



BioTesting Europe

Towards European Testing and Certification of Biometric Components and Systems

The Way Forward
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**Preparatory Action on the
enhancement of the European industrial
potential in the field of Security research**



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1 INTRODUCTION

The BioTesting Europe project, funded by the European Commission under PASR2006, aims to set out the prerequisites for the establishment of testing and certification capabilities on biometric components and systems in Europe. This is driven by the fact that large scale national and international biometrics based identity systems (passports, visa, eID cards) are being developed and procured, mainly by governments and the European Commission (EU VIS / BMS). Also the increasing use of biometrics in access control and surveillance applications drives the increasing need for developing more trust and predicatbility of biometrics based applications.

1.1 Background

According to the EC policies at has been stated in the The Hague program:

“A coherent approach and harmonised solutions on biometric identifiers and data are necessary in the fight against illegal migration and security.”

It is a fact that biometric verification and identification methods are spreading in more and more application fields, including pan European border control systems and applications (e.g. ePassports, VIS/BMS, National eID-Cards). In applications where biometric data may be processed by components of different vendors, the inter-operability of the components and systems is of critical importance. While this requires standards and those standards are developed by the relevant bodies inside ICAO and ISO/IEC there are no criteria to qualify to which extent a system under test, that claims interoperability and conformity to said standards, actually complies to those standards

Given the need for a more coordinated European approach and given the fact that 25 EU member states are now implementing the new electronic passports including biometric identifiers, enormous risks are being created in terms of efficiency, security and convenience of the overall systems. Still there are no adequate testing criteria, nor compliancy tests to verify conformity of the biometric components and systems to certain standards, nor European testing centres to perform these tests and publishing the results such as a white list of components that is compliant to a certain standard. This means that currently no vendor or systems integrator can guarantee interoperability or compliance to existing standards, resulting in ad hoc solutions on national levels, often with proprietary products and systems.

1.2 Need for a European approach

Work is already under way in the international community to define standards for the implementation and testing of biometric devices and systems. Much of this has been pushed under the influence of strong political forces, such as the Homeland Security border control requirements for the US VISIT programme. There is a danger within Europe that European requirements will be neglected and that the US-centric focus will extend into the implementation and test regimes, leaving European governments and companies with little choice than to utilise the US formulated standards and probably US compliance testing in US test laboratories. This paves the way for US biometric products vendors and systems integrators to gain a strong position on the European market, thus leaving a less favourable competitive position for the

European biometrics and related industries.

The European Commission is rightly concerned about its ability to be able to adequately characterise the necessary requirements for the future pan-European biometric programmes and to provide a Europe-based capability to perform its own compliance and other testing. BioTesting Europe© aims to address these concerns by unifying the European interests and providing a direction that shall lead to the development of proper European testing capabilities in the area of biometrics.

1.3 A multi stakeholder approach

In order to establish European interoperability within the large scale cross national identity management systems, more specific requirements for designing testing and evaluation schemes are needed. An integrated approach is the absolute success factor in achieving these goals. That means simultaneous actions are needed that facilitate alignment between all levels of stakeholders that are involved: end users, testing laboratories, accreditation organisations and industry. In parallel input will be provided in order to establish ongoing European research activities.

1.4 Defining the needs, filling the gaps

Although much work has been done in the area of independent testing of biometric systems, there are still many open issues to be resolved due to a fragmentation of efforts and a lack of input by end users. The results of many tests in the last few years have shown that test results are still not comparable and that interoperability of biometric technology is not yet achieved. To improve this situation, this project aims at setting up a framework for a European network of testing laboratories for performance and interoperability testing and security evaluation of biometric systems. In order to join forces a business case for such a network is needed, that involves all stakeholders. Because the lack of clear end user requirements it is too early to start directly with in depth technical discussions and setting up the certification schemes.

Therefore the project has focused on:

- Outlining the need for testing and certification on the end user level and defining the 'business case'
- Making an up-to-date inventory of:
 - o What needs to be tested based on end user requirements
 - o Most relevant existing testing schemes
 - o Existing competencies at European independent testing laboratories in the area of biometric performance, interoperability, and security testing
 - o Existing work on standardisation and testing (within and outside EU)
- Based on the outcome of the inventory:
 - o Mapping of the user requirements on the existing competencies
 - o Performing a gap analysis to determine what existing competencies can be used and what needs to be developed
- The final outcome of the project is:
 - o A definition of the basic requirements for a European network for testing and certification of biometric components and systems
 - o A European Biometric Testing and Certification Roadmap, including

research targets

- Work plan and coordinated actions for the further development of the European biometrics testing and certification network.

2 Conclusions

Starting point of BioTesting Europe is that Europe needs testing and evaluation capabilities in order to achieve harmonized biometric solutions which are interoperable, efficient and reliable in their use. Because the main application areas in the biometrics market place are passports, visa, electronic ID Cards and registered travel programmes, BioTesting Europe chose European member states' governments, government agencies and the European Commission as the primary client targets.

2.1 Inventory

The need for unified test and certification processes is becoming more urgent as the use of biometric verification and identification systems is spreading among all EU countries, while border control being one of the most important areas of application. As electronic travel documents with biometrics become mandatory for EU countries, a pan European approach on testing and certifying biometric components and systems has become paramount. This means a challenge is posed for all stakeholders involved and probably an extra challenge for those countries and organizations having no or limited expertise in the field of biometrics.

One of the biggest problems is the choice of a reliable biometric system, which is predictable in its performance and costs of ownership. Interoperability is a big concern for all, as well as performance and security, and the impact of biometric procedures at the front end processes such as embassies, consulates and border control check points.

It is of particular importance to make sure that external expertise bought in by those countries is accurate and independent. However, such expertise is not widely available. Currently no vendor or systems integrator can guarantee interoperability or compliance to existing standards based on independent third party opinions (such as test laboratories), often resulting in ad hoc solutions on national levels, risking lock-ins with proprietary products and systems.

It is important to certify that common requirements are met, and that the results of these examinations are comparable to evaluation made by others. Therefore it is necessary to define standardized requirements for biometric products, as well as unified, standardized testing and evaluation procedures.

To avoid needless and expensive repetitions of separate and unrelated evaluations, trusted accredited organizations should perform uniform tests, thereby following standardized processes.

By choosing to buy certified biometric systems, the buyers would be sure that the product fulfils all the needed requirements, that way reducing the need to test on their

own. Vendors only than can take responsibility on compliance to certain specifications if their products can be tested on basis of uniform and commonly agreed test schemes and methods.

The overall conclusions of the inventory are:

- Independent testing and certification will improve the overall trust in biometric systems
- According to stakeholders most relevant and urgent areas to be tested and certified are:
 - o interoperability (especially image interoperability, but also on the level of processes and procedures)
 - o performance (mainly failure to enrol / false acceptance / rejection)
 - o security (spoofing, data protection)
 - o ergonomics and human aspects (enrolment and verification process, kiosks, etc)
- Lack of knowledge and experience leads to unclear requirements and costs situations, resulting into:
 - o vendor driven pricing
 - o high prices because vendors include risks and costs for benchmarking and pre-tests
- Independent testing will significantly lower the short term and long term costs of biometric procurements, because there will be:
 - o less vendor dependency, clearer pricing and costs structure, more competitive pricing
 - o significantly lower integration costs

2.2 Main needs and gaps

Based on a comprehensive inventory of the existing testing capabilities and the end user requirements, a gap analysis has been performed in order to identify the gaps in those capabilities, while mapping the existing capabilities against the end user requirements. The main needs and gaps that are not yet being addressed properly are:

- Knowledge Transfer and Co-ordination
 - o Test results repository
 - o Co-ordinating standardisation and development of standards
 - o Design-for-Test and Test Development consultancy
 - o Auditing
 - o Application profiles development and assessment
- Methods & Tools
 - o Test Strategies
 - o Tools for algorithm evaluation
 - o Testability tool set and design methods
 - o Standard test APIs
 - o Conformance testing tools

- Tools for visualisation of results and data mining
- Test Data
 - Development of (synthetic) test databases
 - Development of reference data for testing conformance/interoperability/quality

2.3 Structure

The products and services that are needed to address the current demands have to be structured along the phases of the procurement and development of biometric systems:

- specification (functional requirements, performance needs)
- testing during procurement (benchmarking, selection)
- acceptance testing
- performance monitoring during deployment

2.4 Short term

The following actions are having priority to address urgent needs and to start European testing activities:

- establishing a coordinated dialogue with customers in order to channel the BioTesting services to the clients
- coordination of activities regarding (low level) test issues
- mobilizing the skills to deliver the first test products and services. For the short term these will mainly be consultancy, certain straight forward testing to performance/conformance issues, repository of test data/results, specification support and training/education

2.5 Mid term

In the mid term BioTesting Europe will seek to address the following issues and challenges:

- development of a certification/accreditation program
- communication activities
- study on impact analysis of wide spread use of biometrics
- acquisition of large scale test database
- improving interoperability of fingerprint templates from different vendors (see also www.mtitproject.com)
- development of vendor independent quality test tools for fingerprint and face images
- expanding the partnership network
- promote and develop pan European cooperation

3 INVENTORY AND GAP ANALYSIS

3.1 Inventory

An inventory has been made of standards and existing structures and capabilities for testing of biometric components and systems. The outcome is:

- A lot of testing is needed due to the large scale projects there are being implemented (e.g. biometric passports, European visa). This included test execution, test development and design for test of components and systems.
- The majority of testing is conducted by the suppliers and by the customers (the organisations deploying biometrics). This by far exceeds the amount of testing being conducted by independent test organisations. However, it is acknowledged that supplier testing may oppose interoperability assessment in which multiple vendors are involved and that customer testing is rather ad-hoc.
- Most relevant standards have been developed or are currently under development. However, in several cases those are not ready for use or not fully supported/implemented by suppliers yet. Also the current developed standards only cover a part of the chain
- There are only a few test organizations in Europe that have (parts of) the appropriate knowledge and experience.
- The white-lists of tested biometric products that are maintained by some organisations are not generally accepted by the stakeholders. The reason for this is that the results of a biometric product test is directly related to the application of that product and has no general validity.
- The inventory also shows the existing accreditation, testing and certification in Europe and internationally. To be accepted by most governments, a network for testing and certification of biometric products should fit into this structure in order to capitalize upon existing knowledge experience and practices.
- The most mentioned requirements for biometrics systems are operating speed, accuracy and interoperability.
- The most relevant, as well as urgent subjects to addresses are the further development and implementation of standards that support interoperability and performance, such as image quality, biometric matching performance (FMR/FNMR), security (spoofing) and ergonomics. Also training and education of operating personnel and program managers has been highlighted.

3.2 Requirements Analysis

For the priority applications in border control being considered in this project, the testing of biometrics is being carried out by suppliers of biometric products, by the organisations deploying the biometric systems and by test organisations.

It is clear from our consultations that by far the majority of testing is being undertaken by operators and their suppliers. Only in a minority of cases independent test organisations are significantly involved. Cooperation between member states on an EU level is only seen in specific cases, e.g. at the BIG. Furthermore, it is thought

unlikely that an increased amount of third party testing would reduce the amount of testing conducted by either suppliers or customers; however, such additional testing will improve the level of assurance of deployed systems and reduce overall costs of individual testing if tests are commonly agreed and distributed to all EU member states.

On the basis of the Inventory, the user requirements are depicted as follows:

- Technology and Product assessments
In order to make a selection of suitable biometric modality, vendors and their products, operators need independent, repeatable and accessible test results. These results should focus on operating speed, accuracy and interoperability.
- Component testing
Deals with sub-systems built with biometric products such as kiosks or credential checking in the back-office. Focuses on biometric performance, security, ergonomics and interoperability.
- System testing
These are the end-to-end systems that implement the buyers' business processes. Directly interferes with confidentiality and sometimes even national security policies.
- Standardisation
This subject covers products, methods and tools. Is primarily driven by interoperability improvement and cost reduction.
- Certification
Involves (vendors of) products and services, methods and tools. Aims at increasing confidence and quality.
- Training and Education
Involves vendors (experience), test labs (independent technical knowledge) and independent consultants (implementation, project design etc.) and is targeted to the operators

It may be concluded that the main gaps in European testing capabilities are:

- Open questions in performance
- Fragmented approach to testing
- Area's not sufficiently tested (usability, accessibility, conformance, interoperability, quality, security)
- Lack of suitable test data
- Lack of certification schemes
- No unified approach to understanding test results
- Insufficient testing capabilities.
- Lack of commonly shared knowledge and experiences

3.3 Training and Education

Training and education has been mentioned several times by the stakeholders in the interviews and questionnaires, especially in the answers of the operators (i.e. the end users). Because the functional requirements for biometric enabled ID-systems are the starting point for further specification and (later on) testing, it is of utmost importance that (future) operators are well aware of the various aspects of biometrics and its impact on processes, procedures and system specifications.

There is a need to ensure lessons learned are shared with other programmes.

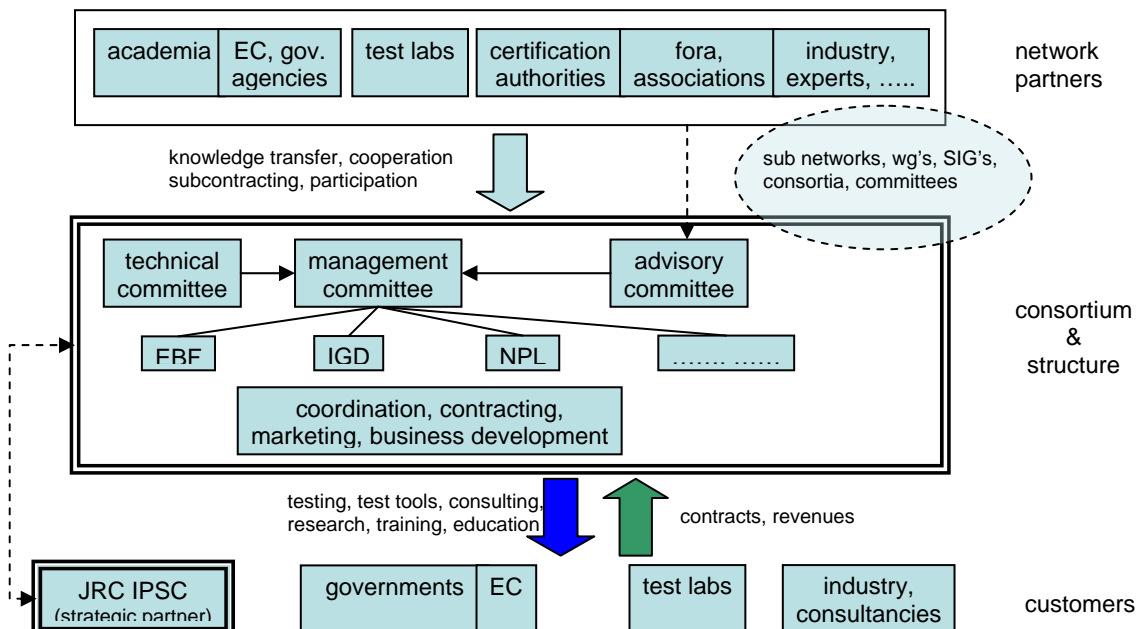
Training requirements mentioned by operators are (see also D3.2):

- Training would give a better understanding to the first line officers and a better acceptance of this tool. Training is needed, but not accomplished.
- Training support concept
- Communication of reason and goals of the biometric system
- Explaining the general way of function
- Handling
- Work flow in normal process
- Work flow in special situations like false acceptance or false rejection
- Training how to cooperate with the public
- Training for border guards must be provided (Frontex).
- More practical experience with the use of visa biometrics control at the border crossing has to be gained

3.4 Organization

It has always been the of BioTesting Europe not only to deliver the results of a study through a report, but to establish a sustainable infrastructure in Europe to provide independent testing, consultation and training services to the community. Currently the BioTesting Consortium has developed an organizational structure which accomodates the development and delivery of the appropriate products and services.

The organizational structure is as follows:



BioTesting Europe organizational chart

4 Afterword

The results of the BioTesting Europe project are based on the consultation of a large group of stakeholders within Europe through structured interviews and questionnaires to end users, vendors, testing laboratories, independent experts, government agencies, border control agencies and many others. A workshop has been organized for interactive information exchange between stakeholders and experts from more than 15 EU member states (incl. USA).

On a regular basis the experts from BioTesting Europe participate to a variety of workshops, meetings and conferences, such as the Biometrics Consortium, the Biometrics Working Group, the Brussels Interoperability Group, the US based NSTC and NIST, ICAO SC37, CEN Biometric Focus Group, Biometrics2006/2007, the EBF European Biometrics Research Seminar and many others. This ensures a truly internationally informed approach and embedding into other relevant activities.

With BioTesting Europe some of Europe's most distinguished and dedicated experts in the field of biometrics have shown the way forward towards pan European testing and certification of biometric components and systems.

For more information or for inquiries on actual testing projects please contact:

Max Snijder, Coordinator
t. +31 624 603809
max.snijder@eubiometricsforum.com