WAVV 2002 Conference

IBM

CICS Transaction Server for VSE/ESA: CICS Web Support Overview

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Fort Mitchell, 12 - 16 April 2002

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Agenda

- What is CICS Web Support?

- CICS Web Support architecture

- Enabling CICS Web Support

- Writing CICS Web Applications

- Running 3270-based transactions with CICS Web Support

- Further Information and Summary

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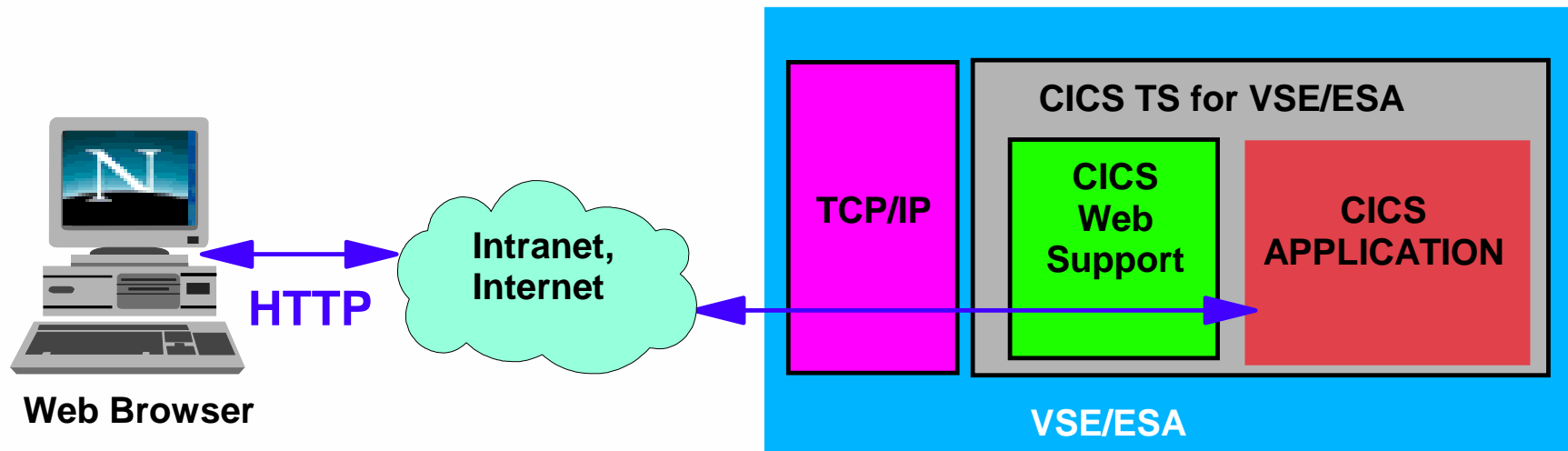
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Agenda

■ **What is CICS Web Support?**

■ CICS Web Support architecture

■ Enabling CICS Web Support

■ Writing CICS Web Applications

■ Running 3270-based transactions with CICS Web Support

■ Further Information and Summary

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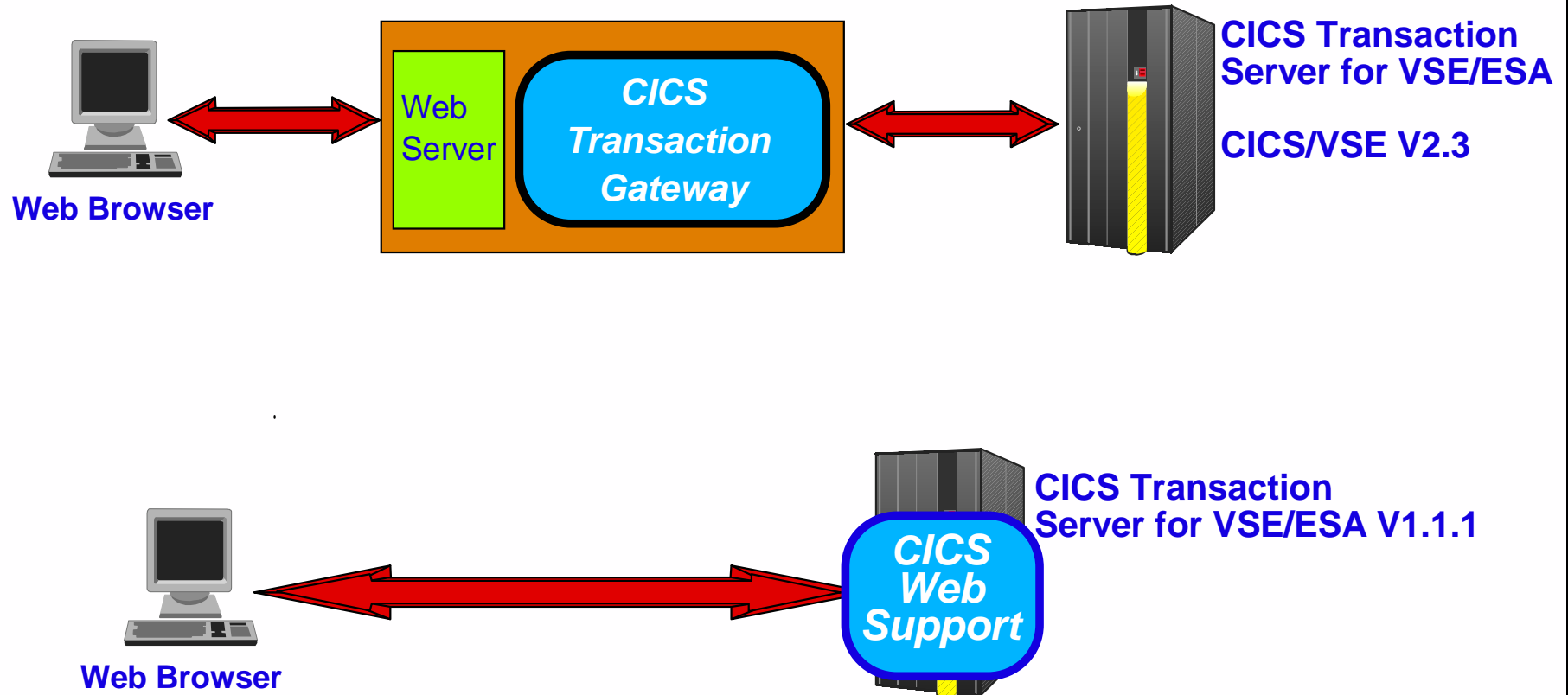
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What is CICS Web Support?

- Set of services that enables direct connection from a Web browser to CICS Transaction Server for VSE/ESA

- Enables access to CICS Application Programs and Transactions

- Formerly known as the CICS Web Interface

- New API's provided for "Web aware" applications

- Delivered in CICS Transaction Server for VSE/ESA V1.1.1

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What is CICS Web Support?

TCP/IP

CICS TS for VSE/ESA

CICS Web Support

CICS APPLICATION

VSE/ESA

HTTP

Intranet, Internet

Web Browser

- Web browser access to CICS Applications and Transactions
- Direct connection - no intermediate gateways or servers
- Standard HTTP protocol used over TCP/IP
- Secure Sockets Layer support available with VSE/ESA V2.6

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Relationship to the CICS Transaction Gateway

Web Browser

Web Server

CICS Transaction Gateway

CICS Transaction Server for VSE/ESA

CICS/VSE V2.3

Web Browser

CICS Web Support

CICS Transaction Server for VSE/ESA V1.1.1

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What is CICS Web Support?

- **CICS Application program to be invoked specified in URL**
  - ► Supplied program for access to 3270-based transactions

- **Default URL format:**
  - ► http://hostid:port/converter/alias/program?optional-token

    hostid is the IP address or DNS name of the CICS region

    port is the configured listening port number

    converter is the name of the program for Decode & Encode processing
    - – "CICS" if no converter

    alias is the transaction id of the alias transaction
    - – "CWBA" is the supplied alias

    program is the name of the CICS application program to be invoked

    optional-token is optional data to be passed with the request

- **Example URL:**
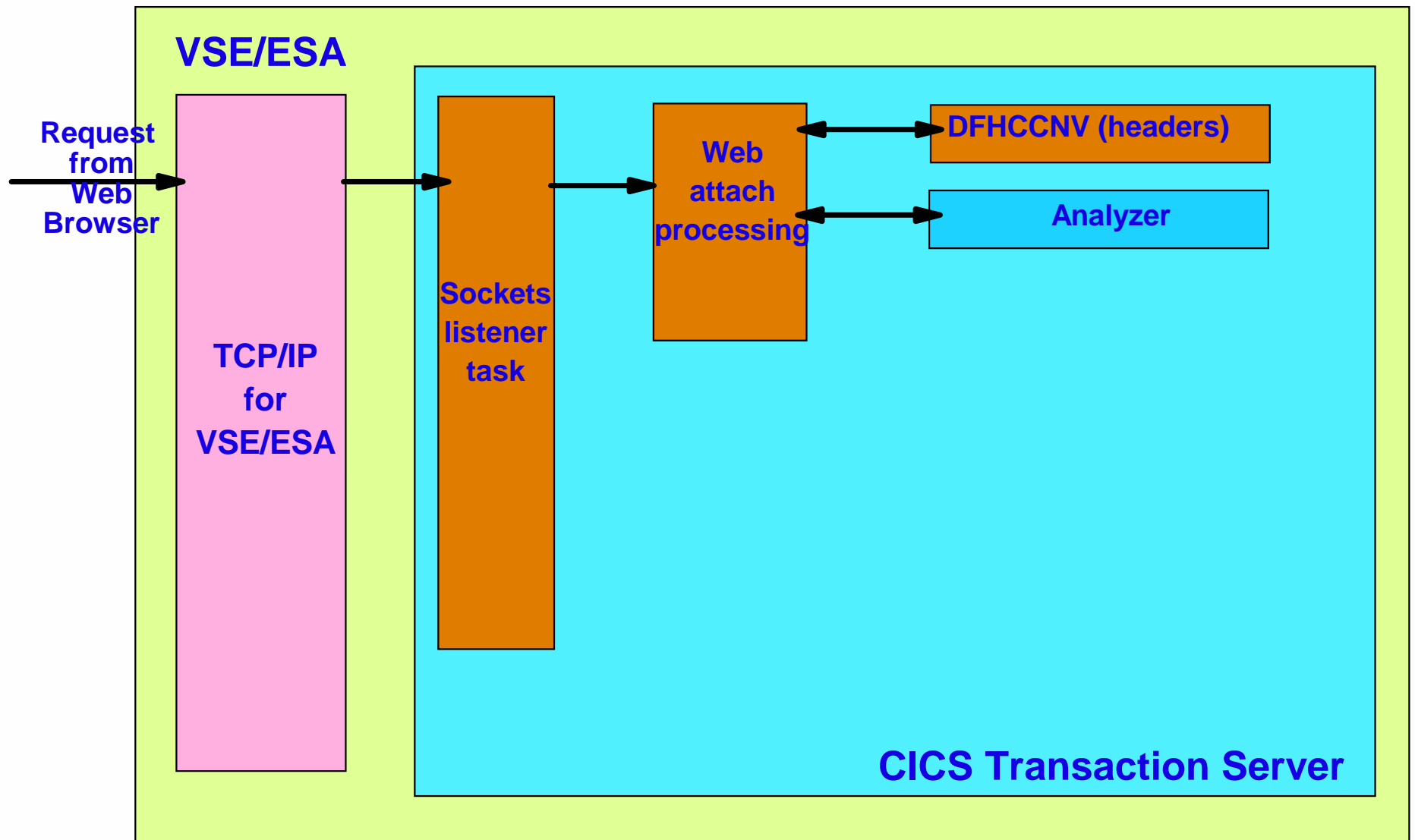 - ► http://cicstest.ibm.com:1080/cics/cwba/webpgm1

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Agenda

- What is CICS Web Support?

- **CICS Web Support architecture**

- Enabling CICS Web Support

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- Running 3270-based transactions with CICS Web Support

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CICS Web Support Architecture

VSE/ESA

Request from Web Browser →

TCP/IP for VSE/ESA

Sockets listener task

Web attach processing

DFHCCNV (headers)

Analyzer

CICS Transaction Server

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CICS Web Support Architecture

- The **Analyzer**:
  - ► Parses the incoming request
  - ► Determines resources and context for Alias transaction
  - ► Specifies codepage conversion for body of http request
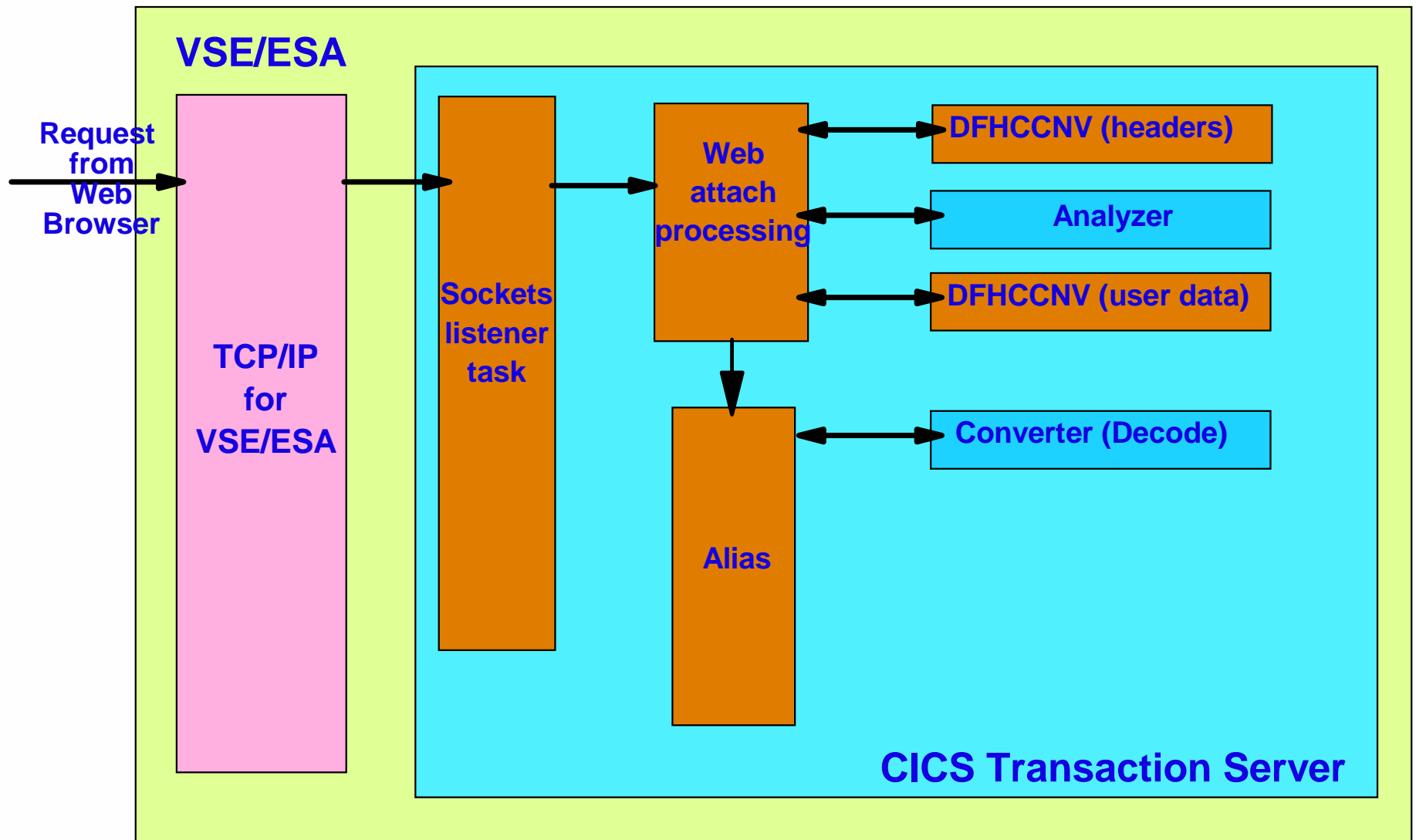 - ► User Replaceable Module

- The supplied default Analyzer:
  - ► Provides ISO-8859-01 codepage conversation
  - ► Supports the default CWS URL format
    - – http://hostid:port/converter/alias/program?optional-token

- The supplied Analyzer programs:
  - ► DFHWBADX ----------->   Assembler
  - ► DFHWBAHX ----------->   C
  - ► DFHWBALX ----------->   PL/I
  - ► DFHWBAOX ----------->   COBOL

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CICS Web Support Architecture

VSE/ESA

Request from Web Browser

TCP/IP for VSE/ESA

Sockets listener task

Web attach processing

DFHCCNV (headers)

Analyzer

DFHCCNV (user data)

Alias

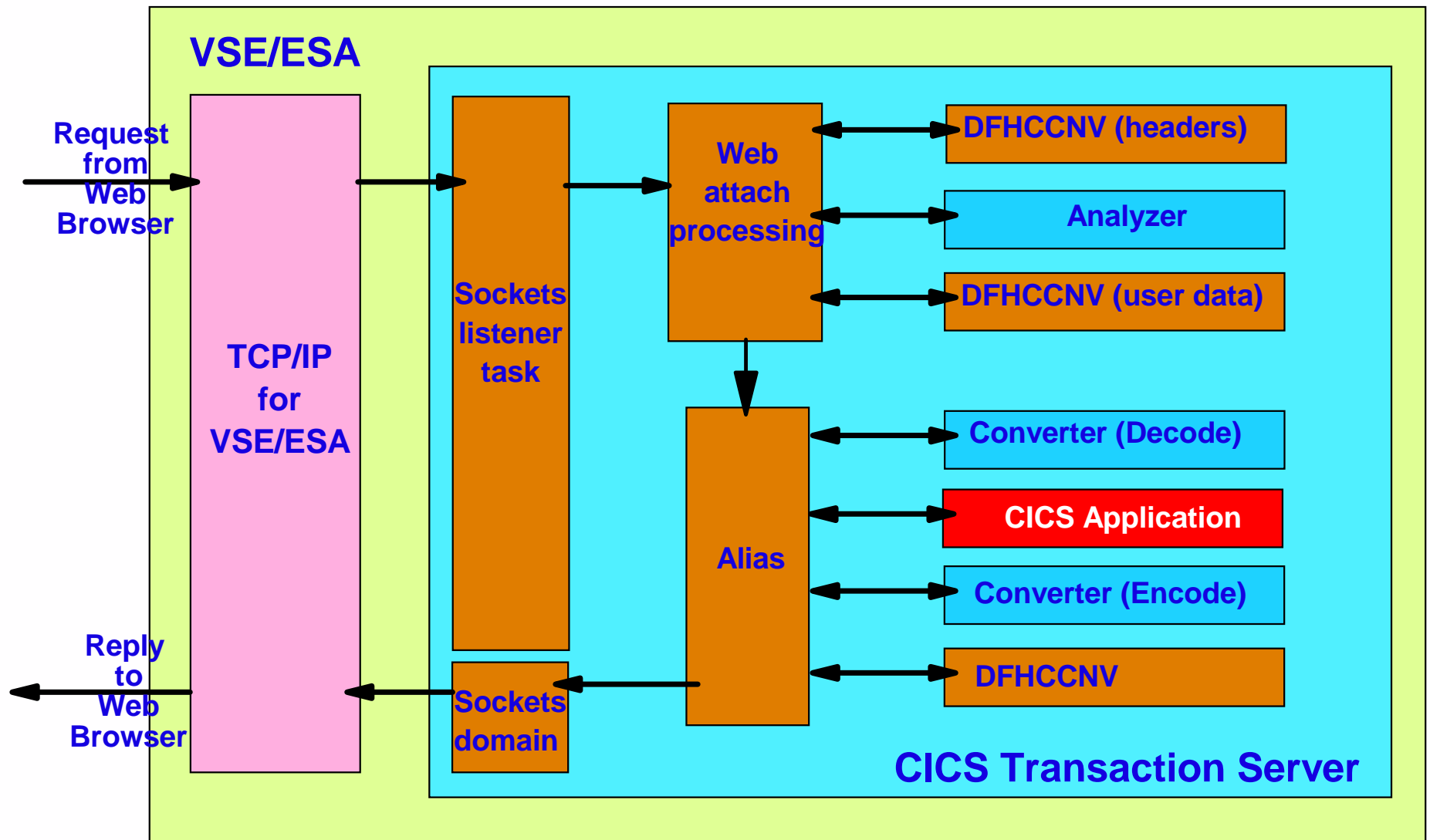**Converter (Decode)**

CICS Transaction Server

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CICS Web Support Architecture

- The **Converter**
  - ► Provides **Decode** and **Encode** functions
- **Decode** invoked *before* request passed to CICS application
  - ► Maps inbound HTTP request to application COMMAREA
- **Encode** invoked *after* CICS application has processed request
 - ► Maps application COMMAREA to outbound HTTP response

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CICS Web Support Architecture

VSE/ESA

Request from Web Browser →

TCP/IP for VSE/ESA

Sockets listener task

Web attach processing

↔ **DFHCCNV (headers)**

↔ **Analyzer**

↔ **DFHCCNV (user data)**

Alias

↔ **Converter (Decode)**

↔ **CICS Application**

↔ **Converter (Encode)**

↔ **DFHCCNV**

Sockets domain

← Reply to Web Browser

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CICS Web Support Architecture

Accessing existing COMMAREA based applications
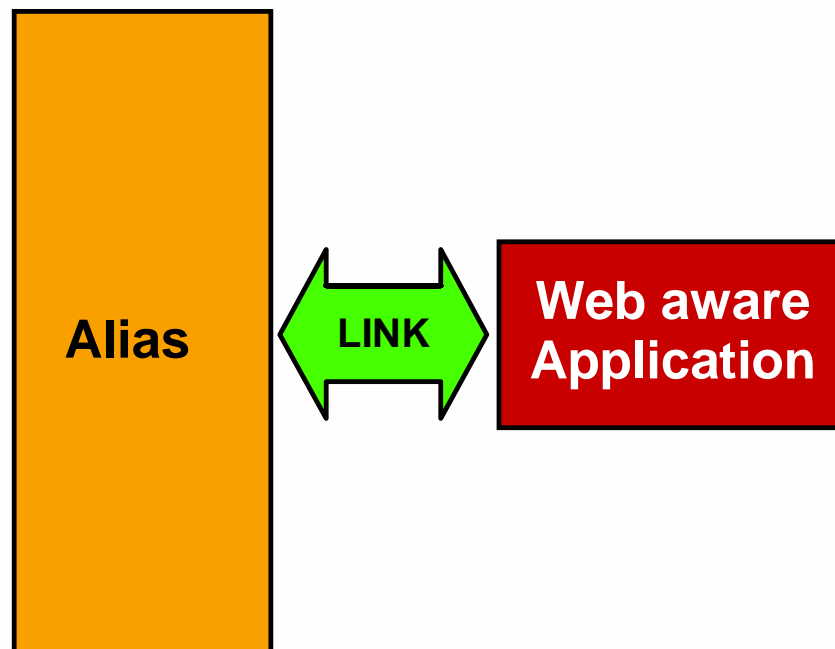
- Converter used to shield applications from HTTP and HTML

Alias	LINK	Converter (Decode)
	LINK	Application
	LINK	Converter (Encode)

User Code
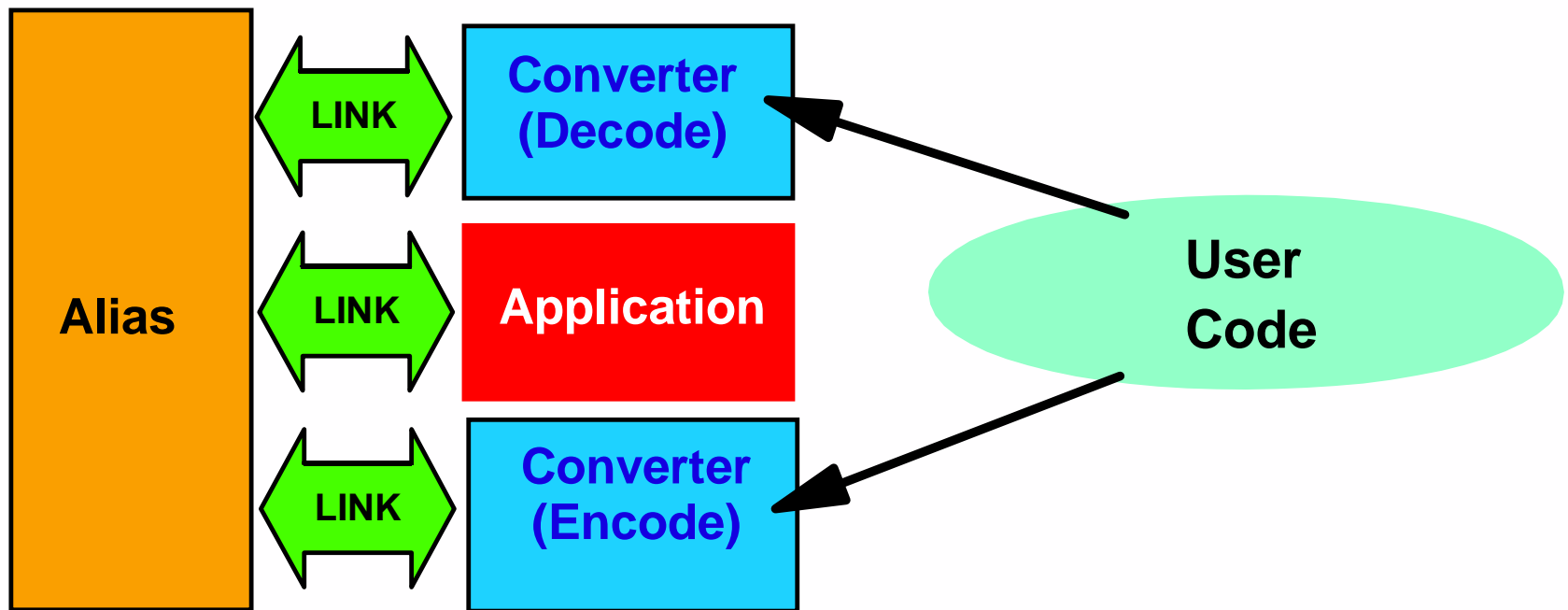
CICS Web Support Architecture

Accessing new CICS "Web aware" Applications
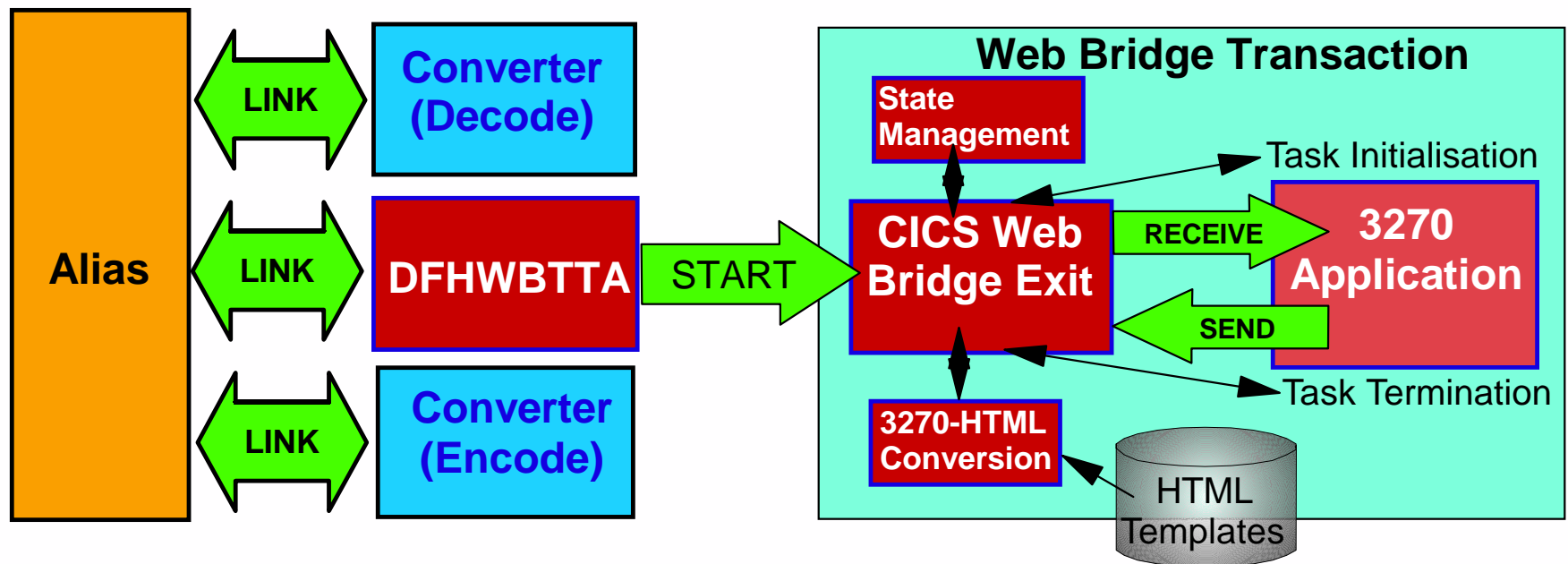
■ The picture becomes simpler using the new API's....

■ NB: "Web aware" applications need to understand HTTP

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CICS Web Support Architecture

Accessing 3270 transactions via the CICS Web Bridge

- Uses the 3270 Bridge support

- Some limitations

Example URL > http://cics1.ibm.com:1080/cics/cwba/dfhwbtta/ceci

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- What is CICS Web Support?

- CICS Web Support architecture

- **Enabling CICS Web Support**

- Writing CICS Web Applications

- Running 3270-based transactions with CICS Web Support

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DFHSIT requirements

- Specify that TCP/IP services are required
  - ► TCPIP=YES

- Specify Web 3270 bridge parameters
  - ► WEBDELAY=(n,m)
    - *n = time transaction is to remain in terminal wait before being terminated*
    - *m = time during which state data is kept for a transaction*

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

- Additional SIT parameters if using SSL
  - ► ENCRYPTION=WEAK|NORMAL|STRONG
  - ► KEYFILE=*name*
  - ► SSLDELAY= *number*

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Resource Definitions

- **Define at least one TCPIPSERVICE**
  - ► Specifies IP address, port number, name of the analyzer
  - ► Also specifies level of SSL support and SSL certificate
  - ► Sample specified in DFH$SOT
- **Install supplied RDO group DFHWEB**
  - ► Contains definitions for CWS transactions and programs
- **Define any required DOCTEMPLATEs**
  - ► Required if using new DOCUMENT API

Other Requirements

- Define a conversion table using DFHCNV macros
  - ► For HTTP conversion between ASCII and EBCDIC
  - ► Example DFHCNV table:

```
DFHCNV TYPE=INITIAL
*
DFHCNV  TYPE=ENTRY,RTYPE=PC,RNAME=DFHWBHH,USREXIT=NO,
        SRVERCP=037,CLINTCP=8859-1
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=8859-1
DFHCNV TYPE=SELECT
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=32767,
        LAST=YES
*
DFHCNV TYPE=FINAL
END
```

- Configure TCP/IP for VSE/ESA

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Other Considerations

- **Security**
  - ► Transactions that compose CICS Web Support
  - ► Running Web transactions with end-user specified Userid
  - ► Use of Secure Sockets Layer (SSL)
  - ► TCP/IP VSE/ESA security facilities

- **Operational Support**
  - ► DFHWBEP - Web Error Program
  - ► SPI and CEMT commands

COMMAND	SPI	CEMT
CREATE DOCTEMPLATE	✓	
CREATE TCPIPSERVICE	✓	
DISCARD DOCTEMPLATE	✓	
DISCARD TCPIPSERVICE	✓	
INQUIRE DOCTEMPLATE	✓	✓
INQUIRE TCPIP	✓	✓
INQUIRE TCPIPSERVICE	✓	✓
INQUIRE WEB	✓	✓
SET TCPIP	✓	✓
SET TCPIPSERVICE	✓	✓
SET WEB	✓	✓

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Agenda

■ What is CICS Web Support?

■ CICS Web Support architecture

■ Enabling CICS Web Support

■ **Writing CICS Web Applications**

■ Running 3270-based transactions with CICS Web Support

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The new Web API's

- **EXEC CICS WEB**
  - ► Retrieve components of the inbound HTTP request
  - ► Construct HTTP headers to be returned in HTTP response
  - ► Select a document for delivery as the body of the response
- **EXEC CICS EXTRACT TCPIP**
  - ► Retrieve TCP/IP information
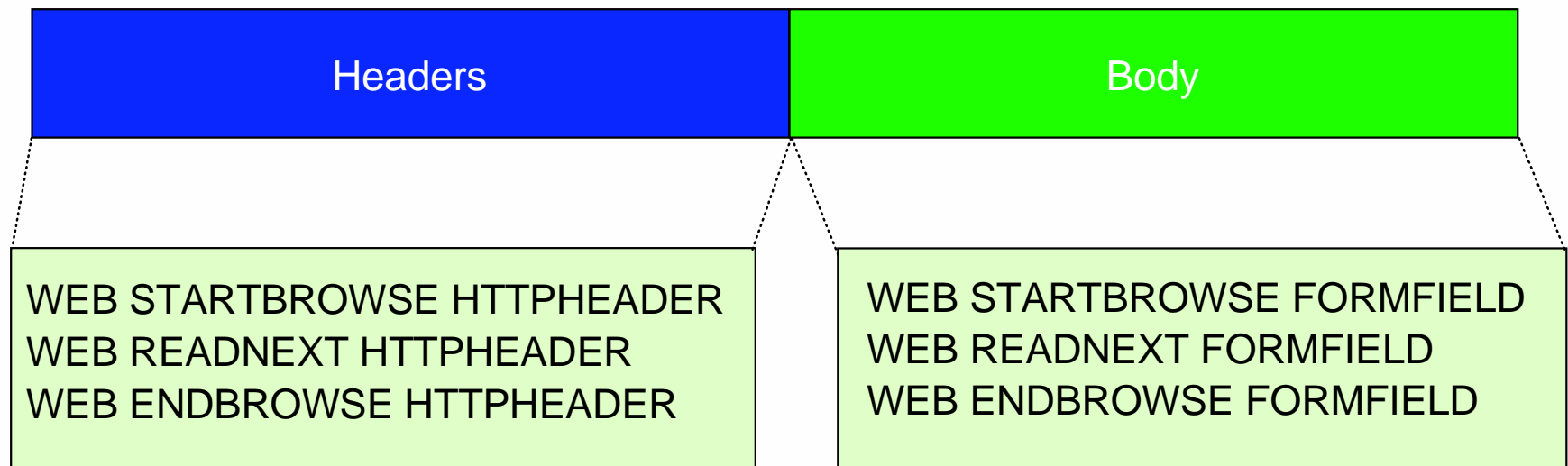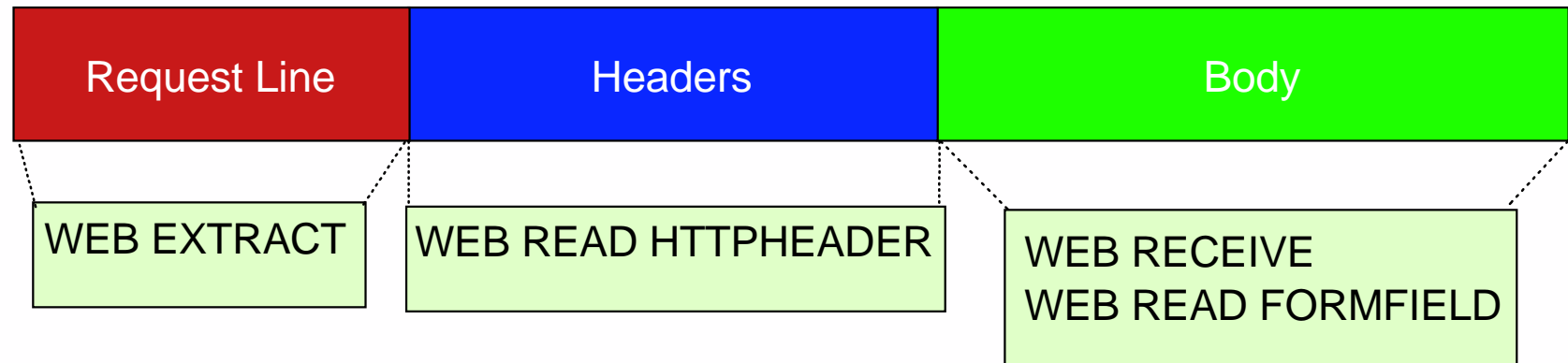- **EXEC CICS EXTRACT CERTIFICATE**
  - ► Retrieve information from the client certificate
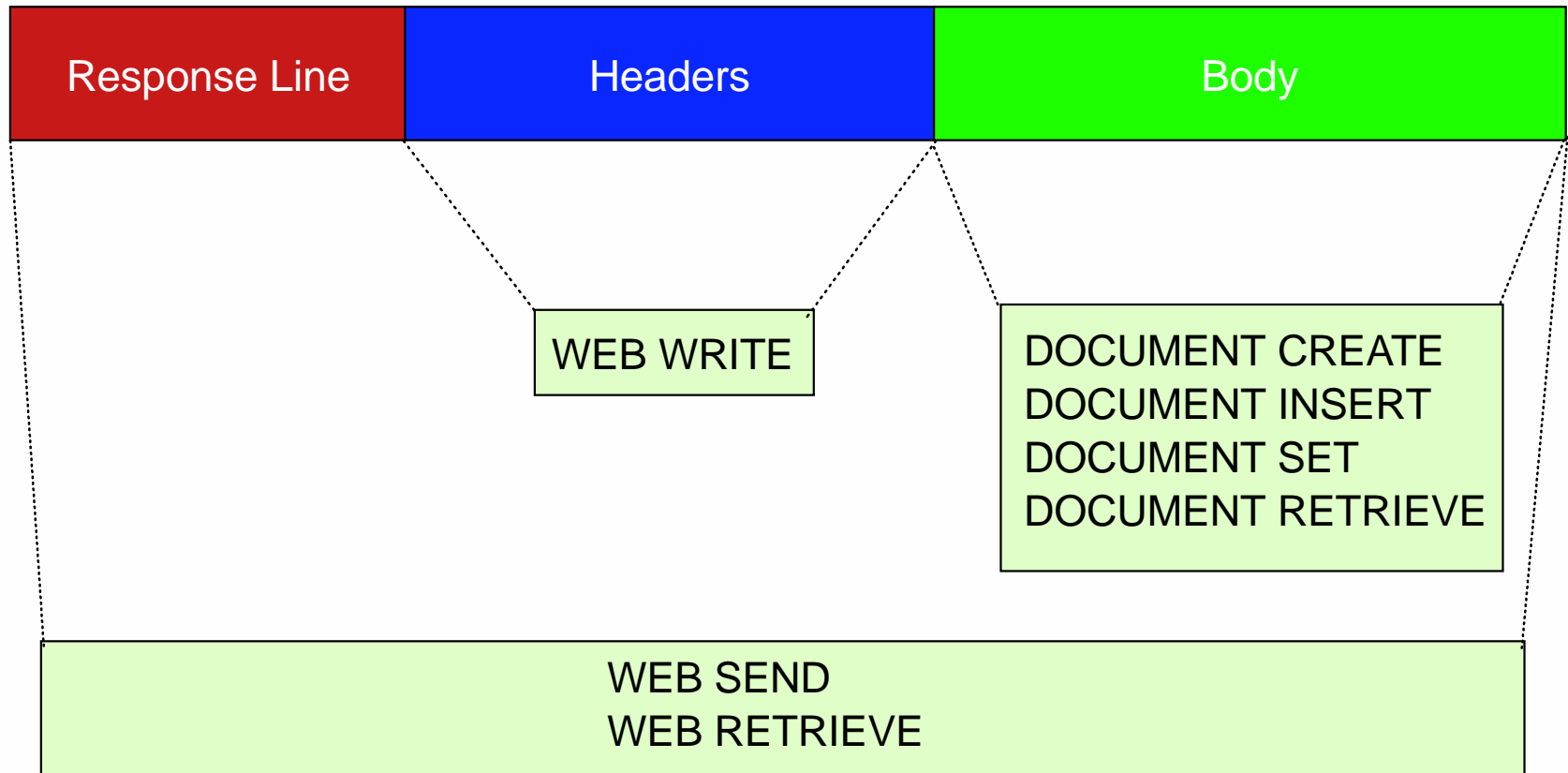- **EXEC CICS DOCUMENT**
  - ► Create and manipulate "Documents"
    - – Can be made up of both text and binary elements
    - – Can contain templates, symbols and bookmarks
    - – Bookmarks can be used to insert data at specifics points
    - – Documents can be imbedded
    - – Codepage information stored with document

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New WEB API's....Processing HTTP Requests

Request Line	Headers	Body

| WEB EXTRACT | WEB READ HTTPHEADER | WEB RECEIVE
WEB READ FORMFIELD |

Headers	Body

| WEB STARTBROWSE HTTPHEADER
WEB READNEXT HTTPHEADER
WEB ENDBROWSE HTTPHEADER | WEB STARTBROWSE FORMFIELD
WEB READNEXT FORMFIELD
WEB ENDBROWSE FORMFIELD |

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New WEB API's....Processing HTTP Responses

Response Line	Headers	Body

WEB WRITE

DOCUMENT CREATE
DOCUMENT INSERT
DOCUMENT SET
DOCUMENT RETRIEVE

WEB SEND
WEB RETRIEVE

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Document Templates

- Templates specified by DOCTEMPLATE resource, can be...
  - ► VSE sub-library member, CICS file, TS queue, TD queue
  - ► Load module, Exit program
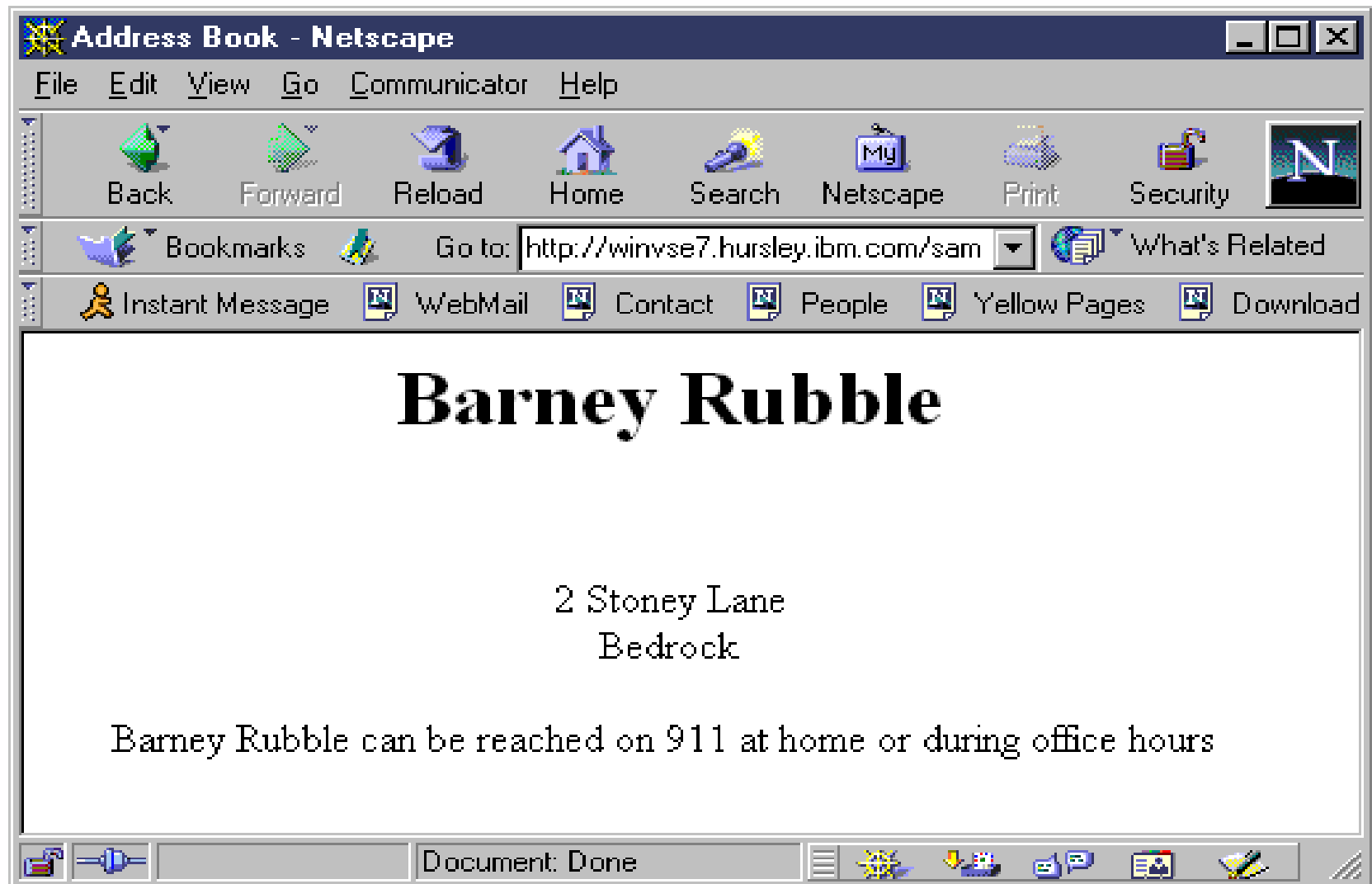
- HTML example:
```
<html>
<head>
<title>Address Book</title>
</head>
<body>
<center>
<h1>&person;</h1><br>
&house_number; &street;<br>
&town;<br>
&zip;<br>
&person; can be reached on &home_number; at home or &work_number; during office hours <br>
</center>
</body>
</html>
```

- Example symbol list for the above would be a single string:
```
"person=Barney Rubble&house_number=2&street=Stoney Lane&town=Bedrock&zip=&home_number=911&work_number=123-456 "
```

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Document Templates...after substitution

Web API's – Assembler code example

```
* Create document from existing HTML template
          EXEC CICS DOCUMENT CREATE DOCTOKEN(DOCTKN)
             TEMPLATE('TEMPL1')
* Get Server TCP/IP address
          EXEC CICS EXTRACT TCPIP
             SERVERADDR(SRVRADDR)  SADDRLENGTH(ADDRL)
* Get Client TCP/IP address
          EXEC CICS EXTRACT TCPIP
             CLIENTADDR(CLNTADDR)  CADDRLENGTH(ADDRL)
* Insert both addresses into document
          EXEC CICS DOCUMENT INSERT DOCTOKEN(DOCTKN)
             TEXT(DOCTXT)  LENGTH(DOCTXTL)
* Add footer to document from existing HTML template
          EXEC CICS DOCUMENT INSERT DOCTOKEN(DOCTKN)
             TEMPLATE('TEMPL2')
* Send completed document
          EXEC CICS WEB SEND DOCTOKEN(DOCTKN)  CLNTCODEPAGE('iso-8859-1')
* Terminate program
          EXEC CICS RETURN


ADDRL        DC  F'15'
DOCTXTL      DC  F'70'
DOCTKN       DC  CL16
DOCTXT       DS  0CL
SRVRTXT      DC  C'<p> Server Address: '
SRVRADDR     DS  CL15
SRVRTXT      DC  C'<p> Client  Address: '
CLNTADDR     DS  CL15
```

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Web API's - Templates example
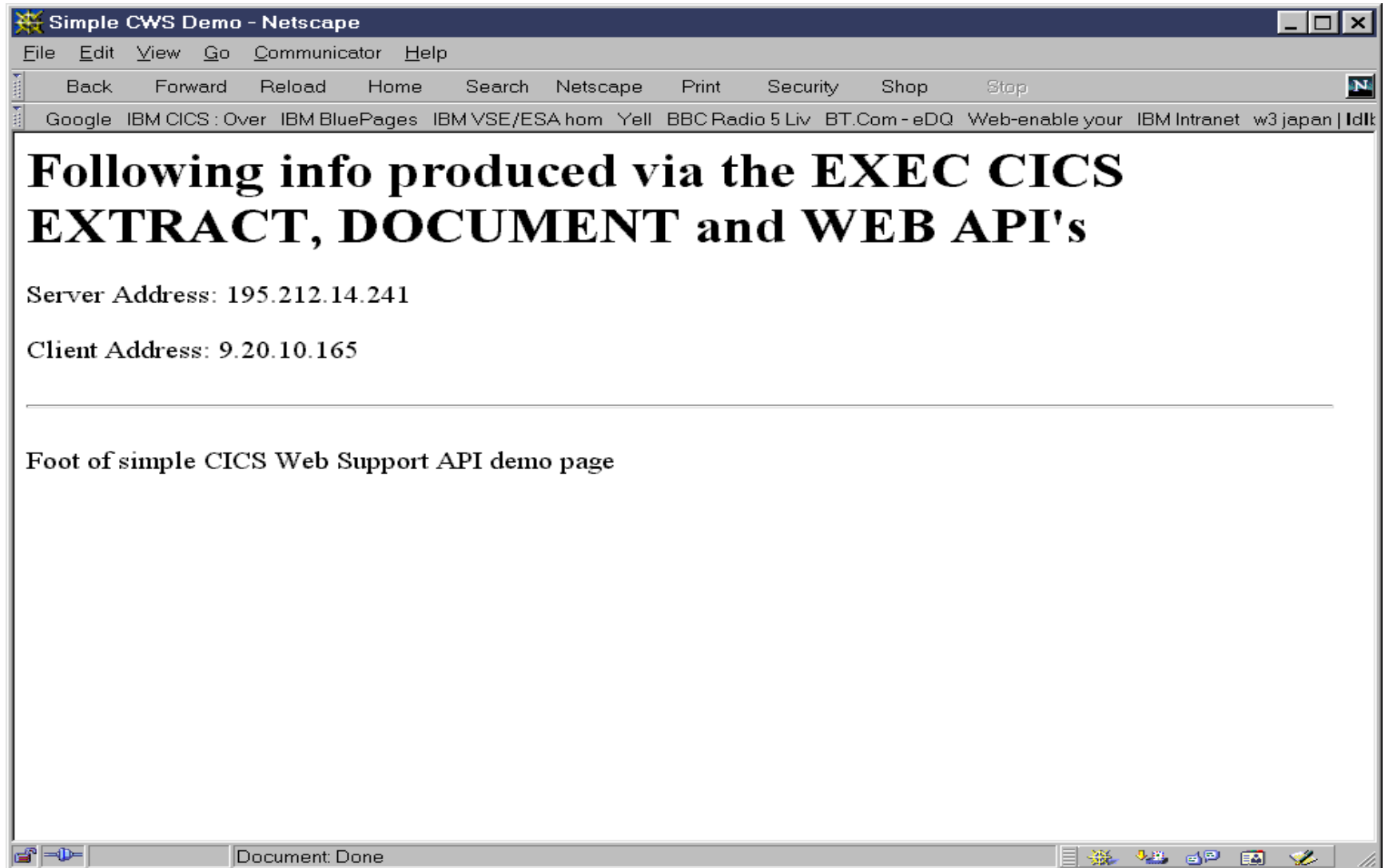
First HTML Template (TEMPL1)

```
<html>
<head>
<title>Simple CWS Demo</title>
</head>
<body>
<h1>Following info produced via the EXEC CICS EXTRACT, DOCUMENT and WEB API's</h1>
```

Second HTML Template (TEMPL2)

```
<p><hr>
<p>Foot of simple CICS Web Support API demo page
</body>
</html>
```

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Web API's – Example output

Following info produced via the EXEC CICS EXTRACT, DOCUMENT and WEB API's

Server Address: 195.212.14.241

Client Address: 9.20.10.165

Foot of simple CICS Web Support API demo page

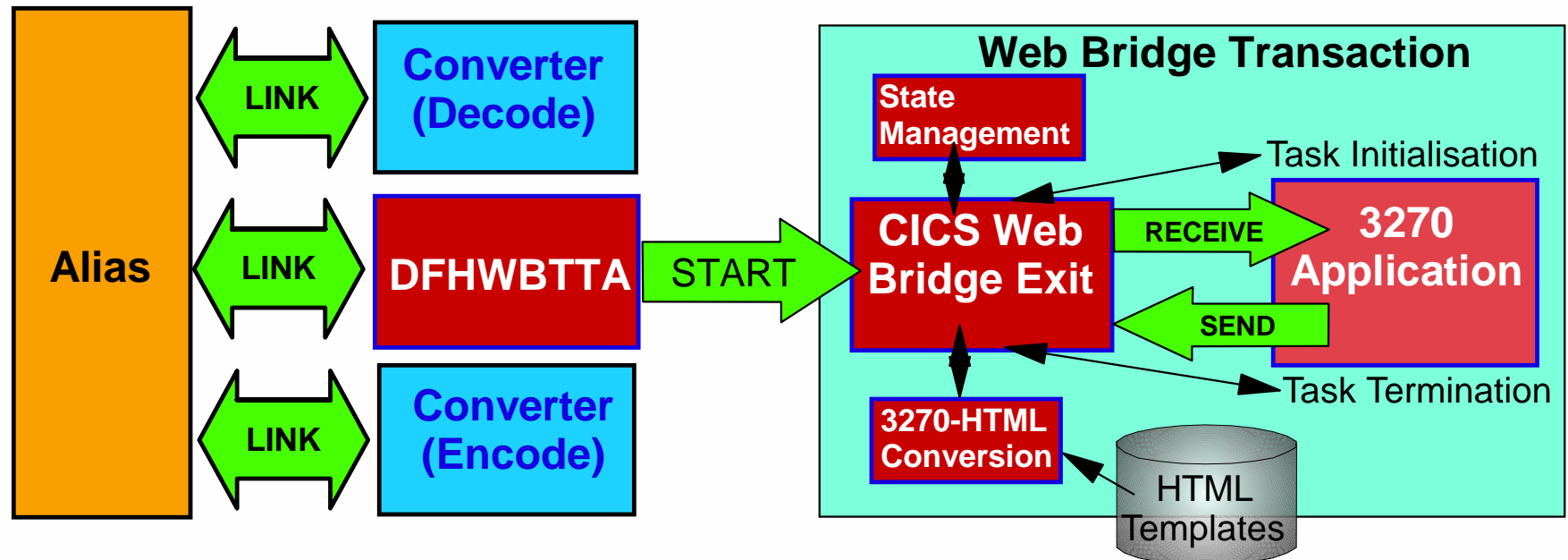**IBM Software Group**

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Agenda

■ What is CICS Web Support

■ CICS Web Support architecture

■ Enabling CICS Web Support

■ Writing CICS Web applications

■ **Running 3270-based transactions with CICS Web Support**
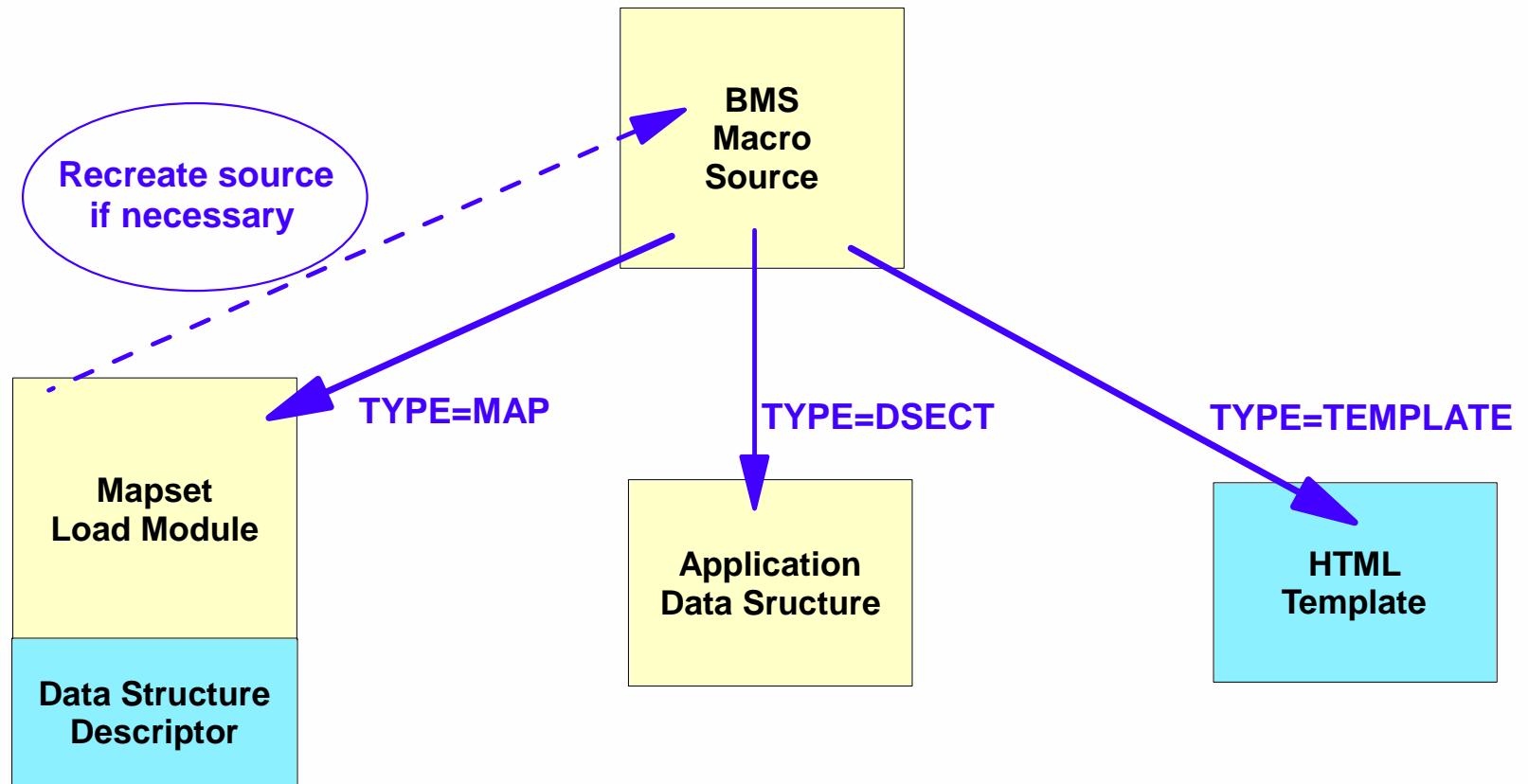
■ Further Information and Summary

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Running 3270 based transactions – Architecture

Alias

LINK → **Converter (Decode)**

LINK → **DFHWBTTA**

LINK → **Converter (Encode)**

START → **Web Bridge Transaction**

CICS Web Bridge Exit

State Management

RECEIVE → **3270 Application**

SEND ←

Task Initialisation

Task Termination

3270-HTML Conversion

HTML Templates

Example URL > http://cics1.ibm.com:1080/cics/cwba/dfhwbtta/ceci

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Creating HTML for BMS applications

BMS
Macro
Source

Recreate source
if necessary

TYPE=MAP

TYPE=DSECT

TYPE=TEMPLATE

Mapset
Load Module

Data Structure
Descriptor

Application
Data Sructure

HTML
Template

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Creating HTML for BMS applications....

A template generated by the standard method contains...

- Constants and input fields from the map

- Buttons to represent:
    - ► ENTER key
    - ► PA1, PA2, PA3 keys
    - ► Program function keys PF1 to PF24
    - ► HTML Reset

- Hidden variables
    - ► For handling conversations/pseudoconversations
    - ► For holding name of map field where cursor is set

- JavaScript
    - ► Function to set the cursor position to a specific field
    - ► Exception handler for tracking cursor movement

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Customising HTML for BMS applications

- Customise via CICS supplied macros

- Edit the generated HTML

- Run time customisation via use of Converter
  - ► Input (Decode)
    - – e.g. change AID, change cursor position
  - ► Output (Encode)
    - – e.g. add timestamp

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Customising HTML for BMS applications....

Customising via the DFHMDX macro.....

■ Defines customization macros used for template creation

■ Is invoked from DFHMSX

■ Can be used to

► Suppress HTML Reset

► Change the appearance of the keys, or associated text

► Provide an HTML title or masthead graphic

► Change the background

► Modify BMS colours

► Suppress parts of the BMS map

► Add Web browser control functions, e.g. JavaScript

Customising HTML for BMS applications....

Customising via the DFHWBOUT macro

■ Add invocations of DFHWBOUT to BMS source

■ Can be used to

  ► Add HTML header information

  ► Add text to HTML page that is not part of BMS map

  ► Add Web browser control functions, e.g. JavaScript

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Examples – DFHMDX & DFHWBOUT

```
* Set default PF keys for all maps and mapsets
        DFHMSX
        DFHMDX MAPSET=*,MAP=*,
                PF1='Help',PF3='Exit',PF4='Save',PF9='Messages'


* Change title and PF4 for all maps in mapset DFHWB0

        DFHMDX MAPSET=DFHWB0,MAP=*,
                TITLE='CICS Web Support - Demo Application',
                PF4='Messages'
```

```
* 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 only appears'
        DFHWBOUT ' in HTML templates and not  in the 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">'
```

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HTML for non-BMS applications

Default presentation...

- Page produced in fixed width font

- Supplied Headers and Footers
  - ► Mandatory HTML page elements
  - ► Input buttons (ENTER, PF Keys, etc)

Customisation...

- Provide replacement header and footer templates

- Use a converter for customisation at run time
  - ► Input (Decode)
    - – e.g. change AID, change cursor position
  - ► Output (Encode)
    - – e.g. add timestamp

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## 3270 based transactions – current restrictions

- No dynamic modification of attribute bytes by BMS

- Multiple SEND MAPs for one screen not supported

- Cannot mix BMS and non-BMS SEND commands

- Structured fields not supported

- Lightpen emulation not supported

- Must use same map on a RECEIVE following a SEND

- BMS Paging not supported

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Accessing Existing CICS Transactions...non-BMS

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Accessing Existing CICS Applications...BMS

BMS application - 3270 screen.....
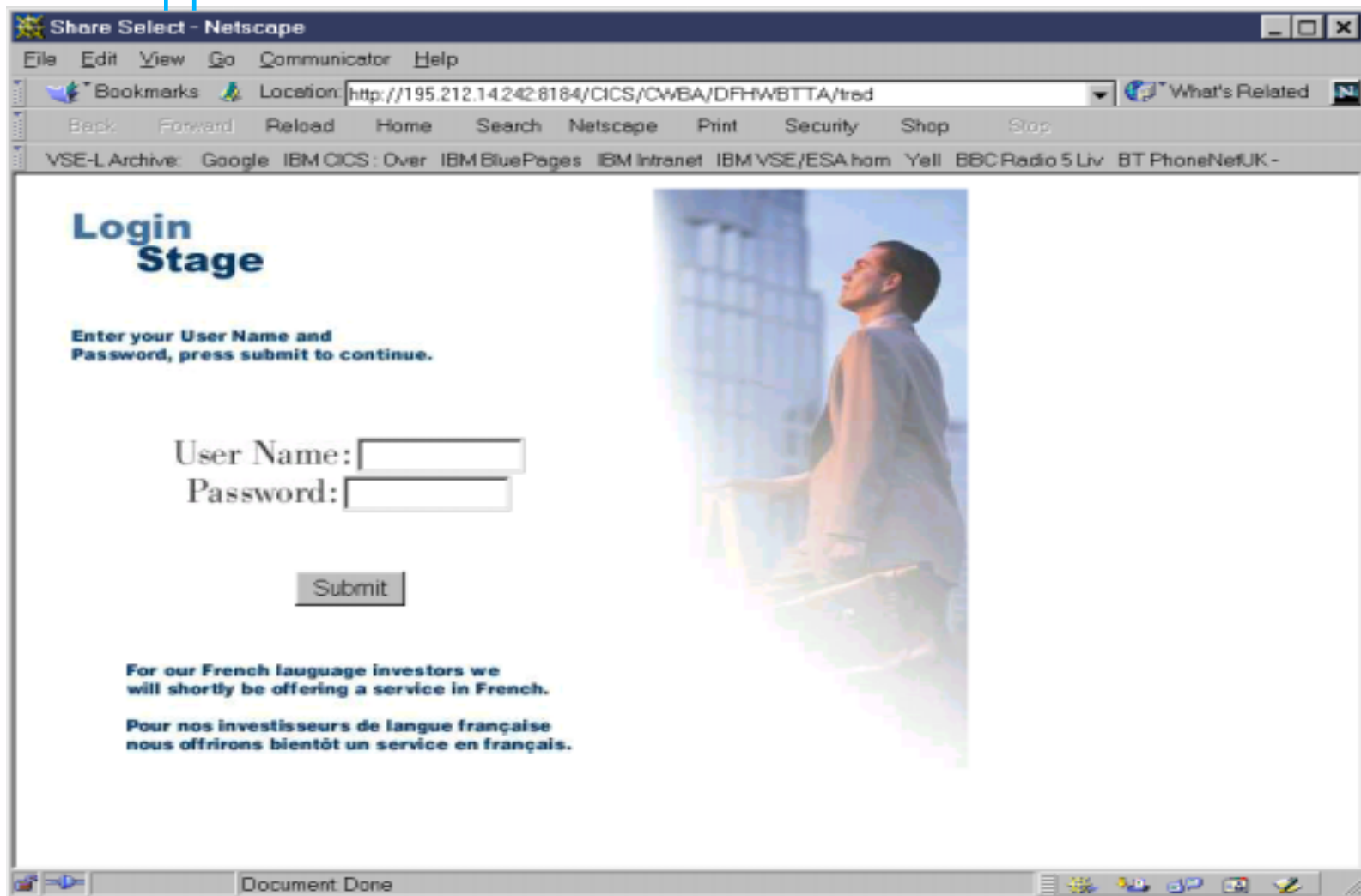
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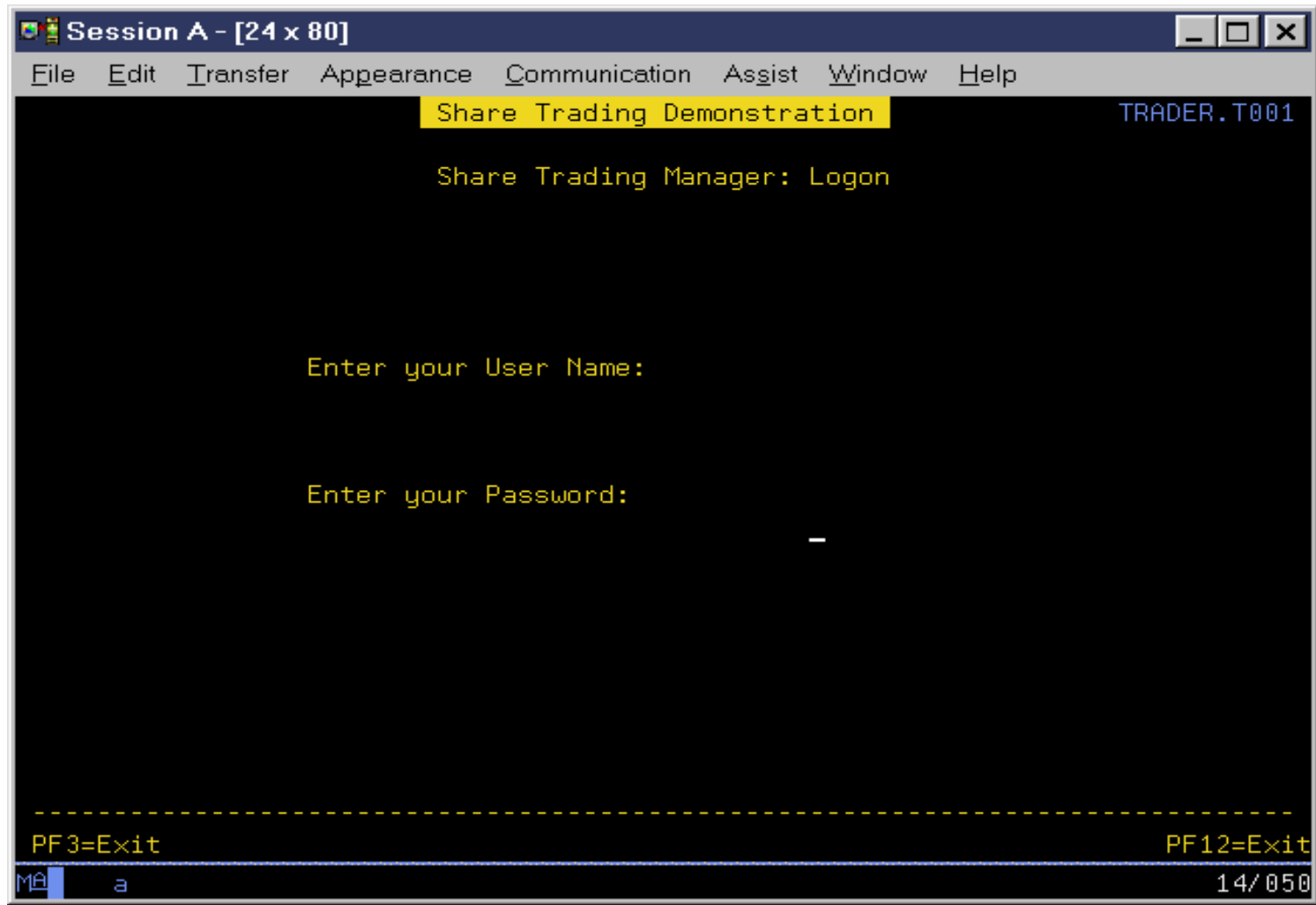
Accessing Existing CICS Applications...BMS

BMS application - default Web browser appearance.....
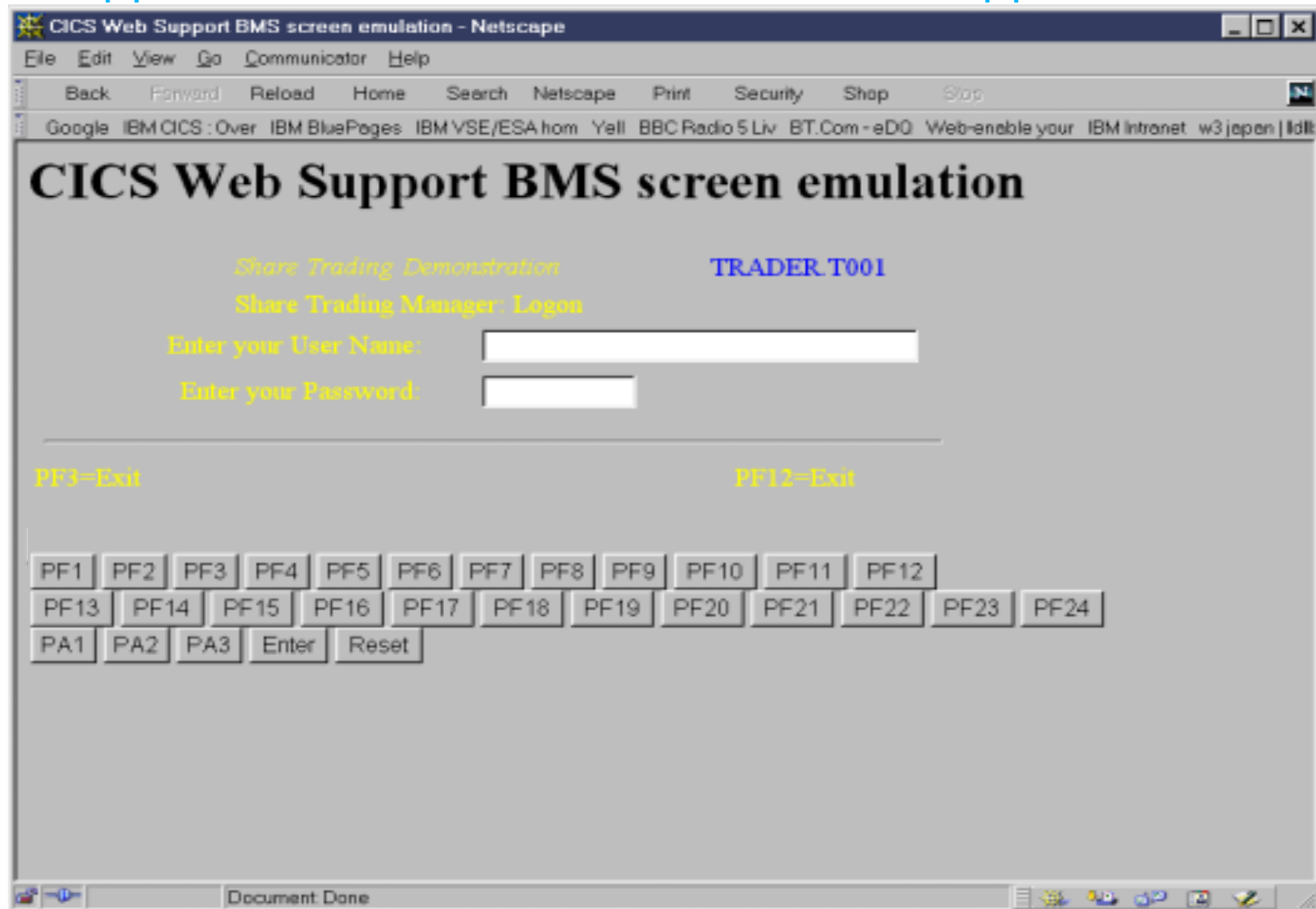
Accessing Existing CICS Applications...BMS

BMS application - customised.....

Agenda

- What is CICS Web Support?

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- Enabling CICS Web Support

- Writing CICS Web applications

- Running 3270-based transactions with CICS Web Support

- **Further Information and Summary**

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Further Information

- **Web Sites**
  - ► CICS (main site)
    - — http://www.ibm.com/software/cics
  - ► CICS Transaction Server for VSE/ESA
    - — http://www.ibm.com/software/cics/platforms/cicsvse/vse.html
  - ► CICS (SupportPacs)
    - — http://www.ibm.com/software/cics/txppacs/
  - ► VSE/ESA
    - — http://www.s390.ibm.com/vse
  - ► Redbooks
    - — http://www.redbooks.ibm.com
- **Announcement Letters**
  - ► CICS Transaction Server for VSE/ESA V1.1.1: 200-293
  - ► VSE/ESA V2.6: 201-325
  - ► VSE/ESA V2.7 Preview: 202-038

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Further Information....

■ Publications

Title	Number
CICS Transaction Server for VSE/ESA V1.1.1 product publications	
Internet Guide	SC34-5765
Enhancements Guide	GC34-5763
External Interfaces Guide	SC33-1669
IBM Redbooks	
CICS Transaction Server for VSE/ESA: CICS Web Support	SG24-5997
Revealed! Architecting Web Access to CICS	SG24-5466
Getting Started with TCP/IP for VSE/ESA V1.4	SG24-5626
e-business Solutions for VSE/ESA	SG24-5662
VSE White Paper	
VSE Applications - How e-business fits	GF22-5137

► Accessible from the CICS and IBM Redbooks Web sites

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Further Information....

- **IBM Planning Services for CICS Web Enablement**
    - ► http://www.as.ibm.com/asww/offerings/mww73bE.html

- **CICS SupportPacs** - download from CICS Web site
    - ► CA8E: CICS 3270 Bridge: Dynamic Attribute Modification

- **Related Conference Sessions**
    - ► VSE Plays Well With Others
    - ► CICS Transaction Gateway: Web and Java Access to CICS
    - ► TCP/IP for VSE Performance
    - ► Native SSL with TCP/IP for VSE

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Summary

- **Access to CICS from Web Browsers**
  - ► Application programs and transactions
  - ► Automatic HTML<->3270 conversion
- **Direct connection**
  - ► No requirement for intermediate server
- **Standard HTTP protocol used**
- **Secure Sockets Layer supported**
- **New APIs to enable creation of new Web aware applications**
- **Provided with CICS Transaction Server for VSE/ESA V1.1.1**
  - ► Delivered with VSE/ESA V2.6
  - ► PTF for VSE/ESA V2.5

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CICS Transaction Server for VSE/ESA:
CICS Web Support Overview

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Fort Mitchell, 12 - 16 April 2002

Appendix

```
┌─────────────────────────────┐
│                             │
│         APPENDIX            │
│                             │
└─────────────────────────────┘
```

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HTTP Request

Request Line	Headers	Body

- **Request Line : method absolute_path http_version CRLF**
  POST /bin/cgi HTTP/1.0

- **Headers: headername: value CRLF**
  Accept: image/jpeg
  Content-length: 44

- **Null Line: single CRLF delimits end of headers**

- **Body: URL encoded forms data : name=value pairs**
  field1=stringa&field2=stringb&field3=stringc

HTTP Response

Status Line	Headers	Body

- **Status Line:** **HTTP_version status_code text CRLF**

  HTTP/1.0 200 Document follows

- **Headers: headername: value CRLF**

  Content-type: text/html

  Content-length: 46

  Last-modified: Wed, 04 Oct 2000 08:45:00 GMT

- **Null Line: single CRLF delimits end of headers**

- **Body: HTML tags and text**

  <html><title>A Sample</title><h1>Sample 1</h1></html>

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HTML Generation

- **Assemble existing BMS maps**
  - ► Specify TYPE=TEMPLATE on the DFHMSD maccro
  - ► Or SYSPARM=TEMPLATE in the Assembler parm statement
  - ► You must also re-assemble 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, etc

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