

**JUST THE FAX! FOR MORE INFORMATION ON MLS-PMAS FAX THIS FORM TO 703.281.4361**

**YES!** I am interested in learning more about the MLS - PMAS. Please contact me as soon as possible.

NAME \_\_\_\_\_ TITLE \_\_\_\_\_  
ORGANIZATION \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
TELEPHONE ( \_\_\_\_\_ ) \_\_\_\_\_ FAX ( \_\_\_\_\_ ) \_\_\_\_\_  
CURRENT MLS SYSTEM \_\_\_\_\_ NO. OF LINES \_\_\_\_\_  
ADDITIONAL COMMENTS \_\_\_\_\_

### Compatibility

The MLS-PMAS stores data in a format users can export to most word processing and spreadsheet packages for further processing.

### Computer Requirements

A large MLS will normally operate the PMAS continuously on a dedicated personal computer for maximum coverage, statistical data, and reduced operator involvement. The operator can schedule the MLS-PMAS package to operate on a non-dedicated computer, but this will restrict performance reports to the monitored periods.

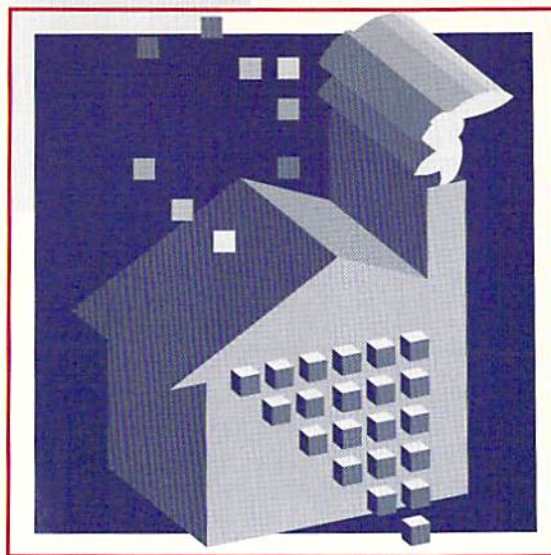
Computer: IBM compatible  
286/386/486  
Memory: 640K RAM minimum  
Hard Disk: 50 Mbytes available  
space minimum  
I /O Ports: 1-parallel (printer)  
1-serial (modem)  
Monitor: VGA  
Operating System: DOS 5.0 or later  
Telecommunications: Maximum speed modem  
supported by the MLS with  
connection to a telephone  
line providing dial-out  
access to all MLS lines  
during tests.

ZONAR Corporation has over a decade of experience leading the field in development of high performance computer software products and extensive experience with MLS analysis, including performance monitoring of two of the largest systems in the world - the MLS of Northern Illinois and the Northern Virginia Association of Realtors.

**ZONAR**  
CORPORATION

Oakton Professional Center  
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## MLS-PMAS MULTIPLE LISTING SERVICE PERFORMANCE MONITOR AND ANALYSIS SYSTEM



*Guaranteeing  
Maximum Value for the  
Realty System User.*

**ZONAR**  
CORPORATION

# MLS-PMAS MULTIPLE LISTING SERVICE PERFORMANCE MONITOR AND ANALYSIS SYSTEM

## MLS-PMAS MULTIPLE LISTING SERVICE PERFORMANCE MONITOR AND ANALYSIS SYSTEM

ZONAR developed the MLS-PMAS to provide Multiple Listing Service (MLS) managers with information to factually assess MLS performance without relying on vendor reports. Whether your MLS provides you with full or turnkey service, the MLS-PMAS alerts you when performance problems begin — it does not wait until they reach a critical point. This enables you to add MLS resources quickly and resolve the problem efficiently and effectively.

ZONAR provides MLS-PMAS users with complete analysis and support services:

- ZONAR identifies industry standard performance commitments by completing a thorough analysis of the MLS vendor contract.
- ZONAR meets with MLS management to confirm specific performance tests for your system.
- ZONAR tests your site-specific monitor on your MLS.
- ZONAR installs the MLS-PMAS at your location and provides key operator training.
- ZONAR provides direct, dial-in support to resolve any problems with the MLS-PMAS.
- ZONAR provides updates as necessary for listing format or other MLS changes.
- ZONAR provides expert testimony on MLS-PMAS performance data in support of MLS management to resolve conflict with vendors or members.



## MLS-PMAS PRODUCT DESCRIPTION

### Overview

- The MLS-PMAS monitors MLS performance automatically from its own microcomputer platform, 24 hours a day, seven days a week.
- MLS management adjusts performance tests and their schedules to provide specific information as needed.
- If the MLS-PMAS detects a problem during its normal scan, it automatically performs a detailed analysis to aid in its resolution.
- The MLS-PMAS generates hundreds of performance samples each day and analyzes these samples on a daily, weekly, and monthly basis to provide comprehensive performance statistics. *MLS management adjusts performance tests and their schedules as needed.*
- The MLS-PMAS submits results as both numerical reports and graphic presentations, with optional comparative reports for each period beginning with system installation. These long-term comparisons identify usage trends and gradual degradation not visible on a day-to-day basis.

### Available Performance Tests

- *Line Busy.* The MLS-PMAS dials in at specified intervals on specified sets of numbers and records "line busy" conditions when they occur. The MLS-PMAS repeatedly dials a "busy" line to determine the duration of a "busy" lockout.
- *Response Times.* The MLS-PMAS conducts up to twenty different MLS sessions from logon to logoff/disconnect, recording timing for each entry-response pair. It records response times from entry of the last key stroke (SEND or RETURN) to receipt of the first response character and last prompt character (ready for next entry) to resolutions of a tenth of a second.

- *Throughput.* The MLS-PMAS automatically measures sustained MLS throughput for listing and report printout in characters per second for all transmissions over fifty characters. For transmissions of over one minute, the MLS-PMAS records the average throughput separately each minute.
- *Session Quality.* The MLS-PMAS captures any departures from standard session scripts which may represent line noise, bad listing data, or program/hardware error. The MLS-PMAS also automatically verifies the echo back (if appropriate) of all simulated key-ins to detect noisy connections. The system uses these events to calculate a measure of session quality available on the MLS.
- *Special Tests (Optional).* ZONAR programs the MLS-PMAS to perform special tests appropriate for each individual MLS. For example, ZONAR can program the system to determine delays in delivery of E-mail or posting of new listings.

### Analysis and Reports

Using the detailed test data accumulated in the MONITOR mode, the MLS-PMAS performs statistical analysis to determine whether MLS performance meets required standards. The MLS-PMAS also generates reports on worst-case, average, and best-case performance in all phases of operation.

### Operation

The MLS-PMAS requires no operator attention while performing MLS monitoring. The operator may display a log of MLS-PMAS activity at any time or interrupt monitor operations to produce desired reports and displays. In case of power failure, the MLS-PMAS automatically resumes monitor duty when power is restored.



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ALL HAVE  
DIF. CLIP ART →  
• DXM12NW2.DOC + • DXM12NWS.DOC  
• DXM12NW3.DOC → (USE THIS ONE)

April '96

Product Update

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THE BEST OF BOTH WORLDS

## ZONAR Announces DxM-X12 Realty Information Server (Z-RIS)



**A**fter decades of thriving as independent facilities, real estate Multiple Listing Services (MLS) now find themselves presented with two different standards for information interchange - the Data Exchange Methodology (DxM) (created by the National Association of Realtors (NAR) Realtors Information Network (RIN) subsidiary) and the Accredited Standards Committee (ASC) X12 Electronic Document Interchange (EDI) standard [chartered by the American National Standards Institute (ANSI) and proposed by the MLS Vendor Roundtable].

RIN sponsored the development of DxM (by contractors Booz-Allen & Hamilton and ZONAR Corporation) using contributions from dozens of MLS and desktop software vendors. The group demonstrated the DxM pilot at the 1995 NAR show in Atlanta, and made the specification and associated data dictionary available to all interested parties in February 1996. At least one MLS currently uses DxM to deliver data for Internet property ads.

Multiple industries developed X12 transaction sets in recent years to replace paper form handling for common interchanges such as invoices, insurance claims, purchase orders, packing slips, and loan applications. Taking advantage of the X12 standards, the MLS Vendor Roundtable developed augmentations to the existing Residential Appraisal Reports Transaction Set (TS262) to accommodate data commonly found in an MLS. The voting members of X12 will likely approve the additions by the fall of 1996.

**Must MLS managers choose only one of these standards to support electronic data interchange?**

The answer is no -- they can have both. ZONAR Corporation has announced the availability of the latest version of its **Realty Information Server (Z-RIS)** which supports exchange in both X12 and DxM standards. "We think the real estate industry should not have to choose between two standards which have different purposes and strengths -- so we added X12 interface modules to our DxM InfoBase to accommodate both," says David Sullivan, president of ZONAR.

"The key is to rigorously define your existing system content," emphasizes Mr. Sullivan. "Then you can map it in and out of either standard as needed."

The **Z-RIS** provides a DxM/X12-compatible repository of real estate information to service MLS systems, non-MLS hosts, and desktop clients. Use of either spec requires "mapping" the current MLS content into a standard code set. ZONAR's product offering provides direct translation between DxM and X12. For example, once an MLS is mapped to either X12 or DxM, the **Z-RIS** will automatically map it to the other standard.

**Z-RIS** operates on PC platforms and is scaleable to accommodate any number of users. The software will be available for installation this summer and will be updated as necessary to accommodate the evolving standards.

*Mr. Sullivan, the creator of the Z-RIS, is a graduate of the Massachusetts Institute of Technology. He established ZONAR Corporation in 1981.*

*ZONAR has provided information technology products and services to the real estate industry for more than a decade -- including the Real Estate Master Data Dictionary (REMDD) adopted by RIN for use in DxM. ZONAR is also a voting member of the X12 Standards Group. Other clients include the Northern Virginia Association of Realtors (NVAR), the Multiple Listing Service of Northern Illinois (MLSNI), Realtron Corporation, Amerestate, Inc. (Mid-West Public Record Information Supplier), and Century 21 Mid-Atlantic.*

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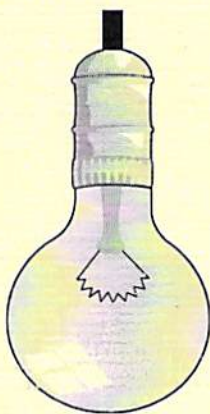
INFORMATION MANAGEMENT  
FOR EVERY INDUSTRY

## ZONAR's Master Information Dictionary (Z-MID) Puts Information Exchange in a Whole New Light

**P**roblem: With the invention of the computer and the advent of the information age, people now have a means of storing huge amounts of information in a small space that is accessible at the touch of a key.

This seems nice, until users realize that, although they have great data storage capability, exchanging the data with another system is a long and complex, if not impossible, process. They find that their systems needed to agree, both semantically and syntactically, before any exchange can occur. *Semantic agreement requires systems to agree on the type of data for exchange, while syntactic agreement requires them to agree on the data format for exchange.*

This creates problems for users in industries where many vendors supply similar products that may not be an exact match semantically and/or syntactically, such as the insurance, banking, and medical industries. Users may have the same types of information and want to pass that information back and forth, but the lack of a predetermined standard prevents them from doing so. In addition, many industries are reluctant to reject their numerous legacy systems in favor of a single system. They want to exchange the data, but they don't want to



have to give up their existing systems and spend the time and money to implement new ones.

**S**olution: These discrepancies between disparate systems no longer present a problem for any industry, thanks to ZONAR Corporation's recent development of their Master Information Dictionary (Z-MID) and Intelligent Information Interchange (I3) information exchange technology. These inventions allow users, with no prior system agreement, to transfer data back and forth between any vendor systems.

How does this technology work? First ZONAR creates a master dictionary for any industry (containing all the possible information elements needed for exchange) by mapping elements from their database to the Z-MID using proprietary mapping software. Using this mapping file and the information contained in the system database, ZONAR staff constructs the I3 object used for data exchange and passes it on to the receiving system. Upon receipt of the object, the system, also mapped to the personalized master dictionary, receives the data and seamlessly formats it into its own display.

The Z-MID provides industries with the benefits of a single system environment while allowing them to retain their legacy systems -- successfully promoting data interchange while eliminating the inherent costs of new system development.

*Mr. Sullivan, the creator of the Z-MID, is a graduate of the Massachusetts Institute of Technology. He established ZONAR Corporation in 1981 to provide large database and telecommunications software solutions for both government and private industry. Federal customers have included the U.S. Marine Corps Personnel Records Center (PRC), the Nuclear Regulatory Commission (NRC), and OSHA.*

*ZONAR has provided technology products and consulting services in the real estate industry to the Northern Virginia Association of Realtors (NVAR), the Multiple Listing Service of Northern Illinois (MLSNI), Realtron Corporation, Amerestate, Inc. (Mid-West Public Record Information Supplier), Century 21 Mid-Atlantic, and the National Association of Realtors (NAR).*

February '96

Product Update

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## REAL ESTATE OPTIONS FOR A MULTILINGUAL WORLD

### ZONAR's Multilingual Desktop (Z-MLDT) Provides Translations for Prospective Buyers

**P**roblem: Up until now, Realtors in the United States used a Multiple Listing Service (MLS) that only returned search results in English. Desktop systems provided screen display and printed materials only in English. However, with the maturing of the baby boomer generation, recent immigrants have become the largest group of first-time home buyers in the country. Many of these immigrants need information sources in their native language.

Government agencies and mortgage lenders recognized this trend and have begun to provide buyer and seller information in other languages. The real estate industry, however, has yet to follow suit. Although some Realtors cater exclusively to the multilingual population and translate information for their clients, they are still restricted by the fact that computer displays and printed materials are available only in English.

**S**olution: ZONAR Corporation recently developed a multilingual desktop that can display and print real estate information for potential buyers and sellers in virtually any language. ZONAR president David Sullivan states, "With the amount of language diversity currently in the United States, we, as service providers, must move to accommodate the needs of international client bases."

ZONAR's Multilingual Desktop (Z-MLDT) will utilize the Data Exchange Methodology (DxM) adopted as the standard for real estate information exchange by

the National Association of Realtors (NAR). The standard allows ZONAR to present all of the information contained in the Realtor's listing in the language most comfortable to the client. The Z-MLDT can even switch between languages with a keystroke or a mouse click.

ZONAR has already developed Spanish, French, and English dictionaries and is currently evaluating sources for other translations and eventual worldwide use.

In its initial target area, ZONAR will provide direct delivery of Spanish data elements via the Internet. Agents will enter the multiple listing numbers of selected properties of interest to their client; the desktop will deliver information in the desired format and language in seconds. Agents may then either continue to work from the display or print the information for the client to take away with them.

The Z-MLDT service is currently available only to Realtors with authorized access to their local MLS; in the future, however, an MLS could provide a similar service to international clients.

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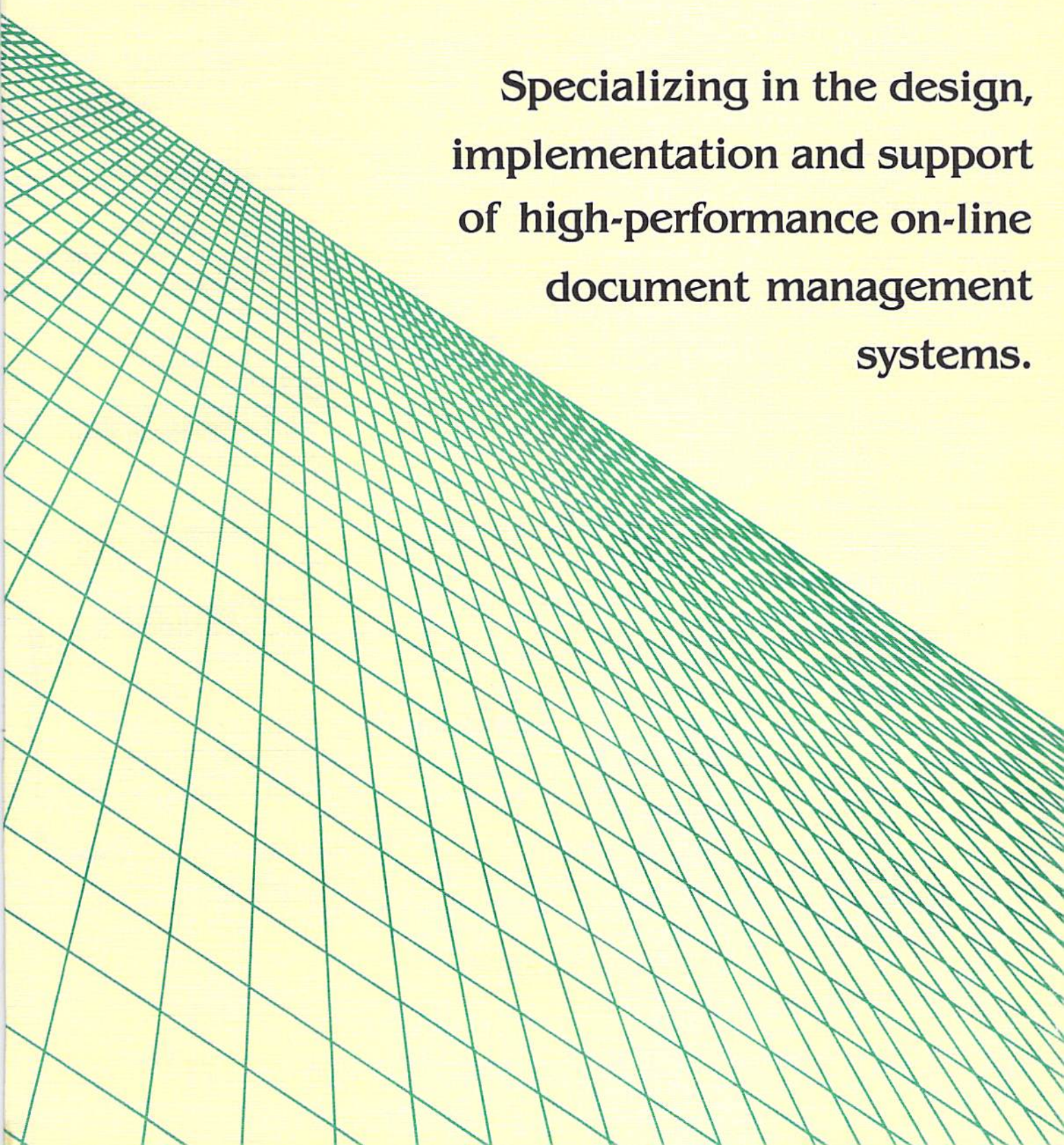
*ZONAR has provided technology products and consulting services in the real estate industry to the Northern Virginia Association of Realtors (NVAR), the Multiple Listing Service of Northern Illinois (MLSNI), Realtron Corporation, Amerestate, Inc. (Mid-West Public Record Information Supplier), Century 21 Mid Atlantic, and the National Association of Realtors (NAR).*


**ZONAR**

# **ZONAR CORPORATION**

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Specializing in the design,  
implementation and support  
of high-performance on-line  
document management  
systems.



## WHO WE ARE—

ZONAR is an established leader in the field of innovative computer-based system design & development. Each principal is a data-processing professional with a strong academic background and more than twenty years' experience and expertise in all aspects of information systems development and technical support. Our staff is a team of carefully selected individuals with the exceptional talent and ability to make high technology work for you!

## WHAT WE DO—

As technological advances continue to shape the course of this industry, ZONAR will provide you with creative, responsive solutions to your

problems. In system design & development, *synergism* is the key to ZONAR's philosophy of combining the hardware and software best suited to your needs, making the resulting system greater than the simple sum of its parts.

## HOW WE DO IT—

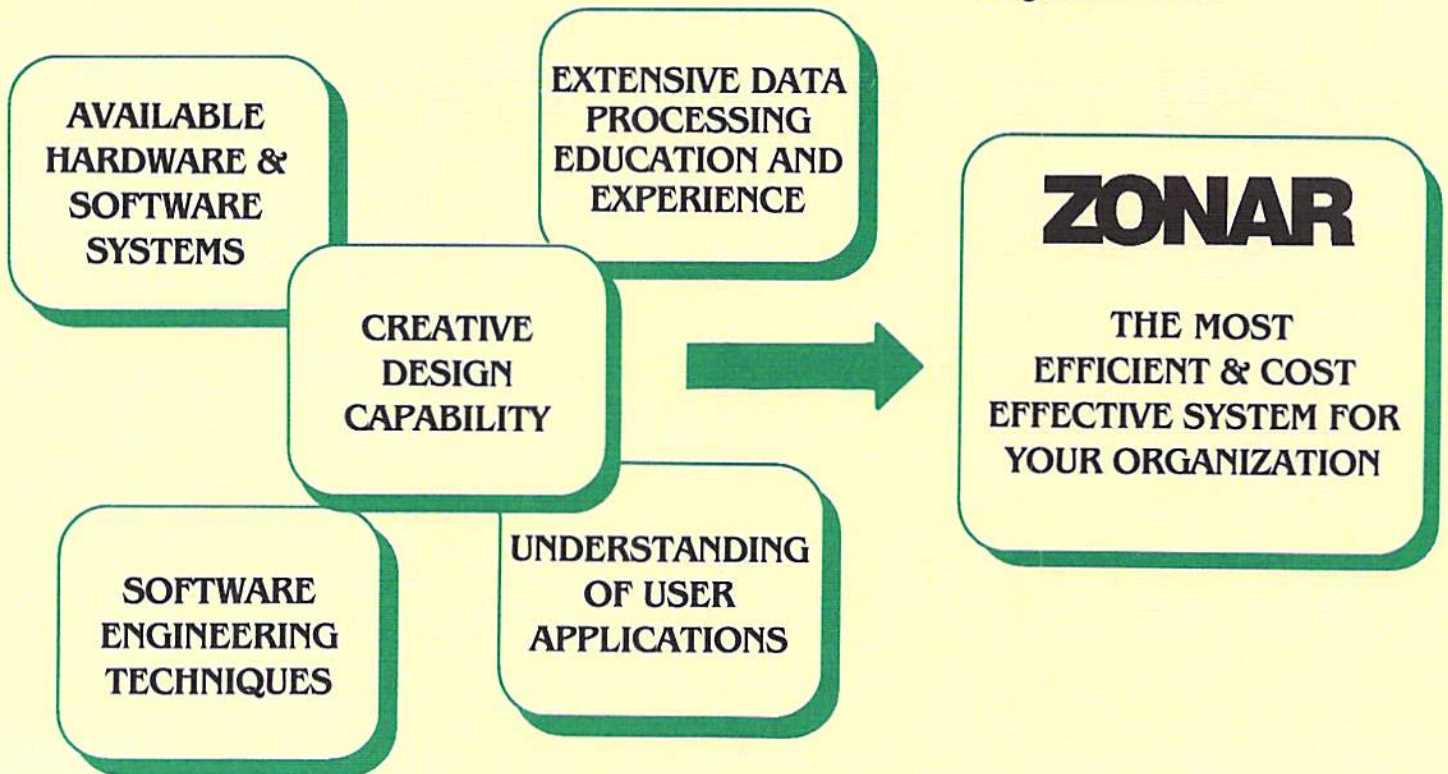
ZONAR integrates the latest available computer technology, including image scanning, CD ROMs, and optical disk components, in creating a design equation that works for you. A specially designed system will give you increased productivity through practical applications of proven, advanced technology.

## THE COSTS—

By combining the most cost-effective, off-the-shelf items with original, program engineering, ZONAR provides *affordable* custom solutions. The performance and efficiency of our custom integration products allows you to do your entire job, your way, at the lowest possible cost.

## THE RESULTS—

With our personalized service, you get the job done promptly, efficiently, and the way you want it. A giant step in your organization's growth could be the installation of a specially designed ZONAR computer-based system. Even our small systems can make big contributions.



**WE MAKE HIGH TECHNOLOGY WORK. . .FOR YOU!**

## PRIMARY APPLICATIONS

- Personnel Records Centers
- Document Centers
- Technical Libraries
- Bibliography and Abstract Retrieval
- PC Based Design & Development Using
  - Data Base Systems
  - Spreadsheet Systems
  - Desktop Publishing

## FUNCTIONAL SERVICES

- Product/Technology Evaluations
- Systems Analysis
- Functional & Systems Design
- Data Base Design
- Development, Implementation & Documentation
- Acceptance Testing & Performance Analysis
- Systems Support
- Education & Training

***ZONAR's accomplishments in system design and development include:***

### **Desktop Publishing of Treasurer's Report for MIT**

ZONAR dramatically reduced the publishing time and expense of producing MIT's annual Treasurer's Report by developing and integrating this microcomputer-based system. Using Lotus 1-2-3 and the desktop publishing package, Ventura, through a comprehensive set of custom models and templates, the system provides a fully automated path from initial number entry to published quality print.

### **Manpower/Personnel Records Management for the USMC**

ZONAR designed, developed and supports the powerful records management system

used by the U.S. Marine Corps to process its more than 2.5 million microfiche and paper personnel records. PC workstations, networks, minicomputers and mainframes are integrated in this interconnected information resource, which provides essential 24 hour per day record retrieval.

### **Accounting Spreadsheets for Johns Hopkins University, Cornell, Vanderbilt, Penn State, MIT**

ZONAR designed a system to allow these universities to recover thousands in what previously were unclaimed costs. ZONAR's spreadsheet model provides a tool to allow determination of the optimum cost allocation strategy for each year-end situation. More than 25 other universities have adopted ZONAR's system.

### **Decision Support System for Mobil Oil**

ZONAR designed and implemented a PC-based decision-making system which provides rapid identification of the preferred supplier of required construction in every location throughout the United States.

### **Internal Revenue Service Wage Information Retrieval System**

ZONAR developed a combined image and data-processing system which allows a small staff in a single service center to resolve discrepancies in wage reports for the entire country and has eliminated the use of over half a million punch cards annually.



## SELECT CLIENT LIST

IBM  
Massachusetts Institute of Technology  
United States Marine Corps  
Nuclear Regulatory Commission  
Mobil Oil Company  
T S Infosystems  
Knorr Brake Corporation  
Washington Theological Union  
Pennsylvania State University  
University of Pennsylvania  
University of Maryland  
ACCESS Corporation  
Vanderbilt University  
Internal Revenue Service  
Department of Labor—  
Occupational Safety & Health Administration  
Department of Labor—  
Bureau of Labor Statistics  
Johns Hopkins University  
Cornell University  
AT&T

**A typical ZONAR designed system has a highly productive life span approaching 10 years, an outstanding accomplishment in the rapidly changing field of high technology.**

**To find out how ZONAR can make this high technology work for you, contact us at:**

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## BRINGING REALTORS INTO STEP WITH THE ONLINE COMMUNITY

### ZONAR's Data Exchange Methodology (DxM) Infobase Supports Interconnectivity Between Disparate Multiple Listing Service (MLS) Systems

**T**he Realtor's Information Network (RIN) -- a subsidiary of the National Association of Realtors (NAR) -- recently announced the particulars of their new data exchange specification, the Data Exchange Methodology (DxM). This specification moves Realtors into a new online domain, allowing them to access, and understand, data from disparate Multiple Listing Service (MLS) systems all over the country.



#### DxM specification

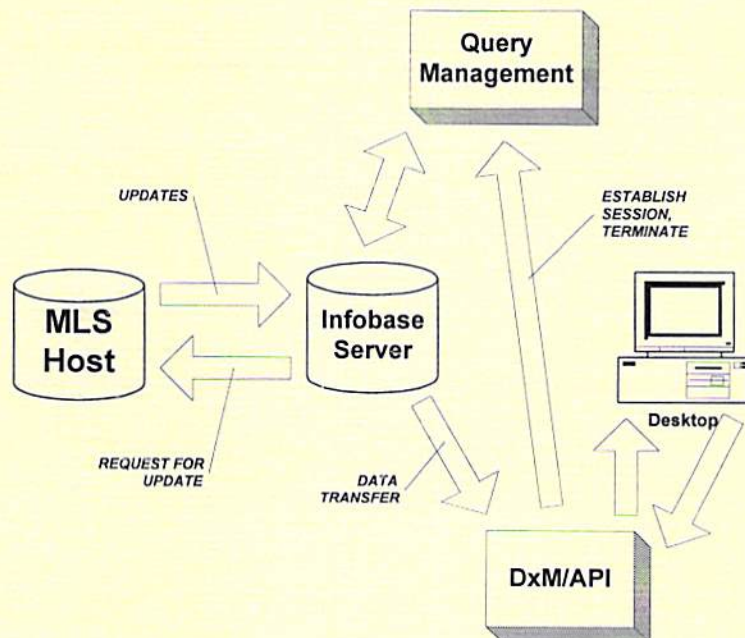
- persistent data storage
- a query management system to process requests from PC-based applications
- delivery of single table results to users

"Using this new product -- and our other related DxM tools -- will allow vendors serving the real estate market to bring DxM-compliant products to market more quickly and with less development cost. This tool levels the playing field for all developers, large and small, and allows them to focus on building the applications instead of the information exchange. As a result, Realtors will have access to a marketplace of more desirable products in a shorter period of time." says ZONAR President David Sullivan.

DxM Infobase resides on a Pentium-class PC and operates in a Windows NT/SQL Server environment.

ZONAR Corporation, a systems/database development firm located in Oakton, Virginia, developed a product to supply all the necessary query management to implement a DxM system -- the DxM Infobase. The Infobase will allow participating DxM-compliant systems to develop a query and retrieve data in a format they predefine. It is a server-based application that provides DxM data warehouse capability without requiring major revamping of current host-based Multiple Listing Service (MLS) products. It incorporates several major functions, such as:

- a DxM-standard logon
- a session manager to handle the connection from server to host
- an information transform process for converting MLS data to and from the



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Z-API BRINGS DXM UP TO  
SPEED FOR REALTOR  
DESKTOP APPLICATIONS  
DEVELOPERS

## ZONAR's Data Exchange Methodology (DxM) Applications Programming Interface (Z-API) Provides the Key to Supporting PC Application Developers and End User Choices



**P**roblem: For several decades, Realtors throughout the United States satisfied their need for computerized property listings through hundreds of separate, distinct systems, each implemented in a local market to satisfy local needs. While providing location-specific information, however, these systems all worked independent of one another, preventing Realtors from taking advantage of new technologies and exchanging information between systems.

**S**olution: The National Association of Realtors (NAR) is working to move Realtors into a new on-line domain with the implementation of their data exchange specification, the Data Exchange Methodology (DxM), a standard for use by all real estate information providers. DxM provides the means to access, and understand, data from Multiple Listing Service (MLS) systems, real estate professionals, various third party data providers, and other industry sources all over the country.

In order to make use of DxM, developers need a key to unlock the technology and make it easily accessible to the user and quickly integratable by vendors of existing MLS systems. The DxM specification deals specifically with only the query and response portions of communication transfer between the MLS systems, leaving users without an interface to access DxM from the desktop.

ZONAR Corporation, using unique knowledge of DxM gained while creating the Real Estate Master Data Dictionary (REMDD), developed a product -- the ZONAR DxM Applications Programming Interface (Z-API) -- to allow PC programmers to take advantage of DxM today and remain compatible with the standard as it evolves.

ZONAR President David Sullivan states, "Using this new product -- and our other related DxM tools -- will allow vendors serving the real estate market to bring DxM-compliant products to market more quickly and with less development cost. This tool levels the playing field for all developers, large and small, and allows them to focus on building the applications rather than reinventing methods of information exchange." This will result in Realtor access to a marketplace of more desirable products in a shorter period of time.

The Z-API is a Windows-based Dynamic Data Exchange (DDF) programming interface that enables PC software developers to create applications that can send and receive both data and queries in the DxM protocol, including full bi-directional data transform and query structuring capability. Using the Z-API, an application developer can create software that is data compatible with any DxM-compliant MLS system, providing Realtors with the freedom to choose among MLS-dependent applications [such as popular Comparable Market Analysis (CMA) packages].

*Mr. Sullivan, an accomplished electrical engineer, is a graduate of the Massachusetts Institute of Technology. He established ZONAR Corporation in 1981 to provide large database and telecommunications software solutions for both government and private industry.*

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## INFORMATION FOR THE REAL ESTATE INDUSTRY

### Realtors Set a New Standard with ZONAR's Master Dictionary

Last year, in response to the growing need for quality information for the real estate industry, the National Association of Realtors (NAR) formed a group to define a real estate information standard that would allow: (1) Seamless transmission of MLS data among different boards; (2) development of inexpensive, nationally compatible software packages by third party vendors for high-tech property search and display; and (3) flexible additions and/or adaptations to the standard to accommodate each board and local proclivities. Working toward achieving this goal, the Realtors Information Network (RIN) has acquired exclusive rights to ZONAR Corporation's Real Estate Master Data Dictionary, which contains more than twenty-five thousand real estate data elements and their definitions.

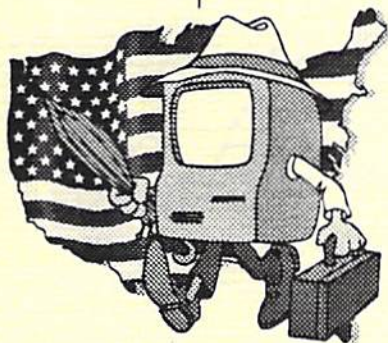
The Dictionary will serve as a key element of RIN's Data Exchange Methodology (DXM), providing a precise definition of all information elements used in real estate. Compiled over the past two years through analysis of MLS profile sheets, public records layouts, and other sources of realty information, "Our product is the most comprehensive computer information dictionary ever assembled for the industry," says Margaret Sullivan, Chairman of ZONAR. "Through the ZONAR Dictionary, information providers, MLS systems, and user systems can share data between disparate hardware and software systems with minimal effort."

The Real Estate Master Data Dictionary includes coded entries for all data elements currently used to carry real estate information and is rapidly growing to accommodate even more. When adding to the Dictionary, ZONAR's staff of Information Engineers

analyze each new source of information, such as a profile sheet, and identify all the elements represented within the source. They then add any new elements they encounter to the Dictionary, along with any similar or related elements suggested by the additions.

David Sullivan, President of ZONAR, believes their Real Estate Master Data Dictionary represents a milestone in data processing. "We no longer need to limit conversations between our computer systems to some sort of primitive 'sign language'. You can transfer any information you have in your system to ours -- and, thanks to the Master Dictionary, our system can understand it perfectly."

RIN will make the Real Estate Master Data Dictionary available to the industry (either through the Realty Information Network itself or by direct distribution) and will administer the standardization process, allowing network participants to specify both the information elements and the data formats used in standard transfers [such as those used in Electronic Data Interchange (EDI)]. ZONAR will provide continuous maintenance of the dictionary, which they expect to include more than ten thousand data elements by early next year.



As the industry evolves to accommodate the ZONAR Real Estate Master Data Dictionary and RIN standards, it will grow into a cohesive unit of online home service providers. As a unit, real estate professionals can retain their position as the most informed and inexpensive providers of these services to the buying and selling public.

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**ZONAR Corporation  
Product Inventory**

<b>Product</b>	<b>Year</b>	<b>Application</b>
U.S. Army Joint Chiefs of Staff Message Switch	1966	Military Communications
RCA AutoDIN Controller	1967	Military Communications
K&E Traverscan Analyzer	1971	Civil Engineering
AU-100 Data Entry System	1972	Data Entry Product
3M Microdisc System	1973	Microfilm Retrieval Product
Pulsecom Micromite 400	1975	Communications Terminal Control
Bureau of Labor Statistics MATRIX System	1976*	Labor Statistics Economic Forecasting
IRS Wage Information Retrieval System (WIRS)	1978*	Microfilm Image Retrieval - Data Entry
Access Corporation Integrated Document Control System (IDCS)	1980*	Microfiche Retrieval Product
NRC Bibliographic Retrieval System (BRS)	1983*	Document Search and Retrieval
USMC Personnel Records System (MAPR)	1986*	Military Personnel Records Management
MicroM Controller	1987*	Microfilm Retrieval Controller
Real Estate Terminals & Systems RETS-100	1987	Real Estate MLS Terminal
MLS-Performance Measurement and Analysis System (PMAS)	1990*	Real Estate MLS performance analysis
USMC Budget Data Display System (BDDS)	1991	Budget Fiscal Data Presentation
World Bank Cost Accounting System (CAS)	1991*	Task Cost Accounting System
Amerestate Prototype	1992	Real Estate Information Retrieval
Realtron WIN Prototype	1993	Real Estate Distributed MLS
Realtron Kiosk Prototype	1993	Real Estate Sales Kiosk

**ZONAR**

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**ZONAR Corporation  
Product Inventory**

<b>Product</b>	<b>Year</b>	<b>Application</b>
ZONAR Distributed MLS Desktop <sup>TM</sup>	1994	Real Estate Distributed MLS
ZONAR InfObject Library <sup>TM</sup>	1994	Object-Oriented Information Management System
ZONAR VB Environment <sup>TM</sup>	1994	VB Project Programming Tools
ZONAR-CLO System <sup>TM</sup>	1994	Computerized Mortgage Loan Origination System
ZONAR-RIN DxM - Real Estate Master Data Dictionary <sup>TM</sup>	1995*	Real Estate Data Exchange Methodology & Dictionary
ZONAR Realty Kiosk <sup>TM</sup>	1995*	Real Estate Consumer Kiosk System
ZONAR-PRC Task Order Management System TOMS <sup>TM</sup>	1996*	Task Order Life Cycle Management System
ZONAR MultiLingual MLS MLSpaniol <sup>TM</sup>	1996	Real Estate Information Retrieval and Multilingual Display
ZONAR VB-HTML Converter <sup>TM</sup>	1996	VB to HTML Automatic Conversion Library
Year 2000 AccommoDate2000 <sup>TM</sup>	1996	Year 2000 Legacy Data Solution

\* Product system in production use as of October, 1996

<sup>TM</sup> Product available for licensing from ZONAR Corporation as of October, 1996

**ZONAR**

**David E. Sullivan**  
**President, ZONAR Corporation**

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**Work Experience**

**Summary**

Mr. Sullivan is responsible for all ZONAR activities as Chief Executive Officer, providing general management as well as technical oversight on all ZONAR's projects.

As an expert in the design and development of high performance information systems, Mr. Sullivan has successfully satisfied the needs of dozens of commercial and governmental clients. In addition, he has lectured extensively throughout the United States and Canada.

Mr. Sullivan's primary focus is the management of computer-based information in complex environments. He has developed a number of key information technology concepts and applied them to successful implementations on a range of computer platforms. Mr. Sullivan is thoroughly familiar with client-server, object-oriented, and CASE technologies and their utilization in real-world situation.

With more than thirty years of experience in telecommunications, operating systems, and databases, he is able to apply a full range of technologies to the development of practical solutions to client problems.

**Experience Highlights**

- Developed ZONAR's Information Object (InfoObject) technology tool set used to implement information management systems in the real estate industry.
- Designed and managed development of the Real Estate Master Data Dictionary adopted as the standard for information exchange by the National Association of Realtors (NAR).
- Supported the conversion of the U.S. Department of Labor, Occupational Safety and Health Administration's (OSHA) Technical Information Retrieval System (TIRS) from microfiche to electronic image on a SUN Sparc 10 Server running Plexis Software on an Informix database.
- Designed index processing software to support electronic image processing in the MS-Windows environment using C++ and a Paradox database for GNMA documents.
- Managed design and development of the Realtor WýXindows Information Network (WIN) PC product for data and high-resolution, full color photo retrieval for Realtron, Inc.
- Managed the design and development of the Request Management System (RMS) employed by the U.S. Marine Corps to service requests for more than one million personnel records managed by the Corps. The system includes an IBM mainframe and SQL relational database interconnected to multiple PC LAN's with true, distributed processing. Mr. Sullivan had total responsibility, from requirements analysis through design, implementation, installation and support, under a multi-year contract with the Marines.
- Designed and developed the prototype Real Estate Terminal System (RETS) software package which provided stand-alone functionality and bulk data transfer between a Realtors PC and a number of computerized Multiple Listing Systems (MLS).

- Under contract to ACCESS Corporation, designed and managed the development of the Integrated Document Control System (IDCS) software system used to manage large microfiche document bases in installations throughout North America. This proprietary package provides a full, inverted file structure database, with performance levels exceeding those of alternative configurations many times its size.
- Under contract to the U.S. Internal Revenue Service (IRS), designed and managed the implementation of the Wage Information Retrieval System (WIRS) that provided microfilm image and computer data concurrent access and update for the entire United States.
- Supported the Nuclear Regulatory Commission's (NRC) Bibliographic Retrieval System (BRS) and the U.S. Department of Labor, Occupational Safety and Health Administration's (OSHA) Technical Information System (TIRS), providing improved performance on a fixed computer platform while increasing system utilization.
- Lectured throughout the United States and Canada on the application of computers and communication in public safety applications.
- Provided product design and implementation management for the MICRODISC computerized microfilm retrieval system developed under contract to the 3M Company and sold throughout the United States.
- Developed the INFOCOM controller product INTEL microcomputer firmware used to access Western Union's message network.
- Designed and managed the development of AU100 shared processor data entry system sold and installed throughout the United States.
- Designed and provided lead technical responsibility for the Joint Chiefs of Staff Computerized Message Switch (CMS) which was operational for more than seven years on the original computer platform.
- Designed and developed operating systems driver program used in RCA Corporation's Random Access Computer Equipment (RACE) and AUTODIN (70X) Products.

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### ***Education***

#### **B.S. in Electrical Engineering, 1964.**

The Massachusetts Institute of Technology (MIT), Cambridge, MA.

#### **Master of Technology Management Program**

The University of Maryland, College Park, MD.

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### ***Associations***

- American Society for Information Science (ASIS)
- Association for Information and Image Management (AIIM)
- The Institute of Electrical and Electronics Engineers, Inc. (IEEE)



## EXPERIENCE AND CAPABILITIES OVERVIEW

**ZONAR Corporation is . . .** an established, successful leader in the field of innovative computer-based system design and development. We have successfully performed advanced computer software design, systems development, and life cycle support for a wide range of computer platforms used by an extensive array of users with varying experience and capabilities. We are an organization focused on what can be rather than what already is -- a team of technical wizards with clear vision anticipating tomorrow's technology breakthroughs **today**.

**ZONAR employees are . . .** part of a highly skilled team combining strong academic credentials and extensive workplace experience. We employ experienced systems analysts, programmers, and technical writers to augment every stage of the development process. ZONAR and its staff maintain active affiliations with the Association for Information and Image Management (AIIM), the American Society of Information Science (ASIS), the Institute of Electrical and Electronics Engineers (IEEE), the American Standards Committee (ACS) X12 (EDI), and numerous regional business and technology organizations.

ZONAR has demonstrable expertise as evidenced by successful participation in, and completion of, numerous projects over the past fifteen years in both the government and commercial business environments. *Some of these projects are highlighted in the following pages.* ZONAR's staff has first-hand experience in a broad range of information-related disciplines.

### I. Database

A. SQL RDMS -- ZONAR specializes in very large, performance-critical databases, providing:

- ◆ Design
- ◆ Redesign/Analysis/Reengineering
- ◆ Migration to Relational DBMS
- ◆ Database Programming (update, query)
- ◆ Rapid Performance Analysis (RPA)

ZONAR staff are expert in SQL/DS, Oracle, and ADABAS.

B. PC/LAN DISTRIBUTED DATABASE -- ZONAR specializes in large, high-traffic applications in highly integrated environments, providing:

- ◆ Design
- ◆ Redesign/Analysis/Reengineering

- ◆ **Migration from Non-Database Systems**
- ◆ **Database Programming (especially for shared database update tasks)**
- ◆ **Application Server Development**

ZONAR staff are expert in Clipper, dBase, Access, and Visual Basic and have experience in FoxPro and C with Xbase functions.

C. MAINFRAME/PC INTERCONNECTIVITY -- ZONAR specializes in near real-time operations with integrated mainframe/LAN applications, providing:

- ◆ **Design**
- ◆ **Redesign/Analysis/Reengineering**
- ◆ **Migration from All-Mainframe or All-LAN Systems**
- ◆ **Migration from Mini-Based Systems**
- ◆ **Database Programming**
- ◆ **Server/Requester Applications**

## **II. Information Structuring**

### ONTOLOGY AND DICTIONARY CONSTRUCTION

- ◆ **Large Scale Superset Information Dictionaries**
- ◆ **Normalized and Denormalized Representations**
- ◆ **Multi-Dimensional Attribute and Element Relationship Definitions**
- ◆ **Self-Defining Data Sets**
- ◆ **Cross-Industry Information Exchange Matrices**

### DATA/INFORMATION MAPPING

- ◆ **Multi-System Information Alignment**
- ◆ **Context Analysis**
- ◆ **Data Scrubbing**
- ◆ **Data Mapping Tools**

### DATA TRANSFORMATIONS

- ◆ **Multi-Lingual Descriptor Sets**
- ◆ **EC/EDI Data Streams**
- ◆ **Icon Representation Sets**
- ◆ **Information Object Encapsulation**

◆ **Fuzzy Context Negotiation and Resolution**

**III. Programming**

MAINFRAME/IBM

- ◆ **Cross System Product (CSP)** -- focused on highly integrated applications
- ◆ **PL/1** -- statistical modeling and transaction-oriented DBMS applications
- ◆ **COBOL** -- data extraction and thesaurus development
- ◆ **FORTRAN** -- bibliographic search and retrieval system development

MINIs

- ◆ **DEC, Data General, and HP Systems**
- ◆ **On-Line, Transaction-Oriented Applications**
- ◆ **Real Time Text-Based Applications**
- ◆ **Assembler, FORTRAN, and C Languages**

MICROs

- ◆ **IBM-Compatible Environments**
- ◆ **MSDOS, Windows, and Unix**
- ◆ **Visual Basic, Clipper, FoxPro, dBase**
- ◆ **C++**

LANs

- ◆ **Token Ring Implementation with PS/2 and MSDOS Workstations**

**IV. Document and Records Processing**

WORKFLOW

Analysis and reduction of document/records processing workflow.

MICROFILM/FICHE

Computer-assisted retrieval and content management, especially with integrated data-document requirements.

## MIGRATION

Paper to microfilm to electronic image.

## EXCEPTION HANDLING

Reduction in high cost/low volume records processing.

## V. Clients

**ZONAR clients are . . .** productive and satisfied. Through our personalized service we complete jobs promptly and efficiently -- and to clients' exact specifications.

ZONAR boasts quick job turnarounds at minimum cost. We are committed to completely satisfying client demands in this manner by combining the most cost-effective, off-the-shelf items with original program engineering.

ZONAR has provided tools and information systems for use by managers, real estate professionals, surveyors, police officers, statisticians, and both military officers and enlisted personnel. Our accomplishments include:

### ***CENTURY 21 MID-ATLANTIC -- LOAN INFORMATION SYSTEM (LIS):***

ZONAR directed the design and development of their computerized LIS product. Operating under Windows, the LIS provides full buyer qualification, loan counseling, access to hundreds of products, and complete tracking of the loan process -- all from the real estate office desktop.

### ***JOHNS HOPKINS, CORNELL, VANDERBILT, PENN STATE, and MIT --***

***ACCOUNTING SPREADSHEETS:*** ZONAR designed a system to allow these universities to recover thousands in what previously were unclaimed costs. ZONAR's spreadsheet model provides a tool to allow determination of the optimum cost allocation strategy for each year-end situation. *More than twenty-five other universities adopted ZONAR's system.*

### ***MARICOPA COUNTY (PHOENIX), ARIZONA -- INTEGRATED DOCUMENT CONTROL SYSTEM:***

ZONAR Corporation developed a system, the Integrated Document Control System, that used microfiche technology and retrieval equipment provided by ACCESS Corporation to organize, maintain, and allow staff to easily access the court records of Maricopa County. The ZONAR software allows identification of all case dockets by searching interested parties, claim or action type, official docket number, or scheduled trial date. The package identifies the current location of the paper case and retrieves the microfiche directly from the ACCESS equipment in less than fifteen seconds. The system supports up-to-date records on more than fifty thousand cases, providing on-line access via a dozen workstations in the court complex.

**MIT -- DESKTOP PUBLISHING of TREASURER'S REPORT:** ZONAR dramatically reduced the publishing time and expense of producing MIT's annual Treasurer's Report by developing and integrating this microcomputer-based system. Using Lotus 1-2-3 and the desktop publishing package Ventura, the system provides a fully automated path from initial number entry to published quality print through a comprehensive set of custom models and templates.

**MLS of NORTHERN ILLINOIS -- MULTIPLE LISTING SERVICE PERFORMANCE MONITOR and ANALYSIS SYSTEM:** ZONAR provided the MLS-PMAS, allowing MLS managers to maintain system performance during rapid expansion. In addition to identifying and documenting any errors, the MLS-PMAS provides continuous monitoring of MLS and report throughput and response times for each of the access ports.

**MOBIL OIL -- DECISION SUPPORT SYSTEM:** ZONAR designed and implemented a PC-based decision-making system which provides rapid identification of the preferred supplier of required construction in every location throughout the United States.

**PRC, INC. -- OSS AND TRAINING TRACKING SYSTEMS:** ZONAR evaluated their existing information and databases and provided a design for an integrated system that would use their existing facilities; interface to other corporate systems; reduce the staff time needed to process subcontract workload; and improve both the quality of technical management and the efficiency and timeliness of billing and collections. ZONAR constructed an information model of subcontractor management within the Super-Minicomputer (SMP) program -- from initial price quote request from the government customer through final invoicing and payment - - and identified potential areas where computer system development would provide significant benefits. From data gathered through this analysis, PRC selected a basic set for immediate interpretation.

**REALTORS INFORMATION NETWORK (RIN) -- REAL ESTATE MASTER DATA DICTIONARY (REMDD):** ZONAR developed the REMDD, providing a precise definition of all information elements used in real estate to facilitate RIN's Data Exchange Methodology (DxM) as a national real estate information standard. The REMDD allows network participants to specify both the information elements and the data formats they want to use in their transfers, allowing (1) seamless transmission of MLS data between different boards and (2) flexible REMDD additions and/or adaptations to accommodate each board and its local proclivities.

**REALTRON CORPORATION -- REALTOR WINDOWS INFORMATION NETWORK (WIN):** ZONAR directed the design and development of Realtron's next generation product, WIN, which includes (1) extensive features and connectivity currently demanded by the real estate industry; (2) open system architecture; and (3) the capability to incorporate new functions as they become

available. The WIN product offers full color photo, mapping, and touch screen technologies.

***U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) -- TECHNICAL INFORMATION RETRIEVAL SYSTEM (TIRS):*** ZONAR developed the Technical Information Retrieval System (TIRS) to provide public and department access to the full scope of technical documents used by OSHA.

The system contains indexed OSHA Regulatory Dockets, the Publications Card Catalog, Dissertation Abstracts, Health Hazard Evaluations, and the Federal Register in a single, integrated information base that allows searches across the entire collection.

***U.S. FEDERAL AVIATION ADMINISTRATION, AIRCRAFT REGISTRATION FACILITY -- INTEGRATED DOCUMENT CONTROL SYSTEM:*** The ZONAR-developed Integrated Document Control System software provided the Airman and Aircraft Registry with an index to their records on all aircraft ever registered in the United States -- from "birth" until "death" -- allowing identification and retrieval by aircraft type and ID, engine type and ID, current and past owners, and any other criteria of interest in a special situation. The FAA is able to add index fields dynamically as requirements change. The ZONAR software provides full control over the entire population of stored, physical documents with on-line access twenty-four hours per day, seven days per week.

***U.S. INTERNAL REVENUE SERVICE -- WAGE INFORMATION RETRIEVAL SYSTEM:*** ZONAR developed a combined image and data-processing system which allows a small staff in a single service center to resolve discrepancies in wage reports for the entire country and has eliminated the use of over half a million punch cards annually.

***U.S. MARINE CORPS -- MANPOWER/PERSONNEL RECORDS MANAGEMENT:*** ZONAR designed, developed, and supported the powerful records management system used by the U.S. Marine Corps to process its more than two and one half million microfiche and paper personnel records. PC workstations, networks, minicomputers, and mainframes are integrated in this interconnected information resource, which provides essential twenty-four hour per day record retrieval.

***U.S. NUCLEAR REGULATORY COMMISSION (NRC) -- BIBLIOGRAPHIC RETRIEVAL SYSTEM (BRS):*** ZONAR provided the programs to search the NRC database of over a million and one half documents. Both staff librarians, who are experts in computer systems and document collection, and the general public use these programs, including dial-in users with limited or no training.

## VI. Client List

Access Corporation  
AT&T  
Booz•Allen & Hamilton  
Century 21 / Mid-Atlantic  
Computer Data Systems, Inc.  
Cornell University  
Dept. of Labor - Bureau of Labor Statistics (BLS)  
Dept. of Labor - Occupational Safety and Health Administration (OSHA)  
Dept. of the Treasury - Internal Revenue Service (IRS)  
Federal Aviation Administration (FAA)  
IBM Corporation  
Johns Hopkins University  
Maricopa County (Phoenix), AZ  
Massachusetts Institute of Technology (MIT)  
Mobil Oil  
Multiple Listing Service of Northern Illinois (MLSNI)  
National Association of Realtors (NAR)  
Northern Virginia Association of Realtors (NVAR)  
Penn State University  
PRC, Inc.  
Realtron Corporation  
U.S. Army  
U.S. Marine Corps  
U.S. Nuclear Regulatory Commission (NRC)  
Vanderbilt University  
The World Bank