

Cleo 3780Plus Evaluation Report

White Paper

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This paper describes and contrasts the functionality of the HP 2780/3780 Protocol Emulator products from Hewlett-Packard Company and the functionality of the Cleo 3780Plus product from Cleo Communications. This evaluation was undertaken to determine if the Cleo 3780Plus product was a suitable replacement product for current HP 2780/3780 Protocol Emulator customers.

The results discussed in this paper provide an overview of the features of both products. However, the evaluation did not have as a goal the creation of a migration guide and this paper should not be used as such.

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Introduction

Executive Summary

The Cleo 3780Plus product is a combination hardware (SYNCcable+) and software (Cleo 3780Plus) product designed to allow a VAX or Alpha system running OpenVMS to emulate an IBM 3780 or 2780 terminal. The goal of the evaluation process described in this white paper was to ascertain its capacity as a possible successor to, and replacement for, HP's current 2780/3780 Protocol Emulator product offerings. The current HP 2780/3780 Protocol Emulator (henceforth referred to as 2780/3780 PE) is an entirely software-based product offered by HP as the bisynchronous protocol solution for its OpenVMS systems.

It is the conclusion of this evaluation that the Cleo 3780Plus product sufficiently fulfills the functional requirements necessary to qualify it as a suitable successor to the current 2780/3780 PE offerings.

Purpose

The purpose of this evaluation was to ascertain the completeness of the Cleo 3780Plus product (henceforth referred to as Cleo) with respect to HP's current 2780/3780 PE products. HP's current bisync market is understood to contain a sizable VAX base. A significant portion of this installed base has expressed a desire to migrate to HP's Alpha hardware bringing forward the 2780/3780 functionality. With the announcement of the retirement of the HP Alpha 2780/3780 PE product, the need to identify and evaluate an Alpha-based bisync product for equivalent functionality was established. As any VAX to Alpha migration would require new bisync software, Cleo is viewed as a possible third-party migration path for HP's current VAX bisync customers. In addition, Cleo will be available for the Alpha customer base as they transition away from the retiring Alpha 2780/3780 PE product.

The Evaluated Products

There are two current HP products in the OpenVMS bisync space: one for VAX and the other for Alpha. Both of these products are functionally equivalent. The focus of this evaluation, the VAX 2780/3780 PE product, is a mature and reliable product. Originally designed by DIGITAL, it is now supported by HP. The OpenVMS system is attached to the mainframe environment through a HP communications device, a line, a modem, and an IBM communications controller. 2780/3780 PE is a software-based solution that relies upon a pseudo-driver to internalize the intricacies of asynchronous/synchronous communication between the OpenVMS client and the IBM mainframe communications controller. It requires that one or more of the following HP communications hardware devices be installed: DMB32, DMB32, DSV11, DPB11, DSF32, DSF32, DSW21/41, DSW42.

Cleo, on the other hand, is a combination hardware/software solution that uses a serial port on the OpenVMS system. It consists of 2 cables (one sync, one async), a black box, and associated software layered onto OpenVMS. The async/sync logic has been removed from the OpenVMS platform and placed in Cleo's black box which sits between the serial port and (ultimately) the mainframe. The Cleo black box requires a separate power source. The async cable connects it to the OpenVMS system; the sync cable connects to a synchronous modem or modem eliminator.

The associated software installed on OpenVMS manages the logical connection through the serial (async) port to the box which performs the appropriate translation (async/sync, sync/async) depending upon the communication direction.

Preinstallation

Test Configurations

Cleo: DEC 3000 Model 400 with 64Mb running OpenVMS Alpha V6.2.

2780/3780 PE: MicroVAX 3000 with 16Mb running OpenVMS VAX V6.2.

IBM Communications Controller: generated for half and then full duplex test capability.

Both systems were evaluated as single-user systems.

Documentation

The documentation for both products consisted of two manuals: an *Installation Guide* and a *User Guide*. The 2780/3780 PE software consisted of a saveset resident on the OpenVMS Layered CD (March 2000). The Cleo software was available as a saveset on a 4mm DAT tape.

Installation Guide

Both products provide a well-organized *Installation Guide*.

The 2780/3780 PE guide identified all of the files (and their location) added to an OpenVMS system by the installation procedure. As with any standard OpenVMS layered product installation, the 2780/3780 PE guide contained a copy of a sample installation.

The Cleo guide does not identify all the files and their locations in the same manner as the 2780/3780 PE guide. However, the Cleo documentation did provide a list of the files added to a target system. Cleo also provides a nice feature that allows the user to remove all unnecessary files depending upon the installation type (Single or Multi-User). The Cleo guide does not provide a sample installation. Instead, it provides a brief description of file system conversion and user management issues (queues, spooling, batch) normally associated with product migrations.

User Guide

Both products provide a substantial *User Guide* designed to allow the programmer to navigate the respective product.

The 2780/3780 PE provides chapter discussions on user interfaces (both supported and unsupported), the command line interface (CLI), detailed command descriptions, and diagnostic information. It contains appendices that discuss record-oriented and DPV11 driver interfaces, communications protocols, the PE components from RMS to the driver, error messages, programming examples, and translation characters (file formats). In this context, and particularly in light of its product maturity, the 2780/3780 PE *User Guide* is a slightly more complete document.

The Cleo *User Guide* focuses on three main topics: use of the Command Menu, an extensive discussion of configuration management and its effects on the operation of the Cleo product, and a detailed discussion of the individual Cleo commands. It also provides a brief tutorial chapter on hypothetical sessions (programming examples), and appendices on modem support, file formats, multi-point operation, and device selection. Unfortunately, the guide's index was all too often

inaccurate in its page references and appeared to have little bearing on the location of many of the subjects listed therein.

Privilege Requirements

The 2780/3780 PE installation requires a minimum of CMKRNL, WORLD, and SYSPRV.

The Cleo installation requires SYSPRV, LOG_IO, PSWAPM, ALTPRI, PRMMBX, SYSNAM, and CMKRNL.

Communication Equipment

2780/3780 PE recommends a Digital or Bell modem for the half or full duplex transfers.

Additional handshaking requirements must be met in order to use other manufacturers' modems.

Cleo offered no particular modem recommendation or requirement for the OpenVMS installation. Instead, they provided modem information in two different appendices: a brief appendix on the Modem Interface Cable in the *Installation Guide* and a more robust Modem Support appendix in the *User Guide*. While both proved useful in their own way, their placement proved curious as the information in the *User Guide* proved to be most critical for the installation process.

Cleo may also be attached to a DECserver serial port connected to an Alpha via DECnet. The installation manual suggests a partial parameter setting list for such a configuration. Due to time and hardware constraints, the DECserver configuration was not tested for this evaluation.

Customer Support

At the time of the 2780/3780 PE installation, the need to contact HP bisync support did not arise. However, to complete the evaluation, HP customer support was later contacted. They provided help in a professional and detailed manner.

Cleo Communications support was contacted during the installation process. This involved leaving either a voice message or email for customer support. They responded within a day and proved to be as professional and helpful as the HP support team.

Installation

Both products install on the currently supported variants of OpenVMS V6.2, V7.2, and V7.3. On the assumption that the older O/S variant would prove to be a harder installation due to its length of time in the field, OpenVMS V6.2 was chosen as the platform for both VAX and Alpha.

The actual installation procedures for 2780/3780 PE and Cleo were reasonably straight forward. 2780/3780 PE employs the standard VMSINSTAL utility; Cleo provides a customized command procedure (INSTALL) with its software kit. However, the installation requirements for the two products are quite different.

2780/3780 PE Installation

Depending upon the configuration of the system, 2780/3780 PE requires the following prerequisite software: the proper DECnet-Plus for OpenVMS for the particular OpenVMS version and the appropriately paired X.25 for OpenVMS product for the version of DECnet-Plus being installed (and any additional ECOs).

The development of the 2780/3780PE product occurred over many years. During its development, other HP products, such as DECnet-Plus for OpenVMS and X.25 for OpenVMS, replaced some of the functionality provided by the 2780/3780 PE product. This led to the need to install components of the DECnet and X.25 products before a customer could use the VAX PE product. The end result of this evolution is that the customer is assumed to have knowledge of the DECnet and X.25 installation processes that they may not possess. Unfortunately, if a customer is not already using the DECnet and X.25 products, this results in a 2780/3780 PE installation (and deinstallation) process that is more cumbersome and time consuming than a simple single-product installation.

2780/3780 PE Diagnostics

Once the software is installed, a degree of effort is required to establish communication between the 2780/3780 PE and the mainframe. Once again, this is not a particularly straightforward process. However, 2780/3780 PE does come equipped with a fairly robust set of diagnostic procedures (XJTEST) that are well documented in the *User Guide*. Ultimately, by utilizing the XJTEST diagnostics in conjunction IBM system configuration resources, communication between the two nodes was established and RJE traffic successfully monitored.

Cleo Installation

The initial supposition was that the Cleo product would also require DECnet-Plus for OpenVMS and X.25 for OpenVMS software in order to properly configure and use the async port. This assumption proved to be false; the Cleo software does not require, nor does it use, the DECnet-Plus for OpenVMS or X.25 for OpenVMS software.

Installing the Cleo software was more problematic in that the Alpha machine had no DAT device requiring, instead, a two-step copy process for proper file placement. Cleo supports diskette, tape, and CD as distribution media.

Mistakes, a part of any evaluation process, were made during the Cleo installation. It should be mentioned that a number of days were lost while attempting to make the OpenVMS machine drop

DSR and recognize the initial handshake from the mainframe. It was only after talking with Cleo customer support and painstakingly reviewing the *Installation Guide* that the critical component was identified: cable length. There is an absolute restriction of 25 feet on the length of the sync cable running from the Cleo black box to a modem eliminator.

The original test-bed had been pre-configured using a 50-foot cable. Once the correct length was employed, all DSR/CTS/DTR issues disappeared. This spawned the observation that, at least in the case of the Cleo product, there does not appear to be any of the traditional engineering “wiggle room” in the specifications. Twenty-five feet means, quite literally, twenty-five feet.

Cleo Diagnostics

Cleo has a Debug (DBG) program - a standalone utility that is used mainly by Cleo support to diagnose port/DECserver problems. While DBG is useful in clearing a "hung" line, it was not of much use in tracing the initial DSR/DTR problems. In contrast, XJTEST, the 2780/3780 PE diagnostic package, provided information that proved valuable in configuring the mainframe system but which was not easily accessible with the Cleo debug utility.

Usage

Command Line Functionality

2780/3780 PE

There are five commands in the 2780/3780 PE user command language: SET, SEND, RECEIVE, SHOW STATE, and WAIT. Each of the 2780/3780 PE commands has at least one qualifier. The 2780/3780 PE commands, their associated qualifiers, and their closest Cleo equivalents are listed in Appendix A of this document.

It is not possible, in all cases, to directly map a 2780/3780 PE command to an equivalent Cleo command. However, the *Cleo User Guide* provides documentation on a rich set of commands that do lend themselves to useful combinations. The features that have been mapped between 2780/3780 PE and Cleo are based upon testing and a comparison of the documentation sets.

Cleo

Appendix B of this document lists all of the Cleo commands available at the Command> prompt. All of these commands may be executed interactively or may be executed automatically from within a job/script file. The majority appear in the Cleo's preferred management method, the Command Menu.

Due to its nature as a multi-platform, menu-driven interface, Cleo has a far more robust set of commands with which to run bisynchronous communications as well as to monitor and/or alter the product's performance and configuration. The Command Menu is a typical character cell interface; the menu is diverse and fully accessible to (and by) the OpenVMS CLI making it an attractive feature. The Command Menu allows an end-user to build (and submit) scripts "on the fly" and eliminates file structure issues (see "File Structures") by creating files in the appropriate record format.

There are additional commands that are not accessible from the Command Menu but which are available at the command prompt (refer to Appendix B for a complete listing). Due to the evaluation's time constraints, not all of the Cleo features were tested for completeness and validated for accuracy.

Cleo's Strengths

The main strength of the Cleo product is that most of the 2780 issues have been removed from the communications process by placing the logic inside its black box and, therefore, behind the product "curtain". The Cleo default mode is 3780 and the accompanying documentation repeatedly emphasizes that the default configuration is sufficient for 2780 processing.

The 3780, therefore, presents the majority of the database and functionality challenges. A series of inherited scripts were quickly adapted to produce PU, PR, and interactive output. However, care should be taken during any migration, in order to properly configure Cleo for the desired output format using a combination of full/half duplex, transparency, and compression options.

Cleo has significantly streamlined the functionality of bisync communications. By externally managing the async/sync logic issues in its black box, the Cleo product has reduced

installation/maintenance issues for OpenVMS. Once one is familiar with the mechanics of the initial installation, there is no requirement for detailed knowledge of additional layered products. In addition, by introducing the Command Menu, Cleo has given the application programmer a degree of control not available with 2780/3780 PE.

Unsupported 2780/3780 PE Interfaces a Possible Problem

VAX PE offers 3 different interface options: command language, record-oriented, and QIO (device driver). Each interface contains different options and each responds to a different set of programming commands. This allows for a robust engineering and development environment. However, only the Command language interface is actually supported by the 2780/3780 PE product.

The evaluation was not able to identify an equivalent functionality in the Cleo product. Support issues aside, this may prove to be a sticking point for an undetermined number of customers who may have come to rely upon or who have developed products incorporating the record-oriented or QIO interfaces.

A Monologue on Use

The Cleo product is surprisingly easy to use and OpenVMS friendly.

Running in interactive mode is straightforward once the end-user has gained a level of familiarity with the Command Menu, building scripts, and job submission. The ability to access DCL level commands from both the Command Menu as well as from a JOB script is a nice feature. The BRanch and EXecute features were particularly interesting and useful features that allow decision making and sequential execution of commands from within a specified job file.

A number of the scripts used to evaluate the 2780/3780 PE product were modified for Cleo product testing. Relying on default configurations and working from within the menu interface, additional tests and commands were issued. This proved to be an easy task to accomplish.

Test output was successfully received (printer/punch). There were a number of unresolved questions that arose regarding the use of special characters, data compression, and transparency. A more detailed understanding of the CONfig options (a matter of continuing to work with the product) should resolve any open issues in this regard. However, due to time and resource constraints, it was not possible to resolve all these issues during the evaluation.

File Structures

2780/3780 PE creates sequential files of variable length records. Each record is as long as the data within it requires and all records are padded to an even number of bytes.

Cleo also creates sequential files. However, the record format is Stream_LF. In Stream_LF files, special characters, called terminators, delimit the records in the file. RMS treats the terminators, in this case the line feed character, as an integral part of each record and ignores leading zeroes.

This directly affects any potential 2780/3780 PE to Cleo migration. Cleo will not recognize file input that is not in the Stream_LF format. This has been recognized as an issue by Cleo and there are at least two methods of converting 2780/3780 PE files to the required Stream_LF format: FDL

conversion and template Job file creation. Each is discussed in the “OpenVMS File Structure” section of the Cleo *Installation Guide*.

Cleo also provides an FDL file template that can be used to convert the output of any editor to the Stream_LF format required by the job and configuration files. The FDL conversion is a straightforward process.

There is also the requisite FDL file for converting stream output received from the mainframe to RMS format as is currently recognized in the OpenVMS environment (and produced by the 2780/3780 PE product).

Interactive Processing

Both products support interactive processing from the command language interface. In this mode, a user cannot access a line currently in use. Command files containing either a series of 2780/3780 PE or Cleo commands may be invoked from the OpenVMS CLI.

Batch Processing

For 2780/3780 PE, batch processing is generally done in what is known as shared mode. In shared mode, the line is kept continuously open as one session that is shared by all users. Users submit jobs to a batch queue regardless of whether the queue has been started and need not be concerned about accessing the line. Queuing of batch jobs follows standard OpenVMS conventions for job submission to batch queues.

Cleo is a well-behaved OpenVMS application which follows the standard OpenVMS conventions for batch job submission, thus allowing Cleo to take advantage of the batch method of processing. Users may submit job/script files to a batch queue for automatic processing. The job file may either be a canned script or created interactively. However, it must be in the appropriate Stream_LF format recognized by Cleo or processing will not occur.

During testing, output was directed to a printer queue from within a Cleo Script. Due to a hardware constraint, there was no ability to actually print the output from the queue to a print device. In lieu of a printer, output was directed to a screen display for verification. The output matched that which was expected (and that which had been analyzed as it came across the wire from the mainframe).

System Management and Security

As previously mentioned, both 2780/3780 PE and Cleo require a certain level of privilege in order for their respective installations to successfully complete.

VAX PE

During testing it was sometimes necessary to run FORCEX against the NYACP process as described in the documentation. Re-running the RJELoad (startup) procedure failed due to the existence of previously installed images. The returned error message indicates that the system needs a reboot when, in actuality, all that is needed is replacement of the previously installed images (prior to starting the ancillary process NYACP) with the INSTALL/REPLACE rather than the INSTALL/ADD command utility.

Cleo

In testing the Cleo product, it was found that certain OpenVMS security features may not be completely understood by the product. The *Installation Guide* (not the *User Guide*) briefly mentions OPER and SYSNAM as the privileges necessary for a user to perform "most functions", for example, running job files, invoking command files, and submitting batch files. However, it would appear, at least in the case of running job files, that OPER and SYSNAM are not sufficient. Using either READALL or SYSPRV appears to work.

The installation procedure is said to require SYSPRV, LOG_IO, PSWAPM, and ALTPRI privileges. However, it appears only to require SYSPRV and CMKRNL. There are two installed, privileged, shareable images associated with Cleo - CLEODAT.EXE and APIDAT.EXE. Both images are installed with SYSPRV and require SYSPRV as well as CMKRNL in their respective installation processing.

Conclusions

Within the context of the stated goal of this evaluation, the migration of VAX bisync customers to an Alpha product, the obvious conclusion is that Cleo 3780Plus presents an attractive migration path for HP's current product offerings in the bisync communications space. With its menu-driven command structure providing a rudimentary ease-of-use, it is clear that the product was developed with an eye to larger functionality, and a broader, multi-platform audience.

Like many products of this type, it attempts to remove the need for in-depth bisync knowledge, as well as extensive configuration management, thus allowing for less long-term maintenance concerns. In other words, it provides flexibility and removes the worry, as it moves the async/sync management issues to the software logic contained in its black box.

Another major attraction is the product's availability on both VAX and Alpha. This addresses the issue of the customer having to support two distinct products - VAX PE and Alpha PE - by potentially consolidating two products into one.

From this evaluator's point of view, the installation is significantly easier because Cleo eliminates the need for detailed knowledge of DECnet-Plus for OpenVMS and X.25 for OpenVMS.

That said, there are two significant caveats. First, the user must read all of the documentation in extreme detail and with the utmost care in order to fully understand the modem implications and cabling restrictions inherent in the product. Second, the 2780/3780 PE files will have to be converted to the appropriate Cleo record format (Stream_LF).

Of course, a migration of any sort is not necessarily a popular concept with customers. However, with some effort, as well as rigorous testing, and by paying attention to detail, converting to Cleo from either of HP's 2780/3780 PE offerings is not only possible but, in many ways, desirable.

Appendix A: Command Language Comparison

The comparisons made in the table that follows provide an overview of the features of both products. However, the evaluation did not have as a goal the creation of a migration guide and this table should not be used as such. Several of the command options presented interrelate to one another in ways too complex to allow a simple one-to-one mapping that is correct in all circumstances. See each product's *User Guide* for more detailed information.

2780/3780 PE

Cleo

SEND

TE(xt)

/timeout=*hh:mm:ss*

set by CO(nfig)

RECEIVE *filename*

same [or INterrupt for partial files]

[/default]

print.000/rcvfile.000

[{/print | /punch}]

any filename

[/spool]

/queue=*name*

[/rename]

through SY(stem) command

WAIT

[{receive all}]

SL(eep) [*seconds*]

[/interval=*hh:mm:ss*]

IDLE (configuration setting)

[/timeout=*hh:mm:ss*]

SHOW [STATE] [line/identification =*line-id*]

XX command

SET [*modifier*] [*qualifier*]

CO(nfig) - interactive; .OVR file - static

Line

[/identification=*line-id*]

set by CO(nfig)

/dsr_wait=*hh:mm:ss*

not identified

[{on | off}]

QU(it)

[{/shutdown | /noshutdown}]

N/A - port is active or not active

[{shared | interactive}]

JO(b) or CLI

[/queue=*queue-name*]

PR(int)

[/priority=*n*]

via the PR(int) command

[{half_duplex | full_duplex}]

set by CO(nfig)

[{2780 | 3780}]

set by CO(nfig)

[{cardimage | nocardimage}]

set by CO(nfig)

[{translation nottranslation}]	partially set by CO(nfig); via commands and qualifiers
[{/transmit	[(TE -B)]
/punch	[(RE -T)]
/print }]	[(PR -T)]
	[(SC -T)]
[{tabs notabs}]	not identified
[{nl nonl}]	Set by CO(nfig); via commands and qualifiers
	[(RE -R)]
	[(PR -R)]
	[(SC -R)]
[{compression nocompression}]	set by CO(nfig)
[{/transmit	
/punch	
/print }]	
[{transparency nottransparency}]	[(TE -N) (PR -N) (RE -N) (SC -N)]
[{forms	
[{/print /punch }]=	Appendix C (device selection);
[{/escape /fortran }]	
	Appendix B (Vertical Forms File);
noforms}]	
[{/print /punch }]=	FDL conversion
[{/variable /fixed }]	
Recordsize	Set by CO(nfig)
[{/print_transparent /print_nottransparent}]	[PR -N]
[{/punch_transparent /punch_nottransparent}]	[RE -N]
/transmit= <i>nnn</i>	3780 = to 4048 char/block
end_of_file	
= { ETX EOT }	[(TE -X) EOT]

Appendix B: Cleo 3780Plus Commands

Making and Breaking the Connection:

- AUtodial - Automatic dial
- ANswer - Automatic answer
- AT - Send an 'AT' string to the modem
- VOIce - Disconnect phone line & disable autoanswer
- DAta - Data mode

File Transfers:

- BIinary - Transmit binary file(s)
- TEExt - Transmit text file(s)
- KEy - Transmit a keyboard message
- EOt - Transmit an End of Transmission
- REceive - Receive file(s)
- SCreen - Receive file(s) and display on screen
- PRint - Receive file(s) and spool to printer
- INterrupt - Interrupt a receive file

Configuration:

- COntig - Display or change configuration
- TAble - Display or change translation table(s)

Diagnostics:

- LOg - Open, close, display, or write to the log file
- MOonitor - Open or close a serial line monitor
- XX - Post current 3780Plus information
- HElp - Display 3780Plus command information

Automating Sessions with Job Scripts:

- JOb - Create or scramble a job/script file
- EXecute - Execute commands from a job/script file
- BRanch - Branch in job/script file based on condition
- ## - Job/script comment line

Tokens, Variables, and Counters:

- TOken - Enable, disable, display, or set token variables
- STart - Display or initialize counter

+COUNTER - Increment counter

-Counter - Decrement counter

Miscellaneous:

SYstem - Execute an operating system command or an application program

SLeep - Pause specified seconds

QUit - Exit 3780Plus