

1. Nominee Information:

Headquarters Air Mobility Command, Data Integration Branch (HQ AMC/SCTI)
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2. Organization submitting the nomination: Same as above

3. Business Summary:

In the early 1980's the Air Mobility Command (AMC) began automating its Command and Control (C2) functions to simplify business processes. As these systems matured it became apparent that by consolidating and sharing data between these systems AMC could create a more efficient and interoperable C2 environment. From this need, AMC developed a strategy through data management to accomplish the goal of consolidating and sharing data. For AMC, data management meant providing the right amount of controls and the right freedom from controls to ensure data timeliness, accuracy, consistency, and synchronization across an enterprise and allow for rapid innovation and fielding of new functionality to meet operational needs.

To accomplish this task, AMC instituted five data management initiatives:

1. Measure performance and analyze deficiencies of C2 data exchanges.
2. Document shared data requirements and related business rules of C2 data exchanges.
3. Centrally manage and distribute enterprise reference data.
4. Institute an effort to identify and document AMC's enterprise data requirements.
5. Gather and validate business rules for the enterprise.

The Program Integration Office began our data management efforts with the first three initiatives in the early 1990s. Each initiative went through varying stages as we analyzed the data and refined the processes. For the first initiative, we used existing capabilities to establish measurement points and in 1996 began capturing data on the C2 data exchanges. The two main areas of analysis were effectiveness (did the message get through without being rejected by the receiving system) and efficiency (how long did the update take across the C2 environment). The Command created an enterprise data quality management team that publishes monthly reports on the causes of message rejections and ways to reduce or eliminate these rejections. The functional managers used these reports and analyses to focus training resources. The system managers began making targeted changes in reference tables and instituted system validation of data entries.

For the second initiative, AMC began to document the content and mechanics of the data exchange between the C2 systems. AMC published the first C2 Interface Design Document (C2IDD) in 1992. This first C2IDD documented what exchanges existed between the systems. It has expanded to detail the structure of the transfer with specifics on data size and format for every data element as well as a description of all the constraints and business rules related to the data included in the transaction.

For the third initiative, the AMC/SC staff began work in 1994 on the Table Management Distribution System (TMDS). The TMDS program had two main goals: (1) to centrally manage AMC's reference data (common data elements used by multiple systems), and (2) to implement a synchronized distribution of this reference data to AMC C2 systems. In the summer of 1995, AMC began distributing reference data in a flat file format for all systems to load at a designated time. The summer of 1996 saw the implementation of an automated distribution process that applied the reference data changes to AMC systems. This automated distribution reduced the time required for distribution of reference data globally from two weeks to fewer than 30 minutes. Today, TMDS distributes over 600 reference data elements to 12 C2 systems with an average of 75 tables per system.

As measured with metrics, the institution of TMDS standardized reference data resulted in dramatic improvements in interoperability. Before implementation, the monthly message reject rates between C2 systems ranged from 20-50%. After implementation, rates fell to a consistent rate of 8%. Today, more than 5,000 customers worldwide process over 207,000 messages monthly using AMC C2 systems. The combination of managed reference data and managed interfaces have reduced the reject rate to 1.17%.

For the fourth initiative, AMC began work to implement DoD data standards in 1993. In order to accomplish this goal, AMC began building an enterprise logical data model (LDM) based on the data centric business rules of the organization. This was quite a challenge in itself due to the variety of data required by our functional community; some of the areas we now support are: aircraft inspections; flight planning; cargo, mail and passenger movement and its subsequent billing; commercial airlift augmentation, airlift operations; air refueling operations; and data management.

To assist in documenting the AMC LDM, a metadata repository was created that was consistent with the Defense Data Dictionary System (DDDS). The dictionary houses data definitions, types, sizes, and domain values. AMC also provides a third-normal form (3NF) transformation data model (TDM) to aid developers in implementing the data standards. AMC's goal is to develop systems that are based on enterprise standards. Subsequently, AMC systems will provide standard data that can be easily exchanged without need of translation. The product of this effort will be realized over the next several years as AMC's core systems implement the standard structures. The Global Decision Support System (GDSS II) is scheduled to make a compliant release in the first quarter of FY04 and Global Air Transportation Execution System (GATES) is scheduled for a compliant release in the first quarter of FY06.

Part of the Command's efforts is to continually assess the data and determine ways to improve data quality for the warfighter. One of our newer initiatives, started in 2001, is our business rules repository. AMC's rules are captured in many places: some rules are documented in an

enterprise manner such as in the C2IDD or LDM; however, many rules are captured in system specific documentation, if documented at all. This situation leads to inconsistent implementation of business rules across the enterprise. The business rules repository provides a starting point for users and developers to understand the common practices and governing rules of the enterprise.

In addition, the Command recently expanded its metrics program to include capturing and analyzing data for AMC's Fusion Cell, which now provides senior leaders improved intransit visibility into the movement of passengers and cargo on AMC missions. The C2IDD has been expanded to include transportation and financial systems, and is now the AMC IDD. And the Data Integration Office recently began an effort to analyze the lifecycle of the Command's data in order to institute tighter controls on who can create and update the data as it flows from planning to mission execution to archival. Ultimately, "the purpose of data and information management is to enable problem solving and decision making."¹ AMC continues to build upon its data management efforts to supply the right data to the right person at the right time.

¹ A quote from the Air Force Enterprise Architecture, Data Information Reference Model.

4. Technical Summary:

The Data Integration Branch has developed and/or used a number of tools to help us implement our data management strategy, and we have relied on a number of outstanding functional analysts to mine and define the Command's data requirements. The analysis team began by analyzing the data exchange process, and they looked for measures of merit. The team found that there was an audit log available on a key communications hub. They used MS Access to parse the audit log into individual exchanges and extract a set of critical elements. The analysis team then built reports in Access that demonstrated the effectiveness and efficiency of the data exchange. These reports enabled the analysis team to focus on particular lower levels for detailed analytical studies. The analysts use the exchange history and their operational experience to determine the root causes of substandard performance, and then they recommend specific corrective actions.

The C2IDD was initially just a document describing the data exchanges in excruciating detail. Today, the IDD information is captured in an Access database with user-friendly input and query screens. It contains the business rules and constraints associated with each message. It also provides a relationship to existing AMC data standards as published in the AMC LDM on a field level basis thereby ensuring that target standards are available for each field in the interfaces. It is maintained in phases (or versions) to allow systems to be backward compatible with systems that are still migrating to more current standards. The tool gives users and developers ready access to the data exchange information.

TMDS is no longer a 'tool' that provides information to our programs; it is a unique, multi-user, on-line information system that supports centralized control, maintenance, and distribution of the Command's reference data (i.e., units, aircraft type, tail numbers, etc.). Operational systems use the data to validate the correctness of specific data fields in actual operational information transactions. Each AMC directorate has designated points of contact to act as data value managers for each element maintained by TMDS. The data is maintained in an Oracle database

and is published via its own website. The program automatically distributes reference data using Computer Associates InfoPump, Oracle 9i SQL updates, and e-mail messages. Users can also get the information manually through web services and flat files. Data collection is currently done through file transfer (FTP) and manual means.

Data modelers and functional analysts are required to build and maintain the AMC data model. Extensive interviews with the functional users and the developers are required to capture and update the enterprise's data requirements. The team is required to follow DoD modeling standards and use the Erwin data modeling tools to build the LDM and TDM. The models are configuration managed using ModelMart. In support of the LDM/TDM, we developed our data dictionary, which is an Access database hosting the metadata for AMC's data requirements. The dictionary is a subset of the DoD Data Dictionary System (DDDS), allowing us to automatically download information to/from the DDDS, and provides better, quicker access to the information. Again, we developed user-friendly screens to retrieve and update the data in the dictionary.

Additional utilities have been developed using published application programming interfaces in order to automatically cross-check the data in the models against the dictionary, and vice versa. These tools allow us to speed release of the LDM/TDM and dictionary to our users and developers. In addition, we have developed a tool to help us assess data models for compliance to published data standards.

The business rules repository (referred to as the BRD) is a relational database, also in Access, which identifies and describes AMC business area rules. The BRD incorporates a methodology for defining, classifying, and documenting information systems and process business rules across the AMC enterprise. It captures, classifies, catalogs, documents, and models information systems and business process rules. It is based on the rigorous business rule identification, expression, and classification guidelines established by the industry Business Rules Group (a recognized authoritative body dealing with this area of information systems) and structures rules within the context of broad business policies, business rule statements covering collections of related enterprise rules and atomic business rules. This method provides a solid interlock with AMC Enterprise Architecture Database functions and requirements by "nesting" children rules with related "adult" rules. It is designed to enable developers and program managers to identify and reconcile duplicate and missing rules, and to analyze utilization and enforcement level across systems. The database was built using Microsoft Access and resides on an AMC/SC local area server.

Currently, the IDD, BRD, LDM and data dictionary all reside on a common data server and logical links have been established between the tools in order to provide the analyst and the user with all of the appropriate metadata. The data within the tools are updated and baselined twice yearly. By June of 2003, we hope to have all of the Access-based tools within a single Oracle database in order to share all common data and to physically link the information, to include providing a physical link to TMDS. Eventually, all of these tools will be accessed via the web. This will allow AMC users and developers easy access to the Command's data, from the highest functional requirement level to the data element level, and will include the ability to drill down to the physical domain values of each data element.

5. Products and/or Services

AMC's 17 primary systems range from web-based applications to client-server environments, primarily hosted on the Oracle relational data base management system, and support over 20,000 users worldwide. The Data Integration Branch services all of the enterprise by providing data quality analysis, data modeling, common reference data, data interfacing, and business rules analysis.