Navy's DENCAS system centralizes dental records and secures access with smart cards and PKI

The U.S. Navy Medical Information Managment Command (NMIMC) and Bureau of Medical and Surgical (BUMED) saw a need to develop an e-business system to gather Dental readiness and productivity information. The Department of the Navy's Smart Card Office (DONSCO) funded the project because it has the capability to use digital certificates stored on DoD's Common Access Card (CAC). DONSCO, NMIMC and BUMED all worked closely with the private contractor, MAXIMUS, in this one year project.

The system is comprised of a Web-based application with a centralized database. Public Key Infrastructure (PKI) is used to provide non-repudiation of a user's identity with the subsequent permissions structure being database driven. PKI is also used for data transmission. This system, called DENCAS (Dental Common Access System) was designed in Summer 2001, developed beginning in September 2000, and was deployed in June 2001 for beta testing. It is currently being deployed worldwide.

MAXIMUS project management and development staff met with all stakeholders to view the existing business process and to analyze the stakeholders' requirements for DENCAS. A functional requirements analysis (FRD) was created and submitted to the stakeholders for approval. From that FRD, a design document was drafted from which DENCAS development was then based.

Currently DOD is in the process of introducing a Common Access Card (CAC) as a smart ID card. The process is underway to replace all military ID cards with CACs, including reserves, dependents and retirees. This total number of CACs is expected to exceed four million smart cards with as many as 13 million eventually issued.

OPERATING ENVIRONMENT

Prior to DENCAS implementation, Navy Dental patient treatment and productivity data was collected in approximately four hundred (400) standalone databases. The productivity data was sent to a centralized location monthly with the patient treatment data available only to the command from which it was generated. Data being transmitted was not protected by encryption, thus anyone able to intercept it could view it.

Navy personnel are now able to access DENCAS through their normal Internet connection and by utilizing their digital certificates to achieve secure log on. These digital certificates are used to identify the user who is then associated with user permissions stored in the database. A user's permissions allows him/her to enter and view near-real time data to which he/she should have authorized access.

For the first time, corporate users at BUMED and NMIMC have access to Navy-wide patient treatment and productivity data. This capability allows for immediate and accurate determination of US Navy dental readiness, something that once took over a month's worth of data collection and processing to compute.

DECISION PROCESS

DONSCO and NMIMC were concerned about the privacy and confidentiality of patient data being accessed over the Internet. The DOD had previously decided to issue digital certificates to DOD personnel on their CAC IDs because it believed that PKI offers the most effective security available. Therefore, it was consistent with prior DOD decisions to design DENCAS with PKI and CAC. DENCAS provided the opportunity to demonstrate the cost effective use of PKI and smart card technology to enhance the delivery of dental services in the military.

BUSINESS ISSUES

Prior to DENCAS, all patient and productivity data were collected and stored at approximately four hundred individual terminals. The distribution of data both upward to corporate users and downward to customer command users required paper printouts of data. This collection and processing of data was cumbersome, tedious and time consuming, resulting in an end product that was out of date and no longer accurate by the time it reached its recipients.

DENCAS' web-based architecture allows individuals Navy wide to view data that is pertinent to them. At the corporate level, the Director of Navy Dentistry can view patient and productivity data either Navy-wide or drill down to various Navy Dental Commands. Dental liaisons at bases and in the fleet are able to view their unit's dental readiness and obtain a list of individuals who need to be sent for dental treatment or for exams.

In all cases, DENCAS relieves dental clinics of the chore of creating reports. Dental Technicians previously assigned to clerical duties can reduce their paperwork by using DENCAS, freeing them to provide enhanced patient services. Shifting dental technicians from clerical assignments to patient support has not only improved the quality of care, but also enhanced the productivity of this staff.

Further, DENCAS has streamlined the deployment process. By enabling the secure access to dental readiness data, DENCAS has decreased the time needed to deploy troops while increasing the security and confidentiality of patient information.

SMART CARD-ENABLED

Smart Cards are currently used at all Navy and Marine Corps recruit commands with the Smart Dental Information application (SDI). SDI documents dental examinations and stores the information on the Recruit's smart card as well as in a central database. These dental examination data are then uploaded into the DENCAS system. Upon completion of CAC issuance Navy wide, individuals logging onto the system can use certificates stored on the CAC to verify their identity.

APPLICATION DESCRIPTION

DENCAS is a web-based application that resides on a server running Windows 2000 Advanced Server. It uses active server pages (ASP) running on Internet Information Services (IIS). The database is SQL Server 2000.

Data from the approximately 400 standalone terminals are initially uploaded to DENCAS to populate the database and to preserve valuable data that existed prior to DENCAS implementation. Because some dental facilities do not have reliable Internet connectivity, DENCAS is designed to allow users to input data into their existing legacy system and then upload that data when connectivity is available. This provides added reliability to clinics that rely on their local data to operate. For this reason, DENCAS data are considered near real time rather than real time data.

Smart cards are currently being designed to become the new Armed Forces ID card. In the future personal dental information will be carried on military ID cards (CAC) in addition to the recruit cards already in use. The digital certificate issued on the CAC can be used to log onto DENCAS.

IMPLEMENTATION OVERVIEW

In 2000 the concept of DENCAS was developed between the medical professionals at NMIMC and the Medical division at MAXIMUS ITD. During that year the requirements and design were fully fleshed out in detail by NMIMC, BUMED, DONSCO and MAXIMUS.

After this design phase, the development phase began in September of 2000. In June of 2001, the initial beta testing began and in August, 2001 the server was delivered to NMIMC.

This was a very rapid design, development and deployment timeline that has been in keeping with the Navy's Task Force Web, which calls for an 80% solution in five months rather than a 100% solution several years down the road.

PROGRAM MANAGEMENT AND SUPPORT

The project was led by a representative from each of the four entities: NMIMC, BUMED, DONSCO and MAXIMUS.

The program is supported by various entities. Operator training is conducted at NMIMC in July 2001. A Helpdesk Maintenance Contract is being negotiated at this time. Certificates are issued by DOD, in compliance with the DOD Certificate Policy. Smart cards are currently issued at the recruit depots and the Armed Forces Smart ID cards (CAC) are being deployed at this time.

COSTS BENEFIT ANALYSIS

The goals of the DENCAS system were to provide a secure and rapid web based system to review dental readiness and productivity throughout the Navy.

The system was delivered on time and on budget. It has surpassed expectations for security and operability.

DENCAS eliminates many hours of report generation for dental providers, allowing dental technicians to perform their core responsibilities. This will lead to greater productivity and efficiency at dental clinics. Top management at the DOD have Navy-wide clinic productivity information to use for allocation of resources which was never before available at a reasonable cost.

Unit deployability and Dental Readiness information is now in a secure, central database and continuously available for near real time analysis by operational decision makers. This Dental Readiness review was not possible at a reasonable cost previously.

Although no studies have been performed to date determining the specific cost savings of DENCAS over the existing paper and stand-alone dental systems, the anecdotal evidence points to significant time savings and better utilization of staff. Additionally, system users emphasize the importance of using smart cards with digital certificates to maintain the privacy and confidentiality of patient identification.

This solution is in conformance with the security and privacy requirements of the Health Information Portability and Accountability (HIPAA) legislation. The Navy has awarded DENCAS its e-Government Award, citing the enhanced efficiency and security it provides.

LESSONS LEARNED/RECOMMENDATIONS

The active participation by the Medical/Dental professionals with the MAXIMUS team enabled continuous refinement of the system. User involvement was critical to the successful implementation of this system.

Rapid deployment methodologies using emerging technologies such as web applications and smart cards result in far more flexible and usable systems. DENCAS is a prime example of the Navy's new model for IT system development—that is, providing an 80% solution in 5 months versus a 100% solution in 5 years. Due to the volatile nature and rapid pace of technology advancement, a rapid development approach enables a more cost-effective approach to keeping up with emerging technologies.

Use of the smart card and web access to multiple databases allowed secure access to critical data not otherwise available without significant investment of manhours.