WHAT'S NEXT FOR BORDER CROSSINGS?

Secure RAIN RFID Increases Throughput without Sacrificing Security

Electronic travel documents have made border crossings more secure and more efficient. A recent trend, which adds **RAIN RFID** to "trusted traveler" documents and makes them readable over a much longer range, reduces wait times for a better experience. In the latest extension to this proven technology, AES cryptography adds high-level security to the long range functionality, so even ePassports can take advantage of it.

Checkpoints along national borders, where people have their passports checked and go through customs before proceeding to their destination, are, in many ways, the first line of defense when it comes to making the world a safer place. When national and international authorities check identities at border crossings, they can uncover criminal activity and help prevent the spread of terrorism, contraband, illegal drugs, and other threats to public safety.

In the past decade, border-crossing agencies around the world have changed how they do business. They have transitioned to electronic, machine-readable versions of travel documents, which offer much better protection against fraud and are faster to process.

THE CONTACTLESS REVOLUTION

It started with the **International Civil Aviation Organization (ICAO)**, the United Nations agency that oversees international air travel, and their work on electronic passports, or ePassports. The ICAO-defined format adds a layer of security to traditional, non-electronic passports by placing a special, built-for-purpose electronic circuit to the inside of the passport booklet.

The ePassport securely stores the biographical and biometric information shown on the passport, along with a digital security feature countries use to verify the authenticity of the document itself. The special ePassport chip builds on the contactless smart-card technology widely used to authenticate identities in banking and other high-security applications.

In 1998, Malaysia became the first country to issue biometric passports. By December 2008, 60 countries were issuing such passports, and by 2017 the number had increased to 120.

120 countries now issue **biometric passports.**

THE NEED FOR SECURITY AND SPEED

Border crossings benefit from two things – security and speed – and ePassports deliver both. In terms of security, the chip-level security mechanisms designed into the **ePassport** make it significantly harder to steal, copy, or fake an official travel document, and that helps reduce fraud.

In terms of speed, the contactless technology the ePassport uses to communicate traveler information works quickly, so there are fewer delays and people spend less time waiting in line. The digitalization of data in ePassports allows to manage and exchange information instantly, and securely, with border control systems.

Another benefit of ePassports is increased automation, because the contactless format works with Automated Border Control (ABC) gates, which process travelers faster, with less human interaction, than traditional security gates staffed by border-crossing personnel. ABC gates free up resources, so border-patrol staff can focus their attention on the cases that need closer examination.

The widespread success of ePassports has influenced other travel documents, too. At border crossings where citizens can use a national ID or a driver's license in place of a passport, more and more of those documents are now electronic and supported by the border crossing's contactless infrastructure.

Other IDs Are Going Contactless, Too

Building on the momentum created by ePassports, other identity documents are adopting the contactless format.

National electronic identity cards (eIDS)

Often build on the ICAO specification, for high-level security and broad interoperability. Some national eIDs also take advantage of the multi-application capabilities of contactless, with support for voting, healthcare access, residence permits, transport ticketing, micropayments, and more.

Electronic driver's licenses (eDLs)

Offer many of the same chip-based security features as ePassports, and can use contactless features to do other things, such as start a car or connect to tachographs and insurance-based apps that track driving habits.

Mobile IDs

Stored on smartphones and other mobile devices, are digital versions of physical documents. Since the physical document remains the root of trust, mobile IDs are currently an extension of the real-world ID, and not a replacement for ePassports, eIDs, and eDLs.

INCREASING THROUGHPUT WITH RAIN RFID

Despite the improvements in processing time that **ePassports** and other electronic travel documents have brought to border crossings, travelers can still find themselves waiting in lines and border-control staff can still struggle to meet the need for personnel to focus on security-relevant tasks.

This has led to another trend, which adds a second wireless technology to the identity document. Now, alongside the contactless technology that supports up-close reading, there is RAIN RFID, which supports reading over a longer distance.

RAIN RFID is a wireless technology that has been used for several decades in supply chains to track items. Adding RAIN RFID to an identity document is a fairly straightforward task for the manufacturers of passports and other travel documents, because many of them are already familiar with RAIN RFID technology because they either already use it or are preparing to use it in their logistics chain to track the materials used in producing these documents.

Putting long-range RAIN RFID alongside the short-range contactless IC that's already in the travel document enables reading over an extended range while maintaining the high-level security mechanisms inside the identity document.

With RAIN RFID inside the travel document, the read range goes from a few centimeters, which is the limit for traditional contactless technology, to several meters or more. Having a longer read range makes it easier to present the document to a reader machine, and that can save time when there are lots of travelers to process. Longer read range can also support public-health requirements for social distancing.

A closer look at one real-world example – the Canadian land border – shows that RAIN RFID is an effective way to reduce waiting and keep things moving.

RAIN RFID INCREASES THROUGHPUT AT THE CANADIAN LAND BORDER

At the border between the United States and Canada, there are designated travel lanes just for people with IDs that are equipped with **RAIN RFID**.

The special lanes lead to booths that are staffed by border-patrol officers. As drivers approach the booth, they present their ID to a reader station that retrieves travelers ID from a database and displays it for the officer in the booth. The process is convenient for drivers to use, since they don't have to insert the card in a reader, and the automated database check saves time because the officer no longer has to manually input information.

The RAIN RFID system at the Canadian border is part of the NEXUS program, a "trusted traveler" program jointly run by the Canada Border Services Agency and the U.S. Customs and Border Protection Agency. The program pre-screens travelers so they can take advantage of expedited processing at the border. Canadian and American citizens who apply for the NEXUS ID card undergo a security check and are deemed to be low risk before being issued a card. The pre-approval process helps maintain security while making it easier for NEXUS cardholders to cross borders and giving border-control officials more time to deal with high-risk cases.

The NEXUS program has been in place for about five years, building on RAIN RFID's solid foundation of proven accuracy and speed. RAIN RFID has been in widespread use for decades, as part of supply-chain, retail, and industrial applications. It already connects billions of everyday devices to the internet, giving each item a unique identity and letting it communicate with the network.

Proven Accuracy. In retail, agriculture, supply chain, and industrial applications, **RAIN RFID** is trusted to identify, locate, and engage each item, streamline logistics and workflows, manage inventories, and reduce the impact of counterfeits and grey-market diversion.

In the airline industry, following guidelines issued by the International Air Transport Association (IATA), RAIN RFID is replacing barcodes in baggage tracking systems. Real-time location data, viewable by airline workers and passengers alike, means RAIN RFID is helping airlines increase operational transparency, reduce the number of mishandled bags, and improve passenger experiences.

NEW AES CRYPTOGRAPHY FEATURES MAKE RAIN RFID A SUITABLE ADDITION FOR ePASSPORTS

With the recent emphasis on network security and data protection, RAIN RFID has gotten an upgrade. This security-enhanced **RAIN RFID** (simply referred to as "secure" RAIN RFID), now offers AES cryptography, and makes it possible to add the long-range accuracy and speed benefits of RAIN RFID to applications that need high-level security, such as ePassports.

AES cryptography is a standards-based approach to security, implemented according to ISO/IEC 29167-10 for proof of origin. It is recognized in the security industry as being among the most effective ways to protect against attacks from unauthorized parties, and is widely trusted in high-security applications to protect against common attack scenarios, such as eavesdropping, emulating, and cloning.

The data sent between a secure RAIN RFID IC and the reader can be made dynamic and randomized, meaning each communication is based on a new computation and is therefore different every time the tag and the reader communicate. This randomness protects the communication from deciphering or copying. Also, the secrets that enable secure communication – that is, the crypto keys – are protected in secure vaults embedded in the chip. The crypto keys never leave this secure vault, so they're protected from being "sniffed" or otherwise intercepted.

For travel documents, AES cryptography means the secure version of RAIN RFID can now expand beyond trusted traveler programs like NEXUS. The long read range, accuracy, and speed benefits of RAIN RFID can now be considered for travel documents that require a higher level of built-in security, including ePassports.

AES cryptography is considered the "**gold standard**" for data encryption

BETTER BORDER CROSSING EXPERIENCES

With secure RAIN RFID designed into **travel documents** and **border-crossing** infrastructures, checkpoints can process more people in a shorter amount of time.

Presenting the travel document to the reader is more convenient, since the traveler can be positioned farther away and still get an accurate read. There's less fiddling, to make sure the document is positioned correctly, and fewer retries due to errors in the way the document is presented.

Also, more than one document can be read at once. With a family, for example, one person can present everyone's documents for group processing. The reader machine can access data without line of sight, so several passports can be held in the hand of one person and presented to the reader in one pass. There's no need for each adult and child in the family to be processed individually.

A contactless ePassport that also has a secure RAIN RFID chip inside is backward compatible with the existing infrastructure, and there's still no need for a battery because, like the contactless technology already employed, secure RAIN RFID draws power from the reader.

Secure RAIN RFID offers similar rates for speed and accuracy as previous RAIN RFID implementations, but with the added advantage of AES cryptography, so border crossings can gain the benefits of faster throughput without sacrificing security. That means border-patrol agencies can take advantage of increased automation to free up personnel for more detailed checks, and travelers can enjoy a better border-crossing experience, with fewer lines, less waiting, and less frustration.

A contactless ePassport that also integrates a secure **RAIN RFID** chip inside can interact with readers placed several meters away

Today's Contactless:

One document at a time, at short range

Adding Secure RAIN RFID:

Multiple documents at once, over a longer range

NXP WORKS CLOSELY WITH GOVERNMENTS TO SECURE IDENTITIES

At NXP, we have been successfully using chip-based credentials to protect private information for more than 20 years. We are a trusted supplier of highly secure, chip-based solutions to nations for their **eGovernment** and **ePassport** programs.

We build on a track record of substantial contributions to the business of secure identification in general, and we have a profound perspective on how secure credentials are used in government applications.

We understand that developing technology for border crossings (or any technology for identification) requires us to view the task not just as technologists, but as citizens, too. We firmly believe that the digital era rests on how we evolve secure electronic credentials. We believe that secure RAIN RFID solutions can move nations and individuals one step ahead when it comes to faster, and more secure, border crossings.

NXP's implementation of secure RAIN RFID, called UCODE® DNA, was among the first to offer RAIN RFID ICs with high-level security based on international standards. Along with higher speed, accuracy, and read range, the UCODE DNA chip includes special features for protecting privacy. Using AES crypto authentication, the data stored on the IC can be hidden from unauthorized readers, so it's harder for thieves to steal the personal information housed in a travel document. At the same time, the IC can be configured to emit only fully randomized signals, making it harder to decode communications between the travel document and the reader.

Our Contribution to Secure Border Crossings

More than two decades spent collaborating with governments, authorities, and standards bodies to help guide the future of identification, interoperability, and security.

Contributions to international standards, including GS1 EPCglobal Gen2V2, ISO/IEC 18000, ISO/IEC 29167, ISO/IEC 14443, NFC, and ICAO 9303, plus LDS2, EMVCo payment, and Common Criteria (CC) Security Certification.
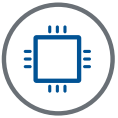
Commitment to secure microcontroller platforms, with ongoing evolution of the SmartMX family, which has been recognized for its approach to security, performance, and flexibility.

Consistent introduction of technology breakthroughs, including secure, robust MOB modules, which empower smartcards, ePassports, and other electronic documents.

Co-inventor of Near Field Communication (NFC) technology and trusted supplier of embedded secure elements into mobile phones.

Deep expertise in issuing and managing secure credentials, with Trusted Identity Management Solutions (TIMS) and secure trust provisioning for flexible government issuance, including virtual mobile ID and online biometric authentication.

Groundbreaking work in secure RAIN RFID to help increase throughput at border crossings without compromising security.

Take the Next Step

To learn more about NXP's approach to border crossing technologies, and the ways secure RAIN RFID can increase throughput, without compromising security, visit:
www.nxp.com/egovernment

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