

Understanding Contactless Smart Card Technologies and Some of the Leading Reader/Card Product Providers

BACKGROUND

Over the last few years, contactless smart card technology has become a very hot topic, particularly in the North American security industry. For several years, 13.56 MHz contactless technologies such as Philips MIFARE® and Sony Felica® have been used in Europe and Asia. Early on, these cards and readers were primarily used for mass transit systems located in large metropolitan areas – not as physical access control products. By the late 1990s, MIFARE® products began showing up in European access control systems.

In mid-2002, HID Corporation (one of the leading providers of access control cards and readers) launched a new product family named iCLASS®. This was the first contactless product family designed specifically for access control and capable of supporting multiple applications on a single credential.

Multi-application smart cards have been in use throughout Europe for several years. “Multi-application” means that one single card may contain several independent applications. Just as many of today’s computers contain applications like Microsoft Word®, Excel®, PowerPoint® and Adobe Acrobat®, contactless smart cards can also contain several applications. Examples of smart card applications include traditional building access, biometrics, parking, cashless vending/payment, time and attendance, loyalty programs, etc. Since 2002 and the introduction of HID iCLASS®, multi-application, contactless smart card usage has been steadily increasing in

North America. The emergence of Philips MIFARE® in North America has also contributed to growing interest in multi-application contactless products.

DIFFERENCES: TRADITIONAL PROXIMITY VS. CONTACTLESS

Traditional RFID proximity (125 kHz prox) cards and readers have a few distinct disadvantages when compared to contactless smart card technology (13.56 MHz).

First, traditional proximity readers/cards communicate by transmitting “license plate” numbers in the open. This means that when proximity cards and readers communicate, no encryption, mutual authentication, or message authentication coding (MAC) takes place to protect data integrity and security. If a person were so inclined, and was skilled in the art/science of RFID, that person could intercept a 125 kHz data transmission. That transmission could then be replayed to a reader to gain access illicitly at some time in the future. In contrast, today’s secure contactless cards and readers (such as XceedID ISOX and HID iCLASS) employ a myriad of cryptographic techniques. These techniques encrypt data in ways that render it useless to an illicit user. Thus, traditional proximity cards and readers provide inferior communication security when compared to secure contactless smart cards and readers.

It is important to note that *not all smart card readers are created equal*. Some readers are referred to as “UID only” or “Serial Number”

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readers. Some do not call attention to UID, serial number, or security. Such readers are likely NOT secure and communicate much like traditional proximity readers (by broadcasting a “license plate” number from card to reader). If security is important, insist on *secure* reader products.

Second, the data rate for traditional 125 kHz proximity is approximately 100 times slower than that offered by contactless technologies. Data rate may not be important when simply broadcasting a “license plate” number but it becomes highly important when utilizing mutual authentication/encryption and/or transmitting data-intensive applications like biometric templates (fingerprint, iris, etc.).

CONTACTLESS ISO STANDARDS

There are a number of ISO standards – and subsets of those standards – for contactless smart card technologies. The most prevalent are ISO15693 and ISO14443. Each ISO standard has a unique advantage. ISO15693 provides the option of longer read ranges than ISO14443. While this is not important to some users, it can be very important to users that have become accustomed to the longer read ranges provided by traditional, mid-range 125 KHz proximity readers/cards. On the other hand, ISO14443 provides much higher data rates than ISO15693. While this may not be important to customers using access control cards as traditional ID-only badges, it is very important when employing data intensive applications (such as biometrics). These tradeoffs should be weighed carefully when selecting a smart card technology. Ideally, a contactless platform that supports both ISO standards would be preferred.

LEADING SILICON PROVIDERS

A few leading silicon manufacturers (NXP/Philips, Infineon, Inside Contactless,

STMicroelectronics and Texas Instruments) supply most of the contactless ICs (microchips) used in today’s contactless access control cards and readers. Since contactless smart cards have been used in Europe for several years, it makes sense that the leading providers of the technology would be European-based.

NXP Semiconductor (based in Germany/Austria, formerly Phillips) currently has the largest market share due to its MIFARE (ISO14443A compliant) product family remaining dominant in Europe. NXP has also marketed its technology and products to the U.S. government and is highly involved in current contactless initiatives around the globe. The Philips DESFire® platform is integral to the U.S. government’s high security contactless program. The NXP MIFARE platform became dominant in Europe over several years and has now become an industry standard platform. While it is highly accepted and compliant with ISO standards, MIFARE remains a proprietary technology owned by NXP.

Infineon Technologies (formerly the German based Siemens silicon group) is also a major provider of contactless technology and provides highly secure products under the trade name my-d®. Infineon’s my-d is an intriguing platform because it crosses ISO14443A and ISO15693 within the same product family. Like MIFARE, Infineon’s my-d is proprietary Infineon technology.

Inside Contactless is a specialized contactless silicon provider based in France. Inside is a much smaller company than Philips or Infineon but has assembled a comprehensive product line of contactless technology products (ISO14443A and ISO15693). Some of Inside’s products are marketed under the trade names PicoPass® and PicoTag®. These products are proprietary Inside products.

LEADING READER MANUFACTURERS

HID Corporation (California-based and owned by Swedish conglomerate Assa Abloy) is currently the leading producer of cards and readers for access control. For years, HID proprietary proximity products (125 KHz) have been recognized and sold worldwide as “industry standard” products. As a leading player in the security market, HID launched its iCLASS contactless smart card and reader product family in 2002. iCLASS is based on Inside Contactless technology and emphasizes the use of ISO15693. ISO15693 provides the opportunity for longer read ranges than ISO 14443 (MIFARE) based products. Since HID Corporation had established expectations for read range in the access control market over several years, it made sense for the company to emphasize ISO15693 in its contactless platform.

General Electric Security is another leading manufacturer of cards and readers. GE purchased the Interlogix Group a few years ago, acquiring the well established Casi-Rusco brand. Casi has been in the access control reader and card business for many years. Like HID, Casi’s original technology was also based on 125 kHz proximity. In early 2003, GE Security announced it was working with XceedID Corporation on a new contactless technology platform. In September of that year, GE Security unveiled the industry’s first multi-technology (13.56 MHz and 125 kHz) product platform, the GE Transition Series Readers. GE Security was subsequently awarded the prestigious 2004 Frost & Sullivan Product Innovation Award for the worldwide access control industry. The significant benefit of this technology innovation includes migration from old proximity systems to new contactless smart systems without having to replace entire card populations at one time. Instead, customers can *transition* from old to new at their own pace. GE Security appears to be intent on securing a

market leading position for contactless smart card readers.

Deister Electronics is a German company that has offered 125 kHz proximity and MIFARE based products for years. Deister products have been used by industry leading OEM companies such as GE Security/Casi-Rusco and Tyco’s Software House division. Software House recently announced the use of Deister readers for its new privately-labeled, multi-technology product line (which is comparable to the GE Transition Series Readers, though offering less read range performance).

XceedID Corporation is based in Golden, Colorado, USA and specializes in innovative contactless technologies and products. XceedID Corporation was formed by a highly experienced RFID development/sales team that had formerly been with HID Corporation and Best Access for many years. Since the launch of HID iCLASS® in 2002, there have been advancements in available contactless technologies and system architectures. XceedID Corporation utilized technology from both industry leading silicon providers, Philips and Infineon, to develop its ISOX family of multi-technology readers (13.56 MHz and 125 KHz) and cards. XceedID is the first U.S. based company to develop and offer secure readers based on Infineon my-d technology. XceedID ISOX readers combine industry leading proximity and contactless technologies in one reader without sacrificing the read range and performance that traditional proximity users have come to expect. XceedID ISOX reader products have a unique patent-pending design that allows upgradeability of readers and cards in the field (XACTT™). XceedID offers its products through leading security industry OEM companies.

**ISO STANDARDS – NOT TO BE
CONFUSED WITH COMPATIBILITY OR
INTEROPERABILITY**

When company “A” claims to be compatible with various ISO standards, it does not necessarily mean that company “A’s” ISO15693 product is compatible with company “B’s” ISO15693 product. In the commercial security business it likely means that each company’s product can read the UID or card serial number from an ISO15693 card. It does not necessarily even mean that the readers will report the same number string (data length or format) to the access control panel because each manufacturer may have its own way of truncating numbers or formatting data. Certainly this can be resolved by requiring various manufacturers to use a common and specific data format.

Unfortunately, this *interoperability* becomes more difficult when customers require “secure” cards and readers. Most secure readers available today reflect a given reader manufacturer’s implementation of one of the major silicon vendor’s proprietary secure technologies. Reader manufacturer development teams typically purchase or license technology from a semiconductor company before layering additional security methods on top of the existing architecture. Add-ons may include varying forms of cryptographics including encryption, random number generation, mutual authentication (three pass being most common), and message authentication coding (MAC). When a reader manufacturer offers “secure” (or “sector”) products, it typically requires that cards for those readers be purchased directly from the respective reader manufacturer. Cards and readers must be programmed to work together. If high security is desired, purchasing cards and readers from the same source ensures that only one source understands and knows the security scheme employed.

The U.S. government has been working on a contactless interoperability specification for several years in order to have a secure specification for products available from multiple manufacturers. Most manufacturers intend to support the interoperability guidelines. The government specification contains several levels of security for devices, including traditional cards and readers. The government’s implementation relies on Philips’ DESFire technology, which has been accepted as a solid, high-security product platform.