

## AN AUTOMATED ENGINEERING ENVIRONMENT

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### ABSTRACT

This paper describes an integrated engineering environment developed to address a critical problem recognized at Warner Robins Air Logistics Center: fragmented and/or non-existent engineering technical resources. Before the development of this service (nicknamed the Engineering Central Computing Facility (ECCF)), resources that did exist were located in obscure locations primarily intended for a select audience. The ECCF would spread these tools to the entire engineering community as well as add the necessary tools for the engineering day-to-day tasks which were being performed manually.

### INTRODUCTION

The concept for the ECCF began with the recognition that each new weapon system procured by the Air Force brought with it an entirely new support system or integrated support facility (ISF). With this new system came a new operating system, a new set of support tools, as well as a new set of contractors who may or may not have a deep understanding of how the Air Force supports its weapon systems. The concept of providing a common host environment for all engineers before the equipment arrived seemed to be a money saver and would add to the combat readiness of the supported systems. Also, due to the classification problems that exist with each supported weapon system, the traditional support system shares no common set of tools. With the ECCF, tool sharing could reduce total acquisition cost.

This concept lost its drive due, however, to a classification requirement. The classification problem between systems could be solved, but would limit access beyond a controlled area, thus limiting the engineering community. The ECCF concept was extended to the entire community by limiting the processing to unclassified work, while another similar system (the integrated classified computer network (ICCN)) would address the classified need. The bottom line; both systems would be like hardware and the same operating systems. Tools could be transported if needed.

### THE NETWORK SOLUTION

To adequately provide service to all engineers, a network back-bone was required. The initial concept was to utilize the base local area network (LAN) which is a point-to-point switching network. This was fine for terminal access, but would not support file transfer between workstations. A second, dedicated network was considered, but was rejected as it essentially duplicated an existing system (the Base LAN). An alternative solution was selected which would allow high speed host to host file transfer over the existing base LAN. Utilizing the ChipCom's Ethermodem and three channels on the base LAN, an Ethernet system was established giving instant access to the engineers.

To reduce total cost, areas with concentrated computer requirements are serviced with dedicated Ethernet access. These were identified using in-depth surveys of the computer requirements. This included existing resources that can now be utilized by all engineers.

Additionally, a large computing facility existed in the maintenance area of the base. If access to these systems could be provided, communication would be easier between the engineers designing the changes and the engineers effecting it. This network bridge was accomplished using existing fiber optic telephone lines. This bridge completed the necessary network scope: All WR-ALC engineers were now as close to the network as their nearest LAN drop.

### THE SOFTWARE PROBLEM

Early in the development of the ECCF, software was considered as the critical component of the system. Again, extensive surveys were conducted both with senior management and the grass roots users of the systems. Huge voids were identified in the following areas:

- 1) Electrical/Electronics Engineering
- 2) Mechanical Engineering
- 3) Facilities Engineering
- 4) Computer Aided Software Engineering
- 5) Engineering Documentation

With these areas as the major goals, intense market surveys were conducted to determine what broad capabilities were available. It was determined that many solutions exist and would suit our needs. With the exception of the Computer Aided Software Engineering, all areas had well defined solutions by several vendors. Therefore a competitive contract was let to provide these items.

To provide the necessary links to previously purchased software and to ensure a growth path for the developed data, minimal standards were required of the contractors. For the electrical, mechanical and facilities software, the Initial Graphics Exchange Specification (IGES) to be upgradable to the Product Definition Exchange Specification (PDES) when it becomes an accepted standard would form the standard interchange standard. For the Electronic Design Software, the Electronic Design Interface Format (EDIF) would be the accepted standard for interchange.

The particular software capabilities provided for each area is:

Mechanical:

- Solids Modeling
- 2D and 3D Design/Drafting (Wireframe and surface modeling)

Facilities Design:

- Drafting
- Facilities Layout
- Electrical Design

Electronic/Electrical:

- Electrical Design/Drafting
- Electronic Design/Drafting
- Electrical/Electronic Analysis, Simulation and testing
- Printed Circuit Board Design

Engineering Documentation:

- Level 1 drawing capability
- Level 2 drawing capability

**TRAINING**

The issue of training also was addressed early in the planning stage. Past experience with delivered systems without adequate training provided the incentive to procure with this system with training for all affected personnel in phases. Training is a constant need and as new personnel come on board, it will be provided.

**COMPUTER HARDWARE**

The core computing capability consists of a cluster of mini-computer which provides generic type services. Included is electronic mail, project management, and general desk top functions. Also, access to the main disk storage is provided through this facility.

Application software is hosted on the central host cluster utilizing a library concept for package check-out and check-in. This dramatically reduced

the total number copies needed for each software package.

Secondary file service is provided at various locations throughout the base. This is primarily for user specific requirements and may also be accessed from any remote location.

For installations requiring dedicated computer resources, engineering workstations were provided with the appropriate software combination. Direct access is provided by locating the workstations in the engineering areas,

For limited access requirements to any of the above resources, terminals were provided as well as the necessary software to utilize existing personal computer (PC) resources. A limited number of Ethernet cards were provided to allow these PCs to transmit data files. For those without this capability, inter-communication software is provided at both the PC and main computing facility.

**SUMMARY**

While this system is in the early stages of development, it is now providing a necessary service to the majority of the engineering community at Warner Robins ALC. Near-term enhancements will further extend its usability and productivity gains.

The system provides a common set of hardware and software tools such that the user interface to support systems is identical, regardless of where an engineer is assigned. This system brings us closer to our goal of true integrated engineering at Warner Robins ALC.