Binding Identities and Attributes Using Digitally Signed Certificates

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Introduction

- In this paper, we
  - Analyze the basic structure of digital certificates and classify the nature of the information.
  - Identify 3 different binders.
  - Describe each binder and compare with others.

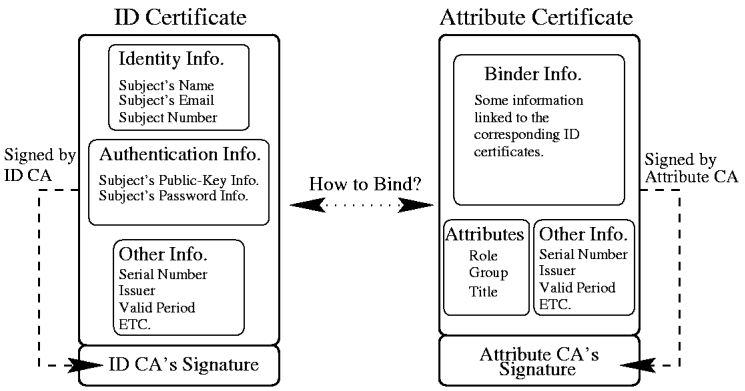
Digital Certificate

- What is it?
  - Signed by a CA to confirm that the information in it is valid and belong to the subject.
- Purpose?
  - To provide the integrity of the information (e.g., identities or attributes) in the certificates.

Related Work

- X.509 Certificates
- Attribute Certificates
- SPKI (Simple Public Key Infrastructure)
- PGP (Pretty Good Privacy)
- Smart Certificates

Basic Structure of Certificates



Note: The content of each block depends on the policy or application.

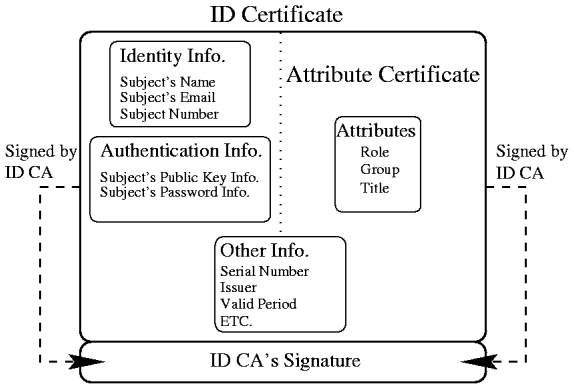
Basic Structure of Certificates

- We classify the nature of information in certificates into blocks.
- The content of each block depends on applications and policies.
- ID certificates should contain authentication information.
- Attribute certificates should link to ID certificates.

Binders

- What is a binder?
  - A mechanism to link attributes to proper identities
- Factors
  - Different CAs
  - Different lifetimes
  - Strength
- To satisfy the requirements, we identify
  - Monolithic Signature
  - Autonomic Signature
  - Chained Signature

Monolithic Signature

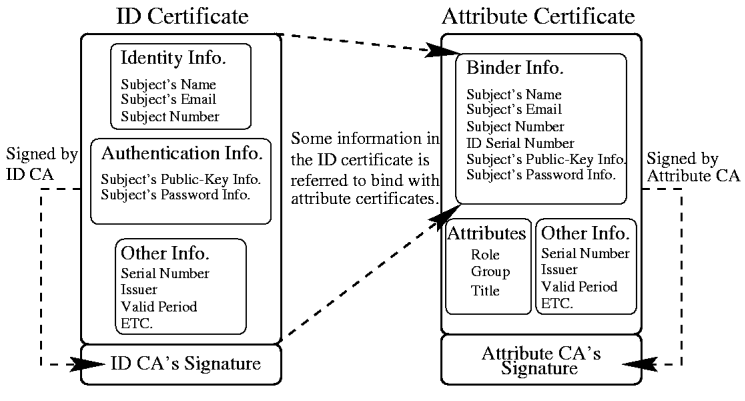


Note: The content of each block depends on the policy or application.

Monolithic Signature

- The simplest binding mechanism.
- Identity and attributes are *tightly-coupled.*
- Problems
  - Multiple CAs, Different Lifetimes

Autonomic Signature

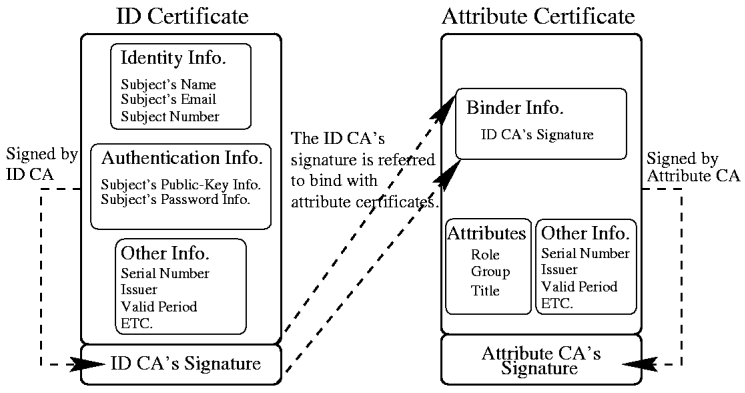


Note: The content of each block depends on the policy or application.

Autonomic Signature

- Supports multiple CAs and different lifetimes.
- Binding some information (e.g., subject's name) in ID certificates and attribute certificates.
- Identity and attributes are *loosely-coupled.*

Chained Signature



Note: The content of each block depends on the policy or application.

Chained Signature

- Supports multiple CAs and different lifetimes.
- Binding ID CA's signatures in ID certificates and attribute certificates.

A Comparison

	Monolithic	Autonomic	Chained
CAs	Single	Multiple	Multiple
Lifetimes	Same	Different	Different
Binding Strength	Tightly-Coupled	Loosely-Coupled	Medium
Reusability	Low	High	Medium
Certificate Discovery	Easy	Medium	Difficult

Conclusions

- In this paper
  - We analyzed the basic structure of digital certificates and classified the nature of the information.
  - We identified 3 different binders.
  - We described each binder and compared with others.