ILT CALS Technology

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CALS Technology

InterLinear Technology Inc. (ILT) is at the forefront of the CALS Raster technology. Dr. Christian Kunz, VP of Development at ILT, was a member of the committee which developed the specification of the CALS tiled raster format (Type 2). ILT, part of the CALS Test Network (CTN), has continually shown clear leadership in the TRIF technology, and developed and supports the world's first true implementation and the first COTS (Commercial Off The Shelf) software in this area.

CALS Test Network uses ODA Tool as Benchmark

ILT has also been a pioneer in implementation. The CTN recognized this expertise and contracted through the Lawrence Livermore National Laboratories (Ref.# B154564) with ILT to produce the first software validation tool for the CALS raster format in 1991. This software called ODA Tool incorporated the functions of conversion, creation, viewing, and evaluation of the CALS raster files. It was recently upgraded to be fully compatible with all the revisions in the raster specification. It has since been redistributed to the CTN sites.

Navy Report on ILT TRIF Technology

In October 1993 the Carderock Division Naval Surface Warfare Center (CDNSWD) gave a favorable evaluation on ILT's CALS Raster viewer which states, "It was determined that a follow-on activity should involve using TRIF-VU to view other vendor raster files that claim to adhere to the MIL-R-28002B tiled raster image format." ILT TRIF technology is used as the benchmark for compliance against which other vendors are compared.

ILT CALS ODA Tool Supports the JCALS/CADA Project

InterLinear Technology Inc. is able to address the functional requirements by the Joint Computer-aided Acquisition and Logistics Support (JCALS) Computer-Assisted Data Acceptance (CADA) project, for the integration of MIL-R-28002B Type-2 data capability into the digital data quality assurance (QA) strategy being developed for the Office of the Secretary of Defense (OSD) CALS executive agent.

The JCALS/CADA project recognized the synergy between its requirements and the initial MIL-STD-1840A Type 2 ODA Tool utility, previous developed for the CALS Test Network (CTN).

The Application Programming Interface of the ODA Tool was integrated into the JCALS / CADA project. The result of the JCALS / CADA project will be a set of Software Tools that will be deployed throughout the JCALS (Army) sites.

U.S. Naval Aviation Depot use AEDIS Conversion Engine

The U.S. Naval Aviation Depot (NADEP) Technical Services Division received over 60,000 C4 image files from the JEDMICS program that required conversion so as to be used in publishing systems. The commander had one week to find, purchase, configure and install a system that would solve this problem. It was accomplished using the ILT AEDIS (Agile Electronic Distributed Information Solution) CALS TRIF Conversion Engine which was able to automate the process so that data conversion and success logs were generated with continuous unattended overnight operation.

Army M1A1 Tank CALS Phase II CITIS Implementation

A complete set of AEDIS software modules are installed at General Dynamics Land Systems Division and the US Army Tank Automotive Command (TACOM). AEDIS is used to provide Electronic Data Interchange (EDI) and shared database access between General Dynamics and the Army for all documentation associated with the Abrams M1A1 Tank. AEDIS modules provide file format conversion between the GD system format (ECARDS) and the US Army system format (DSREDS). AEDIS provides a completely CALS compliant EDI interface between the two systems. This is a pioneer application for the CALS EDI specification.

ECARDS

General Dynamics, Land Systems Division, located in Warren, Michigan, has over four years 1988-1992, implemented an Engineering Computer Aided Retrieval and Distribution System (ECARDS) that is an information management system for raster image data. General Dynamics builds tanks for the US Army and foreign governments. With the

implementation of ECARDS, GD has taken the first step in moving toward a paperless production of a defense product, the M1A1 Tank.

The current paper based M1A1 repository is being scanned into the system from both paper and aperture card originals. Images are being stored digitally onto optical disk. The system is completely computer controlled, automatic, and has the capability of providing audit logs for the tracking of image file retrieval and printing. The system also has access security built into the user interface application. ECARDS utilizes the MIL-R-28002, Type II CALS standard for all image files. This raster data format known as TRIF (Tiled Raster Interchange Format) is tiled on 512 pixel boundaries and compressed via the CCITT Group IV compression standard. Currently the ECARDS system is limited to storing and retrieving only raster image data. The next step in the evolution of ECARDS is to incorporate both CAD vector files and technical publishing files. These formats will be implemented using the IGES and SGML standards respectively.

EDI Between ECARDS and DSREDS

InterLinear was contracted by GDLS to design and implement, within ECARDS, the ability to transfer data electronically to and from the government. The US Army, Tank Army Command (TACOM) is General Dynamics' largest customer. TACOM has implemented a system called DSREDS for (Digital Storage and Retrieval Engineering Documentation System). By using InterLinear's AEDIS modules, it is now possible for a user of the ECARDS system to send image data, drawings, and documents to the DSREDS system electronically. Also, a user of the DSREDS system can automatically access the ECARDS database to search for and retrieve image files electronically. TACOM users can accomplish this by remotely accessing a 3270 terminal emulation session with the IBM mainframe computer at General Dynamics and interacting with the configuration management application. The second step is the ordering of the desired image file or series of files, upon system approval, through an X-windows user interface session that interacts with the ECARDS storage and retrieval application. The communication media between systems can be a T1 leased line or an Internet network. This capability, (government access of contractor database) is an example of CALS phase II Contractor Integrated Technical Information Services (CITIS) implementation. This in an important step in fully implementing a complete paper-less data

interchange environment, and shows how progress is being made by InterLinear to accomplish CALS objectives.

CALS Implementation in the Korean F-16 Fighter Program

The KFP (Korean Fighter Project) is a Korean Government technology project with the prime contract for Samsung Aerospace and various Korean companies to build the F-16 plane with General Dynamics technological assistance and materials. The KFP project, its size, requirement for frequent changes and efficient management call for Engineering Drawing Management and Technical Document Management to be managed under an Optical Filing System. Aperture cards and blueprints from GD are electronically scanned, stored and distributed on demand. The system must has an open system architecture, using an internationally recognized file format (ISO 8613, CALS Type II TRIF), is easily expandable and user friendly.

The document indexing database schema follows the data available on the F-16 aperture cards. This data is formatted according to MIL-STD-804A, "Formats and Coding of Aperture, Copy, and Tabulating Cards for Engineering Data Micro-Reproduction Systems" together with a wide variety of General Dynamics' specific variations from this standard. InterLinear wrote controlling programs to interpret data formats and enable batch mode scanning and importing from the Photomatrix Aperture Card scanner to the AEDIS system. Title data was also added to the database schema. SSA later extracted title data from the IBM mainframe based Bill of Materials system and inserted it into the document indexing database. Additional conversion programming is planned for Boeing and other format aperture cards.

Over 150,000 aperture cards, drawings and documents are being scanned into the system at SaChun. A network of UNIX workstations and PCs connect the Data-processing, Engineering, Planning, and QA departments. Customized work-flow methods route documents between departments. Plans call for installations in the two other F-16 KFP factories with networks linked by T1 dedicated phone lines. Management and Production at any site will have direct electronic access of all project engineering drawings and documents for retrieval, viewing, revision, and forwarding.

Korean Advanced Development Agency CALS Integration

The Korea ADD is the equivalent of US DARPA (Defense Advanced Research Project Agency). They plan to store the information on all their projects in digital form using CALS standards. An immediate requirement is to interface to Samsung Aerospace Korean Fighter Project system. AEDIS is a requirement in the interface of the systems and to supply the CALS standards technology.

Rockwell Space Shuttle Program

The AEDIS system installed at Rockwell in Downey, Southern California is used to support the Space Shuttle Program. Downey is the site where components for the Space Shuttle are designed and built. It is also the location for the configuration management and technical coordination. At this site Rockwell has an old Integrated Automation (IA) Docuvision 3 system with remote nodes at Johnson Space Center (JSC) and Kennedy Space Center (KSC). ILT created AEDIS Database Server Modules (DOCUDEXs) to look over the net to the other systems at JSC and KSC maintain a common database. This site uses the DOCUDEX remote update technology which keeps data in distinct and physically separate database consistent with each other.

AEDIS Supports the Hubble Space Telescope

The system was required to be modular, open, support industry standards, non-proprietary, hardware independent, support use of existing computers and databases, support unlimited system expansion and be portable to future technologies. Files must be stored using the Tiled Raster Interchange Format or TRIF (CALS MIL-R-28002, Type II). The system was designed and developed by ILT.

The TMIS-X system contains a digital image library of 95,000 Hubble Engineering drawings and over 5,000,000 pages of documentation: specifications, diagrams, reports, minutes of meetings, and other documents for the Hubble Space Telescope project, indexed for easy access by scientists and mission support personnel.

InterLinear also developed a database schema which integrates data elements from four existing NASA databases containing the Hubble drawings and documents. This schema enables NASA to merge document

titles and bill of materials data from all Hubble vendors into the TMIS-X database. InterLinear then customized the AEDIS DOCUDEX module (the control and database gateway module) to provide a variety of search methods, including ad-hoc SQL queries, which vastly improved access to these drawings and documents.

ILT Marketing

ILT is working together Accurate Information Systems (AIS) and at the JEDMICS program office and have developed relationships built on our demonstrated capabilities. ILT is expanding involvement in the JCALS/JEDMICS projects where our technology is currently applied.

JCALS

AIS is a subcontractor to Computer Sciences Corp. (the prime) on JCALS. ILT has already delivered an API for the ODA Tool (with CALS Type 2 technology) to AIS. It was well received. It is being tested and integrated into the CADA Software Tools. A report will be delivered to the Army on its functionality and the tools will be delivered to the Army for further testing.

AIS plans licensing for multiple copies of the embedded ILT software. Then when that software is used by the Government they will pay us royalties for all the sites that use this software. Other CALS Raster Type 2 technology they will need in the next phase are:

1. Viewers
2. Editors
3. Conversion from other formats
4. Print filters or drivers (software to print raster files)

JEDMICS

The conversion capabilities of the ILT CALS TRIF engine were demonstrated at the JEDMICS program office. Conversion from the C4 format which is PRC's (the prime contractor) proprietary format (non-CALS compliant) to CALS MIL-R-28002B and viewing of these CALS Type 2 files was shown. They have expressed the desire for ILT to work with them and their prime PRC to insert our capabilities into the JEDMICS project. The JEDMICS project needs for CALS Raster Type 2 technology are similar to the JCALS project needs.

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JEDMICS PRC office	Austin Yerks	Program Manager	

ILT is a leading edge CALS raster technology supplier of COTS software to government and commercial agencies and brings associated benefits through:

- Fulfilling CALS by using ILT's TRIF technology
- Use of International and MIL Standards
- Use of "Open Systems"
- Using existing COTS software
- Lower cost of doing business than the large primes

The program costs as a line item budgeted for this technology in either JCALS / JEDMICS is unknown. However, experienced estimation can bring cost of development to the right order of magnitude. The total budgets for the JCALS and JEDMICS projects are over several years and broken out through several functional Phases.

JCALS had an initial budget of $750 million over several years. Only a small part of this amount has been spent to date.

The breakdown of existing ILT products that would be applicable to the viewing, editing, validation, conversion, printing etc., of the MIL-R-

28002B CALS Raster format is shown below. This set of functional components would be required in each of the DoD data repositories in various combinations.

These following functions will be needed at all the military installations for data viewing. It is also the intention of the Program Managers for vendors of the weapons systems to have in house the same technology in order to generate the data for delivery.

- UNIX based X-Window Raster Viewer
- UNIX based X-Window Raster Editor
- MS-Windows/PC Raster Viewer
- MS-Windows/PC Raster Editor
- ODA Tool
- Conversion from other formats
- Software print filters and drivers
- Tape Tool - MIL-STD-1840B

Multiple copies of some of these items would be required for multiple access to the information while only one copy of most of the software would be needed.

