



# *Interoperability and Conformance Testing*

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***Biometrics Consortium Conference 2005***

*Tuesday, September 20, 2005*

# Outline of Presentation

- Why use Biometric Standards?
- Conformance and Interoperability – What do they really mean?
- ILO SID and ISO 19794-2
- INCITS 378-2004

# Why use Biometric Standards?

- Standards help improve quality, safety, reliability, efficiency and interchangeability
- Standards help reduce cost
- Standards prevent vendor lock-in
- Standards help systems work together
- Standards simplify system design
- Standards simplify support of multiple technologies
- ***Standards allow interoperability***

# Why use Biometric Standards?

- Biometric samples from many locations submitted for central processing
  - FBI IAFIS
  - US VISIT
  - US State Department Visa programs
- Biometric ID created in one nation must be verified in other nations (ISO standards)
  - ICAO E-passport
  - ILO SID
- System has distributed ownership
  - TWIC

# Conformance and Interoperability

- The applications just mentioned require conformance and interoperability to work
  - Conformity Assessment (a.k.a. Conformance Testing) – “activity that provides demonstration that specified requirements relating to a product, process, system, person or body are fulfilled” (SC 37 Standing Document 7)
  - Interoperability – “the ability of different information technology systems and software applications to communicate, to exchange data accurately, effectively, and consistently, and to use the information that has been exchanged”

# Conformance and Interoperability

- Fingerprint Products A and B both claim conformance to INCITS 378-2004
  - A and B should each create INCITS 378-2004 template during enrollment
  - A and B should each be able to read a INCITS 378-2004 template during verification
- If INCITS 378-2004 is perfect and both products conform perfectly then
  - Enroll on A, Verify on B should work
  - Enroll on B, Verify on A should work
- In reality, conformance enhances the chance of interoperability but definitely doesn't guarantee it

# Conformance and Interoperability

- Now assume Products A and B also conform to INCITS 358-2002 (BioAPI)
- Also assume each product on separate PC as part of different application
- If both A and B conform perfectly to BioAPI, then we now also get
  - Interchangability of products from one computer and application to the other
- But, how do we know A and B are conformant to 378 or 358
- Conformance Testing Methodology Standards Required (1749-D, 1703-D)

# Conformance and Interoperability Case Study – ILO SID

- International Labour Organization
- Specialised agency of the United Nations with 176 Member States
- Tripartite Structure (Governments, Employers and Workers with equal rights)
- ILO developed a new Seafarers' Identity Document (SID) Convention to define a professional ID for seafarers, who are internationally mobile workers
- SID uses 2 fingerprint templates in a 2D barcode

# ILO SID Case Study

- Biometric data could be used for identification in issuing country (prevent duplicate identities, do background checks, etc.)
- In receiving countries, biometric data only used to verify that seafarer was person to whom SID was originally issued
- Each national system used for identification could be isolated, but the biometric data on the card had to be interoperable among all countries issuing SIDs and receiving seafarers
- ILO turned to ISO for help with standards

# ILO SID Case Study

- ILO produced technical document SID-0002 that referenced latest versions of multiple SC 37 biometrics standards, including 19794-2, which defines fingerprint minutiae template
- Many biometrics vendors wanted to be part of ILO SID market and claimed they could support ILO requirements
- ILO recognized the need for third party testing for conformance, performance and interoperability
- Thus far, one online scenario test and one offline technology test (using images gathered in scenario test) have taken place

# ILO SID Case Study

## ● Conformance Testing

- Of 10 products tested, only 1 was initially conformant to the standards specified in SID-0002
- Later, 7 products were brought into basic conformance by interactions between test lab and the vendors

## ● Performance Testing

- Data gathered on a ship with real seafarers enrolled once and then verified three times over a six week period.
- Match scores and match results returned immediately for scenario test and images stored for later use in technology (off-line) testing
- Standard false accept rate (FAR) and false reject rate (FRR) data was computed

# ILO SID Case Study

## ● Interoperability Testing

- Each seafarer enrolled 2 fingers on all 7 products
- Each seafarer verified 70 times in each of the 3 visits, so that on each product they could attempt to verify against:
  - their own templates for that product (2)
  - another seafarers' templates for that product (2)
  - their own templates from three randomly selected other products (6)
- After scenario test only 2 products were interoperable at the ILO required performance threshold of 1% FAR and FRR
- After much work reviewing the standard and the various templates, further guidance was issued to the vendors, and after the technology test a third product was declared interoperable

# Results From ILO SID Case Study

## Results from First ILO Performance and Interoperability Test

<http://www.ilo.org/public/english/dialogue/sector/papers/maritime/sid-test-report1.pdf>

**Table 5. Interoperability Score-Based FRR for Key Visit at 1% FAR\***

		Product (Sensor and BSP)							Aggregate Mean	
Template		A	C	D	E	F	G	Mean		
	A	0.0%	3.6%	19.8%	52.0%	1.6%	40.6%	19.6%	A	11.1%
	C	0.0%	1.7%	40.2%	5.5%	59.4%	3.0%	18.3%	C	17.7%
	D	9.4%	40.4%	21.1%	49.7%	22.2%	37.0%	30.0%	D	38.8%
	E	1.9%	6.3%	72.7%	4.9%	1.8%	3.6%	15.2%	E	20.9%
	F	0.0%	4.9%	65.0%	41.9%	0.0%	27.3%	23.2%	F	20.1%
	G	4.3%	46.6%	66.6%	6.3%	17.0%	1.6%	23.7%	G	21.3%
	Mean	2.6%	17.2%	47.6%	26.7%	17.0%	18.9%	21.7%		

\*Product B removed since unable to produce FAR of 1%

# Results From ILO SID Case Study

## Results from Second ILO Performance and Interoperability Test

<http://www.ilo.org/public/english/dialogue/sector/papers/maritime/sid-test-report2.pdf>

Table 7. Enhanced Test: Dual-Finger FRR+FTA at 1% FAR for Key Visit

	A	B	C	E	F	G	
A	0.0%	4.3%	0.9%	3.5%	0.0%	2.6%	Enrol Product
B	2.7%	2.7%	2.7%	3.5%	1.8%	2.7%	
C	0.0%	2.6%	1.2%	3.5%	0.9%	1.8%	
E	1.0%	1.9%	1.0%	2.9%	1.0%	1.0%	
F	0.9%	5.2%	1.6%	3.3%	0.0%	3.5%	
G	0.9%	2.7%	2.7%	2.7%	0.9%	2.7%	
Verify Product							

# ILO SID – Lessons Learned

- ILO required standards. This was a good start
- If ILO had not required conformance testing there could have been 10 products, none of which would have been interoperable
- If ILO had not required interoperability testing, there could have been 7 products, only 2 of which were interoperable
- Now there are 3 interoperable products and all SID systems must use one of them
- Conformance and Interoperability testing are not synonymous and both are important

# Conformance and Interoperability Case Study – INCITS 378-2004

- US fingerprint minutiae standard
- Published last year. Already lots of interest.
  - NIST MINEX 04
  - DHS TSA TWIC
  - Multiple vendors announced support for 378
- So far, no real world experience of conformance or interoperability
- That changes at Biometrics Consortium Conference 2005 !!

# INCITS 378-2004 Case Study

- Four fingerprint vendors involved in standards, all claim conformance to 378
- Bion Biometrics used its multi-standard conformance testing toolkit to evaluate conformance for each vendor
- After a little work, all 4 are conformant

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BCC 2005 **ANSI INCITS 378-2004**  
Interoperability Demonstration

# INCITS 378-2004 Case Study

- Visit any participating vendor's booth in exhibition
- Get fingerprint enrolled using 378 template generated by that vendor
- Template encrypted on to smart card
- Take template to any other vendor
- They will attempt to read it and verify your finger with their matching algorithm
- Different sensors, different algorithms, different vendors, standardized template
- Will there be interoperability?

# Biometric Standards - Resources

## ● SC 37 Web Site (Most docs protected)

- <http://isotc.iso.org/livelink/livelink?func=ll&objId=2262372&objAction=browse&sort=name>
- Need to allow pop-ups

## ● US M1 Web Site (Many docs are open)

- [http://www.incits.org/tc\\_home/m1.htm](http://www.incits.org/tc_home/m1.htm)

## ● National Biometric Security Project

- [https://db.nationalbiometric.net/fmi/iwp/res/iwp\\_home.html](https://db.nationalbiometric.net/fmi/iwp/res/iwp_home.html)
- Need to allow pop-ups