



# New 2011 ANSI/NIST-ITL Biometrics XML

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## Presentation Outline

- What is Biometrics?
- Some History: Convergence of ANSI/NIST and NIEM
- The New Biometrics Schema
- Next Steps
- The Schema: A Closer Look



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## **What is Biometrics?**



## Biometrics Definition

**Biometrics:** Methods for uniquely recognizing humans based on physical or behavioral traits.

**Applications:** Access control; positive identification of subjects in a database – esp. criminal records; crime solving; customs and immigration; terrorist screening; paternity determination;

**Modalities:** Facial photos, fingerprints, palmprints, scars/marks/tattoos, iris, DNA, voice, signature, dental,

**Attributes:** Universal (everybody has it); Unique (distinguishes one from every other); Permanent (resists aging); Collectable (easy to obtain); Performs (fast and economical); Acceptable (public agrees); Secure (hard to spoof)



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## **Some History: Convergence of ANSI/NIST and NIEM**



## ANSI/NIST Legacy

- Type 1 Transaction Information
- Type 2 Descriptive Text
- Type 4, 9, 13, 14 Fingerprint
- Type 8 Signature
- Type 10 Mugshot, Scar, Mark, Tattoo
- Type 15 Palmprint
- Type 17 Iris



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High resolution binary fingerprint image record

## Record Type 4

Single Print WSQ

FGP 1 = Right thumb

Binary image size 40099

LEN: 40117  
IDC: 1  
IMP: 1  
FGP: 1  
255  
255  
255  
255  
255  
ISR: 1  
HLL: 800  
VLL: 750  
CGA: 1  
DAT:

Binary record  
Type 4 has no  
field tags.





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Mixed ASCII/Binary record  
Type 10 has alphanumeric  
field tags, and a binary image.

```

LEN: 10.001:45961•
IDC: 10.002:15•
IMT: 10.003:FACE•
SRC: 10.004:WI0520000•
PHD: 10.005:20051201•
HLL: 10.006:636•
VLL: 10.007:474•
SLC: 10.008:1•
HPS: 10.009:26•
VPS: 10.010:20•
CGA: 10.011:JPEGB•
CSP: 10.012:YCC•
POS: 10.020:F•
DAT: 10.999: . . . ↗

```

Facial & SMT image record  
**Record Type 10**

Mugshot JPEG  
Binary image size 45802



*fs (↗) gs (•) rs (⊙) us (▣)*





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14.001	LEN	Not implemented
14.002	IDC	<ansi-nist:ImageReferenceIdentification>
14.003	IMP	<ansi-nist:FingerprintImageImpressionCaptureCategoryCode>
14.004	SRC	<ansi-nist:CaptureOrganization>
14.005	FCD	<ansi-nist:CaptureDate>
14.006	HLL	<ansi-nist:ImageHorizontalLineLengthPixelQuantity>
14.007	VLL	<ansi-nist:ImageVerticalLineLengthPixelQuantity>
14.008	SLC	<ansi-nist:ImageScaleUnitsCode>
14.009	HPS	<ansi-nist:ImageHorizontalPixelDensityValue>
14.010	VPS	<ansi-nist:ImageVerticalPixelDensityValue>
14.011	CGA	<ansi-nist:ImageCompressionAlgorithmCode>
14.012	BPX	<ansi-nist:ImageBitsPerPixelQuantity>
14.013	FGP	<ansi-nist:FingerprintImagePosition>
14.014	PPD	<ansi-nist:FingerPositionCode>
14.015	PPC	<ansi-nist:MajorCasePrintSegmentOffset>
14.016	SHPS	<ansi-nist:CaptureHorizontalPixelDensityValue>
		...

**ANSI/NIST Legacy XML  
is in “ansi-nist.xsd”  
in NIEM core**



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## **The New Biometrics Schema**



## 2011 NIEM Biometrics Schema Proposal

- “ansi-nist.xsd” is not flexible enough to meet needs of ANSI/NIST standard
- “ansi-nist.xsd” is not completely NIEM-conformant
- “ansi-nist.xsd” contains errors
- A NIEM biometrics schema could be created to meet the needs of ANSI/NIST, but also others
- Management would be in the hands of persons selected from a community of interest.



## Scope of the Biometrics Schema

- Friction ridge prints
  - Fingerprints, Palm prints, Plantar prints (footprints)
- Latent prints
  - Minutiae
- Signatures
- Images of faces (e.g. mug shots)
- Images of scars, marks and tattoos (SMT) and body parts
- Iris scans
- DNA



## Migration of “ansi-nist.xsd” to Biometrics Schema

### issues:

- Backwards compatibility
- Compatibility with "traditional" encoding
- Handling unused/non-biometric elements

### process:

- Name change
- Correction of errors and NIEM conformance issues
- Addition of elements to support new modalities





## Next Steps

- Vote on 2011 version
- ANSI approval
- Finalize the standard
- Anticipate changes for voice, teeth
- Establish maintenance rules
- Ongoing governance



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## **The Biometrics Schema: A Closer Look**



## Key Elements

- Fingerprints and other friction ridge prints
- Images of faces and physical features
- Iris scans
- Signatures
- DNA





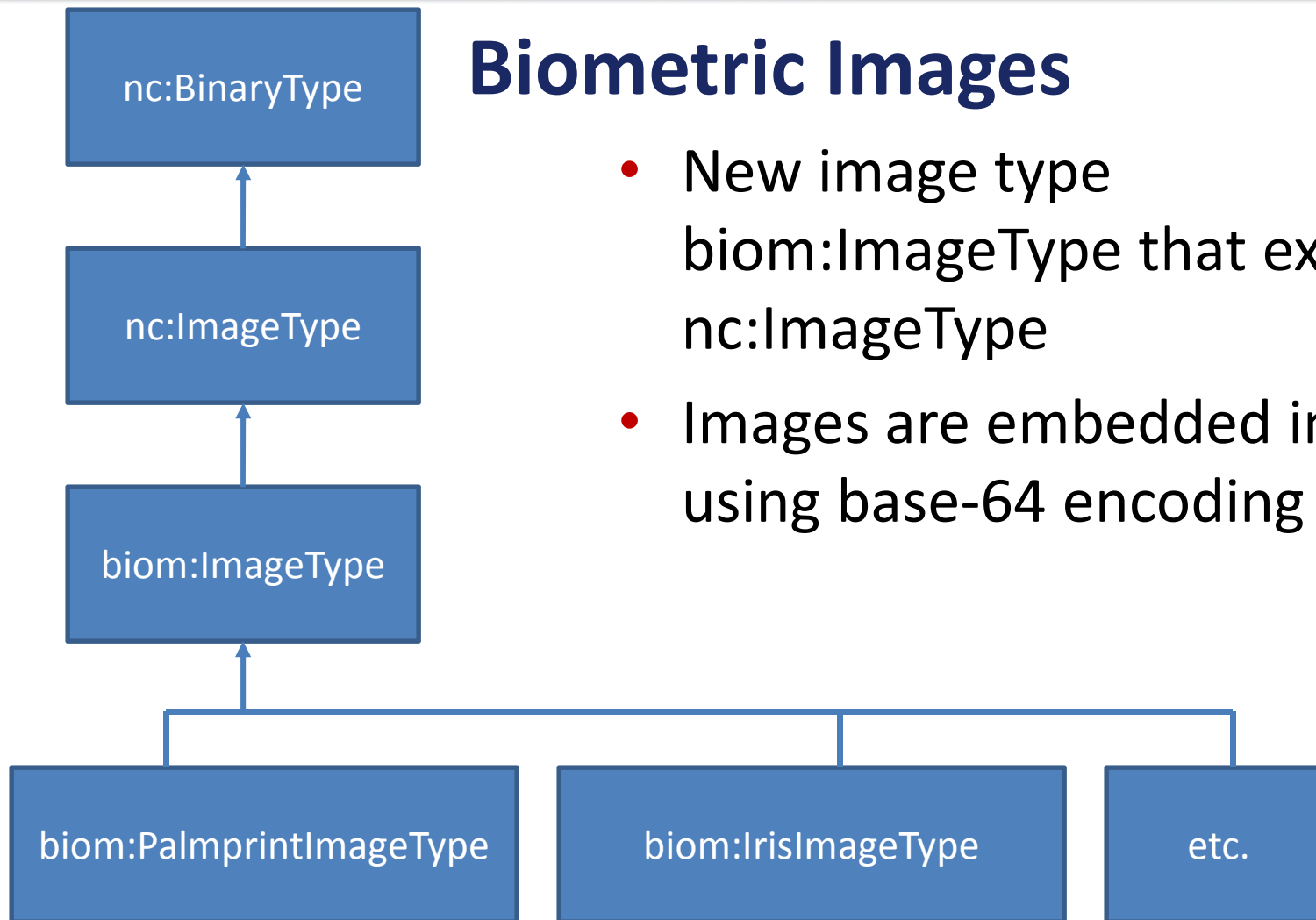
## Technical Information

- Namespace: ???/biometrics/1.0
- Namespace prefix: biom
- Size of the schema(approximate):
  - 550 elements
  - 250 complex types
  - 125 simple types



## Biometric Images

- New image type biom:ImageType that extends nc:ImageType
- Images are embedded in XML using base-64 encoding





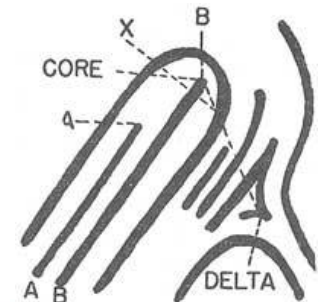
## General Biometric Information

- Capture information
  - when and where the information was captured
  - who captured it
  - what kind of device captured it
    - depending on modality, e.g. fingerprint reader, or camera
- Image characteristics
  - Quality of the image (based on a variety of algorithms)
  - Size, pixel density, resolution, compression method, etc.



## Prints

- Images
  - biom:FingerImpressionImage: Fingerprint
  - biom:PalmprintImage: Palmprint
  - biom:PlantarImage: Plantar print (foot/toe)
  - biom:FrictionRidgeImage: Unknown print
- Covers both exemplar and latent prints
- Minutiae
  - Details about features of the print used in identification





## Facial and Body Part Images

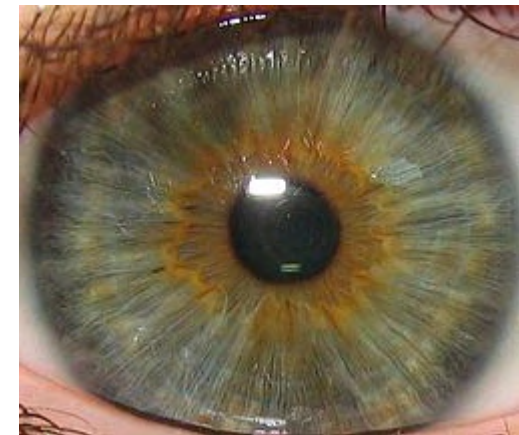
- Images
  - biom:FacelImage - Facial images (e.g. mug shots)
  - biom:PhysicalFeatureImage - Images of scars, marks and tattoos (SMT)
- Facial descriptive information:
  - Eye and hair color, facial expression, pose, description
- Physical feature descriptive information:
  - Color, description, classification, size, location





## Iris Scans

- Image:
  - biom:IrisImage
- Descriptive information
  - Eye color, position
- Image specifics
  - Rotation, lighting, gaze angle, occlusion (blockage)





## Signatures

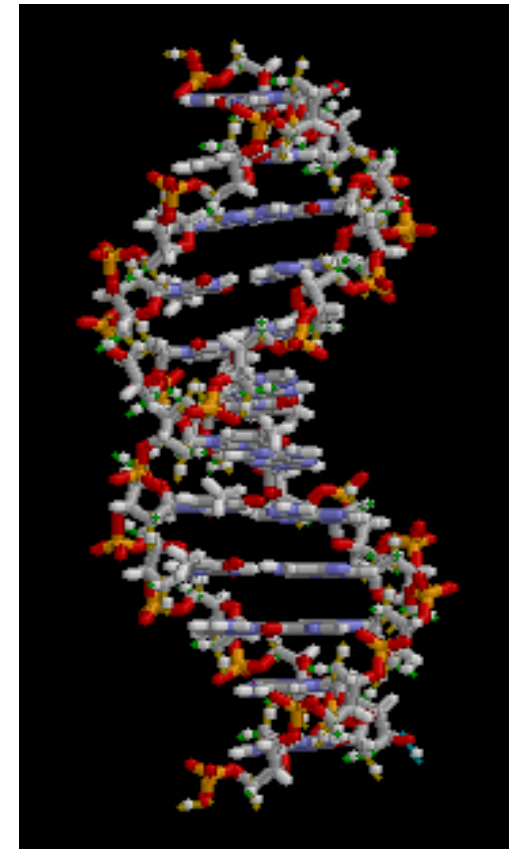
- Image:
  - biom:SignatureImage
- Alternative to a base64-encoded image:
  - List of vectors that represent the pen position and pressure





## DNA

- Data included:
  - Autosomal Short Tandem Repeat (STR)
  - X-Short Tandem Repeat (X-STR)
  - Y-Short Tandem Repeat (Y-STR)
  - Mitochondrial DNA (mtDNA)
  - Pedigree
  - Electropherogram images
- Details on sample type and origin
  - Laboratory name, certifications, etc.
  - Examiner information
  - Sample collection details







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## **The ANSI/NIST-ITL 2011 Standard: A Closer Look**



## ANSI/NIST-ITL 2011

- Standard consists of:
  - Narrative standard document that describes the transaction, records and fields
    - Separate annexes describe the two encodings:
      - "traditional" (Annex B)
      - "NIEM-conformant XML" (Annex C)
  - A complete NIEM-conformant IEPD with:
    - An ITL exchange schema
    - The biometrics schema
    - A NIEM subset
    - Samples, change log, conversion XSLT and other artifacts



## Record Types

### Biometric Information

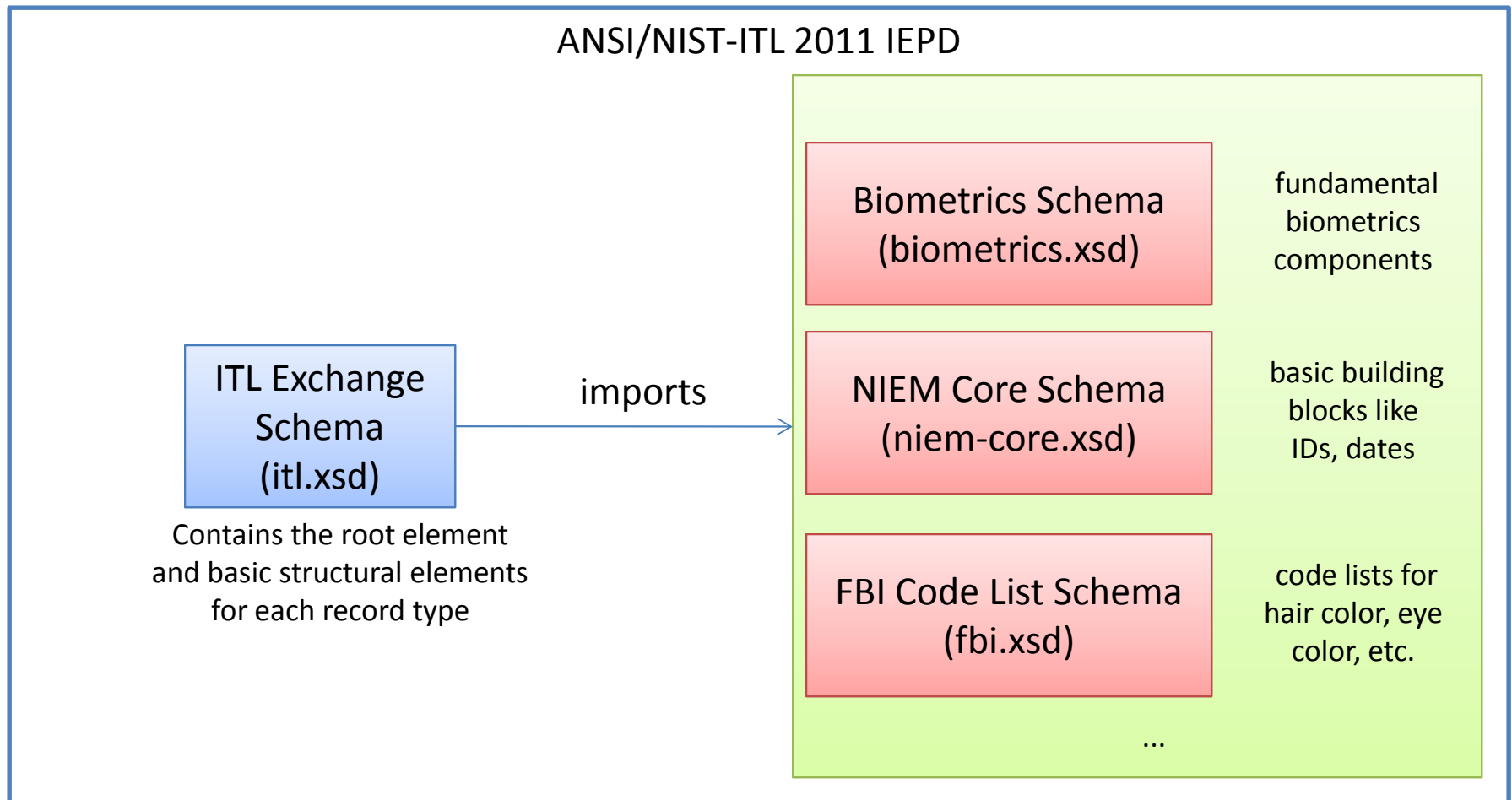
- Type 4, 14: Fingerprints
- Type 7: User-Defined
- Type 8: Signatures
- Type 9: Minutiae
- Type 10: Face and SMTs
- Type 13: Latent Prints
- Type 15: Palmprints
- Type 16: Test images
- Type 17: Irises
- Type 18: DNA
- Type 19: Plantar prints
- Type 99: Other Modalities

### Supporting Information

- Type 1: Transaction Information
- Type 2: Descriptive Information
- Type 20: Source Representation
- Type 21: Associated Context
- Type 98: Information Assurance



## ITL 2011 Use of Biometrics Schema





## ITL 2011 Example

Root element (itl)	→	<itl:NISTBiometricInformationExchangePackage>
Record structure (itl)	→	<itl:PackageHighResolutionGrayscaleImageRecord>
		<biom:RecordCategoryCode>04</biom:RecordCategoryCode>
		<biom:ImageReferenceIdentification>
		<nc:IdentificationID>01</nc:IdentificationID>
		</biom:ImageReferenceIdentification>
Biometric image (biom)	→	<biom:FingerprintImage>
		<nc:BinaryBase64Object>...</nc:BinaryBase64Object>
		<biom:ImageCaptureDetail>
		<biom:CaptureResolutionCode>1</biom:CaptureResolutionCode>
		</biom:ImageCaptureDetail>
		...
		</biom:FingerprintImage>
		</itl:PackageHighResolutionGrayscaleImageRecord>
		</itl:NISTBiometricInformationExchangePackage>



## ITL 2011 Customization Example

Root element (itl)	→	<itl:NISTBiometricInformationExchangePackage>
Record structure (itl)	→	<itl:PackageHighResolutionGrayscaleImageRecord>
		<biom:RecordCategoryCode>02</biom:RecordCategoryCode> <biom:ImageReferenceIdentification> <nc:IdentificationID>01</nc:IdentificationID> </biom:ImageReferenceIdentification> <itl:UserDefinedDescriptiveText>
Customization	→	<ebts:DomainDefinedDescriptiveFields> <biom:RecordRetentionIndicator>>true </biom:RecordRetentionIndicator> <nc:CaveatText>SA J Q DOE,RM 11867</nc:CaveatText> </ebts:DomainDefinedDescriptiveFields>
		</itl:UserDefinedDescriptiveText>
		</itl:PackageHighResolutionGrayscaleImageRecord> </itl:NISTBiometricInformationExchangePackage>



## For More Information

- ANSI/NIST-ITL main page:
  - [http://www.nist.gov/itl/iad/ig/ansi\\_standard.cfm](http://www.nist.gov/itl/iad/ig/ansi_standard.cfm)
- Current draft of the standard document (voting version of July 18, 2011):
  - [http://biometrics.nist.gov/cs\\_links/standard/AN\\_2011\\_Voting\\_Version\\_July\\_2011.pdf](http://biometrics.nist.gov/cs_links/standard/AN_2011_Voting_Version_July_2011.pdf)
- Current draft of the NIEM IEPD:
  - [http://biometrics.nist.gov/cs\\_links/standard/ansi-nist-itl-2011alpha4.zip](http://biometrics.nist.gov/cs_links/standard/ansi-nist-itl-2011alpha4.zip)