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# Observations:

# Election Systems, NIEM and Information Standards Alignment

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## Abstract

The Organization for the Advancement of Structured Information Standards (OASIS) as a group produces a significant body of standards. That OASIS work has recently been combined with the National Information Model Exchange (NIEM.gov) work through joint initiatives. There is much to be learned from the parallels between how the OASIS and NIEM communities has leveraged standards and committed to information sharing as a core value, and how the election support services across the country can approach this also.

The OASIS Election and Voter Services Technical Committee (OASIS Election TC) has developed the Election Markup Language (EML) standard since 2001. The NIEM.gov initiative is focused on enabling interoperability and reuse of information exchanges nationally (www.NIEM.gov). Consistency and accuracy of information is a need for voter registration systems across the country and especially in regard to supporting military and overseas voter registration needs. We can note here that the NIEM core dictionary definitions share the exact same core dictionary components for person and address information with OASIS EML (Election Markup Language) and those are themselves leveraged from the same base standard (the new OASIS CIQ v3.0 - Customer Information Quality definitions).

The application of standards to election and voter services is therefore an area that can be informed from the experience of the NIEM.gov community in adopting promoting and supporting the use of standards nationally across Federal, State and Tribal jurisdictions. Technologies and techniques exploited for NIEM are now also being supported in the new OASIS EML v6.0 specifications.

We discuss here the goals, resources, challenges, outcomes to date and lessons learned.

## The Challenges

Given the myriad local variations currently in election statues and laws, one challenge is providing open standards and specifications that can be utilized across all 50 states and jurisdictions within the USA in a consistent and cost effective way. In the NIEM.gov approach one way this is addressed is using a mechanism called an “IEPD” – Information Exchange Package Documentation. The role of an IEPD is to provide a reusable self-contained package that describes an interchange between two or more partner systems. IEPDs range in scope from local jurisdictions sharing information up to nationally and even internationally agreed exchange formats. The aim is always the same, to as precisely as possible, qualify the information exchange, the participants, their roles and the expected behaviour of the information in the exchanges, along with documentation, testing and verification tools. Aligned with this is supporting reuse of information exchange components.

Buttressing the overall approach is a dictionary of domain terms, semantics and information definitions. These allow interoperability through consistency and avoid reinvention of common shared information components. Communities of common practice act as stewards for domain dictionary components.

The IEPDs themselves are vetted before formal adoption and then submitted to a national repository for IEPD sharing that is web accessible (see the NIEM.gov web site).

Specializations need to be handled in a systematic way so that the overall exchange templates are not burdened with excessive complexity. As was learned from the days of EDI-based exchanges, overburdening components with inconsistent information content that is out of context is to be avoided

at all costs (the “we’ll just put this in here since we’re not using it right now for anything else” syndrome).

Similarly extension mechanisms need to be formally understood. The NIEM approach to extensions leverages specific XSD schema techniques that allow partners to know how and where an exchange can be extended, thus localizing the changes and ensuring overall interoperability around core content. The OASIS EML V6.0 schema supports these same NIEM techniques to structure extension. Also in the same way NIEM provides core component definitions for reuse, the OASIS EML also provides EML core components for commonly occurring election information constructs. Both NIEM and EML also provide formal external linkage mechanisms to allow inclusion of externally defining standard components (such as name and address, geospatial coordinate systems, digital signatures and so on).

Another need is the ability to handle specializations (localizations) of default information exchange structures to meet state and local requirements. To address specializations requires a formal context mechanism that allows exchange templates to explicitly define when particular parts of the exchange are applicable. This is then self-documenting and allows the use patterns to be explicitly seen and understood. Again OASIS EML provides a formal template mechanism that has context handling built-in.

All these challenge areas and potential mechanisms are yet to be formally addressed for election information sharing in the USA and yet the standards exist now to support them.

## Exploiting NIEM Approach?

While a case could be made for incorporating election standards within NIEM, equally a case could be made for keeping it distinct; however since NIEM itself is devolving control to domains this may be a moot point. Either way the fact is that NIEM shares common content particularly around voter registration, driving licenses, military voter registrations, and emergency management and so on. Hence common formats and representations make technical sense. Of course legal constitutional constraints may restrict sharing of actual data sources, but that fact makes common exchange and query formats even more important as for instance when a voter relocates from one State to another.

As noted above the NIEM approach provides a dictionary of common components that can be searched to find existing definitions for use in information exchanges. Similarly the new OASIS EML V6.0 now has a dictionary of all the common components used for elections and voter services information exchanges. The format of the dictionary is compatible with the format used for NIEM dictionaries. Areas such as person information share the common heritage through the use of OASIS CIQ based schema content as previously noted above. There are other areas of overlap too such as use of geospatial information markup for polling place location. As we see in the next section formal collaborations with NIEM are already occurring for these related domains.

## Collaboration with NIEM

While NIEM maintains core domains (currently 13) it also has a mechanism called “adaptors” for handling related domains that are not part of core. A set of such adaptors exist for the OASIS Emergency Management TC work and schemas. Also a formal MoU (Memorandum of Understanding) and management board was instituted between EIC (Emergency Interoperability Consortium), OASIS and NIEM to further this work, where OASIS is the lead party, delivering standards but collaborating with NIEM and ensuring interoperability with NIEM (see http://xml.coverpages.org/edxl.html).

Such an arrangement for election standards looks also potentially very beneficial.

A joint summit is planned for this October between NIEM and OASIS – (see http://fcw.com/calendar/2009/09/emergency-interoperability-summit-2009.aspx) as part of the first NIEM annual exposition in Baltimore.

## Leveraging Templates

With OASIS EML v6.0 there is now a base template provided for each of the information schemas. Templates were introduced as a means to express common use patterns and contextual variations. How does this contribute to the overall goals of broad adoption of standards for US election management? The NIEM.gov work is currently introducing templates as a key enabler in rapidly developing information exchange IEPDs. Whereas this was previously a manual labor intensive process, what formally took weeks and months to complete for an IEPD, can now be done in days and hours using the suite of open source automation tools to assist the solution architects. These same tools also work effectively with OASIS EML V6.0 schemas and therefore election staff and developers can rapidly design and tailor the base templates to suit their own information exchange needs. Furthermore training and education materials developed for NIEM can be applied to teach election developers these techniques.

Resulting IEPDs can be then made available for reuse along with the templates and associated software. This potentially empowers the election community to adopt common standards far more rapidly then before was believed possible. Such national coordination is a key factor in for example providing support for overseas and military voters by making uniform procedures and information exchange formats attainable in a shorter time scale and with significantly less developer resources.

Similarly vendors of commercial election products can also more easily align to standards and bring compatible solutions to market.

In fact OASIS Election TC member companies have already demonstrated this in their symposium in London in 2008 (http://oasis-open.org/committees/download.php/25992/EML%20Interop%20Demo%20Report.pdf ) and the recent European Union elections using EML (http://oasis-open.org/committees/tc_home.php?wg_abbrev=election#announcements).

Similarly test and certification can move to another level. Currently voting system certification does not include any testing to ensure interoperability and consistency of results produced. NIST would be in a position to rapidly develop and maintain conformance test suites that can be shared publically and used to verify vendor products.

## Testing and Certification

Currently the EAC certification process and VVSG are silent on testing of actual voting systems records and information exchange verification. Adopting formal data standards will require that formal test methods be put in place also.

NIST has in the past worked with OASIS TCs to develop and publish formal test and conformance suites. Given this past work and knowledge gained it appears a natural next step to also perform this task for standard election information exchanges.

In addition since the latest OASIS EML v6.0 is providing templates that can be adapted and localized for US election needs these provide a natural mechanism for facilitating and implementing this (http://oasis-open.org/committees/download.php/29381/EML%20and%20jCAM%20tutorial.pdf).

These open source software tools are already available that support these templates and generation of test and conformance examples, schemas and documentation along with a formal validation engine.

This work is implementing the existing OASIS Content Assembly Mechanism (CAM) v1.1 standard specification and template techniques. As previously noted the CAM toolkit supports the development of NIEM IEPDs and also use with EML.

## Conclusions

A significant opportunity exists to leverage existing OASIS standards work, NIEM work and open source technology tools to accelerate the adoption of formal election information standards in the USA. The new OASIS EML v6.0 specification and schemas already have provisions for supporting all the needed collaborations, architecture and technology mechanisms. NIST and OASIS have previously collaborated on developing test and conformance suites for XML-based standard information exchanges. The NIEM and OASIS work on emergency management information exchanges has acted as a successful pathfinder and blueprint.

## Resources

OASIS Election & Voter Services Technical Committee
http://oasis-open.org/committees/election

OASIS Content Assembly Mechanism Technical Committee (CAM templates)
http://oasis-open.org/committees/cam

NIEM.gov
http://www.niem.gov

EIC, OASIS and NIEM – Emergency Management MoU
http://xml.coverpages.org/edxl.html

OASIS Customer Information Quality Technical Committee (CIQ)
http://oasis-open.org/committees/ciq

OASIS Emergency Management Technical Committee
http://oasis-open.org/committees/emergency

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