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# Developing information sharing standards for forensics research

## Abstract

Forensics research depends on the ability to collect and aggregate information exchanged between forensics examiners and external disciplines. Particularly with the explosive proliferation of digital evidence, the need for research to develop new and efficient forensic methodologies requires the analysis of how information is shared and the need to understand data components in a consistent and standardized way. For operational and research purposes, there is a need to develop data standards for composing information exchanges, with consensus on the semantic and syntactic representations of data components in forensic reports. NIEMOpen offers a general data model and methodology for automating such a standard, and there is now a specific domain in the NIEMOpen library to help express the semantic and syntactic exchanges for forensic information. Working groups are now being formed to fulfill this aspiration, aiding further research and expanding the ability to develop new methods and procedures.

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## Introduction

The outcomes of forensic research and science are the basis for decision-making and programmatic outcomes in other fields. In law enforcement and criminal justice fields, practitioners depend on forensic science to defend the credibility and reliability of evidence. When information about forensic outcomes is shared, the terminology used to express outcomes and show credibility becomes extremely important and calls out for the use of some form of standard data element meaning. When the forward progress of automating such reporting is considered, the standards have to include not only the meaning of terms but also the syntax by which they are communicated.

The importance of standards in forensic science has long been recognized. The American Academy of Forensic Science has operated a Standards Board for 20 years and produced 130 specific standards covering all aspects of forensic science.[1] The work continues to develop standards on new substances and processes and to establish the proven credibility of the science. Standards for forensic information sharing create common rules for how data are structured, secured, interpreted, and reported, which makes research more reproducible, collaboration easier, and use in operational contexts more trustworthy. They also help protect subjects and victims, meet legal and ethical obligations, and sustain public and judicial confidence in forensic science.[2] Common technical and reporting standards ensure methods are **reliable**, validated, and applied consistently across laboratories, which is critical for comparing results and aggregating datasets in research.

The automated sharing of forensic information is expanding as agencies and organizations seek to make it available more broadly and in a timely manner, so it is helpful even in preliminary investigations. In pursuit of this goal, standards for information sharing that recognize the need for mutual understanding of terms and how they are represented in automated exchanges become essential. For over 20 years, the National Information Exchange Model (NIEM) has been expanding its content to provide semantic and syntactic standards for information sharing between communities of interest or domains.[3] Now a formal standard issued under the auspices of OASIS, the international open source and standards consortium, the newly designated NIEMOpen is an open source framework for building a consensus on data standards that facilitate information sharing across domains and across nations. Serving 19 separate domains with over 20,000 homogenized data components, NIEMOpen offers the potential for applying its proven methodologies to the forensics field.

Recognizing the potential for NIEMOpen to provide a framework for the forensics field as well as the other domains already served, including justice, emergency management, biometrics, cybersecurity, etc., a collaboration of interested parties has come together to create the NIEMOpen forensics domain. This newly formed community of interest will develop standards for the semantic and syntactic definition of data components that will form the basis of international standards for information sharing between forensics providers and other domains. In the opening town hall on December 8, 2025, the organizers declared their intention to create a common data model for forensics information sharing based on the community adoption of terms and syntax using the NIEMOpen model as a home for these data standards and the metadata that makes it possible to have consistency across all contributing agencies. Their stated intent was to increase interoperability across all organizations that exchange forensic information and speed the availability of data for prosecution and other purposes. It is likely that standardized information models and metadata will make it possible to integrate case data across studies and jurisdictions, enabling forensic intelligence approaches that link patterns and trends rather than just relying on isolated cases.

The NIEMOpen Forensics Subcommittee organizing coalition consists of representatives from the Defense Forensics and Biometrics Agency (DFBA) within the Department of Defense (DoD), the Federal Bureau of Investigation (FBI), the Department of Homeland Security (DHS), and the National Institute of Standards and Technology (NIST). State, local, private forensics organizations and academia are welcome participants in the collaborative effort to establish these information sharing standards, interested parties can participate in this effort by sending a note to hqda.niemforensics@army.mil.

### About NIEMOpen

The NIEMOpen framework consists of the data model with its over 20,000 data components serving 19 separate domains, the naming and design rules to specify how data elements are represented, the methodology for creating exchanges using the model, the toolset to automate the specification of message exchanges, and an on-line

training program in how to use the methodology and the model. All elements of the platform are available at no cost at NIEMOpen.org. While NIEMOpen is now an OASIS standard, activities are underway to make it an ISO standard.

## Conclusion

The formation of the forensics domain in NIEMOpen joins the other 18 NIEMOpen domains in taking advantage of a proven methodology, tool set, and training program to develop semantic and syntactic standards for the exchange of forensic information. This capability will facilitate forensic research by enabling the aggregation of forensic data exchanges to study processes and procedures in the field. The resulting standards will benefit both research and operational practices in forensics.

## Acknowledgements

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## Conflicts of interest

The authors declare that there are no conflicts of interest.

## References

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