WAVV 2000 Conference

IBM

CICS 3270 Bridge and
Web Support

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CICS

Agenda

- CICS 3270 Bridge

  - Overview

  - Components

- CICS Web Support

  - What is CICS Web Support?

  - Enabling CICS Web Support

  - Writing CICS Web Applications

  - Creating HTML templates from BMS definitions

- Summary

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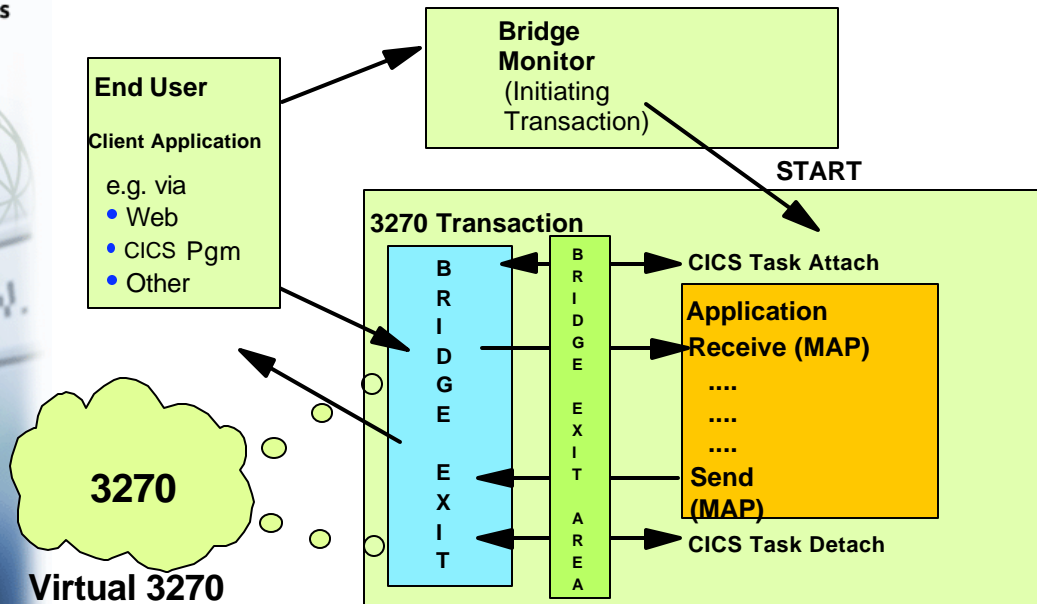
CICS 3270 Bridge

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Overview

- provides the ability to run existing 3270 based transactions

    - Without a 3270 Terminal

    - Without changing application

- 3270 terminal I/O requests handled by a bridge exit program

- CICS supplied 3270 bridge exit programs

    - General purpose sample which uses TS or TD queues for I/O

    - Specific program for use with the CICS Web Interface

The 3270 Bridge Environment

Elements of the 3270 Bridge

- End User Client application

  - The initiating application that can reside on any platform

  - Issues a message to start the CICS Transaction via the TRANSPORT MECHANISM.

- Transport Mechanism

  - The means by which the messages containing the information is passed between the 3270 Bridge and the Client Application

  - TS or TD Queues

  - CICS Web

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Elements of the 3270 Bridge *(continued)*

- Bridge Monitor

  - Optional module that monitors a TRANSPORT MECHANISM for a message to start the 3270 Bridge

  - May be a long running task

- Bridge Exit

  - The module that handles the sending and receiving of messages between the End User Client Application and the CICS Transaction

  - It can handle the formatting of messages for the End User Client and the interpretation of returned messages into 3270 format for CICS or it can call a FORMATTER to do this

  - It is a user replaceable module

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Elements of the 3270 Bridge   *(continued)*

- FORMATTER

  - Formats the messages to be sent to the End User Client and interprets received messages to create the 3270 data required by CICS

  - It is called by the Bridge Exit if defined

  - It is a user replaceable module

- Bridge Exit Area

  - A COMMAREA used between the Bridge Exit and CICS to process and retain information between calls

---

Elements of the 3270 Bridge   *(continued)*

- Bridge Facility

  - the Virtual Terminal that is invisible to the rest of CICS but is visible to the User Transaction

  - Does not appear in the results of a CEMT INQUIRE TERM or CEMT INQUIRE TASK

  - A Real Terminal Definition can be used as a template by naming it in the FACILITYLIKE definition option

- Bridge Environment

  - Term used to describe the components used by the 3270 Bridge when used with a User Transaction
    - ▶ *Includes Bridge Exit, Bridge Exit Area, Formatter and Bridge Facility*

Elements of the 3270 Bridge   *(continued)*

- User Transaction

  - A CICS Transaction or series of Transactions that perform 3270 operations

  - executed by the 3270 Bridge

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Considerations for writing a Bridge Exit

- Supported Languages

  - Assembler, C, COBOL, PL/I
    - ► *Copybooks supplied for these*

- Uses the same Transaction Work Area (TWA) as the User Transaction

- User replaceable module

  - GETMAIN any storage for state data etc

- Commit and Backout are done at the same time as the User Transactions

- Should not attempt to share resources such as VSAM records or ENQ names with the User Transaction

- Do not use EXEC CICS ABEND

  - If abend required set the BRXA_USER_ABEND field

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Considerations for writing a Bridge Exit (continued)

- Bridge Exit Area

  - Interface between Bridge Exit and CICS

  - It is a CICS COMMAREA

  - Subdivided into sub-areas
    - *Header*
    - *Transaction Area*
    - *Command Area*
    - *User Area*
    - *ADS Descriptor*

3270 Bridge - Message format

- Default message exchanged between the 3270 Bridge Exit and the End User Application are based on MQ format

  - Copybooks are provided for supported languages
    - *Assembler - DFHBRMQD*
    - *C   - DFHBRMQH*
    - *PL/I   - DFHBRMQL*
    - *Cobol   - DFHBRMQO*

- For provided samples, ALL messages must start with a standard message header

  - Copybooks for both definition and constants are provided
    - *Assembler Definition - DFHBRMHD   Constants - DFHBRMCD*
    - *C   Definition - DFHBRMHH   Constants - DFHBRMCH*
    - *PL/I   Definition - DFHBRMHL   Constants - DFHBRMCL*
    - *Cobol   Definition - DFHBRMHO   Constants - DFHBRMCO*

3270 Bridge - Samples

- CICS Temporary Storage and Transient Data queues

  - Provided in Cobol
    - *Bridge Exit   - DFHOCBRE*
    - *Formatter   - DFHOCBRF*
    - *Bridge Exit Copybook - DFHOCBRD*
    - *Formatter Copybook - DFHOCBRU*

  - Uses TS or TD Queues for Transport Mechanism
    - *Messages must be in the MQ format*

- CICS Web

  - Object code
    - *DFHWBLT*

  - Allows access via TCP/IP and the Web using a browser

3270 Bridge - BMS Map Utility

- Bridge supports BMS MAPS

  - with Application Data Structures (ADS) which is preferred

  - or without ADS

- To build BMS MAPS with ADS requires the Maps to be reassembled at CICS Transaction Server for VSE/ESA Release 1.1.1 or above level.

- If you do not have the BMS source, there is a provided utility, DFHBMSUP, which will take an assembled Mapset and create a BMS MAP

  - Execute in a batch job giving the Mapset name as the input parameter

  - Result is written to Sequential Disk file addressed by BMSOUT DLBL

-

3270 Bridge - BMS Map Utility *(continued)*

■ Example:

- DLBL Statement
  - ► *// DLBL BMSOUT,'VSE9.BMSMAP.OUTPUT',0,SD*

- Execute Statement
  - ► *// EXEC PGM=DFHBMSUP,SIZE=DFHBMSUP,PARM='BRQMAPS'*

3270 Bridge - BMS Map Utility *(continued)*

■ Example Output

```
* This is an unaligned mapset
*
          TITLE 'BRQMAPS Mapset MACRO Definition Listing'
@000001   DFHMSD TYPE=DSECT,LANG=ASM,TIOAPFX=YES,MODE=INOUT
*
BRQMAP    DFHMDI SIZE=(24,80),CTRL=(FREEKB)
FLD00001  DFHMDF POS=0,LENGTH=4
FLD00002  DFHMDF POS=13,LENGTH=8,ATTRB=(ASKIP,BRT),INITIAL='        '
          DFHMDF POS=22,LENGTH=45,ATTRB=(ASKIP,BRT),                 *
               INITIAL='- CICS 3270 Bridge, Passthrough Transaction  '
          DFHMDF POS=160,LENGTH=33,                                  *
               INITIAL='Overtype to modify then press PF2'
          DFHMDF POS=320,LENGTH=12,INITIAL='MQCIH values'
          DFHMDF POS=361,LENGTH=37,                                  *
               INITIAL='Application Data Structure Descriptor'
FLD00003  DFHMDF POS=402,LENGTH=21,INITIAL='Transaction id    ==>'
FLD00004  DFHMDF POS=424,LENGTH=4,ATTRB=(UNPROT)
          DFHMDF POS=429,LENGTH=0
          DFHMDF POS=443,LENGTH=19,INITIAL='On SEND          ==>'
FLD00005  DFHMDF POS=463,LENGTH=1,ATTRB=(UNPROT)
          DFHMDF POS=465,LENGTH=0
          DFHMDF POS=482,LENGTH=21,INITIAL='Startcode         ==>'
FLD00006  DFHMDF POS=504,LENGTH=2,ATTRB=(UNPROT)
          DFHMDF POS=507,LENGTH=0
          DFHMDF POS=523,LENGTH=19,INITIAL='On RECEIVE       ==>'
FLD00007  DFHMDF POS=543,LENGTH=1,ATTRB=(UNPROT)
          DFHMDF POS=545,LENGTH=0
```

3270 Bridge - BMS Map Utility *(continued)*

- Example *(continued)*

  - New name assigned to MAPSET so that it can be assembled without overwritting original

  - Name and labels can be edited to more reasonable names

  - POS is the offset from the start of the Map.

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3270 Bridge - Support Pack

- Passthrough Utility Support Pack

  - Provides a means of evaluating a 3270 Application to see if it is suitable for use with the 3270 Bridge

  - Allows examination of the 3270 Data streams created by the bridge exit

  - Works with the supplied Temporary Storage and Transient Data sample Bridge Exit
    - ▶ *DFHOCRBE*

  - Can be used with other Bridge Exit
    - ▶ *must conform to the same Interfaces as the supplied Samples*

  - Support Pack number is CA21

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CICS Web Support

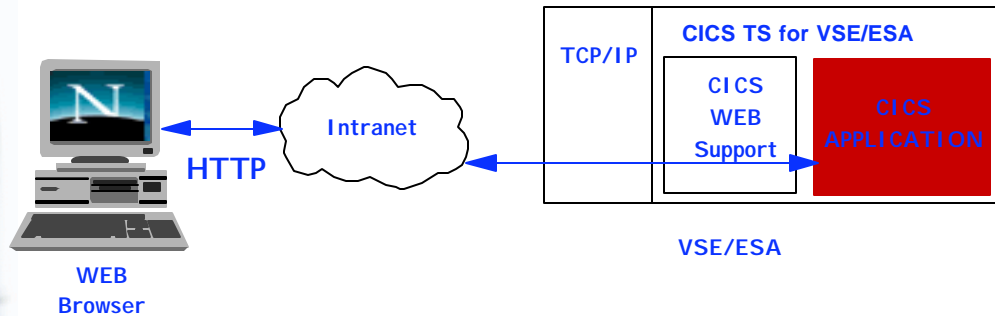*IBM   SOFTWARE*

CICS

Introduction

- Previously referred to as CICS Web Interface

- New functions to be provided to support direct connection from Web to CICS Transaction Server for VSE/ESA

  - CICS Web Support - this presentation

  - 3270 Bridge Support

- Run existing CICS Transactions from a Web Browser, with minimal changes required to existing transactions

- Write new applications for direct access from the Web

- Easy to configure and implement

- Complements CICS Transaction Gateway - see session on Monday at 9:15 for more details

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CICS

What is CICS Web Support ?

```
TCP/IP    CICS TS for VSE/ESA
          CICS
          WEB        CICS
          Support    APPLICATION
```

WEB Browser

HTTP

Intranet

VSE/ESA

Allows a standard Web Browser to invoke a CICS application

The standard HTTP protocol is used

Direct connection - no intermediate gateways or Servers

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Invoking a CICS application from the Web

Via A Uniform Resource Locator (URL) of the general form :

`http://machine.name:port/converter/alias/program?optional-token`
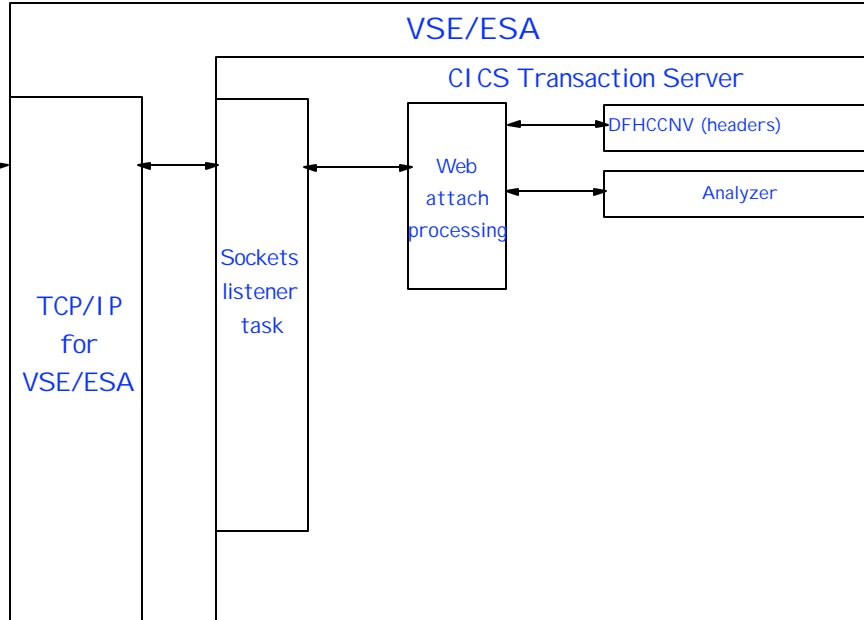Example: `http://cicstest.hur.ibm.com:1080/cics/cwba/webpgm1`

Where :
  machine.name is the IP address or DNS name of the CICS region
  port is the configured CICS Web Interface listening port number
  converter is the name of the program for Decode & Encode processing
  ▬ use 'CICS' if a converter is not required
  alias is the transaction id of the alias transaction
  ▬ CWBA is the supplied alias
  program is the application program name
  optional-token is optional data to be passed with the request

A "Web aware" application understands the HTTP protocol

Accepts HTTP requests and returns HTTP responses

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The CICS Web Support Architecture

VSE/ESA

CICS Transaction Server

DFHCCNV (headers)

Analyzer

Web attach processing

Sockets listener task

TCP/IP for VSE/ESA
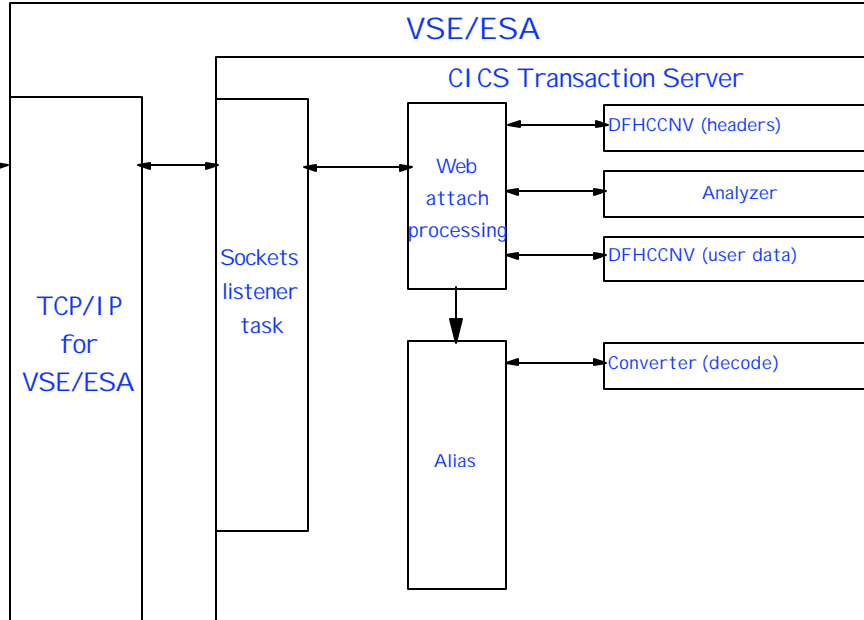
Request from client

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The CICS Web Support Architecture...

- The Analyzer:
  User Replaceable Module

  - Parses the incoming request

  - Determines what to do next

  - An Analyzer Exit is mandatory as it defines the codepage conversion

  - The supplied default:
    - ► Supports the general CWI URL format
    - ► Optional token restricted to 8 bytes
    - ► Provides ISO-8859-01 codepage conversation.

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The CICS Web Support Architecture...

VSE/ESA

CICS Transaction Server

Request from client → TCP/IP for VSE/ESA

Sockets listener task

Web attach processing

DFHCCNV (headers)

Analyzer

DFHCCNV (user data)

Converter (decode)

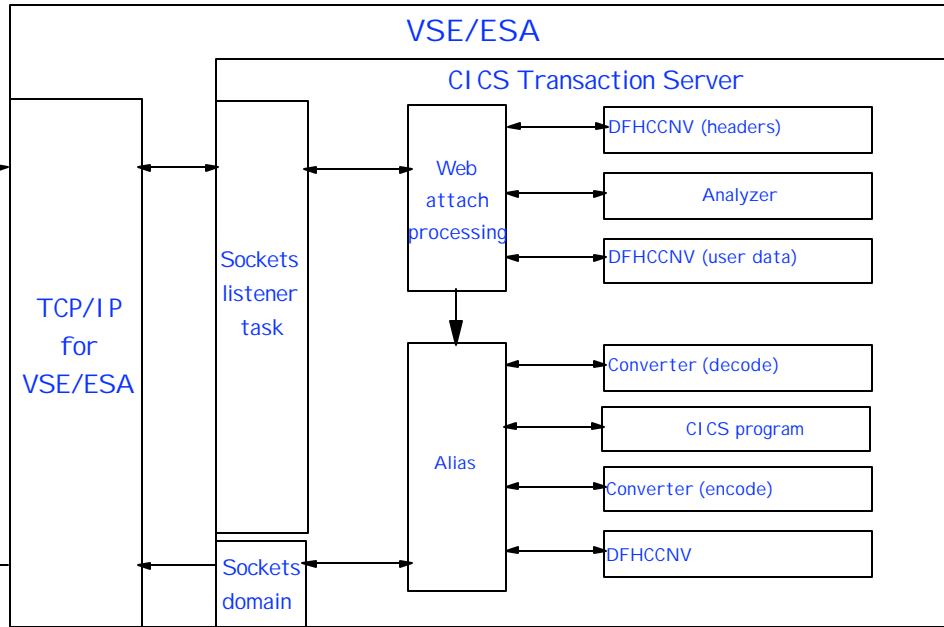Alias

---

The CICS Web Support Architecture...

- The Converter:
  Optional: provides decode and encode functions

  - Decode is invoked before request passed to CICS application
    - provide COMMAREA in the format expected by the application

  - Encode is invoked after CICS application has processed request
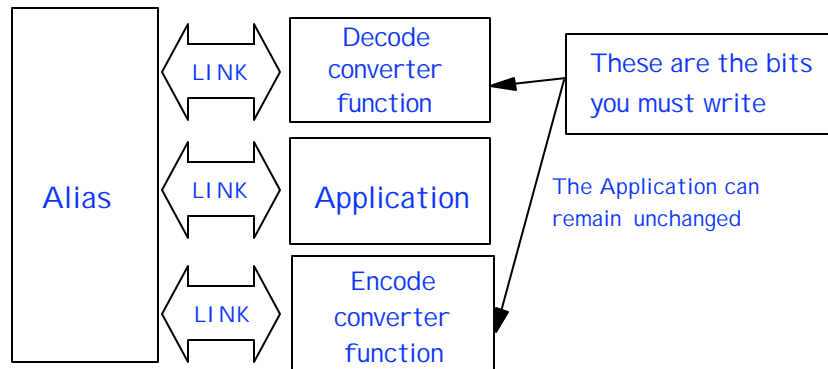   - Build HTTP response and HTTP response headers

The CICS Web Support Architecture...

VSE/ESA

CICS Transaction Server

Request from client →

TCP/IP for VSE/ESA

Sockets listener task

Web attach processing

DFHCCNV (headers)

Analyzer

DFHCCNV (user data)

Alias

Converter (decode)

CICS program

Converter (encode)

DFHCCNV

Reply to client ←
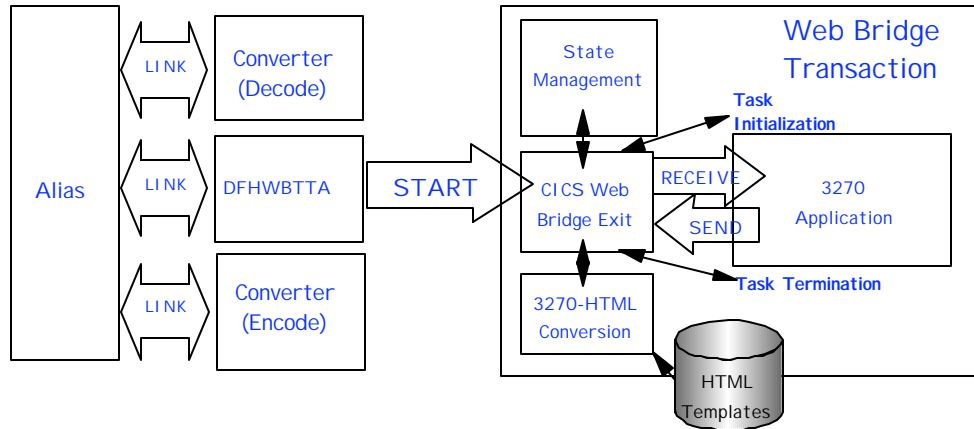
Sockets domain

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Accessing Existing CICS Applications

- COMMAREA applications via use of the Converter....
  A Converter program can shield existing applications from HTML
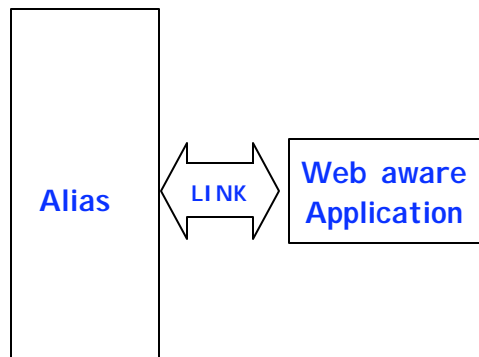
Alias

LINK → Decode converter function

LINK → Application

LINK → Encode converter function

These are the bits you must write

The Application can remain unchanged

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Accessing Existing CICS Applications...

- Via the supplied CICS Web Bridge....
  Uses 3270 Bridge support
    - ► Supports BMS Maps and Terminal Control 3270 datastreams
    - ► No changes to the existing CICS 3270 application

Alias

LINK → Converter (Decode)

LINK → DFHWBTTA

LINK → Converter (Encode)

START →

State Management

CICS Web Bridge Exit

3270-HTML Conversion

HTML Templates

Web Bridge Transaction

RECEIVE

SEND

Task Initialization

3270 Application

Task Termination

And access to NEW applications

Using the new APIs the picture becomes much simpler

Alias

LINK → **Web aware Application**

Enabling CICS Web Support

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CICS

DFHSIT requirements

- Specify that TCP/IP services are required

  - TCPIP=YES

- Specify Web 3270 bridge parameters

  - WEBDELAY=(n,m)
    - ► *n = the time in minutes, that a transaction started by the Web 3270 Bridge is to remain in terminal wait before CICS will terminate it*
    - ► *m = the time in minutes during which state data is kept for a CICS Web 3270 bridge transaction*

- Increase EDSA storage by at least 2M for TCPIP services + 1M per active WEB connection

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CICS

Other requirements

- Define a Conversion table using DFHCNV macros

  - This allow CICS to convert the header pages and user data from ASCII to EBCDIC and EBCDIC to ASCII correctly

- Define a TCPIPSERVICE for each type of service you want

  - Each TCPIPSERVICE defines the port number that CICS is to listen on, the name of the analyzer to be used, the transaction to be attached by CICS when new work arrives, and an IP address on which CICS is to listen for incoming requests

- Define required DOCTEMPLATEs

  - A DOCTEMPLATE allows you to perform variable substitution on documents in a similar manner to that done by BMS for 3270 screens

---

Define a Conversion Table

- Example definition, showing simple ASCII - EBCDIC conversions:

```
DFHCNV TYPE=INITIAL
DFHCNV TYPE=ENTRY,RTYPE=PC,RNAME=DFHWBHH,USREXIT=NO,
       SRVERCP=037,CLINTCP=437
DFHCNV TYPE=SELECT
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=32767,
       LAST=YES
DFHCNV TYPE=ENTRY,RTYPE=PC,RNAME=DFHWBUD,USREXIT=NO,
       SRVERCP=037,CLINTCP=437
DFHCNV TYPE=SELECT
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=32767,
       LAST=YES
DFHCNV TYPE=FINAL
END
```

Define TCP/IP services

```
WINVME
File  Edit  Transfer  Appearance  Communication  Assist  Window  Help

 OBJECT CHARACTERISTICS                          CICS RELEASE = 0411
  CEDA   View TCpipservice( HTTPNSSL )
   TCpipservice   : HTTPNSSL
   Group          : DFH£SOT
   Description    : CICS Web TCPIPSERVICE
   Urm            : DFHWBADX
   Portnumber     : 00080              1-32767
   STatus         : Open               Open | Closed

   TRansaction    : CWXN
   Backlog        : 00005              0-32767
   TSqprefix      :
   Ipaddress      :
   SOcketclose    : No                 No | 0-240000




                                         SYSID=CICS APPLID=IYB7ZA02

 PF  1 HELP 2 COM 3 END        6 CRSR 7 SBH 8 SFH 9 MSG 10 SB 11 SF 12 CNCL
MA       c                                                          01/003
Connected to remote server/host winvme using port 23
```

Define DOCTEMPLATES

```
WINVME
File  Edit  Transfer  Appearance  Communication  Assist  Window  Help

 OBJECT CHARACTERISTICS                          CICS RELEASE = 0411
  CEDA   View Doctemplate( TEST1   )
   Doctemplate    : TEST1
   Group          : WEB
   Description    : DOCUMENT TEMPLATE
  FULL TEMPLATE NAME
   TEmplatename   : THEREALDOCTEMPLATENAME
  ASSOCIATED CICS RESOURCE
   File           :
   TSqueue        :
   TDqueue        :
   Program        :
   Exitpgm        :
  TEMPLATE SUBLIBRARY
   Library        : DFHHTML
   Membername     : TEST1
  TEMPLATE PROPERTIES
   Appendcrlf     : Yes               Yes | No
   TYpe           : Ebcdic            Binary | Ebcdic

                                         SYSID=CICS APPLID=IYB7ZA02

 PF  1 HELP 2 COM 3 END        6 CRSR 7 SBH 8 SFH 9 MSG 10 SB 11 SF 12 CNCL
MA       c                                                          01/003
Connected to remote server/host winvme using port 23
```

Not required for transactions started via CICS Web 3270 Bridge

Writing CICS Web Applications

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The new Web-related API's

- For new and extended applications => Web aware

  - EXEC CICS WEB allows applications to....
    - ► Retrieve the various components of the inbound HTTP request
    - ► Construct HTTP headers to be returned in HTTP response
    - ► Select a document to be delivered as the body of the response
    - ► Symbol list can be passed for substitution

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The new Web-related API's...

- For new and extended applications => Web aware

  - EXEC CICS DOCUMENT allows creation of "Documents"....
    - ► Can be made up of text and binary elements
    - ► Can contain bookmarks and symbols
    - ► Bookmarks can be used to insert data at specific points
    - ► Documents can be imbedded
    - ► Codepage information is stored with the Document

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The new Web-related API's...

- For new and extended applications => Web aware

  - EXEC CICS EXTRACT TCPIP allows retrieval of TCP information
    - ► Client name and address
    - ► Server name and address
    - ► TCPIPService
    - ► Port number

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Document Templates - symbols

- Document templates are defined via RDO

- HTML example:

```
<html>
<head>
<title>Address Book</title>
</head>
<body>
<center>
<h1>&person;</h1><br>
&house_number; &street;<br>
&town;<br>
&zip;<br>
&person; can be reached on &home_number; at home
or &work_number; during office hours <br></center>
</body>
</html>
```
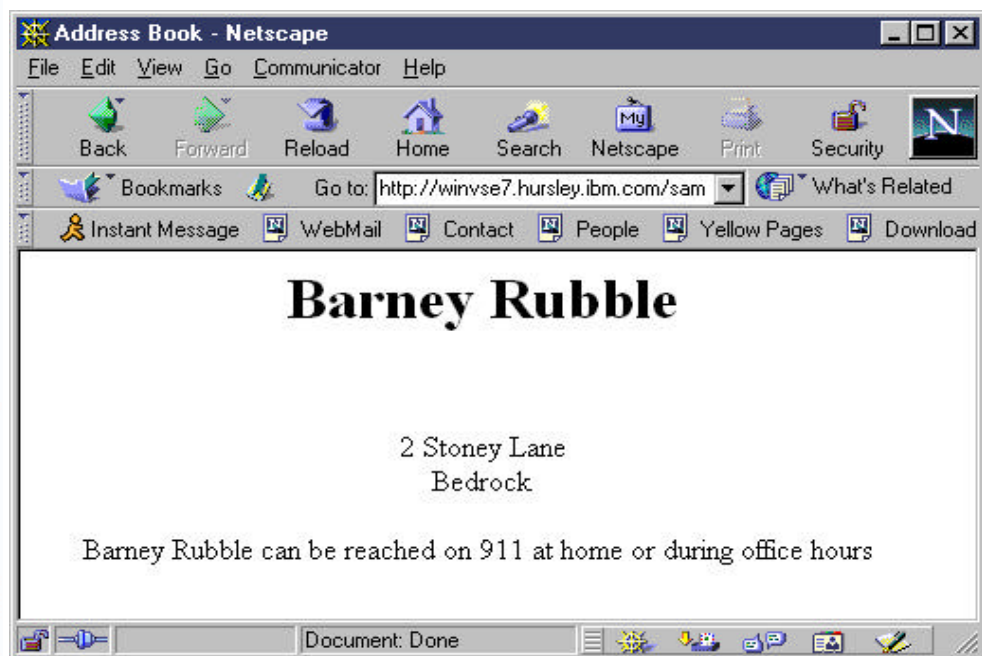
- A symbol list for the previous example would be a single string:
  "person=Barney Rubble&house_number=2&street=Stoney
  Lane&town=Bedrock&zip= &home_number=911&work_number= "
  Any editor can be used for templates

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Example screen after substitution

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Creating HTML templates
from BMS definitions

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HTML templates

- BMS macros have been enhanced to support creation of HTML templates that contain

    - Constants and input fields from the map

    - Buttons to represent
        - ► *ENTER key, PA1..PA3, PF1..PF24 HTML Reset*

    - 5 hidden fields DFH_NEXTTRANSID.1 to DFH_NEXTTRANSID.5

    - Hidden variable DFH_CURSOR

    - A JavaScript function dfhsetcursor
        - ► *sets the cursor position to the field named in DFH_CURSOR*

    - A JavaScript exception handler for the onLoad exception
        - ► *invokes dfhsetcursor*

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HTML Generation

- Assemble existing BMS maps

  - Specify TYPE=TEMPLATE on the DFHMSD macro

  - Or SYSPARM=TEMPLATE in the Assembler parm statement

  - You must also reassemble the physical map (TYPE=MAP)

- Use LIBR to store the templates in a template library

  - CICS assumes Sublibrary called DFHHTML.DFHDOC
    - ► *Otherwise you need to define DOCTEMPLATEs for them*

- There is one template generated for each DFHMDI macro

  - The name for the template is taken from DFHMSD macro
    - ► *Starts by appending 'A' for first map, 'B' for second and so on*

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Customizing HTML templates

- HTML templates can be customized to:

  - Support applications' keys not generated in the standard output

  - Suppress the HTML Reset Button

  - Change the appearance of the keys, or text associated with them

  - Provide an HTML title page

  - Provide a masthead graphic for the page

  - Change the color of the background or specify a special background

  - Modify the BMS colors

  - Suppress parts of the BMS map

  - And more

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Customizing macros

- DFHMDX

  - Define your own customization macro that can be used when creating the templates

  - Is invoked from DFHMSX

  - Add the name of your macro to the TYPE

- DFHWBOUT

  - Add invocations of DFHWBOUT to BMS source

  - Inserts text only if PARM=TEMPLATE

  - For example, add instructions for "web users" unfamiliar with 3270 screens, without affecting your in-house "3270 users"

Customizing examples - DFHMDX

Set default PF keys for all maps and mapsets

```
MACRO
DFHMSX
DFHMDX MAPSET=*,MAP=*,
          PF1='Help',PF3='Exit',PF4='Save',PF9='Messages'
```

Now change title and PF3 for all maps in mapset DFHWB0
```
 DFHMDX MAPSET=DFHWB0,MAP=*,
          TITLE='CICS Web Interface',
          PF3='Messages'
```

Now change title and PF3 for just map DFHWB02
```
DFHMDX MAPSET=DFHWB0,MAP=DFHWB02,
          TITLE='CICS Web Interface Enable',
          PF3='Save'
MEND
```

Customization examples - DFHWBOUT

Add text that appears only on the HTML page

DFHWBOUT '<p>This text illustrates the use of the DFHWBOUT macro,'
DFHWBOUT 'which can be used to output text that should only appear'
DFHWBOUT ' in HTML templates, and will never appear in the'
DFHWBOUT 'corresponding BMS map.'

Add HTML header information to the HTML page

DFHWBOUT '<meta name="author" content="E Phillips Oppenheim">'
DFHWBOUT '<meta name="owner" content="epoppenheim@xxx.com">'
DFHWBOUT '<meta name="review" content="20000314">'

DFHWBOUT and DFHMDX working together

Add Web Browser control functions

Cause an action when the page is loaded

DFHMDX MAP=AD001,ONLOAD='jset("CWS is wonderful", "Hello there!")'

And add the following before any DFHMDF macros

DFHWBOUT '<script language="JavaScript">'
DFHWBOUT 'function jset(msg,wng)'
DFHWBOUT '   {window.status=msg; alert(wng)}'
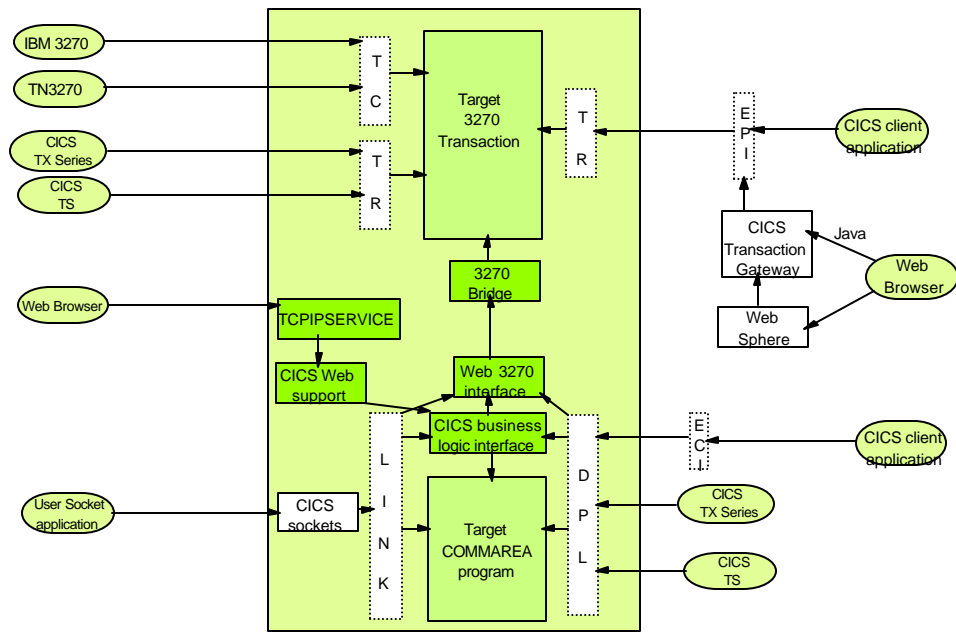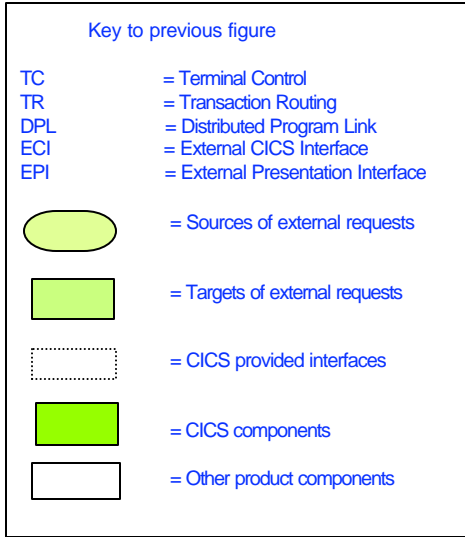DFHWBOUT '</script>'

Summary

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CICS Transaction Server Environment

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CICS Transaction Server Environment

Key to previous figure

TC   = Terminal Control
TR   = Transaction Routing
DPL   = Distributed Program Link
ECI   = External CICS Interface
EPI   = External Presentation Interface

                = Sources of external requests

                = Targets of external requests

                = CICS provided interfaces

                = CICS components

                = Other product components

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Summary

- CICS Web Support will allow you to open your CICS Transaction Server applications up to the World Wide Web even more

- Its easy to configure and use

- Minimal effort needed for existing applications

- New APIs to allow for creating dynamic new applications

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Appendix

APPENDIX

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Additional Reading

- CICS Publications

  - CICS Transaction Server for VSE/ESA: CICS External Interfaces Guide.
    SC33-1669-01

  - CICS Transaction Server for VSE/ESA: CICS Internet Guide.
    SC34-5765-00

- Redbooks

  - CICS Transaction Server for VSE/ESA Web Support
    SG24-5997-00

  - CICS Transaction Server for OS/390 Version 1 Release 3: Web Support
    and 3270 Bridge. SG24-5480-00

  - CICS Transaction Server for OS/390: Web Interface and 3270 Bridge.
    SG24-5243-00

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EXEC CICS WEB

- WEB EXTRACT

- WEB RECEIVE

- WEB READ

- WEB STARTBROWSE HTTPHEADER

- WEB READNEXT

- WEB ENDBROWSE HTTPHEADER

- WEB WRITE

- WEB SEND

IBM SOFTWARE

EXEC CICS DOCUMENT

- DOCUMENT CREATE

- DOCUMENT INSERT

- DOCUMENT SET

- DOCUMENT RETRIEVE

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Writing an Analyzer Exit

- The Analyzer is a user replaceable module

  - Allowing a different URL convention

  - Allowing support for multiple code pages

  - Allowing for auditing and logging

- Inputs

  - resource 'absolute path'

  - request method

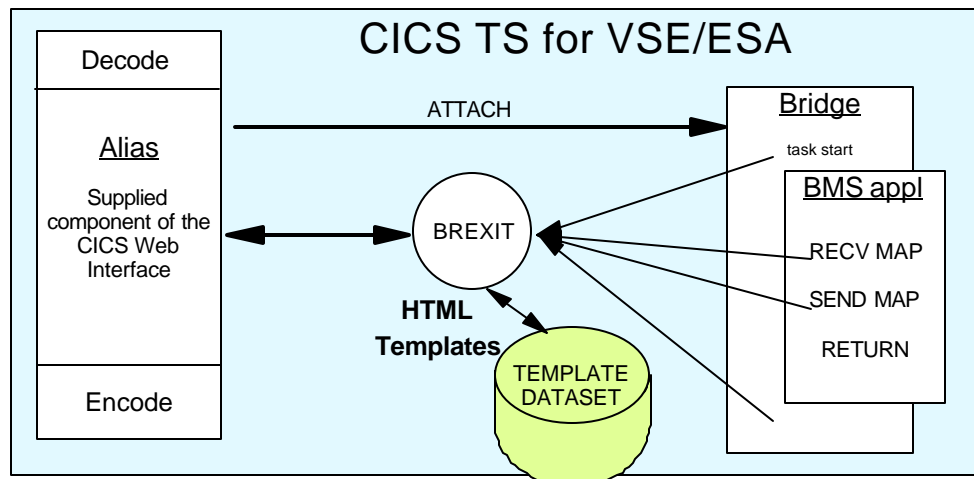 - request headers

  - client address

  - pointer to user data

- Outputs

  - Server Program Name

  - DFHCNV Key

  - converter program name

  - alias transaction id

  - alias user id

  - alias terminal id

IBM SOFTWARE

CICS Web Interface - BMS Transactions

CICS TS for VSE/ESA

Decode

Alias

Supplied component of the CICS Web Interface

Encode

ATTACH

BREXIT

HTML Templates

TEMPLATE DATASET

Bridge

task start

BMS appl

RECV MAP

SEND MAP

RETURN

IBM SOFTWARE

New Tools

Take a mapset and recreate the macros

BMS MACROS

MAP STRUCTURE

MAPSET LOAD MODULE

Create a descriptor so that offsets and field lengths are determined dynamically

Build an HTML template from the macros

HTML TEMPLATE

DATA DEFN STRUCTURE
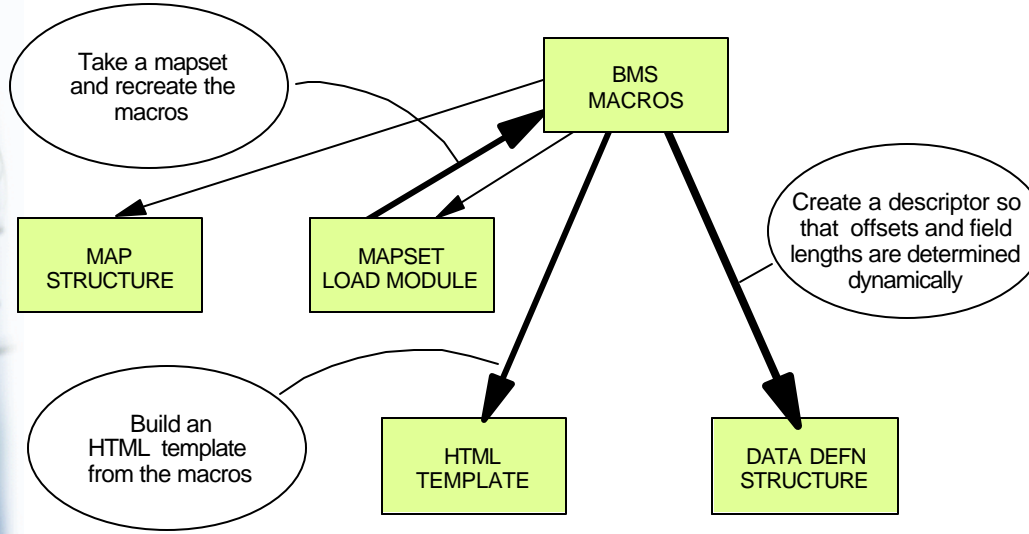
CICS Web Interface 3270 Transactions

CICS TS for VSE/ESA

Decode

Alias

Supplied component of the CICS Web Interface

Encode

ATTACH

BREXIT

Bridge

task start

3270 appl

RECV

SEND

RETURN
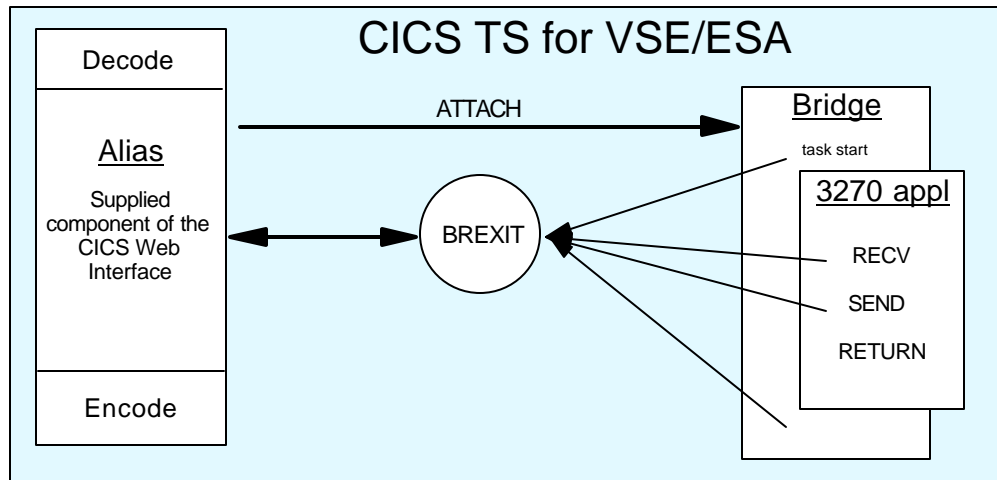
HTML for Raw 3270 Applications

- Makes a reasonable effort to produce a page in fixed width font using the <pre> tag

- Standard header, row of PF buttons, and a footer

- Customizable by writing code in Decode / Encode routines

- E.g. To obtain consistent look with header and footer templates

- REXX available as an easier language to manipulate and parse the body

IBM SOFTWARE

CICS