

# Smart Card Alliance: RFID & Smart Cards

Many applications are using radio frequency (RF) chip technology to automatically identify objects or people. These applications range from tracking animals and tagging goods for inventory control to enabling fast payment and securely identifying people. While these applications all use radio waves to communicate information, the RF-chip technology used for each is quite different.

**R** RFID tags—simple, low-cost and disposable—are being used to identify animals, track goods logistically and replace printed barcodes at retailers. RFID tags include a chip that typically stores a static number (an ID) and an antenna that enables the

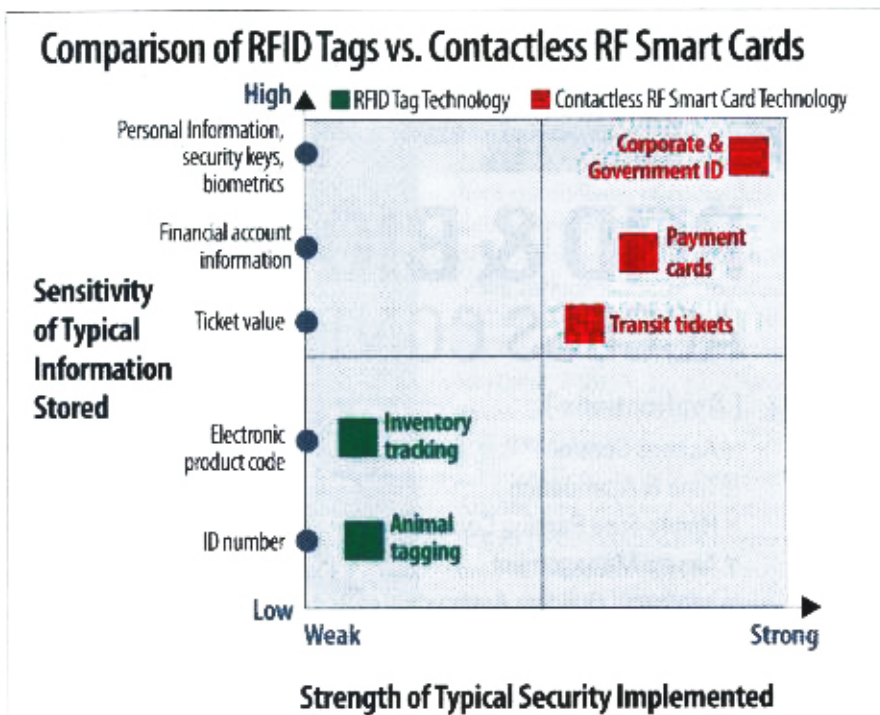
chip to transmit the stored number to a reader. When the tag comes within range of the appropriate RF reader, the tag is powered by the reader's RF field and transmits its ID to the reader. There is no security on the RFID tag or during communication with the reader. Any reader

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using the appropriate RF signal can get the RFID tag to communicate its contents. Typical RFID tags can be easily read from distances of several centimeters to several meters to allow easy tracking of goods. RFID tags have common characteristics, including the following:

- Low-cost, high-volume manufacturing to minimize investment required in implementation
- No security; tags can be read by any compatible reader
- Disposable or one-time use
- Minimal data storage, comparable to bar code, usually a fixed format written once when the tag is manufactured
- Read range optimized to increase speed and utility

Contactless RF smart card technology is used in applications that need to protect personal information or deliver secure transactions. Contact smart card technology provides similar capabilities but lacks the RF interface that allows contactless smart cards to be read at a short distance from the reading mechanism. An increasing number of contactless RF smart card technology implementations capitalize on ability to enable fast convenient transactions and availability in form factors other than plastic cards—for example in a watch, key fob or





document.

Current and emerging applications using contactless RF smart card technology include transit-fare payment cards, government and corporate identification cards, electronic passports and visas, and contactless financial payment cards. The contactless device includes a smart card microcontroller with internal memory that has the unique ability to store large amounts of data, perform complex functions (for example, encryption or other security functions) and interact intelligently via RF with a contactless reader.

Typical contactless RF smart card applications require that information stored on the contactless device is able to be read from only a few centimeters (less than 10) to up to one meter. Unlike RFID tags, contactless RF smart cards support many security features that ensure the integrity, confidentiality and privacy of information stored or transmitted, including the following:

- **Strong information security:** Information stored on a contactless RF smart card can be encrypted and communication between the contactless RF smart card and reader can be encrypted to prevent eavesdropping. Security technologies may also be used to ensure information

integrity.

- **Strong contactless device security:** Like contact smart cards, contactless RF smart card technology is extremely difficult to duplicate or forge and has built-in tamper-resistance.
- **Mutual authentication:** The contactless RF smart card can verify that the reader is authentic and prove its own authenticity to the reader before starting a secure transaction.
- **Authenticated and authorized information access:** The contactless RF smart card's ability to process information and react to its environment allows it to uniquely provide authenticated information access and protect the privacy of personal information. The contactless RF smart card can verify the authority of the information requestor and then allow access to only the information required. Access to stored information can also be further protected by a personal identification number (PIN) or biometric, such as a fingerprint, to protect privacy and counter unauthorized access.

## Different Requirements for Different Applications

Applications often have differing require-

ments in use of RF technology, with RFID-tag and contactless RF smart card technologies providing very different capabilities. The table below summarizes the types of technologies used in some key applications and levels of security that are typically implemented.

It is important to note, however, that information privacy and security must be designed into an application at the system level by the organization issuing the contactless smart card or RFID device. It is critical that issuing organizations have the appropriate policies in place to support security and privacy needed by the application and then implement the appropriate technology that delivers those features.

Contactless RF smart card technology is an excellent privacy-enabling solution for applications that must protect personal information and ensure that communication with the contactless device is secure. The contactless RF smart card's on-chip intelligence uniquely enables systems that use it to comply with strong privacy and security guidelines, as well as delivering speed and convenience of contactless communication.

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## Comparison of Applications Using RFID Tags versus Contactless RF Smart Cards

	Application use of RF technology	Technology being replaced	Information typically stored on RF chip	Read-only information or read/write capability	Typical range needed for reading stored information	Security requirement	Type of Technology used
<b>Inventory tracking</b>	Tag includes an ID number that allows retailers and/or supply-chain partners to track inventory	Bar code	Number (electronic product code)	Read-only, typically (Some advanced production line uses also write to tag.)	Several meters	Low	RFID tag
<b>Animal tagging</b>	Tag includes an ID number that allows animal location to be tracked and recorded	Visual tags or marks	Number	Read-only	Several meters	Low	RFID tag
<b>Transit payment</b>	Payment card used at transit stations for fast, convenient payment of fares	Coins, bills, paper tickets, mag stripe tickets	Fare value and rules	Read/write (Balances are updated, counters are advanced or dates are validated.)	Few (<10) centimeters	Medium	Contactless RF smart card
<b>Credit card payment</b>	Payment card or device used at merchants for fast, convenient payment of goods and services	Mag stripe payment cards	Financial-account information	Read-only (Writing occurs during card personalization after the device is manufactured.)	Few (<10) centimeters	High	Contactless RF smart card
<b>Corporate or government identification card or document</b>	ID card that is used to prove identity for access to physical facilities and networks and to sign and encrypt documents	Mag stripe ID cards; RFID-based physical-access cards; paper documents	Personal information, employee or other ID numbers, digital signatures, security keys, biometrics	Read/write (Cards can be updated after issuance.)	Few (<10) centimeters to one meter	High	Contactless RF smart card