Subject: MCR10098, Make analyze_multics (azm) support several Multics commands

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Multics Ticket 253 proposes enhancing the analyze_multics (azm) request environment by making several Multics active functions available as azm active requests.

- calc, plus, minus, times, divide: for calculations
- decimal, octal: for number base conversion
- index_set: for generation of a set of related numbers to permit display of a list of entries

For example, two such abbreviations are shown below. The first combines the structure display capabilities of the azm display request with the address calculation capabilities added by calc, octal, and decimal to display the System Loader Table Entry (SLTE) for a given octal segment number. The second uses the octal-to-decimal function of the decimal active function to display the Core Map Entry (CME) for octal memory frame in real memory.

```
azm:  .l

b slte     execute_string "display slt +[octal [calc 4*[decimal &1o]+8]] -as slte"

b cme      execute_string "display sst$cmp,*  -as ""cma(""[decimal &1o]"")"" "
```

These abbreviations may then be used as an azm request. For example, to display the SLTE for octal segment number 60:

```
azm:  slte 60
slte                          @ 7|310
  names_ptr = "007300"b3, path_ptr = "000000"b3, access = "1010"b,
  cur_length = "001"b3, ringbrack (1) through ringbrack (3) = "0"b3,
  segno = "000060"b3, max_length = "000"b3, bit_count = "00110000"b3
  ON:  wired, link_sect_wired, combine_link
  OFF: cache, abs_seg, firmware_seg, layout_seg, breakpointable, paged, per_process,
       acl_provided, branch_required, init_seg, temp_seg, link_provided, link_sect,
       pre_linked, defs
```

Once the user has determined how to locate a given structure entry in a dump, that know-how can then be captured as arithmetic in the abbreviation, and shared with others doing dump analysis. Availability of the added Multics active functions enables use of abbrev support within azm and structure display capabilities to provide better easy-to-define structure output requests.

Proposed Changes

The proposed changes are summarized in the following build script file.

```
Description:
  A) Change azm_request_table_ to:
       - Add multics_request entries for calc, decimal, octal, plus, minus,
         times, divide command/active functions.
       - Add documentation for index_set command/active_function.
       - For help request, add short name:  h
       - For index_set request, add short name:  ixs
  B) Change azm.info to make "help azm -bf" display a list of azm request names.

Installation_directory:  >udd>m>gd>w>azm;

 Build_script:              azm.mb;

 Bound_obj:       bound_azm_                          IN: tools  UPDATE;
     source:      azm_request_table_.alm               REPLACE           compiler: alm;

 Info:            analyze_multics.info                IN: priv.info  REPLACE;
                   add_name: azm.info;
```

Changes to azm_request_table_.alm are shown below.

```
compare_ascii >ldd>tools>source>bound_azm_.s.archive::azm_request_table_.alm ==

Inserted in B:
B6
B7          " HISTORY COMMENTS:
B8          "  1) change(2021-09-19,GDixon):
B9          "     A) Add multics_request entries for calc, decimal, octal, plus, minus,
B10         "        times, divide command/active functions.
B11         "     B) Add documentation for index_set command/active_function.
B12         "     C) For help request, add short name:  h
B13         "                                                    END HISTORY COMMENTS
B14
Preceding:
A6          "          AZM_REQUEST_TABLE_


Inserted in B:
B209                   request   help,
B210                             ssu_requests_$help,
B211                             (h),
B212                             (Obtain detailed information on the subsystem.)
B213
Preceding:
A200                   request   nothing,ssu_$just_return,(nt),


A204                   multics_request index_set,
A205                             (),
A206                             (),
Changed by B to:
B218                   multics_request decimal,(dec),
B219                             (Return one or more values in decimal.),
B220                             (),
```

```
B221                          flags.dont_summarize+flags.dont_list+flags.allow_both
B222
B223                multics_request octal,(oct),
B224                          (Return one or more values in octal.),
B225                          (),
B226                          flags.dont_summarize+flags.dont_list+flags.allow_both
B227
B228                multics_request calc,(),
B229                          (Evaluate a single decimal arithmetic expression with
operator precedence.),


Inserted in B:
B233                multics_request plus,(),
B234                          (Return sum of any decimal arguments, or 0 if no args
given.),
B235                          (),
B236                          flags.dont_summarize+flags.dont_list+flags.allow_both
B237
B238                multics_request minus,(),
B239                          (Return decimal numA minus numB, or -numA if numB
omitted.),
B240                          (),
B241                          flags.dont_summarize+flags.dont_list+flags.allow_both
B242
B243                multics_request times,(),
B244                          (Return the product of all decimal args; or 1 if no args
are given.),
B245                          (),
B246                          flags.dont_summarize+flags.dont_list+flags.allow_both
B247
B248                multics_request divide,(),
B249                          (Return integer part of quotient of decimal numA divided
by numB.),
B250                          (),
B251                          flags.dont_summarize+flags.dont_list+flags.allow_both
B252
B253                multics_request index_set,(ixs),
B254                          (Return one or more integers, separated from each other
by spaces.),
B255                          (),
B256                          flags.dont_summarize+flags.dont_list+flags.allow_both
B257
Preceding:
A210                end_table azm_request_table_

Comparison finished: 4 differences, 54 lines.
```

Testing

These changes were tested on a modified azm investigating real dumps in which the above abbreviations were defined and successfully used to determine causes of the crash-causing problem.

Documentation

This change proposes minor changes to azm.info to permit help -brief to summarize names of the available azm requests. Being Multics active functions, the commands included in the new multics_request macros are not true azm requests, only imports from the Multics environment. However, once inside azm, the list_requests -all request will shows the new active requests.

```
compare_ascii >doc>privileged>analyze_multics.info ==

A1        05/05/86  analyze_multics, azm
Changed by B to:
B1        :Info: analyze_multics: azm: 2021-09-20  analyze_multics, azm


A44       List of operations:
Changed by B to:
B44       List of requests:


A198      List of active function operations:
Changed by B to:
B198      List of active requests:
```

The following exec_com will be supplied to the installer to place links to the new (and existing) multics_request info segs in >doc>subsystem>azm, so the azm help and list_help requests can find info segments describing the new functions.

```
&version 2

&set saved_wd &[wd]
cd >doc>subsystem>azm
link >doc>info>(decimal octal plus minus times divide calc index_set).info
   &+  == -copy_names
add_name index_set.info ixs.info -brief
cd &(saved_wd)
```

Version History

Date	Revision	Author	Comment
2021-10-29	1.0	Gary Dixon	Initial version of this MCR.