E-Filing Case Management Services in the US Federal Courts: The Next Generation: A Case Study

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Abstract:

The U.S. Federal Courts Administrative Office of the U.S. Courts (AOUSC) was responsible for developing the Case Management/Electronic Case File system (legacy CM/ECF) originally implemented in 1996 to service the federal courts. The AOUSC is presently developing its 2nd generation service (NextGen). The IJCA carried an earlier narrative of CM/ECF's evolution. This second IJCA article describes the approach taken to define and develop that 2nd generation CM/ECF system. This article reviews the methodology used for determining requirements; the new software tools and hardware technologies used; and the expanded functions and enhanced services being incorporated into the new product. Also included is an exploration of the various obstacles, problems, and organizational issues which occur when transitioning from a legacy system to one that is more modern and complex.

Keywords: Court Administration, E-Filing, Court Management, technology, Caseflow management, United States of America

1. Background & History of Legacy CM/ECF

A generation ago, the Case Management/Electronic Case File (CM/ECF) service became operational in the US federal courts.[3] This service is the oldest, largest, continuous, integrated case management and e-filing system in the world. It was developed entirely in-house by a dedicated group of highly qualified and experienced programmers, systems analysts, computer scientists, and other IT professionals employed by the Administrative Office of the United States Courts (AOUSC), the U.S. Judicial Branch agency responsible for all administrative and management support of the lower federal courts.[4] CM/ECF was subsequently expanded to include cutting-edge case information processing functionality for all 200 US federal courts at the appellate, district, bankruptcy levels and at several specialized courts. All 30,000+ court employees, over 650,000 lawyers who practice in the US federal courts and over 1,000,000 registered public users and organizations have relied on CM/ECF and PACER[5] over the years. Presently, CM/ECF databases contain over 47,000,000 cases and well over 600,000,000 legal documents; approximately 2,000,000 new cases and tens of millions of new documents are entered each year, and the courts are transmitting over 500,000,000 court notices to case participants and interested parties annually.

CM/ECF success and expansion has helped define the standard for electronic filing, and it has become one of the largest (if not *the* largest) electronic depository of PDF-stored legal documents.[6] These electronic files and documents are the permanent and official records for the courts. Readers interested in a review of the overall objectives, design and

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[2]   Dr. Greenwood was Project Manager during the initial prototyping and implementation phases of legacy CM/ECF at the Administrative Office of the US Courts (AOUSC), and co-creator of the PACER service. He has worked developing and implementing various technologies into the U.S. court process for over forty years at the National Center for State Courts, Federal Judicial Center and AOUSC. In recent years, he has consulted for the Russian Federation, Ukraine, and Abu Dhabi courts.

[3]   On January 1, 1996, legacy CM/ECF service began in the U.S. District Court for the Northern District of Ohio (Cleveland).

[4]   In many other countries, the term inferior courts are used to describe the appellate and trial courts below the highest appellate court - in the USA the US Supreme Court.

[5]   Public Access to Court Electronic Records (PACER) is the module that gives the general public access to court information from CM/ECF. PACER does charge usage fees for high volume users. These fees are used to support PACER and NextGen development and implementation.

[6]   The total number of judicial PDF documents stored on CM/ECF computers constitutes approximately 50% of the total number of public PDF documents that can be "googled" (about 1.2 billion) in the world.

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implementation strategies, core functions, and software and hardware components for legacy CM/ECF, are encouraged to review an earlier related article published in IJCA.[7]

2. History of NextGen CM/ECF
Throughout the continuing development and expansion of legacy CM/ECF over the past two decades, various hardware, telecommunication, and software upgrades have been made to make the service more reliable and efficient. Increased user sophistication and dependency on electronic documents and automated court services have created ever greater demands for additional capabilities and services.

A formal modification request (MR) process was implemented for legacy CM/ECF to handle requests for fixes, enhancements, and new functions and services being made by the increasing number of diverse users and interests; i.e., judges, clerks, lawyers, paralegals, academics, and various organizations. While new capabilities and functions were introduced incrementally, the primary focus over time was on the operational stability of existing services; in particular, fixing software bugs and making modest enhancements. Updated national releases for each type of court were typically 12-24 months apart. The growing complexity of the system made many courts reluctant to make major changes and additions since it could require substantial re-education and retraining of judges, court staff, and attorneys. In addition, many courts made local changes that were not incorporated into a national release; it would require substantial local staff work to merge the local changes into each of the national releases. Given the modest nature of the legacy CM/ECF upgrades, the backlog of MRs continued to increase substantially.

In recent years, U.S. Government budgetary constraints and resultant staff layoffs, notwithstanding the continuing demand for expanded services and functionality - a perennial issue almost everywhere - emphasized the need to reduce costs and reconsider options that, until recently, were unthinkable, such as sharing centralized resources. The introduction of new technologies such as tablets and mobile technologies and industry trends such as cloud computing and new programming languages have required court system developers to reassess equipment and software development approaches.

3. The NextGen Approach
In contrast to legacy CM/ECF, which started as a prototype experiment and grew as each additional court unit requested more complex functionality, the U.S. federal courts ultimately opted for a more formal, "waterfall" approach[8] with heavy court participation involving the coordination of a dozen or more stakeholder groups, all of them collecting and assessing proposed new requirements, in a process that lasted several years.[9]

As a report on the process noted:

"What we heard was both reassuring and helpful. All groups reported a high level of satisfaction with our current [legacy CM/ECF] systems, and a desire that our next version not lose any current functionality. Whatever you do, don't break it was a common refrain. That said, hundreds of suggestions for improvement came our way, and surprisingly, there was a remarkable degree of consistency among groups as to the core components that any new system should embrace."[10]

Over 10,000 functional requirements[11] were identified and documented by these groups. The approach called for requirements collected by the various committees to be combined and synchronized so that the requirements associated with similar functionality from the three court types could be combined into a single set of unified requirements acceptable to all three. Once new or revised major functional requirements were synchronized or clarified, (e.g., calendaring, judges

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[7] "Insights to Building a Successful E-Filing Case Management Service: U.S. Federal Court Experience" by J. Michael Greenwood & Gary Bockweg, IJCA, Vol. 4, No. 2,
http://www.iaca.ws/files//journal-eighth_edition/greenwood_bockweg-efilingsystems.pdf
[8] See Appendix B for a glossary of computer-related terminology.
[9] The US Judicial Conference Committee on Court Administration and Case Management (CACM) delegated the responsibility for collecting the requirements for NextGen to the CM/ECF sub-committee which in turn created a Project Steering Group primarily consisting of judges and clerks of court. The Steering Group then created four (Appellate, District, Bankruptcy and Additional (non-court)) functional working groups (Court Committees), each functional working group focusing on various chambers, clerks and non-court issues. The Administrative Office of the US Courts (AOUSC) in Washington, DC supports the US federal courts (Judiciary). An AOUSC responsibility is to develop and support computer systems for the Judiciary.
[10] Page i, Additional Functional Requirements Group Final Report, AOUSC, February 27, 2012
[11] The exact number of requirements is uncertain. There are various ways that a request for new functionality can be broken down into specific requirements, a process that is still ongoing. Indeed, in NextGen there are user functionality requests that, at this writing, have not even been analyzed.

and clerks workspace[12]), expert panels with members drawn from the three court types were created to complete the process of creating a single unified set of NextGen requirements.

The AOUSC contracted with a non-government consultant organization to review technical issues, evaluate architectural alternatives, and submit a study report for NextGen.[13] This study paralleled the collaborative collection of requirements, conducted personal interviews and facilitated group sessions with court participants.

An Architectural Study Group was established as part of the consultant's study. Guided by the vision of creating a successor to legacy CM/ECF that meets the evolving business needs of the courts, the goal was to develop a plan to collect information, and discover user and technical requirements, all at a very high level.[14] The study report presented an architectural concept and a general guide to the key features for NextGen.[15] Besides identifying myriad new functional requirements, the study also stressed system development processes and technical requirements that should be considered in defining NextGen's functionality. A crucial recommendation was to leverage the investment in current CM/ECF; that is, don't toss out the 'old' and start over completely. Other technical requirements stressed the importance of flexibility, local customization, standardized interfaces and sharing data among judiciary applications.

A significant portion of the consultant's study consisted of a detailed alternatives analysis. The alternative recommended was that NextGen should be composed principally of off the shelf (OTS) components. The study suggested that "OTS solutions have been designed by vendors with the ability to customize them to meet the needs of particular users."[16] The AOUSC and Judiciary rejected this recommendation,[17] preferring to continue along the development approach taken by legacy CM/ECF. Almost all development work would be done by AOUSC IT professionals assisted by contractors.[18]

Although the primary recommendation of the study was rejected, the study clearly reiterated what was important to the end users: ease of use, security, customization, efficiency, integration with court and other judiciary applications, scalability, flexible calendaring, and improved performance.

4. Transition to NextGen

The transition from legacy CM/ECF to NextGen is one of the biggest challenges confronting the project. The more than 10,000 requirements enumerated for NextGen so far[19] do not include the original requirements implemented in legacy CM/ECF for the trial courts which are still expected to be met in NextGen[20]. The plans call for the transition from legacy CM/ECF to NextGen to be accomplished in measured steps that incrementally deliver the new functionality using the new technical environment. Old code and new code[21] would co-exist, with old code eventually replaced by new, but not all at once. From the user perspective, the new functions will seamlessly integrate with the existing legacy system capabilities. When necessary, existing software will be repackaged, "wrapped", or re-written using new tools. By adding new modules, replacing old modules, and refreshing old modules as necessary, in time, all of the functionality of legacy CM/ECF and the new NextGen requirements will be incrementally merged.

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[12]   Workspace is a module that presents several windows each on a portion of a computer screen that permits a judge or clerk to view simultaneously various modules, such as a calendar, a docket entry, and a document, and easily switch modules

[13]   "*Application Architecture Study Final Report";* MITRE Corporation; *"Next Generation CM/ECF Architecture Assessment", MITRE* Corporation, October 2012

[14]   The study ran for eight months and involved over 50 court visits, conference and workshops, meetings, interviews in person or by phone and teleconferences. Although focusing on technical issues, user functional requirements were also collected, duplicating previous work.

[15]   Those key features include an enhanced user experience, improved role-based user interface, more flexible and accessible report capability, automated workflow, centralized user registration and authentication, a single centralized and scalable architecture, and improved judge's chambers functions.

[16]   Ibid, page xi

[17]   The Judiciary discovered that successful OTS implementations involved either a great deal of customization to properly meet customer requirements, or that the customer needed to significantly modify its processes to accommodate the OTS product. In the case of the US federal courts, many of the 200 court units would require its own customization (i.e.; no OTS product that was evaluated had the configuration flexibility of legacy CM/ECF, let alone the configuration flexibility that would be required by NextGen). The Judiciary flatly rejected the concept of changing the courts processes to accommodate an OTS.

[18]   The Administrative Office of the U.S. Courts (AOUSC) has a section that developed and maintains legacy CM/ECF and is charged with developing NextGen.

[19]   Except for the appellate courts, as noted above, the full enumeration of detailed requirements will take several more years.

[20]   Many of the NextGen CM/ECF requirement definitions exist only in the code that implements them.

[21]   The new code would be developed using new programming tools, new user interface standards, and the new technical architecture. For example, NextGen employs Java, the Java Server Faces framework, web services and an SOA, and centralized cloud computing integrated into the national JENIE identity management and authorization infrastructure.

Besides giving the users the appearance of stability while delivering new requirements, another advantage of this measured transitional approach is that it avoids the urgency of mass user training, data conversion and other preparations that usually accompany more abrupt, organizationally disruptive, and radical new system implementations.

The initially proposed NextGen delivery schedule specified four to six major releases, in successive increments of approximately 18 months. Since the move from the old to the new is transitional, there is no clear, formal cut-off date for the old, or start-up date for the new. All courts continue to rely on legacy CM/ECF and no significant disruption of existing services is tolerable. The declaration of reaching NextGen is primarily a matter of subjective definition. However, there are two important factors that will determine when that point has been reached: (1) the extent to which users experience a new "look and feel" of the service, and (2) the extent to which new significant and meaningful functionality has seamlessly been delivered.

5. Review of US Judiciary Priorities and Needs for NextGen

Any viable electronic filing and case management system needs a comprehensive and integrated set of capabilities and functions to achieve a fully operational service. Appendix A lists most of these desirable services needed by the courts, litigants, government agencies, the legal and academic communities, and the general public. Different judiciaries will build systems with various levels of complexity based upon their political structures, social frameworks, and the historical and prevailing justice-related practices, needs and priorities, but they will require almost all these building blocks to achieve success.

To some degree, legacy CM/ECF addresses most, if not all, the capabilities and functions listed in Appendix A.[22] NextGen is intended both to fill in the missing and to enhance the limited functionality (for example, judges workspace). Based on the NextGen requirements studies, the NextGen development group at the AOUSC prepared a development plan outlining thirteen functional areas that were prioritized by the federal judiciary stakeholders.[23] The functions to be delivered are: calendar, central sign-on, bankruptcy case opening, workspace, judges review packet, appellate attorney docketing, reports/forms, noticing, bankruptcy claims, bankruptcy order processing, district electronic submission system, district court editing, and district court data exchange. These functions primarily focus on chambers and judicial needs, simplifying access and exchange of information among individuals and organizations, and providing better ad-hoc reporting tools.

Using the building blocks listed in Appendix A as a reference, the following section reviews the type of changes and new capabilities NextGen anticipates, and the obstacles or issues that NextGen has confronted or may yet confront.

5.1 Access Control

Legacy CM/ECF allows each court to regulate who had filing CM/ECF privileges, but a companion application, Public Access to Court Electronic Reports (PACER) was implemented nationally. CM/ECF and PACER accounts were maintained separately. Approximately 50% of trial attorneys who practice in federal courts litigate in more than one federal jurisdiction. As a consequence, they are required to maintain multiple credentials, one for each federal district or circuit in which they practice.[24] Legacy CM/ECF also has multiple levels of restriction and controls for access to basic case information or documents, depending on the (i.) user's role (judge, lawyer, or public), (ii.) the specific court, (iii.) the specific case, and (iv.) the type of docket activity. Generally, case information and documents are available to anyone, but the court or judicial official can activate various content restrictions either temporarily or indefinitely based on specific factors relating to the administration of justice.

One of the highest priorities for NextGen is to provide a central (national) sign-on (CSO) that permits an individual to maintain a single set of credentials for access to automated information services, regardless of the number of jurisdictions in which the individual practices. Where the original objective was to simplify access for practicing attorneys that objective has been expanded to extend this single credential for all authorized court personnel. This centralized registration service also maintains contact information, such as mailing and e-mail addresses, telephone and firm name/address changes. Each court still retains control of who can access what, and who may electronically file with the court. The CSO objective is to coordinate all user accounts, thereby increasing accountability and security and requiring a one-to-one correspondence between the individual user and NextGen CM/ECF activity.[25] This new module will assist in ensuring that sealed cases and documents are only accessed by authorized personnel. It also will impose access restrictions to help remove any lingering concerns about security among some judicial officers.

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[22] For more details, see pp. 3-6, www.iaca.ws/files//journal-eighth_edition/greenwood_bockweg-efilingsystems.pdf
[23] *"CM/ECF NextGen: Development Plan and Preliminary Estimates for Release 1 and 2",* AOUSC, May 17, 2012.
[24] The thirteen US Courts of Appeals (appellate) have a central sign-on in legacy CM/ECF.
[25] In legacy CM/ECF, a substantial number of users shared user identifications. CSO will prohibit any sharing.

CSO is included in the first release of NextGen, but it is very complex. While the concept of a centralized national account is a good idea, particularly for non-court personnel, many technical problems have emerged as a consequence of providing access authentication to judges and court personnel using the Judiciary's JENIE infrastructure; the extensive security requirements; the dependencies among multiple servers and environments used to implement the required functionality; and the varying and differing rules for attorney filers among the courts.[26]

5.2 Calendars & Schedules

Legacy CM/ECF provides very limited calendar or scheduling capabilities.[27] Because there was little agreement over mandatory functionality or what product was 'best,' most courts have implemented their own multiple partial calendars to keep track of various case and trial activities.

A new Calendar module is a high priority for NextGen. Analysts investigated acquiring a commercial calendar product that could be sufficiently modified to meet court needs. However, no commercial product could be identified that could adequately manage all calendaring and scheduling requirements required by the federal bankruptcy and district courts.[28] Instead, the AOUSC leadership decided to build a specialized calendar module in-house. The challenge is develop a comprehensive integrated calendaring program for NextGen that incorporates court, case and other information but also identifies and verifies availability for all participants of a particular court event.

A totally customizable calendar would permit each judge and chambers staff member to create multiple calendar views (e.g., by date or date range, by case, by type of activities)[29], and to control the level of access to a judge's calendar by staff members.[30] In addition, a mobile application will permit judges to import calendar information such as personal activities into the NextGen calendar. Any generated calendar can be saved, electronically transferred, or printed, depending on personal and court needs.

NextGen calendar enhancements are expected to be addressed in a later release such as an alert function that can notify judges and court personnel of last-minute filings either during or shortly before a hearing or proceeding begins.

5.3 Case Processing/Management

Legacy CM/ECF emphasized the electronic processing and management of all activities related to a case and the electronic docketing of these entries into the court's official docket report. When possible, the originating submitter, such as the judge, deputy clerk, or lawyer, personally entered information into the system. Entries were automatically filed and disseminated, in most situations, to all parties in the case.

NextGen expands management capabilities beyond the individual case. It encompasses more sophisticated monitoring of case management for the entire judge's or court's caseload so that court resources (time, personnel, and costs) are managed more efficiently. In particular, NextGen expands upon status and tickler reports, more sophisticated pending motions reports of what is due when, and more sophisticated automatic docketing and noticing functionality from routine court orders.

Legacy CM/ECF for Appellate was originally implemented with attorney docketing modules that required the attorneys to download Java onto their computers. Because of vendor differences in supported versions of Java, a technical support issue ensued. NextGen Appellate rectifies this problem by implementing a docketing module more along the lines used by CM/ECF District and Bankruptcy, which do not require Java downloads.

5.4 Chambers, Courtroom & Judicial Support

Legacy CM/ECF offered judicial access to the judge's official case files from any location inside or outside the courthouse. However, the emphasis was on clerk's office productivity and streamlining administrative activities for the maintenance of the case record. For chambers use, judicial staff would extract materials and reports for the judge's review. As judges have become more computer literate and have come to rely on the system, they have requested additional computer resources and more comprehensive access to various case materials oriented to their judicial needs, e.g.; multiple

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[26]   Creating a shared code base for all three types of courts who have diverse business and processing requirements has also proven challenging.

[27]   Legacy CM/ECF allows each court to generate case-related events and activities in a calendar.

[28]   Legacy CM/ECF had already developed for the appellate courts a specialized paneling and scheduling system.

[29]   NextGen provides various filters (selection criteria) to limit the number and type of calendar entries and control the content that the judge or staff needs to view at a particular time. Legacy CM/ECF calendars were sometimes overwhelming with too much information.

[30]   NextGen provides each judge with the ability to schedule non-case related activities, and to restrict access at various levels of refinement to the judge's calendar.

screens at the judge's bench, attorney's tables, jury area, remote access to judge's laptop and home computers, networking to staff while on the bench or travelling, and remote electronic filing functionality for opinions and decisions.[31]

Four new NextGen modules, Calendar (see above), Judge Review Packets,[32] Workspace, and Business Object reports (see below), were specified to respond to these judicial needs.

NextGen will not modify the basic filing and case and document management services it currently offers. However, a specialized module, Judge Review Packets, has been developed to improve document and case activity workflow among chambers staff. Using rules specified for each judge, the module allows related documents in one or more cases to be packaged into electronic folders. This module, integrated into a general workload manager and rules engine application, will expand judges' ability to more efficiently access the needed case and court information and to effectively distribute work activities and the preparation of judicial orders and decisions among support staff.

NextGen also provides an enhanced interface using Workspace, including a dashboard[33] that can be personally customized to enable judges and court staff to display various NextGen functions on the same screen.

5.5 Data Exchanges & Case Transfers

Legacy CM/ECF allows other government agencies to extract court information primarily on a case-by-case basis using PACER. For a few agencies, a data extraction program operated nightly providing basic case data for each case. In recent years, CM/ECF has incorporated XML coding into the CM/ECF database.[34] Within the court community, other organizations such as pre-trial services, probation, and financial services are not electronically integrated, thereby requiring duplicate entry of case information into other databases. Various court forms were modified to contain XML coding for more reliable and accurate transfer of data both into and out of CM/ECF cases. A substantial number of cases are transferred between trial courts, and trial courts electronically forward files of cases on appeal to the twelve courts of appeals.[35] Presently, courts can review and extract case information and documents from the originating court's CM/ECF database for entry into their database.

Although delayed until later releases, the expectation is for NextGen to allow government agencies and courts to automatically transfer critical case data between the courts and agencies using XML data interchange standards, thereby eliminating duplicate data entry and providing more timely accurate information. Major obstacles to this goal are the various legislative- and executive-branch laws, policies, and regulations that could prolong and delay implementation.[36]

5.6 Filing, e-Forms & e-File

Legacy CM/ECF implemented electronic case filing and case files for all lower courts in the federal system.   Forms could be filed as ordinary documents, but the information on the forms would have to be entered separately.   To facilitate bankruptcy case opening for attorneys, a case upload feature was implemented that allowed data to be uploaded as a separate file along with ordinary documents to minimize manual data entry.

NextGen plans to offer extensive electronic filing and on-line forms to two large groups of bankruptcy litigants: individuals representing themselves – see the Self-Help and Pro Se section below – and parties required to file claims in bankruptcy litigation.   Forms have been designed which allow for XML data to be embedded in the documents. This functionality enables the filed documents to be processed electronically and to extract the data without requiring manual data entry.

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[31]   These tools are also known as electronic bench (e-bench) which has already been adopted in many US federal trial judges courtrooms and chambers.

[32]   Judge Review Packets is a specialized on-line program that permits each judge to automatically customize – also with manual overrides -- the collection of related documents, case information, status and ticklers, and personal notes, for easier review and decisions. This module can also establish workflow routines among designated chambers staff based on the type of docket and document submissions for a case.

[33]   Dashboards are screen interfaces that may look like an auto dashboard with different segments of the screen displaying different sets of information.

[34]   Extensible Markup Language (XML) has come into common use for the interchange of data over the Internet; it defines a set of rules for encoding documents and data in a structured format which is readable by both humans and machines. Various industries and organizations have established XML standards for the automated exchange of information among disparate organizations and databases.

[35]   US federal courts handle multidistrict litigation (MDL) cases where civil actions involving one or more common issues are pending in different districts are consolidated to be handled by a judge in one court for pretrial and discovery. Every year, there are thousands of cases and case files transferred among the district courts, and between the district and appellate courts.

[36]   For example, the bankruptcy courts have well-defined forms required for initiating a new filing. However, major legislative changes to bankruptcy rules, new data collection requirements requiring changes to case management database structure, and revised paper forms have substantially delayed the introduction of these capabilities.

5.7 Legal Research

Legacy CM/ECF provided simple linkages to national and international commercial databases[37]; hypertext links to other case documents stored in any CM/ECF database can be included in the case documents.

NextGen implements a mechanism that converts pure-text legal citations in any electronic document to Internet links to major on-line legal publishers.[38] This feature will only be enabled for judiciary users, and it will be used primarily by judges and law clerks.

5.8 Reports, e-Queries & e-Analytics

Legacy CM/ECF offered every court a substantial variety of reports with various selection criteria.[39] However, each jurisdiction decides which reports to offer their personnel and the public.[40] For special or ad-hoc extraction of case information, a commercial reporting tool was provided to each court.[41] For decades, a substantial amount of case information - particularly when a case is opened and closed – has been transmitted by the local jurisdiction to the centralized AOUSC Statistics Division.[42] CM/ECF provided the capability to more efficiently and accurately transfer that statistical information electronically.

Many courts were disappointed with the commercial ad-hoc reports tool provided in legacy CM/ECF because it required special expertise and IT staff assistance to prepare the reports. Court officials demanded a NextGen reporting tool that allows non-technical court personnel to produce specialized reports, provides easier and faster production of court-wide or nation-wide reports, and possibly offers graphic presentation of information, particularly for case management reports. To reduce costs and streamline overall national data collection and statistical reporting, the AOUSC also decided to create a national enterprise data warehouse (EDW) for all the courts and central administrative services. All national and ad-hoc reports will access the EDW.

The AOUSC selected a commercial report package, Business Objects, with the expectation that it would be simpler, faster, and more flexible to use. To demonstrate the combined capabilities of Business Objects and EDW, three heavily-used reports were programmed.[43] To date, the testing results have been mixed. The reports have superior flexibility in the customization of the final format and presentation of information. However, there are several problems: the reports take substantially longer than comparable legacy CM/ECF reports, and the creation of an ad-hoc report still requires too much training and technical expertise for judges or chambers staff.

5.9 Security

The physical architecture of legacy CM/ECF was primarily guided by security concerns: first, separating the external Internet side of the system from the internal secured court side, and second, ensuring that the Internet side could not access the private court side unless specifically allowed by the system. This security architecture, at least to date, has been very successful; notwithstanding thousands of attempt to 'hack' CM/ECF, none have been successful.

While NextGen employs the basic external/internal architecture, the mechanism for transferring data between the external and internal is different, taking advantage of the service-oriented architecture of NextGen. The goal is implement security that is comparable to legacy CM/ECF but offers better performance and greater flexibility. The security picture has changed since legacy CM/ECF was first designed. Internal attacks are becoming more common; these hacking attempts originate from the secured court network side, initiated either by trusted persons or through previously successful attacks from within the secured court side, and preventing them must be addressed.

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[37] For many decades, two commercial legal databases (Lexis/Nexis and Westlaw) have had agreements with the US courts to provide all U.S. federal courts full access to their data bases.

[38] This feature was originally developed for appellate courts by a court employee in the Court of Appeals for the Fifth Circuit.

[39] There are over 150 standard national reports and queries provided to the US courts, but each court decides which reports to offer their personnel and the public.

[40] A common problem is that not all courts offer the same set reports to the public. For example, the docket activity report is not offered by five district courts, and the judgment index is not offered by 11 district courts.

[41] Crystal Report Writer was provided to each court's technical staff.

[42] These are known as Judicial Statistical Reports; for example, A JS-5 report is submitted when a case is opened, and a JS-6 is submitted when a case is closed. This information is used to generate the Annual Report of the Director of the AOUSC which includes statistics of the business of the U.S. Courts.

[43] These were Standard Docket report for appellate courts, Aged Motions report for district, and Docket Activity report for bankruptcy.

5.10 Self Help & Pro Se

For pro se filers, most courts presently restrict or prohibit opening cases and initiating docket entries for documents or actions on-line. Presently, pro se users either enter case information electronically at the courthouse or mail their paper filings which, on receipt, are entered by court staff.

NextGen extends the case upload functionality of legacy CM/ECF bankruptcy by implementing the filing of data-enabled bankruptcy forms. NextGen incorporates an electronic Self-Representation (eSR) module, which permits individuals without legal representation in bankruptcy proceedings to efficiently and accurately complete electronic filings and submit them to the court. The bankruptcy forms have embedded XML NIEM-based tags that allow automated data extraction from the uploaded forms, reducing manual data entry on the part of both the filer and the courts. Providing eSR is a high priority objective, but unfortunately recent federal procedural rule changes, major mandatory modifications in the design of the forms and new requirements to add additional case information have forced a significant postponement in the timetable for development of this module.

6. Key Technology Strategies

Several key technologies are being implemented in NextGen.

6.1 Centralization

By far, the most radical change from legacy CM/ECF is the move to centralization. Since the early 1980s, the federal courts' case management systems have run on computers located in the courts; the courts were responsible for running those computers. NextGen will be centralized; all computing resources and applications will be centrally located, and responsibility for the physical operation of the systems will rest with AOUSC IT support staff, although the courts will still be responsible for the installation and operation of applications themselves. Court users will access the centralized systems via networks.   Although the concept of centralization had been suggested to the courts before, the courts had vigorously rejected the idea; however, severe budget crises have since forced them to reconsider. By taking advantage of economies of scale for hardware, software and staff, enormous cost savings can be achieved. There are risks to centralization if AOUSC central staffs fail to deliver the same level of service and reliability individual courts have historically provided. To ameliorate the risks, the AOUSC created two data centers (roughly east and west) with the load balanced between them. If one center crashes, the safety functionality of the overall system transfers all functionality to the other center. In addition, the national DCN, secured court system network that connects the courts to the centralized systems, was augmented with alternate circuits that more than doubled the bandwidth while adding to the reliability of the communications infrastructure.[44]

Another advantage of centralization is the ability to share hardware and software resources. The centralized data centers have been configured to allow for cloud computing: on-demand network access to a pool of shared configurable computing resources. Rather than each court operating its own physical computer server and associated resources, computing resources are accessed through and provided as needed from the cloud. Each court appears to have its own resources (sufficient capacity to handle the work and securely isolated not only from other courts but from uninvited external intrusions), while the physical computers and resources are collectively shared.

6.2 Architectural Design

On the software side, a Service Oriented Architecture (SOA) is employed to further facilitate sharing.[45] SOA provides a very flexible way to share computing resources, as well as scale performance (more than one instance of the service) and handle failure modes (redirect service calls from failed services to alternates).   SOA has the potential to achieve significant savings.[46]

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[44]   The original DCN was built using network services from national and local phone carriers. While studying how to improve network reliability, it was noted that most network outages were due to failures in the *local* carriers' facilities, not the long-haul network, nor the 'last mile' physical connection to AOUSC or court facilities. The solution to improved DCN reliability (along with bandwidth) was to contract with an independent network provider, particularly bypassing the local phone office.

[45]   A SOA allows loose coupling between software components so that a single service (e.g., take data and format a report) can be shared by multiple users. Since the exchange of data from user to service back to user uses a network, the caller of the service and the service do not need to be on the same physical machine; in fact they do not need to be in the same data center.

[46]   For example, if NextGen were decentralized, the cost of a commercial data formatting library would have been more than $1.5M for 200 local copies. Centralized, NextGen only needs 4 copies (two per site), accessed as services.

6.3 Data Warehouse
Another shared service is ad hoc reporting. NextGen employs a rather novel approach for a subset of its reports. In real time, data is transferred from a transactional database to a data warehouse. Reports can then be run against the data warehouse using a report writer or other business process tools.

6.4 Programming Language
There was a paucity of programming languages and web library options for web development when CM/ECF was first conceived (circa 1994). Today there are many, with NextGen being developed in Java and using several libraries and frameworks. CM/ECF demonstrated that open-source software was a viable alternative. Most of the software development tools are open source, but have commercial support, e.g., RedHat. Other purely commercial software libraries, e.g., the database, are employed where there is no proven open-source alternative.

6.5 Application Development
As noted earlier, the approach to developing NextGen was largely "waterfall" which entails (1) collect requirements, (ii) go away and code, and (iii) then deliver to user. Even with a great deal of involvement with users and other stakeholders, there remains the risk that what is delivered is not what the user expects. NextGen has adopted an "agile development" approach to minimize that risk.[47]

6.6 Data Exchange
Because of the high priority of system integration, a data exchange standard based on NIEM (National Information Exchange Model)[48] was implemented; deploying NIEM is mandatory for exchanges outside the Judiciary and recommended for exchanges within the Judiciary. The NIEM standard was extended to allow for Judiciary-specific data. A standard for filing data in bankruptcy was published based on forms and NIEM mark-up data. The eSR pro se filing system was implemented using NIEM mark-up. The NIEM-based bankruptcy forms allow data to be easily extracted from the filings for additional processing, for example, verifying whether filers are eligible for a particular class of filing based on information that they submit.

6.7 Access Control
In spite of the decentralized nature of the Federal Judiciary, many court and public users use NextGen services from several courts. For legacy CM/ECF, a filing attorney must register with each court to obtain access to CM/ECF. PACER users, by contrast, have a centralized registration and authentication scheme. As discussed earlier, NextGen implements a unified registration and authentication system for all court, attorney and PACER users that eliminates the multiple registrations requirement.

6.8 Experiments
Before committing itself, the NextGen project experimented with various technologies that were not as mature, or "not sure things." Besides experiments that proved the above-employed technologies, the NextGen project experiments reviewed business process rules engines, web portals, user interfaces, national text search, mobility, and data and system integration standards. Several experiments reviewed how to reuse software, particularly how to leverage the existing legacy CM/ECF code base for NextGen.

7. Commentary
At the time of this writing, NextGen is still under development. The initial proposed release includes only a small proportion of the functional requirements collected since the project started in 2009. What we have seen is impressive. But it is too early to proclaim NextGen as a completed system. However, we can review the processes and plans that have led to the first release.

7.1 Schedule
The NextGen project is at least two years behind its original schedule. Like most very large projects, parts of the original plan have been tossed aside and milestone dates have been revised. Some of the adjustments are normal to any large project; most, however, represent serious management issues that have adversely affected the project and pose a serious risk to its eventual completion.

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[47] The value of the "agile development" approach was highlighted when in final testing a module of Workspace, developed using the waterfall method, was rejected; this after going through requirements collection, several functional reviews, implementation and implementation reviews, and mock-ups. Workspace is being revised using an agile approach.

[48] NIEM, an XML language, is a United States data exchange standard developed by the U.S. Department of Justice in cooperation with Federal, state and local governments for the exchange of justice, law enforcement, public safety and emergency information.

7.2 Size of Project

In the application development business, big is bad. Big projects have a notorious history of failures. Because NextGen qualifies as an enormous project that entails significant, potential for failure, concern within the federal courts' IT community about the technical viability of NextGen is mounting.

Big projects require a significant investment of time and effort during which the need for changes and modifications to initial plans is virtually inevitable. The entire process can be complicated by other unrelated changes such as reshuffling the larger organizational framework within which project development transpires.

A key task of the analysis phase is sizing the project. The developers used an ad hoc methodology based on their experience with adding modification requests (MRs) and extending legacy CM/ECF. Unfortunately, creating a new system like NextGen with a different architecture, different development tools, and different technologies is enormously challenging. Those planning the development schedule failed to take that into account, resulting in a gross underestimation of the magnitude of the project. The technical term for project planned and undertaken with schedule and staffing projections that either discount or are oblivious to the actual size of the project is "Death March".[49] It is a testament to the NextGen development staff that they have achieved as much as they have under these constraints. The problems with Death March projects are the follow-on activities; the staff is mentally exhausted and may lack the motivation and the interest in completing post-implementation enhancements, adjustments, and modifications.

7.3 Reorganization

In the course of the NextGen project but unrelated to it, the AOUSC underwent major top-to-bottom organizational restructuring. An entirely new organizational framework for the systems development function was created comprising half a dozen new branches. Simultaneously, the existing systems development organizational structure was awkwardly inserted into that new framework. Highly cohesive and well-functioning teams of IT specialists were broken up, responsibilities and authority redistributed, and job assignments modified. The reorganization was mandated in 2013 and as of the second quarter of 2015, key managerial positions remain staffed with temporary incumbents; developers cite difficulty in determining who is responsible for what. The impact of the reorganization, coupled with an unrealistic project completion schedule, has culminated serious staff morale issues and the loss of several key managers, developers, and analysts. Given the importance of NextGen, it is surprising that senior management did not consider the impact of the reorganization of the systems development function on viability of completing NextGen.

One of the goals of the AOUSC reorganization was to do away with the 'stovepipes' that had evolved over time, hampering coordination and communications between AOUSC offices. Ironically, the coordination and communications appears to have worsened rather than improved as a consequence of the reorganization. Staff reshuffling and redistribution of responsibilities has fractured both formal and informal staff communications networks and diluted institutional knowledge and expertise across the scope of the new organization, replacing highly experienced incumbents in pivotal positions with newly hired outsiders. Furthermore, the loss of highly competent professional career staff as a consequence of the reorganization has resulted in the AOUSC forfeiting the collective benefit of centuries of institutional knowledge and experience.[50]

As a by-product of federal budget sequestration,[51] the reorganization resulted in a significant reduction in the total complement of Judicial Branch employees, including those at the AOUSC. As a consequence, the development of NextGen is substantially being undertaken by contractors. Contractor turnover is common. Because expertise in new technologies is important to contractors, contractors do not usually stay long at a job but regularly seek out new opportunities involving new technologies. The consequential loss of continuity negatively impacts productivity.

Development has also been hampered by the challenges of working with of a new distributed architecture and several untried technologies. Responsibilities for various parts of the distributed NextGen are spread across several organizations which must be integrated for the full system to work. As noted above, in spite of the reorganization to effect better cooperation, stovepipes and inter-organizational mistrust are still present. The lack of good coordination is particularly evident in difficulties implementing new and complicated technologies, such as central sign-on and the data-warehouse-based reporting facilities, all of which involve multiple organizations.

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[49] See Edward Yourdon's book: *Death March: The Complete Software Developer's Guide to Surviving 'Mission Impossible' Projects,* *Prentice Hall, 2005*

[50] Key staff replacements have largely come from outside the Judiciary. As one of the authors noted, the success of legacy CM/ECF is primarily because the project staff had extensive experience working for the Judiciary.

[51] In 2011, the U.S. Congress mandated severe automatic budget cuts (sequestration) if certain budget negotiations failed; they failed, so the 2014 U.S. Government (and Federal Judiciary) budget was significantly reduced.

NextGen is being delivered as a centralized service. As noted above, this is intended to save a great deal of money and reduce the staffing load on the courts. However, a side effect of centralization is the centralization of responsibility from the courts and their local staff back to the AOUSC, a reality the latter does not seem to fully grasp. We would expect a much stronger customer-service orientation designed to ensure that the centralized service is at least comparable to the services provided by local staff to their courts.

7.4 Defining and Development of Functions

The NextGen project chose the "waterfall' model for development: collect, analyze, implement, integrate, and deliver requirements. The requirements collection phase spanned more three years, orchestrated by teams of analysts and court staff. During collection, requirements were neither fully evaluated nor prioritized; there was no formal systematic process. There was relatively little involvement of the implementation team. The result is that the individual requirements collected, ranging from the trivial to extremely complex, were not in a form that the implementation team found useful or particularly informative. The requirements needed to be revised, reanalyzed and merged because the three categories of courts generated separate requirement using different document formats. There was also no feedback to the analysts and court staff about the feasibility or cost analysis of the requirements. The result of the requirements collection phase was a list comprising more wants than carefully vetted and defined requirements[52] that could be used directly by the implementation team.

7.5 Non-Court Participant Needs

Litigators and other non-court stakeholders external to the Judiciary did participate in the requirements definition process for NextGen. For those involved in litigation in multiple jurisdictions, the Central Sign-On module is highly desirable. The expansion of electronic XML-embedded forms for self-help filings and automated docketing from bankruptcy forms will also be much welcomed. The other major concern for non-court government organizations, litigators, and the public is the substantial variation in local federal district judicial procedures, rules and practices. Courts maintain local discretion in local rules and procedures, but litigants and the public want greater consistency across jurisdictions particularly in the use of terms in docket entries, screen prompts, or reports,[53] all of which most courts are adamantly opposed to. The Judiciary has not commissioned any studies nor proposed any national standards to alleviate any of these problems.

7.6 Technology Issues

On the technology side, there have also been challenges. Some relate to understanding the inevitable idiosyncrasies of the new tools and technologies. In some cases, the technologies have simply not worked well.[54] The technology experiments weeded out some problematic technologies before the project depended on them, but some fragile technologies were included because of the need to integrate infrastructures. Tying disparate technologies together is hard, made all the harder when cooperation issues arise.

By far the biggest technical problem has been the lack of real system architecture: a description of the whole system in terms of its parts and their relationships. With such a large implementation staff working in different organizations on different phases of the project, understanding how things fit together is essential. There are fragments of system architecture and documentation, but nothing describes the whole. The consequences of such a gap were evident, for example, in the difficulty of finding the source of a failure because the operations staff responsible for fixing the problem was unaware of the existence of a network service component that had failed. The consequences will also be felt when the project implements additional components designed to interact with the existing system.[55]

This lack of architectural planning is particularly observable in the absence of core functions, such as a general application program interface (API) which would allow access to, and filing of, documents, and the setting of case data

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[52] In the technical sense, a requirement is a well-defined, testable specification. Many of the wants collected were technically vague, such as 'as fast as possible' or 'user friendly' or "kitchen-sink" specifications such as 'user defined report writer.'

[53] There is little consistency among courts is how party names, types of documents, or abbreviations are entered into the official dockets or indexes, nor consistency in which national reports are offered in all jurisdictions. One of the goals of NextGen is to concentrate court differences in locally defined tables and database entries creating a 'veneer' covering a set of standard components shared by all courts and court types. This provides some degree of consistency across courts and simplifies the support issues for AOUSC developers, but not to the degree desired by external users.

[54] A commercial product procured to replace some open source products has been a major source of bugs and performance issues.

[55] The importance of starting with an overall architecture cannot be over-emphasized, especially for a large project whose development spans several releases over several years. If there are not at least rudimentary considerations of what modules will be implemented and how they will interact with other modules, it is almost certain that significant rewrites of existing modules will be necessary, incurring costs and project delays.

(such as schedules) by users without knowing the details of system implementation. Such an API would allow the AOUSC to greatly expand the number of people who could use and expand NextGen.

A large number of technical APIs have been implemented for internal use, to facilitate the transition from legacy CM/ECF to NextGen, but no general APIs have been created to handle docketing and user-level data access. This lack of APIs severely limits even AOUSC developers; for example, there is no general API to implement user docketing from inside the Calendar module; the user must leave the program and bring up a different interface.

8. Conclusions

8.1 US Federal Courts NextGen Project
Any significant court system automation project entails risks. Upgrading and modernizing well-established automated court case management and e-filing systems can be a formidable undertaking. The circumstances related to the US federal courts NextGen – huge number of new requirements, potentially unrealistic user expectations, concurrent massive AOUSC reorganization, substantial staff turnover and retirements, implementation of new software tools and commercial products – are indicators of uncertainty and substantial risks in the progress of NextGen.

It is surprising that, except for the Appellate attorney docketing module, there has been relatively little pressure to deliver NextGen sooner rather than later. In one sense, this is a testament to CM/ECF; even in its current state, it largely meets the needs of the courts. In another, it perhaps is the realization on the part of the courts that a system with 10,000 new requirements, even introduced over 4-6 releases, would be too difficult to quickly incorporate into a judicial system that is known for its measured approach to change.

NextGen is a work in progress. The Judicial Branch has taken some steps to address the challenges described above; more should be done. Then, too, there is the question of whether the misdirected realignment to date of the development organization and its talent pool can be remediated. We are concerned that insufficient attention is being paid to this component on which the success or failure of so much of the project rests.

8.2 Electronic Case Management & E-Filing Projects
The NextGen project as it stands now does offer lessons to anyone considering implementing an electronic case management and e-filing project:

- maintain organizational stability: don't massively reorganize; don't break-up development teams; value institutional knowledge during major development phases
- watch out for the common causes of project failures: such as underestimating project size and complexity; unrealistic schedules; untried technologies; accepting vendor promises, excessive budget increases, development staff turnover
- let users define the requirements that the users see; the developers should be allowed to define the rest; involve all types of users; in particular those who actually need to use the service.
- manage requirements: differentiate between user 'wants' and real requirements; manage user expectations; don't be afraid to say 'no' (or at least 'not yet'); don't try to implement all the requirements all at once; prioritize; agile development works better than grand design or waterfall techniques
- make sure there is real and continuous communications between all the analysts, developers, implementers, support teams and other players; avoid stovepipes; a detailed architecture design is essential here
- understand the advantages and risks of employing new technologies and new ways to deliver services; but manage those risks
- encourage national and international data and document exchange standards
- failures are normal, plan for them; commercial products are not automatically superior to open-source or locally built software.

Our intent in sharing this ongoing narrative of the development of a successor system to the highly successful CM/ECF system is to raise awareness, both nationally within the U.S. and internationally of the perils and risks associated with enormous enhancement and modernization projects, even in a country such as the U.S. where automated systems are among the most highly developed in the world.

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Appendix A: Building Blocks for a Case Management & E-Filing System

Access Control (Restrict access by court, case, case type, case participant or role, case docket entry or document such as single sign-on)

Attorney Services (Offer attorneys case management services and/or court data that can be integrated into attorney/firm system)

Calendars & Schedules (Display the court hearings & calendars to litigants and public; integrated with scheduling of cases and personnel)

Case & Document Management, **Index**, **and Search** (Electronic storage, indexing, search and organization of case documents - typically PDF-text or PDF-image - to appropriate cases, filings, events, and statuses)

Case Initiation (Electronic submission and acknowledgement of new case filings and payments into the court case management system (CMS); integrated with electronic filing)

Configurable Tables (Permit each local court to configure system to conform to local practices and processes)

Case Processing/Management (Electronic docketing and process from case initiation through case closing, such as automated docketing and review, event workflows, work queues, scheduling, report generation, electronic notifications and notices, payment processing, and indexing and linking of parties, docket entries and documents)

Chambers, Courtroom & Judicial Support (Judge's virtual desk/bench for chambers, courtroom, home, off-site; access to all resources that support the judicial officer's decision-making process including flexible data presentation)

Court Services (A directory that provides various information and related court services to the public (e.g. certified copies, electronic record checks, transcripts, contact information, etc.)

Data Exchanges & Case Transfers (Data to/from law enforcement, motor vehicle, and other government agencies, other courts, and high-volume litigants using industry standards such as XML, PDF, and NIEM)

Filing, e-Forms & e-File (Capability for attorneys, self-represented litigants, and other participants to electronically file, access case documents, receive notices and forms, and interact with the court through the Internet)

Full-Text Search (Ability to easily access and view case and document information across the judiciary)

Judicial Automated Assignment & Conflict Resolution (Automatically assign and reassign judges to cases based on random assignment and other factors, to reduce case assignment conflicts)

Mobile (Support for mobile devices, such as tablets and smart-phones, to receive and transmit information to case management system).

Legal Research (Judicial access to commercial, government, and intra-court information and decisions)

Noticing (Electronically generate and distribute court notices using e-mail, text messages, RSS feeds, or social media to parties of case events and updates)

Payments (Electronic payment of filing fees, fines etc. via credit/debit card, bank transfer or other third-party)

Portal (Court, litigants, and public access to case dockets, court files and related court services via the Internet)

Public Access (Make available via dynamic search tools party-case index, public dockets, judgments, and other special reports for public use)

Reports, e-Queries & e-Analytics (Produce standard and ad-hoc (configurable) reports for users such as statistical, service and answer, deadline and scheduling, quality control, attorney/firm, speedy trial, etc.)

Scheduling (Attorneys and litigants can query and schedule court actions on line, as defined and controlled by the case management system)

Security (Protects the hardware, software, and court information from illegal or improper use)

Self Help & Pro Se (Litigants access procedural guidance, create forms and documents via online instructions & samples)

Signature (Allow judges, court staff, attorneys, and parties to sign court documents electronically)

Utilities (Capabilities to allow court personnel to create, edit, modify, link, delete, verify, or track any entries)

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Appendix B: Glossary of Technical Terms

Various technical terms encompassing computer hardware and software are mentioned in this article.

Agile Development – A software development methodology that emphasizes frequent delivery *and software updates* to the customer so they may see how their requirements *[are]* have actually been implemented.

API – An API (Application Programming Interface) is a set of programs that allow programs to interact or act on behalf of one another.

Bandwidth – The volume of information transmitted on a communications line.

Cloud Computing – Computing resources (computation and storage) delivered on demand, like electricity.

Data Warehouse – Computing facilities, data storage and algorithms designed to handle large amounts of data.

DCN – Data Communication Network is the private network connecting all US federal judiciary entities.

Frameworks – Software that provides generic functionality that is customized for a specific application by user written configuration files.

Gadgets (portlets, widgets) – Small application seen in a window or screen that deliver specialized, but independent information (like a clock or a calendar).

JAVA (Java Server Faces) – The Java programming language includes many libraries like Java Server Faces that are designed to make it easier to build user interfaces for web applications.

JENIE – JENIE is the Federal Judiciary's identity and authentication infrastructure.

Load Balancing – Splitting the computation load between two or more computers so that none of the computers are responsible for the entire computing load.

NIEM – National Information Exchange Model (NIEM) is a standard for adding tags to data documents so that individual data elements can be easily extracted and processed.

Open Source Software – A software licensing model which requires that changes to Open Source Software be freely shared.

SOA – Service Oriented Architecture is a software architecture that employs separate modules (services) that communicate using networks.

Stovepipe – An organization structure which restricts the flow of information, inhibiting cross-organization communications and resolving problems.

XML – Extensible Markup Language is a flexible, extensible, and human readable data tagging standard.

Waterfall Development – A software development methodology that emphasizes staged development: requirements collecting, analysis, programming, testing, and finally delivery to the customer.

Web Services – A service accessed using web technologies (e.g. Internet protocols).

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