Reports of R&D Groups and Teams

研發群組及小組報告

Think Innovative

Live Smart

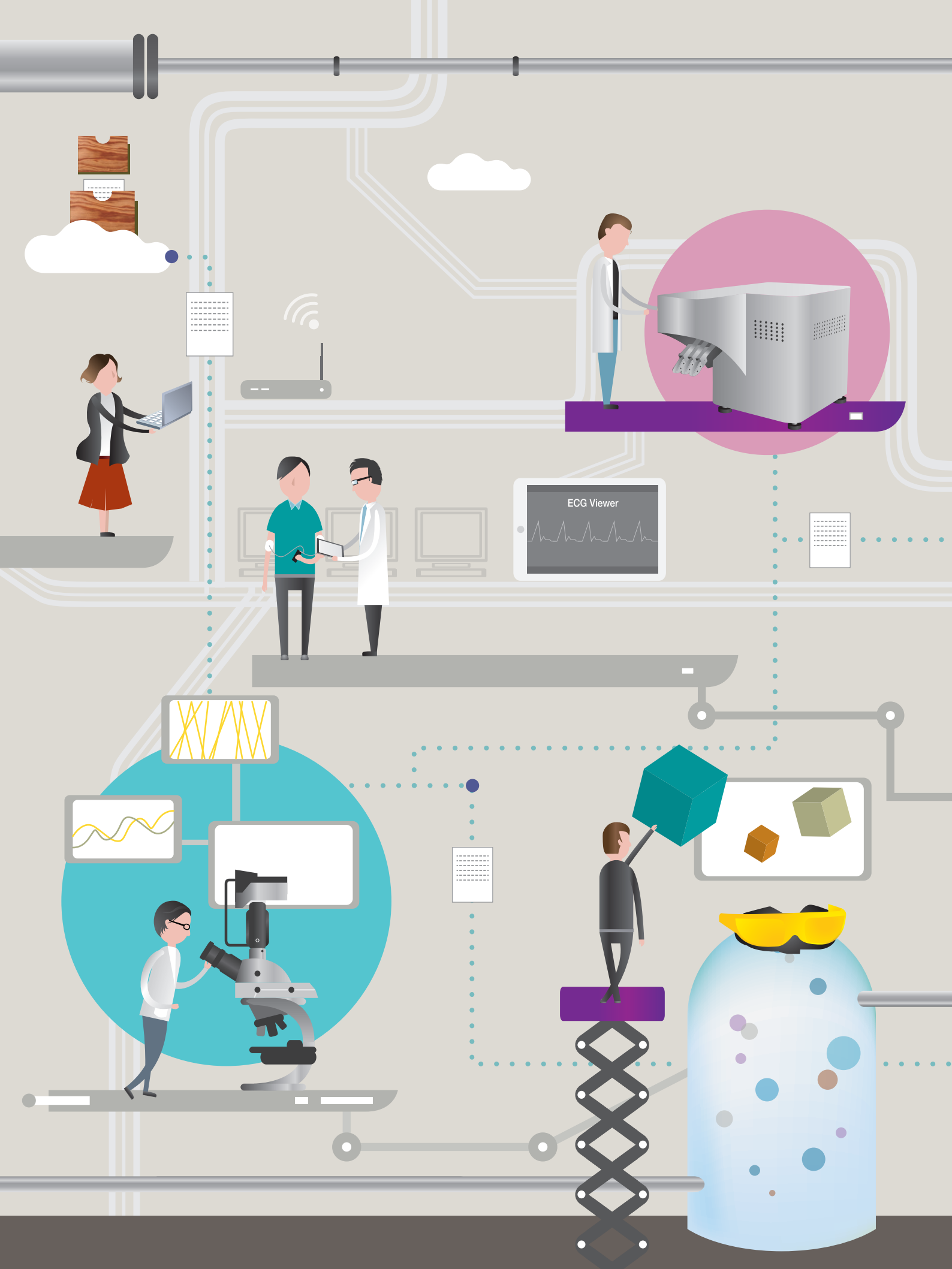
創新意念• 智能生活

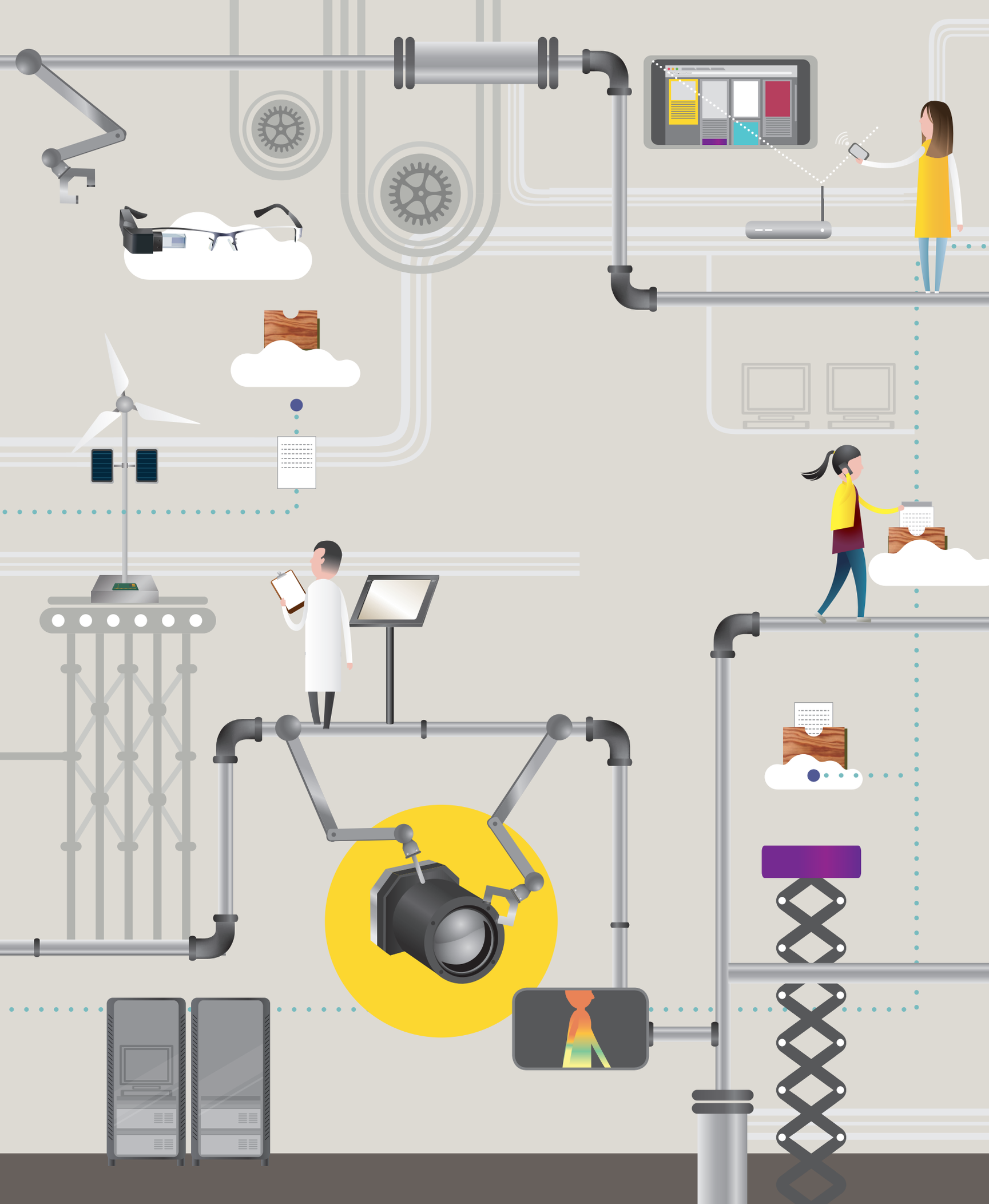
ASTRI™

香港應用科技研究院有限公司

Hong Kong Applied Science and Technology Research Institute Company Limited

Contents
目錄


ECG Viewer



Think Innovative
Live Smart
創新意念• 智能生活

Discover the happiness of a new way of living powered by advanced technologies. At ASTRI, our constant innovation and desire for positive change bring surprises into our everyday life.

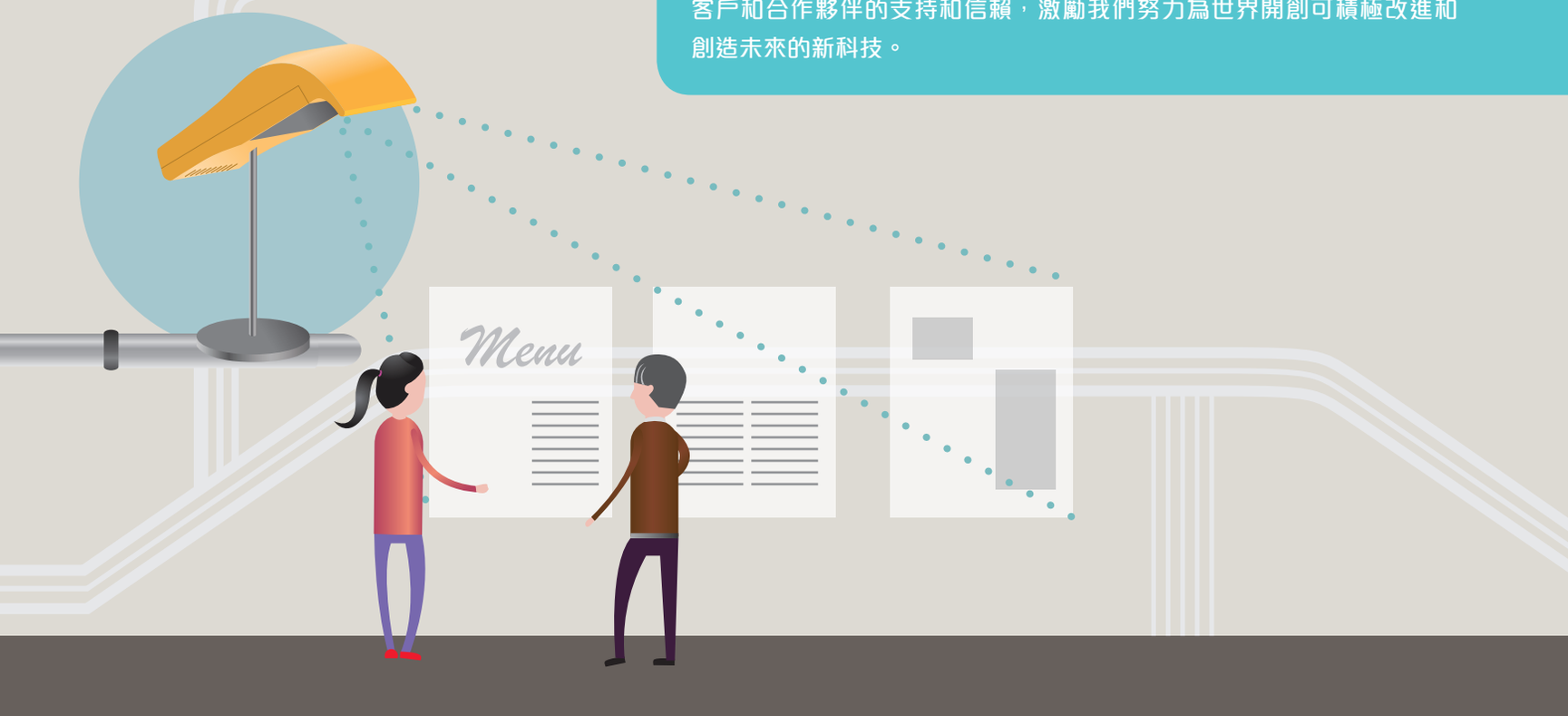
創新科技令生活倍添樂趣，應科院不斷通過開發和推廣新技術，為生活注入新元素，帶來無限驚喜。

Lead Trends • Drive Changes

With the trust and support of our partners and customers, we work towards innovation that inspires the world and shapes our future.

引領潮流 • 開創未來

客戶和合作夥伴的支持和信賴，激勵我們努力為世界開創可積極改進和創造未來的新科技。

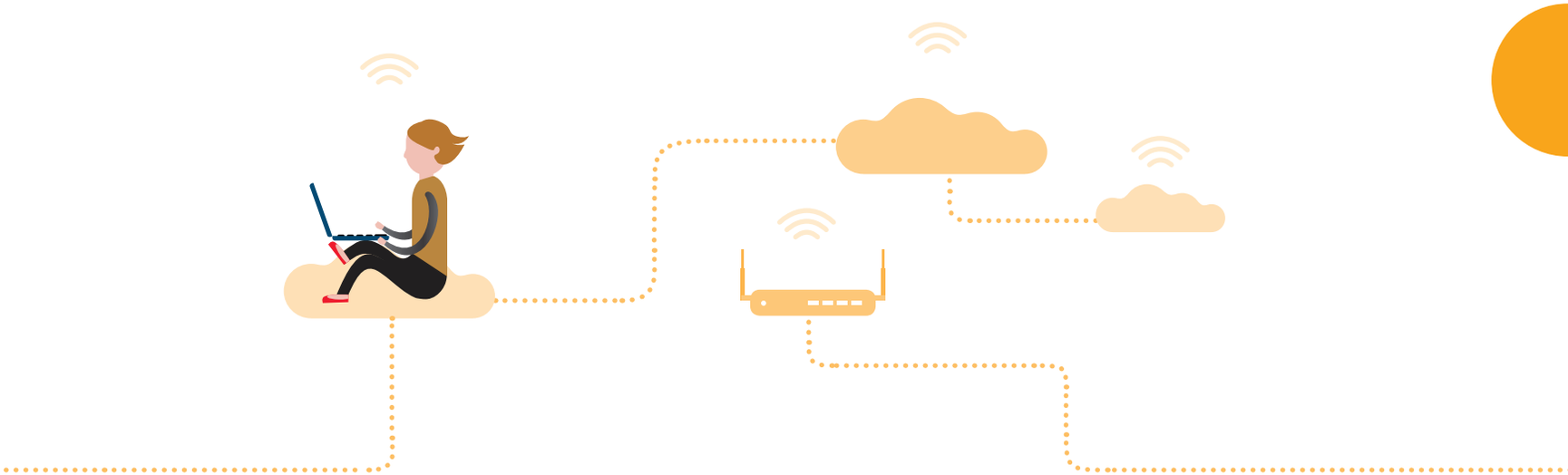


Communications Technologies Group
通訊技術群組

LTE Indoor Small Cell
LTE室內小基站

With LTE indoor small cell enhancing signal coverage, mobile device users can enjoy ubiquitous ultra-high speed streaming media services

LTE室內小基站強化訊號覆蓋，使用者可通過移動設備盡享無處不在的超高速流媒體服務



Overview

The Communications Technologies (CT) Group has been focusing on developing enabling technologies for advanced communication systems and applications to offer market-driven and customer-focused technology solutions. The Group's core technological competitiveness comprises three areas, namely, communications software, baseband solutions and radio frequency (RF) systems. The Group has developed standard-based technologies such as commercial grade 4G/LTE small cell reference designs. It has also been strengthening its competitiveness by combining various core competencies, from RF systems to communication network software, to provide integrated and high value-added technologies and solutions to industry.

During the year, the Group accomplished many technology breakthroughs and commercial successes. It completed the world's first LTE-Advanced uplink MIMO test and commercial end-to-end TD-LTE small cell solution demonstration jointly with partners at the Mobile World Congress. The technologies developed form the foundation for creating win-win collaboration with industry partners enhancing competitiveness of their product portfolio. For example, a long-term strategic partnership was signed this year with TCL Communications on joint R&D focusing on 4G and next generation wireless technologies.

In terms of commercialization, the Group's consistent efforts achieved significant success with income from industry reaching HK$32 million, which was about 60 per cent of the total ITF project cost, or triple the annual target. The total contract and sponsorship value signed with industry came close to HK$30 million.

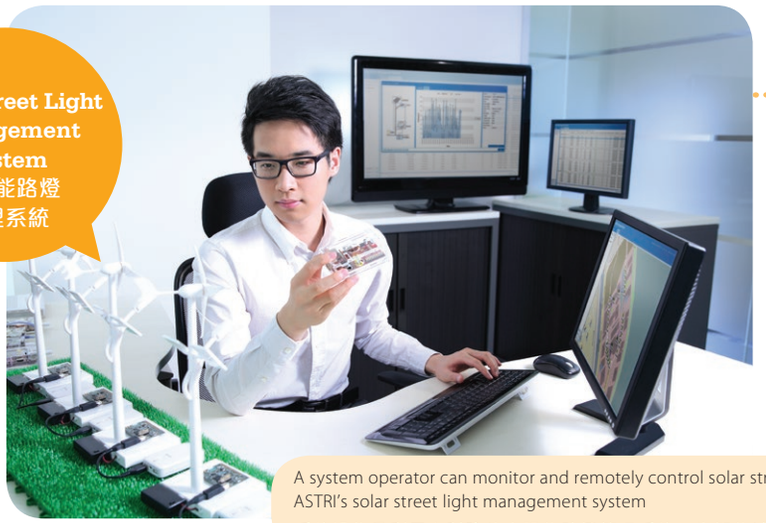
概況

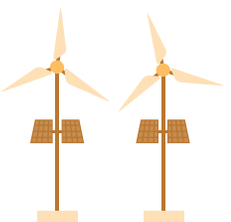
通訊技術群組一直致力開發先進的通訊系統和應用技術，提供市場導向及以客戶為中心的技術解決方案。其核心技術競爭力涵蓋三個領域：通訊軟件、基帶解決方案及射頻系統。群組依據標準，開發了各種技術產品，例如商業級4G／LTE小基站參考設計。同時，透過整合其射頻系統以至通訊網絡軟件等各種技術能力，開發具有競爭力的技術成果，為客戶提供高集成及高附加價值的解決方案。

在過去一年，通訊技術群組在技術上和市場化方面均取得了多個突破性的成果。群組與合作夥伴於全球移動通訊大會上聯合演示了全球首個LTE-Advanced上行多天線系統（MIMO）的測試，以及商業級端到端的TD-LTE小基站解決方案。群組研發的技術構成了與業界緊密合作的基礎，能夠協助提升合作夥伴產品的競爭力，達至雙贏。例如，今年群組與TCL通訊公司簽署了一份長期合作夥伴協議，共同研發4G及下一代無線通訊技術。

群組一直在市場化方面作出努力，並且取得顯著成果。群組本年度的業界收入總額達三千二百萬港元，超過創新及科技基金項目總成本的百份之六十，是本年度目標的三倍。其與業界簽訂的合約及贊助之總額約三千萬港元。

Solar Street Light Management System
太陽能路燈管理系統





A system operator can monitor and remotely control solar street lights in a smart city through ASTRI's solar street light management system

系統操作員利用應科院的太陽能路燈管理系統，為智能城市的太陽能路燈進行狀態監控和遠程控制

Communications Software
通訊軟件

Baseband Solutions
基帶解決方案

RF Systems
射頻系統

		Technological Areas 科技範疇	
Patents Granted 獲得專利	8	• TD-LTE • DTMB • Antenna	TD-LTE DTMB 天線
Patents Filed 專利申請	5	• TD-LTE • RF Systems • Antenna	TD-LTE 射頻系統 天線
Agreements Signed 簽訂合約	16		
Income Received from Industry* 從業界所得收入*	32.75 million HK$ 百萬港元		

* Including cash and in-kind contribution 包括現金及物資資助

Innovations

Baseband Solutions

A leader in 4G/LTE technologies, the CT Group delivered the world's first commercial-grade LTE femto cell and LTE terminal baseband core reference design, which fully comply with LTE Release-9 and support both TDD and FDD modes. In the previous year, the Group developed LTE small cell reference design on a mainstream System-on-Chip (SoC) to capture a bigger market. In particular, the network monitor mode (a.k.a. Sniffer) was developed to facilitate self-organizing network for small cell dense deployment. These technologies are field proven, having passed interoperability tests with infrastructure vendors and operators. The commercially ready technologies enabled customers to manufacture commercial wireless communication products in a timely fashion.

技術突破

基帶解決方案

通訊技術群組是4G／LTE技術的領導者，研發出全球首枚符合LTE版本9標準，並且同時支持TDD和FDD模式的商用級LTE小基站和LTE終端基帶核心參考設計。過去的一年，為了開拓更大的市場，群組成功地在主流系統晶片的平台上開發了LTE小基站參考設計，其中小基站自組網功能的網絡偵測模塊，支持小基站的密集部署。這些技術通過現場驗證，並且成功完成與設備供應商和運營商的互聯互通測試。客戶可以利用這些已可商用化的技術在最短時間內生產出商用的無線通訊設備產品。

An engineer conducting quality assurance tests of commercial grade LTE small cell baseband core

工程師為商用級LTE小基站基帶核心技術進行質素檢測

Communications Software

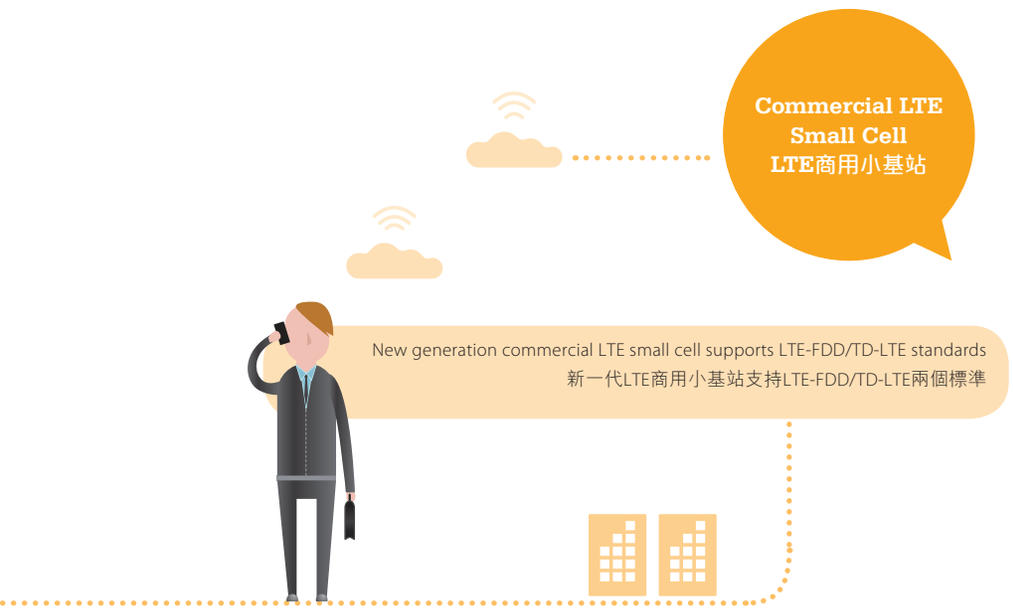
The Group successfully performed a joint live demonstration of end-to-end TD-LTE 20MHz small cell network solution at PT/EXPO COMM CHINA 2013 with Fujian Sunnada Communication Co. Ltd. The demo network comprised Sunnada's TD-LTE MiFi (user equipment), Sunnada's TD-LTE small cells eNB developed based on ASTRI's TD-LTE PHY and a protocol stack, and a small cell gateway. The demonstration showed bi-directional massive FTP data traffic and live video streaming on multiple MiFi devices. The network achieved an aggregated over-the-air throughput up to 80Mbps in 20MHz TD-LTE mode.

In the Mobile Asia Expo 2013, the Group joined hands with Innofidei to demonstrate LTE TDD/FDD dual mode end-to-end network solution. The LTE demonstration consists of user equipment dongles and small cells of both TDD and FDD modes, as well as a core network bridging the two sub-systems. During the expo, bi-directional live video streaming, conferencing and massive FTP data traffic were demonstrated with expected air link throughput up to 100Mbps in LTE-FDD mode and over 60Mbps in TD-LTE mode.

通訊軟件

群組在「2013中國國際信息通訊展覽會」與福建三元達通訊股份有限公司聯合演示了端到端TD-LTE 20MHz小基站網絡解決方案。該網絡的演示包括三元達的TD-LTE MiFi(用戶設備)和使用了應科院的TD-LTE物理層、協議棧的三元達TD-LTE小基站eNB以及小基站網關。該演示透過多個MiFi的設備展示了雙向巨量FTP數據傳遞和現場影音流。在20MHz TD-LTE模式下，網絡的聚合空口吞吐量最高達到80Mbps。

在「2013年亞洲移動通訊博覽會」，群組與創毅視訊公司攜手展示LTE TDD／FDD雙模端到端的網絡解決方案。該端到端示範系統的設置包括LTE TDD和FDD兩種模式的用戶端數據卡和小基站，及連接兩種模式系統的核心網。在博覽會上，兩家公司示範了雙向即場視頻串流、會議和大量FTP數據傳輸，預計LTE-FDD模式的空中數據鏈路吞吐量可達100Mbps，而TD-LTE模式則逾60Mbps。



RF Systems

The Group also developed dual-mode TDD/FDD LTE RF transceiver for terminal applications. The transceiver supports worldwide frequency bands from 700MHz to 3.8GHz. It achieves low power, low noise and high linearity on the same chip and supports 3GPP Release-9 standard. In addition, CT has developed low power and low cost 2.4GHz SoC including RF transceiver, baseband and CPU on-chip. The SoC can be used for wide Internet-of-Things (IoT) applications such as ZigBee, Bluetooth Low Energy and proprietary FSK/GFSK.

The RF Systems team developed digital pre-distortion and crest factor reduction to increase power amplifier efficiency up to 35 per cent, digital up/down convertors and interference cancellation technique for WCDMA/LTE standards with more than 28dB isolation, and active antenna system that integrated with antenna arrays and active components (FPGA, digital, mixed-signal, RF transceiver, power amplifier, etc.) into a low-profile radio access infrastructure unit for next generation wireless network.

射頻系統

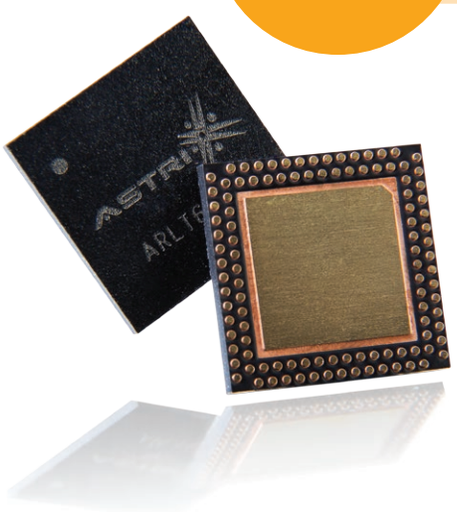
群組已經成功開發了面向終端應用的雙模TDD／FDD LTE射頻收發器。該LTE射頻收發器支持從700MHz到3.8 GHz的世界範圍內的主要頻段，實現了低功耗、低噪聲和高線性度，符合3GPP版本9的技術要求。另外，群組成功開發了低功耗、低成本的2.4GHz片上系統(SoC晶片)，該片上系統集成了射頻收發器、基帶和CPU，能夠廣泛應用於物聯網領域，例如ZigBee、低功耗藍牙和FSK／GFSK調制的應用。

射頻系統團隊開發了數字預失真和波峰因數降低技術，可提升功率放大器的效率達百分之三十五；數字上／下轉換器和WCDMA／LTE的干擾消除技術，支持超過28分貝的隔離度；和有源天線系統，與天線陣列和有源器件(FPGA、數字、混合訊號、射頻收發器及功率放大器等)集成在一起，為下一代無線網絡提供一個低功耗、低成本的無線接入設備基礎單元。

Dr. Zhang Honglei, Principal Engineer
張紅磊博士，主任工程師

Led a research team to complete system design of LTE small cell base station and LTE network monitoring mode
帶領研發團隊完成LTE小基站和網絡監察系統設計

Dual-mode TDD/FDD LTE RF Transceiver Chip
雙模TDD/FDD LTE射頻收發器晶片



Commercialization

Baseband Solutions

During the year under review, CT's LTE team further developed and commercialized LTE-Release-9 small cell baseband reference designs in collaboration with partners. It has licensed LTE small cell baseband technology to Innofidei (Hong Kong) Technology Ltd and Fujian Sunnada Communication Co. Ltd. Innofidei addresses the demands from the vertical market with the Group's LTE technologies. Sunnada, a China-based wireless equipment manufacturer and server provider, partners with the Group to develop TD-LTE small cells for deploying 4G networks on the Mainland.

Communications Software

The Group has demonstrated its "Solar Street Light Management System" technology at the International Consumer Electronics Show (CES 2014) in Las Vegas. This commercially ready technology attracted many potential customers in the area of IoT, and is undergoing field trials in Wuhan City.

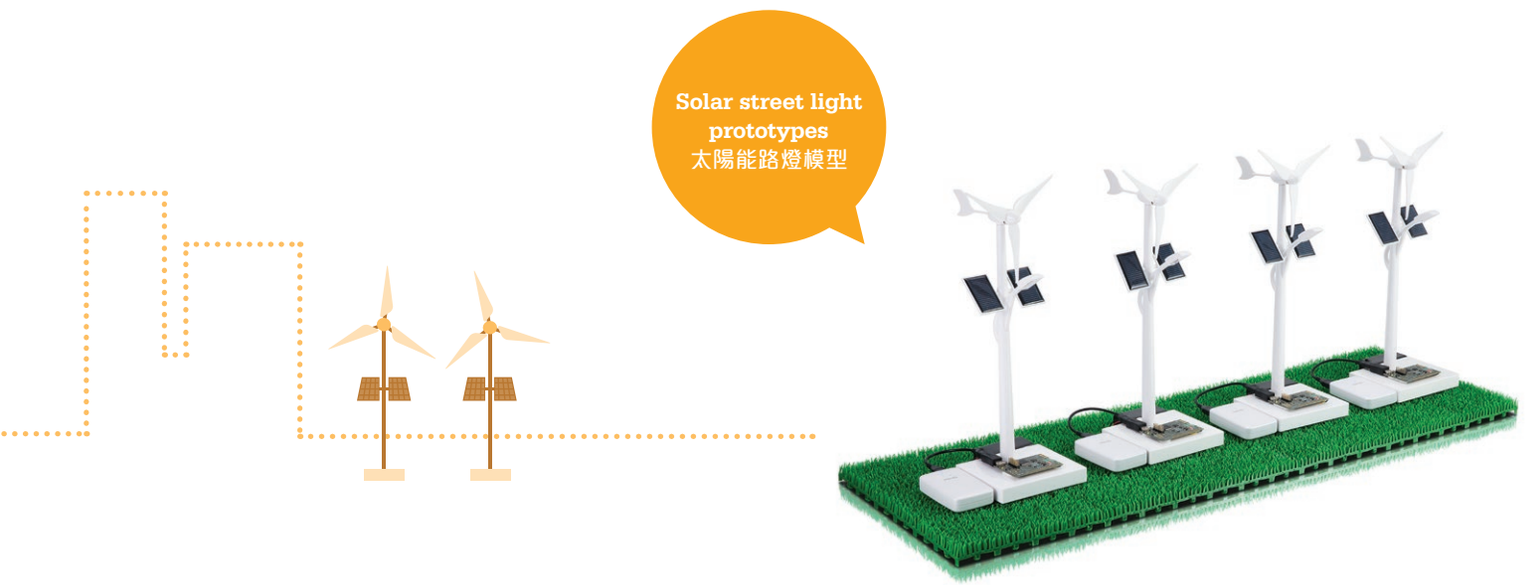
市場化

基帶解決方案

在本年度，LTE研發團隊與多家合作夥伴共同開發了商用級TDD和FDD雙模LTE-R9小基站參考設計，把小基站基帶技術以非獨家形式授權予創毅微電子(香港)科技有限公司和福建三元達通訊有限公司。創毅在其開發的適用專網應用的LTE小基站中採用了群組開發的基帶技術。三元達是一家總部位於中國內地的無線設備製造商和業務供應商，與群組合作開發了用於內地公共4G網絡的TD-LTE小基站。

通訊軟件

在美國拉斯維加斯舉行的「2014年國際消費電子展(CES 2014)」，群組成功演示了自主開發的太陽能路燈管理系統技術。這項技術具備商用條件，吸引了包括物聯網領域客戶在內的多家廠商的關注，該技術正在中國武漢市進行現場試驗。



Solar street light prototypes
太陽能路燈模型

Engineers testing parameters of LTE RF transceiver chips
工程師正在測量LTE射頻收發器晶片的參數

RF Systems

For LTE RF transceivers, the Group's main collaborator and technology licensee was Innofidei, whereas for 2.4GHz SoC, CT mainly collaborated with Shanghai Huahong transferring related technologies to them.

Targeting at the immense Mainland market, the RF Systems team positioned itself as a provider of low-cost and high-performance RF front-end solution to wireless network product manufacturers. The team transferred digital pre-distortion, crest factor reduction, interference cancellation scheme and high-isolation antenna technologies to various wireless communication equipment companies.

射頻系統

在LTE射頻收發器技術方面，創毅視訊是群組的主要合作夥伴，並獲相關技術授權；而在2.4GHz SoC技術方面，群組與上海華虹進行了廣泛的合作，把相關技術予以轉移。

射頻系統團隊針對龐大的內地市場，定位為中國無線網絡產品製造商的供應商，提供一個低成本、高性能的射頻前端解決方案。團隊已經成功地將開發的數字預失真(DPD)，波峰因數降低技術(CFR)、干擾消除方案(ICS)和高隔離度天線設計等多項技術轉移予多家無線通訊設備公司。

Advanced LTE Small Cell
先進LTE小基站

Advanced LTE small cell technology provides operators with seamless and transparent offload and expanded outdoor coverage
先進的LTE小基站技術為運營商提供無縫和透明卸載，以及擴大室外的覆蓋範圍

Future Development

Thrust 1: Open Broadband Wireless Network and Applications

To best synergize resources and strengths of different research groups, ASTRI launched the first cross-domain R&D initiative, known as "Thrust". This endeavour focuses on "Open Broadband Wireless Network and Applications" encompassing several solution-driven, multi-technology and high-value projects. This thrust will enhance ASTRI's core competence technologies in baseband, RF and software to provide LTE small cell infrastructure solutions. They include LTE network planning and management analysis, as well as implementation and deployment of LTE self-organizing network (SON) capability and inter-cell interference control in an E2E LTE small cell trial network for maximizing network capacity and efficiency.

Meanwhile, CT will develop "Beyond 4G" wireless network architecture by applying paradigm-shift technologies, such as software-defined networking and network functions virtualization to mobile access and core networks, to enhance its overall agility, efficiency and scalability.

In addition, CT will leverage cross-domain effort to develop technologies for innovative applications, including standard-based IoT gateway and management platform for city-wide street lights monitoring and control and LTE applications for smart transportation and public safety, such as LTE location tracking, surveillance video analytics, and real time video quality enhancement.

5G Technologies

The Group will perform forward looking research on the emerging 5G technologies to meet the future challenges arisen from the expected 1,000 fold increase in mobile data traffic:

- 5G radio access technologies – to increase throughput and spectral efficiency by improving modulation and multi-access
- 5G RF front-end system – to reduce power consumption and increase spectral efficiency by adaptive closed loop control of RF system
- Machine-to-Machine (M2M) communications technologies – to provide increased RF spectrum for IoT by exploiting TV white space and millimetre wave

未來發展

主推項目(一)：開放式寬頻無線網絡和應用

為了更加充分利用和調配資源，並更有效地結合本院各研發群組的技術優勢，應科院推出了第一組「主推」項目(Thrust)，專研「開放式寬頻無線網絡和應用」，當中包含多個以提供解決方案為導向、多技術相結合並具有高附加值的技術項目。該主推項目將進一步強化應科院在基帶、射頻和軟件的核心技術，提供LTE小基站網絡解決方案。它的核心技術包括LTE網絡的規劃和管理分析、以及在端到端LTE小基站試驗網實現和部署LTE自組織網絡(SON)功能和小區間干擾控制功能，以最大限度地提高網絡容量和效率。

與此同時，群組將研發「Beyond 4G」的無線網絡架構，包括開發基於革命性網絡技術，例如軟件定義網絡(SDN)和網絡功能虛擬化(NFV)的移動接入和核心網絡，以提升整體移動網絡架構的靈活性、效率和可擴展性。

此外，群組將充分利用跨研發領域的核心技術，開發創新應用，包括基於標準的物聯網網關和管理平台，用以監察和控制城市範圍內的路燈；及基於LTE網絡的智能交通和公共安全應用，例如LTE定位追蹤、監控視頻分析，以及實時視頻質素的增強等。

5G技術

群組將開展具有前瞻性的新興5G技術研發，以應付未來預期可達千倍的移動數據量增長的挑戰：

- 5G無線接入技術－通過改進訊號調制和多路接入技術，實現更高的吞吐量和頻譜效率
- 5G射頻前端系統－利用射頻系統的自適應閉環控制，達至低功耗和高頻譜效率
- 機器對機器(M2M)通訊技術－利用電視空白和毫米波技術，提供更多的頻譜以支援物聯網的應用

Baseband Solutions

CT has started working on advanced LTE small cell technologies, including inter-cell interference control in a densely deployed network and self-configuring and self-optimization capabilities, as well as emerging 5G technologies, including radio access for high spectral efficiency and M2M communications for IoT.

Communications Software

The Group will extend its IoT management platform for wider applications in smart homes and smart cities, for example, solar street light management, environment monitoring, and municipal management. The R&D will focus on the platform's scalability, security and flexibility in supporting different sensor devices.

It will develop a NFV/SDN-based 5G core network platform. Its R&D will focus on virtual function performance, dynamic mobility management, virtual machine placement, and WiFi/LTE convergence.

RF Systems

CT will start working on LTE-Advanced RF transceiver supporting 3GPP Release-10 and 11. For IoT applications, it will expand current SoC solution from 2.4GHz to sub-GHz covering 300MHz to 928MHz.

The RF Systems team will integrate its knowledge in software-defined radio and antenna to deliver a high efficiency RF system in collaboration with various wireless communication equipment companies. Riding on the trends in cloud-based processing technologies, the system will enhance the efficiency of next generation wireless networks.

基帶解決方案

通訊技術群組已經開始研發先進的LTE小基站技術，包括怎樣在佈置密集的網絡中控制基站之間的干擾，及LTE小基站的自我配置和自我優化等能力；以及新的5G技術，包括高頻譜利用率的無綫接入技術，及應用於物聯網的機器對機器通訊。

通訊軟件

群組將擴展其開發的物聯網管理平台，更廣泛地應用於智能家居和智能城市，例如太陽能路燈管理、環境監測和城市管理。群組的研發將專注於平台的擴展性、安全性和靈活性，以支持不同的傳感器設備。

群組將開發一個基於NFV／SDN技術的5G核心網絡平台。群組的研發將集中在虛擬化的性能、動態的移動管理、虛擬機技術以及WiFi／LTE的融合。

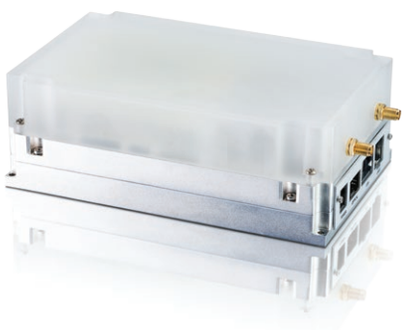
射頻系統

群組將開發支持3GPP標準版本10和版本11定義的LTE-Advanced技術射頻收發器晶片。在物聯網方面，群組會將已經開發的SoC方案從2.4GHz擴展到支持低於1GHz的應用，覆蓋300MHz到928MHz的所有頻段。

射頻系統團隊將繼續努力與各類無線通訊設備公司合作，整合軟件定義無線電(SDR)和天線技術，提供高效率的射頻系統。加上蓬勃發展的雲處理技術，群組開發的技術將為下一代無線網絡帶來更高的網絡效益。

Dr. Zhao Shaohua, Senior Engineer
趙少華博士，高級工程師

Chief architect and key developer of the low power wireless RF SoC and high performance broadband cable access system
低功耗無線系統晶片和有線寬頻接入系統架構總設計師和開發者



Active Antenna System "Smart Tile" Prototype
有源天線系統「智能方磚」原型

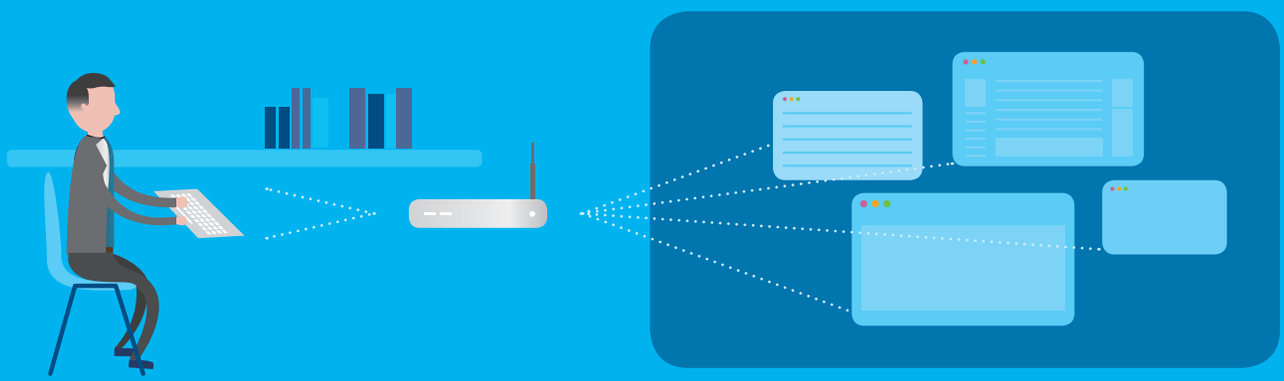
Project Highlights 研發項目

Project Type 類別

- Platform 平台項目
- Seed 種子項目
- Thrust 主推項目

	Project 項目	Duration 時期
1	LTE Femto Access Sub-system LTE家用基站接入子系統	Jan 2012 – Sep 2013 二零一二年一月至 二零一三年九月
2	Digital Repeaters 數字中繼器	Jun 2012 – Dec 2013 二零一二年六月至 二零一三年十二月
3	Cost-effective TDD/FDD LTE RF Transceiver 具有成本效益的TDD/FDD LTE射頻收發器	Oct 2012 – Oct 2014 二零一二年十月至 二零一四年十月
4	Highly Integrated LTE Small Cell Baseband Core Based on Mainstream SoC Device 高整合度LTE小型基站基帶核心	Mar 2013 – Sep 2014 二零一三年三月至 二零一四年九月
5	LTE Access Network Management and Legacy 3GPP Interworking LTE接入網絡的管理和傳統3GPP互通	Apr 2013 – Sep 2014 二零一三年四月至 二零一四年九月
6	Broadband Cable Technology Platform 寬帶有線技術平台	Apr 2013 – Apr 2015 二零一三年四月至 二零一五年四月
7	Active Antenna System Development Platform 有源天線系統開發平台	Oct 2013 – Apr 2015 二零一三年十月至 二零一五年四月
8	WiFi + 4G Convergence Gateway Software Platform WiFi + 4G融合網關平台	Dec 2013 – Nov 2015 二零一三年十二月至 二零一五年十一月
9	Internet-of-Things Management and Application Platform with Broadband Wireless 物聯網設備管理和應用平台	Feb 2014 – May 2015 二零一四年二月至 二零一五年五月
10	Generic Sensor Gateway for 6LoWPAN Applications 支援6LoWPAN應用之通用傳感網網關	Dec 2012 – May 2013 二零一二年十二月至 二零一三年五月

Enterprise & Consumer Electronics Group
企業與消費電子群組



Publishers using the secure book distribution platform to safely upload and publish books

出版商利用圖書安全發佈平台安全上載及發佈書籍

Overview

In the year under review, the Enterprise & Consumer Electronics (ECE) Group (to be renamed Software & Systems Group on 1 April, 2014) continued focusing on three main technology areas, namely application software, embedded computing and cloud service computing, to develop enterprise and consumer software and systems covering education, infotainment, health and safety.

Within these technology areas, ECE established core competence that follows industry technology trends, including increasing user experience focus, devices becoming smart, personalized and socialized contents and services, sensors everywhere, holistic security and intelligent surveillance. ECE will continue to expand relevant research and development activities within the scope of each technology trend to maintain its leading position on core competence.

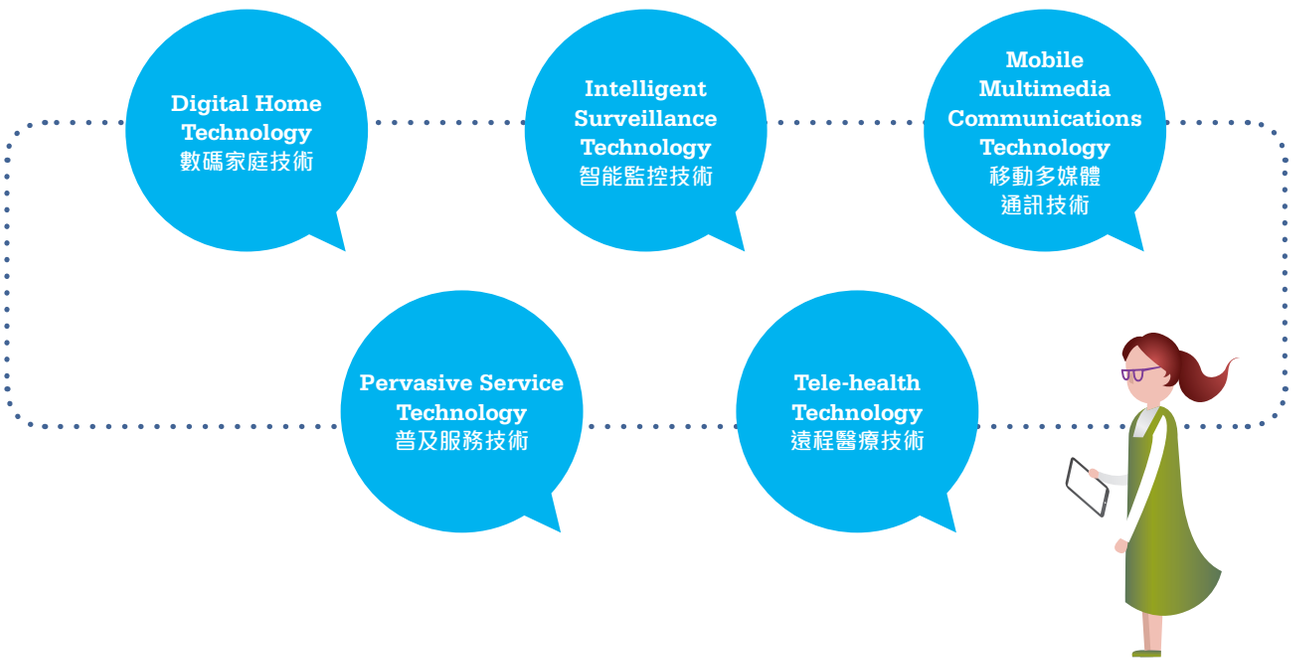
On intellectual property development, ECE was granted 13 patents, further strengthening its value proposition to customers.

概況

本年度內，企業與消費電子群組(由二零一四年四月一日起改名為軟件與系統群組)持續將重點放在三個主要技術領域上，包括應用軟件、嵌入式計算和雲服務計算，以開發企業和消費者軟件和系統，涵蓋了教育、資訊娛樂、健康和安全等範疇。

群組在上述的技術領域內建立核心能力，緊貼行業技術發展趨勢，包括以使用者體驗為重點、設備智能化、內容和服務的個人化和社交化、無所不在的感應器、整體的安全性，以及智能監控。群組在各技術發展趨勢範圍內，將繼續擴大相關研究和開發活動，以維持其核心能力的領先地位。

在知識產權的發展上，企業與消費電子群組獲授13項專利，進一步加強可提供予客戶的價值。



		Technological Areas 技術範疇
Patents Granted **獲得專利**	13	• Peering Pairing 同伴配對 • Video Quality 視頻質素 • Content Distribution 內容分發 • Adaptive QP-shift 自適應QP轉變 • Single Accelerometer Usability 單加速度計用戶體驗 • Energy Management System 能源管理系統 • IC Design 集成電路設計 • Broadcast Encryption 廣播加密 • Video Summary 視頻匯總
Patents Filed **專利申請**	6	• Video CODEC 視頻編解碼 • Distributed Stream Computing 分佈式流計算 • Ciphertext Message Insertion and Deletion 密文信息的插入和刪除
Agreements Signed **簽訂合約**	13	
Income Received from Industry* **從業界所得收入***	10.04 million HK$ 百萬港元	

* Including cash and in-kind contribution 包括現金及物資資助

Real Time Stream Computing Platform
實時流計算平台

The real time stream computing platform can handle data volume and monitor real time market change

利用實時流計算平台，可即時處理大量數據，因應市場變化作出即時反應

Innovations

Android Multi-window Technology

Multi-window technology based on an Android GPU technology platform is enhancement and extension of a standard Android platform. The technology allows users to run multiple applications in different windows simultaneously with PC experience. It is compatible with Android apps in the market and targets at office productivity and personal infotainment.

Surveillance Video Analysis Technologies

The Intelligent Surveillance Technology team continued to put its R&D focus on developing various surveillance video analysis technologies. An automatic learning algorithm was developed to distinguish normal and abnormal behaviours in detected object. Besides post-event analysis, the team also developed video quality enhancement technologies so that video clips with severe quality issues could still be analysed.

Open P2P Mobile Web

The Open P2P Mobile Web team focused on developing an efficient real time communication platform over Internet, covering an enhanced peer-to-peer (P2P) technology and a new mechanism to support fair resource sharing over Wi-Fi for telecom and communication network service providers.

Intelligent Cloud Security Computation for Big Data Applications

The Intelligent Cloud Security Computation for Big Data Applications platform provides new technologies concerning intelligent data processing, such as complex event processing and stream database processing. It also provides a secure cloud computing platform to enhance scalability, error resilience, anomaly detection and statistics tracking. These features would be needed in tackling the challenges in security and performance of many big data applications.

技術突破

安卓多視窗技術

多視窗技術是在安卓的圖形處理器技術平台項目上開發的一種創新技術，它在標準的安卓平台上進行了增強及擴展，讓用戶同時打開多個視窗，運行多個應用程式，並享有個人電腦體驗；它兼容市面上各種安卓應用程式，可提升辦公室效率和用於個人信息娛樂。

監控視頻分析技術

智能監控技術組繼續專注開發各種視頻分析技術，包括一套可自動學習的演算法，以分辨偵測對象的正常及不正常狀態。除事後分析外，研發團隊亦開發了多種視頻畫質加強技術，使質素差的原始視頻也可準確分析。

開放點對點移動網絡

開放點對點移動網絡研發團隊著重於開發互聯網高效實時通訊協議平台。開發的技術包括改進現時的點對點技術，以及一個在無線網絡上為不同運營商作公平資源共用的新機制。

大數據的智能雲安全計算

大數據的智能雲安全計算平台致力於開發智能數據處理的新技術，例如複雜事件處理和流數據庫處理。它還提供安全的雲計算平台，以支援可擴展性、容錯處理、有效異常檢測和統計追蹤，在應付各種大數據應用所面臨安全和性能的挑戰時，這些特性可大派用場。

Dr. Park Jihyoun, Senior Engineer
朴祉炫博士，高級工程師

Chief architect and key developer of the distributed stream computing platform which contributed to the successful launch of several R&D projects. Two patents, one U.S. and one Mainland, were obtained for the technology.

分散式流計算系統的總設計師和開發者，該系統促成了多個技術項目的成功開發，並已取得一項美國專利和一項中國內地專利。

Commercialization

During the year under review, Clever Motion Technology Limited licensed multi-window technology from ASTRI to develop its BoBo Nano PC. The functionalities of Internet TV box, wireless router and PC were integrated with multi-window experience in BoBo, which could also be controlled by Smartphone for entertainment and gaming. The nano PC has entered the stage of mass production.

Koolsee also signed a contract to license GPU technologies from ASTRI for its smart camera, which can be used as professional surveillance or consumer IP camera with 180º view angle.

Furthermore, two Mainland video surveillance system integrators have been working with ECE regarding its intelligent surveillance technology. ASTRI's state-of-the-art video analysis and enhancement technologies were deployed in more than 10 provinces and cities on the Mainland.

The Open P2P Mobile Web platform has a flexible P2P-based architecture which allows users to conduct real time communication over the Internet without constraints in central servers and network infrastructure. It extends the current web real-time communication protocol to improve users' quality of experience. ECE signed several agreements with industry partners to apply the technologies in telecom and communication network processing.

With respect to intelligent cloud security computation for big data applications platform, the Group signed agreements with customers to apply the technologies in personal data sharing, communication network processing and financial transaction analysis.

Mr. Louis Ngai, Senior Engineer
倪一翔先生，高級工程師

Took part in successfully developing the BoBo Nano PC, known to be the world's first multi-window Android nano PC
參與並成功開發寶寶超微電腦，是全球首部多視窗安卓超微電腦

市場化

本年度，應科院向佳駿科技有限公司授權多視窗技術，助其開發「寶寶超微電腦」。「寶寶」結合機頂盒、無線網絡路由器和個人電腦三大功能，並具多視窗體驗，亦可通過智能手機操控，作娛樂和遊戲之用。該超微電腦已進入量產階段。

360° Fisheye Camera
360度魚眼攝像頭

香港酷視公司和應科院簽訂了有關圖形處理器技術的授權協議，應用於其所開發的智能攝影機產品上。該攝影機可作為專業的視頻監控或個人用的網絡攝影機，視野角度超過180º。

此外，群組就智能監控技術與內地兩間視頻監控系統集成商合作，把最新的視頻分析和加強技術在十多個省市中部署。

開放點對點移動網絡平台是一個靈活的點對點架構，用戶可以不受網絡架構和中央伺服器限制，進行互聯網上實時通訊。它擴展現有網絡實時通訊協議，以提高用戶的體驗質素。群組已經與客戶簽約，將平台技術應用於電訊和通訊處理方面。

在大數據的智能雲安全計算平台方面，群組已經與客戶簽約將該平台技術應用於個人數據共享、通訊網絡處理和金融事務分析等領域。

The media playing function enables playing of favourite media contents from networks or personal devices

媒體播放功能讓用戶可從網絡或個人設備播放喜愛的媒體內容

The mini PC function enables handling of multi-tasks in multi-windows

微型電腦功能讓用戶可在多個視窗處理多項工作

Future Development

The ECE Group will focus its R&D efforts on software and systems technology development for vertical applications that are highlighted in the following areas:

Through the development of wearable applications and OS technology for IoT which is based on Linux/Android middleware platform, the R&D team will continue working on GPU-related computation technologies such as object tracking, object recognition, environment sensing and interactivity in the AR/VR areas. ECE intends to provide customers with a system solution that gives end-users a virtual cyber sphere for real communication, gaming, entertainment and education.

Riding on the successes of the classroom management system and cloud learning system, ECE's e-Learning team launched another in-class solution that connects commonly seen equipment in the classroom. In this "Smart Classroom" initiative, the Interactive Whiteboard (IWB) and portable learning devices of teachers and students are connected together via Wi-Fi enabling interactions between teacher and students and collaboration among students. As more and more teachers have requested contents and applications of this nature when using IWBs, vendors are forced to add educational values to their products. The Smart Classroom project will meet these needs.

Network, media and security are rapidly becoming intertwined with technology, especially the Internet. Major trends driving change include changes in technology, changing patterns in how people use technology and the Internet, and universal trust and identity issues. In the decade ahead, the focus may shift back to technology centric security, driven by significant increases in biometrics, data volume, processing speed, communication technology, and emergence of more complex and automated threats. ECE will focus on developing common core technologies related to network, media and security to support cloud-based vertical systems and applications.

In addition, it will continue to use ICT to improve healthcare services and address other healthcare applications beyond the hospital environment to support elderly healthcare.

未來發展

企業與消費電子群組將把研發力量集中於軟件與系統技術的發展，強調對以下幾方面的垂直應用：

通過開發穿戴式應用程式和基於Linux／安卓中間件平台的物聯網操作系統技術，研發團隊將繼續進行有關圖形處理器的計算技術，例如目標跟踪、物件識別、環境感知和虛擬現實與增強實境交互等方面的研究。群組的目標是為客戶提供一個系統解決方案，讓最終用戶可以在一個虛擬的網絡空間，作身臨其境的溝通、遊戲、娛樂和教育。

群組的電子學習研發團隊研發出教室管理系統和雲端學習系統，藉此成功經驗進一步推出另一教室解決方案，把課室內常見的器材連接起來。在這「智慧教室」中，互動電子白板和師生的可攜式學習器件通過Wi-Fi連接起來，促進師生間的互動和同學間的協作。現時老師使用電子白板時，希望有更多相關的的電子教材和軟件配合，這使得電子白板供應商須為其產品增值，而智慧教室便滿足到業界這需求。

網絡、媒體與安全愈來愈快速地與科技交織在一起，特別是互聯網。促成這改變的主要趨勢包括技術的變革、人們使用科技和互聯網的模式的改變，以及普遍的信任和身分問題。在未來十年，被更先進的生物識別技術，更大量的數據、更快的處理速度、更先進的通訊技術，以及更複雜和自動化的威脅所驅動，焦點可能會重回到以技術為中心的安全性。群組會將重點放在發展與網絡、媒體和安全有關的共同核心技術，以支援各種基於雲的垂直系統和應用。

此外，企業與消費電子群組將持續利用資訊及通訊科技改善醫療保健服務，並計劃擴展至醫院以外的老年醫療保健。

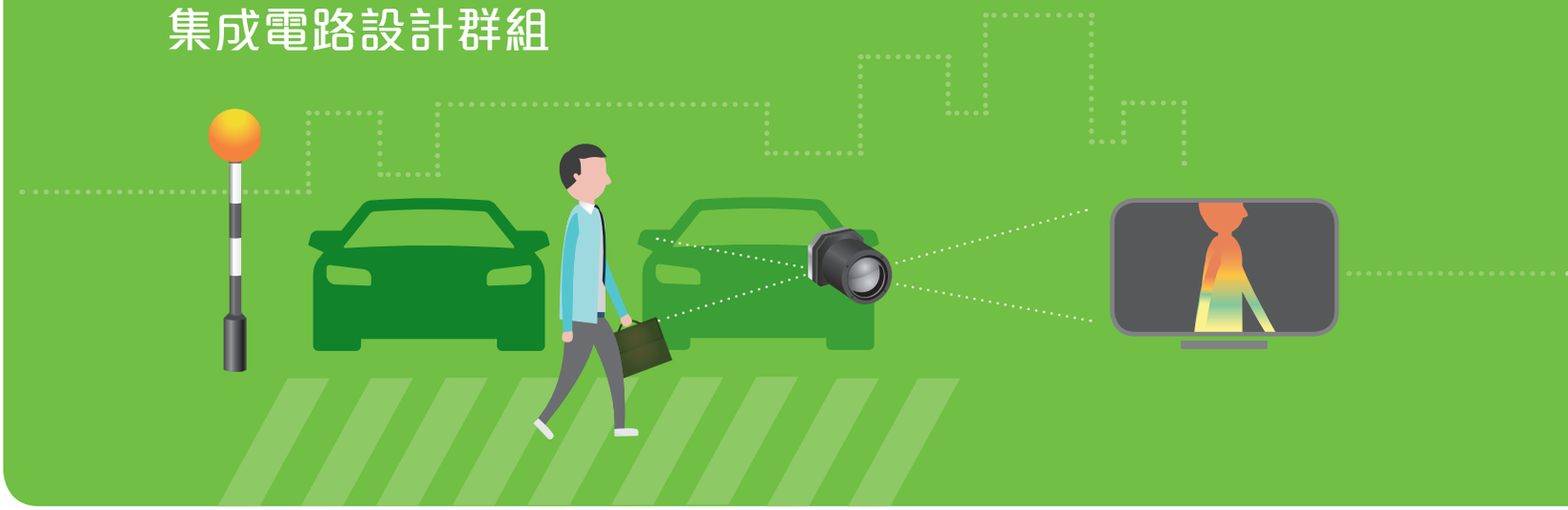
Project Highlights 研發項目

Project Type 類別

- Platform 平台項目
- Seed 種子項目
- ICP 業界合作項目
- Public Sector Trial Scheme 公營機構試用計劃項目

	Project 項目	Duration 時期
1	Intelligent Surveillance Video Scene Analysis Technology Platform 智能監控視頻分析技術平台	Mar 2013 – Jun 2014 二零一三年三月至 二零一四年六月
2	Intelligent Mobile Surveillance Technology Platform 智慧移動監控技術平台	Aug 2012 – Jun 2013 二零一二年八月至 二零一三年六月
3	Mobile Collaborative e-Learning Platform 移動協作學習平台	Dec 2011 – Jun 2013 二零一一年十二月至 二零一三年六月
4	Cloud Facilitated e-Learning 雲端輔助之電子學習平台	Nov 2012 – Nov 2014 二零一二年十一月至 二零一四年十一月
5	Collaborative e-Learning for e-Schoolbag Pilot 電子書包先導計劃內的協作學習	Mar 2012 – Oct 2013 二零一二年三月至 二零一三年十月
6	Application of Augmented Reality to e-Learning 擴增實境應用到電子學習	Jun – Dec 2013 二零一三年六月至 十二月
7	Document Digital Rights Management System for e-Learning 可應用於電子學習的文件數字版權管理系統	Dec 2011 – Aug 2013 二零一一年十二月至 二零一三年八月
8	Smart Consumer Electronics Operating System Framework – Android Plus 智能消費電子產品操作系統框架 – Android+	Oct 2012 – Apr 2014 二零一二年十月至 二零一四年四月
9	Android GPU Technology 安卓圖形處理器技術	Dec 2013 – Jun 2015 二零一三年十二月至 二零一五年六月
10	Privacy Protection Technology for Connected Devices in Cloud Environment 針對網絡設備在雲端運算環境中隱私保護技術	Oct 2012 – Apr 2013 二零一二年十月至 二零一三年四月
11	Tele-health Technology Platform 遠程健康照護技術平台	Dec 2011 – Mar 2014 二零一一年十二月至 二零一四年三月
12	Tele-health Platform 遠程健康照護平台	Mar – Sep 2013 二零一三年三月至 九月
13	Open P2P Mobile Web 開放P2P移動網絡	Jul 2013 – Jan 2015 二零一三年七月至 二零一五年一月
14	Intelligent Cloud Security Computation for Big Data Application 大數據的智能雲安全計算平台	Jul 2013 – Jan 2015 二零一三年七月至 二零一五年一月

IC Design Group
集成電路設計群組



The wireless mini-ECG device can be used to easily monitor and process vital body signs

利用小型無線心電圖設備，可輕易收集和處理重要維生數據

Overview

The IC Design (ICD) Group contributes to the IC industries by developing cost-effective and innovative IC design and solutions. Through years of dedicated research and development, many ICD technologies have been embedded deeply in the electronic products brought to the market by its industrial partners.

ICD signed 28 contracts with some tier one IC design houses and many small to medium technology enterprises. These contracts enable partners to rapidly realize commercial products with ICD's enabling technologies. In monetary terms, ICD received more than HK$20 million as income from industries during the year.

Driving for continual self-improvement is the key of ICD's commercialization success. ICD personnel are keen to explore the unknown and develop novel technologies that help enhance smart living. In this fiscal year, ICD filed seven patent applications and was granted 16 patents.

The three key technology teams under the Group, Portable Analog and Mixed Signal Design (PAD), Applied SoC Design (ASD), and Integrated Circuit Enabled Solutions (ICES), are actively collaborating with R&D professionals in other research institutes. With ASTRI's establishment of the Hong Kong Branch of the National Engineering Research Centre for Application Specific Integrated Circuit System, ICD is taking an active role in creating an ecosystem of advanced and applied research in Hong Kong.

Wireless Body Sensor Network
無線體感網絡

The Visually Enhanced Ultra-HD Application Platform won Bronze Award, Best Lifestyle (Social, Communications & Media) of the Hong Kong ICT Awards 2014

視覺提升超高清顯示平台榮獲2014年香港資訊及通訊科技獎最佳生活時尚獎(社交、傳訊、媒體)銅獎

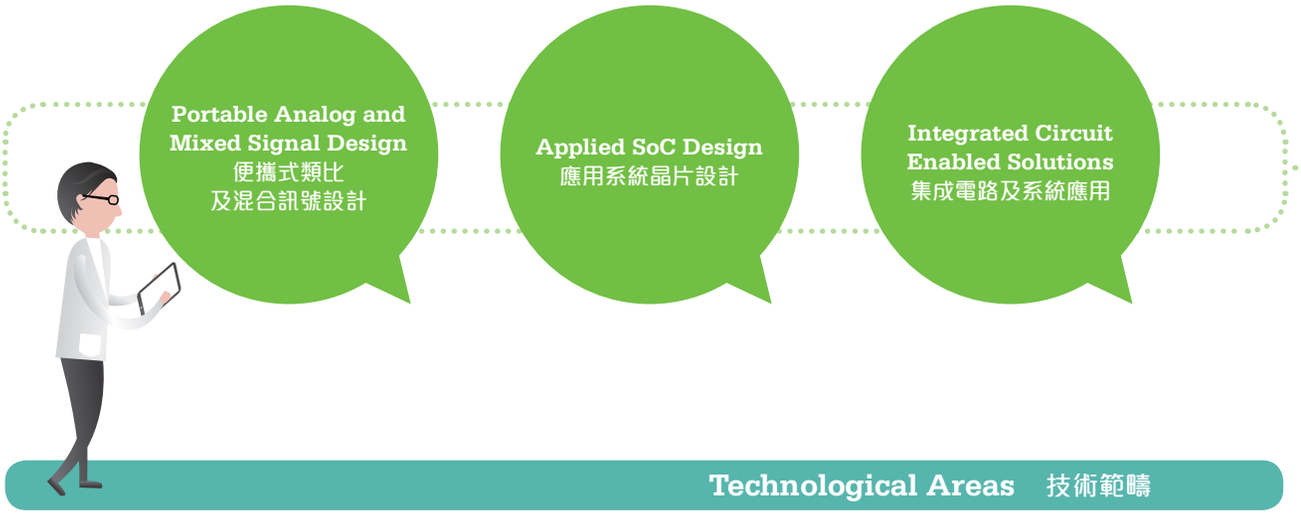
概況

集成電路設計群組致力研發具成本效益和創新的集成電路設計和解決方案，目標是為科技業作出貢獻。經過多年的努力，集成電路設計群組所開發的許多技術已獲合作夥伴採用嵌入在他們的電子產品中並推出市場。

在本財政年度，集成電路設計群組與領先的集成電路設計公司和許多中小型企業簽定了共二十八份合約，讓合作夥伴能夠利用群組的開發成果快速實現商業化產品。收入方面，群組從業界所得收入超過二千萬港元。

不斷要求自我改進是集成電路設計群組能成功邁進商業化的關鍵。群組的成員都熱衷於探索新領域，開發新技術，藉此幫助人們實踐智能生活。本年度，群組已提交七項專利申請和獲授十六項新專利。

群組轄下有三個主要技術團隊，便攜式類比混合訊號設計、應用系統晶片設計，以及集成電路及系統應用。群組積極尋求與外界知名的研究院合作。隨著國家專用集成電路系統工程技術研究中心香港分中心的成立，群組正在積極參與為香港建立一個先進的應用科技研究生態系統。



Technological Areas 技術範疇

Patents Granted 獲得專利

16

- Data Converter 數據轉換器
- Frame Rate Conversion 幀速率轉換
- LED Lighting LED 照明
- Solid State Memory Control 固態存儲器控制
- Super Resolution 超分辨率
- Pico-projection 微型投影
- Power Management 電源管理

Patents Filed 專利申請

7

- Augmented Reality 擴增實境
- Direct Digital Synthesizer 數字頻率合成器
- ESD Protection ESD 保護
- Near Field Communication 近場通訊
- Radio-frequency Identification 射頻識別
- Super Resolution 超分辨率

Agreements Signed 簽訂合約

28

Income Received from Industry* 從業界所得收入*

20.06

million HK$ 百萬港元

* Including cash and in-kind contribution 包括現金及物資資助

Innovations

Portable Analog and Mixed Signal Design (PAD)

During the year, PAD completed five different projects and secured funding to launch four more. The funding opportunity allowed PAD to further strengthen competency in ultra-low power mixed signal integrated circuit design and applications. Many innovative IPs have been delivered to industry.

For example, in the AMS IP for sensor ASIC, PAD delivered Hong Kong's first high-resolution read-out IC (ROIC) for un-cooled infrared micro-bolometer, an integrated mixed signal SoC for wireless ECG and a low-noise micro-power analog front-end (AFE) for multi-axis position/motion MEMS sensor ASIC. The performance of such IPs matches the best in the world.

技術突破

便攜式類比及混合訊號設計

本年度內，便攜式類比及混合訊號設計組成功完成了五個項目，並獲得資金啟動四個全新項目。這些資助令團隊得以進一步加強在超低功耗混合訊號集成電路設計和應用方面的開發能力。許多創新技術相關的知識產權已轉移給業界。

以傳感器ASIC的AMS IP為例，團隊成功研發出香港第一個用於非制冷式紅外微測輻射熱計的高分辨率讀出（ROIC）、應用於無線心電圖的集成混合訊號系統晶片，以及應用於多軸位置／移動MEMS傳感器ASIC的低噪聲微功率模擬前端(AFE)。這些專利技術的性能都處於世界領先水平。

Read Out Integrated Circuit (ROIC) for high resolution un-cooled infrared camera
高分辨率非製冷紅外攝像機的讀出集成電路

High resolution un-cooled infrared camera and imaging technologies can provide car drivers with night vision

高分辨率非製冷紅外攝像機及成像技術可用於為駕駛員提供夜視

In the intelligent display area, PAD is developing an all-in-one LCOS pico-projection technology solution for applications such as head-up display (HUD) for navigation and head-mounted display (HMD). It includes cost-effective LCOS imager ICs, power management and LED driver ICs, thus providing a complete solution to the pico-projection and intelligent display markets.

PAD has built a very large portfolio of innovative power management IPs. With the completion of power factor correction (PFC) project, it has covered almost all the essential technologies for low-power applications for the consumer market. However, high current and high voltage power management with intelligence is crucial for industrial or residential applications. PAD's current effort is to develop innovative analog and mixed signal for high voltage and high temperature power/energy management applications.

The year's innovative achievement can be further demonstrated by the team's patent performance, with 13 new patents granted and three applications filed.

Applied SoC Design (ASD)

While it has been an exciting year for the team, ASD continues to set sail into two new application areas. The first one is smart appliance transceiver. With rising energy costs, the need for smart energy and variable utility rates is inevitable. With expertise in IC design, the team aims to bring further improvements to power-line communication based on the HomePlug Green PHY standard.

The second one is multi-standard wireless power technology. Wireless energy transfer using technologies based on the theory of magnetic induction may become an inevitable trend in the near future. To grasp this opportunity, ASD is developing critical digital and analog IPs that allow customers to freely design their solutions based on their choice of magnetic induction technology.

在智能顯示領域，應科院正為車載平視顯示(HUD)及頭戴式顯示(HMD)等應用，開發全集成LCoS微投影技術。其中包括低成本LCoS成像晶片、功率管理和LED驅動IP等，能夠為微投影及智能顯示市場提供完整的技術解決方案。

便攜式類比及混合訊號設計組已構建了規模龐大的創新型電源管理知識產權組合。隨著功率因數校正項目的完成，團隊掌握了消費市場幾乎所有低功耗應用所需的先進技術。然而，團隊亦意識到高電流與高電壓的智能型電源管理對於工業與住宅應用的至關重要性，因此團隊正專注努力研發用於高溫高壓電力／能源管理的創新型類比及混合訊號技術。

團隊在本年度提交了三項專利申請，又獲授十三項新專利，進一步展示出團隊在本年度的創新成果。

應用系統晶片設計

應用系統晶片設計組勇於面對新挑戰，在本年度內邁向兩個全新的應用領域。第一個新領域是智能電器收發器。隨著能源成本上升，智能能源和可調配能源使用率成為解決問題的關鍵。團隊希望利用自身在集成電路設計方面的專業知識，進一步為電力線通訊基礎如HomePlug Green PHY標準的應用提供更好的設計。

第二個新領域是多標準的無線充電技術。基於磁感應原理的無線能量傳輸在不久將來會成為必然的趨勢。為把握這個機會，團隊擬發展關鍵數字和類比知識產權，讓客戶有彈性地基於他們所選擇的磁感應技術類型來設計解決方案。

Smart Appliance Transceiver
智能家電收發器

Smart appliance transceiver enables remote access and control of home appliances for smart energy monitoring and management

智能家電收發器讓用戶透過移動裝置遙距控制家電，從而有效地監察和管理能源用量

Innovative image processing and digital data storage have always been the team's focus. During the year, ASD's remarkable research results were demonstrated at various international exhibitions. Super resolution is one example. With the advancement of television and projection display resolution, the team is developing a very cost-effective way for conversion of pre-recorded or lower resolution media contents into high-definition images automatically and instantly.

In PCIe-based storage acceleration, the world today is all about cloud computing. Much attention is paid on upgrading the CPUs of data servers, whereas little effort is spent on breaking through traditional data accessing with magnetic hard-drives. ASD takes advantage of the superior accessing speed of the increasingly popular solid state memories to find innovative ways to overcome their physical weaknesses with an aim to deliver an ultra-fast, reliable and durable data server caching and storage solution.

Integrated Circuit Enabled Solutions (ICES)

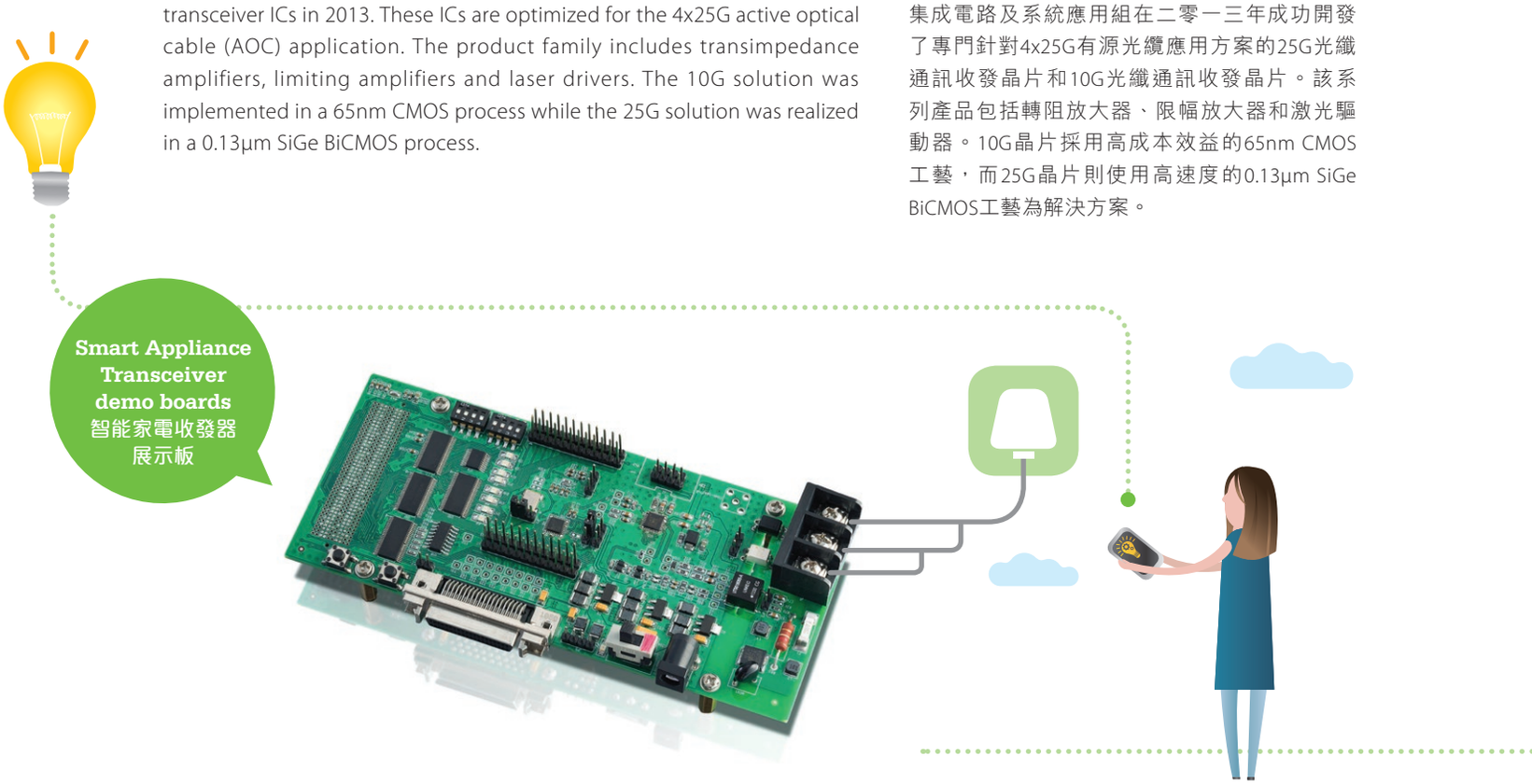
ICES successfully developed 10G and 25G optical communication transceiver ICs in 2013. These ICs are optimized for the 4x25G active optical cable (AOC) application. The product family includes transimpedance amplifiers, limiting amplifiers and laser drivers. The 10G solution was implemented in a 65nm CMOS process while the 25G solution was realized in a 0.13µm SiGe BiCMOS process.

圖像處理和數字存儲一直是團隊的研發重點。本年內團隊在這方面再接再厲，並且將卓越的研究成果在幾個國際展覽會上演示，超分辨率技術便是其中一個例子。隨著電視和投影顯示分辨率的提升，團隊正在開發一個極具成本效益的技術，可以將過往錄影或低分辨率的媒體內容自動和即時轉換成為超高清晰度的圖像。

基於PCIe的存儲加速，當今雲計算成為世界最矚目的技術之一。廠商都著手為伺服器的主控制器升級，而花很少資源在傳統磁性硬盤數據存取這個最大的瓶頸上。團隊利用固態存儲器在存取速度上的優勢，找出創新的方法來克服固態存儲在使用上的弱點。團隊希望能為業界提供一個超速、可靠而耐用的數據伺服器緩存和存儲解決方案。

集成電路及系統應用

集成電路及系統應用組在二零一三年成功開發了專門針對4x25G有源光纜應用方案的25G光纖通訊收發晶片和10G光纖通訊收發晶片。該系列產品包括轉阻放大器、限幅放大器和激光驅動器。10G晶片採用高成本效益的65nm CMOS工藝，而25G晶片則使用高速度的0.13µm SiGe BiCMOS工藝為解決方案。



Commercialization

Portable Analog and Mixed Signal Design (PAD)

During the year, PAD transferred a number of low-power analog-to-digital converters, integrated analog front-end technologies for sensor interface, low-noise read-out IC (ROIC) for IR thermal imaging, as well as AC-DC power management technologies to the region's original equipment manufacturers and original device manufacturers. The high-performance IPs made it possible for manufacturers to achieve realistic return in a relative short period of time.

A 3-axes G-sensor (MEMS) IP went into production shortly after the technology was transferred to a leading provider of SoC design and services. More than 18 million units of the product were shipped to customers in the first 12 months of production, resulting in a substantial income in royalty.

Un-cooled infrared micro-bolometer arrays are replacing cool IR thermal imaging ones and have become the technology of choice for lower cost infrared imaging systems. This technology is widely used in applications such as thermograph, fire fighting, driver night vision, security and surveillance. PAD developed a ROIC platform and licensed the technology to an industrial partner to manufacture micro-bolometer for high-resolution un-cooled infrared camera and imaging equipment.

ASTRI is helping Imperial College London and its spin-off company in Hong Kong to commercialize its body sensor network (BSN) technology for sport performance monitoring. PAD is partnering with them to customize the ultra-low power BSN sensing IC platform for extracting and processing sensitive vital sign signals for their "Elite Sport Performance Research in Training (ESPRIT) Programme in London". A wireless min-ECG device was built for further clinical tests. This technology will be commercialized once the trial is successfully completed.

Finally, the advanced LCoS display team has won an ICP agreement with a local projection display designer. This collaboration project targets the technical challenges of the emerging head-mounted-display (HMD) market.

Mr. Alan Pun, Senior Manager
潘良齡先生，高級經理

Led the MEMS senser IP platform for thermal imaging and G-sensor applications. The technology has been granted three U.S. patents.
開發微機電系統傳感器集成電路技術並應用於熱成像和重力傳感器，已獲發三項美國專利。

市場化

便攜式類比及混合訊號設計

過去一年，便攜式類比及混合訊號設計組成功進行了多項技術轉移給區內的OEM／ODM廠商，包括低功耗的模擬－數字轉換器、傳感器接口的集成模擬前端（AFE）、紅外熱成像用低噪音讀出（ROIC），以及交流－直流電源管理技術。這些高性能的專利技術有助廠商在短時間內取得實際的回報。

團隊開發的三軸重力傳感器（MEMS）獲一家領先的系統級晶片設計和服務供應商採用，不久便開始投產。在首十二個月內，交付給客戶的產品已超過一千八百萬件，應科院由此也收到可觀的收入。

非製冷紅外微測輻射熱計陣列已經替代冷卻式紅外熱成像成為低成本紅外成像系統的首選技術。這項技術被廣泛用於如熱成像、消防、駕駛員夜視、安防和監控等領域。團隊開發了讀出集成電路平台，並授權該技術予合作夥伴生產微測輻射熱計，用於高分辨率非製冷紅外攝像機和成像設備。

為了協助倫敦帝國學院在香港的分拆公司將其用於運動監測的身體傳感器網絡技術商業化，團隊正與他們合作定制用以提取和處理敏感生命體徵的超低功耗身體傳感器網絡感應集成電路平台，用於客戶在倫敦的Elite Sports Performance in Training（ESPRIT）計劃。小型無線心電圖設備已經完成並準備作進一步的臨床試驗。如試驗成功，這項技術將被商業化。

此外，研究集成硅基液精顯示的團隊與一家本地從事投射顯示器設計的公司達成協議，準備開始一個「業界合作項目」，因應新興頭戴式顯示器市場提供解決方案。

Augmented reality enhances browsing experience by using sensors to combine virtual objects with real life images
擴增實境透過傳感器將虛擬影像和現實環境結合，提升瀏覽網頁時的視覺體驗

Applied SoC Design (ASD)

ASD continued to deliver enabling technologies and quality IC design services to industry. A total of 13 contracts were signed with a tier one IC design corporations and small and medium enterprises in Hong Kong and worldwide during the year.

A contract was signed with Sengital Ltd, bringing augmented reality technologies to the "Legends of the Giant Dinosaurs" show at Hong Kong Science Museum. ASD also won an ICP project on image processing with a tier one television supplier to make use of IC technologies to develop cost-effective solution for enhancement of television display quality.

The transformation from IC technologies to commercial electronic products is often a long process and the team takes pride in announcing that the year has been fruitful. In 2012, an ICP project on USB 3.0 application processor IC was completed with a customer. Through hard work spent in thumb drive manufacturing and driving from design-in to design-win, it succeeded in bringing revenue for the partner and royalty for ASTRI.

In the same year, the team licensed its 3D conversion technology to a US customer for manufacturing of a 2D-3D video converter. The end-product was well received by consumers and ASTRI received royalty as a result.

應用系統晶片設計

應用系統晶片設計組繼續為集成電路產業界提供優質的知識產權和技術支援服務。團隊在本年度與業界共簽訂十三份合約，客戶包括本地和外地的領先集成電路設計公司，以及中小企業。

團隊與客戶Sengital Ltd.簽定合約，授權客戶將擴增實境技術用於在香港科學館舉行的「巨龍傳奇」展覽。在影像處理技術方面，團隊亦與一家知名的電視生產商展開一個「業界合作項目」，利用集成電路技術為電視顯示帶來具成本效益的影像畫質美化方案。

從集成電路設計、生產，以至獲採用在商品中在市場出售，是一個漫長的過程。應用系統晶片設計組在商業化方面今年取得兩大成就。團隊與客戶於二零一二年完成了一個USB3.0應用處理器晶片的「業界合作項目」。經過一番努力，產品已獲一家移動存儲製造商青睞並成功取得訂單，應科院和合作夥伴都因此而獲得利潤。

另一個成功個案是團隊將三維轉換技術授權給美國一個客戶來製造二維至三維視頻轉換器。結果產品在推出市場後大受消費者歡迎，應科院也因此而獲得利潤。

Future Development

Portable Analog and Mixed Signal Design (PAD)

Several initiatives are underway to continue the goal of developing innovative technologies for industry. Given the constraint of resources and funding, PAD's strategy is to focus on technology areas which can be leveraged to build integrated circuit products across multiple applications, thus producing a much greater impact on the industry if successful.

Brain computer interface (BCI) applications are growing exponentially in healthcare and wellness monitoring, through accurate detection and analysis of one's brainwave (electroencephalography). It requires precision analog front end (AFE) design, mixed signal integration of digital signal processing (DSP) and low-noise measurement. PAD has launched a research on micro-volt signal detection and advanced signal processing SoC platform. It will provide a portable and low-cost solution for brain signal pattern detection and recognition applications.

Radio frequency identification (RFID) and near-field communication (NFC) are not new to the market. However, their impact on logistics operation, mobile payments and consumer electronics has yet to reach full effect. There are lots of opportunities in high-performance NFC IPs. Before the end of the next fiscal year, PAD will deliver a full set of NFC IPs and application modules for the market.

A novel single stage power factor correction (PFC) AC-DC power converter IC will be developed for improving power consumption efficiency. This will help reduce power loss from power plants. With this ASTRI power management technology, the world would be "greener".

Applied SoC Design (ASD)

Aiming to contribute to a "greener" and "smarter" future in Hong Kong, ASD will devote engineering expertise to the following areas:

Wireless Power Transfer

At the moment, products available are restricted to close proximity (<10cm) and low power (<5W) transmission, but IC design and research is already underway to optimize transceiver systems that allow both greater distance and higher power transmission. ASD is working hard towards the dream of internet-of-things without tangling power cords.

未來發展

便攜式類比及混合訊號設計

便攜式類比及混合訊號設計組持續為業界開發創新技術。在有限的資源和資金供應下，團隊的策略是開發跨應用的集成電路科技，如取得成功，這些多用途技術將可以為產業帶來更大的影響。

腦機介面是通過對個人的腦電圖的精確檢測與分析來實現，如今在醫療健康監控領域的應用正在快速增長。該技術需要高精度模擬前端設計、數字訊號處理和低噪聲測量的混合訊號集成。團隊現已開展了一項針對微伏訊號檢測和先進的訊號處理系統級晶片平台的研究。該研究將為腦訊號模式檢測與識別應用提供一個可攜帶而低成本的解決方案。

無線射頻識別和近場通訊技術在市場面世已有一段時間，然而，這些技術在物流、移動付款和消費類電子產品方面還沒有充分發揮其影響力。高性能的近場通訊技術仍有巨大的發展潛力。團隊來年的目標是要為市場提供一套完整的近場通訊技術和應用模組。

一種新型的單級功率因數校正的交流轉直流電源轉換集成電路即將推出。該集成電路能有效提高能源效率，減少來自發電廠的能源損耗。隨著此能源管理技術的產生，相信我們的生活會變得更環保。

應用系統晶片設計

為推動和實現綠色環保和智能化的香港，團隊將專注開發下列技術：

無線電力傳輸

目前市場上可供選擇的產品僅限於近距離(少於十厘米)和低功耗(低於5W)傳輸，團隊因此正在進行收發系統集成設計的優化，目標是允許更大距離和更大功率傳輸。團隊希望能充份發揮物聯網優勢，實現電子產品無須電線連繫的時代。

Interactive Display Platform
互動顯示平台

The next-generation interactive display platform combines 3D visual effects with interaction to provide a more engaging interactive user experience

新一代互動顯示平台結合3D視覺效果與互動為用戶帶來更吸引的人機交互體驗

Visual Entertainment

Visual sensation is an essential part of daily life and ASD wish to bring more novel ways to improve the quality of multimedia contents as display technology progresses. For example, ultra-high definition, glass-free lenticular and holographic displays and virtual reality are subjects of intensive research by the team.

影視娛樂

影視娛樂是日常生活中一個非常重要的部分，隨著顯示技術日益先進，團隊希望可以相應提高多媒體影像的質量。新技術如超高清、裸眼3D、全息顯示器，以至虛擬現實都是團隊準備深入研究的課題。

Smart Living

Smart home appliances are essential element for smart living. The cloud is the fourth dimensional space offering many convenient services to connect consumers or businesses, for examples, virtual enterprise workstations, private cloud data storage and online shopping and banking. As the public gains more familiarity with digital currency, the concept of the currency itself and the cryptography algorithms behind it are what ASD is targeting as applications of IC design technologies.

智能生活

智能家電是實現智能生活所必須的。雲計算是第四維空間，它提供了很多便捷的服務，可以讓很多消費者和企業聯繫起來，例如虛擬企業工作站、私有雲數據存儲、網上購物和網上銀行等。近來大眾開始認識數字貨幣，數字貨幣的概念和它背後的加密算法是團隊未來一年的其中一個研究目標。

Mr. Chiu King-hung, Senior Manager
趙京雄先生，高級經理

Integrated Circuit Enabled Solutions (ICES)

Having successfully developed 10G and 25G optical communication transceiver ICs in 2013, the team plans to address applications of these ICs in 100Gb/s optical network.

集成電路及系統應用

承接在二零一三年成功研發出10G和25G光通訊收發器晶片，團隊在二零一四年將探討這些晶片在100Gb/s光網絡上的應用。

Led and managed image processing platform projects, which included frame rate conversion and visually enhanced ultra-HD application platform. The latter won Best Lifestyle Bronze Award in the Hong Kong ICT Awards 2014.

領導及管理圖像處理技術相關的研發項目，包括幀速率轉換及視覺提升超高清顯示技術。
後者榮獲2014年香港資訊及通訊科技獎最佳生活時尚獎銅獎。

Project Highlights 研發項目

Project Type 類別

- Platform 平台項目
- Seed 種子項目
- ICP 業界合作項目

	Project 項目	Duration 時期
	Portable Analog and Mixed Signal Design 便攜式類比及混合訊號設計	
1	AMS IP Platform for MEMS Sensor 應用在微機電系統傳感器的混合訊號 集成電路知識產權平台	Jun 2011 – Nov 2013 二零一一年六月至 二零一三年十一月
2	Wireless Sensor Network Signal Processing Platform 無線傳感器網絡訊號處理器平台	Apr 2012 – Dec 2013 二零一二年四月至 二零一三年十二月
3	High-speed and Agile Direct Digital Synthesizer 高速和敏捷的直接數字頻率合成器	Oct 2012 – Oct 2014 二零一二年十月至 二零一四年十月
4	Feasibility Study of a DDR4 Analog PHY's Architectural Design with Industry Standard DFI Bus Interface 一個具備行業標準DFI接口的DDR4模擬PHY的建築設計可行性研究	Feb – Aug 2013 二零一三年二月至 八月
5	Power Factor Correction for Dimmable and Green LED Lighting 功率因數校正適用於可調光LED綠色照明系統	Apr 2013 – Jun 2014 二零一三年四月至 二零一四年六月
6	Bluetooth Low Energy SoC Feasibility – RF Transceiver Front-end Architecture and BaseBand FPGA Implementation 低功耗藍牙系統晶片可行性研究－射頻收發器前端架構及數字基帶FPGA設計	Jul – Dec 2013 二零一三年七月至 十二月
7	AFE and Mixed Signal IPs for Integrated RFID NFC Controllers Design RFID和NFC控制器中模擬前端和混合訊號IP設計	Jul 2013 – Dec 2014 二零一三年七月至 二零一四年十二月
8	Feasibility Study of Reconfigurable Serial Link Transceiver for Low-power Wireline Communication 應用於低功耗有線通訊的可重置串行鏈收發器的可行性研究	Jul 2013 – Jan 2014 二零一三年七月至 二零一四年一月
9	Advanced LCoS Display 集成硅基液晶顯示晶片	Aug 2013 – Aug 2015 二零一三年八月至 二零一五年八月

Project Type
類別

- Platform
  平台項目
- Seed
  種子項目
- ICP
  業界合作
  項目

	Project 項目	Duration 時期
10	μV signal Detection and Advanced Signal Processing SoC Platform for Brain-computer Interface 應用於腦機介面的微伏訊號檢測和先進訊號處理系統晶片平台	Jan 2014 – Jul 2015 二零一四年一月至二零一五年七月
11	Feasibility Study of Intelligent Power IC and Module for Green Energy 智能功率集成電路及模組在綠色能源上應用的可行性研究	Feb – Oct 2014 二零一四年二月至十月
	Applied SoC Design **應用系統晶片設計**	
12	Secure Mobile Storage Processor 移動存儲安全處理器	Mar 2013 – Dec 2014 二零一三年三月至二零一四年十二月
13	Versatile Display Processor 多功能顯示處理器	Apr 2013 – Jul 2014 二零一三年四月至二零一四年七月
14	Hardware Accelerated Super Resolution Technology 硬件加速超解像技術	Jul 2012 – Aug 2014 二零一二年七月至二零一四年八月
15	Stereoscopic Image Signal Processor 立體圖像訊號處理器	Mar 2012 – May 2014 二零一二年三月至二零一四年五月
16	PCIe-based Storage Acceleration Platform 用於企業的PCIe存儲加速平台	Dec 2013 – Nov 2014 二零一三年十二月至二零一四年十一月
17	Wireless Power Technology for Multi-standard Platform 無線電源技術的多標準平台	Jul 2013 – Jul 2014 二零一三年七月至二零一四年七月
18	Advanced Augmented Reality Technologies 先進擴增實境技術	Aug 2013 – Jan 2015 二零一三年八月至二零一五年一月

Material & Packaging Technologies Group
材料與構裝技術群組

Authenticity of luxury products such as wines can be easily verified by simply scanning the RFID tags

只須素描RFID標籤，便能輕易分辨出高消費品，例如紅酒的真偽

Overview

The Material & Packaging Technologies (MPT) Group (to be renamed Sensing & Integration Group on 1 April, 2014) specializes in market-driven solutions focusing on miniaturized sensing modules, advanced packaging solutions and integrated sub-systems for applications in intelligent display, wearable devices, Internet-of-Things, healthcare, power electronics, machine vision and lithium-ion battery.

To help industry partners enhance competitive edge with patent protected solutions that can be brought to the market quicker, MPT offers reliable and proven solution platforms delivered by key technology initiatives in packaging and sensing as well as green technology.

The Group continues to excel with its market-driven application technologies and product-oriented patent portfolios. During the year, the Group filed 44 patent applications and was granted 57 patents from the United States, the Mainland and Taiwan. These patented technologies were licensed 200 times to companies in Hong Kong and the Mainland and turned into actual applications.

概況

材料與構裝技術群組(由二零一四年四月一日起改名為感測與集成群組)致力研發以市場為導向的解決方案，透過先進構裝技術，專注於微型化感測模組與及次系統的開發，應用於智能顯示、穿戴式裝置、物聯網、醫療保健、電力電子、機器視覺與鋰離子電池。

群組為合作夥伴提供可靠、具專利保護和經市場驗証的解決方案，藉此加強合作夥伴們的競爭優勢及把握市場先機。群組的重點技術研究範疇集中於構裝與感測和環保技術兩方面。

群組在開發市場所需的應用科技及以產品為主要的專利組合都有卓越表現。年度內，群組共提交了四十四項專利申請，另從美國、中國內地及台灣獲發專利共五十七項。這些專利技術已通過二百次授權予香港和內地的公司，加以應用在客戶的產品中。

MPT received a number of awards this year for the new technologies it developed, gaining much recognition from industry

材料與構裝技術群組今年贏得數個獎項，其科技創新能力備受業界肯定

Packaging and Sensing 構裝與感測

- Advanced Packaging Technologies 先進構裝技術
- Compact Camera 微型相機
- Healthcare Electronics 醫療保健電子
- Display Systems 顯示系統

Green Technology 環保技術

- LED Lighting LED照明
- Energy Harvesting and Storage 能源採集與儲存

		Technological Areas 技術範疇	
Patents Granted 獲得專利	57	LED Chip & Packaging	LED 晶片與構裝
		LED Device & VLED	LED 裝置及垂直型LED
		Lighting Control	照明控制
		LED Luminaries	LED 照明
		Pico-projector Platform	微型投影顯示平台
		Touch Panel	觸控面板
		Display Method & Apparatus	顯示方法及設備
		3D Packaging	三維構裝
		Tyre Pressure Monitoring System	胎壓監控系統
		Compact Camera Modules	微型相機模組
		Concentrating Photovoltaic	聚光太陽能模組
		Wind Generator	風力發電
		Printed Electronics	印刷電子
Patents Filed 專利申請	44	Lighting Control	照明控制
		LED Luminaries	LED照明
		Pico-projector Platform	微型投影顯示平台
		Touch Panel	觸控面板
		3D Packaging	三維構裝
		RFID	射頻識別
		Power Electronics	電力電子
		Healthcare Electronics	醫療保健電子
		Compact Camera Modules	微型相機模組
		Lithium-ion Battery	鋰離子電池

Agreements Signed 簽訂合約 — 28

Income Received from Industry* 從業界所得收入* — 20.05 million HK$ 百萬港元

* Including cash and in-kind contribution 包括現金及物資資助

Innovations

RFID Reader

An Anti-counterfeit Identification Microsystem (AIM) was developed, which integrated a complete UHF RFID reader and an Android APP serving as both a user interface and an interface to remote database. AIM allows consumers to authenticate commercial products by reading the UHF RFID tags on the product. Consumers can do this simply by replacing SIM cards and downloading the Android App to their smartphones. A total of eight patent applications were filed in the U.S. and the Mainland for this technology.

技術突破

RFID讀寫器

防偽認證微系統(AIM)的開發是集合了超高頻(UHF) RFID讀寫器及Android應用軟件作為用戶介面及遠程數據庫接口。消費者只需更換SIM卡和把Android應用程式下載到智能手機，便可通過閱讀商品上的超高頻RFID標籤來鑒別商品真偽。群組就有關技術已申請了八項美國及中國內地專利。

ECD Software

Basing on fundamental understanding of interaction mechanisms of the three additives (accelerator, suppressor, leveler) used in electrochemical deposition (ECD), MPT developed a mechanism-based software comprising a computational engine, a user interface and a post-processing and visualization module with prediction accuracy of more than 85 per cent. The software can be applied for 3D-interconnect fabrication process window determination and design optimization. A total of six patent applications were filed in the U.S. and the Mainland for this technology.

電化學沉積軟件

透過對三種添加劑(促進劑、抑制劑、整平劑)在電化學沉積(ECD)的相互作用的基礎理解，材料與構裝技術群組成功開發了一套機理性電鍍模擬軟件，包括計算引擎、用戶介面、後處理及顯示模組，軟件預測的準確度超過85％。該軟件可應用於三維互連工序窗口製定和設計優化。群組就有關技術已申請六項美國及中國內地專利。

3D Gesture Control
3D手勢識別技術

3D gesture control allows easy manipulation of screens by pre-defined gestures such as flip, draw, drag and zoom

利用3D手勢識別技術，可以輕易透過各種預定手勢控制畫面，例如翻頁、畫線、拖拽及縮放

3D Machine Vision

The optical 3D machine vision system, especially the structured light projection 3D machine vision system, can help increase accuracy and speed of measurement significantly in modern industrial and non-industrial applications for automatic inspection, process control and robot guidance, etc. The Group established a platform to provide fast measuring speed and highly accurate 3D machine vision system suitable for measuring and reconstructing small or moving objects. The solution provides compact off-axis/on-axis digital pattern projection engine design, smart algorithm and system level integration. Two patent applications were filed in U.S. and the Mainland for this technology.

三維機器視覺

光學三維機器視覺，特別是結構光投影三維機器視覺系統，有助顯著提高測量的精確度和速度，可以被廣泛應用在各種工業和非工業領域，作自動檢測、過程控制和機器人導航等應用。群組建立了一個可提供高速及高精度的三維機器視覺技術平台。特別針對小型或者移動中的被測物體的即時監測和重構，提供離軸／垂軸數字化條紋投影光機系統的微型設計、智能分析算法和系統級整合等關鍵技術。群組已就相關技術申請了兩項美國及中國內地專利。

Gesture Control Module
手勢識別模組

3D Gesture Control

The 3D near-field gesture control technology can be used for natural user interaction with personal computers, tablets, smartphones or other mobile devices, allowing users to control displays through hand gestures in the air. The vision-based technology is capable of real time tracking and can recognize two hands and up to 10 fingers. The technology can quickly and accurately detect pre-defined gestures such as flip, draw, drag, zoom, etc. It can also support different operation systems, such as Windows and Linux/Android.

Portable Interactive Surface

Portable interactive surface can instantly turn an ordinary flat surface into an interactive surface with multi-touch function for gaming and entertainment. It makes use of the Group's patent protected depth sensing technology together with its short-throw offset projector to achieve fast and accurate sensing, significantly reducing computational complexity, system power and production cost. This portable interactive surface has a built-in Android operating system. With its compact size, this portable device supports a 20-inch projection of high quality and interactive image, providing an unparalleled user-friendly human-machine interaction experience.

3D手勢控制

近距離3D手勢控制技術可用於個人電腦、平板電腦、智能手機或者其他移動產品上，透過空間手勢操作控制顯示畫面，實現自然的人機互動體驗。該技術基於視覺方法，可以實時追蹤及識別兩隻手及高達十隻手指。該技術可以快速準確的檢測各種預先設定的手勢，例如翻頁、畫綫、拖拽、縮放等，並且可支援多種操作系統，例如Windows，Linux／Android。

便携式互動桌面

便攜式互動桌面可以即時將一塊普通的平面變成多點觸控的互動平面，可供遊戲和其他娛樂使用。產品採用了群組擁有專利的深度檢測技術和短焦偏置投影光機，令感測速度快而且準確，同時能降低運算複雜度、系統功耗及產品成本。這便攜式互動桌面還內置了安卓系統。除體積輕巧及便於携帶，這投影儀能支援面積達二十寸的高質素互動投影畫面，為用家提供友好的人機互動體驗。

A diner using an interactive menu projected on a restaurant table by portable interactive surface

客人正在使用由便攜式互動桌面技術投射在餐桌上的互動餐牌

Cardiovascular Monitoring Device
心血管監測儀

Cardiovascular monitoring device can be used at home to check wellness of blood vessels.
Results can be uploaded for remote health monitoring by medical professionals.
心血管監測儀方便在家中使用，測量血管健康狀況，所得結果也可上傳給醫護人員作遠程健康監察。

Face Analysis

Face analysis technology can be used in social networks for image storing and sharing. It also offers benefits in the field of security, as well as surveillance or police work. A face analysis technology pool has been built to provide solutions for all face related applications. Technologies developed include face recognition, detection and tracking; age, gender and facial expression recognition; face alignment and high resolution facial images.

Cardiovascular Monitoring Device

A revolutionary cardiovascular monitoring device using smart sensor to measure blood pressure, arterial stiffness and heart rate at wrist has been developed. Unlike traditional cuff-based blood pressure meter, this new device does not block blood vessel during measurement and hence allows continual measurement. The measurement results can be conveniently uploaded to a central database through tele-care systems available in Hong Kong or mobile devices to facilitate health monitoring by medical professionals.

High-capacity Electrode Materials for High-energy Density Advanced Lithium-ion Batteries

In view of the increasing demands for power demanding electronics with battery capacity, size and weight constraints, there are many technical challenges to be tackled before breakthrough can be achieved in developing lithium-ion battery (LIB). These requirements create the need for new material research and development. MPT has been focusing efforts on developing the next generation tin-based anode material and manganese nickel-based lithium rich cathode materials for lithium-ion batteries, which are expected to be impactful components for increasing the energy density of future LIBs. They provide advantages such as high-energy density characteristics, competitive material cost and low environmental impact, which are important factors in commercial applications.

人臉分析

人面分析技術可用於社交網絡、圖像存儲和共享；也可用於保安方面、監視或協助警方工作。群組已建立一個人臉分析技術庫，為人臉識別相關應用提供解決方案。此項目開發的技術包括人臉識別、檢測及追蹤；年齡、性別及表情識別；人臉排列及提供高解像人臉影像。

心血管監測儀

這是一款革命性的心血管監測設備，利用智能感測器量度血壓、動脈僵硬度和脈搏。相比傳統的袖帶式血壓測量儀器，這款心血管監測儀在量度時不會堵塞血管，方便使用者連續測量血壓。測量結果可以輕鬆地通過香港現有的遠程保健系統或移動設備上傳至中央數據庫，以便醫護人員進行健康監測。

用於鋰離子電池的高能量密度電極材料

為了滿足高耗能新型電子產品應用的需求，鋰離子電池(LIB)技術的發展必須克服多重技術挑戰，其中包括電池能量密度、體積和重量等限制，這些需求促使新型電池材料的研發。材料與構裝技術群組專注開發新一代鋰離子電池用錫石墨複合負極及富鋰錳鎳基正極材料，預期這些材料將成為提升未來鋰離子電池能量密度的重要成分。這些新材料兼具高電容量、低成本及低環境污染性等優點，為商業化提供了有利條件。

Cardiovascular Monitoring Device
心血管監測儀

Commercialization

RFID Reader

The technologies and products developed in the Anti-counterfeit Identification Microsystem (AIM) project were transferred to three companies in Hong Kong and the Mainland, resulting in about HK$2.7 million in industry contribution. The technologies and products were also introduced to many other companies.

ECD Software

The technologies and products developed in the mechanism-based software for 3D-interconnect fabrication (MS-3D) project were transferred to two companies in Hong Kong and the Mainland, receiving about HK$3.8 million in industry contribution during the project period. The technologies and products were also introduced to many other companies.

市場化

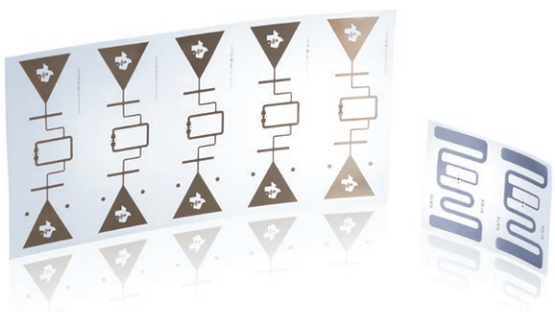
RFID讀寫器

在防僞認證微系統(AIM)項目下開發的技術及產品已成功向三間香港及中國內地的企業作技術轉移，從業界所得收入高達港幣二百七十萬元。群組已將這些技術和產品向其他企業推廣，務求發掘更多合作商機。

電化學沉積軟件

在三維互連製造的機理性軟件(MS-3D)項目下開發的技術及產品已成功向兩間在香港及中國內地的企業作技術轉移，從業界所得收入高達港幣三百八十萬元。群組已將這些技術和產品向其他企業推廣，務求發掘更多合作商機。

RFID Reader in SIM card
RFID讀寫器SIM卡



RFID Antenna
RFID天線

Dual-frequency RFID Reader
RFID雙頻讀寫器

With a virtual display in front, users can get information such as location, call alerts and other instant messages from smartphone
透過眼前的虛擬顯示器，使用者可以即時獲取從手機上傳的各種有用資訊，例如所在位置、來電提示及其他信息

Pico-projector

During the year, the Group engaged global tier-one manufacturers and customers to develop pico-projection technologies for the market. A global leader in micro display OLED manufacturing, who ranks number one on the Mainland and number two globally, signed a contract with ASTRI to develop air gesture and touch module for their head mounted display (HMD) device.

Another customer, being one of the world's leading automotive IC suppliers signed a contract to develop optics engine and driving system for head-up-display (HUD) for delivery to a tier-one car equipment manufacturer in Europe. Both contracts were worth more than HK$1 million. More importantly, the know-how accumulated through the contracts would be very helpful to MPT for moving into HMD and HUD industries.

Optical Multi-touch

During the year, agreements relating to optical multi-touch technology were signed with three local companies for commercialization. This technology helped industry partners develop a time-to-market solution at very low cost and hence increased competitiveness of their products in the market. Also, another industry partner licensed the technology and mass produced products which were subsequently available in the market. Furthermore, with support from the Education Bureau, the technology was put on trial run in more than 20 local schools facilitating e-learning in classrooms.

微型投影

是年內，材料與構裝技術群組成功夥拍世界一級的製造商和客戶，共同開發微型投影技術及產品，預備進軍世界市場。群組與一家在內地領先，在國際市場排名第二的OLED微顯示晶片廠商簽約，為客戶的頭戴式顯示器開發手勢識別和觸控模組。

此外，另一家世界領先的車用集成電路生產商也與群組簽了合約，合作為一家在歐洲知名的汽車設備製造商開發平視顯示器用的光學引擎和驅動系統。以上兩份合約價值都超過一百萬港元，更重要的是群組在這兩個合作項目中所累積的寶貴經驗，對群組進入頭戴式顯示器及平視顯示器市場將有莫大幫助。

光學多點觸控

光學多點觸控技術方面，群組與三家本地公司簽約，將技術市場化。該技術為合作夥伴提供一個可於短時間進入市場的低成本解決方案，從而提高他們的產品在市場上的競爭力。另有一家公司已獲授權利用光學多點觸控技術並進行量產，產品現已推出市場。另一方面，在香港教育局的支持下，本港二十間學校正在試用該技術來進行課堂電子教學。

3D Machine Vision

Two agreements related to 3D machine vision were signed with SMT equipment manufacturers on the Mainland. The technologies helped them develop 3D inspection equipment speedily and increased competitiveness of their products.

Intelligent Audience Analysis

Intelligent audience analysis technology was licensed to two Hong Kong companies for commercialization. The technology, which has been used in different kinds of personalized advertising display systems, has proved to achieve better performance, thus bringing huge benefit to the industry partner. Furthermore, another industry partner licensed MPT's face analysis technology and opened up new market for applications in surveillance and public security on the Mainland.

Reflective Pulse Oximeter

The smart reflective pulse oximeter for remote health monitoring was licensed to several tier-one healthcare manufacturers in Hong Kong and the Mainland for integration into their products, including a wristwatch for measuring vital signs such as body temperature, pulse rate, pulse oximetry and electrocardiogram which will be launched in the market soon.

The device was also installed in the Hong Kong Housing Society Elderly Resources Centre as one of the technologies used to realize smart living for the elderly. With its elderly-friendly design, the device helps the seniors check their health condition in a comfortable and convenient manner.

三維機器視覺

三維機器視覺技術方面，群組和兩家中國內地的表面貼裝設備廠商簽約將技術轉移。此技術可協助他們在很短的時間內開發出具備三維檢測功能的設備，從而大大提升了他們在這一領域的競爭力。

智能觀眾分析技術

智能觀眾分析技術已授權給兩間香港公司作市場化。該技術已應用在多個個性化廣告展示系統中，結果顯示能大大地提高廣告效果，為合作夥伴帶來很大的效益。此外，另一合作夥伴獲授權使用群組開發的人臉分析技術，在中國內地開闢了監控和公共安全應用的新市場。

反射式脈搏血氧測量儀

可用作遠程健康監察的智慧型反射式脈搏血氧測量儀已授權予幾家在中國內地和香港領先的醫療保健電子設備製造商，並結合在他們的產品中。其中一家製造商利用此技術製造了一款可測量體溫、脈搏、脈搏血氧飽和度和心電圖的腕錶，該產品不久便會推出市場。

此外，反射式脈搏血氧測量方案現已安裝於香港房屋協會轄下的長者安居資源中心，作為長者智能家居展示技術之一。由於此產品設計簡單易用，長者可以在很舒適和方便的情況下檢查健康狀況。

Mr. Kenric Lam, Project Manager
林暾先生，項目經理

Set up a software configuration management system for reflective pulse oximeter and cardiovascular monitoring device which led to ISO13485 certification

為反射式脈搏血氧儀和心血管監測儀設計軟件配置管理系統，成功取得ISO13485認證

Team leader of portable interactive surface, an innovation which won Gold Award, Best Lifestyle (Learning & Living) in the Hong Kong ICT Awards

便攜式互動桌面的研發領導，該項新技術榮獲香港資訊及通訊科技獎最佳生活時尚獎（學習 • 生活）金獎

Mr. Kenny Chan, Senior Manager
陳建龍先生，高級經理

Intelligent head-up display can be used to provide driver assistance
用作駕駛輔助的智能平視顯示裝置

Future Development

The MPT Group will continue focusing on developing advanced packaging technologies, display systems, healthcare electronics as well as green energy solutions.

In advanced packaging technologies, the Group will focus on: (1) further developing the miniaturized RFID module with both UHF and HF functions for mobile phone applications; (2) applying ECD software to develop new additive materials for 3D-interconnect fabrication applications; and (3) establishing the power electronics packaging technology platform for developing the high-power module for automotive and green energy related applications.

With display systems, the Group will continue developing 3D digital pattern projection engine and 3D reconstruction algorithm novel technologies. The target application will focus on SMT SPI/AOI equipment, 3D face analysis and recognition, expression analysis, compact 3D scanner or 3D copy machine. It will also explore potential applications in machine vision field in the sensing integrated projection technology platform. Core technologies will be developed for next generation head mounted display and head-up-display with natural user interface.

未來發展

材料與構裝技術群組將繼續致力研發先進構裝技術、顯示系統、醫療保健電子及環保能源解決方案。

在先進構裝技術方面，群組將集中於：(1)進一步開發應用於手機的微型UHF及HF RFID雙頻模組；(2)利用電化學沉積軟件開發應用於3D互連製造的新型添加劑；(3)建立功率電子構裝技術平台，為汽車及綠色能源相關應用開發高功率模組。

在顯示系統方面，群組會繼續專注於研發三維數字投影光機系統和三維重建演算法技術，目標應用將鎖定於表面貼裝工業光學三維檢測設備、3D人臉識別和分析、表情分析、小型三維掃描器或三維影印機。群組會進一步探索傳感集成投影技術平台在機器視覺領域的潛在應用。群組並會為新一代頭戴式顯示器及車用平視顯示器開發結合自然人機介面的核心技術。

Population ageing is a global phenomenon and people nowadays are prone to be more health conscious. In view of the growing demands for healthcare products and services, MPT is taking the lead to launch a "Thrust" focusing on R&D of preventive healthcare technologies. "Thrust" is a collection of solution-driven research projects targeting at new technology areas in an emerging market.

Entitled "Thrust 2: Healthy Ageing Technologies", this new initiative aims at promoting healthy and active ageing through the use of Information and Communication Technologies. It will kick off with a seed project on early detection of cognitive health decline. A user-friendly module for multi-parameter measurement and monitoring of both physiological and psychological conditions will be developed. MPT will also leverage expertise of other ASTRI R&D groups to develop more innovative applications through cross-domain collaboration.

In battery development, the Group will focus on lithium-ion battery materials and component design for consumer and portable electronic products. The Group specializes in high-capacity anode materials and lithium rich cathode materials, advanced binders for active layers and separators, and configuration design for high-energy density battery. With its professional technology background, the Group will work in tandem with the material manufacturing and lithium-ion battery industry to pave the way for a sustainable future.

人口老化是一個全球性的現象，現代人也越來越注重健康，因此市場對於保健產品和服務的需求日益殷切。材料與構裝技術群組因應市場需要牽頭展開一組以研發預防性醫療保健科技為重點的「主推」項目。「主推」項目是針對新興市場需要研發一系列新技術，每組「主推」項目包含多個以提供解決方案為導向的子項目。

最新展開的「主推項目(二)：康健樂頤科技」，目的是透過通訊與資訊科技的使用推廣健康和積極的老齡化。此「主推」項目將率先推出一個種子項目，開發一款方便易用、多參數測量和監察生理和心理狀況的感測器，來檢測早期認知功能衰退。材料與構裝技術群組也會與應科院其他研發群組進行跨領域合作，充分結合各組的技術專長，開發更多創新應用科技。

在電池發展方面，群組會繼續為消費類型和可携式電子產品研發鋰離子電池材料和組件設計。專注範圍包括新一代的高容量負極材料和富鋰正極材料、先進的電極活性塗層和隔膜粘合劑，以及高能量密度電池的配置設計。憑著專業的技術，群組將與材料製造及電池產業同心協力，為行業可持續發展的未來作出貢獻。

Lithium-ion Battery
鋰離子電池

Advanced anode material and anode design for advanced lithium-ion batteries
使用於先進鋰離子電池的先進鋰離子電池陽極材料及電極技術

Lithium battery material fabrication laboratory
鋰離子電池材料製造實驗室

Project Highlights 研發項目

Project Type 類別

- Platform 平台項目
- Seed 種子項目

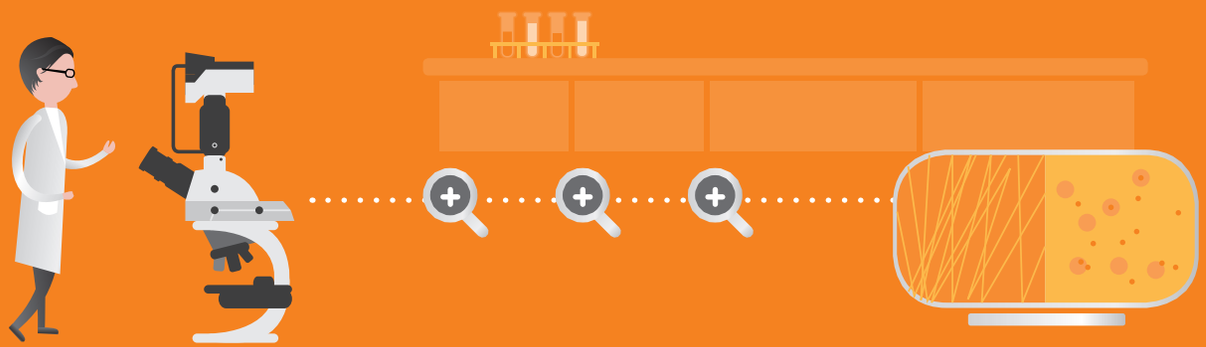
	Project 項目	Duration 時期
1	3D Power Electronics Modules 三維電力電子模組	Nov 2012 – May 2013 二零一二年十一月至 二零一三年五月
2	New Electro-deposition Materials for 3D-Interconnect of High-density Substrate 應用於高密度基板中三維互連的新型電沉積材料	Mar – Aug 2013 二零一三年三月至 八月
3	Miniaturized Dual-frequency RFID-reader with NFC Functions 具有NFC功能的微型化雙頻RFID讀寫器	Aug 2013 – Feb 2014 二零一三年八月至 二零一四年二月
4	Development of Anti-counterfeit Identification Microsystem (AIM) by SiP Technology 利用系統級構裝技術開發防偽認證微系統	Apr 2012 – Oct 2013 二零一二年四月至 二零一三年十月
5	Mechanism-based Software for 3D-interconnect Fabrication 應用於三維互連製造的機理性軟件	Jan 2013 – Mar 2014 二零一三年一月至 二零一四年三月
6	3D High-power Electronics Modules 三維大功率電力電子模組	Mar 2014 – Sep 2015 二零一四年三月至 二零一五年九月
7	New Electrodeposition Additives for Next-generation 3D-interconnect 應用於下一代三維互連技術的新型電沉積添加劑	Mar 2014 – Aug 2015 二零一四年三月至 二零一五年八月
8	Feasibility Study of Smart Compact 3D Machine Vision System 智能微型3D機器視覺系統的可行性研究	Mar – Sep 2013 二零一三年三月至 九月
9	3D Pico-projector and Mobile Interactive I/O Devices 三維微投影系統與便攜式互動I／O終端	Jan 2012 – Jan 2014 二零一二年一月至 二零一四年一月
10	Interactive Displays for e-Classroom e教室之互動顯示	Oct 2012 – Jul 2014 二零一二年十月至 二零一四年七月
11	Smart Compact 3D Machine Vision System 智能微型三維機器視覺系統	Dec 2013 – Jun 2015 二零一三年十二月至 二零一五年六月

Project Type 類別

- Platform 平台項目
- Seed 種子項目

	Project 項目	Duration 時期
12	Smart Digital Signage: Audience Expression Analysis 智能數字標牌：觀眾表情分析	Dec 2013 – Jun 2015 二零一三年十二月至 二零一五年六月
13	High-capacity Anode in Embedded LIB for Popular Consumer Electronics 消費性電子產品使用嵌入式鋰離子電池之高電容陽極	Jan 2013 – May 2014 二零一三年一月至 二零一四年五月
14	Hybrid Mode Real Time Locating System Using LED 利用LED的混合模式實時定位系統	Mar – Sep 2013 二零一三年三月至九月
15	Intelligent Lighting Sensor Module 智能燈光感應模組	Nov 2011 – Apr 2013 二零一一年十一月至 二零一三年四月
16	Panel Level LED Packaging Platform Development 面板級LED技術平台開發	Dec 2011 – Jun 2013 二零一一年十二月至 二零一三年六月
17	Intelligent Omni-directional LED Bulb 智能全方位出光型LED球泡燈	Mar 2013 – Feb 2014 二零一三年三月至 二零一四年二月
18	Optical System for Health Assessment 用作健康評估的光學系統	Oct 2012 – Apr 2013 二零一二年十月至 二零一三年四月
19	Cardiovascular Monitoring Device for Tele-care System 用於遠程照顧的心血管監測儀	Oct 2012 – Apr 2013 二零一二年十月至 二零一三年四月
20	Optical System for Health Assessment 用作健康評估的光學系統	Jan 2014 – Jan 2016 二零一四年一月至 二零一六年一月
21	Compact Optical Zoom Module 微型光學變焦相機模組	Dec 2011 – Nov 2013 二零一一年十二月至 二零一三年十一月

Bio-Medical Electronics Team
生物醫學電子組



Computer-assisted Tuberculosis smear microscopy diagnosis

電腦輔助結核病塗片顯微鏡診斷

Overview

During the past year, the Bio-Medical Electronics (BME) Team continued its R&D efforts in three key directions: digital pathology, traditional Chinese medicine diagnostic instrumentation, and tele-health technology in collaboration with the Enterprise & Consumer Electronics (ECE) Group and the Exploratory Research Laboratory (ERL).

In digital pathology, the Team completed one platform project on high-speed slide digitization platform development and one seed project on image analysis algorithm design for tuberculosis smear diagnosis. In the platform project, the Team built a prototype scanner achieving top-ranking slide scanning speed with real time focus adjustment to ensure sharpness of whole slide images. In the seed project, bacillus detection algorithms for both brightfield and fluorescence smear microscopy were developed with high accuracy validated with hundreds of smears. Following the success of these two projects, a new platform project on high throughput computer-aided fluorescence diagnosis system was initiated.

In traditional Chinese medicine diagnostic instrumentation, the Team completed one seed project on developing a wrist pulse measurement machine to mimic the diagnostic techniques used by Chinese medical practitioners. Various pressure sensors were evaluated for sensitivity and robustness tests, and the most suitable one was chosen and used in a wrist pulse measuring prototype system. The system can successfully measure the waveform of wrist pulses with high temporal resolution and pressure sensitivity.

In tele-health technology, the Team helped ECE Group to roll out a large scale user trial with multiple Community Nursing Service Centres on ASTRI's tele-health technology platform. To provide better navigation service to people with disability, the Team proposed the use of a novel positioning technology with low infrastructure requirement. Moreover, the Team and ERL have plan to initiate a joint seed project on personal health record-based chronic disease management system aiming at providing personalized solution to the elderly.

概況

過去一年，生物醫學電子組的研發重點主要集中在三方面：數字病理、中醫診斷，以及和企業與消費電子群組和信息研究室合作研發遠程健康技術。

在數字病理方面，小組完成了一個明場顯微鏡下高速切片掃描的平台項目和一個電腦輔助結核病痰塗片診斷的種子項目。在平台項目中，小組開發的全切片高速掃描儀兼具實時自動對焦功能，能在高速掃描的同時保證整張切片圖像的高清晰度。在種子項目中，小組開發了明場和螢光雙模式的結核桿菌識別算法，其高精確度經過了數百張痰塗片驗證。基於這兩個項目的研究成果，小組又開始了一個關於高通量電腦輔助螢光顯微診斷的新平台項目。

在中醫診斷方面，小組完成了一個模擬傳統中醫師「把脈」的自動脈診儀種子項目。小組測試了多種壓力傳感器，找出其中表現最好的應用於脈診儀的開發中。結果顯示脈診儀能成功測量具有高時間分辨率和壓力敏感度的脈搏波形。

在遠程健康方面，小組協助企業與消費電子群組和多家社康護理服務中心開展了一個大規模的，關於應科院遠程健康照護技術平台的試驗。另外，小組還提出利用一種低營運成本的創新室內定位技術，為行動障礙人士提供更好的導向服務。小組同時與信息研究室計劃合作開始一個基於個人電子健康記錄的慢性病管理項目，希望能為長者提供個性化保健服務。

Pulse Sensing Machine used in traditional Chinese medicine diagnosis
用於中醫診斷的脈診儀

Technological Areas 技術範疇

Patent Granted
獲得專利

1

- Magnetic Resonance Imaging 磁共振成像

Patents Filed
專利申請

10

- Digital Pathology 數字病理
- Traditional Chinese Medicine Diagnostic Instrumentation 中醫診斷
- Positioning and Navigation 定位導航

Agreements Signed
簽訂合約

2

Income Received from Industry*
從業界所得收入*

0.41

million HK$ 百萬港元

* Including cash and in-kind contribution 包括現金及物資資助

Innovations and Commercialization

Digital Pathology

The excitation-based auto focusing technology greatly increased focusing speed in fluorescence microscopy, making real time focusing for high-speed whole slide imaging under fluorescence mode possible for the first time. Large FOV imaging module design expedited the slide scanning process, particularly for fluorescence microscopy, making its speed comparable to that of brightfield scan for the first time. Combining the two technologies, high throughput fluorescence scanning could be readily accomplished.

The bacillus detection algorithms for tuberculosis smear diagnosis under both brightfield and fluorescence modes, together with the automated smear scanning platform, made automated dual-mode correlated tuberculosis smear microscopy possible for the first time. This platform allows more objective machine-learning for bacillus identification than manual examination reference, excluding both false positive and false negative cases in algorithm training.

BME signed a non-exclusive licensing agreement with a customer on high-speed digital pathology and computer-aided pathology diagnosis technologies during the year.

Traditional Chinese Medicine Diagnostic Instrumentation

Humanoid multi-figure structure design and actuation mechanism allow close mimic of Chinese medicine practitioner's gesture by machine. The mechanical design provides flexibility and control which have not been realized by wrist pulse measurement equipment available in the market. Also, the multi-finger and sensor array design enhances measurement robustness regarding positioning errors.

技術突破及市場化

數字病理

基於激發光的自動對焦技術可以大幅提高螢光顯微成像中的對焦速度，首次實現了螢光顯微掃描中的實時對焦。大視野的成像模組設計特別適用於低訊號的螢光成像，可以使其首次達到與明場模式相當的掃描速度。這兩種技術的結合，使得高通量螢光掃描成為可能。

明場和螢光雙模式下的結核桿菌識別算法，配合高精度自動掃描平台，使得痰塗片的自動雙模對比掃描首次成為可能。相對其他參照人工塗片診斷的自動算法，此雙模對比系統可以對兩種模式都建立更加準確的桿菌形態庫，減少假陰性和假陽性診斷的發生率。

本年度內，生物醫學電子組與一家客戶簽訂了關於高速切片掃描和電腦輔助診斷的非獨家技術授權。

中醫診斷

模擬人手的多指結構和活動機能的機械設計，搭配指端的壓力傳感器陣列，使得小組開發的自動脈診儀能模仿傳統中醫師把脈。此自動脈診儀亦具備其他市面產品所缺乏的彈性、控制和位置檢測的穩定性。

Tele-health Technology

With the increasing need for confined proximity identification together with wide area positioning coverage, many applications combine different positioning techniques (such as Wi-Fi and RFID) to provide positioning capabilities for indoor environments. However, an overall solution based on single technique to provide coarse and fine positioning without extra hardware has yet to be found.

Therefore, the Team introduced an innovative method to use a single Wi-Fi fingerprinting technique to provide coarse and fine location identification simultaneously without employing additional hardware such as tags and beacons. This method requires a specially designed antenna together with a subtractive location-referencing software algorithm. This novel positioning technique will pave the way for technology development of a complete barrier-free access guidance platform for people with special needs such as vision and mobility impairment.

Future Development

The BME Team will continue its R&D efforts on healthcare related projects. This includes the on-going platform project on digital pathology, particularly focusing on building the first dual-mode automated tuberculosis smear diagnosis facilitating system and its field validation with collaborating laboratories.

The Team will also work closely with other parties in and outside ASTRI on personal health record-based chronic disease management module development, aiming at facilitating preventive care services in elderly centres in particular.

Virtual Slide Viewer System supporting touch screen control
支持觸控屏操作的虛擬切片瀏覽器

遠程健康技術

隨著人們對兩種定位技術，即局部範圍的地點辨識和大範圍的覆蓋定位的需求同時不斷增加，現時許多的定位應用都結合不同的技術（例如Wi-Fi和RFID），以提供於室內環境用的定位功能，但現時還沒有一個完整的解決方案是基於單一的技術，能同時提供以上提及的局部精準定位及大範圍覆蓋的粗略估算，而且又不需外加任何額外的硬件。

因此，小組引進了一種創新方法，使用單一的Wi-Fi指紋識別技術來同時提供大範圍的粗略定位估計及局部精準的位置識別，而不用外加任何硬件，例如標籤和信標等等。該方法需要特定設計的天線，並同時配合一種反向式的位置參考軟件演算法來一起使用。這種新穎的定位技術將為一個完整的無障礙引路平台的科技發展鋪路，惠及有需要人士，例如為視覺障礙或行動不便者提供無障礙引路資訊。

未來發展

生物醫學電子組在新一年將繼續開發與健康相關的產品和技術。小組將繼續研究正在進行中的數字病理平台項目，特別是世界首創雙模式自動結核病塗片鏡檢輔助系統的開發，以及與並他實驗室合作進行的系統測試。

小組也將與應科院其他群組及其他團體合作，特別針對老人中心的預防性保健服務需求，開發基於個人電子病歷的慢性病管理軟件模組。

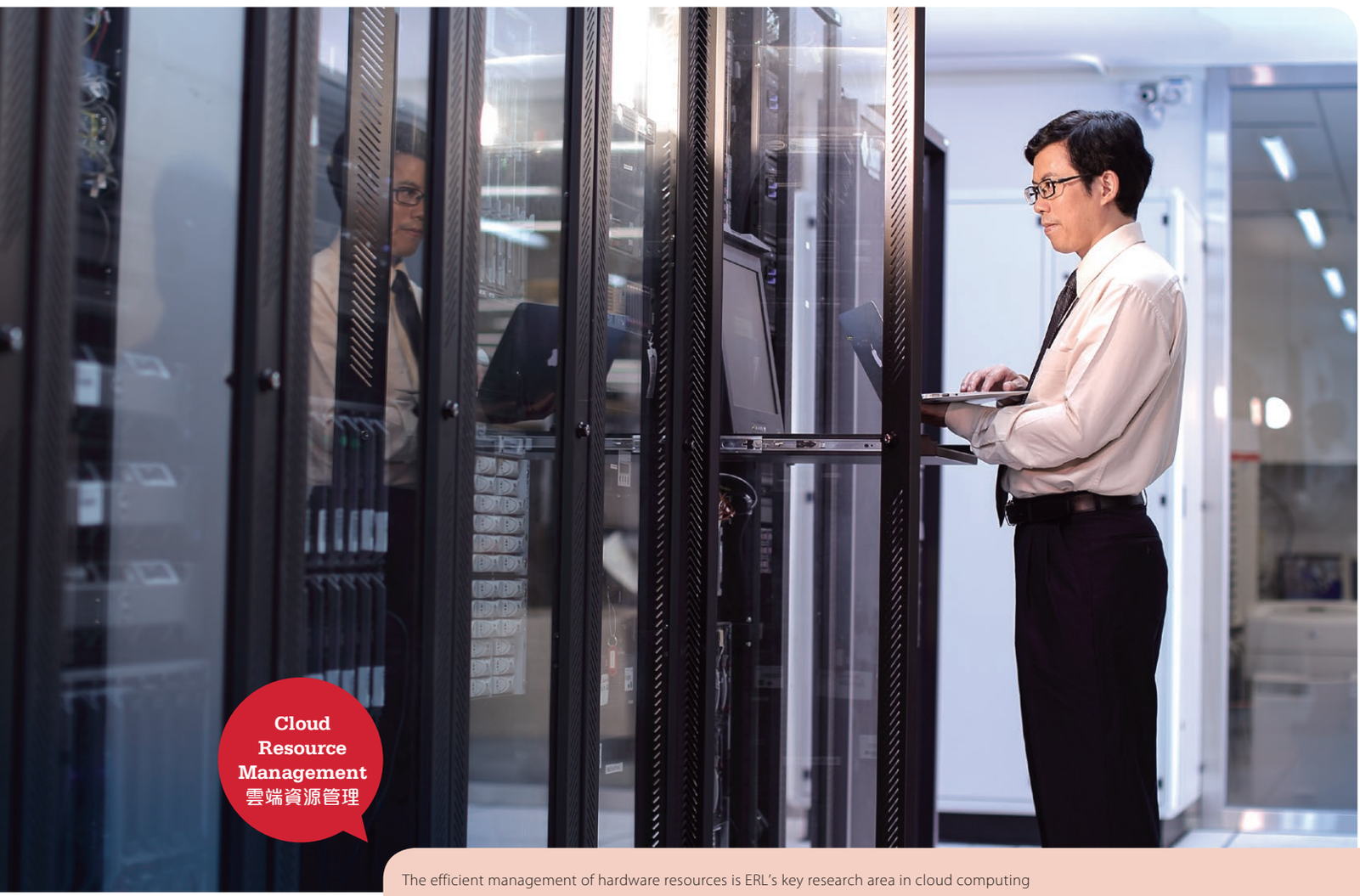
Project Highlights 研發項目

Project Type 類別

- Platform 平台項目
- Seed 種子項目

	Project 項目	Duration 時期
1	High-speed Digital Pathology System 高速數字病理系統	Feb 2012 – Aug 2013 二零一二年二月至 二零一三年八月
2	Computer-aided Pathology Diagnosis – Tuberculosis Sputum Smear 電腦輔助病理診斷－結核病痰塗片	Apr – Sep 2013 二零一三年四月至 九月
3	Cardiovascular Assessments via Chinese Medicine Approach 利用中國醫術進行心臟血脈評估	Jan – Jul 2013 二零一三年一月至 七月
4	High Throughput Computer-aided Fluorescence Diagnosis System 高通量電腦輔助螢光診斷系統	Mar 2014 – Jun 2015 二零一四年三月至 二零一五年六月
5	Tele-health Technology Platform (collaborating with ECE) 遠距離健康照護技術平台 （與企業與消費電子群組合作項目）	Dec 2011 – Mar 2014 二零一一年十二月至 二零一四年三月

Exploratory Research Laboratory
信息研究室



Cloud Resource Management
雲端資源管理

The efficient management of hardware resources is ERL's key research area in cloud computing
如何有效地管理硬件資源是雲計算方面的一個重要研究課題

Overview

The Exploratory Research Laboratory (ERL) focuses mainly on emerging Information and Communication Technology (ICT) initiatives. With the adoption of internet-of-things, cloud computing and social media, there is a plethora of data generated from every facet of our daily lives and transactions. The key challenge is harnessing this trend for a better lifestyle, for commercial sectors to conduct business smarter and for government and public agencies to operate more effectively.

During the year, ERL completed a project on scalable and interoperable cloud management technologies. ERL also embarked on a two-year project on the Big Data and Analytics Platform with a prominent industry partner. The platform aims at making big data technology accessible to non-technical users so they can easily turn raw data into actionable insights. This project hopes to raise big data awareness as well as the relevant ICT skill of the local community, going in line with key trends highlighted in the Government's 2014 Digital 21 Strategy.

In December 2013, ASTRI and HP Hong Kong established the ASTRI-HP Information Technology Research Centre to collaborate on R&D activities in the area of big data analytics and cloud computing. ERL serves as the collaboration representative from ASTRI.

概況

信息研究室致力對新興的資訊和通訊技術領域進行探索性研究。隨著物聯網、雲計算和社交媒體的廣泛應用，在我們日常生活和交易等各方面都產生了大量的數據。信息研究室面臨的主要挑戰是如何利用這些數據，從中分析出有用的資料來提高我們的生活質素，讓企業能夠更明智地開展業務，以及讓政府及公共機構更有效地運作。

本年度內，信息研究室成功完成了可擴展和可互操作的雲計算管理項目，並且和一家業界著名的公司合作展開為期兩年的大數據分析平台的應用和開發。該項目的目的是幫助非技術用戶能夠輕鬆地使用大數據分析技術，將原始數據轉化為有用的資訊。通過該項目，信息研究室希望提高香港資訊科技界對大數據的認識及增強相關技術能力。這與香港特區政府在二零一四年數碼21資訊科技策略中強調的關鍵發展趨勢完全吻合。

二零一三年十二月，應科院與HP香港合作，成立「應科院 • HP資訊科技研究中心」。信息研究室作為應科院的代表和HP香港一起進行大數據分析和雲計算領域的技術研發。

Agreement Signed
簽訂合約

1

Income Received from Industry*
從業界所得收入*

3.50

million HK$ 百萬港元

* Including cash and in-kind contribution 包括現金及物資資助

Innovations

Big Data and Analytics Platform

The proposed Big Data and Analytics (BDA) platform is designed to enable non-technical users to improve their business decisions and operations by harnessing the value of big data. They can easily transfer business intelligence data to the platform and set up data analytics workflow for their specific business domain via a user-friendly interface. While this platform makes use of an open source big data technology called Apache Hadoop, ERL aims to use its ICT programming and UI/UX (user interaction/user experience) design skill to encapsulate the complicated Hadoop configuration, management and programming into a cost-effective and accessible big data turnkey solution for all.

A data analytics system can extract hidden patterns from a huge quantity of data, leading to better data-driven decision making
數據分析系統可從大量數據中找出有用資料， 用作數據導向決策的參考

Scalable and Secure Cloud Management Platform

In this project, ERL designed and implemented a filter enabled, event-driven and incremental reporting system that enables cluster monitoring with minimum network traffic. It enables our Cloud Management Platform to scale up without generating more monitoring traffic linearly. ERL also created several key features such as OS independent VM image encryption and user defined shared virtual networks. The former helps users protect their data and the latter permits sharing of private communication between designated virtual machines.

技術突破

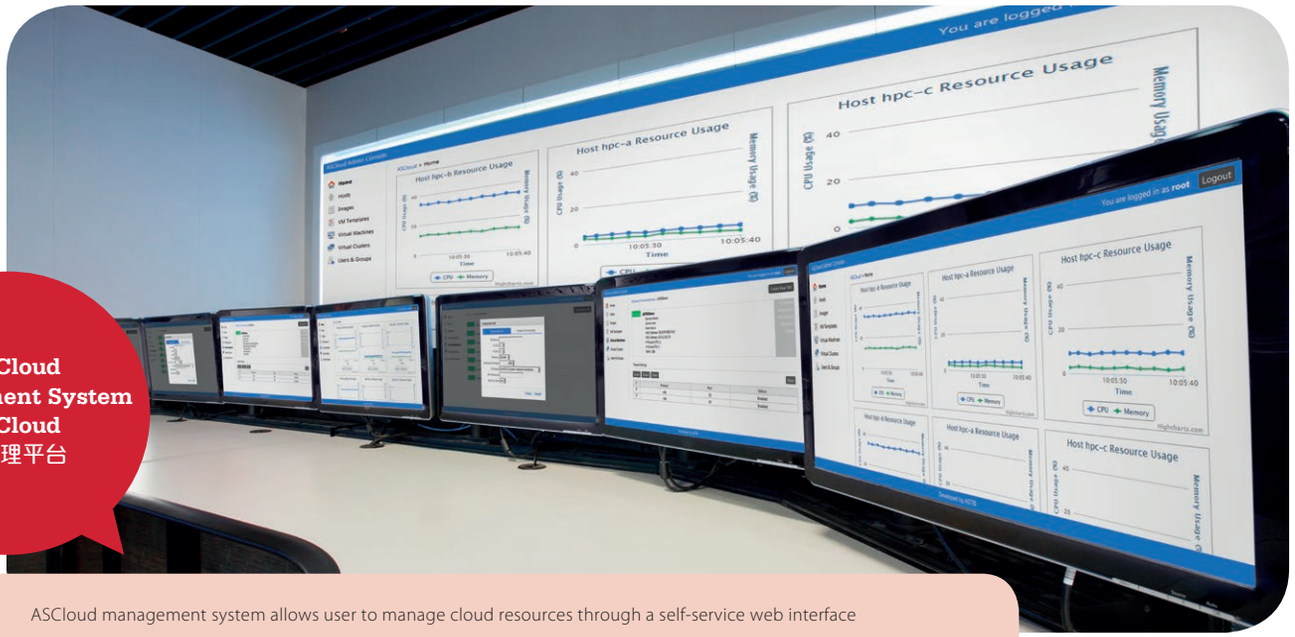
大數據分析平台

大數據分析平台的目標是讓非技術人員也可以利用大數據的優勢來幫助商業決策和改善企業運作。他們可以很容易的通過友好的用戶介面，將相關商業數據轉移到該平台上，並建立與他們有關的領域的分析流程。這套平台是基於Apache Hadoop開源系統，並加入信息研究室的人機用戶交互和軟件設計技術，來打造成一個易於管理、配置和開發的，並可以被應用在大多數應用場景的解決方案。

Return of investment in advertising is improved by analyzing historical data
通過分析歷史數據，可提高廣告的投資回報率

可擴展和安全的雲計算管理平台

信息研究室設計並開發出一套減少在集群監控時所產生消息數據量的系統，該系統是基於消息過濾、事件驅動和遞增報告機制的。它又使得信息研究室的雲計算平台在擴張節點數量的時候不會增加線性的監控所產生的網絡數據量。信息研究室也開發出一套具備跨操作系統加密用戶虛擬磁盤數據的系統和可讓用戶定義的可共享私有虛擬網絡。前者可讓用戶數據在虛擬機停用期間不被盜竊，後者可以讓用戶更安全地在虛擬機之間傳輸和共享信息。



ASCloud management system allows user to manage cloud resources through a self-service web interface

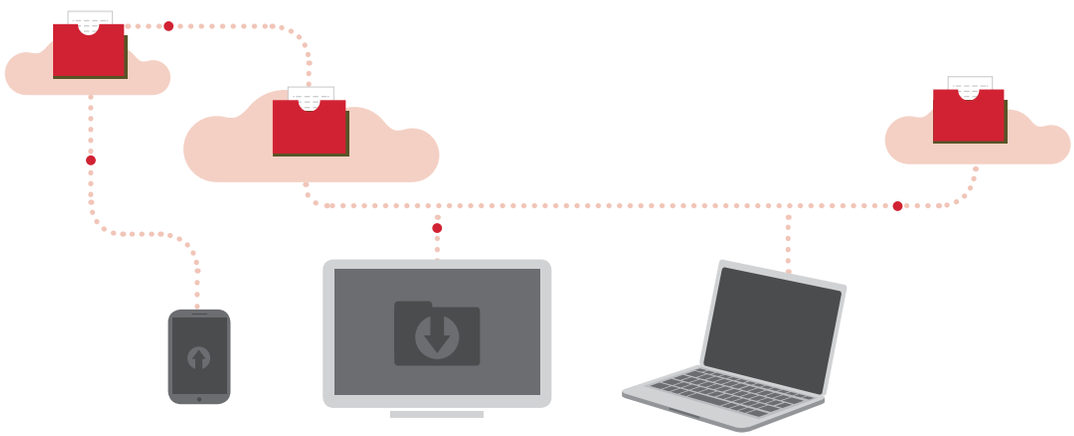
ASCloud雲管理平台讓用戶可以通過一個自助的網絡介面管理雲資源

Cloud Federation Technology

ERL implemented a prototype of cloud interoperability per the IEEE P2302 draft standard. It enables cloud service operators to share resources between different regions, and provides larger service coverage with better service availability.

雲計算聯盟技術

信息研究室通過對IEEE的雲互通草案P2302的研究，開發出一套原型系統，實現了基本的雲服務提供商資源共享功能。這項技術可以讓雲服務提供商跨地區的共享資源，以達到擴大服務覆蓋範圍和高可用性的需求。



Inter-cloud is a new mode of collaboration between clouds

互聯雲是雲際合作的新模式

Future Development

As part of ERL's continued effort to promote adoption of cloud computing and data-driven decision making, two exploratory projects will be carried out. In one project, cyber security technologies will be developed to strengthen virtualization security of the cloud infrastructure and build a cyber threat intelligence system. On one hand, the technologies enable early detection of intrusion and covert channels in the cloud infrastructure, hopefully lessening the concern of data confidentiality which hinders the wide adoption of the public cloud. On the other hand, the technologies can gather data of cyber attacks for analytics, which facilitate formulation of dynamic defence against malware, botnets and advanced persistent threats.

The other project, as a cross-domain effort, will develop a cloud-based personal health record system for chronic disease management, which is in line with the Government's eHR initiative. The system specifically addresses issues of patient privacy concern and ease of use. A security and authorization framework enabling a patient to have full control over the use and distribution of his/her record will be developed. Besides, healthcare analytics will be developed to suggest actionable items from the collected data.

未來發展

提倡雲計算的廣泛應用和基於數據作出決策是信息研究室的持續發展方向。在這方面，信息研究室將開展兩個試點項目。其中一個項目將研發網絡安全技術，以加強雲計算基礎架構的虛擬化安全，並建立一個網絡威脅情報收集系統。一方面，該技術能夠及早發現入侵和雲基礎設施的隱蔽通道，希望藉此可以減輕公共雲數據保密性的疑慮。另一方面，該技術主動收集網絡攻擊數據，以進行分析，這有利於防止惡意軟件、殭屍網絡和高級持續性威脅動態防禦的制定。

另一個項目是一個跨部門的項目，將開發一個雲端個人電子健康記錄系統，方便慢性疾病管理。作為對政府電子健康記錄互通計劃的響應，該項目特別考慮了病人隱私和系統易用性等問題。該項目將研發信息安全和授權框架技術，讓病人可以完全控制個人記錄的使用和共享。此外，該項目將研發醫療分析技術，從收集所得數據提供有用的建議。

Project Highlights 研發項目

Project Type 類別

- Seed 種子項目
- ICP 業界合作項目

	Project 項目	Duration 時期
1	Scalable and Interoperable Cloud Management Technologies 可擴展和可交互的雲管理技術	Nov 2012 – July 2013 二零一二年十一月至 二零一三年七月
2	Bamboo: A Big Data Analytics Platform Bamboo：大數據分析解決平台	Nov 2013 – Nov 2015 二零一三年十一月至 二零一五年十一月

Contact Us 聯絡我們

Please contact the following business representatives from ASTRI's R&D Groups and Teams for information about our technologies and collaboration opportunities.

如欲更深入了解應科院的科技項目及探討合作機會，歡迎與本院各研發群組及小組的業務代表聯絡。

Communications Technologies Group • 通訊技術群組

Mr. Angus Sam • 岑冠文先生

(852) 3406 2469 | augussam@astri.org

Enterprise & Consumer Electronics Group • 企業與消費電子群組

Dr. Tang I-sheng • 湯逸生博士

(852) 3406 2793 | istang@astri.org

IC Design Group • 集成電路設計群組

Dr. Wang Keh-chung • 王克中博士

(852) 3406 2517 | kcwang@astri.org

Applied SoC Design • 應用系統晶片設計

Mr. Li Yiu-kei • 李耀基先生

(852) 3406 2425 | ykli@astri.org

Portable Analog and Mixed Signal Design • 便攜式類比及混合訊號設計

Mr. David Kwong • 鄺國權先生

(852) 3406 2984 | davidkwong@astri.org

Material & Packaging Technologies Group • 材料與構裝技術群組

Mr. Ryan Chung • 鍾沛璟先生

(852) 3406 2868 | si@astri.org

Bio-Medical Electronics Team • 生物醫學電子組

Dr. Wu Xiaohua • 吳曉華博士

(852) 3406 0376 | xhwu@astri.org

Exploratory Research Laboratory • 信息研究室

Dr. Duncan Wong • 王石博士

(852) 3406 0319 | duncanwong@astri.org

www.astri.org

ASTRI.hk

hkastri

Head Office • 總部

Hong Kong Applied Science and Technology Research Institute Company Limited

香港應用科技研究院有限公司

3/F., Bio-informatics Centre, 2 Science Park West Avenue, Hong Kong Science Park Shatin, Hong Kong

香港沙田香港科學園科技大道西2號
生物資訊中心3樓

Tel 電話：(852) 3406 2800
Fax 傳真：(852) 3406 2801
Email 電郵： corporate@astri.org

ASTRI Science and Technology Research (Shenzhen) Company Limited

應科院科技研究(深圳)有限公司

Room 220, 2/F, Chinese Overseas Scholars Venture Building, South District, Shenzhen Hi-tech Industrial Park, Nanshan, Shenzhen Guangdong, PRC 518057

中國廣東省深圳市南山區高新區南區
南環路29號留學生創業大樓2樓220室
（郵編518057）

Tel 電話：(86 755) 8632 9394
Fax 傳真：(86 755) 8632 9394
Email 電郵：corporate@astri.org

This annual report is published by the authority of the Board of Directors of ASTRI
此年報由應科院董事局授權印製

Editor 編輯

David Poon 潘占達
Vice President, Corporate Communications and Company Secretary
副總裁(傳訊)及公司秘書

Deputy Editor 副編輯

Jessie Leung 梁思敏
Corporate Communications Department 傳訊部

Assistant Editors 助理編輯

Arthur Chan 陳敬泉
Dennis Yip 葉宇峰
Karen Lee 李嘉穎
Duston Sin 冼毅銘
Corporate Communications Department 傳訊部

Design and Production Director 設計及製作總監

Joanna Lai 黎詠雯
Corporate Communications Department 傳訊部

Design and Production 設計及製作

GenNex Financial Media Limited
智盛財經媒體有限公司

Photo-taking Location Sponsors 拍攝場地贊助

Tom Bar+Grill
YaYoi Japanese Dining Room 花見月

The project team would like to thank the various ASTRI departments and valued partners for their contributions and support.
謹此特別鳴謝應科院各部門及合作夥伴為製作這份年報所提供的協助和支持。


www.astri.org