (FinFET) 技術上開發低電容結構，滿足射頻電路的靜電保護。此項目不僅研發芯片級低電容結構以滿足射頻電路的靜電保護，同時還針對高速數據線靜電脈衝保護的板級低電容結構。虛擬製造是完整的靜電保護設計方法的基礎，可生成特製的低電容輸入/輸出單元，以應用於芯片上靜電保護或板級高速靜電脈衝保護。該項目屬於電子產品的可靠性研究，不僅提供芯片級

fab approach is presented as the basis of a complete ESD design methodology. Customised low capacitance I/O Cells can be generated for on-chip ESD protection or on-board high speed ESD/surge protection. This project is a reliability research of electronic products, which provides not only chip level ESD protection, but also system level ESD/surge protection solutions. Successful implementation will make our electronic products such as mobile phones and PC safer and more reliable. The technology has already been licensed to a leading multi-national IC design company.

靜電保護，而且提供板級靜電脈衝保護解決方案。此技術方案如成功推出市面，將可令電子產品如：手機、電腦等，變得更加可靠、更加安全。此技術已經授權給全球領先的集成電路設計公司。

ASTRI is developing the low capacitance ESD structures for RF applications based on 16nm FinFET technology

應科院在16納米鰭式場效應電晶體（FinFET）技術上開發低電容結構滿足射頻電路的靜電保護



Hall Sensor Application Specific Integrated Circuit (ASIC)

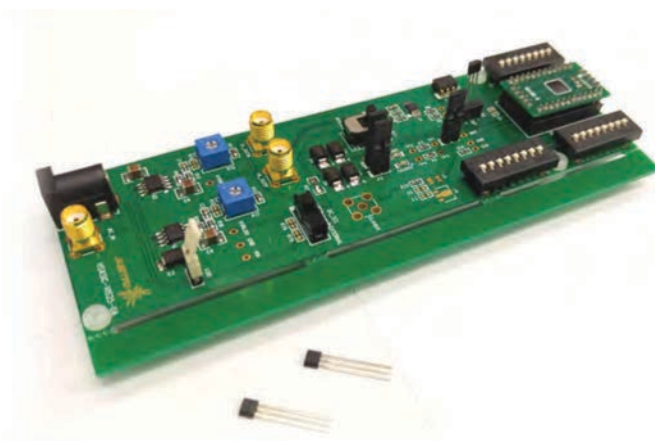
This is a critical part of the Brushless Direct Current (BLDC) motor controller. The high performance and extremely reliable BLDC motor offers many advantages such as noise-free, maintenance-free and low cost. Its compact size and long durability are of great value too. The BLDC motor operates with high efficiency, contributing significantly to energy saving and environmental protection. ASTRI has already transferred the Hall sensor ASIC design to a leading motor manufacturer. Embedded with our innovative Hall sensor ASIC, the controller module is a quarter of the size of the manufacturer's existing product. The development has involved overcoming a series of difficulties within a short period, including device and process design, weak signal processing and noise cancellation. With solid design methodologies, the team has developed ASIC with the first tapeout success. The manufacturer is currently gearing up for mass production of the ASIC in 2017, expecting to make a great leap in the motor controller market.

霍爾傳感器專用集成電路

霍爾傳感器專用集成電路是無刷直流電馬達控制器的重要组成部分。性能卓越、高可靠性的無刷直流電馬達擁有很多優勢，如無噪音、無需維護及低成本，它們體積既小又耐用，運行效率高，而且節能和環保。應科院已將霍爾傳感器專用集成電路設計轉讓給一家領先的馬達製造公司。嵌入我們的創新霍爾傳感器專用集成電路後，控制器模組的尺寸是公司目前產品尺寸的四分之一。我們的研發團隊在短期內克服了包括裝置及工藝設計、弱訊號處理及雜訊消除等一系列困難。憑藉堅實的設計方法，應科院團隊設計的專用集成電路在首次流片已取得成功。合作夥伴公司正準備於2017年開始大量生產專用集成電路，並將為馬達控制器市場帶來重要突破。

Hall sensor ASIC makes the controller module more compact

霍爾傳感器專用集成電路讓控制模組體積變得更小





Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Advanced Device IP Platform 先進器件IP 平台	Mar 2015 – Jun 2017 2015年3月至2017年6月
Investigation of FinFET ESD Design FinFET 靜電保護設計研究	Mar 2016 – Mar 2017 2016年3月至2017年3月
System-on-Chip for Next Generation Bluetooth Low Energy 下一代低功耗藍牙系統芯片	Mar 2016 – Nov 2017 2016年3月至2017年11月
IP Platform for Cellular Internet of Things 用於蜂窩物聯網的IP平台	Mar 2016 – Nov 2017 2016年3月至2017年11月
RF Transceiver Investigation for Bluetooth Low Energy 5 應用於低功耗藍牙5的射頻收發機研究	Feb 2017 – Nov 2017 2017年2月至2017年11月
Low Capacitance ESD Structures for RF Applications 適用於RF應用的低電容ESD保護結構	Feb 2017 – Feb 2019 2017年2月至2019年2月
Advanced Bluetooth Low Energy SoC 先進低功耗藍牙系統芯片	Mar 2017 – Dec 2018 2017年3月至2018年12月



ADVANCED DIGITAL SYSTEMS

先進數碼 系統

Overview

The Advanced Digital System Division (ADS) delivers state-of-the-art SoC design - from advanced algorithm research to IC specification and implementation to production IC testing. ADS plays an important role in the Hong Kong branch of Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System. It strives to create valuable silicon IPs through commercially viable in-house innovation. It targets emerging IC applications in IoT communication, 3D and 4K/8K video and machine learning platforms. ADS creates value by actively engaging with partners across relevant industries and by channelling the outputs of advanced research from local universities to commercialisation through IC realisation and customisation. To enhance the competitive edge of industry partners, ADS offers market-competitive IPs and total turn-key IC solutions.

ADS focuses on the following key technology initiatives:

- IoT Communication IC
- Hardware-oriented Secure Data Storage Platform
- 3D Immersive VR and 4K/8K Video
- SoC Design Services
- Machine Learning Platforms

概覽

先進數碼系統技術部（ADS）提供最先進的系統晶片（SoC）設計，涵蓋嶄新的程式計算研究、晶片規格、測試到製作晶片等服務。該部門為國家專用集成電路系統工程技術研究中心香港分中心作出重要貢獻。部門致力透過市場導向的內部研究，如新興物聯網（IoT）通訊集成電路應用、3D和4K/8K視頻和機器學習平台等，在晶片設計完成後製作晶片樣板以作測試，從而創造具價值的矽IP。技術部積極與業界夥伴合作，透過實現和定制集成電路，將本地大學的高科技研究成果市場化，為業界創造更高價值。此外，技術部提供市場上具競爭力的IP和全面的集成電路解決方案，從而以提升業界夥伴的競爭力。

先進數碼系統技術部專注研發以下的主要技術：

- 物聯網通訊集成電路
- 硬件導向的安全數據儲存平台
- 3D沉浸式虛擬實境（VR）和4K/8K視頻科技
- 系統晶片設計服務
- 機器學習平台

Technology Focus and Services

FinTech

ASTRI works with the Hong Kong Monetary Authority (HKMA) to develop various FinTech applications, Proofs of Concept (PoC) and research projects related to Distributed Ledger Technology (DLT). Commissioned by the Hong Kong Monetary Authority (HKMA), ASTRI developed a Whitepaper on Distributed Ledger Technology (DLT) in November 2016. Working with HKMA's Digital ID Workgroup, ASTRI developed a Digital Identity Management PoC system based on DLT. The exercise was completed in March 2017. The system improves operational efficiency by eliminating duplicated efforts and saving time while Know Your Customer (KYC) processes are performed by banks. It also makes it more convenient for the bank customers to deal with KYC and other compliance requirements. ASTRI has also collaborated with Hong Kong Exchange in 2016 to develop a DLT-based corporate action voting PoC system to ensure better transparency and greater efficiency in the securities investors' voting process. The prototype was completed in Q4 of 2016.

技術重點與服務

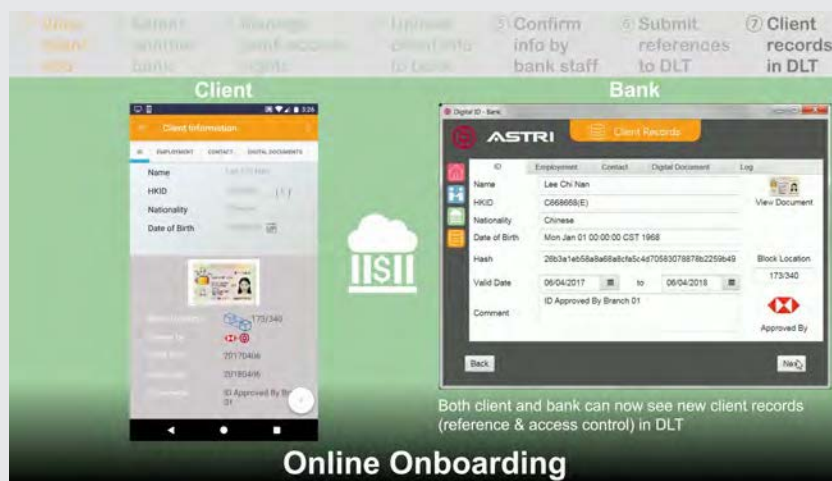
金融科技

應科院與香港金融管理局（金管局）合作研發多項金融科技的應用、概念驗證（PoC）及就分布式分類帳技術（DLT）進行研究項目。此外，應科院亦受金管局委託，於去年11月撰寫《分布式分類帳技術白皮書》；此外又與金管局的數碼身份認證工作小組合作，於2017年3月利用分布式分類帳技術研發數碼身份管理概念驗證系統。該系統有助銀行在「認識你的客戶」（KYC）的流程上減省了重覆的步驟，簡化繁複的手續及節省執行時間，方便客戶辦理銀行服務及其他合規程序，從而提升銀行的營運效率。應科院亦於2016年與香港交易所合作，研發一套採用分布式分類帳技術於公司股東投票的概念驗證系統，以確保證券投資者的投票過程具更高透明度和更有效率。應科院已於2016年第四季完成研發系統的測試版本。



White Paper on Distributed Ledger Technology
Commissioned by the HKMA, ASTRI develops a Whitepaper on Distributed Ledger Technology (DLT) in 2016

應科院受金管局委託，於去年撰寫《分布式分類帳技術白皮書》



Demonstrating the user interface of Digital Identity Management Proofs-of-Concept system
示範數碼身份管理概念驗證系統技術的操作界面

Communications

The Communications Group continues to develop and enhance high-performance power line communication processors. The Group implements silicon IPs to improve communication robustness over power line network based on various industry standards. The Group also develops Blockchain system protocols and applications. It evaluates and optimises Blockchain protocols to improve security, performance and scalability of these systems.

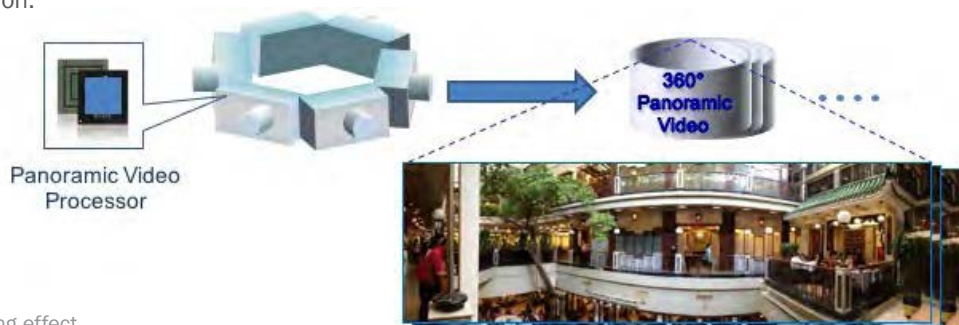
通訊

通訊技術組致力研發和優化高性能電力線載波通訊處理器。該技術組根據多個業界的標準製作流片IP，以提高電力線網絡通訊的穩定性。技術組亦研發區塊鏈（Blockchain）系統的規程和應用，透過評估和優化區塊鏈的規程，提高這些系統的安全性、表現和可擴展性。

Video

The Video Group focuses on improving visual experience in display applications. The Group develops software and hardware accelerated solutions for super-resolution based HD-4K conversion. These solutions are currently used in 4K video production and broadcasting systems.

In addition to 2D visual experience, the Video Group also exploits 3D and other immersive display applications. During 2016-2017, the Group completed the development of a real-time 3D conversion hardware platform for state-of-the-art ultra-high definition spectacles-free 3D displays. The platform greatly expedites 3D content production by using the Field Programmable Gate Array (FPGA) based hardware accelerator and custom-made software plug-ins. In addition, the Group has started developing algorithms and hardware accelerated solutions for 360° panoramic video systems. By enabling panoramic video to be captured using multiple cameras, the FPGA-based platform provides a real-time solution for creating high quality panoramic video with high dynamic range and uniform scene resolution.



Design of panoramic video processor and filming effect
360度全景視頻系統的設計和影像效果

SoC Design

The SoC Design Group realises IC's product ideas for innovative designs. Turning IC and system product ideas into real products involves various design processes covering architecture, digital logic, analog circuitry, physical, component simulation, system testing and software. The Group works closely with the other Groups under ADS and the customers to implement their architecture designs and logic forms into a production ready silicon and system platform. The support model is flexible enough to balance the various trade-offs based on diversified design scenarios and maximised design value.

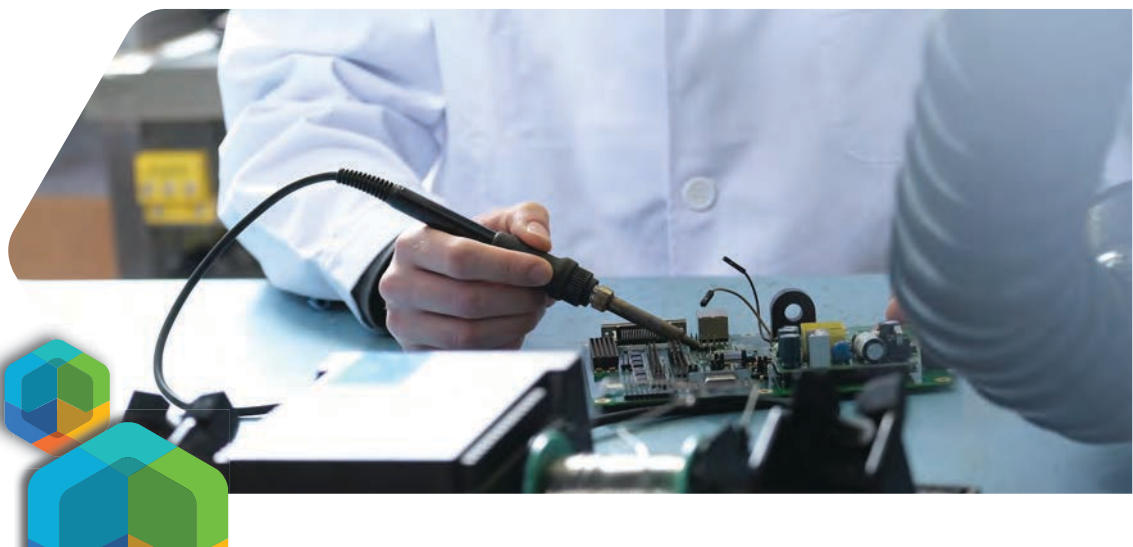
視頻

視頻技術組致力研發提升人們視覺體驗的技術平台，並開發專為超高解像度之高清4000像數（4K）轉換器而設的軟件和硬件加速解決方案，用於4K視頻製作和廣播系統。目前該解決方案廣泛應用於4K視頻製作和廣播系統。

除了2D視覺體驗，視頻技術組亦積極研發3D和其他沉浸式顯示的應用，使影像猶如真實場景般展現在眼前。在2016至2017年期間，視頻團隊成功研發一個能進行實時3D轉換的硬件平台，讓使用者無需佩戴特製眼鏡，也能欣賞到超高清3D影像。該平台透過附有現場可編程門陣列（FPGA）集成電路配件的加速器和特製的軟件插件，大幅縮短3D影像內容的製作時間。此外，該技術組現正努力研發用於360度全景視頻系統的程式計算和硬件加速解決方案。附有FPGA集成電路配件的平台能支援多部攝影機拍攝全景視頻，可實時產生高動態和解像度一致的高質素全景視頻。

系統晶片設計

系統晶片設計技術組致力把創新的設計和集成電路的概念轉化為真實的產品。當中包括多項設計流程：產品架構生成、數碼邏輯設計、模擬電路設計、物理層面設計、電路仿真、系統測試及軟件編寫等。系統晶片設計組更聯同部門旗下的其他團隊與客戶緊密合作，確保產品的架構和概念設計能變成可隨時投產的晶片和系統平台。這種相輔相承的合作模式，令系統晶片設計的流程更靈活，讓研發人員及客戶平衡不同設計方案的利弊而作出取捨，以達到更大的效益。



Machine Learning Platforms

Machine Learning Platforms Group focuses on high-performance, dedicated hardware solutions for machine learning algorithms and artificial intelligence (AI) applications. The group develops innovative deep learning neural network (DNN) optimisation technologies and tools for hardware implementation as well as FPGA accelerators for high-efficiency DNN computations.

Deep Learning Accelerator
深度學習加速器



機器學習平台

機器學習平台技術組利用人工智能（AI）技術，專注研發應用於高性能硬件解決方案上的機器學習程式計算，以提升影像視頻方面的質素及加快3D影像轉換和4K視頻內容製作。研發團隊致力開發創新的深度學習神經網絡（DNN）優化技術和工具，使技術能應用於提升視頻質素的硬件上；另外團隊就附有FPGA集成電路配件的加速器，積極研發優化技術和程式計算，從而實現高效的視覺體驗技術平台。

Innovation, Applications and Collaborations

Communications

ASTRI has started an industrial collaborative project to design a wideband smart meter SoC. The SoC will comply with the China industry standard of powerline communications for smart meters. The team will leverage its ASIC powerline communications expertise in helping our customer to build a complete SoC solution that includes algorithm design, analog frontend, ASIC and firmware implementation.

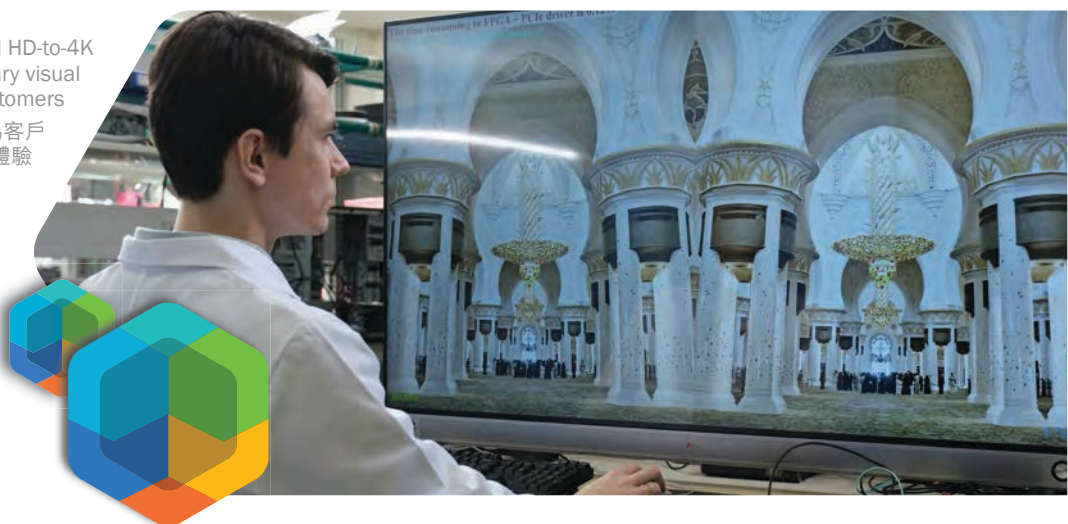
創新、應用和合作

通訊

應科院展開一項有關寬頻智能電錶系統晶片設計的業界合作項目。該系統晶片將符合中國智能電錶電力線通訊行業的標準。技術組亦憑他們在專用集成電路（ASIC）電力線通訊技術的專業知識，協助客戶構建全面的系統晶片解決方案，包括程式計算設計、類比前端集成電路設計、專用集成電路和固件的製成。

ADS develops super-resolution-based HD-to-4K conversion which can bring extraordinary visual experience to the customers

先進數碼系統超高解像度的高清4K，可為客戶帶來非凡的視覺體驗



Video Technology

The 3D technologies developed by the Video Group can be widely applied in 3D conversion service, digital signage, movie and gaming. The applications can also be extended to education and medical imaging. The super-resolution based HD-4K conversion technology can be used in 4K and 8K video content production, upgrading and broadcasting.

視頻技術

視頻團隊開發的3D技術可廣泛應用於3D轉換服務、電子廣告牌、電影和遊戲。該3D技術的應用亦可擴展至教育和醫學影像範疇。而超高解像度的高清4K轉換技術可用於4K和8K視頻內容製作、廣播，和高清電影和視頻的升級。



The Machine Learning Platforms Group has developed an FPGA accelerator for DNN-based video enhancement and applies the technology to 4K/8K video production and devices. The optimised DNN-based technology improves the visual quality of videos and reduces hardware implementation cost.

The algorithms being developed in 3D conversion aim to generate professional 3D output (for both stereo and auto-stereo) in real-time up to ultra-high definition, which are far superior to other solutions available in the market. The hardware accelerated software-hardware hybrid conversion platform is also the world's first technology for 3D conversion.

ASTRI has been developing image enhancement, 3D conversion and resolution technologies for several years, with many platform projects also underway. These projects aim for hardware or hardware-software hybrid platforms, with the implementation of ASTRI's self-developed image processing algorithms. The platforms are meant to deliver sophisticated 3D conversion, and resolution and image enhancing solutions.

- One patent on visual-experience-optimised super-resolution was granted in 2017.
- One patent on high resolution panorama generation was filed in 2016.
- One patent on bit-depth reduction in artificial neural networks was filed in 2017.

SoC Design

The SoC Design Group has been developing Analog IPs for various IC applications. Both Analog IP blocks for SoC application and pure Analog base ICs are supported. Some of the examples are multichannel Analog-to-Digital Converter (ADC) for satellite navigation and video application, Analog Front End (AFE) for power line communication, network controller, motor driver, and ultra-low power timing control IC. ADS has developed patents for power line communication synchronisation algorithms and IP implementation. This improves communication robustness in adverse power line environments.

In the past year, we developed a new SoC application on satellite navigation. The target application supports both GPS and China Beidou navigation standards.

機器學習平台團隊開發了附有FPGA集成電路配件的加速器，可提升採用DNN技術製作的視頻質素，亦能應用於4K/8K視頻製作和裝置。優化的DNN技術能提升視頻的視覺效果，並可降低硬件製造的成本。

視頻技術組所研發的3D轉換程式計算旨在達至實時專業輸出超高清3D影像（立體和自動立體），而影像質素遠超於市面上現有的方案。此硬件加速3D轉換平台是全球首個軟硬件混合3D轉換技術。

應科院一直致力研發提升影像質素、解像度及3D轉換的技術。我們現正進行多個研究項目，旨在把應科院研發的影像處理程式計算應用至硬件或混合軟硬件的平台上。這些平台能實現複雜的3D轉換和提升影像解像度和質素。

- 2017年獲授一項關於視覺效果優化的超解像度專利
- 2016年提交一項高解像度全景製作技術的專利申請
- 2017年提交一項減少人工神經網絡位元深度的專利申請

系統晶片設計

系統晶片設計技術組一直致力為各種集成電路應用發展類比IP，支援應用於系統晶片類比IP模塊以及純類比基礎集成電路，當中例子包括用於衛星導航和視頻應用的多頻道類比數位轉換器（ADC）、用於電力線通訊的類比前端集成電路設計（AFE）、網絡控制器、電機驅動器和超低功率的時間控制集成電路。先進數碼系統技術部成功就電力線通訊同步算法，和IP實施方面取得了專利，有助改善在惡劣環境下電力線的通訊穩定性。

應科院在過去一年成功研發應用於衛星導航的嶄新系統晶片。該應用支持全球定位系統和中國北斗衛星導航系統的標準。



Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Intelligent Video Accelerator 智能視頻加速器	Mar 2017 – Dec 2018 2017年3月至2018年12月
3D Conversion Technologies for Next Generation 3D Display 應用於下一代3D顯示的3D轉換技術	Oct 2015 – Apr 2017 2015年10月至2017年4月
Hardware Enabled Deep Convolutional Neural Network (DCNN) for Imaging Applications 硬件支持的深度卷積神經網圖像處理應用	Mar 2016 – Mar 2017 2016年3月至2017年3月
Advanced Powerline Communications 先進電力線通訊	Aug 2015 – Aug 2017 2015年8月至2017年8月
BeiDou/GPS Dual-mode baseband SoC 北斗/GPS雙模基帶SoC芯片	Nov 2015 – July 2017 2015年11月至2017年7月
Panoramic Video Processor 全景視頻處理器	Jun 2016 – Mar 2018 2016年6月至2018年3月
3D Processing for Immersive Analytics 應用於沉浸式分析的三維處理技術	Jan 2017 – Oct 2017 2017年1月至2017年10月
Blockchain Technology and Applications for Private Domain 私人領域區塊鏈技術和應用	Jun 2016 – Mar 2017 2016年6月至2017年3月
Wideband Smart Meter SoC 寬帶智能儀表系統芯片	Jan 2017 – Jan 2019 2017年1月至2019年1月

OPTO- ELECTRONICS

光電子

Overview

Opto-electronics (OE) Technology Division has three core competence groups (CCG) that develop and commercialise market-driven solutions for intelligent manufacturing, smart city and healthcare applications. The Manufacturing Technologies (MTECH) Group focuses on 3D machine vision, display and sensing, and intelligent industry robots. The Cyber-Physical Systems (CPS) Group focuses on model-based systems engineering for design, synthesis and validation of mission-critical cyber-physical systems of smart factories in Industry 4.0. The Modules and Integration (MI) Group specialises in healthcare electronics for preventive care.

This year, the OE Technology Division stepped into new areas such as deep learning-based defects classification technology, food safety and quality screening technology. It has been granted over 250 invention patents and completed more than 160 technology transfers to the industry over the past few years.

In the area of Intelligent Manufacturing, OE continued to develop technologies that can automatically adapt to changing environments and varying production process requirements of industrial units. It focused on Machine

概覽

光電子技術部（OE）擁有三大技術組專注研發市場導向的技術方案，並把有關方案商用化。技術方案主要應用在智能製造、智慧城市和醫療保健等領域。製造技術組集中研發3D機器視覺、顯示與感應技術及智能工業機器人。信息物理系統技術組專注研發採用模型建立的系統工程，系統適用於設計、合成和驗證在「工業4.0」智能工廠中執行關鍵任務的信息物理系統。模組與集成技術組則專注研發醫療保健電子技術。

光電子技術部於本年度開拓了兩個全新的研究領域，包括採用深入學習的瑕疵分類技術及食品安全和品質篩選技術。在過去數年，技術部已累積獲取超過250項專利，並成功把超過160項技術轉移至業界。

在智能製造方面，光電子技術部致力研發可自動應對環境變遷和符合各種製造過程要求的技術。部門專注研究機器視覺技術和信息物理系統。我們與多間頂尖製造商進行多方面的合作，包括：(1)簽訂業界合作項目協議，研發新一代協同自動機系統；(2)於內地工廠的生產線全面應用桌面式表面瑕疵檢測系統；(3)授權不同業界使用應科院所研發的3D機器人視覺技術。

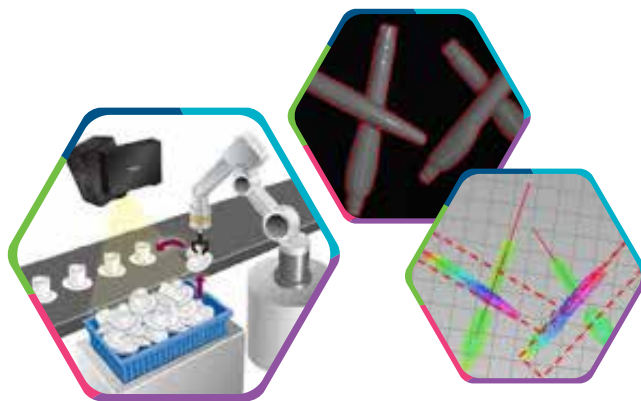
Vision and Cyber-Physical Systems. The Division closely collaborated with several top-tier manufacturing companies in (1) an ICP contract signed to develop the future generations of Collaborative Automator Systems; (2) full implementation of desktop surface inspection system at the Mainland factory lines; (3) licensing ASTRI developed 3D robotic vision for different industry cases.

In terms of Smart City, OE has successfully developed a Head Up Display (HUD) design, which involves see-through optical engines, and finger detection and eye tracking interactive algorithms. These strengthen driving control and safety measures, and enables auto-makers to commercialise related innovative features. Similar technologies have been applied to the Head Mounted Display (HMD) to provide a large field of view (FOV) for augmented reality (AR) applications.

On health monitoring devices, OE successfully commercialised technologies for modularised blood pulse oximeter, and worked with NGO partners to conduct the field test of its cuff-less blood pressure device. OE is expanding its sensing capability into food safety, quality screening and environmental monitoring, applying its technology into component-level design.

在智慧城市方面，光電子技術部成功設計車載抬頭顯示器（HUD），其中包含透視光學引擎、手指檢測和眼球追蹤互動程式計算等技術。這些特點進一步提升車輛操作及駕駛安全，使汽車製造商能把此嶄新技術商業化。頭戴式顯示器也採用了類似技術，為擴增實境（AR）的應用提供廣闊的視野範圍。

在健康監測儀器方面，光電子技術部除了成功把模組式脈搏血氧技術商業化外，亦與多個非政府機構合作，實地測試無袖帶血壓監測儀。光電子技術部積極研發傳感技術，並擴展技術的應用範疇至食品安全、品質篩選和環境監測上，亦把相關技術應用於組件設計上。



Self-learning 2D/3D object recognition
自學2D/3D對象識別技術

Technology Focus and Services

Manufacturing Technologies (MTECH)

MTECH CCG focuses on developing vision and perception technologies. Its core competence includes miniaturising optical engines, as well as creating image understanding and metrology algorithms. There are two technology platforms in MTECH CCG: (i) Machine Vision and (ii) Intelligent Projection.

The Machine Vision technology platform has been used to develop an innovative 2D/3D automatic optical inspection (AOI) system to facilitate Industry 4.0 smart factories, machine deep learning based algorithms for defect inspection and classification, and 3D random bin picking technology for industrial robots. The team works with tier-one manufacturers to develop automated visual inspection systems for production lines, replacing manual inspections on both functional and cosmetic defects.

技術重點與服務

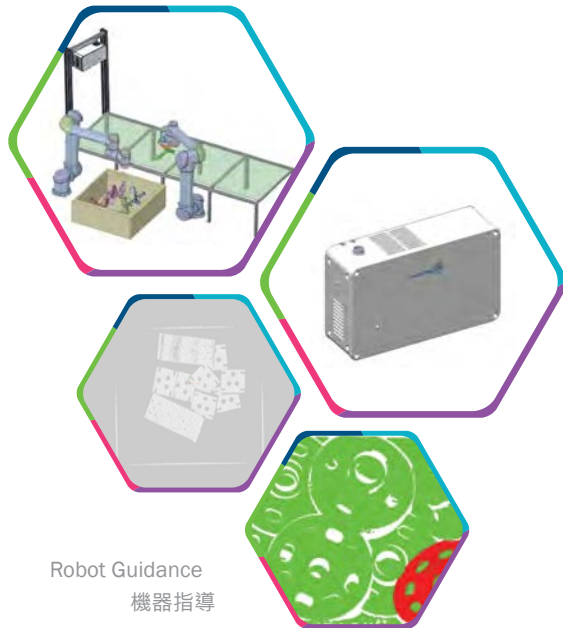
製造技術

製造技術組專注研發視覺和感知技術，核心技術涵蓋微型化光引擎和影像識別與認知程式計算。製造技術組擁有兩個主要技術平台，分別為：(i) 機器視覺和 (ii) 智能投影。

機器視覺技術平台專注開發嶄新的2D/3D自動光學檢測（AOI）系統，以推動發展「工業4.0」智能工廠、採用機器深度學習程式計算的瑕疵檢查和分類，以及應用於工業機器人的3D隨機堆疊取放技術。技術組與多家頂尖製造商合作，共同研發應用於生產線中的自動化視覺檢測系統，取代人手檢查產品功能和表面瑕疵。



The technology and devices to carry out quality inspection (from left): 3D AOI machine and Off-Axis projector
進行質量檢測的技術和設備（左起）：3D自動光學檢測機器和離軸投影機



Robot Guidance
機器指導

The Intelligent Projection technology platform leverages its expertise to develop see-through display systems covering small FOV HMD and large FOV see through HMD. These technologies have been developed further to augmented reality (AR) display technologies for automotive HUD, wearable HMD, as well as other advanced manufacturing applications. The core technologies include Liquid Crystal on Silicone (LCoS) phase modulation panel design and packaging, laser holographic projection optics and related algorithms. This CCG also specialises in FOV see-through display, miniaturised optics integrated gesture, and eye tracking sensing.

Cyber-Physical Systems (CPS)

CPS CCG has particular focus on virtual prototyping, which deploys Model-Based Systems Engineering (MBSE) principle to support system-level design and emulation of complex system dynamics. They also facilitate the evaluation of overall system performance ahead of physical prototype construction. That helps to avoid design iterations, and optimises performance and reliability. New applications developed in CPS improves throughout from the value chain - from system technologies to developers and operators.

CPS works on future generations of embedded ICT systems that bridge the information world and the physical world. It paves the way for a wide range of innovative applications and service in automotive, aerospace, health and energy as well as smart city domains. For the next industrial

System-level Virtual Prototyping of Embedded Systems
嵌入式系統的系統級虛擬樣機



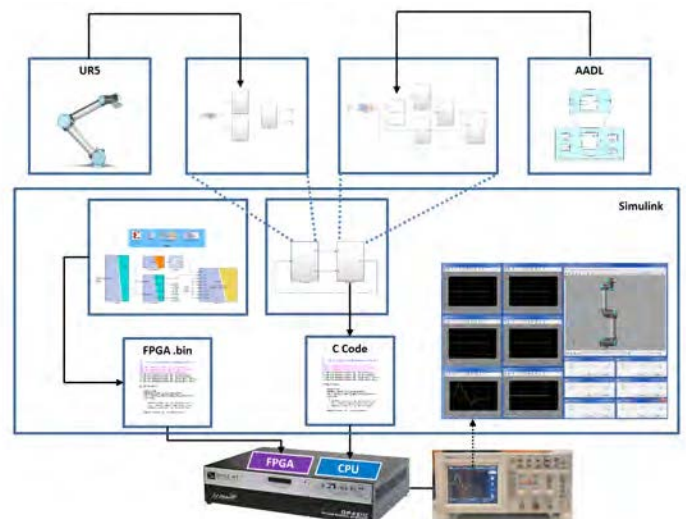
3D vision system with machine deep learning based algorithms for defect inspection and 3D random bin picking technology
三維視覺系統兼具備機器深度學習程式計算，可用於瑕疵檢測以及工業機器人的3D隨機堆疊取放技術

智能投影技術平台利用其專業知識的優勢，研發多種透視式顯示系統，包括較小視野範圍頭戴式顯示器及廣闊視野頭戴式顯示器。技術組更作進一步的研究，開發適用於車載抬頭顯示器、穿戴式頭戴顯示器及各先進製造業的擴增實境（AR）顯示技術。這些核心技術包括矽基液晶相位調製面板設計和封裝、鐳射全息投影光學及相關程式計算等。技術組亦專注研發透視視野顯示器、小型光學整合動作和眼球追蹤感應技術。

信息物理系統

信息物理系統技術組專注研發虛擬原型設計，該設計採用模型建立的系統工程原理，以支援系統設計和模擬複雜系統的動力。這技術有助廠商在製造任何實體原型前，評估整體系統的表現，從而減少修改設計、優化及提升成品性能和可靠度。由技術組所研發之新的應用，能影響整個價值鏈，改善系統技術，並對研發人員和營運商帶來改變。

信息物理系統技術組致力研發新一代嵌入式資訊及通訊科技（ICT）系統，全面連接網絡世界和真實世界。小組成



revolution – referred to as Industry 4.0 – these technologies will fundamentally change the landscape of manufacturing sectors. That is a requirement for the disruptive evolution in the processes of designing and building system architectures.

Modules and Integration (MI)

MI CCG develops different preventive smart health technologies to meet the growing demand for advanced healthcare tools and services. This year, it has ventured into the area of food safety and quality screening application. A new device, developed by this Group and based on Static Fourier transformation technology, can overcome the intrinsic trade-off between size and performance in the conventional spectroscopic devices, enabling on-site checking.

Over the past years, MI CCG developed technologies that include reflective-type pulse oximeter, cardiovascular monitoring device for arterial stiffness measurement, continual cuff-less blood pressure monitoring, cognitive health monitoring device, and non-invasive blood glucose monitoring device. Many of these technologies have been adopted by elderly care centres for trial and evaluation.

Innovation, Applications and Collaborations

Intelligent Wearable Information Display

Google, Samsung and other leading companies have already announced the launches, or development plans, of their wearable devices and accessories. The advancement of perceptual computing technologies have greatly accelerated the development of such devices. Wearable devices and their applications are the next battle field after PC and smartphones. ASTRI has developed see-through optical engines and interactive algorithms for finger/object detection, eye tracking, or related applications. These are applied in single sensing wearable display, bi-sensing wearable display and automotive HUD



功研發多項涵蓋廣泛範疇的創新應用和服務，包括：汽車、航天、健康、能源以及智慧城市。在迎接新一代工業革命（簡稱為「工業4.0」）的來臨，這些技術將徹底為製造業帶來重要變化。這正是變革系統架構和設計時的重要元素。

模組與集成

模組與集成技術組致力研發多項用於預防治療的智能醫療保健技術，以滿足社會對先進醫療保健產品和服務日益俱增的需求。今年，技術組展開在食品安全和品質篩選這個新領域的研究。新儀器採用了靜態傅立葉轉換技術，能克服傳統光譜儀器無法同時兼顧尺寸和性能需求的固有限制，有助進行實地檢查。

過往數年，技術組已成功開發多項技術，包括反射式脈搏血氧計、量度動脈硬度和連續無壓脈帶監測血壓的心血管監測裝置、認知健康監測儀和非侵入性血糖監測器等。多項技術已應用於長者中心進行試驗及評估工作。

創新、應用和合作

智能穿戴式資訊顯示器

隨著市場領先的企業如Google、三星等宣佈穿戴式裝置的生產發展計劃，加上此類裝置的感知運算技術發展迅速，穿戴式裝置及其應用將會繼電腦和智



Technologies including see-through optical engines, finger-detection and eye-tracking interactive algorithms are applied to the Head Up Display (right) and Head Mounted Display (left). The former will improve driving control while the latter aims to provide a large field of view display for augmented reality applications

以多項技術包括透視光學引擎，手指檢測和眼睛跟蹤交互算法，應用到車載式顯示器（右）和頭戴式顯示器（左）。前者將改進駕駛控制，而後者旨在為擴增實境提供廣闊視野顯示



solutions. Many of them have already hit the market – ASTRI has either licensed or transferred these technologies or provided design services to various industry players.

The team is leveraging on its expertise in see-through display systems covering small FOV HMD and large FOV see-through HMD. It will move further to develop augmented reality (AR) display technologies for automotive and advanced manufacturing fields as well. The project team will also venture into the novel optics components from macro optics to micro optics, which would facilitate diffractive and holographic optics for next generation see-through display applications. Overall, the team is trying to extend and integrate existing technology platforms to create new applications and products.

This year, Delphi-ASTRI Digital Optical Simulation Joint Laboratory was set up, followed by a contract service agreement to develop 2D green laser holographic projection engine and optical element film for head-up-display.

Four technology licensing and contract service agreements were signed with several companies for Head Mounted Display (HMD) and Head Up Display (HUD). The customers are looking for a variety of display technologies from ASTRI. These include laser holographic projection engine, large FOV HMD, LCoS-SLM panels assembly support and HUD, cascaded mirror type see through HMD, and projection module for waveguide type HMD.

Intelligent Visual Inspection Technology

Surface quality is an essential factor in the manufacturing sector for both end product appearance and component functions. Taking a smartphone OEM factory as an example, over 30% of the workforce is dedicated to inspecting appearances during the manufacturing process. Automatic visual inspection systems that employ intelligent image capturing and image processing technologies can make a huge difference in that regard. ASTRI has developed mixed-characteristic surface visual inspection technologies, multiple layers transparent surface visual inspection technologies, curve transparent surface visual inspection technologies, and One Glass Solution (OGS) touch panel glass defect inspection systems for the industry. These systems offer efficient solutions to increase both production speed and quality. With the implementation of our intelligent vision inspection technologies, automatic production lines can be widely rolled out across manufacturing sectors in the future.

The project team has successfully developed the patent portfolio and know-how of intelligent vision inspection technologies, comprising of human eye bionic illumination technology, fast defect density estimation technology, deep learning-based defect detection technology, high resolution

能電話後，成為生產商新的競爭市場。應科院研發透視式光學引擎和手指/物體檢測、眼球追蹤或相關的互動程式計算，應用於單感測的穿戴式顯示器、雙感測的穿戴式顯示器及車載抬頭顯示器。應科院成功把技術推出市場及轉移或授權予業界，並為多家業界企業提供設計服務，進行生產。

光電子技術部憑著其專業知識，研發透視式顯示系統，包括較小視野範圍頭戴式顯示器及廣闊視野頭戴式顯示器，並會繼續拓展研發新的技術領域，以至應用於汽車業及各先進製造業的擴增實境（AR）顯示技術。研發人員將通過新型光學元件，由微距光學至微光學，進一步研發此技術項目，利用衍射光電及全息光學以研發新一代的透視式顯示器。技術組努力不懈地拓展和融合現有的技術平台以發展創新的應用和產品。

應科院與德爾福共同成立德爾福－應科院數字光學模擬聯合實驗室，並簽訂合約服務協議，研發應用於車載抬頭顯示器的2D環徑鐳射全息投影引擎和光學薄膜配件。

應科院與多間頭戴式顯示器及車載抬頭顯示器的製造商簽訂合約服務協議，相關技術並獲得四項授權。客戶向應科院尋求多項顯示技術方案，包括鐳射全息投影引擎、顯示廣闊視野範圍的頭戴式顯示器、矽基型液晶空間光調變器板面裝配支援和車載抬頭顯示器、設計多關聯的級聯反射型透視頭戴式顯示器，和應用於波導型頭戴式顯示器的投影模塊。

智能視覺檢測技術

在製造業中，表面品質對成品外觀和組件功能是非常重要。以一智能電話委託生產商為例，在製造過程中，超過三成的工序用在產品外觀檢查上，因此製造商對採用智能影像擷取和處理的自動視覺檢查系統的需求非常殷切。應科院成功研發表面特徵視覺檢測技術和觸控面板玻璃瑕疵檢測機器，並推出市場。該機器能提供有效解決方案以提高生產速度和品質。隨著我們把所研發的智能視覺檢測技術推出，製造業界將來可把此技術廣泛應用於自動化的生產線。

技術組成功研發智能視覺檢測技術的專利和專門知識，包括人眼仿生照明技術、快速瑕疵密度評估技術、採用深度學習的瑕疵檢測技術、高解像度和高密度影像擷取系統設計等，並把相關系統和原型應用到業界夥伴的生產線上和進行測試。小組將致力研發和融合現有的技術平台以拓展新的應用，並研發更多如3D隨機堆疊取放和手眼靈活視覺檢測等技術，以供更多製造業界採用。

應科院與信利光電股份有限公司共同研發蓋板玻璃及觸控面板玻璃自動瑕疵檢測系統。此創新研發榮獲2016香港工商業獎：設備及機器設計獎，並成功應用於信利公司的工廠內進行測試運作。

and high sensitivity image capture system design, etc. A pilot run has been conducted successfully, leading to the deployment of system prototypes to industrial partner's production lines. In addition, the team will extend and integrate existing technology platforms to create more applications, such as 3D random pin picking and eye-in-hand flexible visual inspection for wider adoption in the manufacturing industry.

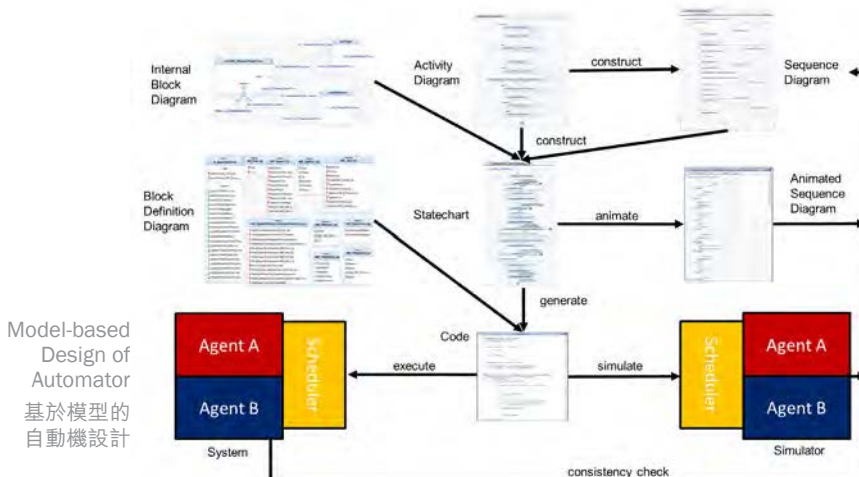
In a joint effort with Truly Opto-electronics, ASTRI developed the Cover Glass and Touch Panel Glass Automatic Defects Inspection System. The innovation won the '2016 Hong Kong Awards for Industries: Equipment and Machinery Design Award'. Pilot-run of the glass inspection system had been successfully conducted in Truly's factory.

ASTRI worked with a tier-one manufacturing company to develop a display panel dead pixel inspection system and mechanical part appearance defects inspection system. The phase 1 development was completed in Q1/2016. The phase 2 deliverable of desktop surface inspection was successfully developed this year and pilot-run in the partner's Wuhan factory.

A total of four technology licensing and contract service agreements were signed with several machine vision companies for ASTRI's 3D robotic vision technologies. Different industry cases have been covered, involving three-dimensional random bin picking, deep learning based classification and 3D vision technologies.

Model-based System Architecture Synthesis for Embedded Systems and Collaborative Automator Systems

The project aims to investigate and deliver Model-based System Architecture Synthesis for Embedded Systems by focusing on (1) System Architecture for Co-Synthesis; (2) Software-Defined Systems Synthesis; and (3) Integrated Real-time Implementation for enabling innovative Co-Synthesis technologies for performance-critical embedded systems. With the project outcome, ASTRI has built the technological foundation for the design of the next generation of intelligent connected embedded systems and Cyber-Physical Systems (CPS).



應科院與頂尖的製造商共同研發顯示屏壞點檢測系統和機器組件外觀瑕疵檢測系統。應科院已於2016年首季度完成首階段的研發，並於2017年成功研發外觀瑕疵檢測系統，現在與合作夥伴位於武漢的工廠內進行運作測試。

應科院的3D機器視覺技術共獲得四項授權。本院亦與多間機器視覺製造商簽訂合約服務協議，涵蓋不同的製造範疇，包括應用於工業機器人的3D隨機堆疊取放技術、採用深度學習的分類技術及3D視覺技術。



Delphi-ASTRI Digital Optical Simulation Joint Laboratory is set up to develop 2D green laser holographic projection engine and optical element film for head-up-display

成立德爾福 - 應科院數字光學模擬聯合實驗室，研發應用於車載抬頭顯示器的2D環保鐳射全息投影引擎和光學薄膜配件

採用模型的嵌入式系統架構合成系統及協同自動機系統

採用模型的嵌入式系統架構合成系統項目專注研發：(1) 系統架構的融合；(2) 軟件定義系統的合成；及 (3) 綜合實時性的應用，實現創新的融合技術於性能關鍵的嵌入式系統。應科院致力就此項目進行研發，成功建立新一代智能連接嵌入式系統設計及信息物理系統的技術基礎。技術組藉著其技術優勢，與業界合作研究協同自動機系統項目，共同研發新一代系統以實現智能工廠的發展。協同自動機系統作為一個具



The Mobile Manipulator - part of the project to develop future generations of collaborative automator systems

移動式機械手臂是研發新一代協同自動機系統項目的組成部分

By developing and leveraging technologies that are well-recognised, the project team collaborated with an industry partner to develop future generations of Collaborative Automator Systems (CAS) for smart factories. CAS is used to serve as a platform with mobility, sensing and manipulation capabilities to enable customisable but specific, reconfigurable, flexible, highly automated and collaborative manufacturing for a wide range of product and process needs. This project served as a great example of how a model factory could be designed and implemented based on Model-Based Systems Engineering (MBSE) paradigm to support the reindustrialisation of Hong Kong.

Having set up the ASTRI-SAE Joint Research and Development Centre, an Industry Collaborative Project (ICP) was undertaken to develop the future generations of Collaborative Automator Systems (CAS) to enable the realisation of smart factories.

Collaboration on Optical Module Integration Technology for Liquid Sensing

ASTRI partnered with a Mainland-based manufacturer to develop optical modules for liquid sensing. A patent of liquid sensing optical module has been filed, and is already available for technology licensing to the industry customers.

A wide range of applications of OE's technologies

Machine Vision

- Consumer electronics manufacturing in-line inspection
- Defect inspection in display panel manufacturing
- Automotive manufacturing
- 3D Random Bin Picking for industry robot

Intelligent Projection

- Automotive
- Wearable display
- Manufacturing
- Entertainment

CPS

- Collaborative Automator Systems
- Model-Based Design of Automator
- System-Level Virtual Prototyping of Embedded Systems
- Model-Based System Architecture Synthesis for Embedded Systems

MI

- Cardiovascular Monitoring
- Cognitive Health Monitoring
- Blood Glucose Monitoring
- Food Safety and Quality Sensing

移動性的平台，可進行感測和操控以訂製特定、可調較、具靈活性和高度自動化的協同製造，並適用於各種產品和生產需要。此項目將展示如何根據採用模型的嵌入式系統的範例，以設計和營運現代工廠，從而支持香港的再工業化。

繼應科院—新科聯合研發中心的成立，應科院簽訂業界合作項目協議，研發新一代協同自動機系統以實現智能工廠的發展。



ASTRI and SAE jointly establish research and development centre
應科院與新科實業共建聯合研發中心

光學模組集成技術與業界的合作

應科院與一家內地製造商共同研發應用於液體感測的光學模塊。應科院已就液體感測光學模塊技術提出專利申請，該技術亦可供授權予業界客戶。

光電子技術部的科技廣泛應用範疇

機器視覺

- 在製造消費者電子產品過程中進行檢查
- 在製造顯示屏過程中進行瑕疵檢查
- 汽車製造
- 應用於工業機器人的3D隨機堆疊取放技術

智能投影

- 汽車
- 穿戴式顯示器
- 製造業
- 娛樂項目

信息物理系統

- 協同自動機系統
- 採用模型的自動機設計
- 系統級的嵌入式系統虛擬原型設計
- 採用模型的嵌入式系統架構合成

模組與集成

- 心血管健康監測
- 認知健康監測
- 血糖監測
- 食品安全和品質檢測



Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Intelligent Wearable Information Display (IWID) 智能穿戴式顯示器	Mar 2015 – Aug 2016 2015年3月 2016年8月
Intelligent Visual Inspection Technology (IVIT) 智能視覺檢測技術	Oct 2015 – Jun 2017 2015年10月 2017年 6月
Feasibility Study on LCoS Phase Modulator for Automotive Holographic Head-up-Display Application 對於可應用於車載全息擡頭顯示器的LCoS相位調制器的可行性研究	Mar 2016 – Mar 2017 2016年3月 2017年3月
Feasibility study of deep learning based defect classification 基於深度學習的瑕疵分類技術的可行性研究	Jun 2016 – Mar 2017 2016年6月 2017年3月
Automotive Holographic Head Up Display 車載全息擡頭顯示器	Nov 2016 – Jun 2018 2016年11月 2018年6月
3D Random Bin Picking Technology for Industried Robot 用於工業機器人的3D隨機堆疊取放技術	Dec 2016 – Jul 2018 2016年12月 2018年7月
System-Level Virtual Prototyping of Embedded Systems 嵌入式系統的系統級虛擬樣機	Sep 2015 – Jun 2016 2015年9月 2016年6月
Model-based System Architecture Synthesis for Embedded Systems 基於模型的嵌入式系統系統架構合成	Jul 2016 – Mar 2017 2016年7月 2017年3月
Collaborative Automator Systems 協同自動機系統	Sep 2016 – Sep 2017 2016年9月 2017年9月
Design Space Exploration based on Virtual Prototypes 基於虛擬原型的設計空間探索	Mar 2017 – Dec 2017 2017年3月 2017年12月
Mood, Stress & Activity Tracking Devices 情緒，壓力與活動感應裝置	Apr 2015 – Sep 2016 2015年4月 2016年9月
Device for Cardiovascular Disease Risk Analysis 心血管疾病風險分析儀	May 2015 – Apr 2016 2015年5月 2016年4月
Cardio-Vascular Monitoring Devices for Tele-Care System (Public Sector Trial Scheme Project) 用於遠程照顧的心血管監察儀（公營機構試用計劃項目）	Aug 2015 – Jan 2017 2015年8月 2017年1月
Compact Optical Module for Food Safety & Quality Screening (Seed Project) 用作食品安全與品質篩查的小巧光學模塊（種子項目）	Sep 2015 – Sep 2016 2015年9月 2016年9月
Compact Optical Module for Food Safety & Quality Screening (Platform Project) 用作食品安全與品質篩查的小巧光學模塊（平台項目）	Mar 2017 – Sep 2018 2017年3月 2018年9月
On-chip spectrometer for chemical sensing 用作化學感測的芯片式光譜儀	Mar 2017 – Dec 2017 2017年3月 2017年12月

The number of confirmed Bitcoin transactions.

Indirectly Transactions

3 1 3



SECURITY AND DATA SCIENCES

信息安全與數據科學

Overview

Security & Data Sciences (SNDS) Division drives its R&D and innovation through four core competence groups. While partnering with the financial services industry, the team excels in information security and data analytics, FinTech applications including Blockchain, advanced information systems, consultancy and assessment. It also nurtures future talents. It has a specific mandate to help cement Hong Kong's position as a premier, global FinTech hub. The team consists of some of the brightest FinTech and data sciences professionals. It acts as a prolific platform for talented practitioners who are committed to boosting Hong Kong's credentials in data analytics and FinTech, including Blockchain and cybersecurity.

ASTRI's Cybersecurity Core Competence Group (CCG) strives to develop innovative and advanced security technologies. It provides industry-standard security solutions and nurtures cyber-security talents to enhance privacy protection for the society. The Group conducts cybersecurity research related to the banking industry. For instance, it has developed an application based on Attribute Based Encryption (ABE) to enable data encryption on the decryptor's attribute, rather than having to encrypt data individually for each decryptor.

概覽

信息安全與數據科學（SNDS）技術部透過轄下四個技術組，推動研發和創新。部門除致力與金融服務業展開合作，亦在資訊安全和數據分析、金融科技應用包括區塊鏈、先進信息系統為各行業提供諮詢和評估，及培育未來人才方面，表現出色。部門由一眾金融科技和數據科學專才組成，肩負著鞏固香港作為全球領先金融科技樞紐的重要使命。技術部作為一個充滿活力的平台，能讓有志貢獻社會的業界專才一展抱負，協助提升香港在數據分析及金融科技，包括區塊鏈和網絡安全方面的能力和認受性。

應科院的網絡安全技術組致力開發創新和先進的安全技術，並透過提供符合行業標準的安全方案、為業界培育網絡安全人才等措施，全面提升社會的私隱保障。技術組亦開展多項與銀行業相關的網絡安全研究，包括開發建基於屬性加密（ABE）的應用程式。此應用程式能針對解密者的屬性進行加密，毋須個別為每個解密者加密。

ASTRI took on a number of other cybersecurity initiatives by partnering with industry players and regulators. As a partner in Hong Kong Monetary Authority's (HKMA) Cybersecurity Fortification Initiative (CFI), ASTRI enables industry-wide exchange through the Cybersecurity Intelligence Sharing Platform (CISP), and facilitates training and certification of cybersecurity professionals through accredited certification trainings. It runs professional training and development programmes for those seeking CREST-certified professionally accredited courses in cybersecurity management.

應科院與業界和監管機構攜手合作，推出了一系列網絡安全先導計劃。應科院作為香港金融管理局（金管局）「網絡防衛計劃」（CFI）的合作夥伴，致力透過「網絡風險資訊共享平台」（CISP）促進網絡風險資訊共享。應科院亦透過提供各類認證培訓，推動網絡安全專業人員的培訓和認證工作。其開辦的多個專業培訓和發展課程，獲英國網絡保安核證機構CREST認可，為有志進修網絡安全管理課程人士提供進修機會。



ASTRI runs professional training and development programmes for those seeking CREST-credited professionally accredited courses in cybersecurity management

應科院開辦多個專業培訓和發展課程，獲英國網絡保安核證機構CREST認可，為有志進修網絡安全管理課程人士提供進修機會

Technology Focus and Services

Cybersecurity and Analytics

Cybersecurity and Analytics (CSA) Group concentrates on platform technology development where big data analytics and machine learning algorithms are devised and applied for automated security threat analytics.

Cybersecurity is a major concern nowadays with ever changing new tactics and exploits. The speed of growth for talents and professionals in this field to combat this challenge struggles to meet the demand. The CSA group works on utilising big data analytics and machine learning algorithms to digest the vast volume of data to detect behavioural anomaly, thereby detecting current or emerging cyber-threats. We are working closely with industry experts and service providers in cybersecurity technologies. Our aim is to supplement their technologies with our big data analytics and machine learning algorithms to build additional modules and collaboration systems to help boost the customers' cyber-defence.

ASTRI Security Lab

ASTRI Security Lab (ASL) nurtures cybersecurity professionals to perform ethical hacking, advanced reverse engineering, crypt-analysis and third-party security assessment opinions.

技術重點與服務

網絡安全與分析

網絡安全與分析（CSA）技術組專注進行平台技術的開發工作。技術組並致力將大數據分析和機器學習算法，應用到自動化安全威脅分析的項目上。

在這個科技發展日新月異、網絡攻擊手法層出不窮的現代社會，網絡安全成為了大家高度關注的議題。在僧多粥少的情況下，市場對網絡安全方面的專才需求極為殷切。網絡安全和分析技術組致力利用大數據分析和機器學習算法處理大量數據，以探測分析對象的異常行為，從而識別現存或新興的網絡威脅。我們正與業界專家和服務供應商密切合作，共同開發網絡安全技術。我們致力以大數據分析和機器學習算法配合業界現有的各種技術，構建額外模式和協力系統，藉以提升客戶的網絡防禦能力。

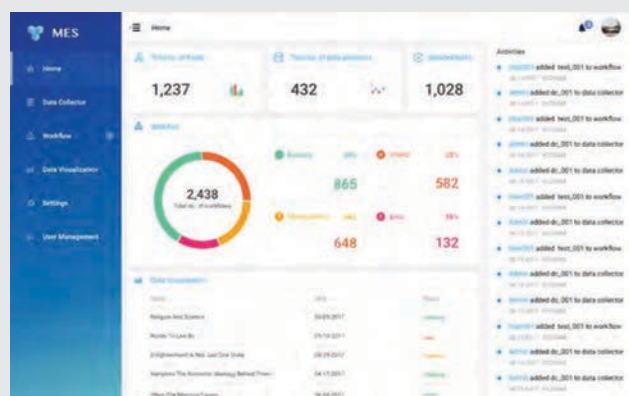
應科院網絡安全研究所

應科院網絡安全研究所（ASL）積極培育網絡安全專才，確保他們有能力執行道德駭客工作、高級逆向工程、密碼分析，以及提供第三方網絡安全評估意見。研究所致力就

The Lab pursues R&D in data encryption, network and system security, software security, authentication and identification, digital signature, cloud security, and secure data analytics - all key components for protecting the data and privacy of banking customers.

Data Analytics

Data Analytics Team specialises in building big data analytics platform to help customers gain insights from big data for better decision making. We are developing technologies throughout the entire data lifecycle - data acquisition, data storage and management, data analytics and data presentation. The team works with different organisations to provide both generic and domain-specific data analytics solutions for FinTech, Intelligent Manufacturing and Smart City related initiatives.



User interface: Real time IoT data analytics for Intelligent Manufacturing
為智能製造而研發的實時物聯網數據分析用戶界面

Blockchain/UIUX

The team builds applications on major Blockchain platforms, and works to enhance Blockchain consensus algorithm and network security. Using a solution developed by ASTRI, Bank of China (Hong Kong) launched a Blockchain-powered property valuation tool - one of the first services of its kind to be launched in Asia. In the early part of 2017, ASTRI conducted a proof-of-concept exercise of Blockchain-based trade finance in collaboration with HKMA. In addition, ASTRI has partnered with a few other players in the financial services industry to explore practical FinTech applications using various tools including artificial intelligence, machine learning, biometric authentication and Blockchain-based identity management.

數據加密、網絡及系統安全、軟件安全、認證和識別、數碼簽名、雲端安全和安全數據分析展開研發工作，確保銀行客戶的數據和私隱受到保障。

大數據分析

數據分析技術組專研創新技術和先進解決方案，以助客戶從大數據中擷取有用資訊，並據此作出更佳決策。團隊現正就整個數據生命週期的不同階段開發相應技術，當中涉及數據收集、數據儲存和管理、數據分析和匯報數據結果各個範疇。團隊並與不同組織合作，提供涵蓋金融科技、智能製造、智慧城市及各種大數據分析等範疇的解決方案。



The trade finance proof-of-concept system using Blockchain technology
引用區塊鏈技術的貿易融資概念驗證系統

區塊鏈技術/用戶界面與體驗

區塊鏈技術組除在多個主要區塊鏈平台上建立應用程式，亦致力在改良區塊鏈共識算法，和提升網絡安全方面貢獻所長。中國銀行（香港）早前利用應科院研發的方案，推出了運用區塊鏈技術的物業估值服務，成為亞洲區最早推出同類服務的企業之一。在2017年初，應科院與金管局合作，進行了建基於區塊鏈技術的貿易融資概念驗證工作。應科院亦與多家金融服務機構合作，探索如何使用人工智能、機器學習、生物認證、建基於區塊鏈技術的身份認證管理工具，在金融科技領域應用。

Innovation, Applications and Collaborations

Blockchain-based Property Valuation Tool

To improve and enhance the mortgage loan application process, Bank of China (Hong Kong) partnered with ASTRI to develop a Property Valuation Blockchain System. It provides a more secure and efficient way to digitise the process of property valuation, streamlining important parts of the lengthy mortgage loan application process.

ASTRI partners with Bank of China (Hong Kong) to develop a Property Valuation Blockchain System for a more secure and efficient way to digitise the property valuation

應科院與中國銀行（香港）合作開發了一套物業估價區塊鏈系統，以更安全和更有效方式將物業估價程序數碼化



The System significantly simplified the entire property valuation process, and thereby led to a sizeable reduction in operation time and cost. Besides supporting multiple appraisers, the system has the potential to be rolled out across many other banks, and more importantly, can subsequently be extended to cover other aspects of the mortgage loan application system. It can enhance productivity, reduce operation cost, improve security and, at the same time, improve user experience.

Project Obsidian: a DLT-based Trade Finance Proof-of-Concept System

Project Obsidian is a DLT-based trade finance proof-of-concept system. It is developed by ASTRI in collaboration with Hong Kong Monetary Authority, HSBC, the Bank of China (Hong Kong), Standard Chartered Bank, the Hang Seng Bank, Bank of East Asia and Tradelink.

Building upon the Blockchain technology, Project Obsidian can effectively simplify the existing and cumbersome paper-based trade finance operations. The system can also provide a real-time visibility that prevents double financing fraud among the participating financial institutions.

Security Threat Analytics System

The project designed and implemented a machine learning based detection system capable of identifying unknown malware. It detects and analyses security threats that demonstrate known malicious features, and also identifies variants of malwares which bypass usual signature-based detection tools.

創新、應用和合作

建基於區塊鏈技術的物業估值工具

為改進樓宇按揭貸款申請流程，中國銀行（香港）與應科院合作開發了一套物業估價區塊鏈系統，以更安全和更有效方式將物業估價程序數碼化，從而簡化冗長的按揭審批流程中一些重要部分。

該系統大大簡化了整個物業估值流程，有效減省處理申請時所需的時間和成本。除了可支援多個審批人使用外，亦可擴展至覆蓋多家銀行。更重要的是，系統可進一步應用於樓宇按揭貸款申請系統的其他環節，從而達致提升生產力、降低營運成本、提高安全性及改善用戶體驗等目標。

Project Obsidian：貿易融資區塊鏈概念驗證系統

Project Obsidian是一個以分布式分類帳技術（DLT）為基礎的貿易融資概念驗證系統。項目由應科院、香港金融管理局、匯豐銀行、中國銀行（香港）、渣打銀行、恆生銀行、東亞銀行及貿易通共同合作開發。

此項目以區塊鏈技術中的分布式分類帳技術為基礎，可有效簡化目前依賴紙張文件作紀錄的繁複貿易融資流程。系統亦具備實時檢視功能，以防止出現誤向金融機構提出雙重融資的情況。

安全威脅分析系統

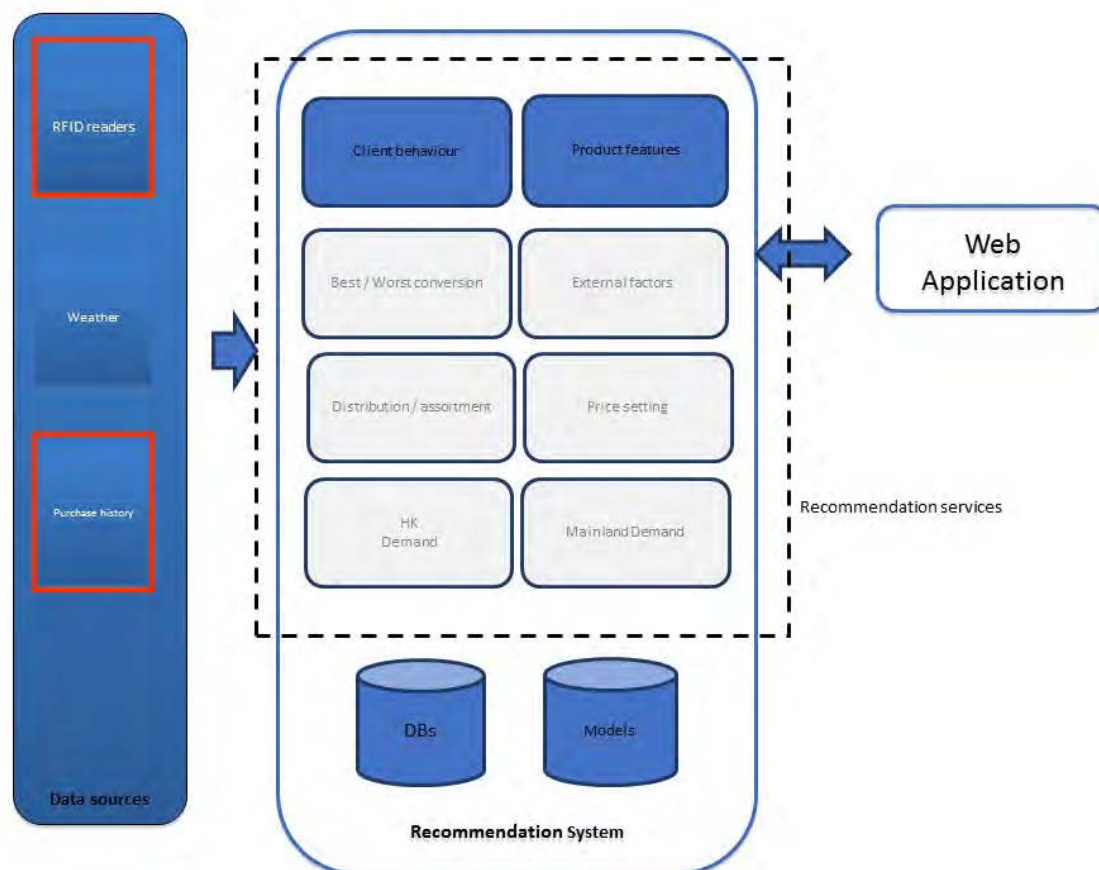
項目設計和試行了一個建基於機器學習的檢測系統，幫助識別未知的惡意軟件。系統可探測和分析網路安全威脅，對於那些能夠繞過一般簽名認證安全檢測工具的惡意軟件及其變種，也能識別出來，並加以防範。

Data Analytics Platform for Luxury Brands

In this project, we focused on the luxury goods retail market to design, analyse and develop a data analytics platform. The platform provides analytics solutions for both retailers and consumers of luxury goods like jewellery, watches, and fashion brands.

專為高級時尚品牌創建的數據分析平台

在此項目中，我們專注為高級時尚產品的零售市場，設計和研發適用的數據分析平台，以開展相應的分析工作。數據分析平台可為珠寶、手錶和時尚品牌等高級時尚產品的零售商和消費者提供分析方案。



System architecture of Data Analytics Platform
數據分析平台的系統結構

Advanced Analytics Technologies and Solutions for Different Industries

In FinTech, we are working with leading financial institutions to provide product take-up evaluation to identify potential customers based on customer profile, customer preference and historical transactions. We are also working on network pattern analysis to help regulatory authorities to identify transaction patterns for monitoring and surveillance, anti-money laundering (AML), and fraud detection.

In Intelligent Manufacturing, we are building an end-to-end real-time data analytics platform that collects, manages, analyses and presents the data for manufacturing industry. The platform allows manufacturing companies to perform real-time problem detection and root cause analysis. It also automates engineering processes to improve productivity and efficiency.

為不同行業而設的先進分析技術和方案

金融科技方面，我們與多家知名金融機構合作，評估他們的客戶選購產品的模式。我們根據客戶資料、偏好和他們過往的交易進行分析，以了解客戶的當前和未來需求。我們亦協助監管機構進行網絡行為分析，以便找出交易模式作監察之用，偵查洗黑錢或欺詐個案。

智能製造方面，我們正致力構建一個端對端的實時數據分析平台，以收集、管理、分析和展示製造業數據。這分析技術有助製造商進行實時問題檢測、分析問題根源，亦有利推動自動化，從而提升產量和效率。

In Smart City, we have built a real-time social data analytics system that collects and analyses data from various social media channels, such as Facebook, Twitter, discussion forums and news sites. The system helps governments or organisations to better understand public opinions by capturing hot topics from various social media channels. Companies can increase their operational efficiency by taking prompt action by analysing market feedback.

在智慧城市領域，我們建立了一個實時社交數據分析系統，以收集和分析來自各種社交媒體渠道，例如 Facebook、Twitter、聊天室、新聞網站等的數據。系統可從中擷取熱門話題，幫助政府及相關組織掌握民情。企業則可根據數據分析資料，就市場反應即時作出相應行動，藉以提高營運成效。



Applying Big Data Analytics on RegTech
把大數據分析應用到金融監管科技

Partnering with Private and Public Sectors to Strengthen Cyber-defence

As mentioned earlier, through its ASL Lab, ASTRI conducts in-depth research, analysis and evaluation of cyber-threats. The insights and intelligence from this Lab are shared across public and private sector organisations, especially with financial services firms. ASTRI is a key facilitator of HKMA's CFI programme. It trains members of the Hong Kong Police Force, cybersecurity professionals from the financial services industry, and test-takers who seek accredited certifications in cybersecurity.

The Hong Kong Institute of Bankers (HKIB) and CREST launched a pilot training programme for Cybersecurity Exam Assessors at ASTRI's Cyber Range Laboratory in December 2016. The programme is an integral part of HKMA's CFI initiative. It aims to develop a local talent pool of exam assessors for the CREST security practical examinations. Successful participants in the programme are identified as potential accredited assessors by CREST after completion of the programme. The four-day programme consists of two sessions of exam orientation and practical beta exams. The first course was conducted from 6 – 9 December 2016 at ASTRI's Cyber Range Laboratory in Hong Kong Science Park.

與私營企業和公營部門合作，加強網絡防禦

如前所述，應科院通過其網絡安全研究所對網絡威脅進行了深入研究，分析和評估。並將分析見解與社會上公、私營部門和機構，特別是金融服務公司分享。應科院是金管局網絡防衛計劃的重要推動者之一。協助訓練香港警務人員，金融服務行業中的從事網絡安全的專才，以及有志在網絡安全方面取得認證的人士。

香港銀行學會（HKIB）和CREST於2016年12月在應科院網絡安全研究與培訓中心推出了網絡安全評核員訓練計劃，該計劃是金管局CFI計劃的組成部分。目的是為CREST的網絡安全實踐試訓練本地人才及評核員，並選出具有潛質的成員，參加CREST評核員的考試。為期四天的課程包括考試簡介及實踐測試考試。第一課於2016年12月6至9日在香港科技園的應科院網絡安全研究與培訓中心進行。



Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Bamboo: A Big Data Analytics Platform Bamboo：大數據分析解決平台	Nov 2013 - May 2016 2013年11月至2016年5月
Data Analytics Platform for Luxury Jewellery and Fashion Brands 針對豪華珠寶和時尚品牌的數據分析平台	Mar 2015 - Sep 2016 2015年3月至2016年9月
Big Data Management System with Social Data Services 社交媒體數據分析及管理系統	May 2016 - Mar 2017 2016年5月至2017年3月
A Security Threat Analytics System 安全威脅分析系統	Jun 2016 - Mar 2017 2016年6月至2017年3月
Cyber-Security Assessment System for Financial and Securities Institutes 金融與證券機構網絡安全評估系統	Oct 2016 - Oct 2018 2016年10月至2018年10月
Apply Graph Analytics for FinTech Solutions 運用圖形分析方法提供金融科技領域的解決方案	Jan 2017 - Oct 2017 2017年1月至2017年10月

INTELLIGENT SOFTWARE AND SYSTEMS

智能軟件 與系統

Overview

Intelligent Software and Systems (ISNS) Technology Division leverages its fundamental R&D competence in Actionable Intelligence, Cognitive Reasoning and Real-time AI Core. It pursues excellence in innovation by focusing on core technologies including Devices/Sensors Data, Connectivity and Digital Ecosystem, Cloud Computing, Machine Learning and Cognitive Computing. Over the past decade, ISNS has developed innovative, end-to-end hardware and software solutions that meet the needs of the business sectors and respond to the emerging technology trends across industries. The Division's sound domain knowledge facilitates the development of relevant systems and applications that cover areas like FinTech, Smart City, healthcare, marketing, retailing, e-commerce, infotainment, surveillance, and many more.

概覽

智能軟件與系統技術部 (ISNS) 以其多個核心研發重點，包括可應用智能、認知推理和實時人工智能核心，推動卓越的技術創新。以此為基礎，發展多項技術如器件/傳感器數據、通信連接和數碼生態系統、雲端計算、機器學習和認知計算等。過去十年，智能軟件與系統技術部緊貼業界發展趨勢，研發創新、端到端的硬件和軟件解決方案，以滿足客戶的業務需求。技術部擁有豐富的相關知識，有助成功研發相關的系統和應用程式，應用到金融科技、智慧城市、健康醫療、市場推廣、零售、電子商務、娛樂資訊、監控等等。

Technology Focus and Services

Currently, ISNS focuses on three Core Competence Groups: Multimedia Systems and Analytics, Intelligent Cognitive Systems, and Cloud Computing.

Multimedia Systems and Analytics

The Group focuses on Embedded System and Machine Learning technologies. It develops applications for Health Technologies (e.g. Medical Imaging Analysis and Medical Imaging Device Development), Smart City (e.g. Virtual Reality/Augmented Reality, Intelligent Video Analysis), and FinTech (e.g. Biometric Authentication, Intelligent Character Recognition).

Intelligent Cognitive Systems

It specialises in machine learning and user experience technologies, and scalable solutions for smart systems. Examples include Behaviour Model and Simulation, and Handwriting Recognition.

Cloud Computing

This Group specialises in financial Big Data Analysis, Blockchain, quantitative investment and wealth management, cybersecurity and intelligent customer service for banks.

Innovation, Applications and Collaborations

ASTRI's Smart Investment Platform

ASTRI's Smart Investment Platform offers some unique innovative features:

- Intelligent stock selection and trading strategy system can choose stocks and automatically generate trading strategies. The system is based on big data analysis, artificial intelligence, genetic algorithm and machine learning algorithm.
- Graphical and intelligent trading strategy generation platform provides visual presentation of trading trends. It displays back-test results, helping ordinary traders to generate trading strategies in an automated manner.

The platform is capable of analysing and measuring cause-and-effect relationship between market variables, external events and asset pricing levels

智能投資平台能分析和衡量市場變動、外圍事件以及資產定價水平之間的相互關係

技術重點與服務

智能軟件與系統技術部正專注研發三個核心技術範疇：多媒體系統和分析、智能認知系統及雲端計算。

多媒體系統及分析

技術組專注嵌入式系統和機器學習技術，開發應用在健康技術（例如：醫療影像分析和醫療影像設備開發）、智慧城市（例如：虛擬實境/擴增實境、智能視頻分析）和金融科技（例如：生物認證、智能字元識別）。

智能認知系統

技術組專注研發機器學習和用戶體驗的技術，以及可擴展的智能系統解決方案。其中例子包括行為模式及模擬和手寫識別等應用。

雲端計算

技術組專注從事金融大數據分析、區塊鏈、量化投資理財、網絡安全和智能銀行客戶服務。

創新、應用和合作

應科院智能投資平台

應科院智能投資平台設有多項創新功能：

- 智能選股和交易策略系統採用了多項技術包括：大數據分析、人工智能、遺傳算法及機器學習程式計算，能自行挑選股票，並自動產生交易策略。
- 圖像化和智能化的交易策略平台利用圖表顯示交易趨勢。用戶可在平台上進行反覆測試，利用過往的數據測試交易策略和結果，從而自動產生交易策略。





The platform can analyse and measure cause-and-effect relationship between market variables, external events and asset pricing levels. By establishing correlations between different market factors using relevant theories and models, the platform makes it easy for the users to understand the market trends and to respond suitably. Such analysis can be real-time, accurate, and even self-correcting. Major events that impact the financial standing also make the market volatile to a certain extent. The extent of the impact is subject to the time involved and the nature of the event itself.

Using this platform, a 'Smart Investment Contest' was jointly organised by the Bank of China (Hong Kong) and ASTRI. The contest simulated real-life investment scenarios to help participants get familiarised with the tools in this platform for stock investment and accumulate investment experience.

ASTRI's Robo-advisor

ASTRI's Robo-advisor is an online wealth management service that provides fully automated, algorithm-based portfolio management advice. According to the client's information including age, income, family, financial needs, risk tolerance and risk preference, etc, the system offers relevant recommendations. Not requiring much human intervention, it applies modern portfolio theories, algorithm generated data models, AI, and internet platform. The system is capable of analysing, calculating and optimising huge chunks of data. It makes accurate estimations using AI-based knowledge of finance, mathematics, and statistics. The strength of this system is that it can provide dynamic monitoring with time-rolling window, robust portfolio, and event driven analysis based on big data and AI. It provides an accurate and timely re-analysis of asset price movement, in addition to studying the inter-relationships between various assets and risk management tools under the worst-case scenarios. The Robo-advisor delivers a timely, real-time portfolio and risk management solution meeting dynamic market needs.

ASTRI's Smart Water IoT System

ASTRI's Smart Water IoT System allows operators to monitor water systems in real-time. Applied through both wired and wireless detectors across systems, it facilitates data analysis, supports user enquiries, and allows timely access to water quality information. The water leakage alert system, along with leakage detection hardware, uses complex event processing systems to minimise water leakage and to improve operational efficiency. The end-users can check and settle payments using a mobile app interface. The app also supports the broadcast of important information and promotional campaigns. It is armed with a resilient and durable smart valve, able to work even under hostile conditions. It also has built-in sensors to transmit critical data (e.g. pressure, flow rate) that helps to ensure efficient leakage management.

智能投資平台能分析和衡量市場變動、外圍事件以及資產定價水平之間的相互關係。平台系統利用相關理論和模型，建立不同市場因素之間的關聯性，讓用戶更易掌握市場趨勢，並因應情況作出適當決定。這類分析不但實時準確，更具備自我修正功能。此外，一些影響財金狀況的重大事件亦會給市場帶來一定程度的波動，所涉及時間、影響程度則取決於事件本身的性質。

應科院與中國銀行（香港）利用此平台合辦「智能投資比賽」，比賽模擬真實的投資場景，讓參加者透過比賽熟悉股票投資程序，同時累積實戰投資經驗。

應科院機械人投資顧問

應科院機械人投資顧問是一個網上理財服務平台，能全自動化地提供根據程式計算所產生的投資組合管理建議。系統根據客戶個人資料包括年齡、收入、家庭、財務需求、風險承受能力和風險偏好等，提供合適的建議。此服務平台利用現代投資組合理論，通過由程式計算產生的數據模型、人工智能和互聯網平台編制建議，過程無須涉及人為干預。系統根據其財務、數學和統計方面的知識，通過人工智能技術進行分析、計算和優化大量數據，並作出精確的估算。

系統擁有特別的動態監控功能，利用大數據和人工智能技術，讓用戶可利用昔日數據，就特定時期的市場情況反覆測試投資策略，及作出投資預測，系統亦可提供穩健投資組合及特定事件分析等資訊。系統除可分析最壞情況下各種資產與風險管理工具的相互關係外，亦可準確及適時地重新分析資產價格的變動。機械人投資顧問旨在提供適時、實時的投資組合及風險管理方案，以滿足現今市場的動態需求。

應科院智慧水務物聯網系統

應科院智慧水務物聯網系統通過有線和無線檢測器，實時監測用水系統，以便操作人員作數據分析，及支持用戶查詢用水量及接收水質資訊。系統配備漏水警報系統及滲漏探測硬件，通過複雜事件處理系統，能減少漏水問題以提高運作效率。用戶可透過流動應用程式查閱資料和結算付款。應用程式亦有助供應商發送重要信息和宣傳活動的資訊。智慧水務物聯網系統設有具彈性和耐用的智能閥門，可在惡劣環境下運作。系統內設有傳感器用作傳輸關鍵數據（例如用水壓力、流速），有助作出有效的滲漏管理。

The system uses ASTRI's LoRa technology. It uses a GPRS uplink and achieves high penetration through LoRa. It can be used across various utility services like water, electricity, gas and heat. It can connect measuring instruments of more than 100 collectors and allows communication distance of more than 1500 meters, easily penetrating 15 to 18 floors. The device runs on a battery which can last more than five years.

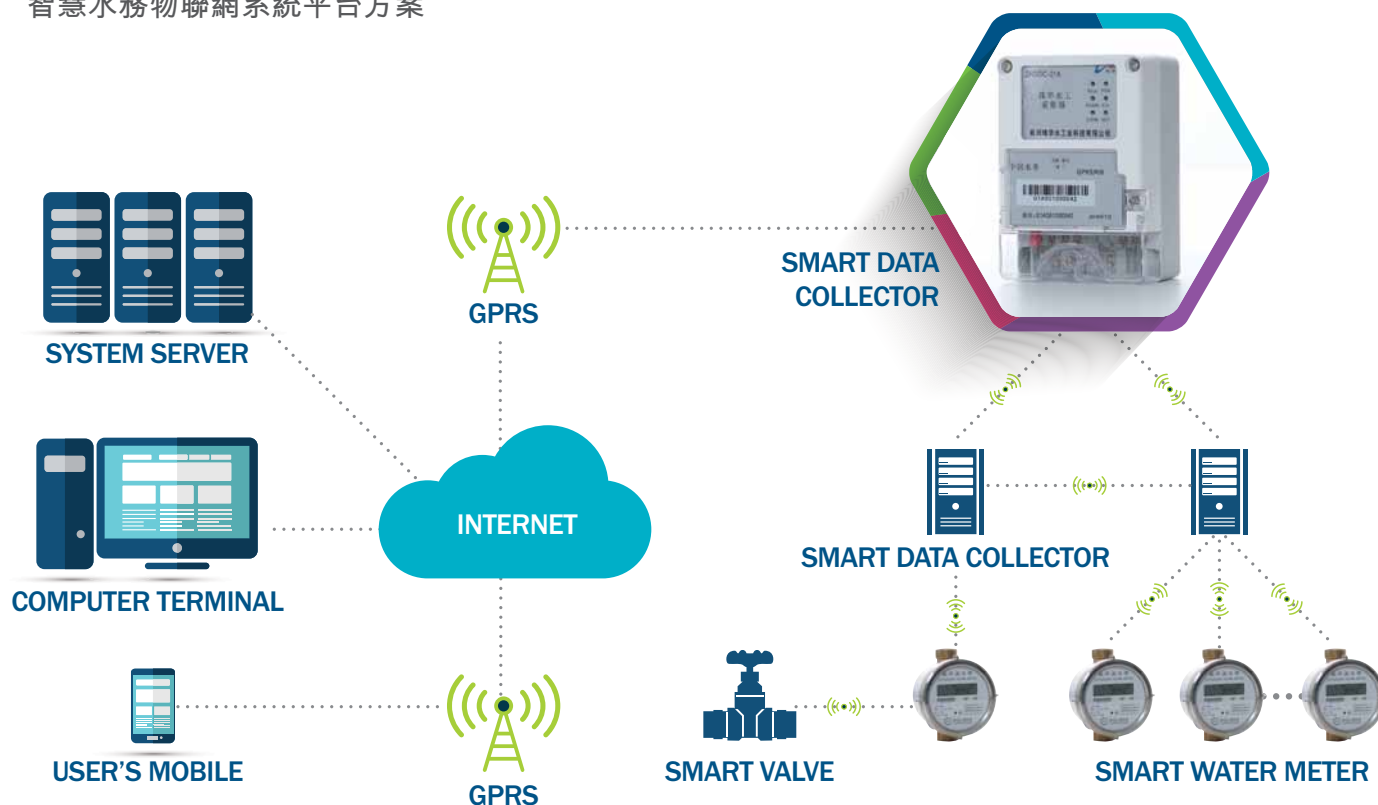
ASTRI works in close partnership with a number of public as well private companies to bring qualitative improvements to water supplies and metering processes. ASTRI's partners in this endeavour include Zhuzhou Southern Valve (to deploy the system in places like Hunan, Henan, Jiangxi and Guangdong in the Mainland). ASTRI is also in discussions with the Water Supplies Department (WSD) of Hong Kong to develop smart water management system for Smart City applications.

此系統採用了應科院的LoRa無線通訊技術。系統透過LoRa無線通訊技術，利用通用封包無線服務（GPRS）的移動數據技術，把數據上傳及廣泛傳輸。系統可應用於多種公用服務設施如水、電力、煤氣和熱能供應等。系統支持連接逾100部收集數據的測量裝置，允許超過1500米以上的通訊距離，發出的訊號能輕易穿透15至18個樓層。系統由電池供電，可持續運作高達五年以上。

應科院與多間公營和私營機構緊密合作，優化供水和計量過程。應科院的合作夥伴包括株洲南方閥門股份有限公司，並把系統應用於內地多個城市如湖南、河南、江西和廣東等地方。此外應科院正與香港水務署合作，研發適用於香港智慧城市發展的智慧水務管理系統。

SMART WATER IOT SYSTEM SOLUTION

智慧水務物聯網系統平台方案

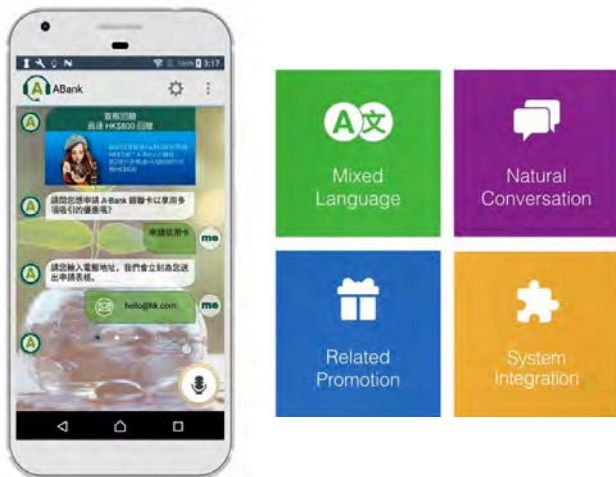


Smart Water IoT system allows real-time monitor of leakage, water supply to authority, as well as payment settlement and enquiry for users
智慧水務物聯網系統讓水務部門實時監察供水、漏水狀況；而市民則可以同一系統付款和作出查詢

Chinese Natural Language Processor

In Hong Kong, there is a unique cultural practice of mixing written Chinese together with English, emojis, local slangs, colloquial terms, and domain jargons. Sometimes, these are used alongside intentionally or unintentionally 'mis-written terms'. This 'mix' of linguistic expressions makes it complex to analyse the language and associated mood and emotions. ASTRI has developed a natural language processing (NLP) technology to understand the context of these written passages. It has a built-in database of colloquial Cantonese vocabulary together with a large set of synonyms, and 'confusion sets' of words that are similar in pronunciation or construct. This technology can be applied to conduct big data applications on social media analytics, including mood/sentiment analysis, topics analysis and contextual analysis. The tool can be used to assist teachers in assessing students' Chinese writing and helping them to avoid common mistakes.

When the NLP is connected to a voice recognition engine, it can be developed into Chatbot applications or other voice-interactive tools.



Cyber Range Laboratory

The first Cyber Range facility in Hong Kong was established at ASTRI in 2016. The Cyber Range provides cybersecurity training to law enforcement agencies as well as the financial services industry. Jointly built with The Cyber Security & Technology Crime Bureau (CSTCB) of The Hong Kong Police Force, it is equipped with advanced computer systems as well as sophisticated cybersecurity hardware. Its server farm can support up to 240 simultaneously run virtual machines. The Cyber Range software platform facilitates team-based cyber-attack and defence exercises. It also includes an advanced training management system that supports training logistics, content preparations, and trainee assessments. Besides training, investigations and analysis of cyber-attacks as well as research of cyber-defence can also be conducted in the Range.

中文自然語言處理器

在香港，人們慣常在書面語夾雜一些英語詞彙、表情符號、地方俚語、口語詞彙、行業術語，以及有意或無意的錯別字等等。這種「攪雜不同元素」的表達方法，令分析語言以及相關情緒和情感時更加複雜。因此應科院研發了一套中文自然語言處理器（NLP）技術，以便分析這些書面段落內所蘊藏的真正含意。系統除配備內置的廣東話口語詞庫及「混淆詞彙集」，來辨別及更改常見的錯/別字，同/近音字。此技術可應用於社交媒體的大數據分析，包括情緒/情感分析、主題分析和語境分析，並可應用於協助教師評估學生的書寫中文，糾正常見的錯誤。

若把自然語言處理器連接到語音識別引擎和對話系統時，即可變成聊天對話器的應用程式或其他語音互動工具。



Natural Language Processor can help analyse the special mix of linguistic expressions in Hong Kong

中文自然語言處理器能就香港獨特的語意表達作出分析

網絡安全研究與培訓中心

應科院在2016年成立全港首個網絡安全研究與培訓中心（又稱網絡靶場）。該中心設於應科院大樓內，為執法機構和金融服務業提供網絡安全培訓服務。培訓中心由應科院與香港警務處的網絡安全及科技罪案調查科（CSTCB）共同成立，配備先進電腦系統和精密的網絡安全硬件。中心的主伺服器最多可支援240部虛擬機器同時運作。中心內的軟件平台有助進行團隊形式的網絡攻擊和防禦演習。平台更設有一套先進的培訓管理系統，能支援培訓流程、編寫教材及學員評估。中心除了提供培訓外，亦支援進行網絡攻擊調查和分析、網絡防禦研究等工作。

Features of Cyber Range:

- Develop defence techniques against emerging cyber-attacks
- Conduct cyber-crime investigations
- Real-life cybersecurity and network infrastructure of financial institutions can be configured and simulated
- Completely isolated network for cyber-warfare
- Offers hands-on, team-based training of both attack and defence techniques

The Range imparts training courses to members of the Hong Kong Police Force, cybersecurity professionals from the financial services industry, and test-takers who seek accredited certifications in cybersecurity.

網絡靶場的特點：

- 研發針對新興網絡攻擊的防禦技術
- 進行網絡罪案調查
- 可配置金融機構的網絡基礎設施用以防禦模擬網絡攻擊
- 擁有完全獨立的網絡以進行網絡戰
- 提供通過手動實踐、及團隊形式的攻擊和防禦技術培訓

網絡安全研究與培訓中心為警務人員、金融業界的網絡安全專才和尋求網絡安全專業認證的從業員提供培訓課程。



ASTRI sets up the first Cyber Range in Hong Kong in 2016
應科院在2016年設立全港首個網絡安全研究與培訓中心

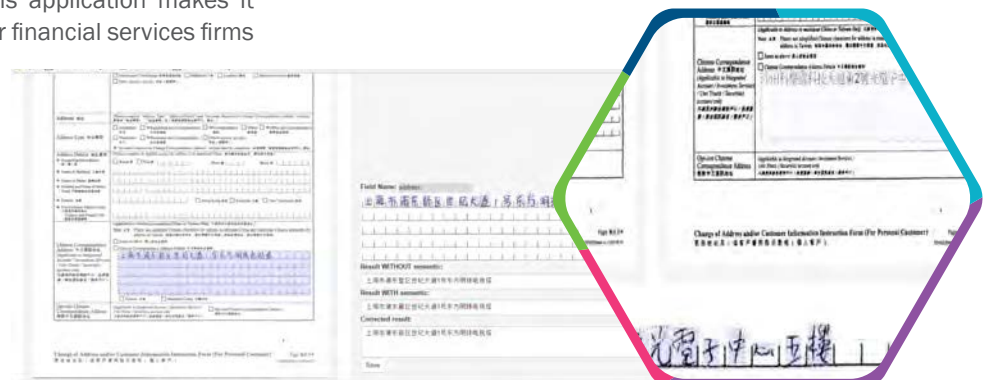
Intelligent Character Recognition (ICR)

This Intelligent Character Recognition (ICR) application uses state-of-the-art Computer Vision and Deep Learning techniques to process handwritten text in traditional and simplified Chinese. It can 'read' and process Chinese characters including Hong Kong's colloquial expressions, English block letters, and numbers. With efficient text extraction, character segmentation and deep learning based recognition technologies, this application makes it simpler, easier and more efficient for financial services firms to deal with customer information and process application forms.

Intelligent Character Recognition (ICR) helps businesses including financial institutions to digitalise hand-written information to facilitate automation
智能字元識別技術有助企業包括金融機構把手寫申請表電子化

智能字元識別 (ICR)

智能字元識別應用利用最先進的計算機視覺技術和深度學習技術處理手寫文字，包括繁體和簡體中文。此技術能識別及處理特別的中文字元，包括香港常用的口語、英文正楷和數字。透過有效提取相關的文本、字元分割和採用深度學習的識別技術，此應用有助金融機構簡化和加快處理客戶資料和申請表格，提升營運效率。





Touch Behavioural Biometric Authentication

It uses behavioural interactions, such as touch, behaviours for biometric authentication on mobile devices. Applying two-factor authentication with touch patterns, it controls access based on fingerprint pressure levels combined with traditional passwords. It extracts fingerprint data, and monitors users' touch behaviours and gestures like scrolling and keypress, by machine learning methods for seamless authentication.

Virtual Reality (VR) and Augmented Reality (AR)

ASTRI's Head Mount Display (HMD) device works on VR and AR technologies. HMD is a popular device with innovative and advanced functions. The device uses core techniques like sensor fusion, embedded OS optimisation, gesture recognition, and offloading in edge cloud computing. Its various applications include portable device control, gesture control, 360-degree panorama virtual tour and live streaming.



Head Mounted Display software solution and reference design and prototype
頭戴式顯示器參考設計圖與原型

Handheld Medical Imaging Device

The device consists of a low-cost disposable endoscopic probe and a re-useable main processing unit. Its embedded low-latency WiFi, Bluetooth Low Energy (BLE) and Radio Frequency Identification (RFID) functionality modules provide long and short-distance reliable transmission in both video and RF signals. Its unique features include low-power consumption, miniature size and easy operability. It captures high-definition (HD) video image data and streams to the server for simultaneous recording and processing, while also supporting local display.

採用觸摸模式進行生物認證

生物認證技術是根據用戶的行為互動，例如：觸摸的模式及其他生物認證的行為，在移動設備上進行認證。此應用方案乃採用觸摸模式及密碼作雙重認證，通過指紋壓力程度和傳統的密碼輸入以登入帳戶，並利用機器學習程式計算，提取指紋和監控用戶的觸摸行為動作、如滑動、按鍵壓等模式，以進行認證。

虛擬實境/擴增實境

應科院的頭戴式顯示器能提供虛擬實境/擴增實境的應用，是一個備有創新和先進功能的且備受歡迎的設備。此顯示器利用多項核心技術，如傳感器融合、嵌入式操作系統優化、手勢識別、和基於邊緣雲的計算負載分擔，提供多種應用功能，包括便攜設備控制、手勢控制、360度全景虛擬旅遊和在線直播。

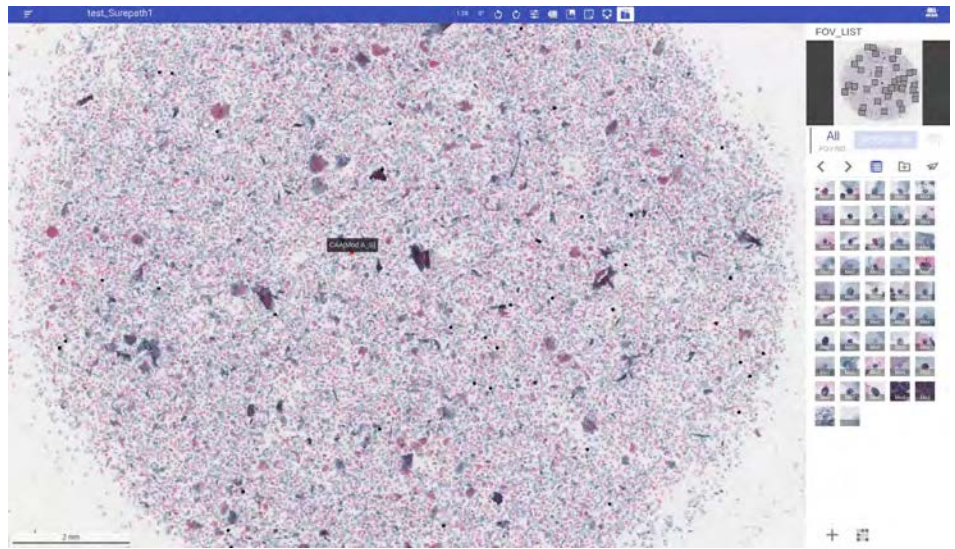


手持式醫療影像儀器

這款手持式儀器包括一支低成本即棄的內窺鏡探針和可重複使用的主處理器。儀器設有嵌入式低延遲WiFi、低功耗藍牙 (BLE) 和射頻識別技術 (RFID) 的功能模塊，能在長/短距離範圍內，穩定可靠地傳送影像和無線信號。該儀器擁有多種獨特性能，包括低功耗、體積細小和易操控性，並能收集高清影像數據，在即場顯示影像數據的同時，同步傳送至伺服器以作錄製和影像數據處理。

Medical Imaging Analysis

This application uses state-of-the-art Deep Learning method to assist in the medical diagnosis process. Focusing on screening and grading of anomalous cells in cervical smear, it identifies suspicious cells with high accuracy, using multiple deep convolutional neural network (DCNN) models. It uses a slide image viewer supporting 4-5 billion pixels. The viewer is platform independent, vendor-neutral, and does not require the installation of any separate software.



Machine learning algorithm identifies suspicious cells
以機器學習算法來識別可疑細胞

Multi-lingual Address Recognition for Smart Phone

ASTRI team has successfully developed an address recognition system that works with regular expressions in English, French, German, Italian, Spanish, and Portuguese languages in short messages on mobile phones. By using our technology, mobile phones are able to recognise addresses inside the short messages received. The accuracy and recall rate are all above 85%, verified on hundreds of thousands annotated sentences in each language. Based on this, users can easily tab the address and link to search for locations on maps.

Crowd Analysis Based on Human Detection and Mobile Phone Signal Analysis

ASTRI is working on crowd analysis based on human detection and mobile phone signal analysis in Shanghai. The tool has been tried across various locations. It will help the customer to evaluate scenarios, understand traffic conditions and make better plans.

醫療影像分析

醫療影像分析技術利用了最先進的深度學習方法，以輔助醫療診斷。此技術主要用於子宮頸塗片異常細胞進行篩選和程度分級，通過融合多個深度卷積神經網絡（DCNN）模型，識別懷疑異常的細胞，並達至高精確度的分析。這技術利用全切片圖像瀏覽器來檢視影像。瀏覽器是一個獨立、供應商中立的網上平台，無需安裝外掛程式就可以於瀏覽器中瀏覽高解像度（40-50億像素）圖像。

智能手機上的地址識別 (適用於多種語言)

應科院團隊成功在智能電話上建構了地址識別系統，能夠識別智能電話內多種語言（英、法、德、意、西、葡）的短訊。研發組對每種語言均作了數十萬條附有註解句子測試，檢測結果顯示系統識別每種語言的準確率和召回率均超過85%。有了此項技術，用戶可簡易地點擊智能電話上藏於短訊中的地址資料，並於地圖中搜尋。

以移動電話信號和行人檢測來作人群流量分析

應科院研發組亦在上海進行技術研發，以移動電話信號、和行人檢測來作人群流量分析。有關的器材在多個不同地點測試應用，有助客戶評估各種情況，獲得人流信息，以作出更好的計劃。



Crowd analysis based on human detection and mobile phone signal
以移動電話信號、和行人檢測來作人群流量分析



Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Intelligent Software Defect Detection Technology 智能軟件瑕疵檢測技術	Sep 2015 – Jan 2018 2015年9月至2018年1月
Open Quant Cloud for Internet Finance 互聯網金融的開放式量化雲平台	Sep 2015 – Mar 2016 2015年9月至2016年3月
Smart Classroom 智慧教室	Jun 2014 – Apr 2016 2014年6月至2016年4月
Cryptographic Biometrics as Personal Security and Access Technology 針對個人安全和接入的生物識別加密技術	Mar 2015 – Jun 2016 2015年3月至2016年6月
Chinese Handwriting Recognition from Scanned Form 從表格掃描圖像中識別手寫中文的技術	Nov 2015 – Aug 2016 2015年11月至2016年8月
Low Cost, Miniature Handheld Smart Video Scope Technology 手持微型高清監視儀技術	Jun 2015 – Dec 2016 2015年6月至2016年12月
LTE Wireless Broadband Applications for Smart Transportation and Public Safety LTE無線寬帶智能交通和公共安全應用	Feb 2015 – Jan 2017 2015年2月至2017年1月
eLearning Analytics 電子學習數據分析	Jan 2015 – Jan 2017 2015年1月至2017年1月
Intelligent Distributed Mobile Computing-OS Technology 智能分佈式移動計算-操作系統技術	Mar 2015 – Mar 2017 2015年3月至2017年3月
Next Generation Augmented Reality Technologies 新一代增強現實技術	May 2015 – Apr 2017 2015年5月至2017年4月
Complex Event Computation System and Platform for Uncertain Data 複雜事件計算和處理平臺	Jan 2016 – Jul 2017 2016年1月至2017年7月
Cybersecurity Research & Practice Platform for Financial Services 財經服務的網絡安全研究和實習平台	Jan 2016 – Jun 2017 2016年1月至2017年6月



Medical Image Data Analytics Platform 醫學圖像數據分析平臺	Feb 2016 – Jan 2018 2016年2月至2018年1月
Mobile Multimedia Processing with Enhanced Quality of Experience 增強用戶體驗的移動多媒體處理	Mar 2016 – Mar 2017 2016年3月至2017年3月
Mobile Business Assistant 移動商務助理	Mar 2016 – Aug 2017 2016年3月至2017年8月
Behavioral Biometrics Authentication for Mobile Devices 移動裝置的行為生物認證	Jun 2016 – Mar 2017 2016年6月至2017年3月
Social Data Analytics for Cantonese and Informal Languages 針對廣東話及非正規語言的社交網絡數據分析平台	Jun 2016 – Mar 2017 2016年6月至2017年3月
Sentiment Analysis for Financial Investment (SAFI) 金融投資中的情感分析	Jun 2016 – Mar 2017 2016年6月至2017年3月
Intelligent 3D Data Analysis System 智能三維數據分析系統	Jun 2016 – Mar 2017 2016年6月至2017年3月
Intelligent Companion for Elderly 智能長者布偶平台	Feb 2017 – Nov 2018 2017年2月至2018年11月
Mobile Visual Computing Platform 移動視覺計算平台	Mar 2017 – Sep 2018 2017年3月至2018年9月
Mixed Language Speech/Text Recognition 混合語言的語音/文字識別	Mar 2017 – Dec 2017 2017年3月至2017年12月
Next Generation Capsule Endoscopy System 新一代膠囊內鏡系統	Mar 2017 – Mar 2019 2017年3月至2019年3月
Multilingual Address Recognition for Smart Phone 智能手機上的多種語言地址識別	Feb 2016 – June 2017 2016年2月至2017年6月
Crowd Analysis based on Human Detection and Cell Phone Signal Analysis 行人檢測和移動設備信號分析的人群分析	Feb 2016 – June 2017 2016年2月至2017年6月

7 PERFORMANCE

業績

As a publicly funded applied science and technology R&D institution, ASTRI is committed to bringing the benefits of science and technology to people's lives. ASTRI's efforts is measured by the scale of its innovation, the economic impact of its solutions on different industries and the tangible improvements brought to people's lives. To generate practical and measurable impact, ASTRI focuses on commercialising its technologies - addressing the specific needs of its customers and also the community.

作為一所政府資助的應用科技研發機構，應科院致力透過科技提升人們的生活質素。應科院所取得的成果可透過其創新的規模，所研發之技術為業界帶來的經濟效益及為人們生活帶來的切實改善。為了使研發的技術為社會帶來實用和可量化的效益，應科院致力把科研成果商業化，以切合其客戶及社群的需求。

ASTRI's success are quantified using three major performance measures:

應科院的成就可從以下三項可量化業績方面體現出來：

01

Number of patent applications filed and granted

申請和取得的專利數量

This is important because patent is an essential indicator of the real value of innovations and is being used to maximise the benefits of technology transfers.

專利是評估所研發的技術是否有價值的主要指標，同時，亦有助提升技術轉移所獲得的好處，因此十分重要。

03

Annual income from industry

每年從業界所得的收入

As ASTRI continues to engage with customers and build a valuable brand name for its customer base, the eventual income from this base, through services such as technology licensing and sales, design and product development, will increase.

應科院致力服務業界，並在客戶心目中建立有價值的品牌，透過各種服務、如技術授權、技術轉售、設計及產品開發等，從業界所得的最終收入將會增加。

02

Number of technologies transferred to industry every year

每年轉移至業界的技術數量

This is a very crucial target as technology transfer leads to the actual commercialisation of ASTRI's intellectual properties for the benefit of different industries.

由於技術轉移有助應科院把研發項目之知識產權轉移至業界應用，所以技術轉移的數目是一個相當重要的目標。



Number of Patents

Sixty patents have been filed in the US, the Mainland and other territories in 2016-17.

專利數量

2016至2017年，應科院在美國、內地及其他國家共提交60項專利申請。

Number of Patents Filed by Technology Divisions 各技術部提交專利申請的數量

Technology Division 技術部	2016-17	2015-16	2014-15
Communications Technologies 通訊技術	10	15	9
Mixed Signal Systems IC 混和信號系統晶片	6	15	12
Advanced Digital Systems 先進數碼系統	8	0	1
Intelligent Software and Systems 智能軟件與系統	11	2	4
Security and Data Sciences 信息安全與數據科學	0	4	3
Opto-electronics 光電子	11	12	15
Electronics Components 電子元件	14	8	6
Total 總數	60	56	50

Number of Patents Granted 榮獲的專利數量

Fiscal Year 財政年度	Number 數量
2016-17	59       
2015-16	92            
2014-15	102            
2013-14	95            
2012-13	130            
2011-12	106            
2010-11	65       
PRE 2010-11 之前	65       

Total 總數
714

 = 10 Patents 專利

Technology Transfers

技術轉移

Number of Technology Transfers to Industries by Technology Divisions

各技術部向業界轉移的技術數量

Technology Division 技術部	Agreements Signed in the Financial Year 財政年度簽署協定	
Communications Technologies 通訊技術	11	  
Mixed Signal Systems IC 混和信號系統晶片	2	
Advanced Digital Systems 先進數碼系統	9	 
Intelligent Software and Systems 智能軟件與系統	9	 
Security and Data Sciences 信息安全與數據科學	11	  
Opto-electronics 光電子	11	  
Electronics Components 電子元件	7	 

Total 總數
60 = 5 Technology Transfers 技術轉移

Number of Technology Transfers to Industries by Channels

向業界轉移技術的途徑與數量

Contract Type 合約類型	Agreements Signed in the Financial Year 財政年度簽署協定	
Industry Collaborative Projects 業界合作項目	4	
Contract Research Projects 合約研究項目	31	     
Licensing Agreements* 授權合約	25	    

Total 總數
60 = 5 Technology Transfers 技術轉移

*Certain licensing agreements consist of contract research services provided by ASTRI

*部份授權合約包含應科院提供的合約研究服務

Number of Projects Undertaken

應科院進行的研發項目數量

Project Type 項目類型	Number of Projects 研發項目數量	
ITF-funded Platform Projects 創新及科技基金資助平台項目	44	        
ITF-funded Seed Projects 創新及科技基金資助種子項目	44	        
Industry Collaborative Projects 業界合作項目	10*	 
Public Sector Trial Scheme Projects 公營機構試用計劃項目	8	 

Total 總數
106 = 5 Projects 項目

*An industry collaborative project withdrawn on 23 August 2016 is not included

*一個於2016年8月26日退出的業界合作項目不包含在內

Income from Industry

Income received* from industry for all projects amounted to HK\$78.45 million. The level of industry contribution is 21.3 per cent. The graph below shows the income received from industry in the past three years.

業界收入

本年度應科院從所有項目取得的業界收入*總額為7,845萬港元，業界贊助水平亦達至21.3%。下圖顯示過去三年從業界所得收入總額。

Income from Industry (HK\$M)
已收取的業界收入（百萬港元）

2016-17



2015-16



2014-15



* Including cash and in-kind contribution

*包括現金及物資資助

Income received* from the industries by various Technology Divisions in the 2016-17 financial year is tabulated below.

下表列出2016-17財政年度各技術部所獲得的業界收入*。

Income Received* from industry
已收取的業界收入*

Technology Division / Others 技術部 / 其他	HK\$M 百萬港元
Communications Technologies 通訊技術	15.59
Mixed Signal Systems IC 混和信號系統晶片	10.94
Advanced Digital Systems 先進數碼系統	10.98
Intelligent Software and Systems 智能軟件與系統	10.41
Security and Data Sciences 信息安全與數據科學	6.65
Opto-electronics 光電子	12.57
Electronics Components 電子元件	8.40
Headquarter 總部	2.46
General Support Programme 一般支援計劃	0.45
Total 總數	78.45

* Including cash and in-kind contribution

*包括現金及物資資助

Thriving on Collaborations

ASTRI thrives on collaboration with various segments of the community to enhance Hong Kong's competitiveness through applied research. As a leading force in promoting innovation and technology in the HKSAR, ASTRI puts equal emphasis on performing innovative R&D for applications in industries, as it does on nurturing technology talents and the next generation of tech-leaders for this region. Our R&D strategy is deeply intertwined with our endeavour to collaborate with academic and R&D institutions, as well as public and private sector enterprises.

In our R&D partnerships, including both project-specific and wider-scope initiatives, we emphasise on building collaboration platforms to promote R&D advancements, exchange information, and share technological developments. These collaboration platforms could be in the form of joint laboratories, Memorandums of Understanding and other alliances.

與業界攜手合作

應科院致力與社會各界攜手合作，透過應用科技的研發，以提升香港科技競爭力。作為香港特別行政區推動創新科技的重要一員，應科院非常注重把科研成果應用到社會各行各業；同時也不忘孕育科技人才以及栽培新一代技術領袖，使區內科研精神得以薪火相傳。我們與大學院校、研發機構、公營機構及商界企業共同研發的項目，與我們整體的研發策略緊密相扣。

就合作夥伴關係而言，無論是特定的研發項目，或更廣範圍合作方案，我們所著重的是透過構建合作平台促進科研的進程，交流資訊和分享技術開發成果。這些合作平台可以是聯合研究實驗室、合作備忘錄，或其他合作聯盟的形式。





List of Joint Research Laboratories Commissioned or Initiated Throughout 2016- 2017

應科院在2016至2017年成立或開展的聯合研發實驗室

Joint R&D Labs and Facilities 聯合研發實驗室和設備	Date 日期	Focus 研發重點
ASTRI – Comba Joint Research and Development Laboratory 應科院 — 京信通信聯合研發實驗室	2016-05-26	Smart city and smart home technologies 智慧城市與智能家居技術
ASTRI – HED Joint Research and Development Centre 應科院 — 華大電子集成電路設計聯合研發中心	2016-06-06	Advanced integrated circuit designs 先進集成電路設計
ASTRI – Marvel Digital Joint Research and Development Centre 應科院 — 萬維數碼聯合研發中心	2016-06-20	Advanced technologies in 3D imaging 先進3D影像技術
ASTRI – Airport Authority of Hong Kong Joint Research and Development Centre for Smart Airport 應科院 — 香港國際機場智能機場聯合研發中心	2016-07-04	Smart airport 智能機場
Bank of China (Hong Kong) Limited – ASTRI FinTech Collaboration Centre 中銀香港 — 應科院金融科技聯合創新中心	2016-07-14	FinTech tools and solutions 金融科技工具和解決方案
Hong Kong Police Force – ASTRI Cyber Range Laboratory 香港警務處 — 應科院網絡安全研究與培訓中心	2016-07-20	Technical readiness of law enforcement and financial institutions against malicious cyber-attacks 提升應對抗日益增加的惡意網絡攻擊的能力
ASTRI – 21Vianet Joint Research and Development Laboratory 應科院 — 世紀互聯聯合研發實驗室	2016-07-29	Smart city and the next generation network 智慧城市與新一代網絡
ASTRI – Accoresys Visual Intelligence Joint Laboratory 應科院 — 上海智擎視覺智能聯合實驗室	2016-08-29	Research and development of visual intelligence 視覺智能的研究與開發
HSBC - ASTRI Research and Development Innovation Laboratory 滙豐 — 應科院研發創新實驗室	2016-09-01	FinTech innovation 金融科技創新
ASTRI – Nantong Industrial Technology Institute (NTITI) Joint Laboratory 應科院 — 南通先進通信技術研究院聯合研發實驗室	2016-09-22	Next generation wireless network solutions 新一代無線網絡解決方案
ASTRI – Richen Joint Research and Development Laboratory 應科院 — 華亘聯合研發實驗室	2016-10-12	Endoscopy imaging technologies: disposable and affordable devices and computer-aided screening and diagnosis 內窺鏡影像技術：價格實惠的一次性裝置及電腦輔助篩查和診斷



University of Hong Kong (HKU) – ASTRI Joint Research Laboratory 香港大學 — 應科院聯合研發實驗室	2016-10-17	FinTech education, health technologies and smart city applications 金融科技教育、醫療技術及智慧城市應用
Chinese University of Hong Kong (CUHK) – ASTRI Joint Research Laboratory 香港中文大學 — 應科院聯合研究實驗室	2016-10-28	Next generation 5G mobile network, FinTech and intelligent manufacturing 新一代5G流動網絡、金融科技以及智能製造
Hong Kong Monetary Authority – ASTRI Fintech Innovation Hub 香港金融管理局 — 應科院金融科技創新中心	2016-11-11	Research and adoption of FinTech 研究和採用金融科技的現代化平台
The Delphi – ASTRI Digital Optical Simulations Joint Laboratory 德爾福 — 應科院數字光學模擬聯合實驗室	2016-12-15	Advanced digital optical technologies 先進數字光學技術
ASTRI – Zhongke Laifang Energy Technology (Hong Kong) New Energy Storage System Joint Laboratory 應科院 — 中科來方能源科技（香港）新型儲能系統聯合研究實驗室	2017-02-20	Next generation energy storage systems 新一代儲能系統
ASTRI – Magic Eye Technology Partnership for development of Joint Laboratory 應科院與魔眼科技合作成立聯合實驗室	2017-03-03	Mobile imaging and computing, virtual reality (VR) and augmented reality (AR) technologies 移動圖像及運算技術、虛擬實境 (VR) 與擴增實境 (AR) 技術
Hong Kong University of Science and Technology – ASTRI Joint Research Laboratory 香港科技大學 — 應科院聯合研發實驗室	2017-03-15	FinTech, communications technologies and smart city 金融科技、通訊技術及智慧城市
TransUnion – ASTRI FinTech Innovation Centre 環聯 — 應科院金融科技創新中心	2017-03-16	Digital identity solutions 數碼身份認證解決方案



Some Other Partnerships Signed with Various Organisations Throughout 2016-2017

應科院在2016至2017年度與不同機構簽署的一些其他合作項目

Partnerships 合作夥伴	Date 日期	Focus 研發重點
PCCW Group 電訊盈科集團	2016-10-04	3GPP Release 13 LTE WiFi Aggregation 3GPP Release 13 版本 LTE 無線網絡聚合試驗
Electronic Transactions Development Agency (ETDA) of Thailand 泰國電子交易發展局 (ETDA)	2016-10-07	FinTech, cybersecurity, blockchain technology and electronic payments and transactions 金融科技、網絡安全、區塊鏈技術及電子支付與交易
Zhuhai Hengqin New Area Administrative Committee 珠海市橫琴新區管理委員會	2016-11-21	FinTech research and development, nurture and exchange of FinTech talents, and collaboration amongst Guangdong, Hong Kong and Macau 金融科技研發及人才培養與交流、深化粵港澳合作
The Bank of Thailand 泰國中央銀行	2016-12-01	Electronic transactions, blockchain technology, cybersecurity and big data analytics 電子交易、區塊鏈科技、網絡安全和大數據分析
Beijing Institute of Collaborative Innovation 北京協同創新研究院	2017-01-05	Next generation network technologies 新一代網絡技術
Dongguan Southern Semiconductor Technology Company Limited 東莞南方半導體科技有限公司	2017-03-07	Innovation drive for 3rd generation semiconductors 第三代半導體產業創新發展
HKT, Huawei and Qualcomm Technologies 香港電訊、華為與高通科技	2017-03-15	A Smart Mobility Consortium on Cellular-Vehicle-to-Everything (C-V2X) technologies, Intelligent Transport Services (ITS) in Hong Kong 流動車聯網 (C-V2X) 的技術智能交通聯盟及香港智能交通服務 (ITS)



Awards and Accolades

Through strong R&D partnerships with Truly Opto-electronics Co Ltd, ASTRI's Cover Glass and Touch Panel Glass Automatic Defect Inspection System won the Equipment and Machinery Design category of the 2016 Hong Kong Awards for Industries.

通過與信利光電股份有限公司建立穩固的研發合作夥伴關係，應科院防護玻璃和觸控式螢幕玻璃自動瑕疵檢測系統榮獲2016年香港工業獎之設備與機械設計獎。

獎項與殊榮



ASTRI's Automatic Meter Reading System received the Hong Kong ICT 2017: Best Business Solution (Application) Bronze Award.

應科院智慧水務平台榮獲2017年香港資訊及通訊科技獎之最佳商業方案（應用）銅獎。

Bank of China (Hong Kong), ASTRI's partner in FinTech R&D and innovation, won a 'Gold Award' at the 'Hong Kong ICT 2017 Awards – Best in FinTech Category' for its Blockchain-based property valuation system for mortgage. This award-winning system was built using a Blockchain tool developed by ASTRI.

應科院在金融科技研發與創新的合作夥伴中國銀行（香港），就其物業按揭估價區塊鏈系統榮獲2017年香港資訊及通訊科技獎之最佳金融科技金獎。獲得殊榮的系統採用了應科院研發的區塊鏈工具。

8 ENGAGING WITH THE COMMUNITY

心繫社群

In 2016-2017, ASTRI continued to reach out to the community with its knowledge and insights. As a pioneer in promoting innovation and technology in Hong Kong and this region, ASTRI invested time and resources to support the SAR Government's efforts. Various segments of the community with whom the Institute worked include public and private sector organisations as well as students and teachers from academic institutions. ASTRI also partnered with social service organisations, community campaigns in partnership with industry players, and various other organisations that promote innovation and technology.



ASTRI's Board Chairman shares insights at EMBA Annual Conference and Reunion Dinner of the Chinese University of Hong Kong (CUHK) on 24 Oct 2016

應科院董事局主席於2016年10月24日香港中文大學EMBA周年大會及團圓晚宴分享洞見

2016至2017年，應科院繼續努力向社群分享在科研方面的知識與成果。應科院作為香港及區內專注科技研發的先驅，一向以來致力投入大量時間與資源，支持特區政府推動創新科技發展方面的工作。應科院亦透過主辦或參與一些推廣活動、講座、研討會，讓廣大市民認識科技對經濟及社會發展的重要性。同時又與公共機構和私營企業建立合作平台，把所研發的技術轉移到業界，令市民得到裨益。

R&D professionals including senior leaders from ASTRI participated in a large number of seminars, workshops, training programmes and other thought leadership forums. They discussed the latest technological development spearheaded by ASTRI, and the innovation and technology trends in this region. ASTRI's participation in these forums – covering over 60 such events in Hong Kong, the Mainland and abroad – contributed to bolstering the Hong Kong SAR Government's innovation and technology promotion strategy. For example, ASTRI was a host partner in the MIT Technology Review EmTech Hong Kong Conference and delivered keynote speeches.



ASTRI CTO delivers a speech at the MIT Technology Review EmTech Hong Kong 2016

應科院首席科技總監在2016《麻省理工科技評論》EmTech香港科技會議發表演講

應科院的高層領導及科研隊伍積極參與各種專題研討會、工作坊、培訓計劃及其他領袖論壇。他們和與會人員分享應科院研發的最新科技以及區域內創新科技發展趨勢。年內，應科院在香港、內地及海外參與的六十多個演講及技術展示的項目，均旨在推廣香港在科技創新方面所作的貢獻。例如，應科院曾在《麻省理工科技評論》EmTech香港科技會議中發表重要演講。

Flagship Events

One of the most important events in Hong Kong's 2016 technology calendar was the Cyber Security Summit jointly organised by ASTRI, Hong Kong Police Force and the Hong Kong Monetary Authority. The three-day event was amply covered by local, regional and international news media.

The Industry University Collaboration Forum (IUCF) in October 2016 was a major effort from ASTRI to bring together experts and industry leaders from more than 20 universities, research institutes and technology companies around the world to exchange thoughts and ideas for smart cities and 5G applications. Other events where ASTRI was an organiser, co-organiser or a joint-host include APAC Innovation Summit 2016, HKMA FinTech Day, Advance in Display Workshop, etc.

Group photo with Mr Wong Ming-yam (2nd row 6th from right), Chairman of Board of Directors of ASTRI, Dr Frank Tong (2nd row 5th from right), Chief Executive Officer of ASTRI, R&D experts of ASTRI, mentors of AIR programme, and graduates of the AIR Programme

「應科院創新跑道」項目畢業生與應科院董事局主席王明鑫先生（第二排右六）、應科院行政總裁湯復基博士（第二排右五）、應科院研發專家及項目導師合影



旗艦活動

由應科院、香港警務處及香港金融管理局聯合舉辦的網絡安全峰會，是2016年香港的科技盛事之一。為期三天的活動獲得本地、區域及國際新聞媒體的廣泛報導。

應科院又於去年十月舉辦了2016產學研合作論壇，全球二十多間大學、研究院及科技公司的專家和業界領袖雲集香港，交流對智慧城市和5G應用的構思和意念。其他由應科院主辦、協辦或合辦的活動包括亞太創新峯會2016、香港金融管理局金融科技日以及2016年先進顯示科技工作坊等。



ASTRI Chairman speaks at the Industry University Collaboration Forum (IUCF) 2016

董事局主席在2016應科院產學研合作論壇上致辭



Co-organising the Cyber Security Summit 2016 with the Hong Kong Police Force

與香港警務處合辦「網絡安全峰會2016」



HKMA FinTech Day

與金管局協辦「金融科技日」

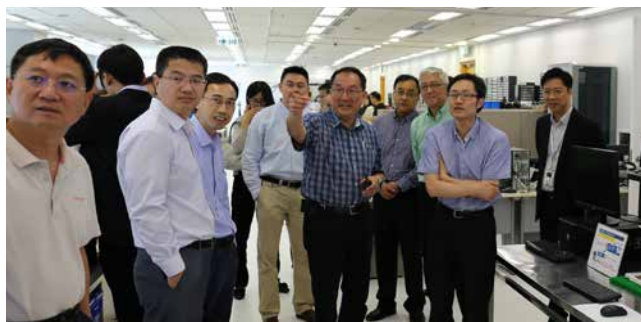


Advances in Display Workshop
先進顯示科技工作坊

Industry Collaborations

Throughout the year, ASTRI was in the news for its collaboration and partnership efforts with various organisations. Most notable among ASTRI's public sector partnerships were those with Hong Kong Police Force, Hong Kong Monetary Authority, and Airport Authority of Hong Kong. Private sector collaborations included Marvel Digital, Comba, Delphi Systems, Nantong Industrial Technology Institute, Bank of China (Hong Kong), 21 Vianet Group, PCCW, Keysight Technologies, and TransUnion, etc. Partnerships with the Chinese University of Hong Kong, the University of Hong Kong and the Hong Kong University of Science and Technology were also notable. ASTRI received a large number of visitors from these and other organisations who exchanged ideas, technology insights and industry knowledge with the Institute's R&D teams.

In total, over 160 delegations visited ASTRI throughout the year – learning about the Institute's various technology projects and innovation initiatives. A large majority of these visitors represented business organisations from private sectors who help to commercialise ASTRI's technologies for the benefit of consumers at large, and educational institutions who provide an important link between academic and applied research.



Mr Li Meng (2nd at the right), China's Vice Minister of Science and Technology leads a delegation to visit ASTRI on 25 September 2016

國家科技部李萌副部長（右二）於2016年9月25日率團到訪香港應科院



ASTRI's senior management and R&D team explains our latest technologies to Mr Allen Yeung, Government Chief Information Officer during his visit on 20 January 2017

政府資訊科技總監楊德斌先生在2017年1月20日到訪應科院，應科院管理層與研發團隊講解最新的研發成果

業界同行

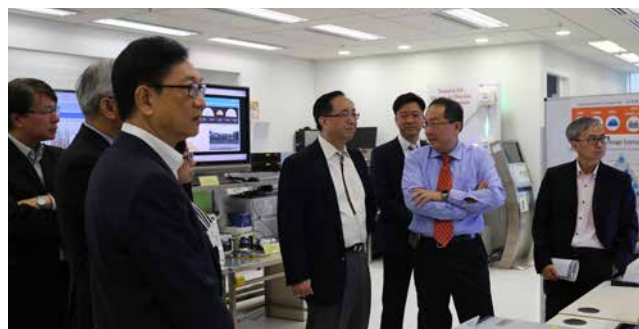
應科院年中無間斷地與各類機構和組織積極合作，其中公營機構的合作夥伴有香港警務處、香港金融管理局及香港機場管理局。而來自業界的私營機構如：萬維數碼、京信通訊、德爾福、南通先進通訊技術研究院、中國銀行(香港)、世紀互聯、香港電訊盈科、是德科技及環聯等等。至於與專上學府如香港中文大學、香港大學及香港科技大學的合作同樣重要。應科院也接待很多來自這些合作夥伴及其他組織的訪客，我們的研發團隊與來訪賓客共同交流見解、技術理念和行業知識。



Former Financial Secretary Mr John C Tsang visits ASTRI on 13 July 2016

前財政司司長曾俊華先生在2016年7月13日到訪應科院

全年共有160多個代表團來訪應科院，了解院內各項技術項目和創新科研計劃。大部分訪客或來自私營企業，有助應科院將相關技術商業化、從而惠及消費者；或來自多家學術機構，為學術與應用研究之間提供了重要聯繫。



Mr Nicholas Yang (4th at the right), the Secretary for Innovation and Technology, discusses with ASTRI's senior management on the future directions of the organisation during his visit on 10 August 2016

創新及科技局局長楊偉雄先生(右四)在2016年8月10日到訪應科院，並與管理層就本院未來發展方向進行討論

2016至2017年度來訪應科院的高級政府官員（按時間順序排列）包括香港特別行政區行政會議召集人陳智思先生、前財政司司長曾俊華先生、創新及科技局局長楊偉雄先生、國家科技部副部長李萌先生、前香港特別行政區政府財經事務及庫務局局長陳家強教授、政府資訊科技總監楊德斌先生、中央人民政府駐香港特別行政區聯絡辦公室副主任譚鐵牛博士、中國科學技術部港澳台辦公室(MOST)副巡視員徐捷先生。

Among senior Government Officials who visited ASTRI in 2016-17 were (in chronological order of visits) Mr Bernard Charnwut Chan, Convenor of Executive Council, HKSAR; Mr John C Tsang, former Financial Secretary; Mr Nicholas W Yang, Secretary for Innovation and Technology; Mr Li Meng, Vice Minister of Science and Technology of the Chinese Central Government; Professor K C Chan, former Secretary for Financial Services and the Treasury of the Hong Kong SAR Government; Ir Allen Yeung, Government Chief Information Officer; Dr Tan Tieniu, Deputy Director of the Chinese Central Government's Liaison Office in Hong Kong; Mr Xu Jie, Deputy Inspector, Office of Hong Kong, Macao and Taiwan Affairs, the Ministry of Science and Technology of the People's Republic of China (MOST).



Dr Tan Tieniu, Deputy Director of the Central Government's Liaison Office in the Hong Kong SAR visits ASTRI on 25 January 2017

中央政府駐香港特區聯絡辦公室副主任譚鐵牛博士在2017年1月25日訪問應科院

Other visitor groups came from government and statutory organisations, public sector and utility services companies, diplomatic missions, inter-governmental and industry associations, and charitable organisations. About 41% of visitors came from Hong Kong-based organisations while 35%, 4% and 20% were based in the Mainland, Asian countries, and other parts of the world respectively.

Visiting delegations from abroad included the Electronic Transaction Authority of Thailand, International Monetary Fund, Central Bank of Thailand, Singapore's Agency for Science, Technology & Research (A*STAR) and Economic Development Board, Vice Minister for Finance of Thailand, Canadian FinTech delegation led by the Consulate of Canada, Sagamiyara Chamber of Commerce and Industry of Japan, US Commodity Futures Trading Commission, etc.

Showcasing Technologies and Promoting Innovation

ASTRI took part in over 20 industry exhibitions, expos and similar events throughout the year. Among the major events, ASTRI took part in two editions of the Mobile World Congress – Shanghai in June-July 2016 and Barcelona in February-March 2017. ASTRI showcased a number of advanced and latest mobile communication tools including 5G solutions, in

其他來訪團體來自政府和法定機構、公共機構與公共事業公司、外交使團、政府部門及行業協會以及慈善組織。其中約41%訪客來自香港本土組織，其餘35%、4%和20%則分別來自內地、亞洲國家和世界其他地區。



Thailand's Vice Minister for Finance Mr Kiatchai Sophasienphong (2nd at the left), together with a delegation of private and public sector representatives visit ASTRI on Tuesday, 17 January 2017

泰國副財政部長林國孝先生（左二）於2017年1月17日率領公共部門和私營機構代表到訪應科院

來自海外的代表團包括泰國電子交易管理局、國際貨幣基金組織、泰國中央銀行、新加坡科技研究局 (A*STAR) 與經濟發展局、泰國財政部副部長、加拿大領事館帶領的加拿大金融科技代表團、日本相模原工商會以及美國商品期貨交易委員會。



Professor K C Chan, former Secretary for Financial Services and the Treasury leads a delegation of government officials and top executives from Hong Kong's major financial regulators to visit ASTRI on 25 October 2016

前財經事務及庫務局局長陳家強教授於2016年10月25日率領金融監管機構政府官員和高級行政人員，和私營機構代表到訪應科院

展示技術，推廣創新

應科院全年共參加了20多個業界展會、展覽及類似活動，包括參加2016年6月至7月在上海以及2017年2月至3月在巴賽隆那舉辦的兩屆世界移動通訊大會。兩屆展會上，應科院展示了一批最新先進流動通訊工具，包括與領先電訊設備製造商合作推出的5G解決方案。應科院還參加了2016年中國國際信息通訊展覽會，並展示了智慧城市5G解決方案和體驗。

partnership with leading telecom equipment manufacturers, in these two events. ASTRI also took part in the PT/EXPO China 2016 demonstrating 5G solutions and experiences for a smart city.

Other major events and exhibitions where ASTRI participated include: Thailand e-Commerce Week 2016, InnoCarnival 2016, China (Shanghai) International Machine Vision Exhibition and Machine Vision Technology & Application Conference 2017, and Smart Living@Science Park – Ageing in Place.

Through a jointly hosted launch ceremony, the Smart Mobility Consortium on Cellular-Vehicle-to-Everything (C-V2X) technologies was announced by ASTRI, HKT, Huawei and Qualcomm. An MoU on the collaboration, which can potentially revolutionise the transportation sector in Hong Kong, was signed by top officials from the four organisations. ASTRI's Chairman Mr Wong Ming-yam and Dr Jolly Wong, Chief Telecommunications Engineer of the Hong Kong Police Force were among the dignitaries attending the ceremony.

應科院參與的其他重大活動和展會包括：2016年泰國電子商務周、2016年創新科技嘉年華、2017中國（上海）國際機器視覺展覽會暨機器視覺技術與工業應用研討會以及智慧生活@科學園 - 家居安老體驗館。

應科院、香港電訊、華為及高通聯合舉辦發佈會，宣佈推出流動車聯網Cellular-Vehicle-to-Everything (C-V2X) 技術並創立智能交通聯盟。四個組織的高層官員簽署了合作諒解備忘錄，該項合作將對香港運輸業產生革命性影響。應科院董事局主席王明鑫先生及香港警務處資訊系統部電訊總工程師（通訊科）黃振球博士出席了發佈會。

ASTRI participation in more than 20 industry exhibitions, expo and similar events throughout the year
應科院全年共參加了20多個業界展會、展覽及類似活動



Investing in the Next Generation

Helping Hong Kong's younger generation to understand how technology can be used to improve and strengthen the business sectors, ASTRI undertook two major initiatives this year: CASH-ASTRI ALGO Trading Contest and BOCHK-ASTRI Smart Investment Contest. The first one encouraged young contestants to learn to use algorithm based technologies in financial trading. In the second one, ASTRI developed an AI-based platform that Bank of China (Hong Kong) used for the technology-powered simulated investment exercise.

Jointly with the Hong Kong Monetary Authority, ASTRI launched the FinTech Career Accelerator Scheme (FCAS) on 16 December 2016 to nurture the next generation of Hong Kong's FinTech talents. Aiming to meet the growing needs of trained FinTech professionals in Hong Kong, the programme is supported by 12 banks and 10 tertiary education institutions.

Another community engagement initiative from ASTRI in 2016-17 was the first ever Inter-Tertiary-Institute Capture the Flag Contest 2017 organized in partnership with iChunQiu.com for students from tertiary educational institutions in Hong Kong and Macau. The programme was launched on 7 March 2017 - 96 teams comprising 317 students from 14 tertiary educational institutions took part.

ASTRI hosted a large number of students' groups ranging from primary schools to tertiary institutions, predominantly from Hong Kong-based universities but also from the Mainland and other parts of the world. R&D and technological exchange with teachers and researchers from higher educational institutions were also intensified, allowing ASTRI to bridge a connection between the academia and the industry.

Throughout the year, ASTRI hosts a large number of students' groups ranging from primary schools to tertiary institutions
過去一年以來，應科院盡心接待來自不同地區的學界團體

培育新一代

為幫助香港的年輕一代了解科技如可能改善和加強商界競爭力，應科院今年舉辦了兩項重要賽事：大學校際演算交易大賽，和中銀香港——應科院智能投資比賽。第一項賽事鼓勵年輕選手在金融交易中學習使用演算技術；第二項賽事採用了應科院為中銀香港模擬投資活動開發的人工智能平台。



ASTRI and the Hong Kong Monetary Authority jointly launch the FinTech Career Accelerator Scheme

應科院與香港金融管理局攜手推出「金融科技人才培育計劃」

應科院與香港金融管理局於2016年12月16日攜手推出「金融科技人才培育計劃 (FCAS)」，培育新一代金融科技人才。該計劃獲得12間銀行及10所院校支持，旨在滿足香港日益增長的受訓金融專業人才需求。

應科院今年三月與春秋學院 (iChunQiu.com) 攜手合辦香港首個「大專聯校網絡安全競賽2017」，吸引來自香港和澳門的大專院校學生參加。該活動於2017年3月7日啟動，來自14所大專院校的317名學生組成96支隊伍參加了比賽。

應科院盡心接待來自不同地區的學界團體，包括香港大專院校、內地，以致全球其他地區，由小學到大學的大批學生到訪。同時，應科院還加強與高等院校教師與研究人員的研發與技術交流，擔當起促進學術界與業界溝通的角色。



In the Media

2016-17 was a prolific year for ASTRI in terms of strong, positive news coverage from media outlets based in Hong Kong, the Mainland and other parts of the world. The Institute's R&D initiatives, latest innovation projects, announcement of collaborations, and major events were covered by local, regional and international media.

A total of 41 news releases from ASTRI was published in the year with local (both Hong Kong and the Mainland), regional, and global media outlets carrying our stories. Most of them announcing major breakthroughs or innovative technologies, either quoted ASTRI's R&D professionals, carried interviews with the Institute's senior leaders, or referred to our R&D initiatives in particular tech areas. In total, over 6,000 news pieces were carried by print, digital, or electronics media with reference to ASTRI.

媒體聚焦

2016至2017年度，應科院積極開展項目、或與公營機構、私營企業建立合作夥伴關係，共同研發；或是出席重要活動，發表研究成果等等，均吸引本地、內地和海外媒體注目，對我們的活動作出報導。

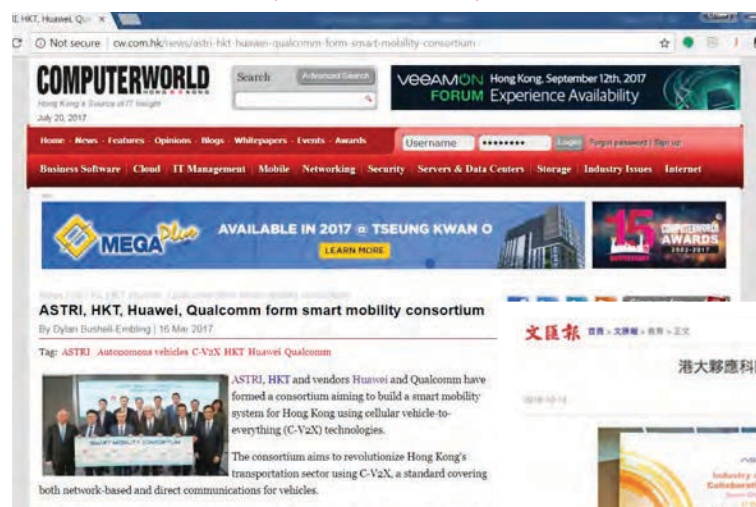
年內，應科院發佈了41篇新聞稿，獲本地（香港和內地）、區內及國際媒體報導。報導內容大部分有關應科院宣佈重要發展或創新技術，有些援引了應科院相關專家的講話，或是管理層的專訪，甚或參考我們就特定範疇的研發項目成果。年內，與應科院相關的報導，包括印刷版、數碼版或電子媒體，累計超過6,000篇報導。

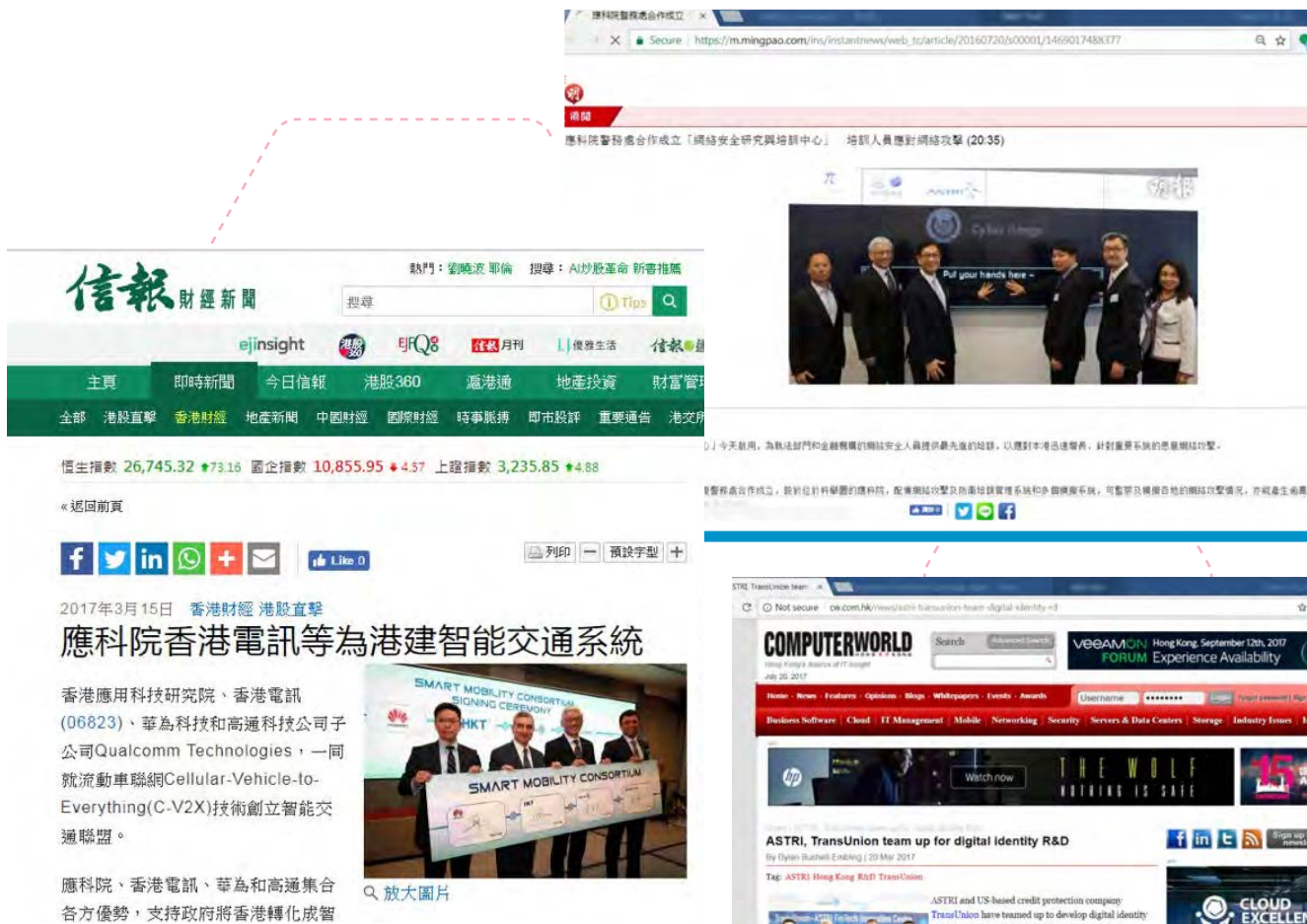
Media interviews
接受媒體訪問



Major online, print and electronic news media that featured ASTRI in their stories include South China Morning Post, China Daily, Ming Pao, Sing Tao, Metro Daily, Computerworld HK, Financial Times, Commercial Radio Hong Kong, Hong Kong, TVB Finance Magazine, TVB News Magazine, Master Insight, Yazhou Zhoukan, Hong Kong Economic Times, Hong Kong Economic Journal, Ta Kung Pao, and Oriental Daily, etc.

報導過應科院新聞的主要網上新聞媒體、印刷媒體及電子新聞媒體包括《南華早報》、《中國日報》、《明報》、《星島日報》、《都市日報》、《香港電腦世界》、《金融時報》、《香港商業電台》、《香港TVB財經透視》、《TVB新聞透視》、《灼見名家》、《亞洲週刊》、《香港經濟日報》、《信報》、《大公報》及《東方日報》等。





Source:

- Ming Pao website
- South China Morning Post website
- Computerworld HK website
- Yazhou Zhoukan website
- Hong Kong Wen Wei Po website
- Ta Kung Pao website
- Hong Kong Economic Journal website

資料來源：

- 明報網
- 南華早報網
- 香港電腦世界網
- 亞洲週刊網
- 香港文匯網
- 大公報網
- 信報網

大公報

大公報 | 中國 | 國際 | 香港 | 專欄

金管局夥港應科院培育金融人才

2016-12-17 03:01:17 | 來源：大公報 | 我要分享

打印



金融科技人才培育計劃簡介

- 由11間銀行提供共約70個實習職位，銀行包括工銀亞洲、中銀香港、渣打銀行、交通銀行（香港）、東亞銀行、法國巴黎銀行、北京銀行、恒生銀行、星展香港、廣發銀行及渣打香港
- 參與院校：中文大學、公開大學、城市大學、科技大學、香港大學、香港中文大學、樹仁大學及嶺南大學
- 銀行提供的金融科技項目：網絡安全、分布式分佈數據技術、大數據分析、人工智能等
- 對象：參與院校內修讀工程、計算機科學、科學、商業、金融或法律的本科生和研究生
- 實習期由2017年起為期1年
- 薪酬：視乎學生學歷及銀行決定，學士學生月薪約10000元，碩士學生月薪約16000元

圖：金管局總裁陳德霖（前排中）、香港應用科技研究院主席王明燾（前排右五）、十一間銀行的高層和九所大學的校長或高層代表昨日主持金融科技人才培育計劃啟動儀式

「十八般武艺」請來港應科院，金管局與港應科院合作，攜手培育金融科技人才

In the Social Media

During the year 2016-17, ASTRI maintained a strong and regular presence in the social media, particularly in Facebook, LinkedIn and WeChat. Specifically in Facebook, the ASTRI page enjoyed a loyal 'fanbase' of circa 6,000 users, most of them belonging to the 'below 30' age group. The page posted nearly a hundred updates throughout the year, touching upon topics from interesting technology trivia to latest innovation news from around the world to the most recent ASTRI projects.

Some of the most popular Facebook posts from ASTRI included:

1. ASTRI's CEO Dr Frank Tong was one of the panel discussion speakers in the "City University MBA Sharp Forum".
2. ASTRI, in partnership with iChunQiu.com, organised the first ever Inter-Tertiary-Institute Capture the Flag (CTF) Contest 2017 in Hong Kong and Macau.
3. According to an Accenture report, investment in FinTech in Asia has quadrupled in 2016 from 2015.
4. ASTRI won the Hong Kong ICT Award 2017 (Bronze) in the Best Business Solution (Application) category, for its Automatic Meter Reading System.

ASTRI 香港應用科技研究院
Published by Ada Lee [?] · February 14 ·

FinTech係金融界發展趨勢，呢方面亦係ASTRI嘅重點研究項目，因此CityU嘅日為MBA課程而設嘅「城大工商管理尖端論壇」，邀請咗ASTRI CEO Dr. Frank Tong作為其中一位講者，同電子錢包公司TNG Asia CEO Mr Alex Kong，以及香港工業總會主席Prof. Ir Daniel Cheng一齊探討FinTech帶俾香港嘅益處、挑戰同前景，同場嘉賓仲有匯豐銀行CIO, International & RBWM Rest of Asia, Dr KK Chan。

FinTech is undoubtedly the trend for financial industry in Hong Kong, it is also one of the initiatives for ASTRI. That's the reason why CityU invited ASTRI's CEO Dr Frank Tong to be one of the panel discussion speakers yesterday in the "City University MBA Sharp Forum". Other speakers include TNG Asia's CEO Mr Alex Kong and Chairman of Federation of Hong Kong Industries Prof. Ir Daniel Cheng. They shared with audiences on the topic of "FinTech - Benefits, Challenges and Prospects in Hong Kong". Another honorable guest of the event was Dr C K Chan, CIO, International & RBWM Rest of Asia of HSBC.



1

ASTRI 香港應用科技研究院
12 January ·

金融科技2015年嘅亞太區有超過4倍嘅增長，有US\$4,300,000,000*增多！點可以話唔重要？

所以新一年我哋有份支持嘅「2017香港資訊及通訊科技獎：最佳金融科技獎」一樣好重要，好想邀請企業或初創公司參加，以開發金融科技嘅方案，例如支付方案、結算系統等，快啲去<http://www.hkictawards.hk/>或<http://www.hkib.org/>報名啦！

*source: Accenture report titled "Fintech and the evolving landscape: Landing points for the financial services industry."



3

社交媒體

2016至2017年度，應科院在Facebook、LinkedIn及微信等社交媒體相當活躍。尤其是在Facebook上，應科院專頁擁有約6,000名用戶的忠實「粉絲團」，其中大多數為「30歲以下」年齡組別。全年間應科院在Facebook專頁上共發佈近一百篇貼文，內容涉及有趣的技術軼事、來自世界各地的最新創科新聞乃至應科院的最新項目。

應科院在Facebook上發佈的最受歡迎貼文包括：

1. 應科院行政總裁湯復基博士在「城大工商管理尖端論壇」擔任小組討論演講者之一。
2. 應科院與春秋學院 (iChunQiu.com) 舉辦了香港和澳門首個「大專聯校網絡安全競賽 (CTF) 2017」。
3. 森哲研究報告指出，2015至2016年亞洲金融科技投資增幅達一倍。
4. 應科院智慧水務平台榮獲2017年香港資訊及通訊科技獎之最佳商業方案（應用）銅獎。



2

ASTRI 香港應用科技研究院 added 3 new photos.
Published by Ada Lee [?] · April 13 ·

早前於3月31日，香港資訊及通訊科技獎宣佈應科院的智慧水務平台，獲頒發最佳商業方案銅獎。上星期五(4月7日)，行政總裁湯復基博士帶同一眾同仁，包括副總裁(新一代通訊網絡)莊哲義博士、署理總監(智能軟件和系統)雷志誠博士等，出席「2017香港資訊及通訊科技獎」頒獎典禮暨晚宴。

ASTRI has won the 2017 Hong Kong ICT Award (bronze) in the Best Business Solution (Application) category, for its automatic meter reading system. The announcement came on 31 March 2017. On the occasion, a team of ASTRI R&D professionals attended the Awards Presentation Ceremony followed by a Celebration Dinner on 7 April. Led by Dr Frank Tong, ASTRI CEO, the team also included Dr Justin Chuang, Vice President, Next Generation Network; and Dr James Lei, Acting Director, Intelligent Software and Systems.



4

- Students from seven universities in Hong Kong and six from the Mainland took part in the 2nd Annual Inter-University Algo Trading Contest co-organised by CASH co-organised by ASTRI.
- What if cars could talk to each other? Or warn their drivers about an imminent danger? Why can't our cars advise us on the most time-and-fuel-efficient route? If Hong Kong's Smart Mobility Consortium – launched recently by ASTRI, HKT, Huawei and Qualcomm – is successful, our city can be a pioneer for rest of Asia with its smart transportation system powered by Vehicle-to-Everything technology.
- A group of people from ASTRI joined the 'skip lunch' day organised by the Community Chest of Hong Kong, and donated the money to a great cause - helping those in need. At ASTRI, we take pride in helping Hong Kong to become more competitive. We also take our community engagement very seriously, and try to make a difference wherever we can.

ASTRI's channel in WeChat has helped the Institute to stay in close touch with the audience in the Mainland. In addition, its LinkedIn channel has actively promoted ASTRI as an inspiring, preferred place to work for technology professionals.

- 來自香港的七間大學，及來自內地的六間大學的大學生參加了由時富量化金融和應科院聯合舉辦的「第二屆年度大學校際演算交易比賽」。
- 如果汽車可以互相交談會怎樣？又或者汽車可以向司機發出預警以避免面前的危險，又會怎樣？為什麼我們的汽車不能提議最省時和慳油的行車路線？當應科院、香港電訊、華為及高通聯合發佈的香港智能交通聯盟試驗成功，我們這城市以流動車聯網Vehicle-to-Everything技術為基礎的城市智慧交通系統，將成為亞洲其他地區的先鋒。
- 應科院的同事參加了由香港公益金組織的「折」食日，捐款幫助有需要的人。應科院全人為著可以幫助提高香港競爭力而深感自豪，也非常重視與社群接觸，並盡可能為接觸的社群帶來一點點改變。

應科院微信渠道幫助我們與內地的觀眾保持密切聯繫。此外，應科院LinkedIn渠道則將應科院介紹給更多技術專家，藉以吸納更多人才。



1,307 people reached

Boost Post

6



Organised by CASH Algo Finance Group and co-organised by ASTRI, the 2nd Annual Inter-University Algo Trading Contest is about to have the results. This year, we have invited 7 renowned universities in Hong Kong and 6 in Mainland China to participate. A total of 99 teams have created and tested their own designed algo trading strategies. After the first round of the Contest, the Finale is about to begin and we would like to invite all University students to come! Please send email to rsvp-contest@cashaigo.com to join!

Details of the Finale:
Date: 19 Feb 2017 (Sun)
Time: 10am – 4pm
Venue: Grand Hall @ Hong Kong Science Park
Website: algocontest.cashaigo.com



5



7

9 FINANCIAL REPORT

財務報告

Overview

For 2016-17 financial year, the consolidated income and expenditure of ASTRI amounted to HK\$446,038,360 and HK\$442,167,720 respectively, resulting in a surplus of HK\$3,870,640.

The funds from the Government comprised HK\$142,706,472 from recurrent subvention, HK\$212,894,473 from ITF project funds ("ITF"), HK\$788,639 from ITF General Support Programme ("GSP"), HK\$4,532,070 from ITF Public Sector Trial Scheme ("PSTS"), HK\$3,915,777 from ITF Internship and HK\$4,656,107 from ITF for Chinese National Engineering Research Centre for Application Specific Integrated Circuit System (Hong Kong Branch). In 2016-17 financial year, the income from the industry amounted to HK\$76,544,822.

The total expenditure of recurrent subvention amounted to HK\$141,988,438, which represented an increase of HK\$7,474,702 (5.6%) compared with the previous year. The increase was mainly due to the increase in depreciation of leasehold improvements incurred for the renovation of 3rd and 5th floors of Photonics Centre in 2016 as well as more expenses for advertising and promotional activities. ASTRI's operation remained steady with prudent financial management throughout the year.

The total expenditure of the ITF, GSP and PSTS projects amounted to HK\$269,239,799, of which 77% of the expenditure was spent on manpower and 23% of the expenditure was spent on equipment and other direct costs. The total expenditure mainly represented the actual cash outflow incurred during the year for 68 full projects, 52 seed projects, two GSP projects and six PSTS projects. Meanwhile, the internship expenditure amounted to HK\$3,915,777, which represented the actual cash outflow of salary payment for interns engaged in 18 full projects and six seed projects.

The consolidated financial statements of ASTRI for the year ended 31 March 2017 have been audited by independent auditors with unqualified audit opinion, an extract of the Consolidated Statement of Income and Expenditure, Consolidated Statement of Comprehensive Income and Consolidated Statement of Financial Position are set out in the pages 100-102.

概況

應科院在2016-2017年度的綜合收入和支出分別為港幣446,038,360元及港幣442,167,720元，所得盈餘為港幣3,870,640元。

來自政府款項包括經常性撥款港幣142,706,472元；創新及科技基金的項目研發費港幣212,894,473元；創新及科技基金的一般支援計劃資助港幣788,639元；創新及科技基金的公營機構試用計劃資助港幣4,532,070元；創新及科技基金的實習研究員計劃資助港幣3,915,777元及創新及科技基金向國家專用集成電路系統工程技術研究中心(香港分中心)提供的資助港幣4,656,107元。在2016-17年度內從業界所得的總收入為港幣76,544,822元。

經常性撥款的總支出為港幣141,988,438元，比去年同期增加港幣7,474,702元（5.6%），主要是由於2016年裝修的光電子中心3樓及5樓的租賃物業裝修折舊增加，以及宣傳推廣活動的開支增加。應科院全年保持穩定經營及繼續以審慎原則執行財務管理。

創新及科技基金的項目研發、一般支援計劃資助和公營機構試用計劃資助項目的總開支達港幣269,239,799元，當中77%用於人力資源，23%用於儀器及其他直接開支，總開支主要為六十八個正式項目，五十二個種子項目，兩個一般支援計劃項目和六個公營機構試用計劃項目的實際現金支出。同時，實習研究員計劃支出為港幣3,915,777元，為實習研究員參與十八個正式項目和六個種子項目的實際薪酬支出。

應科院全年截至2017年3月31日止的綜合財務報表經由獨立核數師審計，並獲發無保留審計意見書。綜合收支表及全面收益表及綜合財務狀況表詳載於第100至102頁。

Consolidated Statement of Income and Expenditure and Comprehensive Income

綜合收支表及全面收益表

Year ended 31 March 2017 截至2017年3月31日止年度		2017 HK\$ 港幣	2016 HK\$ 港幣
Subvention	資助		
Income from Government subvention	政府資助收入	142,706,472	144,245,404
Administrative expenses	行政支出	(141,988,438)	(134,513,736)
Surplus on subvention	資助盈餘	718,034	9,731,668
Project Funding from Innovation and Technology Fund and Industry Contributions	創新及科技基金及 業界投入資金		
Project fund income	項目收入		
• Innovation and Technology Fund	• 創新及科技基金	212,894,473	183,238,421
• Industry contributions	• 業界投入資金	50,573,437	54,022,267
Project expenditure	項目支出	(263,467,910)	(237,260,688)
Balance on project funding	項目資金餘額	-	-
General Support Programme	一般支援計劃		
Project fund income	項目資金收入		
• Innovation and Technology Fund	• 創新及科技基金	788,639	741,343
• Industry contributions	• 業界投入資金	451,180	40,000
Project expenditure	項目支出	(1,239,819)	(781,343)
Balance on project funding	項目資金餘額	-	-
Public Sector Trial Scheme	公營機構試用計劃		
Project fund income	項目資金收入		
• Innovation and Technology Fund	• 創新及科技基金	4,532,070	6,408,909
Project expenditure	項目支出	(4,532,070)	(6,408,909)
Balance on project funding	項目資金餘額	-	-
Internship Funding from Innovation and Technology Fund	創新及科技基金的實習 研究員計劃基金		
Internship fund income	實習研究員計劃資助收入	3,915,777	3,898,648
Internship expenditure	實習研究員計劃支出	(3,915,777)	(3,898,648)
Balance on internship funding	實習研究員計劃資助餘額	-	-
Funding Support from Innovation and Technology Fund for Chinese National Engineering Research Centre For Application Specific Integrated Circuit System (Hong Kong Branch) ('CNERC-ASIC')	創新及科技基金給國家專用 集成電路系統工程技術 研究中心（香港分中心） 的資助		
Expenditure incurred in relation to Funding Support from Innovation and Technology Fund	由創新及科技基金資助 的有關支出	(4,656,107)	(4,506,711)
Amount for reimbursement	發還款項	4,656,107	4,506,711

Year ended 31 March 2017 截至2017年3月31日止年度		2017 HK\$ 港幣	2016 HK\$ 港幣
Other Income, Net	其他淨收入		
Other income	其他收入	25,520,205	24,263,006
Other expenses	其他支出	(18,281,132)	(16,765,455)
Other income, Net	其他淨收入	7,239,073	7,497,551
Amount Return to the Government of The Hong Kong Special Administrative Region	退還香港特別行政區政府款項	(4,201,322)	(2,988,372)
Surplus Before Tax	稅前盈餘	3,755,785	14,240,847
Income Tax Credit / (Expense)	所得稅抵免 / (支出)	114,855	(768,405)
Surplus for the Year	本年度盈餘	3,870,640	13,472,442
Other Comprehensive Loss to be Reclassified to Surplus or Deficit in Subsequent Periods	在以後會計期重新分類作盈餘或虧損的其他全面虧損		
Exchange Differences arising on Translation of Foreign Operations	外幣報表換算差額	(62,909)	(59,073)
Total Comprehensive Income for the Year	本年度全面總收入	3,807,731	13,413,369

Consolidated Statement of Financial Position

綜合財務狀況表

As at 31 March 2017 於2017年3月31日		2017 HK\$ 港幣	2016 HK\$ 港幣
Non-current Assets	非流動資產		
Property, plant and equipment	物業、機器及設備	19,761,787	15,229,959
Current Assets	流動資產		
Accounts receivable, prepayments and deposits	賬戶應收款項、預付款項及按金	29,868,833	22,601,718
Amount due from the Government of the Hong Kong Special Administrative Region	應從香港特別行政區政府收回款項	4,473,375	4,379,430
Tax recoverable	可退回稅項	687,237	659,904
Cash and cash equivalents	現金及現金等值	171,568,853	210,565,678
		206,598,298	238,206,730
Current Liabilities	流動負債		
Accounts and other payables, provisions and accruals	賬戶及其他應付款項、撥備及應計款項	67,285,532	49,303,328
Receipts in advance	預收款項	58,545,919	108,645,540
Amount due to the Government of the Hong Kong Special Administrative Region	應付予香港特別行政區政府款項	4,345,661	3,112,579
		130,177,112	161,061,447
Net Current Assets	流動資產淨值	76,421,186	77,145,283
Total Assets Less Current Liabilities	總資產減流動負債	96,182,973	92,375,242
Non-current Liability	非流動負債		
Provision	撥備	1,500,000	1,500,000
Net Assets	資產淨值	94,682,973	90,875,242
Equity	股權		
Share capital	股本	2	2
Reserves	儲備	94,682,971	90,875,240
Total Equity	股權總值	94,682,973	90,875,242

Note:

These financial statements have been prepared in accordance with Hong Kong Financial Reporting Standards issued by the Hong Kong Institute of Certified Public Accountants, accounting principles generally accepted in Hong Kong, and the Hong Kong Companies Ordinance.

The above financial information relating to the years ended 31 March 2017 and 31 March 2016 set out on pages 100-102 does not constitute the Company's statutory annual consolidated financial statements for those years but is derived from them. Further information relating to those statutory consolidated financial statements required to be disclosed in accordance with section 436 of the Hong Kong Companies Ordinance is as follows:

As the Company is a private company, the Company is not required to deliver its financial statements to the Registrar of Companies, and has not done so. The Company's auditors have reported on the financial statements of the Company for both years. The auditors' reports were unqualified; and did not include a reference to any matters to which the auditors drew attention by way of emphasis without qualifying their reports; and did not contain a statement under section 406(2), 407(2) or (3) of the Hong Kong Companies Ordinance.

備註：

本財務報表乃根據香港會計師公會頒布之香港財務報告準則、香港公認會計原則及香港公司條例編制。

以上第100至102頁截至2017年3月31日及2016年3月31日的財務資料並不構成本公司有關財政年度的法定財務報表，但這些財務資料均取自有關財務報表。有關這些法定財務報表需要根據香港公司條例第四百三十六條作進一步披露的資料如下：

由於本公司是私人公司，無須向公司註冊處遞交財務報表，同時從未遞交過。本公司的核數師已報告了兩年間的財務報表。核數師呈交的無保留報告，並不包括該核數師在其報告不作保留意見之情況下，以強調的方式促請有關人士注意的任何事宜之提述，亦未載有按香港公司條例第四百零六（二）、四百零七（二）或（三）所指的陳述。

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