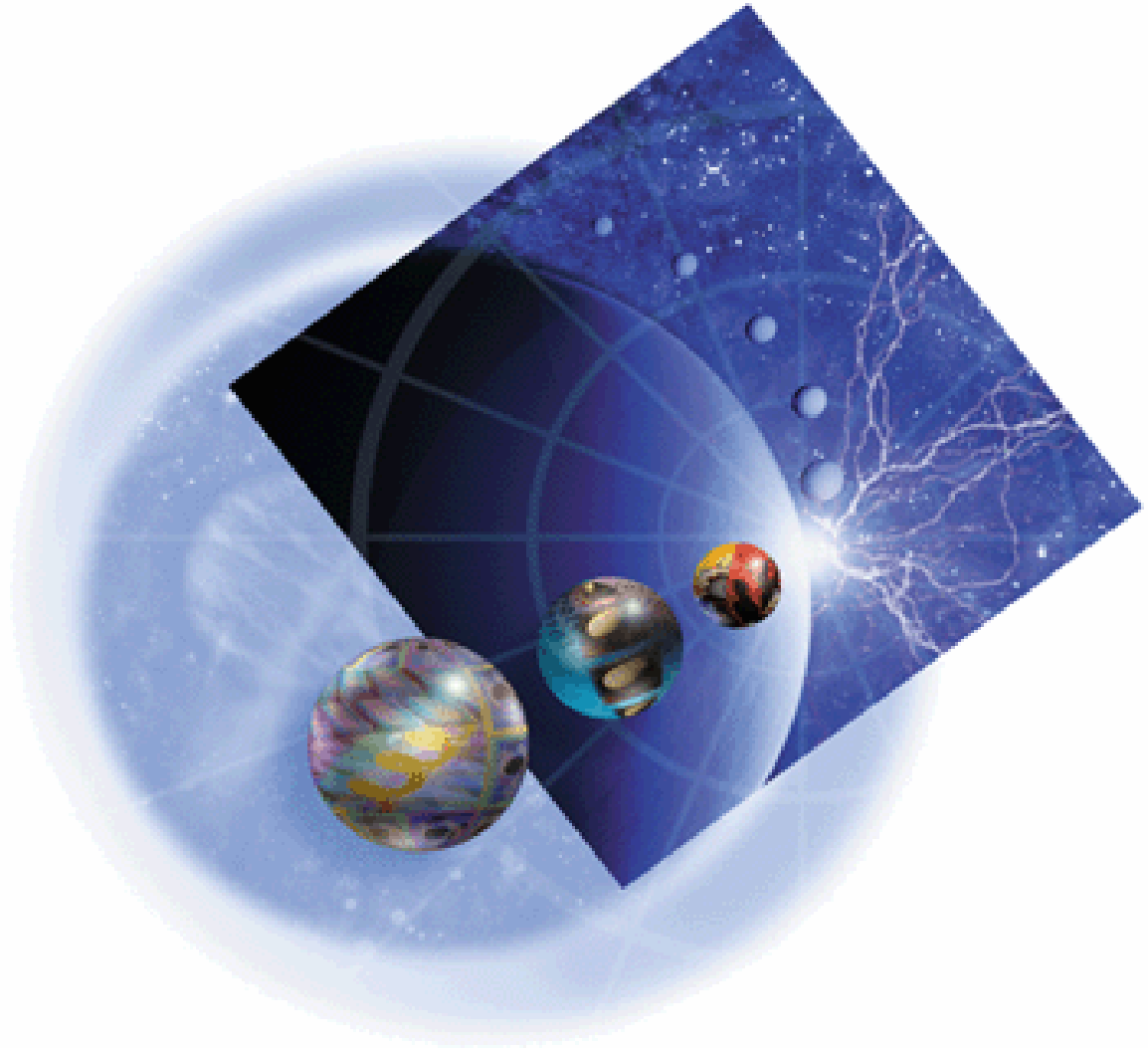


CODE/400 Introduction

Inge Weiss
iweiss@ca.ibm.com
IBM Toronto Lab
Fall COMMON 2001

Session ID: 404228
Agenda Key: 15TC



Acknowledgement and Disclaimer

Acknowledgement:

Many people contributed to this presentation. In particular thanks goes to:
John Steinbacher, IBM Canada, Ltd

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IBM CODE/400

Not your father's SEU!

```
CODE - E:\ADTSWIN\LOCAL\samplv2.rpg *
File Edit View Actions Options Windows Help
.....CL 0N01N02N03Factor1+++0pcde fact
000710 C EXCPTADDN
000720 C* Re-access record to bring in
000730 C ACCT CHAINMLGM
000740 C 20 DO
000750 C MOVE 'REA
```

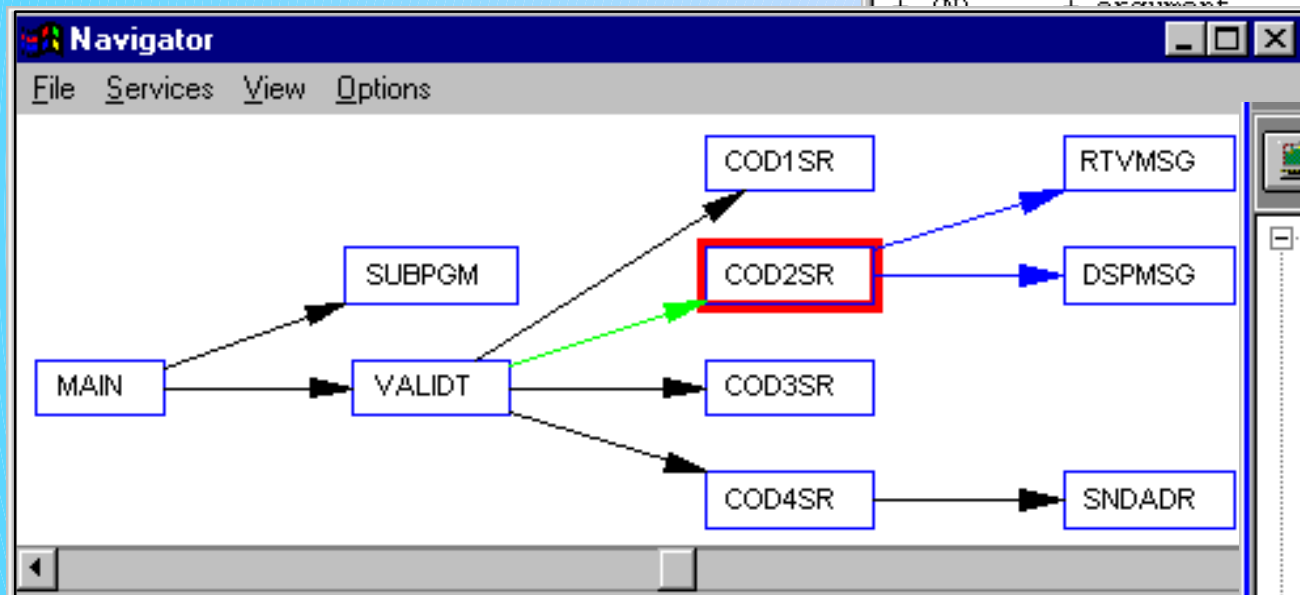
RPG/400 Help - CHAIN (Random Retrieval from a File) - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Guide Print Security Stop

CHAIN (Random Retrieval from a File)

CODE	FACTOR 1	FACTOR 2	RESULT FIELD
CHAIN	Search	File name	Data structure



D:\ADTSW

- File Key
- MENU
- ENTRY
- INFO
- SF
- SFCTL
- SFBOT
- SCREEN1

Details SCREEN1 Source

MENU

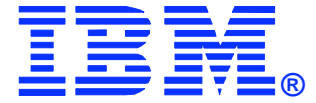
Ignore all indicators

Select one of the fo

1. Work with cu
2. Work with in
3. Work with pa
4. Work with ad
5. Work with on
6. Work with pe

90. Sign off

The Agenda



iSeries Application Development

- What is CODE/400 ?
- The CODE/400 Tools:
 - Editor
 - Designer
 - Distributed Debugger
 - Project Organizer
- Summary
- CODE/400 demo

CODE/400

- ✓ For RPG, COBOL, CL, C, C++, DDS

VisualAge RPG

- ✓ For RPG GUI

VisualAge for Java for iSeries

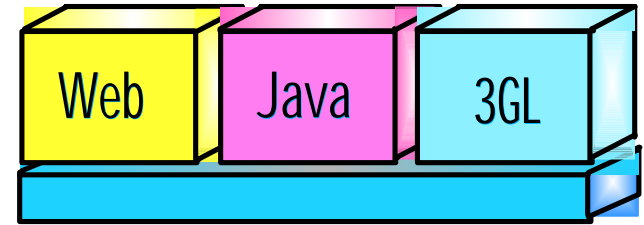
- ✓ For Java
- ✓ Pro plus Enterprise Toolkit for iSeries

WebSphere Studio For iSeries

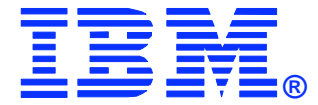
- ✓ For Web sites and Web pages
- ✓ Standard plus Affinity Toolkit for iSeries

WebFacing

- ✓ Build a Web interface to existing 5250 applications

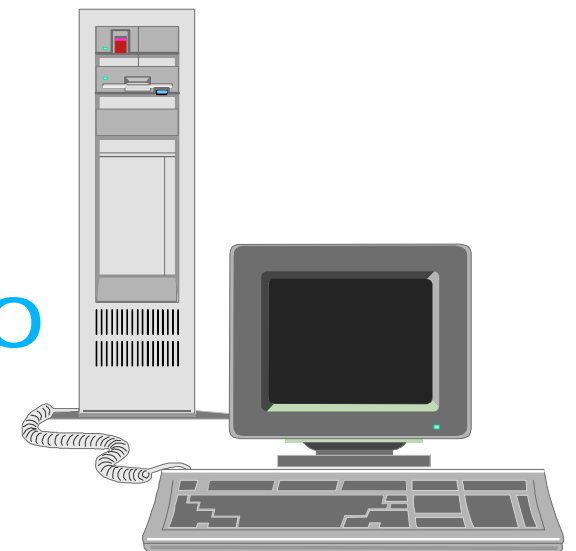


What is CODE/400 ?

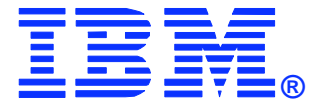


iSeries Application Development

- A complete application development environment for developing iSeries host applications on your Windows PC.
- Delivers significant productivity enhancements to:
 - ▶ Edit / compile cycle
 - ▶ DDS Designing
 - ▶ Debugging
 - ▶ Work at home scenario



CODE/400 Includes...



iSeries Application Development

- **CODE Editor**

- **A powerful PC editor for iSeries and PC source with integrated local and remote compilation.**

- **CODE Designer**

- **A rich graphical interface for designing DDS display, printer and physical files.**

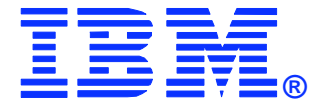
- **CODE Debugger**

- **Debug host applications from your workstation.**

- **CODE Project Organizer**

- **PDM for your PC - it integrates and organizes your programming projects.**

CODE/400's Value Proposition

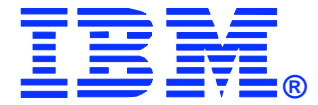


iSeries Application Development

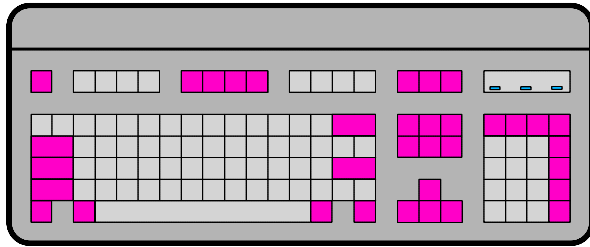
CODE/400 delivers...

- ✓ Significant productivity gains
 - **New functions and GUI**
 - **Shortens edit/compile/debug cycle**
- ✓ Off-loads host cycles
 - **Use PC for editing, designing and verifying**
 - **Work at home! In 'disconnected' mode**
- ✓ Investment protection
 - **Makes use of existing developer skills**
- ✓ Migration path
 - **Host applications today. Web applications tomorrow.**
- ✓ Fun

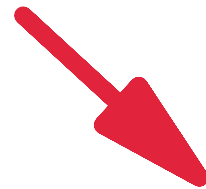
Working the legacy way



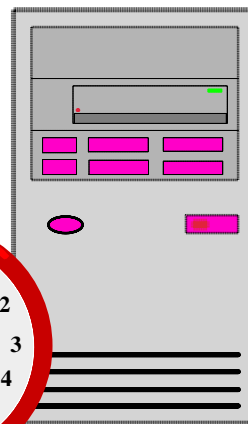
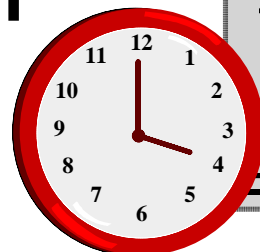
iSeries Application Development



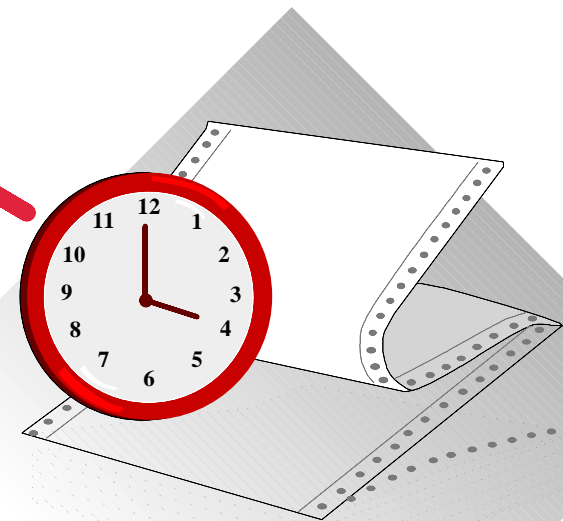
- 1- Open source
- 2- Make changes
- 3- Save source



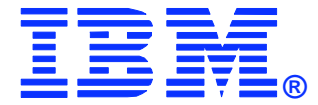
- 4- Submit compile
- 5- Batch job ends
- 6- Completion message



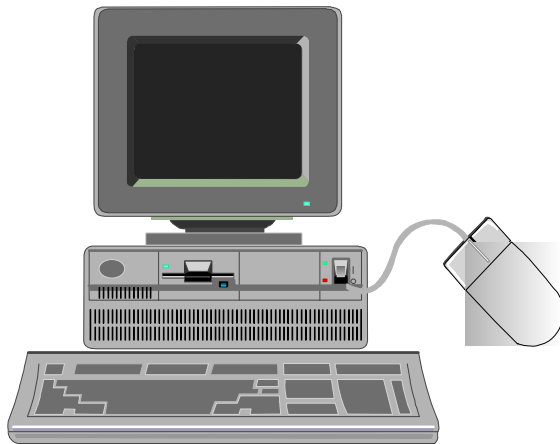
- 7- Look for listing
- 8- Look for errors
- 9- Find fix in source



Working With CODE



iSeries Application Development



- 1- Open Source
- 2- Make changes
- 3- Verify
- - Error feedback

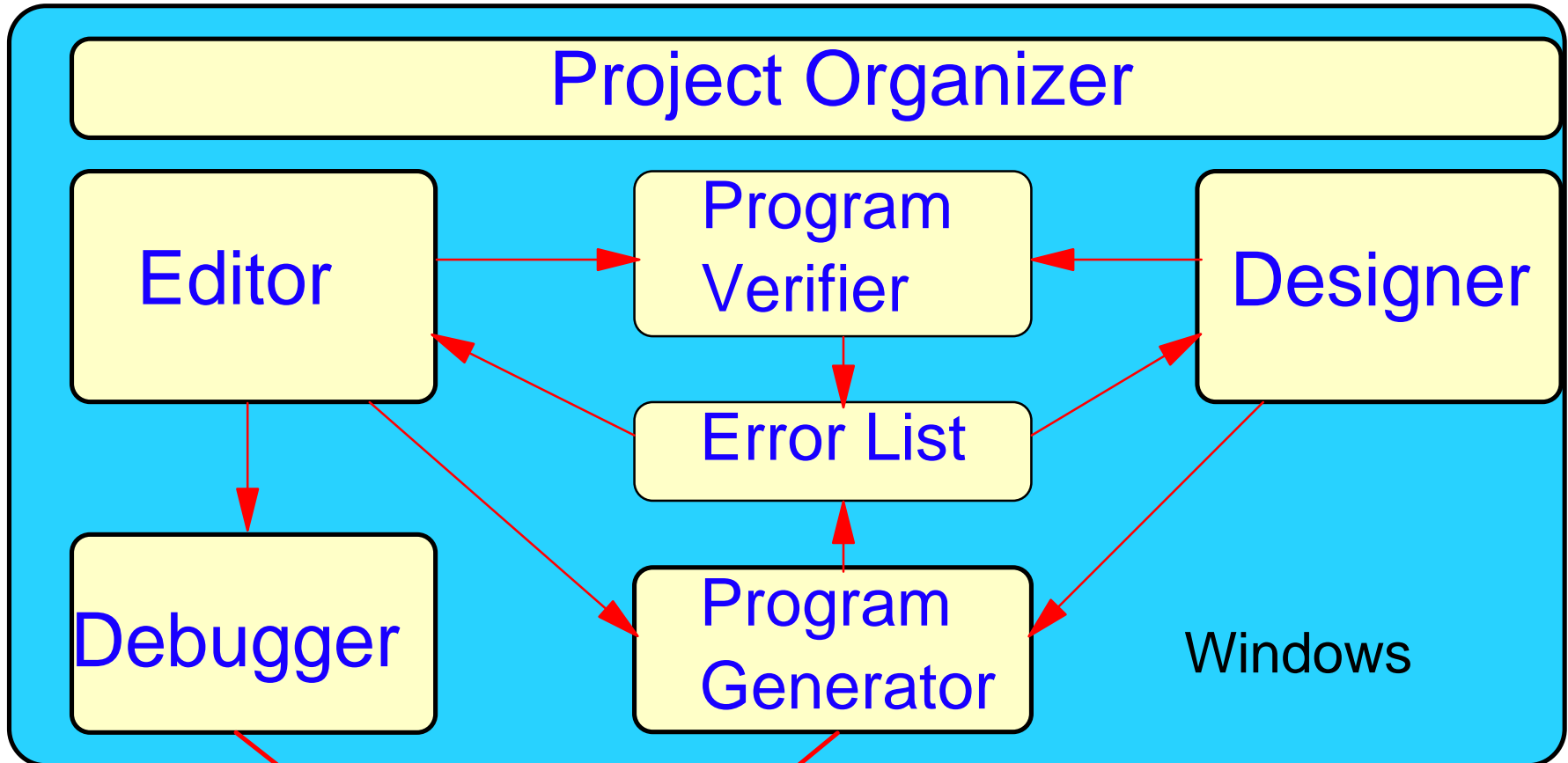
● Event files

- 4-Submit compile
- - Auto save to host
- - Error feedback when compile ends



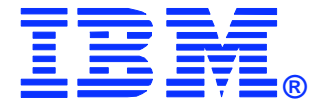
CODE/400 - An Integrated Environment

iSeries Application Development




Host execution

The CODE Editor



iSeries Application Development

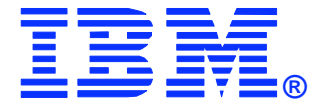
- ▶ Seamless access to local and host source, ADM parts
- ▶ Language-sensitive editing
 - **Token highlighting**
 - **Built-in syntax checking**
 - **Program verification**
 - **SEU-commands, format rulers and prompting**
 - **Lots of on-line help**
- ▶ Windows GUI, clipboard, unlimited undo, multiple files
- ▶ Command shell
- ▶ Programmable and customizable
- ▶ Plus lots more...



RPG,
COBOL,
CL, DDS,
C, C++,
Java
HTML



The CODE Editor



iSeries Application Development

```
CODE - c:\temp\payroll.dsp
File Edit View Actions Options Windows Help
c:\temp\payroll.dsp
Row 48      Column 21      Insert
.....AAN01N02N03.....Functions+++++++
000390      A              23  7'F3-End of Job'
000400      A*%%GP MAIN_MENU  01
000410      A*  89/04/10  16:28:41  SING      REL-R01M02  5728-PW1
000420      A*  THE EMPSEL FORMAT ALLOWS SELECTION OF THE EMPLOYEE TO BE
000430      A*  MAINTAINED AND THE TYPE OF MAINTENANCE TO BE PERFORMED
000440      A              EMPSEL
000440      DDS7410S Characters in indicated field not allowed.
000450      A*%%TS  SD  19920629  165055  SMYTH      REL-U2R2M0  5738-PW1
000460      A              BLINK
000470      A  60          ALARM
000480      A              CA11(11 'Use subfile')
000490      A              2  5'PRG01'
000500      A              2  30'Time Reporting System'
c:\temp\payroll.dsp saved
```

Status area

Command line

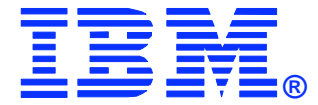
Format line

Sequence numbers

Syntax checking

Quick file access

SEU - Like Features



SEU
commands

Format
line

CODE - <OS400>CODELAB/QRPGLESRC(PAYROLL)

File Edit View Actions Options Windows Help

<OS400>CODELAB/QRPGLESRC(PAYROLL)

Row 30 Column 10 Replace

```
.....FFilename++IPEASFRlen+LKlen+AIDevice+.Keywords+++++++
000280 FEMPST UF A E K DISK
15 FPRJST UF A E K DISK
000300 FRSNMST UF A E K DISK
000310 D*
```

RPG IV - F - File Description

File Name	File Type	File Designation	End of File	File Addition	Sequence
FRSNMST	U	F	<input type="checkbox"/>	A	<input type="checkbox"/>

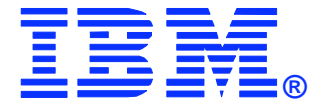
File Format	Record Length	Limits Processing	Length of Key Field	Record Address Type	File Organization
E		<input type="checkbox"/>		K	<input type="checkbox"/>

Device: DISK Keywords: Comments:

```
.....FFilename++IPEASFRlen+LKlen+AIDevice+.Keywords+++++++Comments+++++++
FRSNMST UF A E K DISK
```

F-spec
prompt

Finding Your Way



ation Development

The main application window displays a table with the following data:

Row	Column	Replace
000500	C	MAIN
003390	C	EDITSL
003960	C	ACDESR
004180	C	ADDCDE
004330	C	CHGCDE
004500	C	DELCDE
004660	C	INUCDE

The 'Filter' dialog box is open, showing the search string 'BEGSR'. The 'Case sensitive' and 'Pattern match' options are unchecked. The 'Filter' button is highlighted.

Filtering

Command line

The 'Find and Replace' dialog box shows the search string 'BEGSR'. The 'Replace with' field is empty. The 'Replace this occurrence' radio button is selected. The 'Case sensitive' option is unchecked, 'Pattern match' is checked, and 'Wrap' is checked. The 'Find' button is highlighted.

Find and Replace

Integrated Error Feedback

iSeries Application Development

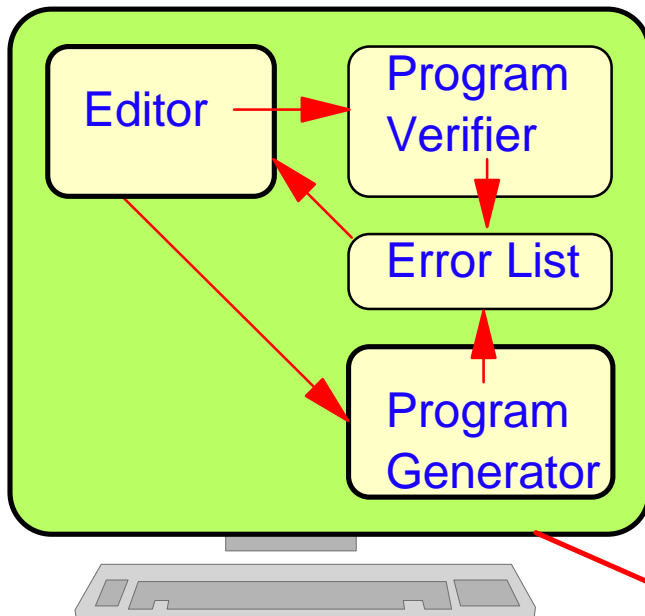


Local processing
saves cycles on your
iSeries

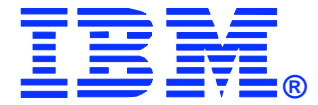
New edit-compile paradigm

- **Local syntax check**
- **Local program verify**
- **Caching: /COPY, DB refs**
- **Invoke host compiler**

- **From the edit window you can:**
 - **Work with syntax checker, verifier, and compiler errors**
 - **Search language reference manuals**
 - **Start debug session**



The Program Verifier



iSeries Application Development

CODE - <OS400>CODELAB/QRPGLESRC(PAYROLL)

File Edit View Actions Options Windows Help

Issue edit command... Esc
Compare...
Keystroke recorder
Syntax check selection
Syntax check file
Verify program
Compile
Create program... Ctrl+Shift+P
Update program
Debug

<OS400>CODE
Row 338
.....
003360
003370
003380
003390
003400
003410
003420
003430
003440
003450

es the ti
lay field
*BLANKS
'0'

MOVE

C*

ILE RPG - Program Verifier

Listing Compile Data Settings

Source Output
 Output listing

Listing Options
 Cross-reference listing
 Show COPY statements
 Expand DDS statements
 External procedures and fields

Lines per page 60

Path H:\Program Files\IBM\WDT400\T mp

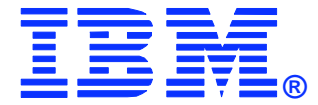
File name VERIFY.LST

Source listing indentation *NONE

Edit listing file

Submit Cancel Default Help

The Error-List Window



iSeries Application Development

The screenshot displays the IBM iSeries Application Development environment. The main window shows a code editor for the file `E:\ADTSWIN\SAMPLE.RPG`. The code is displayed in a monospaced font with various colors for syntax highlighting. The error list window is open, showing a list of errors for the same file. The error `GRP7030E` is highlighted, and a tooltip is displayed over it, showing the error details: `GRP7030 - Severity: Error Line: 10`.

Code Editor Content:

```
00001      H
00002      FQSYSVRT 0  F  13
00002 GRP2318I Overflow indicator
00003      E
00004      I          'INSTALLATION'      C          INSTAL
00005      IDS          DS
00005 GRP7031I The name or indicator DS is not referenced.
00006      I I          'COMPLETED'          1  9 OK
00007      C          MOVE 'FAILED'      OK
00008      C          MOVE ARRAY,2      ARRAY,3
00009      C          RESETOK
00010      C          Z-ADD 0          BADVAR
00010 GRP7030E The name or indicator is not defined.
00010 GRP7044E The field BADVAR on the C specification is not numeric; th
00011      C          SETON          LR
```

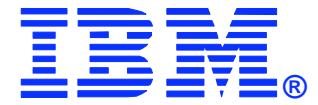
Error List Window Content:

- <LOCAL>E:\ADTSWIN\SAMPLE.RPG
 - GRP2318I Overflow indicator OA is assigned to PRINTER file QSYSVRT.
 - GRP7031I The name or indicator DS is not referenced.
 - GRP7030E The name or indicator is not defined.**
 - GRP7044E The field BADVAR on the C specification is not numeric; the s

Tooltip Content:

GRP7030 - Severity: Error Line: 10

Help - at your fingertips



iSeries Application Development

- Context-sensitive
- Message help
- RPG, COBOL, DDS online references
- Lots of online documentation

RPG/400 Help - CHAIN (Random Retrieval from a File) - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Guide Print Security

CHAIN (Random Retrieval from a File)

```
*-----*-----*-----*
+ CODE + FACTOR 1 + FACTOR 2 + RESULT
+      +          +          +      FIELD
*-----*-----*-----*
+ CHAIN + Search      + File name  + Data
+ (N)   + argument   +           + structure
*-----*-----*-----*
```

The CHAIN operation retrieves a record from a full procedural file (F in [position 16](#) of the file description specifications), sets a [record identifying indicator](#) on (if specified on the input specifications), and places the data from the record into the input fields.

CODE - <OS400>CODELAB01/QRPGLESRC(PAYROLL)

File Edit View Actions Options Windows Help Extras

<OS400>CODELAB01/QRPGLESRC(PAYROLL)

Row 117 Column 26 Replace

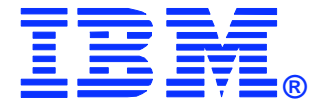
```
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLo
```

000116	C*			
000117	C	*INKC	IFEQ	'0'
000118	C	RSCDE	CHAIN	RSNMST
000119	C		EXSR	ACDESR
000120	C		ELSE	

the key or relative record is by key, factor 1 can be constant, or a literal. In name can be specified in ess is by relative record d or a numeric field with

me that is to be read. A

Multi-File Search



iSeries Application Development

The screenshot displays the 'empapl - Multi-File Search' application window. On the left, a tree view shows the search path: <OS400A>CODELAB/QRPGLE. The main pane lists search results for the term 'empapl'. At the bottom, a status bar indicates 'Found 16 occurrences of 'empapl''. A blue arrow points from a text box to the selected entry 'EMPAPL OREQ 'X''. Another blue arrow points from a second text box to the 'EMPAPL OREQ 'X'' entry in the code editor window, which is open to the file '<OS400A>CODELAB/QRPGLESRC(PAYROLLG)'. The code editor shows a list of code lines with row and column numbers. The line '000354 C* THE BUG IS HERE' is highlighted, and a blue arrow points to it from the second text box.

empapl - Multi-File Search

File Edit View Options Tools H

<OS400A>CODELAB/QRPGLE

- C MOVE *BLANKS EMPAPL
- C* IF EMPAPL (EMPLOYEE MAINTENANCE) EQUALS X, THE PROGRAM
- C EMPAPL IFEQ 'X'
- C EMPAPL IFEQ 'X'
- C EMPAPL OREQ 'X'
- C EMPAPL IFEQ ''
- C EMPAPL IFNE ''
- C EMPAPL ANDNE 'X'

Found 16 occurrences of 'empapl'.

CODE - <OS400A>CODELAB/QRPGLESRC(PAYROLLG)

File Edit View Actions Options Windows Help

<OS400A>CODELAB/QRPGLESRC(PAYROLLG)

Row 352 Column 12 Replace

```
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLo
```

000348 C* selected.

000349 C*

000350 C EMPAPL IFEQ 'X'

000351 C PRJAPL ANDEQ 'X'

000352 C EMPAPL OREQ 'X'

000353 C RSNAPL ANDEQ 'X'

000354 C* THE BUG IS HERE

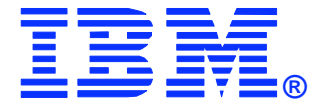
000355 C* *****

000356 C MOVE '1' *IN60

Click to open file

Search host libraries, directories, ADM parts

The Indent Function



iSeries Application Development

```
CODE - <OS400>CODELAB/QRPGLESRC(PAYROLL) : INDENTED
File Edit View Actions Options Windows Help
<OS400>CODELAB/QRPGLESRC(PAYROLL) : INDENTED
Row 139 Column 1 Replace Browse
.....CL0N01Factor1+++++0opcode(E)+Factor2+++++Result+++++Len++D+Hi
001370 C*
001380 C *INKC IFEQ '0'
001390 C ACODE IFEQ 'A'
001400 C *IN50 ANDEQ '1'
001410 C MOVE 'A' ACREC
001420 C WRITE RCRSN
001430 C ELSE
001440 C ACODE IFEQ 'A'
001450 C *IN50 ANDEQ '0'
001460 C ACREC ANDEQ 'D'
001470 C MOVE 'A' ACREC
001480 C UPDATE RCRSN
001490 C ELSE
001500 C ACODE IFEQ 'D'
001510 C MOVE 'D' ACREC
001520 C UPDATE RCRSN
001530 C ELSE
001540 C ACODE IFEQ 'C'
001550 C UPDATE RCRSN
001560 C END
001570 C END
001580 C END
001590 C END
001600 C ELSE
001610 C GOTO END
001620 C END
```

The Navigator



iSeries Application Development

The screenshot shows the Navigator application window with the following content:

Called functions

MAIN	SUBPGM
	VALIDT
	VALIDT
	SUBPGM
VALIDT	
	COD1SR
	COD2SR
	COD3SR
	COD4SR
COD1SR	
COD2SR	
	RTMSG
	DSPMSG

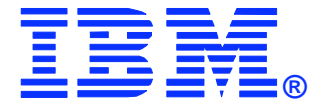
Navigator

The call graph diagram shows the following flow:

- MAIN calls SUBPGM and VALIDT.
- SUBPGM calls COD1SR.
- VALIDT calls COD2SR, COD3SR, and COD4SR.
- COD1SR calls RTVMSG.
- COD2SR calls DSPMSG.
- COD4SR calls SNDADR.

The COD2SR node is highlighted with a red border, and a green arrow points to it from the VALIDT node.

Graphical Compare



iSeries Application Development

CODE - E:\ADTSWIN\LOCAL\samplev1.rpg: 2

File Edit View Actions Compare Options Windows Help

E:\ADTSWIN\LOCAL\samplev2.rpg: 2

Row	Column	Replace
163	1C 0N01N02N03Factor1+++0pcdeFacto
		C* Validate routine goes to
		C EXSR VAL
		C MLACCT CABEQ*ZE
		C MLSRCH CABEQ*BL
		C MLCITY CABEQ*BL
		C MLSTAT CABEQ*BL
		C MLZIP CABEQ*ZE
		C* Record is already added, pe
		C UPDATMLG
		C* Check error routine will
		C *IN20 IFEQ '1'
		C* Status 01021 is a duplicate
		C STS CABEQ010
		C MOVE 'DS
		C GOTO BAD
		C ENDIF
		C GOTO PRO

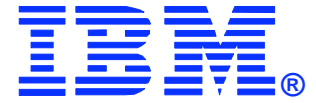
E:\ADTSWIN\LOCAL\samplev1.rpg: 2

Row	Column	Replace
159	1C 0N01N02N03Factor1+++0pcdeFacto
		C* Validate routine goes to
		C EXSR VAL
		C* Record is already added, pe
		C UPDATMLG
		C* Check error routine will
		C 20 EXSR CHK
		C GOTO PRO
		C END
		C* If Chg type, validate field
		C '2' IFEQ ACT
		C* Validate routine goes to
		C EXSR VAL
		C UPDATMLG
		C* Check error routine will
		C 20 EXSR CHK
		C GOTO PRO
		C END

Inserted lines

Deleted lines

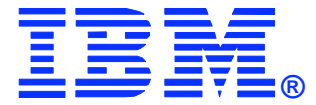
Editor Programming



iSeries Application Development

- **Why program it?**
 - **Need for a new editor function**
 - **Repetitive task, fastpath key for heavily used function**
 - **Tailor the editing environment for your shop**
- **What can you do?**
 - **Specify editor default settings**
 - **Add editor functions and your own macros to the menus and toolbar**
 - **Assign/re-assign keys and/or line commands to editor functions and your own macros**
 - **Interact with the host via the CODESRV command**
- **How do you do it?**
 - **Write macros in REXX or Java + editor commands**
 - **Use the 'profiles' to load in the macros.**

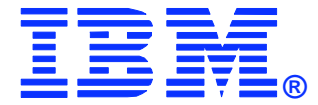
Sample Editor Extensions



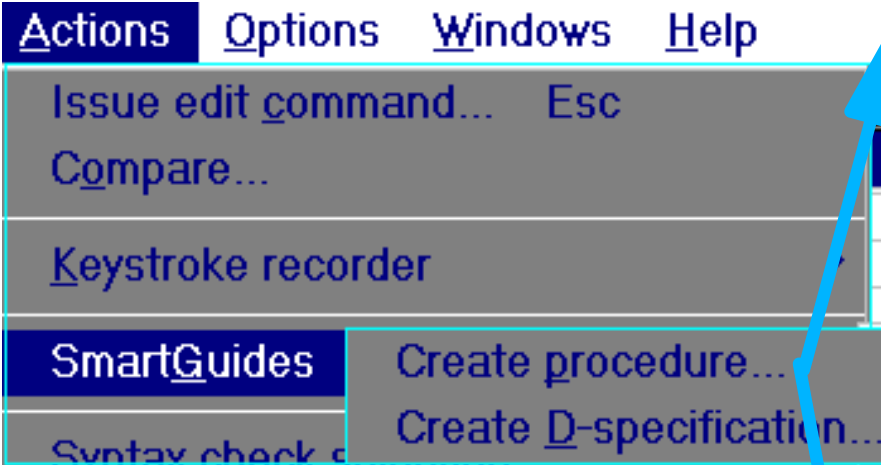
iSeries Application Development

- Many sample editor macros shipped with product
- Since V3R2M2: Java examples
 - **RPG IV Procedure SmartGuide**
 - **RPG IV D-Spec SmartGuide**
 - **RPG and Cobol Cross Reference Window**
 - **numerous more**
- Source included too
 - ▶ See how its done, write your own!

Procedure SmartGuide



iSeries Application Development



RPG Procedure SmartGuide

Start Parm1

Procedure name: GetCurrentDay

External name (EXTPROC):

Exportable for use by other code (EXPORT)

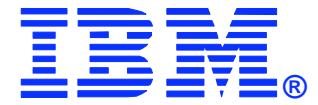
Purpose: Return current day as a string

Return a value

How many parameters? 1

<<Previous Next>> Final Cancel Help

Procedure SmartGuide



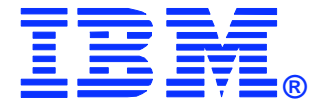
iSeries Application Development

Procedure
prototype

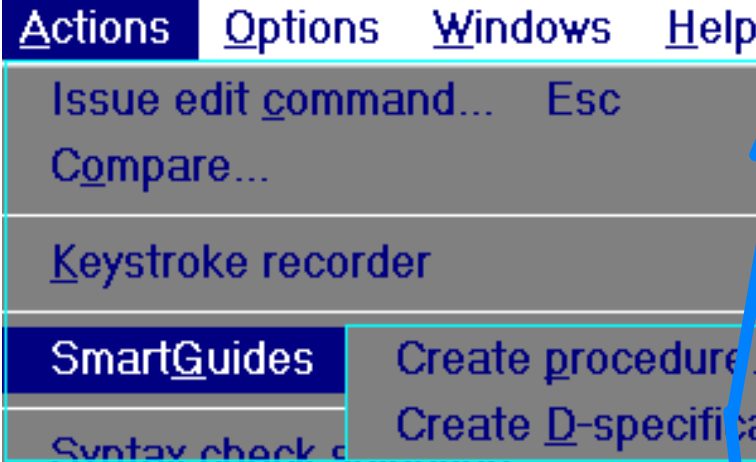
Procedure
template

```
CODE - Untitled Document 6 *
File Edit View Actions Options Windows Help Extras
Untitled Document 6 *
Row 20 Column 60 Replace 1 change.
.....PName+++++.....B.....Keywords+++++.....Co
00001
00002 D*-----
00003 D* Prototype for procedure: GetCurrentDay
00004 D*-----
00005 D GETCURRENTDAY PR
00006 D DAY D DATFMT:(*YMD.)
00007
00008 P*-----
00009 P* Procedure name: GetCurrentDay
00010 P* Purpose: Return current day as a string
00011 P* Parameter: day =>
00012 P*-----
00013 P GETCURRENTDAY B
00014 D GETCURRENTDAY PI
00015 D DAY D DATFMT:(*YMD.)
00016
00017 C* Your calculation code goes here
00018
00019 C RETURN
00020 P GETCURRENTDAY E
```

D-Spec SmartGuide



iSeries Application Development



1. Select options via GUI
2. D-Spec code generated in editor

RPG Definition Specification SmartGuide

Start Standalone

Attributes

Defined like another field (LIKE):

Type: Packed Decimal

Length: 7 1 - 30

Decimals: 2 0 - 7

Array? How many entries (DIM): 0

Array keywords

Keywords...

Other keywords

STATIC INZ(*USER) INZ

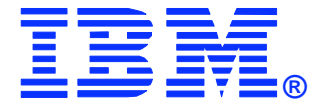
EXPORT IMPORT

ALTSEQ(*NONE) NOOPT BASED

No optimization alt+O

<<Previous Next>> Final Cancel Help

CODE Program Generator

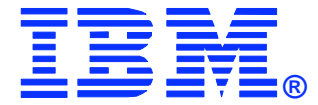


iSeries Application Development

Submit
compile
to AS/400

Change CRTxxx
command
options

Compile Option Notebooks



iSeries Application Development

ILE RPG - Create Bound RPG Program Options

Program Compile Data Listing/Generation Activation/Binding

Compiler Options

Debugging views *ALL

Authority *CMDDFT

User profile *CMDDFT

Target release *CMDDFT

Optimize *CMDDFT

Enable performance collection *FULL

Profiling data *CMDDFT

Define condition names *CMDDFT

Add

Delete

CRTBNDRPG SRCFILE(&L/&F) SRCMBR(&M) PGM(&L/&M)
REPLACE(*YES) DBGVIEW(*ALL) ENBPFRCOL(*FULL)

OK Cancel Default Help

► CODE/400 remembers your compile options

CODE Designer

Not your father's SDA!

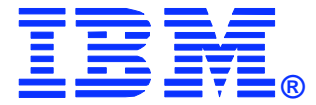
The screenshot shows the CODE Designer interface. At the top, there are dropdown menus for 'EMPMNT' and 'EDEPT', and a text field for 'Inval Dept'. Below this is a data entry screen for 'PRG01' with fields for 'Number', 'Name', 'Category', 'Department', 'Location', 'USRID', and 'Normal week hours'. A 'Record properties' dialog box is open, showing options for 'Title' (checked) and 'Referenced field'. The dialog also has sections for 'Alignment', 'Position', 'Attributes', and 'Color'. At the bottom of the dialog, there is a text field containing 'WDWTITLE((*TEXT 'Select Supplier') (*COLO' and buttons for 'Add', 'Change', and 'Delete'.

This screenshot shows a list of record keywords and help specifications. The list includes 'Record Keyword: BLINK', 'ALARM', 'Help Specification: APPHELP', '*DATE', 'Maintenance: Maintenance', '*TIME', '*PRG01', and 'EMPAPL'. The 'APPHELP' item is highlighted with a blue selection box.

This screenshot shows a list of record keywords and an error message. The list includes '00580 A', '00590 A', '00600 A', and '00600 DDS7410S Characters'. Below the list is an 'Error list' section with the message 'DDS7596S Constant field requires valid keywords.'

This screenshot shows a context menu with the following options: 'Copy Ctrl+C', 'Paste Ctrl+V', 'Find selection', 'Deselect all', 'Filter selection', and 'Show all Ctrl+A'.

CODE Designer



iSeries Application Development

- Graphical design tool for DDS
 - **display files - screens**
 - **printer files - reports**
 - **physical files - databases**
- Powerful intuitive interface
 - ▶ Lets novice create DDS quickly and easily
 - **while giving expert access to all the features of DDS**
 - ▶ WYSIWYG graphical design
 - **Drag/drop ease**
 - ▶ Properties notebook
 - **full power of DDS exposed**
 - ▶ Integrated verifier
 - **Catch all your errors locally**
 - ▶ Explorer-like browsing of DDS hierarchy

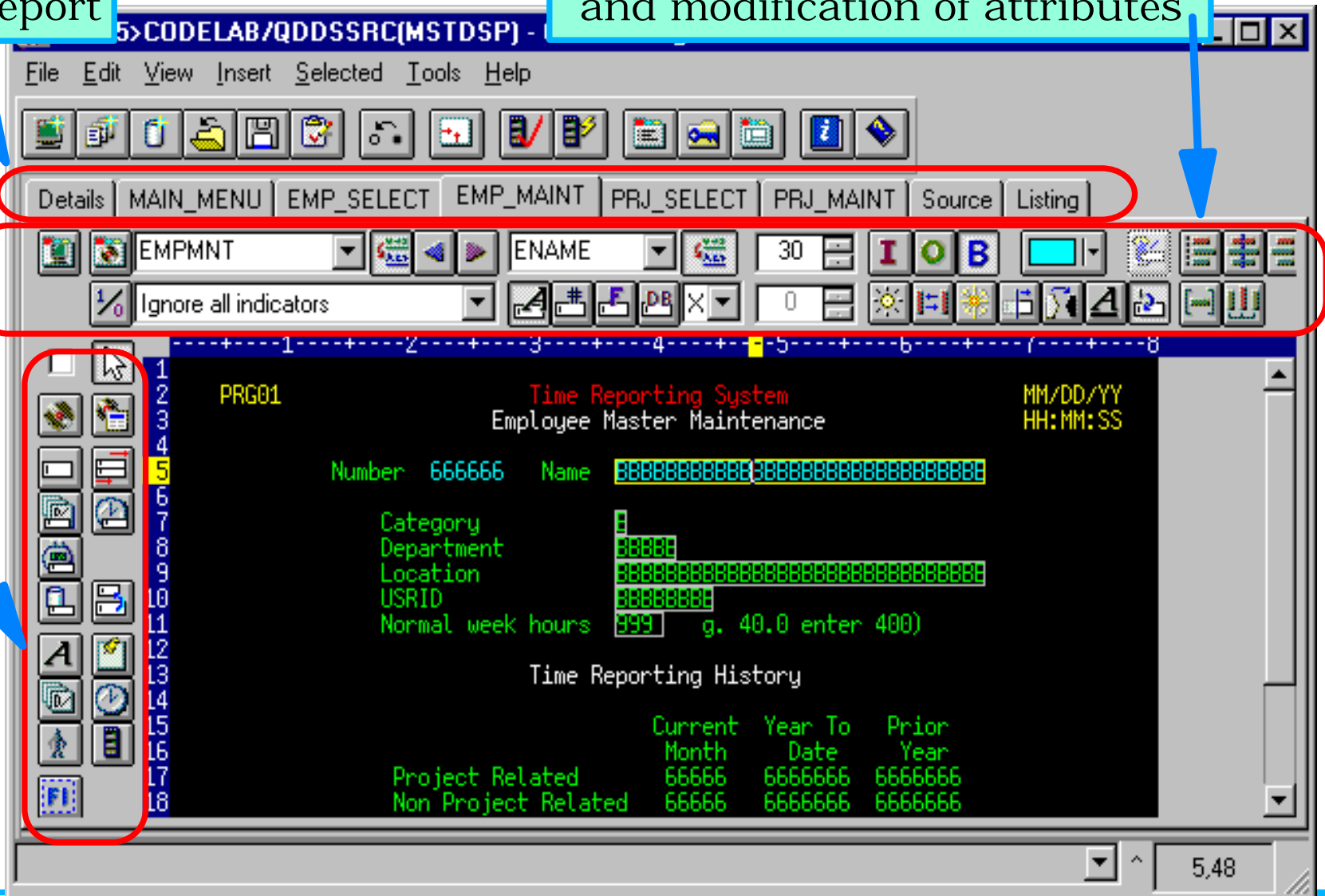
Design Page - WYSIWYG layout

iSeries Application Development

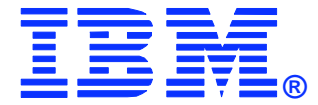
Tab for each screen/report

Toolbar for visual display and modification of attributes

Drag/Drop from Palette



Properties Notebooks



iSeries Application Development

The screenshot displays the 'Record properties' dialog box in the iSeries Application Development environment. The dialog is open to the 'Basics' tab and shows the following configuration:

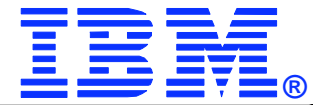
- Title:** Title
- Defined as text:** Error Window
- Referenced field:** [Empty]
- Alignment:** [Left] [Center] [Right]
- Position:** [Top] [Bottom]
- Attributes:** [None] [Bold] [Italic] [Underline]
- Color:** [Green] [White] [Red] [Cyan] [Yellow] [Magenta] [Blue]
- Text List:**
 - WDWTITLE>(*TEXT 'Error Window') (*DSPA
 - 01 WDWTITLE((*COLOR RED))
 - WDWTITLE((*COLOR YLW))
- Buttons:** Add, Change, Delete

Other visible dialog boxes include 'Validity check' and 'Styles'.

A red banner at the bottom of the screenshot contains the text: "The CA/CF keyword is specified at another level."

All of the power of DDS is abstracted in an intuitive highly visual user interface

Windows Explorer for DDS



The screenshot shows the IBM Code Designer interface. The title bar reads '<T015>CODELAB/QDDSSRC(MSTDSP) - CODE Designer'. The menu bar includes File, Edit, View, Insert, Selected, Tools, and Help. The toolbar contains various icons for file operations and development tools.

The left pane shows the DDS Tree with a tree view of the project structure. The main pane is divided into two sections: 'Details' and 'Selected DDS'. The 'Details' section shows a table of fields for the 'Record EMPMNT fields'.

Field	Position	Length	Type	Shift	Usage	Reference
*DATE	2, 70	6	Date constant			
*TIME	3, 70	6	Time constant			
'Employ...enance'	3, 27	27	Text constant			
'Number'	5, 14	6	Text constant			
EMPNO	5, 22	6.0	Numeric	S - Signed numeric	Output	RCEMP/EMPNO C
'Name'	5, 31	4	Text constant			
ENAME	5, 37	30	Alphanumeric	X - Alphabetic	Both	RCEMP/ENAME C
'Category'	7, 18	8	Text constant			

The 'Selected DDS' section shows the source code for the selected field:

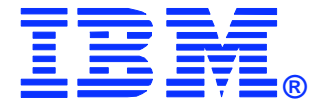
```
A          ENAME      R      X  B  5  37COLOR(TRQ)
A          REFFLD(RCEMP/ENAME *LI
A  90          DSPATR(PR)
A          DSPATR(PC)
```

Details page

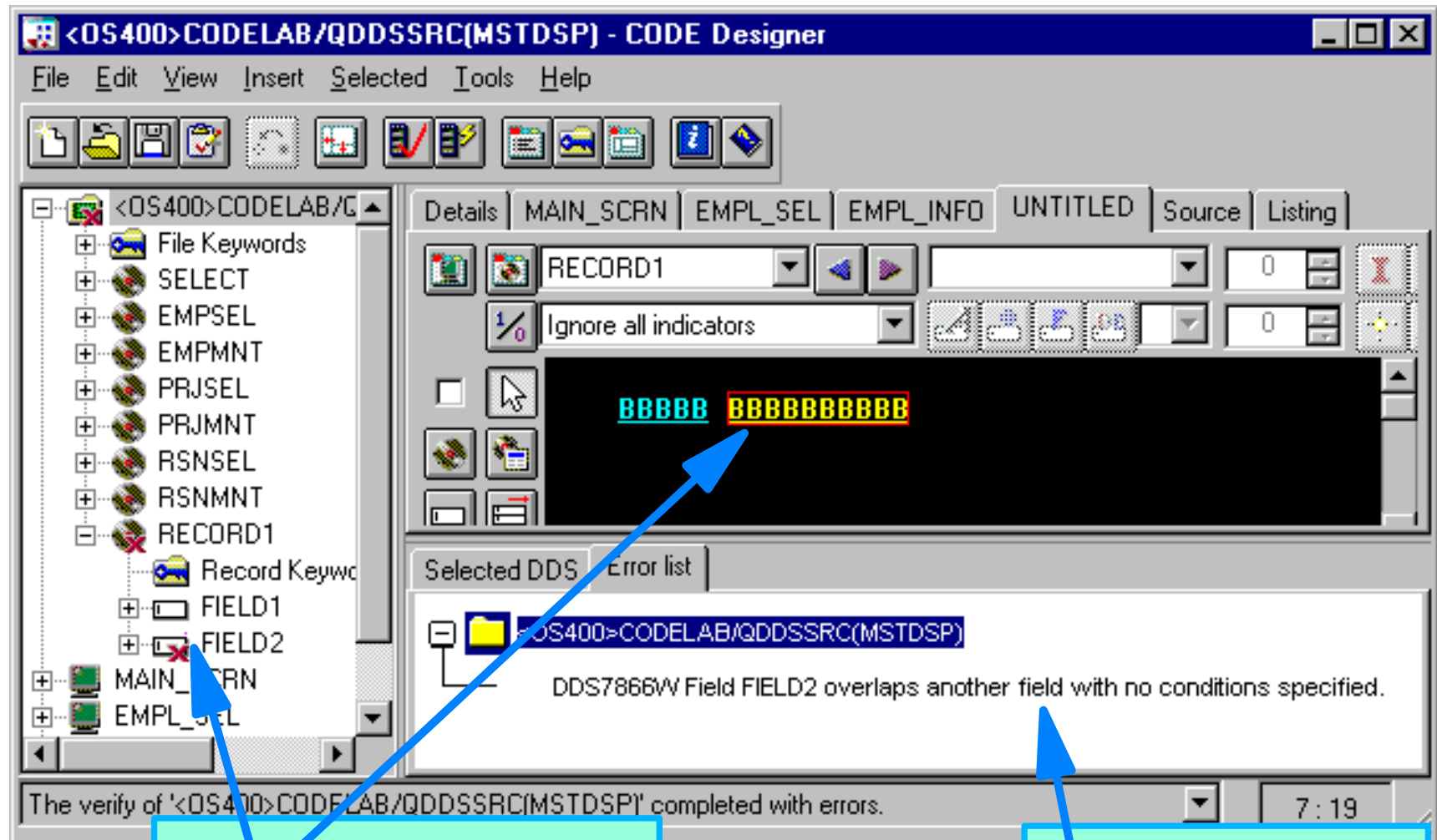
DDS Tree

Selected DDS source page

Designer - Program Verify



iSeries Application Development

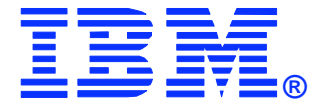


Errors highlighted

Error list page

► Same DDS verifier as used by editor

Integrated DDS Editor



Series Application Development

Single click back to design mode

Single click verify

Full power of editor

Integrated error feedback

The screenshot shows the Integrated DDS Editor interface. At the top, there is a menu bar with options: Edit, View, Insert, Selected, Tools, Help. Below the menu bar is a toolbar with various icons for editing and development. The main area is a code editor displaying a DDS source file. The editor shows a table of data definitions with columns for Row, Column, and Replace. The code includes comments and field definitions. At the bottom, there is an error feedback window showing two error messages: DDS7520E and DDS7508E. The status bar at the very bottom indicates that the verify process completed with errors.

```
Row 13      Column 52      Replace 1 change.
.....A.....Functions+++++++
00050      A*      TIME REPORTING SYSTEM FILES. THESE DEFINITIONS WILL BE REFERE
00060      A*      BY WHEN CREATING THE SPECIFIC PHYSICAL AND LOGICAL FILES AS WE
00070      A*      BY SDA WHEN CREATING DISPLAY FORMATS.
00080      A*****
00090      A          R RCREF          TEXT('DATA BASE REFERENCE')
00100      A*%TS DD 19990204 231630 REINHARD REL-U3R2M2 5763-CL2
00110      A*      COMMON FIELDS
00120      A          ACREC          1      B      TEXT('ACTIVE RECORD CODE')
00130      A          COLHDG(ACREC )
00130DDS7508E Closing apostrophe missing for quoted string.
00140      A          DATEFL          6      0B      TEXT('DATE FIELD')
```

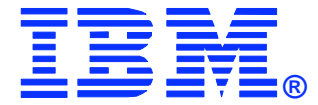
DATE

DDS7520E Keyword COLHDG ignored because of error in list of values.

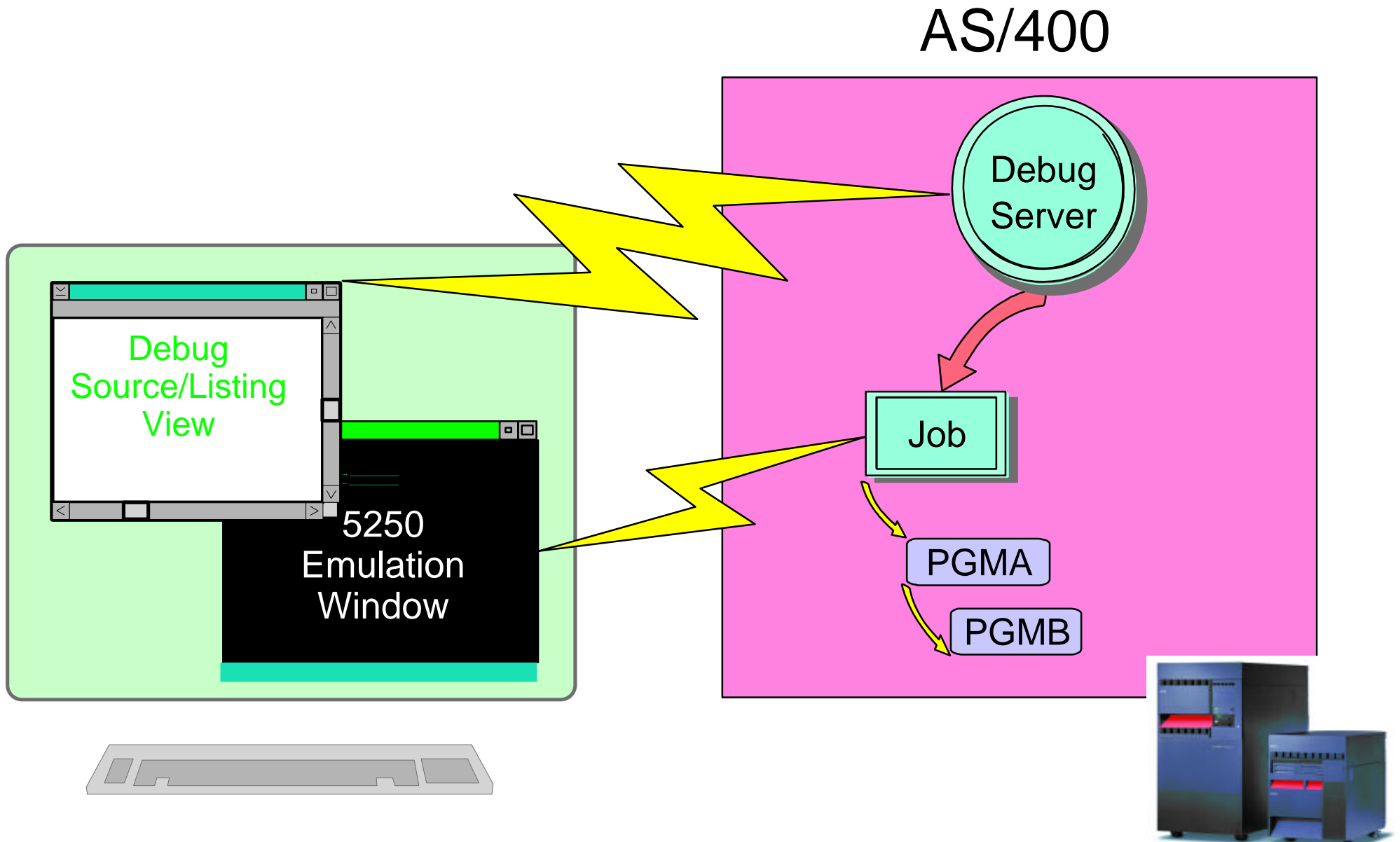
DDS7508E Closing apostrophe missing for quoted string.

The verify of '<T015>CODELAB/QDDSSRC(REFMST)' completed with errors.

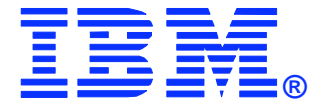
Debugger Architecture



iSeries Application Development



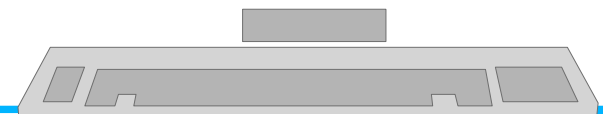
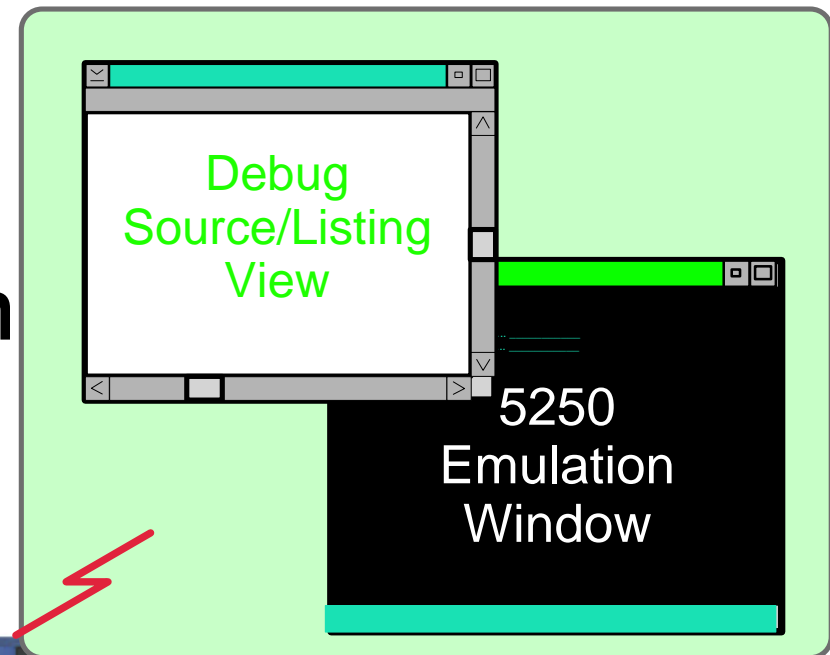
CODE Debugger



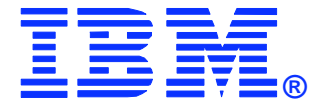
iSeries Application Development

- ▶ RPG, COBOL, CL, C, C++, and Java
- ▶ Both OPM and ILE; step between them
- ▶ Multiple breakpoint types
- ▶ Display and change variables
- ▶ Source and listing views
- ▶ Look at call stack
- ▶ Batch and interactive
- ▶ Attach to a running application

- ▶ **Application runs on the host**



CODE Debugger Window



iSeries Application Development

The screenshot shows the IBM Distributed Debugger interface. The main window displays source code for Thread 1: *PGM CODELAB01/PAYROLLG. The code includes comments and assembly instructions. A context menu is open over line 59, showing options like 'Set Breakpoint F9' and 'Run to Location'. Three callout boxes at the bottom identify key features: 'Active breakpoint' (line 52), 'Disabled breakpoint' (line 61), and 'Breakpoint context menu' (line 59).

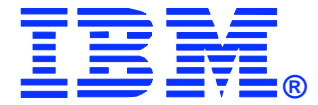
Line	Code	Breakpoint Status
47	C EXSR MAIN	
48	C MOVE '1' *INLR	
49	* MAIN SUBROUTINE	
50	C MAIN BEGSR	
51	C BEGIN TAG	
52	C MOVE '0' *IN60	Active
53	C MOVE *BLANKS EMESS	
54	C MOVE *BLANKS EMPAPL	
55	C MOVE *BLANKS PRJAPL	
56	C MOVE *BLANKS RSNAPL	
57		
58	C * branch to END TAG; ELSE edit SELECT format.	
59	C * SELTAG TAG	Disabled
60	C EXFMT SELECT	
61	C *INKC IFEQ '1'	Disabled
62	C GOTO END	
63	C ELSE	
64	C EXSR EDTST	
65		
66		

Active breakpoint

Disabled breakpoint

Breakpoint context menu

Monitoring Variables



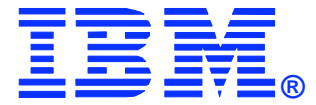
iSeries Application Development

The screenshot shows the IBM Distributed Debugger interface. The main window displays source code for a program named EW37TEST/DBGDEMO. The code includes several assembly-like instructions such as Z-ADD, CALLP, EXSR, and CALLB. A context menu is open over line 35, which contains options like 'Add to Program Monitor', 'Add to Storage Monitor', 'Copy to Clipboard', 'Find', 'Find Next', and 'Find Procedure'. In the bottom-left corner, a 'Monitors' pane shows two monitored variables: NUM = -234 and A = 0000. A blue arrow points from the 'monitored variables' label to this pane. Another blue arrow points from the 'Variables context menu' label to the context menu.

monitored variables

Variables context menu

CODE Project Organizer



iSeries Application Development

- Like PDM - manages lists. But lists of...
 - **Local Windows files**
 - **AS/400 libraries, files, objects, members and fields**
 - **ADM projects, groups and parts**
- Not restricted to one type of list
 - **E.g.: can list objects, members, local files simultaneously**
- Pop-up menus for actions
 - **Easy access to local and AS/400 commands**
- Easy to create user-defined actions
 - **Can use all PDM substitution variables**
 - **Actions can be AS/400 or Windows commands**
 - **Actions are importable and exportable for teams**
- Great ADM support
 - **and CMS and Turnover integration**

CODE Project Organizer

The screenshot shows the 'qcodelab - CODE Project Organizer' window. The interface includes a menu bar (Project, Filter, Edit, View, Options, Tools, Help), a toolbar with various icons, and a main workspace divided into several panes. The left pane shows a project tree with a filter list. The right pane shows a table of file contents. A context menu is open over the 'CUPDATELE' file in the table.

Name	Context	Type
CUPDATELE	Properties...	
EVFDCOMP	Refresh selected	
ACTMST	Refresh all	
BRWORD	Clear all	
CUSMST	CODE edit	
CUSTOMER	CODE browse	
DATADICT	CODE compile	
DISPLAY	CODE compile...	
DSPUPDAT	CODE debug...	
MENUBAR	Get from host	
ORDHMST	SEU edit	
ORDREP	SEU browse	
PRINT	SEU print	
CUPDATE	Change type or description...	
COPYFILELE	PDM find string...	
	PDM compare...	
	PDM merge...	
	Delete member	
	Rename member	
	Copy source member	
	Copy member	

Filter List

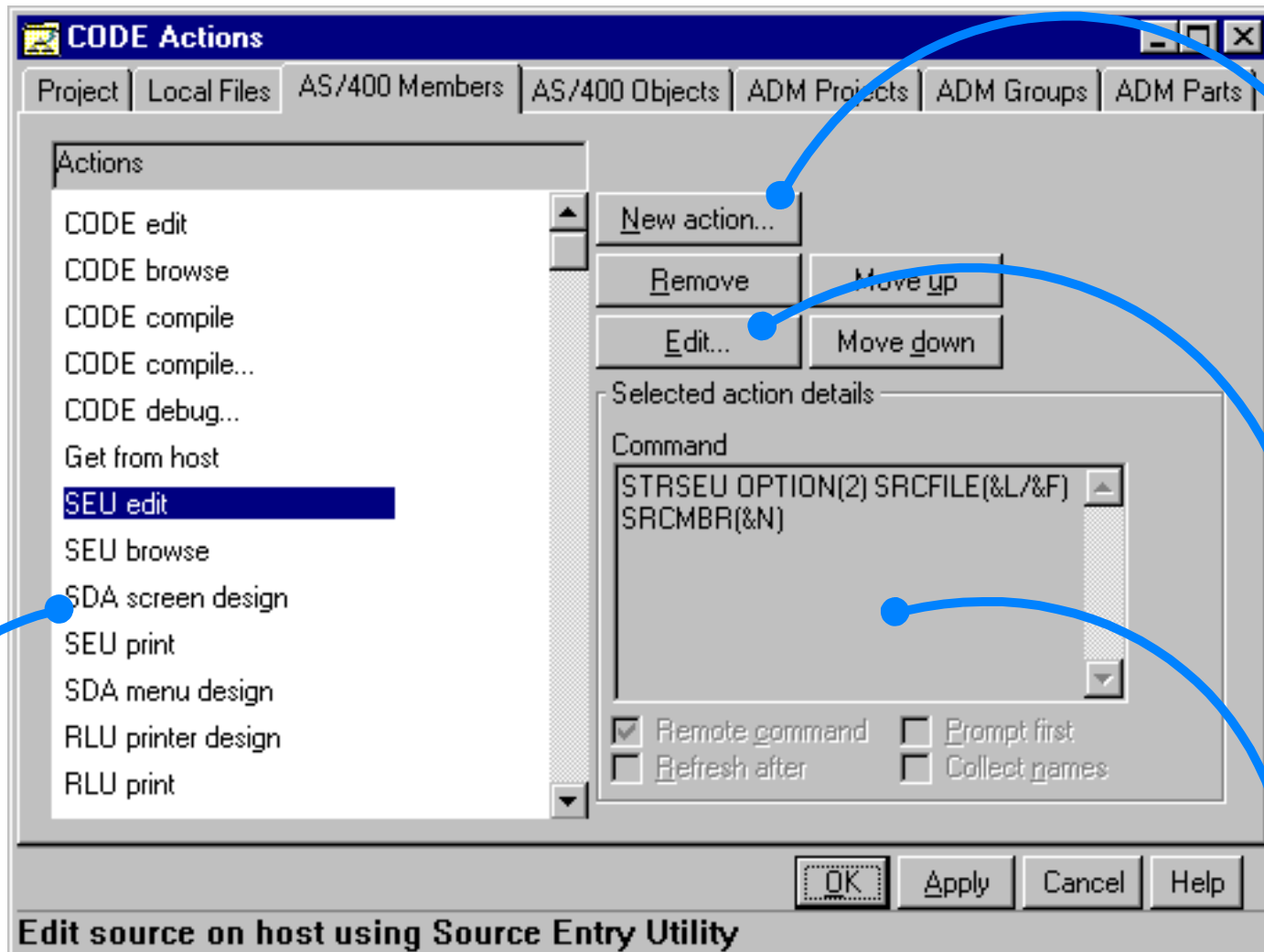
Monitor window

Details list

Context menu

CODE Project Organizer - Actions

iSeries Application Development



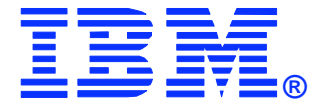
Create your own actions

Edit the predefined actions

Actions list

Action details

Editing Actions



iSeries Application Development

Substitution Variables

Member action variables

- &B List type: J=Project action, F=Local file, L=Library
- &C This user defined action name
- &D Last modified date
- &E Run in batch. *YES or *NO. From project setup
- &F AS/400 file name for members and parts. Full name
- &G Job description library from project setup
- &H Job description name from project setup
- &J Job description, fully qualified, from project setup
- &L AS/400 library name. Directory for local files
- &N Selected object name, not qualified
- &O Object library from project setup for AS/400 lists
- &P Compile in batch. *YES or *NO from project setup
- &PZ Project level server from project setup
- &R Replace. *YES or *NO from project setup
- &S AS/400 type without asterisk
- &T AS/400 type with asterisk
- &U Name of actions file for this list type
- &V Name of action types files

OK Insert Cancel Help

Change Member Action

Action: PDM find string...

Comment: Search for given string using FNDSTRPDM ho

Command:
SBMCODEJOB NOTIFY(*YES) SERVER(&Z)
CMD(FNDSTRPDM FILE(&L/&F) MBR(&N)
OPTION(*NONE) PRTRCDS(*ALL)
PARM(*EVENTF))

Browse... Variables...
Prompt...

Remote command Prompt first Refresh after Collect games

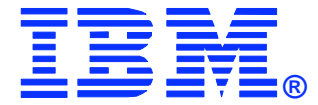
All types: <ALL>, <C>, <CBL>, <CL>, <DDS>, <DSPF>, <MENU>, <PGM>, <PRTF>, <RPG>

Selected types: <ALL>

Add >> << Remove Edit...

Change Cancel Help

CODE/400 Summary

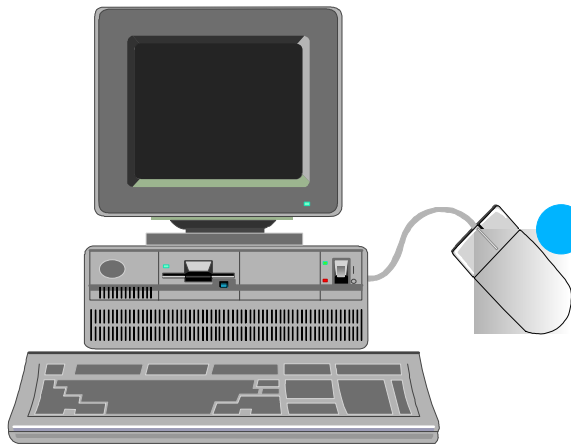


iSeries Application Development

- IBM's follow-on to SEU, PDM, RLU, SDA
- New world, new servers, new tools!
 - ▶ Much higher productivity
 - ▶ Much more fun programming again
 - ▶ Much easier to attract/retain talent
 - ▶ Much more flexibility
 - **Work at home**
 - **Tailor extensively to suit your needs**
 - ▶ Much easier transition to future
 - **Today: host applications, new tools**
 - **Tomorrow: Web applications!**
 - RPG IV, ILE, GUI, VisualAge, Java, WebSphere. . .

CODE/400 - What you need

iSeries Application Development



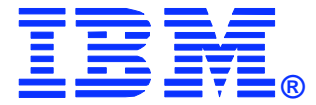
- **All you need is:**

- ▶ Windows 98/NT/2000/ME
- ▶ Emulator of choice
- ▶ Web browser to view help
- ▶ JDK 1.2.2
- ▶ Pentium II processor 64MB mem
- ▶ 235MB disk

- **TCP/IP**



Additional Information



iSeries Application Development

- **homepage**

- ▶ www.ibm.com/software/ad/wdt400

- **Education**

- ▶ S6186 CODE/400 for iSeries -- Basic (2 days)

- ▶ S6205 CODE/400 for iSeries -- Advanced (1 day)

- **Order number**

- ▶ V4R5M1: 5769-WDS

- ▶ V5R1: 5722-WDS

- **Newsgroup**

- ▶ <news://news.software.ibm.com/ibm.software.code400>