Introduction

The purpose of this manual is to provide information about the set of software utilities furnished by Kernel Toolkit Version 7.3. This manual is written with the assumption that the reader is familiar with the DHCP computing environment, understands VA FileMan data structures and terminology, and has some understanding of the MUMPS programming language. If you do not use the system on a regular basis, it is recommended that you review the *User's Guide to Computing*.

The four major areas of the Kernel Toolkit, that are described in this manual, are listed below:

1. **Multi-Term Look-Up (MTLU)**

   DHCP Multi-Term Look-Up (MTLU) utilities provide a method of enhancing the look-up capabilities of associated VA FileMan files. Multi-Term Look-Up (MTLU) is an adaptation of a tool developed by the Indian Health Service (IHS) which was made generic by the Albany Information Systems Center (ISC).

2. **Duplicate Resolution Utilities**

   Duplicate Resolution utilities give programmers a shell that allows their users to check their data files for duplicates and merge them if any are found. They provide the functionality of combining duplicate records based on conditions established in customized applications. The Merge Shell was developed by the IHS to support their Multi-Facility Integration project.

3. **Capacity Management Tools**

   Capacity Management tools are provided in Kernel Toolkit to measure resource consumption by package and help identify and solve performance problems. In addition, new Capacity Management utilities have been created to utilize Virtual Memory Systems (VMS), MUMPS, and the latest VA Kernel utilities. These utilities sample running systems at regular intervals and store a key subset of system's metrics related to configuration, database activity, response time, CPU, memory, and I/O utilization.

4. **Tools**

   A set of generic tools have been developed to aid the DHCP development community and IRM in writing, testing, and analysis of code. These tools are used by developers, documenters, verifiers, and packages to support distinct tasks.

The instructions for installing Kernel Toolkit on different operating systems are provided in the *Kernel Toolkit Installation Guide Version 7.3.* Files, routines and options, along with other structural features, are documented in the *Kernel Toolkit Technical Manual V. 7.3.*

Kernel V. 7.1, VA FileMan V. 20.0, and MailMan V. 7.0 must be installed before installing Kernel Toolkit V. 7.3. For more information on installing Kernel refer to the *Kernel Installation Guide.*

If the reader is not already familiar with Kernel, the *Kernel Systems Manual* and the *Kernel Technical Manual* should be obtained and reviewed. Other documents describing overall DHCP policy are the VA *Programming Standards and Conventions (SAC),* the *MIRMO/ISC Operations Document,* and the *National Verification Document.*

Orientation

This manual uses several methods to highlight different aspects of the material. Descriptive text is presented in a proportional font. "Snapshots" of computer dialogue (and other on-line displays) are shown in a non-proportional font and enclosed within a box. Process charts, used to illustrate option flow in step-by-step procedures, are also illustrated in a non-proportional font. Editor's comments within a dialogue are displayed in italics. Italics are also used to emphasize a particular word or phrase within a sentence. The user's responses to on-line prompts are highlighted in boldface. Boldface is also used to highlight a particular topic.

The Return key is used to terminate "reads". It is illustrated as <RET> and is included in examples only when it might be unclear to the reader that such a keystroke must be entered. The following example indicates that you should enter two question marks followed by pressing the Return key when prompted to select a menu option:

```
Select Primary Menu option: ??
```

All uppercase is reserved for the representation of MUMPS code, variable names, or the formal name of options, field and file names, and security keys (e.g., the XUPROGMODE key).

After introducing the idea of a prompt and describing how it appears within the menu system, further references to that prompt might use an abbreviated form of the prompt name. For example, the "Select Primary Menu option:" prompt may be referred to as the select prompt after the initial description.

Programmer calls that are supported for use in application packages [on the Database Integration Committee (DBIC) list] are presented with a leading bullet, or indented, and include the up-arrow (^) used when calling the routine. The following is an example:

```
EN1^XQH
```

Direct mode utilities are prefaced with the MUMPS prompt to emphasize that the call is to be used *only in direct mode*. They also include the MUMPS command used to invoke the utility. The following is an example:

```
>D ^XUP
```

Package Management

Throughout this manual, advice and instructions are offered about the numerous utilities the Kernel Toolkit provides for overall DHCP management. Site parameters, for example, are discussed in various chapters. The *Kernel Toolkit Installation Guide V. 7.3* also includes information about package management (such as recommended settings for site parameters).

There are no special legal requirements involved in the use of the Kernel Toolkit's utilities.

Package Operation

The following chapters, contained in the *Kernel Toolkit User Manual V. 7.3*, provide the information necessary for the user to operate the package. On-line documentation is included where applicable.

Multi-Term Look-Up (MTLU)

Duplicate Resolution Utilities

Capacity Management Tools

Tools

Multi-Term Look-Up (MTLU)

Multi-Term Look-Up (MTLU)

Overview

This section contains an introduction and functional description, site implementation instructions for Multi-Term Look-Up (MTLU), the actual option documentation, and the Application Programming Interface (API) for MTLU.

Introduction to Multi-Term Look-Up (MTLU)

Many medical information systems depend on the standardized encoding of diagnoses and procedures for reports, searches, and statistics. The ICD DIAGNOSIS (#80), ICD OPERATION/PROCEDURE (#80.1), and CPT (#81) files are among some of the more critical files. The Multi-Term Look-Up utility increases the accessibility of the information in these files by associating user-supplied words or phrases with terms found in a more descriptive, free-text field.

Multi-Term Look-Up enables:

- **Local set-up of virtually any reference file.**
- **Developers to modify the behavior of the "special" look-up by defining shortcuts, synonyms, or keywords.**

MTLU integrates with any package that uses a reference file which has been entered in a site's LOCAL LOOKUP file (#8984.4). The only related manual is the *Kernel Toolkit Technical Manual V. 7.3*. It is intended for use by technical computer personnel and provides necessary information for technical operation of the software product.

Functional Description

The DHCP Multi-Term Look-Up (MTLU) utility provides a method of enhancing the look-up capabilities of associated software packages. This utility is comprised of the following options:

- **The Multi-Term Lookup (MTLU) option [XTLKLKUP] is used to test ICD diagnosis and procedure codes, CPT codes, and other commonly used references that have been entered in the LOCAL LOOKUP file (#8984.4). Optionally, terms or phrases may be entered into the LOCAL KEYWORD (#8984.1), LOCAL SHORTCUT (#8984.2), or LOCAL SYNONYM (#8984.3), files.**

- **The Print Utility option [XTLKPRTUTL] is used to print a list of shortcuts, keywords, or synonyms from a specified reference file in the LOCAL LOOKUP file (#8984.4). This list can be sorted alphabetically by name or numerically by code.**

- **The Delete Entries from Look-Up option [XTLKMODPARK] is used to delete a reference file from a site's LOCAL LOOKUP file (#8984.4). This option should be used as an IRM/developer utility and can only be accessed by holders of the XTLKZMGR security key.**

- **The Add Entries to Look-Up File option [XTLKMODPARS] is used to add reference files to a site's LOCAL LOOKUP file (#8984.4). This option should be used as an IRM/developer utility and can only be accessed by holders of the XTLKZMGR security key. In order to add entries with this option, DUZ(0) must be set to an at-sign (@).**

- **The Add/Modify Utility option [XTLKMODUTL] is used to enter new or edit existing shortcuts, keywords, or synonyms to the LOCAL LOOKUP file (#8984.4) as described below:**

    - **The Shortcuts option [XTLKMODSH] is used to enter new or edit existing shortcuts to the LOCAL LOOKUP file (#8984.4).**

    - **The Keywords option [XTLKMODKY] is used to enter new or edit existing keywords to the LOCAL LOOKUP file (#8984.4).**

    - **The Synonyms option [XTLKMODSY] is used to enter new or edit existing synonyms to the LOCAL LOOKUP file (#8984.4).**

Usage Considerations

MTLU provides users and programmers with the ability to perform specialized look-ups on database files using standard VA FileMan calls. These files typically

comprise a number or "term" in the .01 field and a longer description or definition in some other field.

In the simplest application of MTLU, a special look-up routine (XTLKDICL) is defined in the file's Data Dictionary (DD), then a MUMPS cross reference is applied to the description/definition field. Options are available to fully configure a file for use with MTLU. FileMan is used to create/build the cross reference. To set the cross reference, text from the selected field is passed to a tokenizing routine (XTLKTOKN). Trivial words are filtered by an expanded Key Word In Context (KWIC), then each remaining token is added to the cross reference.

To request a look-up, users and programmers can pass in words or phrases. Their input is similarly tokenized. However, only terms associated with *all* tokens entered are found. Input can be generalized using partial words or fewer words as well as lexical variants. For example, using the FileMan Inquire to File Entries option on the ICD DIAGNOSIS file (#80) one could first enter "MALIG". MTLU informs the user which terms apply to the search, "MALIG/MALIGNANT", and that 447 matches are found. To be more specific, the user might enter "MALIG LIP" to request all malignancies associated with the lip. In this case, only 12 matches are found. The user can further screen searches by using the Not-Sign (') before a word or phrase. To request all malignancies of the lip *except* those of the lower lip, one could enter "MALIG LIP 'LOWER" and obtain 10 matches. Though the term "malignancies" may not exist in the look-up file, MTLU might still produce a match. When a term contains a suffix that does not produce a match, MTLU removes the suffix and continues the search.

NOTE: See the "How to Display and Print File Data" chapter in the *VA FileMan User Manual* for more information on the Inquire to File Entries option.

Three additional files are supplied that can dramatically alter the predictable behavior described above. They are checked in the following order against the user's entry:

1. **LOCAL SHORTCUT file (#8984.2): Shortcuts are used to point to a single term. They can be a word or phrase. MTLU checks the user's entry against this file first for an exact match. If found, the look-up displays only the associated entry. A single shortcut cannot point to multiple terms.**

2. **LOCAL SYNONYM file (#8984.3): Synonyms can be associated with many terms in a file because they can be associated with multiple "tokens" rather than a specific term. For example, CANCER can be defined as a synonym of "MALIG", "TUMOR", and "LEUKEMIA". When the user enters CANCER, the look-up finds *all* terms associated with the three tokens as if each had been entered separately. Compared with the example above, CANCER returns 534 matches. CANCER LIP returns the same 12 matches as MALIG LIP.**

3. **LOCAL KEYWORD file (#8984.1): A keyword or phrase can be associated with a single term, much like a shortcut. However, it can also be associated**

with multiple terms, and multiple keywords can be associated with the same term.

The term SMOKER can be used as a synonym or keyword. As a keyword, one can associate it with a few *specific* diseases. As a synonym, properly selected tokens might result in a display of all smoking-related diseases.

Recall that MALIG results in 447 matches. If this were used as a shortcut to a single entry, MTLU would display only that entry and the remaining 446 would never be displayed.

These files add some control over the behavior of certain look-ups. However, developers should use extreme caution when placing entries in these files to ensure that results are predictable and appropriate for both users and other DHCP package developers.

The decision to populate them for a given look-up file depends on whether or not a commonly used word or phrase results in any matches during a look-up. If not, it is a candidate. The LOCAL KEYWORD (#8984.1), LOCAL SHORTCUT (#8984.2), and LOCAL SYNONYM (#8984.3) files should only be populated with common words or phrases.

In the event that a search produces no matches, MTLU continues with a standard FileMan search.

USER INTERFACE

Multi-Term Look-Up Menu Options

The following is a description of the Multi-Term Lookup Main Menu options [XTLKUSER2] which can be selected from the Application Utilities menu [XTMENU]. The options are described in the same order as they appear on the screen:

```
Application Utilities ...                                        [XTMENU]
   Multi-Term Lookup Main Menu ...                             [XTLKUSER2]
      Multi-Term Lookup (MTLU)                                  [XTLKLKUP]
      Print Utility                                            [XTLKPRTUTL]
      Utilities for MTLU ... <Locked with XTLKZMGR>          [XTLKUTILITIES]
```

Most options are described using the following methods:

- **Introduction** — **A detailed description of the option is given. The introduction usually contains any necessary special instructions.**
- **Process Chart** — **The step-by-step flow of the option is illustrated, showing the various choices allowed at each prompt.**
- **Examples** — **In most cases, there is an example of what might appear on the screen when using the particular option. If the option produces a hardcopy output, an example of the output is usually given.**

The phrase "You will be prompted for a device at this step" appears in the process chart when a device is asked for. A Standard Device Chart is shown on the next page. It provides assistance in answering prompts related to device selection.

The MTLU Process Charts do not contain documentation of the system's response to erroneous input. In certain instances, in order to preserve the integrity of previously entered data, the system does not allow the entry of an up-arrow (^). This might not be documented.

The following chart provides assistance in answering prompts related to device selection:

Standard Device Chart

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	DEVICE:	Device name/number from your DEVICE file (#3.5) for report to print on	3
		'Q'UEUE to have report queued to print at a Later date/time	2
		<RET> for report to Print on your screen	3
		Up-arrow <^>	6
2	DEVICE:	Device name/number from your DEVICE file (#3.5) for report to print on	3
		Up-arrow <^>	6
3	RIGHT MARGIN: 132//	*<RET> to accept default, different RIGHT MARGIN Value, or up-arrow <^>	6
		*The next step depends on what you entered in Step 1:	
		Device name/number	4
		"Q"	5
		<RET> (The report appears on your screen)	6
4	WANT TO FREE UP THIS TERMINAL? NO//	<RET> to accept default	6
		'Y'ES to free up terminal during report processing and to exit from the system	5
		Up-arrow <^>	6
5	REQUESTED TIME TO PRINT: NOW//	*<RET> to accept default	6
		*Later date/time for report process to begin	6
		Up-arrow <^>	6
		*If <RET> or later date/time is entered, the following message appears: "REQUEST QUEUED!"	
6	Return to the menu.		

Using the Multi-Term Lookup (MTLU) Option

The Multi-Term Lookup (MTLU) option [XTLKLKUP] is used to test the ICD diagnosis and procedure codes, CPT codes, and other commonly used references that have been entered in the LOCAL LOOKUP file (#8984.4) and have been associated with a shortcut, synonym, or keyword.

The system searches for entries in the following order: shortcut, synonym, then keyword. If you are entering a multi-term narrative (phrase), you can enter double spaces between each term to avoid a search of the LOCAL SHORTCUT file (#8984.2). When searching for a keyword phrase, the system searches for each word in the phrase and then displays all common entries. For example, if the keyword is FRACTURE FEMUR, the system searches for FRACTURE and then FEMUR and displays only those codes with a diagnosis containing both keywords or synonyms of those words.

The following process chart shows the prompts and steps involved in using the Multi-Term Lookup (MTLU) option:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	Lookup on which file?:	Name of entry in LOCAL LOOKUP file (#8984.4).....	2
		<?> for list of entries.....	1
		<RET> or up-arrow <^>.....	4
2	NARRATIVE:	Existing shortcut, synonym, or keyword.....	3
	If a word, phrase, or symbol is entered that the system cannot identify, the following appears: "Narrative contained no usable words. The following word(s) was not used in this search: {word(s)} Search was unsuccessful."		
	The selected code or description is displayed. The system searches in the following order: shortcut, synonym, then keyword. If more than one entry is found, they are displayed, and you are prompted to select one. If only one entry is found, the following appears:		
3	OK? Y//	<RET> to accept default.....	4
		'N'O.....	4
4	Return to the menu.		

The following is an example of what might appear on your screen when using the Multi-Term Lookup (MTLU) option:

```
Lookup on which file?:  ICD DIAGNOSIS

NARRATIVE:  DIABETES  MELLITUS
( DIABETES|DIABETIC MELLITUS )
....

The following 3 matches were found:

   1: 250.00  (250.00)
      DIABETES UNCOMPL ADULT/NIDDM
   2: 250.40  (250.40)
      DIAB RENAL MANIF ADULT/NIDDM
   3: 775.0  (775.0)
      INFANT DIABET MOTHER SYN

Select 1-3: 2
```

Using the Print Utility Option

The Print Utility option [XTLKPRTUTL] is used to print a list of shortcuts, keywords, or synonyms from a specified reference file in the LOCAL LOOKUP file (#8984.4). Both the shortcut and keyword lists can be sorted alphabetically by name or numerically by code. The synonym list, however, only prints alphabetically.

Since these lists can be long and the generation time consuming, it is suggested you queue the report to a device during off hours.

The following process chart shows the prompts and steps involved in using the Print Utility option:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	Select one of the following: SH Shortcuts KE Keyword SY Synonyms Print which file?:	SH for Shortcuts.....2 KE for Keywords.....2 SY for Synonym.....3	
2	Select one of the following: A Alphabetic C Code Sort By?:	'A'lphabetic.....3 'C'ode.....3	
3	Print {Shortcuts, Keywords, or Synonyms} for which file?:	Name of entry in LOCAL LOOKUP file (#8984.4).....4 <?> for list of entries.....3 <RET> or up-arrow <^>.....5	
4	You will be prompted for a device at this step.....		1
5	Return to the menu.		

The following is an example of what might appear on your screen when using the Print Utility option (an example of the output generated by this option is provided following the computer dialogue):

```
      Select one of the following:

           SH        Shortcuts
           KE        Keywords
           SY        Synonyms

       Print which file?: SH <RET>  Shortcuts

      Select one of the following:

           A         Alphabetic
           C         Code

       Sort By?:  Alphabetic


Print Shortcuts for which file?:  CPT
DEVICE:  HOME// <RET>    RIGHT MARGIN: 80// <RET>



sample output

Shortcuts of the CPT file sorted by Name        NOV 23, 1994  13:36  PAGE 1
FREQUENTLY USED NARRATIVE                ENTRY
------------------------------------------------------------------------------

DREAM                                    01200
NIGHT                                    02400
SLEEP                                    01100
```

Using the Utilities for MTLU Option

The following is a list of the options and their descriptions that comprise the Utilities for MTLU option [XTLKUTILITIES]. This option can only be accessed by holders of the XTLKZMGR security key:

- **The Delete Entries From Look-Up option [XTLKMODPARK] deletes entries from the LOCAL LOOKUP file (#8984.4). In order to do this, there cannot be any shortcuts, synonyms, or keywords associated with the file to be deleted. This option should be used as an IRM/developer utility and can only be accessed by holders of the XTLKZMGR security key.**

- **The Add Entries To Look-up File option [XTLKMODPARS] sets entries in the LOCAL LOOKUP file (#8984.4). This option should be used as an IRM/developer utility and can only be accessed by holders of the XTLKZMGR security key. In order to add entries with this option, DUZ(0) must be set to an at-sign (@).**

- **The Add/Modify Utility option [XTLKMODUTL] is used to make or edit entries in the LOCAL KEYWORD (#8984.1), LOCAL SHORTCUT (#8984.2), and LOCAL SYNONYM (#8984.3) files.**

```
Application Utilities ...                                          [XTMENU]
   Multi-Term Lookup Main Menu ...                                [XTLKUSER2]
      Multi-Term Lookup (MTLU)                                     [XTLKLKUP]
      Print Utility                                               [XTLKPRTUTL]
      Utilities for MTLU ... <Locked with XTLKZMGR>              [XTLKUTILITIES]
        KL Delete Entries From Look-up <Locked with XTLKZMGR> [XTLKMODPARK]
        ST Add Entries To Look-Up File <Locked with XTLKZMGR> [XTLKMODPARS]
           Add/Modify Utility...                                   [XTLKMODUTL]
```

Delete Entries from Look-Up

The Delete Entries From Look-Up option [XTLKMODPARK] is used to delete a reference file from a site's LOCAL LOOKUP file (#8984.4).

All shortcuts, synonyms, and keywords associated with the reference file you wish to delete must be canceled before you attempt to delete the file.

It should be noted that when a reference file is "killed" through this option, all variable pointers from the LOCAL KEYWORD (#8984.1) and LOCAL SHORTCUT (#8984.2) files are deleted. The special look-up routine for the file is also deleted.

Only holders of security key, XTLKZMGR, can access this option.

Due to the brevity of this option, no process chart has been provided.

The following is an example of what might appear on your screen when using the Delete Entries From Look-Up option:

```
Select LOCAL LOOKUP NAME: PROCEDURE MODIFIERS

Are you sure you want to delete PROCEDURE MODIFIERS? YES

Deleting from Local Lookup file.....
Deleting variable pointers from Local Keyword and Shortcut files.
Deleting special lookup routine from PROCEDURE MODIFIERS DD.
```

Add Entries to Look-up File

The Add Entries To Look-Up File option [XTLKMODPARS] is used to add/edit reference files to a site's LOCAL LOOKUP file (#8984.4). Examples of files that a site might wish to enter in their LOCAL LOOKUP file (#8984.4) include: ICD DIAGNOSIS (#80), ICD OPERATION/PROCEDURE (#80.1), and CPT (#81).

Only holders of security key, XTLKZMGR, can access this option. In order to add entries with this option, DUZ(0) must be set to an at-sign (@).

The process chart below shows the prompts and steps involved in using this option:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	Select LOCAL LOOKUP NAME:	Name of new reference file you wish to enter in LOCAL LOOKUP file (#8984.4).....	2
		<?> for file list.....	1
		Name of existing file.....	8
		<RET> or up-arrow <^>.....	12
2	ARE YOU ADDING {reference file name} AS A NEW LOCAL LOOKUP (THE nTH)?	'Y'ES.....	3
		'N'O.....	1
3	LOCAL LOOKUP NAME: {reference file name}//	<RET> to accept default.....	4
		Other file name.....	4
4	LOCAL LOOKUP DISPLAY PROTOCOL:	Entry point for routine to determine the display format.....	5
		<RET> to accept the internal default display format.....	5
	If the entry made at this step is not the same as the cross reference in the description field of the file, the software still functions, but it only uses the keywords entered in the LOCAL LOOKUP file (#8984.4).		
* 5	INDEX:	Cross reference to be used to create new key-words.....	6

***Required field**

Add Entries To Look-Up File option process chart (continued):

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
	NOTE: The following message is displayed : "...Ok, will now setup KEYWORD and SHORTCUT file DD's to allow terms for {reference file name} entries..."		
* 6	PREFIX: M//:	Letter(s) to be used to identify a variable pointer	7
7	The following reminder message is displayed: <REMINDER> Using 'Edit File', set the lookup routine, XTLKDICL, in {reference file name} DD		1
	The selected file is displayed.		
8	...OK? YES//	<RET> to accept default 'N'O	9 1
9	LOCAL LOOKUP NAME: {reference file name}//	<RET> to accept default Correct file name	10 10
10	LOCAL LOOKUP DISPLAY PROTOCOL: {protocol}//	<RET> to accept default Correct entry point for routine to set display format <RET> (no default) to accept the internal Default display format	11 11 11
11	INDEX: {index}//	<RET> to accept default correct cross reference to be used to create new Keywords	12 12
12	Return to the menu.		

***Required field**

The following is an example of what might appear on your screen when using the Add Entries To Look-Up File option:

```
Select LOCAL LOOKUP NAME: PROCEDURE MODIFIERS
   ARE YOU ADDING 'PROCEDURE MODIFIERS' AS A NEW LOCAL LOOKUP (THE 4th)? Y
     <RET> (YES)
   LOCAL LOOKUP NAME: PROCEDURE MODIFIERS// <RET>
   LOCAL LOOKUP DISPLAY PROTOCOL: <RET>
INDEX: AIHS
...Ok, will now setup KEYWORD and SHORTCUT file DD's
   to allow terms for 'PROCEDURE MODIFIERS' entries...
PREFIX: M// <RET>
  <REMINDER> Using 'Edit File', set the lookup routine, XTLKDICL, in
     PROCEDURE MODIFIERS DD
Select LOCAL LOOKUP NAME: <RET>
```

Add/Modify Utility

The Add/Modify Utility option [XTLKMODUTL] is used to enter new or edit existing shortcuts, keywords, or synonyms to the LOCAL LOOKUP file (#8984.4).

A shortcut is a word or phrase which recognizes one specific code or procedure. If you are adding a shortcut whose text duplicates the first part of an existing entry, you must enclose the new shortcut word or phrase in double quotes to prevent the system from matching it to existing terms.

A keyword is a word or phrase which corresponds to several related codes or procedures. Keywords are typically terms commonly used to describe a clinical entity. Entering a series of keywords separated by single spaces results in all of the keywords being added to the specified code.

A synonym is a word entered to expand the look-up capability of an existing term or terms in the LOCAL LOOKUP file (#8984.4). Synonyms would be used in cases where several words within the text of codes or procedures have the same diagnostic meaning (e.g., CANCER and MALIGNANCY). A synonym can be entered for an existing keyword or for a word in the diagnostic description or procedure (e.g., the term CANCER might be matched to the synonyms MALIGNANCY, LEUKEMIA, and CARCINOMA). When CANCER is referenced in the Multi-Term Lookup (MTLU) option, it recognizes all the codes and descriptions associated with MALIGNANCY, LEUKEMIA, and CARCINOMA.

NOTE: A synonym replaces the original word in the look-up process. Therefore, to retain the original word in the search, it must be matched to itself as well as to other synonyms.

Words used as a shortcut should never be repeated as synonyms or keywords. Since the system searches for shortcuts first and stops when one is found, it cannot find duplicated words in the LOCAL SYNONYM (#8984.3) or LOCAL KEYWORD

(#8984.1) files. Since searching all files for each word is time consuming, the search is done in this order so as to speedup the search process.

Since the add/modify functions for shortcuts, keywords, and synonyms are considered separate options, a process chart for each is provided. The charts on the following pages show the prompts and steps involved in using the following options:

```
Select Add/Modify Utility Option: ??

    SH      Shortcuts                                          [XTLKMODSH]
    KE      Keywords                                           [XTLKMODKY]
    SY      Synonyms                                           [XTLKMODSY]
```

The Shortcuts option [XTLKMODSH], one of the three selections within the Add/Modify Utility option, is described below.

The following process chart shows the prompts and steps involved in using the Add/Modify Utility option when adding or editing a shortcut:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	SH Shortcuts KE Keywords SY Synonyms Select Add/Modify Utility Option:	SH for Shortcuts <RET> or up-arrow <^>	2 11
2	Additions/Modifications to Shortcuts in which file?	Name of entry in local reference file <?> for list of entries <RET>	3 2 1
3	Select LOCAL SHORTCUT FREQUENTLY USED NARRATIVE:	New text you wish to use as a shortcut Existing shortcut term <RET>	4 8 1
4	ARE YOU ADDING {'text'} AS A NEW LOCAL SHORTCUT?	'Y'ES 'N'O or <RET>	5 3
	An at-sign (@) entered at this step deletes the entire entry.		
5	LOCAL SHORTCUT FREQUENTLY USED NARRATIVE: {shortcut}//	<RET> to accept default Other text	6 6
6	LOCAL SHORTCUT ENTRY:	Name or number of entry in LOCAL LOOKUP file (#8984.4) you wish your shortcut to reference	7

Add/Modify Utility option when adding or editing a shortcut process chart (continued):

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
7	If the selected number/name corresponds to more than one entry, they are shown and you are prompted to choose one. If there is only one corresponding entry, it is displayed and the following appears:		
	"...OK? YES//	<RET> to accept default.....2 'N'O.....6	
8	LOCAL SHORTCUT FREQUENTLY USED NARRATIVE:{shortcut}//	<RET> to accept default.....9 Correct shortcut term.....9	
9	LOCAL SHORTCUT ENTRY: {code}//	<RET> to accept default.....2 Correct code.....10	
	The selected code is displayed.		
10	...OK? YES//	<RET> to accept default.....2 'N'O.....9	
11	Return to the menu.		

The Keywords option [XTLKMODKY], one of the three selections within the Add/Modify Utility option, is described below.

The following process chart shows the prompts and steps involved in using the Add/Modify Utility option when adding or editing a keyword:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	SH Shortcuts KE Keywords SY Synonyms Select Add/Modify Utility Option:	KE for Keywords..... <RET> or up-arrow <^>.....	2 7
2	Additions/Modifications to Keywords in which file?	Name of entry in local reference file..... <?> for list of entries..... <RET>.....	3 2 1
3	Which code in the {file name} file?	Code for which you wish to enter a keyword.....	4
4	Select LOCAL KEYWORD NAME:	New text you wish to use as a keyword..... Existing keyword term..... <RET>.....	5 6 1
5	ARE YOU ADDING {'text'} AS A NEW LOCAL KEYWORD?	'Y'ES..... 'N'O or <RET>.....	6 1
	An at-sign (@) entered at this step deletes the entire entry.		
6	LOCAL KEYWORD NAME: {keyword}//	<RET> to accept default..... Correct keyword term.....	2 2
7	Return to the menu.		

The Synonyms option [XTLKMODSY], one of the three selections within the Add/Modify Utility option, is described below.

The following process chart shows the prompts and steps involved in using the Add/Modify Utility option when adding or editing a synonym:

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
1	SH Shortcuts KE Keywords SY Synonyms Select Add/Modify Utility Option:	SY for Synonyms <RET> or up-arrow <^>	2 9
2	Additions/Modifications to Synonyms in which file?	Name of entry in local reference file <?> for list of entries <RET>	3 2 1
	The entry made at this step must be in all upper case letters.		
3	Select LOCAL SYNONYM TERM:	New text you wish to use as a synonym Existing synonym term <RET>	4 7 1
4	ARE YOU ADDING {'text'} AS A NEW LOCAL SYNONYM?	'Y'ES 'N'O	5 3
	An at-sign (@) entered at this step deletes the entire entry.		
5	LOCAL SYNONYM TERM: {synonym}//	<RET> to accept default Other text	6 6
6	LOCAL SYNONYM Select SYNONYM:	Existing term in LOCAL LOOKUP file (#8984.4) for which you are entering a synonym	2

Add/Modify Utility option when adding or editing a synonym process chart (continued):

STEP	AT THIS PROMPT...	IF USER ANSWERS WITH...	THEN STEP
7	TERM: {term entered at Step 3}//	<RET> to accept default.....8 Correct synonym term.....8	
	The entry made at this step must be in all upper case letters.		
8	Select SYNONYM: {term synonym was entered for}//	<RET> to accept default.....2 Correct term.....2	
9	Return to the menu.		

The following are examples of what might appear on your screen when using the Add/Modify Utility option. The first example is for a new shortcut entry, the second example shows a new keyword entry, and the third shows the editing of an existing synonym entry.

Example 1: Illustration of a new Shortcut entry.

```
    SH     Shortcuts
    KE     Keywords
    SY     Synonyms

Select Add/Modify Utility Option: SH <RET> Shortcuts


Additions/Modifications to Shortcuts in which file? CPT

Select LOCAL SHORTCUT FREQUENTLY USED NARRATIVE: COUGH
    ARE YOU ADDING 'COUGH' AS A NEW LOCAL SHORTCUT? Y <RET> (YES)
    LOCAL SHORTCUT FREQUENTLY USED NARRATIVE: COUGH// <RET>
    LOCAL SHORTCUT ENTRY: 31659

      Searching for a CPT  31659          BRONCHOSCOPIC PROCEDURES
          ...OK? YES// <RET> (YES)
```

Example 2: Illustration of a new Keyword entry.

```
    SH     Shortcuts
    KE     Keywords
    SY     Synonyms

Select Add/Modify Utility Option: KE <RET> Keywords


Additions/Modifications to Keywords in which file?: CPT

Which code in the CPT file?: 11044 <RET>    CLEANSING TISSUE/MUSCLE/BONE
Select LOCAL KEYWORD NAME: TISSUE SKIN
    ARE YOU ADDING 'TISSUE SKIN' AS A NEW LOCAL KEYWORD? Y <RET> (YES)
    LOCAL KEYWORD NAME: TISSUE SKIN// <RET>
```

Examples when using the Add/Modify Utility option (continued):

Example 3: Illustration of editing an existing Synonym entry.

```
    SH     Shortcuts
    KE     Keywords
    SY     Synonyms

Select Add/Modify Utility Option: SY <RET> Synonyms


Additions/Modifications to Synonyms in which file?: CPT

Select LOCAL SYNONYM TERM: SLEEP
TERM: SLEEP// <RET>
Select SYNONYM: DREAM// NIGHT
```

SYSTEMS MANAGEMENT ISSUES

Implementation of Multi-Term Look-Up (MTLU)

This is how the user would configure a new file to be used with MTLU. The file you select would typically contain a free text field that more completely describes the record entry. Users would then use a cross-reference on this text field to perform look-ups. MTLU is distinguished from FileMan in that users can enter a narrative or phrase, rather than a single term. The cross-reference can be either a FileMan KWIC cross-reference, or you can create a custom MUMPS cross-reference that calls the routine, ^XTLKWIC (shown below). The ICD DIAGNOSIS file (#80) is used as an example.

NOTE: Be sure to review the "Programmer API" at the end of this chapter to accomplish the same tasks.

Once you are in VA FileMan, do the following:

```
Select OPTION: UTILITY FUNCTIONS
Select UTILITY OPTION: CROSS-REFERENCE A FIELD

MODIFY WHAT FILE: ICD DIAGNOSIS// <RET>   ICD DIAGNOSIS
                                          (12535 entries)
Select FIELD: DESCRIPTION

CURRENT CROSS-REFERENCE IS MUMPS 'D' INDEX OF FILE
CHOOSE E (EDIT)/D (DELETE)/C (CREATE): C
WANT TO CREATE A NEW CROSS-REFERENCE FOR THIS FIELD? NO// Y <RET> (YES)
CROSS-REFERENCE NUMBER: 2// <RET>
Select TYPE OF INDEXING: REGULAR// MUMPS
WANT CROSS-REFERENCE TO BE USED FOR LOOKUP AS WELL AS FOR SORTING? YES// N
     <RET> (NO)
SET STATEMENT: S %="^ICD9(""AIHS"",I,DA)" D S^XTLKWIC
KILL STATEMENT: S %="^ICD9(""AIHS"",I,DA)" D K^XTLKWIC
INDEX: AC// AIHS
...

NO-DELETION MESSAGE: <RET>
DESCRIPTION: <RET>
  Edit? NO// <RET>

DO YOU WANT TO CROSS-REFERENCE EXISTING DATA NOW? YES// Y <RET> (YES)
...EXCUSE ME, THIS MAY TAKE A FEW MOMENTS...
```

```
>D ^XUP

Setting up programmer environment
Terminal Type set to: C-VT100

Select OPTION NAME: APPLICATION UTILITIES  XTMENU     Application Utilities


          Multi-Term Lookup Main Menu ...

Select Application Utilities Option: Multi-Term Lookup Main Menu


          Multi-Term Lookup (MTLU)
          Print Utility
          Utilities for MTLU ...

Select Multi-Term Lookup Main Menu Option: Utilities for MTLU


   KL     Delete Entries From Look-up
   ST     Add Entries To Look-Up File
          Add/Modify Utility ...

Select Utilities for MTLU Option: ST <RET> Add Entries To Look-Up File
Select LOCAL LOOKUP NAME: ICD DIAGNOSIS
  ARE YOU ADDING 'ICD DIAGNOSIS' AS A NEW LOCAL LOOKUP (THE 3RD)? Y <RET>
    (YES)
  LOCAL LOOKUP NAME: ICD DIAGNOSIS//  <RET>
  LOCAL LOOKUP DISPLAY PROTOCOL:  DSPLYD^XTLKKWLD
INDEX: AIHS
...Ok, will now setup KEYWORD and SHORTCUT file DD's
   to allow terms for 'ICD DIAGNOSIS' entries...
PREFIX: M// ?
     Answer must be a unique prefix, 1-10 characters in length
PREFIX: M// D    (NOTE:  Enter the "Variable Pointer" prefix.)
  <REMINDER> Using 'Edit File', set the lookup routine, XTLKDICL, in ICD
    DIAGNOSIS DD
Select LOCAL LOOKUP NAME:  <RET>
```

If *all* references to a file (by all packages) are to behave as MTLU look-ups, add the special look-up routine, ^XTLKDICL, to the file's DD using the FileMan Edit File option. (See the "Utility Functions" chapter in the *VA FileMan User Manual* for more information on the Edit File option.):

```
VAH,MTL>D Q^DI


VA FileMan 20.0


Select OPTION: UTILITY FUNCTIONS
Select UTILITY OPTION: EDIT FILE

MODIFY WHAT FILE: ICD DIAGNOSIS// <RET>
NAME: ICD DIAGNOSIS// <RET>
DESCRIPTION: <RET>
  1>Contains all valid ICD diagnosis codes.
EDIT Option: <RET>
Select APPLICATION GROUP: <RET>
DEVELOPER: <RET>
VERSION: 9// <RET>
DATA DICTIONARY ACCESS: <RET>
READ ACCESS: <RET>
WRITE ACCESS: <RET>
DELETE ACCESS: <RET>
LAYGO ACCESS: <RET>
AUDIT ACCESS: <RET>
DD AUDIT? NO// <RET>
ASK 'OK' WHEN LOOKING UP AN ENTRY? YES// <RET>  (YES)
POST-SELECTION ACTION: <RET>
LOOK-UP PROGRAM: XTLKDICL
CROSS-REFERENCE ROUTINE: <RET>


Select UTILITY OPTION:<RET>
```

NOTE: The developer might elect to use MTLU only in selected instances. This is accomplished by *not* adding the special look-up routine to the file's DD. After the file has been added to the LOCAL LOOKUP file (#8984.4), you can make a programmer call to LKUP^XTLKMGR.

PROGRAMMER API

How to Override MTLU

If files are fully configured for the special Multi-Term Look-Up, all standard FileMan look-ups invoke MTLU. The following are procedures one can take to override MTLU:

- **Users can enter an accent grave (`) as a prefix to request a look-up by Internal Entry Number (IEN).**
- **Users can enter a tilde (~) as a prefix to force a standard FileMan look-up.**

  NOTE: In the event that a search produces no matches, MTLU continues with a standard FileMan search by default.

- **Programmers can override MTLU by setting the variable XTLKUT="" prior to referencing the file and killing it upon exit, or set DIC(0) to include "I":**

```
S DIC=81,DIC(0)="AEMQI",X="" D ^DIC
```

MTLU and VA FileMan Supported Calls

Developers can perform any supported VA FileMan calls on files fully configured for MTLU.

The preferred method of performing look-ups from programmer mode is to add the target file to the LOCAL LOOKUP file (#8984.4) and calling LKUP^XTLKMGR. However, Multi-Term Look-Ups can be performed on any VA FileMan file, even if it has not been configured for use by MTLU. Using the programmer API, the look-up can be performed using any index contained within the file, such as a FileMan KWIC cross-reference.

Entry point: **XTLKKWL**

Required input variables:

(XTLKGBL, XTLKKSCH("GBL")) = This is the global root (same as DIC).

XTLKKSCH("DSPLY") = This variable displays the routine. For example:

DGEN^XTLKKWLD

Required input variables (continued):

XTLKKSCH("INDEX") = Cross-reference selected by the developer for performing a MTLU.

XTLKX = This is the user input.

Optional input variables:

XTLKSAY = 1 or 0. If XTLKSAY = 1, MTLU displays details during the look-up.

NOTE: The purpose of XTLKSAY is to control the degree of output to the screen, not the amount of "file information" displayed.

XTLKHLP = Executable code to display custom help.

Toolkit V. 7.3 Enhanced API

Programmer calls to MTLU-configured files now return all standard FileMan variables, i.e., Y, DTOUT, DUOUT, DIROUT, and DIRUT.

The programmer's API for performing a look-up has been enhanced functionally, simplified, and converted to a procedure call.

A series of new procedure calls have been written to provide full, non-interactive management of the following MTLU control files: LOCAL KEYWORD (#8984.1), LOCAL SHORTCUT (#8984.2), LOCAL SYNONYM (#8984.3), and LOCAL LOOKUP (#8984.4).

All procedure calls are contained in the routine ^XTLKMGR.

Errors are returned in the XTLKER() array. Kill this array before calling any of these new procedure calls, and check the array after returning from the calls. All calls require that the target file be defined in the LOCAL LOOKUP file (#8984.4). If removing an entry from the LOCAL LOOKUP file (#8984.4), all shortcuts, synonyms, and keywords associated with that file must be deleted first.

The following is a list of the new procedure calls, including a brief description and the input and output variables associated with each call:

- **K^XTLKMGR(XTLK1,XTLK2,XTLK3)**

  Add Keywords to the LOCAL KEYWORD file (#8984.1).

  INPUT:

  XTLK1=associated file
  XTLK2=code in the associated file
  XTLK3=keyword

  OUTPUT:

XTLKER(1,filename)	**File not defined in the LOCAL LOOKUP file (#8984.4).**
XTLKER(2,code)	**The code is not in the associated file.**
XTLKER(3,synonym)	**The keyword could not be added.**

- **SH^XTLKMGR(XTLK1,XTLK2,XTLK3)**

Add Shortcuts to the LOCAL SHORTCUT file (#8984.2).

INPUT:

XTLK1=associated file
XTLK2=code in the associated file
XTLK3=shortcut (word or phrase)

OUTPUT:

XTLKER(1,filename)	**File not defined in the LOCAL LOOKUP file (#8984.4).**
XTLKER(2,code)	**The code is not in the associated file.**
XTLKER(3,shortcut)	**The shortcut could not be added.**

- **SY^XTLKMGR(XTLK1,XTLK2,XTLK3)**

Add Terms and Synonyms to the LOCAL SYNONYM file (#8984.3).

INPUT:

XTLK1=associated file
XTLK2=term
XTLK3=synonym (or optional array for multiple synonyms per term)

NOTE: Use one-dimensional arrays wherever supported in ^XTLKMGR as in the following example:

```
SYN(1)=<first synonym>
SYN(2)=<second synonym>
SYN(3)=<third synonym>

>D SY^ROUTINE(XTLK1,XTLK2,.SYN)
```

OUTPUT:

XTLKER(1,filename)	**File not defined in the LOCAL LOOKUP file (#8984.4).**
XTLKER(2,term)	**The term could not be added.**
XTLKER(3,synonym)	**The synonym could not be added.**

- **L^XTLKMGR(XTLK1,XTLK2,XTLK3,XTLK4)**

  Define a file in the LOCAL LOOKUP file (#8984.4). Adding the target file here does *not* automatically place the special look-up routine, ^XTLKDICL, in the file's Data Dictionary (DD). Since use of this routine is at the discretion of the developer, it should be manually added via the Edit File option under VA FileMan's Utilities Menu. (See the "Utility Functions" chapter in the *VA FileMan User Manual* for information on the Edit File option.)

  INPUT:
  XTLK1=filename or number
  XTLK2=application-specific display protocol (optional)
  XTLK3=MTLU index to use for look-ups
  XTLK4=variable pointer prefix

  OUTPUT:
  XTLKER(1,filename) File could not be added.

  Examples (index and prefix can differ from actual implementation):

  For the ICD DIAGNOSIS file (#80):

```
>K XTLKER
>D L^XTLKMGR(80,"DSPLYD^XTLKKWLD","AIHS","D")
```

  For the ICD OPERATION/PROCEDURE file (#80.1):

```
>K XTLKER
>D L^XTLKMGR(80.1,"DSPLYO^XTLKKWLD","KWIC","O")
```

- **DK^XTLKMGR(XTLK1,XTLK2)**

  Delete Keywords from the LOCAL KEYWORD file (#8984.1).

  INPUT:
  XTLK1=filename
  XTLK2=leave undefined to delete all keywords for a given target file
  or pass in an array for selected keywords

- **DSH^XTLKMGR(XTLK1,XTLK2)**

  Delete Shortcuts from the LOCAL SHORTCUT file (#8984.2).

  INPUT:
  XTLK1=filename
  XTLK2=leave undefined to delete all shortcuts for a given target file or pass in an array for selected shortcuts

- **DSY^XTLKMGR(XTLK1,XTLK2)**

  Delete Synonyms from the LOCAL SYNONYM file (#8984.3).

  INPUT:
  XTLK1=filename
  XTLK2=leave undefined to delete all synonyms for a given target file or pass in an array for selected synonyms

- **DLL^XTLKMGR(XTLK1)**

  Delete an entry from the LOCAL LOOKUP file (#8984.4).

  INPUT:
  XTLK1=associated filename or number

  OUTPUT:

XTLKER(1,filename)	**File is not in the LOCAL LOOKUP file (#8984.4)**
XTLKER(2)	**Entries exist for keywords, shortcuts, or synonyms for the associated file. These must be deleted first.**

- **LKUP^XTLKMGR(FIL,XTLKX,XTLKSAY,XTLKHLP, XTLKMORE)**

This is the new general look-up facility for MTLU. The target file must be properly cross-referenced and defined in the LOCAL LOOKUP file (#8984.4), but the routine ^XTLKDICL does *not* have to be defined in the target file's DD.

INPUT:

FIL=target file (must be defined in the LOCAL LOOKUP file, #8984.4)
XTLKX=word or phrase to use in look-up
XTLKSAY (optional)=-1, 0, or 1 (default=1). Set to "0" to minimize, "-1" to prevent screen display, "1" or "" for full screen (normal) display.

NOTE: The purpose of XTLKSAY is to control the degree of output to the screen, not the amount of "file information" displayed.

If screen displays are turned off, MTLU matches can be processed by checking the count in ^TMP("XTLKHITS",$J). ^TMP("XTLKHITS",$J,count)=IEN of the entry in the target file. ^TMP("XTLKHITS") should be killed after processing.

XTLKHLP (optional)=executable code to display application-specific help
XTLKMORE (optional) Set to "1" to continue with FileMan search (default=1)

OUTPUT:

Y=-1 **The Look-up was successful.**

Y=N^S **N is the internal number of the entry in the file and S is the value of the .01 field for that entry.**

Y=N^S^1 **N and S are defined as above and the 1 indicates that this entry has just been added to the file.**

Example 1: Standard look-up, single term entered.

```
VAH,MTL>D LKUP^XTLKMGR(80,"MALIG")
( MALIG/MALIGNANT )
.....................................................................
.....................................................................
.....................................................................
.....................................................................
.....................................................................
.....................................

The following 443 matches were found:

   1: 140.1 (MAL NEO LOWER VERMILION)
       MALIGNANT NEOPLASM OF LOWER LIP, VERMILION BORDER

   2: 140.3 (MAL NEO UPPER LIP, INNER)
       MALIGNANT NEOPLASM OF UPPER LIP, INNER ASPECT

   3: 140.4 (MAL NEO LOWER LIP, INNER)
       MALIGNANT NEOPLASM OF LOWER LIP, INNER ASPECT

   4: 140.5 (MAL NEO LIP, INNER NOS)
       MALIGNANT NEOPLASM OF LIP, UNSPECIFIED, INNER ASPECT

   5: 140.6 (MAL NEO LIP, COMMISSURE)
       MALIGNANT NEOPLASM OF COMMISSURE OF LIP

Press <RET> or Select 1-5: ^
...Nothing selected. Attempting Fileman lookup.
```

NOTE: Pressing the Return key continues listing the MTLU matches. If no selection is made, MTLU initiates a standard FileMan look-up (using all available cross-references).

Example 2: Standard look-up, multiple terms entered.

```
VAH,MTL>D LKUP^XTLKMGR(80,"MALIGNANCY OF THE LIP")


( LIP/LIPIDOSES/LIPODYSTROPHY/LIPOID/LIPOMA/LIPOPROTEIN/LIPOTROPIC/LIPS
MALIGNAN/MALIGNANT )

The following words were not used in this search:
     OF
     THE
.............

The following 12 matches were found:

   1: 140.1 (MAL NEO LOWER VERMILION)
       MALIGNANT NEOPLASM OF LOWER LIP, VERMILION BORDER

   2: 140.3 (MAL NEO UPPER LIP, INNER)
       MALIGNANT NEOPLASM OF UPPER LIP, INNER ASPECT

   3: 140.4 (MAL NEO LOWER LIP, INNER)
       MALIGNANT NEOPLASM OF LOWER LIP, INNER ASPECT

   4: 140.5 (MAL NEO LIP, INNER NOS)
       MALIGNANT NEOPLASM OF LIP, UNSPECIFIED, INNER ASPECT

   5: 140.6 (MAL NEO LIP, COMMISSURE)
       MALIGNANT NEOPLASM OF COMMISSURE OF LIP


Press <RET> or Select 1-5: ^
...Nothing selected. Attempting Fileman lookup. ??
```

Example 3: Display minimized by setting the 3rd parameter=0.

```
VAH,MTL>S XTLKX="MALIGNANCY OF THE LIP"

VAH,MTL>D LKUP^XTLKMGR(80,XTLKX,0)

The following 12 matches were found:

   1: 140.1 (MAL NEO LOWER VERMILION)
       MALIGNANT NEOPLASM OF LOWER LIP, VERMILION BORDER

   2: 140.3 (MAL NEO UPPER LIP, INNER)
       MALIGNANT NEOPLASM OF UPPER LIP, INNER ASPECT

   3: 140.4 (MAL NEO LOWER LIP, INNER)
       MALIGNANT NEOPLASM OF LOWER LIP, INNER ASPECT

   4: 140.5 (MAL NEO LIP, INNER NOS)
       MALIGNANT NEOPLASM OF LIP, UNSPECIFIED, INNER ASPECT

   5: 140.6 (MAL NEO LIP, COMMISSURE)
       MALIGNANT NEOPLASM OF COMMISSURE OF LIP


Press <RET> or Select 1-5: ^ ??
VAH,MTL>
```

Example 4: MTLU with screen display turned off.

```
VAH,MTL>D LKUP^XTLKMGR(80,XTLKX,-1)


VAH,MTL>D ^%G

Global ^TMP("XTLKHITS",$J
        TMP("XTLKHITS",$J
^TMP("XTLKHITS",591795907) = 12
^TMP("XTLKHITS",591795907,1) = 167

     NOTE:  "167" is the IEN of the target file.
            ^ICD9(167,0) = 140.1^Y^MAL NEO LOWER VERMILION^^3^^^^
            ^ICD9(167,1) = MALIGNANT NEOPLASM OF LOWER LIP, VERMILION
            BORDER
            ^ICD9(167,"DRG") = 64^^ VERMILION^^3^^^^

^TMP("XTLKHITS",591795907,2) = 168
^TMP("XTLKHITS",591795907,3) = 169
^TMP("XTLKHITS",591795907,4) = 170
^TMP("XTLKHITS",591795907,5) = 171
^TMP("XTLKHITS",591795907,6) = 172
^TMP("XTLKHITS",591795907,7) = 173
^TMP("XTLKHITS",591795907,8) = 220
^TMP("XTLKHITS",591795907,9) = 221
^TMP("XTLKHITS",591795907,10) = 8595
^TMP("XTLKHITS",591795907,11) = 8623
^TMP("XTLKHITS",591795907,12) = 8624
```

Duplicate Resolution Utilities

Duplicate Resolution Utilities

Overview

The Duplicate Resolution Utilities provided by Toolkit allow programmers to combine duplicate records based on conditions established in application-specific comparison routines. The customized merge allows users to check their data files for duplicates and merge them if any are found. Two files are involved, the DUPLICATE RECORD file (#15) and the DUPLICATE RESOLUTION file (#15.1).

The potential duplicates are identified by comparing each record against other records and assigning a score to the pair of potential duplicate records. This score acts as a confidence factor and if it's greater than or equal to the POTENTIAL DUPLICATE THRESHOLD%, the pair is automatically entered into the DUPLICATE RECORD file (#15) and marked as Potential Duplicates, Unverified.

The person who is identified as in charge of the checking and merging of duplicates then starts reviewing all the potential duplicate pairs and verifies them as either a Verified Duplicate or Verified, Not A Duplicate.

Once a pair of records has been identified as a Verified Duplicate, the user selects which record is merged into the other record. The user can also select the field values to be retained. Any special merge routines from other packages that affect the file that the user is working with are executed at this time. During the merge process, all files that have records that point to the merged-from record are re-pointed to the retained, or merged-to, record. After the merge process is complete, a bulletin is sent to all members of the XDR mail group notifying them of the pair of records that were merged.

The DUPLICATE RECORD file (#15) stores all pairs of records that have been identified as Potential Duplicates, Unverified and the scores that they received by the duplicate checking algorithm.

The DUPLICATE RESOLUTION file (#15.1) stores all the control information about which file to check for duplicates, the routines to be run to gather potential duplicate candidates, and the tests that should be run with the scoring values. Further information about this control file can be found in the description of the DUPLICATE RESOLUTION file (#15.1) and from its Data Dictionary (DD) listing.

USER INTERFACE

Duplicate Resolution Utilities Menu Options

The following is a description of the Duplicate Resolution System menu options [XDR MAIN MENU]. The options are described in the same order as they appear on the screen:

```
Systems Manager Menu                                                    [EVE]
  Application Utilities ...                                           [XTMENU]
    Duplicate Resolution System ... <Locked with XDR>          [XDR MAIN MENU]
      XDRO  Operations ...                                  [XDR OPERATIONS MENU]
      XDRU  Utilities ...                                    [XDR UTILITIES MENU]
      XDRM  Manager Utilities ... <Locked with XDRMGR> [XDR MANAGER UTILITIES]
```

- **The Operations menu [XDR OPERATIONS MENU] contains options for running duplicate check searches and verifying and merging duplicate pairs.**
- **The Utilities menu [XDR UTILITIES MENU] gives access to various Duplicate Resolution Utilities.**
- **The Manager Utilities option [XDR MANAGER UTILITIES] controls access to various manager utilities. These utilities include: automatically merging ready to merge duplicates, editing the DUPLICATE RESOLUTION file (#15.1), and purging the DUPLICATE RECORD file (#15).**

OPERATIONS MENU

The following is a description of the Operations menu options on the Duplicate Resolution System menu. The options are described in the same order as they appear on the screen:

```
Application Utilities ...                                          [XTMENU]
  Duplicate Resolution System ... <Locked with XDR>          [XDR MAIN MENU]
    XDRO  Operations ...                                [XDR OPERATIONS MENU]
      DSS  Display Search Status <Locked with XDR> [XDR DISPLAY SEARCH STATUS]
      SRCH Start/Halt Duplicate Search                        [XDR SEARCH ALL]
      VPD  Verify Potential Duplicates                        [XDR VERIFY ALL]
      SPD  Verify Selected Potential Duplicate Pair [XDR VERIFY SELECTED PAIR]
      MVD  Merge Ready to Merge Verified Duplicates[XDR MERGE READY DUPLICATES]
      SVD  Merge Selected Verified Duplicate Pair    [XDR MERGE SELECTED PAIR]
```

How to Display the Search Status

Display Search Status Option

The Display Search Status option [XDR DISPLAY SEARCH STATUS] displays the status of a selected search for duplicates and is locked with the XDR security key.

The Status can be Running, Halted, or Completed. If you are checking the Status to make sure the duplicate checking software is Running, you must first make sure that not only is the Status stated to be Running, but also that the Count (which is the number of records that have been checked for duplicates) is also steadily increasing. If the Count is not increasing notify your site manager.

To see the Status for a particular duplicate search, choose the Display Search Status option from the Operations menu shown below:

```
Duplicate Resolution Operations Menu




   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: DSS <RET> Display Search Status

Select duplicate search file to check status for: 200 <RET> NEW PERSON



                    Duplicate NEW PERSON Search

Search Type   Date Started   Status       Date Completed  # Records Checked
-----------   ------------   ----------   --------------  -----------------

BASIC         MAY  6, 1994   COMPLETED    JUL 22, 1994      521
```

How to Search For Duplicates

Start/Halt Duplicate Search Option

The Start/Halt Duplicate Search option [XDR SEARCH ALL] searches a selected file for potential duplicates. It provides a choice of two methods. This is a tasked job that can be started and halted until the entire file has been checked.

To Start a search for duplicates within a file, choose the Start/Halt Duplicate Search option from the Operations menu.

There are two types of searches that a user can run:

1. **Basic: Checks all records, starting at the beginning of the file, regardless of whether a duplicate search was run before.**

2. **New: Checks only the records that have been added or edited since the last time a duplicate search was run. The New option uses a cross reference that must be setup and identified by a programmer for this purpose.**

Since the search is started by TaskMan and run as a background process, the user needs to specify the Start time. The user also has an option to specify a Halt time at which point the search stops. This provides the capability to schedule and limit the search to off hours, which is what we recommend. By selecting the New option, each subsequent new search starts at the record immediately following the last record from the previous search. This prevents the entire file from being searched again at the beginning.

See the following page for a sample dialogue of a Basic search.

The following is an example of beginning a search for duplicate records on the NEW PERSON file (#200):

```
Duplicate Resolution Operations Menu



   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: SRCH <RET> Start/Halt Duplicate Search

Select file to be checked for duplicates: 200 <RET> NEW PERSON



                     Duplicate NEW PERSON Search


Search Type   Date Started   Status       Date Completed  # Records Checked
-----------   ------------   ----------   --------------  -----------------

BASIC         MAY  6, 1994   COMPLETED    MAY  7, 1994      521


Do You wish to RUN a search? YES
Which type of Search do you wish to run ? ?

This is the type of search that is currently being run or has been
completed.  Choose from:
b        BASIC
n        NEW


Which type of Search do you wish to run ? BASIC
Requested Start Time: NOW// <RET> (AUG 26, 1994@10:02:06)

Do You wish to schedule a time to HALT this search? NO
```

It is suggested, at this point, to use the Display Search Status option to make sure that the search has been started.

```
Duplicate Resolution Operations Menu


   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: DSS <RET> Display Search Status

Select duplicate search file to check status for: 200 <RET> NEW PERSON


                     Duplicate NEW PERSON Search

Search Type   Date Started   Status       Date Completed  # Records Checked
-----------   ------------   ----------   --------------  -----------------

BASIC         AUG 26, 1994   RUNNING                        2
```

To Halt a search for duplicates within a file, choose the Start/Halt Duplicate Search option from the Operations menu shown below:

```
Duplicate Resolution Operations Menu


   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: SRCH <RET> Start/Halt Duplicate Search

Select file to be checked for duplicates: NEW PERSON


                    Duplicate NEW PERSON Search

Search Type   Date Started   Status       Date Completed  # Records Checked
-----------   ------------   ----------   --------------  -----------------

BASIC         AUG 26, 1994   RUNNING                        6


Do You wish to HALT this search? YES
Requested Start Time: NOW// <RET> (AUG 26, 1994@10:08:37)
```

Again, it is suggested, at this point, to use the Display Search Status option to make sure that the search has been halted.

```
Duplicate Resolution Operations Menu


   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: DSS <RET> Display Search Status

Select duplicate search file to check status for: NEW PERSON

                    Duplicate NEW PERSON Search

Search Type   Date Started   Status       Date Completed  # Records Checked
-----------   ------------   ----------   --------------  -----------------

BASIC         AUG 26, 1994   HALTED                         6
```

HOW TO VERIFY DUPLICATE PAIRS

Within the XDR system, three options allow you to decide whether a pair of records are duplicates and to change their STATUS within the DUPLICATE RECORD file (#15).

The Verify Potential Duplicates option loops through the DUPLICATE RECORD file (#15) entries that have a Potential Duplicate, Unverified STATUS, continuing to loop till you wish to stop. The Verify Selected Potential Duplicate Pair option allows you to select a duplicate pair from the DUPLICATE RECORD file (#15) that has a Potential Duplicate, Unverified STATUS. The Add Verified Duplicate Pair option allows you to select a pair of records from a file that are not in the DUPLICATE RECORD file (#15) and add them to the DUPLICATE RECORD file (#15) with a Verified Duplicate STATUS.

Verify Potential Duplicates Option

The Verify Potential Duplicates option [XDR VERIFY ALL] is used to mark a Potential Duplicate, Unverified as an actual Verified Duplicate. The "from" and "to" records are identified and all top level patient file fields resolved and a bulletin generated informing the Verified Duplicate mailgroup of the actual Verified Duplicate.

The merge process is started when you verify them as duplicates and there are no interactive merges that need to occur.

Choosing this option from the Operations menu allows you to loop through the potential duplicates of the DUPLICATE RECORD file (#15) and change the duplicate pair STATUS from Potential Duplicate, Unverified to either Verified Duplicate or Verified, Not A Duplicate. The computer dialogue is shown on the next page.

The following is an example of the prompts and the computer dialogue involved with selecting the Verify Potential Duplicates option:

```
Duplicate Resolution Operations Menu


   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: VPD <RET> Verify Potential Duplicates
Select file to verify potential duplicates: 200 <RET>  NEW PERSON

COMPARISON OF NEW PERSON FILE ENTRIES       AUG 26, 1994@10:21   PAGE 1
NEW PERSON                FREEMAN,JON                FREEMAN,JOHN
------------------------------------------------------------------------

*** NAME                   FREEMAN,JON                FREEMAN,JOHN

    INITIAL                JF                         JF

*** ACCESS CODE            <Hidden>

*** DATE VERIFY CODE       MAY 6,1992
    LAST CHANGED

*** DATE ENTERED           MAY  6, 1992               JUN  9, 1992

    CREATOR                DOE,JANE                   DOE,JANE

*** LAST SIGN-ON DATE/     JUN 29, 1994@10:08:
    TIME                   43

*** TERMINAL TYPE LAST     C-VT100
    USED
          V         VERIFIED DUPLICATE
          N         VERIFIED, NOT A DUPLICATE
          U         UNABLE TO MAKE DETERMINATION

Verification status of potential duplicate pair: VERIFIED DUPLICATE
MERGE DIRECTION: 2// ?
     Must be verified duplicate

     RECORD1=FREEMAN,JON
     RECORD2=FREEMAN,JOHN

     CHOOSE FROM:
       1        RECORD1 to RECORD2
       2        RECORD2 to RECORD1
MERGE DIRECTION: 2// <RET>  RECORD2 to RECORD1
```

Verify Potential Duplicates option (continued):

```
I will now merge the NEW PERSON file, this may take some time please be
patient.

COMPARING THE TWO ENTRIES.....

COMPARISON OF NEW PERSON FILE ENTRIES       AUG 26, 1994@10:22   PAGE 1
NEW PERSON                FREEMAN,JOHN              [FREEMAN,JON]
---------------------------------------------------------------------

1.  NAME                  FREEMAN,JOHN              [FREEMAN,JON]

2.  INITIAL               JF                        JF

3.  ACCESS CODE                                     [<Hidden>]

4.  DATE VERIFY CODE                                [MAY 6,1992]
    LAST CHANGED

5.  DATE ENTERED          JUN  9, 1992              [MAY  6, 1992]

6.  CREATOR               DOE,JANE                  DOE,JANE

7.  LAST SIGN-ON DATE/                              [JUN 29, 1994@10:08:]
    TIME                                            [43]

8.  TERMINAL TYPE LAST                              [C-VT100]
    USED

Default is enclosed in brackets, e.g., [FREEMAN,JON]
Enter 1-8 to change default value, RETURN to continue, ^ to exit: <RET>

OK.  I'M READY TO DO THE MERGE.

     Select one of the following:

          P         PROCEED to merge the data
          S         SUMMARIZE the modifications before proceeding
          E         EDIT the data again before proceeding

ACTION: PROCEED to merge the data

  NOTE: Multiples will be merged into the target record

I will now merge all subfiles in this file ...
This may take some time, please be patient.

I will now merge all files that point to the NEW PERSON file that do not
have a specific package merge ... This may take some time, please be
patient.

Gathering files and checking 'PT nodes
.....................................................................
.........................
```

Verify Potential Duplicates option (continued):

```
Merging entries

No REGULAR xref on 1,20.  582 entries.  Searching data global.
No REGULAR xref on 2,.096.  189 entries.  Searching data global.
.
.
.
No REGULAR xref on 791813.0101,.01.  1 entries.  Searching data global.

Merge complete
```

Verify Selected Potential Duplicate Pair Option

The Verify Selected Potential Duplicate Pair option [XDR VERIFY SELECTED PAIR] is used to select a potential duplicate pair that is already in the DUPLICATE RECORD file (#15) and verify that the pair is either Verified, Not A Duplicate or a Verified Duplicate pair. The option can be found on the Operations menu.

The merge process is started when you verify them as duplicates and there are no interactive merges that need to occur.

The following is an example of the prompts and the computer dialogue involved with selecting the Verify Selected Potential Duplicate Pair option:

```
Duplicate Resolution Operations Menu



   DSS     Display Search Status
   SRCH    Start/Halt Duplicate Search
   VPD     Verify Potential Duplicates
   SPD     Verify Selected Potential Duplicate Pair
   MVD     Merge Ready to Merge Verified Duplicates
   SVD     Merge Selected Verified Duplicate Pair

Select Operations Option: SPD <RET> Verify Selected Potential Duplicate
     Pair

Select file to verify potential duplicates: 200 <RET> NEW PERSON
```

Verify Selected Potential Duplicate Pair option (continued):

```
Select DUPLICATE RECORD RECORD1: ?
 ANSWER WITH DUPLICATE RECORD RECORD1
 DO YOU WANT THE ENTIRE DUPLICATE RECORD LIST? Y <RET> (YES)
CHOOSE FROM:
    TEST,TEST      TEST,TESTC       POTENTIAL DUPLICATE, UNVERIFIED
    TEST,USER      TEST,USER1       POTENTIAL DUPLICATE, UNVERIFIED
    COLINS,PHIL    COLLINS,PHIL     POTENTIAL DUPLICATE, UNVERIFIED
.
.
.
    BAKER,JAMES    BAKKER,JAMES     POTENTIAL DUPLICATE, UNVERIFIED
    MONTOYA,CARL   MONTOYA,CARLOS   POTENTIAL DUPLICATE, UNVERIFIED
    FREEMAN,JON    FREEMAN,JOHN     POTENTIAL DUPLICATE, UNVERIFIED

Select DUPLICATE RECORD RECORD1: FREEM
     1   FREEMAN,JOHN  FREEMAN,JOHN
     2   FREEMAN,JON  FREEMAN,JON
CHOOSE 1-2: 1  FREEMAN,JOHN         FREEMAN,JOHN     POTENTIAL DUPLICATE,
                                                      UNVERIFIED



COMPARISON OF NEW PERSON FILE ENTRIES       AUG 26, 1994@10:21   PAGE 1
NEW PERSON                FREEMAN,JON               FREEMAN,JOHN
-------------------------------------------------------------------------

*** NAME                   FREEMAN,JON               FREEMAN,JOHN

    INITIAL                JF                        JF

*** ACCESS CODE            <Hidden>

*** DATE VERIFY CODE       MAY 6,1992
    LAST CHANGED

*** DATE ENTERED           MAY  6, 1992              JUN  9, 1992

    CREATOR                DOE,JANE                  DOE,JANE

*** LAST SIGN-ON DATE/     JUN 29, 1994@10:08:
    TIME                   43

*** TERMINAL TYPE LAST     C-VT100
    USED
          V          VERIFIED DUPLICATE
          N          VERIFIED, NOT A DUPLICATE
          U          UNABLE TO MAKE DETERMINATION
```

Verify Selected Potential Duplicate Pair option (continued):

```
Verification status of potential duplicate pair: VERIFIED DUPLICATE
MERGE DIRECTION: 2// ?
     Must be verified duplicate

     RECORD1=FREEMAN,JON
     RECORD2=FREEMAN,JOHN

     CHOOSE FROM:
       1        RECORD1 to RECORD2
       2        RECORD2 to RECORD1
MERGE DIRECTION: 2// <RET>  RECORD2 to RECORD1

I will now merge the NEW PERSON file, this may take some time please be
patient.

COMPARING THE TWO ENTRIES.....



COMPARISON OF NEW PERSON FILE ENTRIES       AUG 26, 1994@10:22   PAGE 1
NEW PERSON                FREEMAN,JOHN              [FREEMAN,JON]
------------------------------------------------------------------------

1.  NAME                  FREEMAN,JOHN              [FREEMAN,JON]

2.  INITIAL               JF                        JF

3.  ACCESS CODE                                     [<Hidden>]

4.  DATE VERIFY CODE                                [MAY 6,1992]
    LAST CHANGED

5.  DATE ENTERED          JUN  9, 1992              [MAY  6, 1992]

6.  CREATOR               DOE,JANE                  DOE,JANE

7.  LAST SIGN-ON DATE/                              [JUN 29, 1994@10:08:]
    TIME                                            [43]

8.  TERMINAL TYPE LAST                              [C-VT100]
    USED
Default is enclosed in brackets, e.g., [FREEMAN,JON]
Enter 1-8 to change default value, RETURN to continue, ^ to exit: ^

OK.  I'M READY TO DO THE MERGE.

     Select one of the following:

          P         PROCEED to merge the data
          S         SUMMARIZE the modifications before proceeding
          E         EDIT the data again before proceeding

ACTION: PROCEED to merge the data
```

Verify Selected Potential Duplicate Pair option (continued):

```
   NOTE: Multiples will be merged into the target record

I will now merge all subfiles in this file ...
This may take some time, please be patient.

I will now merge all files that point to the NEW PERSON file that do not
have a specific package merge ... This may take some time, please be
patient.

Gathering files and checking 'PT' nodes.................................
.....................................................................
.............................

Merging entries

No REGULAR xref on 1,20.  582 entries.  Searching data global.
No REGULAR xref on 2,.096.  189 entries.  Searching data global.
.
.
.
No REGULAR xref on 791813.0101,.01.  1 entries.  Searching data global.

Merge complete
```

How to Merge Verified Duplicates

The merge process can be initiated several different ways. After selection of any of the options that verify duplicate pairs the merge process is automatically started. Along with the verification process, there are three other options for merging duplicate pairs.

The Merge Ready to Merge Verified Duplicates option and the Merge Selected Verified Duplicate Pair option can be selected from the Operations menu. The Automatically Merge Already Verified Duplicates option can only be accessed by the merge manager and is selected from the Manager Utilities menu.

MERGE PROCESS

The process of merging two records starts out with the selection of which way you want the merge to occur (i.e., merge Record 1 to Record 2 or Record 2 to Record 1).

If any other packages point to the file that you are merging, their files are checked to see if they have data for the merged-from record. If they do, the merge process checks to see if they have an interactive merge process or a special merge routine. If the package has an interactive merge process, the merge process is stopped until that package completes its interactive merge. If the process is stopped, a bulletin is sent to all members of the mail group notifying them of the two records that have been verified as duplicates.

Next, if no interactive merges need to be concluded, any pre-merging action that the file maintainer might wish to occur is done. This could include such things as the saving of any data before the merge, etc.

After any pre-merge processing, the two records are displayed on your screen side by side and you are allowed to choose certain field values from the merged-from record which you wish to replace in the merged-to records values. This process uses the Compare and Merge utility from FileMan.

After you have completed the field by field merging, all files with records that point to the merged-from record are re-pointed to the merged-to record.

If any packages have special merge routines in the PACKAGE file (#9.4), this processing would now be done.

The final part of the process is either the deletion of the merged-from record leaving only a trail stub, or the processing of any post-merge action that the file maintainer wished to have done. A bulletin is sent to all members of the mail group notifying them that the two duplicate records have been merged.

Verification Options

The merge process begins immediately after the verification of a pair of records as Verified Duplicates

Merge (Ready to Merge) Verified Duplicates Option

The Merge Ready to Merge Verified Duplicates option [XDR MERGE READY DUPLICATES] loops through the DUPLICATE RECORD file (#15, AMRG X-ref) for all duplicate record pairs and merges ready to merge verified duplicate pairs that were not merged during the verification process. These would include record pairs that had completed any needed package interactive merge processes. It would also include any record pairs for which you had stopped the merge process.

This process may or may not be interactive depending on the value of the MERGE STYLE field of the DUPLICATE RESOLUTION file (#15.1).

Merge Selected Verified Duplicate Pair Option

The Merge Selected Verified Duplicate Pair option [XDR MERGE SELECTED PAIR] is used to select a certain ready to merge verified duplicate pair for merging. You would use this option if you had a pair of records you wanted to merge but didn't have the time to merge all the ready to merge duplicate pairs before them.

NOTE: The Automatically Merge Already Verified Duplicates option [XDR AUTO MERGE] is a special option that is only available to the merge manager and is selected from the Manager Utilities menu. (The Manager Utilities menu is described later on in this chapter.)

If you choose this option, you loop through ready to merge duplicate pairs in the DUPLICATE RECORD file (#15) but without the ability to select on a field-by-field basis which field values to retain for the merged-to record. All of the other merge processes occur in the same way.

UTILITIES MENU

The following is a description of the Utilities menu options on the Duplicate Resolution System menu. The options are described in the same order as they appear on the screen:

```
Application Utilities ...                                          [XTMENU]
  Duplicate Resolution System ... <Locked with XDR>          [XDR MAIN MENU]
    XDRU   Utilities ...                                  [XDR UTILITIES MENU]
      CHCK Check Pair of Records to see if Duplicates        [XDR CHECK PAIR]
      ADD  Add Verified Duplicate Pair                [XDR ADD VERIFIED DUPS]
      FIND Find Potential Duplicates for an Entry in a File
                                              [XDR FIND POTENTIAL DUPLICATES]
      EDIT Edit Duplicate Record Status          [XDR EDIT DUP RECORD STATUS]
      VIEW View Duplicate Record Entries          [XDR VIEW DUPLICATE RECORD]
      PRNT Print List of File Duplicates                    [XDR PRINT LIST]
      TSF  Tally STATUS and MERGE STATUS fields     [XDR TALLY STATUS FIELDS]
```

Check Pair of Records to see if Duplicates Option

To check a possible score for two records, should they have gone through the duplicate checking algorithm, select the Check Pair of Records to see if Duplicates option from the Utilities menu.

The Check Pair of Records to see if Duplicates option [XDR CHECK PAIR] allows a user to input two records and then run them through the duplicate resolution software to see what their Match Score would be.

Once you have selected the file to be checked, you are asked to input the two records you wish to check. The two records are then displayed side by side using the Compare and Merge option of FileMan and then their test scores are also displayed. It is important to note that this pair of records cannot be added to the DUPLICATE RECORD file (#15) by checking them through this option. If the score is high enough and you are certain that they are duplicates, you can add them using the Add Verified Duplicate Pair option of the Utilities menu.

The following is an example of the prompts and the computer dialogue involved with selecting the Check Pair of Records to see if Duplicates option:

```
Duplicate Resolution Utilities Menu



   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option: CHCK <RET> Check Pair of Records to see if
     Duplicates
COMPARE ENTRIES IN WHAT FILE:    NEW PERSON


COMPARE NEW PERSON: COLINS,PHIL
    WITH NEW PERSON: COLLI
     1   COLLINS,PHIL
     2   COLLINS,PHILLIS
CHOOSE 1-2: 1
DEVICE: HOME// <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



COMPARISON OF NEW PERSON FILE ENTRIES       AUG 26, 1994@10:36   PAGE 1
NEW PERSON                COLINS,PHIL               COLLINS,PHIL
------------------------------------------------------------------------

*** NAME                  COLINS,PHIL               COLLINS,PHIL

*** INITIAL                                         PC

*** FILE MANAGER ACCESS   Dd
    CODE

*** DATE VERIFY CODE      OCT 24,1990               MAY 5,1994
    LAST CHANGED

  NOTE: Multiples will be merged into the target record

    "KEYS"                "26 entries"              "  ---"

    "ACCESSIBLE FILE"     "72 entries"              "  ---"

POINTS POSSIBLE: 60                    POTENTIAL DUPLICATE % 50
DUPLICATE SCORE: 36                    DUPLICATE SCORE % 60
NAME TEST SCORE: 36                    DOB TEST SCORE: 0
```

Add Verified Duplicate Pair Option

The Add Verified Duplicate Pair option [XDR ADD VERIFIED DUPS] allows you to add a pair of records that are not already identified as Potential Duplicates, Unverified or Verified Duplicates to the DUPLICATE RECORD file (#15). They are added as Verified Duplicates and the merge process begins if there are no interactive package merges that need to occur.

After you have entered the two records that are duplicates, the sequence is the same as it is for the Verify Selected Potential Duplicate Pair option.

Find Potential Duplicates for an Entry in a File Option

The Find Potential Duplicates for an Entry in a File option [XDR FIND POTENTIAL DUPLICATES] finds all potential duplicates for an entry in a file. Any potential duplicate pairs are then added to the DUPLICATE RECORD file (#15) with a STATUS of Potential Duplicates, Unverified. The user is prompted to enter the file, then to select an entry within that file. This option can be found on the Utilities menu.

The following is an example of the prompts and the computer dialogue involved with selecting the Find Potential Duplicates for an Entry in a File option:

```
Duplicate Resolution System Menu


   XDRO   Operations ...
   XDRU   Utilities ...
   XDRM   Manager Utilities ...

Select Duplicate Resolution System Option: Utilities

Duplicate Resolution Utilities Menu


   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option:  Find Potential Duplicates for an Entry in a File

This option will collect all Potential Duplicates for an entry in a file.
It will then add any pairs found to the Duplicate Record file.

Find Potential Duplicates for entry in what file:    NEW PERSON
```

Find Potential Duplicates for an Entry in a File option (continued):

```
Find Potential Duplicates for NEW PERSON:  TEST,TEST
     1   TEST,TEST
     2   TEST,TESTA
     3   TEST,TESTB
     4   TEST,TESTC
CHOOSE 1-4: 1

Hold On... This may take a little while...


The following NEW PERSON entry(ies) are now in the Duplicate
Record file as Potential Duplicates to
NEW PERSON:         TEST,TEST
                    TEST,TESTA
                    TEST,TESTB
                    TEST,TESTC
```

Edit Duplicate Record Status Option

The Edit Duplicate Record Status option [XDR EDIT DUP RECORD STATUS] allows you to select a pair of records from the DUPLICATE RECORD file (#15) and change their STATUS field. You can change the STATUS from Verified Duplicate to Verified Not A Duplicate or Potential Duplicate, Unverified. However, once you have merged the records you cannot change the STATUS.

This option is used when a pair is identified as a Verified Duplicate and this turns out to be incorrect. It can be found on the Utilities menu.

The following is an example of the prompts and the computer dialogue involved with selecting the Edit Duplicate Record Status option:

```
Duplicate Resolution Utilities Menu


   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option: EDIT <RET> Edit Duplicate Record Status

Select DUPLICATE RECORD RECORD1:  COL
     1   COLINS,PHIL    COLINS,PHIL
     2   COLLINS,PHIL   COLLINS,PHIL
     3   COLLINS,PHILLIS  COLLINS,PHILLIS
CHOOSE 1-3: 1 <RET> COLINS,PHIL        COLLINS,PHIL     VERIFIED DUPLICATE
STATUS: VERIFIED DUPLICATE// ?
     Cannot be modified once MERGE STATUS is set to 2=MERGED
     CHOOSE FROM:
       P        POTENTIAL DUPLICATE, UNVERIFIED
       N        VERIFIED, NOT A DUPLICATE
       V        VERIFIED DUPLICATE
STATUS: VERIFIED DUPLICATE// P <RET> POTENTIAL DUPLICATE, UNVERIFIED

Select DUPLICATE RECORD RECORD1:  COLINS,PHIL  <RET>      COLLINS,PHIL
    POTENTIAL DUPLICATE, UNVERIFIED
STATUS: POTENTIAL DUPLICATE, UNVERIFIED// <RET>

Select DUPLICATE RECORD RECORD1: <RET>
```

View Duplicate Record Entries Option

The View Duplicate Record Entries option [XDR VIEW DUPLICATE RECORD] allows you to look at selected entries from the DUPLICATE RECORD file (#15) in a captioned format. This option can be found on the Utilities menu.

```
Duplicate Resolution Utilities Menu



   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option: VIEW <RET> View Duplicate Record Entries

Select DUPLICATE RECORD RECORD1:  COL
     1   COLINS,PHIL    COLINS,PHIL
     2   COLLINS,PHIL   COLLINS,PHIL
     3   COLLINS,PHILLIS  COLLINS,PHILLIS
CHOOSE 1-3: 1 <RET> COLINS,PHIL        COLINS,PHIL     POTENTIAL DUPLICATE,
                                                        UNVERIFIED

DEVICE: <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



DUPLICATE RECORD LIST                       AUG 26,1994  10:39    PAGE 1
------------------------------------------------------------------------

RECORD1: COLINS,PHIL                    RECORD2: COLLINS,PHIL
  STATUS: POTENTIAL DUPLICATE, UNVERIFIED
  DATE FOUND: APR  1, 1994              WHO CREATED: DOE,JOHN
  WHO CHANGED: DOE,JOHN                 DC TOTAL POSSIBLE SCORE: 60
  DC POTENTIAL DUPE THRESHOLD %: 50     DC DUPE MATCH SCORE: 36
  DC DUPE MATCH PERCENTILE: 60

DUPLICATE TEST: NAME                    DUPLICATE SCORE: 36
DUPLICATE TEST: DOB                     DUPLICATE SCORE: 0

Select DUPLICATE RECORD RECORD1: <RET>
```

Print List of File Duplicates Option

If you select the Print List of File Duplicates option [XDR PRINT LIST] from the Utilities menu you are allowed to print different types of listings from the DUPLICATE RECORD file (#15).

You can choose to print entries of the DUPLICATE RECORD file (#15) that have a STATUS of Potential Duplicate, Unverified, or Verified Duplicate and a MERGE STATUS of Ready (to be merged), or a STATUS of Verified Not A Duplicate and a MERGE STATUS of Not Ready (to be merged). The printout is in captioned format.

```
Duplicate Resolution Utilities Menu


   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option: PRNT <RET> Print List of File Duplicates

Select File you wish to list for:    NEW PERSON

This utility provides reports on verified and unverified potential
duplicates.

     Select one of the following:

          1         UNVERIFIED potential duplicates
          2         READY TO MERGE VERIFIED duplicates
          3         NOT READY TO MERGE VERIFIED duplicates
          4         MERGED VERIFIED duplicates

report: 1 <RET> UNVERIFIED potential duplicates     (AUG 26, 1994@10:43)
     FILE #15
  START WITH DATE FOUND: FIRST// <RET>
DEVICE: <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>
```

Print List of File Duplicates option (continued):

```
Unverified Potential Duplicates             AUG 26,1994  10:43    PAGE 1
-------------------------------------------------------------------------


RECORD1: COLLINS,PHILLIS                RECORD2: COLLINS,PHIL
  STATUS: POTENTIAL DUPLICATE, UNVERIFIED
  DATE FOUND: APR  1, 1994              WHO CREATED: DOE,JOHN
  DC TOTAL POSSIBLE SCORE: 60           DC POTENTIAL DUPE THRESHOLD %: 50
  DC DUPE MATCH SCORE: 36               DC DUPE MATCH PERCENTILE: 60
DUPLICATE TEST: NAME                    DUPLICATE SCORE: 36
DUPLICATE TEST: DOB                     DUPLICATE SCORE: 0

RECORD1: MOOREHEAD,AGATHA               RECORD2: MOOREHEAD,AGNES
  STATUS: POTENTIAL DUPLICATE, UNVERIFIED
  DATE FOUND: APR  1, 1994              WHO CREATED: DOE,JOHN
  DC TOTAL POSSIBLE SCORE: 60           DC POTENTIAL DUPE THRESHOLD %: 50
  DC DUPE MATCH SCORE: 36               DC DUPE MATCH PERCENTILE: 60
DUPLICATE TEST: NAME                    DUPLICATE SCORE: 36
DUPLICATE TEST: DOB                     DUPLICATE SCORE: 0

RECORD1: JACKSON,BILLY BOB JOE          RECORD2: JACKSON,BO
  STATUS: POTENTIAL DUPLICATE, UNVERIFIED
  DATE FOUND: APR  1, 1994              WHO CREATED: DOE,JOHN
  DC TOTAL POSSIBLE SCORE: 90           DC POTENTIAL DUPE THRESHOLD %: 50
  DC DUPE MATCH SCORE: 48               DC DUPE MATCH PERCENTILE: 53
DUPLICATE TEST: NAME                    DUPLICATE SCORE: 24
DUPLICATE TEST: DOB                     DUPLICATE SCORE: 24


     Select one of the following:

          1         UNVERIFIED potential duplicates
          2         READY TO MERGE VERIFIED duplicates
          3         NOT READY TO MERGE VERIFIED duplicates
          4         MERGED VERIFIED duplicates

report: ^
```

Tally STATUS and MERGE STATUS Fields Option

By selecting the Tally STATUS and MERGE STATUS fields option [XDR TALLY STATUS FIELDS] from the Utilities menu, a report is produced that tallies the STATUS and MERGE STATUS fields for all entries in the DUPLICATE RECORD file (#15) for the file that you select. In the example below, we selected the NEW PERSON file (#200):

```
Duplicate Resolution Utilities Menu



   CHCK    Check Pair of Records to see if Duplicates
   ADD     Add Verified Duplicate Pair
   FIND    Find Potential Duplicates for an Entry in a File
   EDIT    Edit Duplicate Record Status
   VIEW    View Duplicate Record Entries
   PRNT    Print List of File Duplicates
   TSF     Tally STATUS and MERGE STATUS fields

Select Utilities Option: TSF <RET> Tally STATUS and MERGE STATUS fields

This report will tally the Status and Merge Status fields for all entries
in the Duplicate record file for the file that you select.


Tally duplicate entries for which file? 200 <RET> NEW PERSON

DEVICE: HOME// <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



   SAN FRANCISCO                              AUG 26, 1994        Page 1

            TALLY OF DUPLICATE RECORDS' STATUS/MERGE STATUS FIELDS
                          FILE:  NEW PERSON

------------------------------------------------------------------------

Total Number of Duplicate Records for File NEW PERSON:               58

     STATUS field:        VERIFIED, NOT A DUPLICATE                   2
                          POTENTIAL DUPLICATE, UNVERIFIED            53
                          VERIFIED DUPLICATE                          3

     MERGE STATUS field:  READY                                       0
                          MERGED                                      3

End of Report.  Press return to exit <RET>
```

MANAGER UTILITIES

The following is a description of the Manager Utilities menu options on the Duplicate Resolution System menu. The options are described in the same order as they appear on the screen:

```
Application Utilities ...                                              [XTMENU]
  Duplicate Resolution System ... <Locked with XDR>           [XDR MAIN MENU]
    XDRM   Manager Utilities ...<Locked with XDRMGR>  [XDR MANAGER UTILITIES]
      AUTO   Automatically Merge Already Verified Duplicates  [XDR AUTO MERGE]
      FILE   Edit Duplicate Resolution File     [XDR EDIT DUP RESOLUTION FILE]
      PRGE   Purge Duplicate Record File                          [XDR PURGE]
```

Automatically Merge Already Verified Duplicates Option

The Automatically Merge Already Verified Duplicates option [XDR AUTO MERGE] is used to non-interactively merge all Verified Duplicate pairs that are Ready (to be merged). This option might take some time depending on how many Verified Duplicate pairs there are. It can be found on the Manager Utilities menu.

```
Duplicate Resolution System Menu




    XDRO    Operations ...
    XDRU    Utilities ...
    XDRM    Manager Utilities ...

Select Duplicate Resolution System Option: Manager Utilities

Duplicate Manager Utilities Menu




    AUTO    Automatically Merge Already Verified Duplicates
    FILE    Edit Duplicate Resolution File
    PRGE    Purge Duplicate Record File

Select Manager Utilities Option: AUTO <RET> Automatically Merge Already
     Verified Duplicates
Select file to merge ready to merge duplicates:    NEW PERSON
```

This option is used to merge all Verified Duplicate pairs for a selected file that have a MERGE STATUS of Ready.

This merges all records that were not previously merged in the normal merge process due to special package merges that needed to occur before the final merge could occur.

When this option is used there is no interaction with the user and no messages written to the screen.

Some sites might choose to place this option in a TaskMan queue to run in the background, but it is not known what effect FileMan dictionaries that write messages to the screen have on this process.

The merge process might take quite some time depending on the amount of information and the number of files that have to be merged. This option, if not queued, should only be run on a terminal that can be dedicated to this task for a large amount of time.

Edit Duplicate Resolution File Option

The Edit Duplicate Resolution File option [XDR EDIT DUP RESOLUTION FILE] allows you to edit the values used to select potential duplicates.

This option is also used to change the POTENTIAL DUPLICATE THRESHOLD% which is used by the duplicate checking software to determine whether to add a pair of records to the DUPLICATE RECORD file (#15). This option can be selected only by the merge manager from the Manager Utilities menu.

```
Duplicate Manager Utilities Menu


   AUTO    Automatically Merge Already Verified Duplicates
   FILE    Edit Duplicate Resolution File
   PRGE    Purge Duplicate Record File

Select Manager Utilities Option: Edit Duplicate Resolution File

Select DUPLICATE RESOLUTION FILE TO BE CHECKED:    NEW PERSON
FILE TO BE CHECKED: NEW PERSON// <RET>
CANDIDATE COLLECTION ROUTINE: Z2NPCAN// <RET>
Select DUPLICATE TEST: DOB// <RET>
  DUPLICATE TEST: DOB// <RET>
  ORDER OF TEST: 2// <RET>
  DUPLICATE TEST ROUTINE: Z2NPDOB// <RET>
  FILE FOR INFORMATION: <RET>
  FIELD TO BE CHECKED: 5// <RET>
  SUCCESSFUL MATCH WEIGHT: 30// <RET>
  UNSUCCESSFUL MATCH WEIGHT: -20// <RET>
Select DUPLICATE TEST: <RET>
POTENTIAL DUPLICATE THRESHOLD%: 50// <RET>
MERGE STYLE: INTERACTIVE// <RET>
DUPLICATE MANAGER MAIL GROUP: JOHN'S MAIL GROUP// <RET>
VERIFIED DUPLICATE MAIL GROUP: JOHN'S MAIL GROUP// <RET>
VERIFIED DUPLICATE MSG ROUTINE: <RET>
MERGE MAIL GROUP: JOHN'S MAIL GROUP// <RET>
MERGE MSG ROUTINE: <RET>
VERIFIED DUPLICATE THRESHOLD%: <RET>
```

Purge Duplicate Record File Option

The purging of the DUPLICATE RECORD file (#15) can only be done by the merge manager, and the Purge Duplicate Record File option [XDR PURGE] can only be selected from the Manager Utilities menu.

You can purge the Potential Duplicate, Unverified entries and Verified Not A Duplicate entries, or both, from the DUPLICATE RECORD file (#15). You *cannot* purge any records that have a STATUS of Verified Duplicate or a MERGE STATUS of Merged.

```
Duplicate Manager Utilities Menu


   AUTO    Automatically Merge Already Verified Duplicates
   FILE    Edit Duplicate Resolution File
   PRGE    Purge Duplicate Record File

Select Manager Utilities Option: PRGE <RET> Purge Duplicate Record File
Select File to Be Checked to purge:    NEW PERSON

     Select one of the following:

          1         POTENTIAL DUPLICATES PURGE
          2         VERIFIED NOT DUPLICATES PURGE
          3         ALL RECORDS EXCEPT VERIFIED DUPLICATES PURGE

Choice : ^
```

PROGRAMMER API

Developing a File Merge Capability

This topic provides developers with a set of instructions to follow in building a merge capability for a file. After a developer identifies a file that has a substantial number of duplicates and that the nature and use of the file warrants a merge utility, he/she then follows the steps outlined below in developing that merge capability.

Let us continue the rest of the discussion as a specific example of developing a Patient Merge using the Duplicate Resolution Utilities.

Step 1

Notify the Toolkit developers of the perceived need for a duplicate checking/merge capability for a particular file. The Toolkit development team then assists the developer in deciding whether there is indeed a need for a Duplicate Resolution Utility for this particular file. The Toolkit developers then add the file to the .01 and .02 variable pointer field definitions in the DUPLICATE RECORD file (#15). The Toolkit developer notifies the application developer when the modified dictionary is to be released to the field.

Step 2

The developer needs to now communicate to the larger development community his/her intention to develop a merge capability for this file. All developers need to determine if the merging and deleting of records in this file affects their package in such a way that they need to have their own unique merge routine that deals with only their package's files. A developer usually has to write their own unique merge routine if any of the following conditions exist:

1. **The patient pointer field is defined as a numeric or free text field rather than a pointer.**

2. **The developer wants their end users to complete some task prior to the merge occurring.**

3. **They have compound cross references that include the patient pointer on another field but the cross reference is not triggered by the changing of the patient pointer.**

4. **The Merge (Duplicate Resolution Utilities) does not do what the package developer desires.**

The Following is a Description of what Occurs During the Merge:

The base file (e.g., PATIENT file, #2) is checked to see if it exists. Then the PT nodes (e.g., ^DD(2,0,"PT",) are checked and any false positives are removed. It then creates a list of files and fields within those files that point to the file being merged (e.g., in this example the file being merged is the PATIENT file, #2). If a file is pointing to the file being merged by its .01 field, and if that .01 field is DINUM, then all files/fields that point to that file are also gathered. The DINUM rule also applies to that file and any files pointing to it, to any depth.

Each file/field is checked and re-pointed/merged as follows:

> **If the field pointing is not a .01 field, the "from entry" is changed to the "to entry".**
>
> **If the field pointing is the .01 field but not DINUM, the "from entry" is changed to the "to entry".**
>
> **Each pointing .01 DINUM field is handled as follows:**
>
> > **If the .01 DINUM field is at the file level, ^DIT0 is called to merge the "from entry" to the "to entry" and then the "from entry" is deleted. ^DIT0 merges field by field but does not change any value in the "to entry". That means that NULL fields in the "to entry" get the value from the same field in the "from entry" if it is not NULL, and valued fields in the "to entry" remain the same. ^DIT0 also merges multiples. If a multiple entry in the "from entry" cannot be found in the "to entry", it is added to the "to entry". If a multiple entry in the "from entry" can be found in the "to entry", then that multiple entry is merged field by field.**
> >
> > **If the .01 DINUM field is at the subfile level (in a multiple), it is handled as follows:**
> >
> > > **If there is a "from entry" but no "to entry", the "from entry" is added to the "to entry", changing the .01 field value in the process, and the "from entry" is deleted.**
> > >
> > > **If there is a "from entry" and also a "to entry", the "from entry" is deleted and the "to entry" remains unchanged.**

If it is determined that a developer must have their own unique merge that deals with their files, they must make the appropriate entries in the PACKAGE file (#9.4). If they have to have some sort of action taken by end users prior to the merging of the records, they must update the MERGE PACKAGES multiple in the DUPLICATE RECORD file (#15) for that pair of records.

The following explains the entries that need to be made in the PACKAGE file (#9.4):

In your PACKAGE file (#9.4) make an entry in the AFFECTS RECORD MERGE field (#20).

In the .01 field, enter the file affected (e.g., PATIENT file, #2).

In the NAME OF MERGE ROUTINE field enter the name of your merge routine which is executed via indirection by Duplicate Resolution Utilities. If you leave this field blank but still place an entry in the PACKAGE file (#9.4), Duplicate Resolution Utilities assumes that you have some sort of interactive merge process that your end users must complete prior to the main merge occurring. It also assumes that this interactive merge process is on a separate option within the developer's package options. The values of the two records being merged are placed in:

^TMP("XDRMRGFR",$J,XDRMRG("FR"),

and

^TMP("XDRMRGTO",$J,XDRMRG("TO"),

These should be referenced by the developer if they need any certain field values since the values might have been changed prior to the execution of their merge routine.

In the RECORD HAS PACKAGE DATA field you would enter a string of MUMPS executable code that is passed the variable XDRMRG("FR") (the "from record" IEN) and set XDRZ to 0. The code should set XDRZ=1 if XDRMRG("FR") has data within your package files.

Remember to only make these entries in the PACKAGE file (#9.4) if the normal merge does not suffice for your package. If you have an entry in the PACKAGE file (#9.4) the repointing and merging as described above does not take place for those files within your Package entry.

If you leave the NAME OF MERGE ROUTINE field blank, it is assumed that you have some sort of interactive merge process that must occur prior to the main merging of the two records. At the completion of your interactive merge process the developer must set the STATUS field of the MERGE PACKAGES multiple for their package in the DUPLICATE RECORD file (#15) entry to Ready. This must be done using FileMan because of the trigger that is on the STATUS field. Once all of the MERGE PACKAGE entries have a STATUS of Ready, the main merging of the two records can occur.

Step 3

The developer now needs to add an entry in the DUPLICATE RESOLUTION file (#15.1) for the file being built. The following fields need to be updated in the DUPLICATE RESOLUTION file (#15.1) and data should be entered by the developer:

.01 FILE TO BE CHECKED (required)

.06 CROSS-REF FOR NEW SEARCH (optional)

.09 CANDIDATE COLLECTION ROUTINE (required)

.11 DUPLICATE MANAGER MAIL GROUP (optional)

.15 POTENTIAL DUPLICATE THRESHOLD% (required)

.16 VERIFIED DUPLICATE MAIL GROUP (optional)

.17 VERIFIED DUPLICATE MSG ROUTINE (optional)

.18 VERIFIED DUPLICATE THRESHOLD% (optional)

.25 MERGE STYLE (required)

.26 DELETE FROM ENTRY (optional)

.27 PRE-MERGE ROUTINE (optional)

.28 POST-MERGE ROUTINE (optional)

.29 MERGE MAIL GROUP (optional)

.31 MERGE MSG ROUTINE (optional)

.33 MERGE DIRECTION INP TRANSFORM (optional)

1100 DUPLICATE TESTS (required)
- **.01 DUPLICATE TEST (required)**
- **.02 ORDER OF TEST (required)**
- **.03 DUPLICATE TEST ROUTINE (required)**
- **.04 FILE FOR INFORMATION (optional)**
- **.05 FIELD TO BE CHECKED (required)**
- **.06 SUCCESSFUL MATCH WEIGHT (required)**
- **.07 UNSUCCESSFUL MATCH WEIGHT (required)**

1200 DINUM FILES FOR MERGE (optional)
- **.01 DINUM FILES FOR MERGE (optional)**

EXPLANATION OF FIELDS IN LOGICAL ORDER OF ENTRY

Selected fields are now explained in the logical order of entry versus strict numeric field order as follows:

.01 FILE TO BE CHECKED

Enter the file for which the developer wants to check and merge duplicates. You can only enter files that are also defined in the .01 variable pointer field of the DUPLICATE RECORD file (#15). If the file you are interested in is not there, contact the Kernel Toolkit team for coordination.

.09 CANDIDATE COLLECTION ROUTINE

This field is updated with the name of the routine that the Duplicate Resolution Utilities executes to generate the list of potential duplicate candidates. The list of candidates is passed back to the merge shell in ^TMP("XDRD",$J,file number. For example, if this is a patient merge utility, the candidate collection routine might pass back, to the merge shell, all patients who either have the same last name as the record being processed, the same DOB as the record being processed, or who have the same or similar SSN. This candidate collection routine is used to minimize the number of records the merge shell has to process in determining potential duplicates.

For an example of a Candidate Collection routine, see Appendix A.

Selecting Fields to Compare in Candidate Collection:

- **The developer needs to give this considerable thought as selecting wrong fields for candidate collection results in either missed or many false potential duplicate candidates.**
- **The most important characteristic that a field should have is the probability of containing data. If a SSN field exists in a file but the field is rarely filled in, it would not be a good field to build candidates from.**
- **Since selection of candidates deals with minimizing the set of records to test further, we look at the whole file initially. It becomes desirable for the field to have a cross reference.**
- **Uniqueness of a field is also important. If all records contain one of two possible values, e.g., Male or Female, it makes little sense for us to select all records that are the same value as the record compared. However, such a field can be useful later in performing individual tests.**

- **One final point to keep in mind is, if we finally come up with very few fields to collect candidates on, we may need to be very liberal in the comparison. Furthermore, we might want to make more than one pass through the same field with a different comparison logic, hoping to find additional records that we missed initially.**

1100 DUPLICATE TESTS

The developer must identify data items/fields to be used to assist in determining if a pair of records are duplicates. These items/fields must be single valued fields (i.e., data in multiple fields is not supported), as follows:

.01 DUPLICATE TEST

This is a free text name for the test (e.g., Name, SSN, DOB).

.02 ORDER OF TEST

Enter in the numeric value of the order you want the tests executed.

.03 DUPLICATE TEST ROUTINE

Enter the name of the routine that is called to do the actual comparison of the two records for a specific field.

For examples of duplicate test routines, see Appendix A.

Variables passed to the test routine:

XDRCD=IEN of Record 1
XDRCD2=IEN of Record 2
XDRFL=file number being checked
XDRDTEST(XDRDTO)=zero node of test entry from the DUPLICATE RESOLUTION file (#15.1)
XDRDCD(XDRFL,XDRCD,field number,"I")=internal data value for this field for record 1
XDRDCD2(XDRFL,XDRCD2,field number,"I")=internal data value for this field for record 2
XDRD("TEST SCORE")=0, this variable is used to pass the test score back to XDRDUP

The successful maximum score can be obtained from:

```
$P(XDRDTEST(XDRDTO),U,6)
```

The unsuccessful score can be obtained from:

```
$P(XDRDTEST(XDRDTO),U,7)
```

Within the duplicate test routine, the developer can assign the entire successful match weight if both records' data is exactly the same, or he can assign a percentage of the match score if the data is similar, but not exactly the same. For example, if record 1 has a NAME of Jones,Mary Ann and record 2 has a NAME of Jones,Mary and the successful match weight for NAME is 50 points, this pair might be assigned 90% of the total 50 points. The developers have to go through trial and error methods of changing and calculating the percent of the total match score that is assigned.

For examples of duplicate test routines, see Appendix A.

.04 FILE FOR INFORMATION

If the field that is being tested is not in the base file being checked, the developer must enter the file where the information is stored. For example, in the IHS Patient Merge, the TRIBE OF MEMBERSHIP is a field used for a duplicate test, and this data field is stored in the IHS PATIENT file (#2). If no entry is made in this field, the Merge (Duplicate Resolution Utilities) assumes the base file.

.05 FIELD TO BE CHECKED

This field contains the field number of the data being used for this test. The developer must be aware that multiple fields cannot be used for duplicate tests.

.06 SUCCESSFUL MATCH WEIGHT

This is the score or total number of points assigned when a match is made on the data item being checked. This score can be anywhere from 0 to 99. The development team needs to determine the level of confidence associated with each test. The higher confidence fields would be assigned a greater successful match score than the lower confidence fields. For example, in a Patient Merge, if NAME matches exactly, a total of 60 points might be given, but if SEX or TRIBE OF MEMBERSHIP match exactly only 10 points is given. The total number of points between all the tests does not have to equal 100. The calculations to determine whether or not the pair is a potential duplicate is

based on a percentage of the total possible score. If a data item is missing, it does not figure in the denominator in calculating the percentage.

.07 UNSUCCESSFUL MATCH WEIGHT

This is the score or total number of points assigned when the data items for the two records being checked do *not* match. This score is normally a negative number. For example, if the DOB for the two records is different, a score of -40 might be assigned. This score can be anywhere from 0 to -99. The development team needs to determine the level of confidence associated with each test. The higher confidence fields would be assigned a greater negative unsuccessful match score than the lower confidence fields.

.15 POTENTIAL DUPLICATE THRESHOLD%

This is the possible percentage out of 100 after the accumulation of the test scores. If the final accumulated test score is equal to or greater than this percentage of the total possible points, the record pair is added to the DUPLICATE RECORD file (#15) as a potential duplicate pair. The percentage has to be experimented with to find the best percentage to use. It is recommended that the percentage be set low at first and gradually increased to find the best possible percentage so that you don't have a large number of false negatives.

.25 MERGE STYLE

This determines whether or not the merge process is to be interactive or not. It is highly recommended that the merge be interactive. If it is interactive, the user is able to select fields from both the from and the target record. If non-interactive, all values are taken from the source record.

.11 DUPLICATE MANAGER MAIL GROUP

This field contains a pointer to the mail group that receives messages in cases when the duplicate checking process could not be started. Some examples of conditions that would generate bulletins include: the test routine is not present, no entry in the DUPLICATE RESOLUTION file (#15.1) for this field, the global root node in ^DIC is undefined, etc.

.16 VERIFIED DUPLICATE MAIL GROUP

This field contains a pointer to the mail group that receives messages when a pair of records have been verified as duplicates. For example, in the case of a

patient merge, there might be things that pharmacy or lab staff want to do before the two records are merged.

.17 VERIFIED DUPLICATE MSG ROUTINE

See a good description in the DD for this field in the DUPLICATE RESOLUTION file (#15.1).

.29 MERGE MAIL GROUP

This field contains a pointer to the mail group that receives messages when a pair of records have been merged. Generally this is the same mail group as the VERIFIED DUPLICATE MAIL GROUP (#.16). These recipients can examine the merged-to record to make sure that all data transferred from the merged-from record successfully.

.31 MERGE MSG ROUTINE

See a good description in the DD for this field in the DUPLICATE RESOLUTION file (#15.1). Also, this routine might very well need to be different than the VERIFIED DUPLICATE MSG ROUTINE (#.17), because the information that users need to see after the merge is different than before.

.18 VERIFIED DUPLICATE THRESHOLD%

If this field contains a percentage from 0 to 100, the XDR software automatically marks the two records as Verified Duplicates if the comparison score percentage is equal or greater to this value. This number, if entered, needs to be somewhat high, probably above 90% (e.g., IHS does not use this field in the case of the patient merge, because they would like human determination if the two records are indeed duplicates).

Capacity Management

Capacity Management

THE CAPACITY PLANNING SUITE OF TOOLS

- **Automated System Resource Monitoring**
- **Response Time Monitoring**
- **Performance Assurance**

Introduction to Capacity Management

Performance management and capacity planning at the site, and for VA, necessitates the accurate characterization and quantification of workload and the demand it places on the configuration under *normal* conditions. In a multi-user environment, increasing demand for one or more resources may lead to degradation of performance. Given that hardware resources are finite, systems must be properly configured, workload must be properly distributed, and systems should be continuously monitored to maintain desirable response times. Clearly, this can involve a considerable investment in human resources as well.

An essential goal of the Capacity Management Program (CMP) has been to develop and distribute cost effective tools which would permit the automated collection of performance, workload, and resource utilization data on a continuous basis. In addition to a variety of on-line reports, this data can be easily exported to spreadsheets using the data export utilities of VA FileMan.

The CMP toolset frees the site manager of laborious data collection procedures, assists in normalizing the computing environment, and guides the site manager toward sound decisions in the areas of performance monitoring, system management, and planning for future capacity.

The following software products are part of the Capacity Management Toolset:

- **VAX/Alpha Performance Monitor (VPM)**
- **VAX/Alpha Resource Consumption**
- **Micronetics Standard MUMPS (MSM) Performance Monitor (MPM)**
- **Response Time Measures**

Performance Assurance for VA Computing Systems

OVERVIEW

Physical systems of most types tend to behave consistently over time until acted upon by some external force. Repeated, quantitative measurements of these systems yields a normal distribution of data which is fully described by its mean, or average, and its Standard Deviation (SD), a measure of variability. Systematically monitoring VA computing systems with respect to their *normal* or expected behavior allows one to clearly distinguish between normal and abnormal behavior, describe the causes of performance bottlenecks, and take corrective action. This is the basis for a sound quality control program. These principals have been applied to the Performance Assurance component of VPM in Toolkit version 7.3. A similar component is planned for the MSM systems in a future release.

STANDARD DEVIATION REVIEW

Standard deviation is a statistical tool used to describe the frequency distribution of data about a mean value. Most of the measurements tend to cluster around the average, while measurements far from the average occur less and less frequently until some point is reached where there are essentially *no* occurrences outside this normal distribution.

The VA's performance tools collect and file data at regular intervals. The average and standard deviation can then be computed for all or part of the database. Each value is then subtracted from the mean to yield the deviation. The deviation is then squared. From this, the standard deviation is calculated as the square root of the sum of the squared deviations divided by the count-1.

n = number of observations
Average = sum/n
SD = square root(sum of squared differences from Average/(n-1))

Given a sufficient number of observations:

68% will be within ONE STANDARD DEVIATION
95% will be within TWO STANDARD DEVIATIONS
99.7% will be within THREE STANDARD DEVIATIONS

The Two Standard Deviation Rule

Sites should consider the mean +/- 2 SD (2*SD) as the limit of tolerance for evaluating performance data. A single observation outside of three SD is *abnormal*. If a group of observations fall outside of three SD, one can conclude that a clearly abnormal situation has developed. Observations that are between two and three SD are considered *suspect*. In any event, the cause of the change should be investigated and characterized. While evaluating suspect and abnormal conditions, site managers should consider the following:

- **Does the abnormal observation appear to be isolated or reproducible?**
- **Do historical averages or raw data indicate a pattern of change that occurs suddenly but regularly, or gradual, as in a trend?**
- **Can you determine that the performance event(s) affected Response Time? Did the event influence other related metrics?**
- **Are the underlying assumptions for establishing your tolerance limits valid? The general environment for taking measurements should not change over time. This includes changes in your configuration as well as differences in processing requirements, say, between day and evening. Data should be collected for a sufficient length of time to include a large sample of "normal" day-to-day variations.**

What is "Normal" is Strictly up to You

It is necessary for each site to measure and establish their own set of normal values and tolerance limits. Though the hardware may be the same among a group of sites, no two sites have the same working environments. The mix of workload and resource requirements and even the human perception of good vs. bad levels of performance make it virtually impossible to state an absolute range of reference. However, the CMP Directorate at ISC San Francisco attempts to approximate this absolute reference range by pooling your data with the universe of data from all participating sites. In support of this goal, sites are strongly encouraged to activate the performance monitoring software as soon as possible.

In summary, your system should be continuously monitored for deviations from what you have established as normal, and you should periodically review your tolerance limits in the context of the wider universe of data. Your performance means should fall within two standard deviations (95%) of all the sites having similar configurations.

PERFORMANCE ASSURANCE OPTIONS/SAMPLE REPORTS IN VPM

```
Select VAX/ALPHA Performance Monitor Option: performance Assurance
Select Performance Assurance Option: ??

    EL      Edit # Days to Compute Reference Ranges    [XUCM EDIT REF THRESH]
    ES      Edit Volume Set Threshold                  [XUCM EDIT VOL SET THRESH]
    EV      Edit VMS Disk Space Threshold              [XUCM EDIT DISK THRESHOLD]
            Compute New Local References          [XUCM COMPUTE LOCAL REFERENCES]
            Enable Alerts for Selected Metrics                [XUCM SET ALERTS]
            Performance Analysis                                 [XUCM ANALYSE]
```

Edit # Days to Compute Reference Ranges

The Edit # Days to Compute Reference Ranges option [XUCM EDIT REF THRESH] is used to control your local reference mean and standard deviation. For example, if 90 is entered, then each evening your reference range is re-computed based on the previous 90 days. This 90-day moving average is maintained by hardware-type in the CM METRICS file (#8986.4). In this scenario, current data is always compared with the last 90 days, regardless of how well the system performed during that period. If this field is blank, no updating occurs. If you enter "999", *all* data is used.

Suggested usage:

If your system appears to be functioning normally, enter "999" to include all data until the standard deviation appears to be stable and you are within 2 standard deviations of the VA reference mean. After a reasonable period of monitoring, set this field to null to "fix" your reference ranges on a period that you consider "normal" for that hardware. Your local standard deviation should be considerably smaller than those published by the VA and should be particularly useful for monitoring the affect of tuning or capacity changes.

Edit Volume Set Threshold

The Edit Volume Set Threshold option [XUCM EDIT VOL SET THRESH] is used to enter the percentage threshold of volume set blocks free that is tolerated before an alert should be fired. This is based on the totals for a complete volume set rather than a single volume.

Edit VMS Disk Space Threshold

The Edit VMS Disk Space Threshold option [XUCM EDIT DISK THRESHOLD] is used to enter the percentage of VMS blocks free (space remaining) that is tolerated before an alert should be fired. A null entry or 0 ignores this particular drive.

Compute New Local References

The Compute New Local References option [XUCM COMPUTE LOCAL REFERENCES] computes means and standard deviations using local historical data for a user-selected range of dates. You have the opportunity to review/print current data and the newly calculated data before allowing the routine to update your CM METRICS file (#8986.4). For a definition of the following metrics, see the topic entitled "The VAX/Alpha Performance Monitor (VPM)" in this chapter.

```
Select Performance Assurance Option: compute New Local References
Enter EARLIEST DATE: T-1// t-90  (APR 12, 1994)
Enter  LATEST  DATE: T-1@2400// t-30  (JUN 11, 1994)
I will print your current metric references and the new
ranges. You will be able to exit this routine if the new ranges
are unsatisfactory.
Print current references to which DEVICE? HOME// <RET>  DECSERVER



>>Current entries in CM METRICS FILE<<         JUL 11,1994  13:41    PAGE 1
HW TYPE       LOC MEAN          SD     VA MEAN          SD
------------------------------------------------------------------------------

        METRIC: ASTI
4200              7.39        8.28
6430              6.13        5.81
        METRIC: ASTL
4200              0.64        0.42
6430              0.72        0.45
        METRIC: ASTO
4200              4.06        3.00
6430              9.92       15.83
        METRIC: AZS
4200              0.00        0.00
6430              0.00        0.00
        METRIC: BIO
4200             18.37       11.63
6430             27.47       13.46
.
.
etc...
```

Compute New Local References option (continued):

```
Computing new references. One Moment...
Print NEW references on which DEVICE? HOME// <RET>



Hardware            Metric              New             New
Type     Count      Name                Mean            SD
4200      52        ITM                 75.97           10.42
4200      52        USR                 8.34            5.34
4200      52        KRM                 7.47            3.29
4200      52        IST                 6.74            2.66
4200      52        FLS                 55653.69        8886.54
4200      52        MLS                 2329.31         716.98
4200      52        DIO                 6.18            3.32
4200      52        BIO                 21.30           13.11
4200      52        PFR                 24.33           10.32
4200      52        PRR                 1.07            0.48
4200      52        PRC                 64.13           12.08
4200      50        IPC                 12.62           6.20
4200      53        RLD                 2.78            1.43
4200      48        MRL                 0.00            0.00
.
.
etc...

Your site parameters indicate that your new data will be overwritten
the next time the Morning Summary is generated.
To prevent this, you may delete the entry in the following field.
DAYS FOR COMPUTING REFERENCES: 999// <RET>
OK to file this data? YES// <RET>
```

Enable Alerts for Selected Metrics

When locally computed means and standard deviations are considered to be satisfactory, sites can use the Enable Alerts for Selected Metrics option [XUCM SET ALERTS] to enable the alert system for selected metrics. During each import of raw data (hourly is recommended), the local mean and standard deviation is checked for each metric. If the measured value is outside of *three* standard deviations, an alert is fired and the site may choose to initiate an investigation. When data falls outside of 3 SD it is outside of 99.7% of the population used to compute the mean. Though this indicates a significant change in the usual behavior of your system, it may not indicate a "critical" situation has developed. Alerts are sent to the local CMP mail group defined in your site parameters.

Enable Alerts for Selected Metrics option (continued):

```
Select Performance Assurance Option: enable Alerts for Selected Metrics

Select CM METRICS: bio <RET>          Buffered IO
ALERT: YES// <RET>
ALERT RULE: ??
     If ALERTING is enabled for this metric, '<' will fire alerts only if
the value is LESS THAN 3 STANDARD DEVIATIONS, '>' will fire an alert when
the result is GREATER THAN 3 STANDARD DEVIATIONS, and NO entry will alert
you when the result is EITHER ABOVE OR BELOW 3 STANDARD DEVIATIONS.

     CHOOSE FROM:
       <        Alert if less than 3 SD
       >        Alert if greater than 3 SD
ALERT RULE:
```

Performance Analysis

The Performance Analysis option [XUCM ANALYSE] provides a basic analysis of workday averages for a user-selected date. The usefulness of this analysis is dependent on the reliability of the site's local reference range. Data falling within *two* standard deviations of the local mean are considered normal. Commentary provided by the analysis is based on a subset of the data collected; though, all data collected is presented adjacent to its normal range and flagged when out of range.

```
Select Performance Assurance Option:  Performance Analysis
Analysis of which DATE? T-1// t-4
DEVICE: HOME// <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



          PERFORMANCE ANALYSIS FOR DATE JUL 7,1994               PAGE:   1
PERFORMANCE ASSESSMENT OF DISK DRIVES
Disk drive utilization appears to be consistent with historical data.

PERFORMANCE ASSESSMENT ON NODE ISC6V0

>> MEMORY <<
Overall fault rate: 43.61
Maximum fault rate tolerated: 76.5
Memory usage is consistent with historical data.

>> IO <<
IO demand is consistent with previous data.
```

Performance Analysis option (continued):

```
>> CPU <<
Queue Length (COM+COMO): .29
CPU utilization is consistent with historical data.

PERFORMANCE ASSESSMENT ON NODE ISC6V2

>> MEMORY <<
Overall fault rate: 17.97
Maximum fault rate tolerated: 44.9
Memory usage is consistent with historical data.

>> IO <<
IO demand is consistent with previous data.

>> CPU <<
Queue Length (COM+COMO): .31
CPU utilization is consistent with historical data.

PERFORMANCE ASSESSMENT ON NODE ISC6V4

>> MEMORY <<
Overall fault rate: 28.72
Maximum fault rate tolerated: 44.9
Memory usage is consistent with historical data.

>> IO <<
IO demand is consistent with previous data.

>> CPU <<
Queue Length (COM+COMO): .37
CPU utilization is consistent with historical data.
      NODE   HW TYPE    METRIC         MEAN LOCAL RANGE (2 SD)

(EVIDENCE)
    ISC6V0      6430      ASTI        5.2 (0-17.8)
    ISC6V0      6430      ASTL        0.7 (0-1.6)
    ISC6V0      6430      ASTO        7.4 (0-41.6)
    ISC6V0      6430       AZS        0.0 (0.0-0.0)
    ISC6V0      6430       BIO       27.9 (0.6-54.4)
```

Capacity Management Menu Options

```
SYSTEMS MANAGER MENU                                                  [EVE]
  Capacity Management ...                                          [XTCM MAIN]
    VPM    VAX/ALPHA Capacity Management ...                       [XUCM MAIN]
           Move Host File to Mailman                            [XTCM DISK2MAIL]
           Response Time Log Options ...                               [XURTLM]
```

VAX/ALPHA Capacity Management

The VAX/ALPHA Capacity Management menu [XUCM MAIN] is the primary menu of the two VMS-specific capacity management components, VPM and Resource Consumption. These components are independently enabled or disabled.

Move Host File to MailMan

The Move Host File to MailMan option [XTCM DISK2MAIL] prompts you for a host file name and moves the file to a mail message. You must know the path/directory of the host file and have read access to the file before this can work. The option requires an *unsecured* Host File Server (HFS) device defined in the DEVICE file (#3.5). On VAX/Alpha systems, the HFS device must also be defined in the CM SITE PARAMETERS file (#8986.095).

From programmer mode:

- **Set "%" equal to the file name, then D ^XTCMFILN. This moves your data to the global, ^TMP($J).**
- **To move the data from ^TMP to a mail message, D MAIL1^XTCMFILN.**

Response Time Log Options

The Response Time Log Options menu [XURTLM] is the menu for System Response Time Logging. In order to generate Response Time (RT) data, it is necessary that calls to start and stop the RT clock be present in the routines to be monitored. Then enabling RT logging causes data to be collected.

The VAX/Alpha Performance Monitor (VPM)

```
Select VAX/ALPHA Capacity Management Option: ??

          Resource Usage Menu ...                              [XUCPMENU]
          VAX/ALPHA Performance Monitor ...      [XUCM PERFORMANCE MONITOR]
```

The VPM has been designed to utilize OpenVMS and Digital Standard MUMPS (DSM) monitoring utilities to sample running systems at regular intervals and store a key subset of data associated with configuration, database activity, response time, Central Processing Unit (CPU), memory, and I/O utilization.

Using VA FileMan, standard and ad hoc reports may be generated to facilitate the identification and investigation of major resource bottlenecks. Raw historical data and daily averages are maintained in VA FileMan compatible files allowing system managers to monitor trends and identify potential performance degradation that may result from configuration or workload changes. System alerts and the daily summary report can provide early notification of unexpected degradation in performance and influence the direction of further investigations when warranted.

Ongoing data collection is governed entirely by TaskMan. The data retention time and nodes to be monitored can be determined by the site. Each evening, raw data from the previous day is processed. Workday averages (8 a.m. to 4:30 p.m.) are computed and stored in the CM DAILY STATISTICS file (#8986.6), a workday summary report is sent through MailMan to the site manager and a server message is generated and sent through MailMan to the Capacity Management Program Directorate at the San Francisco ISC.

In addition to facilitating local management of system resources, data collection at the Directorate allows for timely, pro-active capacity management and permits VA to establish and publish meaningful, hardware-specific performance targets, comparative summaries, and site-specific commentaries. It provides an empirical basis for modifying current configurations and improves VA's ability to independently assess future hardware and capacity requirements.

All processes in a configuration should receive CPU, I/O, and memory services promptly, and terminal response times should average less than one second. Bottlenecks occur as demand for these services approaches capacity. They can usually be prevented or corrected simply by identifying underutilized resources and redistributing workload or adjusting appropriate system parameters. The appropriate course of action is determined by knowing how the system responds to current demand, what is the normal response, and how the system behavior changes after one changes the operating environment.

VPM for Toolkit V. 7.3 now permits, in addition to automated monitoring, the ability to establish criteria for normalizing your environment. A target mean and standard deviation is automatically recomputed each evening during the nightly

update for each of the elements monitored. The site may elect to update this information based on all data collected, the previous "n" days of data, or over a specific range of dates where performance was perceived to be acceptable. These target values can then be "fixed" so that updates are no longer automatically generated. These "local" references can be evaluated in terms of VA targets that can be published as data is accumulated from participating sites. Once reliable reference ranges have been established, VPM can produce a performance assessment of a given date as well as generate real-time alerts for selected metrics. VPM can also warn of disk and volume set space shortages based on thresholds determined by the site.

Each of the data elements (metrics) collected by VPM can be found in the CM METRICS file (#8986.4). This file also contains the reference ranges by hardware type and a flag to enable or disable sending alerts. The file is exported with data and the metric abbreviations should not be edited locally. The following is a brief listing of those metrics:

CM METRICS LIST

METRIC	METRIC NAME
ASTI	Blocking AST (Incoming)-Asynchronous system traps
ASTL	Blocking AST (Local)
ASTO	Blocking AST (Outgoing)
AZS	Active Zslots
BIO	Buffered IO Excessive buffered IO rates can be reflected in Interrupt stack time as well. Certain terminal controllers interrupt the CPU for every character read or written. Screen painting applications, and certain line printers may do the same.
BRT	Response Time-As measured by the VAX Bernstein Response Time Monitor
COM	Compute State
COMO	Compute (outswapped) Used to determine the average length of the compute queue. COM+COMO is a good measure of CPU responsiveness. Generally, the larger the queue, the longer response time will be since only one process can acquire a quantum of CPU at a time. This is influenced by factors such as the amount of interrupt stack time, CPU type, the process' computing requirements and scheduling priority.
CUR	Current Process
DDP	DDP Transmits
DIO	Direct IO Rate A general indicator of CPU and disk utilization. Direct IO is costly in terms of CPU cycles and can therefore have a significant impact on system response time.
DKIO	Disk IO Oper. Rate
DKQ	Disk Queue Length

CM METRICS LIST (continued):

ENQF	ENQ's Forced to Wait	The average number of lock requests that had to wait in the wait queue.
ENQI	New ENQ Rate (Incoming)	Lock request rate from remote nodes.
ENQL	New ENQ Rate (Local)	The locking rate on the local node.
ENQO	New ENQ Rate (Outgoing)	Lock requests sent to remote nodes.
FREL	Free List Size:	An indicator of deficient memory if the average size is between the values of the FREELIM and FREEGOAL system parameters.
GGET	Global Gets	
GKIL	Global Kills	
GSET	Global Sets	
IPC	Interactive Process Count	
ISTK	Interrupt Stack	The amount of time the CPU spends processing interrupts from peripheral devices. Also, incoming and outgoing distributed lock manager activity is executed on the interrupt stack.
IDLE	Idle Time	A measure of available CPU cycles UNLESS processes are blocked because of insufficient memory or an overloaded disk IO subsystem.
IUSR	Interactive Users	
KRM	Kernel Mode	High kernel mode time can indicate a memory limitation when the system is found to be paging excessively , swapping or both. Excessive local locking may be confirmed by this indicator as well as file system activity and direct IO.
LGRD	Logical Reads	
LGWT	Logical Writes	
MODL	Modified List Size	
MPRL	Mapped Routine Loads	
PGFR	Page Fault Rate	The average number of soft faults.
PRC	Total Process Count	
PHRD	Physical Reads	
PGIO	Page Read IO Rate	The average number of hard faults.
PHWT	Physical Writes	
RLD	Routine Loads	
USR	User Mode	If CPU utilization is excessive and most of that time is spent in SUPERVISOR, USER, and COMPATIBILITY MODE, the CPU is meeting user demand and there is probably not a bottleneck other than the demand itself.
VBF Volume Set Blocks Free		

VPM Options

```
Select VAX/ALPHA Performance Monitor Option: ??

          Enable/Disable VPM                                  [XUCM ON/OFF]
          Manual Purge of VPM Data                             [XUCM PURGE]
          Performance Assurance ...                               [XUCM PA]
          Setup Performance Monitor                            [XUCM SETUP]
          VPM Reports ...                                     [XUCM REPORTS]
```

Enable/Disable VPM

Use the Enable/Disable VPM option [XUCM ON/OFF] to enable/disable *only* the VPM component of VAX/ALPHA capacity management tools. The Resource Usage options must be managed separately. Note that after disabling VPM, RTHIST continues running until the final scheduled collection; however, it is not rescheduled for the next day.

Manual Purge of VPM Data

The Manual Purge of VPM Data option [XUCM PURGE] allows you to manually purge data from the CM BERNSTEIN DATA (#8986.098), CM DISK DRIVE RAW DATA (#8986.5), CM NODENAME RAW DATA (#8986.51), and CM DAILY STATISTICS (#8986.6) files. The default values displayed are those defined in your site parameters. Entering a new value for the manual purge does not change your site settings.

Setup Performance Monitor

Use the Setup Performance Monitor option [XUCM SETUP] to configure the Performance Monitor site parameters, define nodenames, create the host directory, and install the Digital Command Language (DCL) files required for data collection.

NOTE: This option must be run during the initial setup and must be re-run each time nodes are added or deleted.

The Setup Performance Monitor option dialogue follows:

```
Select CM SITE PARAMETERS:
 ANSWER WITH CM SITE PARAMETERS:
   ISC SAN FRANCISCO

     YOU MAY ENTER A NEW CM SITE PARAMETERS, IF YOU WISH

 ANSWER WITH INSTITUTION NAME
Select CM SITE PARAMETERS: ISC SAN FRANCISCO      CALIFORNIA       16000
         ...OK? YES// <RET>  (YES)
SITE: ISC SAN FRANCISCO// <RET>
CMP HOST FILE PATH: USER$:[CMP]// <RET>
MONITOR ENABLED/DISABLED: ENABLED// <RET>
HFS DEVICE: HFS// <RET>
DAYS TO KEEP RAW DATA: 90// <RET>
DAYS FOR COMPUTING REFERENCES: ??

     This field is used to control your local reference mean and standard
deviation. For example, if 90 is entered, then each evening your reference
range will be re-computed based on the previous 90 days. This 90-day
moving average is maintained by hardware-type in the CM METRICS file. In
this scenario, current data will always be compared with the last 90 days,
regardless of how well the system performed during that period. If this
field is blank, no updating will occur. If you enter '999', ALL data will
be used. Suggested usage: If your system appears to be functioning
normally, enter 999 to include all data until the standard deviation
appears to be stable and you are within 2 standard deviations of the VA
reference mean. After a reasonable period of monitoring, set this field to
null to 'fix' your reference ranges on a period that you consider 'normal'
for that hardware. Your local standard deviation should be considerably
smaller than those published by the VA and should be particularly useful
for monitoring the affect of tuning or capacity changes.

DAYS FOR COMPUTING REFERENCES: 999
MAILGROUP FOR REPORTS/ALERTS: VPM// <RET>
MAILGROUP FOR REMOTE XMITS: VPM// <RET>
DAYS TO KEEP DAILY AVERAGES: 999// <RET>
DAYS TO KEEP BRTL DATA: 365// <RET>
THRESHOLD (%) DSM BLOCKS FREE: 5// ??

     This field will be referenced each evening to determine if there is
sufficient space remaining in your volume sets. If the PERCENTAGE of DSM
blocks free drops below this threshold  for a VOLUME SET an alert will be
fired.

THRESHOLD (%) DSM BLOCKS FREE: 5// <RET>
CONFIGURATION: LAVC// <RET>
CRT's IN SERVICE: 3// <RET>
PRINTERS IN SERVICE: 15// <RET>
NETWORKED WORKSTATIONS: 38// <RET>
STANDALONE WORKSTATIONS: 20// <RET>
HSC NAME(S): <RET>
```

Setup Performance Monitor option dialogue (continued):

```
NETWORK TOPOLOGY: <RET>
Edit? NO// <RET>
Select CM SITE NODENAMES: ISC
     1   ISC6V0
     2   ISC6V2
     3   ISC6V4
CHOOSE 1-3: 1
NODENAME: ISC6V0// <RET>

NOTE:  If you have already defined all nodes in version 7.2, be sure to
       update the new fields under this multiple for each node.

NODE-SPECIFIC BATCH QUEUE: ISC6V0$BATCH// ??

          Enter a node-specific batch queue for each node in this
     configuration. You must be running the 'SETUP...' option when defining
     this entry. If batch queues are defined for ALL nodes, com files will
     be built that submit jobs to these queues rather than using SYSMAN.
     An example of such a queue would be DSM$BATCH_<nodename>. For example:

     ISC6V0: sho que/full dsm$batch_isc6v0
     Batch queue DSM$BATCH_ISC6V0, idle, on ISC6V0::
       /BASE_PRIORITY=4 /JOB_LIMIT=1 /OWNER=[SYSTEM]
     /PROTECTION=(S:E,O:D,G:R,W:W)

     or

     ISC6V0: sho que/full sys$batch
     Batch queue ISC6V0$BATCH, available, on ISC6V0::
       /BASE_PRIORITY=4 /JOB_LIMIT=15 /OWNER=[SYSTEM]
     /PROTECTION=(S:E,O:D,G:R,W:RW)

     If Taskman is configured to run from a dcl context, you may enter the
     queue TM$nodename.

NODE-SPECIFIC BATCH QUEUE: ISC6V0$BATCH// <RET>
USERNAME: TASKMAN// ??

           Enter the name of a VMS user, such as TASKMAN, which has been
      previously added to UAF with sufficient privileges.

USERNAME: TASKMAN// <RET>
```

Setup Performance Monitor option dialogue (continued):

```
DSM ENVIRONMENT MANAGER: ISCMGR// ??

            The DSM ENVIRONMENT name will be that which is entered when
      logging into DSM. The name itself follows 'DSM/ENVIRONMENT=', ie,

      $ dsm/environment=ABCMGR

            If running taskman from a DCL context, this was defined in the
      TASKMAN SITE PARAMETERS as well. This field will be used by taskman
      when starting new RTHIST sessions.

DSM ENVIRONMENT MANAGER: ISCMGR// <RET>
Select CM SITE NODENAMES: <RET>

Requested Start Time: NOW// <RET>

One moment while I check/clean up MTLU variable pointers.
Done...

TO PROTECT THE SECURITY OF DHCP SYSTEMS, DISTRIBUTION OF THIS
SOFTWARE FOR USE ON ANY OTHER COMPUTER SYSTEM IS PROHIBITED.
ALL REQUESTS FOR COPIES OF THE KERNEL FOR NON-DHCP USE SHOULD
BE REFERRED TO YOUR LOCAL ISC.
NXT,KDE>
```

Using the TaskMan option, Schedule/Unschedule Options, queue XUCM TASK VPM to run hourly. This option is the data collection driver for the VMS monitor and checks for and loads new data into the CM DISK DRIVE RAW DATA (#8986.5) and CM NODENAME RAW DATA (#8986.51) files. Each data collection runs for 15 minutes. Queue the option XUCM TASK NIT to run in the early a.m., (e.g., 0001 hours). This option compiles workday averages, mails server messages, and collects "static" information such as node and hardware types. Finally, this option files selected RTHIST data and restarts RTHIST data collections for the next 24 hours.

VPM Reports

This VPM Reports option [XUCM REPORTS] provides the menu of VPM reports available. The report options are described in the topic that follows.

VPM Reports

The Hardware Performance Summary is a VPM report automatically generated by the TaskMan option XUCM TASK NIT. This option is scheduled to run nightly. The report generated is sent via MailMan to the local capacity management mail group. It summarizes the averages computed for the previous workday for system data (by node), disk utilization, DHCP database utilization, and RTHIST sessions. If reference ranges are available, they are displayed along with specific events that exceeded the site's tolerance limits. An asterisk is displayed following any average that falls outside of the two standard deviation range (2sd Range).

The following is an excerpt from such a report:

```
System Performance Summary for 8am - 4:30pm, 1/10/95
(Hourly collections of 15 minutes duration, 10 second sample intervals)



------------------------------------------------------------------------------
SYSTEM SUMMARY
------------------------------------------------------------------------------

For Node: ISC6A1 / Type: DEC 2000 Model 300S / Memory: 128 Mbytes

                       Metric    Average           High(Low)       2sd Range
        Total Process Count:        88.8               98.6       30.7-94.0
  Interactive Process Count:         7.3               13.0          0-35.3
              Active Zslots:         0.0            0.0(0.0)         0.0-0.0

                  CPU MODES
                  Idle Time:        77.4           81.4(69.6)      74.2-106.6
                  User Mode:        12.2            17.7(9.5)          0-17.5
               Kernel Mode:          4.9 *                5.9          0-4.3
            Interrupt Stack:         4.4                  5.8         0.1-4.7

             COMPUTE QUEUES
            Current Process:         1.0                  1.0         1.0-1.0
              Compute State:         0.3                  0.5           0-0.4
       Compute (outswapped):         0.0                  0.0         0.0-0.0

                  MEMORY/IO
              Free List Size:     2166.5              (1036.6)  1791.0-10240.4
          Modified List Size:      140.1               (116.9)      88.4-226.6
             Page Fault Rate:      171.9 *              207.2          0-144.3
           Page Read IO Rate:        7.8 *                8.8           0-6.5
              Direct IO Rate:       12.3                 17.0          0-16.2
                 Buffered IO:       31.3                 58.9          0-34.1
```

Hardware Performance Summary (continued):

```
                      LOCKS
       New ENQ Rate (Local):       41.4 *              46.9          0-32.8
    New ENQ Rate (Incoming):       13.2                18.8          0-17.2
    New ENQ Rate (Outgoing):        3.5                 4.2           0-5.8
       Blocking AST (Local):        3.0 *               4.7           0-2.5
    Blocking AST (Incoming):       10.1                35.7          0-14.0
    Blocking AST (Outgoing):       12.4                15.0          0-16.9
       ENQ's Forced to Wait:       11.6 *              16.9          0-10.9

ALL EVENTS OUTSIDE 3 STANDARD DEVIATIONS ON NODE ISC6A1
                         Date       Metric             Value       3sd Limits
          Jan 10, 1995@08:33         ASTL               2.6          0.0-2.6
          Jan 10, 1995@08:33         COMO               0.0          0.0-0.0
          Jan 10, 1995@08:33         ENQL              36.5         0.0-29.1
          Jan 10, 1995@08:33          KRM               4.2          0.0-4.0
          Jan 10, 1995@08:33         PGFR             154.2        0.0-106.3
          Jan 10, 1995@08:33         PGIO               7.1          0.0-5.9
          Jan 10, 1995@09:33         COMO               0.0          0.0-0.0

For Node: ISC6A2 / Type: DEC 2000 Model 300S / Memory: 128 Mbytes

                       Metric    Average           High(Low)       2sd Range
        Total Process Count:       82.6                91.9       30.7-94.0
  Interactive Process Count:       39.5 *              51.0          0-35.3
              Active Zslots:        0.0             0.0(0.0)         0.0-0.0

                   CPU MODES
                   Idle Time:       85.8          90.5(79.4)      74.2-106.6
                   User Mode:        7.3           13.1(4.4)          0-17.5
                 Kernel Mode:        2.8                 4.2           0-4.3
            Interrupt Stack:         3.6                 4.8         0.1-4.7

             COMPUTE QUEUES
            Current Process:         1.0                 1.0         1.0-1.0
              Compute State:         0.2                 0.3           0-0.4
      Compute (outswapped):          0.0                 0.0         0.0-0.0

                   MEMORY/IO
              Free List Size:     4136.5            (3543.5)  1791.0-10240.4
          Modified List Size:      147.4             (119.7)      88.4-226.6
             Page Fault Rate:      108.8               144.5          0-144.3
           Page Read IO Rate:        3.6                 4.1           0-6.5
              Direct IO Rate:       13.4                28.7          0-16.2
                 Buffered IO:       26.4                37.0          0-34.1
```

Hardware Performance Summary (continued):

```
                      LOCKS
       New ENQ Rate (Local):        9.8              22.9          0-32.8
    New ENQ Rate (Incoming):       13.2              18.8          0-17.2
    New ENQ Rate (Outgoing):        3.5               4.2           0-5.8
       Blocking AST (Local):        1.1               1.3           0-2.5
    Blocking AST (Incoming):        9.7              36.7          0-14.0
    Blocking AST (Outgoing):       12.5              30.4          0-16.9
       ENQ's Forced to Wait:        5.3               6.9          0-10.9

ALL EVENTS OUTSIDE 3 STANDARD DEVIATIONS ON NODE ISC6A2
                         Date       Metric            Value       3sd Limits
          Jan 10, 1995@08:33         PGFR            113.3        0.0-106.3
          Jan 10, 1995@10:33         ASTI             13.7         0.0-10.1
          Jan 10, 1995@15:33         PGFR            117.7        0.0-106.3

For Node: ISC6A3 / Type: DEC 2000 Model 300S / Memory: 128 Mbytes

                       Metric    Average          High(Low)       2sd Range
        Total Process Count:        51.3               52.9        30.7-94.0
  Interactive Process Count:        13.4               15.0           0-35.3
              Active Zslots:         0.0            0.0(0.0)         0.0-0.0

                  CPU MODES
                  Idle Time:        93.2          96.8(79.1)       74.2-106.6
                  User Mode:         2.3            9.6(0.4)           0-17.5
                Kernel Mode:         1.5                 5.8           0-4.3
             Interrupt Stack:        2.9                 5.4         0.1-4.7

              COMPUTE QUEUES
             Current Process:        1.0                 1.0         1.0-1.0
               Compute State:        0.1                 0.4           0-0.4
       Compute (outswapped):         0.0                 0.0         0.0-0.0

                  MEMORY/IO
              Free List Size:     7252.1            (7081.6)  1791.0-10240.4
          Modified List Size:      121.3              (39.9)      88.4-226.6
             Page Fault Rate:       34.9               105.8           0-144.3
           Page Read IO Rate:        0.7                 0.9           0-6.5
              Direct IO Rate:       12.7                69.9          0-16.2
                 Buffered IO:        9.1                15.4          0-34.1

                      LOCKS
       New ENQ Rate (Local):       11.3                65.9          0-32.8
    New ENQ Rate (Incoming):       13.2                18.8          0-17.2
    New ENQ Rate (Outgoing):        3.5                 4.2           0-5.8
       Blocking AST (Local):        0.3                 0.4           0-2.5
    Blocking AST (Incoming):        9.5                16.0          0-14.0
    Blocking AST (Outgoing):       16.6                97.8          0-16.9
       ENQ's Forced to Wait:        2.7                 3.3          0-10.9
```

Hardware Performance Summary (continued):

```
ALL EVENTS OUTSIDE 3 STANDARD DEVIATIONS ON NODE ISC6A3
                        Date       Metric            Value       3sd Limits
          Jan 10, 1995@10:33         ASTI             16.0         0.0-10.1
For Node: ISC6A4 / Type: DEC 2000 Model 300S / Memory: 128 Mbytes

                      Metric    Average           High(Low)       2sd Range
        Total Process Count:       54.6                58.4       30.7-94.0
  Interactive Process Count:       12.4                16.0          0-35.3
              Active Zslots:        0.0             0.0(0.0)         0.0-0.0

                   CPU MODES
                   Idle Time:       94.5          96.7(90.5)      74.2-106.6
                   User Mode:        2.0            5.7(0.7)          0-17.5
                 Kernel Mode:        0.8                 1.0          0-4.3
             Interrupt Stack:        2.6                 3.2          0.1-4.7

              COMPUTE QUEUES
             Current Process:        1.0                 1.0          1.0-1.0
               Compute State:        0.0                 0.1          0-0.4
       Compute (outswapped):         0.0                 0.0          0.0-0.0

                   MEMORY/IO
              Free List Size:     7819.4            (7572.1)  1791.0-10240.4
          Modified List Size:      163.9             (123.5)      88.4-226.6
             Page Fault Rate:       29.9                49.3          0-144.3
           Page Read IO Rate:        0.7                 0.9            0-6.5
              Direct IO Rate:        2.4                 3.0          0-16.2
                 Buffered IO:        7.7                15.0          0-34.1

                      LOCKS
       New ENQ Rate (Local):         1.4                 2.0          0-32.8
    New ENQ Rate (Incoming):        13.2                18.8          0-17.2
    New ENQ Rate (Outgoing):         3.5                 4.2           0-5.8
       Blocking AST (Local):         0.5                 0.9           0-2.5
    Blocking AST (Incoming):        14.2 *              39.8          0-14.0
    Blocking AST (Outgoing):         1.9                 2.6          0-16.9
       ENQ's Forced to Wait:         3.4                 5.1          0-10.9

ALL EVENTS OUTSIDE 3 STANDARD DEVIATIONS ON NODE ISC6A4
                        Date       Metric            Value       3sd Limits
          Jan 10, 1995@10:32         ASTI             24.6         0.0-10.1
          Jan 10, 1995@11:32         ASTI             39.8         0.0-10.1
          Jan 10, 1995@12:32         ASTI             14.5         0.0-10.1
          Jan 10, 1995@13:32         ENQI             18.8         0.0-15.3
```

Hardware Performance Summary (continued):

DISK USAGE

Drive / Type	IO Rate	Q Length	VMS Blocks	Blocks Free	Resp. Time*
1DKA0: / RZ26L:	10.5	0.2	0	0	16
1DKA100: / RZ26L:	1.1	0.1	0	0	71
1DKA200: / RZ26L:	0.7	0.0	0	0	14
1DKB0: / RZ26L:	3.7	0.1	0	0	16
1DKB100: / RZ26L:	0.0	0.0	0	0	
1DKB200: / RZ26L:	1.0	0.0	0	0	10
1DKC0: / RZ26L:	0.3	0.0	0	0	0
1DKC100: / RZ26L:	0.0	0.0	0	0	
1DKC200: / RZ28:	0.0	0.0	0	0	
1DKC300: / RZ28:	0.0	0.0	0	0	
2DKA0: / RZ26L:	6.7	0.1	0	0	9
2DKA100: / RZ26L:	0.4	0.0	0	0	77
2DKA200: / RZ26L:	1.5	0.0	0	0	7
2DKB0: / RZ26L:	4.5	0.1	0	0	16
2DKB100: / RZ26L:	0.0	0.0	0	0	
2DKB200: / RZ26L:	1.3	0.0	0	0	8
2DKC0: / RZ26L:	0.6	0.0	0	0	0
2DKC100: / RZ26L:	0.0	0.0	0	0	
2DKC200: / RZ28:	0.0	0.0	0	0	
2DKC300: / RZ28:	0.0	0.0	0	0	
3DKA0: / RZ28:	0.0	0.0	0	0	
3DKA100: / RZ26L:	0.1	0.0	0	0	0
3DKA200: / RZ28:	0.0	0.0	0	0	
3DKB0: / RZ28:	0.0	0.0	0	0	
3DKB100: / RZ28:	3.5	0.0	0	0	12
3DKB200: / RZ28:	0.7	0.0	0	0	15
3DKC0: / RZ28:	1.0	0.0	0	0	19
3DKC100: / RZ28:	29.8	0.4	0	0	12
3DKC200: / RZ28:	1.7	0.0	0	0	11
4DKA0: / RZ28:	0.0	0.0	0	0	
4DKA100: / RZ26L:	0.1	0.0	2050860	1300590	91
4DKA200: / RZ28:	0.0	0.0	0	0	
4DKB0: / RZ28:	0.0	0.0	0	0	
4DKB100: / RZ28:	3.4	0.0	0	0	9
4DKB200: / RZ28:	0.8	0.0	0	0	13
4DKC0: / RZ28:	1.0	0.0	0	0	19
4DKC100: / RZ28:	19.1	0.3	0	0	16
4DKC200: / RZ28:	1.6	0.0	0	0	12
4DKC600: / RRD44:	0.0	0.0	1217280	148137	
4DVA0: / RX26:	0.0	5.0	5760	1	

Hardware Performance Summary (continued):

```
                DSA0: / RZ26L:      17.2       0.2   2050860   869244    12
                DSA10: / RZ28:       0.0       0.0   4110480  1596172
                DSA11: / RZ28:       2.4       0.0   4110480  1172464     8
                DSA12: / RZ28:       0.5       0.0   4110480   944148    19
                DSA13: / RZ28:       0.6       0.0   4110480    93956    18
                DSA14: / RZ28:      26.1       0.3   4110480   160692    11
                DSA15: / RZ28:       1.2       0.0   4110480   216176    17
                DSA1: / RZ26L:       4.2       0.1   2050860   781122    12
                DSA2: / RZ26L:       0.0       0.0   2050860    50223
                DSA3: / RZ26L:       0.9       0.0   2050860    46746    11
                DSA4: / RZ26L:       0.7       0.0   2050860  1737672     0
                DSA5: / RZ26L:       0.0       0.0   2050860  1581051
                 DSA6: / RZ28:       0.0       0.0   4110480  2510044
                 DSA7: / RZ28:       0.0       0.0   4110480  3801784
                 DSA8: / RZ28:       0.0       0.0   4110480  3110080
              DSA900: / RZ26L:       0.7       0.0   2050860   210945    14
                 DSA9: / RZ28:       0.0       0.0   4110480  2776952
*Disk Response Times are estimated: RT (ms)=(QUE LENGTH/IO RATE)*1000


-------------------------------------------------------------------------------
DATABASE UTILIZATION
-------------------------------------------------------------------------------
                                                        DSM Blks  DSM Blks
                          Volume          Total Mb        In Use      Free
        DSA13:[...]HIVVOL1.GLS;1               586        600000         0
        DSA13:[...]HIVVOL2.GLS;1               684        700000         0
        DSA13:[...]HIVVOL3.GLS;1               684        639317     60683
        DSA14:[...]FCDVOL1.GLS;1               195        188828     11172
        DSA14:[...]FCDVOL2.GLS;1               195         40528    159472
        DSA14:[...]ISCVOL1.GLS;1               195        151793     48207
        DSA14:[...]ISCVOL2.GLS;1               195        199748       252
        DSA14:[...]ISCVOL3.GLS;1               195        199713       287
        DSA14:[...]ISCVOL4.GLS;1               195        192279      7721
        DSA14:[...]ISCVOL5.GLS;1               342        178039    171961
        DSA15:[...]MCRVOL1.GLS;1               537        550000         0
        DSA15:[...]MCRVOL2.GLS;1               537        201945    348055
        DSA15:[...]NRMVOL1.GLS;1               195        160072     39928
        DSA15:[...]NRMVOL2.GLS;1               195        198547      1453
        DSA15:[...]NRMVOL3.GLS;1               195        184874     15126
        DSA15:[...]NRMVOL4.GLS;1               195         25879    174121
         DSA1:[...]RDOVOL1.GLS;1               195        199469       531
         DSA1:[...]RDOVOL2.GLS;1               195        183462     16538
         DSA1:[...]RDOVOL3.GLS;1               195         50161    149839
```

Hardware Performance Summary (continued):

```
------------------------------------------------------------------------------
RTHIST SUMMARY
------------------------------------------------------------------------------

            ON NODE ISC6A1     Average           High(Low)        2SD Range
             Routine Loads:        7.1                22.0          0.0-5.0
      Mapped Routine Loads:        0.0                 0.0          0.0-0.0
               Global Gets:        8.2                26.3          0.0-8.2
               Global Sets:        2.2                 5.5          0.0-4.2
              Global Kills:        0.6                 1.3          0.0-0.7
             Logical Reads:       78.3               201.1         0.0-68.8
            Logical Writes:        3.1                 7.7          0.0-6.4
            Physical Reads:        1.3                 2.1          0.0-2.7
           Physical Writes:        0.8                 1.4          0.0-0.5
             DDP Transmits:        0.6                 1.4          0.0-1.7

            ON NODE ISC6A2     Average           High(Low)        2SD Range

            ON NODE ISC6A3     Average           High(Low)        2SD Range

            ON NODE ISC6A4     Average           High(Low)        2SD Range
```

The following is a description of the VPM Reports menu options. The options are described in the same order as they appear on the screen:

```
Select VPM Reports Option: ??

    LL   Locking Data                                              [XUCM LOCKS]
    LM   CPU Modes/Compute States                                  [XUCM MODES]
    LP   Raw Paging/BIO/DIO/FLS/MLS                                 [XUCM PAGE]
    LR   List Raw RTHIST Data for a Range of Dates    [XUCM RAW RTHIST DATA]
    LS   List Raw System Data                                   [XUCM LIST RAW]
    LV   List Volume Set Information                [XUCM LIST VOL SET INFO]
    LW   List Workday Averages for Selected Metric(s)[XUCM LIST DAILY STATS]
         Bernstein Response Time Reports ...                      [XUCMBR MENU]
             Average Response Time by Nodename                      [XUCMBR2B]
             Bernstein RT Statistics (detailed)                      [XUCMBR2]
             Nodename Average by Day of Week                        [XUCMBR2C]
             Site/Event Rate Summary                                [XUCMBR2A]
         Disk Drive Raw Data Statistics ...                          [XUCM DISK]
         Graph Workday Averages for Selected Metric      [XUCM GRAF MET AVE]
```

Locking Data

The Locking Data option [XUCM LOCKS] lists locking information for a range of dates in the CM NODENAME RAW DATA file (#8986.51). This list includes Local Enq, Incoming Enq, Outgoing Enq, Incoming Blast, Outgoing Blast, Local Blast, and Enq's Forced to Wait.

```
RAW LOCKING DATA                                          JAN 24,1995  09:20    PAGE 1

                                                        BLOCKING   BLOCKING   BLOCKING   ENQ'S
                          ENQ        ENQ        ENQ        AST        AST        AST     FORCED
SAMPLE DATE            (LOCAL)  (INCOMING) (OUTGOING) (INCOMING) (OUTGOING)  (LOCAL)  TO WAIT
-------------------------------------------------------------------------------------------------

         NODENAME: ISC6A1
JAN 19,1995  10:30       67.4       40.0        5.2        6.0       11.2       11.4      48.7
JAN 19,1995  10:41       34.8       40.0        5.2        4.2        9.2        5.3      20.9
JAN 19,1995  11:33       25.4       22.6        3.6       16.8        6.1        4.3      16.3
JAN 19,1995  12:33       38.0       23.1        2.9       16.8        6.1        5.5      19.9
JAN 19,1995  13:33       29.6       16.1        2.0       16.1       12.0        3.9      13.0
JAN 19,1995  14:34       92.9      111.2        2.7       10.8        6.7       35.7     172.8
JAN 19,1995  15:42       32.7       18.4        4.7        0.8        7.2        3.9      16.4
JAN 19,1995  16:34       31.7       18.5        3.6        3.5        5.4        4.9      16.6
JAN 19,1995  17:33       44.7       10.4        2.4        0.3        8.6        3.5      12.5
JAN 19,1995  18:33       47.2        1.2        1.0        0.2       11.2        3.2      15.1
JAN 19,1995  19:33       13.0        1.2        1.0        0.0        3.9        0.1       0.8
JAN 19,1995  21:43       51.8       11.0        1.3        1.6       17.1        5.2      13.4
JAN 19,1995  22:33      111.6       16.1        2.7        0.5      107.0        5.4      17.4
```

CPU Modes/Compute States

The CPU Modes/Compute States option [XUCM MODES] lists raw data collected for Idle Time, User Mode, Kernel Mode, Interrupt Stack Time, Current Process State, Compute State, and Compute/Outswapped States for a range of dates within a nodename.

```
Select VPM Reports Option: LM <RET>  CPU Modes/Compute States
START WITH NODENAME: FIRST// <RET>
  START WITH SAMPLE DATE: FIRST// T-1
  GO TO SAMPLE DATE: LAST// <RET>
DEVICE: ;132  HOME


CPU Modes/States                                                    JUL  1,1994  12:20    PAGE 1
                                                                    CURRENT
                     PROCESS   ACTIVE     IDLE     USER   KERNEL  INTERRUPT  PROCESS  COMPUTE      COMPUTE
SAMPLE DATE            COUNT   ZSLOTS     TIME     MODE     MODE      STACK    STATE    STATE  (OUTSWAPPED)
-------------------------------------------------------------------------------------------------------------
       NODENAME: 541A01
JUL  1,1994  09:03      79.6        0     19.7     38.2     15.5       26.2      1.0      3.0          0.0
JUL  1,1994  10:03      93.7        0     40.7     24.9     13.3       20.7      1.0      1.6          0.0
       NODENAME: 541A02
JUL  1,1994  09:03      75.0        0      4.6     42.5     20.1       32.6      1.0      4.2          0.0
JUL  1,1994  10:03      81.6        0     19.0     39.8     14.7       26.2      1.0      3.1          0.0
       NODENAME: 541A03
JUL  1,1994  09:03      24.0        0     86.4      0.3      0.5       12.8      1.0      0.0          0.0
JUL  1,1994  10:03      24.0        0     91.2      0.3      0.5        8.1      1.0      0.0          0.0
       NODENAME: 541A04
JUL  1,1994  09:03     154.4       77     12.4     40.4     14.8       31.5      1.0      2.9          0.0
JUL  1,1994  10:03     154.0       77     20.4     40.4     13.7       24.7      1.0      2.7          0.0
```

Raw Paging/BIO/DIO/FLS/MLS

The Raw Paging/BIO/DIO/FLS/MLS option [XUCM PAGE] lists raw paging and IO data for a range of dates within a nodename. Includes Page Fault Rate, Page Read IO Rate (Hard Faults), Direct IO Rate, and Buffered IO Rate.

```
Select VPM Reports Option: LP <RET> Raw Paging/BIO/DIO/FLS/MLS
START WITH NODENAME: FIRST// <RET>
  START WITH SAMPLE DATE: FIRST// T-1
  GO TO SAMPLE DATE: LAST// <RET>
DEVICE: ;132  HOME
```

Raw Paging/BIO/DIO/FLS/MLS (continued):

```
VPM Raw Paging/BIO/DIO/FLS/MLS                                    JUL  1,1994  12:21    PAGE 1

                                                    PAGE
                                          PAGE      READ    DIRECT
                          PROCESS  ACTIVE FAULT      I/O      I/O     BUFFERED     AVE FREE     AVE MOD
SAMPLE DATE                 COUNT  ZSLOTS RATE      RATE     RATE    I/O RATE    LIST SIZE    LIST SIZE
-------------------------------------------------------------------------------------------------------
        NODENAME: 541A01
JUL  1,1994  09:03          79.6       0 11.1       2.0     150.7       106.2       4355.3       118.7
JUL  1,1994  10:03          93.7       0 12.2       2.2     127.7        73.9       2958.6       137.9
        NODENAME: 541A02
JUL  1,1994  09:03          75.0       0  2.1       0.4     238.5        57.5       4382.9       154.3
JUL  1,1994  10:03          81.6       0  2.4       0.4     163.9        87.5       3587.0       175.8
        NODENAME: 541A03
JUL  1,1994  09:03          24.0       0  0.1       0.0       0.0         0.0       9585.7       253.2
JUL  1,1994  10:03          24.0       0  0.0       0.0       0.0         0.0       9584.7       252.2
        NODENAME: 541A04
JUL  1,1994  09:03         154.4      77 26.4       5.2     148.4       203.0        124.5       143.3
JUL  1,1994  10:03         154.0      77 25.0       4.4     121.4       286.5        132.5       144.8
```

List Raw RTHIST Data for a Range of Dates

The List Raw RTHIST Data for a Range of Dates option [XUCM RAW RTHIST DATA] produces a listing by nodename of raw RTHIST data in the CM NODENAME RAW DATA file (#8986.51) and should be displayed in 132 columnar format.

```
Select VPM Reports Option: LR <RET> List Raw RTHIST Data for a Range of
Dates
  START WITH SAMPLE DATE: FIRST// T-1
  GO TO SAMPLE DATE: LAST// <RET>
DEVICE: ;132;60  DECSERVER



RAW RTHIST DATA LISTING                                          JUL  8,1994  11:34    PAGE 1
DATE                    RLD     MRL     GGT     GST     GKL     LRD     LWT     PRD     PWT     DDP
-------------------------------------------------------------------------------------------------

        NODENAME: ISC6V0
JUL  7,1994  00:16      1.3     0.0     1.8     0.5     0.1    17.5     0.7     0.1     0.2     0.1
JUL  7,1994  00:31      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  00:40      0.7     0.0     1.1     0.2     0.1    10.5     0.3     0.0     0.1     0.0
JUL  7,1994  01:33      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  02:07      2.2     0.0     2.6     0.7     0.2    25.3     0.9     0.0     0.2     0.0
JUL  7,1994  02:32      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  03:07      2.4     0.0     2.6     0.6     0.2    25.9     0.8     0.0     0.2     0.0
JUL  7,1994  03:32      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  04:08      1.7     0.0     2.0     0.6     0.1    20.0     0.8     0.0     0.2     0.1
JUL  7,1994  04:32      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  05:08      1.4     0.0     1.7     0.4     0.1    17.2     0.6     0.0     0.1     0.0
JUL  7,1994  05:32      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  06:08      3.7     0.0     3.9     1.0     0.2    39.5     1.3     0.5     0.4     0.1
JUL  7,1994  06:32      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  07:08      4.7     0.0     6.2     1.0     0.3    67.8     1.4     1.5     0.4     0.3
JUL  7,1994  07:33      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
JUL  7,1994  08:08      6.8     0.0     9.4     2.0     0.6    80.0     2.9     2.1     0.9     1.2
```

List Raw System Data

The List Raw System Data option [XUCM LIST RAW] lists raw data from the CM SITE NODENAMES file (#8986.3) and should be displayed in *very wide* format.

List Volume Set Information

The List Volume Set Information option [XUCM LIST VOL SET INFO] option lists volume set block utilization for a range of dates.

```
Select VPM Reports Option: LV <RET> List Volume Set Information
  START WITH DATE: FIRST// T-10
  GO TO DATE: LAST// <RET>
DEVICE: <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



VPM VOLUME SET INFORMATION                    JUL  8,1994  11:44    PAGE 1
                TOTAL      DSM
                  DSM   BLOCKS
DATE           BLOCKS     FREE
-------------------------------------------------------------------------------

        VOLUME: ISCMAIL$:[DMANAGER.DATABASE]ISCVOL1.GLS;1
JUN 28,1994   200000    48508
JUN 29,1994   200000    48552
JUN 30,1994   200000    48181
JUL  1,1994   200000    48483
JUL  2,1994   200000    47582
JUL  3,1994   200000    42926
JUL  4,1994   200000    47789
JUL  5,1994   200000    46494
JUL  6,1994   200000    46080
JUL  7,1994   200000    45893
        VOLUME: ISCMAIL$:[DMANAGER.DATABASE]ISCVOL2.GLS;1
JUN 28,1994   200000    42312
```

List Workday Averages for Selected Metric(s)

The List Workday Averages for Selected Metric(s) option [XUCM LIST DAILY STATS] displays metric data over a range of dates sorted by Metric, Date, and Nodename.

Bernstein Response Time Reports

The Bernstein Response Time Reports menu option [XUCMBR MENU] is used when running VPM on a VAX in conjunction with the Bernstein Response time monitor. This menu is comprised of four report options:

- **Average Response Time by Nodename [XUCMBR2B]**
- **Bernstein RT Statistics (detailed) [XUCMBR2]**
- **Nodename Average by Day of Week [XUCMBR2C]**

- **Site/Event Rate Summary [XUCMBR2A]**

Disk Drive Raw Data Statistics

The Disk Drive Raw Data Statistics menu [XUCM DISK] is a menu containing disk drive report and graph options.

Graph Workday Averages for Selected Metric

The Graph Workday Averages for Selected Metric option [XUCM GRAF MET AVE] plots daily averages for a selected disk or system metric.

```
Select VPM Reports Option:  Graph Workday Averages for Selected Metric
Select a metric to plot: BIO <RET>          Buffered IO
Enter EARLIEST DATE: T-1// T-30  (JUN 01, 1994)
Enter  LATEST  DATE: T-1@2400// <RET> (JUN 30, 1994@24:00:00)
To sort by a particular nodename, enter that node: <RET>

The MINIMUM and MAXIMUM values are normally used for scaling.
You can optionally change these values.
ENTER MINIMUM: // <RET>
ENTER MAXIMUM: // <RET>
DEVICE: HOME// <RET>  HOME    RIGHT MARGIN: 80// <RET>



          Buffered IO on 541A01
               From 6/1/94 to 6/30/94@24:00
Jun 02, 1994      |************
Jun 08, 1994      |**********
Jun 09, 1994      |***************
Jun 10, 1994      |*********
Jun 11, 1994      |****
Jun 12, 1994      |***
Jun 28, 1994      |*****
-------------------------------------------------------------------------
               0.00  28.38  56.76  85.14 113.52 141.90 170.28 198.66 227.04


          Buffered IO on 541A02
               From 6/1/94 to 6/30/94@24:00
Jun 02, 1994      |********************
Jun 08, 1994      |************************
Jun 09, 1994      |********************
Jun 10, 1994      |****************
Jun 11, 1994      |*****
Jun 12, 1994      |*
Jun 28, 1994      |**************
-------------------------------------------------------------------------
               0.00  28.38  56.76  85.14 113.52 141.90 170.28 198.66 227.04
```

MSM Performance Monitoring (MPM)

Overview

MSM's RTHIST utility currently provides a wealth of performance data. This module automates the process of collecting and organizing the data into VA FileMan files at regularly scheduled intervals each day for each of the machines in your configuration. The historical database and reports created provide site managers with an improved ability to perform critical assessments of demand for system resources and workload distribution.

MPM uses TaskMan to perform the following functions:

- **Initiates RTHIST runs on each machine defined in the MSM RTHIST SITE file (#8987.1). MPM does not start up RTHIST on weekends or holidays.**
- **Compiles the *previous* day's data for each CPU into the MSM RTHIST REPORT DATA file (#8987.2).**
- **Sends a mail message via MailMan with a summary of the *previous* day's data to the CMP Directorate at San Francisco ISC where it is included in a centralized performance database.**

MPM Options

```
Select MSM Capacity Management Manager's Menu Option: ??

MSM Capacity Management Manager's Menu                    [XUCS MANAGER MENU]


   CM Reports Menu ...                                      [XUCSR REPORTS MENU]
      DATE/VG MSM CM Reports ...                  [XUCSRB REPORTS BY (DATE,VG)]
        CPU/DISK Utilization Report (By Date/VG)     [XUCSRB CPU/DISK REPORT]
        Global Reference Report (By Date/VG)             [XUCSRB GREF REPORT]
        Response Time Report (By Date/VG)           [XUCSRB RESPONSE REPORT]
        Routine CMNDS/GREF Report (by Date/VG)[XUCSRB ROU CMNDS/GREF REPORT]
        System Statistical Report (By Date/VG)       [XUCSRB SYS STAT REPORT]
      VG/DATE MSM CM Reports ...                  [XUCSRA REPORTS BY (VG,DATE)]
        CPU/DISK Utilization Report (By VG/Date)     [XUCSRA CPU/DISK REPORT]
        Global Reference Report (By VG/Date)             [XUCSRA GREF REPORT]
        Response Time Report (By VG/Date)           [XUCSRA RESPONSE REPORT]
        Routine CMNDS/GREF Report (By VG/Date)[XUCSRA ROU CMNDS/GREF REPORT]
        System Statistical Report (By VG/Date)       [XUCSRA SYS STAT REPORT]
      Graph Menu ...                                         [XUCSRG GRAPHS MENU]
        ACD    Ave. %CPU & %DISK Graph                [XUCSRG CPU-DISK GRAPH]
        ART    Ave. Response Time Graph          [XUCSRG RESPONSE TIME GRAPH]


   Manually Purge CM Data                          [XUCS MANUAL PURGE OF DATA]
```

MPM Options (continued):

```
MSM Site Parameters Enter/Edit Menu ...              [XUCS SITE EDIT MENU]
   1      Edit MSM CM Site Parameters                      [XUCS SITE EDIT]
   2      Enter/Edit Volume Group (Node)             [XUCS VOL GROUP EDIT]
   3      Print/Display System Configuration Parameters
                                          [XUCS SYS CONFIG PARMS DISPLAY]
```

How to Configure the MPM

MSM Site Parameters Enter/Edit Menu

The MSM Site Parameters Enter/Edit Menu option [XUCS SITE EDIT MENU] is used to configure the MPM after installation.

```
Select MSM Capacity Management Manager's Menu Option: MSM Site Parameters
                                                      Enter/Edit Menu
Select MSM Site Parameters Enter/Edit Menu Option: ?

   1      Edit MSM CM Site Parameters
   2      Enter/Edit Volume Group (Node)
   3      Print/Display System Configuration Parameters

Select MSM Site Parameters Enter/Edit Menu Option: 1
SITE NAME: CLARKSBURG VAMC// <RET>
SITE NUMBER: 540   ???

       This is your station number.  For example, 662

SITE NUMBER: 540 <RET>
DFLT ROU NAME LENGTH: ???

       This is a required field that is used by the Routine Report so that
routines can be grouped by name.  For example, if you enter a "3", then
routine commands and routine global accesses will be grouped together by
the first 3 characters of their name.

DFLT ROU NAME LENGTH: 4
DFLT GBL NAME LENGTH: ???

       This is a required field that is used by the Global Report so that
global accesses can be grouped.  For example, if you enter a "3", then the
global names will be grouped together by the first 3 characters of their
name.

DFLT GBL NAME LENGTH: 4
<thresh ROU CMDS/SEC: ???

       Some DHCP routines are executed very briefly.  Therefore, the number
of commands they execute are relativity very small for a RTHIST session.  A
"bucket" called '<thresh' in the Routine command report is where all
command counts for these types of routine(s) will be collected.  For
example, if routine ABC executes 976 commands for a RTHIST session and you
specify 1000 as the thresh hold value, then ABC's command count will be
placed in the '<thresh' bucket.
<thresh ROU CMDS/SEC: ?

       Type a Number between 1 and 999999, 0 Decimal Digits
<thresh ROU CMDS/SEC: 100
```

MSM Site Parameters Enter/Edit Menu (continued):

```
<thresh GBL GREFS/SEC: ???

       Some DHCP routines reference global(s) very little.  Therefore, the
number of global references are relativity very small for a RTHIST session.
A "bucket" called '<thresh' in the Global Access report is where all these
type of global(s) will get placed.  For example, if global ABC is
referenced 109 times from RTHIST session and you specify 300 as the thresh
hold, the ABC's reference count will be placed in the '<thresh' bucket.
<thresh GBL GREFS/SEC: ?
       Type a Number between 0 and 999999, 0 Decimal Digits
<thresh GBL GREFS/SEC: 100
DAYS TO KEEP DATA: ???

       This field represents the number of days data will be kept in File
#8987.2.  If NULL, then 45 days is the used for the default.

DAYS TO KEEP DATA: <RET>
Select LOCAL CMP RECIPIENTS: DOE,JOHN
Select LOCAL CMP RECIPIENTS: <RET>
Select REMOTE CMP RECIPIENTS:        (NOTE:  Optional, enter a mail group
                                             for your ISC if required.)

Select MSM Site Parameters Enter/Edit Menu Option: 2 <RET> Enter/Edit
    Volume Group (Node)
Select MSM RTHIST SITE SITE NAME: `1  CLARKSBURG VAMC
Select VOL GROUP (NODE): PSA
  ARE YOU ADDING 'PSA' AS A NEW VOL GROUP (NODE) (THE 1ST FOR THIS MSM
    RTHIST SITE)? Y <RET> (YES)
  SERVER TYPE: Print
  NAME OF MANAGER UCI: MGR
  NAME OF PRODUCTION UCI: VAH
  AUTO ADJUST RTHIST TABLE SIZE: ???

       Leave this field blank to AUTOMATICALLY ADJUST THE RTHIST TABLE
SIZE. When the RTHIST job is started, it requires the number of table
entries to be specified.  If the entry for table size is too small, then a
~TABLE,FULL~ condition will occur. If you define this field (i.e. Not
Null), then I will use this value for the MAXIMUM RTHIST table size. On the
other hand, if you leave this field Null, then I will use the MAX AM TABLE
SIZE field (#6) to adjust the AM RTHIST table size for the morning RTHIST
session, or the MAX PM TABLE SIZE field (#7) to adjust the PM RTHIST table
size for the afternoon RTHIST session.

  AUTO ADJUST RTHIST TABLE SIZE: ?

       Type a Number between 700 and 2300, 0 Decimal Digits

  AUTO ADJUST RTHIST TABLE SIZE: <RET>
Select MSM RTHIST SITE SITE NAME:    CLARKSBURG VAMC  <RET>
Select VOL GROUP (NODE): PSA// CSA
  ARE YOU ADDING 'CSA' AS A NEW VOL GROUP (NODE) (THE 2ND FOR THIS MSM
    RTHIST SITE)? Y <RET> (YES)
```

Use the TaskMan's Schedule/Unschedule Options [ZTMSCHEDULE], to schedule the following options:

- **XUCSTASK AM RTHIST [XUCSTASK AM RTHIST]**
- **XUCSTASK PM RTHIST [XUCSTASK PM RTHIST]**
- **XUCSTASK FILE UPDATE AUTO [XUCSTASK FILE UPDATE AUTO]**
- **XUCSTASK PURGE CM DATA [XUCSTASK PURGE CM DATA]**

AM MSM RTHIST Task Option [XUCSTASK AM RTHIST]

```
NAME: XUCSTASK AM RTHIST                MENU TEXT: AM MSM RTHIST Task
Option
  TYPE: run routine                     CREATOR: POSTMASTER
  PACKAGE: MSM CAPACITY MANAGEMENT
 DESCRIPTION:   This option is scheduled thru TaskMan's [ZTMSCHEDULE] for
the morning RTHIST data capture.  It should be setup for a 1D rescheduling
frequency.  NO output device is necessary.
  ROUTINE: XUCSTM
  QUEUED TO RUN AT WHAT TIME: MAY  3, 1994@08:30
  RESCHEDULING FREQUENCY: 1D            SCHEDULING RECOMMENDED: YES
  UPPERCASE MENU TEXT: AM MSM RTHIST TASK OPTION
```

PM MSM RTHIST Task Option [XUCSTASK PM RTHIST]

```
NAME: XUCSTASK PM RTHIST                MENU TEXT: PM MSM RTHIST Task
Option
  TYPE: run routine                     CREATOR: POSTMASTER
  PACKAGE: MSM CAPACITY MANAGEMENT
 DESCRIPTION:   This option is scheduled thru TaskMan's [ZTMSCHEDULE] for
the afternoon RTHIST data capture.  It should be setup as 1D rescheduling
frequency.  No output device is necessary.
  ROUTINE: XUCSTM
  QUEUED TO RUN AT WHAT TIME: MAY  2, 1994@14:30
  RESCHEDULING FREQUENCY: 1D            SCHEDULING RECOMMENDED: YES
  UPPERCASE MENU TEXT: PM MSM RTHIST TASK OPTION
```

Tasked CM File Update [XUCSTASK FILE UPDATE AUTO]

```
NAME: XUCSTASK FILE UPDATE AUTO          MENU TEXT: Tasked CM File Update
  TYPE: run routine                      CREATOR: POSTMASTER
  PACKAGE: MSM CAPACITY MANAGEMENT
 DESCRIPTION:   This option is scheduled thru TaskMan's [ZTMSCHEDULE].  It
gathers the data from each Vol. Group defined in the MSM Site Parameters
file. It first transfers the PREVIOUS day's ^RTHIST data to the
%ZRTL("XUCS", nodes. It then formats the data into FileMan compatible data,
moving the data into the MSM RTHIST Data file.  Finally, it creates a
server message to transmit a summary of the PREVIOUS day's data to the
National Data Base.  It should be setup with a 1 DAY rescheduling
frequency.  No output device is necessary, but you might want to consider
using a RESOURCE device, so that option XUCSTASK PURGE CM DATA falls after
this option.
  ROUTINE: XUCSTME
  QUEUED TO RUN AT WHAT TIME: MAY  3, 1994@01:00
  DEVICE FOR QUEUED JOB OUTPUT: ZZRES;;132;66
  RESCHEDULING FREQUENCY: 1D             SCHEDULING RECOMMENDED: YES
  UPPERCASE MENU TEXT: TASKED CM FILE UPDATE
```

Auto Purge of CM Data [XUCSTASK PURGE CM DATA]

```
NAME: XUCSTASK PURGE CM DATA             MENU TEXT: Auto Purge of CM Data
  TYPE: run routine                      CREATOR: POSTMASTER
  PACKAGE: MSM CAPACITY MANAGEMENT
 DESCRIPTION:

 This is the schedulable TaskMan option to purge data from the MSM RTHIST
Data file .  A selectable range of days to keep old data is in the SITE
file.  If this is not filled in 45 days is the default.  It is recommended
to schedule this option so that it is run AFTER the option XUCSTASK FILE
UPDATE AUTO.  No output device is necessary, but might want to consider
using a RESOURCE device for ease of scheduling.

  ROUTINE: DEQUE^XUCSPRG
  QUEUED TO RUN AT WHAT TIME: MAY  3, 1994@03:00
  DEVICE FOR QUEUED JOB OUTPUT: ZZRES;;132;66
  RESCHEDULING FREQUENCY: 1D             SCHEDULING RECOMMENDED: YES
  UPPERCASE MENU TEXT: AUTO PURGE OF CM DATA
```

NOTE: Any RTHIST that is *running* when either the AM or PM RTHIST is started will be stopped, as if it were stopped using the RTHIST - TERMINATE (SAVE).

Any RTHIST that is *scheduled* during the time period (1 hour) that is a scheduled AM or PM RTHIST will be unscheduled.

CM Reports Menu

The following are descriptions of the CM Reports menu options on the MSM Capacity Management Manager's Menu. The options are described in the same order as they appear on the screen.

```
   CM Reports Menu ...                                    [XUCSR REPORTS MENU]
      DATE/VG MSM CM Reports ...                 [XUCSRB REPORTS BY (DATE,VG)]
        CPU/DISK Utilization Report (By Date/VG)     [XUCSRB CPU/DISK REPORT]
        Global Reference Report (By Date/VG)             [XUCSRB GREF REPORT]
        Response Time Report (By Date/VG)           [XUCSRB RESPONSE REPORT]
        Routine CMNDS/GREF Report (by Date/VG)[XUCSRB ROU CMNDS/GREF REPORT]
        System Statistical Report (By Date/VG)       [XUCSRB SYS STAT REPORT]
      VG/DATE MSM CM Reports ...                 [XUCSRA REPORTS BY (VG,DATE)]
        CPU/DISK Utilization Report (By VG/Date)     [XUCSRA CPU/DISK REPORT]
        Global Reference Report (By VG/Date)             [XUCSRA GREF REPORT]
        Response Time Report (By VG/Date)           [XUCSRA RESPONSE REPORT]
        Routine CMNDS/GREF Report (By VG/Date)[XUCSRA ROU CMNDS/GREF REPORT]
        System Statistical Report (By VG/Date)       [XUCSRA SYS STAT REPORT]
      Graph Menu ...                                     [XUCSRG GRAPHS MENU]
        ACD    Ave. %CPU & %DISK Graph                [XUCSRG CPU-DISK GRAPH]
        ART    Ave. Response Time Graph          [XUCSRG RESPONSE TIME GRAPH]
```

DATE/VG MSM CM REPORTS [XUCSRB REPORTS BY (DATE,VG)]:

CPU/DISK Utilization Report (By Date/VG)

```
CPU/DISK Utilization Report (By Date/VG)
Enter Beginning Date: (11/21/94 - 1/19/95): 01/19/95// <RET> (JAN 19, 1995)
   Enter Ending Date: (1/19/95 - 1/19/95): 01/19/95// <RET>  (JAN 19, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL
```

CPU/DISK Utilization Report (By Date/VG) (continued):

```
CPU/DISK Utilization Report  JAN 20, 1995@14:31                    Page: 1
-------------------------------------------------------------------------

JAN 19, 1995 (08:30-09:30)    540CSA.CLARKSBURG, WV
Time   Jobs     %CPU                                                %DISK
08:30   57      56.0%|           ++++++++++++-----                  | 29.7%
08:35   53      24.2%|                  ++++---                     | 19.8%
08:40   55      27.5%|                +++++----                     | 22.0%
08:45   50      29.7%|                +++++---                      | 16.5%
08:50   58      22.0%|                 ++++---                      | 17.6%
08:55   52      28.6%|                +++++-----                    | 28.6%
09:00   49      20.9%|                 ++++--                       | 14.3%
09:05   48      19.8%|                  +++---                      | 15.4%
09:10   50      23.1%|                 ++++---                      | 15.4%
09:15   50      22.0%|                 ++++----                     | 24.2%
09:20   51      29.7%|                +++++----                     | 20.9%
09:25   50      25.3%|                +++++---                      | 16.5%

Ave.    52      27.4%|                +++++----                     | 20.1%
```

Global Reference Report (By Date/VG)

```
Global Reference Report (By Date/VG)
DFLT GBL NAME LENGTH: 4// <RET>
<thresh GBL GREFS/SEC: 1// ??
     Some DHCP routines reference global(s) very little.  Therefore, the
     number of global references are relativity very small for a RTHIST
     session.  A "bucket" called '<thresh' in the Global Access report is
     where all these type of global(s) will get placed.  For example, if
     global ABC is referenced 109 times from RTHIST session and you specify
     300 as the thresh hold, the ABC's reference count will be placed in
     the '<thresh' bucket.
<thresh GBL GREFS/SEC: 1// <RET>
Enter Beginning Date: (11/21/94 - 1/19/95): 01/19/95// <RET> (JAN 19, 1995)
   Enter Ending Date: (1/19/95 - 1/19/95): 01/19/95// <RET>  (JAN 19, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL



Global Reference Report  JAN 20, 1995@14:35                      Page: 1
------------------------------------------------------------------------------

JAN 19, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV          Ave.# Jobs: 52
Global   GREF/S               UCI: MGR (MGR)
%ZOS*       4.0 |
RTHI*       1.6 |
<thresh     0.2 |
                # of Globals <thresh:        8
                Tot. GREFs <thresh:       6768
```

Global Reference Report (By Date/VG) (continued):

```
JAN 19, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV          Ave.# Jobs: 52
Global   GREF/S              UCI: VAH (PROD)
DD         61.8 |******
DG          2.1 |
DGPM        3.1 |
DI          7.1 |
DIC        14.9 |*
DIE         6.5 |
DIPT        1.4 |
DIST        3.3 |
DPT        14.4 |*
ENG         3.0 |
GMR         1.4 |
LAB         3.6 |
LR          1.7 |
LRO         1.7 |
OR          1.6 |
ORD         5.9 |
PRCA        2.0 |
PS          3.3 |
PSDR*       1.1 |
RADP*       1.6 |
RAMI*       1.8 |
RAO         1.2 |
SC          3.8 |
SCE         1.0 |
SD          1.5 |
SDV         1.1 |
SRF         1.8 |
TMP        27.8 |**
VA          1.1 |
W           4.0 |
XMB        11.2 |*
XTV        11.4 |*
<thresh     0.2 |
               # of Globals <thresh:       74
               Tot. GREFs <thresh:      52591
** Summary For This Session **
Total Global References:                        831592
Average Global References per Second:            231.0
```

Response Time Report (By Date/VG)

```
Response Time Report (By Date/VG)
Enter Beginning Date: (11/21/94 - 1/19/95): 01/19/95// <RET> (JAN 19, 1995)
   Enter Ending Date: (1/19/95 - 1/19/95): 01/19/95// <RET>  (JAN 19, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>   VIRTUAL


Response Time Report  JAN 20, 1995@14:36                          Page: 1
------------------------------------------------------------------------------

JAN 19, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 52
 0- 0.99 Sec.  24626 79.6%
 1- 1.99 Sec.   5452 17.6%
 2- 2.99 Sec.    598  1.9%
 3- 3.99 Sec.    148  0.5%
 4- 4.99 Sec.     41  0.1%
 5- 5.99 Sec.     25  0.1%
 6- 6.99 Sec.      9  0.0%
 7- 7.99 Sec.      8  0.0%
 8- 8.99 Sec.      6  0.0%
 9- 9.99 Sec.      2  0.0%
10-19.99 Sec.      4  0.0%
20-29.99 Sec.     21  0.1%

total<30 Sec.  30940
total>30 Sec.     36
Average RT for Responses between 0 and 30 Sec.:   0.51
```

Routine CMNDS/GREF Report (By Date/VG)

```
Routine CMNDS/GREF Report (By Date/VG)
DFLT ROU NAME LENGTH: 4// <RET>
<thresh ROU CMDS/SEC: .5// <RET>
Enter Beginning Date: (11/21/94 - 1/19/95): 01/19/95// <RET> (JAN 19, 1995)
   Enter Ending Date: (1/19/95 - 1/19/95): 01/19/95// <RET>  (JAN 19, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


CMNDs vs GREF By Routine  JAN 20, 1995@14:38                      Page: 1
------------------------------------------------------------------------------
Note: (???) indicates that NEGATIVE counts occur in the MSM-RTHIST global.

JAN 19, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 52
Routine  CMND/S               UCI: MGR (MGR)
GREF/S
%ACT*       1.2 |                                                  |   0.0
%DT        13.0 |                          +                       |   0.0
%DTC       42.6 |                        ++++                      |   0.0
%MER*       2.9 |                                                  |   1.9
%RCR       33.4 |                         +++---                   |   6.7
%SS         2.6 |                                                  |   0.0
%VGU*       4.6 |                                                  |   0.0
%ZIS       30.6 |                         +++-----                 |  10.1
%ZIS*      90.0 | (???)                      ----                  |  10.0
%ZTL*      15.2 | (???)                                            |   1.7
LATA*       1.5 |                                                  |   0.3
RTHI*       1.0 |                                                  |   0.2
<thresh    -2.4 |                                                  |   0.0
                # of Routines <thresh:      10
                Tot. CMDS <thresh:      -84797
                Tot. Grefs <thresh:       1241
```

Routine CMNDS/GREF Report (By Date/VG) (continued):

```
Note: (???) indicates that NEGATIVE counts occur in the MSM-RTHIST global.

JAN 19, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 52
Routine  CMND/S               UCI: VAH (PROD)
GREF/S
#Pgm*    1352.4 ++++++++++++++++++++++++++                          |   0.0
ABSV*       3.8 | (???)                                             |   0.1
DDGL*       2.6 |                                                   |   0.3
DDS0*       0.7 |                                                   |   0.0
DDS1*      10.4 |                            +-                     |   2.7
DDS4        0.8 |                                                   |   0.4
DDS4*       4.5 |                                                   |   1.2
DDSR       -0.1 | (???)                                             |   0.6
DDSR*       0.8 |                                                   |   0.3
DDW         0.9 |                                                   |   0.0
DDW1        2.2 |                                                   |   0.1
DDW5        2.8 |                                                   |   0.0
DDW6        2.0 |                                                   |   0.0
DDWK        6.8 |                                                   |   0.0
DDWT*       1.6 |                                                   |   0.0
.
.
.
XQ12       24.2 |                           ++-----                 |  11.6
XQ2         3.4 |                                                   |   0.1
XQ71       19.9 |                            +-                     |   2.8
XQ72        2.8 |                                                   |   0.5
XQ75       10.1 |                            +                      |   1.5
XQ83        0.7 |                                                   |   0.3
XQAL*       0.4 | (???)                       -                     |   2.8
XQCH*       3.4 |                                                   |   0.4
XQOR        8.5 |                             --                    |   5.6
XQOR*      47.4 |                          ++++---------            |  19.0
XQSE*       9.6 |                                                   |   1.9
XQTO*       0.6 |                                                   |   0.2
XTER*       2.9 |                                                   |   0.8
XUS         5.5 |                                                   |   1.2
XUS1        7.8 |                                                   |   0.9
XUS1*       1.4 |                                                   |   1.0
XUSC*      11.0 |                             +--                   |   4.9
XUSH*      24.8 |                            ++                     |   0.0
ZU          2.1 |                                                   |   0.4
ZZDI*       1.6 |                                                   |   0.0
<thresh     0.1 |                                                   |   0.0
               # of Routines <thresh:     277
               Tot. CMDS <thresh:       67808
               Tot. Grefs <thresh:      22949
** Summary For This Session **
Total Routine Commands Counted:                 10311125
Average Routine Commands per Second:              2864.2
Total Routine Global References Counted:          980693
Average Routine Global References per Second:      272.4
```

System Statistical Report (By Date/VG)

```
System Statistical Report (By Date/VG)
Enter Beginning Date: (11/21/94 - 1/19/95): 01/19/95// <RET> (JAN 19, 1995)
   Enter Ending Date: (1/19/95 - 1/19/95): 01/19/95// <RET>  (JAN 19, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>    VIRTUAL

System Statistics  JAN 20, 1995@14:39                              Page: 1
------------------------------------------------------------------------------

JAN 19, 1995 (08:30-09:30) 540CSA.CLARKSBURG, WV            Ave.# Jobs: 52
                                Events/Sec
MUMPS Commands                   3023.8

      Global Set Commands          22.8
      Global Kill Commands          8.9
      Global Fetches              348.4
TOTAL Global Accesses             380.1
TOTAL Logical Read Operations     352.3
TOTAL Logical Write Operations     15.6
      Disk Reads                   21.4
      Disk Writes                   3.0
TOTAL Disk I/O                     24.4
TOTAL DDP Global Requests          13.3
TOTAL RVG Requests                305.4

      INPUT From Terminals         15.1
      OUTPUT To Terminals         718.5
TOTAL Terminal I/O                733.6
```

VG/DATE MSM CM REPORTS [XUCSRA REPORTS BY (VG,DATE)]:

CPU/DISK Utilization Report (By VG/Date)

```
CPU/DISK Utilization Report (By VG/Date)
Enter Beginning Date: (11/28/94 - 1/26/95): 01/26/95// <RET> (JAN 26, 1995)
   Enter Ending Date: (1/26/95 - 1/26/95): 01/26/95// <RET>  (JAN 26, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


CPU/DISK Utilization Report  JAN 27, 1995@09:55                    Page: 1
------------------------------------------------------------------------------

JAN 26, 1995 (08:30-09:30)    540CSA.CLARKSBURG, WV
Time   Jobs     %CPU                                                  %DISK
08:30   56      30.8%|                ++++++-----                   | 27.5%
08:35   45      36.3%|               +++++++------                  | 34.1%
08:40   51      22.0%|                  ++++---                     | 16.5%
08:45   48      20.9%|                  ++++--                      | 13.2%
08:50   51      26.4%|                 +++++---                     | 17.6%
08:55   46      24.2%|                  ++++---                     | 17.6%
09:00   44      22.0%|                  ++++---                     | 15.4%
09:05   46      22.0%|                  ++++---                     | 19.8%
09:10   39      16.5%|                   +++--                      | 13.2%
09:15   43      24.2%|                  ++++---                     | 18.7%
09:20   49      38.5%|               +++++++-------                 | 39.6%
09:25   48      22.0%|                  ++++----                    | 23.1%

Ave.    47      25.5%|                 +++++----                   | 21.3%
```

Global Reference Report (By VG/Date)

```
Global Reference Report (By VG/Date)
DFLT GBL NAME LENGTH: 4// <RET>
<thresh GBL GREFS/SEC: 1// <RET>
Enter Beginning Date: (11/28/94 - 1/26/95): 01/26/95// <RET> (JAN 26, 1995)
   Enter Ending Date: (1/26/95 - 1/26/95): 01/26/95// <RET>  (JAN 26, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// AM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


Global Reference Report  JAN 27, 1995@09:58                      Page: 1
------------------------------------------------------------------------------

JAN 26, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV          Ave.# Jobs: 47
Global   GREF/S               UCI: MGR (MGR)
%ZIS       11.9 |*
%ZOS*       4.4 |
%ZTS*       1.9 |
SYS         1.0 |
<thresh     0.1 |
                # of Globals <thresh:        6
                Tot. GREFs <thresh:       2189

JAN 26, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV          Ave.# Jobs: 47
Global   GREF/S               UCI: VAH (PROD)
DD         53.1 |*****
DG          2.1 |
DGMT        2.8 |
DGPM        3.4 |
DI          7.9 |
DIC        16.6 |*
DIE         5.4 |
DIST        5.7 |
DISV        2.0 |
DPT        16.2 |*
ENG         7.9 |
IBT         1.5 |
LAB         6.3 |
LR          3.2 |
LRO         4.9 |
OR          1.7 |
ORD        10.0 |*
```

Global Reference Report (By VG/Date) (continued):

```
PRC          5.9 |
PRCD         1.2 |
PRCF         1.3 |
PRCS         4.3 |
PRSP*        1.4 |
PRST         2.2 |
PS           5.3 |
PSDR*        1.4 |
PSRX         2.3 |
RADP*        1.2 |
RT           2.6 |
RTV          2.1 |
SC           7.8 |
SCE          1.1 |
SD           2.6 |
SDV          1.3 |
TMP         43.5 |****
UTIL*       16.7 |*
VA           5.7 |
XMB         14.2 |*
XTV         16.9 |*
XUSE*        1.5 |
XUTL        28.7 |**
<thresh      0.2 |
                 # of Globals <thresh:       70
                 Tot. GREFs <thresh:      56558
** Summary For This Session **
Total Global References:                      1287071
Average Global References per Second:           357.5
```

Response Time Report (By VG/Date)

```
Response Time Report (By VG/Date)
Enter Beginning Date: (11/28/94 - 1/26/95): 01/26/95// <RET> (JAN 26, 1995)
   Enter Ending Date: (1/26/95 - 1/26/95): 01/26/95// <RET>  (JAN 26, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// aM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


Response Time Report  JAN 27, 1995@10:00                          Page: 1
------------------------------------------------------------------------------

JAN 26, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 47
 0- 0.99 Sec.  13115 73.6%
 1- 1.99 Sec.   4044 22.7%
 2- 2.99 Sec.    483  2.7%
 3- 3.99 Sec.     90  0.5%
 4- 4.99 Sec.     41  0.2%
 5- 5.99 Sec.     21  0.1%
 6- 6.99 Sec.     11  0.1%
 7- 7.99 Sec.      3  0.0%
 8- 8.99 Sec.      0  0.0%
 9- 9.99 Sec.      0  0.0%
10-19.99 Sec.      2  0.0%
20-29.99 Sec.      5  0.0%

total<30 Sec.  17815
total>30 Sec.      5
Average RT for Responses between 0 and 30 Sec.:   0.57
```

Routine CMNDS/GREF Report (By VG/Date)

```
Routine CMNDS/GREF Report (By VG/Date)
DFLT ROU NAME LENGTH: 4// <RET>
<thresh ROU CMDS/SEC: .5// <RET>
Enter Beginning Date: (11/28/94 - 1/26/95): 01/26/95// <RET> (JAN 26, 1995)
   Enter Ending Date: (1/26/95 - 1/26/95): 01/26/95// <RET>  (JAN 26, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// aM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


CMNDs vs GREF By Routine  JAN 27, 1995@10:01                      Page: 1
------------------------------------------------------------------------------
Note: (???) indicates that NEGATIVE counts occur in the MSM-RTHIST global.

JAN 26, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 47
Routine  CMND/S               UCI: MGR (MGR)
GREF/S
%ACT*       1.1 |                                                  |   0.0
%DT        16.0 |                          +                       |   0.0
%DTC       61.8 |                       ++++++                     |   0.0
%RCR       31.1 |                          +++-                    |   3.1
%SS         5.2 |                                                  |   0.0
%VGU*       4.2 |                                                  |   0.0
%ZIS       32.4 |                          +++----                 |   9.6
%ZIS*     103.3 | (???)                       -----                |  11.5
%ZTE*       0.8 |                                                  |   0.2
LATA*       1.7 |                                                  |   0.3
RTHI*       1.5 |                                                  |   0.3
<thresh    -1.0 |                                                  |   0.0
                # of Routines <thresh:      12
                Tot. CMDS <thresh:      -44828
                Tot. GREFs <thresh:        834
```

Routine CMNDS/GREF Report (By VG/Date) (continued):

```
Note: (???) indicates that NEGATIVE counts occur in the MSM-RTHIST global.

JAN 26, 1995 (08:30-09:30)  540CSA.CLARKSBURG, WV           Ave.# Jobs: 47
Routine  CMND/S               UCI: VAH (PROD)
GREF/S
#Pgm*    1198.4 ++++++++++++++++++++++++++                          |   0.0
ABSV*       1.8 | (???)                                            |   0.1
DDGL*       2.9 |                                                  |   0.4
DDS         0.9 |                                                  |   0.1
DDS0        1.3 |                                                  |   0.2
DDS0*      11.0 |                             +                    |   1.8
DDS1        1.0 |                                                  |   0.2
DDS1*      17.4 |                             +-                   |   3.7
DDS4        2.2 |                                                  |   0.7
DDS4*       7.6 |                                                  |   1.9
DDSR       11.2 |                             +                    |   1.6
DDSR*       1.3 |                                                  |   0.6
DDSU       10.4 |                             +                    |   0.1
DDW         1.0 |                                                  |   0.0
DDW1        2.2 |                                                  |   0.1
DDW5        3.7 |                                                  |   0.0
DDW6        1.2 |                                                  |   0.0
DDWK        5.7 |                                                  |   0.0
DDWT*      25.4 |                            ++                    |   0.0
.
.
.
XQCH*       6.9 |                                                  |   0.4
XQH         0.6 |                                                  |   0.1
XQOR       13.7 |                              +----               |   9.1
XQOR*      80.6 |                      ++++++++----------------     |  31.9
XQSE*      16.9 |                              +-                  |   3.4
XQTO*       1.1 |                                                  |   0.3
XUS         8.3 |                                                  |   1.5
XUS1        9.0 |                                                  |   1.0
XUS1*       5.3 |                                                  |   1.2
XUSC*      11.5 |                             +--                  |   5.8
XUSH*      29.4 |                            ++                    |   0.0
ZU          2.9 |                                                  |   0.6
<thresh     0.0 | (???)                                            |   0.0
                # of Routines <thresh:     315
                Tot. CMDS <thresh:       56020
                Tot. GREFs <thresh:      24477
** Summary For This Session **
Total Routine Commands Counted:                  9934454
Average Routine Commands per Second:              2759.6
Total Routine Global References Counted:        1161589
Average Routine Global References per Second:     322.7
```

System Statistical Report (By VG/Date)

```
System Statistical Report (By VG/Date)
Enter Beginning Date: (11/28/94 - 1/26/95): 01/26/95// <RET> (JAN 26, 1995)
   Enter Ending Date: (1/26/95 - 1/26/95): 01/26/95// <RET>  (JAN 26, 1995)

     Select one of the following:

          A         AM Reports Only
          P         PM Reports Only
          B         Both AM & PM Reports

     Report Type: Both// aM Reports Only
Select Site/Vol. Group: ALL// 540CSA
Select MSM RTHIST REPORT DATA SITE_VOL GROUP: <RET>
DEVICE: HOME// <RET>  VIRTUAL


System Statistics  JAN 27, 1995@10:04                              Page: 1
------------------------------------------------------------------------------

JAN 26, 1995 (08:30-09:30) 540CSA.CLARKSBURG, WV            Ave.# Jobs: 47
                                Events/Sec
MUMPS Commands                   2857.4
      Global Set Commands          24.3
      Global Kill Commands         10.4
      Global Fetches              325.7
TOTAL Global Accesses             360.4
TOTAL Logical Read Operations     396.7
TOTAL Logical Write Operations      0.0
      Disk Reads                   19.9
      Disk Writes                   3.5
TOTAL Disk I/O                     23.4
TOTAL DDP Global Requests          14.1
TOTAL RVG Requests                270.2

      INPUT From Terminals          9.0
      OUTPUT To Terminals         741.2
TOTAL Terminal I/O                750.2
```

GRAPH MENU [XUCSRG GRAPHS MENU]:

Ave. %CPU & %DISK Graph

```
Select Graph Menu Option: acd <RET> Ave. %CPU & %DISK Graph
Select Site/Vol. Group: ALL// <RET>
Select number of days to graph: 90// <RET>
DEVICE: HOME// <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



Ave. %CPU & %DISK Utilization Graph JUL 12, 1994@11:01              Page: 1
------------------------------------------------------------------------------
Date       Jobs  %CPU  540CSA. (AM)                                  %Disk
05/02/94     0    23 |                  +++++---                    | 16
05/03/94     0    13 |                    +++--                     | 10
05/04/94     0    17 |                    +++---                    | 14
05/05/94     0    16 |                    +++--                     | 12
05/06/94     0    16 |                    +++--                     | 10
05/07/94-05/08/94            * No Data Recorded *
05/09/94     0    26 |                  +++++-----                  | 27
05/10/94     0    21 |                   +++---                     | 14
05/11/94     0    18 |                   +++---                     | 13
05/12/94     0    15 |                    +++--                     | 11
05/13/94     0    20 |                   ++++--                     | 11
05/14/94-05/15/94            * No Data Recorded *
05/16/94     0    16 |                    +++--                     | 11
05/17/94     0    25 |                  +++++---                    | 16
05/18/94     0    17 |                    +++--                     | 12
05/19/94     0    15 |                    +++--                     | 11
05/20/94     0    15 |                    +++--                     | 10
05/21/94-05/22/94            * No Data Recorded *
```

Ave. Response Time Graph

```
Select Graph Menu Option: art <RET> Ave. Response Time Graph
Select Site/Vol. Group: ALL// <RET>
DEVICE: HOME// <RET>  DECSERVER    RIGHT MARGIN: 80// <RET>



Ave. Response Time Graph for: AM RTHIST's
Report Date: JUL 12, 1994@11:06       540CSA.CLARKSBURG, WV         Page: 1
--------------------------------------------------------------------------------
 0.58|       |  |         |  |         |  |         |  |         |  |
     |       |  |         |  |         |  |         |  |         |  |
     ||    | |  | |    | |  | |    | |  | |    | |  | |    | |  |
 0.43||   || |  | |   || |  | |   || |  | |   || |  | |   || |  |
     ||  ||| |  |||  ||| |  |||  ||| |  |||  ||| |  |||  ||| |  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
 0.29||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
 0.14||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
     ||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
 0.00||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||||| |||  ||
      |+++++++++|+++++++++|+++++++++|+++++++++|+++++++++|++++++++|
    T-60      T-50      T-40      T-30      T-20     T-10      T-1
```

Resource Usage

Resource Usage is a capacity management tool available to IRM and application programmers. Its purpose is to measure resource consumption by package. Resource Usage groups data by application namespace and node/CPU. The current version of the Resource Usage module is intended only for VMS sites.

USER INTERFACE

The options provided with the Resource Usage module allow the IRM staff to do the following:

- **Output raw data to any DHCP device (including host files).**
- **Sort data by namespace for any date range.**
- **Display on screen or print summary data in table or graph format.**
- **Purge raw data for any date range.**
- **Schedule the enabling and disabling of data collection by way of TaskMan.**

SYSTEMS MANAGEMENT ISSUES

Data is gathered by means of hooks throughout the Kernel. Hooks exist in Sign-on, Menu Manager, and TaskMan. Every time an option is selected by a user or started by TaskMan, the corresponding hook is activated and a "snapshot" of the resources in use are recorded.

The LOG RESOURCE USAGE? field (#300) is found in the KERNEL SITE PARAMETERS file (#4.3). It controls resource monitoring. If this field contains "Y" (Yes response) data is collected. The value "N" inhibits resource data collection.

General Usage Information

Date Range

When the options Write Raw Resource Usage Data, Sort Resource Usage Data, or Kill Resource Usage Data are used the user can select the date range to process. The user may specify times with dates for more exact cut off points; however, time is not required.

Devices

All options that produce output prompt for the output device. First the user is asked if they want to output to a specific VMS file. The special name that is assigned to this file is created automatically and cannot be changed. If the user chooses not to output to this file, they are asked for a standard DHCP device.

It is important for each site to have a device called HFS. This is a Host File Server type of device and is necessary for Resource Usage output. Since Kernel does not distribute any entries in the DEVICE file (#3.5), the IRM Staff must set the configuration for the HFS device prior to using the Resource Usage module.

Sample configuration for HFS device:

```
NAME: HFS                              $I: TMP.TMP
 ASK DEVICE: YES                       ASK PARAMETERS: NO
 LOCATION OF TERMINAL: DISK FILE       ASK HOST FILE: YES
 ASK HFS I/O OPERATION: YES            MARGIN WIDTH: 132
 FORM FEED: #                          PAGE LENGTH: 24
 BACK SPACE: $C(8)                     SUBTYPE: P-OTHER
 TYPE: HOST FILE SERVER
```

NOTE: The printed output of graph formatted reports requires a page width of at least 132 columns.

Queuing

In all instances the user may choose to run the option "live" or schedule it for later execution by TaskMan.

Description of Options and Sample Sessions

RESOURCE USAGE MENU OPTIONS

The following are descriptions of the Resource Usage Menu options on the VAX/Alpha Performance Monitor menu. The options are described in the same order as they appear on the screen:

```
Capacity Management ...                                          [XTCM MAIN]
   VAX/Alpha Performance Monitor ...                             [XUCM MAIN]
      Resource Usage Menu ...                                     [XUCPMENU]
         Write raw Resource Usage data                         [XUCPRAWPRINT]
         Sort raw Resource Usage data                             [XUCPSORT]
         Print formatted report (Table/Graph)                  [XUCPFORMATTED]
         Kill raw Resource Usage data                             [XUCPKILL]
         Enable/Disable collection of Resource Usage data      [XUCPTOGGLE]
```

Write Raw Resource Usage Data

The Write Raw Resource Usage Data option [XUCPRAWPRINT] outputs the raw Resource Usage data. The output is usually directed to a host file for export or porting into other software.

Various hooks in DHCP collect data about each option used. Data is gathered on: CPU seconds, disk I/O, and buffered I/O. It is stored in the ^XTMP global. This option is used to output this raw, unformatted data. Even the header is not printed. For the most part this output should be routed to a predefined VMS file for possible export later. However, you may also direct output to any other valid device.

This report may be queued.

Examples can be found on the following pages.

Example 1: Illustration of the Write Raw Resource Usage Data option (Live execution).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: Write raw Resource Usage data

I will write raw Resource Usage data in the ^XTMP( global,
sorted by Node, Job, Date and Time

Please specify the date range to process.
   Start   Date@Time: 4/1/94 <RET> (APR 01, 1994)
     End   Date@Time: 4/6/94 <RET> (APR 06, 1994)

Write to file (CUMC3PO_APR011994000001_APR0619942400.XUCP)? YES// NO
DEVICE: HOME// <RET>   REMOTE CPU  RIGHT MARGIN: 80// <RET>



sample output:

C3PO^538969286^54515^39255^11.51^433^989^1796^XMQUEUED^ 4-APR-1994 10:54:15.78
C3PO^538969286^54515^39263^12.12^495^1017^1802^XMQACTIVE^ 4-APR-1994 10:54:24.56
C3PO^538981939^54515^36873^2.43^67^124^1501^XMQUEUED^ 4-APR-1994 10:14:33.45
C3PO^538981939^54515^36892^2.8^69^150^1576^XMQSHOW^ 4-APR-1994 10:14:53.18
C3PO^538981939^54515^36959^3.44^102^203^1654^XMREAD^ 4-APR-1994 10:16:00.12
.
.
R2D2^549469872^54517^86171^2.13^31^69^985^DSMIN^ 6-APR-1994 23:56:12.23
R2D2^549469879^54517^58624^2.1^31^69^882^DSMIN^ 6-APR-1994 16:17:05.05
R2D2^549470007^54517^70759^2.21^31^69^1006^DSMIN^ 6-APR-1994 19:39:19.43
R2D3^545263190^54515^68547^1.63^42^58^991^DSMIN^ 4-APR-1994 19:02:28.46
R2D3^545263192^54515^73229^1.58^29^54^883^DSMIN^ 4-APR-1994 20:20:30.11
R2D3^545263319^54517^26540^1.91^43^58^976^DSMIN^ 6-APR-1994 07:22:20.81

I'm finished outputting the data.
```

Example 2: Illustration of the Write Raw Resource Usage Data option (Queued for background processing).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: Write raw Resource Usage data


I will write out raw Resource Usage data in the ^XTMP("XUCP", global,
sorted by Node, Job, Date and Time

Please specify the date range to process.
   Start   Date@Time: 4/6/94 <RET> (APR 06, 1994)
     End   Date@Time: 4/6/94 <RET> (APR 06, 1994)

Write to file (CUMC3P_APR061994000001_APR0619942400.XUCP)? YES// <RET>
Would you like to queue this job for background execution? YES// <RET>
Requested Start Time: NOW// <RET>  (OCT 07, 1994@13:33:35)
Queued as task 164817
```

Sort Raw Resource Usage Data

The Sort Raw Resource Usage Data option [XUCPSORT] sorts some or all of the Resource Usage data by Option, Node, Job, Date, and Time. The table and graph reports are generated from this sorted data. Data is copied, specified by a date range, from ^XTMP("XUCP" global to the ^XTMP("XUCP","zzz" subtree. Data is stored subscripted (sorted) by Option, Node, Job, Date, and Time. This option simply copies the data, it does not delete it out of the global. Once the data is collected in the "zzz" subtree, it can be printed with the Print Formatted Report (Table/Graph) option.

You have a choice to specify whether or not you want to merge the new sort with previous sorts. If you do not choose to merge the new sort, the "zzz" subtree is cleaned (K ^XUCP("zzz")). If data is merged in a non-overlapping fashion, the date range specified in the Print Formatted Report (Table/Graph) option may not be representative of the data since there may be "holes" in the data set.

You may also write out the data after the sort. You get a prompt that asks you if you want to do that. If you choose to output the sorted data in its raw state, you are asked if you want to send it to a specific VMS file or to any valid device.

You may run this option repeatedly before printing a report in order to combine data from different date ranges.

This option may be queued.

Examples can be found on the following pages.

Example 1: Illustration of the Sort Raw Resource Usage Data option (Live execution).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: SORT raw Resource Usage data

I will copy raw Resource Usage data into ^XTMP("XUCP","zzz" subtree
sorted by Option, Node, Job, Date and Time.

Merge with previous sort(s)? NO// <RET>
Output unformatted, sorted data after the sort? NO// <RET>

Please specify the date range to process.
   Start   Date@Time: 4/1/94  <RET> (APR 01, 1994)
     End   Date@Time: 4/30/94 <RET> (APR 30, 1994)
Would you like to queue this job for background execution? YES// NO
I'm finished sorting the data.
```

Example 2: Illustration of the Sort Raw Resource Usage Data option (Queued for background processing).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: SORT raw Resource Usage data

I will copy raw Resource Usage data into ^XTMP("XUCP","zzz" subtree
sorted by Option, Node, Job, Date and Time.

Merge with previous sort(s)? NO// <RET>
Output unformatted, sorted data after the sort? NO// <RET>

Please specify the date range to process.
   Start   Date@Time: 4/1/94 <RET> (APR 01, 1994)
     End   Date@Time: 4/30/94 <RET> (APR 30, 1994)

Would you like to queue this job for background execution? YES// <RET>
Requested Start Time: NOW// <RET>   (OCT 07, 1994@13:33:59)
Queued as task 164818
```

Example 3: Illustration of the Sort Raw Resource Usage Data option with output of sorted raw data (Live execution).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: SORT raw Resource Usage data


I will copy raw Resource Usage data into ^XTMP("XUCP","zzz" subtree
sorted by Option, Node, Job, Date and Time.

Merge with previous sort(s)? NO// <RET>
Output unformatted, sorted data after the sort? NO// YES

Please specify the date range to process.
   Start   Date@Time: 4/6/94 <RET> (APR 06, 1994)
     End   Date@Time: 4/6/94 <RET> (APR 06, 1994)

Write to file (CUMC3P_APR061994000001_APR0619942400.XUCPS)? YES// NO
DEVICE: HOME// <RET>   REMOTE CPU  RIGHT MARGIN: 80// <RET>



sample output:

DSMIN^C3PO^539004472^54517^36724^1.9^118^53^610^23^ 6-APR-1994 10:11:42.49
DSMIN^R2D2^549468974^54517^51262^1.77^77^20^628^24^ 6-APR-1994 14:13:59.08
XMSCRIPTPLAY^C3PO^539002620^54517^48468^9.4^274^717^241^133^ 6-APR-1994 13:25:36.16
XUEDITOPT^R2D2^549469404^54517^41176^.47^25^30^65^21^ 6-APR-1994 11:25:55.48


I'm finished sorting and outputting the data.
```

Print Formatted Report (Table/Graph)

The Print Formatted Report (Table/Graph) option [XUCPFORMATTED] is used to print Resource Usage data that was previously sorted using the Sort Raw Resource Usage Data option. You have a choice of two formats for the output (i.e., table or graph). These formats organize the raw data to produce more readable reports. Whether the graph or the table format is selected, you can choose to break down the output by specific nodes (CPUs), the cumulative totals, or both.

Table Format

The table format displays data values in columnar format in more detail than the graph format. You can print the reports on any valid device, but it must be at least 80 columns for the table format. For the table format, the columns are as follows:

1. **CPU .... Elapsed CPU time in seconds**
2. **DIO ..... Direct I/O count**
3. **SEC .... Elapsed time in seconds**
4. **N ..... Number of occurrences**
5. **C/N ..... CPU/N**
6. **D/N ..... DIO/N**
7. **S/N ..... SEC/N**
8. **C/S ..... CPU/SEC**
9. **D/S ..... DIO/SEC**

Graph Format

The graph format gives a better visual representation of the data. You can print the reports on any valid device, but it must be at least 132 columns for the graph format.

This option may be queued.

Examples can be found on the following pages.

Example 1: Illustration of the Print Formatted Report (Table/Graph) option in Table format (subtotals printed by node and cumulative station totals).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: PRINT formatted report (Table/Graph)

I will write out Resource Usage by Namespace, based on the preceding sort.

Subtotal by Node? YES// <RET>
Would you also like cumulative by option for all nodes? YES// <RET>
Namespace length: 4// <RET>
Format for report (<T>able/<G>raph): T// <RET> able
Write to file (CUMC3P_APR061994000001_APR0619942400.XUCPT)? YES// NO
DEVICE: HOME// <RET>   REMOTE CPU    RIGHT MARGIN: 80// <RET>



sample output:

Node C3PO from APR 06, 1994@00:00:01 to APR 06, 1994@24:00

OPT     CPU     DIO     SEC     N     C/N     D/N     S/N      C/S      D/S
DSMI      2     118      23     1    1.90   118.0    23.0     0.08      5.1
XMSC      9     274     133     1    9.40   274.0   133.0     0.07      2.1

TOTAL    11     392             2

Node R2D2 from APR 06, 1994@00:00:01 to APR 06, 1994@24:00

OPT     CPU     DIO     SEC     N     C/N     D/N     S/N      C/S      D/S
DSMI      2      77      24     1    1.77    77.0    24.0     0.07      3.2
XUED      0      25      21     1    0.47    25.0    21.0     0.02      1.2

TOTAL     2     102             2

Station C3P0 from APR 06, 1994@00:00:01 to APR 06, 1994@24:00

OPT     CPU     DIO     SEC     N     C/N     D/N     S/N      C/S      D/S
DSMI      4     195      47     2    1.83    97.5    23.5     0.08      4.1
XMSC      9     274     133     1    9.40   274.0   133.0     0.07      2.1
XUED      0      25      21     1    0.47    25.0    21.0     0.02      1.2

TOTAL    13     494             4
```

Example 2: Illustration of the Print Formatted Report (Table/Graph) option in Table format (without subtotals).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: PRINT formatted report (Table/Graph)

I will write out Resource Usage by Namespace, based on the preceding sort.

Subtotal by Node? YES// NO
Namespace length: 4// 3
Format for report (<T>able/<G>raph): T// <RET>  able
Write to file (CUMC3P_APR011994000001_APR3019942400.XUCPT)? YES// NO
DEVICE: HOME// <RET>   REMOTE CPU  RIGHT MARGIN: 80// <RET>
```

sample output:

Station C3P0 from APR 01, 1994@00:00:01 to APR 30, 1994@24:00

OPT	CPU	DIO	SEC	N	C/N	D/N	S/N	C/S	D/S
DII	1	62	45	1	1.08	62.0	45.0	0.02	1.4
DIL	54	2091	735	7	7.64	298.7	105.0	0.07	2.8
DIP	28	1131	1175	8	3.56	141.3	146.8	0.02	1.0
DIT	2	79	96	2	0.99	39.5	48.0	0.02	0.8
DSM	81	5318	2536	57	1.41	93.2	44.4	0.03	2.1
XMC	2	120	13	1	1.64	120.0	13.0	0.13	9.2
XMH	4	70	173	1	4.16	70.0	173.0	0.02	0.4
XMM	15	364	6495	5	2.98	72.8	1299.0	0.00	0.1
XMN	31	827	2344	14	2.21	59.0	167.4	0.01	0.4
XMP	3	190	195	2	1.54	95.0	97.5	0.02	1.0
XMQ	2	156	141	5	0.48	31.2	28.2	0.02	1.1
XMR	140	2752	16344	13	10.74	211.6	1257.2	0.01	0.2
XMS	45	1325	2207	7	6.46	189.2	315.2	0.02	0.6
XMT	8	278	7275	2	3.78	139.0	3637.5	0.00	0.0
XMU	17	664	2212	3	5.81	221.3	737.3	0.01	0.3
XQB	28	660	541	1	28.31	660.0	541.0	0.05	1.2
XQT	51	752	7043	7	7.30	107.4	1006.1	0.01	0.1
XU-	30	772	514	29	1.03	26.6	17.7	0.06	1.5
XUE	62	1771	2500	10	6.22	177.1	250.0	0.02	0.7
XUI	7	275	483	6	1.20	45.8	80.5	0.01	0.6
XUP	102	3129	5799	12	8.51	260.7	483.2	0.02	0.5
XUR	9	49	115	8	1.15	6.1	14.3	0.08	0.4
XUS	1	57	23	1	1.06	57.0	23.0	0.05	2.5

Example 2: Illustration of the Print Formatted Report (Table/Graph) option in Table format (without subtotals) (continued):

XUT	1	25	62	2	0.54	12.5	31.0	0.02	0.4
XUU	7	568	106	2	3.73	284.0	53.0	0.07	5.4
XUX	1	67	30	1	0.78	67.0	30.0	0.03	2.2
ZIS	0	33	26	2	0.22	16.5	13.0	0.02	1.3
ZTM	19	677	999	12	1.60	56.4	83.2	0.02	0.7
ZZJ	41	709	2620	1	40.92	709.0	2620.0	0.02	0.3
ZZR	45	1012	5887	7	6.47	144.5	841.0	0.01	0.2
TOTAL	837	25983		229					

Example 3: Illustration of the Print Formatted Report (Table/Graph) option in Graph format (subtotaled by node).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: PRINT formatted report (Table/Graph)


I will write out Resource Usage by Namespace, based on the preceding sort.

Subtotal by Node? YES// <RET>
Would you also like cumulative by option for all nodes? YES// NO
Namespace length: 4// 2
Format for report (<T>able/<G>raph): T// G <RET> raph
Write to file (C3PO_APR011994000001_APR3019942400.XUCPG)? YES// NO
DEVICE: HOME// ;132  <RET>  REMOTE CPU



sample output: (The actual size of this report is 132 columns)

                        Node C3PO from APR 01, 1994@00:00:01 to APR 30, 1994@24:00

OPT  CPUSEC                                                                                 DIO   SEC    N

DI       85            ****************************  --------------------------------     3363  2051   18
DS       11                                    ***  ------                                660   154    9
XM      117  ************************************  ------------------------------      3200 22334   34
XQ       79              *************************  --------------                      1412  7584    8
XU      107       *********************************  ------------------------------------ 3845  3484   54
ZI        0                                                                               33    26    2
ZT       19                                  ******  ------                              677   999   12
ZZ       45                            ***************  ----------                        1012  5887    7

TOTAL   463                                                                            14202        144


                      Node R2D2 from APR 01, 1994@00:00:01 to APR 30, 1994@24:00

OPT  CPUSEC                                                                                 DIO   SEC    N

DS       42                               *************  ---------------------------      2830  1362   28
XM      129 ****************************************  -------------------------        2730 14309    9
XU       38                                ************  ------                          634  3389   10

TOTAL   209                                                                             6194         47
```

Kill Raw Resource Usage Data

The Kill Raw Resource Usage Data option [XUCPKILL] is used to delete (KILL) the raw Resource Usage data stored in ^XTMP("XUCP" global but not in ^XTMP("XUCP","zzz" subtree. You are asked for a date range to delete from, and only the data falling within that date range is deleted.

There is no output in this option.

This option may be queued.

Example: Illustration of the Kill Raw Resource Usage Data option (Live execution).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: Kill raw Resource Usage data


I will kill the raw Resource Usage data in the ^XTMP( global for the
date range you specify.  I will not touch the ^XTMP("XUCP","zzz" subtree.

Please specify the date range to process.
   Start   Date@Time: 4/1/94 <RET> (APR 01, 1994)
     End   Date@Time: 4/4/94 <RET> (APR 04, 1994)

Would you like to queue this job for background execution? YES// NO
I'm finished killing the data.
```

Enable/Disable Collection of Resource Usage Data

The Enable/Disable Collection of Resource Usage Data option [XUCPTOGGLE] may be used to start or stop collection of Resource Usage data. You are asked for the date/time of when to start and date/time of when to stop the collection. If you respond with date and time for only one of the two prompts, then only that action (start or stop) is done. To bypass a prompt, enter an "^". By taking the default of "NOW//" you enable or disable collection immediately. It is possible to schedule a whole series of start and stop times.

Whether you choose to start/stop collection now or some time in the future, you actually schedule a task to run at the date/time you've specified. This task simply sets a flag in the KERNEL SITE PARAMETERS file (#4.3) to "Y" or "N".

Example 1: Illustration of the Enable/Disable Collection of Resource Usage Data option; Enable collection of data (Queued for background processing).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: Enable /Disable collection of Resource
     Usage data


Currently collection of resource usage data is ENABLED.

Enter "^" to NOT START collecting resource usage data.
When do you want to START the collection: NOW// T@14:00 <RET>  (OCT 07,
     1994@14:00)

Enter "^" to NOT STOP collecting resource usage data.
When do you want to STOP the collection: NOW// T+30  <RET> (NOV 06, 1994)

Collection will start OCT 7,1994@14:00 and stop NOV 6,1994.
Is that OK? YES// <RET>

START collecting resource usage data on OCT 7,1994@14:00
was scheduled as task: 164820

STOP collecting resource usage data on NOV 6,1994
was scheduled as task: 164821
```

Example 2: Illustration of the Enable/Disable Collection of Resource Usage Data option; Disable collection of data (Queued for background processing).

```
Resource Usage Menu

     Write raw Resource Usage data
     Sort raw Resource Usage data
     Print formatted report (Table/Graph)
     Kill raw Resource Usage data
     Enable/Disable collection of Resource Usage data

Select Resource Usage Menu Option: ENABLE /Disable collection of Resource
     Usage data


Currently collection of resource usage data is ENABLED.

Enter "^" to NOT START collecting resource usage data.
When do you want to START the collection: NOW// ^

Enter "^" to NOT STOP collecting resource usage data.
When do you want to STOP the collection: NOW// T@15:00 (OCT 07, 1994@15:00)

Collection will stop OCT 7,1994@15:00.
Is that OK? YES// <RET>

STOP collecting resource usage data on OCT 7,1994@15:00
was scheduled as task: 164819
```

Response Time Measures

USER INTERFACE

User perception of system efficiency is primarily influenced by response time. Response time is the time it takes for the system to respond with the next prompt after a user presses the Return key (termination of a MUMPS Read). They may also be concerned with the time it takes to receive output, such as a report that is sent directly or queued to a printer. There are many factors that influence response time and overall system performance. Capacity management tools are provided by Toolkit to help identify and solve performance problems.

SYSTEM MANAGEMENT ISSUES

Response Time Log Options

In order to generate Response Time (RT) data, it is necessary that calls to Start and Stop the RT clock be present in the routines to be monitored. Then enabling RT logging causes data to be collected. The Response Time Log Options menu is accessed through the Capacity Management menu.

```
SYSTEMS MANAGER MENU ...                                          [EVE]
  Capacity Management ...                                      [XTCM MAIN]
    Response Time Log Options ...                                 [XURTLM]
      Enable/Disable RT Logging                                    [XURTL]
      Print RT Report                                             [XURTLP]
      Long RT Report Print                                       [XURTLPL]
      Graphic RT Report Print                                    [XURTLPG]
      Multiday RT Averages                                       [XURTLMA]
      Kill Raw RT Data, Save Means                                [XURTLK]
      Copy RT Raw Data to FM File                                 [XURTLC]
      Destroy FM Copy of Raw RT Data                             [XURTLCK]
```

Logging is enabled as a site parameter with the Enable/Disable RT Logging option [XURTL]. When response time logging is enabled (the LOG SYSTEM RT? Kernel Site Parameter is set to "Y") the XRTL local variable is set at user login, satisfying the START-test, and causing RTs to be collected.

The raw data is stored in the following form:

^%ZRTL(3,<UCI/volume set,stop date,routine name,stop time)=Start date,Time^#Jobs

Other Response Time Log options print reports, purge raw data, and move summary results to FileMan files:

- **Print RT Report option [XURTLP]. This option prints System Response Time hourly averages from raw data.**
- **Long RT Report Print option [XURTLPL]. This option prints System Response Time hourly averages from raw data. It includes Highs, Lows, Counts, and Standard Deviations.**
- **Graphic RT Report Print option [XURTLPG]. This option prints a System Response Time bar graph of hourly averages over a selected range of dates.**
- **Multiday RT Averages option [XURTLMA]. This option prints System Response Time multiday hourly averages.**
- **Kill Raw RT Data, Save Means option [XURTLK]. This option kills System Response Time raw data and saves Means in a FileMan file.**
- **Copy RT Raw Data to FM File option [XURTLC]. This option queues a task to copy raw RT data to a FileMan (FM) file. It takes a long time and requires a lot of space if significant amounts of data is involved.**
- **Destroy FM Copy of Raw RT Data option [XURTLCK]. This option kills the FileMan file containing a copy of raw RT data.**

A check point exists in the Kernel sign-on routine XUS so that initial response time logging can begin on all operating systems (OS). The check measures the elapsed time between the sign-on display of volume set, UCI, device, and the subsequent prompt for access code. There is no terminal IO between these two points, as there should not be when setting such RT check points. The start and stop entry points into ^%ZOSV are T0 and T1 respectively. The data stored in ^%ZRTL is the start and stop times.

For VAX DSM, the T0 and T1 entry points into ^%ZOSV also stores additional data that is available on such systems (e.g., CPU, DIO, and BIO). Toolkit also provides an additional check point to measure the time needed to create a VMS process and activate a DSM image. This check point is in the ZUVXD routine, the VAX-specific sign-on routine that is executed before the generic XUS sign-on routine. In this way, VMS logons and Kernel logons can be monitored independently.

Files

Data is stored in the ^%ZRTL global in the Manager account. It is first stored in ^%ZRTL(3,. This is a non-FileMan compatible global for which a Standards and Conventions Committee (SACC) exemption was granted. The format of this global is as follows:

^%ZRTL(3,UCI/volume set, stop date, routine name, stop time)=

DSM for OpenVMS: **Start Date,Time^#Jobs^CPU^DIO^BIO**

For all other OS: **Start Date,Time^#Jobs**

There are three other files in the ^%ZRTL global that are used for the summarization and reporting of response time data. They are as follows:

^%ZRTL(1, RESPONSE TIME (#3.091)

This file points to the RT DATE_UCI,VOL file (#3.092). It contains system response time averages by date, UCI/volume set, hour of day, and routine name. Data is moved into this file by the XURTLK routine which condenses and then purges raw Response Time (RT) data.

^%ZRTL(2, RT DATE_UCI,VOL (#3.092)

This file contains unique entries for each DATE_UCI,VOL combination as well as hourly active job averages if active job data is available. Data is moved into this file by the XURTLK routine.

^%ZRTL(4, RT RAWDATA (#3.094)

This file allows the optional storage of raw response time data in VA FileMan format. Data transfer is handled by the XURTLC routine. Creating this file greatly enlarges the size of the ^%ZRTL global. An option is available for killing this file when no longer needed.

RTHIST Summary Report for VAX DSM

Operating system utilities are available on DSM and MSM systems for logging CPU, disk, and routine usage. Toolkit utilities have been designed to enhance the OS utilities.

	Operating System Utilities	Toolkit Utilities
For VAX DSM:	**RTHIST**	**ZTRTHV**

PROGRAMMER API

In order to measure response times, it is necessary to have edited versions of routines that make calls to start and stop the response time clock and store elapsed times. The syntax of the calls is as follows:

```
D:$D(XRTL) T0^%ZOSV ; START

S:$D(XRT0) XRTN=$T(+0) D:$D(XRT0) T1^%ZOSV ; STOP
```

Callable Entry Points

A callable entry point is an authorized programmer call that may be used in any DHCP application package. The Database Administrator (DBA) maintains the list of entry points approved by the Database Integration Committee (DBIC).

T0^%ZOSV Start RT Measure

The Kernel site parameter flag to enable RT logging must be set for the volume set. The setting of this flag defines the XRTL variable. The call to this entry point should thus include a check for the existence of XRTL, such as the following:

```
D:$D(XRTL) T0^%ZOSV
```

This call should be placed just before a process that may take a few seconds before the system responds with another prompt. If the minimal pause is at least a half second, there is enough variability to notice changes as the load on the system is increased or decreased. There should be no terminal IOs between the T0 start point and the T1 stop point.

output: XRT0 output variable (start time)

The T0 call sets the XRT0 variable to the start time. To discard a sample, the XRT0 variable should be killed. Such a kill would be appropriate if there is an exit path between the T0 and T1 check points that is circuitous or otherwise irrelevant to the normal execution of the code in question.

T1^%ZOSV Stop RT Measure

This call logs the elapsed time into the ^%ZRTL global. The call should include a check for the existence of XRT0 to confirm that the start time is available.

input: XRTN input variable (routine name)

The XRTN variable is normally set to the name of the routine being monitored via the command:

```
S XRTN=$T(+0)
```

To log more than one stop point in the same routine, a number or other characters may be concatenated (e.g., XRTN_1) so that a separate entry is made in the ^%ZRTL global (since the global is subscripted by routine name):

```
S:$D(XRT0) XRTN=$T(+0) D:$D(XRT0) T1^%ZOSV
```

Direct Mode Utility

Calls that are documented as direct mode utilities *cannot* be used in application package code.

The ZHDIF entry point into %ZOSV may be used on VAX DSM systems to display the amount of system resources used between two end points. This entry point is intended for interactive use to examine the effect of the execution of specific portions of code and is shown below:

```
>S %ZH0=$ZH

>F J=1:1:100 W "."

>S %ZH1=$ZH

>D ZHDIF^%ZOSV

 CPU=  0.15    ET=  25.9    DIO=    0    BIO=  104
```

Tools

Routine Tools

OVERVIEW

Toolkit provides an Application Programming Interface (API) that includes programmer utilities for working with routines and globals. This chapter describes routine tools exported with Toolkit. These tools are useful to IRM staff, application developers, and package verifiers.

Most of the tools are available as options on the Programmer Options menu, locked with the XUPROG key. Some options are locked with the XUPROGMODE or XUPROG keys as an extra level of security. Your MUMPS vendor may supply other related tools that are direct mode only (not attached to any of the DHCP options).

Routines can be edited, analyzed by flow charting, printed, compared, deleted, and moved by using a direct mode utility or the corresponding option. The direct mode utilities are listed in the Programmer API at the end of this chapter. The Routine Tools menu, located on the Programmer Options menu, is shown below:

```
SYSTEMS MANAGER MENU ...                                          [EVE]
  Programmer Options ... <locked with XUPROG>                   [XUPROG]
    Routine Tools ...                                 [XUPR-ROUTINE-TOOLS]
      %Index of Routines                                         [XUINDEX]
      Compare routines on tape to disk                 [XUPR-RTN-TAPE-CMP]
      Compare two routines                            [XT-ROUTINE COMPARE]
      Delete Routines <Locked with XUPROGMODE>                    [XTRDEL]
      First Line Routine Print                       [XU FIRST LINE PRINT]
      Flow Chart Entire Routine                                    [XTFCR]
      Flow Chart from Entry Point                                  [XTFCE]
      Group Routine Edit <Locked with XUPROGMODE>                [XTRGRPE]
      Input routines <Locked with XUPROG>                  [XUROUTINE IN]
      List Routines                                              [XUPRROU]
      Output routines                                     [XUROUTINE OUT]
      Routine Edit <Locked with XUPROGMODE>               [XUPR RTN EDIT]
      Variable changer <Locked with XUPROGMODE>          [XT-VARIABLE CHANGER]
      Version number update <Locked with XUPROGMODE>       [XT-VERSION NUMBER]
```

Each of these options on the Routine Tools menu are grouped together by type of routine and are described on the following pages.

USER INTERFACE

Analyzing Routines

Flow Chart Entire Routine

The Flow Chart Entire Routine option [XTFCR] generates a flow chart of an entire routine.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTFCR
```

Flow Chart from Entry Point

The Flow Chart from Entry Point option [XTFCE] generates a flow chart of the processing performed from a specified entry point to the termination of processing resulting from that entry point. It also permits the user to expand the code in other routines or entry points referenced by DO or GOTO commands.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTFCE
```

%INDEX

The Toolkit's %INDEX utility is a verification tool for programmers and verifiers. It reviews a routine according to the 1990 ANSI MUMPS Standard and according to the VA *Programming Standards and Conventions (SAC).*

%INDEX reports any errors that it finds. The error flags are F for a fatal MUMPS error, S for a violation of VA Standards, and W (warning) for a violation of VA Conventions. The utility can be called directly (i.e., >D ^%INDEX) or via an option on the Programmer Options menu.

```
>D ^%INDEX

                  V. A.  C R O S S  R E F E R E N C E R  7.3
                   UCI: NXT CPU: KDE    FEB 21, 1995@10:12:25

routine(s) ?   >   XDRMAIN
routine(s) ?   >   <RET>

Select PACKAGE NAME: XT  <RET> TOOLKIT        XT     (Enter the package
                                                     name you want to
                                                     check with %INDEX)
Include the compiled template routines: N// <RET>

Print more than compiled errors and warnings? YES// <RET>

Print summary only? NO// <RET>

Print routines? YES// <RET>

Print (R)egular,(S)tructured or (B)oth?  R// <RET>   (or enter S for an
                                                     indented report)
Print the DDs, Functions, and Options? YES// <RET>

Print errors and warnings with each routine? YES// <RET>

Save parameters in ROUTINE file? NO// <RET>          (or enter YES to
                                                     store documentation)
Index all called routines? NO// <RET>
```

%INDEX can also be used to verify parts of a package that contain MUMPS code. Compiled templates can be included. The MUMPS code used in data dictionaries, functions, and options can also be reviewed. When using %INDEX to review an entire package, it is best to queue the report for an off-peak time since processing is intensive.

The following is a list of the error conditions that the %INDEX utility flags. The 1990 ANSI MUMPS Standard is taken into account with new syntax and other checks.

The reported error codes (error flags) are as follows:

S Standard (according to VA Standards)
W Warning (according to VA Conventions)
F Fatal Error (hard MUMPS error)

1	F - UNDEFINED COMMAND (rest of line not checked).	*(must be manually checked by the programmer or verifier)*
2	F - Non-standard (Undefined) 'Z' command.	
3	F - Undefined Function.	
4	F - Undefined Special Variable.	
5	F - Unmatched Parenthesis.	
6	F - Unmatched Quotation Marks.	
7	F - ELSE Command followed by only one space.	
8	F - FOR Command did not contain '='.	
9	W - QUIT Command followed by only one space.	
10	F - Unrecognized argument in SET command.	
11	W - Invalid local variable name.	
12	W - Invalid global variable name.	
13	F - Blank(s) at end of line.	
14	F - Missing LABEL, REFERENCED in this routine.	
15	W - Duplicate label.	
16	F - Error in pattern code.	
17	W - First line tag NOT routine name.	
18	W - Line contains a CONTROL (non-graphic) character.	
19	S - Line is longer than 245 bytes.	
20	S - View command used.	
21	F - General Syntax Error.	
22	S - Exclusive Kill.	
23	S - Unargumented Kill.	
24	S - Kill of an unsubscripted global.	
25	S - Break command used.	
26	S - Exclusive or Unargumented NEW command.	
27	S - $View function used.	
28	S - Non-standard $Z special variable used.	
29	S - 'Close' command should be invoked through 'D ^%ZISC'.	
30	S - TAG+OFFSET syntax.	
31	S - Non-standard $Z function used.	
32	S - 'HALT' command should be invoked through 'G ^XUSCLEAN'.	

%INDEX Error Condition List (continued):

```
| 33  S - Read command doesn't have a timeout.                          |
| 34  S - 'OPEN' command should be invoked through ^%ZIS.               |
| 35  S - Routine exceeds SACC maximum size of 5000 (|).                |
| 36  S - Should use 'TASKMAN' instead of 'JOB' command.                |
| 37  F - Tag is not valid.                                             |
| 38  F - Call to this MISSING LABEL (see INVOKED BY list).             |
| 39  S - Kill of a protected variable (|).                             |
| 40  S - Space where a command should be.                              |
| 41  S - Star or pound READ used.                                      |
| 42  F - Null line (no commands or comment).                           |
| 43  F - Invalid or wrong number of arguments to a function.           |
| 44  S - Version number not found on 2nd line of routine.              |
| 45  S - Set to a '%' global.                                          |
| 46  F - Quoted string not followed by a separator.                    |
| 47  S - Lowercase command(s) used in line.                            |
| 48  F - Missing argument to a command post-conditional.               |
| 49  F - Command missing an argument.                                  |
| 50  S - Extended reference.                                           |
| 51  F - Block structure mismatch.                                     |
| 52  F - Reference to routine '^|'. That isn't in this UCI.           |
| 53  F - Bad Number                                                    |
```

The following is a list of the error conditions that the ^XINDEX utility flags. The 1990 ANSI MUMPS Standard is taken into account with new syntax and other checks.

The reported error codes (error flags) are as follows:

S Standard (according to VA Standards)
W Warning (according to VA Conventions)
F Fatal Error (hard MUMPS error)

1	F - UNDEFINED COMMAND (rest of line not checked).	*(must be manually checked by the programmer or verifier)*
2	F - Non-standard (Undefined) 'Z' command.	
3	F - Undefined Function.	
4	F - Undefined Special Variable.	
5	F - Unmatched Parenthesis.	
6	F - Unmatched Quotation Marks.	
7	F - ELSE Command followed by only one space.	
8	F - FOR Command did not contain '='.	
9	W - QUIT Command followed by only one space.	
10	F - Unrecognized argument in SET command.	
11	W - Invalid local variable name.	
12	W - Invalid global variable name.	
13	F - Blank(s) at end of line.	
14	F - Missing LABEL, REFERENCED in this routine.	
15	W - Duplicate label.	
16	F - Error in pattern code.	
17	W - First line tag NOT routine name.	
18	W - Line contains a CONTROL (non-graphic) character.	
19	S - Line is longer than 245 bytes.	
20	S - View command used.	
21	F - General Syntax Error.	
22	S - Exclusive Kill.	
23	S - Unargumented Kill.	
24	S - Kill of an unsubscripted global.	
25	S - Break command used.	
26	S - Exclusive or Unargumented NEW command.	
27	S - $View function used.	
28	S - Non-standard $Z special variable used.	
29	S - 'Close' command should be invoked through 'D ^%ZISC'.	
30	S - TAG+OFFSET syntax.	
31	S - Non-standard $Z function used.	
32	S - 'HALT' command should be invoked through 'G ^XUSCLEAN'.	
33	S - Read command doesn't have a timeout.	
34	S - 'OPEN' command should be invoked through ^%ZIS.	
35	S - Routine exceeds SACC maximum size of 5000 (|).	
36	S - Should use 'TASKMAN' instead of 'JOB' command.	
37	F - Tag is not valid.	
38	F - Call to this MISSING LABEL (see INVOKED BY list).	
39	S - Kill of a protected variable (|).	

^XINDEX Error Condition List (continued):

```
| 40  S - Space where a command should be.                                  |
| 41  S - Star or pound READ used.                                          |
| 42  F - Null line (no commands or comment).                               |
| 43  F - Invalid or wrong number of arguments to a function.               |
| 44  S - Version number not found on 2nd line of routine.                  |
| 45  S - Set to a '%' global.                                              |
| 46  F - Quoted string not followed by a separator.                        |
| 47  S - Lowercase command(s) used in line.                                |
| 48  F - Missing argument to a command post-conditional.                   |
| 49  F - Command missing an argument.                                      |
| 50  S - Extended reference.                                               |
| 51  F - Block structure mismatch                                          |
| 52  F - Reference to routine '^|'. That isn't in this UCI.               |
| 53  F - Bad Number                                                        |
| 54  S - Access to SSVN's restricted to Kernel.                            |
```

Editing Routines

Group Routine Edit

The Group Routine Edit option [XTRGRPE] calls the XTRGRPE routine to edit a group of routines. Once several routines are identified, the Toolkit ^%Z editor is called. This option is locked with XUPROGMODE.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTRGRPE
```

Routine Edit

The Routine Edit option [XUPR RTN EDIT] invokes the ^%Z editor. (See the "^%Z Editor" chapter in this manual for more detailed information.) The ^%Z editor can be used to edit a group of routines with the Group Routine Edit option. This allows programmers on the site manager's staff to edit MUMPS routines. This option is locked with XUPROGMODE.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>X ^%Z
```

Variable Changer

The Variable Changer option[XT-VARIABLE CHANGER] runs the XTVCHG routine which changes all occurrences of one variable to another. This option is locked with XUPROGMODE.

WARNING: This option changes DOs and GOTOs also, but it doesn't change the target of the DOs and GOTOs. For example, if you request to change all occurrences of "TAG" to "TAGS", "DO TAG" would be changed to "DO TAGS". However, the actual Line Label called TAG would not be changed.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTVCHG
```

Version Number Update

The Version Number Update option [XT-VERSION NUMBER] is used to update version numbers of one or more routines. This option runs the XTVNUM routine to update or set the version number into a set of routines. This option is locked with XUPROGMODE.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTVNUM
```

Printing Routines

First Line Routine Print

The First Line Routine Print option [XU FIRST LINE PRINT] is used to obtain a summary listing of the first, and optionally the second, line of one or more routines. This option uses the utility %ZTP1 to print the first line of user specified routines.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^%ZTP1
```

List Routines

The List Routines option [XUPRROU] uses the utility %ZTPP to print a listing of entire routines.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^%ZTPP
```

Comparing Routines

Compare Two Routines

The Compare Two Routines option [XT-ROUTINE COMPARE] is used to compare two routines with different names and display the differences (using MailMan's PackMan compare utilities). This option allows you to compare two routines located in the current account and print a list of differences.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^XTRCMP
```

Compare Routines on Tape to Disk

The Compare Routines on Tape to Disk option [XUPR-RTN-TAPE-CMP] compares routines on tape with those on disk and displays the differences. This option reads a standard DSM %RS tape or disk file, or M/SQL tape and compares the routines on the tape with a routine with the same name in the current account.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D TAPE^XTRCMP
```

Deleting Routines

The Delete Routines option [XTRDEL] can be used to delete one or more routines. The wildcard syntax can be used to delete a set, such as ABC* to delete all those routines beginning with the letters ABC. This option is locked with XUPROGMODE.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^%ZTRDEL
```

Load and Save Routines

The Input Routines and Output Routines options can be used to move routines from one UCI to another. These make use of operating system-specific utilities such as %RR for routine restore and %RS for routine save.

Input Routines

The Input Routines option [XUROUTINE IN] loads routines from an external device, such as magtape. This option is locked with XUPROG.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^%RR (OS-specific)
```

Output Routines

The Output Routines option [XUROUTINE OUT] outputs routines to an external device such as a magtape.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode as follows:

```
>D ^%RS (OS-specific)
```

PROGRAMMER API

Direct Mode Utilities

Many options on the Programmer Options menu can also be run as direct mode utilities. Some tools are not available as options but only as direct mode utilities callable at the MUMPS prompt. Calls that are documented as direct mode utilities cannot be used in application package code. Illustrated below, are examples from this chapter, on how to run these utilities when working in programmer mode:

DIRECT MODE UTILITY	DESCRIPTION
`>D ^XTFCR`	Generate a flow chart of an entire routine.
`>D ^XTFCE`	Generate a flow chart of the processing performed from a specified entry point to the termination of processing resulting from that entry point.
`>D ^%INDEX`	To run %INDEX.
`>X ^%Z`	Invokes the ^%Z editor.
`>D ^XTRGRPE`	Edit a group of routines.
`>D ^XTVCHG`	Changes all occurrences of one variable to another.
`>D ^XTVNUM`	Update or set the version number into a set of routines.
`>D ^%ZTP1`	A summary listing of the first, and optionally the second, line of one or more routines can be obtained.
`>D ^%ZTPP`	Print a listing of entire routines.
`>D ^XTRCMP`	Compare two routines with different names and display the differences (using MailMan's PackMan compare utilities).

Direct Mode Utilities (continued):

DIRECT MODE UTILITY	DESCRIPTION
>D TAPE^XTRCMP	**Compares routines on tape with those on disk and displays the differences.**
>D ^%ZTRDEL	**Delete one or more routines.**
>D ^%RR (OS-specific)	**Loads routines from an external device, such as magtape.**
>D ^%RS (OS-specific)	**Output routines to an external device, such as a magtape.**

Verification Tools

OVERVIEW

Toolkit provides an Application Programming Interface (API) that includes programmer utilities for working with routines and globals. This chapter describes verification tools exported with Toolkit that are available for reviewing a package. These tools are useful to IRM staff, application developers, and package verifiers.

Tools that have been written specifically for verifiers have been placed under the Verifier Tools Menu located on the Programmers Option menu. However, an understanding of other Kernel options may be important to the verifiers as well. Some of these options are locked with the XUPROG, XUPROGMODE, or XUMGR keys as an extra level of security. Please refer to the *Kernel Systems Manual* for descriptions of options not covered here.

Verification tools can be accessed through one of three methods:

- **Programmer Options menu**
- **Operations Management menu**
- **Direct Mode utilities**

USER INTERFACE

Verifier Tools Menu

The Verifier Tools Menu contains options which are available as tools for verification during program development. The Verifier Tools Menu option is located on the Programmer Options menu. Several tools are available for programmers and verifiers to compare different versions of routines and different states of Data Dictionaries. A routine or a Data Dictionary is first stored line-by-line in a VA FileMan file. After changes have been made, the new version can be compared with the one on file and any changed or deleted lines are recorded. For routines, the text of each line that differs is stored. For data dictionaries, changes in the data definition, not in the data values, are stored. Changes in templates and security protection are also stored.

There are several reasons for maintaining a record of changes to routines or Data Dictionaries. Verifiers could run comparisons when receiving a new version of a test package to confirm that only patches had been applied. Programmers could run comparisons each time they modify routines or Data Dictionaries as an internal monitor of changes.

The Verifier Tools Menu [XTV MENU] consists of the following options that are described below:

```
SYSTEMS MANAGER MENU ...                                              [EVE]
   Programmer Options ... <locked with XUPROG>                      [XUPROG]
     Verifier Tools Menu ...                                      [XTV MENU]
       Update with current routines                             [XTVR UPDATE]
       Routine Compare - Current with Previous                  [XTVR COMPARE]
       Accumulate Globals for Package                            [XTVG UPDATE]
       Edit Verification Package File                 [XTV EDIT VERIF PACKAGE]
       Global Compare for selected package                      [XTVG COMPARE]
       Last Routine Change Date Recorded       [XTVR MOST RECENT CHANGE DATE]
       UNDO Edits (Restore to Older Version of Routine)
                                                  [XTVR RESTORE PREV ROUTINE]
```

ROUTINE COMPARE OPTIONS

Update with Current Routines

The Update with Current Routines option [XTVR UPDATE] records the text of the routines indicated in the file used to maintain changes in routines. Only the last version entered is kept intact, previous entries reflect only the changes in lines added, and/or deleted, to make the next version. This option is used to record the current routine structure so that it can be compared with future versions of the routine using the Routine Compare - Current with Previous option.

After editing the routine, the Update with Current Routines option can again be used to store changes. Rather than storing all minor changes, the user can choose to wait and use the Update with Current Routines option only after extensive edits have been made. Lines are compared and changes, including inserted or deleted lines, are recorded. (Alteration of the routine's second line are usually insignificant and are ignored.) The Update with Current Routines option can be used whenever the programmer would like a new "snapshot" of the routine. The XTV ROUTINE CHANGES file (#8991) holds each new snapshot as a new version. This filing method does not, however, alter the actual version number of the routine itself.

Routine Compare - Current with Previous

The Routine Compare - Current with Previous option [XTVR COMPARE] is used to compare one or more current routines to previous versions. To use the routine compare utility, copies of the selected routines must first be stored in the XTV ROUTINE CHANGES file (#8991), stored in ^XTV(8991,. This is achieved by use of the Update with Current Routines option [XTVR UPDATE] on the Verifier Tools Menu. Routines can be specified one by one or as a group with the wildcard syntax (e.g., XQ*). Any initialize routines are automatically excluded. Differences between the current version and the indicated number of prior versions are noted. The user

is prompted for the number of previous versions from which to begin the listing. An entire history, or just a brief display of recent modifications, can thus be obtained.

Last Routine Change Date Recorded

The Last Routine Change Date Recorded option [XTVR MOST RECENT CHANGE DATE] generates a list of routines by the date of the last modification. The user is prompted for a date from which changes should be indicated. Routines which have not changed since the selected date are also included and are noted as not having changed. This option checks that the current version has been included within the file (eliminating the necessity to run the options Update with Current Routines [XTVR UPDATE] and Routine Compare - Current with Previous [XTVR COMPARE] as a separate step prior to running this option). Routines are selected that have been added to the file following the date indicated for new routines. After the specified routines have been processed all of the two letter namespaces, which were input for processing, are identified on the basis of the first two letters of the routines which were selected for comparison. The entries are then searched beginning with those namespaces which have been logged in the file, but are not present in the current account (basically deleted routines). A section total is printed following each section of the report.

The output identifies a routine which has another tag on the first line instead of the current routine name. The last date on which a change was recorded in the file, including more than a change in line 2, is printed along with the date piece (3rd ";"-piece) of the first line of the routine. Previously, only the version (3rd ";"-piece) and the patch indicator (4th ";"-piece) of the second line were listed. The second line from the 3rd ";" through the 6th ";"-piece is now shown including version number;package ID;patches;date of release.

(See Appendix B for a screen capture of a typical user interaction, and resulting output, from the option Last Routine Change Date Recorded [XTVR MOST RECENT CHANGE DATE].)

UNDO Edits (Restore to Older Version of Routine)

The UNDO Edits (Restore to Older Version of Routine) option [XTVR RESTORE PREV ROUTINE] is used to restore a routine back to its previous version which is available in the previous version edits shown by the Routine Compare - Current with Previous option. The user must specify a routine name to be used for the restored routine that is not currently used (so that no current routine is destroyed as a result of saving the newly restored routine). After checking that the restored routine is the desired version, the user can rename it as desired.

DATA DICTIONARY COMPARE OPTIONS

Accumulate Globals for Package

The Accumulate Globals for Package option [XTVG UPDATE] is used to accumulate the current globals for a package for comparison with subsequent versions. When first using the Accumulate Globals for Package option, a snapshot of the Data Dictionary structure is stored in the XTV GLOBAL CHANGES file (#8991.2), stored in ^XTV(8991.2,. The global data is accumulated for the ^DIC(fn,0, the ^DD(fn, nodes, i.e., where fn is an included file number, and the Edit, Print, and Sort Templates for the file(s) indicated as related to the package in the XTV VERIFICATION PACKAGE file (#8991.19).

Edit Verification Package File

Before the current globals for a package are accumulated, the set of files and templates must first be defined as a Verification Package with the Edit Verification Package File option [XTV EDIT VERIF PACKAGE]. This option is used to enter or edit files and namespaces in the XTV VERIFICATION PACKAGE file (#8991.19).

Verification package specifications are stored in the XTV VERIFICATION PACKAGE file (#8991.19), stored in ^XTV(8991.19,. References are not made to the PACKAGE file (#9.4), stored in ^DIC(9.4,. A tailor-made package can instead be defined to compare the changing states of specified data dictionaries.

The data definition is retrieved from ^DIC(file number,0 and the attribute definition is retrieved from ^DD(file number. Subfiles are included so that the subsequent addition or deletion of a subfile can be detected. The structure of templates and the codes for file security are recorded as well.

Global Compare for Selected Package

The Global Compare for Selected Package option [XTVG COMPARE] is used to produce a listing of changes in the global structure, including file protection and templates, between a previously stored version of the package (using the Accumulate Globals for Package option).

Miscellaneous Verifier Tools

PROGRAMMER OPTIONS MENU

The Programmer Options menu consists of the following options:

```
SYSTEMS MANAGER MENU ...                                                    [EVE]
  Programmer Options ... <locked with XUPROG>                             [XUPROG]
    NTEG  Build an 'NTEG' routine for a package                         [XTSUMBLD]
    PG    Programmer mode <Locked with XUPROGMODE>                     [XUPROGMODE]
          Calculate and Show Checksum Values                       [XTSUMBLD-CHECK]
          Delete Unreferenced Options                          [XQ UNREF'D OPTIONS]
          Error Processing ...                                            [XUERRS]
          Global Block Count                                   [XU BLOCK COUNT]
          List Global <Locked with XUPROGMODE>                            [XUPRGL]
          Map Pointer Relations                                         [DI DDMAP]
          Number base changer <Locked with XUPROGMODE>[XT-NUMBER BASE CHANGER]
          Routine Tools ...                                  [XUPR-ROUTINE-TOOLS]
          Test an option not in your menu <Locked with XUMGR> [XT-OPTION TEST]
          Verifier Tools Menu ...                                       [XTV MENU]
```

Tools found on the Programmer Options menu that can be of use to verifiers include:

- **Calculate and Show Checksum Values [XTSUMBLD-CHECK]**
- **Error Processing [XUERRS]**

These options are described below.

Calculate and Show Checksum Values

The Calculate and Show Checksum Values option [XTSUMBLD-CHECK] gives verifiers the ability to check the value of a routine at any given time. It does not regenerate NTEG routines and can safely be used anytime. This option is also on the Programmer Options menu.

This option calls CHECK^XTSUMBLD to calculate and show the checksum value for one or more routines in the current account. This value is referenced in the Patch Module description for routine patches.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utility can be used in programmer mode:

```
>D CHECK^XTSUMBLD
```

Error Processing (Kernel Error Trapping and Reporting)

If verifiers have entered programmer mode with D ^XUP, they might choose to record an error they encountered with D ^%ZTER. The error log can be displayed with D ^XTER, or with the corresponding option. Also, the error log can be purged with D ^XTERPUR. Errors can also be purged from within the menu system with an option that is locked with the XUPROGMODE security key.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utilities can be used in programmer mode as follows:

- **Record an Error**

```
>D ^%ZTER
```

- **Display Error Trap**

```
>D ^XTER
```

- **Purge Error Log**

```
>D ^XTERPUR
```

For more details on Error Processing, please refer to the *Kernel Systems Manual*.

OPERATIONS MANAGEMENT MENU

Another Kernel option that may be of use to verifiers is found on the Routine Management Menu [XUROUTINES] under the Operations Management menu [XUSITEMGR]. The Routine Management Menu consists of the following options:

```
SYSTEMS MANAGER MENU ...                                                [EVE]
  Operations Management ...                                          [XUSITEMGR]
     Routine Management Menu ...                                    [XUROUTINES]
        Bring in Sent Routines <Locked with XUPROGMODE>              [XTMOVE-IN]
        Delete Routines <Locked with XUPROGMODE>                        [XTRDEL]
        First Line Routine Print                          [XU FIRST LINE PRINT]
        List Routines                                                 [XUPRROU]
        Move Routines across Volume Sets <Locked with XUPROGMODE>      [XTMOVE]
        Program Integrity Checker                                     [XUINTEG]
```

The Program Integrity Checker [XUINTEG] is a tool found on the Routine Management Menu that may be of use to verifiers.

Program Integrity Checker

The Program Integrity Checker option [XUINTEG] runs the XUGET routine in order to check the integrity of package routines. It allows the comparison of current and exported checksum values from within the menu system. This comparison can also be invoked directly by verifiers with a call to the package's <namespace>NTEG routine to identify changed routines within a package. The current checksum values are compared to the exported checksum values and any changed routines are flagged. For example, the following direct mode utility is used for the Toolkit (XT) namespace (ns):

```
>D ^XTNTEG
```

The ONE^<namespace>NTEG entry point can also be used to locate changes within a selected routine or namespace (ns). The namespace that is entered is case sensitive.

As is mentioned in the following description of the Programmer API, the corresponding direct mode utilities can be used in programmer mode:

```
>D ^nsNTEG
```

and

```
>D ONE^nsNTEG
```

NOTE: The Build an 'NTEG' Routine for a Package option [XTSUMBLD] is a developer tool that generates the exported checksum values for a package. It is on the Programmer Options menu. It gets a package namespace from the PACKAGE file (#9.4), and a list of routines from the user. It then builds a <namespace>NTEG routine that has a checksum for each of the routines. This option should not be run by verifiers.

PROGRAMMER API

Direct Mode Utilities

Some verification tools are not available as options but only as direct mode utilities callable at the MUMPS prompt, usually involving the DO command.

The %INDEX utility can be used to check a routine, or set of routines, against standards such as the 1990 ANSI MUMPS Standard syntax and VA *Programming Standards and Conventions (SAC)*. (See the "Routine Tools" chapter in this manual for more information on the %INDEX utility.) The corresponding direct mode utility can be used in programmer mode:

```
>D ^%INDEX
```

Calls that are documented as direct mode utilities cannot be used in application package code. Many of the options on the Programmer Options menu can also be run as direct mode utilities. Illustrated below, are examples from this chapter of how to run these utilities when working in programmer mode:

DIRECT MODE UTILITY	DESCRIPTION
`>D CHECK^XTSUMBLD`	Check the value of a routine at any given time.
`>D ^nsNTEG`	Check Integrity of namespace (ns) Package. For example, D ^XTNTEG compares the Toolkit namespace (XT) checksums with expected values.
`>D ONE^nsNTEG`	Check Integrity Routine in namespace (ns) Package.
`>D ^%ZTER`	Record an Error.
`>D ^XTER`	Display Error Trap.
`>D ^XTERPUR`	Purge Error Log.
`>D ^%INDEX`	To run %INDEX.
`>D ^XINDEX`	Similar to %INDEX but supports the most current MUMPS standard.

Programmer Options Menu

USER INTERFACE

The List Global and Number Base Changer options are found on the Programmer Options menu, locked with the XUPROG key. These options are also locked with the XUPROGMODE key as an extra level of security. Your MUMPS vendor may supply other related tools that are direct mode only (not attached to any of the DHCP options).

```
SYSTEMS MANAGER MENU ...                                                  [EVE]
  Programmer Options ... <locked with XUPROG>                           [XUPROG]
    NTEG Build an 'NTEG' routine for a package                        [XTSUMBLD]
    PG   Programmer mode <Locked with XUPROGMODE>                    [XUPROGMODE]
         Calculate and Show Checksum Values                      [XTSUMBLD-CHECK]
         Delete Unreferenced Options                          [XQ UNREF'D OPTIONS]
         Error Processing ...                                          [XUERRS]
         Global Block Count                                   [XU BLOCK COUNT]
         List Global <Locked with XUPROGMODE>                          [XUPRGL]
         Map Pointer Relations                                        [DI DDMAP]
         Number base changer <Locked with XUPROGMODE>[XT-NUMBER BASE CHANGE]
         Routine Tools ...                                  [XUPR-ROUTINE-TOOLS]
         Test an option not in your menu <Locked with XUMGR>[XT-OPTION TEST]
         Verifier Tools Menu ...                                       [XTV MENU]
```

Listing Globals

The List Global option [XUPRGL] can be used to list the contents of a global to the screen. It makes use of operating system-specific utilities such as %G, the global lister. For MSM this is %GL, for other systems it is %G. This option is locked with XUPROGMODE.

The corresponding direct mode utility can be used in programmer mode. For example:

```
>D ^%G (OS-specific)
```

Number Base Changer

The Number Base Changer option [XT-NUMBER BASE CHANGER] runs a number base calculator. It allows input in base 2, 8, 10, and 16 and displays the number in all 4 bases. This option is locked with XUPROGMODE.

The corresponding direct mode utility can be used in programmer mode. For example:

```
>D ^XTBASE
```

PROGRAMMER API

Direct Mode Utilities

Many options on the Programmer Options menu can also be run as direct mode utilities. Some are not available as options, but only as direct mode utilities callable at the MUMPS prompt. Calls that are documented as direct mode utilities cannot be used in application package code. Illustrated below are examples from this chapter on how to run these utilities when working in programmer mode:

DIRECT MODE UTILITY	DESCRIPTION
>D ^%G (OS-specific)	**List the contents of a global to the screen.** **NOTE: For MSM this is %GL for other systems it is %G.**
>D ^XTBASE	**Runs the number base calculator.**

Kermit

USER INTERFACE

Using Kermit as an Alternate Editor

Toolkit supports use of the Kermit file transfer protocol as an alternate editor. This allows the transfer of files from a PC or other system into a mail message or other VA FileMan word-processing field. The benefit of using the Kermit file transfer protocol is that large files can be sent faster and more easily due to the efficient Kermit error checking mechanism. The following steps illustrate the use of Kermit on a Macintosh:

1. **Check your White Knight or other emulator's settings for Kermit preferences. The defaults are probably correct.**

2. **Check the Decserver's local switch. It cannot be a printable character like a tilde (~) or Kermit will not work. Change it to a control character by setting the local switch at the DECserver prompt. First, do the following: SHOW PORT CHARACTERISTICS to see its setting. Then set local switch XXX to change it to XXX.**

3. **Go to a word-processing field, such as a mail message.**

4. **At the Edit Option prompt, choose Utilities, then Editor Change and you see the "Select ALTERNATE EDITOR:" prompt; choose Kermit.**

5. **Go to White Knight's File menu and select the option: Send File Using. By selecting this option, a menu will appear to the right, at which point, you select SK:Kermit Protocol. You are then prompted to select one of your Microsoft Word, or other files. Be sure that it is a file that has been saved as "Text Only with Line Breaks".**

6. **If you found the file quickly enough, and didn't time out, the transfer takes place. You then see a chart that shows the processing and indication of when it is done.**

Using the Toolkit's Kermit Options

If Kermit exists on an external PC or other computer, files may be sent back and forth (both directions) with use of the Toolkit's KERMIT HOLDING file (#8980). The options are on a stand-alone menu that is not tied to EVE, the System Manager Menu, as shown below:

```
KERMIT MENU ...                                              [XT-KERMIT MENU]
  E  Edit KERMIT holding file                                [XT-KERMIT EDIT]
  R  Receive KERMIT file                                  [XT-KERMIT RECEIVE]
  S  Send KERMIT file                                        [XT-KERMIT SEND]
```

Edit Kermit Holding File

```
Select Kermit menu Option: E <RET> Edit KERMIT holding file

Select KERMIT HOLDING NAME: DEMO
ARE YOU ADDING 'DEMO' AS A NEW KERMIT HOLDING (THE 2ND)? Y <RET> (YES)
NAME: DEMO// <RET>

Replace File Name: YES// <RET>

KERMIT transfer mode: TEXT// <RET>

Select ACCESS ALLOWED TO USER: ?
 ANSWER WITH ACCESS ALLOWED TO USER
     YOU MAY ENTER A NEW ACCESS ALLOWED TO USER, IF YOU WISH
     Add other users that can access these records.
 ANSWER WITH NEW PERSON NAME, OR INITIAL, OR SSN, OR NICK NAME

Want to edit the data?: YES
DATA:
  1>I am inputting text in a word <RET>
  2>processing field <RET>
  3>  <RET>

EDIT Option: <RET>
```

Receive Kermit File

```
Select Kermit menu Option: R <RET> Receive KERMIT file

If you enter 'XXX' for the file name it will be replaced by the name sent.
RECEIVE TO KERMIT FILE:XXX
   ARE YOU ADDING 'XXX' AS A NEW KERMIT HOLDING (THE 12TH)? Y <RET> (YES)
      KERMIT HOLDING Replace File Name: YES// <RET>
         KERMIT HOLDING KERMIT transfer mode: TEXT// <RET>

Starting KERMIT receive.N3

NOTE:  This is where the computer sends a text file using KERMIT.

Done with received, File transfer was successful.  (542 bytes)
```

Send Kermit File

```
Select Kermit menu Option: S <RET> Send KERMIT file
KERMIT FILE TO SEND:DEMO
KERMIT transfer mode: TEXT// <RET>
Starting KERMIT send.

NOTE:  This is where the computer receives a text file using KERMIT.

Done with send, File transfer was successful.  (542 bytes)
```

SYSTEM MANAGEMENT ISSUES

Kermit may be added to the ALTERNATE EDITOR file (#1.2) as shown below. Installing Kermit as an Alternate Editor permits users to import files into VA FileMan word processing fields, such as MailMan messages.

```
>D Q^DI          (This entry point may be used to maintain device variables)

VA FileMan 20

Select OPTION: ENTER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: 1.2 <RET> ALTERNATE EDITOR            (2 entries)
EDIT WHICH FIELD: ALL// <RET>

Select ALTERNATE EDITOR: KERMIT LOAD
  ARE YOU ADDING 'KERMIT LOAD' AS A NEW ALTERNATE EDITOR? Y <RET> (YES)
ACTIVATION CODE FROM DIWE: S XTKDIC=DIC D RECEIVE^XTKERMIT
OK TO RUN TEST: <RET>
RETURN TO CALLING EDITOR: K XTKDIC
DESCRIPTION:
  1> This option uses the KERMIT protocol to load word-processing <RET>
  2> fields from another system. <RET>
  3> <RET>
EDIT Option:  <RET>

Select ALTERNATE EDITOR:
```

To give users access to the Toolkit's Kermit options for bi-directional file transfer, the Kermit menu needs to be assigned, perhaps as a secondary menu, for those users. The Kermit menu is exported as a stand-alone menu without a parent option like EVE.

PROGRAMMER API

Callable Entry Points

A callable entry point is an authorized programmer call that may be used in any DHCP application package. The DBA maintains the list of DBIC approved entry points. The two programmer calls that can be used in application code are listed below:

CALLABLE ENTRY POINT	DESCRIPTION
SEND^XTKERMIT	Send a File
RECEIVE^XTKERMIT	Receive a File

To call XTKERMIT:

Set XTKDIC = FileMan type global root, DWLC = last current data node. Set DWLC to append data to existing word processing multiple. Return DWLC = last data node, XTKDIC is killed.

Optional:

Set XTKMODE = 0 to send/receive in IMAGE mode (no conversion).
1 to send/receive in DATA mode (just convert control character).
2 to send/receive as TEXT (Mac, FM word-processing).
3 to send/receive as TEXT (PC).

Text mode sends a carriage return (CR) after each global node. Make a new global node for each CR received.

^%Z Editor

USER INTERFACE

The Toolkit's routine editor is installed in the Manager account as the ^%Z global by ZTMGRSET during installation. (It can also be installed with D ^ZTEDIT.) To use the editor, load the routine (it must pre-exist) and then X ^%Z. The following example creates a one-line routine in VAX DSM and then calls the ^%Z Editor.

```
>ZR

>ZZTEST <RET> ;ID/SITE;test routine;     (The editor fills in the third
                                         "<space>;" piece with the date/time
                                         that the routine is filed.)
>ZS ZZTEST

>ZL ZZTEST X ^%Z

%Z Editing: ZZTEST  Terminal type: C-VT100
Edit:
```

Enter ".F" (dot-file) at the edit prompt to change files. When saving with dot-file, an edit comment may be entered. This text is stored in the ROUTINE file's (#9.8) EDIT HISTORY multiple as programmer documentation. The following example shows how an entire routine can be displayed by entering the MUMPS print command ZP followed by a space. Dot-file (.File) is then used to file. A dot is then used to exit. (The dot exit does not automatically file changes.)

```
>ZL ZZTEST X ^%Z

%Z Editing: ZZTEST  Terminal type: C-VT100
Edit: ZP<SPACE> <RET>
ZZTEST   ;test routine

Length:  20  <RET>  Line: ZZTEST
ZZTEST ;test routine
Edit: .Insert after: ZZTEST// <RET>
Line:    ;next line    (First either a <tab> or line label is entered)
Line:    Q
Line: <RET>
Edit: .File ZZTEST
Edit comment:
  1>This text is stored in the Routine file's Edit History multiple. <RET>
  2> <RET>
EDIT Option: <RET>
Edit: . <RET>
>
```

Routines are filed by the name used when loading, not by the first line tag. If a ROUTINE file (#9.8) exists, then the routine is added if not already there, and an entry is made of the date/time and DUZ of the user that filed it. When filing, the editor updates the third piece of the first line of the routine with the date/time.

When editing, a question mark can be entered to provide help. The dot commands are listed first. They provide the usual break, join, insert, and remove functions. The +n method of selecting lines to edit is also noted. The line tag can be used along with a number (e.g., TAG+3) to reach a particular line. A minus sign will backup lines. And the asterisk can be entered to reach the last line.

```
>X ^%Z
Edit: ?
.ACTION menu              .BREAK line              .CHANGE every
.FILE routine             .INSERT after            .JOIN lines
.MOVE lines               .REMOVE lines            .SEARCH for
.TERMinal type            .XY change to/from replace-with
. -TO EXIT THE EDITOR
""+n Absolute line n    +n To advance n lines   -n To backup n lines_
 use '*' to get last line

^NAME - to edit a GLOBAL node        *NAME - to edit a LOCAL variable
MUMPS command line (mumps command <space> or Z command <space>)
```

Help displays information about editing in line mode. A complete line is displayed and various keys can be used to navigate. The spacebar moves forward by words, the period moves forward by characters, and the <CTRL H> command key sequence moves backwards by characters. Upon reaching the desired location, the delete key may be used to remove characters. To enter characters, the character "E" must first be entered as an insert/delete toggle. Pressing the Return key reverses the toggle and allows navigation. Pressing the Return key again moves back to the beginning of the line.

```
In the line mode,
Spacebar moves to the next space or comma. Dot to the next char.
'>' To move forward 80 char or to end of line.
Backspace to back up one char. E to enter new char's at the cursor.
CR to exit enter mode, return to start of line or EDIT prompt.
D to delete from the cursor to the next space or comma.
Delete (Rub) to delete the char under the cursor.
CTRL-R to restore line and start back at the beginning.
```

Replace mode editing can be invoked by entering dot-XY at the edit prompt. This method allows easy string substitution, as in the VA FileMan line editor. Entering a question mark at the next edit prompt displays the following help:

```
In the replace/with mode,
SPECIAL <REPLACE> STRINGS:
  END    -to add to the END of a line
  ...    -to replace a line
  A...B  -to specify a string that begins with "A" and ends with "B"
  A...   -to specify a string that begins with "A" to the end of the line
CTRL-R to restore line.
```

The ACTION menu provides additional functions. Save and restore lines can be used to move lines within one routine, or from one routine to another. To copy lines to another routine first save the lines, then load and edit the other routine, and restore the lines.

When patching a routine, the ACTION menu can be used to calculate checksums. Before filing changes, the new checksum can be displayed and compared with the patch report for verification of editing. The following shows how to reach the ACTION menu with dot-A (.A).

```
Edit:  .A
Action: ?
Bytes in routine          Checksum                Restore lines
Save lines                Version #
Action: C
                    Checksum is 4971725
Action: <RET>
Edit: <RET>
```

Global nodes and local variables may also be edited with the ^%Z editor. Editing occurs directly, so the idea of filing does not apply. The editor must then be exited with a dot, not with a dot-file, since filing should not take place.

Appendix A

Appendix A

Example of a Candidate Collection Routine for Patient Merge

```
DPTDCAN  ;IHS/OHPRD/JCM - GETS POSSIBLE DUPLICATE CANDIDATES ;09/16/93/ 08:19
      ;;1.0;DPTD;;
      ;
      ; Calls: EN^DIQ1
      ;
START ;
      K ^TMP("XDRD",$J,XDRFL),DPTDCAN
      Q:$P(^DPT(XDRCD,0),U,19)
      D VALUE
      D NAME
      D SSN
      D DOB
END   D EOJ
      Q
      ;
VALUE ;
      S DIC=2,DA=XDRCD,DIQ(0)="I",DIQ="DPTDCAN",DR=".01;.03;.09"
      D EN^DIQ1 K DIC,DA,DR,DIQ
      Q
      ;
NAME  ;Get patients with the same last name and first initial
      G:DPTDCAN(XDRFL,XDRCD,.01,"I")']"" NAMEX
      S DPTDCAN("NAME")=DPTDCAN(XDRFL,XDRCD,.01,"I")
      S DPTDCAN("LNAME&FI")=$P(DPTDCAN("NAME"),",",1)_","_$E($P(DPTDCAN("NAME"
),",",2),1)_"AAA"
      S DPTDCAN("BNAME")=DPTDCAN("LNAME&FI")
      F I=0:0 S DPTDCAN("BNAME")=$O(^DPT("B",DPTDCAN("BNAME"))) Q:DPTDCAN("BNA
ME")=""!(($P(DPTDCAN("NAME"),",",1)_","_$E($P(DPTDCAN("NAME"),",",2),1)
)'=($P(DPTDCAN("BNAME"),",",1)_","_$E($P(DPTDCAN("BNAME"),",",2),1)))
D
. S DPTDCAN("BNAMEDFN")=0 F  S DPTDCAN("BNAMEDFN")=$O(^DPT("B",DPTDCAN("
BNAME"),DPTDCAN("BNAMEDFN"))) Q:DPTDCAN("BNAMEDFN")=""  S:DPTDCAN("BNAM
EDFN")'=XDRCD ^TMP("XDRD",$J,XDRFL,DPTDCAN("BNAMEDFN"))="".
QNAMEX      Q
      ;
SSN   ;Get patients with same last four digits of ssn
      G:DPTDCAN(XDRFL,XDRCD,.09,"I")']"" SSNX
      S DPTDCAN("SSN")=DPTDCAN(XDRFL,XDRCD,.09,"I")
      S DPTDCAN("L4SSN")=$E(DPTDCAN("SSN"),6,9)
      S DPTDCAN("BL4SSN")=XDRCD
      F %=0:0 S DPTDCAN("BL4SSN")=$O(^DPT("BS",DPTDCAN("L4SSN"),DPTDCAN("BL4SS
N"))) Q:'DPTDCAN("BL4SSN")  S ^TMP("XDRD",$J,XDRFL,DPTDCAN("BL4SSN"))=""
      ;
      ; Check SSNS with same first five digits
      ; Commented out the following line, is not specific enough for IHS
      ; but would be useful for the VA
      ;
      ;S DPTDCAN("F5SSN")=$E(DPTDCAN("SSN"),1,5)_"0000",DPTDCAN("5SSN")=DPTDCA
N("F5SSN") D
      . F %=0:0 S DPTDCAN("5SSN")=$O(^DPT("SSN",DPTDCAN("5SSN"))) Q:DPTDCAN("5
SSN")'=+DPTDCAN("5SSN")!($E(DPTDCAN("5SSN"),1,5)'=$E(DPTDCAN("SSN"),1,5
))  S ^TMP("DPTDCAN",$J,XDRFL,$O(^DPT("SSN",DPTDCAN("5SSN"),"")))=""
```

```
      . Q
SSNX  Q
      ;
DOB   ;Get patients with same date of birth
      G:DPTDCAN(XDRFL,XDRCD,.03,"I")']"" DOBX
      S DPTDCAN("DOB")=DPTDCAN(XDRFL,XDRCD,.03,"I")
      S DPTDCAN("BDOB")=XDRCD
      F %=0:0 S DPTDCAN("BDOB")=$O(^DPT("ADOB",DPTDCAN("DOB"),DPTDCAN("BDOB"))
) Q:'DPTDCAN("BDOB")  S ^TMP("XDRD",$J,XDRFL,DPTDCAN("BDOB"))=""
      ;
      ;Transpose day of birth and get patients with same date of birth
      ;
      S DPTDCAN("TDOB")=$E(DPTDCAN("DOB"),1,5)_$E(DPTDCAN("DOB"),7)_$E(DPTDCAN
("DOB"),6)
      S DPTDCAN("BDOB")=XDRCD
      F %=0:0 S DPTDCAN("BDOB")=$O(^DPT("ADOB",DPTDCAN("TDOB"),DPTDCAN("BDOB")
)) Q:'DPTDCAN("BDOB")  S ^TMP("XDRD",$J,XDRFL,DPTDCAN("BDOB"))=""
DOBX  Q
      ;
EOJ   ;
      K DPTDCAN,%
      Q
```

Two Examples of Duplicate Test Routines

1. Name Test Routine for a Patient Merge

```
DPTDN ;IHS/OHPRD/JCM;COMPARES NAMES; [ 06/08/92  12:14 PM ]
      ;;1.0;DPTD;;AUG 13, 1991
      ;
      ; Calls: SOU^DICM1
      ;
START ;
      D INIT
      D NAME
      I $O(^DPT(XDRCD,.01,0)) D OTHER
END   D EOJ
      Q
      ;
EN    ; EP - Entry Point for any routines comparing names
      ;
      D INIT1
      D COMPARE
      D EOJ
      Q
      ;
INIT  ;
      D EOJ
      S DPTDN("MATCH")=$P(XDRDTEST(XDRDTO),U,6)
      S DPTDN("NO MATCH")=$P(XDRDTEST(XDRDTO),U,7)
      S DPTDN=$G(XDRCD(XDRFL,XDRCD,.01,"I")),DPTDN2=$G(XDRCD2(XDRFL,XDRCD2,.01
,"I"))
      ;
INIT1 S DPTDNL=$P(DPTDN,","),DPTDNF=$P($P(DPTDN,",",2)," "),DPTDNFI=$E(DPTDNF)
      ,DPTDNM=$P($P(DPTDN,",",2)," ",2),DPTDNMI=$E(DPTDNM)
      ;
INIT2 S DPTDNL2=$P(DPTDN2,","),DPTDNF2=$P($P(DPTDN2,",",2)," "),DPTDNFI2=$E(DP
TDNF2),DPTDNM2=$P($P(DPTDN2,",",2)," ",2),DPTDNMI2=$E(DPTDNM2)
      Q
      ;
NAME  ;
      D COMPARE
      D:$O(^DPT(XDRCD2,.01,0)) OTHER2
      Q
      ;
OTHER ;
      F DPTDNO=0:0 S DPTDNO=$O(^DPT(XDRCD,.01,DPTDNO)) Q:'DPTDNO  S DPTDN=$P(^
DPT(XDRCD,.01,DPTDNO,0),U,1) S:'$D(DPTDN2) DPTDN2=XDRCD2(XDRFL,XDRCD2,.01,"I")
D INIT1,NAME
      Q
      ;
OTHER2      ;
      F DPTDNO2=0:0 S DPTDNO2=$O(^DPT(XDRCD2,.01,DPTDNO2)) Q:'DPTDNO2  S DPTDN
2=$P(^DPT(XDRCD2,.01,DPTDNO2,0),U,1) D INIT2,COMPARE
      Q
      ;
COMPARE     ;
      S:'$D(DPTDN("TEST SCORE")) DPTDN("TEST SCORE")=DPTDN("NO MATCH")
      I DPTDN=DPTDN2 S DPTDN("TEST SCORE2")=DPTDN("MATCH") G COMPAREX
```

```
      I DPTDNF=DPTDNF2,DPTDNL=DPTDNL2 S DPTDN("TEST SCORE2")=DPTDN("MATCH")*.8
  G COMPAREX
      I DPTDNFI=DPTDNFI2,DPTDNL=DPTDNL2 S DPTDN("TEST SCORE2")=DPTDN("MATCH")*
.6 G COMPAREX
      I DPTDNL=DPTDNL2 S DPTDN("TEST SCORE2")=DPTDN("MATCH")*.4 G COMPAREX
      S X=DPTDNL D SOU^DICM1 S DPTDNLS=X S X=DPTDNL2 D SOU^DICM1 S DPTDNL2S=X
      S X=DPTDNF D SOU^DICM1 S DPTDNFS=X S X=DPTDNF2 D SOU^DICM1 S DPTDNF2S=X
      I DPTDNLS=DPTDNL2S,DPTDNFS=DPTDNF2S S DPTDN("TEST SCORE2")=DPTDN("MATCH"
)*.6 G COMPAREX
      I DPTDNFS=DPTDNF2S S DPTDN("TEST SCORE2")=DPTDN("MATCH")*.2 G COMPAREX
      S DPTDN("TEST SCORE2")=DPTDN("NO MATCH")
COMPAREX    ;
      S:DPTDN("TEST SCORE2")>(DPTDN("TEST SCORE")) DPTDN("TEST SCORE")=DPTDN("
TEST SCORE2")
      K X,DPTDNLS,DPTDNL2S,DPTDNFS,DPTDNF2S,DPTDN("TEST SCORE2")
      Q
      ;
EOJ   ;
      S:$D(DPTDN("TEST SCORE")) XDRD("TEST SCORE")=DPTDN("TEST SCORE")
      K DPTDN,DPTDN2,DPTDNF,DPTDNF2,DPTDNL,DPTDNL2,DPTDNM,DPTDNM2
      K DPTDNMI,DPTDNMI2,DPTDNFI,DPTDNFI2,DPTDNO,DPTDNO2
      Q
```

2. Date of Birth test Routine for a Patient Merge

```
DPTDOB      ;IHS/OHPRD/JCM;COMPARES DATE OF BIRTHS; [ 06/08/92  12:10 PM ]
      ;;1.0;DPTD;;AUG 13, 1991
START ;
      D INIT
EN    ; EP - Entry point for comparing dates
      D COMPARE
END   D EOJ
      Q
      ;
INIT  ;
      K DPTDOB,DPTDOB2
      S DPTDOB=$G(XDRCD(XDRFL,XDRCD,.03,"I")),DPTDOB2=$G(XDRCD2(XDRFL,XDRCD2,.
03,"I"))
      S DPTDOB("MATCH")=$P(XDRDTEST(XDRDTO),U,6)
      S DPTDOB("NO MATCH")=$P(XDRDTEST(XDRDTO),U,7)
      Q
      ;
COMPARE     ;
      I DPTDOB']""!(DPTDOB2']"") G COMPAREX
      I DPTDOB=DPTDOB2 S XDRD("TEST SCORE")=DPTDOB("MATCH") G COMPAREX
      S DPTDOB("CNT")=0
      F DPTDOBI=1:1:7 Q:DPTDOB("CNT")>2  I $E(DPTDOB,DPTDOBI)'=$E(DPTDOB2,DPTD
OBI) S DPTDOB("CNT")=DPTDOB("CNT")+1
      K DPTDOBI
      S XDRD("TEST SCORE")=$S(DPTDOB("CNT")>2:DPTDOB("NO MATCH"),1:(DPTDOB("MA
TCH")*.8))
COMPAREX  Q
      ;
EOJ   ;
      K DPTDOB,DPTDOB2
      Q
```

Appendix B

Appendix B

Last Routine Change Date Recorded (User interaction and resulting output)

The following screen capture illustrates a typical user interaction and resulting output from the option Last Routine Change Date Recorded [XTVR MOST RECENT CHANGE DATE]:

```
>D ^XTVRC1A


routine(s) ?   >   XT*
searching directory ...
routine(s) ?   >   -XTIN*
routine(s) ?   >

List CHANGES since DATE:  T-100
DEVICE: HOME// <RET>  DECSERVER
.....................................................

The following routines have been logged as NEW ROUTINES since 11/15/94



No  NEW routines were logged

The following routines have logged CHANGES since 11/15/94


XTNTEG    02/23/95  11:26    2950223.101309   7.3;TOOLKIT;;Feb 23, 1995
XTNTEG0   02/23/95  11:26    2950223.101309   7.3;TOOLKIT;;Feb 23, 1995
XTNTEG01  02/23/95  11:26    2950223.101309   7.3;TOOLKIT;;Feb 23, 1995

XTLKEFOP  02/17/95  00:15    02/16/95  16:05  7.3;TOOLKIT;;Feb 23, 1995

XTSUMBLD  02/15/95  00:15    8/25/94  13:39   7.3;TOOLKIT;;Feb 23, 1995
XTVNUM    02/15/95  00:15    11/22/94  15:44  7.3;TOOLKIT;;Feb 23, 1995

XTLKMGR   02/14/95  00:15    02/13/95  11:52  7.3;TOOLKIT;;Feb 23, 1995

XTLKPST   02/11/95  00:15    FIX DD OF 8984.1, 8984.2  7.3;TOOLKIT;;Feb 23,
1995
XTVGC2    02/11/95  00:15    12/13/93  13:38  7.3;TOOLKIT;;Feb 23, 1995
XTVGC2A   02/11/95  00:15    12/13/93  15:18  7.3;TOOLKIT;;Feb 23, 1995

XTLKKWL1  01/21/95  00:15    01/20/95  10:27  7.3;TOOLKIT;;Feb 23, 1995

XTCMFILN  01/20/95  00:15    01/19/95  10:15  7.3;TOOLKIT;;Feb 23, 1995

XTRTHV    01/19/95  00:15    01/18/95  13:46  7.3;TOOLKIT;;Feb 23, 1995
```

```
XTLKDICL  01/05/95  00:15    10/11/94  14:42  7.3;TOOLKIT;;Feb 23, 1995

XTVRC1    01/05/95  00:15    12/7/93  13:56   7.3;TOOLKIT;;Feb 23, 1995

XTKERMIT  11/23/94  00:15    9/14/94  08:38   7.3;TOOLKIT;;Feb 23, 1995
XTLKTICD  11/23/94  00:15    07/22/93  15:50  7.3;TOOLKIT;;Feb 23, 1995
XTVCHG    11/23/94  00:15    2/3/93  13:45    7.3;TOOLKIT;;Feb 23, 1995

18 old routines were CHANGED

The following routines have NOT LOGGED CHANGES since 11/15/94



XTVRC1A   11/10/94  10:19    12/8/93  14:52   7.3;TOOLKIT;;Feb 23, 1995
XTLKKWL   11/10/94  10:18    07/22/93  15:46  7.3;TOOLKIT;;Feb 23, 1995

XTBASE    11/09/94  00:15    4/9/92  07:31    7.3;TOOLKIT;;Feb 23, 1995
XTEDTVXD  11/09/94  00:15    10/31/94  08:32  7.3;TOOLKIT;;Feb 23, 1995
XTER1     11/09/94  00:15    8/26/94  10:32   7.3;TOOLKIT;;Dec 06, 1994
XTER1A    11/09/94  00:15    8/19/94  13:37   7.3;TOOLKIT;;Dec 06, 1994
XTER2     11/09/94  00:15    9/10/93  12:57   7.3;TOOLKIT;;Dec 06, 1994
XTFC0     11/09/94  00:15    9/21/93  09:44   7.3;TOOLKIT;;Feb 23, 1995
XTFC1     11/09/94  00:15    9/21/93  09:46   7.3;TOOLKIT;;Feb 23, 1995
XTFCR1    11/09/94  00:15    9/21/93  09:58   7.3;TOOLKIT;;Feb 23, 1995
XTKERM1   11/09/94  00:15    8/30/94  10:52   7.3;TOOLKIT;;Feb 23, 1995
XTKERM2   11/09/94  00:15    11/8/93  11:50   7.3;TOOLKIT;;Feb 23, 1995
XTLATSET  11/09/94  00:15    11/03/94  16:32  7.3;TOOLKIT;;Feb 23, 1995
XTLKKSCH  11/09/94  00:15    07/22/93  15:45  7.3;TOOLKIT;;Feb 23, 1995
XTLKPRT   11/09/94  00:15    PRINT ROUTINE    7.3;TOOLKIT;;Feb 23, 1995
XTLKTOKN  11/09/94  00:15    07/22/93  15:51  7.3;TOOLKIT;;Feb 23, 1995
XTLKWIC   11/09/94  00:15    07/22/93  15:52  7.3;TOOLKIT;;Feb 23, 1995
XTVGC1    11/09/94  00:15    12/16/93  14:06  7.3;TOOLKIT;;Feb 23, 1995
XTVGC1A   11/09/94  00:15    12/13/93  13:45  7.3;TOOLKIT;;Feb 23, 1995
XTVGC2A1  11/09/94  00:15    5/10/93  13.06   7.3;TOOLKIT;;Feb 23, 1995
XTVRC1Z   11/09/94  00:15    9/29/92  14:50   7.3;TOOLKIT;;Feb 23, 1995
XTVRC2    11/09/94  00:15    12/7/93  15:20   7.3;TOOLKIT;;Feb 23, 1995

XTER      11/05/94  00:15    8/11/94  10:33   7.3;TOOLKIT;;Dec 06, 1994
XTER1B    11/05/94  00:15    9/9/92  15:41    7.3;TOOLKIT;;Dec 06, 1994
XTFCE     11/05/94  00:15    11/18/93  09:29  7.3;TOOLKIT;;Feb 23, 1995
XTFN      11/05/94  00:15    3/14/89  11:05   7.3;TOOLKIT;;Feb 10, 1995
XTKERM3   11/05/94  00:15    8/19/92  11:19   7.3;TOOLKIT;;Feb 23, 1995
XTKERM4   11/05/94  00:15    11/8/93  11:46   7.3;TOOLKIT;;Feb 23, 1995
XTLKKWLD  11/05/94  00:15    07/22/93  15:48  7.3;TOOLKIT;;Feb 23, 1995

XTER1A1   11/04/94  00:15    12/7/93  14:16   7.3;TOOLKIT;;Dec 06, 1994

XTRCMP    10/28/94  13:32    1/28/92  09:33   7.3;TOOLKIT;;Feb 23, 1995
XTFCR     10/28/94  13:21    9/21/93  09:53   7.3;TOOLKIT;;Feb 23, 1995

XTERPUR   09/02/94  00:15    8/26/94  14:52   7.3;TOOLKIT;;Dec 06, 1994

XTLKKWL2  06/21/94  10:47    07/22/93  15:47  7.3;TOOLKIT;;Feb 23, 1995

XTLKPACH  05/03/94  00:05    FIX DD OF 8984.1, 8984.2  7.3;TOOLKIT;;Feb 23,
1995
XTPDUTL   05/03/94  00:05    11/2/92  13:54   7.3;TOOLKIT;;Feb 23, 1995
```

```
XTFCE1    09/21/93  09:47    9/21/93  09:47   7.3;TOOLKIT;;Feb 23, 1995

XTVRCRES  09/15/93  00:05    8/24/93  14:53   7.3;TOOLKIT;;Feb 23, 1995

XTSPING   10/21/92  00:05    8/11/92  15:02   7.3;TOOLKIT;;Feb 23, 1995

XTRGRPE   10/14/92  09:25     12/21/88  14:49  7.3;TOOLKIT;;Feb 23, 1995

41  UNCHANGED routines were included

The following routines were previously LOGGED BUT NOT IN THE ACCOUNT
Routines were searched for using 2 letter namespaces from routines
originally specified.

 XTLKNTEG  XTNTEG02

2  DELETED routines identified using 2 letter namespaces input
```

Glossary

Glossary

ABBREVIATED RESPONSE	**This feature allows you to enter data by typing only the first few characters for the desired response. This feature will not work unless the information is already stored in the computer.**
ACCESS CODE	**A code that, along with the verify code, allows the computer to identify you as a user authorized to gain access to the computer. Your code is greater than six and less than twenty characters long; can be numeric, alphabetic, or a combination of both; and is usually assigned by a site manager or application coordinator . It is used by the Kernel's Sign-on/Security system to identify the user (see Verify Code).**
ALERTS	**Brief on-line notices that are issued to users as they complete a cycle through the menu system. Alerts are designed to provide interactive notification of pending computing activities, such as the need to reorder supplies or review a patient's clinical test results. Along with the alert message is an indication that the View Alerts common option should be chosen to take further action.**
ANS MUMPS	**The MUMPS programming language is a standard, that is an American National Standard (ANS). MUMPS stands for Massachusetts Utility Multi-programming System.**
ANSI	**American National Standards Institute**
APPLICATION PACKAGE	**In DHCP, software and documentation that support the automation of a service, such as Laboratory or Pharmacy within VA medical centers (see Package). The Kernel is like an operating system relative to other DHCP applications.**
APPLICATION PROGRAMMER	**The person who writes code for application packages. The Kernel provides tools to facilitate package development.**
APPLICATION PROGRAMMING INTERFACE (API)	**Programmer calls provided by the Kernel for use by application programmers. APIs allow programmers to carry out standard computing activities without needing to duplicate Kernel utilities in their own packages. APIs also further DBA goals of system integration by channeling activities, such as adding new users, through a limited number of callable entry points.**

ARRAY	**An arrangement of elements in one or more dimensions. A MUMPS array is a set of nodes referenced by subscripts which share the same variable name.**
BULLETINS	**Electronic mail messages that are automatically delivered by MailMan under certain conditions. For example, a bulletin can be set up to fire when database changes occur, such as adding a record to the file of users. Bulletins are fired by bulletin-type cross references.**
CALLABLE ENTRY POINT	**An authorized programmer call that may be used in any DHCP application package. The DBA maintains the list of DBIC-approved entry points.**
CAPACITY MANAGEMENT	**The process of assessing a system's capacity and evaluating its efficiency relative to workload in an attempt to optimize system performance. The Kernel Toolkit provides several utilities which aid in the short and long term decision process of hardware and application code optimization.** **New Capacity Management Utilities have been created to utilize VMS, MUMPS and the latest VA Kernel Utilities. These utilities sample running systems at regular intervals and store a key subset of systems metrics related to configuration, database activity, response time, CPU, memory, and I/O utilization.**
CARET	**A symbol expressed as up caret (^), left caret (<), or right caret (>). In many M systems, a right caret is used as a system prompt and an up caret as an exiting tool from an option. Also known as the up-arrow symbol or shift–6 key.**
COMMAND	**A combination of characters that instruct the computer to perform a specific operation.**
COMMON MENU	**Options that are available to all users. Entering two question marks at the menu's select prompt displays any secondary menu options available to the signed-on user along with the common options available to all users.**
COMPILED MENU SYSTEM (^XUTL GLOBAL)	**Job-specific information that is kept on each CPU so that it is readily available during the user's session. It is stored in the ^XUTL global, which is maintained by the menu system to hold commonly referenced information. The user's place within the menu trees is stored, for example, to enable navigation via menu jumping.**
CPT	**Current Procedural Terminology**

CROSS REFERENCE An indexing method whereby files can include pre-sorted lists of entries as part of the stored database. Cross references (x-refs) facilitate look-ups and reporting.

A cross reference is also referred to as an index or cross index.

DATA A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. The information you enter for the computer to store and retrieve. Characters that are stored in the computer system as the values of local or global variables. VA FileMan fields hold data values for file entries.

DATA ATTRIBUTE A characteristic of a unit of data such as length, value, or method of representation. VA FileMan field definitions specify data attributes.

DATA DICTIONARY The Data Dictionary is a global containing a description of what kind of data is stored in the global corresponding to a particular file. The data is used internally by FileMan for interpreting and processing files.

A Data Dictionary (DD) contains the definitions of a file's elements (fields or data attributes), relationships to other files, and structure or design. Users generally review the definitions of a file's elements or data attributes; programmers review the definitions of a file's internal structure.

DATABASE A set of data, consisting of at least one file, that is sufficient for a given purpose. The Kernel database is composed of a number of VA FileMan files.

DBA Database Administrator. In DHCP, the person who monitors namespacing conventions and other procedures that enable various DHCP packages to coexist within an integrated database system.

DBIA Database Integration Agreement, a formal understanding between two or more DHCP packages which describes how data is shared or how packages interact. The DBA maintains a list of DBIAs between package developers allowing the use of internal entry points or other package-specific features that are not available to the general programming public.

DBIC — **Database Integration Committee. Within the purview of the DBA, the committee maintains a list of DBIC-approved callable entry points and publishes the list on FORUM for reference by application programmers and verifiers.**

DEFAULT — **A response the computer considers the most probable answer to the prompt being given. It is identified by double slash marks (//) immediately following it. This allows you the option of accepting the default answer or entering your own answer. To accept the default you simply press the enter (or return) key. To change the default answer, type in your response.**

DELETE — **The key on your keyboard (may also be called rubout or backspace on some terminals) which allows you to delete individual characters working backwards by placing the cursor immediately after the last character of the string of characters you wish to delete. The @ sign (uppercase of the 2 key) may also be used to delete a file entry or data attribute value. The computer asks "Are you sure you want to delete this entry?" to insure you do not delete an entry by mistake.**

DELIMITER — **A special character used to separate a field, record or string. VA FileMan uses the ^ character as the delimiter within strings.**

DEVICE — **A peripheral connected to the host computer, such as a printer, terminal, disk drive, modem, and other types of hardware and equipment associated with a computer. The host files of underlying operating systems may be treated like devices in that they may be written to (e.g., for spooling).**

DEVICE HANDLER — **The Kernel module that provides a mechanism for accessing peripherals and using them in controlled ways (e.g., user access to printers or other output devices).**

DHCP — **The Decentralized Hospital Computer Program of the Veterans Health Administration (VHA), Department of Veterans Affairs (VA). DHCP software, developed by VA, is used to support clinical and administrative functions at VA Medical Centers nationwide. It is written in MUMPS and, via the Kernel, runs on all major MUMPS implementations regardless of vendor. DHCP is composed of packages which undergo a verification process to ensure conformity with namespacing and other DHCP standards and conventions.**

DICTIONARY	**A database of specifications of data and information processing resources. VA FileMan's database of data dictionaries is stored in the FILE of files (#1).**
DIFROM	**VA FileMan utility that gathers all package components and changes them into routines (namespaceI* routines) so that they can be exported and installed in another VA FileMan environment.**
DIRECT MODE UTILITY	**A programmer call that is made when working in direct programmer mode. A direct mode utility is entered at the MUMPS prompt (e.g., >D ^XUP). Calls that are documented as direct mode utilities *cannot* be used in application package code.**
DOUBLE QUOTE (")	**A symbol used in front of a Common option's menu text or synonym to select it from the Common menu. For example, the five character string "TBOX" selects the User's Toolbox Common option.**
DR STRING	**The set of characters used to define the variable DR when calling VA FileMan. Since a series of parameters may be included within quotes as a literal string, the variable's definition is often called the DR string. To define the fields within an edit sequence, for example, the programmer may specify the fields using a DR string rather than an input template.**
DUPLICATE RESOLUTION UTILITIES	**The Merge Shell was developed by the Indian Health Service (IHS) to support their Multi-Facility Integration project. Duplicate Resolution Utilities provide the functionality of combining duplicate records based on conditions established in customized applications.**
DUZ	**A local variable holding the user number that identifies the signed-on user.**
DUZ(0)	**A local variable that holds the File Manager Access Code of the signed-on user.**
ELECTRONIC SIGNATURE CODE	**A secret password that some users may need to establish in order to sign documents via the computer.**
ENTRY	**A VA FileMan record. It is uniquely identified by an internal entry number (the .001 field) in a file.**

ERROR TRAP	**A mechanism to capture system errors and record facts about the computing context such as the local symbol table, last global reference, and routine in use. Operating systems provide tools such as the %ER utility. The Kernel provides a generic error trapping mechanism with use of the ^%ZTER global and ^XTER* routines. Errors can be trapped and, when possible, the user is returned to the menu system.**
EXTRINSIC FUNCTION	**An extrinsic function is an expression that accepts parameters as input and returns a value as output that can be directly assigned.**
FIELD	**In a record, a specified area used for the value of a data attribute. The data specifications of each VA FileMan field are documented in the file's Data Dictionary. A field is similar to blanks on forms. It is preceded by words that tell you what information goes in that particular field. The blank, marked by the cursor on your terminal screen, is where you enter the information.**
FILE	**A set of related records treated as a unit. VA FileMan files maintain a count of the number of entries or records.**
FILE MANAGER (VA FILEMAN)	**The DHCP's Database Management System (DBMS). The central component of the Kernel that defines the way standard DHCP files are structured and manipulated.**
FORCED QUEUING	**A device attribute indicating that the device can only accept queued tasks. If a job is sent for foreground processing, the device rejects it and prompts the user to queue the task instead.**
FORM	**A screen-oriented display (see ScreenMan Forms).**
FORUM	**The central E-mail system within DHCP. It is used by developers to communicate at a national level about programming and other issues. FORUM is located at the Washington, DC ISC (162-2).**
FREE TEXT	**The use of any combination of numbers, letters, and symbols when entering data.**
GLOBAL VARIABLE	**A variable that is stored on disk (MUMPS usage).**

GO-HOME JUMP	**A menu jump that returns the user to the Primary menu presented at sign-on. It is specified by entering two up-arrows (^^) at the menu's select prompt. It resembles the rubber band jump but without an option specification after the up-arrows.**
HELP FRAMES	**Entries in the HELP FRAME file (#9.2) that may be distributed with application packages to provide on-line documentation. Frames may be linked with other related frames to form a nested structure.**
HELP PROCESSOR	**A Kernel module that provides a system for creating and displaying on-line documentation. It is integrated within the menu system so that help frames associated with options can be displayed with a standard query at the menu's select prompt.**
HOOK OR LINK	**Non-specific terms referring to ways in which files may be related (via pointer links) or can be accessed (via hooks).**
HOST FILE SERVER (HFS)	**A procedure available on layered systems whereby a file on the host system can be identified to receive output. It is implemented by the Device Handler's Host File Server (HFS) device type.**
HUNT GROUP	**An attribute of an entry in the DEVICE file (#3.5) that allows several devices to be used interchangeably; useful for sending network mail or printing reports. If the first hunt group member is busy, another member may stand in as a substitute.**
ICD	**International Classification of Diseases**
IDCU	**The Integrated Data Communications Utility which is a wide area network used by VA for transmitting data between VA sites.**
IHS	**Indian Health Service**
INDEX (%INDEX)	**A Kernel utility used to verify routines and other MUMPS code associated with a package. Checking is done according to current ANSI MUMPS standards and DHCP programming standards (see SAC). This tool can be invoked through an option or from direct mode (>D ^%INDEX).**
INIT	**Initialization of an application package. INIT* routines are built by VA FileMan's DIFROM and, when run, recreate a set of files and other package components.**

INTERNAL ENTRY NUMBER (IEN)	**The number used to identify an entry within a file. Every record has a unique internal entry number.**
IRM	**Information Resource Management. A service at VA medical centers responsible for computer management and system security.**
JUMP START	**A logon procedure whereby the user enters the "access code;verify code;option" to go immediately to the target option, indicated by its menu text or synonym. The jump syntax can be used to reach an option within the menu trees by entering "access;verify;^option".**
KERMIT	**A standard file transfer protocol. It is supported by the Kernel and can be set up as an alternate editor.**
KERNEL	**A set of DHCP MUMPS software routines that function as an intermediary between the host operating system and the DHCP application packages enabling packages to coexist in a standard OS-independent computing environment. The Kernel provides a standard and consistent user and programmer interface between application packages and the underlying MUMPS implementations.**
KEY	**The purpose of Security Keys is to set a layer of protection on the range of computing capabilities available with a particular software package. The availability of options is based on the level of system access granted to each user.**
KEYWORD	**A word or phrase used to call up several codes from the reference files in the LOCAL LOOKUP file (#8984.4). One specific code may be called up by several different keywords.**
LINK	**Non-specific term referring to ways in which files may be related (via pointer links). Files have links into other files.**
LOCAL LOOKUP FILE	**The file into which sites enter selected reference files to be used in the look-up process.**
MAIL MESSAGE	**An entry in the MESSAGE file (#3.9). The DHCP electronic mail system (MailMan) supports local and remote networking of messages.**
MAILMAN	**The Kernel module that provides a mechanism for handling electronic communication, whether it is user-oriented mail messages, automatic firing of bulletins, or initiation of server-handled data transmissions.**

MANAGER ACCOUNT — A UCI that can be referenced by non-manager accounts such as production accounts. Like a library, the MGR UCI holds percent routines and globals (e.g., ^%ZOSF) for shared use by other UCIs.

MENU — A list of choices for computing activity. A menu is a type of option designed to identify a series of items (other options) for presentation to the user for selection. When displayed, menu-type options are preceded by the word "Select" and followed by the word "option" as in Select Menu Management option: (the menu's select prompt).

MENU CYCLE — The process of first visiting a menu option by picking it from a menu's list of choices and then returning to the menu's select prompt. Menu Manager keeps track of information, such as the user's place in the menu trees, according to the completion of a cycle through the menu system.

MENU MANAGER — The Kernel module that controls the presentation of user activities such as menu choices or options. Information about each user's menu choices is stored in the Compiled Menu System, the ^XUTL global, for easy and efficient access.

MENU SYSTEM — The overall Menu Manager logic as it functions within the Kernel framework.

MENU TEMPLATE — An association of options as pathway specifications to reach one or more final destination options. The final options must be executable activities and not merely menus for the template to function. Any user may define user-specific menu templates via the corresponding Common option.

MENU TEXT — The descriptive words that appear when a list of option choices is displayed; specifically, the Menu Text field of the OPTION file (#19). For example, User's Toolbox is the menu text of the XUSERTOOLS option. The option's synonym is TBOX.

MENU TREES — The menu system's hierarchical tree-like structures that can be traversed or navigated, like pathways, to give users easy access to various options.

MULTI-TERM LOOK-UP (MTLU)	**Multi-Term Look-Up (MTLU) is an adaptation of a tool developed by the Indian Health Service (IHS) which was made generic by the Albany ISC. Multi-Term Look-Up provides a method of enhancing the look-up capabilities of associated VA FileMan files.**
MULTIPLE	**A multiple-valued field; a subfile. In many respects, a multiple is structured like a file.**
MUMPS (ANSI STANDARD)	**A programming language recognized by the American National Standards Institute (ANSI). The acronym MUMPS stands for Massachusetts General Hospital Utility Multi-programming System.**
NAMESPACING	**A convention for naming DHCP package elements. The DBA assigns unique character strings for package developers to use in naming routines, options, and other package elements so that packages may coexist. The DBA also assigns a separate range of file numbers to each package.**
NODE	**In a tree structure, a point at which subordinate items of data originate. A MUMPS array element is characterized by a name and a unique subscript. Thus the terms: node, array element, and subscripted variable are synonymous. In a global array, each node might have specific fields or "pieces" reserved for data attributes such as name.**
OPERATING SYSTEM (OS)	**A basic program that runs on the computer, controls the peripherals, allocates computing time to each user, and communicates with terminals.**
OPERATING SYSTEM INDEPENDENCE (OS-INDEPENDENT)	**A key goal of DHCP. An insulation from specific features of the underlying operating system that allows application packages to run in different OS environments. The Kernel provides the interface mainly with use of the ^%ZOSF global.**
OPTION	**An entry in the OPTION file (#19). As an item on a menu, an option provides an opportunity for users to select it, thereby invoking the associated computing activity. Options may also be scheduled to run in the background, non-interactively, by TaskMan.**
OPTION NAME	**The Name field in the OPTION file (#19) (e.g., XUMAINT for the option that has the menu text "Menu Management"). Options are namespaced according to DHCP conventions monitored by the DBA.**

PAC	**Programmer Access Code. An optional user attribute that may function as a second level password into programmer mode.**
PACKAGE	**The set of programs, files, documentation, help prompts, and installation procedures required for a given software application. A DHCP software environment composed of elements specified via the Kernel's PACKAGE file (#9.4). Elements include files and associated templates, namespaced routines, and namespaced file entries from the OPTION (#19), SECURITY KEY (#19.1), HELP FRAME (#9.2), BULLETIN (#3.6), and FUNCTION (#.5) files. Packages are transported using VA FileMan's DIFROM routine that creates initialization routines to bundle the files and records for export. Installing a package involves the running of the installation routines that create the required software environment. Verified packages include documentation. As public domain software, verified packages may be requested through the Freedom of Information Act (FOIA).**
PERIPHERAL DEVICE	**Any hardware device other than the computer itself (central processing unit plus internal memory). Typical examples include card readers, printers, CRT units, and disk drives.**
PHANTOM JUMP	**Menu jumping in the background. Used by the menu system to check menu pathway restrictions.**
POINTER	**A relationship between two VA FileMan files that makes navigation possible via the pointer (forward or backward).**
PRIMARY MENUS	**The list of options presented at sign-on. Each user must have a primary menu in order to sign-on and reach Menu Manager. Users are given primary menus by IRM. This menu should include most of the computing activities the user needs.**
PRODUCTION ACCOUNT	**The UCI where users log on and carry out their work, as opposed to the Manager, or Library, account.**
PROGRAMMER ACCESS	**The ability to use DHCP features reserved for programmers. Having the programmer's at-sign, when DUZ(0)=@, enables programmer access.**
PROMPT	**The computer interacts with the user by issuing questions called *prompts*, to which the user issues a response.**

PROTOCOL — An entry in the PROTOCOL file (#101). Used by the Order Entry/Results Reporting (OE/RR) package to support the ordering of medical tests and other activities. The Kernel includes several protocol-type options for enhanced menu displays within the OE/RR package.

QUEUING — Requesting that a job be processed in the background rather than in the foreground within the current session. Jobs are processed sequentially (first-in, first-out). The Kernel's Task Manager handles the queuing of tasks.

QUEUING REQUIRED — An option attribute that specifies that the option must be processed by TaskMan (the option can only be queued). The option may be invoked and the job prepared for processing, but the output can only be generated during the specified time periods.

RECORD — A set of related data treated as a unit. An entry in a VA FileMan file constitutes a record. A collection of data items that refer to a specific entity (e.g., in a name-address-phone number file, each record would contain a collection of data relating to one person).

RESOURCE — A method that enables sequential processing of tasks. The processing is accomplished with a RES device type designed by the application programmer and implemented by IRM. The process is controlled via the RESOURCE file (#3.54).

RETURN — On the computer keyboard, the key located where the carriage return is on an electric typewriter. It is used in DHCP to terminate "reads" and is symbolized by <RET>.

ROUTINE — A program or a sequence of instructions called by a program, that may have some general or frequent use. MUMPS routines are groups of program lines which are saved, loaded, and called as a single unit via a specific name.

RUBBER BAND JUMP — A menu jump used to go out to an option and then return, in a bouncing motion. The syntax of the jump is two up-arrows followed by an option's menu text or synonym (e.g., ^^Print Option File). If the two up-arrows are not followed by an option specification, the user is returned to the primary menu (see Go-home Jump).

SAC	**Standards and Conventions. Through a process of verification, DHCP packages are reviewed with respect to SAC guidelines as set forth by the Standards and Conventions Committee (SACC). Package documentation is similarly reviewed in terms of standards set by the Documentation Standards and Conventions Committee (DSCC).**
SACC	**DHCP's Standards and Conventions Committee. This Committee is responsible for maintaining the document called SAC.**
SCHEDULING OPTIONS	**This is a technique of requesting that TaskMan run an option at a given time, perhaps with a given rescheduling frequency, such as once per week.**
SCREENMAN FORMS	**A screen-oriented display of fields, for editing or simply for reading. VA FileMan's Screen Manager is used to create forms that are stored in the FORM file (#.403) and exported with a package. Forms are composed of blocks [stored in the BLOCK file (#.404)] and can be regular, full screen pages or smaller, pop-up pages for multiples.**
SECONDARY MENUS	**Options assigned to individual users to tailor their menu choices. If a user needs a few options in addition to those available on the Primary menu, the options can be assigned as secondary options. To facilitate menu jumping, secondary menus should be specific activities, not elaborate and deep menu trees.**
SECURITY KEY	**The purpose of Security Keys is to set a layer of protection on the range of computing capabilities available with a particular software package. The availability of options is based on the level of system access granted to each user.**
SERVER	**An entry in the OPTION file (#19). An automated mail protocol that is activated by sending a message to a server at another location with the "S.server" syntax. A server's activity is specified in the OPTION file (#19) and can be the running of a routine or the placement of data into a file.**
SET OF CODES	**Usually a preset code with one or two characters. The computer may require capital letters as a response (e.g., M for male and F for female). If anything other than the acceptable code is entered, the computer rejects the response.**

SHORTCUT — A word used to call up one specific code from the reference files in the LOCAL LOOKUP file (#8984.4).

SIGN-ON/SECURITY — The Kernel module that regulates access to the menu system. It performs a number of checks to determine whether access can be permitted at a particular time. A log of sign-ons is maintained.

SITE MANAGER/ IRM CHIEF — At each site, the individual who is responsible for managing computer systems, installing and maintaining new modules, and serving as liaison to the ISCs.

SPECIAL QUEUING — An option attribute indicating that TaskMan should automatically run the option whenever the system reboots.

SPOOLER — An entry in the DEVICE file (#3.5). It uses the associated operating system's spool facility, whether it is a global, device, or host file. The Kernel manages spooling so that the underlying OS mechanism is transparent. In any environment, the same method can be used to send output to the spooler. The Kernel subsequently transfers the text to the ^XMBS global for subsequent despooling (printing).

Spooling (under any system) provides an intermediate storage location for files (or program output) for printing at a later time.

SUBSCRIPT — A symbol that is associated with the name of a set to identify a particular subset or element. In MUMPS, a numeric or string value that: Is enclosed in parentheses, is appended to the name of a local or global variable, and identifies a specific node within an array.

SYNONYM — A field in the OPTION file (#19). Options may be selected by their menu text or synonym (see Menu Text).

In the case of Multi-Term Look-Up (MTLU), it is a word used to expand the call-up capability of existing terms in the LOCAL LOOKUP file (#8984.4).

TASKMAN — The Kernel module that schedules and processes background tasks (also called Task Manager).

TEMPLATES — In VA FileMan, a means of storing report formats, data entry formats, and sorted entry sequences. A template is a permanent place to store selected fields for use at a later time. Edit sequences are stored in the INPUT TEMPLATE file (#.402), print specifications are stored in the PRINT TEMPLATE file (#.4), and search or sort specifications are stored in the SORT TEMPLATE file (#.401).

TIMED-READ — The amount of time the Kernel waits for a user response to an interactive READ command before starting to halt the process (times out).

TOOLKIT — Toolkit is a robust set of tools developed to aid the Decentralized Hospital Computer Program (DHCP) development community, and Information Resources Management (IRM), in writing, testing, and analysis of code. It is a set of generic tools that are used by developers, documenters, verifiers, and packages to support distinct tasks.

Toolkit provides utilities for the management and definition of development projects. Many of these utilities have been used by the San Francisco Information Systems Center (ISC) for internal management and have proven valuable. Toolkit also includes tools provided by other ISCs based on their proven utility.

TREE STRUCTURE — A term sometimes used to describe the structure of a MUMPS array. This has the same structure as a family tree, with the root at the top, and ancestor nodes arranged below, according to their depth of subscripting. All nodes with one subscript are at the first level, all nodes with two subscripts at the second level, and so on.

TRIGGER — A type of VA FileMan cross reference. Often used to update values in the database given certain conditions (as specified in the trigger logic). For example, whenever an entry is made in a file, a trigger could automatically enter the current date into another field holding the creation date.

TYPE-AHEAD — A buffer used to store characters that are entered before the corresponding prompt appears. Type-ahead is a shortcut for experienced users who can anticipate an expected sequence of prompts.

UCI — User Class Identification, a computing area. The MGR UCI is typically the Manager's account, while VAH or ROU may be Production accounts.

UP-ARROW JUMP — In the menu system, entering an up-arrow (^) followed by an option name accomplishes a jump to the target option without needing to take the usual steps through the menu pathway.

USER ACCESS — This term is used to refer to a limited level of access to a computer system which is sufficient for using/operating a package, but does not allow programming, modification to data dictionaries, or other operations that require programmer access. Any option, for example, can be locked with the key XUPROGMODE, which means that invoking that option requires programmer access.

The user's access level determines the degree of computer use and the types of computer programs available. The Systems Manager assigns the user an access level.

USER INTERFACE — The way the package is presented to the user such as issuing of prompts, help messages, menu choices, etc. A standard user interface can be achieved by using VA FileMan for data manipulation, the menu system to provide option choices, and VA FileMan's Reader, the ^DIR utility, to present interactive dialogue.

VA FILEMAN — A set of programs used to enter, maintain, access, and manipulate a database management system consisting of files. A package of on-line computer routines written in the MUMPS language which can be used as a stand-alone database system or as a set of application utilities. In either form, such routines can be used to define, enter, edit, and retrieve information from a set of computer stored files.

VARIABLE — A character, or group of characters, that refer to a value. MUMPS recognizes three types of variables:

1. local variables
2. global variables
3. special variables

Local variables exist in a partition of main memory and disappear at sign-off. A global variable is stored on disk, potentially available to any user. Global variables usually exist as parts of global arrays. The term "global" may refer either to a global variable or a global array. A special variable is defined by systems operations (e.g., $TEST).

VENDOR INDEPENDENCE — **A goal of DHCP: to develop a system that does not assume the existence of a particular hardware/software platform supplied by a particular vendor. (See Operating System Independence.)**

VERIFICATION — **A process of DHCP package review carried out by technical staff not directly involved in the development of the package. Software and associated documentation are reviewed in terms of the *Programming Standards and Conventions (SAC)*.**

VERIFY CODE — **The Kernel's Sign-on/Security system uses the verify code to validate the user's identity. This is an additional security precaution used in conjunction with the Access Code. Like the Access Code, it is also 6 to 20 characters in length. If entered incorrectly, it does not allow the user to access the computer. To protect the user, both codes are invisible on the terminal screen.**

Z EDITOR (^%Z) — **A Kernel tool used to edit routines or globals. It can be invoked with an option, or from direct mode after loading a routine with >X ^%Z.**

ZOSF GLOBAL (^%ZOSF) — **The MUMPS OPERATING SYSTEM File (#.7) is a Manager account global distributed with the Kernel to provide an interface between DHCP application packages and the underlying operating system. This global is built during Kernel installation when running the manager setup routine (ZTMGRSET). The nodes of the global are filled-in with operating system-specific code to enable interaction with the operating system. Nodes in the ^%ZOSF global may be referenced by programmers so that separate versions of the package need not be written for each operating system (see Operating System Independence).**

Index

Index

A

Accumulate Globals for Package option 194
ACTION menu 215
Add Entries To Look-Up File option 12, 21, 23
Add Verified Duplicate Pair option 75
Add/Modify Utility option 12, 21, 25
ALTERNATE EDITOR file 209
AM MSM RTHIST Task Option 133
Application Utilities menu 15
Auto Purge of CM Data 134
Automatically Merge Already Verified Duplicates
  Example 83
  option 72, 83
Ave. %CPU & %DISK Graph 150
Ave. Response Time Graph 151

B

Bernstein Response Time Reports menu option 127
Bernstein RT Statistics (detailed) [XUCMBR2] 127
Build an 'NTEG' Routine for a Package option 198

C

Calculate and Show Checksum Values option 195
Callable Entry Points
  Kermit 211
  RECEIVE^XTKERMIT 211
  SEND^XTKERMIT 211
  T0^%ZOSV Start RT Measure 173
  T1^%ZOSV Stop RT Measure 174
  XRT0 Output Variable, Start Time 173
  XRTN Input Variable, Routine Name 174
  XTLKKWL 39
Candidate Collection Routine for Patient Merge
  Example 219
Candidate Collection, Selecting Fields to Compare in 91
Capacity Management
  Capacity Management menu
    Move Host File to MailMan option 107
    Response Time Log Options 107
    VAX/ALPHA Capacity Management menu 107
  Direct Mode Utility, Resource Usage
    D ZHDIF^%ZOSV 174
  Hardware Performance Summary
    Example 117
  MSM Capacity Management Manager's Menu
    CM Reports Menu 129, 135
      Ave. %CPU & %DISK Graph 150
      Ave. Response Time Graph 151
      CPU/DISK Utilization Report (By Date/VG) 135, 136
      CPU/DISK Utilization Report (By VG/Date) 143
      Global Reference Report (By Date/VG) 137, 138
      Global Reference Report (By VG/Date) 144, 145
      Response Time Report (By Date/VG) 139
      Response Time Report (By VG/Date) 146
      Routine CMNDS/GREF Report (By Date/VG) 140, 141

Routine CMNDS/GREF Report (By VG/Date) 147, 148
System Statistical Report (By Date/VG) 142
System Statistical Report (By VG/Date) 149
MSM Site Parameters Enter/Edit Menu 131
options 129, 130
Performance Assurance menu
Compute New Local References option 103
Edit Days to Compute Reference Ranges option
Edit VMS Disk Space Threshold option 102
Edit Volume Set Threshold option 102
Enable Alerts for Selected Metrics option 104
Performance Analysis option 105
Performance Monitor
Configuring 112, 131
Resource Usage
Date Range 154
Devices 154
Host File Server (HFS) Device 154
LOG RESOURCE USAGE? field 153
Measure Resource Consumption by Package 153
Queuing 154
^XTMP Global 155, 158, 166
Response Time Log Options 169
Copy RT Raw Data to FM File option 170
Destroy FM Copy of Raw RT Data option 170
Enable/Disable RT Logging option 169
Graphic RT Report Print option 170
Kill Raw RT Data, Save Means option 170
Long RT Report Print option 170
Multiday RT Averages option 170
Print RT Report option 170
Response Time Measures 169
^%ZRTL global 171, 174
^%ZRTL(1, RESPONSE TIME (3.091)
^%ZRTL(2, RT DATE_UCI,VOL 171
^%ZRTL(4, RT RAWDATA 171
Callable Entry Points
T0^%ZOSV Start RT Measure 173
T1^%ZOSV Stop RT Measure 174
XRT0 Output Variable, Start Time 173
XRTN Input Variable, Routine Name 174
Logging is Enabled 169
MUMPS Read 169
Performance Problems 169
Response Time 169, 173
RT logging 173, 174
System Performance 169
User Termination 169
XRTL variable 173
System Performance Summary
Example 117
VAX/ALPHA Performance Monitor menu
Enable/Disable VPM option 112
Manual Purge of VPM Data option 112
Resource Usage Menu
Enable/Disable Collection of Resource Usage Data
Example, Disable collection of data (Queued for background processing) 168
Example, Enable collection of data (Queued for background processing) 167
option 167
Kill Raw Resource Usage Data

Example, Live execution 166
option 166
options 155
Print Formatted Report (Table/Graph)
Example, Graph format subtotaled by node (Live execution) 165
Example, Table format with subtotals printed by node and cumulative station totals (Live execution) 162
Example, Table format without subtotals (Live execution) 163
option 161
Sort Raw Resource Usage Data
Example, Live execution 159
Example, Live execution with output of sorted raw data 160
Example, Queued for background processing 159
option 158
Write Raw Resource Usage Data
Example, Live execution 156
Example, Queued for background processing 157
option 155
Setup Performance Monitor option 112
VPM Reports option 115
VPM Reports menu
Bernstein Response Time Reports menu option 127
CPU Modes/Compute States option 125
Disk Drive Raw Data Statistics menu 128
Graph Workday Averages for Selected Metric option 128
List Raw RTHIST Data for a Range of Dates option 126
List Raw System Data option 126
List Volume Set Information option 127
List Workday Averages for Selected Metric(s) option 127
Locking Data option 124
Raw Paging/BIO/DIO/FLS/MLS option 125
Check Pair of Records to see if Duplicates
Example 74
option 73
Checksum 215
CHECK^XTSUMBLD 195
CM DAILY STATISTICS file 109
CM DISK DRIVE RAW DATA file 115
CM METRICS file 103, 110
CM METRICS List 110
CM NODENAME RAW DATA file 115, 124
CM SITE PARAMETERS file 107
Compare Routines on Tape to Disk option 186
Compare Two Routines option 185
Compute New Local References option 103
Configuring the MPM 131
Control File
(See also DUPLICATE RESOLUTION file) 53
Copy RT Raw Data to FM File option 170
CPU Modes/Compute States option 125
CPU/DISK Utilization Report (By Date/VG) 135, 136
CPU/DISK Utilization Report (By VG/Date) 143
Customized Merge 53, 87

D

Date of Birth test Routine for a Patient Merge
Example 223

DATE/VG MSM CM Reports 135
Delete Entries From Look-Up option 12, 21, 22
Delete Routines option 186
Destroy FM Copy of Raw RT Data option 170
Device Chart 16
DEVICE file 107
Direct Mode Utilities
>D ^%ZTER 196
>D ^XTER 196
>D ^XTERPUR 196
>D ^XTNTEG 197
>D ^%G (OS-specific) 201, 203
>D ^%INDEX 179, 189, 199
>D ^%RR (OS-specific) 186, 190
>D ^%RS (OS-specific) 187, 190
>D ^%ZTER 199
>D ^%ZTP1 185, 189
>D ^%ZTPP 185, 189
>D ^%ZTRDEL 186, 190
>D CHECK^XTSUMBLD 195, 199
>D MAIL1^XTCMFILN 107
>D nsNTEG 197, 199
>D ONE^nsNTEG 197, 199
>D TAPE^XTRCMP 186, 190
>D ^XINDEX 199
>D ^XTBASE 202, 203
>D ^XTCMFILN 107
>D ^XTER 199
>D ^XTERPUR 199
>D ^XTFCE 178, 189
>D ^XTFCR 178, 189
>D ^XTLKKWL 39
>D ^XTRCMP 186, 189
>D ^XTRGRPE 184, 189
>D ^XTVCHG 184, 189
>D ^XTVNUM 185, 189
>X ^%Z 184, 189
Disk Drive Raw Data Statistics menu 128
Display Search Status
Example 56
option 55
DK^XTLKMGR 43
DLL^XTLKMGR 44
DSH^XTLKMGR 44
DSY^XTLKMGR 44
Duplicate Checker, How to check a pair of records using the. 73
Duplicate Checking Algorithm 53
Duplicate Pairs, Duplicate Resolution Utilities
How to Verify Duplicate Pairs 63
Duplicate Pairs, How to Verify 63
DUPLICATE RECORD file 53, 54, 63, 66, 72, 73, 75, 77, 78, 79, 81, 85, 86, 87, 88, 89, 91, 94
Duplicate Records 53
DUPLICATE RESOLUTION file 53, 72, 90, 92, 94
Duplicate Resolution System menu
Manager Utilities menu 54, 83
Operations menu 54, 55
options 54
Utilities menu 54, 73
Duplicate Resolution Utilities
Add Verified Duplicate Pair option 75
Automatically Merge Already Verified Duplicates
Example 83
option 72, 83
Candidate Collection, Selecting Fields to Compare in 91
Check Pair of Records to see if Duplicates
Example 74
option 73
Control File
(See also DUPLICATE RESOLUTION file) 53
Customized Merge 53, 87
Display Search Status
Example 56
option 55
Duplicate Checking Algorithm 53
DUPLICATE RECORD file 53, 54, 63, 66, 72, 73, 75, 77, 78, 79, 81, 85, 86, 87, 88, 91, 94
Duplicate Records 53
DUPLICATE RESOLUTION file 53, 72, 90, 92, 94
Duplicate Threshold% 53, 85, 94
Edit Duplicate Record Status
Example 77
option 77

Edit Duplicate Resolution File
Example 85
option 85
Find Potential Duplicates for an Entry in a File
Example 75
option 75
Manager Utilities menu
AUTO Automatically Merge Already Verified Duplicates option 72, 83
FILE Edit Duplicate Resolution File option 85
PRGE Purge Duplicate Record File option 86
Merge (Ready to Merge) Verified Duplicates option 72
Merge Capability, Developing 87
Merge Process 53, 71
Merge Process, Interactive 71
Merge Selected Verified Duplicate Pair option 72
Merge, Customized 53
Merged-From Record 53
Merged-To Record 53
Operations menu
DSS Display Search Status option 55
MVD Merge (Ready to Merge) Verified Duplicates option 72
SPD Verify Selected Potential Duplicate Pair option 66
SRCH Start/Halt Duplicate Search option 57
SVD Merge Selected Verified Duplicate Pair option 72
VPD Verify Potential Duplicates option 63
Potential Duplicate Pairs 53
POTENTIAL DUPLICATE THRESHOLD% 53, 85, 94
Potential Duplicates 53, 85, 94
Print List of File Duplicates
Example 79
option 79
Purge Duplicate Record File
Example 86
option 86
Selecting Fields to Compare in Candidate Collection 91
Start or Halt a Search for Duplicate Records 57
Start/Halt Duplicate Search
Example, Halting a search 60
Example, Starting a search 58
option 57
Tally STATUS and MERGE STATUS fields
Example 81
Tally STATUS and MERGE STATUS fields option 81
Utilities menu
ADD Add Verified Duplicate Pair option 75
CHCK Check Pair of Records to see if Duplicates option 73
EDIT Edit Duplicate Record Status option 77
FIND Find Potential Duplicates for an Entry in a File option 75
PRNT Print List of File Duplicates option 79
TSF Tally STATUS and MERGE STATUS fields option 81
VIEW View Duplicate Record Entries
option 78
Verified Duplicates 53, 66
Verified Non-Duplicates 53, 66
Verify Potential Duplicates
Example 64
option 63
Verify Selected Potential Duplicate Pair
Example 66
option 66
View Duplicate Record Entries
Example 78
option 78
Duplicate Resolution Utilities, 89
Duplicate Search, Duplicate Resolution Utilities
Start/Halt Duplicate Search option 57
Duplicate Test Routines

Examples 221
Duplicate Threshold% 53, 85, 94

E

Edit Days to Compute Reference Ranges option
Edit Duplicate Record Status
Example 77
option 77
Edit Duplicate Resolution File
Example 85
option 85
Edit Kermit Holding File option 206
Edit Verification Package File option 194
Edit VMS Disk Space Threshold option 102
Edit Volume Set Threshold option 102
Editing in Line Mode, Help 214
Enable Alerts for Selected Metrics option 104
Enable/Disable Collection of Resource Usage Data
Example, Disable collection of data (Queued for background processing) 168
Example, Enable collection of data (Queued for background processing) 167
option 167
Enable/Disable RT Logging option 169
Enable/Disable VPM option 112
Error Log 196

F

File Merge Capability, Developing 87
FileMan look-ups and MTLU 39
Find Potential Duplicates for an Entry in a File
Example 75
option 75
First Line Routine Print option 185
Flow Chart Entire Routine option 178
Flow Chart from Entry Point option 178

G

%G 201
%GL 201
Global Compare for Selected Package option 194
Global Reference Report (By Date/VG) 137, 138
Global Reference Report (By VG/Date) 144, 145
Graph Workday Averages for Selected Metric option 128
Graphic RT Report Print option 170
GRAPHS MENU MSM CM Reports 150
Group Routine Edit option 184

H

Hardware Performance Summary
Example 117
Help
Line Mode Editing 214
HFS 154
How to Configure the MPM 131

I

Implementation of MTLU 35
%INDEX of Routines option 179
%INDEX Utility 179, 180, 199
Input Routines option 186

K

Kermit
Callable Entry Points 211
Kermit as an Alternate Editor 205
Kermit file transfer protocol 205
Macintosh steps 205
KERMIT HOLDING file 206

Kermit Menu 206, 209
Edit Kermit Holding File option 206
Receive Kermit File option 207
Send Kermit File option 207
KERNEL SITE PARAMETERS file 153
Key Word In Context (KWIC) 13, 35
Keywords, Multi-Term Look-Up (MTLU) 11, 12, 25, 41, 43
Associated with a Single Term and Multiple Terms 14
Example 33
option 29
Kill Raw Resource Usage Data
Example, Live execution 166
option 166
Kill Raw RT Data, Save Means option 170
KWIC 13, 35
K^XTLKMGR 41

L

Last Routine Change Date Recorded option 193, 227
Line Mode Editing Help 214
List Global option 201
List Raw RTHIST Data for a Range of Dates option 126
List Raw System Data option 126
List Routines option 185
List Volume Set Information option 127
List Workday Averages for Selected Metric(s) option 127
LKUP^XTLKMGR 37, 39, 45
LOCAL KEYWORD file 12, 14, 21, 22, 26, 41, 43
LOCAL LOOKUP file 11, 12, 17, 19, 21, 23, 25, 37, 39, 41, 43, 44, 45
LOCAL SHORTCUT file 12, 13, 14, 17, 21, 22, 42, 44
LOCAL SYNONYM file 12, 13, 14, 21, 26, 42, 44
Locking Data option 124
LOG RESOURCE USAGE? field 153
Logging is Enabled 169
Long RT Report Print option 170
L^XTLKMGR 43

M

Manual Purge of VPM Data option 112
Merge (Ready to Merge) Verified Duplicates option 72
Merge Capability, Duplicate Resolution Utilities
Developing 87
Merge Process 53, 71
Merge Process, Interactive 71
Merge Process, Verified Duplicates 71
Merge Routines 53
Merge Selected Verified Duplicate Pair option 72
Merge Verified Duplicates, Duplicate Resolution Utilities
Merge Process 71
Merge, Customized 53
Merging of Duplicates 53
Morning RTHIST Data Capture 133
Move Host File to MailMan option 107
MPM Schedule/Unschedule options 133
MPM, How to configure the 131
MSM Capacity Management Manager's Menu
options 129, 130
MSM RTHIST REPORT DATA file 129
MSM RTHIST SITE file 129
MSM Site Parameters Enter/Edit Menu 131
Multi-Term Look-Up (MTLU) 12
Add Entries To Look-Up File
Example 25
IRM/Developer Utility 12, 21, 23
option 12, 21, 23
Set Entries in the LOCAL LOOKUP file 21, 23
XTLKZMGR Security Key 12, 21, 23
Add/Modify Utility
Examples 33
Keywords example 33

Keywords option 12, 25, 29
option 21, 25
Shortcuts example 33
Shortcuts option 12, 25
Synonyms example 34
Synonyms option 12, 25, 30
Callable Entry Point
XTLKKWL 39
Delete Entries From Look-Up
Example 22
IRM/Developer Utility 12
option 12, 21, 22
XTLKZMGR Security Key 12
Direct Mode Utilities
>D ^XTLKKWL 39
Enhanced API
DK^XTLKMGR 43
DLL^XTLKMGR 44
DSH^XTLKMGR 44
DSY^XTLKMGR 44
K^XTLKMGR 41
LKUP^XTLKMGR 45
L^XTLKMGR 43
SH^XTLKMGR 42
SY^XTLKMGR 42
Example 18
Functional Description 12
Keywords 11, 25
Associated with a Single Term and Multiple Terms 14
Example 33
option 29
Lexical Variants 13
LOCAL KEYWORD file 12, 14, 21, 22, 26, 41, 43
LOCAL LOOKUP file 11, 12, 17, 19, 21, 23, 25, 37, 39, 41, 43, 44, 45
LOCAL SHORTCUT file 12, 13, 14, 17, 21, 22, 42, 44
LOCAL SYNONYM file 12, 13, 14, 21, 26, 42, 44
Look-up, How to Request a 13
Look-ups on Database Files 13
MTLU and FileMan look-ups 39
MTLU and VA FileMan Supported Calls 39
MTLU, How to Override FileMan look-ups and MTLU 39
Multi-Term Lookup (MTLU) option 12, 17
Multi-Term Lookup (MTLU) Main Menu
Add Entries To Look-Up File option 12, 21, 23
Add/Modify Utility option 12
Keywords option 12
Shortcuts option 12
Synonyms option 12
Delete Entries From Look-Up option 12
Multi-Term Lookup (MTLU) option 12, 17
Print Utility option 12, 19
Utilities for MTLU option 21
Add Entries To Look-Up File option 21, 23
Add/Modify Utility option 21, 25
Examples 33
KE Keywords 29
SY Synonyms 30
Delete Entries From Look-Up option 21, 22
Multi-Term Lookup (MTLU) Main Menu options 15, 21
Print Utility
Example 20
option 12, 19
Shortcuts 11, 25
Example 33
Point to a Single Word or Phrase 13
Site Implementation 35
Standard Device Chart 16
Synonyms 11, 25
Associated with Multiple Terms 13
Example 34
Multiple Tokens 13
option 30
Utilities for MTLU option
Add Entries To Look-Up File option
Example 25
Add/Modify Utility option
Example, Keywords 33
Example, Shortcuts 33

Example, Synonyms 34
Delete Entries From Look-Up option
Example 22
Multi-Term Lookup (MTLU) option 17
Multiday RT Averages option 170
MUMPS error 179
MUMPS Read 169

N

Name Test Routine for a Patient Merge
Example 221
New Fields 114
Nodename Average by Day of Week [XUCMBR2C] 127
NTEG 197, 198
Number Base Changer option <Locked with XUPROGMODE> 202

O

Operations Management menu 197
Output Routines option 187

P

Performance Analysis option 105
Performance Monitor 112, 131
Performance Problems 169
PM MSM RTHIST Task Option 133
Potential Duplicate Pairs 53
POTENTIAL DUPLICATE THRESHOLD% 53, 85, 94
Print Formatted Report (Table/Graph)
Example, Graph format subtotaled by node (Live execution) 165
Example, Table format with subtotals printed by node and cumulative station totals (Live execution) 162
Example, Table format without subtotals (Live execution) 163
option 161
Print List of File Duplicates
Example 79
option 79
Print RT Report option 170
Print Utility, MTLU
Example 20
option 12, 19
Producing Reports, Searches, and Statistics Through Standardized Encoding of Diagnoses and Procedures 11
Program Integrity Checker option 197
Programmer Options menu 177, 195, 201
Build an 'NTEG' Routine for a Package option 198
Calculate and Show Checksum Values option 195
List Global option 201
List Global option <Locked with XUPROGMODE> 201
Number Base Changer option 202
Purge Duplicate Record File
Example 86
option 86

R

Raw Paging/BIO/DIO/FLS/MLS option 125
Receive Kermit File option 207
Resource Consumption Measured by Package 153
Resource Usage Menu options 155
Resource Usage, Capacity Management 153
Response Time 169
Response Time Log Options menu 107
Response Time Report (By Date/VG) 139
Response Time Report (By VG/Date) 146
Routine Changes File 192
Routine CMNDS/GREF Report (By Date/VG) 140, 141

Routine CMNDS/GREF Report (By VG/Date) 147, 148
Routine Compare - Current with Previous option 192, 193
Routine Compare Utility 192
Routine Edit option 184
Routine Editor 213, 215
Routine Management Menu 197
Routine Tools menu
%INDEX of Routines option 179
Compare Routines on Tape to Disk option 186
Compare Two Routines option 185
Delete Routines option 186
First Line Routine Print option 185
Flow Chart Entire Routine option 178
Flow Chart from Entry Point option 178
Group Routine Edit option 184
Input Routines option 186
List Routines option 185
Output Routines option 187
Routine Edit option 184
Variable Changer option 184
Version Number Update option 185
%RR 186
%RS 186, 187
RT logging 173
RTHIST 112, 115, 117, 126, 129, 134, 171

S

Search Status option, Display the 55
Search Status, Duplicate Resolution Utilities
Display Search Status option 55
Selecting Fields to Compare in Candidate Collection, Duplicate Resolution Utilities 91
Send Kermit File option 207
Setup Performance Monitor option 112
Shortcuts, Multi-Term Look-Up (MTLU) 11, 12, 25
Example 33, 42, 44
Point to a Single Word or Phrase 13
SH^XTLKMGR 42
Site/Event Rate Summary [XUCMBR2A] 128
Sort Raw Resource Usage Data
Example, Live execution 159
Example, Live execution with output of sorted raw data 160
Example, Queued for background processing 159
option 158
Standard Device Chart 16
Start or Halt a Search for Duplicates Within a File 57
Start/Halt Duplicate Search
Example, Halting a search 60
Example, Starting a search 58
option 57
Synonyms, Multi-Term Look-Up (MTLU) 11, 12, 25, 42, 44
Associated with Multiple Terms 13
Example 34
Multiple Tokens 13
option 30
System Performance 169
System Performance Summary
Example 117
System Statistical Report (By Date/VG) 142
System Statistical Report (By VG/Date) 149
SY^XTLKMGR 42

T

T0^%ZOSV
Start RT Measure 173
T1^%ZOSV
Stop RT Measure 174
Tally STATUS and MERGE STATUS fields
Example 81
option 81
TAPE^XTRCMP 186
Tasked CM File Update 134
Tokenizing Routine 13
Two Standard Deviation Rule 101

U

UNDO Edits (Restore to Older Version of Routine) option 193
Update with Current Routines option 192, 193
User Termination 169
Utilities For MTLU option 21

V

VA Programming Standards and Conventions (SAC) 179, 199
Variable Changer option 184
VAX/ALPHA Capacity Management menu 107
VAX/ALPHA Performance Monitor (VPM) 109
Verified Duplicates, Duplicate Resolution Utilities 53, 66
Verified Non-Duplicates, Duplicate Resolution Utilities 53, 66
Verifier Tools Menu 192
  Accumulate Globals for Package option 194
  Edit Verification Package File option 194
  Global Compare for Selected Package option 194
  Last Routine Change Date Recorded option 193
  Routine Compare - Current with Previous option 192, 193
  UNDO Edits (Restore to Older Version of Routine) option 193
  Update with Current Routines option 192, 193
Verify Potential Duplicates
  Example 64
  option 63
Verify Selected Potential Duplicate Pair
  Example 66
  option 66
Version Number Update option 185
VG/DATE MSM CM Reports 143
View Duplicate Record Entries
  Example 78
  option 78
VMS monitor 115
VPM Reports option 115
VPM Schedule/Unschedule options 114

W

Write Raw Resource Usage Data
  Example, Live execution 156
  Example, Queued for background processing 157
  option 155

X

^XINDEX 182
XRTL variable 169, 173
XTBASE 202
XTER 196
XTERPUR 196
^XTLKDICL 13, 37, 43, 45
XTLKER() array 41
^XTLKMGR 41, 42
XTLKTOKN 13
^XTLKWIC 35
XTLKZMGR 12, 21
^XTMP Global 155, 158, 166
XTRCMP 186
XTSUMBLD 195
XTV ROUTINE CHANGES file 192
XTV VERIFICATION PACKAGE file 194
XTVCHG 184
XTVNUM 185
XUCM TASK NIT 115, 117
XUCM TASK VPM 115
XUGET 197
XUMGR key 191
^XUP 196
XUPROG key 177, 186, 191, 201
XUPROGMODE key 177, 184, 185, 186, 191, 196, 201, 202
XURTLC 171
XURTLK 171

Z

^%Z Editor 184, 213, 215
^%Z Global 213
^%ZOSV 170, 174
^%ZRTL 169, 170, 171, 174
^%ZRTL(1, RESPONSE TIME (3.091)
^%ZRTL(2, RT DATE_UCI,VOL 171
^%ZRTL(4, RT RAWDATA 171
%ZTER 196
%ZTP1 185
%ZTPP 185
%ZTRDEL 186

Options

Options

[XDR ADD VERIFIED DUPS] 75
[XDR AUTO MERGE] 72, 83
[XDR CHECK PAIR] 73
[XDR DISPLAY SEARCH STATUS] 55
[XDR EDIT DUP RECORD STATUS] 77
[XDR EDIT DUP RESOLUTION FILE] 85
[XDR FIND POTENTIAL DUPLICATES] 75
[XDR MAIN MENU] 54
[XDR MANAGER UTILITIES] 54
[XDR MERGE READY DUPLICATES] 72
[XDR MERGE SELECTED PAIR] 72
[XDR OPERATIONS MENU] 54
[XDR PRINT LIST] 79
[XDR PURGE] 86
[XDR SEARCH ALL] 57
[XDR TALLY STATUS FIELDS] 81
[XDR UTILITIES MENU] 54
[XDR VERIFY ALL] 63
[XDR VERIFY SELECTED PAIR] 66
[XDR VIEW DUPLICATE RECORD] 78
[XT-KERMIT EDIT] 206
[XT-KERMIT MENU] 206
[XT-KERMIT RECEIVE] 207
[XT-KERMIT SEND] 207
[XT-NUMBER BASE CHANGER] 202
[XT-ROUTINE COMPARE] 185
[XT-VARIABLE CHANGER] 184
[XT-VERSION NUMBER] 185
[XTCM DISK2MAIL] 107
[XTCM MAIN] 107, 155
[XTCM] 169
[XTFCE] 178
[XTFCR] 178
[XTLKLKUP] 12, 17
[XTLKMODKY] 12, 29
[XTLKMODPARK] 12, 21, 22
[XTLKMODPARS] 12, 21, 23
[XTLKMODSH] 12, 27
[XTLKMODSY] 12, 30
[XTLKMODUTL] 12, 21, 25
[XTLKPRTUTL] 12, 19
[XTLKUSER2] 15, 21
[XTLKUTILITIES] 21
[XTMENU] 15, 21, 54
[XTRDEL] 186
[XTRGRPE] 184
[XTSUMBLD-CHECK] 195
[XTSUMBLD] 198
[XTV EDIT VERIF PACKAGE] 194
[XTV MENU] 192
[XTVG COMPARE] 194
[XTVG UPDATE] 194
[XTVR COMPARE] 192, 193
[XTVR MOST RECENT CHANGE DATE] 193, 227
[XTVR RESTORE PREV ROUTINE] 193
[XTVR UPDATE] 192, 193
[XU FIRST LINE PRINT] 185
[XUCM ANALYSE] 105
[XUCM COMPUTE LOCAL REFERENCES] 103
[XUCM DISK] 128
[XUCM EDIT DISK THRESHOLD] 102
[XUCM EDIT REF THRESH] 102
[XUCM EDIT VOL SET THRESH] 102
[XUCM GRAF MET AVE] 128
[XUCM LIST DAILY STATS] 127
[XUCM LIST RAW] 126
[XUCM LIST VOL SET INFO] 127
[XUCM LOCKS] 124
[XUCM MAIN] 107, 155
[XUCM MODES] 125
[XUCM ON/OFF] 112
[XUCM PAGE] 125
[XUCM PERFORMANCE MONITOR] 109
[XUCM PURGE] 112
[XUCM RAW RTHIST DATA] 126
[XUCM REPORTS] 115
[XUCM SET ALERTS] 104
[XUCM SETUP] 112
[XUCMBR MENU] 127
[XUCMBR2A] 128

[XUCMBR2C] 127
[XUCMBR2] 127
[XUCPFORMATTED] 161
[XUCPKILL] 166
[XUCPMENU] 109, 155
[XUCPRAWPRINT] 155
[XUCPSORT] 158
[XUCPTOGGLE] 167
[XUCS SITE EDIT MENU] 131
[XUCSR REPORTS MENU] 135
[XUCSRA CPU/DISK REPORT] 143
[XUCSRA GREF REPORT] 144, 145
[XUCSRA REPORTS BY (VG,DATE)] 143, 144, 145, 146, 147, 148, 149
[XUCSRA RESPONSE REPORT] 146
[XUCSRA ROU CMNDS/GREF REPORT] 147, 148
[XUCSRA SYS STAT REPORT] 149
[XUCSRB CPU/DISK REPORT] 135, 136
[XUCSRB GREF REPORT] 137, 138
[XUCSRB REPORTS BY (DATE,VG)] 135, 136, 137, 138, 139, 140, 141, 142
[XUCSRB RESPONSE REPORT] 139
[XUCSRB ROU CMNDS/GREF REPORT] 140, 141
[XUCSRB SYS STAT REPORT] 142
[XUCSRG CPU-DISK GRAPH] 150
[XUCSRG GRAPHS MENU] 150, 151
[XUCSRG RESPONSE TIME GRAPH] 151
[XUINDEX] 179
[XUINTEG] 197
[XUPR RTN EDIT] 184
[XUPR-RTN-TAPE-CMP] 186
[XUPRGL] 201
[XUPROG] 177, 192, 195, 201
[XUPRROU] 185
[XUROUTINE IN] 186
[XUROUTINE OUT] 187
[XUROUTINES] 197
[XURTLCK] 170
[XURTLC] 170
[XURTLK] 170
[XURTLMA] 170
[XURTLM] 107, 169
[XURTLPG] 170
[XURTLPL] 170
[XURTLP] 170
[XURTL] 169
[XUSITEMGR] 197

Department of Veterans Affairs
Decentralized Hospital Computer Program

KERNEL TOOLKIT
USER MANUAL

Version 7.3

April 1995

Information Systems Center
San Francisco, California

Preface

This manual provides descriptive information about the Kernel Toolkit (also referred to as "Toolkit") for use by the Information Resource Management (IRM) staff and the Decentralized Hospital Computer Program (DHCP) development community. A wider audience of technical personnel engaged in operating and maintaining VA software might also find it useful as a reference.

Toolkit provides software services in the following functional areas:

■ Development and Verification Tools

- **Promotes standard programmer interface.**
- **Provides programmer and systems management.**
- **Checks adherence to programming standards and correct syntax with %INDEX.**
- **Provides standard error trapping, storing, and reporting.**
- **Supports verification tools for the comparison of routines and data dictionaries.**
- **Customizes and tunes site parameters for local requirements.**
- **Provides MUMPS (Massachusetts General Hospital Utility Multi-Programming System) function libraries.**
- **Provides a portable routine and global editor.**
- **Provides a Kermit file transfer utility.**
- **Provides a Multi-Term Look-Up (MTLU) utility for enhanced VA FileMan look-ups.**
- **Provides software project management utilities.**
- **Provides Duplicate Resolution utilities for the creation of file maintenance applications.**

■ Performance & Capacity Management

- **Produces system status reports and usage statistics.**

- **Provides system response time logging for performance management.**
- **Provides automated system monitoring and reporting tools.**
- **Provides automated performance analysis tools.**
- **Alerts system managers to dangerous or unusual conditions.**
- **Delivers reports automatically via MailMan.**
- **Provides tools for software optimization and application sizing.**

Where applicable, each major area of Kernel Toolkit is described first in terms of its user interface. Issues of system management are then presented, with a focus on the menu that can be used to accomplish the task at hand. Finally, the Application Programming Interface (API) is addressed. Any callable entry points that are authorized for use in application programs are described. Direct mode utilities to support the writing and testing of software are also identified.

This manual is written with the assumption that the reader is familiar with the DHCP computing environment, understands VA FileMan data structures and terminology, and has some understanding of the Massachusetts General Hospital Utility Multiprogramming System (MUMPS) programming language. No attempt is made to explain how the overall DHCP programming system is integrated and maintained. Such methods and procedures are documented elsewhere. Suggested reading materials are referenced in the Introduction of this manual. This manual does provide, however, an explanation of the Kernel Toolkit utilities, describing how these tools can be used for the management and definition of development projects.

Table of Contents

Introduction 1
Orientation 3
Package Management 5
Package Operation 7
Multi-Term Look-Up (MTLU) 9
- **User Interface** 15
- **Systems Management Issues** 35
- **Programmer API** 39

Duplicate Resolution Utilities 51
- **User Interface** 54
- **Programmer API** 87

Capacity Management 97
- **The Capacity Planning Suite of Tools** 99
- **The VAX/Alpha Performance Monitor (VPM)** 109
- **MSM Performance Monitoring (MPM)** 129
- **Resource Usage** 153
  - **User Interface** 153
  - **Systems Management Issues** 153
- **Response Time Measures** 169
  - **User Interface** 169
  - **System Management Issues** 169
  - **Programmer API** 173

Tools 175
- **Routine Tools** 177
  - **User Interface** 178
  - **Programmer API** 189
- **Verification Tools** 191
  - **User Interface** 191
  - **Programmer API** 199
- **Miscellaneous Programmer Tools/APIs** 201
  - **Programmer Options Menu** 201

User Interface 201
Programmer API 203
Kermit 205
User Interface 205
System Management Issues 209
Programmer API 211
^%Z Editor 213
User Interface 213
Appendix A 219
Example of a Candidate Collection Routine for Patient Merge 219
Two Examples of Duplicate Test Routines 221
Appendix B 227
Last Routine Change Date Recorded (User interaction and resulting output) 227
Glossary 233
Index 253
Options 267