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Editor

Trevor Eddolls

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Temporary storage CPU costs

BACKGROUND

In some CICS/ESA 4.1.0 environments, it is noted that CICS CPU usage and temporary storage request response times increase during the running of the CICS system. This is a result of several factors that are reviewed here, and recommendations are given to address the situation.

CICS/ESA 4.1.0 maintains a binary tree structure containing the temporary storage queue objects (TSUTEs) within a CICS system. Each TSUTE represents a unique temporary storage queue. The binary tree holds the TSUTEs as individual nodes within the tree. From the root node, there are 0, 1, or 2 sub-nodes. Each sub-node can in turn have 0, 1, or 2 sub-nodes of its own. The tree is structured so that its nodes (TSUTEs) are held in an alphanumerically increasing order across the tree. Binary trees are maintained such that a given node's left and right sub-nodes (if they exist) are 'less than' and 'greater than' the value of the parent node, respectively. CICS will insert/locate/remove nodes within the tree as temporary storage queues are created/updated/deleted.

As an increasing number of temporary storage queues are created during a CICS session, so increasing numbers of TSUTE nodes are inserted into the binary tree structure. CICS systems programmers have always been aware of the need for prudent management of their temporary storage data on the system – each record added to queues results in additional control block relationships being required to represent the new data, and of course there is the need to hold the data items themselves (within the CICS address space for main temporary storage queues, or buffered there until written to VSAM ESDS DFHTEMP for auxiliary destinations). As such, it has always been recognized that redundant temporary storage queues should be deleted when no longer required. In addition to freeing up control block and record/buffer space, this also allows the TSUTE node to be removed from the tree structure. Typical CICS systems can have a great many temporary storage queues that are still validly required however, and so the tree can grow to hold a large number of TSUTE nodes. As each node can have at most only two sub-nodes, there is the need for CICS to ensure the tree stays well-balanced. An unbalanced tree is one with an asymmetrical branch structure. If CICS determines the tree is unbalanced, it adjusts the nodes to make a different node the root node, and so have a more even number of sub-nodes from each nodal point. CICS performs such an operation (resplay) automatically when a temporary storage request references a TSUTE whose node is greater than 17 sub-nodes deep into the tree.

Such a resplay operation is CPU-intensive because it involves a series of pointer manipulations. It also has the effect of increasing the pathlength of the temporary storage request that triggered it, and hence affecting the task's response time. Occurring under the QR CICS TCB, it can also momentarily affect the overall transaction throughput of the system. The benefit of a resplay is that the better-balanced tree resulting from it will have its nodes arranged in a way that means they are located quicker by future temporary storage requests.

It can be seen that as the number of temporary storage queues increases during a CICS run, so the tree size grows and the search depth increases. This results in additional CPU costs to process the requests. If such requests also force CICS into resplaying the tree, there is the additional CPU cost of this operation too. Hence CPU usage and response times can grow as the CICS session progresses.

CAUSES OF FREQUENT RESPLAYS

CICS environments that generate many temporary storage queues with identical queuename prefixes can result in unbalanced trees, because CICS will always insert the next instance of such a queue beneath the preceding one within the tree. One example is that of REQIDs specified for EXEC CICS START requests that differ by some fairly random suffix value but which all begin with the same prefix. These can result in resplaying activity being kicked off when the started task retrieves its FROM data from the REQID queue, and its TSUTE has to be located within the tree. If this retrieval operation exceeds 17 sub-nodes, CICS resplays the tree. However, such a queue will in all likelihood never get referenced again since it will be deleted when the ATI'd task terminates, so the benefit of moving its node will not be seen.

RECOMMENDATIONS

A good rule of thumb is to try and randomize the temporary storage queuename prefixing as much as possible. This allows for a naturally balanced tree structure and so reduces the need for CICS to resplay the tree. If common prefixes are required, one alternative may be to use a GLUE to change the queuename around and have the 'random' suffix component of the name at the start of the queuename. For START requests, the REQID passed to XICEREQ as an argument via UEPCLPS could be modified in such a way. Also, always ensure that redundant queues are deleted as soon as possible. This is good for many reasons, and also reduces the size of the tree and hence the search depth for the remaining TSUTEs, so preventing resplays. Finally, ensure APAR PN89684 (PTF UN98081) is applied, because this modified CICS to increase the search depth that can trigger a resplay operation.

One of the many enhancements to CICS Transaction Server was to change the tree into a 16-way structure, providing a naturally shallower tree and so reducing search depths for nodes and avoiding the need for resplays. This helps avoid the temporary storage CPU cost increases over time that can be seen in CICS/ESA 4.1.0.

I hope this article has helped explain the background to CICS temporary storage CPU utilization within CICS/ESA 4.1.0.

CICS is a registered trademark of International Business Machines Corporation. Readers wishing to discuss the material in this article further are welcome to contact me via e-mail, at address andy_wright@uk.ibm.com.

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CICS/TS 1.3 and Wireless Mark-up Language

INTRODUCTION

The public's apparently insatiable demand for smaller mobile handheld devices with Web access (driven on by the marketing men and beloved in the Far East) has given rise to the Wireless Mark-up Language (WML).

This article demonstrates a general purpose CICS program that can be used to send WML data.

WML BASICS

WML is a lightweight mark-up language. It works along similar lines to HTML, except that the language is specifically optimized for specifying presentation and user interaction on limited-capability devices such as palm organizers and mobile phones.

In the same way that HTML supports scripting languages, WML supports a scripting language – WMLScript.

Images can be sent as bitmaps using the Wireless Bitmap Format (WBMP).

WML AND THE CICS DOCUMENT API

The great thing about the document API, available with CICS/TS 1.3, is that it is capable of manipulating many different types of data. Or to put it another way, it is not tied to HTML.

All that is required is a CICS application program that will serve up the appropriate content type when requested.

Example content type headers for WML applications include:

- text/vnd.wap.wml for WML.
- text/vnd.wap.wmlscript for WMLScripts.

- image/vnd.wap.wbmp for bitmaps.
- text/x-hdml for wml predecessor HDML.

Phone.com’s Handheld Device Mark-up Language (HDML) served as the basis for WML and is supported by older devices.

The only problem for CICS is deciding upon a naming convention for CICS templates, because CICS does not support file extensions.

In our example code, the naming convention implemented uses the first three characters of the object name to differentiate between the different flavours of WML data.

SAMPLE PROGRAM T13WAP

This program is invoked with the following URL, and is designed to work with the default analyser program DFHWBADX:

```
http://ipaddress:port/no_converter/alias/program/object_name
```

Where:

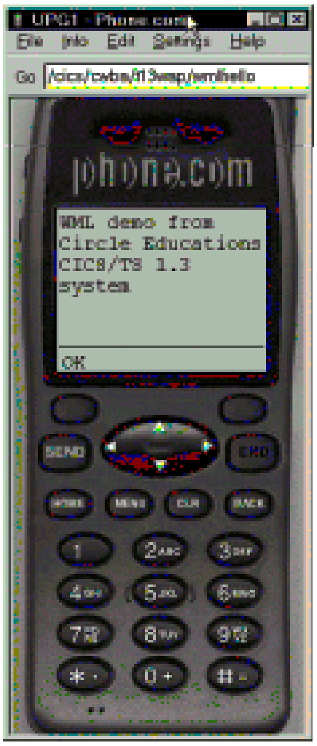
- ipaddress:port is the DNS or IP address of your MVS system (port relates to a configured TCPIPSERVICE definition).
- No_converter implies a keyword of cics or CICS.
- Alias implies a clone of the alias transaction (default CWBA).
- Program is T13WAP.
- Object_name is the name of the WML object you wish to send (must have a defined and installed doctemplate definition).

The first three characters of the object_name are examined and the appropriate content-type is set as follows:

- wml+++++ – WML
- wbm+++++ – WBMP (bitmap)
- wls+++++ – WMLS (wlmscript)
- whd+++++ – HDML.

This program can also deliver other types of data – look at the comments in the code.

To display, you will need a WML-capable browser such as the phone emulator available at Phone.com's Web page for developers – http://www.phone.com/developers/index.html.



WML demo from Circle Educations CICS/TS 1.3 system

OK

Figure 1: Example phone emulator

WML TEMPLATE EXAMPLE

WML is a tag-based document language and is specified as an extensible mark-up language [XML] document type, eg:

```
<?xml version="1.0"?>
<!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.1//EN"
"http://www.wapforum.org/DTD/wml_1.1.xml">
<wml>
<card id="Circle" title="Demo">
<p>
WML demo from Circle
Educations CICS/TS 1.3 system
```

PROGRAM T13WAP

```
*******************************************
* Circle Computer Group
* MODULE NAME      T13WAP.cob
* picture processing for 1.3
* Check the first letter of the object name
* and set the appropriate content-type
* currently supports
* j jpeg, g gif, p pdf, f fdf, m mpg or s for js
*
* WML processing for 1.3
* Check the first three characters of the object name
* and set the appropriate content-type
* currently supports
* wml wml, wbm wbmp, wlc wmlc, wls wmls, wsc wmlsc
* whd hdml
*****************************************

 PROCESS XOPTS(NOLINKAGE)
 IDENTIFICATION DIVISION.
 PROGRAM-ID. T13WAP.
 ENVIRONMENT DIVISION.
 DATA DIVISION.
 WORKING-STORAGE SECTION.
*        Symbols table
 Ø1 WS-SYMBOLS.
    Ø3 filler             pic x(6)  value 'docnm='.
    Ø3 WS-DOC-NM          PIC X(8) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&doctn='.
    Ø3 WS-DOC-TN          PIC X(48) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&doccr='.
    Ø3 WS-DOC-CR          PIC X(3) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&docdd='.
    Ø3 WS-DOC-DD          PIC X(8) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&docmn='.
    Ø3 WS-DOC-MN          PIC X(8) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&docds='.
    Ø3 WS-DOC-DS          PIC X(56) VALUE SPACE.
    Ø3 filler             pic x(7)  value '&docty='.
    Ø3 WS-DOC-TY          PIC X(6) VALUE SPACE.
    Ø3 filler             pic x(5)  value '&act='.
    Ø3 WS-DOC-ACT         PIC X(6) VALUE SPACES.
    Ø3 filler             PIC x(7) value '&hostv='.
    Ø3 ws-host            pic x(24) value space.
    Ø3 filler             PIC x(7) value '&resp='.
    Ø3 ws-resp-message    pic x(24) value space.
    Ø3 FILLER             PIC X(9) VALUE '&message='.
    Ø3 WS-BAD-MESSAGE     PIC X(3Ø) VALUE SPACES.
 Ø1 WS-build.
```

```
   02 ws-object-name PIC X(8) value spaces.
   02 filler redefines ws-object-name.
      03 toChar pic x occurs 8 times
                indexed by toIndex.
   02 ws-newstring pic x(100).
   02 filler redefines ws-newstring.
      03 fromChar pic x occurs 100 times
                indexed by fromIndex, lastIndex, startIndex.
   02 ws-object-name-len    pic s9(4) comp value 0.
01 WS-HTTP-HEADER.
   05 pragma-hdr       PIC X(6) VALUE IS 'Pragma'.
   05 pragma-val       PIC X(7) VALUE IS 'nocache'.
   05 content-type-hdr PIC X(12) VALUE IS 'Content-type'.
   05 content-type-val PIC x(30) VALUE IS SPACES.
   05 content-type-len PIC 9(8) comp value is 0.
   77 content-pdf      PIC x(15) VALUE IS 'application/pdf'.
   77 content-fdf      PIC x(19)
                       VALUE IS 'application/vnd.fdf'.
   77 content-gif      PIC x(09) VALUE IS 'image/gif'.
   77 content-jpg      PIC x(10) VALUE IS 'image/jpeg'.
   77 content-mpg      PIC x(10) VALUE IS 'video/mpeg'.
   77 content-txt      PIC x(09) VALUE IS 'text/html'.
   77 content-wbmp     PIC x(18) VALUE IS 'image/vnd.wap.wbmp'.
   77 content-wml      PIC x(16) VALUE IS 'text/vnd.wap.wml'.
   77 content-hdml     PIC x(11) VALUE IS 'text/x-hdml'.
   77 content-wmlc     PIC x(24)
                       VALUE IS 'application/vnd.wap.wmlc'.
   77 content-wmls     PIC x(22)
                       VALUE IS 'text/vnd.wap.wmlscript'.
   77 content-wmlsc    PIC x(30)
               VALUE IS 'application/vnd.wap.wmlscriptc'.
   77 content-js       PIC x(24)
                       VALUE IS 'application/x-javascript'.
01 HTTP-EXTRACT.
   03 HTTP-METHOD            PIC X(6).
   03 HTTP-VERSION           PIC X(10).
   03 HTTP-PATH              PIC X(100).
   03 HTTP-QUERY-STRING      PIC X(256).
   03 HTTP-TYPE              PIC s9(8) COMP.
   03 HTTP-METHOD-LENGTH     PIC S9(8) COMP VALUE +6.
   03 HTTP-VERSION-LENGTH    PIC S9(8) COMP VALUE +10.
   03 HTTP-PATH-LENGTH       PIC S9(8) COMP VALUE +100.
   03 HTTP-QUERY-STRING-LEN  PIC S9(8) COMP VALUE +256.
01 CLIENT-INFO-EXTRACT.
   03 client-name            PIC X(100).
   03 client-address         PIC X(100).
   03 server-name            PIC X(100).
   03 server-address         PIC X(100).
   03 client-address-nu      PIC 9(8) comp.
```

```
    Ø3 server-address-nu      PIC 9(8) comp.
    Ø3 ssl-type               PIC s9(8) COMP.
    Ø3 tcpip-service          PIC x(8).
    Ø3 port-number            PIC x(5).
    Ø3 port-number-nu         PIC s9(8) comp.
    Ø3 client-name-LENGTH     PIC S9(8) COMP VALUE +1ØØ.
    Ø3 server-name-LENGTH     PIC S9(8) COMP VALUE +1ØØ.
    Ø3 client-address-length  PIC S9(8) COMP VALUE +1ØØ.
    Ø3 server-address-length  PIC S9(8) COMP VALUE +1ØØ.
 Ø1 ws-template-name          pic x(48) value spaces.
 Ø1 WS-SUB                    PIC S9(8) COMP VALUE +Ø.
 Ø1 WS-buffer-len             PIC S9(8) COMP VALUE +Ø.
 Ø1 INIT-VAL                  PIC X VALUE LOW-VALUES.
 Ø1 WS-RESP                   PIC S9(8) BINARY.
 Ø1 hdr-name                  PIC x(1ØØ) value spaces.
 Ø1 hdr-val                   PIC x(2ØØ) value spaces.
 Ø1 WS-TOKEN                  PIC X(16).
 Ø1 WS-TOKEN1                 PIC X(16).
 Ø1 WS-RETRIEVE-LENGTH        PIC S9(8) BINARY.
 Ø1 WS-RETRIEVE-LENGTH1       PIC S9(8) BINARY.
 Ø1 CRLF                      PIC X(2)  VALUE IS X'ØD25'.
 77 counter                   PIC S9(4) COMP.
 Ø1 lower  PIC X(27) VALUE 'abcdefghijklmnopqrstuvwxyz+'.
 Ø1 filler REDEFINES lower.
    Ø5  lowerc PIC X OCCURS 27 INDEXED BY lowerc-idx.
 Ø1 upper  PIC X(27) VALUE 'ABCDEFGHIJKLMNOPQRSTUVWXYZ '.
 Ø1 filler REDEFINES upper.
    Ø5  upperc PIC X OCCURS 27.

 LINKAGE SECTION.
 COPY DFHEIBLC.
  Ø1 DFHCOMMAREA  PIC X(1).
  Ø1 LS-BUFFER.
    Ø5 FILLER              PIC X(32764).
 PROCEDURE DIVISION USING DFHEIBLK DFHCOMMAREA.
*================================================================*
 AA-MAIN SECTION.
* MAIN CODE                                                      *
 CONTIBOARD.
* find out why invoked and what the path is
     EXEC CICS WEB EXTRACT
          HTTPMETHOD (HTTP-METHOD)
          METHODLENGTH(HTTP-METHOD-LENGTH)
          HTTPVERSION(HTTP-VERSION)
          VERSIONLEN(HTTP-VERSION-LENGTH)
          PATH(HTTP-PATH)
          PATHLENGTH(HTTP-PATH-LENGTH)
          QUERYSTRING(HTTP-QUERY-STRING)
          QUERYSTRLEN(HTTP-QUERY-STRING-LEN)
```

```
                REQUESTTYPE(HTTP-TYPE)
                RESP(WS-RESP)
           END-EXEC
      * extract tcpip info
           EXEC CICS EXTRACT TCPIP
                CLIENTNAME(CLIENT-NAME)
                CNAMELENGTH(CLIENT-NAME-LENGTH)
                SERVERNAME(SERVER-NAME)
                SNAMELENGTH(SERVER-NAME-LENGTH)
                CLIENTADDR(CLIENT-ADDRESS)
                CADDRLENGTH(CLIENT-ADDRESS-LENGTH)
                CLIENTADDRNU(CLIENT-ADDRESS-NU)
                SERVERADDR(SERVER-ADDRESS)
                SADDRLENGTH(SERVER-ADDRESS-LENGTH)
                SERVERADDRNU(SERVER-ADDRESS-NU)
                SSLTYPE(SSL-TYPE)
                TCPIPSERVICE(TCPIP-SERVICE)
                PORTNUMBER(PORT-NUMBER)
                PORTNUMNU(PORT-NUMBER-NU)
                RESP(WS-RESP)
           END-EXEC
      * convert path info to uppercase
           perform with test after varying counter from 1 by +1
               until counter = 27
               inspect http-path  replacing all
                   lowerc(counter) by upperc(counter)
           end-perform
      * need to determine what token was entered
           set toIndex to 1
           set lastIndex to http-path-length
           move http-path to ws-newstring
           perform append
           move ws-object-name to ws-template-name
                ws-doc-nm
      * add the header template to master document
           EXEC CICS
                DOCUMENT CREATE
                DOCTOKEN(WS-TOKEN)
                DOCSIZE(WS-RETRIEVE-LENGTH)
                TEMPLATE(WS-TEMPLATE-NAME)
                SYMBOLLIST(WS-SYMBOLS)
                LISTLENGTH(LENGTH OF WS-SYMBOLS)
                RESP(WS-RESP)
           END-EXEC
      * check the response
           EVALUATE WS-RESP
               WHEN DFHRESP(NORMAL)
                  PERFORM GOODCODE
               WHEN OTHER
```

```
                 PERFORM BADCODE
          END-EVALUATE
          EXEC CICS RETURN END-EXEC.
      GOODCODE.
     * Check the object name
     * and set the appropriate content-type
     * currently supports
     * j jpeg, g gif, p pdf, f fdf, m mpg or s for js
     * wml wml, wbm wbmp, wlc wmlc, wls wmls, wsc wmlsc
     * whd hdml
              if ws-template-name(1:3) = 'WML'
                 move content-wml to content-type-val
                 move length of content-wml
                             to content-type-len
              end-if
              if ws-template-name(1:3) = 'WBM'
                 move content-wbmp to content-type-val
                 move length of content-wbmp
                             to content-type-len
              end-if
              if ws-template-name(1:3) = 'WLC'
                 move content-wmlc to content-type-val
                 move length of content-wmlc
                             to content-type-len
              end-if
              if ws-template-name(1:3) = 'WLS'
                 move content-wmls to content-type-val
                 move length of content-wmls
                             to content-type-len
              end-if
              if ws-template-name(1:3) = 'WSC'
                 move content-wmlsc to content-type-val
                 move length of content-wmlsc
                             to content-type-len
              end-if
              if ws-template-name(1:3) = 'WHD'
                 move content-hdml to content-type-val
                 move length of content-hdml
                             to content-type-len
              end-if
              if ws-template-name(1:1) = 'J'
                 move content-jpg to content-type-val
                 move length of content-jpg
                             to content-type-len
              end-if
              if ws-template-name(1:1) = 'G'
                 move content-gif to content-type-val
                 move length of content-gif
                             to content-type-len
```

```
         end-if
         if ws-template-name(1:1) = 'M'
            move content-mpg to content-type-val
            move length of content-mpg
                        to content-type-len
         end-if
         if ws-template-name(1:1) = 'P'
            move content-pdf to content-type-val
            move length of content-pdf
                        to content-type-len
         end-if
         if ws-template-name(1:1) = 'F'
            move content-fdf to content-type-val
            move length of content-fdf
                        to content-type-len
         end-if
         if ws-template-name(1:1) = 'S'
            move content-js  to content-type-val
            move length of content-js
                        to content-type-len
         end-if
* write the content type header
     EXEC CICS WEB WRITE
          HTTPHEADER (CONTENT-TYPE-HDR)
          NAMELENGTH(LENGTH OF CONTENT-TYPE-HDR)
          VALUE(CONTENT-TYPE-VAL)
          VALUELENGTH(CONTENT-TYPE-LEN)
     END-EXEC
* send the master document
     evaluate content-type-val
         when content-js
             EXEC CICS
                  WEB SEND
                  CLNTCODEPAGE('819')
                  DOCTOKEN(WS-TOKEN)
             END-EXEC
         when content-wml
             EXEC CICS
                  WEB SEND
                  CLNTCODEPAGE('819')
                  DOCTOKEN(WS-TOKEN)
             END-EXEC
         when content-hdml
             EXEC CICS
                  WEB SEND
                  CLNTCODEPAGE('819')
                  DOCTOKEN(WS-TOKEN)
             END-EXEC
         when content-wmls
```

```
             EXEC CICS
                  WEB SEND
                  CLNTCODEPAGE('819')
                  DOCTOKEN(WS-TOKEN)
             END-EXEC
         when other
             EXEC CICS
                  WEB SEND
                  DOCTOKEN(WS-TOKEN)
             END-EXEC
     end-evaluate.
 BADCODE.
* we must have got a notfnd from the previous
* create document - send an error html page
* set content-type header for text/html
        move content-txt to content-type-val
        move length of content-txt
                    to content-type-len
         MOVE 'Host' to HDR-NAME
         MOVE 'CICS returned notfnd for ' to ws-bad-message
* set base document symbol
         EXEC CICS WEB READ
              HTTPHEADER (HDR-NAME)
              NAMELENGTH(4)
              VALUE(HDR-VAL)
              VALUELENGTH(LENGTH OF HDR-VAL)
              RESP(WS-RESP)
         END-EXEC
         MOVE HDR-VAL TO WS-HOST
* add the error html page
         EXEC CICS
              DOCUMENT CREATE
              DOCTOKEN(WS-TOKEN)
              DOCSIZE(WS-RETRIEVE-LENGTH)
              TEMPLATE('T13WAPB')
              SYMBOLLIST(WS-SYMBOLS)
              LISTLENGTH(LENGTH OF WS-SYMBOLS)
              RESP(WS-RESP)
         END-EXEC
* set the content-type header
     EXEC CICS WEB WRITE
          HTTPHEADER (CONTENT-TYPE-HDR)
          NAMELENGTH(LENGTH OF CONTENT-TYPE-HDR)
          VALUE(CONTENT-TYPE-VAL)
          VALUELENGTH(CONTENT-TYPE-LEN)
     END-EXEC
* send the master document but translate to ascii
     EXEC CICS
          WEB SEND
```

```
                DOCTOKEN(WS-TOKEN)
                CLNTCODEPAGE('819')
           END-EXEC.
       append.
      * cobol stuff to work out how many bytes present in
      * object name
           perform varying fromIndex from lastIndex by -1 until
                   fromChar(fromIndex) equal "/"
                   or
                   fromIndex = 1
           end-perform
           set fromIndex up by 1
           perform varying startIndex from fromIndex by 1 until
                   startIndex > lastIndex
                   or
                   toIndex > 8
                   move fromChar(startIndex) to toChar(toINdex)
                   set toIndex up by 1
           end-perform.

       AA999-EXIT.
           EXIT.
           STOP RUN.
```

T13WAPB HTML TEMPLATE (NOT FOR USE WITH WML DEVICES)

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2//EN">
<HTML>
<HEAD>
<TITLE> CIRCLE CICS/TS 1.3 Error PAGE</TITLE>
</HEAD>
<BODY>
<BASE href="http://&hostv;">
<form
 action="/cics/cwba/docntem">
<H1>There was a problem with your request</H1>
<p>&message;&docnm;
<p>Probable cause - doctemplate not defined
<p>or not defined in template library
<table>
<tr>
<td>
<input type="submit" value=" update Doctemplate">
<p></td></tr></table>
</form>
</BODY>
</HTML>
```

David Clancy
Circle Computer Group (UK)

TMONCICS transaction record detailed analysis – part 2

This month we conclude the code that extends the functionality of TMCE, to assist in debugging problems encountered on production CICS systems.

```
address ispexec "tbcreate tmextab nowrite replace,
  names(descr value)"
do v = 1 to 197
  value = val.v
  descr = des.v
  address ispexec "tbadd tmextab"
end
address ispexec "tbtop tmextab"
next = 'n'
do until next = 'y'
  address ispexec "tbdispl tmextab panel(tmtap3)"
  if rc ¬= Ø then do
    address ispexec "tbclose tmextab"
    signal EXIT_EXTAB
  end
  select
    when ZCMD = 'HEX' then do
      call proc_hex_display
    end
    when ZCMD = 'SAVE' then do
      call proc_save_to_file
    end
    when ZCMD = 'FAT' then
      if val.179 ¬= Ø then do
        call proc_fat_segments
      end
    when ZCMD = 'UVL' then
      if val.182 ¬= Ø then do
        call proc_uvl_segments
      end
    when ZCMD = 'UTG' then
      if val.185 ¬= Ø then do
        call proc_utg_segments
      end
    when ZCMD = 'MRO' then
      if val.188 ¬= Ø then do
        call proc_mro_segments
      end
    when ZCMD = 'REQ' then
      if val.191 ¬= Ø then do
```

```
        call proc_req_segments
      end
    when ZCMD = 'WAT' then
      if val.194 ¬= Ø then do
        call proc_wat_segments
      end
    when ZCMD = 'TCB' then
      if val.197 ¬= Ø then do
        call proc_tcb_segments
      end
    otherwise
      next = 'y'
  end                                             /* end select      */
end                                               /* end do until    */
address ispexec "tbclose tmextab"
EXIT_EXTAB:
return
/*-------------------------------------------------------------------*/
/* Process hex display                                               */
/*-------------------------------------------------------------------*/
proc_hex_display:
address ispexec "tbcreate tmhextab nowrite replace,
  names(offh offd valhex valdisp)"
offs = 1
reclen = length(tmnrec)
do until offs > reclen
  offh    = d2x(offs - 1)
  offd    = offs - 1
  left    = reclen - offs
  if left < 16 then
    tmnlen = left + 1
  else
    tmnlen = 16
  valhex  = c2x(substr(tmnrec,offs,tmnlen))
  valdisp = substr(tmnrec,offs,tmnlen)
  address ispexec "tbadd tmhextab"
  offs    = offs + 16
end                                               /* end do until    */
address ispexec "tbtop tmhextab"
address ispexec "tbdispl tmhextab panel(tmtap4)"
address ispexec "tbclose tmhextab"
return
/*-------------------------------------------------------------------*/
/* Process save to file command                                      */
/*-------------------------------------------------------------------*/
proc_save_to_file:
savmem = 'TA'    val.1Ø                           /* Task number     */
"ALLOC FI(TMSAVE) DA(TMTA.SAVE("savmem")) SHR REUSE"
tmsave = 'Off  Field   Form Decription                          Value'
push tmsave
"execio 1 diskw tmsave"
```

```
call write_blank
do v = 1 to 197
  tmsave = des.v    '  '    val.v
  push tmsave
  "execio 1 diskw tmsave"
end
a= 177; depth = 14; segname = 'File access segments'
call init_fat_des
call_sec = 'PROC_FAT_VAL'
call proc_save_segments
a= 18Ø; depth = 7; segname = 'User variables segments'
call init_uvl_des
call_sec = 'PROC_UVL_VAL'
call proc_save_segments
a= 183; depth = 6; segname = 'User target segments'
call init_utg_des
call_sec = 'PROC_UTG_VAL'
call proc_save_segments
a= 186; depth = 9; segname = 'MRO segments'
call init_mro_des
call_sec = 'PROC_MRO_VAL'
call proc_save_segments
a= 189; depth = 7; segname = 'Request segments'
call init_req_des
call_sec = 'PROC_REQ_VAL'
call proc_save_segments
a= 192; depth = 6; segname = 'Wait segments'
call init_wat_des
call_sec = 'PROC_WAT_VAL'
call proc_save_segments
a= 195; depth = 9; segname = 'TCB segments'
call init_tcb_des
call_sec = 'PROC_TCB_VAL'
call proc_save_segments
call write_blank
"execio Ø diskw tmsave (finis"
"FREE FI(TMSAVE)"
return
/*--------------------------------------------------------------------*/
/* Process save to file command / segment data                        */
/*--------------------------------------------------------------------*/
proc_save_segments:
b = a + 1
c = b + 1
seg_off = x2d(val.a)
seg_len = x2d(val.b)
seg_num = val.c
seg_off = seg_off + 1
if seg_num > Ø then do
  call write_blank
  tmsave = segname
  push tmsave
  "execio 1 diskw tmsave"
  call write_blank
  do v = 1 to seg_num
    call signal_value
    do u = 1 to depth
      tmsave = seg_des.u    '  '    seg_val.u
      push tmsave
      "execio 1 diskw tmsave"
    end
    seg_off = seg_off + seg_len
  end                                             /* end do v =      */
end                                               /* end if          */
return
/*-------------------------------------------------------------------*/
/* Protect the loop structure by CALLing a routine which then issues */
/* Signal Value to a variable.                                       */
/*-------------------------------------------------------------------*/
signal_value:
signal value call_sec
return
/*-------------------------------------------------------------------*/
/* Write a blank line                                                */
/*-------------------------------------------------------------------*/
write_blank:
tmsave = ' '
push tmsave
"execio 1 diskw tmsave"
return
/*-------------------------------------------------------------------*/
/* Process fat segment data                                          */
/*-------------------------------------------------------------------*/
proc_fat_segments:
seg_off = x2d(val.177)
seg_len = x2d(val.178)
seg_num = val.179
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_fat_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_fat_val
  do u = 1 to 14
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*-------------------------------------------------------------------*/
/* Process fat segment values                                        */
/*-------------------------------------------------------------------*/
proc_fat_val:
seg_val.1  = substr(tmnrec,seg_off,8)
seg_val.2  = c2x(substr(tmnrec,seg_off+8,1))
seg_val.3  = c2x(substr(tmnrec,seg_off+9,2))
seg_val.4  = substr(tmnrec,seg_off+11,6)
seg_val.5  = substr(tmnrec,seg_off+17,4)
seg_val.6  = c2d(substr(tmnrec,seg_off+21,8))/1000000
seg_val.7  = c2d(substr(tmnrec,seg_off+29,4))
seg_val.8  = c2x(substr(tmnrec,seg_off+33,1))
seg_val.9  = c2d(substr(tmnrec,seg_off+34,4))
seg_val.10 = c2d(substr(tmnrec,seg_off+38,4))
seg_val.11 = c2d(substr(tmnrec,seg_off+42,4))
seg_val.12 = c2d(substr(tmnrec,seg_off+46,4))
seg_val.13 = c2d(substr(tmnrec,seg_off+50,4))
seg_val.14 = ''
return
/*-------------------------------------------------------------------*/
/* Process uvl segment data                                          */
/*-------------------------------------------------------------------*/
proc_uvl_segments:
seg_off = x2d(val.180)
seg_len = x2d(val.181)
seg_num = val.182
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_uvl_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_uvl_val
  do u = 1 to 7
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*-------------------------------------------------------------------*/
/* Process uvl segment values                                        */
/*-------------------------------------------------------------------*/
proc_uvl_val:
seg_val.1  = substr(tmnrec,seg_off,8)
seg_val.2  = c2x(substr(tmnrec,seg_off+8,4))
seg_val.3  = substr(tmnrec,seg_off+12,1)
seg_val.4  = substr(tmnrec,seg_off+13,1)
seg_val.5  = substr(tmnrec,seg_off+14,1)
seg_val.6  = substr(tmnrec,seg_off+15,240)
seg_val.7  = ''
return
/*-------------------------------------------------------------------*/
/* Process utg segment data                                          */
/*-------------------------------------------------------------------*/
proc_utg_segments:
seg_off = x2d(val.183)
seg_len = x2d(val.184)
seg_num = val.185
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_utg_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_utg_val
  do u = 1 to 6
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*-------------------------------------------------------------------*/
/* Process utg segment values                                        */
/*-------------------------------------------------------------------*/
proc_utg_val:
seg_val.1  = c2x(substr(tmnrec,seg_off,1))
seg_val.2  = c2x(substr(tmnrec,seg_off+1,1))
seg_val.3  = c2x(substr(tmnrec,seg_off+2,8))
seg_val.4  = c2d(substr(tmnrec,seg_off+10,4))
seg_val.5  = c2x(substr(tmnrec,seg_off+14,1))
seg_val.6  = ''
return
/*-------------------------------------------------------------------*/
/* Process mro segment data                                          */
/*-------------------------------------------------------------------*/
proc_mro_segments:
seg_off = x2d(val.186)
seg_len = x2d(val.187)
seg_num = val.188
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_mro_des
```

```
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_mro_val
  do u = 1 to 9
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*-------------------------------------------------------------------*/
/* Process mro segment values                                        */
/*-------------------------------------------------------------------*/
proc_mro_val:
seg_val.1  = substr(tmnrec,seg_off,4)
seg_val.2  = c2x(substr(tmnrec,seg_off+4,1))
seg_val.3  = c2x(substr(tmnrec,seg_off+5,1))
seg_val.4  = c2x(substr(tmnrec,seg_off+6,1))
seg_val.5  = substr(tmnrec,seg_off+7,8)
seg_val.6  = c2d(substr(tmnrec,seg_off+15,8))/1000000
seg_val.7  = c2d(substr(tmnrec,seg_off+23,4))
seg_val.8  = c2x(substr(tmnrec,seg_off+27,1))
seg_val.9  = ''
return
/*-------------------------------------------------------------------*/
/* Process req segment data                                          */
/*-------------------------------------------------------------------*/
proc_req_segments:
seg_off = x2d(val.189)
seg_len = x2d(val.190)
seg_num = val.191
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_req_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_req_val
  do u = 1 to 7
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
```

```
return
/*----------------------------------------------------------------------*/
/* Process req segment values                                           */
/*----------------------------------------------------------------------*/
proc_req_val:
seg_val.1  = c2x(substr(tmnrec,seg_off,2))
seg_val.2  = c2d(substr(tmnrec,seg_off+2,4))
seg_val.3  = c2d(substr(tmnrec,seg_off+6,8))/1000000
seg_val.4  = c2d(substr(tmnrec,seg_off+14,4))
seg_val.5  = c2d(substr(tmnrec,seg_off+18,8))/1000000
seg_val.6  = substr(tmnrec,seg_off+26,16)
seg_val.7  = ''
return
/*----------------------------------------------------------------------*/
/* Process wat segment data                                             */
/*----------------------------------------------------------------------*/
proc_wat_segments:
seg_off = x2d(val.192)
seg_len = x2d(val.193)
seg_num = val.194
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_wat_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_wat_val
  do u = 1 to 6
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                                /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*----------------------------------------------------------------------*/
/* Process wat segment values                                           */
/*----------------------------------------------------------------------*/
proc_wat_val:
seg_val.1  = substr(tmnrec,seg_off,8)
seg_val.2  = substr(tmnrec,seg_off+8,8)
seg_val.3  = c2d(substr(tmnrec,seg_off+16,4))
seg_val.4  = c2d(substr(tmnrec,seg_off+20,8))/1000000
seg_val.5  = c2x(substr(tmnrec,seg_off+28,1))
seg_val.6  = ''
return
/*----------------------------------------------------------------------*/
/* Process tcb segment data                                             */
/*----------------------------------------------------------------------*/
```

```
proc_tcb_segments:
seg_off = x2d(val.195)
seg_len = x2d(val.196)
seg_num = val.197
address ispexec "tbcreate tmsegtab nowrite replace,
  names(value descr)"
call init_tcb_des
seg_off = seg_off + 1
do v = 1 to seg_num
  call proc_wat_val
  do u = 1 to 9
    value = seg_val.u
    descr = seg_des.u
    address ispexec "tbadd tmsegtab"
    end
  seg_off = seg_off + seg_len
end                                               /* end do v =      */
address ispexec "tbtop tmsegtab"
address ispexec "tbdispl tmsegtab panel(tmtap3)"
address ispexec "tbclose tmsegtab"
return
/*-------------------------------------------------------------------*/
/* Process tcb segment values                                        */
/*-------------------------------------------------------------------*/
proc_tcb_val:
seg_val.1  = substr(tmnrec,seg_off,2)
seg_val.2  = c2d(substr(tmnrec,seg_off+2,8))/1000000
seg_val.3  = c2d(substr(tmnrec,seg_off+10,4))
seg_val.4  = c2d(substr(tmnrec,seg_off+14,8))/1000000
seg_val.5  = c2d(substr(tmnrec,seg_off+22,4))
seg_val.6  = c2d(substr(tmnrec,seg_off+26,8))/1000000
seg_val.7  = c2d(substr(tmnrec,seg_off+34,4))
seg_val.8  = c2d(substr(tmnrec,seg_off+38,8))/1000000
seg_val.9  = ''
return
/*-------------------------------------------------------------------*/
/* Initialize main portion field descriptions                        */
/*-------------------------------------------------------------------*/
init_des:
des.1   = '002 TMHDTYPE CL3  Product id and record type        '
des.2   = '005 TMHDFLG1 XL1  Global control flag #1            '
des.3   = '006 TMHDVREL XL2  Version and release number        '
des.4   = '008 TMHDCDAT CL8  Date record was produced: yyyymmdd'
des.5   = '010 TMHDTIME XL4  Time record produced (64ms.)      '
des.6   = '014 TMHDJOBC CL8  User id (CICS jobname etc)        '
des.7   = '024 TASYSID  CL4  CICS sysid                        '
des.8   = '028 TACICLVL CL4  CICS level of generating system   '
des.9   = '02C TAMONVER XL1  Monitor version of generator      '
des.10  = '02D TATASKID PL4  Task number                       '
des.11  = '031 TAOPRID  CL3  Operator id                       '
des.12  = '034 TAPTRAN  CL8  Primary tran id                   '
des.13  = 'Ø3C TAOTRAN  CL8  Original tran id                  '
des.14  = 'Ø44 TATERID  CL4  Terminal id                       '
des.15  = 'Ø48 TATRMRMT CL4  Termid in owning region           '
des.16  = 'Ø4C TARMTSYS CL4  Sysid of owning region            '
des.17  = 'Ø5Ø TANETLNM CL8  VTAM terminal lu name             '
des.18  = 'Ø58 TAVTMID  CL8  Region VTAM applid                '
des.19  = 'Ø6Ø TAPGM1   CL8  Transaction base program          '
des.2Ø  = 'Ø68 TASMFSID CL4  MVS SMF system identification     '
des.21  = 'Ø6C TAMVSID  CL8  MVS image id                      '
des.22  = 'Ø74 TAJOBID  CL8  Job identifier                    '
des.23  = 'Ø84 TAASID   XL2  Job asid                          '
des.24  = 'Ø86 TAUOWLNM CL2Ø Uowid luname                      '
des.25  = 'Ø9A TAUOWCTM XL6  Uowid clock value                 '
des.26  = 'ØAØ TAUOWNUM XL2  Uowid sequence number             '
des.27  = 'ØA2 TALUOWID XL8  Local uow                         '
des.28  = 'ØAA TAABNCDE CL4  Abend code                        '
des.29  = 'ØAE TABENDPG CL8  Abending program                  '
des.3Ø  = 'ØBE TAWMSRVC CL8  WLM service class                 '
des.31  = 'ØC6 TAWMRPTC CL8  WLM report class                  '
des.32  = 'ØCE TAWMLOAD CL8  WLM work load                     '
des.33  = 'ØD6 TAXMCLAS CL8  Tran class                        '
des.34  = 'ØDE TAGROUP  CL8  Tmon group                        '
des.35  = 'ØE6 TAPRIRTY XL4  Tran priority                     '
des.36  = 'ØEA TAFACTYP XL1  Facility type from tca (tcafci)   '
des.37  = 'ØEC TAENGMTØ XL8  GMT offset in microseconds        '
des.38  = 'ØF4 TATSKCT  XL4  Task originated count             '
des.39  = 'ØF8 TAUSERID CL8  Userid                            '
des.4Ø  = '1ØØ TAHWMRSN XL2  EIP function exceeding limit      '
des.41  = '1Ø2 TASTRDTP PL4  Transaction start day             '
des.42  = '1Ø6 TASTRTOD XL8  Transaction start time            '
des.43  = '1ØE TAENDDTP PL4  Transaction end day               '
des.44  = '112 TAENDTOD XL8  Transaction end time              '
des.45  = '11A TACPURTM XL8  Task real cpu time                '
des.46  = '122 TADBCTHC XL8  DBCTL thread cpu time             '
des.47  = '12A TARSPTM  XL8  Response time                     '
des.48  = '132 TARSPCT  XL4  Response count                    '
des.49  = '136 TAOPRWTM XL8  Primary facility wait time        '
des.5Ø  = '13E TATRANCT XL4  Tran count                        '
des.51  = '142 TATSKWTM XL8  Task wait time                    '
des.52  = '152 TATSKDTM XL8  Task dispatched time (process)    '
des.53  = '15A TADISPCT XL4  Dispatch count                    '
des.54  = '15E TAWMVSCT XL4  Wait MVS count                    '
des.55  = '162 TAWMVSTM XL8  Wait MVS time                     '
des.56  = '16A TAOLDCCT XL4  Wait oldc count                   '
des.57  = '16E TAOLDCTM XL8  Wait oldc time                    '
des.58  = '176 TAOLDWCT XL4  Wait oldw count                   '
des.59  = '17A TAOLDWTM XL8  Wait oldw time                    '
des.6Ø  = '182 TASUSPCT XL4  Suspend count                     '
des.61  = '186 TASUSPTM XL8  Suspend time                      '
des.62  = '18E TAINITCT XL4  Init wait count                   '
des.63  = '192 TAINITTM XL8  Init wait time (wait 1st dispatch)'
des.64  = '19A TASTCBCT XL4  TCB switch count                  '
des.65  = '19E TASTCBTM XL8  TCB switch time                   '
des.66  = '1A6 TAEXCWCT XL4  Exception wait count              '
des.67  = '1AA TAEXCWTM XL8  Exception wait time               '
des.68  = '1B2 TAIOCT   XL4  Total i/o count                   '
des.69  = '1B6 TAIOTM   XL8  Total i/o time                    '
des.70  = '1BE TAISPRCT XL4  MRO/ISC count                     '
des.71  = '1C2 TAISPRTM XL8  MRO/ISC time                      '
des.72  = '1CA TAPGEICT XL4  Page in count                     '
des.73  = '1CE TAPGEOCT XL4  Page out count                    '
des.74  = '1D2 TAPGETCT XL4  Total page activity               '
des.75  = '1D6 TATIOHWM XL4  TIOA storage hwm                  '
des.76  = '1DA TAU24HWM XL4  User 24 pool hwm                  '
des.77  = '1DE TAU31HWM XL4  User 31 pool hwm                  '
des.78  = '1E2 TAC24HWM XL4  CICS 24 pool hwm                  '
des.79  = '1E6 TAC31HWM XL4  CICS 31 pool hwm                  '
des.80  = '1EA TAGETMCT XL4  Getmain count                     '
des.81  = '1EE TASTGWTM XL8  Storage suspend wait time         '
des.82  = '1F6 TAGMAWCT XL4  Storage suspend count             '
des.83  = '1FA TATERWTM XL8  Terminal suspend wait time        '
des.84  = '202 TATERWCT XL4  Terminal suspend wait count       '
des.85  = '206 TATERICT XL4  Terminal input count              '
des.86  = '20A TATERILG XL4  Terminal input length             '
des.87  = '20E TATEROCT XL4  Terminal output count             '
des.88  = '212 TATEROLG XL4  Terminal output length            '
des.89  = '216 TATERDTP XL1  Terminal device type from tctte   '
des.90  = '217 TAAIDSTU XL1  Tctte AID byte at task start      '
des.91  = '218 TAFLAG1  XL1  Flag byte 1                       '
des.92  = '219 TAFLAG2  XL1  Flag byte 2                       '
des.93  = '21A TAFLAG3  XL1  Flag byte 3                       '
des.94  = '21B TAFLAG4  XL1  Flag byte 4                       '
des.95  = '21C TAFLAG5  XL1  Flag byte 5                       '
des.96  = '21D TAFLAG6  XL1  Flag byte 6                       '
des.97  = '21E TAFLAG7  XL1  Flag byte 7                       '
des.98  = '21F TAFLAG8  XL1  Flag byte 8                       '
des.99  = '220 TAFLAG9  XL1  Flag byte 9                       '
des.100 = '221 TAFLAGA  XL1  Flag byte 10                      '
des.101 = '222 TAFLAGB  XL1  Flag byte 11                      '
des.102 = '223 TAFLAGC  XL1  Flag byte 12                      '
des.103 = '224 TAFLAGD  XL1  Flag byte 13                      '
des.104 = '225 TAFLAGE  XL1  Flag byte 14                      '
des.105 = '226 TAFLAGF  XL1  Flag byte 15                      '
des.106 = '227 TAFLAG16 XL1  Flag byte 16                      '
des.107 = '228 TAFLAG17 XL1  Flag byte 17                      '
des.108 = '229 TAFLAG18 XL1  Flag byte 18                      '
des.109 = '22A TAFLAG19 XL1  Flag byte 19                      '
des.110 = '22B TAFLAG20 XL1  Flag byte 20                      '
des.111 = '22C TAEIPRTM XL8  Total request time                '
des.112 = '234 TAEIPRCT XL4  Total request count               '
des.113 = '238 TAEIPWTM XL8  Total request wait time           '
des.114 = '240 TAEIPWCT XL4  Total request wait count          '
des.115 = '244 TAFCPRTM XL8  FCP file request time             '
des.116 = '24C TAFCPRCT XL4  FCP request count                 '
des.117 = '250 TAFCPWTM XL8  FCP file wait time                '
des.118 = '258 TAFCPWCT XL4  FCP wait count                    '
des.119 = '25C TADLIRTM XL8  DL1 request time                  '
des.120 = '264 TADLIRCT XL4  DL1 request count                 '
des.121 = '268 TADLIWTM XL8  DL1 wait time                     '
des.122 = '270 TADLIWCT XL4  DL1 wait count                    '
des.123 = '274 TAPGMRTM XL8  Program fetch request time        '
des.124 = '27C TAPGMRCT XL4  Program fetch request count       '
des.125 = '280 TAPGMWTM XL8  Program fetch wait time           '
des.126 = '288 TAPGMWCT XL4  Program fetch wait count          '
des.127 = '28C TAJCPRTM XL8  Journal request time              '
des.128 = '294 TAJCPRCT XL4  Journal request count             '
des.129 = '298 TAJCPWTM XL8  Journal wait time                 '
des.130 = '2A0 TAJCPWCT XL4  Journal wait count                '
des.131 = '2A4 TATSQRTM XL8  TS request time                   '
des.132 = '2AC TATSQRCT XL4  TS request count                  '
des.133 = '2B0 TATSQWTM XL8  TS wait time                      '
des.134 = '2B8 TATSQWCT XL4  TS wait count                     '
des.135 = '2BC TATDQRTM XL8  TD req time                       '
des.136 = '2C4 TATDQRCT XL4  TD req count                      '
des.137 = '2C8 TATDQWTM XL8  TD wait time                      '
des.138 = '2D0 TATDQWCT XL4  TD wait count                     '
des.139 = '2D4 TAGDSRTM XL8  GDS req time                      '
des.140 = '2DC TAGDSRCT XL4  GDS req count                     '
des.141 = '2E0 TAGDSWTM XL8  GDS wait time                     '
des.142 = '2E8 TAGDSWCT XL4  GDS wait count                    '
des.143 = '2EC TASPLRTM XL8  Spool req time                    '
des.144 = '2F4 TASPLRCT XL4  Spool req count                   '
des.145 = '2F8 TASPLWTM XL8  Spool wait time                   '
des.146 = '300 TASPLWCT XL4  Spool wait count                  '
des.147 = '304 TARDORTM XL8  RDO req time                      '
des.148 = '30C TARDORCT XL4  RDO req count                     '
des.149 = '310 TARDOWTM XL8  RDO wait time                     '
des.150 = '318 TARDOWCT XL4  RDO req count                     '
des.151 = '31C TAFEPRTM XL8  FEPI req time                     '
des.152 = '324 TAFEPRCT XL4  FEPI req count                    '
des.153 = '328 TAFEPWTM XL8  FEPI wait time                    '
des.154 = '330 TAFEPWCT XL4  FEPI wait count                   '
des.155 = '334 TASQLCTM XL8  SQL calls time                    '
des.156 = '33C TASQLCCT XL4  SQL calls count                   '
des.157 = '340 TANSQCTM XL8  DB2 non-SQL calls time            '
des.158 = '348 TANSQCCT XL4  DB2 non-SQL count                 '
des.159 = '34C TADB2WTM XL8  DB2 wait time                     '
des.160 = '354 TADB2WCT XL4  DB2 wait count                    '
des.161 = '358 TAUDBRTM XL8  User data base request time       '
des.162 = '360 TAUDBRCT XL4  User data base request count      '
des.163 = '364 TAWMRESP XL8  WLM expected response             '
des.164 = '36C TAWMPCNT XL4  WLM percent goal                  '
des.165 = '370 TAWMTGTP XL1  WLM target type                   '
des.166 = '371 TAWMIMPT XL1  WLM importance                    '
des.167 = '372 TADB2ID  CL4  DB2 subsys id                     '
des.168 = '376 TAUSER   CL16 User data field                   '
des.169 = '386 TATCBSCT XL4  Total TCB switches                '
des.170 = '38A TATCBSTM XL8  TCB switch time                   '
des.171 = '392 TAMQSRCT XL4  MQSERIES request count            '
des.172 = '396 TAMQSRTM XL8  MQSERIES request time             '
des.173 = '39E TAMQSWCT XL4  MQSERIES wait count               '
des.174 = '3A2 TAMQSWTM XL8  MQSERIES wait time                '
des.175 = '3AA TAINETOD XL8  Normalized interval end time      '
des.176 = '3B2 TADBCJOB CL8  DBCTL region name                 '
des.177 = '464 TAFILOFF XL2  Offset to fat segments         FAT'
des.178 = '466 TAFILLEN XL2  Length of fat segments            '
des.179 = '468 TAFILCNT XL2  Number of fat segments            '
des.180 = '46A TAUSROFF XL2  Offset to usr-vl segments      UVL'
des.181 = '46C TAUSRLEN XL2  Length of usr-vl segments         '
des.182 = '46E TAUSRCNT XL2  Number of usr-vl segments         '
des.183 = '470 TAUTGOFF XL2  Offset to user target segments UTG'
des.184 = '472 TAUTGLEN XL2  Length of user target segments    '
des.185 = '474 TAUTGCNT XL2  Number of user target segments    '
des.186 = '476 TAMROOFF XL2  Offset to MRO segments         MRO'
des.187 = '478 TAMROLEN XL2  Length of MRO segments            '
des.188 = '47A TAMROCNT XL2  Number of MRO segments            '
des.189 = '47C TAARQOFF XL2  Offset to req segments         REQ'
des.190 = '47E TAARQLEN XL2  Length of req segments            '
des.191 = '480 TAARQCNT XL2  Number of req segments            '
des.192 = '482 TAAWTOFF XL2  Offset to wait segments        WAT'
des.193 = '484 TAAWTLEN XL2  Length of wait segments           '
des.194 = '486 TAAWTCNT XL2  Number of wait segments           '
des.195 = '488 TADSPOFF XL2  Offset to TCB usage segments   TCB'
des.196 = '48A TADSPLEN XL2  Length of TCB usage segments      '
des.197 = '48C TADSPCNT XL2  Number of TCB usage segments      '
return
/*-------------------------------------------------------------------*/
/* Init fat segment descriptions                                     */
/*-------------------------------------------------------------------*/
init_fat_des:
seg_des.1  = '000 TAFILID  CL8  File/DBD name                     '
seg_des.2  = '008 TAFILACM XL1  Access method type indicator      '
seg_des.3  = '009 TAFILUCB XL2  File/DBD UCB chan/unit address    '
seg_des.4  = '00B TAFILVOL CL6  Volume serial number              '
seg_des.5  = '011 TAFILTRN CL4  Tran for DB2 rct entry            '
seg_des.6  = '015 TAFILETI XL8  File/DBD gross access time        '
seg_des.7  = '01D TAFILECT XL4  File/DBD times accessed           '
seg_des.8  = '021 TAFILEXC XL1  Exception conditions              '
seg_des.9  = '022 TAFILDEL XL4  Delete requests                   '
seg_des.10 = '026 TAFILGET XL4  File/DBD get requests             '
seg_des.11 = '02A TAFILBRW XL4  File/DBD browse requests          '
seg_des.12 = '02E TAFILADD XL4  File/DBD add requests             '
seg_des.13 = '032 TAFILUPD XL4  File update requests              '
seg_des.14 = ''
```

```
return
/*-------------------------------------------------------------------*/
/* Init uvl segment descriptions                                     */
/*-------------------------------------------------------------------*/
init_uvl_des:
seg_des.1  = '000 TAUSRKEY CL8  User data key                     '
seg_des.2  = '008 TAUSRSEQ XL4  User data sequence                '
seg_des.3  = '00C TAUSRFRM CL1  User data format                  '
seg_des.4  = '00D TAUSRFUL CL1  User data full flag               '
seg_des.5  = '00E TAUSRSLK CL1  User data slack                   '
seg_des.6  = '00F TAUSRDAT XL240User data area                    '
seg_des.7  = ''
return
/*-------------------------------------------------------------------*/
/* Init utg segment descriptions                                     */
/*-------------------------------------------------------------------*/
init_utg_des:
seg_des.1  = '000 TAUTID   XL1  User target id                    '
seg_des.2  = '001 TAUTIND  XL1  Type indicators                   '
seg_des.3  = '002 TAUTDATA XL8  Accumulated data                  '
seg_des.4  = '00A TAUTDCNT XL4  Target event count                '
seg_des.5  = '00E TAUTSTIM XL8  Pending start time                '
seg_des.6  = ''
return
/*-------------------------------------------------------------------*/
/* Init mro segment descriptions                                     */
/*-------------------------------------------------------------------*/
init_mro_des:
seg_des.1  = '000 TATARSID CL4  Sysid of target system            '
seg_des.2  = '004 TATARFG1 XL1  MRO flag byte                     '
seg_des.3  = '005 TAMRGRP  XL1  Request group id                  '
seg_des.4  = '006 TAMRFUN  XL1  MRO function                      '
seg_des.5  = '007 TATARAID CL8  Applid of target system           '
seg_des.6  = '00F TATARETM XL8  Total elapsed time                '
seg_des.7  = '017 TATARECT XL4  MRO event count                   '
seg_des.8  = '01B TAMRFLG2 XL1  MRO flag byte 2                   '
seg_des.9  = ''
return
/*-------------------------------------------------------------------*/
/* Init req segment descriptions                                     */
/*-------------------------------------------------------------------*/
init_req_des:
seg_des.1  = '000 TAARQIDS XL2  EIB function code                 '
seg_des.2  = '002 TAARQCTS XL4  Request count                     '
seg_des.3  = '006 TAARQRTM XL8  Request time                      '
seg_des.4  = '00E TAARQWCT XL4  Imbedded wait count               '
seg_des.5  = '012 TAARQWTM XL8  Imbedded wait time                '
seg_des.6  = '01A TAARQTXT CL16 Request description               '
seg_des.7  = ''
return
/*-------------------------------------------------------------------*/
```

```
/* Init wat segment descriptions                                      */
/*--------------------------------------------------------------------*/
init_wat_des:
seg_des.1  = '000 TAAWTRTP CL8  Resource type                     '
seg_des.2  = '008 TAAWTRNM CL8  Resource name                     '
seg_des.3  = '010 TAAWTCTS XL4  Wait count                        '
seg_des.4  = '014 TAAWTTMS XL8  Wait time                         '
seg_des.5  = '01C TAAWTFLG XL1  Wait flag                         '
seg_des.6  = ''
return
/*--------------------------------------------------------------------*/
/* Init tcb segment descriptions                                      */
/*--------------------------------------------------------------------*/
init_tcb_des:
seg_des.1  = '000 TADSPID  CL2  Dispatch TCB id                   '
seg_des.2  = '002 TADSPCPU XL8  TCB cpu time used                 '
seg_des.3  = '00A TADSPDSC XL4  TCB dispatch count                '
seg_des.4  = '00E TADSPDST XL8  TCB elapsed time                  '
seg_des.5  = '016 TADSPSWC XL4  TCB switch count                  '
seg_des.6  = '01A TADSPSWT XL8  TCB switch time                   '
seg_des.7  = '022 TADSPQSC XL4  Queued switch count               '
seg_des.8  = '026 TADSPQST XL8  Queued switch time                '
seg_des.9  = ''
return
```

TMTAP1 ISPF PANEL

```
)attr
 ~ type(text) color(yellow) skip(on)
 ! type(output) intens(low) just(right)
 $ type(output) intens(low) just(asis)
 # type(output) intens(high)
   type(text) skip(on) intens(low)
)body expand(@@)
%@-@  TMCE TA record display  @-@
%Command  ===>_zcmd                                     +     %Scroll
===>_amt +
%
%Dataset  ===>_dsn                                         +
%Trans    ===>_Z   +
%Terminal ===>_Z   +
+
)init
.help = tmtaph
.zvars = '(tranmask termmask)'
&zcmd = &z
&ztdmark = ' '
)proc
vput (dsn)
)end
```

TMTAP2 ISPF PANEL

```
)attr
 ~ type(text) color(yellow) skip(on)
 ! type(output) intens(low) just(right)
 $ type(output) intens(low) just(asis)
 # type(output) intens(high)
   type(text) skip(on) intens(low)
)body expand(@@)
%@-@  TMCE TA record display  @-@
%Command  ===>_zcmd                                     +     %Scroll
===>_amt +
%
%                         _Z   +       _Z   +
%X Date    Time   Jobname  Tran    Task Term    Resp    CPU  Paging
FileIO Abnd
%
)model
_Z$date $time    $jobn    $tran !tskn  $term!resp    !cpu    !page !ioct
!abnd+
)init
.help = tmtaph
.zvars = '(tranmask termmask exp)'
&zcmd = &z
&ztdmark = ' '
)proc
)end
```

TMTAP3 ISPF PANEL

```
)attr
 ~ type(text) color(yellow) skip(on)
 ! type(output) intens(low) just(right)
 $ type(output) intens(low) just(asis)
 # type(output) intens(high)
   type(text) skip(on) intens(low)
)body expand(@@)
%@-@  TMCE TA record display - DSECT  @-@
%Command  ===>_zcmd                                     +     %Scroll
===>_amt +
%
%Off  Field   Form Description                          Value
+
)model
$descr                                               +$value
+
)init
.help = tmtaph
&zcmd = &z
&ztdmark = ' '
```

```
)proc
)end
```

TMTAP4 ISPF PANEL

```
)attr
 ~ type(text) color(yellow) skip(on)
 ! type(output) intens(low) just(right)
 $ type(output) intens(low) just(asis)
 # type(output) intens(high)
   type(text) skip(on) intens(low)
)body expand(@@)
%@-@  TMCE TA record display - HEX  @-@
%Command  ===>_zcmd                                     +     %Scroll
===>_amt +
%
%   Offhex Offdec
+
)model
    !offh +!offd + $valhex                          + $valdisp         +
)init
.help = tmtaph
&zcmd = &z
&ztdmark = ' '
)proc
)end
```

TMTAPH ISPF PANEL

```
)attr
 # type(output) intens(high)
   type(text) skip(on) intens(low)
)body expand(@@)
%@-@  TMCE TA record display - Help  @-@
%Command  ===>_zcmd                                     +     %Scroll
===>_amt +
+
+  This system is used with#The Monitor for CICS/ESA V2.0+(TMCE) from
+  Landmark Systems Corporation. Transaction Detail Records created by
+  TMCE, archived and decompressed, can be selected for display in a
+  detailed format, and this display can be saved to a disk file.
+
+  Panel TMTAP1 - Enter decompressed record dataset name, optionally
+  limit the subsequent display to specific transactions and/or
+  terminals.
+
+  Panel TMTAP2 - Select a specific record for detailed display with
+  'x'. Press enter to get the next set of matching records. Overtype
+  tran/term criteria for subsequent displays.
+
+  Panel TMTAP3 - Display DSECT view of the TMCE record. 'HEX' command
+  switches to hex dump view (TMTAP4). To view record segments, enter
+  command as appropriate: 'FAT', 'UVL', 'UTG', 'MRO', 'REQ', 'WAT',
+  'TCB'. 'SAVE' command writes formatted display (including segments)
+  to a member TAnnnnn (nnnnn = task number) in PDS userid.TMTA.SAVE.
+
)init
&zcmd = &z
&ztdmark = ' '
)proc
)end
```

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Wiring CICS regions for desktop sound, e-mail, and alpha paging via TCP/IP – part 1

In recent years, the mainframe has become a significant player in the local area networks and wide area networks of the modern business environment. With the implementation of the TCP/IP SOCKETS interface in CICS, the mainframe can now talk to the desktops within the company or a server on the other side of the world. The following paragraphs describe hypothetical examples of how a mainframe CICS region could play specific sounds on a desktop computer sound card, send e-mails to an SMTP server on the intranet or the Internet, or send an alpha page to a paging application hooked to an SMTP server.

In this example there are five programs, TCPIP00A through TCPIP00E. Each is discussed in its own section, and its workings should be relatively clear with minimal study.

TCPIP00A

This is the root program and is driven by a transaction that is started based upon an ICE timer event. It could be driven directly by paragraphs in application programs that identify certain error conditions and tie these to some identification number. In this case, the procedure division paragraph MAINLINE retrieves sound, page, and e-mail data in the form of an identifying number and short piece of textual data. Subsequently, each function (sound, e-mail, and page) is processed in sequence followed by a simple posting of an ICE to repeat the process in a few seconds. The functions are processed in separate dedicated programs. This is accomplished via LINKS to each program. The links carry a communications area consisting of the numeric key, the short alpha message, and the IP address required for TCP/IP connection identification. Note that the COMM-IP-ADDRESS field is 9(8) comp. This is an unsigned field. This is critical because some higher IP addresses require the leftmost bit to represent them. To develop the address, convert each part of the COMM-IP-ADDRESS to a hex number of two digits, then combine the four as a single hex value. Finally, convert this to decimal and add it to the COMM-IP-ADDRESS field. (For example 10.64.01.127 on your LAN would be 0A.40.01.7F, or 0A40017F which is 171966847 in decimal. When added to the field, while the field is zero, a full word of 0A40017F results.)

```
ID DIVISION.
PROGRAM-ID. TCPIPØØA.
DATE-WRITTEN. DEC 1999.
ENVIRONMENT DIVISION.
DATA DIVISION.
WORKING-STORAGE SECTION.
77  ABSTIME                PIC S9(15) COMP-3.
77  RESTART-INTERVAL       PIC S9(8) COMP VALUE +Ø3Ø.
77  LINK-RESPONSE          PIC S9(8) COMP.
77  START-RESPONSE         PIC S9(8) COMP.
77  TRANSDATA-RESPONSE     PIC S9(8) COMP.
77  OPERATOR-RESPONSE      PIC S9(8) COMP.
77  ABEND-CODE             PIC X(Ø4).
77  SYSTEM-ID  PIC X(Ø4).
Ø1  PAGE-COMMAREA.
    Ø2  COMM-PAGE-NUM      PIC 9(6).
    Ø2  COMM-MESSAGE       PIC X(3Ø).
    Ø2  COMM-IP-ADDRESS    PIC 9(Ø8) COMP.
Ø1  ERROR-MESSAGE.
    Ø2  ERR-PROGRAM-ID           PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-DATE                 PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TIME                  PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TRANSACTION           PIC X(Ø4).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TYPE                  PIC X(1Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-CALL-TYPE             PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TEXT                  PIC X(4Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-NUMBER                PIC 9(8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-RETURN-CODE           PIC 9(8).
Ø1  OPERATOR-MESSAGE.
    Ø2  OPR-REGION-ID             PIC X(Ø4).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-PROGRAM-ID            PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TYPE                  PIC X(1Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-CALL-TYPE             PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TEXT                  PIC X(28).
PROCEDURE DIVISION.
MAINLINE.
    PERFORM HANDLE-ABEND
    PERFORM HOUSE-KEEPING
    PERFORM GET-PAGE-SOUND
    PERFORM SEND-PAGE-SOUND
    PERFORM SEND-PAGE-PAGER
    PERFORM SEND-PAGE-EMAIL
    PERFORM START-TRANSACTION
    GO TO CLEAR-EM-OUT.
HANDLE-ABEND.
    EXEC CICS HANDLE ABEND LABEL(ABEND-ERR) END-EXEC
    CONTINUE.
HOUSE-KEEPING.
    EXEC CICS ASKTIME
        ABSTIME(ABSTIME)
        END-EXEC
    EXEC CICS FORMATTIME
        ABSTIME(ABSTIME)
        YYMMDD(ERR-DATE) DATESEP
        TIME(ERR-TIME) TIMESEP
        END-EXEC
    EXEC CICS ASSIGN SYSID(SYSTEM-ID) END-EXEC
    MOVE SYSTEM-ID TO OPR-REGION-ID
    MOVE 'TCPIPØØA' TO ERR-PROGRAM-ID
                       OPR-PROGRAM-ID
    MOVE EIBTRNID TO ERR-TRANSACTION
    CONTINUE.
```

```
GET-PAGE-SOUND.
    MOVE 'LINK    ' TO ERR-CALL-TYPE
    EXEC CICS LINK PROGRAM('TCPIPØØB')
        COMMAREA(PAGE-COMMAREA)
        LENGTH(LENGTH OF PAGE-COMMAREA)
        RESP(LINK-RESPONSE) END-EXEC
    IF LINK-RESPONSE = DFHRESP(NORMAL)
        CONTINUE
    ELSE
        PERFORM EVALUATE-LINK-RESPONSE
        GO TO CLEAR-EM-OUT
    END-IF
    CONTINUE.
SEND-PAGE-SOUND.
    MOVE ZEROES TO COMM-IP-ADDRESS
    ADD 123456789 TO COMM-IP-ADDRESS
    IF COMM-PAGE-NUM NOT = 999ØØØ
        MOVE 'LINK    ' TO ERR-CALL-TYPE
        EXEC CICS LINK PROGRAM('TCPIPØØC')
            COMMAREA(PAGE-COMMAREA)
            LENGTH(LENGTH OF PAGE-COMMAREA)
            RESP(LINK-RESPONSE) END-EXEC
        IF LINK-RESPONSE = DFHRESP(NORMAL)
            CONTINUE
        ELSE
            PERFORM EVALUATE-LINK-RESPONSE
            GO TO CLEAR-EM-OUT
        END-IF
    END-IF
    CONTINUE.
SEND-PAGE-PAGER.
    MOVE ZEROES TO COMM-IP-ADDRESS
    ADD 123456789 TO COMM-IP-ADDRESS
    IF COMM-PAGE-NUM NOT = 999ØØØ
        MOVE 'LINK    ' TO ERR-CALL-TYPE
        EXEC CICS LINK PROGRAM('TCPIPØØD')
            COMMAREA(PAGE-COMMAREA)
            LENGTH(LENGTH OF PAGE-COMMAREA)
            RESP(LINK-RESPONSE) END-EXEC
        IF LINK-RESPONSE = DFHRESP(NORMAL)
            CONTINUE
        ELSE
            PERFORM EVALUATE-LINK-RESPONSE
            GO TO CLEAR-EM-OUT
        END-IF
    END-IF
    CONTINUE.
SEND-PAGE-EMAIL.
    MOVE ZEROES TO COMM-IP-ADDRESS
    ADD 123456789 TO COMM-IP-ADDRESS
    IF COMM-PAGE-NUM NOT = 999ØØØ
```

```
            MOVE 'LINK    ' TO ERR-CALL-TYPE
            EXEC CICS LINK PROGRAM('TCPIPØØE')
                COMMAREA(PAGE-COMMAREA)
                LENGTH(LENGTH OF PAGE-COMMAREA)
                RESP(LINK-RESPONSE) END-EXEC
            IF LINK-RESPONSE = DFHRESP(NORMAL)
                CONTINUE
            ELSE
                PERFORM EVALUATE-LINK-RESPONSE
                GO TO CLEAR-EM-OUT
            END-IF
        END-IF
        CONTINUE.
    START-TRANSACTION.
        MOVE 'START   ' TO ERR-CALL-TYPE
        EXEC CICS START TRANSID('TCPL') AFTER
            SECONDS(RESTART-INTERVAL)
            REQID('STRTTCPL')
            RESP(START-RESPONSE) END-EXEC
        IF START-RESPONSE = DFHRESP(NORMAL)
            CONTINUE
        ELSE
            PERFORM EVALUATE-START-RESPONSE
            GO TO CLEAR-EM-OUT
        END-IF
        CONTINUE.
    EVALUATE-START-RESPONSE.
        EVALUATE START-RESPONSE
            WHEN DFHRESP(INVREQ)
                MOVE 'INVREQ    ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(IOERR)
                MOVE 'IOERR     ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(ISCINVREQ)
                MOVE 'ISCINVREQ ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(LENGERR)
                MOVE 'LENGERR   ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(NOTAUTH)
                MOVE 'NOTAUTH   ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(SYSIDERR)
                MOVE 'SYSIDERR  ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(TERMIDERR)
                MOVE 'TERMIDERR ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(TRANSIDERR)
                MOVE 'TRANSIDERR' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
        END-EVALUATE.
        PERFORM WRITEQ-TRANSIENT-DATA
        CONTINUE.
    EVALUATE-LINK-RESPONSE.
        EVALUATE LINK-RESPONSE
            WHEN DFHRESP(INVREQ)
                MOVE 'INVREQ    ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(LENGERR)
                MOVE 'LENGERR   ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(NOTAUTH)
                MOVE 'NOTAUTH   ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(PGMIDERR)
                MOVE 'PGMIDERR  ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN TERMINATED' TO ERR-TEXT
            WHEN DFHRESP(SYSIDERR)
                MOVE 'LINK    ' TO ERR-CALL-TYPE
                MOVE 'SYSIDERR  ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-
            WHEN DFHRESP(TERMERR)
                MOVE 'LINK    ' TO ERR-CALL-TYPE
                MOVE 'TERMERR   ' TO ERR-TYPE
                MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-
        END-EVALUATE.
        PERFORM WRITEQ-TRANSIENT-DATA
        CONTINUE.
    WRITEQ-TRANSIENT-DATA.
        EXEC CICS WRITEQ TD QUEUE('CSMT')
            FROM(ERROR-MESSAGE)
            LENGTH(LENGTH OF ERROR-MESSAGE)
            RESP(TRANSDATA-RESPONSE)
            END-EXEC
        IF TRANSDATA-RESPONSE = DFHRESP(NORMAL)
            CONTINUE
        ELSE
            MOVE 'WRITE TD' TO OPR-CALL-TYPE
            MOVE 'SEVERE ERR' TO OPR-TYPE
            MOVE 'TRANSIENT DATA WRITE FAILED' TO OPR-TEXT
            EXEC CICS WRITE OPERATOR
                TEXT(OPERATOR-MESSAGE)
                TEXTLENGTH(LENGTH OF OPERATOR-MESSAGE)
                RESP(OPERATOR-RESPONSE)
                END-EXEC
        END-IF
        CONTINUE.
    ABEND-ERR.
        EXEC CICS ASSIGN ABCODE(ERR-TYPE) END-EXEC
        MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
        PERFORM WRITEQ-TRANSIENT-DATA
        GO TO CLEAR-EM-OUT.
    CLEAR-EM-OUT.
        EXEC CICS RETURN END-EXEC
        STOP RUN.
```

TCPIP00B

This program's source is not included because its function is not germane to what this article is attempting to show. It determines whether an error condition (page) has been added to the file and retrieves the data needed by subsequent modules. The data is returned in the communications area.

TCPIP00C

This program is the shortest and easiest one to study. It is used to send a numeric value to a TCP/IP LISTENER module running on a desktop PC. This could be anywhere on the IP network that your installation can communicate with. In the example, it would likely be on the LAN. The LISTENER on the desktop receives and logs the number (sound key) and uses this key to build the name of the sound file that is to be played (999001.wav). This is accomplished by using the TCPIP SOCKETS interface from within CICS to connect to the desktop and subsequently send the small piece of data. The basic use of the SOCKETS interface is almost identical in the other programs, but they have the necessary code differences interleaved into the appropriate places. If you are not familiar with the SOCKETS interface then I recommend that you study this module to get a basic understanding.

```
ID DIVISION.
PROGRAM-ID. TCPIPØØC.
DATE-WRITTEN. DEC 1999.
***************************************************************
* CICS TCP/IP SOCKET INTERFACE PROGRAM--SEND TO SOUND-LISTENER
****************************************************************
 ENVIRONMENT DIVISION.
 DATA DIVISION.
 WORKING-STORAGE SECTION.
 77  ABSTIME                     PIC S9(15) COMP-3.
 77  TRANSDATA-RESPONSE          PIC S9(8) COMP.
 77  OPERATOR-RESPONSE           PIC S9(8) COMP.
 77  ABEND-CODE                  PIC X(Ø4).
```

```
77  SYSTEM-ID                    PIC X(Ø4).
Ø1  FILLER                  PIC X(13) VALUE 'TCPIP PARMS >'.
Ø1  SOCKET-GROUP.
    Ø3  SOC-FUNCTION             PIC X(16) VALUE SPACES.
    Ø3  ERRNO                    PIC 9(8) COMP VALUE ZEROES.
    Ø3  RETCODE                  PIC S9(8) COMP VALUE ZEROES.
    Ø3  AF                       PIC 9(8) COMP VALUE 2.
    Ø3  SOCTYPE                  PIC 9(8) COMP VALUE 1.
    Ø3  PROTO                    PIC 9(8) COMP VALUE Ø.
    Ø3  NAME.
        Ø5  FAMILY               PIC 9(4) COMP VALUE 2.
        Ø5  PORT                 PIC 9(4) COMP VALUE 3ØØØ.
        Ø5  IP-ADDRESS           PIC 9(8) COMP.
        Ø5  RESERVED             PIC X(8) VALUE LOW-VALUES.
    Ø3  FLAGS                    PIC 9(8) COMP VALUE Ø.
    Ø3  SOCKET-DESC              PIC 9(4) COMP.
    Ø3  NBYTE                    PIC 9(8) COMP.
Ø1  BUFFER-LITERAL               PIC X(11) VALUE 'BUFFER OUT>'.
Ø1  BUFFER-OUT.
    Ø2  FILLER                   PIC 9(Ø6).
Ø1  ERROR-MESSAGE.
    Ø2  ERR-PROGRAM-ID           PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-DATE                 PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TIME                 PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TRANSACTION          PIC X(Ø4).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TYPE                 PIC X(1Ø).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-CALL-TYPE            PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TEXT                 PIC X(4Ø).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-NUMBER               PIC 9(8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-RETURN-CODE          PIC 9(8).
Ø1  OPERATOR-MESSAGE.
    Ø2  OPR-REGION-ID            PIC X(Ø4).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-PROGRAM-ID           PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TYPE                 PIC X(1Ø).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-CALL-TYPE            PIC X(Ø8).
    Ø2  FILLER                   PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TEXT                 PIC X(28).
LINKAGE SECTION.
Ø1  DFHCOMMAREA.
    Ø2  COMM-PAGE-NUM            PIC 9(6).
    Ø2  COMM-MESSAGE             PIC X(3Ø).
    Ø2  COMM-IP-ADDRESS          PIC 9(Ø8) COMP.
PROCEDURE DIVISION.
MAINLINE.
    PERFORM HANDLE-ABEND
    PERFORM HOUSE-KEEPING
    PERFORM GET-SOCKET
    PERFORM CONNECT-SOCKET
    PERFORM SEND-SOCKET
    PERFORM SOCKET-CLOSE-CALL
    GO TO CLEAR-EM-OUT.
HANDLE-ABEND.
    EXEC CICS HANDLE ABEND LABEL(ABEND-ERR) END-EXEC
    CONTINUE.
HOUSE-KEEPING.
    EXEC CICS ASKTIME
        ABSTIME(ABSTIME)
        END-EXEC
    EXEC CICS FORMATTIME
        ABSTIME(ABSTIME)
        YYMMDD(ERR-DATE) DATESEP
        TIME(ERR-TIME) TIMESEP
        END-EXEC
    EXEC CICS ASSIGN SYSID(SYSTEM-ID) END-EXEC
    MOVE SYSTEM-ID TO OPR-REGION-ID
    MOVE 'TCPIPØØC' TO ERR-PROGRAM-ID
                       OPR-PROGRAM-ID
    MOVE EIBTRNID TO ERR-TRANSACTION
    CONTINUE.
GET-SOCKET.
    MOVE 'SOCKET          ' TO SOC-FUNCTION
    CALL 'EZASOKET' USING SOC-FUNCTION
         AF
         SOCTYPE
         PROTO
         ERRNO
         RETCODE
    IF RETCODE < Ø
        MOVE 'TCPIP   ' TO ERR-CALL-TYPE
        MOVE 'GET SOCKET' TO ERR-TYPE
        MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
        PERFORM WRITEQ-TRANSIENT-DATA
    ELSE
        MOVE RETCODE TO SOCKET-DESC
    END-IF
    CONTINUE.
CONNECT-SOCKET.
    MOVE COMM-IP-ADDRESS TO IP-ADDRESS
    MOVE 'CONNECT         '   TO SOC-FUNCTION
    CALL 'EZASOKET' USING SOC-FUNCTION
         SOCKET-DESC
         NAME
         ERRNO
         RETCODE
    IF RETCODE = 0
        CONTINUE
    ELSE
        MOVE 'TCPIP   ' TO ERR-CALL-TYPE
        MOVE 'CONNECT   ' TO ERR-TYPE
        MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
        PERFORM WRITEQ-TRANSIENT-DATA
    END-IF
    CONTINUE.
SEND-SOCKET.
    MOVE COMM-PAGE-NUM TO BUFFER-OUT
    MOVE LENGTH OF BUFFER-OUT TO NBYTE
    CALL 'EZACIC04' USING BUFFER-OUT
         NBYTE
    MOVE LENGTH OF BUFFER-OUT TO NBYTE
    MOVE 'SEND            ' TO SOC-FUNCTION
    CALL 'EZASOKET' USING SOC-FUNCTION
         SOCKET-DESC
         FLAGS
         NBYTE
         BUFFER-OUT
         ERRNO
         RETCODE
    IF RETCODE <  0
        MOVE 'TCPIP   ' TO ERR-CALL-TYPE
        MOVE 'SEND      ' TO ERR-TYPE
        MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
        PERFORM WRITEQ-TRANSIENT-DATA
    ELSE
        CONTINUE
    END-IF
    CONTINUE.
SOCKET-CLOSE-CALL.
    MOVE ZEROES TO RETCODE ERRNO
    MOVE 'CLOSE           ' TO SOC-FUNCTION
    CALL 'EZASOKET' USING SOC-FUNCTION
        SOCKET-DESC
        ERRNO
        RETCODE
    IF RETCODE <  0
        MOVE 'TCPIP   ' TO ERR-CALL-TYPE
        MOVE 'CLOSESOKET' TO ERR-TYPE
        MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
        PERFORM WRITEQ-TRANSIENT-DATA
    ELSE
        CONTINUE
    END-IF
    CONTINUE.
```

```
 WRITEQ-TRANSIENT-DATA.
     EXEC CICS WRITEQ TD QUEUE('CSMT')
         FROM(ERROR-MESSAGE)
         LENGTH(LENGTH OF ERROR-MESSAGE)
         RESP(TRANSDATA-RESPONSE)
         END-EXEC
     IF TRANSDATA-RESPONSE = DFHRESP(NORMAL)
         CONTINUE
     ELSE
         MOVE 'WRITE TD' TO OPR-CALL-TYPE
         MOVE 'SEVERE ERR' TO OPR-TYPE
         MOVE 'TRANSIENT DATA WRITE FAILED' TO OPR-TEXT
         EXEC CICS WRITE OPERATOR
             TEXT(OPERATOR-MESSAGE)
             TEXTLENGTH(LENGTH OF OPERATOR-MESSAGE)
             RESP(OPERATOR-RESPONSE)
             END-EXEC
     END-IF
     CONTINUE.
 ABEND-ERR.
     EXEC CICS ASSIGN ABCODE(ERR-TYPE) END-EXEC
     MOVE 'TRANSACTION HAS BEEN RESCHEDULED' TO ERR-TEXT
     PERFORM WRITEQ-TRANSIENT-DATA
     GO TO CLEAR-EM-OUT.
 CLEAR-EM-OUT.
     EXEC CICS RETURN END-EXEC
     STOP RUN.
```

TCPIP00D

This program uses the same basic SOCKETS logic to connect to an SMTP server on the LAN at TCP/IP port 25. You can read about SMTP by using an Internet Portal (search engine) to search on RFC788.

Request for Change 788 defines the protocol and can be reviewed in a minimum of time. However, the necessary commands are coded into this module and executed in the correct sequence to accomplish the connection and transmission of a short e-mail message to the server. This e-mail message is special and has a RCPT TO field that uniquely identifies to the SMTP server an ID belonging to an ALPHA paging application. This application receives messages and dials the paging service via a modem. The SUBJECT field is by definition the telephone number that uniquely identifies the pager. The pager number is obtained by using the COMM-PAGE-NUM field as the key to a simple VSAM file. These records contain the key and the pager number that is to be notified. Multiple pager numbers are processed reading each subsequent record until the key no longer matches.

```
 ID DIVISION.
 PROGRAM-ID. TCPIPØØD.
 DATE-WRITTEN. DEC 1999.
******************************************************************
* CICS TCP/IP SOCKET INTERFACE PROGRAM--EMAIL SMTP PAGING SERVICE
******************************************************************
 ENVIRONMENT DIVISION.
 DATA DIVISION.
 WORKING-STORAGE SECTION.
 77  ABSTIME                      PIC S9(15) COMP-3.
 77  EML-REC-LENGTH               PIC S9(4) COMP VALUE +8Ø.
 77  EML-KEY-LENGTH               PIC S9(4) COMP VALUE +12.
 77  TRANSDATA-RESPONSE           PIC S9(8) COMP.
 77  OPERATOR-RESPONSE            PIC S9(8) COMP.
 77  FILE-RESPONSE                PIC S9(8) COMP.
 77  ABEND-CODE                   PIC X(Ø4).
 77  SYSTEM-ID                    PIC X(Ø4).
 77  PAGER-SS                     PIC 9(Ø2).
 Ø1  END-FILE-SW                  PIC X(3).
   88 END-FILE VALUE 'END'.
 Ø1  FILLER                  PIC X(13) VALUE 'TCPIP PARMS >'.
 Ø1  SOCKET-GROUP.
     Ø2  SOC-FUNCTION             PIC X(16) VALUE SPACES.
     Ø2  ERRNO                    PIC 9(8) COMP VALUE ZEROES.
     Ø2  RETCODE                  PIC S9(8) COMP VALUE ZEROES.
     Ø2  AF                       PIC 9(8) COMP VALUE 2.
     Ø2  SOCTYPE                  PIC 9(8) COMP VALUE 1.
     Ø2  PROTO                    PIC 9(8) COMP VALUE Ø.
     Ø2  NAME.
         Ø4  FAMILY               PIC 9(4) COMP VALUE 2.
         Ø4  PORT                 PIC 9(4) COMP VALUE 25.
         Ø4  IP-ADDRESS           PIC 9(8) COMP.
         Ø4  RESERVED             PIC X(8) VALUE LOW-VALUES.
     Ø2  FLAGS                    PIC 9(8) COMP VALUE Ø.
     Ø2  SOCKET-DESC              PIC 9(4) COMP.
     Ø2  FILLER                   PIC X(1Ø) VALUE 'LENGTH--->'.
     Ø2  NBYTE                    PIC 9(8) COMP.
 Ø1  FILLER                   PIC X(1Ø) VALUE 'BUFFER-IN>'.
 Ø1  BUFFER-IN.
     Ø2  SMTP-DATA.
         Ø4  SMTP-RETURN-CODE     PIC 9(Ø3).
         Ø4  SMTP-RETURN-MESSAGE  PIC X(253).
 Ø1  FILLER                   PIC X(11) VALUE 'BUFFER-OUT>'.
 Ø1  BUFFER-OUT.
     Ø2  FILLER                   PIC X(8Ø).
 Ø1  MAIL-MESSAGE-HEADER.
     Ø2  MAIL-HEADER-LINEØ1.
         Ø4  FILLER   PIC X(18)
```

```
        VALUE 'HELO ACOMPANY.COM '.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
    Ø2  MAIL-HEADER-LINEØ2.
        Ø4  FILLER   PIC X(39)
        VALUE 'MAIL FROM:<CICS-12345@ACOMPANY.COM>    '.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
    Ø2  MAIL-HEADER-LINEØ3.
        Ø4  FILLER   PIC X(34)
        VALUE 'RCPT TO: <EMLPAGER@ACOMPANY.COM>'.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
    Ø2  MAIL-HEADER-LINEØ4.
        Ø4  FILLER   PIC X(Ø5)
        VALUE 'DATA '.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
Ø1  MAIL-MESSAGE-BODY.
    Ø2  MAIL-BODY-LINEØ1.
        Ø4  FILLER   PIC X(2Ø)
        VALUE 'FROM: CICS 12345    '.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
    Ø2  MAIL-BODY-LINEØ2.
        Ø4  FILLER   PIC X(Ø4) VALUE 'TO: '.
        Ø4  PAGE-TO.
            Ø6  PAGE-TO-ENTRY OCCURS 8 TIMES PIC X(Ø1).
        Ø4  FILLER   PIC X(Ø6) VALUE '@PAGE '.
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
    Ø2  MAIL-BODY-LINEØ3.
        Ø4  FILLER   PIC X(Ø8) VALUE 'SUBJECT:'.
        Ø4  PAGE-SUBJECT.
            Ø6  PAGE-SUBJECT-ENTRY OCCURS 8 TIMES PIC X(Ø1).
        Ø4  FILLER   PIC X(Ø5) VALUE '@PAGE'.
        Ø4  FILLER   PIC X(Ø4) VALUE X'ØD15ØD15'.
    Ø2  MAIL-BODY-LINEØ4.
        Ø4  FILLER   PIC X(3Ø).
        Ø4  FILLER   PIC X(Ø2) VALUE X'ØD15'.
Ø1  MAIL-BODY-END.
    Ø2  FILLER   PIC X(Ø5) VALUE X'ØD154BØD15'.
Ø1  MAIL-MESSAGE-END.
    Ø2  FILLER   PIC X(Ø5)
    VALUE 'QUIT '.
    Ø2  FILLER   PIC X(Ø2) VALUE X'ØD15'.
Ø1  MAIL-MESSAGE-RSET.
    Ø2  FILLER   PIC X(Ø5)
    VALUE 'RSET '.
    Ø2  FILLER   PIC X(Ø2) VALUE X'ØD15'.
Ø1  HOLD-EML-RECORD.
    Ø2  EML-KEY.
        Ø4  EML-RECTYPE       PIC X(1).
        Ø4  FILLER            PIC X(1).
        Ø4  EML-COMPONENT     PIC 9(6).
        Ø4  FILLER            PIC X(1).
        Ø4  EML-RECORD        PIC X(3).
    Ø2  FILLER                PIC X(1).
    Ø2  EML-FLAG              PIC X(1).
    Ø2  FILLER                PIC X(1).
    Ø2  EML-DATA              PIC X(65).
    Ø2  EML-ADDRESSEE REDEFINES EML-DATA.
        Ø4  EML-ADDRESSEE-ENTRY OCCURS 65 TIMES PIC X(1).
    Ø2  EML-PAGER-DATA REDEFINES EML-DATA.
        Ø4  EML-PAGER-NUM.
            Ø6  EML-PAGER-NUM-ENTRY OCCURS 8 TIMES PIC X(1).
        Ø4  EML-DESCRIPTION   PIC X(57).
Ø1  ERROR-MESSAGE.
    Ø2  ERR-PROGRAM-ID            PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-DATE                  PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TIME                  PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TRANSACTION           PIC X(Ø4).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TYPE                  PIC X(1Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-CALL-TYPE             PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-TEXT                  PIC X(4Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-NUMBER                PIC 9(8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  ERR-RETURN-CODE           PIC 9(8).
Ø1  OPERATOR-MESSAGE.
    Ø2  OPR-REGION-ID             PIC X(Ø4).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-PROGRAM-ID            PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TYPE                  PIC X(1Ø).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-CALL-TYPE             PIC X(Ø8).
    Ø2  FILLER                    PIC X(Ø1) VALUE SPACE.
    Ø2  OPR-TEXT                  PIC X(28).
LINKAGE SECTION.
Ø1  DFHCOMMAREA.
    Ø2  COMM-PAGE-NUM             PIC 9(6).
    Ø2  COMM-MESSAGE              PIC X(3Ø).
    Ø2  COMM-IP-ADDRESS           PIC 9(Ø8) COMP.
```

Editor's note: this article will be concluded in the next issue.

Robert Bilyeu
Senior Systems Programmer (USA)

CICS news

TBS Software has announced SMTP-Send for OS/390, which makes it easy to send e-mail messages, notifications, reports, etc from CICS applications to the outside world using industry-standard SMTP. CICS applications are now able to send information to conventional e-mail users as well as to pagers, mobile phones, and PDAs.

Using the SMTP-Send CICS interface, an application writes its e-mail request to a CICS Temporary Storage Queue, then links to SMTP-Send. Application programmers are insulated from the need to learn arcane e-mail protocols such as SMTP, POP3, IMAP, MIME, etc.

SMTP-Send works with all current releases of CICS. It requires OS/390 (MVS) Version 1.3 or OS/390 Version 2 or higher and IBM TCP/IP Version 3.2 or OS/390 Version 2 Communications Server, and must run SMTP Server.

For further information contact:
TBS Software Inc, 100 Mural Street, Suite 100, Richmond Hill, Ontario, Canada, L4B 1J3.
Tel: (905) 707 9373.
URL: http://www.tbssoft.com/smtp-send.

* * *

IBM has announced Version 3.5 of its VisualAge for Java, Professional and Enterprise Editions, which includes a cross-platform object-oriented Java application development tool for extending current information technology assets to the Web.

Both support incremental rapid Java application development, a server-side Java programming environment, WebSphere test environment, and Tool Integrator API.

Also included in the Enterprise version are additional and enhanced Enterprise Access Builders for CICS, MQSeries, Encina, TXSeries, Host-On Demand, and SAP R/3 plus enterprise toolkits for OS/390 and OS/400.

For further information contact your local IBM representative.
URL: http://www-4.ibm.com/software/ad/vajava.

* * *

IBM has launched its Fault Analyzer and File Manager for OS/390, tools for developing and testing new and existing applications.

Fault Analyzer helps analyse and fix application and system failures, while File Manager helps create, edit, compare, print, and (re)format data files in OS/390 file formats, including QSAM and VSAM.

Products diagnosed in the abend environment include OS/390, CICS, IMS, DB2, COBOL, PL/I, C/C++, Assembler, Language Environment, and Unix System Services.

For further information contact your local IBM representative.
URL: http://www.ibm.com.

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