Terrorist Watchlist Person Data Exchange Standard (TWPDES)
Version 3.0

Biometric Data
and
Minor TWPDES Core Changes

Information Exchange Package Documentation (IEPD)

December 2009

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Document Revision History

Revision	Revised By	Date	Summary of Change
3.0 R0C0	C. J. Lee	12/4/2009	• Removed "Sensitive But Unclassified //For Official Use Only" markings in the document. • Removed references to "Controlled Unclassified Information". • Updated Version 1.2b to Version 3.0 to mark the changes.

1 Introduction

1.1 Purpose

This document describes the biometric data exchange format and minor changes to the core schema in the Terrorist Watchlist Person Data Exchange Standard (TWPDES), version 3.0 (see Figure 1). One of the goals of TWPDES is to provide not only biographic but also biometric data for the communication of known and suspected terrorist (KST) information across the law enforcement and intelligence communities. Using biometric data can substantially improve the accuracy in the verification of possible KST matches.
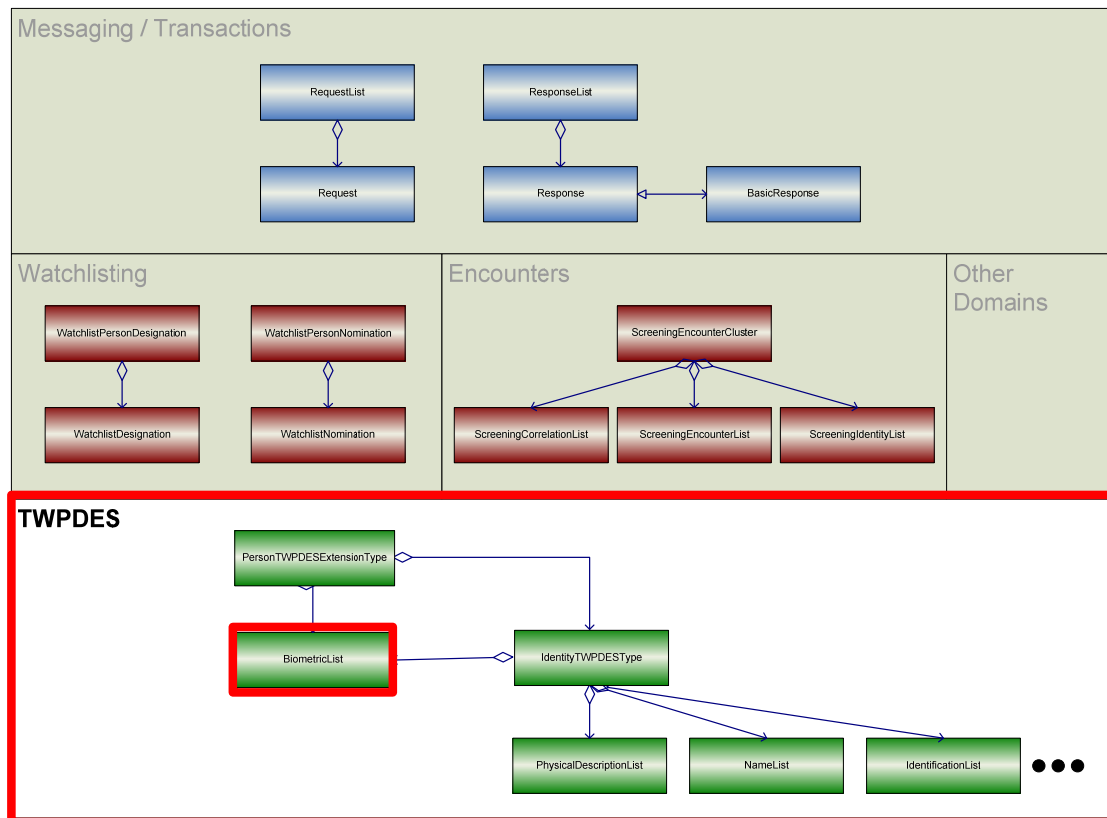
Figure 1: TWPDES Schema Context

1.2 Principles

The primary design objective of the biometric data format in TWPDES is to allow biometric information to be exchanged between agencies, while leveraging existing standards and anticipating future standards and new biometric modalities as much as possible. As such, the TWPDES Biometric List utilizes existing American National Standards Institute (ANSI)/National Institute of Standards and Technology (NIST)-Information Technology Laboratory (ITL) Biometric Standards Part 2, National Information Exchange Model (NIEM) and TWPDES. When an element was created to support the biometric data list, ANSI/NIST-ITL or NIEM 2.0 data types were used whenever possible. If there was not an appropriate type in those two standards, TWPDES types were used if available. If no types were found in any standard to support the requirements, new types were created using NIEM's naming and design rules (NDR). TWPDES 3.0 *BiometricList* also has extension

mechanisms built-in for future biometric standards and/or modalities as well as legacy biometric exchange formats.

1.3 Requirements

The *BiometricList* in TWPDES 3.0 is designed to support data flows, as depicted in Figure 2. Biometric information can be sent from the intelligence community to a watchlisting agency and then exported downstream to screening agencies. When an identity matches an entry on the watchlist at a screening agency, an encounter request with new and/or updated biometric information is sent to the watchlisting agency to begin the verification process. If the match is confirmed, then the new and/or updated biometric information on the watchlisted individual is circulated back to the intelligence community for review. As a result, a watchlist nomination update with the new and/or updated biometric information is sent to the watchlisting agency to update the watchlist and distribute the updates to the screening agencies.
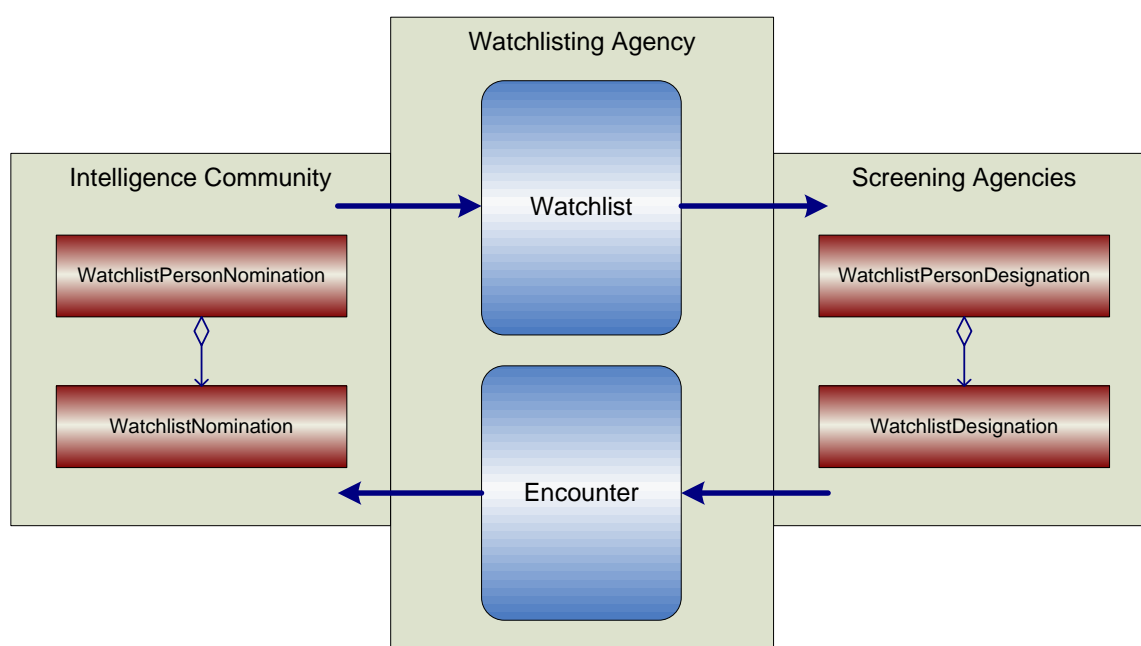
Figure 2: Biometric Data Flow

In TWPDES 3.0, a physical person is a biological entity that uniquely represents a person. An identity is a set of biographic information and/or biometric information (e.g. photographs) that a person uses and/or is associated with at a point in time. Each physical person can have multiple identities. Biometric information in the watchlist can be sent at a physical person level to avoid duplication. See Figure 3. Since a physical person can assume more than one identity, the watchlist schema supports the grouping of multiple identities together into a single person, and associating the group to the biometric information for the person (see "TWPDES 3.0 Watchlisting Specification IEPD" [11]). Including biometric information at a person level allows biometric-only entities to be watchlisted. For example, an image or a set of fingerprints of person collected from security camera or a weapon used at a crime scene could be watchlisted even though there is no biographical information about the source of the image or fingerprints.

Biometric information in the encounter is conveyed at an identity level because whether the obtained biometric data actually belongs to the encountered person is subject to verification. See "TWPDES 3.0 Encounter Specification IEPD" [26].

For each biometric modality, the biometric list includes one-to-many system identifiers. The system identifier allows biometric information to be communicated even if the receiving agency does not have biometric data capability, or the biometric data itself cannot be included in the payload.

TWPDES 3.0 schema definition is backward compatible with TWPDES 1.2b messages, with the exception to remove the TWPDES 1.2b namespace reference "http:/twpdes.gov/twpdes/twpdes-adaptor/1.2b" and replace it with "http:/twpdes.gov/twpdes/twpdes-adaptor/3.0". Other than this change, an XML file that is valid for TWPDES 1.2b schema definition will also be valid for TWPDES 3.0 schema definition.

Note that an XML file that is valid for TWPDES 3.0 schema definition may not be valid for TWPDES 1.2b schema definition. This is because some of the required fields in 1.2b are changed to be optional in 3.0 in addition to the new optional fields added to TWPDES 3.0 schema definition.

1.4 External Schema Dependencies

The TWPDES 3.0 Biometric List utilizes a number of external schema dependencies from ANSI/NIST-ITL and NIEM. These schemas, and their respective locations, are listed below:

Item	Location
action.xsd	schemas/twpdes/action/1.0/action.xsd
ansi-nist_itl_constraint.xsd	schemas/niem/ansi-nist/2.0/
appinfo.xsd	schemas/niem/appinfo/2.0/
ITL-2007-Package.xsd	schemas/niem/nist-itl/2.0
niem-core.xsd	schemas/niem/niem-core/2.0/
structures.xsd	schemas/niem/structures/2.0/
twpdes-adaptor.xsd	schemas/twpdes/twpdes-adaptor/3.0
TWPDES_DNA.xsd	schema/twpdes/biometrics/DNA/2.0
xsd.xsd	schemas/niem/proxy/xsd/2.0/

2 Biometric Data List

Biometric data in TWPDES is represented by the data element "*BiometricList*". Figure 1 shows the context of biometric list in TWPDES. Figure 3 shows the location of the biometric list in the TWPDES schema.
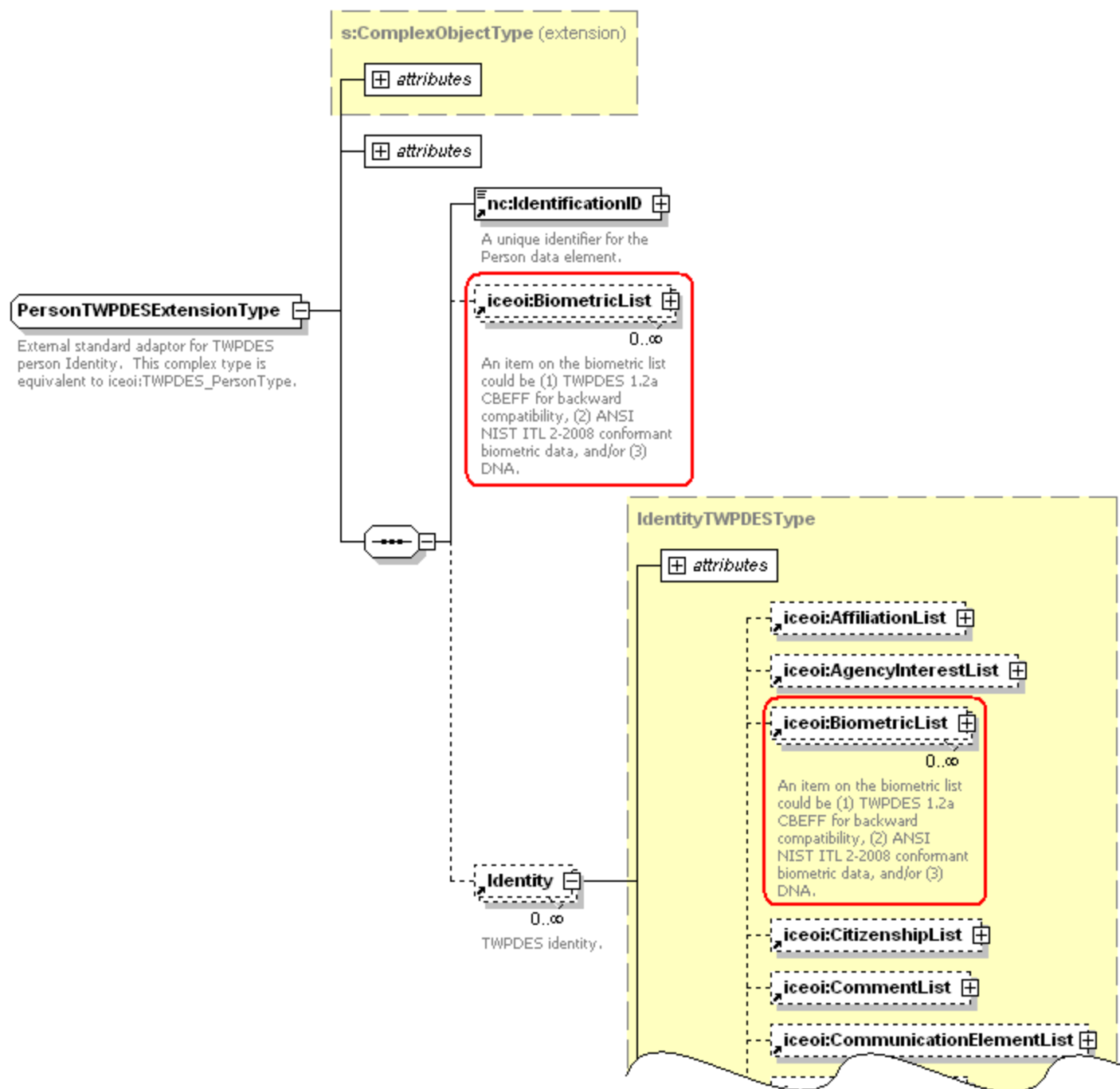
Figure 3: Schema Location of Biometric List

As mentioned previously, the biometric list is an optional element for either a person or an identity.

An element in the TWPDES biometric list may contain any of the four types shown in Figure 4:
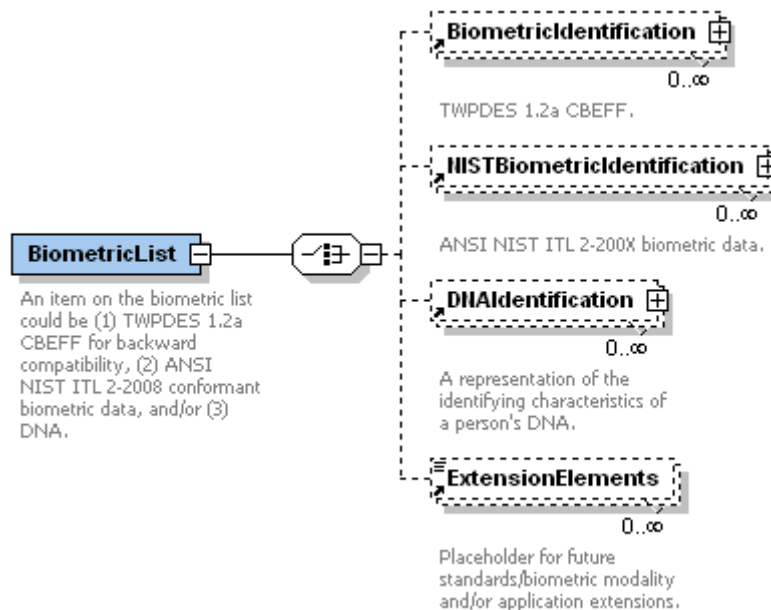
Figure 4: Acceptable Elements in Biometric List

1. *NISTBiometricIdentification* – Biometric data element that is conformant to the ANSI/NIST-ITL Part 2 Standards for Biometrics. That is, the data element supports record types 1 – 17 and Type 99[7].
2. *DNAIdentification* – Biometric data element that supports DeoxyriboNucleic Acid (DNA) data sharing.
3. *ExtensionElements* – Data element that supports exchange-specific extensions that cannot be represented by the above lists, e.g. the ANSI/NIST ITL 2000 or ANSI/NIST ITL 2007 Part 1 biometric transactions.
4. *BiometricIdentification* – Biometric Common Biometric Exchange Formats Framework (CBEFF) links to external files (for backward compatibility, not currently used).

The *BiometricList* in TWPDES 3.0 supports new standards/formats for biometric data whenever they are approved/published. For example, the Federal Bureau of Investigation (FBI) Criminal Justice Information Services (CJIS) division is working on the Extensible Markup Language (XML) implementation of the FBI's Electronic Biometric Transmission Specification (EBTS) v.9.0 [6], and the Department of Defense (DoD) is working on DoD EBTS v.2.0 [8]. The substitution groups defined in the ANSI/NIST ITL XML schema and the ExtensionElements defined in *BiometricList* can be used to include these new biometric exchange formats as they become available.

2.1 Biometric Data Defined in the ANSI/NIST ITL Standard

The ANSI/NIST ITL biometric standard defines the content, format, and units of measurement for the exchange of fingerprint, palmprint, facial/mugshot, scar mark and tattoo, iris and other biometric sample information (in CBEFF format) that may be used in the identification or verification process of a subject [1]. The CBEFF format should only be used for biometric modalities other than fingerprint, palmprint, facial/mugshot, scar mark and tattoo, iris, and DNA. The ANSI/NIST ITL biometric standard is implemented in the TWPDES element, *NISTBiometricIdentification*. The components of *NISTBiometricIdentification* are shown in Figure 5.
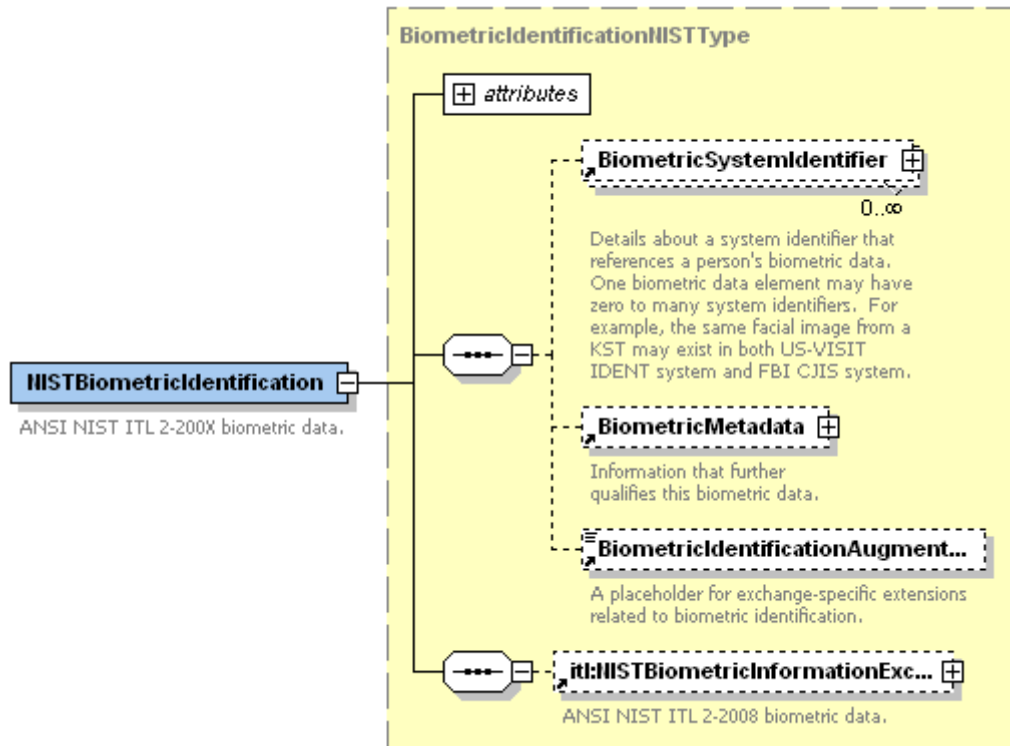
Figure 5 Components of NISTBiometricIdentification

The components: *BiometricSystemIdentifier*, *BiometricMetadata* and *BiometricIdentificationAugmentation* convey reference information to the receiving agency on the existence and location of the biometric data. These components provide a "shallow" payload option when the biometric data is not exchanged between the systems. The payload is "shallow" because it may contain only a system identifier for the receiving agency to indicate the existence of biometric data and where to find it without sending the actual data. A detailed description of each of the components in *NISTBiometricIdentification* is listed in Table 1.

2.1.1 Data Element and Attributes for NIST Biometric Identification

Table 1 lists the elements and attributes for the biometric data in ANSI/NIST ITL Standard.

	Element/Attribute	Description
1	iceoi:NISTBiometricIdentification/@act:designatedActionCode	Type of designated action (add, modify, delete or no change) for the information.
2	iceoi:NISTBiometricIdentification/@ism:classification	United States (US), non-US, and joint classification portion mark abbreviations from the Controlled Access Program Coordination Office (CAPCO) Register.
3	iceoi:NISTBiometricIdentification/@ism:ownerProducer	ISO 3166-1 trigraph(s) of the owner or producer country(ies) and/or CAPCO-specified tetragraphs of international organizations. Either (a) a single trigraph or tetragraph or (b) a space-delimited list of trigraphs followed by tetragraphs. Trigraphs must be in alphabetical order and tetragraphs must be in alphabetical order.
4	iceoi:NISTBiometricIdentification/@iceoi:lastUpdated	Date information was last modified.
5	iceoi:NISTBiometricIdentification/@s:id	XML ID such that other elements in a document can reference the biometric data element.
6	iceoi:NISTBiometricIdentification/iceoi:BiometricSystemIdentifier/TWPDESSystemIdentifier	Reference system identifier for the biometric data. For example, if the biometric data is a set of fingerprints that exists in the FBI's AFIS, then the IdentificationID will be the AFIS ID, the IdentifierName will be "AFIS ID", and the SystemName will be FBI Automated Fingerprint Identification System (AFIS). This object is optional to support the use cases where the biometric data cannot be included. In that case, the agency holding the biometric data and the unique identifier for the biometric data should be provided.
7	iceoi:NISTBiometricIdentification/iceoi:BiometricSystemIdentifier/intel:SystemIdentifier	Backward compatibility item. SHOULD NOT BE USED in new implementations of TWPDES. Use TWPDESSystemIdentifier.
8	iceoi:NISTBiometricIdentification/iceoi:BiometricSystemIdentifier/TWPDESSystemIdentifier/IdentifierName	Name of the identifier.

	Element/Attribute	Description
9	iceoi:NISTBiometricIdentification/BiometricSystemIdentifier/iceoi:BiometricSystemIdentifier/BiometricDataContactEntity	An entity that may be contacted for the biometric data or answer questions about the data.
10	iceoi:NISTBiometricIdentification/iceoi:BiometricSystemIdentifier/BiometricDataCommentText	A remark or explanation for the biometric data and/or its system identifier. For example, the actual biometric data cannot be included but it exists in the system specified by the SystemIdentifier.
11	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:AdministrativeID	An identifier generated locally within a processing system used to identify sub-records within an entity of interest record.
12	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:CommentText	A remark, explanation, or observation of the set of biometric data.
13	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:DistributionText	Allowable recipients of information; dissemination statement or instructions.
14	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:EffectiveDate	A date that information take effect.
15	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:LastUpdatedDate	Date information was last modified.
16	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:QualityCommentText	A remark, explanation, or observation regarding the accuracy or trustworthiness of the set of biometric data.
17	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:ReportedDate	Date information was observed, measured, identified, or became known.
18	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:ReportingOrganizationText	A name, identifier, or reference of an organization that provided the information.
19	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:ReportingPersonText	A name, identifier, or reference of a person who provided the information.
20	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/nc:SensitivityText	A sensitivity level of the information. It describes or distinguishes data that may or may not be classified (in the national security sense of TS, S, C, or U), but may be of a nature that requires some form of protection or special treatment. Examples may include "controlled with standard dissemination", "personally identifiable information", "proprietary" etc.

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	Element/Attribute	Description
21	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/iceoi:DataInSystemTotal	The total number of data units stored in the source system. For example, there may be 10 facial images stored in the watchlist database for an individual but due to destination screening agency's rule sets only the most recent image is sent in the transaction. This information combined with DataIncludedTotal can be useful for the receiver to determine if the biometric data not included in this message should be requested.
22	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/iceoi:DataIncludedTotal	The total number of data units included in this transaction. For example, 2 facial images are included in this message. This information combined with DataInSystemTotal can be useful for the receiver to determine if the biometric data not included in this message should be requested.
23	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/iceoi:DataQualityRankingAlgorithm	The algorithm or mechanism used to select DataIncludedTotal out of DataInSystemTotal. The acceptable values should come from an enumerated list and the list should be defined in each exchange-specific Interface Control Document (ICD) and linked to this element using substitution.
24	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/iceoi:DataQualityRankedBy	The entity that made the ranking evaluation, e.g. Person or FBI AFIS. The acceptable values should come from an enumerated list and the list should be defined in each exchange-specific ICD and linked to this element using substitution.
25	iceoi:NISTBiometricIdentification/iceoi:BiometricMetadata/DataQualityRankCommentText	Additional information about the ranking, e.g. the name of the person who ranked the facial images or the version number of the system that provided the ranking.
26	iceoi:NISTBiometricIdentification/iceoi:BiometricIdentificationAugmentation	A placeholder for exchange-specific extensions related to biometric identification.</xsd:documentation.
27	iceoi:NISTBiometricIdentification/itl:NISTBiometricInformationExchangePackage	See ANSI/NIST ITL Biometrics schema.
28	iceoi:NISTBiometricIdentification/itl:NISTBiometricInformationExchangePackage/itl:PackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\TWPDESSystemIdentifier	See Section 2.1.1 item 6.

	Element/Attribute	Description
29	iceoi:NISTBiometricIdentification/itl:NISTBiometric InformationExchangePackage/itl:PackageImageReco rd\itl:UserDefinedFields (TWPDESDefinedFields)\intel:SystemIdentifier	See Section 2.1.1 item 7.
30	itl:NISTBiometricInformationExchangePackage\itl:P ackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\iceoi:DataEnhancedIndicat or	True if the data has been enhanced, false if it is not. This information is important especially for facial images. An enhanced facial image may appear to be a clear photo when in fact the image may miss an important mark/scar on the face. Knowing the image has been enhanced helps to interpret a matching or non-matching result.
31	itl:NISTBiometricInformationExchangePackage\itl:P ackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\ iceoi:DataEnhancedBy	The entity that enhanced the image, e.g. Person or ImageWare. The acceptable values should come from an enumerated list and the list should be defined in each exchange-specific ICD and linked to this element using substitution.
32	itl:NISTBiometricInformationExchangePackage\itl:P ackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\ iceoi:DataEnhancedCommentText	Additional information about the enhancement, e.g. the version number of the system that provided the enhancement.
33	itl:NISTBiometricInformationExchangePackage\itl:P ackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\ iceoi:BiometricDataCommentText	A remark or explanation for the biometric data and/or its system identifier. For example, the actual biometric data cannot be included but it exists in the system specified by the SystemIdentifier.
34	itl:NISTBiometricInformationExchangePackage\itl:P ackageImageRecord\itl:UserDefinedFields (TWPDESDefinedFields)\ iceoi:BiometricDataContactEntity	An entity that may be contacted for the biometric data.

Table 1: Data Element and Attribute of *NISTBiometricIdentification*

2.1.2 ANSI/NIST ITL Sample Message Content

The following sample message is an example of biometric data for a known or suspected terrorist (KST) on the watchlist. The data includes a photo and fingerprints.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<iceoi:NISTBiometricIdentification ism:ownerProducer="USA" ism:classification="U">
        <iceoi:BiometricMetadata>
                <nc:AdministrativeID>123456</nc:AdministrativeID>
                <nc:LastUpdatedDate>
                        <nc:DateTime>2008-05-10T14:00:00</nc:DateTime>
                </nc:LastUpdatedDate>
        </iceoi:BiometricMetadata>
        <itl:NISTBiometricInformationExchangePackage>
                <itl:PackageInformationRecord>
                        <ansi-nist:RecordCategoryCode>01</ansi-nist:RecordCategoryCode>
                        <ansi-nist:Transaction>
                                <ansi-nist:TransactionDate/>
                                <ansi-nist:TransactionDestinationOrganization/>
                                <ansi-nist:TransactionOriginatingOrganization/>
                                <ansi-nist:TransactionControlIdentification/>
                                <ansi-nist:TransactionImageResolutionDetails>
                                        <!-- For transactions that do not contain Type-3 through Type-7 fingerprint image records, this field shall be set to 00.00.  -->
                                        <ansi-nist:NativeScanningResolutionValue>00.00</ansi-nist:NativeScanningResolutionValue>
                                        <ansi-nist:NominalTransmittingResolutionValue>00.00</ansi-nist:NominalTransmittingResolutionValue>
                                </ansi-nist:TransactionImageResolutionDetails>
                                <ansi-nist:TransactionMajorVersionValue>04</ansi-nist:TransactionMajorVersionValue>
                                <ansi-nist:TransactionMinorVersionValue>00</ansi-nist:TransactionMinorVersionValue>
                                <!-- TransactionCategoryCode NFUF: NON-FEDERAL APPLICANT USER FEE  -->
                                <ansi-nist:TransactionCategoryCode>NFUF</ansi-nist:TransactionCategoryCode>
                                <ansi-nist:TransactionContentSummary>
                                        <ansi-nist:ContentFirstRecordCategoryCode>01</ansi-nist:ContentFirstRecordCategoryCode>
                                        <ansi-nist:ContentRecordCount>1</ansi-nist:ContentRecordCount>
                                        <ansi-nist:ContentRecordSummary>
                                                <ansi-nist:ImageReferenceIdentification/>
                                                <ansi-nist:RecordCategoryCode/>
                                        </ansi-nist:ContentRecordSummary>
                                </ansi-nist:TransactionContentSummary>
                        </ansi-nist:Transaction>
                </itl:PackageInformationRecord>
                <itl:PackageDescriptiveTextRecord>
                        <ansi-nist:RecordCategoryCode>02</ansi-nist:RecordCategoryCode>
                        <ansi-nist:ImageReferenceIdentification/>
                        <itl:UserDefinedDescriptiveText>
```

```xml
            <itl:ExampleDomainDefinedDescriptiveText/>
          </itl:UserDefinedDescriptiveText>
        </itl:PackageDescriptiveTextRecord>
        <itl:PackageFacialAndSMTImageRecord>
          <!-- Photo -->
          <ansi-nist:RecordCategoryCode>10</ansi-nist:RecordCategoryCode>
          <ansi-nist:ImageReferenceIdentification/>
          <ansi-nist:FaceImage>
            <nc:BinaryBase64Object>
RU5DT0RFRCBTVFVFVGRg==

            </nc:BinaryBase64Object>
            <ansi-nist:ImageColorSpaceCode>UNK</ansi-nist:ImageColorSpaceCode>
            <ansi-nist:ImageCompressionAlgorithmCode>0</ansi-nist:ImageCompressionAlgorithmCode>
            <!-- ImageHorizontalPixelDensityValue (Field 10.009: Horizontal pixel scale (HPS)): A "1" in this field indicates pixels per inch, or a "2"
indicates pixels per centimeter.  A "0" in this field indicates no scale is given. -->
            <ansi-nist:ImageHorizontalPixelDensityValue>0</ansi-nist:ImageHorizontalPixelDensityValue>
            <!-- ImageVerticalPixelDensityValue (Field 10.010: Vertical pixel scale (VPS)): A "1" in this field indicates pixels per inch, or a "2" indicates
pixels per centimeter.  A "0" in this field indicates no scale is given. -->
            <ansi-nist:ImageVerticalPixelDensityValue>0</ansi-nist:ImageVerticalPixelDensityValue>
            <ansi-nist:FaceImageAcquisitionProfileText/>
          </ansi-nist:FaceImage>
        </itl:PackageFacialAndSMTImageRecord>
        <itl:PackageFingerprintImageRecord>
          <!-- Variable Resolution Fingerprint Image  -->
          <ansi-nist:RecordCategoryCode>14</ansi-nist:RecordCategoryCode>
          <ansi-nist:ImageReferenceIdentification/>
          <itl:FingerprintImage>
            <nc:BinaryBase64Object>mrHbPdrko3u1s7ahtgPBjtmO1s85tfG2U7bpofY9
4Czu2SbY7d7wF9fQ7ZptgGrtkO2a2dsJ7wZbe 8BlzvAmQ7xq+Y94GoHeEsR3ikWd4DIGhzmp3k42
d4DRmzs94DKveDTB3hqw6PeBLrtpPep0H/+h</nc:BinaryBase64Object>
            <ansi-nist:ImageBitsPerPixelQuantity>8</ansi-nist:ImageBitsPerPixelQuantity>
            <ansi-nist:ImageCompressionAlgorithmText>NONE</ansi-nist:ImageCompressionAlgorithmText>
            <ansi-nist:ImageHorizontalLineLengthPixelQuantity>80</ansi-nist:ImageHorizontalLineLengthPixelQuantity>
            <ansi-nist:ImageHorizontalPixelDensityValue>1200</ansi-nist:ImageHorizontalPixelDensityValue>
            <!-- ImageScaleUnitsCode (Scale units) 0 = No scale is given  -->
            <ansi-nist:ImageScaleUnitsCode>0</ansi-nist:ImageScaleUnitsCode>
            <ansi-nist:ImageVerticalLineLengthPixelQuantity>65</ansi-nist:ImageVerticalLineLengthPixelQuantity>
            <ansi-nist:ImageVerticalPixelDensityValue>1200</ansi-nist:ImageVerticalPixelDensityValue>
```

```
                        <!-- FingerprintImageImpressionCaptureCategoryCode (Impression type) 29 = Unknown   -->
                        <ansi-nist:FingerprintImageImpressionCaptureCategoryCode>29</ansi-nist:FingerprintImageImpressionCaptureCategoryCode>
                        <!-- FingerPositionCode 13 = Plain right four fingers   -->
                        <ansi-nist:FingerPositionCode>13</ansi-nist:FingerPositionCode>
                    </itl:FingerprintImage>
                </itl:PackageFingerprintImageRecord>
            </itl:NISTBiometricInformationExchangePackage>
</iceoi:NISTBiometricIdentification>
```

2.2 DNA Data

2.2.1 Taxonomy of the Data Element

As mentioned in the previous section, the DNA element follows the transaction format defined in the *NISTBiometricIdentification*.
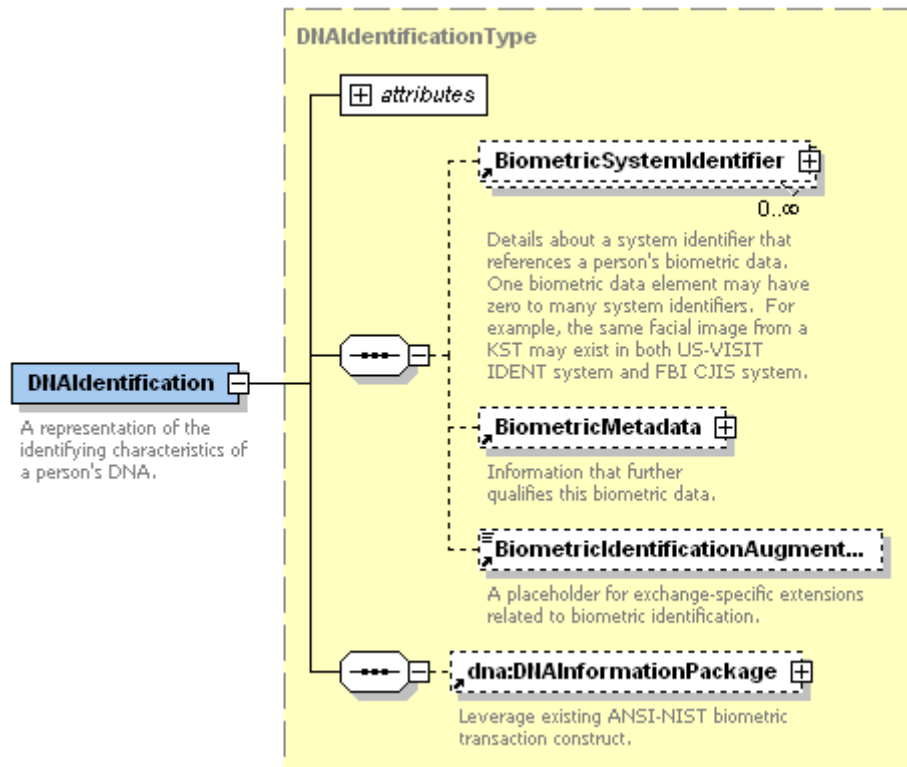

Figure 6: DNA Data Structure

The DNA exchange format supports the DNA technologies currently used in the forensic community, Short Tandem Repeat (STR), Y chromosome STR (Y-STR), mitochondria DNA (mtDNA) and Single Nucleotide Polymorphism (SNP). As in the *NISTBiometricIdentification*, an ExtensionElement is added to account for future DNA technology and/or application extension.

2.2.2 Data Element and Attributes for DNA

The data elements and attributes for DNATyping elements are listed in Table 2 below.

	Element/Attribute	Description
1	dna:PackageDNARecord/DNASampleCategory	A category name or code of the biological sample for which the DNA information is allowed to be collected by law. The list of sample categories can be extended by substitutable elements.
2	dna:PackageDNARecord/DNASampleCellularType	The name or code of the cellular type of the sample.
3	dna:PackageDNARecord/SampleSource	A physique type that contains the number of source contributors of the biological sample and the confidence level of the number. e.g. NumberSourceContributor=1 and ConfidenceNumeric=0.99 mean the biological sample is from one person with a 99% confidence level; NumberSourceContributor=2 and ConfidenceNumeric=0.5 mean the biological sample is from two people with a 50% confidence level. The meaning of the confidence level requires standardization.
4	dna:PackageDNARecord/SampleSourceStatus	True if the identity(identities) of the source(s) of the biological sample is known; otherwise, false. Not sure if N/A should be allowed here.
5	dna:PackageDNARecord/DNATypingData/DNATypingTechnologyName	DNA Typing technology used to obtain DNA data.
6	dna:PackageDNARecord/DNATypingData/dna:DNADataPOC	DNA analyst/organization that is responsible for dispositioning any matches with the data or providing more information about the data. For example, the DNA data may be generated by a private vender for a crime laboratory. dna:DNADataPOC should be the tech lead/examiner at the crime laboratory while the DNA analyst from the vendor lab who performed the DNA typing should be the nc:BiometricTester.
7	dna:PackageDNARecord/DNATypingData/nc:BiometricTester	DNA analyst/organization that performed the DNA typing/testing.
8	dna:PackageDNARecord/DNATypingData/nc:Biometri	The testing method used to obtain the DNA data.

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	Element/Attribute	Description
	cTestMethodText	
9	dna:PackageDNARecord/DNATypingData/nc:BiometricTestDate	Date/time when the typing/testing was performed.
10	dna:PackageDNARecord/DNATypingData/nc:BiometricTestDescriptionText	A description of the testing method used to obtain the DNA data.
11	dna:PackageDNARecord/DNATypingData/dna:TypeInstrumentationText	Instrument used in the typing/testing. e.g. Applied Biosystems (ABI) 310 ABI, ABI 3700, etc.
12	dna:PackageDNARecord/DNATypingData/dna:DNABatchID	Batch or Run Identifier. This identifier can be used in querying out all of the DNA data generated by the same run for quality check/assurance purposes. This DNA Batch ID value is at the technology level.
13	dna:PackageDNARecord/DNATypingData/dna:DNAKit	Name of the DNA kit used for the typing. This is the kit value at the technology-level.
14	dna:PackageDNARecord/DNATypingData/ta:ClassifiableText	Important information about the DNA typing/testing to further describe the data. e.g., the description could be "Attempted to type 16 loci using Applied Biosystems Identifiler Kit but only 8 loci (Amelogenin, D19S433, D3S1358, D8S1179, D5S818, vWA, TH01, D21S11) have data."
15	dna:PackageDNARecord/DNATypingData/dna:DNATypeTechQuality	The quality of the DNA profile developed by the typing technology. It contains the resolution/readability of the DNA measurements, match probability of this profile (e.g. STR profile match probability, mtDNA profile frequency, etc.), and a text description of the data quality.
16	dna:PackageDNARecord/DNATypingData/dna:DNATestData	Resulting data from executing the DNA testing method.
17	dna:PackageDNARecord/DNATypingData/nc:DNAImage	Data image that could further describe the quality of the data. e.g. electropherograms.

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	Element/Attribute	Description
18	dna:PackageDNARecord/DNATypingData/SNPData/SNPLocusName	SNP locus name.
19	dna:PackageDNARecord/DNATypingData/SNPData/SNPValue	SNP allele value.
20	dna:PackageDNARecord/DNATypingData/SNPData/SNPQuality	The quality of SNP data. It contains the resolution/readability of the SNP measurements and a text description of the data quality. Since SNP data may not be statistically independent across loci, SNP locus probability is not collected.
21	dna:PackageDNARecord/DNATypingData/SNPData/dna:DNADataPOC	Locus-level DNA analyst/organization who is responsible for dispositioning any matches with the data or providing more information about the data.
22	dna:PackageDNARecord/DNATypingData/SNPData/nc:BiometricTester	Locus-level DNA analyst/organization who performed the DNA typing/testing.
23	dna:PackageDNARecord/DNATypingData/SNPData/nc:BiometricTestDate	Locus-level Date/time when the typing/testing was performed.
24	dna:PackageDNARecord/DNATypingData/SNPData/dna:TypeInstrumentationText	Locus-level Instrument used in the typing/testing. e.g. ABI 310 ABI, ABI 3700, etc.
25	dna:PackageDNARecord/DNATypingData/mtDNAData/mtDNAFragStart	Start position of the mtDNA fragment.
26	dna:PackageDNARecord/DNATypingData/mtDNAData/mtDNAFragStop	End position of the mtDNA fragment.
27	dna:PackageDNARecord/DNATypingData/mtDNAData/mtDNAPolymorphismLocation	Location of the mtDNA type, following the sequence naming convention of the reference Cambridge sequence.

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	Element/Attribute	Description
28	dna:PackageDNARecord/DNATypingData/mtDNAData/mtDNAPolymorphismType	mtDNA type, following the sequence naming convention of the reference Cambridge sequence.
29	dna:PackageDNARecord/DNATypingData/mtDNAData/mtDNAQuality	The quality of mtDNA data. It contains the resolution/readability of the DNA measurements and a text description of the data quality. Since the mtDNA fragments are not statistically independent, fragment match probability is not collected.
30	dna:PackageDNARecord/DNATypingData/mtDNAData/dna:DNADataPOC	Fragment-level DNA analyst/organization that is responsible for dispositioning any matches with the data or providing more information about the data.
31	dna:PackageDNARecord/DNATypingData/mtDNAData/nc:BiometricTester	Fragment-level DNA analyst/organization that performed the DNA typing/testing.
32	dna:PackageDNARecord/DNATypingData/mtDNAData/nc:BiometricTestDate	Fragment-level Date/time when the typing/testing was performed.
33	dna:PackageDNARecord/DNATypingData/mtDNAData/dna:TypeInstrumentationText	Fragment-level Instrument used in the typing/testing. E.g. ABI 310 ABI, ABI 3700, etc.
34	dna:PackageDNARecord/DNATypingData/STRDataType/STRLocusName	Name of the STR locus.
35	dna:PackageDNARecord/DNATypingData/STRDataType/Partial	A TRUE/FALSE flag to indicate if this locus has allele(s) just below the threshold defined by the lab's Standard Operation Procedure (SOP), and therefore, cannot be reported.
36	dna:PackageDNARecord/DNATypingData/STRDataType/STRAllele	Allele type at the STR locus.
37	dna:PackageDNARecord/DNATypingData/STRDataType/LocusQuality	The quality of the DNA profile/data for this locus. It contains the resolution/readability of the DNA measurements of this locus, match probability of this locus profile, and a text description of the data quality. The text could be that this locus has the "bleed through" phenomenon.

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	Element/Attribute	Description
38	dna:PackageDNARecord/DNATypingData/STRDataType/dna:DNADataPOC	Locus-level DNA analyst/organization who is responsible for dispositioning any matches with the data or providing more information about the data.
39	dna:PackageDNARecord/DNATypingData/STRDataType/nc:BiometricTester	Locus-level DNA analyst/organization who performed the DNA typing/testing.
40	dna:PackageDNARecord/DNATypingData/STRDataType/nc:BiometricTestDate	Locus-level Date/time when the typing/testing was performed.
41	dna:PackageDNARecord/DNATypingData/STRDataType/dna:TypeInstrumentationText	Locus-level Instrument used in the typing/testing. E.g. ABI 310 ABI, ABI 3700, etc.
42	dna:PackageDNARecord/DNATypingData/STRDataType/dna:DNAKit	DNA Kit used for the DNA typing for this locus. This kit value is at the locus level.
43	dna:PackageDNARecord/DNATypingData/STRDataType/dna:DNABatchID	Batch or Run Identifier. This identifier can be used in querying out all of the DNA data generated by the same run for quality check/assurance purposes. This DNA Batch ID value is at the locus level.
44	dna:PackageDNARecord/DNATypingData/YSTRDataType/YSTRLocusName	Name of the Y-STR locus.
45	dna:PackageDNARecord/DNATypingData/YSTRDataType/Partial	A TRUE/FALSE flag to indicate if this locus has allele(s) just below the threshold defined by the lab's SOP, and therefore, cannot be reported.
46	dna:PackageDNARecord/DNATypingData/YSTRDataType/YSTRAllele	Allele type at the Y-STR locus.
47	dna:PackageDNARecord/DNATypingData/YSTRDataType/YLocusQuality	The quality of the DNA profile/data for this locus. It contains the resolution/readability of the DNA measurements of this locus, match probability of this locus profile, and a text description of the data quality. The text could be that this locus has the "bleed through" phenomenon.

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	Element/Attribute	Description
48	dna:PackageDNARecord/DNATypingData/YSTRData Type/dna:DNADataPOC	Locus-level DNA analyst/organization who is responsible for dispositioning any matches with the data or providing more information about the data.

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49	dna:PackageDNARecord/DNATypingData/YSTRData Type/nc:BiometricTester	Locus-level DNA analyst/organization who performed the DNA typing/testing.
50	dna:PackageDNARecord/DNATypingData/YSTRData Type/nc:BiometricTestDate	Locus-level Date/time when the typing/testing was performed.
51	dna:PackageDNARecord/DNATypingData/YSTRData Type/dna:TypeInstrumentationText	Locus-level Instrument used in the typing/testing. e.g. ABI 310 ABI, ABI 3700, etc.
52	dna:PackageDNARecord/DNATypingData/YSTRData Type/dna:DNAKit	DNA Kit used for the DNA typing for this locus. This kit value is at the locus level.
53	dna:PackageDNARecord/DNATypingData/YSTRData Type/dna:DNABatchID	Batch or Run Identifier. This identifier can be used in querying out all of the DNA data generated by the same run for quality check/assurance purposes. This DNA Batch ID value is at the locus.
54	dna:PackageDNARecord/DNATypingData/SampleQuality	Overall sample quality of all of the DNA typing technologies/data this sample has. It contains the resolution/readability of the DNA measurements, combined match probability across the entire DNA typing technologies used, and a text description of the data quality. The text could be the fact that the biological sample (e.g. blood stain) is captured/collected from a pair of denim jeans. This is important information to include since the dye in denim jeans often cause failure to detect DNA alleles using the STR typing technology.
55	dna:PackageDNARecord/DNATypingData/SampleCapturer	The person/organization that captured/collected the biological sample.
56	dna:PackageDNARecord/DNATypingData/SampleCaptureDate	The date/time when the biological sample was captured/collected.
57	dna:PackageDNARecord/DNATypingData/SampleCaptureLocation	The address location where the biological sample was captured/collected.

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| 58 | dna:PackageDNARecord/DNATypingData/SampleCaptureGeoLocation | The geo-spatial location where the biological sample was captured/collected. It was suggested at the NIST XML Mobile ID Workshop in September 2007, Gaithersburg, MD, that Mobile ID should be able to capture geo-spatial location as well as biometric measurements. |
| 59 | dna:PackageDNARecord/DNATypingData/SampleCommentsText | Comments, description, and/or information of the sample capturing. |

<div align="center">Table 2: Data Elements and Attributes of DNATyping</div>

2.2.3 DNA Sample Message Content

The following sample message is an example of a DNA data message.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<dna:DNAInformationPackage>
        <itl:PackageDescriptiveTextRecord>
                <ansi-nist:RecordCategoryCode>02</ansi-nist:RecordCategoryCode>
                <ansi-nist:ImageReferenceIdentification>
                        <nc:IdentificationSourceText>Mr. KST X's STR and mtDNA data.</nc:IdentificationSourceText>
                </ansi-nist:ImageReferenceIdentification>
                <iceoi:TWPDESDefinedFields>
                        <intel:SystemIdentifier>
                                <nc:IdentificationID>1234567890</nc:IdentificationID>
                                <intel:SystemName>Screening Agency DNA Database </intel:SystemName>
                        </intel:SystemIdentifier>
                </iceoi:TWPDESDefinedFields>
                <itl:UserDefinedDescriptiveText>
                        <itl:ExampleDomainDefinedDescriptiveText>
                                <nc:DescriptionText>Blood sample.</nc:DescriptionText>
                        </itl:ExampleDomainDefinedDescriptiveText>
                </itl:UserDefinedDescriptiveText>
        </itl:PackageDescriptiveTextRecord>
        <dna:PackageDNARecord>
                <dna:DNASampleCategoryText>Immigrant Visa</dna:DNASampleCategoryText>
                <dna:DNASampleCellTypeText>Blood</dna:DNASampleCellTypeText>
                <dna:SampleSource>
```

```xml
                    <dna:NumberSourceContributor>1</dna:NumberSourceContributor>
            </dna:SampleSource>
            <dna:SampleSourceStatusText>True</dna:SampleSourceStatusText>
            <dna:DNATypingData>
                    <dna:DNATypingTechnologyName>PCR/STR</dna:DNATypingTechnologyName>
                    <dna:DNADataPOC>
                            <nc:EntityOrganization>
                                    <nc:OrganizationIdentification>
                                            <nc:IdentificationID>VENDERLAB1</nc:IdentificationID>
                                    </nc:OrganizationIdentification>
                                    <nc:OrganizationName>DNA Vendor Laboratory 1 who performed the DNA Testing.</nc:OrganizationName>
                            </nc:EntityOrganization>
                    </dna:DNADataPOC>
                    <nc:BiometricTestDate>
                            <nc:Date>2007-01-01</nc:Date>
                    </nc:BiometricTestDate>
                    <dna:TypeInstrumentationText>ABI 3100</dna:TypeInstrumentationText>
                    <dna:DNABatchID>ABIL1234567890</dna:DNABatchID>
                    <dna:DNAKit>Identifiler</dna:DNAKit>
                    <dna:DNATypeTechQuality>
                            <dna:DataConfidenceNumeric>1</dna:DataConfidenceNumeric>
                            <!-- NFIQ numver: Highly confident -->
                            <dna:MatchabilityNumeric>1468000000000000000</dna:MatchabilityNumeric>
                            <dna:QualityDescriptionText>Highest random match probability in the 4 major US population groups (BLK, CAU, SEH, SWH) using NRC 96
probability formula: 1 in 1 quintillion.</dna:QualityDescriptionText>
                    </dna:DNATypeTechQuality>
                    <dna:STRData>
                            <dna:STRLocusName>D3S1358</dna:STRLocusName>
                            <dna:STRAllele>
                                    <dna:Allele>16</dna:Allele>
                            </dna:STRAllele>
                            <dna:STRAllele>
                                    <dna:Allele>17</dna:Allele>
                            </dna:STRAllele>
                            <dna:DNADataPOC>
                                    <nc:EntityOrganization>
                                            <nc:OrganizationIdentification>
                                                    <nc:IdentificationID>VENDERLAB1</nc:IdentificationID>
                                            </nc:OrganizationIdentification>
```

```xml
                        <nc:OrganizationName>DNA Vendor Laboratory 1 who performed the DNA Testing.</nc:OrganizationName>
                    </nc:EntityOrganization>
                </dna:DNADataPOC>
                <nc:BiometricTestDate>
                    <nc:Date>2007-01-01</nc:Date>
                </nc:BiometricTestDate>
            </dna:STRData>
            <dna:STRData>
                <dna:STRLocusName>vWA</dna:STRLocusName>
                <dna:STRAllele>
                    <dna:Allele>16</dna:Allele>
                </dna:STRAllele>
                <dna:STRAllele>
                    <dna:Allele>18</dna:Allele>
                </dna:STRAllele>
                <dna:DNADataPOC>
                    <nc:EntityOrganization>
                        <nc:OrganizationIdentification>
                            <nc:IdentificationID>VENDERLAB1</nc:IdentificationID>
                        </nc:OrganizationIdentification>
                        <nc:OrganizationName>DNA Vendor Laboratory 1 who performed the DNA Testing.</nc:OrganizationName>
                    </nc:EntityOrganization>
                </dna:DNADataPOC>
                <nc:BiometricTestDate>
                    <nc:Date>2007-01-01</nc:Date>
                </nc:BiometricTestDate>
            </dna:STRData>
            <dna:STRData>
                <dna:STRLocusName>FGA</dna:STRLocusName>
                <dna:STRAllele>
                    <dna:Allele>22</dna:Allele>
                </dna:STRAllele>
                <dna:DNADataPOC>
                    <nc:EntityOrganization>
                        <nc:OrganizationIdentification>
                            <nc:IdentificationID>VENDERLAB1</nc:IdentificationID>
                        </nc:OrganizationIdentification>
                        <nc:OrganizationName>DNA Vendor Laboratory 1 who performed the DNA Testing.</nc:OrganizationName>
                    </nc:EntityOrganization>
```

```xml
                                    </dna:DNADataPOC>
                                    <nc:BiometricTestDate>
                                            <nc:Date>2007-01-01</nc:Date>
                                    </nc:BiometricTestDate>
                    </dna:STRData>
                    <dna:STRData>
                            <dna:STRLocusName>D8S1179</dna:STRLocusName>
                            <dna:STRAllele>
                                    <dna:Allele>14</dna:Allele>
                            </dna:STRAllele>
                            <dna:STRAllele>
                                    <dna:Allele>17</dna:Allele>
                            </dna:STRAllele>
                            <dna:DNADataPOC>
                                    <nc:EntityOrganization>
                                            <nc:OrganizationIdentification>
                                                    <nc:IdentificationID>VENDERLAB1</nc:IdentificationID>
                                            </nc:OrganizationIdentification>
                                            <nc:OrganizationName>DNA Vendor Laboratory 1 who performed the DNA Testing.</nc:OrganizationName>
                                    </nc:EntityOrganization>
                            </dna:DNADataPOC>
                            <nc:BiometricTestDate>
                                    <nc:Date>2007-01-01</nc:Date>
                            </nc:BiometricTestDate>
                    </dna:STRData>
                    <dna:mtDNAData>
                            <dna:mtDNAFragStart>16024</dna:mtDNAFragStart>
                            <dna:mtDNAFragEnd>16400</dna:mtDNAFragEnd>
                            <dna:DNADataPOC>
                                    <nc:EntityOrganization>
                                            <nc:OrganizationIdentification>
                                                    <nc:IdentificationID>VENDERLAB2</nc:IdentificationID>
                                            </nc:OrganizationIdentification>
                                            <nc:OrganizationName>DNA Vendor Laboratory 2 who performed the mitochondria testing.</nc:OrganizationName>
                                    </nc:EntityOrganization>
                            </dna:DNADataPOC>
                            <dna:TypeDate>
                                    <nc:Date>2006-12-01</nc:Date>
                            </dna:TypeDate>
```

```
                </dna:mtDNAData>
                <dna:mtDNAData>
                        <dna:mtDNAFragStart>30</dna:mtDNAFragStart>
                        <dna:mtDNAFragEnd>394</dna:mtDNAFragEnd>
                        <dna:mtDNAPolymorphism>
                                <dna:mtDNAPolymorphismLocation>259</dna:mtDNAPolymorphismLocation>
                                <dna:mtDNAPolymorphismType>G</dna:mtDNAPolymorphismType>
                        </dna:mtDNAPolymorphism>
                        <dna:mtDNAPolymorphism>
                                <dna:mtDNAPolymorphismLocation>263</dna:mtDNAPolymorphismLocation>
                                <dna:mtDNAPolymorphismType>G</dna:mtDNAPolymorphismType>
                        </dna:mtDNAPolymorphism>
                        <dna:mtDNAPolymorphism>
                                <dna:mtDNAPolymorphismLocation>315.1</dna:mtDNAPolymorphismLocation>
                                <dna:mtDNAPolymorphismType>C</dna:mtDNAPolymorphismType>
                        </dna:mtDNAPolymorphism>
                        <dna:DNADataPOC>
                                <nc:EntityOrganization>
                                        <nc:OrganizationIdentification>
                                                <nc:IdentificationID>VENDERLAB2</nc:IdentificationID>
                                        </nc:OrganizationIdentification>
                                        <nc:OrganizationName>DNA Vendor Laboratory 2 who performed the mitochondria testing.</nc:OrganizationName>
                                </nc:EntityOrganization>
                        </dna:DNADataPOC>
                        <dna:TypeDate>
                                <nc:Date>2006-12-01</nc:Date>
                        </dna:TypeDate>
                </dna:mtDNAData>
        </dna:DNATypingData>
    </dna:PackageDNARecord>
</dna:DNAInformationPackage>
```

3 Minor Changes to the TWPDES Core Schema

This section details changes made to the existing schemas. The changes made were the result of either bugs reported on the schema or issues found during implementation of data exchanges using the standard.

3.1 Non-Expiring Identification Documents

Issue: the document expiration date only allowed real dates but some documents do not expire.

Resolution: added NonExpiring Boolean child element to complex type Identification_Person.

3.2 Biometric Link to Document

Issue: a biometric could not reference a document that it came from. For instance, if you have a facial image from a passport, you could not specify in the image that it came from the passport in the file (i.e. by idref or other convention).

Resolution: added DocumentReferenceID child element to complex type TWPDESDefinedFieldsType

3.3 Transportation Type

Issue: a vehicle type could not be specified. In the migration from TWPDES 1.0 to 1.2, the vehicle model was replaced and the type was changed from an element to a type. Some vehicle types were not implemented and no substitution group was provided.

Resolution: added Type child element to complex type Transport_TWPDES

3.4 Multiple Vehicle Colors

Issue: only a single vehicle color was allowed. In the migration from TWPDES 1.0 to 1.2, the vehicle model was replaced and the vehicle color multiplicity was changed from multiple to one.

Resolution: added attribute maxOccurs with value "unbounded" to child element Color in complex type Transport_TWPDES

3.5 Refresh Action

Issue: multiple customers requested an additional action of Refresh to allow for the exchange to replace the current entities in their system. The NoChange was not adequate since it did not inform the downstream system that something may have changed. This action helps with reconciliation.

Resolution: Added enumeration value Refresh in action.xsd

3.6 Updates to Location Type

Issue: Location_TWPDES could not be referenced as a concrete implementation. Child elements were previously specified as a choice and users could only select one element out of the group. Users may now select one or more elements.

Resolution: modified complex type Location_TWPDES to not be abstract and changed the set of child elements to be a sequence.

3.7 Added SubjectTypeCode

Both Watchlist and Encounter use SubjectTypeCode to categorize subjects. Therefore, this element is implemented in TWPDES core.

3.8 Added TWPDESSystemIdentifier

Watchlist, Encounter and Biometrics schemas use TWPDESSystemIdentifier to cross reference system identifiers. Therefore, this complex type is implemented in TWPDES core. TWPDESSystemIdentifier is an extension of the NIEM Intelligence domain object SystemIdentifiers. TWPDESSystemIdentifier has an optional element "IdentifierName" for the identifier to specify the identifier's name.

3.9 Data Element and Attributes for the Changed Elements

	Element/Attribute	Description
1	NonExpiring	Indicates if the designator expires or not.
2	DocumentReferenceID	The identity of the document the biometric data came from.
3	Type	A type of vehicle such as automobile, boat, bus, or motorcycle.
4	SubjectTypeCode	A categorization of the subject (identity) of the message. For example, the person has an open domestic or international case against them.
5	TWPDESSystemIdentifier/nc:IdentificationID	An identifier that optionally contains the identifier's name.
6	TWPDESSystemIdentifier/IdentifierName	Name of the identifier.
7	TWPDESSystemIdentifier/intel:SystemName	The name of the source of a system identifier.

4 Glossary

Acronym	Definition
ABIS	Automated Biometric Identification System
ABI	Applied Biosystems
AFIS	Automated Fingerprint Identification System
ANSI	American National Standards Institute
CAPCO	Controlled Access Program Coordination Office
CBEFF	Common Biometric Exchange Formats Framework
CJIS	Criminal Justice Information Services
CODIS	Combined DNA Index System
DHS	Department of Homeland Security
DNA	Deoxyribonucleic Acid
DoD	Department of Defense
EBTS	Electronic Biometric Transmission Specification
EDMO	Enterprise Data Management Office
FBI	Federal Bureau of Investigation
IED	Improvised Explosive Device
IAFIS	Integrated Automated Fingerprint Identification System
IC	Intelligence Community
ICD	Interface Control Document
IEC	International Electrotechnical Commission
ICMWG	Intelligence Community Metadata Working Group

Acronym	Definition
IEPD	Information Exchange Package Documentation
ISM	Information Security Marking
ISO	International Standard Organization
ITL	Information Technology Laboratory
KST	Known or Suspected Terrorist
MDR	Metadata Registry
Metadata	Descriptive data. That is, data that is used for describing other data.[1]
mtDNA	Mitochondria DNA
NCBI	National Center for Biotechnology Information
NGCODIS	Next Generation CODIS
NIEM	National Information Exchange Model
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
PMO	Program Management Office
SNP	Single Nucleotide Polymorphism
SOP	Standard Operation Procedure
STR	Short Tandem Repeat
TWPDES	Terrorist Watchlist Person Data Exchange Standard
US	United States
WL	Watchlist

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[1] ISO/IEC 11179-1 Information technology – metadata registries (MDR) Part 1: Framework, second edition, 9/15/2004.

Acronym	Definition
XML	eXtensible Markup Language
Y-STR	Short Tandem Repeat on the Y chromosome

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5 Participants

Staff from the following organizations has contributed to the construction of the DNA XML schema. Inclusion in this list does not necessarily imply concurrence with the proposed standards by these organizations or the staff members who made the contribution.

Applied Biosystems

DHS EDMO

FBI CJIS

FBI NGCODIS PMO

FBI NGCODIS

NIH NLM NCBI

NIST Biochemical Science Division

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