IBM Software

UKInnovate2010

The Rational Software Conference

Smarter software for a smarter planet.

IBM Software

UKInnovate2010

The Rational Software Conference

RDp – Future of Development on Power Servers

Andrew Ireland

Smarter software for a smarter planet.

Power your planet.

Smarter systems for a Smarter Planet.

IBM Power Systems

Agenda

- *Solution Overview*
- *Rational Developer for Power - RPG and COBOL Development Tools for IBM*
- *Open Access: RPG edition*
- *Rational Developer for Power – for AIX Development*
- *Summary*

POWER7™ BUILT ON Power™

Announcing: The IBM Rational Solutions for Power Systems

IBM Rational Developer for Power Systems Software

Common developer desktop delivering integrated **developer tools** for Power operating systems and programming languages.

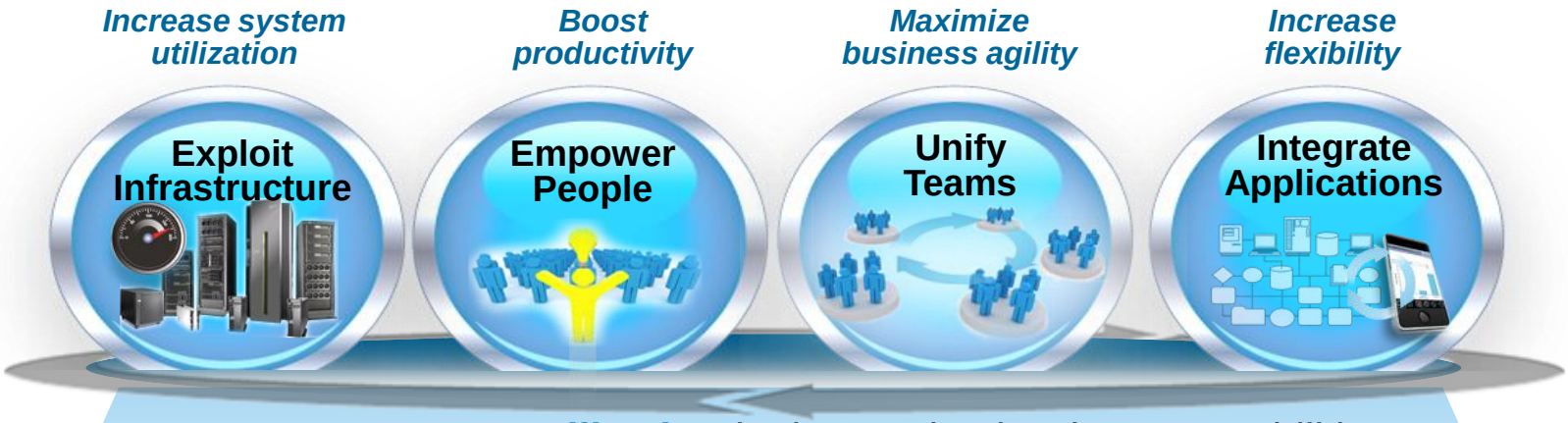
IBM Rational Team Concert for Power Systems Software

Common server infrastructure enables **collaborative coordination** for multi-platform development teams.

IBM Rational Compilers

New **compilers** exploit Power Systems including the latest POWER7 architecture and multi-core technology, boosting performance, productivity and portability.

IBM Rational solutions for Power Systems can help



- **Increase system utilization** by leveraging hardware capabilities
- **Boost productivity** and accelerate innovation with modern skills
- **Maximize business agility** by bridging organizational silos
- **Increase flexibility** by integrating application portfolio

Rational Software Delivery Platform powered by Jazz

IBM Power Systems

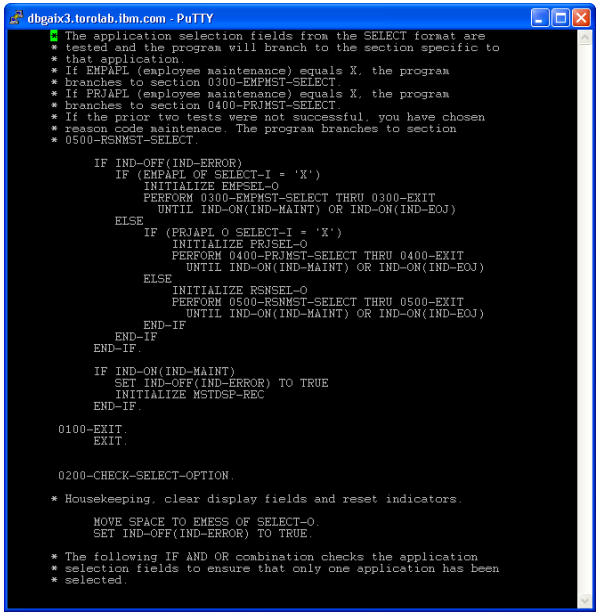
AIX · i for Business · Linux

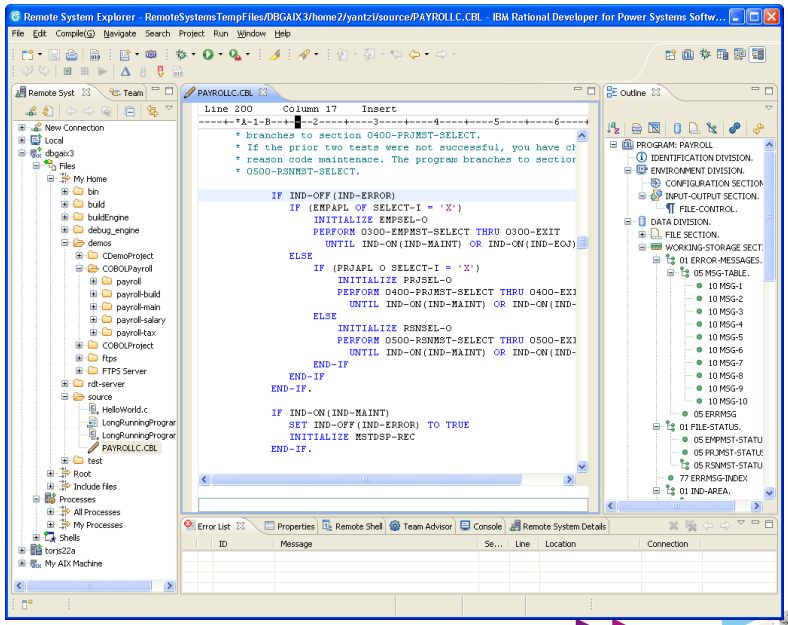
POWER7™ BUILT ON Power™

What is Rational Developer for Power Systems

Rational Developer for Power

- *Modern* workstation development tools for native IBM i and AIX development
- Industry standard Eclipse base development environment
- *Integrated* search, edit, analysis, build, and debug capabilities
- Work with remote files, folders, and processes
- Tools to help developers *understand* applications
- *Replacement* for text based, command line development tools





Power your planet.

Smarter systems for a Smarter Planet.

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POWER7™ BUILT ON Power™

Rational Developer for Power Systems Software

RPG and COBOL Development Tools for IBM i

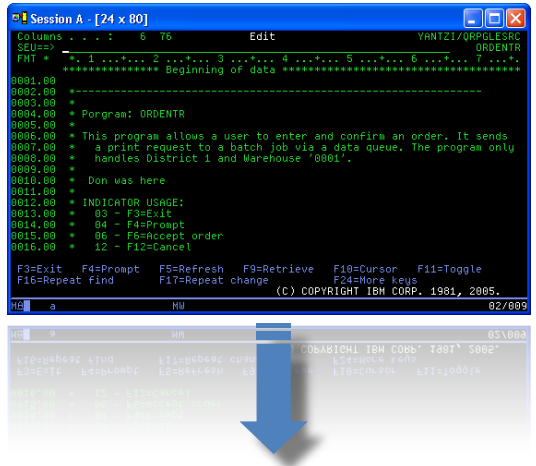
Modern development tools for RPG, COBOL, CL, DDS, and SQL on IBM i

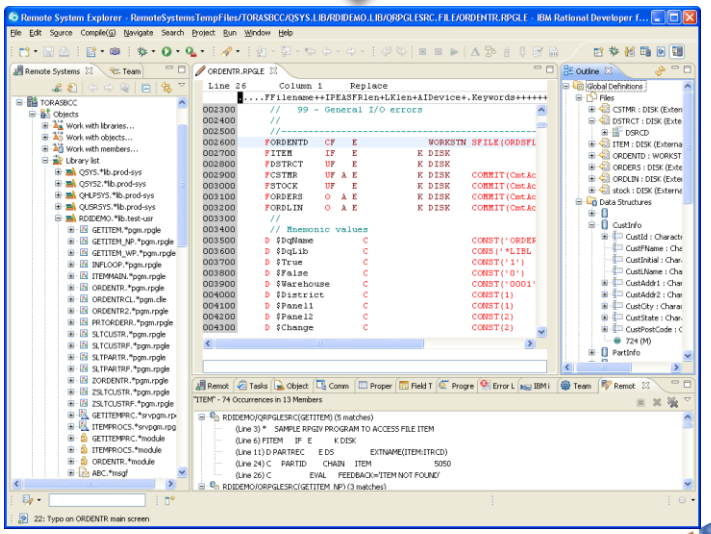
- SEU and PDM still supported but no longer being enhanced
- WDSC went out of support in April
- Replaces Rational Developer for i

Features

- Lightweight, graphical, development tools for RPG, COBOL, CL, DDS, and SQL
- Integrated file access, search, edit, compile and debug
- Rich editing features such as outline view, content assist, formatting, color tokenizing, filtering, searching, compare
- Visualize program structure with Application Diagram
- Easily debug batch, interactive, and Web applications and Web services with a common visual debugger

- Visual DDS design tools: Screen and Report Designer
- Integration with Rational Team Concert for Power





NEW!

Why Use Rational Developer for Power Systems Software

Improved productivity

- Integrated search / edit / compile / debug
- Rich source editing features
- Visual analysis tools
- Visual DDS designers

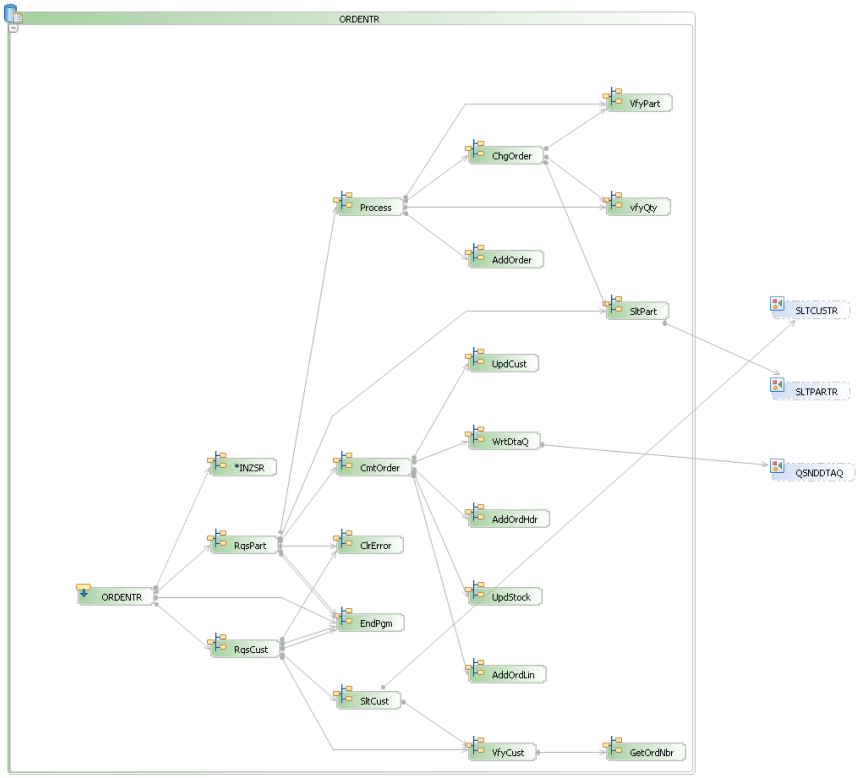
Improved developer skills

- Lower learning curve for other technologies
- Learn Rational Developer for Power (Eclipse) for RPG or COBOL development
- Then use similar Eclipse based tools for Java, Web, EGL, XML, or PHP development

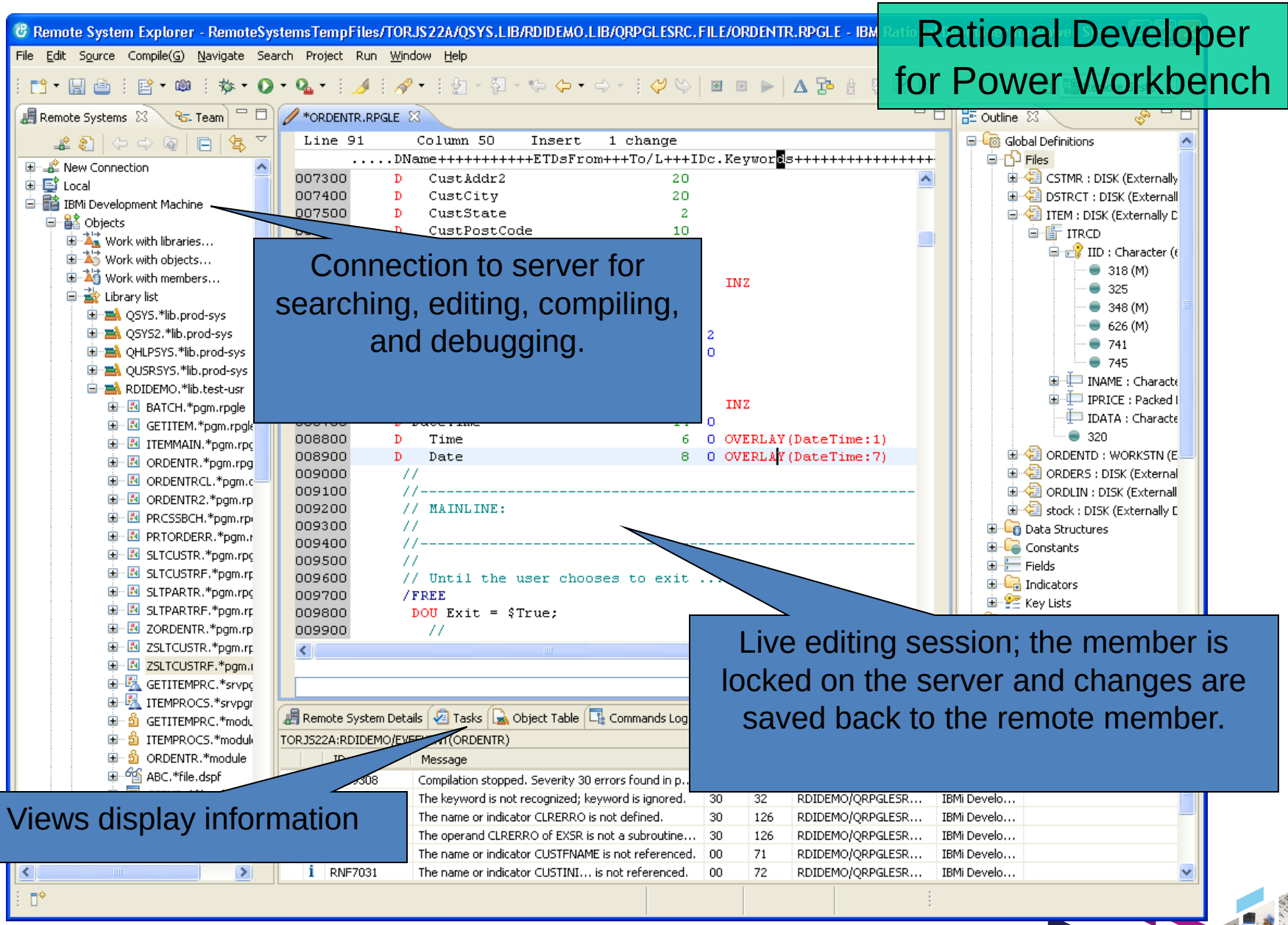
Common development tools across multiple platforms and languages

- Rational Developer for Power
- Rational Application Developer for J2EE
- Rational Business Developer for EGL
- Rational Software Architect for UML modeling

Integration with Rational Team Concert for Power Systems Software



Rational Developer for Power Workbench



Connection to server for searching, editing, compiling, and debugging.

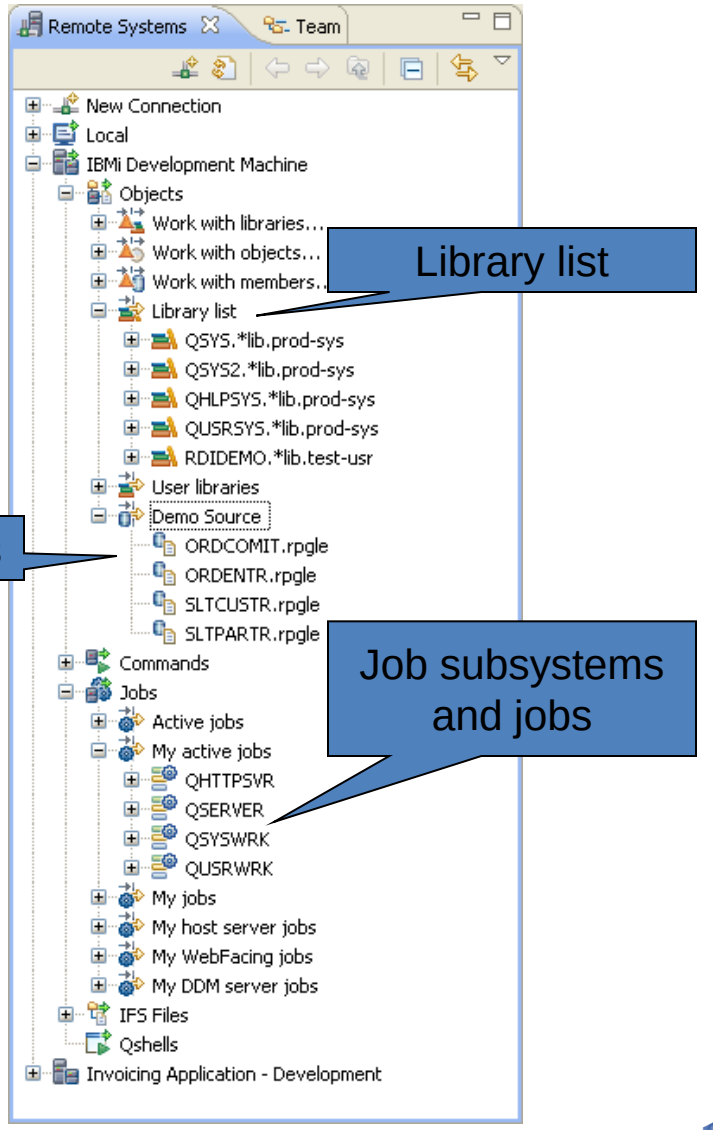
Live editing session; the member is locked on the server and changes are saved back to the remote member.

Views display information

Remote System Explorer

The Remote Systems view allows you to:

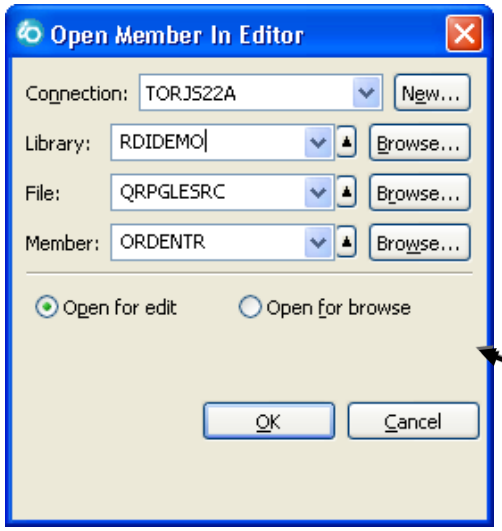
- Define and manage connections to IBM i servers
- Configure library list
- Browse libraries, objects and members
  - Drill down access
  - Filtered access
- Perform actions
  - Copy, renamed, delete, compile, search
  - User defined actions
- Run CL commands
- Browse jobs and run job specific actions
- Access IFS files and folders
- Start remote Qshells sessions

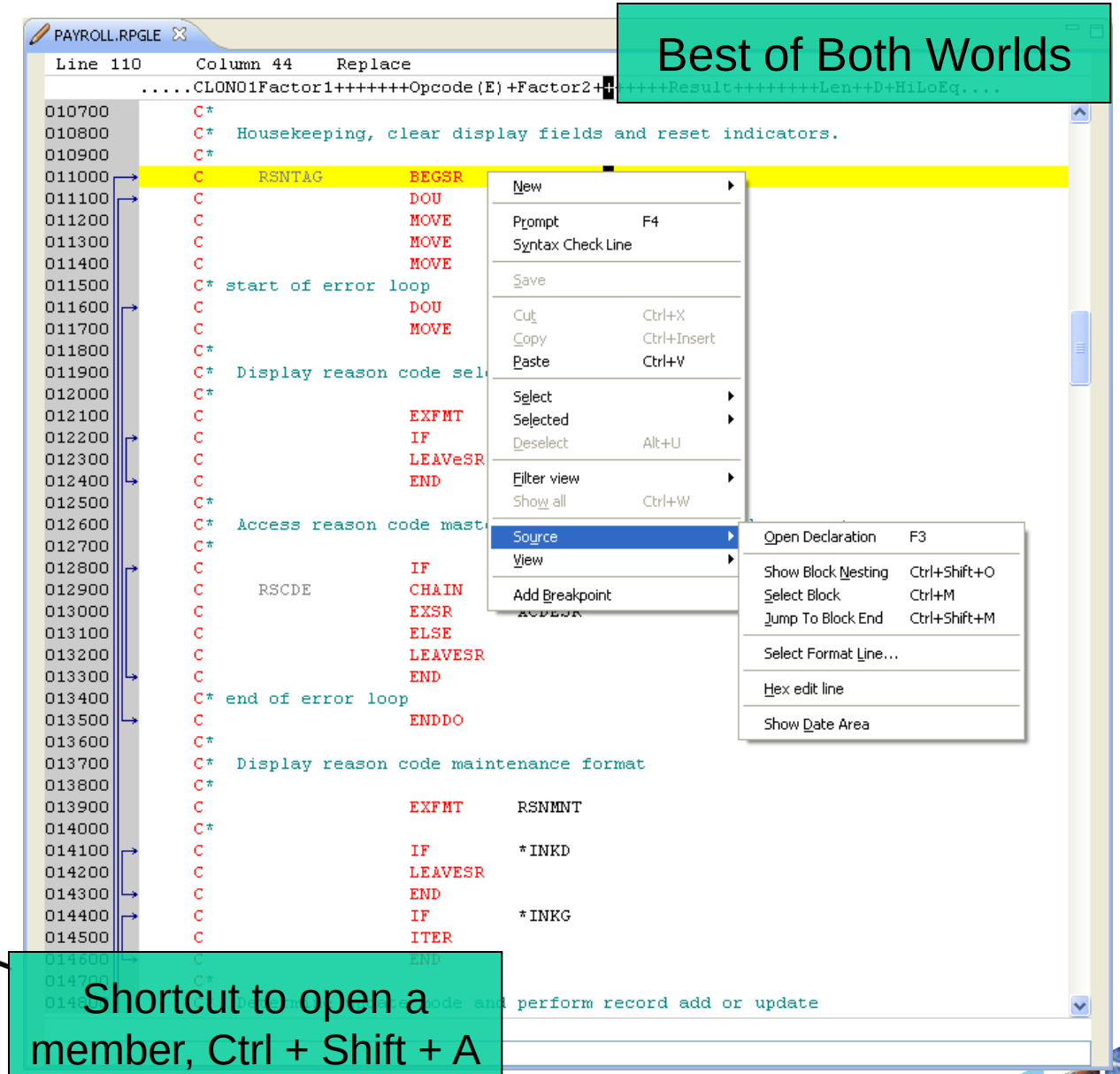


Remote Systems LPEX Editor

SEU look and feel
- Prefix commands
- Date fields
- Syntax checking
- Prompting

Modern look and feel
- Colors!
- Modern editor features

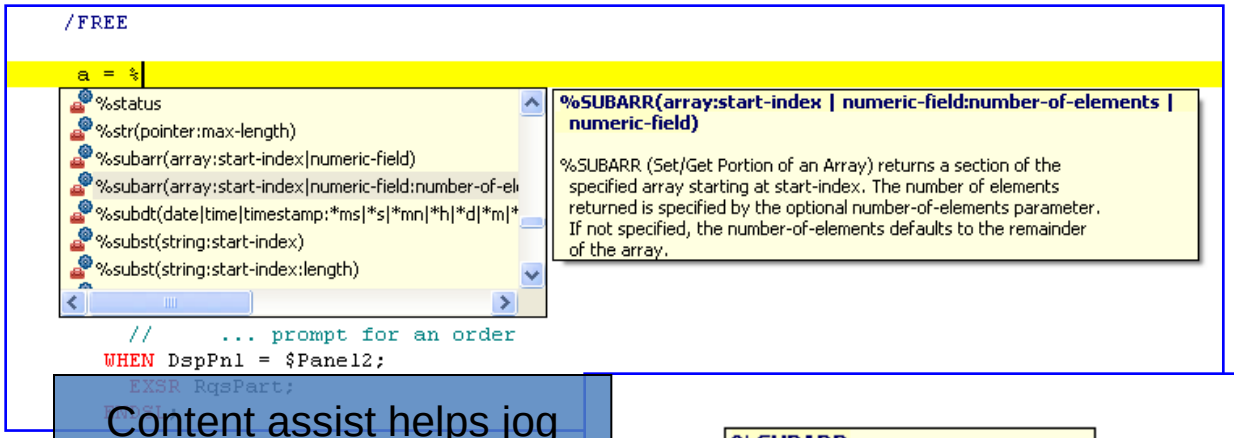




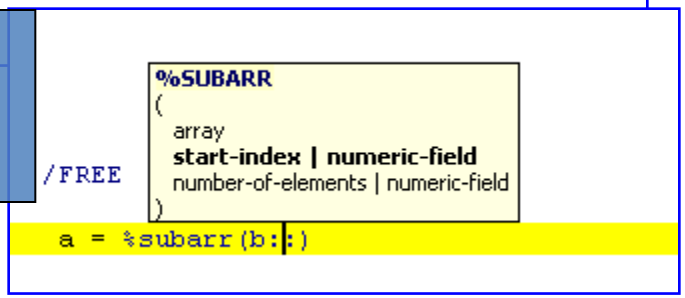
Best of Both Worlds

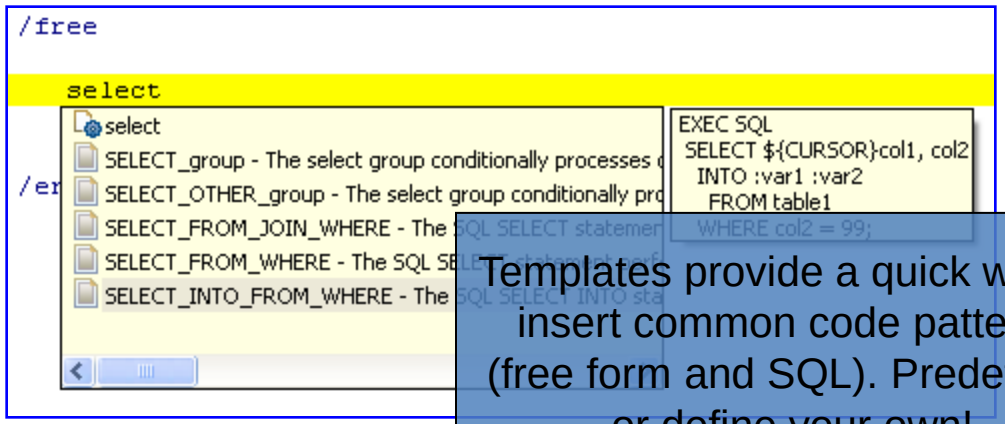
Shortcut to open a member, Ctrl + Shift + A

Outline View and Content Assist

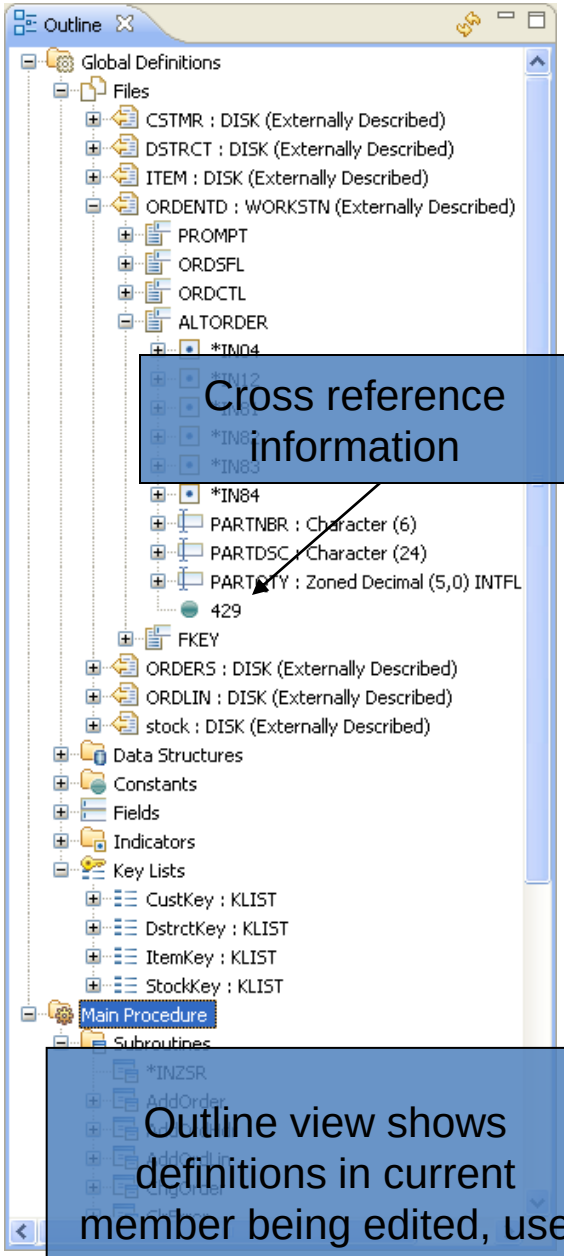


Content assist helps jog your memory (opcodes, BIFs, fields)





Templates provide a quick way to insert common code patterns (free form and SQL). Predefined or define your own!

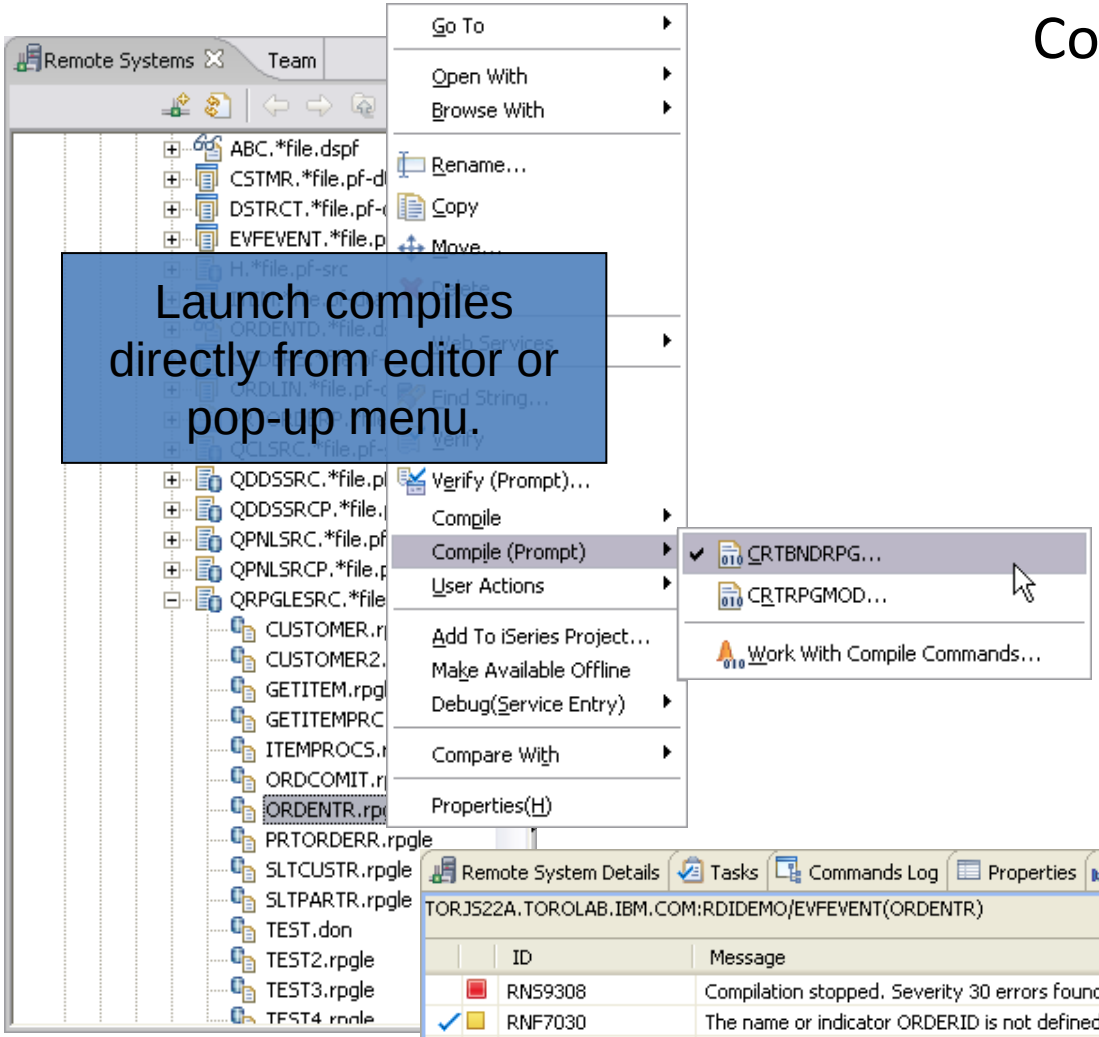


Cross reference information

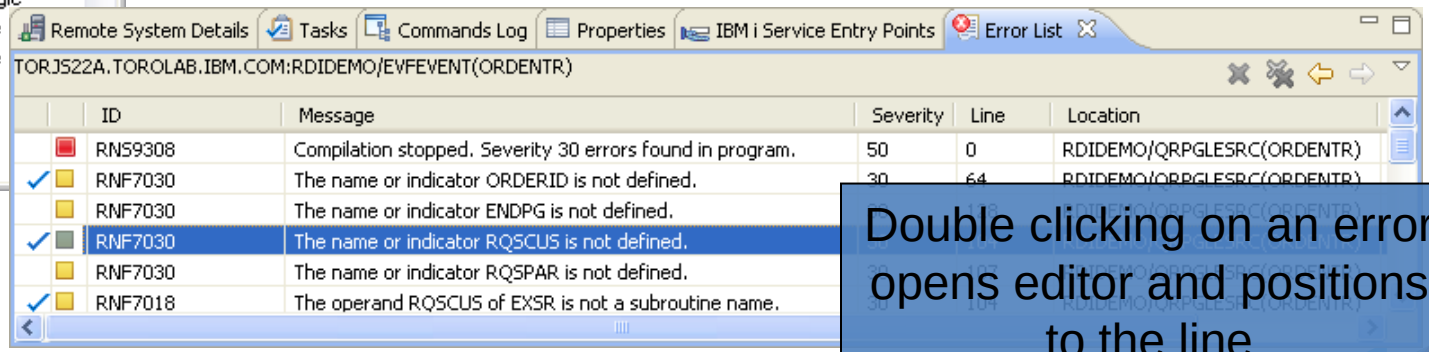
Outline view shows definitions in current member being edited, use for quick navigation.

Compiling (and Fixing Errors) Integrated Error Feedback

Launch compiles directly from editor or pop-up menu.



Compile errors automatically downloaded and shown in Error List



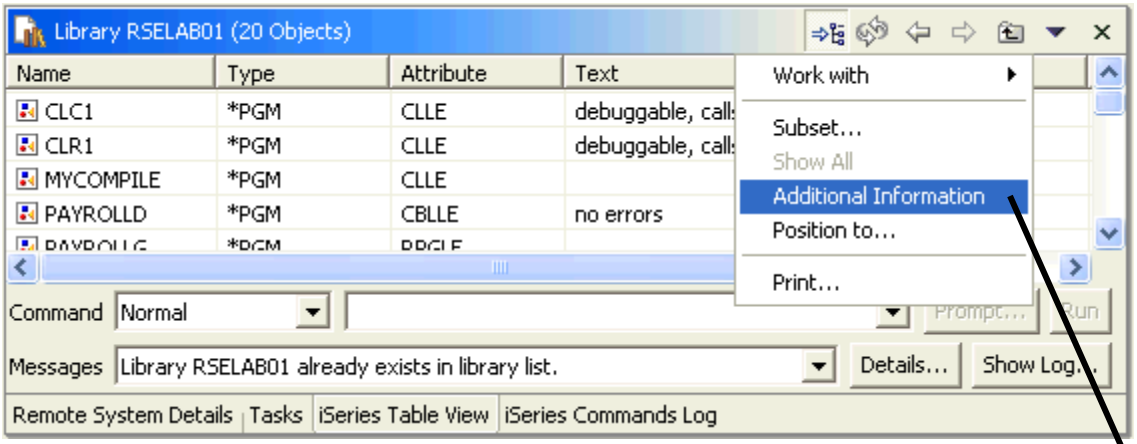
Double clicking on an error opens editor and positions to the line

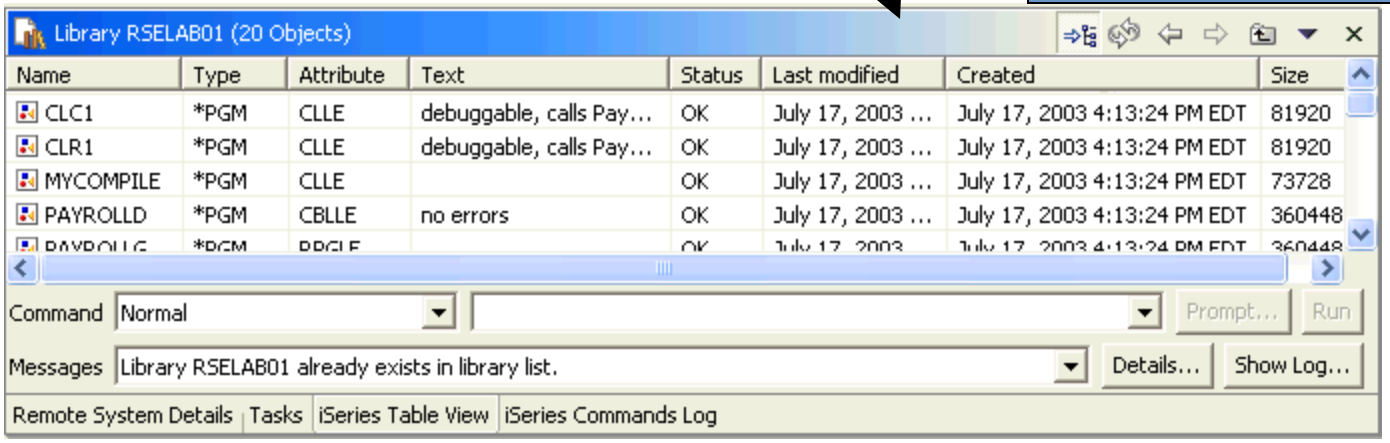
Object Table View

Table view eases migration from PDM to RSE!

- ✓Change contents
- ✓Subset
- ✓Sort
- ✓Position list
- ✓Print list

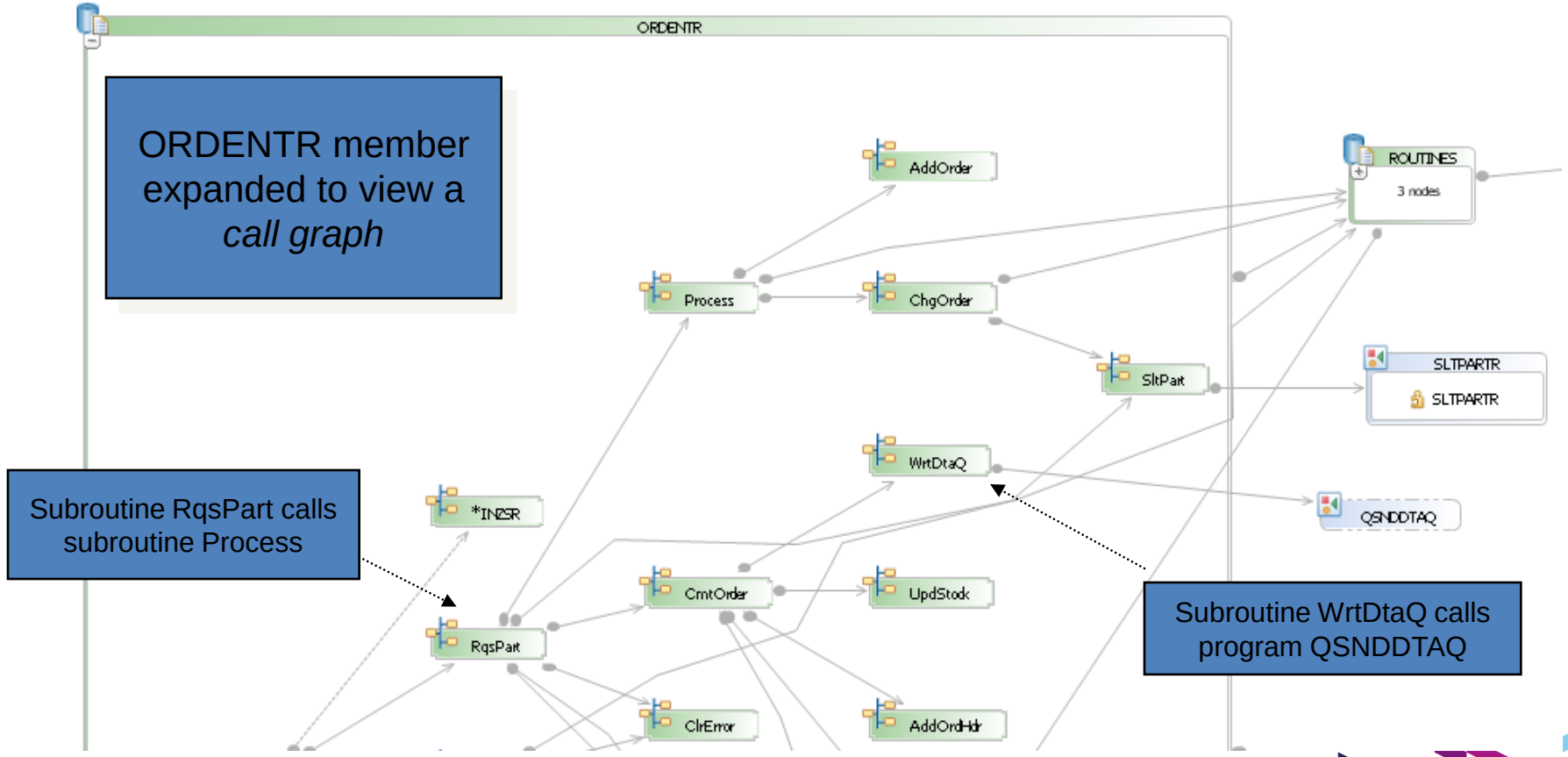
- ✓…. Just like PDM!



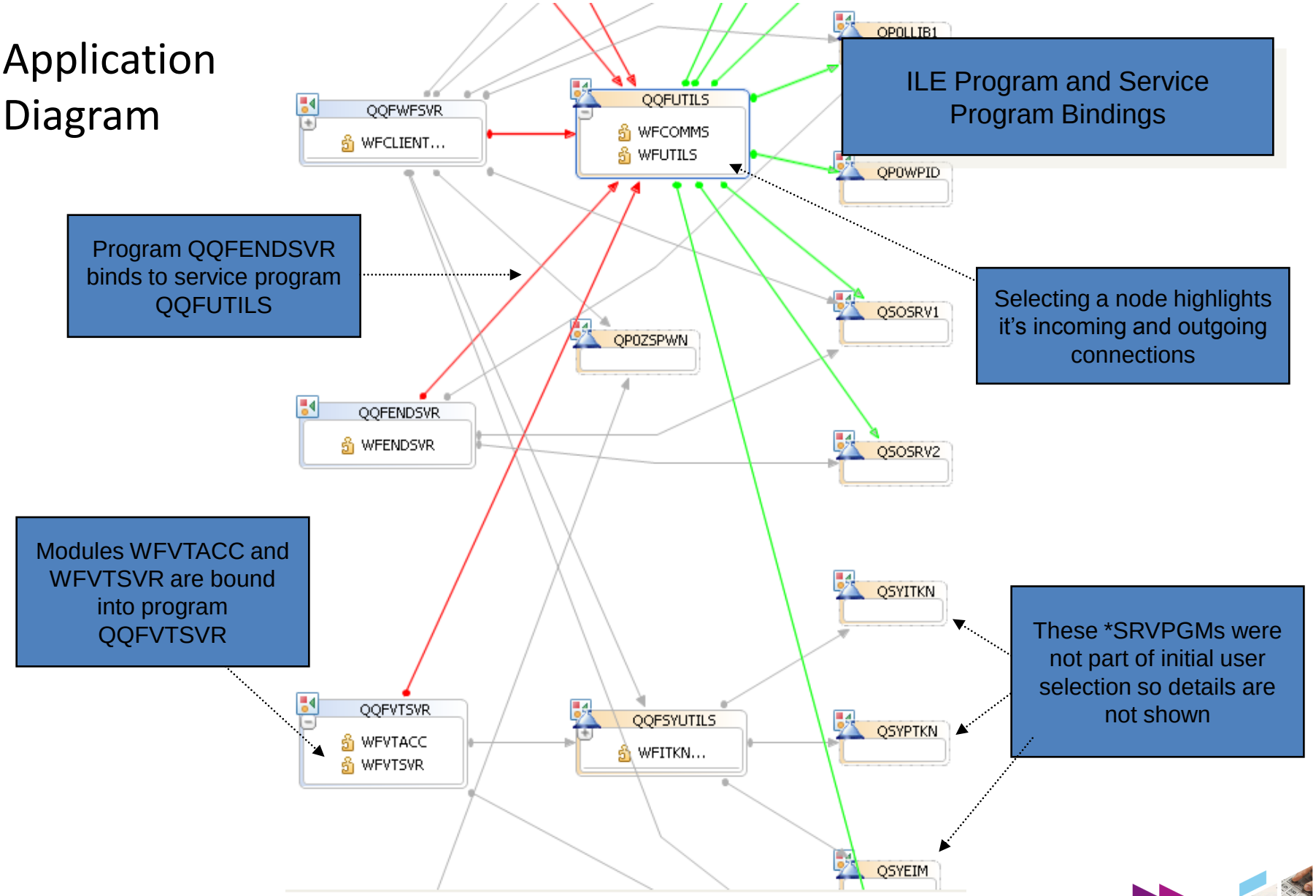


Application Diagram

- Provides developers with a graphical overview of the structure of their native i applications
  - Call graph showing subroutine, procedure, and program calls
  - ILE program and service program bindings



Application Diagram



ILE Program and Service Program Bindings

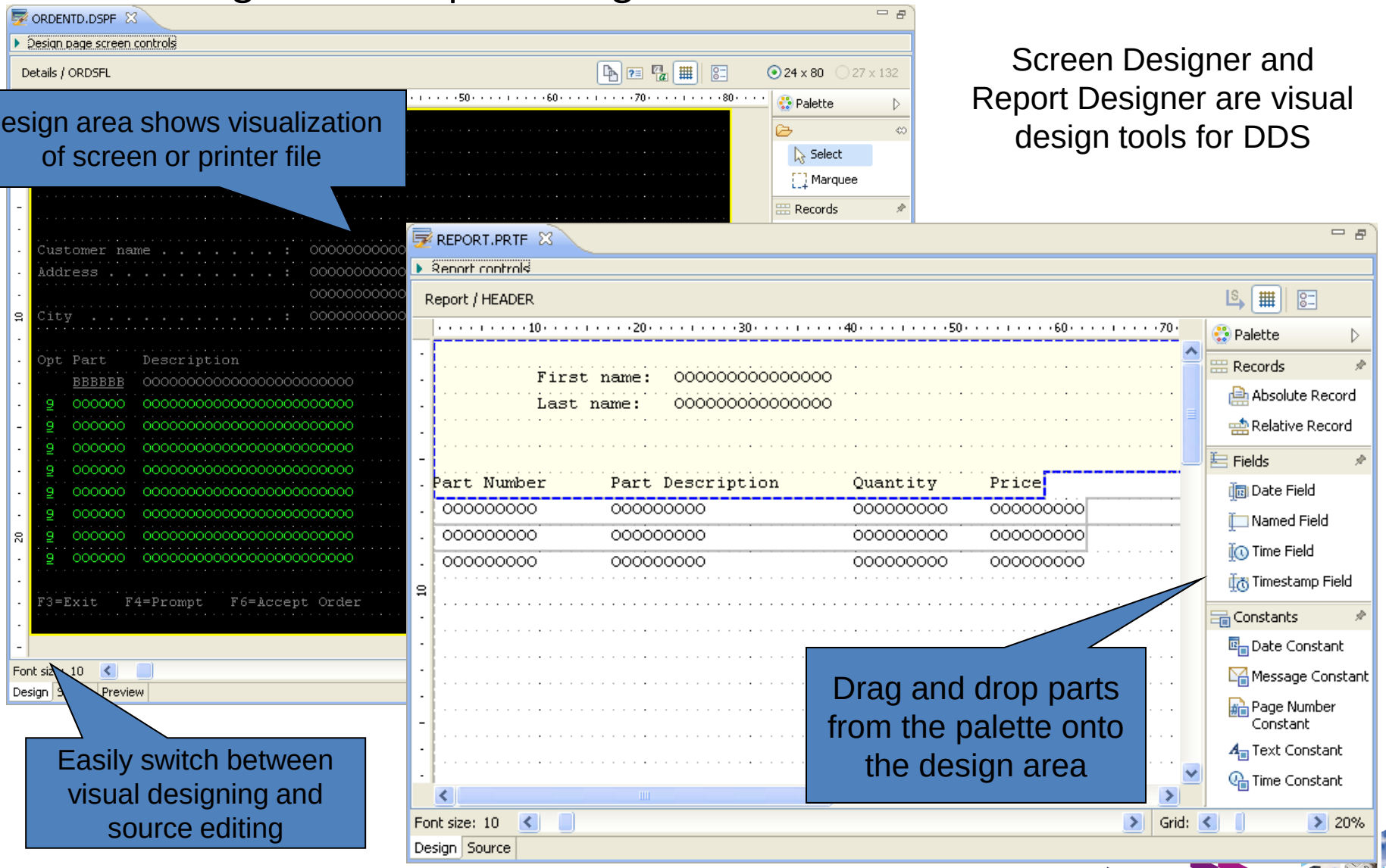
Program QQFENDSVR binds to service program QQFUTILS

Selecting a node highlights it's incoming and outgoing connections

Modules WFVTACC and WFVTSVR are bound into program QQFVTSVR

These *SRVPGMs were not part of initial user selection so details are not shown

Screen Designer and Report Designer



Design area shows visualization of screen or printer file

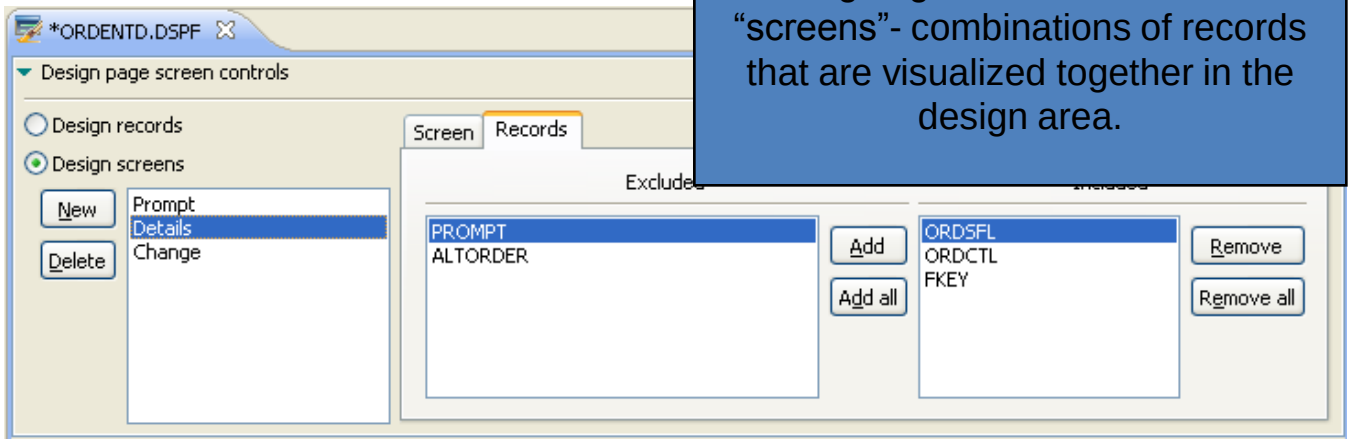
Screen Designer and Report Designer are visual design tools for DDS

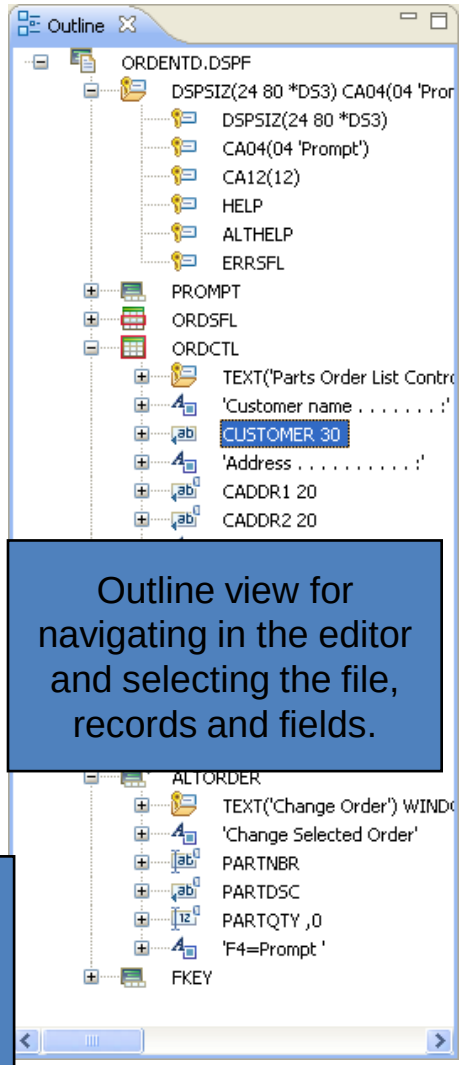
Easily switch between visual designing and source editing

Drag and drop parts from the palette onto the design area

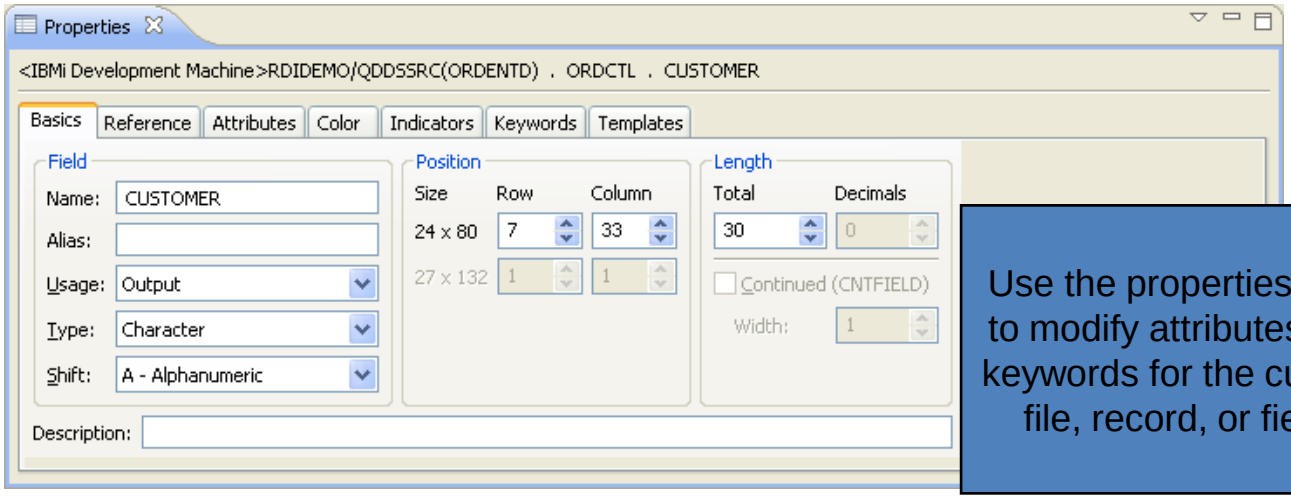
Screen Designer and Report Designer

Screen/Report controls area allows designing individual records or "screens"- combinations of records that are visualized together in the design area.





Outline view for navigating in the editor and selecting the file, records and fields.



Use the properties view to modify attributes and keywords for the current file, record, or field.

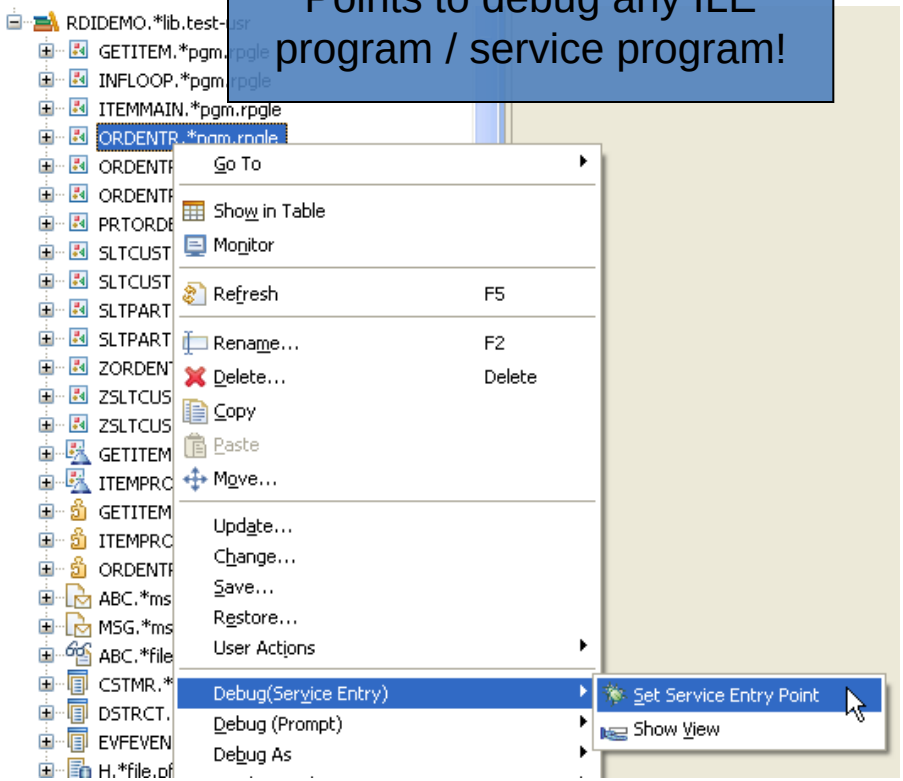
Integrated i Debugger - Overview

- RPG, COBOL, CL, C, and C++
- ILE and non-ILE
- DB2 and SQL stored procedures
- Source and Listing view
- Batch, interactive, and Multi-Threaded Applications
- Web applications
- Client/Server applications
- Distributed applications

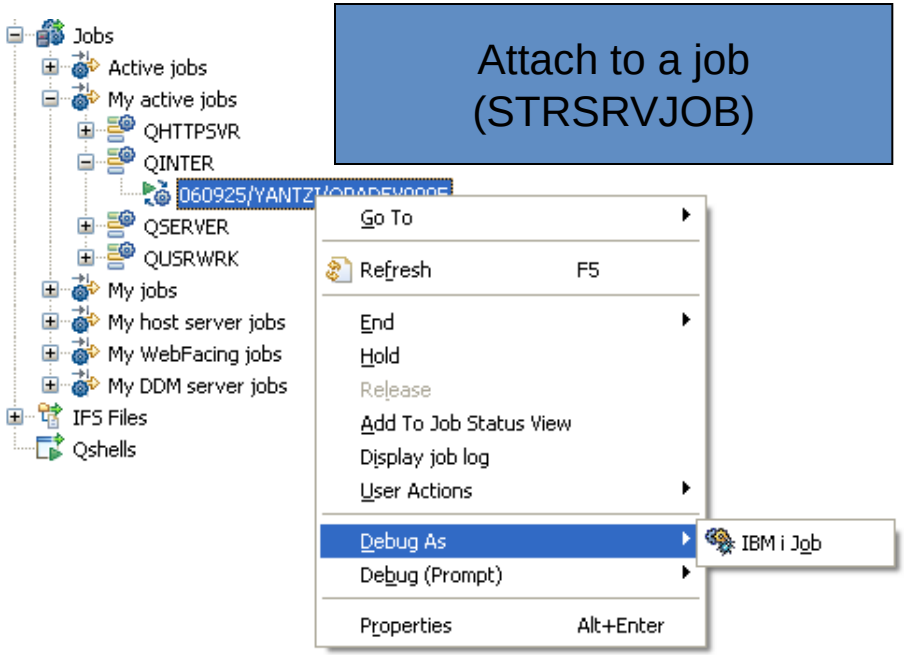
Launching the Debugger

One Click Actions

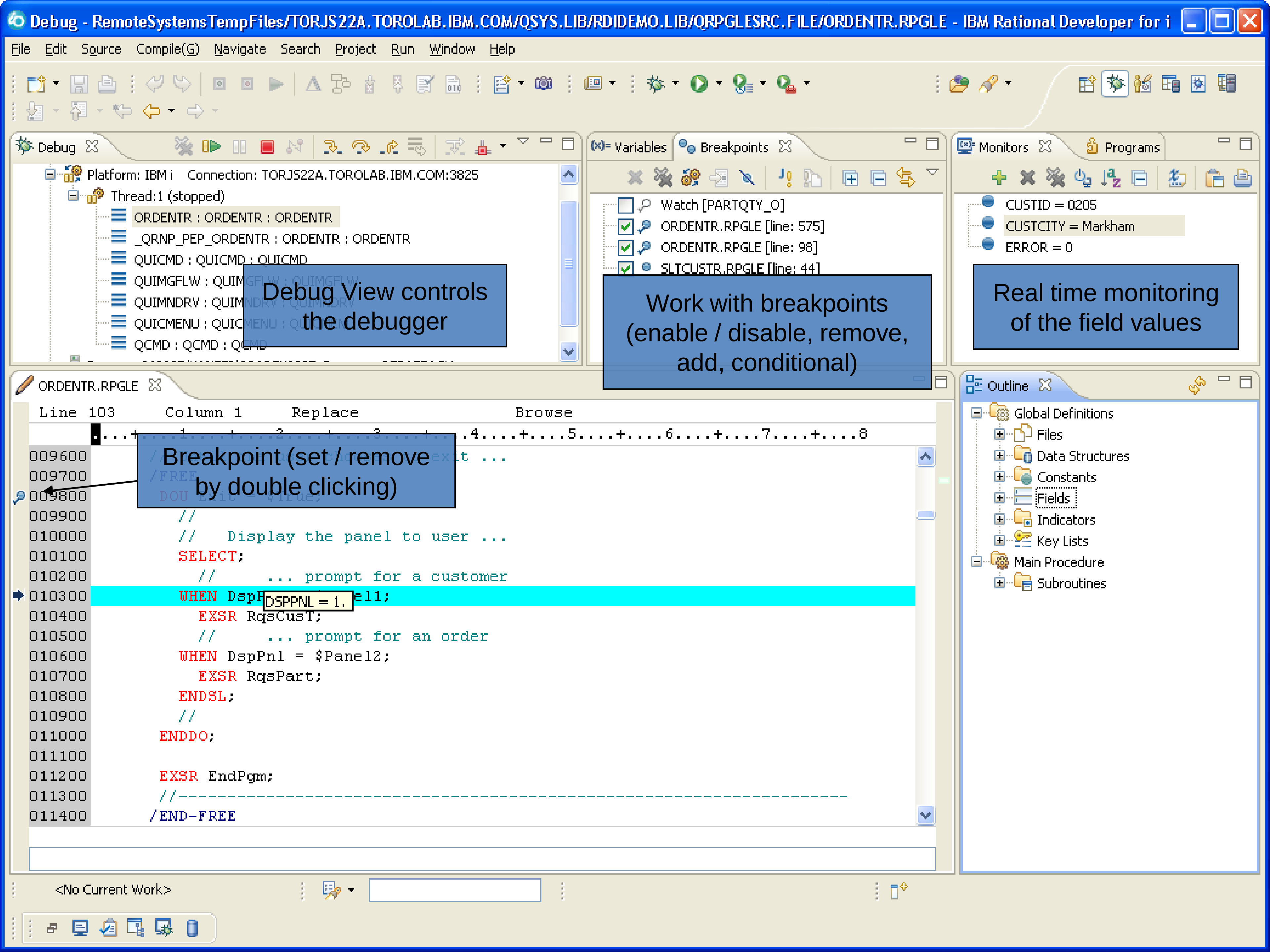
Always use Service Entry Points to debug any ILE program / service program!



Attach to a job (STRSRVJOB)



Single click debug for batch (don't use for interactive – use service entry points or debug job)


Debug - RemoteSystemsTempFiles/TORJS22A.TOROLAB.IBM.COM/QSYS.LIB/RDIDEMO.LIB/QRPGLESRC.FILE/ORDENTR.RPGLE - IBM Rational Developer for i
Debug View controls the debugger
Work with breakpoints (enable / disable, remove, add, conditional)
Real time monitoring of the field values
Breakpoint (set / remove by double clicking)
Platform: IBM i Connection: TORJS22A.TOROLAB.IBM.COM:3825
Thread:1 (stopped)
ORDENTR : ORDENTR : ORDENTR
Watch [PARTQTY_O]
ORDENTR.RPGLE [line: 575]
ORDENTR.RPGLE [line: 98]
SLTCUSTR.RPGLE [line: 44]
CUSTID = 0205
CUSTCITY = Markham
ERROR = 0
Line 103 Column 1 Replace Browse
DSPPNL = 1.
Global Definitions
Files
Data Structures
Constants
Fields
Indicators
Key Lists
Main Procedure
Subroutines

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What is Rational Open Access: RPG Edition?

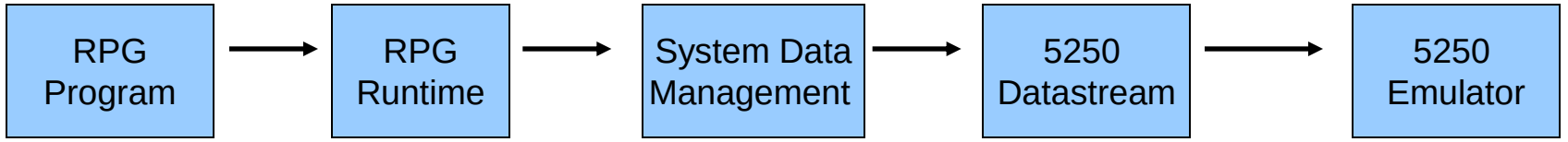
IBM has opened the RPG I/O interface to allow programmers to extend their applications to access resources beyond the native interfaces available in previous releases of RPG.

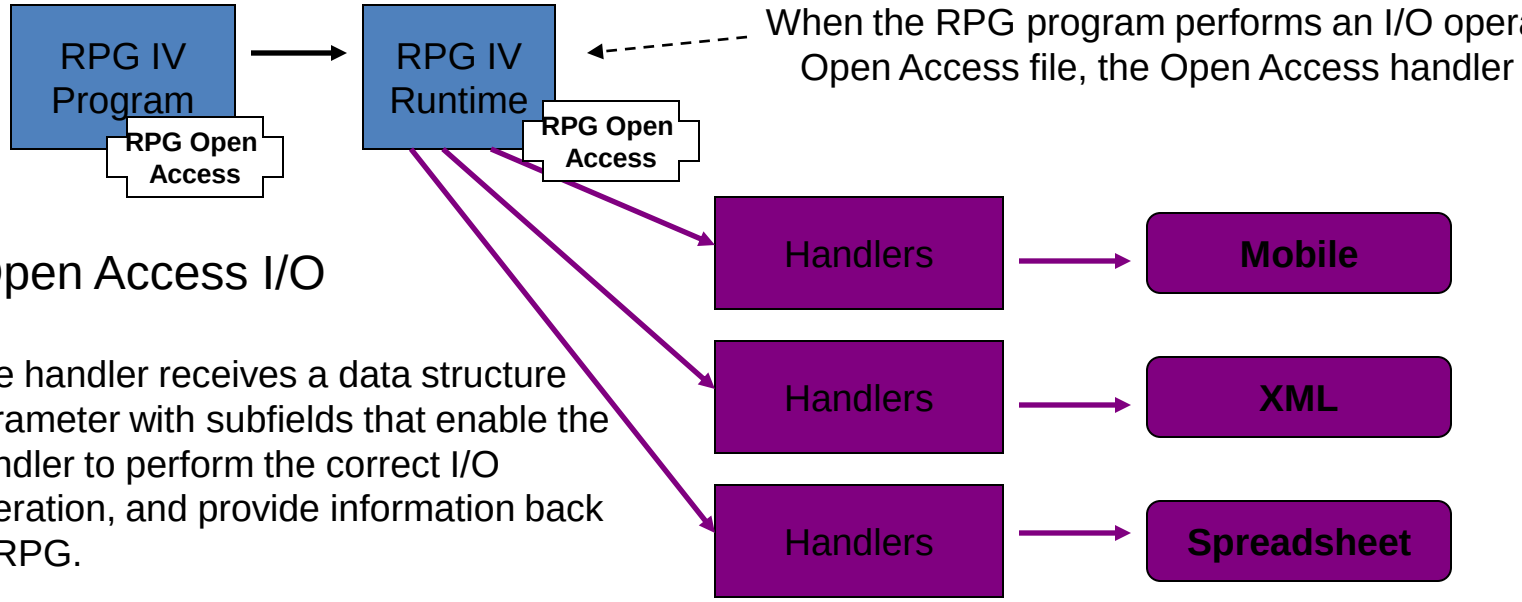
Developers are able to direct RPG IV I/O operations to devices other than traditional 5250 screens, printer files, or native database. Such as: Web browsers, mobile devices, Web services, XML, or spreadsheets to name a few. This feature is limitless once programmer imagination and modern coding techniques are applied to business applications.

How Does Open Access Work?

When an RPG program performs an I/O operation for a “normal” file, a system data management function is called to handle the operation

Traditional I/O





Open Access I/O

The handler receives a data structure parameter with subfields that enable the handler to perform the correct I/O operation, and provide information back to RPG.

Details…

Who provides the handlers?

- Open Access does not provide the handlers
- Anyone can write the handlers that extend RPG IV's I/O capabilities to new resources and devices

Software tool vendors

Business partners

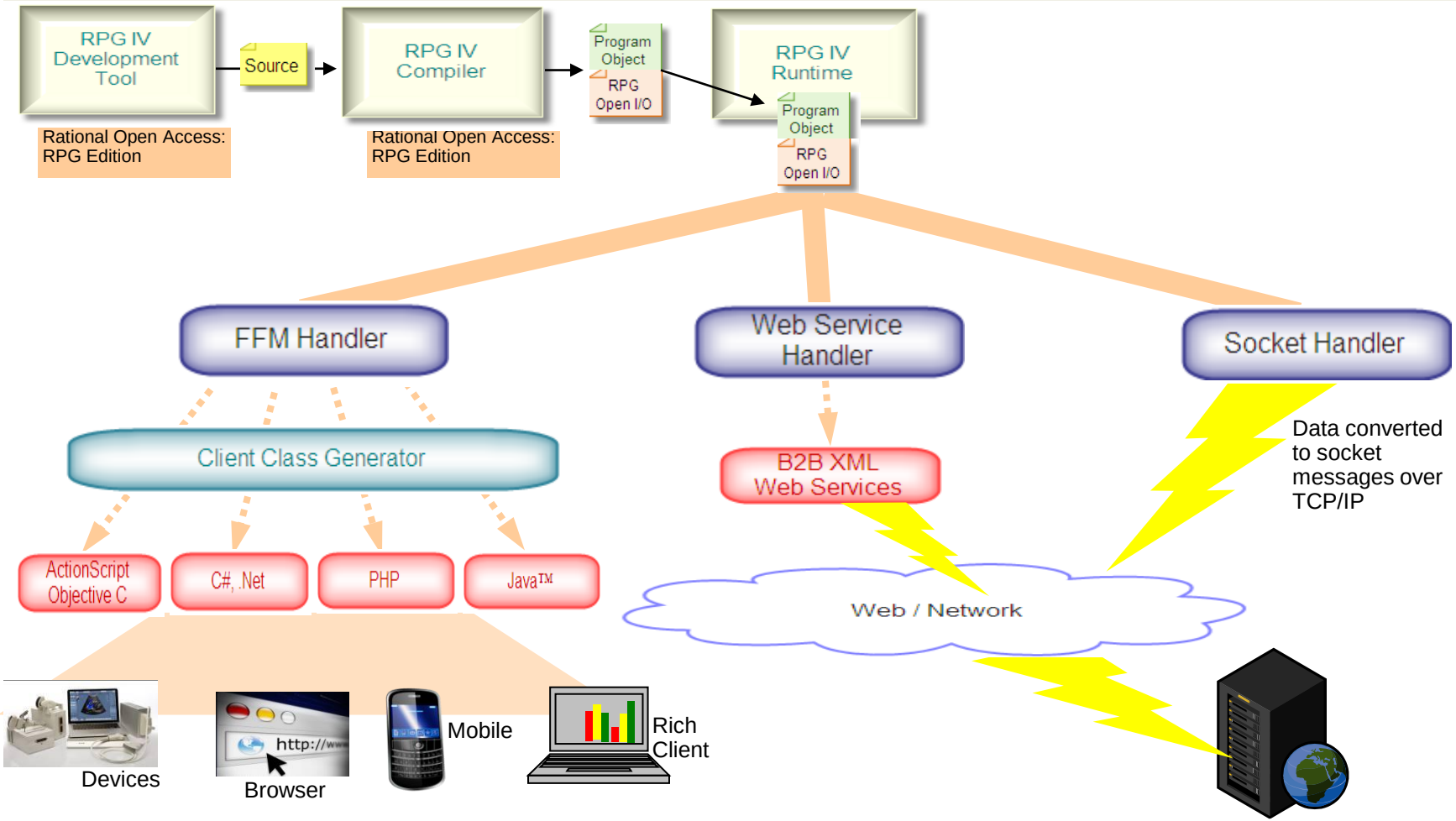
Services organizations

Programmers

What device type to use?

- Any RPG device type can be defined as an Open Access file: DISK, PRINTER, or WORKSTN
- The provider of the handling procedure can choose the RPG device-type that best fits the function that the handler provides
- Examples:
  - User interface device: WORKSTN file
  - Creating an spreadsheet: PRINTER file
  - Accessing a Web service: keyed DISK file

Real World Example
STG Lab Services: RPG Handlers for Interfacing Applications



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ILE RPG Enhancements

Many enhancements have been made to ILE RPG over the past releases of IBM i and 7.1 is no exception

Enhancements are based on user feedback, system changes, and language improvements

Improve code quality and ease application maintenance

- ✓ Support for ALIAS names in externally-described data structures
- ✓ New built-in function %PARMNUM

Improve programmer productivity

- ✓ Sort and search data structures
- ✓ Sort Ascend or descend
- ✓ New and updated built-in functions %LEN and %SCANRPL
- ✓ Optional prototypes

Improve performance

- ✓ Performance when returning large values

Allow RPG to be used in today's mixed environments

- ✓ Implicit Unicode conversion for parameters
- ✓ New options for XML-INTO (also available with a PTF for 6.1)

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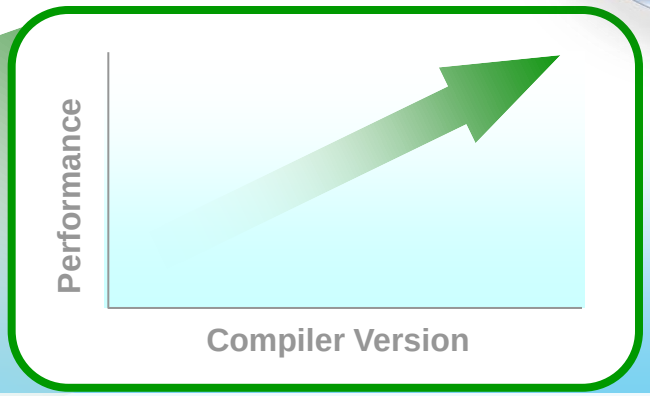
Compilers on Power Systems

IBM Power Systems



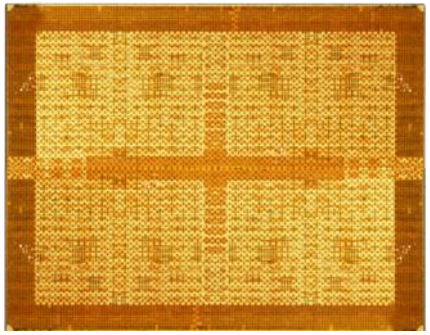
***Same* hardware + *NEW* compiler**
= *Increased* Performance

***NEW* hardware + *NEW* compiler**
= *Maximum* Performance

- ✓ Exploit multi-core capabilities of your hardware
- ✓ Improve performance of your application suite
- ✓ Easily port applications to IBM platforms

- IBM XL C/C++ for AIX and Linux
- IBM XL Fortran for AIX and Linux
- IBM COBOL for AIX
- IBM PL/I for AIX
- IBM WebSphere® Development Studio (IBM i compilers)

Advanced Optimization & Exploitation



- XL C/C++ v11 is key to delivering application performance for POWER7 systems

- Enhancements to industry leading optimization technology
  - Exploitation of POWER7 architecture
    - Software pipelining, instruction scheduling, code generation…
    - Exploit Vector-Scalar Extension (VSX) unit
  - Memory optimization, Loop optimization, Auto-SIMDization, Auto-parallelization…

- Industry Leadership on Performance with latest IBM Rational XL C/C++ and XL Fortran Compilers on POWER7

IBM COBOL Products

Enterprise COBOL for z/OS

- Leading-edge IBM z/OS-based compiler
- Helps create and maintain mission-critical, line-of-business COBOL applications targeted to execute on z/OS systems
- Helps integrate COBOL and web-based business processes in Web Services, XML, Java™ and COBOL applications
- Provides access to IBM DB2®, IBM CICS®, and IBM IMS™ systems

COBOL for AIX

- Productive and powerful development tool for building COBOL applications
  - includes COBOL compiler, COBOL library, and distributed debugger for the AIX
- Based on Enterprise COBOL for z/OS
- Provides access to IBM DB2®, and IBM CICS TX®
- Certified to work with Oracle and Tuxedo

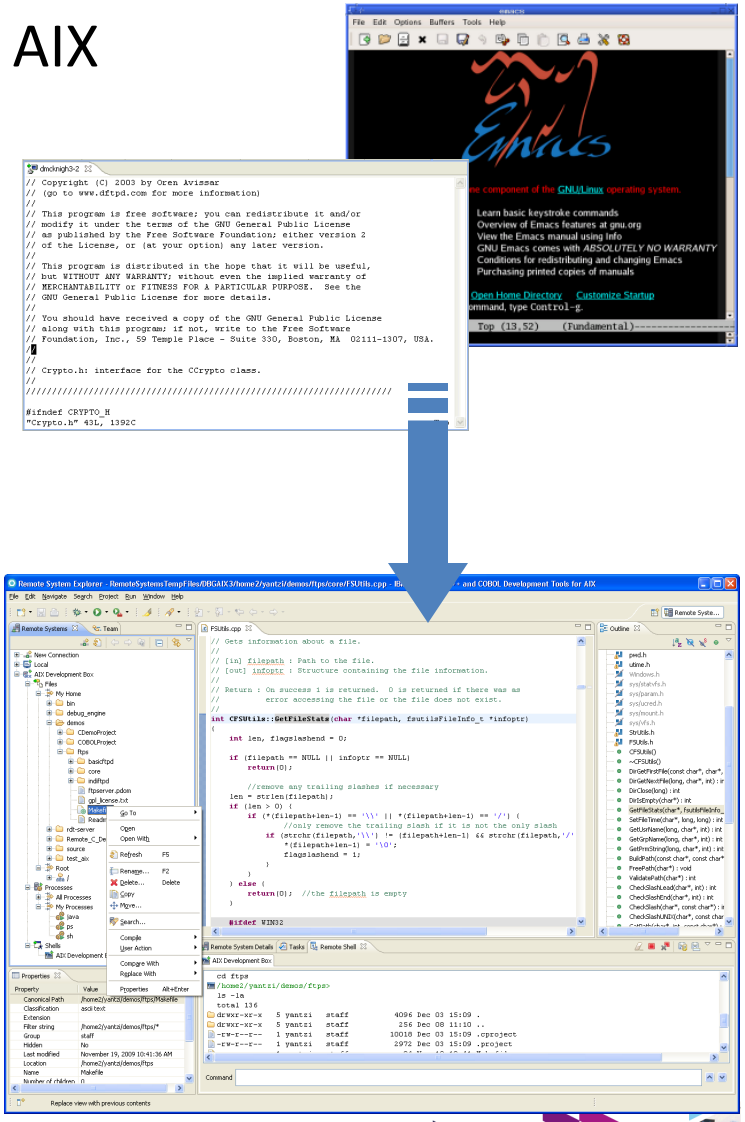
Rational Developer for Power Systems Software C/C++ & Cobol Development Tools for AIX

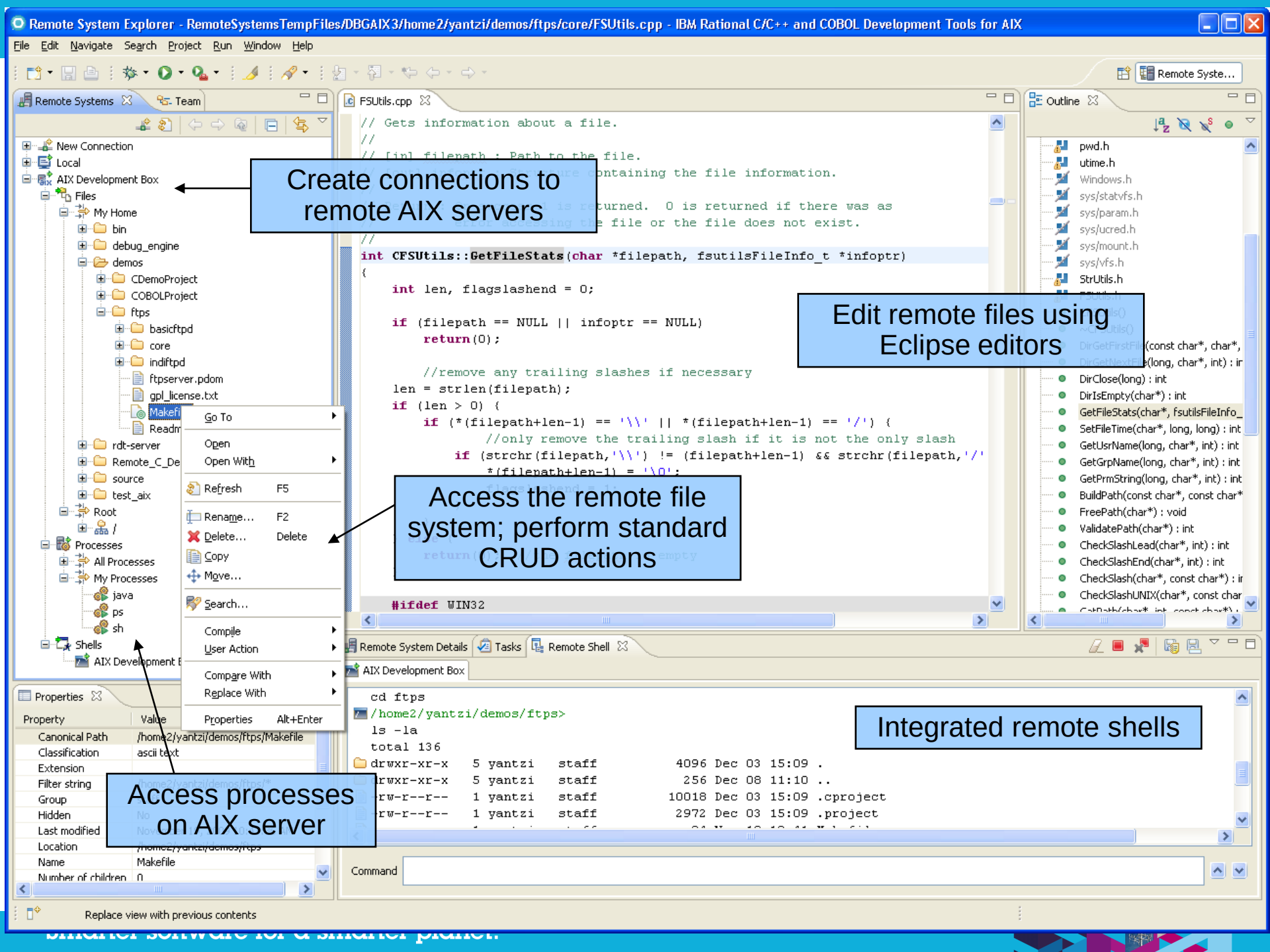
NEW!

Modern development environment for C/C++ development on AIX

- Based on Eclipse
- Integrated search, edit, build, and debug
- Remote access to files, processes, and shells
- Language aware searching
- Rich editing features
- Integrated build with error feedback
- Remote debug
- Analysis tools
- Integration with Rational Team Concert for Power Systems Software

Replacement (compliment) to text based and command development tools




Remote System Explorer - RemoteSystemsTempFiles/DBGAIX3/home2/yantzi/demos/ftps/core/FSUtils.cpp - IBM Rational C/C++ and COBOL Development Tools for AIX
File Edit Navigate Search Project Run Window Help
Remote Systems
Team
New Connection
Local
AIX Development Box
Files
My Home
bin
debug_engine
demos
CDemoProject
COBOLProject
ftps
basicftpd
core
indiftpd
ftpserver.pdom
gpl_license.txt
Makefile
Readme
rdt-server
Remote_C_De
source
test_aix
Root
/
Processes
All Processes
My Processes
java
ps
sh
Shells
AIX Development
Create connections to remote AIX servers
Go To
Open
Open With
Refresh F5
Rename... F2
Delete... Delete
Copy
Move...
Search...
Compile
User Action
Compare With
Replace With
Properties Alt+Enter
Access the remote file system; perform standard CRUD actions
Access processes on AIX server
FSUtils.cpp
// Gets information about a file.
//
// [in] filepath : Path to the file.
// containing the file information.
// is returned. 0 is returned if there was as
// error accessing the file or the file does not exist.
//
int CFSUtils::GetFileStats(char *filepath, fsutilsFileInfo_t *infoptr)
{
int len, flagslashend = 0;
if (filepath == NULL || infoptr == NULL)
return(0);
//remove any trailing slashes if necessary
len = strlen(filepath);
if (len > 0) {
if (*(filepath+len-1) == '\\' || *(filepath+len-1) == '/') {
//only remove the trailing slash if it is not the only slash
if (strchr(filepath,'\\') != (filepath+len-1) && strchr(filepath,'/'
*(filepath+len-1) = '\0';
#ifdef WIN32
Outline
pwd.h
utime.h
Windows.h
sys/statvfs.h
sys/param.h
sys/ucred.h
sys/mount.h
sys/vfs.h
StrUtils.h
DirClose(long) : int
DirIsEmpty(char*) : int
GetFileStats(char*, fsutilsFileInfo_
SetFileTime(char*, long, long) : int
GetUsrName(long, char*, int) : int
GetGrpName(long, char*, int) : int
GetPrmString(long, char*, int) : int
BuildPath(const char*, const char*
FreePath(char*) : void
ValidatePath(char*) : int
CheckSlashLead(char*, int) : int
CheckSlashEnd(char*, int) : int
CheckSlash(char*, const char*) : i
CheckSlashUNIX(char*, const char
Edit remote files using Eclipse editors
Remote System Details
Tasks
Remote Shell
AIX Development Box
cd ftps
/home2/yantzi/demos/ftps>
ls -la
total 136
drwxr-xr-x 5 yantzi staff 4096 Dec 03 15:09 .
drwxr-xr-x 5 yantzi staff 256 Dec 08 11:10 ..
-rw-r--r-- 1 yantzi staff 10018 Dec 03 15:09 .cproject
-rw-r--r-- 1 yantzi staff 2972 Dec 03 15:09 .project
Integrated remote shells
Command
Properties
Property Value
Canonical Path /home2/yantzi/demos/ftps/Makefile
Classification ascii text
Extension
Filter string
Group
Hidden
Last modified
Location
Name Makefile
Number of children 0
Replace view with previous contents

Integrated Debug

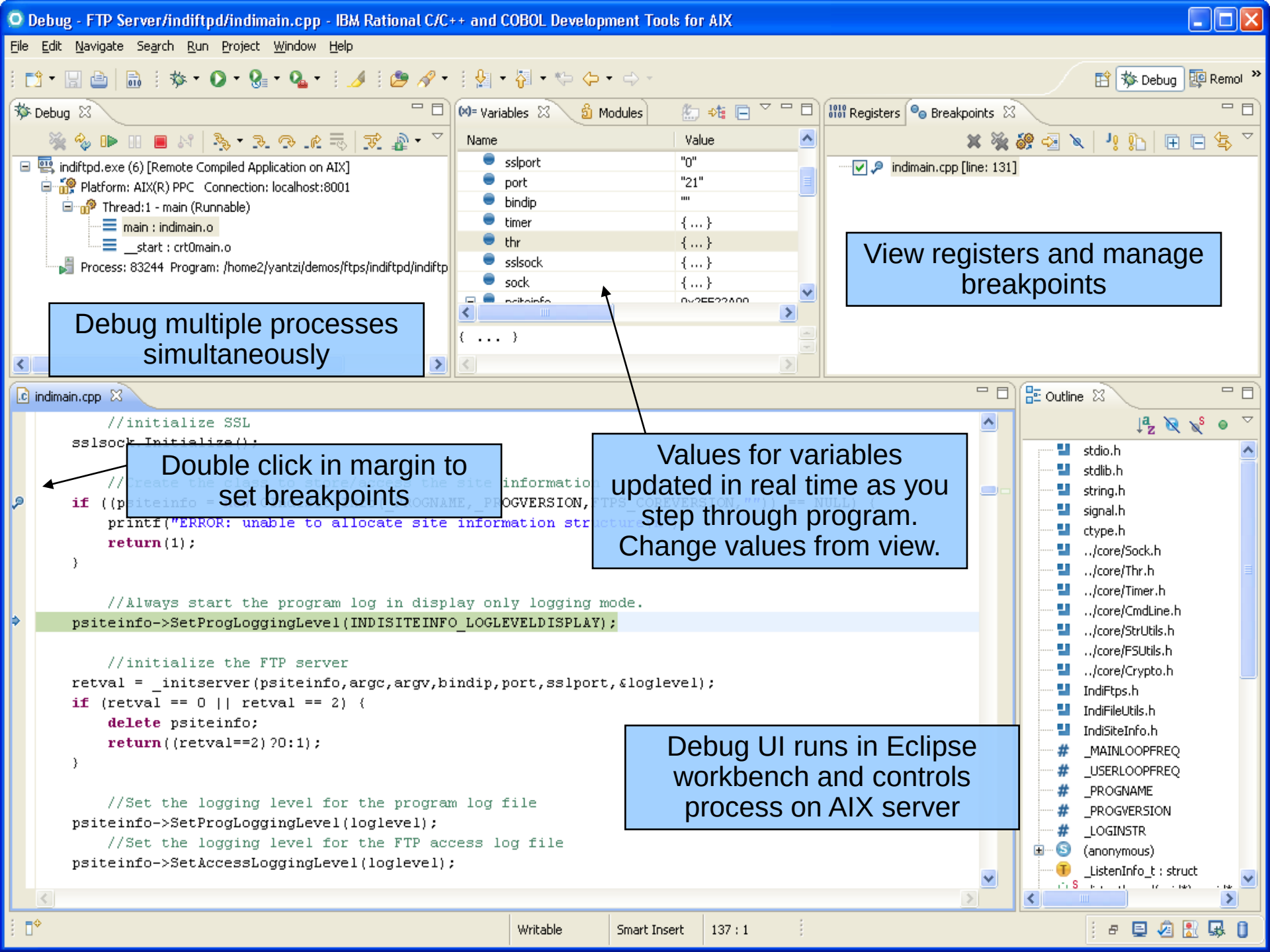
Integrated graphical debug tooling that can debug:

- Interactive and batch C/C++ applications
- Attach to existing processes
- CORE file debug for post analysis

Simple user interface based on Eclipse debug

Same debugger used for AIX, IBM i, System z, WebSphere J2EE, EGL, etc.

No more cryptic debug commands eases adoption


Debug - FTP Server/indiftpd/indimain.cpp - IBM Rational C/C++ and COBOL Development Tools for AIX
File Edit Navigate Search Run Project Window Help
Debug
indiftpd.exe (6) [Remote Compiled Application on AIX]
Platform: AIX(R) PPC Connection: localhost:8001
Thread:1 - main (Runnable)
main : indimain.o
__start : crt0main.o
Process: 83244 Program: /home2/yantzi/demos/ftps/indiftpd/indiftp
Debug multiple processes simultaneously
Variables
Modules
Name
Value
sslport "0"
port "21"
bindip ""
timer { ... }
thr { ... }
sslsock { ... }
sock { ... }
{ ... }
Registers
Breakpoints
indimain.cpp [line: 131]
View registers and manage breakpoints
indimain.cpp
//initialize SSL
sslsock_Initialize();
if ((psiteinfo
printf("ERROR: unable to allocate site information str
return(1);
//Always start the program log in display only logging mode.
psiteinfo->SetProgLoggingLevel(INDISITEINFO_LOGLEVELDISPLAY);
//initialize the FTP server
retval = _initserver(psiteinfo,argc,argv,bindip,port,sslport,&loglevel);
if (retval == 0 || retval == 2) {
delete psiteinfo;
return((retval==2)?0:1);
}
//Set the logging level for the program log file
psiteinfo->SetProgLoggingLevel(loglevel);
//Set the logging level for the FTP access log file
psiteinfo->SetAccessLoggingLevel(loglevel);
Double click in margin to set breakpoints
Values for variables updated in real time as you step through program. Change values from view.
Outline
stdio.h
stdlib.h
string.h
signal.h
ctype.h
../core/Sock.h
../core/Thr.h
../core/Timer.h
../core/CmdLine.h
../core/StrUtils.h
../core/FSUtils.h
../core/Crypto.h
IndiFtps.h
IndiFileUtils.h
IndiSiteInfo.h
_MAINLOOPFREQ
_USERLOOPFREQ
_PROGNAME
_PROGVERSION
_LOGINSTR
(anonymous)
_ListenInfo_t : struct
Debug UI runs in Eclipse workbench and controls process on AIX server
Writable
Smart Insert
137 : 1

Integrated Cobol Debug

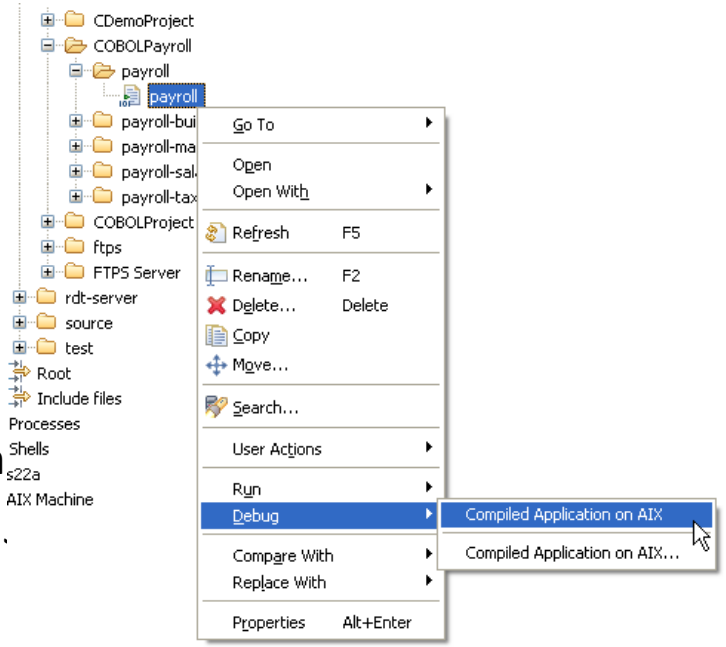
Integrated graphical debug tooling that can debug:

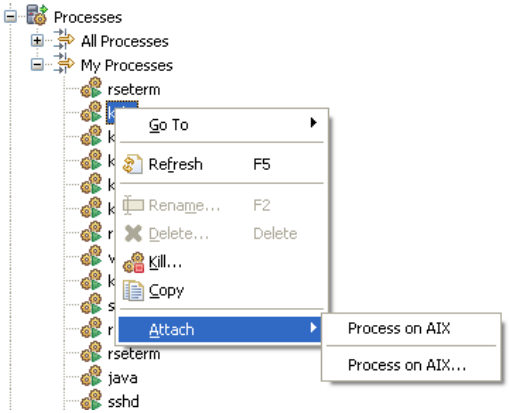
- Interactive/Batch COBOL applications
- TXSeries applications

Same debugger used for AIX, IBM i, System z, WebSph

Simple user interface based on Eclipse debug used by .

No more cryptic debug commands eases adoption





End to end debugging of heterogeneous applications

Power your planet.

Smarter systems for a Smarter Planet.

IBM Power Systems

POWER7™ BUILT ON Power™

Agenda

- *Solution Overview*
- *Rational Developer for Power - RPG and COBOL Development Tools for IBM*
- *Open Access: RPG edition*
- *Rational Developer for Power – for AIX Development*
- *Summary*

Summary

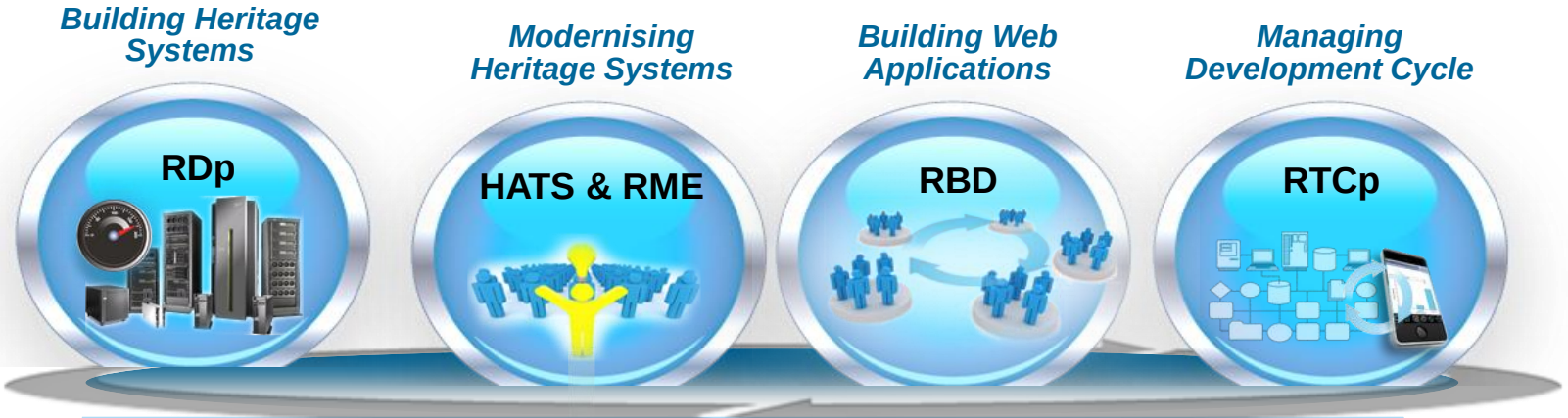
Common Toolset across Power Platform

IBM offers a complete development solution for IBM i development to help leverage this asset

- Modern and productive development tools
- Application Lifecycle Management
- RPG, COBOL & C/C++ language enhancements to keep the languages current
  - On "I" typically 10-30% productivity gains
- Rational Open Access: RPG Edition to leverage new devices and resources

Additional Material at the end of this presentation

IBM Rational Portfolio of Solution for Power Users



- **Increase system utilization** by leveraging hardware capabilities
- **Boost productivity** and accelerate innovation with modern skills
- **Maximize business agility** by bridging organizational silos
- **Increase flexibility** by integrating application portfolio

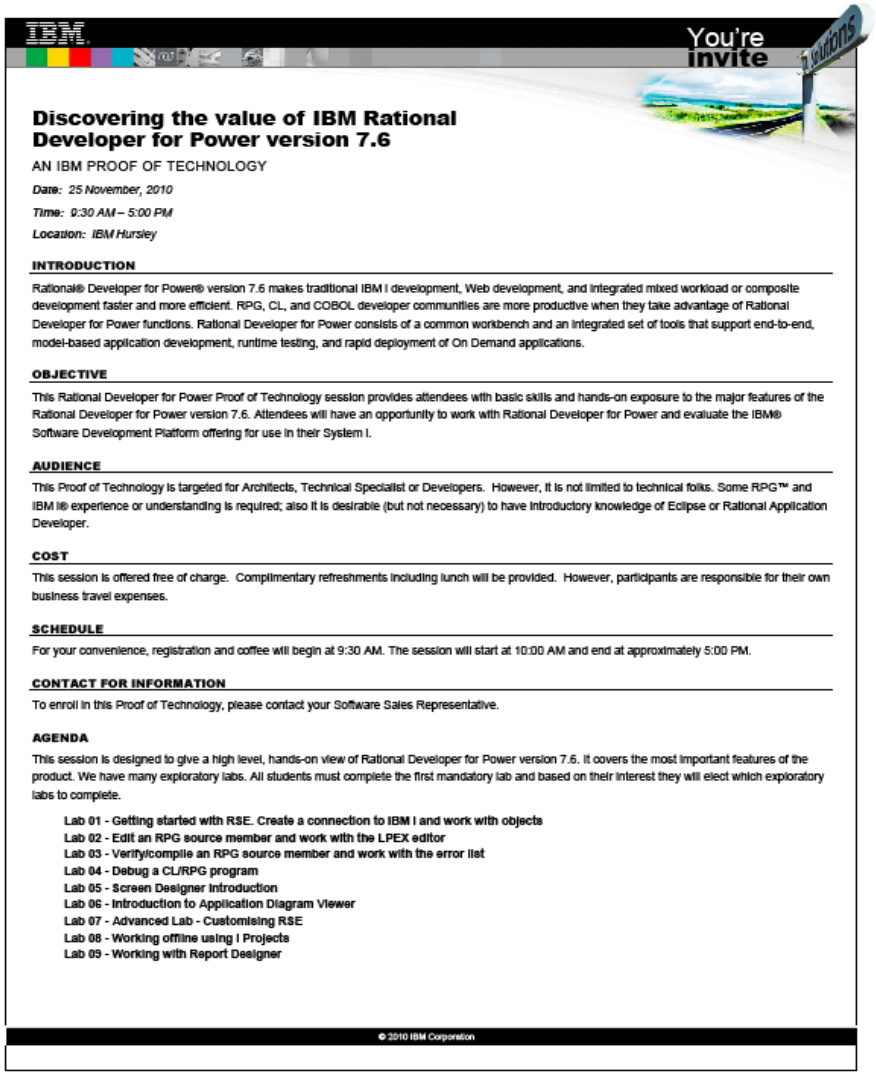
powered by Jazz

Rational Software Delivery Platform

IBM Power Systems

AIX · i for Business · Linux

POWER7™ BUILT ON Power™



IBM

You're invited

Discovering the value of IBM Rational Developer for Power version 7.6

AN IBM PROOF OF TECHNOLOGY

Date: *25 November, 2010*

Time: *9:30 AM – 5:00 PM*

Location: *IBM Hursley*

INTRODUCTION

Rational® Developer for Power® version 7.6 makes traditional IBM i development, Web development, and integrated mixed workload or composite development faster and more efficient. RPG, CL, and COBOL developer communities are more productive when they take advantage of Rational Developer for Power functions. Rational Developer for Power consists of a common workbench and an integrated set of tools that support end-to-end, model-based application development, runtime testing, and rapid deployment of On Demand applications.

OBJECTIVE

This Rational Developer for Power Proof of Technology session provides attendees with basic skills and hands-on exposure to the major features of the Rational Developer for Power version 7.6. Attendees will have an opportunity to work with Rational Developer for Power and evaluate the IBM® Software Development Platform offering for use in their System i.

AUDIENCE

This Proof of Technology is targeted for Architects, Technical Specialist or Developers. However, it is not limited to technical folks. Some RPG™ and IBM i® experience or understanding is required; also it is desirable (but not necessary) to have introductory knowledge of Eclipse or Rational Application Developer.

COST

This session is offered free of charge. Complimentary refreshments including lunch will be provided. However, participants are responsible for their own business travel expenses.

SCHEDULE

For your convenience, registration and coffee will begin at 9:30 AM. The session will start at 10:00 AM and end at approximately 5:00 PM.

CONTACT FOR INFORMATION

To enroll in this Proof of Technology, please contact your Software Sales Representative.

AGENDA

This session is designed to give a high level, hands-on view of Rational Developer for Power version 7.6. It covers the most important features of the product. We have many exploratory labs. All students must complete the first mandatory lab and based on their interest they will elect which exploratory labs to complete.

Lab 01 - Getting started with RSE. Create a connection to IBM i and work with objects
Lab 02 - Edit an RPG source member and work with the LPEX editor
Lab 03 - Verify/compile an RPG source member and work with the error list
Lab 04 - Debug a CL/RPG program
Lab 05 - Screen Designer introduction
Lab 06 - Introduction to Application Diagram Viewer
Lab 07 - Advanced Lab - Customising RSE
Lab 08 - Working offline using i Projects
Lab 09 - Working with Report Designer


Questions

www.ibm/software/rational

Additional Material

Improve Maintenance: Support for ALIAS names

Background

Fields in externally described files can have a standard name up to 10 characters and an alternate (ALIAS) name up to 128 characters.

RPG III only allowed 6 characters, so many customers have files with cryptic names like CUSNAM, CUSADR. The files often have alternate names such as CUSTOMER_NAME and CUSTOMER_ADDRESS, that can be used in SQL queries.

New ALIAS keyword for RPG

When ALIAS is specified, RPG will use the alternate name instead of the 10-character standard name.

Supported on F specs for any file that will not have Input or Output specs generated. Used for LIKEREC data structures.

Supported on D specs for any externally-described data structure.

```
A       R CUSTREC
              A          CUSTNM       25A       ALIAS(CUSTOMER_NAME)
              A          CUSTAD       25A       ALIAS(CUSTOMER_ADDRESS)
              A          ID          10P 0

              D custDs       e ds                ALIAS
              D                                  QUALIFIED EXTNAME(custFile)
               /free
                 custDs.customer_name = 'John Smith';
                 custDs.customer_address = '123 Mockingbird Lane';
                 custDs.id = 12345;
```

Improve Maintenance: New built-in function %PARMNUM

Problem solved by %PARMNUM:

- →Parameter-information APIs such as CEEDOD or CEETSTA require a parameter's number.
- →The %PARMNUM built-in function returns a parameter's position in the parameter list.
- →Soft-coding the parameter's number makes the code easier to read and maintain.

```
D  myProc          pi       10A   OPDESC
D   company                 25A   OPTIONS(*VARSIZE)
D   city                    25A   OPTIONS(*VARSIZE)

   CEEDOD (2 : more parms);                 // hard to understand
   CEEDOD (%PARMNUM(city) : more parms);    // better
```

Improve Productivity: Sort & Search

SORT AND SEARCH DATA STRUCTURE ARRAYS:

➢To sort or search a data structure array, one subfield is identified as the "key" for the array, using the syntax ARRAY(*).KEYSUBFIELD.

Example: Sort the INFO array by the SALARY subfield and search for the name. Note that 'Jack' in the NAME subfield of the INFO array.

Sort a data structure array using one subfield as a key

```
// sort by name
SORTA info(*).name;

// sort by due date
SORTA info(*).dueDate;
```

Search a data structure array using one subfield as a key

```
// search for a name
pos = %LOOKUP('Jack' : info(*).name);

// search for today's date
pos = %LOOKUP(%date() : info(*).dueDate);
```

Improve Productivity: Sort ascending or descending

- Non-sequenced arrays can be sorted either ascending or descending.
- Extender indicates a descending sort.
- Extender indicates ascending (default).

```
D meetings        S         D   DIM(100)
 /free
      // sort descending, with the
      // most recent date first
      sorta(d) meetings;
```

Improve Productivity: %LEN(varying : ***MAX**)

Problem solved by %LEN(*MAX):

- Starting in V6R1, calculations involving the size of the varying-length prefix became error-prone because the size might be either 2 or 4.
- In V6R1, %ADDR was enhanced with %ADDR(*DATA) to simplify getting the address of the data part. Previously, programmers added 2 to %ADDR.
- %LEN(*MAX) simplifies getting the maximum length of the data part. Previously, programmers subtracted 2 from %SIZE, and then divided by 2 for UCS-2 and DBCS.

Get the maximum number of characters for a varying field.

```
D char_varying      S          5000A  VARYING
 /free
     // Pass address and length of the data
     conv (%addr(char_varying : *data)
         : %len(char_varying : *max));
```

Improve Productivity: New built-in function %SCANRPL

Problem solved by %SCANRPL:

→ Hand-written versions of scan-and-replace tend to be large, error prone, and difficult to maintain.

→ The %SCANRPL built-in function replaces all occurrences a string with another string.

```
fileErr = 'File &1 not found. Please create &1.';
msg = %scanrpl ('&1' : filename : fileErr);

// msg = 'File MYFILE not found. Please create MYFILE.'
```

Improve Performance: Returning large values

- RTNPARM keyword greatly improves performance when a procedure returns a large value
- The speed of using a parameter with the convenience of using a return value
- Especially noticeable when the prototyped return value is a large varying length value

```
D center          pr        100000a   varying
D                                     rtnparm
D   text                     50000a   const varying
D   len                         10i 0 value
D title           s             100a   varying
 /free
   title = center ('Chapter 1' : 60);
```

Mixed Environments: Implicit CCSID conversion - parms

- Implicit CCSID conversion is now supported for prototyped parameters passed by VALUE and by read-only reference (CONST)
- This reduces the number of code changes that have to be made when a database field is changed from alphanumeric or DBCS to Unicode (UCS-2 or UTF-16).
- Prior to this change, if the type (A, C or G) of a passed parameter was not the same as the prototype, the compiler would issue a diagnostic. With this change, the compiler will implicitly convert the passed parameter to the type of the prototype.

In the example below, there is only one "makeTitle" procedure with a UCS-2 parameter and return value. If the passed parameter is alpha or DBCS, it will be converted to UCS-2 on the call. The procedure will work with the UCS-2 parameter and return a UCS-2 value. This returned value can then be converted on assignment to alpha or DBCS, if necessary.

```
// makeTitle() upper-cases the parameter
// and centers it within the provided length

alphaTitle = makeTitle(alphaValue : 50);
ucs2Title = makeTitle(ucs2Value : 50);
dbcsTitle = makeTitle(dbcsValue : 50);
```

Mixed Environments: New XML-INTO option datasubf

The new datasubf option enables XML-INTO to support XML elements in this form

```
<emp type="regular" id="13573">John Smith</emp>
```

Problem solved by datasubf:

When an XML element has attributes or child elements, the XML element (emp) itself matches an RPG data structure and the attributes (type, id) match the subfields. (Child elements would also match subfields.) If there is text data for the data structure ("John Smith"), there is no XML name available for subfield matching.

Without the datasubf option, two XML-INTO operations would be needed to get the data from that XML element.

- One XML-INTO would get the type and id values
- One XML-INTO would get the value "John Smith"
- The allowextra=yes option would be needed for both XML-INTOs

XML-INTO datasubf Example

```
<emp type="regular" id="13573">John Smith</emp>
```

RPG coding to get the information with one XML-INTO operation:

```
D emp          ds
D   id                    7p 0
D   type                 10a
D   value               100a
 /free
   XML-INTO emp %xml('emp.xml' :
                     : 'datasubf=value doc=file');
   // emp.id = 13573
   // emp.type = 'regular'
   // emp.value = 'John Smith'
```

Mixed Environments: New XML-INTO option countprefix

The new countprefix option enables RPG programmers to get more information about an XML document using XML-INTO.

Problem solved by countprefix:

When an XML element has a variable number repeating elements, it matches an RPG array. The RPG programmer has to code the maximum elements for the RPG array, but the XML document will usually have fewer elements.

Without the countprefix option,

- The allowmissing=yes option would be required, also allowing other necessary data to be missing
- The RPG programmer would have to figure out how many XML elements there were by looking for some default value.

XML-INTO countprefix Example

The countprefix option gives the prefix for the subfields to receive the count of the number of XML elements used to fill the RPG array.

```
<team>
     <manager>Jack Spratt</manager>
     <emp>John Smith</emp>
     <emp>Mary Jones</emp>
</team>
```

The RPG data structure.

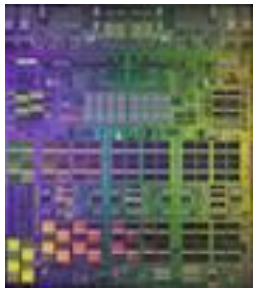
```
D team            DS
D   manager                25A
D   emp                    25A   dim(100)
D   numemp                 10i 0
```

No "numemp" tag in the XML for subfield "numemp".

IBM XL C/C++ for AIX Compiler

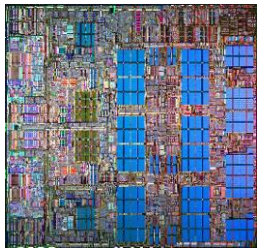
XL C/C++ for AIX

- **Provides full exploitation of all POWER hardware architectures, including POWER7**
  - Enable applications to take advantage of leading-edge performance of the new hardware *without source code changes*
- **Compiler development works closely with hardware development team**
  - Compiler prototypes were used to validate functional and performance objectives of IBM processors



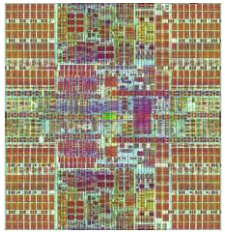
POWER4

2001



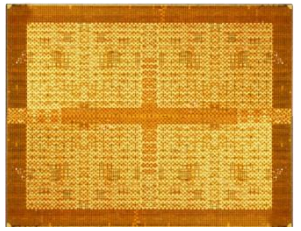
POWER5

2004



POWER6

2007

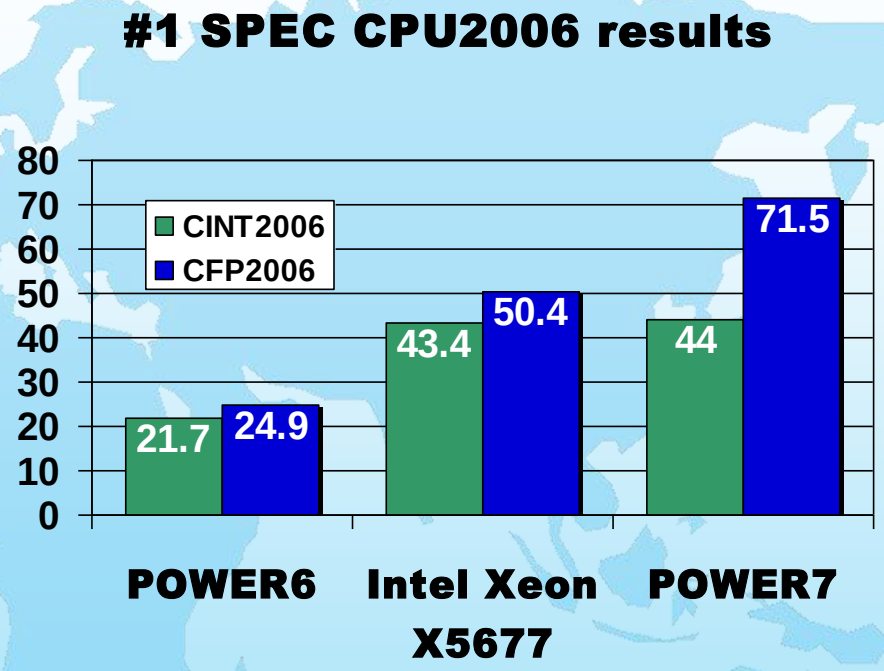


POWER7

2010

Delivering industry leading performance on POWER7

- **XL C/C++ v11, XL Fortran v13 and POWER7 delivered *indsutry leading* SPEC® CPU2006 performance results**
  - ***#1*** in both SPECint® and SPECfp® performance
- **Enhanced Optimization Capabilities**:
  - POWER7 exploitation
  - Automatic SIMD code generation
  - Automatic parallelization
  - Whole program optimization
  - Profile-based optimization
  - Aggressive memory optimization



SPEC® and the benchmark names SPECint® and SPECfp® are registered trademarks of the Standard Performance Evaluation Corporation. Competitive benchmark results stated above reflect results published on www.spec.org as of May 19, 2010. For the latest SPEC®CPU2006 benchmark results, visit www.spec.org.

Delivering Performance for Key IBM Software

XL C/C++ for AIX is used to build and tune IBM's leading software products

Example: DB2, AIX Operating System…

"The DB2 product is built using the xlC compiler, including advanced optimization capabilities including whole program analysis and profile directed feedback. We leverage the detailed informational messages emitted by the compiler to improve source quality and identify defects early in the development cycle. We find that the xlC compiler produces high quality code that contributes to the superior database performance that our customers value. We depend on the continual improvements in compiler optimization technology delivered in xlC to effectively exploit new processor technology such as POWER7"

Drew Bradstock, Program Director, DB2 LUW Product Management

Improve Programmer Productivity

New compile option to protect applications from stack-smashing attacks

- Ensures stack stays coherent and uncorrupted

Listing enhancements to improve program understanding and problem determination

- Profiling reports now shows loop iteration counts, function call structures and execution counts, and cache miss data
- Data reorganization report shows a summary of how program variables areh reorganized by the compiler

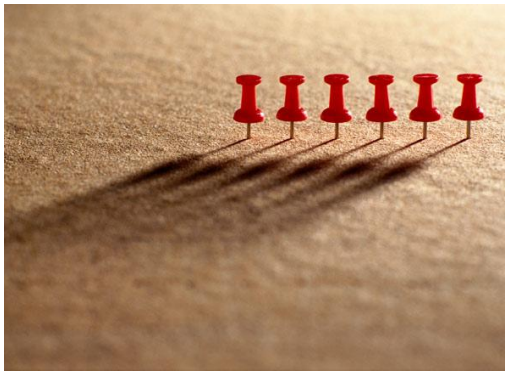
New compiler reports to assist performance tuning

- Provide users insights into what the optimizer has done to the code
- Generate transformation report in XML format
  - Enable better visualization and analysis of compiler information
  - Consumable by programming tools

New features to reduce compile time at high optimization

- Support pre-link of IPA objects
- Allow use of stale profile directed feedback information at link time

Simplify Programming
Support for parallel programming



- **Support for Automatic Parallelization**
  - Automatically parallelize loops without changes to existing “serial” source code
  - ***Reduces complexity*** in parallel programming, ***shortens development time,*** and ***increases programmer productivity***

- **Leverage OpenMP (Open Multi-Processing) Parallel Programming Language**
  - ***Non-proprietary*** application programming interface (API) specification for shared-memory multiprocessing systems
  - Simplify programming model to ***increase productivity***
  - Develop ***portable*** parallel code

- ***XL C/C++ v11*** support Automatic Parallelization and the latest OpenMP API V3.0 specification

Protect Investment *Providing Easy Migration to IBM Power Systems*

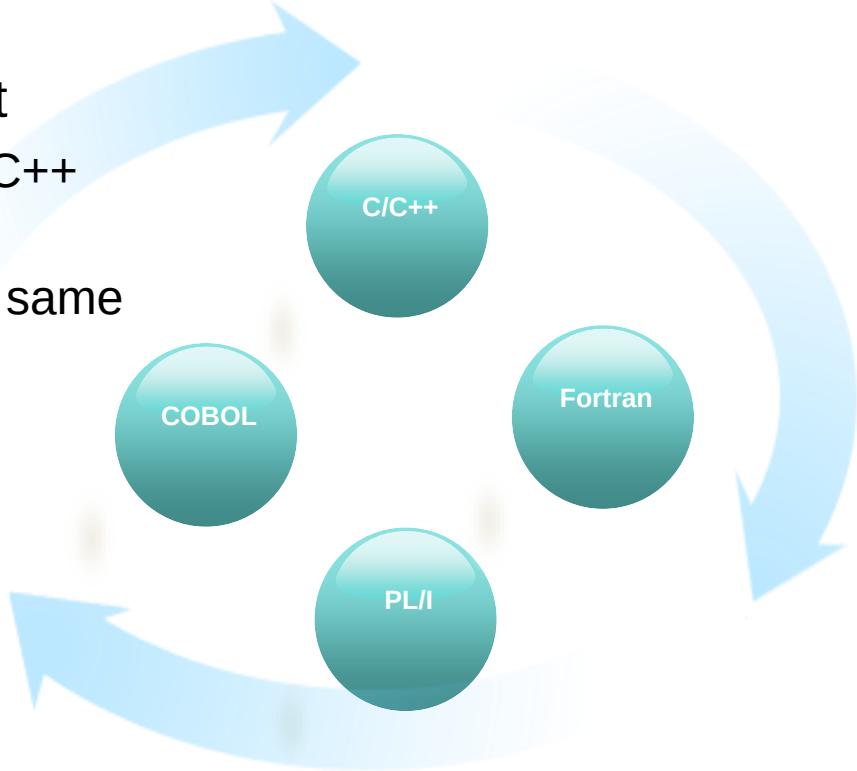
- Supports the C and C++ ANSI programming language standards and gcc extensions
  - Allows for portability of source code among a variety of compiler implementations
  - Enables easy migration of C/C applications to IBM Power Systems
- Supports a subset of the draft C++0x standard
  - C++0X is the the next C++ programming language standard
- Supports OpenMP (Open Multi-Processing)
  - Non-proprietary application programming interface (API) specification for shared-memory multiprocessing systems
  - Simplify programming model to increase productivity

Complex Applications with Multiple Languages

Leverage the strengths of different programming languages within the same application

Support mixed language environment

- Allows intermix COBOL, PL/I, C, and C++ within the same application
- Intermix C/C++ and Fortran within the same application



Summary

- **IBM C/C++ Compilers are designed to exploit …**
  - Advances in POWER architectures
- **New innovations in optimization technology improves application performance on both new and existing hardware**
  - Introduced over 100 new optimizations in the last 5 years
  - Provides significant performance boost to applications without the need for source change
  - *Don't have to wait for hardware upgrade to upgrade compilers*
- **IBM C/C++ compilers provide capability to ….**
  - Support industry language standards and extensions
    - Easily port applications to IBM platforms
  - Improve programmer productivity
    - Reduce programming complexity of hardware architectures
    - Improve efficiency of problem determination and performance tuning

Rational Developer for Power Systems Software

A family of integrated development environments for any type of Power Systems Software application development.

Why Use Rational Developer for Power Systems

Improve developer productivity

- Integrated tools
- Rich development features
- Analysis tools to improve code understanding
- Customizable environment

Skills

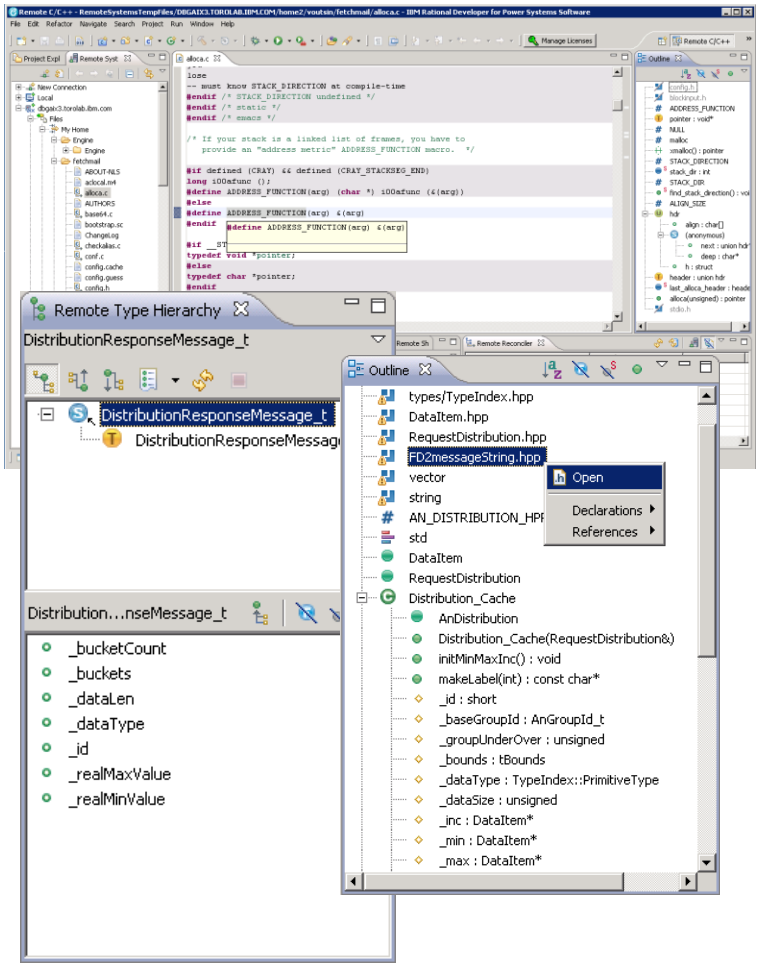
- Attract and retain new talent
- Skills portability between projects and platforms

Common development tools across multiple platforms and programming languages

- Rational Developer for System z
- Rational Application Developer for J2EE
- Rational Business Developer for EGL
- Rational Software Architect for UML modeling

Community

- Vibrant Eclipse community providing educational ongoing enhancements, resources, open source and 3rd party extensions



Install Local – Develop Remote

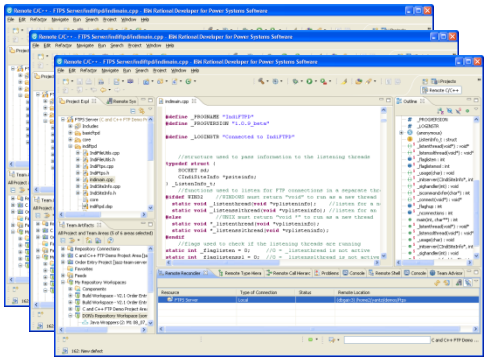
Rational Developer for Power tools install on a PC

- Leveraging processing and graphical capabilities of the workstation
- Allows for off-loading of server and disconnected development

Target remote systems for development (IBM i, AIX)

- File access, searching, build, and debug performed on server
- Same design as Rational Developer for System z

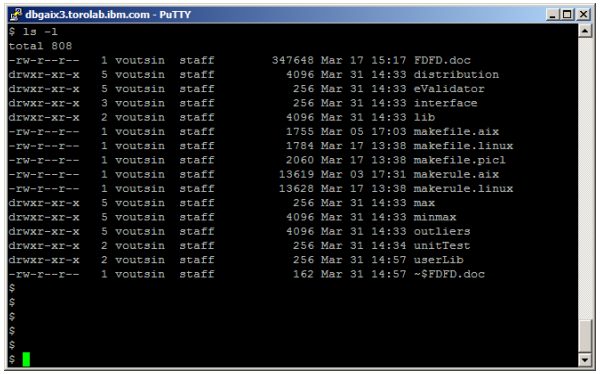
Authentication and access based on AIX server ID

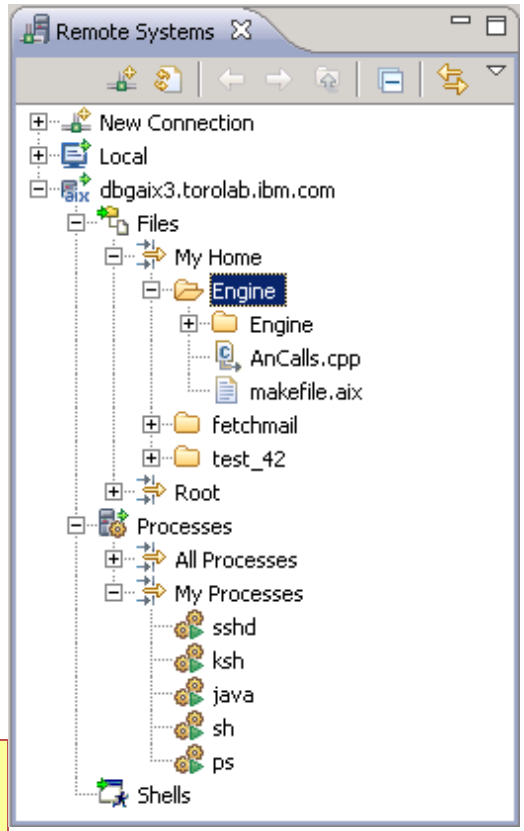


Remote System Explorer

Remote System Explorer (RSE) is a graphical explorer mechanism for remote systems

1. Define a connection to your desired server
2. Expand to explore the file system and processes
3. Create filters for quick access to common folders & files
4. Integrated actions (copy, renamed, delete, search)
5. Run shells from inside the Workbench





* Reduce learning curve with simple UI
* Eliminate platform specific development tools improving skills portability between platforms

Remote System Explorer

Remote System Explorer predefines common actions for files, folders, and processes

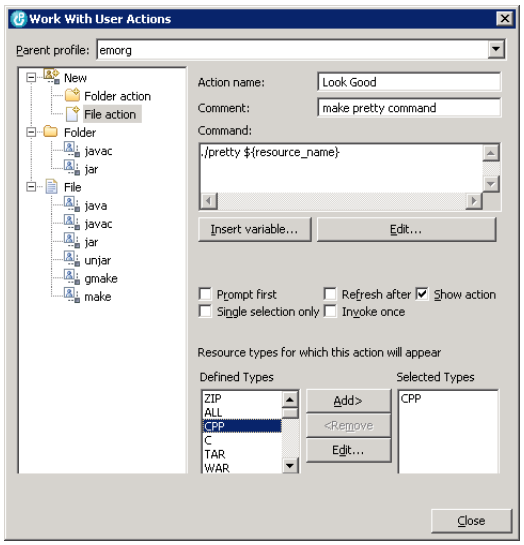
Users can define their own as well

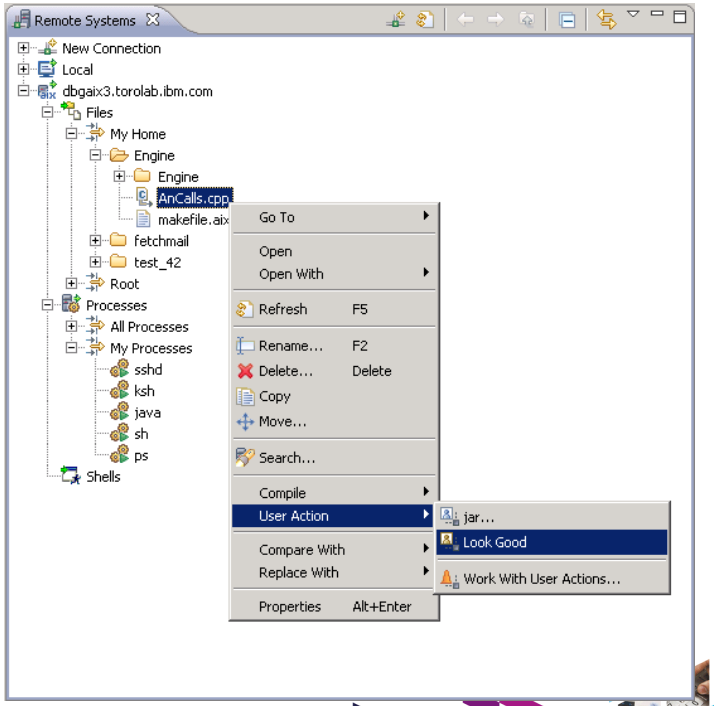
- Predefined actions for all file types on the server
- User/team can define custom actions

  Custom commands like “make pretty”

  Build scripts

  Team specific tools for files, folders, jobs, etc.





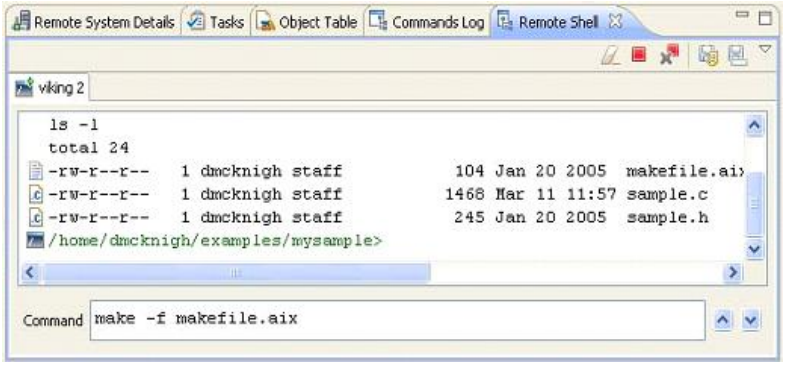
Reduce integration time for new team members into development process

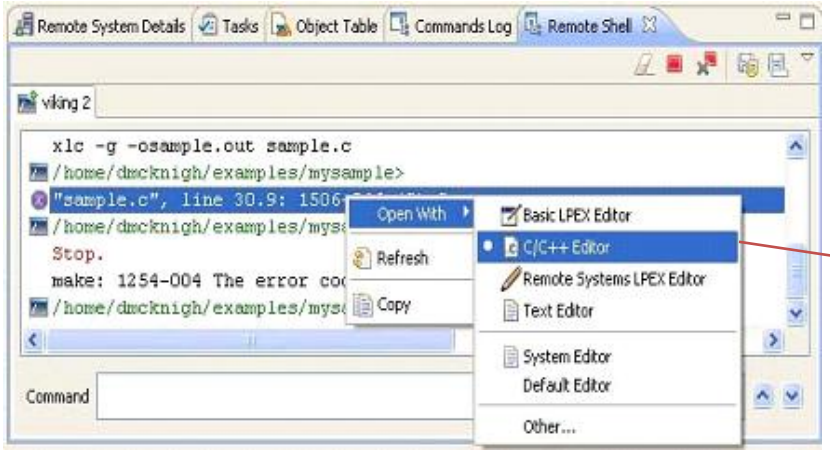
Integrated Command Shell

Remote System Explorer (RSE) brings the shell environment into the IDE

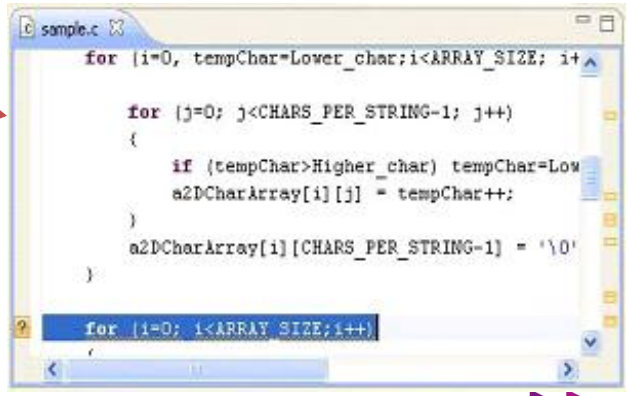
- Open multiple shells for any connection
- Helps bridge old command line with new technology by integrating actions into shell

Reduce learning curve for shell based developers by allowing them to exploit existing command line skills



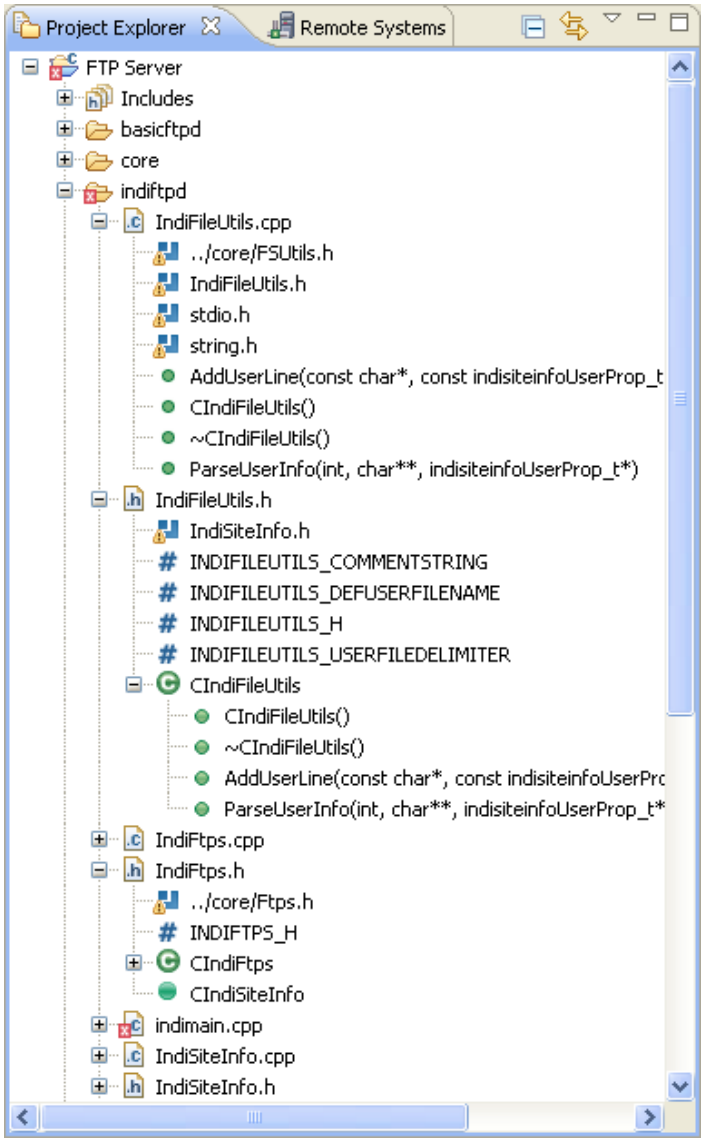


Action launches editor



Organize with Projects

- Projects are a grouping to help organize source
  - 3 Options: remote, local, or mounted
- Remote projects
  - Maps project to remote file system
  - Keeps source code on the server
- Local projects
  - Project stored on local drive
  - Changes synchronized with remote location
  - Allows disconnected development
- Mounted projects
  - Local project but stored on a mounted file system
  - Hybrid of remote and local



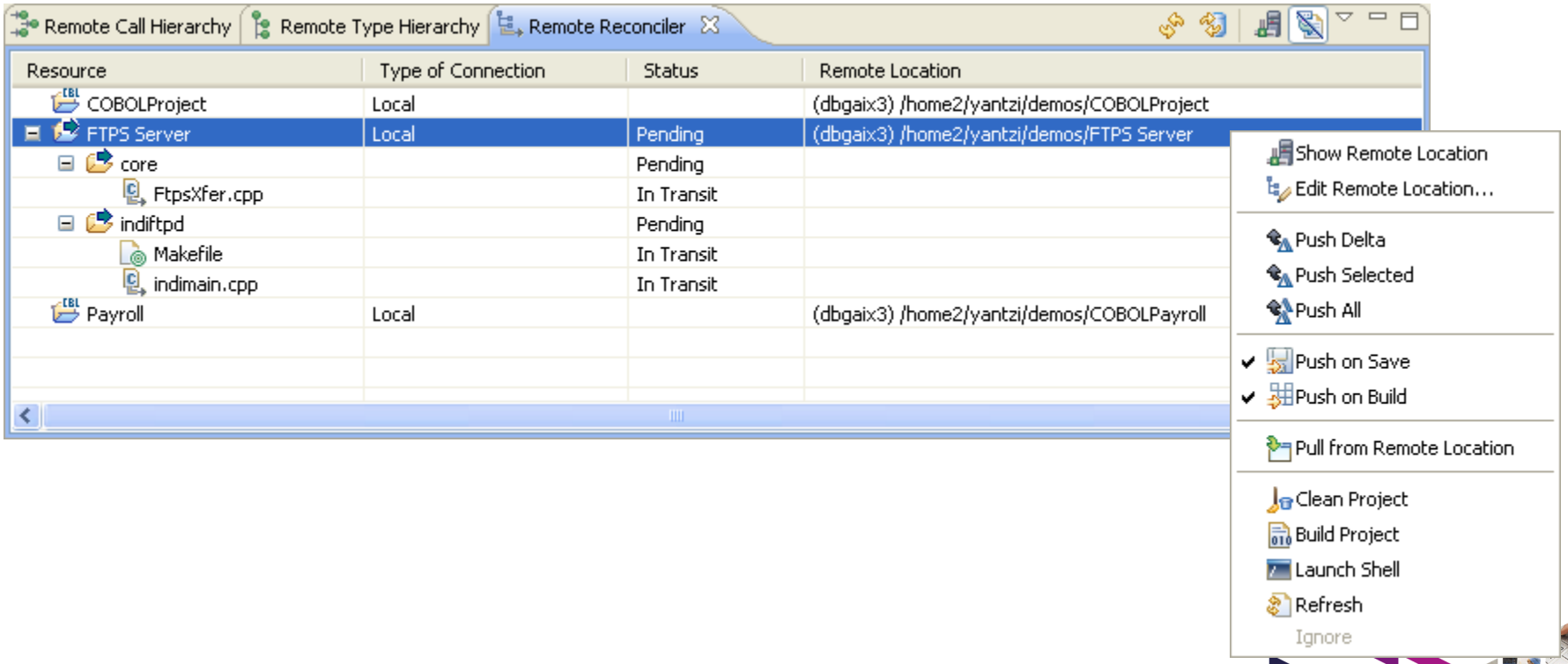
Local Project with File Synchronization

Files in a local project are stored on the local workstation

But are also associated with a remote location

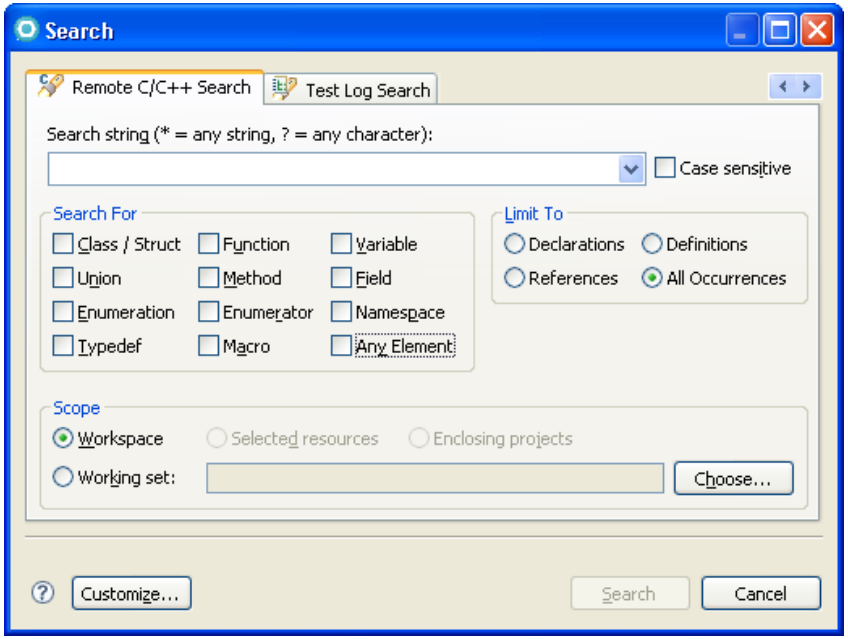
Remote Reconciler view keeps local project and remote location synchronized

Changes can be pushed automatically on a save or build



Organize with Projects

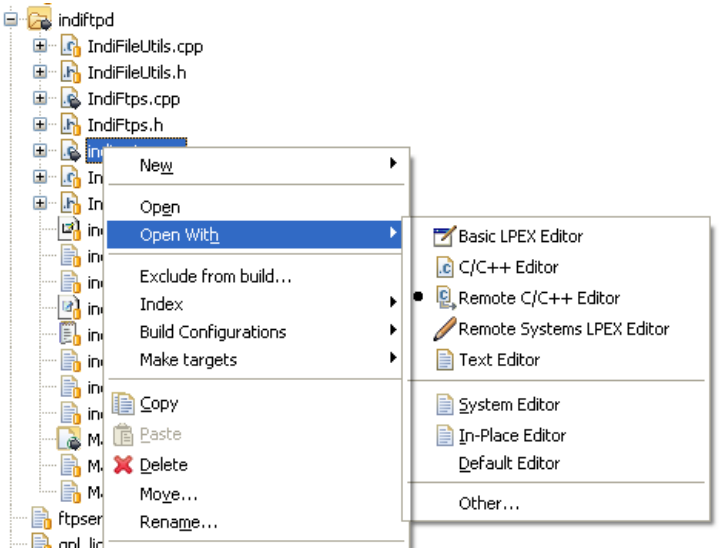
- Projects allow the tools to understand more than individual source members
- Allows for project level awareness
  - Project level indexing
    - Content assist
    - Language aware searching
    - Type and call hierarchies
  - Leverage Eclipse project features like local history and working sets
  - Integrated build and error feedback
  - Integration with Eclipse team providers like Rational Team Concert for Power

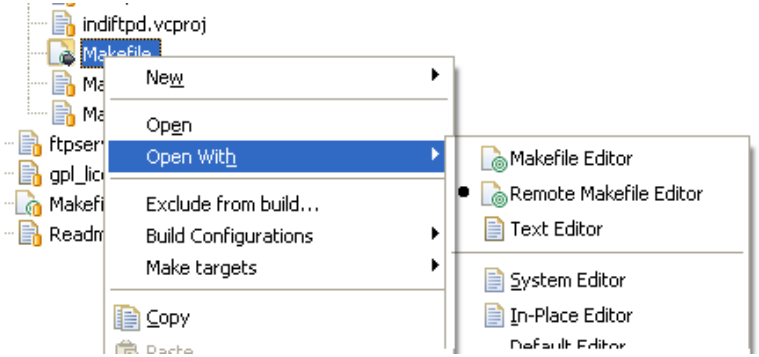


Rich C/C++ Editing

Rational Developer for Power uses registered Eclipse editors based on file type

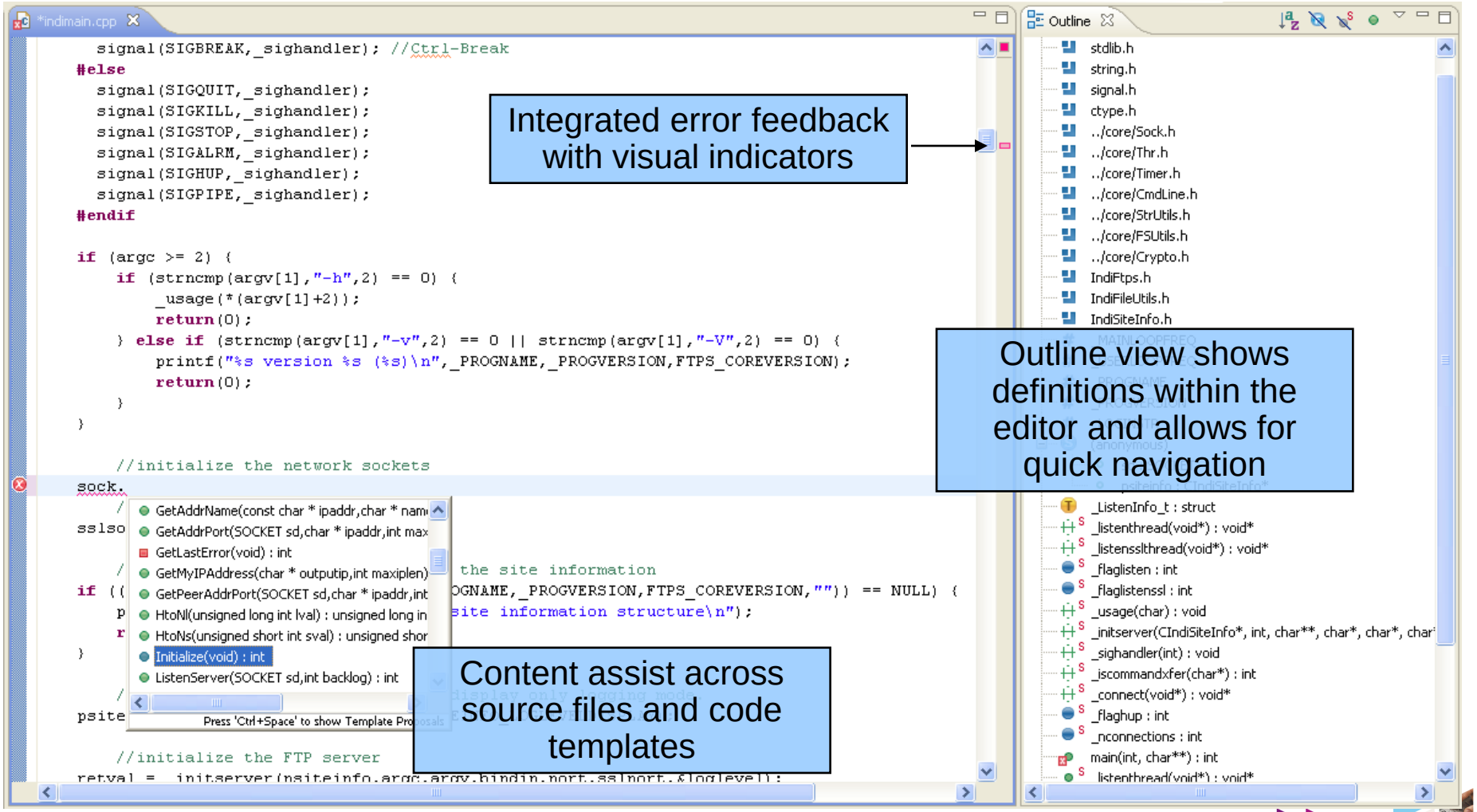
Same editors are used by Remote System Explorer and projects





Rich C/C++ Editing

Rich editing experience with language specific Eclipse editors



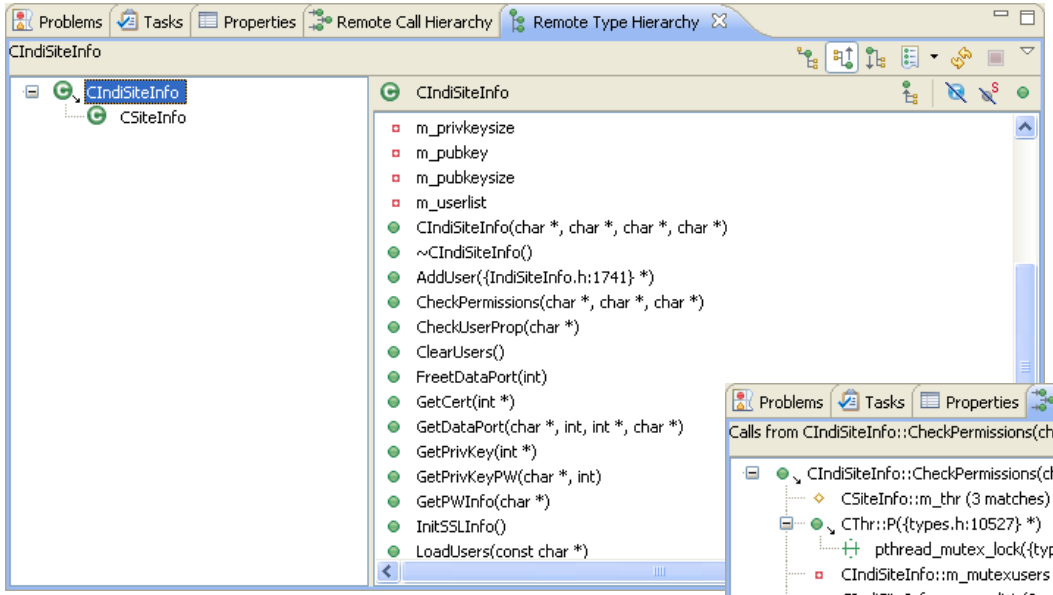
Integrated error feedback with visual indicators

Outline view shows definitions within the editor and allows for quick navigation

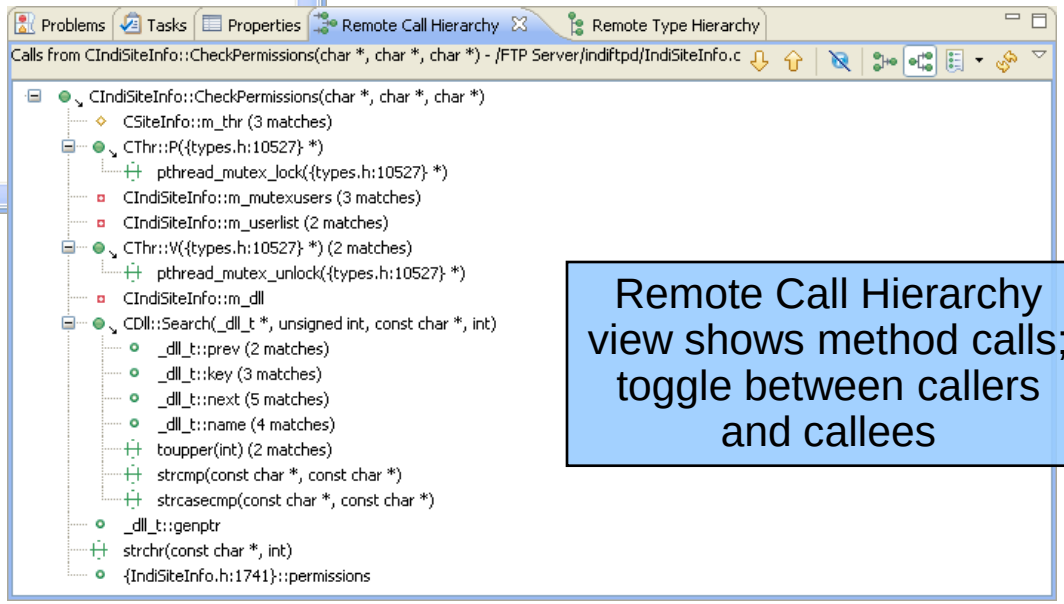
Content assist across source files and code templates

C/C++ Analysis Tools

Rational Developer for Power includes additional tools to help understand and navigate structure of an application



Remote Type Hierarchy view shows C++ inheritance hierarchy along with fields and methods



Remote Call Hierarchy view shows method calls; toggle between callers and callees

Integrated Build Support

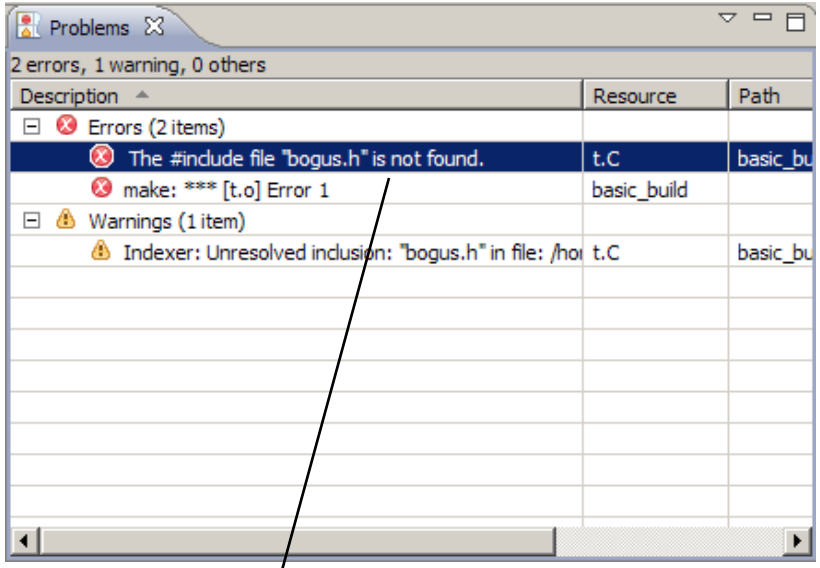
Exploit your make files quickly and easily

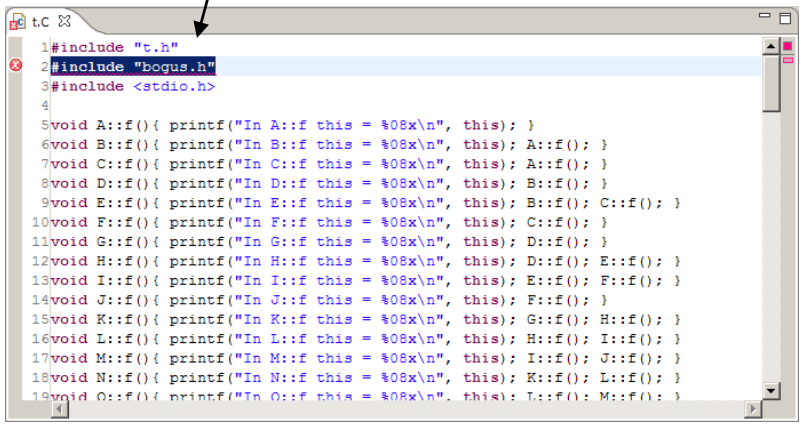
Builds can be invoked

- On demand
- Each time a file is saved

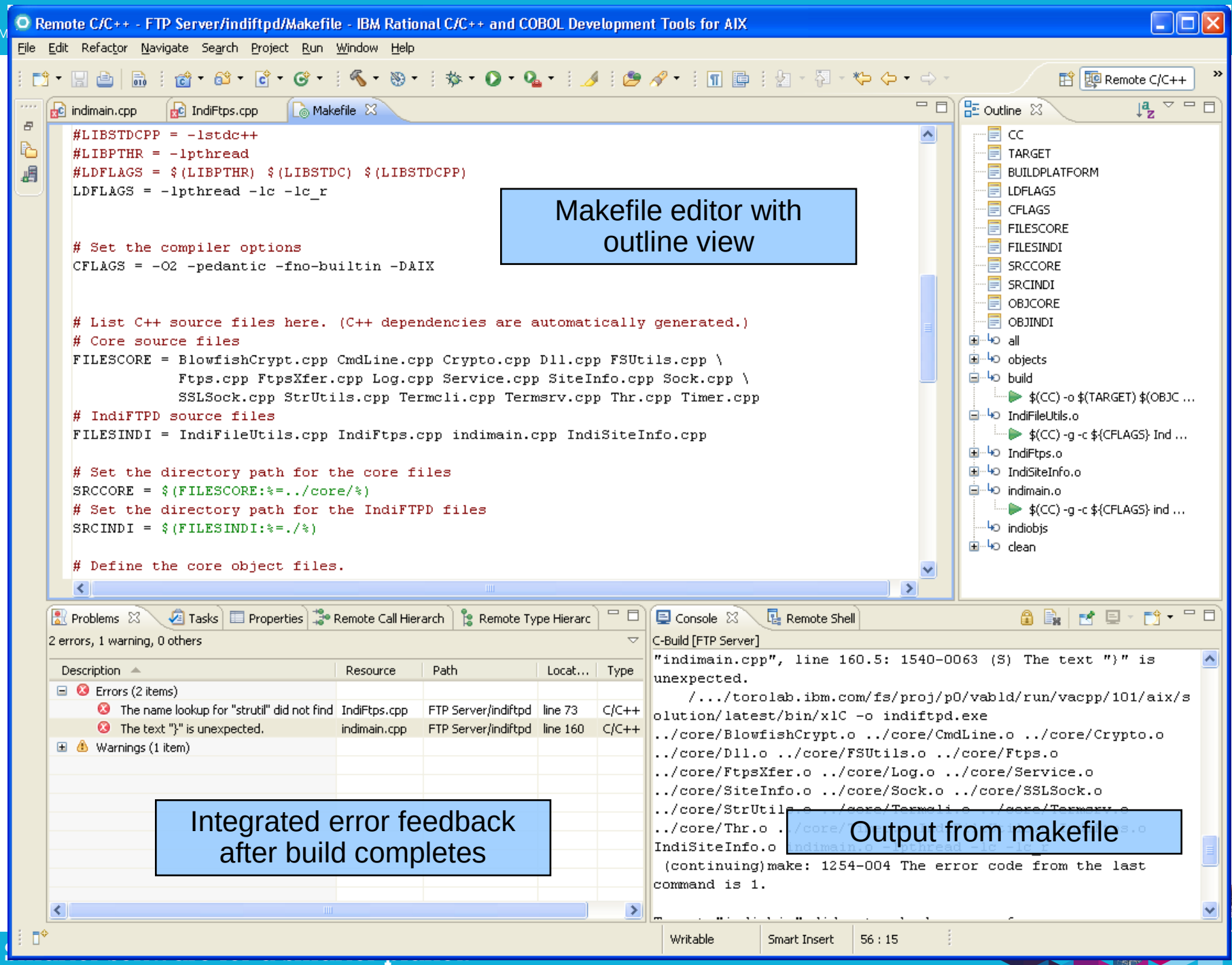
Integrated error feedback, allows for fast compile problems

- Output from make shown in console view
- Individual compiler messages are extracted and added to the Problems view
- Double-clicking on an error opens the file and jumps to the line in error





Identify, location, and fix errors quickly


Remote C/C++ - FTP Server/indiftpd/Makefile - IBM Rational C/C++ and COBOL Development Tools for AIX
File Edit Refactor Navigate Search Project Run Window Help
Remote C/C++
indimain.cpp
IndiFtps.cpp
Makefile
#LIBSTDCPP = -lstdc++
#LIBPTHR = -lpthread
#LDFLAGS = $(LIBPTHR) $(LIBSTDC) $(LIBSTDCPP)
LDFLAGS = -lpthread -lc -lc_r
# Set the compiler options
CFLAGS = -O2 -pedantic -fno-builtin -DAIX
# List C++ source files here. (C++ dependencies are automatically generated.)
# Core source files
FILESCORE = BlowfishCrypt.cpp CmdLine.cpp Crypto.cpp Dll.cpp FSUtils.cpp \
Ftps.cpp FtpsXfer.cpp Log.cpp Service.cpp SiteInfo.cpp Sock.cpp \
SSLSock.cpp StrUtils.cpp Termcli.cpp Termsrv.cpp Thr.cpp Timer.cpp
# IndiFTPD source files
FILESINDI = IndiFileUtils.cpp IndiFtps.cpp indimain.cpp IndiSiteInfo.cpp
# Set the directory path for the core files
SRCCORE = $(FILESCORE:%=../core/%)
# Set the directory path for the IndiFTPD files
SRCINDI = $(FILESINDI:%=./%)
# Define the core object files.
Makefile editor with outline view
Outline
CC
TARGET
BUILDPLATFORM
LDFLAGS
CFLAGS
FILESCORE
FILESINDI
SRCCORE
SRCINDI
OBJCORE
OBJINDI
all
objects
build
$(CC) -o $(TARGET) $(OBJC ...
IndiFileUtils.o
$(CC) -g -c ${CFLAGS} Ind ...
IndiFtps.o
IndiSiteInfo.o
indimain.o
$(CC) -g -c ${CFLAGS} ind ...
indiobjs
clean
Problems
Tasks
Properties
Remote Call Hierarch
Remote Type Hierarc
2 errors, 1 warning, 0 others
Description
Resource
Path
Locat...
Type
Errors (2 items)
The name lookup for "strutil" did not find
IndiFtps.cpp
FTP Server/indiftpd
line 73
C/C++
The text "}" is unexpected.
indimain.cpp
FTP Server/indiftpd
line 160
C/C++
Warnings (1 item)
Integrated error feedback after build completes
Console
Remote Shell
C-Build [FTP Server]
"indimain.cpp", line 160.5: 1540-0063 (S) The text "}" is unexpected.
/.../torolab.ibm.com/fs/proj/p0/vabld/run/vacpp/101/aix/solution/latest/bin/xlC -o indiftpd.exe
../core/BlowfishCrypt.o ../core/CmdLine.o ../core/Crypto.o
../core/Dll.o ../core/FSUtils.o ../core/Ftps.o
../core/FtpsXfer.o ../core/Log.o ../core/Service.o
../core/SiteInfo.o ../core/Sock.o ../core/SSLSock.o
../core/Thr.o .
IndiSiteInfo.o
(continuing)make: 1254-004 The error code from the last command is 1.
Output from makefile
Writable
Smart Insert
56 : 15

IBM Software

UKInnovate2010

The Rational Software Conference

Smarter software for a smarter planet.