

EPC

Creating An Internet of Things
創造物聯網



Right

Value 最確切的價值

Partner 最佳的夥伴

Now 就在此刻

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1. A Background to EPC

產品電子代碼背景資料

The advent of Electronic Product Code™ (EPC), which combines Radio Frequency Identification (RFID) with the internet backbone, is predicted by many as the next big hit that will revolutionize the modern supply chain.

業界普遍預期結合無線射頻識別 (RFID) 技術、互聯網主幹線的產品電子代碼會成為革新現代供應鏈「炙手可熱」的技術。



Major Stakeholders are Joining The Team

The number of companies preparing to leverage the promising technologies and standard is inflating. Among them are the biggest retailers of the world such as Wal-Mart, Tesco and Metro, as well as the US Department of Defense who have announced concrete plans to adopt EPC as the standard to integrate RFID into their supply chain.

What actually does EPC do to revitalize a 50-year technology in RFID?

Business Driver Behind EPC

RFID operation starts with a tag consisting of an integrated circuit attached to an antenna. Data on the tag can thus be read and sent over in radio waves by a reader, and decoded by a processor on the receiving end. It has been in use as early as the second World War for detection of friendly aircrafts in the air.

RFID tags can be read through packaging, shipping containers, and most materials without direct physical contact, and therefore do not need to be placed on the outside of the unit item. In addition, multiple RFID tags can be read simultaneously. The combination of the mobility offered by wireless interface and the bulk-reading capability represents strong potential in improving productivity and efficiencies of the supply chain by a large extent. Real-time visibility of inventories enabled by RFID also contribute to combat shop thefts, and speed up costly product recalls.

To apply the technology on our supply chain where different parties interact, however, a common global standard is a must. EPC has been proposed by EPCglobal Inc and is being accepted by the industries as such standard. It is a unique number that represents a unique item. By reading the number and referring to the corresponding database over the EPCglobal Network, details of the item can be retrieved and updated on-line immediately and accessed practically anywhere in the world with internet connection.

主要貿易夥伴陸續加入團隊

準備建立具潛力的技術和標準的公司數量正迅速增加，它們包括全球最大零售商—沃爾瑪 (Wal-Mart)、Tesco、麥德龍 (Metro) 以及美國國防部；其中美國國防部已提出具體計劃，逐步採納產品電子代碼 (EPC) 為標準，將無線射頻識別 (RFID) 技術併入其供應鏈。

產品電子代碼如何令具有50年歷史的無線射頻識別 (RFID) 技術復興起來呢？

產品電子代碼技術背後的商業動力

無線射頻識別的操作是由一個連接天線的集成電路的標籤開始。標籤上的數據能被閱讀器閱讀出來，並且經過電波傳送，再由接收端的處理器解讀。早於二次大戰時期，無線射頻識別已被應用於偵測空中的盟友飛機。

無線射頻識別標籤毋須經直接接觸，便可以通過包裝、付運的貨櫃和大部分物料被閱讀出來，故無需將標籤放置在物件外層。此外，多個無線射頻識別標籤能同時被閱讀，而其結合了無線介面的流動性和龐大的閱讀能力，表示已具備了提升供應鏈生產力和效益的潛能，無線射頻識別賦予的庫存實時透明度，既可打擊店鋪盜竊，更可加快昂貴的產品回收過程。

應用這技術於牽涉各方的供應鏈時，必須有一個全球公認的標準。產品電子代碼由EPCglobal提出，業界亦已接受了它作為標準。產品電子代碼是一個獨一無二的編碼，用以代表獨一無二的物件，透過閱讀編碼及參考其在EPCglobal網絡上相應的數據庫，各物件的詳細資料便能被檢索出來，在網上即時更新，並透過互聯網於世界任何一個角落被存取。

“ Do you know? 你知道嗎？ ”

- RFID is still used in civil & military aviation.
無線射頻識別現仍用於民事和軍事航空交通上。
- RFID was first used to identify friendly aircraft.
無線射頻識別最初用以識別盟友航機。



2. Components of EPC Technology

產品電子代碼技術各元件



2.1 Electronic Product Code™

The Electronic Product Code (EPC) is a unique number that is used to identify a specific item in the supply chain. The EPC is stored on a radio frequency identification (RFID) tag, which combines a silicon chip and an antenna. Once the EPC is retrieved from the tag, it can be associated with dynamic data held in a secured database such as where an item originated or the date of its production. Much like a Global Trade Item Number (GTIN) or Vehicle Identification Number (VIN), the EPC is the key that unlocks the power of the information systems that are part of the EPCglobal Network™.

產品電子代碼

產品電子代碼是一組用來識別於供應鏈上某一物件的獨一無二編碼。每組產品電子代碼均植於一枚結合矽晶片和天線的無線射頻識別標籤內。當產品電子代碼由標籤中被擷取出來時，它可以結合存於安全數據庫內的動態數據，例如物件的來源地或其生產日期。如國際貿易貨品編碼 (GTIN) 或車輛識別編碼 (VIN) 一樣，產品電子代碼是開啟EPCglobal網絡內各信息系統力量之鎖鑰。

The EPC Manager Number (96 bits) 產品電子代碼 (96位元)

35.0203D2A.916E8B.0719BAE03C			
8 bits(位元) Header 前置編號	28 bits(位元) EPC Manager Number EPC 管理單位代碼 (CompanyPrefix)	24 bits(位元) Object Class (Product Type) 物品類別 (物品種類)	36 bits(位元) Unique Serial Number 獨一無二的序號

An EPC number is made up of a header and three sets of data.

The header identifies an EPC's format, which facilitates different volumes of EPC data to follow - this allows for different lengths or types.

The second part of the number identifies the EPC manager – most likely the manufacturer of the product the EPC is attached to – for example “The Coca-Cola Company”.

The third, which is termed as “object class”, refers to the exact type of product, most often the Stock Keeping Unit (SKU) – for example “Diet Coke 330 ml can”.

The fourth is the serial number, unique to the item; this specifically informs which 330 ml can of Diet Coke is being referred to, which makes it possible, for example, to quickly find products that might be nearing their expiration date.

產品電子代碼由一組前置編號和三組數據結合而成。

前置編號識別產品電子代碼的格式，讓不同容量的產品電子代碼數據緊隨其後 - 它容許不同長度和類別的數據；

代碼的第二部分識別管理單位，一般指貼有產品電子代碼產品的生產商，例如「可口可樂公司」；

第三部分，稱為物品類別，參考產品的正確類別，大部分情況下是指庫存單位，例如「健怡可樂330毫升罐裝」；

第四部分是單元編號，每個項目的單元編號均是獨一無二，這便可以正確無誤地提示我們，究竟談及的是那一罐330毫升的健怡可樂，單元編號令例如盡快找出已屆到期的產品變得輕而易舉。

2.2 Radio Frequency Identification (RFID) Tag

An RFID tag is made up of a microchip attached to an antenna. There are different kinds of tags for different applications. Active tags have a battery, which is used to run the microchip's circuitry and to broadcast a signal to a reader (the way a cell phone transmits signals to a base station). Passive tags have no battery. Instead, they draw power from the reader, which sends out electromagnetic waves that induce a current in the tag's antenna. In general, active tags have a longer reading distance than passive tags.

無線射頻識別標籤

一個無線射頻識別標籤是由內藏天線和矽晶片組成，不同的無線射頻識別標籤可配合各種應用需要。主動式標籤內含電池，用以驅動微晶片的電路系統，從而向閱讀器發放信號(方法就像手提電話傳送信號到發射台)；被動式標籤則沒有電池，相反，它從閱讀器獲取電源，令標籤天線產生電流，藉此傳送電磁波。一般而言，主動式標籤比被動式標籤具有更長的閱讀距離。



2.3 Readers

RFID readers use a variety of methods to communicate with tags. The most common method for reading passive tags at close range is called inductive coupling. The coiled antenna of the reader creates a magnetic field with the coiled antenna of the tag. The tag draws energy from this field and uses it to send back waves to the reader, which are turned into digital information - the tag's Electronic Product Code.

The reading range of readers depends on its power and frequency range. In general, readers with higher frequency have longer reading distance but the power required is also higher.

閱讀器

無線射頻識別閱讀器以多種方法來與標籤溝通。最普遍的方法是近距離閱讀被動式標籤，稱為「電感耦合」。閱讀器的環形天線產生磁場，標籤的環形天線則由磁場獲取能量，利用它來向閱讀器回送電波，電波遂轉化成數碼訊息——標籤的產品電子代碼。

閱讀器的閱讀距離由其電源和頻率範圍決定。普遍情況下，較高頻率的閱讀器具有較遠的閱讀距離，但同時需要的電源也較高。



“ Do you know? 你知道嗎？ ”

- EPCglobal Generation 2 compliant tags can be read from as far away as 10 metres.
EPCglobal 第二代電子標籤讀取距離遠至10公里。
- Tag data can be rewritten or modified.
電子標籤內含訊息能重寫或修改。
- EPCglobal Generation 2 Air Protocol uses a series of 'flag' to manage which tag talks to which reader.
EPCglobal 第二代空中協定使用一系列「旗幟」來管理不同電子標籤，讓它們與相關閱讀器直接「對話」。
- A reader can scan hundreds of tags per seconds and can scan the same tag many times in doing so.
閱讀器每秒可掃描數百個電子標籤，並能掃描多次相同標籤。

2.4 EPC Middleware

In a world where every object has an RFID tag, readers will be picking up a continual stream of EPCs. Managing and moving all this data is a difficult problem and one that must be overcome for any global RFID network to be of value. Software technology called EPC Middleware has been designed to act as the nervous system of the network.

EPC Middleware is different from most enterprise software in that it is not one overarching application. Instead, it uses a distributed architecture and is organized in a hierarchy that manages the flow of data. EPC Middlewares at each level will gather, store and act on information and interact with other EPC Middlewares.

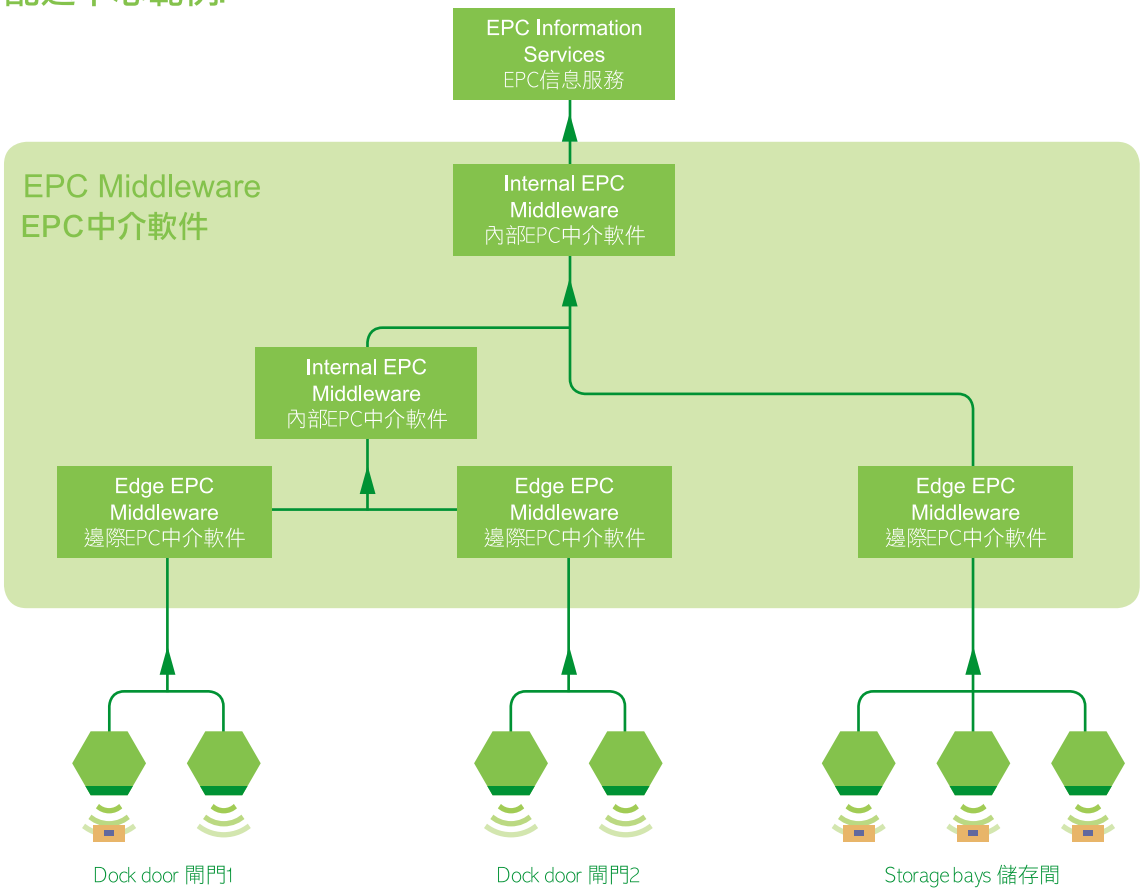
EPC中介軟件

若世界上每件物件均貼上無線射頻識別標籤，閱讀器便要不斷接收一束延綿不絕的產品電子代碼。然而管理和移動所有這些訊息便非常困難，要成為具有價值的全球無線射頻識別網絡，就必須克服這問題。為此，便設計了EPC中介軟件，並在網絡裏擔當神經系統的角色。

EPC中介軟件與大部分企業軟件的分別在於它並非支配一切的應用程式，相反，它利用分散式結構，並以等級和組織來管理數據的流向。各層的EPC中介軟件會收集、儲存和執行訊息，並與其他EPC中介軟件互相聯繫。

Distribution centre example:

配送中心範例:



“ Do you know? 你知道嗎？ ”

- EPC tells you where something is, when it got there and even detect how long it stayed there.
產品電子代碼能告訴你物件在那裏，何時到達那裏，甚至偵測到它逗留那多久。
- EPC enables you to have accurate detailed and timely data.
產品電子代碼令你掌握準確、詳細和即時的數據。
- EPC tells you how long everything took in a particular process, gives you average performance.
產品電子代碼能告訴你某個程序需多久才完成，並提供平均表現。

2.5 Object Name Service (ONS)

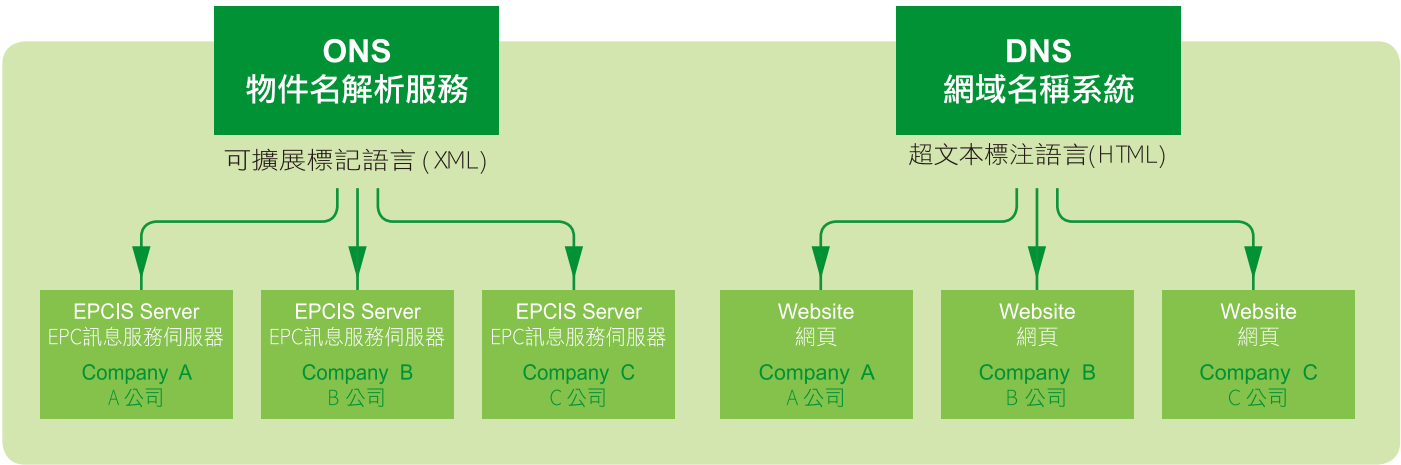
The EPC vision of an open, global network for tracking goods requires some special network architecture. Since only the EPC is stored on the tag, computers need some way of matching the EPC to information about the associated item. That is the role of the Object Name Service (ONS), an automated networking service similar to the Domain Name System (DNS) that points domain names to websites on the internet.

When a system with RFID reader reads an RFID tag, the EPC is passed on to an ONS in a local network or the Internet to find where information of the product is stored. ONS points the system to a EPCIS server (see below) where information about that product is stored. The information about the product can then be retrieved by the system, and be forwarded to a company's inventory or supply chain applications.

物件名解析服務(ONS)

產品電子代碼需要一些特別網絡結構，才可以開創全天候、全球性貨品追蹤的新景象。由於標籤內只儲存產品電子代碼，電腦需要找方法來將產品電子代碼與相關物件的訊息連結起來，這就是物件名解析服務(ONS)的主要任務。物件名解析服務(ONS)是一套自動網絡服務，原理類似網域名稱系統(DNS)，將網域名稱定位到互聯網上的網站。

當一個配置了無線射頻識別閱讀器的系統閱讀到一個無線射頻識別標籤時，產品電子代碼便會被傳送到區域性網絡或互聯網的物件名解析服務(ONS)來尋找產品訊息，而物件名解析服務(ONS)亦會將系統定位到儲存了產品訊息的EPC訊息服務伺服器(如下圖)，這樣，產品訊息便能給系統擷取，並發送給公司庫存或供應鏈等應用程式。



2.6 EPC Information Services (EPCIS)

EPCIS is a component of the EPCglobal Network, which enables users to exchange EPC-related data with trading partners through the Network. It gathers EPC-related data from the EPC Middleware and integrates with enterprise applications. It also provides standard interface for EPC-related data exchanges within the enterprise and with its trading partners. The exchange of EPC data allows EPCglobal Network participants to gain a shared view of the status of the physical goods in a relevant business context. With different parties in the supply chain sharing EPC information, end-to-end supply chain visibility could be realized.

EPC訊息服務(EPCIS)

EPC訊息服務是EPCglobal網絡其中一個元件，它讓用戶能透過網絡與貿易夥伴交換有關產品電子代碼的數據。EPC訊息服務從EPC中介軟件收集有關產品電子代碼的數據，與企業應用程式結合使用。此外，它亦提供標準介面讓企業內部或與其貿易夥伴交換有關產品電子代碼資料。產品電子代碼的數據交換，令EPCglobal網絡的參與者能獲得並分享產品在具體商業環境下的狀態。供應鏈內各方得以交換產品電子代碼的訊息，實現點對點供應鏈透明化。



The EPCglobal Network™

EPCglobal網絡



3.1 Facts about the EPCglobal Network™

What is the EPCglobal Network?

The EPCglobal Network is a set of technologies that enable immediate, automatic identification of items in the supply chain; the network allows trading partners to exchange such information about the goods they ship amongst themselves. In this way, the EPCglobal Network makes organizations more effective by uncovering inefficiencies and reducing eternal issues such as counterfeiting, internal theft, and other drains on productivity and profitability.

What are the components of the EPCglobal Network?

The EPCglobal Network consists of several components that are designed to work together to give maximum visibility to a supply chain. The components are made up of Electronic Product Code (EPC), tags, readers, and software that helps all of the pieces communicate in a common “language”.

The EPC sits on a tag which is physically attached to an item, a case or a pallet of items. The tag “communicates” its unique number to a reader through radio frequency. The reader then passes the number to a computer that accesses the Object Name Service (ONS). The ONS directs the computer systems where to locate information on the secure network about the object carrying an EPC, which includes, for example, when the item was produced and where.

EPC Information Services (EPCIS) provide a common set of data elements, a common language for communication, and a set of defined messages for trading partners to use when storing, accessing and communicating data on objects moving in the supply chain. The key to these information services is the EPC held in the RFID tag on each object.

How does the EPCglobal Network deliver value?

The technology helps businesses reduce on costs that are commonly encountered with internal operations, such as internal theft, out of stocks, counterfeiting, and various other similar plagues. This in turn drives down the cost of doing business, which helps business succeed while applying downward pressure on consumer prices.

EPCglobal網絡真面目

甚麼是EPCglobal網絡？

EPCglobal網絡是一套能在供應鏈上即時自動識別各物件的技術，同時，網絡容許貿易夥伴間就其付運貨品交換訊息；這樣，EPCglobal網絡能揭露程序上的漏洞，有助提升企業組織的效率，並且減少冒牌貨、內部失竊和生產力下降、盈利流失等持續難題。

EPCglobal網絡包含甚麼元件？

EPCglobal網絡由多個元件組成，它們合作無間，務求令供應鏈達至最高透明度。這些元件由產品電子代碼、電子標籤、閱讀器和軟件組合而成，務求令各部份能使用共同「語言」溝通。

產品電子代碼藏於電子標籤內，並可貼在物件、裝箱或卡板上。它利用無線射頻，以其獨一無二的編碼與閱讀器溝通。閱讀器將編碼傳送到電腦，並登入物件名解析服務(ONS)，物件名解析服務便會導引電腦系統由安全可靠的網絡上哪處取得帶有產品電子代碼的物件資訊，包括例如物件在何時何地生產的資料。

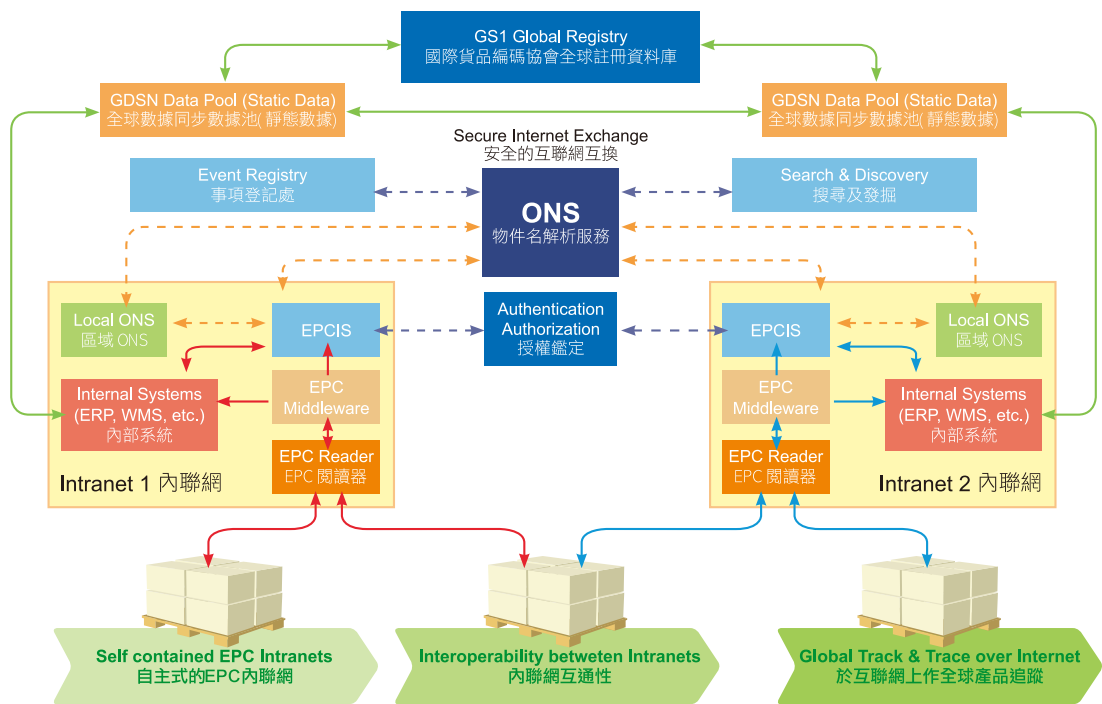
EPC訊息服務提供一套共同的數據元，一種共同的溝通語言，以及一套已定義的信息，供貿易夥伴於供應鏈上對某一物件進行貯存、擷取和溝通數據時使用；而通往這些訊息服務的關鍵，就是貼在各物件上無線射頻識別標籤裏的產品電子代碼。

EPCglobal網絡如何助您增值？

這技術幫助商業機構解決內部營運普遍遇到的問題，從而達致降低成本，例如內部失竊、缺貨、冒牌貨及其他類似的煩惱。這樣，即使消費價格出現下降壓力，機構也可以藉減低經營成本來取得成功。

The EPCglobal Network Architecture & Components

EPCglobal網絡架構及組成元件

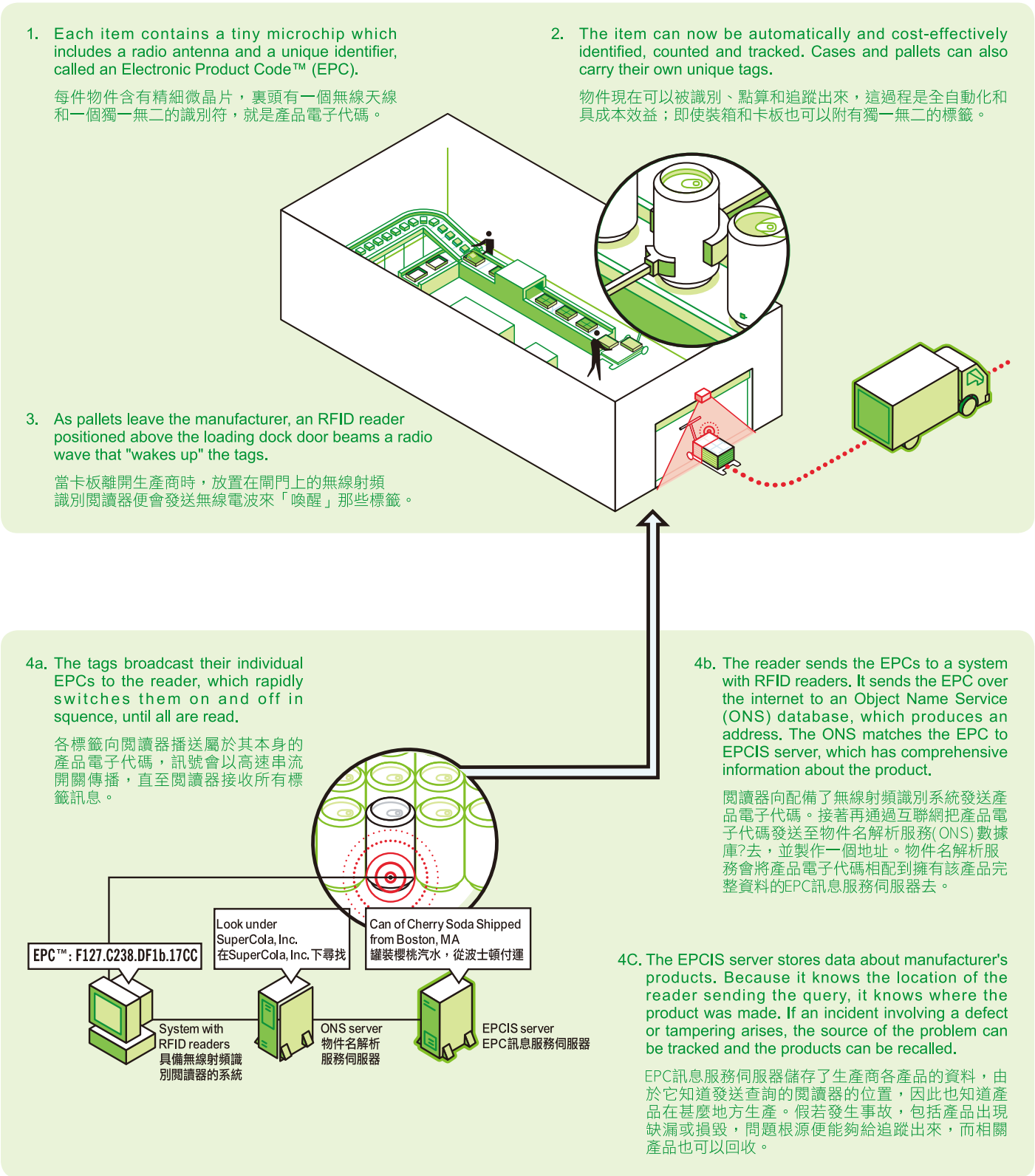


3.2 How the EPCglobal Network Works?

EPCglobal網絡如何運作？

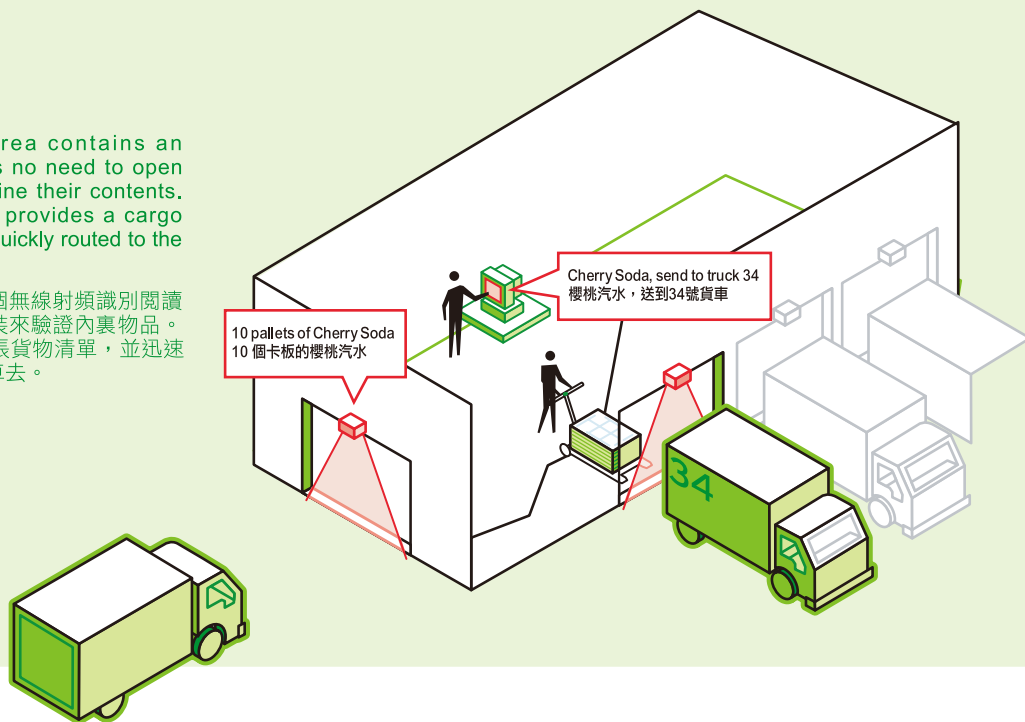
With the new EPCglobal Network™, computers will be able to "see" physical objects, allowing manufacturers to track and trace items automatically throughout the supply chain. This technology will revolutionize the way we manufacture, distribute, sell and buy products. Here's how it works:

透過最新的EPCglobal網絡，電腦能夠「看見」物件的「行蹤」，生產商自然可以在整個供應鏈內自動追蹤和追溯物件。這技術全面革新我們生產、配送和買賣產品。以下就是它的運作模式：



5. If the unloading area contains an RFID reader, there's no need to open packages and examine their contents. EPCglobal Network provides a cargo list, and the pallet is quickly routed to the appropriate truck.

如果卸貨區裝置了一個無線射頻識別閱讀器，便可毋須開啟包裝來驗證內裏物品。EPCglobal網絡提供一張貨物清單，並迅速發送卡板到恰當的貨車去。

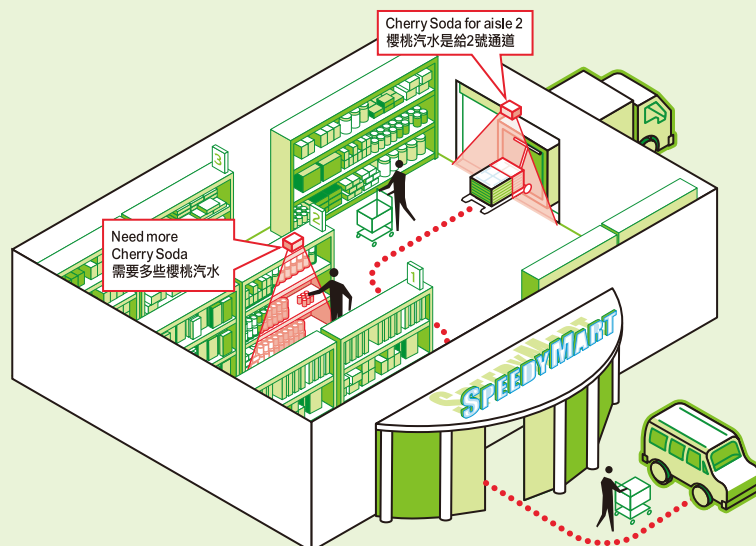


6. SpeedyMart tracks the shipment through its own EPCglobal Network connection. As soon as it arrives, retail systems are updated to include every item. In this way, stores can locate their entire inventory automatically, accurately and at low cost.

SpeedyMart透過EPCglobal網絡的連繫來追蹤運送過程。貨品一到達，零售系統便會更新，納入每件物件。這樣，商舖便能夠以最低的成本、自動、並準確地查找全部庫存。

7. Reader-enabled "smart shelves" can automatically order more products from the back room or the manufacturer. With such a system, the need to maintain costly "safety volumes" in remote warehouses is eliminated.

配備了閱讀器的聰明貨架能自動向後倉或生產商補充或訂購更多產品。有了這個系統，便不再需要在倉庫裏保持高成本的「安全數量」產品。



4. Potential Applications of EPC 產品電子代碼的應用潛能



4.1 Logistics Track-and-Trace

The growing consumer-driven demand has put the modern supply chain under immense pressure to shorten turnaround time for product-to-market. Riding on a common global standard and the internet as communications channel, EPC is capable of taking supply chain efficiency to the next level.

By leveraging adoption of EPC on the supply chain, manufacturers, logistics service providers and retailers, disregarding their geographic locations, could all take advantage of the web-based EPC Information Services network to get a better picture of where logistics units are on a real-time basis.

4.2 Production Control

In an increasingly globalised supply chain, it has become critical for manufacturers to shorten their production cycle time in order to response more quickly to market demand. By adopting EPC internally, manufacturers could gain the valuable edge on enhanced visibility over their whole production line.

The production process becomes a lot more visible with the flow of raw materials and components tracked automatically by RFID tags and the information shared either within the internal EPCglobal Network or internet-based EPCglobal Network.

4.3 Warehouse Management

In a warehouse environment, different sorts of goods come in and out frequently. The adoption of EPC could provide organizations with an accurate account of the inventory on-hand on a real-time basis. While internal resources could be planned more efficiently, enhanced visibility enables better monitoring of internal resources. Consequently, problems associated with shrinkage and theft could be diminished as well.

物流追蹤與追溯

顧客主導需求的情況日益增長，令現代供應鏈在縮短貨品到市場的轉迴時間上面對沉重壓力。憑藉一個全球共同標準和利用互聯網為溝通頻道，產品電子代碼甚具實力將供應鏈的效能提升到新階段。

將產品電子代碼應用於供應鏈上，莫管地理位置如何，生產商、物流服務供應商和零售商等，也可以透過以互聯網為本的EPC訊息服務網絡，看清楚物流單位在實時下的狀況。

生產監控

在日益蓬勃的全球供應鏈內，對生產商最關鍵的是如何縮短生產周期，藉以回應市場愈加迫切的需求。把產品電子代碼應用於企業內部，生產商便能從提高整個生產線的透明度中獲取相當優勢。

因為原料和元件的流向都能透過無線射頻識別標籤被自動追蹤出來，生產過程變得更透明。同時，訊息可以在內部EPCglobal網絡或互聯網版的EPCglobal網絡上分享使用。

倉庫管理

在倉庫裏，不同種類貨品經常進出，於倉庫使用產品電子代碼能令企業在實時狀況下即場獲得準確的庫存描述。此應用除了幫助企業更有效地規劃內部資源外，亦提高了透明度，容許企業更好地管理資源，最終減少貨品耗損和失竊等問題。

4.4 Asset Management

Asset management is becoming a key issue for organizations that aim at getting better hold of their own resources, especially for those that are spread out geographically. By applying EPC to track individual items automatically, organizations would have better management of their resources. Efficiency of processes such as warranty, replenishment and audit could be improved as a result.

4.5 Anti-counterfeiting

While product counterfeiting is on the rise, it becomes increasingly important for genuine brand-owners to come up with measures to protect their products circulating in the market. With unique serialization of products enabled by EPC, there is an added domain to identify items individually. The internet-based EPC back-end infrastructure, which allows for real-time traceability, is a new potential platform for anti-counterfeiting applications development.

資產管理

資產管理逐漸成為企業的主要課題。資產管理的目的是希望能更好掌握本身資源，這對那些在世界各地也有分支的企業尤其重要。使用產品電子代碼來自動追蹤個別物件，能讓企業更好管理其資源，同時，亦令程序如保養(保證條款)、補貨和查帳等項目的效率最終便能得以改善。

防偽

當冒牌產品日益嚴重，對真正商標的擁有者來說，如何保障他們正在市場流通的產品，便成為迫在眉睫的任務。產品電子代碼提供獨一無二的產品序列，其中新增區域更可以將各物件單獨識別出來。以互聯網為本的產品電子代碼後方基建容許實時追溯，成為發展防偽應用程式的嶄新平台。

EPC's Impact on the Supply Chain 產品電子代碼對供應鏈的影響



“ Do you know? 你知道嗎？ ”

- RFID enabled baggage-handlingsystem at Hong Kong International Airport handles all outgoing baggage. The electronic toll collection service-Autotoll, equips with RFID technology, Octopus, a RFID enabled electronic payment system offers an easy and hassle-free way to travel, dine and buy around busy Hong Kong.
無線射頻識別支援的行李處理系統，幫助香港國際機場處理所有離港行李；此外，電子收費服務——快易通，以及配合了採用無線射頻識別技術的八達通，讓繁忙的香港市民能以方便、輕鬆的方法享用交通、膳食和購物等服務。
- Skies and theme park visitors benefit from less queuing, thanks to RFID.
航空及主題公園的旅客不用大排長龍，也多虧無線射頻識別。
- Sheep, cows and domestic pets are tracked using RFID.
無線射頻識別甚至可追蹤綿羊、牛和寵物。

5. About EPCglobal 關於 EPCglobal

In 1999, a group of retailers and manufactures identified the potential of radio frequency identification (RFID) to complement and perhaps eventually supersede the barcode. The group recognized, however, that the lack of global industry driven standards meant that many RFID applications and solutions were developed as closed and proprietary systems. This limited the widespread adoption of RFID due to the high cost and incompatibility of the systems.

1999年，一群零售商和生產商意識到無線射頻識別可配合電腦條碼，甚至取代它的潛能。他們明白若沒有全球業界合作發展其標準，將令大部分無線射頻識別應用程式和解決方案淪為封閉和私營的系統，這樣便會因成本高昂和系統不協調，防礙無線射頻識別的廣泛應用。



5.1 A Background to EPCglobal

This group chose to fund research, initially by the Massachusetts Institute of Technology (MIT) and subsequently by six other universities – two in Europe (Cambridge and St Gallen), one in Australia (Adelaide) and three in Asia (Fudan, China, Keio, Japan, ICU, Korea) – collectively know as the Auto-ID Labs (formerly known as Auto-ID Centre). The challenge for these universities was to develop globally applicable and economically viable standards for RFID usage in the supply chain.

By 2003, the research carried out by the Auto-ID Lab had resulted in a set of solutions based on a uniquely numbered low-cost tag and a network similar to the internet holding relevant supply chain data. This included detailed specifications for:

1. The EPC™ numbering scheme
2. Proposals for the Network components
3. Passive tags and readers

As a result of the work done by the Auto-ID Lab, EPCglobal Inc. was formed in 2003 as a not-for-profit joint venture between the standard organizations GS1 and GS1 US. These bodies were given the task of building on the work undertaken by the Auto-ID Lab and driving global adoption of EPC technology by establishing open, voluntary standards for the EPCglobal Network™.

The importance of open, non-proprietary standards are key elements to ensuring its successful development across borders worldwide. Additionally, an important aspect of the structure of EPCglobal is the royalty-free nature of the standards development process to ensure low-cost accessibility to the technology, which will leverage the GS1 global user base of over one million member companies to drive adoption of EPC technology through the development of universally supported standards.

Since its inception, EPCglobal has ratified standards for Generation 2 tags and for software interface components. The Generation 2 standard has been designed and developed specifically to take into account global telecommunications' requirements. EPCglobal also works with international bodies, including the International Organization for Standardisation (ISO).

EPCglobal 背景

這群有心人決定資助學術機構進行研究，首先由麻省理工學院開始，接下去六所大學也加入此行列，兩所在歐洲(英國劍橋大學Cambridge、瑞士University of St. Gallen)、一所在澳洲(University of Adelaide)和三所在亞洲(中國復旦大學、日本Keio University、南韓 Information and Communication University)，共同創建Auto-ID實驗室(前稱為Auto-ID中心)。各大學面對的挑戰是如何發展全球適用及經濟可行的標準，讓無線射頻識別可以應用在供應鏈上。

2003年，由Auto-ID實驗室領導的研究提交了一系列解決方案，其中主要由獨一無二、已編碼的廉價標籤和類似互聯網、貯存相關供應鏈數據的網絡組成的解決方案。這詳細規格包括：

1. EPC編碼計劃
2. 網絡元件建議書
3. 被動式電子標籤和閱讀器

Auto-ID實驗室所做的工作成果，促成EPCglobal Inc.正式在2003年成立，它是由GS1標準組織和GS1 US組成的非牟利合營企業，EPCglobal Inc.繼承了Auto-ID實驗室已開展的工作，同時透過建立開放、自發的EPCglobal網絡標準，推動EPC技術在全球使用。

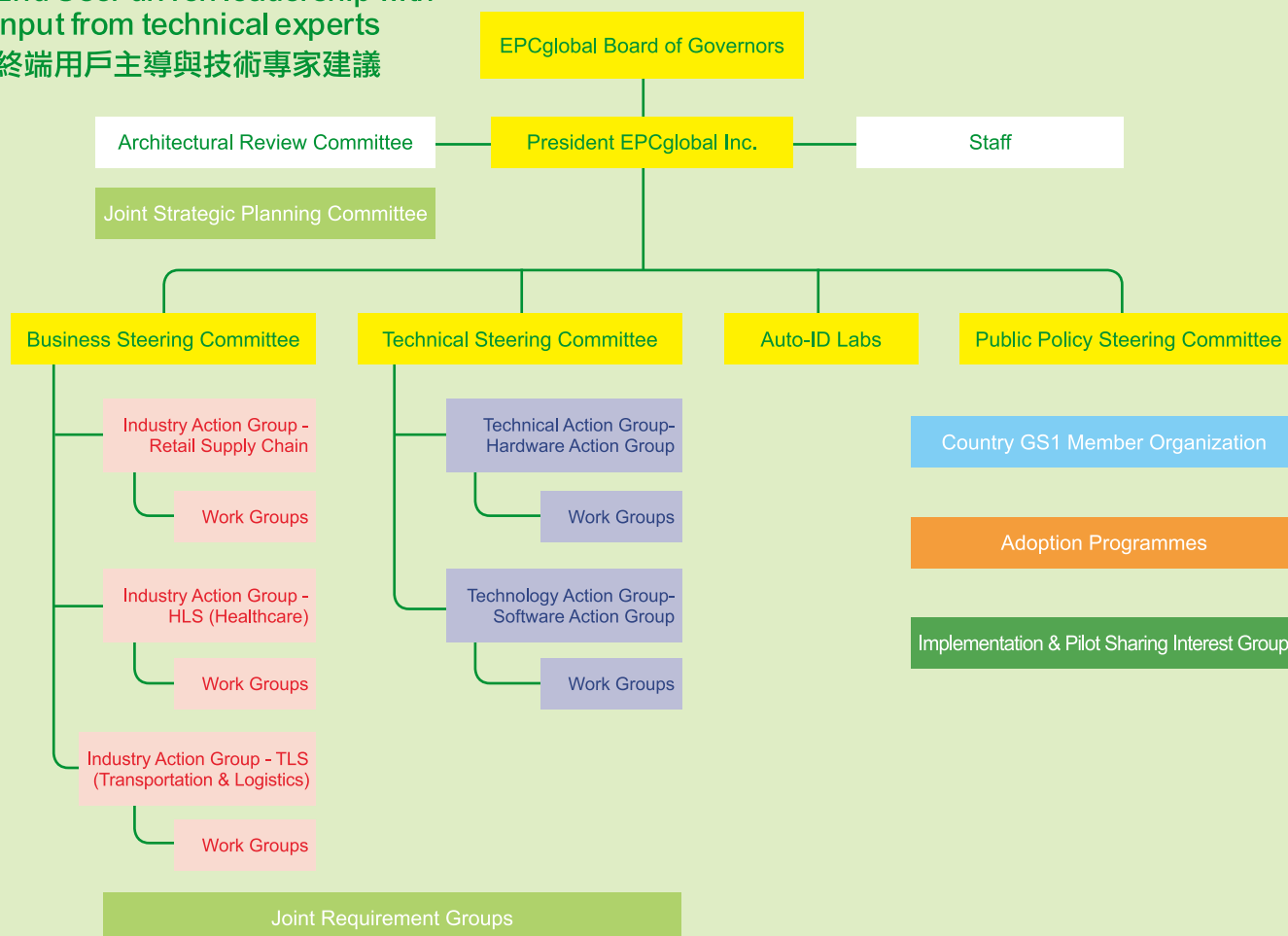
開放、非私有的標準非常重要，它是確保產品電子代碼能不受地域限制，成功發展的關鍵元素。同時，發展EPCglobal標準結構其中一要項是過程必須不含版稅，確保能以低成本應用此技術，開發環球支援的標準，從而鼓勵GS1全球超過100萬的公司會員採納產品電子代碼標準。

開始至今，EPCglobal已確認第二代電子標籤和軟件介面元件的標準。在設計和發展第二代電子標籤標準時，EPCglobal已特別顧及全球電訊規定。EPCglobal也會與國際組織合作，包括國際標準化組織(ISO)。

“ Do you know? 你知道嗎？ ”

- The EPCglobal affiliated AutoID Labs in China are reducing tag power needs. 附屬於EPCglobal的中國自動識別實驗室旨在降低電子標籤的能量需求。
- AutoID Labs in Cambridge, England focus on the use of RFID in manufacturing. 位於英國劍橋的自動識別實驗室集中研究在製造業應用無線射頻識別。
- The team in Zurich have developed the use of RFID in tackling counterfeiting. 蘇黎世的小組研發利用無線射頻識別來識別冒牌貨。

End User driven leadership with input from technical experts 終端用戶主導與技術專家建議



5.2 Organization Structure of EPCglobal Inc.

EPCglobal Board of Governors

Representatives from GS1 US, GS1 Member Organizations, the Auto-ID Labs and end users from the public and private sectors.

EPCglobal President

Responsible to the EPCglobal Board of Governors and CEO of GS1.

EPCglobal Staff

Work collaboratively with multi-industry representatives to facilitate the development and recommendations of technical standards, to manage public policy, marketing and communications and administration.

Architecture Review Committee (ARC)

The ARC is a standing committee that reports to the EPCglobal President. It helps to evaluate and prioritize requirements affecting the overall EPCglobal Reference Architecture, and can be utilised by the EPCglobal Board of Governors as a technical resource.

EPCglobal Inc. 組織結構

EPCglobal董事局

各代表分別來自GS1 US、GS1 會員組織、Auto-ID實驗室和公私營部門的終端用戶。

EPCglobal主席

向EPCglobal董事局和GS1 行政總裁負責。

EPCglobal職員

與不同行業代表緊密合作，協助技術標準的發展和提供建議，處理公共政策、市場推廣、溝通和行政管理。

Architecture Review Committee (ARC)

Architecture Review Committee是向EPCglobal主席匯報的常設委員會，它主要評估及優先處理會影響整個EPCglobal相關結構的要求，此委員會亦為EPCglobal董事局用作為產品電子代碼技術資源。

Industry Action Groups (IAG)

The Industry Action Groups determines high level industry business process opportunities where RFID can be leveraged as a solution and ensures they are represented on the appropriate Joint Requirement Action Groups to aid in defining more specific business or user requirements that feed functional requirements (specification) development of a Technical Action Group.

Joint Requirement Action Groups (JRG)

JOINT means cross industry or cross action. The Joint Requirement Action Groups consolidate industry requirements developed by IAGs and co-develop more unified and refined business and user requirements that feed the functional requirement development described in a specification by a Technical Action Group.

The JRGs are also responsible for the development of specific use cases will result in a very specific set of requirements that a specification will need to be considered.

Cross Industry Adoption and Implementation Groups

These groups aimed to drive industry as well as regional adoption and implementation. Regional issues and concerns in EPC / RFID adoption or implementation will also be discussed.

Technical Action Groups (TAG)

The Hardware Action Groups (HAG) and Software Action Groups (SAG) are members of TAG. The ARC and Technical Steering Committee will assist in mapping the JRGs to SAG or HAG working groups' through the development of the appropriate charters. These working groups will only develop specifications that meet the requirements coming from the JRGs and will reconcile the specification to the requirements in conjunction with the JRGs.

業界工作組 (IAG)

業界工作組(IAG) 確定哪些高層次的商業程序能利用無線射頻識別技術作為解決方，同時確保向聯合要求工作組 (JAG) 適當陳述更具體的商業和用戶要求，讓這些要求能作為技術工作組(TAG) 發展應用要求(規格) 之源。

聯合要求工作組 (JRG)

「聯合」指跨業界或跨行動。聯合要求工作組(JRG) 進一步鞏固從業界工作組(IAG) 發展出來的業界要求，並合作發展出更一致和精確的商業和用戶應用要求，藉此協助技術工作組(TAG) 發展相關的技術規格。

聯合要求工作組也負責發展個別應用個案，並由此衍生出一套需要納入考慮規格之個別要求。

跨業界採納與執行工作組

這些工作組目標旨在推動業界和地區採納與執行產品電子代碼/無線射頻識別；同時，也會討論關於產品電子代碼/無線射頻識別於地區內採納或執行的相關課題與關注事項。

技術工作組 (TAG)

硬件工作組(Hardware Action Groups) 和軟件工作組(Software Action Groups) 均是技術工作組的成員。ARC和技術指導委員會(Technical Steering Committee) 藉着成立合適支部協助將聯合要求工作組的要求併入軟件工作組(SAG) 或硬件工作組(HAG) 的工作範圍內。這些工作小組只會發展符合聯合要求工作組(JRGs) 要求的規格，並與聯合要求工作組合作調節規格，從而達致相關要求。



“ Do you know? 你知道嗎？ ”

- EPCglobal compliant tags contain only data relating to an item or location. 符合EPCglobal標準的電子標籤只包含與物件或地點相關的訊息。
- No EPCglobal compliant tag contains data about a person. 沒有任何一個EPCglobal的電子標籤包含個人資料。



5.3 EPCglobal & ISO

EPCglobal Inc., is forecasted to develop global technical standards for the Electronic Product Code and the EPCglobal Network. EPCglobal works with other standard organizations, such as the ISO, to promote its standards to the broader international community. While the standards development processes of EPCglobal and ISO differ, there are essential similarities in their respective formal directives and procedures that assure due process and valid, defensible consensus. ISO and EPCglobal complement one another with their shared goal to develop global standards and methodologies.

The Class-1 Generation 2 UHF RFID Protocol for communications at 860 MHz – 960 MHz was ratified by the EPCglobal Board of Governors in December 2004 and was successfully accepted into ISO/IEC 18000-6 Amendment 1 standard as Type C in July 2006. This is a significant milestone because it provides recognition of the work that the EPCglobal community is doing to build user-driven technical standards to advance the adoption of EPC/RFID technologies in supply chains throughout the world.

EPCglobal與國際標準化組織

EPCglobal Inc. 被預期會為產品電子代碼和EPCglobal網絡發展出全球技術標準。EPCglobal與其他訂立標準的組織合作，例如國際標準化組織(ISO)，藉此把標準推廣至更闊的國際社群。儘管EPCglobal和ISO的標準發展程序各異，它們各自的正式指令和執行步驟卻有相同之處，彼此都是以確保一套有效的標準制定過程與可行模式為目標。EPCglobal與ISO均有著共同的願景開發相互補足的標準與模式。

EPCglobal董事局於2004年12月確認由860 MHz 到960 MHz頻率的第二代的Class-1 超高頻無線射頻識別空中通訊協定，並於2006年7月成功納入ISO/IEC 18000-6 Amendment 1 標準的C類別。這是一個重要的里程碑，亦證明EPCglobal社群透過建立用戶主導的技術標準和促進全球供應鏈採納產品電子代碼/無線射頻識別技術等工作已獲得認同。



“ Do you know? 你知道嗎？ ”

- Consumers should be able to choose to remove or retain RFID tags on their items. 消費者有權選擇除去或保留物件上的無線射頻識別標籤。
- EPCglobal continues to work with governments on consumer privacy. EPCglobal與各政府緊密合作，竭力保障消費者權益。
- Legislation should protect this choice, not remove it. 法律上應保留這選擇權，而不是除去這電子標籤。

5.4 EPCglobal Public Policy Steering Committee

EPCglobal Inc. and representatives of various industry sectors that are implementing RFID and EPC technology have formed the EPCglobal Public Policy Steering Committee (PPSC) to foster open dialogue with key audiences around public policy and other important areas relative to EPC technology and the EPCglobal Network.

The members of EPCglobal recommended guidelines for use by all companies engaged in the large-scale deployment of EPC. Since EPC is an emerging technology, usage guidelines supplementing or modifying those already available will evolve as applications are developed and implemented. For example, with developments in EPC technology or its use for providing consumers with added flexibility when controlling EPC tags or record personal consumer information beyond that provided by conventional bar code technology; changes to notices required by consumers or to the guidelines themselves may be appropriate.

EPCglobal and PPSC will administer these guidelines. The PPSC will monitor the proper use of these guidelines and be responsible for updating them as further developments occur in technology, new applications and enhanced benefits. These developments will provide even more choices to both consumers and companies when using EPC tags.

EPCglobal 公共政策指導委員會

EPCglobal Inc. 與應用無線射頻識別和產品電子代碼的不同業界代表，組成公共政策指導委員會 (PPSC)，藉此推動主要受眾就公共政策和其他與產品電子代碼及EPCglobal網絡相關範疇公開交換意見。

EPCglobal會員向所有大規模展開產品電子代碼技術的公司提供指引。由於產品電子代碼是一項嶄新技術，每當應用程式發展和執行後，使用指引需要在適當的時候作出補充或修訂，例如，透過產品電子代碼技術發展和應用，消費者能更有彈性地控制產品電子代碼標籤或是普通電腦條碼無法做到的個人資料。指引會因應消費者要求而作出適當的修訂。

EPCglobal和公共政策指導委員會共同管理這些指引。公共政策指導委員PPSC會監管這些指引是否給適當使用，同時會因應技術發展、嶄新應用程式和新增效能等隨時更新指引內容。這些發展將會賦予消費者和公司在產品電子標籤時更多選擇。



“ Do you know? 你知道嗎？ ”

- MIT Auto-ID Labs team develop technology to support the EPCglobal Network. 麻省理工學院的自動識別實驗室小組研發支援EPCglobal網絡的技術。
- The Adelaide, Australia team focus on antennas. 澳洲University of Adelaide小組集中研發集成天線。

6. EPC / RFID Enabling Services of GS1 Hong Kong 香港貨品編碼協會產品電子代碼/無線射頻識別服務



6.1 EPCglobal Membership Services

EPC is an emerging technology standard that transforms the modern supply chain to a new paradigm. Apart from administering the EPC Manager Numbering System and EPCglobal Standards, GS1 Hong Kong is also responsible for offering End User Membership and Solution Partners Membership schemes. Both membership types are granted with exclusive access to global EPC standard and technology development, cross-industry support and services.

Solution Partners Membership

This group of members is made up of organizations that facilitate the end-user community to implement the EPC network and its technologies. Members include hardware and software companies, consultants, system integrators, training companies and trade associations.

End User Membership

This group of members comprises of organizations that have objects in motion in the supply chain. Members include manufacturers, retailers, wholesalers, logistics service providers, public organizations and government bureaus.

EPCglobal 會籍服務

產品電子代碼是項新興技術標準，它改變了現代供應鏈的面貌，並將之帶至新領域。香港貨品編碼協會除了管理產品電子代碼系統和EPCglobal的標準外，也負責提供終端用戶會籍及解決方案夥伴會籍計劃。兩種會籍均享通達全球產品電子代碼標準和技術發展、跨業界支援和服務之專利。

解決方案夥伴會籍

這組會員是由一些促進終端用戶社群實行產品電子代碼網絡和相關技術的機構組成。會員包括硬件和軟件公司、顧問、系統整合供應商、培訓公司和業界組織。

終端用戶會籍

這組會員包括供應鏈上不同環節運作的貿易夥伴。會員包括生產商、零售商、批發商、物流服務供應商、公共機構和政府機關。



“ Do you know? 你知道嗎？ ”

- Barcodes needs a visible line of sight. RFID doesn't.
條碼需要一束肉眼可見的光線，無線射頻識別則不必。
- Barcodes can be visually read by people.
條碼可讓人們親眼閱讀。
- Barcodes suffer from high humidity.
條碼容易受潮濕天氣影響。



6.2 EPC Knowledge Transfer Services

EPC / RFID deployment begins with awareness and in-depth understanding of the technologies, costs and benefits involved. GS1 Hong Kong, with its extensive and first-hand knowledge of the EPC standard and technologies, is committed to organizing regular seminars, training workshops, certification programs and various industry events to infuse the essential knowledge, skills and methodologies to potential EPC users, solution providers and other interested parties. Participants will obtain valuable insight and key learning from EPC adopters to develop a practical and optimal EPC implementation roadmap.

The online knowledge bank disseminates the latest and hottest EPC / RFID related industry information to the EPC community. Go to www.epcglobal.org.hk to stay updated with the latest EPC / RFID developments.

產品電子代碼知識轉移服務

產品電子代碼/無線射頻識別的應用始於對技術、成本和利益的覺醒和深入認識。香港貨品編碼協會憑藉多方面和第一手的EPCglobal標準與技術知識，定期舉辦研討會、培訓工作坊、驗證計劃和各種業界活動，向準產品電子代碼用戶、解決方案供應商和任何有興趣人士灌輸相關知識、技能和方法。參與者將能從產品電子代碼先導者身上取得寶貴意見和重要經驗，從而發展出可行和最佳的產品電子代碼施行路線圖。

網上知識庫向產品電子代碼社群傳遞關於產品電子代碼/無線射頻識別的最新、最熱訊息，只要登入 www.epcglobal.org.hk，用戶便可以知悉產品電子代碼/無線射頻識別的最近發展情況

6.3 Industry Adoption Facilitation

Technology development is a long term yet fast changing process that requires special attention. Building on its strong and long-established relationships with various industry bodies and the government, GS1 Hong Kong strives to keep the EPC community abreast of the global EPC developments. It also secures support, resources and business opportunities for both end users and solution providers with the aim of exploring and realizing business cases that justify its EPC initiatives.

促進業界趕上產品電子代碼步伐

技術發展過程是持久和急速變化的，故需要特別關注。香港貨品編碼協會憑藉與各行業和政府的長期良好的關係，努力使產品電子代碼社群趕上全球產品電子代碼的發展步伐。與此同時，香港貨品編碼協會保證向終端用戶和解決方案供應商提供支援、資源及商機，希望共同探索和實現具效益的產品電子代碼商業實例。



6.4 EPC Professional and Consultancy Services

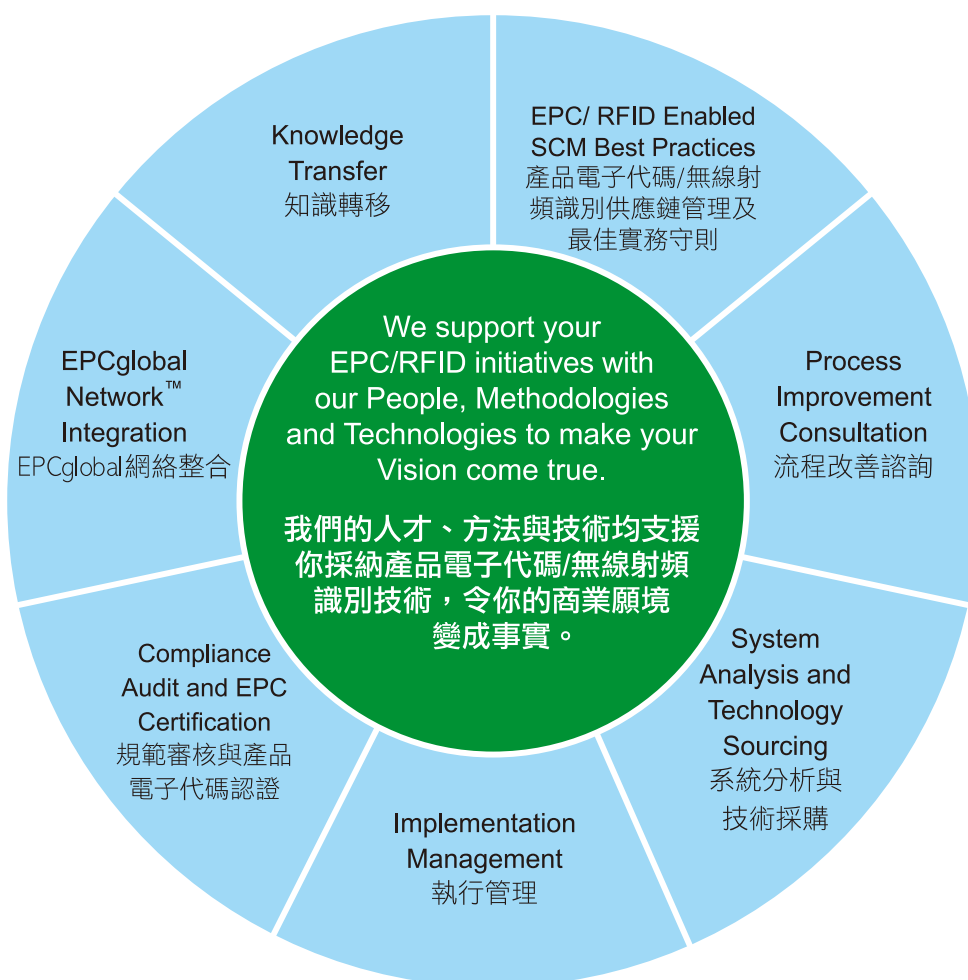
With its profound knowledge of modern supply chain management (SCM), different global standards and enabling technologies, GS1 Hong Kong's consulting team offers a wide range of professional consultancy services in collaboration with strategic partners to facilitate enterprises to become EPC compliant. It lets organisations define approaches that can maximize business values out of their EPC/RFID initiatives and opens the door for EPC deployment at different stages.

The consulting team comprises of experienced consultants who have broad exposure and expertise which can support companies' EPC /RFID supply chain initiatives:

產品電子代碼專業及諮詢服務

香港貨品編碼協會顧問團隊於現代供應鏈管理、全球不同標準和技術使用等方面均有深厚知識，並與策略夥伴合作，提供一系列專業顧問服務，協助企業執行產品電子代碼規範，給使用產品電子代碼/無線射頻識別的企業確立提升商業價值至極的方法，讓企業在不同階段都可以打開使用產品電子代碼之門。

我們的顧問團隊由具備豐富經驗、專業技能的顧問組成，支援你在供應鏈上應用產品電子代碼/無線射頻識別技術：



“ Do you know? 你知道嗎？ ”

- RFID can be made to work through water at short ranges. 無線射頻識別能在水中近距離操作。
- RFID systems can suffer from interference. 無線射頻識別會受電波干擾。
- There are handhelds that combined RFID and bar code scanner. 很多手提儀器都結合了無線射頻識別和條碼掃描器之功能。

6.5 Certification and Accreditation Program

To ensure the smooth adoption of EPC / RFID compliant standards by EPC users, GS1 Hong Kong works closely with EPCglobal Inc. on various EPC / RFID certification programs, to establish a neutral source to provide global certification testing and information about EPC-compliant vendors and products. GS1 Hong Kong will also be accrediting Performance Testing Centres, where users can have tagged products, cases, and pallets tested for readability in conditions similar to those that will be experienced within their own supply chains.

For End Users : This program will enable them to quickly and more easily identify solution providers offering products and services that comply with EPCglobal Standards.

For Solution Providers : This program offers a single, authoritative source for neutral certification and performance testing. Certified vendors receive a direct link to the EPCglobal community and end-user subscribers who are looking for specific products and services to help them implement EPCglobal Standards and EPC technology.

認證和檢定計劃

為確保終端用戶能順利執行產品電子代碼/無線射頻識別的規範標準，香港貨品編碼協會與EPCglobal Inc.多方面緊密合作，建立一個中介機構，為符合產品電子代碼規範的供應商和產品提供全球檢定測試服務。香港貨品編碼協會亦會檢定Performance Testing測試中心，讓用戶可以在類似他們供應鏈的狀況下測試裝箱和卡板上已貼上產品電子代碼的產品是否可讀。

對終端用戶的幫助：此計劃令他們更快捷和容易識別出那些解決方案供應商提供的產品與服務的是符合EPCglobal標準。

對解決方案供應商的幫助：此計劃提供單一、具權威的中肯認證和表現測試。已被認證的供應商將能直接連繫尋求個別產品和服務的EPCglobal終端用戶社群，協助他們執行EPCglobal標準和產品電子代碼技術。







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