Developing CICS COBOL and PL/I Applications with WDz

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Session 4128A
CICS and Enterprise Transformation

impact·venture*

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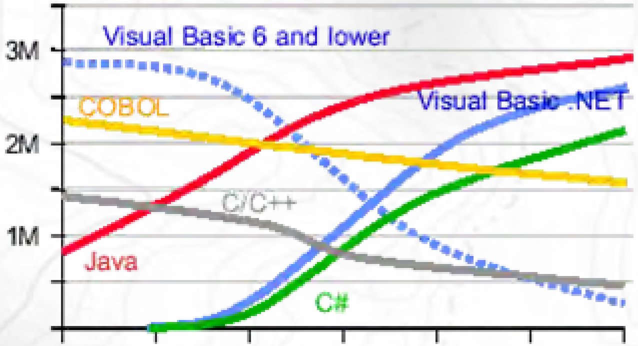
Assemble
Deploy
Model
Manage
Governance & Processes

Legacy applications

- Significant business intelligence exists in core systems
  - "200 Billion lines of COBOL code in existence" ***eWeek***
  - "5 Billion lines of COBOL code added yearly“ ***Bill Ulrich, TSG Inc.***
  - “2 Million COBOL developers" ***Gartner***
  - "Majority of customer data still on mainframes“ ***Computerworld***
  - “Replacement costs $20 Trillion” ***eWeek***
- Rewriting - is it an option.....
  - How long will it take? (lose strategic benefit)
  - Who will do it? (who has the business knowledge?)
  - How much will it cost?
  - Risk?

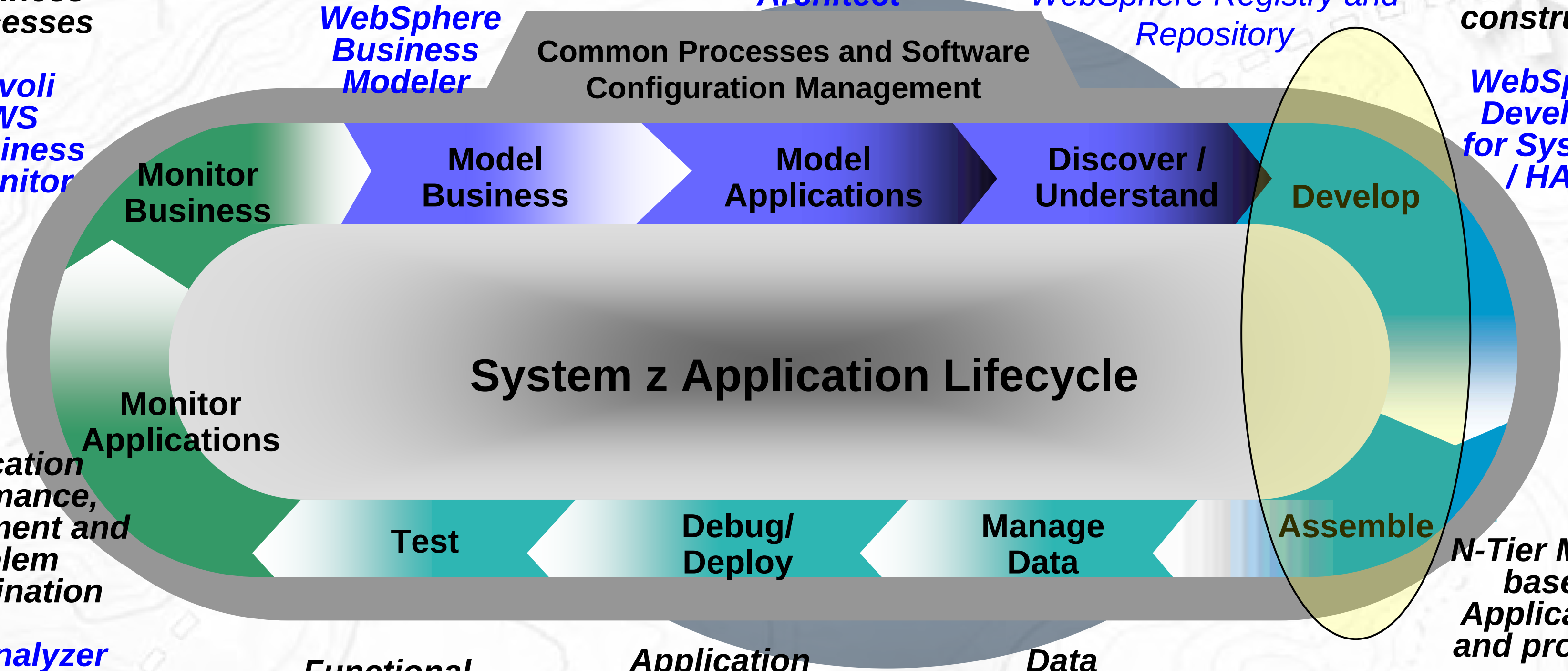
Developers
From an estimated worldwide market size of 7 million “professional” developers



M = million

Gartner

Develop and Assemble



Monitor and manage Business processes

Tivoli WS Business Monitor

Model and simulate business processes

WebSphere Business Modeler

Model applications and data

Rational Software Architect

Understand, Identify and prepare existing assets for reuse

WSAA / ATW / CICS IA

WebSphere Registry and Repository

N-Tier Visual construction

WebSphere Developer for System z / HATS

Common Processes and Software Configuration Management

Monitor Business

Model Business

Model Applications

Discover / Understand

Develop

System z Application Lifecycle

Monitor Applications

Assemble

Manage Data

Debug/ Deploy

Test

Application performance, management and problem determination

Fault Analyzer ITCAM Omegamon Application Performance Analyzer

Functional and Load Testing

RPT/RFT

Application Test, Debug, and Deploy

Debug Tool Utilities

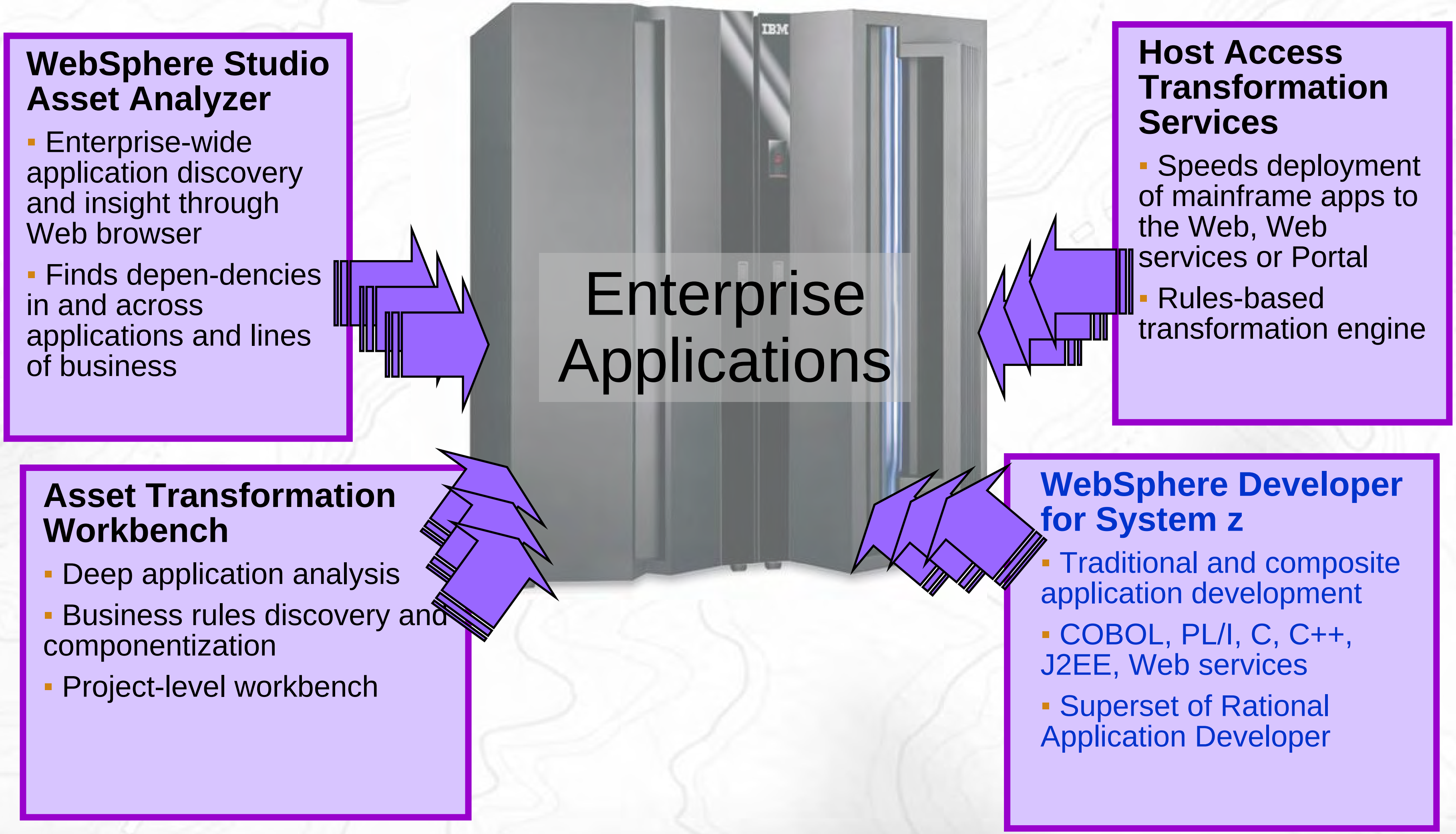
Data Creation, update

File Manager

N-Tier Model based Application and process generation

WebSphere Integration Developer

zSeries AD Transformation Tools



WebSphere Studio Asset Analyzer

- Enterprise-wide application discovery and insight through Web browser
- Finds depen-dencies in and across applications and lines of business

Host Access Transformation Services

- Speeds deployment of mainframe apps to the Web, Web services or Portal
- Rules-based transformation engine

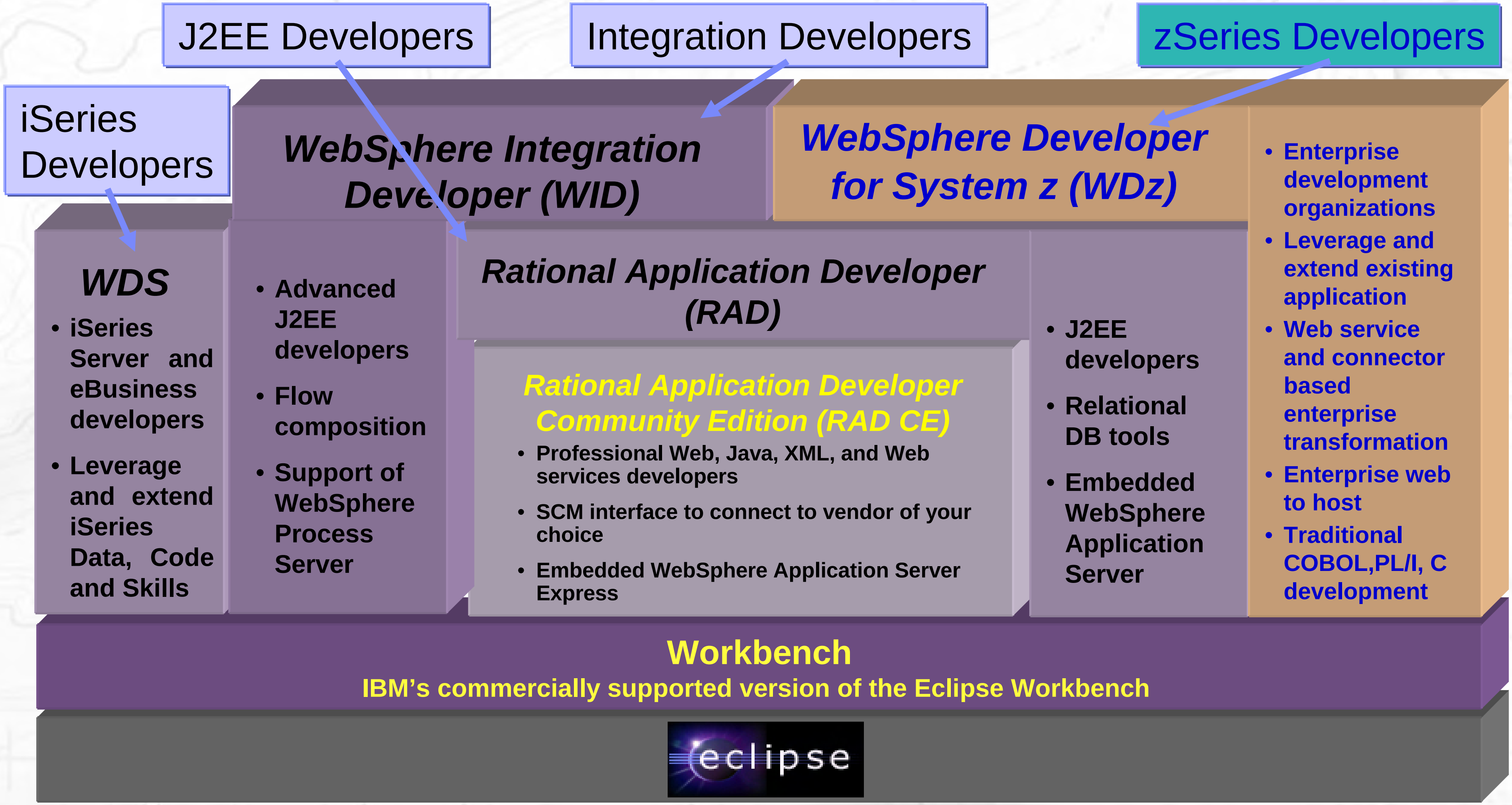
Asset Transformation Workbench

- Deep application analysis
- Business rules discovery and componentization
- Project-level workbench

WebSphere Developer for System z

- Traditional and composite application development
- COBOL, PL/I, C, C++, J2EE, Web services
- Superset of Rational Application Developer

WebSphere/Rational development family V7



J2EE Developers

Integration Developers

zSeries Developers

iSeries Developers

WebSphere Integration Developer (WID)

WebSphere Developer for System z (WDz)

- Enterprise development organizations
- Leverage and extend existing application
- Web service and connector based enterprise transformation
- Enterprise web to host
- Traditional COBOL,PL/I, C development

WDS

- iSeries Server and eBusiness developers
- Leverage and extend iSeries Data, Code and Skills

- Advanced J2EE developers
- Flow composition
- Support of WebSphere Process Server

Rational Application Developer (RAD)

- J2EE developers
- Relational DB tools
- Embedded WebSphere Application Server

Rational Application Developer Community Edition (RAD CE)

- Professional Web, Java, XML, and Web services developers
- SCM interface to connect to vendor of your choice
- Embedded WebSphere Application Server Express

Workbench

IBM's commercially supported version of the Eclipse Workbench

eclipse

IBM WebSphere Developer for System z

XML Services for the Enterprise (XSE)

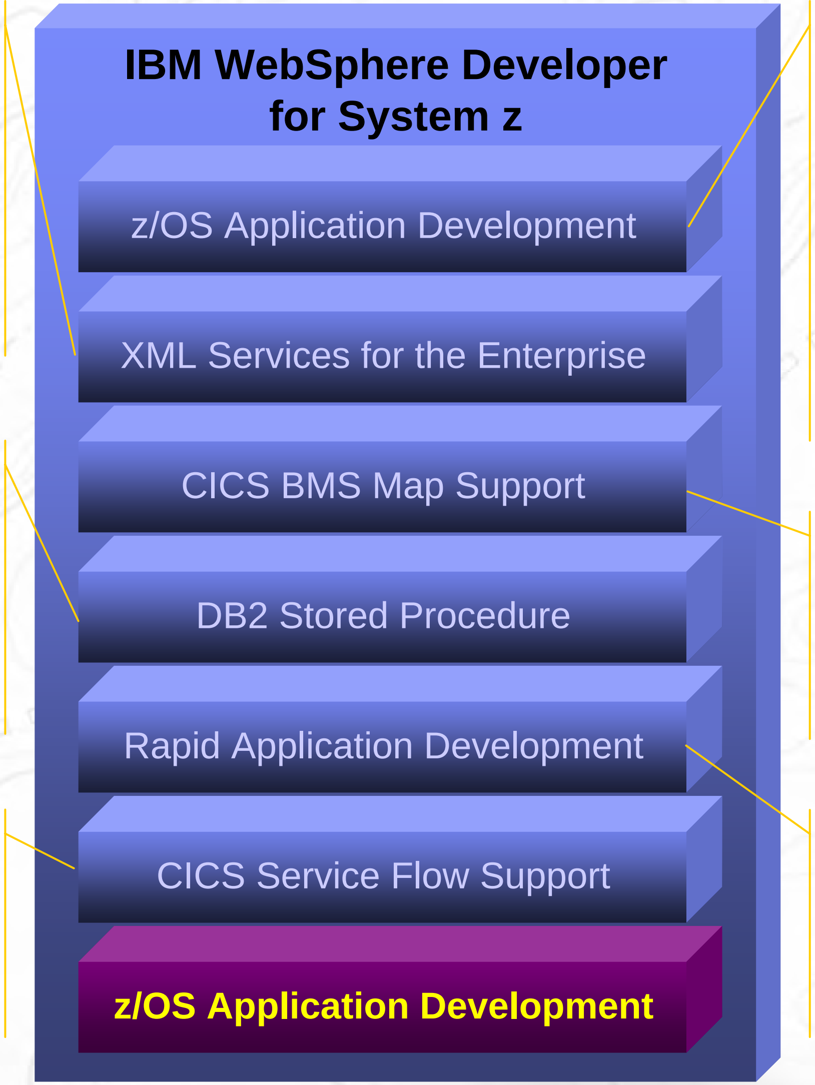
- SOA access to CICS V3.1 and IMS V9 COBOL applications
- Bottom-up/Top-down or meet-in-the-middle COBOL to XML mapping support
- Integrated COBOL XML converters, XML schemas, and WSDL generation

DB2 Stored Procedure for COBOL and PL/I

- Create DB2 stored procedures on z/OS in either COBOL or PL/I
- Build and catalog support for the DB2 stored procedure
- Debug z/OS based stored procedures from workstation

CICS Service Flow Feature

- Implements SOA and Web Services
- Service Flow is a tool to build service flows out of your existing Commarea and Terminal based CICS applications.



IBM WebSphere Developer for System z

z/OS Application Development

XML Services for the Enterprise

CICS BMS Map Support

DB2 Stored Procedure

Rapid Application Development

CICS Service Flow Support

z/OS Application Development

z/OS Application Development

- Connect to z/OS systems
- Work with z/OS resources like COBOL, PL/1 , C, C++, JCL, etc.
- Interact with the Job Entry Subsystem (JES) to submit jobs, monitor jobs, and review job output
- Perform dataset management actions like allocating datasets and migrating datasets
- Perform typical edit, compile, and debug tasks on remote z/OS resources from the workstation

CICS BMS/ IMS MFS Map Support

- Visually create and modify BMS Map sets or IMS/MFS
- Generates JCL
- Work with local or remote maps

Rapid Application Development Tool

- Ability to generate WSDL and CICS Cobol program to access DB2
- CRUD operations
- Can be added to SF flow

IBM WebSphere Developer for System z

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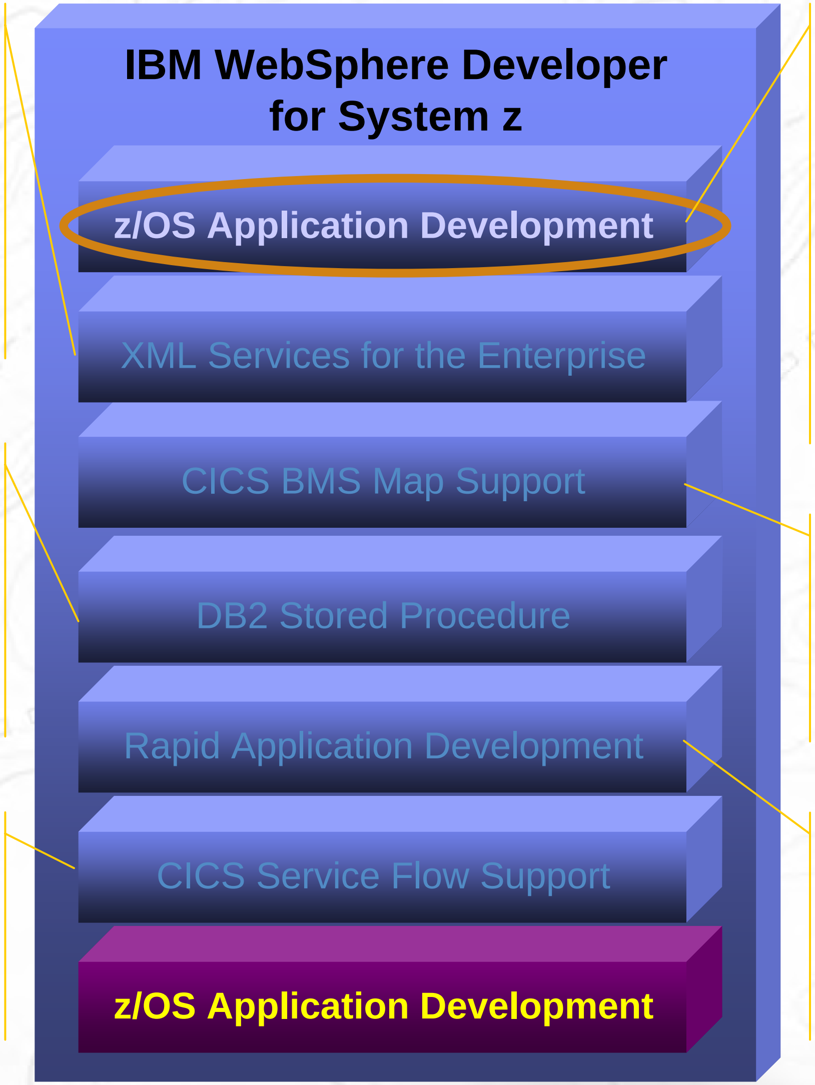

IBM WebSphere Developer for System z

z/OS Application Development

XML Services for the Enterprise

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ISPF based development

edit JCL

submit compile job

swap to SDSF

select job

find error msg

find code line
(remember error)

swap to edit
session

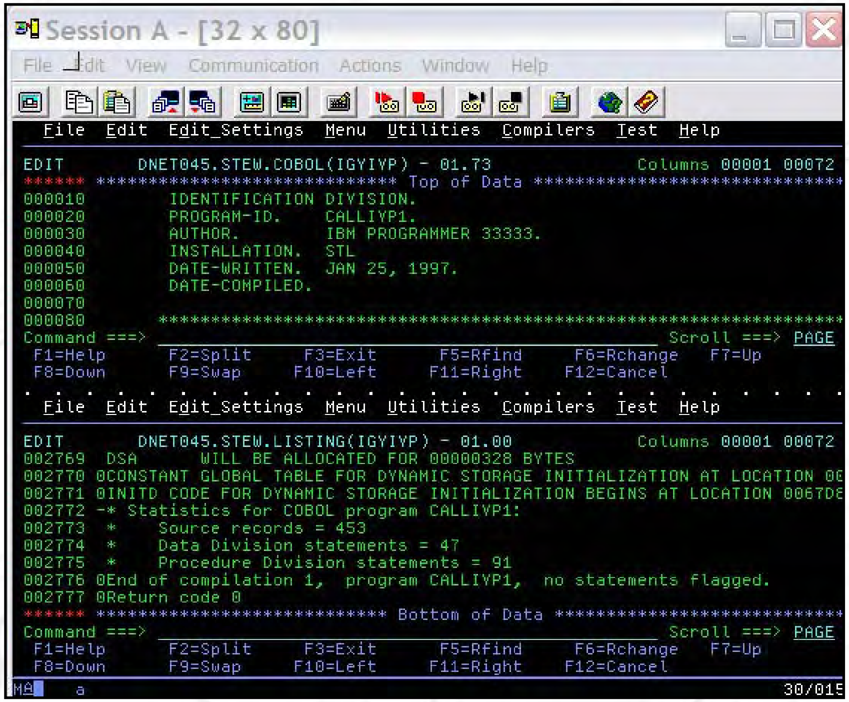
exit JCL

edit source

find code line

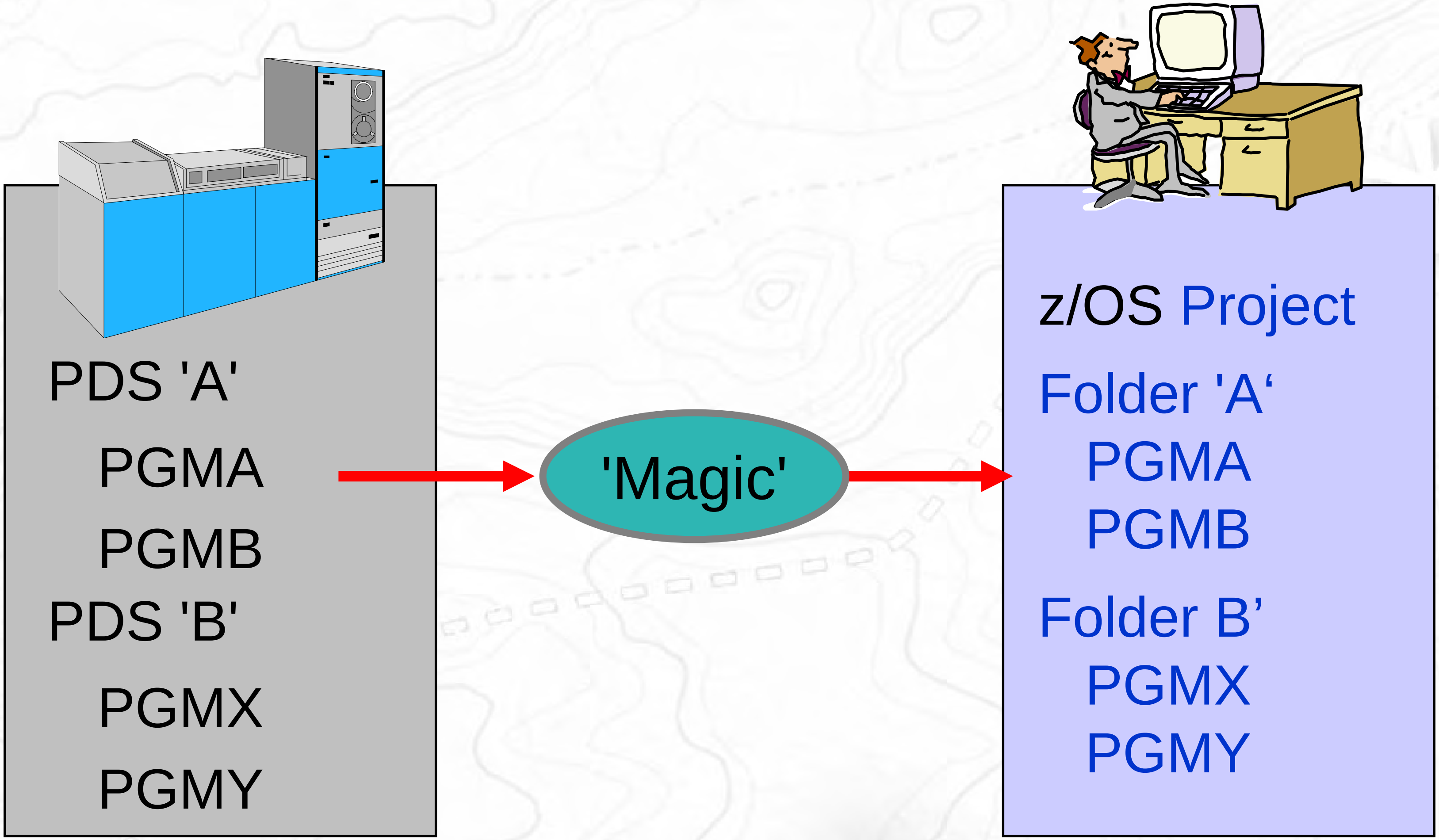
change code

exit source



```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help

EDIT       DNET045.STEW.COBOL(IGYIYP) - 01.73            Columns 00001 00072
****** ***************************** Top of Data ******************************
000010        IDENTIFICATION DIVISION.
000020        PROGRAM-ID.    CALLIYP1.
000030        AUTHOR.        IBM PROGRAMMER 33333.
000040        INSTALLATION.  STL
000050        DATE-WRITTEN.  JAN 25, 1997.
000060        DATE-COMPILED.
000070
000080       *****************************************************************
Command ===> ____________________________________________ Scroll ===> PAGE
 F1=Help      F2=Split     F3=Exit      F5=Rfind     F6=Rchange   F7=Up
 F8=Down      F9=Swap     F10=Left     F11=Right    F12=Cancel
 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help

EDIT       DNET045.STEW.LISTING(IGYIYP) - 01.00          Columns 00001 00072
002769  DSA      WILL BE ALLOCATED FOR 00000328 BYTES
002770 0CONSTANT GLOBAL TABLE FOR DYNAMIC STORAGE INITIALIZATION AT LOCATION 00
002771 0INITD CODE FOR DYNAMIC STORAGE INITIALIZATION BEGINS AT LOCATION 0067D8
002772 -* Statistics for COBOL program CALLIYP1:
002773  *    Source records = 453
002774  *    Data Division statements = 47
002775  *    Procedure Division statements = 91
002776 0End of compilation 1,  program CALLIYP1,  no statements flagged.
002777 0Return code 0
****** **************************** Bottom of Data ****************************
Command ===> ____________________________________________ Scroll ===> PAGE
 F1=Help      F2=Split     F3=Exit      F5=Rfind     F6=Rchange   F7=Up
 F8=Down      F9=Swap     F10=Left     F11=Right    F12=Cancel
MA      a                                                                30/015
```

Host to Workstation Overview



PDS 'A'
PGMA
PGMB
PDS 'B'
PGMX
PGMY

'Magic'

z/OS Project
Folder 'A'
PGMA
PGMB
Folder B'
PGMX
PGMY

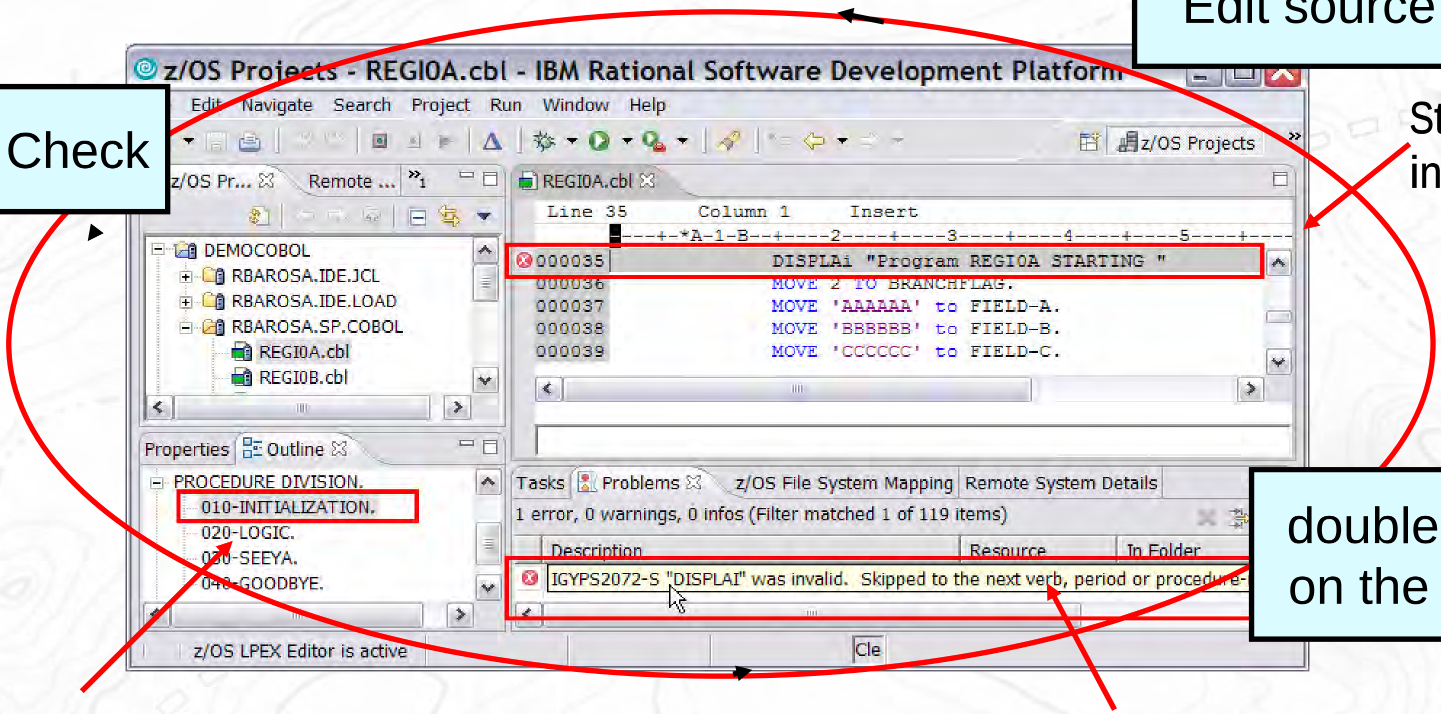
Files on the host look as though they are workstation files

Eclipse based Development

Edit source

Syntax Check

Statement in error



z/OS Projects - REGI0A.cbl - IBM Rational Software Development Platform
Edit
Navigate
Search
Project
Run
Window
Help
z/OS Projects
z/OS Pr...
Remote ...
REGI0A.cbl
DEMOCOBOL
RBAROSA.IDE.JCL
RBAROSA.IDE.LOAD
RBAROSA.SP.COBOL
REGI0A.cbl
REGI0B.cbl
Properties
Outline
PROCEDURE DIVISION.
010-INITIALIZATION.
020-LOGIC.
030-SEEYA.
040-GOODBYE.
Tasks
Problems
z/OS File System Mapping
Remote System Details
Description
Resource
In Folder
z/OS LPEX Editor is active
Cle

```
Line 35          Column 1        Insert
    ----+-*A-1-B--+----2----+----3----+----4----+----5----+----
000035               DISPLAi "Program REGI0A STARTING "
000036               MOVE 2 TO BRANCHFLAG.
000037               MOVE 'AAAAAA' to FIELD-A.
000038               MOVE 'BBBBBB' to FIELD-B.
000039               MOVE 'CCCCCC' to FIELD-C.
```

1 error, 0 warnings, 0 infos (Filter matched 1 of 119 items)

IGYPS2072-S "DISPLAI" was invalid. Skipped to the next verb, period or procedure-

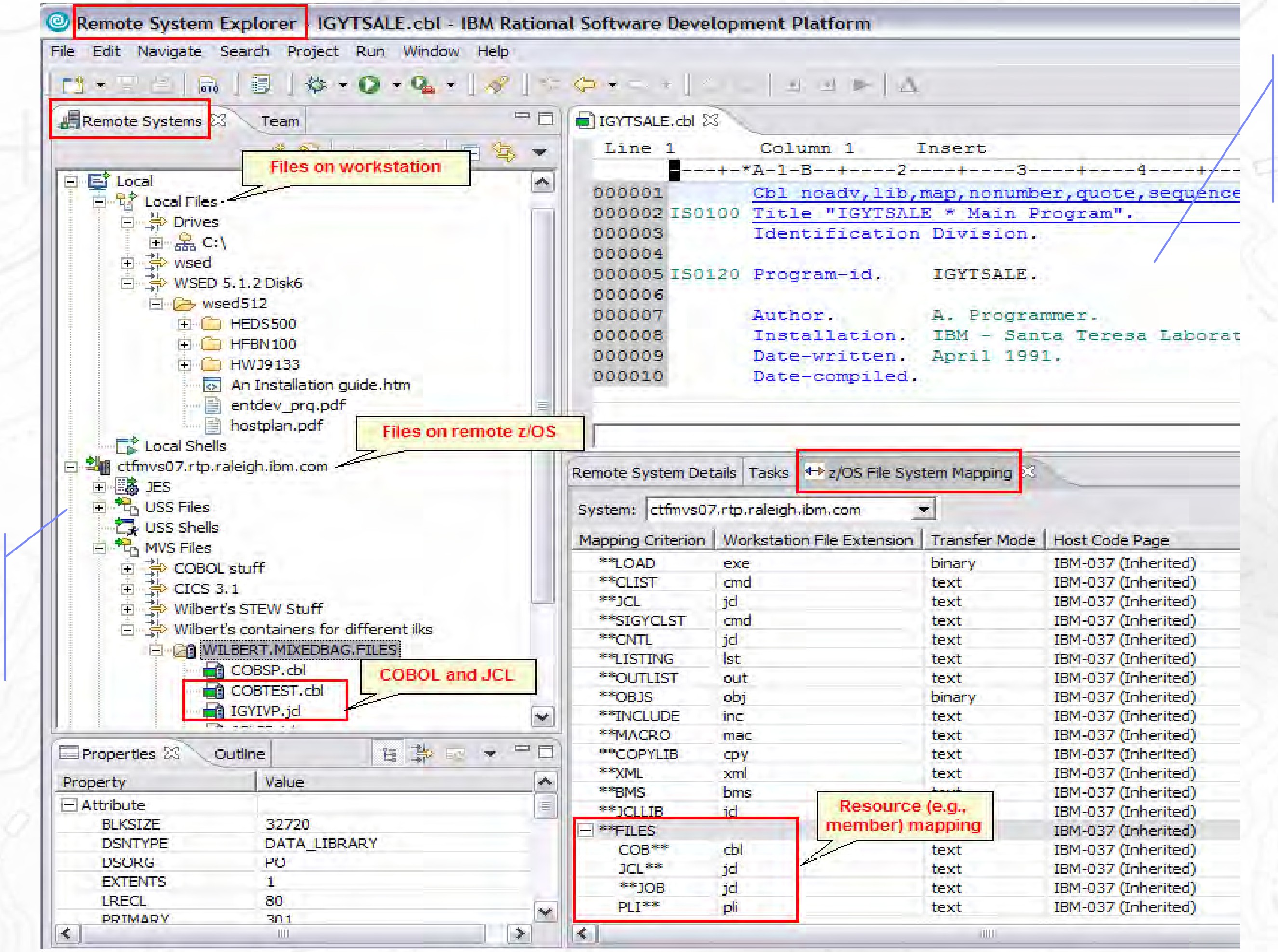
double click on the error

Outline view presents COBOL structure

Error list in Tasks view

Benefit: Simplified development for COBOL, PL/I, C and C++ on a common development environment

Interactive Access to z/OS


Remote System Explorer - IGYTSALE.cbl - IBM Rational Software Development Platform
File Edit Navigate Search Project Run Window Help
Remote Systems
Team
Files on workstation
Files on remote z/OS
COBOL and JCL
Resource (e.g., member) mapping
Properties
Outline
Remote System Details
Tasks
z/OS File System Mapping

- Local
  - Local Files
    - Drives
      - C:\
    - wsed
    - WSED 5.1.2 Disk6
      - wsed512
        - HEDS500
        - HFBN100
        - HWJ9133
        - An Installation guide.htm
        - entdev_prq.pdf
        - hostplan.pdf
  - Local Shells
- ctfmvs07.rtp.raleigh.ibm.com
  - JES
  - USS Files
  - USS Shells
  - MVS Files
    - COBOL stuff
    - CICS 3.1
    - Wilbert's STEW Stuff
    - Wilbert's containers for different ilks
      - WILBERT.MIXEDBAG.FILES
        - COBSP.cbl
        - COBTEST.cbl
        - IGYIVP.jcl

Property	Value
Attribute	
BLKSIZE	32720
DSNTYPE	DATA_LIBRARY
DSORG	PO
EXTENTS	1
LRECL	80
PRIMARY	301

IGYTSALE.cbl

```
Line 1          Column 1      Insert
       ----+-*A-1-B--+----2----+----3----+----4----+---
000001        Cbl noadv,lib,map,nonumber,quote,sequence
000002 IS0100 Title "IGYTSALE * Main Program".
000003        Identification Division.
000004
000005 IS0120 Program-id.     IGYTSALE.
000006
000007        Author.         A. Programmer.
000008        Installation.   IBM - Santa Teresa Laborat
000009        Date-written.   April 1991.
000010        Date-compiled.
```

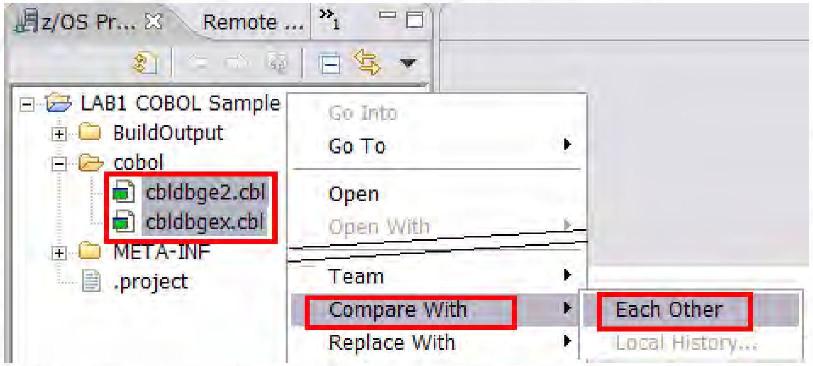
System: ctfmvs07.rtp.raleigh.ibm.com

Mapping Criterion	Workstation File Extension	Transfer Mode	Host Code Page
**LOAD	exe	binary	IBM-037 (Inherited)
**CLIST	cmd	text	IBM-037 (Inherited)
**JCL	jcl	text	IBM-037 (Inherited)
**SIGYCLST	cmd	text	IBM-037 (Inherited)
**CNTL	jcl	text	IBM-037 (Inherited)
**LISTING	lst	text	IBM-037 (Inherited)
**OUTLIST	out	text	IBM-037 (Inherited)
**OBJS	obj	binary	IBM-037 (Inherited)
**INCLUDE	inc	text	IBM-037 (Inherited)
**MACRO	mac	text	IBM-037 (Inherited)
**COPYLIB	cpy	text	IBM-037 (Inherited)
**XML	xml	text	IBM-037 (Inherited)
**BMS	bms	text	IBM-037 (Inherited)
**JCLLIB	jcl		IBM-037 (Inherited)
**FILES			IBM-037 (Inherited)
COB**	cbl	text	IBM-037 (Inherited)
JCL**	jcl	text	IBM-037 (Inherited)
**JOB	jcl	text	IBM-037 (Inherited)
PLI**	pli	text	IBM-037 (Inherited)

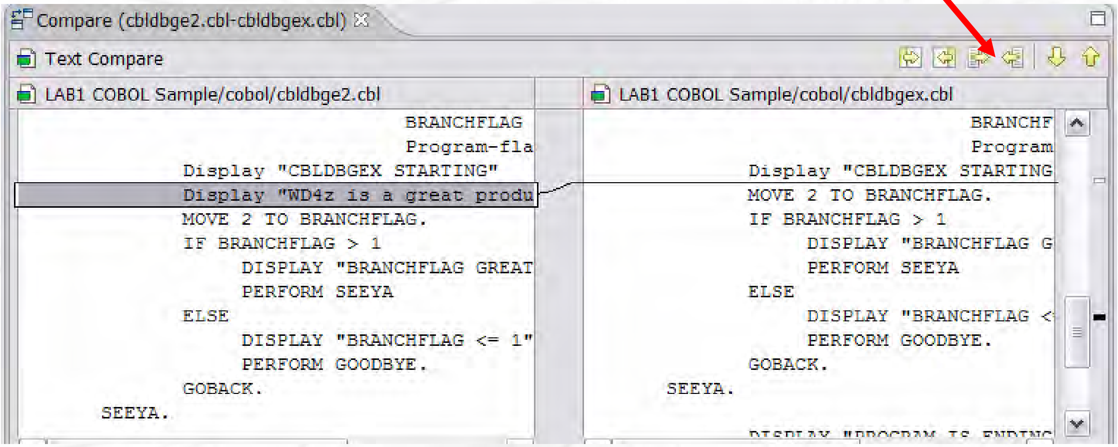
LPEX Editor

MVS datasets

Eclipse features on z/OS assets – File Compare


z/OS Pr...
Remote ...
LAB1 COBOL Sample
BuildOutput
cobol
cbldbge2.cbl
cbldbgex.cbl
META-INF
.project
Go Into
Go To
Open
Open With
Team
Compare With
Replace With
Each Other
Local History...

Able to merge the differences using the icons

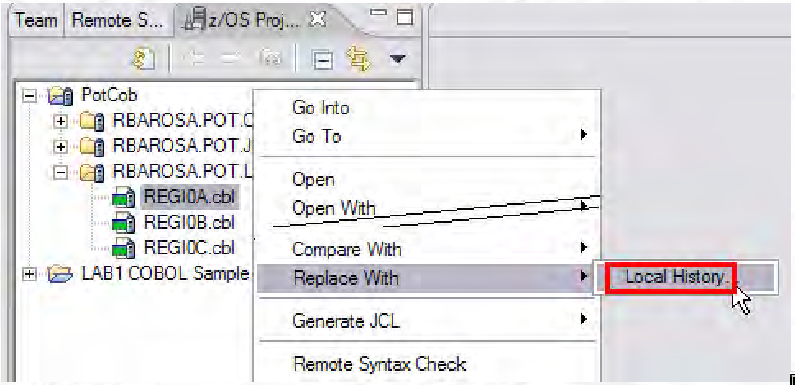

Compare (cbldbge2.cbl-cbldbgex.cbl)
Text Compare
LAB1 COBOL Sample/cobol/cbldbge2.cbl
LAB1 COBOL Sample/cobol/cbldbgex.cbl

```
                              BRANCHFLAG
                              Program-fla
           Display "CBLDBGEX STARTING"
           Display "WD4z is a great produ
           MOVE 2 TO BRANCHFLAG.
           IF BRANCHFLAG > 1
               DISPLAY "BRANCHFLAG GREAT
               PERFORM SEEYA
           ELSE
               DISPLAY "BRANCHFLAG <= 1"
               PERFORM GOODBYE.
           GOBACK.
       SEEYA.
```

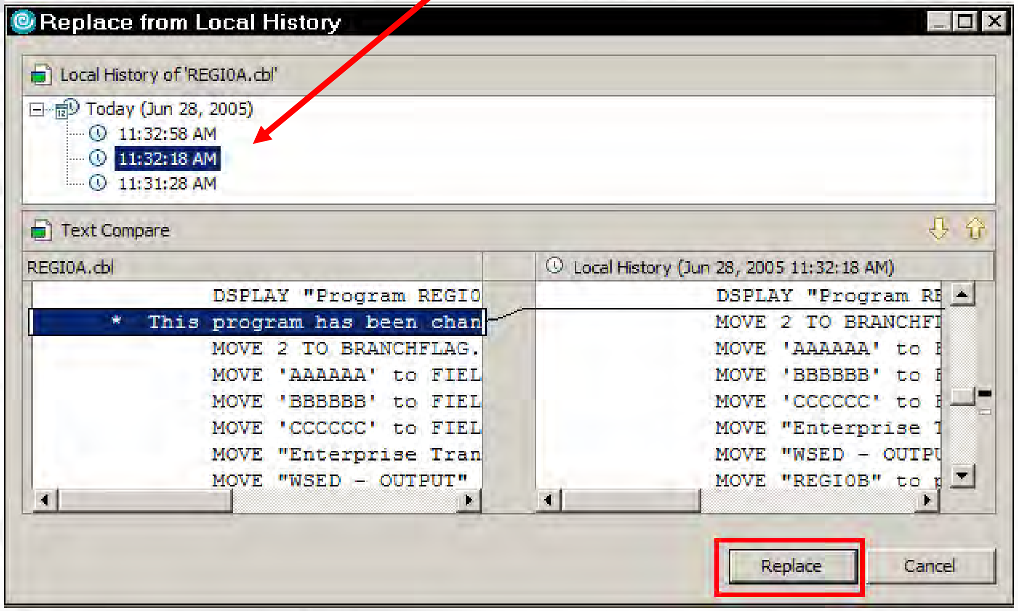
```
                              BRANCHF
                              Program
           Display "CBLDBGEX STARTING
           MOVE 2 TO BRANCHFLAG.
           IF BRANCHFLAG > 1
               DISPLAY "BRANCHFLAG G
               PERFORM SEEYA
           ELSE
               DISPLAY "BRANCHFLAG <
               PERFORM GOODBYE.
           GOBACK.
       SEEYA.
```

Benefit: help maintenance for COBOL, PL/1, C, C++ or JCL

Eclipse features on z/OS assets – Replace File


Team
Remote S...
z/OS Proj...
PotCob
RBAROSA.POT.C
RBAROSA.POT.J
RBAROSA.POT.L
REGI0A.cbl
REGI0B.cbl
REGI0C.cbl
LAB1 COBOL Sample
Go Into
Go To
Open
Open With
Compare With
Replace With
Generate JCL
Remote Syntax Check
Local History...

Keep as many local versions as you want and compare with the z/OS current version..

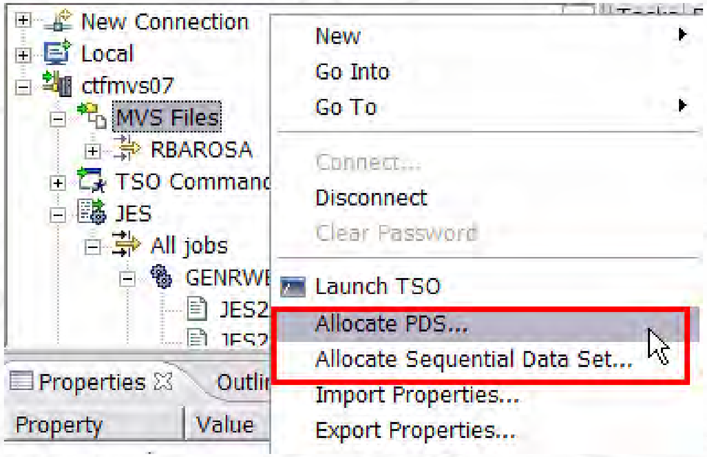

Replace from Local History
Local History of 'REGI0A.cbl'
Today (Jun 28, 2005)
11:32:58 AM
11:32:18 AM
11:31:28 AM
Text Compare
REGI0A.cbl
Local History (Jun 28, 2005 11:32:18 AM)
Replace
Cancel

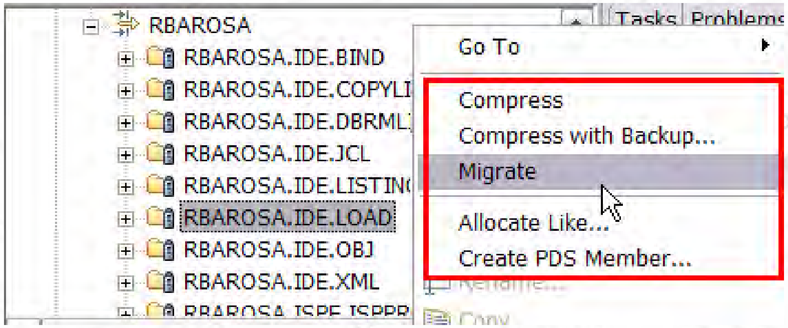
```
       DSPLAY "Program REGI0
    *  This program has been chan
       MOVE 2 TO BRANCHFLAG.
       MOVE 'AAAAAA' to FIEL
       MOVE 'BBBBBB' to FIEL
       MOVE 'CCCCCC' to FIEL
       MOVE "Enterprise Tran
       MOVE "WSED - OUTPUT"
```

```
       DSPLAY "Program RE
       MOVE 2 TO BRANCHFI
       MOVE 'AAAAAA' to F
       MOVE 'BBBBBB' to F
       MOVE 'CCCCCC' to F
       MOVE "Enterprise T
       MOVE "WSED - OUTPU
       MOVE "REGI0B" to F
```

Benefit: help maintenance for COBOL, PL/1, C, C++ or JCL

z/OS Files and Dataset Management

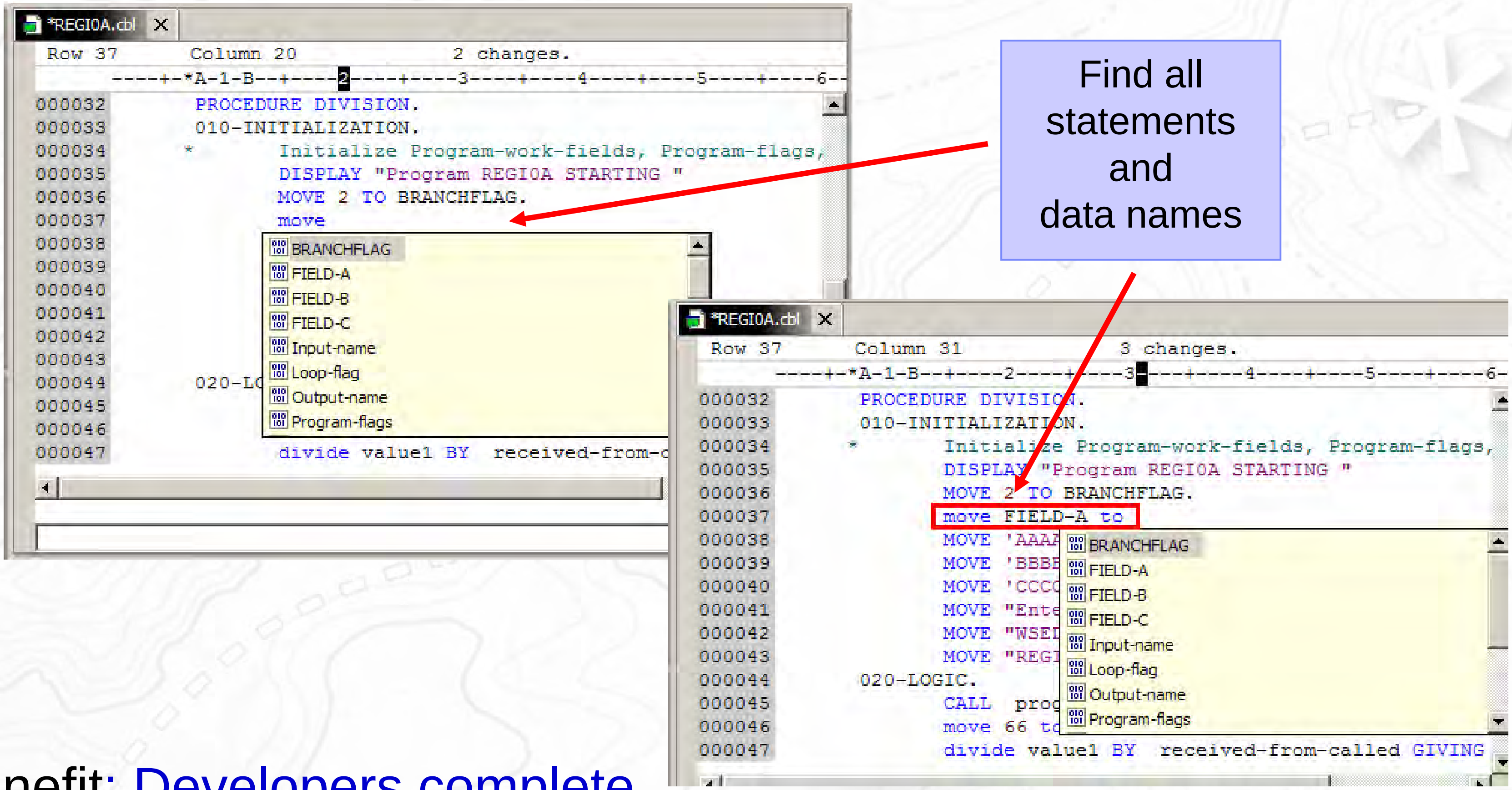

New Connection
Local
ctfmvs07
MVS Files
RBAROSA
TSO Command
JES
All jobs
GENRWE
JES2
Properties
Property
Value
New
Go Into
Go To
Connect...
Disconnect
Clear Password
Launch TSO
Allocate PDS...
Allocate Sequential Data Set...
Import Properties...
Export Properties...


RBAROSA
RBAROSA.IDE.BIND
RBAROSA.IDE.COPYLI
RBAROSA.IDE.DBRML
RBAROSA.IDE.JCL
RBAROSA.IDE.LISTIN
RBAROSA.IDE.LOAD
RBAROSA.IDE.OBJ
RBAROSA.IDE.XML
Tasks
Problems
Go To
Compress
Compress with Backup...
Migrate
Allocate Like...
Create PDS Member...
Rename...
Copy

- Allocate, Create PDS/PDSE, Member, etc ...
- PDS allocation models, example PDS for COBOL source, Listing, etc.
- Compress, Compress with Backup, Migrate
- Copy files between different systems (local or remote)

Benefit: Developers can easily allocate datasets and create members on z/OS. No need for ISPF utilities.

Content Assist for COBOL/PL/1/C or C++


*REGIOA.cbl

```
 Row 37         Column 20           2 changes.
          ----+-*A-1-B--+----2----+----3----+----4----+----5----+----6--
000032        PROCEDURE DIVISION.
000033        010-INITIALIZATION.
000034       *       Initialize Program-work-fields, Program-flags,
000035               DISPLAY "Program REGIOA STARTING "
000036               MOVE 2 TO BRANCHFLAG.
000037               move
000038
000039
000040
000041
000042
000043
000044        020-LO
000045
000046
000047               divide value1 BY  received-from-c
```

BRANCHFLAG
FIELD-A
FIELD-B
FIELD-C
Input-name
Loop-flag
Output-name
Program-flags

*REGIOA.cbl

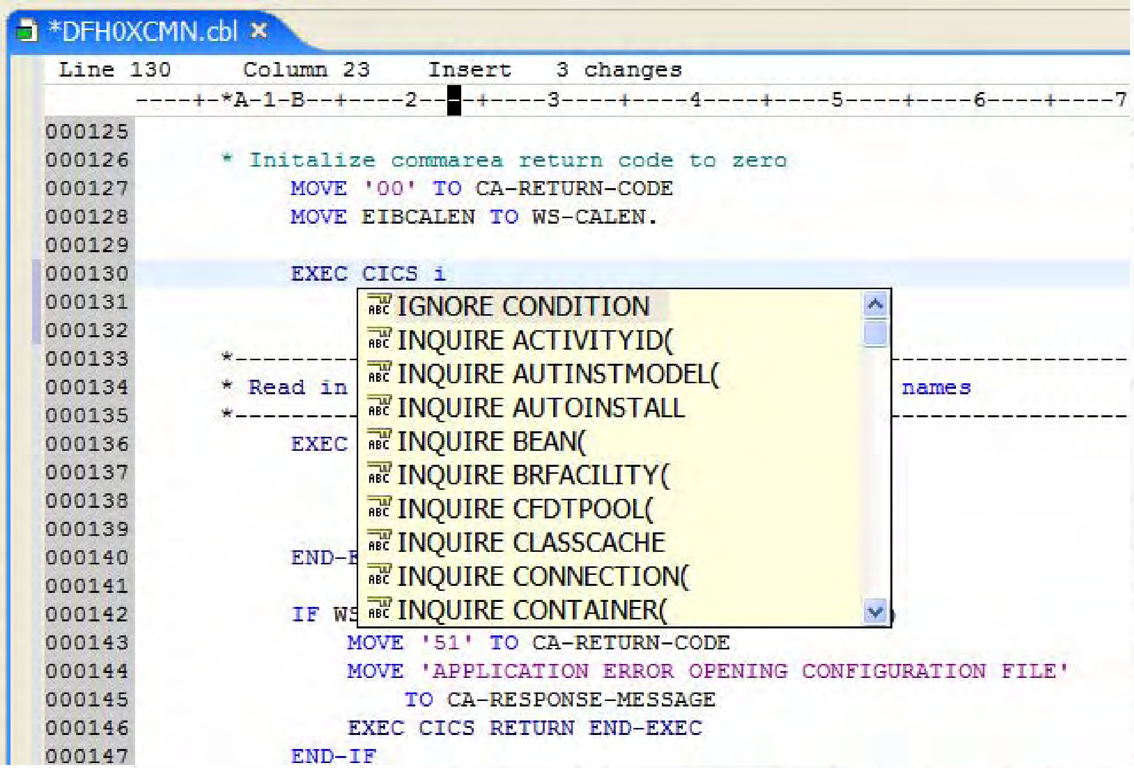
```
 Row 37         Column 31           3 changes.
          ----+-*A-1-B--+----2----+----3----+----4----+----5----+----6-
000032        PROCEDURE DIVISION.
000033        010-INITIALIZATION.
000034       *       Initialize Program-work-fields, Program-flags,
000035               DISPLAY "Program REGIOA STARTING "
000036               MOVE 2 TO BRANCHFLAG.
000037               move FIELD-A to
000038               MOVE 'AAAA
000039               MOVE 'BBBB
000040               MOVE 'CCCC
000041               MOVE "Ente
000042               MOVE "WSEI
000043               MOVE "REGI
000044        020-LOGIC.
000045               CALL  prog
000046               move 66 to
000047               divide value1 BY  received-from-called GIVING
```

BRANCHFLAG
FIELD-A
FIELD-B
FIELD-C
Input-name
Loop-flag
Output-name
Program-flags

Find all statements and data names

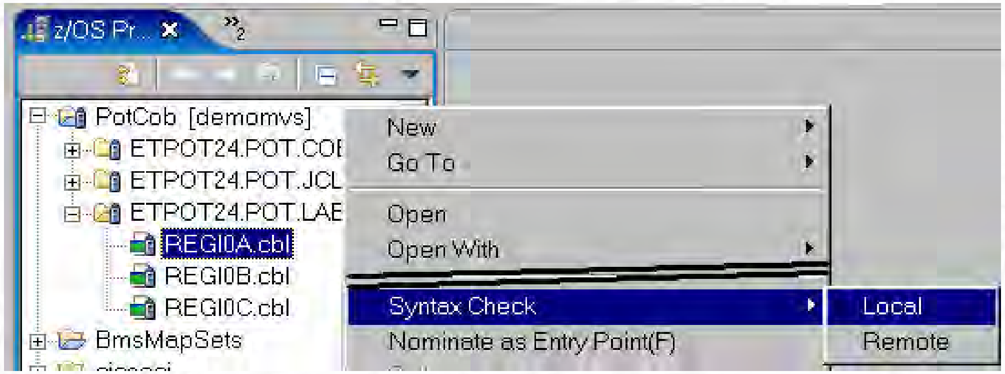
Benefit: Developers complete code more accurately and efficiently.

Content Assist for CICS Development

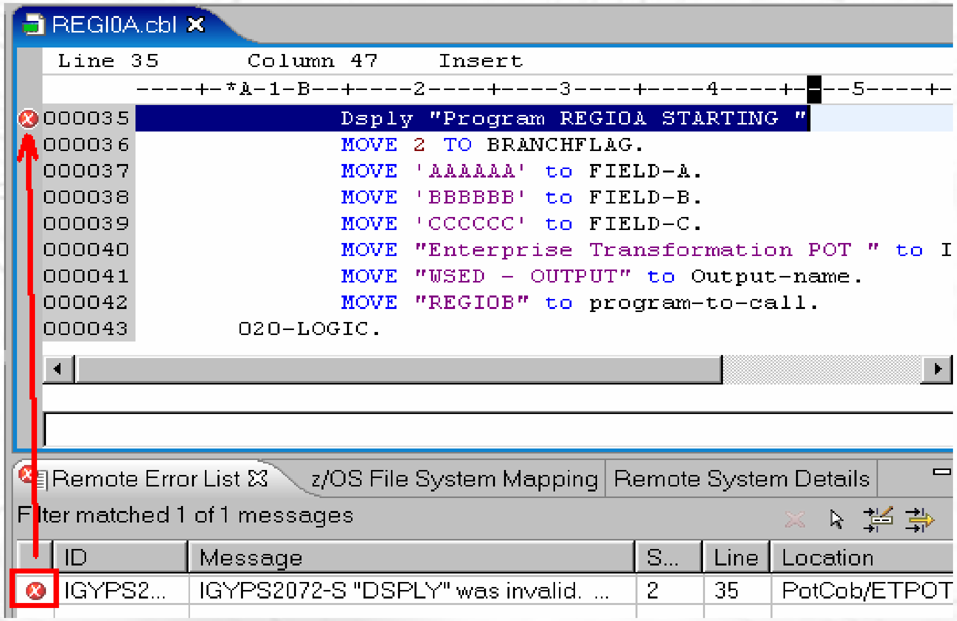

*DFH0XCMN.cbl
IGNORE CONDITION
INQUIRE ACTIVITYID(
INQUIRE AUTINSTMODEL(
INQUIRE AUTOINSTALL
INQUIRE BEAN(
INQUIRE BRFACILITY(
INQUIRE CFDTPOOL(
INQUIRE CLASSCACHE
INQUIRE CONNECTION(
INQUIRE CONTAINER(

```
Line 130      Column 23      Insert    3 changes
----+-*A-1-B--+----2--█-+----3----+----4----+----5----+----6----+----7

      * Initalize commarea return code to zero
           MOVE '00' TO CA-RETURN-CODE
           MOVE EIBCALEN TO WS-CALEN.

           EXEC CICS i


      *--------                                   ------------------
      * Read in                                   names
      *--------                                   ------------------
           EXEC



           END-

           IF WS
               MOVE '51' TO CA-RETURN-CODE
               MOVE 'APPLICATION ERROR OPENING CONFIGURATION FILE'
                   TO CA-RESPONSE-MESSAGE
               EXEC CICS RETURN END-EXEC
           END-IF
```

Syntax Checking


z/OS Pr...
PotCob [demomvs]
ETPOT24.POT.COB
ETPOT24.POT.JCL
ETPOT24.POT.LAB
REGI0A.cbl
REGI0B.cbl
REGI0C.cbl
BmsMapSets
New
Go To
Open
Open With
Syntax Check
Nominate as Entry Point(F)
Local
Remote

Local Syntax checking..


REGI0A.cbl
Remote Error List
z/OS File System Mapping
Remote System Details

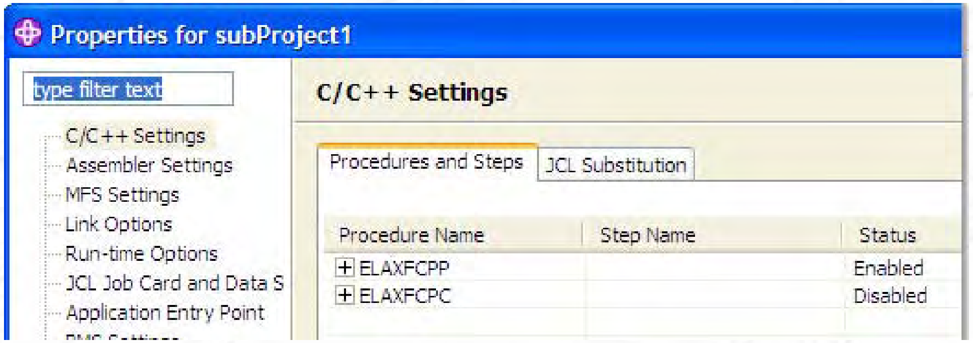
```
 Line 35          Column 47       Insert
          ----+-*A-1-B--+----2----+----3----+----4----+----5----+-
000035                Dsply "Program REGIOA STARTING "
000036                MOVE 2 TO BRANCHFLAG.
000037                MOVE 'AAAAAA' to FIELD-A.
000038                MOVE 'BBBBBB' to FIELD-B.
000039                MOVE 'CCCCCC' to FIELD-C.
000040                MOVE "Enterprise Transformation POT " to I
000041                MOVE "WSED - OUTPUT" to Output-name.
000042                MOVE "REGIOB" to program-to-call.
000043         020-LOGIC.
```

Filter matched 1 of 1 messages

	ID	Message	S...	Line	Location
⊗	IGYPS2...	IGYPS2072-S "DSPLY" was invalid. ...	2	35	PotCob/ETPOT

Just double-click to find the error

New on v7: Support for C/C++


Properties for subProject1

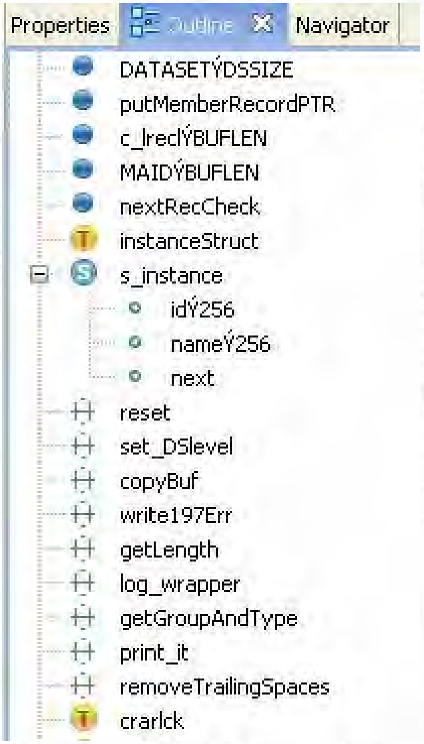
type filter text

- C/C++ Settings
- Assembler Settings
- MFS Settings
- Link Options
- Run-time Options
- JCL Job Card and Data S
- Application Entry Point

C/C++ Settings

Procedures and Steps | JCL Substitution

Procedure Name	Step Name	Status
ELAXFCPP		Enabled
ELAXFCPC		Disabled

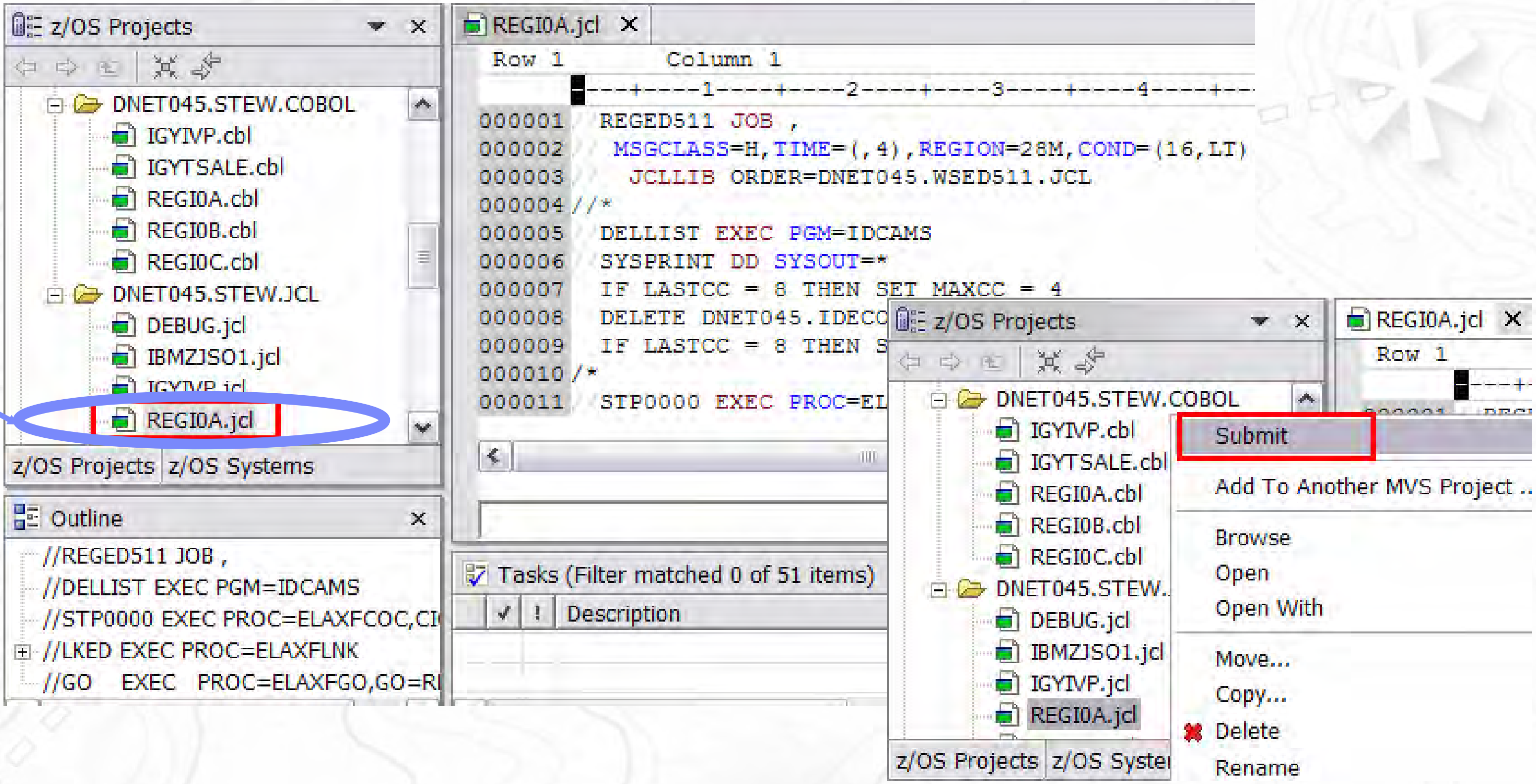

Properties | Outline | Navigator

- DATASETÝDSSIZE
- putMemberRecordPTR
- c_lreclÝBUFLEN
- MAIDÝBUFLEN
- nextRecCheck
- instanceStruct
- s_instance
  - idÝ256
  - nameÝ256
  - next
- reset
- set_DSlevel
- copyBuf
- write197Err
- getLength
- log_wrapper
- getGroupAndType
- print_it
- removeTrailingSpaces
- crarlck

- Full edit, compile, content assist, syntax highlighting
- Remote Syntax check
- zOS Debug (through IBM Debug tool)
- Enhanced code navigation support
  - Outline view shows functions, classes, macros, global variables and include statements for ease of navigation
  - Open include files from outline view
  - Open Declaration action
- Extends Eclipse and CDT (C/C++ Development)
- Work out of MVS or USS

JCL Generation and Submission to z/OS

JCL generated from COBOL Code

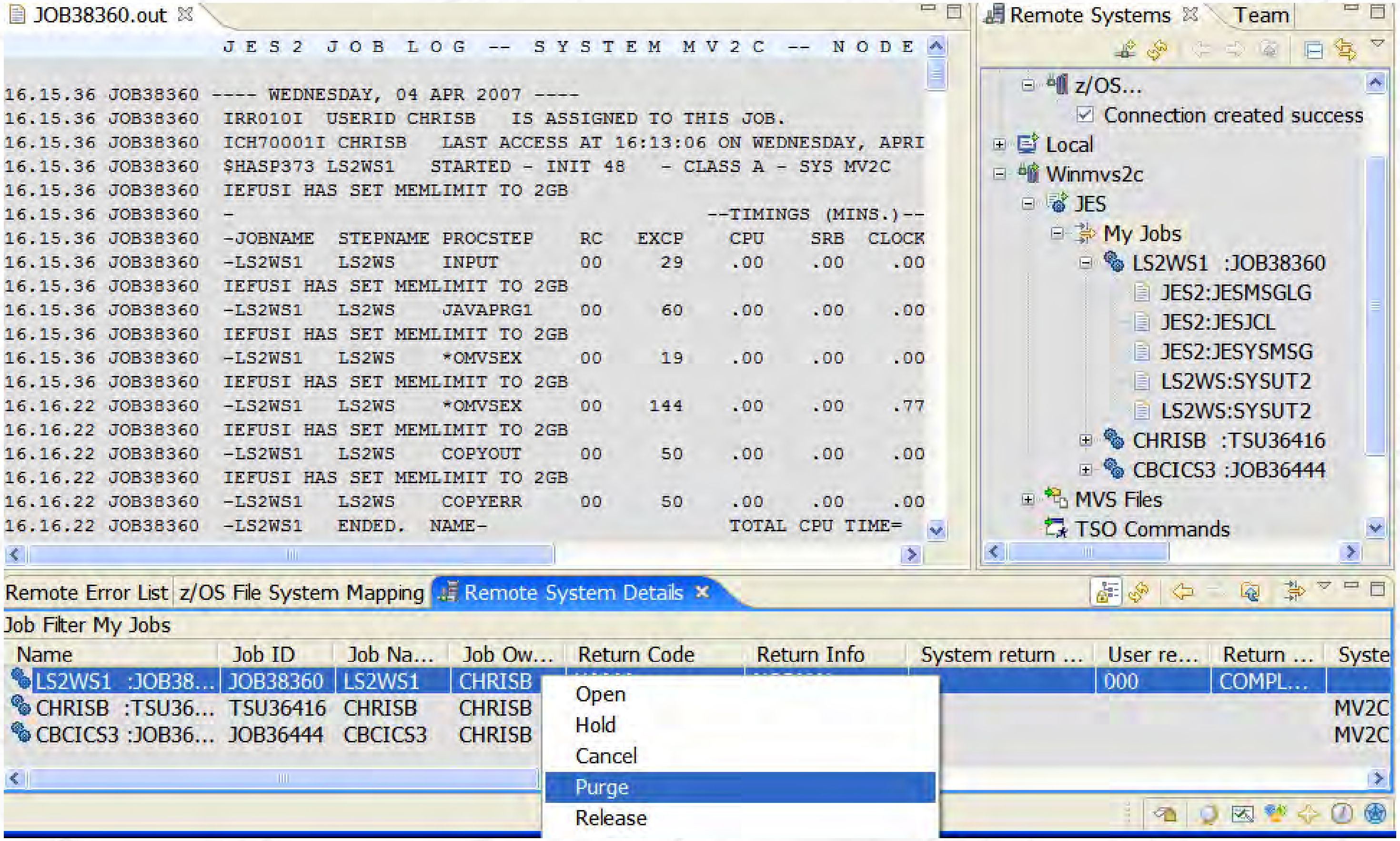

z/OS Projects
DNET045.STEW.COBOL
IGYIVP.cbl
IGYTSALE.cbl
REGI0A.cbl
REGI0B.cbl
REGI0C.cbl
DNET045.STEW.JCL
DEBUG.jcl
IBMZJSO1.jcl
IGYIVP.jcl
REGI0A.jcl
z/OS Projects
z/OS Systems
Outline
REGI0A.jcl
Row 1
Column 1
Tasks (Filter matched 0 of 51 items)
Description
Submit
Add To Another MVS Project ..
Browse
Open
Open With
Move...
Copy...
Delete
Rename

```
 REGED511 JOB ,
  MSGCLASS=H,TIME=(,4),REGION=28M,COND=(16,LT)
   JCLLIB ORDER=DNET045.WSED511.JCL
//*
 DELLIST EXEC PGM=IDCAMS
 SYSPRINT DD SYSOUT=*
 IF LASTCC = 8 THEN SET MAXCC = 4
 DELETE DNET045.IDECC
 IF LASTCC = 8 THEN S
/*
 STP0000 EXEC PROC=EL
```

```
//REGED511 JOB ,
//DELLIST EXEC PGM=IDCAMS
//STP0000 EXEC PROC=ELAXFCOC,CI
//LKED EXEC PROC=ELAXFLNK
//GO    EXEC    PROC=ELAXFGO,GO=R
```

Benefit: Developers focused on business logic and not on writing JCL

- JCL smart editor, Outline…



JOB38360.out
Remote Systems
Team
z/OS...
☑ Connection created success
Local
Winmvs2c
JES
My Jobs
LS2WS1 :JOB38360
JES2:JESMSGLG
JES2:JESJCL
JES2:JESYSMSG
LS2WS:SYSUT2
LS2WS:SYSUT2
CHRISB :TSU36416
CBCICS3 :JOB36444
MVS Files
TSO Commands
Remote Error List
z/OS File System Mapping
Remote System Details
Open
Hold
Cancel
Purge
Release

```
                   J E S 2   J O B   L O G   --   S Y S T E M   M V 2 C   --   N O D E

16.15.36 JOB38360 ---- WEDNESDAY, 04 APR 2007 ----
16.15.36 JOB38360  IRR010I  USERID CHRISB   IS ASSIGNED TO THIS JOB.
16.15.36 JOB38360  ICH70001I CHRISB   LAST ACCESS AT 16:13:06 ON WEDNESDAY, APRI
16.15.36 JOB38360  $HASP373 LS2WS1   STARTED - INIT 48   - CLASS A - SYS MV2C
16.15.36 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.15.36 JOB38360  -                                        --TIMINGS (MINS.)--
16.15.36 JOB38360  -JOBNAME  STEPNAME PROCSTEP    RC   EXCP    CPU    SRB   CLOCK
16.15.36 JOB38360  -LS2WS1   LS2WS    INPUT       00     29    .00    .00    .00
16.15.36 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.15.36 JOB38360  -LS2WS1   LS2WS    JAVAPRG1    00     60    .00    .00    .00
16.15.36 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.15.36 JOB38360  -LS2WS1   LS2WS    *OMVSEX     00     19    .00    .00    .00
16.15.36 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.16.22 JOB38360  -LS2WS1   LS2WS    *OMVSEX     00    144    .00    .00    .77
16.16.22 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.16.22 JOB38360  -LS2WS1   LS2WS    COPYOUT     00     50    .00    .00    .00
16.16.22 JOB38360  IEFUSI HAS SET MEMLIMIT TO 2GB
16.16.22 JOB38360  -LS2WS1   LS2WS    COPYERR     00     50    .00    .00    .00
16.16.22 JOB38360  -LS2WS1   ENDED.  NAME-                     TOTAL CPU TIME=
```

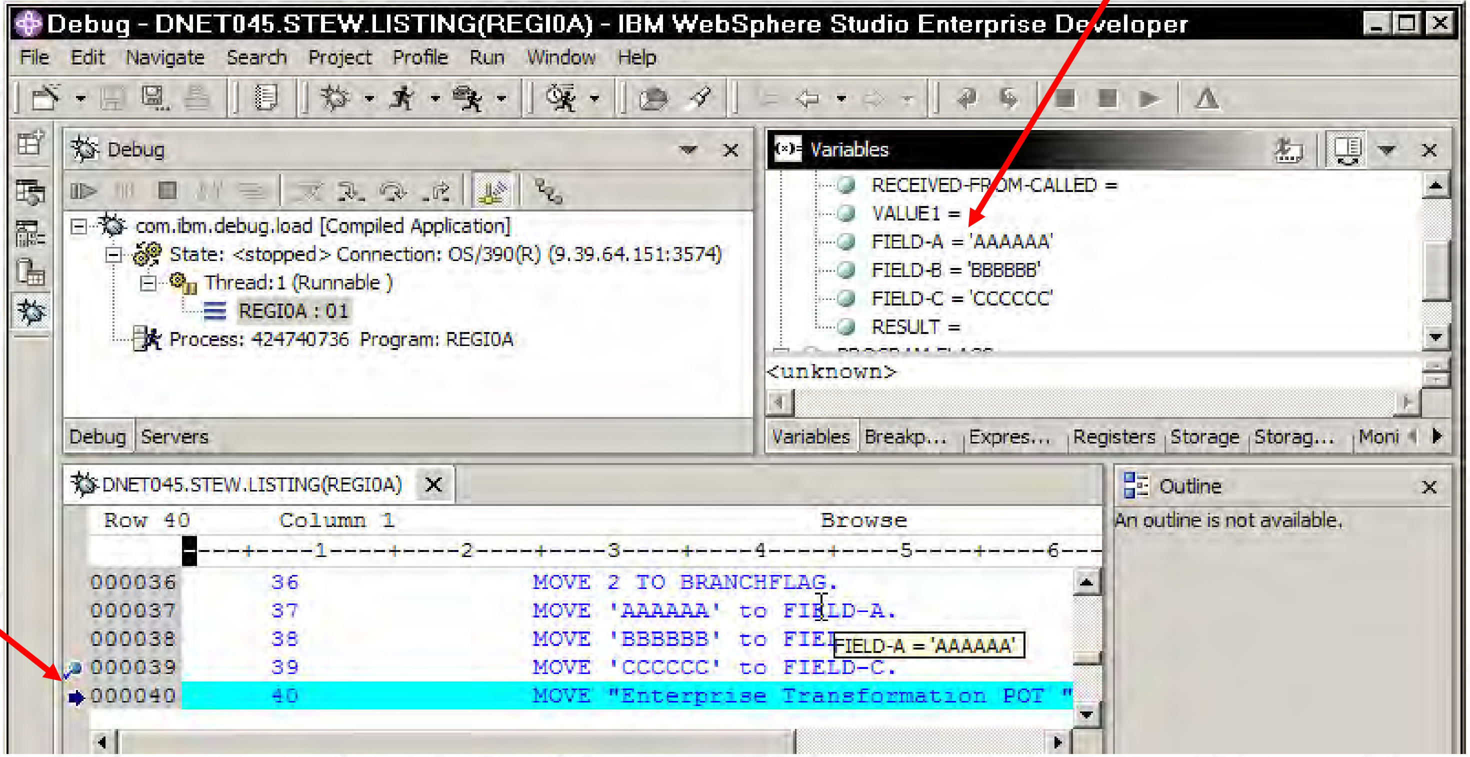
Job Filter My Jobs

Name	Job ID	Job Na...	Job Ow...	Return Code	Return Info	System return ...	User re...	Return ...	Syste
LS2WS1 :JOB38...	JOB38360	LS2WS1	CHRISB				000	COMPL...	
CHRISB :TSU36...	TSU36416	CHRISB	CHRISB						MV2C
CBCICS3 :JOB36...	JOB36444	CBCICS3	CHRISB						MV2C

Remote and Local Debug

Change contents, etc..

Breakpoints, watchpoints, Jump to, Run to etc..


Debug - DNET045.STEW.LISTING(REGI0A) - IBM WebSphere Studio Enterprise Developer
File Edit Navigate Search Project Profile Run Window Help
Debug
Variables
Debug Servers
Variables Breakp... Expres... Registers Storage Storag... Moni
DNET045.STEW.LISTING(REGI0A)
Outline

com.ibm.debug.load [Compiled Application]
State: <stopped> Connection: OS/390(R) (9.39.64.151:3574)
Thread:1 (Runnable)
REGI0A : 01
Process: 424740736 Program: REGI0A

RECEIVED-FROM-CALLED =
VALUE1 =
FIELD-A = 'AAAAAA'
FIELD-B = 'BBBBBB'
FIELD-C = 'CCCCCC'
RESULT =

<unknown>

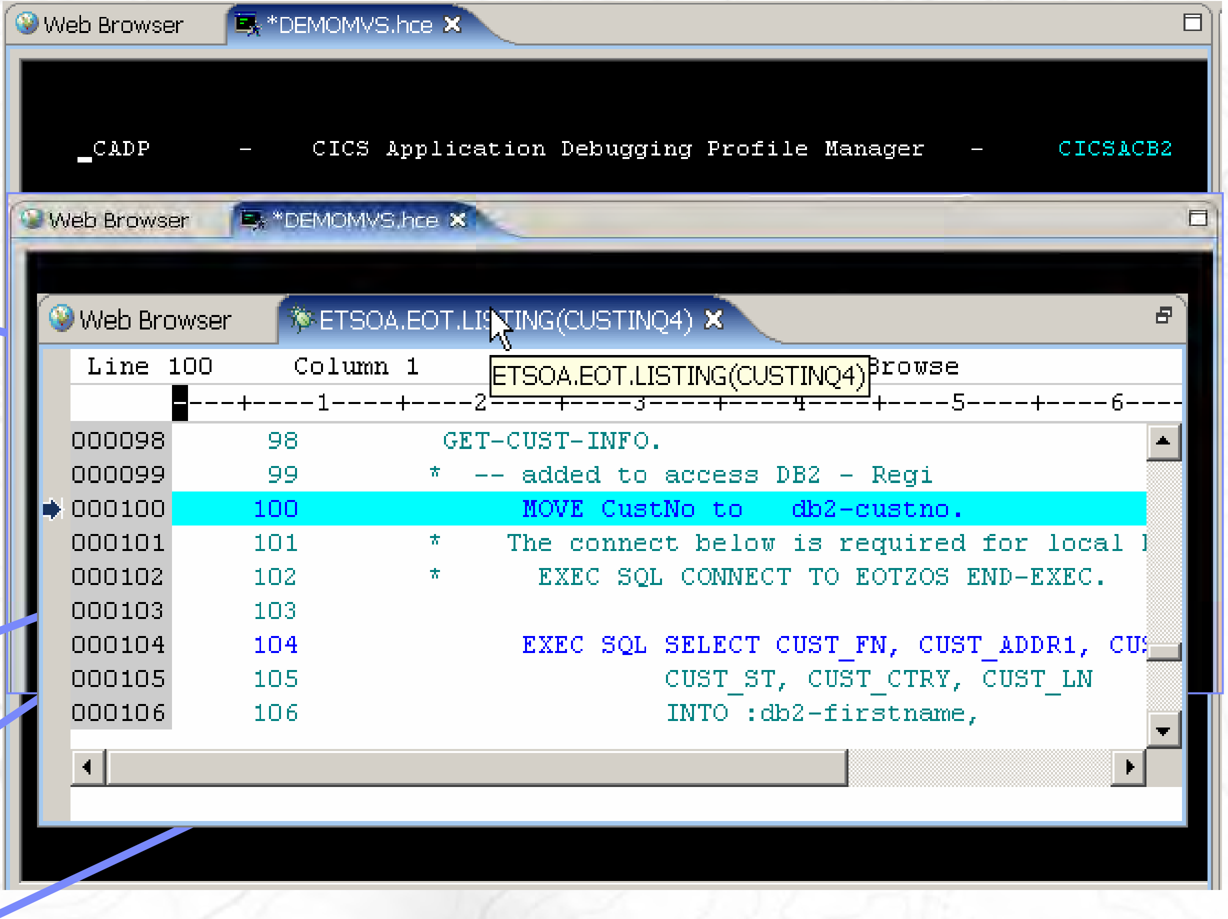
An outline is not available.

```
 Row 40        Column 1                        Browse
 ----+----1----+----2----+----3----+----4----+----5----+----6---
000036      36          MOVE 2 TO BRANCHFLAG.
000037      37          MOVE 'AAAAAA' to FIELD-A.
000038      38          MOVE 'BBBBBB' to FIEL FIELD-A = 'AAAAAA'
000039      39          MOVE 'CCCCCC' to FIELD-C.
000040      40          MOVE "Enterprise Transformation POT "
```

Benefit: Same Debug Perspective used for COBOL, PL1, C, C++, Java, JSP, HTML, etc..

Remote CICS Debug – Setup to use WDz

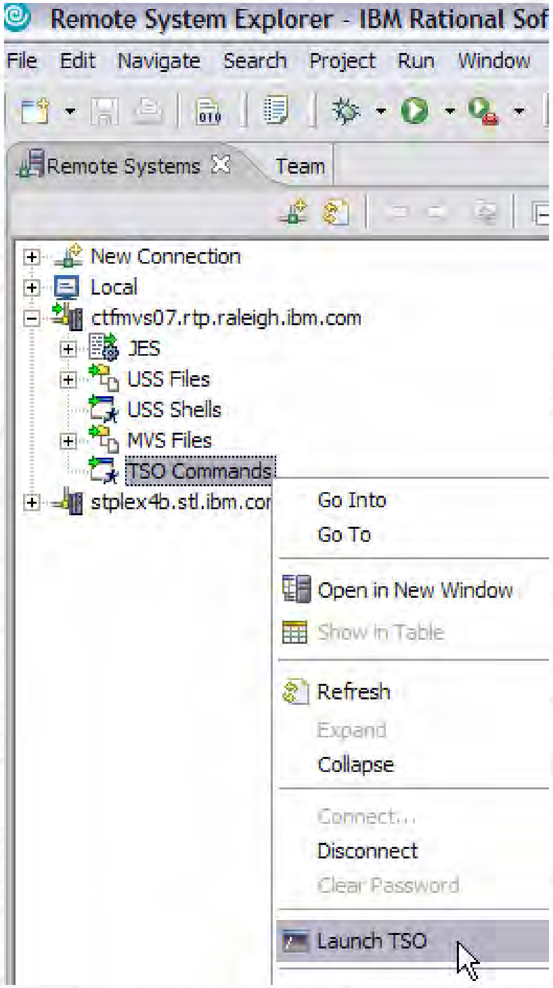
- Initiated based on:
  - Transaction
  - Program
  - UserID
  - TermId
  - Netname
  - Etc
- Can use TCP/IP
  - Workstation TCP/IP address
  - Port to broadcast on

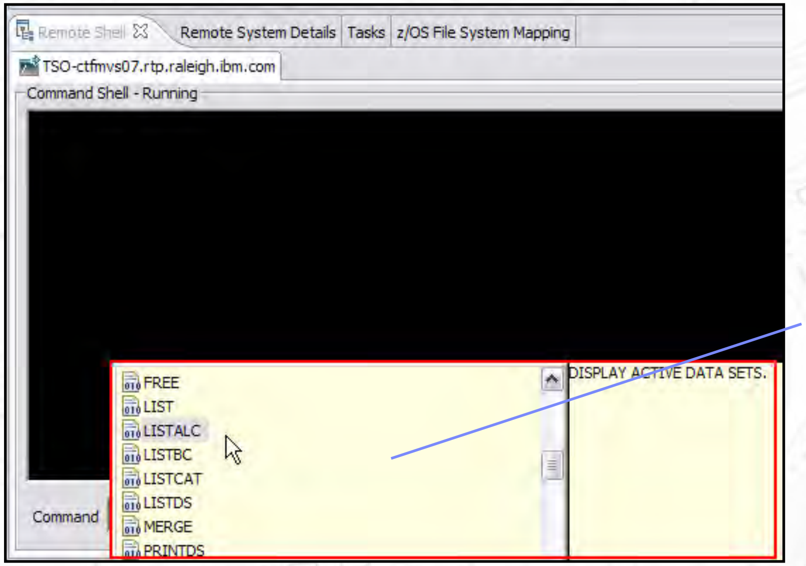

Web Browser
*DEMOMVS.hce
Web Browser
*DEMOMVS.hce
Web Browser
ETSOA.EOT.LISTING(CUSTINQ4)
ETSOA.EOT.LISTING(CUSTINQ4)

```
_CADP      -     CICS Application Debugging Profile Manager     -     CICSACB2
```

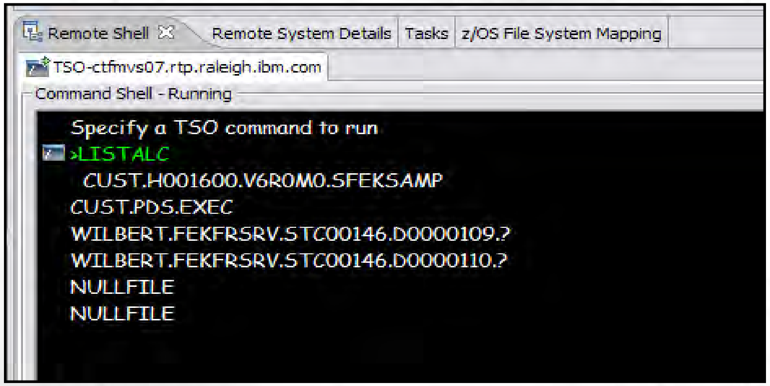
```
 Line 100       Column 1                          Browse
          ----+----1----+----2----+----3----+----4----+----5----+----6----
000098      98         GET-CUST-INFO.
000099      99        *   -- added to access DB2 - Regi
000100     100                MOVE CustNo to    db2-custno.
000101     101        *     The connect below is required for local I
000102     102        *       EXEC SQL CONNECT TO EOTZOS END-EXEC.
000103     103
000104     104                EXEC SQL SELECT CUST_FN, CUST_ADDR1, CUS
000105     105                         CUST_ST, CUST_CTRY, CUST_LN
000106     106                         INTO :db2-firstname,
```

TSO Commands


Remote System Explorer - IBM Rational Sof
File Edit Navigate Search Project Run Window
Remote Systems
Team
New Connection
Local
ctfmvs07.rtp.raleigh.ibm.com
JES
USS Files
USS Shells
MVS Files
TSO Commands
stplex4b.stl.ibm.cor
Go Into
Go To
Open in New Window
Show in Table
Refresh
Expand
Collapse
Connect...
Disconnect
Clear Password
Launch TSO


Remote Shell
Remote System Details
Tasks
z/OS File System Mapping
TSO-ctfmvs07.rtp.raleigh.ibm.com
Command Shell - Running
Command
FREE
LIST
LISTALC
LISTBC
LISTCAT
LISTDS
MERGE
PRINTDS
DISPLAY ACTIVE DATA SETS.

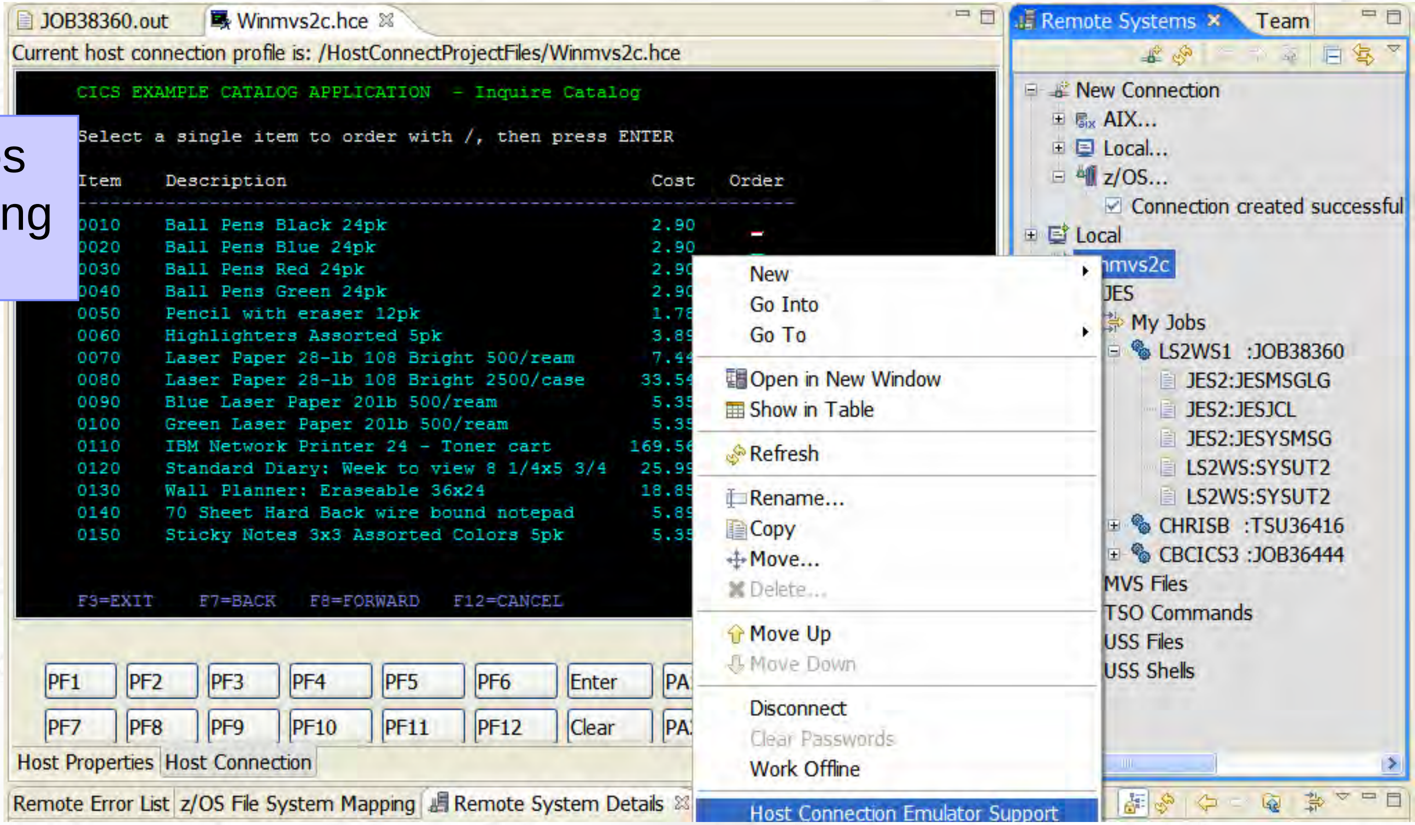
Content Assist


Remote Shell
Remote System Details
Tasks
z/OS File System Mapping
TSO-ctfmvs07.rtp.raleigh.ibm.com
Command Shell - Running

```
 Specify a TSO command to run
>LISTALC
  CUST.H001600.V6R0M0.SFEKSAMP
 CUST.PDS.EXEC
 WILBERT.FEKFRSRV.STC00146.D0000109.?
 WILBERT.FEKFRSRV.STC00146.D0000110.?
 NULLFILE
 NULLFILE
```

Invoke 3270 screens from WDz

Can use macros to record operating sequence

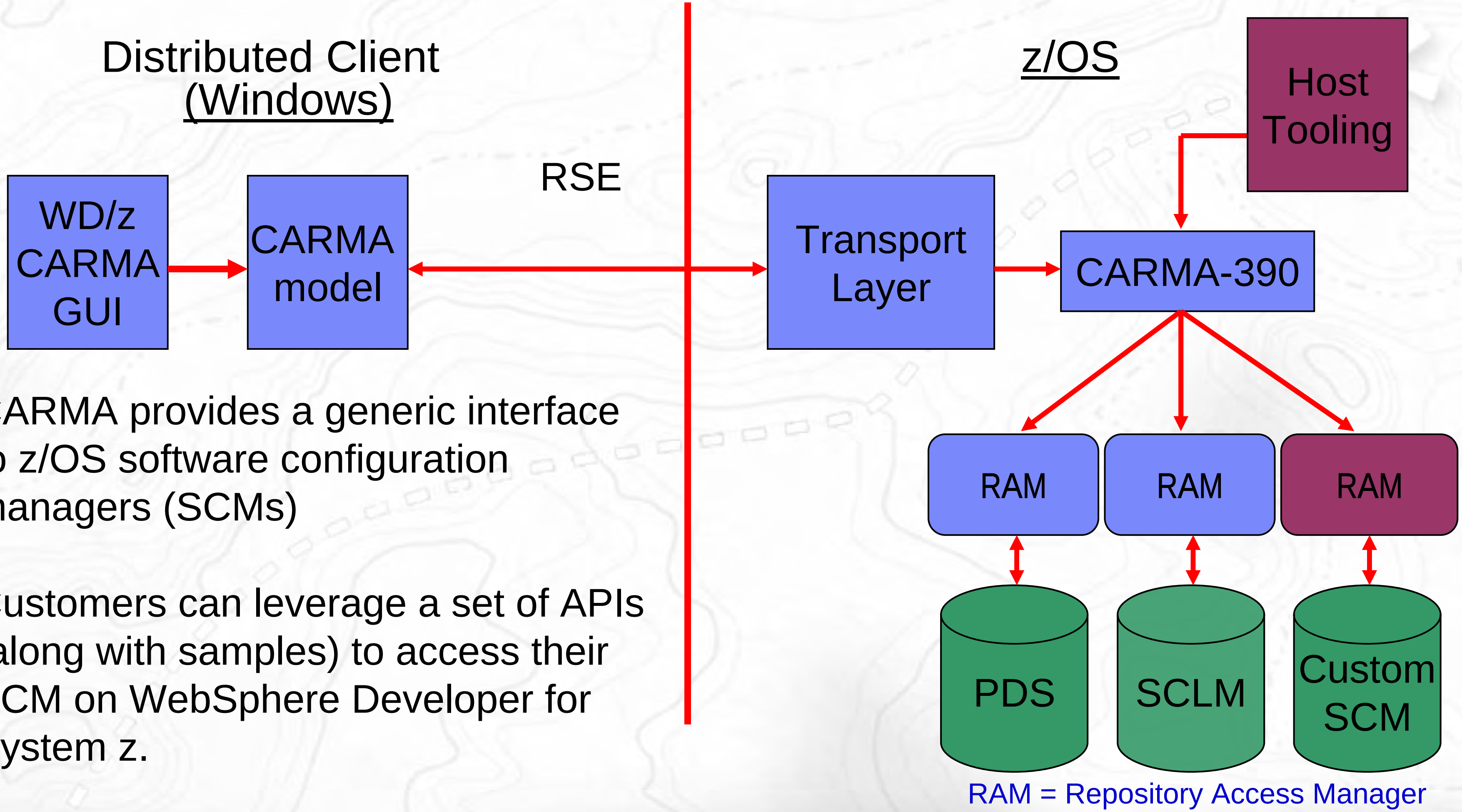

JOB38360.out
Winmvs2c.hce
Remote Systems
Team
New Connection
AIX...
Local...
z/OS...
Connection created successful
Local
mvs2c
JES
My Jobs
LS2WS1 :JOB38360
JES2:JESMSGLG
JES2:JESJCL
JES2:JESYSMSG
LS2WS:SYSUT2
LS2WS:SYSUT2
CHRISB :TSU36416
CBCICS3 :JOB36444
MVS Files
TSO Commands
USS Files
USS Shells
New
Go Into
Go To
Open in New Window
Show in Table
Refresh
Rename...
Copy
Move...
Delete...
Move Up
Move Down
Disconnect
Clear Passwords
Work Offline
Host Connection Emulator Support
PF1
PF2
PF3
PF4
PF5
PF6
Enter
PA
PF7
PF8
PF9
PF10
PF11
PF12
Clear
PA
Host Properties
Host Connection
Remote Error List
z/OS File System Mapping
Remote System Details

Current host connection profile is: /HostConnectProjectFiles/Winmvs2c.hce

```
CICS EXAMPLE CATALOG APPLICATION  - Inquire Catalog

Select a single item to order with /, then press ENTER

Item    Description                                Cost   Order
-----------------------------------------------------------------
0010    Ball Pens Black 24pk                       2.90     _
0020    Ball Pens Blue 24pk                        2.90
0030    Ball Pens Red 24pk                         2.9
0040    Ball Pens Green 24pk                       2.9
0050    Pencil with eraser 12pk                    1.7
0060    Highlighters Assorted 5pk                  3.8
0070    Laser Paper 28-lb 108 Bright 500/ream      7.4
0080    Laser Paper 28-lb 108 Bright 2500/case    33.5
0090    Blue Laser Paper 20lb 500/ream             5.3
0100    Green Laser Paper 20lb 500/ream            5.3
0110    IBM Network Printer 24 - Toner cart      169.5
0120    Standard Diary: Week to view 8 1/4x5 3/4  25.9
0130    Wall Planner: Eraseable 36x24             18.8
0140    70 Sheet Hard Back wire bound notepad      5.8
0150    Sticky Notes 3x3 Assorted Colors 5pk       5.3


F3=EXIT    F7=BACK    F8=FORWARD    F12=CANCEL
```

Benefit: Eliminates need for terminal emulation

Common Access Host Repository Manager (CARMA)

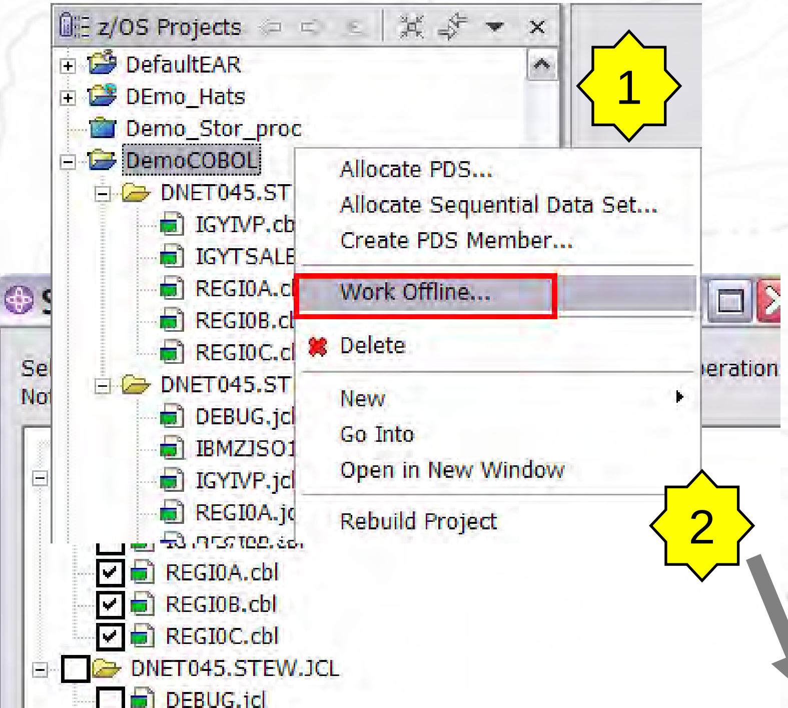

Distributed Client
(Windows)
z/OS
Host Tooling
RSE
WD/z CARMA GUI
CARMA model
Transport Layer
CARMA-390
RAM
RAM
RAM
PDS
SCLM
Custom SCM

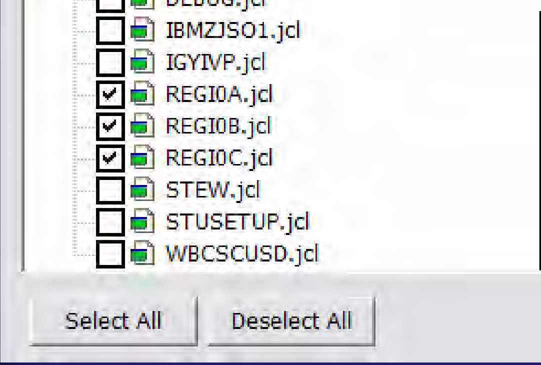
CARMA provides a generic interface to z/OS software configuration managers (SCMs)

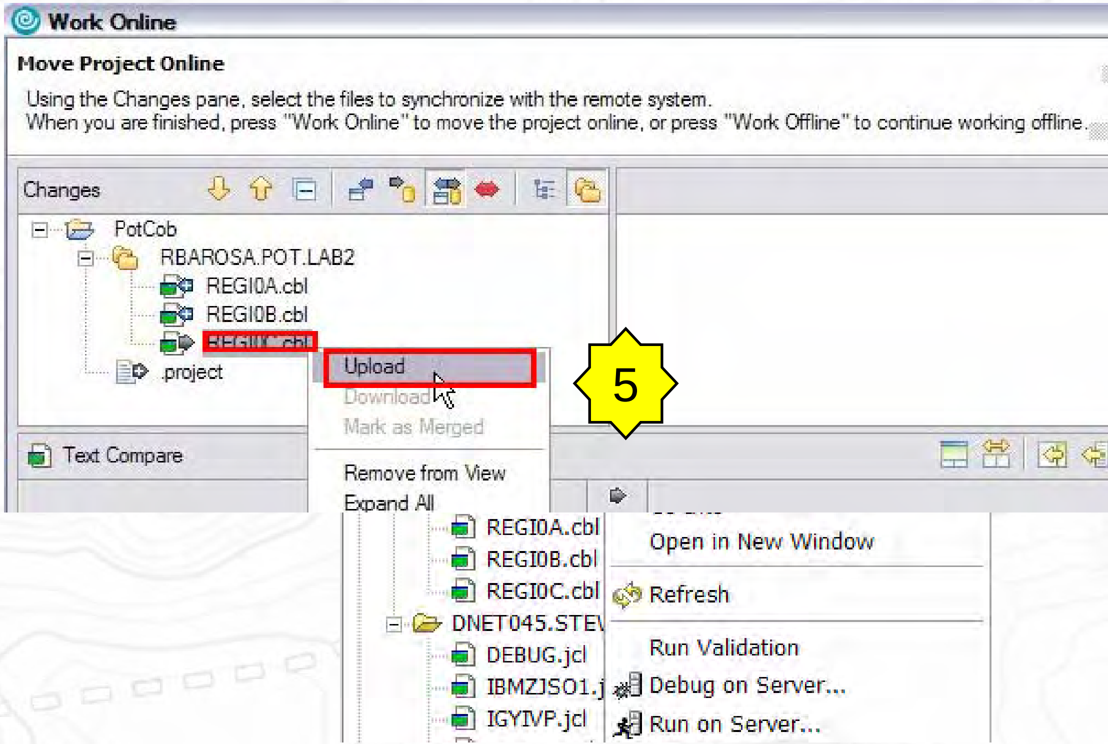
Customers can leverage a set of APIs (along with samples) to access their SCM on WebSphere Developer for System z.

RAM = Repository Access Manager

Working Offline


z/OS Projects
DefaultEAR
DEmo_Hats
Demo_Stor_proc
DemoCOBOL
DNET045.ST
IGYIVP.cb
IGYTSALE
REGI0A.c
REGI0B.cl
REGI0C.cl
DNET045.ST
DEBUG.jcl
IBMZJSO1
IGYIVP.jcl
REGI0A.jc
Allocate PDS...
Allocate Sequential Data Set...
Create PDS Member...
Work Offline...
Delete
New
Go Into
Open in New Window
Rebuild Project
1
2


☑ REGI0A.cbl
☑ REGI0B.cbl
☑ REGI0C.cbl
☐ DNET045.STEW.JCL
☐ DEBUG.jcl
☐ IBMZJSO1.jcl
☐ IGYIVP.jcl
☑ REGI0A.jcl
☑ REGI0B.jcl
☑ REGI0C.jcl
☐ STEW.jcl
☐ STUSETUP.jcl
☐ WBCSCUSD.jcl
Select All
Deselect All


Work Online

Move Project Online

Using the Changes pane, select the files to synchronize with the remote system.
When you are finished, press "Work Online" to move the project online, or press "Work Offline" to continue working offline.

Changes
PotCob
RBAROSA.POT.LAB2
REGI0A.cbl
REGI0B.cbl
REGI0C.cbl
.project
Upload
Download
Mark as Merged
Remove from View
Expand All
Text Compare
5
REGI0A.cbl
REGI0B.cbl
REGI0C.cbl
DNET045.STEW
DEBUG.jcl
IBMZJSO1.j
IGYIVP.jcl
Open in New Window
Refresh
Run Validation
Debug on Server...
Run on Server...

- Allows users to edit and Syntax check on files while disconnected from the host
- Detects conflicts and changes

Benefits of z/OS Application Development

- Utilizes Workbench features/tools to support COBOL, PL/I, Assembler, C/C++ development for the z/OS platform
  - Simplifies development process
  - Provides consistent development environment
  - Better interface, no need for TSO
- Provides development support for traditional runtimes
  - CICS, IMS, DB2, batch
- Help developers with no mainframe skills to work with mainframe assets
  - Same eclipse based tool for Java, COBOL, PL/I and C/C++

IBM WebSphere Developer for System z

XML Services for the Enterprise (XSE)

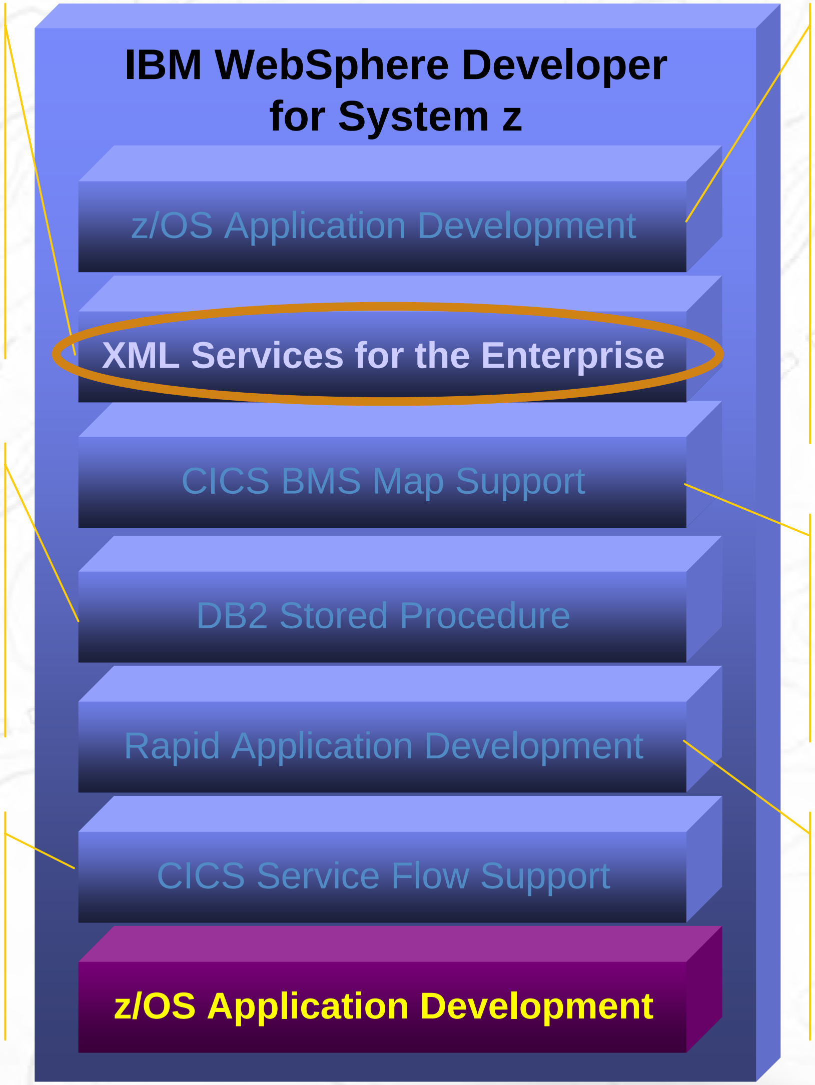
- SOA access to CICS V3.1 and IMS V9 COBOL applications
- Bottom-up/Top-down or meet-in-the-middle COBOL to XML mapping support
- Integrated COBOL XML converters, XML schemas, and WSDL generation

DB2 Stored Procedure for COBOL and PL/I

- Create DB2 stored procedures on z/OS in either COBOL or PL/I
- Build and catalog support for the DB2 stored procedure
- Debug z/OS based stored procedures from workstation

CICS Service Flow Feature

- Implements SOA and Web Services
- Service Flow is a tool to build service flows out of your existing Commarea and Terminal based CICS applications.



IBM WebSphere Developer for System z

z/OS Application Development

XML Services for the Enterprise

CICS BMS Map Support

DB2 Stored Procedure

Rapid Application Development

CICS Service Flow Support

z/OS Application Development

z/OS Application Development

- Connect to z/OS systems
- Work with z/OS resources like COBOL, PL/1 , C, C++, JCL, etc.
- Interact with the Job Entry Subsystem (JES) to submit jobs, monitor jobs, and review job output
- Perform dataset management actions like allocating datasets and migrating datasets
- Perform typical edit, compile, and debug tasks on remote z/OS resources from the workstation

CICS BMS/ IMS MFS Map Support

- Visually create and modify BMS Map sets or IMS/MFS
- Generates JCL
- Work with local or remote maps

Rapid Application Development Tool

- Ability to generate WSDL and CICS Cobol program to access DB2
- CRUD operations
- Can be added to SF flow

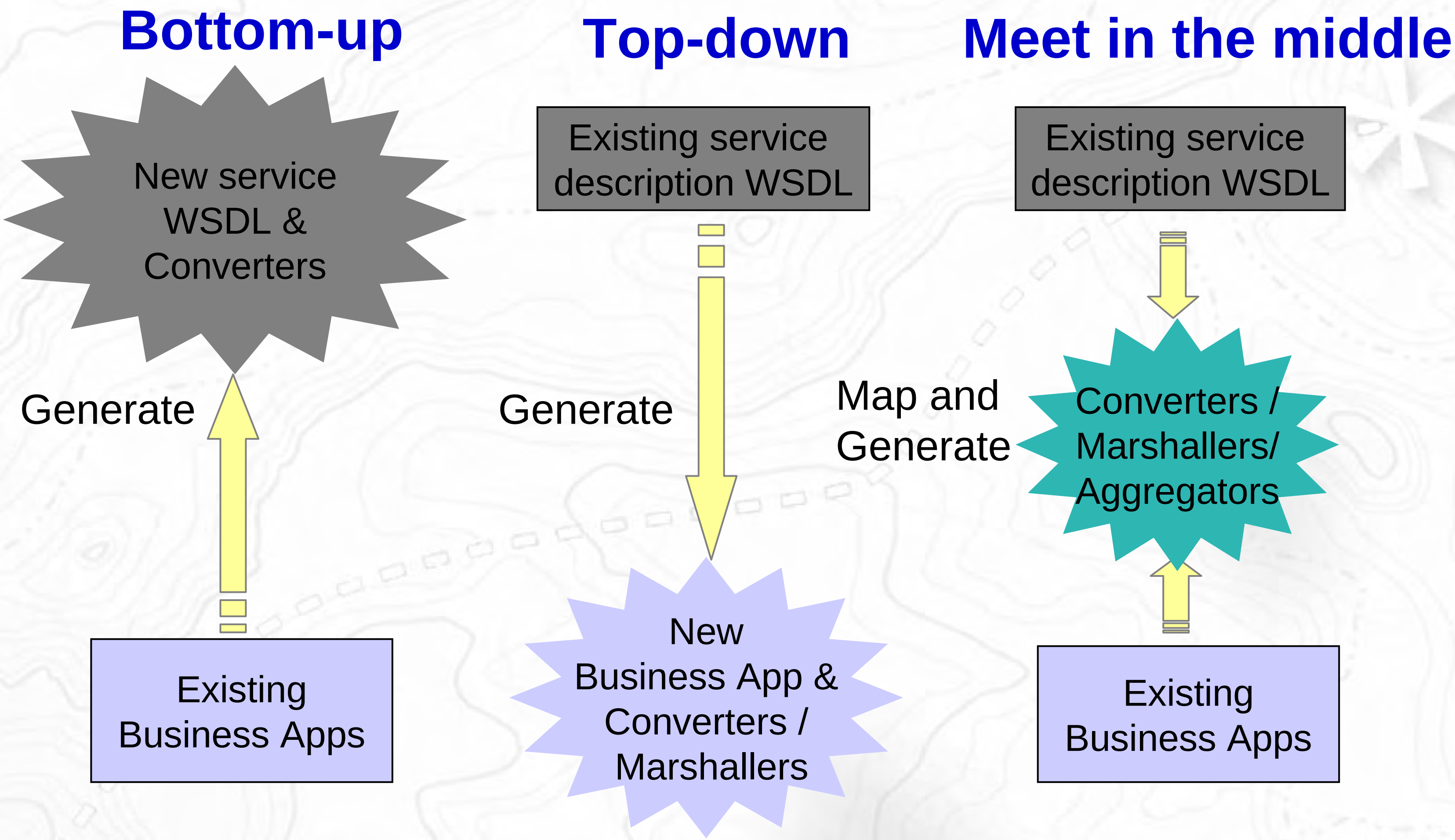
Why Web Services?

- Web services provide standardized access to assets for different software applications residing on disparate platforms

- Web service definitions provide abstract interfaces which allow for loose coupling between business components – implementation can vary without affecting consumers

- You can reuse applications exposed as Web services in a variety of service-oriented architecture frameworks, such as a process choreographer or an enterprise service bus.

Web Service Enablement Styles



Bottom-up

New service WSDL & Converters

Generate

Existing Business Apps

Top-down

Existing service description WSDL

Generate

New Business App & Converters / Marshallers

Meet in the middle

Existing service description WSDL

Map and Generate

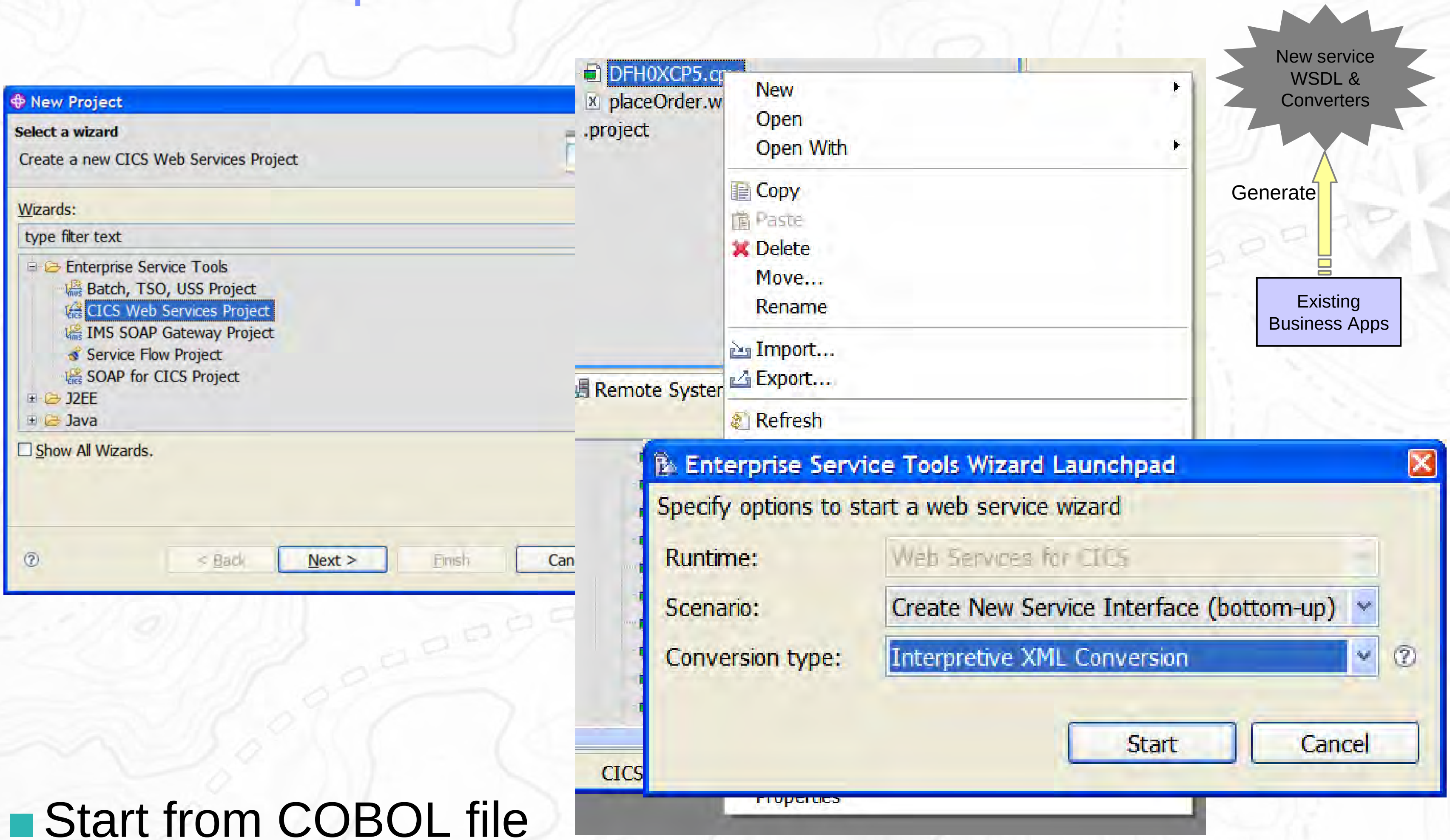
Converters / Marshallers/ Aggregators

Existing Business Apps

XML Services for the Enterprise (XSE)

- Web Services Enablement wizard (bottom-up)
  - Generate Web Service interface from existing COBOL application
  - Bottom-up approach since COBOL at the bottom (base) of the creation
  - Avaliable for both interpretive (CICS runtime) converters and compiled (COBOL) converters
- Web Services Enablement wizard (top-down)
  - Generate COBOL CICS program and copybooks from existing WSDL
  - Available for interpretive (CICS runtime) converters only
- Web Services Enablement wizard (meet-in-the-middle)
  - Map existing WSDL or XML to existing COBOL app.
  - Meet-in-the-middle since Web Services/XML definition “meets” or maps to the existing COBOL interface
  - Available for compiled (COBOL) converters only

XSE – Bottom Up Enablement



New Project

Select a wizard

Create a new CICS Web Services Project

Wizards:

type filter text

- Enterprise Service Tools
  - Batch, TSO, USS Project
  - CICS Web Services Project
  - IMS SOAP Gateway Project
  - Service Flow Project
  - SOAP for CICS Project
- J2EE
- Java

☐ Show All Wizards.

Enterprise Service Tools Wizard Launchpad

Specify options to start a web service wizard

Runtime: Web Services for CICS

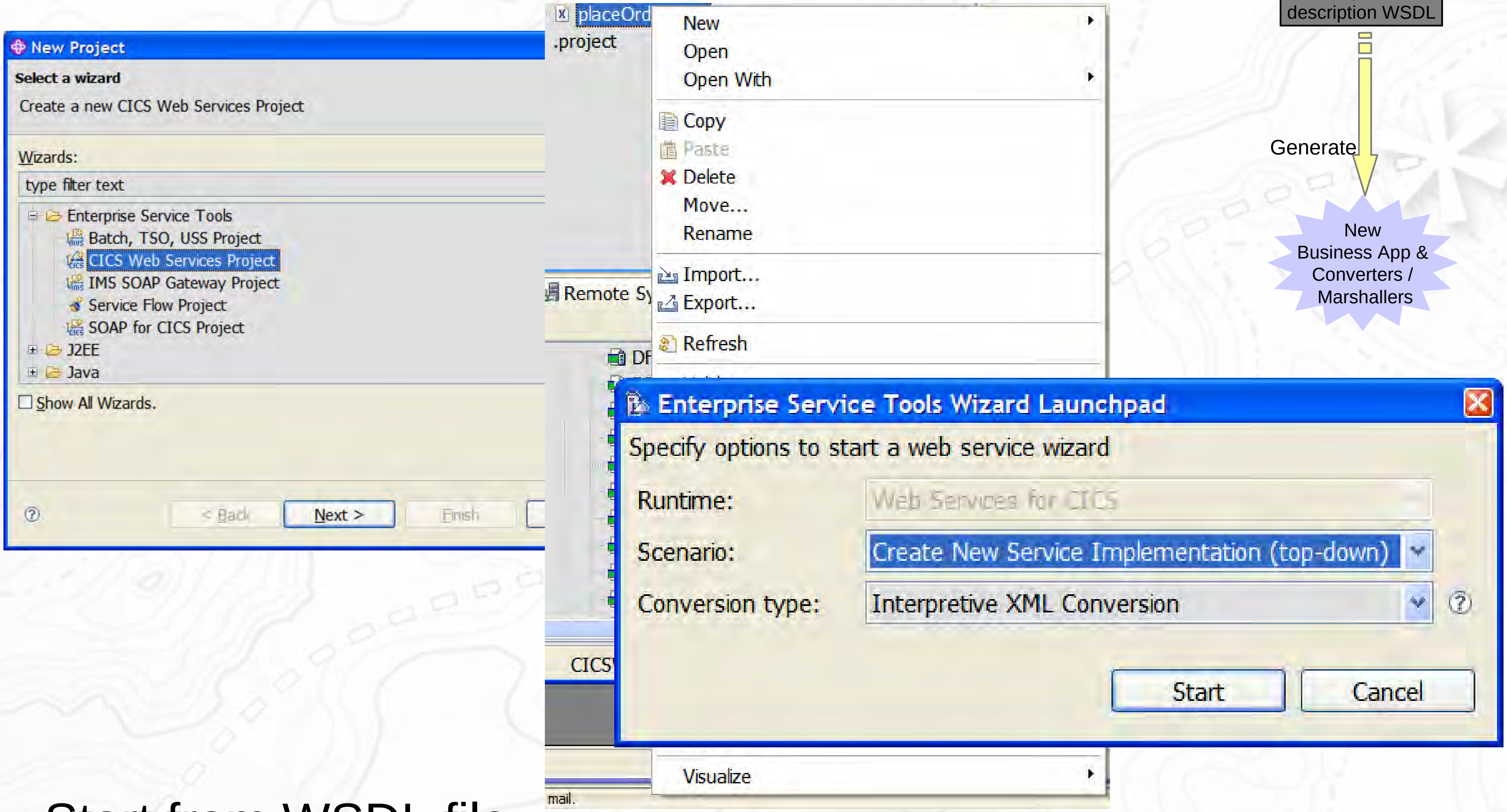
Scenario: Create New Service Interface (bottom-up)

Conversion type: Interpretive XML Conversion

< Back
Next >
Finish
Can
DFH0XCP5.cp
placeOrder.w
.project
Remote Syster
CICS
New
Open
Open With
Copy
Paste
Delete
Move...
Rename
Import...
Export...
Refresh
Properties
Start
Cancel
New service WSDL & Converters
Generate
Existing Business Apps

- Start from COBOL file
- Available for both Interpretive (CICS Runtime) and Compiled (COBOL) Converters

XSE – Top Down Enablement



New Project

Select a wizard

Create a new CICS Web Services Project

Wizards: type filter text

- Enterprise Service Tools
  - Batch, TSO, USS Project
  - CICS Web Services Project
  - IMS SOAP Gateway Project
  - Service Flow Project
  - SOAP for CICS Project
- J2EE
- Java

☐ Show All Wizards.

< Back
Next >
Finish
placeOrd
.project
New
Open
Open With
Copy
Paste
Delete
Move...
Rename
Import...
Export...
Refresh
Visualize
Remote Sy
DF
CICS
mail.

Enterprise Service Tools Wizard Launchpad

Specify options to start a web service wizard

Runtime: Web Services for CICS

Scenario: Create New Service Implementation (top-down)

Conversion type: Interpretive XML Conversion

Start
Cancel

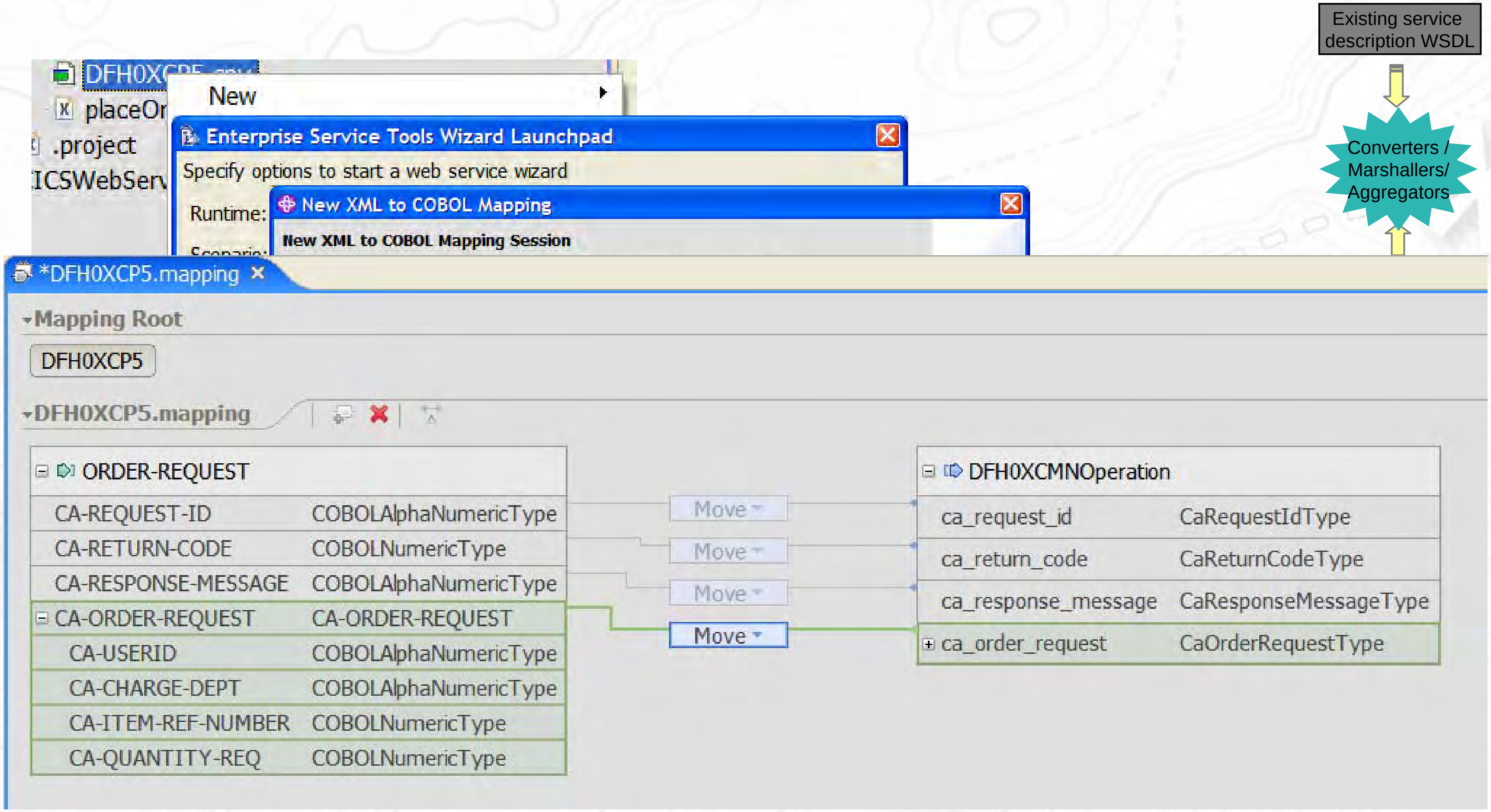
Existing service description WSDL

Generate

New Business App & Converters / Marshallers

- Start from WSDL file
- Available for only Interpretive (CICS Runtime) Converters

XSE – Meet in the Middle Enablement



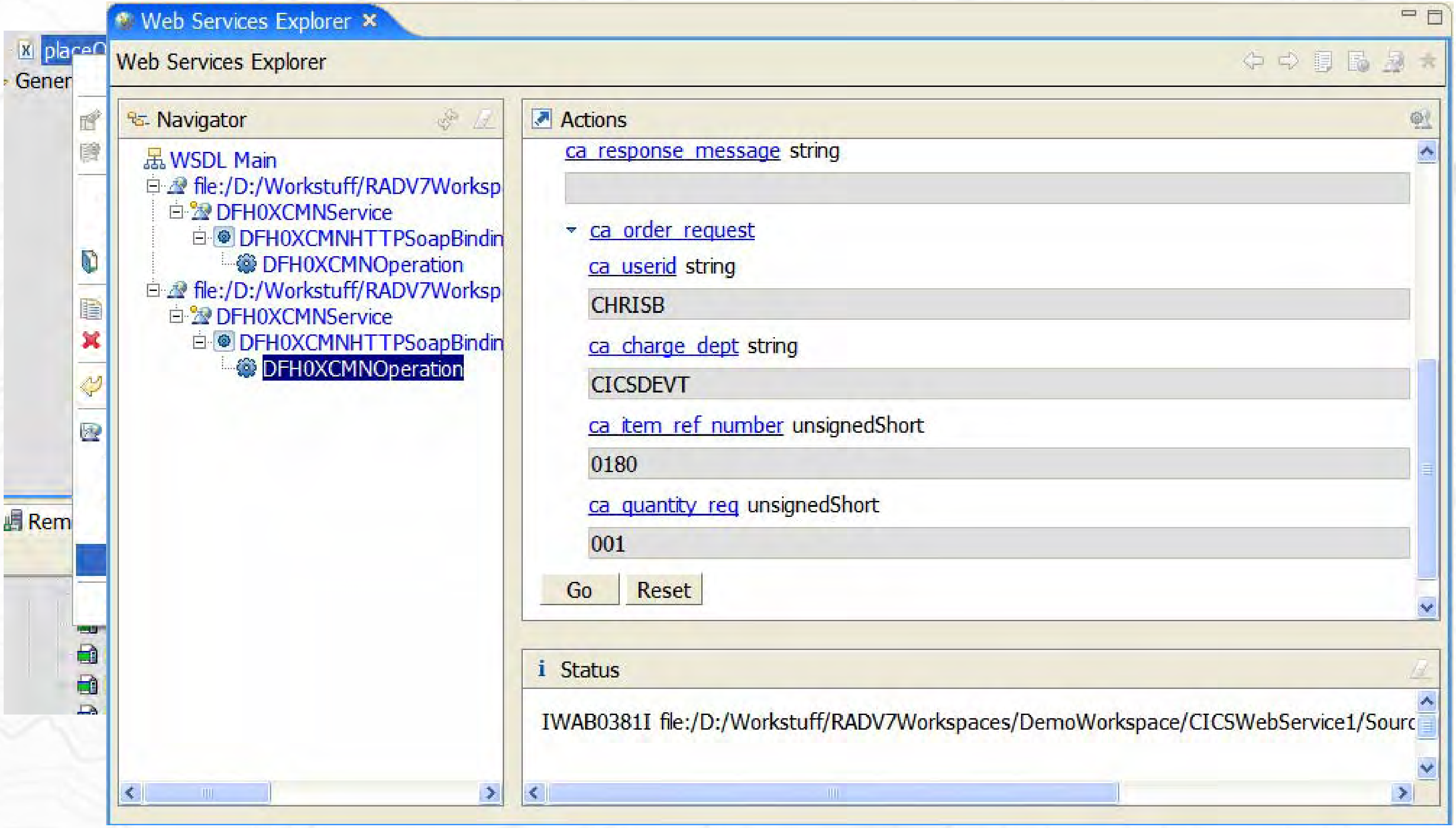
Existing service description WSDL
Converters / Marshallers/ Aggregators
DFH0XCP5.cpy
placeOr
.project
ICSWebServ
New
Enterprise Service Tools Wizard Launchpad
Specify options to start a web service wizard
Runtime:
Scenario:
New XML to COBOL Mapping
New XML to COBOL Mapping Session
*DFH0XCP5.mapping
Mapping Root
DFH0XCP5
DFH0XCP5.mapping
Move
Move
Move
Move

ORDER-REQUEST	
CA-REQUEST-ID	COBOLAlphaNumericType
CA-RETURN-CODE	COBOLNumericType
CA-RESPONSE-MESSAGE	COBOLAlphaNumericType
CA-ORDER-REQUEST	CA-ORDER-REQUEST
CA-USERID	COBOLAlphaNumericType
CA-CHARGE-DEPT	COBOLAlphaNumericType
CA-ITEM-REF-NUMBER	COBOLNumericType
CA-QUANTITY-REQ	COBOLNumericType

DFH0XCMNOperation	
ca_request_id	CaRequestIdType
ca_return_code	CaReturnCodeType
ca_response_message	CaResponseMessageType
ca_order_request	CaOrderRequestType

- Start from COBOL and WSDL file
- Available for only Compiled (COBOL) Converters

Testing with Web Services Explorer


Web Services Explorer
Web Services Explorer
Navigator
WSDL Main
file:/D:/Workstuff/RADV7Worksp
DFH0XCMNService
DFH0XCMNHTTPSoapBindin
DFH0XCMNOperation
file:/D:/Workstuff/RADV7Worksp
DFH0XCMNService
DFH0XCMNHTTPSoapBindin
DFH0XCMNOperation
Actions
Go
Reset
Status

ca_response_message string

ca_order_request

ca_userid string: CHRISB

ca_charge_dept string: CICSDEVT

ca_item_ref_number unsignedShort: 0180

ca_quantity_req unsignedShort: 001

```
IWAB0381I file:/D:/Workstuff/RADV7Workspaces/DemoWorkspace/CICSWebService1/Sourc
```

- Start from WSDL file
- Dynamically generates SOAP request to Web service

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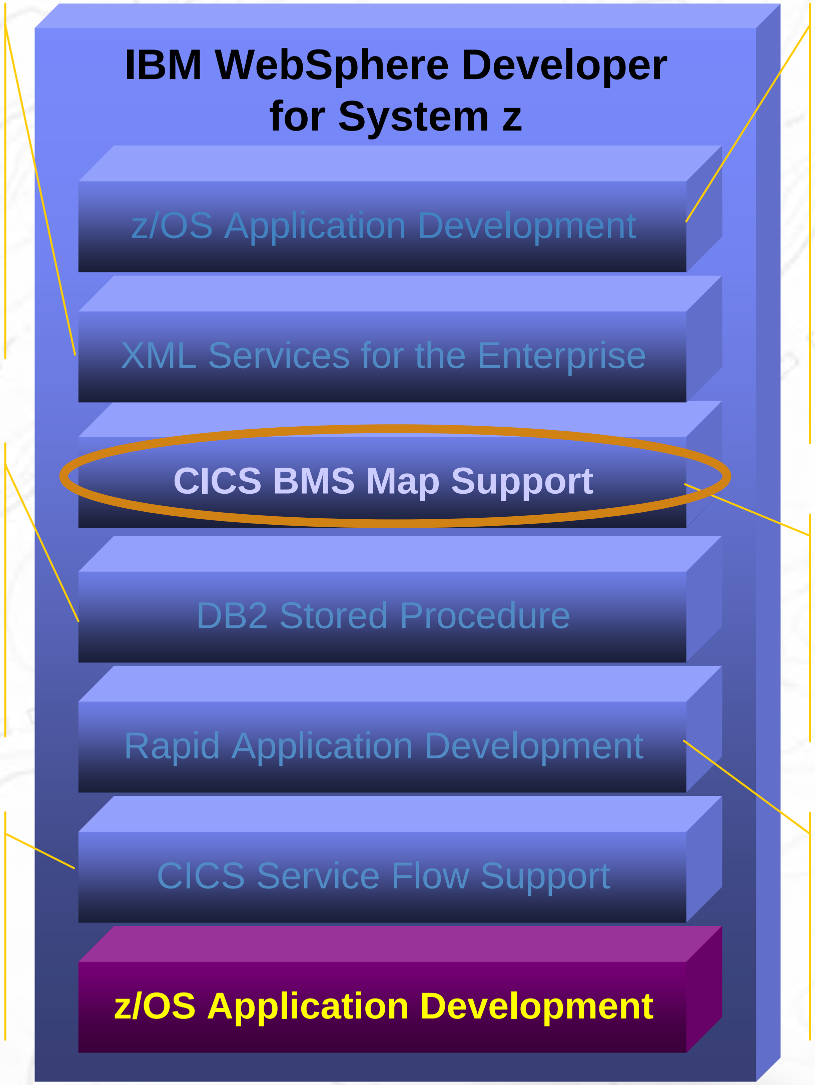

IBM WebSphere Developer for System z

z/OS Application Development

XML Services for the Enterprise

CICS BMS Map Support

DB2 Stored Procedure

Rapid Application Development

CICS Service Flow Support

z/OS Application Development

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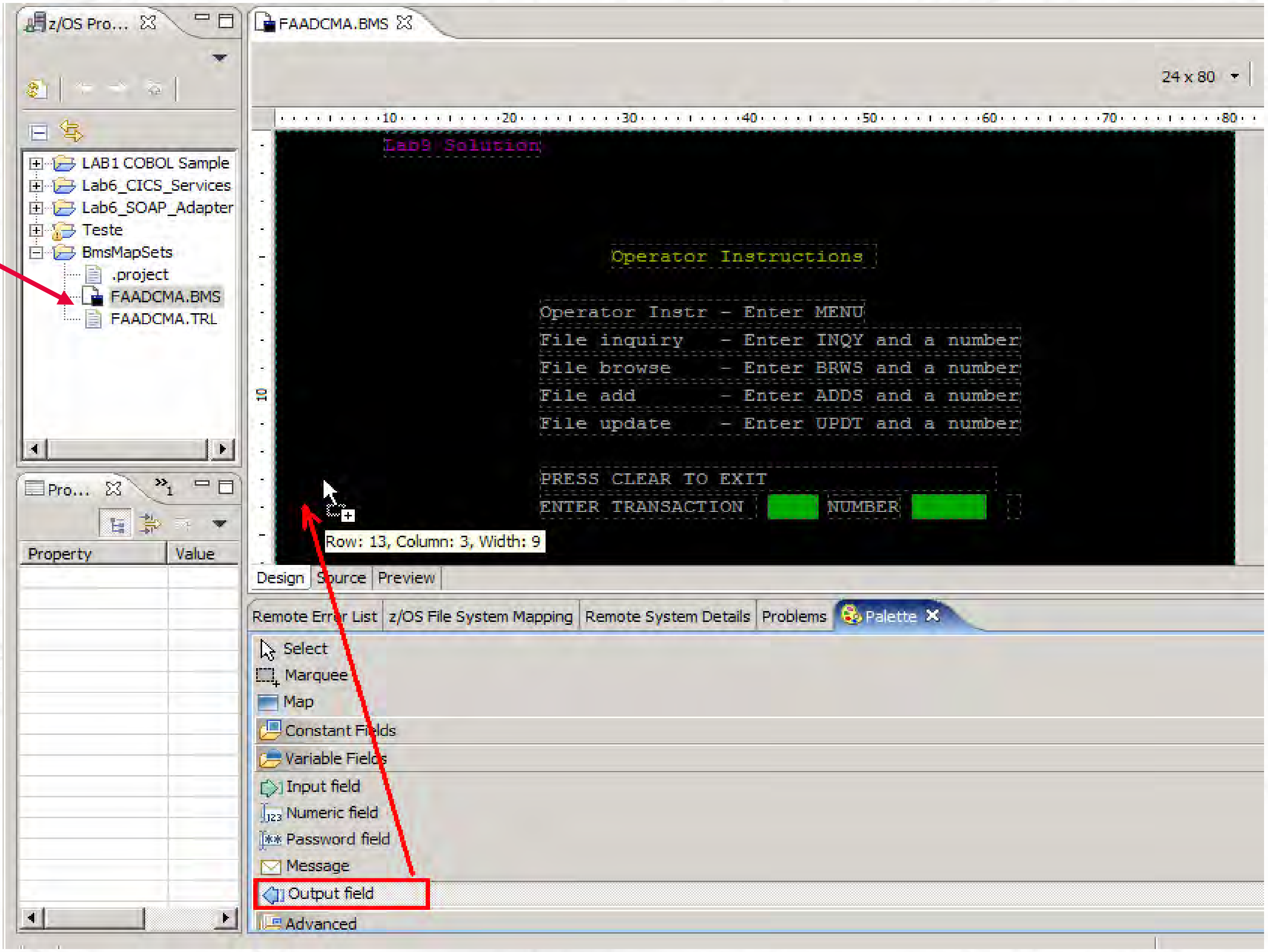
- Can be added to SF flow

CICS BMS Map Support

BMS Project

- Wizard for creating new BMS map set files
- Drag & Drop BMS editor
- Design, Source and Preview views
- Create new or import/edit existing BMS maps
- Works with local and remote scenarios

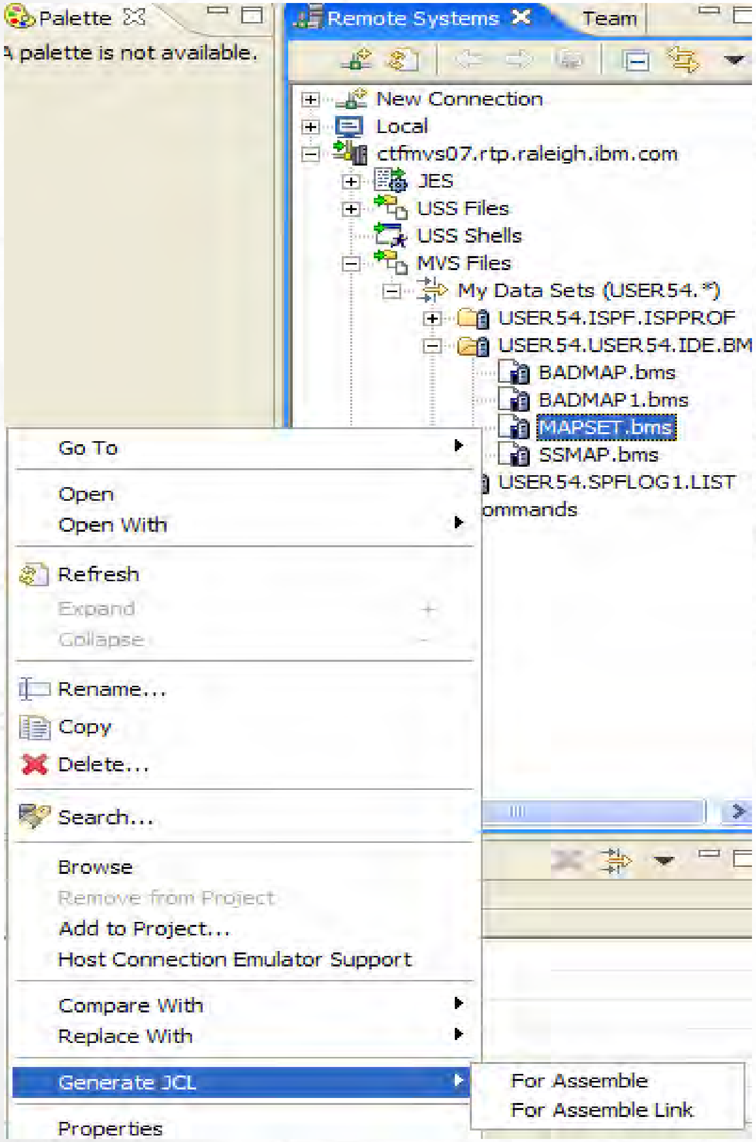

z/OS Pro...
LAB1 COBOL Sample
Lab6_CICS_Services
Lab6_SOAP_Adapter
Teste
BmsMapSets
.project
FAADCMA.BMS
FAADCMA.TRL
Pro...
Property
Value
FAADCMA.BMS
24 x 80
10
20
30
40
50
60
70
80
Design
Source
Preview
Remote Error List
z/OS File System Mapping
Remote System Details
Problems
Palette
Select
Marquee
Map
Constant Fields
Variable Fields
Input field
Numeric field
Password field
Message
Output field
Advanced

```
   Lab9 Solution

                              Operator Instructions

                         Operator Instr - Enter MENU
                         File inquiry   - Enter INQY and a number
                         File browse    - Enter BRWS and a number
                         File add       - Enter ADDS and a number
                         File update    - Enter UPDT and a number

                         PRESS CLEAR TO EXIT
                         ENTER TRANSACTION        NUMBER
```

Row: 13, Column: 3, Width: 9

Generate JCL for maps

- Generate JCL directly for map files
  - –JCL for Assemble
  - –JCL for Assemble and Link
  - –A proerties sheet defines the Properties for the .bms member to be used for the compile


Palette
A palette is not available.
Remote Systems
Team
New Connection
Local
ctfmvs07.rtp.raleigh.ibm.com
JES
USS Files
USS Shells
MVS Files
My Data Sets (USER54.*)
USER54.ISPF.ISPPROF
USER54.USER54.IDE.BM
BADMAP.bms
BADMAP1.bms
MAPSET.bms
SSMAP.bms
USER54.SPFLOG1.LIST
ommands
Go To
Open
Open With
Refresh
Expand
Collapse
Rename...
Copy
Delete...
Search...
Browse
Remove from Project
Add to Project...
Host Connection Emulator Support
Compare With
Replace With
Generate JCL
Properties
For Assemble
For Assemble Link

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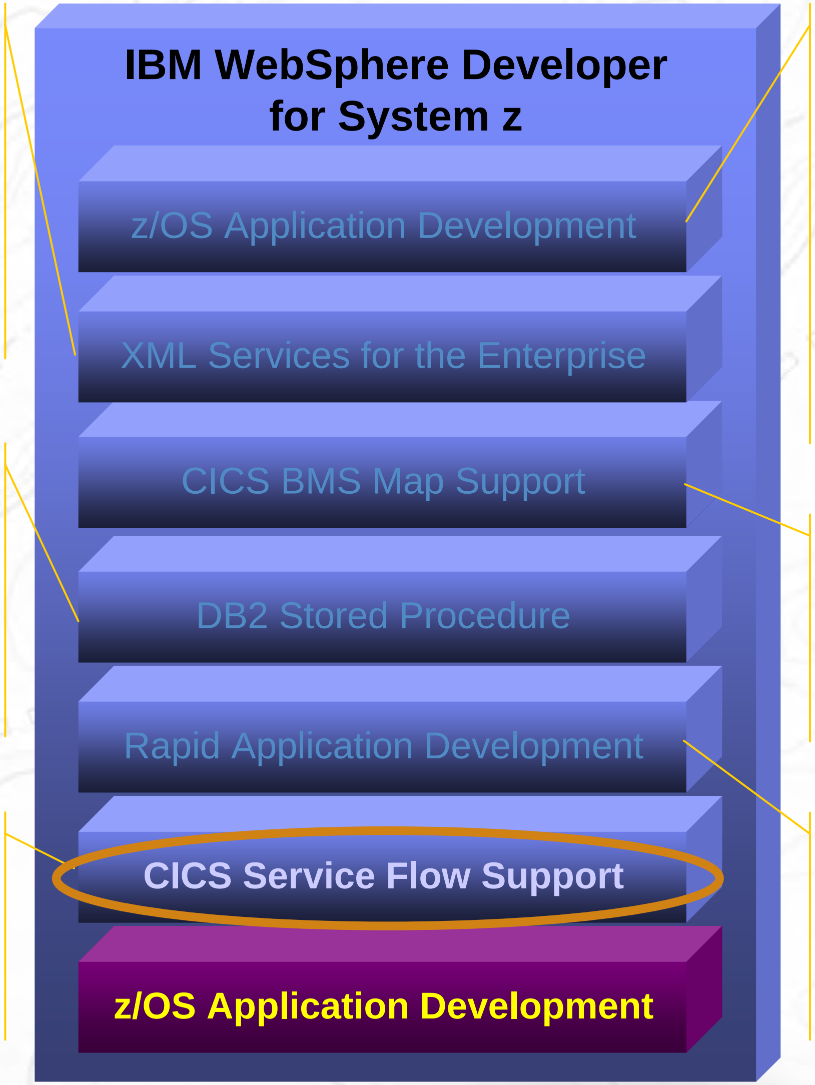

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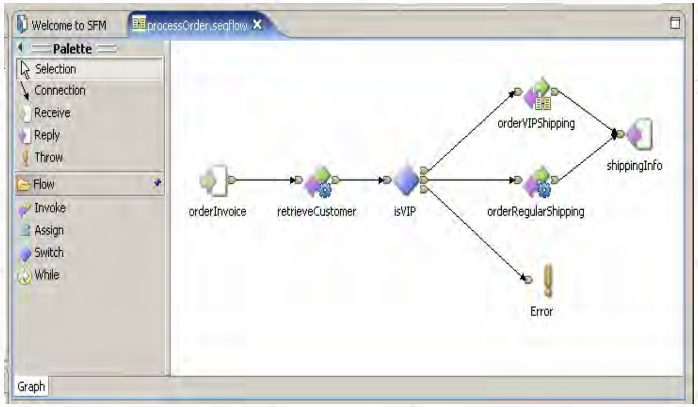
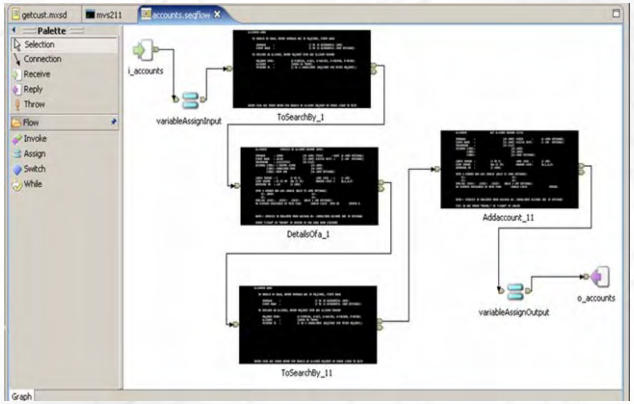
What is Service Flow Support

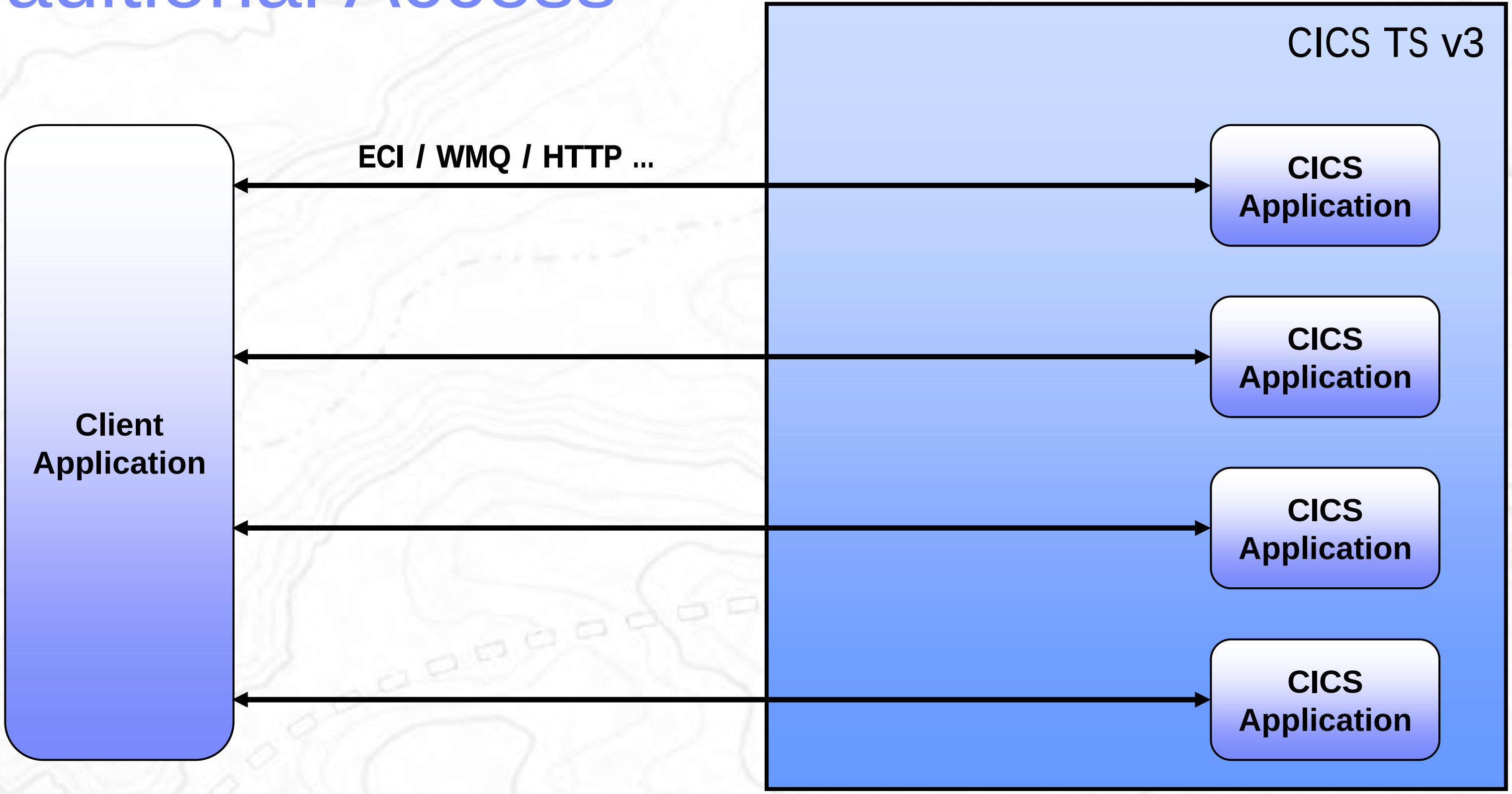
- CICS Service Flow Feature provides capability to aggregate existing CICS applications into composed business services which may be integrated into an SOA environment
  - Aggregate multiple calls to CICS applications in one business level service call (CICS runtime only)
  - Automate the interaction with 3270 terminal based applications and expose as a business level service


Welcome to SFM
processOrder.seqflow
Palette
Selection
Connection
Receive
Reply
Throw
Flow
Invoke
Assign
Switch
While
orderVIPShipping
shippingInfo
orderInvoice
retrieveCustomer
isVIP
orderRegularShipping
Error
Graph


getcust.mxsd
mvs211
accounts.seqflow
Palette
Selection
Connection
Receive
Reply
Throw
Flow
Invoke
Assign
Switch
While
i_accounts
variableAssignInput
ToSearchBy_1
DetailsOfa_1
Addaccount_11
ToSearchBy_11
variableAssignOutput
o_accounts
Graph

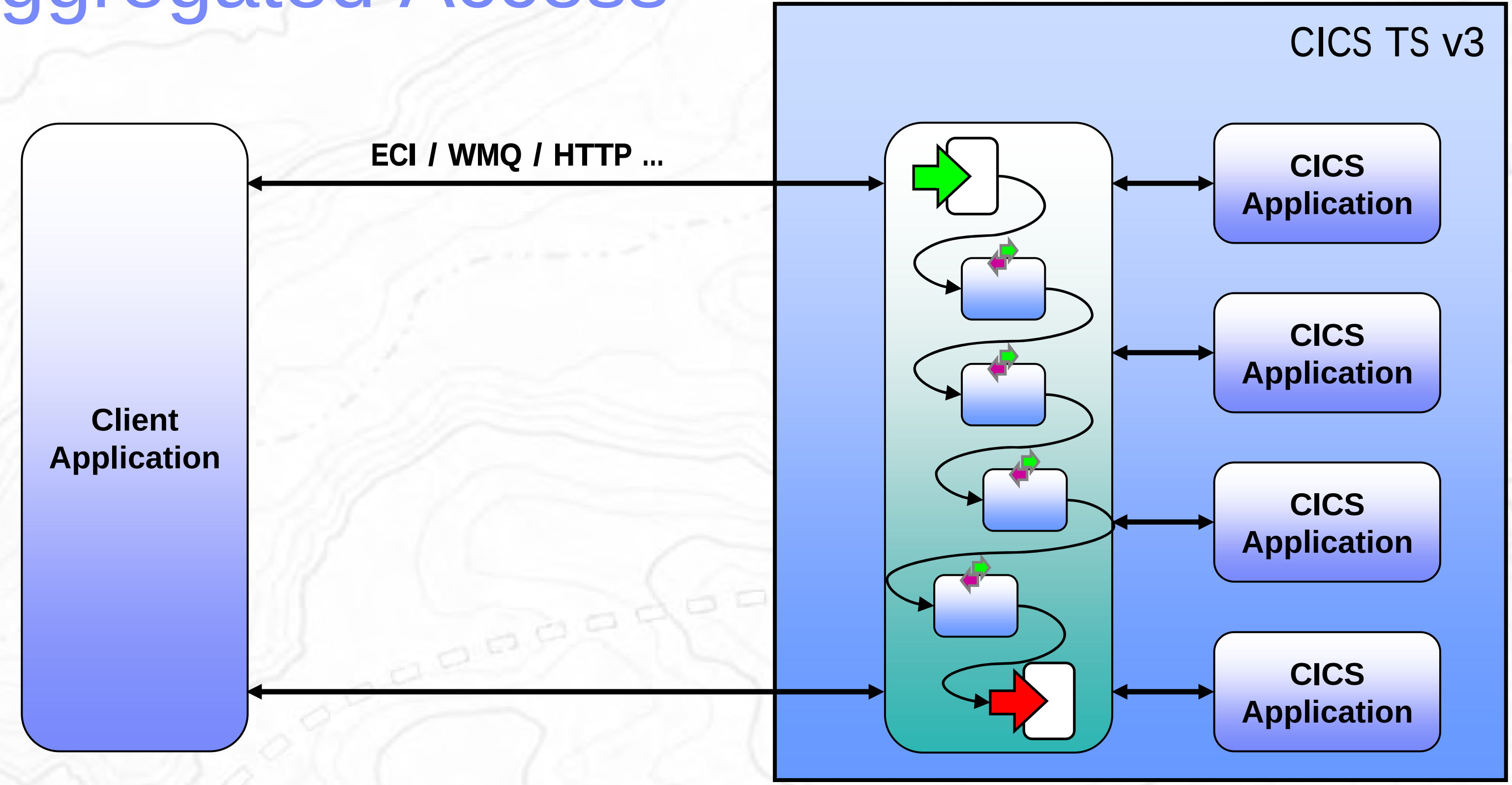
- Deploy resultant flow into a CICS or WebSphere runtime

Traditional Access


CICS TS v3
Client Application
ECI / WMQ / HTTP ...
CICS Application
CICS Application
CICS Application
CICS Application

- Multiple requests from client application
  - Expensive
  - Low potential for reuse

Aggregated Access


CICS TS v3
ECI / WMQ / HTTP ...
Client Application
CICS Application
CICS Application
CICS Application
CICS Application

- Single request from client
  - Potentially reusable component
  - More efficient

Service Flow Capabilities

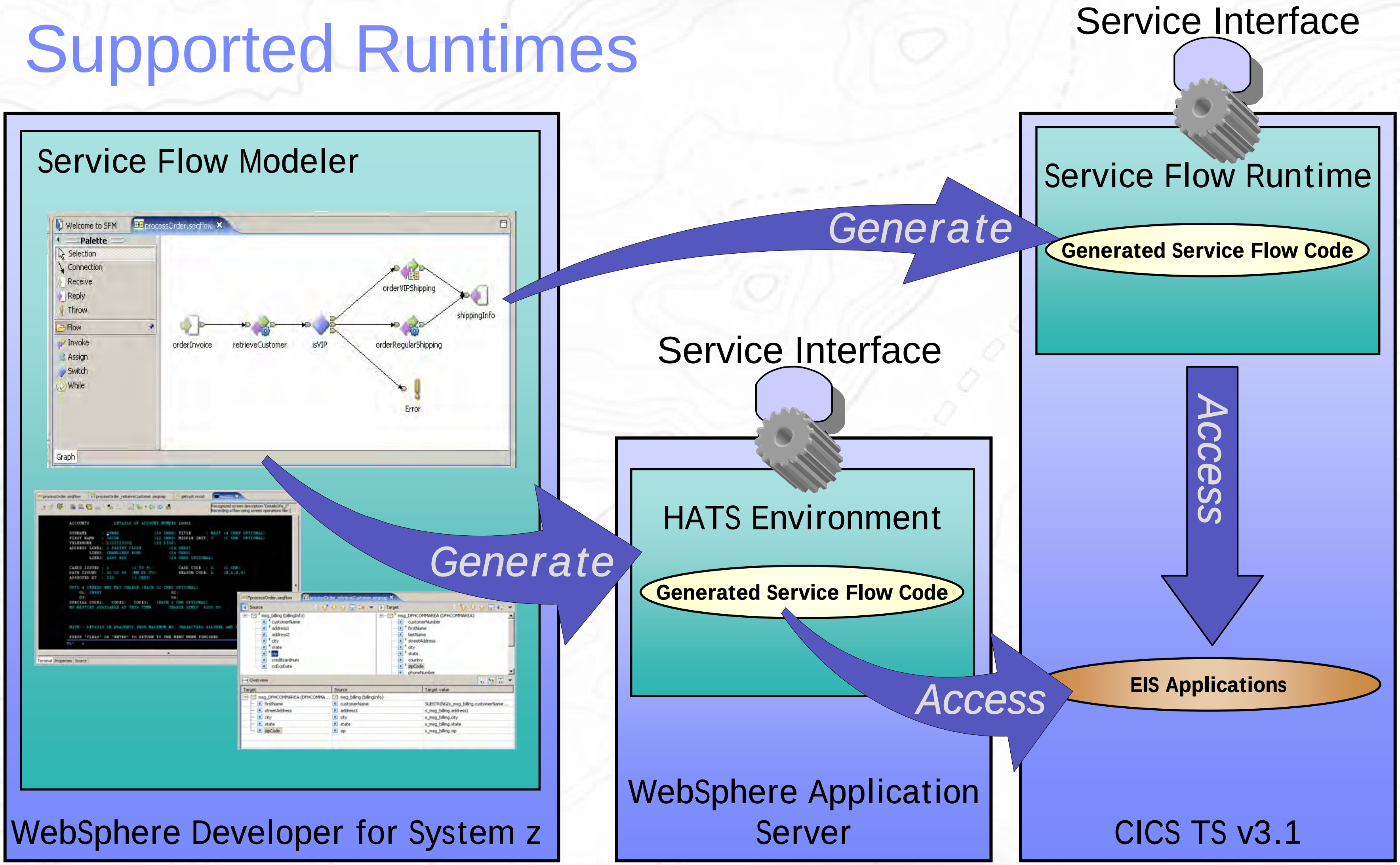
Feature	WSA	SFF	HATS
Supports bottom up style	●	●	●
Supports batch bottom up generation	●		
Supports meet in the middle style	●	●	
Enables terminal applications		●	●
Enables commarea applications	●	●	
Can drive multiple apps from one operation		●	
Targets WebSphere runtime			●
Targets CICS runtime	●	●	

Why a Service Flow Feature?

- Increase Productivity
  - By building libraries of annotated components representing current assets
  - By rapidly assembling new applications out of existing components using graphical tools
  - By exploiting existing developer skills and literacy

- Transform the Enterprise
  - By unlocking critical IT assets and re-purposing them to participate in a service oriented architecture
  - By opening access to existing fine-grained applications as coarse-grained business functions, while maintaining QOS
  - By providing a layer of abstraction between service consumer and application implementation / user interface
  - By fostering SOA skills in traditional developers

Supported Runtimes


Service Flow Modeler
Welcome to SFM
processOrder.seqflow
Palette
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While
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shippingInfo
orderInvoice
retrieveCustomer
isVIP
orderRegularShipping
Error
Graph
WebSphere Developer for System z
Generate
Generate
Service Interface
HATS Environment
Generated Service Flow Code
Access
WebSphere Application Server
Service Interface
Service Flow Runtime
Generated Service Flow Code
Access
EIS Applications
CICS TS v3.1

Generation & Deployment

- CICS 3.1
  - **Generate**
    - COBOL for Adapter Navigator and Server Adapters
    - JCL for compiling, linking, and defining resources to CICS
    - WSDL and WSBIND
  - **Deploy**
    - Transfer artefacts to Host
    - Deploy artefacts by submitting the generated JCL
- HATS
  - **Generate**
    - HATS Macro
  - **Deploy**
    - Import into HATS Studio
    - Use HATS to generate Web service from macro

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Questions
and
Answers