

Special Message

The IAI and the Development of Standards
for Electronic Fingerprint Images (United
States)

Curtis Shane

President

In Volume 43, Number 3, pp 223-225 of the *Journal of Forensic Identification*, an editorial was published written by William J. Watling and Tankard G. Evans. The editorial was prefaced with the introduction that; "The views expressed. . . .do not reflect the opinion or position of the Internal Revenue Service". What it should have said was that the views expressed do not reflect the opinion, position or achievements being accomplished by the IAI.

The IAI has been in the forefront of developing the standards for electronic fingerprint images. The editorial contained falsehoods and erroneous statements which require a response to ensure that members do not feel that it was the position of the IAI.

The National Institute of Science and Technology (NIST) is not coordinating the development of standards for Live-Scan, as implied in the article title [1]. The standards for Live-Scan were developed by the FBI. The live-scan requirements were released in an FBI document dated November 10, 1988. The document, entitled "Minimum Image Quality Requirements for Live-Scan Electronically Produced Fingerprint Cards (MIQR)", was prepared by the Identification Division of the FBI. It was revised on August 30, 1991, and distributed to all interested parties.

1. Editorial response by Mr. Michael McCabe, *Journal of Forensic Identification*, 43(3), 1993, pp 223-225.

The MIQR describes the live-scan equipment testing that will be conducted and the criteria that live-scan cards must meet before a vendor's electronically produced (live-scan) fingerprint cards will be approved by FBI for retention in their files. On February 26, 1991, the FBI approved the first live-scan equipment for producing fingerprint cards that would be retained in the FBI files. In a separate but related effort the NIST is coordinating the development of a standard for the interchange of fingerprint information. The standard is being developed for the exchange of electronic fingerprint images and other information between agencies.

The IAI participated in the development of the MIQR. At the 73rd Annual Educational Conference of the IAI held July 3-8, 1988, in Sacramento, California, the AFIS Sub-Committee reviewed the status of live-scan technology and issued a position statement on live-scan electronically produced fingerprint images. The position statement was published in the *Journal*, Volume 38, Number 6, 1988, p 310. Two key points made in the position statement were,

“The sub-committee does not, at this time, recommend the use of live-scan electronically produced ten print cards as a replacement for inked fingerprint cards.”

“To assist and encourage the continued research and development of this technology, the FBI is developing image quality standards for their identification division. These are intended to eventually permit live-scan electronically produced fingerprint images to be acceptable as replacements for inked fingerprint cards for all identification purposes. This standard is intended to provide the various vendors with detailed technical requirements to aid and assist them in producing systems that will yield acceptable images. The AFIS Sub-Committee endorses and supports this objective.”

The FBI published the requirements contained in the MIQR in the *Journal*, 39(3), 1989, pp 193-203. The MIQR was published for all IAI members and subscribers to review and direct any questions or comments to the FBI. Subsequently, the FBI published the revised MIQR in the *Journal*, 41(3), 1991, pp 204-209.

The IAI took exception to the revised MIQR. In a letter to Mr. William S. Sessions, Director of the FBI, dated December 23, 1991, the

IAI expressed concerns that the MIQR will not satisfy all the needs of the latent print community and may, in fact, be a ten print standard. Mr. Lawrence York, Assistant Director, FBI, responded with a letter dated May 7, 1992, which was published in the *Journal*, 42(4), 1992, pp 351-354. In his letter, Mr. York acknowledged that,

“To date, the specific live-scan equipment configurations accepted by the FBI produce fingerprint cards which are satisfactory for most identification processing needs. However, it should be noted that live-scan images printed on fingerprint cards do not consistently provide all of the ridge information, such as texture, continuity, edges and pores, needed to conduct some latent fingerprint comparisons. Improvements to the image quality are required for live-scan fingerprint images to provide the ridge information necessary to support all latent fingerprint comparisons...”

The FBI placed this statement in the revised MIQR. In addition, the FBI places a statement in each acceptance of live-scan equipment notification to all agencies that,

“It should be noted that, although latent print comparisons can be conducted using live-scan, grey-scale fingerprints, the live-scan fingerprints do not provide all of the ridge information, such as texture, continuity, edges and pores, needed to conduct some latent fingerprint comparisons.”

Shortly before the commencement of the 76th IAI Annual Educational Conference held in St. Louis, Missouri, July 7-12, 1991, the AFIS Sub-Committee reviewed the test documents of the one live-scan vendor's grey-scale equipment that successfully passed FBI and Underwriters Laboratory (UL) testing and was approved by the FBI. The review concluded with the committee agreeing that the live-scan fingerprint card images were of good quality and could be used in the majority of latent print comparisons. The committee also noted that the live-scan fingerprint card images do not contain sufficient information to perform conclusive comparisons in an estimated three to five percent of the latent prints compared. Those latent prints that could not be conclusively compared with the fingerprint images on the live-scan fingerprint card would require the investigator to obtain a set of inked fingerprints for comparison purposes. The committee decided that live-scan technology had progressed considerably since 1988 when the first

position statement on live-scan was issued. The committee felt the 1988 position of not accepting live-scan fingerprint cards as a replacement for the inked fingerprint cards should be reviewed. A proposed revised position paper was developed and presented to the membership, as described below.

During the conference, four sessions were devoted to live-scan and electronic fingerprint images. Topics discussed were Electronic Ten-Print Image Quality for Comparison and Identification; (FBI) Status Report; Live-Scan Testing by the FBI; Latent Print Fingerprint Comparisons Using Live-Scan Fingerprints (FBI); Status Report on Live-Scan Electronic Fingerprint Recording (AFIS Sub-Committee); and Live-Scan Electronic Fingerprint Recording - Panel Discussion (AFIS Sub-Committee and FBI). At the end of the panel discussion, the proposed new IAI position was presented to the delegates in attendance. The contents of the position statement were discussed and a vote of the delegates was taken to approve or disapprove the revised position. The vote of the informed delegates concluded with 100 votes to accept the position statement and 1 vote to reject the position statement. The position statement was adopted and published in the *Journal*, 41(5), 1991, pp 368-371. The position statement approves the FBI standards for live-scan equipment and recognizes that live-scan fingerprint cards produced by FBI-approved live-scan equipment can successfully be used for the majority of forensic fingerprint identification functions.

The position statement also contained the IAI position on electronic images:

“The IAI accepts the concept of transmitting electronic fingerprint images captured at a minimum 500 pixels per inch and 256 levels of grey for processing and retention in electronic fingerprint database files.”

The position further states that:

“The IAI recognizes that data transmissions and storage costs can be minimized by the use of data compression and decompression algorithms, but urges caution to insure that the quality of the resulting images does not adversely affect their use for forensic fingerprint identification functions.”

These two items and others contained in the position statement set the groundwork for the IAI participation in the NIST workshops for the development of an American National Standard on the Data Format for the Interchange of Fingerprint Information.

Mr. Watling and Mr. Evans state in their editorial that, "The subject has received some, albeit minimal, coverage in the *Journal*, and has been somewhat discussed at the IAI conferences and meetings." This is untrue. In addition to the conferences, meetings, and articles published in the *Journal*, the topic was also presented at the following conferences and in these additional articles appearing in the *Journal*:

Educational Conferences

75th IAI Annual Educational Conference - Nashville, TN, July 29- August 3, 1990: 2-hour AFIS seminar entitled "Live-Scan Electronic Fingerprinting - A Status Report."

77th IAI Annual Educational Conference - Atlantic City, NJ, June 28- July 3, 1992: 2-hour seminar presented by the FBI - "Live-Scan Electronically Produced Fingerprints - A Status Report," "Compression/Decompression of Electronically Transmitted Fingerprint Images," and "Fingerprint Image Quality In An Electronic Paperless Environment."

***Journal of Forensic Identification* articles and announcements:**

"Electronic Exchange of Fingerprint Images" 43(3), 1993, pp 281-284.

"Electronic Exchange of Fingerprint Images" 43(1), 1993, pp 81-85.

"updated NIST Draft Document" 42(5), 1992, p 438.

"Draft - Revised Working Document, December 30, 199 1" 42(2), 1992, pp 147-177.

"NIST Revised Draft Working Document" 42(2), 1992, pp 145-146.

"NIST Workshop on the Electronic Exchange of Fingerprint Images 42(1), 1992, p 52.

"Live Scan Equipment Acceptance by the FBI" 41(5), 1991, p 372.

“Resolution: Line-pairs and What They Mean” 41(5), 1991, pp 333-343.

“Fingerprint Image Exchange Standard” 42(2), 1991, pp 129-130.

“Report on the NIST Fingerprint Workshop” 41(1), 1991, pp 11-15.

“A Preliminary Minutiae Accuracy Analysis of Electronic Fingerprint Recording” 38(6), 1988, pp 285-291.

Mr. Watling's and Mr. Evans' editorial further states, “You might assume that the law enforcement agencies involved, and certainly the IAI, would adequately represent the field of fingerprint identification, and therefore would strive for the highest possible quality standards. This has not been so.” The editorial goes on to state, “The IAI did not even have a representative at the fourth and final meeting of the NIST Workshop for the Interchange of Fingerprint Information. At the three previous meetings, representatives for the IAI did hold discussion groups and did present their dissenting view, but this was ineffective.” The editorial continues to state that, “Many individuals, agencies and groups, including the IAI, failed to speak adequately or effectively for acceptable standards.”

There were only three NIST workshops for the interchange of fingerprint information. There was a fourth meeting wherein vendors, engineers, etc. were invited to discuss the technical operation of the proposed WSQ compression algorithm. This meeting pertained to the technical implementation of the WSQ algorithm and was not attended by representatives of the IAI. The IAI representatives had already been appointed to the compression/decompression image committee which was to deal with the images resulting from the WSQ implementation.

The three NIST workshops held September 25-27, 1990, May 15-17, 1991, and March 4-6, 1992, were all attended by a minimum of three IAI representatives. The IAI representatives present were also representing their respective agencies. The discussions conducted at the workshops were, at times, lengthy, emotional, and frustrating. At the last workshop the IAI requested that the IAI be recognized as a group, that an IAI breakout session be scheduled as part of the workshop, and that time be provided at the general workshop session for the IAI to present a report. This report would reflect the breakout session topics that were discussed and their recommendations. The IAI breakout session report would be included in the official minutes of the work-

shop. NIST agreed to the IAI representatives' request. The breakout session was conducted and a report was made at the general session of the workshop. A copy of the breakout session report was given to NIST. NIST included it in the minutes of the workshop which was circulated to all attendees. The IAI representatives were effective and accomplished the goals of the IAI.

The editorial also stated, "The IAI can instruct its legal counsel to look into the possibility of filing suit to block the standard from taking effect." The IAI, through the AFIS Subcommittee, supports the standard and we have no intention of recommending such an action.

The IAI position states that electronic fingerprint images should be captured at a minimum of 500 pixels per inch with 256 levels of grey. This requirement has been included in the proposed NIST Standard under Logical Record Type 4. The position statement also expresses concern that any use of data compression and decompression algorithms used **must not adversely affect the use of fingerprint images in forensic identification functions.**

A motion was made at the last NIST workshop that a committee be formed to test and review compressed/decompressed images to ensure that the algorithms do not have a adverse effect on the original image. A WSQ Review Group was formed and two IAI representatives have been appointed.

The WSQ algorithm is in the testing phase and no conclusions have been reached at this time. By the time that you receive this issue of the *Journal* the IAI will have become actively involved in assisting the FBI on their IAFIS project by doing independent blind tests on the algorithms.

I have appointed Mr. Michael Fitzpatrick, of the Illinois State Police, to the IAFIS Design Group. He will coordinate the IAI Electronic Fingerprint Test group by setting the procedures as well as initiating and supervising the test. I have directed him to draw upon any resource that the IAI may have to accomplish this task. The IAI has been invited to make a presentation at the NCIC Advisory Policy Board meeting in December. Mr. Fitzpatrick and I will represent the IAI at that meeting.

The FBI also formed an internal Image Quality Committee. Mr. Leonard Butt, of the Baltimore County Police, Maryland, will continue to serve as the IAI representative on this testing committee.

The IAI feels that the immediate task is the electronic fingerprint image test. As stated, the IAI has adopted the position that the 500 pixels per inch by 256 levels of grey for electronic fingerprint images is **acceptable for the majority of forensic comparisons and identifications**. The current concern surrounds the WSQ compression/decompression setting. There are several opinions, to say the least, on this issue.

The AFIS Subcommittee and live scan vendors have stated that a compression ratio of 10 or 15:1 is the maximum compression that an electronic fingerprint image can withstand before a deprivation or modification of information is experienced. The FBI is recommending a compression of 20:1. There are differences of opinions from latent print examiners. Even those individuals who have never seen an electronic fingerprint image are voicing their opinions.

The IAI intends to conduct this test of the WSQ compression/decompression algorithm to determine which ratio will provide an electronic image that is acceptable for forensic applications. To this end the IAI will determine what we feel is the acceptable compression/decompression setting for the purpose of forensic comparisons.

The FBI will be providing the IAI with the WSQ algorithm at settings of 5, 10, 15 and 20:1, enabling us to conduct the required test. The FBI has agreed to provide any equipment deemed necessary and not available at NIST. Upon the conclusion, the IAI will provide the FBI with the test results.

I would like to thank Mr. Peter Higgins of the FBI for his overwhelming response and eagerness to cooperate, and for providing support for this IAI project.

Because of the impact that live-scan, AFIS, and IAFIS will have on our future, the Board of Directors voted to make the AFIS Subcommittee a standing Committee effective January 1, 1994. I would like to acknowledge the AFIS Subcommittee whose members prepared the background information for this response.