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Modern Environment for z/OS Development

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March 12th, 2014
Session: 14619

SHARE in Anaheim

Purpose and Presentation flow

- Purpose … to present application development tools as a user might use them through the software development life cycle
- Flow
  - Overview
    - Software development
    - Tools
  - Walk through the life cycle and tooling that supports each step

Four key barriers preventing optimal return on IT investments

Decades of application investments

"We don't understand the effort, risk and impact of modernizing our legacy applications."

Islands of skills, languages and platforms

"Our skills gap keeps growing. How do we stay current with all the language and technology changes?"

Poorly integrated teams

"We need to enable our teams to collaborate across platforms, languages, and environments."

Infrastructure inefficiency

"We need a cost effective way to improve our infrastructure efficiency and free up capacity to handle more workload."

Overview of Supported Production Scenario

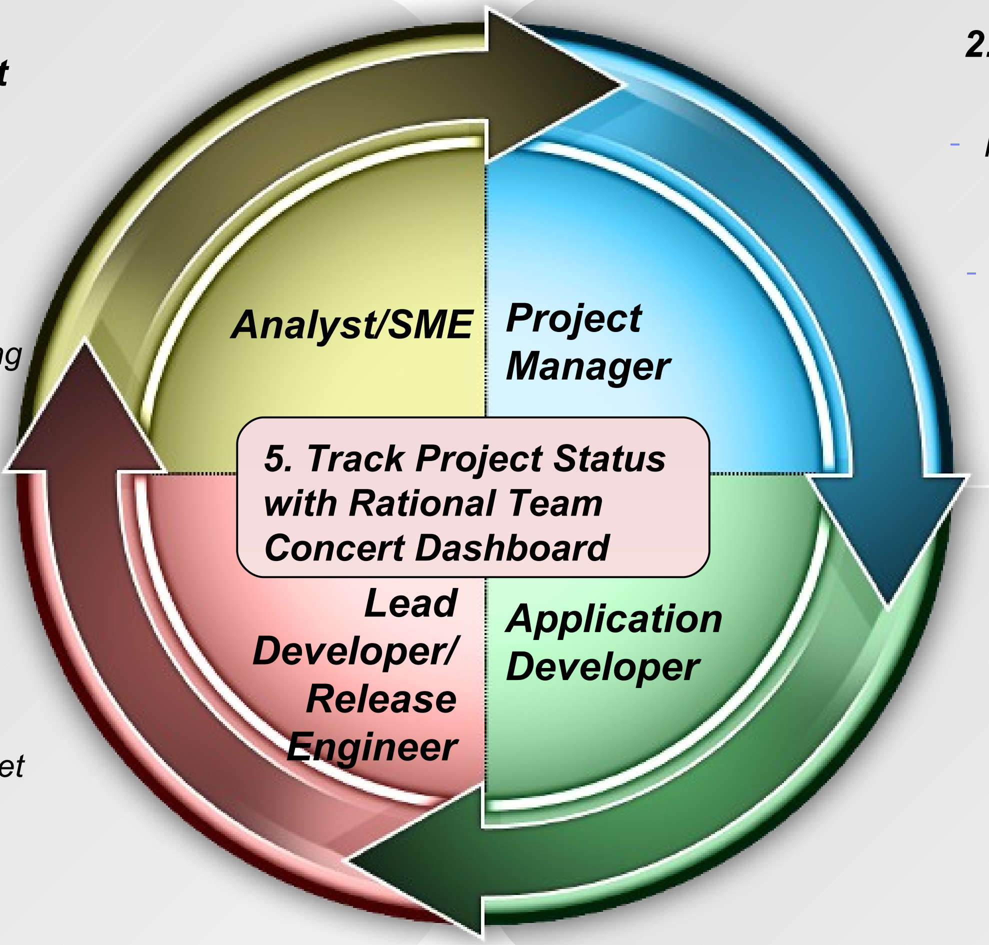
Project Manager or Support Team has submitted Project Change Request …

1: Review Change Request

- *Analyze application to be changed*
- *Size/scope effort and risk of change*
- *Submit to Project Manager for review, approval and scheduling*

2: Review and Approve Change Request

- *Review analysis for change request and approve for scheduling*
- *Create development work item(s) for implementation*
- *Add work to project plan*


Analyst/SME
Project Manager
5. Track Project Status with Rational Team Concert Dashboard
Lead Developer/ Release Engineer
Application Developer

3: Implement required changes, build and deliver

- *Analyze source to identify modifications*
- *Implement and test modifications*
- *Perform personal build and deliver new features*

4: Promote and deploy enhancement

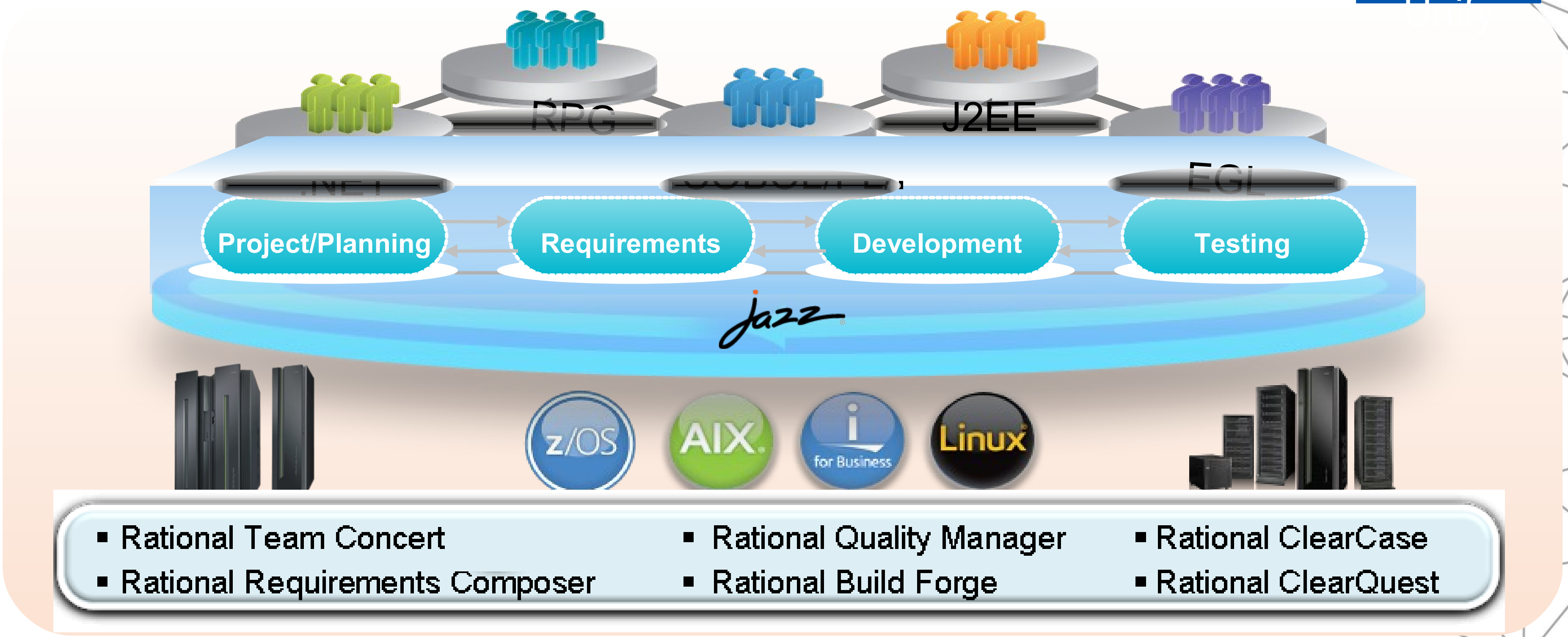
- *Promote changes from development to test*
- *Create update package with set of changes from development*
- *Deploy update package to the test environment*

Development Life Cycle

Planning	Source Dev	Governance/Unit test	Build
• Define the tasks • Create a plan • Create a work item • Assign the work item to a developer	• Load the project/source artifacts from SCM • Navigate, Analyze, Edit, Syntax check source code	• Compile • Quality assurance • Debug • Code Coverage • Code review • Unit Testing	• Check-in/Deliver the source code • Build
CLM	RDz RTC	RDz RD&T RTC	RTC RDz

Collaborative application lifecycle management

Deploy new, common team infrastructure for source control, change management and build that empowers your team with integrated collaboration, process automation and reporting



- Rational Team Concert
- Rational Requirements Composer
- Rational Quality Manager
- Rational Build Forge
- Rational ClearCase
- Rational ClearQuest

"Building an agile development team requires a multiplatform approach, and Sodifrance uses Rational Developer for System z and Rational Team Concert for System z to help application teams synchronize their efforts and improve collaboration. Rational on System z offers a powerful and valuable combination for any company that wants to boost its development team's productivity."

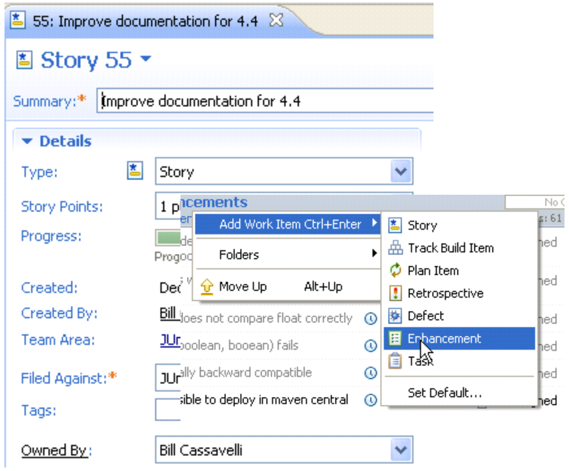
— Hugh Smith, Project Manager, Sodifrance

SODIFRANCE

SHARE in Anaheim

Rational Team Concert – A single tool, many capabilities

- Work Items


55: Improve documentation for 4.4

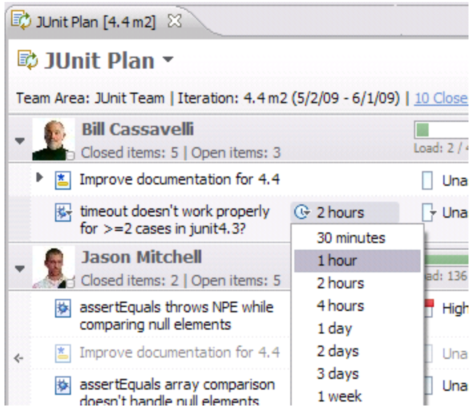
Story 55

Summary:* Improve documentation for 4.4

Details

Type: Story
Story Points: 1 p
Progress:
Created: Dec
Created By: Bill
Team Area: JUn
Filed Against:* JUn
Tags:
Owned By: Bill Cassavelli

- Planning


JUnit Plan [4.4 m2]

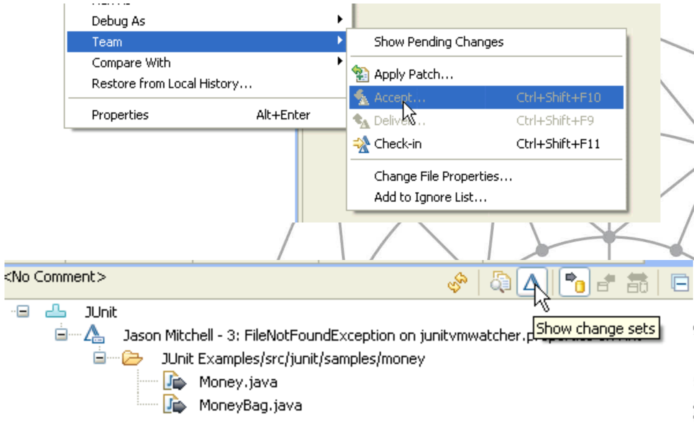
JUnit Plan

Team Area: JUnit Team | Iteration: 4.4 m2 (5/2/09 - 6/1/09) | 10 Close

Bill Cassavelli
Closed items: 5 | Open items: 3 Load: 2 /
Improve documentation for 4.4 Una
timeout doesn't work properly for >=2 cases in junit4.3? 2 hours Una

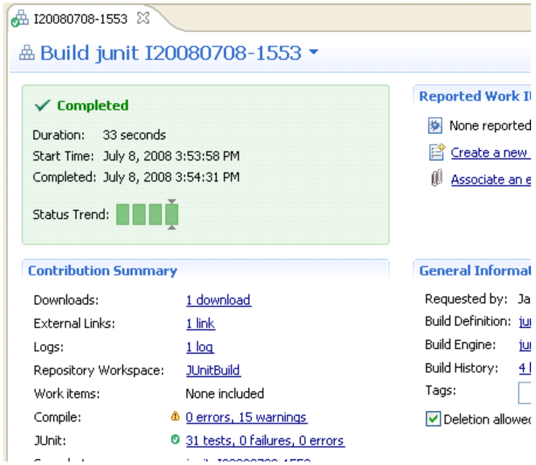
Jason Mitchell
Closed items: 2 | Open items: 5 Load: 136
assertEquals throws NPE while comparing null elements High
Improve documentation for 4.4 Una
assertEquals array comparison doesn't handle null elements Una

- Source Control



<No Comment>
JUnit
Jason Mitchell - 3: FileNotFoundException on junitvmwatcher.p
JUnit Examples/src/junit/samples/money
Money.java
MoneyBag.java

- Builds – Continuous


I20080708-1553

Build junit I20080708-1553

Completed
Duration: 33 seconds
Start Time: July 8, 2008 3:53:58 PM
Completed: July 8, 2008 3:54:31 PM
Status Trend:

Reported Work I
None reported
Create a new
Associate an e

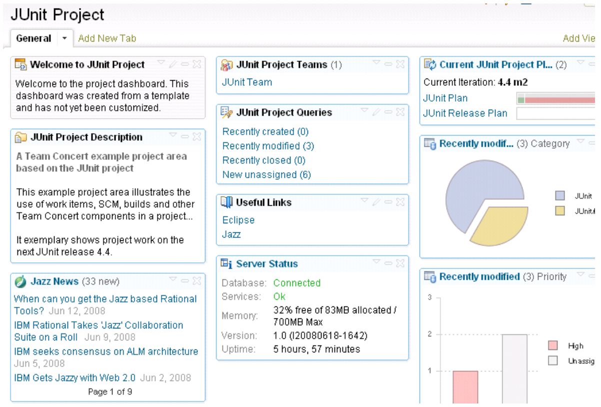
Contribution Summary

Downloads:	1 download
External Links:	1 link
Logs:	1 log
Repository Workspace:	JUnitBuild
Work items:	None included
Compile:	0 errors, 15 warnings
JUnit:	31 tests, 0 failures, 0 errors

General Informat

Requested by:	Ja
Build Definition:	ju
Build Engine:	ju
Build History:	4
Tags:	
Deletion allowed	

- Dashboards & Reporting


JUnit Project

Welcome to JUnit Project
Welcome to the project dashboard. This dashboard was created from a template and has not yet been customized.

JUnit Project Description
A Team Concert example project area based on the JUnit project

This example project area illustrates the use of work items, SCM, builds and other Team Concert components in a project...

It exemplary shows project work on the next JUnit release 4.4.

Jazz News (33 new)
When can you get the Jazz based Rational Tools? Jun 12, 2008
IBM Rational Takes 'Jazz' Collaboration Suite on a Roll Jun 9, 2008
IBM seeks consensus on ALM architecture Jun 5, 2008
IBM Gets Jazzy with Web 2.0 Jun 2, 2008
Page 1 of 9

JUnit Project Teams (1)
JUnit Team

JUnit Project Queries
Recently created (0)
Recently modified (3)
Recently closed (0)
New unassigned (6)

Useful Links
Eclipse
Jazz

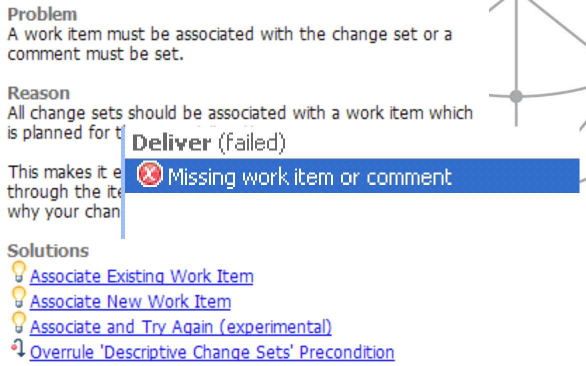
Server Status

Database:	Connected
Services:	Ok
Memory:	32% free of 83MB allocated / 700MB Max
Version:	1.0 (I20080618-1642)
Uptime:	5 hours, 57 minutes

Current JUnit Project Pl… (2)
Current Iteration: 4.4 m2
JUnit Plan
JUnit Release Plan

Recently modif… (3) Category
Recently modified (3) Priority

- Method Enforcement and Automation


Problem
A work item must be associated with the change set or a comment must be set.

Reason
All change sets should be associated with a work item which is planned for t

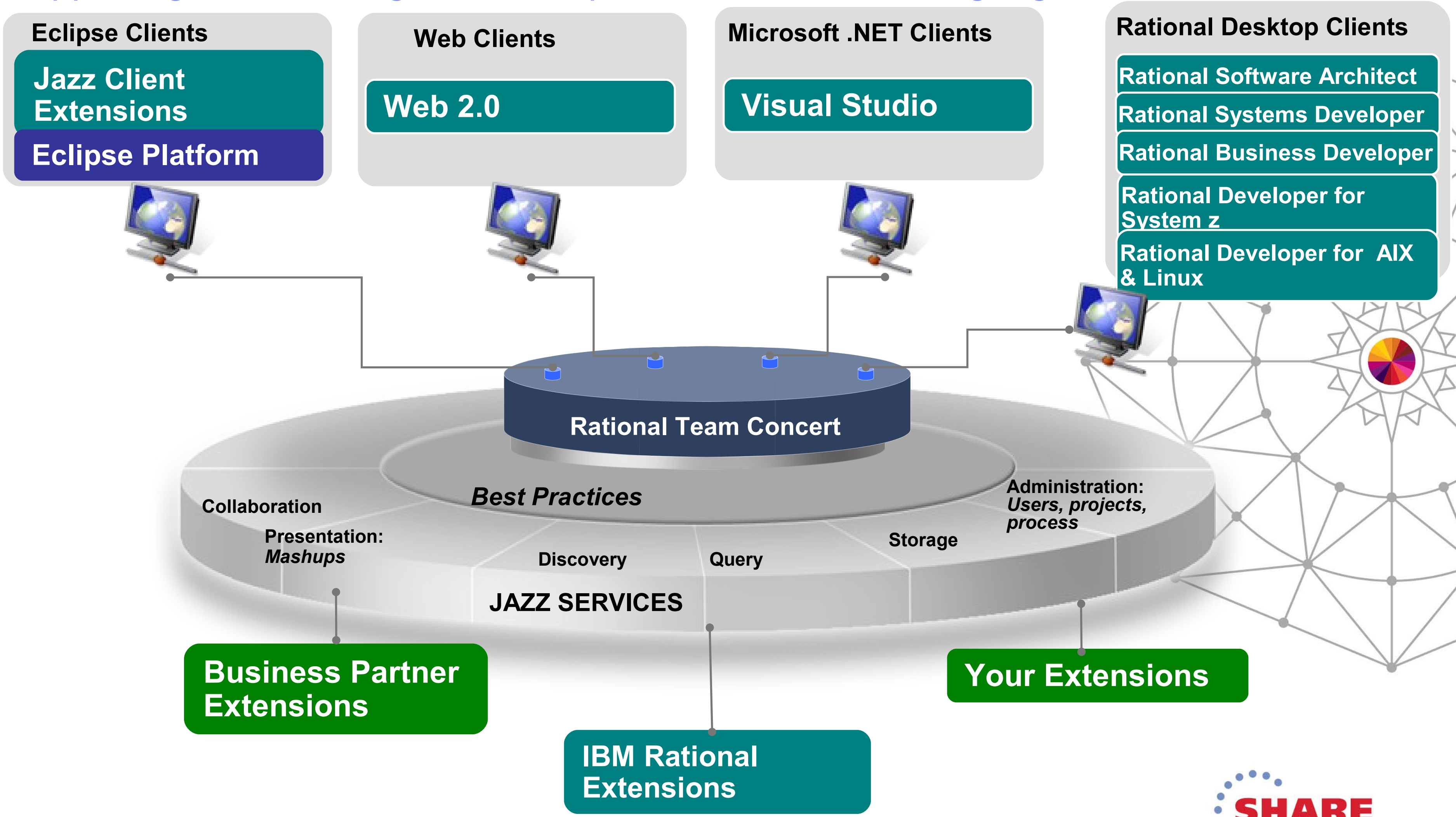
This makes it e
through the ite
why your chan

Deliver (failed)
Missing work item or comment

Solutions
Associate Existing Work Item
Associate New Work Item
Associate and Try Again (experimental)
Overrule 'Descriptive Change Sets' Precondition

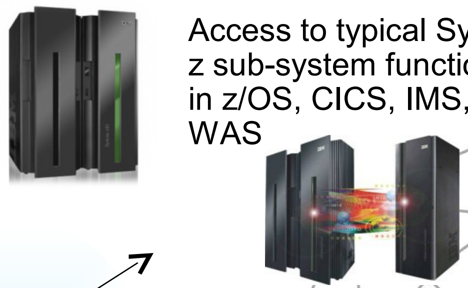
Rational Team Concert: Built on an open, Web 2.0 platform

Supporting a broad range of desktop clients, IDE's and languages



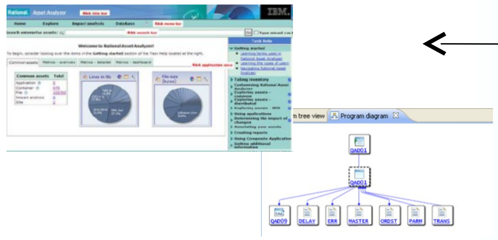
Rational Developer for System z:
An Integrated Development Environment for System z

Integration with Team Concert for Lifecycle and Source Management

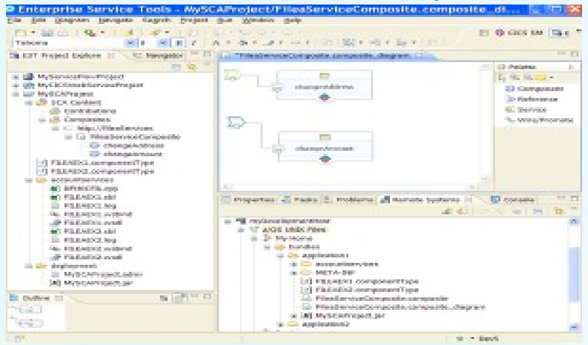


Access to typical System z sub-system functionality in z/OS, CICS, IMS, DB2, WAS

Integration with Asset Analyzer for Application Understanding and Impact Analysis

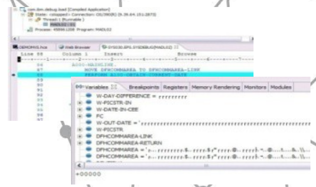


Rational Developer for System z



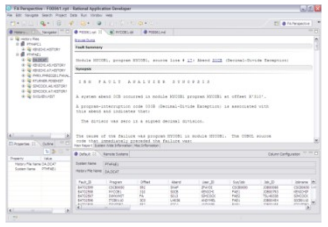
New

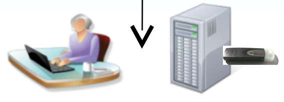
Out of the Box debugger and code coverage capabilities



A modern IDE for productive development of cross-platform applications written in COBOL, PL/I, ASM, Java, EGL or C/C++ in System z CICS, IMS, DB2, Batch applications

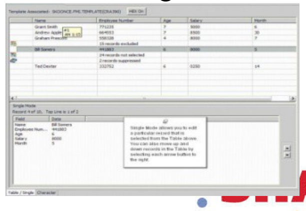
Integration with Fault Analyzer for Dump Analysis





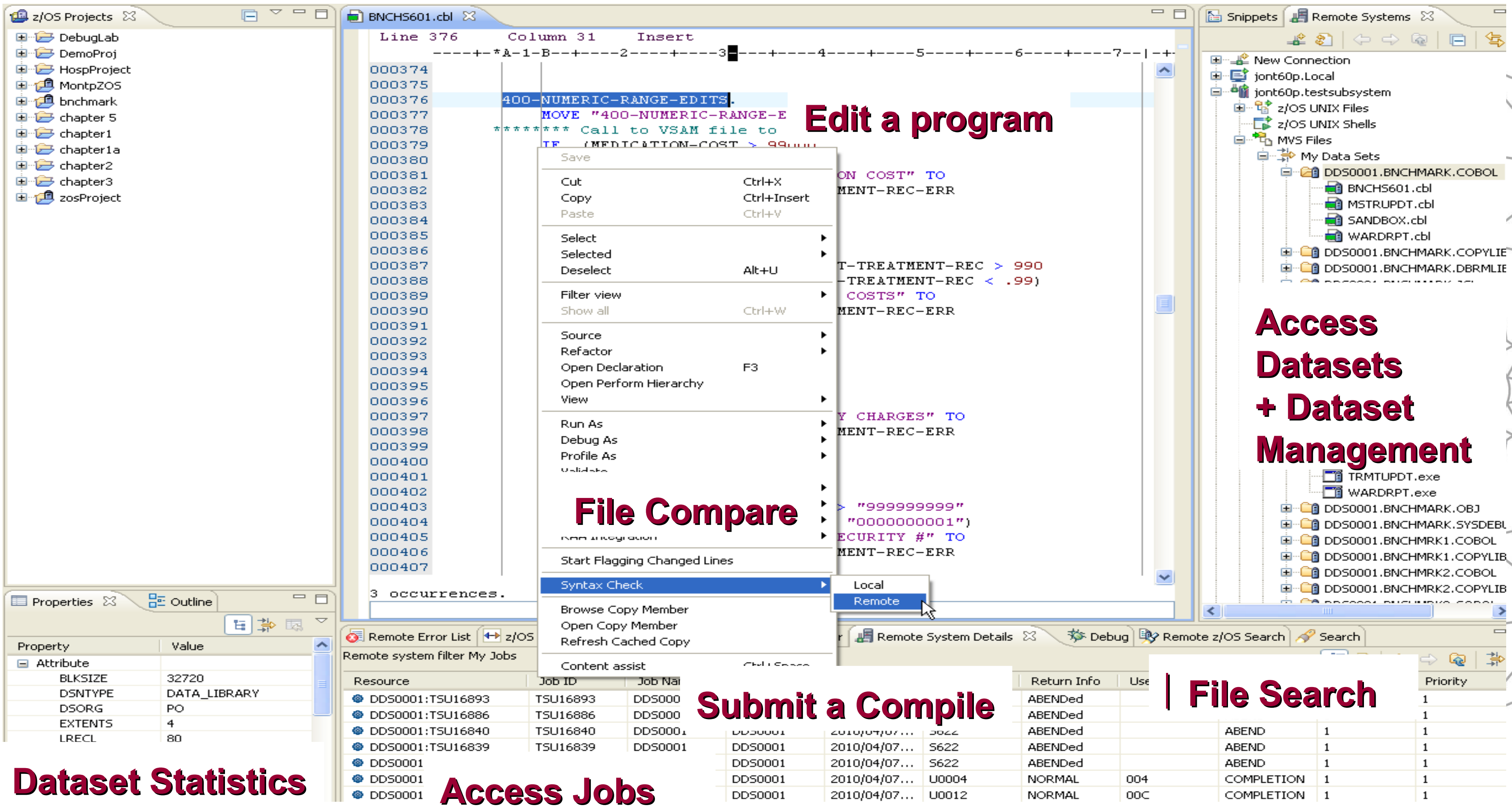
Integration with RD&T for flexible access to System z environment

Integration with File Manager for file and test data handling



The Benefits of RDz

Instead of maneuvering to access panels and working **sequentially**, in RDz the functionality you need is always in-focus – you work **concurrently**



```
Line 376       Column 31      Insert
----+-*A-1-B--+----2----+----3----+----4----+----5----+----6----+----7--|-+-
       400-NUMERIC-RANGE-EDITS.
           MOVE "400-NUMERIC-RANGE-E
      ******** Call to VSAM file to
           IF   (MEDICATION-COST > 99....
                                      ON COST" TO
                                      MENT-REC-ERR
                                      T-TREATMENT-REC > 990
                                      -TREATMENT-REC < .99)
                                       COSTS" TO
                                      MENT-REC-ERR
                                      Y CHARGES" TO
                                      MENT-REC-ERR
                                      > "999999999"
                                       "0000000001")
                                      ECURITY #" TO
                                      MENT-REC-ERR
3 occurrences.
```

Property	Value
Attribute	
BLKSIZE	32720
DSNTYPE	DATA_LIBRARY
DSORG	PO
EXTENTS	4
LRECL	80

Resource	Job ID	Job Name				Return Info	User			Priority
DDS0001:TSU16893	TSU16893	DDS000				ABENDed				1
DDS0001:TSU16886	TSU16886	DDS000				ABENDed				1
DDS0001:TSU16840	TSU16840	DDS0001	DDS0001	2010/04/07...	S622	ABENDed		ABEND	1	1
DDS0001:TSU16839	TSU16839	DDS0001	DDS0001	2010/04/07...	S622	ABENDed		ABEND	1	1
DDS0001			DDS0001	2010/04/07...	S622	ABENDed		ABEND	1	1
DDS0001			DDS0001	2010/04/07...	U0004	NORMAL	004	COMPLETION	1	1
DDS0001			DDS0001	2010/04/07...	U0012	NORMAL	00C	COMPLETION	1	1

Edit a program

Access Datasets + Dataset Management

File Compare

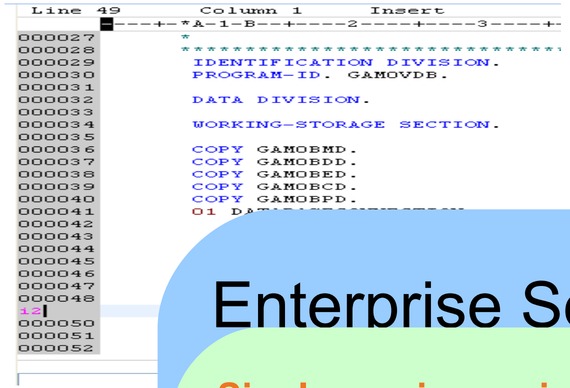
Submit a Compile

File Search

Dataset Statistics

Access Jobs (Outlist facility)

Traditional development and Enterprise web services



```
 Line 49        Column 1        Insert
       ----+-*A-1-B--+----2----+----3----+-
000027      *
000028      *****************************
000029       IDENTIFICATION DIVISION.
000030       PROGRAM-ID.  GAMOVDB.
000031
000032       DATA DIVISION.
000033
000034       WORKING-STORAGE SECTION.
000035
000036       COPY GAMOBMD.
000037       COPY GAMOBDD.
000038       COPY GAMOBED.
000039       COPY GAMOBCD.
000040       COPY GAMOBPD.
000041       01  D
000042
000043
000044
000045
000046
000047
000048
12
000050
000051
000052
```

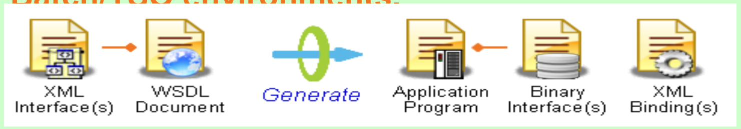
Supports traditional development/maintenance
- Cobol, PL/I, Assembler, JCL

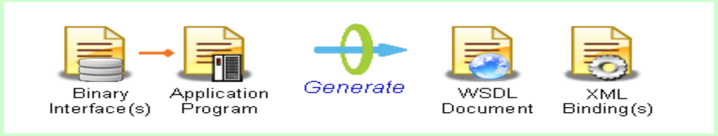
Supports modern architecture development

Enterprise Service Tools

Single service projects

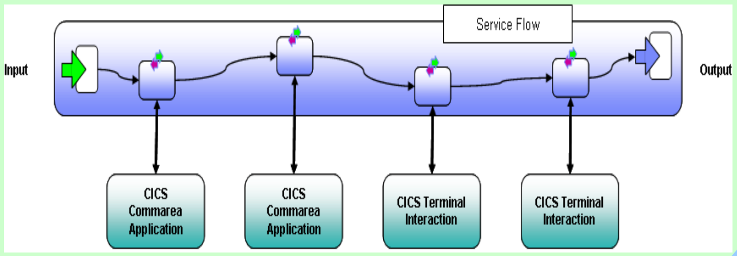
Top down, bottom up, and meet in the middle web service enablement for CICS, IMS, and Batch/TSO environments.





Service flow projects

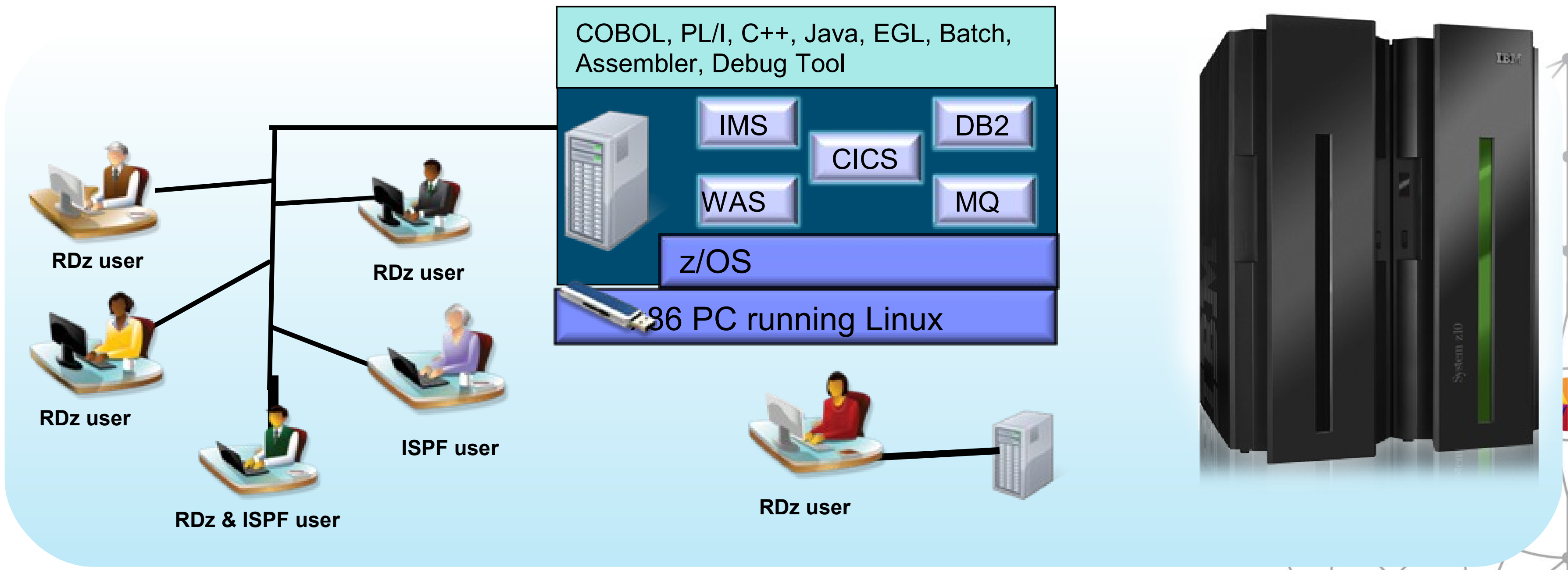
Graphical composition of CICS applications chained together to form a new business service.


Service Flow
Input
Output
CICS Commarea Application
CICS Commarea Application
CICS Terminal Interaction
CICS Terminal Interaction

Enable Enterprise Applications for Mobile and Web

Rational Development and Test Environment for System z

The ultimate in modern application development for System z



- Increase availability of z/OS testing environment and resources
  - Liberate developers to rapidly prototype new applications
  - Develop and test System z applications anywhere, anytime!
  - Eliminate costly delays by reducing dependencies on operations staff
- Improve quality and lower risk via automation, measurement, and collaboration
- Focus on what is required for the change at hand, then scale

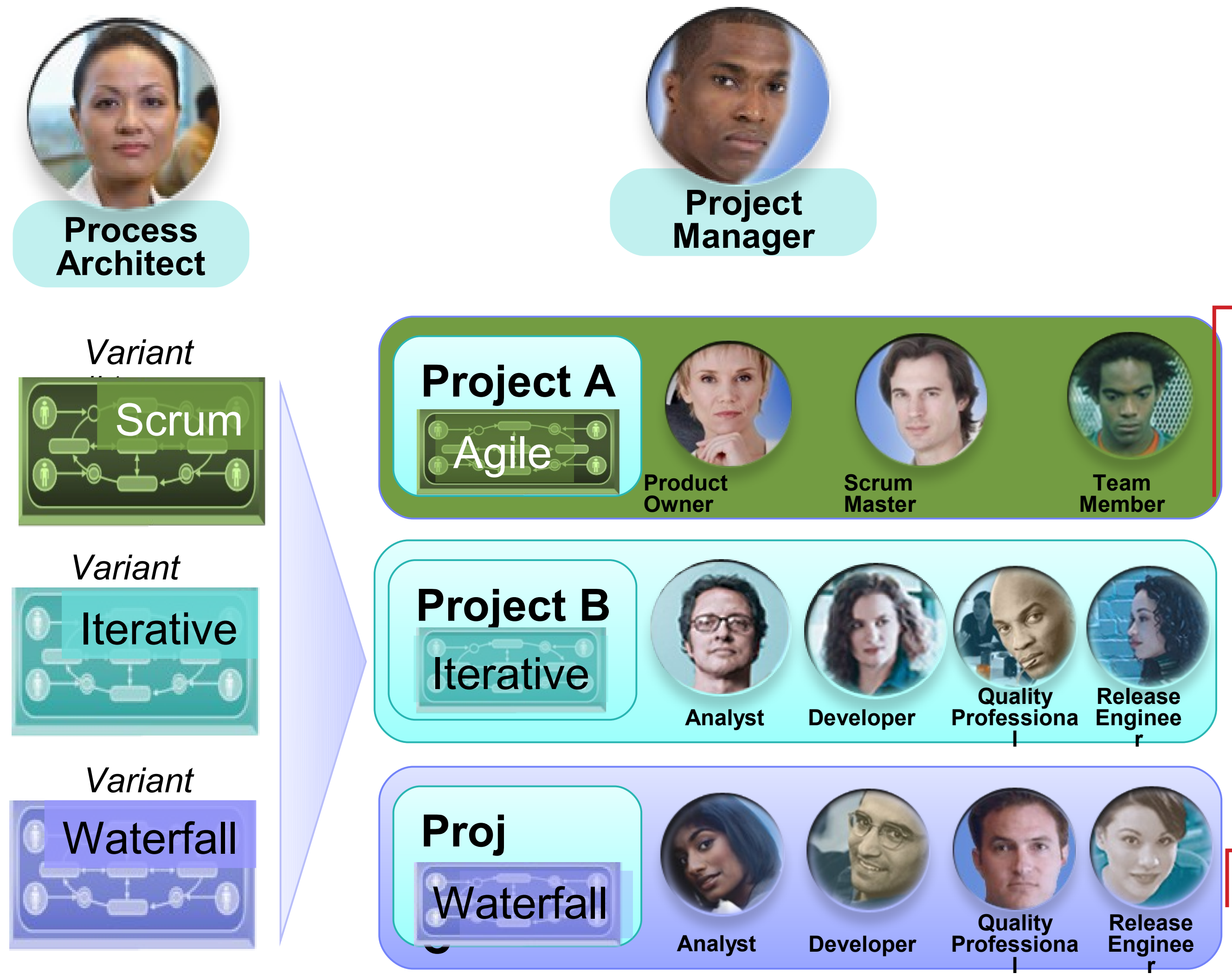
Note: This Program is licensed only for development and test of applications that run on IBM z/OS. The Program may not be used to run production workloads of any kind, nor more robust development workloads including without limitation production module builds, pre-production testing, stress testing, or performance testing.

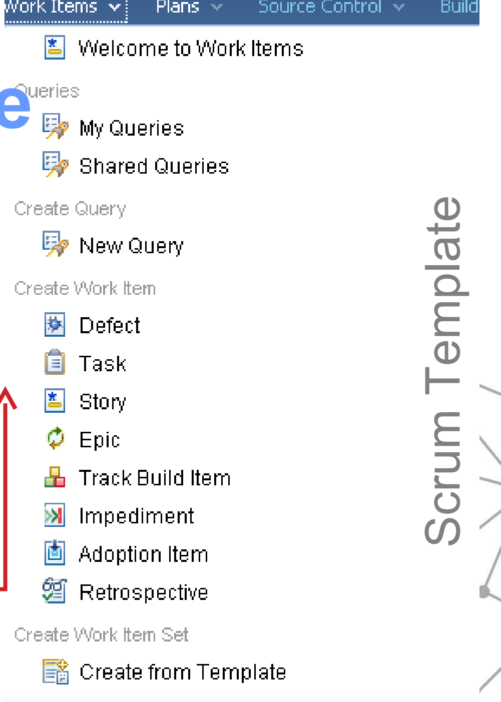
Development Life Cycle

Planning	Source Dev	Governance/Unit test	Build
• Define the tasks • Create a plan • Create a work item • Assign the work item to a developer	• Load the project/source artifacts from SCM • Navigate, Analyze, Edit, Syntax check source code	• Compile • Quality assurance • Debug • Code Coverage • Code review • Unit Testing	• Check-in/Deliver the source code • Build
CLM	RDz RTC	RDz RD&T RTC	RTC RDz

Any process: Executable and repeatable

Use ONE tool to support both agile and non-agile





Work Items | Plans | Source Control | Builds

- Welcome to Work Items

Queries

- My Queries
- Shared Queries

Create Query

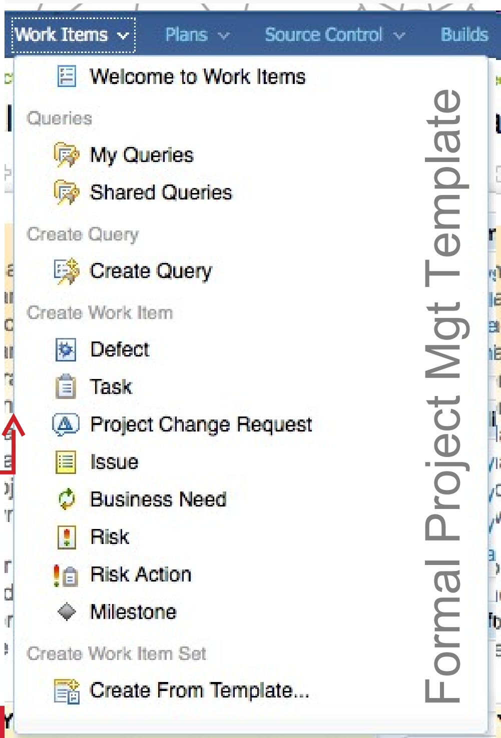
- New Query

Create Work Item

- Defect
- Task
- Story
- Epic
- Track Build Item
- Impediment
- Adoption Item
- Retrospective

Create Work Item Set

- Create from Template



Work Items | Plans | Source Control | Builds

- Welcome to Work Items

Queries

- My Queries
- Shared Queries

Create Query

- Create Query

Create Work Item

- Defect
- Task
- Project Change Request
- Issue
- Business Need
- Risk
- Risk Action
- Milestone

Create Work Item Set

- Create From Template...

Multiple plan views facilitate continuous planning

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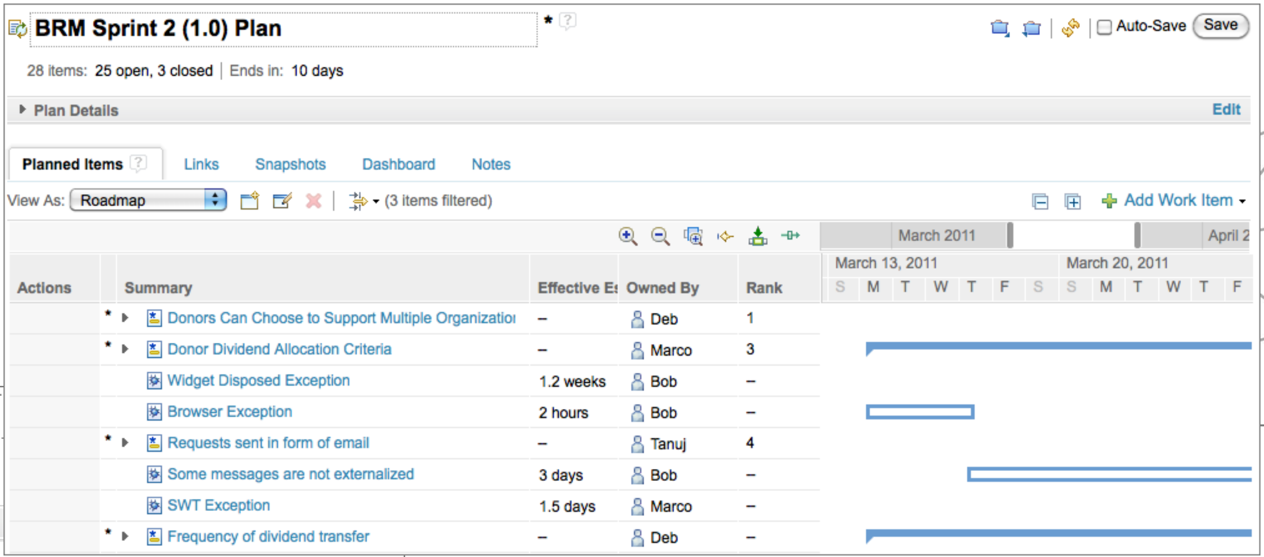
Technology · Connections · Results



BRM Sprint 2 (1.0) Plan *

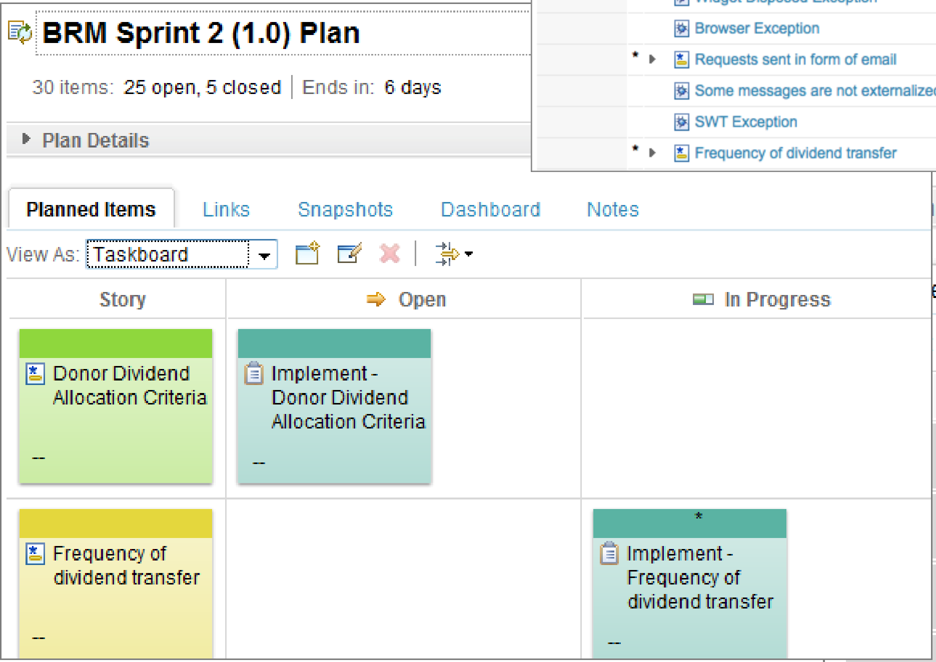
28 items: 25 open, 3 closed | Ends in: 10 days

Plan Details — Edit

Planned Items | Links | Snapshots | Dashboard | Notes

View As: Roadmap (3 items filtered) — Add Work Item

Actions		Summary	Effective E:	Owned By	Rank
	*	Donors Can Choose to Support Multiple Organizatio	–	Deb	1
	*	Donor Dividend Allocation Criteria	–	Marco	3
		Widget Disposed Exception	1.2 weeks	Bob	–
		Browser Exception	2 hours	Bob	–
	*	Requests sent in form of email	–	Tanuj	4
		Some messages are not externalized	3 days	Bob	–
		SWT Exception	1.5 days	Marco	–
	*	Frequency of dividend transfer	–	Deb	–



BRM Sprint 2 (1.0) Plan

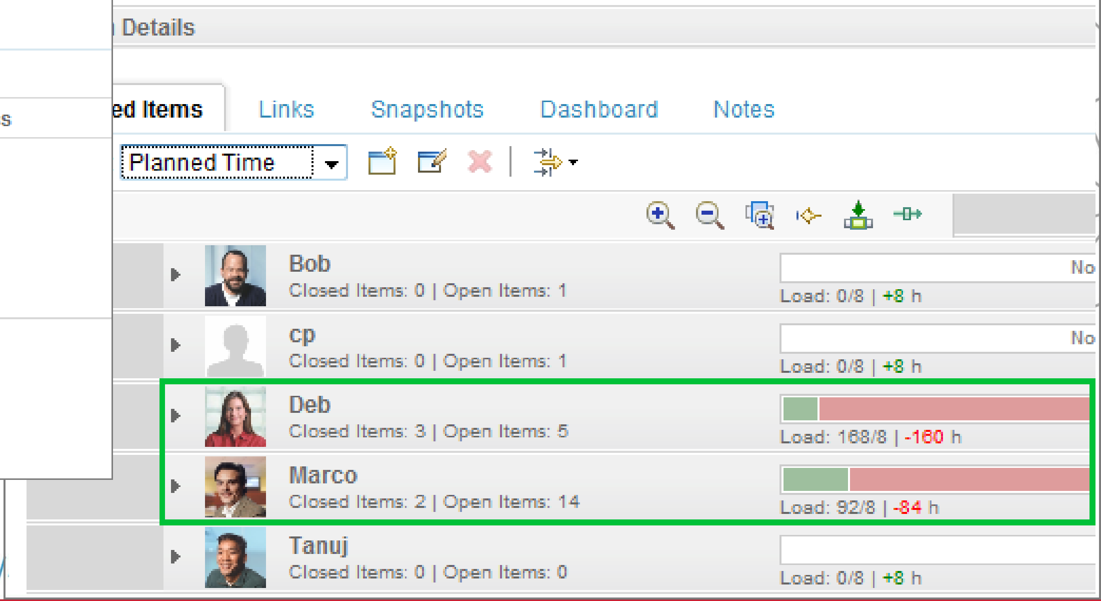
30 items: 25 open, 5 closed | Ends in: 6 days

Plan Details

Planned Items | Links | Snapshots | Dashboard | Notes

View As: Taskboard

Story	Open	In Progress
Donor Dividend Allocation Criteria –	Implement - Donor Dividend Allocation Criteria –	
Frequency of dividend transfer –		* Implement - Frequency of dividend transfer –



Details

ed Items | Links | Snapshots | Dashboard | Notes

Planned Time

Bob — Closed Items: 0 | Open Items: 1 — Load: 0/8 | +8 h — No

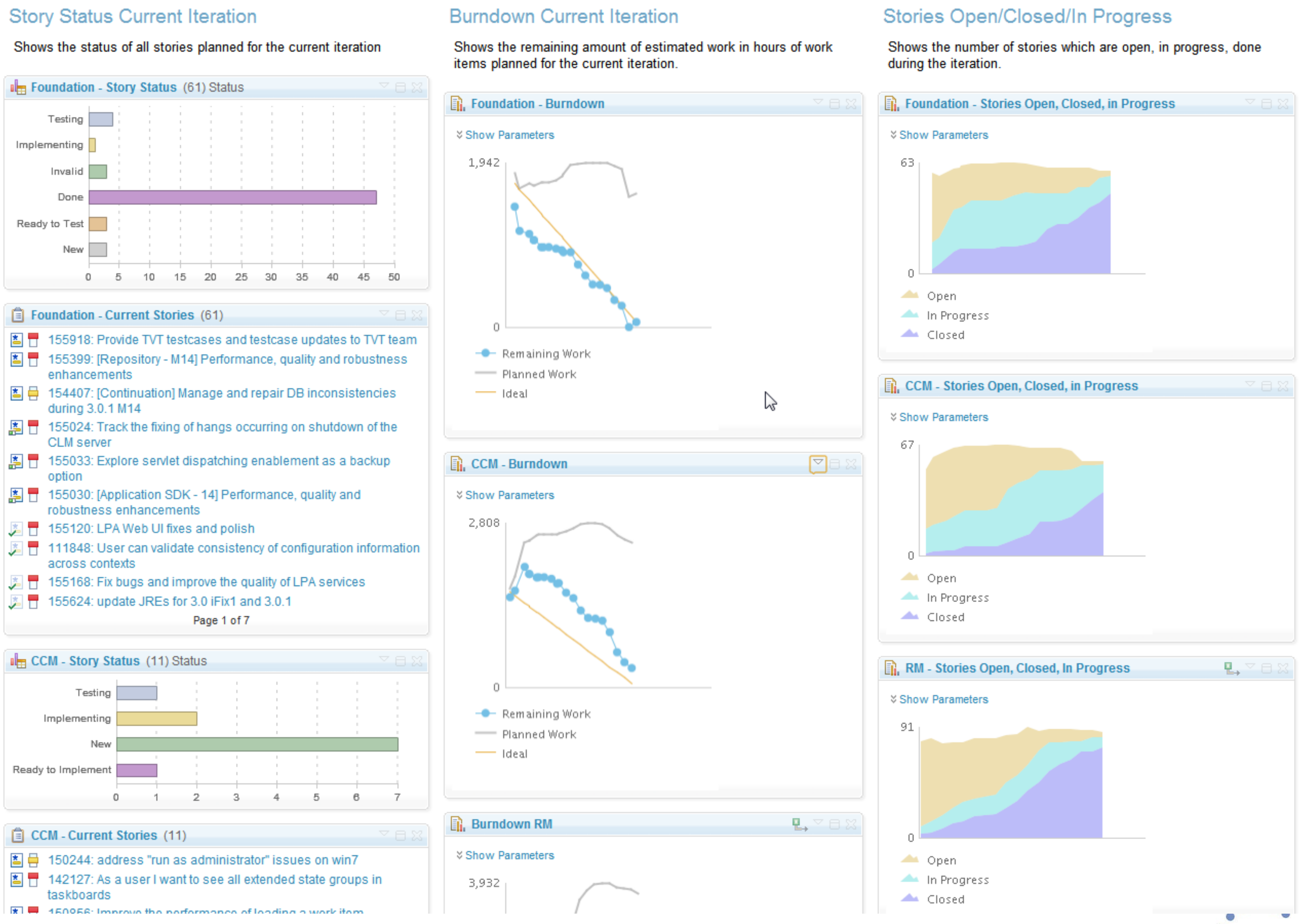
cp — Closed Items: 0 | Open Items: 1 — Load: 0/8 | +8 h — No

Deb — Closed Items: 3 | Open Items: 5 — Load: 168/8 | -160 h

Marco — Closed Items: 2 | Open Items: 14 — Load: 92/8 | -84 h

Tanuj — Closed Items: 0 | Open Items: 0 — Load: 0/8 | +8 h

Progress Tracking - Everyone can see live project status



Story Status Current Iteration

Shows the status of all stories planned for the current iteration

Foundation - Story Status (61) Status

Foundation - Current Stories (61)

- 155918: Provide TVT testcases and testcase updates to TVT team
- 155399: [Repository - M14] Performance, quality and robustness enhancements
- 154407: [Continuation] Manage and repair DB inconsistencies during 3.0.1 M14
- 155024: Track the fixing of hangs occurring on shutdown of the CLM server
- 155033: Explore servlet dispatching enablement as a backup option
- 155030: [Application SDK - 14] Performance, quality and robustness enhancements
- 155120: LPA Web UI fixes and polish
- 111848: User can validate consistency of configuration information across contexts
- 155168: Fix bugs and improve the quality of LPA services
- 155624: update JREs for 3.0 iFix1 and 3.0.1

Page 1 of 7

CCM - Story Status (11) Status

CCM - Current Stories (11)

- 150244: address "run as administrator" issues on win7
- 142127: As a user I want to see all extended state groups in taskboards
- 150856: Improve the performance of loading a work item

Burndown Current Iteration

Shows the remaining amount of estimated work in hours of work items planned for the current iteration.

Foundation - Burndown

Show Parameters

CCM - Burndown

Show Parameters

Burndown RM

Show Parameters

Stories Open/Closed/In Progress

Shows the number of stories which are open, in progress, done during the iteration.

Foundation - Stories Open, Closed, in Progress

Show Parameters

CCM - Stories Open, Closed, in Progress

Show Parameters

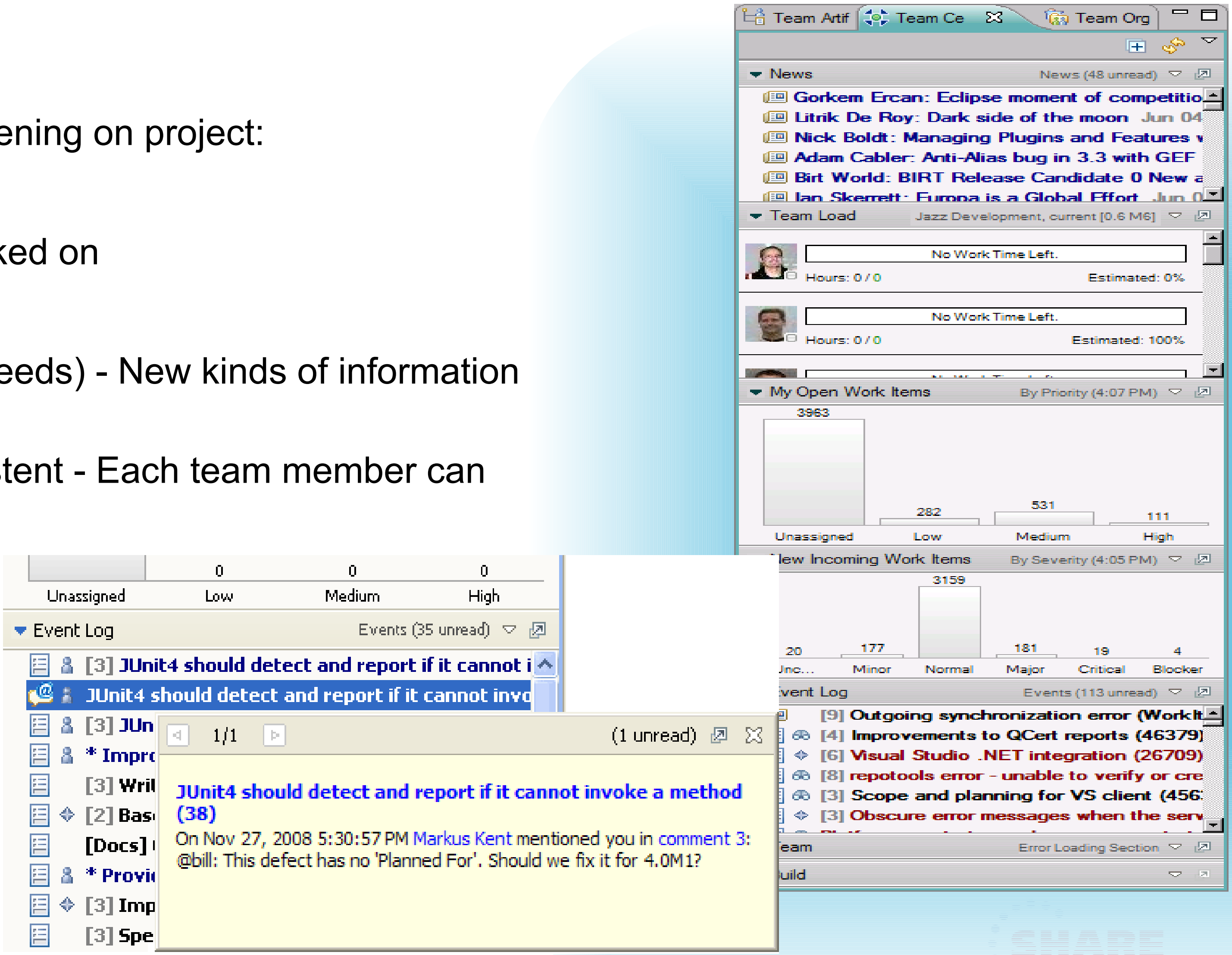
RM - Stories Open, Closed, In Progress

Show Parameters

In-context Collaboration – Team View

Team Central

- Shows what is happening on project:
  - News & events
  - What's being worked on
  - Changes
- Configurable (RSS feeds) - New kinds of information easily added
- Personalized, Persistent - Each team member can tailor to their needs



News — News (48 unread)

Gorkem Ercan: Eclipse moment of competitio
Litrik De Roy: Dark side of the moon Jun 04
Nick Boldt: Managing Plugins and Features v
Adam Cabler: Anti-Alias bug in 3.3 with GEF
Birt World: BIRT Release Candidate 0 New a
Ian Skerrett: Europa is a Global Effort Jun 0

Team Load — Jazz Development, current [0.6 M6]

No Work Time Left.
Hours: 0 / 0 Estimated: 0%

No Work Time Left.
Hours: 0 / 0 Estimated: 100%

My Open Work Items — By Priority (4:07 PM)

Unassigned	Low	Medium	High
3963	282	531	111

New Incoming Work Items — By Severity (4:05 PM)

Unc...	Minor	Normal	Major	Critical	Blocker
20	177	3159	181	19	4

Event Log — Events (113 unread)

[9] Outgoing synchronization error (WorkIt
[4] Improvements to QCert reports (46379)
[6] Visual Studio .NET integration (26709)
[8] repotools error - unable to verify or cre
[3] Scope and planning for VS client (456:
[3] Obscure error messages when the serv

Team — Error Loading Section

Build

Unassigned	Low	Medium	High
	0	0	0

Event Log — Events (35 unread)

[3] JUnit4 should detect and report if it cannot i
JUnit4 should detect and report if it cannot invo
[3] JUn
* Impro
[3] Wri
[2] Bas
[Docs]
* Provi
[3] Imp
[3] Spe

1/1 (1 unread)

JUnit4 should detect and report if it cannot invoke a method (38)

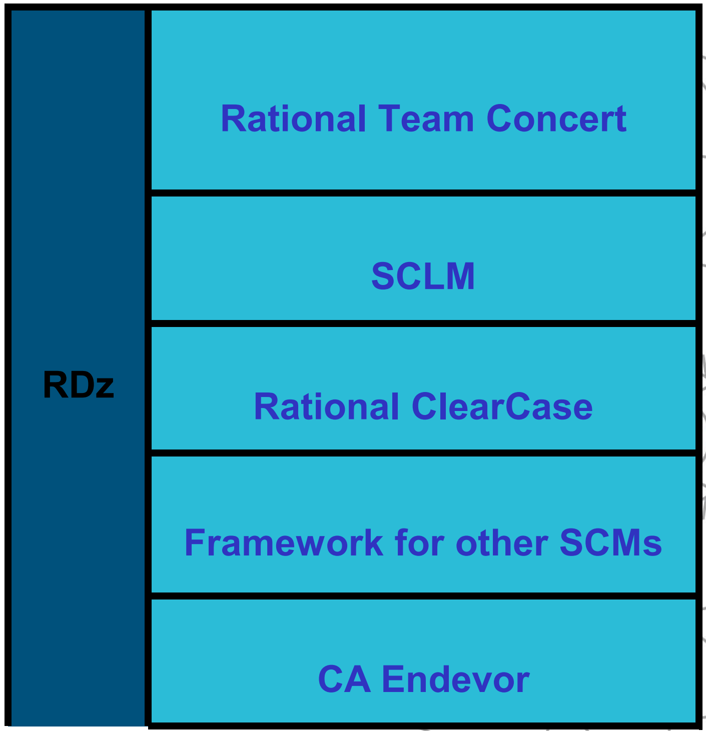
On Nov 27, 2008 5:30:57 PM Markus Kent mentioned you in comment 3:
@bill: This defect has no 'Planned For'. Should we fix it for 4.0M1?

Development Life Cycle

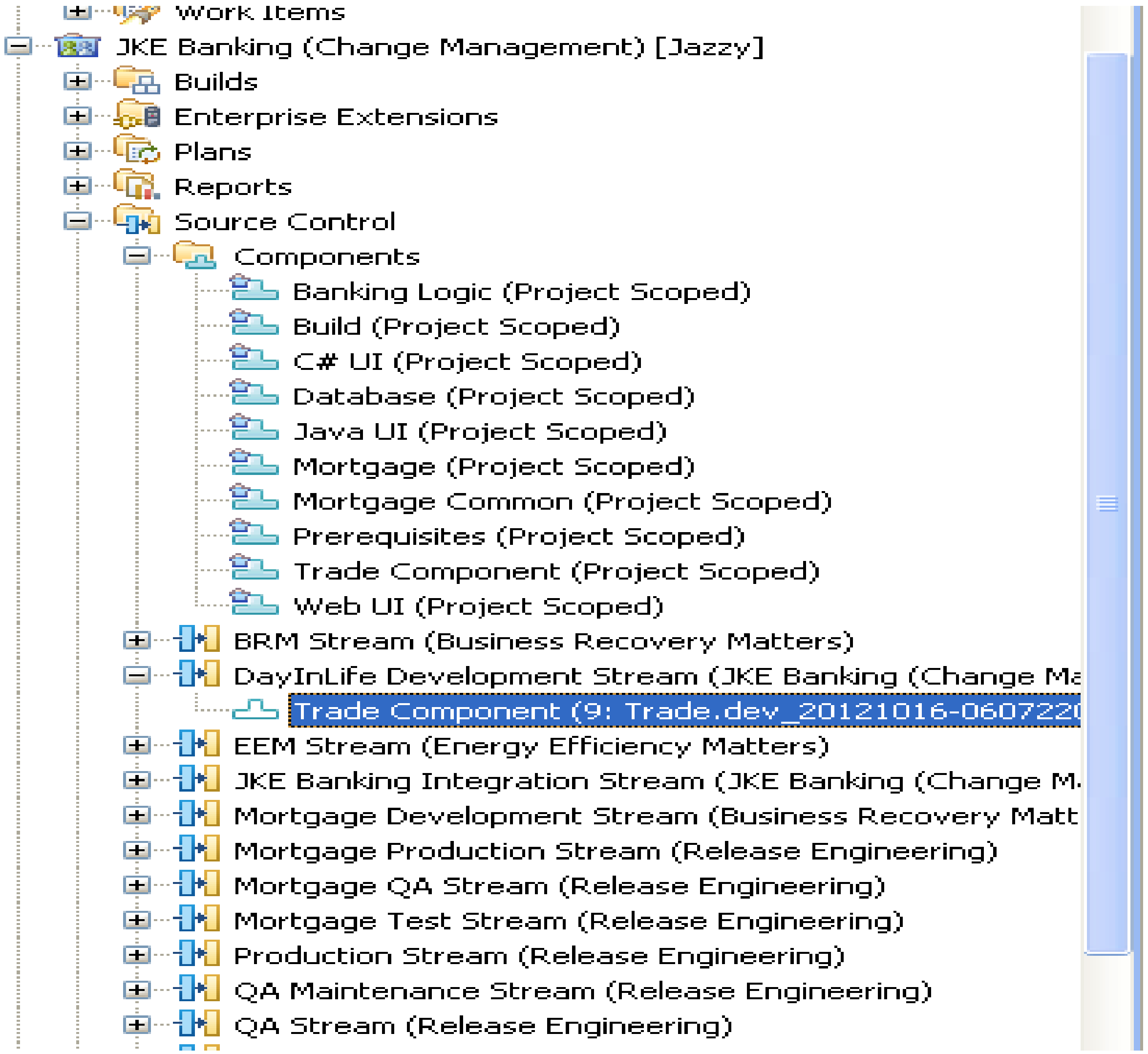
Planning	Source Dev	Governance/Unit test	Build
• Define the tasks • Create a plan • Create a work item • Assign the work item to a developer	• **Load the project/source artifacts from SCM** • **Navigate, Analyze, Edit, Syntax check source code**	• Compile • Quality assurance • Debug • Code Coverage • Code review • Unit Testing	• Check-in/Deliver the source code • Build
CLM	**RDz** **RTC**	RDz RD&T RTC	RTC RDz

RDz Source Code Integration

- Rational's Strategic Source Code tooling is RTC and RDz provides tight integration
- RDz offers integration into a variety of other Source Code Management (SCM) tools as well as a framework for creating SCM integration on your own (CARMA)
- Variety of vendors supply plug-ins to RDz to provide easy access to processes and source code controlled by their products

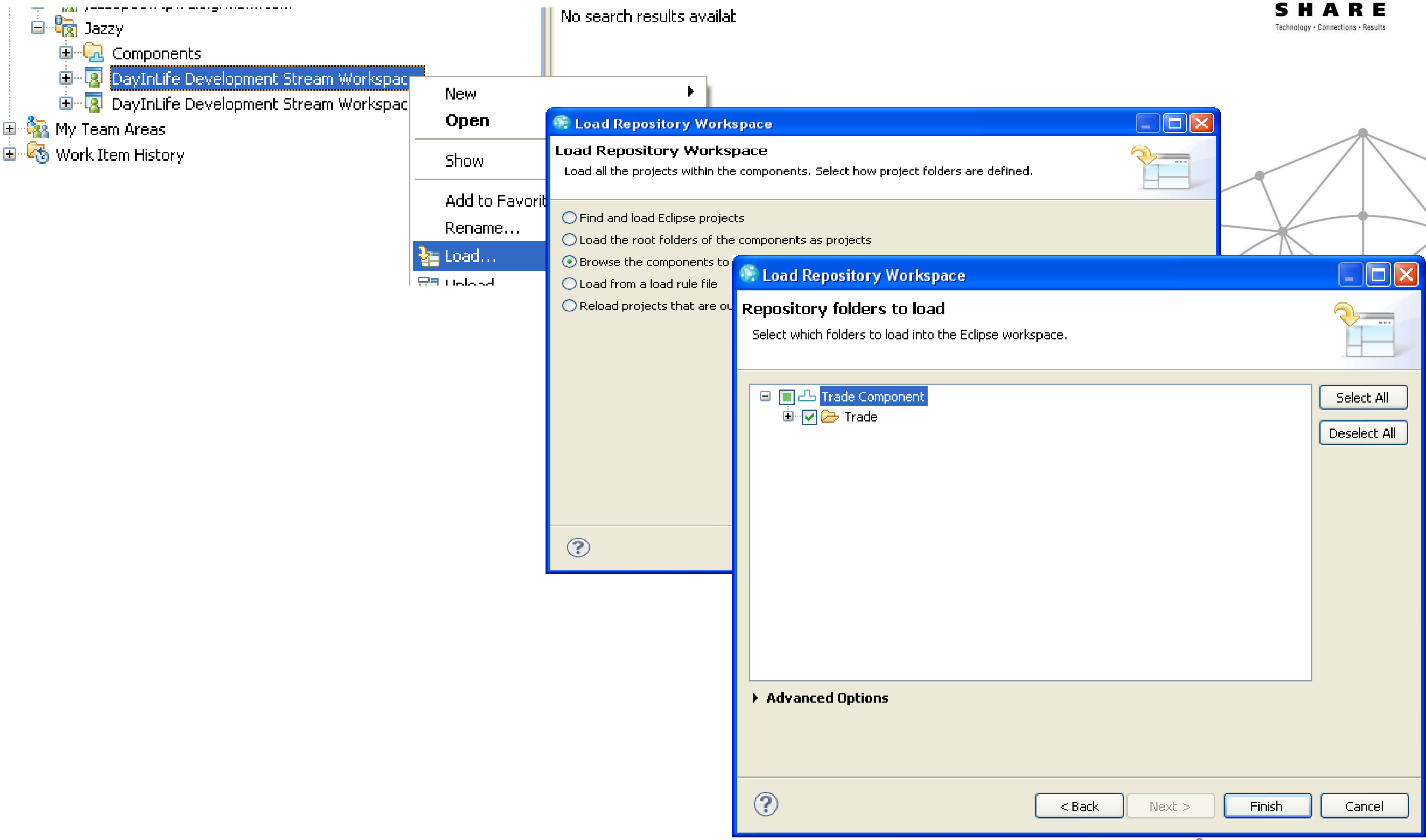


Source Control Management



Work Items
JKE Banking (Change Management) [Jazzy]
Builds
Enterprise Extensions
Plans
Reports
Source Control
Components
Banking Logic (Project Scoped)
Build (Project Scoped)
C# UI (Project Scoped)
Database (Project Scoped)
Java UI (Project Scoped)
Mortgage (Project Scoped)
Mortgage Common (Project Scoped)
Prerequisites (Project Scoped)
Trade Component (Project Scoped)
Web UI (Project Scoped)
BRM Stream (Business Recovery Matters)
DayInLife Development Stream (JKE Banking (Change Ma
Trade Component (9: Trade.dev_20121016-060722
EEM Stream (Energy Efficiency Matters)
JKE Banking Integration Stream (JKE Banking (Change M
Mortgage Development Stream (Business Recovery Matt
Mortgage Production Stream (Release Engineering)
Mortgage QA Stream (Release Engineering)
Mortgage Test Stream (Release Engineering)
Production Stream (Release Engineering)
QA Maintenance Stream (Release Engineering)
QA Stream (Release Engineering)

Load the source artifacts



Jazzy
Components
DayInLife Development Stream Workspac
DayInLife Development Stream Workspac
My Team Areas
Work Item History

No search results availat

New
Open
Show
Add to Favorit
Rename...
Load...

Load Repository Workspace

Load all the projects within the components. Select how project folders are defined.

- ( ) Find and load Eclipse projects
- ( ) Load the root folders of the components as projects
- (●) Browse the components to
- ( ) Load from a load rule file
- ( ) Reload projects that are ou

Repository folders to load

Select which folders to load into the Eclipse workspace.

- Trade Component
  - ✓ Trade

Select All | Deselect All

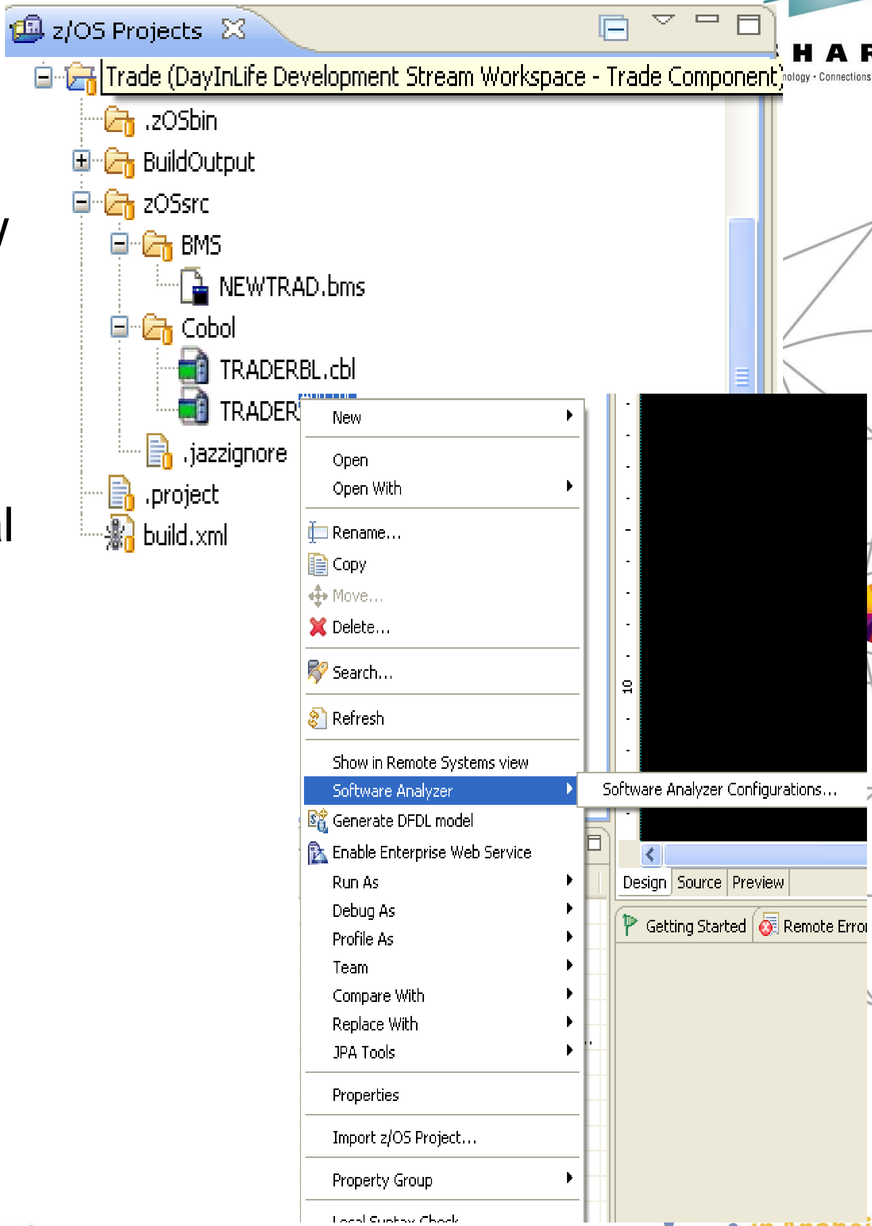
Advanced Options

< Back | Next > | Finish | Cancel

RDz and RTC together

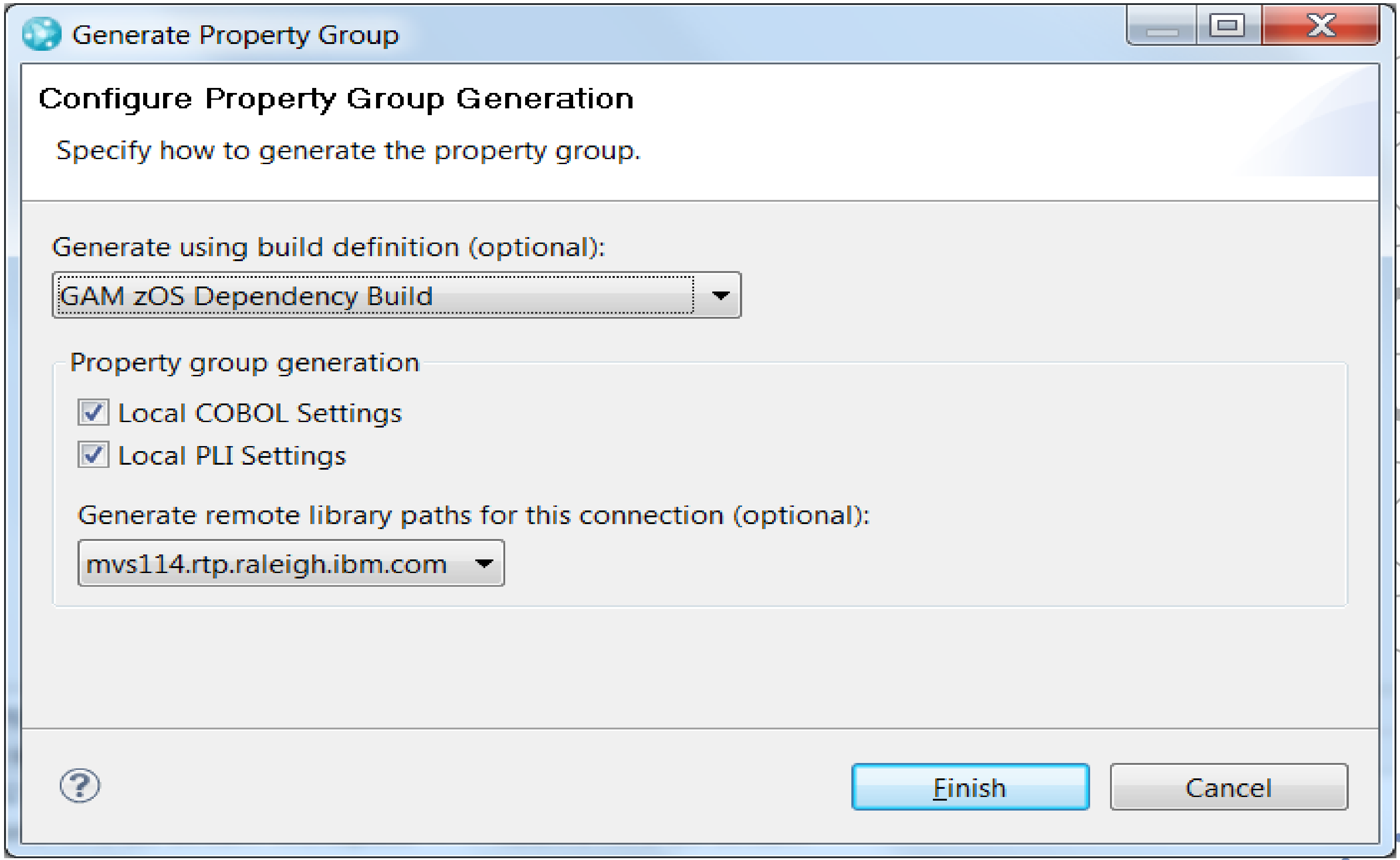
- Once the project is loaded, it will appear in the RDz z/OS projects view

- RDz augments the development productivity & experience
  - Appropriate editors (COBOL, maps, etc.) and functions (content assist, real time syntax check, etc.)
  - High value functions (Enterprise web services, SFM, Code review, Unit testing, program analysis/control flow etc.)



Create a Property Group

- Generate property groups for your project based on RTC build definition
- Allows RDz to resolve the dependencies and thus offer all the tooling



Generate Property Group

Configure Property Group Generation

Specify how to generate the property group.

Generate using build definition (optional): GAM zOS Dependency Build

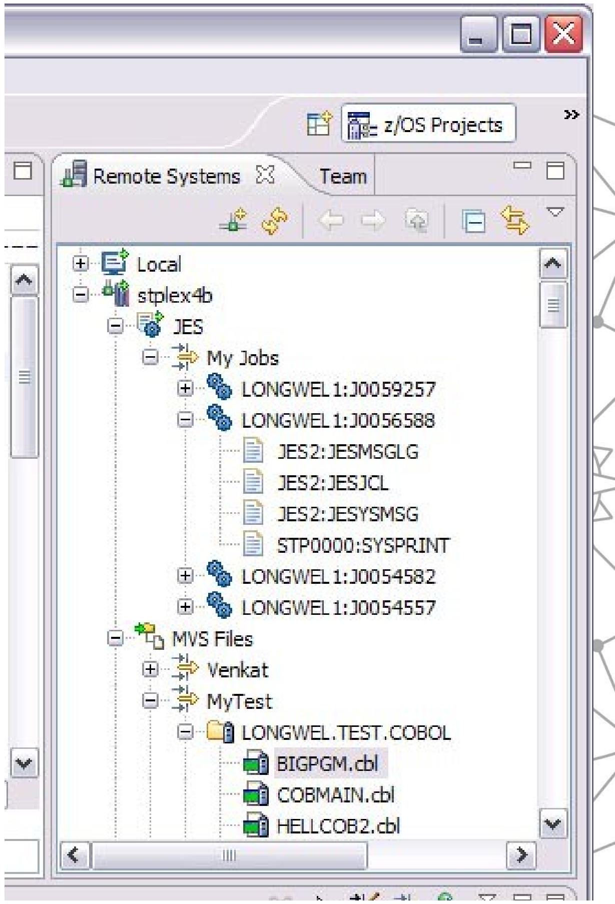
Property group generation

- [✓] Local COBOL Settings
- [✓] Local PLI Settings

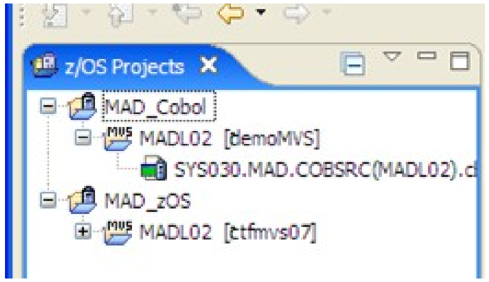
Generate remote library paths for this connection (optional): mvs114.rtp.raleigh.ibm.com

Navigate datasets and jobs live on zOS

- Connect to multiple hosts concurrently
- Respects existing security configurations and user IDs
- Search, filter, browse, edit, compare, migrate, and allocate new MVS datasets and USS files
- Copy source code, members, or datasets between systems with a few mouse clicks.
- Access JES queues submit jobs, view job state, and open output spools
- Submit TSO or USS commands
- Add datasets and members into projects to group applications and work items together logically
- Open an emulator in the IDE to configured hosts



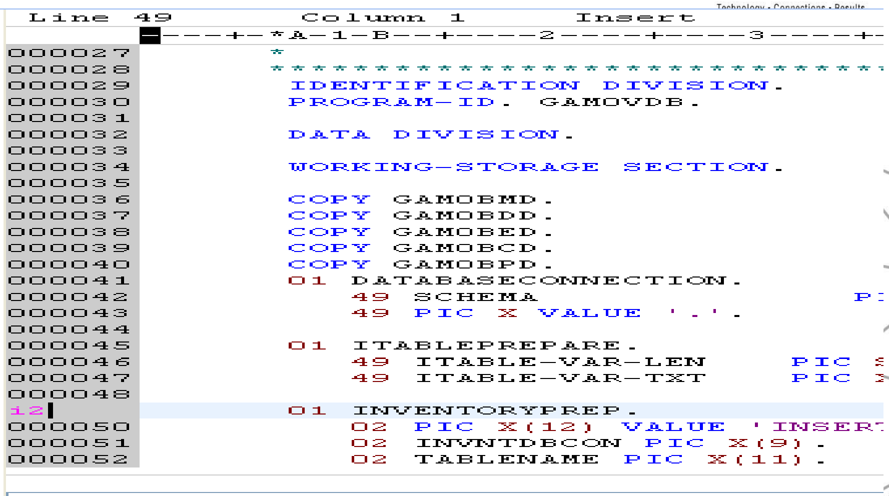
```
Local
stplex4b
  JES
    My Jobs
      LONGWEL1:J0059257
      LONGWEL1:J0056588
        JES2:JESMSGLG
        JES2:JESJCL
        JES2:JESYSMSG
        STP0000:SYSPRINT
      LONGWEL1:J0054582
      LONGWEL1:J0054557
  MVS Files
    Venkat
    MyTest
      LONGWEL.TEST.COBOL
        BIGPGM.cbl
        COBMAIN.cbl
        HELLCOB2.cbl
```



```
MAD_Cobol
  MADL02 [demoMVS]
    SYS030.MAD.COBSRC(MADL02).c
MAD_zOS
  MADL02 [ttfmvs07]
```

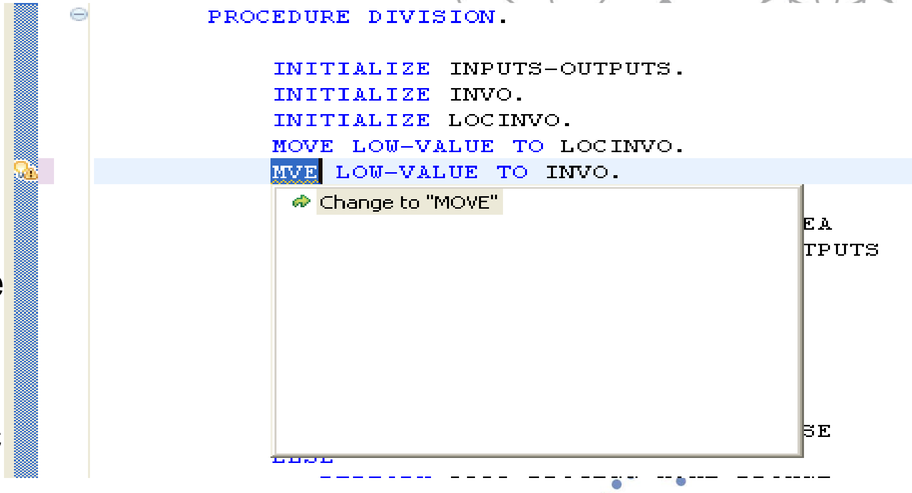
Edit capabilities in RDz

- RDz at a high level has different types of editors
  - LPEX Editor
    - Supports editing of COBOL, PLI, HLASM, JCL, C/C++, Rexx etc.
    - Provides ISPF like edit experience including prefix commands, command line and even look and feel
    - Supports advanced edit functions for COBOL, PLI and HLASM like real time syntax checking, content assist



```
  Line 49               Column 1        Insert
 ----+-*A-1-B--+----2----+----3----+-
000027       *
000028       ***********************************
000029        IDENTIFICATION DIVISION.
000030        PROGRAM-ID.  GAMOVDB.
000031
000032        DATA DIVISION.
000033
000034        WORKING-STORAGE SECTION.
000035
000036        COPY GAMOBMD.
000037        COPY GAMOBDD.
000038        COPY GAMOBED.
000039        COPY GAMOBCD.
000040        COPY GAMOBPD.
000041        01 DATABASECONNECTION.
000042           49 SCHEMA                         PI
000043           49 PIC X VALUE '.'.
000044
000045        01 ITABLEPREPARE.
000046           49 ITABLE-VAR-LEN         PIC S
000047           49 ITABLE-VAR-TXT         PIC X
000048
i2            01 INVENTORYPREP.
000050           02 PIC X(12) VALUE 'INSERT
000051           02 INVNTDBCON PIC X(9).
000052           02 TABLENAME PIC X(11).
```

  - COBOL, PLI, and JCL advanced editors
    - Based on the Eclipse editor infrastructure, provide more advanced edit capabilities like quick fixes, hyper-linking, hover, easy navigation between various edit sessions or within the same edit session.
    - Supports real time syntax checking, content assist, key word highlighting etc

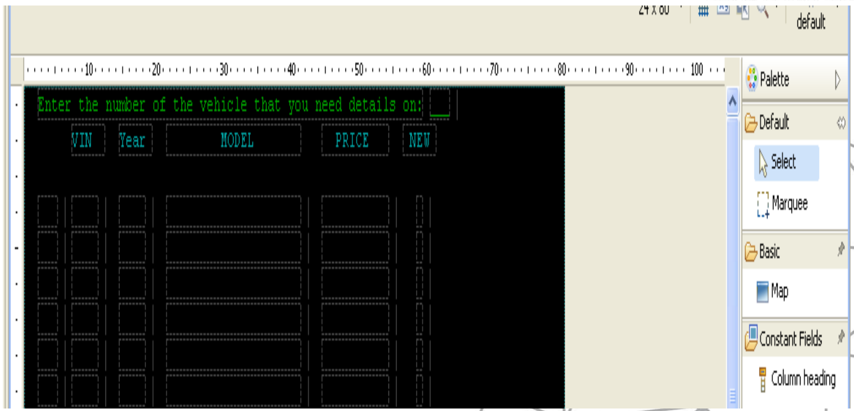


```
       PROCEDURE DIVISION.

           INITIALIZE INPUTS-OUTPUTS.
           INITIALIZE INVO.
           INITIALIZE LOCINVO.
           MOVE LOW-VALUE TO LOCINVO.
           MVE LOW-VALUE TO INVO.
```

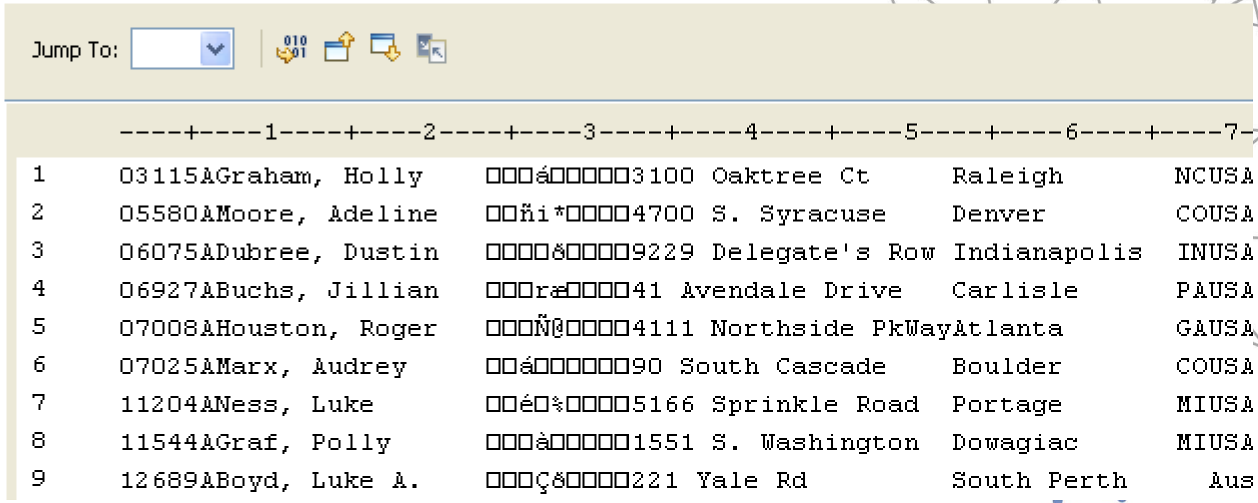
Change to "MOVE"

Edit capabilities in RDz

- RDz at a high level has different types of editors
  - WYSIWYG editors
    - Creation, edit of BMS and MFS maps
    - Has the source and design view – allows drag and drop of fields in the design view which generates the appropriate source



  - Data Editors
    - Edit QSAM data

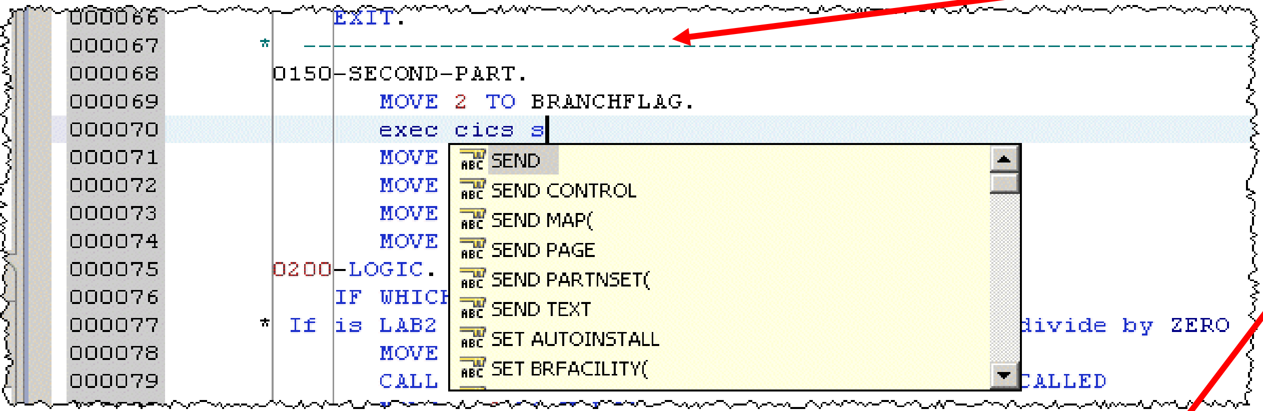


```
        ----+----1----+----2----+----3----+----4----+----5----+----6----+----7-
1       03115AGraham, Holly     □□□á□□□□□3100 Oaktree Ct      Raleigh        NCUSA
2       05580AMoore, Adeline    □□ñi*□□□□4700 S. Syracuse     Denver         COUSA
3       06075ADubree, Dustin    □□□□ô□□□□9229 Delegate's Row Indianapolis    INUSA
4       06927ABuchs, Jillian    □□□ræ□□□□41 Avendale Drive    Carlisle       PAUSA
5       07008AHouston, Roger    □□□Ñ@□□□□4111 Northside PkWayAtlanta         GAUSA
6       07025AMarx, Audrey      □□á□□□□□□90 South Cascade     Boulder        COUSA
7       11204ANess, Luke        □□é□%□□□□5166 Sprinkle Road   Portage        MIUSA
8       11544AGraf, Polly       □□□à□□□□□1551 S. Washington   Dowagiac       MIUSA
9       12689ABoyd, Luke A.     □□□Çô□□□□221 Yale Rd          South Perth      Aus
```

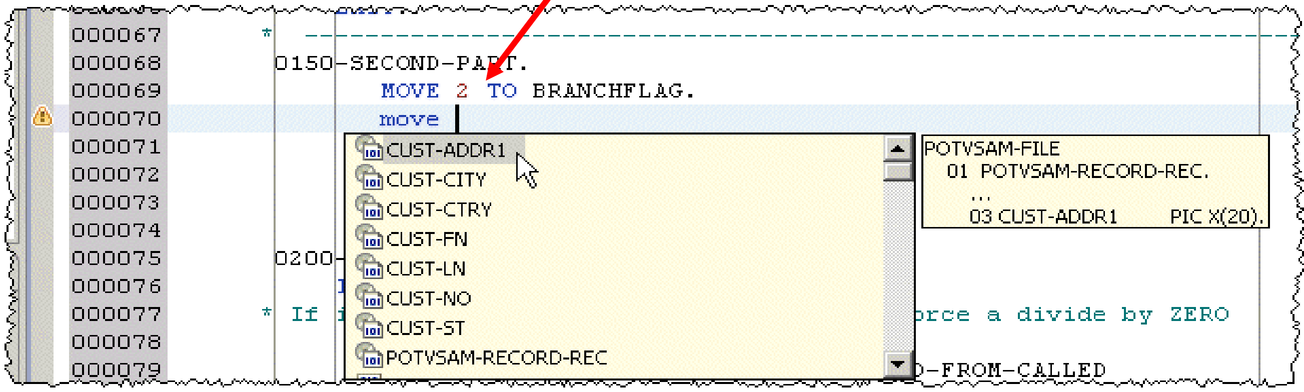
Editor Productivity features - Develop code more efficiently

Find all statements
and
variables

(including from COPYBOOKS or INCLUDE)



```
           EXIT.
      *  -------------------------------------------------------------
       0150-SECOND-PART.
           MOVE 2 TO BRANCHFLAG.
           exec cics s
           MOVE
           MOVE
           MOVE
           MOVE
       0200-LOGIC.
           IF WHICH
      *  If is LAB2                                 divide by ZERO
           MOVE
           CALL                                    CALLED
```

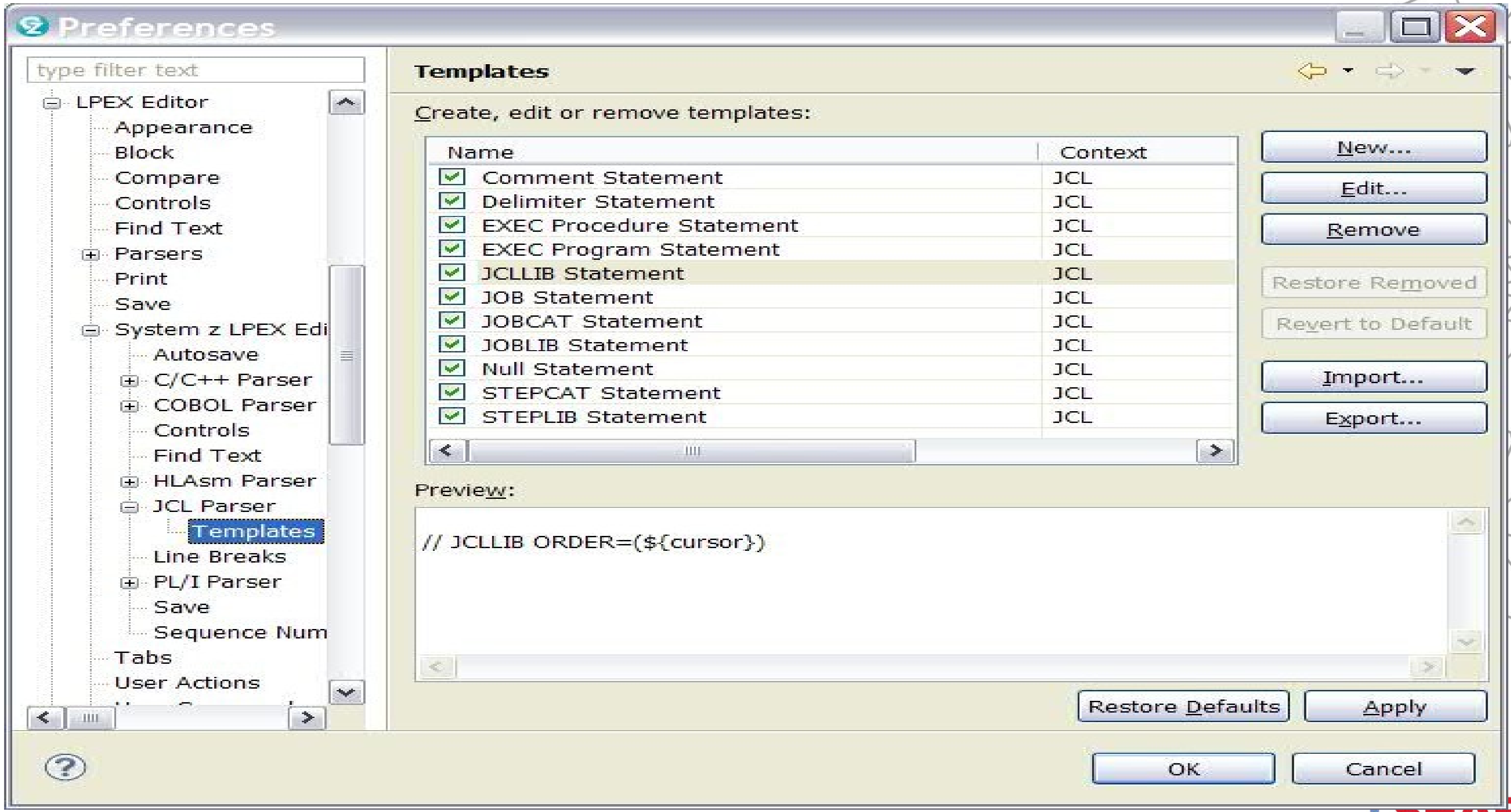


```
      *  -------------------------------------------------------------
       0150-SECOND-PART.
           MOVE 2 TO BRANCHFLAG.
           move
       0200-
      *  If i                                       orce a divide by ZERO
                                                   -FROM-CALLED
```

```
POTVSAM-FILE
  01  POTVSAM-RECORD-REC.
      ...
      03 CUST-ADDR1          PIC X(20).
```

JCL Template Support

- Templates are provided for standard JCL statements, and users can create their own Templates
- When editing .jcl file using “Ctrl+Space” in the editor will trigger a pop list allowing the user to select the template to insert into the editor contents

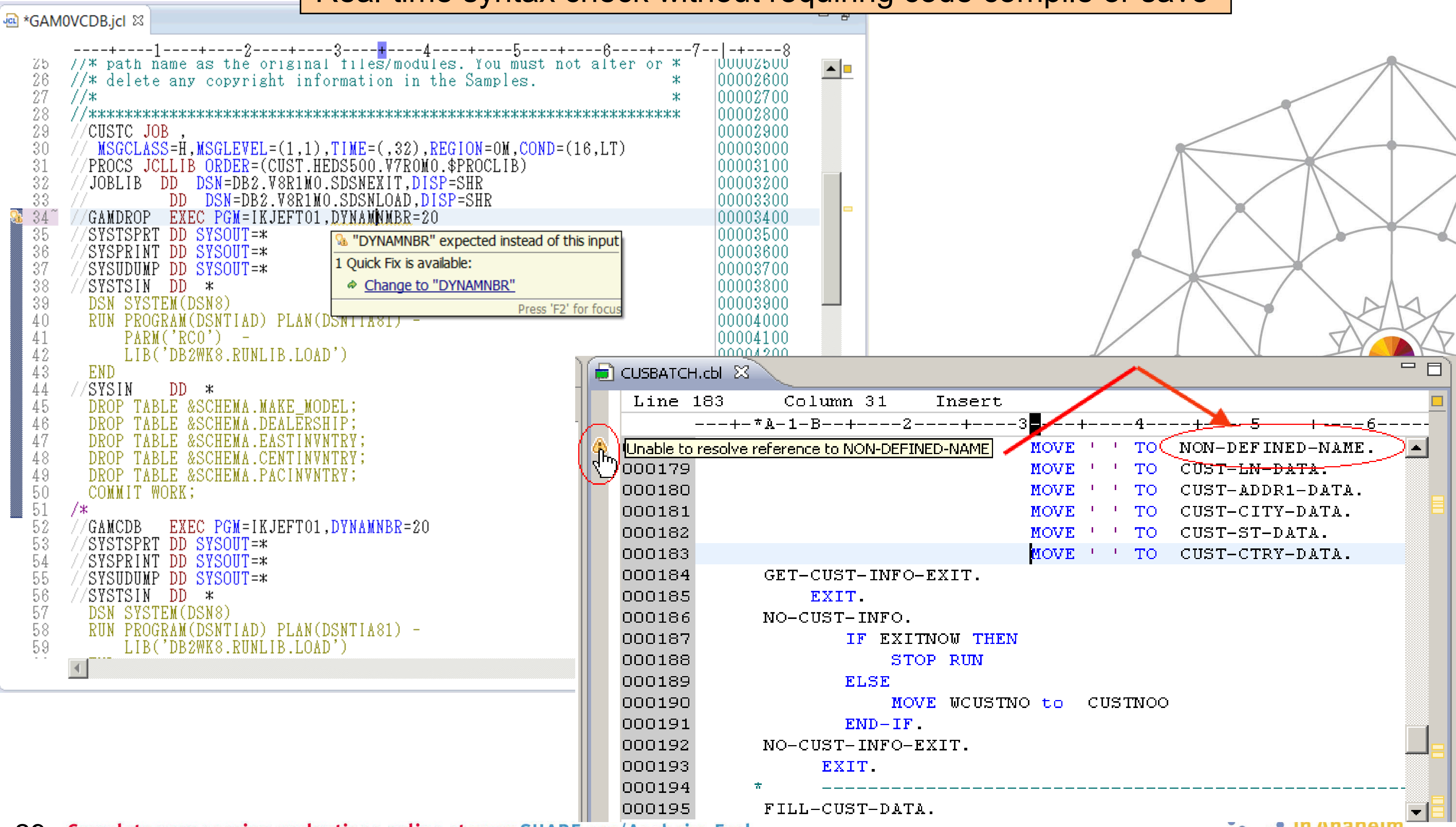


Name	Context
✓ Comment Statement	JCL
✓ Delimiter Statement	JCL
✓ EXEC Procedure Statement	JCL
✓ EXEC Program Statement	JCL
✓ JCLLIB Statement	JCL
✓ JOB Statement	JCL
✓ JOBCAT Statement	JCL
✓ JOBLIB Statement	JCL
✓ Null Statement	JCL
✓ STEPCAT Statement	JCL
✓ STEPLIB Statement	JCL

```
// JCLLIB ORDER=(${cursor})
```

Editor Productivity Features – real time syntax checking

Real-time syntax check without requiring code compile or save



*GAM0VCDB.jcl

```
//* path name as the original files/modules. You must not alter or *   00002500
//* delete any copyright information in the Samples.                *   00002600
//*                                                                 *   00002700
//*******************************************************************   00002800
//CUSTC JOB ,                                                           00002900
//  MSGCLASS=H,MSGLEVEL=(1,1),TIME=(,32),REGION=0M,COND=(16,LT)         00003000
//PROCS JCLLIB ORDER=(CUST.HEDS500.V7R0M0.$PROCLIB)                     00003100
//JOBLIB  DD  DSN=DB2.V8R1M0.SDSNEXIT,DISP=SHR                          00003200
//         DD  DSN=DB2.V8R1M0.SDSNLOAD,DISP=SHR                         00003300
//GAMDROP  EXEC PGM=IKJEFT01,DYNAMNMBR=20                               00003400
//SYSTSPRT DD SYSOUT=*                                                  00003500
//SYSPRINT DD SYSOUT=*                                                  00003600
//SYSUDUMP DD SYSOUT=*                                                  00003700
//SYSTSIN  DD  *                                                        00003800
 DSN SYSTEM(DSN8)                                                       00003900
 RUN PROGRAM(DSNTIAD) PLAN(DSNTIA81) -                                  00004000
     PARM('RC0')  -                                                     00004100
     LIB('DB2WK8.RUNLIB.LOAD')                                          00004200
 END
//SYSIN     DD  *
 DROP TABLE &SCHEMA.MAKE_MODEL;
 DROP TABLE &SCHEMA.DEALERSHIP;
 DROP TABLE &SCHEMA.EASTINVNTRY;
 DROP TABLE &SCHEMA.CENTINVNTRY;
 DROP TABLE &SCHEMA.PACINVNTRY;
 COMMIT WORK;
/*
//GAMCDB   EXEC PGM=IKJEFT01,DYNAMNBR=20
//SYSTSPRT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSTSIN  DD  *
 DSN SYSTEM(DSN8)
 RUN PROGRAM(DSNTIAD) PLAN(DSNTIA81) -
     LIB('DB2WK8.RUNLIB.LOAD')
```

"DYNAMNBR" expected instead of this input
1 Quick Fix is available:
Change to "DYNAMNBR"
Press 'F2' for focus

CUSBATCH.cbl

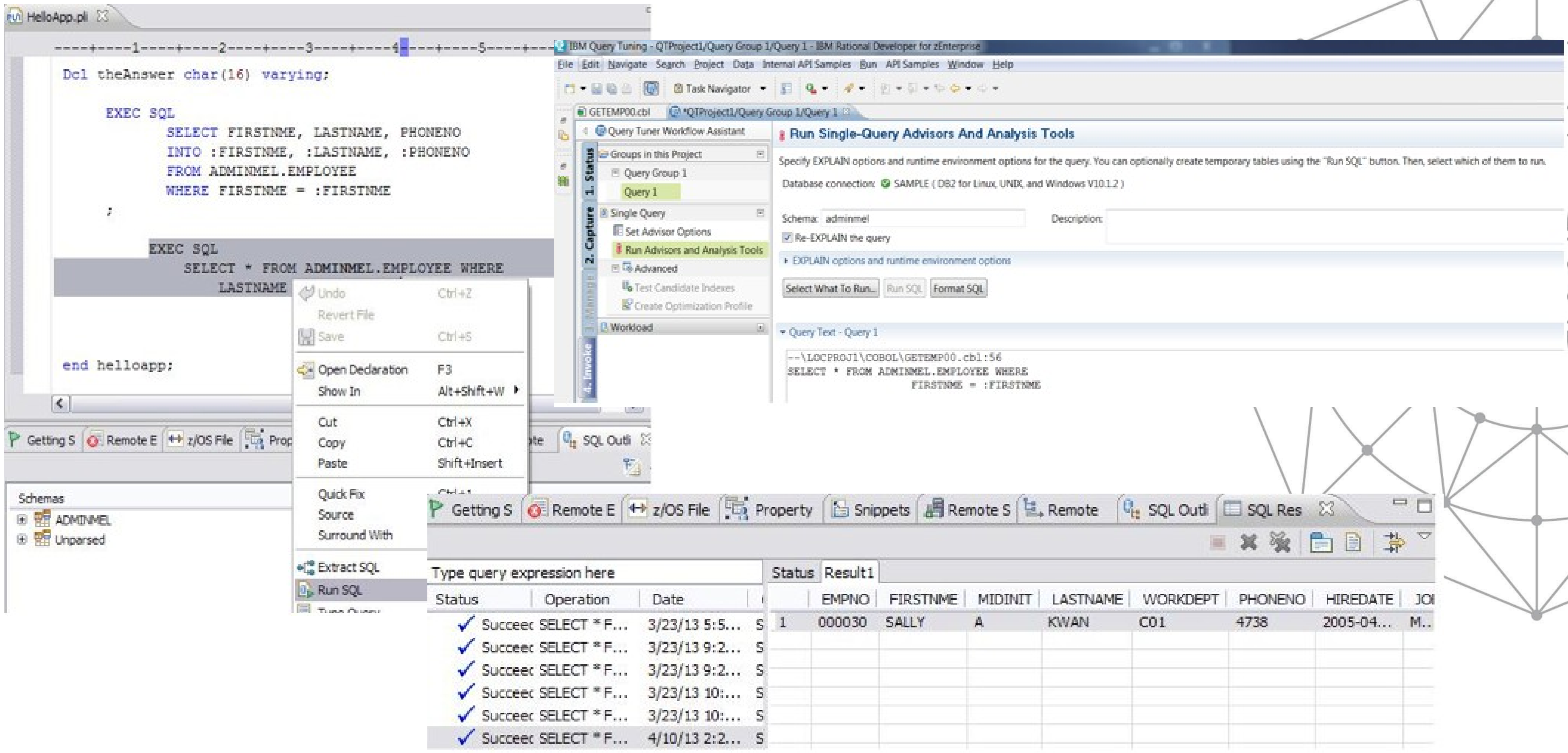
Line 183   Column 31   Insert

Unable to resolve reference to NON-DEFINED-NAME

```
                                   MOVE ' ' TO NON-DEFINED-NAME.
000179                             MOVE ' ' TO CUST-LN-DATA.
000180                             MOVE ' ' TO CUST-ADDR1-DATA.
000181                             MOVE ' ' TO CUST-CITY-DATA.
000182                             MOVE ' ' TO CUST-ST-DATA.
000183                             MOVE ' ' TO CUST-CTRY-DATA.
000184        GET-CUST-INFO-EXIT.
000185            EXIT.
000186        NO-CUST-INFO.
000187                IF EXITNOW THEN
000188                   STOP RUN
000189                ELSE
000190                   MOVE WCUSTNO to  CUSTNOO
000191                END-IF.
000192        NO-CUST-INFO-EXIT.
000193             EXIT.
000194      *    ---------------------------------------------------
000195        FILL-CUST-DATA.
```

Editor Productivity Features – Data Tooling

- Run SQL – Highlight the EXEC SQL statement, and run it on the server
- Results in SQL Results View
- Tune SQL: Opens Query tuning analysis tools



```
----+----1----+----2----+----3----+----4----+----5----+--
 Dcl theAnswer char(16) varying;

      EXEC SQL
             SELECT FIRSTNME, LASTNAME, PHONENO
             INTO :FIRSTNME, :LASTNAME, :PHONENO
             FROM ADMINMEL.EMPLOYEE
             WHERE FIRSTNME = :FIRSTNME
      ;

          EXEC SQL
              SELECT * FROM ADMINMEL.EMPLOYEE WHERE
                  LASTNAME

 end helloapp;
```

Run Single-Query Advisors And Analysis Tools

Specify EXPLAIN options and runtime environment options for the query. You can optionally create temporary tables using the "Run SQL" button. Then, select which of them to run.

Database connection: SAMPLE (DB2 for Linux, UNIX, and Windows V10.1.2)

Schema: adminmel   Description:

[✓] Re-EXPLAIN the query

EXPLAIN options and runtime environment options

Query Text - Query 1

```
--\LOCPROJ1\COBOL\GETEMP00.cbl:56
SELECT * FROM ADMINMEL.EMPLOYEE WHERE
                FIRSTNME = :FIRSTNME
```

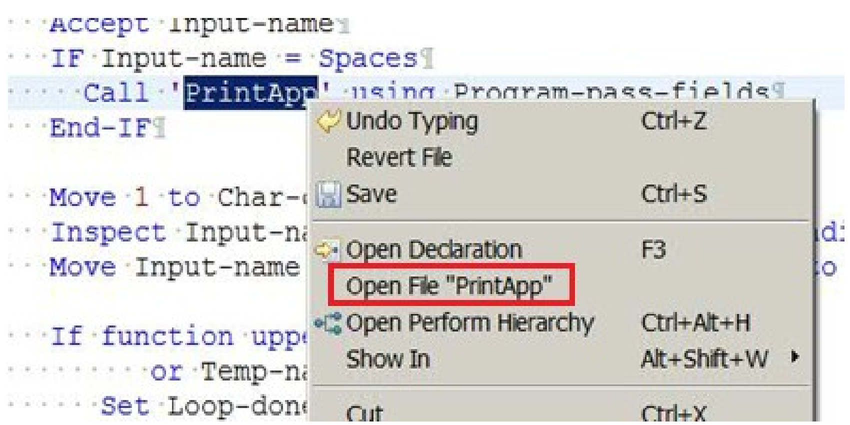
Status	Operation	Date	
✓ Succeec	SELECT * F...	3/23/13 5:5...	S
✓ Succeec	SELECT * F...	3/23/13 9:2...	S
✓ Succeec	SELECT * F...	3/23/13 9:2...	S
✓ Succeec	SELECT * F...	3/23/13 10:...	S
✓ Succeec	SELECT * F...	3/23/13 10:...	S
✓ Succeec	SELECT * F...	4/10/13 2:2...	S

Status | Result1

	EMPNO	FIRSTNME	MIDINIT	LASTNAME	WORKDEPT	PHONENO	HIREDATE	JOI
1	000030	SALLY	A	KWAN	C01	4738	2005-04...	M..

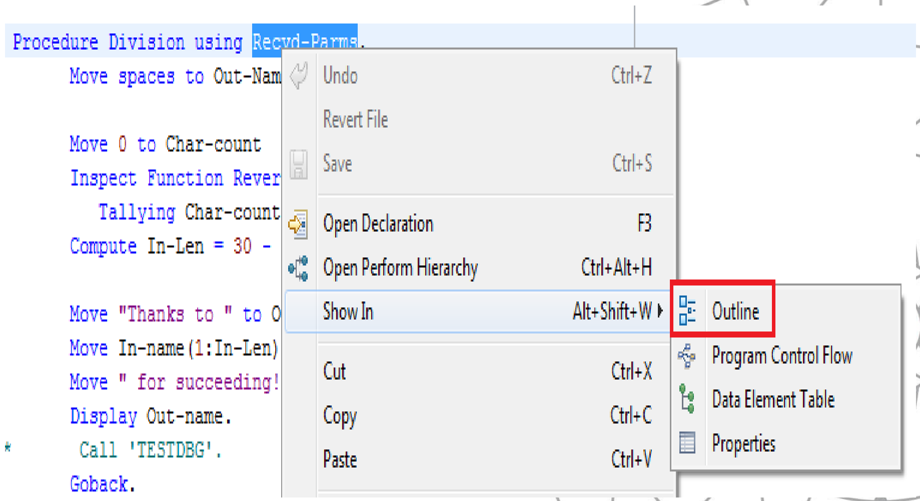
Editor Productivity Features

- Provide "**Open Called Program**" action



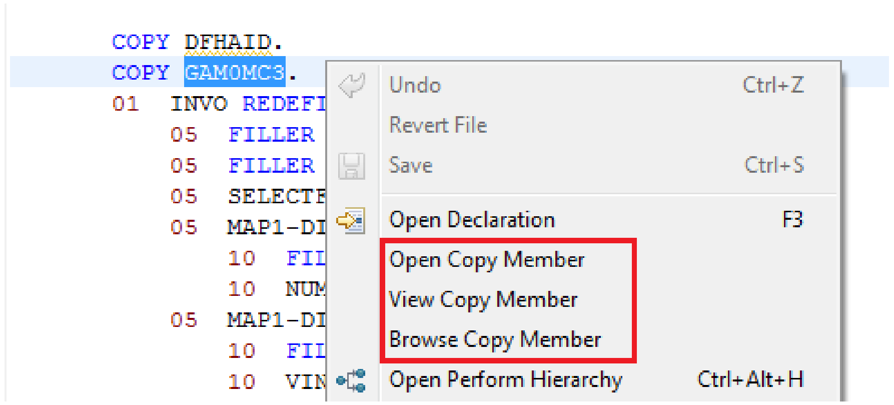
```
  Accept Input-name
  IF Input-name = Spaces
     Call 'PrintApp' using Program-pass-fields
  End-IF

  Move 1 to Char-
  Inspect Input-n
  Move Input-name

  If function upp
        or Temp-n
     Set Loop-done
```

- Show In > Outline action to COBOL and PL/I Editor

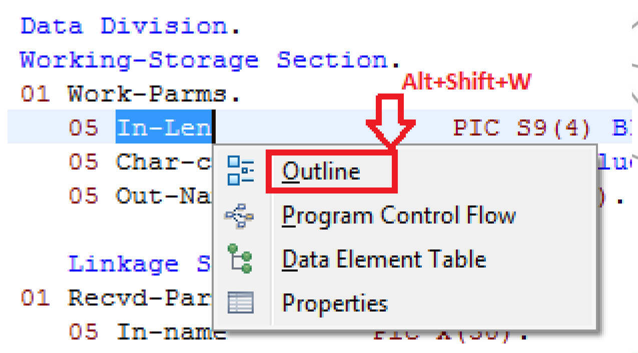


```
Procedure Division using Recvd-Parms.
    Move spaces to Out-Nam
    Move 0 to Char-count
    Inspect Function Rever
       Tallying Char-count
    Compute In-Len = 30 -

    Move "Thanks to " to O
    Move In-name(1:In-Len)
    Move " for succeeding!
    Display Out-name.
*    Call 'TESTDBG'.
    Goback.
```

- Hyper linking support for Open/ Browse/ View copybooks/include files



```
       COPY DFHAID.
       COPY GAM0MC3.
       01  INVO REDEFI
           05  FILLER
           05  FILLER
           05  SELECTI
           05  MAP1-DI
               10  FIL
               10  NUM
           05  MAP1-DI
               10  FIL
               10  VIN
```



```
Data Division.
Working-Storage Section.
01 Work-Parms.
   05 In-Len                PIC S9(4) B
   05 Char-c
   05 Out-Na

   Linkage S
01 Recvd-Par
   05 In-name               PIC X(30).
```

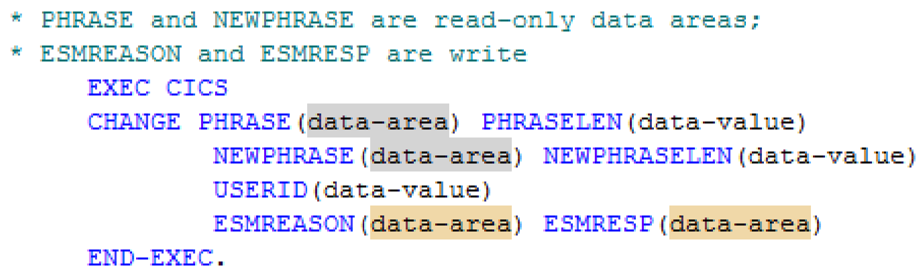
Complete your session evaluations online at www.SHARE.org/Anaheim-Eval

Editor Productivity Features

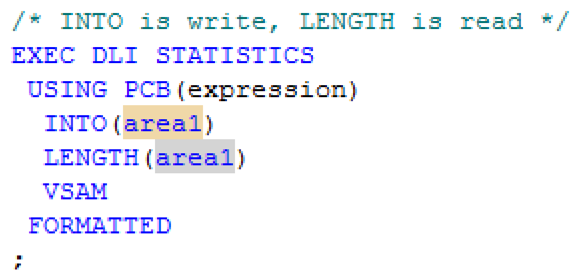
- Mark “Write occurrences” capability to the supported EXEC statements

- Occurrences within EXEC statements known to be “writes” are highlighted with a BROWN background

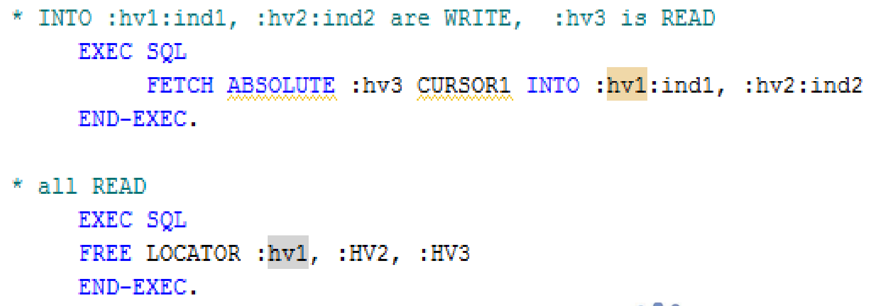
- All “read” statements will continue to be highlighted with a GREY background



```
* PHRASE and NEWPHRASE are read-only data areas;
* ESMREASON and ESMRESP are write
     EXEC CICS
     CHANGE PHRASE(data-area) PHRASELEN(data-value)
            NEWPHRASE(data-area) NEWPHRASELEN(data-value)
            USERID(data-value)
            ESMREASON(data-area) ESMRESP(data-area)
     END-EXEC.
```



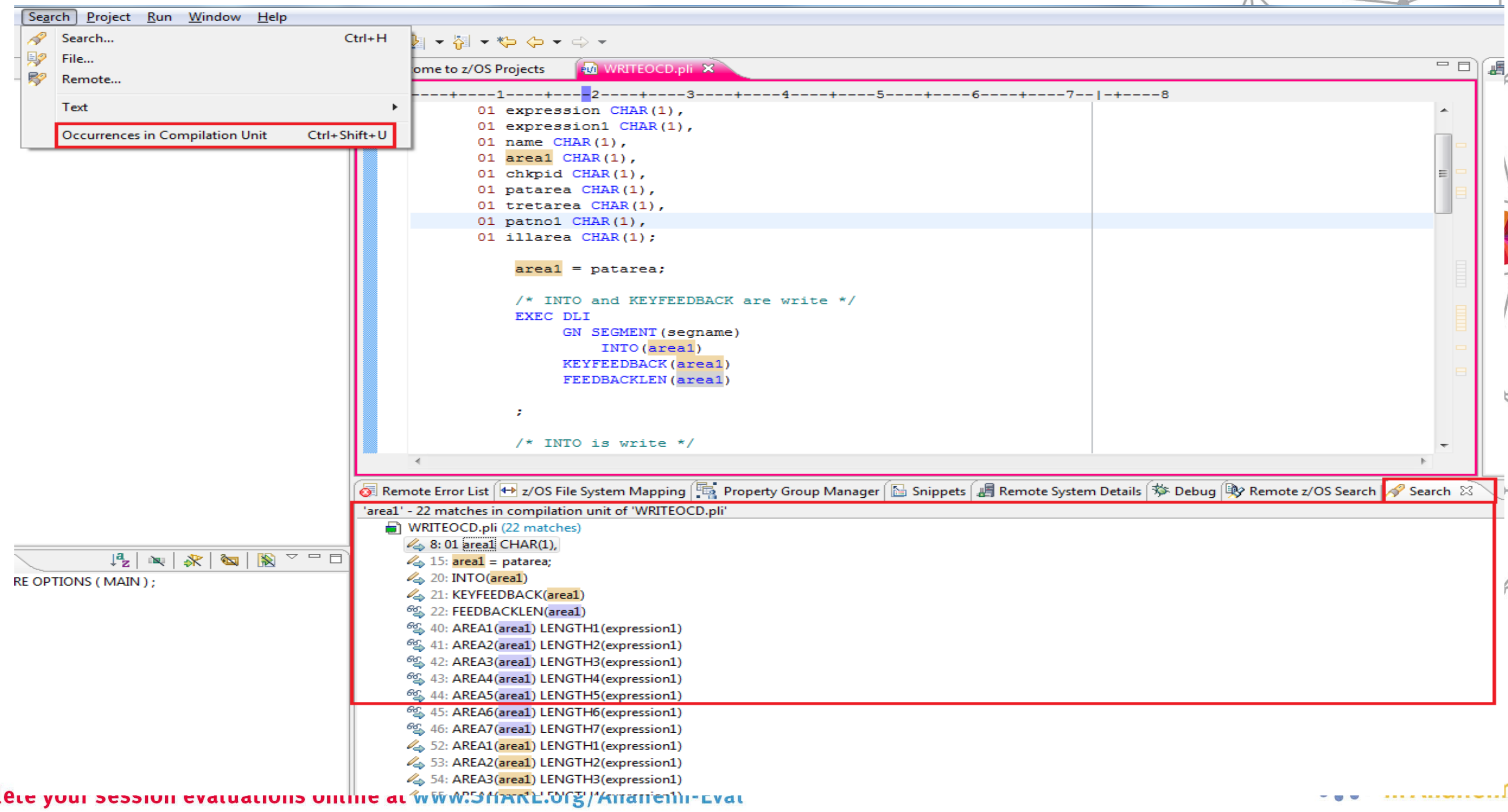
```
/* INTO is write, LENGTH is read */
EXEC DLI STATISTICS
 USING PCB(expression)
  INTO(area1)
  LENGTH(area1)
  VSAM
 FORMATTED
;
```



```
* INTO :hv1:ind1, :hv2:ind2 are WRITE,  :hv3 is READ
     EXEC SQL
         FETCH ABSOLUTE :hv3 CURSOR1 INTO :hv1:ind1, :hv2:ind2
     END-EXEC.

* all READ
     EXEC SQL
     FREE LOCATOR :hv1, :HV2, :HV3
     END-EXEC.
```

Search for Occurrences Action

- Once a variable is selected the user triggers the “Find Occurrences” action using the Menu under search or keyboard shortcut “Ctrl+Shift+U”
- The occurrences are shown in the “Search results” page



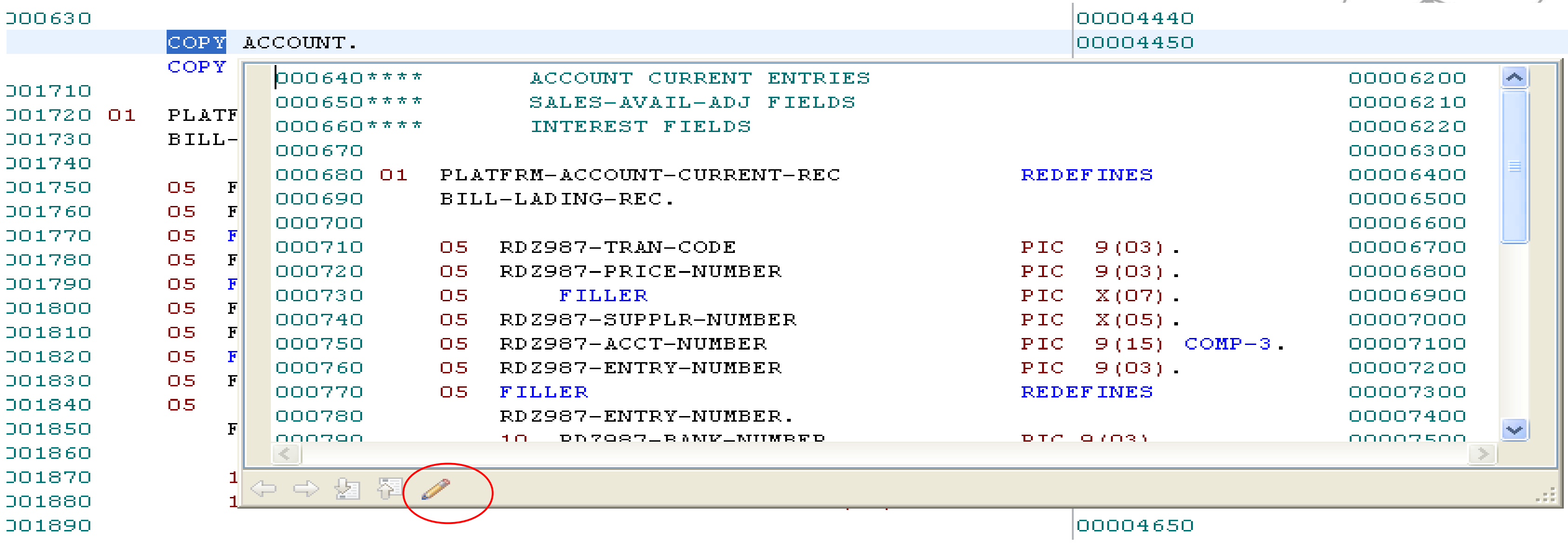
```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--|-+----8
     01 expression CHAR(1),
     01 expression1 CHAR(1),
     01 name CHAR(1),
     01 area1 CHAR(1),
     01 chkpid CHAR(1),
     01 patarea CHAR(1),
     01 tretarea CHAR(1),
     01 patno1 CHAR(1),
     01 illarea CHAR(1);

         area1 = patarea;

         /* INTO and KEYFEEDBACK are write */
         EXEC DLI
              GN SEGMENT(segname)
                  INTO(area1)
              KEYFEEDBACK(area1)
              FEEDBACKLEN(area1)

         ;

         /* INTO is write */
```

```
RE OPTIONS ( MAIN );
```

```
'area1' - 22 matches in compilation unit of 'WRITEOCD.pli'
  WRITEOCD.pli (22 matches)
    8: 01 area1 CHAR(1),
    15: area1 = patarea;
    20: INTO(area1)
    21: KEYFEEDBACK(area1)
    22: FEEDBACKLEN(area1)
    40: AREA1(area1) LENGTH1(expression1)
    41: AREA2(area1) LENGTH2(expression1)
    42: AREA3(area1) LENGTH3(expression1)
    43: AREA4(area1) LENGTH4(expression1)
    44: AREA5(area1) LENGTH5(expression1)
    45: AREA6(area1) LENGTH6(expression1)
    46: AREA7(area1) LENGTH7(expression1)
    52: AREA1(area1) LENGTH1(expression1)
    53: AREA2(area1) LENGTH2(expression1)
    54: AREA3(area1) LENGTH3(expression1)
```

Copy book and Include file resolution

- Hover over a COPY book name or a INCLUDE file to see the contents
  - Pressing F2 when hovering will "pin" the hover as shown
  - The window can then be dragged to expand, the Pencil icon shown below can be used to edit the copy book

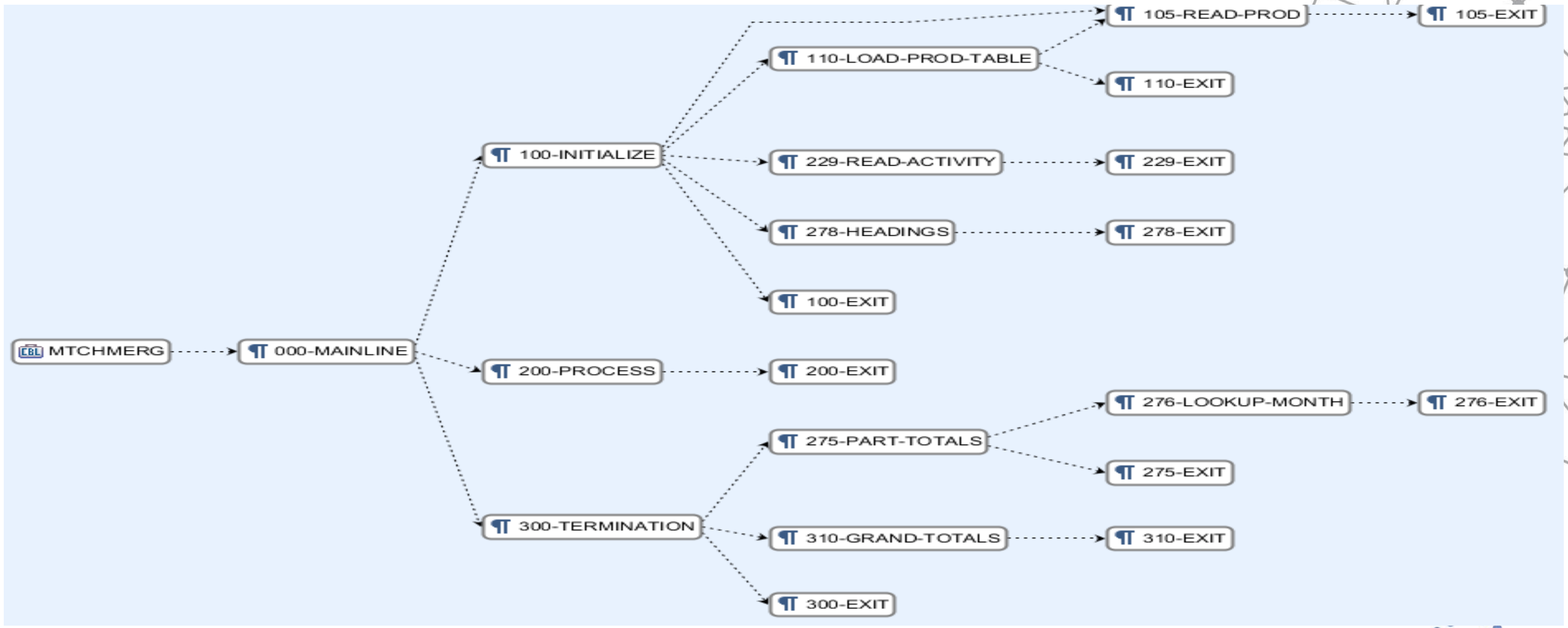


```
000630                                                                   00004440
          COPY ACCOUNT.                                                  00004450
          COPY
001710
001720 01 PLATF
001730    BILL-
001740
001750    05  F
001760    05  F
001770    05  F
001780    05  F
001790    05  F
001800    05  F
001810    05  F
001820    05  F
001830    05  F
001840    05
001850        F
001860
001870        1
001880        1
001890                                                                   00004650
```

```
000640****          ACCOUNT CURRENT ENTRIES                         00006200
000650****          SALES-AVAIL-ADJ FIELDS                          00006210
000660****          INTEREST FIELDS                                 00006220
000670                                                              00006300
000680 01   PLATFRM-ACCOUNT-CURRENT-REC          REDEFINES          00006400
000690      BILL-LADING-REC.                                        00006500
000700                                                              00006600
000710          05   RDZ987-TRAN-CODE            PIC  9(03).        00006700
000720          05   RDZ987-PRICE-NUMBER         PIC  9(03).        00006800
000730          05       FILLER                  PIC  X(07).        00006900
000740          05   RDZ987-SUPPLR-NUMBER        PIC  X(05).        00007000
000750          05   RDZ987-ACCT-NUMBER          PIC  9(15) COMP-3. 00007100
000760          05   RDZ987-ENTRY-NUMBER         PIC  9(03).        00007200
000770          05   FILLER                      REDEFINES          00007300
000780               RDZ987-ENTRY-NUMBER.                           00007400
000790                10   RDZ987-BANK-NUMBER    PIC  9(03)         00007500
```

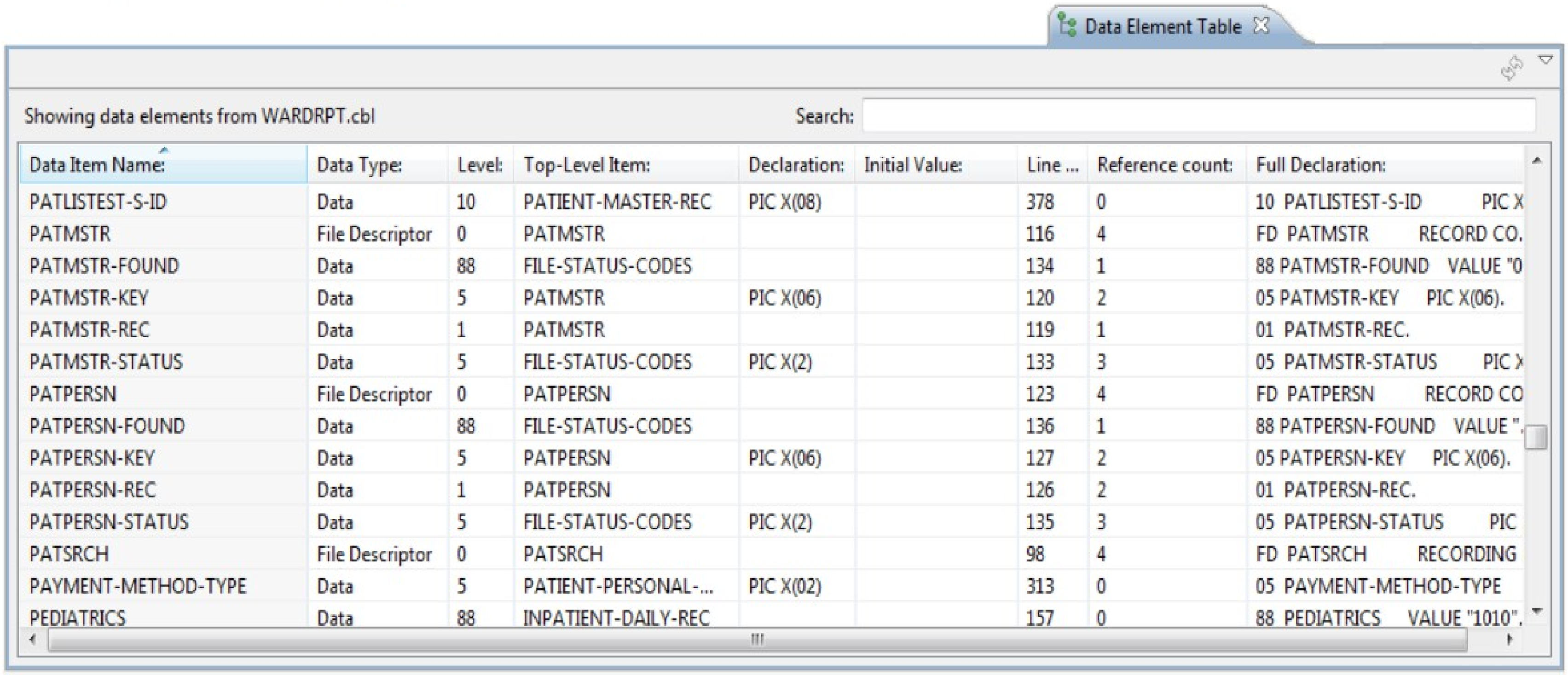
Enhanced Application Quality & Structure Analysis

- Application Analysis
  - Control flow diagrams for COBOL programs,
    - ***Graphical representation of the program flow with links to the source***
  - Helps identify and highlight potential unreachable code



Enhanced Structure Analysis – Data Element Table

- A table representation of the user-defined data items and symbols in a program
  - Hyperlinks in the table are integrated with the editor allowing easy access to the declaration of the data items.
- Generated by showing the “symbol table” generated when RDz real-time syntax check parses the program


Data Element Table

Showing data elements from WARDRPT.cbl

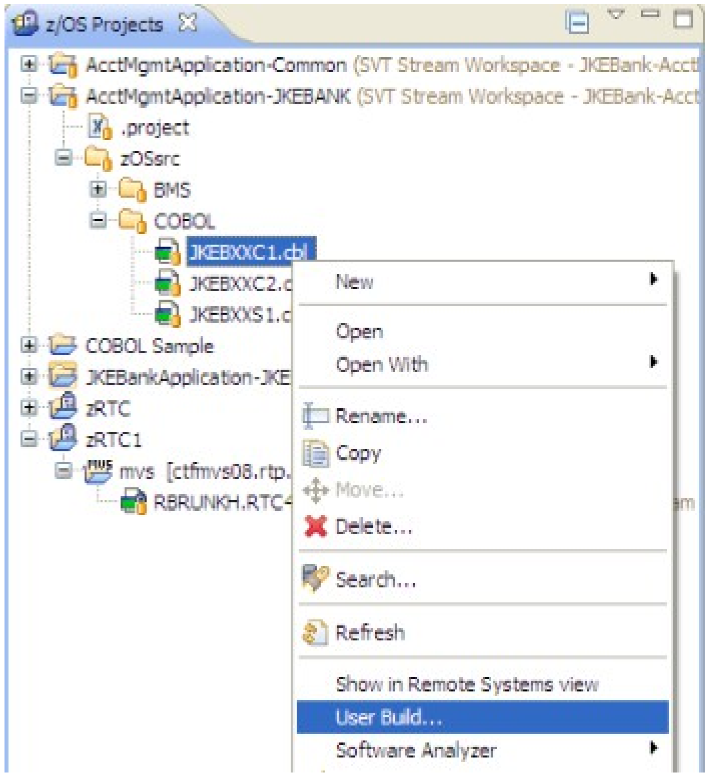
Search:

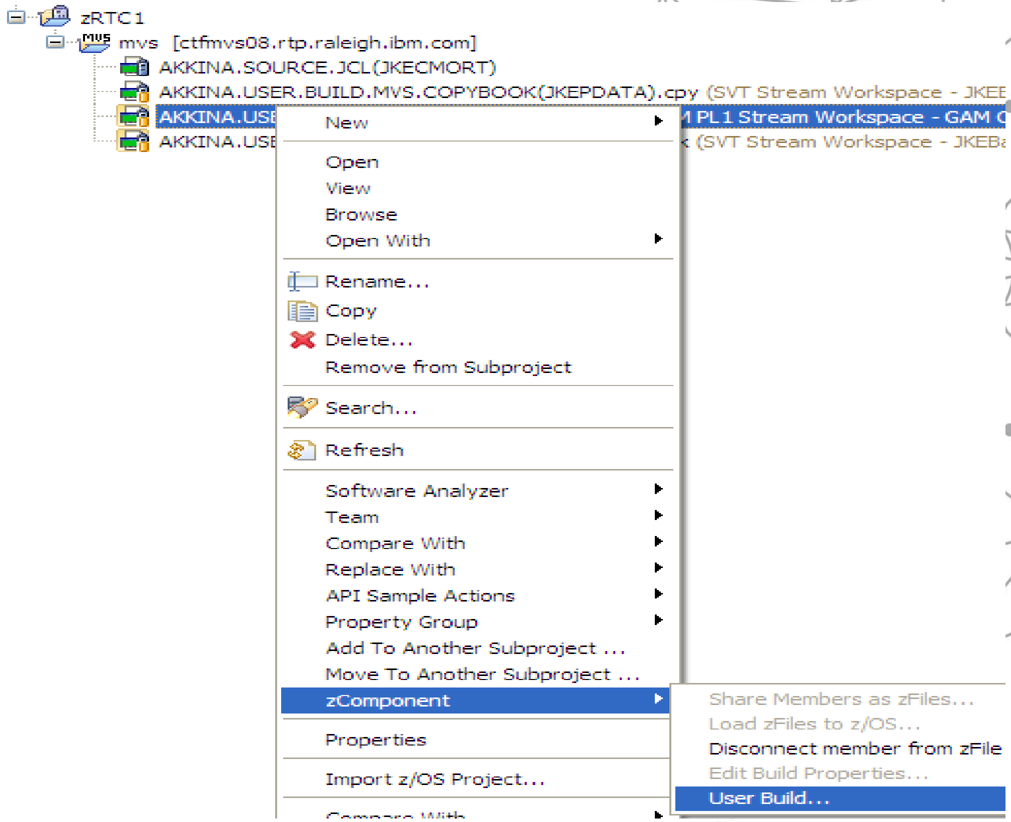
Data Item Name:	Data Type:	Level:	Top-Level Item:	Declaration:	Initial Value:	Line ...	Reference count:	Full Declaration:
PATLISTEST-S-ID	Data	10	PATIENT-MASTER-REC	PIC X(08)		378	0	10 PATLISTEST-S-ID PIC X
PATMSTR	File Descriptor	0	PATMSTR			116	4	FD PATMSTR RECORD CO.
PATMSTR-FOUND	Data	88	FILE-STATUS-CODES			134	1	88 PATMSTR-FOUND VALUE "0
PATMSTR-KEY	Data	5	PATMSTR	PIC X(06)		120	2	05 PATMSTR-KEY PIC X(06).
PATMSTR-REC	Data	1	PATMSTR			119	1	01 PATMSTR-REC.
PATMSTR-STATUS	Data	5	FILE-STATUS-CODES	PIC X(2)		133	3	05 PATMSTR-STATUS PIC X
PATPERSN	File Descriptor	0	PATPERSN			123	4	FD PATPERSN RECORD CO
PATPERSN-FOUND	Data	88	FILE-STATUS-CODES			136	1	88 PATPERSN-FOUND VALUE ".
PATPERSN-KEY	Data	5	PATPERSN	PIC X(06)		127	2	05 PATPERSN-KEY PIC X(06).
PATPERSN-REC	Data	1	PATPERSN			126	2	01 PATPERSN-REC.
PATPERSN-STATUS	Data	5	FILE-STATUS-CODES	PIC X(2)		135	3	05 PATPERSN-STATUS PIC
PATSRCH	File Descriptor	0	PATSRCH			98	4	FD PATSRCH RECORDING
PAYMENT-METHOD-TYPE	Data	5	PATIENT-PERSONAL-...	PIC X(02)		313	0	05 PAYMENT-METHOD-TYPE
PEDIATRICS	Data	88	INPATIENT-DAILY-REC			157	0	88 PEDIATRICS VALUE "1010".

User Build from RDz

"User build", is supported both in zComponent projects and RDz remote z/OS projects

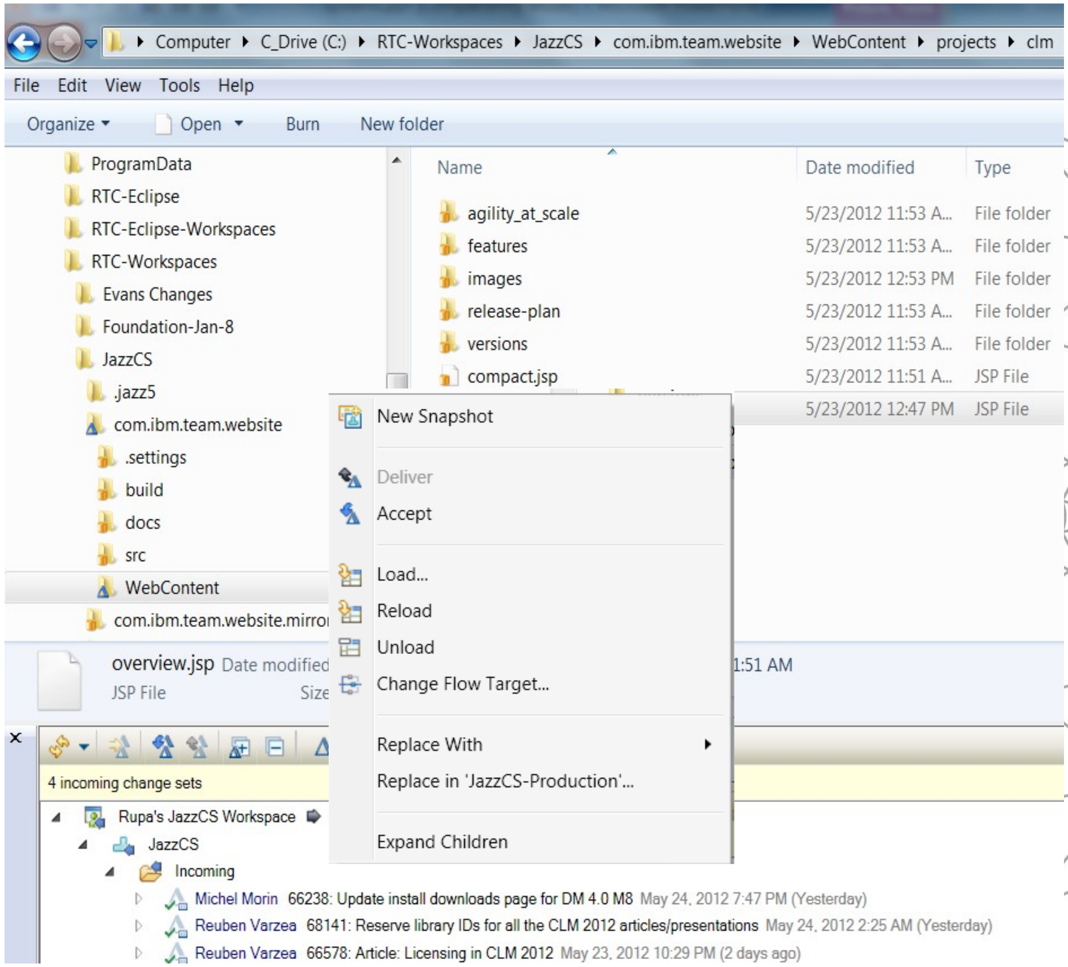
- Builds just one the single file selected, supports Error feedback
- Generates JCL based on the associated RTC Language definitions and Translators




zRTC1
mvs [ctfmvs08.rtp.raleigh.ibm.com]
AKKINA.SOURCE.JCL(JKECMORT)
AKKINA.USER.BUILD.MVS.COPYBOOK(JKEPDATA).cpy (SVT Stream Workspace - JKEE
AKKINA.USE
PL1 Stream Workspace - GAM C
AKKINA.USE
(SVT Stream Workspace - JKEB
New
Open
View
Browse
Open With
Rename...
Copy
Delete...
Remove from Subproject
Search...
Refresh
Software Analyzer
Team
Compare With
Replace With
API Sample Actions
Property Group
Add To Another Subproject ...
Move To Another Subproject ...
zComponent
Properties
Import z/OS Project...
Compare With
Share Members as zFiles...
Load zFiles to z/OS...
Disconnect member from zFile
Edit Build Properties...
User Build...

Pending Changes

- If you want finer grained control on your SCM operations, then the Pending Changes view is for you
  - Check in, deliver, accept changes
  - Suspend, resume, discard changes
  - Replace, reload out-of-sync
  - Resolve conflicts
  - Open change sets and work items via the web client



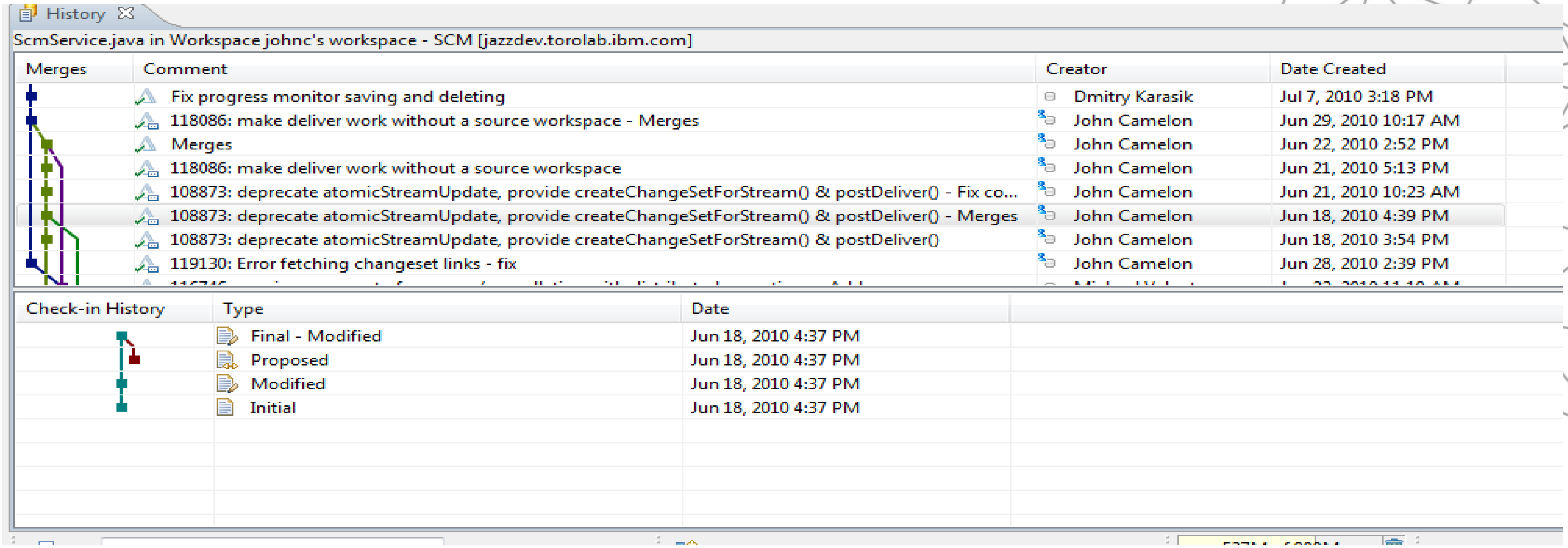
Name	Date modified	Type
agility_at_scale	5/23/2012 11:53 A...	File folder
features	5/23/2012 11:53 A...	File folder
images	5/23/2012 12:53 PM	File folder
release-plan	5/23/2012 11:53 A...	File folder
versions	5/23/2012 11:53 A...	File folder
compact.jsp	5/23/2012 11:51 A...	JSP File
	5/23/2012 12:47 PM	JSP File

4 incoming change sets

Rupa's JazzCS Workspace
JazzCS
Incoming
Michel Morin 66238: Update install downloads page for DM 4.0 M8 May 24, 2012 7:47 PM (Yesterday)
Reuben Varzea 68141: Reserve library IDs for all the CLM 2012 articles/presentations May 24, 2012 2:25 AM (Yesterday)
Reuben Varzea 66578: Article: Licensing in CLM 2012 May 23, 2012 10:29 PM (2 days ago)

Traceability : Check-in History

- Someone made a costly mistake merging and you want to understand exactly where the mistake was made
  - Problem : Traditional history commands & UI only show before/after & merge states for a change set … it does not show intermediates
  - Solution : Use Check-in history in Eclipse, CLI or .NET clients



History

ScmService.java in Workspace johnc's workspace - SCM [jazzdev.torolab.ibm.com]

Merges	Comment	Creator	Date Created
	Fix progress monitor saving and deleting	Dmitry Karasik	Jul 7, 2010 3:18 PM
	118086: make deliver work without a source workspace - Merges	John Camelon	Jun 29, 2010 10:17 AM
	Merges	John Camelon	Jun 22, 2010 2:52 PM
	118086: make deliver work without a source workspace	John Camelon	Jun 21, 2010 5:13 PM
	108873: deprecate atomicStreamUpdate, provide createChangeSetForStream() & postDeliver() - Fix co...	John Camelon	Jun 21, 2010 10:23 AM
	108873: deprecate atomicStreamUpdate, provide createChangeSetForStream() & postDeliver() - Merges	John Camelon	Jun 18, 2010 4:39 PM
	108873: deprecate atomicStreamUpdate, provide createChangeSetForStream() & postDeliver()	John Camelon	Jun 18, 2010 3:54 PM
	119130: Error fetching changeset links - fix	John Camelon	Jun 28, 2010 2:39 PM

Check-in History	Type	Date
	Final - Modified	Jun 18, 2010 4:37 PM
	Proposed	Jun 18, 2010 4:37 PM
	Modified	Jun 18, 2010 4:37 PM
	Initial	Jun 18, 2010 4:37 PM

Development Life Cycle

Planning	Source Dev	Governance/Unit test	Build
• Define the tasks • Create a plan • Create a work item • Assign the work item to a developer	• Load the project/source artifacts from SCM • Navigate, Analyze, Edit, Syntax check source code	• **Compile** • **Quality assurance** • **Debug** • **Code Coverage** • **Code review** • **Unit Testing**	• Check-in/Deliver the source code • Build
CLM	RDz RTC	**RDz** **RD&T** **RTC**	RTC RDz

SHARE in Anaheim

Introducing Integrated Debugger…

A GUI-based, powerful, multi-platform, multi-language debugger:

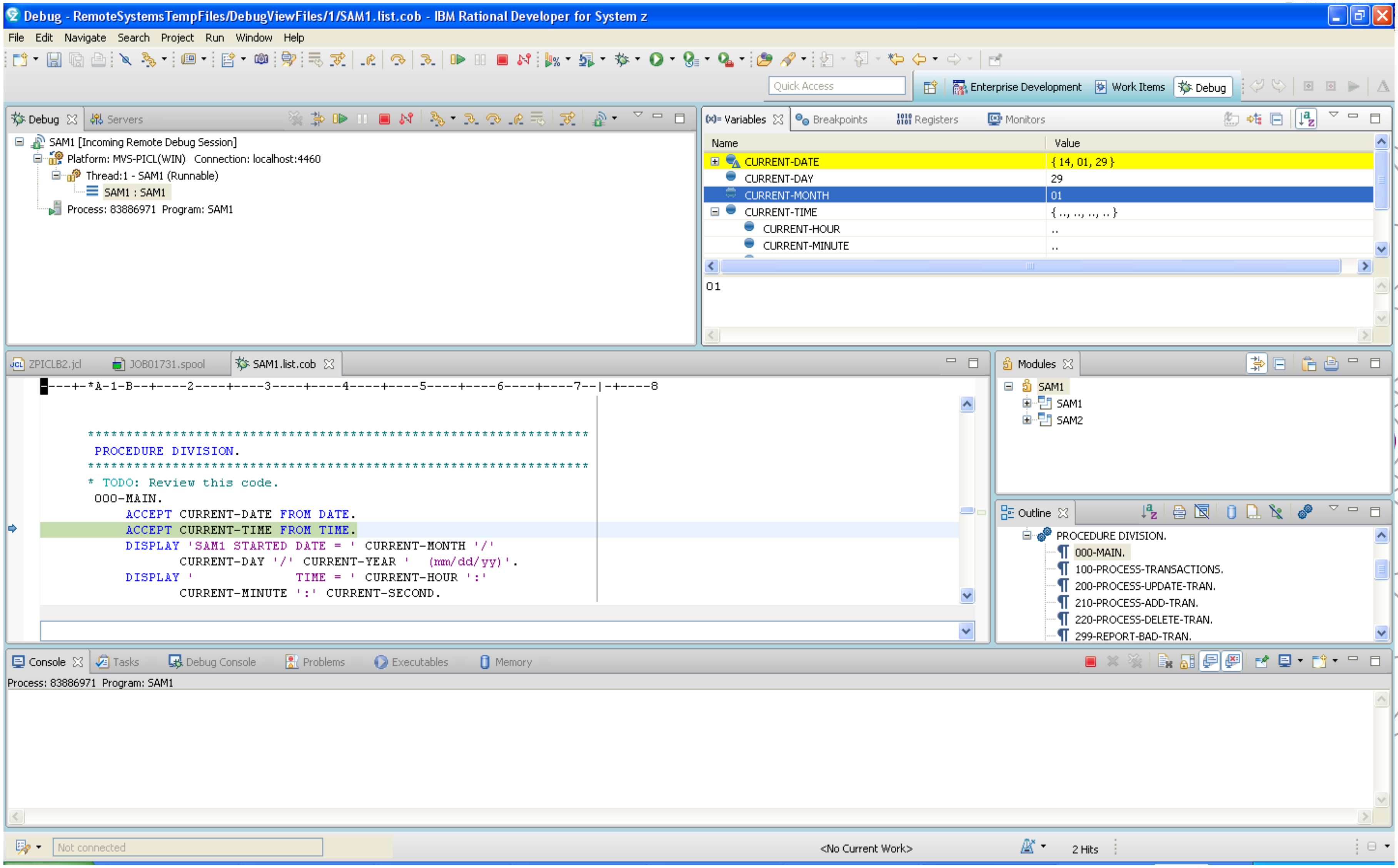
- ✓ **Platform exploitation:**
  - ✓ Language and subsystem support in RDz v9.0.1
    - ✓ COBOL V5.1, V4, V3.4
    - ✓ Batch, Batch IMS, Batch DB2, CICS 5.1, 4.2, 4.1
  - ✓ Full asynchronous mode:
    - ✓ Thread-level control of multithreaded applications
  - ✓ Automonitor support

Introducing Integrated Debugger…

A GUI-based, powerful, multi-platform, multi-language debugger:

- ✓ **Interactive Code coverage:**
  - ✓ Measures and reports on the test coverage of an application
- ✓ **Host-offload architecture:**
  - ✓ Remote debugger with only a small footprint on the mainframe:
    - Leverages workstation CPUs enabling faster processing of debug information
    - Enables scalability and reliability
  - ✓ Debugger client is supported on Windows and Linux
- ✓ **Simple and Secure Connections:**
  - ✓ Single client can handle multiple debug sessions on multiple hosts or an application the spans multiple systems

Leveraging the Debug Perspective…



```
SAM1 [Incoming Remote Debug Session]
  Platform: MVS-PICL(WIN)   Connection: localhost:4460
    Thread:1 - SAM1 (Runnable)
      SAM1 : SAM1
  Process: 83886971  Program: SAM1
```

Name	Value
CURRENT-DATE	{ 14, 01, 29 }
CURRENT-DAY	29
CURRENT-MONTH	01
CURRENT-TIME	{ .., .., .., .. }
CURRENT-HOUR	..
CURRENT-MINUTE	..

```
01
```

```
----+-*A-1-B--+----2----+----3----+----4----+----5----+----6----+----7--|-+----8


      *****************************************************************
       PROCEDURE DIVISION.
      *****************************************************************
      * TODO: Review this code.
       000-MAIN.
           ACCEPT CURRENT-DATE FROM DATE.
           ACCEPT CURRENT-TIME FROM TIME.
           DISPLAY 'SAM1 STARTED DATE = ' CURRENT-MONTH '/'
                  CURRENT-DAY '/' CURRENT-YEAR '   (mm/dd/yy)'.
           DISPLAY '              TIME = ' CURRENT-HOUR ':'
                  CURRENT-MINUTE ':' CURRENT-SECOND.
```

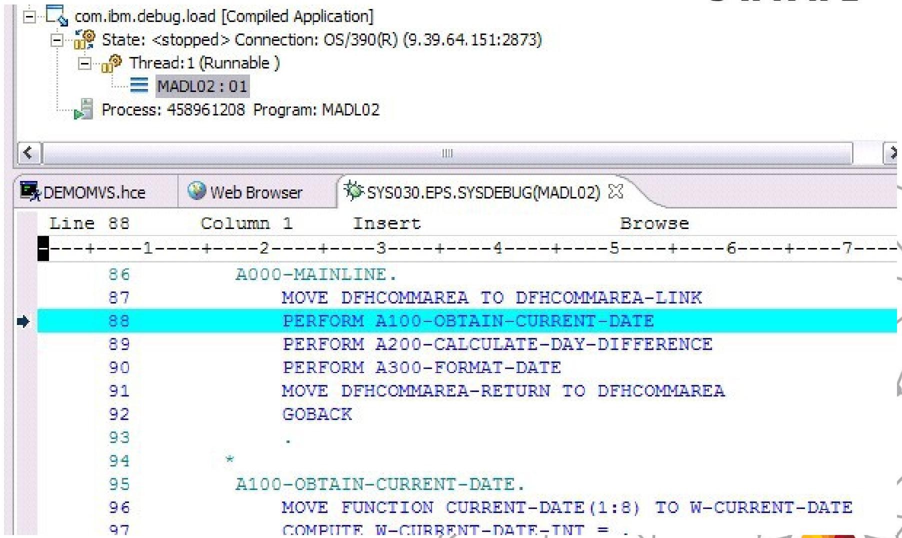
```
SAM1
  SAM1
  SAM2
```

```
PROCEDURE DIVISION.
  000-MAIN.
  100-PROCESS-TRANSACTIONS.
  200-PROCESS-UPDATE-TRAN.
  210-PROCESS-ADD-TRAN.
  220-PROCESS-DELETE-TRAN.
  299-REPORT-BAD-TRAN.
```

```
Process: 83886971  Program: SAM1
```

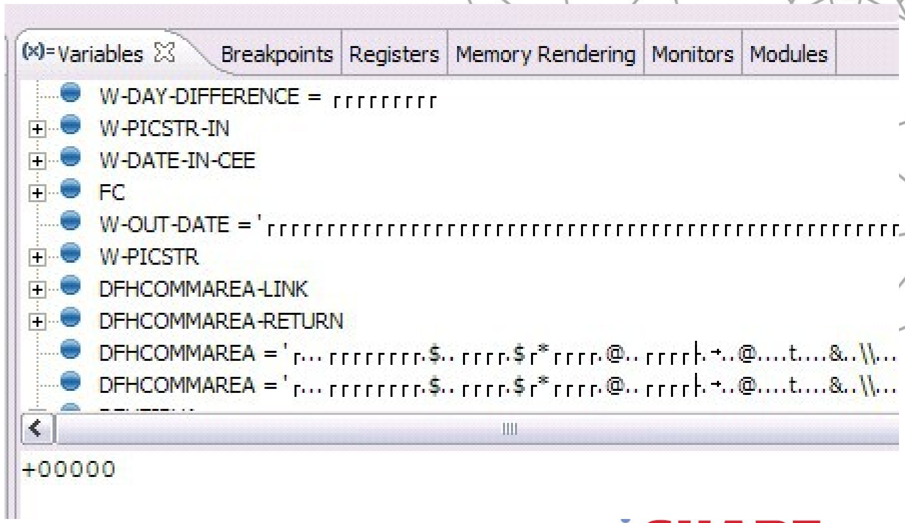
Debug Multiple Runtimes

- Use the cross-platform debugger to debug end-to-end systems as they execute in the runtime
  - CICS
  - Batch
  - Java
- From the workstation:
  - View executing source code
  - Step through host code line-by-line
  - Set breakpoints
  - Alter working storage values
  - Alter register values
  - Etc…
- Debug zOS and distributed code in the same interface even stepping between runtimes and platforms!
- Leverage Integration with IBM Debug Tool for other runtimes



```
com.ibm.debug.load [Compiled Application]
  State: <stopped> Connection: OS/390(R) (9.39.64.151:2873)
    Thread:1 (Runnable )
      MADL02 : 01
  Process: 458961208 Program: MADL02
```

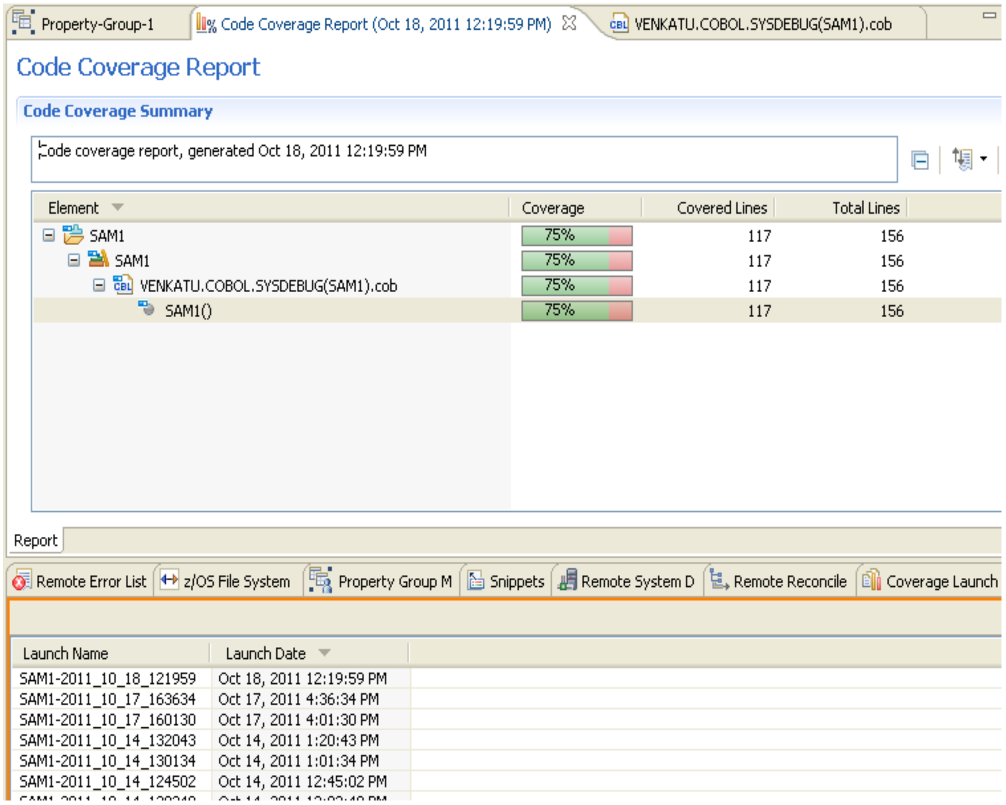
```
 Line 88         Column 1        Insert                  Browse
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----
           A000-MAINLINE.
               MOVE DFHCOMMAREA TO DFHCOMMAREA-LINK
               PERFORM A100-OBTAIN-CURRENT-DATE
               PERFORM A200-CALCULATE-DAY-DIFFERENCE
               PERFORM A300-FORMAT-DATE
               MOVE DFHCOMMAREA-RETURN TO DFHCOMMAREA
               GOBACK
               .
          *
           A100-OBTAIN-CURRENT-DATE.
               MOVE FUNCTION CURRENT-DATE(1:8) TO W-CURRENT-DATE
               COMPUTE W-CURRENT-DATE-INT = .
```



```
W-DAY-DIFFERENCE = rrrrrrrrr
W-PICSTR-IN
W-DATE-IN-CEE
FC
W-OUT-DATE = 'rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
W-PICSTR
DFHCOMMAREA-LINK
DFHCOMMAREA-RETURN
DFHCOMMAREA = 'r... rrrrrrrr.$.. rrrr.$r*rrrr.@.. rrrr}.+..@....t....&..\\...
DFHCOMMAREA = 'r... rrrrrrrr.$.. rrrr.$r*rrrr.@.. rrrr}.+..@....t....&..\\...
+00000
```

Enhanced Application Quality – Code Coverage

- Line Level Code Coverage - provides tools to measure and report on test coverage of an application
  - Leverages the Integrated Debugger technology
  - Indicating what source code lines were tested and remain to be tested



Property-Group-1 | Code Coverage Report (Oct 18, 2011 12:19:59 PM) | VENKATU.COBOL.SYSDEBUG(SAM1).cob

Code Coverage Report

Code Coverage Summary

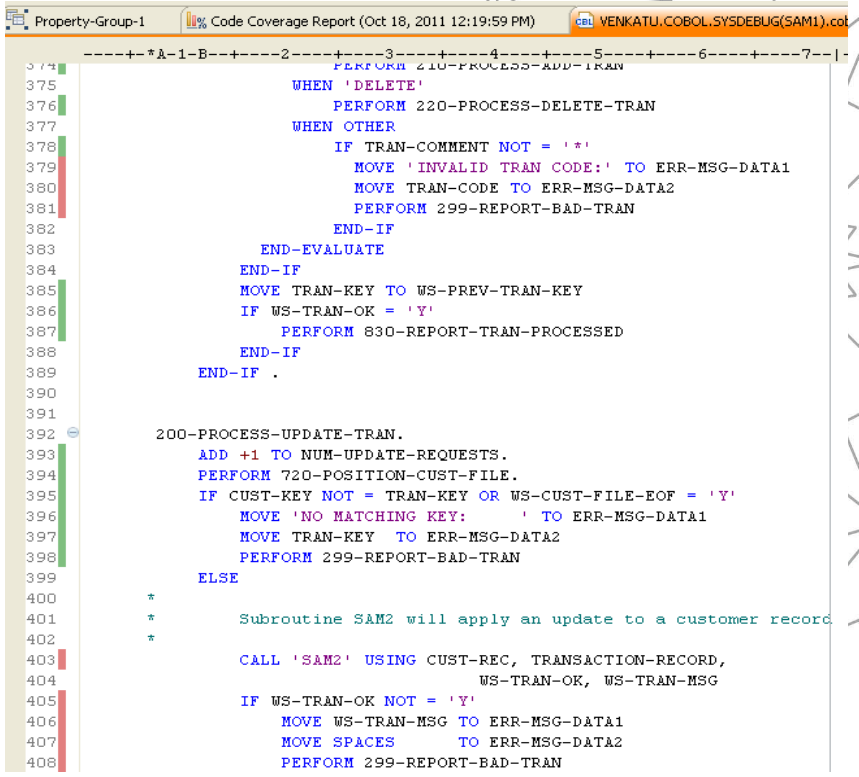
Code coverage report, generated Oct 18, 2011 12:19:59 PM

Element	Coverage	Covered Lines	Total Lines
SAM1	75%	117	156
SAM1	75%	117	156
VENKATU.COBOL.SYSDEBUG(SAM1).cob	75%	117	156
SAM1()	75%	117	156

Report

Remote Error List | z/OS File System | Property Group M | Snippets | Remote System D | Remote Reconcile | Coverage Launch

Launch Name	Launch Date
SAM1-2011_10_18_121959	Oct 18, 2011 12:19:59 PM
SAM1-2011_10_17_163634	Oct 17, 2011 4:36:34 PM
SAM1-2011_10_17_160130	Oct 17, 2011 4:01:30 PM
SAM1-2011_10_14_132043	Oct 14, 2011 1:20:43 PM
SAM1-2011_10_14_130134	Oct 14, 2011 1:01:34 PM
SAM1-2011_10_14_124502	Oct 14, 2011 12:45:02 PM

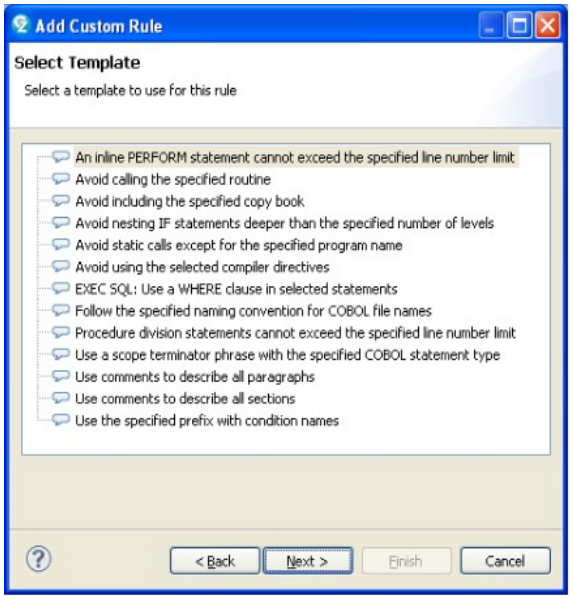


Property-Group-1 | Code Coverage Report (Oct 18, 2011 12:19:59 PM) | VENKATU.COBOL.SYSDEBUG(SAM1).cob

```
----+-*A-1-B--+----2----+----3----+----4----+----5----+----6----+----7--|-
                    WHEN 'DELETE'
                        PERFORM 220-PROCESS-DELETE-TRAN
                    WHEN OTHER
                        IF TRAN-COMMENT NOT = '*'
                          MOVE 'INVALID TRAN CODE:' TO ERR-MSG-DATA1
                          MOVE TRAN-CODE TO ERR-MSG-DATA2
                          PERFORM 299-REPORT-BAD-TRAN
                        END-IF
                 END-EVALUATE
               END-IF
               MOVE TRAN-KEY TO WS-PREV-TRAN-KEY
               IF WS-TRAN-OK = 'Y'
                   PERFORM 830-REPORT-TRAN-PROCESSED
               END-IF
           END-IF .


       200-PROCESS-UPDATE-TRAN.
           ADD +1 TO NUM-UPDATE-REQUESTS.
           PERFORM 720-POSITION-CUST-FILE.
           IF CUST-KEY NOT = TRAN-KEY OR WS-CUST-FILE-EOF = 'Y'
               MOVE 'NO MATCHING KEY:      ' TO ERR-MSG-DATA1
               MOVE TRAN-KEY  TO ERR-MSG-DATA2
               PERFORM 299-REPORT-BAD-TRAN
           ELSE
      *
      *        Subroutine SAM2 will apply an update to a customer record
      *
               CALL 'SAM2' USING CUST-REC, TRANSACTION-RECORD,
                                    WS-TRAN-OK, WS-TRAN-MSG
               IF WS-TRAN-OK NOT = 'Y'
                   MOVE WS-TRAN-MSG TO ERR-MSG-DATA1
                   MOVE SPACES      TO ERR-MSG-DATA2
                   PERFORM 299-REPORT-BAD-TRAN
```

Enhanced Quality & Structure Analysis – Code review

- Code Review/Governance - provides predefined rules and templates for COBOL and PL/I applications
  - Ensure adherence to corporate standards

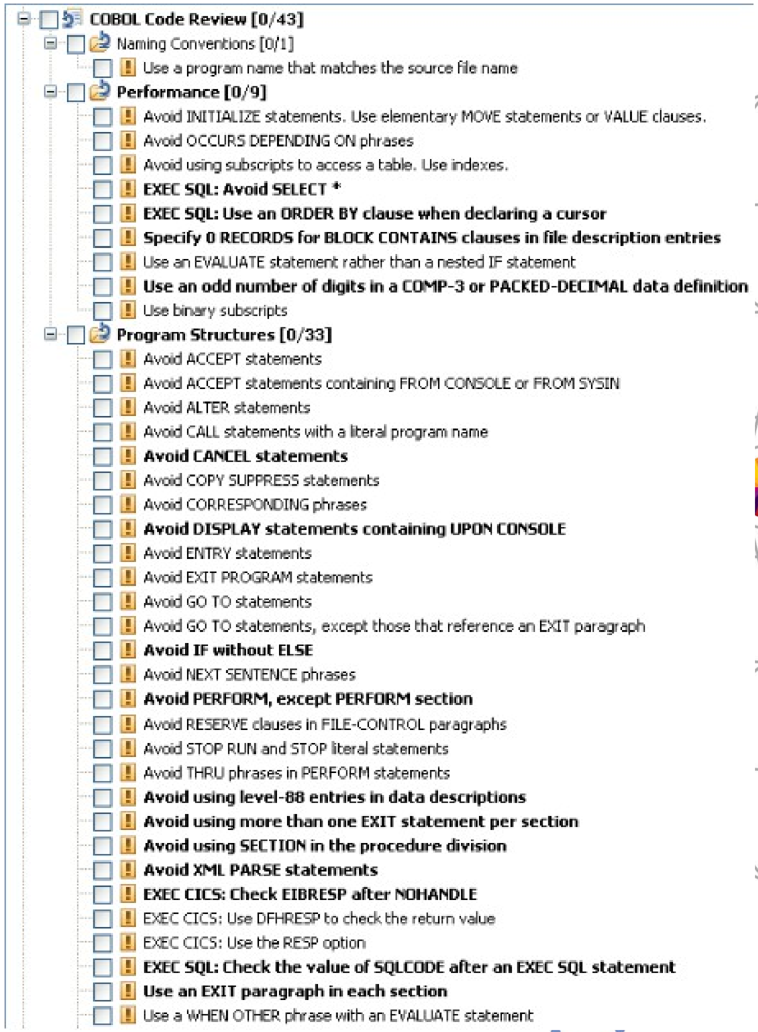


Add Custom Rule

Select Template

Select a template to use for this rule

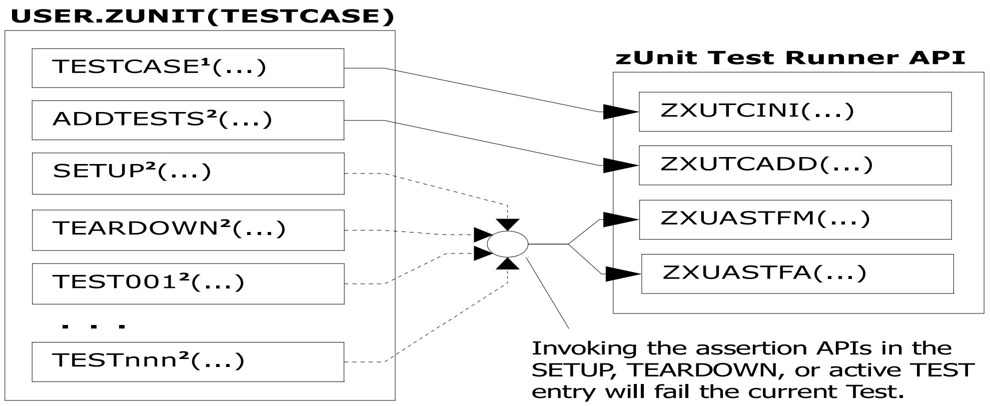
- An inline PERFORM statement cannot exceed the specified line number limit
- Avoid calling the specified routine
- Avoid including the specified copy book
- Avoid nesting IF statements deeper than the specified number of levels
- Avoid static calls except for the specified program name
- Avoid using the selected compiler directives
- EXEC SQL: Use a WHERE clause in selected statements
- Follow the specified naming convention for COBOL file names
- Procedure division statements cannot exceed the specified line number limit
- Use a scope terminator phrase with the specified COBOL statement type
- Use comments to describe all paragraphs
- Use comments to describe all sections
- Use the specified prefix with condition names



- COBOL Code Review [0/43]
  - Naming Conventions [0/1]
    - Use a program name that matches the source file name
  - Performance [0/9]
    - Avoid INITIALIZE statements. Use elementary MOVE statements or VALUE clauses.
    - Avoid OCCURS DEPENDING ON phrases
    - Avoid using subscripts to access a table. Use indexes.
    - **EXEC SQL: Avoid SELECT ***
    - **EXEC SQL: Use an ORDER BY clause when declaring a cursor**
    - **Specify 0 RECORDS for BLOCK CONTAINS clauses in file description entries**
    - Use an EVALUATE statement rather than a nested IF statement
    - **Use an odd number of digits in a COMP-3 or PACKED-DECIMAL data definition**
    - Use binary subscripts
  - Program Structures [0/33]
    - Avoid ACCEPT statements
    - Avoid ACCEPT statements containing FROM CONSOLE or FROM SYSIN
    - Avoid ALTER statements
    - Avoid CALL statements with a literal program name
    - **Avoid CANCEL statements**
    - Avoid COPY SUPPRESS statements
    - Avoid CORRESPONDING phrases
    - **Avoid DISPLAY statements containing UPON CONSOLE**
    - Avoid ENTRY statements
    - Avoid EXIT PROGRAM statements
    - Avoid GO TO statements
    - Avoid GO TO statements, except those that reference an EXIT paragraph
    - **Avoid IF without ELSE**
    - Avoid NEXT SENTENCE phrases
    - **Avoid PERFORM, except PERFORM section**
    - Avoid RESERVE clauses in FILE-CONTROL paragraphs
    - Avoid STOP RUN and STOP literal statements
    - Avoid THRU phrases in PERFORM statements
    - **Avoid using level-88 entries in data descriptions**
    - **Avoid using more than one EXIT statement per section**
    - **Avoid using SECTION in the procedure division**
    - **Avoid XML PARSE statements**
    - **EXEC CICS: Check EIBRESP after NOHANDLE**
    - EXEC CICS: Use DFHRESP to check the return value
    - EXEC CICS: Use the RESP option
    - **EXEC SQL: Check the value of SQLCODE after an EXEC SQL statement**
    - **Use an EXIT paragraph in each section**
    - Use a WHEN OTHER phrase with an EVALUATE statement

zUnit – Unit testing framework for z/OS

- Frameworks that assist developers in writing code to perform repeatable, self-checking unit tests are collectively known as *x*Unit.
- xUnit defines a set of concepts that together provide a light-weight architecture for implementing unit testing frameworks.
  - JUnit, for example, is a very popular instance of the xUnit architecture.
- **zUnit** is a xUnit instance for System z
- Goal is to encourage the **continuous integration and continuous testing** methodology for System z Application development and maintenance



¹Language-specific details:
- In COBOL, this is the first program appearing in the Test Case source file and it will be invoked by the Test Runner for Test Case initialization.
- In PL/I, the is the procedure declared with option(fetchable) in the Test Case source file and it will be invoked by the Test Runner for Test Case initialization.

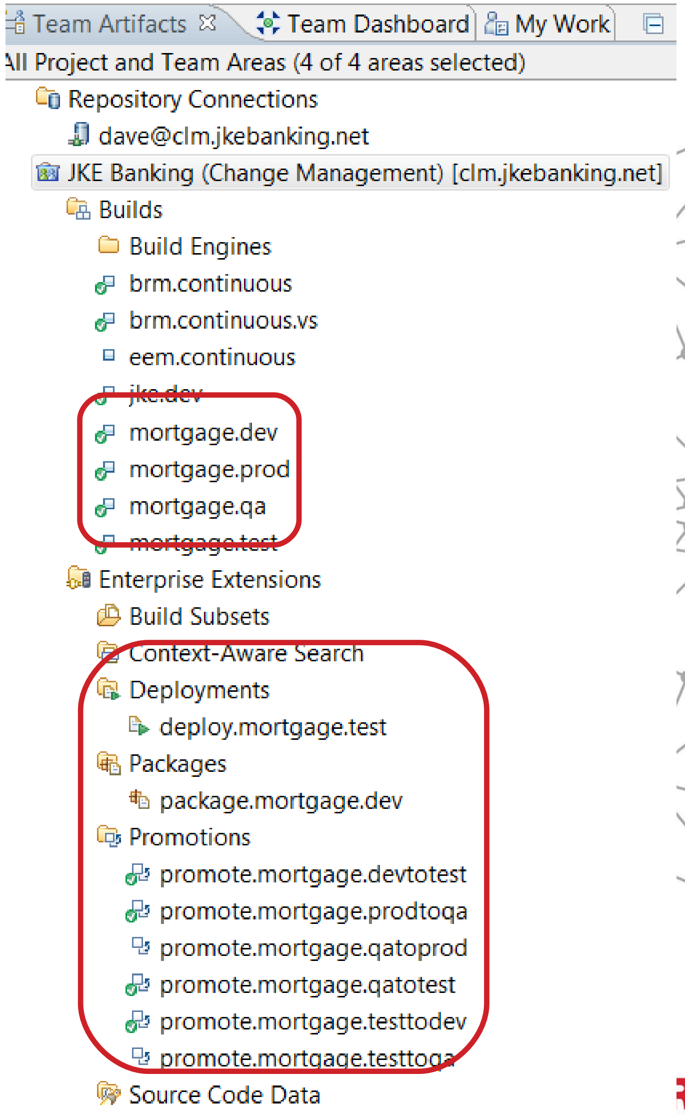
²Language-specific details:
- In COBOL, these are expected to be subprograms (non-nested and therefore compatible with FUNCTION-POINTER).
- In PL/I, these are expected to be internal procedures that are declared at the package level (non-nested).

Development Life Cycle

Planning	Source Dev	Governance/Unit test	Build
• Define the tasks • Create a plan • Create a work item • Assign the work item to a developer	• Load the project/source artifacts from SCM • Navigate, Analyze, Edit, Syntax check source code	• Compile • Quality assurance • Debug • Code Coverage • Code review • Unit Testing	• **Check-in/Deliver the source code** • **Build**
CLM	RDz RTC	RDz RD&T RTC	RTC RDz

Enterprise Extensions Specific Functions

- Dependency build
  - "Smart build" of z/OS and IBM i applications, based on what has changed
- Promotion
  - Flow of source code changes and build outputs through development hierarchy
- Packaging and deployment
  - Package build outputs and deploy to another system (e.g. test environment, QA, production, etc)

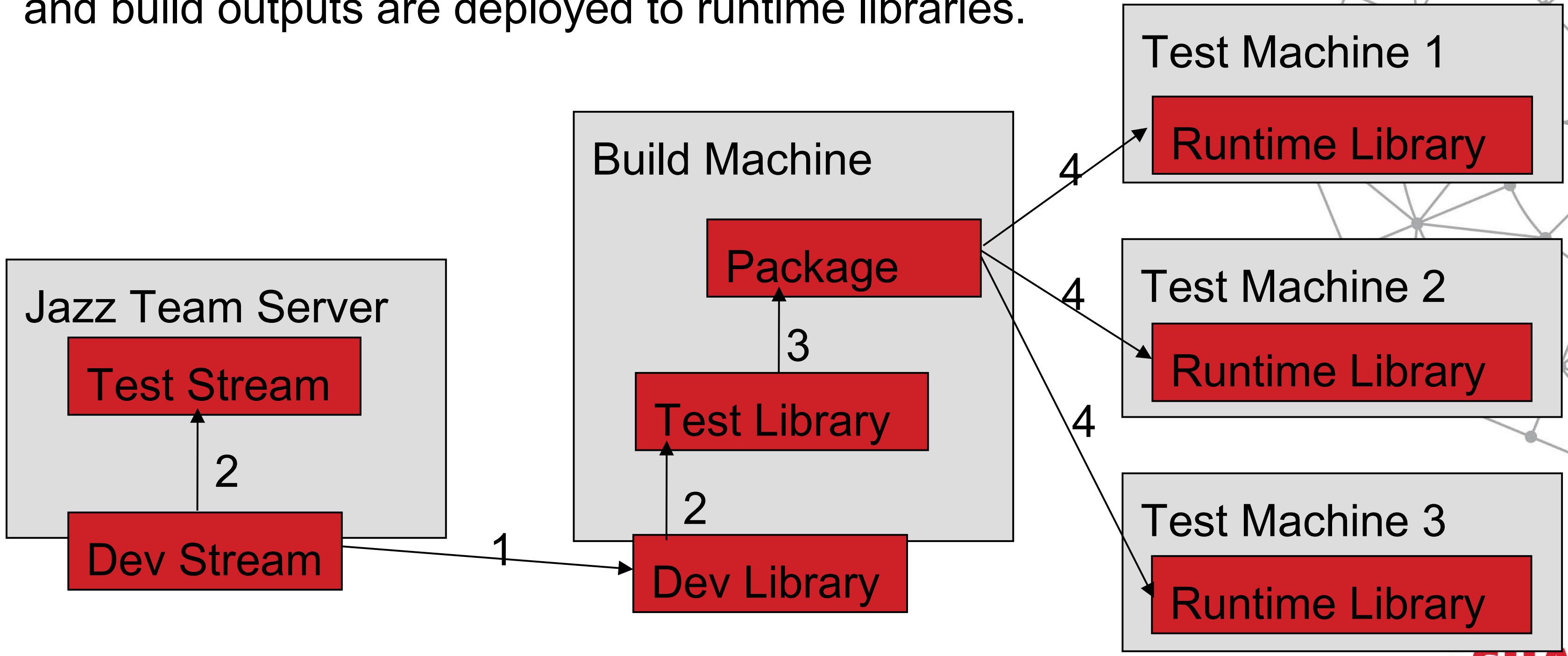

Team Artifacts | Team Dashboard | My Work

All Project and Team Areas (4 of 4 areas selected)

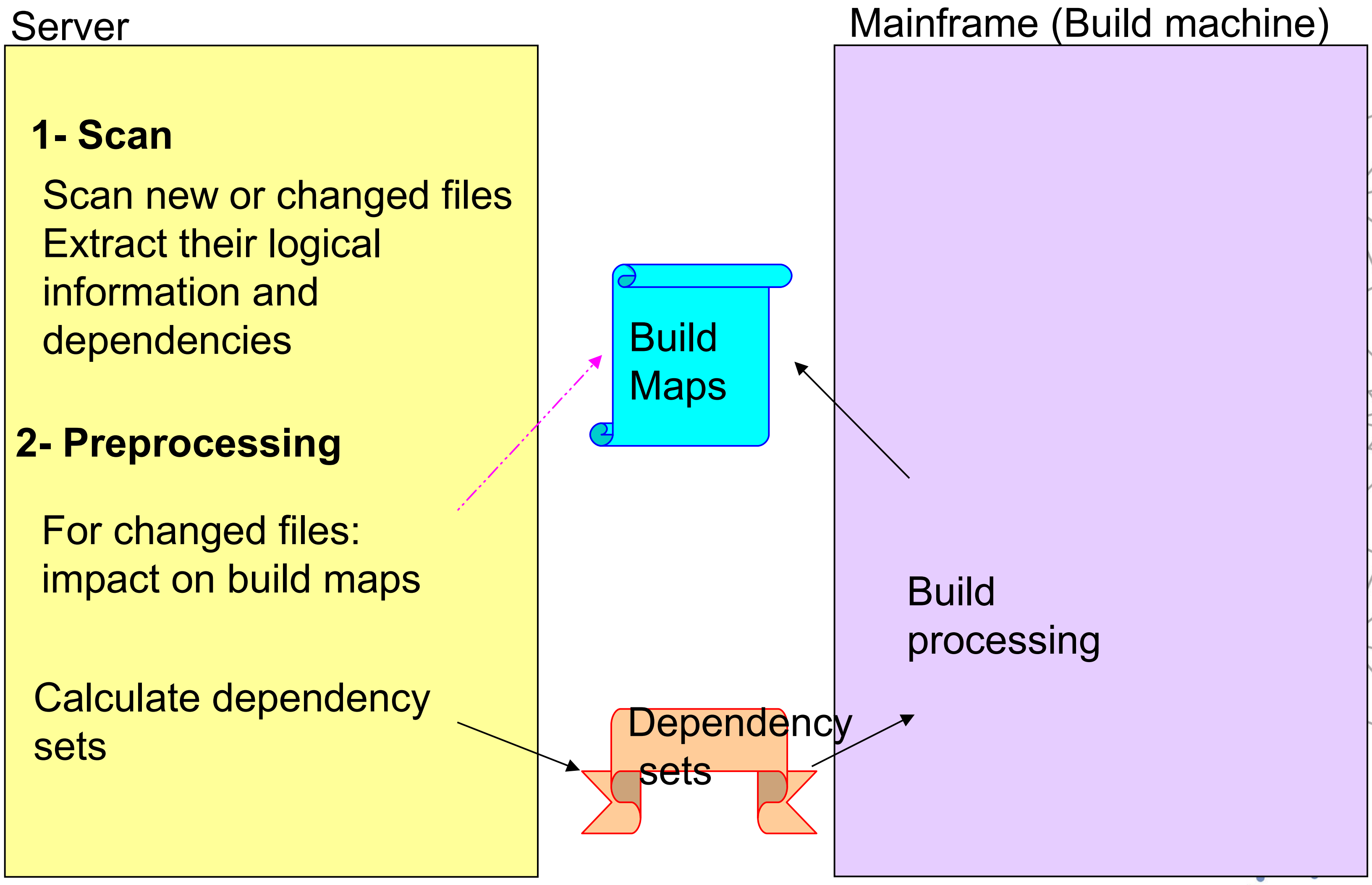
```
Repository Connections
  dave@clm.jkebanking.net
JKE Banking (Change Management) [clm.jkebanking.net]
  Builds
    Build Engines
    brm.continuous
    brm.continuous.vs
    eem.continuous
    jke.dev
    mortgage.dev
    mortgage.prod
    mortgage.qa
    mortgage.test
  Enterprise Extensions
    Build Subsets
    Context-Aware Search
    Deployments
      deploy.mortgage.test
    Packages
      package.mortgage.dev
    Promotions
      promote.mortgage.devtotest
      promote.mortgage.prodtoqa
      promote.mortgage.qatoprod
      promote.mortgage.qatotest
      promote.mortgage.testtodev
      promote.mortgage.testtoqa
    Source Code Data
```

The big picture

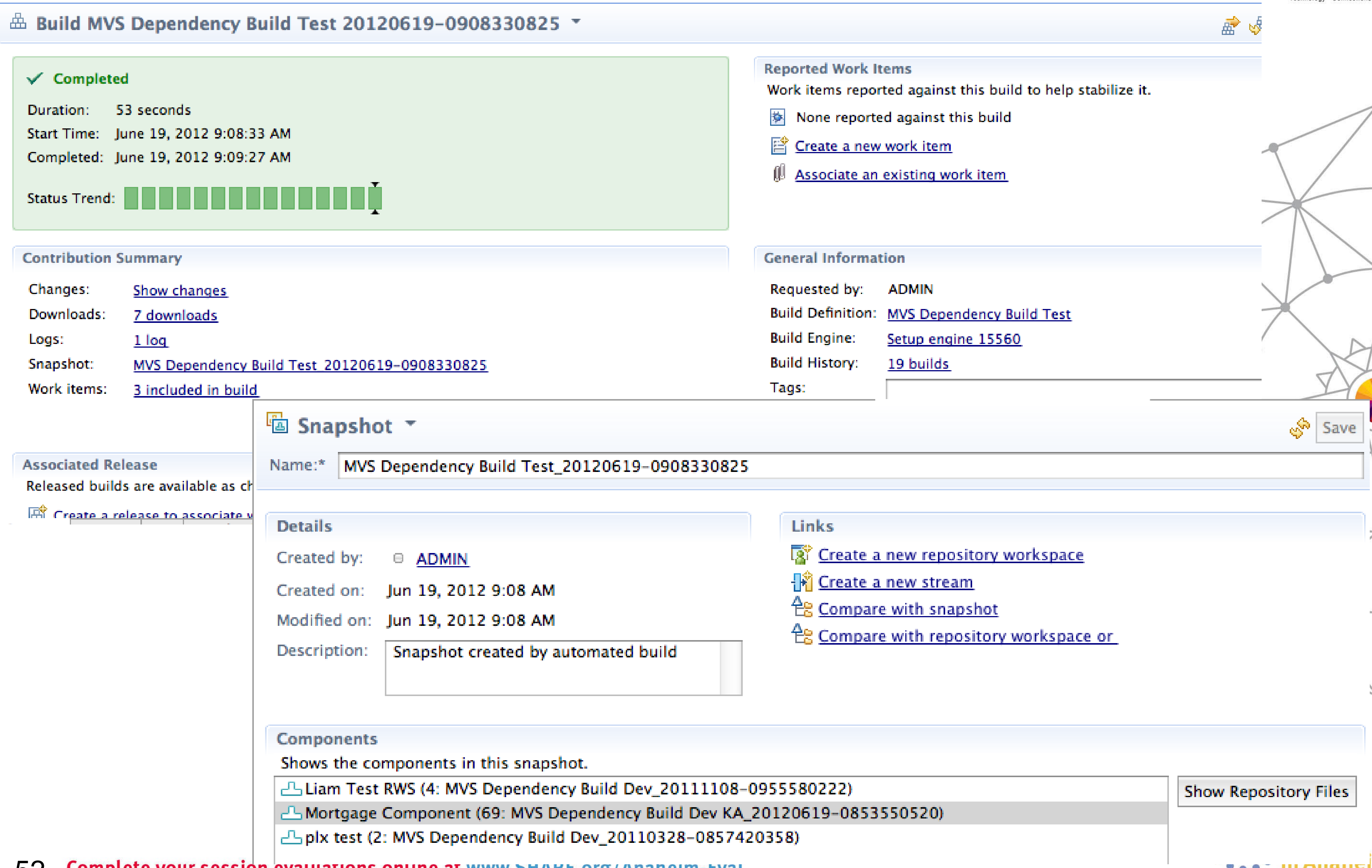
1. Dependency build runs on build machine. Source is loaded from Dev Stream and outputs are built in Dev Library.
2. Promotion build runs on build machine. Source is promoted from Dev Stream to Test Stream and build outputs are copied from Dev Library to Test Library.
3. Package build runs on build machine. Test Library build outputs are archived in a package.
4. Deploy build runs on various test machines. Package is loaded to test machine and build outputs are deployed to runtime libraries.



Dependency Build Summary


Server
Mainframe (Build machine)
1- Scan
Scan new or changed files
Extract their logical information and dependencies
2- Preprocessing
For changed files: impact on build maps
Calculate dependency sets
Build Maps
Dependency sets
Build processing

Snapshots for every build



Build MVS Dependency Build Test 20120619-0908330825

✓ Completed

Duration:	53 seconds
Start Time:	June 19, 2012 9:08:33 AM
Completed:	June 19, 2012 9:09:27 AM
Status Trend:	🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩🟩

Reported Work Items

Work items reported against this build to help stabilize it.

None reported against this build

Create a new work item

Associate an existing work item

Contribution Summary

Changes:	Show changes
Downloads:	7 downloads
Logs:	1 log
Snapshot:	MVS Dependency Build Test_20120619-0908330825
Work items:	3 included in build

General Information

Requested by:	ADMIN
Build Definition:	MVS Dependency Build Test
Build Engine:	Setup engine 15560
Build History:	19 builds
Tags:	

Associated Release

Released builds are available as ch

Create a release to associate w

Snapshot

Name:* MVS Dependency Build Test_20120619-0908330825

Details

Created by:	ADMIN
Created on:	Jun 19, 2012 9:08 AM
Modified on:	Jun 19, 2012 9:08 AM
Description:	Snapshot created by automated build

Links

Create a new repository workspace

Create a new stream

Compare with snapshot

Compare with repository workspace or

Components

Shows the components in this snapshot.

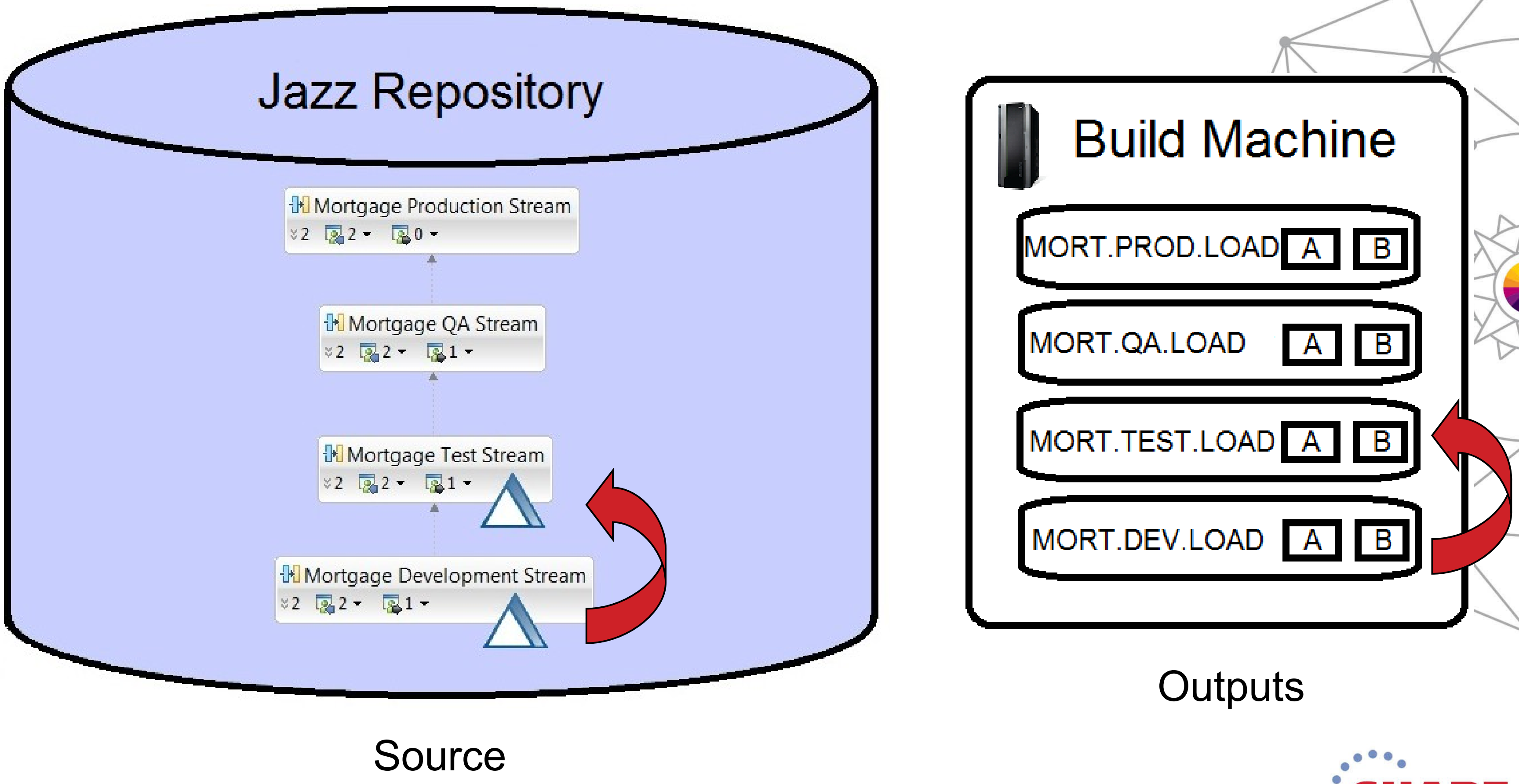
Liam Test RWS (4: MVS Dependency Build Dev_20111108-0955580222)

Mortgage Component (69: MVS Dependency Build Dev KA_20120619-0853550520)

plx test (2: MVS Dependency Build Dev_20110328-0857420358)

Promotion

- Flow source code changes and build outputs through the development hierarchy



Summary

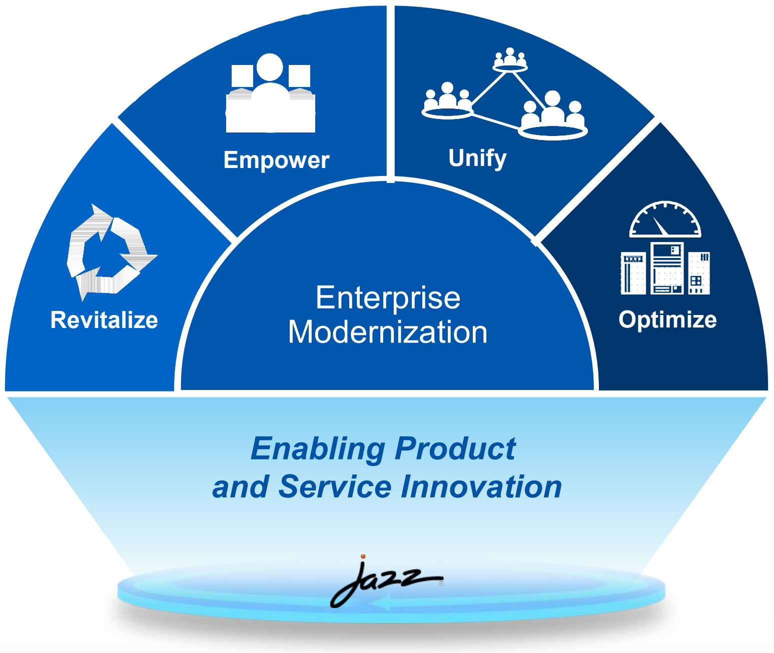
- Many companies spend more than 70% on keeping lights on, and that amount is increasing
- IT organizations have problems modifying applications at speed of business
- IBM provides a structured approach to incrementally modernize your portfolio based on business priorities
- Change without a plan is chaos
- A Plan without change is stagnation
- Business goals change
  - applications need to change to address them
- Continual renewal is required
  - tools help to guide, govern, drive, and accomplish this change

- Related sessions 14617,14616 & Exhibit Hall

Getting started

Next steps to modernize your enterprise applications

www.ibm.com/rational/modernization



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