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The Future of C2

Providing Enterprise Information Services for Multinational Interoperability - The EIM Approach

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Abstract

Coalition operations for multi-national forces require network enabled coalition interoperability to be effective. There are many opportunities to provide the capability for coalition interoperability, but there are also many challenges. In this paper, we will identify the opportunities for enabling information sharing for coalition forces, identify the associated challenges of integrating information systems and providing appropriate levels of security, and then present a framework called EIM (Enterprise Information Management) that enables coalition interoperability. The EIM framework proposed by us spans the range of structured, semi-structured and unstructured data sources to provide an extensible framework that uses a virtual repository engine. Our framework has the advantage of being able to deliver information using thin-client, browser-based access for multiple devices and form factors. It provides secure search across system boundaries and disparate data sources. We present an application of the EIM framework in an unclassified domain that shows how it enables information interoperability on-demand. The EIM framework enables data management with full audit trails and provides business process management and workflow across organization boundaries.

1. Introduction

Coalition operations in today's war-fighting environments are very important, since the armed forces of many nations have to collaborate in war scenarios as well as peacetime operations and joint exercises. Coalition interoperability requirements listed by OASD [1] at the highest level of abstraction are:

- Must support coalitions that are dynamic by nature
- Must support coalitions that are formed for a specific purpose, then disbanded
- Coalition networks must be adaptable
- Coalitions must employ interoperable communications standards in order to communicate effectively

Short-term requirements for coalition interoperability dictate that:

- Coalition networks must be installed quickly
- Must be agile enough to handle the addition & subtraction of member nations
- Relevant info from U.S.-only sources must be quickly and easily transferred to coalition networks
- Reduce hardware & number of personnel required to establish and maintain coalition networks

Longer-term requirements are to provide the ability for any member of a coalition to use one network that provides immediate access to the information they require and are cleared to receive. All nations will need to use interoperable and secure network standards. It is also important to recognize the importance of Policy when dealing with Multi-National Coalition Networks. National Disclosure Policy governs release of information to our coalition partners as follows:

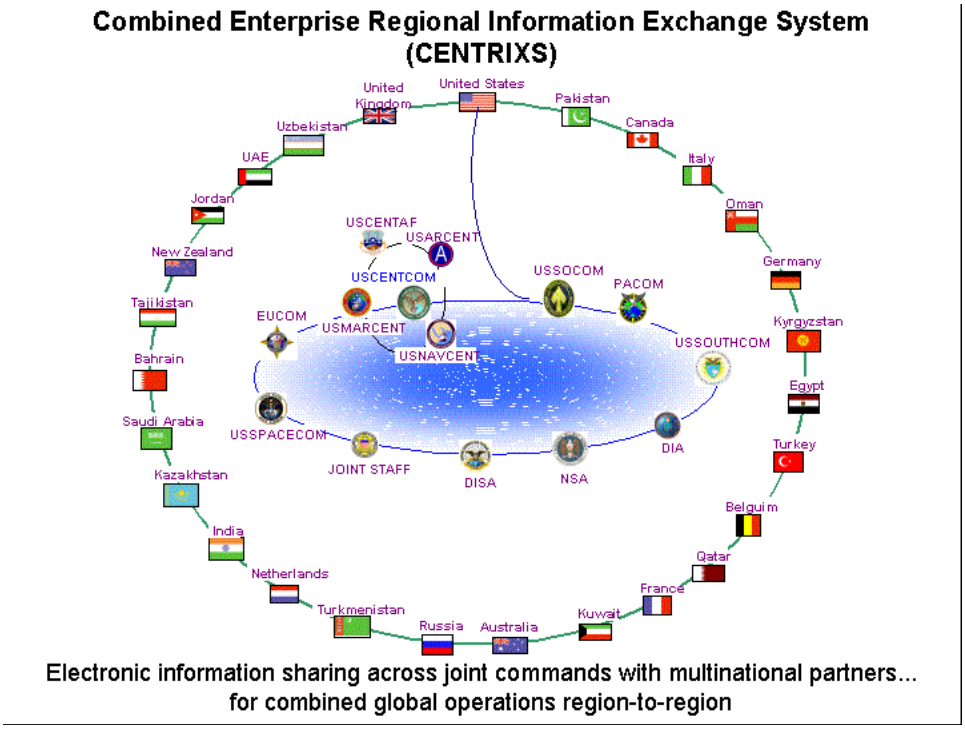
- Receiving nation must agree to protect information
- The originator must agree to its release
- Specially trained Foreign Disclosure Officers are usually given responsibility for actual transfer
- Commander in the field has latitude to share military info that his unit originates with participating coalition partners

Information Assurance policy sets requirements of technical measures for release. Technical implementation is sometimes extremely difficult and varies according to situation and better guidance for implementers is needed in this area. Common unified operational requirements for multinational information sharing include frequent real multinational exercises with real systems and real data. Sharing this data requires an "(N+1)" Security Domain solution with Content-Based Information Security

and “Black” information transport. The challenge of multinational interoperability in national programs spans the Reverse requirements definition process including Multinational/ Combined operations, joint operations and service operations. Multinational C2 requirements satisfy minimum essential joint and service exchange requirements as multinational C2 standard. There is also the issue of US Release Policy to Coalition Partners. This includes trained, certified, authoritative National Disclosure Officer (NDO) co-located with COCOM, a Disclosure Decision Support Tool, and release within minutes to multinational force (versus months/years). These are very stringent requirements that lead to many integration challenges.

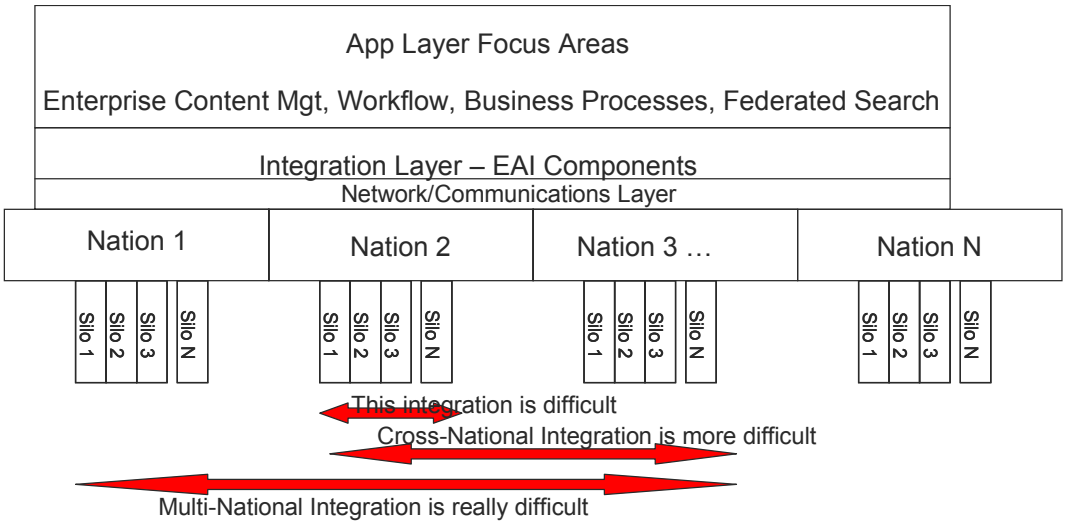
2. Information Sharing Scenario

Consider a real scenario shown in the following diagram – the CENTRIXS system [2]. This system has the objective of providing electronic information sharing across joint commands with multi-national partners for combined global operations on a region-to-region basis. This is a very complex undertaking, since it involves the whole DoD enterprise and touches upon many other national defense enterprise entities for the creation of ad-hoc and planned information sharing networks.



The integration issues for scenarios such as CENTRIXS are identified in the following diagram. They include integration issues within country silos, across country silos and then the N+1 issues that impact any coalition of more than two members. These issues are further complicated by different security protocols, access privileges,

network/communication protocols, and system and language issues. In this paper, we focus on integration issues above the Network and/or Communications layer, with a primary focus on the Application Layers.

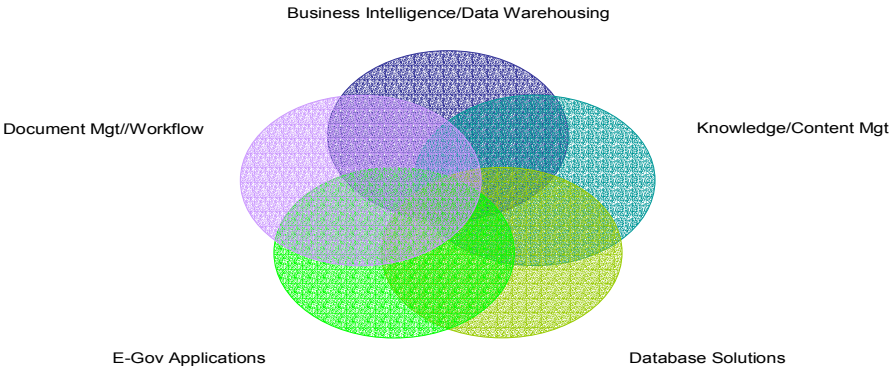


3. EIM Solution Framework

To address the challenges identified above, we present a high-level overview of an Enterprise Information Management (EIM) solution. EIM is an integrated approach for capturing, processing, managing and analyzing an enterprise's data, including structured and unstructured data, to optimize the information value chain. EIM addresses:

- Intra-department integration
- Cross-department integration
- Cross-agency integration
- Enterprise-wide integration
- Multi-National Integration

EIM Solution Focus Areas

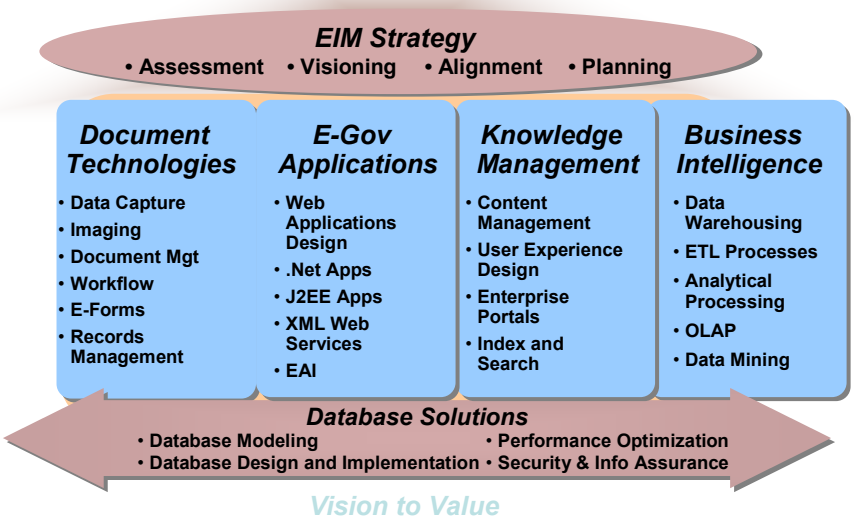


EIM is a holistic approach for looking at data sharing and information integration that seamlessly integrates multiple components such as Business/Intelligence, Data Warehousing, Knowledge Management, Content Management, Document Management and Workflow and database solutions to create collaborative solutions on-demand. This capability supports the creation of ad-hoc networks between nations and allows participants to collaborate and share data in these ad-hoc networks. EIM solution components are described in more detail in the following figure.

The EIM framework spans the entire range of structured, semi-structured and unstructured data sources to provide an extensible framework that uses a virtual repository engine and has the following features:

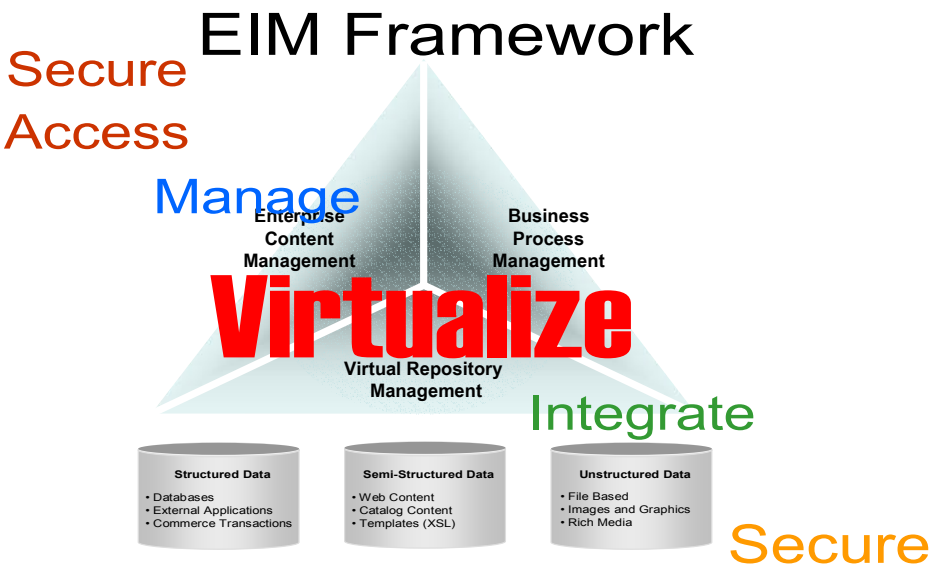
- Loosely coupled web-services
- Accommodates wide variety of disparate data sources
- Extensible adapter based data access
- Federated Infrastructure through Storage Virtualization
- Integrated Search Mechanism,
- Combined with a Thin-Client, Web-Based Portal for secure information delivery

EIM Solution Components



The EIM framework that we have designed for coalition interoperability was done using an iterative, spiral development approach. The successive iterations of the iterative approach included:

- Integration Approach 1: Use XML everywhere to solve the problem. This approach seems to be promising at first, but is not a "silver bullet" because XML is basically a data definition and data interchange protocol. The application still needs to supply the schema to make sense of XML and a lot of extra work needs to be done at the application level to connect disparate systems.
- Integration Approach 2: Use "Web Services Everywhere" to solve the problem. This approach, while using established standards, again has some limitations, including the fact that we need in-depth business logic to make the interoperability work.
- Integration Approach 3: Use an Enterprise Portal/Thin Client to solve the problem. Again, this is a promising approach for integrating mostly static data, but it does not solve the issue of integrating dynamic data by itself. The solution would need in-depth business logic and specialized web-parts to make this approach work.
- Integration Approach 4: Use a Virtual Repository Engine to provide access to structured, semi-structured and unstructured data using XML, Web Services and an Enterprise Portal framework as shown in the following diagram.



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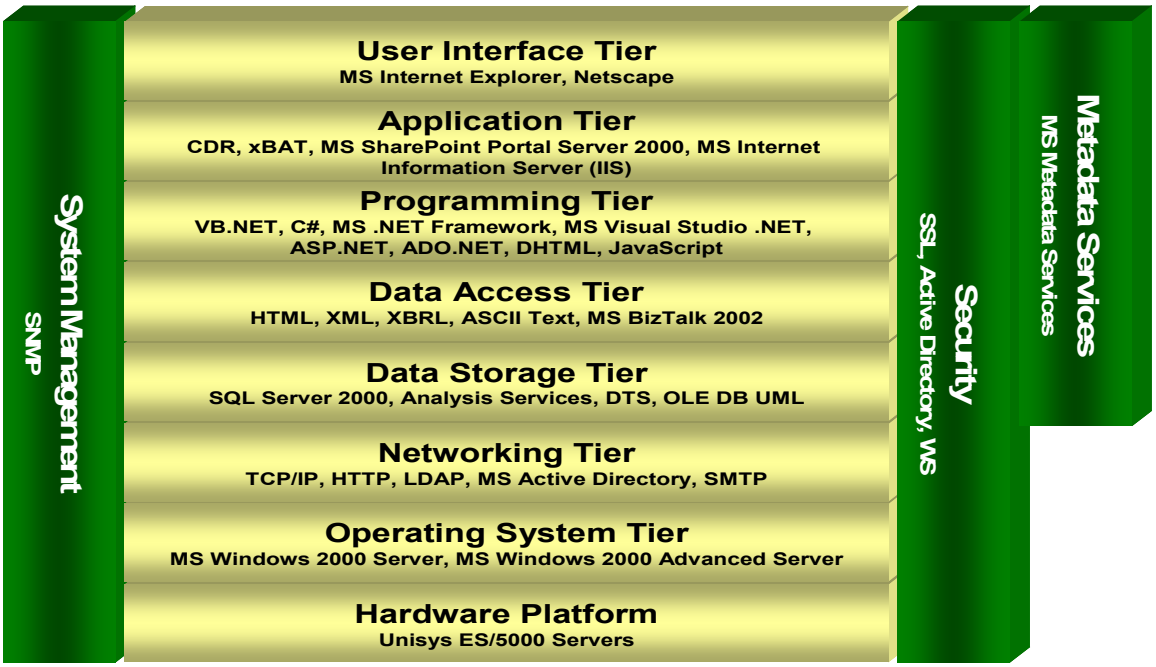
The EIM framework is neutral with respect to the technology platform on which it needs to be implemented. We can implement it on the latest generation technology foundations including Microsoft.NET, various J2EE implementations (IBM, BEA, Sun etc.), Open Source software (Linux, Apache etc.). More importantly, for maximum flexibility we can implement the EIM framework on *some combination of the above platforms*. This capability is crucial for multi-national operations, since it is very likely that various national units will be using different technological foundations for their internal core systems. Our adapter based approach, founded on XML web services enables us to transcend application/system/COTS boundaries and provide data sharing in a seamless manner.

4. EIM Implementation Example

We illustrate the use of the EIM framework through an example of an unclassified application that we built for FDIC. We have applied the EIM framework across all three major government areas, Civilian agencies, Homeland Security Agencies, and DoD agencies. However, we picked this example because it does not use any classified data.

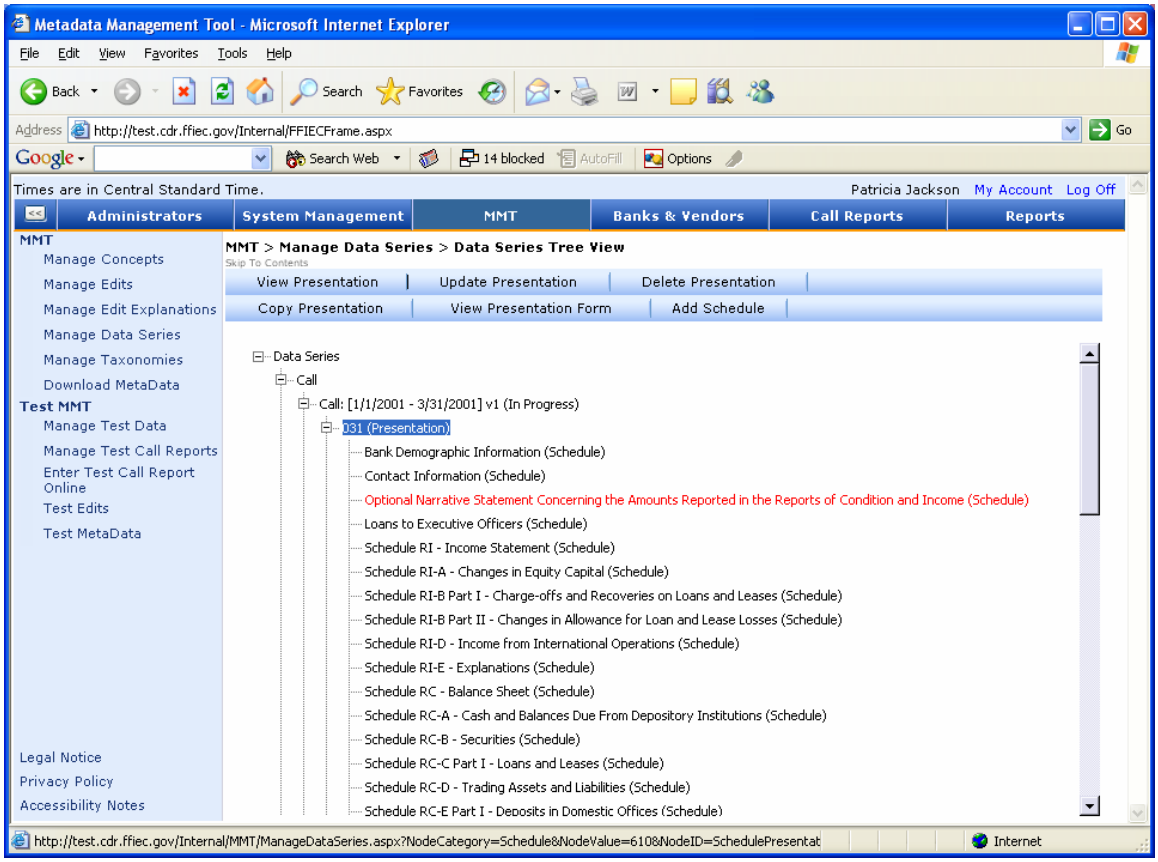
The application creates a centralized data repository for the collection of financial data from all banks in the US that are regulated by FDIC. This secure solution is based on the latest web-enabled technologies and provides for a timelier, more efficient, and higher-quality regulatory reporting process. The hosted solution is built using XML, XBRL (eXtensible Business Reporting Language) and web services, and uses an underlying Microsoft Enterprise server based platform. It is compliant with existing federal requirements such as Section 508 compliance and FISMA security compliance. FDIC wanted a centralized data collection, validation, integration, and distribution process to replace the existing manual process that took three months to process the results of banking reports.



Key to the new process is the implementation of a Central Data Repository (CDR) that will use emerging technologies to effectively collect and process Call Report data. This project will cut down the time required to process U.S. banks financial reports from 90 days to three days, and will also improve the data quality and validation process. It is the first enterprise class XBRL project in the world, and has great importance from the public sector perspective, since the templates and processes created in this project will be extensible for use by agencies such as the Federal Reserve, the SEC, the Nuclear

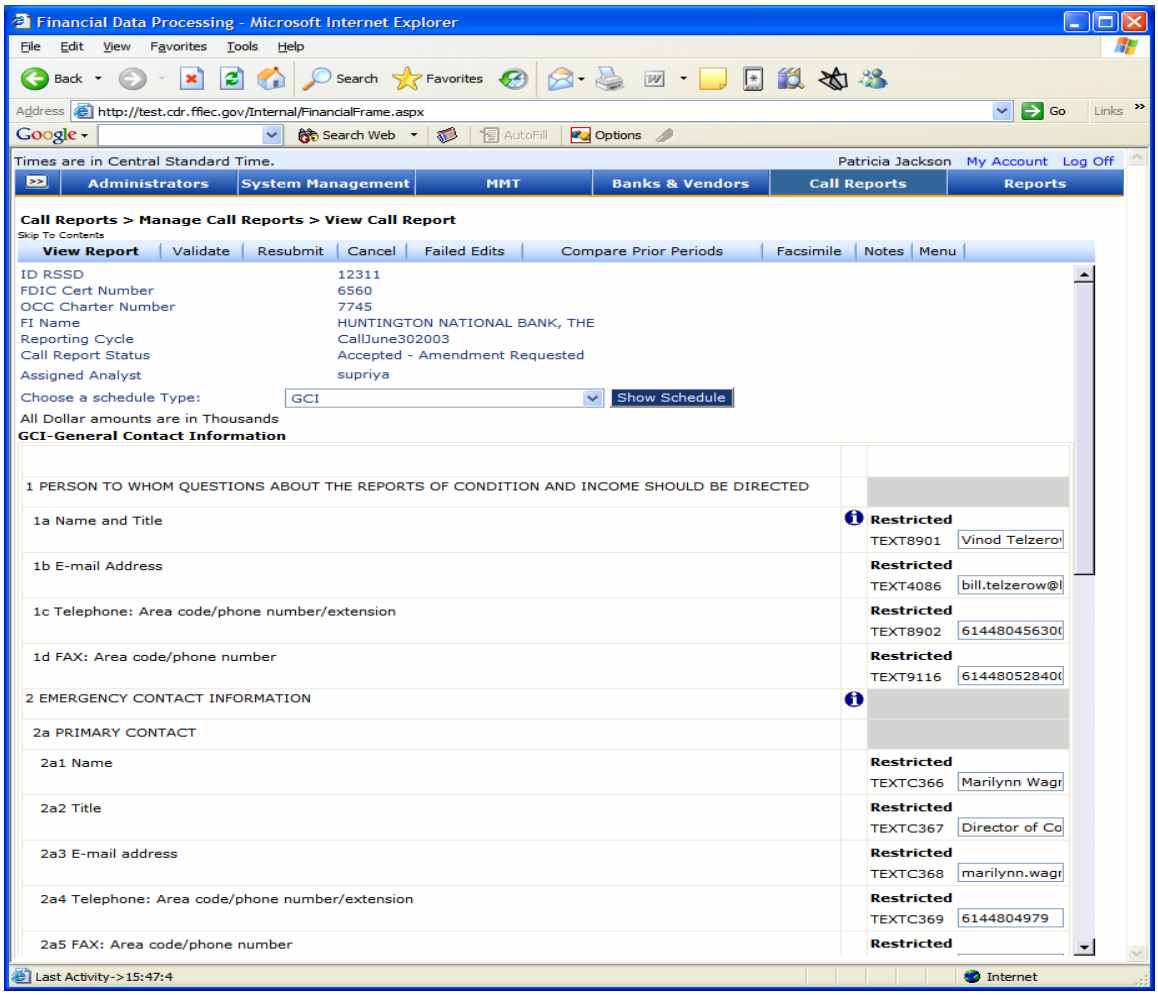
Regulatory Reporting agency and the DoD agencies among others. This approach is extensible for use for coalition information sharing across national agencies since it uses a common interchange standard based on XML. The diagram above shows a Technical Reference Model (TRM) for the application.

The CDR system is driven by metadata using the XBRL format. The metadata is extensible and contains rules for both data description and layout, and also supports calculations on the data and derived data. The CDR metadata captures the complete business rules for any reporting period in the form of a taxonomy. An example of the metadata is shown in the screen shot below. Each element of the metadata can be edited to change business rules as the reporting requirements change.



The user-interface layer is shown in the screen-shot below that shows the application portal interface and an example of a financial report submitted by a financial institution. In the context of coalition operations this could be a report submitted by a coalition agency or a coalition unit that is then processed and stored in a centralized data repository. Events are set up to inform all associated parties about the submission, receipt and processing of associated information. A fully featured workflow server supports the entire workflow of the report from submission, to processing and storage. This workflow server also triggers events and actions that inform all relevant parties about the progress of the workflow. This system is a complete, secure and hosted enterprise class system

that contains almost a million lines of code, a quarter million lines of database code, and more than 400 function points.



5. Conclusion

The EIM framework proposed by us has the advantages of being able to deliver information using thin-client, browser-based access for multiple devices and form factors. It provides secure search across system boundaries and disparate data sources. The framework enables enterprise content management with full audit trails and provides business process management and workflow across system boundaries. We discussed an example of the application of the framework in an unclassified domain that enables interoperability among more than 8000 financial institutions and a central coordinating agency. Similar applications can be built to support coalition operations. Plug-in extensions for coalition operations can be provided through the following services that can be provisioned on demand for ad-hoc and planned operations:

- Collaboration workspaces

- Application Sharing
- Collaborative Authoring
- Secure Knowledge Networks
- Federated Search
- Document Processing and Archiving
- Workflow processing

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