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EVALUATION OF PROTOCOL CONVERTERS

Final Report

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16. ABSTRACT

This report summarizes the results of a process of acquisition and evaluation of various types of Protocol Converters by the Information Systems Group of ADOT.

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FINAL REPORT & EVALUATION

I. INTRODUCTION

This project was originally submitted for approval to the Arizona Department of Transportation Research Center (ATRC) by John Amidon, Information Systems Group, (ISG), ADOT. The goal of the study was to determine a practical approach to facilitate access to the ADOT mainframe computer systems from personal computers; this access to be made available through a standard, easy to use interface; and without a continuing involvement on the part of the ISG systems programming staff, or of the other ISG support personnel. All references to personal computers in this project are to the IBM PC or a compatible product. References to CRTs are to any CRT with the capability of emulating a supported ASCII CRT (VT100, IBM 3101, Hazeltine 1500, and others).
The objectives of the study were to demonstrate

1) a feasible method of printing reports from the the mainframe without the use of RJE.
2) a feasible full screen 3270 capability from an ASCII terminal or Personal Computer (PC), and
3) a feasible file transfer methodology between a PC and an IBM mainframe.

The objectives were to be achieved by bidding for solutions in each of the three categories, by acquiring the products bid, and by using them.

CONCLUSIONS:

A. The printing of reports to 3270 cluster printers is a reliable and practical approach to distributing mainframe generated reports.

B. The use of protocol converters to provide access to the ADOT mainframe computer systems from personal computers is a workable solution, but only a partial solution, and not a panacea.

C. The practical approach to facilitate access to the ADOT mainframe computer systems from personal computers is not static.

   1. Today's best solution will not be tomorrow's best solution.

   2. A better dial-up connection is required.

   3. Improved dial-up modems are needed.

4. Wherever possible, hardwire connection to an intelligent controller should be used.

D. The use of appropriate software in the personal computer, in the mainframe, and in intervening intelligent converters or protocol converters, is as important as the hardware itself.

E. Expenditures of funds and resources to provide mainframe to personal computer linkage should be made with a view to both the immediate needed functionality and to the long term system wide functionality acquired by those expenditures.

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II. PERFORMANCE OF THE STUDY

SELECTION CRITERIA

An RFP was issued for three categories: report retrieval software, ASCIIto 3270 protocol converters, and PC/mainframe file transfer software. As many items in each category as satisfied the bid and fell under the budgetary limit were selected.

A REVIEW OF THE PRODUCTS EVALUATED

PROTOCOL CONVERTERS

PCI 276

This is free standing or rack mounted unit, and was installed in the CPU room and hardwired to the front end processor. Auto answer modems were attached to receive calls from remote terminals. Both IBM PCs and ASCII CRTs used this protocol converter to gain full screen access to mainframe 3270 applications. File transfer worked successfully using EXCELLINK, and using PANLINK, although PANLINK does not support the model 276. This unit was found to be easy to configure (by Operations), easy to use and read by all users, straightforward in its keystroke sequences (protocol converters require two key combinations where a 3270 display will require only one).

CX-80

This is free standing or rack mounted unit, and was installed in the CPU room and hardwired to the front end processor. Auto answer modems were attached to receive calls from remote terminals. Both IBM PCs and ASCII CRTs used this protocol converter to gain full screen access to mainframe 3270 applications. File transfer worked successfully using EXCELLINk, and using PANLINK. This unit was found to be confusing to configure (by Operations), not as easy to use or read by users.

AVATAR PA1000E

This is a dial up converter that is designed to attach via coax to a port on an IBM 3274 cluster controller. It was intended that this unit would be attached to an ADOT IBM 3274 controller; however, this test could not be made as the planned installation of an IBM 3274 at ADOT did not occur.

HYDRA

This is free standing or rack mounted unit, and was intended to be installed in the CPU room and hardwired to the channel. Much

effort went into installing this unit; however, it never went on-line due to the unexpected complexity. Where the end attached devices required only the addition of a "3270" controller, the HYDRA required a large block of contiguous subchannel addresses; this required a substantial revision to the addressing arrangements already in place to support other I/O on the channel. This, plus difficulty in fitting in the requirements of the unit resulted in the unit's not being used.

REPORT RETRIEVAL SOFTWARE

VPSS (VTAM PRINTER SUPPORT SYSTEM)

This is mainframe based software that allows a 3270 cluster attached printer to have sent to it reports from the JES2 SPOOL. This system has done everything expected of it, and has provided a good remote job output capability to many sites not equipped with a true remote job output printer. It was hoped that a way would be found to permit retrieval of reports by the IBM PC, using the protocol converter; although the protocol converters do support a logical printer on the PC this capability was not made to work. This function has not been abandoned, and may still be made to work.

FILE TRANSFER SOFTWARE/HARDWARE

EXCELLINK

This is a software system composed of two parts, one residing in the IBM PC, and one residing in TSO, on the mainframe. The PC portion also includes an IBM 3101 emulator. The emulator includes a logon script capability to remove from the operator the burden of of dialing the protocol converter and responding to a variety of system prompts. The logon script works well, and can be tailored to fit the system by a knowledgable programmer. The 3101 emulator can be used for full screen interaction with any mainframe 3270 application when connected to the protocol converter.

File transfer is initiated from the PC. File transmissions were always successful on transfers of under 15 minutes. Mainframe files are sequential, and are usable in any mainframe program, and can be SYSOUT files.

PANLINK

This is a software system composed of two parts, one residing in the IBM PC, and one residing in TSO, on the mainframe. The PC portion also includes an IBM 3101 emulator, although this is not documented. No logon script capability is included with the system; for this reason it was found more convenient to use the

EXCELLINK emulator for PANLINK. The 3101 emulator can be used for full screen interaction with any mainframe 3270 application when connected to the protocol converter. Pansophic does not support connection to the PCI 276, a fact which was not known on acquiring the products. However, the products did work together when some software tables were corrected.

File transfer is initiated from the PC. File transmissions were always successful on transfers of under 15 minutes. Mainframe files exist in a special VSAM catalog which can be accessed from the mainframe batch via special utilities. From the PC, the files are treated as ordinary PC files on disk drives D, E, F, G, etc. As such they can be copied from one drive to another, or can be accessed from a PC program. Access time was found to be too slow when using 1200 bps modems, however. PANLINK was also used through the 3270 cluster controller. The speed was improved as was the reliability of the transfer. No errors were encountered when using the coax connection.

PC/TERM

This software is designed to interface to the PCI 276 and to an IBM mainframe based software package. Owing to its limited capability, it was not tested first. Due to the complexity of the other systems generally, and of the limited personnel resources available to review the products, this product was unable to be tested.

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CONCLUSIONS

SUPPORTING DETAIL AND DOCUMENTATION

A. The use of protocol converters to provide access to the ADOT mainframe computer systems from personal computers is a workable solution, but only a partial solution, and not a panacea.

B. The practical approach to facilitate access to the ADOT mainframe computer systems from personal computers is not static.

1. Today's best solution will not be tomorrow's best solution.

a. Past solution: Dial-up access to TSO or WYLBUR via ASCII/TTY; dial-up access to JES2 (RJE) via 3780 emulation board.

b. Present solution: As above, except: DELETE--dial-up access to TSO.

c. Recommended next step: As above, except:

ADD--dial-up access to WYLBUR, TSO, IMS, and others via protocol converters and 3270 emulation:

ADD--hard wired access to all mainframe systems via 3270 cluster controllers.

d. Future solution #1: Dial-up access, and/or hard wired access, to intelligent controllers using computer-to-computer logic (ISDN) or X.25).

2. A better dial-up connection is required.

a. Problems exist when dialing out though the current S1-1 switch.

- Users dialing long distance to out-of-state, experience problems with data transmission that are resolved by the use of an outside line not going through the switch.

- Users dialing from ADOT remote sites have found circuit problems alleviated by using an outside line, or by physically going to an off-site telephone.

b. Many ADOT remote sites have poor quality telephone service, as provided by the telephone company.

3. Improved dial-up modems are needed.

a. The current dial-up modems are not as reliable as needed.

b. Transmissions develop error conditions when a long transmission occurs (over 30 minutes). Although this could be blamed on the circuit, corrective action could be accomplished by intelligent modems.

4. Wherever possible, hardwire connection to an intelligent controller should be used.

a. A reliable connection from the controller to the mainframe is needed; use of leased lines or of a local computer room connnection is the best.

b. The reliabilty of data transmission using leased lines continues to be the fastest and most reliable.

C. The use of appropriate software in the personal computer in the mainframe, and in intervening intelligent converters or protocol converters, is as important as the hardware itself.

a. Experience with the products used in this project showed the need for compatibility at all levels of hardware. PC software at a different release level from the mainframe software produced garbled transmissions, even though the hardware was working correctly.

b. User friendliness at all levels is highly dependent on the software provided. Functionally equivalent protocol converters produced markedly different user satisfaction levels because of their ease of use and the accuracy of their simulation of 3270 functionality.

c. Tables of parameters provided in support of some software were not only wrong, but would not load correctly due to incorrect block lengths.

D. Expenditures of funds and resources to provide mainframe to personal computer linkage should be made with a veiw to both the immediate needed functionality and to the long term system wide functionality acquired by those.

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PERIPHERAL DEVELOPMENTS--EXTERNAL YET RELATED

ACTIVITIES AT ADOT:

During the time that this study has been in progress, ADOT has implemented personal computer to mainframe access from the ADOT construction sites. This system was implemented with a large amount of development and support from ISG personnel. As Operating System, and other mainframe hardware and software, changes have occurred, varous unexpected problems have also occurred with the mainframe accessability, resulting in a continuing need for ISG support. This mainframe access utilitizes ASCII/TTY dial-up to a mainframe system called WYLBUR. This access system originally utilized a mainframe system called TSO; during the evolution of TSO, however, dial-up ASCII/TTY support was discontinued by the vendor of TSO.

ITT COURIER 3270 CLUSTER CONTROLLER

Of the two file transfer software products used (PANLINK and EXCELLINK) only PANLINK could use the hardwired connection to the 3270 cluster controller. This would suggest that ADOT concentrate its investment in the PANLINK product. However, Courier has now developed a new PC board that supports applications requiring an "IRMA board"; this permits the use of EXCELLINK in the hardwired environment.

FILE TRANSFER CAPABILITY TO WYLBUR

A new announcement from On Line Business Systems offers file transfer capability to/from WYLBUR. This is of especial interest to ADOT as so many of the user files already exist in WYLBUR. This means that the widespread use of TSO may not be necessary in order to support file transfer. This capability, coupled with ITT Courier's announcement of IRMA board emulation makes EXCELLINK a much stronger product for ADOT.

An upgrade to the Excellink product includes support for co-ax connection boards to cluster controllers from several vendors, including ITT Courier. This makes Excellink even more attractive in the ADOT environment.

COMPUTER TO COMPUTER LOGIC

IBM has announced a 3270 cluster controller, the 31/4, that supports the IBM token ring connection and DISOSS, permitting the

transfer of files between personal computers and mainframes. Also announced, was future support for LU6.2 protocol, computer to computer logic, by the 3174. While these announcements do not immediately affect ADOT, from a strategic viewpoint they do indicate that the use of current file transfer products may be short lived (two years), or that these products may evolve to take advantage of the LU6.2 capabilities. In either case we should beware of erecting systems that lean heavily on a highly tailored or modified version of current products and should maintain a posture of flexibility so we can use new products when they become available.

ERROR CORRECTING MODEMS

Coming onto the market place, now, are error correcting modems. These modems have the ability to examine the characters or blocks of data they send and append or compare error correction information. They have the ability to interact with other modems so that they can request retransmission of data without ever involving the attached terminal or computer devices. We have not tried any of these modems, but they hold out great promise to solve some of our recognized data transmission problems.

ADVANCED TELEPHONE AND WIRING FUNCTIONALITY

ADOT will be participating in a test of new telephone circuit and switch system (ISDN and X.25) this year (1986). One of the expected benefits of this system is a vastly improved level of reliability for dial-up data transmission. All signals will be digital, from end to end, and modems will not be used. Also, voice and data signals will be able to travel over the same wiring, both in the office and between locations. This will mean an eventual need for only one set of wires for an office, as they will support both the voice and data requirement. The significance here is that the payback on investments in wiring and modems should be visible now, not at some remote point in the future.

III. RECOMMENDATIONS

A. The report retrieval software (VPSS) acquired under this project should be kept in production status, and its use expanded if necessary. This is a valuable tool for distributing reports to printers attached to 3270 clusters.

B. The PCI protocol converter acquired under this project should be put into production as soon as possible. A second unit should be acquired for backup. Supported functions should be:

   1. Dial-up 3270 emulation from the personal computer to ADOT's mainframe interactive applications (IMS, TSO, WYLBUR).

   2. File transfer from personal computer to mainframe, and from mainframe to personal computer.

C. The EXCELLINK file transfer software should be put into production as soon as possible. Supported hardware and software should be:

   1. Dial-up from the personal computer, to a protocol converter, to ADOT's mainframe TSO.

   2. Hardwire connection from the personal computer, to a 3270 cluster controller (ITT Courier), to ADOT's mainframe TSO.

   The EXCELLINK/WYLBUR product should be acquired and installed to permit file transfer to and from WYLBUR.