

**Smart Card
Alliance**

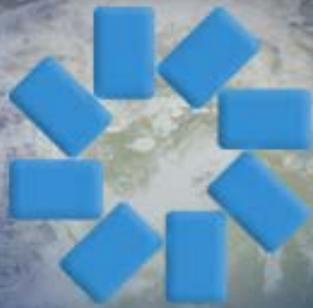


Mobile/NFC Security Fundamentals

NFC Application Use Cases: Security Perspectives

- **Smart Card Alliance and NFC Forum Webinar**
- **May 9, 2013**





**Smart Card
Alliance**

Introductions

- **Randy Vanderhoof**
- **Executive Director, Smart Card Alliance**

Mobile & NFC Council



- *Raise awareness and accelerate the adoption* of all applications using NFC
 - Access control, identity, loyalty, marketing, payments, peer-to-peer, promotion/coupons/offers, transit, ...
- *Accelerate the practical application of NFC*, providing a bridge between technology development/specifications and the applications that can deliver business benefits to industry stakeholders.



Today's Webinar Topics & Speakers



- **Introductions:** Randy Vanderhoof, Executive Director, Smart Card Alliance



- **Isis Mobile Wallet and Payment:** Tony Sabetti, Merchant Integration Leader, Isis Mobile Commerce



- **Using NFC Devices for Logical Access:** Christian Ali, Vice President, Product Management, SecureKey Technologies

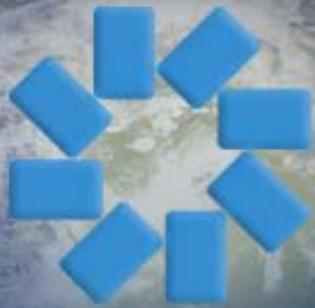


- **NFC Forum Tag Use Cases:** Jonathan Main, NFC Forum Technical Committee, MasterCard



- **Physical Access Control Use Cases:** Steve Rogers, President, IQ Devices

- **Q&A:** Randy Vanderhoof, Smart Card Alliance



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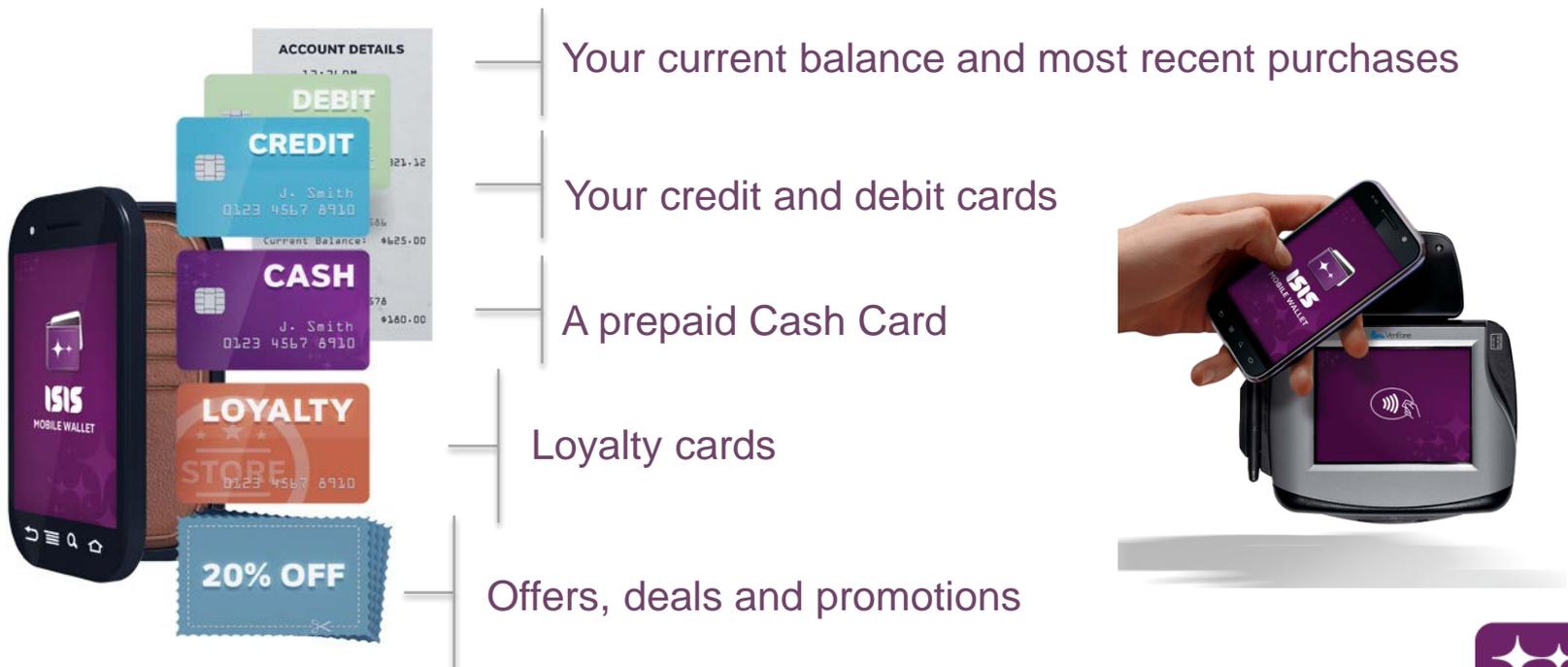


NFC Application Use Cases: Security Perspectives – ISIS Mobile Wallet & Payment

- Tony Sabetti
- Merchant Integration Leader
- Isis Mobile Commerce

What Is an NFC Mobile Wallet?

- Application for Smart Phone
- Holds credentials on Secure Element
- Presentment via Near Field Communications



Anatomy of an NFC Smart Phone

➤ NFC phones contain special hardware

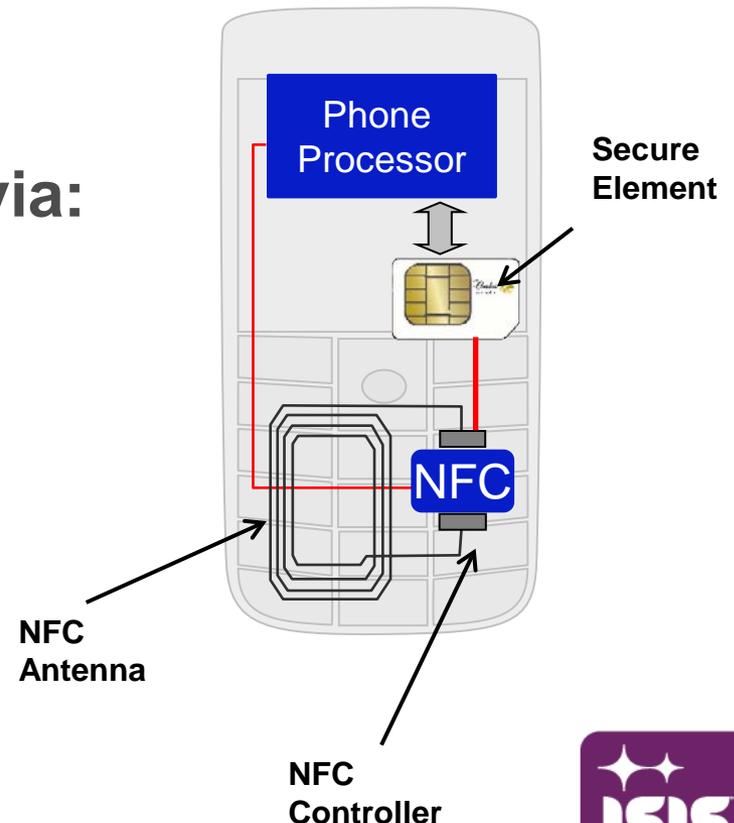
- Secure Element: Stores sensitive data (e.g. payment card information)
- NFC Controller: Manages traffic and RF signals
- NFC Antenna: Collects & transmits the RF

➤ Secure Elements protect data via:

- Encryption keys / Crypto engines
- Secured Communications
- Secured memory

➤ Secure Element Form Factors:

- UICC / SIM Cards
- Embedded
- MicroSD Cards



Secure Element

- **Java Card Operating Platform**
- **Secure memory**
- **Contact and contactless interfaces**
 - ISO7816 and Single Wire Protocol (SWP)
- **Implements Global Platform**
 - Smart card specification that defines card components, command sets, transaction sequences
 - Systems specification that standardizes back end systems for personalization, security, key management and application loading
 - Supports multiple security domains - One bank can have its own separate domain for secure credentials and Java applets

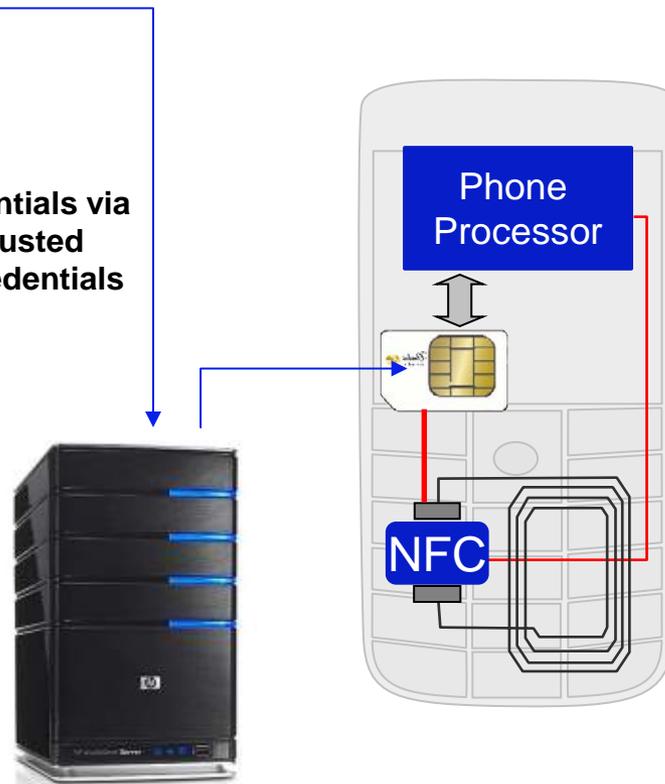
End to End Security



1 Bank sends payment credentials via secure connection to the Trusted Service Manager (TSM). Credentials can be encrypted.

2 TSM uses secure carrier channel used by mobile operator to communicate and transfer credentials directly into the Secure Element (SE) on the UICC (SIM). The credential is never stored in handset memory.

3 SE runs Global Platform and a JavaCard OS. Only the bank has the keys to access its customers' payment credentials in the SE.



4 The Isis wallet running in the handset's host processor does not even know what the payment credentials are. It does provide basic data for display purposes.

5 The credentials are sent through the contactless interface when power is induced by a payment terminal at 4 cm or less distance.

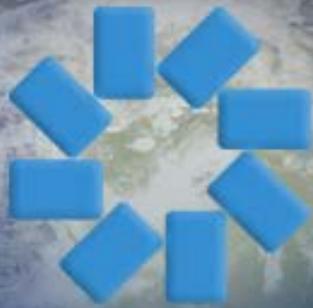


6 All 4 payment networks use Dynamic CVV – CVV is changed for each transaction.

Security - Consumer Experience

- **Wallet PIN** can be set
- **Extremely short distance** between handset and payment terminal making it difficult to “eavesdrop”
- **Dynamic CVV** protects against any replay attacks
- All **sensitive data is stored only on the Secure Element** and not accessible to the app or phone OS
- **One call to freeze** your Isis Mobile Wallet if phone lost or stolen





Smart Card
Alliance



NFC Application Use Cases: Using NFC Devices for Logical Access

- Christian Ali
- Vice President, Product Management
- SecureKey Technologies Inc.

Logical Access Options

NFC enabled devices support strong logical access use cases for:

- Government
- Healthcare
- Banking
- Payments...

Enabled through a trusted device:

- as a reader of external credentials
(various form factors e.g. phone, tablet, laptop, peripheral device)
- as a proxy credential (mobile)



Improved Online Experience

Password

Baseline Security

Password + Intel® IPT

Improved Website Security

Intel® IPT + NFC Sensor

Hardware based multi-factor authentication for sign-up/into

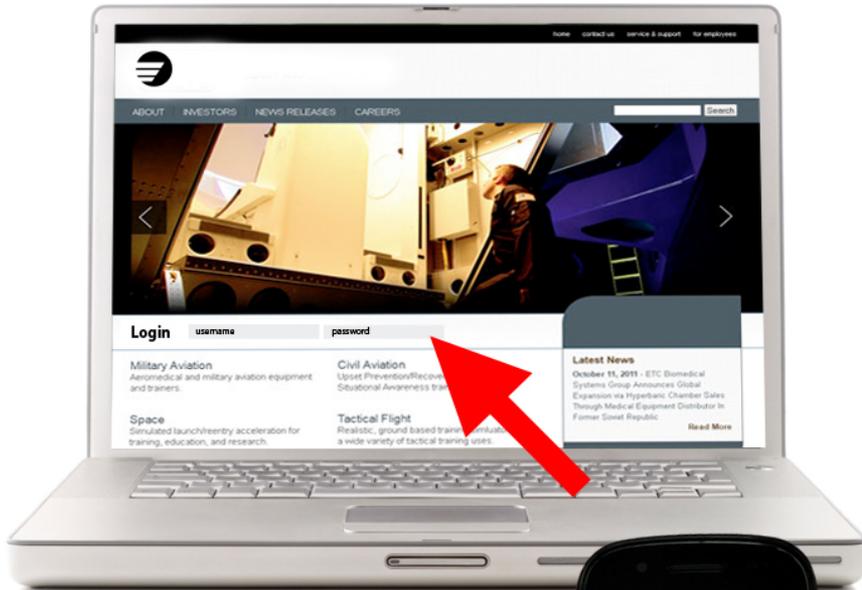
Improved Security + Better Experience

Tap and Pay
Tap to Authenticate

Intel® Identity Protection Technology (Intel® IPT) + NFC

- All Intel Core™ & vPRO™ PC (notebook, desktop, convertible, and tablets) will have IPT features enabled for multi-factor (device) authentication
- OEMs adding NFC capabilities to select SKUs

Proxy Credential in Phone



- Tap card to load credential to verified NFC phone
- Use phone as credential
 - Requires retrieving credential from Secure Element
- Tap NFC enabled phone on NFC enabled device
- Drives a mobile-centric, customer-centric user experience

Access Online Gov't Services



Canada Revenue Agency
Agence du revenu du Canada

Canada



Canada Revenue Agency

Français

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canada.gc.ca

Resource Centre

About Credential Selection

Frequently Asked Questions FAQs

Notifications

Proactive Disclosure

Login Options

To use the online credential that you have with one of the institutions listed below, select the **SecureKey Concierge Login** button.

- BMO Financial
- Scotiabank
- TD Canada Trust

To use your Government of Canada Access Key credential, select the **Access Key Login** button.

If you do not have an Access Key and would like to obtain one, select [Register](#)

[Sign-in Partner Login](#)

OR

[CRA Login](#)

Return to [Service Canada's home page](#) without logging in or registering for MSCA.

[Exit](#)

SECURE **KEY** Concierge

Online Access Made Easy

SIMPLE | CONVENIENT | SECURE

- ✓ It's easy to use
- ✓ We protect your privacy
- ✓ No passwords or personal information (i.e.: name, address, date of birth, etc.) are exchanged during this process
- ✓ Your Sign-In Partner won't know which government service you're accessing and the government won't know which Sign-In Partner you're using

Select Sign-In Partner

By selecting a Sign-In Partner, you are agreeing to the [Terms and Conditions](#) and [Privacy Notice](#) of SecureKey Concierge.



[Switch My Sign-In Partner](#) 

Device as your UserID



MY BANK

Hold the card flat against your computer's built-in card reader

Please tap your card to authorize this device

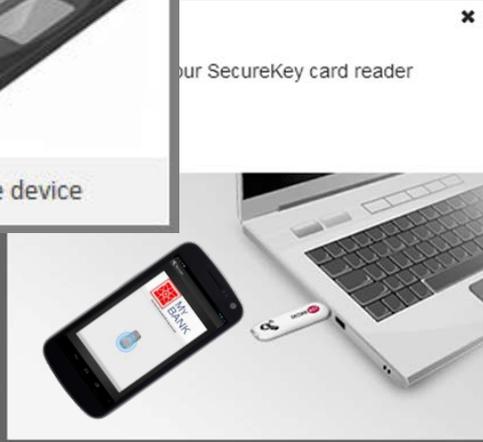
Help

For additional help and contact information, please take a look at [our FAQs](#).



Hold your phone flat against your computer's built-in card reader

Please tap your phone to authorize the device



Hold your SecureKey card reader



Enter your Passcode

[Rates](#) | [Tools](#) | [Site Map](#) | [Contact Us](#)



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Fraud Prevention & Online Security
[Report Suspicious Email](#)
[Take Our Identity Fraud Quiz](#)
[Read Our Online Security Guarantee](#)



Sign in to government services

Present your MyBank card using a SecureKey-enabled card reader.

Enter your MyBank password.

[Forgot Password](#)

Help

For additional help and contact information, please take a look at [our FAQs](#).



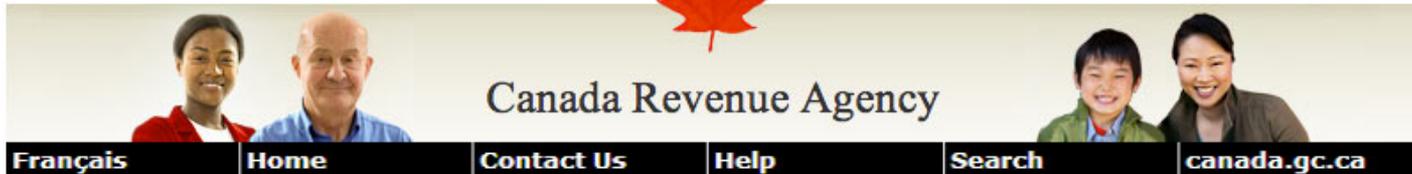
Intel® Identity Protection Technology

Your Intel® inspired Ultrabook™ provides additional security.

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Access Granted



Canada Revenue Agency

Français Home Contact Us Help Search canada.gc.ca

Logout

Welcome page

Tax returns

Accounts and
payments

Benefits and
credits

RRSP and
savings plans

Personal
information

My Account

Quick links

- [Change my return](#)
- [Change my address](#)
- [Apply for child benefits](#)
- [Arrange my direct deposit](#)
- [Authorize my representative](#)
- [Set-up my pre-authorized payment plan](#)
- [Register my formal dispute](#)

Welcome, JOHN SMITH

Important information

- Your 2011 return was assessed and a refund of \$9,901.49 was mailed to you on May 17, 2012.
[Summary of 2011 assessment](#)
- [NETFILE access code](#)
- View your [T4 and other tax slip information](#).

Security Options

- ▶ [Manage my security options](#)

Related links

- ▶ [Terms and Conditions of use](#)
- ▶ [My Account survey](#)

Secure Healthcare Applications

Identity Validation :

1 Patient Taps Card or Phone

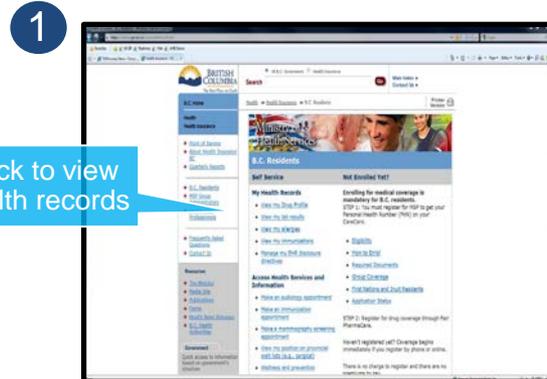


2 Checks Credential is Valid

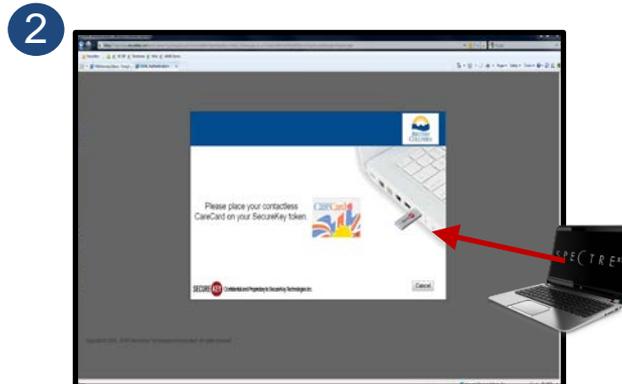


Provides Digitally Signed Photo to Authenticate

On-line Services :



Government Health Portal



Prompt Patient to Tap Card or Phone Device is already verified

3 Done! Patient Access To Personal Health Records



Secure Healthcare Applications



A screenshot of the British Columbia Health Services website. The page is titled "Drug Profile" and shows a welcome message for Ian Bailey. It lists "Medications Recently Prescribed (Last 6)" with an entry for "ramipril - 5MG" (1 capsule daily with bkfst., Prescribed by Dr. Turner on 11/6/2009). The website header includes a search bar, navigation links, and the British Columbia logo. A hand is holding a smartphone in the foreground, displaying a "SECURE KEY" authentication screen with a timer and a smart card icon. A sample British Columbia Health Services card is also visible in the background.

- Allows for citizen access to health information when coupled with strong authentication
- Allows for healthcare provider access to records with citizen consent





Secure Banking Applications

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Welcome: Evie Sun
Last Log In: Dec 03 2012 3:41 P.M. EST

[Change Password](#) | [Contact Details](#)

[logout](#)

[My Account](#) | [My Transfers](#) | [My Bill Payment](#) | [My Credit Cards](#) | [My Loans](#) | [My Funds](#)

Current/Savings Accounts

My Account

New Mail : 5

[View & Download Statements](#)

[View Account Balance](#)

[View Cheque Status](#)

[Transfer Funds](#)

Request

[Request](#)

[Account Statement](#)

[Demand Draft](#)

[Cheque Book](#)

[Stop Payment of Cheque](#)

[TDS Inquiry](#)

[Hold Inquiry](#)

Last Log In: Dec 03 2012 3:41 P.M. EST

Account	A/C Number	Available Balance	Mini Statement
Checking	123-456001	\$9800.00	View
Savings	345-456004	\$9000.00	View
Tax A/C	134-456011	\$3000.00	View
Investment	544-900190	\$1200.00	View
Total		\$23,000.00	

Note:

The Available Balance displayed includes the credit balance and overdraft limit (if any) in your account. It excludes unclear Funds and Amounts marked for Holds.

Savings account customers can now receive their statements monthly, by email, free. To register - [Click Here!!](#)

Register for your bills online. [Click here](#) to know more.



Transfer Funds

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Current/Savings Accounts

Transfer Funds

New Mail : 5

[View & Download Statements](#)
[View Account Balance](#)
[View Cheque Status](#)
[Transfer Funds](#)

Request

[Request](#)
[Account Statement](#)
[Demand Draft](#)
[Cheque Book](#)
[Stop Payment of Cheque](#)
[TDS Inquiry](#)
[Hold Inquiry](#)

From Account:
Account Number:
Description:
Amount \$: Example : 5000.00

Total Available Balance: \$9,800

I accept the [Terms & Conditions](#) of this transaction.

OK

CANCEL

Note:
Please ensure that the beneficiary account is correct.
For further information and charges, [click here](#).





Confirm Txn Online

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Welcome: Evie Sun
Last Log In: Dec 03 2012 3:41 P.M. EST

[Change Password](#) | [Contact Details](#)

[logout](#)

[My Account](#) | [My Transfers](#) | [My Bill Payment](#) | [My Credit Cards](#) | [My Loans](#) | [My Funds](#)

Current/Savings Accounts

[View & Download Statements](#)
[View Account Balance](#)
[View Cheque Status](#)
[Transfer Funds](#)

Request

[Request](#)
[Account Statement](#)
[Demand Draft](#)
[Cheque Book](#)
[Stop Payment of Cheque](#)
[TDS Inquiry](#)
[Hold Inquiry](#)



Confirm Fund Transfer

New Mail : 5

From Account: Checking 123-456001
Account Number: Investment 544-900190
Description: Stock purchase
Amount \$: 5000

Total Available Balance: \$9,800

[Cancel](#)

[Confirm](#)

Note:
For security purposes, transactions over \$500 require additional confirmation.





Multi-Factor with NFC

The screenshot shows the My Bank website interface. At the top, there are navigation links: "Download MobileBanking", "Insta Alerts", "SMS Banking Registration", "Contact Us", and "Help". Below this, a user is logged in as "Evie Sun" with a "logout" button. The main navigation bar includes "Credit Cards", "My Loans", and "My Funds". A "New Mail : 5" notification is visible. Two instructional pop-ups are overlaid on the page:

- Pop-up 1:** "MY BANK" logo, "Hold the card flat against your computer's built-in card reader". It shows an image of a credit card being held against a laptop's built-in reader.
- Pop-up 2:** "MY BANK" logo, "Hold your phone flat against your computer's built-in card reader". It shows an image of a smartphone being held against a laptop's built-in reader.

At the bottom of the page, there is a "What's New" section with a red arrow pointing to the right, containing the text "Fly Free Faster. Introducing the MyBank Travel Card".





Transfer Complete

[Download MobileBanking](#) | [Insta Alerts](#) | [SMS Banking Registration](#) | [Contact Us](#) | [Help](#)



Welcome: Evie Sun
Last Log In: Dec 03 2012 3:41 P.M. EST

[Change Password](#) | [Contact Details](#)

[Logout](#)

[My Account](#) | [My Transfers](#) | [My Bill Payment](#) | [My Credit Cards](#) | [My Loans](#) | [My Funds](#)

Current/Savings Accounts

Transaction Completed

New Mail : 5

- [View & Download Statements](#)
- [View Account Balance](#)
- [View Cheque Status](#)
- [Transfer Funds](#)

The funds have been successfully transferred.
The Reference Number: **MB-893943**

Request

- [Request](#)
- [Account Statement](#)
- [Demand Draft](#)
- [Cheque Book](#)
- [Stop Payment of Cheque](#)
- [TDS Inquiry](#)
- [Hold Inquiry](#)





Securely Extend Online Services

My BANK

Banking Credit Cards Lending Investing Business Rewards & Offers Services

Enjoy a New Level of Security for Online Banking...

click here to learn more

My Health Care

- Need A Doctor?
- Find Health Care
- Know Your Health Care Options
- Manage Diabetes
- Child Care

What's New Fly Free Faster, Intro

Tools & Calculator

- MySavings Rewards
- Car Loans
- Home Loan
- Health Insurance
- Life Insurance
- Financial Planning

Apply Or

- Loans - C
- Get instan
- Internet B
- Accounts -
- Deposits -
- Money Ma

MyGov

HOME ABOUT MY GOVERNMENT RESOURCE CENTER TOPICS SERVICES DEPARTMENTS FAQ'S

Community Business Visitors Kids & Teens Form & Publications Press Release Calendar

Minister Simon Walder Pre-Budget Roundtable in Burlington

An Immigration System that Works for Cordova

Statement by the Prime Minister of Cordova on the Christmas season

Official Dedication of Diamond Jubilee Park

Welcome to MyGov Online Portal

"We provide secure and easy access to all your government services today!"

Use your SecureKey token, IPT ultrabook or mobile device, with your MyGov Access Card to securely access government services.

Login

Latest News

Dec 18, 2012
The Honourable Simon Walder, Minister of Finance, today took part in a pre-budget...

Dec 17, 2012
The Honourable Simon Walder, Minister of Finance, today took part in a pre-budget...

Dec 16, 2012
The Honourable Simon Walder, Minister of Finance, today took part in a pre-budget...

MOST REQUESTED

- Online City Tax eFile
- City Holiday Schedule
- Recreation
- Maps
- Watch Online
- Building Permit Guide
- Accident Reports
- Commercial Waste Services
- Missing Persons Report
- Vendor Self Service

MasterPass

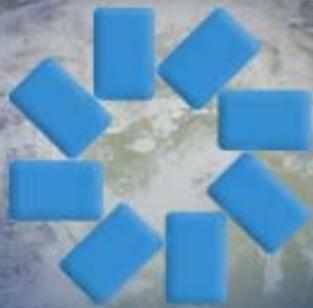
CHOOSE YOUR WALLET VERIFY YOUR ID CONFIRM DETAILS

Tap Your NFC Reader Now

Simply tap your PayPass-enabled card or NFC-enabled mobile device on your computer's Near Field Communication (NFC) reader and your card information will be added for you.

waiting for tap...

Cancel



Smart Card
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NFC Forum Tag Use Cases and Security

- Jonathan Main
- NFC Forum Technical Committee, MasterCard

NFC Security

- **NFC is a secure technology**
 - Security standards are in place
 - Solutions providers and manufacturers can easily add application-appropriate security features
 - Many highly-effective mitigation measures available for tags

NFC Enables 3 Different Actions

Card in a Phone

Moves payment, event or ticketing information into a mobile phone

Store and redeem with a touch.

Get information back at the same time(coupons, receipts, warranties, loyalty points, etc)



Reading Tags

Enables mobile phones to read inexpensive tags that hold pertinent information

Examples include product comparisons, coupons, health care instructions, transit timetables



Making Connections

Enables devices to communicate with one another just by touching

Examples include connecting laptops and printers. sharing photos between a camera and TV, simple set up of Bluetooth and WiFi



Advertising

Tap the movie poster to see a film trailer and/or buy a theatre ticket



Source: Blue Bite

Ensuring Advertising Security

➤ Potential vulnerability

- Tag information changed to direct user to a different (possibly malicious) web address

➤ Mitigations

- Lock the tag – prevent overwriting
- Physical controls to prevent replacement of the tag – e.g. display poster behind glass

Retail

- In Aug. 2012, a top 5 consumer packaged food and beverage company piloted a shelf-talker with an embedded NFC tag
- Shoppers tapped their phones to access recipes, download an app or share on Facebook
- 36% of shoppers who tapped took an action
- Engagement with NFC was 12 times higher than QR codes
- Engagement time increased from 5 sec. to 48 sec.



Source: Mobile Commerce Daily

Retail

- A major Australian supermarket chain
- Tap your phone to the smart poster and receive:
 - Free recipes from a celebrity chef
 - Cookbook videos

Download a FREE
Coles & Curtis video
recipe right here.



The smart poster features a central smartphone displaying a video of a chef cooking. To the left is a circular logo with a fork and knife that says "feed your family". To the right is a "VIDEO COOKBOOK with Curtis Stone" tag. Below the phone, a man in a blue shirt stands with his arms crossed. To the right of the phone are instructions for downloading the recipe via NFC and WiFi, accompanied by icons for NFC, iPhone, and WiFi. At the bottom right, it says "More Video Cookbook recipes at coles.com.au".

feed your family

VIDEO COOKBOOK with Curtis Stone

FREE download:
Tap your NFC enabled mobile phone on this logo to connect to Coles.

FREE iPhone download:
Activate your WiFi. Select Coles WiFi. Open your internet browser to any URL and refresh to connect with the Coles Video Cookbook.

More Video Cookbook recipes at coles.com.au

Quality food costs less | coles

Source: NFC World

Ensuring Retail Security

➤ **Potential vulnerabilities**

- Modification of information
- Redirection to malicious web site

➤ **Mitigations**

- Lock tags – prevent overwriting
- Design displays to prevent physical replacement of tags
- Sign tags – provide integrity of information using NFC Forum Signature RTD
- Mobile app may verify information source

Health Care

- Tags on prescription jars
- Provides usage/dosage information for consumers



Ensuring Health Care Security

➤ **Potential vulnerability**

- Modification of prescription information

➤ **Mitigations**

- Lock tags – prevent overwriting
- Digitally sign tags using Signature RTD
- Use an app to read tag information and verify signature and information source
- Include (and check) patient identification information – prevent swapping of valid tags

NFC and Active Packaging

Commercial Uses

- Package tracking
- Content identification
- Temperature exposure log
- Authentication



Source: Kovio

Ensuring Active Packaging Security

➤ Potential vulnerabilities

- Modification of data
- Moving tag to another bottle

➤ Mitigations

- Active tags allow security at application level
- Include digital signatures on tag using Signature RTD
- Use tamper-evident labels with tags

NFC Tag Security Landscape

Vulnerability	Attack	Mitigation	Note
Data modification e.g. smart poster	Replace tag with another i.e. phishing attack	NFC Forum Signature RTD - Data integrity	Adds no cost to the tag
Eavesdropping e.g. medical history	Listen from a distance	Encrypt the tag contents or password protected URL	Adds no cost to the-tag - Tag could have an encryption engine (cost)
Data corruption/replace ment e.g. any tag	Destroy the tag i.e. denial of service	Physical protection	Tag replacement can be detected using web analytics
Man in the middle e.g.. ticketing	Intercept and modify data without parties knowing	Secure challenge-response and/or encryption engine	Tag must have a crypto engine e.g. ticketing



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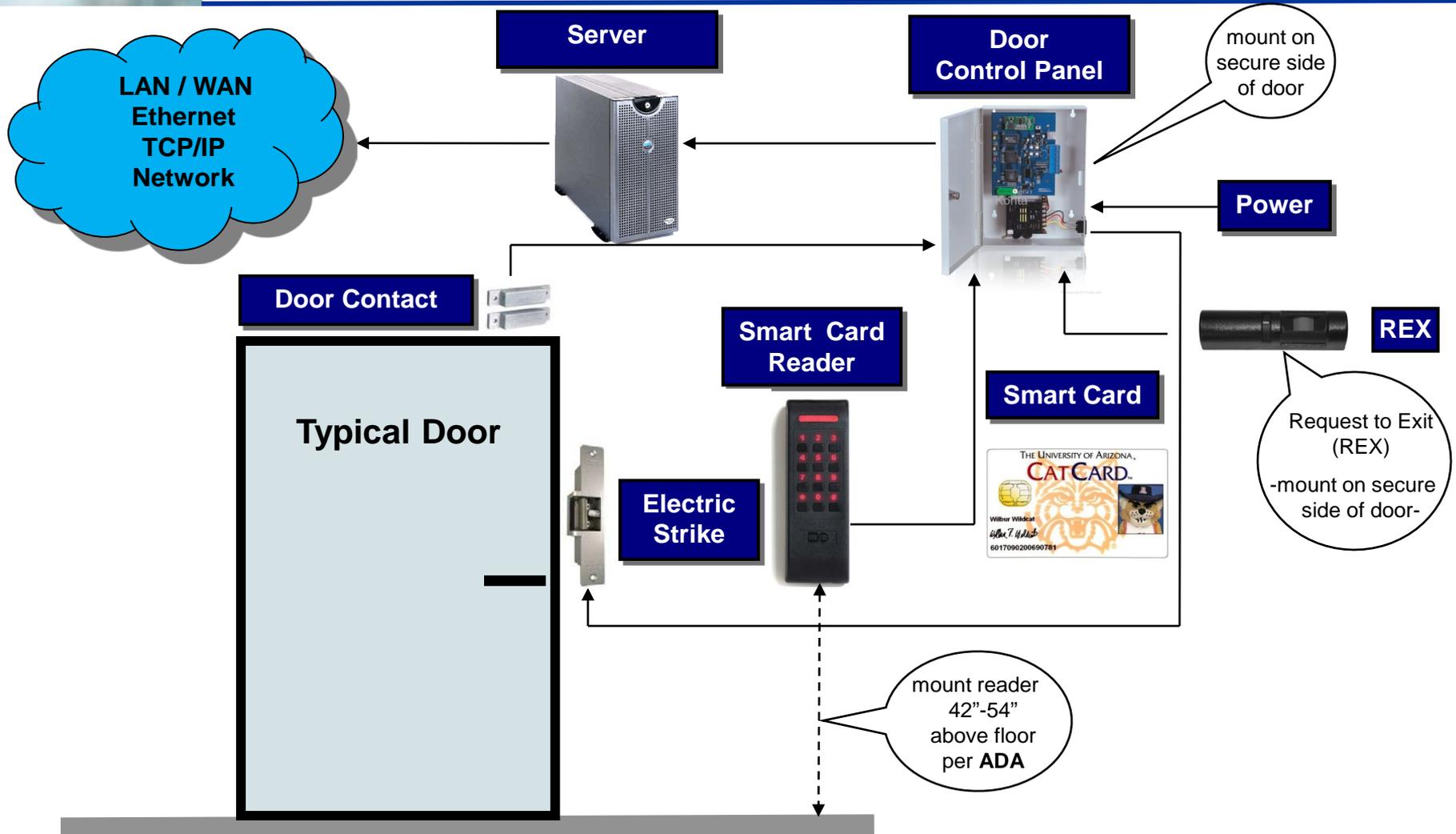


NFC Application Use Case: Physical Access Control (PACS)

- Steve Rogers, CSCIP
- President
- IQ Devices

Traditional PACS Controlled Door

Includes Reader, Controller, Locking and Exit Devices



Traditional PACS Components

Traditional PACS Credential

ISO14443 Smart Card – Student ID

- Small, Rugged, Reliable
- Familiar, Easy-to-Carry Form Factor
- Identity & Identifiers Stored Securely
- High Resistance to Use by Non-Owner
- High Resistance to Alteration, Forgery, Duplication (Authenticators)
- Inexpensive, Well Standardized
- No Battery or Internal Power Requirement
- Easily Lost or Stolen



Secure NFC Credential

NFC Technology in Smart Phones, Offers New Possibilities:

- Interoperability With ISO14443 Standards-Based Credentials
- Secure Elements, UICC, SAM, TEE Support Access Rules
- Keyboard, PIN & Biometric Verification, Screen, Power, Enable Strong Binding
- Users Control Release of Information, Specific Access Privileges & Authorization, Rules for Each Function
- Reader & Credential Communication Security, Strong Authentication
- OTA Provisioning, Just-in-Time Credentials (e.g. Visitors)
- Access Cloud Identity Infrastructure

NFC Smart Phone Security

- Device Integrity Self Check, App and Hardware Image
- Isolation of Stored Data
- Protected Storage and De-Provisioning
- OTA SAM Management
- If Smart Phone Lost or Stolen:
 - Issue Temp Key to Alternate
 - Wipe Phone
 - Remove PACS Privilege





NFC PACS Pilot Details

November 2011 - Present



Phase 1

- 30 Students & 12 Staff
- 6 dorms, office, etc.

Phase 2

- Over 100 students and staff
- 2 major residence halls 80 AD Locks
 - 4 people per room, 201 residents
- Ecosystem expanded substantially
 - Vending, Point of Sale, Laundry, PACS

Phase 1

- Access Control & Laundry
- 12 main doors, 3 elevators w/ floor control

Phase 2

- Explore alternate student demographics & feedback
- Executive MBA graduate students at Branch Campus

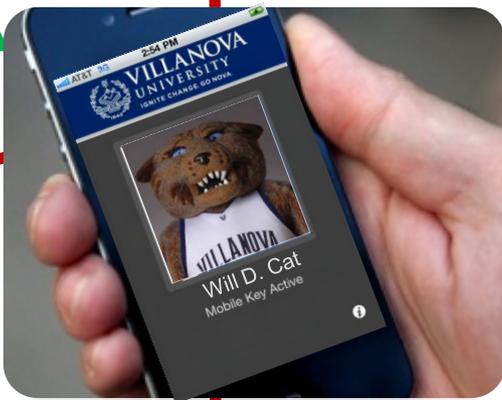


NFC PACS Pilots




Physical Access

Use your phone as your key!




Laundry



Vending Machines



Bookstores



College meal programs

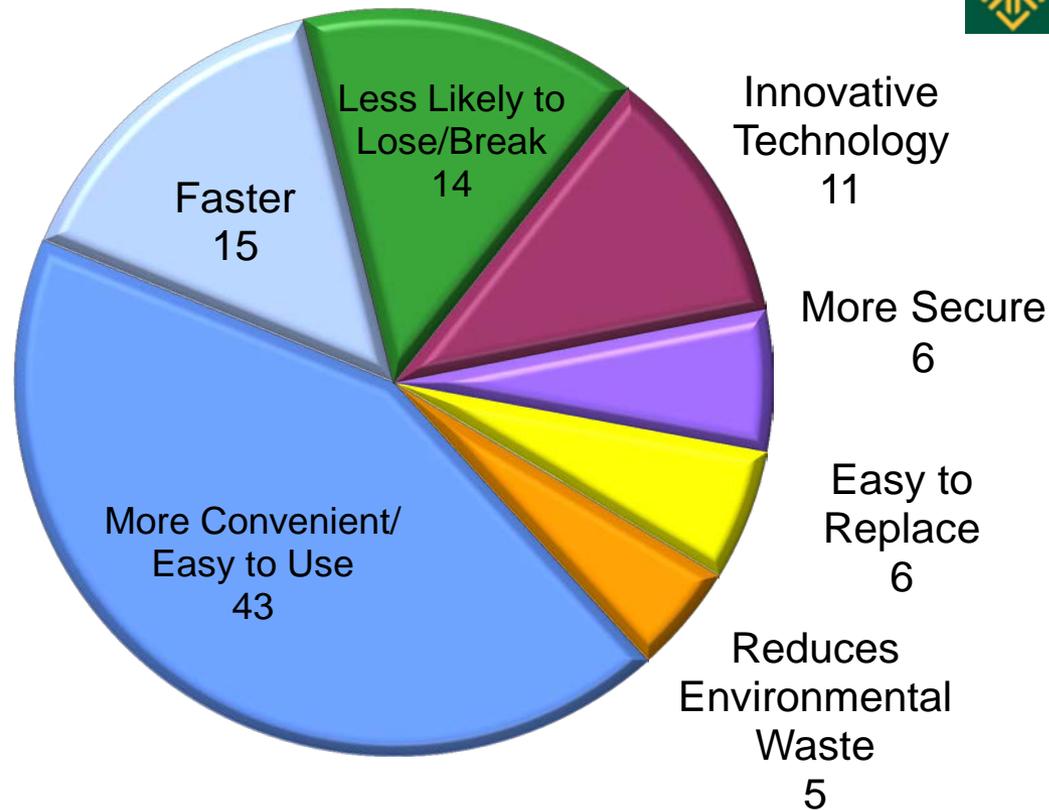


Campus Pilot Results

- 70%-80% = Student Physical Keys & Student Access Cards Lost or Stolen
- 91% of Students Said Ease-of-Use or Convenience Was The Best Part of NFC.
- Over 70% Preferred Using Smart Phone to Enter Buildings Over Using Their Student ID (Smart Card).
- 100% of Students Surveyed Would Be Interested in Owning NFC Technology Built Into Their Own Smart Phone...BYOD



Relative Importance of Benefits



Student Survey Data

Convenience Security

- A “Frictionless” Solution Requires the Balance of Convenience & Security

- Convenience:
 - Always On - Tap and Go
 - Activation Key - Shortcut
 - No Battery = No Problem - Inductive

- Security:
 - PIN or BIO to activate SE
 - Smart Phone Challenge the Reader
 - Mutual Authentication Support



Overwhelming Student Benefit

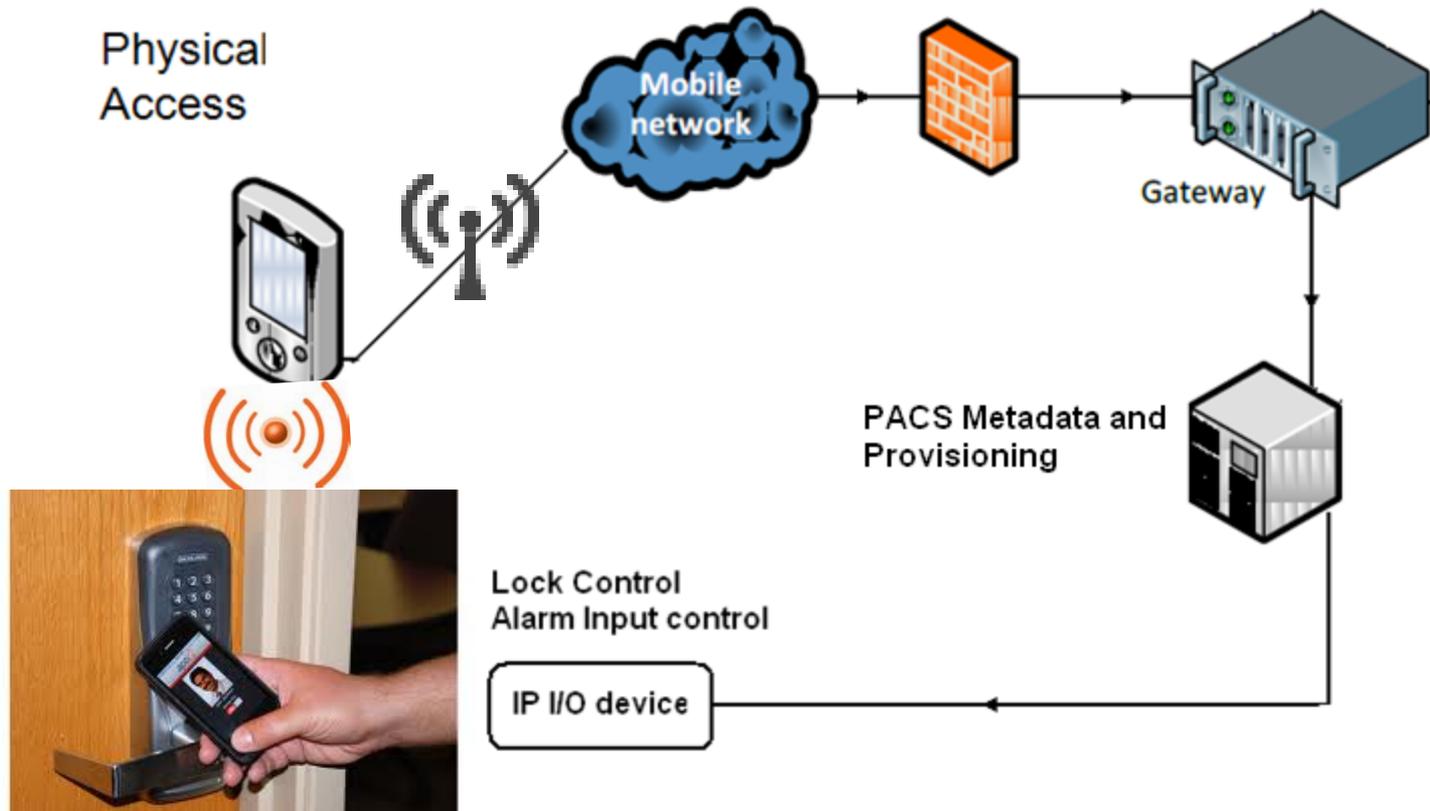
➤ *Most common student quote:*

- *“I sometimes forget my keys, my ID, my watch, my wallet...”*

but I NEVER forget my phone”



NFC Revolutionize PACS Topology?

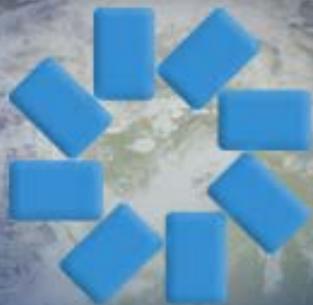




NFC Industry Trends & Growth Drivers

- NFC-based mobile transactions are expected to reach nearly \$50 billion worldwide by 2014.
 - *Juniper Research*

- Expected 46% of all mobile smart phones will be NFC enabled by 2016.
 - *Market Research*



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Questions & Answers





Mobile & NFC Security Webinar Series Recordings

Mobile & NFC Webinar Series Recordings

- **Anatomy of a Mobile Device: Security Architecture and Secure Provisioning**
- **Mobile/NFC Security Fundamentals: Secure Elements 101**
- **Mobile/NFC Security Fundamentals : NFC Forum Tags and Security Considerations**
- **Mobile/NFC Security Fundamentals : NFC Application Use Cases – Security Perspectives**

Available at:

- **<http://www.smartcardalliance.org/pages/activities-events-mobile-nfc-security-fundamentals>**



NFC Solutions Summit 2013



NFC SOLUTIONS SUMMIT 2013



SMART SECURE MOBILE PAYMENTS AND NON-FINANCIAL NFC APPS

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