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U.S. DEPARTMENT OF JUSTICE
Office of Justice Programs
CATEGORICAL/DISCRETIONARY ASSISTANCE PROGRESS REPORT

The information provided will be used by the grantor agency to monitor grantee cash flow to ensure proper use of Federal funds. No further monies or other benefits may be paid out under this program unless this report is completed and filed as required by existing law and regulations (Uniform Administrative Requirements for Grants and Cooperative Agreements -- 28 CFR, Part 66, Common Rule, and OMB Circular A-110).

1. GRANTEE Georgia Tech Applied Research Corporation		2. AGENCY GRANT NUMBER 2003-IJ-CX-K030	3. REPORT NO. 7
4. IMPLEMENTING SUBGRANTEE <i>John F. Wandelt</i>		5. REPORTING PERIOD (Dates) FROM: 01/01/2003 TO: 03/31/2006	
6. SHORT TITLE OF PROJECT Justice XML Research and Design		7. GRANT AMOUNT \$600,000.00	8. TYPE OF REPORT <input type="checkbox"/> REGULAR <input type="checkbox"/> SPECIAL REQUEST <input checked="" type="checkbox"/> FINAL REPORT
9. NAME AND TITLE OF PROJECT DIRECTOR John F. Wandelt, Principal Research Scientist		10. SIGNATURE OF PROJECT DIRECTOR	11. DATE OF REPORT 07/15/2006

12. COMMENCE REPORT HERE (Continue on plain paper)

The original goal of this project was to design and implement an Information sharing infrastructure for the justice and public safety community that could enable data interoperability on a large scale. All intermediate objectives have been achieved and in some cases surpassed.

The work performed under this grant focused on the research, analysis, design, development, and engineering of the Global Justice XML Data Model (GJXDM) and associated tools and infrastructure. The final year also expanded the scope of this work into the design, development, and engineering of the multi-domain National Information Exchange Model (NIEM). The GJXDM is now an established standard information sharing model, and includes a repository of reusable information objects, tools to build information exchanges, support for the GJXDM life cycle, and training support materials for users. In turn, the infrastructure built through this grant has spawned the growth of a large federal, state, local, and tribal user base, a helpdesk and listserv, a mobile training program, and a governance structure with user representation.

Under this grant, the accomplishments of this project have been numerous:

(1) The initial research effort was tedious. Engineers sifted through and analyzed volumes of justice community data sources, dictionaries, models, and schemas; studied current XML Schema best practices, literature, and techniques used by others (including W3C and OASIS). From the results of this analysis they designed and implemented a data model. From this model was generated and published the first GJXDM Prerelease 3.0.0.0 in April 2003. This prerelease (similar to beta software) included both documented and undocumented schemas for the baseline GJXDM as well as supplemental external enumeration schemas for standard code lists; documentation including a GJXDM spreadsheet, manual (in pdf), Web index pages, frequently asked question (FAQ) lists, Introductory briefing slides, change logs, and data sheets.

(2) For the remainder of 2003, GTRI engineers applied and tested refinements and changes to the GJXDM and, therefore, to the XML schemas generated from the model; prepared a number of technical white papers and associated briefings to describe the technical aspects and usage of GJXDM; constructed many example reference schemas and corresponding instances from components in the GJXDM as test cases and demonstrations for practitioners; and designed and implemented software tools and advanced GJXDM capabilities that support optimal and effective use.
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13. CERTIFICATION BY GRANTEE (Official signature) <i>Janis L. Gaddard</i>	14. DATE 07/15/2006
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These tools and capabilities included an XML validation tool that uses the Xerces validation tool library, the capability for GJXDM to represent multiple versions; an online GJXDM component search/lookup capability (to replace the PDF document); and an online schema subset generation tool (SSGT) to enable users to build and generate reference document schemas directly from the GJXDM. By the end of 2003, in addition to the tools and capabilities, GTRI engineers had delivered a total of four prerelease versions of GJXDM (3.0.0.0, 3.0.0.1, 3.0.0.2, and 3.0.0.3).

(3) After much guidance from Global and DoJ domain experts resulting in many refinements, in early 2004, GTRI generated and delivered the first operational GJXDM release version 3.0.0. The release included a complete set of schemas and documentation as described earlier. In May 2004, GTRI coordinated, hosted, and conducted the GJXDM Developer's Workshop for over 300 attendees from around the U.S. GTRI prepared and presented virtually all the technical training for this workshop. GTRI recorded the presentations and later implemented a Web site where the public could download the training materials and view the audio/video streams of all the workshop sessions. Also in 2004, GTRI engineers continued to analyze new data requirements from the field, XML Schema best practices, new proposed techniques (including W3C and OASIS), and feedback from the justice community and improved the GJXDM. Two more operational releases (versions 3.0.1 and 3.0.2) were published in 2004. These updates were generated using new schema generation code, and contained new features including *xsd:annotations*, identification of deprecated components, and *xsd:appInfo* constructs.

(4) Several new technical white papers, updated briefings, and Web pages were also published that described the GJXDM Reference Architecture, as well as new features and capabilities in GJXDM and its associated tools. GTRI also prepared for DoJ instructions to grantees for writing XML schemas that conform to the GJXDM reference architecture. After continued design and development, a new version of GJXDM Schema Subset Generation Tool (SSGT) was released that included multiple version capability; improvements to the user interface; new editing capabilities; and the ability to load/save partial work using a new Wantlist specification. This tool enables a user to select the JXDM components required for an application and automatically generate a correct schema subset including dependencies and appropriate code table and supplemental schemas. Along with the SSGT, GTRI released new version of its fast Xerces-based XML validator.

(5) Also in 2004, GTRI delivered a number of technical reports, white papers, and products including: a standard mapping between GJXDM and the National Incident Based Reporting System (NIBRS) (in collaboration with the FBI); the Concrete Typing technique as an alternative to *xsi:Type* substitution; refinements and improvements to the GJXDM Reference Architecture; and a study and comparison of the Universal Business Language Specification to the GJXDM; and additional reference schemas and instances built from GJXDM components as test cases and examples for practitioners. At the end of 2004, GTRI assisted DoJ with information briefings and discussions related to a possible partnership with Department of Homeland Security and a new effort to establish the National Information Exchange Model (NIEM) which would extend the GJXDM into multiple domains beyond justice.

(6) In 2005, GTRI recommended to Global the establishment of a more formal life cycle process for developing and publishing future release versions. This process required the each release move through a sequence of Alpha, Beta, and Release Candidate (RC) states prior to being published as an operational release. This process was designed to control the quality of the published releases. The process has slowed down the release cycle, but has resulted in higher quality releases. Thus, in 2005 GTRI engineers generated and released versions 3.0.3alpha, 3.0.3beta, 3.0.3RC, and finally published GJXDM operational version 3.0.3 (with all schemas and documentation). Frequently asked questions (FAQs) were completely revised. Release 3.0.3 contained new features including *sequenceID* and over 30 changes submitted to the GJXDM feedback site and approved by Global. Engineering continued the analysis of new data

requirements and best practices from the field. As a result, in mid 2005 significant new design work began for the next series of releases (3.1.x). A significantly large number of important changes were positioned for the eventual release of GJXDM 3.1. Furthermore, GTRI designed new concepts for associations (data relationships), roles, and metadata and presented them to Global as solutions for particular weaknesses in the data model. These were approved for implementation toward the end of 2005.

(7) Also in mid 2005, GTRI began drafting a formal Naming and Design Rules (NDR) document, the normative specification for the GJXDM. Four iterative versions of the GJXDM NDR were drafted and reviewed by Global. The NDR was suspended at the fourth draft until the significant new concepts to be integrated into the GJXDM 3.1 series could be designed by GTRI and decided by Global. As a result, GTRI published for Global review three important technical white papers detailing requirements, concepts, alternative designs, examples, advantages, disadvantages, and recommendations for the implementation of associations, roles, and metadata. Global approved all new concepts and designs by the end of 2005, and work on the NDR has resumed in 2006. In early 2006, GTRI assisted Global domain experts in remodeling several major GJXDM objects (Person, Activity, and Property). GTRI is now refactoring GJXDM for the 3.1 series releases to take advantage of the new features (associations, roles, and metadata).

(8) Simultaneously in 2005, GTRI began the research, design, and development of the National Information Exchange Model (NIEM), a joint effort between DoJ and DHS. NIEM is based on the partitioning and refactoring of GJXDM into multiple domains (and therefore multiple namespaces). Since future releases of GJXDM would be significantly impacted by the development of NIEM and would likely become a part of NIEM, and to protect DoJ's investment in GJXDM, GTRI formulated NIEM concepts and design for a smooth evolution of GJXDM and its associated architecture and tools into NIEM. Both efforts have been and continue to proceed in parallel to the maximum extent possible. The intent is that if and when NIEM is ready for operational release, the current GJXDM release content (3.1 series) will match NIEM content so that the only significant differences will be namespace designations. This will enable GTRI to provide relatively simple migration tools to assure minimal impact to current GJXDM users.

(9) As part of the NIEM effort in 2005, GTRI refactored GJXDM 3.0.3 into NIEM 0.1 and published the release in September 2005. Additionally, GTRI adapted and delivered the NIEM Configuration Control Tool (NCCT) based on an open source software product. NCCT is an on-line collaborative tool that manages the NIEM release life cycle and controls change to the model. GTRI also delivered a new version of the SSGT capable of handling the multi-domain, multi-namespace environment of NIEM. After collecting new data requirements from the field (DoJ and DHS) for a few months, GTRI published NIEM release versions 0.2 and 0.2.1 in early 2006. Work toward both the GJXDM 3.1 series and NIEM 1.0 continues.

The foregoing report outlines GTRI work that was performed under this grant from 2003 through early 2006 and resulted in numerous deliverables and products. Most of these items are available on the Web. The attached table on page 4 lists each significant output from this grant and a link to either the product itself or a page from which the product or a set of related products can be accessed. The table lists both products that GTRI produced independently and products that GTRI made significant contributions to.

Original work (sole contributor):	
GJXDM Prereleases	http://it.ojp.gov/topic.jsp?topic_id=141
GJXDM Releases	http://it.ojp.gov/jxdm/
GJXDM Patch-1	http://it.ojp.gov/topic.jsp?topic_id=218
GJXDM FAQ	http://it.ojp.gov/jxdm/faq.html
GJXDM Schema Subset Generation Tool	http://gjxdmtools.gtri.gatech.edu/ssgt/
Rules for Schema Subsets	http://justicexml.gtri.gatech.edu/rules_for_schema_subsets.html
Wantlist Schema Spec	http://justicexml.gtri.gatech.edu/wantlist_1.xsd
GTRI Justice XML Information Center	http://justicexml.gtri.gatech.edu
Technical Documentation	http://justicexml.gtri.gatech.edu/technical_documentation.html
GJXDM Reference Architecture	http://justicexml.gtri.gatech.edu/Reference_Architecture.pdf
Component Definitions & Examples	http://it.ojp.gov/topic.jsp?topic_id=175
GJXDM Implementation Guidelines	http://it.ojp.gov/topic.jsp?topic_id=138
GJXDM Class Hierarchy	http://it.ojp.gov/topic.jsp?topic_id=154
Mapping NIBRS vs GJXDM	http://it.ojp.gov/topic.jsp?topic_id=165
GJXDM and XML Tools	http://justicexml.gtri.gatech.edu/gtri_xml_tools.html
GJXDM Feedback Web site	http://justicexml.gtri.gatech.edu/feedback/
Information Exchange Package Documentation (IEPD) Catalog	http://justicexml.gtri.gatech.edu/xstf/doc/
GJXDM Developer's Workshop 2004	http://justicexml.gtri.gatech.edu/developerworkshop/
GJXDM User Conference 2005: GJXDM Schema Subset Generation Tool (SSGT) Overview and Demo	http://it.ojp.gov/topic.jsp?topic_id=204#ssgt
GJXDM User Conference 2005: GJXDM Tool Road Map Architecture Layout – Justice Information Exchange Model (JIEM) Interface/Registry	http://it.ojp.gov/topic.jsp?topic_id=204#tool
NIEM 1.0beta	http://niem.gov/topicIndex.php?topic=file-currentWithDocs
NIEM Library (whitepapers and 1.0beta release)	http://www.niem.gov/library.php
NIEM Tools	http://www.niem.gov/tools.php
Significant contributions to:	
Building Exchange Content Using the GJXDM: A User Guide for Practitioners and Developers	http://it.ojp.gov/topic.jsp?topic_id=201
Global JXDM Overview CD, Edition 1	http://it.ojp.gov/jxdm/jxdmcd/splash.swf
About GJXDM	http://it.ojp.gov/topic.jsp?topic_id=228
National Information Exchange Model (NIEM)	http://niem.gov