Digital Identity

Identity, Security, and Data Provenance

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IARIA

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Abstract

- Digital Identity is an abiding problem
- Data-Centric Protection:
  - Can augment conventional AAA
  - Can provide context-sensitive policy
  - Is compatible with Zero-Trust Architectures
  - Can provide Digital Identity

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Professional Experience

- Co-Director, Connected Infrastructure Initiative (CIEDAR), Texas State University
- Professor, Ingram School of Engineering, Texas State University (2008 – Present)
- Director, Ingram School of Engineering, Texas State University (2013 – 2018)
- CTO & co-Founder, Power Tagging Technologies (2008-2010)
- Chief Architect – Systems & Solutions, ZNYX Networks (2006 – 2008)
- Technical Director & Distinguished Technologist, Hewlett Packard (2000 – 2006)

Publications & Activities

- Smart Cities in Application: Healthcare, Policy, and Innovation. Springer. 2019
- Smart Cities: Applications, Technologies, Standards and Driving Factors. Springer, 2017.
- The Smart Grid as an Application Development Platform. Artech House, 2017.
- “Smart City Applications,” IEEE GreenTech 2018, Apr. 2018.
- “The Smart Grid as an Application Deployment Platform,” IEEE GLOBECOM, 2014.
- “Cyber Security & Threat Management for the Smart Grid,” IEEE ICC, June 2012.
- “Security & Network Management in the Smart Grid,” 4th IEEE Computer & Communication Workshop (CCW), Oct. 2010.

Basic Agenda

- Background
  - Classical AAA
  - Contemporary Approaches
- Problems
  - High Profile
  - Constant Failure
- (re)Definition
  - Phases & Principles
  - Use Cases & Comparison
- Possible Outcome
  - Protected Data
  - Zero-Trust Architecture

Classical Authentication

- What I <u>know</u>
  - Password, Challenge/Response, etc.
- What I <u>have</u>
  - Access Card, USB Dongle, etc.
- What I <u>am</u>
  - Fingerprint, Retina Scan, etc.

Classical AAA

- Authentication
  - Are you who you say you are?
  - Exercises “Know / Have / Am” of classical authentication
- Authorization
  - Should you have access to this data?
  - Typically via access control lists (ACL) and user databases
- Accounting
  - Access for how long, and in what fashion?
  - Most often used for billing purposes and audit trails

Approaches: Technologies

- Network-based
  - TACACS/+
  - RADIUS (RFC-2865 et.al.)
  - DIAMETER (RFC-6733, et.al.),
- Person-based
  - Self-Sovereign Identity (SSI)
  - Decentralized Identifiers (DID)
  - e.g. EU “ESSIF” per eIDAS

- Application-based
  - SSL/TLS (RFC-8446): encryption
  - OAuth2: constrained delegation of access to applications
  - UMA: user-managed access, extensions of OAuth
  - FIDO2 (WebAuthn, CTAP2.x): client-to-authenticator protocol
  - OpenID/FAPI: decentralized attestation

Approaches: Companies

Large Companies

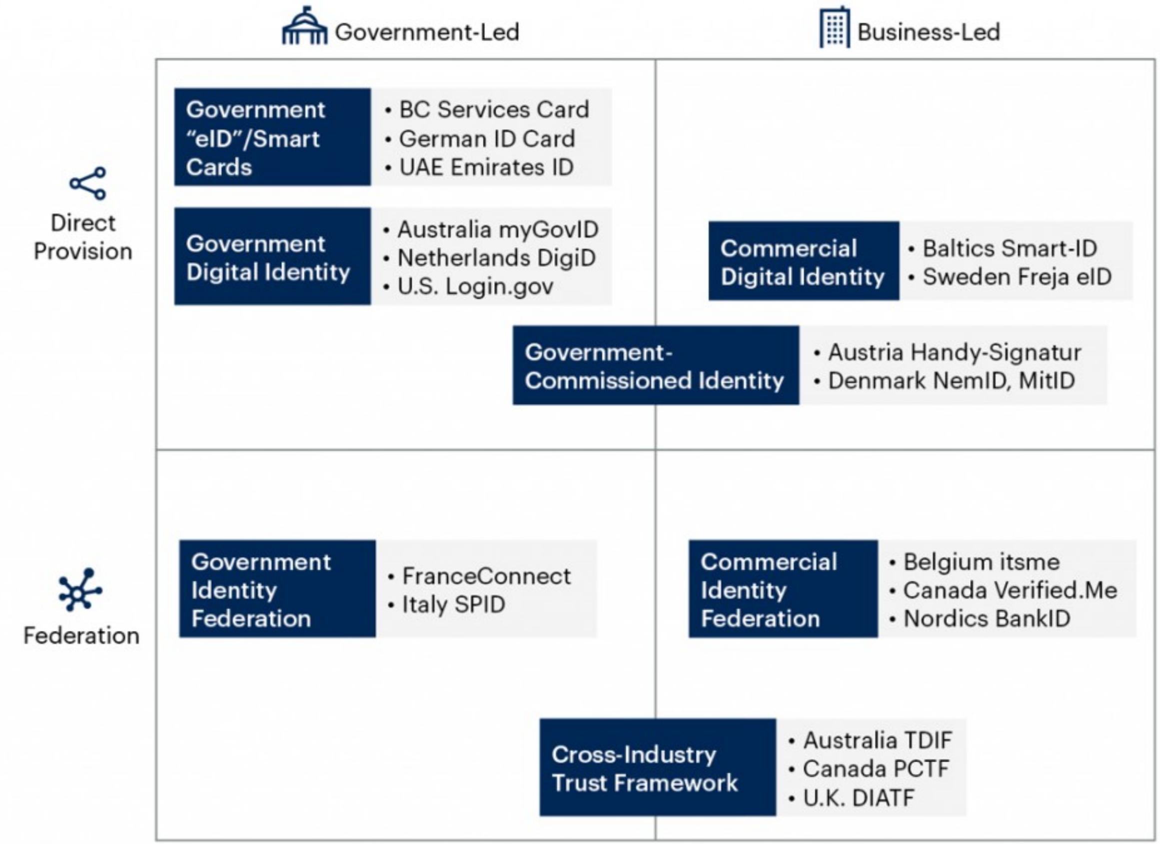
- Okta (https://www.okta.com)
- IBM (https://www.ibm.com/in-en/blockchain/identity)
- Thales Group (https://www.thalesgroup.com/en/markets/digital-identity-and-security)
- Docusign (https://www.docusign.com/products/identify)
- Teradata (https://www.teradata.com/Solutions/Digital-Identity-Management)

Small Companies

- ImageWare (https://imageware.io)
- Mitek (https://www.miteksystems.com)
- Vouched (https://www.vouched.id)
- Trulioo (https://www.trulioo.com)
- iComply (https://icomplyis.com)
- InCode (https://info.incode.com)
- TeleSign (https://www.telesign.com)

There are a bunch of them … The market is crowded and growing

Approaches: Governments



- By 2023, at least 80% of government services that require citizen authentication will support access through multiple digital identity providers.
- By 2024, at least a third of national governments and half of U.S. states will offer citizens mobile-based identity wallets.
- Only a minority will be interoperable across sectors and jurisdictions.

This is a problem

Source: Gartner 760929_C

Defining a "Digital Identity"

- Bundle of identifying attributes and data
  - Discrete, secure, self-contained, extensible ("atomic")
- Authentication + Authorization
  - Uniquely identifies the entity to which it belongs
- Portable
  - Can be sent to insecure location via insecure network

<u>*Not*</u> Digital Identity

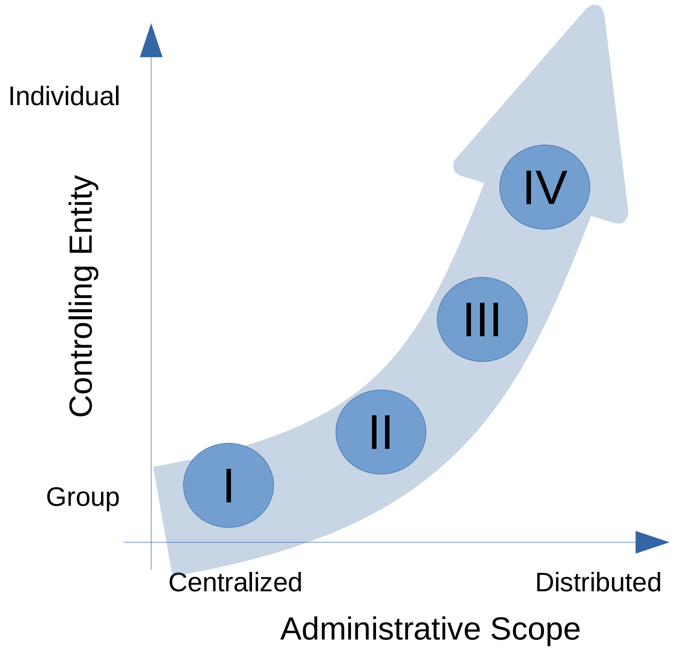
- National/Civil Identity
  - Passport, Driver License, Social Security, etc.
- Online Identity
  - Breadcrumbs, purchase history, public information, etc.
- Computer Identity
  - Usernames, passwords, encryption keys, etc.
- Encryption (!)

Digital ID vs. Encryption

	Function	Encryption	Digital ID
General	Support multiple algorithms (e.g. AES-128)	Y	Y
	Support multiple keys per user or instance	Y	Y
	Partial decryption / partial disclosure	N	Y
Detection	Interval (dates, times)	N	Y
	Locations (geo, network, system)	N	Y
	Attempt tracking (number, lockout)	Y	Y
Countermeasure	Notification (of owner – email, text, etc.)	N	Y
	Escalate (new & stricter challenges, etc.)	N	Y
	Self-Destruct	N	Y

Phases of Identity (C.Allen)

- Centralized (unitary)
  - Single administrative authority
- Federated (multi-central / oligarchy)
  - Multiple administrative authorities, federated
- User-Centric (multi-central / individual)
  - Multiple administrative authorities, federated
- Self-Sovereign (non-central)
  - Individual control regardless of authorities



Ten Principles of Identity (C.Allen)

1. Exist Independently
2. User Control
3. Self-Owned Data
4. System Transparency
5. Persistence
6. Transportable
7. Widely Used
8. User Consent
9. Minimal Disclosure
10. Protection of Rights

EcoSystem is Mandatory

- Creation
  - Created and owned by the entity identified
  - More than one ID per entity (many to one)
  - Identifying data provided at creation (schema)
  - Requires secure, validated “writer” to ingest data, create bundle
- Usage
  - Network needed to share and for some countermeasures
  - May require centralized management (ala PKI?)
  - Requires secure, validated “reader” to ingest bundle, validate access

  Must be cross-sector and cross-jurisdiction, and linked to valuable use-cases

Blockchain is not Identity

- Myths
  - Use Blockchain as a database to store personally identifying information (PII)
  - Use Blockchain as a distributed hash table (DHT) for PII data that is stored off-chain
- Reality
  - Blockchain is transparent, immutable, reliable and auditable
  - It can be used in the secure exchange of cryptographic keys … e.g. *PKI* not *PII*
  - This may be a step toward decentralized public key infrastructure (PKI) which can lead to management of PII

High Profile, High Cost

- April 2021
  - UN Data Breach
    - Fraudulent credentials allow access to sensitive data
    - https://solutionsreview.com/identity-management/un-data-breach-expert-commentary-on-a-high-profile-attack/
- January 2022
  - Okta Identity Management compromised by Lapsus$
    - 2.5% of customers data “may have been viewed or acted upon”
    - https://www.wired.com/story/okta-hack-customers-lapsus-breach/
  - Tesla cars compromised by German researcher
    - Bug in open source logging tool exposed cars directly to the internet
    - https://techcrunch.com/2022/01/24/teslamate-bug-teslas-exposed-remote/
- July 2022
  - MICODUS GPS Tracker compromised by Bitsight
    - Exploit tracks and remotely manipulates “at least a million vehicles”
    - https://techcrunch.com/2022/07/19/micodus-gps-tracker-exposing-vehicle-locations

- [T]raditional protections just aren’t working …
- [T]he solution is actually quite simple: Protect the data itself

Key: Zero Trust Architecture

- Everything is a resource. All resources can present a threat.
- All communication is secured, regardless of location.
- Access to a resource is on a per-person basis, with minimal privilege granted.
- Access policies are dynamic, and based on telemetry.
- All assets are monitored. No asset is inherently trusted.
- Authentication and authorization are enforced per-resource, requiring identity, credential, access, and asset management.
- Telemetry of access requests and asset state is used for continual improvement

(per NIST SP 800-207)

Use Case: Supply Chain

- Problem
  - Layered security model doesn't work
  - Boundary, Network, System, File … easily exploited
- Approach
  - ***Data-Centric Protection***
  - Augments the layered enterprise security model
  - Built-in policy-based tracking and protection

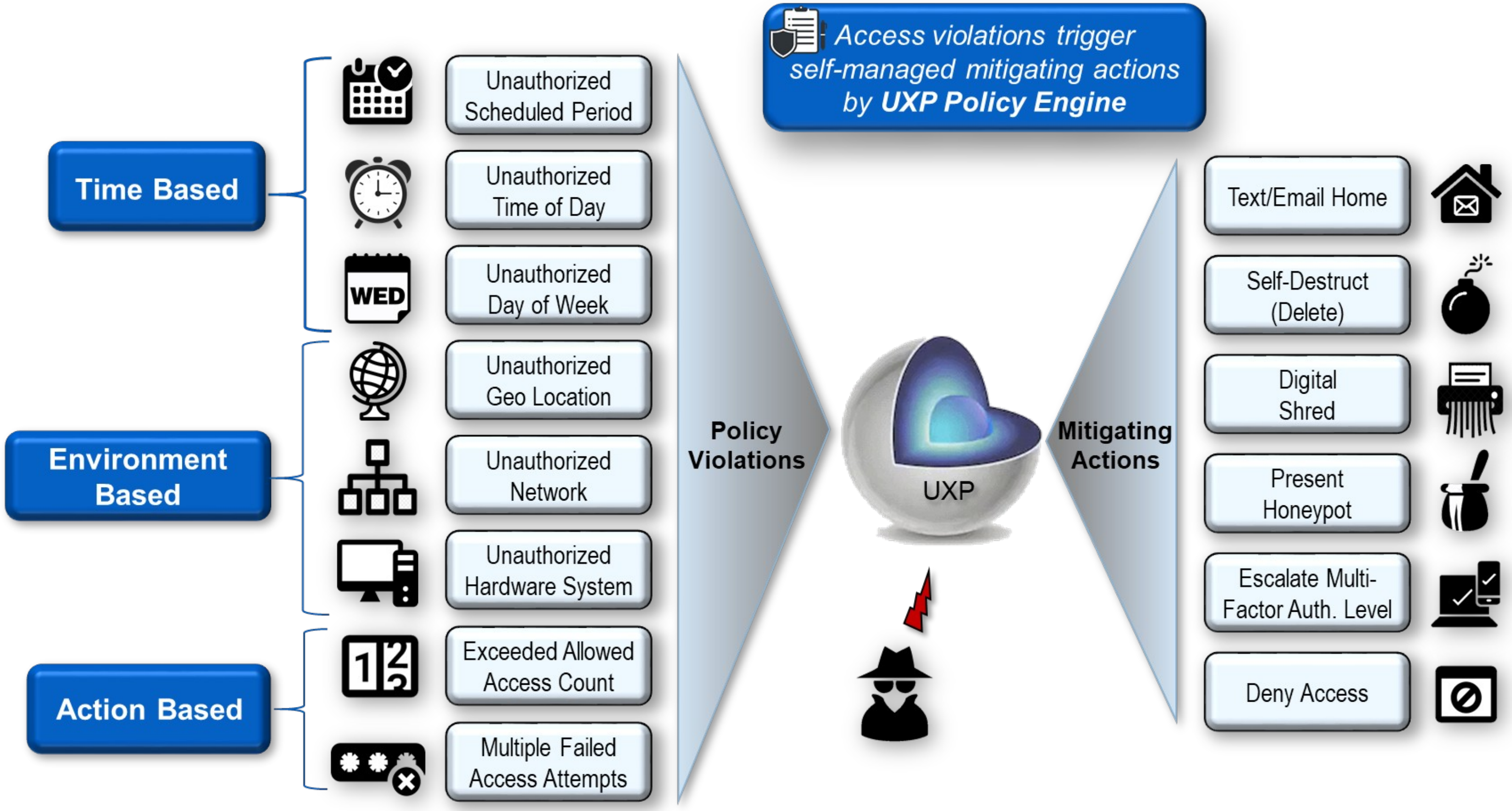
- Results
  - Intelligent data self-enforces protection policies
  - Self-destruct, invoke different access procedures, call-home, honeypot, etc.

Use-Case: IT/OT Convergence

- Problem
  - Endpoints are small, remote, with limited CPU and memory
  - Battery-powered devices conserve energy by “sleeping”
  - Data may transit unknown networks from insecure locations
- Approach
  - ***Secure the data at the source before transmission***
  - Track the data when it is received and utilized via enclosed policies

- Result
  - Independence from incompetent device manufacturers
  - Independence from insecure intervening networks and paths
  - Policy-driven visibility for all activities, states, and locations *of the data itself*

Intelligent Data



Data-Centric Protection

- Adheres to:
  - Principles of Zero-Trust Architecture
  - Conventional AAA principles
- Is not:
  - BlockChain, but can be co-implemented
  - Encryption, but depends on it
- Provides:
  - Use-Case-Aware security
  - Context-sensitive policy
- Implements:
  - Digital Identity

Thank You!

- Useful References

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