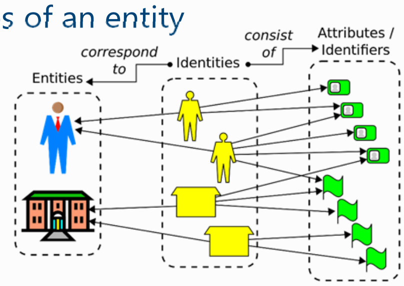
Identity management

Digital identity

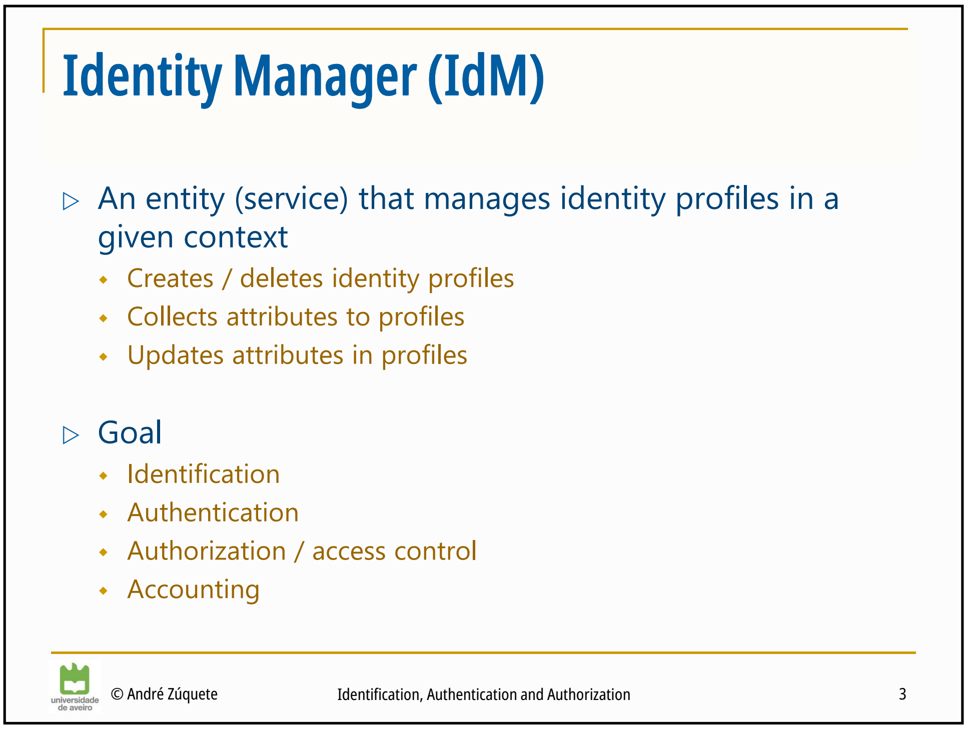
David W. Chadwick. "Federated Identity Management". Springer. 2009.

- ▷ An arbitrary set of attributes of an entity
  - Which can be segregated in different contexts



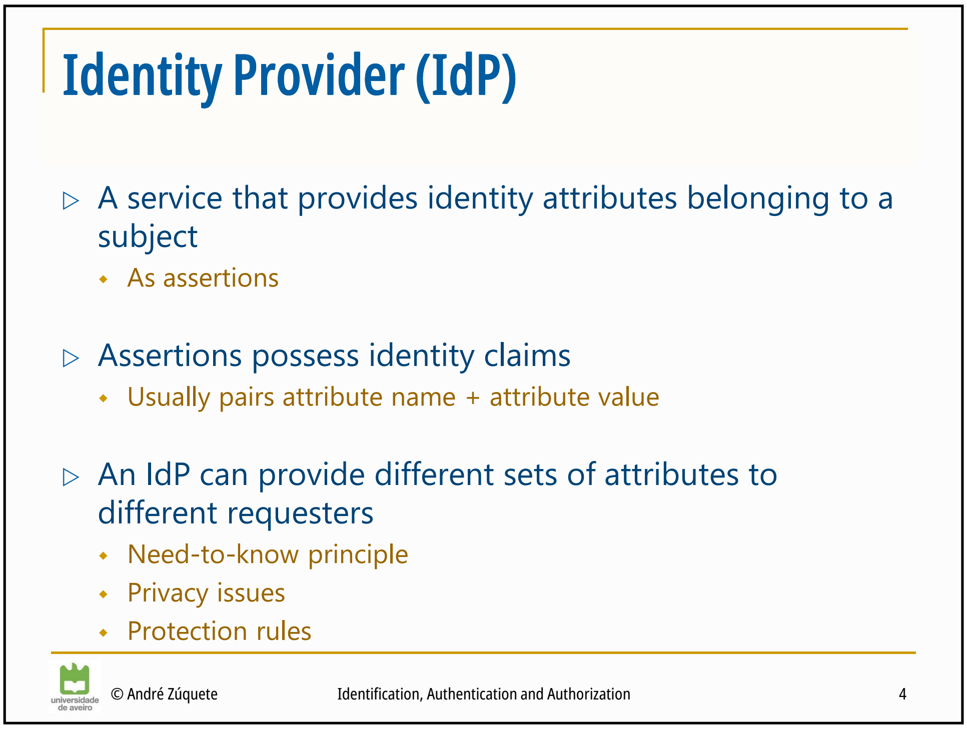
- ▷ Only a subset of those attributes is used to unequivocally recognize the entity in a given context
  - Those attributes are called (contextual) identifiers

https://en.wikipedia.org/wiki/Identity_management#/media/File:Identity-concept.svg



Identity Manager (IdM)

- An entity (service) that manages identity profiles in a given context
  - Creates / deletes identity profiles
  - Collects attributes to profiles
  - Updates attributes in profiles
- Goal
  - Identification
  - Authentication
  - Authorization / access control
  - Accounting

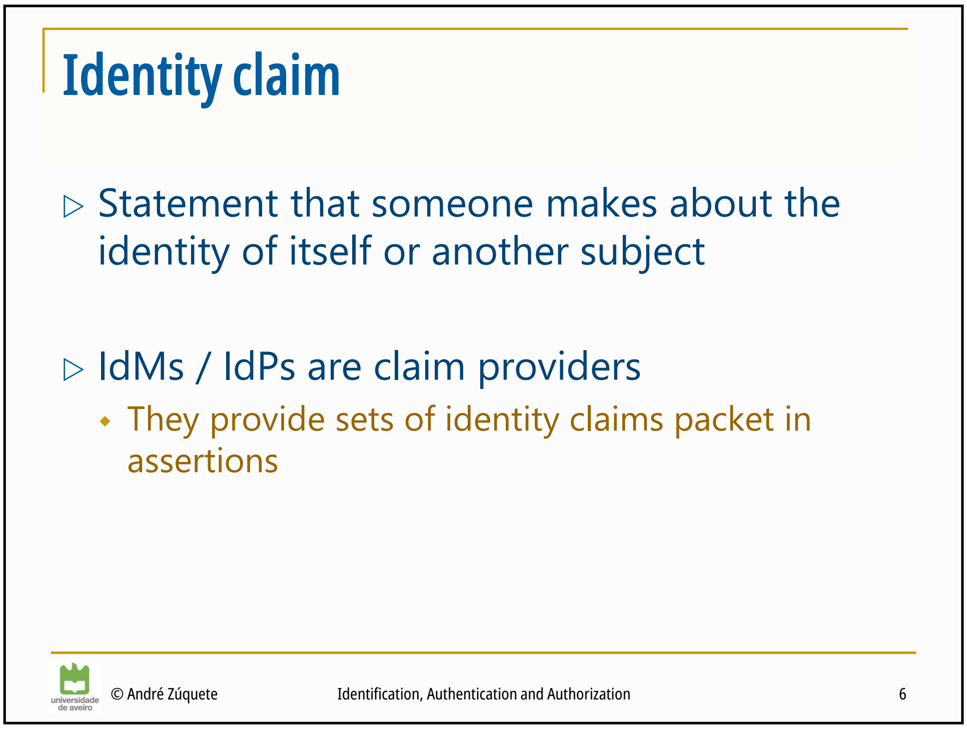


Identity Provider (IdP)

- A service that provides identity attributes belonging to a subject
  - As assertions
- Assertions possess identity claims
  - Usually pairs attribute name + attribute value
- An IdP can provide different sets of attributes to different requesters
  - Need-to-know principle
  - Privacy issues
  - Protection rules

Authoritative source

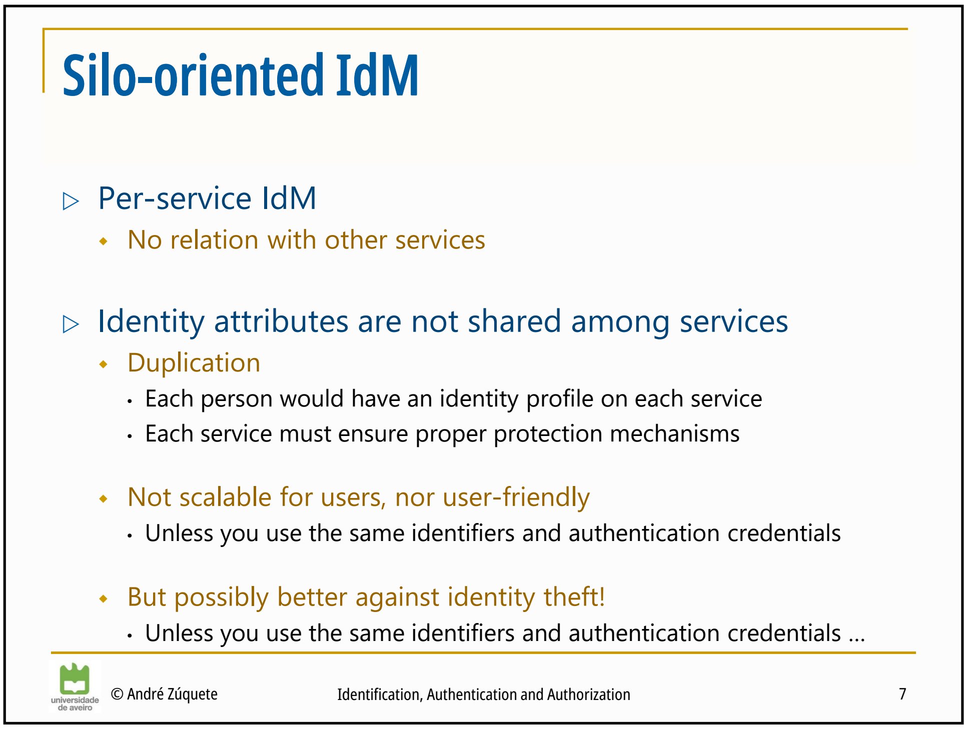
- Top-most IdM responsible for providing a given identity attribute of a subject
  - Aka Attribute Authority



Identity claim

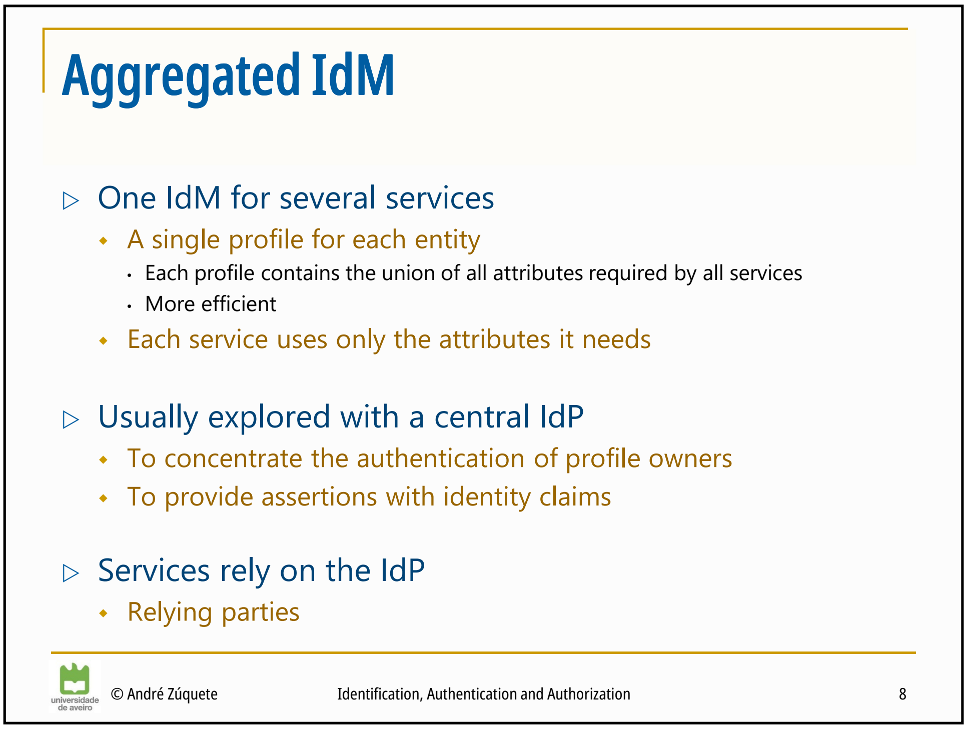
- Statement that someone makes about the identity of itself or another subject

- IdMs / IdPs are claim providers
  - They provide sets of identity claims packet in assertions



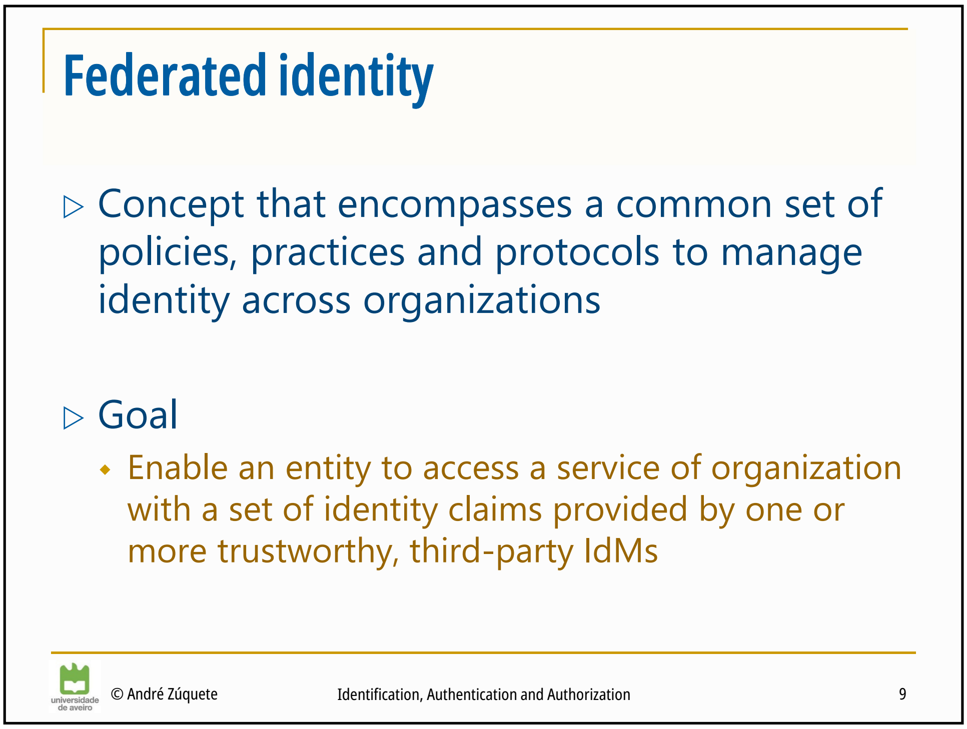
Silo-oriented IdM

- ▷ Per-service IdM
  - No relation with other services
- ▷ Identity attributes are not shared among services
  - Duplication
    - Each person would have an identity profile on each service
    - Each service must ensure proper protection mechanisms
  - Not scalable for users, nor user-friendly
    - Unless you use the same identifiers and authentication credentials
  - But possibly better against identity theft!
    - Unless you use the same identifiers and authentication credentials …



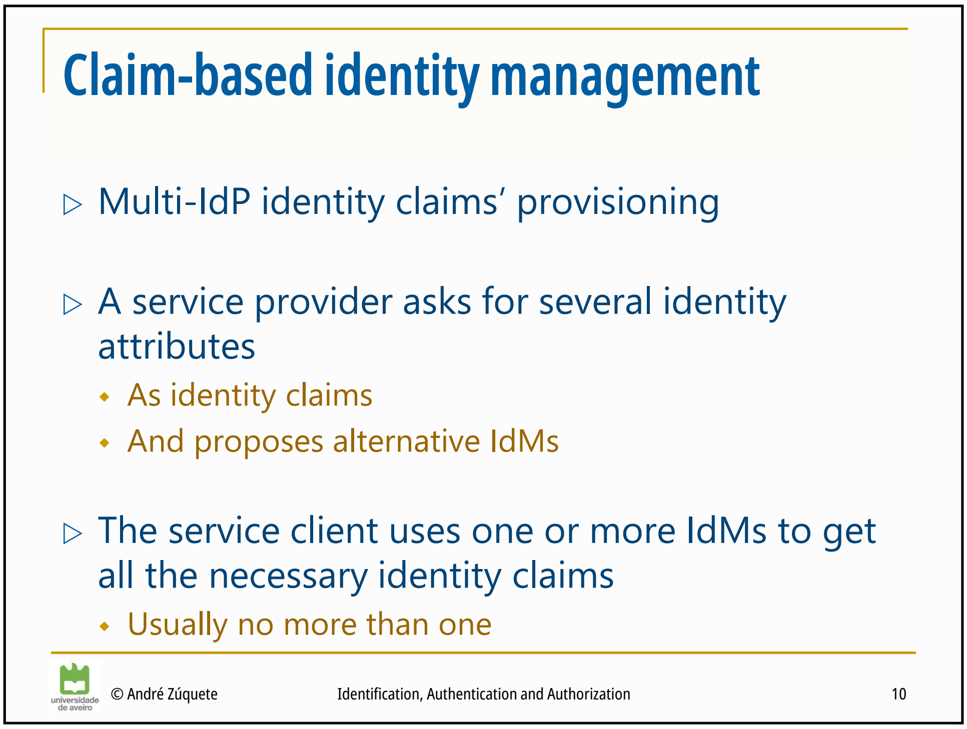
Aggregated IdM

- ▷ One IdM for several services
  - A single profile for each entity
    - Each profile contains the union of all attributes required by all services
    - More efficient
  - Each service uses only the attributes it needs
- ▷ Usually explored with a central IdP
  - To concentrate the authentication of profile owners
  - To provide assertions with identity claims
- ▷ Services rely on the IdP
  - Relying parties



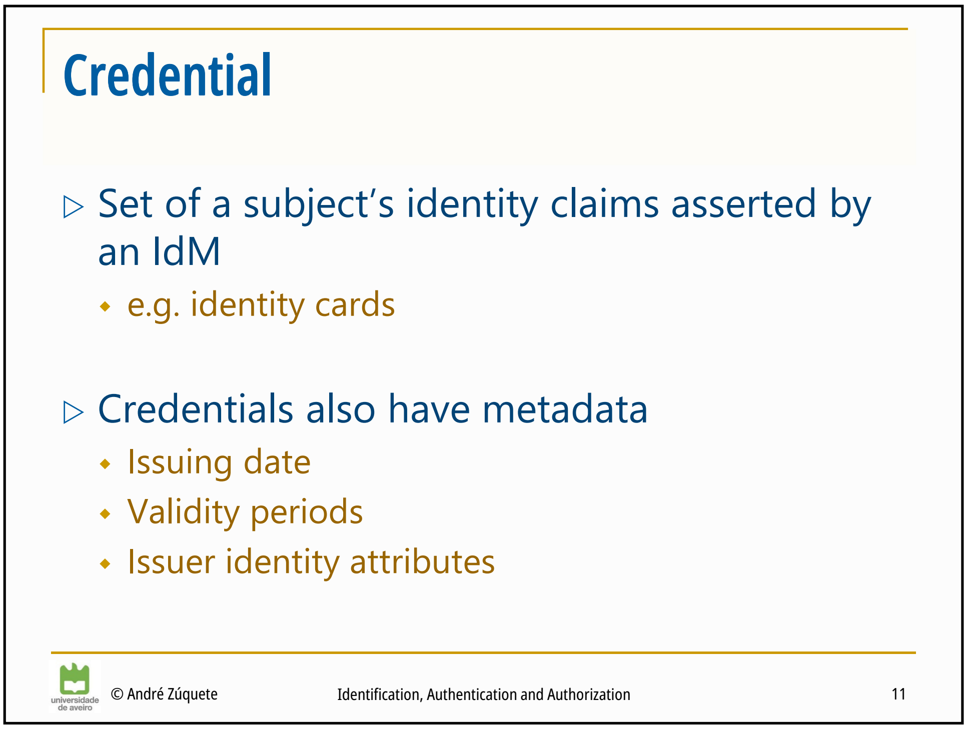
Federated identity

- ▷ Concept that encompasses a common set of policies, practices and protocols to manage identity across organizations
- ▷ Goal
  - Enable an entity to access a service of organization with a set of identity claims provided by one or more trustworthy, third-party IdMs



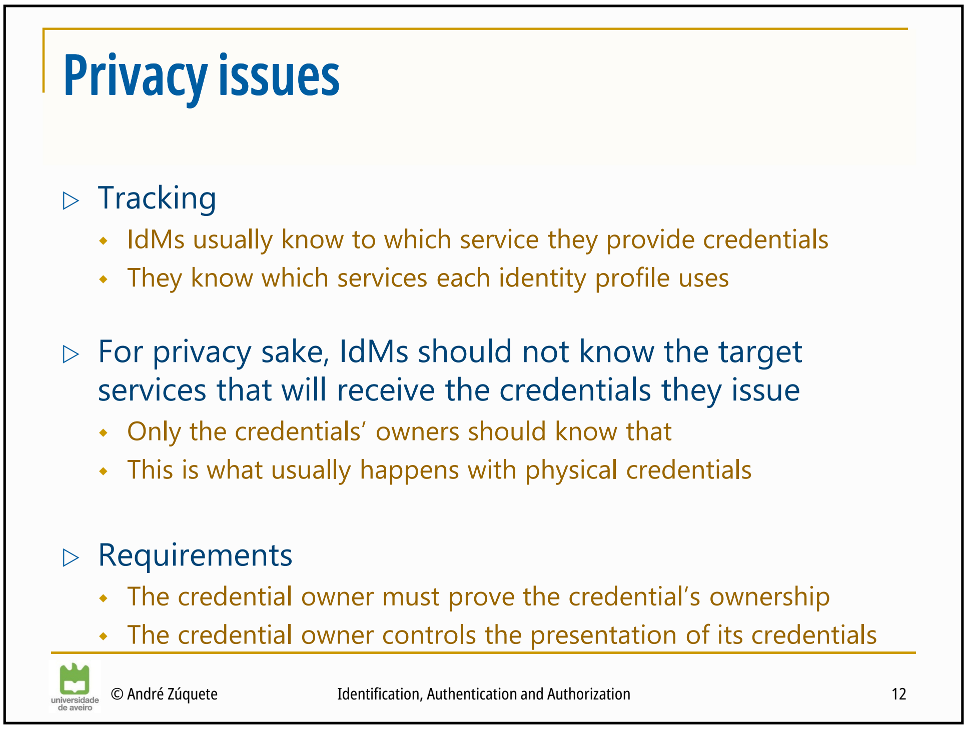
Claim-based identity management

- ▷ Multi-IdP identity claims' provisioning
- ▷ A service provider asks for several identity attributes
  - As identity claims
  - And proposes alternative IdMs
- ▷ The service client uses one or more IdMs to get all the necessary identity claims
  - Usually no more than one



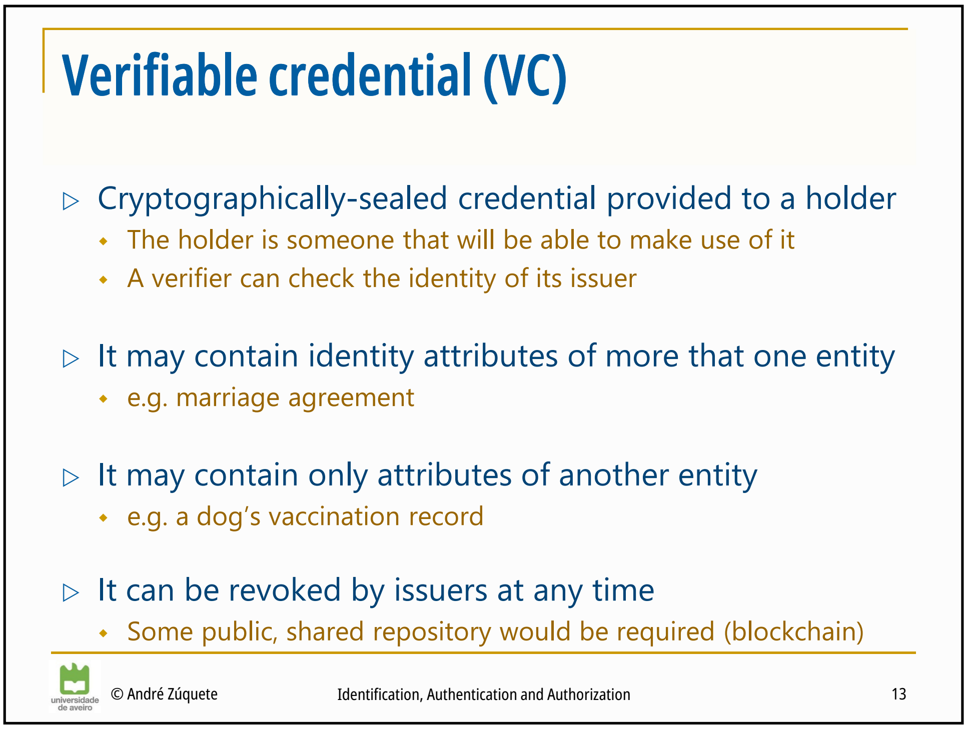
Credential

- ▷ Set of a subject’s identity claims asserted by an IdM
  - e.g. identity cards
- ▷ Credentials also have metadata
  - Issuing date
  - Validity periods
  - Issuer identity attributes



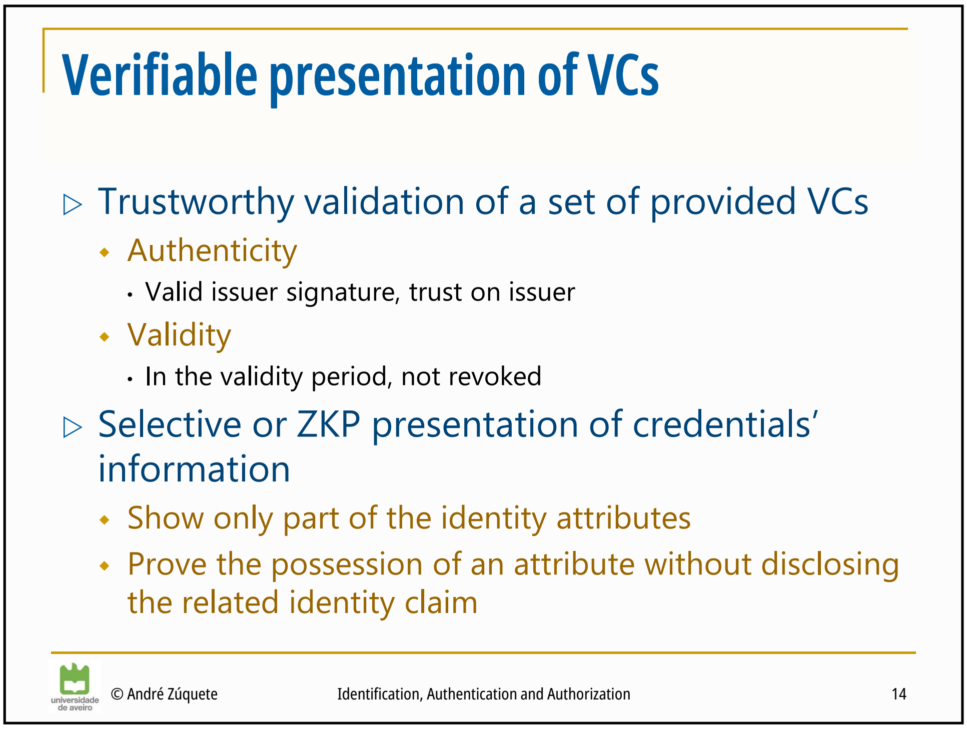
Privacy issues

- ▷ Tracking
  - IdMs usually know to which service they provide credentials
  - They know which services each identity profile uses
- ▷ For privacy sake, IdMs should not know the target services that will receive the credentials they issue
  - Only the credentials’ owners should know that
  - This is what usually happens with physical credentials
- ▷ Requirements
  - The credential owner must prove the credential’s ownership
  - The credential owner controls the presentation of its credentials



Verifiable credential (VC)

- Cryptographically-sealed credential provided to a holder
  - The holder is someone that will be able to make use of it
  - A verifier can check the identity of its issuer
- It may contain identity attributes of more that one entity
  - e.g. marriage agreement
- It may contain only attributes of another entity
  - e.g. a dog’s vaccination record
- It can be revoked by issuers at any time
  - Some public, shared repository would be required (blockchain)



Verifiable presentation of VCs

- Trustworthy validation of a set of provided VCs
  - Authenticity
    - Valid issuer signature, trust on issuer
  - Validity
    - In the validity period, not revoked
- Selective or ZKP presentation of credentials’ information
  - Show only part of the identity attributes
  - Prove the possession of an attribute without disclosing the related identity claim

Self-Sovereign Identity (SSI)

- Not a very good name …
  - Decentralized identity?
- It requires a digital wallet
  - For keeping digital credentials
  - Credentials are VCs that can prove to a verifier:
    - Who is the issuer
    - To whom they where issued
    - Whether it has been altered since it was issued
    - Whether it has been revoked by the issuer

SSI:
Types of credentials

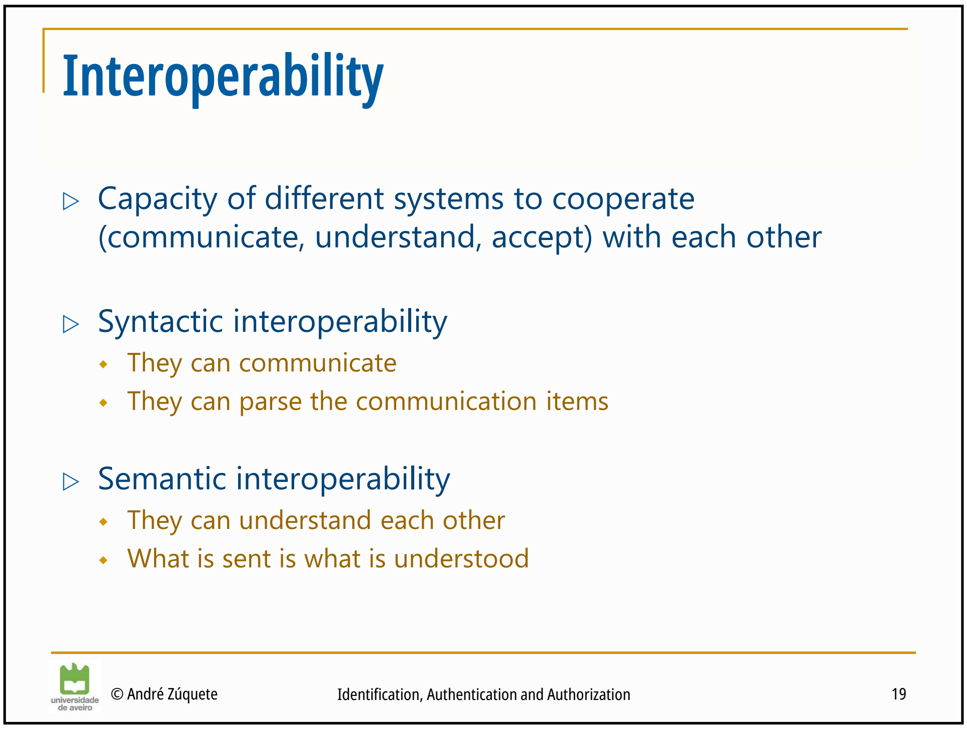
- Third-party attested credentials
  - The credentials a person shows to others to prove their identity attributes
  - They imply the trust of the credential receiver in the credentials' issuers
- Self-attested credentials
  - What I say about myself
    - Opinion, preference, consent
  - Still needs credentials issued by TTPs
    - To associate identity attributes recognized by other to you opinion, preference or consent

SSI:
Credential issuers

- ▷ They act in response to requests of credentials owners
  - And not the services they access
- ▷ They can change / revoke issued credentials at any time
  - But credential owners can still used them
  - Revocation verification should not require a contact with the credential issuer
    - Some public repository must exist (blockchain)

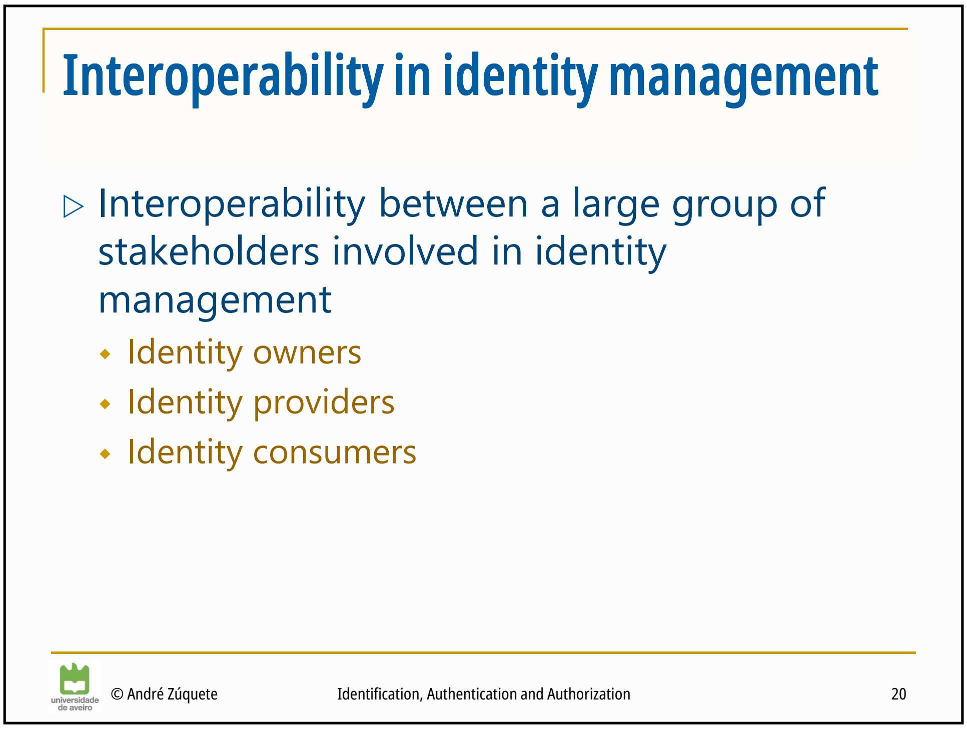
SSI:
P2P sessions

- ▷ Each entity possesses a wallet
  - With contains an asymmetric key pair
- ▷ Thus, each pair of entities can establish a secure, P2P “connection”, or “session”
  - With which they can securely exchange credentials



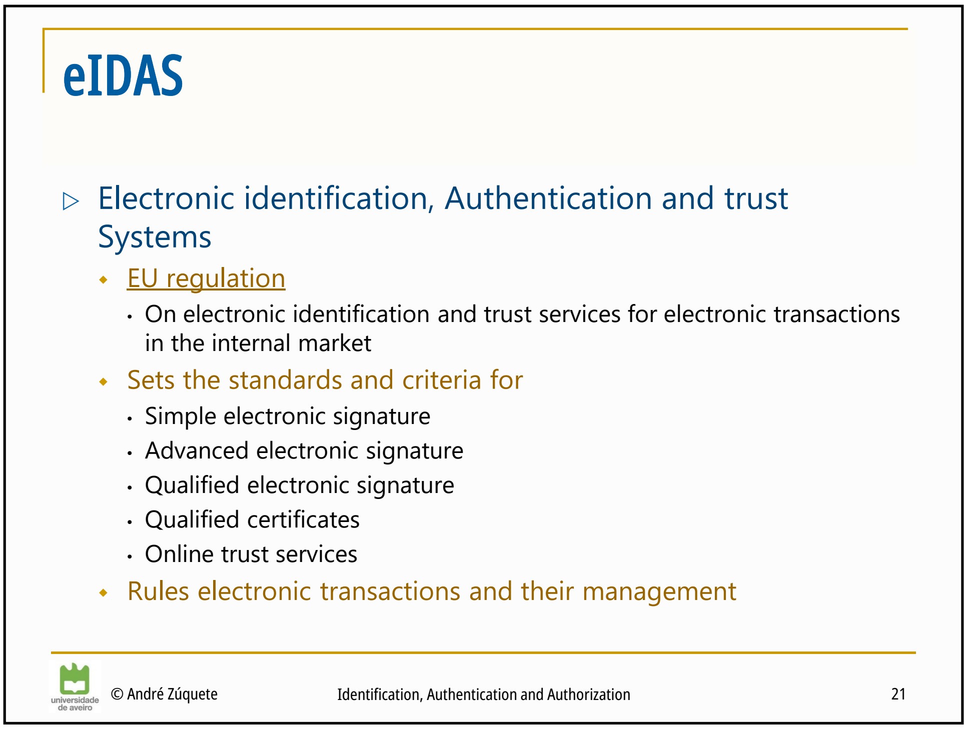
Interoperability

- ▷ Capacity of different systems to cooperate (communicate, understand, accept) with each other
- ▷ Syntactic interoperability
  - They can communicate
  - They can parse the communication items
- ▷ Semantic interoperability
  - They can understand each other
  - What is sent is what is understood



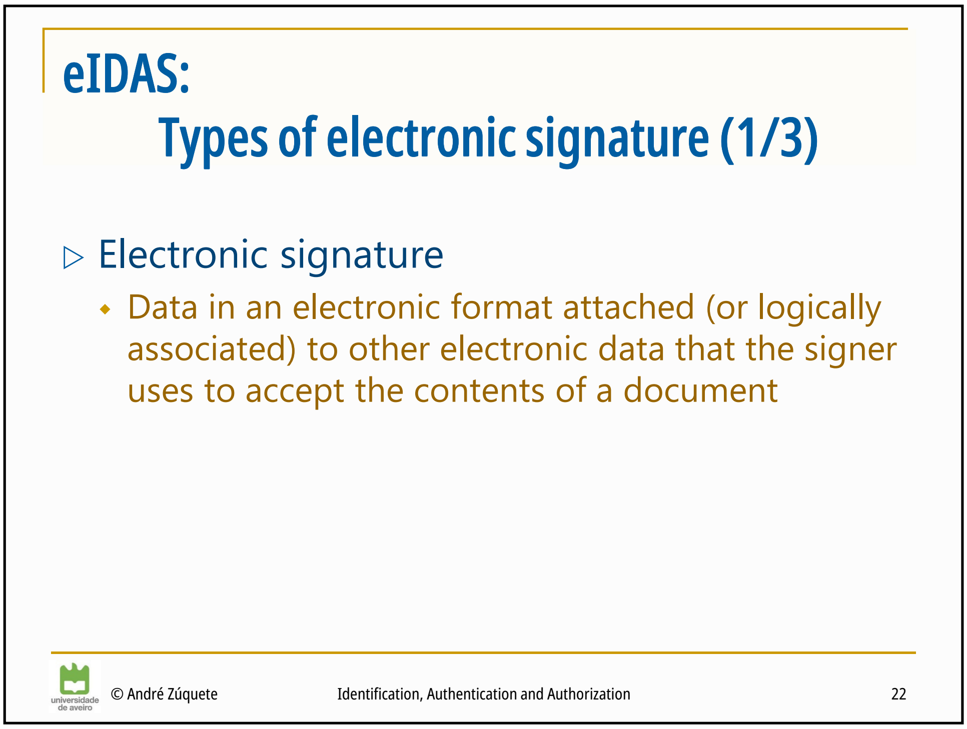
Interoperability in identity management

- ▷ Interoperability between a large group of stakeholders involved in identity management
  - Identity owners
  - Identity providers
  - Identity consumers



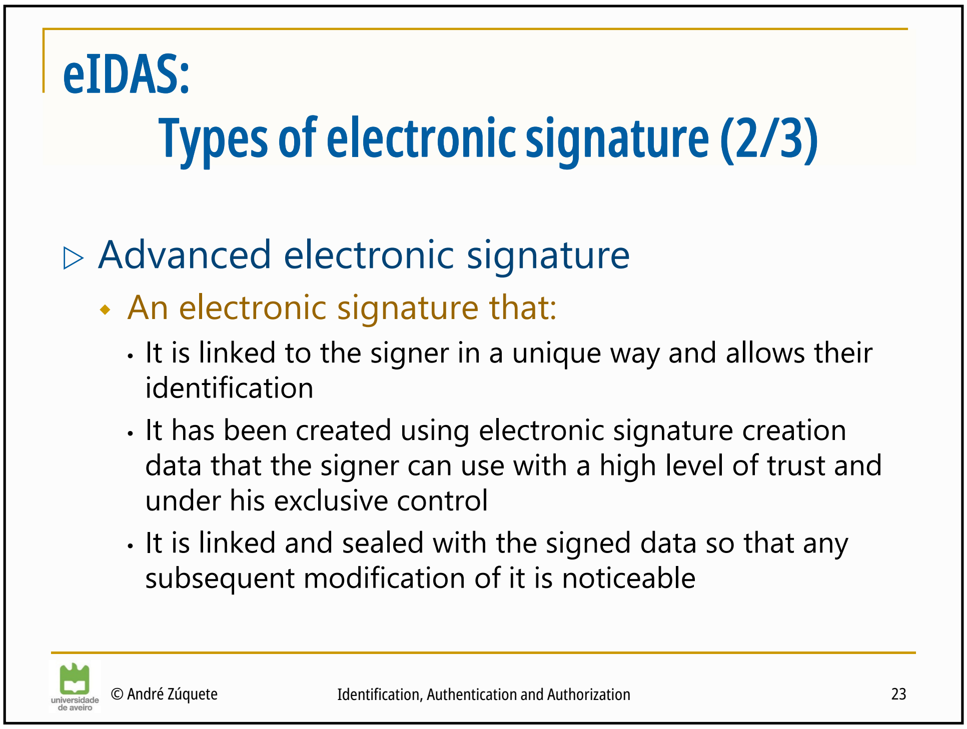
eIDAS

- Electronic identification, Authentication and trust Systems
  - EU regulation
    - On electronic identification and trust services for electronic transactions in the internal market
  - Sets the standards and criteria for
    - Simple electronic signature
    - Advanced electronic signature
    - Qualified electronic signature
    - Qualified certificates
    - Online trust services
  - Rules electronic transactions and their management



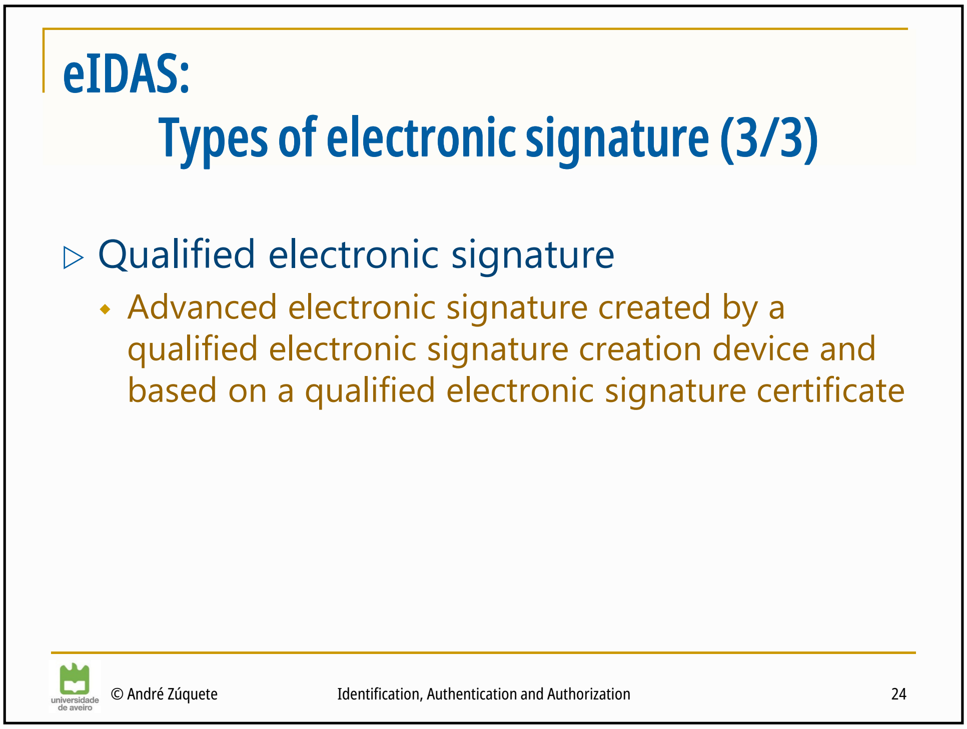
eIDAS: Types of electronic signature (1/3)

- Electronic signature
  - Data in an electronic format attached (or logically associated) to other electronic data that the signer uses to accept the contents of a document



eIDAS: Types of electronic signature (2/3)

- ▷ Advanced electronic signature
  - An electronic signature that:
    - It is linked to the signer in a unique way and allows their identification
    - It has been created using electronic signature creation data that the signer can use with a high level of trust and under his exclusive control
    - It is linked and sealed with the signed data so that any subsequent modification of it is noticeable



eIDAS: Types of electronic signature (3/3)

- ▷ Qualified electronic signature
  - Advanced electronic signature created by a qualified electronic signature creation device and based on a qualified electronic signature certificate

eIDAS: Qualified trust services (1/2)

- Services electronically provided that
  - Meet eIDAS requirements
    - To operate at a high level of confidence and technical security
  - A natural or a legal person who provides one or more trust services
    - Either as a qualified or non-qualified trust service provider
  - Hold authenticity presumption

eIDAS: Qualified trust services (2/2)

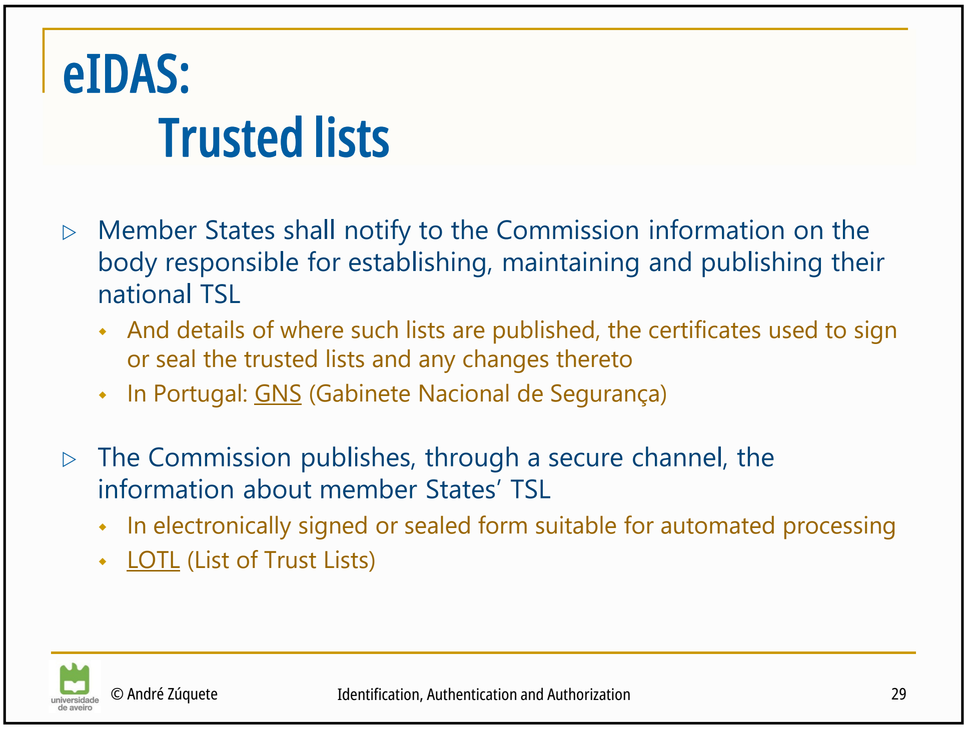
- Services, normally provided for remuneration, of:
  - Creation, verification, and validation of electronic signatures, electronic seals or electronic time stamps, electronic registered delivery services and certificates related to those services
  - Creation, verification and validation of certificates for website authentication
  - Preservation of electronic signatures, seals or certificates related to those services

eIDAS: Qualified (digital) certificate

- Public key certificate issued by a qualified trust service provider

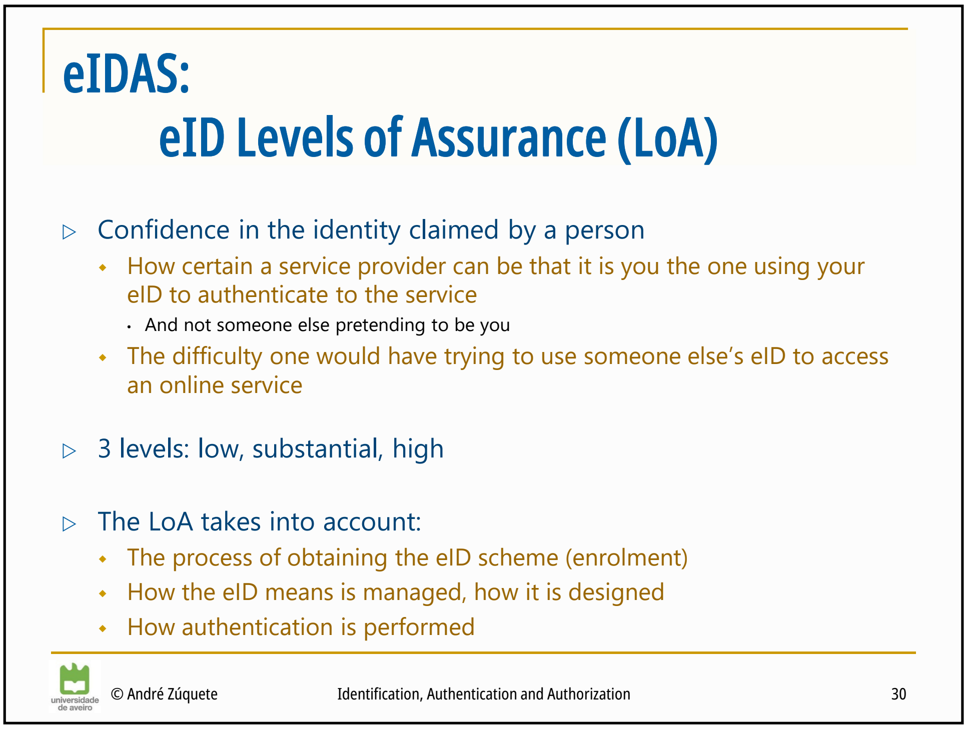
eIDAS: Trusted lists (TSL)

- Each Member State shall establish, maintain and publish trusted lists
  - Relation (Trusted-Service Status List) of certifying entities that are registered or accredited by the accrediting authority
  - Information about qualified trust service providers for which it is responsible
  - A TSL may include information on non-qualified trust service providers
    - It shall be clearly indicated that they are not qualified according to EU Regulation
- Member States shall establish, maintain and publish, in a secured manner, the electronically signed or sealed trusted lists in a form suitable for automated processing
  - Usually XML



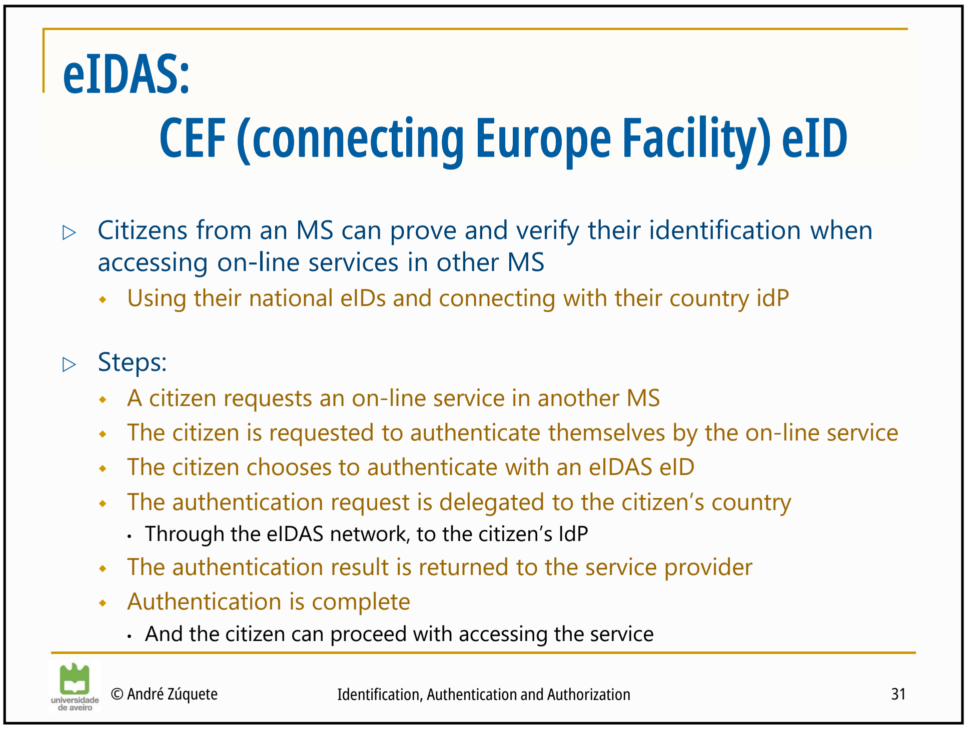
eIDAS:
Trusted lists

- Member States shall notify to the Commission information on the body responsible for establishing, maintaining and publishing their national TSL
  - And details of where such lists are published, the certificates used to sign or seal the trusted lists and any changes thereto
  - In Portugal: GNS (Gabinete Nacional de Segurança)
- The Commission publishes, through a secure channel, the information about member States' TSL
  - In electronically signed or sealed form suitable for automated processing
  - LOTL (List of Trust Lists)



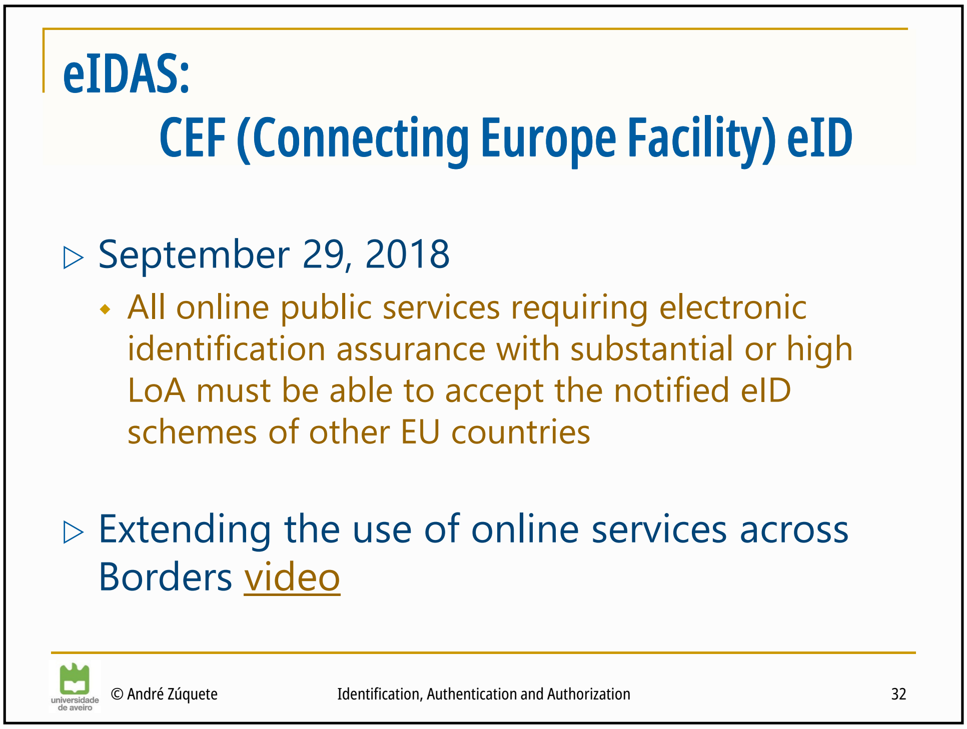
eIDAS:
eID Levels of Assurance (LoA)

- Confidence in the identity claimed by a person
  - How certain a service provider can be that it is you the one using your eID to authenticate to the service
    - And not someone else pretending to be you
  - The difficulty one would have trying to use someone else's eID to access an online service
- 3 levels: low, substantial, high
- The LoA takes into account:
  - The process of obtaining the eID scheme (enrolment)
  - How the eID means is managed, how it is designed
  - How authentication is performed



eIDAS: CEF (connecting Europe Facility) eID

- Citizens from an MS can prove and verify their identification when accessing on-line services in other MS
  - Using their national eIDs and connecting with their country idP
- Steps:
  - A citizen requests an on-line service in another MS
  - The citizen is requested to authenticate themselves by the on-line service
  - The citizen chooses to authenticate with an eIDAS eID
  - The authentication request is delegated to the citizen's country
    - Through the eIDAS network, to the citizen's IdP
  - The authentication result is returned to the service provider
  - Authentication is complete
    - And the citizen can proceed with accessing the service



eIDAS: CEF (Connecting Europe Facility) eID

- September 29, 2018
  - All online public services requiring electronic identification assurance with substantial or high LoA must be able to accept the notified eID schemes of other EU countries
- Extending the use of online services across Borders video