W3C Workshop on Next Steps for XML Signature and XML Encryption

The importance of incorporating XAdES extensions into ongoing XML-Sig work

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Historical background

- 1999: European Directive on a Community framework for electronic sigantures, by the European Commission.
  - Defines Advanced Electronic Signatures as those ones that:
    - Are uniquely linked to the signatory
    - Are capable of identifying the signatory
    - Are created using means that the signatory may maintain under his sole ontrol
    - Are linked to the data to which it relates in such a manner that any subsequent change of the data is detectable

Historical background

- ETSI (European Telecommunications Standardization Institute) starts developing standards for electronic signatures aligned with European directive.
- February 2002: ETSI publishes version 1.1.1 of Technical Specification (TS) 101 903: “XML Advanced Signature (XAdES)”
- February 2003, W3C acknowledges a submission based on XAdES v1.1.1 as W3C Note.

Historical background

- An interoperability event is organized by ETSI at November 2003.
- April 2004 publishes XAdES v1.2.2.
- Interoperability event in May 2004.
- March 2006 publishes XAdES v1.3.2

Technical background: generalities

- XAdES signatures build on XMLDSig signatures.
- XAdES signatures use XMLDSig extension capabilities (ds:Object).
- XAdES standardizes:
  - A number of new properties that further qualify XMLDSig signatures with information able to fulfil a number of common requirements (long term validity, non-repudiation, alignment to European Directive, etc)
  - Mechanisms to incorporate the aforementioned properties.

Technical background: generalities

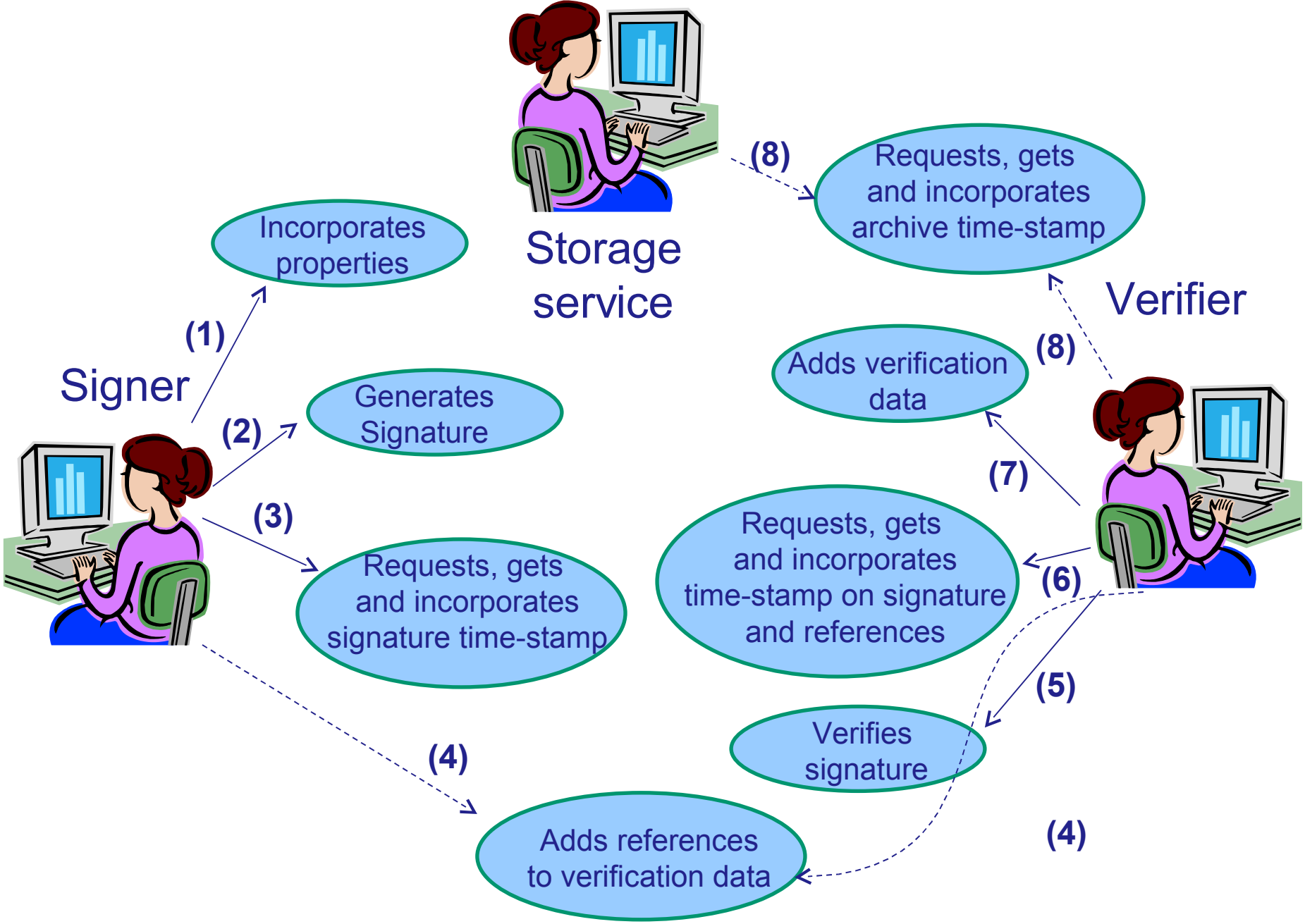
- Defines a number of so-called “XAdES forms” as signatures that incorporate specific combinations of properties.

Technical background: properties

- XAdES properties may:
  - Qualify the signature itself, the data to be signed or the signatory.
  - Be incorporated to the signature by the signer before actually produce the digital signature value it and be secured by the signature itself (signed properties).
  - Be incorporated by the signer, the verifier or another party after the generation of the digital signature value (unsigned properties).

Technical background: XAdES and signature lifecycle

- XAdES forms (specific combinations of properties) are designed to encompass signatures life-cycle.
- This specially includes long-term signatures, where XAdES forms provides mechanisms covering from their creation to their auditing long time after their creation and first verification.


Storage service
Signer
Verifier
(1)
Incorporates properties
(2)
Generates Signature
(3)
Requests, gets and incorporates signature time-stamp
(4)
Adds references to verification data
(5)
Verifies signature
(6)
Requests, gets and incorporates time-stamp on signature and references
(7)
Adds verification data
(8)
Requests, gets and incorporates archive time-stamp
(4)

Technical background: properties overview

- Signed properties.
  - Incorporated by the signer before actually computing the digital signature value.
  - Secured by the digital signature value.
- SigningCertificate:
  - Reference to the signing certificate and optionally to the certificates in the certpath. References incorporate identifiers and also digest values of the certificates.
  - Secures signer certificate reference.

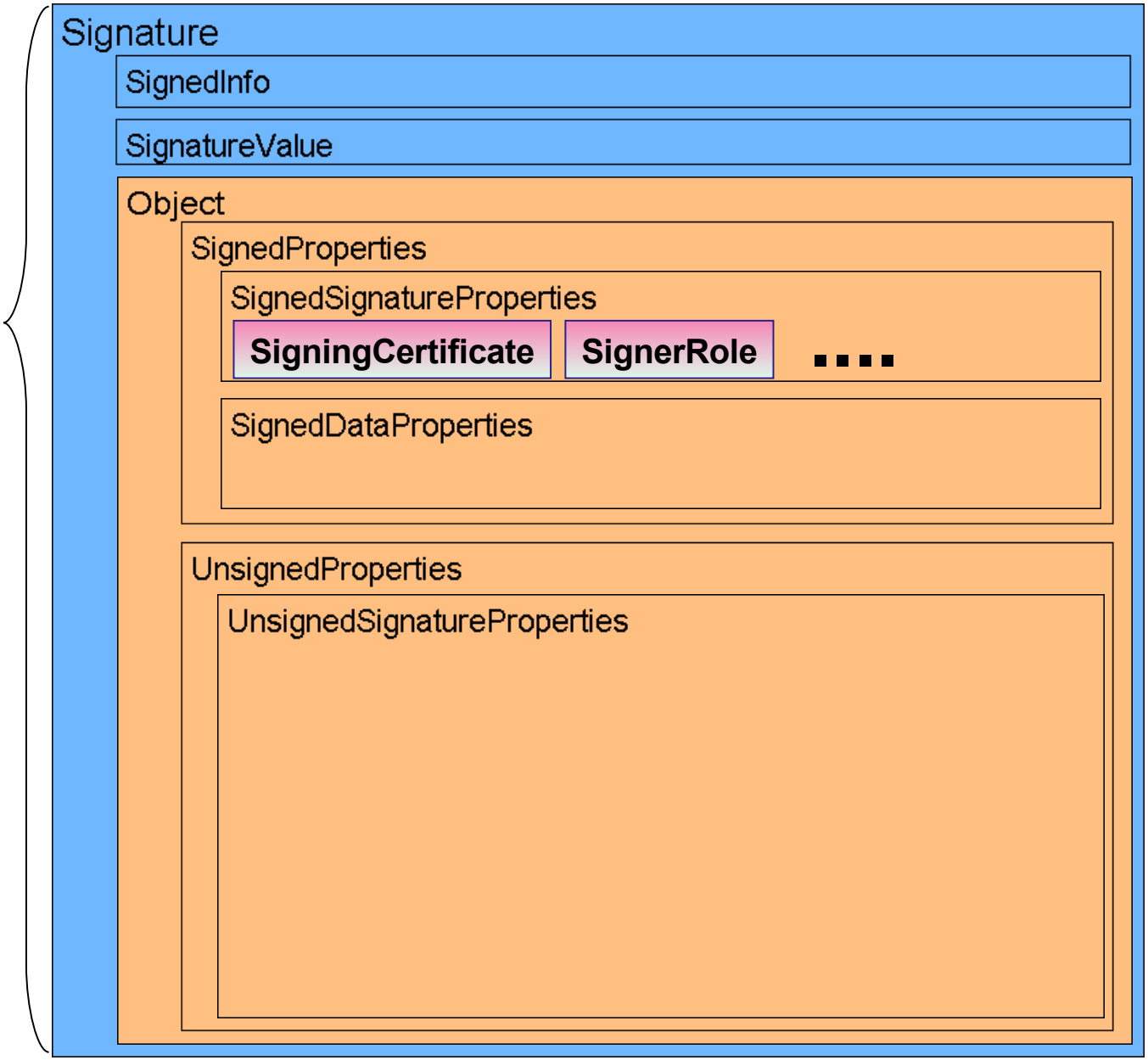
Technical background: properties overview

- SignerRole:
  - Indication of the role played by the signer when generating the signature. They may be claimed or certified (certificate attributes).
- CommitmentTypeIndication:
  - Commitment endorsed by the signer when producing the signature (proof of origin, proof of receipt, etc) .

Technical background: properties overview

- SignatureProductionPlace:
  - Indication of the claimed place where the signature is produced.
- SigningTime:
  - indication of the claimed time when the signature is produced.
- Data object time-stamps:
  - Time-stamps on the to-be-signed data objects may also be incorporated.

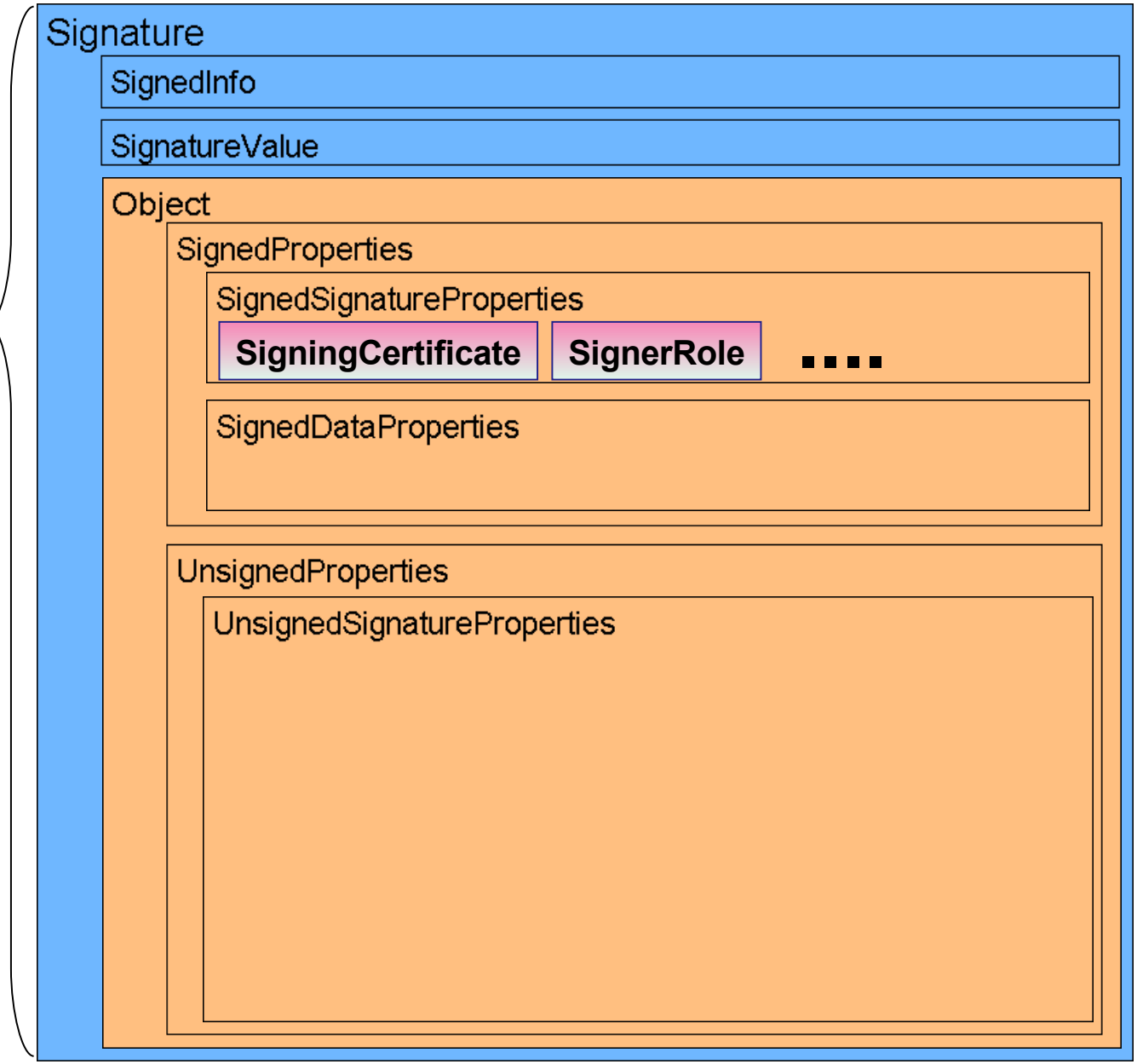
XAdES-BES


Signature
SignedInfo
SignatureValue
Object
SignedProperties
SignedSignatureProperties
SigningCertificate
SignerRole
....
SignedDataProperties
UnsignedProperties
UnsignedSignatureProperties

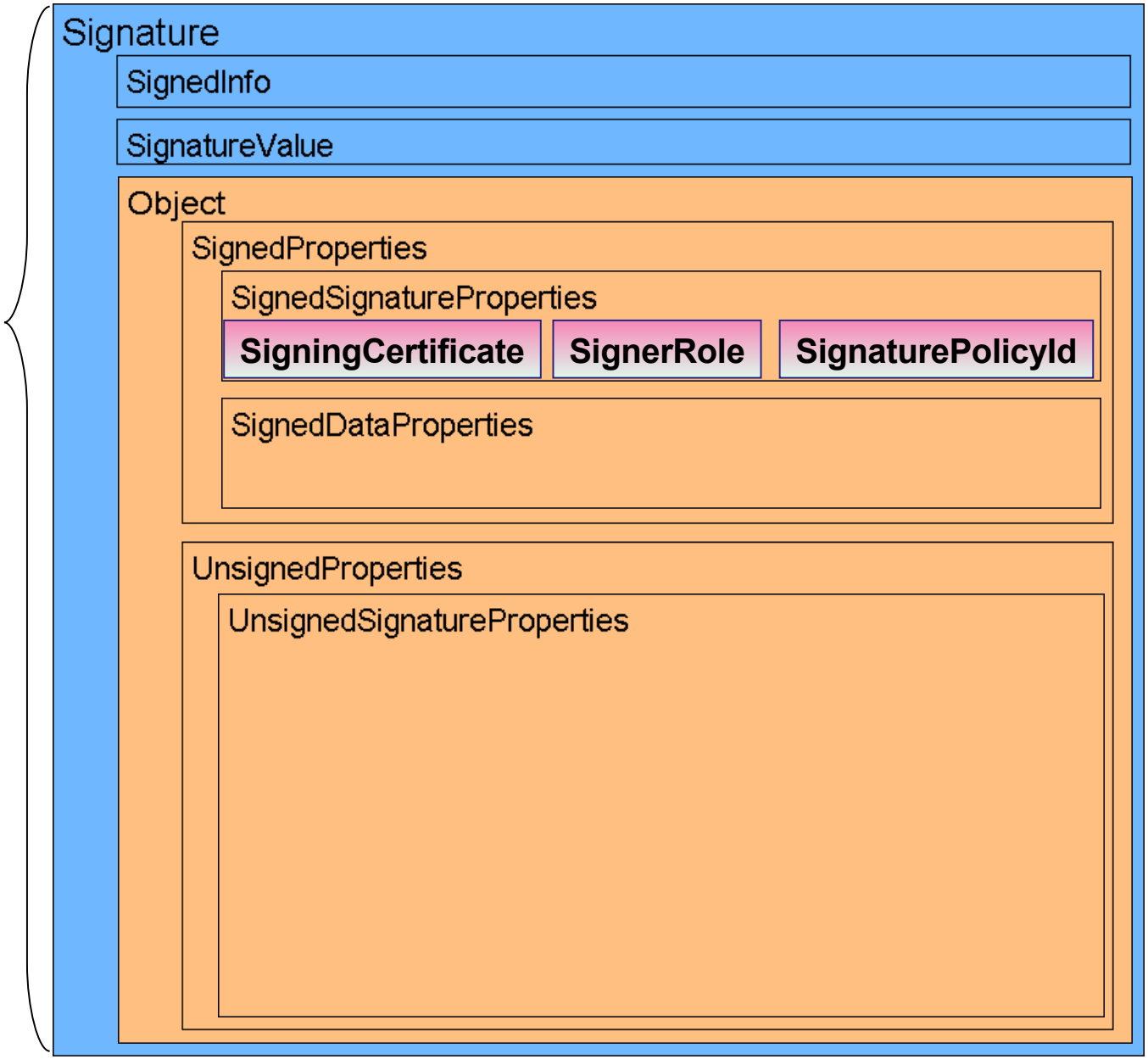
Technical background: properties overview

- Signature policy identifier:
  - Reference to a set of rules followed when generating the signature and that also must be met when verifying it in order to consider the signature valid. This reference also includes a digest value computed on an electronic form of the signature policy document.

XAdES-EPES


Signature
SignedInfo
SignatureValue
Object
SignedProperties
SignedSignatureProperties
SigningCertificate
SignerRole
....
SignedDataProperties
UnsignedProperties
UnsignedSignatureProperties

XAdES-BES


Signature
SignedInfo
SignatureValue
Object
SignedProperties
SignedSignatureProperties
SigningCertificate
SignerRole
SignaturePolicyId
SignedDataProperties
UnsignedProperties
UnsignedSignatureProperties

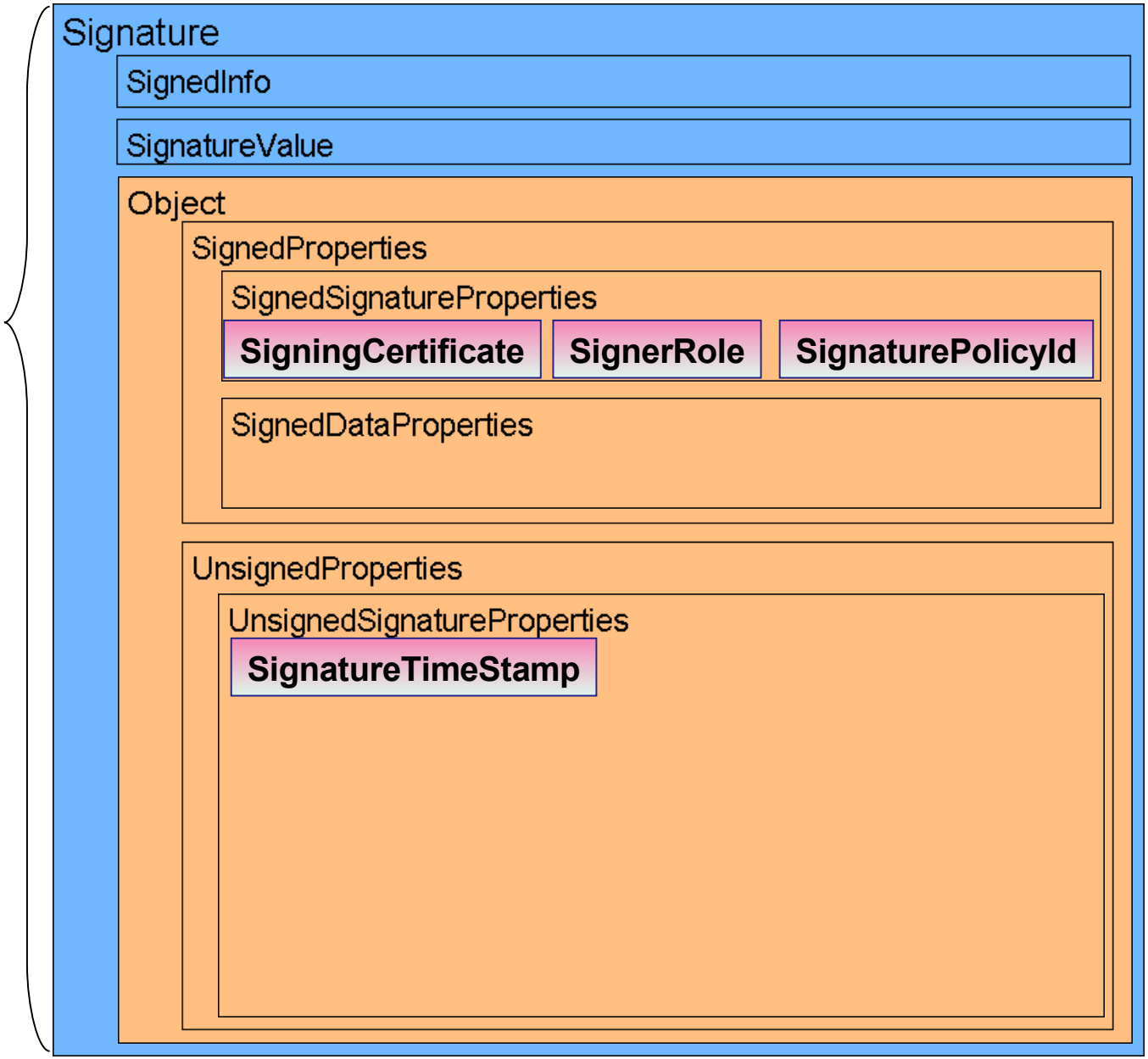
Technical background: properties overview

- Unsigned properties:
  - Generated after the production of digital signature value.
  - Generated by the signer, verifier or other parties.
  - Usually data that help verifiers and auditors to assert the validity of the signature even long time after it was generated.

Technical background: properties overview

- SignatureTimeStamp:
  - Time-stamp on the signature that proves that the electronic signature was actually generated before that time.
- CompleteCertificateRefs:
  - References (including identifiers and digest values) to all the certificates in the certpath (but the signing certificate) that whose status verifiers must check while verifying the signature.

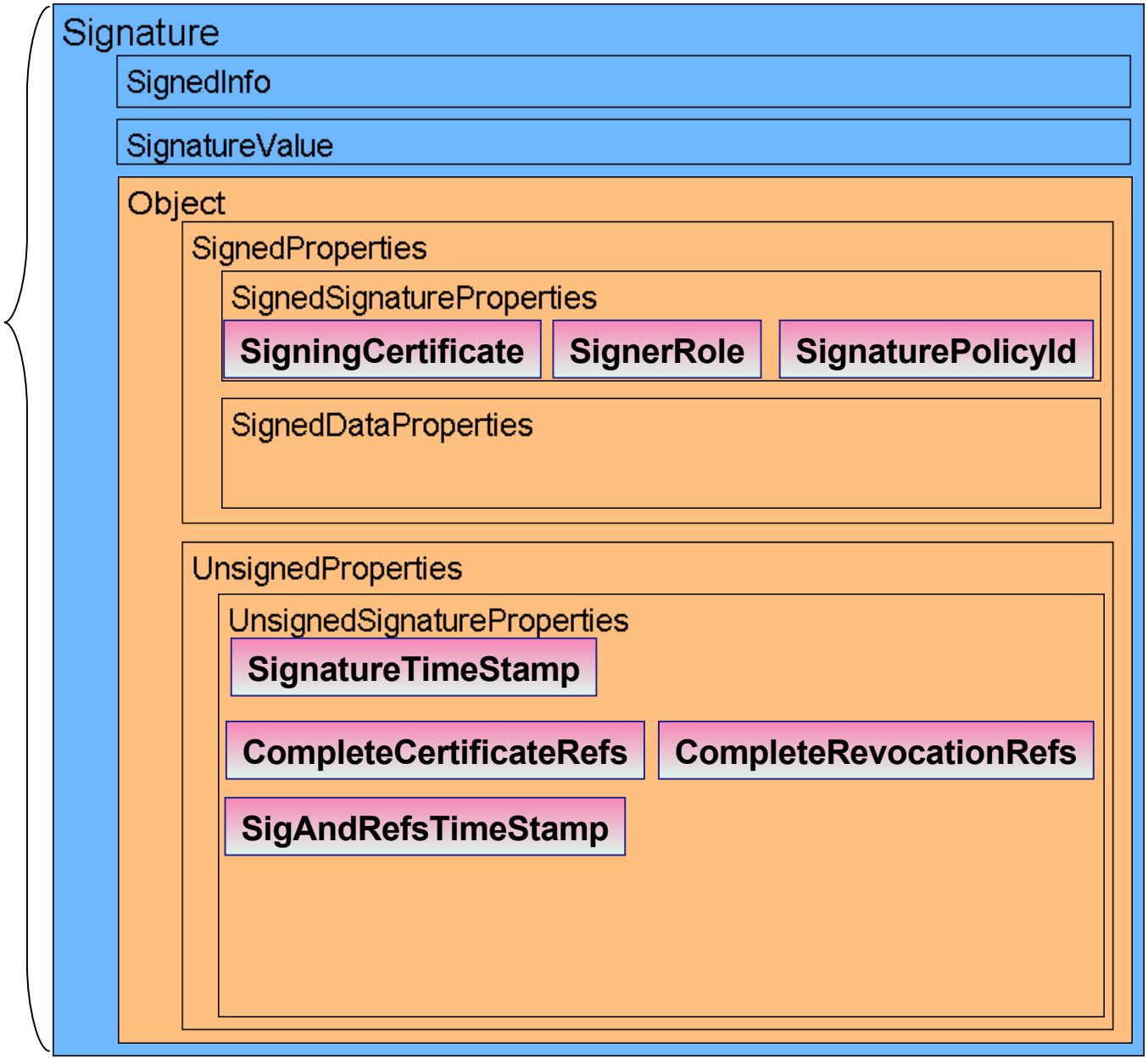
XAdES-T


Signature
SignedInfo
SignatureValue
Object
SignedProperties
SignedSignatureProperties
SigningCertificate
SignerRole
SignaturePolicyId
SignedDataProperties
UnsignedProperties
UnsignedSignatureProperties
SignatureTimeStamp

Technical background: properties overview

- CompleteRevocationRefs:
  - References (including identifiers and digest values) of certificate status data (CRLs, OCSP responses, etc) that verifiers get while verifying the electronic signature.
- Time-stamp on signature and references:
  - Time-stamp securing signature and references to the material used by the verifier. It proves that at that time, a first verification of the signature took place and used the cryptographic material time-stamped. This may be assessed time after the verification.

XAdES-C
XAdES-X



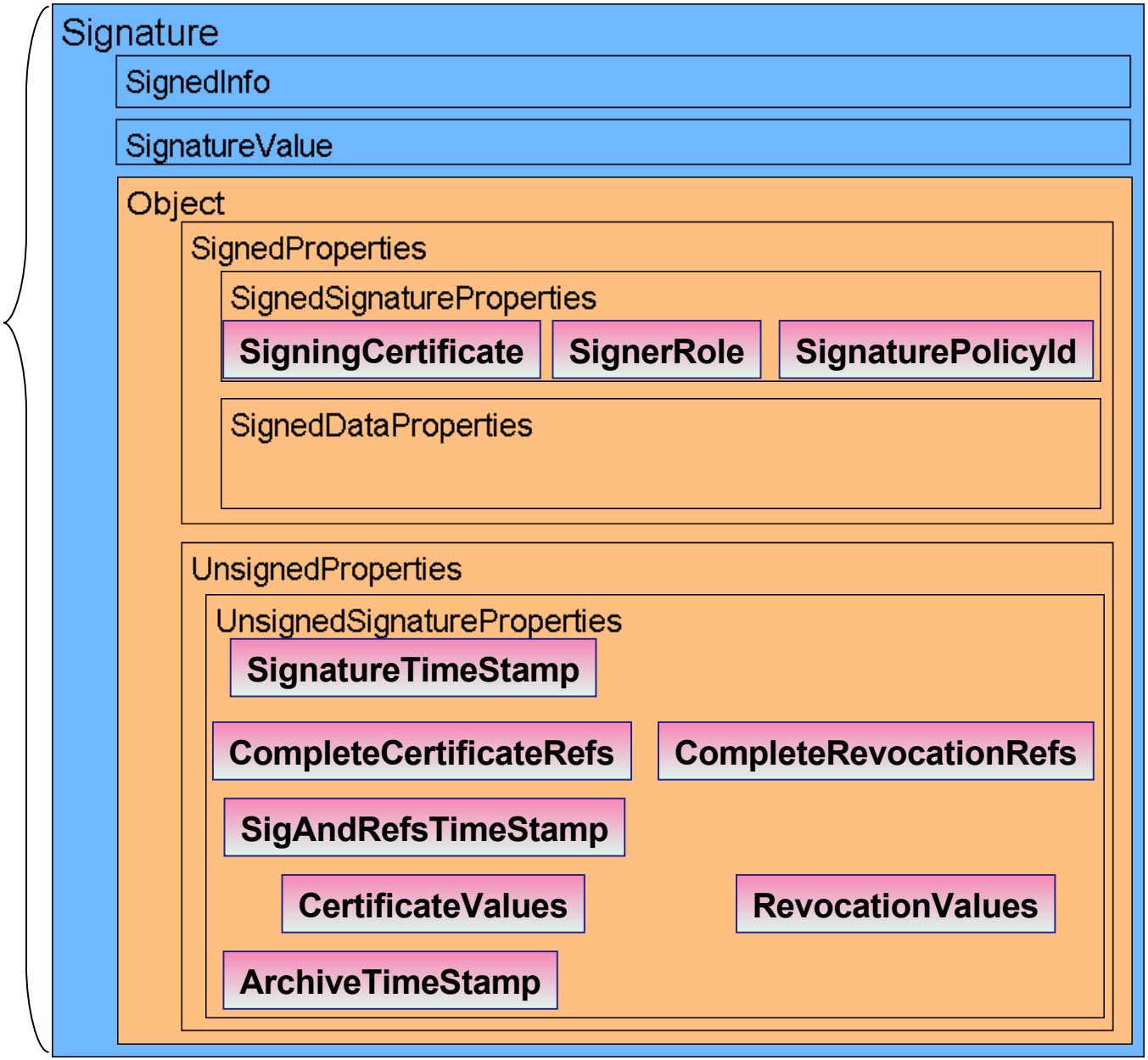
Technical background: properties overview

- The next three properties are used when a long-term signature is required that incorporates all the cryptographic material used in its verification:
- CertificateValues:
  - All the certificates required in its validation.
- RevocationValues:
  - All the CRLs and/or OCSP required in its validation.

Technical background: properties overview

- ArchiveTimeStamp:
  - Time-stamp securing all the material in the signature including the values of the certificates and revocation data, to counter weakness of algorithms and cryptographic material signature-related as time goes bay.
  - Nesting allowed to counter weaknesses in algorithms and cryptographic material in previous time-stamps.

XAdES-X-L
XAdES-A



XAdES current deployment

- XAdES signatures are nowadays being deployed in European countries for a variety of environments: electronic invoicing, digital accounting, Registered Electronic e-mail, etc.
- In certain countries, laws require use of XAdES signatures for certain transactions.
- ETSI has issued TS 102 904 “Profiles of XML Advanced Electronic Signatures based on TS 101 903 (XAdES)”, defining XAdES profiles for e-invoicing, e-government, and also a baseline profile

Position

- XAdEs provides a relevant building block for international mutual legal recognition of electronic signatures. This is a critical issue in areas like European Union (3-years programme for rollout of cross-border interoperable e-ID services) and Asia (e-Asian Framework agreement, to “facilitate the establishment of mutual recognition of digital signature frameworks”)

Position

- It is suggested that W3C notes the existence of the features already defined in ETSI TS 101903, and does not re-define any features already addressed there.
- It is suggested that W3C works with ETSI to establish common specifications for use of XML-based signatures.

Position

- It is suggested that W3C takes account of the lack of reversibility between ASN.1 and string representation for Distinguished Names as stated in XMLDSig and produces a reversible way (XAdES uses these mechanisms for identifying cryptographic validation material).

References

- W3C Note on XAdES. At http://www.w3.org/TR/XAdES/
- TS 101 903: “XML Advanced Electronic Signature (XAdES)“
- ETSI TS 102904: “Profiles of XML Advanced Electronic Signatures based on TS 101 903 (XAdES)“
- ETSI Standards may be downloaded at: http://pda.etsi.org/pda/queryform.asp