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# Remote System Explorer (RSE) Overview

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### **Acknowledgement:**

- This presentation is a collaborative effort of the IBM Toronto iSeries Application Development presentation team, including work done by:

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## Agenda

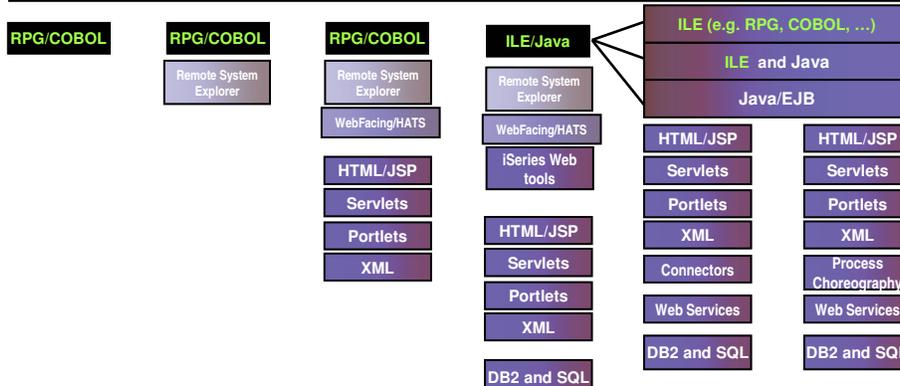
- **IBM System i™ Developer Roadmap**
- Remote System Explorer (RSE)
  - Getting started
  - Accessing libraries, objects, and members
  - Remote Systems LPEX Editor
  - Other cool (and useful) features
- Integrated Debugger

## IBM System i™ Developer Roadmap

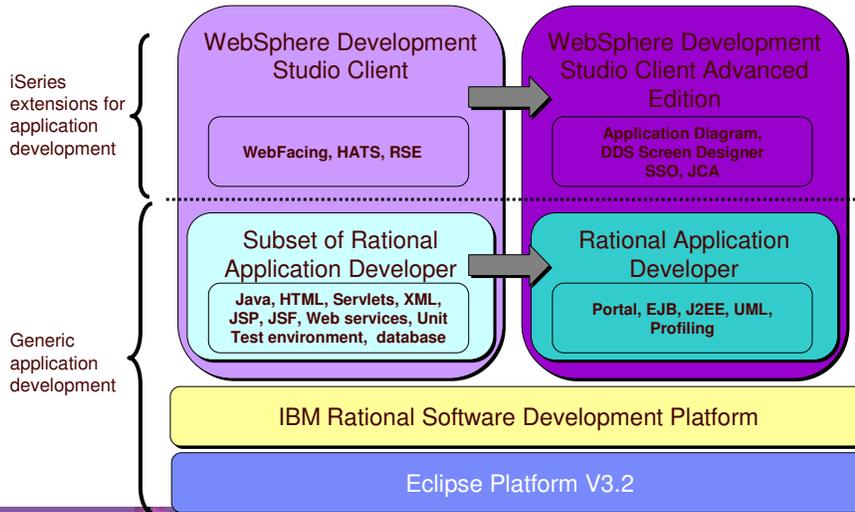
*Traditional*      *Improve Your Productivity*      *Enhance the End User Experience*      *Create a Modular Architecture*      *Integrate Applications*      *Integrate Business Processes*



### User Interface



## WSDC Packaging



## Agenda

- IBM System i™ Developer Roadmap
- **Remote System Explorer (RSE)**
  - Getting started
  - Accessing libraries, objects, and members
  - Remote Systems LPEX Editor
  - Other cool (and useful) features
- Integrated Debugger

## What is the RSE?

- **Application Development Tools** for RPG and COBOL developers
  - Tightly integrated set of tools
  - Modern, graphical, workstation based tools
  - PDM / SEU like features to make transition easier
- Remote access to i5/OS development resources
  - Libraries, objects and members
  - CL commands
  - Jobs
  - Integrated file system
- Replacement for SEU/PDM and CODE/400
  - But so much more than just a replacement
- A “perspective” inside of WDSC

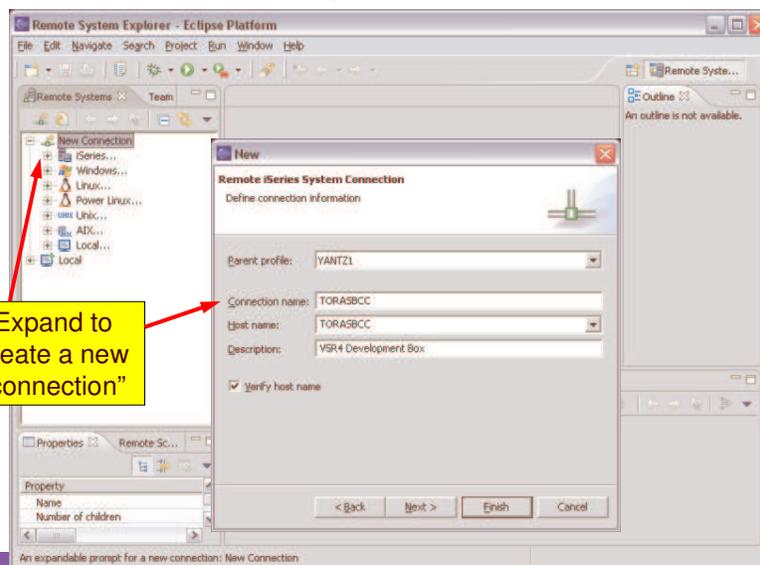
## Why the RSE?

- Integrated set of tools for developing i5/OS applications
  - Tools based on Eclipse open source IDE
  - RPG, COBOL, DDS, CL
  - Integrated with change management systems
  - Open source tools
  - Vendor tools
- Improve productivity for native development
  - Closely integrated edit, compile, run / debug experience
  - Tools to help better understand large applications
  - Setup and customize development environment based on projects and individual preferences
- Lower learning curve for other technologies
  - Learn the Workbench tools with RPG / COBOL development
  - Then branch into Web, XML and Web Services development using the same tools platform

## Getting Started

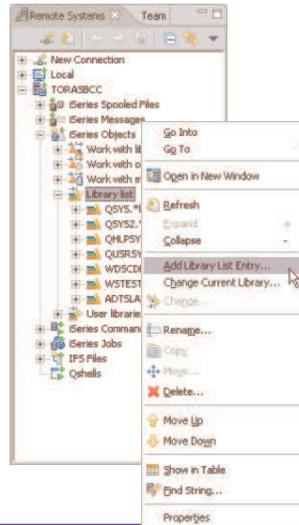
- Create a connection to your iSeries
- Setup library list
- Drill down to source member
- Edit source member using Remote Systems LPEX Editor
- Save changes and Compile
- Debug ☹

## Create a Connection to your iSeries

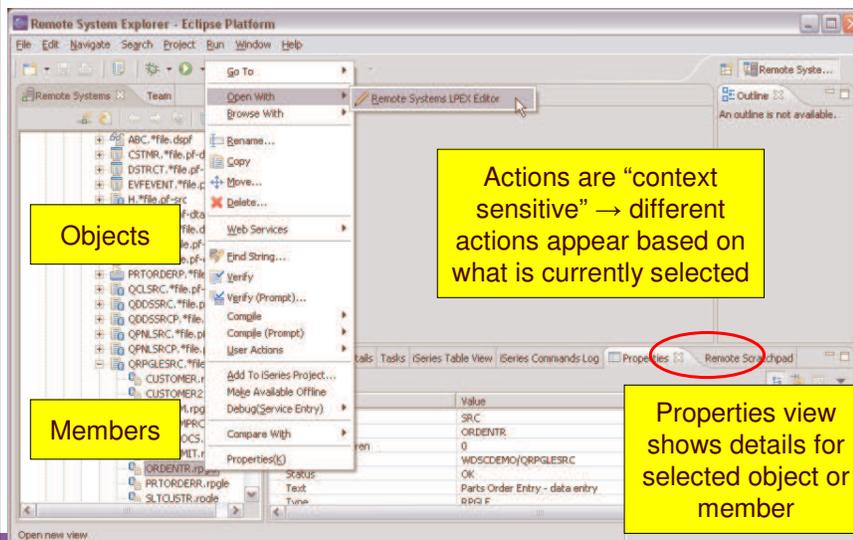


## Setup Library List

- Expand the new connection shows “subsystems”
  - Represent different resources you can access on the server
- Expanding a subsystem shows predefined filters
  - Subsets of resources
  - Create your own (more on this later)
- iSeries Objects > Library List
  - Shows library list for connection
  - Right click on Library List filter to add additional libraries
  - Right click on libraries in the list to:
    - Remove from LIBL
    - Move [ up | down | within ] LIBL



## Drill Down To Source Member





## Editing Source Members

The screenshot shows the Remote System Explorer interface with a source member being edited. A yellow callout box points to the content-assist popup that appears when the user presses Ctrl+Space. The popup lists various keywords such as ALTSEQ(\*NONE), ASCEND, CCSID(\*DFT|NUMERIC-LITERAL), CLASS(\*JAVA:CLASS-NAME), CONST, CONST(CONSTANT-VALUE), and DATFMT(DATE-FORMAT|DATE-SEPARATOR|).

**Content-assist: Ctrl+Space**

When the ALTSEQ(\*NONE) keyword is specified, the alternate collating sequence will not be used for comparisons involving this field, even when the ALTSEQ keyword is specified on the control specification. ALTSEQ(\*NONE) on Data Definition specifications will be meaningful only if one of ALTSEQ, ALTSEQ(\*SRC) or ALTSEQ(\*TEXT) is coded in the control specifications. It is ignored if this is not true.

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## Compiling (and Fixing Errors)

The screenshot illustrates the process of compiling source members. A yellow callout box indicates that compilation can be launched directly from the editor or a pop-up menu. Another yellow callout box states that compile errors are automatically downloaded and shown in the iSeries Error List. The error list table below shows several messages:

ID	Message	Se...	Line	Location	
RNF9308	Compilation stopped. Severity 30 errors found i...		50	0	WDSCDEMO\QRPGL...
RNF7030	The name or indicator DSPRN is not defined. ...		30	105	WDSCDEMO\QRPGL...
RNF7503	Expression contains an operand that is not def...		30	105	WDSCDEMO\QRPGL...
RNF2013	The Device entry is not PRINTER, DISK, SEQ, ...		20	28	WDSCDEMO\QRPGL...
RNF7031	The name or indicator CUSTNAME is not refere...		00	71	WDSCDEMO\QRPGL...
	... is not referen...		00	72	WDSCDEMO\QRPGL...
	NAME is not refere...		00	73	WDSCDEMO\QRPGL...
	is not referenced.		00	5	WDSCDEMO\QRPGL...

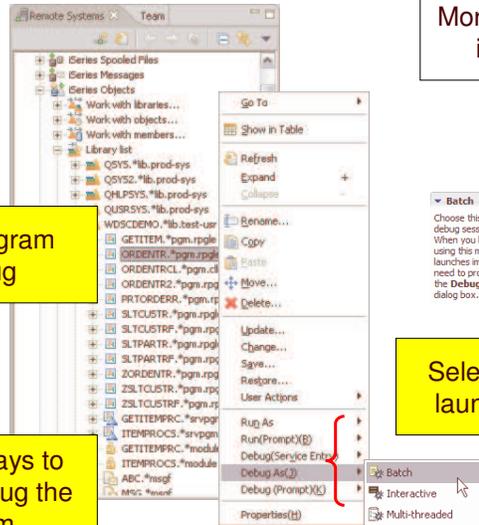
**Launch compiles directly from editor or pop-up menu.**

**Compile errors automatically downloaded and shown in iSeries Error List**

**Double clicking on an error opens editor and positions to the line**

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## Debug



More on debugging in a minute...

Select program to debug

Different ways to run and debug the program

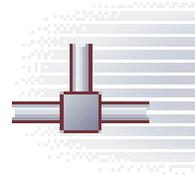
Select method to launch program

**Batch**  
Choose this menu item to launch a debug session for a batch application. When you launch a debug session using this menu item, the session launches immediately and you do not need to provide launch parameters in the Debug launch configurations dialog box.

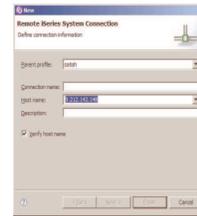
## Agenda

- IBM System i™ Developer Roadmap
- Packaging and Install
- Remote System Explorer (RSE)
  - Getting started
  - **Accessing libraries, objects, and members**
  - Remote Systems LPEX Editor
  - Other cool (and useful) features
- Integrated Debugger

## What is an RSE “Connection”?



- Represents a remote system
  - Given a connection name
  - Multiple connections to one system permitted
- Each connection can be customized with its own:
  - i5/OS user profile
  - Library list and environment variables
  - Command execution parameters
    - Object library for compiles
    - JOBD for batch compiles / commands
  - Filters and filter pools
- Think of a connection as a development project instead of a remote system
  - Order Entry Application
  - Inventory Management Application

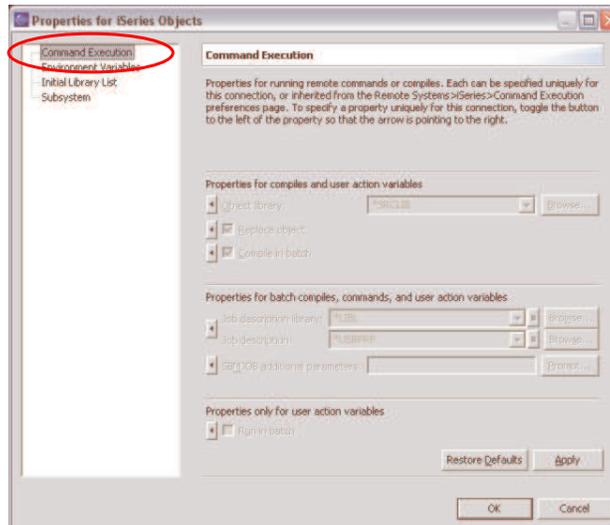


## Customizing a Connection

The **Initial Library List** property page allows you to specify additional job setup information such as the library list, current library, and a sign on command.

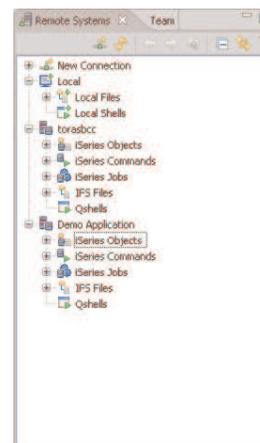
Library	Library Position
COULTHAR	*LAST
FARR	*LAST
WEISS	*LAST

## Customizing a Connection - 2



## Accessing Libraries, Objects and Members

- Remote Systems View
  - Shows all connections
  - Allows drill down access to remote objects
- Expanding a connection shows "subsystems"
  - These are not i5/OS job subsystems
  - Just different parts of the i5/OS you can access
  - Drill down to access
- Subsystems
  - iSeries Objects
  - iSeries Commands
  - iSeries Jobs
  - IFS files
  - Qshells



## Drilling Down

- Typically we start using the RSE by just expanding:
  - Expand Library list to see libraries on library list
    - Expand a library to see all objects in it
      - Expand a source file to see members in it
  - Expand Home directory to see folders in \home in IFS
    - Expand a folder to see all folders and files in it
      - And so on
- But this usually results in lists that are too large
  - Its unwieldy to scroll through thousands of items in a list
    - You really want to keep lists small, less than one hundred at most

## Introducing Filters

- Eventually you will need to see a subsetted list
  - Using criteria like generic names, types and attributes
  - All subsystems (nodes under a connection) support “**filters**”
    - These allow fine-grained control over what is shown in the RSE.
- To create a filter, right click on any subsystem and select New -> xxx
  - iSeries Objects -> New -> Library Filter, Object Filter, Member Filter
  - iSeries Commands -> New -> Command Set
  - iSeries Jobs -> New -> Job Filter
  - IFS Files -> New -> Filter
- Or use the fastpath Work With XXX... prompts under iSeries Objects

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## Object Filters

Specify simple, special, or generic library name

Specify simple or generic object name

Specify object type

Specify simple or generic object attribute

More types (next page)

Expand

Filter name: My Objects

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## Filtering objects by type + attribute

When More Types >>> pressed

Prompt for object type

Prompt for object attribute

Specify multiple object type + attribute pairs

Will list all objects with any of the specified types+attributes

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## Expanding Object Filters

Remote Systems Explorer interface showing a tree view of objects under 'My Objects'. A context menu is open over the 'My Objects' folder, with the 'Change...' option highlighted. A yellow callout box points to the 'Change...' option with the text 'Use Change to edit filter later'. Another yellow callout box points to the 'My Objects' folder with the text 'Filter is created, and expanded. It lists all objects matching the given criteria.' A third yellow callout box points to the 'My Objects' folder with the text 'Filter exists until you delete it'. A fourth yellow callout box points to the bottom of the window with the text 'Filter exists in all connections by default'.

Filter is created, and expanded. It lists all objects matching the given criteria.

Filter exists until you delete it

Filter exists in all connections by default

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## Changing Filters

'Change Object Filter' dialog box. The 'Filter name' is 'My Objects' and the 'Parent filter pool' is 'Yantz1 Filter Pool'. The 'Filter strings' list contains 'AOTSLAB/A\* OBJTYPE(\*FILE)\*' and 'AOTSLAB/B\* OBJTYPE(\*FILE)\*'. A red arrow points from a yellow callout box to the 'Filter strings' list with the text 'Show all \*PGM and \*FILE starting with A and B'. A yellow callout box on the left contains the text 'Filters are really made up of 1 or more filter strings. You can add additional filter strings in the change dialog. This can allow you to create filters that capture exactly the objects or members you are interested in.'

Filters are really made up of 1 or more filter strings. You can add additional filter strings in the change dialog. This can allow you to create filters that capture exactly the objects or members you are interested in.

Show all \*PGM and \*FILE starting with A and B

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## iSeries Table View

- Remote Systems View
  - Tree view of resources
  - Great for seeing hierarchical structure
    - Library > Object > Member
  - Not natural for people used to PDM
  
- iSeries Table View
  - Table view of resources showing additional attributes
  - Select "Show in Table" from the pop-up menu of any filter, library, or file in the Remote Systems View

Remote System Explorer - Welcome - WebSphere Development Studio Client for iSeries

Library RSELAB01 (20 Objects)

Name	Type	Attribute	Text	Status
CLC1	*PGM	CLLE	debuggable, calls Payroll, parm workstation num	OK
CLR1	*PGM	CLLE	debuggable, calls Payroll, parm workstation num	OK
MYCOMPILE	*PGM	CLLE		OK
PAYROLLD	*PGM	CBLE	no errors	OK
PAYROLLG	*PGM	RPGLE		OK
COMPARE	*FILE	PF-SRC		OK
EMPMST	*FILE	PF-DTA		OK

✓ Same popup actions in table, and tree

✓ Sort by clicking on column heading

Show children of selected object in a table view

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## iSeries Table View

✓ Use local pulldown to see additional columns

Can also

- ✓ Change contents
- ✓ Subset contents
- ✓ Position list
- ✓ Print list
- ✓ ... Just like PDM!

Name	Type	Attribute	Text
CLC1	*PGM	CLLE	debuggable, call
CLR1	*PGM	CLLE	debuggable, call
MYCOMPILE	*PGM	CLLE	
PAYROLLD	*PGM	CBLE	no errors
DAVROLLG	*PGM	DBCLF	

Name	Type	Attribute	Text	Status	Last modified	Created	Size
CLC1	*PGM	CLLE	debuggable, calls Pay...	OK	July 17, 2003 ...	July 17, 2003 4:13:24 PM EDT	81920
CLR1	*PGM	CLLE	debuggable, calls Pay...	OK	July 17, 2003 ...	July 17, 2003 4:13:24 PM EDT	81920
MYCOMPILE	*PGM	CLLE		OK	July 17, 2003 ...	July 17, 2003 4:13:24 PM EDT	73728
PAYROLLD	*PGM	CBLE	no errors	OK	July 17, 2003 ...	July 17, 2003 4:13:24 PM EDT	360448
DAVROLLG	*PGM	DBCLF		OK	July 17, 2003 ...	July 17, 2003 4:13:24 PM EDT	360448

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## Working with different objects types

Use right click actions

- \*LIB
- \*PGM
- \*FILE
- MBR

\*LIB

- New
- Go To
- Expand To
- Refresh
- Expand
- Collapse
- Rename
- Copy
- Paste
- Delete
- Add Library List Entry...
- Remove From Library List
- Move Up In Library List
- Move Down In Library List
- Move Within Library List...
- Show In Table
- Find String...
- Change...
- Save(B)
- Restore...
- User Actions
- Create iSeries Project
- Properties(K)

\*PGM

- Go To
- Show In Table
- Refresh
- Expand
- Collapse
- Rename
- Copy
- Paste
- Move
- Delete
- Update...
- Save...
- Restore...
- User Actions
- Service Entry Point
- Run As(B)
- Run(Prompt)(F)
- Debug As(J)
- Debug (Prompt)(K)
- Properties(K)

\*FILE

- New
- Go To
- Refresh
- Expand
- Collapse
- Rename
- Copy
- Paste
- Move
- Delete
- Show In Table
- Cache File Descriptions
- Find String...
- Change(B)...
- Save...
- Restore...
- User Actions
- Add To iSeries Project...
- Make Available Offline
- Properties(K)

MBR

- Go To
- Open With
- Browse With
- Rename
- Copy
- Move
- Delete
- Verify
- Verify (Prompt)
- Find String...
- Compile
- Compile (Prompt)
- User Actions
- Add To iSeries Project...
- Make Available Offline
- Compare With
- Properties(K)

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  - Other cool (and useful) features
- Integrated Debugger

## Remote Systems LPEX Editor

- What happens during editing?
  - Double click on member or select Open With > Remote Systems LPEX Editor
  - RSE checks for required authority and member locks
    - Prompted if either check fails
  - Member is locked on i5/OS, downloaded and opened in editor
  - Changes written back to remote member on save
  - Locks released when editor is closed
    - Or the RSE connection is disconnected
- Editor and parsers
  - “LPEX Editor” provides basic editing capabilities
    - Copy, paste, undo, redo, find / replace, etc...
    - Not language specific
  - “Parsers” provide language specific features
    - Color tokenizing, prompting, syntax checking, content assist, etc...

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## Remote Systems LPEX Editor

Best of Both Worlds

*SEU look and feel*  
-prefix commands  
-format bar

*Modern Editor*  
-Color tokenizing  
-Undo / redo  
-Highlight code with mouse and copy / paste

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## Outline View

Click on entry to position to it

Refresh: This populates Outline view

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## Content Assist

Use Ctrl+Space for context-sensitive selection

Vastly improved for RPG in 5.1!

Available for COBOL in 5.1 and later

## Editing Tips

- In the RSE you can edit as many members as you like at once
  - Each editor opens up as a separate tab
- Double click on editor tab maximizes editor within workbench window
- Split screen editing for two or more members
  - Drag and drop editors to the left or right for *vertical* split screen editing of two (or more) members
  - Drag and drop editors to the bottom for *horizontal* split screen editing
- Split screen editing of the same member
  - Use the LPEX View > Open new view pop-up menu to open 2 views in the same source member
    - Each view is editable
    - Open more than 2 if you want



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Remote System Explorer - GETITEM.RPGLE - Eclipse Platform

File Edit Source Compile Navigate Search Project Run Window Help

ORDENTR.RPGLE

Line 1	Column 1	Replace
000100	.....1.....2.....3.....4.....+	
000200	///	
000300	/// ROUTINE: ORDENTR	
000400	///	
000500	/// This program allows a user to enter	
000600	/// a print request to a batch job vi	
000700	/// handles District 1 and Warehouse	
000800	///	

GETITEM.RPGLE

Line 13	Column 1	Replace
000800	...CLONG1Factor1+++++OpCode(E)+Factor2++++	
000900	* ITEM IF E K Disk	
001000	*	
001100	*Input parameter from Web page	
001200	* Data structure to specify output str	
001300	D partid	
001400	D partrec	
001500	D feedback	

SLTCUSTD.OSPF

Line 1	Column 1	Replace
000100	...+A*..1.....2.....3.....4.....5.....6	
000200	▲%TS DD 20050428 125247 yantzi REL-V5.0.1 M	
000300	▲%FD test	
000400	▲%EC	
000500	▲	DSPSI2(24 80 *DS9)
000600	▲	REF(*LIBL/CSTHR)
000700	▲	CA12(12 'Cancel')
000800	▲	HELP
000900	▲	ALHELP
		R DORNY

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Three members, one split horizontally along the bottom and two split vertically at the top

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Remote System Explorer - ORDENTR.RPGLE - Eclipse Platform

File Edit Source Compile Navigate Search Project Run Window Help

ORDENTR.RPGLE

Line 46	Column 7	Replace	Line 198	Column 19	Replace	Line 710	Column 31	Replace
004000	D \$Warehouse	C	018600	CUSTOMER = %TRIM		061900	/// Terminate the program	
004100	D \$District	C	018700	%TRIM(%FIRST		062000	///	
004200	D \$Panel1	C	018800	///		062100	///	
004300	D \$Panel2	C	018900	/// Determine		062200	CSR EndPgms	EDGRP
004400	D \$Change	C	019000	EXNR GetOrdNbr;		062300	///	
004500	///		019100	///		062301	/FREE	
004600	/// Miscellaneous vari		019200	ENDIF;				
004700	D \$FlRcn	S	019300	///				
004800	D CmcActive	S	019400	ENDIF;				
004900	D Error	S	019500	///				
005000	D Exit	S	019501	/END-FREE				
005100	D Exit2	S	019600	CSR				
005200	D DspPnl	S	019700	///				
005300	D \$FlCnt	S	019800	/// SUBROUTINE: C				
005400	D OrdCnt	S	019900	///				
005500	D OrdTot	S	020000	/// To clear any erro		063200	/// SUBROUTINE: *INZSR	
005600	///		020100	///		063300	///	
005700	/// Data queue variabl		020200	///		063400	///	
005800	D DqName	S	020300	CSR ClrError	BI	063500	/// Initialise the program	
005900	D DqLib	S	020400	///		063501	///	
006000	D QueDtaLen	S	020500	/// Clear error indic		063502	///comment by don	
006100	D QueDta	DS	020600	C		063503	///	

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One member with three editable views

## LPEX Editor Functions: Source Pull-Down Menu

The screenshot shows the 'Source' menu in the LPEX Editor. A yellow box lists the following functions available in the menu:

- ✓ Create new procedure
- ✓ Prompt
- ✓ Syntax check
- ✓ Program verify
- ✓ Show indent view
- ✓ Show fields of selected F-spec
- ✓ Open select /copy member
- ✓ Resequence

The menu items visible in the screenshot include: New, Prompt (F4), Syntax Check All, Verify (Ctrl+Shift+V), Verify With Prompt..., Convert All To Free-Form, Select Format Line..., Show Indentation, Show fields, /COPY Member (with sub-menu Edit and Browse), ILE RPG Help, Resequence All Lines, and Refresh (Ctrl+F5).

## Prompting

The screenshot shows the prompting interface in the LPEX Editor. A yellow box contains the text: "Disable/Enable Prompter and Syntax checking Toggle insert/replace".

An arrow points from the text "F4" to the F4 key icon in the prompting toolbar. Another arrow points from the text "Disable/Enable Prompter and Syntax checking Toggle insert/replace" to the 'Source' menu icon in the prompting toolbar.

The prompting interface shows a table with columns: Control level, Indicator, Factor 1, Operation and extender, Factor 2, and Result field. The current row shows: C, NO1, Factor 1, EXPFMT, SELECT, and C.

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## Editing Embedded SQL

Automatic formatting of SQL statements

Color tokenization (customizable)

New in 7.0!

Templates (predefined + add your own)

```

003359
003369 /free
003370
003371 exec sql
003372 DECLARE listCursor CURSOR
003373 FOR
003374 SELECT * FROM WBSDEMO/ITEM
003375 WHERE IPRICE >= :minprice and IPRICE <= :maxprice;
003376
003377 exec sql
003378 OPEN listCursor;
003379
003384 exec sql
003385 FETCH NEXT FROM listCursor INTO :ipartrecs;
003386
003387 select
003388
003389
003390
003391
003392
003393

```

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## Filtering

Right click in editor to filter view

Only lines meeting filter criteria are shown

Use + / - to expand or collapse filtered sections

```

005900
006000
006100
006200
006300
006400
006500
006600
006700
006800
006900
007000
007100
007200
007300
007400
007500
007600
007700
007800
007900
008000

```

Row	Column	Insert
005200	C	MAIN
010200	C	ENDSR
011000	C	RSNTAG
017600	C	ENDSR
018300	C	EMPTAG
025700	C	ENDSR
026400	C	PRJTAG
033500	C	ENDSR
034700	C	EDITSL
040300	C	ACDESR
041700	C	ENDSR
043100	C	ADDGDE
044000	C	ENDSR
044400	C	CHGDE
044500	C	IF *IN50
044600	C	EVAL *IN60 = *C

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## Indent View

Remote System Explorer - PAYROLL - WebSphere Development Studio Client Advanced Edition for iSeries

File Edit Source Compile Navigate Search Project Run Window Help

Row 72 Column 12 Replace 1 change.

```

006000 C* Write the SELECT format to display. If end of job requested,
006100 C*
006200 C
006300 C
006400 C
006500 C *INRC DOU not *IN60
006600 C EXPMT SELECT
006700 C IFPQ '1'
006800 C LEAVESR
006900 C EXSR EDITSL
007000 C END
007100 C
007200 C* IF the general error indicator *IN60 is on (equal to 1), the
    
```

iSeries Indent

Row 69 Column 12 Browse

```

C* Write the SELECT format to display. If end of job requested,
C*
C*
C*
C | | | DOU not *IN60
C | | | EXPMT SELECT
C | | | IFPQ '1'
C | | | LEAVESR
C | | | ELSE
C | | | EXSR EDITSL
C | | | END
C*
C* IF the general error indicator *IN60 is on (equal to 1), the
    
```

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## Language Help – at your Fingertips

- RPG, Cobol, DDS online references
- Programming Guides including CL
- F1 Help
  - Sensitive to where cursor is in the editor
- Message Help
- and much more

Help - WebSphere Development Studio Client Advanced Edition for iSeries

Search:  GO Search scope: iSeries

Contents

- iSeries application development
- iSeries programming information
  - High-level languages
    - PDF versions of the books
    - C/C++
    - COBOL/400
    - ILE COBOL
      - Language Reference
      - Programming Guide
    - Java
    - RPG/400
    - ILE RPG
      - Language Reference
        - Contents
        - RPG IV Concepts
        - Definitions
        - Specifications
          - About Specifications
          - Control Specific
          - File Description
        - File Description

iSeries programming information

### WebSphere(R) Development Reference

#### File Description Specifications

[File description specifications](#) identify each file that must have a corresponding file description specification. (File description specifications identify each file that must have a corresponding file description specification. Externally described files have file descriptions that are included within the file description specifications. Externally described files have file descriptions that are included within the file description specifications.)

A file can be either [program-described](#) or [externally described](#). Externally described files have file descriptions that are included within the file description specifications. Externally described files have file descriptions that are included within the file description specifications.)

The following limitations apply per program:

- Only one primary file can be specified. The primary file is required.
- Only one record-address file.
- A maximum of eight PRINTER files.
- There is no limit for the maximum number of files.

[ Top of Page | Previous Page | Next Page ]

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# Verifying

Verify runs built-in copy of the compiler

The screenshot shows the 'Verify' menu with options like 'Verify With Prompt...', 'Select Format Line...', 'Show Indentation', 'Show Fields', '/COPY Member', 'Resequence All Lines', and 'Refresh'. The 'Program Verification Options' dialog box is open, showing a list of options to generate and format the verification listing.

Automatically caches server info unless "Refresh" cache option selected.

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# Verify – Error List

The screenshot shows a source code window with an error highlighted: 'Move operands ERR and EMES have types that are not the same or indicator EMES is not defined.' The 'iSeries Error List' dialog box is open, showing a table of error messages.

Double clicking on error takes you to error in source

Message	Se...	Line	Location	Cor
RNF7004 Factor 2 must be '0' or '1' when the Result is an i...	30	364	RSELAB01/QRPGLES...	My
RNF7515 Move operands ERR and EMES have types that ...	30	365	RSELAB01/QRPGLES...	My
RNF7089 RPG provides Separate-Indicator area for file M...	0	27	RSELAB01/QRPGLES...	My
RNF7031 The name or indicator RSNNTAG is not referenced.	0	110	RSELAB01/QRPGLES...	My

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## LPEX Preferences

Two sets of "LPEX" preferences:

1. LPEX Editor (generic editor preferences)
2. Remote Systems > iSeries > LPEX Editor Parsers (language specific preferences)

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## LPEX Editor Functions: Preferences

Language-specific editor preferences

- Enable auto syntax checking
- Enable auto uppercasing
- Enter key behaviour
- Tab key behaviour

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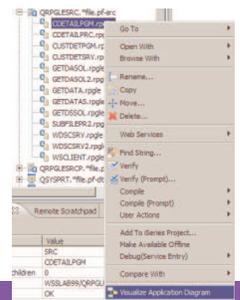
## Agenda

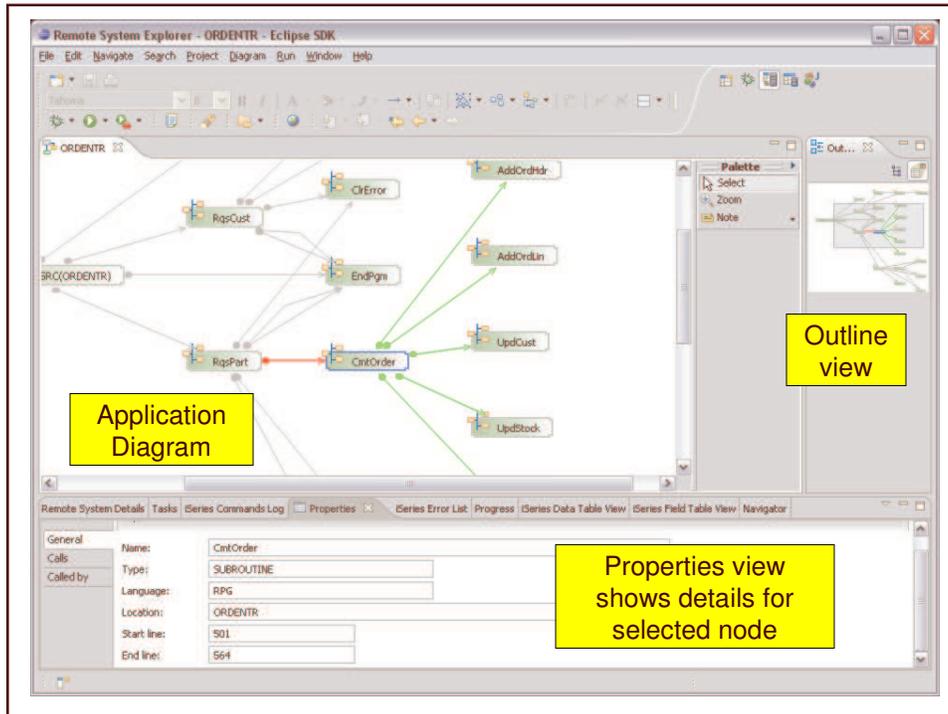
- IBM System i™ Developer Roadmap
- Packaging and Install
- Remote System Explorer (RSE)
  - Getting started
  - Accessing libraries, objects, and members
  - Remote Systems LPEX Editor
  - **Other cool (and useful) features**
- Integrated Debugger

## IBM Application Diagram Component [WASC Advanced Edition Only]

New in  
7.0!

- Application Diagram
  - Graphical representation of the structure of an application
    - Call Graph Diagram shows
      - Source call graph showing RPG and COBOL subroutine and procedure calls
    - Program Structure Diagram shows
      - ILE binding relationships between programs and service programs
      - Modules bound into programs and service programs
- Features
  - Outline view shows high level overview and helps navigate diagram
  - Double click on nodes to launch Remote Systems LPEX editor
  - Properties view shows additional details for selected node in diagram
    - Exported procedures for module or service program
    - Starting and ending line numbers for subroutines and procedures
  - Save, print, export to text or image file
  - Attached notes to document the diagram





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## DDS Screen Designer Technical Preview [WDCS Advanced Edition Only]

New in 7.0!

- New editor for display file DDS source
  - Design and source views
  - Changes made in one view automatically updated in the other
  - Outline view shows structure of source member
- Design View
  - Graphical editor for display file DDS source
  - Drag and drop parts from palette
  - Use mouse to move and resize fields
  - Use properties view to graphically modify field name, data type, length, attributes, keywords, indicators, etc...
- Source View
  - Embedded copy of Remote Systems LPEX Editor

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## DDS Screen Designer Technical Preview [WJSC Advanced Edition Only]

New in 7.0!

Define "screens" that affect visual display below

Switch between Design and Source views

Drag n' drop parts from the palette

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## User Defined Actions

- User-Defined Actions ... like PDM!
  - Right-click on iSeries Objects -> Work With
    - User-defined Actions
      - Create, delete or change user-defined actions
      - Scope them so you only see them when appropriate
    - Named Types
      - Create named types to scope actions against
      - EG. "RPG" might be RPG + RPGLE + SQLRPGLE
- ... and even beyond PDM!
  - Create user actions for libs/objects, members ... and even jobs and IFS folders and files!
- Same Substitution variables as PDM
  - Plus a few extras!

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## User Defined Actions

Define your own actions for object and member popup menus

Work With User Actions

Parent profile: PhilCoulthard

Action name: Add to Library List

Comment: Add selected library to lib list

Command: Normal command

ADDLIBLE &N

Insert variable... Edit... Browse...

Prompt...

Prompt first  Refresh after  Show action

Single selection only

Resource types for which this action will appear

Defined Types	Selected Types
ALL	LIB
CMD	
FILE	
FILE_DATA	
FILE_DSPF	
FILE_MBRFS	
FILE_PRTF	

LIB: \*LIB:\*

Apply Revert

Close

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## Running User Actions

Add Library List Entry (ADDLIBLE)

Library: CODELAB Name

Library list position: \*FIRST

List position: \*FIRST

Reference library: Name

Advanced  All Parameters  Keywords

ADDLIBLE LIB(CODELAB)

OK Restore defaults Cancel

My iSeries Commands Log

My iSeries

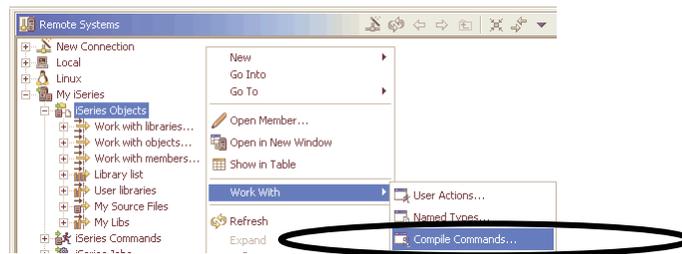
ADDLIBLE LIB(CODELAB)  
Library CODELAB added to library list.  
Cause . . . . : If the ADDLIBLE command was used, CODELAB was added to the user library list. If the CHG3SYSLIB command was used, CODELAB was added to the system portion of the library list.

Command Normal Prompt... Run

56 IBM System i5 Tools Remote System Details | Tasks | iSeries Table View | iSeries Commands Log | iSeries Error List

## Work With Compile Commands

- You can change IBM or vendor supplied compile commands, and add your own



## Customizing and Creating Compile Commands

The 'Work With Compile Commands' dialog box is shown with several annotations:

- Create new or edit existing:** Points to the 'Compile Commands' list on the left, which contains 'New command', 'CRTBNDRPG', and 'CRTRPGMOD'.
- Commands per member type:** Points to the 'Member type' dropdown menu, which is currently set to 'RPGLE'.
- Brings up larger window for editing:** Points to the 'Edit...' button.
- Browse iSeries for \*CMD object:** Points to the 'Browse...' button.
- Subset of PDM substitution variables allowed:** Points to a legend box containing:
  - &F - Name of file containing selected member
  - &L - Object or member library name
  - &N - Name of selected resource
  - &O - Object library, from Command Execution properties
  - &R - Replace object when compiling. \*YES or \*NO. From Command Execution properties
  - &X - Object or member text, in single quotes

The dialog also shows the 'Selected compile command' section with 'Label: CRTBNDRPG' and 'Command: CRTBNDRPG PGM(&O/&N) SRCFILE(&L/&F) SRCMBR(&N) F...'.

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## Running New Compile Command

The screenshot shows the 'Library list' on the left with a context menu open over the 'PAYROLL.rpgle' file. The menu options include 'Go To', 'Open With', 'Browse With', 'Rename', 'Copy', 'Move', 'Delete', 'Verify', 'Verify (Prompt)', 'Compile', 'Compile (Prompt)', 'User Actions', 'Add To iSeries Project...', and 'Make Available Offline'. The 'Compile' option is selected, and a sub-menu is visible with 'CRTBNDRPG', 'CRTRPGMOD', 'My RPG Compile Command', and 'Work With Compile Commands...'. A yellow callout box points to 'My RPG Compile Command' with the text: 'You will see the Error List view if the command generates an event file'. Below this, the 'iSeries Error List - CODELAB/EVFEVENT(PAYROLLG)' window is shown, displaying a table of error messages.

ID	Message	Severity	Line	Location	Connection
RNS9308	Compilation stopped. Severity 40 errors found in program.	50	0	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF2120	External descriptions for file MSTDSP not found; file is ignored.	40	27	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF2120	External descriptions for file PRJNST not found; file is ignored.	40	29	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF2120	External descriptions for file RSNMST not found; file is ignored.	40	30	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF7030	The name or indicator ACODE is not defined.	30	103	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF7030	The name or indicator EMPAPL is not defined.	30	54	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF7030	The name or indicator PRCDE is not defined.	30	257	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries
RNF7030	The name or indicator PRCMP is not defined.	30	264	CODELAB/QRPGLESRC(PAYROLLG)	My iSeries

Remote System Details | Tasks | iSeries Table View | iSeries Commands Log | iSeries Error List | Remote Commands

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## Running CL Commands

The screenshot shows the 'Library R5ELAB01 (22 Objects)' window with a table of objects. A yellow callout box points to the table with the text: 'Enter command, press Enter Use arrows to retrieve commands'. Below the table, the 'Command' window is shown with 'Normal' selected and 'addible test' entered. A yellow callout box points to the 'Prompt...' button with the text: 'Prompt'. Another yellow callout box points to the 'Run' button with the text: 'Run'. Below the command window, the 'iSeries Commands Log' window is shown, displaying the command and its output. A yellow callout box points to the 'Show Log...' button with the text: 'Show Log'.

Name	Type	Attribute	Text	Status
CLC1	*PGM		adable, calls Payroll, par...	OK
CLR1	*PGM		adable, calls Payroll, par...	OK
MYCOMPILE	*PGM			OK
PAYROLL	*PGM			OK
PAYROLLD	*PGM		ors	OK
PAYROLLG	*PGM	RPGLE		OK
COMPARE	*FILE	RE SRC		OK

Remote System Details | Tasks | iSeries Table View | iSeries Commands Log

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## Multi-file Search

Select Search → iSeries from pull-down menu

GUI interface to FNDSTRPDM

Supports multi-generic names

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## Search Result

Double click on match entry to open + position in editor

Use as a "task list", select line and click X button to remove from view.

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## iSeries Data Table View

- Shows records from data physical file in the iSeries Data Table View
  - Retrieves and displays first few records for performance
  - Additional records retrieved as you scroll through table
- Read-only access
- Position to record by key
  - Start typing in table and dialog box appears where you enter search values for key fields

ID	INAME	IPRICE	IDATA
000005	Cross_Country_Ski_Set	93.00	ENTRY LEVEL
000009	Rubber_Baby_Buggy_Wheel	98.71	4 INCH SIZE
000010	ITSO REDBOOK 5624-2152	50.00	ACCESSING THE AS/400 WITH JAVA
000011	ITSO REDBOOK 5624-2163	20.87	BUILDING AS/400 APPLICATIONS WITH JAVA
000012	Plastic_Garbage_Pail	22.40	36 GALLON CAPACITY
000013	Doll_House_Furniture	24.22	KITCHEN ONLY
000014	Plan_Podcasts_Pants	10.28	SEVERAL COLORS AVAILABLE
000015	25_Inch_Color_TV's	63.75	BUILT-IN VCR
000016	Multi-System_Paper	71.57	STANDARD US SIZE
000017	Magical_Mystery_Maze	39.83	FOR BEGINNERS
000018	Radio_Controlled_Plane	12.41	CHEAP MODEL
000019	Radio_Controlled_Plane	50.44	BETTER MODEL
000020	Square_Plastic_Calendar	49.04	FIVE YEAR CALENDER

New in 7.0!

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## Agenda

- IBM System i™ Developer Roadmap
- Packaging and Install
- Remote System Explorer (RSE)
  - Getting started
  - Accessing libraries, objects, and members
  - Remote Systems LPEX Editor
  - Other cool (and useful) features
- Integrated Debugger

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## Integrated iSeries Debugger

- RPG, Cobol, CL, C, and C++
- ILE and non ILE, incl. free-form RPG
- DB2 and SQL stored procedures
- Source and Listing view
- Batch, interactive, and Multi-Threaded Applications
- Client/Server Applications
- Distributed Applications

## Debugger Invocation

### Debug As

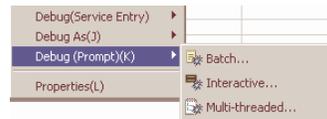
Program  
iSeries job

### Debug (Prompt)

Program  
Service program

### Debug (Service Entry)

ILE Program  
Service program  
Module  
Procedure



To start debug session, select entry in Remote Systems view and use popup-menu, workbench Run menu, debug tool button, or debug pull-down menu.

## Service Entry Points view

- Break is triggered when the first line of a specified procedure is executed in a job that is not under debug.
- Service Entry Points view is automatically displayed when Service Entry Point set.
- List of all Service Entry Points set from the RSE
- Pop-up menu to work with Service Entry Points
  - Set, Modify, Remove, Enable/Disable
- Pull down menu to Clear all or selected Service Entry Points

Library	Program	Program Type	Module	Procedure	User ID	Connection	Enabled
RSELAB10	PAYROLLG	*PGM	*ALL	*ALL	IWEISS	torasbcc	Yes
RSELAB10	CLR1	*PGM	*ALL	*ALL	IWEISS	torasbcc	Yes

## Debug Perspective

**Resume, Suspend, Terminate, Step Into, Step Over, Step Return**

**Call Stack**

**Break Point**

**Current Line**

**Variables Breakpoints Monitored variables Programs under debug**

The screenshot shows the Debug Perspective with several panels:
 

- Top Panel:** Debug toolbar with buttons for Resume, Suspend, Terminate, Step Into, Step Over, and Step Return.
- Left Panel:** Call Stack showing the current thread and its call stack.
- Right Panel:** Variables, Breakpoints, Registers, and Memory panels.
- Bottom Panel:** Source code editor showing assembly code with a green highlight on the current line.
- Bottom Right Panel:** Outline panel showing the project structure.
- Bottom Left Panel:** Console, Tasks, Properties, Debug Console, Series Commands Log, and Memory panels.

## Program Execution

- **Step Into**
  - Debug the next call level
- **Step Over**
  - Run the next call level and stop at the next statement
- **Step Return** (for ILE on V5R3 or higher)
  - Run until you are back in the previous call level and stop at the next statement
- **Resume**
  - Run until an event is encountered
- **Run To Location**
  - Run and stop at the current cursor position or until an event is encountered
- **Suspend**
  - Halt program at point of execution
- **Terminate**
  - End the debug session (but not the job being debugged)

## Setting Breakpoints

### Ways to set a Line Breakpoint:

- Double click in prefix area
- In Editor prefix area, select [Add Breakpoint](#) from pop-up menu
- In Editor, select [Add Breakpoint](#) from pop-up menu
- In Breakpoints view, select [Add Breakpoint >Line](#) from pop-up menu.

### Ways to set a Watch Breakpoint:

Double click variable and

- In Editor, select [Add Watch Breakpoint](#) from pop-up menu
- In Breakpoints view, select [Add Breakpoint > Watch](#) from pop-up menu.

## Conditional Line Breakpoint

Set:

- Frequency
- Value to start
- Value to stop
- Breaks to skip

Expression: Condition must be true for break to happen

## Viewing (and Changing) Fields

1. Select variable
2. Click plus sign for dialog
3. Variable pre-filled
4. Can add dimension

- Data in Monitor view updated at each stop
- Changed data marked in red with triangle icon
- Double click on entry to open for edit, modify value and press Enter

## Display Memory Content

The screenshot shows the IBM Rational Software Development Platform interface. A context menu is open over a memory address, with the 'Monitor Memory' option selected. A sub-menu is visible, showing options like '1 Memory', '2 ASCII/EBCDIC', '3 Signed Integer', '4 Unsigned Integer', '5 Map...', '6 dis.xml', and '7 psb.xml'. The '2 ASCII/EBCDIC' option is highlighted. The main window shows a memory dump with columns for Address, 0-3, 4-7, 8-B, C-F, and Hex. The selected address 0x0b442ba48b017e80 is circled in red.

1. Select variable to display in a Memory view
2. Select Monitor Memory > Memory
3. Displays hex content
4. Select Monitor Memory > ASCII/EBCDIC to display text

- Each variable gets a new tab
- Memory displayed starting with address of selected variable
- Editable for teraspace enabled programs

## Summary

- IBM System i™ Developer Roadmap
  - A starting place for i5/OS application modernization
- Remote System Explorer (RSE)
  - Much more than just a replacement for SEU / PDM
  - Modern application development tools for i5/OS developers
  - First step in the roadmap
- Lots of resources available to get you started:
  - Webcasts and System i magazines
  - WDSC website
    - [www.ibm.com/software/awdtools/wdt400/](http://www.ibm.com/software/awdtools/wdt400/)
    - midrange.com mailing list
    - <http://lists.midrange.com/mailman/listinfo/wdsci-l>
  - IBM Learning Services
  - COMMON and System i Technical Conferences
  - User group meetings



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