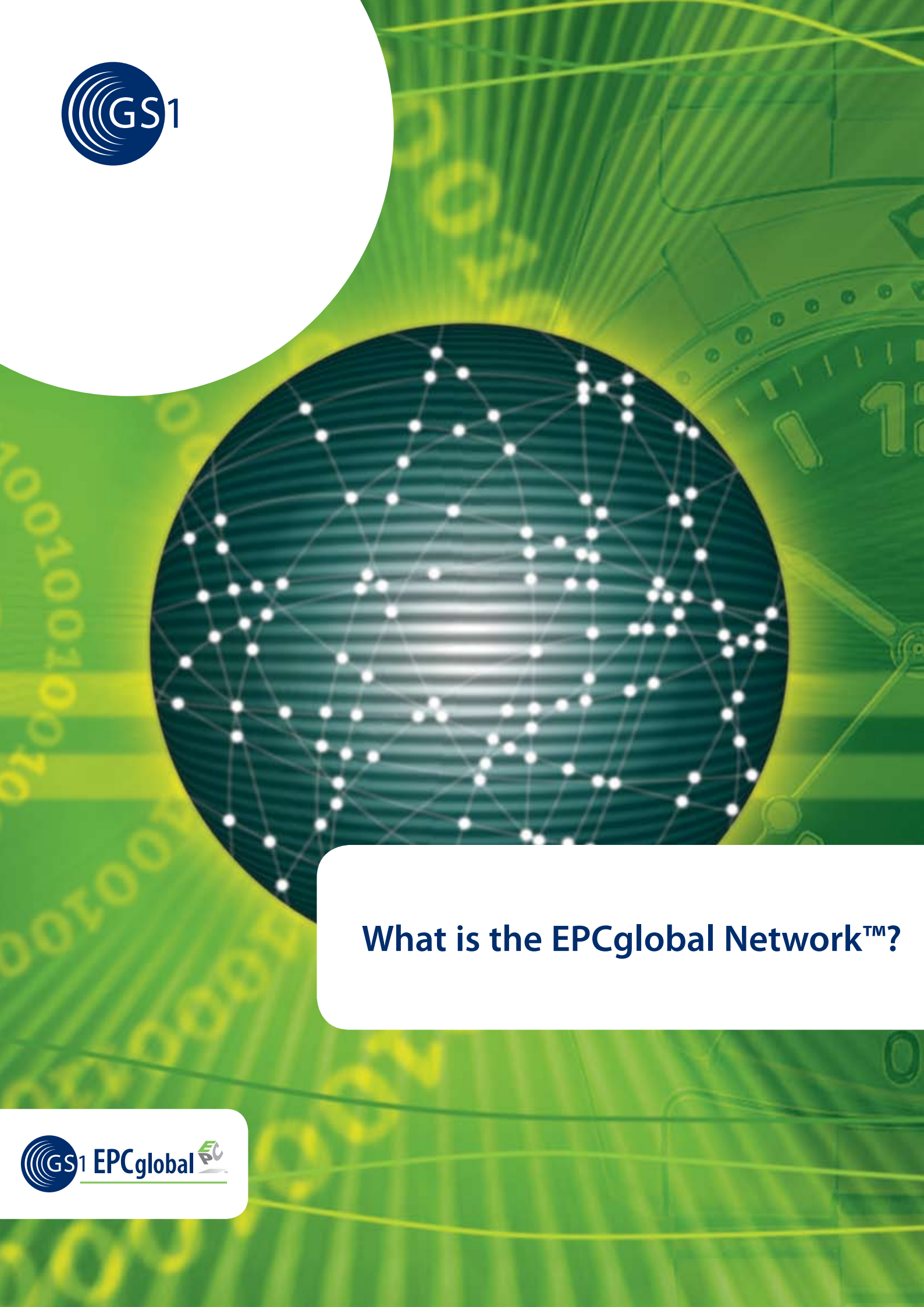

What is the EPCglobal Network™?

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1 INTRODUCTION

Companies require detailed information about their products and supply chain, and the ability to share that information with their trading partners in order to facilitate commercial transactions and the movement of goods and services. As business, technology and information needs continue to evolve, so do the standards and methods for communicating information. The bar code is a universally recognisable example of a standardised method for communicating static product information in the global supply chain. Working in conjunction with industry leaders and academic institutions around the world, the AutoID Center was created to build the next generation of the bar code utilising radio frequency identification (RFID). Leveraging existing RFID and Internet technologies, the AutoID Center designed a system for conveying dynamic information about individual objects they move through the supply chain in order to provide a history of product movement accessible to authorised users. That system is called the EPCglobal Network™.

2 PURPOSE OF THIS DOCUMENT

This paper serves as an introduction to the EPCglobal Network. By providing a high level discussion of the EPCglobal Network development, design and components, this paper seeks to answer the following questions:

- What is RFID?
- What are the benefits of using RFID for product identification?
- Who is the AutoID Center?
- What is the EPCglobal Network?
- How does the EPCglobal Network work?

3 RADIO FREQUENCY IDENTIFICATION

Radio Frequency Identification, or RFID, is a technology that identifies objects using radio frequency transmissions. In its most basic form, RFID requires two components. The first component is a *Radio Signal Transponder*, or tag, that is attached to an object. That tag consists of a chip that contains identifying information about the object to which it is attached, and an antenna to communicate that information via radio waves. The second component is a *reader*, which creates a radio frequency field that detects radio waves. When a tag passes through a radio frequency field generated by a compatible reader, the tag reflects the identifying information about the object to which it is attached to the reader, thus identifying that object.

3 - 1 HISTORICAL USES OF RFID

RFID technology has been utilised for decades. One well-documented use of radio frequency technology dates back to World War II, when the British attached RFID transponders to their own aircraft to enable their radar system to differentiate between their own planes and incoming German aircraft. Throughout the ensuing years, the use of RFID technology has become quite prevalent. One museum in Rotterdam uses RFID to guard its priceless paintings. In addition, scores of livestock have been tagged with RFID in order to track them in the event of a disease outbreak. One of the most visible uses of RFID in today's society is automated toll-collection on turnpikes and bridges, where cars display an RFID tag in their window and tollbooths equipped with readers identify the car and then charge the toll to the correct account as the car passes through the booth.

3 - 2 BENEFITS OF USING RFID FOR PRODUCT IDENTIFICATION

There are two primary benefits of using RFID technology for product identification in the supply chain. The first benefit is increased product information. Bar codes are an effective way to identify a type of product (e.g. a certain brand of razors). However, the bar code's visual structure constrains the amount of product information that can be conveyed to the product class level. In contrast, product identification information on RFID tags are stored on computer chips, an innovation that significantly expands the level of information that can be conveyed. As a result, the use of an itemised numbering system on RFID tags enables the identification of individual items in the supply chain (e.g. a specific razor).

The second benefit of using RFID technology is the ability to identify objects without seeing them. Bar code scanners must "see" the bar code to read it. As a result, bar coded items are scanned one at a time for identification. In contrast, an RFID reader instantly detects all radio waves tags passing through its radio frequency field. This enables the RFID reader to detect (and thus identify) from a distance every RFID tagged item in a pallet, case or shopping basket in one glance.

These benefits translate to a significant advancement in supply chain management. RFID provides the ability to read hundreds of tags per second, an exponentially faster identification rate over bar codes. In addition, the ability to read product identification information from a distance facilitates greater automation of tracking procedures. Finally, RFID can be done at the shipping dock, warehouse and checkout alike. Thus, the placement of RFID readers in a series of gateways provides the ability to track individual items through the entire supply chain, from manufacture through to point of sale.

4 THE AutoID CENTER

Headquartered at the Massachusetts Institute of Technology (MIT), the AutoID Center was an independent, not-for-profit global research organisation founded in 1999 to build the next generation of the bar code utilising RFID. In order to achieve its goal, the founding sponsors, Gillette, Proctor & Gamble, the Uniform Code Council (*now known as GS1 US*) and MIT, enlisted the support of more than 100 global organisations and companies, including EAN International (*now known as GS1*) and six other leading research universities around the world. Leveraging global standards and existing RFID and Internet technologies, the AutoID Center designed the EPCglobal Network to bring the benefits of RFID technology to the global supply chain.

5 EPCglobal NETWORK COMPONENTS

The EPCglobal Network uses RFID tags and readers to pass unique identifiers affixed to individual items in the supply chain, whether the item be a pallet, case or individual unit. The network then leverages the Internet to hold information associated with that unique identifier that can be shared among authorised trading partners in the global supply chain. There are six components of the EPCglobal Network:

Electronic Product Code (EPC)	Unique number that identifies a specific item in the supply chain. This number may be used to identify a container, pallet, case or individual unit.
EPC Tag	Radio frequency tag attached to an item consisting of a microchip that contains the EPC for that item, and an RFID antenna to reflect the EPC back to an EPC reader.*
EPC Reader	Radio frequency reader that detects EPC tags and communicates their associated EPC numbers to the EPC Middleware.
EPC Middleware	Software that sorts and manages data coming in from the EPC readers.
ONS	Network resolution services that direct EPC queries to the location where information associated with that EPC can be accessed by authorised users.
EPC Information Services (EPC-IS)	Information services necessary for the storage, communication and dissemination of EPC data which leverages security technology including authentication, authorisation and access control.

* Although most sectors require only the simplest, lowest cost tag, the potential value of more complicated tags justifies their increased cost in certain industries. For example, the food industry may want to add temperature tracking by adding a temperature sensor on tags. As a result, various tag classifications are being developed in order to accommodate varying levels of complexity.

6 THE NETWORK IN ACTION

The components defined above provide the ability to capture and share information in the EPCglobal Network. To capture data, inexpensive EPC tags carrying a unique EPC identifier are affixed to containers, pallets, cases and/or individual units. Then, strategically placed EPC readers at gateways throughout the supply chain will read each tag as it passes and communicate the EPC number and the time, date and location of the read to the network. EPC Middleware will control and integrate the EPC tags, readers and local infrastructure at the individual site.

Once the information is captured as described above, the EPCglobal Network then utilises Internet technology to create a network for sharing that information among authorised trading partners in the global supply chain. The ONS serves as the EPCglobal Network's "Yellow Pages," pointing EPC queries to where information associated with that EPC can be found. From there, actual access to data in the EPCglobal Network is managed at the local level by the EPC-IS where each company itself designates which trading partners have access to its information. The result will be a network of information that provides a history of individual product movement in real time.

7 CONCLUSION

Leveraging existing RFID and Internet technologies, the EPCglobal Network will convey real time data about individual items as they move through the supply chain. As a result, it will provide a history of product movement accessible to authorised users. With the release of Generation 1 specifications for the EPCglobal Network components, the mission of the AutoID Center was achieved. At that point, the development of the EPCglobal Network shifted into the current phase where the business community joins the process to develop industry-accepted standards for the EPCglobal Network. In order for the EPCglobal Network to reach its potential, it must be based on global standards that ensure universal applicability and optimal functionality across the globe for all industry sectors. Without such horizontal standards, industries and/or geographic regions would be left to develop their own standards, which would create diverse, incompatible systems that inhibit collaboration across industries, commercial sectors and geography.

Today, the research facilities of the AutoID Center operate as the AutoID Labs. The AutoID Labs continue the work of designing, building and testing the EPCglobal Network infrastructure.

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