Identity Ecosystem Use Cases

AN IDESG STANDARDS COMMITTEE DELIVERABLE

ABSTRACT

This document contains a set of use cases adopted by the IDESG to guide its work and for use by IDESG committees and stakeholders to inform their work efforts.

Table of Contents

1. Introduction

1.1 Scope

This document contains a set of Use Cases adopted by the Identity Ecosystem Steering Group (IDESG) intended to guide the many activities of the IDESG in its mission to cultivate and enhance the identity ecosystem and its underlying framework.

1.2 Purpose

The purpose of the IDESG Use Cases is multifaceted, but is primarily to inform and facilitate the work of the IDESG as a whole, by providing context for this work. In particular, the IDESG Use Cases are meant to:

- Frame the IDESG's initial objectives and scope of work
- Provide a basis for the development of IDESG work products
- Drive consensus among IDESG plenary members about the characteristics of the ecosystem and identity ecosystem framework they are trying to bring into existence
- Provide a method for the elicitation and capture the requirements of the various NSTIC constituencies
- Make more concrete the application of the NSTIC guiding principles in terms of real-world scenarios
- Serve as a test target against which IDESG work products can be evaluated
- Serve as a guide for the collective efforts of the IDESG, to maintain a common focus and alignment

These use cases are meant to describe digital identity problems to be solved and not to constrain solutions to these problems.

1.3 Definition

Use Cases are scenarios representing mission or stakeholder goals – a methodology used in system analysis to identify, clarify, and organize system requirements. The use case is made up of a set of possible sequences of interactions between systems and users in a particular environment and related to a particular goal.

According to "Writing Effective Use Cases", by Alistair Cockburn, a Use Case is explained as follows:

"A use case captures a contract between the stakeholders of a system about its behavior. The use case describes the system's behavior under various conditions as it responds to a request from one of the stakeholders, called the primary actor. The primary actor initiates an interaction with the system to accomplish some goal. The system responds, protecting the interests of all the stakeholders. Different sequences of behavior, or scenarios, can unfold, depending on the particular requests made and conditions surrounding the requests. The use case collects together those different scenarios."

1.4 History

Since the inception of the IDESG in August 2012, a need has been identified for a set of use cases to reflect the desired functionality and capabilities of the identity ecosystem. The Standards Coordinating Committee (SCC) was given the responsibility to facilitate this, as a collaborative effort across the IDESG. To this end, the SCC sponsored the IDESG Use Case Ad Hoc Group (UCAHG) in the Fall of 2012 with a mission to gather use cases from IDESG members, review them for consistency and quality, present them to IDESG committees for comment, and recommend them to the SCC as candidates for adoption. A Use Case Wiki was set up and we began the collecting use cases from interested contributors in early 2013.

In Spring 2013, as part of the IDESG plenary meeting, a Use Case Workshop was held, with the goal of advancing the use case development activity, increasing IDESG involvement, and preparing for 2013 use case deliverables. At this workshop, a representative set of contributed use cases were analyzed by different functional group breakouts – privacy, security, standards, user experience, and economic inclusion (roughly mapping to the NSTIC Guiding Principles). The primary feedback from the workshop was that the Use Cases need to be less implementation/technology specific.

2. Use Case Process

Development of Use Cases within the IDESG is meant to be a collaborative process, involving all of the various committees, stakeholders and individuals comprising the organization. The SCC acts as the steward of this process and the UCAHG as the working group which operationalizes the process. Participation in the UCAHG is open to both IDESG members and non-members and has actively solicited representation from all IDESG committees.

2.1 Use Case Life Cycle

The Use Case process is embodied within the adopted Use Case Life Cycle (UCLC) as shown in Figure 1.

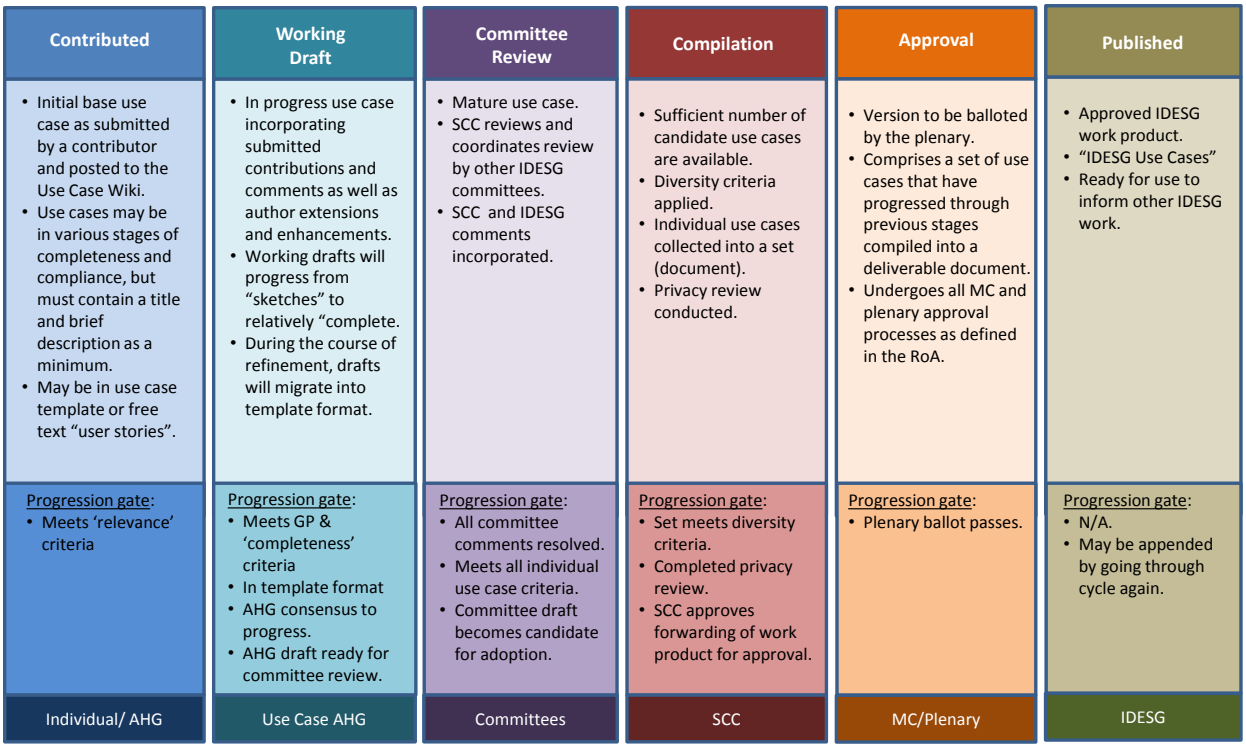


Figure 1. Use Case Life Cycle

To be published within this *IDESG Use Cases* document (last step, publication), a use case will have gone through the previous 5 steps as indicated – from initial contribution through IDESG Plenary approval.

The Use Case process is iterative. After initial publication, additional sets of use cases are expected to be added to the document through a revision process. That is, additional sets having traversed the life cycle will be added to the document and the revised document

submitted for Plenary approval. Additionally, existing use cases may be updated during the revision process as well.

The UCAHG maintains a queue of upcoming use cases for review, and accepts nominations from the Standards committee as input to that queue. The UCAHG will notify the Standards committee when the queue is short so that the Standards committee may call for nominations of additional use cases for review.

2.2 Use Case Wiki

IDESG Use Cases are collected and managed through the IDESG Use Case Wiki: https://www.idecosystem.org/wiki/Use_Cases. The Use Case Wiki contains all contributed use cases in various stages of processing, with their current status indicated. Each Use Case includes a discussion page for the collection of comments on that Use Case.

2.3 Use Case Criteria

To progress through the UCLC, criteria are applied to the use case, or set of use cases, at various points. These criteria comprise the following:

Individual Use Case Criteria

- ***Relevance***
  - Related to and supportive of the goals of the identity ecosystem
  - If "solved" would advance adoption of the identity ecosystem
- ***Completeness***
  - Provide information that can be mapped to items of the template
- ***Level***
  - Functional level (not implementation specific)
- ***Guiding Principles***
  - How they address the 4 NSTIC guiding principles*

Criteria for Use Case Sets

- ***Diversity***
  - As a set, cover a good-cross section of populations and functionality
  - Include edge cases; underserved communities
  - Address high, medium, and low risk scenarios
  - Focus on both the adoption of existing solutions as well as the creation of new capabilities
  - Address the perspectives of all participants – RPs, IDPs, and end-users
  - Address the range of identity life cycle functionality.

*NOTE: In the spirit of the Cockburn explanation, the goal of the UCAHG has been to ensure that Use Cases in general capture and maintain the guiding principles of NSTIC in supporting solutions which are privacy-enhancing and voluntary, secure and resilient, interoperable, cost-effective and easy to use.

2.4 Use Case Level

After much discussion about the appropriate level of implementation specific details to allow in the final use case, it was decided to follow the example of the OASIS Identity in the Cloud Use Cases. That is, implementation specific use cases have been allowed when they are clearly identified as such.

If a use case is too abstract, it provides little "meat" for analysis or application. However, if a use case is too implementation or technology specific, it becomes too low level and infinite variations are possible. We are trying to strike a balance between the two extremes.

2.5 Use Case Template

To ensure completeness and ease of use, Use Cases are formatted into a common template, consisting of the following elements:

- Use Case description
- Actors
- Goals/user stories
- Assumptions
- Process flows
- Success scenario
- Error conditions
- Relationships
- References and citations

In addition, diagrams are encouraged and there are ancillary sections to address Guiding Principles considerations and domain expert considerations.

2.6 Categories of Use Cases

The following list categorizes and describes the types of use cases received.

- **Identity Ecosystem Functions** are very abstract representations of core functions in the Identity Ecosystem.
    - Registration and Issuance
        - Credential Issuance Use Case

        - Identity Proofing Use Case
    - Authentication and Attribute Services
        - Selectively Disclose Attributes Use Case
        - Access Age Restricted Content Use Case
        - Authenticate Person Use Case
        - Four Party Authentication and Authorization Use Case
- **Platform Features** are examples of ways that system components can support desired functions in the Identity Ecosystem
    - Device Integrity supporting User Authentication
    - Privacy Enhanced by User Agent
- **Protocols** speak to potentially standardized ways of performing Identity Ecosystem functions.
    - Cryptographic Authentication for Access to Online Resources
    - Delegated Authentication for User Managed Access
- **Processes** are moderately implementation specific descriptions of how to address certain functions within the Identity Ecosystem.
    - Remote Electronic Identity Proofing Use Case
    - Trust Elevation Use Case
    - Un and Underserved People Use Case

3. Use Cases

NOTE: Use cases in this document are intended to be useful and illustrative, but not normative: the individual cases do not constitute an endorsement of a method, and the set as a whole does not attempt to be comprehensive, nor purport to cover all important digital identity issues.

3.1 Device Integrity Supporting User Authentication

Use Case Description

Establish an integrity (aka health) claim for a device that, together with other security measures, is good evidence of the integrity of the information exchanged with the user. Today many relying parties do ensure that users can only access their services with devices that are known to be in the possession of the user. This case extends that to allow the relying party to specifically request an integrity claim from the user's device.

Integrity has two meanings in computer security. The first relates to the device not having been changed in any way since it was created. The second relates to the device reliably behaving in an expected manner. In a modern operating system, with vulnerabilities patched every month, the former definition is not practical and so the later definition is the one that applies in this use case.

Actors

- Relying party (RP) in this case is a web service that requires user identity and other attribute information to complete a digital transaction.
- Identity Provider (IdP) for this case contains identity of the user potentially with other attributes.
- User Device is a modern computer system with graphical user interface and internet connectivity.
- Device Attribute Provider (DAP) registers the user device, receives signed status information from the device, can evaluate the status of the device and generate an integrity claim for the device.
- Individual user in this case is a human being that wants to access a high value web site on the internet.
- User agent is digital process running on and trusted by a user to represent then on the network.

Goals / User Stories

- The integrity of the device used for authentication of user identity provides the foundation for strong authentication and protection of user privacy.
- RP can prove compliance with regulations that require proof of user intent.
- User can know the device is only presenting the allowed information.
- User identity theft from their personal device is blocked.

Assumptions

- The RP has a relatively clear set of privacy compliance regulations to follow.
- Users are provided sufficient motivation to acquire device integrity information to obtain web services.
- Secure token services (STS) are available in the marketplace to provide user ID (IdP) and device integrity (DAP).

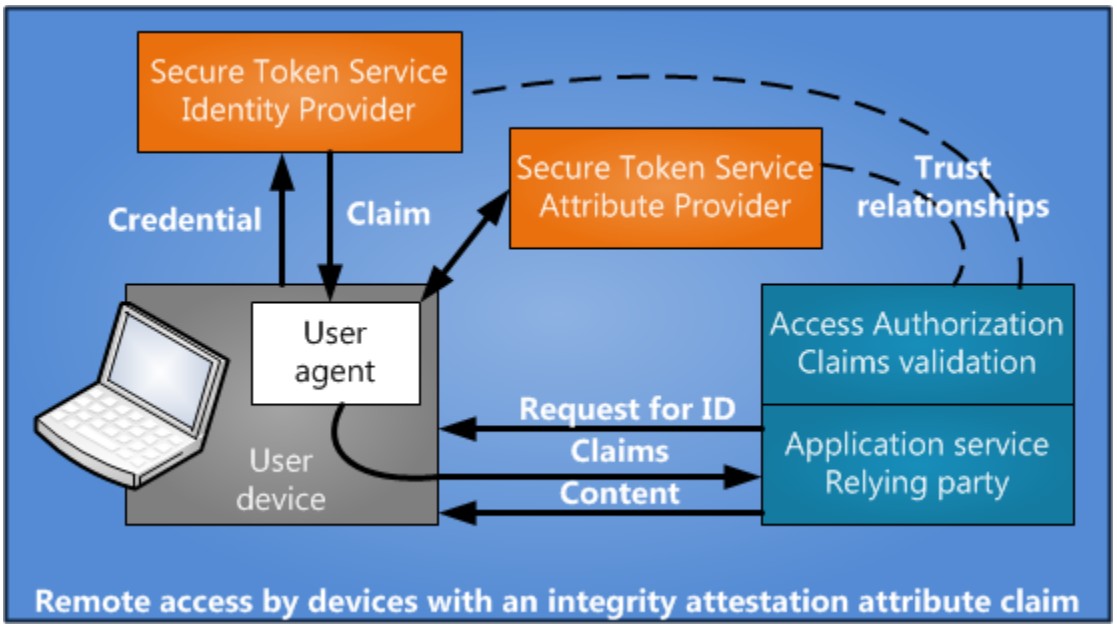
Requirements

- Individual users have access to a modern digital device with secure root of trust.
- A minimalist standard taxonomy of data type is presented for user choice.
- The user device is the able to collect credentials from the user and transmit them to the identity provider.
- Claims from the identity provider and attribute providers, including the device attribute provider, can be composed into a bag of claims to be sent to the relying party. In this case the compositing function is provided by the user device.

Process Flow

1. The user establishes an account with one or more IdPs.
2. The user's device is registered with a device attribute provider.
3. The user accesses a web site which requires identity attributes of some sort to continue to process the user request. That web site then becomes a relying party.
4. The RP uses a standard protocol and taxonomy to request the information needed from the user.
5. This request for information is intercepted by an agent for the user that can:
    - Determine if the requested information is available,
    - Determine if the user has already authorized release of the requested information to this RP,

- Display any remaining choices to the user to acquire more attributes or release those already available,
- Compose user and device claims in a way the RP can evaluate the data,
- Send the composed claims to the RP who has sole responsibility to determine if sufficient identity and attribute information has been proved to provide the requested access.
- Repeat these steps until the RP is satisfied or one side gives up and abandons the effort.



6. The above figure shows the user agent as a part of the user device. Other implementations are certainly possible. It is responsible for collecting, storing and releasing a collection of claims to the relying party based on informed user consent.
7. The Secure Token Service / Device Attribute Provider is called a remote attestation service in some environments. It accepts the information created by the device at boot time in a Trusted Platform Module (TPM) to compare with known good configuration information to attest to the integrity (health) of the device by means of a device attribute claim.

Success Scenario

- Strong authentication (using two factors: user ID plus machine integrity claims) actually improves the security of users on the internet.

- Modern devices in common use for connecting users to the internet already come with a hardware root of trust that can be used to report on the current status of the device is a way that is not susceptible to tampering.
- A device integrity attestation attribute service becomes available in the cloud to the user at little cost to create claims as to the integrity of the user device and to enable easy remediation of any defects found in the device integrity. This service acts like an extension of an antivirus product that be determine if the device is truthfully representing its status.
- The RP gets access to the user identity and device integrity information in claims that are trusted to authorize release of the desired information to the user.

Error Conditions

- User does not have the credentials required by the relying party. Mitigation: the relying party redirects the user to one or more sources of appropriate credentials.
- The device or user agent loses the trust of the RA and hence of the RP. Mitigation: the user must be given actionable steps to get their devices and agents back into compliance. It should never be the case that an "unauthorized" message be transmitted without mitigation steps.

Relationships

- Extended by:
    - Privacy Enhanced by User Agent Use Case at https://www.idecosystem.org/wiki/Privacy_Enhanced_by_User_Agent
    - Privacy Enhancing Technologies at https://www.idecosystem.org/wiki/Privacy_Enhancing_Technologies
- Extension of: N/A.

References and Citations

- Authenticate Windows Azure with ADFS at http://technet.microsoft.com/en-us/magazine/dn250023.aspx
- Trusted Platform Module at http://www.trustedcomputinggroup.org/developers/trusted_platform_module/specifications
- Endpoint Compliance Profile at http://www.trustedcomputinggroup.org/resources/tnc_endpoint_compliance_profile_specification
- NIST SP 800-164 Hardware-Rooted Security in Mobile Devices at http://csrc.nist.gov/publications/drafts/800-164/sp800_164_draft.pdf
- Cloud Platform Audit and Asset Management using Hardware-based Identities at http://docs.oasis-open.org/id-cloud/IDCloud-usecases/v1.0/cn01/IDCloud-usecases-v1.0-cn01.html#_Toc324801965

NSTIC Guiding Principles Considerations

Privacy Considerations

A device identity attribute is implicitly created by a raw integrity claim. For example this could be through the public key in the integrity certificate. In many cases the device is used by one or a small number of users which would allow linkage of this attribute to a user. Like any attribute, the device integrity claim would only be provided if the user authorized its release. It is certainly also possible to use a privacy enhancing technology provider (PETP) to combine all proffered claims into a composite claim with some identity that cannot be linked back to the original user.

3.2 Authenticate Person Use Case

Use Case Description

A user is seeking to gain access to gain access to an online resource that requires authentication - that user becomes the Claimant actor. The online resource provides the Claimant the ability to authenticate their identity using an Identity Service Provider of the Claimant's choice through the use of privacy enabling and standards based protocols.

Actors

- Claimant – wants to obtain access to a web resource
- Identity Service Provider – performs primary authentication of the Claimant's credentials
- Relying Party – requires a level of assurance about the identity of the Claimant
- User Agent – accepts user input from the Claimant and mediates the authentication process

Goals / User Stories

The Claimant is able to gain authenticated access to the Relying Party online resource without having to provide the Relying Party with a primary credential. The Claimant is able to perform a single authentication with an Identity Service Provider of their choice and the manner in which the Identity Service Provider is identified is an intuitive process. An example of an intuitive process (but not a requirement) would be to identify the Identity Service Provider via the Claimant's email address. If the Claimant has previously established a trusted relationship with the Identity Service Provider then a session management design should enable the authentication to take place without requiring an additional prompt for the primary credential.

Assumptions

- It is assumed that the Claimant has already been identity proofed to some LOA and has already received credentials binding their identity to one or more tokens.
- The Claimant must be capable of selecting an Identity Service Provider of their choice (provided that the Identity Service Provider meets the LOA requirements of the Relying Party)
- The Identity Service Provider may present the Claimant with privacy protection choices that minimally include the ability to not disclose their true identity (e.g. use a pseudonym)
- The Identity Service Provider may present the Claimant with an option to not track the Relying Party

Process Flow

1. The Claimant attempts to access a resource and the site requires an authenticated identity in order to proceed.
2. The Claimant is able to intuitively indicate to the Relying Party their preferred Identity Service Provider
3. The Relying Party directs the Claimant to their Identity Service Provider, via a User Agent, for example a web browser
4. The Identity Service Provider authenticates the Claimant. The Identity Service Provider may accomplish this authentication either via performing primary authentication of the Claimant, or via the Claimant's possession of a bearer token showing that authentication has already taken place, e.g. via the presentation of a session or persistent cookie. Note that some Relying Parties might have differing requirements that dictate whether or not cookies (or other session tokens) may be used, and if so what lifetime is acceptable before the Relying Party requires the Identity Service Provider to perform Primary Authentication of the Claimant. Such requirements should be indicated by the Relying Party in its request to the Identity Service Provider when asking for an Identity Token for the Claimant.
5. Upon successful authentication of the Claimant, the Identity Service Provider generates an Identity Token which contains the claimed identity of the Claimant and possibly other personally identifiable information. The Claimant must be able to indicate what personally identifiable information is included in the Identity Token, including the usage of real name vs. pseudonym or other personally identifiable information such as email address, street address, or birthday. The Identity Token is sent back to the Relying Party via the Claimant's User Agent.
6. The Relying Party validates the Identity Token from the the Identity Service Provider and extracts the claimed identity and possibly other personally identifiable information. The Relying Party may optionally query a third party attribute provider for additional attributes bound to the claimed identity or may map the claimed identity to local attributes.
7. The Relying Party makes authorization decisions based on the claimed identity, attributes of the identity, or both and returns resource (as applicable) to the Claimant's User Agent.

Success Scenario

The Relying Party returns the requested resource to the Claimant's User Agent

Error Conditions

- Relying Party cannot validate assertion

- Identity Service Provider cannot authenticate the Claimant
- The Relying Party rejects the LOA of the Identity Token
- The Relying Party is unable to authorize the Claimant, even after validating the claimed identity
- The Claimant is not authorized to access the requested application, resource or service

Relationships

Extended by: Authenticate Using Pseudonymous Identity Use Case

References and Citations

- NIST Special Publication 800-63-1

NSTIC Guiding Principles Considerations

Privacy Considerations

As currently constructed, this use case adopts the NIST SP 800-63 model of identity providers rather than the separate Identity Provider/Attribute Provider described in the NSTIC strategy. Accordingly, it uses the concept of Level of Assurance (LOA) that includes both the strength of authentication and the confidence in certain identifying attributes such as name. It does not therefore support strong authentication in the absence of identifying attributes, such as the ability to assert one's age without identifying oneself in an attributable way (see NSTIC strategy, page 11). Identity proofing relates to the binding of certain attributes to the identity, and therefore is maintained by an attribute provider, and is related to attribute release, not authentication per se.

Another distinction not covered in the use case is anonymous vs. pseudonymous authentication. In pseudonymous authentication, multiple visits from the same user use the same identifier, and can be linked. In anonymous authentication, the user does not want to be linkable at all, and may want to authenticate only for purposes of making trustable assertions (such as age or state of residence) but does not want to be tracked from session to session.

It should also be noted that the choice of Identity Service Provider may have some impact on privacy. In the extreme, the choice of an Identity Service Provider with only one customer identifies the user, so there is a balance that needs to be struck in Identity Service Provider size between very small and very large.

3.3 Identity Proofing Use Case

Use Case Description

Identity Proofing is the process by which a Credential Service Provider (CSP) and a Registration Authority (RA) collect and verify information about a person for the purpose of issuing credentials to that person. This verification can be in-person or remote.

Actors

- Credential Service Provider requires identity attributes about a Person for the purposes of issuing credentials to that person.
- Registration Authority collects and verifies attributes about a Person. Identity Proofing can be performed during the Enrollment process prior to Credential Issuance.
- Applicant presents verifiable attributes about themself in order to obtain credentials.

Assumptions

- There is verifiable information about Applicant that Registration Authority can validate.
- Registration Authority has access to authoritative sources of attribute verification.

Process Flow

1. Applicant presents an identity claim to the Registration Authority. This identity claim consists of a set of attributes that Applicant asserts belong to them. These attributes can include legal name, date of birth, address of record, etc. During in person identity proofing, evidence can consist of documents that support the identity claim. During remote identity proofing, evidence is supplied by the applicant to substantiate that the claimed identity belongs to the Applicant.
2. Registration Authority validates the claimed identity by checking the attribute claims against authoritative sources of attribute information.

Success Scenario

Identity Proofing completes successfully when the Registration Authority accepts or rejects the applicant's identity claim.

Error Conditions

- Applicant does not have address of record.
- Applicant cannot supply verifiable attributes.
- Registration Authority's verification processes fails.

Relationships

Extended by: Remote Identity Proofing Use Case, In-person Identity Proofing Use Case

References and Citations

- NIST Special Publication 800-63-1

3.4 Cryptographic Authentication for Access to Online Resources

Use Case Description

This use case outlines two approaches for providing cryptographic authentication to online resources. In both approaches, the need for shared secrets between users and relying parties, such as passwords or answers to challenge questions, is eliminated.

One of the NSTIC Guiding Principles is that identity solutions should be secure and resilient. Authentication methods that rely on shared secrets, such as passwords, are well known to be less secure than methods based on public key cryptography, for example. NSTIC-compliant identity solutions for high assurance applications, such as access to high value online resources, should therefore eliminate reliance on weak authentication methods based on shared secrets. The NSTIC derived requirements compiled by the National Program Office also specify that identity credentials should be resistant to theft, tampering, counterfeiting, and exploitation. Although no single authentication technology has a monopoly on these properties, public key cryptography arguably provides better security than most, if not all, current alternatives. In addition, recent advances such as the standardized Universal Second Factor protocol put forth by the FIDO Alliance, has the potential to make public key crypto usable for consumer applications. Although a Use Case does not need to focus on any specific technologies, a goal of this Use Case is to help ensure that an NSTIC-compliant identity ecosystem will incorporate strong authentication methods that have previously not been usable by consumers.

Actors

- User: An individual who needs to access an online resource.
- Token: Something that a user possesses and controls that is used to authenticate the user for access to a protected resource such as a financial account.
- Public / Private Key Pair: a public cryptographic key and its corresponding private key. The private key resides on the user's computing device (or external USB device or smartcard) and can be locked with a PIN or password. The private key acts as a token.
- Relying Party: a website that must authenticate a user for access to a service or resource provided by the relying party.
- Device: a computing device such as a personal computer, laptop computer, tablet computer, or mobile phone that is able to store and manipulate cryptographic keys. It could possibly also include USB dongles that include processing capabilities, as well as smartcards.
- Third Party: a third party entity that can provision private / public key pairs on a user's device, and can provide an additional layer of security by acting to sign an authentication request independently of the user.

Goals / User Stories

The goal of this use case is to outline two approaches for providing cryptographic authentication to online resources. In both approaches, the need for shared secrets between users and relying parties, such as passwords or answers to challenge questions, is eliminated. The term “cryptographic authentication” here means that a relying party is able to authenticate a user seeking access to an online resource by means of an authentication protocol that verifies that the user controls a cryptographic private key. It is assumed that the corresponding public key has been previously bound to the online resource.

Neither of these two approaches depends on the use of client-side certificates issued by a certificate authority that has vetted the user’s identity prior to issuing the certificate. Instead, it is assumed that the service provider / relying party has independently determined that a particular user is entitled to access an online resource, and is able to bind a public cryptographic key to that resource.

In one approach, the relying party directly provisions a private / public key pair on the user’s device, uploads the public key to the relying party site, and binds the public key to the online resource. Ongoing authentication for access to the resource then depends on a user being able to demonstrate control of the associated private key.

An alternate approach assumes the existence of a third party entity that provisions public / private key pairs on the user’s device, and provides an additional measure of security by means of an authentication protocol that requires the third party to demonstrate control of an additional private key.

Traditional PKI and client-side certificates can also achieve the goal of providing strong cryptographic authentication. But PKI and client-side certificates have been cumbersome and costly to deploy and maintain, and are not widely used, especially for authentication of consumers. This use case proposes an alternative to traditional PKI in which public / private key pairs are provisioned directly on user devices without involvement of client-side certificates or certificate authorities.

Assumptions

- Strong authentication for access to online resources is assumed to require two-factor authentication, where the two factors are “something you know” and “something you have.”
- The “something you have” factor consists of a computing device, such as a desktop or laptop PC, tablet computer, or smartphone, that is used to access a protected online resource. It could possibly also include a separate authentication device that is able to store and manipulate private keys. To transform a computing device into a secure authentication token, a public / private cryptographic key pair will be provisioned on the

user's device. The public key will be uploaded to the relying party site, and strong authentication will depend on the user's ability to demonstrate control of the private key.

- A private key on the user's computing device may be "locked", and if so is usable for authentication only if it can be unlocked with a PIN, password, or biometric. This PIN or password is the "something you know" authentication factor, while a biometric is a "something you are" authentication factor. However, none of these is a shared secret between the user and the relying party because neither the PIN, password, nor biometric information leaves the user's device.
- In the case where the relying party directly provisions a public / private key pair on the user's device, an appropriate application will exist on the user's device to manage multiple private keys that are used for authentication to multiple websites. This application may consist of a browser plug-in or extension, and must provide a user interface that makes it easy for users to cryptographically authenticate to different relying party sites. Each user device will be provisioned with its own public/private key pair specific to that device, and each relying party site will need to maintain public keys for each of the user's devices.
- A mechanism will exist for users to add new devices and to provision those devices with appropriate public / private key pairs so that those devices can be used for authentication to protected resources at a relying party site. [A similar mechanism can exist to remove a device.]
- In the case where a third party is used to provision public / private key pairs on the user's device(s), an additional private key maintained by the third party is used in the authentication protocol. An advantage of this approach is that if a device is lost, the user can instruct the third party not to sign (with its private key) an access request originating from the lost device. On the other hand, involvement by a third party introduces the possibility that the third party may be unavailable during the authentication process, rendering the user unable to authenticate to the relying party site.
- User's computing devices must be equipped with an application that provides users with the ability to easily manage multiple crypto private keys for authentication to multiple websites.

<u>Process Flow</u>

Enrollment

When a new user is enrolled at a relying party site, the site instructs the user's device (browser) to generate a public /private key pair. The device-specific public key is uploaded to the relying party site, along with some type of user and/or device identifier. This public key is bound to the user's protected resource at that site.

Alternately, when a third party is involved, the device public key along with the public key of the third party are both uploaded to the relying party site, and bound to the protected resource.

Authentication for Access to a Protected Resource

The relying party site (or the app on the user's device) will display a button for the user to click for access. The relying party site identifies the user and/or device on the basis of some type of user / device identifier, and sends a challenge to the user's device. The user clicks on the button, and is prompted for a PIN or password to unlock the corresponding private key on the user's device (if the key was previously locked). Once unlocked, the private key is used to digitally sign a response, which is returned to the relying party. The relying party verifies the digital signature with the corresponding public key. If verified, the user is allowed to access the protected resource.

Alternately, if a third party is used, the response to the relying party's challenge is signed by the private key on the user's device, and is then forwarded to the third party. After authenticating the device using the device's public key, the third party signs the response with the third party's private key, and then returns it to the user. The user forwards the doubly-signed response to the relying party. The relying party verifies the two digital signatures with the public keys corresponding to the user's device and the third party.

Authentication of an Individual Transaction

When a user initiates a specific type of transaction, such as moving money out of a financial account, the user's device may sign the transaction with the device's private key. The relying party site verifies the signature with device's public key. Alternately, the third party private key is also used to sign the transaction.

Adding a New Device

A user will be able to provision new public / private key pairs on a new device by leveraging the capabilities of an existing device that has already been provisioned with key pairs for multiple relying party sites. One possible way to do this may be for the user to activate a process on the existing device that causes an email to be sent to the user, which contains a link that must be activated on the new device. Once activated, this link generates a private / public key pair on the device. For added security, the user may be required to enter a one-time code sent to the user's out-of-band mobile phone.

<u>Success Scenario</u>

- Users are successfully provisioned with public / private key pairs on each of their computing devices, for strong authentication to relying party websites.

- Users are able to successfully authenticate to each relying party website where they have protected resources, using strong cryptographic authentication.
- Users can successfully add new devices for strong authentication to their protected resources, and remove them if necessary.

Error Conditions

- Relying party sites do not support this use case.
- There are difficulties or errors when provisioning the necessary public/private key pairs on user's devices.
- Users cannot successfully add a new device (or remove an existing device) for access to a relying party site.
- If a third party is used for added security, the third party may be unavailable to sign a response or transaction with its private key when needed.

Relationships

- Two other consumer-class use cases rely on public key cryptography for user authentication. These are: IRS Identity Theft Use Case and Delegated Authentication for User Managed Access Use Case.
- This use case extends the Authenticate Person use case.

References and Citations

- In addition, other initiatives and commercial products exist that are geared to making public key cryptography usable for consumer-class applications. These include the FIDO Alliance's Universal Second Factor (U2F) Initiative, as well as OneID.

3.5 Delegated Authentication for User Managed Access

Use Case Description

There are many instances in which the owner of an online protected resource, such as a bank account, health record, or other information repository, needs to allow someone else to access the resource. The resource owner can either provide another party with full access to the resource, or with access that is constrained in some way. Since many, if not most, online resources today are protected with only a password or other shared secret(s), the simplist example of a resource owner allowing someone else to access the protected resource is simply to share knowledge of the same userID and password that the resource owner uses. But in addition to being insecure, this provides the other party with unconstrained access to the protected resource.

There is increasing recognition that resource owners need to have a way to delegate access to protected resources that is constrained in some way, as determined by policies defined by the resource owner. This need is at the heart of the Kantara Initiative's User Managed Access (UMA) project. But there is also recognition that protecting these online resources with a single shared secret such as a password is insecure, and that some form of stronger authentication is needed. One of the most common forms of two-factor authentication involves sending an SMS text message containing a one-time code to a mobile phone, which then must be entered onto the appropriate webpage. However, in a UMA context this method of multifactor authentication suffers from two defects: First, the resource owner cannot simply share the same one-time code with another party in a practical way. There would need to be a way to have a separate one-time code sent to the other party's mobile phone when it is needed for authentication by the other party. Second, even if this could be done, requiring a one-time code to be retrieved from a mobile phone and entered into the user's computer every time the user seeks access to the protected resource is cumbersome and adds "friction" to the process.

This use case proposes a way in which strong authentication for access to protected resources can be established as part of the permissioning process by which a resource owner delegates access to that resource by someone else. This method of strong authentication does not depend on the resource owner sharing any secrets with anyone else.

Specifically, this use case proposes an authentication scheme that: (a) uses a private cryptographic key residing on the Requesting Party's computing device as a second "something you have" authentication factor; (b) requires that a one-time code be sent to the Requesting Party's "out of band" mobile phone only when needed to register a new computing device with the Resource Server, or when renewing a device's permission to access a protected resource as determined by the policy established by the Resource Owner. The way in which the Requesting Party's device is recognized by the Resource Server depends on a cryptographic public/private

key authentication protocol, rather than some form of shared secret between the Requesting Party's device and the Resource Server.

One of the NSTIC Guiding Principles is that identity solutions should be secure and resilient. Authentication methods that rely on shared secrets, such as passwords, are well known to be less secure than methods based on public key cryptography, for example. NSTIC-compliant identity solutions for high assurance applications, such as a user allowing someone else to have restricted access to the user's high value online resources, should therefore eliminate reliance on weak authentication methods based on shared secrets. The NSTIC derived requirements compiled by the National Program Office also specify that identity credentials should be resistant to theft, tampering, counterfeiting, and exploitation. Although no single authentication technology has a monopoly on these properties, public key cryptography arguably provides better security than most, if not all, current alternatives. In addition, recent advances such as the standardized Universal Second Factor protocol put forth by the FIDO Alliance, has the potential to make public key crypto usable for consumer applications. Although a Use Case does not need to focus on any specific technologies, a goal of this Use Case is to help ensure that an NSTIC-compliant identity ecosystem will incorporate strong authentication methods that have previously not been usable by consumers.

Actors

- A Resource Owner is the owner of a protected online resource who wishes to allow another individual to have access to that resource.
- A Requesting Party is an individual person who seeks access to a protected resource owned by the Resource Owner.
- An Authorization Server is an online system that allows the Resource Owner to specify a set of access permissions to be granted to the Requesting Party. The Resource Owner interacts with the Authorization Server to specify the policies or constraints that define the permissions that will be granted to a particular Requesting Party. The Resource Owner may choose to provide full access to the protected resource, so that the Requesting Party is treated the same as the Resource Owner when accessing the resource. Alternately, the Resource Owner may choose to specify a limited, constrained set of permissions.
- A Resource Server is an online system that a Requesting Party interacts with in order to obtain access to the protected resource. The Requesting Party must authenticate to the Resource Server to gain access to the protected resource.

Assumptions

- An NSTIC-compliant identity ecosystem is presumed to incorporate functionality necessary to make public key cryptography usable and practical as a strong authentication method for consumer applications such as UMA.
- An appropriate application (the "crypto manager") will exist on the Requesting Party's device to generate and manage public/private key pairs for authentication to multiple websites. This application must provide a user interface that makes it easy for users to cryptographically authenticate to multiple websites. This crypto manager is assumed to be an important component of NSTIC-compliant identity ecosystems and will be deployed on user devices in a manner yet to be described.
- For increased security, Requesting Parties will only be able to access protected resources from "registered" devices, where a device becomes registered if it is provisioned with a private crypto key providing strong authentication. The registration process itself requires that the Requesting Party control a particular email account as well as a particular mobile phone number.

Process Flow

Resource Owner

The Resource Owner logins in to the Authorization Server to either define a new policy that specifies the access permissions for some specific Requesting Party, or to reuse a previously-defined policy to assign access permissions for the Requesting Party. [The method of authentication used by the Resource Owner for this purpose is not specified here, but can be similar to that used by the Requesting Party for access to the Resource Server.]

After the access permissions are defined, the Authorization Server requests that the Resource Owner provide a mobile phone number and email address for the Requesting Party. [Note: if the Requesting Party cannot receive SMS text messages on a mobile phone, the Resource Owner must indicate this and provide the phone number of a phone that can receive ordinary voice calls instead.]

After this information is provided, the Authorization Server sends an email message to the Requesting Party containing the URL of the Resource Server, together with a unique permission code. The message instructs the Requesting Party to register the device(s) that the Requesting Party wishes to use to access the protected resource by: (a) browsing to the URL of the Resource Server using the desired device, (b) providing the permission code to the Resource Server registration page, (c) receiving a one-time code from the Requesting Party's mobile phone, and (d) entering it on the Resource Server registration page. [If the Requesting Party does not use a mobile phone that can accept SMS text messages, the alternative is that the

Resource Server makes an automatic call to the Requesting Party's phone, and generates a spoken one-time code.]

To change the access permissions granted to the Requesting Party, including revocation of the permissions, the Resource Owner logins in to the Authorization Server, using the permission code to identify the set of permissions to be changed. Once changed, the new set of permissions is associated with the permission code.

Requesting Party

The Requesting Party receives an email from the Authorization Server, and proceeds to register a desired device for access to the protected resource, as described above.

As part of the registration process, a private cryptographic key is provisioned on the Requesting Party's device (using the crypto manager), with the corresponding public key sent to the Resource Server. The private key, in combination with the permission code, will allow the Requesting Party to access the protected resource with the appropriate permissions. An additional option may require the Requesting Party to provide a PIN or password to unlock the private key on the device. However, this PIN/password is not a shared secret, since it never leaves the device.

Once registered, the crypto manager on the device will presents a simple user interface when the Requesting Party accesses the appropriate Resource Server access page. The Requesting Party clicks a button to initiate the cryptographic authentication process, which may require the Requesting Party to provide a PIN or password to unlock the private key. Once this is done, the Requesting Party is granted permissioned access to the protected resource.

Any changes to the access permissions made by the Resource Owner will be noticed when the Requesting Party authenticates to the Resource Server and seeks to access the protected resource, since the modified permissions are associated with the same permission code used during the authentication process.

<u>Success Scenario</u>

- A Resource Owner is able to successfully create a policy specifying the constraints under which a Requesting Party is given permission to access a protected resource.
- The Requesting Party is able to obtain access to the protected resource after a successful challenge-response interaction between the Resource Server and the Requesting Party's device that depends on the presence of the private key provisioned during the registration process.

Error Conditions

- The registration process is compromised in some way, so that an attacker is able to register his device for access to the protected resource.
- A hacker is able to compromise the private key on the Requesting Party's device.

References and Citations

- Cryptographic Authentication for Access to Online Resources Use Case
- Eve Maler: Two Step Verification Will End Consensual Impersonation (http://blogs.forrester.com/eve_maler/13-04-01-two_step_verification_will_end_consensual_impersonation)
- Kantara User Managed Access (UMA), https://kantarainitiative.org/confluence/display/uma/Home

3.6 Credential Issuance Use Case

Use Case Description

The use case pertains to the issuance of a credential during the registration process, after identity proofing has optionally occurred.

Below are some non-normative examples of issuance of particular forms of authentication factors for credentials.

Example: Linux passwords

On Linux systems passwords are selected by the Claimant and a hash of the password is recorded in /etc/passwd associated with the Claimant's username.

Example: Asymmetric Crypto

Asymmetric cryptography with user-generated keys allows the CSP to record the public key of the Claimant without having knowledge of the associate private key. In a PKI model, the CSP can issue X.509 certificates that associate the public key with the Claimant's unique identifier; alternatively in a non-PKI model, the CSP can record the Claimant's public keys in a trusted identity store associated with the Claimant's unique identifiers.

Example: On Time Password to Mobile Phone

Authentication tokens based on sending One Time Passwords (OTP) to a mobile device, so credentials might consist of mobile phone numbers associated with the Claimant's unique identifier.

Actors

- Entity (a Person or Non-Person Entity) has enrolled for credentials from Credential Service Provider
- Credential Service Provider has the goal of issuing credentials to Entity.
- Registration Authority provides verified information about an entity so as to issue credentials.
- Applicant or Sponsor presents verifiable information about the entity in order to obtain credentials.

Assumptions

- The Registration Authority can provide verified identity attributes for the Entity.

Process Flow

1. In the case of credential issuance to a Person, the Claimant is the Person to whom credentials are being issued. In the case of credential issuance to the Non Person Entity

(NPE), the Claimant is the NPE and the Sponsor is the individual requesting credentials on behalf of the NPE. The process flow sometimes refers to “Claimant/Sponsor”, this indicates the human in the process.

2. Credentials consist of one or more authentication factors linked to the Claimant’s unique identifier.
3. During the credential issuance process, each authentication factor must be collected or generated and recorded in such a way as to support subsequent authentication operations.
4. When a sufficient number of authentication tokens have been generated and recorded, the Credential Issuance process is complete and the Applicant becomes a Subscriber.

Success Scenario

- All authentication tokens are successfully generated.
- The credential issuance process may require publication of information.

Error Conditions

- An authentication token cannot be generated
- Storage of authentication factor information fails.

Relationships

- Related to: Identity Proofing Use Case, Authenticate Person Use Case

References and Citations

- NIST Special Publication 800-63

3.7 Access Age Restricted Content Use Case

Use Case Description

Enable individuals to prove that they are within a certain age range without disclosing their identity. This could be to support COPPA safe harbor provisions by verifying minority status without identification, or to enable adults to access mature content with privacy.

Actors

- Subscriber is a human wishing to access a service with age restrictions without revealing their identity.
- Service Provider needs to provide access only to individuals within a specified age range.
- Attribute Provider provides an age verification service.

Goals / User Stories

- Enable individuals to prove that they are within a certain age range without disclosing their identity.
- No identity information about adult must be verifiable but age.

Assumptions

- Individuals are willing to share identity information with Attribute Provider in order to obtain anonymous age verified access to Service Provider.

Process Flow

Proof of Age Process Flow

1. Subscriber enrolls with Attribute Provider
2. During enrolment, Subscriber undergoes Identity Proofing that includes verification of their Date of Birth.
3. Attribute Provider and Subscriber establish an anonymous credential by which Subscriber can authenticate to Attribute Provider.

Verification of Age Process Flow

1. Subscriber attempts to access an age-restricted Service Provider.
2. Service Provider discovers Attribute Provider.
3. Subscriber informs Service Provider of Attribute Provider, or
4. Service Provider queries for Attribute Provider that can verify Subscriber.
5. Service Provider informs Attribute Provider of required age range.
6. Subscriber authenticates to Attribute Provider.
7. Attribute Provider locates Subscriber's Date of Birth and calculates whether Subscriber is in the required age range.

8. Attribute Provider responds to Service Provider with confirmation or denial that the Subscriber falls in the required age range.

Success Scenario

- The use case is successful when the Service Provider can verify whether Subscribers are in the specified age range.

Failure Scenario

- Service Provider is unable to find an Attribute Provider to vouch for the Subscriber's age.

Error Conditions

- Adult viewing laws in various states or countries conflict with NSTIC policy.

Relationships

- Related to Identity Proofing Use Case, Verify Identity Claim Use Case

References and Citations

- NSTIC Strategy (p. 2, p. 11, p. 23, p. 38)
- Children's Online Privacy Protection Act (COPPA)

3.8 Privacy Enhanced by User Agent

Use Case Description

Provide sufficient claims to a relying party to allow an online transaction to commence while limiting disclosures to those attributes that the user is willing to share with that party. A user agent is present in all digital transactions to represent a legal entity, the user, to the digital world. Enabling privacy in the digital world requires the existence of a Privacy Enhancing Technology Provider which can exist either as a part of the user agent on in some cloud service. This use case considers the former implementation. In either implementation there will be an actor that accepts claims from a variety of sources and a set of privacy policy directives from the user to craft a set of claims for the relying party that is designed specifically to meet both the requirements of the relying party and the user's privacy directives. It is important that both the user and the relying party trust the user agent. In this case a registration authority is described as the means for either to trust the user agent. As always the relying party has the final say on whether the proffered claims are adequate to allow the transaction to continue.

Actors

- User: In this case a human being that wants to access services of a relying party and still retain privacy for details that are not needed by the RP.
- Device Owner: An entity that can set privacy policy on the user agent residing in the user device. Note that the user will be the owner in the case of consumer devices. For enterprise owned devices the owner may have restrictions that they place on enterprise-owned data over and above user privacy concerns.
- User Agent (UA) is a process that assembles a collection of user identities and attributes to be transmitted to an RP in accordance with user or device owner intent.
- Identity Provider (IdP) contains identities and attributes of users.
- Relying Party (RP): A service provider that needs a collection of claims to provide that service. The claims may relate to financial responsibility or other user attributes that are required by regulation to meet legal responsibilities. It is beyond the scope of this use case to determine whether the RP actually has any justification in requesting any user attribute at all.
- Registration Authority (RA) is a service that can register other actors; in this case the RA needs to attest to the trustworthiness of the UA.
- Identity Ecosystem: a set of conventions for actors to exchange trusted claims. In this case the ecosystem needs to provide a taxonomy of claims requests to be sent from the RP to the UA for user decisions on which attributes to share with the RP.

Goals / User Stories

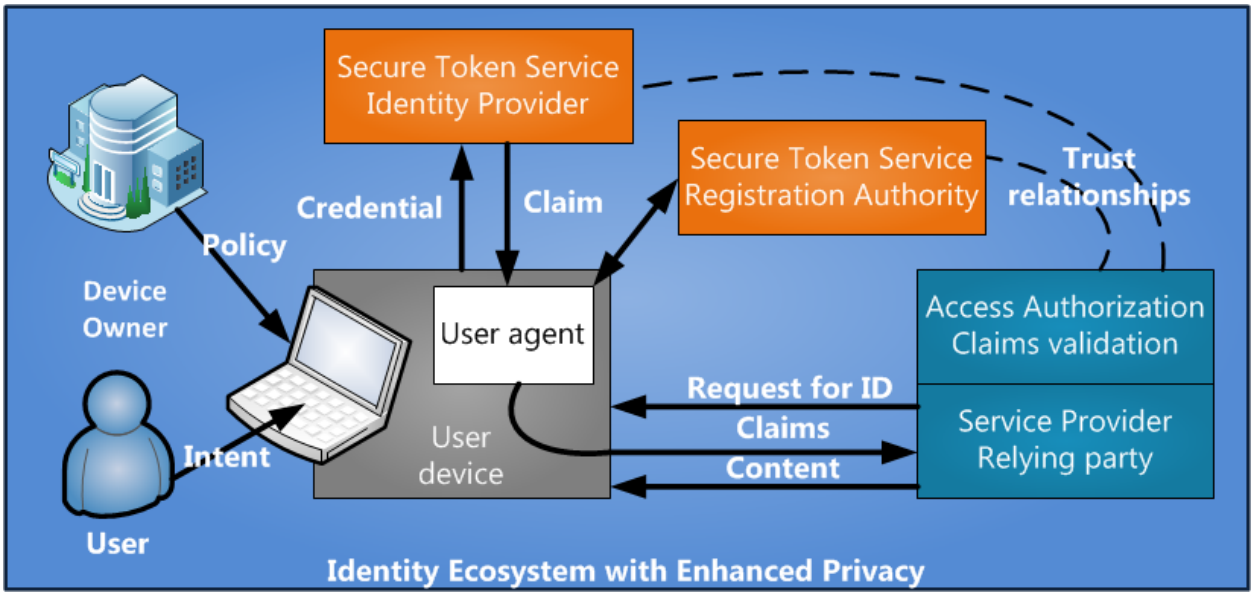
- Compliance with regulations for RPs and IdPs.
- Common method for reliably describing and reporting an individual user's intent.
- High comfort level for users that they can selectively share information.

Assumptions

- The RP has a relatively clear set of privacy compliance regulations to follow.
- Standards will exist that permit the composition of claims by the UA in a format acceptable to the RP.
- It is possible for an RA to reliably report to an RP that a UA is trusted to reliably convey user identities and attributes only in accordance with user intent. In the case of a privacy enhanced technology provider in the cloud, the RP may be able to trust it directly.
- Individual users have access to a digital device upon which they can depend to host a user agent that can represent their intent in a common digital format.
- Registration Authorities exist and have a common protocol and taxonomy to report on UAs to RPs.
- Public audibility of the open standards and code of UA systems in order to check the sharing of data and identity.

Process Flow

1. The user establishes an account with one or more IdPs. In this case there is no need to distinguish between identity providers and other attribute providers.
2. The user accesses a web site which requires identity attributes of some sort to continue to process the user request. They then become a relying party.
3. The RP uses a standard protocol and taxonomy to request the information needed from the user.
4. This request for information is intercepted by an agent for the user that can:
    a. Determine if the information is available
    b. Determine if the user has already authorized release to this RP
    c. Display any remaining choices to the user to acquire more attributes or release those already available.
5. Format the set of requested claims into a response in a way the RP can evaluate the claims.
6. Send the response to the RP who has sole responsibility to determine if sufficient identity has been proved to provide the request access.
7. Repeat these steps until the RP is satisfied or one side gives up.



Success Scenario

- Modern devices in common use for connecting users to the internet now come with a root of trust that can be used to report on the health of the device.
- User agents are created on a user's device or in the cloud that can be audited to assure that they report only identity and attribute information the user wishes to release.
- A small common taxonomy of user private data is established so that RPs can request information, and users can understand what information has been requested. This model works now for smart phones releasing user data to the internet because a small taxonomy of user information is reported. If the list grows long, the user experience is known to suffer as the display becomes too long for users to quickly scan before they assent. In no case should a user ever be asked for more types of information than can be displayed on a single screen with the acceptance button.
- The success metric should be that users are shown to be able to make intelligent choices given the displayed list of fields requested by the RA. Note that in some cases the data display to the user (e.g. date of birth) will not be the same as the claim provided to the RP (e.g. over 21). These cases are especially challenging for the user interface designer.
- User choices are collected by the user agent so that if the same information has been requested by the same RP in the past, the user is not continually bothered with the same questions.

Error Conditions

- User does not have the credentials required by the relying party. Mitigation: the relying party redirects the user to one or more sources of appropriate credentials.

- The user agent loses the trust of the RA and hence of the RP. Mitigation: the user must be given actionable steps to get their agents back in compliance. It should never be the case that an “unauthorized” message be passed to the user with no remediation action indicated. Recall that for this case the user agent is under user control. In cases where the privacy enhancing technology provider is in the cloud, the user is not part of the remediation process.

Relationships

- An overall privacy use case showing the relationship between this use case and similar use cases can be found at: https://www.idecosystem.org/wiki/Privacy_Enhancing_Technologies
- The Device Integrity is defined the use case at https://www.idecosystem.org/wiki/Device_Integrity_supporting_User_Authentication

References and Citations

- COPPA is the Children's Online Privacy Protection Act that is well described in: http://en.wikipedia.org/wiki/Children%27s_Online_Privacy_Protection_Act

NSTIC Guiding Principles Considerations

Privacy Considerations

Privacy enhancement is the core of the purpose of this use case. One particularly challenging problem is the case of minors under the age of 13 that are covered by COPPA. Those challenges are left for another use case.

In the following comments PII (personally identifiable information) is used in the broad sense of information that could allow linkage of an online identity to one specific carbon-based life form.

The following points address the concerns of the privacy committee as described on the discussion page:

1. Several actors get access to user's privacy information as a part of the regular business operations. Beside the general use of care as described in any identity ecosystem agreed between the parties the following comments might help in an implementation of this use case: 1a. The Registration Authority (RA) that attests to the trustworthiness of the user agent (UA) will receive information about a piece of code that could be linked to an individual user. That makes the identity of the user agent instance PII that needs the normal protection of PII. 1b. The Identity Provider (IdP) must have sufficient information to accept credentials from the user and authenticate that the user has the right to that particular identity. In a fully protected exchange the IdP should not be able to ascertain which other identity or attribute providers are accessed by the user or which RP is the source of the inquiry.

2. The user is given the option to select that the user agent (UA) will track their connections to relying parties to reduce the number of times that they are asked to approve release of the same information to the same party. The working assumption is that RPs are reliably identified and trusted to receive the user information. As a result the UA will contain a large amount of information about where the user navigates and what information they have provide to which RPs, not unlike the current situation with cookies on the user browser. Clearly the UA needs to be trustworthy of this burden.

3. Claims persist on the UA in the same way that cookies persist on current UAs known as browsers. It is expected that by identifying the responsibility of the UA to the user it will be possible to create compliance criteria for UA that will allow them to be both useful to the user as well as respecting the user's wishes. It is recognized that this is a tough requirement that will require years to get right.

4. The RP can request any claim that they wish. As described in the usability section it is critical that the user be given sufficient information to evaluate the reason for the request within the stated constraint that all such UX must fit on a single page if we are to expect the user to tolerate the intrusion in their goal, which is to get access to the resources on the RP.

Security Considerations

In general security is not considered in this use case as security will be provided by the same type of credentials, token and claims as used in any secure implementation.

User Experience/Usability Considerations

One important part of any use case is the intelligibility of the choices presented to the user. Here it is very important that the user be give only some decisions to address as can easily and comprehensibly be display on the device that is used. In particular it is important that the RP have a taxonomy of requested attributes or groups of attributes for presentation to the user within the scope of a single device page. That implies that the taxonomy of requested fields needs to be limited to those items that the user can sensibly be expected to comprehend.

Interoperability Considerations

This process is designed to interoperate with existing SAML, JWT and other token types. Token composition is not well defined in any extant standard and needs to be addressed by the ecosystem.

3.9 Trust Elevation Use Case

Use Case Description

Establish a person's identity with an unverified credential and raise the level of authentication using credentials with higher trust levels as needs dictate. The particular scenario described below is based on a user that has a low trust identity at some benefits provider that needs to be elevated in order to complete a sign up for benefits. This same flow should work in many other scenarios as well.

Actors

- Financial institution - typically a federal depository institution (FDI).
- Benefits providers - typically a governmental entity (e.g., SNAP also known as food stamps) that fills the role of attribute verifier. The claims provided by a benefits provider have nearly the exact opposite meaning of claims in the case of (e.g.) a health insurance provider. In this case the claim is an assertion of the availability of compensation to the RP for service provided to the user.
- User - typically a human being acting through a user agent that needs to evaluate benefits of service providers (RPs).
- Relying parties (RP) - a provider of services to the user.
- Identity providers - typically a government sponsored provider (state DMV, contractor, etc.)

Goals / User Stories

- Low barriers for new users to evaluate relying party's services.
- Fraud reduction which may imply cost reduction for the relying party.
- Viable business model for the identity provider.

Assumptions

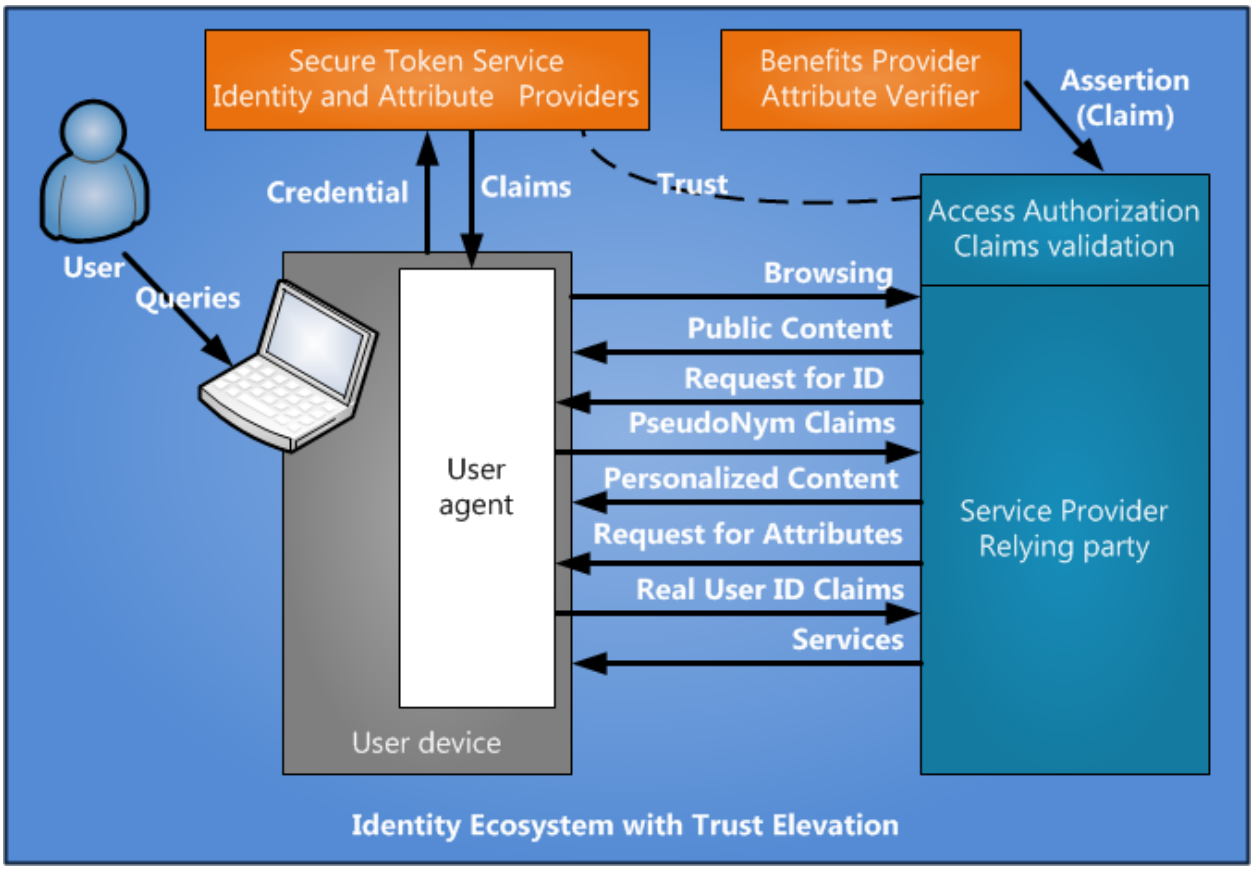
- The relying party has a service to offer that the user needs to understand better before making a commitment to offer more of their own identity to the relying party.
- The relying party requires an external proofing service to provide a higher level of assurance before full access to site may be granted.
- User has a device with internet access.
- Relying Party has a list of trusted Identity Providers.

Process Flow

1. The user accesses the relying party anonymously seeking information about the service offerings.
2. The user wish to establish a profile to create a continuing identity with the site.

- The site offers a selection of identity providers, perhaps including itself.
- Each identity provider choice includes a link to acquire a credential.

3. The user goes to that identity provider and satisfies their need for high level authentication as required by the relying party.
4. The user device receives and stores the credential in the manner consistent with the level of assurance required by the relying party.
5. The user returns to the relying party and continues the access for services requiring high assurance credentials.
6. The relying party requests the credentials from the user's device.
7. A user agent on the user device determines if the user:
   - Has the proof-of-presence needed for authentication (e.g. biometrics)
   - Has protected the credential at the required level.
   - Verifies the identity of the relying party.
   - Has authorized the release of the information to the relying party.
8. The user agent sends a collection of tokens as authorized by the user.
9. The relying party either accepts the collection of tokens or requests more.
10. The user agent my respond with more information or not as authorized by the user and returns to step 6 or terminates.



Success Scenario

- User can access the state benefits office to determine what benefits are offered and how they can qualify to receive them.
- The state benefits offices makes clear that the user that a DMV (department of motor vehicle) license is required and the conditions needed to acquire one. The credential needs to assert the legal residence (among other attributes) that meets the criteria for the benefit sought by the user.
- The user goes to the DMV with the required documentation and gets the license delivered in the manner required by law. (This may require multiple attempts.)
- The user is required to visit a benefits office in person one time to provide proof of presence. (Deputy Registrars are enabled to provide this service in many state office buildings and approved notary publics in banks and other institutions.)
- A financial card is issued to the user that can be used to purchase approved rent and groceries for the WIC program at approved markets.
- The user is required to validate their account on line every two months and every year in person at a deputy registrar.

Error Conditions

- User does not have the credentials required by the relying party. Mitigation: the relying party redirections the user to one or more sources of appropriate credentials.
- User cannot acquire the requisite credentials. Mitigation, the user needs to find the proof needed to satisfy one of the identity providers acceptable to the relying party.

3.10 Four Party Authentication and Authorization Use Case

Use Case Description

NIST Interagency Report 7817, titled *A Credential Reliability and Revocation Model for Federated Identities*, is a document that provides a model for tracking the revocation status and overall reliability of credentials by having various participants report misuse or other risk factors to a service that can track the reliability of the credential. In the course of the discussion, this document introduces a clear model of different ways for a service party or relying party to perform authentication and access control based on interactions with identity and attribute providers. The most robust example in the document is referred to as the Four Party model due to the number of actors involved in the process. It describes a case in which a Service Provider obtains information about a User sufficient to make an access control decision based on identity and attribute information gathered from the Identity Provider and Attribute Provider.

Attributes upon which access control decisions might be made may include age, location (address of residence or current geo-location), biographical information including employment current or history (e.g. military or veteran status, access granted to employees of member companies, etc.), professional skills (e.g. medical or first responder status), law enforcement status, health plan membership, organization membership.

This use case does not incorporate the credential reliability and revocation features proposed in NISTIR 7817, but we recognize that revocation is an important topic.

Actors

- Identity Provider - establish and manage their user community's digital identities. These identities (in the form of digital credentials) are employed by users to authenticate to service providers. The digital identity technology deployed by an Identity Provider for the population of its users varies and often dictates a specific authentication solution in order for the service provider to authenticate the user.
- Attribute Provider - that vouch for attributes requested by the Relying Party. The need for attributes, in addition to user identification and authentication, stems from access control models in which combinations of attributes (authorization attributes) are evaluated at the access decision point of the service to determine authorized access. This includes two models - single-source, where the service provider relies on a single source to provide attributes in an authentication event, and multi-source, where the Relying Party uses several independent attribute providers to provide attributes in an authentication and authorization event.
- Relying Party - a Service Provider that relies on identity and attribute information to make a decision to grant access to resources. In federations, service providers relinquish

control of maintaining their own population of user credentials by accepting credentials managed by a third-party identity provider.

- User - Individuals that wish to obtain access to Relying Party's resources.

Goals / User Stories

From the User's point of view, the goal of the use case is to obtain access to Relying Party's resource. From the Relying Party's point of view, the goal is to identify the User and obtain sufficient attributes to deny or grant access. From the Identity Provider's point of view, the goal is to issue credentials to Users and support the subsequent authentication of those credentials. From the Attribute Provider's point of view, the goal is to provide attribute information for uniquely identified individuals.

Assumptions

- User has been identity proofed and obtained credentials from an Identity Provider that uniquely identify the user. Depending on how this is implemented, the result may be a unique identifier or a collection of attributes sufficient to identify the user (e.g. "Clark Kent from Smallville"). If unique identifiers are used, some means of managing uniqueness must be established.
- Attribute Provider has a source of verified attributes, or a means of verifying attributes, for the user.

Process Flow

1. User accesses Relying Party to obtain access to resources
2. Relying Party communicates with User and Identity Provider (as necessary) to authenticate the User. This mechanism will be credential dependent.
3. Relying Party communicates with Attribute Provider to obtain attributes for the User based on the User's identifier obtained from the authentication.
4. Relying Party makes an access control decision based on the attribute information received.

Success Scenario

- User authenticates successfully.
- Attribute Provider delivers verified attributes to the Relying Party.
- Relying Party makes an access decision based on the User's attributes.

Error Conditions

Attribute Provider cannot identify User based on identifier or identifying information provided by Identity Provider.

Relationships

- Extended by:
    - Authenticate Person is a step in this process
    - Credential Issuance is a prior step in the process
    - Identity Proofing is a prior step during Credential Issuance

References and Citations

- NISTIR 7817, *A Credential Reliability and Revocation Model for Federated Identities*

3.11 Un and Underserved People Use Case

Use Case Description

Un and Underserved refers to people that do not have, have lost, or have inadequate digital identities to enable them to participate in the secure and resilient, cost effective and easy to use, privacy enhancing and voluntary interoperable online Identity Ecosystem envisioned by NSTIC and the IDESG. Currently there are barriers to and opportunities for the Un and Underserved to enter the IDESG Identity Ecosystem. Such barriers may be, limited financial means, physical disadvantage or challenge, language differences, loss of employment, to name but a few. Such opportunities may be new products and services to remove these barriers, innovations in serving this community as well as greater social cohesion and internet-wide cyber-security.

Importantly, many of the Un and Underserved are also financially un and underserved. Today 68 million American adults are un or under banked. More than 2.5 billion adults around the world are unbanked.

The goal of this use case is to leverage existing programs and services, for example the FDIC "Safe Account" program, to allow the Un and Underserved to use their "Safe Account" bank account enrollment process as a means of obtaining a digital identity and entering the IDESG Identity Ecosystem. Being Un and Underserved is not a new problem but one that has had a long (perhaps going back to the beginnings of money and then banking) and often intractable set of complexities. The efficiencies of cyberspace (the internet) provide an historic opportunity to bridge this gap.

Scenario (Example):

Julia, a prospective underserved financial services customer, wants to open a bank account as well as obtain a digital identity for use in the IDESG Identity Ecosystem.

Julia learns of a FDIC "Safe Account" type of account at her local community center which allows her to apply for an account and subsequently obtain a digital identity. Julia applies for and gets an FDIC “Safe Account” through an FDIC insured bank or equivalent financial institution compliant with 31 CFR 1020.220 - Customer identification programs (CIP) for banks, savings associations, credit unions, and certain non-Federally regulated banks, or other acceptable customer identification program. The enrollment vetting process into a "Safe Account" serves the vetting requirements for Julia to obtain her digital identity.

Goals Summary:

Julia will be able to obtain a digital credential with the qualifications used to obtain her Safe Account. Julia will be able manage her finances in a secure and insured or protected environment where she can increase her income through entrepreneurship, improving the

quality of life for herself and her son, the economic activity in her neighborhood through her purchases, and tax receipts to her city and state. Julia will be able to interact with some government and non-profit services improving confidence in government and non-profit institutions and financial institutions including banking. The financial institution and non-profit organizations will be able to increase the number of their customers/participants.

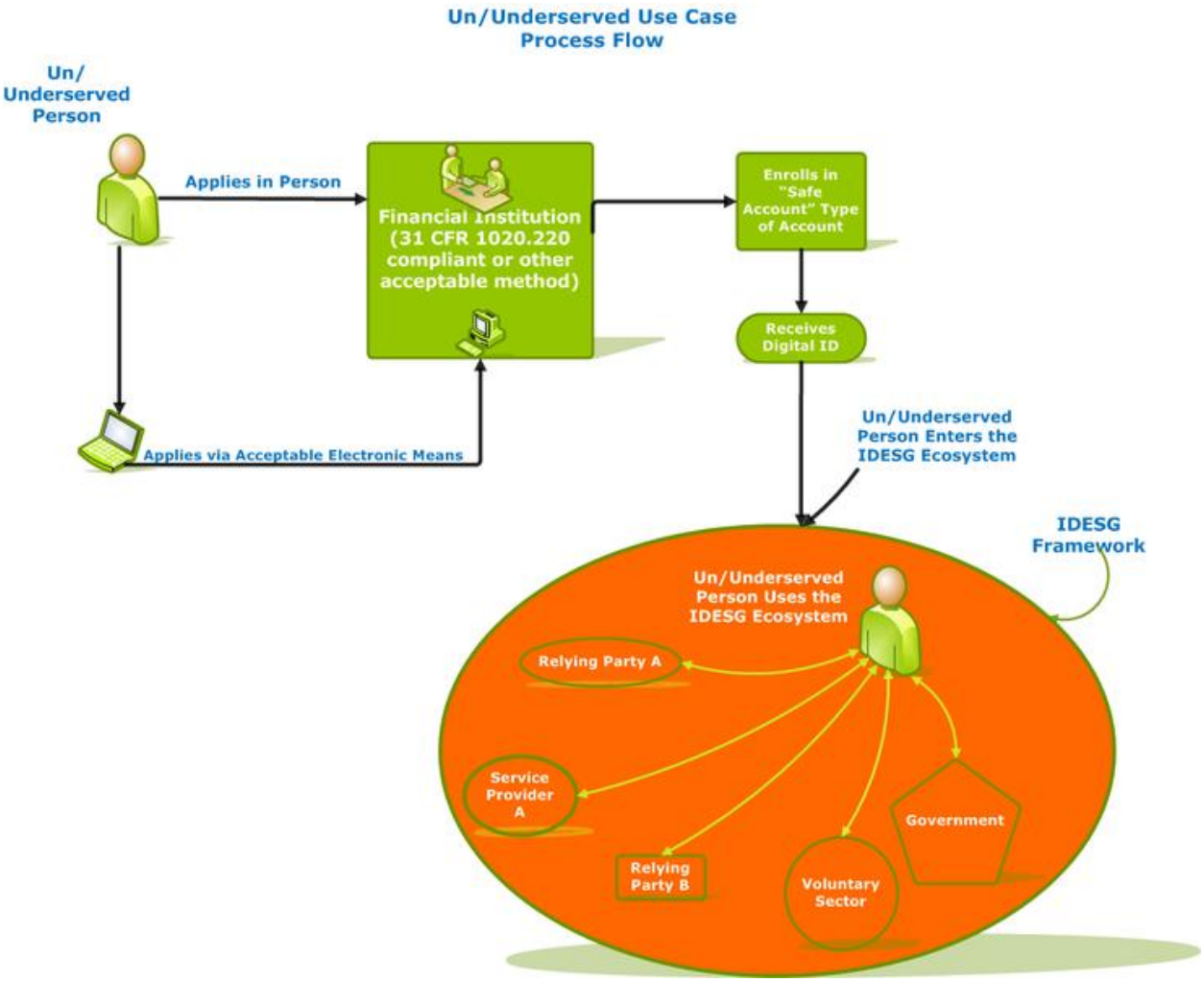
Actors

- Un and Underserved People.
- Financial Institutions.
- Non-profit Organizations.
- Government.
- Any Relying Party or Service Provider in the IDESG Identity Ecosystem that complies with the NSTIC principles and has a Trustmark Accreditation.
- Alternative Financial Services.

Assumptions

- Un and Underserved Person applies in person at the Financial Institution or uses an acceptable electronic means of application including for example Treasury's OCIP that has brought together the FSSCC, DHS, and NIST to create a Cooperative Research and Development Agreement on identity proofing, which has identified new methods for satisfying the "know your customer" requirements of financial institutions.
- Financial Institution must be a FDIC insured bank or equivalent. The digital identity meets the needs of relying parties.

Process Flow



Success Scenario

Julia is able to enroll in a Safe Account that provides her with a digital identity useful in the ID Ecosystem for products and services and for federal, state and local governments. Julia can also apply for and potentially receive other digital identities from other ID Ecosystem providers enlarging the range of products and services, including financial she can access.

References and Citations

- ("Safe Accounts are checkless, card-based electronic accounts that allow withdrawals only through automated teller machines, point-of-sale terminals, automated clearinghouse pre-authorizations, and other automated means and which has lower-cost, electronic payments and prohibits overdraft or non-sufficient funds fees.")
- Consumer Privacy Bill of Rights
- Fair Information Practice Principles (FIPPS)

- FDIC Model Safe Account Pilot (http://www.fdic.gov/consumers/template/)
- Federal Cloud Credential Exchange (FCCX)
- According to the 2011 FDIC National Survey of Unbanked and Underbanked Households, September 2012, 68 million American Adults, making up 30 million American Households, are either unbanked or underbanked. Safe Account Final Report (http://www.fdic.gov/consumers/template/SafeAccountsFinalReport.pdf)
- Federal Identity, Credential, and Access Management (FICAM)

3.12 Selectively Disclose Attributes Use Case

Use Case Content

A Claimant possesses multiple attributes and is eligible for different benefits and/or online services from a Relying Party based on specific attributes. The attributes addressed in this use case can include identity attributes (i.e., name, address, phone number) and biographical attributes (i.e., age, individual certifications, professional affiliations). The Relying Party offers a benefit or service if the claimant discloses the attribute in order to prove eligibility for the specific program. In this use case, the Relying Party is only interested in the specific attribute information and the claimant needs a way to disclose that attribute information.

Actors

- Claimant: a human individual who wants to demonstrate some claim of an attribute.
- Relying Party: an organization wanting to deliver a benefit or service to individuals possessing specific attributes.
- Attribute Verifier
- Registration Authority

Goals / User Stories

John realizes that he is eligible for a benefit from an organization that offers an exclusive benefit/service for people who possess the same attribute as John. The organization wants to verify that John is actually eligible for the benefit/service to protect themselves from fraud or abuse. John is able to provide the minimum necessary information to a third-party attribute verifier who then matches that information against an authoritative source. John is able to review the information before it is shared back to the organization offering the benefit. If John authorizes the release of the information, the organization unlocks the benefit/service to John based on a "yes" or "no" response. The goal of this use case is to protect John's privacy while giving him access to the benefit and at the same time protecting the organization from fraud and abuse. The organization is also able to grow their market share with the community of people possessing specific attributes.

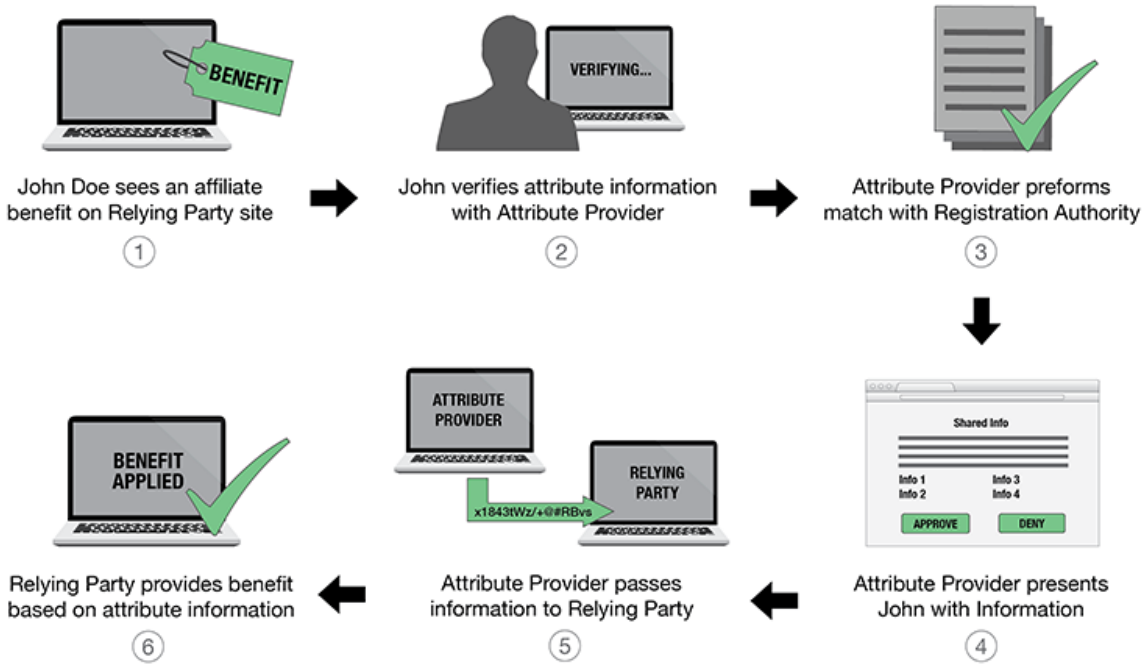
Assumptions

- Relying Party only requires the attribute information be verified and not the identity of the claimant.
- The Relying Party does not need to uniquely identify a single person.
- Relying Party requires the attribute information to be verified against an authoritative source.

- An authoritative source exists to proof the attribute assertion of a claimant.
- Attribute Verifier is able to verify the attribute information of a claimant against the authoritative source.
- Relying Party has an existing relationship with an Attribute Verifier that provides an acceptable level of assurance based on the value and risk of the benefit or service.
- Attribute is bound in some way to limit its scope. That can include (but is not limited to) a pseudonym, timestamp, session ID or other item that will prevent a replay of the attribute claim.

Process Flow

1. A Claimant sees they are eligible for a benefit or service on a Relying Party site based on an attribute the user possesses.
2. The Claimant chooses to prove to the Relying Party that he possesses the attribute and qualifies for the benefit or service.
3. The claimant verifies attribute information with an acceptable Attribute Verifier.
4. The Attribute Verifier performs a match with the authoritative database associated with the particular attribute.
5. The Attribute Verifier presents the results of the match against the authoritative database and gives the user control of whether or not that information is shared with the Relying Party.
6. Upon authorization by the Claimant, the Attribute Verifier passes the minimum attribute information to the relying party to prove the Claimant is eligible.
7. The Relying Party unlocks the benefit or service for the Claimant upon receiving confirmation from the Attribute Verifier that the user is qualified.



Success Scenario

- The Claimant is able to access a benefit or service online by proving that they possess a specific attribute.
- The Claimant is then able to disclose their attribute information without having to re-verify.
- A Relying Party realizes a reduction in risk through the use of verified attributes
- A Relying Party is able to grow market share and loyalty with people possessing specific attributes

Error Conditions

- The Claimant possesses the attribute, but is not able to verify that attribute with the Attribute Verifier.
- The Claimant does not possess the attribute, but is able to verify through the Attribute Verifier and fraudulently access the benefit or service.
- Someone other than the claimant is able to present the attribute token in a replay outside of the authorized scope and gain access to the benefit or service.

References and Citations

- FTC Fair Information Practice Principles http://www.ftc.gov/reports/privacy3/fairinfo.shtm
- NSTIC Strategy, http://www.whitehouse.gov/sites/default/files/rss_viewer/NSTICstrategy_041511.pdf

- NIST SP 800-63-2
  http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-63-2.pdf

3.13 Remote Electronic Identity Proofing Use Case

Use Case Description

The core function of this Use Case is to streamline the identity proofing process engaging live human interaction virtually via video conferencing. Additionally, this Use Case is fundamentally different and considers between physical face to face in-person identity proofing in contrast to a real-time virtual face to face in person identity proofing meeting using video conferencing that is recorded, to capture claimants/subscribers verbal and written statements, identification document images, oath based under penalty of perjury, attributes, and facial/voice biometrics.

Actors

- Identity Proofer and Verification Service Provider collects a set of attributes for identity verification - (IPVSP)
- Claimant/Subscriber - (C)
- Public Claimant/Subscriber - (PC)
- Registration Authority/Credential Service Provider - (RA/CSP)

Goals

- Goal 1) (C) Claimant, who is distal (not in the physical presence) of RA and has an antecedent relationship with the RA, is given approval by RA to acquire a trusted credential. (C) Claimant connects via method for attribute collection with RA's IP for an identity proofing antecedent in - person event to submit their attributes. IPVSP collects (C) Claimant attributes and submits to RA/CSP.
- Goal 2) PC, who is remote (not in the physical presence) and does not have an antecedent relationship with an RA, requires a trust credential and via method for attribute collection connects to an IPVSP who has an established trust relationship with a RA/CSP to submit the PC attributes to RA/CSP.

Assumptions

- (C) Claimant/PC needing to initiate the process for acquiring a trust credential, is in the physical presence of the IPVSP to present their attributes.
- RA/CSP has a pre-authorized trust relationship with IPVSP.
- RA/CSP has issued to the IPVSP a method for the collection of the required (C) Claimant/PC attributes.
- IPVSP must have a trust relationship with RA/CSP.
- (C) Claimant/PC is distal or remote (not in the physical presence) of the IPVSP System and device used in method for attribute collection, attestation, and digital signing.

- IP and (C) Claimant/PC process the collection of attributes via prescribed method to include accordance with 28 U.S.C. 1746 (declaration under penalty of perjury) and provisions in FBCA 3.2.3.1 authentication of Human Subscribers.

Process Flow

1. (C) Claimant/PC initiates remote electronic identity proofing event via on-line appointment. If PC, payment for services options are necessary.
2. IPVSP retrieves request. IPVSP confirms payment receipt if service is for PC; however IPVSP implements attribute collection methodology via video conferencing.
    - It is contemplated that attribute collection methodology via video conference may interface with CSP platform to streamline trust credential enrollment processing and issuance.
    - It is also contemplated to augment high assurance identity proofing to include collection of biometric attributes in accordance with FIPS 201-1.

Success Scenario

- (C) Claimant/PC who is remote (not in the physical presence) of the RA/CSP securely submits their attributes to IPVSP maintaining IDESG privacy standards.
- IPVSP submits (C) Claimant/ PC's attributes to RA/CSP for authentication, and digital identity trust credential is issued to (C) Claimant/PC.

Error Conditions

- (C) Claimant/PC submits fraudulent attributes.
- (C) Claimant/PC does not have required identification documents.
- PC fails to make payment.
- (C) Claimant/PC attributes do not comply with RA/CSP authentication standards.
- Communication transmission between (C) Claimant/PC, IPVSP, RA/CSP, disruptions.
- (C) Claimant/PC or IPVSP does not have system or devices for implementation of attribute collection methodology.
- (C) Claimant/PC and/or IPVSP inputs errors or creates omissions in attribute collection.
- IPVSP does not have trusted relationship with RA/CSP.

References and Citations

- NIST 800-63-1
- Federal Bridge Certificate Authority
- ISO/IEC WD1 29003 -- Information technology – Security techniques – Identity Proofing
- FPKIPA – CPWG Antecedent, In-Person Task Group
- FIPS 201-1
- FIPPS
- CPBR

- VPPA
- Privacy and Security Tiger Team Trusted Identity of Patients in Cyberspace Recommendations on Patient Identity Proofing and AuthN
- Patent Nos. 7590852, 8190904

NSTIC Guiding Principles Considerations

Privacy Considerations

- It is expected that attributes gathered during identity proofing are sensitive information and deserving of privacy protections. In addition the Remote Electronic Identity Proofing Use Case recommends all actors refer to Fair Information Privacy Practice Principles (FIPPS), Consumer Privacy Bill of Rights (CPBR), Video Privacy Protection Act (VPPA), and the IDESG PEM for ongoing guidance as this Use Case is further developed and is not implementation specific.

Annex A – Acknowledgments

The UCAHG would like to thank Bryan Russell, Ann Racuya-Robbins, J. Andrew Hatter, Jim Fenton, Tom Jones, Bob Pinheiro, Scott Shorter, Matt Thompson, the Nym Issues Group, and Cathy Tilton for their participation and contribution.

In addition, appreciation is given to the members of the Standards Coordination Committee and other IDESG committees who contributed to and reviewed this document.

Annex B – References

1. National Strategy for Trusted Identities in Cyberspace (NSTIC): http://www.whitehouse.gov/sites/default/files/rss_viewer/NSTICstrategy_041511.pdf (Source for NSTIC Guiding Principles)
2. IDESG Use Case Wiki: https://www.idecosystem.org/wiki/Use_Cases
3. OASIS Identity in the Cloud Use Cases: http://docs.oasis-open.org/id-cloud/IDCloud-usecases/v1.0/cn01/IDCloud-usecases-v1.0-cn01.html
4. "Writing Effective Use Cases", by Alistair Cockburn copyright 2001, http://www.infor.uva.es/~mlaguna/is1/materiales/BookDraft1.pdf

Annex C – 2013 Goals

In May of 2013, the IDESG Plenary Chair, Bob Blakely, identified a set of goals to be achieved with the IDESG Use Cases. The following table discusses activity against these goals.

Goal	Explanation
Frame the IDESG's initial objectives and scope of work	The use cases contributed by IDESG members (over 50 from individuals, 20 from the UCAHG) reflected the interests and priorities of the contributors, and considerable discussion and effort has been put into obtaining the opinions of diverse constituencies within IDESG.
Drive consensus among IDESG plenary members about the characteristics of the ecosystem and identity ecosystem framework we are trying to bring into existence	This deliverable sketches a map with a few prominent landmarks. We call upon IDESG work groups to draw roads and settlements and fill in that map. Then the IDESG can discuss where to drive consensus to.
Capture the requirements of all NSTIC constituencies	Many constituencies did participate and the review process was open to all.
Make the application of the NSTIC principles to real-world scenarios concrete	Some are concrete, many are more abstract. The abstract use cases are molds into which the IDESG committees may pour concrete.
Serve as a test target against which developing IDESG work products can be evaluated	Please submit these into evaluation methodologies, we welcome comments regarding: • Security considerations (including assumptions, requirements, security levels, security policies, security evaluation techniques, etc.) • Privacy considerations • Relevant legislation, regulation, standards and/or best practices • Real world examples, **NSTIC Pilots particularly welcome!** If the use cases selected for this publication are not the ones you would pick there are many more to choose from, and the process to contribute a use case is open to all IDESG members.
Drive the development of evaluation guidelines which can facilitate granting of an IDESG trustmark	These use cases are trial input to those evaluation guidelines. Consider them test grist for a prototype mill.
Provide a yardstick for measuring success of NSTIC pilot projects	This was outside our scope of effort. NSTIC pilot evaluation is not the mission of the use case UCAHG or the Standards Committee.