WHITE PAPER

ANSI/NIST-ITL 1-2011:

Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information

OVERVIEW OF 2011 REVISIONS TO THE STANDARD

AWARE

ANSI/NIST-ITL 1-2011: Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information

OVERVIEW OF 2011 REVISIONS TO THE STANDARD

This white paper is derived from a presentation given by Rob Mungovan, Vice President of Aware's biometrics group, to the annual meeting of the International Association of Identification. It is intended to summarize the changes in the 2011 version of the ANSI/NIST-ITL 1 standard.

History of the Standard

Development of standards for the interchange of digital biometric data began in 1986, with the drafting of ANSI/NBS-ICST 1-1986. The standard was called "Fingerprint Identification – data format for information interchange". The purpose of the standard was to standardize a data structure that would enable sharing of biometric data between disparate organizations; namely local, state, and federal law enforcement organizations and it was minutiae centric. The 1993 revision introduced many of the features still present in today's standard. It specified nine "logical records" labeled as "Types." The Type-1 was defined as the "header" record and contained transaction specific information. The Type-2 record contained biographic information. The Type-4 record contained "high resolution" fingerprint images. Note that a standard for image compression had yet to be identified.

The standard was revised again in 1997, 2000, 2007, 2008, and in 2011. The 1993 version added record Types 5 through 9, yet was compact and consisted of only 26 pages.

The 1997 version was an addendum that introduced the "Type-10" record for "mug shot" facial images and "SMT" images of scars, marks, and tattoos. This is the revision that gained adoption because it coincided with when the FBI "IAFIS" AFIS was "turned on" in 1999. This was the first large-scale test and validation of the standard. All organizations intending to submit fingerprints to the FBI were (and are still) required to comply with the FBI's implementation of the standard known at the time as EFTS: "Electronic Fingerprint Transmission Specification." With the Type 10 addendum the standard document was extended to about 50 pages.

The 2000 version introduced support for international character sets and several new record types, including records for latent images (Type 13), "variable resolution" fingerprint images (Type 14), palm images (Type 15), and a user defined test image record (Type 16). This brought the total length of the standard to 70 pages. The 2007 version added support for iris images (Type 17) and CBEFF-wrapped records, new image formats (JPEG 2000 and PNG), better support for international character sets, and also greatly expanded the Type-10 record. The 2008 introduced an XML version.

This paper will describe the changes introduced in the 2011 version, which are extensive. The size and detail of the document grew by a fair share in 2011, which is now officially called "ANSI/NIST-ITL 1-2011, NIST Special Publication 500-290 Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information."

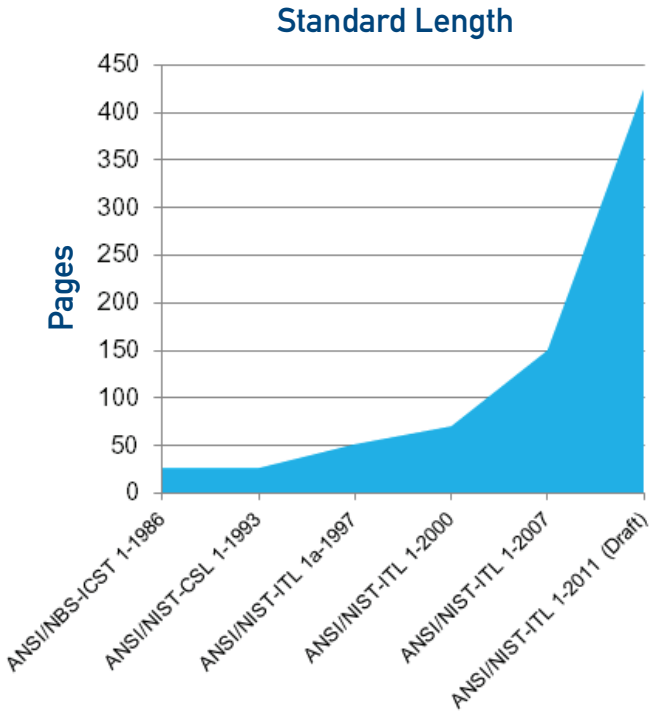

Figure 1 - Growth of the ANSI/NIST standard in pages

Refresher on "Binary" Syntax

The binary syntax used in Part 1 of the ANSI/NIST-ITL standards utilizes 7-bit ASCII code, and supports international character sets through UTF-8. It compartmentalizes data types as "records" of two types: 1) ASCII separated and 2) binary (Type-4 only). It uses "information separators" to delineate each data element. These field, subfield, and item separators are denoted as FS (record separator), GS (field separator), RS (subfield separator), and US (item separator). This data structure is widely used and has worked well supporting the purpose of its design: to enable disparate systems to exchange biometric data.

FBI EBTS Arrest Segment Literal (ASL)

2.047:19940915usDUIrs19940920usPOSSSESSION OF FIREARMS*gs*

Figure 2 - Example of binary syntax

Support for Images

ANSI/NIST-ITL standards support several different compression standards for different image types:

COMMON IMAGE RECORD TYPES						
RECORD TYPE	4	10	13	14	15	17
Record Content	Slap+roll	Facial/SMT	latent fingerprints	4/4/2 fingerprints	palms	Iris
Resolution						
500 ppi	X		X	X	X	
1000 ppi			X	X	X	
variable		X	X	X		X
COMPRESSION						
WSQ	X			X	X	
JPEG lossy		X				
JPEG lossless			X			X
JPEG 2000 lossy		X		X*		X
JPEG 2000 lossless			X			
PNG lossless			X			X

Figure 3 - Image compression types supported by each record type

** 1000ppi only, based on "Profile for 1000ppi Fingerprint Compression"*

All image records added to the standard since 2000 are similar to the Type-10 facial/SMT record. These include Types-13, -14, -15, and -17. The 2011 revision adds Types-19, -20, and -21. The binary version takes the same structure, so it is relatively easy to add support for new image record types and existing parsers should be able to handle new image records. The following table shows those fields common across all image record types (except Type-4, which is the legacy fingerprint image record).

FIELD	CODE	DATA	NOTES
xx.004		Source or originating agency	
xx.005		Capture date	
xx.006	HLL	Horizontal line length	
xx.007	VLL	Vertical line length	
xx.008		Scale units	Pixels/in or /cm
xx.009		Horizontal pixel scale	500 ppi or 200 pixels/cm
xx.010		Vertical pixel scale	500 ppi or 200 pixels/cm
xx.011	CGA	Compression algorithm	
xx.012	BPP	Bits per pixel	except for Type-10
xx.995	ASC	Associated context	New, optional in 2011. Added to support a reference from Type-21 records
xx.996	HAS	Hash value of the image in field 999	New, optional in 2011. Must use the SHA 256 hash algorithm
xx.997	SOR	Source representation	New, optional in 2011. Points back to the relevant Type-20 record.
xx.998	GEO	Geographic sample acquisition	New, Optional in 2011. Alternate formats supported.
xx.999		Image data	

Figure 4 - Fields common across all image record types (except Type-4)

New Records and Deprecated Records

There are five new record types in the 2011 revision, and three record types that have been deprecated and removed. The deprecated records types describe either low resolution (less than 500 ppi) or binary (black and white) image data. In 1993 it seemed possible that this type of data would be produced, but in fact never was to any great extent, and therefore these records were never adopted.

Type-18	DNA
Type-19	Plantar
Type-20	Source representation data
Type-21	Associated context record
Type-98	Information assurance record

Figure 5 - New Records in the 2011 Revision

Type-3	Low-resolution grayscale image
Type-5	Low-resolution binary record
Type-6	High-resolution binary record

Figure 6 - Deprecated record types

New Records

Type-18 - DNA

The Type-18 record for DNA and related data is introduced in the 2011 revision. It does not contain an image. It adds substantial descriptive text and tables to the standard.

18.003	DLS	DNA laboratory setting
18.004	SRC	Source agency
18.005	NAL	Number of analysis
18.006	SDI	Sample donor information
18.010	STY	Sample type
18.011	STI	Sample typing information
18.013	SCD	Sample collection date
18.015	DPD	DNA profile data

Figure 7 - Type-18 record - DNA – sample of mandatory fields

Type-19 - Plantar

The new Type-19 record for plantar (definition: adjective, pertaining to the sole of the foot) is an image record for footprint images. It is very similar to the palm image record (Type-15), and is to be used for exemplars only (non-latents). Latent footprint images should be included in the Type-13 latent record.

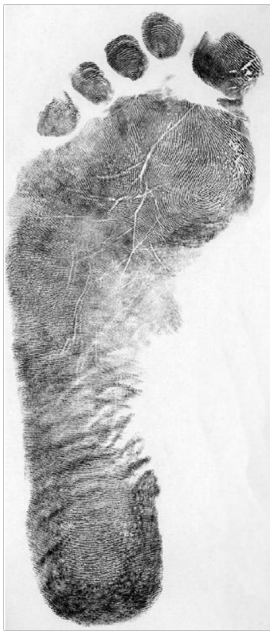

Figure 8 - Plantar image

Type-20 - Source Representation

A “source representation” is the original image from which other image record types were derived. Examples are an image of the original inked fingerprint card used to derive a Type-14 record or a group photo used to derive a Type-10 record containing a single facial image. Type-20 records are structured like other image records (Type-10, Type-14, Type-17).

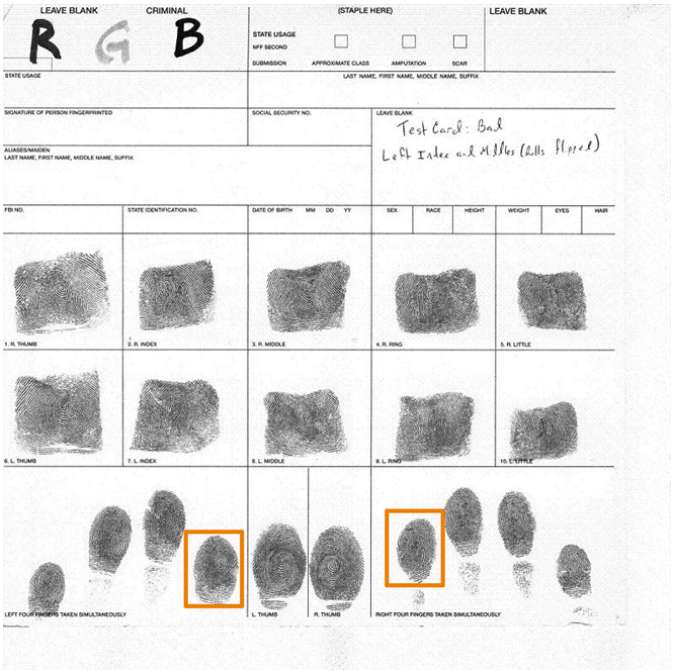

Figure 9 - Example, source representation image

Some mandatory fields in a Type-20 record are as follows:

20.003	SRN	Description of how the record is being used	Source of another Type-20 record
20.014	AQS	Acquisition Source	25 codes, still images, ideo, video frame, audio, computer screen capture, land-line/mobile phone, etc.
20.902	ANN	Annotated information (optional)	A listing of the operations performed on the original source.
20.019	TIX	Time index (conditional)	Start and end times of a segment, if records contain video or audio

Type-21 – Associated Context

Type-21 records may contain images that do not serve as sources for other images but rather for context, such as a photograph of a crime scene or objects in some way related to other records.

Figure 10 - Example, image in a Type-21 "Associated Context" record

Two new fields shared by Types-20 and -21

21.016	SEG – Segments (optional)	Designed to support a polygonal boundary around an area of interest (several sub fields) RTV; Index to other record IPT; Internal File Reference Pointer Text; Holds a code describing image in the record or image type if outside the record (PDF, video, etc) Coordinates of the vertices in pairs HPO, VPO; Horizontal Pixel Offset, Vertical Pixel Offset
21.994	External file reference (conditional)	URL, folder or location reference for an external file that is not a 2D still image

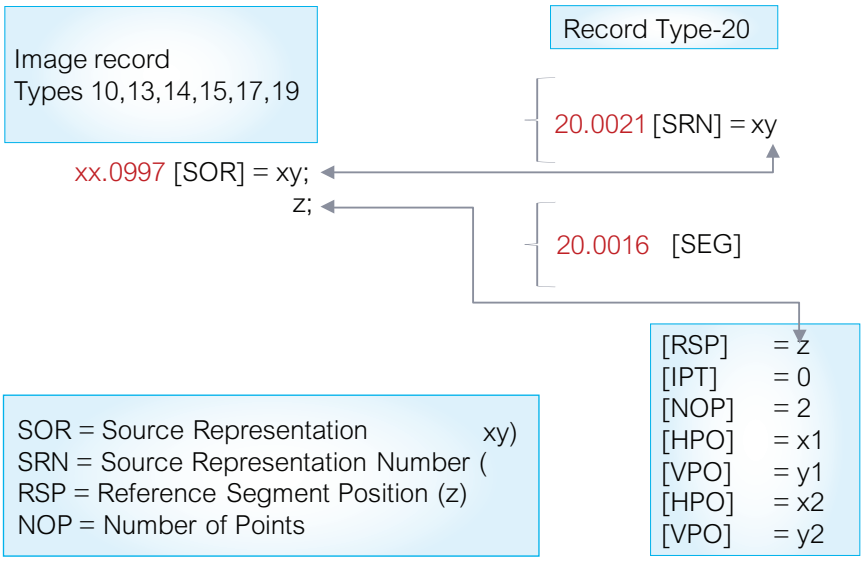

Figure 11 - Image source linking - how Type 20 and 21 image records are linked to biometric image records

Type-98 Record – Information Assurance

The new, optional Type-98 record is sometimes referred to as the crypto binding record. It contains security information, and allows assurance of data authenticity and integrity. It can contain hashes, digital signatures, and audit logs. It includes 6 mandatory fields, and there can be many Type-98 records per transaction. Most of the data is user-defined, as with Type-2 data. Information Assurance Data resides in user-defined fields 98.200 through 98.899.

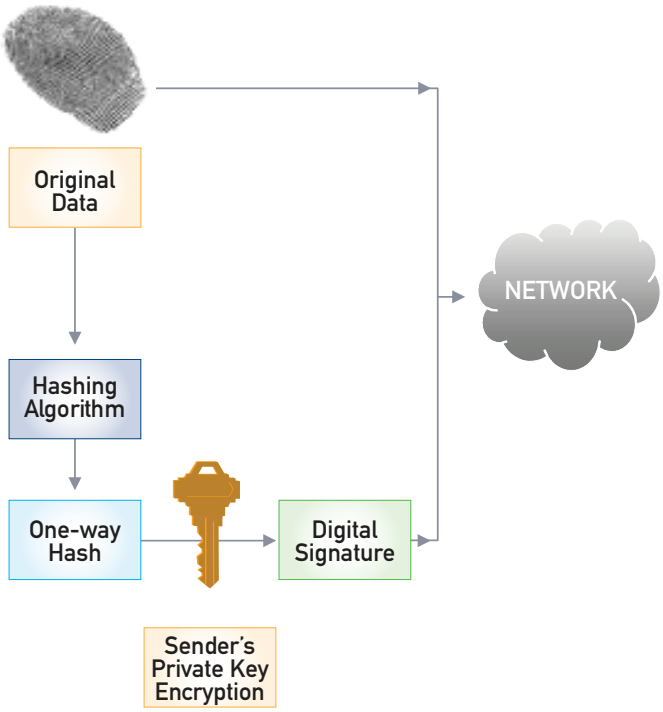

Figure 12 - Creation of a digital signature for storage in Type-98 record

98.003	IAR - Format Owner	See http://www.nist.gov/itl/iad/ig/ansi_standard_cfm
98.004	Originating Agency	
98.005	IAR Format Type	
98.900	Audit Log	EVT, event EVR, event reason IID, information identifier AGT, agent LER, log entry reference
98.200 – 98.899	User-defined data	Options for the data are: – Non-standard, unpublished – Standardized data – Industry group – Consortia – Standards body – Examples – Hashes – Encryption – Digital signatures – PIV or ICAO Security Objects

Figure 13 – Type 98 record required fields. All others are user defined.

Revisions to the Type-9 Record

The 2011 revision extends the descriptive text of the Type-9 record from 9 to 69 pages. The traditional Type 9 fields used to describe generic minutiae data have been deprecated and replaced with blocks of fields designed to hold the proprietary feature vectors of certain vendors. Fields 9.126 through 9.150 are specified for the interoperable template defined by INCITS 378 (and should also specify ISO 19794-2). Fields 9.176 through 9.225 are specified for other feature vectors and replace the deprecated fields by providing a location other standards based or proprietary feature vectors.

9.005	OFR	Originating fingerprint reading system
9.006	FGP	Finger position
9.007	FPC	Fingerprint pattern classification
9.008	CRP	Core position
9.009	DLT	Delta position
9.010	MIN	Number of minutiae
9.011	RDG	Ridge count indicator
9.012	MRC	Minutiae ridge count data

Figure 14 - Fields deprecated in Type-9

Extended Feature Set

Most new descriptive text is dedicated to extended features sets (EFS), an initiative that dates back to 2005. EFS is essentially more data used to describe latent prints. The goals of the EFS are quantifiable, standardized descriptions and data, which is intended to capture and save all substantive data an examiner sees in the course of an analysis.

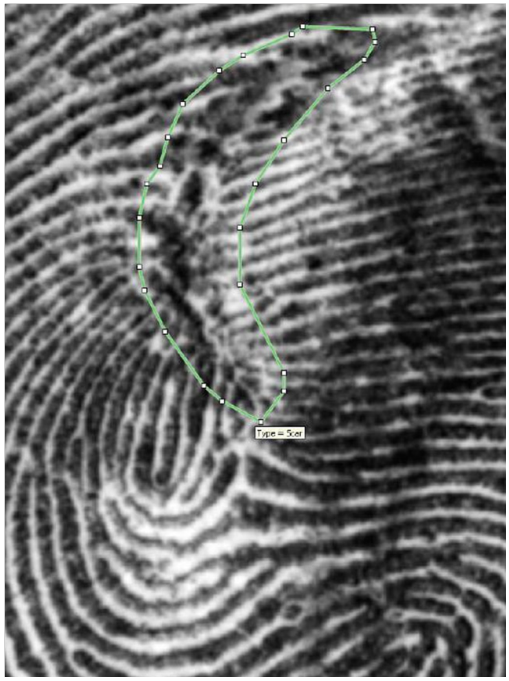

Figure 15 - Extended feature sets

9.013-9.030	FBI feature set
9.031-9.055	Cogent (3M) feature set
9.056-9.070	Motorola feature set
9.071-9.099	MorphoTrak feature set
9.100-9.125	NEC feature set
9.126-9.150	M1-378 fields
9.151-9.175	L1/Identix feature set
9.176-9.225	Other feature set
9.300-9.399	Extended feature set
9.901	Universal Latent annotation (repeating values of subfields)

Figure 16- Sample of new fields in Type-9 record

Miscellaneous Updates

New Type-10 Fields

10.014	FIP	Face Image Position
10.018	DIS	Distortion
10.019	LAF	Lighting Artifacts
10.029	FFP	2D Facial Features
10.031	TMC	Tiered Markup Collection
10.032		3D Facial Feature Points

Figure 17 - New Type-10 fields, all optional

Change to the WSQ Fingerprint Image Compression Standard

A new revision (3.1) of the WSQ standard was published approximately one year prior to the finalization of the 2011 revision to address a bug. The bug in NIST's reference code caused images of one or two fingers not placed in the center of the captured image to compress improperly, as shown below. Implementers of Aware WSQ1000 received a patch to fix this problem in 2005.

Figure 18a - Original captured image

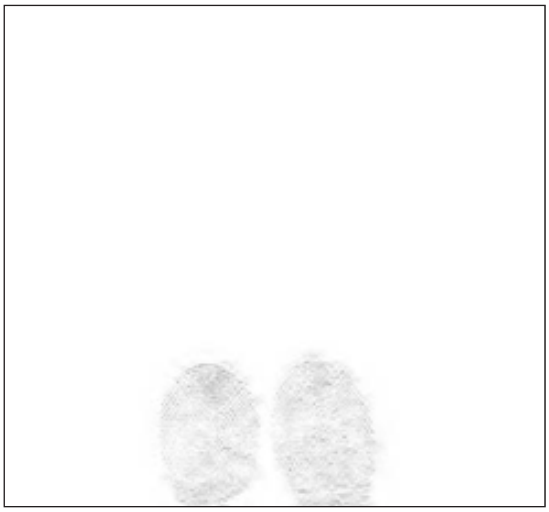

Figure 18b – Compressed/decompressed image

XML Encoding

As XML has evolved to become the de facto global standard for data interchange, the ANSI/NIST biometric standard committee wrestled with strategies and schemas to provide an XML version of ANSI/NIST-ITL 1-200x. Several proposals were received and discussed in 2007. In 2008 an XML version of the standard was released by a special subcommittee which based its schema on GJXML (Global Justice XML) and which utilized a tag "name space" –ansi-nist. In 2011 the special subcommittee revised the XML version of the standard to be based on NIEM.

```
<!--**********************************************-->
<!--Type-2 Record (User Defined Descriptive Text Record)-->
<!--**********************************************-->
<itl:PackageDescriptiveTextRecord>
<!--NAM 2.064B-->
<nc:PersonGivenName>ANTHONY</nc:PersonGivenName>
```

Figure 19 - XML information separators

NIEM

NIEM is the "National Information Exchange Model. It is a U.S. Government XML schema and name space launched in 2005 through a partnership between the CIOs or DOJ and DHS. It is based on an earlier standard called "Global Justice XML Model" (GJXDM). It complies with HSPD-5, assigning the Secretary of the DHS as principal federal official for domestic incident management. It complies with IRTPA, the Intelligence Reform and Terrorism Prevention Act for Information Sharing Environment (ISE) established by the President in 2004.

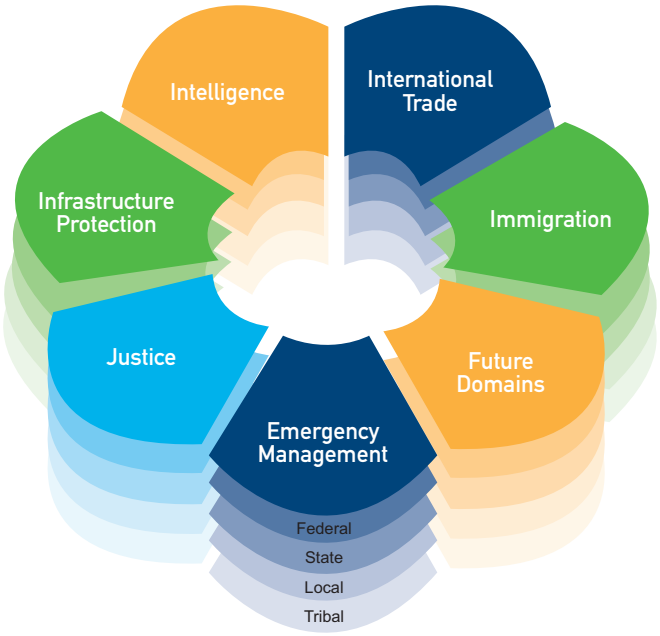

Figure 20 - NIEM domains

The purpose of NIEM is the same as ANSI/NIST-ITL, in that is it intended to enable cross-domain information exchange Between key domain and communities of interest, and local, state, and federal agencies.

Key NIEM concepts are its data components, written in an XML schema, and the NIEM Core. The NIEM Core is a small set of data components (XML schema) shared by all domains (i.e. "person component").

Other concepts defined by NIEM are ***Information Exchange Package Documentation*** (IEPD), ***Communities of Interest and Domains***. IEPD is a documented XML schema that is designed explicitly for a particular use case. ANSI/NIST-ITL 1-2011 defines and lists an IEPD. The document that shows the XML elements (tag names) used by ANSI/NIST-ITL 1-2011. Communities of Interest are people who use NIEM to share information. Domains are a "business enterprise," agencies, units of government, etc. affiliated to meet common goals and organized to facilitate governance.

Field ID	Mnemonic	XML element name
		itl:PackageInformationRecord
1.001		biom:RecordCategoryCode
-	-	biom:Transaction
1.005	DAT	biom:TransactionDate
-	-	biom:TransactionDestinationOrganization
1.007	DAI	nc:OrganizationIdentification
1.017	DAN	nc:OrganizationName
-	-	biom:TransactionOriginatingOrganization
1.008	ORI	nc:OrganizationIdentification
1.017	OAN	nc:OrganizationName
1.014	GMT	biom:TransactionUTCDate
1.009	TCN	biom:TransactionControlIdentification
1.01	TCR	biom:TransactionControlReferenceIdentification
1.013	DOM	biom:TransactionDomain

Figure 21 - Type-1 XML mappings (partial)

Field ID	Mnemonic	XML element name
		itl:PackageHighResolutionGrayscaleImageRecord
4.001	-	biom:RecordCategoryCode
4.002	IDC	biom:ImageReferenceIdentification
-	-	biom:FingerprintImage
4.009	DATA	nc:BinaryBase64Object
-	-	biom:ImageCaptureDetail
4.005	ISR	biom:CaptureResolutionCode
4.008	GCA/BCA	biom:ImageCompressionAlgorithmCode
4.006	HLL	biom:ImageHorizontalLineLengthPixelQuality
4.007	VLL	biom:ImageVerticalLineLengthPixelQuality
-	-	biom:FingerprintImagePosition
4.004	FGP	biom:FingerPositionCode
4.003	IMP	biom:FingerPrintImageImpressionCaptureCategoryCode
1.013	DOM	biom:TransactionDomain

Figure 22 - Type-4 mappings (partial)

Type-2 Record Tag Selection

Tag names for almost all fields for all record types are published in the standard. (See Annex G of ANSI/NIST ITL 1-2011: Mapping to the NIEM IEPD). The Type-2 record is still user-defined. Options for Type-2 field names are to either use elements defined by NIEM, to make up your own, or reuse the binary field names.

The main point, however, is that agencies cannot simply dictate NIEM/XML compliance to their vendors or IT professionals without first documenting the TOTs, name space, tag names, and data elements to be used. For the most part this is relevant to the XML equivalent of Type 2 record.

Field ID	Mnemonic	XML element name
		itl:PackageDescriptiveTextRecord
2.001	-	biom:RecordCategoryCode
2.002	IDC	biom:ImageReferenceIdentification
2.003+	-	itl:UserDefinedDescriptiveDetail
9.010	MIN	Number of minutiae
9.011	RDG	Ridge count indicator
9.012	MRC	Minutiae ridge count data

Figure 23 - XML Type-2 Record mandatory elements

Record Category Code	Record Element Tag	Logical record contents
1	<itl:PackageInformationRecord>	Transaction information
2	<itl:PackageDescriptiveTextRecord>	User-defined descriptive text
3		**deprecated**
4	<itl:PackageHighResolutionGrayscaleImageRecord>	High-resolution grayscale fingerprint image
5		**deprecated**
6		**deprecated**
7	<itl:PackageUserDefinedImageRecord>	User-defined image
8	<itl:PackageSignatureImageRecord>	Signature image
9	<itl:PackageMinutiaeRecord>	Minutiae data
10	<itl:PackageFacialAndSMTImageRecord>	Facial, SMT and other body part image
11		Reserved for voice
12		Reserved for dental
13	<itl:PackageLatentImageRecord>	Variable-resolution latent image
14	<itl:PackageFingerprintImageRecord>	Variable-resolution fingerprint image
15	<itl:PackagePalmprintImageRecord>	Variable-resolution palm print image
16	<itl:PackageUserDefinedTestingImageRecord>	User-defined variable-resolution testing image
17	<itl:PackageIrisImageRecord>	Iris image
18	<itl:PackageDNARecord>	DNA data or image
19	<itl:PackagePlantarImageRecord>	Plantar image
20	<itl:PackageSourceRepresentationRecord>	Source representation
21	<itl:PackageAssociatedContextRecord>	Associated context
22-97		Reserved for future use
98	<itl:PackageInformationAssuranceRecord>	Information assurance
99	<itl:PackageCBEFFBiometricDataRecord>	CBEFF biometric data

Figure 24 - NIEM Record names

```
<itl:UserDefinedDescriptiveText>
<ebts:DomainDefinedDescriptiveFields>
        <!--RET 2.005-->
        <ansi-nist:RecordRetentionIndicator>true</ansi-nist:RecordRetentionIndicator>
        <!-- SCO 2.007-->
<ansi-nist:RecordForwardOrganizations>
    <nc:OrganizationIdentification>
        <nc:IdentificationID>WV1000000</nc:IdentificationID>
    </nc:OrganizationIdentification>
    <nc:OrganizationIdentification>
        <nc:IdentificationID>NY030025P</nc:IdentificationID>
</nc:OrganizationIdentification>
</ansi-nist:RecordForwardOrganizations>
```

"Name Space"

Figure 25 - Section of FBI EBTS 9.2 NIEM-compliant Type-2 Record

```
<!--RAP 2.070-->
</ansi-nist:RecordRapSheetRequestIndicator> true<ansi-nist:RecordRapSheetRequestIndicator>t
<!--ATN 2.006--><
    <nc:CaveatText>SA J Q DOE,RM 11867</nc:CaveatText>
<!-- IMT 2.062-->
    <ebts:RecordLatentImageCategoryCode>1</ebts:RecordLatentImageCategoryCode
<!--ASL 2.047-->
    <j:Arrest>
<!-- DOO 2.047A-->
    <nc:ActivityDate>
        <nc:Date>1995-03-24</nc:Date>
    </nc:ActivityDate>
```

Figure 26 - NIEM compliant FBI EBTS 9.2

Following describes example name spaces used by FBI EBTS:

- "nc" = NIEM Core
- "ebts" = data elements devised by FBI for FBI EBTS
- "J" = data elements reused by justice domain
- "biom" = data elements devised by NIST committee
- "itl" = reserved by standard
  - – logical separations
    - records
    - user defined descriptive text

Alternative encodings or XML schemas are possible, but were lobbied against by powerful organizations and voted down immediately, so alternatives are currently not allowed. "Short Tag XML" was advocated by some. It provides simplified compact schema, using "short tags" that map one-to-one with the binary tags (e.g. "IMP" instead of "FingerprintImageImpressionCaptureCategoryCode").

Sh g example of Type-1 Record data	Same information in NIEM-compliant schema
<RecordType>01</RecordType> <DAT>20090921</DAT> <DAI>DAI000000</DAI> <ORI>MDNCANIST</ORI> <TCN>FBI_JABS0001</TCN> <DOM>NORAM</DOM> <NSR>19.69</NSR> <NTR>19.69</NTR> <VER>0500</VER> <TOT>NFXX</TOT>	<?xml version="1.0" encoding="UTF-8"?> <itl:NISTBiometricInformationExchangePackage xsi:schemaLocation="http://cjis.fbi.gov/fbi_ebts/2.0 ../xsd/fbi_ebts/2.0/fbi_ebts.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:j="http://niem.gov/niem/domains/jxdm/4.0" xmlns:nc="http://niem.gov/niem/niem-core/2.0" xmlns:itl="http://biometrics.nist.gov/standard/2-2008" xmlns:ansi-nist="http://niem.gov/niem/ansi-nist/2.0" xmlns:ebts="http://cjis.fbi.gov/fbi_ebts/2.0"><!--**********--> <!--Type-1 Record (Header Record)--> <!--**********--> <itl:PackageInformationRecord> <!--RCC--> <ansi-nist:RecordCategoryCode>1</ansi-nist:RecordCategoryCode> <ebts:Transaction> <!--DAT 1.005--> <ansi-nist:TransactionDate> <nc:Date>2007-01-01</nc:Date> </ansi-nist:TransactionDate> <!--DAI 1.007--> <ansi-nist:TransactionDestinationOrganization><nc:OrganizationIdentification><nc:IdentificationID>WI013415Y</nc:IdentificationID> </nc:OrganizationIdentification></ansi-nist:TransactionDestinationOrganization><!--ORI 1.008--> <ansi-nist:TransactionOriginatingOrganization><nc:OrganizationIdentification><nc:IdentificationID>DCFBIWAA4</nc:IdentificationID> </nc:OrganizationIdentification></ansi-nist:TransactionOriginatingOrganization><!--GMT 1.014, Optional--> <ansi-nist:TransactionUTCDate> <nc:DateTime>2007-01-01T00:00:01Z</nc:DateTime> </ansi-nist:TransactionUTCDate> <!--TCN 1.009--> <ansi-nist:TransactionControlIdentification> <nc:IdentificationID>5683956839</nc:IdentificationID> </ansi-nist:TransactionControlIdentification> <!--TCR 1.010, Optional--> <ansi-nist:TransactionControlReferenceIdentification> <nc:IdentificationID>1234567890</nc:IdentificationID> </ansi-nist:TransactionControlReferenceIdentification><!--DOM 1.013, Optional--> <ansi-nist:TransactionDomain> <ansi-nist:DomainVersionNumberIdentification><nc:IdentificationID>002</nc:IdentificationID></ansi-nist:DomainVersionNumberIdentification><ansi-nist:OrganizationName>NORAM</ansi-nist:OrganizationName></ansi-nist:TransactionDomain> <ansi-nist:TransactionImageResolutionDetails> <!--NSR 1.011--> <ansi-nist:NativeScanningResolutionValue>19.69</ansi-nist:NativeScanningResolutionValue> <!--NTR 1.012--> <ansi-nist:NominalTransmittingResolutionValue>19.69</ansi-nist:NominalTransmittingResolutionValue> </ansi-nist:TransactionImageResolutionDetails>

NIEM Pros and Cons

Pros	Cons
■ Modern data structures ■ Human readable syntax (XML) ■ Provides mechanism of more seamless data interchange with other NIEM domains or users ■ Very large data dictionary	■ Mandated, managed, governed by large US Federal IT bureaucracies – Little input from or discussion with state local stake holders – Is very U.S.- and English-centric ■ Verbose descriptors; generally more complex syntax- XML schema is very complex ■ "Close" to one-to-one mapping of the binary ■ Very large data dictionary

Summary

The ANSI/NIST-ITL 1-2011 standard has many more stakeholders now, and a result is that it has become far more complex. The adoption of the binary version by most major global government systems has been a resounding success. Adoption of the XML likely will occur over time, but the adoption rate to date has been slow due to series of changes made to the XML, to the complexity of the XML and to the huge amount of legacy infrastructure that utilizes and leverages the binary structure.

The traditional version ("binary") is still valid. The FBI has no plans to stop supporting it, and the vast majority of systems continue to implement it. Focus on forensic/biometric image exchange across disparate systems remains the purpose of standard.

About Aware, Inc.

Aware is a leading provider of commercial off-the-shelf (COTS), standards-based biometrics software since 1992. Our products enable solution providers and system integrators with interoperable, standards-compliant, field-proven biometric functionality for applications including credentialing, border management, and criminal justice. Aware continues to build upon this legacy as a leading provider of innovative, high-quality, state-of-the-art biometrics software. Our client- and server-based software tools and applications enable integrators, solution providers, and government agencies to analyze, optimize, compress, format, match, store and transport biometric images and data according to international standards. End users include federal, state, and local government agencies such as the FBI and other U.S. Department of Justice agencies, the U.S. Department of State, the Department of Homeland Security, and government entities throughout Europe, Asia, and South America. More can be learned about Aware's products at www.aware.com/biometrics.

AWARE

The information presented in this document is designed as an introduction to the Aware suite of biometric tools. If you would like further information, extended examples, or product manuals, please contact Aware at:

sales@aware.com
www.aware.com/biometrics