Schichtenübergreifendes Identitätsmanagement zwischen HIP und SAML

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Ein Architekturkonzept

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Outline

Introduction	Identities on different layers
Motivation	Combination of User IdM and HIP
Background	Introduce User IdM and HIP
Architecture	Overview of combined system
Message Flows	Management of different identities
Summary and Future Work	

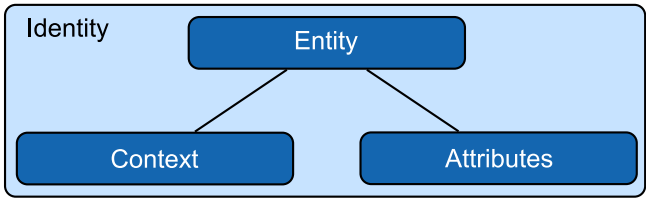
Introduction

What is an identity?

Definition

An identity describes an entity represented by different attributes within a specific context.

Source: P. Windley, "Digital Identity", O'Reilly



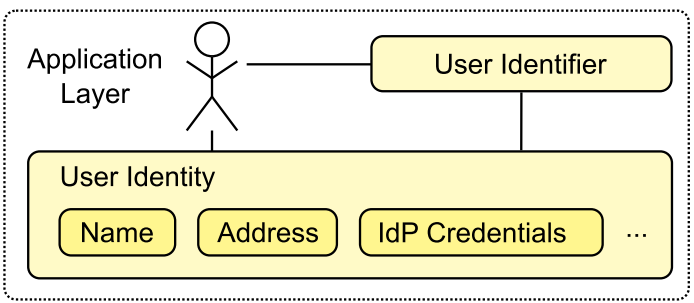
Examples for Identities

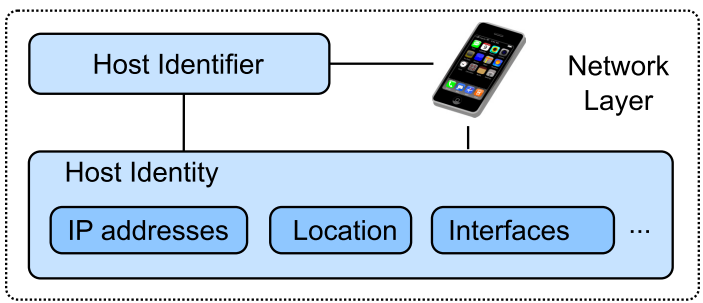
Account with Amazon → User Identity

- Entity: User
- Attributes: Name, Credit Card, ...
- Context: Buying books

Mobile phone→ Host Identity

- Entity: Cell phone (Host)
- Attributes: IP Address, IMEI, ...
- Context: Surfing the web

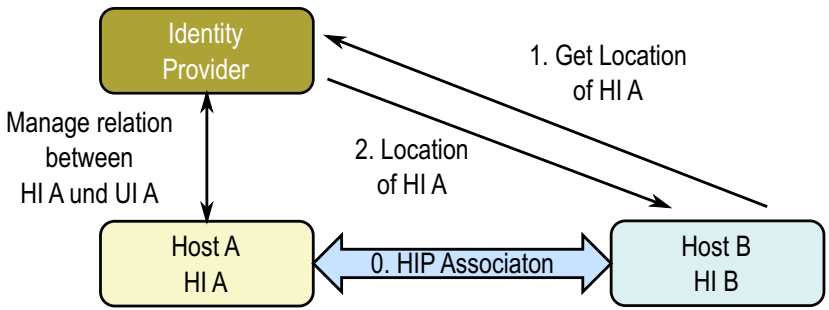




→ Can we benefit from an **integrated identity concept?**

Motivation for an Integrated Identity Concept

- Benefit from mutual advantages
  - User IdM System - SAML-based
    - Single Sign-On
    - Attribute Retrieval
  - Network Protocol - Host Identity Protocol
    - Mobility
    - Multihoming
- Avoid duplicate security functionality
  - User IdM System - SAML-based
    - TLS
  - Network Protocol - Host Identity Protocol
    - IPSec
- Provide new possibilities
  - Extension of trust concepts
  - Cross-Layer Attribute Exchange

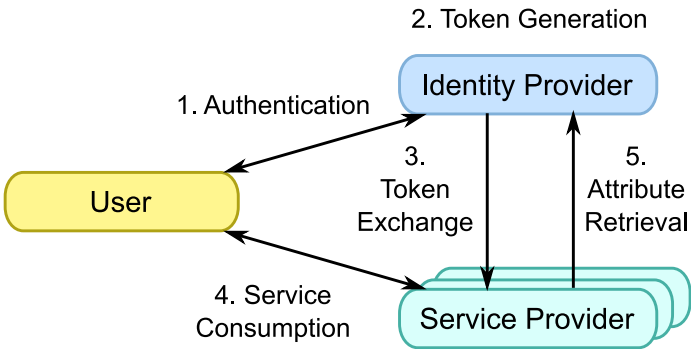


→ **Design an integrated architecture**

Background

User Identity Management Systems – SAML-based

- Roles
  - User
  - Service Provider (Relying Party)
  - Identity Provider
- Message Flow
  1. User authenticates against IdP
  2. IdP creates tokens
  3. SP receveives token
  4. User consumes service provided by SP
  5. SP retrieves attributes from IdP
- Advantages
  - Improves Security
  - Improves Usability

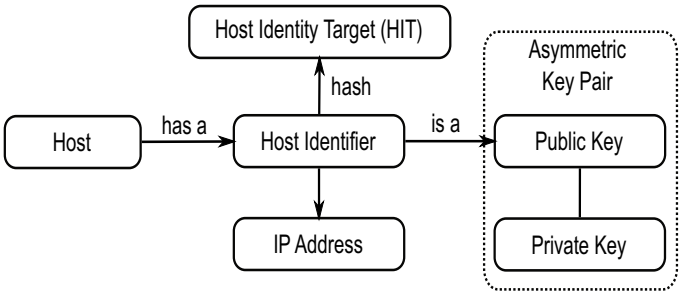


Background

Host Identity Protocol (RFC 4423, 5201-5206)

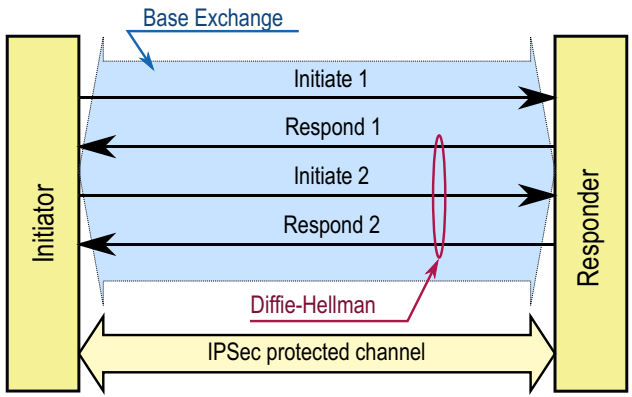
Characteristics

- Host is identified by Host Identifier (HI)
- Host Identifier is the **public key** of a corresponding asymmetric key pair
- Dynamic mapping of HI to IP addresses
- **Additional control layer** between network and transport layer
  - Mobility
  - Multihoming



Base Exchange to establish HIP association

- Four-way handshake
- Key Negotiation Protocol → **IPSec** channel
- Basis to enable host authentication



Requirements for Cross-Layer Attribute Exchange

Mapping between HIP namespace and IdM namespace

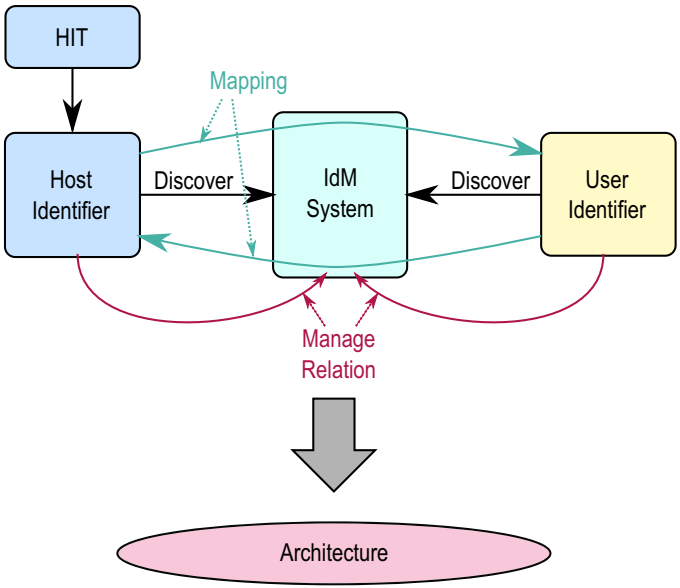
- HIP namespace is flat
- User identifier namespace is hierarchical
  - User part
  - Identity Provider part

→ Additional **mapping mechanisms** in IdM system required

Managing the relation between HI and user identifiers

- User has different hosts, i.e. assign host identity based on user identity
- Trust in HI requires secure mapping between host identity and user identity

→ Additional **HI assignment/registration mechanism** required



Architecture

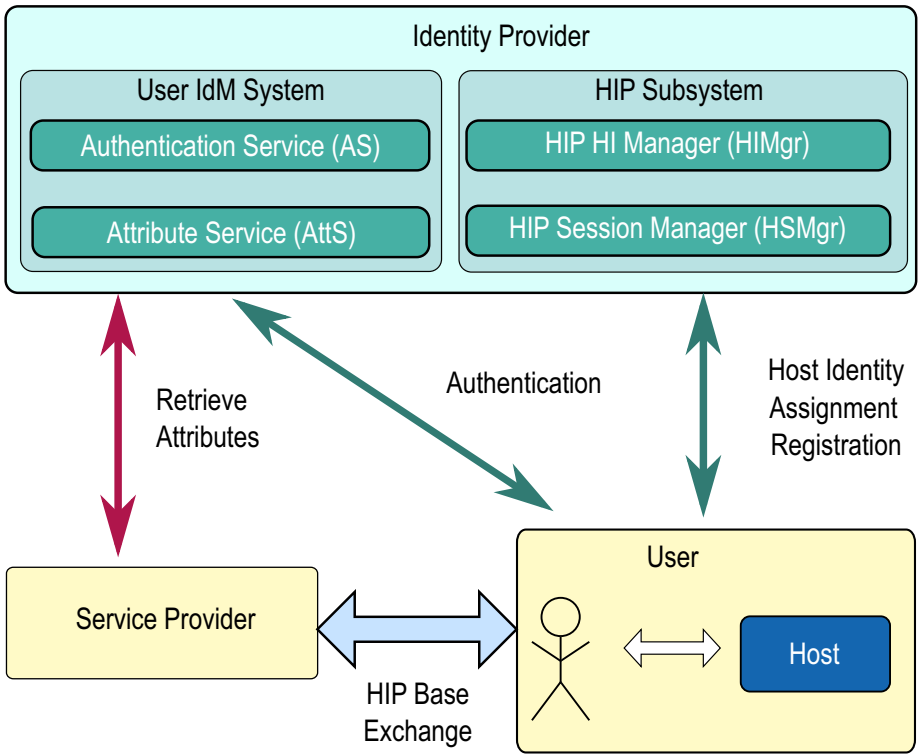
User IdM Subsystem

- Authentication Service:
  - Authentication of users
  - Single Sign-On support
- Attribute Service
  - User and host attributes
  - Mapping of identifiers

HIP Subsystem

- HIP HI Manager
  - Assignment of HI
  - Registration of HI
- HIP Session Manager

  Manage active HIP sessions



Attribute Retrieval

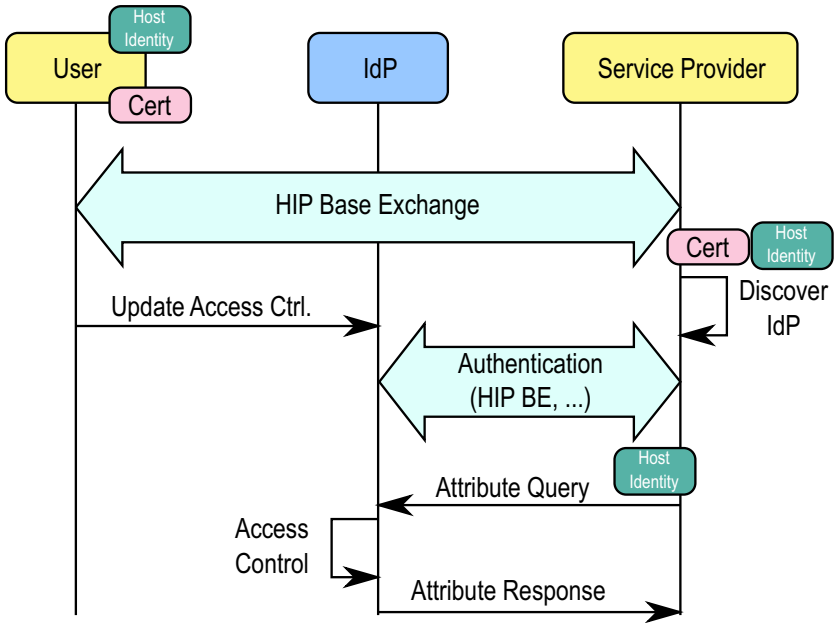
Mapping mechanism between HI and UI

Possible to exchange X.509 certificate in HIP Base Exchange

- **Trust:** Verify host identity
- **Attribute Retrieval:** Discover IdP with additional information

Access control framework

- **Static policies** based on existing HIP associations
- **Dynamic policies** based on HI of communication partner (i.e. Service Provider)



Host Identity Assignment/Registration

Two alternatives

Alt 1: Host Identity Assignment

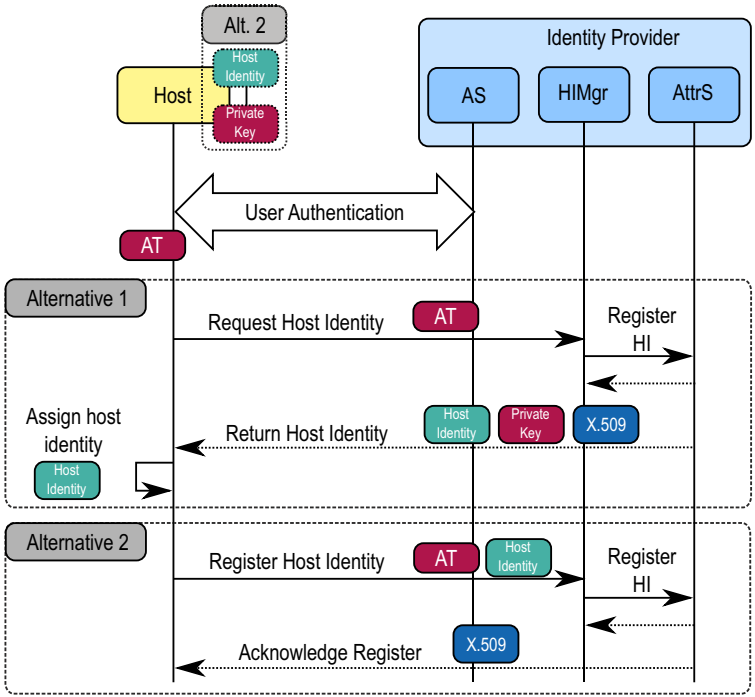
- Host has no identity before
- IdP assigns identity

Alt2: Host Identity Registration

- Host has already an identity
- IdP manages mapping to user id.

Process

- Successful user authentication with Authentication Service (**AS**)
- Host Identity Manager (**HIMgr**) responsible for assignment/registration of HI
- HIMgr creates **X.509 certificate** to attest host identity and as prerequisite for attribute retrieval
- Mapping between HI and UI is stored in Attribute Service (**AttrS**)



Summary and Future Work

Summary

- Motivated **advantages** of proposed solutions
  - Combine advantages of HIP and User IdM (mobility, trust, security)
  - Cross-Layer attribute retrieval
- Presented an **architecture** that integrates user and host identities
- Proposed protocol to **assign/register** host identities
  - Not considered by IETF, so far
  - Alternatives have different security properties
- Introduced solution to map HI to user identities based on **extended X.509** certificates

Future Work

- Evaluation of privacy issues
- Support for multiple hosts and multiple identities (Virtual Identities)
- Work on proof-of-concept **implementation** started
- Integration into **Liberty Alliance** possible
- Extension towards **other technologies** (e.g. MIP, SHIM, ...) that have a notion of identity on the network layer

- Examination of privacy problem by several simultaneous HI

Backup Slides

Introduction

Identity Concepts on Different Layers

Application Layer/ User Identity Management	**Network Layer Host Identity Management**
Purpose	
– Identification and Authentification of users – Improve Security (Reduce number of accounts) – Single Sign-On and Single Bill – Attribute Retrieval	– Support Mobility – Support Multihoming – Improve Security (e.g. Encryption, Network Endpoint Assessment)
Solutions	
– Windows CardSpace – Liberty Alliance – Shibboleth → Security Assertion Markup Langauge **(SAML)**is often the basis	– Explicit Notion of Identity • Host Identity Protocol (**HIP**) • SHIM6 – Implicit Notion of Identity • Mobile IP (MIP • Network Endpoint Assessment (NEA)

→ **Combine** both Identity Concepts at the example of **SAML** and **HIP**

Motivation for Integration of Identity Concepts

- **Differentation** between user and device identities is hard
  - Devices are typically not shared between users
  - Which attribute belongs to the user and which to the device?
- **Benefit** from mutual advantages
  - **Security**: Avoid duplicate security functionality (Authentication, Encryption)
  - **Trust**: Use IdM systems to create trust between hosts
  - **Mobility**: HIP provides a mobility solution
  - **Attribute Exchange**: Retrieve user attributes based on the HI/HIT and vice versa

Example Scenario

Retrieve location information based on Host Identity