Strong Authentication for Physical Access using Mobile Devices

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Mapping the Future of Identity Management

Electrosoft

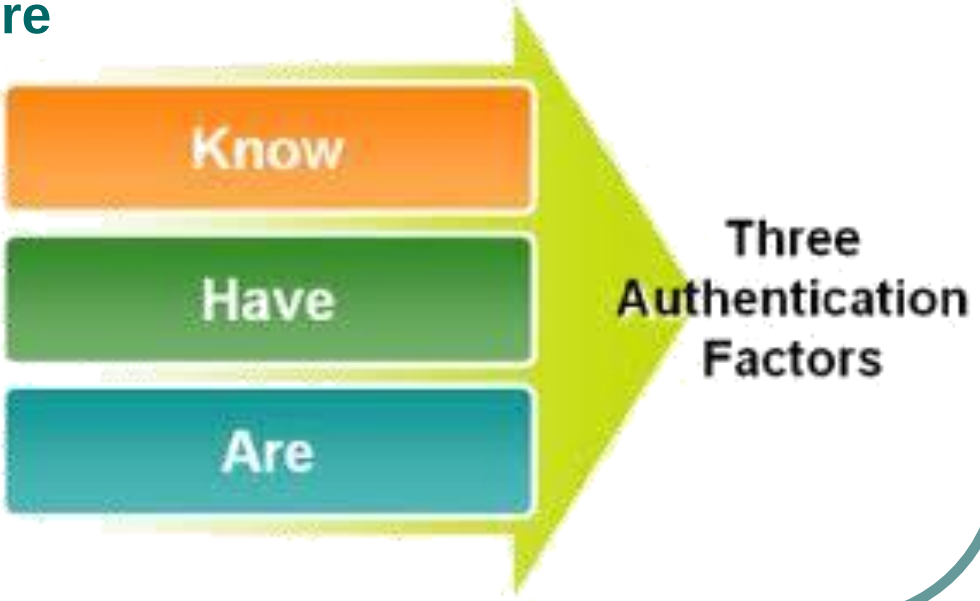
Managing Cyber Security Risk through Innovation and Engineering

Agenda

- Establishing Context
- Need for Strong Authentication for Physical Access
- Mobile Device Capabilities
- Authentication using Mobile Devices
- Strengths and Weaknesses
- Applicability
- Wrap-Up

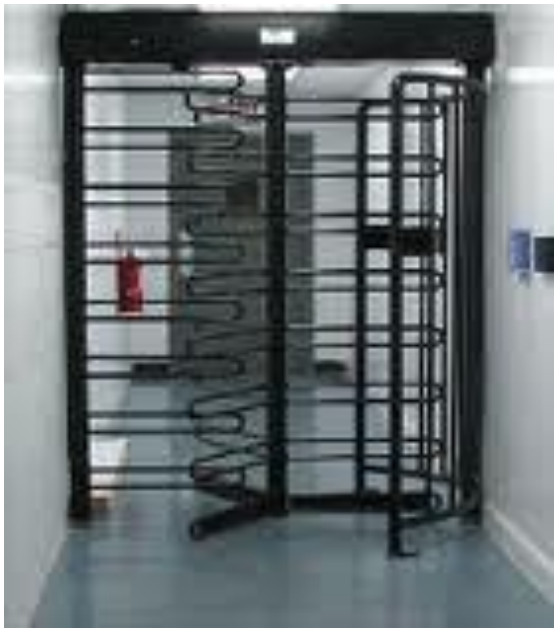
Establishing Context (I)

- **Strong Authentication**
  - **Identifying an individual through 2 or more factors of authentication:**
    - **Something you Know**
    - **Something you Have**
    - **Something you Are**



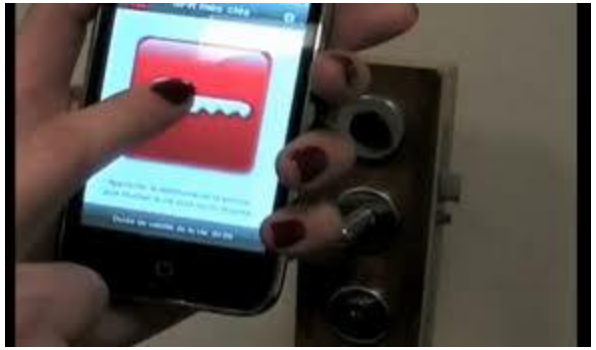
Establishing Context (II)

- **Physical Access**
  - **Entry into a controlled physical space such as a Government Facility or Lab**



Establishing Context (III)

- **Mobile Devices**
  - **Cell Phones, Smart Phones, PDAs, etc.**



Determining the Need for Strong Authentication

- **Guidance/Policy on Protection of Physical Facilities**
  - **MCO 5530.14A – Marine Corps Physical Security Program Manual**
  - **DoD 5100.76-M – Physical Security of Sensitive Conventional Arms, Ammunition, and Explosives**
  - **ISC Facility Security Level (FSL) Determinations for Physical Facilities**
  - **NIST 800-116 – A Recommendation for the Use of PIV Credentials in Physical Access Control Systems (PACS)**

ISC Facility Security Level (FSL) Determination

- **Interagency Security Committee (ISC)**
- **Standard for determining "Facility Security Level (FSL)" of a Federal facility based on:**
  - **Mission Criticality; Symbolism; Facility Population; Facility Size; Threat to Tenant Agencies**
- **FSL determines security protections needed**
- **However, *no guidance on authentication mechanisms* to be used at each FSL**

NIST SP 800-116

- **A Recommendation for Use of PIV Credentials in Physical Access Control Systems (PACS)**
- **Defines types of Security Areas based on Army Field Manual 3-19.30, *Physical Security (*2001)**
- ***Assigns Authentication Factors required for each type of Security Area***

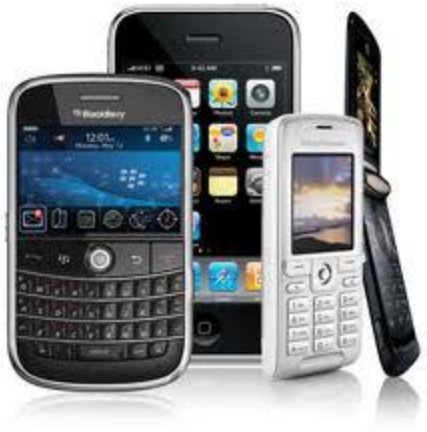
Security Areas	Basis for Authentication	# Authentication Factors Reqd.
Controlled	Proof of Affiliation	1
Limited	Functional Roles	2
Exclusion	Individual Authorization	3

Government Position on Personal Mobile Devices

- **Obama Executive Order (Nov 2011)**
  - **"limit the number of information technology devices (e.g. cell phones, smartphones, tablets, laptops) that can be issued to individual employees"**
  - ***IMPLICATION → Employee personal mobile devices to be utilized when possible***
- **"BYOD" Phenomenon**
  - **Most Agencies crafting "bring your own device" policy**
- **DoD developing "no nonsense policy" on use of mobile devices**

Mobile Device Capabilities

- Telephone
- SMS (Short Message Service)
- Email
- Web Access
- Secure Storage
  - User Identifier, Crypto Keys, PKI certs, Other …
- One Time Passwords (OTP)
- Cryptographic Functions
  - Symmetric, Asymmetric
- NFC (Near Field Communications)



One Time Password (OTP)

- **Random Authentication Code**
  - **Valid for only one logon session / transaction**
  - **Has a short time to live**
  - **Resistant to "Replay Attacks"**
  - **Frequently more complex than passwords humans can memorize**
- **Both Server and Client may need to be synchronized**
  - **Time synchronization**
  - **Counter Synchronization**
  - **Chaining of previous passwords**
  - **Challenge-Response**

OTP on Mobile Devices

- **Delivered (from Server) to mobile device**
  - **Voice call**
  - **SMS**
  - **Email**
- **Generated locally on mobile device**
  - **Mobile device application (App)**
    - **App initialized to synchronize with Server**
  - **May require user to enter a PIN**
    - **Second Factor of Authentication**

Near Field Communications (NFC)

- **Wireless communication protocol built into late model mobile devices**
  - **Range typically 2 - 4 cm**
  - **Data stored locally in Secured Element (SE)**
    - **Embedded secure element, secure micro SD cards**
- **Communication Modes**
  - **Passive – Initiator device provides power to target device**
  - **Active – Both Initiator and Target devices need own power**
- **Used for:**
  - **Contactless payments**
  - **Ticketing**
  - **Holder Authentication**
  - **Sharing data between mobile devices**
  - **Other …**

NFC for Mobile Device Authentication

- **Data in SE can be accessed by:**
  - **Software Applet on the phone**
  - **Single Wire Protocol (SWP)**
    - **Enables communication with partnered device (Card reader, other phone …)**
    - **Allows access without power to the host phone**
  - **Device can be configured to grant or restrict access to individual SE applets from the SWP**
- **NFC allows mobile device to act as a contactless smart card**

Strong Authentication with Mobile Devices

- **Possible Schemes:**
  - **Delivered-OTP + User Password**
  - **Generated-OTP using User PIN**
  - **User Data Read + Visible Match**
  - **Cryptographic Challenge Response**

Delivered-OTP + User Password

- **One Time Password (OTP) delivered to mobile device**
  - **On User request to Server**
  - **Delivered via Phone, SMS, or Email**
- **At Physical Entry Point, User enters:**
  - **OTP received**
  - **User's static password**
    -
- **Notes:**
  - **Requires device to be charged**
  - **Requires cellular or data connection**
  - **Easy to use; Inexpensive**
  - **Delays due to OTP request and delivery time**

Generated-OTP using User PIN

- **OTP generated on mobile device**
  - **Using App on device**
  - **Requires User to enter PIN on device**
- **At Physical Entry Point:**
  - **User enters OTP generated, OR**
  - **OTP communicated to reader via NFC**
- **Notes:**
  - **Requires device to be charged**
  - **Does not require cellular or data connection**
  - **Easy to use; Inexpensive**
  - **Very fast**

User Data Read + Visible Match

- **Assumes presence of Guard**
- **At physical entry point, device presented to Guard**
  - **Guard device reads User Data from device using NFC**
  - **Guard's Device displays User Data (e.g. Facial Image)**
  - **Guard matches device holder face to displayed image**

- **Notes:**
  - **Does not require device to be charged**
  - **Does not require cellular or data connection**
  - **Easy to use; Inexpensive**
  - **Delays due to integrity check of User data read**

Cryptographic Challenge Response with User PIN

- **Assumes presence of contactless card reader**
- **At physical entry point :**
  - **User holds device close to card reader**
  - **User required to enter PIN on device**
  - **Card reader conducts cryptographic challenge-response with mobile device via NFC**
  - **Symmetric or Asymmetric (PKI) based schemes possible**
- **Notes:**
  - **Does not require device to be charged**
  - **Does not require cellular or data connection**
  - **Easy to use; Inexpensive**
  - **Delays due to cryptographic operations**

Mobile Devices as Authentication "Tokens" – Pros and Cons

- **Strengths**
  - **Lower cost "token" since widely deployed**
  - **Fewer "tokens" for User to track and manage**
  - **Higher security through fewer cases of "forgotten card"**
  - **Device may be "wiped clean" remotely if lost**
- **Weaknesses**
  - **Risk of hacking through "Trojan Horse" Apps**
  - **User authentication data represents high value target for theft**
  - **NFC interface (if present) poses significant risk from "skimming" attacks**

Applicability

- **Individuals with PIV, CAC or other smart cards**
  - **Credentials transferred to mobile device**
- **Visitors or Short-Term Workers**
  - **Visitor mobile phones registered during "enrollment" process**

Wrap-Up

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