# Identity Systems

Jim Fenton

"Defining identity is like nailing Jell-O® to the wall."

**– Source Uncertain**

Flickr photo by stevendepolo

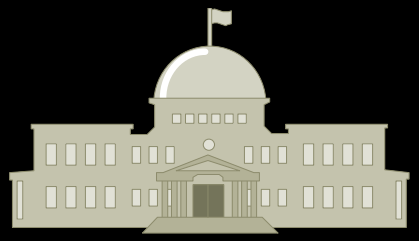
# Terminology

- Subject
  - The person (usually) whose identity is involved
  - Sometimes called the User
- Relying Party
  - The entity the Subject is interacting with
  - Sometimes called the Service Provider
- Attribute
  - A piece of information about the Subject
  - Sometimes called a Claim

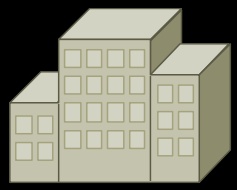
# A Basic Identity System

Identity Provider

Authentication Request



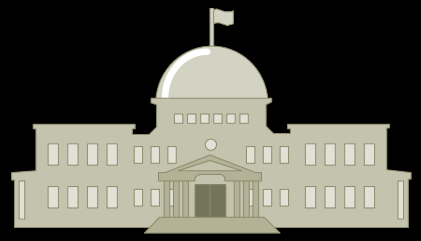
Government



Commerce

Social Media

# A Basic Identity System

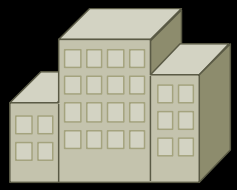


Government

User Authentication

Identity Provider

User Credentials



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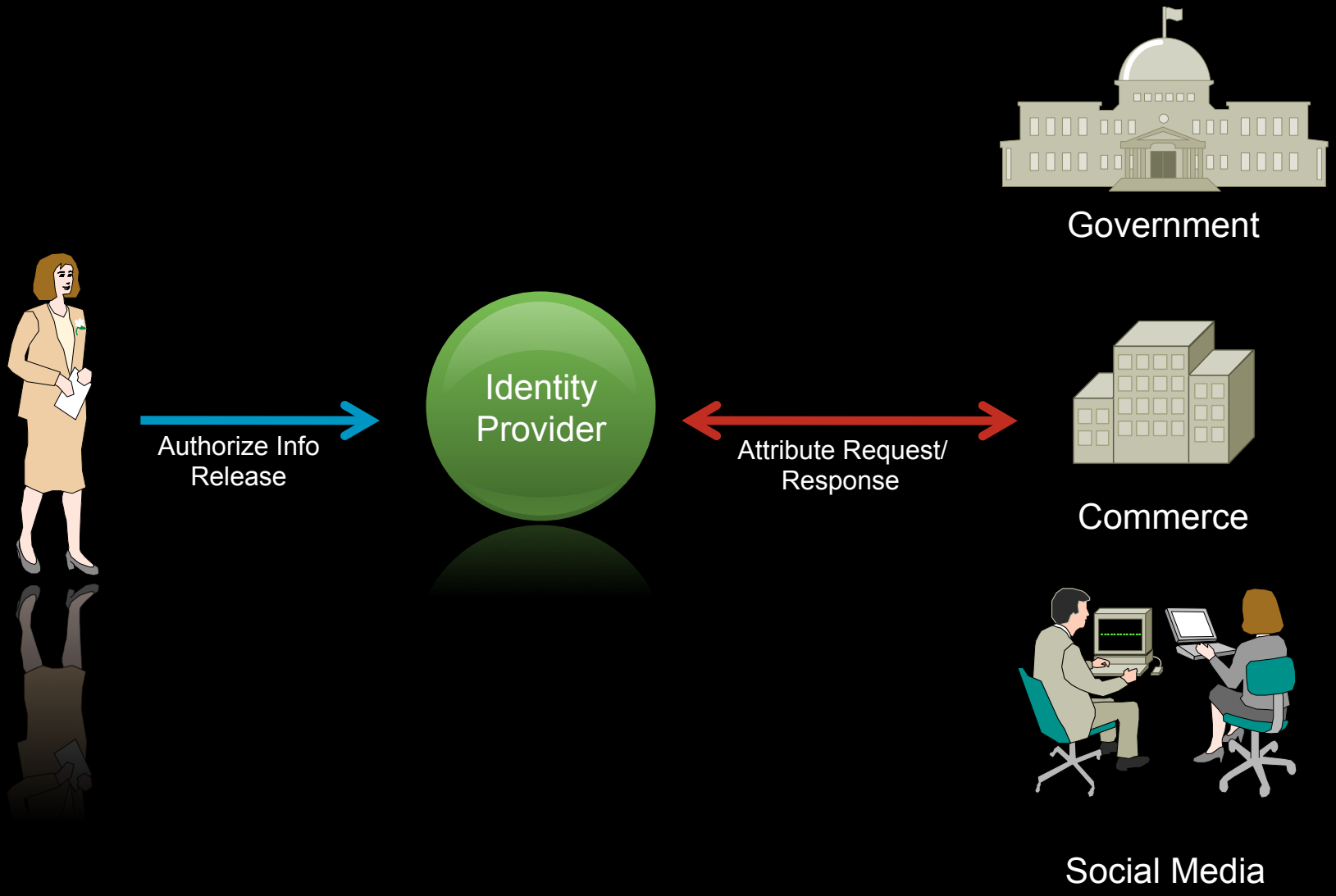
# A Basic Identity System



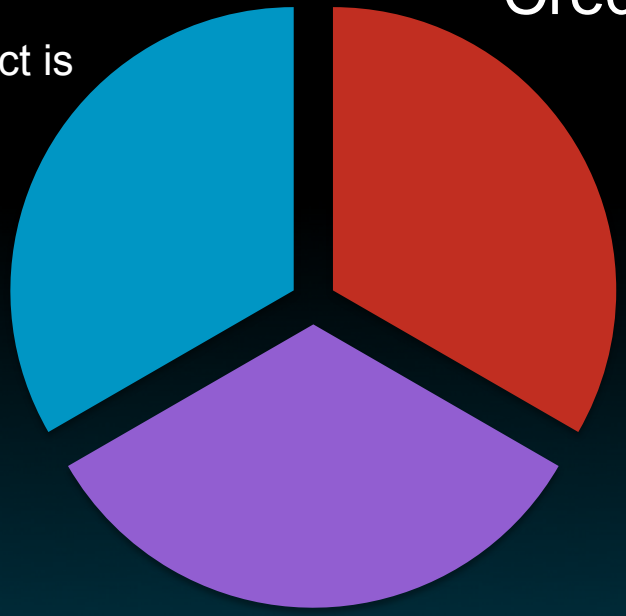
# Elements of Identity Management

## Authentication

Establish who the Subject is

## Credential Management

Prove to Relying Parties
who the Subject is



## Attribute Management

Provide information about
the Subject

# User Trust

- User trust in their Identity Provider is fundamental
  - Not all users trust any one entity
  - Most likely to trust entities they do business with and strong, trusted brands
  - Different trusted entities in different cultures
- An ecosystem of identity providers is required
  - Users need to choose their own identity provider
  - Need to consider ability to migrate to a different provider if required

# Authentication

Flickr photo by shannonpatrick17

# Authentication Methods

- Methods useful for user authentication are situation-specific
  - Type of endpoint being used
  - Required authentication strength (transaction value, etc.)
- Problem: Many existing identity systems are bound tightly to specific authentication methods

# Authentication Strength

- Authentication strength should depend on transaction value
  - iTunes purchase (99 cents) vs. vehicle purchase
- NIST Special Pub 800-63 defines 4 levels:
  - Level 1: Minimal challenge/response
  - Level 2: Single-factor identity proofing
  - Level 3: Multi-factor identity proofing
  - Level 4: Hardened multi-factor
- Relying party specifies the required strength to the identity management system

# Authentication Endpoint Diversity

- The Web is pervasive, but not *everything* is a browser
- Examples
  - Vending Machines
  - Set-top boxes
  - Doors (physical security)
- Modular approaches to authentication needed to consider a wide range of use cases

# Security Opportunities

- Users that authenticate frequently at a given service are more likely to detect anomalies
  - More likely to be suspicious about, for example, lack of a certificate
  - Browsers can be configured to specially flag “chosen” identity providers
- Identity providers can detect anomalous user behavior
  - Similar to detection of fraudulent credit card transactions
  - Business/policy framework should encourage this

# Credential Management

# Credential Management: Functions

- Act as a “key cabinet” for the user
  - Each relying party has its own credentials
- Support Directed Identity
  - Prevent undesired release of correlation handles
  - Identifiers to Relying Parties are opaque by default
- Enforce secure use of credentials
  - Require use of secure channel (e.g., SSL)

# Directed Identity

- It should not necessarily be possible for different Relying Parties to correlate identifiers
  - Insurance company vs. supermarket account
  - Pseudonymous identifiers for tip hotlines
- Users may still choose to link relying parties' identifiers
- Attributes may also provide correlation handles
- Credential manager can be subpoenaed if appropriate

# Security and Availability Issues

- Security
  - The credential store is a very high-value target
  - Credentials can be distributed to diffuse attack
  - High-level physical security is also required
- Availability
  - Failure of an Identity Manager may have severe impact on its Subjects
  - Solvable problem, but needs to be addressed

# Attribute Management

# Distributed Attributes

- Self-asserted attributes have limited utility
- Authoritative sources for different attributes come from different places
  - FICO scores from a credit bureau
  - Driving record from state Motor Vehicle Department
  - Proof of employment from employer
- Identity system has a role in locating trustable sources of attributes
- Attributes delivered as signed assertions

# Attribute Distribution: Example

Healthcare Provider

Authorization Request

Identity Provider

Birthdate Request

Wine Merchant

Motor Vehicle Department

# Attribute Distribution: Example

Healthcare Provider

Release Authorization

Identity Provider

Trust Negotiation

Wine Merchant

Motor Vehicle Department

# Attribute Distribution: Example

Healthcare Provider

Identity Provider

Birthdate Request

Wine Merchant

Motor Vehicle Department

# Attribute Distribution: Example

Healthcare Provider

Identity Provider

4 July 1976 –DMV

Wine Merchant

Motor Vehicle Department

# Attribute Trust

- Federation: Prearranged trust relationships
  - Personnel Security Clearances among Federal agencies
  - Business partners
- Accreditation: Indirect federation
  - Financial institutions, schools
  - Scales much better than direct federation

# Identity Provider Trust

- Identity Provider has a fiduciary responsibility
- To the Subject:
  - Must use credentials only for the proper Subject
- To Relying Parties:
  - Must associate attribute requests and responses reliably
- Identity Provider may coincidentally function as an Attribute Provider
  - Functions should be considered separate to maintain privacy

# Summary

# Observations

- Scaling is critical
  - Technical (protocol) aspects of scaling are a solved problem
  - Scaling of trust relationships is the real limitation
- Chosen technologies need to consider a very wide range of use cases
- An ecosystem of identity and attribute providers is needed
  - Need business models for these functions
  - Public policy should encourage constructive behavior and help these entities manage liability exposure

# Questions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